



**TENNESSEE CONSOLIDATED NETWORK
FOR EMERGENCY COMMUNICATIONS
AND TECHNOLOGY**

TN-CNECT

State of FirstNet Across The Country

Mark Snyder
3/2/2016



Agenda

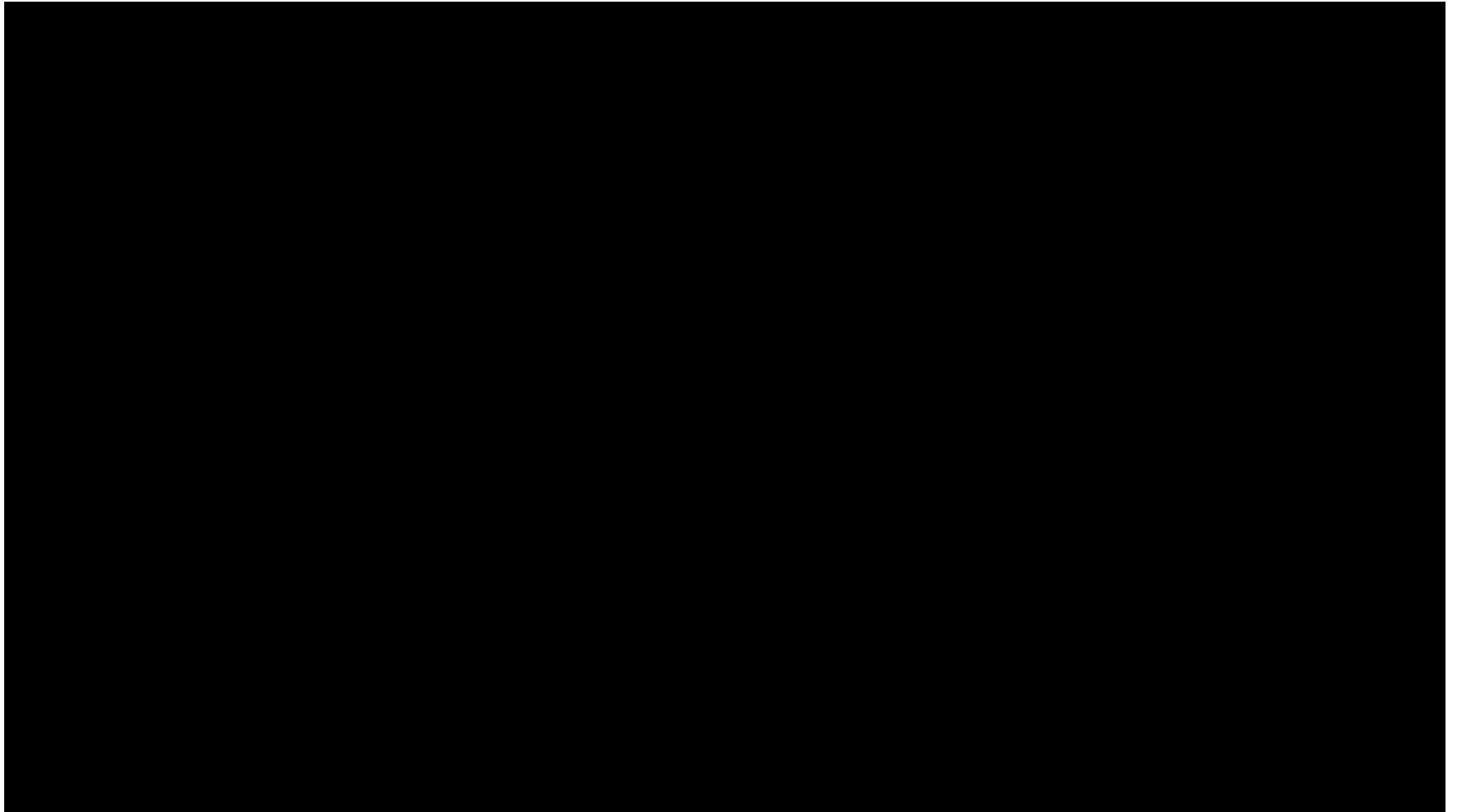
- ▶ Early Builder Projects
- ▶ Lessons Learned
- ▶ Future Vision



Early Builder Projects and Demos

- ▶ Harris County TX
- ▶ JerseyNet Papal Visit
- ▶ Colorado Parks and Wildlife Checkpoint
- ▶ EDGE Winter Institute Exercise
- ▶ Chicago LTE Video Pilot

Harris County, TX

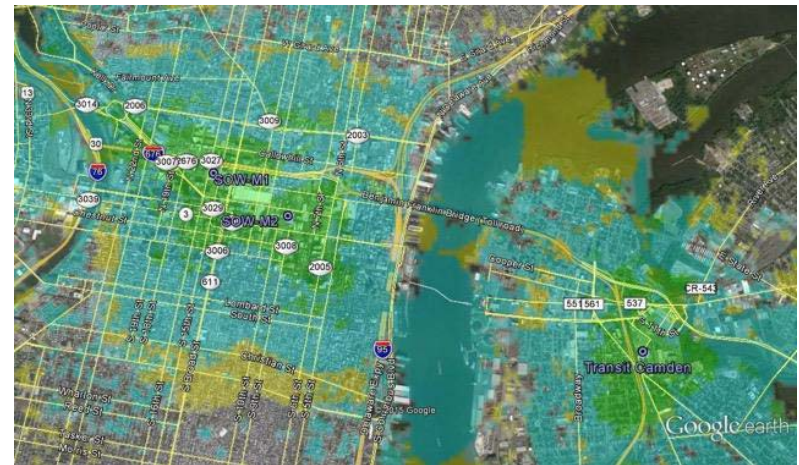




Jersey Net

▶ Papal Visit September 2015

- ▶ Secure communications including live streaming video
- ▶ Two SOWs
- ▶ One SOW /Command Post
- ▶ One COW
- ▶ Multiple agencies with BCI4 Devices
 - ▶ PSP
 - ▶ NJ
 - ▶ Red Cross
 - ▶ EMS, USAR, Camden County
- ▶ 5 mobile camera trailers



FirstNet

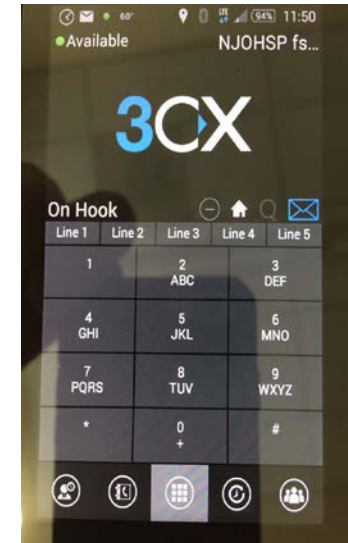




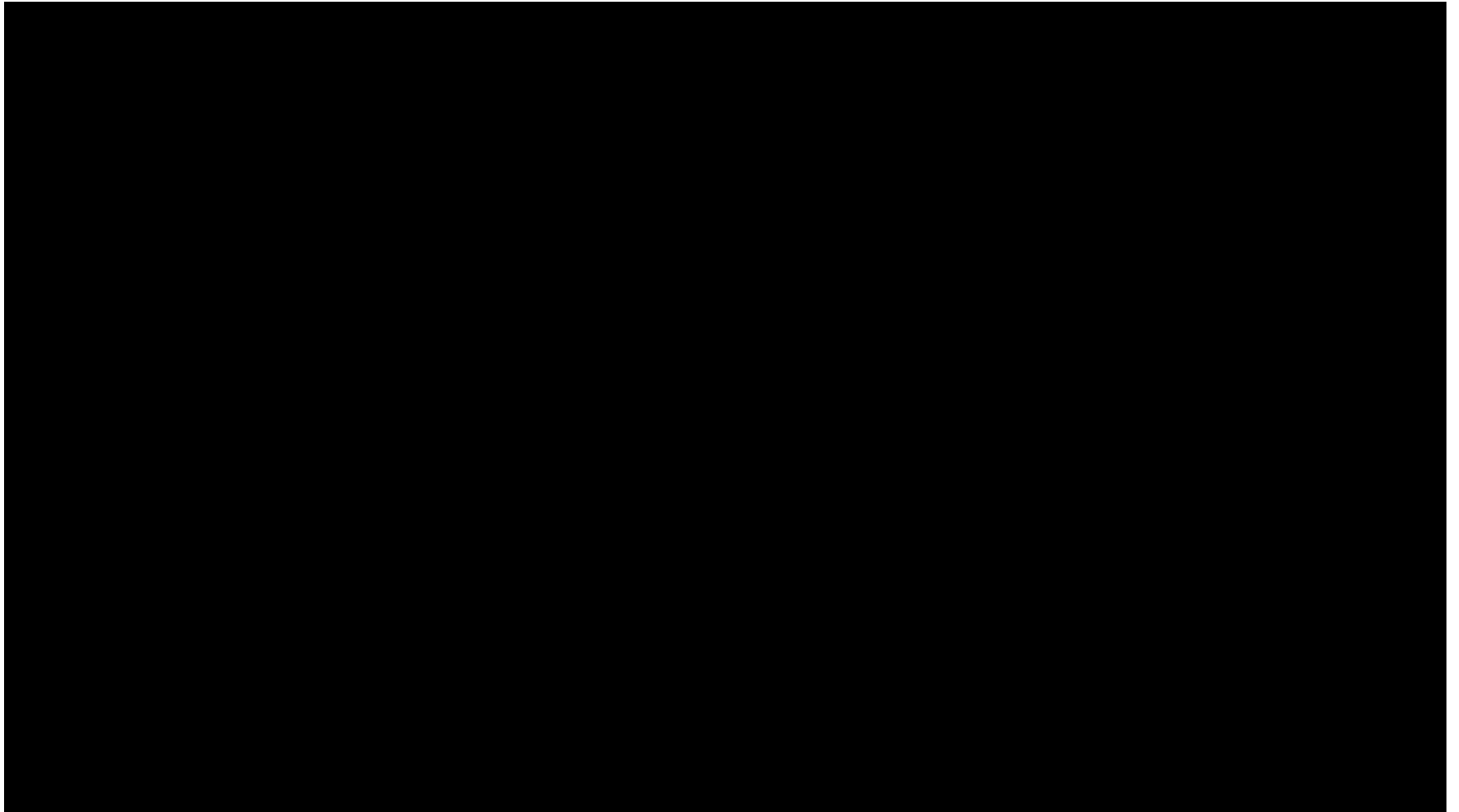
Jersey Net

▶ Applications

- ▶ Mutualink on Band 14 and Commercial
- ▶ Mutualink sharing of voice / LMR
- ▶ Multiple groups for information sharing
- ▶ SONIM PBX app to allow dialed voice calls over Band 14



Colorado Parks and Wildlife





Colorado Parks and Wildlife

- ▶ Planned high-volume event – 2nd Big Game Rifle Season (deer and elk)
- ▶ October 20-21 2015
- ▶ Goal was to collect biological data and support wildlife LE presence (checking game licenses)
 - ▶ Nine state, federal, and local agencies
 - ▶ More than 230 personnel
- ▶ Public safety risky environment



Colorado Parks and Wildlife



- ▶ Potential for high number of commercial network users
- ▶ Minimal commercial coverage
- ▶ Standalone 4G LTE Band Class 14 network, 3 channels
- ▶ Three (3) WiFi hotspots
- ▶ Custom app supporting barcode scanning of wildlife credentials and real-time database queries
- ▶ Save officer resources, improve efficiency

Based on metrics recorded by Sierra Wireless, the event may have been supported using only two gateways





EDGE Winter Institute

- ▶ Joint Interagency Field Experimentation (JIFX) conducted by Naval Postgraduate School, Cause III led by DHS 11/2-11/6/2016
- ▶ Disaster City, TX and Gulf of Mexico
- ▶ Sponsored by GDIT Mission Systems
- ▶ EPC at TAMU lab in College Station
- ▶ Applications include data and voice transmission



EDGE Winter Institute

- ▶ **Power failed** in lab where EPC was located
- ▶ **Failures** in the host network linking RAN with EPC
- ▶ Hard-wired **backhaul failed** over to LTE (non-BCI4)
- ▶ Texas NG supported with Satellite backhaul and power
- ▶ Exercise was hindered by **late arrival of equipment**, **insufficient incident management hierarchy**, and **insufficient planning** in some areas
- ▶ Exercise was saved by collaboration and preparation between partners



Chicago LTE Video Pilot

- ▶ “Chicago LTE video Pilot Final Lessons Learned and Test Report” DHS Science and Technology First Responders Group October 2015
- ▶ EPC Leased from Motorola as cloud core service
- ▶ One eNodeB
- ▶ Throughputs ~ 27 Mb/s DL / 20 Mb/s UL
- ▶ Video transmitted at 720p 30 frames/sec
- ▶ At video rate of 650 kb/s can simultaneously support real-time video to ~40 users
- ▶ **Capacity and quality at cell edges significantly reduced**



Chicago LTE Video Pilot

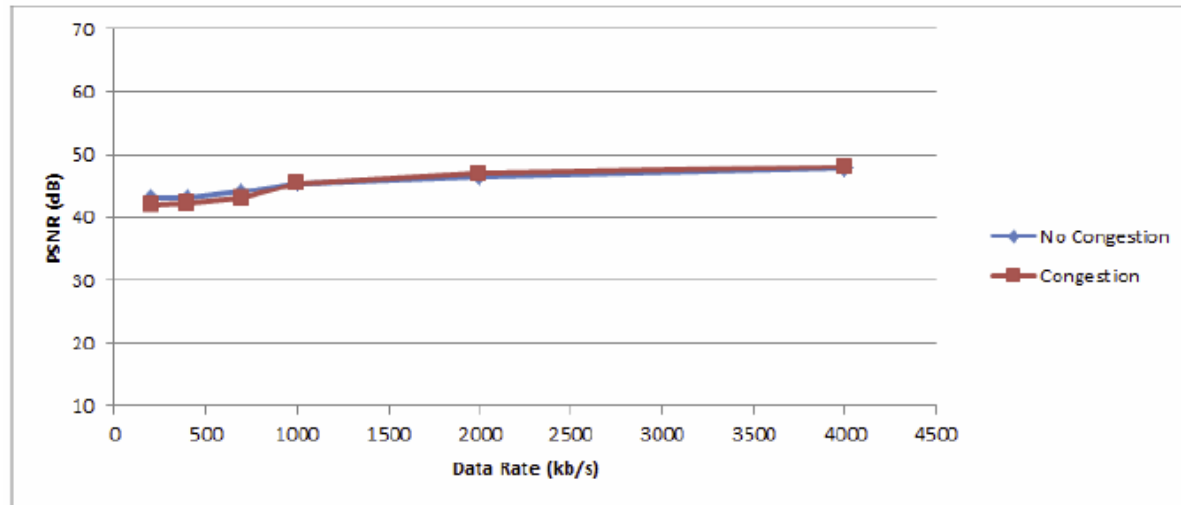


Figure 7: PSNR Video Quality Measurement

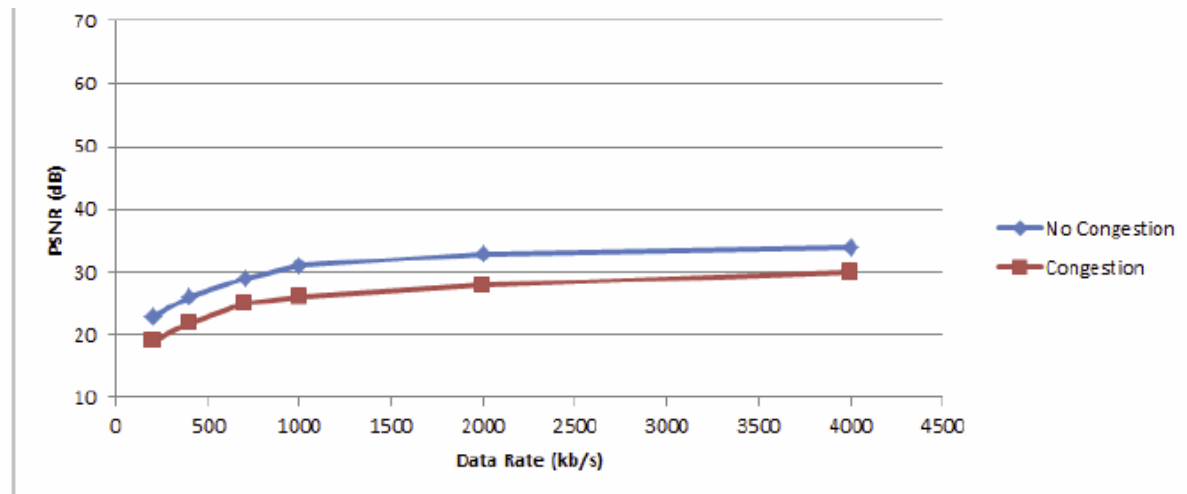


Figure 9: PSNR Video Quality Measurements (Cell Edge)



Lessons Learned

▶ Harris County TX

- ▶ Plan and operate as a business
- ▶ Education and Outreach

▶ JerseyNet

- ▶ Consider applications integration and security as early as possible
- ▶ Training of First Responders on apps and devices
- ▶ Outreach to individual agencies

▶ FNCWCP

- ▶ Put enough effort into considering the use case(s)
- ▶ Familiarize responders with technology early



Lessons Learned...cont'd

▶ EDGE Winter Institute

- ▶ Backup – backhaul, EPC, power, everything. Have a plan for every contingency
- ▶ Single point of incident management and close coordination among players
- ▶ Plan, Prepare, and Coordinate
 - ▶ Access policy – who, and at what level (priority)
 - ▶ Security
 - ▶ Recovery
 - ▶ Training – apps and devices
 - ▶ Outreach

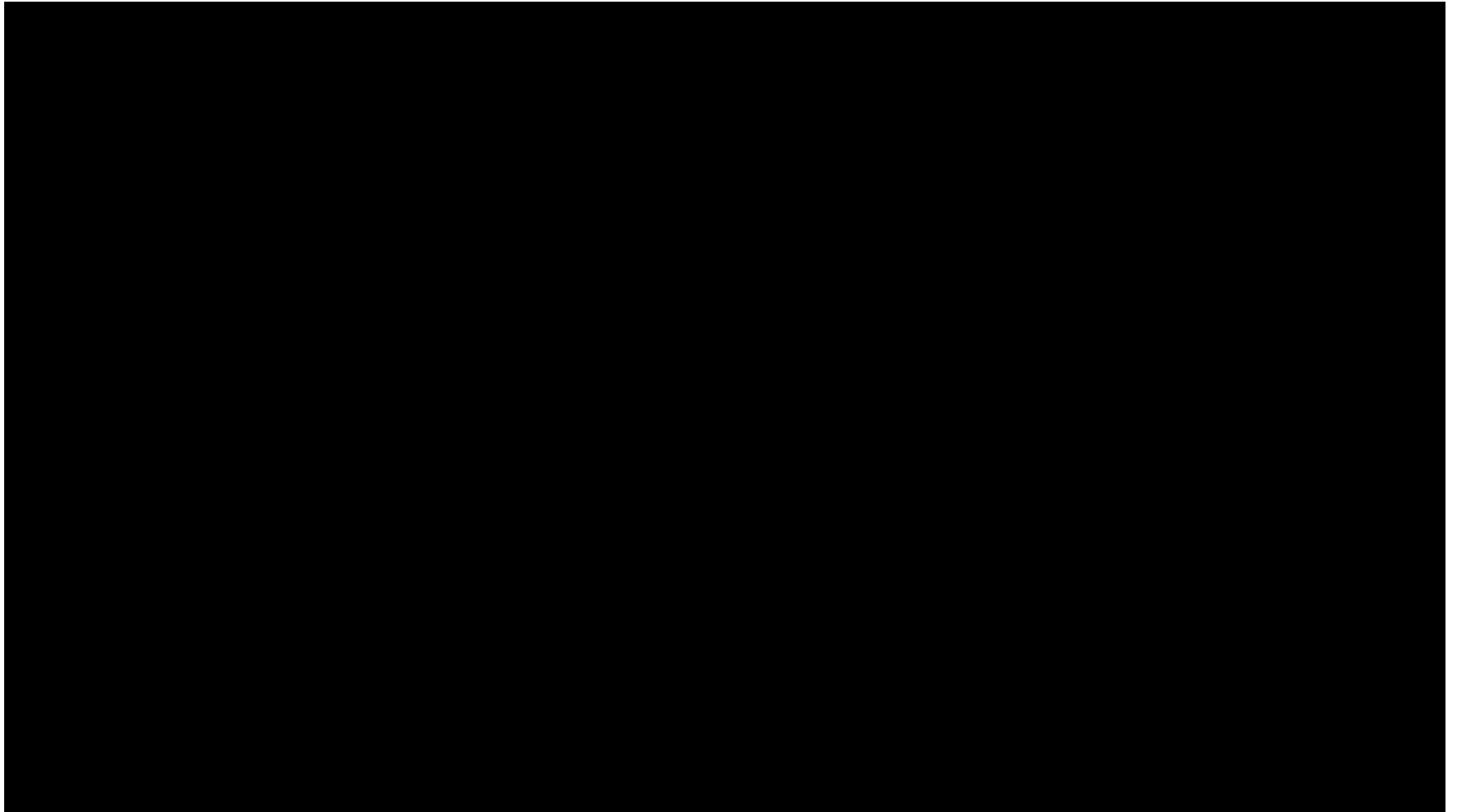


Lessons Learned...cont'd

▶ Chicago LTE Video Pilot

- ▶ Consider QoS and prioritization when scheduling network resources
- ▶ RF planning / analysis essential to ensure QoS needed at operating edges
- ▶ Capacity planning

Future Vision





Takeaways

- ▶ The potential benefits of 4G LTE for Public safety are real
- ▶ Lessons Learned consistently highlight the need for careful planning and stakeholder involvement
- ▶ Apps demonstrated thus far are only the beginning, there is great potential to improve efficiency and save lives

Questions?



Tennessee Consolidated Network
For Emergency Communications

Backup Slides



Enabling Technology – Mutualink’s Media Cohesion Framework



- ▶ Uses “Technology Bridges” and “Application Services” to provide lowest-common denominator data interoperability
 - ▶ Technology Bridges (TB) adapt networks to a common format, similar to IP gateways in the LMR world
 - ▶ Application Services (AS) provide a common service supporting communications across dissimilar platforms
- ▶ TB+AS functions form “Media Cohesion” nodes
 - ▶ Media Cohesion (MC) nodes occur at different levels of the hierarchy – LTE client, EPC, Regional Data Centers, High-Level Data Centers
- ▶ Deployment of on-scene LTE client nodes can effectively reduce the load on the LTE network





Harris County, TX

- ▶ Operating under Spectrum Manager Lease Agreement (SMLA)
- ▶ Deployable eNodeB
- ▶ Site at College Station/Disaster City
- ▶ Spectrum for Harris County build-out
- ▶ 18 sites in Harris county service area
- ▶ 1 site in Brazos County (extended range test site)
- ▶ 1 mobile unit
- ▶ 64 Brazos County patrols equipped

New Jersey Net



- ▶ Private, dedicated, secure, mobile Band 14 4G LTE for First Responders supporting the sharing of diverse, mixed media mission critical information
- ▶ Three Regions, each will have the following deployable capability:
 - ▶ One System on Wheels (SOW)
 - ▶ Multiple Cell on Wheels (COW)
- ▶ Satellite Backhaul
- ▶ One Network Operations Center



Colorado Parks and Wildlife Additional Metrics



- ▶ 685 device connections, 35.501 MB of data traversed the network in 36 hours
- ▶ 1,090 total vehicles contacted
- ▶ 1,949 total persons contacted
- ▶ 298 total game surveyed
- ▶ 89 CPW written citations issued
- ▶ 75 written violations and 46 written warnings
- ▶ 4 felonies, 2 arrests, 1 DUI
- ▶ Interceptor vehicles stopped > 195 vehicles failing to stop
- ▶ CPW estimates another 200-300 vehicles intentionally failed to stop
- ▶ Additional technologies (streaming video, PTT voice, ALPR) may have resulted in higher number of vehicles failing stop intercepted

The Big Game



- ▶ Broadband voice, data, video
- ▶ (2) BC I4 eNodeBs at North and South scoreboards
- ▶ (1) 3GPP compliant RAN orchestrator
- ▶ Mutualink interoperability
- ▶ 35 SONIM XP7 smartphones provided to Northern California Regional Intelligence Center (NCRIC)
- ▶ ESChat secure PTT



For More Information

- ▶ <http://txlte.com/>
- ▶ jersey.net.state.nj.us
- ▶ <https://sites.google.com/a/state.co.us/firstnetcolorado/>
- ▶ <http://www.firstresponder.gov/TechnologyDocuments/Chicago%20LTE%20Video%20Pilot%20Lessons%20Learned%20Test%20Report.pdf>