

APCO International Emerging Technology Forum

The Power of the LTE Public Safety Network

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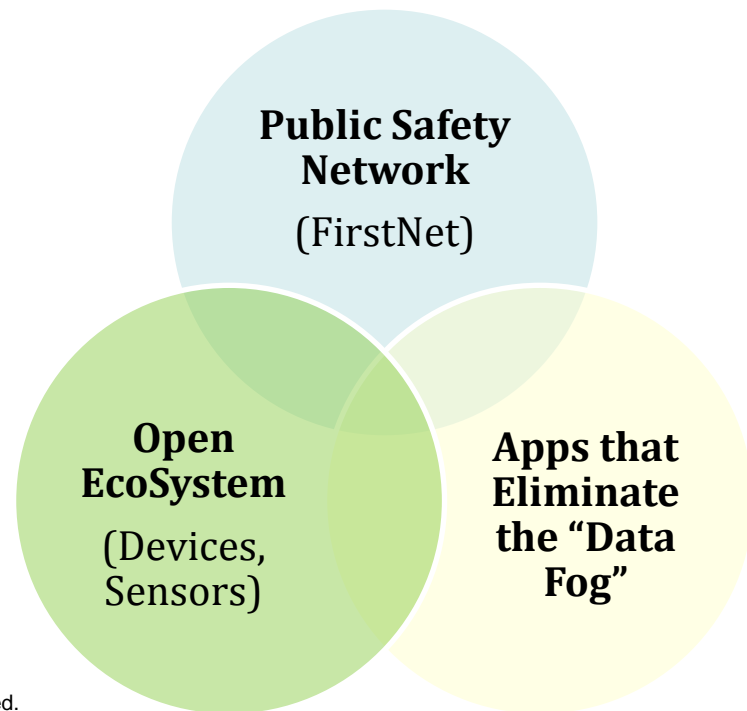
General Dynamics Mission Systems

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Emerging Technologies in Public Safety

Public Safety is beginning to discover a world of connected sensors and data that's transforming the way you respond to your mission

1. *Purpose-built private networks, meeting public agencies' demand for secure voice, data and video (the NPSBN by FirstNet)*
2. *Industry's offering of an open Eco-System of devices, end points and capabilities that run on the NPSBN*
3. *Unique visualization and collaboration apps that reduce the "Swivel Chair" paradigm, and manage the "Data Fog"*

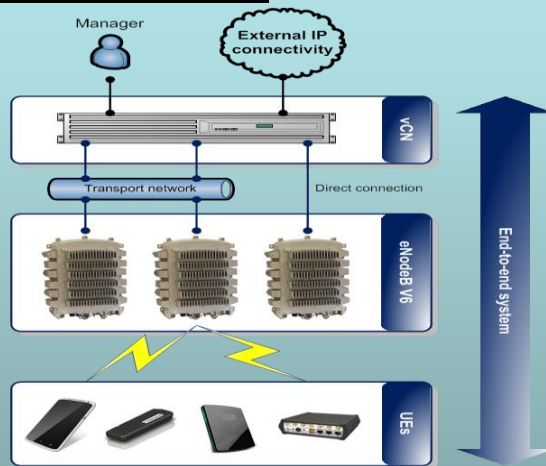


- Future Public Safety communications will rely on the 700 MHz LTE Network from FirstNet
- General Dynamics Mission Systems is a leading provider of 700 MHz LTE networks

LTE End-to-End Solution

End-to-end solution consists of:

- Virtual Core Network
- eNodeB
- Range of user equipment



**Public Safety
Network
(FirstNet)**



- System Integrator
- Solution Provider
- Original Equipment Manufacturer
- Site Engineering
- Standards Advocacy
- Research Support

FirstNet “Early Builder” networks, FirstNet LTE demonstrations, research and development, other mission-critical networks. *General Dynamics prime contract and subcontracts.*



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June 6, 2014 – ADCOM911 Goes Live:

- 1,200 Square miles
- 2,000 first responders
- 13 public safety agencies
- 440,00 citizens



- Concert Weekend Event at Dick's Sporting Goods Stadium
- Over 30,000 Attendees and Staff
- Public Safety Network Speeds between 14 – 16 Mbps

Partnered Public Safety Organizations:



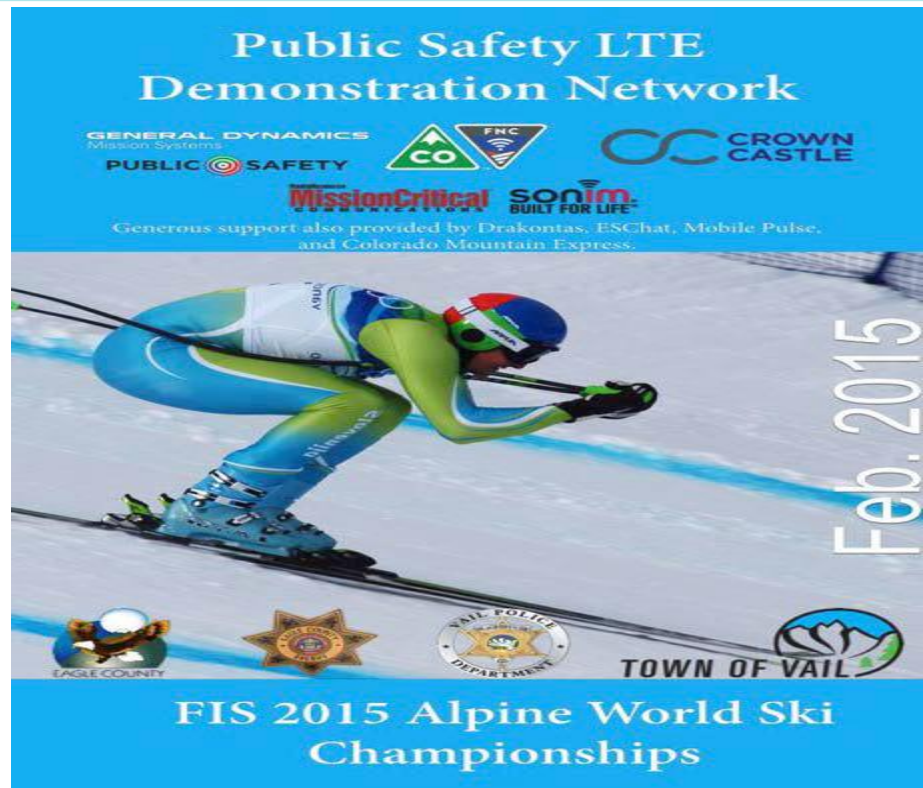
“Representing one of the largest and most impressive collection of ski racing talent in the world”

- Over 200,000 Spectators in the Small Mountainous Town of Vail Colorado
- 800 International Athletes from 70 Different Countries
- 1,100 Local First Responders and volunteers
- Event Televised to over 750 Million viewers worldwide



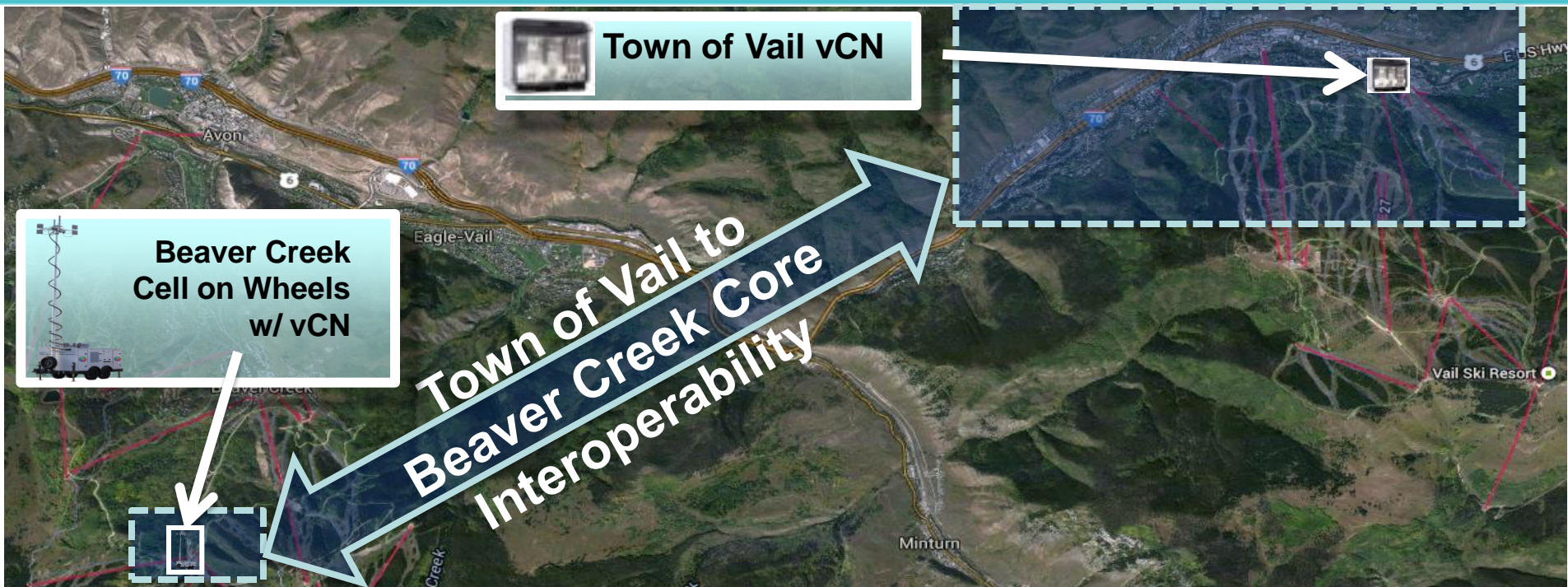
Demonstration Networks Goal:

Deploy a first-of-its-kind Band Class 14 Public Safety LTE Demonstration Network (PSLDN) using a Deployable, a Distributed Antenna System (DAS) and ruggedized devices to augment specific operational goals - crowd and traffic control activities.



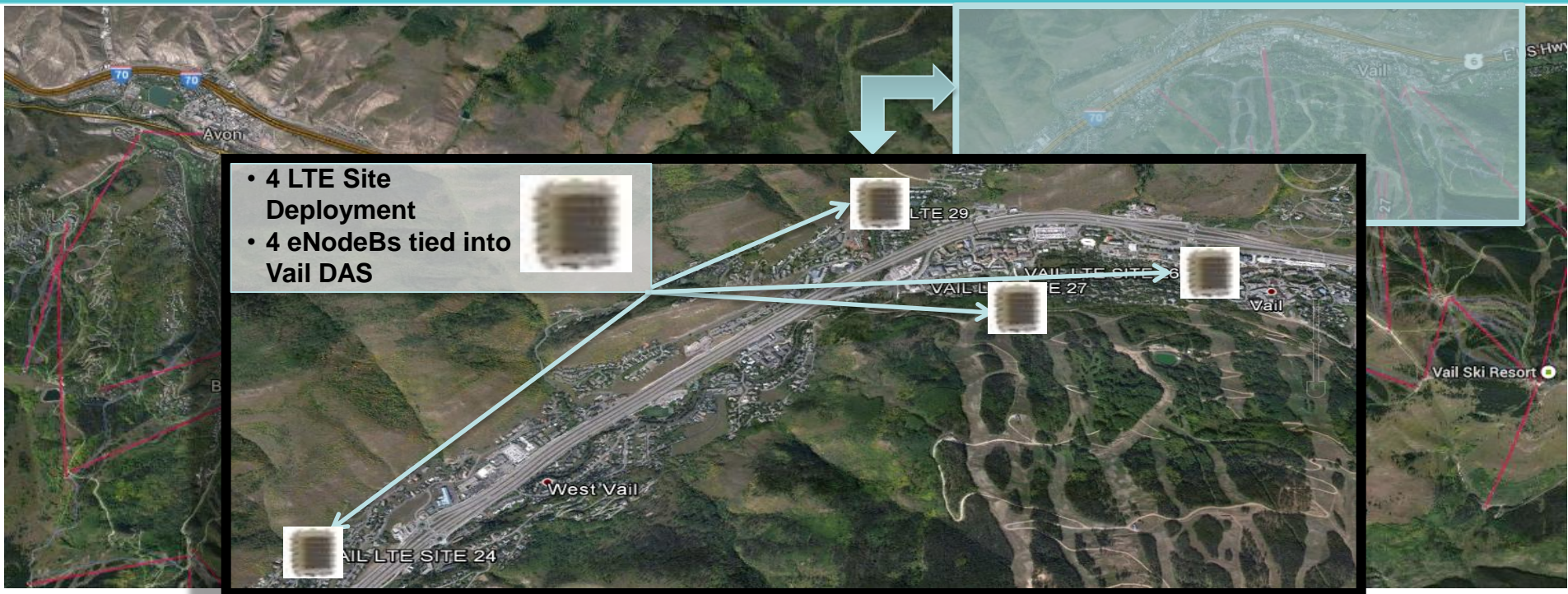
Town of Vail Technology Deployment

Town of Vail and Beaver Creek Interoperability



Town of Vail Technology Deployment

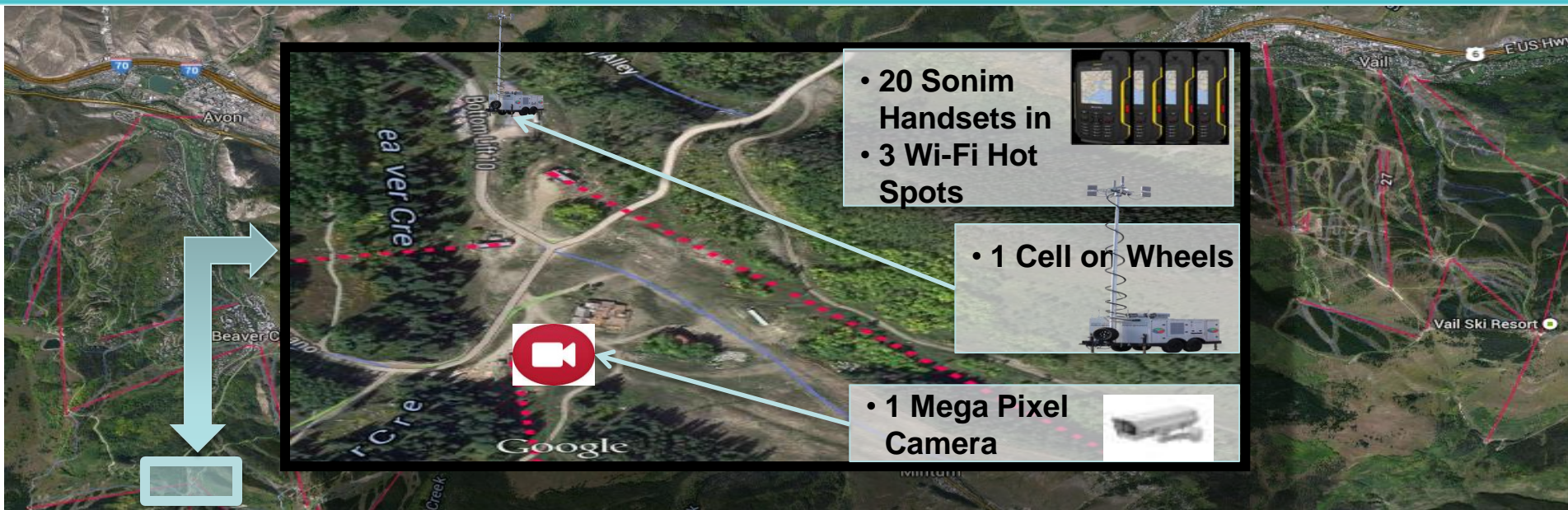
eNodeBlue Powered Network



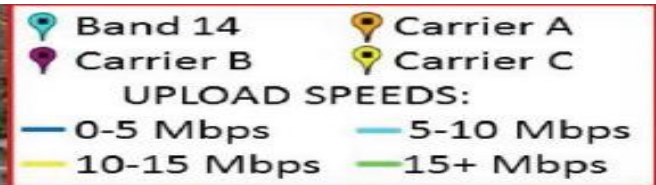
Town of Vail Technology Deployment Solaris Award Ceremony Support



Beaver Creek Deployment (Birds of Prey Finish Line) Network Powered by Cell on Wheels



BC 14 maintained a relatively consistent upload speed when migrating from outside the concert into the primary crowd, whereas commercial upload speeds frequently dropped and experienced connectivity issues.



- Demonstration Network showed consistent download (DL) speeds of 20 – 22 Mbps and upload (UL) speeds of 10 – 12 Mbps – Even in the most remote areas with the Deployable
- Commercial carriers saw a 70% decline during peak events while the Demonstration Network maintained consistent performance throughout
- Successfully demonstrated Core-to-Core interoperability
- Successful Federal, State and Local participation and collaboration
- Successful integration of applications and devices – Push-to-Talk and User situational awareness were critical capabilities



- Statewide Public Safety LTE Deployment
- Significant Federal Partnership
- Core-to-Core Interoperability between States
- Local Event Public Safety LTE Support



New Mexico State Fair/Expo



State of New Mexico Fair/Expo:

Over 100,000 attendees and staff
at Fair Venue



Performance comparison:

Public Safety: 14 – 16 Mbps
Commercial: 0 – 1 Mbps



Albuquerque Balloon Fiesta



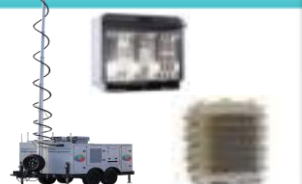


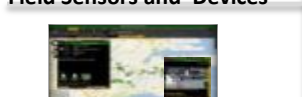
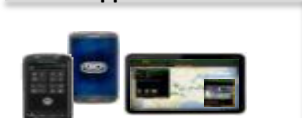
Albuquerque Balloon Fiesta:

Over 800,000 spectator from around the
world expected during event



**First-Net ready
smart phones
operating in
Public Safety
Band**

**General Dynamics C4S Cell on Wheels
providing deployable service to Public Safety**

Enabler	Users	Location	Benefit / New Capability Offered
 <p>Private , Assured 700 MHz LTE Network</p>	<ul style="list-style-type: none"> • All Users 	<ul style="list-style-type: none"> • Throughout Area of Operations 	<ul style="list-style-type: none"> • Private, Secure, Broadband Data • Infrastructure to integrate sensors and assets • Ability to collaborate and share across all users
 <p>In-Vehicle Modems</p>	<ul style="list-style-type: none"> • First Responders in Proximity to Vehicles 	<ul style="list-style-type: none"> • Installed in First Responder Vehicles 	<ul style="list-style-type: none"> • Connects to Private 700 MHz Broadband • Connects to Public Commercial LTE (Roaming / Fallback) • Integrates Vehicle Systems; Offers Position Location • Offers local WiFi around Vehicle
 <p>Field Sensors and Devices</p>	<ul style="list-style-type: none"> • Local Public Safety • Federal Law Enforcement • All Networked Users 	<ul style="list-style-type: none"> • Fixed or Mobile Video • High Definition Mega Pixel Cameras 	<ul style="list-style-type: none"> • Offers video feeds that assist teams in situational awareness and better decision making
 <p>Applications</p>	<ul style="list-style-type: none"> • All Networked Users 	<ul style="list-style-type: none"> • Command Post • Vehicle MDTs • Field Laptops • Mobile Handhelds 	<ul style="list-style-type: none"> • Map-Based Situational Awareness across all Users • Position Location of Networked Assets and Resources • Access to all data collected or interfaced from legacy systems • Push-to-Talk
 <p>Mobile Devices</p>	<ul style="list-style-type: none"> • Any Mobile User equipped with a Networked Device 	<ul style="list-style-type: none"> • Throughout Area of Operations with Sonim Handsets • All mobile devices within hotspot radius 	<ul style="list-style-type: none"> • User Access to Broadband Applications such as the Common Operating Picture • Ability to run future Apps to bring further value to Users in the Field • Push to Talk



- Network Functionality was immediately viewed as a 'must have' rather than a 'nice to have' and responders quickly adopted new technology with limited training
- LTE technology performed well, even where LMR could not and offered a legitimate alternative for non-mission critical PTT communications
- First Responders Mission must be considered when deploying technology
- Operational requirements critical to ensure network design provides adequate bandwidth to support all activities (e.g., cameras, PTT, multimedia sharing)
- The use of existing public and private assets was critical to rapid implementation of network
- Identify and work through site issues early



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