



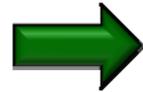
*Interoperability of Customer Mobile Equipment
Across Commercial Spectrum Blocks
in the 700 MHz Band
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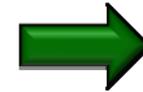
Public Safety Communications: System Evolution



Today



Mid-Term



Long -Term

Multiple Technologies Disparate Networks

LMR & Paging
Systems



Commercial
Cellular Data
Services

Hybrid Network

Legacy LMR &
Paging Systems



Voice
Interoperability

700 MHz Public
Safety LTE
Network



- Roaming
- Asset Leverage
- Services

Commercial
Cellular Data
Services
(3G & 4G)

Converged Network

National Public Safety LTE
Network Supports:

- Mission Critical Voice & Data
- Nation-wide Roaming
- Public Safety Grade – Availability & Service Levels
- Interoperability with Relevant Alternate Technologies



Key Market Issues for 700 MHz Public Safety Equipment



- Public safety is facing two technology migrations
 - Private narrowband voice systems to Voice-Over-LTE
 - Public carrier cellular data services to dedicated LTE V+D network
- Migration and interoperability are interwoven
 - Migration involves interoperation with legacy technologies & systems
 - Emerging interoperability framework for inter-carrier roaming between commercial and dedicated 700 MHz LTE networks
- Emerging regulatory framework
 - Governance Structure and System Architecture
 - 3rd R&O codifies LTE as the 700 MHz standard
 - Ongoing Fourth FNMRM
 - Public policy issues related to allocation of upper D-Block to Public Safety
- Multiple emerging business models
 - Dedicated Networks ↔ Fully Shared, Retail
- Public Safety is not a commercial business
 - It is a collection of mission-oriented enterprises chartered with protecting life and property
 - Service levels (coverage, availability, security etc.) are not based on commercial value
 - Challenge/opportunity is to leverage commercial technology while retaining mission-focus

Public Safety Broadband Network Business Models



Infrastructure Oriented



Service Oriented

	Dedicated Network	Dedicated Radio Access Network	Dedicated Channel	Fully Shared, Enterprise	Fully Shared, Retail
<i>Description</i>	<ul style="list-style-type: none"> PS has separate base stations, backhaul and core network 	<ul style="list-style-type: none"> PS has separate base stations, uses carrier core network 	<ul style="list-style-type: none"> PS uses carrier RAN and core, with line card for PS spectrum 	<ul style="list-style-type: none"> PS uses carrier network for data transport, adds service layer 	<ul style="list-style-type: none"> PS relies on carrier network for data transport and services
<i>Business Model</i>	<ul style="list-style-type: none"> Contract to build and manage network 	<ul style="list-style-type: none"> Contract for RAN OA&M Tonnage fees for core services 	<ul style="list-style-type: none"> Install subsidy for channel card Tonnage fees for core services 	<ul style="list-style-type: none"> Tonnage fees 	<ul style="list-style-type: none"> User / service fees
<i>Advantages</i>	<ul style="list-style-type: none"> Maximum PS control, flexibility, and dedicated capacity 	<ul style="list-style-type: none"> PS can specify RAN req's, dedicated RAN capacity 	<ul style="list-style-type: none"> Dedicated RAN capacity, cost-efficient 	<ul style="list-style-type: none"> High cost efficiency, service level flexibility 	<ul style="list-style-type: none"> High cost efficiency, operational simplicity
<i>Disadvantages</i>	<ul style="list-style-type: none"> High PS cost and complexity 	<ul style="list-style-type: none"> RAN cost redundancies 	<ul style="list-style-type: none"> Some limits on feature flexibility 	<ul style="list-style-type: none"> No dedicated capacity 	<ul style="list-style-type: none"> No dedicated capacity, less service flexibility, higher user fees

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- Public Safety is not a monolithic market
 - Diverse governance structure – States, Local, Tribal & Federal
 - Jurisdictional needs vary across states, large cities and rural areas
 - Mission requirements vary between first responders (law enforcement, fire service, EMS)
 - Complex funding mechanisms
 - Public safety traditionally has very long market cycles for introduction of new technologies
 - Alignment with commercial technologies will create opportunities to improve this
 - New challenges will be created to synchronize the whole market to commercial technology evolution (Rel. 8, Rel. 9, etc.)