Josep Prat

Editor

Next-Generation FTTH Passive Optical Networks

Research towards unlimited bandwidth access

Springer

Next Generation Ftth Passive Optical Networks Research Towards Unlimited Bandwidth Access

René Bonk

Next Generation Ftth Passive Optical Networks Research Towards Unlimited Bandwidth Access:

Next-Generation FTTH Passive Optical Networks Josep Prat,2008-07-16 Fibre to the Home networks constitute a fundamental telecom segment with the required potential to match the huge capacity of transport networks with the new user communication demands Huge investments in access network infrastructure are expected for the next decade with many initiatives already launched around the globe recently driven by the new broadband service demands and the necessity by operators to deploy a future proof infrastructure in the field Dense FTTH Passive Optical Networks PONs is a cost efficient way to build fibre access and international standards G E PON have been already launched leading to new set of telecom products for mass deployment However these systems only make use of less than 1% of the optical bandwidth thus relevant research is taking place to maximize the capacity of these systems with the latest opto electronic technologies demonstrating that the huge bandwidth available through the fibre access can be exploited in a cost efficient and reliable manner Next Generation FTTH Passive Optical Networks gathers and analyzes the most relevant techniques developed recently on technologies for the next generation FTTH networks trying to answer the question what s after G E PONs   *Linear and Nonlinear Semiconductor Optical Amplifiers for Next-Generation Optical Networks* René Bonk,2014-05-12 In this book semiconductor optical amplifiers SOAs are studied with a view to linear and nonlinear applications in next generation optical networks Quantum dot SOAs can be optimized for linear amplification of signals with different modulation formats and multiplexing techniques Conversely bulk SOAs can be easily optimized for operation in the nonlinear regime However due to the fast carrier recovery times in QD SOAs we also look into nonlinear applications with these devices   **Paving the Way for 5G Through the Convergence of Wireless Systems** Trestian, Ramona,Muntean, Gabriel-Miro,2018-12-28 In the ever evolving telecommunication industry smart mobile computing devices have become increasingly affordable and powerful leading to significant growth in the number of advanced mobile users and their bandwidth demands Due to this increasing need the next generation of wireless networks needs to enable solutions to bring together broadband broadcast and cellular technologies for global consumers Paving the Way for 5G Through the Convergence of Wireless Systems provides innovative insights into wireless networks and cellular coexisting solutions that aim at paving the way towards 5G Through examining data offloading cellular technologies and multi edge computing it addresses coexistence problems at different levels i e physical characteristics open access technology neutrality economic characteristics healthcare education energy etc influencing networks to provide solutions for next generation wireless networks Bridging research and practical solutions this comprehensive reference source is ideally designed for graduate level students IT professionals and technicians engineers academicians and researchers   **Semiconductor Optical Amplifiers and mm-Wave Wireless Links for Converged Access Networks** Koenig, Swen,2014-11-20 Future access networks are converged optical wireless networks where fixed line and wireless services share the same infrastructure In this book semiconductor optical amplifiers SOA and

mm wave wireless links are investigated and their use in converged access networks is explored SOAs compensate losses in the network and thereby extend the network reach Millimeter wave wireless links substitute fiber links when cabling is not economical **Quantum-Dot-Based Semiconductor Optical Amplifiers for O-Band Optical Communication** Holger Schmeckebier,2016-10-21 This thesis examines the unique properties of gallium arsenide GaAs based quantum dot semiconductor optical amplifiers for optical communication networks introducing readers to their fundamentals basic parameters and manifold applications The static and dynamic properties of these amplifiers are discussed extensively in comparison to conventional non quantum dot based amplifiers and their unique advantages are elaborated on such as the fast carrier dynamics and the decoupling of gain and phase dynamics In addition to diverse amplification scenarios involving single and multiple high symbol rate amplitude and phase coded data signals wide range wavelength conversion as a key functionality for optical signal processing is investigated and discussed in detail Furthermore two novel device concepts are developed and demonstrated that have the potential to significantly simplify network architectures reducing the investment and maintenance costs as well as the energy consumption of future networks **Evolution of Telecommunication Services** Emmanuel Bertin,Noel Crespi,Thomas Magedanz,2013-10-14 In the telecom world services have usually been conceived with a specific mindset This mindset has defined the traditional characteristics of these services services distinguished by their linkage with the access network tight control over service use e g authentication billing lack of deep personalization capabilities mass services only and reliance on standardization to achieve end to end interoperability between all the actors of the value chain e g operators platform manufacturers device manufactures This book offers insights into this complex but exciting world of telecommunications characterized by constant evolution and approaches it from technology as well as business perspectives The book is appropriately structured in three parts a an overview of the state of the art in fixed mobile NGN and standardization activities b an analysis of the competitive landscape between operators device manufactures and OTT providers emphasizing why network operators are challenged on their home turf and c opportunities for business modeling and innovative telecom service offers **Second International Conference on Computer Networks and Communication Technologies** S. Smys,Tomonobu Senjyu,Pavel Lafata,2020-01-21 This book presents new communication and networking technologies an area that has gained significant research attention from both academia and industry in recent years It also discusses the development of more intelligent and efficient communication technologies which are an essential part of current day to day life and reports on recent innovations in technologies architectures and standards relating to these technologies The book includes research that spans a wide range of communication and networking technologies including wireless sensor networks big data Internet of Things optical and telecommunication networks artificial intelligence cryptography next generation networks cloud computing and natural language processing Moreover it focuses on novel solutions in the context of communication and networking challenges such

as optimization algorithms network interoperability scalable network clustering multicasting and fault tolerant techniques network authentication mechanisms and predictive analytics **Broadband Optical Access Networks and Fiber-to-the-Home** Chinlon Lin,2006-07-11 Broadband Optical Access and Fiber to the Home FTTH will provide the ultimate broadband service capabilities Compared with the currently well deployed broadband access technologies of ADSL Asymmetric Digital Subscriber Line and Cable Modems optical broadband access with Fiber to the User s home will cater for much higher speed access for new services Broadband Optical Access Networks and Fiber to the Home presents a comprehensive technical overview of key technologies and deployment strategies for optical broadband access networks and emerging new broadband services The authors discuss network design considerations new services deployment trends and operational experiences while explaining the current situation and providing insights into future broadband access technologies and services Broadband Optical Access Networks and Fiber to the Home Offers a comprehensive up to date introduction to new developments in broadband access network technologies and services Examines the impact of research and development in photonics technologies on broadband access and FTTH Covers ADSL VDSL with FTTC Fiber to the Curb Cable Modem over HFC Hybrid Fiber Coax and Gigabit Ethernet Discusses the roles of Broadband Wireless LAN and integrated FTTH Wireless Broadband Access as well as Broadband Home Networks Provides a global view of broadband network development presenting different technical and system deployment approaches and strategic considerations for comparison Gives insight into the worldwide broadband competition and the future of this technology Broadband Optical Access Networks and Fiber to the Home will be an invaluable resource for engineers in research and development network planners business managers consultants as well as analysts and educators for a better understanding of the future of broadband in the field of telecommunications data communications and broadband multimedia service industries

Handbook of Research on Heterogeneous Next Generation Networking: Innovations and Platforms Kotsopoulos, Stavros,Ioannou, Konstantinos,2008-10-31 This book presents state of the art research developments and integration activities in combined platforms of heterogeneous wireless networks Provided by publisher **Next-Generation Passive Optical Networks** Ahmad R. Dhaini,2008 Research and development on optical networks generally and on Passive Optical Networks PON particularly have matured considerably The exponential increase in the demand for bandwidth has exposed many challenges in the last mile that remains the bottleneck in broadband access networks Currently Ethernet PON has emerged as the most inexpensive panacea providing more bandwidth than Cable Modems and Digital Subscriber Lines Nevertheless providing fair and efficient Quality of Service QoS has always been a major issue due to the un deterministic nature of Time Division Multiple Access TDMA technology and the limited 1 Gbps channel speed that EPON relies on unlike backbone networks that uses the Wavelength Division Multiplexing WDM technology This book instruments these challenges and issues and offers effective solutions More specifically it presents an upgrade from a TDM PON to a Hybrid TDM WDM

PON and proposes and validates the first framework that enables for per stream QoS protection in EPON using a new fair QoS scheduler The book addresses professionals in optical and access networks It is also directed towards researchers who would like to get a novel fragrance of EPONs   Long Reach Passive Optical Networks Huan Song,2009 With the advances in optical technology the span of a broadband access network using Passive Optical Network PON technology can be increased from today s standard of 20 km to 100 km or higher Such an extended reach PON is known as Long Reach PON LR PON This technology can enable broadband access for a large number of customers in the access metro area while decreasing capital and operational expenditures for the network operator Therefore it is very desirable to comprehensively investigate this technology for future broadband access This dissertation is dedicated to the research of architecture management and reliability of LR PON This dissertation first reviews the evolutionary path of access networks and shows the drivers from technology and business perspectives for high bandwidth and low cost A variety of research challenges in this field is reviewed from optical components in the physical layer to the control and management issues in the upper layers We discuss the requisites for optical sources optical amplifiers and optical receivers in optical access networks with high transmission rate 10 Gbps and large power attenuation due to large split transmission over 100 km and beyond and propagation We analyze the key topological structures to guarantee physical protection e g tree and branch ring and spur Then some relevant demonstrations of Long Reach optical access networks developed worldwide by different research institutes are presented A major challenge in LR PON is that the propagation delay for data as well as control signals between the telecom central office CO and the end user is increased by a very significant amount Now traditional PON algorithms for scheduling the upstream transmission such as dynamic bandwidth allocation DBA algorithms may not be sufficient actually they may lead to degraded performance because of the long delay of the CO to Users control loop This challenge motivates us to propose and study a multi thread polling algorithm to effectively and fairly distribute the upstream bandwidth dynamically This algorithm exploits the benefits of having multiple polling processes running simultaneously and enabling users to send bandwidth requests before receiving acknowledgement from the CO We compare the proposed algorithm with traditional DBA and show its advantage on average packet delay With the increased bandwidth requests from the expanding base of users LR PON should utilize the network resource e g wavelengths lasers etc more effectively We propose a new and efficient protocol to achieve better utilization of tunable lasers as well as wavelength resources across different user groups in LR PON In order to accommodate downstream bursty traffic and provide Quality of Service QoS in the user specified Service Level Agreements SLA the protocol integrates our proposed SLA aware bandwidth allocation scheme based on flow scheduling We show the protocol s advantage to support incremental upgrade of bandwidth with increasing user bandwidth requests and to provide a user with a SLA which guarantees a number of streaming flows with average bandwidth and maximum delay guarantee e g 5 ms as well as data flows with average bandwidth specifications

Since LR PON serves a lot more users a network failure may lead to a huge amount of data loss and negative user experience Thus to understand the importance of LR PON survivability we propose hardware accelerated protection schemes for the LR PON incorporating the ring and spur structure to achieve fast protection switching time and automatic failure location at the Optical Line Terminal OLT which is located at the head end of the optical access network We design the protection schemes for multiple network environments e g unidirectional transmission vs bidirectional transmission and 1 1 protection vs 1 1 protection The numerical examples demonstrate that protection paths can be established within a few tens of ms after a failure occurs This dissertation makes important contributions by studying novel architectures protocols and algorithms of LR PON that will help to improve the next generation telecom access networks   **Passive Optical Networks** Cedric F. Lam,2011-10-10 Passive optical network PON technologies have become an important broadband access technology as a result of the growing demand for bandwidth hungry video on demand applications Written by the leading researchers and industry experts in the field Passive Optical Networks provides coherent coverage of networking technologies fiber optic transmission technologies as well as the electronics involved in PON system development Features An in depth overview of PON technologies and the potential applications that they enable Comprehensive review of all major PON standards and architecture evolutions as well as their pros and cons Balanced coverage of recent research findings with economic and engineering considerations Presents system issues of protocols performance management and protection Extensive references to standards and research materials for further studies This book provides an authoritative overview of PON technologies and system requirements and is ideal for engineers and managers in industry university researchers and graduate students Balances treatment of the optical technologies with systems issues such as protocols performance management and protection Covers latest developments in WDM PONS protection switching dynamic bandwidth allocation Practical coverage with a chapter on PON applications and deployment Case studies on implementing PONs   **Optical Access Networks and Advanced Photonics: Technologies and Deployment Strategies** Chochliouros, Ioannis P.,Heliotis, George A.,2009-07-31 This book presents a comprehensive overview of emerging optical access network solutions to efficiently meet the anticipated growth in bandwidth demand Provided by publisher   Gigabit-capable Passive Optical Networks D. Hood,2012-03-13 Gigabit capable passive optical networks G PON have a large and increasing base of support among telecommunications operators around the world Written by two of the experts in the field this book explains G PON in detail both the original 2 5 Gb s version and XG PON the 10 Gb s second generation The foundation established by this book is also invaluable in understanding NG2 next generation 2 G PON which is built upon a number of XG PON systems on parallel wavelengths As well as a history that clarifies the reasons for many of the existing features the book looks at current and evolving technology and discusses some of the alternatives for future access networks   *Analysis of the Performances and Tolerances of the 2nd Generation Passive Optical Networks (NGPON2) for FTTH Systems* Juan Camilo Velásquez

Micolta,2014 ENGLISH In a Fiber to the Home FTTH system the fiber is connected until the household users A passive optical network PON is a particular type of FTTH networks that uses P2MP point to multipoint fiber premises in which unpowered optical splitters are used to share part of the infrastructure enable a single optical fiber to serve multiple premises The evolution of PON systems across the years can be associated with the evolution in multiplexing technologies In the first years with the use of TDM the achieved upstream and downstream aggregate bandwidth was in the order of 155 Mbit s until 10 GBit s in XG PON standard But with the implementation of WDM the capacities have been increased significantly until get bandwidths of 250 GBit s and 500 GBit s using ud WDM with coherent detection This new standards use advanced modulation and codification formats This project will evaluate the new international standard ITU T G 989 for next generation optical fiber access to the home FTTH network operating at 4x 10GBit s that uses time multiplexing and dense wavelength multiplexing TWDM The key commercial devices for its implementation will be identified and modelled Next the access network will be built in a computer simulator different tests will be run and the system will be optimized Tasks Study of the state of art of optical access networks comparing different technologies devices and architectures Analysis of the new international standard ITU T G 989 to review the optical spectrum management devices and subsystems proposed Use of VPI simulator in order to build an access network architecture and realize different tests linking it with MATLAB to analyze the achieved results Optimization of the network built   Supporting Diverse Customers and Prioritized Traffic in Next-generation Passive Optical Networks Naureen Hoque,2018 The already high demand for more bandwidth usage has been growing rapidly Access network traffic is usually bursty in nature and the present traffic trend is mostly video dominant This motivates the need for higher transmission rates in the system At the same time the deployment costs and maintenance expenditures have to be reasonable Therefore Passive Optical Networks PON are considered promising next generation access technologies As the existing PON standards are not suitable to support future PON services and applications the FSAN Full Service Access Network group and the ITU T Telecommunication Standardization Sector of the International Telecommunication Union have worked on developing the NG PON2 Next Generation PON 2 standard Resource allocation is a fundamental task in any PON and it is necessary to have an efficient scheme that reduces delay maximizes bandwidth usage and minimizes the resource wastage A variety of DBA Dynamic Bandwidth Allocation and DWBA Dynamic Wavelength and Bandwidth Allocation algorithms have been proposed which are based on different PONs e g EPON GPON XG PON 10G EPON etc But to our knowledge no DWBA scheme for NG PON2 system with diverse customers and prioritized traffic has been proposed yet In this work this problem is addressed and five different dynamic wavelength and bandwidth allocation DWBA schemes are proposed First mixed integer linear programming MILP models are developed to minimize the total delay of the high priority data Due to the MILP s high computational complexity heuristic algorithms are developed based on the MILP model insights The five heuristics algorithms are No Block Split Heuristic NBH Equal Block Split Heuristic EBH

Priority Based No Block Split Heuristic P NBH Priority Based Equal Block Split Heuristic P EBH and Priority Based Decider Block Split Heuristic P DBH Six priority classes of requests are introduced with the goal of minimizing the total delay for the high priority data and to lessen the bandwidth wastage of the system Finally experiments for the performance evaluation of the five DWBA schemes are conducted The results show that P NBH P EBH P DBH schemes show a 47 63% less delay and 30% of less bandwidth wastage on average for the highest priority data transmission than the schemes without priority support NBH and EBH Among these five schemes NBH method has the highest delay whereas EBH and P EBH waste more bandwidth than the other schemes P DBH is the most efficient among the five because this scheme offers the lowest delay for high priority data and the minimum bandwidth wastage for lower priority ones **Design, Implementation, and Analysis of Next Generation Optical Networks: Emerging Research and Opportunities** ,2020 By the end of the decade approximately 50 billion devices will be connected over the internet using multiple services such as online gaming ultra high definition videos and 5G mobile services The associated data traffic demand in both fixed and mobile networks is increasing dramatically causing network operators to have to migrate the existing optical networks towards next generation solutions The main challenge within this development stems from network operators having difficulties finding cost effective next generation optical network solutions that can match future high capacity demand in terms of data reach and the number of subscribers to support multiple network services on a common network infrastructure Design Implementation and Analysis of Next Generation Optical Networks Emerging Research and Opportunities is an essential reference source that discusses the next generation of high capacity passive optical access networks PON in terms of design implementation and analysis and offers a complete reference of technology solutions for next generation optical networks Featuring research on topics such as artificial intelligence electromagnetic interface and wireless communication this book is ideally designed for researchers engineers scientists and students interested in understanding designing and analyzing the next generation of optical networks **Simulation & Analysis of Fiber-to-the-Home (FTTH)** Jitesh D. Chauhan,2019-02-25 Fiber based access networks can deliver performance that can support the increasing demands for high speed connections One of the new technologies that have emerged in recent years is Passive Optical Networks PON To satisfy future bandwidth demands existing fiber to the home FTTH access networks must be upgraded Since the lifetime of a passive optical network PON is expected to be greater than 25 years replacing the existing PON infrastructure is not desirable when upgrading the network throughput Fiber based access systems can demand of execution that can high speed net work One of the new innovations that have risen as of late is Passive Optical Net works PON Fiber to the home FTTH is encountering awesome open acknowl edgment all through the world For investigate the Fiber to the Home architecture are main work with any users can drop or add in optical fiber communication for long distance In continues type laser to external modulated source through each user allocated separate wavelength then no inter symbol interference ISI and for same wavelength we can nearest distance then

drop the same wavelength and same wave allocate for in line next user **Reconfigurable Technology for Future Optical Access Networks** She-Hwa Yen,2011 Fiber based access is recognized as the most promising technology for solving broadband bandwidth bottlenecks Time division multiplexing passive optical networks TDM PONs that are passive and non reconfigurable are currently the most widely deployed type of fiber access networks However due to their passive nature TDM PONs faces several limitations such as inflexible service area coverage lack of intelligence for control and inability to counteract security attacks In order to address the current limitations of optical access networks we propose reconfigurable technologies for next generation PONs Two novel reconfigurable technologies are proposed analyzed and experimentally evaluated The first solution is a reconfigurable power and wavelength assignment technology based on a novel non volatile reconfiguration node The proposed remote node can reconfigure the network to adapt it to varying degrees of deployment conditions and or network attacks Moreover the proposed remote node incorporates a novel quasi passive device that does not consume energy once it is reconfigured into a new latching state Therefore the proposed remote node has very low energy consumption and does not require local power supply to preserve the passive character of the distribution network In particular two novel quasi passive optical power splitter technologies based on Micro Electro Mechanical Systems MEMS and transition metal oxide have been designed for the reconfigurable device A simulation study shows the proposed reconfigurable device would outperform traditional passive splitter in terms of maximum number of supportable users under realistic deployment conditions The second solution addresses the issue of reconfigurable network consolidation and infrastructure simplification Current TDM PONs suffers from limited reach and split ratio To enhance the performance in terms of service range and quality of service reconfigurable network consolidation is a promising solution It can also simplify the network and reduce cost We propose the following novel reconfigurable technologies for consolidation and simplification of next generation access networks 1 Passive reach extension technology for the drop section of optical access networks 2 Sleep mode ONUs for energy saving 3 Centrally managed optical signature that can monitor and protect the upstream link and 4 Multi rate burst mode receivers These reconfigurable technologies can bring the intelligence into optical access networks and improve the efficiency and flexibility for next generation optical access networks **The ComSoc Guide to Passive Optical Networks** Stephen B. Weinstein,Yuanqiu Luo,Ting Wang,2012-04-24 Describes the major architectures standards and technologies of Passive Optical Networks PONs The ComSoc Guide to Passive Optical Networks provides readers with a concise explanation of the key features of Passive Optical Networks PONs the different types of PON architectures and standards key issues of PON devices management and implementation and the promising business opportunities in access networks Written for a broad audience ranging from developers to users this indispensable book provides an understanding o the evolutionary path of PON access systems and their positioning with respect to the cable copper and wireless competitors for broadband access networks In addition The ComSoc Guide to Passive Optical Networks

Provides brief high level overviews of the architectures and applications of Fiber to the Home FTTH or Fiber to the Curb FTTC access networks and the alternative HFC subscriber line and WiMAX access systems Awards readers with a clear understanding of what BPON GPON WDM PON and EPON are and how they work together with an introduction to their respective standards Carefully defines all acronyms and technical terms making the book accessible to those who may not be specialists in this area Gives readers an appreciation of the last mile problems in telecommunications access networks and the opportunities in optical wireless integration

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