

NSF Wireless Edge: Apps Session

**Bob Iannucci
Lakshmi Subramanian**

Participants:

**Mark Berman, Timothy Salo, George Riley, Murat Yuksel,
Ting Zhu, Houbing Song, Gil Zussman, Romit Roy Choudhury**

Crazy Apps

- Smart Cities and Environment
 - Earthquake, Water Quality, Hydrology
 - Vehicular
 - Passive Infrastructure
- Call for Application Centric Testbeds
 - MVNO – Private Carrier Model
 - Context Aware CDN
 - Drones – Latency sensitive? (3D-Mesh)

Environmental Monitoring

- Remote areas -> no infra
 - Current: Deploying narrow band VHF channels over 10s of miles, or copters flying and gathering data?
- Water quality monitoring/Air quality monitoring
- Earthquake monitoring
- Hydrology monitoring (Flash floods, Water quality?)
 - Chemical leakage in West Virginia
- Alert based applications (Urgent) vs Continuous monitoring
- New: Need better coverage, cost shared network?
- Why Research Infrastructure?
 - Need better way to understand environment (climate change)
 - Reduce property damage ?
 - Q: What is the business model? – Economic vs Social value?
 - A: Shared infrastructure? – Cost effective

Earthquake App

- Every (ms) of an Earthquake feedback?
 - Being able to locally process and react? Instead of cloud-centric response?
 - Local aggregation?
 - Event Detection
 - Quick messaging
- Cyber-geophysical systems
- Internet of Natural Things?

Smart Cities Applications

- Street View vs Street Video
 - Surveillance as a Service
- Traffic Jams
- Street Light Control – turn them on/off on demand?
- Emergency Response
- Smart Grid

Passive Infrastructure

- Infrastructure talks to you!
- Network based out “passive” participants?
 - Pave your road with RFIDs every 12 ft.
 - Elements are activated only when they people come by and visit them?
- How can we instrument our city?
 - Huge upfront costs? Adding Sensors as part of the Infrastructure rollout?
 - Incremental investment
- Car driving by smart roads with in built sensors
- Pouring location aware sensors

Vehicular applications

- Driverless vehicles
 - Collision detection and avoidance system
- Check email while you are driving?
- Sensing/Network/Cloud - Actuation
 - Getting from Sensing to Actuation from 200 ms to 2 ms?
 - Anything actuation based is local? – Highway sensitive?
 - Moving computation to the Network?

The Multi-campus MVNO: Private Carrier Model

- How do we bootstrap a replacement infrastructure to large mobile provider infrastructure: ATT, Verizon
- New infrastructure -> completely programmable?
- 1000s of users? – distribute SIM Cards to users?
- Campus carrier?
 - Spidercloud, ATT SDN
- Mobile NSFNET: Multicampus MVNO?
- What are the apps for it?
- What do you want to look into this box?
 - What aspects does a user/admin/operator want to see?
 - Cellular state transitions, what apps are users are they using, consumption?
 - Network centric view vs User centric view
 - Sub-carrier assignment or changing LTE?

In-Network Automatic Content Distribution/Management?

- Traveling a train -> streaming video and reaching a shadow area (accident ahead)
 - Precache your video?
 - Something local -> Local CDN redistribution?
 - On demand CDN
 - Signaling between the app and the network?
 - Sharing between the apps to the network and the network needs to quickly adapt to app requirements
 - Emergency response with a CDN – why not been there?
 - Local vs Cloud controlled: Latency?
 - Intelligent decision making of what content is geographically required by users in a region?
 - Saving wireless spectrum?
 - A lot of people want similar content -> emergency setting?

Call for a UAV Testbed

- Providing connectivity coverage and moving UAVs based on demand
- Surveillance applications
- Personalized UAV applications
 - Dedicated hotspots
 - Take a picture
 - Street video
 - Driving directions in lost areas?
 - Person tracking for safety?