



# California Public Safety Radio Communications Strategic Plan

September 3, 2010

# 2010

A Unified Strategy for Communications



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Teri Takai  
California Chief Information Officer

**CALIFORNIA EMERGENCY  
MANAGEMENT AGENCY**

Matthew Bettenhausen  
Secretary

September 3, 2010

Dear Fellow Californians:

In all aspects of our lives we can see the benefits, challenges and opportunities associated with the incredible technological advancements in our society. Telecommunications dependent entities rank high among the myriad of professional areas benefiting from this technological evolution. Yet California state public safety agencies responsible for our well-being are equipped with outmoded and inadequate communications systems to assist them in the fulfillment of their critical missions.

State public safety agencies are faced with the challenge of making difficult telecommunications choices related to: the increasing demands on public safety's incompatible and aging communications equipment; growing requirements for interagency emergency communications; limited and fragmented coordination, funding and radio spectrum; emergent regulatory mandates; and evolving technologies. After looking at the myriad of issues facing State public safety agencies it was determined that California agencies must join forces in order to most efficiently plan for the State's needs. This planning process must take into account the needs of today and future needs at each agency both as separate entities and as a collective public safety group.

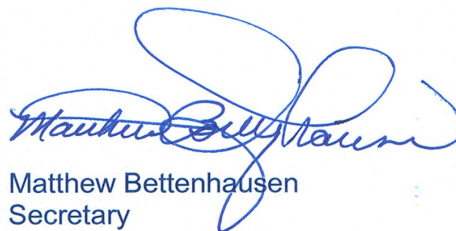
In recognizing these major challenges, representatives from California's 13 largest state public safety agencies collaborated in the development of this innovative California Public Safety Radio Communications (CAPSCOM) Strategic Plan. To meet the challenges of a dynamic environment, the Strategic Plan achieves an equitable balance between evolving gracefully towards advanced systems and business models while at the same time leveraging legacy resources and practices to the greatest extent practicable. By implementing the plan's strategic goals and objectives, we can ensure that up-to-date technologies enable the delivery of vital services to the people of California throughout the next ten years and beyond.

I would like to commend all of the associated representatives from each of the thirteen participating agencies for their extraordinary, collaborative efforts in contributing to the development of this ground-breaking Strategic Plan. The result of their hard work is a guiding document of considerable utilitarian value - and based upon which remedial changes are already underway!

Sincerely,



Teri Takai  
Chief Information Officer



Matthew Bettenhausen  
Secretary

## Executive Summary

During the past 30 years, California public safety agencies have successfully used their existing radio systems to protect the citizens, resources and property of the State. These systems have historically met the needs of each department, but due to the age of these systems, departments now have the opportunity to enhance their ability to communicate within their department (operability), with other departments and allied partners (interoperability) and improve the situational awareness of their personnel.

Throughout the past decade, there has been a virtual revolution in commercial communications—a revolution which shows no signs of slowing down. Cell phones, smartphones, high-speed broadband wireless networks, Global Positioning System (GPS) location based services, voice/data integration and other capabilities have become available and common. Although these offerings have been proliferating in the commercial marketplace, public safety agencies have been slow to adopt them because of reliability and operational concerns, budget constraints and cultural preferences.

During the next 10 years, public safety entities in the State of California will replace their existing systems with modern communications systems that bring advanced capabilities available to the commercial market into public safety communications. The future of public safety communications in California will be based on the following three visions:

- **System of Systems Vision**—The State of California will implement a System of Systems that interconnects individual public safety systems with one another to facilitate improved interoperability and enhanced virtual coverage.
- **Consolidation Vision**—The State of California will reduce the number of Statewide public safety radio communications systems in order to optimize the usage of infrastructure and frequencies.
- **Governance Vision**—The State of California will implement a governance structure that clearly delineates roles and responsibilities; the new governance structure will define a single entity to be accountable for Statewide public safety radio communications strategic planning, but it will ensure that each department has a voice in the process.



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Book 1:

## AN ENVIRONMENT POISED FOR CHANGE

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***“Public safety is the first priority of government.”***

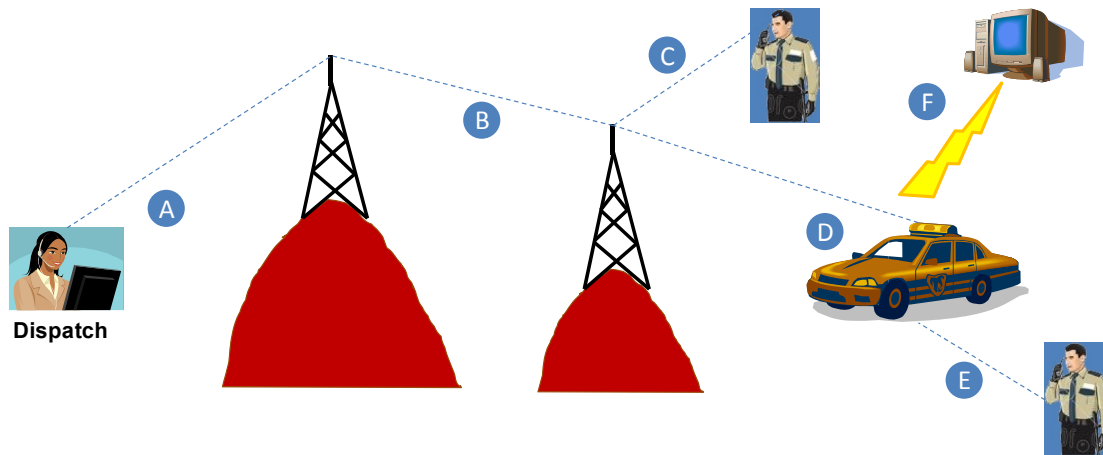
***Governor Arnold Schwarzenegger—2007 State of the State Address***

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## WHAT IS PUBLIC SAFETY RADIO COMMUNICATIONS?

Public safety radio communications systems allow personnel in the field to communicate with each other, dispatch centers, supervisors and personnel from allied agencies across a range of different situations. A critical, real-time lifeline for both public safety personnel and for the public they protect and serve, radio communications are mission-critical tools without which public safety personnel simply cannot fulfill their duties. Frequently there are tense tactical situations (fire, law enforcement, emergency medical services) in which the reliability, timeliness and clarity of voice communications can mean the difference between success and tragedy—or even the loss of life.

**Figure 1. Key Components of Public Safety Communications Systems**



- A. **The Dispatch Center** is a central location which serves as the primary point of contact between the First Responder and the general public. 9-1-1 calls are received here and routed to the appropriate nearest available personnel. Dispatch center personnel also play a critical role in coordinating public safety personnel in the field and monitoring the communications for emergency situations which require real-time action.
- B. **The Public Safety Radio Communications Network.** Radio communications among field personnel and dispatch centers are usually accomplished through a network of powerful radio transceivers and receivers located on prominent points of presence such as mountaintops. This equipment may receive the transmission from one device (such as a mobile or portable) and retransmit it so that everyone tuned to a particular channel can hear it within a prescribed service area. Communications to or from field personnel may also be received by, or emanate from, several interconnected mountaintops. This enables a dispatch center to monitor and respond to field communications over a large geographic area defined by the aggregate coverage of the network.
- C. **Portable Radios** are handheld radio transceivers which public safety personnel carry on their persons. These devices are typically configured to communicate with other

*Portable or Mobile Radios* which are within a short transmission range, and with the *Public Safety Radio Communications Network (PSRCN)* which provides connectivity to a dispatch center.

- D. **Mobile Radios** are mounted in a vehicle. They have significantly more range than *Portable Radios* because they are able to transmit with higher power and benefit from the use of a larger antenna mounted on the vehicle to send and receive signals. *Mobile Radios* are typically configured to communicate with other *Portable or Mobile Radios* located within range, and with the PSRCN.
- E. **A Portable Radio Extender** is a *Mobile Radio* that works in conjunction with a *Portable Radio* to extend the portable's range. The *Portable Radio* communicates with a mobile transceiver installed in the user's vehicle, which receives and retransmits the message at a higher power, both extending its range and enabling it to be more reliably heard by other nearby field radios or by the PSRCN.
- F. **Mobile Data Connection** refers to a separate radio system which provides connectivity between a terminal or laptop personal computer (PC) located in a user's vehicle and computer applications and databases located at a central site. For example, the California Highway Patrol (CHP) uses such systems to look up vehicle registration information prior to approaching a vehicle during a traffic stop.



## A TIME OF CHANGE AND TRANSFORMATION

New technology drivers and the public safety communications industry trends were factors in shaping the State's vision for the future. These drivers and trends are summarized in the sections below:

**Availability of a new and reclaimed spectrum**—The next few years provide two unique opportunities for the State to capture more frequencies: utilizing the new 700 megahertz (MHz) frequencies that were made available as part of the digital TV transition which occurred in 2009; and leveraging interstitial VHF and UHF narrowband channels becoming available as a result of the Federal Communications Commission's (FCC) narrowband mandate.<sup>1</sup>

The FCC recently realigned a large block of 700 MHz frequencies allocated for public safety use. The lower half of the 700 MHz Public Safety Band (763-768/793-798 MHz) is designated for broadband communications. The FCC also consolidated existing narrowband allocations to the upper half of the 700 MHz Public Safety block (769-775/799-805 MHz). The narrowband frequency block is essentially a "Greenfield" area and these narrowband frequencies can be applied for by any of the State's public safety agencies, but as with public safety spectrum in other bands, the number of frequencies is finite – and once assigned, they are no longer available within that prescribed geography. Those agencies currently using 800 MHz radios in some cases can expand their existing systems to utilize the new 700 MHz narrowband frequencies.

The State also has a unique one-time opportunity to capture the interstitial frequencies that will be created by narrowbanding VHF and UHF frequencies by 2013.<sup>2</sup> The State must be prepared and proactive in applying for these frequencies because other public safety entities will also be applying for the interstitial frequencies.

**Shift toward digital, standards-based technologies**—Several public safety entities have migrated away from analog systems to digital systems in order to use additional features and capabilities to support their public safety mission. Digital systems offer capabilities that will improve operability (e.g., private communications between users), interoperability (e.g., multi-band), situational awareness and maintenance (e.g., over-the-air programming). Future investments in public safety communications must implement some of these features and functionality, and thereby advance the communications capabilities for each agency.

Within the United States, Project 25 (P25)<sup>3</sup> is becoming the consensus digital standard. Most next-generation public safety radio communications systems will utilize digital technologies and will be based on the P25 Phase 2 standard. Few public safety agencies will invest in or deploy

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<sup>1</sup> See "Promotion of Spectrum Efficient Technologies on Certain Part 90 Frequencies" (WT Docket No.99-87; Third Memorandum Opinion and Order FCC-04-292) released: December 23, 2004

<sup>2</sup> See Appendix A for a detailed explanation of the FCC narrowbanding mandate.

new analog systems. Fewer still will invest in or deploy public safety radio communications systems based on proprietary technologies.

**Successful implementation of systems specifically designed to support multiple agencies—**

Public safety entities are taking action to optimize the use of their current resources. Several public safety entities have taken action by consolidating infrastructures in order to minimize large refresh costs for their infrastructure and to increase interoperability. Several large states, including Florida, Pennsylvania, Indiana and Michigan, and regions including California's San Diego/Imperial Counties (RCS), have recognized increased capacity and capabilities by deploying shared trunked radio systems. In most instances, the trigger for starting these consolidation projects was when a State Police and/or Department of Transportation communications system became obsolete and needed to be refreshed.

**Future availability of reasonably priced multi-band radios—** Evolving technologies also impact how interoperability functions are performed. Multi-band radios that allow users to access different frequency bands on one device are becoming more affordable. As digital technologies mature over the next ten years, costs will drop to the point where public safety voice and data tools will be more readily attainable on public safety communication systems.

**Growing importance of real-time data in public safety—** The widespread availability of mobile applications for the general public and the need for real-time data have increased the demand for data technologies in the public safety sector. This need is growing, especially for law enforcement and fire services, where situational awareness is extremely important. For example, law enforcement personnel need to know the criminal background of drivers whom they have pulled over, and fire services must know where their vehicles are located and details about buildings (such as floor plans) they may be entering. This need is becoming more and more critical to successfully support an agency's public safety mission.

**Tactical use of commercial networks for wireless data until the rollout of regional or nationwide public safety communications broadband networks—** Public entities are continuing to use Land Mobile Radio (LMR) technologies for voice communications and can only accommodate limited data needs, such as short messaging, on those systems. Some public entities with compact geographic areas, such as cities and counties, are accommodating and building out their own public safety data solutions. Larger public entities with geographically dispersed needs, such as states, however, are reliant on private companies (common carrier-provided solutions) for data needs, because it would be cost-prohibitive for the entity to build out its own systems. These realities result in separate voice and data infrastructures, which currently prevent the convergence of public safety voice and data communications.

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<sup>3</sup> The Telecommunications Industry Association (TIA) P25 suite of standards involves digital Land Mobile Radio (LMR) services for local, state and national public safety organizations and agencies (see [http://www.tiaonline.org/standards/technology/project\\_25/index.cfm](http://www.tiaonline.org/standards/technology/project_25/index.cfm)).

**Uncertainty for the future of the 700 MHz broadband spectrum currently assigned to public safety**— The 700 MHz block managed by the Public Safety Spectrum Trust (PSST) has recently garnered a great deal of attention through a failed auction of the block in 2008 coupled with the 700 MHz “D-block,” followed by a flurry of waiver petitions, public comment and much debate. Though uncertainty exists relative to both public safety’s use of its broadband resource and the fate of the D-block, recent progress includes the FCC granting (with conditions) those waivers filed by public safety entities (“Petitioners”) seeking early deployment of statewide or local public safety broadband networks in the 700 MHz public safety broadband spectrum (763-768 MHz and 793-798).<sup>4</sup>

The latest progress on the D-block (758–763 MHz and 788–793 MHz) is that a bill was introduced by Representative King<sup>5</sup> on April 20, 2010 to grant the D-block to first responders, with specific emphasis on leveraging existing commercial infrastructure. This bill would effectively block the auction of the spectrum for commercial use.

The significant amount of action surrounding the two blocks in the 700 MHz band presents both uncertainty and opportunities for state or regional entities to potentially pursue independent initiatives, likely in advance of a national build-out of this spectrum. Twenty-one states and regions which filed petitions for waiver with the FCC had their waivers approved including the State of Oregon, Los Angeles Regional Interoperable Communications System (LA-RICS), and jointly the City and County of San Francisco, the City of Oakland, and the City of San Jose, CA.

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<sup>4</sup>See “Requests for Waiver of Various Petitioners to Allow the Establishment of 700 MHz Interoperable Public Safety Wireless Broadband Networks” PS Docket No. 06-229; Order FCC 10-79 released May 12, 2010.

<sup>5</sup> H.R. 5081—Broadband for First Responders Act of 2010



## UNDERSTANDING CALIFORNIA'S READINESS FOR CHANGE

Like many states, California has a wide array of agency-specific solutions that have evolved over time to meet the unique mission needs of each specific agency. There are 14 distinct communications systems in place to support the Public Safety Radio Strategic Planning Committee (PSRSPC) member agencies today. A brief overview of each of these systems is provided in Appendix B. As indicated in Figure 2, these systems are meeting the critical needs of all the agencies, and are regarded as providing “acceptable” (or better) services for all but three agencies.

**Figure 2. Key Components of Public Safety Communications Systems**



**Widely varying radio communications systems**—Public safety radio systems in California vary as widely as the missions and organizations of the agencies they support: fire protection, law enforcement, public health and critical infrastructure protection. Some systems are designed to support users who are mostly confined to specific geographic regions or facilities, while others support users who must be able to travel freely around the State with a communications system that can quickly adapt to their current locations. Many agencies support a partial or full law enforcement mission, while other agencies focus on fire protection or critical infrastructure protection/maintenance activities. Some agencies require coverage primarily in urban areas or along major roadways and transportation corridors, while others primarily require coverage in rural, wildlands areas. The wide variety of missions, coupled with the lack of a centralized

governing body for Statewide public safety communications, has understandably led to development of different systems for each agency and, in some cases, multiple different systems within an agency.

**Use shared-services maintenance provider, shared vaults/towers and first-generation governance structure**—Although the State’s public safety radio systems are owned, funded and controlled by the individual public safety agencies, the State has made significant progress during the past two decades toward centralizing, consolidating and standardizing how radio systems are maintained and deployed in the State. For example, the Public Safety Communications Division (PSCD) within the Office of the State Chief Information Officer (OCIO) has responsibility for engineering, installing and maintaining all public safety radio equipment across all State agencies. Similarly, the State’s 400+ unmanned mountaintop radio sites are effectively shared by most agencies. Both of these represent “best practices” and have resulted in significant savings and efficiencies to the State. In 2002, the State established the Public Safety Radio Strategic Planning Committee (PSRSPC) currently under the leadership of the California Emergency Management Agency (Cal EMA) to facilitate improved planning and coordination among the major public safety radio-using agencies. While this body lacks governance authority, it has been effective in fostering increased communications and highlighting the need for collective action. The initiation and completion of the strategy project that produced this report resulted from PSRSPC action.

**Three major approaches to interoperability**—All PSRSPC agencies need to facilitate communications among their own personnel and with allied local, State and federal partners. This latter requirement for interoperability does not need to be met for all personnel at all times. Different situations require a flexible approach to connect specific field- or command-level personnel with others, when a specific need arises. Nationally, California is recognized as a leader in providing interoperability solutions across state agency lines as well as across levels of government. The high number of incidents (fires, floods, earthquakes, etc.) that California experiences during a typical decade encourages both interoperability planning and the field testing of interoperability solutions. Over time, all PSRSPC agencies have developed interoperability methods that meet their operational needs. There are three basic approaches for providing interoperability within California: mutual aid channels/gateways, common equipment and multi-band radios.<sup>6</sup>

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<sup>6</sup> Appendix B contains illustrations of the three basic approaches for interoperability in California.

## REQUIREMENTS FOR COLLABORATIVE TRANSFORMATION

The transformation of public safety communications within the State cannot be driven by a single individual or organization. For these changes to take place and to endure, all public safety organizations within the State must actively participate. An effort of this magnitude will require strong executive sponsorship and a high degree of coordination. Also, the needs of each agency must be accommodated during the transformation to ensure that the needs of all public safety entities are continuously maintained. The State currently has several organizations that will play important roles during these changes in public safety communications.

**State Agencies**—Historically, agencies have been responsible for planning and funding their individual communications solutions. During the planning stages of this transformation, they must actively participate in order to ensure that their requirements are met, but they will simultaneously need to balance the needs of their agencies against the needs of the State as a whole. For the most part, agencies will become subscribers to shared systems where planning and funding will be managed using a multi-agency governance process.

**Public Safety Communications Division (PSCD)**—The PSCD must take a more prominent role in leading the Statewide public safety communications planning effort. In its role as the maintenance and operations provider for public safety agency communications systems, PSCD has the most insight into agency requirements and system capabilities. By leveraging this knowledge, PSCD can play a critical role in designing and architecting the State public safety communications solution.

**Public Safety Radio Strategic Planning Committee (PSRSPC)**—The PSRSPC was codified with the Public Safety Communications Act of 2002. The government code that legislated the creation of this entity also established a statutory requirement for an annual strategic plan. The PSRSPC is optimally positioned to become the forum for agency input into the strategic direction for public safety communications within the State.

**California State Interoperability Executive Committee (CalSIEC)**—CalSIEC has been tasked with managing the designated interoperability spectrum in the State. It also has taken on the responsibility of coordinating interoperability solutions for all public safety entities in the State, including local, State and federal. The CalSIEC brings together the largest number of public safety entities in the State and provides the State a mechanism to ensure that its strategic planning is aligned with the interoperability direction being followed by the larger California public safety community. The development of the California Statewide Communications Interoperability Plan (CalSCIP) in 2007 is an example of the collaborative effort of CalSIEC.



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Book 2:

## A PRAGMATIC STRATEGY FOR AN ENTERPRISE TRANSFORMATION

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***“But you also have to have a vision and the vision should be that your primary goal is prevention.”***

***Cal EMA Secretary Matt Bettenhausen***

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## STRATEGIC GUIDING PRINCIPLES

The following strategic guiding principles must be fulfilled when developing the public safety radio communications vision for the State:

- Antiquated systems, which are difficult for either the State or manufacturers to support, represent a high risk and must be a priority for replacement
- System replacement priorities must emphasize operability drivers over interoperability drivers where system operability is a significant concern
- Although the ability to communicate with other agencies and allied partners (“interoperability”) is also important, any initiatives to improve interoperability cannot diminish an agency’s operability
- The Statewide public communications strategy must strive towards providing optimized support for each agency’s mission
- Support and funding for each agency’s communication capabilities must be maintained during any system transition
- All new and existing State public safety radio systems must integrate with the overall California “System of Systems” strategy outlined in the CalSCIP
- There must be 50% fewer standalone agency public safety radio communications systems, and more shared systems in order to realize economies of scale benefits
- New public safety radio communications systems must consist of modern, standards-based digital technologies
- Standardized voice and data solutions must be deployed across agencies to the extent practicable
- New systems must be remotely programmable and manageable
- California’s public safety communications infrastructure must be managed as enterprise rather than agency assets
- State agencies must leverage high-quality regional public safety communications systems to supplement State systems, where possible
- California must strive to be a leader in the development of the national public safety communications broadband plan

## A VISION FOR THE FUTURE

The strategic future vision for public safety communications within California is based on the following three visions:

- Systems of Systems Vision
- Consolidation Vision
- Governance Vision

The following sections fully describe these visions and how they are intertwined.

### **SYSTEM OF SYSTEMS VISION**

When deciding the public safety communications vision for the State, several alternatives were considered. The formal selection of a System of Systems as the recommended solution was performed via an alternatives analysis of potential solutions, which is available in Appendix D-Determining a Suitable Solution. The alternatives considered include the following:

**Continue with the status quo (“Stovepipe Systems”)**—The Stovepipe Systems alternative is the lowest-cost solution and can be accomplished, but it does not improve the current state of Statewide public safety radio communications and it marginally improves each departmental system.

**Build-out of a single system for the State (“Single System”)**—The Single System provides significant benefits, but it comes with the highest capital investment and would be extremely difficult to implement.

**Develop a System of Systems (“System of Systems”)**—The System of Systems (SoS) solution uses a common communications transport layer (e.g., the State Microwave System) to network together the departmental systems. The SoS alternative provides almost all the operability and interoperability benefits<sup>7</sup> of the Single System alternative. This alternative is the most feasible because it leverages existing State infrastructure and allows agencies to operate on systems built for their missions.

**National Broadband Solution**—The National Broadband Solution has similar benefits to those of the Single System alternative, and the estimated cost<sup>8</sup> for this solution would be less than the Single System solution because of proposed federal funding and public-private partnership (PPP) contributions. Because of the size, logistical and technological complexities, and cost implications, this alternative has a low likelihood of being completed in the next decade.





<sup>7</sup> Illustrations of the benefits of the SoS are outlined in Appendix C.

<sup>8</sup> Based upon federal cost estimates derived from the FCC’s OBI Technical Paper No. 2 titled, “A Broadband Network Cost Model: A Basis for Public Funding Essential to Bringing Nationwide Interoperable Communications to America’s First Responders.” See <http://www.broadband.gov/plan/broadband-working-reports-technical-papers.html>



Figure 3 summarizes the alternatives analysis for the public safety communications vision.

**Figure 3. High-Level Alternatives Analysis**

Alternative	Stovepipe Systems	Single System	System of Systems	National Broadband Solution
Depiction				
Benefits	Low	High	Medium - High	High
10 Year Cost	\$\$	\$\$\$	\$\$	\$\$
Feasibility	Low	Low	Medium-High	Low

After considering all the alternatives, the preferred solution for the State is to implement the System of Systems solution because of the following reasons:

- An SoS solution is the most likely to be successfully implemented because it leverages the existing infrastructure.
- An SoS solution will meet the needs of agencies because it provides departments with the flexibility of being able to use systems that best meet their operational needs.
- An SoS solution will improve interoperability between departments and can potentially increase each department's virtual coverage.
- An SoS solution achieves almost all the benefits of a Single System but at a significantly lower cost.
- An SoS solution gives the State the flexibility to participate in the National Broadband Solution in the future because the National Broadband Solution will simply become another "system" within the system of systems.
- An SoS solution aligns with the strategy outlined in the California Statewide Communications Interoperability Plan (CalSCIP). The CalSCIP's description of the SoS solution is provided below:

## A Description of the “System of Systems” (SoS) Approach

(Excerpt from “California Communications Interoperability Plan,” December 2007)

### Achieving Interoperability through a System of Systems

The concept for an SoS network architecture is based on technology “hubs,” which allow controlled interconnection of individual radio systems; statewide interoperability is achieved by interconnecting hubs. Controlled, shared use of compatible radio systems can be integrated into the hub architecture. As demonstrated by Figure 19, a typical hub concept will include the following:

1. Local Response Area Hub: interconnection of a cluster of individual systems to enable interoperable communications between individual agencies within a Local Response Area, such as a municipality, county, or other local service area boundary.
2. Regional Hub: interconnection of a cluster of Local Response Area hubs within a defined geographic boundary to enable interoperability between emergency responders in different Local Response Areas within a region.
3. State Hub: interconnection of all Regional Hubs to enable statewide interoperability between emergency responders in different regions. The State can work to integrate systems as regional hubs are further developed.

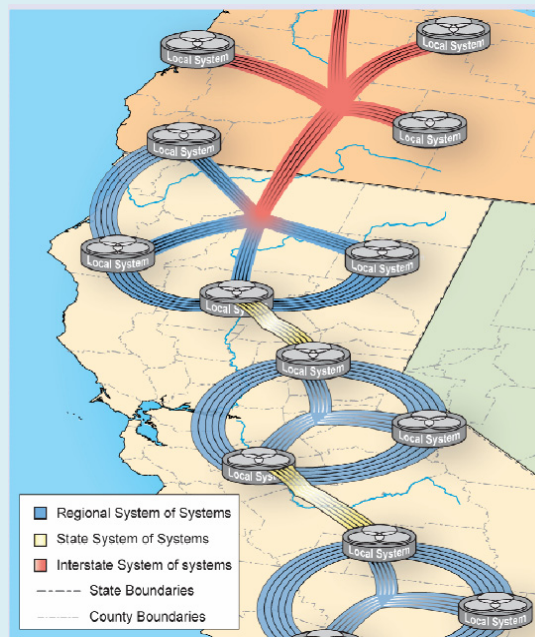


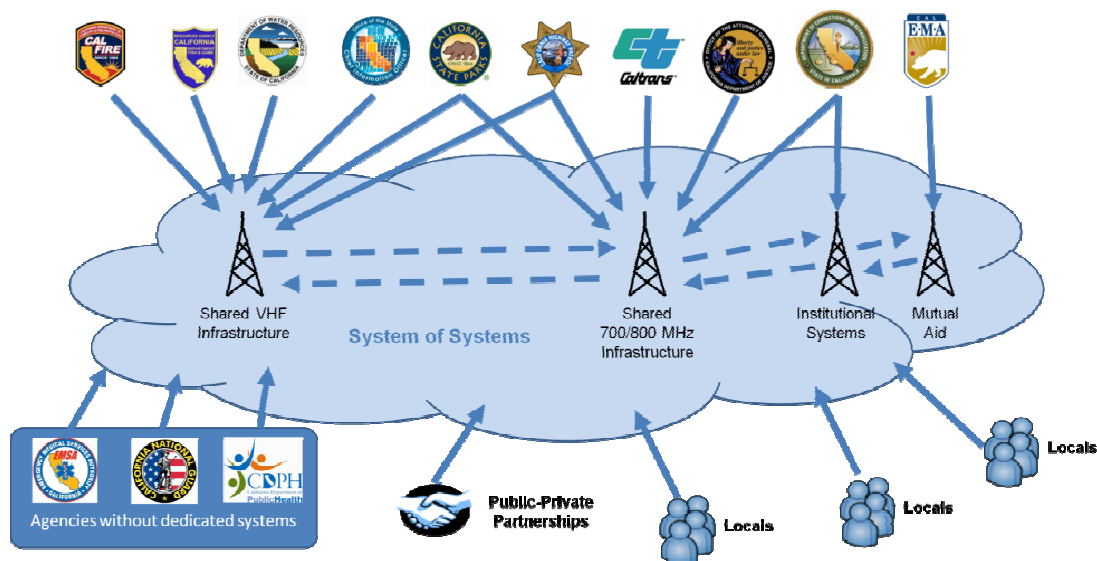
Figure 19 of the CalSCIP: System of Systems Hub Interconnection

## CONSOLIDATION VISION

The transition to a System of Systems addresses several public safety communications operability and interoperability requirements for the agencies, but the State can also achieve additional operational efficiencies. A Strategic Concept identified in the State of California's IT Strategic Plan is "facilitating collaboration that breeds better solutions." Within public safety communications, the sheer number of State radio infrastructures (there are 14 systems in the State with supporting infrastructure) highlights a possibility for interdepartmental collaboration to achieve greater efficiency.

A high-level depiction of infrastructure consolidation is depicted in Figure 4. CHP, the Department of Transportation (Caltrans), the Department of Justice (DOJ) and the California Department of Corrections and Rehabilitation (CDCR) Statewide Transportation Unit could potentially share the 700–800 MHz infrastructure because of their coverage requirements along the major highways. The Department of Parks and Recreation (DPR), the Department of Fish and Game (DFG), the Department of Water Resources (DWR) and the California Multi-Agency Radio System (CMARS) systems could potentially be combined with the shared 700–800 MHz system, but because these departments require coverage in remote areas of the State, it makes sense for them to eventually share a VHF system. CAL FIRE currently has a system that could be the starting point for a shared VHF system. However, because the fire discipline in California (including CAL FIRE, the local and federal agencies) has standardized on conventional, analog communications (as part of FIRESCOPE) and this technology is not ideal for a shared multi-agency system, sharing CAL FIRE's system would be challenging in the short-term. The California Emergency Management Agency (Cal EMA) currently has three systems, and could consolidate the infrastructure of those three systems into one system.

**Figure 4. Potential Future Sharing**

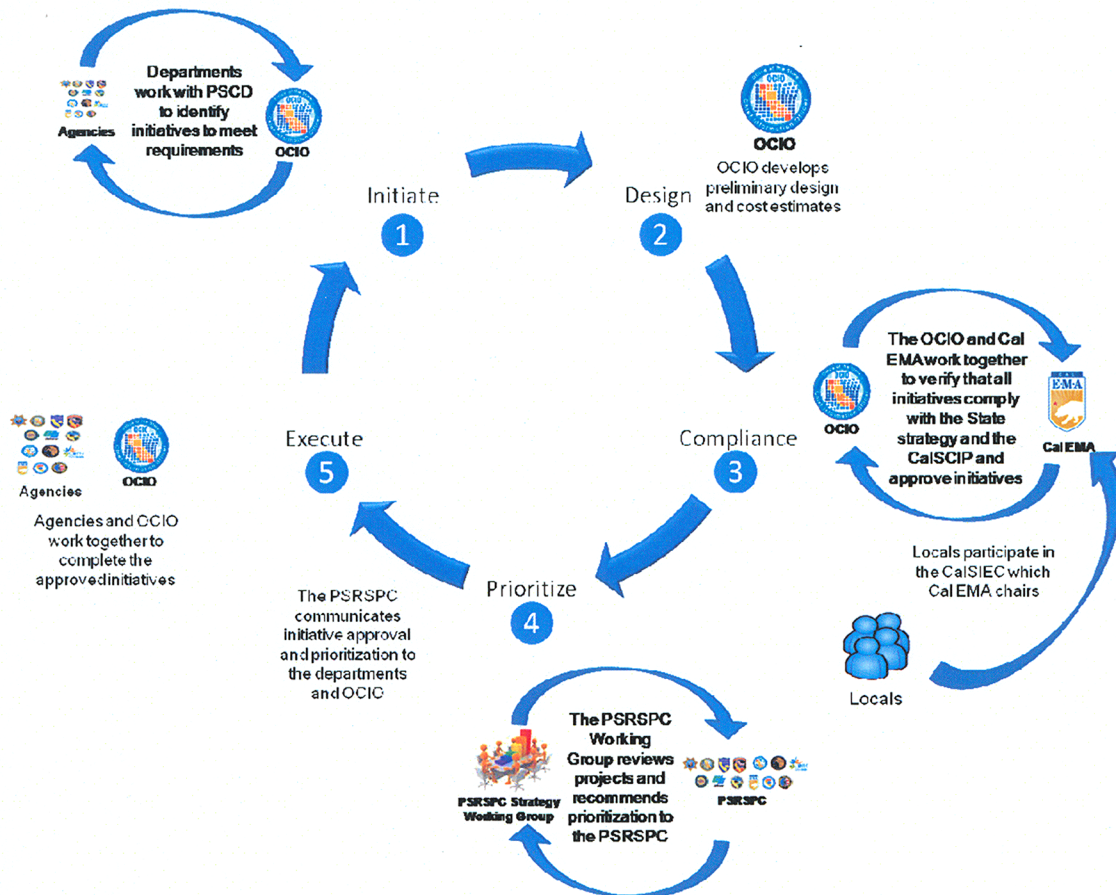


## GOVERNANCE VISION

The successful implementation of a System of Systems and the successful consolidation of disparate departmental systems will require a strong executive presence, but it will also require the collaboration of all participants. Because of the importance of public safety agencies, they must have a forum for communicating their public safety communications requirements. The PSRSPC is an existing forum that could meet this need, but given its current charter and organization, it does not have the proper mission or composition to fulfill this task. The PSRSPC must be re-purposed to focus on working with the OCIO to define the State public safety communications strategy, and be comprised of executive-level representation from each public safety department.

After the PSRSPC is re-purposed, the relationships between the agencies, OCIO, Cal EMA, CalSIEC and the PSRSPC must be clearly defined within an overall public safety communications governance structure for the State. The governance structure must foster collaboration between all public safety communications entities and support a process for reviewing, approving and prioritizing agency-specific initiatives. The proposed process for reviewing department initiatives is illustrated in Figure 5 below.

**Figure 5. Roles and Responsibilities for Reviewing Departmental Initiatives**



In the Initiate phase, the agencies will work with the OCIO to identify initiatives that will address department-specific requirements. If the agency wants to pursue an identified initiative, it will work with OCIO to develop a preliminary design and estimate initiative costs in the Design phase. The OCIO and Cal EMA will review the proposal to ensure that it aligns with the State strategy, and the CalSCIP and will either approve or reject the initiative in the Compliance phase. If the initiative is approved in the Compliance phase, the PSRSPC Strategy Working Committee will review the project and prioritize it against other Statewide initiatives in the Prioritize phase. Once the initiative is prioritized, it will be passed to the PSRSPC for final approval and then sent back to the agencies so that they can work with OCIO to complete the initiative in the Execute phase.

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BOOK 3:  
STRATEGIC GOALS AND OBJECTIVES

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***“We are a forward-looking people, and we must have a forward-looking government.”***

***Governor Arnold Schwarzenegger***

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## STRATEGIC GOALS AND OBJECTIVES

The current state of the public safety agencies, the strategic guiding principles, the technology drivers and the industry trends outline a compelling case for pragmatic change. The result of these forces is a *Pragmatic Strategy for the Future of Public Safety Communications* based on the following five goals:

**Strengthen enterprise public safety communications governance**—Enable greater accountability through enhanced government transparency and accessibility.

**Enhance OCIO-PSCD capabilities and improve performance**—Enhance the Public Safety Communication Division’s (PSCD’s) organizational capabilities, processes and tools to improve current performance, support transparency and prepare PSCD for additional responsibilities.

**Goal #3 – Ensure that each agency operates on "acceptable" systems or better and complies with FCC mandates**—Upgrade the communications infrastructure of the agency systems that warrant immediate attention so that they operate on “acceptable” systems or better.<sup>9</sup> Also, ensure that departments are prepared to meet the FCC-mandated narrowbanding deadline of January 1, 2013.

**Establish System of Systems architecture and infrastructure**—Provide a technical framework, interconnecting systems using standards-based technologies, that allows for greater interoperability and may allow agencies to expand the virtual range of their systems, but also allows agencies to maintain their autonomy.

**Established shared systems where possible**—Seize the opportunity to increase the sharing of communications infrastructures across the State as agencies retire obsolete equipment.

The following sections provide high-level descriptions for these goals, and outline specific objectives for achieving each goal.

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<sup>9</sup> As depicted in Figure 2 - Key Components of Public Safety Communications Systems

## **GOAL 1—STRENGTHEN ENTERPRISE PUBLIC SAFETY COMMUNICATIONS GOVERNANCE**

**DESCRIPTION:** To create an effective process for establishing, maintaining and enforcing public safety radio communications strategies and standards, the governance strategy must clearly identify how the State will establish and enforce public safety radio communications goals, policies and standards that will be followed by all agencies, and agencies that deploy or use public safety radio communications systems in support of their defined missions.

PSCD provides the OCIO with the necessary resources, expertise and experience to define the strategy and standards for public safety communications for the entire State. Currently, PSCD has the authority to ensure that all agencies adopt common solutions. PSCD must be more proactive in ensuring that solutions are standardized and offered to all agencies.

### **Objective 1—Re-establish California as a leading voice in the national public safety communications policy making**

California must resume the responsibilities of coordinating a Statewide perspective and communicating this at the national level. This must specifically include being active participants in key governmental and non-governmental organizations (e.g., APCO, NENA, NPSTC, etc.), communicating the State's needs to federal entities and carrying out the National Broadband Plan within California.

### **Objective 2—Align public safety communications and enterprise IT governance processes**

The Governor's Executive Order S-03-10 established responsibility for developing a Statewide Information Technology (IT) strategy to be within the jurisdiction of the OCIO. As public safety radio communications is a domain of Information Technology, the Executive Order grants both the authority and responsibility of this to the OCIO. Within the OCIO, this responsibility has been assigned to the PSCD. The Public Safety Communications Act of 2002 established the PSRSPC, whose statutory mission includes the development and communication of the State's public safety radio communications strategy.

The OCIO-PSCD will create and communicate processes for:

- Developing public safety radio communications policies and standards
- Collaborating with appropriate stakeholders on department, agency and Statewide public safety system proposals
- Collaborate with voting members of the PSRCPC on Statewide system enhancements and upgrades.

### **Objective 3—Re-charter and re-launch the Public Safety Radio Strategic Planning Committee**

The State must update the PSRSPC's charter to include a primary responsibility for contributing to and ratifying Statewide public safety radio communications strategies and standards. The

revised charter must formally identify the OCIO as the Chair or Co-chair (possibly with Cal EMA, the current Chair) of the PSRSPC to reflect the OCIO's position as the leader of Statewide public safety radio communications strategy development efforts.

The revised charter must also clarify the role of PSRSPC vs. the role of CalSIEC. CalSIEC includes representatives from the State, local and federal public safety agencies that operate within California. Among its responsibilities, CalSIEC develops and maintains the overall CalSCIP. The PSRSPC will be responsible for monitoring the implementation of the CalSCIP at the State government level.

#### **Objective 4—Establish a governance model for the California public safety radio communications System of Systems**

As the State's public safety communications systems are integrated into the System of Systems described in Book 2, the State's public safety radio communications governance structure must make technical and policy decisions which affect the shared and non-shared (e.g., agency-specific) portions of the Systems of Systems through collaboration with stakeholders. It will also need to ensure that agencies are appropriately coordinating with PSCD (the presumed operator of the System of Systems) and with one another, and that all agencies follow a common set of "rules for the road" when connecting to or utilizing the System of Systems.

In consultation with an appropriately chartered PSRSPC working group, the OCIO will initiate a project which will define a governance process for the California System of Systems.

#### **Objective 5—Establish governance model for shared public safety radio communications systems**

As the State's public safety communications systems are consolidated into fewer systems, agency-specific public safety radio communications systems will become the exception rather than the rule. Future consolidated systems will not be owned or controlled by any one agency; rather, they will be operated as a shared service entity that must be responsive to the needs of all the tenant agencies on the system. Careful consideration must be given to the decision rights which will be granted to various public safety radio communications user agencies and to the system's operator.

In consultation with an appropriately chartered PSRSPC working group, the OCIO-PSCD will initiate a project which will define recommended governance structure and processes for future multi-agency shared radio systems.

## **GOAL 2—ENHANCE PUBLIC SAFETY COMMUNICATIONS DIVISION (PSCD) CAPABILITIES AND IMPROVE PERFORMANCE**

**DESCRIPTION:** OCIO-PSCD must be empowered to improve its current delivery model and augment the scope and services within its service offering through transparency and collaboration with client agencies.

### **Objective 1—Complete PSCD restructuring, improve service/cost transparency and establish a more effective funding model**

In order to successfully perform its new responsibilities within the public safety communications governance structure, PSCD must improve its capabilities and performance by placing emphasis on customer service management and project management. PSCD must maintain transparency in time tracking, work order management, asset/configuration management and billing through open communications and sound data systems. PSCD must enhance the effectiveness of the services it delivers through a proactive approach to system enhancements and problem solving. With a collaborative method of service delivery, a greater transparency of costs for services to customer agencies will be achieved.

### **Objective 2—Establish PSCD as a leader for enterprise- and agency-level public safety communications strategy and planning**

PSCD must establish itself as a leader in public safety communications for the State by providing strategic planning services for customer agencies both proactively and when requested. PSCD must proactively assist agencies with the creation of their public safety communications tactical and strategic plans through collaboration with other State and local government entities. PSCD must lead the State in Statewide or cross-agency public safety communications, data communications planning and standards development.

This will ensure that each agency has a strategic and tactical plan that is consistently updated, and that these all align with each other and with Statewide strategic plans and standards.

### **Objective 3—Improve public safety radio communications reliability and manageability**

OCIO-PSCD must be proactively involved in coordinating Statewide public safety radio communications resources and improving how these resources are coordinated at a Statewide level. For example, the OCIO-PSCD must become more proactive in frequency management and the management of Statewide public safety communications assets such as vaults/towers.

- **Frequency management**—PSCD has visibility into the capacity requirements and capabilities of each agency and must anticipate spectrum needs, proactively seeking frequencies as they become available. As more agencies begin to share systems, PSCD must also proactively monitor the capacity of the shared systems in order to be able to address capacity issues before they become critical or user-impacting.

- **State public safety communications asset management**—The OCIO-PSCD must establish Statewide standards for asset management, including vault and tower infrastructure and services at remote sites, because that will enable the State to increase the reliability of public safety radio communications systems and significantly reduce many barriers to planning for new systems or refreshing existing ones. To begin making systems more consistent and reliable to ensure that each is up to public safety (and user agency) standards, and is consistently maintained, PSCD must:
  - ❑ Assume responsibility for the management of all shared radio services
  - ❑ Facilitate the development and management of an effective and usable centralized inventory of the equipment contained at each site and how much vault/tower capacity remains available for new/replacement systems at each site.

In addition to managing frequencies and Statewide assets, the OCIO-PSCD must proactively reach out to public/private partnerships for shared infrastructure. The OCIO-PSCD must examine the benefits of using shared sites from these partnerships to enhance services and to lower infrastructure development and maintenance costs.

**Objective 4—Establish competitive, reusable contracts for the acquisition of public safety communications equipment, voice and data equipment and services**

Agencies will move forward with procurements to ensure that their radio systems continue to meet their mission’s radio communications requirements and to employ the technologies necessary to participate in the System of Systems. In order to streamline the procurement process and make it easier for agencies to adhere to enterprise standards, PSCD must define the infrastructure and subscriber equipment requirements for the System of Systems and establish competitive and reusable multiple-award, MSA-style contracts for the acquisition of a variety of public safety communications voice and data equipment and services from leading vendors.

### **GOAL 3—ENSURE THAT EACH AGENCY OPERATES ON "ACCEPTABLE" SYSTEMS OR BETTER AND COMPLIES WITH FCC MANDATES**

**DESCRIPTION:** State public safety agencies must replace equipment or infrastructure that is near, at or beyond its recommended useful lifespan. This equipment may not be fully supported by the manufacturer in the event of a system failure. Experience has shown that older systems fail more often and require more specialized in-house expertise to support. In addition, quality replacement parts can be difficult to acquire.

While this strategic plan is forward-looking, some immediate needs must be met while governance structures are being developed. The needs of three agencies: the California Department of Corrections and Rehabilitation (CDCR), the Department of Fish and Game (DFG) and the Department of Parks and Recreation (DPR) have been highlighted for special attention, along with the requirement that all State systems comply with the Federal Communications Commission's (FCC's) January 1, 2013 deadline for compliance with Phase 1 of its narrowbanding mandate.

#### **Objective 1—Address CDCR's communications needs**

CDCR must improve its institutional systems, its non-institutional communications and its transportation communications:

- **Replace institutional public safety radio communications systems**—The institutional radio systems are used by correctional officers to communicate within and in close proximity to major institutions. Due to the age and criticality of the institutional radio systems, CDCR must take immediate action and begin to replace these systems at each institution. Within the next three years, all institutional radio systems must be replaced. To accomplish this objective, CDCR, in consultation with the OCIO, must take immediate action to develop an upgrade plan and secure the appropriate funding. Once the upgrade is complete, CDCR must define and fund a formal, long-term refresh program for all its radio equipment.
- **Develop and implement Parole and Office of Correctional Safety (OCS) public safety radio communications solutions**—Non-institution CDCR units (Parole and OCS) have diverse radio communications requirements because they often must communicate with local entities that all operate on different radio systems. Currently, these units do not have a sufficient amount of radio equipment and largely rely on equipment provided by local entities when they must interoperate during tactical operations. During the next two to three years, CDCR should assess radio usage for these non-institution units and procure an appropriate number of standards-based, multi-band, interoperable radios required to meet their usage needs.
- **Develop and Implement CDCR Statewide Transportation radio communications solutions**—The Statewide Transportation unit uses commercial wireless services to communicate while transporting prisoners to and from institutions. A solution for the Statewide Transportation unit would result in enhanced personnel and public safety. CDCR, in consultation with PSCD, must determine an appropriate alternate



communications solution for Statewide Transportation, and must implement this solution.

**Objective 2—Develop and implement DPR and DFG tactical improvement solutions**

The Department of Parks and Recreation (DPR) and the Department of Fish and Game (DFG) have similar issues with the coverage and capacity of their public safety radio communications systems. Because both departments operate in remote areas, have similar law enforcement missions and are part of the Resources Agency, there are natural opportunities for coordinated efforts to address their needs.

Both DFG and DPR must explore, in consultation with PSCD, using vehicular repeaters to extend the coverage provided by their portable radios when operating in remote areas. This approach is consistent with the approach CHP has been using for several years. These agencies must immediately engage PSCD to begin discussions on how vehicular repeaters can be used to enhance coverage.

These departments must also explore the mobile wireless data solutions and contracts that CHP is using, to see if they can be leveraged to meet their own mobile wireless data requirements.

DFG and DPR also have the ability to combine their existing infrastructure with the California Multi-Agency Radio Systems (CMARS) infrastructure to create a multi-agency shared system. This improved infrastructure would benefit DFG, DPR and all CMARS users, and the use of vehicular repeaters in conjunction with this shared solution would vastly improve the coverage and capacity for DFG and DPR radio users. PSCD, in consultation with DPR and DFG, will develop a CMARS/DFG/DPR infrastructure consolidation plan that will outline the feasibility and business case, architecture, cost and detailed schedule for a consolidated system.

**Objective 3—Complete FCC-mandated public safety radio communications 800 MHz rebanding for affected agencies as necessary, and narrowband conversion for affected agencies by January 1, 2013**

All agencies with VHF and UHF systems must convert these systems to narrowband operation by January 1, 2013. Several agencies, such as the CAL FIRE, the California Emergency Management Agency (Cal EMA), DFG, the Department of Water Resources (DWR) and DPR (on the North Coast) will need to take action to complete their preparations (equipment replacement, reprogramming, cut-over) for the narrowband transition.

## **GOAL 4—ESTABLISH SYSTEM OF SYSTEMS ARCHITECTURE AND INFRASTRUCTURE**

**OVERVIEW:** The State must address the operability and interoperability needs of its public safety agencies by developing a System of Systems (SoS). The SoS solution will use an IP/MPLS<sup>10</sup>-enabled State Public Safety Microwave Network to interconnect agency systems. This approach allows each agency to operate on a system configured for its needs, but will facilitate interoperability and can expand the virtual geographic range of operations. Appendix B illustrates a few of the major potential features/benefits of the proposed SoS from the perspective of a public safety radio user.

### **Objective 1—Define public safety communications System of Systems (SoS) architecture, business case and implementation plan**

PSCD, in consultation with the PSRSPC and other internal and external stakeholders, will define the business requirements and technical architecture for the State's public safety radio System of Systems. The State will need to upgrade the communications infrastructure throughout the State to modern, standards-based, digital systems in order to move to an SoS solution. It has already mandated that public safety communications equipment purchased by State agencies must be APCO P25-compliant.

The State must:

- Develop a complete business case for proceeding with an SoS solution, and the business case must document the added benefits and avoided risk that will be achieved through the public safety radio communications System of Systems.
- Implement standards that allow for the following:
  - ❑ Technical support staff to perform Over-The-Air Re-keying (OTAR) and Over-The-Air Programming (OTAP) from a central location so that there will be no need for them to have physical possession of the device during configuration.
  - ❑ Remote monitoring, diagnosis and reconfiguration via Internet Protocol (IP)-type connections. This functionality would reduce the required number of maintenance trips to remote sites.

### **Objective 2—Update enterprise public safety communications procurement standards**

PSCD must develop detailed enterprise public safety radio communications technical and procurement standards which are based on the requirements and architecture developed in Objective 1. OCIO and PSCD will communicate these standards to all public safety radio communications user agencies and monitor procurement activity to:

- Ensure compliance with the standard

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<sup>10</sup> Internet Protocol (IP), the main network protocol used by most modern communications systems, including but not limited to the Internet. Multi-Protocol Label Switching (MPLS) is a networking protocol which is used make IP networks more reliable and predictable.

- Modify the standards over time as public safety radio communications capabilities and requirements evolve.

### **Objective 3—Communicate SoS vision and capabilities to all stakeholders**

When reviewing other states' successful statewide public safety communications initiatives, a common factor in their success was strong executive leadership. The State must define an executive sponsor(s) for the SoS solution who will consistently support and proactively advocate this initiative during its planning and implementation phases. The State must also clearly establish the business case for agencies to participate in the SoS, and must communicate these benefits to agencies and agency leaders.

### **Objective 4—Determine leveragability of major current/planned regional systems**

In order to understand the feasibility of leveraging systems within the SoS solution framework, OCIO-PSCD must perform the following:

- Review additional opportunities to leverage existing State systems and existing and planned regional systems (e.g., RCS, LA-RICS and BayRICS)
- Inventory the existing systems and perform coverage and load analyses
- Actively participate in the planning for new regional systems as they are designed and built in order to accommodate the State's compatibility with these systems for possible application in the future.

### **Objective 5—Design and construct the System of Systems infrastructure**

PSCD must take an active role in developing the design and standards for the System of Systems by performing the following:

- Ensure that design aligns with the principles outlined in the CalSCIP
- Ensure that overall Statewide interoperability is not compromised when the major State agencies begin to participate in the SoS
- Ensure agency missions are not compromised

After completing the design, PSCD will coordinate the build-out and management of the infrastructure for the System of Systems.

## **GOAL 5—ESTABLISH SHARED SYSTEMS WHERE POSSIBLE**

**DESCRIPTION:** The State will reduce the number of public safety radio systems in the State by increasing the collaboration between agencies and consolidating the disparate radio infrastructures throughout the State. Over the next decade, California’s public safety agencies will work together to plan for the consolidation of several Statewide public safety communications systems.

### **Objective 1—Develop a 700–800 MHz Shared Infrastructure Plan**

Natural candidates for infrastructure consolidation are agencies that have overlapping radio coverage requirements because equipment can easily be shared at sites where both agencies have radio equipment. In California, both CHP and Caltrans have extensive systems that cover almost all the State’s highways and roadways. The overlapping coverage of these two agencies, and the recent availability of additional frequencies in the 700 MHz band, create an opportunity for the State to leverage CHP and Caltrans’ existing site infrastructures to deploy a shared 700–800 MHz digital trunked system. This shared system will increase the coverage for both CHP and Caltrans, and also accommodate the needs of other departments such as CDCR for its Statewide Transportation Unit/Parole/Office of Correctional Safety (OCS) needs and the Department of Justice (DOJ).

This approach is similar to what has been successfully implemented in other states. For states that have consolidated radio systems, the primary driver for consolidation was the necessary refresh of their state police or department of transportation systems.

The experience of other large states, including Pennsylvania, Florida, New York and others, also indicates that successful shared systems generally require seven to 10 years of planning in advance of a successful deployment. Given the amount of planning required, the consolidation of these infrastructures is not imminent, but the timing for the planning of this consolidation aligns with efforts that CHP and Caltrans already have planned for in the next decade:

- Caltrans needs to upgrade its aging 800 MHz system and plans to begin the refresh of this system during the next decade
- CHP will complete its CHPERS project and begin exploring opportunities for transitioning from its VHF low-band system due to decreasing manufacturer support of VHF low-band equipment, and other issues.

Over the next decade, PSCD must work with Caltrans and CHP executive leadership to develop a 700–800 MHz Shared Infrastructure Plan that determines the feasibility, business case and strategy to begin moving both departments to a common public safety radio communications system by the end of 2020.

## **Objective 2—Develop a VHF Shared Infrastructure Plan**

The Department of Forestry and Fire Protection (CAL FIRE) system would be the ideal starting point for a shared VHF public safety communications radio system because it has a fair amount of site infrastructure and spectrum resources which could potentially be shared. Additionally, CAL FIRE has wildlands-oriented coverage requirements that are similar to those of the DFG and the DPR, and all three of these departments are part of the Resources Agency. The deployment of a shared VHF system would also optimize the usage of the State’s VHF frequencies and infrastructure, and would improve the coverage and capacity available to DFG, DPR and several other departments.

Moving CAL FIRE to a shared system would require the implementation of digital, trunked technologies, but because of the FIRESCOPE standards and the characteristics of what is required from its radio systems on firegrounds, CAL FIRE cannot easily convert to a digital, trunked system.

CAL FIRE may need to move to a digital standard when the FCC further narrowbands VHF frequencies.<sup>11</sup> Further narrowbanding would require VHF radio system users, such as CAL FIRE and other members of FIRESCOPE, to move to digital operations, because analog radios may not be adequate for their needs when the bands are that narrow. When this mandate is issued, the State would have the opportunity to use CAL FIRE’s system as the starting point for a shared VHF system. Once the FCC issues a mandate to further narrowband frequencies, PSCD must work with the executive leadership from CAL FIRE and other agencies to develop a VHF infrastructure consolidation plan that determines the feasibility and business case and strategy to begin moving these agencies to a digital, trunked system using currently available technologies.

## **Objective 3—Design a Shared 700–800 MHz Public Safety Communications System**

Once the 700–800 MHz Shared Infrastructure Plan is complete and communicated to key stakeholders, CHP, Caltrans and PSCD must work together to develop the detailed design for the Shared 700–800 MHz System. Upon its completion, PSCD can work with the agencies and the Department of General Services (DGS) to begin the procurement process. Given the timing of CHP and Caltrans’ current initiatives, the 10-year objective for State is to begin the procurement process for the Shared 700–800 MHz system.

## **Objective 4— Design a Shared VHF Public Safety Communications System**

Once the VHF Shared Infrastructure Plan is complete and communicated to key stakeholders, CAL FIRE, PSCD and other involved agencies must work together to develop the detailed design for the Shared VHF System. Upon its completion, PSCD can work with the departments and the DGS to begin the procurement process. Departments such as DPR and DFG must coordinate the

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<sup>11</sup> See Appendix A to understand FCC narrowbanding mandates.

planning for the Shared VHF System with their individual plans to implement vehicular repeaters that will extend the range of their portable radios.



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Book 4:

## STRATEGIC ROAD MAP

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***“Change is a good thing, and we are out of necessity going through that change. But the change is an opportunity. The change is a real chance for us to change our game, to not look at what’s happening immediately, to look at what’s happening over the broader term.”***

***Teri Takai, State of California Chief Information Officer (CIO)***

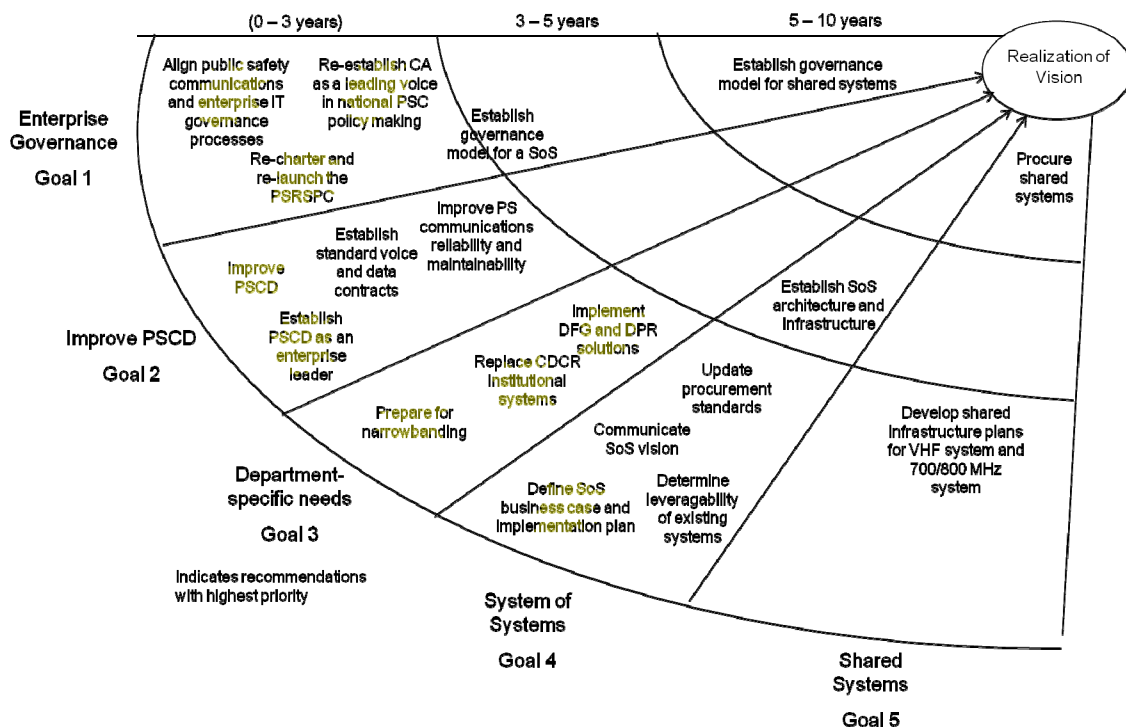
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## STRATEGIC ROAD MAP

During the next 10 years, the State will be actively working to address the five goals outlined in Book 3. A detailed Tactical Road Map is provided in Book 5, but Figure 6 provides a summary of the 10-year road map using the following tracks:

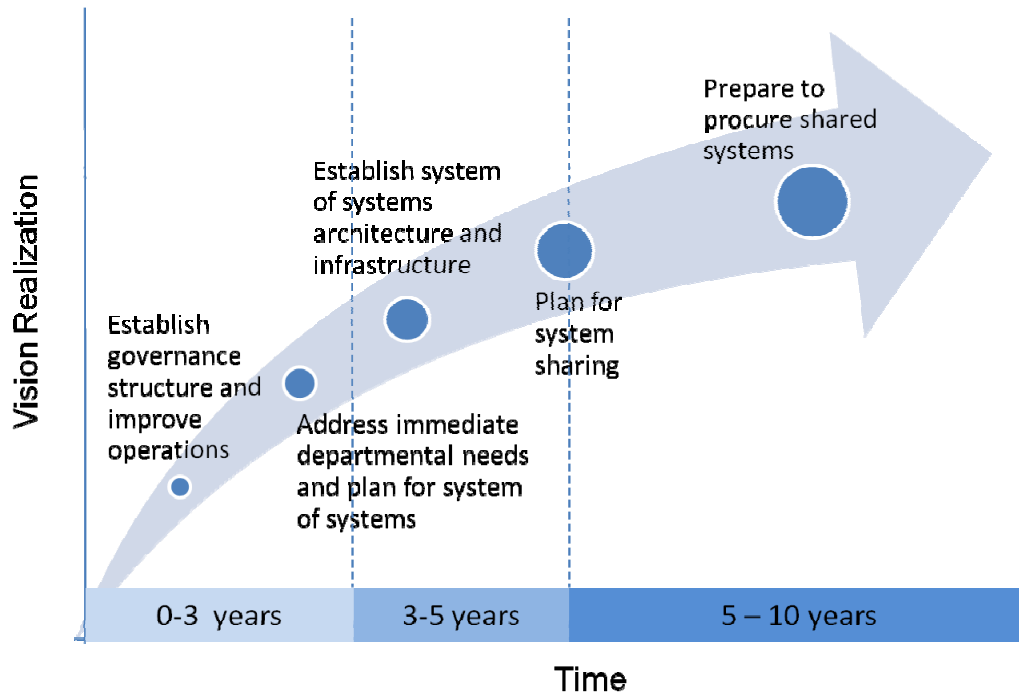
- **Goal 1—Enterprise Governance:** During the next three years, the State will work on establishing the governance model. The State will evolve the governance model to accommodate the implementation of the System of Systems and shared systems.
- **Goal 2—Enhance and Improve PSCD:** During the next three years, the State will improve PSCD and enhance its service delivery capabilities.
- **Goal 3—Department-Specific Needs:** During the next three years, the State will work on replacing CDCR’s institutional systems and meeting the narrowbanding mandate.
- **Goal 4—System of Systems:** During the next three years, the State will evaluate the feasibility of leveraging existing systems and will complete the design of the System of Systems. Once the design is complete, the State will establish the SoS architecture and infrastructure.
- **Goal 5—Shared Systems:** During the next three years, the State will deploy a shared solution for DPR, DFG and CMARS. It will develop infrastructure plans for a shared VHF system and shared 700–800 MHz system and be prepared to procure the shared system in 10 years.

**Figure 6. Summary Road Map**



The summary road map can also be depicted against high-level milestones as shown in Figure 7.

**Figure 7. High-Level Milestones**



**During the next three years:** The State must focus on establishing an effective governance structure and improving public safety communications operations. The State must also address the immediate needs of departments, such as replacing CDCR's institutional systems, and begin actively planning for the system of systems.

**In five years:** The State must establish a System of Systems architecture and infrastructure that effectively support its participating agencies. The State must also begin to actively plan for system sharing.

**In 10 years:** The State must complete the plan for system sharing and be prepared to procure shared systems—such as a shared VHF system and a shared 700–800 MHz system.

## KEY SUCCESS FACTORS

The realization of this strategy is dependent on the following key success factors:

- Active, consistent executive-level support from the State CIO, the Governor's Office and key agency executives
- Support for the System of Systems (SoS) and consolidation from the leadership at the four largest public safety communications agencies (CHP, Caltrans, CAL FIRE and CDCR)
- Willingness and ability of the Legislature and Governor's Office to make sufficient funding available to support the goals and objectives of this strategy and the agencies' tactical road maps
- Improvement of PSCD services is a pre-condition to enterprise transformation
- Willingness and ability of leading public safety communications technology vendors to engage with the State of California

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Book 5:  
**TACTICAL PLAN**

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***“It isn’t a question of winning it or losing it, it isn’t a question of overcoming it; it’s a question of incorporating that kind of need and that kind of protection into everything that we do going forward.”***

***Teri Takai, State of California Chief Information Officer (CIO)***

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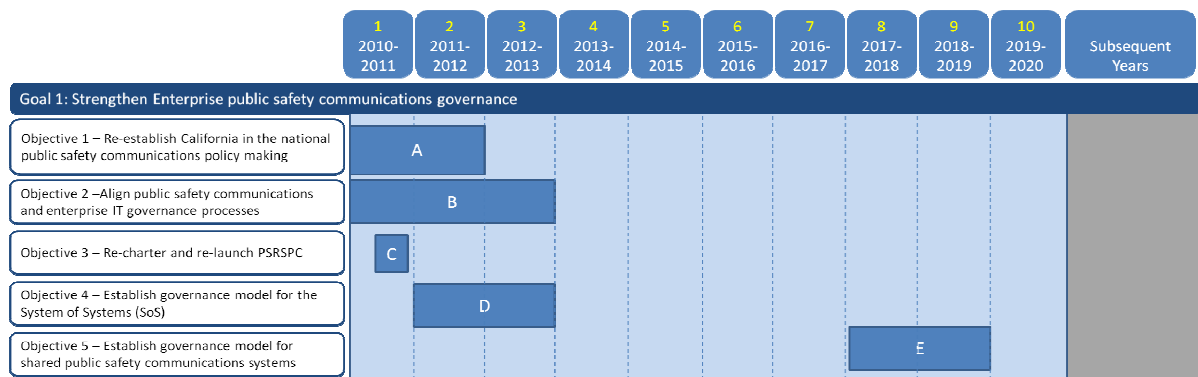
## TACTICAL ROAD MAP

The timing, prioritization and sequencing of the goals and objectives for the State public safety communications strategy outlined in Book 3 are depicted in the following sections. The letters on the road maps correspond to the description in the text below.

### GOAL 1—ESTABLISH ENTERPRISE PUBLIC SAFETY COMMUNICATIONS GOVERNANCE

- A. Public safety communications representatives from the State must participate in national forums and represent California’s interests in national and Statewide communications planning discussions.
- B. In order to establish enterprise public safety communications governance, the State must clearly define the roles of the OCIO, PSCD, Cal EMA, PSRSPC and CalSIEC. This task cannot be fully completed until PSCD completes Task F—which allows PSCD to take a larger role in Statewide strategic planning.
- C. Once roles and responsibilities for these entities are defined, the State must re-charter and re-launch the PSRSPC to reflect its position in the revised governance structure. SB 858 is current legislation that will need to be rewritten to reflect the PSRSPC’s new role.
- D. As the State moves forward with the implementation of a System of Systems solution, the governance model will need to evolve to ensure that agencies’ needs are heard and that standards can be defined and enforced. The definition of this governance may take a few years while new roles and responsibilities are identified and defined.
- E. When the State begins to design shared systems, the governance model will again need to evolve to ensure that agency needs are heard and appropriately prioritized against one another. The definition for this governance structure will not need to take place for several years—when the detailed design for shared systems begins.

**Figure 8. Goal 1 Road Map**

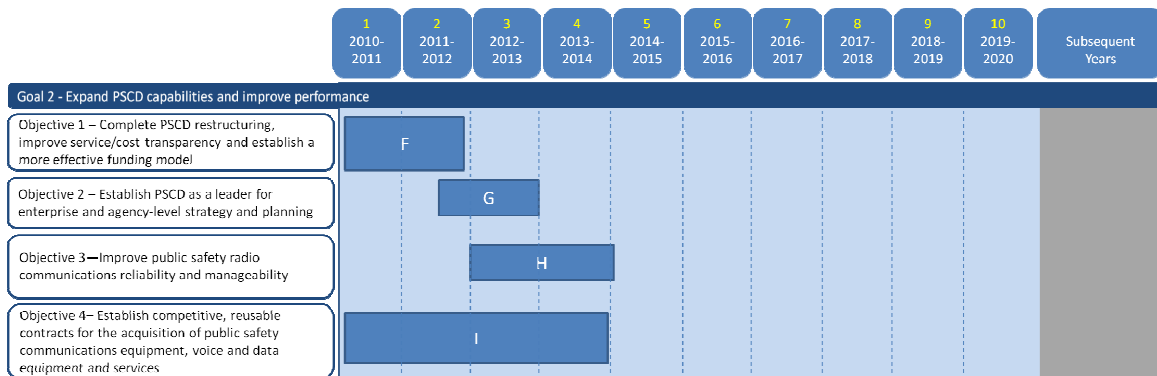




## GOAL 2—ENHANCE PUBLIC SAFETY COMMUNICATIONS DIVISION (PSCD) CAPABILITIES AND IMPROVE PERFORMANCE

- F. PSCD must take immediate steps to change the organization to be more customer-focused and implement processes and tools that allow for transparency into costs.
- G. PSCD must add strategic services and take a more active role in defining the Statewide strategy. One of PSCD's first tasks as a strategic services organization will be to coordinate the Statewide transition to narrowband operations which must be completed by January 1, 2013.
- H. PSCD must work with the agencies to begin transferring ownership and responsibility of remote sites to PSCD. Also, PSCD must become the State's spectrum management and acquisition organization, and coordinating the applications for interstitial frequencies created by the FCC narrowbanding mandate should be an early undertaking in that role.
- I. PSCD already has the authority to define and uphold technical standards for the State, but it must establish MSA-type contracts through which agencies can easily purchase voice and data equipment/services. PSCD must establish these contracts as soon as possible so that they can be leveraged to purchase equipment to meet the narrowbanding mandate. The contracts will need to be amended or revised once Statewide technical standards are defined in Task N and procurement standards are defined in Task O.

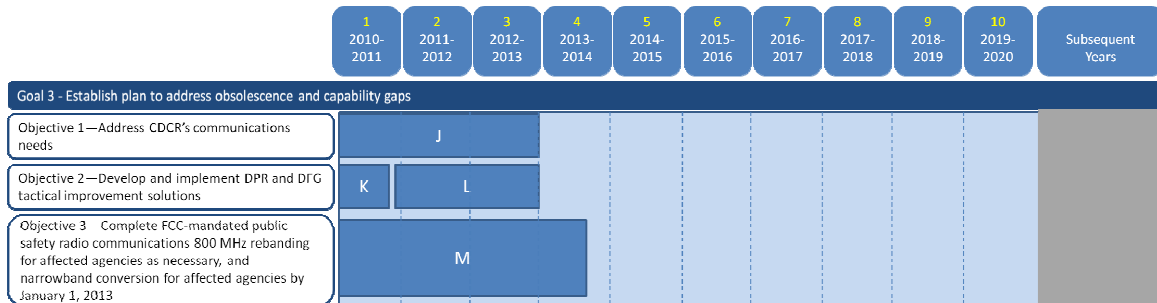
**Figure 9. Goal 2 Road Map**



### GOAL 3—ESTABLISH PLAN TO ADDRESS OBSOLESCENCE AND CAPABILITY GAPS

- J. CDCR has already completed plans to replace its institutional systems and has a goal to replace them in the next three years. CDCR is currently assessing various solutions for its Statewide Transportation Unit. A possible solution being considered is the shared system that will be created by combining the Department of Fish and Game (DFG), Department of Parks and Recreation (DPR) and California Multi-Agency Radio System (CMARS) infrastructures. CDCR will determine the number of multi-band radios required for OCS and Parole.
- K. DFG and DPR will work with PSCD on two tactical solutions: 1) they will begin planning the shared DFG/DPR/CMARS system; and 2) they will begin planning to use vehicular repeaters in their agencies.
- L. Once the design for the DFG/DPR/CMARS solution is complete, PSCD will completely implement the system within two years. This effort will occur in parallel to the deployment of vehicular repeaters at DFG and DPR.
- M. Agencies are at different levels of readiness for narrowbanding compliance. Several agencies will spend the interval between now and December 31, 2012 upgrading their systems to become compliant. Also, a few agencies will be impacted by the 800 MHz effort and will need to prepare their systems once the FCC mandates the change.

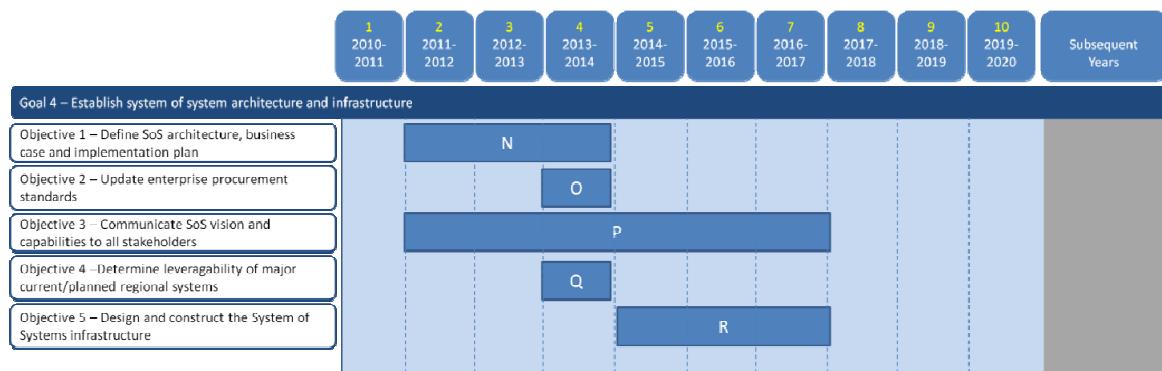
**Figure 10. Goal 3 Road Map**



## GOAL 4—ESTABLISH SYSTEM OF SYSTEMS ARCHITECTURE AND INFRASTRUCTURE

- N. Once the appropriate organizational structure, processes and tools are in place, PSCD will lead the development of the System of Systems (SoS) architecture and standards, and will coordinate the development of the SoS business case and implementation plan.
- O. As the SoS architecture standards are finalized, PSCD will update the enterprise procurement standards to reflect the new SoS technical standards.
- P. The OCIO, PSCD and the PSRSCP must make a concerted effort to communicate the benefits of the SoS approach to all stakeholders through the planning, procurement and implementation phases.
- Q. As the SoS business case is developed, PSCD must assess the feasibility of leveraging major current/planned regional systems within the SoS.
- R. After the SoS architecture is complete in Task N and the procurement standards are updated in Task O, PSCD will be ready to design, procure and construct the System of Systems infrastructure.

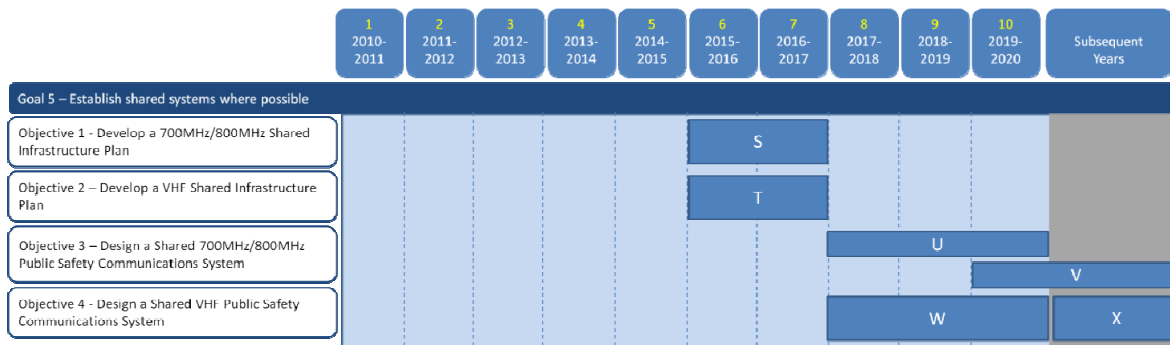
**Figure 11. Goal 4 Road Map**



## GOAL 5—ESTABLISH SHARED SYSTEMS WHERE POSSIBLE

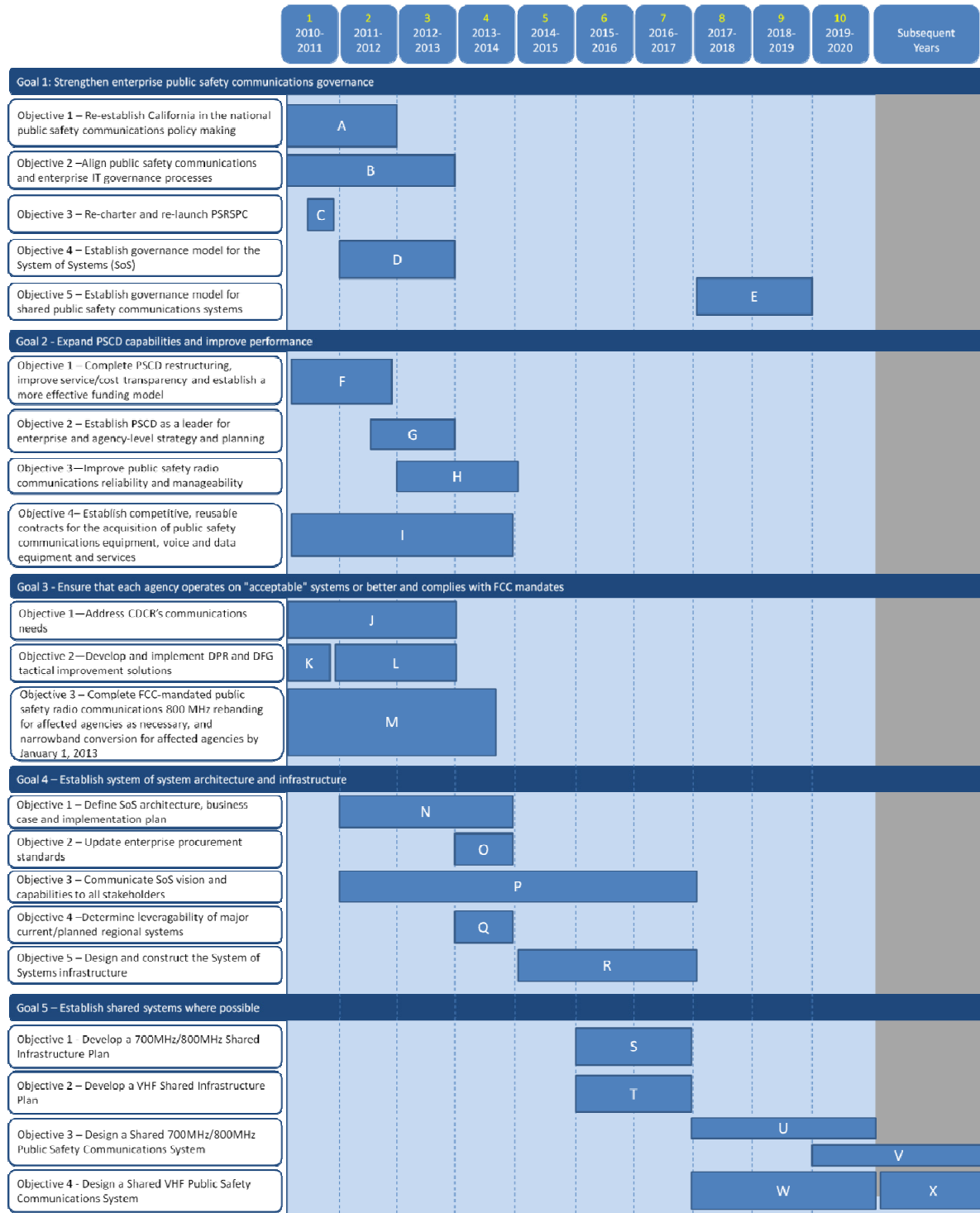
- S. As CHP completes CHPERS and Caltrans completes the transition to 800 MHz, the PSCD must begin to plan for the development of a shared 700–800 MHz system. The planning for this system coincides with the end of the SoS architecture definition and business case development, which will free PSCD resources to begin working on this consolidation plan.
- T. As CAL FIRE begins to explore a potential move to digital operations, PSCD must assist it in the planning for a potential shared VHF system.
- U. Once the planning for the shared 700–800 MHz system is complete, PSCD must work with CHP and Caltrans to develop the detailed design and to conduct the procurement for the shared system.
- V. The deployment of a shared 700–800 MHz shared system will begin at the conclusion of Task U and will most likely begin approximately 10 years from now.
- W. Once the planning for the shared VHF system is complete, PSCD must work with CAL FIRE and other departments to develop the detailed design and to conduct the procurement for the shared system.
- X. The deployment of a shared VHF system will begin at the conclusion of Task W and will most likely begin approximately 10 years from now.

**Figure 12. Goal 5 Road Map**



The overall road map is summarized in Figure 13.

**Figure 13. Overall Road Map**



Note: Letters refers to projects named on the pages immediately preceding this chart.

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## APPENDICES

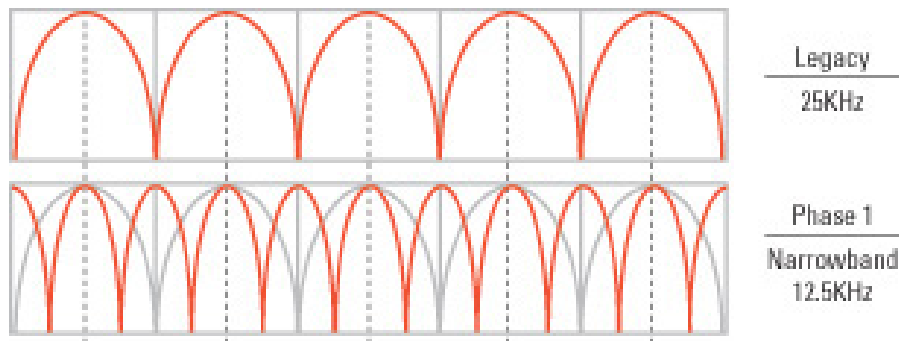
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## APPENDIX A—WHAT IS NARROWBANDING?

For decades, the UHF and VHF frequency bands have been the mainstay of public safety, military and commercial land mobile radio systems. As a result, these bands are very crowded and there is seldom any opportunity for a user of these frequencies to obtain additional channels. The FCC has established January 1, 2013 as the deadline for all VHF and UHF radio users to transition from “wide band” to “narrowband” operation. Figure 14 below depicts the effects of narrowbanding.

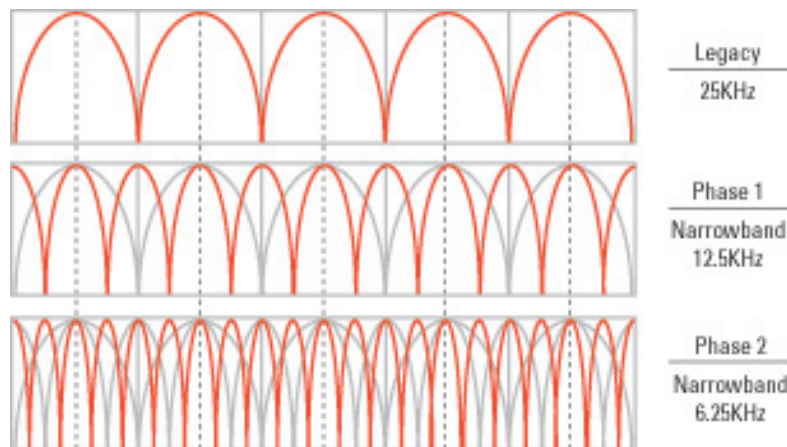
**Figure 14. Effects of Narrowbanding the VHF and UHF Spectrum**



Once narrowbanding has occurred, each existing user will consume approximately one-half the bandwidth that it currently uses. This will have the effect of creating new channels known as “interstitial frequencies.” The interstitial channels will be available for license from the FCC in accordance with its normal licensing application procedures.

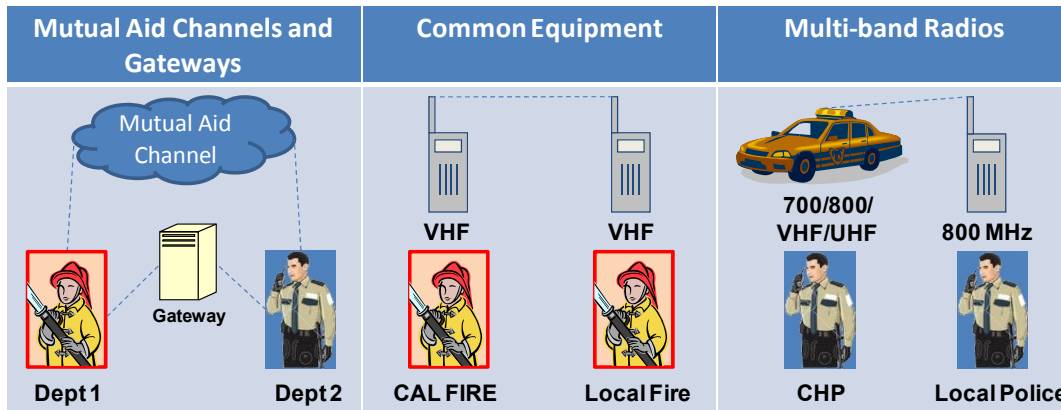
As depicted in Figure 15, the FCC may further narrowband VHF and UHF frequencies during the next several years.

**Figure 15. Effects of Further Narrowbanding VHF and UHF**





## APPENDIX B—COMMON INTEROPERABILITY SOLUTIONS



**Mutual Aid Channels:** Cal EMA, in cooperation with others, has established several mutual aid channels and systems to facilitate emergency communications between agencies. Most PSRCPC agencies rely on the State and federal mutual aid channels to communicate with allied agencies. Some agencies also utilize “workarounds,” such as cell-phone calls to allied agencies’ dispatch centers, to fulfill their interoperability requirements.

**Common Equipment:** During the past 30 years, the fire discipline in California (including local fire departments, federal agencies and CAL FIRE) created a set of interoperability procedures called FIREScope, which govern how communications will be handled at multi-agency incidents. These procedures establish a command-and-control structure and standardized toolsets that allow members of FIREScope to interoperate. As part of the FIREScope protocols, all fire vehicles in the State maintain a VHF analog (*lingua franca*) radio capability.

**Multi-band Radio Solution:** CHP is implementing a sophisticated next-generation multi-radio, multi-band solution. This solution places five different radios (Low Band, VHF, UHF, 700–800 Band and Data) in the trunk of each patrol vehicle, along with a head-end device and a laptop computer which can integrate and bridge between the different radio units. This solution allows officers to communicate on every public safety frequency used within the State, enabling CHP officers to accommodate the radio communications capabilities of their local allied partners. On a smaller scale, other agencies are exploring the use of multi-band radio capabilities to allow communications with allied partners.

## APPENDIX C—OVERVIEW OF PSRSPC AGENCY SYSTEMS

Agency Radio Usage	Current State of Radio Systems	Future Plans
<ul style="list-style-type: none"> <li>• <b>California Department of Corrections and Rehabilitation (CDCR)</b> requires effective radio communications within an institution for both day-to-day operations and emergency management</li> <li>• Radio communications for CDCR’s Statewide Transportation unit is also critical. Studies have shown that nearly 10% of the State’s inmate population can be in transit during a typical weekday.</li> <li>• CDCR’s large Parole unit and the Office of Correctional Safety (OCS) are spread throughout the State and require radio communications for emergency purposes</li> </ul>	<ul style="list-style-type: none"> <li>• CDCR has more than 30 institutional radio systems that are past their useful life, which include critical equipment no longer supported by the original equipment manufacturers</li> <li>• The radio systems used by CDCR’s Statewide Transportation, Parole, OCS and Internal Affairs Units are deficient (e.g., major coverage gaps, not monitored for emergency conditions and insufficient interoperability capabilities)               <ul style="list-style-type: none"> <li>○ Transportation units have become overly dependent on cell phones and “9-1-1” for communications and emergency support</li> <li>○ CDCR’s Parole and OCS units are dependent on a combination of cell phones and “borrowed” local agency radios for emergency communications</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Completely replace/upgrade all institution radio systems within the next three years</li> <li>• Refresh the current radio equipment for Parole and OCS with multi-band radios and increase the quantity of radios for these programs to accommodate all their radio users</li> <li>• Investigate alternative Statewide Transportation unit radio communications system possibilities. Candidates include the previously mentioned proposed networked and shared CMARS/DFG/DPR system and CHP’s Blue.</li> <li>• Prepare a defined cycle and sustainable funding source for the refresh and upgrade of all radio assets within the Department</li> </ul>

Agency Radio Usage	Current State of Radio Systems	Future Plans
<ul style="list-style-type: none"> <li>• <b>California Department of Fish and Game (DFG)</b> is responsible for protecting California’s wildlife and wildlife habitat; its Game Wardens require effective radio communications in remote areas where they operate</li> <li>• DFG’s biologists also require radios for emergency communications because they spend several days in remote areas for research purposes</li> </ul>	<ul style="list-style-type: none"> <li>• DFG has a VHF radio infrastructure that does not meet the agency’s coverage and capacity requirements <ul style="list-style-type: none"> <li>○ Game Wardens and biologists operate in remote regions of the State that have no cell phone coverage and are out of the range of their radio system</li> <li>○ DFG’s current channels are heavily congested in many parts of the State</li> </ul> </li> <li>• Game Wardens do not have mobile wireless data capabilities (e.g., CLETS)</li> <li>• DFG currently contracts with DPR to provide dispatch and emergency response services</li> </ul>	<ul style="list-style-type: none"> <li>• Upgrade infrastructure and equipment to comply with narrowbanding mandate</li> <li>• Implement vehicular repeaters to extend hand-held radio coverage for personnel away from vehicles</li> <li>• Explore merging infrastructure with DPR, DWR and CMARS to provide a shared system</li> </ul>

Agency Radio Usage	Current State of Radio Systems	Future Plans
<ul style="list-style-type: none"> <li>• <b>California Department of Forestry and Fire Protection (CAL FIRE)</b> views radio communications as critical to its organization</li> <li>• It requires radio communications to dispatch its firefighters and for fireground operations</li> </ul>	<ul style="list-style-type: none"> <li>• CAL FIRE employs a conventional, analog VHF system that is used for both day-to-day operational purposes (dispatch, command, etc.) and for fireground control and coordination purposes</li> <li>• It is primarily used in simplex mode with extensive use of talk-around. The current VHF infrastructure is largely sufficient for CAL FIRE's needs</li> <li>• Like many other entities in the fire discipline, CAL FIRE is reluctant to transition onto digital or trunked solutions because of concerns that these technologies do not meet operational requirements. According to The California Fire Service Magazine – November/December 2009, "The safest network for firefighters is one that uses analog repeated and analog simplex channels as part of it and not a fully trunked system"</li> <li>• CAL FIRE requires some form of mobile wireless data connectivity from fire vehicles to support automatic vehicle location and other data applications</li> </ul>	<ul style="list-style-type: none"> <li>• Finish upgrading infrastructure and equipment to comply with the narrowbanding mandate</li> <li>• Procure automatic vehicle location (AVL) solution</li> </ul>

Agency Radio Usage	Current State of Radio Systems	Future Plans
<ul style="list-style-type: none"> <li>• <b>California Department of Justice (DOJ)</b> primarily uses the radio for tactical coordination by various task forces during law enforcement operations</li> </ul>	<ul style="list-style-type: none"> <li>• DOJ uses a conventional analog VHF system comprised of 34 standalone repeaters. These repeaters provide coverage around populated areas.</li> <li>• To meet the FCC requirement for narrowbanding by January 1, 2013, DOJ has fully refreshed its RF infrastructure and subscriber equipment</li> <li>• Although DOJ has identified difficulties in communicating with allied local and State agencies, it has manual workarounds in place that are inconvenient but workable (e.g., swapping radios)</li> </ul>	<ul style="list-style-type: none"> <li>• Move to P25 digital operations</li> </ul>

Agency Radio Usage	Current State of Radio Systems	Future Plans
<ul style="list-style-type: none"> <li>• <b>California Department of Parks and Recreation (DPR)</b> is responsible for protecting and patrolling California's State parks and beaches, and often requires radio coverage in remote areas</li> </ul>	<ul style="list-style-type: none"> <li>• DPR has a dedicated 800 MHz radio infrastructure and a dedicated VHF high-band radio infrastructure (in Del Norte, Humboldt and Mendocino Counties) that do not meet the agency's coverage and capacity requirements:               <ul style="list-style-type: none"> <li>○ Many State Park Rangers operate in remote regions of the State that have no cell phone coverage and are out of the range of their radio systems</li> <li>○ Historically, the DPR system has been specifically configured to provide coverage in areas where the parks are located</li> <li>○ During the past 10–15 years, the number of parks has expanded significantly, while the radio systems have not kept pace</li> <li>○ For areas where there is coverage, the existing channels are often very congested, making it difficult for lower-priority users to access the system</li> </ul> </li> <li>• State Park Rangers currently do not have mobile wireless data capabilities (e.g., CLETS)               <ul style="list-style-type: none"> <li>○ DPR has started its Public Safety Technology Modernization (PSTM) project that includes deployment of mobile data technology to several pilot districts by the end of 2010</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Upgrade infrastructure and equipment to comply with the narrowbanding mandate</li> <li>• Implement vehicular repeaters to extend hand-held radio coverage for personnel away from vehicles</li> <li>• Explore merging infrastructure with DFG, DWR and CMARS to provide a shared system</li> </ul>

Agency Radio Usage	Current State of Radio Systems	Future Plans
<ul style="list-style-type: none"> <li>• <b>California Department of Public Health (CDPH)</b> employs a cache of radios for use while working in its warehouses or for communicating with CHP in cases where it is performing a transport of critical vaccines to public inoculation sites</li> </ul>	<ul style="list-style-type: none"> <li>• CDPH has a cache of 10 portable 800 MHz radios</li> </ul>	<ul style="list-style-type: none"> <li>• Continually re-evaluate radio program and evolving technologies to ensure that the program is effective in support of the Department's mission for emergency response</li> </ul>
<ul style="list-style-type: none"> <li>• <b>California Department of Transportation (Caltrans)</b> performs the maintenance and operations of the State's highway system, and requires radios for both day-to-day and emergency communications</li> <li>• Caltrans is segmented into districts, and their radio communications system is also segmented into those same districts for operations</li> </ul>	<ul style="list-style-type: none"> <li>• Caltrans is primarily on a conventional analog 800 MHz system Statewide, although four districts have overlaid a proprietary Motorola-based trunking system to provide additional capacity and thereby relieve congestion</li> <li>• Four districts are in the process of completing the transition from a legacy VHF low-band system to the 800 MHz system. This migration, which began in the 1980s, is expected to be completed within the next five years <ul style="list-style-type: none"> <li>○ During this migration, Caltrans has partnered with regional communications systems, such as RCS in San Diego, where it is advantageous. The current system appears to satisfy Caltrans' operability requirements within the region.</li> <li>○ Because parts of the system were first installed more than 25 years ago, some components of the system are well past their useful life</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Complete transition to 800 MHz</li> <li>• Add 700 MHz channels while refreshing/upgrading to help alleviate congestion issues</li> <li>• Complete Phase 2 of the Caltrans 2001 Strategic Plan (i.e., move to digital operation; add mobile data capabilities)</li> </ul>

Agency Radio Usage	Current State of Radio Systems	Future Plans
<ul style="list-style-type: none"> <li>• <b>California Department of Water Resources (DWR)</b> uses its radio systems primarily for day-to-day maintenance and operations work in the field and within water facilities, but their system is designed to support the Department in emergency situations</li> </ul>	<ul style="list-style-type: none"> <li>• DWR has 28 standalone VHF repeaters that are sufficient for field maintenance and operations work</li> <li>• DWR also has UHF repeaters in some facilities that provide adequate in-building communications</li> </ul>	<ul style="list-style-type: none"> <li>• Upgrade infrastructure and equipment to comply with the narrowbanding mandate</li> <li>• Interconnect VHF and UHF systems</li> <li>• Explore merging infrastructure with DFG, DPR and CMARS to provide a shared system</li> </ul>
<ul style="list-style-type: none"> <li>• <b>California Emergency Management Agency (Cal EMA)</b> is accountable for coordinating a number of mutual aid channel systems within the State</li> </ul>	<ul style="list-style-type: none"> <li>• Cal EMA supports infrastructure for three mutual aid systems (CESRS, CLERS and FIRENET). These systems have not been updated or refreshed in more than a decade.</li> <li>• Cal EMA plans to update mutual aid systems as they are available to become compliant with the narrowbanding mandate</li> </ul>	<ul style="list-style-type: none"> <li>• Upgrade infrastructure and equipment to comply with the narrowbanding mandate</li> <li>• Update the documentation of the mutual aid systems</li> <li>• Have all mutual aid systems operating on P25 Phase 1 in 10 years</li> </ul>
<ul style="list-style-type: none"> <li>• <b>California Emergency Medical Services Authority (EMSA)</b> staff and volunteers use radio communications to support emergency services during incidents they are supporting</li> </ul>	<ul style="list-style-type: none"> <li>• EMSA has mobile radio banks, including every public safety band, in a variety of vehicles and a cache of 300 UHF portable radios that can be dispersed during a large-scale incident</li> <li>• EMSA maintains a mobile communications center that can be deployed during a large-scale incident</li> <li>• EMSA is responsible for coordination of the Federal MedNET mutual aid channels within California</li> </ul>	<ul style="list-style-type: none"> <li>• Switch MedNET channels to narrowband operations in coordination with all users</li> <li>• Establish a governance structure that promotes efficient and effective operability and interoperability</li> </ul>



Agency Radio Usage	Current State of Radio Systems	Future Plans
<ul style="list-style-type: none"> <li>• <b>California Highway Patrol (CHP)</b> patrols all the major highways and roadways within the State and performs the role of the former State Police</li> <li>• CHP is the primary support agency for all other law enforcement agencies in the State</li> <li>• CHP requires extensive Statewide coverage</li> </ul>	<ul style="list-style-type: none"> <li>• CHP is currently in the midst of implementing a \$500M+ upgrade to its main radio system (i.e., the CHPERS project), which is intended to provide patrol officers with a highly interoperable solution along with mobile data access capabilities in most areas</li> <li>• The next major strategic initiative following the completion of the CHPERS rollout (in five to seven years) will be planning for the probable eventual replacement of the VHF low-band infrastructure, because limited vendor support for VHF low-band and the age of the components may expose CHP to higher support costs, reliability problems and unacceptable failure risks</li> <li>• CHP officers currently have mobile data access in their vehicles via their mobile data terminals, but there are gaps in their data coverage across the State</li> </ul>	<ul style="list-style-type: none"> <li>• Complete CHPERS implementation</li> <li>• Explore migration off of VHF low-band system</li> </ul>

Agency Radio Usage	Current State of Radio Systems	Future Plans
<ul style="list-style-type: none"> <li>• <b>California Military Department (CMD)</b> is activated by Cal EMA to support declared or undeclared emergencies. CMD has the capability of deploying self-contained, multi-band, highly flexible communications packages to support whichever agency or mission requires it.</li> <li>• CMD is compensated by either the State or federal government when activated for a mission, but it is reliant on grant funds for its daily operations, which limits its ability to refresh equipment and conduct training exercises</li> </ul>	<ul style="list-style-type: none"> <li>• CMD can deploy a wide array of communications equipment such as IC4Us (a mobile platform that is self-sufficient, mounted on the back of a military High Mobility Multipurpose Wheeled Vehicle [HMMWV] or commercial truck), Fly Away Kits (units used by a one- to two-man team for immediate on-scene communications that provides voice and data connectivity) and other high-end radio equipment</li> </ul>	<ul style="list-style-type: none"> <li>• Acquire additional communications equipment</li> </ul>




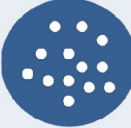
Agency Radio Usage	Current State of Radio Systems	Future Plans
<ul style="list-style-type: none"> <li>• <b>California Office of the Chief Information Officer (OCIO) Public Safety Communications Division (PSCD)</b> owns and operates the California Multi-Agency Radio System (CMARS)</li> <li>• CMARS was originally conceived of as a low-cost, best-efforts radio system which could be leveraged by small agencies that cannot afford their own radio system. Today, the largest system user (providing 87% of CMARS funding) is the CDCR Statewide Transportation unit.</li> </ul>	<ul style="list-style-type: none"> <li>• CMARS is a collection of 35 standalone, conventional, analog 800 MHz community repeaters arranged along the major transportation corridors in the State</li> <li>• CMARS does not provide the coverage and functionality (ability to communicate directly with the institutions and, when required, call out to CHP for emergency support) that CDCR requires for its Statewide Transportation unit</li> <li>• The system is funded by a monthly fee per subscriber; however, there is no way currently to enforce this</li> <li>• Due to the absence of a formal governance and funding structure, CMARS is essentially a “best-efforts” system. Any upgrades or expansion would require direct funding from the agency requesting the upgrade.</li> </ul>	<ul style="list-style-type: none"> <li>• Explore merging infrastructure with DFG, DPR and DWR to provide a shared system</li> </ul>

## APPENDIX D—DETERMINING A SUITABLE SOLUTION

In 2007, the California Statewide Communications Interoperability Plan (CalSCIP) identified a System of Systems (SoS) as the proposed solution for Statewide communications (including local entities). However, when defining the Statewide vision for communications, the SoS solution was not the default solution accepted for the State. The SoS was one alternative compared against three other alternatives:

- Continuing with the independent development of agency-specific solutions (“Stovepipe Systems”)
- Developing a large Statewide system that could be shared by all or most of the public safety agencies in the State (“Single Consolidated Statewide System”)
- Waiting for the National Broadband Solution to be deployed within the State (“National Broadband Solution”).

**Figure 16. Solution Alternatives Considered**

Alternative	Stovepipe Systems	Single System	System of Systems	National Broadband Solution <sup>12</sup>
Depiction				
Description	<ul style="list-style-type: none"> <li>Existing “stovepipe” systems continue to evolve along separate paths based on agency needs and funding, as constrained by enterprise standards and architecture guidelines</li> </ul>	<ul style="list-style-type: none"> <li>Existing systems are replaced by a single Statewide shared, multi-agency, digital, trunked system (similar to Florida, Pennsylvania, Indiana and others; also similar to what was proposed by PRISM in 1997)</li> <li>Such a system would provide all agencies with Statewide radio coverage/capacity and would facilitate interoperability among State agencies</li> </ul>	<ul style="list-style-type: none"> <li>Use IP- and standards-based Public Safety Communications networking technologies to link separate legacy networks together to improve operability and interoperability</li> <li>As legacy networks migrate to standards-based digital technologies, evolve the integration to enable infrastructure sharing (e.g., roaming) and more-advanced interoperability</li> <li>Selectively consolidate aligned agency systems (and possibly those of willing larger agencies) into a shared, multi-agency digital trunked network. Coverage and capacity of this network would be based on the needs of the participating agencies.</li> </ul>	<ul style="list-style-type: none"> <li>California wireless communications coordinators and political leaders work with the California congressional delegation and the FCC to develop a strategy for actively involving the State in the development of a National Broadband Plan that accommodates the needs of public safety</li> <li>Most major State agencies would migrate to this system over time. Some State agencies may choose to maintain private systems or other capabilities, based on business requirements not met by the new system.</li> </ul>
Feasibility	<ul style="list-style-type: none"> <li>High probability that agencies will independently plan their systems to meet their needs</li> <li>Low probability for smaller agencies to adequately fund the deployment of these systems</li> </ul>	<ul style="list-style-type: none"> <li>Low probability that all agencies will participate in a single consolidated system</li> <li>Low probability of funding the build-out of a large, single system</li> </ul>	<ul style="list-style-type: none"> <li>High probability that all agencies will participate in a System of System, and medium probability that larger agencies will share their systems</li> <li>Medium probability of funding the migration to a System of Systems</li> </ul>	<ul style="list-style-type: none"> <li>Low probability that a National Broadband System will be deployed during the next 10 years and will be adequate for public safety use</li> </ul>
Cost	\$\$	\$\$\$	\$\$	\$\$

While each of these alternatives has its share of positives and negatives, the alternatives analysis showed that the System of Systems alternative was preferred, primarily for the following four reasons:

- The National Broadband Solution may not be implemented in the near term, and may not provide appropriate solutions for the State

<sup>12</sup> Anticipated ten-year cost estimates to provide nationwide advanced public safety broadband network capabilities are delineated in the FCC’s OBI Technical Paper No. 2 titled, “A Broadband Network Cost Model: A Basis for Public Funding Essential to Bringing Nationwide Interoperable Communications to America’s First Responders” (see <http://www.broadband.gov/plan/broadband-working-reports-technical-papers.html>) and associated documents. Since much of California’s geography comprises very low population densities, significant additional costs would be incurred to fill the geographical “gaps” currently accommodated by many of the State’s communications systems.

- A Stovepipe Evolution alternative is not an acceptable solution for the State
- The SoS has a higher probability of success than the Single System alternative
- The SoS provides the State the flexibility to accommodate a wide range of requirements

### ***THE NATIONAL BROADBAND SOLUTION MAY NOT BE IMPLEMENTED IN THE NEAR TERM, AND MAY NOT PROVIDE APPROPRIATE SOLUTIONS FOR THE STATE***

The National Broadband solution could potentially be the best solution for the State for most of its public safety communications needs. The solution, however, has not been agreed upon, in terms of technology selection, the time frame for implementation or the coverage of the system. It is likely that this solution, if it is approved and implemented by the federal government or its partners, will not become adequately available to most public safety users for several years, especially as a primary voice communications tool. As such, the State needs to pursue alternatives that are more appropriate for current needs and have a higher probability of success.

Although the National Broadband Solution is not viewed as a viable alternative for voice communications within the next decade, the State must actively participate in the planning for this solution because it could provide next-generation capabilities to public safety while becoming a “system” connected to the SoS in several years.

### ***STOVEPIPE EVOLUTION IS NOT AN ACCEPTABLE SOLUTION FOR THE STATE***

The Stovepipe Evolution alternative has the lowest implementation cost and has the highest probability of being achieved, but moving the current systems forward without coordination yields the fewest benefits.

The expected future of this path is that agencies with the least amount of funding will continue to under-fund their radio systems, and public safety communications within those agencies will not track best-practice technology and application trends for public safety, eventually being superseded by (and incompatible with) the rest of the public safety communications industry.

If each department decided to independently fund its communications system along best practices, the overall ongoing cost to the State would eventually be higher than any of the other alternatives, because each system would need to be maintained and then replaced. These independent investments would not incorporate any of the economies of scale that are achievable through the execution of a collaborative strategy, including evolutionary costs, enhanced spectrum efficiencies and reduced maintenance costs.

Because the Stovepipe Evolution alternative achieves the fewest benefits and potentially has the highest ongoing costs, it has been deemed the least-preferred alternative for the State.

### ***THE SOS HAS A HIGHER PROBABILITY OF SUCCESS THAN THE SINGLE SYSTEM ALTERNATIVE***

When directly comparing the SoS with a Single System alternative, the SoS has the highest probability of success, because the State-built single system is a monolithic project that would require large amounts of coordination and funding. The State tried the Single System alternative in the early 2000s with the PRISM project, but because of the amount of political will required and the high one-time costs, PRISM was not successful.

An SoS, on the other hand, would provide the State with a means to interconnect systems, and therefore allow effective intra- and inter-agency communications, while leveraging the existing systems that are in place and were purpose-built for each agency.

### ***THE SOS PROVIDES THE STATE THE FLEXIBILITY TO ACCOMMODATE A WIDE RANGE OF REQUIREMENTS***

The SoS gives the State flexibility to modernize components to take advantage of digital and data capabilities while maintaining the ability to continue the use of proven analog technologies where the mission requires this. The SoS would consist of systems that were purpose-built for each agency. The individual solutions that are currently deployed would not be required to be rebuilt (unless this is desired) and operations could continue, mostly as they are today. Each would have the ability to add connections to aligned agencies for day-to-day, incident or emergency use as authorized, and would potentially increase the coverage and capabilities of its system. This alternative is also complementary to selectively consolidating aligned agency systems (and possibly those of willing larger agencies) into one or more shared, multi-agency digital trunked network(s). The coverage and capacity of this network would be based on the needs of the participating agencies.

## APPENDIX E—BENEFITS OF AN SOS SOLUTION

Figure 17 depicts the operability of Department A's radio system within a defined geographic area. The following numbered items correspond to the numbers on the figure:

1. A radio user from Department A uses his radio on Department A's VHF system.
2. If the portable radio keyed by the user in Step 1 is tuned to the dispatch for Department A, Department A's dispatch will be able to communicate with the user.
3. If the portable radio keyed by the user in Step 1 is tuned to a channel or talk group to which several other portable users are tuned—in that systems coverage area—all the users on the talk group will be able to participate in voice conversation with the user from Step 1.

**Figure 17. Operability Within One Area**

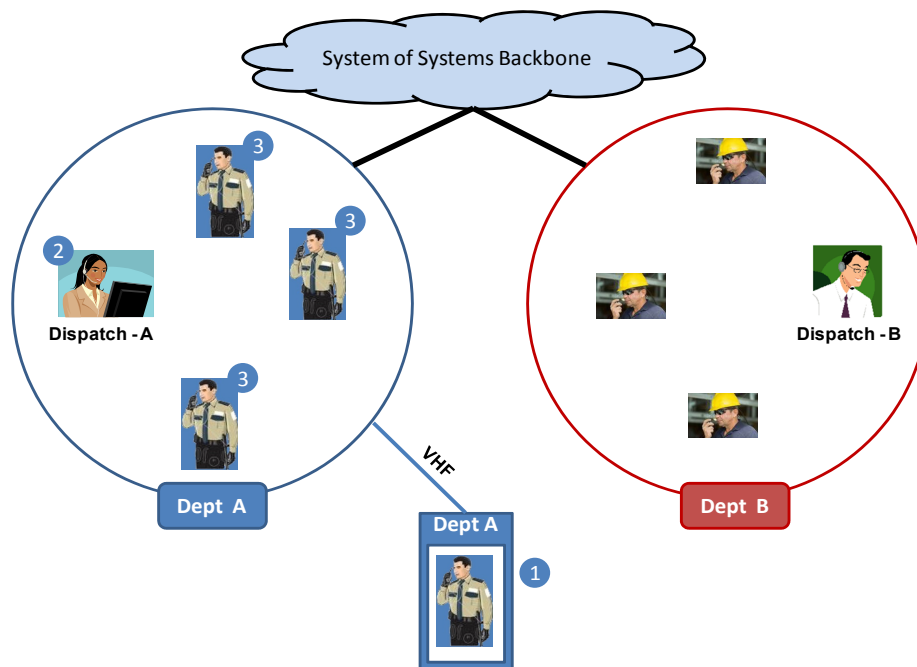




Figure 18 depicts the proposed operability of Department A's radio system across two separate geographic areas. The following numbered items correspond to the numbers on the figure:

1. A radio user from Department A uses his radio on Department A's Area 1 VHF system.
2. If the portable radio keyed by the user in Step 1 is tuned to the channel or talk group of a Department A portable user in a geographically separated Area 2, the SoS deployment will allow both users on the talk group to be able to participate in a voice conversation from their respective systems' location or within other SoS-enabled and technologically compatible areas wherein they have the authorization to so operate.

**Figure 18. Operability Across Geographies**

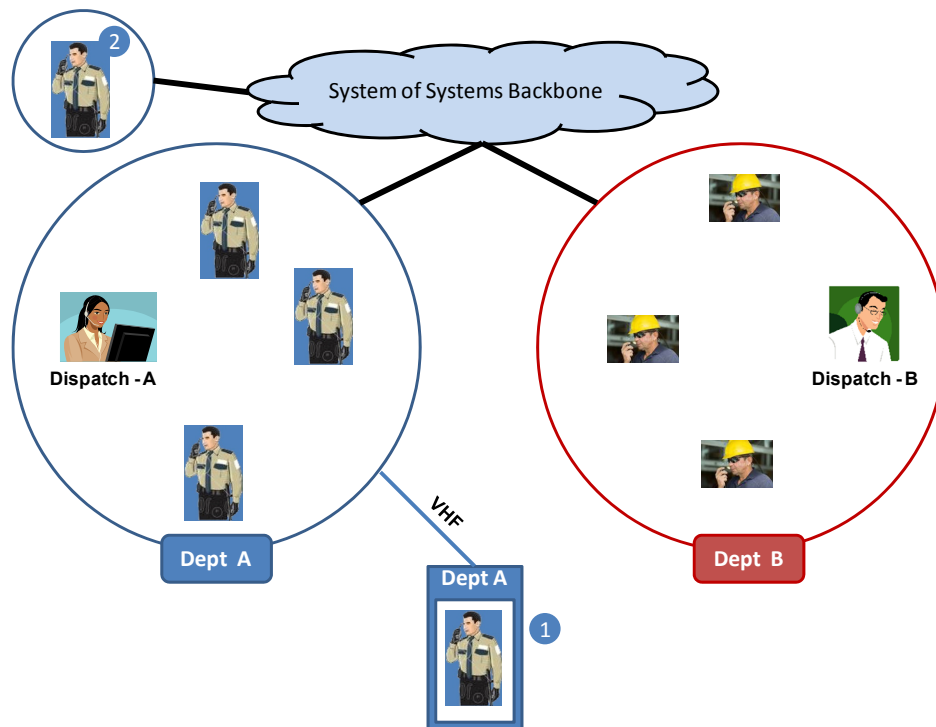


Figure 19 depicts the interoperability goals of a radio system between Department A and Department B after the SoS is deployed, if Department A system users are authorized connectivity with Department B system users. The following numbered items correspond to the numbers on the figure:

1. A radio user from Department A uses his radio on Department A's VHF system.
2. If the portable radio keyed by the user in Step 1 is network-enabled for interconnectivity with Department B's system, Department B's dispatch will be able to communicate with the Department A user.
3. If the portable radio keyed by the user in Step 1 is tuned to a channel or talk group that several of Department B's portable users are on, any of the Department B users on the talk group will be able to participate in voice conversation with the Department A user from Step 1.

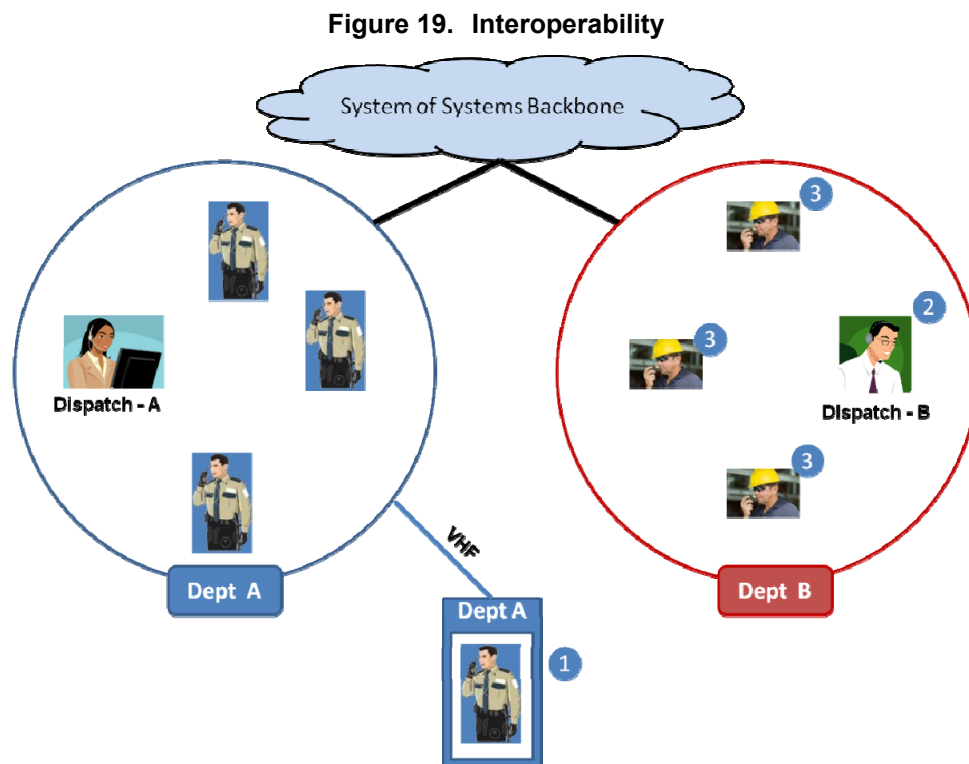
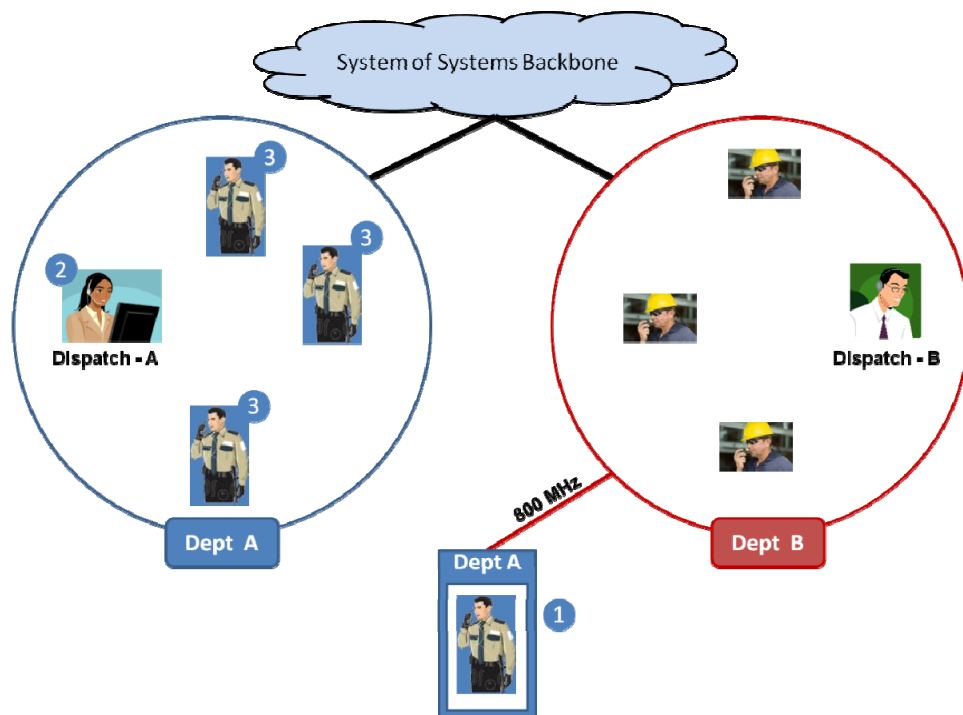


Figure 20 depicts the ability of a user to be a guest user on another system and still be able to communicate back to radio users on their home system. Often times, this is called “roaming.” This feature could potentially extend the virtual coverage of radio users in the State. That is, if the technologies are compatible (e.g., same band, etc.) and an authorization (MOU) exists for the users to operate within each other’s coverage areas, they will have effectively expanded the range of each user. The following numbered items correspond to the numbers on the figure:

1. A radio user from Department A uses his multi-band radio to become a guest user on Department B’s 800 MHz system.
2. If the portable radio keyed by the user in Step 1 is tuned to Department A’s dispatch, Department A’s dispatch will be able to communicate with the user.
3. If the portable radio keyed by the user in Step 1 is tuned to a channel or talk group that several of Department A’s portable users are on, any of the Department A users on the channel or talk group will be able to participate in voice conversation with the Department A user from Step 1.

**Figure 20. Roaming**



## GLOSSARY

**Analog radio** – radio technologies which transmit information by altering the amplitude (AM) or frequency (FM) of a given frequency channel. These technologies have been used for radio transmissions since the late 1800's

**AVL** – Automatic Vehicle Location; the technique of using a navigation system, such as GPS, to determine a vehicle's position

**CalSCIP** – California Statewide Communications Interoperability Plan prepared by CalSIEC

**CalSIEC** – California Statewide Interoperability Executive Committee; it is tasked with managing the state and federally designated interoperability spectrum on behalf of public safety first responders in California. The committee has also adopted responsibility for coordinating interoperability plans and processes in California

**Caltrans** – California Department of Transportation

**Cal EMA** – California Emergency Management Agency

**CAL FIRE** – California Department of Forestry and Fire Protection

**CDCR** – California Department of Corrections and Rehabilitation

**CDPH** – California Department of Public Health

**CMD** – California Military Department

**CHP** – California Highway Patrol

**CMARS** – California Multi-Agency Radio System; a series of non-interconnected radio sites that transmit and receive in the 800 MHz range. The system is a subscription service maintained by OCIO-PSCD

**D-Block** – A portion of the unauctioned radio spectrum consisting of two 5 MHz slices in 700 MHz range adjacent to public safety's correlating broadband spectrum that has been the subject of debate on a federal level over its use

**DFG** – California Department of Fish and Game

**Digital radio** – Radio technologies which carry information by sending and receiving discrete packets of data over radio waves

**EMSA** – Emergency Medical Services Authority

**FCC** – Federal Communications Commission

**DOJ** – California Department of Justice

**DPR** – California Department of Parks and Recreation

**DWR** – California Department of Water Resources

**FIREScope** – Firefighting REsources of California Organized for Potential Emergencies was originally founded in 1972. It consists of all local, State and Federal firefighting organizations within California and is designed to deal with mutual aid, cooperative agreements, and fire/rescue regional policy issues and to advise the Secretary of Cal EMA in matters of statewide importance

**GHz** – Gigahertz; a measure of frequency. One GHz is equal to 1 billion cycles per second, 1 billion Hertz, or 1,000 MHz

**GPS** – Global Positioning System; a navigational system involving satellites and computers that can determine the latitude and longitude of a receiver on Earth by computing the time difference for signals from different satellites to reach the receiver

**Interoperability** – In this document, the ability for personnel to communicate with the personnel operating on other radio systems or in other agencies

**Interstitial frequencies** – New usable frequencies created by the FCC narrowbanding mandate (see Appendix A)

**IT** – Information Technology

**kHz** – Kilohertz; a measure of frequency. One kHz is equal to 1,000 cycles per second, or 1,000 Hertz

**LMR** – Land Mobile Radio

**MHz** – Megahertz; a measure of frequency. One MHz is equal to 1,000,000 cycles per second, 1 million Hertz, or 1,000 kHz

**Multiband radio** – a radio that can operate on more than one band (e.g. UHF and VHF)

**National Broadband Plan** – The FCC was directed by Congress in early 2009 to develop a National Broadband Plan (NBP). Its intent is to ensure every American has “access to broadband capability.” Another requirement was that the NBP “...include a detailed strategy for achieving affordability and maximizing use of broadband to advance consumer welfare, civic participation, public safety and homeland security, community development, health care delivery, energy

independence and efficiency, education, employee training, private sector investment, entrepreneurial activity, job creation and economic growth, and other national purposes.<sup>13</sup>”

**OCIO** –California Office of the State Chief Information Officer

**Operability** – In this document, the ability for personnel to communicate with one another via radio, often used to mean communications within one agency (intra-agency)

**OTAP** – Over-The-Air Programming; methods of distributing new software updates such as frequency lists to mobile devices, including mobile and portable radios, wirelessly

**OTAR** – Over-The-Air Rekeying; methods of changing encryption keys in a two-way radio system over the radio channel

**PC** – Personal Computer

**Project 25 (P25)** – A suite of standards for digital radio communications for use by federal, state/province and local public safety agencies in North America to enable them to communicate with personnel utilizing disparate systems

**P25 Phase 1** – Phase 1 radio systems operate in 12.5 kHz analog, digital or mixed mode using a C4FM modulation. Phase 1 equipment will be backwards compatible with legacy systems

**P25 Phase 2** – Phase 2 is currently under development. It aims to achieve 6.25 kHz efficiency. Concurrent work is being done on 2-slot TDMA and FDMA (CQPSK) modulation schemes.

**PSCD** – The Public Safety Communications Division of the OCIO

**PSRCN** – Public Safety Radio Communications Network

**PSRSPC** – Public Safety Radio Strategy Planning Committee; launched in code in 2002, with a stated mission “To provide the leadership needed that allows California to effectively leverage existing investments in communications infrastructures while moving rapidly and decisively to meet targeted goals for improved interoperability, universal statewide access, enhanced modernization, increased functionality, and adequate channel availability throughout California in support of public safety.”

**RCS** – The San Diego - Imperial County Regional Communications System; a shared 800 MHz system used by over 200 agencies in those two counties

**System of Systems (SoS)** – A network of systems interconnected by a communications backbone that allows for communications between systems and the sharing of systems

**UHF** – Ultra High Frequency; Radio spectrum between 300 MHz and 3 GHz. Also refers to bands of public safety spectrum between 421 and 512 MHz

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<sup>13</sup> See <http://www.broadband.gov/plan/executive-summary/>

**VHF** – Very High Frequency; Radio spectrum between 30 MHz and 300 MHz. Also refers to two bands of spectrum: VHF low band or “low band” with public safety frequencies licensed within the 25 and 50 MHz range, and VHF high band with public safety frequencies licensed within the 148-174 MHz range

**700 MHz** – A portion of the radio spectrum from 698 to 806 MHz within which there are two 12 MHz-wide public safety blocks. In this document the term refers to only the public safety blocks unless otherwise specified

**800 MHz** – A portion of the radio spectrum between 800 and 900 MHz. In this document, it specifically refers to the public safety spectrum between 806 and 824 MHz paired with spectrum between 851 and 869 MHz