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October 1, 2012

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Ms. Marlene H. Dortch, Secretary
Federal Communications Commission
445 Twelfth Street, SW
Washington, DC 20554

RE: Notice of Ex Parte Presentation
WT Docket No. 10-208 - Universal Service Reform – Mobility Fund
ET Docket No. 10-237 – Promoting More Efficient Use of Spectrum
Through Dynamic Spectrum Use Technologies
PS Docket No. 11-5 – Utilizing Rapidly Deployable Aerial
Communications Architecture (DACA) in Response to an
Emergency

Dear Ms. Dortch:

On September 27, 2012, Benjamin H. Dickens, John A. Prendergast and undersigned counsel of this firm, and representatives of xG Technology, Inc. (xG) and its parent company, MB Technology Holdings, LLC, met with members of the Commission's staff in Washington, DC (named below), to describe xG's latest developments in cognitive radio technology, including its rapid deployment and its interference avoidance and mitigation capabilities, in meeting public safety and homeland security goals in emergency and mission critical situations.

The meeting included a PowerPoint presentation, included herein, and a live demonstration of a self-contained, single-cell xMax system in a commercially obtained vehicle that had an antenna mast and satellite uplink equipment installed.

The demonstration was done to exhibit xG's equipment and capabilities, to prove that a working spectrum sharing system does exist in connection with the Commission's DACA

proceeding (PS Docket No. 11-15), and to assuage the concerns of some who have claimed that cognitive radio is as yet an unproven technology.¹

The demonstration used commercial off-the-shelf (COTS) electronic equipment that was used to send and receive push-to-talk calls, voice phone calls, text messages and Internet data applications through the use of pre-production versions of the xMod (an xMax to WiFi, USB, Ethernet bridge) and the xMax system to and from various locations. Part of the demonstration with the COTS equipment was conducted in a moving vehicle to show the mobility of the system. The entire demonstration was successfully conducted, without interference, in the shared unlicensed 900 MHz band of the metro DC area.

Only frequencies in the unlicensed 900 MHz band under Part 15 of the Commission's Rules were used along with Wi-Fi to connect the COTS equipment to the xMod device.

We also urged the Commission, in connection with the Mobility Phase II proceeding (WT Docket No. 10-208) to make it clear that the "spectrum availability" requirement will be considered satisfied where a carrier plans to provide service using technology that can achieve 3G or better service using unlicensed spectrum, such as xG's xMax technology.

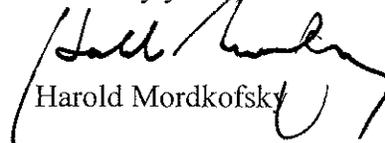
The xG representatives were George Schmitt (CEO of xG's parent), John Coleman (CEO of xG) and Rick Rotondo (Vice President of Marketing).

The member of the Commission's staff attending the meeting included, from the Office of Engineering and Technology, Julius Knapp (Chief), Ira Keltz (Deputy Chief), Bruce Romano (Associate Chief - Legal), Mark Settle (Deputy Chief, Policy and Rules Division), Robert Weller (Technical Analysis Branch Chief, Electromagnetic Compatibility Division), and Engineers, Michael Ha, Brett Greenwalt, Peter Georgiou and Aole Wilkins; and from the Public Safety and Homeland Security Bureau's Emergency Response Interoperability Center (ERIC), Behzad Ghaffari, Ph.D. (Systems Engineering Chief), Rasoul Safavian (Engineer) and Brian Hurley (Chief Counsel).

A copy of this filing is being emailed to each member of the Commission's staff mentioned above.

Please contact undersigned counsel if there are any questions concerning this filing.

Sincerely yours,



Harold Mordkofsky

¹ See, e.g., Reply Comments of CTIA – The Wireless Association in PS Docket No. 11-15, at pp. 5-6, citing the Commission's Notice of Inquiry in ET Docket No. 10-237, 25 FCC Rcd 16632 (2010).



xMax for Public Safety, Homeland Security and DACA Applications

Presentation to the FCC



September, 2012



- ▶ DACA and other Public Safety Initiatives
- ▶ Cognitive Radio Helps Realize These Initiatives
- ▶ xMax & Demo Overview
- ▶ 4 Demos Combining xMax and Cellular Networks:
 - Broadband
 - Voice/text
 - Location Tracking
 - Interference Mitigation

- ▶ Review Current State of the Art in Cognitive Radio Technology
- ▶ Show xMax Supports FCC Spectrum Sharing and DACA Initiatives.
- ▶ Demonstrate Prototype xMax 2.0 Gear and Technology
- ▶ Show Commercial Boards and Finished Mock-ups

- ▶ **Purpose:** address the gap during the first 72 hours after a catastrophic event when communications may be disrupted or completely disabled
- ▶ **Method:** facilitate emergency response by rapidly restoring communications capabilities in the immediate aftermath of a catastrophic event.

Responses to the DACA PN raised issues with: interference coordination, mitigation and spectrum management with commercial and public safety networks before and during DACA deployment

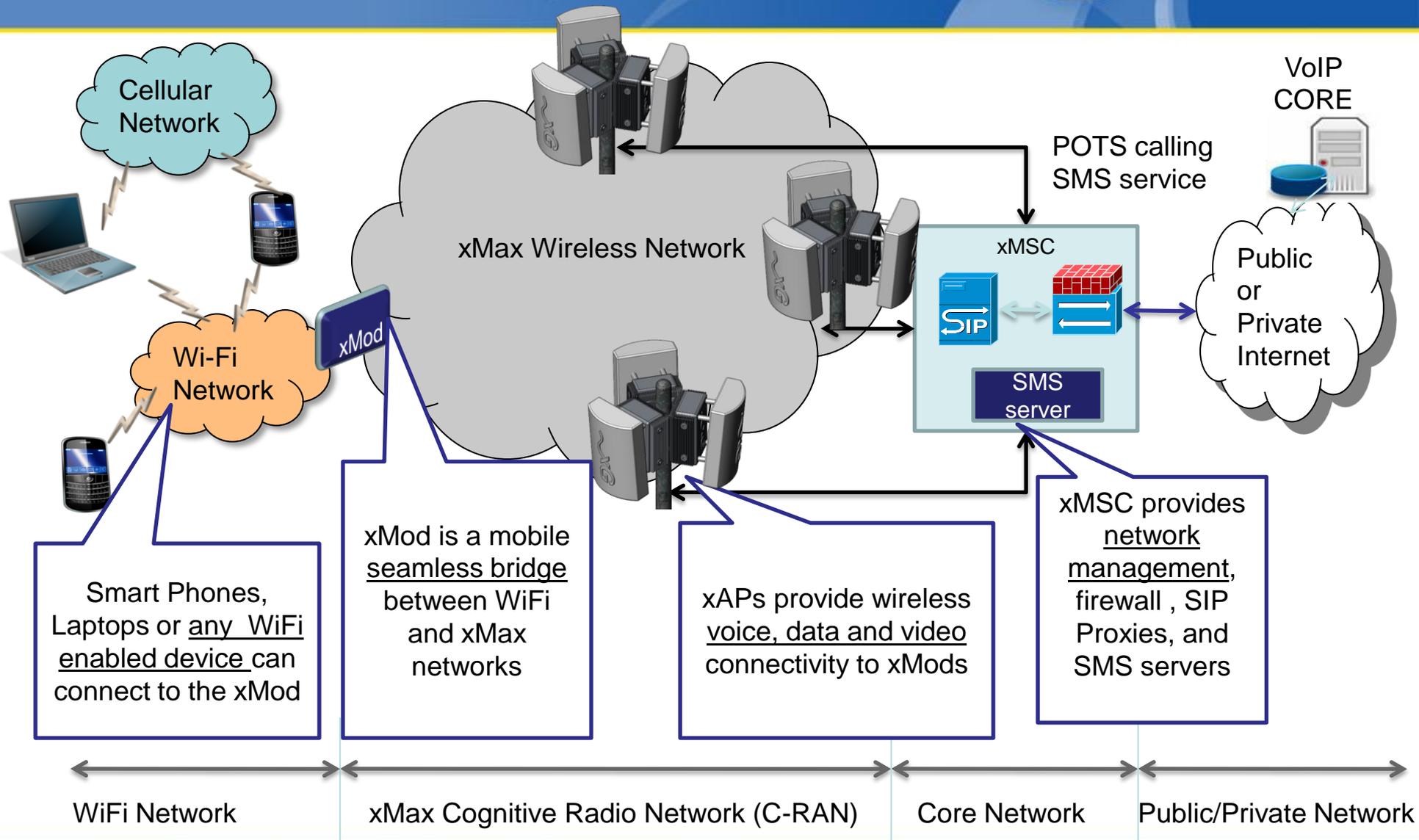
- ▶ Cognitive systems are able to identify spectrum that is not being used, and to tune to those frequencies to transmit and/or receive signals.
- ▶ Have the ability to instantly find unused spectrum if interference is detected.
- ▶ Can adapt their own power output, modulation, channel plan, network protocol, etc. dynamically to maximize throughput.
- ▶ Issue: there may not be better channels to operate upon

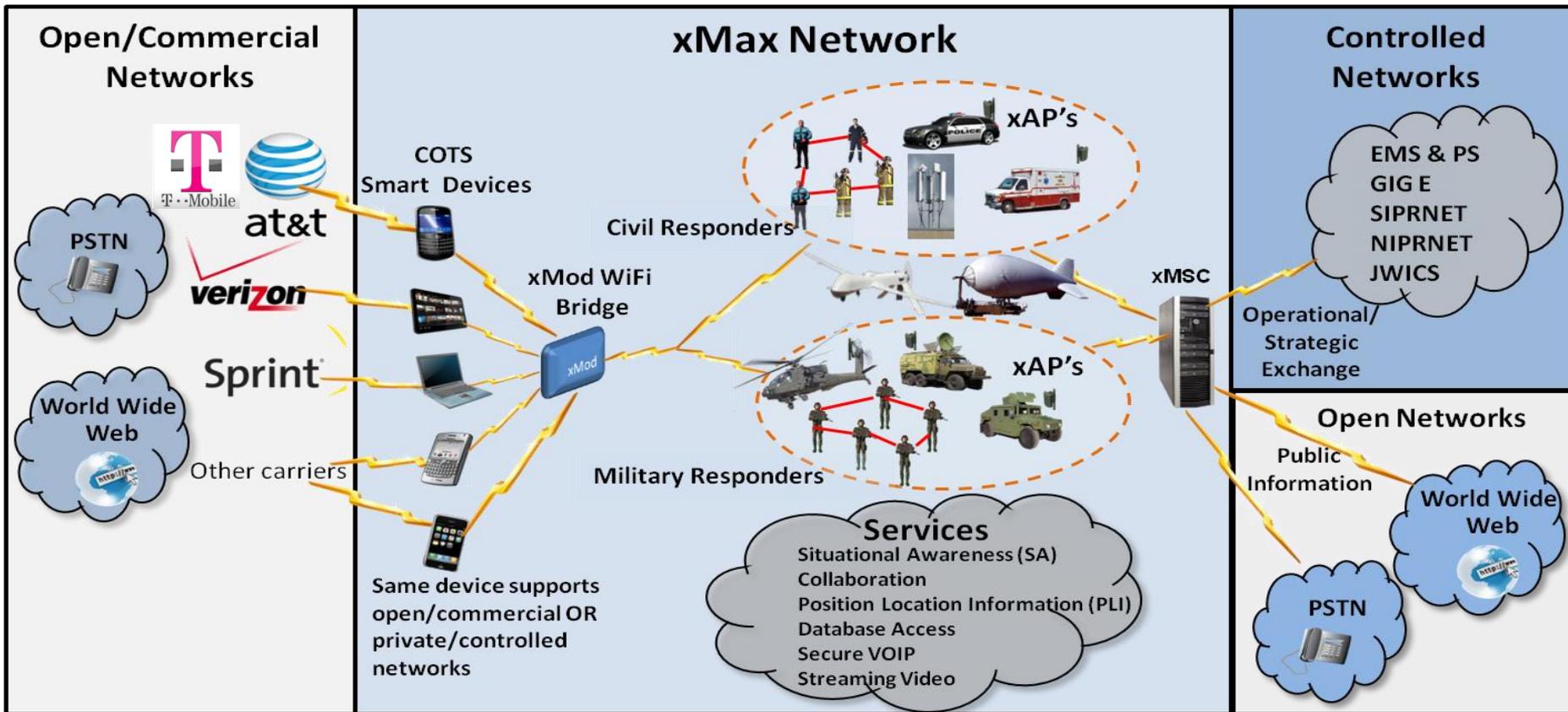
Interference Mitigation, not just *interference Avoidance*, is required for Emergency Communications in limited spectrum scenarios

- ▶ Rapid deployment to extend or even replace commercial cellular, PS functionality. Complimentary capability, capacity, devices, etc. (DACA, Tactical & Disaster Applications)
- ▶ Seamless support for existing devices & apps when cellular capacity is not available
 - Focused Overload – Snowmagedon, Coastal Earthquake
 - Disasters – Hurricane, 911, War, Jamming, Hot Cut
- ▶ 3G/4G overlay solutions require licensed 3G/4G spectrum in order to operate – no uncoordinated use on same frequency
 - Carriers do not support/allow in populated areas – DACA PN filings with FCC
 - D Block LTE overlay will require multi-agency coordination within 700 MHz band

xMax can deliver a licensed spectrum experience using unlicensed spectrum with no interference to existing networks

xMax Overview





xMax Broadband Network Deployed Using DACA Will Not Interfere With Commercial Or Public Safety Frequencies Due To Use Of *Unlicensed Spectrum*

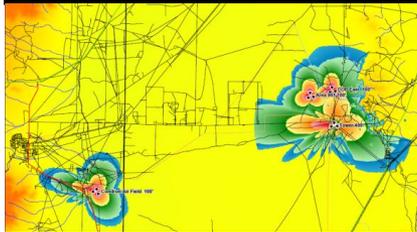


Urban/Suburban - Ft. Lauderdale, Florida

- fully mobile 32 mile² network
- densely populated
- interference-rich environment
- extensive testing has allowed continual system performance enhancement and development of robust system

"These are major-league pioneers who have built something that works well."

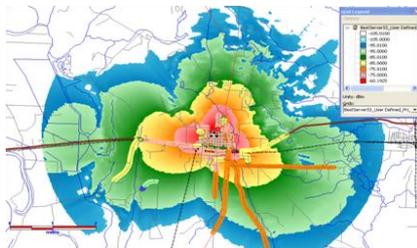
*—Craig Mathias,
Wireless Analyst, 2010*



White Sands, NM

Military - US Army - TX, NM, NJ

- lab validated (CERDEC)
- garrison enterprise solution
- tactical cellular – austere desert



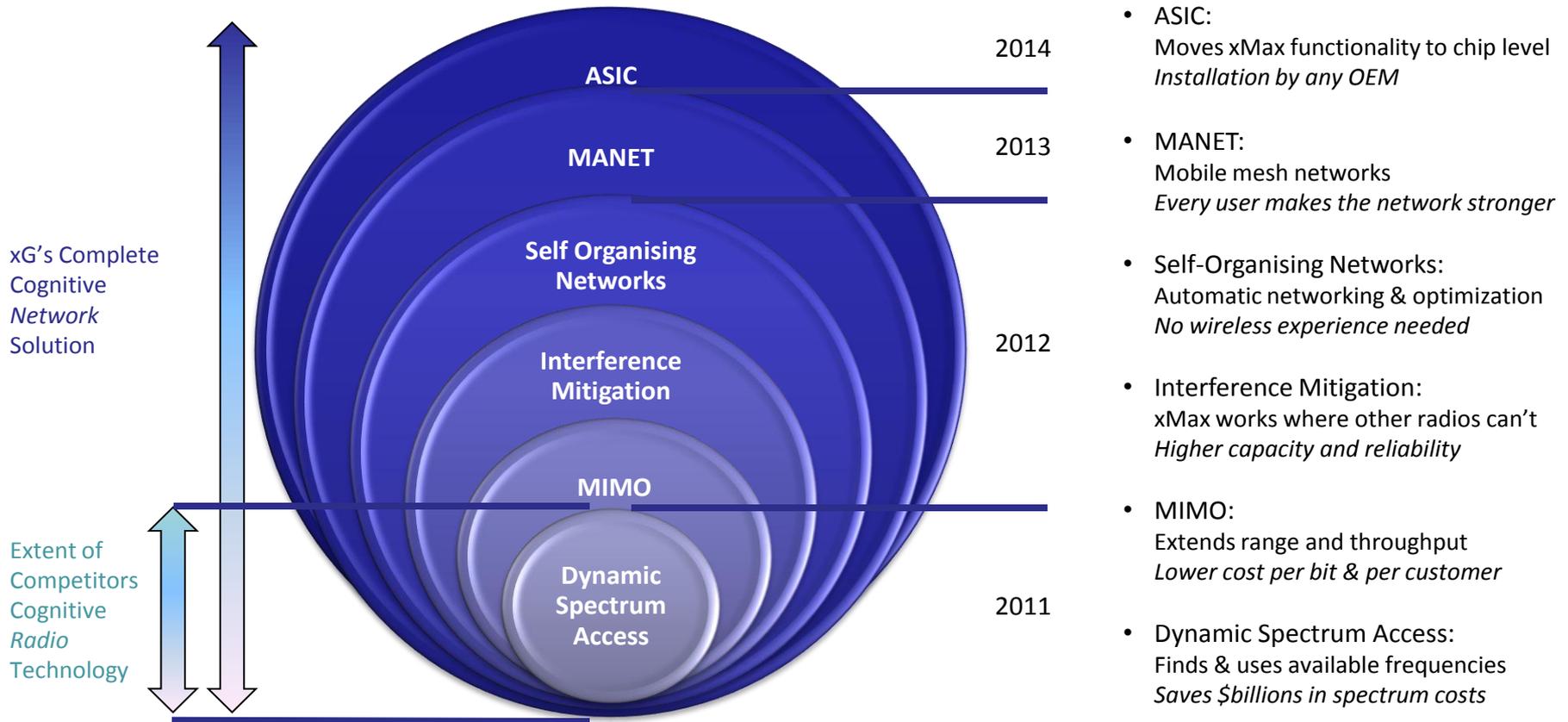
Lewisville, AR

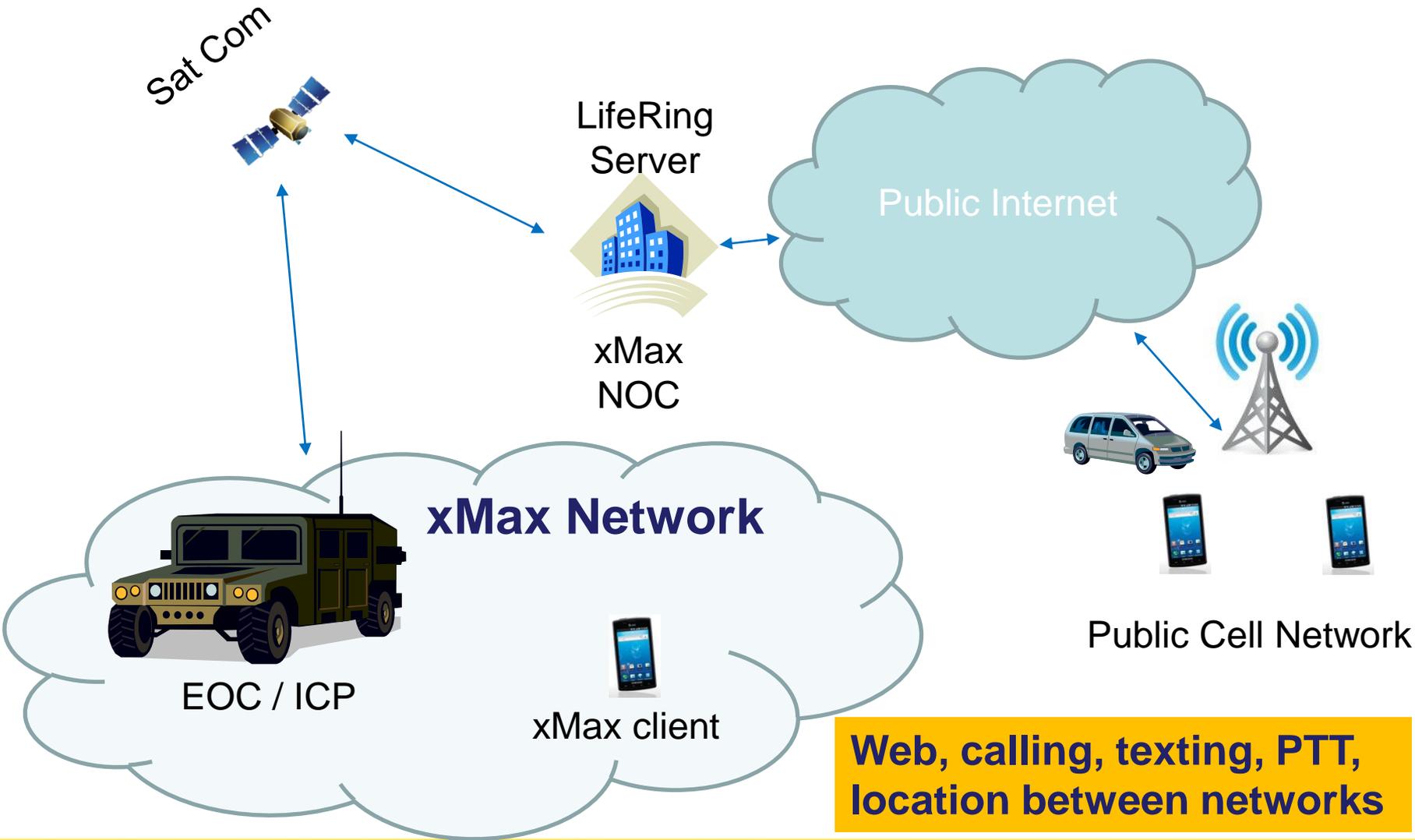
Rural – Lewisville, Arkansas

- underserved market
- low noise, excellent range



- ▶ Dynamic Spectrum Access (DSA) is key
- ▶ But xG's Cognitive Network solution xMax delivers much more than just DSA

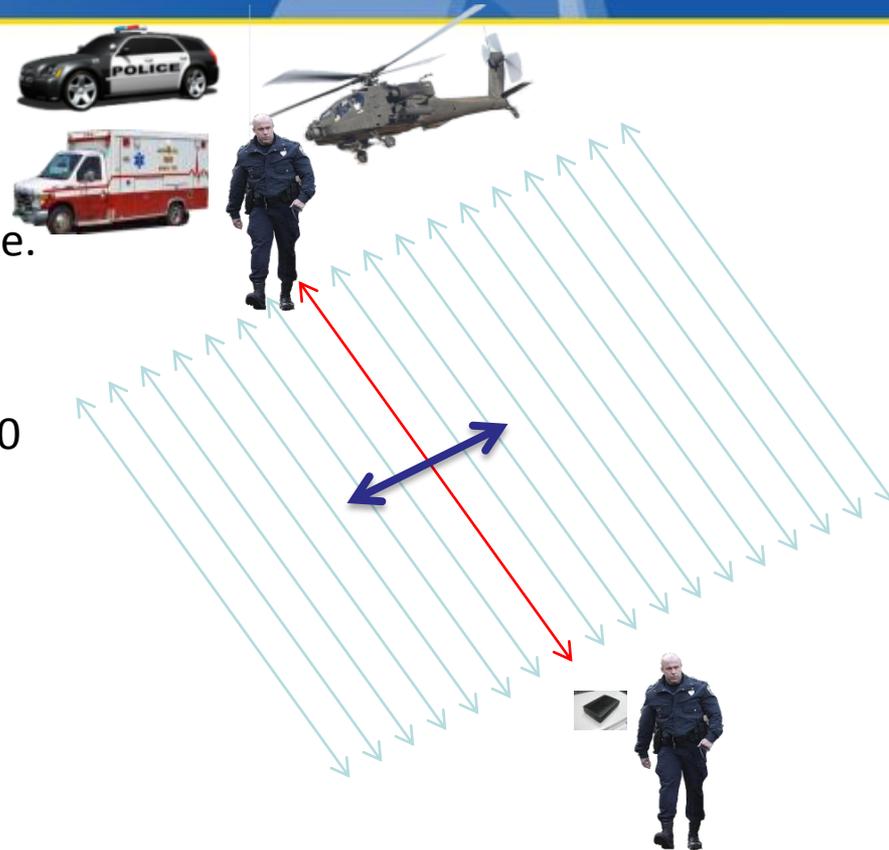




Web, calling, texting, PTT, location between networks

Dynamic Spectrum Access

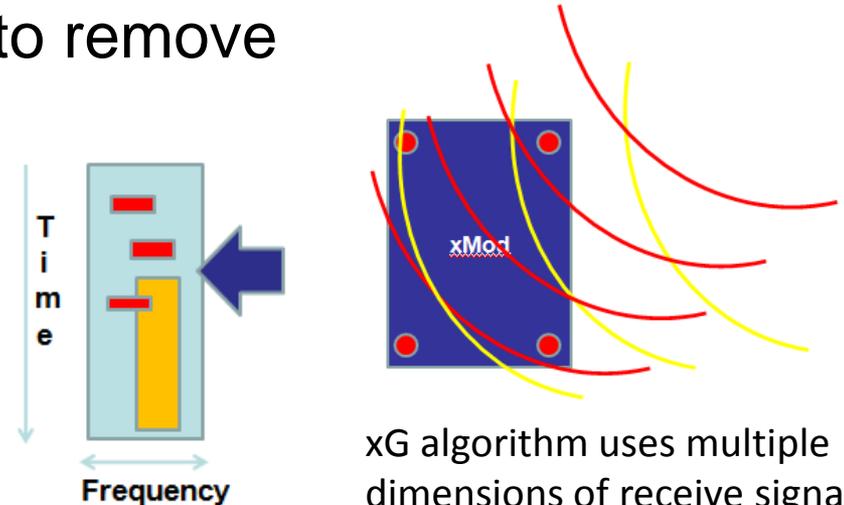
- ▶ Access point and xMod are frequency agile. Either can move channel in response to interference
- ▶ Devices background channel scan every 20 mSec cycle for available channels
- ▶ Comm links migrate to another channel if interference is encountered.
- ▶ Existing users not impacted



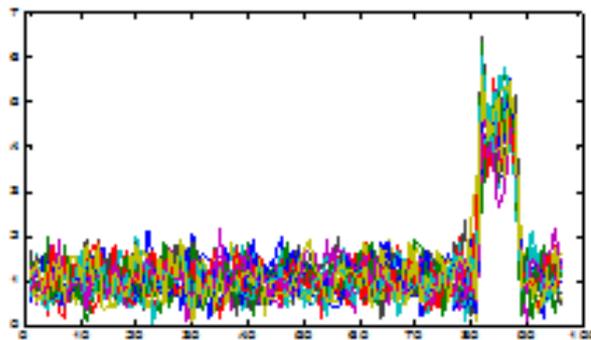
"I ran an excursion where we attempted to jam it with conventional military jamming systems, and we were unable to do it, xMax was able to stay ahead of the jammers that were trying to attack it and kept the communications systems up and operational throughout the two weeks that I ran the jammers".

Mike McCarthy, Director of Operations, Brigade Modernization Command , Ft. Bliss, TX

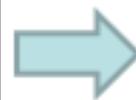
- ▶ Spatial projection processing to remove interference
- ▶ xMax can mitigate narrow and wideband interference, burst and continuous time interference
- ▶ Interference mitigation results



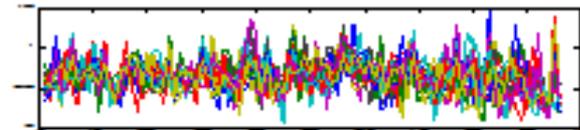
xG algorithm uses multiple dimensions of receive signals from 2X4 MIMO

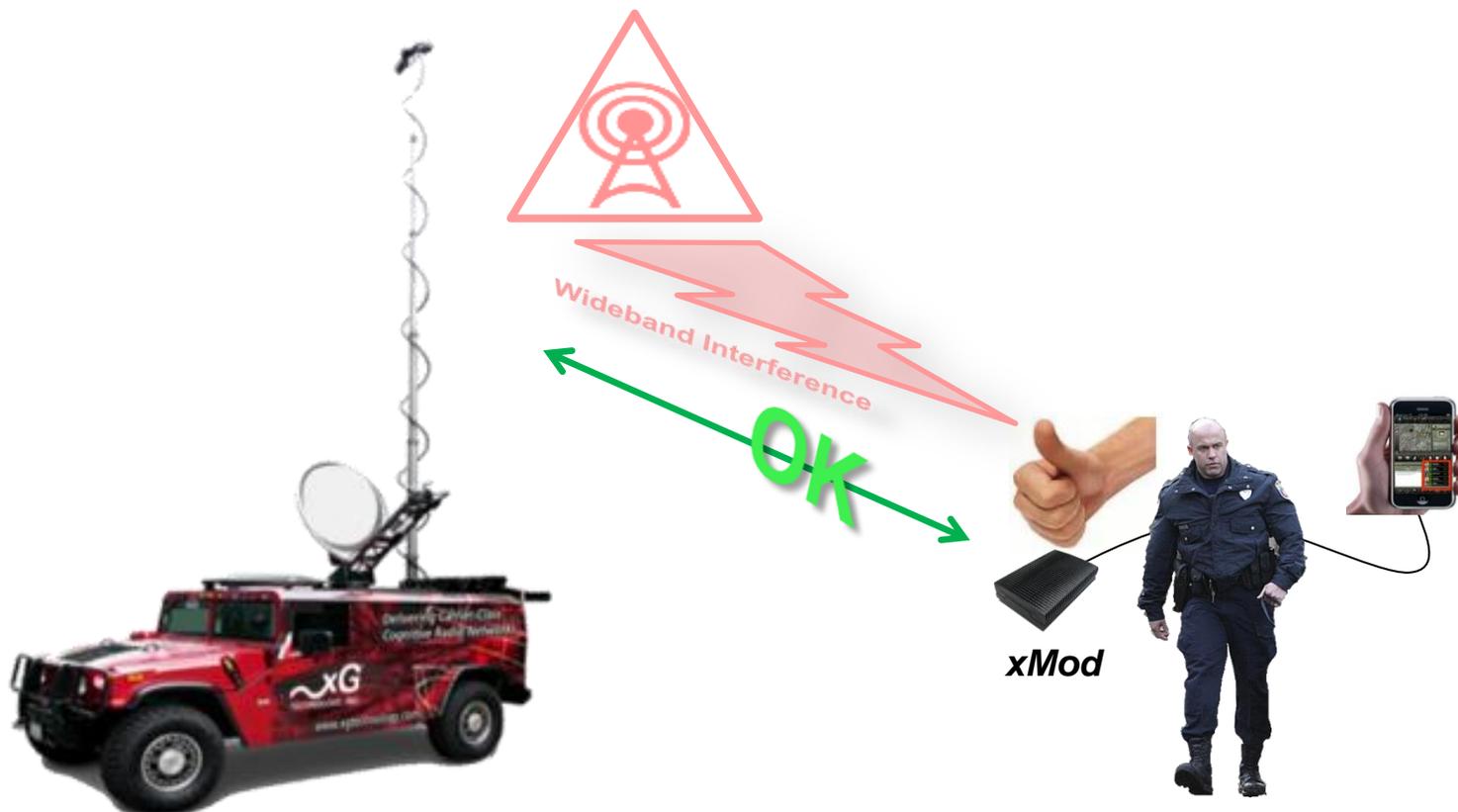


1.4 MHz wide xMax with jammer



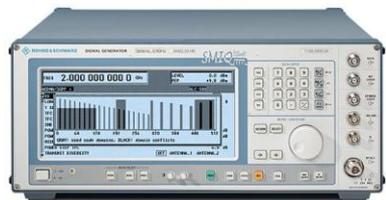
1.4 MHz wide xMax signal after subspace projection





Receiver-based spatial processing algorithm currently maintains comms in the presence of interfering signal 2X stronger than desired signal. *No additional noise created on channel!*

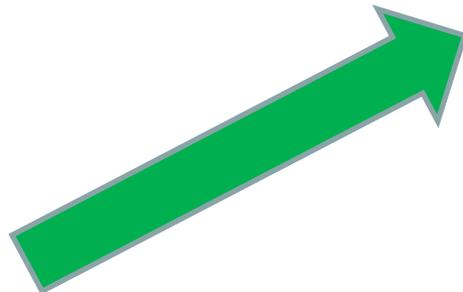
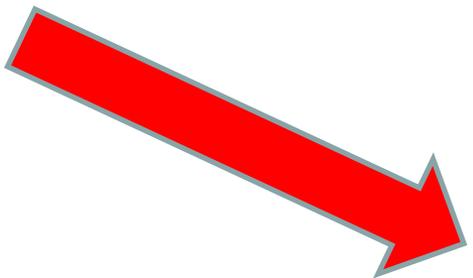
Over The Air Interference Mitigation System Demo



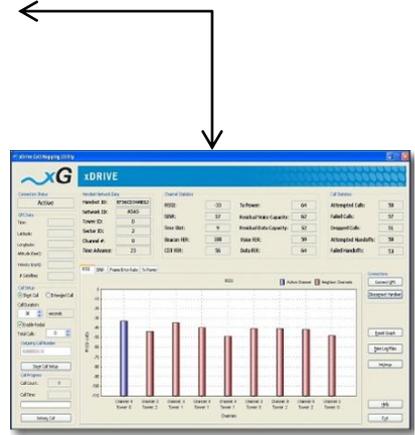
Interference Signal Generator
(Interfering signal)



Base Station Emulator Signal Generator
(Desired signal)



xMod



xDrive reports % of frames recovered by the interference mitigation algorithm (vs. MRC).

- ▶ xMax is a cognitive radio access network (C-RAN) with a scalable, flexible architecture that
 - Supports rapid response communications & DACA
 - Embraces COTS smart devices with an all-IP approach that increases affordability
 - Delivers capabilities via software and hardware reducing life cycle costs
 - Is secure and difficult to jam or hack
 - Solves spectrum challenges such as re-banding, RF planning, co-site & adjacent channel interference

Software Defined Radio + MIMO

▶ xMax Radio Assembly

- DSP subsystem/Digital board on top
- RF subsystem is on a separate board mounted below the main digital board



▶ 2X4 MIMO Antenna

- Patch structure through multiple ports
- Extremely small antenna stacks on top of the cognitive radio platform.
- 12dB+ diversity gain in Rayleigh fading channel

