Wireless Grids Innovation Testbed

7th Consortium Meeting
January 28, 2011

Syracuse Center of Excellence in Energy and Environmental Systems (COE)

School of Information Studies
SYRACUSE UNIVERSITY

KAUFFMAN
The Foundation of Entrepreneurship

Wireless Grid Lab
Advancing Communication Through Research

WiGiT
Wireless Grids Innovation Testbed

Syracuse University

Welcome
7th Annual WiGiT Consortium

Dr. Steve Sawyer
Acting Associate Dean for Research

Dr. Carlos Hartmann
Computer Science

Syracuse University

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Announcements

Dr. Lee McKnight

- WiGiT's Virtual Organization grows, New members::
  - Seneca Nation of Indians, RIT, CCNY
  - Govsphere : George Mazevski
- Research
- Open Specifications

Director, Wireless Grid Lab
Syracuse University

7th WiGiT Meeting,
January 28, 2011

New Members, Research, Open Specs Schedule

Lee McKnight

Welcome!

BOCES Rockland County

City College of New York

Govsphere (please meet George Mazevski)

Rochester Institute of Technology

Seneca Nation of Indians

Research

Check out latest publications at:

http://wglab.net/publications

New student research, new publications from partners to be added soon, on range of topics

- Much more to be done with testbed resources (CORNET, 802.15.5, wireless grid apps, etc)
- And of course, new publications, both books & articles!
- Procedure: WiGiT partners have 30 days to preview – and correct – WiGiT publications before wider dissemination

Open Specs Schedule

8th WiGiT March 14 @ Virginia Tech

Review CORNET

Summer/Fall 2011: DRAFT 0.0 WiGiT specs

Spring 2012: Version 1.0

Beyond: TBD

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Towards Ambient Connectivity

Bob Frankston
Keynote

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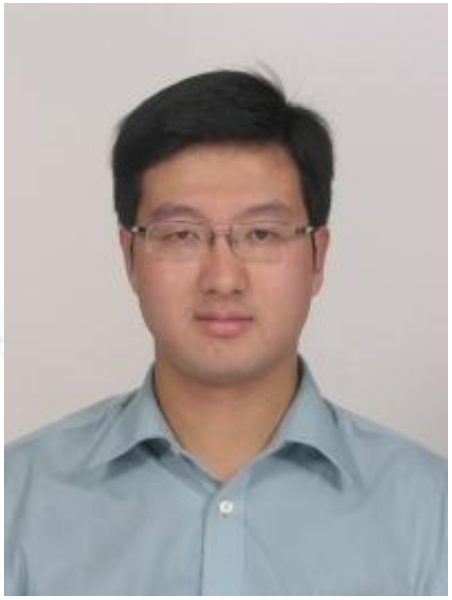
Virginia Tech CORNET Update

Wireless @ Virginia Tech



Dr. Tamal Bose
Associate Director, Wireless@VT

Xuetao Chen
PhD Candidate
Virginia Tech

WiGiT Updates

CORNET & WDCN

Tamal Bose, Wireless @VT, tbose@vt.edu
Xuetao Chen, Wireless@VT, chext@vt.edu

Wireless @ Virginia Tech

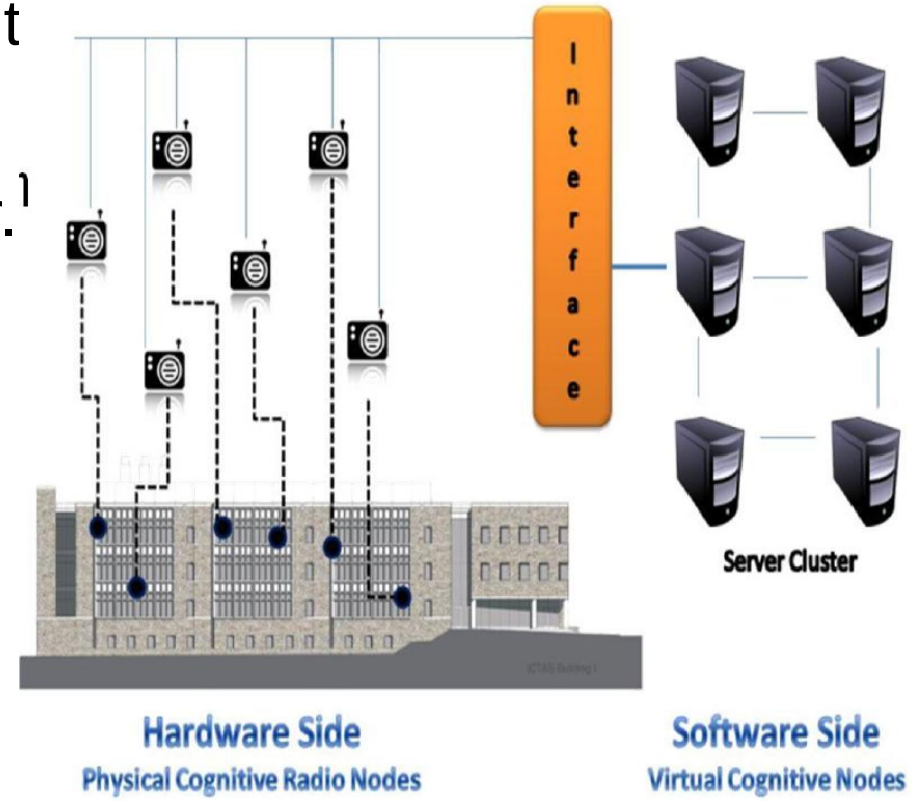
CORNET

Cognitive radio network testbed physically deployed throughout a new campus building.

48 nodes, 12 nodes each floor.[1]

Numerous productivity applications are feasible when given this infrastructure.

WiGiT is one of them.



Hardware

Radio Nodes: USRP

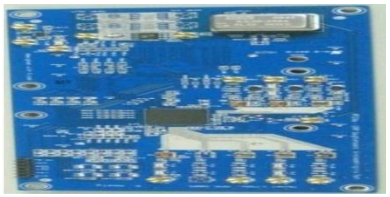
Motorola RFIC Ver. 4.0

100 MHz – 4GHz

20 MHz BW

25dB – 50 dB Rx Gain

Multiple Tx(3) and Rx(4) path



Server:

Intel Xeon Quadcore 2.13GHz

48 for radio, 5 for management

Upgradable to Intel Nehalem

3G RAM, Gigabit Ethernet

Software

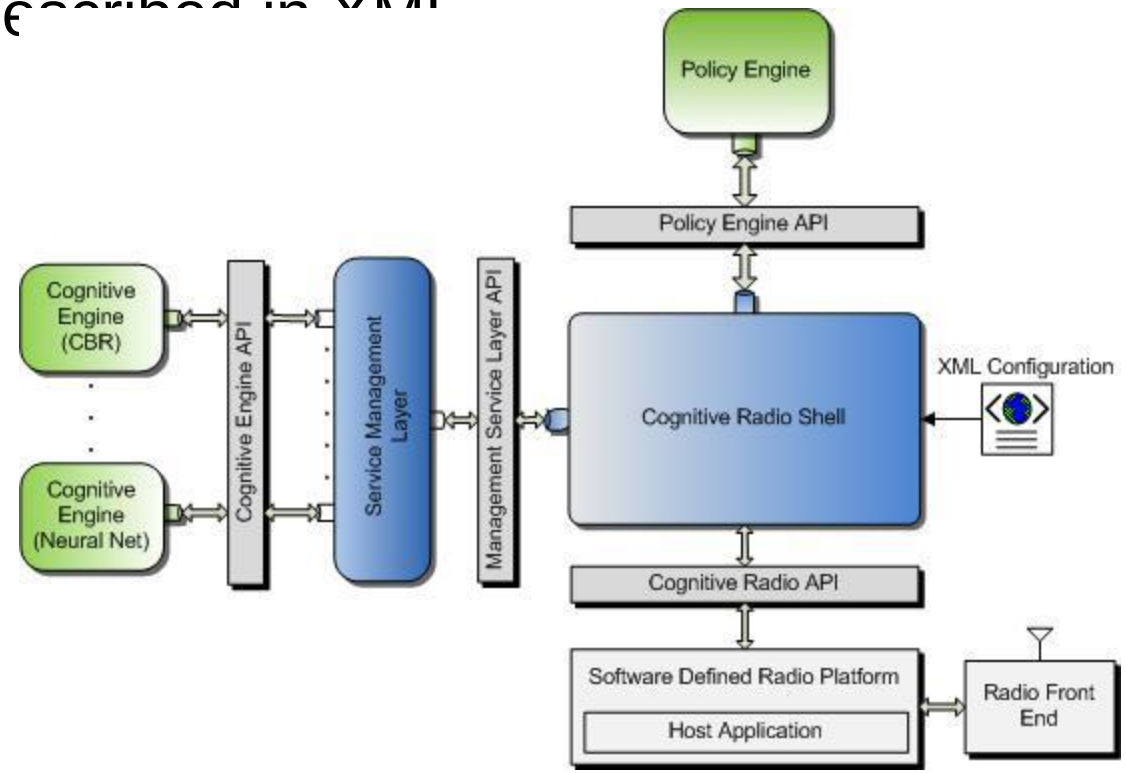
Open Source Cognitive Engine System API

Reference implementation uses a Case-Based Reasoning Engine

Radio Configuration described in XML

Application simply links to library to access system

Cognitive Engines can be swapped in and out



Updates for Last Six Months

Installed 42 nodes, 6 nodes to be installed in the future.

Included a tutorial in the CORNET.

Revised and improved the performance of all the demos including Dynamic Spectrum Access (DSA) and localization demos.

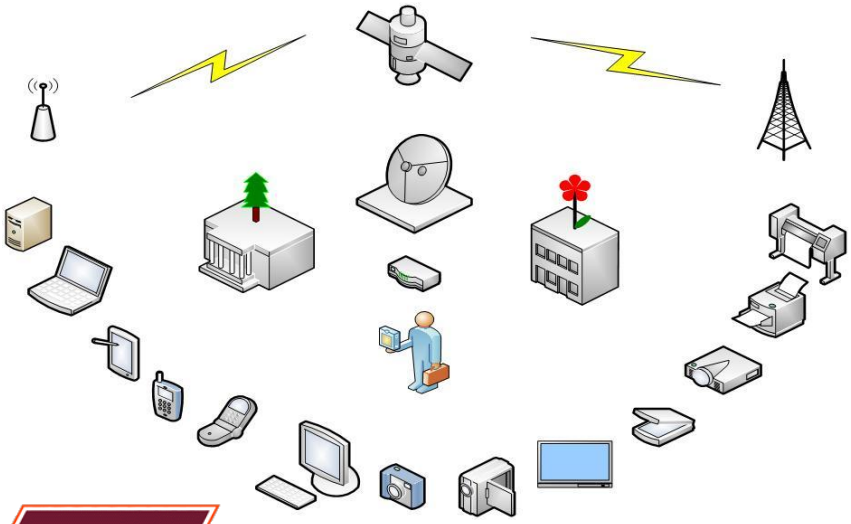
Currently, a wireless device for each node is being installed in order to power cycle the radio nodes remotely.

WDCN Updates

Network Model

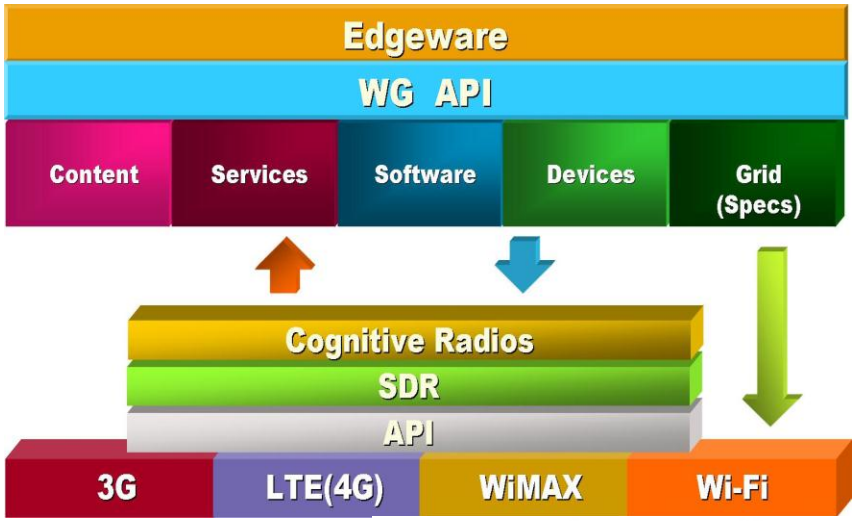
Heterogeneous network.

- Device, Channel, and Application.



Node Model

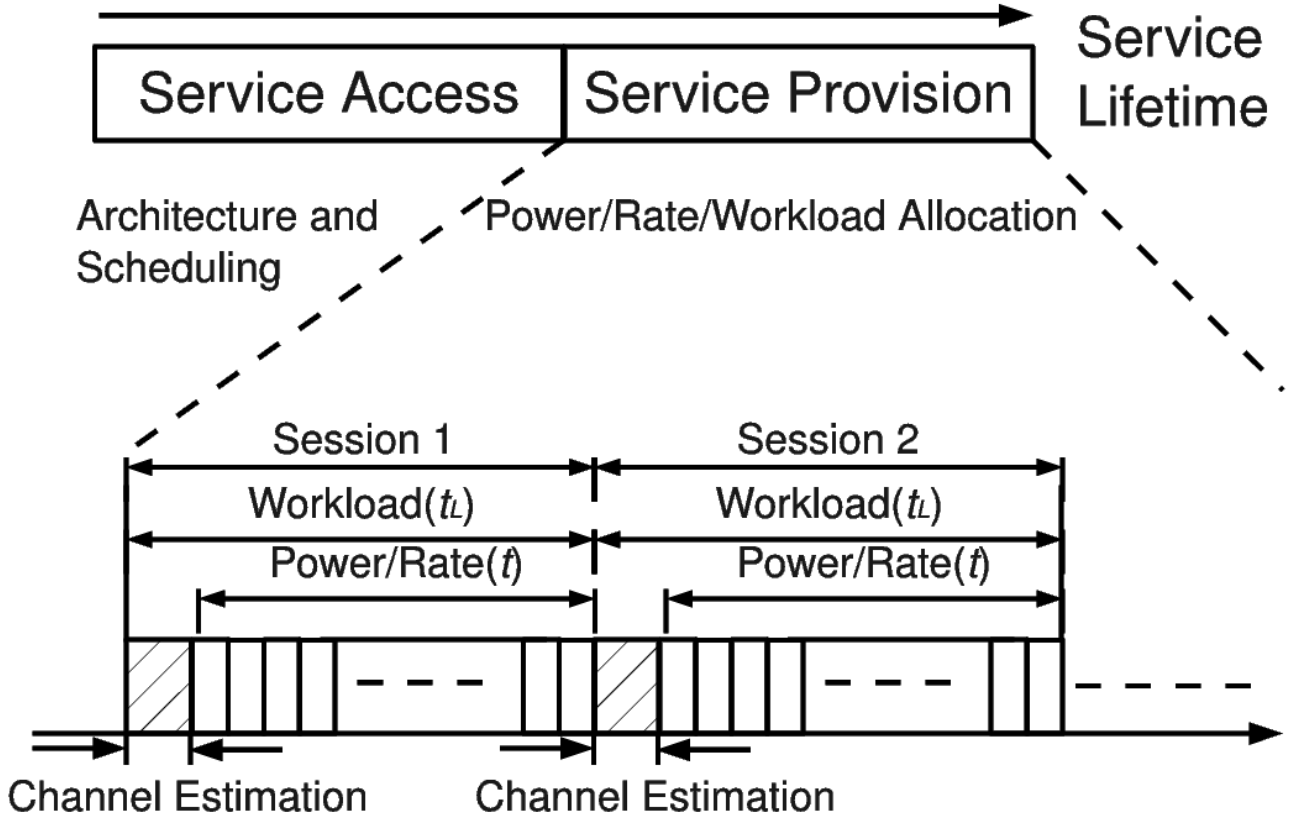
SDR for integrating different wireless standards.



Wireless @ Virginia Tech

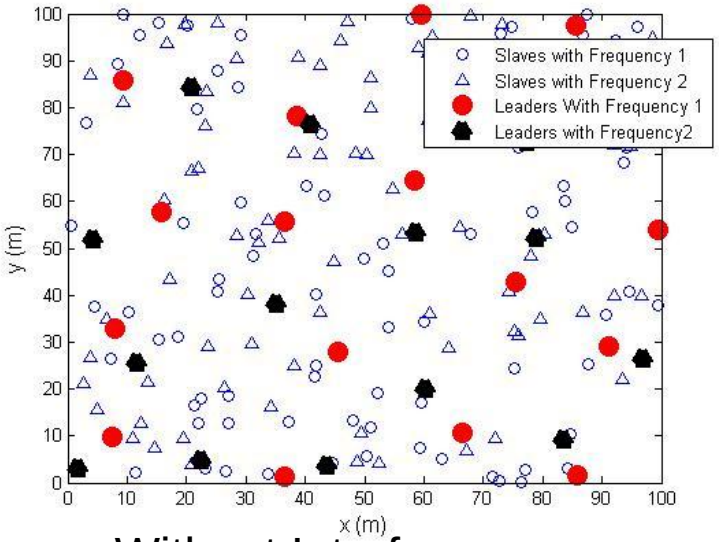
Service Model

Service Model

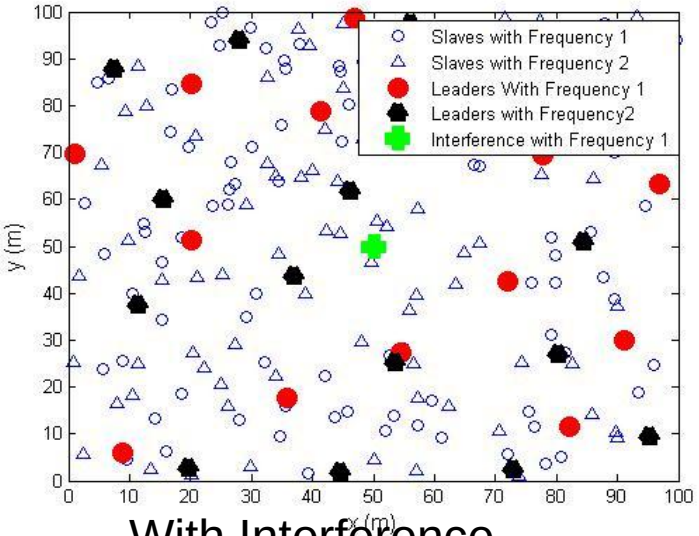


An Example

If there are 200 nodes located within an area of 100 by 100 square meters and frequency band F = 2, λ=0.02, α= 20 meters, ε=10-3. Then, p = 0.0263, $T1$ =954, and $T2$ =2592.



Without Interference

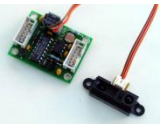


With Interference

Wireless Grid: Wireless Everywhere

Wireless Networking

Information Collection



Control System

Information Processing and Human Interface

Wireless @ Virginia Tech

Thank You!

Questions or Comments?

Wireless @ Virginia Tech

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Wireless Grid Secure Architecture & Interoperable Emergency Response Research

WiGiT Working Group Information Security

Joe Treglia, PhD Candidate

Tyson Brooks, PMP
PhD, DPS Candidate

Syracuse University

Conceptualizing a Secure Wireless Cloud

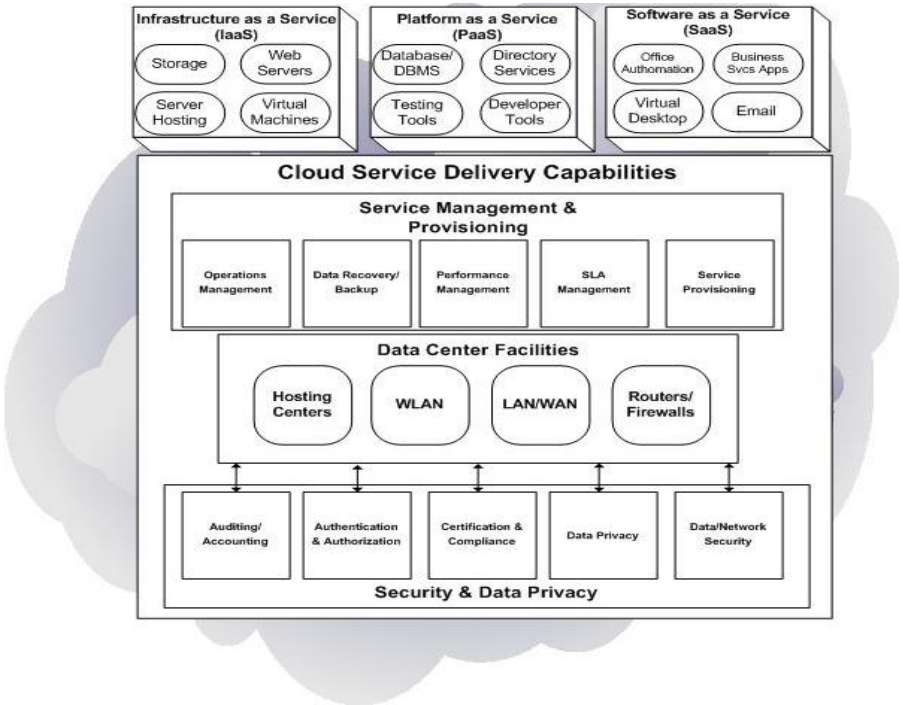
Bottom Line

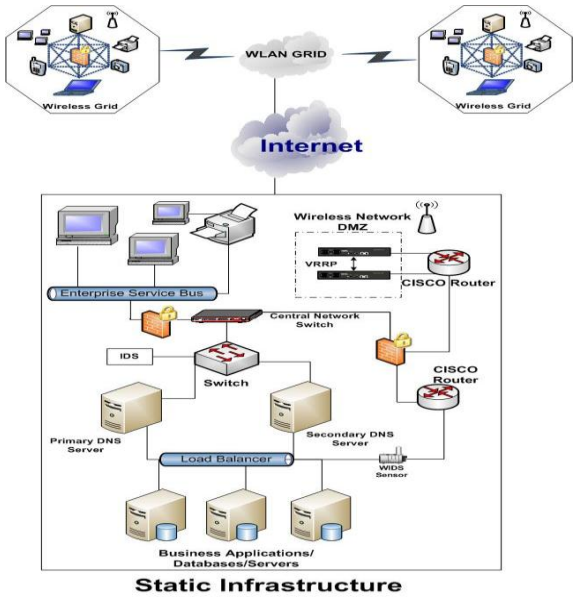
Cloud computing is a strong economic and technical force transforming IT, core desire to become more effective and efficient with IT

Cloud computing creates significant risks and requires a rethink - but not reinvention - of security programs and architecture

Wireless Grid provides sharing of physical and virtual resource among heterogeneous devices

Lack of security architecture is major issue with Wireless Grid





Conceptualizing a Secure Wireless Cloud

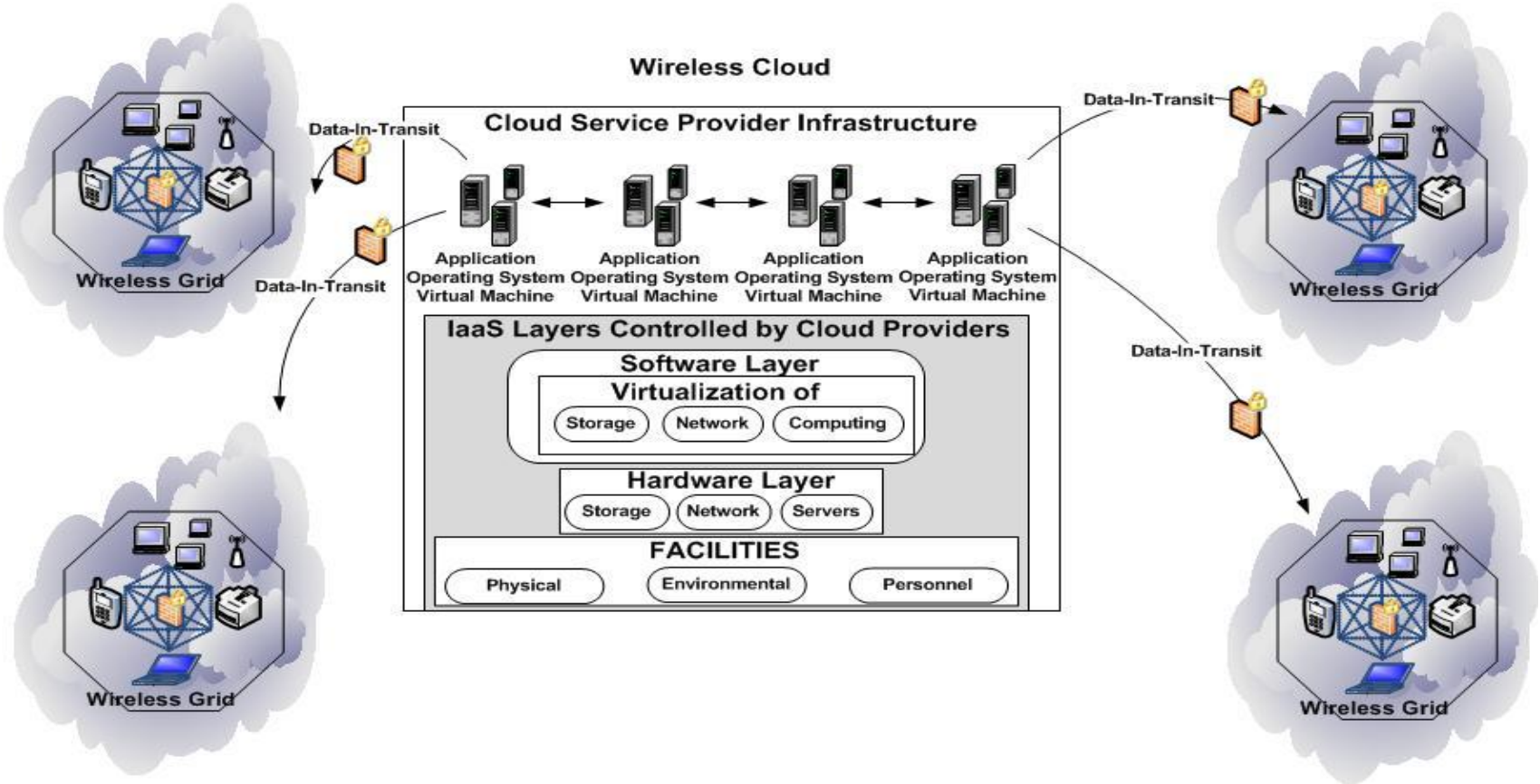
Wireless Cloud

Natural Extension of the Wireless Grid and Cloud Computing

> "*The set of disciplines, technologies, and business models used to render IT capabilities as on-demand services regardless of location*."

Cloud tiered architecture enabling sharing of resources

Has to address the potential security vulnerabilities, threats and attacks



Conceptualizing a Secure Wireless Cloud

What…me worry?

- Cloud's multi-tenant, dynamic characteristics may put sensitive, or regulated data at risk
- The relationship with cloud vendors, and in some cases, their viability creates strategic risk
- A lack of transparency and accountability about security about Wireless Grid contributes to user anxiety
- Enterprises are not all rushing to embrace wireless cloud offerings; many are investigating internal cloud deployment as well as hybrid cloud architectures that balance low costs with risk mitigation
- Numerous threat/vulnerabilities exist in both cloud and wireless architectures (e.g. confidentiality/integrity, infrastructure/communications, people, etc.)

Secure Wireless Cloud – Research Initiatives

- C.I.A. Triad (Confidentiality, Integrity, Availability)
  - Enterprises want to ensure that data/information is accessible, accurate and available to authorized users only
- Trust Management
  - Identifies the specific mechanisms that are necessary to respond to specific threat profiles
  - Must include implicit or explicit validation of an entity's identity or the characteristics necessary for a particular event or transaction to occur
- Data Access/Protection
  - Data is not only difficult to control in the wireless cloud, but it would also be difficult to access, classify, discover, analyze, protect, retain, and destroy
  - Mechanisms in place to secure data privacy, resource security and privacy imperatives
- Encryption
  - Data in motion should be encrypted to/from wireless cloud environments
  - Encryption would also be desirable for data-at-rest in multi-tenant wireless cloud environments
- Authentication and Identity Management
  - Must have some form of an identity management mechanism to authenticate users and services based on credentials and characteristics.

Conceptualizing a Secure Wireless Cloud

Conclusion

- Understanding of Cloud and Wireless Grid technologies and security policies
- Wireless Cloud computing must have a well-defined security architecture
- Visibility into who is doing what and how across the infrastructure is paramount
- Research, research & more research to provide validity for Enterprises (specifically the U.S. Department of Defense) to change their security and organizational business models/architectures
- Interested? Contact me @ **ttbrooks@syr.edu**

Reference

Brooks, T. Conceptualizing a Secure Wireless Cloud. WiGiT. Forthcoming 2011/2012.

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IP, Copyright & WiGiT: Open Innovation Best Practices

Kevin Dames, Esq., Syracuse University Library

Jacob Weintraub, Esq, JWPatents LLC

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Cyberlearning Wireless Grids Research & Practice

Angela Ramnarine-Rieks , Syracuse U
Sarah Chauncey
Sumita Mishra, RIT
Murali Venkatesh, Syracuse U
Peter Wong, Tufts & Museum of Science

7th WiGiT Meeting
Jan 28, 2011
Center of Excellence

Collaborative Learning Through Wireless Grids

Angela Ramnarine-Rieks
PhD Candidate
School of Information Studies,
Syracuse University

Technology Natives

Photo Credit: Flickr/drcorneilus

Yankee Group 2011 predictions: Forty one percent of consumers are likely to choose an advanced OS phone as their next mobile phone purchase.

The trend is towards devices that are smaller, more powerful, web-based, with **longer battery life,** using operating systems designed for mobile use. Features previously purchased in **separate devices are now converging** into one 'smart' device..

Wireless Grids and Collaborative Learning

Wireless Grids Summer Institute

- First publically controlled experiment
  - Museum of Science, Boston
  - High school students – 24
- Research Questions
  - How do the students use Wireless Grids during the two week period of the summer course?
  - Knowing the capabilities of the technology, what other applications besides screen- and audio-sharing do students think are viable for Wireless Grids?

Wireless Grids Summer Institute

STEM Disciplines

Instrument – surveys

Direct Quotes:

> “I think experiencing the Display Sharing Application was fun because you actually do it on your own rather than just watch someone else doing it.”

“I [would] like to know more about the wireless grid because I want to see how useful this technology can be.”

Dorm trials

Trials of the updates were offered at the dorms at Syracuse University.

- 284 students

Three research methods

- factorial survey, policy capturing or vignette studies, and conjoint measurement.

Scenario:

- Suppose you and your good friend Jamie are at the Library using your laptops to work on your own writing assignment that is due shortly. All of a sudden the screen of Jamie's laptop goes down. Because the rest of the laptop seems to work fine, he asks you to share your screen so he can submit his assignment in time.

Future Research

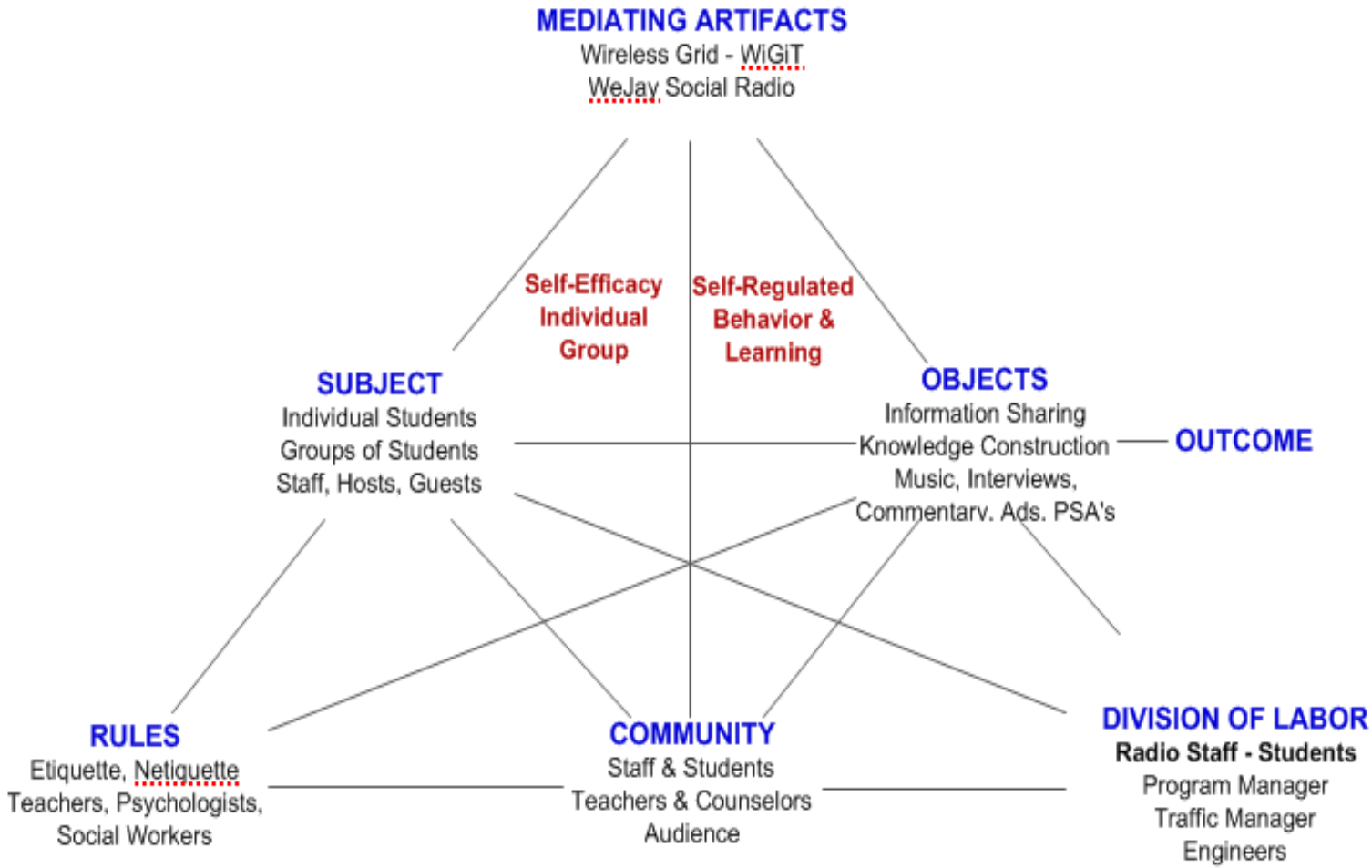
Principal research question

To what degree can wireless grid technologies can be used to successfully create a distributed, synchronous and asynchronous, collaborative learning environment?

Sarah Chauncey

Can You Hear Us Now? Investigating the Effects of Using **Wireless Grids Technologies** in Motivating Inquiry, Socialization, Participation and Trust in Fragile Populations

Can You Hear Us Now? Investigating the Effects of Using **Wireless Grids Technologies** in Motivating Inquiry, Socialization, Participation and Trust in Fragile Populations



Activity Theory

Sarah A. Chauncey
Chair, Dr. Ruth Small

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Cyberlearning Wireless Grids

Peter Wong,
Tufts University

Cyberlearning Wireless Grids

Clarify Objective: Learning to make WG vs. Learning through WG

Past Audience:

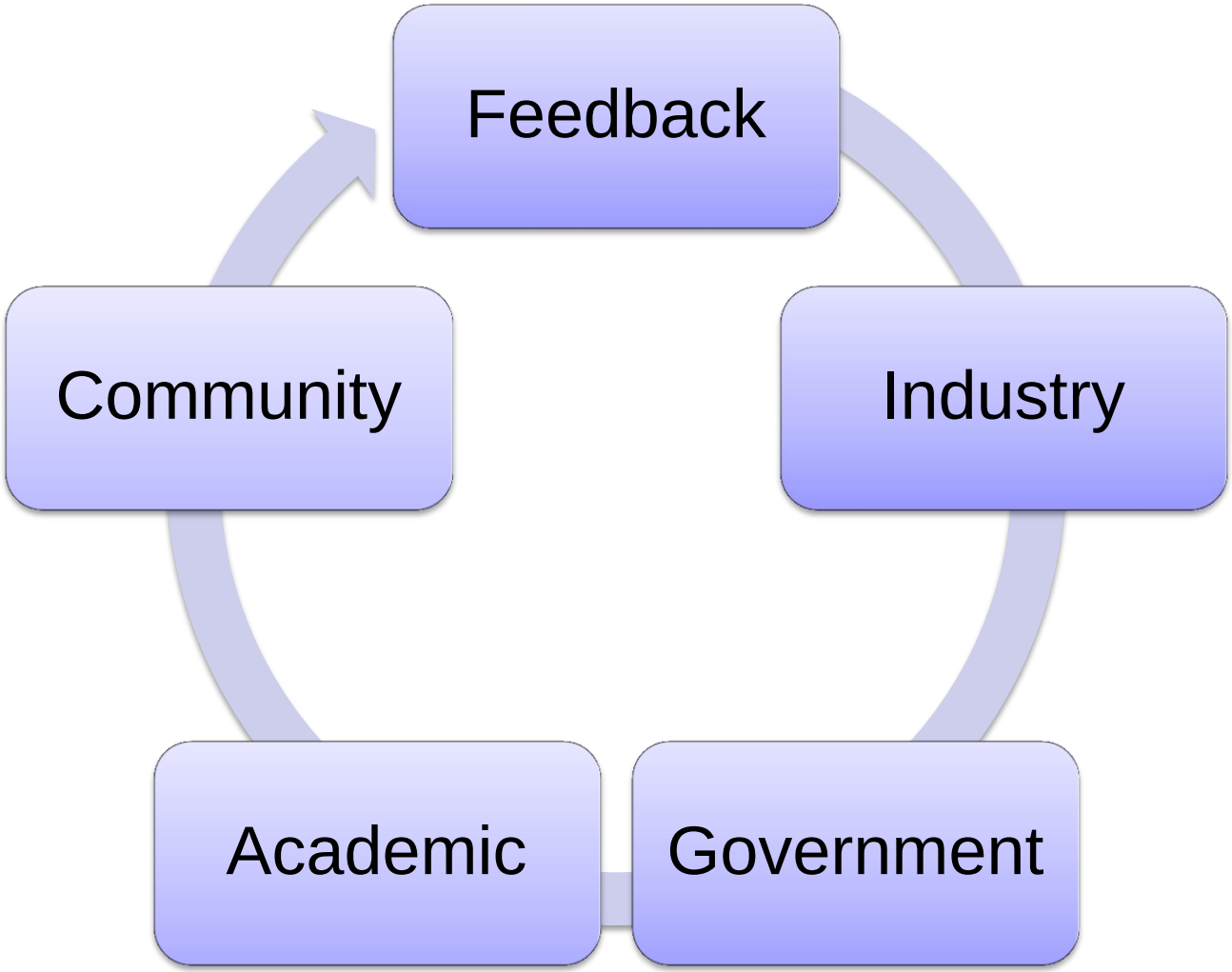
- PFI1: Tricity High School (ThroughWG) - difficult for students to envision
- PFI1: Netherland Grad Business (ThroughWG) - looking for killer app

Current Audience:

- Syracuse Undergrad IT (MakeWG) - needed client clarifications
- Tufts Undergrad Engineering (MakeWG) - Spring 2011

Dissemination: Conferences and Journals

Future directions: Partnerships and Funding


Feedback
Industry
Government
Academic
Community

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Summary & Next Steps

Dr. Tamal Bose,
Associate Director,
Wireless@VT
(Virginia Tech)

Dr. Craig Watters
Entrepreneurship
Whitman School of Management
(Syracuse University)

Dr. Lee McKnight,
Director, Wireless Grid Lab,
(Syracuse University)

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7th Consortium
End of Meeting
Thank You

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