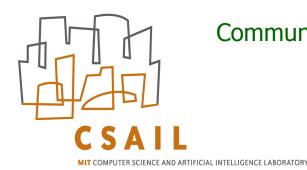
"Defining the roadmap for communications and its impact on adjacent industries."

## Spectrum Management Working Group

"Toward More Efficient Spectrum Management"

## William Lehr

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Communications Futures Program (CFP) Workshop Friday, April 25, 2014 Cambridge, MA

## Spectrum Management: future is shared spectrum

#### Future is (increasingly) wireless → RF spectrum scarcity!!!

# Need commercialize Dynamic Spectrum Access (DSA) technology, business models and policy to support novel ways to share spectrum in multiple ways...

- National Broadband Plan (<u>March2010</u>): "500MHz additional spectrum for mobile BB"
- Spectrum Act (Feb2012): legislative mandate for FCC
- PCAST report (<u>Jul2012</u>): government spectrum sharing
- FCC Initiatives: 600MHz (Incentive Auctions), TVWS, 3.5GHz, 5GHz, etc.
- CFP Spectrum WG
  - LSA/ASA CFP Spectrum WG (Feb2014)
  - LTE-U (Mar2014+)



#### **MIT Communications Futures Program**

## Toward More Efficient Spectrum Management

New Models for Protected Shared Access Spectrum Working Group William Lehr, Chair Computer Science and Artificial Intelligence Lab (CSAIL)

(CFP White Paper)

#### Licensed Shared Access (LSA)/Authorized Shared Access (ASA)

- New licensing regime (between licensed & unlicensed)
- Protected sharing with Incumbent (e.g., government spectrum)
- Standards, Business/technology, & Policy reforms...
- EU: 2.3GHz, US: 3.5GHz, 1.7/2.1GHz, 5GHz, 600MHz/TVWS

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## 3.5GHz Proceeding

#### FCC GN Docket 12-354

- up to 150 MHz of spectrum @ 3.55-3.70GHz, partially shared with DoD radar
- Small Cells, but also other uses (backhaul, rural access)
- Timeline: launched 2012, FNPRM (April 2014)
- 3 Tiers Usage: (a) Incumbent, (b) Priority Access, (c) General Auth Access
  - PA = LSA/ASA, GAA = Unlicensed\*

#### Spectrum Access System

- Priority Access Licenses (PAL): granular time/geo, tradable
- Unlicensed (GAA): everywhere else
- Competing SAS: models, sensing, etc.

#### Why important?

- Small cells!
- New model for sharing spectrum, especially between govt & commercial users
- More dynamically flexible spectrum mgmt process
- Dynamic Spectrum Access (DSA) compatible framework... (leverages TVWS)

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## **5GHz Proceeding**

#### FCC ET Docket 13-49

- Add 195 to current 555MHz of 5GHz available for unlicensed use.
- Spectrum shared with Radar, Satellite, DoD airborne.
- Unlicensed uses Dynamic Frequency Selectrion (DFS) to share (aka, LBS).
- Timeline: 300MHz (1997), +255Mhz (2003), +195MHz (2013)
- R&O adopted March 31, 2014

#### "Gigabit" WiFi (802.11ac)

- Higher power for 5Ghz unlicensed devices & Outside uses.
  - In-home 5GHz coverage ~ 2.4GHz
  - Global harmonization, simpler rules → lower equipment costs
  - WISP backhaul (point-to-point) and public hotspot access

#### Why important?

- Small cells
- Unlicensed spectrum
- 802.11ac is big jump for WiFi (40->160MHz channels, 64->256QAM, 4->8xMIMO)

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#### LTE-U – started in March

#### LTE over Unlicensed

- Can LTE-U match WiFi economics?
- LTE-U co-existence with unlicensed?
- Roadmap/barriers/opportunities/forecasts?
- Co-existence of "WiFi" (user-deployed) & "LTE" (MNO)??
  - Small cells
  - Spectrum access
  - Service control (source-based routing, multihoming, etc.)

```
And, continue to track....

5GHz
```

3.5Ghz

1.7/2.3GHz

600MHz

etc.

## Spectrum WG: spectrum sharing policy

- -- Biweekly WEBEX calls (Thursday 10am EDT, -4GMT)
- -- CFP members + invited guests
- -- Website for sharing links, notes, drafts
- -- Email list for announcements, discussions
- -- Deliverables: white paper, presentations, research, workshops....

For more information:

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