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Quality of Service, Priority, & Preemption (QPP) Consultation Task Teams (CTTs)

Regional Engagement

Region 7

Osceola, IA

August 16, 2016

- Welcome
 - Introductions
 - QPP CTT Timeline
 - Regional Engagement Outcomes
- QPP Overview
 - General Q & A
- QPP Scenario Discussions
- Participant Feedback

- FirstNet QPP CTT Team
- Iowa
- Kansas
- Missouri
- Nebraska

2016 Consultation Elements



SPOC
Engagement
Meeting



Governance
Body
Meeting



Consultation
Task
Teams (CTTs)



Executive
Consultation
Meeting

EXPANDED NATIONAL OUTREACH

EXPANDED FEDERAL CONSULTATION

Regional Engagement Outcomes



- Educate and provide clarity surrounding QPP to FirstNet stakeholders.
- Allow stakeholders to provide feedback to help shape future FirstNet Network policies and procedures.

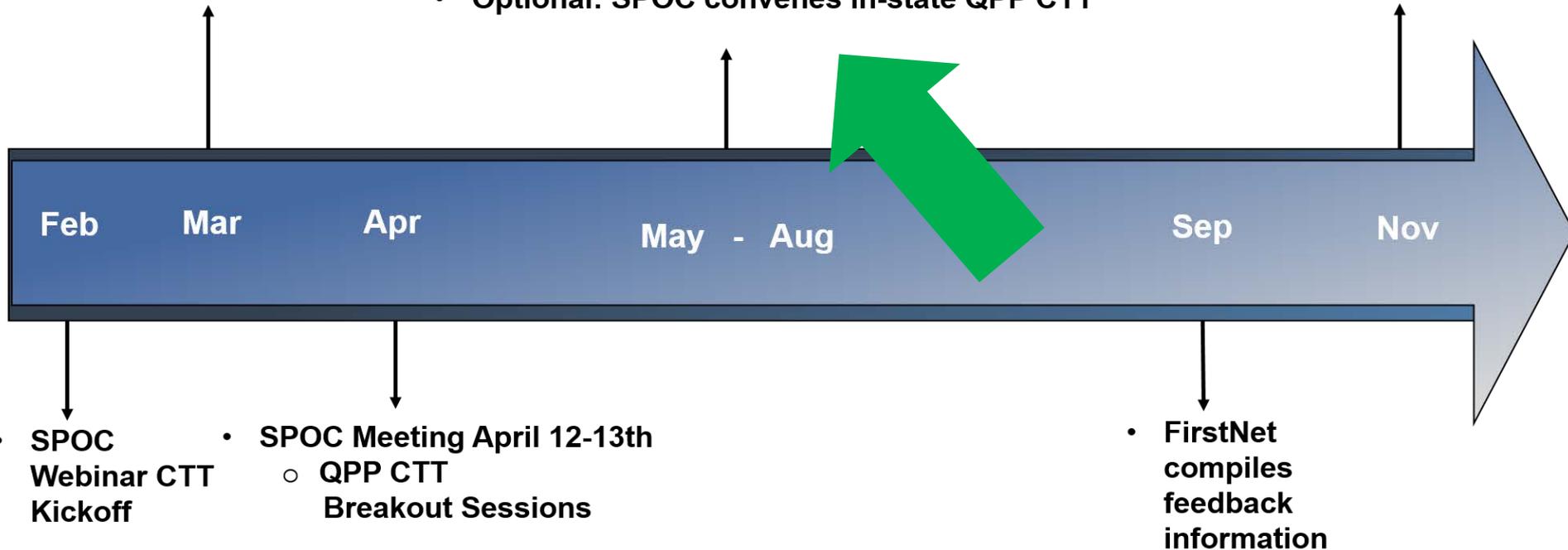
QPP CTT Timeline



- FirstNet mails FAQs
- State Identifies CTT Members

- FirstNet disseminates materials
- SPOC identifies 5 CTT members to review materials
- FirstNet convenes Regional QPP Engagement
- Optional: SPOC convenes in-state QPP CTT

- FirstNet provides overview of the feedback



QPP Overview



Review & Reminders



What are Quality of Service, Priority and Preemption (QPP)?

Hi, I'm Fred!

Hi, I'm Sam!

- **Quality of Service** – Quality of Service is the overall performance of a telephony or data network, particularly as seen by the users of the network. To measure quality of service quantitatively, several related aspects of the network service are often considered, such as error rates, bandwidth, throughput, transmission delay, availability and jitter.
- **Priority** – Priority is a network capability that enables a user's application or usage of the network to take precedence over another user's application or usage of the network.
- **Preemption** – A network capability that permits authorized high priority traffic, e.g., coming from public safety or first responders, to take over resources assigned to lower priority traffic, e.g., private traffic.

FirstNet

TRUE PRIOR

FirstNet

Nationwide Public Safety Broadband Network (NPSBN) QoS Priority and Preemption (QPP) Framework

FirstNet CTO Whitepaper

Version 3.0 Draft
11/18/2016

- Read/view ahead materials
- Reminders
 - Framework is conceptual, not final
 - Outcome may differ due to pending responses from RFP offerors
 - **Inputs in today's session may influence network policies, but not the RFP or acquisition**
 - **If you have any questions related to the RFP, please contact our Contracting Officer:**

greg_ruderman@ibc.doc.gov

Conceptual Definition Review



Primary User States	Three temporary responder states (i.e., Immediate Peril, Responder Emergency, and Relayed Users) that elevate the criticality of a responder's network access and usage.
Secondary User States	Three non-public safety states (i.e. Free Range, Restricted, and Preempted) used to control CLA user access to available Band 14 spectrum.
Quality of Service	Network feature that ensures Public Safety users have access to their needed services and applications at the appropriate level for their immediate situation/activity.
Priority	Network feature that allows specific users, applications, traffic streams, or data packets to take precedence over others during periods of congestion.
Preemption	Network feature used to control resource use by removing active sessions of lower priority users to give those resources to higher priority users during periods of congestion.

Conceptual Definition Review



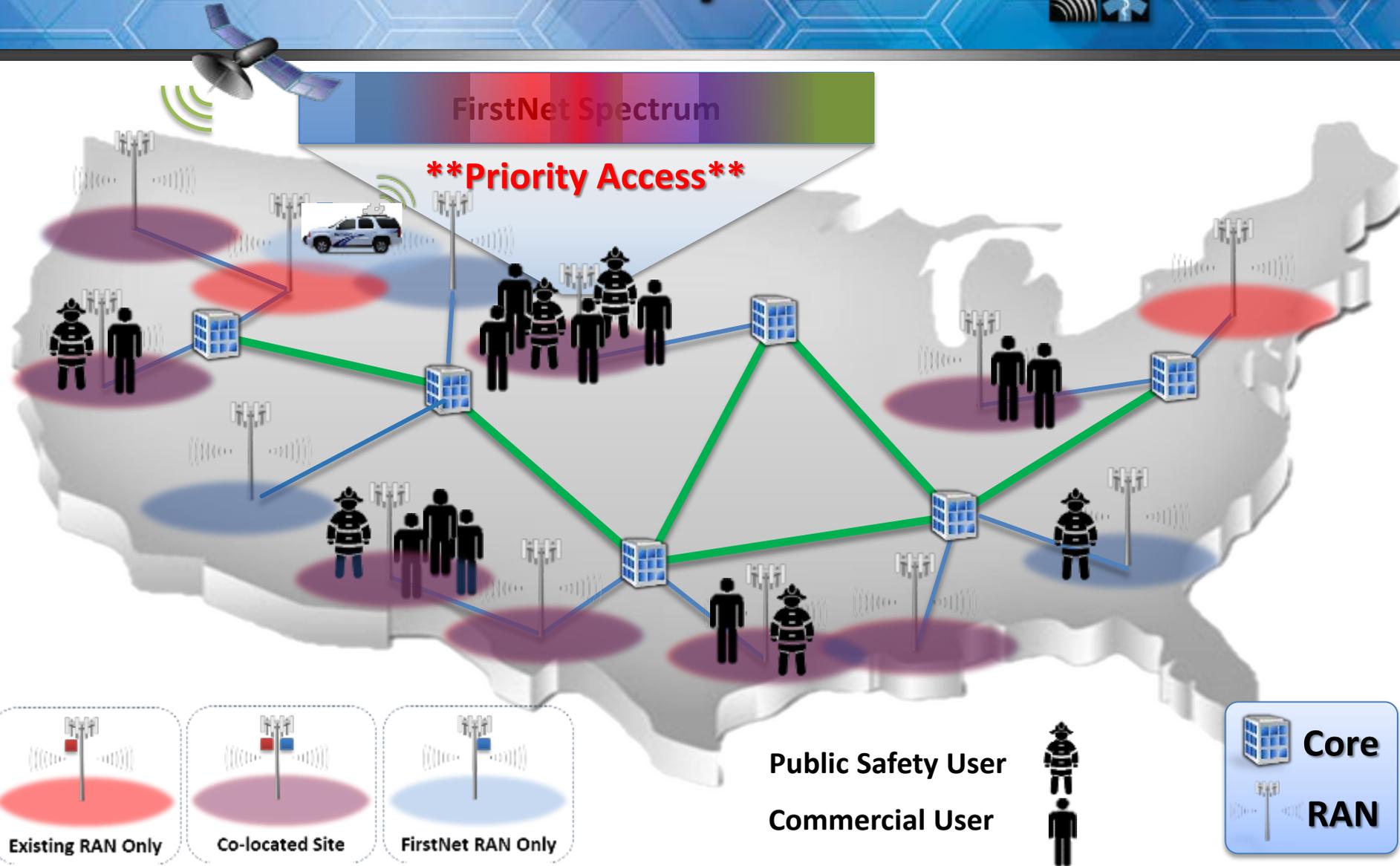
QPP Profiles	The assigned attributes of users, devices, or applications that the network uses to make QPP decisions for that user, device, or application.
Triggers & Thresholds	Benchmarks that, when attained, prompt the network to shift among network states.
Static Network State	Network operational mode that uses the QPP properties assigned to users & devices when they were provisioned onto the network.
Dynamic Network State	Network operational mode when the network sees congestion it cannot relieve using static QPP data alone. This state uses new or “real time” data to improve QPP functionality.
Controlled Network State	Network operational mode when an authorized individual can further influence the dynamic controller to improve QPP functionality to alleviate congestion.

Conceptual Definition Review



Dynamic Controller	A network component that allows the network to manage, operate, and command QPP properties in real time.
Dynamic Incident Data Types	Future incident data provided in real time by public safety about an incident that may be available to the dynamic controller via CAD interfaces or other sources to make more informed decisions about QPP profiles.
Governance of QPP	Relationships among public safety entities to adjudicate QPP conflicts, collaborate on QPP profiles, etc.
Local Control	A methodology for public safety entities to interact with/influence the network.

Architecture & Priority



Questions or Comments?

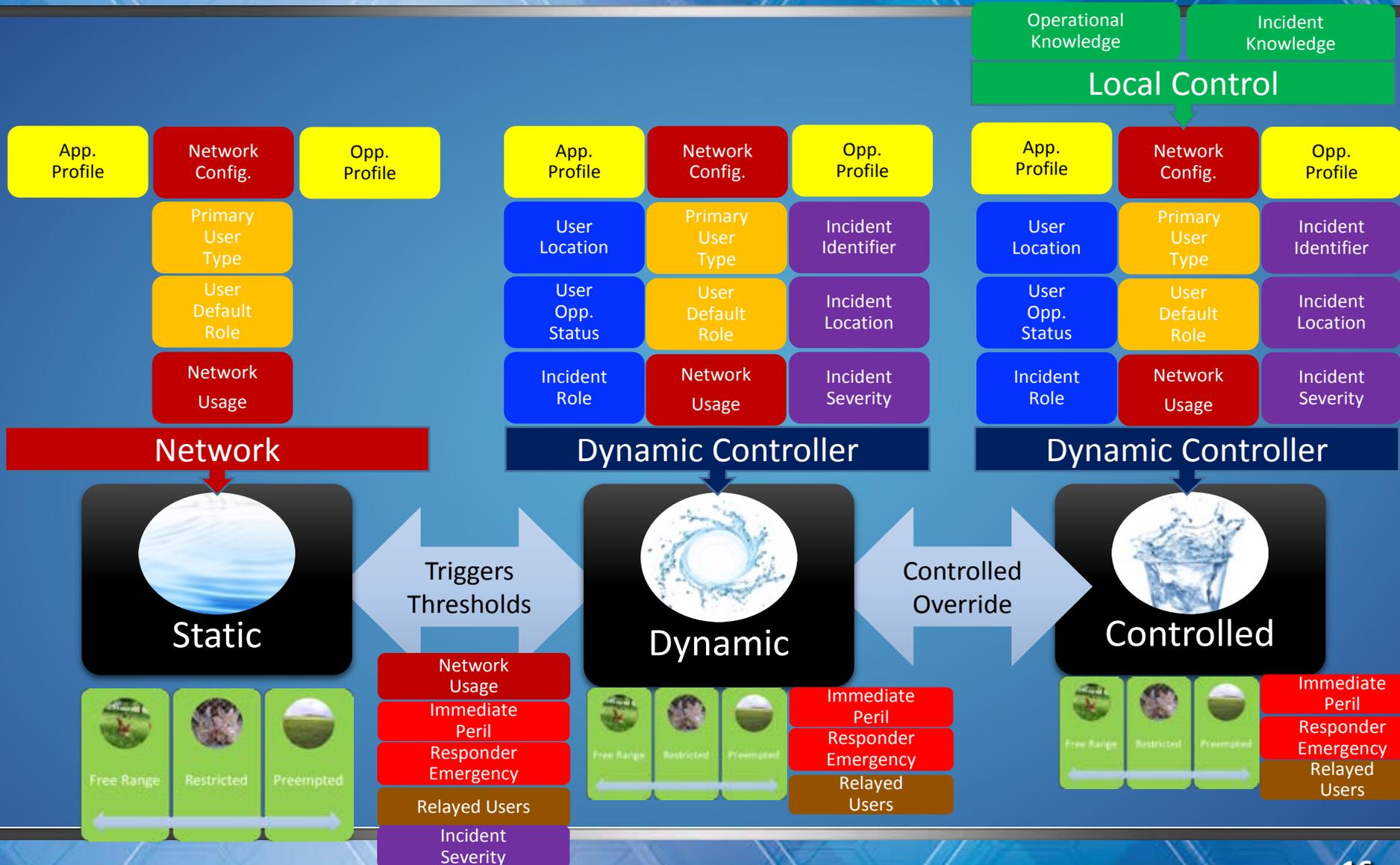
QPP Scenario Discussion



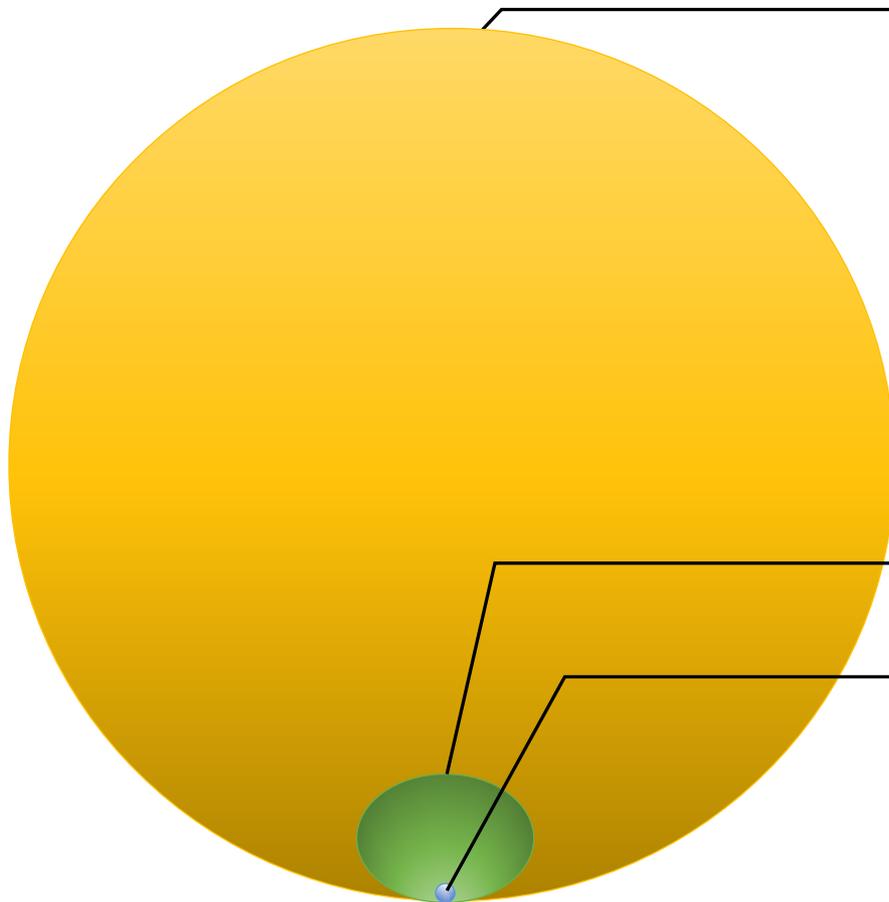
Network States



QPP Framework



QPP States: Relative Frequency



STATIC QPP

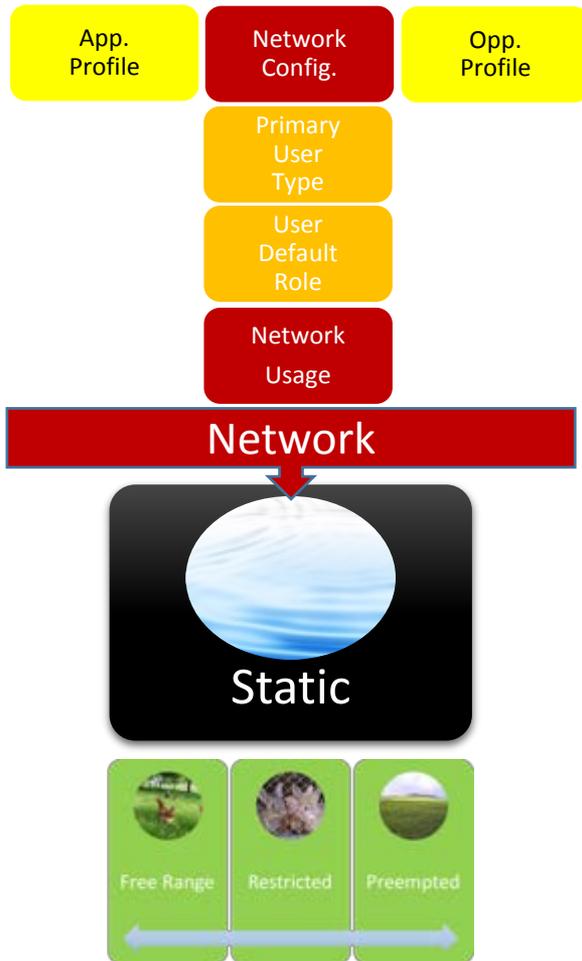
- User Roles & Profiles
- Application Profiles
- Network Status

DYNAMIC QPP

- **Additional Situational Data (Geographic Information System (GIS), Automatic Vehicle Location (AVL), Device Sensors)**
- User Roles & Profiles
- Application Profiles
- Network Status

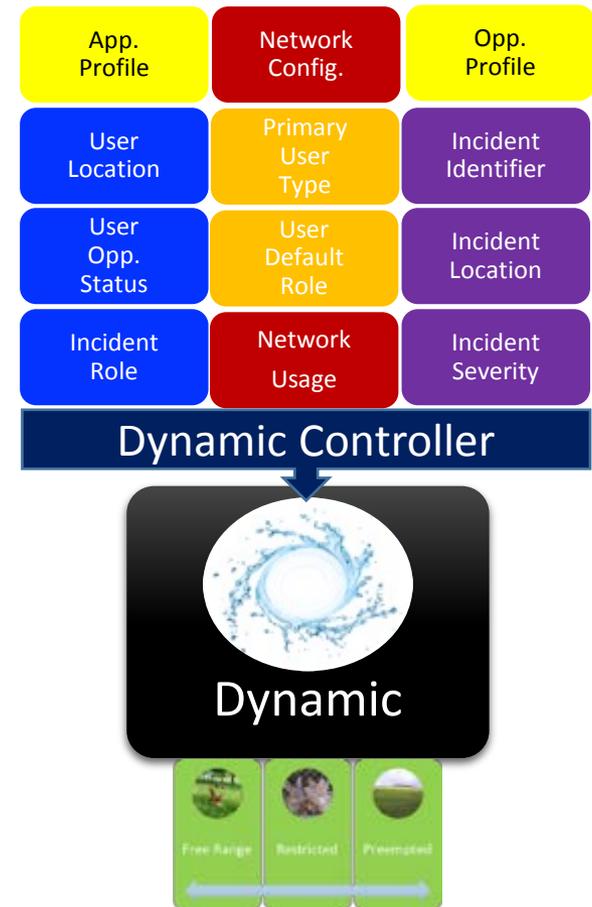
CONTROLLED QPP

- **Human Input**
- **Agency Directed Changes**
- Additional Situational Data
- User Roles & Profiles
- Application Profiles
- Network Status



- What the Static State Is:
 - The network operating based on data it already knows
 - Able to handle network traffic for all users the vast majority of the time
 - Heavily influenced by local control provisioning
- What the Static State is **Not**:
 - What's happening when nothing is happening
 - What's happening when public safety is "idle"

- What the Dynamic State Is:
 - The network incorporating real time data on top of data it already knows
 - Able to respond to most instances of congestion
 - Needed infrequently
 - Influenced by local control inputs
- What the Dynamic State is **NOT**:
 - What is always happening in the network during a public safety incident
 - A “steady state” for the network, or one it frequently stays in for prolonged periods of time



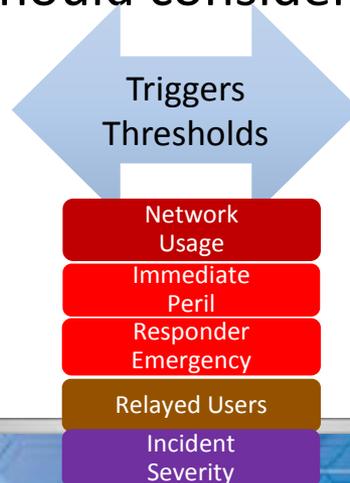
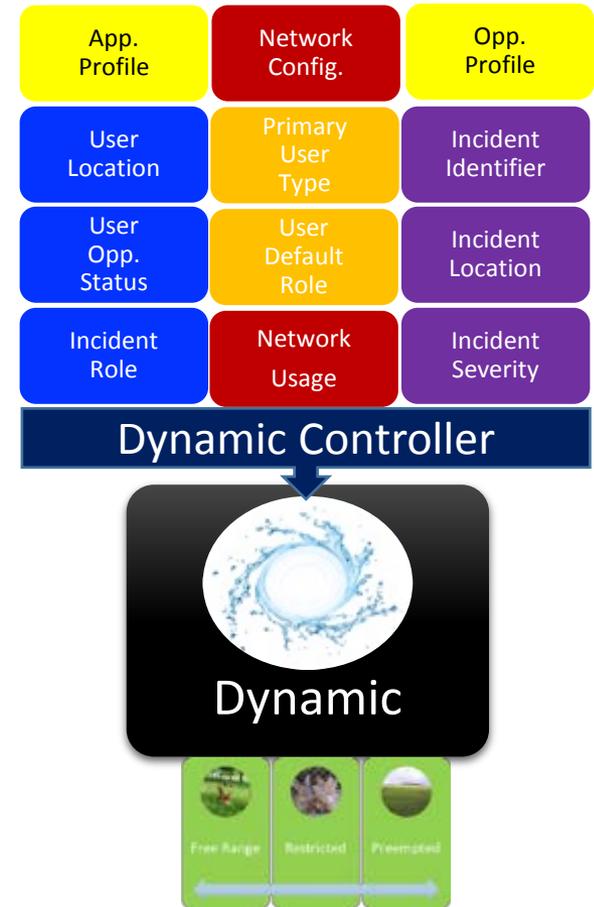
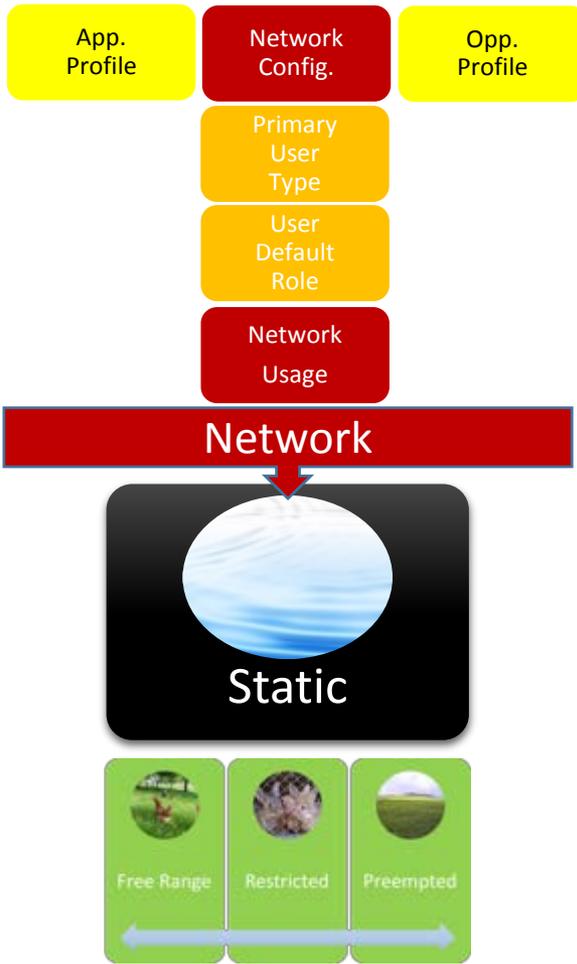
Static vs. Dynamic

- Data Inputs

- Have we considered all of the static and dynamic inputs you think should be relevant to the network?

- Shifting States

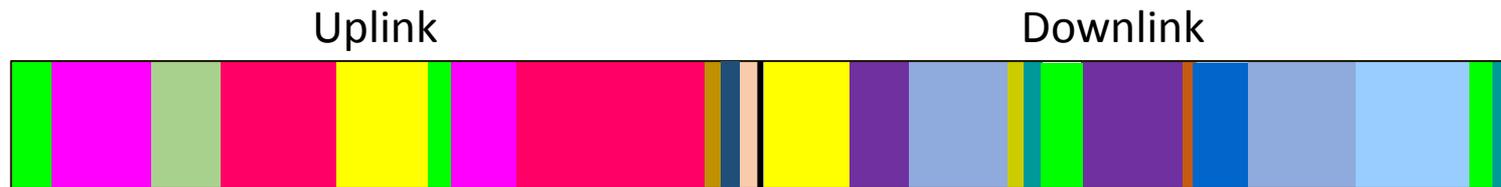
- Any other triggers or thresholds for moving between the two we should consider?



Priority & Preemption

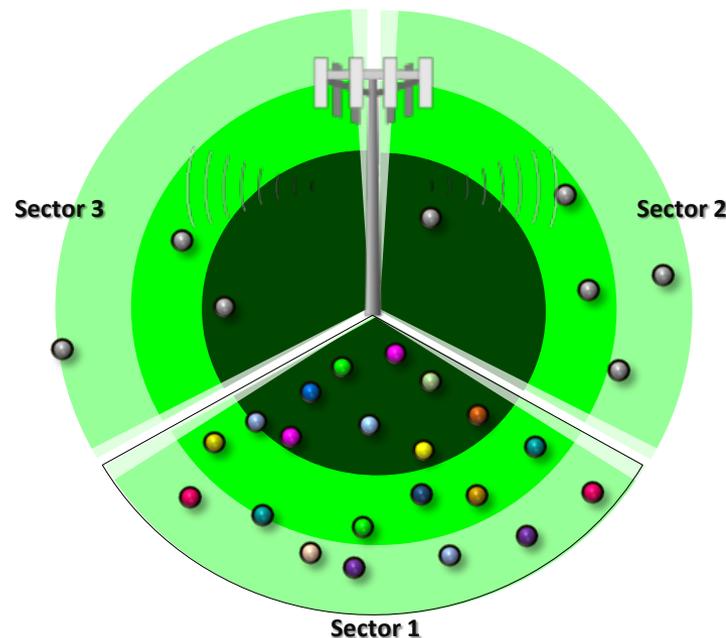


LTE Cell Sector – Best Effort Approach



LTE Spectrum

- Voice call
- Upload Video
- Upload Pictures
- Send Text Message
- Stream Video
- Body Sensors
- Location
- Video Call

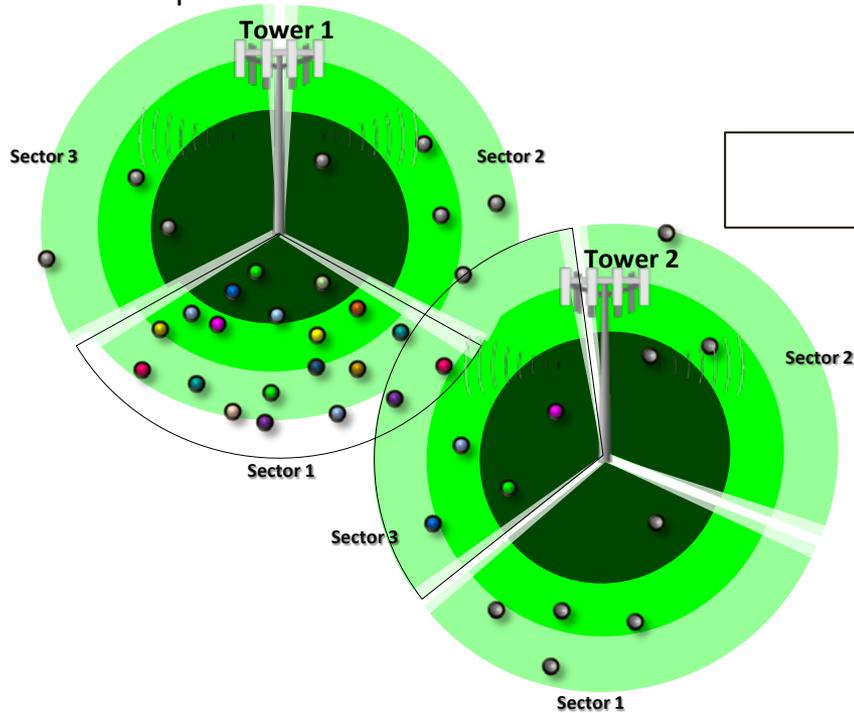


- Voice call
- Download Video
- Download Pictures
- Receive Text Message
- Stream Video
- Web Search
- Data Base Lookup
- Video Call

Load Balancing



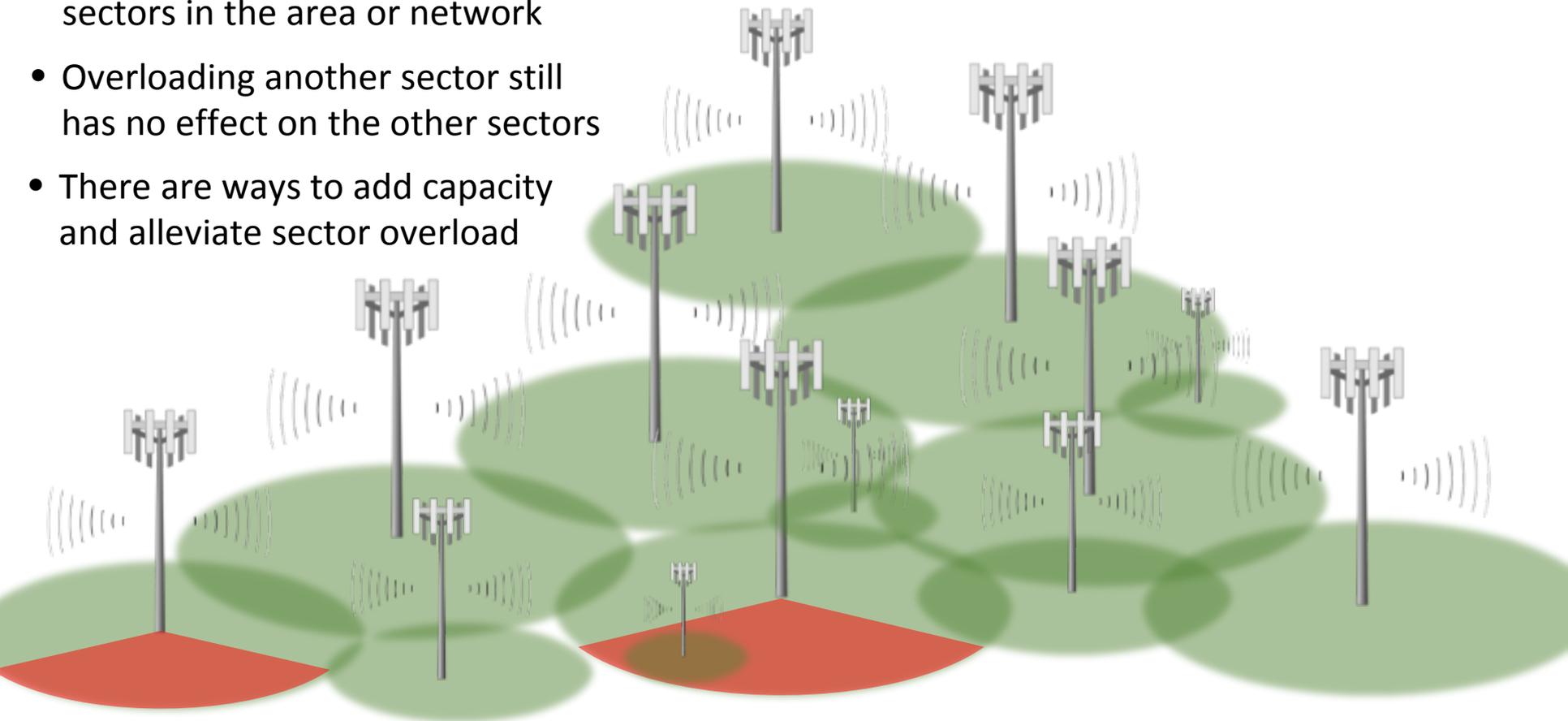
Uplink Tower 1/Sector 1 LTE Spectrum Downlink



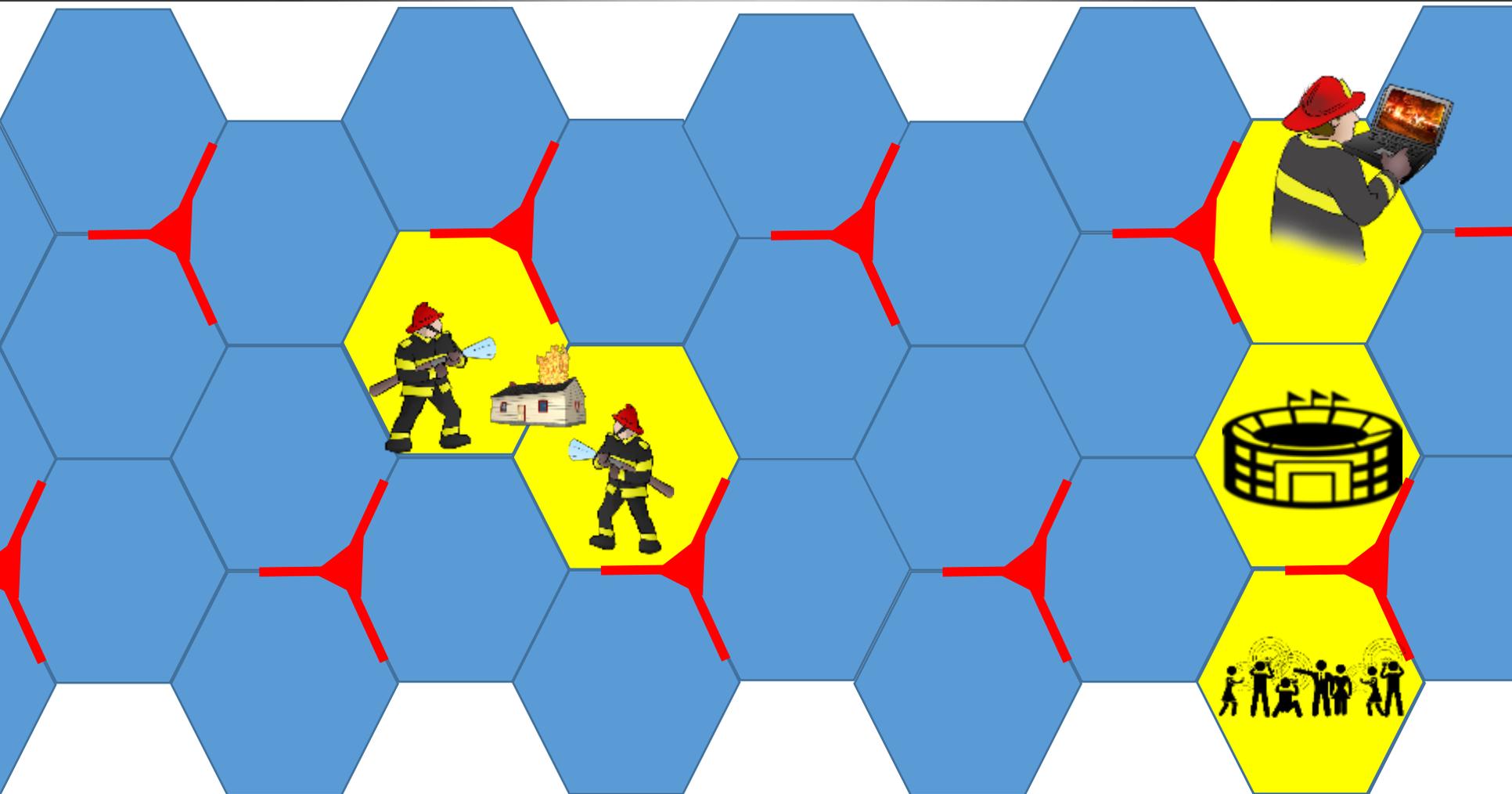
Uplink Tower 2/Sector 3 LTE Spectrum Downlink

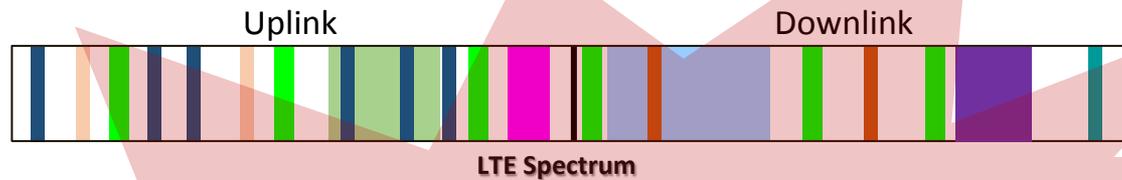
Sector Overload

- Overloading one sector does not have an effect on the rest of the sectors in the area or network
- Overloading another sector still has no effect on the other sectors
- There are ways to add capacity and alleviate sector overload



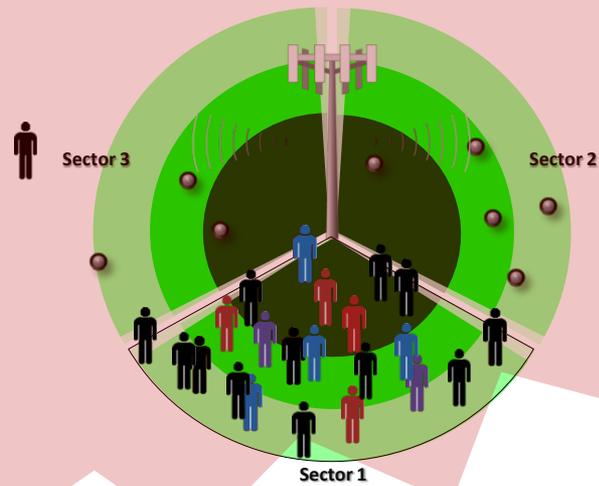
..to find this! look like THIS!



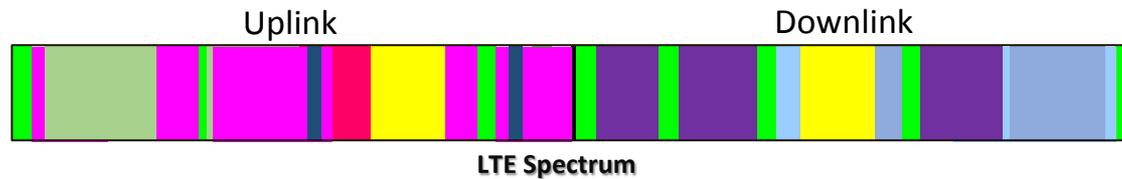


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- Location
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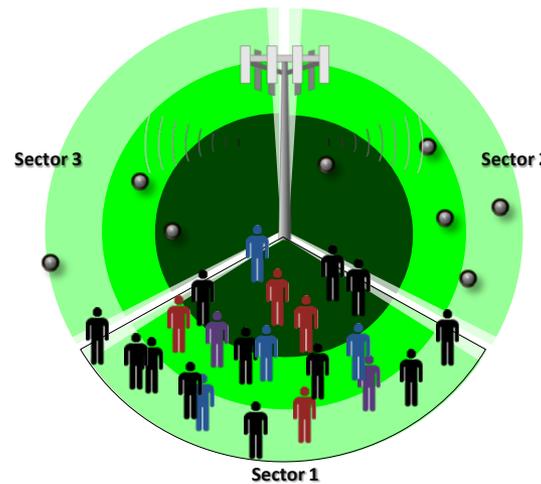
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- Public Safety Users
- Commercial Users



- Voice call
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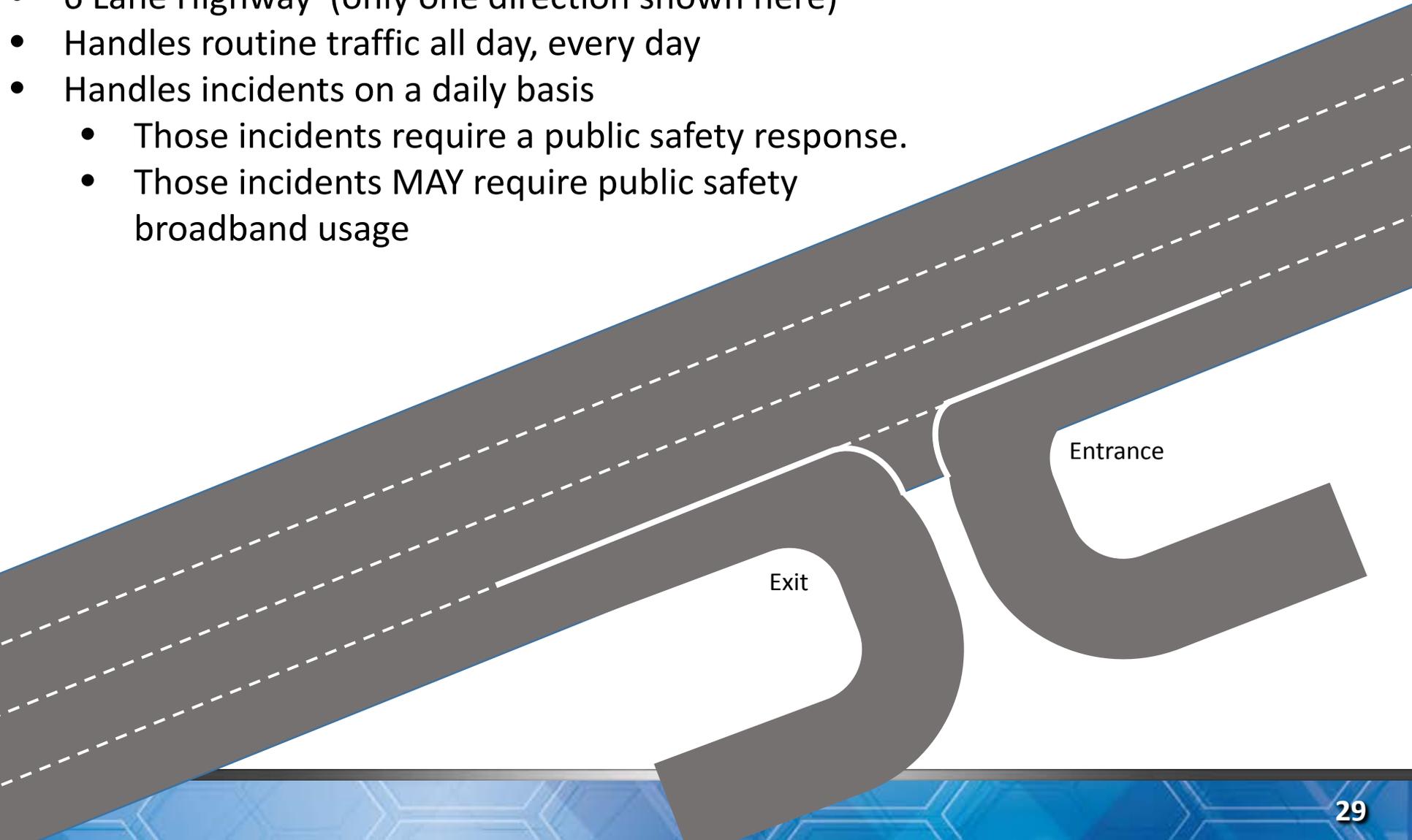
Responder Roles vs. Broadband Needs



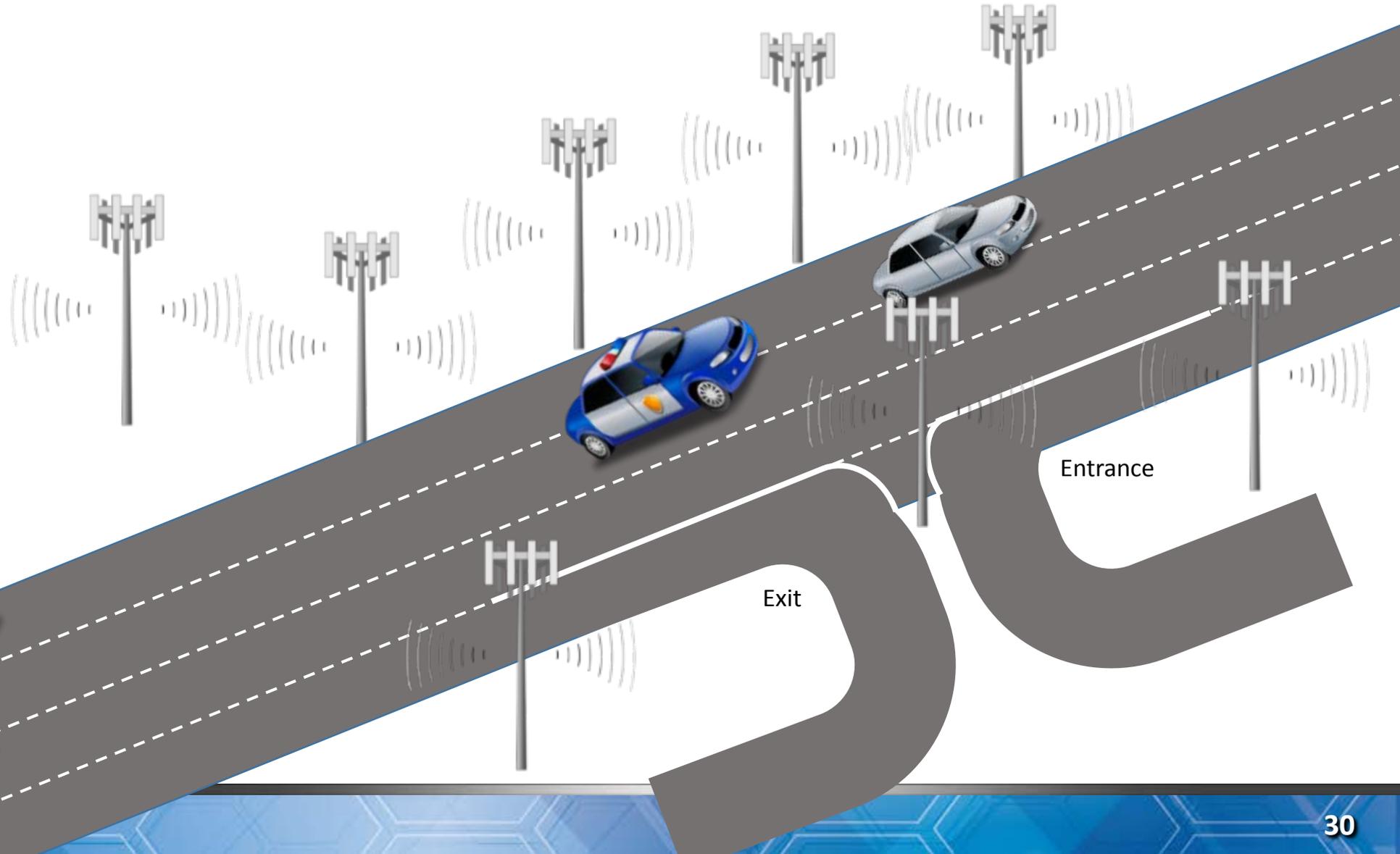
On the Road Again....



- 6 Lane Highway (only one direction shown here)
- Handles routine traffic all day, every day
- Handles incidents on a daily basis
 - Those incidents require a public safety response.
 - Those incidents MAY require public safety broadband usage



Example Incident #1: Pursuit



Example Incident #2: HAZMAT

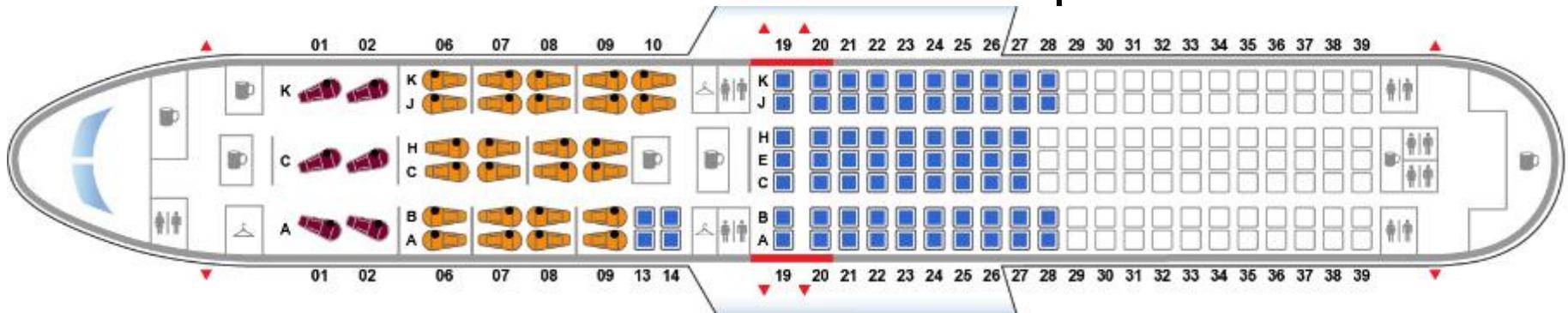


Handling Severe Loading



...or you could think of it this way...

- **QoS** = Flight leaves on time, travels the planned route, and lands on time at the correct airport.



- **Priority** = Public safety has your own check in line and security lane, boards first, and has the best seats.
- **Preemption** = When the flight is oversold, public safety does not get bumped.



In the event of an inflight emergency...

- Assuming all secondary users were bumped from the flight and all seats are taken by public safety...
- Who should make decisions to manage the emergency?
 - What qualifications should the pilots have?



Pilot



Air Traffic Control



Aircraft



Passenger in 36E

Questions or Comments?

QPP Additional Feedback & Questions



General Comments

- Does this conceptual framework address your QPP needs?
- Is there anything about the conceptual framework that surprised you?
- Is there anything you think we may not have anticipated?

QPP Feedback Form



- Please complete our online Feedback Form to provide additional thoughts, comments, and input on the conceptual QPP Framework.
- The Feedback Form should take 10 minutes to complete.

https://www.research.net/r/QPP_FeedbackForm



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Thank you!