



# Wireless/Sensor Breakout

GENI Town Hall Meeting  
10 March 2006

# Wireless/Sensor Breakout

- Experiments
- Questions and Concerns

# What Experiments?

## ■ Large wireless / sensor network

- Really evaluate the capacity limits?
- Compare theory versus experiment with real environments, protocols, etc.
- Many platforms, open layers, measurement tools

## ■ Mobility in sensor networks

- Limited mobility and passive mobility (nodes uninformed about their motion)
- As opposed to traditional cellular / WLAN mobility
- Range of mobility models and infrastructure

## ■ Sensor networks

- Internetworking
- Distributing functionality – for example, possibly data fusion in the core?

# What Experiments?

- Routing between wired/wireless – seamless interworking, with e.g., what new addressing?
- Routing and topology with directional antennas – cannot do this in ORBIT (research agendas)...
- Location and privacy experiments – scale and interworking in GENI might make these experiments much easier / better
- Cellular & ad hoc internetworking
- Configurable, repeatable mobility
- Vehicular networking – intermittent connectivity (DTNs), different traffic types (distributed mobile sensors)

# What Experiments?

## ■ Programmable MAC

- Both capability and environments in which to test and evaluate
- Is this feasible? Limited platform availability
- Possibly provide platforms to do this experimentation
- Is GENI large enough to influence openness of platforms?

## ■ Other lower layers?

- Hybrid ARQ, coding, modulation
- But really trying to address how wireless interfaces with rest of future Internet...

# What Experiments?

- FCS-Communications-like experiments
  - 20 SUVs with directional antennas, helicopters, etc.
- Some experiments might map to scaled-down testbeds
  - UCLA Lego implementation
  - CMU platform
  - Stony Brook miniaturized testbed
- Heavily instrumented environments to collect traffic information, etc.
- Wireless / security – denial of service, other types of attacks

# What Experiments?

- Disruption Tolerant Networks
- Hybrid FSO/RF
- 3G / 802.16 deployments
  - Work with municipalities – public safety, public access, public works
  - Also provides real users
  - But – how to get real traffic for in situ testbeds

# What Experiments?

- Co-location issues?
  - Sensor network to collect data, wireless PDA to interface
  - Some scenarios with some connected nodes, but maybe not all...
  
- Location determination experiments
  - Facilities to try methods – which might be at physical layer – on shared facility
  
- Use economies of scale for RF systems – shared test lab?
  
- Agile wideband transceivers
  - At Area 51?

# Questions and Concerns

- How do I get to GENI from my campus?
  - Islands of experimentation
  - PlanetLab and/or ORBIT models?
  - Some concern about complexity of slices
  
- What is expectation for GENI end result in wireless?
  - Large scale, realistic system evaluations

# Questions and Concerns

- Can virtualize down to network layer, how below?
  - One user at a time? Time scales may be different – PlanetLab long term versus ORBIT short experiments
- What does GENI provide beyond the local area?
  - In other words, wireless is inherently local
  - 1 – Shared facilities, 2 – Internetworking
  - Example – test the protocol interoperability of different wireless network subnets using the rest of GENI as transport
- The key is the research agendas
  - ORBIT, for example, might work for some experiments (routing) but not others (location-based scenarios)
  - How are the particular subnet testbeds structured – in detail – and how are they adapted for particular experiments?
- Real users on wireless nets, versus shared experiments
  - How to get more users onto the wireless portion of GENI? They are inherently local – need recruiting...

# Questions and Concerns

- How do we add a new sub-testbed that interfaces with an existing GENI?
- Can GENI make use of existing non-GENI testbeds?
  - How much sharing is possible?
- NSF model to encourage additions (self-owned) to GENI?
  - Fund research through programs?

# Questions and Concerns

- Shared testbed experiences – e.g., ORBIT
  - Customize shared facilities at physical layer?
  - Is the “accelerator” model the best?
  
- Need an operational model with staff to customize?
  - Vanilla and easily scaled are correlated
  - Customize, e.g, sensors with different antennas? How?
  - Mechanisms for community additions to testbed?
  - Analogous to experiment support in rest of GENI?
  
- How do you make GENI future-proof?