IEEE Communications Society's Enhanced Conference Tutorials on CD

2012

Abstracts

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Introduction

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Updated on: 24/01/2012 Resource Centre Team

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IEEE ComSoc Tutorials
Abstract

1.

Author(s): Dahlman, Erik (Ericsson, Canada)
Title: **3G wireless system**
Presented at: ICC 2004 (IEEE International Conference on Communications)
Duration: 123 min; 105 slides.
Call No.: 621.3821 DAH
Acc. No.: A00179
Keywords: Digital communications; Wireless communications; CDMA; Multiple access.

Abstract: The aim of this tutorial is to give some insight into the technical details of the different technologies that exists for 3G wireless communication.
The tutorial begins with a short overview of the different technologies that exist for 3G wireless communication. This also includes an overview of the related specification and standardization activities technologies.

In the second, main part, of the tutorial, a more detailed description of the different 3G wireless technologies, *Wideband CDMA (WCDMA)*, *cdma2000*, and *UTRA TDD*, is given. The main focus is on the physical layer but some higher-layer aspects are also being discussed. Furthermore, the differences between the different 3G technologies are high-lighted.

The third part of the tutorial covers the evolution of the 3G wireless technologies. I this part, *WCDMA HSDPA*, *WCDMA Enhanced uplink*, and *cdma2000 1xEV* is covered.

2.

Author(s): Soomro, Amjad, (Philips Research USA) & Shankar N, Sai (Qualcomm Standards Engineering Dept.)
Title: **A-T of IEEE 802.11 wireless LAN protocols? an in-depth look at the current standard and upcoming future amendments**
Presented at: WCNC 2005 (IEEE Wireless Communications and Networking Conference CO-located with CTIA)
Duration: 333 min; 216 slides
Call No.: 621.319 SOO
Acc. No.: A00180
Keywords: Digital communications; Wireless communications; Wireless LAN protocols.

Abstract: IEEE 802.11 WLAN has emerged as a prevailing technology for the (indoor) broadband wireless access. IEEE 802.11 can be considered a wireless version of Ethernet by virtue of supporting a best-effort service (not guaranteeing any service level to users/applications). The purpose of this tutorial is to provide a comprehensive overview on the IEEE 802.11 MAC and PHY and its amendments. First, the tutorial provides a review of the legacy MAC standard. Next the physical layer enhancement both in 2.4 GHz and 5 GHz bands, namely b, g and a, are covered.

On the MAC side, protocol amendments related to: 1) geographical information, IEEE 802.11d; 2) inter access point protocol, IEEE 802.11f; and, 3) Dynamic frequency selection (DFS) and transmit power control (TPC), IEEE 802.11h, will be discussed in detail. IEEE 802.11 task group TGe is working on an amendment to the protocol to address QoS needs of multimedia and real-time applications. Specifically, a hybrid coordination function (HCF) consisting of enhanced distributed contention access (EDCA) method and hybrid controlled contention access (HCCA) method are presented.

IEEE 802.11 standards provides optional WEP security protection, however, under greater scrutiny vulnerabilities in this protocol were discovered. IEEE 802.11i amendment to the standard providing enhancements to the security mechanism will be covered in detail.

Next IEEE 802.11 task group k's work to amend the standard to include mechanisms and protocols for radio resource measurement are presented. Finally, a brief overview are given of the purpose and scope of the work being conducted in task and study groups addressing enhancements for higher throughput 'n', wireless access for vehicular environments 'p', fast roaming 'r', ESS mesh networking 's' , ,wireless performance prediction 't', interworking with external networks 'u' and wireless network management 'v'.

3.

Author(s): Bing, Benny (Georgia Institute of Technology)
Title: **Advances in wireless local area networks**
Presented at: INFOCOM 2005 (IEEE International Conference on Computer Communication)
Duration: 139 min.; 132 slides
Call No.: 621.382 BIN
Acc. No.: A00181
Keywords: Digital communications; Wireless communications; Local area network.

Abstract: Wi-Fi applications have blossomed tremendously over the last few years. What started out as cable replacement for static desktops in indoor networks has been extended to fully mobile broadband applications involving wide-area outdoor community networks, moving vehicles, high-speed trains, and even airplanes. Wi-Fi data rates have also continued to increase from 2 to 54 Mbit/s with current 802.11n proposals topping 500 Mbit/s. This development may eventually render wired Ethernet redundant in the local network.

Despite its success in the LAN environment, Wi-Fi is now aggressively deployed as outdoor multihop mesh networks to provide pervasive broadband wireless access. The broadcast nature of wireless transmission and the ubiquity of Wi-Fi devices offer immediate access for both fixed and mobile users. Unlike wired access, a large portion of the deployment costs is incurred only when a subscriber signs up for service. A more significant trend is the increasing number of municipal governments that are financing the deployment of multihop Wi-Fi networks with the overall aim of providing ubiquitous Internet access and enhanced public services. This tutorial provides a concise discussion on several key topics related to current and emerging 802.11 technologies.

4.

Author(s): Glitho, Roch
Title: **Applications enablers for challenged networks**
Presented at: IEEE Globecom 2009 (IEEE Global Communications Conference Tutorials)
Duration: 111 min.
Call No.: 621.382 GLI
Acc. No.: A01442
Keywords: Wireless communications; Mobile network.

Abstract: Tutorial presented at: IEEE Globecom 2009 More and more networks that do not meet the Internet design assumptions are being deployed (e.g. deep space networks, mobile ad hoc networks and wireless sensor networks). These networks are known as challenged (or unusual, or non conventional) networks. This tutorial reviews applications enablers for challenged networks and discusses related research directions. A three dimensional taxonomy (challenged network type, involved layers, and application) is used as framework for the discussions. The tutorial starts by introducing the most widely deployed challenged networks. After that, we introduce the two challenged networks-agnostic application enablers (i.e. enablers that target all challenged networks), meaning the delay/disruption tolerant network (DTN) overlay of the IETF and the ambient control space (ACS) overlay from an EU 6FP project. The last part of the tutorial focuses on the challenged networks specific enablers (i.e. enablers that target a specific challenged network). In this category, the middleware approaches for wireless sensor networks are categorized and reviewed. The conferencing enablers for mobile ad hoc networks (e.g. signalling, media handling) are also discussed. Case studies such as engineering applications like E-mail, web access with DTN or opportunistic mobile ad hoc routing, in environments where conventional networks are not feasible (e.g. villages in India, nomadic Saami in Laplan), are used throughout the tutorial for illustration purpose.

5.

Author(s): Jajszczyk, Andrzej (AGH University of Science and Technology)
Title: **Architectures of intelligent optical networks**
Presented at: ICC 2004 (IEEE International Conference on Communications)
Duration: 158 min.; 175 slides
Call No.: 621.38275 JAJ
Acc. No.: A00182
Keywords: Communication networks; Optical communications.

Abstract: The tutorial presents possible evolution paths for core and metropolitan networks taking into account the changing telecommunications environment. First, the current status of core and metropolitan networks is presented, including a brief description of such networking technologies as: SDH/SONET and their enhancements, Generic

Framing Procedure, Ethernet and its Gigabit and 10 Gigabit versions, as well as Resilient Packet Ring. Then, the Optical Transport Network standard as well as all-optical networking technologies are discussed. The second part of the tutorial deals with the intelligence of optical networks based on the ASON control plane. The tutorial is concluded by presenting current standardization activities, open issues and perspectives of intelligent optical networking.

Part 1: SDH/SONET Development
Part 2: Generic Framing Procedure
Part 3: Ethernet Transport
Part 4: Resilient Packet Ring
Part 5: Optical Transport Network
Part 6: All-Optical Networks
Part 7: Control Plane
Part 8: Automatically Switched Optical Network (ASON)
Part 9: ASON Implementation Issues

6.

Author(s): Strassner, John (MDAPCE)
Title: **Autonomic networking - theory and practice**
Presented at: NOMS 2004 (IEEE/IFIP Network Operations and Management Symposium)
Duration: 242 min.; 128 slides
Call No.: 004.22 STR
Acc. No.: A00183
Keywords: Communication networks; Autonomic computing.

Abstract: This tutorial describes the essential theory and practice of autonomic networks. Part 1 describes the current problems in building and deploying an OSS. Part 2 provides a primer to autonomic computing. Part 3 emphasizes two key principles of an autonomic network: Contracts and State Machines. Part 4 shows how the TMF's NGOSS Methodology can be used to create a self-governing system. Part 5 defines the important role that information modeling plays in autonomic systems, illustrated using DEN-ng. Part 6 explains the critical roles of policy-based management and process automation using an example. Part 7 analyzes the OMG's Model Driven Architecture, and describes a custom-built MDA code generator. Part 8 shows how the Contract serves multiple constituencies throughout a solution's lifecycle, and defines key architectural abstractions. Part 9 uses a real-world case study that enabled an existing network to operate in a more autonomic fashion, and provides a list of references.

7.

Author(s): Keiser, Gerd
Title: **Basics of optical communications and WDM**
Presented at: IEEE OFC/NFOEC 2009 (Optical Fiber Communication Conference and Exposition (OFC) and the National Fiber Optic Engineers Conference)
Duration:
Call No.: 621.3827 KEI
Acc. No.: A01433
Keywords: Optical communications; Wavelength division multiplexing; Telecommunication systems; Computer networks.

Abstract: Tutorial presented at: IEEE OFC/NFOEC 2009 The tutorial covers the functions and operational characteristics of available optical fibers, transceivers, and specialized passive and active components needed for designing modern optical fiber communication links. It explains the distortion effects that dispersion and nonlinear processes have on signals, defines bit error rate concepts, and identifies measurement equipment and procedures used to verify system operating characteristics. The tutorial also defines wavelength division multiplexing (WDM) concepts, components, and applications. The topics include characteristics of wavelength multiplexers, optical amplifier uses in WDM links, the basics of Raman amplification, and implementation of WDM-based networks.

8.

Author(s): Kazovsky, Leonid G.; Gutierrez, David; Shaw, Wei-Tao and Wong, Gordon (Stanford University)
Title: **Broadband Fiber Access**
Presented at: IEEE Globecom 2006 (IEEE Global Communications Conference)
Duration: 156:10 min; 147 slides
Call No.: 621.38275 KAZ

Acc. No.: A01356
Keywords: Optical communications; Fiber optics; Digital communications ; Optical fiber subscriber loops; Broadband communication systems; Fiber optic cables; Coaxial cables; Optical fiber communication; Multiplexing; Tutorial

Abstract: Broadband fiber access is becoming increasing important in USA as major service providers are gearing to bridge the gap between world leaders in access (South Korea and Japan) and USA. This tutorial will first review fiber access technologies currently being deployed: passive optical networks (PONs) including A/B PON, E-PON and G-PON; and hybrid networks having both fiber and DSL segments. The issues of bandwidth, QoS and security will be discussed. Next, the tutorial will review possible evolution scenarios from hybrid PON / DSL networks to PON / wireless, pure PON, and next-generation PON networks. In the latter group, we will cover more powerful 10Gb/s TDM PONs and evolution toward even more powerful WDM PONs. Special attention will be paid to graceful, economically feasible evolutions scenarios.

This tutorial includes results of some six years of research conducted by my group, Photonics and Networking Research Laboratory at Stanford University. The research was conducted with a generous support of various industrial companies (including both service providers and equipment manufacturers) and government agencies (such as N F).

Part Number and Titles:

- Tutorial Preview
- Session 1 - Motivation and Basic Access Technologies - Part A
- Session 1 - Motivation and Basic Access Technologies - Part B
- Session 2 - Passive Optical Networks
- Session 3 - PON Research
- Session 4 - Future Outlook - Part A
- Session 4 - Future Outlook - Part B

9.
Author(s): Engel, Marc (Flanders Mechatronics Technology Centre)
Title: **Broadband fixed wireless access**
Presented at: ICC 2004 (IEEE International Conference on Communications)
Duration: 146.6 min.; 123 slides
Call No.: 621.382 ENG
Acc. No.: A00185
Keywords: Communication networks; Digital communications; Wireless communications; Broadband wireless access.

Abstract: With the advent of the IEEE 802.16 standard and next generation equipment, Broadband Wireless Access (BWA) is experiencing a renewed interest. Especially the application at microwave frequencies between 2 and 11 GHz are an attractive option for operators without an existing access infrastructure to reach the end users. This tutorial gives an introduction to the fast developing field of BWA. More in particular it will cover:

Markets and applications
Frequency bands and propagation conditions for BWA
Available standards (IEEE802.16, HIPERACCESS, HIPERMAN)
  - Different modulation technologies.
  - Multiple access options.

Technological challenges and design issues.
Further evolution of the BWA technology.

10.
Author(s): Bing, Benny (Georgia Institute of Technology)
Title: **Broadband wireless access – the next wireless revolution**
Presented at: ENTNET 2006 (IEEE International Enterprise Networking & Services Conference)
Duration: 135 min.; 113 slides
Call No.: 621.38212 BIN
Acc. No.: A00
Keywords: Broadband communication systems; Multimedia systems--Congresses; Computer network protocols

Abstract: Broadband wireless access is the third wireless revolution, after cellphones and Wi-Fi. It is viewed by many carriers and cable operators as a “disruptive” technology and rightly so. The broadcast nature of wireless transmission offers ubiquity and immediate access for both fixed and mobile users, clearly a vital element of next-generation

quadruple play (i.e., voice, video, data, and mobility) services. Unlike wired access (copper, coax, fiber), a large portion of the deployment costs is incurred only when a subscriber signs up for service. An increasing number of municipal governments around the world are financing the deployment of multihop wireless networks with the overall aim of providing ubiquitous Internet access and enhanced public services. This tutorial will provide a comparative assessment of the key standards and technologies underpinning promising broadband wireless access solutions.

11.

Author(s): Jamalipour, Abbas (University of Sydney, Australia)
Title: **Broadband wireless IP**
Presented at: WCNC 2004 (IEEE Wireless Communications and Networking Conference CO-located with CTIA)
Duration: 203.53 min.; 118 slides
Call No.: 621.3821 JAM
Acc. No.: A00184
Keywords: Communication networks; Digital communications; Integrated networks; Wireless communications; Data networks.

Abstract: Research on wireless IP has become one of the most important topics in the field of telecommunications. On one hand, the increasing popularity of Internet services in the past few years has introduced a kind of necessity to have those services on a mobile platform, and on the other hand, advanced technologies such as cellular and wireless LAN have provided the fundamental requirements to support the wireless Internet. Wireless LAN has already established an important role in providing high-speed data access for cellular systems as it can be seen from recent significant standardization activities. The European Telecommunications Standards Institute (ETSI) has specified two generic approaches toward the integration of the wireless LAN and GPRS/UMTS systems, known as loose coupling and tight coupling. In this tutorial, the wireless IP, considered not only as an extension of the conventional wired IP but also as a cooperating network with the wired IP, will be introduced. The change in protocol design required for a complete migration from the wired network into a heterogeneous wired/wireless as well as wireless LAN/cellular will be explained and the architectural concepts to support the future broadband and high-speed wireless IP will be discussed. Comparison between the loose and tight coupling architecture as well as with other possible architectures will be provided. The tutorial will also examine the third generation wireless networks and the wireless LAN architectures in detail and show that how the two differently designed networks can efficiently work together. Major research topics in the field including quality of service, mobility and traffic management, TCP, and IP protocol enhancement will be addressed. Standardization activities within 3GPP, 3GPP2, and ETSI will be also included in the tutorial.

Part 1: An Introduction to the Mobile Internet
Part 2: Wireless Cellular Data Networks
Part 3: Enhanced General Packet Radio Service (EGPRS)
Part 4: Universal Mobile Telecommunication System (UMTS)
Part 5: Integrated Networks
Part 6:Next Generation Mobile Networks & Concluding Remarks

12.

Author(s): Ghrayeb, Ali; Duman, Tolga
Title: **Coding for cooperative communications**
Presented at: IEEE Globecom 2009
Duration: NA; 170 slides
Call No.: 621.382 GHR
Acc. No.: A01443
Keywords: MIMO; Wireless communications; WiMax.

Abstract: Future wireless communication systems deployment, including fourth generation (4G) cellular systems, wireless sensor networks, fixed broadband communications (WiMax), to name a few, will be based on the emerging technology of cooperative communications. The notion here is that the nodes comprising the network (referred to as relay nodes) will cooperate among themselves in transmitting data from a source to a destination, resulting in a virtual multiple-input multiple-output (MIMO) system. This technology has significant advantages over conventional ones, including configuration flexibility, better coverage, higher capacity, improved performance, to name a few. This tutorial gives a complete overview of the various emerging coding techniques for cooperative communication networks. These include distributed space-time coding, distributed concatenated coding and iterative decoding, combined network coding and

channel coding, among others. The tutorial focuses on the construction and performance analysis of such coding schemes over various wireless channels. In addition, it addresses information theoretical limits for various configurations of cooperative wireless networks. Participants will also see comparisons between these coding schemes in terms of performance and complexity. Furthermore, various relaying strategies will be addressed. Practical issues such as antenna and relay selection and the effects of sub-channel correlation and channel estimation error on the system performance will also be considered.

13.

Author(s): Duman, Tolga M. (Arizona State University) & Ghrayeb, Ali (Concordia University)
Title: **Coding for MIMO systems**
Presented at: WCNC 2004 (IEEE Wireless Communications and Networking Conference CO-located with CTIA)
Duration: 208.51 min.; 214 slides
Call No.: 621.38215 DUM
Acc. No.: A00186
Keywords: Digital communications; Wireless communications; Diversity; Multipath -- fading; MIMO communications.

Abstract: Achieving reliable high-speed data transmission over wireless links is a challenging task due to multipath fading and interference from other users. The single most effective technique to combat such adverse effects is to introduce diversity into the system. There are many different diversity techniques including temporal, frequency, and spatial diversity. Furthermore, different diversity techniques may be combined to enhance the performance of the wireless system. Space-time coding, a new coding paradigm suitable for multiple antenna systems, is a successful example that combines temporal diversity (through channel coding) and spatial diversity (through multiple transmit and receive antennas). This tutorial gives a complete overview of the various emerging space-time coding techniques. These include space-time trellis codes, space-time block codes, turbo codes, and concatenated codes with iterative decoding, among others. The tutorial focuses on the construction and performance analysis of such coding schemes over various wireless channels. In addition, it addresses information theoretical limits for multi antenna systems over wireless channels. Participants will also see comparisons between these coding schemes in terms of performance and complexity. In addition, several practical space-time coding architectures such as BLAST and its variants will be described. Other practical issues such as antenna selection at the transmitter and/or receiver and the effects of sub-channel correlation on the system performance will also be considered.

Part 1: Multiple Antennas: Why and How
Part 2: Channel Capacity and Information rates for MIMO Wireless Systems
Part 3a: Space-Time Block Codes
Part 3b: Space-Time Trellis Codes
Part 4: Performance Analysis of STTC
Part 5: Layered Space-Time Coding
Part 6: Concatenated Space-Time Coding and Iterative Decoding
Part 7: Differential and Unitary Space-Time Coding
Part 8: Practical Considerations
Part 9: Antenna Selection for MIMO Systems
Part 10: Wideband MIMO Communications

14.

Author(s): Burbank, Jack L. (The Johns Hopkins University Applied Physics Laboratory [JHU/APL])
Title: **Commercial wireless networking: creating a tactical internet capability with commercial technology**
Presented at: MILCOM 2005 (Military Communications Conference)
Duration: 181 min.; 220 slides
Call No.: 621.3821 BUR
Acc. No.: A00
Keywords: Wireless communication systems; Computer networks
Abstract: The military is undergoing a "transformation" to a network-centric warfare (NCW) paradigm. In the NCW paradigm, more importance is placed on the collection of, dissemination of, synthesis of, and action on information by lightweight, highly-mobile, highly-lethal forces. This represents a fundamental trade of armor for network connectivity, placing unprecedented importance on the network(s) supporting the force structure. This warfighting paradigm is predicated upon the presence of a robust, highly-capable, highly-interoperable, readily deployable and manageable, and secure

networking capability to provide ubiquitous “anytime, anywhere, to anyone” communications. The composite of these networks will constitute the emerging Global Information Grid (GIG), a world-wide IP-based DoD network that is intended to remove communications as a constraint to the warfighter and his warfighting tactics.

There is a growing interest within the DoD community to leverage commercial Internet and wireless networking technologies in order to achieve this desired network-centric capability. This is understandable given the commercial Internet possesses many of the characteristics desired in the military counterpart. Subsequently, there continues to be an increasing number of military networks that are at least partly-based upon commercial wireless technologies and practices. However, these commercial technologies were not designed to meet military requirements, and as a result they may not perform well for all applications. If improperly applied within the military domain, they could represent a regression of capability. In fact, commercial technologies are often defined to meet rigidly-defined performance goals and a narrow set of use cases. These constraints often result in poor performance when the network technologies are applied outside of the original scope, even within the commercial domain. Thus, it is important that the military communications community understand these technologies from a variety of perspectives. This includes becoming familiar with the technologies themselves, knowledge of what they are and are not designed for, how they are used within the commercial domain, and the relationships between these various technologies. Such an understanding enables the military community to identify gaps between technology and military needs, identify potential shortcomings that may induce operational constraints, and work to design military-specific augmentations as necessary to bridge these gaps and maintain a technological edge against potential adversaries who also have access to these same commercial technologies. Conversely, it is also important for the military community to have intimate familiarity with these technologies because those are the technologies adversaries are likely to possess.

The goal of this tutorial is to provide an introduction to many of the wireless network technologies that are used within the commercial domain. This tutorial would provide attendees technical knowledge on pervasive wireless networking techniques and issues unique to the wireless domain. This tutorial will focus upon standardized commercial technologies, while refraining from presenting academic proposals from literature (there are too many technology proposals within the literature to realistically cover, even at a high-level, in a single tutorial session). Introductory material would be provided to identify key differences between wired and wireless domains, and highlight the key problematic areas in wireless internetworking. Introductory topics of the tutorial include:

- Introduction and motivation
  - Why do we need to be concerned, from a military point of view, about commercial wireless technologies?
    - Facts, figures, and trends of wireless networking technologies
    - Key functional attributes of pervasive commercial wireless technologies
- Background
  - What is a wireless network?
  - What does network mobility (NEMO) mean?
  - What is mobile ad-hoc networking (and how is it different than NEMO)?

- Key differences between wired and wireless networks
    - Mobility
    - Management
    - Security
    - Performance

The proposed tutorial then continues on to provide an overview of key pervasive commercial network technologies including:

- Current IEEE 802.11 WLAN technologies (a, b, g, i)
- Upcoming IEEE 802.11 WLAN technologies (e, s, r, t)
- WPAN technologies (Bluetooth, 802.15 (.1/.2/.3/.4))
- Wireless broadband access technologies (802.16 (a, d, e))

Each technology discussion includes: 1) a description of the historical lineage of each

technology, 2) the key design goals and usage cases for each technology, 3) some typical deployment models of the technology, 4) an overview of the technology itself at the physical layer, medium access control (MAC) layer, and at the system-view, 5) a survey of the current equipment market (typical off-the-shelf product capabilities and profile (size, weight, power, etc.)), 6) on-going standardization efforts, and 7) on-going and envisioned deployment activities. Presentation of the different technologies aims to remain neutral to preclude any bias towards one technology as a more suitable candidate to another for any particular application. Finally, a commercial 'big picture' will be provided, showing how each of these technologies serves a particular role within the commercial domain and how all these technologies together form the emerging wireless Internet.

The tutorial will then continue on to describe key technologies at the network-layer and above that are typically associated with wireless networking. This will include an overview of IP mobility support (both MIPv4 and MIPv6 models will be described). NEMO activities within the IETF will also be described. MANET routing protocols will be described (e.g. Ad-hoc On-Demand Distance Vector (AODV) and Optimized Link State Routing (OLSR)), as well as research associated with transport layer and application layer techniques to mitigate the effects of the wireless network. The performance of and technical issues associated with each technology will be discussed, and on-going development efforts within standards organizations and emerging technologies will also be discussed.

The tutorial will next discuss the issues of technology standardization, vendor selection, interoperability, and the need for military-specific enhancements. The tutorial will discuss the need for advocating military requirements within standards bodies while maintaining chosen technology gaps. Such gaps would be bridged with military-specific augmentations to maintain a technological edge.

15.

Author(s): Figueiras, Joao Carlos Prazeres and Frattasi, Simone
Title: **Cooperative mobile positioning : bringing social lifestyle into wireless location**
Presented at: ICC 2006 (IEEE International Conference on Communications)
Duration:
Call No.: 621.384 FIG
Acc. No.: A01435
Keywords: Antennas, propagation and radio networking; Networking and Security; Radio Access Technology; Mobile communication systems -- Social aspects; Interpersonal communication; Mobile geographic information systems; Cell phones -- Social aspects.

Abstract: Along with a vision that foresees the fourth generation (4G) as based on a cellular system that will also support short-range communications among its terminals, in this paper we propose an innovative geolocation scheme that exploits such an architecture and combines long- and short-range location information in a novel location algorithm. The simulation results presented in the paper show that our proposed scheme permits to enhance the location estimation accuracy with respect to the actual stand-alone hybrid cellular solutions.

16.

Author(s): Fitzek, Frank and Katz, Marcos
Title: **Cooperative wireless networking**
Presented at: IEEE Globecom 2009
Duration: 163 min.
Call No.: 621.382 FIT
Acc. No.: A01444
Keywords: Wireless Networks

Abstract: Cooperation is known as an effective strategy in nature to achieve individual or common goals by forming cooperative groups. As the crossover between nature and engineering has always been fruitful, this tutorial is introducing cooperative concepts for wireless networks advocating mobile devices to cluster in a peer]to]peer fashion. In three lectures cooperation is advocated to overcome the most critical problems in mobile communication, known as energy consumption, security, and higher data rates. The first part will introduce the main rules for cooperation. Whether to cooperate or act autonomously has to be decided by each mobile device individually. Following the rule "The real egoistic behavior is to cooperate", mutual aid among mobile devices will be applied if and only if it is beneficial for all group members. The second part is presenting cooperation concepts at the different protocol layers from applications to the physical layer. In the last part topics such as social mobile networks, game theory

and genetic programming are presented. The scope of the tutorial is to give a wide overview of non]altruistic cooperation (which makes it fundamentally different to all tutorials given with the same label of cooperation). The tutorial will highlight the potential and applicability of non-altruistic cooperation in future networks. In order to spice up the tutorial, simple demonstrators will be presented and hands-on parts for the attendees will be available.

17.

Author(s): Faloutsos, Michalis (UC Riverside) and Faloutsos, Christos (Carnegie Mellon)
Title: **Data mining the internet**
Presented at: SIGCOMM 2002
Duration:
(Web Version)
Keywords: Topology and models; Network performance, traffic, and long range dependence; BGP literature.

Abstract: The main goal of this tutorial is to present what we know about modeling the Internet, and how we can learn more. The tutorial intends to bridge the gap between network researchers and data mining research.

We addresses these two questions: what and how. First, we present the state of the art of WHAT we know about modeling and simulating the Internet. Second, we present cutting edge techniques of HOW to further our understanding of the network.

The motivation is that despite the significant research efforts, we know very little about the Internet. Furthermore, most network researchers are unaware of the wealth of analysis tools from the areas of data mining and statistics. Data analysis based on averages, standard deviation and Poisson processes has exhausted its capabilities.

Presents two scenarios that describe eloquently the two main thrusts of this tutorial.

1. Scenario one (WHAT): You want to simulate your new protocol. What topology should you use? What is the distribution of sources and destinations? What is the traffic intensity of each connection? What kind of background traffic should we use?
2. Scenario two (HOW): You just obtained large measured data of round trip delays among several node pairs over a few hours. How can you characterize it? How do you compare the delays between different end-points? How do you cluster "similar" round-trip behavior? How can you identify abnormal behavior such as a Distributed Denial of Service Attack (DDoS)?

Part A I: Topology
Part A II: Traffic and Performance
Part A III: Protocols (BGP)
Part B I: Traditional Data Mining
Part B IIa: Digital signal processing: DFT and DWT
Part B IIb: Forecasting: ARIMA methodology
Part B III: Singular Value Decomposition
Part B IV: Fractals, self similarity and power laws

18.

Author(s): Agrawal, Dharma P.
Title: **Design and performance issue in wireless mesh networks**
Presented at:
Duration:
Call No.: 621.384 AGR
Acc. No.: A01424
Keywords: Wireless communication systems; Wide area networks (Computer networks)

Abstract: This tutorial provides an overview of the Wireless Mesh Networks (WMNs) and identifies various associated characteristics. We present the evolution of mesh technology and also describe the IEEE 802.11s standard that formalizes the physical and MAC layer of WMN. We systematically analyze the key challenges in each layer of the network and discuss feasible state-of-the-art protocols. We provide a broad insight into many open research issues such as radio resource management, multipath route determination protocol, queue management policy to ensure fairness of multihop flows, etc. We address some fundamental design issues such as optimal number of MRs and IGWs and an optimal placement strategy to maximize the network capacity. Further, we analyze important channel assignment strategies to be followed during deployment of a WMN that maximally utilizes the network resources such as radio interfaces, channel. We also address other issues such as load balancing among MRs to avoid congestion and ensure a scalable operation. Finally, we outline various security

challenges that are impeding the rapid deployment of mesh networks.

19. **Author(s):** Bing, Benny (Georgia Institute of Technology)
Title: **Emerging Technologies in Wireless LANs: Theory, Design, Deployment**
Presented at:
Duration: 173.07 min; 161 slides
Call No.: 004.68 BIN
Acc. No.: A01357
Keywords: Wireless LANs; Tutorial

Abstract: Wireless LAN applications have blossomed tremendously over the last few years. What started out as cable replacement for static desktops in indoor networks has been extended to fully mobile broadband applications involving moving vehicles, high-speed trains, and even airplanes. Wi-Fi data rates have also continued to increase from 2 to 54 Mbit/s with current 802.11n proposals topping 600 Mbit/s. This development may eventually render wired Ethernet redundant in the enterprise network. When wireless LANs were first deployed, they give laptop and PDA users the same freedom with data that cellphones provide for voice. However, a wireless LAN need not transfer purely data traffic. It can also support packetized voice and video transmission. People today are spending huge amounts of money, even from office to office, calling by cellphones. With a wireless LAN infrastructure, it costs them a fraction of what it will cost them using cellphones or any other equipment. Thus, voice telephony products based on Wi-Fi standards have recently emerged. A more compelling use of wireless LAN is in overcoming the inherent limitations of wireless WANs. An increasing number of municipal governments around the world and virtually every major city in the U.S. are financing the deployment of mesh networks with the overall aim of providing ubiquitous Internet access and enhanced public services. In addition, cheap phone calls using voice over IP may become one of the biggest benefits of a citywide municipal network. This has led some technologists to predict that eventually we are more likely to see meshed wireless LAN cells that are linked together into one network rather than widespread use of high-powered WAN handsets cramming many bits into expensive and narrow slices of radio spectrum.

This first part of this tutorial will provide participants with a solid understanding of emerging wireless LAN technologies. Specific topics include quality of service, security, high throughput systems, mesh networking, WLAN/cellular interworking, coexistence, radio resource management, cognitive systems, range and capacity evaluation, hotspots, new applications, and public wireless broadband.

Ultra-wideband (UWB) is a license-free spectrum sharing technique where the transmitted RF energy is spread over a wide bandwidth so that interference to existing spectrum users is kept at a minimum. Driven largely by UWB technology, high-speed short-range Wireless Personal Area Networks (WPANs) are expected to proliferate in the coming years. A band-hopping OFDM transmission method developed by the WiMedia Alliance (and standardized by ECMA) has gained significant industry support for deploying high-rate WPANs. One key application envisioned for this technology is cable replacement for Universal Serial Bus (USB) 2.0 devices. In addition, IEEE 802.15 and ECMA have formed task groups aimed at developing new specifications for wireless connectivity in the 60 GHz frequency band. The 60 GHz band offers a large amount of bandwidth (up to 7 GHz) and relaxed transmit power limits, and therefore has the potential to meet the demand for multi-gigabit data rates. However, the need for directionality in millimeter wave operation implies that antenna sector switching and beamforming may be needed although the smaller antenna sizes make these techniques very attractive.

The second part of the tutorial will focus on the PHY and MAC layer methods developed by the WiMedia Alliance. It will also cover several challenges involving 60 GHz WPANs, including hardware and antenna design, multi-channel support, transmit power and interference considerations.

Part Number and Titles

- part 0 - preview - 2 slides (2 min)
- part 1 - 22 slides (19:23 min)
- part 2 - 16 slides (17:46 min)
- part 3 - 17 slides (20:26 min)
- part 4 - 15 slides (15:17 min)
- part 5 - 15 slides (20:23 min)
- part 6 - 20 slides (23:33 min)

- part 7 - 22 slides (23:35 min)
- part 8 - 14 slides (10:31 min)
- part 9 - 20 slides (22:13 min)

20.

Author(s): Hassanein, Hossam and Taha, Abd-Elhamid
Title: **Enabling technologies and standardization activities of IMT-advanced**
Presented at: IEEE Globecom 2009
Duration: 117 min
Call No.: 621.382 HAS
Acc. No.: A01445
Keywords: Broadband Wireless Network

Abstract: The objective of this tutorial is to show how the candidate technologies for Broadband Wireless Access (BWA) are able to meet the requirements set by IMT-Advanced, taking into account both current advances in addition to those expected in the near future. The tutorial will focus on efforts made by the IEEE (through its candidate IEEE 802.16m) and 3GPP2 (pushing LTE-Advanced). The participants will be familiarized with these technologies which are about to be offered into the market, and will come out with a solid understanding for the physical and MAC layers. Furthermore, the tutorial will provide participants with a timely perspective on hot research topics relating to IEEE 802.16m and LTE-Advanced.

21.

Author(s): Roberts, Jim (University of Surrey, UK)
Title: **Engineering for QoS: applying traffic theory to the internet**
Presented at: INFOCOM 2003 (IEEE International Conference on Computer Communication)
Duration: 118.13 min.; 148 slides **(Web Version)**
Keywords: Internet traffic characterization; QoS architectures; Flow aware networking.

Abstract: Here he discussed essential traffic characteristics, identifying the notions of flow and session as more appropriate for modeling than the datagram or the broadly defined traffic aggregate. We then successively describe performance models developed for the two main types of flow: streaming (mainly audio and video applications) and elastic (document transfers). Streaming traffic relies on open loop control and the models in question are those of statistical multiplexing. Elastic traffic, on the other hand, is subject to closed loop control and its performance is evaluated using the more recent theory of statistical bandwidth sharing. Qualitative results derived from the models are used to critically appraise the network architectures (notably, Diffserv and Intserv) currently proposed as Internet enhancements. We also discuss the application of the performance results in traditional traffic engineering activities of sizing, routing and overload control. We examine the link between QoS and pricing since this has a clear impact on the economic viability of the different architectures

Part 1: Traffic characterization: the nature of Internet traffic, what it is important to know for QoS

Part 2: Open loop control performance: understanding how demand, capacity and performance are related for audio and video traffic using open-loop, or preventive, traffic control

Part 3: Closed loop control performance: understanding how demand, capacity and performance are related for data traffic using closed-loop, or reactive, traffic control

Part 4: Realizing QoS guarantees: we apply the results and insights of the traffic theory discussed previously to critically appraise proposed QoS architectures.

22.

Author(s): Liotine, Matthew (BLR Research)
Title: **Essentials of enterprise continuity**
Presented at: ENTNET 2004 (IEEE International Enterprise Networking & Services Conference)
Duration: 248 min.; 189 slides
Call No.: 623.73 LIO
Acc. No.: A00187
Keywords: Analog communications, Carrier recovery diversity; Wired-line communications; Military communications.

Abstract: This tutorial presents numerous techniques on how to minimize single points of failure through redundancy and elimination of serial paths. It also reviews how to choose and

use conventional networking technologies and services to improve survivability and performance. It stresses fundamental principles that are key to developing an IT infrastructure that can withstand adverse events. This "art of war" approach to network continuity focuses on understanding basic concepts that can be applied to all levels of an information technology infrastructure. It teaches the strategies to withstand adverse situations and avoid remedial actions that can lead to a false sense of security.

23.

Author(s): Roch H. Glitho, (Ericsson Canada / Concordia University, Canada)
Title: **Engineering value added services in next generation networks**
Presented at: GLOBECOM 2003 (IEEE Global Communications Conference)
Duration: 257.20 min.; 261 slides
Call No.: 621.382 GLI
Acc. No.: A00188
Keywords: Digital communications; Wireless communications; Wired-line communications.

Abstract: This tutorial provides an overview of the architectures used for engineering value added services in next generation networks. It starts by given background information on service architectures and next generation networks. The concept of value added service is introduced and the architectures for engineering them in today's networks are discussed (i.e. IN, WAP and TINA-C). Next generation networks are defined and the signaling protocols on which they reply are presented (e.g. SIP, H.323, Megaco/H.248). After the background information, we successively review the signaling protocol specific service architectures (e.g. H.323 supplementary services, SIP CGI and SIP servlets) and the signaling protocol neutral service architectures (e.g. Parlay, JAIN JCC/JCAT, CPL) for next generation networks. The third and last part is devoted to the emerging trends. It focuses on the web services based-service architectures and the mobile agent based-services architectures.

Part 1: – Intro + IN 23:26
Part 2: WAP 23:12
Part 3: TINA 19:40
Part 4: SIPH323 18:03
Part 5: Megaco3GPP3GPP2 20:57
Part 6: Legacy architectures 26:52
Part 7: H323 services SIPCGI 19:41
Part 8: SIPservlets 3GPP SIP AS 18:31
Part 9: Parlay 25:10
Part 10: JAINCPL 13:11
Part 11: Web services (1) 15:27
Part 12: Web Services (2) 17:22
Part 13: Mobile Agents 16

24.

Author(s): Hellerstein, Joseph L. (IBM Corporation)
Title: **Fast track introduction to control theory for computer scientists**
Presented at: IM 2003 (IFIP/IEEE International Symposium on Integrated Network Management)
Duration: 160.8 min; 81 slides **(Web Version)**
Keywords: Systems engineering; Communications and control engineering.

Abstract: Part 1: Background and motivation.
Part 2: Qualitative control theory.
Part 3: Model dynamics.
Part 4: Control analysis.
Part 5: Case study and conclusions.

25.

Author(s): Marchetti, Nicola and Rahman, Muhammad Imadur
Title: **Future gigabits systems : towards real 4G and cognitive radios**
Presented at: Globecom 2008 (IEEE Global Communications Conference)
Duration:
Call No.: 621.384 MAR
Acc. No.: A01425
Keywords: Wireless communication systems; Wide area networks (Computer networks); Gigabit communications.

Abstract: Next generation wireless systems are supposed to reach ambitious targets in terms of

data rate and spectrum efficiency, which can be fulfilled only if a sufficient degree of intelligence and adaptivity can be put into future radios. This tutorial will address a number of intelligent and autonomous techniques that can be implemented in future wireless systems to realize such efficient high rate networks.

After a general introduction on future Gigabit/s systems, some advanced PHY and RRM techniques suitable for achieving "real" 4G targets in terms of data rate and spectral efficiency will be given, keeping especially an eye on smart and flexible design. The concentration will be on multi-antenna techniques, cognitive radios, advanced spectrum management, adaptive scheduling etc. Specifically, challenges and benefits related to flexible and smart spectrum utilization, spectrum sharing and cognitive radio techniques will be touched, as complementary and evolved technologies with respect to the above-mentioned PHY and RRM architectures.

26.

Author(s): Akansu, Ali
Title: **Generalized DFT for OFDM communications**
Presented at: IEEE Globecom 2009
Duration: 174 min.
Call No.: 621.382 AKA
Acc. No.: A01446
Keywords: Wireless communication systems

Abstract: Constant modulus orthogonal transforms have been widely used in many communications applications due to their efficiency at RF power amplifiers. Discrete Fourier transform (DFT) has been the center piece of discrete multi-tone (DMT) and orthogonal frequency division multiplexing (OFDM) based communications technologies. In this tutorial, we review the theoretical framework of the recently introduced non linear phase Generalized DFT (GDFT). GDFT sets are shown to yield significantly superior auto- and cross-correlations compared to DFT. Adaptive GDFT mimicks channel variations and attempts to mitigate BER and RF power amplifier degradations due to ISI, ICI and PAPR. Several GDFT design methods with computationally efficient implementations are highlighted. We expect GDFT with better performance and system security than DFT to find its use in the OFDM based communications systems of the future.

27.

Author(s): Jamalipour, Abbas (University of Sydney, Australia)
Title: **Heterogeneous wireless IP networks - architectures and requirements**
Presented at: WCNC 2005 (IEEE Wireless Communications and Networking Conference CO-located with CTIA)
Duration: 156 min.; 143 slides.
Call No.: 621.3845 JAM
Acc. No.: A00189
Keywords: Digital communications; Mobile communication Systems; Wireless communications; CDMA; UMTS.

Abstract: Access to broadband Internet services on a mobile platform has introduced tremendous research and development in the area of wireless IP in the past few years. Existing and emerging wireless technologies for wide area networks and hot spots, including third generation wireless cellular systems such as UMTS and cdma2000, wireless LAN defined in IEEE 802.11 (Wi-Fi) and HIPERLAN standards, as well as wireless MAN proposals such as IEEE 802.16 (WiMAX) and HIPERMAN, have provided substantial elements for realization of the broadband mobile Internet. Such a system should not only provide the commonly known Internet services, but also traditional voice and other real-time applications and eventually more advanced broadband multimedia services. This will require more research on architectures and protocols that interconnect those heterogeneous networks efficiently and in a seamless form. In this tutorial, the state-of-the art technologies for the wireless IP will be explored. The change in protocol design required for a complete migration from traditional wired network into a heterogeneous wired/wireless will be explained and the architectural concepts to support a broadband wireless IP in heterogeneous networks will be discussed. The tutorial will also examine third generation wireless networks in detail and show that how 3G and beyond networks could support the wireless IP. Standardization activities will be included in the tutorial too.

Part 1: Heterogeneous Networks

Part Title: Introduction to the Wireless IP

Part 2: Heterogeneous Networks

Part Title: Heterogeneous Next Generation Networks

Part 3: Heterogeneous Networks

Part Title: Wireless LAN and Cellular Network Integration

Part 4: Heterogeneous Networks

Part Title: Next Generation Networks: Technological Requirements

Part 5**:** Heterogeneous Networks

Part Title: Broadband Wireless IP and the IEEE Standards

Part 6: Heterogeneous Networks

Part Title: Concluding Remarks

28.

Author(s): Subramanian, Mani (Georgia Institute of Technology)
Title: **Home networking : market drivers, technologies, and business models**
Presented at: ENTNET 2004 (IEEE International Enterprise Networking & Services Conference)
Duration: 225.27 min.; 98 slides
Call No.: 621.3845 SUB
Acc. No.: A00190
Keywords: Digital communications; Wireless communications; Personal area networks; Home networking.

Abstract: This tutorial will review the lower-layer enabling technologies for home networking, which will include both wired and wireless. Wired protocols that are treated include Ethernet, IEEE 1394 Firewire, HomePlug,, HomePNA, USB (Universal Serial Bus), and CableHome.

Wireless networks include LANs (Local Area Networks) and PANs (Personal Area Networks). They include wireless LANs based on IEEE 802.11a/b/g, and the three 802.15 PANs - Bluetooth, UWB (Ultra-wideband), and low data-rate personal area network. WiFi Wireless LANs based on 802.11 will be covered in detail. The current limitations in bandwidth and QoS in 802.11a/g to handle multimedia traffic will be addressed; and emerging technologies such as 802.11n and 802.11e that address these issues will be detailed. Security and interference issues associated with WiFi are of primary concern to subscribers.
The tutorial concludes with cost and technology comparison of the various home networks and a summary of the tutorial.

Title and Module 1 Broadband Networks to and in Home and SME
Module 2 Part I Broadband Home Networks: Deployment
Market Drivers, and Business Models
Module 2 Part II Broadband Home Networks: Deployment
Market Drivers, and Business Models
Module 3 Home Networking Technologies: Overview
Module 4 Part I Middleware and Application Protocols
Module 4 Part II Middleware and Application Protocols
Module 5 Part I Lower Layer Wired Network Protocols
Module 5 Part II Lower Layer Wired Network Protocols
Module 6 Part I Wireless LAN Protocols and HomeRF
Module 6 Part II Wireless PAN Protocols, Technology Comparison,
and References

29.

Author(s): Montpetit, Marie-Jose (Motorola Connected Home Division)
Title: **Home networking standards**
Presented at: CCNC 2005 (IEEE Consumer Communications and Networking Conference co-located with CES)
Duration: 93.18 min.; 103 slides
Call No.: 621.3845 MON
Acc. No.: A00191
Keywords: Digital communications; Wireless communications; Home networking; Wired-line communications.

Abstract: This tutorial addresses the current and proposed home networking standards and how

they are implemented in devices today. Topics that are covered include and are not limited to: - physical and MAC layer standards such as the 802.11 series, DVB, DOCSIS, Bluetooth, HPNA, powerline etc. - middleware and interconnectivity such as MHP, UPnP and OSGi, and - how standards that were developed for other services in the Internet can migrate to the home environment.

Part:1 Basic Concepts
Part:2 Architectures
Part:3 Technologies 1
Part:4 Technologies 2
Part:5 Wired Technologies and Transport
Part:6 Internet Protocols
Part:7 Middleware 1
Part:8 Middleware 2
Part:9 DRM and Converged Standards
Part:10 Conclusion

30. **Author(s):** Perahia, Eldad and Stacey, Robert (Intel Corporation)
Title: **IEEE 802.11n: Throughput, Robustness, and Reliability Enhancements to WLANs**
Presented at: IEEE Globecom 2006 (IEEE Global Communications Conference)
Duration: 189 min; 107 slides
Call No.: 621.38212 PER
Acc. No.: A01358
Keywords: Wireless LANs; IEEE 802.11 (Standard); Wireless communication systems – Standards; Tutorial

Abstract: The IEEE802.11n standard will enable a new class of consumer and enterprise products utilizing wireless LAN connectivity that is ten times faster than is feasible with the current IEEE802.11a/b/g standards. This tutorial will provide a comprehensive overview of the technology in the p802.11n draft standard.

We begin with an overview of the applications, environments, channel models, use cases, and usage models developed by the study group and task group which provided the framework for proposal development. We continue with a history of the various coalitions that ultimately led to the final joint proposal adopted as the draft standard.

The technical description of the draft standard starts with a detailed discussion of the key throughput enhancing features: multiple-input, multiple-output (MIMO) / space division multiplexing (SDM) in the PHY and packet aggregation in the MAC. Further throughput enhancements in the PHY include 40 MHz channelization, reduced guard interval, tone filling, high rate coding, and efficient (greenfield) preambles. In the MAC this includes enhancements to the block acknowledgement (BA) protocol, such as a compressed BA frame format, implicit BA request, partial state operation, and no ACK delayed BA protocol. The reverse direction data protocol, which provides throughput enhancements for certain types of traffic patterns, is also discussed.

Additional topics include PHY interoperability techniques such as the mixed mode preamble, legacy spoofing, auto-preamble detection, and MAC techniques such as long network allocation vector (NAV) protection, legacy signal field (L-SIG) transmit opportunity (TXOP) protection, greenfield and reduced inter-frame space (RIFS) operation, 20/40MHz phase coexistence operation, and channel width management.

An overview will be provided of the robustness enhancements in both the MAC and the PHY. The PHY techniques include spatial spreading, receive diversity, transmit beamforming, space-time block code (STBC), and low density parity check (LDPC) codes. The MAC techniques include fast link adaptation and beamforming control.

Finally, we highlight video streaming as the key application that benefits from the IEEE802.11n standard. An overview of the throughput, latency, and reliability requirements for video is provided. This is followed by a review of how the robustness and throughput enhancements meet these requirements and significantly improve video streaming performance over what is achievable on WLANs today.

31. **Author(s):** Vilho, Raisanen (Nokia Corporation)
Title: **Implementing service quality for IP-based services in wireless environment**
Presented at: WCNC 2004 (IEEE Wireless Communications and Networking Conference CO-located with CTIA)

Duration: 101 min.; 78 slides
Call No.: 621.3845 VIL
Acc. No.: A00192
Keywords: Wireless communication systems; Mobile communication; Wireless communications; Wireless networks.

Abstract: The tutorial discusses implementation of service quality in wireless context, starting with a clarification of the concepts relating to service quality. A classification of applications is introduced, and characteristics and requirements of different classes with respect to different classes are discussed. Means of supporting service quality in wireless networks are discussed using examples from 3rd generation cellular networks and WiFi domain. A sampler of challenges in implementing service quality is discussed together with solutions.

Part 1: Background
Part 2: Architectures and service quality support
Part 3: Service characteristics and requirements
Part 4: Service quality in wireless environment and summary

32. **Author(s):** Khasnabish, Bhumip (DMTS, Verizon)
Title: **Implementing voice over IP (VoIP)**
Presented at: ENTNET 2005 (IEEE International Enterprise Networking & Services Conference)
Duration: 75 min.; 91 slides
Call No.: 621.385 KHA
Acc. No.: A00
Keywords: Communication technology-networks; Networking; Internet telephony.

Abstract: The standards and technologies for transmitting voice via the Internet protocol (IP) are areas of huge commercial importance in modern telecommunications. Until recently, the majority of traffic over communications networks was made up of circuit-switched voice calls. Today, the amount of voice traffic is dwarfed by the huge volume of packet-switched data (including text and audio files, streaming video, etc.) that is overtaking the medium. Consequently, public and private networks must be configured to route all voice calls using IP-based protocols.
Amazing phenomena are happening in the area of voice based communications!
Communication networks -- public, private, wired, and wireless -- are being configured in such a way that the voice calls can be routed using the Internet based protocols. Legacy protocols like H.323, MGCP, and IPv4 have limitations, but the emerging protocols (SIP, H.248, and IPv6) have Interoperability related issues and concerns.
This course reviews the existing and emerging voice signal coding techniques (G.711, G.729, G.723, etc.) and the standards (SIP, H.323, MGCP and Megaco) for signaling and transmission of Voice over IP (VoIP). It provides guidance on how to engineer any Internet protocol based network for (a) efficient VoIP transmission and (b) service quality management and enforcement.
We discuss the implementation and interoperability challenges, and a few feasible solution options in order to achieve convergence by supporting the VoIP service *seamlessly* over multiple technology and administrative domains. The technology domains include VoIP over wire-line and wireless (WiFi, WiMax, CDMA/RF), and administrative boundaries include those related to Intranet/Internet, wire-line and wireless carriers.

Topics related to reliability, availability, security, and quality of service (QoS) will be also covered.

Part 1: VoIP Basics, Enabling Technologies and Architectures.
Part 2: How to Implement VoIP for Residential and Enterprise Voice Services, Standards and Engineering Guidelines.
Part 3: VoIP Implementation Challenges, Solution Guidelines and Useful Websites (URLs).

33. **Author(s):** Progri, Ilir F.
Title: **Indoor geolocation systems**
Presented at: GLOBECOM 2008 (IEEE Global Communication Conference)
Duration:
Call No.: 621.384 PRO
Acc. No.: A01426
Keywords: Broadband communication systems; Ultra-wideband devices; Wireless communication

systems.

Abstract: Currently there is a need to design, develop, and deploy autonomous and portable indoor geolocation systems to fulfill the needs of military, civilian, governmental and commercial customers where GPS and GLONASS signals are not available due to the limitations of both GPS and GLONASS signal structure designs.

The goal of this course is (1) to introduce geolocation systems; (2) to classify the state of the art geolocation systems; (3) to identify the issues with the state of the art indoor geolocation systems; and (4) to propose and assess three Giftet Inc. indoor geolocation systems. It is assessed that the current GPS and GLONASS signal structures are inadequate to overcome two main design concerns; namely, (1) the near-far effect and (2) the multipath effect. We propose three Giftet Inc. indoor geolocation systems as an alternative solution to near-far and multipath effects. The Giftet Inc indoor geolocation systems are (1) a C-CDMA indoor geolocation system, (2) an OFDMA indoor geolocation system, and (3) a MC-CDMA indoor geolocation system. Each system is researched, discussed, and analyzed based on its principle of operation, its transmitter, the indoor channel, and its receiver design and issues associated with obtaining an observable to achieve indoor navigation. Our assessment of these systems concludes the following.

First, a C-CDMA indoor geolocation system is a potential candidate for indoor positioning, with data rate up to 3.2 KBPS, pseudorange error, less than to 2 m and phase error less than 5 mm and overall to provide centimeter level position and velocity accuracy 99.9% of the time. Second, an OFDMA indoor geolocation system is another potential candidate with a totally different signal structure than the C-CDMA indoor geolocation systems, but with similar pseudorange error performance and overall system position and velocity performance. Third, a MC-CDMA indoor geolocation system is a potential candidate to achieve centimeter level position and velocity performance accuracy 99.999% of the time and data rate up to 5 MBPS.

The main objective of this course is to introduce students and young professionals to INDOOR GEOLOCATION SYSTEMS which will enable them to obtain an introductory level in indoor geolocation systems modeling, analysis, design, and implementation.

34. **Author(s):** Chakrabarti, Anirban (Infosys Technologies) & Manimaran, G.(Iowa State University)
Title: **Internet infrastructure security**
Presented at: INFOCOM 2004 (IEEE International Conference on Computer Communication)
Duration: 320 min.; 220 slides
Call No.: 621.3192 CHA
Acc. No.: A00193
Keywords: Digital communications; Wireless communications; Information security; Infrastructure security; Mobile adhoc networks security.

Abstract: The Internet has witnessed an enormous growth over the last decade and has become ubiquitous. Most of the research focus in the past has been on improving the performance and scalability of the Internet. In the past decade or so, there have a seen a surge of Internet security research activities in the field of “information security,” which primarily focused on protecting the information exchange between communicating users; and its primary goal is to satisfy properties such as confidentiality, integrity, authenticity, and non-repudiation using techniques such as encryption, digital signatures, and the public-key infrastructure.

However, information security assumes that the devices responsible for implementing security functions and packet forwarding are trustworthy. Experts are now questioning these assumptions, as instances have taken place wherein the network infrastructure elements -- routers, servers, protocols -- were misconfigured or compromised to the extent that it caused service noticeable disruptions in the Internet. Moreover, the growing concerns for “cyber terrorism” highlight the importance of securing the Internet infrastructure.

Internet infrastructure security is about protecting infrastructure elements such as routers, DNS servers, communication links, and the protocols themselves. Several infrastructure security solutions have been and/or are being developed, such as firewalls, intrusion detection systems, denial of service (DoS) prevention, DoS mitigation, and DoS trace back schemes, secure Internet protocols, and wireless infrastructure security solutions.

The goal of this tutorial is to provide a comprehensive understanding of the issues and solutions in the emerging area of Internet Infrastructure Security. Specifically, this

tutorial discusses a taxonomy of attacks, a taxonomy of countermeasures and their implementation methods. The tutorial also discusses issues such as performance, scalability, deployability, and high speed implementations for several countermeasures.

The tutorial is made self-contained to provide a comprehensive understanding of issues and solutions, based on recent research articles, journal and conference papers, and relevant IETF drafts. This tutorial is beneficial to security researchers, practitioners, students, and to a limited extent to policy makers. The listeners of this tutorial are expected to have basic knowledge in the operation of the Internet.

Module I: A Taxonomy of Internet Infrastructure Attacks
Module 1a: Information Security vs. Infrastructure Security
Module 1b: DNS Attacks, Internet Worms
Module 1c: Routing Attacks, DoS Attacks

Module II: DoS/DDoS Attacks and Countermeasures
Module 2a: DoS Prevention
Module 2b: DoS Mitigation
Modules 2c, 2d, 2e: DoS Traceback

Module III: Routing Attacks and Countermeasures
Module 3a: Introduction to Routing Attacks
Module 3b: Link State Protocol Attacks and Countermeasures
Module 3c: Distance Vector Protocol Attacks and Countermeasures
Modules 3d, 3e: Path Vector (BGP) Protocol Attacks and Countermeasures

Module IV: Wireless Infrastructure Security
Module 4a: Wireless LAN Security
Module 4b: Mobile Adhoc Networks Security
Module 4c: Sensor Networks Security

35.

Author(s): James Won-Ki Hong (POSTECH, Korea)
Title: **Internet traffic monitoring & analysis: methods & applications**
Presented at: IM 2003 (IFIP/IEEE International Symposium on Integrated Network Management)
Duration: 119.31 min.; 123 slides **(Web Version)**
Keywords: Network traffic; Network optimizations; WAN design; Network traffic modeling.

Abstract:

Part 1 Introduction
Part 2 Network Monitoring Metrics
Part 3 Traffic Monitoring Techniques
Part 4 Traffic Monitoring R&D, Standards Activities|
Part 5 Monitoring and Analysis Tools
Part 6 Real World Applications

36.

Author(s): Hosein, Patrick; Vannithamby, Rath and Srinivasan Balasubramaniam (Ericsson Inc)
Title: **Introduction to CDMA2000 1xEV-DV**
Presented at: WCNC 2005 (IEEE Wireless Communications and Networking Conference CO-located with CTIA)
Duration: 265 min.; 185 slides.
Call No.: 621.3845 HOS
Acc. No.: A00194
Keywords: CDMA; Digital communications; Multiple access; Spread spectrum; Wireless communications.

Abstract:

The wireless communication industry is currently in a state of transition from second generation (2G) to third generation (3G) systems -- a move from circuit-switched transport (designed for real-time services such as voice) to packet-switched transport (for supporting multi-media services that include packet switched voice, packet data and video). The IS-2000 family of standards is based upon code division multiple access (CDMA) technology. The early revisions of the CDMA2000 standard support data transmission up to 633.6 kbps using dedicated synchronous data channels. The latest revisions (commonly known as 1xEV-DV) significantly increase the efficiency of the air interface by introducing high-speed packet data channels in both the forward link (with a peak rate of 3.1 Mbps) and reverse link (with a peak rate of 1.8 Mbps) while maintaining backward compatibility with previous revisions. 1xEV-DV was completed in March 2004 and submitted to ITU in May 2004. This tutorial covers a number of key features of 1xEV-DV as standardized in IS-2000 Revision C and D. It will discuss extensively the support for high-speed packet data in both the forward and

reverse links.

1. Introduction and Executive Summary
2. General Overview
3. Forward Link New Physical Layer Channels
4. Forward Link Radio Resource Allocation
5. Forward Link Modulation and Coding
6. Reverse Link Rate Control Mechanisms
7. Common Rate Control Mechanisms
8. Forward Link MAC Design
9. Reverse Link MAC Design
10. Implementation Issues
11. Performance Results and Summary

37.

Author(s): Weast, Jack (Intel Corp)
Title: **Introduction to UPnP**
Presented at: CCNC 2004 (IEEE Consumer Communications and Networking Conference co-located with CES)
Duration: 55.57 min.; 112 slides
Call No.: 621.3828 WEA
Acc. No.: A00195
Keywords: Analog communications; Applications amplitude modulation radio; Universal serial bus; Wired-line communications.

Abstract: Networked devices should be as easy for consumers to set up as stereo equipment—when you plug it in and turn it on, it just works. Universal Plug and Play technology can make this happen. This book is primarily a resource for software developers who are implementing UPnP technology in their products. It also provides a great introduction for those who are new to the technology.

Traditionally, network peripherals have not been easy to install. Recent standards such as Universal Serial Bus (USB) and Plug-and-Play have improved the situation so that devices are automatically detected and device drivers automatically installed. Yet, networked devices, like Internet gateways and networked printers, still require manual setup and configuration.

In this presentation, you will learn the motivation and context for creation of UPnP technologies, the organization and structure of the UPnP Forum, basic concepts and terminology of the UPnP architecture, and a detailed review of the framework protocols such as SSDP, SOAP, and GENA.
Introduction to UPnP 1 – It Just Works
Introduction to UPnP 2 – Basic Concepts
Introduction to UPnP 3 – The Protocols

38.

Author(s): Fitzek, Frank (Aalborg University), Madsen, Tatiana K. (Aalborg University) & Seeling, Patrick (Arizona State University)
Title: **IP header compression enabling high quality consumer-oriented communications**
Presented at: CCNC 2005 (IEEE Consumer Communications and Networking Conference co-located with CES)
Duration: 99.13 min.; 115 slides
Call No.: 621.38212 FIT
Acc. No.: A00
Keywords: Digital communications; Wireless communications; Wireless LAN protocols.

Abstract: This tutorial covers header compression schemes for wireless communications. We focus on the header compression scheme development history and give an overview of header compression schemes as they were developed towards the recently standardized Robust Header Compression (ROHC) Scheme. The importance of ROHC is its standardized model, which has been adopted by the third generation partnership project, and will thus be implemented in forthcoming cellular networks of the third generation. For ROHC, we provide an in-depth performance analysis for the transmission of multimedia data, whereby we focus on audio and video data. We present a quantitative and qualitative analysis of traffic and perceived user quality after transmission of multimedia data and give an overview of freely available tools for such analysis. We also review currently ongoing activities in the domain of header

compression, focusing on the standardization activities around ROHC. In the following, we introduce cooperative header compression, which has become a recent field of research interests. We provide exemplary calculations of the benefits that cellular network providers can obtain by applying header compression within a cell.

39.

Author(s): Varma, Vijay K. (Telcordia Technologies, Inc.)
Title: **IP multimedia subsystem (IMS) : evolution to new capabilities**
Presented at: Globecom 2008 (IEEE Global Communication Conference)
Duration:
Call No.: 621.384 VAR
Acc. No.: A01427
Keywords: Wireless communication systems; Mobile communication systems; Multimedia communications; Internet Protocol multimedia subsystem; Computer networks -- Management; Circuit-Switched; GSM/UMTS; Networks.

Abstract: The IP Multimedia Subsystem (IMS) has become the defacto platform of choice for providing a unified session control on top of multiple access network technologies for realizing flexible multimedia applications. Initiated by the Third Generation Partnership Project (3GPP), IMS is now embraced by a number of other standards bodies. Fueled by the notion of Common IMS that consolidates all IMS core standardization in 3GPP, IMS is evolving rapidly with new features and capabilities including ability to anchor calls/sessions in IMS even when the calls are originated/terminated from/to legacy networks, interworking with legacy messaging, multimedia session continuity, support of emergency services, to name a few. IMS architecture and procedures are evolving to support these developments. This tutorial will start with a brief introduction to IMS vision and its evolution from GSM/UMTS. It will then discuss IMS concepts, architectures, procedures, protocols and services. As communications networks are evolving towards packet-based infrastructures with IMS control, consistent provision of services from different access networks becomes a major challenge, particularly during the transition period from circuit-switched networks. The tutorial will discuss how the 3GPP is addressing this challenge with its on-going work on IMS centralized services (ICS), Combined Circuit-Switched and IMS (CSI), Service Level Interworking of Messaging Services, Multimedia Session Continuity, and IMS Session Continuity. The tutorial will conclude with a discussion of IMS interoperability, IMS test beds, and a survey of field trials and deployments of IMS networks.

40.

Author(s): Srivastava, Anurag & Acharya, Swarup (Bell Laboratories, Lucent Technologies)
Title: **IPTV deployment challenges and opportunities**
Presented at: CCNC 2006 (IEEE Consumer Communications and Networking Conference co-located with CES)
Duration: 180 min.; 100 slides
Call No.: 621.38807 SRI
Acc. No.: A00277
Keywords: Digital television; Television broadcasting--Technological innovations; Multicasting (Computer networks); Internet television; Television broadcasting; Digital.

Abstract: IPTV is generating huge interest in the telecom industry lately. By offering video over their access infrastructure, Telcos hope to match the voice, video and data ("triple-play") offering of Cable providers. However, unlike Cable TV systems that are typically analog broadcast transmissions, IPTV uses IP-multicast over point-to-point hybrid Fiber/DSL infrastructure that while enabling more efficient networks, is also causing Telcos growing pains in field deployments.
In this tutorial, we will provide an overview of the network architectures and will highlight the various tradeoffs (e.g., channel change latency vis-a-vis compression technology). We will focus on hardware and software technologies from the service provider core to the home --- multicast transport, DSL technologies, MPEG standards and home-networking requirements such as the IPTV set-top box. Finally, we will also review the regulatory issues faced by Telcos, and describe the various lifestyle services such as "CallerId-on-TV" and converged voice-video applications that provides IPTV its cutting-edge differentiation

41.

Author(s): Hain, Tony
Title: **IPv6 deployment issues**
Presented at: MILCOM 2004(Military Communications Conference)

Duration: 188 min.; 155 slides
Call No.: 004.62 HAI
Acc. No.: A00276
Keywords: IPv6 (Computer network protocol); TCP/IP (Computer network protocol); Computer network protocols; Computer networks; Internet.

Abstract: This talk on IPv6 presents a high level overview of the global situation on IP addressing and application developments and will provide an overview of the basic technology highlighting differences from IPv4, as well as deployment and transition tools and scenarios. The target audience is IT management, as well as lead architects and engineers.

42. **Author(s):** Hanzo, Lajos (School of Electronics and Computer Science, University of Southampton)
Title: **Joint physical and network layer optimization of wireless systems: smart antennas, turbo coding, space-time coding, adaptive transceivers and `all that' for improved QoS**
Presented at: WCNC 2003 (IEEE Wireless Communications and Networking Conference CO-located with CTIA)
Duration: **(Web Version)**
Keywords: Wireless communications; Wireless networking; Coding theory.

Abstract: Part 1: Introduction
Part 2: Comparative Study of TCM, TTCM, BICM and BICM-ID schemes.
Part 3: Comparative Study of Space Time Block Codes and Various Concatenated Turbo Coding Schemes.
Part 4: The Network Performance of Multi-rate FDD-mode UMTS Adaptive Modulation and Adaptive Antenna Arrays.

43. **Author(s):** Tomasin, Stefano
Title: **Key technologies for next generation digital video broadcasting standard**
Presented at: IEEE ICC 2009
Duration: **118 min.**
Call No.: 621.382 TOM
Acc. No.: A01447
Keywords: Digital television –Standards, Television broadcasting.
Abstract: The tutorial presents an overview of the new digital video broadcasting standard DVB-T2 which has been recently approved by ETSI. The new standard provides high definition television over terrestrial links, by deploying new error protection codes, new modulation schemes and new transmission formats. The overview provides an insight not only into the main issues and potentials of the standard but also into the design of receiver architectures. A performance evaluation of the new standard is also discussed, showing the merit of DVB-T2 with respect to previous digital television standards. The audience of the tutorial is people from both industry, who are interested in the new standard for implementation purposes, and from academia, who may see a practical implementation of the technologies and how they interact in a complete standard.

44. **Author(s):** Narayanan, Krishna R. (Texas A&M University)
Title: **Low density parity check codes**
Presented at: WCNC 2004 (IEEE Wireless Communications and Networking Conference CO-located with CTIA)
Duration: 215 min.; 127 slides
Call No.: 003.54 NAR
Acc. No.: A00278
Keywords: Error-correcting codes (Information theory); Data transmission systems; Coding theory; Telecommunication; Information theory.

Abstract: Low density parity check (LDPC) codes are very powerful error control codes that can provide near Shannon limit performance. It is not an overstatement to say that turbo codes and LDPC codes have revolutionized the field of error control coding. These codes are being considered for use in several applications in wireless communications and data storage and will likely be the choice for many more applications in the future as well. This tutorial will provide an in-depth treatment of theoretical and practical aspects in the design and implementation of LDPC codes. Particular topics covered include Structural properties of LDPC codes, how to decode them using an iterative message-passing decoding algorithm?, how to design good LDPC codes, how to

analyze the performance of LDPC codes?, and the state of the art in hardware implementation of such codecs. Several codes closely related to LDPC codes such as turbo codes, irregular repeat accumulate codes, concatenated tree codes and some classes of algebraically constructed LDPC codes will also be discussed. Iterative signal processing for channels with memory will also be discussed as a natural extension of the decoding algorithm for LDPC codes

Part 1 - Introduction
Part 2 - LDPC Codes - Structure, Encoding
Part 3 - LDPC Decoding and Analysis Over Erasure Channels
Part 4 - Decoding for memoryless channels (part one)
Part 5 - Decoding for memoryless channels (part 2)
Part 6 - Asymptotic analysis and design of LDPC codes
Part 7 - Construction of finite length LDPC codes
Part 8 - Special classes of LDPC codes
Part 9 - Survey of hardware architectures
Part 10 – Extensions and conclusion

45.

Author(s): Parkvall, Stefan
Title: **LTE radio access : physical layer**
Presented at:
Duration: 192 min; 142 slides.
Call No.: 621.384 PAR
Acc. No.: A01436
Keywords: Universal Mobile Telecommunications System; Wireless communication systems; Mobile communication systems; Global system for mobile communications.

Abstract: This tutorial provides an overview of the LTE radio access with focus on the physical layer. Starting with a brief background of LTE and its creation, and an overview of the basic principles and the overall architecture, it continues with an in-depth description of the physical layer processing. Different transmission and access procedures such as cell search and random access are also described. Although the tutorial focuses on the physical layer, parts of the MAC and RLC layers are also described.

The presentation is divided into seven parts:

- o Overview (18 slides, 29 min)
  - overview, protocol structure, architecture, basic principles
- o Downlink (23 slides, 34 min)
  - overall structure, reference signals, multi-antenna transmission
- o Downlink, cont'd (17 slides, 25 min)
  - downlink control signaling
- o Uplink (24 slides, 26 min)
  - overall structure, reference signals, uplink control signaling
- o TDD (8 slides, 9 min)
  - TDD, half-duplex FDD
- o Transmission Procedures (32 slides, 45 min)
  - uplink power control, ICIC, retransmission mechanisms (MAC and RLC), scheduling
- o Access Procedures (20 slides, 23 min)
  - cell search, system information, random access

46.

Author(s): Langendoen, Koen (Delft University of Technology)
Title: **MAC protocols for wireless sensor networks**
Presented at: SECON 2004 (IEEE Communications Society Conference on Sensor and Ad Hoc Communications and Networks)
Duration: 156.11 min.; 106 slides
Call No.: 621.3821 LAN
Acc. No.: A00196

Keywords: Wireless communications; TDMA; Mobile communication; Signal processing.

Abstract: The effective deployment of Wireless Sensor Networks (WSN) calls for new, unorthodox solutions to traditional distributed-computing problems to handle the nodes' scarce resources: energy and memory. Since radio communication is expensive in terms of energy consumption, yet collaboration between nodes is essential for providing emerging services, managing the communication protocol stack is the key to success. The performance of the Medium Access Control (MAC) layer determines the energy consumption to a large extent, since it decides when to switch the radio on/off.

In contrast to typical WLAN designs, which optimize for latency, throughput and fairness, WSN-specific MAC protocols focus on energy consumption and memory footprint. Impressive energy savings can be obtained by putting the radio into sleep mode for long periods of time, and a wide range of new MAC protocols have been proposed in the last few years.

This tutorial surveys about 20 WSN-specific MAC protocols and classifies them according to three key issues: number of used channels, degree of organization, and notification mechanism. Four MAC protocols (S-MAC, T-MAC, Low-power listening and LMAC) will be studied in depth, including a head-to-head comparison on a common simulation framework. The tutorial concludes with a number of generic guidelines for energy-efficient MAC design.

47.

Author(s): Papadias, Constantinos (Athens Information Technology & Angel Lozano, Bell Labs)
Title: **MIMO systems for wireless communications**
Presented at: ICC 2006 (IEEE International Conference on Communications)
Duration: 175.30min.; 131 slides
Call No.: 621.384 PAP
Acc. No.: A00359
Keywords: MIMO systems; Wireless communications; Signal processing; Wireless LANs.

Abstract: Multiple-Input Multiple Output (MIMO) technology has emerged, in the last decade, as a powerful means of increasing the performance of wireless communication systems. Research on this relatively new technology has penetrated in a substantial way many fields, ranging from signal processing to communication theory and channel modeling. Equally importantly, MIMO technology has rapidly made its way into current and next generation communication standards and systems. This tutorial presents a comprehensive overview of the theory that underlies MIMO communication as well as a perspective of how it is already impacting emerging commercial systems. The tutorial is organized in 3 distinct parts. In the first part, we establish the necessary basics: information-theoretic fundamentals, modeling of fading channels, transceiver architectures, diversity, space-time coding, and channel estimation. In the second part, we examine more advanced topics: diversity vs. multiplexing trade-off, coherence vs. noncoherence, precoding and optimum signaling, and multiuser MIMO (uplink, downlink and intercell). In the third and final part, we illustrate some of the applications that MIMO is finding in cellular systems and wireless LANs, and we anticipate other exciting applications that are forthcoming.

Parts 1a1, 1a2, 1b

Tutorial Part2a, Tutorial Part2b and TutorialPart3.

48.

Author(s): Belding-Royer (University of California at Santa Barbara and Sung-Ju Lee, Hewlett-Packard Labs)
Title: **Mobile ad hoc networking**
Presented at: WCNC 2003 (IEEE Wireless Communications and Networking Conference CO-located with CTIA)
Duration: 180.37 min.; 209 slides **(Web Version)**
Keywords: Mobile communication; Wireless networking; Wireless communications.

Abstract: Part 1: Introduction and Medium Access Control
Part 2. Unicast Routing
Part 3. Multicast Routing
Part 4. Bluetooth and Future Directions

49. **Author(s):** Vaidya, Nitin H. (University of Illinois at Urbana-Champaign)
Title: **Mobile ad hoc networks: routing, MAC and transport issues**
Presented at: INFOCOM 2004 (IEEE International Conference on Computer Communication)
Duration: 281 min.; 345 slides
Call No.: 621.3845 VAI
Acc. No.: A00197
Keywords: Mobile communication; Wireless networking; Wireless communications; Topology in ad hoc networks; Routing.

Abstract: A mobile ad hoc network is a collection of mobile wireless nodes that can dynamically form a network without necessarily using any pre-existing infrastructure. Due to the potential ease of deployment, many practical applications have been conceived for ad hoc networks. When designing mobile ad hoc networks, several interesting and difficult problems arise due to shared nature of the wireless medium, limited transmission range of wireless devices, node mobility, and energy constraints. This tutorial will present an overview of selected issues related to medium access control protocols, routing protocols, and performance of TCP on mobile ad hoc networks.

50. **Author(s):** Wong, K. Daniel (MUST and Telcordia Technologies Applied Research) & Dutta, Ashutosh (Telcordia Technologies Applied Research)
Title: **Mobility management in next generation networks**
Presented at: GLOBECOM 2003 (IEEE Global Communications Conference)
Duration: 394 min.; 195 slides
Call No.: 621.3845 WON
Acc. No.: A00198
Keywords: Digital communications; Wireless communications; Route optimization; Wireless standards.

Abstract: Ubiquitous access over heterogeneous wireless networks and mobility management are going to be an integral part of the next generation IP networks. Even today, as wireless LANs gain momentum and cellular network providers start providing data services over diverse type of networks such as CDPD, GPRS, CDMA 1XRTT, and wideband CDMA, mobility management has become a norm rather than an exception. This tutorial will cover various types of state-of-the-art mobility management techniques to support personal mobility, session mobility, service mobility, pre-session terminal mobility and mid-session terminal mobility for both real-time streaming media and non-real-time data traffic in Mobile IPv4 and IPv6 networks. Available mobility management techniques at all networking layers will be analyzed and a policy based integrated mobility management approach, suitable for both commercial and ad hoc networks, will be discussed.

Mobility Management Section 1
Part 1 – Introduction – 12 minutes, 3 slides
Part 2 – Mobile IP – 15 minutes, 8 slides
Part 3 – Next Generation Networks – 20 minutes, 11 slides
Part 4 – Mobility Concepts – 21 minutes, 10 slides
Part 5 – Route Optimization and Mobile IPv6 – 15 minutes, 6 slides

Mobility Management Section 2

Part 1 – Transport Layer and Application Layer Mobility - 46 minutes, 24 slides
Part 2 – SIP-based Mobility Management- 35 minutes, 13 slides
Part 3 – Inter-domain Mobility with SIP and MIP – 38 minutes, 14 slides

Mobility Management Section 3

Part 1 – MIP-LR – 15 minutes, 9 slides
Part 2 – Micro-mobility Part I – 24 minutes, 14 slides
Part 3 - Micro-mobility Part II – 28 minutes, 20 slides
Part 4 – Integrated Mobility Management – 15 minutes, 9 slides
Part 5 – Simultaneous Mobility - 22 minutes, 9 slides

Mobility Management Section 4

Part 1 – Multi-Interface and Multicast Mobility – 40 minutes, 14 slides
Part 2 - Wireless Standards, Multimedia Testbeds – 38 minutes, 22 slides
Part 3 – References, Appendices – 10 minutes, 9 slides

51. **Author(s):** Eberhart, Andreas (HP Germany)
Title: **Modern web applications with Ajax and Web 2.0**

Presented at: Integrated Network Management 2007, Munich, Germany
Duration: 176.5 min.; 96 slides
Call No.: 005.2768 EBE
Acc. No.: A00360
Keywords: Mashups (World Wide Web); Web 2.0.; Web site development; World Wide Web; Ajax (Web site development technology); JavaScript (Computer program language); Semantic Web; SOA; Internet programming.

Abstract: Web 2.0 is a comprehensive term for a set of interesting, trend-setting advancements of the World Wide Web. With the programming paradigm of Asynchronous Javascript and XML (Ajax) Web 2.0 Sites are characterized e.g. by a high degree at interactivity and user friendliness, which so far was only reached by classical desktop applications. The so-called Mashup Sites offer comfortable access to several data sources and make a mix of applications appear as an integrated overall experience. Finally, Web 2.0 prompts a wave of individualization and democratization of the Internets. It promotes a strong commitment of the individual participant, supported by so-called social software such as Wikis and Blogs. The tutorial provides an overview over the Web 2.0 landscape and a Web 2.0 technology deep dive. Several important developer tools and available Web 2.0 APIs and libraries are presented. Finally, the Web 2.0 developments are compared to the fields of SOA and the Semantic Web.

52. **Author(s):** Baldi, Mario (Politecnico di Torino)
Title: **MPLS - the importance of offering the right solution at the right moment**
Presented at: IEEE Globecom 2006, IEEE Networks 2006, 2005 IEEE International Conference on Software, Telecommunications and Computer Networks (SoftCOM 2005), Split 2005 (Croatia)
Duration: 307 min; 99 slides
Call No.: 621.38216 BAL
Acc. No.: A01359
Keywords: MPLS standard; Extranets (Computer networks); Multiprotocol label switching; Tutorial.

Abstract: Derived from a proprietary fast packet switching technique, MPLS (Multi-Protocol Label Switching) has played various roles throughout the years. It has been an approach for the deployment of IP over ATM networks, a solution in utilizing ATM hardware within IP networks, a traffic engineering enhancement for IP, and finally a unifying control plane technology.

After presenting the basic mechanisms and operating principles of MPLS, the tutorial discusses the two features of MPLS that make it a particularly important technology today: traffic engineering capability and the control plane. The limitations of IP with respect to the realization and operation of large backbones are analyzed and then traffic engineering features that enable MPLS to overcome such limitations are illustrated together with their underlying mechanisms and protocols. Concerning MPLS control plane, on the one hand, it is well integrated with the control plane of IP, on the other hand it is suitable for deployment on connection oriented networks. For this reason the control plane of MPLS has become a unifying solution for various network technologies.

Part Number and Titles

Preview

- Part 1 -- Motivations
- Part 2 -- Basic concepts and MPLS history
- Part 3 -- Header and label
- Part 4 -- Label handling
- Part 5 -- Label distribution
- Part 6 -- Routing protocols
- Part 7 -- Enabled features and traffic engineering
- Part 8 -- MPLS extensions and classes of service
- Part 9 -- Label stack, VPN, and standardization
- Part 10 -- Label distribution protocols
- Part 11 -- Fault protection

53. **Author(s):** Dave Marples & Stan Moyer (Telcordia Technologies Inc.)
Title: **Networked appliances; what they are, how they work and challenges to adoption**

Presented at: CCNC 2004 & 2005 (IEEE Consumer Communications and Networking Conference co-located with CES)
Duration: 135.6 min.; 115 slides
Call No.: 621.382 MAR
Acc. No.: A00199
Keywords: Analog communications; Applications -- AM radio.

Abstract: As computing power becomes more ubiquitous we can reasonably expect it to move from desktop behemoths down to the individual gadgets that already fill our lives - the networked toaster has long been used as an example of the kind of device that might receive network functionality in the fullness of time, but prior to that the TV Remote, the HiFi or the Central Heating/Air Conditioning systems are all better candidates for the addition of network functionality.

While the utility of adding a network connection to a toaster might reasonably be called into question there could be significant advantages from having many devices in your home connected together burglar alarms that can use your house lighting system, home entertainment systems that can co-ordinate with your curtains or perhaps something as simple as being able to query the electricity, water or gas consumption of your home and the devices in it are all interesting and compelling applications of this kind of technology.

This tutorial will answer the question of what is a Networked Appliance and will go on to give use cases and practical examples of where we might typically expect to find them. It will then go on to discuss the constraints and capabilities of the early devices that we see in the market today, highlighting the limitations of the technology that is available. It will then discuss the work that is progressing to address some of these limitations in many fora with specific examples of how technologies such as SIP for Appliances can be applied to the problems we foresee before concluding with a vision of a possible future with multiple, integrated, devices in heterogeneous network environment communicating and interworking seamlessly with the other devices around them.

Part 1: Introductory Materials (26' 17", 12 slides)
Part 2: The Alarm Clock is not alone - the benefits of networking appliances (16' 20", 11 slides)
Part 3: Market Drivers and Forces (23' 38", 20 slides)
Part 4: Home Networks today - the state of the market (30' 2", 18 slides)
Part 5: Some Key Problems; Appliance addressing and access, Feature Interaction (34' 53", 24 slides)
Part 6: More Key Problems and Conclusions (30' 56", 30 slides)

54. **Author(s):** Chen, Hsiao-Hwa
Title: **Next generation CDMA technology**
Presented at: Globecom 2007 (IEEE Global Communication Conference)
Duration:
Call No.: 621.3845 CHE
Acc. No.: A01430
Keywords: Code division multiple access; CDMA; Multiple access; Multipath mitigation; Multiple access interference suppression; Spread spectrum; Spreading sequences; Wireless communications.

Abstract: Future wireless communication systems should be operating mainly, if not completely, for burst data services carrying multimedia traffics. The need to support high-speed burst traffic has already posed a great challenge to all currently available air-link technologies based on either TDMA or CDMA. The first generation CDMA technology has been widely applied to 2G and 3G mobile cellular standards and it has been suggested that it may not be suitable for high-speed burst-type traffic. There are many problems with the first generation CDMA technology, such as its low spreading efficiency, interference-limited capacity and the need for precision power control, etc. This tutorial on "The Next Generation CDMA Technologies" will offer very first-hand information on how to make use of various innovative technologies to implement the next generation CDMA technology, which can offer a much better performance than the first generation CDMA technology.

This tutorial covers various important issues about the next generation CDMA technologies as a major air-link technology for beyond 3G wireless applications. It includes the topics from next generation CDMA system modeling to analytical methodology, starting with the basics and progressing to more advanced subjects. It contains many new research results. Innovative CDMA technologies will be introduced

in a step-by-step approach, such as DS/CC-CDMA, OS/CC-CDMA, space-time complementary coding CDMA, multi-dimensional spreading techniques, etc.

As an all-in-one tutorial on next generation CDMA technologies, it is a must for telecommunications engineers, advanced R&D personnel, undergraduate and postgraduate students.

This tutorial is proposed based on Hsiao-Hwa Chen's recently published 544 pages book, carried the same title as "The Next Generation CDMA Technologies" by IEEE Press and John Wiley (ISBN-10: 0-470-02294-9, ISBN-13: 978-0-470-02294-8). The book has been available in the worldwide book stores since September 2007.

55.

Author(s): Viswanathan, Harish (Alcatel-Lucent)
Title: **Next Generation Cellular Networks: Novel Features and Algorithms**
Presented at: IEEE Globecom 2007 (IEEE Global Communications Conference)
Duration: 160 min; 93 slides
Call No.: 621.38456 VIS
Acc. No.: A01360
Keywords: Cellular telephone systems; Wireless communication systems -- Technological innovations; Cellular telephone systems -- Technological innovations; Mobile communication systems -- Technological innovations; Tutorial; Orthogonal frequency division multiplexing.

Abstract: Motivated by the dramatically growing demand for high data rate wireless data services, cellular wireless communications standards fora such as Third generation partnership program (3GPP) in Europe and 3GPP2 in the U.S. have been actively involved in standardizing orthogonal frequency division multiple access (OFDMA) based air-interface for next generation cellular networks under the Long Term Evolution (LTE) and ultra mobile broadband (UMB) frameworks, respectively. Several novel technologies built upon OFDMA such as dynamic fractional frequency reuse (FFR), DFT spread OFDMA or single-carrier FDMA, pre-coded code division multiple access (CDMA) and advanced multiple antenna (MIMO) techniques have been included in the standards. In this tutorial, we start with a brief introduction on the evolution of cellular networks and then describe the novel aspects of the next generation systems. We emphasize the fundamental concepts and design tradeoffs involved, and discuss relevant algorithms for maximizing the performance using the various features in the standards.

Part Number and Titles:

- Tutorial Preview - Tutorial-Preview-HV-Jan08
- Part 1 - Next-Gen-Networks-Tutorial-HV-Jan08-part I
- Part 2 - Next-Gen-Networks-Tutorial-HV-Jan08-part II
- Part 3 - Next-Gen-Networks-Tutorial-HV-Jan08-part III
- Part 4 - Next-Gen-Networks-Tutorial-HV-Jan08-part IV
- Part 5 - Next-Gen-Networks-Tutorial-HV-Jan08-part V

56.

Author(s): Bing, Benny
Title: **Next generation wireless broadband**
Presented at: IEEE Globecom 2008
Duration: 161 min.
Call No.: 621.382 BIN
Acc. No.: A01448
Keywords: Digital communications; Wireless communication Systems; Internet --Technological innovations—Standards;

Abstract: 802.16m, 802.22 and LTE are emerging broadband wireless standards that offer many powerful wireless features. This tutorial aims to provide the participant with a strong foundation on these standards. Topics covered include the physical (PHY) layer, adaptive modulation and coding, OFDMA, SC-FDMA, multiple antenna systems, medium access control (MAC), TDD and FDD transmission, and the frame formats. It also provides two case studies on wireless relay and co-operative networks (emphasizing 802.11s and 802.16j) and on improving cell edge performance for OFDMA networks.

57.

Author(s): Qiao, Chunming (CSE Department, University at Buffalo (SUNY))
Title: **Optical burst switching for ip/wdm integration**
Presented at: GLOBECOM 2003 (IEEE Global Communications Conference)
Duration: 150 min.; 116 slides
Call No.: 621.38216 QIA
Acc. No.: A00200
Keywords: Digital communications; Wireless communications; Packet switching (Data transmission); Optical communications.

Abstract: Since its inception in 1997, optical burst switching (OBS) has been receiving an increasing amount of attention from both academic and industrial R&D groups around the world. In this tutorial, Dr. Qiao, the inventor of OBS, also the recipient of the 2004 IEEE ComSoc's Best Tutorial Paper Award for an article on OBS, will provide an introduction to a broad range of issues related to OBS and its roles in building the next generation Internet. The tutorial will have two parts: Part I deals with the motivations for opticall/photonic switching as opposed to electronic switching, various optical switching paradigms including wavelength routing (a form of optical circuit switching) and optical packet switching, basic concepts of OBS, and IP over WDM integration, as well as the potential s of OBS from business and economic point of view.The Part II of the tutorial contains more quantitative materials covering the assembled burst traffic characteristics, TCP performance and its improvement in OBS networks, and QoS differentiation mechanisms in OBS networks. The tutorial also discusses ongoing research topics and provides an extensive list of references to OBS related publications, workshops and OBS Forum. The targeted audience include students and researchers from universities, researchers from government and industrial R&D institutes, as well as engineers and managers at component vendors, equipment vendors, OSS vendors and carriers in the telecommunications industry.

58.

Author(s): Keith Ross (Polytechnic University and Dan Rubenstein, Columbia)
Title: **Peer-to-peer systems**
Presented at: INFOCOM 2003 (IEEE International Conference on Computer Communication)
Duration: 336.22 min.; 246 slides **(Web Version)**
Keywords: Peer-to-peer architecture (Computer networks); Client/server computing; Web security

Abstract: Part 1: Overview of P2P Systems
Part 2: Unstructured P2P File Sharing
Part 3: Structured P2P: DHTs
Part 4: Applications of DHTs
Part 5: Security in P2P Systems
Part 6: Graph Structure and Measurement

59.

Author(s): Kellerer, Wolfgang (DoCoMo Communications Laboratories Europe), Kunzmann, Gerald (Technische Universitat Munchen) & Zols, Stefan (Technische Universitat Munchen)
Title: **Peer-to-Peer technologies for next generation communication systems-basic principles and advanced issues**
Presented at: IEEE International Conference on Communications 2007 (ICC-2007)
Duration: 256.51 min.; 219 slides
Call No.: 004.65 KEL
Acc. No.: A00361
Keywords: Peer-to-peer architecture (Computer networks); Peer-to-Peer (P2P); P2P technologies; Local area networks (Computer networks); Peer-to-Peer communications; Computer networks -- Security measures.

Abstract: Peer-to-Peer (P2P) systems can be regarded as decentralized and self organizing overlay architectures, independent of specific access networks. Self organization makes them robust and flexible to dynamic changes without provider interaction. Their main objective is to support to find and use distributed resources. P2P technologies have thus received an increased interest in academia and also in industry in different application areas, not limited to file sharing, but also in communication applications such as Skype. The potential of P2P is in the realization of novel applications (user generated content, community based services) and also in applying its principles to use existing resources in a more clever way to save infrastructure cost. This tutorial explains basic principles of Peer-to-Peer communications and selected advanced issues. We first explain the concepts and algorithms of structured and unstructured P2P systems, which are the two main concepts used for resource lookup. Both

concepts will be explained and illustrated with examples about analysis, traffic evaluations and applications. We further elaborate on basic algorithms for P2P data delivery taking place after a resource is found (example: BitTorrent). Advanced issues include selected topics in hierarchical P2P systems, P2P applications, such as Voice over IP systems, P2P security, and P2P for mobile communications and mobile ad hoc networks. We conclude with a discussion of industry perspectives on P2P.

Part 1a: Introduction and principles (1) (24:47 – 26 slides)
Part 1b: Introduction and principles (2) (14:20 – 18 slides)
Part 2a: P2P Lookup – Unstructured P2P (22:36 – 27 slides)
Part 2b: P2P Lookup – Structured P2P (1) (16:13 – 14 slides)
Part 2c: P2P Lookup – Structured P2P (2) (22:21 – 18 slides)
Part 2d: P2P Lookup – Structured P2P (3) (31:32 – 15 slides)
Part 2e: P2P Lookup – Hierarchical P2P (28:51 – 19 slides)
Part 3: P2P data delivery (18:16 – 16 slides)
Part 4: P2P security (13:59 – 10 slides)
Part 5: P2P applications (26:31 – 21 slides)
Part 6: Mobile P2P (25:56 – 22 slides)
Part 7: Summary and industry perspective (11:29 – 13 slides)

60.

Author(s): Mynbaev, Djafar K. (City University of New York)
Title: **Physical layer of the optical networks: devices and subsystems**
Presented at: GLOBECOM 2004 (IEEE Global Communications Conference)
Duration: 216 min.; 319 slides
Call No.: 621.38275 MYN
Acc. No.: A00204
Keywords: Analog communications; Applications amplitude modulation radio; Optical networks.

Abstract: This tutorial provides a thorough overview of the components for current and next generation optical networks. We discuss passive and active devices and subsystems that make up the physical layer of the optical networks. All the devices and subsystems are discussed in accord with the following format: function of the unit, principles of operation and comparison of the existing types, problems encountered and existing solutions. We also consider (in problem-solution format) how the specific requirements of various types of optical networks are met by the characteristics of their individual components and subsystems. Our discussion concludes with a consideration of the typical characteristics of commercially available devices and subsystems and the future trends in their developments. This discussion also considers transmission engineering problems.

Part: 1 Introduction
Part: 2 Optical fiber:
Part: 2A Transmission medium and attenuation
Part: 2B Bandwidth and optical fiber for different optical networks
Part: 3 Transmitters and receivers
Part: 4 Optical amplifiers
Part: 5 Passive and active components
Part: 6 Subsystems and modules

61.

Author(s): Chadha, Ritu
Title: **Policy-based network configuration management for MANETs**
Presented at: GLOBECOM 2008 (IEEE Global Communication Conference)
Duration:
Call No.: 004.6 CHA
Acc. No.: A01434
Keywords: Computer networks -- Management; Computer networks -- Security measures; Communication Networks; Military Communications; Satellite communications; Wired-line communications; Wireless communications; Context-aware computing; Autonomic computing.

Abstract: Mobile ad hoc wireless networks differ fundamentally both in functionality and capability from their static wireline network counterparts due to a variety of reasons, including random node mobility, unpredictable network dynamics, fluctuating link quality, limited processing capabilities, power constraints, etc. Existing network management research and standards have resulted in valuable architecture definitions, abstractions, protocols, and process models for managing different types of networks. However, aspects that have not been adequately addressed include the automation of

network management and the integration of different management functions. In order to reduce the cost of network operations, it is critical that human intervention be minimized by creating a feedback loop between fault/performance monitoring systems and configuration systems, and by specifying policies that regulate how the system should be reconfigured in response to various network events. The lack of automation in network management poses a much greater problem for MANETs than for wireline networks, due to the fact that the characteristics of MANETs result in a requirement for much more frequent network reconfiguration and much more stringent monitoring than needed in wireline networks. This tutorial discusses the management challenges associated with ad hoc networks, and provides an in-depth description of how policy-based network management can be used for increasing automation in the management and configuration of mobile ad hoc networks. This tutorial is partly based on a book recently co-authored by Dr. Ritu Chadha entitled "Policy-Driven Mobile Ad Hoc Network Management", and is targeted at professionals, researchers and advanced graduate students in the field of IP network management who are interested in mobile ad hoc networks in particular.

62. **Author(s):** Chadha, Ritu (Telcordia)
Title: **Policy-based network management**
Presented at: MILCOM 2005 (Military Communications Conference)
Duration: 164.34 min.; 120 slides
Call No.: 004.6 CHA
Acc. No.: A00201
Keywords: Computer networks--Management; Computer networks--Security measures; Wireless Communications; Wired-line Communications.

Abstract: This tutorial will discuss the above management challenges by providing an in-depth discussion of policy-based network management. The audience will gain an understanding of how policy-based management can solve very real network management problems. The tutorial covers the following topics:

- **Introduction to Policy-Based Management**: This section provides an introduction to the subject of policy-based management and policies in general. Different types of policies in existence today are described and broadly classified into categories. An overview of how policy-based management can be used for managing IP networks is provided in this section.
- **Policy languages and frameworks**: This section discusses the leading policy frameworks and languages that are in existence today, their features, and their strengths and weaknesses. An overview of the following languages and frameworks is provided:
  - Role-Based Access Control (RBAC)
  - XACML (XML Access Control Markup Language)
  - IETF/DMTF Policy Framework
  - IBM Policy Management for Autonomic Computing (PMAC)
  - Ponder
  - Telcordia PECAN (Policies using Event Condition Action Notation)
- **Management issues for ad hoc networks**: This section presents an in-depth discussion of network management issues for ad hoc networks. The restrictions imposed on network management by the dynamic topology and low bandwidth, high loss environment that is typical of ad hoc networks are described, and a policy-based solution that addresses these restrictions is presented. This section includes a number of usage scenarios that describe practical examples of management issues that arise in ad hoc networks and show how these issues can be addressed by the use of a policy-based management framework.

Part I – Introduction (12.37 minutes)
Part II – Policies (17.50 minutes)
Part III – Languages-1 (17.57 minutes)
Part IV – Languages-2 (23.26 minutes)
Part V – Languages-3 (28.41 minutes)
Part VI – Languages-4 (15.19 minutes)
Part VII – Languages-5 (13.43 minutes)
Part VIII – AdHoc-1 (19.48 minutes)
Part IX – AdHoc-2 (17.13 minutes)

63.

Author(s): Desmond, Celia
Title: **Project management for telecommunications projects-ensuring success**
Presented at: GLOBECOM 2008 (IEEE International Conference on Communications)
Duration:
Call No.: 384.0684
Acc. No.: A01428
Keywords: Telecommunication -- Management; Project management; Communications; Risk Management; Time Management; Telecommunications.

Abstract: Use of proper project management is becoming a requirement in telecommunications companies. With the rapid changes in the electronic communications environment many companies are failing; others are struggling to survive in a competitive field. The industry has recognized that business models must change, products and services must reflect new technologies, new industry players, and a new approach. Successful development in this environment depends on very strong project management along with strong technical, business and marketing skills. Projects must maximize success to enhance business success. Teams must apply PM techniques and maintain their focus on the environment in which the project is being performed. This tutorial focuses on bringing telecommunications technologies to fruition via successful projects and on achieving customer satisfaction by producing what the customer really wants while maintaining happiness of the team members.

64.

Author(s): Zhang, Zhensheng (San Diego Research Center)
Title: **Routing protocols in delay tolerant networks (DTN)**
Presented at: MILCOM 2005 (Military Communications Conference)
Duration: 144.23 min.; 190 slides
Call No.: 004.6 ZHA
Acc. No.: A00279
Keywords: Computer networks -- Reliability; Computer network protocols.

Abstract: Recently there has been much research activity in the emerging area of intermittently connected ad hoc networks and delay/disruption tolerant networks (DTN). There are different types of DTNs depending on the nature of the network environment. Routing in DTNs is one of the key components in the DTN architecture. Therefore, researchers have proposed different routing protocols for different types of DTNs in the last few years. In this tutorial, we capture the state of the art in routing protocols in DTN networks. We categorize these routing protocols based on information used. For deterministic time evolving networks, three main approaches are discussed: the tree approach, the space and time approach, and the modified shortest path approach. For stochastic time evolving networks, the following approaches are reviewed: the epidemic or random forwarding approach, predication or history based approach (including per contact routing based on one hop information only and per contact routing based on average end to end information), the model based routing approach as well as approaches which control the movement of certain special nodes are reviewed. Recent development in erasure coding and network coding applied to DTNs are also discussed. The tutorial also identifies open research issues and intends to motivate new research and development in this area.

Part1-Introduction
Part2-Deterministic
Part3- Random and estimation based approaches
Part4-Model based and node movement
Part5-Coding based approach, future topics
Part6-References

65.

Author(s): Jack Kerivan (Heroix Security)
Title: **Securing the enterprise: the network security-integrity problem**
Presented at: INFOCOM 2003 (IEEE International Conference on Computer Communication)
Duration: 175.44 min.; 144 slides **(Web Version)**
Keywords: Information security; Security technologies; Network security practice.

Abstract: Part 1: Intrusion Detection & Prevention Network Security Models
Part 2: Intrusion Detection & Prevention Deployment Strategies
Part 3: Interoperability Issues
Part 4: Security Tools, Attacks & Effective Defenses

66.

Author(s): Malek, Manu (Department of Computer Science, Stevens Institute of Technology)
Title: **Security and information assurance**
Presented at: GLOBECOM 2003 (IEEE Global Communications Conference)
Duration: 192 min.;
Call No.: 005.8 MAL
Acc. No.: A00202
Keywords: Information security; Security technologies; Wireless security.

Abstract: Information is one of the major assets of any organization or business. Organizations are using computing and intelligent networking infrastructure as a critical resource. Businesses reach a worldwide audience via the Internet/www at a relatively low cost. Due to the very advantages it provides, however, the Internet poses a unique set of vulnerabilities which need to be addressed.

This tutorial provides a comprehensive introduction to the field of information security. It covers security vulnerabilities, threats, and the corresponding safeguards and defenses. It describes security services, and provides examples of how to integrate these services into the layered communications architecture, with emphasis on the network and transport layers. The topics covered in the course include: overview of secret-key and public-key encryption techniques, digital certificates and certification authority, message integrity, digital signature, IPSec, SSL/TLS, firewalls, virtual private networks (VPNs), and backup and disaster recovery techniques.

67.

Author(s): Farhang-Boroujeny, Behrouz
Title: **Signal processing techniques for spectrum sensing and communications in cognitive radios**
Presented at: GLOBECOM 2008 (IEEE International Conference on Communications)
Duration:
Call No.: 621.384 FAR
Acc. No.: A01429
Keywords: Equalization; FDMA; Multiple access; Multiple access interference suppression; OFDM; Pulse shaping; Wireless Channels; Wireless communications; Wireless communication systems; Signal processing -- Digital techniques; Digital communications.

Abstract: The idea of cognitive radio, although have been around for almost a decade, still may be considered as an emerging technology. From a physical and MAC layer point of view, a cognitive radio is an intelligent device that senses the spectrum and finds the portions of the spectrum that are not being used by other radios. It then picks one or more of these portions of the spectrum for communication. Therefore, a cognitive radio should be equipped with an spectrum analyzer for spectrum sensing, and a flexible signal processing tool for efficient signal channelization over the portions of the free spectrum. This tutorial addresses this aspect of the cognitive radios.

In the past, a number of researchers have proposed the orthogonal frequency division multiplexing (OFDM) for signal channelization in cognitive radios.

In this tutorial three distinct topics are covered:

Firstly, we look at OFDM for signal channelization, and show its shortcomings. Secondly, we review some spectrum analysis methods that have recently been proposed for spectrum sensing in cognitive radios. We find a spectrum analysis method that uses filter banks for signal analysis gives good results at a relatively low computational cost. Next, we look at three multicarrier methods that use filter banks for signal modulation. The fascinating mathematical backgrounds that these methods are based on are presented in detail. We show that these methods match the needs of cognitive radios perfectly, thus conclude that they are a preferred choice over OFDM. In addition, the filter banks used here can also be used for spectrum sensing, at virtually no cost.

68.

Author(s): Winters, Jack H. (Motia)
Title: **Smart antennas for wireless systems**
Presented at: GLOBECOM 2003 (IEEE Global Communications Conference)
Duration: 218.41 min.; 113 slides
Call No.: 621.3813 WIN
Acc. No.: A00203

Keywords: Wireless communications; Intersymbol interference; Pulse shaping

Abstract: In this tutorial, we will discuss current and future antenna technology for wireless systems and the improvement that smart and adaptive antenna arrays can provide. We will describe standard cellular antennas, smart antennas using fixed beams, and adaptive antennas for base stations, as well as antenna technologies for handsets and other wireless devices. We will show the potential improvement that these antennas can provide, including range extension, multi-path diversity, interference suppression, and capacity increase.

The issues involved in incorporating these antennas into wireless systems, including cellular and wireless local area networks, will be described in detail. Theoretical, computer simulation, experimental, and field trial results will be presented. This tutorial should provide a basic understanding of the antenna technology options and their potential in wireless systems.

69. **Author(s):** Xiang, Weidong (University of Michigan, Dearborn)
Title: **Software radio implementation for MIMO/OFDM high-speed wireless LAN/MAN with space-time coding and blast technologies**
Presented at: WCNC 2005 (IEEE Wireless Communications and Networking Conference CO-located with CTIA)
Duration: 155.55 min.; 93 slides
Call No.: 621.3822 XIA
Acc. No.: A00280
Keywords: Wireless application protocol (Computer network protocol); MIMO systems; Orthogonal frequency division multiplexing; Signals and communication technology; Wireless communication systems.

Abstract: The tutorial dedicates to the cutting-edge wireless parallel transmission technologies in frequency-domain and space-domain, known as orthogonal frequency-division multiplexing (OFDM) and multiple input multiple out (MIMO) respectively, with focuses on the implementations of OFDM MIMO high-speed wireless local area network (WLAN) and wireless metropolitan area network (WMAN) prototypes on the basis of the technology of software radio. The related technical backgrounds are briefly introduced firstly, which includes OFDM, MIMO, space-time coding, Bell laboratory layered space-time (BLAST), the IEEE 802.11a based WLAN, the IEEE 802.16 based WMAN and software radio testbed. The tutorial then discusses the implementations of a two-transmitter tow-receiver (2x2) real-time space-time coding OFDM WLAN/WMAN prototype and a four-transmitter four-receiver (4x4) OFDM BLAST WLAN/WMAN prototype. At First, we discuss the configuration of an up-to-date software radio testbed. The key algorithms implementations based on multiple TMS320C6701 DSPs are then presented, including QAM map/de-map, FFT/IFFT, time synchronization, frequency synchronization, channel estimation and compensation, and coding/decoding. The prototype realizes a 30 Mb/s wireless link based on the IEEE 802.16 standard and Alamouti's space-time diversity scheme. Next, we present the experimental results of a four-transmitter four-receiver OFDM BLAST prototype, offering a peak date rate of 525Mb/s with a spectrum efficient of 19.2 b/Hz/s. BLAST detection algorithms, bit error rate (BER) to signal to noise ratio (SNR) curves, the impairments of carrier frequency offset, the impact on system capacity due to the degradation of MIMO channel, the error distributions and the unsymmetric MIMO configurations are discussed in details. Software radio testbed can rapidly implement and evaluate new algorithms and schemes, which benefits to both academy research and product development. This tutorial is based on our five years' research in the software radio laboratory at Georgia Tech and offers fundamental and helpful information for development engineers, system engineers, technical managers, and graduate students who are interested in the promising wireless parallel transmission technologies.

70. **Author(s):** Bregni, Stefano (Politecnico di Milano)
Title: **Synchronization of digital telecommunications networks**
Presented at: GLOBECOM 2005 (IEEE Global Communications Conference)
Duration: 140.25 min.; 103 slides
Call No.: 621.38216 BRE
Acc. No.: A00362
Keywords: Synchronous data transmission systems; Timing circuits; Synchronization; Network synchronization; Telecommunication; SDH networks; SONET networks

Abstract: Network synchronization has gained increasing importance in telecommunications throughout the last thirty years: digital switching, SDH/SONET, ATM, CDMA, GSM and UMTS are striking examples where network synchronization has been proven to affect quality of service.

In this tutorial lecture, synchronization processes at different levels in telecommunications are first reviewed and fundamental definitions about timing of digital signals, jitter and wander are introduced. Major topics of this tutorial are: timing aspects in SDH/SONET networks; architectures and requirements for timing transfer in PDH, SDH/SONET, ATM and fixed/mobile telephone networks; strategies, architectures and clocks for synchronization networks.

71.
Author(s): Le Cheminant, Gerg D.
Title: **Test and measurement of high-speed communications signals**
Presented at: IEEE OFC/NFOEC 2009 (Optical Fiber Communication Conference and Exposition (OFC) and the National Fiber Optic Engineers Conference)
Duration:
Call No.: 621.3822 LEC
Acc. No.: A01437
Keywords: Digital communications – Measurement ; Digital communications ; Signal processing -- Digital techniques.

Abstract: Tutorial presented at: IEEE OFC/NFOEC 2009 The ability to accurately characterize signals and waveforms is an essential element in the development and manufacturing of high-speed communications components and systems. This course will emphasize measurement tools and techniques to characterize signal quality and how well it is maintained when transmitted through an optical system. It will focus on three measurement areas: bit-error-ratio (BER) analysis, oscilloscope waveform analysis with emphasis on the eye diagram and jitter analysis. The basics for each measurement type will be covered, gradually building to the more difficult aspects of measurements, including common measurement problems and their solutions. Results from tests performed on actual components and systems using BERTs, high-speed sampling oscilloscopes and jitter test sets will be presented. The course will emphasize research and development and manufacturing measurements of components and subsystems instead of installation and maintenance test.

72.
Author(s): Ansari, Nirwan (New Jersey Institute of Technology)
Title: **Tracing cyber attacks**
Presented at: GLOBECOM 2004 (IEEE Global Communications Conference)
Duration: 147.56 min.; 118 slides
Call No.: 005.84 ANS
Acc. No.: A00205
Keywords: Communication networks; IP Trace back schemes; Anonymous attacks.

Abstract: Recent high profile cyber attacks have caught much attention; they have also revealed the vulnerability of the existing information technology (IT) infrastructure. Developing technology to ensure connectivity of computer and information resources has become the utmost concern to facilitate various rapidly growing e-commerce applications. A number of approaches to security have been proposed, each attempting to mitigate a specific set of concerns. The specific threat, which is the main focus of this tutorial, is *anonymous attacks*. In anonymous attacks, the identity of the attacker(s) is concealed from the victim since the Source Address (SA) field in the attack packets is spoofed. (Distributed) Denial of Service ((D)DoS) attacks are anonymous attacks, which currently attract much attention since there is no obvious way to prevent them or to trace them.

Currently, there are several ways of tackling anonymous attacks including source address filtering, SYN Flood Protection, and implementing a BlackHole Router server. The currently available methods for addressing anonymous attacks are not comprehensive. They either deal with a very limited set of the problems or are too expensive to implement and enforce. Prevention of all attacks on the Internet is far from reality. When prevention fails, a mechanism to identify the source(s) of the attack is needed to at least insure accountability for these attacks. This is the motivation for designing IP Traceback schemes to trace cyber attacks. This tutorial covers the state of the art of IP Traceback, and concludes with discussion on challenges of IP traceback along with future research directions. The tutorial follows the outline below:

Prelude
Types of Attacks
Currently Available Techniques to Cope with Anonymous Attacks
Motivation for IP Traceback and its Performance Metrics
Evaluation of Proposed IP Traceback Schemes
Deterministic Packet Marking
Conclusion/Discussion/Future Work

73.

Author(s): Chen, Thomas M. (Southern Methodist University)
Title: **Traffic Analysis for Network Security**
Presented at: INFOCOM 2005 (IEEE International Conference on Computer Communication)
Duration: 175.11 min; 190 slides
Call No.: 005.8 CHE
Acc. No.: A01361
Keywords: Computer networks -- Security measures; Computer security; Information networks; Communication -- Network analysis; Network analysis (Planning); Hierarchical clustering; Network traffic data.

Abstract: This half-day tutorial gives an introduction to how network traffic data is collected, processed, and analyzed to differentiate normal traffic from suspicious and malicious traffic. The tutorial is organized into six parts. The first part describes the goals of traffic analysis. The second part presents a taxonomy of attacks categorized into directed attacks against specific targets, undirected large-scale attacks against many targets, and attacks against the network infrastructure. This part is essential background to understand how these attacks typically generate specific patterns of traffic that is different and distinguishable from normal traffic. Infrastructure attacks are not covered in this tutorial, but directed attacks and undirected large-scale attacks are covered. Directed attacks are described as a three-phase process, and an overview of each step is given. Undirected large-scale attacks are described using the example of viruses and worms. The self-replication capability of viruses and worms is explained. The third part covers how traffic data is monitored and collected from various points in the network, such as sniffers, routers, firewalls, intrusion detection systems, servers, and honeypots. The data collection capabilities of each network equipment is described. The fourth part of the tutorial describes how the collected traffic data is processed to reassemble IP packets into TCP sessions. Relevant fields in the IP, UDP, and TCP headers are reviewed. Software tools such as Ethereal and Snort/ACID are very useful for this processing. The fifth part of the tutorial describes identification of malicious traffic based on misuse (signature-based) detection or anomaly (behavior-based) detection. A taxonomy of misuse detection approaches is described. Examples of signatures to detect scans and worms are shown. A taxonomy of anomaly detection approaches is also given. Anomaly detection approaches based on statistical profiles and self-learning neural networks and clustering are described. Examples of behavior-based detection of worm traffic are explained. The final section of the tutorial concludes with a summary of current difficulties and limitations of traffic analysis for security.

Parts:

1. : Goals of traffic analysis
2. : Types of attacks
3. : Traffic monitoring and data collection
4. : Traffic data processing
5. : Traffic analysis and interpretation
6. : Challenges

74.

Author(s): Molina, Maurizio and Quittek, Juergen (Network Laboratories, NEC Europe Ltd.)
Title: **Traffic measurement in IP networks**
Presented at: NOMS 2004 (IEEE/IFIP Network Operations and Management Symposiium)
Duration: 131 min.; 110 slides
Call No.: 621.382 MOL
Acc. No.: A00206
Keywords: Communication networks; TCP/IP computer network protocol; Telecommunications.

Abstract: Traffic Measurement in the Internet is an area of rapid growth in recent years, although the issue is not new at all. But many tools have been developed and methodology and technologies have been improved significantly. This tutorial gives an

overview of methods, technologies and existing tools for traffic measurements. It starts with basic requirements, constraints, and problems of metering IP traffic. Then capturing IP packets at link layer level and at network level is discussed. For traffic metering, there exist several IETF standards and other de-facto standards. These are discussed together with common low-level metering tools.

On higher levels of IP traffic measurement, a large variety of tools, frameworks, and systems can be found supporting visualization, integration, and correlation of measurements from different locations. For the tutorial, a representative subset was selected and will be presented. An outlook on current challenges concludes the tutorial.

Part 0: Outline
Part 1: Applications
Part 2: Classification
Part 3.1: Technologies (1)
Part 3.2: Technologies (2)
Part 4.1: Tools (1)
Part 4.2: Tools (2)
Part 4.3: Tools (3)
Part 4.4: Tools (4)
Part 5: Protocols
Part 6: Challenges
Part 7: References

75.

Author(s): Benedetto, Sergio (Politecnico di Torino)
Title: **Turbo codes: performance analysis, design, iterative decoding and applications**
Presented at: GLOBECOM 2004 (IEEE Global Communications Conference)
Duration: 285 min.; 196 slides
Call No.: 621.3891 BEN
Acc. No.: A00207
Keywords: Error-correction coding; Wireless communications; Information coding.

Abstract: Turbo codes are parallel concatenated codes formed by two constituent, simple convolutional codes separated by an interleaver. They have astonishing performance close to the Shannon limits, yet enabling simple decoding algorithms whose complexity is comparable to that of decoding the simple constituent codes. After their invention in 1993, other forms of concatenations have been studied, and numerous applications of the so-called “turbo principle” applied to fields like equalization, multiuser detection, carrier synchronization, and others. This tutorial provides an understanding of the principles governing the codes behavior, analytical tools to evaluate the maximum likelihood performance, design rules for both the constituent codes and the interleaver, explanation of the maximum-a-posteriori algorithms which form the core of the iterative decoding algorithms, extensive analytical and simulation results, a comparative analysis of the implementation complexity, and a number of important applications like third-generation wireless communications, and deep-space communications .

76.

Author(s): Yu, James T. (DePaul University)
Title: **Tutorial on wireless LAN (Wi-Fi) security**
Presented at: ENTNET 2005 (IEEE International Enterprise Networking & Services Conference)
Duration: 181.35 min.; 95 slides
Call No.: 621.319 YU
Acc. No.: A00208
Keywords: Wireless communications; Network security; WLAN Security WLAN security; Communication networks.

Abstract: The tutorial first presents a brief overview of the Wireless Local Area Network a s specified in IEEE 802.11 and then present various security threats to the WLAN. Examples are war drive attack, rogue access point (AP), replay attack, man-in-the-middle attack, forgery attack, MAC spoofing, risk of ad hoc networks, and Denial of Service (DoS) attack. The tutorial covers the technical details of Wired Equivalent Privacy (WEP) as defined in the 802.11 standard, and presents several problems with WEP, including no user authentication, no key management, no protection of frame header, and weak encryption mechanism. The conclusion is that WEP is acceptable for home and small office environments where the deployment of an authentication server (RADIUS server) cannot be justified. However, WEP is not acceptable for the enterprise

environment.

The solution to the WEP is the new 802.11i standard which covers authentication, key management, and improved data encryption mechanism. The user authentication is based on IEEE 802.1X, also known as port-based network access control. This protocol is adopted from the IE TF Extensible Authentication Protocol (EAP) and it supports various authentication methods, such as MD5, TLS, TTLS, LEAP, and PEAP. This tutorial also covers using these authentication methods to support key distribution and key management where the encryption key is dynamically created for individual frames, known as per key stream.
The issue of data encryptionin WEP is well known in the literature and there are shareware tools to decipher the WEP keys. The 802.11i standard addresses this issue by introducing two new encryption methods. An *evolutionary* approach is Temporal Key Integrity Protocol (TKIP) and it is backward compatible with WEP. Although TKIP is a significant improvement over WEP, there are weaknesses of TKIP due to its use of the RC4 algorithm. A *revolutionary* approach to WEP is Counter Mode with CBC-MAC Protocol (CCMP) and it is a replacement of WEP. This new encryption protocol is based on Advanced Encryption Protocol (AEP), and it is considered the strongest secured mechanism for WLAN. However, CCMP requires new ASIC and cannot be supported on wireless devices that are already deployed.
Lastly, the tutorial presents a few design concepts for improving WLAN security. It covers the use of Virtual LAN (802.1Q) and Virtual Private network (VPN) to separate the wireless traffic from the wired traffic. Wireless traffic is then routed to a firewall where strict security policy is implemented. A summary of the WLAN security issues and solutions is given at the end of the tutorial.

Part 1: Introduction and WLAN Review
Part 2: WLAN Security Threat
Part 3: WLAN Security Fundamentals
Part 4: 802.11 Security WEP
Part 5: 802.11i (I) - Authentication (802.1X) and Key Management
Part 6: 802.11i III) - Encryption (TKIP and CCMP)
Part 7: WLAN Design for Security and Summary

77. **Author(s):** Giancola, Guerino and Benedetto, Maria-Gabriella Di (University of Rome La Sapienza)

Title: **Ultra wide band in distributed wireless networks**

Presented at: WCNC 2005 (IEEE Wireless Communications and Networking Conference CO-located with CTIA)

Duration: 131.42 min.; 150 slides

Call No.: 621.384135 GIA

Acc. No.: A00209

Keywords: Ultra-wideband antennas; Communication networks; Analog communications; Applications amplitude modulation radio; Pulse position modulation.

Abstract: The main goal of this tutorial is the analysis and discussion of the potentials of Ultra Wide Band (UWB) radio in the design of distributed wireless networks. Fundamental issues related to UWB systems are investigated in order to highlight the potentials of a technology which appears as one of the favourite candidates in the definition of standards for new generation wireless networks.

In particular, attention will focus on the capability provided by UWB to acquire accurate information about node positions in the network, which leads to the definition of flexible and power efficient procedures for both resource management and routing.
At the end of the tutorial, attendants will have acquired the basics of UWB radio, including topics such as synchronization, ranging and positioning, and medium access, and will have gained insight into UWB network design.

Section 00: Tutorial Promo
Section 01: Tutorial Preface
Section 02: Introduction (Part 1)
Section 03: Introduction (Part 2)
Section 04: Distributed Wireless Networks
Section 05: Multi User Interference (Part 1)
Section 06: Multi User Interference (Part 2)
Section 07: Multi User Interference (Part 3)
Section 08: Ranging (Part 1)
Section 09: Ranging (Part 2)
Section 10: Ranging (Part 3)

Section 11: Medium Access Control (Part 1)
Section 12: Medium Access Control (Part 2)
Section 13: Routing

78. **Author(s):** Ghavami, Mohammad; University of London
Title: **UWB signals and systems in communication engineering**
Presented at: PIMRC 2004 (IEEE International Symposium on Personal, Indoor and Mobile Radio Communications)
Duration: 287.58 min.;160 slides
Call No.: 621.384135 GHA
Acc. No.: A00210
Keywords: Ultra-wideband antennas; Communication networks; Analog communications; Applications amplitude modulation radio; Pulse position modulation

Abstract: Ultra wideband (UWB) radar systems were originally developed as a military tool because they could penetrate through trees and beneath ground surfaces. UWB technology has recently targeted consumer electronics and communications. Ideal objectives for UWB systems are low power consumption, low manufacturing cost, high data rates, precise positioning capability, and extremely low interference characteristics.

This tutorial examines the fundamentals of UWB signals and systems in Communication Engineering and includes a variety of topics, such as: basic properties of UWB signals and systems, generation of UWB waveforms for impulse radio systems, signal processing techniques for UWB systems, UWB channel modeling techniques and algorithms, ultra wideband communication methods, ultra wideband antenna and array structures, and UWB applications in military, commercial and medical domains.

79. **Author(s):** Touch, Joseph D. (USC/ISI)
Title: **Virtual and overlay networks**
Presented at: INFOCOM 2005 (IEEE International Conference on Computer Communication)
Duration: 216 min.; 134 slides
Call No.: 004.68 TOU
Acc. No.: A00211
Keywords: Communication networks; Digital communications; Wireless communications network.

Abstract: This tutorial covers the basics of virtual and overlay networks, and how they can be used to simplify applications, network management, and testbed deployment. It discusses the unique opportunities afforded by this capability, the different overlay methods available, how they challenge the Internet architecture, and their current and inherent limitations. The tutorial presents basic concepts and taxonomies, focusing on principles, uses, and issues in overlay deployment, management, and support. It assumes a basic knowledge of network architecture, including hosts, routers, and tunnels, and uses examples from the Internet architecture to highlight interactions among tunneling, forwarding, and security.

The tutorial begins with the definition of virtual and overlay networks, discussing the characteristics of virtual links, virtual routers, and virtual hosts, and how they differ from their non-virtual counterparts. The particular impacts of virtualization on forwarding, routing, and naming systems are also discussed, and virtual networks are compared to VPNs and peer-to-peer networks.

Related work covers the origins of virtual networks in the M-Bone and 6-Bone, the differences between end-to-end overlays (X-Bone, DynaBone, GeoNet) and core-based overlays (RON, Detour, SOS, VNS, PPVPN). It also covers variants of multi-layer overlays (VAN, SuperNet, MorphNet), service overlays (Grid, PlanetLab, NetLab), and application overlays (A-Bone, YOID/Yallcast). Uses of overlays are presented, including testing new protocols and services, and network abstraction for sharing and protection. The tutorial considers the ways in which virtual networks extend and apply concepts from virtual memory, as well as the impact of virtualization on the future Internet architecture. Challenges are presented, including host and router extensions, multihoming, protocol extensions for routing, transport, and naming, and support for recursion (overlays on overlays). Advanced concepts are covered, including deployment, management, and monitoring, ways to support recursion and revisitation (one node emulating many), and path and component placement optimization. Finally, future directions are examined, including ways to integrate virtual networks with VPNs and peer-to-peer nets, uses of virtual nets for infrastructure management, and the

ultimate convergence of virtual networks and virtual memory concepts.

- Background
- Uses of Overlays
- Survey
- Challenges
- Advanced Concepts
- Future Directions

80.

Author(s): McBeath, Sean, Hosein, Patrick and Soong, Anthony
Title: **VoIP enhancements for OFDMA systems**
Presented at: ICC 2008 (IEEE International Conference on Communications)
Duration:
Call No.: 621.3845 MCB
Acc. No.: A01431
Keywords: Wireless communication systems – Standards; Mobile communication systems – Standards; Global system for mobile communications; 802.16 5. LTE; Orthogonal frequency division multiplexing (OFDM); VoIP; Wireless communications.

Abstract: This tutorial provides an overview of VoIP support for OFDMA systems. The tutorial begins with an overview of the wireless industry, enablers for B3G systems, and the motivation for voice services in future wireless systems. Next, an overview of VoIP is provided. In this section, the vocoder and VoIP packets are described. VoIP challenges are then presented. By comparing voice support 10-15 years ago to voice support today, we can see what has changed and how these changes result in unique problems for OFDMA systems. We formalize the VoIP problem statement into 5 distinct problems which must be addressed. Then, scheduling algorithms are discussed. Finally, performance results are provided. The performance section first describes how to evaluate the performance of a VoIP system and then provides performance results for LTE, UMB, and 802.16 systems.

81.

Author(s): Nguyen, Hung
Title: **WCET area 1 : RF engineering, propagation and antennas**
Presented at: WCP 2009 (IEEE Wireless Communications Professional)
Duration:
Call No.: 621.38411 NGU
Acc. No.: A01438
Keywords: Radio wave propagation; Antennas (Electronics); Wireless communication systems; Wireless LANs.

Abstract: Wireless Communications Professional Tutorial This tutorial covers RF Engineering, Antenna and Propagation and in wireless networks, corresponding to Area 1 of the Wireless Communications Engineering Technologies (WCET) certification program. The tutorial is divided into 3 main parts: Antennas, Propagation and RF Engineering, following a brief depiction of the topics covered in each part. The first part is an introduction to antenna engineering basic concepts such as directivity, gain aperture, polarization and bandwidth. Examples of different antenna types are illustrated with additional newer antenna subsystems such as phased array, beamformer and smart antennas. Practical engineering tasks such as antenna design, measurement and RF site survey are described. Advanced antenna diversity and MIMO concepts are also explained. The second part attempts to provide the student the basic principles on line-of-sight radio wave propagation and how it affects the intended receiver. From the free space transmission theory, the different loss mechanisms are described leading to a link budget example. In addition, vicious propagation environments such as reflection, diffraction and scattering are covered with statistical fading models for indoor and outdoor scenarios. A brief discussion on software modeling tools will be presented. The third and final part on RF engineering covers a few RF transceiver design concepts, from the idea of heterodyning to direct conversion transceiver and software define radios. Other important receiver design parameters such as selectivity, sensitivity, third order intercept point, and phase noise effects are discussed. Given the wide range of topics in Area 1, it is not realistic to cover all the topics in great details, thus only the underlying principles and main ideas are emphasized. Therefore, this tutorial serves as a catalyst for further study with the WEBOK, with selected examples that are helpful for grasping particular key concepts.

82.

Author(s): Erfanian, Javan
Title: **WCET area 2 : wireless access technologies**
Presented at: WCP 2009 (IEEE Wireless Communications Professional)
Duration:
Call No.: 621.38212 ERF
Acc. No.: A01439
Keywords: Wireless communication systems; Mobile communication systems; Signal processing -- Digital techniques; IEEE 802.16 (Standard); Wireless LANs.

Abstract: Wireless Communications Professional Tutorial This online tutorial provides an end to end picture of wireless access technologies with much focus on generations of mobile technology standards. A general perspective of wireless communications and radio transmission is provided along with the fundamental but directly relevant concepts such as multiple access, modulation and coding, physical layer attributes and others and how they get more sophisticated in the evolution of wireless access generations. The key aspects and technologies that define wireless broadband technologies such as those defined by IEEE, 3GPP, and 3GPP2 are defined. In outlining the technologies such as GSM, GPRS, cdmaOne, UMTS / HSPA, CDMA2000 and IEEE Wireless broadband technologies, an end to end view of the entire network, allocation of functions, and evolution towards all-IP are highlighted. Furthermore, Long-Term Evolution (LTE), Ultra Mobile Broadband (UMB), and WiMax technologies are introduced. This course is concluded by a perspective of spectrum considerations, trends and topics of research, and wrap-up remarks and summary. The insight, principles, and technology elements discussed throughout the course are meant to empower the trainee to both extrapolate to any other wireless system not necessarily covered, and also to get deeper in any one of the areas covered in here. The course will help to understand and learn about wireless technologies and the end to end picture of wireless access and standards, to act as a refresher and a way to acquire an updated and holistic perspective and knowledge, and also to help prepare candidates who are aiming to write the IEEE Communications Society Wireless Communications Engineering Technologies (WCET) certification examination.

83.

Author(s): Wong, Daniel
Title: **WCET area 3 : network and service architectures**
Presented at: WCP 2009 (IEEE Wireless Communications Professional)
Duration:
Call No.: 621.382 WON
Acc. No.: A01432
Keywords: Wireless communication systems; Mobile communication systems; IP networking; Network and Service Architectures; Cellular network architectures; Wireless networks.

Abstract: This tutorial covers Network and Service Architectures in wireless networks, corresponding to Area 3 of the Wireless Communications Engineering Technologies (WCET) certification program. The tutorial is divided into 4 main parts, following a brief introduction of the Area 3 task statements and knowledge statements.

The first main part is a broad introduction that provides: a review of fundamental networking concepts; a brief introduction to IP networking fundamentals, including IPv6; mobility management; 802.11-based WLAN network fundamentals; basics of teletraffic analysis. The second main part focuses on cellular network architectures: functional requirements; network elements and functions; network protocols; examples of signaling for call delivery, roaming, etc.; packet data services in 2G cellular systems. The third main part goes on to discuss the movement towards the "all IP" network, covering: technologies for QoS support; technologies for VoIP transport; SIP signaling; Cellular network evolution to all-IP core network architectures; LTE's EPC (Evolved Packet Core). The fourth main part then dwells on service architectures and alternative architectures, including: IMS; service creation and architectures, including Parlay/OSA concepts; mesh networks; ad hoc networks; satellite networks.

Given the range of topics in Area 3, there is not enough time to cover all the topics in great detail. Instead, the underlying principles and main ideas are emphasized. Thus, the tutorial serves as a springboard for further study, with selected examples that are helpful for grasping particular key concepts.

84.

Author(s): Kartalopoulos, S. V. (University of Oklahoma)
Title: **WDM: technology & networks**
Presented at: ICC 2004 (IEEE International Conference on Communications)
Duration: 210 min.; 120 slides
Call No.: 621.3827 KAR
Acc. No.: A00212
Keywords: Communication networks; Wavelength division multiplexing; Polarization mode dispersion.

Abstract: This is half a day short-course on DWDM optical networks, devices and technology. It consists of three major units:

•Optical and photonic concepts; including are the dual nature of light, refraction, diffraction, interferometry, polarization, linear and non-linear optical medium properties, propagation of light in optical medium, loss, scattering, dispersion (modal, chromatic, and polarization), Raman scattering, Brillouin scattering, four wave mixing, and more.

•Description of key photonic passive and active devices; including are filters, gratings, multi-mode and single-mode fibers, FBGs, polarizers, phase shifters, rotators, modulators, optical amplifiers (EDFA and Raman), optical switches, lasers (VCSEL, DBF, FP), and photodetectors.

•The DWDM and CWDM channel grid and its characteristics according to ITU-T standards, including applicability.

•Transmission impairments and ramification strategies for dispersion compensation, and more.

•Optical topologies ring, mesh, and point-to-point.

•Optical network layers (including access FTTx, metro (small, medium, large), FSO, backbone and long-haul.

•Network reliability and network survivability, protection strategies, switching, and routing and wavelength assignment (static and dynamic with wavelength converters).

85.

Author(s): Chen, Thomas M. (Southern Methodist University)
Title: **Web Security**
Presented at: IEEE Globecom 2007 (IEEE Global Communications Conference)
Duration: 184.25 min; 220 slides
Call No.: 005.8 CHE
Acc. No.: A01362
Keywords: Computer networks -- Security measures; World Wide Web -- Security measures; Tutorial; Web Protocols; Cryptography.

Abstract: The World Wide Web is used to carry out fraud, identity theft, malware downloads, and direct attacks on computers. This tutorial gives an overview of threats and defenses related to the World Wide Web which should concern all Internet users. The tutorial is organized into four major parts. After a short introduction, the first major part covers the protocols and technologies underlying the Web. These technologies allow the Web to be dynamic and powerful, but expose servers and clients to risks. The second major part describes threats to TCP/IP connections between clients and servers, and cryptographic means to protect connections at the IP and transport layers. The third major part describes threats to Web servers and defensive methods to protect servers. The fourth major part discusses threats to Web browsers and available security measures on the client side. The tutorial concludes with several observations about current trends and open issues.

Outline:

1. Introduction
2. Web protocols and technologies
   - HTML, URLs, HTTP, cookies, Java, ActiveX, Javascript, VBScript, CGI
3. Secure communications
   - Cryptography, RSA, signatures, certificates, SSL/TLS, IPSec, DNSSEC
4. Web server security
   - Data loss, password attacks, cookie reuse, exploits, malware, input attacks, DoS, denial of service, server defenses
5. Web browser security

- Threats to privacy, cookies, web bugs, spyware, phishing, browser exploits, malware

6. Conclusions and open issues

Part Number and Titles

- Preview: 5 min 33 s, 7 slides
- Part 1: 25 min 2 s, 28 slides
- Part 2: 26 min 22 s, 30 slides
- Part 3: 30 min 41 s, 44 slides
- Part 4: 34 min 00 s, 26 slides
- Part 5: 22 min 44 s, 21 slides
- Part 6: 19 min 46 s, 31 slides
- Part 7: 20 min 17 s, 33 slides

86.

Author(s): Bing, Benny (Georgia Institute of Technology)
Title: **WiMax-Mobilizing the internet**
Presented at:
Duration: 127 min.; 89 slides
Call No.: BIN
Acc. No.: A00363
Keywords: Wireless metropolitan area networks; WiMAX; Mobile WiMAX; Wireless communication systems; Broadband communication systems; Telecommunication -- Technological innovations; Data transmission systems; Broadband wireless access; OFDM and OFDMA; Medium access control.

Abstract: Broadband wireless access (BWA) is viewed by both telephone and cable operators as a disruptive technology and rightly so. The broadcast nature of wireless transmission offers ubiquity and immediate access for both fixed and mobile users, clearly a vital element of next-generation quadruple play services involving voice, video, data, and mobility. WiMax is a promising BWA option that includes many powerful wireless features. This tutorial aims to provide the participant with a strong foundation on the IEEE 802.16 standard. Topics covered include the physical (PHY) layer, adaptive modulation and coding, OFDM and OFDMA, multiple antenna systems, medium access control (MAC), TDD and FDD transmission, frame formats, quality of service, security, mobility support, deployment considerations, the WiMax Forum, ongoing 802.16 projects, and 802.16 performance evaluation using OPNET.

Preview: 2 min 24 s, 2 slides
Part 1: 10 min 49 s, 7 slides
Part 2: 13 min 20 s, 11 slides
Part 3: 14 min 45 s, 9 slides
Part 4: 21 min 52 s, 15 slides
Part 5: 18 min 3 s, 12 slides
Part 6: 15 min 9 s, 11 slides
Part 7: 19 min 16 s, 12 slides
Part 8: 11 min 44 s, 12 slide

87.

Author(s): Jha, Uma S.
Title: **Wireless communication systems - a journey from 1st generation to 3rd generation and beyond**
Presented at: PIMRC 2004 (IEEE International Symposium on Personal, Indoor and Mobile Radio Communications)
Duration: 180.58 min.; 143 slides
Call No.: 621.382 JHA
Acc. No.: A00281
Keywords: Wireless communication systems; Signal processing--Digital techniques.

Abstract: This tutorial covers the evolution of the global wireless standards from the 1st generation of analog cellular standards (such as AMPS, TACS, NMT) to the 3rd generation of digital cellular standards based on WCDMA multiple access scheme and beyond. It presents the implementation and air interface issues including limitations as well as the discussion of multiple access schemes including capacity, coverage and incompatibility issues based on the regional regulations and standards. The intent of the tutorial is to discuss the basics of the air interface of covering present cellular/wireless standards. The coverage and capacity enhancements from 1G to 3G and beyond will also be discussed. The 1st and 2nd generations of standards were voice centric but 3rd generation systems are built to be data centric and have added

new multimedia rich features. The lecture delineates capabilities and air interface aspects of standards and emphasizes their limitations including capacity, coverage, and incompatibility issues. The intent of the tutorial is to cover the basics of the air interface including present wireless standards and evolution of 3GPP standard, which have successively added multimedia capable downlink and uplink enhancements. The coverage and capacity enhancements of 3G and beyond schemes will be discussed with respect to spectral and power efficiency as well.

Part Number
Part 1: Introduction
Part 2: Wireless Communication Fundamentals
Part 3: Digital Modulation
Part 4: Multiple Access Techniques
Part 5: Evolution of Cellular Systems
Part 6: 3rd Generation Systems

88.

Author(s): Dohler, Mischa (France Telecom R&D) & Aghvami, Hamid (Kings College London)
Title: **Wireless cooperative communication networks**
Presented at: ICC 2007 (IEEE International Conference on Communications)
Duration: 156.64 min.; 176 slides
Call No.: 621.384 DOH
Acc. No.: A00364
Keywords: Wireless communication systems; Wireless LANs; Sensor networks; Communication network; Cooperative Communication Network; ad hoc and sensor networks; Wireless communications systems; Cooperation; Cognitive radio architecture; Distributed antennas.

Abstract: A communication network where an information source communicates with a sink via topologically imposed distributed and potentially collaborating relaying nodes, is referred to as a Cooperative Communication Network. The aim of this tutorial is to expose an industrial and academic audience to the challenges related to the analysis and design of such recently emerged networks at PHY and MAC layers - with particular emphasis on application within cellular, ad hoc and sensor networks.

The tutorial is structured into several parts, i.e. application scenarios, historical background, hardware design issues, channel models, cooperative and distributed transceiver structures at PHY layer, as well as MAC and elements of cross-layer design. These topics prove vital in conveying the essentials relating to the design of these networks.

The listener is expected to be well equipped with the functioning and understanding of modern communication systems. Knowledge in channel modeling, STC design and MAC is advantageous but not vital. Since the presented topic is very new, we have endeavored to make the presentation self-consistent. Mainly material from 2006/2007 is included.

89.

Author(s): Yu, James T.(DePaul University)
Title: **Wireless LANs: business models, technologies, deployment, and challenges**
Presented at: ENTNET 2004 (IEEE International Enterprise Networking & Services Conference)
Duration: 220.02 min.; 100 slides
Call No.: 621.319 YU
Acc. No.: A00213
Keywords: Wireless LAN security; Wireless communications; Wireless network security; OMFD.

Abstract: This tutorial presents the Wireless LAN (WLAN) technology a s specified in the IEEE 802.11 standard and its extensions. It also presents how to design and deploy WLAN networks for different market segments. Issues and challenges of security, Quality of Services (QoS), and IP mobility are addressed, along with potential solutions to these problems.

This tutorial starts with the basics of WLAN a s specified in the IEEE 802.11 standard which includes both the physical layer and the data link layer. At the physical layer, the instructor presents different transmission media and variou s spread spectrum methods used in 802.11, 802.11a, 802.11b, and 802.11g. At the data link layer, the instructor will give a brief overview of the wired network a s specified in 802.3, and then address the challenges of applying the Ethernet technology to a wireless network a s specified in 802.11. Topics are wireless operation modes, CSMA/CA (Carrier Sense Multiple Access with Collision Avoidance), Distributed Coordination Function (DCF),

Point Coordination Function (PCF), hidden station problem, MAC addressing schemes, fragmentation, and positive confirmation.

After WLAN theory, the instructor will teach how to design and deploy WLAN networks. Various WLAN products will be introduced, along with the required protocols on each product. One important isuee of WLAN design is the choice of non-overlapping channels and the location of Wireless Access Points (WAPs). The instructor will present several examples of using these non-overlapping channels to maximize the user performance in a dense population area.

In summary, this tutorial seeks a balance of theory and practice. Students will learn the details of the 802.11 protocol and its extensions and apply the theory to design a cost-effective wireless network that will meet the user requirements on performance, security, reliability, and scalability.

Part Number and Titles:
Part 1: Business Models and WLAN Applications
Part 2: WLAN Technologies, Physical Layer
Part 3: WLAN Technologies, Addressing Scheme
Part 4: WLAN Technologies, Access Methods
Part 5: WLAN Standard Extensions (a/b/g)
Part 6: WLAN Security – WEP and non-standard solutions
Part 7: WLAN New Security Standards 802.1X and 802.11i
Part 8: WLAN Design and Deployment
Part 9: WLAN Challenges – Quality of Services (QoS)
Part 10: WLAN Challenges – Mobility

90.

Author(s): Mohapatra, Prasant (University of London)
Title: **Wireless mesh networks**
Presented at: BROADNETS 2005 (Int'l. Conference on Broadband Networks)
Duration:
Call No.: 621.3821522 MOH
Acc. No.: A00214
Keywords: WIMENETs; Wireless communication networks; Routers (Computer networks).

Abstract: Wireless MEsh NETworks (WIMENETs) are composed of wireless routers that provide multihop communication paths between wireless clients as well as facilitate connection to the wide area network and the Internet. WIMENETs can be used as a very low-cost local area network because of the avoidance of the installation costs of wired infrastructure. These networks will not only be useful for applications that are supported by wireless local area networks or mobile ad hoc networks, but also will have scope for usage in providing Internet access to various community networks, enterprise networks, and home networks. This tutorial will provide a comprehensive study of various issues in WIMENETs. We will explore the issues associated with each of the protocol stack in a top-down manner. In addition, several issues that are unique to WIMENET will be discussed in the context of cross-layer aspects. We will also discuss the experiences and lessons learnt from various test-bed and experimental implementations. Techniques to build simple WIMENETs will be explained in this tutorial. We will overview the standard-related activities followed by the future outlook of WIMENETs.

91.

Author(s): Cayirci, Erdal (Istanbul Technical University)
Title: **Wireless mobile internet - architecture, protocols & services**
Presented at: ICC 2004 (IEEE International Conference on Communications)
Duration: 204.5 min.; 202 slides **(Web Version)**
Keywords: Wireless telephony applications; Mobile internet future; Mobile computing.

Abstract: Part 1: Introduction to Mobile Internet
Part 2: Advanced Technologies to Support Mobile Internet
Part 3: Quality and Security for Mobile Internet

92.

Author(s): Cayirci, Erdal (Istanbul Technical University)
Title: **Wireless sensor and actuator networks**
Presented at: ICC 2004 (IEEE International Conference on Communications)
Duration: 126.43 min.; 202 slides
Call No.: 681.2 CAY

Acc. No.: A00215
Keywords: Sensor networks; Physical channel models; Wireless channels; Communication networks; Wireless communications; Multiuser information theory.

Abstract: Advances in digital electronics, embedded systems and wireless communications leaded the way to a new class of ad hoc networks, namely wireless sensor networks (WSNs). WSNs have a wide range of potential applications, including security and surveillance, control, actuation and maintenance of complex systems, and fine-grain monitoring of indoor and outdoor environments. They differ from conventional network systems in many aspects. WSNs usually involve a large number of spatially distributed, energy-constrained, self-configuring and self-aware nodes. Furthermore, they tend to be autonomous and require a high degree of cooperation and adaptation to perform the desired coordinated tasks and networking functionalities. As such, they bring about new challenges and design considerations, which go much beyond conventional network systems. These design considerations, which are the reasons to develop new schemes and technologies rather than using available, will be explained in this tutorial where we also present a survey of protocols and algorithms proposed thus far for sensor networks. Our tutorial is organized as follows: After introduction, we present potential sensor network applications. Then, we discuss the factors that influence the sensor network design, and provide an investigation of current proposals in this area. Then we conclude the tutorial.

Part 1: Introduction and Applications
Part 2: Factors Influencing SensorNetwork Design
Part 3: Sensor Networks Communications Architecture
Part 4: Node Localization and Time Synchronization
Part 5: Transport and Network Layer
Part 6: Data Aggregation and Routing
Part 7: Data Link Layer
Part 8: Physical Layer, Modelling and Simulation, Conclusion

93. **Author(s):** Govindan, Ramesh (University of Southern California)
Title: **Wireless sensor networks**
Presented at: INFOCOM 2004 (IEEE International Conference on Computer Communication)
Duration: 230 min.; 202 slides
Call No.: 681.2 GOV
Acc. No.: A00216
Keywords: Sensor networks; Wireless communications network.

Abstract: Sensor networks is an increasingly hot networking topic, yet, beyond the sensor networks community there is a lack of understanding of the problems the field is trying to solve. This tutorial will attempt to cut through the hype surrounding the subject and survey work done in the area till date. Presented from a system and networking perspective, this tutorial will start with potential applications, and then cover the major subsystems in a sensor network, ranging from platforms and hardware up to application level support for network-level querying.

94. **Author(s):** Ulema, Mehmet (Manhattan College)
Title: **Wireless sensor networks : applications, technology, and management**
Presented at: NOMS 2004 (IEEE/IFIP Network Operations and Management Symposiium)
Duration: 216.41 min.; 170 slides
Call No.: 681.2 ULE
Acc. No.: A00217
Keywords: Sensor networks; Digital communications; Wireless communications networks; Military communications; CDMA; TDMA.

Abstract: Wireless sensor networks an example of the paradigm shift taking place in wireless network architectures. A wireless sensor network consists of large numbers of sensors, which are tiny, low-cost, low-power radio devices dedicated to performing certain functions such as collecting various environmental data and sending them to infrastructure processing nodes. The field of wireless sensor networking is also gaining greater interest among not only researchers but also diverse groups such as environmental, public safety, medicine, and military.
This tutorial starts with an overview of the wireless sensor networks. Then, a survey of current and potential applications is presented. A review of the current technologies used for these types of wireless networks is provided next. The focus is on the architectural issues such as topology, routing, and protocols. Finally, the network

management issues related to wireless sensor networks are discussed. The tutorial concludes with a discussion of the open research problems in this area.

Part 1 - Introduction
Part 2 - Sensor Network Applications
Part 3 - Technology and Sensor Nodes
Part 4 - Networking and Protocols
Part 5 - Management of Sensor Networks
Part 6 - Conclusions

Resource Centre
DA-IICT
Near Indroda Circle
Gandhinagar – 382007

Phone: 079 30510578
Email:
rcservices@daiict.ac.in