

Tuesday 17 APRIL 2007 • 9:00 – 12:00
O'Connell Room

T1 - The Policy and Practice of Spectrum Trading

Instructors:

Dr. Martin Cave, *Warwick Business School, UK*
Mr. Darrin Mylet, *Cantor Fitzgerald, USA*

Description:

This tutorial provides an in-depth overview of the current state and future trends in secondary spectrum markets and trading, from two of the leading experts in the field.

Biographies:

Martin Cave is Professor and Director of the Centre for Management under Regulation, Warwick Business School. Until 2001 he was Professor of Economics at Brunel University. He specialises in regulatory economics, especially of the communications sector. He has advised a number of Regulatory Agencies in Telecommunications and Broadcasting. As well as his academic work he has also undertaken studies for the European Commission and advised regulatory agencies. He was a member of the Competition Commission from 1996 to 2002. He is the author of the Independent Review of Spectrum Management (2002) for the UK Government, co-author of *Understanding Regulation* (1999) and co-editor of the *Handbook of Telecommunications Economics* (Vol. 1, 2002, Vol. 2, 2005).

Darrin Mylet is Vice President-Wireless Services for Cantor Fitzgerald. Mr. Mylet joined Cantor Fitzgerald in 2003 to grow the firm's unique trading technologies and business objectives relative to wireless. Mr. Mylet is working with both the public and private sectors in facilitating the trading of radio frequency rights and tower assets among telecommunications operators, spectrum/tower owners, equipment vendors, municipalities and government agencies. Further, entities can lease or buy dormant or partially used licensed spectrum rights, tower assets and tower space for private or public use which should increase broadband per capita in specific jurisdictions. Cantor Fitzgerald will enable this using the firm's unique, proven, scalable and un-biased trading and proprietary systems. Prior to joining Cantor-Fitzgerald, Mr. Mylet was with Radiant Networks, a U.K. based pioneer in "physical mesh" broadband wireless equipment vendor, where he was Vice President of Sales & Marketing-Americas from 2000-2003. Prior to this position, Mr. Mylet was an executive with Worldcom/MCI from 1997 to 2000. From 1992 to 1997, Mr. Mylet was with GTE Corporation (now Verizon). Mr. Mylet earned his bachelor's degree in economics from Indiana University, Bloomington, IN. Mr. Mylet was recently named to the White House led Department of Commerce Spectrum Policy Task Force in October of 2006. Mr. Mylet has had the honor of speaking at numerous industry events including WCAI, USTA, SUPERCOMM, WISPCON, ISPCON, EU/UK SPECTRUM TRADING, BWWF, NTIA, NATPE & CTIA.

Tuesday 17 APRIL 2007 • 13:00 – 17:00
O'Connell Room

T2 - Game Theory in the Analysis and Design of Cognitive Radio Networks

Instructor:

Dr. James Neel, *Virginia Tech, USA*

Description:

This tutorial presents the relationship between game theory and the design and analysis of cognitive radio networks as most frequently encountered in today's cognitive radio literature. The subject matter ranges from basic game theoretic concepts – e.g., the concept of a game and Nash equilibria – to more esoteric material typically covered in graduate game theory courses, but which are critical to understanding state-of-the-art dynamic spectrum access networks. This tutorial illustrates how concepts from game theory are being used to shape the design of dynamic spectrum access networks to yield powerful low-complexity cognitive radio algorithms, e.g., power control, dynamic frequency selection, spectrum trading, sensor network formation, routing, and node participation.

Biography:

In 2006 **James "Jody" Neel** received his PhD in Electrical Engineering from Virginia Tech for his dissertation on the topic of "Analysis and Design of Cognitive Radio Networks and Distributed Radio Resource Management Algorithms." At Virginia Tech, he was an IREAN Fellow advised by Dr. Jeffrey H. Reed. He has an extensive history of involvement with software radio, with twenty publications on software radio, including two textbook chapters on data conversion and the history of software radio in Dr. Reed's *Software Radio: A Modern Approach to Radio Engineering* and another chapter on analyzing cognitive radio interactions in *Spectrum Efficiency and Cognitive Radio Technology* edited by Dr. Bruce Fette. Jody also received awards for his 2002 and 2004 SDR Forum papers on applying game theory to the analysis of cognitive radio networks.

Contents:

Cognitive radio is a frequently touted platform for implementing dynamic spectrum access algorithms. In the envisioned scenarios, radios react to observations of their environment and change their operation according to some goal driven algorithm. While potentially yielding tremendous gains in performance, the adaptations of radios also change the environment for other cognitive radios spawning an interactive decision process. In such a scenario, algorithms which have desirable properties over a single link can result in catastrophic failures when numerous cognitive radios implement the same algorithm in a network setting.

To address these issues, many researchers have turned to game theory to model and analyze the interactions of cognitive radios and to improve the design of networks. However, game theory is a topic that falls well outside of traditional engineering curricula. Lacking knowledge of concepts such as Nash bargaining solutions, mixed strategy equilibria, Shapley values, and potential games, the typical engineer or spectrum regulator faces a daunting task to just understand what researchers are proposing.

Intended to provide attendees with knowledge of the most important game theoretic concepts employed in state-of-the-art dynamic spectrum access networks, this tutorial presents the relationship between game theory and the design and analysis of cognitive radio networks as most frequently encountered in today's cognitive radio literature. The subject matter will range from basic game theoretic concepts – e.g., the concept of a game and Nash equilibria – to more esoteric material typically covered in graduate game theory courses, but which are critical to understanding state-of-the-art dynamic spectrum access networks. This tutorial will also illustrate how concepts from game theory are being used to shape the design of dynamic spectrum access networks to yield powerful low-complexity cognitive radio algorithms. To provide a more familiar learning environment and an appreciation of how game theory applies to cognitive radio, all concepts in this tutorial will be illustrated with examples frequently encountered in the cognitive radio literature – e.g., power

control, dynamic frequency selection, spectrum trading, sensor network formation, routing, and node participation.

This tutorial is arranged into six sections of varying length. The first portion of this tutorial will cover basic concepts from game theory and their application to cognitive radio networks. This includes a summary of the analysis and design challenges posed by cognitive radio networks, the basic components of a game model, and how and when game theory can be applied to cognitive radio networks. To aid the discussion of later more in-depth material, a brief review of mathematical concepts fundamental to the application of game theory to cognitive radio networks will also be presented.

The second and third sections will cover the application of game theoretic equilibrium concepts to cognitive radio networks. As researchers have proposed both non-cooperative and cooperative approaches to implementing cognitive radio networks, this section covers concepts such as Nash equilibria, mixed strategy equilibria, strong equilibria, and the core. Techniques for evaluating the desirability of these equilibria, such as Pareto efficiency and Shapley values, are then presented.

The fourth section addresses the notion of time and imperfections and how they can be incorporated into game models of cognitive radio networks including extensive form games, repeated games, trembling hand games, and Markovian games. The fifth section examines how the analysis techniques of the preceding sections can be leveraged to design cognitive radio networks that yield desired behavior with schemes for punishment and reward and by designing for implicit cooperation with potential games. The tutorial concludes with a summary of the critical concepts presented and speculation on the future role of game theory in the design and regulation of dynamic spectrum access networks.

Tuesday 17 APRIL 2007 • 13:00 – 17:00

Elgin Room

T3 - End-to-End Reconfigurability – The European E2R II program

Instructors:

Dr. Didier Bourse, *Motorola Labs, France*

Dr. Markus Muck, *Motorola Labs, France*

Dr. Klaus Moessner, *University of Surrey, UK*

Mr. David Grandblaise, *Motorola Labs, France*

Pr. Panagiotis Demestichas, *University of Piraeus, Greece*

Dr. Pieter Ballon, *University of Brussels, Belgium*

Description:

This tutorial presents some of the most promising developments relative to cognitive radio systems developed by the European E2R II program on End-to-End Reconfigurability. Tutorial topics include advanced radio resource management, flexible spectrum management, dynamic network planning and management, and the cognitive pilot channel. The objective of the E2R II research program is to devise, develop and trial an architectural design for adaptive communication systems that offers an expanded set of operational choices to users, applications and service providers, operators, manufacturers and regulators in the context of heterogeneous mobile radio systems composed of cellular, wireless local area, broadcast and other technologies.

Contents:

1. From Software Defined Radio to End-to-End Efficiency
 - 1.1) Research and Developments on SDR, CR and Reconfigurable Radio and Networks
 - 1.2) EU FP6 E2R program in a Nutshell
 - 1.3) E2R program Key Technical Achievements
2. Business Models and Standardization/Regulation Perspectives for Cognitive Radio Systems
 - 2.1) Unified Business Model (UBM)
 - 2.2) Key UBM Instantiations (DSA, CPC, White Plastic...)
 - 2.3) Technology Roadmaps towards Cognitive Networks and Reconfigurable Equipment
 - 2.4) Regulatory and Standardization Perspectives
3. Efficiency Enhancement for Radio Resource and Spectrum
 - 3.1) Managing Spectrum and Radio Resources in a Reconfigurability and Cognitive Network Context
 - 3.2) Functional Architecture for Managing Radio Resources and Spectrum in a Reconfigurability Context
4. Joint Radio Resource Management
 - 4.1) Problem Statement
 - 4.2) Solution Algorithms for the Control Domain and Machine Learning Functionality
 - 4.3) Key Results
 - 4.4) Enhancements in the Direction of Cognitive Technologies
5. Advanced Spectrum Management
 - 5.1) Description of Problems Addressed, Technical and Economic Perspectives, Single and Multi-Operator Scenarios
 - 5.2) Solution Algorithms and Machine Learning Functionality
 - 5.3) Key Results
 - 5.4) Enhancement
6. Dynamic Network Planning and Management
 - 6.1) Description of Problem, Distributed and Semi-Distributed Solutions
 - 6.2) Input Description: Context, Profiles, Policies
 - 6.3) Algorithms for the Solution: Bayesian Networks, Greedy Algorithms, Mid-term Optimisation Algorithms, Pattern Matching Techniques
 - 6.5) Key Results
 - 6.6) Demonstration Samples
 - 6.7) Enhancements in the Direction of Cognitive Networks and Autonomics
7. Key Challenges to enable the Seamless Experience
 - 7.1) Reconfigurability Time Frames
 - 7.2) Next Research Steps

Wednesday 18 April 2007

8:30 – 10:00 • Landsdowne Room

PLENARY SESSION**OPENING WELCOME****General Chair:** William Webb, Ofcom, UK**KEYNOTE****John Kneuer**, (Assistant Secretary of Commerce for Communications and Information and Administrator of the National Telecommunications and Information Administration (NTIA))**KEYNOTE****Bruce Fette**, (Chief Scientist in the Communications Networking Division business area of General Dynamics C4 Systems)

> Opportunities for Cognitive Radio applications

10:00 – 10:30 **AM Networking Break**

10:30 – 12:00

Plenary Policy IA**Trends and Precedents favoring Regulatory Embrace of Smart Radio Technologies**

Bradley Bernthal, Tim Brown, Dale Hatfield, Douglas Sicker, Philip Weiser, (University of Colorado, USA), and Peter Tenhula, (Shared Spectrum Company, USA)

Plenary Technology IA**Applications of Topology Information for Cognitive Radios and Networks**

Petri Mähönen, (Aachen University, Germany)

Plenary Technology IB**A Location-Based Method for Specifying RF Spectrum Rights**

John A. Stine, (Mitre, USA)

Plenary Technology IC**Dynamic Spectrum Needs, Research, and Development in Japan**

Hiroshi Harada, (NICT, Japan)

12:00 – 13:00 • Herbert Suite

Lunch

13:00 - 15:00 • Ulster Room

TECHNOLOGY TRACK**Theme: Signal Detection and Spectrum Awareness for Dynamic Coexistence****Session Chair:****Jens Zander**, (KTH, Royal Institute of Technology)**Tech 1-1: Cyclostationary Signatures for Rendezvous in OFDM-based Dynamic Spectrum Access Networks**

Paul Sutton, (Center for Telecommunication Value-Chain Research, Ireland); Keith Nolan and Linda Doyle, (Trinity College, Ireland)

Tech 1-2: Covariance based Signal Detections for Cognitive Radio

Yonghong Zeng and Ying-Chang Liang, (Institute for Infocomm Research, Singapore)

Tech 1-3: SNR Walls for Feature Detectors

Rahul Tandra and Anant Sahai, (University of California - Berkeley, USA)

Tech 1-4: Coexistence with Primary Users of Different Scales

Shridhar Mishra, Rahul Tandra and Anant Sahai, (University of California, USA)

Tech 1-5: Detect and Avoid: An Ultra-Wideband/WiMax Coexistence Mechanism

Stephan Brink and Ravishankar Mahadevappa, (Realtek Semi Conductors, USA); Shridhar Mishra and Robert Brodersen, (University of California - Berkeley, USA)

Tech 1-6: Recognition Among OFDM-Based Systems Utilizing Cyclostationarity-Inducing Transmission

Koji Maeda, Anass Benjebbour, Takahiro Asai, Tatsuo Furuno and Tomoyuki Ohya, (NTT DoCoMo, Inc., Japan)

Tech 1-7: VHF/UHF Building Penetration Characteristics When Using Low Antenna Heights

William Turney, Margot Karam, Laddie Malek and Gregory Buchwald, (Motorola Labs, USA)

13:00 - 15:00 • Munster Room

POLICY TRACK**Theme: Radio Design and Policy****Session Chair:****William Lehr**, (MIT, USA)**Policy 1-1: Radio System Innovation and Time-Limited Certification**

John Chapin, (Vanu, Inc., USA); William Lehr, (MIT, USA)

Policy 1-2: Potential Value of Decentralized Trunking as Regulatory Precedent for the Introduction of Dynamic Spectrum Access Technology

Dale Hatfield, (University of Colorado, USA); Peter Tenhula, (Shared Spectrum Company, USA)

Policy 1-3: Flexible Spectrum Management and the Need for Controlling Entities for Reconfigurable Wireless Systems

Simon Delaere and Pieter Ballon, (Vrije Universiteit Brussels, Belgium)

Policy 1-4: Dynamically Controlling Behaviors of Cognitive Radio System

Garrett and Bradford

15:00 – 15:30 • **PM Networking Break**

15:30 – 18:00 • Ulster Room

TECHNOLOGY TRACK**Theme: Platforms, Systems, and Architectures for Dynamic Spectrum Access****Session Chair:****Bruce Fette**, (General Dynamics, USA)**Tech 2-1: Fast Spectrum Allocation in Coordinated Dynamic Spectrum Access Based Cellular Networks**

Milind Buddhikot, (Alcatel-Lucent/Bell Labs, USA), Anand Prabhu Subramanian, Himanshu Gupta and Samir Das, (State University of New York, Stony Brook, USA)

Tech 2-2: Experiences With a Platform for Frequency-Agile Techniques

Dirk Grunwald, Douglas Sicker, Jeff Fifield, (University of Colorado, USA)

Wednesday 18 April 2007

Continued

Tech 2-3: KUAR: A Flexible Software-Defined Radio Development Platform

Gary Minden, Joe Evans, Leon Searl, Daniel DePardo, Victor Petty, Rakesh Rajbanshi, Timothy Newman, Qi Chen, Frederick Weidling, Brett Barker, Brian Cordill, Alexander Wyglinski and Arvin Agah, (The University of Kansas, USA)

Tech 2-4: Community-Based Cognitive Radio Architecture: Policy-Compliant Innovation via The Semantic Web

Allen Ginsberg, William Horne and Jeffrey Poston, (MITRE, USA)

Tech 2-5: CogMesh: A Cluster-based Cognitive Radio Network

Tao Chen and Honggang Zhang, (CREATE-NET, Italy)

Tech 2-6: Interference-Tolerant Spatio-Temporal Dynamic Spectrum Allocation

Laszlo Kovács, Attila Vidács, (Budapest University of Technology and Economics, Hungary)

Tech 2-7**Optimal Design of a Multi-Antenna Access Point with Decentralized Power Control using Game Theory**

Igor Stanojev, Osvaldo Simeone and Yeheskel Bar-Ness, (New Jersey Institute of Technology, USA)

Tech 2-8**Finite Population Model for Performance Evaluation Between Narrowband and Wideband Users in the Shared Radio Spectrum**

Miroslava Raspopovic and Charles Thompson, (University of Massachusetts Lowell, USA)

15:30 – 18:00 • Munster Room

POLICY TRACK**Theme: Getting the Property Rights Right for DSA****Session Chair:**

Linda Doyle, (Trinity College, Ireland)

Policy 2-1: Towards a Fluid Spectrum Market for Exclusive Usage Rights

Linda Doyle and Tim Forde, (Trinity College, Ireland)

Policy 2-2: Technical basis for spectrum rights

Adele Morris, (US Department of Treasury, USA) and Robert Matheson, (US National Telecommunications Information Agency (NTIA), USA)

Policy 2-3: Microeconomics Inspired Mechanisms to Manage Dynamic Spectrum Allocation

David Grandblaise, (Motorola Labs, France); Clemens Kloeck and Tobias Renk, (Universität Karlsruhe, Germany); Parimal Bag, Paul Levine and Klaus Moessner, (University of Surrey, UK); Ji Yang, Miao Pan and Kui Zhang, (BUPT, China)

Policy 2-4: Imagining Radio: Mental Models of Wireless Communications

Pierre de Vries, (University of Southern California, USA)

Policy 2-5: An Economic Framework for Spectrum Allocation and Service Pricing with Competitive Wireless Service Providers

Shamik Sengupta, Mainak Chatterjee; (University of Central Florida, USA) and Samrat Ganguly, (NEC Labs, USA)

Thursday 19 April 2007

8:00 – 10:30 • Landsdowne Room

PLENARY SESSION**OPENING WELCOME**

Chair: Paul Kolodzy, Kolodzy Consulting, USA

KEYNOTE

Jawad Khaki, Corporate Vice President, Windows Networking & Device Technologies, Microsoft Corporation

KEYNOTE

Joseph Mitola, Consulting Scientist, The MITRE Corporation
> The Future of Cognitive Radio

KEYNOTE

David Cleevly, Chairman of the Communications Research Network
> Do Decentralised Radio Systems Make Economic Sense

10:00 – 10:30 **AM Networking Break**

10:30 – 12:00

Plenary Policy IIA**Building an ecosystem for innovation in wireless broadband architecture**

Jon Crowcroft, (Cambridge University, UK) and William Lehr and David Reed, (MIT, USA)

Plenary Technology IIA: What is Needed to Exploit Knowledge of Primary Transmissions?

Anant Sahai and Pulkit Grover, (University of California - Berkeley, USA)

Plenary Technology IIB: Grouping Abstraction and Authority Control in Policy-based Spectrum Management

David Lewis, (Trinity College, Ireland)

Plenary Technology IIC: A General Framework for Wireless Spectrum Auctions

Sorabh Gandhi, Chiranjeev Buragohain, Lili Cao, Haitao Zheng and Subhash Suri, (University of California, USA)

12:00 – 13:00 • Herbert Suite

Lunch

13:00 - 15:00 • Landsdowne Room

TECHNOLOGY TRACK**Theme: Dynamic Spectrum Technology Enabling Policy****Session Chair:**

Joe Evans, (University of Kansas, USA)

Tech 3-1: Secondary Pricing of Spectrum in Cellular CDMA Networks

Ashraf Al Daoud, Murat Alanyali and David Starobinski, (Boston University, USA)

Tech 3-2: Dynamic Property Rights Spectrum Access: Flexible Ownership based Spectrum Management

Omer Ilerii, (Rutgers University, USA); Dragan Samardzija, (Bell Laboratories, Lucent Technologies, USA); Narayan Mandayam, (Rutgers University, USA)

Thursday 19 April 2007

Continued

Tech 3-3: Dual-Site Spectrum Measurements in the Public Safety Band

Steven Jones, Naim Merheb and Ijeng Wang, (Johns Hopkins University, USA); Xin Liu and Eric Jung, (University of California, Davis, USA)

Tech 3-4: A Game-Theoretic View on the Interference Channel with Random Access

Osvaldo Simeone, (CWGSPR, NJIT, USA)

Tech 3-5: Technical-Economic Impact of UWB Personal Area Networks on a UMTS Cell: Market-driven Dynamic Spectrum Allocation Revisited

Virgilio Rodriguez and Friedrich Jondral, (University of Karlsruhe, Germany)

Tech 3-6: Development of a Radio Enabler for Reconfiguration Management within the IEEE P1900.4 Working Group

Oliver Holland, Alireza Attar, Hamid Aghvami, (King's College London, UK); Markus Muck, Didier Bourse, David Grandblaise, (Motorola Labs, France); Patricia Martigne, Pascal Cordier, Sana Ben Jamaa, Paul. Houze, (France Telecom R&D, France)

Tech 3-7: IEEE P1900.B: Coexistence Support for Reconfigurable, Heterogeneous Air Interfaces

Markus Muck, Soodesh Buljore, (Motorola Labs, France); Patricia Martigne, (France Telecom R&D, France); Apostolos Kousaridas, Eleni Patouni, Gerassimos. Stamatelatos, (University of Athens, Greece); Kostas. Tsagkaris, (University of Piraeus, Greece); Ji Yang, (Beijing University of Posts and Telecommunications, China); Oliver Holland, (King's College London, UK)

13:00 - 15:00 • Munster Room

POLICY TRACK**Theme: Getting to Secondary Market Trading for Spectrum****Session Chair:**

Milind Buddikhot, (Alcatel-Lucent/Bell Labs, USA)

Policy 3-1: Dynamic Spectrum Access: Completing the Spectrum Circle

Bill Glover and Maziar Nekovee, (BT Group, UK)

Policy 3-2: Understanding Dynamic Spectrum Access: Taxonomy, Models, and Challenges

Milind Buddikhot, (Alcatel-Lucent/Bell Labs, USA)

Policy 3-3: Spectrum Trading: An Analysis of Implementation Issues

Carlos Caicedo and Martin Weiss, (University of Pittsburgh, USA)

Policy 3-4: CR: Cooperative Radio or Confrontational Radio

Michael Marcus, (Marcus Spectrum Solutions, France)

13:00 - 15:00 • Ulster Room

PANEL SESSIONS**Theme: Making IEEE DySPAN Work****Session Chair:**

Will Stewart, (Visiting Professor UCL & ORC University of Southampton)

13:00

Industry Panel

14:00

Conformity Assessment for IEEE DySPAN Systems

This panel will present what various organizations are doing in this arena with the organizing structure of how the contribution of each organization is leading to a complete conformity assessment system that assures IEEE DySPAN systems meet their specifications in actual use.

Stephen Berger, (TEM Consulting, LP, USA)

Mark Scoville, (L-3 Communications, USA)

Brian Lawrence, (NARTE, UK)

Fred Frantz, (L-3 Communications, USA)

15:00 - 15:30 **PM Networking Break**

15:30 - 18:00 • Landsdowne Room

TECHNOLOGY TRACK**Theme: Algorithms and Technologies Enabling Dynamic Spectrum Access****Session Chair:**

Petri Mähönen, (RWTH Aachen University, Germany)

Tech 4-1: Distributed Coordinated Spectrum Sharing MAC Protocol for Cognitive Radio

Hao Nan and Sang-jo Yoo, (Inha University, Korea); Tae-In Hyon, (Samsung Advanced Institute of Technology Communication & Network Lab, Korea)

Tech 4-2: A Novel On-Demand Cognitive Pilot Channel Enabling Dynamic Spectrum Allocation

Jordi Perez-Romero, Oriol Sallent, Ramon Agusti and Lorenza Giupponi, (Universitat Politècnica de Catalunya, Spain)

Tech 4-3: Primary-Prioritized Markov Approach for Dynamic Spectrum Access

Beibei Wang, Zhu Ji and KJ Ray Liu, (University of Maryland, USA)

Tech 4-4: Single-Radio Adaptive Channel Algorithm for Spectrum Agile Wireless Ad Hoc Networks

Liangping Ma and Bo Ryu, (San Diego Research Center, Inc., USA); Chien-Chung Shen, (University of Delaware, USA)

Tech 4-5: ESCAPE: A Channel Evacuation Protocol for Spectrum-Agile Networks

Xin Liu and Zhi Ding, (University of California - Davis, USA)

Tech 4-6: Adaptive Positioning Systems for Cognitive Radios

Hasari Celebi and Huseyin Arslan, (University of South Florida, USA)

Tech 4-7: Performance of Transport Control Protocol over Dynamic Spectrum Access Links

Alex Slingerland, Przemyslaw Pawelczak and Venkatesha Prasad, (Delft University of Technology, The Netherlands)

Tech 4-8: C-MAC: A Cognitive MAC Protocol for Multi-Channel Wireless

Carlos Cordeiro and Kiran Challapali, (Philips Research North America, USA)

Thursday 19 April 2007

Continued

15:30 - 18:00 • Munster Room

POLICY TRACK**Theme: Cognitive Radio and Implications for the Future of Wireless****Session Chair:****Doug Sicker**, (University of Colorado, USA)**Policy 4-1: Can Cognitive Radio Support Broadband Wireless Access?**

Tim Brown and Douglas Sicker, (University of Colorado, USA)

Policy 4-2: Security Issues in Cognitive Radio

Sadia Ahmed, (University of South Florida, USA)

Policy 4-3: DoD Shared Spectrum Access Needs and Requirements

Erena Chan, (Institute for Defense Analyses, USA)

Policy 4-4: Cognitive Capabilities Use Cases for Public Safety

Frederick Frantz, (L-3 Communications, USA)

Policy 4-5: Cognitive Policy: Spectrum Policy Reforms to Enhance Potential for CR in Licensed Land Mobile Radio

Nancy Jesuale, (NetCityEngineering, USA); and Bernard Eydt, (Booz Allen Hamilton, USA)

15:30 - 18:00 • Ulster Room

XG Track**Theme: XG Session****Session Chair:****Preston Marshall**, (DARPA, USA)**XG-1: Introductory Presentation on XG Program Overview**

Preston Marshall, (DARPA, USA)

XG-2: A Description of the August 2006 XG Demonstrations at Fort A.P. Hill

Frederick W. Seelig, (Shared Spectrum Company, USA)

XG-3: XG Dynamic Spectrum Sharing Field Test Results

Mark Mchenry, (Shared Spectrum Company, USA)

XG-4: A Policy Engine for Spectrum Sharing

Grit Denker, (SRI International, USA)

XG-5: Policy-based Network Management for NeXt Generation Spectrum Access Control

Filip Perich and Mark Mchenry, (Shared Spectrum Company, USA)

XG-6: Dynamic Spectrum Sharing Detectors

Karl Steadman, Ashley Rose and Thao Nguyen, (Shared Spectrum Company, USA)

XG-7: Invited Paper on Nonlinear Effects

Paul Kolodzy, (Kolodzy Consulting, USA) and Martin Cave, (Warwick University, UK)

XG-8: Beyond XG

Preston Marshall, (DARPA, USA)

Friday 20 April 2007

8:00 - 10:00

PLENARY SESSION**OPENING WELCOME****Chair: Linda Doyle**, Trinity College, Ireland**KEYNOTE****Peter Cochrane**, ConceptLab

> Flying Upside Down - Is Nothing Sacred Anymore?

Invited**Preston Marshall**

> Dynamic Spectrum Access Progress, Results, and Challenges

Summary of Demonstrations**Keith Nolan**, (CTVR at Trinity College)**Todd Martin**, (STA Associates Inc)10:00 - 10:30 **AM Networking Break**

10:30 - 12:00

Plenary Policy IIIA**Technical and commercial factors influencing dynamic radios**

Dr. Robert Pepper, (Cisco, USA)

Plenary Technology IIIA: A Cognitive Radio System for Efficient Spectrum Utilization Using Adaptive Bandwidth Tuning

Yuan Yuan, (University of Maryland, USA); Victor Bahl, Philip Chou, Ranveer Chandra, Srihari Narlanka and Yunnan Wu, (Microsoft Research, USA)

Plenary Technology IIIB: Dynamic Spectrum Access and Coexistence Experiences Involving Two Independently Developed Cognitive Radio Testbeds

Keith Nolan, Paul Sutton and Linda Doyle, (Trinity College, Ireland); Tom Rondeau, Bin Le and Charles Bostian, (Virginia Tech, USA)

Plenary Technology IIIC: Feasibility of Dynamic Spectrum Access in Underutilized Television Bands

Victor Petty, Rakesh Rajbanshi, Dinesh Datla, Frederick Weidling, Daniel DePardo, Alexander Wyglinski, Joe Evans, Gary Minden and James Roberts, (University of Kansas, USA); Paul Kolodzy, (Kolodzy Consulting, USA); Michael Marcus, (Marcus Spectrum Solutions, France)