Overarching Architecture for Mobile and Wireless Networks

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Challenged Networks

- Mobile, frequently disconnected, users
- DTNs
- Multi-modal WSNs serving diverse apps
  - from temp. to video sensors
- Mobile devices with multiple interfaces
- Connectivity for underserved communities: still a major issue
- Vehicular networks

Common Characteristics

- Unpredictable connectivity, but …
- … lots of diversity: data, nodes, links, performance criteria, …
- Current Solutions – Status Quo
  - Diverse, point solutions
  - Communication embedded in application
  - Ad hoc solutions to critical problems, e.g. security, energy-efficiency, incentives, etc.
  - Poorly integrated in today's "Internet"

The Opportunity: Overarching Architecture

- Need for an overarching networking architecture
  - Seamless transition between operating regimes
  - Leverage Content-centric and in-network services
  - Leverage infrastructure-less networking paradigms, e.g., multi-hop, DTNs
  - Leverage heterogeneous wireless access technologies
- Architecture must be adaptable to the context/scenario
  - Performance metrics will differ
  - Diverse resource constraints
  - Security requirements are different
  - Adaptable both within and across regimes
    - (Re)negotiate with application on nature of service

Research Issues

- Appropriate evaluation metrics?
  - Mapping appl metrics onto network metrics
- Opportunistic Communication
  - Network service driven preferred
- Resource Sharing and Management
- Incentive schemes for cooperation
- Energy-efficient computing and networking
- Adaptable to multiple contexts
- Adaptable to multiple application models
  - In-network data aggregation, security, ..
- How much is reusable across network types?

Security and Privacy

- Security and Privacy
  - Trust
  - Provable/quantifiable security
  - Impact on other metrics, e.g. throughput, energy, ..
- Not all applications may be appropriate in all contexts
  - Lack of trust, e.g. in forwarding nodes, ..