Rapidly Deployable Radio Networks


Dan Depardo, Kambhammettu Nalinimohan (Mohan), Craig Sparks, Scott Woodward

Ricardo Sanchez, Deb Chatterjee, Tim Gallagher, Saravanan Radhakrishnan, Fadi Wahhab, Shane Haas, John Paden

Information & Telecommunication Technology Center
University of Kansas
http://www.ittc.ukans.edu/RDRN

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RDRN Concepts

Phased array antenna with digital beamforming
Omni antenna

Out of band Orderwire Network
1.5 Mb/s Wireless ATM user link
45-155 Mb/s Wireless ATM Backbone Network

GPS based location used for antenna-beam steering

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RDRN Concepts
RDRN Phase I Accomplishments

• Developed digital beamforming transmitter, omnidirectional receiver at 1.2 GHz
  – $10^{-6}$ BER at ~10 km with 4 elements @ 2 W each
• Developed interoperable software ATM switch with flexible control architecture
  – based on Linux/ATM stack and Q.port
  – OC-3c and wireless ports
• Developed location-based (GPS) network control algorithms
• Developed adaptive HDLC algorithms
RDRN Phase II Project Goals

- Develop a modular and configurable radio with moderate range
- Develop rapidly self organizing IP/ATM based wireless network
- Deploy research prototypes for experimentation
- Extend location-based network control algorithms for QoS sensitive traffic
- Develop dynamic channel, beamforming, and link adaptation algorithms
New Ideas

- Modular and scaleable architecture based on phased array antenna, digital beamforming software radio, and software ATM switch
- Extended architectures and protocols for a quickly deployable radio network with highly mobile user and switch nodes
- Protocols for highly mobile communications with quality of service constraints, based on location information
RDRN Phase II Focus Areas

• **Software radio with smart antennas**
  - DBF receiver architecture
  - fabrication of software radio testbed
  - digital beamforming dynamics
  - cylindrical and hemispherical antennas

• **System implementation & integration**
  - design modular TX and RX
  - scaleable computing resources
  - system integration, testing, evaluation
RDRN Phase II Focus Areas

• Adaptive networking
  - flowspec for mobile nodes
  - efficient MAC protocols
  - resource reservation styles

• Channel estimation & link adaptation
  - channel estimation algorithms
  - angle of arrival estimation & beamforming
  - link level adaptation
Fabricate software radio testbed

Flowspec for mobile nodes

Beamforming dynamics

Efficient MAC protocols

Resource reservation styles

Channel & link adaptation algorithms

System integration and testing

End of Phase II

Advanced antennas

IP/ATM performance evaluation

Scaleable computing resources

Design modular TX & RX

Design digital beamforming receiver architecture

Project start

Resource reservation styles

Scaleable computing resources

Efficient MAC protocols

IP/ATM performance evaluation

Advanced antennas

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