Speakers

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# Carrier Tools To Address QoS....

- Access Class Barring (ACB): Consumers stay "in garage"
- Allocation & Retention Priority (ARP): Users stay on entrance ramp
- "On the road," it's Quality of Service Class Identifiers (QCI)
  - Guaranteed
 - Best Effort
- Band 14 "Reservation"
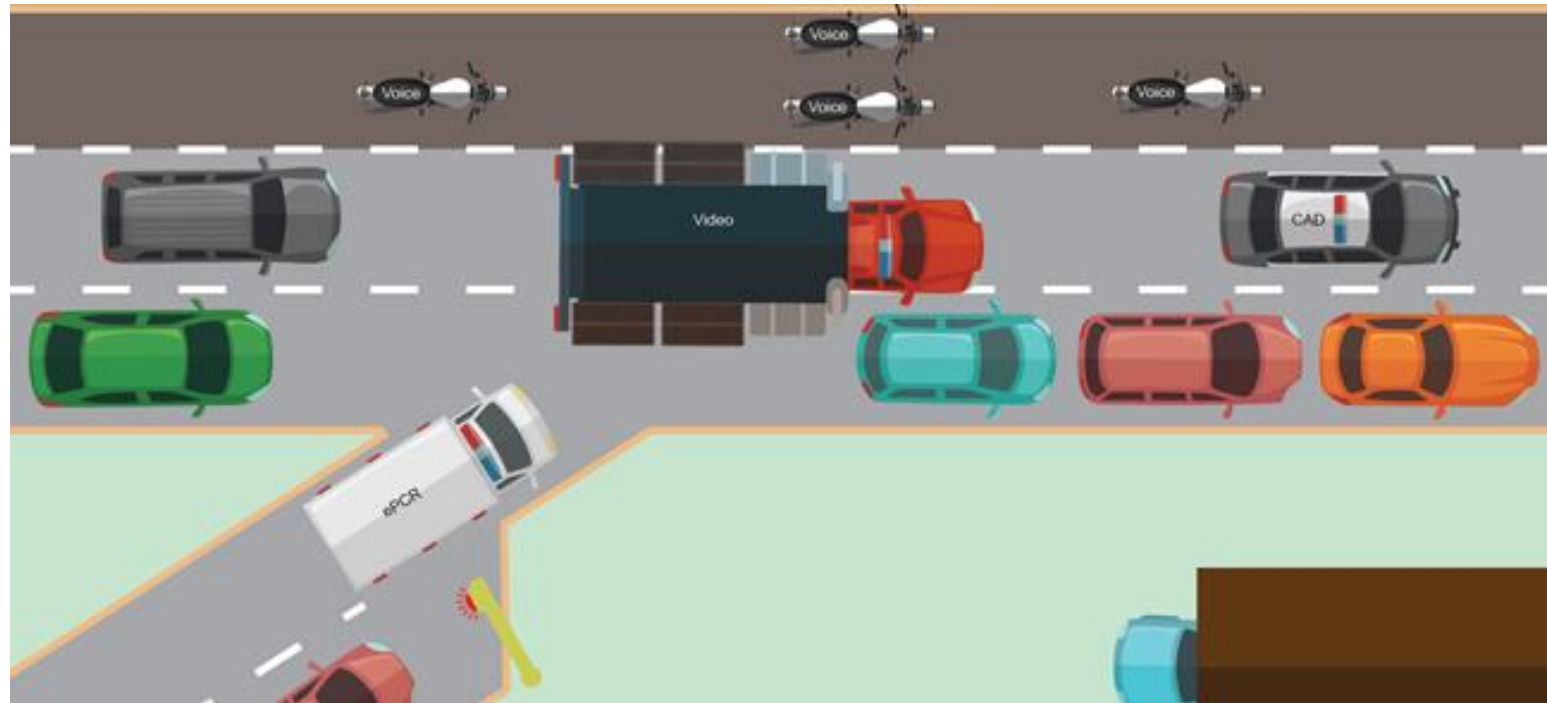
The Typical Case

- QPP automatically handles most "routine" situations

- "All Bands" approach provides 100's Mbps per site

- Small percentage of resources used…

- Voice given preferential treatment

- Rare circumstances where traffic levels are very high is the issue
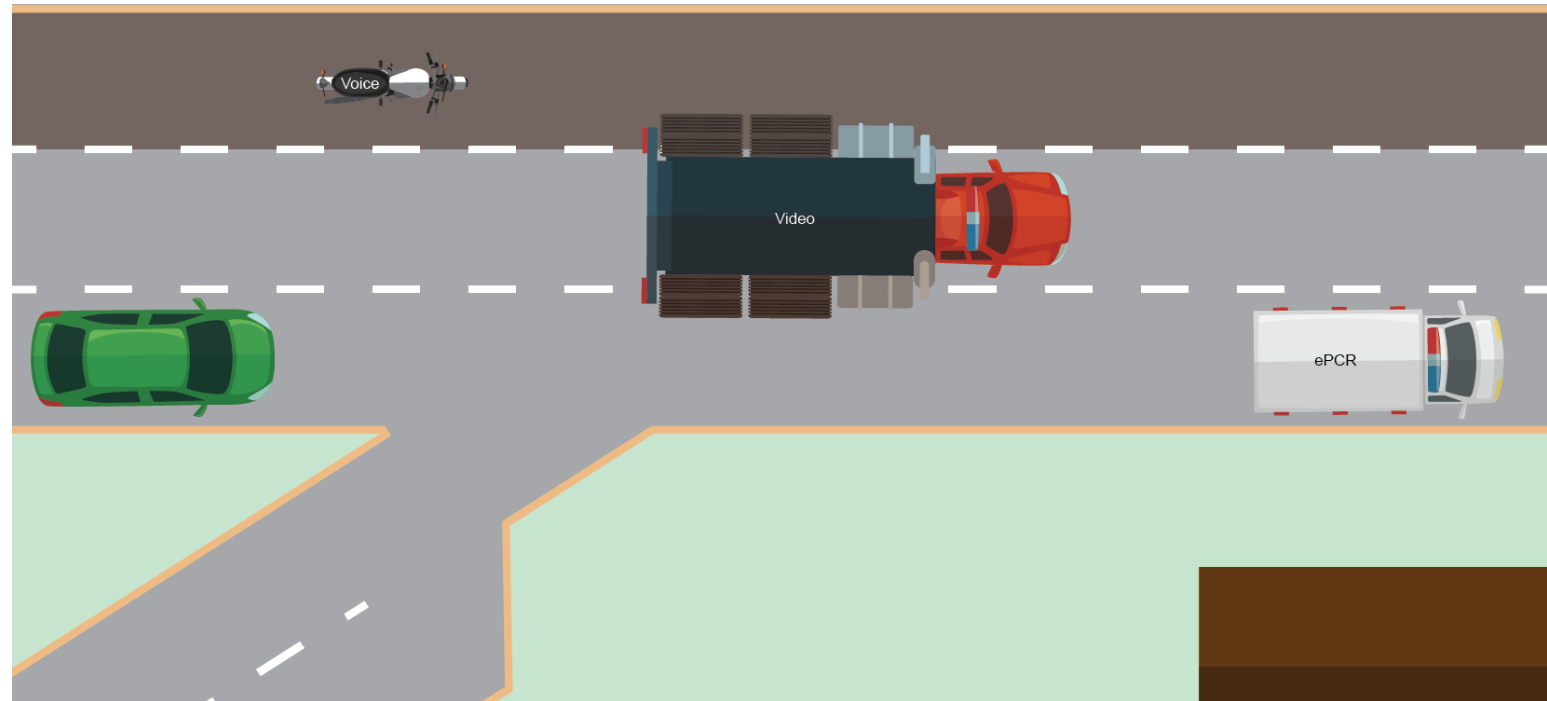
Severe Congested Case

- Driven by consumer traffic
- Voice gets guaranteed services
- "Best Effort" apps are at risk
- Video "clogs" highway

- Without sufficient priority, mission critical apps can degrade

➢ Local Control
  ➢ Use of priority tiers
  ➢ Incident uplift
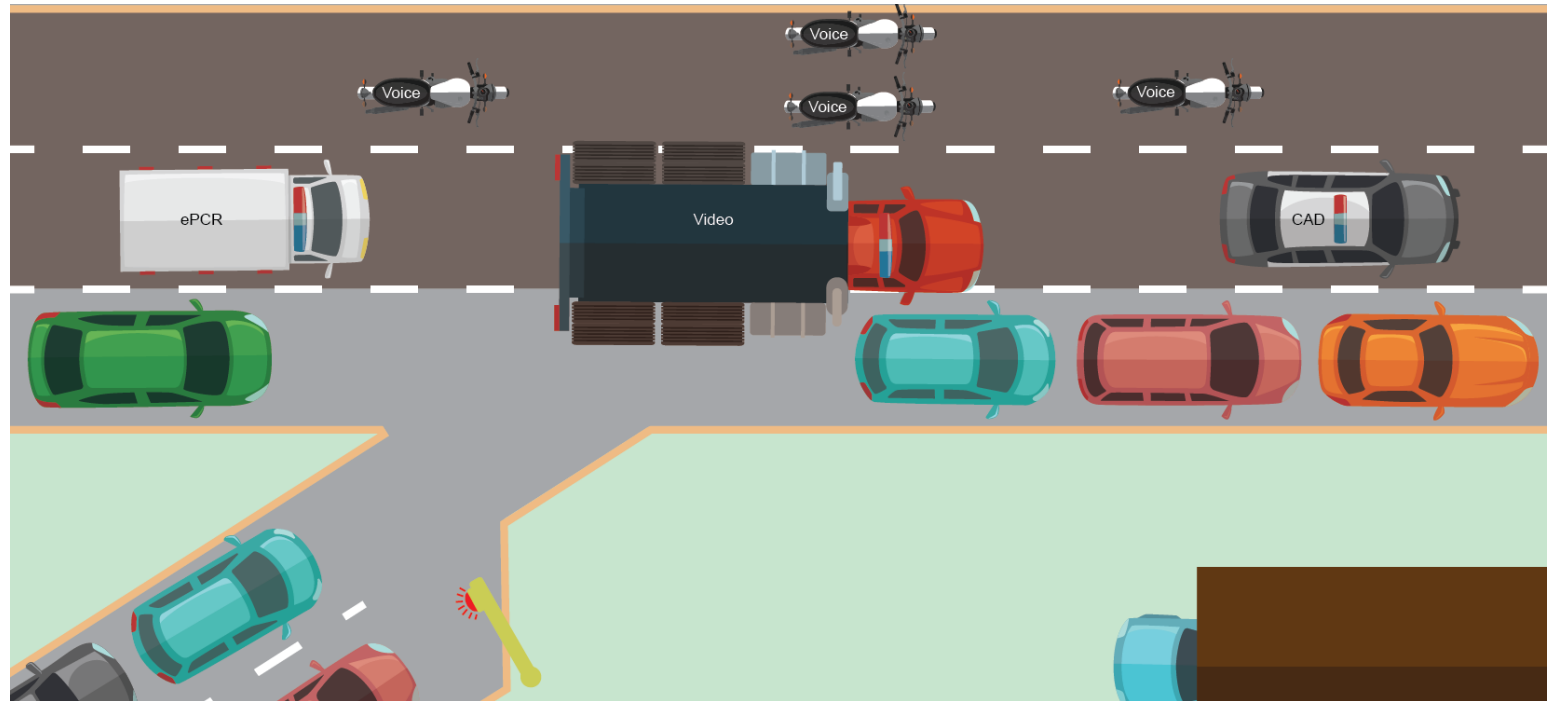
Major Factors In Adequate QoS

- Need for local control will be driven by QPP configuration
- What priority does public safety traffic receive relative to consumers? For which services?
- Will "special" apps receive higher priority?
- How will LTE vendor algorithms behave?
- Local Control Elements:
  - What are first responder tiers placed?
  - Where will uplifted traffic fall?

QCI	Resource Type	Priority	Packet Delay Budget	Packet Error Loss Rate	Example Services
1	GBR	2	100ms	10^{-2}	Conversational Voice
2	GBR	4	150ms	10^{-3}	Conversational Video
3	GBR	3	50ms	10^{-3}	Real Time Gaming, V2X messages
4	GBR	5	300ms	10^{-6}	Non-Conversational Video
65	GBR	0.7	75ms	10^{-2}	Mission Critical user plane PTT voice
66	GBR	2	100ms	10^{-2}	Non-Mission-Critical user plane PTT voice
75	GBR	2.5	50ms	10^{-2}	V2X messages
5	non-GBR	1	100ms	10^{-6}	IMS Signaling
6	non-GBR	6	300ms	10^{-6}	Video TCP-Based
7	non-GBR	7	100ms	10^{-3}	Voice, Video, Interactive Gaming
8	non-GBR	8	300ms	10^{-6}	Video TCP-Based
9	non-GBR	9	300ms	10^{-6}	Video TCP-Based
69	non-GBR	0.5	60ms	10^{-6}	Mission Critical delay sensitive signaling
70	non-GBR	5.5	200ms	10^{-6}	Mission Critical Data
79	non-GBR	6.5	50ms	10^{-2}	V2X messages

Ultimately…

- Carriers need to balance consumers vs. public safety
- Automatic QPP will probably handle needs 99% of the time
- FirstNet/AT&T Band 14 advantage may deliver good QoS even during high periods of congestion
- Apps you use may dictate QPP (e.g., over the top PTT)
- Video is most likely to benefit from Local Control
  - Unlikely to receive high automatic priority
  - Can benefit from "incident uplift" when content is critical

- A lot of unknowns, but Local Control will likely be a big benefit to mission critical needs