



# Public Safety Communications Research Program

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PSCR

# Priority – QoS - Preemption

## Today's Talk

- QPP Overview
- Commercial Plans and Public Safety Vision
- Looking Ahead



**Public Safety Priority, Preemption and QoS**

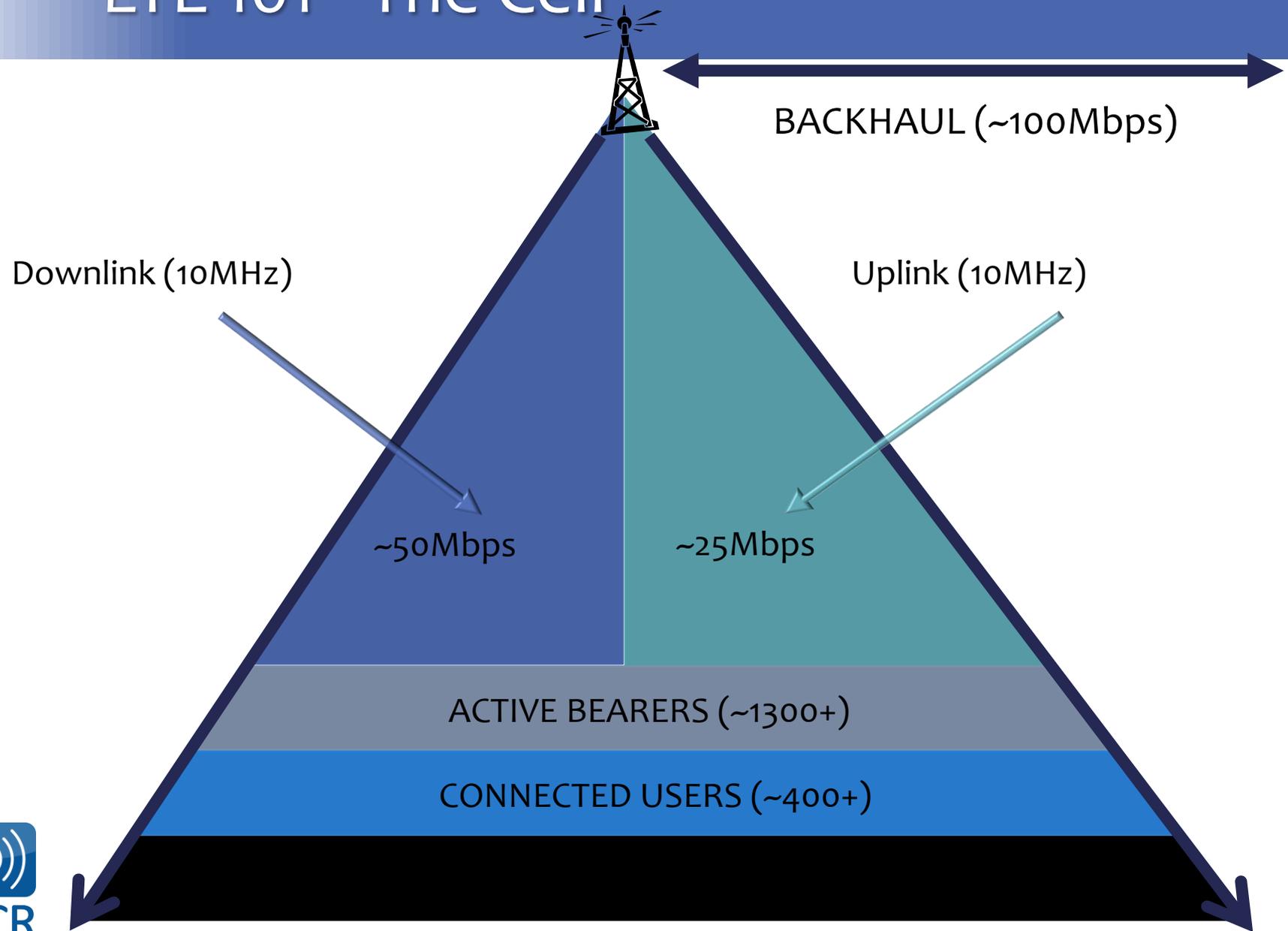
# Key Thought....



The needs of public safety and first responders are diverse.

What works for one discipline may not work for another.

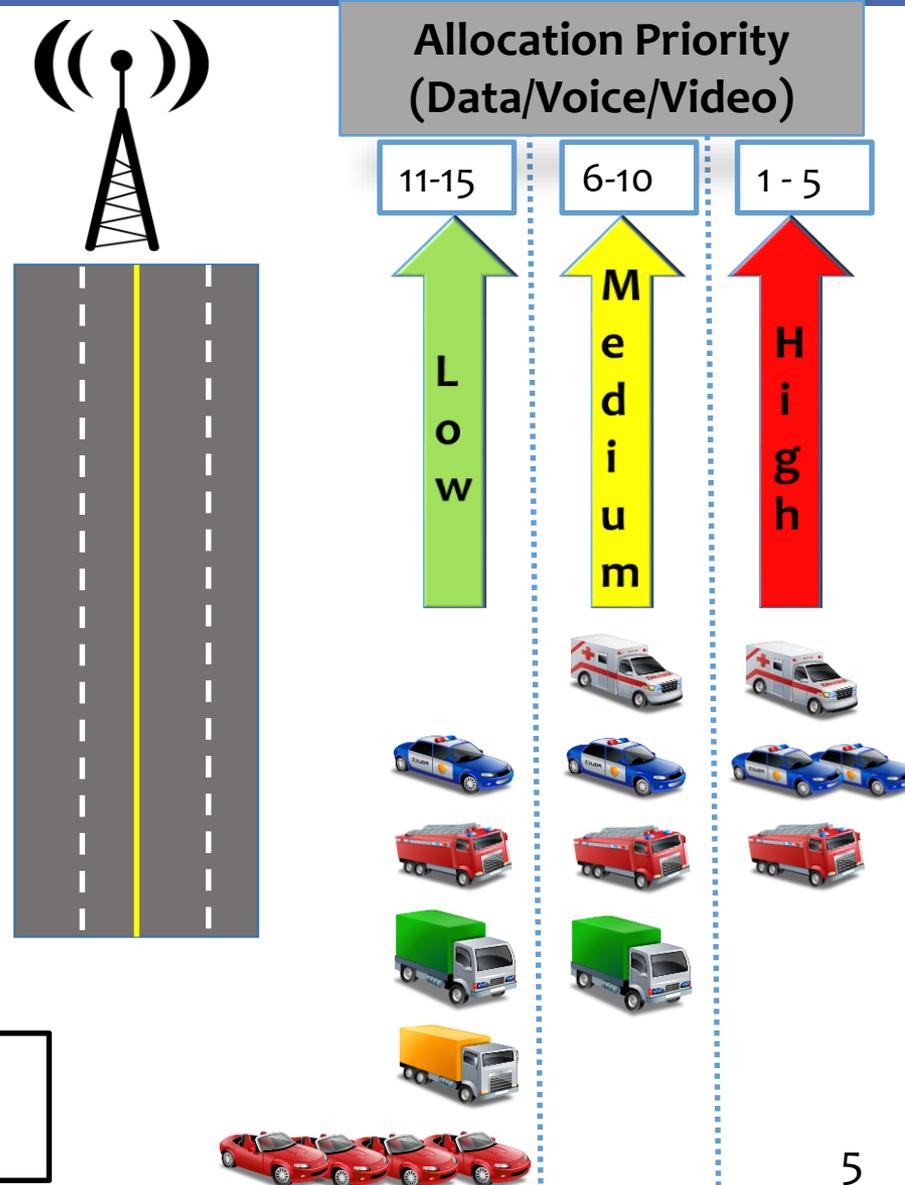
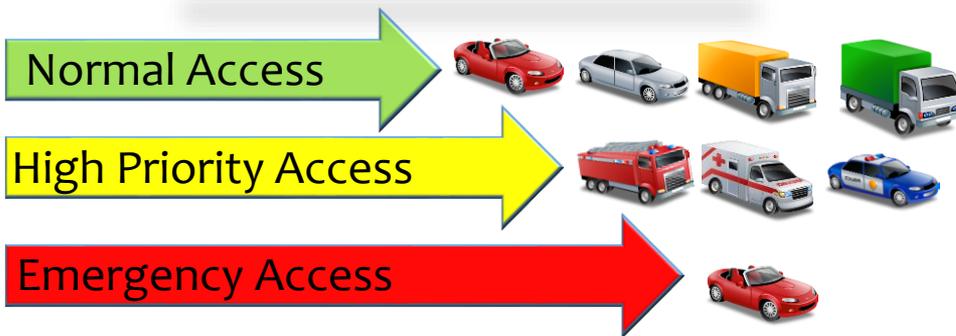
# LTE 101 “The Cell”



# Priority Access "To" The Network

If you can't get access to the network, the network doesn't do you any good.

## Establishment Priority (RF)

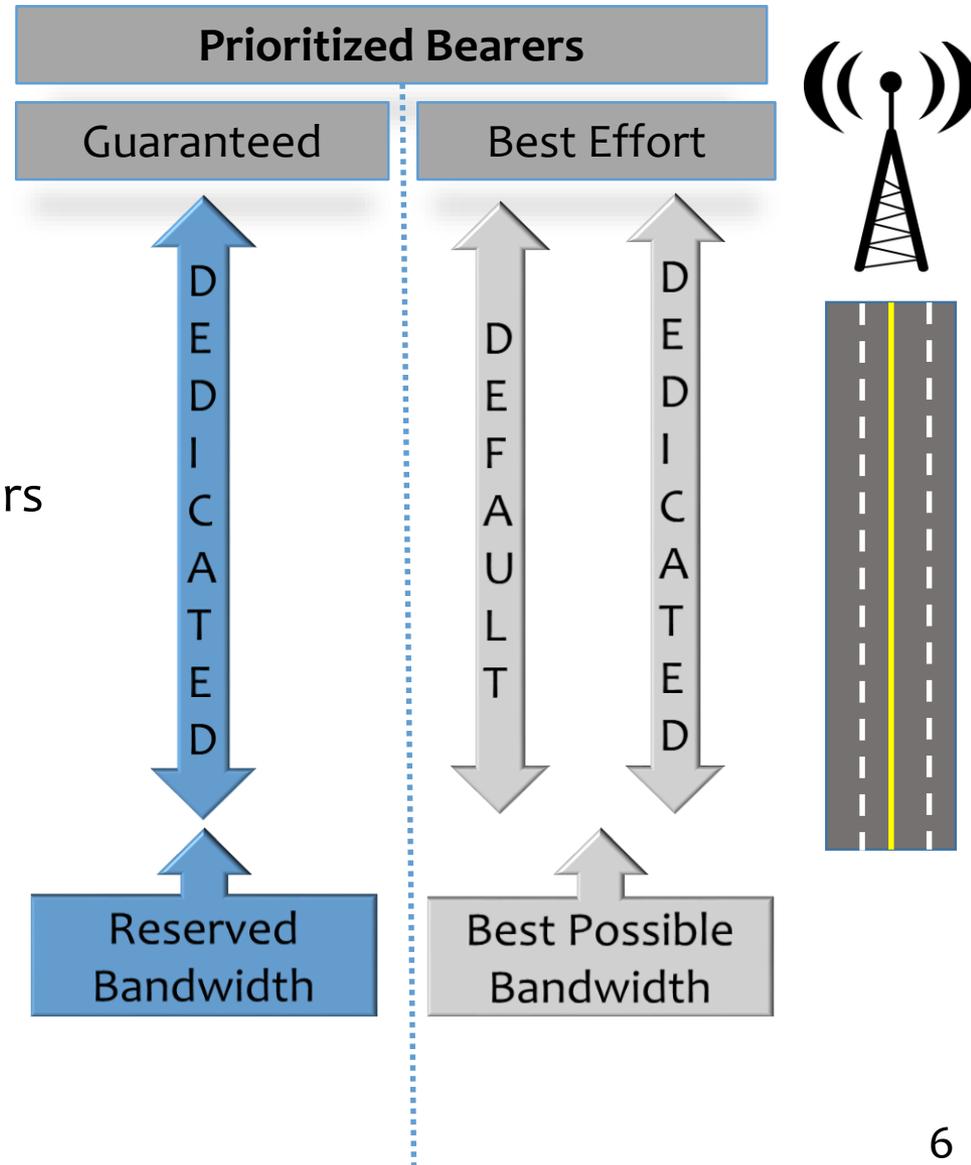


Note: A device supports up to 8 active connections at one time.

# Priority Path “THROUGH” The Network

Once you are in, you need a set of rules that ensures your applications work.

- Application Performance Parameters
  - Packet Priority
  - Packet Loss, Packet Delay
  - Maximum/Guaranteed Bitrate
  - Aggregate Maximum Bitrate
  - Preemption Vulnerability
  - Preemption Capability



# Priority Preemption of Applications

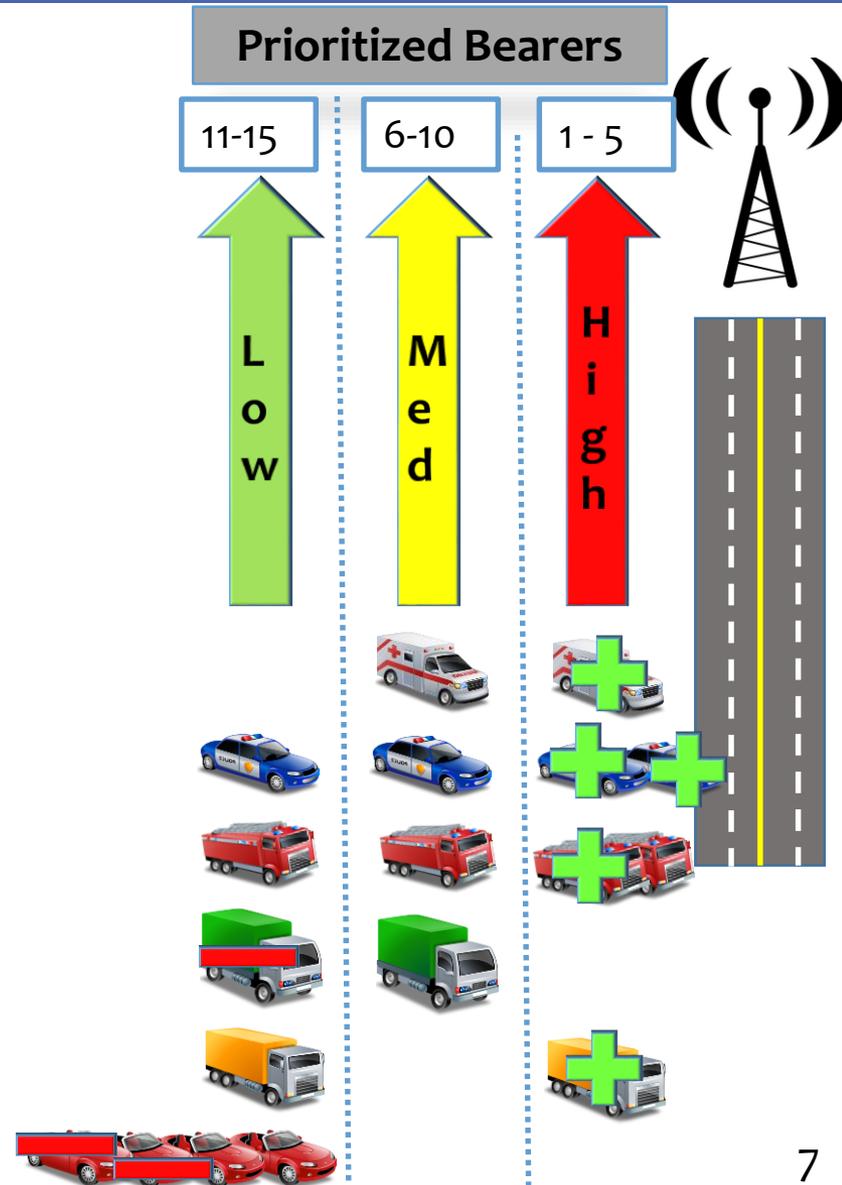
When the network becomes congested, resources may need to be preempted.



**Retention** is triggered during extreme overload events



**Preemption** is triggered when resources are exhausted



# Priority Preemption of Users

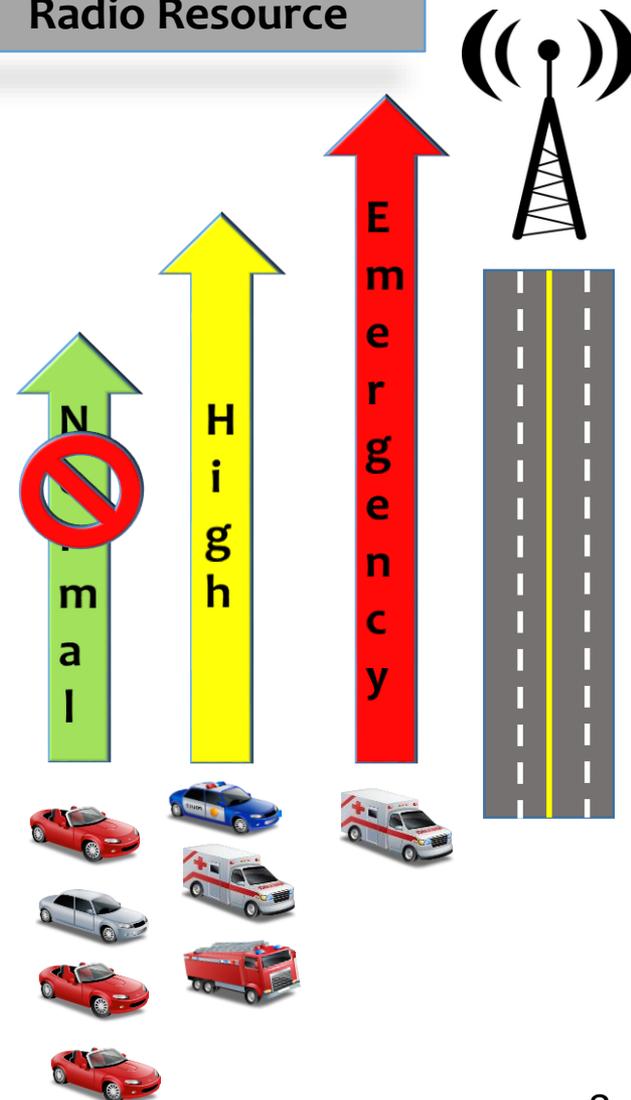
If there is a security concern or extreme event, you may need to restrict access to users.

Automatic Access Class Barring (ACB) can either discourage users, or completely prohibit them from accessing the system for a period of time.

Key attributes

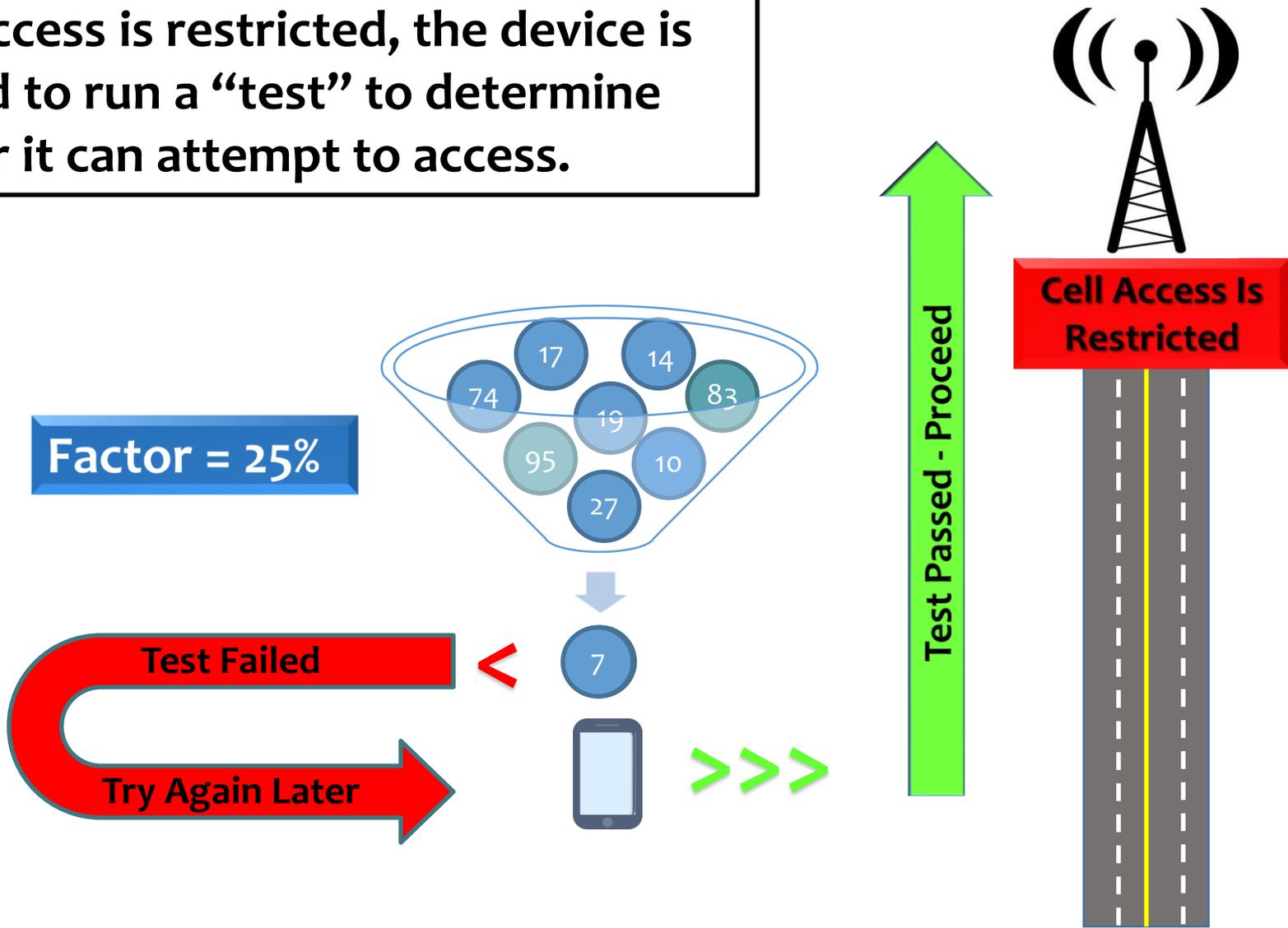
- Barring Probability Factor (0-100%)
- Barring Time (seconds)

Radio Resource



# Priority Preemption of Users

When access is restricted, the device is required to run a “test” to determine whether it can attempt to access.



# Public Safety Priority and QoS

## Commercial Priority Vision

Static Priority/QoS

Best Effort

No Preemption

Public Safety is an “Enterprise”

## Public Safety Priority Vision

Static and Dynamic Priority/QoS

Best Effort and Guaranteed Bitrate

User/Bearer Preemption

Local Control Interfaces

Deployable System Priority Framework

Diverse Public Safety User Community

# Static QoS – 100 Users(50Mbps demand)

High Priority  
QCI 6



Normal Priority  
QCI 9



# of Users	Throughput per user	Video Quality QCI 6	Video Quality QCI 9
100	0.5 Mb (low rate streaming)	Good	Good



# Static QoS – 140 Users(70Mbps demand)

High Priority  
QCI 6



Normal Priority  
QCI 9



# of Users	Throughput per user	Video Quality QCI 6	Video Quality QCI 9
140	0.5 Mb (low rate streaming)	Good	Pixelation



# Static QoS – 200 Users(100Mbps demand)

High Priority  
QCI 6

Normal Priority  
QCI 9



# of Users	Throughput per user	Video Quality QCI 6	Video Quality QCI 9
200	0.5 Mb (low rate streaming)	Good	Not Viewable



# Local Control - 200 Users(100Mbps demand)

High Priority  
QCI 6



Normal Priority  
QCI 9



# of Users	Throughput per user	Video Quality QCI 9 -> QCI 6	Video Quality QCI 9
200	0.5 Mb (low rate streaming)	Not Viewable ->Good	Not Viewable



# Application Pre-emption – 100 Users (50Mbps demand)

High Priority  
High Priority  
Pre-emption Capable  
ARP = 3  
Pre-emption Capable



Normal Priority  
Pre-empted  
Dedicated Bearer  
ARP = 7  
Default Bearer  
Vulnerable to Pre-emption



# of Users	Throughput per user	Video Quality
50	0.5 Mb	Dedicated Bearers QCI = 2, ARP = 6
50	0.5 Mb	Default



## Takeaway:

- Public Safety's needs are diverse.
- Commercial priority is a positive step.
- When everyone has the same priority, nobody has priority.

**Thank You!**