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Short CV



Dr. Evangelos Pallis holds a PhD degree from the Electrical and Electronics Engineering dept., University of East London (February 2003), an MSc diploma in telecommunications for the same university (October 1997), and a BEng degree in electronics engineering from the Technological Educational Institute of Crete (April 1994). Currently, he acts as a full professor at the department of Electrical and Computer Engineering (ECE), School of Engineering of the Hellenic Mediterranean University (HMU), serving as Head of the “Research and Development of Telecommunications Systems” research group (PASIPHAE), which is part of the "Multimedia, Networks and Communications" Laboratory.

His academic activities are focused both at undergraduate and postgraduate levels, including lecturing in the fields of wireless networks, linear and interactive broadcasting, satellite and mobile communications, resource optimization and network virtualisation. He has supervised more than 50 diploma theses, 3 MSc dissertations, and has guided 7 PhD research in collaboration with other Greek and European universities. His academic activities are complemented by a series of invited lectures at other national and international universities, as well as external advisor/evaluator for academic programme of studies.

His research interests are in the fields of wireless networks and mobile communications, linear and interactive broadcasting, network/service management, QoS provision, and in service/network virtualization over SDN/NFV infrastructures. Results of his research efforts appear in 39 journal papers, 114 peer-reviewed conference publications, 8 books (2 of them under publication), 3 collective volumes, and 38 articles as book chapters (3 of them under publication). Part of his published research have been cited by other scientists' work, gathering more than 1900 citations in Google Scholar and more than 1000 in Scopus, accumulating h-index=26 and h-index=20 respectively. He has participated in more than 30 National and EU-funded R&D projects the last 15 years. Currently he is involved as institutional coordinator and scientific manager (Principal Investigator for HMU) in three R&D H2020 projects. He has also participated in a patent proposal that is under evaluation by the European Patent Office, “Forecasting Middleware Scheduler - EP16186667.8”.

In the framework of knowledge dissemination, Dr. Pallis acts as member of the IEE/IET and IEEE/ComSoc, member of the Editorial Board (Regional Editor) for the Information Technology Journal and the Research Journal of Information Technology (Science Alert), reviewer in a number of scientific publications such as the IEEE Network Magazine, COMNET (Elsevier), Journal of Network and Computer Applications (MDPI), and has also acted as member in numerous technical programme committees for international peer-reviewed conferences. He also holds the General Chair of the “International Conference on Telecommunications and Multimedia” (TEMU), which is technical co-sponsored by IEEE/ComSoc. Since May 2007, and has been announced as “distinguished member” by the Greek Association of Regional TV.

Dr. Pallis has also served as the Chair of the Broadcast & Multicast Cluster coordinating the efforts of 7 EU-funded projects (March 2006 to March 2008), and has participated in the standardisation efforts of IETF CDNi (June 2011 to April 2012), while from March 2017 he is contributing to the ETSI “NG112 Emergency Communications Plugtests”.

Personal information

Nationality:	Greek
Date of birth:	22/09/1971
Place of birth:	Athens, Attiki, Greece
Marital status:	Married, one child
Military service:	Fulfilled
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Education

- **BEng, Electronics Engineering dept.**, T.E.I. of Crete, April 1994.
- **MSc in telecommunications**, Electrical and Electronic Engineering Dept., University of East London, October 1997.
- **PhD in wireless communications**, thesis title “Towards the Provision of High Quality Interactive Multimedia Services via a Wireless Broadband Networking Infrastructure”, Electrical and Electronic Engineering Dept., University of East London, February 2003.

Appointments

Current positions

Full professor, Electrical and Computer Engineering dept., HMU (since October 2019)

Director of PASIPAHE research group, Informatics Engineering dept., TEI of Crete (since November 2005)

Researcher, Centre for Technological Research of Crete “CTR-Crete” (since October 2004)

Past positions

Full professor, Informatics Engineering dept., TEI of Crete (March 2017 to September 2019)

Deputy director, "Multimedia, Networks and Communications" Lab., Informatics Engineering dept., TEI of Crete (March 2016 to February 2020)

Departmental ERASMUS+ coordinator, Informatics Engineering dept., TEI of Crete (December 2014 to October 2019)

Associate professor (tenured), Informatics Engineering dept., TEI of Crete (March 2012 to February 2017)

Vice president, Informatics Engineering dept., TEI of Crete (September 2014 to September 2016)

Director of the Network Engineering division, Informatics Engineering dept., TEI of Crete (February 2013 to March 2019)

Assistant professor (tenured track): Informatics Engineering dept., TEI of Crete (February 2010 to March 2012)

Adjunct assistant professor, Informatics Engineering dept., TEI of Crete (November 2005 to February 2010)

Scientific associate, Marketing & Business dept. TEI of Crete (June 2004 to August 2005)

Laboratory and Scientific associate, Applied Informatics and Multimedia dept. TEI of Crete (September 2004 to November 2005)

Scientific associate, Programme of Study Selection on “Technology of Medical Systems”, TEI of Crete (September 2000 to July 2004)

Laboratory associate, Applied Informatics and Multimedia dept. TEI of Crete (March 1999 to June 2004)

Research associate, Institute of Informatics & Telecommunications “NCSR Demokritos” (November 1998 to June 2006)

Academic experience

Since 1999, I participated within a number of academic activities for tertiary education in the fields of telecommunications, networks and digital broadcasting, including lecturing on theoretical aspects as well as laboratory training for technological skills development. Nowadays, I act as the academic/scientific director for the “wireless networks” and “digital TV principles” modules at the undergraduate level, as well as for the “wireless networks” at the MSc level. Since 2003, I have supervised more than 50 BEng diploma theses, 5 MSc ones and 7 PhD research. Currently I am supervising 2 BEng degree theses, 1 MSc diploma thesis and 2 PhD research. My teaching/lecturing experience is complemented by a number of invited lectures for postgraduate students at other universities in Greece and abroad, as well as by a series of key-note talks at international summer-schools. I have acted as the coordinator (project manager) of two European-funded projects for ICT skills development in tertiary education: the “PervasivE netwoRks and ServicE infrastructUreS” (PERSEUS, ERA10-15351) that was funded by the ERASMUS LLP framework (2011-2014), and the “Next gEneration netwoRked mEdia over 4G+ infrastrUctureS” (NEREUS, KA2 2016-1-EL01-KA203-023637) that was funded under the ERASMUS+ framework (2016-2019).

Undergraduate teaching experience

Since 1999, I have lectured (laboratory and/or theory) on a series of modules in the department of Informatics Engineering at TEI of Crete, as well as in the Electrical and Computer Engineering dept. of the Hellenic Mediterranean University, among which are “introduction to telecommunications”, “introduction to electronics”, “telecommunication systems”, “data networks”, “wireless networks”, “ISDN networks”, “interactive terrestrial

digital TV”, “digital TV principles”, and “satellite communications”. Also, from September 2000 to July 2004 I have lectured in the "Technology of Medical Systems" programme at TEI of Crete, the modules "computer networks", “telemedicine”, "digital communication systems" and "introduction to telecommunications". As a faculty member – since 2005 – I acted as the departmental coordinator for the “wireless networks” and the “digital TV principles” modules, having the academic responsibility of the theoretical and laboratory courses.

MSc teaching/lecturing and thesis supervision

From 2001 to 2011 I guided 3 MSc research/dissertations in collaboration with the Brunel University, focused on the design, implementation and performance evaluation of converged IP/Broadcasting infrastructures for the provision of multimedia services with guaranteed QoS. Since 2012, I act as faculty member of the MSc programme “Informatics Engineering” at department of Electrical and Computer Engineering, Hellenic Mediterranean University, lecturing on “wireless networks” and having supervised 2 MSc in the field of Network Functions Virtualisation (NFV), while nowadays I am guiding 1 MSc research in the same scientific topic. My work in postgraduate teaching is also complemented by invited talks/lecturing in MSc programmes of other universities in Greece and abroad.

Role	Topic/subject	Year																		
		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019 until today
Thesis co-supervision	E. Markakis "Converging broadcasting and telecommunication technologies towards a broadband access infrastructure", Brunel, UK		■	■																
	A. Sideris "End-to-end quality of service in an interactive digital TV environment", Brunel, UK						■	■												
	N. Zotos "MPLS-DiffServ Experimental Network Infrastructure for Qos Provisioning", Brunel, UK							■	■											
Thesis supervision	I. Nikoloudakis "Design and implementation of a Virtual Network Function for Traffic classification", TEI of Crete, Greece															■	■			
	S. Bourazani "A Virtual Network Function (VNF) implementation used for P2P traffic optimization, within a cloud-based infrastructure", TEI of Crete, Greece																■	■		
	G. Alexiou "NFV Lifecycle Orchestration Management Platform", TEI of Crete, Greece																	■	■	
Invited lectures	Technologies and management of information systems, University of the Aegean, Samos, Greece							■												
	Content-aware networks & Network-aware services, University of the Aegean, Samos, Greece											■								
	Interactive Broadcasting & Future Internet, School of Computing & Information Systems, Kinston University, UK																			
	Interactive Digital TV and Cognitive Radio Networks, University of the Aegean, Samos, Greece																			
	From Analogue to Interactive Broadcasting: A roadmap to 5G, University of the Aegean, Samos, Greece																			
Teaching	Wireless networks, TEI of Crete, Greece																			
	Advanced Topics in Antennas, Propagation of EMF fields, and Wireless Networks, Hellenic Mediterranean University, Greece																			

Figure 1 Academic experience at MSc level since 2002 (thesis supervision, teaching and invited lectures)

PhD guidance and supervision

My PhD-supervision efforts/tasks started in 2004 in collaboration with the University of the Aegean, department of Information & Communication Systems Engineering, guiding the work of Dr./Prof. Mastorakis in the area of interactive broadcasting. The research was focused on a prototype DVB/IP platform that can deliver personalized multimedia services with high QoS. This PhD was carried-out entirely in PASIPHAE lab. premises, at TEI of Crete, and was completed in 2008. The successful completion of this PhD was followed by 4 more doctoral research in the fields of broadcasting, mobile/wireless and IP technologies, with 3 of them been carried in PASIPHAE lab. (Dr. Bourdena – 2013, Dr. Markakis – 2014, and Dr. Sideris – 2015) and one at the university of the Aegean premises (Dr. Makris - 2013). I have also collaborated with the University of Bordeaux I, CNRS Labri Lab for guiding the PhD research of Dr. Anapliotis, and with the University of Patras, department of Electrical and Computer Engineering for co-supervising the efforts of Dr. Efthimiopoulou. More specifically, the former (Dr. Anapliotis) was focused in the field of content-aware networking and QoS provision, was carried-out entirely in PASIPHAE lab., and was successfully completed in 2014 with distinction (Très Honorable). The latter (Dr. Efthimiopoulou), was in the area of the efficient resource exploitation in peer-to-peer video networks, was carried-out in university of Patras premises and was successfully completed in 2015.

Research topic/title	Year																		
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019 until today		
G. Mastorakis "Contribution to broadband metropolitan networking infrastructures utilising digital terrestrial television (DVB-T)", University of the Aegean, Samos, Greece																			
A. Bourdena "Study, design and development of novel architectures and technologies that exploit the digital spectrum dividend for the development of wireless local/metropolitan multimedia services infrastructures, University of the Aegean, Samos, Greece																			
P. Makris "Context aware resource management for mobile and fixed networking systems", University of the Aegean, Samos, Greece																			
E. Markakis "Contribution to Peer-to-Peer constellations in broadcasting environments", University of the Aegean, Samos, Greece																			
P. Anapliotis "Content aware networking for optimised resource exploitation", University of Bordeaux I, CNRS Labri Lab, France																			
M. Efthimiopoulou "Distributed control and optimization of peer to peer video streaming systems", University of Patras, Dept. of Electrical and Computer Engineering, Greece																			
A. Sideris "Dynamic network resource management and service adaptation in interactive digital broadcasting systems for achieving the maximum possible quality of service", University of the Aegean, Samos, Greece																			
N. Zotos "Dynamic energy resources management in P2P systems", University of the Aegean, Samos, Greece																			
I. Nikoloudakis "Dynamic Network Resource Management & Service Adaptation in Fog-Based environments for Real Time Media Delivery with Maximum Possible Quality of Experience", University of the Aegean, Samos, Greece																			

Figure 2 Guidance and supervision of PhD research since 2004

Currently, I am guiding the PhD research of Mr. Zotos in the field of energy efficiency in peer-to-peer networks, and the PhD efforts of Mr. Nikoloudakis in the area of network functions virtualization (NFV). Both of these PhDs are in collaboration with the University of the Aegean, department of Information & Communication Systems Engineering, and are being carried in PASIPHAE laboratory premises (HMU).

Research experience

My research activities are focused on the scientific area of wireless networking, including mobile communications, radio access and backbone networks, linear and interactive broadcasting, fixed/mobile convergence, network management and resource optimization for QoS provision, and service/network virtualization over SDN infrastructures (network functions virtualization – NFV). In this context, I have participated in 14 national competitive R&D projects, as well as in 18 European-funded projects of the 4th, 5th, 6th and 7th and the recent HORIZON-2020 frameworks.

In the framework of the national and EU-funded projects (32 in total), I have served as the Project Manager and Scientific Coordinator in six of them, as the Technical Manager in one project, Scientific Manager for the partner institution (principal investigator) in ten projects, while in the rest projects I have participated as Associate Researcher.

Also, within the framework of the EU-funded projects I have chaired the Broadcast & Multicast Cluster (through ATHENA project) from March 2006 to March 2008, I actively participated in the IETF CDNi standardization work (through the ALICANTE project) and I also contributed to the standardisation efforts of the ETSI "NG112 Emergency Communications Plugtests" group, through the project "EMYNOS".

Participation in national-funded R&D projects

Project acronym	Funding authority / framework	Partner institution	Position/Role in the project	Contract duration	Total project funding
ΑΜΦΙΤΡΥΩΝ	General secretariat for research and technology (EPETII)	IIT, NCSR Demokritos	Associate researcher	01/01/2000 to 31/03/2001	836.390 €
ΔΙΟΣΚΟΥΡΟΙ	General secretariat for research and technology (EPETII)	CRT-Crete	Scientific manager for CTR-Crete	01/12/2003 to 31/10/2005	179.972 €
ΚΕΡΒΕΡΟΣ	Hellenic Ministry of Education, Lifelong Learning and Religious Affairs (ARCHIMEDIS II)	TEI of Crete, Informatics Engineering dept.	Associate researcher	01/06/2006 to 31/12/2006	70.000 €
WWCIR	Hellenic Ministry of Education, Lifelong Learning and Religious Affairs (ARCHIMEDIS II)	TEI of Crete, Informatics Engineering dept.	Associate researcher	01/11/2005 to 30/06/2007	51.000 €

ΕΠΙΤΗΡΗΤΗΣ	Hellenic Ministry of Education, Lifelong Learning and Religious Affairs (ARCHIMEDIS II)	TEI of Crete, Informatics Engineering dept.	Associate researcher	10/11/2005 to 30/06/2007	83.650 €
I4CRETE	General secretariat for research and technology (Operational Programme Competitiveness)	CRT-Crete	Associate researcher	01/12/2006 to 30/04/2007 & 02/01/2008 to 30/04/2008 & 09/06/2008 to 31/10/2008	4.980.351,63 €
ΠΑΣΙΦΑΗ	General secretariat for research and technology (PEP Kritis)	CTR-Crete	Scientific and Technical Project Manager	04/09/2006 to 31/03/2008	537.780 €
ΔΙΑΜΟΥΣΕΣ	General secretariat for research and technology (PEP Kritis)	TEI of Crete, Informatics Engineering dept.	Associate researcher	01/10/2006 to 31/12/2006 & 01/04/2007 to 31/08/2007 & 01/10/2007 to 31/03/2008	638.332 €
PERSEUS I	Hellenic Ministry of Education, Lifelong Learning and Religious Affairs (ERASMUS)	TEI of Crete, Informatics Engineering dept.	Scientific and Technical Project Manager	01/09/2011 to 31/08/2012	33.547 €
VELLEREFONTS	Hellenic Ministry of Education, Lifelong Learning and Religious Affairs (ARCHIMEDIS III)	TEI of Crete, Informatics Engineering dept.	Scientific and Technical Project Manager	01/09/2012 to 31/10/2015	82.000 €
ANTENA	Hellenic Ministry of Education, Lifelong Learning and Religious Affairs (ARCHIMEDIS III)	TEI of Crete, Informatics Engineering dept.	Associate researcher	01/03/2012 to 31/05/2013	80.000 €
PERSEUS II	Hellenic Ministry of Education, Lifelong Learning and Religious Affairs (ERASMUS)	TEI of Crete, Informatics Engineering dept.	Scientific and Technical Project Manager	01/09/2012 to 31/08/2013	35.741 €
PERSEUS III	Hellenic Ministry of Education, Lifelong Learning and Religious Affairs	TEI of Crete, Informatics Engineering dept.	Scientific and Technical Project Manager	01/09/2013 to 31/08/2014	35.741 €

	(ERASMUS)				
POLYSHEILD	Ministry of Economy and Development OPERATIONAL PROGRAMME 'COMPETTIVENESS AND ENTREPRENEURSHIP' (OPCE II)	Hellenic Mediterranean University , Electrical and Computer Engineering dept.	Associate researcher	05/10/2018 – 27/06/2021	887.500 €

Participation in EU-funded R&D projects

Project acronym	Funding framework	Partner institution	Position/Role in the project	Contract duration	Total project funding
CRABS (AC. 215, ACTS 96)	European Commission (ACTS)	IIT, NCSR Demokritos	Associate researcher	23/03/1998 – 30/06/1999	11.319.000 €
MAMBO (FP5-IST-26298)	European Commission (IST-FP5)	IIT, NCSR Demokritos	Associate researcher	01/07/2001 – 31/12/2001	4.900.000 €
SOQUET (FP5-IST-28521)	European Commission (IST-FP5)	IIT, NCSR Demokritos	Associate researcher	01/01/2002 – 31/12/2003	3.723.000 €
REPOSIT (FP5-IST-34692)	European Commission (IST-FP5)	IIT, NCSR Demokritos	Associate researcher	01/03/2004 – 31/10/2004	2.410.000
ATHENA (IST-FP6-507312)	European Commission (ICT-FP6)	CTR-Crete	Technical Project manager	01/01/2004 – 30/06/2006	2.150.000 €
IMOSAN (IST-FP6-025457)	European Commission (IST-FP6)	CTR-Crete	Scientific manager for CTR-Crete	03/01/2006 – 30/06/2008	2.700.000 €
VITAL++ (FP7-ICT-224287)	European Commission (ICT-FP7)	CTR-Crete	Scientific manager for CTR-Crete	01/06/2008 – 31/11/2010	2.000.000 €
CLIQ	INTERREG IVC	CTR-Crete	Associate researcher	17/07/2010 – 31/10/2011	1.951.637€
ALICANTE (FP7-ICT-248652)	European Commission (ICT-FP7)	TEI of Crete	Scientific manager for TEI of Crete	05/03/2010 – 04/03/2011 & 09/03/2011 – 31/08/2013	7.268.403 €
3DConTourNet (COST-IC1105)	European Commission (COST Action)	Individual participation	Member of the Management Committee	22/05/2012 – 30/04/2016	130.000 €

T-NOVA (FP7-ICT-619520)	European Commission (ICT-FP7)	TEI of Crete	Scientific manager for TEI of Crete	15/01/2014 – 31/12/2016	6.743.000 €
EMYNOS (H2020-DRS-19-2014-653762)	European Commission (H2020)	TEI of Crete	Technical manager of the project	01/09/2015 – 28/02/2018	4.130.493 €
NEREUS (KA2, 2016-1-EL01-KA203-023637)	European Commission ERASMUS+ (KA2 - Strategic Partnerships for higher education)	Hellenic Mediterranean University , Electrical and Computer Engineering dept.	Scientific and Technical Project manager	01/09/2016 – 31/08/2019	254.656 €
FORTIKA (H2020-DS-SC7-2016-740690)	European Commission (H2020)	Hellenic Mediterranean University , Electrical and Computer Engineering dept.	Scientific manager for HMU	01/06/2017 to 31/05/2020	3.997.025 €
SMILE (H2020-SEC-2016-2017-1-740931)	European Commission (H2020)	Hellenic Mediterranean University , Electrical and Computer Engineering dept.	Scientific manager for HMU	01/07/2017 to 30/06/2020	4.999.276 €
SPHINX (H2020-SC1-FA-DTS-2018-1-826183)	European Commission (H2020)	Hellenic Mediterranean University , Electrical and Computer Engineering dept.	Scientific manager for HMU	01/01/2019 to 31/12/2021	4.999.435 €
SHAPES (H2020-SC1-FA-DTS-2018-2)	European Commission (H2020)	Hellenic Mediterranean University , Electrical and Computer Engineering dept.	Scientific manager for HMU	01/11/2019 – 30/11/2023	18.732.468 €
5D-Aerosafe (H2020-MG-2018-2019-2023)	European Commission (H2020)	Hellenic Mediterranean University , Electrical and Computer Engineering dept.	Scientific manager for HMU	01/05/2020 – 30/04/2023	3.497.475 €

Publications

Scientific publications in peer-reviewed journals (published)

Table 1 Journal publications since 1999

Year	As 1st author	2nd and beyond	Total
1999		1	1
2000		1	1
2002	1	0	1
2006	1	2	3
2007		1	1
2008		2	2
2010	1	1	2
2011		1	1
2012		2	2
2013		1	1
2014		4	4
2015		4	4
2016		3	3
2017		5	5
2018		3	3
2019		3	3
2020		2	2
Total	3	36	39

J1. A. Kourtis, Ch. Mantakas, E. Pallis, “Broadband Interactive Services and Digital Television at 42 GHz”, *International Journal of Communication Systems*, January 1999, Vol. 12, pp. 12-22.

Abstract: This paper describes and evaluates the first results, from a trial under real conditions, of a wireless cellular interactive network at 42 GHz, for broadband services and digital (MPEG-2) television, realized in the frame of an European Union program, in the area of Athens. The adopted system architecture and network configuration are described and technical data concerning the development of the interactive services are provided. The performance of the system is also evaluated.

J2. G. Kormentzas, E. Pallis, A. Kourtis, K. Kontovasilis, “A Broadband Wireless Access System for Wired and Wireless LANs”, *Journal of Communications and Networks*, September 2000, Vol. 2, No. 3, pp. 259-265, ISSN 1229-2370.

Abstract: The paper presents a broadband wireless access system for wired and wireless LANs. The system supports the provision of Internet access and of multimedia services of moderate bandwidth requirements (such as the reception of short audio and video clips) with a guaranteed minimum throughput. Design issues, as well as a prototype implementation, are discussed. The prototype has served as a testbed for conducting performance measurements and the paper reports on relevant results. Details on the prototype's operational status and on user feedback are included together with a vision for future exploitation and extensions.

- J3.** E. Pallis, A. Kourtis, A. Alexandridis, M.C.B. Smith “Wireless provision of true VoD services and fast access to Internet”, *International Journal of Communication Systems*, March 2002, Vol. 15, Issue 5, pp.401-415.

Abstract: The evolution of digital compression techniques has made possible the provision of full-motion video services through networking infrastructures of sufficient bandwidth. This paper presents a wireless broadband network, which is capable of providing true interactive VoD services (with full VCR functions) and fast access to Internet to a number of simultaneous clients. The network is based on frequency hopping spread spectrum (FHSS) technology operating in the 2:4 GHz frequency band. The paper describes the system architecture and configuration adopted in a real environment trial and elaborates on the provided picture quality in a multi-client environment.

- J4.** E. Pallis, C. Mantakas, G. Mastorakis, A. Kourtis, V. Zacharopoulos, “Digital Switchover in UHF: the ATHENA concept for broadband access”, *European Transactions on Telecommunications*, March 2006, Vol. 17, Issue 2, pp. 175-182.

Abstract: This paper presents a concept adopted by ATHENA IST-507312 project for the proper adoption of digital switchover (DSO) in UHF, towards establishing broadband access especially in rural and less favoured regions. Taking into account the local and networking capabilities of terrestrial digital video broadcasting standard (DVB-T), and by building on three pillars (a) the regenerative DVB-T concept, (b) the backhaul configurations and (c) the ‘bit-rate allocation’ aspect rather than the ‘frequency allocation’ one, it designs, implements and validates a broadband Fusion environment, which is capable of enabling access not only to digital TV bouquets, but also and most predominant to Information Society services, such as Internet, e-mail, multimedia on demand etc. within the same stream. Citizens access them via intermediate distribution nodes, namely cell main nodes (CMNs). Such a Fusion environment is commonly shared among broadcasters, telecom operators and active users/citizens, for open competition in technological and service level, in content creation and delivery level, in networking business/market field. Finally, the paper elaborates on the potentialities of the DSO in UHF to provide not only digital TV bouquets, but also a broadband access Fusion environment in regional level.

- J5.** H. Koumaras, G. Gardikis, G. Xilouris, E. Pallis, A. Kourtis, “Shot Boundary Detection without Threshold Parameters”, *Journal of Electronic Imaging (JEI), SPIE, IS&T*, April 2006 Vol.15, No.2, doi: 10.1117/1.2199878.

Abstract: Automatic shot boundary detection is a field, where many techniques and methods have been proposed and have claimed to perform reliably, especially for abrupt scene cut detection. However, all the proposed methods share a common drawback: the necessity of a threshold value, which is used as a reference for detecting scene changes. The determination of the appropriate value or the dynamic reestimation of this threshold parameter remains the most challenging issue for the existing shot boundary detection algorithms. We introduce a novel method for shot boundary detection of discrete cosine transform (DCT)-based and low-bit-rate encoded clips, which exploits the perceptual blockiness effect detection on each frame without using any threshold parameter, therefore minimizing the processing demands required for algorithm implementation.

- J6.** G. Mastorakis, E. Pallis, C. Mantakas, G. Kormentzas, C. Skianis, “Exploiting Digital Switchover for Broadband Services Access in Rural Areas”, *Journal of Communications*, Sept. 2006, Vol. 1, No. 6, pp. 45-50.

Abstract: The paper discusses how the imminent transition to the digital terrestrial television in UHF (Digital Switchover) could be employed towards enabling always-on connectivity and triple-play services access even from rural and dispersed locations, i.e. in areas where no termination/connection exists between the local PSTN exchanger and the optical fibre core backbone. Exploiting the European digital video broadcasting standard in regenerative configurations, the paper introduces an architecture that utilises the television stream as a common broadband infrastructure, capable to deliver not only custom digital television bouquets, but also and most predominant, to provide access to triple-play services.

Utilising this television beam in backhaul (middle-mile) configurations it extends the core backbone to reach rural and dispersed locations, enabling therefore the immediate and cost-effective deployment (in these areas) of technologies that provide for always-on connectivity, such as WLAN, xDSL, etc.

- J7.** G. Mastorakis, G. Kormentzas, E. Pallis, “A Fusion IP/DVB Networking Environment for Providing Always-On Connectivity and Triple-Play Services to Urban and Rural Areas”, *IEEE Network Magazine*, March/April 2007, Vol. 21, No. 2, pp. 21-27.

Abstract: This article introduces and validates a concept for the realization of a fusion IP/DVB networking environment that supports the provision of urban and rural always-on connectivity and triple-play services. Specifically, the proposed fusion environment realizes a unified infrastructure that changes traditional, passive urban users into active, information society participants capable of creating, manipulating, and distributing their own content/services over a commonly exploited infrastructure. Further, the environment enables triple-play services and always-on connectivity in rural areas, that is, in regions where there is no termination of the core backbone to the local PSTN/ISDN exchanger. Finally, the article describes important directions for future research to follow to exploit the proposed IP/DVB unified platform for the synergy of emerging broadcasting, telecommunications, wireless, and wired technologies, to alleviate the digital divide that currently exists not only among countries but also within most countries.

- J8.** G. Gardikis, S. Orfanos, A. Kourtis, G. Kormenzas, E. Pallis, “Dynamic IP Configuration of Terminals in Broadcasting Networks”, *Computer Networks*, January 2008, Volume 52, Issue 1, pp. 292-302.

Abstract: The concept of synergy between broadcasting and telecommunication networks has been strengthened by the emergence of multi-modal terminals, which are used in a broadcast environment (mainly in DTV-Digital Television networks) to provide IP-based multimedia services. The migration of IPv4/IPv6 applications, either interactive or not, in a broadcasting network, requires that certain parameters, such as Host, Gateway and DNS IP addresses are configured in the terminals, either statically or dynamically. This paper discusses issues of dynamic configuration of IP parameters for DTV terminals, based on an overview of relevant mechanisms usually used in access networks. It proposes an IP-based autoconfiguration protocol tailored to the needs of an IP/DTV access platform, describes its implementation and evaluates its behaviour in a laboratory-based DVB-T network.

- J9.** G. Mastorakis, G. Kormentzas, E. Pallis, “A DVB/IP QoS aware Backhaul Networking Environment”, *Special Issue on Resource and Mobility Management and Cross-Layer Design for the Support of Multimedia Services in Heterogeneous Emerging Wireless Networks, Wireless Personal Communications*, November 2008, Volume 52, Issue 3, pp. 637-649, DOI: 10.1007/s11277-008-9625-8.

Abstract: The paper discusses a DVB/IP backhaul networking environment that enables users to access triple-play IP services at a guaranteed end-to-end QoS level. Utilising the DVB-T stream in a regenerative configuration, it presents the formation of a QoS aware backhaul that interconnects intermediate distribution nodes and service/content providers (e.g. ISPs, IPTV multicasters, etc.), for enabling always-on and triple-play services access, even from rural or dispersed areas. The capability of the proposed QoS aware DVB/IP backhaul networking environment is validated through experimental tests, that were conducted under real transmission/reception conditions at a prototype infrastructure that conforms to the discussed architectural design issues.

- J10.** E. Pallis, D. Negru, and A. Bourdena, “Hybrid Terrestrial-Satellite DVB/IP Infrastructure in Overlay Constellations for Triple-Play Services Access in Rural

Areas” *International Journal of Digital Multimedia Broadcasting*, Vol. 2010, Article ID 913421, 11 pages, 2010. doi:10.1155/2010/913421

Abstract: This paper discusses the convergence of digital broadcasting and Internet technologies, by elaborating on the design, implementation, and performance evaluation of a hybrid terrestrial/satellite networking infrastructure, enabling triple-play services access in rural areas. At local/district level, the paper proposes the exploitation of DVB-T platforms in regenerative configurations for creating terrestrial DVB/IP backhaul between the core backbone (in urban areas) and a number of intermediate communication nodes distributed within the DVB-T broadcasting footprint (in rural areas). In this way, triple play services that are available at the core backbone, are transferred via the regenerative DVB-T/IP backhaul to the entire district and can be accessed by rural users via the corresponding intermediate node. On the other hand, at regional/national level, the paper proposes the exploitation of a satellite interactive digital video broadcasting platform (DVB S2/RCS) as an overlay network that interconnects the regenerative DVB-T/IP platforms, as well as individual users, and services providers, to each other. Performance of the proposed hybrid terrestrial/satellite networking environment is validated through experimental tests that were conducted under real transmission/reception conditions (for the terrestrial segment) and via simulation experiments (for the satellite segment) at a prototype network infrastructure.

J11. Nikolaos Zotos, Evangelos Pallis, and Anastasios Kourtis, “Performance Evaluation of Triple Play Services Delivery with E2E QoS Provisioning” *International Journal of Digital Multimedia Broadcasting*, Vol. 2010, Article ID 836501, 14 pages, 2010. doi:10.1155/2010/836501G.

Abstract: The creation and wide use of new high quality demanding services (VoIP, High Quality Video Streaming) and the delivery of them over already saturated core and access network infrastructures have created the necessity for E2E QoS provisioning. Network Providers use at their infrastructures several kinds of mechanisms and techniques for providing QoS. Most known and widely used technologies are MPLS and DiffServ. The IEEE 802.16-2004 standard (WiMAX) refers to a promising wireless broadband technology with enhanced QoS support algorithms. This document presents an experimental network infrastructure providing E2E QoS, using a combination of MPLS and DiffServ technologies in the core network and WiMAX technology as the wireless access medium for high priority services (VoIP, High Quality Video Streaming) transmission. The main scope is to map the traffic prioritization and classification attributes of the core network to the access network in a way which does not affect the E2E QoS provisioning. The performance evaluation will be done by introducing different kinds of traffic scenarios in a saturated and overloaded network environment. The evaluation will prove that this combination made feasible the E2E QoS provisioning while keeping the initial constraints as well as the services delivered over a wireless network.

J12. G. Mastorakis, E. Pallis, V. Zacharopoulos, A. Bourdena, “New Business Strategies and Marketing Opportunities Utilizing a Liberalized Spectrum Management Framework”, *Transactions on Business and Economics*, April 2011, Vol. 8, Issue 2, pp. 39-49.

Abstract: The current global move to switch from analogue to digital terrestrial television has opened up an opportunity for the re-allocation of valuable spectrum resources in VHF/UHF frequencies. In one way, spectrum bands once used for analogue TV broadcasting will be completely cleared, leaving a space for deploying new licensed wireless services, and in another way, digital terrestrial television technology geographically interleaves spectrum bands to avoid interference between neighboring stations, leaving a space for deploying new unlicensed wireless services. In this context, this paper studies spectrum availability in VHF/UHF frequencies, elaborates on their exploitation under a dynamic management approach and discusses their potential business strategies for introducing secondary systems/services within primary bands (i.e. TV bands). Following existing technological and scientific approaches for dynamic spectrum access, it presents a liberalised spectrum exploitation, based on “spectrum commons” and “spectrum markets” regimes rather than the custom “command and control” one.

- J13.** Gardikis, G. Xilouris, E. Pallis, A. Kourtis, "Joint Assessment of Network- and Perceived-QoS in Video Delivery Networks", Special Issue on the "Quality of Experience issues in Multimedia Provision", *Telecommunication Systems, Springer*, January 2012, Volume 49, Issue 1, pp 75–84.

Abstract: Given the increasing number of IP streaming video customers, service providers are seeking an efficient way to monitor in real time the offered quality of service, as perceived by each end user. Since real-time video quality assessment via image processing algorithms is quite bandwidth- and processing-power-demanding, a feasible alternative could be to monitor the network-level quality of service (NQoS) and associate it with the perceived QoS (PQoS). This article presents a network-agnostic framework for the joint assessment of N- and PQoS, with the aim of correlating these two parameters for a specific network and service configuration. This framework/architecture is implemented with open source software tools and is being demonstrated in an actual WiMAX streaming video distribution platform.

- J14.** Georgios Gardikis, Lemonia Boula, George Xilouris, Anastasios Kourtis, Evangelos Pallis, Mamadou Sidibé, Daniel Négru, "Cross-layer Monitoring in IPTV Networks", *IEEE Communications Magazine*, July 2012, Vol. 5, Issue 7, pp. 77-84.

Abstract: In a time when media content, including user-generated one, is flooding the Internet and WebTV services are becoming more and more attractive and competitive, "fenced wall" IPTV operators need to come up with clear benefits, focusing on high content quality and guaranteed QoS/QoE. Quality guarantees can be achieved only via an end-to-end network and service management architecture, supported by an efficient monitoring system. This article discusses cross-layer IPTV service and network monitoring approaches, presenting overall aims and challenges, metrics to be monitored and measurement strategies according to point of observation (in-network or client-side monitoring). Finally, it presents the monitoring system developed within the ALICANTE research project as an example of a complete end-to-end, cross-layer monitoring framework for media services.

- J15.** A. Bourdena, G. Mastorakis, E. Pallis, G. Kormentzas, "A Routing Protocol for Enhanced Efficiency in Cognitive Radio Networks", *Journal of Communications and Computers*, May 2013, Vol. 10, No 5, pp. 675-685.

Abstract: This paper proposes a novel routing protocol enriched with an assigning mechanism that enables for efficient data flow coordination, among communication nodes with heterogeneous spectrum availability in distributed cognitive radio networks. Efficient routing protocol operation, as a matter of maximum-possible routing paths establishments and minimum delays is obtained, by utilizing a signaling mechanism that was developed based on a simulation scenario. This simulation scenario includes a number of secondary communication nodes, operating over television white spaces (TVWS) under the "spectrum of commons" regulation regime. The validity of the proposed routing protocol for enhanced efficiency in cognitive radio networks is validated, by conducting experimental simulations and obtaining performance evaluation results. Simulation results verified the efficiency of the proposed routing protocol for minimizing routing delays among secondary communication nodes and identified fields for further research.

- J16.** Bourdena, E. Pallis, G. Kormentzas, G. Mastorakis, "A prototype cognitive radio architecture for TVWS exploitation under the real time secondary spectrum market policy", *Physical Communication, Elsevier*, March 2014, Vol. 10, pp. 159-168.

Abstract: This paper elaborates on the design and implementation of a prototype system architecture enabling for TVWS exploitation by LTE Advanced systems, under the real time secondary spectrum market policy. It describes a centralized infrastructure-based cognitive radio network, where dynamic TVWS allocation among unlicensed systems is administrated by a spectrum broker, carrying out radio-resource management and spectrum trading in real time. For efficient system performance as a matter of both maximum-possible radio resource exploitation and trading revenue, the paper discusses the design

and implementation of a prototype mechanism at the spectrum broker side, which exploits the backtracking algorithm for obtaining the best-matching solution. Performance evaluation experiments carried-out under controlled conditions (i.e. simulation) verified the validity of the proposed architecture, besides establishing its capacity for maximum spectrum utilization and minimum fragmentation under a fixed-price trading policy.

- J17.** C. X. Mavromoustakis, G. Mastorakis, A. Bourdena, E. Pallis, “Energy Efficient Resource Sharing using a Traffic-oriented Routing Scheme for Cognitive Radio Networks”, *IET Networks Journal*, March 2014, Vol. 3, No.1, pp. 54-63 **The paper received the “IET Premium Award” in 2015.**

Abstract: This study proposes a resource intensive traffic-aware scheme, incorporated into an energy-efficient routing protocol that enables maximum energy conservation and efficient data flow coordination, among secondary communicating nodes with heterogeneous spectrum availability in cognitive radio networks. The proposed scheme associates the backward difference of the traffic moments of each node according to a Fibonacci model, with the sleep-time duration, in order to tune the activity periods for achieving optimal energy conservation. Efficient routing protocol operation, as a matter of maximum-possible routing paths establishments and minimum delays is obtained, by utilising a signalling mechanism, developed based on a simulation scenario that includes secondary communication nodes, operating over television white spaces. The validity of the proposed Fibonacci-based backward traffic difference is verified, by conducting experimental simulation tests. Simulation results validate the efficiency of the proposed traffic-aware scheme for minimising energy consumption and routing delays, as well as maximising resources exchange between secondary communication nodes.

- J18.** A. Bourdena, E. Pallis, G. Kormentzas, G. Mastorakis, “Efficient Radio Resource Management Algorithms in Opportunistic Cognitive Radio Networks”, *Emerging Telecommunication Technologies*, Wiley, August 2014, Vol. 25, No. 8, pp. 785-797.

Abstract: Cognitive radio (CR) paradigm was introduced, towards addressing challenges, related with radio spectrum scarcity and increased needs for wireless networking services provision. In this direction, CR networks exploit novel networking architectures, as well as dynamic radio spectrum access techniques and methods, alleviating problems, regarding limited wireless networking resources and their inefficient usage/exploitation. CR terminals exploit innovative mechanisms to identify unused parts of radio spectrum, such as TV white spaces (TVWS) in ultra-high frequency/ frequency bands following an interference-free opportunistic manner. However, introduction of CR networks creates new challenges that are highly related to the fluctuation of TVWS, as they vary over time and location, as well as issues related to diverse Quality of Service requirements. In this context, this paper proposes two radio resource management (RRM) algorithms, enabling for the opportunistic exploitation of TVWS in a centralised CR networking architecture. Efficient administration of radio spectrum resources is achieved, by exploiting a novel RRM framework, adopted in a spectrum broker, which is in charge to effectively orchestrate the available wireless networking resources. Efficient RRM algorithms performance, as a matter of maximum-possible spectrum broker benefit and radio spectrum utilisation, as well as minimum-possible spectrum fragmentation is evaluated, by considering a fixed-price and an auction-based optimization approach. Experimental tests that were conducted under controlled simulation conditions, confirmed the validity of both RRM algorithms adopted in the proposed CR networking architecture, identifying fields for further research and experimentation.

- J19.** A. Bourdena, C. X. Mavromoustakis, G. Kormentzas, E. Pallis, G. Mastorakis, Muneer Bani Yassein, "A Resource Intensive Traffic-Aware Scheme using Energy-efficient Routing in Cognitive Radio Networks", *Future Generation Computer Systems*, Elsevier, October 2014, Vol. 39, pp. 16-28.

Abstract: This paper proposes a resource intensive traffic-aware scheme, incorporated into an energy-efficient routing protocol that enables energy conservation and efficient data flow coordination, among secondary communicating nodes with heterogeneous spectrum availability in distributed cognitive radio

networks. The proposed scheme associates the backward difference traffic moments with the Sleep-time duration to tune the activity durations of a node for achieving optimal energy conservation and alleviating the uncontrolled energy consumption of wireless devices. Efficient routing protocol operation, as a matter of maximum energy conservation, maximum-possible routing paths establishments and minimum delays is obtained, by utilizing a signalling mechanism, developed based on a simulation scenario that includes a number of secondary communication nodes. The validity of the proposed resource intensive traffic-aware scheme and the energy-efficient routing protocol is estimated and verified, by conducting experimental simulation tests and obtaining performance evaluation results. The simulation results validated the efficiency of the proposed scheme and the effectiveness of the routing protocol, in terms of minimizing the energy consumption and maximizing resources exchange between secondary communication nodes in a distributed cognitive radio network.

- J20.** C .X. Mavromoustakis, A. Bourdena, G. Mastorakis, E. Pallis, G. Kormentzas, "An Energy-Aware Scheme for Efficient Spectrum Utilization in a 5G Mobile Cognitive Radio Network Architecture", *Special Issue on Energy Efficient 5G Wireless Technologies, Springer Telecommunication Systems Journal*, May 2015, Volume 59, Issue 1, pp 63–75

Abstract: This paper proposes an energy-efficient delayaware cooperative scheme, exploited for efficient resource management and maximum energy conservation in a 5G mobile cognitive radio network architecture. The proposed scheme is based on the comparison of the queuing delays of both the secondary nodes and the Radio Access Points, when delay sensitive transmission is requested, providing optimal TV White Spaces exploitation via a spectrum broker. The spectrum broker manages the process of the energy consumption of the 5G mobile communication systems, according to the proposed delay-aware cooperative scheme and the comparative evaluation of the queuing delays. The validity of the performance of the scheme is verified through extended simulation tests, carried out under controlled experimental conditions.

- J21.** C. X. Mavromoustakis, G. Mastorakis, A. Bourdena, E. Pallis, "Using Incoming Traffic for Energy-Efficient Routing in Cognitive Radio Networks", *Journal of Information Technology Research (JITR), IGI-Global*, 2015, pages 24, DOI: 10.4018/JITR.2015010102

Abstract: This paper proposes an energy-efficient routing scheme that is based on a resource intensive traffic-aware approach, enabling for the maximization of the energy conservation in cognitive radio networks. The proposed approach interrelates the moments of the backward difference traffic, together with the sleep-time duration, towards tuning the activity periods of the network nodes. The effective operation of the proposed scheme, in terms of minimum energy consumption, minimum delays and maximum number of the routing paths established, is achieved through the exploitation of a signalling mechanism. The validity of the proposed traffic-aware scheme is tested, through several simulation tests, by obtaining multiple performance evaluation results. The experimental results verified the proper operation of the proposed scheme to maximize the energy conservation, optimize the data exchange among the network nodes and minimize the routing delays.

- J22.** O. Shiakallis, C. X. Mavromoustakis, G. Mastorakis, A. Bourdena, E. Pallis, "Traffic-based S-MAC: A novel Scheduling Mechanism for Optimized Throughput in Mobile Peer-to-Peer Systems", *International Journal of Wireless Networks and Broadband Technologies, IGI-GLOBAL*, 2015, pages 19, DOI: 10.4018/ijwnbt.2015010105

Abstract: Mobile Peer-to-Peer (MP2P) is a networking paradigm that will be exploited in the future to support technological advances and systems for the efficient provision of multiple services to mobile users. In a general context, the mobile community seeks to invest in on-the-fly services, by minimizing the effort and the increasing mobile users' performance. In this framework, the mobile Ad-Hoc Networks provide mobile nodes the flexibility of operating as flexible networking points, without the use of a centralized

entity, where issues such as the energy consumption and the data packets transmission failure arise along with many more. Towards minimizing the factors that contribute to the increased consumption of the energy and the resources, as well as the loss of data, a Traffic-based S-MAC protocol is proposed in this paper to increase the data exchange and preserve the energy conservation, among the nodes in mobile Ad-Hoc Networks. The performance of the proposed protocol was thoroughly evaluated, by conducting multiple experimental results. The results verify the efficient performance of the protocol and indicate fields for further research and experimentation.

- J23.** C. X. Mavromoustakis, G. Mastorakis, A. Bourdena, E. Pallis, “Energy Efficient Management using a Traffic-oriented Routing Scheme for Cognitive Radio Networks”, *International Journal of Network Management, Wiley*, November/December 2015, Volume 25, Issue 6, pp. 418–434.

Abstract: This paper proposes a resource intensive traffic-aware scheme, incorporated into an energy-efficient routing protocol that enables maximum energy conservation and efficient data flow coordination, among secondary communicating nodes with heterogeneous spectrum availability in ubiquitous cognitive radio networks. The proposed scheme associates the backward difference of the traffic moments of each node according to a Fibonacci model, with the sleep-time duration, in order to tune the activity durations of a node for achieving optimal energy conservation. Efficient routing protocol operation, as a matter of maximum energy conservation, maximum-possible routing paths establishments and minimum delays is obtained, by utilizing a signalling mechanism, developed based on a simulation scenario that includes secondary communication nodes, operating over television white spaces (TVWS). The validity of the proposed Fibonacci-based Backward Traffic Difference (F-BTD) is thoroughly evaluated and energy-efficient routing protocol is verified, by conducting experimental simulation tests and obtaining performance evaluation results. Simulation results validated the efficiency of the proposed traffic-aware scheme and the effectiveness of routing protocol, for minimizing energy consumption, maximizing resources exchange between secondary communication nodes and minimizing routing delays.

- J24.** Y. Kryftis, G. Mastorakis, C. X. Mavromoustakis, J. M. Batalla, E. Pallis and G. Kormentzas, “Efficient Entertainment Services Provision over a Novel Network Architecture”, *IEEE Wireless Communications Magazine*, February 2016, Volume: 23 Issue: 1, pp. 14-21.

Abstract: The provision of entertainment services through current network infrastructures generates a significant part of global Internet traffic. Such traffic is created by users who are interconnected through social media networks, distributing multimedia content, as well as through their online games interaction, leading to a significant increase in data traffic demands. At the same time, users demand the high-quality content delivery necessary for such multimedia-based services and applications. In this article, a novel network architecture is proposed that exploits a resource prediction engine to predict the upcoming demands on resources for the optimal distribution of streaming data among content delivery networks, emerging mobile networks, cloudbased providers, and home media gateways. Performance evaluation experiments carried out under controlled conditions verify the validity of the proposed network architecture and establish its effectiveness for efficient resources prediction during the provision of entertainment services.

- J25.** Y. Nikoloudakis, S. Panagiotakis, E. Markakis, E. Pallis, G. Mastorakis, C. X. Mavromoustakis and C. Dobre, "A Fog-based Emergency System for Smart Enhanced Living Environments", *IEEE Cloud Computing Magazine*, December 2016, vol. 3, Issue 6, pp. 54–62.

Abstract: The emergence of ubiquitous computing paradigms, empowered by the upcoming 5th generation networking (5G), as well as emerging smart Ambient Intelligence environments, might play a crucial role, towards creating better living environments for activity challenged individuals, such as disabled, or elderly people that require constant care. In addition, cloud computing has been an empowering force for that endeavour, albeit raising several ethical, security and user experience issues. In

this article, we present a virtualised Fog-based infrastructure, harvesting and managing distributed, IT resources, shifting the entire cloud functionality at the network edge, utilizing the cloud in an assistive manner to ensure the resources-wise system's robustness. The presented infrastructure facilitates an Ambient Assisted Living emergency system, which alerts the nearest responding authority, when the target user wanders-off and leaves the house premises, employing an outdoor positioning mechanism, emergency protocols such as LoST, and Internet of Things communication protocols such as MQTT.

- J26.** Y. Rebahi, M. S. Ghamsi, N. Herbaut, D. Negru, P. M. Comi, P. S. Crosta, P. Lorenz, E. Pallis and E. K. Markakis, "Virtual Network Functions Deployment Between Business Expectations and Technical Challenges: The T-NOVA Approach", *Recent Advances in Communications and Networking Technology journal*, 2016, Volume 5 , Issue 1 , pp. 49 - 64.

Abstract: This paper belongs to the series of research documents describing the progress in the specification and development of the T-NOVA framework offering a marketplace for virtual network functions. T-NOVA is an international research project co-funded by the European Commission. Although, the idea of having a marketplace enabling buying, composing, and deploying “virtual” services on the fly, is promising, its implementation or prototyping remains far from realization. This is mainly due to the limitations in the existing cloud computing platforms on top of which the services should be built. In this paper, we discuss the T-NOVA approach and in particular some of the Virtual Network Functions (VNFs) that were developed in this context. A special focus is on the design and specification of the VNFs as well as the related technical challenges that were faced when deployed within the marketplace. Some experiments and test results are also provided.

- J27.** E. Markakis, A. Lykourgiotis, I. Politis, A. Dagiuklas, Y. Rebahi, E Pallis, “EMYNOS: Next Generation Emergency Communication”, *IEEE Communication Magazine*, January 2017, Volume: 55, Issue: 1, pp. 139 – 145.

Abstract: Current emergency systems and 112 services are based on legacy telecommunication technologies, which cannot cope with IP-based services that European citizens use every day. Some of the related limitations are the partial media support, the lack of integration of social media, and the use of an analogue modem for providing emergency Call (eCall) services with limited data amount. As most operators have started migrating towards broadband IP-based infrastructures, current emergency systems need also to be upgraded and adapted in order to fulfil regulatory requirements in terms of next generation emergency services. This paper present EMYNOS project which aims to the design and implementation of a Next Generation platform capable of accommodating rich-media emergency calls that combine voice, text, and video, thus constituting a powerful tool for coordinating communication among citizens, call centers and first responders. Additionally, issues such as call routing/redirection to the closest-available call center, retrieval of the caller location, support for people with disabilities, and integration of social media will be detailed.

- J28.** E. Markakis, K. Karras, N. Zotos, A. Sideris, T. Moysiadis, A. Corsaro, C. Skianis, G. Mastorakis, C. X. Mavromoustakis, E. Pallis, “EXEGESIS: Extreme edge resources harvesting for a virtualised Fog environment”, *IEEE Communications Magazine*, July 2017, Volume: 55, Issue: 7, pp. 173 - 179.

Abstract: Currently there is an active debate about how the existing cloud paradigm can cope with the volume, variety, and velocity of the data generated by end devices (e.g., Internet of Things sensors). It is expected that there will be over 50 billion of these devices by 2020, which will create more than two Exabytes worth of data each day. Additionally, the vast number of edge devices create a huge ocean of digital resources close to the data source, which, however, remain so far unexploited to their full extent. EXEGESIS proposes to harness these unutilized resources via a three-layer architecture that encompasses the mist, fog, and cloud. The mist network is located at the very bottom, where interconnected objects (Internet of Things devices, small servers, etc.) create neighborhoods of objects. This arrangement is enhanced by a virtual fog layer, which allows for

dynamic, ad hoc interconnections among the various neighborhoods. At the top layer resides the cloud with its abundant resources that can also be included in one or more virtual fog neighborhoods. Thus, this article complements and leverages existing cloud architectures, enabling them to interact with this new edge-centric ecosystem of devices/resources, and benefit from the fact that critical data are available where they can add the most value.

- J29.** G. Atsali, S. Panagiotakis, E. Markakis, G. Mastorakis, C. X. Mavromoustakis, E. Pallis, A. Malamos, "A mixed reality 3D system for the integration of X3DoM graphics with real-time IoT data", *Multimedia Tools and Applications*, Springer, July 2017, pp. 1 - 22.

Abstract: A mixed reality system is a set of interlinked real-time sensors' and actuators' data presented within a virtual world with graphics and texts. This paper describes a methodology for the implementation of mixed reality systems that interconnect real-world IoT systems with 3D virtual worlds. In particular, this paper presents the steps for integrating X3DoM graphics with real-time data and discusses the associated technologies from a developer's point of view. Such a mixed reality 3D system, interconnecting real-time sensors and actuators from a real-world wastewater management system, with all the corresponding components and controls was developed. This mixed reality 3D world was created using open source web technologies that provide users, in this case the building tenants, with the ability to monitor and control the water consumption of their homes at anytime and from anywhere. It provides not only a comprehensive monitoring 3D model of the real building management system but also an easy to use controlling platform, where the commands are executed in the real building infrastructure.

- J30.** Evangelos K. Markakis, Kimon Karras, Anargyros Sideris, George Alexiou, and Evangelos Pallis, "Computing, Caching, and Communication at the Edge: The Cornerstone for Building a Versatile 5G Ecosystem", *IEEE Communications Magazine*, Volume: 55, Issue: 11, November 2017, pp. 152-257.

Abstract: This article presents a unified computing, caching, and communication (3C) solution for the upcoming 5G environment that will allow service, content, and function providers to deploy their services/ content/functions near the end users (EUs); to allow network providers to virtually deploy their connectivity services over commodity hardware; and to enable end users to renounce their role as passive 5G stakeholders and become active ones by offering their 3C resources to the 5G ecosystem. In this direction, we foresee the exploitation of a peer-to-peer- like middleware/app solution that upon installation will enhance the end user devices with the ability to form virtual fogs capable of providing their 3C resources to the 5G ecosystem. Additionally, we propose the introduction of heterogeneous nodes (e.g., FPGAs and GPUs) at the networks edge, which will boost the processing capabilities without paying a premium in power consumption. This will enable efficient and thorough filtering of the information that makes it all the way up to the cloud. In summary, this article proposes an architecture that exploits and advances the edge and extreme edge 3C paradigms toward enabling the 5G ecosystem to meet its own criterion for low end-to-end latencies and, as such, enable it to provide and sustain high QoS/QoE levels.

- J31.** E. Markakis, I. Politis, A. Lykourgiotis, Y. Rebahi, G. Mastorakis, C. X. Mavromoustakis, E. Pallis, "Efficient Next Generation Emergency Communications over Multi-Access Edge Computing", *IEEE Communications Magazine*, Volume 55, Issue 11, November 2017, pp. 92-97.

Abstract: Traditionally, emergency communications between citizens and public authorities relied on legacy telecommunication technologies unable to cope with the agile, rich-media-content communications that mobile users are already using. This is due to the lack of harmonization and interoperable IP-based networking solutions. With the operators currently migrating to broadband IP infrastructures, emergency systems also need to follow this path and adapt their emergency communication platforms to fulfill next generation emergency services regulatory requirements. This

becomes even more evident in light of the forthcoming 5G networks, which are envisioned to support an amalgam of diverse applications and services with heterogeneous performance requirements, including mission-critical IoT communication, massive machine-type communication, and gigabit mobile connectivity. Emergency service operators face an enormous challenge in order to synchronize their model of operation with the 5G paradigm. This article studies the challenges that next generation emergency services need to overcome in order to fulfill the requirements for rich-content, real-time, location-specific communications. The concept for next generation emergency communications as described in the project EMYNOS is presented, along with a vision of how this concept can fulfill the 5G requirements for ultra-reliable and ultra-low-latency emergency communications.

- J32.** C. X. Mavromoustakis, J. M. Batalla, G. Mastorakis, E. Markakis, E. Pallis, "Socially oriented Edge Computing for Energy Awareness in IoT Architectures", *IEEE Communications Magazine*, Volume 56, Issue 7, July 2018, pp. 139-145.

Abstract: The Internet of Things services provision, by using machine-to-machine (M2M) communication, plays a critical role in today's ubiquitous systems. This service provision offers reliability and consistency to the end user. In many cases, there are secondary devices that are interconnected (glasses, set-top-boxes, home furniture, etc.), playing an active role in the level of QoS/QoE provided to end users. This is valid for any service demands, requested by end users on the move. The most important aspect of this kind of communication is to allow users to exploit continuous on-demand service provision, regardless of how demanding their running applications are. This is feasible to achieve by using schemes to support the edge devices. Considering the latter, this work presents and identifies the different ways to implement the edge computing paradigm by using M2M communications in dense networked systems via social connectivity from two different perspectives: the offered reliability for delay-tolerant (delay-sensitive) services and the energy conservation over reliability provision. Both perspectives introduce significant applications execution optimization when using delay-sensitive data. In such a case, the offloading social-based processing of selected applications to the edge devices, in terms of both time and energy, offers significant lifetime extensibility for each device as indicative results show.

- J33.** Yacine Rebahi, Kin Tsun Chiu, Nikolay Tcholtchev, Simon Hohberg, Evangelos Pallis, Evangelos Markakis, "Towards a Next Generation 112 Testbed: The EMYNOS ESInet", *International Journal of Critical Infrastructure Protection*, Elsevier, 12 June 2018, <https://doi.org/10.1016/j.ijcip.2018.05.001>.

Abstract: This paper belongs to a series of research documents describing the progress in the specification and development of the EMYNOS framework offering an IP based platform for emergency services. EMYNOS is an international research project funded by the European Commission. Although, migrating to Next Generation 112 and 911 is not new as a topic, no real testbed that can be used for evaluating the relevant standards exist so far. In this paper, we discuss the EMYNOS approach and in particular some mechanisms that have been developed in this context. Special attention is paid to the EMYNOS testbed that was assessed during the ETSI NG112 plugtests in 2016 and 2017. Some experiments and test results are provided as well.

- J34.** Yannis Nikoloudakis, Spyridon Panagiotakis, Thrasivoulos Manios, Evangelos Markakis, Evangelos Pallis, "Composting as a Service: A Real-World IoT Implementation", *Future Internet*, MDPI, Volume 10, Issue 11, 107, November 2018, DOI 10.3390/f10110107.

Abstract: Composting is the delicate procedure of supervised decomposition of organic waste, which gradually transforms waste to nutrient-rich manure. It requires deep knowledge and constant attention by experts to achieve a quality outcome in a timely fashion. Nevertheless, due to the bizarre nature of the materials and the overall procedure, along with the space required and emitted odors, it is required that composting infrastructures and machinery are installed away from residential areas, rendering supervision a very tedious task. Automatic composting machinery is a promising new idea,

but still cannot substitute the insightfulness of a human supervisor. In this paper, we introduce COMPosting as a Service (COMPaaS). COMPaaS is a novel cloud service in composition with specialized Internet of Things (IoT)-based composting machinery that allows for unsupervised composting. The focus of this work is on the tiered IT approach that is adopted following the edge-computing paradigm. More specifically, composting machinery, enriched with several sensors and actuators, performs a set of basic routine tasks locally and sends sensor values to a cloud service which performs real-time data analysis and instructs the composting machinery to perform the appropriate actions based on the outcome of the analysis. The overall composting procedure is performed in a completely unsupervised manner, and field evaluation has shown an up to 30% faster outcome in comparison to traditional supervised composting.

- J35.** Yannis Nikoloudakis, Evangelos Pallis, George Mastorakis, Constandinos X. Mavromoustakis, Charalabos Skianis, Evangelos K. Markakis, “Vulnerability assessment as a service for fog-centric ICT ecosystems: A healthcare use case”, *Peer-to-Peer Networking and Applications*, Springer, vol. 12, no. 5 (January 2019): 1216-1224.

Abstract: Modern ICT ecosystems such as healthcare environments (hospitals, care-centers etc.), operate in different abstraction layers (cloud, fog, extreme-edge) and comprise large numbers of network entities such as terminals, devices, sensors or even specialized appliances (virtual or physical). It is common in such environments, that several network entities with intermittent connectivity, join and leave the network in an unstructured and unsupervised manner (Wi-Fi access-points, BYOD policies, IoT, etc.). Such devices of frivolous nature, or even trusted devices/terminals, are prone to security vulnerabilities, since they are operated by regular, non-expert users who are not aware of any security aspects whatsoever. To effectively manage and proactively protect such large, complex and multilayered networks, dedicated personnel (system administrators, security specialists etc.) must be employed and specialized appliances must be deployed. On the other hand, modern cyber-warfare has become even more elaborate and insightful. Thus, ICT infrastructures must continuously evolve and adapt to the everchanging cyber-threats, which is a rather cumbersome and expensive task to accomplish. Towards addressing the above-mentioned issues, this paper proposes a cross-layered system, which leverages the Software Defined Networking (SDN) paradigm and the distributed Fog architecture, for network slicing and task offloading to provide dynamic, security-aware Vulnerability-Assessment as a service for large ICT infrastructures. The presented system provides seamless assessment for all existing and newly introduced network entities against all known security vulnerabilities, certifies them through a Common Vulnerability Scoring System (CVSS), classifies them according to the cyber-threat they introduce, and finally assigns them to a connectivity-appropriate VLAN. The presented system was preliminarily evaluated under a controlled-conditions simulation environment.

- J36.** E. Markakis, Y. Nikoloudakis, G. Mastorakis, C. X. Mavromoustakis, E. Pallis, A. Sideris, N. Zotos, J. Antic, A. Cernivec, D. Fejzic, J. Kulovic, A. Jara, A. Drosou, K. Giannoutakis, D. Tzovaras, “Acceleration at the Edge for supporting SMEs Security: The FORTIKA Paradigm”, *IEEE Communications Magazine*, Volume 57 , Issue: 2 , February 2019, pp. 41-47.

Abstract: This article presents FORTIKA, an ongoing EU-funded project which is a resilient cyber-security solution that can easily be tailored and adjusted to the versatile and ever changing needs of small and medium-sized enterprises (SMEs). To fulfill its vision, FORTIKA adopts a security-by-design hybrid approach that adequately integrates hardware and software with business needs and behavioral patterns at the individual and organizational levels to introduce an FPGA-powered middleware security layer as an add-on to existing network gateways, orientating small business users to trusted cyber-security services (through FORTIKA's marketplace) packaged in tailored solutions for each enterprise, and further extended to accommodate security intelligence and encourage security-friendly behavioral and organizational changes. Finally, the introduction of a software-defined smart ecosystem in the FORTIKA marketplace provides the feature of a lightweight solution, which offers virtualized security services (with minimum downloading requirements). Users (i.e., SMEs) may

utilize a variety of services and share profiling information with the service providers in return for tailored security services aligned with their actual needs. FORTIKA marketplace also functions as a single point of access for the profiling information for each SME. Preliminary evaluation results indicate that users can upload bundles to the marketplace repository in approximately 4 to 5 minutes, download bundles from the FORTIKA marketplace to the gateway in approximately 20 seconds, and deploy them in an average of 4.5ms.

- J37.** G. Skourletopoulos, C. X. Mavromoustakis, G. Mastorakis, J. M. Batalla, H. Song, J. N. Sahalos, E. Pallis, "Elasticity Debt Analytics Exploitation for Green Mobile Cloud Computing: An Equilibrium Model", in *IEEE Transactions on Green Communications and Networking*, Volume 3 , Issue: 1 , March 2019, pp. 122-131.

Abstract: Mobile cloud computing is the model to ubiquitously access a shared pool of cloud computing resources, data, and services on-demand. This paper introduces the elasticity debt analytics paradigm as a solution concept for the resource provisioning problem in mobile cloud computing environments, guaranteeing the quality of service requirements. A novel green-centric, game theoretic approach to minimizing the elasticity debt on mobile cloud-based service level is proposed, investigating the mobile cloud offloading case. The decision to offload a mobile device user's task on cloud affects the level of elasticity debt minimization for the provided services. The modeling for the computation of the processing time, energy, and overhead in mobile opportunistic offloading is presented. A utility-driven elasticity debt and profit quantification approach is also examined for maximization of resource utilization, exploiting the hidden Markov model. The problem is formulated as an elasticity debt quantification game, elaborating on an incentive mechanism to predict elasticity debt, mitigate the risk of service over-utilization, achieve scalability, and optimize cloud resource provisioning. The experimental results prove the effectiveness of the equilibrium model, which allocates the mobile device user requests to high elasticity debt-level services and facilitates the elasticity debt minimization for green mobile cloud computing environments.

- J38.** Kimon, Karras, Evangelos Pallis, George Mastorakis, Yannis Nikoloudakis, Jordi Mongay Batalla, Constandinos X. Mavromoustakis, and Evangelos Markakis. "A Hardware Acceleration Platform for AI-Based Inference at the Edge." *Circuits, Systems, and Signal Processing* 39, no. 2 (2020): 1059-1070.

Abstract: Machine learning (ML) algorithms are already transforming the way data are collected and processed in the data centre, where some form of AI has permeated most areas of computing. The integration of AI algorithms at the edge is the next logical step which is already under investigation. However, harnessing such algorithms at the edge will require more computing power than what current platforms offer. In this paper, we present an FPGA system-on-chip-based architecture that supports the acceleration of ML algorithms in an edge environment. The system supports dynamic deployment of ML functions driven either locally or remotely, thus achieving a remarkable degree of flexibility. We demonstrate the efficacy of this architecture by executing a version of the well-known YOLO classifier which demonstrates competitive performance while requiring a reasonable amount of resources on the device.

- J39.** Maria Stoyanova, Yannis Nikoloudakis, Spyridon Panagiotakis, Evangelos Pallis, and Evangelos K. Markakis, "A Survey on the Internet of Things (IoT) Forensics: Challenges, Approaches and Open Issues", *IEEE Communications Surveys and Tutorials*, 6 January, 2020, DOI: 10.1109/COMST.2019.2962586.

Abstract: Today is the era of the Internet of Things (IoT). The recent advances in hardware and information technology have accelerated the deployment of billions of interconnected, smart and adaptive devices, in critical infrastructures like health, transportation, environmental control and home automation. Transferring data over a network without requiring any kind of human-to-computer or human-to-human interaction, brings reliability and convenience to consumers, but also opens a new world of opportunity for

intruders, and introduces a whole set of unique and complicated questions to the field of Digital Forensics. Although IoT data could be a rich source of evidence, forensics professionals cope with diverse problems, starting from the huge variety of IoT devices and non-standard formats, to the multi-tenant cloud infrastructure and the resulting multi-jurisdictional litigations. A further challenge is the end-to-end encryption which represents a trade-off between users' right to privacy and the success of the forensics investigation. Due to its volatile nature, digital evidence has to be acquired and analysed using validated tools and techniques that ensure the maintenance of the Chain of Custody. Therefore, the purpose of this paper is to identify and discuss the main issues involved in the complex process of IoT-based investigations, particularly all legal, privacy and cloud security challenges. Furthermore, this work provides an overview of the past and current theoretical models in the digital forensics science. Special attention is paid to frameworks that aim to extract data in a privacy-preserving manner or secure the evidence integrity using decentralized blockchain-based solutions. In addition, the present paper addresses the ongoing Forensics-as-a-Service (FaaS) paradigm, as well as some promising cross-cutting data reduction and forensics intelligence techniques. Finally, several other research trends and open issues are presented, with emphasis on the need for proactive Forensics Readiness strategies and generally agreed-upon standards.

Scientific publications in international peer-reviewed conferences

Table 2 Publications in referred international referred conferences since 1998

Year	In peer-reviewed conferences	Extended abstracts	Total
1998	3	1	4
1999	3		3
2000	1		1
2001	5		5
2002	4		4
2003	5		5
2004	5		5
2005	6	1	7
2006	6		6
2007	4	2	6
2008	3	1	4
2009	1		1
2010	3		3
2011	7		7
2012	15		15
2013	8		8
2014	11		11
2015	4		4
2016	7		7
2017	2		2
2018	4		4
2019	2	1	3
2020	5		5
Total	114	6	120

1998

- C1.**E. Pallis, A. Kourtis, G. Kormetzas, K. Kontovasilis, "A Cellular System for Providing Wireless Services", 3rd Mobile Communications Summit, Rhodes, Greece, June 1998, Vol. 2, pp. 672-677.

Abstract: This paper presents a cellular system for the provision of wireless Internet access and of multimedia services (specifically, the reception of short audio and video clips) with a guaranteed minimum throughput. The paper outlines the design, as well as the implementation of a prototype for this system, which was developed in the framework of the CRABS research project. Preliminary performance evaluation results are also reported.

- C2.**E. Pallis, A. Kourtis, N. Papadopoulos, "A 42GHz Broadband Wireless Terrestrial System for Digital Interactive Television", International Communication Conference 1998, Porto Carras, Greece, June 1998, Vol. 2, pp.370-373.

Abstract: This paper describes and evaluates the first results from a real condition trial of a terrestrial wireless cellular system at 42 GHz for interactive digital (MPEG-2) television, realized in the frame of an E.U. ACTS 96 program, in the area of Athens.

- C3.**E. Pallis, A. Kourtis, Ch. Mantakas, N. Papadopoulos, "Provision of Digital Television and Broadband Multimedia Services in the 42 GHz Band", WPMC98, Yokosuka Research Park, Yokosuka, Japan, November 1998, pp. 99-103.

Abstract: This paper describes and evaluates the first results from a trial under real conditions, of a wireless cellular interactive network at 42 GHz, for the provision of digital (MPEG-2) television and broadband multimedia services. This trial is realized in the frame of the CRABS project in the area of Athens. The system architecture and network configuration are described and technical data concerning the development of the interactive services are provided. The performance of the system is also evaluated.

1999

- C4.**E. Pallis, G. Pantos, A. Kourtis, A. A. Alexandridis, Ph. Constantinou, "Provision of Internet and digital MPEG-2 programmes via a wireless broadband network", 4th ACTS Mobile Communications Summit, Sorrento, Italy, June 8-11, 1999, pp. 875-880.

Περίληψη: This paper describes a wireless broadband network developed in CRABS project and demonstrates its feasibility of providing Internet and an MPEG-2 video/audio programme to portable and mobile users. The network configuration is described and technical data concerning the production and delivery of the MPEG-2 TV programme are provided. The quality of the video service is evaluated for various MPEG-2 encoding rates, under portable and mobile outdoor conditions.

- C5.**E. Pallis, G. Pantos, A. Kourtis, A. A. Alexandridis, "QoS in the Provision of MPEG-2 Programmes in a Wireless Indoor Environment", International Workshop on Mobile Communications, Chania, Crete, Greece, 24-26 June 1999, pp. 105-111.

Abstract: This paper describes a trial for the provision of digital MPEG-2 video/audio programmes through a broadband wireless network to portable workstations. The network is TCP/IP based and operates in the frequency band of 2.4 GHz, using frequency hopping spread spectrum modulation. The network configuration is described and technical data concerning the production and delivery of the MPEG-2 programmes are provided. The quality of the provided video service to portable indoor workstations is also evaluated.

- C6.** E. Pallis, M.C.B. Smith, A. A. Alexandridis, A. Kourtis, K. Dangakis, P. Kostarakis, "Wireless provision of fast access to Internet and multimedia services to stationary and portable stations", International Workshop on Mobile Communications, Chania, Crete, Greece, 24-26 June 1999, pp. 415-423.

Abstract: This paper describes and evaluates the performance of a system which provides wireless broadband access to Internet and multimedia services to a number of stationary and portable users. The system architecture is cellular and expandable. A prototype of the system has been implemented, ranging between the premises of NCSR Demokritos and the municipality of an Athens suburb, Filothei, at a distance of about 5 km. The prototype is used as a test bed for validating the design and for conducting performance evaluation measurements.

2000

- C7.** E. Pallis, A. A. Alexandridis, G. Pantos, A. Kourtis, Ph. Constantinou, "Provision of true VoD services via a broadband wireless networking infrastructure", Proceedings of the 4th World Multiconference on Circuits, Systems, Communications and Computers (CSCC 2000), pp. 107-113, July 10-15 2000, Astir Palace Vouliagmeni, Athens, Greece.

Abstract: The evolution of MPEG-2 compression technique has made possible the communication of full motion video as a type of computer data. However, how to access the video from anywhere at any time using a band-limited network, while maintaining the Quality-of-Service (QoS) at high levels has become the main research topic in recent years. This paper proposes a broadband wireless network architecture that enables access to full motion video programmes, and also provides fast access to Internet. It describes the system architecture and configuration adopted for the provision of digital MPEG-2 video programmes via a broadband wireless network, using Frequency Hopping Spread Spectrum (FHSS) technology in the ISM frequency band. It elaborates on the provided picture quality and evaluates the system's Quality-of-Service (QoS) in a multi-client environment.

2001

- C8.** E. Pallis, V. Zacharopoulos, A. Kourtis, K. Anagnostakis, I. Xezonakis, G. Gardikis, "Tele-Learning: A prototype System Utilising the New Advanced technologies in Education", 1st IOSTE Symposium in Southern Europe, Paralimni, Cyprus, 29th April - 2nd May, 2001, pp. 304-314.

Abstract: Advances in telecommunication and computer technologies, have enhanced the role of knowledge by converging information and communication technologies towards a more dynamic stage: the Global Information Society (GIS). Realising the momentousness of knowledge in the globalise world and becoming aware of the importance of the converged-technologies in GIS, Technological Educational Institute (TEI) of Crete, has adopted a revolutionary way for enabling students to access, and adopt knowledge, any-time from anywhere. This paper describes the architecture of a tele-learning system that enables for distant educational activities, while defining the network configuration that utilises both wired and wireless access. Finally, tests on the system's performance evaluate on the system's QoS.

- C9.** V. Zacharopoulos, I. Xezonakis, C. Athanasaki-Michailidou, A. Kourtis, E. Pallis, "The Need of Broadening Tertiary Level Technological Education in Informatics in Greece. A New Department in Crete", ", 1st IOSTE Symposium in Southern Europe, Paralimni, Cyprus, 29th April - 2nd May, 2001, pp. 235-243.

Abstract: The 21st century is the century of the information society (I.S.), which is expected to introduce a different kind of development, thus leading to evolution and market competitiveness. Greece will be highly benefited from the I.S., as the new technologies will bring the country closer to central

Europe, by fighting against the disadvantage of the “isolated regional country”, while reinforcing its development process. The new department of Applied Information Technology and multimedia (AITM) of the Technological Educational Institute (TEI) of Crete aims to contribute with its scientific staff and graduates to the establishment and operation of the I.S. In this paper a feasibility study is presented, that has been conducted towards the drawing up of the curriculum for the new department in terms of the perspective of labor market and the balance between supply and demand concerning professions. Also, some features and ideas are presented, which support the new course concerning mainly new methods of teaching. Furthermore, concerning the two years of operation of the Department some statistical data will be analyzed and reflections on its future and viability will be outlined.

- C10.** G.Gardikis, E.Pallis, A.Kourtis, "Beyond 3G: A multi-services broadband wireless network with bandwidth optimisation", International Symposium 3rd Generation Infrastructure and Services, 2-3 July 2001, Athens, Greece, pp. 176-179.

Abstract: The main goal towards which nearly all research activities in the field of digital wireless communications are oriented is the development of a global wireless access network, capable of offering real-time bandwidth-demanding multimedia applications and enabling for anytime/anywhere access. This paper proposes a wireless access network which is a result of the convergence of telecommunications and digital broadcasting, two sectors in which Europe is a global pioneer. The proposed network, whose implementation will be undertaken in the frame of the EU-funded MAMBO project, can offer digital television and fast Internet access to both mobile and stationary users, while achieving bandwidth optimization through perceptive QoS estimation and transcoding algorithms. DVB-T technology is used for broadband downlink, while the uplink is based on present cellular platforms (GSM for mobile and LMDS for residential end-users).

- C11.** E. Pallis, A. Kourtis, G. Gardikis, G. Xilouris, “Electronic News Gathering via a wireless broadband infrastructure”, Proceedings of the 5th WSES/IEEE World Multiconference, CSCC 2001, p.p. 268-273, July 8-15 2001, Rethymnon, Crete, Greece.

Abstract: This paper describes a prototype system that enables for Electronic News Gathering applications through a wireless broadband networking infrastructure. The network makes use of the TCP/IP protocol stack and operates in the frequency band of 2.4GHz by utilising Spread Spectrum (SS) modulation technique. The use of the TCP/IP enables for various additional applications (e.g. videoconferencing), while the use of SS technique in the wireless links provides for portability and low mobility. Furthermore, the utilisation of broadband communication channels in the forward and the reverse path enables for high quality full-motion video transmission. Performance evaluation results are also reported.

- C12.** E. Pallis, V. Zacharopoulos, Ch. Athanasaki-Michailidou, "Multimedia and telecommunication technologies education: Preparing future citizens", International Conference on Technology Education, Cape-Town, South Africa, 4-6 October, 2001, pp. 71-75.

Abstract: This paper presents preliminary results of the first phase of a pilot educational programme running in the Applied Information Technology & Multimedia (AITM) department in the Technological Educational Institute of Crete, Heraklion, which targets to set-off new methods for innovative use of existing resources in technology education. In the first phase of this programme, a networking infrastructure has been implemented that enables the students to access anytime during day from anywhere existing human and technological resources provided by the AITM. In this respect, this paper outlines the overall network configuration, describes the first phase of the pilot programme and evaluates on preliminary results of this phase, while elaborating on its effectiveness in technology education.

2002

- C13.** G. Gardikis, G. Xilouris, E. Pallis, A. Kourtis, "An Interactive DVB-T Platform with Broadband LMDS Uplink", IST Mobile & Wireless Telecommunications Summit 2002, Thessaloniki, Greece, 16-19 June 2002, pp. 288-291.

Abstract: Contemporary DTV technologies introduce the concept of interactivity to traditional TV broadcast services, provided that a data return channel exists. This paper proposes a wireless access network which is a result of the convergence of wireless data network technologies and digital broadcasting. The proposed network, which is being implemented in the frame of the EU-funded MAMBO IST project, can offer digital television and fast Internet access to stationary users, utilizing DVB-T technology for broadband downlink, while the uplink is based on an LMDS network.

- C14.** G. Xilouris, G. Gardikis, E. Pallis, A. Kourtis, "Reverse Path Technologies in Interactive DVB-T Broadcasting", IST Mobile & Wireless Telecommunications Summit 2002, Thessaloniki, Greece, 16-19 June 2002, pp. 292-295.

Abstract: The convergence of different networking infrastructures and the integration of fixed, mobile and broadcasting technologies is the new era in telecommunications. This paper describes the design, implementation and testing of a network architecture able to integrate DVB-T broadcasting technology for the downlink with GSM and LMDS access technologies for the uplink. It provides fast access to IP services and digital television to residential and mobile users and it will be used as a demonstration platform for the EU-funded MAMBOIST project.

- C15.** E. Pallis, G. Xilouris, G. Gardikis, A. Kourtis, "The use of a DVB-T platform as an IP backbone for interconnection of LANs", 6th WSEAS International Conference on Communications, Rethymnon, Crete, July 7-14, 2002, pp. 64-67, ISBN 960-8052-62-9.

Abstract: DVB-T technology has traditionally been used as an access network, providing digital TV programs along with IP based multimedia services to single end users. This paper presents an additional usage of DVB-T as a backbone for the interconnection of Local Area Networks, scattered all over the DVB-T coverage area.

- C16.** E. Pallis, V. Zacharopoulos, S. Apostolakis and N. Gargoulakis "Utilising DVB-T standard for supporting tele-learning applications", International Symposium, Engineer of the 21st Century, St.-Petersburg, September 16-19, 2002, ISBN 5-94211-073-5, Vol. 2, pp. 363-371.

Abstract: This paper presents an innovative utilisation of Terrestrial Digital Video Broadcasting standard (DVB-T) for supporting the provision of interactive tele-learning applications. It describes a prototype networking platform that converges existing wired and wireless access technologies, it evaluates on the overall system performance and presents some preliminary results concerning the system's attractiveness during a four-month operation.

2003

- C17.** E. Pallis, S. Apostolakis, V. Zacharopoulos, E. Markakis, "Broadband Metropolitan Area Network: supporting tele-learning applications via the DVB-T stream", International Conference on Network Universities and e-Learning, Valencia, Spain, 8-9 May, 2003.

Abstract: This paper presents the architecture and the network configuration of a metropolitan area network that can efficiently support broadband interactive multimedia applications, such as telelearning ones. It proposes the use of the terrestrial digital video broadcasting standard (DVB-T) for implementing a broadband infrastructure, through which all citizens of a city can access synchronously (in real time) or asynchronously (off-line) educational material, besides actively and/or passively participating in the learning process.

- C18.** E. Pallis, G. Xilouris, G. Gardikis, A. Kourtis, C. Mantakas, “The new Interconnecting Television: An alternative approach to next generation broadband networking”, 7th International Conference on Telecommunications, Zagreb, Croatia, June 11-13, 2003, pp. 709-712.

Abstract: In Sevilla European Council it was indicated that two major problems (among the others) have to be solved towards eEurope 2005 and beyond: the transition to digital television in UHF band (digital switchover) and the broadband access for all. This paper considers that if proper decision will be taken for the digital switchover (taking into account the networking aspect of the new television) it will also provide a solution for the second problem (the broadband access for all citizens). It presents an approach towards the solution of the digital switchover that comprises the use of the DVB stream for interconnecting next generation network (NGN) nodes, by the use of regenerative configurations. The utilisation of regenerative configurations enables for the realisation of a virtual common Ethernet backbone that can be exploited by 3G/UMTS and B3G operators and broadcasters, besides enabling for broadband access for all citizens.

- C19.** Safwan El Assad, Jacqueline Boniffay, Sebastian Pavel, Evangelos Pallis, “COBBALT Multimedia self-learning telecommunications on Internet”, 6th International Conference on Computer Based Learning in Science, Nicosia, Cyprus, 5-10 July 2003, pp 272-280.

Abstract: E-learning represents in our times a very important technology for learning/teaching without having many of the constraints of the classical methods. COBBALT is a multimedia Web based application for self-learning telecommunications. This application concerns students that are interested in the field of telecommunications, at an intermediate level, and offers as principal services the access to the course and to additional resources, the possibility of self-testing one’s knowledge, a section providing some interactive experiment’s simulations and a help section.

- C20.** G. Xilouris, A. Kourtis, G. Stefanou, E. Pallis, “A laboratory regenerative satellite platform with dynamic bandwidth management capabilities”, 1st International Working Conference on Performance Modelling and Evaluation of Heterogeneous Networks, Ilkley, West Yorkshire, U.K., 21-23 July, 2003, pp 45/1 – 45/7.

Abstract: This paper presents a regenerative satellite (DVB-S) network configuration, using real time dynamic management of the available bandwidth, for supporting the provision of interactive IP-based multimedia services among terrestrial distribution nodes. The paper describes a prototype testbed that is implemented based on the proposed architecture. Furthermore, it presents performance evaluation measurements that prove the validity and the capabilities of the proposed network configuration.

- C21.** E. Pallis, C. Mantakas, G. Xilouris, G. Gardikis, A. Kourtis, “Digital Switchover: Developing infrastructures for broadband access”, IPSI 2003 VIP Forum, Sveti Stefan, Montenegro, 4-11 October 2003, ISBN: 88-85280-62-5.

Abstract: This paper presents an approach towards the digital switchover in UHF, which can provide the basis for developing broadband access infrastructures in European cities. It proposes the use of regenerative configurations of the DVB-T that exploit the networking capabilities of the television stream

and which creates a uhf broadcasted Ethernet backbone, commonly exploited by any citizen/user, who access it via any appropriate Node within the broadcasting area.

2004

- C22.** E. Pallis, C. Mantakas, G. Xilouris, G. Gardikis, A. Kourtis “Digital Switchover and Broadband Access: Drawing-up the routes towards NGN”, 1st International Workshop on Next Generation Networking Middleware, Athens, Greece, 14 May 2004, pp. 32-36.

Abstract: This paper presents an approach towards the realization of broadband access next generation networks (NGN), by making use of the synergy between the broadcasting and telecommunication sectors (at both technological and business level). Taking into account the networking potentialities of the new digital TV in UHF (Terrestrial Digital Video Broadcasting – DVB-T) and the broadband capabilities of the recent access technologies (i.e. WLAN, UMTS, etc.), this paper proposes a networking infrastructure that utilises the DVB-T stream in regenerative configurations for the realization of a common Ethernet backbone capable to interconnect all citizens within the broadcasting area. Citizens access this backbone via appropriate Distribution Nodes (DN), which make use of broadband access technologies. Such an approach enables for a multi-service capable environment (digital TV programmes, Interactive TV programmes, Internet access, e-mail, video/audio on demand, etc.), which is commonly shared among broadcasters, telecom operators and any active citizen who creates, manipulates and distributes his own content to the entire infrastructure (MPEG-21 approach).

- C23.** Safwan El Assad, Evangelos Pallis, Bogdan Iordache, Georgi Rusev, “COBBALT Project – e-learning development and learning environment”, 5th International Conference on Information Communication Technologies in Education, Samos Island, Greece, 1-3 Jul 2004.

Abstract: The Cobbalt Project has been developed for improving the learning experience in Telecommunications for the students of “Université Virtuelle des Pays de la Loire”. By keeping the traditional structure for learning activities, but moving them to the Internet environment, the students are now able to expand their knowledge regardless of time and place. We will describe the methods and technologies used to substantially improve their learning process.

- C24.** H. Koumaras, E. Pallis, G. Xilouris, A. Kourtis, D. Martakos, J. Lauterjung, “Pre-Encoding PQoS Assessment Method for Optimized Resource Utilization”, 2nd International Conference on Heterogeneous Networks (HET-NETs 2004), Ilkley, UK, West Yorkshire, U.K., 26-28 July, 2004, pp. 14/1-14/10, ISBN : 0-9540151-6-9.

Abstract: This paper presents an assessment method for fast and quantified estimation of the Perceived Quality of Service (PQoS) for homogeneous MPEG-4 video content, enabling optimized utilization of the corresponding storage and bandwidth resources. Besides, the Mean Perceived Quality of Service (MPQoS) as a function of the video encoding rate is introduced and exploited as a metric for objective video quality assessment. The validity of this metric is evaluated by comparing PQoS experimental curves to the theoretical benefit functions. Based on the proposed metric the paper presents a method for pre-encoding PQoS assessment based on the fast estimation of the S-T activity level for homogeneous MPEG-4 video content, encoded at constant bit-rate.

- C25.** E. Pallis, C. Mantakas, G. Xilouris, G. Gardikis, A. Kourtis, “Digital Switchover: An alternative solution towards broadband access for all citizens”, International

Conference on E-Business and Telecommunication Networks (ICETE-2004), Setubal, Portugal, 25-28 August, 2004, pp. 31-40.

Abstract: The paper anticipates that the actions to be taken concerning the Digital Switchover (transition from analogue to digital broadcasting – DSO) in UHF are of strategic importance for the European Member Countries and most candidate ones, as long as DSO arises as a possible and complementary solution towards the deployment of Broadband Access Infrastructures, especially in less favoured regions. Taking into account the networking potentialities of the new digital TV in UHF (Terrestrial Digital Video Broadcasting – DVB-T) and the broadband capabilities of the recent access technologies (i.e. WLAN, UMTS, etc.), the paper proposes a networking infrastructure that utilises the DVB-T stream in regenerative configurations for the realization of a common Ethernet backbone capable to interconnect all citizens within the broadcasting area. Citizens access this backbone via appropriate Distribution Nodes (DN), which make use of broadband access technologies. Such an approach enables for a multi-service capable environment (digital TV programmes, Interactive TV programmes, Internet access, e-mail, video/audio on demand, etc.), which is commonly shared among broadcasters, telecom operators and any active citizen who creates, manipulates and distributes his own content to the entire infrastructure (MPEG-21 approach).

C26. E. Pallis, C. Mantakas, “Digital Switchover: Paving the way towards a fusion environment”, 7th International Symposium on Communications Interworking, Ottawa - November 29, 30 - December 1, 2004.

Abstract: This paper presents an architecture that realises the capabilities/potentialities of the Digital Switchover (i.e. the transition from analogue to digital broadcasting in UHF – DSO), for creating an infrastructure that provides for multi-service capabilities, with a single access network physical infrastructure shared by multiple services stemming from different service/content providers and addressed to different client/users. In this respect, it describes a TV channel (developed within the ATHENA FP6-507312 IST project and operating in Heraklion city since 1st of August 2004), that utilises a regenerative DVB-T conception for enabling/permitting/promoting/accepting all kind of providers to become co-equal users of the same infrastructure, through which they access (or provide) IP services and digital TV programmes to a whole metropolitan area. This TV channel creates a neutral infrastructure, which does not belong to any broadcaster or 3G operator, but it is used/exploited as common infrastructure by i) 3G/B3G operators and broadcasters having independent business plans and different users/clients, and ii) by any spin-off businessman in the field of broadcasting/multicasting/networking. In this context, this TV channel realizes and demonstrates an issue that is one-step-beyond the convergence and synergy of the pre-mentioned sectors; this is the issue of the Fusion Environment enabling for the i) co-presence and co-existence of all sectors in the same neutral beam, ii) common exploitation of the same infrastructure that it is offered to all for open competition in technological and service level, in content creation and delivery level, in networking business/market field.

2005

C27. E. Pallis, C. Mantakas, V. Zacharopoulos, G. Mastorakis, “Transition from analogue to digital broadcasting in UHF: The ATHENA concept”, in Proc. 4th WSEAS International Conference TELE-INFO '05, Prague, Czech Republic, 13-15 March, 2005, pp. 39-47

Abstract: In Sevilla European Council (21-22 June 2002), the European Commission recognised the importance of broadband access infrastructures for the successful deployment of Information Society (IS) throughout the Union by 2005, and identified the actions to be taken, among which is the transition from analogue to digital broadcasting (DSO). In a number of EU states where broadband networking infrastructures have already been disposed, DSO in UHF does not constitute a critical issue for the successful deployment of IS. In all other EU countries, however, where the low penetration of broadband access infrastructures hampers the successful deployment of IS, digital switchover arises as a unique opportunity to fill the gap and shorten the digital divide. In this respect, this paper presents an approach – that has been adopted and elaborated with the ATHENA FP6-507312 project – for the proper adoption of DSO that provides the basis for fast and successful establishment of broadband infrastructures, especially

in the less developed regions. Taking into account the local and networking aspect (IP capabilities) of the new digital terrestrial television (Terrestrial Digital Video Broadcasting – DVB-T), it describes a Fusion environment that enables broadband access not only to digital TV bouquets, but also to Information Society services, besides being offered to all existing and potential service/content providers for open competition at all levels (technological, service, content creation and distribution).

C28. E. Pallis, C. Mantakas, G. Mastorakis, V. Zacharopoulos, “Digital Switchover in UHF: the ATHENA concept for Broadband access”, 14th IST Mobile & Wireless Communications Summit 2005, Dresden, Germany, 19-23 June, 2005.

Abstract: This paper presents a concept adopted by ATHENA IST-507312 project for the proper adoption of digital switchover (DSO), i.e. the transition from analogue to digital broadcasting in UHF. It anticipates that if DSO is properly adopted, by taking into account the local and networking capabilities of Terrestrial Digital Video Broadcasting standard (DVB-T), it may constitute the vehicle towards the creation of a broadband access infrastructure, which is capable of enabling access not only to digital TV bouquets, but also and most predominant to Information Society services, such as Internet, e-mail, IP-TV, IP-Radio, Video-on-Demand, Audio-on-Demand, etc. Such an infrastructure, which is commonly shared among broadcasters, telecom operators, Internet Service Providers (ISP), active users/citizens who create/manipulate and distribute their own services, constitutes a Fusion environment that is offered to all existing and potential service/content providers for open competition in technological and service level, in content creation and delivery level, in networking business/market field. In this respect it presents the design and architecture of such a Fusion environment that makes use of regenerative DVB-T configuration for providing both digital TV programmes and Information Society services, in Heraklion city, Crete, Greece, while enabling users/citizens to access/participate in this Fusion environment via intermediate communication nodes (cell main nodes – CMN). Finally, based on the adopted architecture, the paper elaborates on the potentialities of the proposed DSO concept to establish broadband access Fusion environment in metropolitan areas.

C29. Daniel Negru, Ahmed Mehaoua, Evangelos Pallis, MIPv6 Extensions for seamless IP Mobility in Converged DVB-T/WLAN Networks, 14th IST Mobile & Wireless Communications Summit, Dresden, Germany, 19-23 June, 2005.

Abstract: The tremendous interest received by Internet applications over the last decade, on one hand, and the emergence of the digital switchover, transition from the analogue to the digital TV, on the other hand, convey the trend for the convergence of broadcasting and IP-based networks. Permitting the access to IP services inside a broadcasting context already represents an evolution in next generation of services for digital television. Furthermore, the development of a mobility support for IP users inside such an environment stands as an important enhancement, especially since wireless communications have taken a significant place into the networking world. In this paper, we propose a solution for achieving seamless mobility of IP users in a hybrid IP/DVB context, based on a network layer approach and supporting multicast. This work has been accomplished within the framework of the IST-funded European project ATHENA.

C30. Daniel Negru, Ahmed Mehaoua, Evangelos Pallis, “Adaptive Bandwidth Sharing Policies for IP over DVB Traffic”, 5th International Network Conference (INC 2005), Samos Island, Greece, July 2005.

Abstract: Interoperation of Digital Video Broadcasting technologies and IP-based technologies represents one of the main evolutions in next generation of services for digital television and Internet applications. This incredible synergy is jointly driven by the growing number of devices willing to access the Internet and the sensational development of digital broadcasting networks. The profound interest received by multimedia services promoted this expansion. In this paper, we describe a DVB architecture with bi-directionality, thus permitting Digital TV and Internet-based services over a wireless metropolitan area network. A complete IP/DVB inter-working environment is hence presented, mainly dedicated to multimedia services, those being either Digital TV or IP. Approaches for complete management and conformance to quality requirements of each kind of service represent the main framework of the paper. A

proposal for an efficient interactive bandwidth management between IP and DTV flows is developed for maintaining a high level of QoS for the desired multimedia applications.

- C31.** G. Mastorakis, V. Zacharopoulos, A. Fatsea, S. Orfanos, E. Markakis, A. Sideris, E. Pallis, “Ψηφιακή Μετάβαση στα UHF: Υποστηρίξη εφαρμογών τηλε-εκπαίδευσης στην πλατφόρμα ATHENA”, International Conference on Telecommunications & Multimedia (TEMU2005), Heraklion, Crete, Greece, 23-26 Ιουνίου, 2005, pp. 27-34.

Περίληψη: Σε αυτήν την εργασία παρουσιάζονται οι δυνατότητες της νέας ψηφιακής τηλεόρασης στα UHF (Digital Video Broadcasting Terrestrial – DVB-T) για την υποστήριξη καινοτόμων εφαρμογών τηλε-εκπαίδευσης, όπως η “ηλεκτρονική διάλεξη”, όπου ο καθηγητής και οι φοιτητές είναι εικονικά παρόντες στο ίδιο αμφιθέατρο από το δικό τους χώρο. Η εργασία αυτή, βασισμένη στο Ευρωπαϊκό ερευνητικό έργο ATHENA IST FP6-507312 που προτείνει έναν τρόπο μετάβασης από την αναλογική στην επίγεια ψηφιακή τηλεόραση, περιγράφει μία ευρυζωνική υποδομή πρόσβασης και την αξιοποίηση ενός κοινού καναλιού μεταφοράς (διαθέσιμο σε όλη την περιοχή εκπομπής) το οποίο μπορεί να υποστηρίξει εφαρμογές τηλε-εκπαίδευσης δίνοντας τη δυνατότητα στους καθηγητές και στους μαθητές να συμμετέχουν ενεργά με παρεμβάσεις σε πραγματικό χρόνο (ήχος/βίντεο).

- C32.** G. Mastorakis, V. Zacharopoulos, A. Fatsea, S. Orfanos, E. Markakis, A Sideris, E. Pallis, “Μετάβαση από την Αναλογική στην Επίγεια Ψηφιακή Ευρυεκπομπή: Η προσέγγιση του ATHENA για Ευρυζωνικές υποδομές”, International Conference on Telecommunications & Multimedia (TEMU2005), Heraklion, Crete, Greece, 23-26 Ιουνίου, 2005, pp. 17-26.

Περίληψη: Η εργασία αυτή παρουσιάζει τη διαδικασία μετάβασης από την αναλογική στην επίγεια ψηφιακή τηλεόραση (Digital Switchover, DSO), όπως αυτή υιοθετήθηκε από το ερευνητικό πρόγραμμα ATHENA (Digital Switchover: Developing Infrastructures for Broadband Access – IST-507312), και προτείνει τον τρόπο εκμετάλλευσης του προκύπτοντος μερίσματος φάσματος (Spectrum Dividend) για τη δημιουργία ευρυζωνικών υποδομών πρόσβασης σε υπηρεσίες της Κοινωνίας της Πληροφορίας, κυρίως στις μη-αναπτυγμένες περιοχές. Κάνοντας χρήση του Ευρωπαϊκού προτύπου ευρυεκπομπής, Terrestrial Digital Video Broadcasting (DVB-T), και λαμβάνοντας υπ’ όψιν το ενδογενές χαρακτηριστικό του να ενσωματώνει στον ίδιο συρμό μεταφοράς (transport stream) ετερογενείς υπηρεσίες (heterogeneous services), προτείνει τη χρήση του DVB-T σε αναγεννητικές διατάξεις/σχηματισμούς, για τη δημιουργία ενός κοινού δικτυακού κορμού (backbone) τον οποίο εκμεταλλεύονται από κοινού τηλεοπτικοί (broadcasters) και τηλεπικοινωνιακοί (telecom) φορείς, παροχείς υπηρεσιών Διαδικτύου (Internet Service Providers – ISPs), ή ακόμα και ενεργοί χρήστες/πολίτες (οι οποίοι μπορούν να δημιουργούν και να διανέμουν τις δικές τους υπηρεσίες). Μια τέτοια δικτυακή υποδομή αποτελεί ένα περιβάλλον συνένωσης/σύντηξης (Fusion environment), το οποίο προσφέρει τη δυνατότητα ανοιχτού ανταγωνισμού τόσο σε επίπεδο τεχνολογιών όσο και σε επίπεδο δημιουργίας και παροχής υπηρεσιών. Στα πλαίσια αυτά, η συγκεκριμένη εργασία παρουσιάζει την αρχιτεκτονική και την υλοποίηση ενός τέτοιου περιβάλλοντος συνένωσης, το οποίο κάνει χρήση αναγεννητικών διατάξεων/σχηματισμών του DVB-T (Regenerative DVB-T), για την διασύνδεση ενδιάμεσων κόμβων πρόσβασης (Cell Main Nodes – CMNs) σε υπηρεσίες της Κοινωνίας της Πληροφορίας, όπως ψηφιακά τηλεοπτικά προγράμματα, υπηρεσίες Διαδικτύου, ηλεκτρονικό ταχυδρομείο (e-mail), εικόνα και ήχο κατά παραγγελία (Video/Audio on Demand), IP-TV, IPRadio κ.λ.π.

2006

- C33.** Daniel Negru, Ahmed Mehaoua, Evangelos Pallis, “ATHENA: a Large-Scale Testbed for the Next Generation of Interoperable Networks and Services”, IEEE/Create-Net TridentCom 2006, Barcelona, Spain, March 2006.

Abstract: Next Generation Networks consist of the convergence of all the types of networks, from cellular, broadcast to IP-based, with QoS, mobility and security functions assured, and designed to

transport multimedia and data services over the same medium. The ATHENA approach is heading toward this by proposing a powerful concept of hybrid wireless metropolitan networking area that interconnects different heterogeneous networks, including the support of next generation IPv6 over broadcasting environments. Indeed, ATHENA1 proposes broadband infrastructure for the Digital SwitchOver, transition from analogue to digital TV, enhanced by the provision of IP services. Demonstration and evaluation of a large-scale deployed testbed in the city of Heraklion, Crete, Greece, is presented.

- C34.** E. Pallis, C. Mantakas, G. Mastorakis, A. Kourtis, V. Zacharopoulos, “Leveraging Digital Terrestrial Television to Extend Broadband access to Dispersed Locations”, IST-Africa 2006, Pretoria, South Africa, 03-05 May, 2006.

Abstract: This paper presents a concept for the adoption of the imminent – around Africa – transition to the digital terrestrial television in UHF (Digital Switchover – DSO), which exploits the potentialities of this new television in UHF (DVB-T) in creating broadband infrastructures in cities, and/or to realise backhaul networks towards proving broadband access. The proposed architecture effectively extends the backbone networks allowing for “always-on” connectivity and triple-play services in areas that are located far away from the high-capacity national networks. In this respect, this paper recommends the transition to the digital terrestrial television to be exploited not only for the provision of more TV programmes (bouquets), but also (added-value) for the fast deployment of broadband infrastructures and for the extension of the high-capacity national core networks in dispersed locations, small cities and rural areas.

- C35.** E. Pallis, C. Mantakas, G. Mastorakis, A. Kourtis, V. Zacharopoulos, “Transition to the Digital Terrestrial Television: an opportunity to create broadband infrastructures and extend the broadband core backbones in dispersed locations, small cities and rural areas”, 15th IST Mobile & Wireless Communications Summit 2006, Mykonos, Greece, 04-08 June, 2006.

Abstract: This paper presents a concept for the adoption of the imminent transition to the digital terrestrial broadcasting in UHF (Digital Switchover – DSO), which exploits the potentialities of the new television (DVB-T) in creating broadband infrastructures in cities, and/or to realise backhaul networks towards proving broadband access. The proposed architecture effectively extends the backbone networks allowing for “always-on” connectivity and triple-play services in areas that are located far away from the high-capacity national networks. In this respect, this paper recommends the transition to the digital terrestrial television to be exploited not only for the provision of more TV programmes (bouquets), but also (added-value) for the fast deployment of broadband infrastructures and for the extension of the high-capacity national core networks in dispersed locations, small cities and rural areas.

- C36.** G. Mastorakis, E. Pallis, C. Mantakas, G. Kormentzas, C. Skianis, “Exploiting Digital Terrestrial Television for Broadband access to Dispersed Locations”, IEEE ICC2006 / Workshop in IP over Broadcasting Networks, Istanbul, Turkey, 11- 15 June, 2006, pp. 01-04.

Abstract: This paper presents a concept for the adoption of the imminent transition to the digital terrestrial television in UHF (Digital Switchover – DSO), which exploits the potentialities of this new television in UHF (DVB-T) in creating broadband infrastructures in cities, and/or to realise backhaul networks towards proving broadband access. The proposed architecture effectively extends the backbone networks allowing for “always-on” connectivity and triple-play services in areas that are located far away from the high-capacity national networks. In this respect, this paper recommends the transition to the digital terrestrial television to be exploited not only for the provision of more TV programmes (bouquets), but also (added-value) for the fast deployment of broadband infrastructures and for the extension of the high capacity national core networks in dispersed locations, small cities and rural areas.

- C37.** H. Koumaras, E. Pallis, G. Gardikis, A. Kourtis, “Real Time PQoS Enhancement of IP Multimedia Services Over Fading & Noisy DVB-T Channel”, International Conference on Telecommunications and Multimedia (TEMU2006), Heraklion, Greece, 5-7 July 2006.

Abstract: This paper presents the implementation and testing of a complete transmission and control chain of a DVB-T network architecture featuring QoS capabilities, by enhancing in real time the PQoS degradation, resulting from a fading/noisy downlink DVB-T channel.

- C38.** N. Farsaris, D. Stratakis, A. Miaoudakis, E. Pallis, T. Xenos and V. Zacharopoulos: “Airborne Digital Video Transmission Techniques in L/S Bands”, Proceedings of the International Conference on Telecommunications & Multimedia, TEMU 2006, ISBN: 960-88785-2-7, Heraklion, Crete, Greece, 5-7 July 2006.

Abstract: In certain military and civil security operations a video must be transmitted from an aerial platform – aircraft, helicopter, unmanned aerial vehicle or airship – to a surface station in real time. In this paper the radio channel characteristics and the antenna systems needed are examined in order to achieve a robust direct communication channel with enough bandwidth between the airborne vehicle and the base station. Simulation and experimental work has shown that for a reliable operation, diversity (spatial or frequency) techniques must be used in order to achieve the most reliable link between a moving and a stationary platform over any terrain, and any troposphere conditions.

2007

- C39.** N. Vorniotakis, A. Burdena, E. Markakis, A. Sideris, G. Mastorakis, E. Pallis, V. Zacharopoulos, “Exploiting a unified infrastructure of a fusion networking environment for the support of novel tele-learning applications”, 8th International Conference on Computer Based Learning in Science (CBLIS 2007), Heraklion, Greece, 30 June - 6 July, 2007, pp. 243-254.

Abstract: This paper presents the capabilities of the new digital terrestrial television (DVB-T) in supporting tele-learning applications, where the lecturer and the students are virtually present in the same classroom from their own premises. Based on a concept for the transition from analogue to digital terrestrial broadcasting (Digital Switchover in UHF – DSO), the paper describes a novel unified infrastructure of a fusion networking environment and the realisation of a common IP backbone (present and available in the entire broadcasting area), that is capable to support tele-learning applications enabling lecturers and students to actively participate in the educational process using real time interventions (video/audio). By utilising the DVB-T stream in regenerative configurations, this broadband access infrastructure enables distant learners and professors to access/provide realtime interactive educational audiovisual material.

- C40.** E. Pallis, G. Mastorakis, A. Burdena, A. Mehaua, Y. Hadjadj Aoul, “The use of novel satellite broadcast technologies for the provision of integrated services”, 16th IST Mobile & Wireless Communications Summit 2007 / International Workshop on IP Networking over Next-generation Satellite Systems (INNSS’07), Budapest, Hungary, 1-5 July, 2007.

Abstract: Digital satellite broadcasting, primarily targeted to unidirectional services, soon expanded to the interactive domain, utilising uplink technologies such as DVB-RCS. In this context, due to their wide and uniform coverage, satellites can provide an ideal medium for the provision of triple play services (voice, video and data) to remote areas not covered by terrestrial infrastructures. This paper discusses and demonstrates the delivery of triple play services over a fully functional platform utilising the second-

generation satellite broadcasting technology (DVB-S2) for the downlink combined with DVB-RCS for the uplink.

- C41.** G. Mastorakis, E. Markakis, A. Sideris, E. Pallis, V. Zacharopoulos, “Experimental infrastructures for IP/DVB convergence: an actual substantiation for triple play services provision at remote areas”, 18th Annual IEEE International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC’07), Athens, Greece, 3 - 7 September, 2007.

Abstract: This paper introduces and validates an experimental infrastructure of a fusion IP/DVB networking environment for the provision of triple play services at remote areas exploiting the synergy of Broadcasting, Internet and Telecommunication sectors technologies. This synergy constitutes a challenge for creating a networking platform which exploits the particularities and complementarities of these sectors for the support of ubiquitous services and always-on connectivity enabling passive rural citizens to become active Information Society participants. This paper describes important directions for exploiting the proposed unified platform alleviating the digital divide that currently exists not only among countries but also within most regions of the same country.

- C42.** G. Gardikis, H.Koumaras, G.Xilouris, E.Pallis, A.Kourtis, “Real-time, Dynamic Resource Allocation in DVB-S.2/RCS Networks”, 8th International Symposium on Interworking, Santiago, Chile, 15 – 19 January, 2007.

Abstract: The enhanced features and increased efficiency of the second-generation digital satellite broadcast technology (DVB-S.2) strengthen the role of satellite networks as carriers of “triple-play” services (television/telephony/Internet access). Interactivity can be provided with appropriate satellite interaction technologies, such as DVB-RCS. This paper presents the concept of the EU-funded IMOSAN project which aims to provide triple-play services over an interactive DVB-S.2/DVB-RCS network, achieving at the same time optimum bandwidth allocation. This is realised via a multi-layer resource allocation mechanism, operating at real time and spanning across the physical, network and application layers of the platform.

2008

- C43.** E. Markakis, A. Sideris, E. Pallis, V. Zacharopoulos, “Differentiated services provision in a converged DVB/IP networking environment”, IEEE/ACS International Conference on Computer Systems and Applications (AICCSA 2008), Doha Qatar, March-April 2008, ISBN: 978-1-4244-1967-8.

Abstract: The paper discusses a converged DVB/IP environment capable to provide differentiated services at a guaranteed quality. Towards this the paper presents the design, implementation and integration of QoS aware mechanisms in the DVB/IP environment in order to enhance its capability as an IP networking infrastructure, optimizing the system’s for the provision of IP heterogeneous services. The capability of the proposed QoS aware DVB/IP network environment is validated through experimental tests that were conducted under real transmission/reception conditions at a prototype infrastructure that conforms to the discussed architectural design issues.

- C44.** N. Zotos, G. Xilouris, E. Pallis, A. Kourtis, “An MPLS-DiffServ Experimental Core Network Infrastructure for E2E QoS Content Delivery”, 6th IEEE/ACS International Conference on Computer Systems and Applications (AICCSA 2008), Doha Qatar, March-April 2008, ISBN: 978-1-4244-1967-8.

Abstract: The continuing and rapid growth of the Internet has created an extremely large capacity problem to the service and content provider’s networks. The increased network traffic and the absence of

service priority, usually produce high network congestions, delayed data and service transmissions and lack of throughput. The effect of these factors in A\V content transmission is to distort the initial content and decrease the content quality. To avoid this negative effect, service and content providers are looking for architectures that give them greater control on traffic passing through their domains and other heterogeneous networks. This document proposes an experimental core network architecture (MPLS-DiffServ) presenting a solution for content providers that want reliable and agreed level of quality, even if the network is under congestion. MPLS-DiffServ architecture, couples the DiffServ's per hop guarantees with MPLS traffic engineering capabilities. Furthermore, content/services of different format will be distributed over MPLS-DiffServ network with different guarantee limits and delivered on a variety of user terminals.

- C45.** E. Markakis, A. Sideris, G. Mastorakis, E. Georgaras, N. Polichronakis, E. Pallis, V. Zacharopoulos, "Dynamic differentiated services provision in a Backhaul DVB/IP networking environment", International Conference on Telecommunications and Multimedia (TEMU2008), Ierapetra, Crete, Greece, 16-18 July, 2008.

Abstract: The paper discusses a DVB/IP backhaul environment as part of a metropolitan/regional networking infrastructure that enables users to access tripleplay IP services at a guaranteed QoS. Utilising the DVB-T stream in regenerative configurations, it initially elaborates on its exploitation as a middle-mile network that extends the core backbone to reach every urban/rural user within the entire broadcasting footprint. Users receive/deliver triple-play IP-services via intermediate communication nodes, which make use of wired/wireless technologies in the access network. Services provision at guaranteed QoS is confronted via the design and implementation of QoS-aware mechanisms, following a services differentiation approach. Performance evaluation tests, conducted under real transmission/reception conditions on a prototype that conforms to the design specifications, verified the system's capacity in QoS provisioning, as well as establishing fields for future exploitation.

2009

- C46.** G. Mastorakis, M. Astrinaki, E. Pallis, V. Zacharopoulos, "Radio spectrum exploitation: A survey on a liberalized management framework, business strategies and marketing opportunities", in Proc. 6th International Conference "New Horizons in Industry, Business and Education" (NHIBE2009), Santorini, Greece, 27-28 August, 2009, pp. 341-352.

Abstract: This paper studies the spectrum availability issue in VHF/UHF frequencies, elaborates on their exploitation under a dynamic management approach and discusses their potential business strategies for introducing secondary systems/services within primary bands (TV bands). Following existing technological and scientific approaches for dynamic spectrum access, it presents a liberalised spectrum exploitation, based on "spectrum commons" and "spectrum markets" regimes rather than the custom "command and control" one.

2010

- C47.** Bourdena, M. Astrinaki, G. Mastorakis, E. Pallis and V. Zacharopoulos, "Efficient sharing of TV White Spaces utilizing mobile TV networks with a cognitive radio approach", International Conference on Telecommunications and Multimedia TEMU 2010, Chania, Greece, 14-16 July, 2010, pp.243-254.

Abstract: The transition from analogue to digital terrestrial television (i.e. Digital Switchover - DSO) releases a significant amount of valuable spectrum in UHF band (i.e. Digital Dividend), that could be utilized in the future for the provision of multiple networking services, by innovative systems and sophisticated technologies. The spectrum resulting after DSO will be available in the form of a "cleared

spectrum” of contiguous channels, as well as in the form of “interleaved spectrum”, namely TV White Spaces (i.e. TVWS), unused within given geographical locations so as to avoid causing interference to co-channel or adjacent channel DVB-T transmitters. The “cleared spectrum” and TVWS provide an opportunity to deploy Cognitive Radio (CR) networks, operating in UHF band, able to deliver multiple multimedia and networking services by sharing the available spectrum with other licensed systems in the same frequency band. In this context, this paper elaborates on the efficient sharing of TVWS by utilizing a mobile TV network with a CR approach. The mobile TV network is based on DVB-H standard and operates as an unlicensed secondary system, accessing TVWS channels via a spectrum broker in order to avoid causing interference to other licensed primary systems (i.e. DVB-T systems).

- C48.** E. Markakis, C. Skianis, A.Sideris, E. Pallis, V. Zacharopoulos, L. Sakizoglou, “Peer to Peer Constellations in a broadcasting Environment”, International Conference on Telecommunications and Multimedia (TEMU2010), Chania, Crete, Greece, 14-16 July, 2010.

Abstract: This paper presents a novel DVB-T based networking architecture that exploits the P2P technology, enabling for an efficient way of network resource exploitation and management. By using a P2P overlay in the DVB-T infrastructure, we are managing to release a portion of the already reserved DVB-T downlink resources and exploit them for new services thus increasing the Service/Bandwidth gain of the system. The capability of the proposed P2P aware DVB/IP networking environment is validated through experimental tests that were conducted under real transmission/reception conditions.

- C49.** E. Markakis, E. Pallis, C. Skainis, V. Zacharopoulos, “Exploiting Peer-to-Peer technology for network and resource management in interactive broadcasting environments”, IEEE Globecom 2010, Miami, Florida, USA, 6-10 December, 2010.

Abstract: This paper presents a novel DVB/IP infrastructure that exploits P2P technology for optimised resource exploitation in interactive services’ provision. Building upon a prototype DVB-T regenerative platform, it presents a decentralized architecture that exploits the broadcasting stream as part of the core/backbone network, providing interactive IP services to rural/urban citizens. Users access the provided IP services via intermediate communication nodes (access network), which are responsible for managing/controlling both uplink and downlink flows. Towards enhancing the scalability as well as the performance of the entire network, the paper studies the realisation of IP overlays by exploiting P2P technology, and proposes a prototype configuration for optimum resource exploitation and increased Service/Bandwidth gain both at the core and access segments. Performance evaluation experiments carried-out under real transmission/reception conditions verified the validity of the proposed architecture, besides outlining fields for future research.

2011

- C50.** G. Mastorakis, A. Bourdena, G. Kormentzas, E. Pallis, V. Zacharopoulos, “TV White Spaces exploitation utilizing a Cognitive Radio system based on DVB-H”, IEEE International Symposium on Computer Networks and Distributed Systems, IEEE CNDS2011, Tehran, Iran, 23-24 February, 2011, pp. 127-130.

Abstract: The transition from analogue to digital terrestrial television (i.e. Digital Switchover - DSO) releases a significant amount of valuable spectrum (i.e. Digital Dividend), in UHF band. Digital Dividend will be available in the form of a “cleared spectrum” of contiguous channels, as well as in the form of “interleaved spectrum”, namely TV White Spaces (i.e. TVWS), unused within given geographical locations, in order to avoid causing interference to co-channel or adjacent channel DVB-T transmitters. “Cleared spectrum” and TVWS provide an opportunity to deploy Cognitive Radio (CR) networks, able to operate in UHF band, by sharing the available spectrum with other licensed systems. In this context, this paper elaborates on the efficient sharing of TVWS by proposing a mobile TV network with CR capabilities,

based on DVB-H. The proposed network operates as an unlicensed secondary system, accessing TVWS via a spectrum broker, which is in charge of assigning the available spectrum.

- C51.** G. Mastorakis, A. Bourdena, E. Pallis, V. Zacharopoulos, “New Business Strategies and Marketing Opportunities Exploiting TV White Spaces”, 5th International Conference on Management, Marketing and Finances, MMF ’11, Meloneras, Gran Canaria, Canary Islands, Spain, 24-26 March, 2011, pp. 145-150.

Abstract: Radio spectrum when used appropriately is an important catalyst for the flourishing of economic activities through broadband wireless services provision. The radio spectrum suitable for the propagation of wireless signals is a limited resource and hence requires optimal allocation as collectively dictated by regulatory, technical and market domains. The current global move to switch from analogue to digital terrestrial television has opened up an opportunity for the re-allocation of this valuable resource. In one way, spectrum bands once used for analogue TV broadcasting will be completely cleared – leaving a space for deploying new licensed wireless services, and in another way, digital terrestrial television technology geographically interleaves spectrum bands to avoid interference between neighbouring stations – leaving a space for deploying new unlicensed wireless services. In this context, this paper elaborates on new business strategies and marketing opportunities, which arise, by exploiting geographically interleaved spectrum, also known as TV White Spaces (TVWS).

- C52.** P. Anapliotis, D.Negru, E.Pallis, V. Zacharopoulos, “Enhancing Legacy Infrastructures With Content Aware Enablers Towards A Networked-Media Platform”, IEEE International Conference on Multimedia and Expo (ICME 2011), Barcelona, Spain, July 11-15, 2011.

Abstract: This paper presents a novel user-centric networked-media architecture, where content-aware capabilities at the network layer are intimately tied-up with network-aware functions at the service’s layer, towards maximum possible QoS/QoE provision. Focusing on the network segment, the paper initially presents the design of a novel virtual layer on top of the traditional network plane capable to enable content awareness, describes its operational components and functions, while elaborating on its communication with legacy infrastructures.

- C53.** N. Vorniotakis, G. Xilouris, G. Gardikis, N. Zotos, A. Kourtis, E. Pallis, “A preliminary implementation of a content-aware network node”, IEEE International Conference on Multimedia and Expo (ICME 2011), Barcelona, Spain, July 11-15, 2011, doi 10.1109/ICME.2011.6012248.

Abstract: This paper presents a preliminary implementation of a content-aware network node as part of a Content-Aware capable network infrastructure. The proposed network node facilitates all the possible functions provided by an ordinary router or gateway while at the same time exploits flow- and content-awareness in order to identify the content carried within a flow and handle it efficiently. In this context this paper discusses the main concepts and operating principles around the flow and content awareness and presents a preliminary implementation, build around the Linux operating system.

- C54.** G. Gardikis, G. Xilouris, D. Negru, P. Anapliotis, Y. Chen, E. Pallis, A. Kourtis, “Media Ecosystem Deployment in a Content-Aware Future Internet Architecture” IEEE Symposium on Computers and Communications 2011 (IEEE ISCC 2011), Corfu, Greece, June 28th - July 1st 2011.

Abstract: Creation and efficient distribution of new rich media services is foreseen to play a key role in the Future Internet. Emerging FI architectures should be able to fully support and facilitate all kinds of current and future media-oriented applications. The architecture illustrated in this paper facilitates the deployment of an integrated Media Ecosystem, where all users can efficiently not only have access to, but

also compose and share rich media services. This is achieved via a mesh of intelligent, media-centric home gateways (“HomeBoxes”), which utilize novel Content-Aware network overlays, developed on top of the existing transport infrastructures. This concept has been designed and is being implemented as an international pilot demonstrator in the frame of the EU-funded ICT project ALICANTE.

- C55.** G. Mastorakis, A. Bourdena, K. Mathioudakis, E. Pallis, V. Zacharopoulos, “Interactive Marketing Optimization Utilizing Next Generation Network Technologies”, in Proc. 7th International Conference "New Horizons in Industry, Business and Education", (NHIBE2011), Chios Island, Greece, 25-26 August, 2011, pp. 409-415.

Abstract: Interactive broadcasting elaborates on the realization of novel next generation network technologies, able to provide multiple interactive multimedia and Internet based services, utilizing Digital Video Broadcasting advances. On the other hand, IP Multimedia Subsystem (IMS) is a promising solution that may be adopted in next generation networks providing advanced capabilities and added value data services. In this context, this paper investigates interactive broadcasting systems and IMS convergence and proposes a novel research approach, which could be adopted towards optimizing interactive marketing. The proposed approach may enable for a more efficient process of collecting and analyzing feedback data from users/viewers. This process is vital for optimum marketing and advertising purposes, since potential information data, collected by utilizing sophisticated technologies, may be used effectively to target customers in a more efficient way.

- C56.** A. Bourdena, E. Pallis, G.Kormentzas, C. Skianis, G.Mastorakis, “Real-Time TVWS Trading Based on a Centralized CR Network Architecture”, in Proc. IEEE Globecom2011, IEEE International Workshop on Recent Advances in Cognitive Communications and Networking, Texas, Houston, USA, 05-09 December, 2011, pp. 964-969.

Abstract: This paper discusses the design and prototyping of a cognitive radio system architecture that enables for TVWS exploitation under the real time secondary spectrum market policy. It describes a centralized infrastructure-based network, where TVWS allocation among unlicensed systems is administrated by a spectrum broker, carrying out radio-resource management and spectrum trading in real time. For optimum system performance as a matter of maximum-possible radio resource exploitation and trading revenue, the paper studies and implements a prototype mechanism at the spectrum broker side, which exploits backtracking algorithm for obtaining the best-matching solution. Performance evaluation experiments carried-out under controlled conditions verified the validity of the proposed architecture, besides establishing its capacity for maximum spectrum utilization and minimum fragmentation under a fixed-price trading policy.

2012

- C57.** E. Markakis, E. Pallis, C. Skianis, V. Zacharopoulos, “Optimised network resource exploitation in interactive broadcasting environments via P2P constellations”, in Proc. IEEE Communications Society, International Conference on Computing, Networking and Communications (ICNC2012), Maui, Hawaii, USA, January 30 - February 2, 2012.

Abstract: This paper proposes the utilisation of peer-to-peer (P2P) concept in interactive broadcasting environments, as an enabling technology for optimised network resource exploitation. Building upon a regenerative DVB-T platform, it presents a decentralised architecture that exploits the broadcasting stream as part of the core/backbone network, providing interactive IP services to rural/urban citizens. Towards enhancing the scalability as well as the performance of the entire network, the paper studies the realisation of IP overlays by exploiting P2P technology, and proposes a prototype configuration for optimum resource exploitation and increased Service/Bandwidth gain both at the core and access segments.

Performance evaluation experiments carried-out under real transmission/reception conditions with a number of real users verified the validity of the proposed architecture, besides outlining fields for future research.

- C58.** A. Bourdena, E. Pallis, G. Kormentzas, G. Mastorakis, “A centralised broker-based CR network architecture for TVWS exploitation under the RTSSM policy”, in Proc. 2nd IEEE Workshop on Convergence among Heterogeneous Wireless Systems in Future Internet (CONWIRE 2012), IEEE ICC2012, Ottawa, Canada, 10-15 June, 2012, pp. 5685 - 5689.

Abstract: The paper discusses the TV white spaces exploitation by a prototype centralised cognitive radio network architecture, under the real time secondary spectrum management scheme. Vital part of this architecture is a spectrum broker that coordinates the radio resources allocation process among secondary systems, as well as the transactions of spectrum trading following a fixed-price policy. Efficient broker operation as a matter of maximum-possible spectrum utilisation and minimum fragmentation is obtained by decision-making methods based on Backtracking, Simulated Annealing and Genetic algorithm. The validity of the proposed approach is verified via a number of experiments under controlled conditions, while its performance is evaluated against a number of secondary systems competing for TVWS exploitation, each one featuring different transmission characteristics.

- C59.** G. Mastorakis, A. Bourdena, G. Kormentzas, E. Pallis, “Spectrum aware routing in ad-hoc cognitive radio networks”, in Proc. IEEE Future Network & Mobile Summit 2012 (FUNEMS2012), Berlin, Germany, 04-06 July, 2012.

Abstract: The paper discusses spectrum aware routing in an ad-hoc cognitive radio network architecture that exploits television white spaces, under the spectrum of commons regime. Vital part of this network architecture is a novel routing protocol that coordinates data flows and establishes optimum routing paths among secondary users with heterogeneous spectrum availability. Efficient protocol operation as a matter of maximum-possible routing paths establishments and minimum delays is obtained by a coordination mechanism that was implemented based on a simulation scenario. The validity of the proposed approach is verified via a number of experiments, under controlled simulation conditions and the performance of the proposed protocol is evaluated considering delay metrics.

- C60.** A. Bourdena, G. Mastorakis, E. Pallis, E. Karditsis, G. Kormentzas, “A radio resource management framework for TVWS exploitation under the RTSSM policy”, in Proc. IEEE International Conference on Telecommunications and Multimedia (TEMU2012), Heraklion, Greece, 30 July – 01 August, 2012, pp. 01-06.

Abstract: This paper elaborates on the design implementation and performance evaluation of a prototype Radio Resource Management (RRM) framework for TV white spaces (TVWS) exploitation, under the Real Time Secondary Spectrum Market (RTSSM) policy. The proposed RRM is applied in centralised CR network architectures, where exploitation of the available TVWS is orchestrated by a Spectrum Broker. Efficient RRM performance as a matter of maximum-possible spectrum utilisation and minimum fragmentation is performed by decisionmaking optimisation methods based on the Backtracking and the Simulated Annealing algorithms. Experimental tests that were carried-out under controlled conditions environment, verified the validity of the proposed framework, besides identifying fields for further research.

- C61.** A. Bourdena, G. Mastorakis, E. Pallis, A. Arvanitis, G. Kormentzas, “A Spectrum Aware Routing Protocol for Public Safety Applications over Cognitive Radio Networks”, in Proc. IEEE International Conference on Telecommunications and Multimedia (TEMU2012), Heraklion, Greece, 30 July – 01 August, 2012, pp. 07-12.

Abstract: The paper elaborates on a routing protocol that efficiently coordinates data flows among public safety secondary systems considering the unpredictable availability of TVWS spectrum resources. The proposed application scenario exploits for the communication of the nodes both Ad-hoc and mesh network architectures. Ad-hoc network connections are ideally for emergency situations, when the spectrum resources are poor, while the mesh network architecture addresses the emerging market requirements for building wireless networks that are highly scalable and cost effective, offering a solution for the easy deployment of high-speed ubiquitous wireless access. Efficient protocol operation as a matter of maximum-possible routing paths establishments and minimum delays is obtained by a coordination mechanism. The validity of the research approach is verified via a number of experimental tests, conducted under controlled simulation conditions, evaluating the performance of the proposed routing protocol.

C62. A. Bourdena, G. Mastorakis, G. Kormentzas, E. Pallis, “A Spectrum Aware Routing Protocol for Ad-Hoc Cognitive Radio Networks”, in Proc. 23rd IEEE International Symposium on Personal Indoor and Mobile Radio Communications (IEEE PIMRC2012), Sydney, Australia, 09-12 September, 2012, pp. 1096 - 1101.

Abstract: The paper proposes a routing protocol that efficiently coordinates data flows among secondary systems with heterogeneous spectrum availability in an ad-hoc cognitive radio network architecture. Efficient protocol operation as a matter of maximum-possible routing paths establishments and minimum delays is obtained by a coordination mechanism, which was implemented based on a simulation scenario. The simulation scenario includes a number of secondary systems that exploit television white spaces, under the spectrum of commons regime. The validity of the research approach is verified via a number of experimental tests, conducted under controlled simulation conditions, evaluating the performance of the proposed routing protocol.

C63. A. Bourdena, G. Mastorakis, E. Pallis, A. Arvanitis, G. Kormentzas, “A Dynamic Spectrum Management Framework for Efficient TVWS Exploitation”, in Proc. 17th IEEE International Workshop on Computer-Aided Modeling Analysis and Design of Communication Links and Networks (IEEE CAMAD2012), Barcelona, Spain, 17-19 September, 2012, pp. 51 - 55.

Abstract: This paper elaborates on a prototype spectrum management framework, for dynamic exploitation of underused radio spectrum, such as TV White Spaces (TVWS), QoS provisioning and policy management, under the real time secondary spectrum market policy. The proposed framework is applied in a centralised Cognitive Radio (CR) network architecture, where the exploitation of the available TVWS, as well as the administration of the economic transactions is orchestrated via a Spectrum Broker. Towards efficiently exploiting TVWS, a fixed-price algorithm is proposed that coordinates the available resources among Secondary Systems, in terms of maximum possible TVWS utilisation and minimum frequency fragmentation. Furthermore, an auction-based algorithm is proposed that considers both frequency and time domain during TVWS allocation process, where maximum payoff of Spectrum Broker is the optimization target. Experimental tests that were carried-out under controlled conditions environment, verified the validity of the proposed framework, besides identifying fields for further research.

C64. A. Bourdena, G. Mastorakis, E. Pallis, C. X. Mavromoustakis, G. Kormentzas, E. Karditsis, “A Radio Resource Management Framework for Opportunistic TVWS Access”, in Proc. 1st ACM Workshop on High Performance Mobile Opportunistic Systems (HP-MOSys 2012), 15th ACM International Conference on Modeling, Analysis and Simulation of Wireless and Mobile Systems, in cooperation with R8 IEEE Computer Society C16, Paphos, Cyprus, 21-25 October 2012, pp. 33-38.

Abstract: This paper elaborates on the design, implementation and performance evaluation of a prototype Radio Resource Management (RRM) framework for opportunistic TV white spaces (TVWS) exploitation, under an auction-based approach. The proposed RRM framework is applied in a centralized Cognitive Radio (CR) network architecture, where exploitation of the available TVWS by Secondary

Systems is orchestrated via a Spectrum Broker. Efficient RRM framework performance, as a matter of maximum-possible resources utilization and benefit of Spectrum Broker, is achieved by proposing, implementing and evaluating an auction-based algorithm. This auction-based algorithm considers both frequency and time domain during TVWS allocation process which is defined as an optimization problem, where maximum payoff of Spectrum Broker is the optimization goal. Experimental tests that were carried-out under controlled conditions environment, verified the validity of the proposed framework, besides identifying fields for further research.

- C65.** A. Bourdena, E. Pallis, G. Kormentzas, G. Mastorakis, “A radio resource management framework for TVWS exploitation under an auction-based approach”, in Proc. IEEE 8th International Conference on Network and Service Management (IEEE CNSM2012), Las Vegas, USA, 22-26 October, 2012, pp. 204-208.

Abstract: This paper elaborates on the design, implementation and performance evaluation of a prototype Radio Resource Management (RRM) framework for TV white spaces (TVWS) exploitation, under an auction-based approach. The proposed RRM framework is applied in a centralised Cognitive Radio (CR) network architecture, where exploitation of the available TVWS by Secondary Systems is orchestrated via a Spectrum Broker. Efficient RRM framework performance, as a matter of maximum-possible resources utilization and benefit of Spectrum Broker, is achieved by proposing and evaluating an auction-based algorithm. This auction-based algorithm considers both frequency and time domain during TVWS allocation process which was defined as an optimization problem, where maximum payoff of Spectrum Broker is the optimization goal. Experimental tests that were carried-out under controlled conditions environment, verified the validity of the proposed framework, besides identifying fields for further research.

- C66.** A. Bourdena, E. Pallis, G. Kormentzas, H. Skianis, G. Mastorakis, “QoS provisioning and policy management in a broker-based CR network architecture”, in Proc. IEEE Globecom 2012, Anaheim, California, USA, 03-07 December, 2012, pp. 1841-1846.

Abstract: The paper presents an infrastructure-based cognitive radio network architecture that enables for TV white spaces exploitation, QoS provisioning and policy management, under the real time secondary spectrum market policy. It describes the configuration of a spectrum broker that coordinates the radio resource management process (RRM) among LTE secondary systems as a matter of maximum possible TVWS utilisation and minimum frequency fragmentation, and also administrates the economics of such transactions towards maximum revenue following a fixed-price trading. The validity of the proposed architecture is verified via a number of tests carried under controlled experimental conditions (i.e. simulations) exploiting a decision-making algorithm.

- C67.** E. Markakis, E. Pallis, C. Skianis, V. Zacharopoulos “Optimised network resource exploitation in interactive broadcasting environments via P2P constellations”, in Proc. IEEE Communications Society, International Conference on Computing, Networking and Communications (ICNC 2012), Maui, Hawaii, USA, January 30 - February 2, 2012.

Abstract: This paper proposes the utilisation of peer-to-peer (P2P) concept in interactive broadcasting environments, as an enabling technology for optimised network resource exploitation. Building upon a regenerative DVB-T platform, it presents a decentralised architecture that exploits the broadcasting stream as part of the core/backbone network, providing interactive IP services to rural/urban citizens. Towards enhancing the scalability as well as the performance of the entire network, the paper studies the realisation of IP overlays by exploiting P2P technology, and proposes a prototype configuration for optimum resource exploitation and increased Service/Bandwidth gain both at the core and access segments. Performance evaluation experiments carried-out under real transmission/reception conditions with a number of real users verified the validity of the proposed architecture, besides outlining fields for future research.

- C68.** A. Sideris, E. Pallis, C. Skianis, V. Zacharopoulos “Distributed NQoS provision in interactive DVB-T systems”, IEEE ICC 2012 Ottawa, Canada, June 10-15, 2012 pp.1906-1910.

Abstract: Abstract: This paper discusses a Distributed Network Quality of Service (NQoS) provision approach in decentralized interactive DVB-T systems (IDVB-T), enabling for scalable and fault tolerant operation. The paper describes the design and overall architecture of a regenerative IDVB-T infrastructure, where network resource allocation and service classification processes are performed at local level within each intermediate distribution node (Cell Main Node CMN), setting the basis for a CMN-to-CMN NQoS provision. Validity of the proposed approach is experimentally verified, and the test-results are compared against the aggregated and federated NQoS provision approaches, indicating similar performance but better scalability and fault-tolerant design.

- C69.** A. Sideris, E. Markakis, P. Anapliotis, E. Pallis, C. Skianis “Content adaptation of IPTV services in Interactive DVB-T systems”, IEEE TEMU 2012 Heraklion, Crete, Greece, 30 July-01 August, 2012 pp. 107-111.

Abstract: This paper discusses how Content Adaptation of IPTV Services may enable decentralized Interactive DVB-T systems (IDVB-T) to optimize the utilization of their network resources, while offering End Users the higher possible QoE. The paper describes the design and overall architecture of a regenerative IDVB-T infrastructure, where content adaptation processes are performed following either a centralized or a distributed approach, setting the basis for a real time accommodation of IPTV services to the available network resources (i.e. bandwidth) and capabilities of End Users terminals (i.e. processing power, screen resolution, codec support). Validity of both Content Adaptation approaches is experimentally verified, with the initial test-results indicating similar performance.

- C70.** P. Anapliotis, E. Markakis, A. Sideris, E. Pallis, D. Négru, “A novel content-aware multipath routing concept exploiting random utility theory principles”, IEEE TEMU 2012 Heraklion, Crete, Greece, 30 July-01 August, 2012 pp. 107-111, pp. 49-53.

Abstract: This paper presents a novel multipath routing concept for content-aware networks, enabling better resource utilization and end-to-end QoS provision. Based on random utility theory and traffic identification techniques it delves into multinomial-type probability for efficient packet distribution among intra domain paths, by exploiting the capability of edge nodes to identify the content in transit, and proposes a network architecture where this concept may be applied. We focus on the methodology alterations that content-awareness will impose on the calculation of the utility that a corresponding packet will inherit in choosing a specific path, assuming that packets of “premium” content will have demanding QoS-centric network “taste” when they will have to choose a specific path.

- C71.** E. Markakis, A. Sideris, P. Anapliotis, G. Alexiou, C. Skianis, E. Pallis, “IMS-enabled interactive broadcasting network utilizing peer to peer constellations”, IEEE TEMU 2012 Heraklion, Crete, Greece, 30 July-01 August, 2012 pp. 107-111, pp. 130-134.

Abstract: This paper propose an overlay interoperability technology for introducing the concept of Peer to peer (P2P) communications in the context of IP Multimedia Subsystem (IMS) enabled interactive broadcasting networks (iDVB-T), bearing the following: a) user initiated conception of communication applications paradigms and deployment, b) access of users on P2P applications from any rural-access network, and c) creation of a new ecosystem of users, emerging different behaviour from the traditional consumers, gearing-up new business and revenue prospects. The overall assessment of the proposed P2P-IMS architecture is evaluated by Real transmission reception experiments justifying the interoperability and validity of the iDVB-T environment proposed.

2013

- C72.** G. Mastorakis, C. X. Mavromoustakis, A. Bourdena, E. Pallis, "An Energy-Efficient Routing Scheme using Backward Traffic Difference Estimation in Cognitive Radio Networks", in Proc. 14th IEEE International Symposium on a World of Wireless, Mobile and Multimedia Networks (IEEE WoWMoM 2013), 3rd IEEE Workshop on Convergence among Heterogeneous Wireless Systems in Future Internet (CONWIRE 2013), Madrid, Spain, 04-07 June, 2013, pp. 01-06.

Abstract: This paper proposes an energy-efficient routing scheme that enables energy conservation and efficient data flow coordination, among communication nodes with heterogeneous spectrum availability in distributed cognitive radio networks. Effective routing scheme operation, as a matter of maximum energy conservation and traffic manipulation is obtained, by utilizing backward traffic activity evaluation, developed based on a simulation scenario. This simulation scenario includes a number of secondary communication nodes, operating over television white spaces (TVWS), under "spectrum of commons" regulation policy. The validity of the proposed energy-efficient routing scheme is verified, by conducting experimental simulations and obtaining performance evaluation results. Simulation results validated its efficiency for minimizing energy consumption and maximizing resources exchange among secondary communication nodes.

- C73.** A. Bourdena, E. Pallis, G. Kormentzas, G. Mastorakis, "Radio Resource Management Algorithms for Efficient QoS Provisioning over Cognitive Radio Networks", in Proc. IEEE International Conference on Communications, IEEE ICC2013, Budapest, Hungary, 09-13 June, 2013, pp.2415-2420.

Abstract: This paper proposes two radio resource management (RRM) algorithms for QoS provisioning over an infrastructure-based cognitive radio network architecture that enables for TV White Spaces exploitation. QoS provisioning and policy management is achieved via a spectrum broker that coordinates the RRM process among LTE secondary systems, under the real time secondary spectrum market policy.

- C74.** C. D. Dimitriou, C. X. Mavromoustakis, G. Mastorakis, E. Pallis, "On the performance response of delay-bounded energy-aware bandwidth allocation scheme in wireless networks", in Proc. IEEE ICC2013, Workshop, Budapest, Hungary, 09-13 June, 2013.

Abstract: This paper proposes a joint power and resource allocation methodology, by using a node-centric scheme. Each node estimates the throughput $\Theta(t_s)$ and tunes the proposed path-aware energy conservation mechanism, according to requested delay constrained resources, as well as the bandwidth resources that the associated channels can handle in time. The combined power and frequency bandwidth allocation scheme is estimated for delay bounded streams, in order to provide the least power cost path to be traversed by the stream. The time-constrained transmissions are being manipulated in a collaborative manner through either the Radio Access Technologies or through the Peer-to-Peer mobile collaboration. The conducted simulation experiments and the results extracted, show that the proposed scheme could be applied to different Radio Access Technologies with variable delay-bound constraints, providing nodal and path-aware energy manipulation, whereas the proposed scheme minimizes the estimated power consumption of each device and prolongs the node's lifetime.

- C75.** G. Mastorakis, A. Bourdena, C. X. Mavromoustakis, E. Pallis, G. Kormentzas, "An energy-efficient routing protocol for ad-hoc cognitive radio networks", in Proc. Future Network & Mobile Summit 2013 (IEEE FUNEMS2013), Lisbon, Portugal, 03-05 July, 2013.

Abstract: This paper proposes a routing protocol enriched with an assigning mechanism and a capacity-aware scheme, enabling for efficient data flow coordination and energy conservation, among networking nodes with heterogeneous radio spectrum availability in ad-hoc cognitive radio networks. The proposed assigning mechanism is able to effectively determine efficient routing paths in a distributed networking architecture, designed based on a simulation scenario, where networking nodes operate over television white spaces (TVWS). The main target of routing in this simulation scenario is to provide optimal, high throughput data transfer, by efficiently selecting the best routing paths. Towards enabling Energy-Efficiency in the proposed research approach, a Backward Traffic Difference (BTD) estimation methodology is exploited. The novelty adopted in the proposed capacity-aware scheme arises by the ability to utilize different assignments of sleep-wake schedules, depending on different incoming traffic that each networking node receives through time. The validity of the proposed energy efficient routing protocol is verified, by conducting experimental simulations and obtaining performance evaluation results. Simulation results validate routing protocol efficiency for minimizing energy consumption, maximizing resources exchange between networking nodes and minimizing routing delays in ad-hoc cognitive radio networks.

- C76.** G. Mastorakis, C. X. Mavromoustakis, A. Bourdena, G. Kormentzas, E. Pallis, “Maximizing Energy Conservation in a Centralized Cognitive Radio Network Architecture”, in Proc. 18th IEEE International Workshop on Computer-Aided Modeling Analysis and Design of Communication Links and Networks (IEEE CAMAD 2013), Berlin, Germany, 25-27 September, 2013.

Abstract: This paper proposes two energy-aware algorithms exploited for optimal resources administration and maximum energy conservation of secondary communication nodes in a centralized cognitive radio network architecture. The proposed algorithms optimally enable efficient TV White Spaces exploitation, through a radio spectrum broker that administrates the resources trading process, based on real-time secondary spectrum market policy. In addition, both algorithms adopt a joint path lifetime and utility maximization scheme, which encompasses a capacity-aware policy for achieving minimum energy consumption and reliability during the resource sharing process. Validity of both algorithms is verified through several sets of extended experimental/simulation tests, carried out under controlled conditions.

- C77.** G. Mastorakis, C. X. Mavromoustakis, A. Bourdena, E. Pallis. G. Sismanidis, “Optimizing Radio Resource Management in Energy-Efficient Cognitive Radio Networks”, in Proc. 2nd ACM Workshop on High Performance Mobile Opportunistic Systems (HP-MOSys 2013), 16th ACM International Conference on Modeling, Analysis and Simulation of Wireless and Mobile Systems, in cooperation with R8 IEEE Computer Society C16, Barcelona, Spain, 03-08 November 2013.

Abstract: This paper elaborates on two radio resource management (RRM) algorithms exploited to optimally allocate radio spectrum and maintain maximum energy in cognitive radio (CR) network nodes of a centralized system architecture. Both RRM algorithms allow for effective TV White Spaces (TVWS) exploitation, using a radio spectrum broker. This broker orchestrates TVWS trading, between several secondary systems, based on an energy-efficient process, as well as the real time secondary spectrum market policy. The proposed TVWS allocation process follows, either a fixed-price or an auction-based trading approach. The efficiency of both algorithms is validated through a number of experimental tests, conducted under controlled simulation conditions. More specifically, their performance was evaluated, in terms of spectrum broker benefit, energy consumption level and throughput response, during TVWS allocation process.

- C78.** P. Mousicou, C. X. Mavromoustakis, G. Mastorakis, A. Bourdena, E. Pallis., “Performance Evaluation of Dynamic Cloud Resource Migration Based on Temporal and Capacity-Aware Policy for Efficient Resource Sharing”, in Proc. 2nd ACM Workshop on High Performance Mobile Opportunistic Systems (HP-MOSys 2013), 16th ACM International Conference on Modeling, Analysis and Simulation

of Wireless and Mobile Systems, in cooperation with R8 IEEE Computer Society C16, Barcelona, Spain, 03-08 November 2013.

Abstract: This paper elaborates on practical considerations, such as location and capacity issues to offload resources, by adopting a rack based approach for the implementation. The proposed cooperative migration of resources enables efficient resource manipulation without any intermittent execution of the claimed tasks by the mobile devices, while it significantly reduces crash failures that lead all servers to become unavailable within a rack. In addition, this paper presents a modular resource migration scheme for failure-aware resource allocation, where according to the estimated performance of the resource sharing process (e.g. access time, service delay etc.) resources are migrated to another cloud rack based on the associated performance-oriented metrics. The proposed architecture is thoroughly evaluated through simulation tests for the resource migration policy used in the context of cloud rack failures for delay-bounded resource availability of mobile users, as well as for the efficiency of the proposed resource migration scheme.

C79. C. X. Mavromoustakis, C. Dimitriou, G. Mastorakis, E. Pallis, “Real-Time Performance Evaluation of F-BTD scheme for optimized QoS Energy Conservation in Wireless Devices”, in Proc. IEEE Globecom 2013, 2nd IEEE Workshop on Quality of Experience for Multimedia Communications (QoEMC2013), Atlanta, GA, USA, 09-13 December, 2013.

Abstract: This work proposes and elaborates on the realtime implementation and comparative evaluation with other similar schemes of the Fibonacci-based Backward Traffic Difference (F-BTD). The proposed scheme aims to prolong the lifetime of the nodes in real-time for MICA2dot wireless sensor nodes/motes while at the same time it aims at optimizing the QoS and the overall throughput response of each node. The F-BTD scheme allows the nodes to sleep adaptively according to the estimated volume of incoming traffic. By considering the incoming traffic, the selective FBTD allows each node to adaptively assign a sleep-time duration for each node’s cycle by using traffic’s backward difference. The F-BTD sleep-time duration associations of each node are then comparatively evaluated in order to define a minimum duty cycle for the next sleep-time slot of the node. The proposed scheme is being evaluated through Real-Time implementation by using the MICA2dot wireless motes that are exchanging resources in a Mobile Peer-to-Peer manner using a specified motion pattern. Comparative performance evaluations with other similar schemes show the efficiency of the proposed scheme in contrast to the nodes’ lifetime extensibility. The proposed framework maximizes further the efficiency and reliability of the resource exchange process of the nodes, while it minimizes the energy consumption.

2014

C80. G. Xilouris, E. Trouva, F. Lobillo, J. Soares, J. Carapinha, M. J. McGrath, G. Gardikis, P. Paglierani, E. Pallis, L. Zuccaro, Y. Rebahi, and A. Kourtis, “T-NOVA: A Marketplace for Virtualized Network Functions”, IEEE European Conference on Networks and Communications (EUCNC2014), Bologna, Italy, June 23-26, 2014.

Abstract: Network Functions Virtualization (NFV) is a concept, which has attracted significant attention as a promising approach towards the virtualization/ “softwarisation” of network infrastructures. With the aim of promoting NFV, this paper outlines an integrated architecture, designed and developed within the context of the EU FP7 T-NOVA project, which allows network operators not only to deploy virtualized Network Functions (NFs) for their own needs, but also to offer them to their customers, as value-added services (Network Functions as-a-Service, NFaaS). Virtual network appliances (gateways, proxies, firewalls, transcoders, analyzers etc.) can be provided on-demand as-a-Service, eliminating the need to acquire, install and maintain specialized hardware at customers’ premises. A “NFV Marketplace” is also introduced, where network services and functions created by a variety of developers can be published, acquired and instantiated on-demand.

- C81.** Dimitrios Stratakis , A. Miaoudakis, George Mastorakis, Evangelos Pallis, Thomas Xenos, Traianos Yioultsis and Constandinos Mavromoustakis: “Noise Reduction for Accurate Power Measurements of Low Level Signals”, Proceedings of the International Conference on Telecommunications & Multimedia, TEMU 2014, Heraklion, Crete, Greece, 28-30 July, 2014, pp. 162-166.

Abstract: As a result of the rapid evolution of mobile communications in the last decade many propagation models have been developed for radio planning purposes. To verify the various propagation models, accurate measurements of the received signals have to be performed especially at the edges of mobile communication cells, where the received power is at very low level and signal to noise ratio is degraded. In these cases narrowband receivers such as spectrum analyzers have to be employed. The settings of the receivers have to be examined carefully, since they are of crucial importance, in order to discriminate the measured signals from the noise. On the other hand, noise has to be removed from the measurements and uncertainty has to be estimated correctly; thus the “clean” levels will be suitable for verifying the propagation models and optimize the radio planning. In this paper a method of noise reduction for such signals is presented.

- C82.** G. Mastorakis, Evangelos K. Markakis, Evangelos Pallis, Constandinos X. Mavromoustakis, Georgios Skourletopoulos, "Virtual Network Functions Exploitation through a Prototype Resource Management Framework", International Conference on Telecommunications and Multimedia TEMU 2014, IEEE Communications Society proceedings, 28-30 July, Crete, Greece, pp. 24-28.

Abstract: This paper elaborates on the design of a prototype framework for the exploitation of virtual Network Functions (NFs) and virtual Network Resources (NRs) in a cloud-based network architecture. The proposed framework is based on a Marketplace approach, utilizing a centralized network architecture, where the exploitation of the available NFs/NRs is managed by a Brokerage Module. This Brokerage Module applies trading policies based on a resource predictive entity that monitors the resources, towards matching the end-user demands and providing the acceptable bandwidth required.

- C83.** M. Papadopoulos, C. X. Mavromoustakis, G. Skourletopoulos, G. Mastorakis, E. Pallis, "Performance Analysis of Reactive Routing Protocols in Mobile Ad hoc Networks", International Conference on Telecommunications and Multimedia TEMU 2014, IEEE Communications Society proceedings, 28-30 July, Crete, Greece, pp. 104-110.

Abstract: Mobile Ad hoc Networks (MANETs) are self-organized infrastructure-less networks, including wireless mobile systems, which have been thoroughly studied and widely used in a variety of applications. Routing mechanisms in MANETs are considered as a major research challenge due to the nature of the network topology, where the nodes are able to move in any direction in the network showing unpredictable behavior. Nodes failures and absence of centralized coordinators are also important challenges in such network configurations. In addition, the routing protocols that are usually exploited in MANETs are characterized as proactive (Table-driven) and reactive (On demand). In this context, this paper elaborates on a preliminary comparison study among different reactive protocols, such as the Ad hoc On-demand Distance Vector (AODV) and the Dynamic Source Routing (DSR). This comparison was conducted towards investigating the optimum exploitation of such routing protocols in MANETs, in terms of their performance against the number of the nodes in the network.

- C84.** E. Markakis, C. Skiannis, A. Sideris, E. Palis, “Improving BitTorrent Content Delivery over Broadcast Networks”, International Conference on Telecommunications and Multimedia TEMU 2014, IEEE Communications Society proceedings, 28-30 July, Crete, Greece, pp. 111-115.

Abstract: The paper presents a hybrid P2P-IP/Digital Video Broadcasting platform where user-generated content and services can be enrolled in the frame designated by interactive broadcasting, thus making optimum resource exploitation and become widely available to users with maximum possible QoS. For optimised resource exploitation especially in the backbone segment (DVB-T) the paper elaborates on a prototype broadcast-aware mechanism that assists P2P content distribution among prosumers located in different CMNs by minimising redundant traffic in the downlink stream, thus providing for enhanced scalability and optimised performance. Performance evaluation tests, conducted under real transmission/reception conditions on a prototype that conforms to the design specifications, verified the validity of the Mechanism presented.

C85. A. Sideris, E. Markakis, A. Trigonis, G. Alexiou, E. Pallis, C. Skianis, “QoE Fairness, HTTP Adaptive Streaming and IDVB-T: The AWM approach”, International Conference on Telecommunications and Multimedia TEMU 2014, IEEE Communications Society proceedings, 28-30 July, Crete, Greece, pp. 29-33.

Abstract: In this paper, we show how Active Window Management (AWM) technique can be exploited for providing QoE fairness to the HTTP Adaptive Streaming users of an interactive digital broadcasting network. Furthermore, we test AWM's efficiency against another QoE fairness provision solution, presented in other research efforts, namely the Traffic Shaping. Towards these, we firstly describe the deployment of AWM and Traffic Shaping software modules in each intermediate node (Cell Main Node-CMN) of the broadcasting network and secondly we proceed with the experimental evaluation. The experimental results showed not only AWM's efficiency to achieve the set fairness goal but also revealed AWM's capacity, when compared to Traffic Shaping, to provide for much lower TCP Round Trip Times (88% less) and zero retransmissions; a result which could, in principle, lead to less TCP rate variations and thus less Quality Profile fluctuations.

C86. G. Skourletopoulos, R. Bahsoon, C. X. Mavromoustakis, G. Mastorakis, E. Pallis, “Predicting and Quantifying the Technical Debt in Cloud Software Engineering”, in Proceedings of the 19th IEEE International Workshop on Computer-Aided Modeling Analysis and Design of Communication Links and Networks (IEEE CAMAD 2014), Athens, Greece, 1-3 December, 2014.

Abstract: Identifying and managing effectively the Technical Debt has become an issue of great importance over recent years. In cloud marketplaces, where the cloud services can be leased, the difficulty to promptly predict and manage the Technical Debt has a significant impact. In this paper, we examine the Technical Debt, which stems from budget constraints during the software development process as well as the capacity of a cloud service. In this context, the budget and the cloud service selection decisions may introduce Technical Debt. Towards reaching a conclusion, two approaches are taken into consideration. Initially, a cost estimation approach is researched, which is related to implementing Software as a Service (SaaS) in the cloud for three scenarios aiming to predict the incurrence of the Technical Debt in the future. The Constructive Cost Model (COCOMO) is exploited, in order to estimate the implementation cost and define a range of secureness. In addition, a Technical Debt quantification approach is adopted, which is associated with leasing a cloud Software as a Service (SaaS), towards indicating the most appropriate cloud service to be selected.

C87. Y. Kryftis, C. X. Mavromoustakis, J. M. Batalla, G. Mastorakis, E. Pallis, G. Skourletopoulos, “Resource Usage Prediction for Optimal and Balanced Provision of Multimedia Services”, in Proceedings of the 19th IEEE International Workshop on Computer-Aided Modeling Analysis and Design of Communication Links and Networks (IEEE CAMAD 2014), Athens, Greece, 1-3 December, 2014.

Abstract: This paper proposes a novel network architecture for optimal and balanced provision of multimedia services, exploiting a resource prediction system. This architecture enables for the long-term prediction of multimedia services future demands, based on the history of previous network resources usage. The proposed research approach provides the opportunity for the optimal distribution of streaming

data, among Content Delivery Networks, cloud-based providers and Home Media Gateways. The short-term prediction that is performed, enables for making the proper decisions by the system, according to specific network metrics, towards achieving higher Quality of Service and Quality of Experience for the end users. The validity of the proposed system is verified through several sets of extended experimental simulation tests, carried out under controlled simulation conditions.

- C88.** A. Sideris, E. Markakis, A. Trigonis, G. Alexiou, E. Pallis, C. Skianis, "MPEG-DASH over IDVB-T: The QoE unfairness issue" *Computer Aided Modeling and Design of Communication Links and Networks (CAMAD)*, 2014 IEEE 19th International Workshop, vol., no., pp.70,74, 1-3 December 2014.

Abstract: MPEG-DASH is the first international standardisation effort in the area of HTTP Adaptive Streaming, but as its vendor counterparts suffers from the QoE unfairness issue: alike MPEG-DASH users, sharing the same net and requesting the same video service, receive segments from different Quality Profiles. Being interested to exploit MPEG-DASH paradigm for transferring video services over interactive digital broadcasting networks, we discuss, in this paper, how these broadcasting networks can provide QoE fairness to their MPEG-DASH users. In more detail, we propose the elevation of the broadcasting networks' edge routers to QoE fairness nodes able to enforce any QoE fairness policy to their MPEG-DASH users. Towards validating our approach, we integrated in each edge router a Traffic Shaper, to be used as a QoE fairness module, and run several experiments that verified the QoE unfairness issue, besides revealing ours solution capacity to eliminate it.

- C89.** C. X. Mavromoustakis, G. Mastorakis, A. Bourdena, E. Pallis, G. Kormentzas, J. Rodrigues, "Context-oriented Opportunistic Cloud Offload Processing for Energy Conservation in Wireless Devices", in *IEEE Globecom 2014-Cloud Computing Systems, Networks, and Applications - Globecom 2014 Workshop - The Second International Workshop on Cloud Computing Systems, Networks, and Applications (CCSNA)*, GC14, Austin, TX, USA, 8-12 December, 2014.

Abstract: This paper elaborates on the design and the comparative evaluation with other similar approaches, of a Cloud executable process-offloading scheme. The mobile devices gather through their communication and social context ("friend's" available resources and bandwidth etc.), the related data, towards elaborating further and enabling the process of the execution offloading. The proposed scheme aims at prolonging the lifetime of the mobile devices, while at the same time, it aims at saving resources on the user's device to maximize the efficiency in running context applications. The proposed social-aware scheme opportunistically exploits the resources of other socially-connected peers, in order to extend the capabilities of the mobile devices, by providing extra computing, storage resources, as well as the execution guarantee within a specified time frame. Comparative performance evaluations, in the presence of "critical-process executions", as well as in the sense of meeting the required deadlines, were performed for the comparison with other similar schemes to prove the validity and the efficiency of the proposed framework, in contrast to the nodes' lifetime extensibility.

- C90.** C. X. Mavromoustakis, G. Mastorakis, A. Bourdena, E. Pallis, G. Kormentzas, C. Dimitriou, "Joint Energy and Delay-aware Scheme for 5G Mobile Cognitive Radio Networks", in *proceedings of IEEE GlobeCom 2014, track Globecom 2014 - Symposium on Selected Areas in Communications: GC14 SAC Green Communication Systems and Networks - GC14 SAC Green Communication Systems and Networks*, Austin, TX, USA, 8-12 December, 2014.

Abstract: This paper proposes a delay-assisted cooperative scheme for optimal TV White Spaces (TVWS) exploitation and maximum energy conservation in a 5G mobile cognitive radio (CR) network architecture. This architecture utilizes a radio spectrum broker, which administrates the process of network resources management among several 5G base-stations to support Quality of Service (QoS) provision and minimum energy consumption. The proposed scheme is based on the comparison of the delays of both

the secondary nodes and the Radio Access Points, when a delay sensitive transmission is requested. The validity of the proposed scheme is verified through several experimental tests, performed under controlled simulation conditions. The performance evaluation results include the energy consumption level and the lifetime span of each wireless node, the throughput response of the system during the delay-sensitive resource exchange process, as well as quantitative measurements of the energy efficiency levels of the proposed scheme.

2015

- C91.** A. Sideris, E. Markakis, N. Zotos, E. Pallis, C. Skianis, "MPEG-DASH users' QoE: The segment duration effect", in *proc. of Seventh International Workshop on Quality of Multimedia Experience (QoMEX)*, vol., no., pp.1,6, 26-29 May 2015.

Abstract: MPEG-DASH has become one of the mainstream methods for streaming video over unmanaged networks, as it enables users to receive this video at the best possible QoE level the network capacity and the users' terminals capabilities allow. However, it has been observed that when MPEG-DASH users, sharing the same access network, request, in parallel, the offered video content, QoE unfairness occurs: some users receive video content that corresponds to a high QoE level whereas all others do not. As a reason for this result, literature points out the inter-dynamics between TCP's congestion avoidance mechanism and the on-off operational pattern of MPEG-DASH switching logic. In this paper, we try to shed some more light on this QoE unfairness issue by investigating how the segment duration of the video content can affect the MPEG-DASH users' QoE level. Towards this, we designed a number of experiments where two identical users request, concurrently, the same video service, but utilising a different segment duration. As this work is part of a larger effort regarding MPEG-DASH, QoE and interactive digital broadcasting, we conducted our experiments over an interactive DVB-T testbed. The experimental results show a strong correlation between the video's segment duration and the MPEG-DASH users QoE level: the user utilizing a longer segment duration achieves a higher QoE level than the one utilising a shorter segment duration.

- C92.** Y. Kryftis, C. X. Mavromoustakis, G. Mastorakis, E. Pallis, J. M. Batalla, J. Rodrigues, C. Dobre, G. Kormentzas, "Resource Usage Prediction Algorithms for Optimal Selection of Multimedia Content Delivery Methods", in *proc. of IEEE International Conference on Communications 2015 (IEEE ICC 2015)*, London, UK, 08-12 June 2015.

Abstract: This paper proposes two algorithms adopted in a prototype network architecture, for optimal selection of multimedia content delivery methods, as well as balanced delivery load, by exploiting a novel resource prediction engine. The proposed architecture exploits both algorithms for the prediction of future multimedia services demands, by providing the ability to keep optimal the distribution of the streaming data, among Content Delivery Networks, cloud-based providers and Home Media Gateways. In addition, the prediction of the upcoming fluctuations of the network, provides the ability to the proposed network architecture, achieving optimized Quality of Service (QoS) and Quality of Experience (QoE) for the end users. Both algorithms were evaluated to establish their efficiency, towards effectively predicting future network traffic demands. The experimental results validated their performance and indicated fields for further research and experimentation.

- C93.** D. Posnakides, C. X. Mavromoustakis, G. Skourletopoulos, G. Mastorakis, E. Pallis, J. M. Batalla, "Performance Analysis of a Rate-Adaptive Bandwidth Allocation Scheme in 5G Mobile Networks", *The 20th IEEE Symposium on Computers and Communications (IEEE ISCC 2015)*, Larnaca, Cyprus, 06-09 July 2015.

Abstract: The efficient support of the massive device transmission is challenging in Machine-to-Machine (M2M) communications. A large number of devices activate transmissions within a short period

of time in M2M communications, which in turn cause high radio access congestions and severe wireless access medium delay. In this context, this work proposes a hybrid MAC approach, based on the well-known ALOHA protocol, and intended to be applied in 5G mobile networks. The topology changes dynamically in the proposed rate-adaptive ALOHA scheme, whereas the bandwidth of a channel is utilized effectively aiming to improve the overall performance of the M2M mobile environment. A random distribution model was exploited during the conducted experiments in order to perform a systematic evaluation of bidirectional communication within a 5G mobile environment. The major contribution of the proposed scheme is the improvement of the network throughput as multiple connections are possible. The experimental results indicate the scheme's efficiency by offering high throughput as opposed to the delay variations between packets, while the proposed scheme aims at maximizing the efficiency of resource exchange between mobile peers.

- C94.** C. X. Mavromoustakis, G. Mastorakis, C. Mysirlidis, T. Dagiuklas, I. Politis, E. Pallis, "On the perceived quality evaluation of opportunistic Mobile P2P Scalable Video streaming ", 11th International Wireless Communications & Mobile Computing Conference (IWCMC 2015), Dubrovnik, Croatia, 24 -28 August, 2015.

Abstract: This paper studies the evaluation of the video streaming over Mobile Peer-to-Peer (MP2P) networks using Scalable Video Coding. The proposed research framework exploits the MP2P diversity characteristics where each node acts as a Mobile Peer for every neighboring node in a relay-based communicating path. Mobile Peers use a common look-up table to request video streaming resources in order to estimate the video packets transfer duration in the end-to-end path. The collaborative streaming is achieved through the data packets replication policy, which uses a bounded upper time limitation for the video packets of each layer (Use of Scalable Video). Each node/device utilizes a specified amount of capacity for both channel and storage purposes. Different scenarios have been introduced in this paper towards evaluating the video streaming policy in the MP2P system, using a real-time probabilistic Fractional Brownian Motion (FBM) and a Random Waypoint (RWP) Mobility model. In both models, nodes move according to certain probabilities, location and time. Intermittent connectivity occurs while nodes claim video streams, whereas promiscuous caching policy enables -where possible- recoverability of lost packets offering priority to packets from the base layer. The simulation results show that FBM provides better objective and subjective quality results for two video sequences resolution, in the MP2P network configuration.

2016

- C95.** G. Skourletopoulos, C. X. Mavromoustakis, G. Mastorakis, E. Pallis, P. Chatzimisios, J. M. Batalla, "Towards the Evaluation of a Big Data-as-a-Service Model: A Decision Theoretic Approach", IEEE INFOCOM session on Big Data Sciences, Technologies and Applications (BDSTA 2016)- 2016 IEEE Infocom BDSTA Workshop, IEEE International Conference on Computer Communications, San Francisco, CA, USA10-15, April 2016.

Abstract: The rise of large data centers has created new business models, where businesses can lease storage and computing capacity and pay only for the storage they actually use, rather than making the large capital investments needed to construct and provision large-scale computer installations. In this context, investments in big-data computing are rapidly gaining ground, having extraordinary near-term and long-term benefits. The mobile cloud can be considered as a marketplace, where the storage and computing capabilities of the mobile cloud-based system architectures can be leased off. However, cloud storage is not less expensive, only that it incurs operating rather than capital expenses. This paper elaborates on a novel cost analysis model, adopting a non-linear and asymmetric approach. The proposed modeling aims to evaluate the adoption of a big data-as-a-service business model against the traditional high-performance data warehouse appliances that exist in the market in order to inform effective and strategic decision making. The lease of cloud storage is investigated, when developing the mathematical formulas, and the research approach is examined with respect to the cost that derives from the unused storage. Possible upgrade of the storage and the risk of entering into new and accumulated costs in the future are also considered in this study. A quantification tool has been also developed as a proof of concept (PoC),

implementing the proposed quantitative model and intending to shed light on the adoption of big data-as-a-service business models.

- C96.** G. Skourletopoulos, C. X. Mavromoustakis, G. Mastorakis, E. Pallis, J. M. Batalla, G. Kormentzas, “Quantifying and Evaluating the Technical Debt on Mobile Cloud-Based Service Level”, IEEE International Conference on Communications 2016 (IEEE ICC 2016), Kuala Lumpur, Malaysia, 23-27 May 2016.

Abstract: As network bandwidth and coverage continue to increase, the adoption rates of mobile devices are growing over time and the mobile technology is becoming increasingly industrialized. In mobile cloud marketplaces, the cloud-supported mobile services can be leased off. However, the mobile service selection may introduce technical debt (TD), which is essential to be predicted and quantified. In this context, this paper examines the incurrence of technical debt in the future when leasing cloud-based mobile services by proposing a novel quantitative model, which adopts a linear and symmetric approach as a linear growth in the number of users, is predicted. The formulation of the problem is based on a cost-benefit analysis, elaborating on the potential profit that could be obtained if the number of users would be equal to the maximum value. The probability of overutilization of the selected service in the long run is also researched. Finally, a quantification tool has been developed as a proof of concept (PoC), which initiates the technical debt analysis and optimization on mobile cloud-based service level and aims to provide insights into the overutilization or underutilization of a web service when a linear increase in the number of users occurs.

- C97.** Vasos Hadjioannou, Constantinos X. Mavromoustakis, George Mastorakis, Evangelos Pallis, Dimitrios Stratakis, Dimitra Valavani, “On the Performance Comparison of the Agent-based Rate Adaptivity Scheme for IEEE 802.11n and ZigBee”, Proceedings of the International Conference on Telecommunications & Multimedia, TEMU 2016, Heraklion, Crete, Greece, 25 - 27 July, 2016.

Abstract: This work examines the IEEE 802.11, used in WLANs (Wireless Local Area Network), and IEEE 802.15.4, for WPANs (Wireless Personal Area Network), along with the Agent-based Rate Adaptive Scheme. The paper presents the Agent-based Rate Adaptive Scheme, which allows each channel to adaptively set the rate for serving a specific transfer. To this end Agents are being utilized on each node in order to enable efficient monitoring of the requirements of each transfer and adjust the rate accordingly. Results were extracted by conducting simulation experimentation, and comparing the behavior and performance of a WLAN and a ZigBee network, in a short distance environment such as an office or a house, in order to determine the optimal protocol to be used in applications such as home/building automation. The experiment showed that while the 802.11 protocol performs better when it comes to delay, ZigBee has the upper hand in reliability, as more packets were successfully delivered in the WPAN, rather than the WLAN. Furthermore, this paper takes into consideration parameters such as queuing delay and transmission rate adaptivity, investigates them in a more calculative manner, and presents the findings of our evaluations.

- C98.** E. Markakis, A. Sideris, G. Alexiou, A. Bourdena, E. Pallis, G. Mastorakis, C. X. Mavromoustakis, "A Virtual Network Functions Brokering Mechanism", International Conference on Telecommunications and Multimedia TEMU 2016, IEEE Communications Society proceedings, Heraklion, Greece, 25-27 July, 2016.

Abstract: The application of virtualisation techniques in communication networks is growing in response to continuous pressure due to profitability stagnation and profit margin reduction. In this regard, the trend of Network Function Virtualisation (NFV), which refers to the use of cloud-based software for carrying out network functions, is expected to modify this scenario. The EU FP7 T-NOVA project has the goal of providing mechanisms to foster the adoption of NFV. In this paper, we present a look in the commercialisation of NFV-based offerings through a marketplace, in which users can trade, auction, select and acquire NFV services. In this respect, a brokering mechanism was developed that is able to facilitate competition among Function Providers (FPs), allowing the T-NOVA customers to search for available

offerings, trade between the third-party function developers (FPs) and finally the Service Provider (SP) to find the best price for the VNFs, which will be part of each T-NOVA Network Service.

- C99.** V. Hadjioannou, C. X. Mavromoustakis, G. Mastorakis, E. Markakis, E. Pallis, "Context Awareness Location-based Android Application for Tracking Purposes in Assisted Living", International Conference on Telecommunications and Multimedia TEMU 2016, IEEE Communications Society proceedings, Heraklion, Greece, 25-27 July, 2016.

Abstract: Smart phones are equipped with a variety of sensors (accelerometer, light sensor, etc.), as well as other specialized hardware (camera, flashlight, etc.), giving them this way a plethora of value-added capabilities, apart from the conventional phone call and message exchange. They are able to turn every user into a data gathering agent, since information can be collected from both the environment outside of the device, as well as be retrieved from the digital world. Although smart phones have become an indispensable gadget in data gathering and telecommunication, the features that they provide can also be taken advantage for improving the living conditions of people around the world. The various sensors that are embedded in mobile phones nowadays can accurately measure, monitor, and keep track of their surroundings, as well as transmit any gathered information from their environment to designated individuals or organizations. This way, a smart phone can be used for remotely monitoring, and keeping an eye, on people that are in need of someone looking after them. This paper presents the steps that were taken for the development of a location-based Android application which can be used for the tracking purpose of people that are in need of such services. It will be able to inform a number of the users chosen peers about their where about in case the owned device is located in an area where it is not expected to be in. The application will also be capable of sensing a few simplified movements the user performs with the device and fire particular events based on the user's gesture, giving this way a context awareness aspect to the application.

- C100.** K. Pantelaki, D. Stratakis, E. Pallis, S. Miclaus, N. Balcescu, Z. D. Zaharis, T. Xenos, "Radar Measurements with Remote Control Software", International Conference on Telecommunications and Multimedia TEMU 2016, IEEE Communications Society proceedings, Heraklion, Greece, 25-27 July, 2016.

Abstract: The great development of wireless communication technology has caused much concern about the possible adverse effects of electromagnetic field exposure on human health. A special type of such emissions is the rotating pulsed signals, such as civil aviation approach Radars, often situated close to residential areas. This paper describes a dedicated remote control software developed in order to automate the measurement procedures together with the evaluation of the relevant electromagnetic radiation. The great benefit of this software is that random errors caused by the personnel employed in the measurement procedure are avoided. The remote communication with the measurement system consists of a traditional spectrum analyzer (SA) and a rotating dipole antenna, whereas the post processing of the measurement data is done using two Graphical User Interfaces (GUI) developed in MATLAB. The setup of the SA is performed using Standard Commands for Programmable Instruments and Virtual Instrument Software Architecture.

- C101.** Z. D. Zaharis, T. Yioultsis, C. Skeberis, T. Xenos, P. Lazaridis, D. Stratakis, E. Pallis, "Near optimal synthesis of exponential log-periodic dipole array geometry by applying invasive weed optimization", International Conference on Telecommunications and Multimedia TEMU 2016, IEEE Communications Society proceedings, Heraklion, Greece, 25-27 July, 2016.

Abstract: A new geometry of log-periodic dipole array (LPDA) is presented in this work. Unlike the traditional LPDA geometry, where all dipoles are considered to be inside the same angular sector, the proposed LPDA adopts an exponential geometry, described by two parameters called exponential scale factor and exponential relative spacing. By properly adjusting these two parameters, the exponential LPDA (ELPDA) geometry obtains wideband behavior with excellent radiation characteristics. A near optimal

ELPDA geometry that achieves the desired radiation characteristics inside the required bandwidth is found in the present work by applying a recently developed method called invasive weed optimization (IWO). In particular, the ELPDA is required to operate in the 800-3300MHz frequency range under specific constraints concerning standing wave ratio, forward gain, gain flatness, front-to-back ratio and side lobe level. A comparison with a traditional LPDA of the same total antenna length exhibits the superiority of the proposed geometry.

2017

C102. Y. Nikoloudakis, E. Markakis, G. Mastorakis, E. Pallis, C. Skianis, "An NFV-Powered Emergency System for Smart Enhanced Living Environments", in IEEE Conference on NFV/SDN, 4th Workshop on Network Function Virtualization and Programmable Networks, Berlin, Germany, pp. 258–263, 6-8 November, 2017.

Abstract: The emergence of ubiquitous computing paradigms, and smart Ambient Intelligence environments, will play a crucial role, towards creating better living environments for activity-challenged individuals, such as disabled, or elderly people that require constant care. In addition, cloud computing has been an empowering force for that endeavour. In this paper, we propose a virtualized Cloud-based Ambient Assisted Living (AAL) system that enables caretakers and first responders to constantly monitor a patient's indoor/outdoor position and be notified in case of emergency. Positioning is made possible through an embedded device (carried by the patient) that performs proximity estimation (Wi-Fi) and cell identification (Cellular). The geolocation data are sent to a VNF (Virtual Network Function) for further processing and assessment. In case the patient drifts away from his/her premises, the VNF retrieves the closest-to-the-patient third party agents (caretakers, hospital, police, volunteers, first responders, etc.) through the Location-to-Service-translation (LoST) protocol [1] and alerts them via a SIP-based (Session Initiation Protocol) VOIP (Voice over IP) communication channel.

C103. E. Pallis, G. Papadourakis, C. J. Debono, J. A. Briffa, D. Negru, C. X. Mavromoustakis, C. Politis, D. Tsaptsinos, G. Mastorakis, "NEREUS: an ERASMUS+ Strategic Partnership for skills development in the field of "next generation networked media over 4G+ infrastructures", European Association for Education in Electrical and Information Engineering (EAEEIE), Grenoble, France, June, 2017.

Abstract: This paper presents the implementation approach adopted by "NEREUS", an ERASMUS+ KA2 project, which is funded under the Strategic Partnership framework for enabling young engineers to gain multidisciplinary talents in the ICT domain, involving principles from the Informatics and Internet technologies, Telecommunications and Network engineering, Social Media sciences and service/network Security field. It describes the methodology utilized by five (5) European Higher Education Institutes towards the implementation and quality-evaluation of a novel multidisciplinary module/programme for "next generation networked media over 4G+ infrastructures", and elaborates on the planned activities for educating/training students in cutting-edge topics, of i) novel media coding and "green" transport mechanisms, ii) open network architectures with service orchestration, iii) QoS/QoE modeling & management, iv) next generation cloud-based services, and v) secure and trustworthy communications.

2018

C104. G. Skourletopoulos, C. X. Mavromoustakis, G. Mastorakis, J. M. Batalla, H. Song, J. N. Sahalos, E. Pallis, "Elasticity Debt Analytics Exploitation for Green Mobile Cloud Computing: An Equilibrium Model", in 2018 IEEE International Conference on Communications (ICC), Kansas City, MO, USA, 20-24 May 2018 pp. 1-6.

Abstract: Mobile cloud computing is being accepted as the model for mobile users to ubiquitously access a shared pool of cloud computing resources, data and services on-demand. In this context, elasticity debt analytics can be harnessed as a measure for efficient scheduling of cloud resources and guarantee of quality of service requirements. This paper proposes a novel green-driven, game theoretic approach to minimizing the elasticity debt on mobile cloud-based service level, investigating the case when a task is offloaded, scheduled and executed on a mobile cloud computing system. The decision to offload a mobile device user's task on cloud affects the level of elasticity debt minimization for the provided services. The research problem is formulated as an elasticity debt quantification game, elaborating on an incentive mechanism to: (a) predict elasticity debt and mitigate the risk of service overutilization, (b) achieve scalability as the number of mobile device user requests for cloud resources increases or decreases accordingly, and (c) optimize cloud resource provisioning, parameterizing the current pool of active users per service. The experimental results prove the effectiveness of the equilibrium model, which allocates the mobile device user requests to high elasticity debt-level services and facilitate elasticity debt minimization for greener mobile cloud computing environments.

C105. T. Alshayeh, C. X. Mavromoustakis, J. M. Batalla, G. Mastorakis, E. Markakis, E. Pallis, "On the Efficiency Evaluation of a Novel Scheme Based on Daubechies Wavelet for Watermarking in 5G", IEEE CAMAD 2018, IEEE International Workshop on Computer-Aided Modeling Analysis and Design of Communication Links and Networks, Barcelona, Spain, 17-19 September 2018.

Abstract: Nowadays the Internet infrastructure enables the transfer of massive amounts of large data sets throughout the Web. Over this infrastructure, the risks of infringement of the owner's rights and the incapability to defend their data from attacks are important. There are several demands for novel and smart watermarking schemes to save those rights from an illegal copying of the digital products. The Digital watermarking is a technology used to protect the copyrights of the digital media. Image watermarking scheme is used to limit the chances of piracy. Various approaches were proposed to be used with an image watermarking scheme, such as wavelet transforms, principle component analysis and singular value decomposition. In this work, the proposed watermarking scheme is based on the Daubechies family wavelets, Daubechies-5 and Daubechies-7 wavelet transform. This wavelet family approach is highly robust against various types of attacks, prohibiting the piracy and authentication of the digital data. The experimental results depict that this proposed scheme allows protection at a higher level compared with other existing frameworks and schemes.

C106. Y. Nikoloudakis, H. Skianis, I. Politis, C. X. Mavromoustakis, E. Markakis, G. Alexiou, S. Bourazani, G. Mastorakis, E. Pallis, "Edge Caching Architecture for Media Delivery over P2P Networks", IEEE CAMAD 2018, IEEE International Workshop on Computer-Aided Modeling Analysis and Design of Communication Links and Networks, Barcelona, Spain, 17-19 September 2018.

Abstract: Peer to Peer (P2P) systems, have been identified as one of the main contributors to the exponential growth of internet traffic. File sharing applications such as BitTorrent clients, are the most popular among P2P systems and tend to consume great amounts of network resources, stretching infrastructure capabilities to their limits. This causes interdomain links to be overloaded with traffic, created from content traversing the network, which is most of the times redundant. Cloud computing has been an empowering force towards alleviating this issue and many research approaches have been proposed. With cloud orchestration frameworks and Software Defined Networks (SDN) as our empowering technologies, we propose a cross-layered edge-caching mechanism to alleviate content and service providers of link-saturation problems, caused by identical content requested and downloaded by multiple users in the same network vicinity. The proposed mechanism identifies and classifies P2P data-in-transit, caches it locally and successively acts as a peer by sharing it with all other requesting users. This way, redundant traffic in the backhaul link is minimized, since requests for content cached by the mechanism, will be served by the target edge-node and not from the content provider. To validate the performance and overall efficacy of the proposed mechanism, simulation experiments were conducted under a controlled-conditions environment. Results indicated that the proposed mechanism can reduce redundant network traffic up to 22%.

- C107.**E. Pallis, C. J. Debono, D. Negru, C. X. Mavromoustakis, C. Politis, G. Papadourakis, J. A. Briffa, A. Makrodimitris, G. Mastorakis, “Skills development in the field of next generation networked media over 4G+ infrastructures: the NEREUS approach and its first results”, 28th EAEEIE Annual Conference, Reykjavík, Iceland, September 26-28, 2018.

Abstract: The paper discusses the first-year results from the NEREUS project, an ERASMUS+ KA2 Strategic Partnership (2016-1-EL01-KA203-023637) for skills development in the field of “next generation networked media over 4G+ infrastructures”. It initially outlines the overall approach adopted by five European Higher Education Institutes (HEI) towards the implementation of a number of Intellectual Outputs in the areas of Informatics, Telecommunications and service/network Security, and presents the overall methodology/policy adopted for assessing the quality of the provided modules by external and internal advisory boards. In turn, the paper elaborates on the implementation of two Intensive Courses for assessing the educational/training content by real/actual audience, analyzes the evaluations results and describes the actions taken for enhancing the quality of the provided material, as well as NEREUS learning outcomes. The paper concludes by discussing the next steps within NEREUS and future work.

2019

- C108.**Evangelos Markakis; Yannis Nikoloudakis; Evangelos Pallis; Marco Manso, “Security Assessment as a Service Cross-Layered System for the Adoption of Digital, Personalised and Trusted Healthcare”, IEEE 5th World Forum on Internet of Things (WF-IoT), Limerick, Ireland, 15-18 April 2019, pp. 91-94, DOI: 10.1109/WF-IoT.2019.8767249

Abstract: The healthcare sector is exploring the incorporation of digital solutions in order to improve access, reduce costs, increase quality and enhance their capacity in reaching a higher number of citizens. However, this opens healthcare organisations' systems to external elements used within or beyond their premises, new risks and vulnerabilities in what regards cyber threats and incidents. We propose the creation of a Security Assessment as a Service (SAaaS) crosslayered system that is able to identify vulnerabilities and proactively assess and mitigate threats in an IT healthcare ecosystem exposed to external devices and interfaces, considering that most users are not experts (even technologically illiterate") in cyber security and, thus, unaware of security tactics or policies whatsoever. The SAaaS can be integrated in an IT healthcare environment allowing the monitoring of existing and new devices, the limitation of connectivity and privileges to new devices, assess a device's cybersecurity risk and - based on the device's behaviour - the assignment and revoking of privileges. The SAaaS brings a controlled cyber aware environment that assures security, confidentiality and trust, even in the presence of non-trusted devices and environments.

- C109.**Nikolaos Astyrakakis; Yannis Nikoloudakis; Ioannis Kefaloukos; Charalabos Skianis; Evangelos Pallis; Evangelos K. Markakis, “Cloud-Native Application Validation & Stress Testing through a Framework for Auto-Cluster Deployment”, 2019 IEEE 24th International Workshop on Computer Aided Modeling and Design of Communication Links and Networks (CAMAD), Limassol, Cyprus, 11-13 Sept. 2019, pp. 1-5.

Abstract: The proliferation of cloud-native applications (applications built specifically for the cloud) has taken cloud computing to another level, but it also revealed several issues such as the lack of automation and complexity of deployment. Extensive research on the subject, revealed many endeavours towards that end. Nonetheless, there are still issues to be solved, such as the cluster monitoring and the cluster deployment automation. Most of the existing solutions, are semi-automated or completely manual approaches, with some of them targeting specific cloud providers/vendors. Furthermore, there is also very limited research that tackles the validation of such applications. Untrusted developers are able to develop and upload applications to marketplaces, without being audited and verified. Towards addressing the above-mentioned issues, this paper presents a novel, completely automated tool for deploying and monitoring a Kubernetes cluster over OpenStack. Additionally, we propose a tool that provides automatic

validation of cloud-native applications. The evaluation of the proposed toolbox resulted in the deployment of Kubernetes clusters with remarkably low overall times, compared to other, manual approaches. The validation process lasted approximately 11 minutes for a containerized application with the Kubernetes Horizontal Pod Autoscaler (HPA) enabled and approximately 3 minutes for a containerized application with the Kubernetes HPA disabled. These overall times are relatively shorter than several other non-automated approaches. The afore-mentioned overall times, are analogous to the underlying hardware and network resources of our test-bed.

2020

C110. Grace Khayat, Constandinos X. Mavromoustakis, George Mastorakis, Hoda Maalouf, Jordi Mongay Batalla, Mithun Mukherjee, Evangelos Pallis, "Retransmission-based Successful Delivery Tuning in Damaged Critical Infrastructures for VANETs", ICC 2020 - 2020 IEEE International Conference on Communications (ICC), Dublin, Ireland, 7-11 June 2020, pp. 1-6.

Abstract: Breakdown or interruption of communication infrastructure is one of the most immediate and significant impacts of natural disasters. This paper is devoted to the modeling of the successful uplink in Vehicular ad-hoc networks (VANET) in disaster cases where vehicles encounter disrupted communication. The packets' size to be transmitted, the vehicles' speed, the infrastructure coverage range, the disconnected distance, and the number of copies sent have a strong influence on the probability of success for uploading the packets. A simple connectionless retransmission scheme is proposed where several copies of the same packet are transmitted to make sure that the vehicle will upload successfully at least one copy of the packet. The optimum number of retransmission and the choice of inter-frame gap required between successive copy packets are also found. In this respect, this paper studies the mentioned parameters' effect on the probability of success for the uplink and the throughput. MATLAB was used to run a simulation and validate the theoretical analysis.

C111. G. Khayat, C. X. Mavromoustakis, G. Mastorakis, J. M. Batalla, H. Maalouf and E. Pallis, "VANET Clustering Based on Weighted Trusted Cluster Head Selection," 2020 International Wireless Communications and Mobile Computing (IWCMC), Limassol, Cyprus, 15-19 June 2020, pp. 623-628.

Abstract: VANET is a spontaneous creation of a wireless network among vehicles to exchange data. Clustering is one of the most common networking protocols for data propagation in those networks. The application of the clustering algorithm is effective in VANET because the algorithm makes it a more robust and scalable network. However, due to the high mobility of nodes, it is difficult to obtain stable clusters. One of the major challenges in clustering is the cluster head (CH) election since the CH has a critical role in data routing. For stable cluster formation in VANET, some constraints such as vehicles' velocity and vehicles' separation distance must be considered while selecting the CH. This paper proposes a new clustering algorithm based on a weighted formula for calculating the probability of cluster head selection. The weighted formula is based on three parameters: the trust, the distance, and the velocity. The trust is a newly added metric that is calculated by each vehicle and broadcasted to all neighbours. Whereas, the distance and the velocity are previously treated by other papers.

C112. A. Andreas, C. X. Mavromoustakis, G. Mastorakis, S. Mumtaz, J. M. Batalla and E. Pallis, "Modified Machine Learning Technique for Curve Fitting on Regression Models for COVID-19 projections," 2020 IEEE 25th International Workshop on Computer Aided Modeling and Design of Communication Links and Networks (CAMAD), Pisa, Italy, 14-16 September 2020, pp. 1-6, DOI: 10.1109/CAMAD50429.2020.9209264.

Abstract: COrona Virus Disease 2019 (COVID-19) is a disease caused by Severe Acute Respiratory Syndrome Corona Virus 2 (SARS-CoV-2) and was first diagnosed in China in December, 2019. Dr. Tedros Adhanom Ghebreyesus, World Health Organization (WHO) director-general on March 11th declared the COVID-19 pandemic. The cumulative cases of infected individuals and deaths due to COVID-19 develop

a graph that could be interpreted by an exponential function. Mathematical models are therefore fundamental to understanding the evolution of the pandemic. Applying machine learning prediction methods in conjunction with cloud computing to such models will be beneficial in designing effective control strategies for the current or future spread of infectious diseases. Initially, we compare the trendlines of the following three models: linear, exponential and polynomial using R-squared, to determine which model best interprets the prevailing data sets of cumulative infectious cases and cumulative deaths due to COVID-19 disease. We propose the development of an improved mathematical forecasting framework based on machine learning and the cloud computing system with data from a real-time cloud data repository. Our goal is to predict the progress of the curve as accurately as possible in order to understand the spread of the virus from an early stage so that strategies and policies can be implemented.

- C113.** Khayat, G., Mavromoustakis, C. X., Mastorakis, G., Batalla, J. M., Maalouf, H., Mumtaz, S., & Pallis, E, "Successful Delivery in VANETs with Damaged Infrastructures Based on Double Cluster Head Selection," 2020 IEEE 25th International Workshop on Computer Aided Modeling and Design of Communication Links and Networks (CAMAD), Pisa, Italy, 14-16 September 2020, pp. 1-5, DOI: 10.1109/CAMAD50429.2020.9209259.

Abstract: COrona VIRus Disease 2019 (COVID-19) is a disease caused by Severe Acute Respiratory Syndrome Corona Virus 2 (SARS-CoV-2) and was first diagnosed in China in December, 2019. Dr. Tedros Adhanom Ghebreyesus, World Health Organization (WHO) director-general on March 11th declared the COVID-19 pandemic. The cumulative cases of infected individuals and deaths due to COVID-19 develop a graph that could be interpreted by an exponential function. Mathematical models are therefore fundamental to understanding the evolution of the pandemic. Applying machine learning prediction methods in conjunction with cloud computing to such models will be beneficial in designing effective control strategies for the current or future spread of infectious diseases. Initially, we compare the trendlines of the following three models: linear, exponential and polynomial using R-squared, to determine which model best interprets the prevailing data sets of cumulative infectious cases and cumulative deaths due to COVID-19 disease. We propose the development of an improved mathematical forecasting framework based on machine learning and the cloud computing system with data from a real-time cloud data repository. Our goal is to predict the progress of the curve as accurately as possible in order to understand the spread of the virus from an early stage so that strategies and policies can be implemented.

- C114.** Tamara Al-Shayea, Constandinos X. Mavromoustakis, Jordi Mongay Batalla, George Mastorakis, Evangelos Pallis, Mithun Mukherjee. A Novel Gaussian in Denoising Medical Images with Different Wavelets for Internet of Things Devices. 2020 IEEE Global Communications Conference (GLOBECOM): Selected Areas in Communications: E-Health, Taipei, Taiwan, 7-11 December 2020 (**accepted for presentation and to be published in the proceedings**).

Abstract: Over recent years the focus on the comprehensive health-care system in IoT has become increasingly important, which considers in many ways a significant concept to promote healthcare. It plays a positive role in increasing the highlight of the issue of medical disadvantage that threatens the medical diagnosis. Medical image constitutes a crucial carrier of the patient's diagnosis information. It nonetheless is exposed to several kinds of noise through transmission, and storage, which leads to impeding the full diagnosis for the patient and a loss of its quality as a medical digital image. Noise is a key factor in decreasing the image quality of different sorts of medical images (X ray, CAT scan, and MRI). Many techniques have been applied for image de-noising. The Discrete wavelet transform which is regarded as the most recent and optimum technique. This paper has been presented four levels of a discrete wavelet transform for the removal of Gaussian noise from several medical images based on diverse wavelet family transforms and median filtering. The proposed method submitted admissible results with regard to removing noise from medical images. The performance evaluation of the proposed algorithm is done by measuring the values PSNR, MSD, and NC.

Scientific publications in international conferences (Conference – Extended Abstract)

- C-EA1.** Ε. Πάλλης, Γ. Κορμέτζας, Α. Κούρτης, Α. Κοντοβασιλης, "Κυφελωτό Σύστημα Παροχής Ασυρμάτου Internet και Πολυμέσων με Υψηλό Ρυθμό Μετάδοσης", 1^ο Πανελλήνιο Συνέδριο Νέων Τεχνολογιών Πληροφόρησης (NIT98), Αθήνα, Οκτώβριος 1998, pp. 39-48.
- C-EA2.** Γ. Μαστοράκης, Α. Σιδέρης, Ε. Μαρκιάκης, Β. Ζαχαρόπουλος, Χ. Μάντακας, Ε. Πάλλης, "Η μετάβαση από την αναλογική στην επίγεια ψηφιακή τηλεόραση ως μοχλός ανάπτυξης νέων επιχειρηματικών δυνατοτήτων και οικονομικής άνθησης", Scientific Congress New Technologies & Marketing, Ierapetra, Crete, Greece, 19-20 May, 2005, pp. 09-16.
- C-EA3.** Ε. Μαρκιάκης, Α. Σιδέρης, Α. Μπουρδένα, Γ. Μαστοράκης, Ε. Πάλλης, Β. Ζαχαρόπουλος, "Παροχή υπηρεσιών τουριστικού και αρχαιολογικού ενδιαφέροντος μέσω πλατφόρμας επίγειας ψηφιακής τηλεόρασης", Scientific Congress on New Technologies & Marketing, Ierapetra, Crete, Greece, 24-25 May, 2007.
- C-EA4.** Ν. Βορνωτάκης, Σ. Καραγιάννης, Ε. Μαρκιάκης, Γ. Μαστοράκης, Ε. Πάλλης, Β. Ζαχαρόπουλος, "Έρευνα πεδίου τάσεων ανάγκης παροχής υπηρεσιών τουριστικού και αρχαιολογικού ενδιαφέροντος με τη χρήση διπύλων επίγειας ψηφιακής τηλεόρασης", Scientific Congress on New Technologies & Marketing, Ierapetra, Crete, Greece, 24-25 May, 2007.
- C-EA5.** Δ. Κοπανάκη, Ε. Μαρκιάκης, Α. Σιδέρης, Γ. Μαστοράκης, Ε. Πάλλης, Β. Ζαχαρόπουλος, "Πρωτογενής έρευνα αγοράς πεδίου και σχέδιο αξιοποίησης αποτελεσμάτων αναφορικά με την παροχή υπηρεσιών τουριστικού και αρχαιολογικού ενδιαφέροντος μέσω πλατφόρμας επίγειας ψηφιακής τηλεόρασης", Marketing & Management στις τουριστικές επιχειρήσεις: Σύγχρονες & Καινοτόμες Προσεγγίσεις (MMTE2008), Ηράκλειο, 29-30 Μαΐου, 2008.

Contribution in book editorials, collective volumes and book chapters

Table 3 Contribution in book editorials, collective volumes and book chapters

Year	Books	Collective Volumes	Book Chapters	Total
2001			1	1
2006			1	1
2007			3	3
2008			1	1
2011			2	2
2014	1	1	10	12

2015	1		4	5
2016		1	3	4
2017	2		7	9
2018	1			1
2019				0
2020	1	1	3	5
Total	6	3	35	44

Published books

- B1.** C. X. Mavromoustakis, E. Pallis, G. Mastorakis, “Resource management in mobile computing environments”, Modeling and Optimization in Science and Technologies Series, Springer International Publishing AG, 2014, ISBN 978-3-319-06704-9.
- B2.** G. Mastorakis, C. X. Mavromoustakis, E. Pallis, “Resource Management of Mobile Cloud Computing Networks and Environments”, IGI-GLOBAL, 2015, ISBN13: 9781466682252.
- B3.** E. Markakis, G. Mastorakis, C. X. Mavromoustakis, E. Pallis, “Cloud and Fog Computing in 5G Mobile Networks: Emerging Advances and Applications”, IET Book, March 2017, ISBN: 978-1-78561-083-7.
- B4.** J. M. Batalla, G. Mastorakis, C. X. Mavromoustakis, E. Pallis, “Beyond the Internet of Things: Everything Interconnected”, Internet of Things: Technology, Communications and Computing Series, Springer International Publishing AG, 2017, ISBN 978-3-319-50758-3.
- B5.** G. Skourletopoulos, G. Mastorakis, C. X. Mavromoustakis, C. Dobre, E. Pallis, Book title: “Mobile Big Data”, Lecture Notes on Data Engineering and Communications Technologies book series (LNDECT), Springer International Publishing AG, Volume 10, November, 2018, ISBN 978-3-319-67924-2.
- B6.** G. Mastorakis, C. X. Mavromoustakis, J. M. Batalla, E. Pallis, "Convergence of Artificial Intelligence and Internet of Things", Internet of Things Series, Springer International Publishing AG, 2020, ISBN 978-3-030-44907-0.

Edited volumes (special issues)

- EV1.** G. Mastorakis, E. Pallis, C. X. Mavromoustakis, Guest editorial in the Special Issue “Future Mobile Computing Environments and Multimedia”, International Journal of Wireless Networks and Broadband Technologies, IGI Global, 2014.
- EV2.** G. Mastorakis, E. Pallis, C. X. Mavromoustakis, L. Shu, J. J. P. C. Rodrigues, Guest editorial in the Special Issue “Multimedia Services Provision over Future Mobile Computing Systems”, IEEE Systems Journal, Vol 10, No. 2, June 2016.
- EV3.** Dinh-Thuan Do, Varun G Menon, Mian Ahmad Jan, George Mastorakis, Evangelos Pallis, Guest editorial in the Special Collection on Power Domain Based Multiple Access Techniques in Sensor Networks, International Journal of Distributed Sensor Networks, SAGE, 2020 (**to be published in 2021**).

Book chapters

BC1. E. Pallis, M.C.B. Smith, A. A. Alexandridis, A. Kourtis, K. Dangakis, P. Kostarakis, G. Kormentzas, “Fast Internet and multimedia services: Facing the new challenge”, in the book “Third Generation Mobile Systems, UMTS and IMTS-2000”, Editor P. Stavroulakis, Springer Verlag, ISBN 3-540-67850-6, pp.557-589, March 2001.

Abstract: This chapter demonstrates the feasibility of using the new wireless access technology (MMDS) with the IEEE 802.11 standard, and describes a cellular broadband wireless network providing access to fast Internet and multimedia services. The system operates in the ISM frequency band of 2.4GHz, at a data rate of 2Mbps, and uses both FHSS and DSSS modulation techniques. It exploits a hierarchical architecture with two core subsystems: the Service Provider by the service origin and several Cell Main Nodes defining user areas, called Cells. For a given number of users (stationary, portable or mobile) in a cell, each user is guaranteed a minimum throughput during multimedia services access. On the one hand, the fact that the system is built around components of standard technology (low cost and easy set-up), makes the systems very attractive to both users and service providers. On the other hand, the revenues of such a system are expected to be high, since the overall architecture provides for flexibility and scalability.

BC2. Ε. Πάλλης, Χ. Μάντακας, Γ. Μαστοράκης, Β. Ζαχαρόπουλος, “Ψηφιακή Μετάβαση στα UHF: Υποστηρίξιξη Εφαρμογών Τηλε-Εκπαίδευσης στο Τ.Ε.Ι. Κρήτης με τη Χρήση της Πλατφόρμας ATHENA”, στο βιβλίο “Προσεγγίσεις της εκπαίδευσης από απόσταση στην τριτοβάθμια εκπαίδευση”, Editors Κ. Βασιλάκης & Μ. Καλογιαννάκης, Κ. Βασιλάκης, Μ. Καλογιαννάκης, εκδόσεις Ατραπός, ISBN 978-960-6622-96-0, 2006.

Περίληψη: Στο κεφάλαιο αυτό παρουσιάζονται οι δυνατότητες της νέας ψηφιακής τηλεόρασης στα UHF (Digital Video Broadcasting Terrestrial – DVB-T) για την υποστηρίξιξη καινοτόμων εφαρμογών τηλε-εκπαίδευσης, όπως η «ηλεκτρονική διάλεξιξη», όπου ο καθηγητής και οι φοιτητές είναι εικονικά παρόντες στο ίδιο αμφιθέατρο από το δικό τους χώρο. Η εργασία είναι βασισμένη στο ευρωπαϊκό έργο ATHENA FP6-507312 που προτείνει ένα τρόπο μετάβασης από την αναλογική στην επίγεια ψηφιακή τηλεόραση, περιγράφει μια ευρυσζωνική υποδομή πρόσβασης και την αξιοποίηξιξη ενός κοινού καναλιού μεταφοράς (διαθέσιμο σε όλη την περιοχή εκπομπής) το οποίο μπορεί να υποστηρίξει εφαρμογές τηλε-εκπαίδευσης δίνοντας τη δυνατότητα στους καθηγητές και στους μαθητές να συμμετάσχουν ενεργά με παρεμβάσεις σε πραγματικό χρόνο.

BC3. Η. Koumaras, E. Pallis, G. Xilouris, A. Kourtis, D. Martakos, “Perceived Quality Evaluation for Multimedia Services”, in the “Encyclopedia of Mobile Computing & Commerce”, Editor D. Taniar, Idea Group Pub., ISBN: 978-1-59904-675-4, pp. 758-762, October 2007.

Abstract: The advent of 3G mobile communication networks has caused the fading of the classical boundaries between telecommunications, multimedia, and information technology sectors. The outcome of this convergence is the creation of a single platform that will allow ubiquitous access to the Internet, multimedia services, and interactive audiovisual services, and in addition (and most importantly) offering the required/appropriate perceived quality level at the end user’s premises. In this respect, multimedia services that distribute audiovisual content over 3G/4G mobile communication systems are expected to possess a major part of the bandwidth consumption, making necessary the use of video compression. Therefore, encoding techniques (e.g., MPEG, H-26x) will be applied which achieve high compression ratios by exploiting the redundancy in the spatiotemporal domain of the video content, but as a consequence produce image artifacts, which result in perceived quality degradation. One of the 3G/4G visions is the provision of audiovisual content at various quality and price levels. There are many approaches to this issue, one being the perceived quality of service (PQoS) concept. The evaluation of the PQoS for audiovisual content will provide a user with a range of potential choices, covering the possibilities of low-, medium-, or high-quality levels. Moreover the PQoS evaluation gives the service provider and network operator the capability to minimize the storage and network resources by allocating

only the resources that are sufficient to maintain a specific level of user satisfaction. The evaluation of the PQoS is a matter of post-encoding procedures. The methods and techniques that have been proposed in the bibliography mainly aim at: a) determining the encoding settings (i.e., resolution, frame rate, bit rate) that are required in order to carry out successfully a communication task of a multimedia application (i.e., videoconference); and b) evaluating the quality level of a media clip based on the detection of artifacts on the signal caused by the encoding process. The scope of this article is to outline the existing procedures and methods for estimating the PQoS level of a multimedia service.

BC4. H. Koumaras, G. Xilouris, E. Pallis, G. Gardikis, A. Kourtis, “Shot Boundary Detection Techniques For Video Sequences”, in the “Encyclopedia of Mobile Computing & Commerce”, Editor D. Taniar, Idea Group Pub., ISBN: 978-1-59904-675-4, pp. 889-893, October 2007.

Abstract: This article outlines the various methods for detecting and extracting the scene changes from a video sequence. Depending on the metric that is exploited for the detection procedure, the methods that have been proposed are classified into two broad categories: those based on the uncompressed domain and those that exploit the metric of the compressed domain. Both the categories share the common drawback that they use threshold values for their decisions. Thus, the research community faces the challenge to develop new techniques that eliminate the use of threshold values, eliminating in this way the complexity and the computational requirements of the proposed methods.

BC5. E. Pallis, G. Mastorakis, A. Burdena, A. Mehaua, Y. Hadjadj Aoul, “The use of novel satellite broadcast technologies for the provision of integrated services”, in the book “IP Networking over Next-Generation Satellite Systems”, Editors Linghang Fan, Haithan Cruickshank and Zhili Sun, Springer New York, ISBN: 978-0-387-75427-7, pp. 151-156, December, 2007.

Abstract: Digital satellite broadcasting, primarily targeted to unidirectional services, soon expanded to the interactive domain, utilising uplink technologies such as DVB-RCS. In this context, due to their wide and uniform coverage, satellites can provide an ideal medium for the provision of triple play services (voice, video and data) to remote areas not covered by terrestrial infrastructures. This chapter discusses and demonstrates the delivery of triple play services over a fully functional platform utilising the second-generation satellite broadcasting technology (DVB-S2) for the downlink combined with DVB-RCS for the uplink. Service distribution from the satellite node to nearby customers is performed via a WiMAX infrastructure. A real on-air validation is carried out, via the HellasSat II satellite.

BC6. H. Koumaras, E. Pallis, A. Kourtis, D. Martakos “Principles of Digital Video Coding”, in the “Encyclopedia of Information Science & Technology”, Editor Mehdi Khosrow-Pour, 2nd Edition, Idea Group Pub, ISBN: 978-1-60566-026-4, pp. 3119-3124, September 2008.

Abstract: Video compression algorithms exploit the redundancy that a video signal contains in the spatial, temporal, and frequency domain. Thus, by removing this redundancy in these three different domain types, it is possible to achieve high compression of the deduced data. Briefly the encoding process consists of the following stages: (1) the temporal, (2) the spatial, (3) the transform, (4) the quantization, and (5) the entropy coding stage. This article has presented, explained, and analyzed the principles of each encoding stage, which remain the common basis over any existing video coding standard.

BC7. A. Christakidis, N. Efthymiopoulos, S. MJ Dempsey, J. Fiedler, K. Koutsopoulos, E. Markakis, S. Garvey, N. Pereira, S. Denazis, S. Tombros, E. Pallis, O. Koufopavlou, “Integrating P2P with Next Generation Networks”, in the book “Advances in Next Generation Services and Service Architectures”, Editors: Anand

R. Prasad, John F. Buford, Vijay K. Gurbani, River Publishers, ISBN-10: 8792329551, ISBN-13: 978-8792329554 April 2011.

Abstract: This chapter describes the major components and their interactions of a novel architecture called VITAL++ that combines the best features of the two seemingly disparate worlds, Peer-to-Peer (P2P) and NGN in particular IMS, which are then used to support multimedia applications and content distribution services. To this end, P2P is enhanced with advanced authentication, DRM mechanisms while NGN benefits from the enhanced scalability, reliability and efficient distribution of service and content by exploiting P2P self – organization properties. We describe novel P2P algorithms for optimizing network resources in order to efficiently distribute content among various users without resorting to laborious management operations required in NGN.

BC8. H. Koumaras, D. Negru, E. Borcoci, V. Koumaras, C. Troulos, Y. Lapid, E. Pallis, M. Sidibé, A. Pinto, G. Gardikis, G. Xilouris, C. Timmerer, in the book “Media Ecosystems: A Novel Approach for Content-Awareness in Future Networks”, in the book *The Future Internet*, LNCS, Volume 6656/2011, Print ISBN 978-3-642-20897-3, pp. 369-380, DOI: 10.1007/978-3-642-20898-0_26, 2011.

Abstract: This chapter proposes a novel concept towards the deployment of a networked ‘Media Ecosystem’. The proposed solution is based on a flexible cooperation between providers, operators, and end-users, finally enabling every user first to access the offered multimedia services in various contexts, and second to share and deliver his own audiovisual content dynamically, seamlessly, and transparently to other users. Towards this goal, the proposed concept provides content-awareness to the network environment, network- and user context awareness to the service environment, and adapted services/content to the end user for his best service experience possible, taking the role of a consumer and/or producer.

BC9. Georgios Gardikis, Evangelos Pallis, Michael Grafl, “Media-Aware Networks in Future Internet Media”, Editors Ahmet Kondoç, Tasos Dagiuklas, in the book “3D Future Internet Media”, Springer, Print ISBN 978-1-4614-8372-4, pp. 105-112, 2014.

Abstract: Within the Future Internet scene, where multimedia traffic is expected to play a dominant role, the network infrastructure needs to be transformed from a service-agnostic to a media-aware domain, able to offer service-specific handling and in-network operations to the traversing media flows. In this context, this chapter discusses techniques for Media-Aware Networking and illustrates the approaches which have been adopted in the FP7 ALICANTE project towards a novel Media-Aware Network Element (MANE). The media-centric functions of the MANE are presented, namely, content awareness, caching/buffering, QoS management, and flow processing/stream thinning. The added value of media-aware networking is also discussed for four use cases (unicast VoD, multicast streaming, peer-to-peer streaming, and dynamic adaptive streaming over HTTP).

BC10. D. Stratakis, A. Miaoudakis, E. Pallis, T. Yioultsis, T. Xenos, G. Mastorakis, C. X. Mavromoustakis, “Measurements on Modern Wireless Communication Technologies and Estimation of Human Exposure” in the book “Resource Management in Mobile Computing Environments”, Springer International Publishing, pp. 115-130, June 2014.

Abstract: The evolution of wireless networking technologies in recent years leads to a faster, safer and more efficient knowledge transfer with the demand of growing up the volume of information handled. The ultimate aim of improving the living standards of citizens, requires a new foundation to evaluate and improve the existing to the present relevant measurement techniques and possibly the introduction of new ones. Also, new wireless information propagation models have to be proposed in the future and the old models have to be evaluated and modified for their improvement. This will be achieved by conducting reliable measurements and experimental tests. A key element of such measurements is the estimation of the present uncertainty. In this context, the purpose of this chapter is to study how the electromagnetic fields

generated by modern wireless communication base stations can be measured and evaluated in terms of exposure.

BC11. N. Zotos, C. Stergiopoulos, K. Anastasopoulos, G. Bogdos, E. Pallis, C. Skianis, G. Mastorakis, C. X. Mavromoustakis, “Unified Platform for M2M Virtual Object Interoperability” in the book “Resource Management in Mobile Computing Environments”, Springer International Publishing, pp. 497-512, June 2014.

Abstract: Sensor networks contribute to the interconnection of a large variety of devices (i.e. transducers, sensors, actuators) thus, enable monitoring and control processes. While new wireless technologies are emerging, a major issue of interoperability has to be addressed in terms of data communications, controlling and interfacing in order to confront the heterogeneity of networks and connected devices and enable end-to-end communication, as well as efficient resource management. A proposed solution to this problem is the provision of a unified service access architecture, which will support common interfaces for data communications, as well as device management and control that will be based on open standards. The concept of object virtualization and IP based networking is introduced for resolving interoperability issues. In this context, the architecture can serve applications that are in line with Machine-to-Machine (M2M) and Internet-of-Things (IoT) concepts.

BC12. A. Andreou, C. X. Mavromoustakis, G. Mastorakis, A. Bourdena, E. Pallis, “Adaptive Heuristic-Based P2P Network Connectivity and Configuration for Resource Availability” in the book “Resource Management in Mobile Computing Environments”, Springer International Publishing, pp. 221-240, June 2014.

Abstract: Many schemes have been examined in the recent past in order to define a methodology for efficient resource sharing in combination with the temporal characteristics of dynamically varying topologies whereas others create a ground for a combination of temporal and spatial techniques. This chapter provides a brief introduction to, and motivation for, topology formation for P2P network connectivity and configuration from a network resource availability viewpoint. Efficient topology formation is probably the crucial parameter for enabling end-to-end reliability and data integrity between peers. The research background is presented using different approaches in the field of topology formation with respect to the parameters that affect the reliability issues of each node. Self-awareness is presented as well as the choice of mechanisms for efficient and reliable communication in a dynamically changing peer-to-peer system. Thereafter the recent adaptive heuristic-based P2P network connectivity approach for topology configuration for resource availability is presented along with some conducted results extracted from the research bibliography. Finally the chapter ends with the conclusion based on the general discussion of the covered issues in the chapter and the open ended research issues that come along with the discussed ones.

BC13. E. Markakis, C. Skianis, E. Pallis, G. Mastorakis, C. X. Mavromoustakis, A. Antonas, “Peer-to-Peer Constellations in an IMS-Enabled Network Architecture Based on Interactive Broadcasting” in the book “Resource Management in Mobile Computing Environments”, Springer International Publishing, pp. 271-282, 2014, June 2014.

Abstract: This chapter elaborates on emerging advances and solutions to introduce the convergence of Peer-to-Peer (P2P) mechanisms into interactive broadcasting systems, enhanced with IP Multimedia Subsystem capabilities. The proposed solutions enable for the proper users' access on P2P-based services from dispersed locations, as well as the deployment of a novel users' ecosystem to gear-up new businesses and increase revenue prospects. The P2P-based network architecture is validated through several experimental tests, performed on an actual prototype providing real transmission and reception of data. The experimental results justify the effectiveness of the solution and identify open issues for further investigation and experimentation.

BC14. C. X. Mavromoustakis, C. Dimitriou, G. Mastorakis, A. Bourdena, E. Pallis, “Using Traffic Diversities for Scheduling Wireless Interfaces for Energy Harvesting in Wireless Devices”, in the book “Resource Management in Mobile Computing Environments”, Springer International Publishing, pp.481-496, June 2014.

Abstract: The data traffic in many cases is specifying the expectations and the encouragement of new Mobile services/M-services (Location-based etc) and embosoms, through the user-centered awareness, to expose an innovative range of on-the-move applications. As today two distinct domains exist, the wireless world and the Internet world where, both can be met over a traffic-oriented framework providing reliable end-to-end users’ connectivity and exchange of resources. The need to allocate and balance resources among different traffic classes to accomplish the best usage of network resources while maintaining the topology and the wireless connectivity of the users is today even more timely. The user’s movements affect the type of connectivity, thus aggravating the degree of cooperation among users and degrading the reliability of communication. Traffic diversities are being considered in this chapter taking into consideration the traffic impact on the energy conservation of the nodes that are changing their location according to certain pattern as well as the consideration of the traffic as a feedback mechanism to prolong network’s lifetime and nodes lifetime and communication duration extensibility. The chapter covers the primary traffic techniques and methodologies in order to show the direct dependencies between traffic and wireless interfaces’ scheduling mechanisms as well as exposing the power-related parameters during the resource exchange process in order to enable the wireless communicating nodes to efficiently utilize their energy resources. Different variations of the proposed schemes are presented where the energy benefit is specified. The performance evaluations through conducted experiments were performed in real-time, through wireless sensor nodes, and through simulation presenting the effectiveness of the framework which efficiently maximizes the reliability of the resource exchange process of the nodes, while it minimizes the energy consumption and prolongs the system’s lifetime.

BC15. G. Mastorakis, C. X. Mavromoustakis, A. Bourdena, E. Pallis, G. Sismanidis, D. Stratakis, S. Papadakis, “Energy-Efficient Routing in Cognitive Radio Networks”, in the book “Resource Management in Mobile Computing Environments”, Springer International Publishing, pp.323-340, June 2014.

Abstract: This chapter proposes a novel routing protocol enriched with a capacity-aware scheme that enables energy conservation and efficient data flow coordination among communication nodes with heterogeneous spectrum availability in distributed cognitive radio networks. Efficient routing protocol operation, as a matter of maximum energy conservation, maximum-possible routing paths establishments and minimum delays is obtained by utilizing both a signaling mechanism and an energy efficient scheme that were implemented based on a simulation scenario. This simulation scenario includes a number of secondary communication nodes, operating over television white spaces (TVWS) under the “spectrum of commons” regulation regime. The validity of the proposed energy efficient routing protocol is verified, by conducting experimental simulations and obtaining performance evaluation results. Simulation results validated routing protocol efficiency for minimizing energy consumption, maximizing resources exchange between secondary communication nodes and minimizing routing delays.

BC16. G. Mastorakis, E. Pallis, C. X. Mavromoustakis, A. Bourdena, “Efficient Resource Management Utilizing Content-Aware Multipath Routing”, in the book “Resource Management in Mobile Computing Environments”, Springer International Publishing, pp. 389-395, June 2014.

Abstract: This chapter proposes a multipath routing approach that is adopted in content-aware networks, towards providing end-to-end Quality of Service (QoS) and an efficient exploitation/management of the resources. According to traffic identification mechanisms, this approach elaborates on effective packet distribution within several intra-domain paths. This is achieved through the capability of the edge nodes to recognize the content in a prototype network architecture. In addition, this chapter elaborates on content-awareness issues, regarding the utility estimation for a packet to select a particular path, based on different QoS-centric network criteria and requirements.

BC17. G. Mastorakis, S. Panagiotakis, K. Kapetanakis, G. Dagalakis, C. X. Mavromoustakis, A. Bourdena, E. Pallis, “Energy and Resource Consumption Evaluation of Mobile Cognitive Radio Devices” in the book “Resource Management in Mobile Computing Environments”, Springer International Publishing, pp. 359-388, June 2014.

Abstract: This chapter proposes a Cognitive Radio network architecture that enables for the efficient operation of mobile devices over TV White Spaces. The proposed network architecture comprises of a Geo-location database and a spectrum broker that coordinates TV White Spaces access, by a number of 4G secondary communication systems, competing/requesting for the available radio spectrum. Furthermore, it introduces an innovative methodology for evaluation of energy and resource consumption in mobile cognitive devices that does not require any external metering device but exploits the advanced software and hardware features of modern smart phones to this end. In particular, the various APIs provided, by such operating systems for access to their functionality can be used for adequately auditing and reporting resource consumption on such mobile platforms. More specifically, we evaluate energy consumption and CPU utilisation in various communication scenarios via a number of experimental tests, carried out under controlled conditions. Network connectivity, calling and multimedia playback are some of the scenarios that are evaluated and presented here.

BC18. C. X. Mavromoustakis, G. Mastorakis, A. Bourdena, E. Pallis, “Efficient Multimedia Services Provision over Cognitive Radio Networks using a Traffic-Oriented Routing Scheme”, in the book “Multimedia Over Cognitive Radio Networks: Algorithms, Protocols, and Experiments”, Editors Fei Hu, Sunil Kumar, Taylor and Francis LLC, CRC Press, ISBN 9781482214857, pp 119-147, December 2014.

Abstract: This chapter elaborates on the design, development, and experimental evaluation of a resource-intensive traffic-aware scheme and an energy-efficient routing protocol for ad hoc CR network architectures, enabled for the efficient communication of secondary communication nodes that operate under the Spectrum of Commons regime, offering effective multimedia services provision. More specifically, a signaling mechanism combined with an energy-efficient scheme is proposed in order to support multimedia services in an end-to-end manner. The mechanism is based on the backward traffic difference (BTD estimation) in contrast to the end-to-end bounded delay of the transmission. Wireless ad-hoc networks need to be supported by improved system reliability and availability through automatic traffic measurements and configuration of traffic-aware network parameters. Depending on the underlying routing scheme and the volume of traffic that each node receives/transmits, the proposed scheme aims at minimizing energy consumption by applying asynchronous, non-periodic sleep-time assignment slot to the secondary wireless nodes according to the Fibonacci-based backward traffic difference (F-BTD) scheme. The F-BTD scheme is applied in order to enable delay-sensitive multimedia content in an end-to-end, reliable manner.

BC19. C. X. Mavromoustakis, P. Mousicou, K. Papanikolaou, G. Mastorakis, A. Bourdena, E. Pallis, "Dynamic cloud resource migration for efficient 3D video processing in mobile computing environments", in the book Book “Novel 3D Media Technologies”, by Ahmet Kondoç and Tasos Dagiuklas, by Springer International Publishing, ISBN: 978-1-4939-2025-9 (Print), pp. 119-134, October 2015.

Abstract: This chapter presents a dynamic cloud computing scheme for efficient resource migration and 3D media content processing in mobile computing environments. It elaborates on location and capacity issues to offload resources from mobile devices due to their processing limitations, towards efficiently manipulating 3D video content. The proposed scheme adopts a rack-based approach that enables cooperative migration for redundant resources to be offloaded towards facilitating 3D media

content manipulation. The rack-based approach significantly reduces crash failures that lead all servers to become unavailable within a rack and enables mobile devices with limited processing capabilities to reproduce multimedia services at an acceptable level of quality of experience (QoE). The presented scheme is thoroughly evaluated through simulation tests, where the resource migration policy was used in the context of cloud rack failures for delay-bounded resource availability of mobile users.

BC20. C. X. Mavromoustakis, G. Mastorakis, A. Bourdena, E. Pallis, D. Stratakis, E. Perakakis, I. Kopanakis, S. Papadakis, Z. D. Zaharis, C. Skeberis, T. D. Xenos, “A Social-oriented Mobile Cloud Scheme for Optimal Energy Conservation”, in the Book on “Resource Management of Mobile Cloud Computing Networks and Environments”, IGI-GLOBAL, ISBN13: 9781466682252, pp 97-121, 2015.

Abstract: This chapter elaborates on energy usage optimization issues, by exploiting a resource offloading process based on a social-oriented mobile cloud scheme. The adoption of the proposed scheme enables for increasing the reliability in services provision to the mobile users, by guaranteeing sufficient resources for the mobile applications execution. More specifically, this chapter describes the process to improve the energy consumption of the mobile devices, through the exploitation of a social-oriented model and a cooperative partial process offloading scheme. This research approach exploits social centrality, as the connectivity model for the resource offloading, among the interconnected mobile devices to increase the energy usage efficiency, the mobile nodes availability, as well as the process of execution reliability. The proposed scheme is thoroughly evaluated to define the validity and the efficiency for the energy conservation increase of future mobile computing devices.

BC21. Y. Kryftis, G. Mastorakis, C. X. Mavromoustakis, J. M. Batalla, A. Bourdena, E. Pallis, “A Resource Prediction Engine for Efficient Multimedia Services Provision”, in the Book on “Resource Management of Mobile Cloud Computing Networks and Environments”, IGI-GLOBAL, ISBN13: 9781466682252, pp 97-121, pp. 361-377, 2015.

Abstract: This chapter presents a novel network architecture for optimal and balanced provision of multimedia services. The proposed architecture includes a central Management and Control (M&C) plane, located at Internet provider’s premises, as well as distributed M&C planes for each delivery method, including Content Delivery Networks (CDNs) and Home Gateways. As part of the architecture, a Resource Prediction Engine (RPE) is presented that utilizes novel models and algorithms for resource usage prediction, making possible the optimal distribution of streaming data. It also enables for the prediction of the upcoming fluctuations of the network that provide the ability to make the proper decisions, in achieving optimized Quality of Service (QoS) and Quality of Experience (QoE) for the end users.

BC22. Z. D. Zaharis, P. I. Lazaridis, C. Skeberis, G. Mastorakis, C. X. Mavromoustakis, E. Pallis, D. I. Stratakis, T. D. Xenos, “Design and optimization of wideband log-periodic dipole arrays under requirements for high gain, high front-to-back ratio, optimal gain flatness and low side lobe level: The application of Invasive Weed Optimization”, in the Book on “Wireless Network Performance Enhancement via Directional Antennas: Models, Protocols, and Systems”, Editors John D. Matyjas, Fei Hu, Sunil Kumar, CRC Press Taylor and Francis, ISBN 978149870753, pp.21-63, 2015.

Abstract: The design and optimization of wideband log-periodic dipole arrays (LPDAs) are presented in this chapter. The LPDAs are expected to simultaneously satisfy several requirements inside a wide operating frequency range. In particular, the optimized LPDA has to provide standing wave ratio below a predefined value, gain values as high as possible, gain flatness below a desired value, both side lobe level and front-to-back ratio below a desired value, and all these requirements must be satisfied at the same time inside the entire frequency range of operation. Since the design problem is non-linear and inherently multi-

objective, the simultaneous satisfaction of all the above requirements can only be achieved by applying global optimization algorithms. These algorithms are usually based on evolutionary optimization methods and have been proved to be capable of solving complex non-linear problems with great success. Such an evolutionary method with high potential in antenna design is presented here. The method is called Invasive Weed Optimization (IWO) and is applied in conjunction with the Method of Moments to optimize LPDAs under the above-mentioned requirements. The Method of Moments is a well-known full-wave analysis method and is utilized here to extract the radiation characteristics of the LPDA required by the IWO algorithm. Several design cases are studied concerning the LPDA geometry and the operating bandwidth. The derived LPDA geometries exhibit a behavior close to the desired one and therefore are able to enhance the performance of a wireless network in practical applications.

BC23. O. Shiakallis, C. X. Mavromoustakis, G. Mastorakis, A. Bourdena, E. Pallis, E. Markakis, C. Dobre, "A Scheduling Scheme for Throughput Optimization in Mobile Peer-to-Peer Networks", in the Book "Emerging Innovations in Wireless Networks and Broadband Technologies", Editor: Prof. Naveen Chilamkurti, publisher: IGI-GLOBAL, ISBN13: 9781466699410, March 2016.

Abstract: Mobile Cloud Computing (MCC) paradigm includes all the emerging technological advances, mechanisms and schemes for the efficient resource offloading and the energy-efficient provision of services to mobile users. In addition, the mobile nodes will act as flexible networking points in emerging mobile networking architectures, where several challenges have to be addressed, like the high energy consumption and the data packets transmission failure, under a Mobile Peer-to-Peer (MP2P) approach. Towards addressing such challenges, several factors that contribute to the increased consumption of the energy, have to be investigated, as well as issues related with the loss of data during the provision of services. In this framework, the chapter proposes a Traffic-based S-MAC scheme for increasing the data exchange and minimizing the energy consumption, between mobile nodes operating under an Ad-Hoc approach. The performance of the proposed scheduling scheme was thoroughly evaluated, through a number of simulation experiments.

BC24. E. Markakis, D. Negru, J. Bruneau-Queyreix, E. Pallis, G. Mastorakis, C. X. Mavromoustakis, "A P2P Home-Box Overlay for Efficient Content Distribution" in the Book "Emerging Innovations in Wireless Networks and Broadband Technologies", Editor: Prof. Naveen Chilamkurti, publisher: IGI-GLOBAL, ISBN13: 9781466699410, March 2016.

Abstract: The overlay networks composed of residential gateways (i.e. home-box) leverage their storage and upload capacity to achieve scalable and cost-efficient content distribution. In this chapter, we present the architecture of the home-box overlay for video on demand services, with the network-aware request redirection and content caching strategy that optimizes the resource usage at both network and client side, for reducing the overall distribution cost. The proposed system is compared with existing solutions through comprehensive simulations. The results demonstrate the advantage of network-aware and popularity-based caching strategy, with reduced the overall cost of the VoD services.

BC25. E. Markakis, G. Mastorakis, D. Negru, E. Pallis, C. X. Mavromoustakis, A. Bourdena, "A Context-Aware System for Efficient Peer-to-Peer Content Provision", in the Book "Pervasive Computing: Next Generation Platforms for Intelligent Data Collection", Eds.: Ciprian Dobre, Fatos Xhafa, publisher Elsevier, ISBN: 9780128036631, April 2016.

Abstract: Peer-to-Peer (P2P) computing paradigm is considered to be a scalable and cost-effective solution for content distribution that is becoming widely deployed over the current Internet infrastructure. Moreover, several commercial deployments already exist, providing Video on Demand (VoD) and IPTV services to a large number of end users and customers. When compared to Content Distribution Network (CDN)-assisted content delivery, or other managed network-based approaches, P2P schemes become very attractive solutions. Taking into consideration that a Home-Box entity has built-in storage, stable presence, monitoring capability and management interface, it makes it a good candidate for participating in P2P

networks. In this framework, a HB P2P Engine module can be exploited to assist the content distribution. Instead of retrieving content from the servers solely, the Home-Box can download content from other Home-Boxes, which are caching and forwarding / seeding the content. In this context, this chapter proposes a context-aware system to support an efficient resource sharing among different Home-Boxes, by exploiting P2P approaches and configurations.

BC26. Y. Nikoloudakis, S. Panagiotakis, E. Markakis, G. Mastorakis, C. X. Mavromoustakis, and E. Pallis, “Towards a FOG-enabled navigation system with advanced cross-layer management features and IoT equipment,, in the Book “Cloud and Fog Computing in 5G Mobile Networks: Emerging advances and applications”, Eds.: Evangelos Markakis, George Mastorakis, Constandinos X. Mavromoustakis, Evangelos Pallis, publisher Institution of Engineering and Technology, ISBN: 978-1-78561-083-7, March 2017.

Abstract: In this chapter, we present a cross-layer fog-enabled framework that offers visitors of small venues; such as museums, malls, convention centres, hospitals, and so on; enhanced context-aware experience and navigation services over 5G small-cell infrastructure. Distributed fog-enabled devices provide 5G networking throughout the surrounding establishment. The visitor, after signing into the network, is able to view various information and multimedia content concerning the narrow points of interest (POIs). The infrastructure also provides the ability to navigate the visitor throughout the establishment, using well-known positioning techniques. The positioning takes place with the mobile device receiving and juxtaposing the signal strength of small RF beacons sculling the local area. Finally, the network proposes other nearby POIs, depending on the user’s preferences, based on the meta-data information stored inside the user’s mobile device. The framework logic and calculations are transferred and sent back to the user through the cloud.

BC27. G. Skourletopoulos, C. X. Mavromoustakis, G. Mastorakis, J. M. Batalla, C. Dobre, S. Panagiotakis, E. Pallis, “Big Data and Cloud Computing: A Survey of the State-of-the-Art and Research Challenges”, in the Book on “Advances in Mobile Cloud Computing and Big Data in the 5G Era”, Studies in Big Data Series, vol. 22, pp. 23-41, Springer, ISBN 978-3-319-45143-5, Publication Year 2017.

Abstract: The proliferation of data warehouses and the rise of multimedia, social media and the Internet of Things (IoT) generate an increasing volume of structured, semi-structured and unstructured data. Towards the investigation of these large volumes of data, big data and data analytics have become emerging research fields, attracting the attention of the academia, industry and governments. Researchers, entrepreneurs, decision makers and problem solvers view ‘big data’ as the tool to revolutionize various industries and sectors, such as business, healthcare, retail, research, education and public administration. In this context, this survey chapter presents a review of the current big data research, exploring applications, opportunities and challenges, as well as the state-of-the-art techniques and underlying models that exploit cloud computing technologies, such as the big data-as-a-service (BDaaS) or analytics-as-a-service (AaaS).

BC28. G. Skourletopoulos, C. X. Mavromoustakis, G. Mastorakis, J. M. Batalla, C. Dobre, S. Panagiotakis, E. Pallis, “Towards Mobile Cloud Computing in 5G Mobile Networks: Applications, Big Data Services and Future Opportunities”, in the Book on “Advances in Mobile Cloud Computing and Big Data in the 5G Era”, Studies in Big Data Series, Springer, vol. 22, pp. 43-62, ISBN 978-3-319-45143-5, Publication Year 2017.

Abstract: The highly computationally capable mobile devices and the continuously increasing demand for high data rates and mobility, which are required by several mobile network services, enabled the research on fifth-generation (5G) mobile networks that are expected to be deployed beyond the year 2020 in order to support services and applications with more than one thousand times of today’s network traffic. On the other hand, the huge and complex location-aware datasets exceed the capability of spatial

computing technologies. In this direction, the mobile cloud computing (MCC) technology was introduced as the combination of cloud computing and mobile computing, enabling the end-users to access the cloud-supported services through mobile devices (e.g., smartphones, tablets, portable computers or wearable devices). The mobile applications exploit cloud technologies for data processing, storage and other intensive operations, as they are executed on resource providers external to the devices. This tutorial article is a comprehensive review of the current state-of-the-art and the latest developments on mobile cloud computing under the 5G era, which helps early-stage researchers to have an overview of the existing solutions, techniques and applications and investigate open research issues and future challenges in this domain.

BC29. G. Alexiou, E. Pallis, G. Mastorakis, E. Markakis, A. Sideris, A. Bourdena, C. X. Mavromoustakis, “A Novel Marketplace for Trading/Brokering Virtual Network Functions over Cloud Infrastructures”, in the Book on “Cloud and Fog Computing in 5G Mobile Networks”, Eds.: E. Markakis, G. Mastorakis, C. X. Mavromoustakis, E. Pallis, IET, e-ISBN: 9781785610844, Publication Year 2017.

Abstract: Following up the success story of the OS-Specific App Stores, we present a new business case in network function virtualization (NFV), where function provider (FP) can publish, broke, trade, offer, and advertise their developed functions inside a novel Marketplace for NFV. This novel approach is able to attract new entrants to the networking market, including among other, a Novel Brokerage Platform, allowing Service Providers to transact with the FP. Finally, via the Marketplace, customers can browse and select services and virtual appliances that best match their needs, as well as negotiate Service Level Agreements and be charged under various billing models browse and select the services and virtual appliances that best match their needs.

BC30. I. Deligiannis, G. Alexiou, G. Papadourakis, E. Pallis, E. Markakis, G. Mastorakis, C. X. Mavromoustakis, " Internet of Things: A Systematic Literature Review", in the Book on "Cloud and Fog Computing in 5G Mobile Networks", Eds.: E. Markakis, G. Mastorakis, C. X. Mavromoustakis, E. Pallis, e-ISBN: 9781785610844, Publication Year 2017.

Abstract: The “Internet of Things”(IoT) is becoming an increasingly growing topic of conversation worldwide that it promises to offer a revolutionary fully connected “smart”world. IoT represents a vision, in which the Internet extends into the real world involving everyday objects equipped with sensors, processing, and communications capabilities that will allow them to interconnect to each other over the Internet to accomplish some objective. This chapter reports on the current status of research on the IoT by examining the literature, identifying trends, exploring issues, challenges, and opportunities associated with IoT.

BC31. M. Gajewski, W. Latoszek, J. M. Batalla, G. Mastorakis, C. X. Mavromoustakis, E. Pallis, “ID-based communication for access to sensor nodes”, in the Book on “Beyond the Internet of Things: Everything Interconnected”, Eds.: J. M. Batalla, G. Mastorakis, C. X. Mavromoustakis, E. Pallis, Internet of Things Series, Springer, pp. 145-163, ISBN 978-3-319-50756-9, Publication Year 2017.

Abstract: Home automation and intelligent building are the areas where Internet of Things (IoT) has been applied relatively early. Everyday intuitive use of smart things can increase comfort at home and productivity at work. Introducing new solutions for smart devices controlling the natural human environment rises challenges— especially when fast and reliable communication within the hierarchized network is needed. Specifically, we consider scenario, where the network structure is aligned to a building structure. Moreover, we used the hierarchized addressing structure based on unique identifiers to benefit from Information Centric Network based architecture. This chapter describes the design, implementation and test results of the ID-based communication network with a particular emphasis on interworking with a sensor node.

BC32. P. Krawiec, M. Sosnowski, J. M. Batalla, C. X. Mavromoustakis, G. Mastorakis, E. Pallis, “Survey on technologies for enabling real-time communication in the Web of Things”, in the Book on “Beyond the Internet of Things: Everything Interconnected”, Eds.: J. M. Batalla, G. Mastorakis, C. X. Mavromoustakis, E. Pallis, Internet of Things Series, Springer, pp. 323-339, ISBN 978-3-319-50756-9, Publication Year 2017.

Abstract: The Web of Things (WoT) can be considered as a step towards the Internet of Everything development. The concept of WoT assumes that objects of the Internet of Things (IoT) seamlessly interact with the Web by re-using web protocols wherever possible. One of the most desirable service in the WoT is real-time communication, due to the event-driven character of many IoT applications. This chapter provides an overview of the protocols which are taken into account in order to ensure real-time interaction of WoT objects. We describe two technologies: WebSocket and WebRTC, which are a part of HTML5 specification and are considered as solutions that bring real-time communication capabilities into the WoT. CoAP, a specialized protocol for use in resource constrained devices, is also presented, as well as two solutions that implement publish/subscribe interaction model. Next, we discuss which protocols can have the greatest impact on the WoT development.

BC33. Khayat, G., Mavromoustakis, C. X., Mastorakis, G., Maalouf, H., Batalla, J. M., Pallis, E., & Markakis, E. K., (2020) Intelligent Vehicular Networking Protocols. In: Mastorakis G., Mavromoustakis C., Batalla J., Pallis E. (eds) Convergence of Artificial Intelligence and the Internet of Things. Internet of Things (Technology, Communications and Computing). Springer, Cham. https://doi.org/10.1007/978-3-030-44907-0_4.

Abstract: This chapter will introduce Vehicular Ad Hoc Network; abbreviated as VANET; which is a variation of Mobile Ad Hoc Network, MANET. In VANET the nodes are either vehicles or fixed roadside units considered as VANET infrastructure. This chapter will discuss the five categories of VANET routing protocols with some of the most known examples in each. Each of the mentioned protocols will have a brief overview of its design and implementation. Besides, we will mention some of the protocols’ benefits, drawbacks, and enhancements. With the emergence of the Internet of Things (IoT) in the last decade, vehicles have a subcategory known as Internet of Vehicles (IoV) due to the special characteristics of vehicles and road topology. Therefore, the second section of this chapter will discuss the classification of routing protocols in IoV which is the promising future in the vehicular network world.

BC34. Athanasaki D.E., Mastorakis G., Mavromoustakis C.X., Markakis E.K., Pallis E., Panagiotakis S. (2020) IoT Detection Techniques for Modeling Post-Fire Landscape Alteration Using Multitemporal Spectral Indices. In: Mastorakis G., Mavromoustakis C., Batalla J., Pallis E. (eds), Convergence of Artificial Intelligence and the Internet of Things. Internet of Things (Technology, Communications and Computing). Springer, Cham. https://doi.org/10.1007/978-3-030-44907-0_14.

Abstract: It is challenging to detect burn severity due to the long-time period needed to capture the ecosystem characteristics. Whether there is a warning from the IoT devices, multitemporal remote sensing data is being received via satellites to contribute to multitemporal observations before, during and after a bushfire, and enhance the difference on detection accuracy. In this study, we strive to design an infrastructure to fire detection, to perform a qualitative assessment of the condition as quickly as possible in order to avoid a major disaster. Studying the multitemporal spectral indicators such as Normalized difference vegetation index (NDVI), Enhanced vegetation index (EVI), Normalized burn ratio (NBR), Soil-adjusted vegetation index (SAVI), Normalized Difference Moisture (Water) Index (NDMI or NDWI) and Normalized wildfire ash index (NWAI), we can draw reliable conclusions about the seriousness of an area. The scope of this project is to examine the correlation between multitemporal spectral indices and field-observed conditions and provide a practical method for immediate fire detection to assess its burn

severity in advance. Furthermore, a quantified mapping model is presented to illustrate the spatial distribution of fire severity across the burnt area. The study focuses on the recent bushfire that took place in Mati Athens in Greece on 24 July 2018 which had as a result not only material and environmental disaster but also was responsible for the loss of human lives.

BC35. Tamara K. Al-Shayea, Constandinos X. Mavromoustakis, Jordi Mongay Batalla, George Mastorakis, Evangelos Pallis, Evangelos Markakis, Spyros Panagiotakis, Imran Khan, (2020) Medical Image Watermarking in Four Levels Decomposition of DWT Using Multiple Wavelets in IoT Emergence. In: Mastorakis G., Mavromoustakis C., Batalla J., Pallis E. (eds) Convergence of Artificial Intelligence and the Internet of Things. Internet of Things (Technology, Communications and Computing). Springer, Cham. https://doi.org/10.1007/978-3-030-44907-0_2.

Abstract: Medical images will be an inseparable part for evaluating medical conditions of a person in real-time. This process will become efficient by exploiting the characteristics that are offered by IoT in the healthcare sectoral issues. This will allow more efficiency in the processing of a medical image. However, the medical images are exposed to the major risks through frequent attacks which may lead up to misinformation the physician in the diagnosis of the disease. Piracy eradication remains the major challenge in the present-day world in IoT platform. Subsequently, the medical watermarked image is significant technique of ensuring the clinical information that exists in the medical images. In this regard, this paper labors on a medical image based on digital watermarking can be utilized to protect health sign embedding in a medical image within an invisible status. The proposed method performance is evaluated by utilizing MSE, PSNR, SSIM, and NC, which are necessary to get the best result for performance metrics. This work is achieved in four levels Discrete Wavelet Transform (DWT). Each level is utilized different wavelet family. These wavelets family are composed of biorthogonal wavelet, reverse biorthogonal wavelet, discrete meyer wavelet, symlet wavelet, and coiflets wave-let transform. The proposed technique is highly robust against numerous sorts of attacks. The results refer that this proposed algorithm permits prevention at a higher level compared with other current structures and algorithms.

Citations

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Metrics overview

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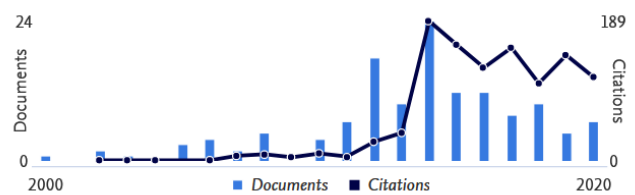
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Patent

I am member of a scientific team that hold a patent named on “Forecasting Middleware Scheduler - (FMS)”, which refers to a System and Method for Forecasting the Demand for Multimedia and Content and for selecting the Optimal Delivery Method", European Patent Office, EP3301945 (A1) — 2018-04-04.

Administrative/management experience

Apart from my academic and research work, I have also served as Deputy Head of the Department of Information Engineering, Director of the Network Engineering division, Head of the “Research and Development of Telecommunications Systems – PASIPHAE”, Deputy Director of the "Multimedia, Networks and Communications" Lab., and departmental academic coordinator for the ERASMUS+ programme. I have also contributed to a number of administrative efforts both at departmental and institutional levels, including participation in collective bodies and committees, evaluation and conducting panels, faculty member elections, evaluation/recruitment committees of scientific and research staff, selection committees for recruiting postgraduate students, bodies for reforming the undergraduate curriculum and the MSc program-of-studies, the internal quality evaluation committee at departmental level, as well as the organization and participation in a series of dissemination events for the institution.