Building Networks and Public Safety Communications Project
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BFRL Project:

Does the building have a role to play in radio interoperability?

Why connect to the building or use the building networks?

- Answer from previous project:
  - Buildings have information that responders need
- Answers for current project:
  - Most emergency incidents involve buildings
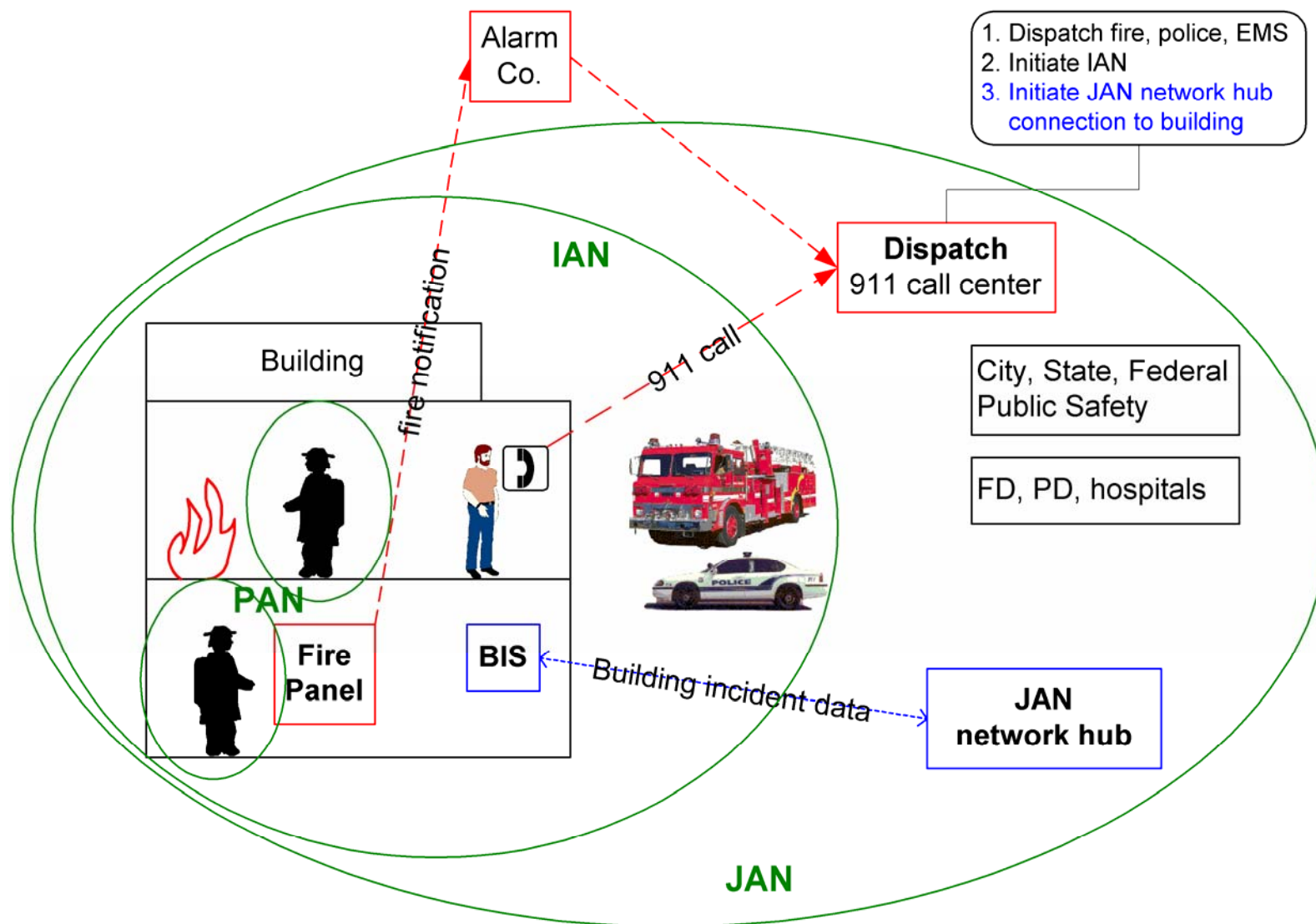 - Large buildings are more complex and are more likely to present RF signal propagation problems
- Bonus:
  - Connecting to the building could aid in referencing location within the building space.

So how do we make use of building networks and is it practical?

Building connections

Alarm Co.

1. Dispatch fire, police, EMS
2. Initiate IAN
3. Initiate JAN network hub connection to building

IAN

Building

Dispatch
911 call center

City, State, Federal Public Safety

FD, PD, hospitals

fire notification

911 call

PAN

Fire Panel

BIS

Building incident data

JAN network hub

JAN

NIST

Some objections to connecting to building

1. Lots of info sources: utilities, weather, local gov't (building plans), DOT, hospitals, Red Cross, FEMA, national guard, etc.
2. SAFECOM is focused on comm systems owned and maintained by PS
3. The building network is not reliable—it might get burned up
4. Building owners don't want to pay the cost of added infrastructure

- Buildings are part of the incident
  - The building information server (BIS) provides mission critical info for situational awareness.
  - Building provides communication path from Incident Command to the responder, acting as a node on the IAN
- Municipalities are moving toward requiring large building owners to provide radio coverage—why not tie into that effort?
- Beyond buildings—sensor info can be collected from other on-site sensors and served to PS

Project Components

1. **Investigate the potential use of the building network infrastructures to facilitate public safety communications.**

    - Description of current building networks

    - Scenario development

    - Network traffic simulation

    - AML networks study

2. **Recommend changes to the SAFECOM Statement of Requirements**

    - Draft changes to SoR based on Component 1

    - Building community and PS evaluation of changes to SoR

3. **Host a conference to identify best practices for effective high-rise RF communication.**

IT network

- IP based, has bandwidth to handle MCVVD traffic.
- Accessible in office spaces, less so in other spaces
- Would require wifi nodes on the network
- Controlled by IT dept rather than facility dept.
- Not guaranteed reliability. No safety codes.
- Subject to hacking

HVAC/ Facility network

- Many facilities have dedicated building control network, but may have multiple vendors over time.

- Common now to put high level IP controllers on IT LAN and share backbone.

- BACnet has 3 primary link layers: IP, Ethernet, MSTP

- Lower level controllers and devices are typically on a low-speed MSTP network

- Networks are fairly accessible—where ever there is a thermostat or VAV box

- Lighting networks are similar to HVAC networks, if a digital lighting network is present.

Fire network

- Current fire network is digital, low-speed, not IP

- loop architecture for redundancy

- Accessible in all spaces via smoke sensors

- Could pass MCVVD signal on top in DSL fashion

- Governed by safety codes and not subject to modification without oversight by fire dept.

- Perhaps could be used as wired network in combination with DAS to limit number of wifi APs

Distributed Antenna (DAS)

- Multiple use, could use for 800MHz radios as well as cell phone and wifi
- Will become common in large buildings
- Still need wired network from wifi APs to external APs
- DAS extends range of an AP, limits number required
- For 800MHz, the antenna could be used in passive mode to bring all internal radio signals to a single receiver
- This is basically the solution (with or without amps) being used in large buildings today

Scenario Development

- We looked at different scenarios for use of building networks to connect to responders inside buildings
- 3 scenarios:
  - School shooter, police response
  - Residential high-rise fire, small fire response
  - Explosion in large building, major fire response
- Using the AML explosion scenario for simulation work

Simulation work

- Have OPNET now in the labs and training to use it
- Have developed simple simulation model to look at load on network based on AML explosion scenario
- Have traffic profiles for different networks
- Ongoing work

Summary of Project Component 1

- Study of building networks is nearly complete, some parts still collecting information
- Analysis in progress and report is in preparation
- Scenarios developed
- Simulation work is continuing

Component 2 Update SoR

- Take the results of our previous OLES project and incorporate into SoR--done
- Working with Andy and considering place of building in SoR and potential of Addendum to SoR
- Getting feedback from PS and building communities
- Ongoing effort

BFRL
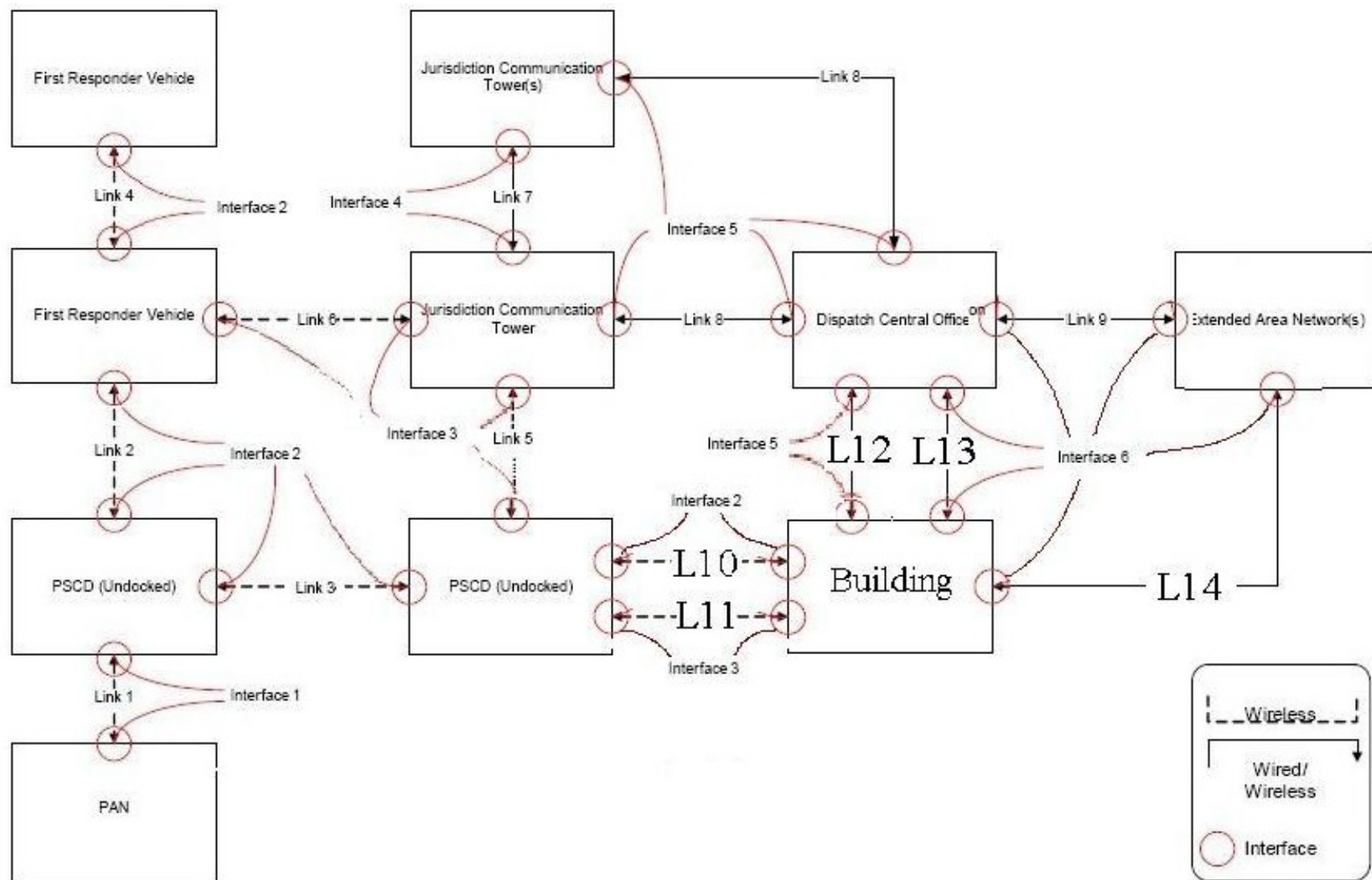
SoR feedback received so far

- Have heard back from 2 Fire Chiefs, one Police Chief

- Excellent comments on the SoR as well as some of our specific questions

- All see the building as a tremendous aid to response, and believe the building should be part of the network

- Recognize that demand on building owners needs to be analyzed relative to building size and jurisdiction needs

- One chief raised the issue of CAD to CAD system standards for mutual aid resource tracking between jurisdictions

Component 3:
High Rise RF Communications
Best Practices Conference

- ■ workshop with public safety to discuss best practices for radio communication systems in high-rises and large-scale incidents (like hurricane Katrina)

- ■ Very successful meeting held June 20-21, 2006 at NIST

- ■ Large city fire and police, ATF, building fire system vendors, radio manufacturers.

- ■ Discussed what the problems are and what works today

- ■ Report due out soon

Conclusions from workshop

HIGH RISE ISSUES

■ **There are solutions to high-rise comm difficulties:**

- ◥ Post radio
- ◥ robust network
- ◥ BDAs/ repeater systems installed in building
- ◥ work together to find a solution
- ◥ simple solutions (move the radio)

■ **Don't like digital, and narrow banding promises worse**

- ◥ Time lag – hearing yourself talk
- ◥ If digital signal gets corrupted, no transmission
- ◥ Cops/firefighters want to hear everything, digital cleans the signal and scrubs information that is useful
- ◥ Digital radios still sound inhuman
- ◥ Officer needing help is a problem for digital as only one can talk at a time
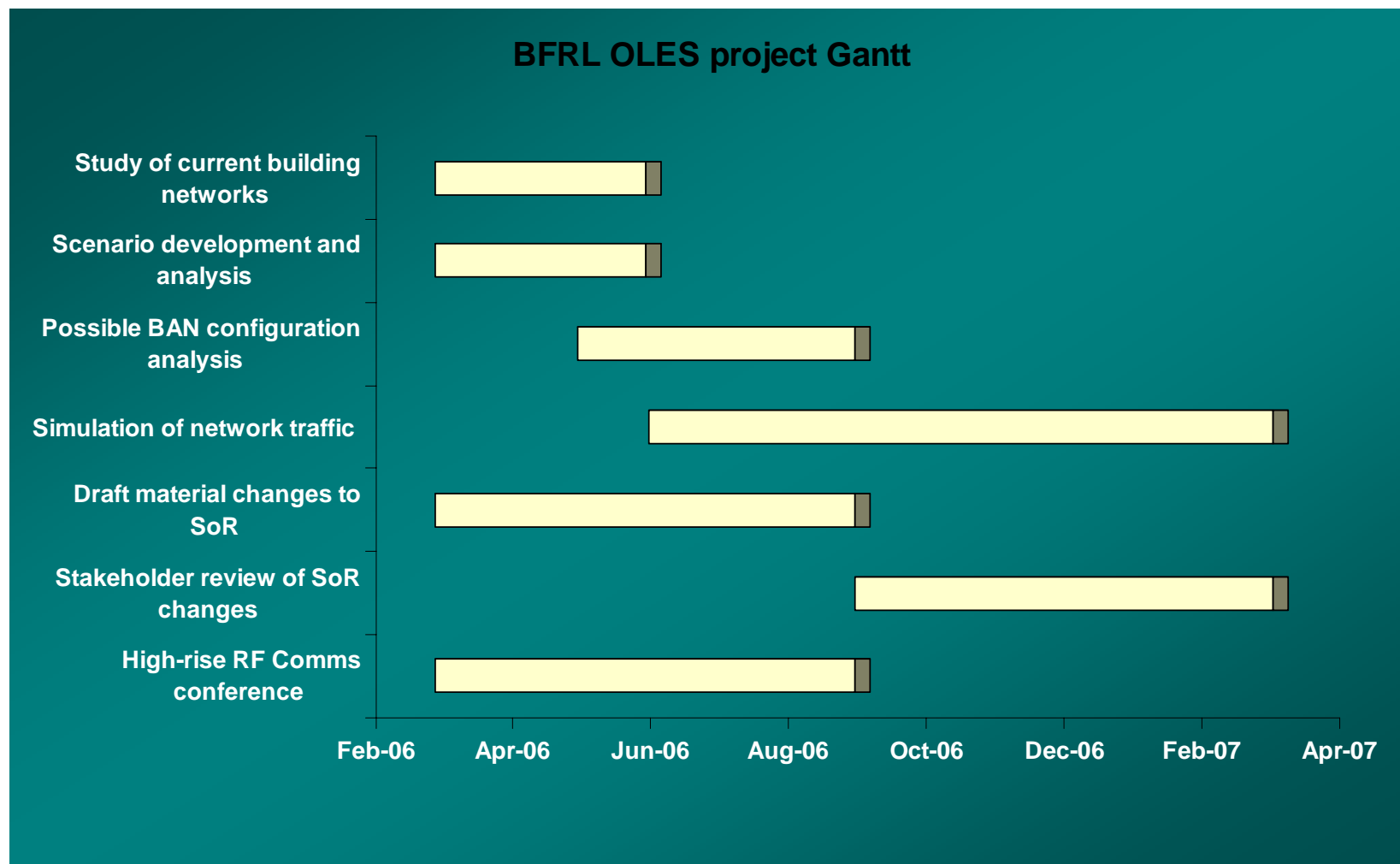- ◥ Some cities have dropped the 800 MHz systems

Conclusions from workshop

LARGE INCIDENT/COMPLEX INCIDENT ISSUES

■ No *technical* solutions to the command and control problems

- ◥ Interoperability is about SOP
- ◥ Need interoperability in command, not on tactical level channel. Everybody agreed that interoperability is only at the command level
- ◥ Commanders get together—don't need radios to talk. So, not a technical issue
- ◥ If the infrastructure is there, then you're OK if you follow Incident Command System and NIMS
- ◥ Need planning, teamwork, leadership and good training

■ **Example from last inauguration: had 127 agencies out at Herndon TSA. Commanders talk, then plans sent out by phones to respective agencies.**

BFRL Project Component timeline

BFRL OLES project Gantt

Tasks:
- Study of current building networks
- Scenario development and analysis
- Possible BAN configuration analysis
- Simulation of network traffic
- Draft material changes to SoR
- Stakeholder review of SoR changes
- High-rise RF Comms conference

Timeline: Feb-06, Apr-06, Jun-06, Aug-06, Oct-06, Dec-06, Feb-07, Apr-07

Getting building data to first responders