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## Optical Network Design and Modeling

Anna Tzanakaki, Manos Varvarigos, Raul Muñoz, Reza Nejabati, Noboru Yoshikane, Markos Anastasopoulos, Johann Marquez-Barja

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# Optical Network Design and Modeling


23rd IFIP WG 6.10 International Conference, ONDM 2019  
Athens, Greece, May 13–16, 2019  
Proceedings

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# Preface

It was an honor and a pleasure to welcome everyone to ONDM 2019, the 23rd edition of the Optical Network Design and Modelling conference, which was held at the National and Kapodistrian University of Athens, Greece, May 13–16, 2019.

ONDM 2019 focused on cutting-edge research in established areas of optical networking as well as their adoption in support of a wide variety of new services and applications. This involved the most recent trends in networking, including 5G and beyond, big data and network data analytics, cloud/edge computing, autonomic networking, artificial intelligence assisted networks, secure and resilient networks, etc., that drive the need for increased capacity, efficiency, flexibility, and adaptability in the functions that the network can perform.

In this context new disaggregated optical network architectures were discussed, exploiting and integrating novel multidimensional photonic technology solutions, as well as adopting open hardware and software platforms relying on software defined networking (SDN) and network function virtualization (NFV) to allow support of new business models and opportunities.

Some of the thematic areas that were covered include:

- Novel and multidimensional optical network architectures
- Optical network control, management, and orchestration, including SDN and NFV solutions
- Slicing, virtualization, and multitenancy techniques for optical networks
- Optical networking supporting low latency and high bandwidth network function virtualization
- Optical and wireless network convergence, including radio-over-fiber access networks
- Optical networks in support of intra-/inter-data center connectivity and cloud/edge computing
- Artificial intelligence and data analytics techniques for optical networks
- Advances in optical network modeling and optimization
- Routing and spectrum assignment in fixed and flex-grid optical networks
- Novel optical node designs including disaggregation and open optical line systems
- Optical network availability, resilience, survivability, security, and privacy
- Optical networking in support of vertical industries
- Field trials and interoperability demonstrations of optical networks
- Techno-economic studies of optical networks with emphasis on 5G consideration

Some of the key take away messages of the conference include:

- The importance of network user increases, as armed with increasingly-capable smart devices drive network level specifications and design/operation choices
  - The concept of service is being expanded beyond the traditional end-user context to a variety of end-user and operational services that are ICT or vertical industry related

- This imposes the requirement for newer infrastructures, e.g., 5G, 6G and beyond consisting of (optical) communication networks, (edge and cloud) data centers, distributed network functions, etc., in order to become more agile and facilitate more application-centric services with improved user experience
- Infrastructures equipped with additional/newer resources supporting higher bandwidth and lower latency focusing only on the lower layers of the protocol stack are not sufficient anymore
  - Instead, novel, flexible, open, and scalable architectural approaches supporting technology convergence, not only across network domains but also across network and compute/storage domains, involving inter- and intra-Data Center connectivity, are becoming essential
  - Methods developing real-time network-, service-, and application-centric analytics, able to process huge volumes of data, adopting artificial intelligence and machine-learning methods are needed to offer improved network and network service performance as well as user-experience, in support of the vision of future IT infrastructures
- Significant experimentation activities in real-life test-beds (5G UK) have already provided proof of principle demonstrations of the use and potential of optical networking in support of the new 5G and beyond network paradigm to facilitate end-user services with emphasis in improved experience and quality of leaving
- Significant attention has been put towards resilience and security considerations in the context of optical networking and the role optical technologies can play to facilitate more resilient and secure future network infrastructures

ONDM 2019 was a single-track conference. The conference included two workshops, one industrial panel, and one summer school co-organized by the H2020 5G PPP project 5G-PICTURE and the Erasmus Mundus programme SMARTNET:

- Workshop I: Optical Networking an enabler for 5G Solutions, Trials and Demonstrators
- Workshop II: Optical Intra- and Inter- Data Center Networks
- Industry Panel: 5G in 2020 and beyond: reality check, rollout plans and path ahead

Attendance: 90 Attendees

May 2019

Anna Tzanakaki  
Manos Varvarigos  
Raul Muñoz  
Reza Nejabati  
Noboru Yoshikane  
Markos Anastasopoulos  
Johann Marquez-Barja

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The original version of the book was revised: The affiliation of the volume editor Johann Marquez-Barja has been corrected. The correction to the book is available at [https://doi.org/10.1007/978-3-030-38085-4\\_56](https://doi.org/10.1007/978-3-030-38085-4_56)

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# Contents

## Regular Papers

Hybrid Backup Resource Optimization for VNF Placement Over Optical Transport Networks . . . . .	3
<i>João Pedro and António Eira</i>	
Software-Defined Reconfigurability, White Boxes, and Abstraction. . . . .	15
<i>Nicola Sambo, Alessio Giorgetti, Andrea Sgambelluri, Piero Castoldi, and Luca Valcarenghi</i>	
Embedding Virtual Networks in Flexible Optical Networks with Sliceable Transponders . . . . .	26
<i>Juzi Zhao and Suresh Subramaniam</i>	
Virtualized Controller Placement for Multi-domain Optical Transport Networks. . . . .	39
<i>Sabidur Rahman, Tanjila Ahmed, Sifat Ferdousi, Partha Bhaumik, Pulak Chowdhury, Massimo Tornatore, Goutam Das, and Biswanath Mukherjee</i>	
End-to-End Network Slicing in Support of Latency-Sensitive 5G Services . . .	51
<i>Rafael Montero, Fernando Agraz, Albert Pagès, and Salvatore Spadaro</i>	
The Impact of the Optical Network on 5G – The Metro-Haul Project . . . . .	62
<i>Andrew Lord, Albert Rafel, Michael Parker, and Adrian Farrel</i>	
Availability-Guaranteed Slice Provisioning in Wireless-Optical Broadband Access Networks Supporting Mobile Edge Computing. . . . .	70
<i>Ke Chen, Gangxiang Shen, Shuiping Jie, Boping Jiang, and Sanjay K. Bose</i>	
DU/CU Placement for C-RAN over Optical Metro-Aggregation Networks . . .	82
<i>Hao Yu, Francesco Musumeci, Jiawei Zhang, Yuming Xiao, Massimo Tornatore, and Yuefeng Ji</i>	
Adaptive Function Chaining for Efficient Design of 5G Xhaul . . . . .	94
<i>Bahare M. Khorsandi, Didier Colle, Wouter Tavernier, and Carla Raffaelli</i>	

Dynamic Softwarised RAN Function Placement in Optical Data Centre Networks . . . . .	108
<i>Nikolaos Gkatzios, Markos Anastasopoulos, Anna Tzanakaki, and Dimitra Simeonidou</i>	
Techno-Economic Aspects of 5G Transport Network Deployments . . . . .	118
<i>I. Mesogiti, E. Theodoropoulou, G. Lyberopoulos, F. Setaki, K. Filis, A. Di Giglio, A. Percelsi, and Anna Tzanakaki</i>	
RHODA Topology Configuration Using Bayesian Optimization . . . . .	130
<i>Maotong Xu, Min Tian, Eytan Modiano, and Suresh Subramaniam</i>	
Dynamic Abstraction of Optical Networks with Machine Learning Technologies. . . . .	142
<i>Shuangyi Yan, Zhengguang Gao, Rui Wang, Alex Mavromatis, Reza Nejabati, and Dimitra Simeonidou</i>	
Novel P-Cycle Selection Algorithms for Elastic Optical Networks. . . . .	154
<i>Rujia Zou and Suresh Subramaniam</i>	
How to Survive Targeted Fiber Cuts: A Game Theoretic Approach for Resilient SDON Control Plane Design . . . . .	168
<i>Jing Zhu, Marija Furdek, Carlos Natalino, Lena Wosinska, and Zuqing Zhu</i>	
Joint Fronthaul Optimization and SDN Controller Placement in Dynamic 5G Networks. . . . .	181
<i>Victoria-Maria Alevizaki, Markos Anastasopoulos, Anna Tzanakaki, and Dimitra Simeonidou</i>	
3-Stage Hierarchical Quality of Service for Multi-tenant Passive Optical Networks . . . . .	193
<i>Frank Slyne, Bruno Cornaglia, Marco Boselli, and Marco Ruffini</i>	
Machine Learning Assisted Optical Network Resource Scheduling in Data Center Networks . . . . .	204
<i>Hongxiang Guo, Cen Wang, Yinan Tang, Yong Zhu, Jian Wu, and Yong Zuo</i>	
Machine Learning Assisted Quality of Transmission Estimation and Planning with Reduced Margins . . . . .	211
<i>Konstantinos Christodoulopoulos, Ippokratis Sartzetakis, Polizois Soumplis, and Emmanouel (Manos) Varvarigos</i>	
Network Programmability and Automation in Optical Networks . . . . .	223
<i>Ricard Vilalta, Ramon Casellas, Ricardo Martínez, and Raul Muñoz</i>	

Fragmentation Metrics in Spectrally-Spatially Flexible Optical Networks . . . .	235
<i>Piotr Lechowicz, Massimo Tornatore, Adam Włodarczyk, and Krzysztof Walkowiak</i>	
Intrinsically Resilient Optical Backbones: An Efficient Ring-Based Interconnection Paradigm . . . . .	248
<i>Marcia H. M. Paiva, Gilles Caporossi, Moises R. N. Ribeiro, and Marcelo E. V. Segatto</i>	
Experimental Evaluation of Dynamic Resource Orchestration in Multi-layer (Packet over Flexi-Grid Optical) Networks . . . . .	261
<i>Silvia Fichera, Barbara Martini, Ricardo Martínez, Ramon Casellas, Ricard Vilalta, Raul Muñoz, and Piero Castoldi</i>	
Optics for Disaggregating Data Centers and Disintegrating Computing . . . . .	274
<i>Nikos Terzenidis, Miltiadis Moralis-Pegios, Stelios Pitris, Charoula Mitsolidou, George Mourgias-Alexandris, Apostolis Tsakyridis, Christos Vagionas, Konstantinos Vyrsoinos, Theoni Alexoudi, and Nikos Pleros</i>	
Simplifying Optical DCN Fabrics with Blocking Space Switching and Wavelength-Constrained WDM. . . . .	286
<i>Konstantinos Kontodimas, Kostas Christodouloupoulos, and Emmanouel Varvarigos</i>	
Dual-Layer Locality-Aware Optical Interconnection Architecture for Latency-Critical Resource Disaggregation Environments . . . . .	299
<i>Nikos Terzenidis, Miltiadis Moralis-Pegios, Theoni Alexoudi, Stelios Pitris, Konstantinos Vyrsoinos, and Nikos Pleros</i>	
Network-Wide Localization of Optical-Layer Attacks . . . . .	310
<i>Marija Furdek, Vincent W. S. Chan, Carlos Natalino, and Lena Wosinska</i>	
Analytical Modeling of Survivable Anycast Communication in Optical Networks . . . . .	323
<i>Yan Cui and Vinod M. Vokkarane</i>	
Network Coding for Security Against Eavesdropping Attacks in Elastic Optical Networks . . . . .	336
<i>Giannis Savva, Konstantinos Manousakis, and Georgios Ellinas</i>	
Resilient Cloud-RANs Adopting Network Coding . . . . .	349
<i>Arash Farhadi Beldachi, Markos Anastasopoulos, Alexandros Manolopoulos, Anna Tzanakaki, Reza Nejabati, and Dimitra Simeondou</i>	

**A Novel Carrier-Cooperation Scheme with an Incentive for Offering  
Emergency Lightpath Support in Disaster Recovery. . . . . 362**  
*Sugang Xu, Noboru Yoshikane, Naoki Miyata, Masaki Shiraiwa,  
 Takehiro Tsuritani, Xiaocheng Zhang, Yoshinari Awaji,  
 and Naoya Wada*

**State-of-the-Art and Future of Submarine Cable System Technology . . . . . 377**  
*Hidenori Takahashi*

**Modeling Long-Haul Optical Networks with Quasi-single-mode Fibers . . . . . 389**  
*Ioannis Roudas, Xin Jiang, and Luis Miranda*

**Crosstalk Mitigation in Long-Reach Multicore Fiber Communication  
Systems Using RKHS Based Nonlinear Equalization . . . . . 398**  
*Sandesh Jain, Anuj Agrawal, Vimal Bhatia, and Shashi Prakash*

**Physical Layer Security in Optical Networks . . . . . 412**  
*Dimitris Syvridis, Evangelos Pikasis, and Charidimos Chaintoutis*

**A Gated Service MAC Protocol for 5G Fiber-Wireless Cloud-Radio  
Access Networks. . . . . 425**  
*Agapi Mesodiakaki, Pavlos Maniotis, Georgios Kalfas,  
 Christos Vagionas, John Vardakas, Elli Kartsakli,  
 Angelos Antonopoulos, Eftychia Datsika, Christos Verikoukis,  
 and Nikos Pleros*

**12 Gb/s Multiband Fiber-Wireless Link Using Coherent IFoF and V-band  
mmWave Radio . . . . . 437**  
*Nikos Argyris, Giannis Giannoulis, Konstantina Kanta,  
 Panagiotis Toumasis, Dimitrios Apostolopoulos,  
 and Hercules Avramopoulos*

**System Innovations in Inter Data Center Transport Networks . . . . . 444**  
*Loukas Paraschis, Harald Bock, Parthiban Kandappan,  
 Bernd Sommerkorn-Krombholz, Joao Pedro, Abhinava Sadasivarao,  
 Sharfuddin Syed, Jeff Rahn, Paul Doolan, and Biao Lu*

**SDN Control of Disaggregated Optical Networks with OpenConfig  
and OpenROADM . . . . . 452**  
*Ramon Casellas, Ricard Vilalta, Ricardo Martínez, and Raúl Muñoz*

**Poster Papers**

**Self-learning Routing for Optical Networks . . . . . 467**  
*Yue-Cai Huang, Jie Zhang, and Siyuan Yu*

Deterministic Contention Management for Low Latency Cloud RAN over an Optical Ring . . . . .	479
<i>Dominique Barth, Maël Guiraud, and Yann Strozecki</i>	
Resource Analysis and Cost Modeling for End-to-End 5G Mobile Networks . . . . .	492
<i>Hilary Frank, Rodrigo S. Tessinari, Yuqing Zhang, Zhengguang Gao, Carlos Colman Meixner, Shuangyi Yan, and Dimitra Simeonidou</i>	
Analog IFoF/mmWave 5G Optical Fronthaul Architecture for Hot-Spots Using Multi-channel OFDM-Based WDM Signals. . . . .	504
<i>Charoula Mitsolidou, Christos Vagionas, Agapi Mesodiakaki, Pavlos Maniotis, George Kalfas, Chris G. H. Roeloffzen, Paulus W. L. van Dijk, Ruud M. Oldenbeuving, Amalia Miliou, and Nikos Pleros</i>	
Hybrid and Optical Packet Switching Supporting Different Service Classes in Data Center Network . . . . .	516
<i>Artur Minakhmetov, Cédric Ware, and Luigi Iannone</i>	
Reduction of Delay Overfulfillment in IP-over-DWDM Transport Networks . . . . .	528
<i>Uwe Bauknecht, Tobias Enderle, and Arthur Witt</i>	
Design of a Real-Time DSP Engine on RF-SoC FPGA for 5G Networks. . . . .	540
<i>Vasileios Kitsakis, Konstantina Kanta, Ioannis Stratakos, Giannis Giannoulis, Dimitrios Apostolopoulos, George Lentaris, Hercules Avramopoulos, Dimitrios Soudris, and Dionysios I. Reisis</i>	
Performance of Underwater Wireless Optical Link Under Weak Turbulence and Pointing Errors Using Heterodyne QAM Technique . . . . .	552
<i>Argyris N. Stassinakis, Hector E. Nistazakis, George K. Varotsos, and George S. Tombras</i>	
MCF Skew Estimation at the Receiver for ARoF Antenna Beamforming . . . . .	560
<i>Thomas Nikas, Evangelos Pikasis, Sotiris Karabetzos, and Dimitris Syvridis</i>	
Core Arrangement Based Spectrum-Efficient Path Selection in Core-Continuity Constrained SS-FONs. . . . .	570
<i>Anuj Agrawal, Vimal Bhatia, and Shashi Prakash</i>	
Topology and Failure Modeling for Optical Network Resilience Analysis Against Earthquakes . . . . .	584
<i>Anuj Agrawal, Vimal Bhatia, and Shashi Prakash</i>	

A Performance Analysis of Supervised Learning Classifiers for QoT Estimation in ROADM-Based Networks . . . . . 598  
*Alan A. Diaz-Montiel and Marco Ruffini*

Programmable Flex-E and X-Ethernet Networks for Traffic Isolation in Multi-tenant Environments . . . . . 610  
*Kostas Katsalis and Rixin Li*

Q-Learning Based Joint Allocation of Fronthaul and Radio Resources in Multiwavelength-Enabled C-RAN . . . . . 623  
*Ahmed Mohammed Mikaeil and Weisheng Hu*

Advanced Interconnect Technologies . . . . . 635  
*Christina (Tanya) Politi, Dimitris Alexandropoulos, and Dimitra Simeonidou*

Supporting Diverse Customers and Prioritized Traffic in Next-Generation Passive Optical Networks . . . . . 645  
*Naureen Hoque and Byrav Ramamurthy*

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*Anna Tzanakaki, Manos Varvarigos, Raul Muñoz, Reza Nejabati, Noboru Yoshikane, Markos Anastasopoulos, and Johann Marquez-Barja*

**Author Index** . . . . . 659