



System Performance Innovation Fact Sheet

Professional Capacity Building for Rural ITS Communications

Description of the Challenge or Opportunity

Professional Capacity Building for Rural ITS Communications

Understanding the motivation.

Rural transportation engineers design and implement ITS installations in some of the most remote locations in California. These Rural ITS deployments are becoming increasingly complex in order to adequately address the challenges that rural transportation presents. However, even though rural communications engineering is a mission critical skill, many engineers have relatively little experience with the myriad of technologies that could be applied. Furthermore, because technologies are changing and becoming obsolete very quickly, transportation professionals find it challenging to stay abreast of the latest technologies available on the market. Transportation agencies are also faced with the challenges of finding qualified staff, increasing turnover, retention of existing staff with their experience, skill and leadership, and attracting new entrants to the transportation workforce.

A variety of training options for communications are available commercially, from academic institutions, trade organizations, and industry. However, the opportunity to obtain training that is particular to transportation communications is limited. There are even fewer options directly addressing professional capacity development for rural transportation communications.

Available training opportunities could provide valuable training and information to a transportation engineer looking to build professional capacity in telecommunications. However, because the available training is so diverse, it would be extremely difficult to gain sufficient, up-to-date, and practical skills or professional capacity to adequately address the challenges of rural ITS communications faced by Caltrans.

To build the professional capacity of rural ITS engineers and maximize the benefits of a more efficient and better quality rural transportation information and communications system, the goals of this project are to develop a comprehensive curriculum and conduct training for Rural ITS communications. The project has an educational focus and its primary objective is to have leading subject matter experts provide a hands-on, “nuts and bolts” learning experience for rural ITS engineers and technicians. Learning outcomes are centered on understanding the various communication technologies available and how to best select and implement these technologies, particularly in a rural environment.



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Training for plant wireless communications, RF System Basics was conducted during Phase 1 of the project. In Phase 2, training was provided for IP Fundamentals and Plant Wired communications on the topic of Optical Fiber. Phase 3 will focus on Telco Wireless technologies.

The subject areas and topics established as part of the curriculum include the following:

Telco Wireless

- Cellular/PCS basics
- GSM data, 3G and beyond
- CDMA data, 3G and beyond
- LTE, 4G and Next Generations
- Telco owned WiMax

Telco Wired

- POTS
- ISDN
- xDSL
- DS1/ T1
- Fractional DS1/ T1
- Frame relay
- Analog data circuits

Plant Wireless

- RF system basics
- 802.11 (WiFi) and related
- Microwave
- Short haul radio
- Privately owned WiMax

Plant Wired

- Plant wiring basics
- Serial connectivity
- xDSL
- Optical fiber



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IP Fundamentals

- _Understanding IP networks
- _Local area networks
- _Wide area networks
- _Network security
- _Vendor specific equipment

This methodology of providing immersive training on specific ITS communication topics has wide applicability to other ITS components and throughout other regions of the state. The maintenance of these technology components, crucial to accurate and reliable transportation management, rest in the hands of capable individuals that have proper and up-to-date training.

Information Regarding the Innovation

Defining the need.

- How does innovation support the Department's mission, vision, and goals?
 - Safety: Proper functionality of ITS elements is crucial to safe operation of traffic signal systems, and other traffic devices used for incident management, traveler information, etc. A properly trained workforce will ensure that these devices are installed correctly, and properly maintained to ensure safe operations.
 - Stewardship and Efficiency: A trained workforce will ensure that ITS assets are properly installed and maintained, extending the lifecycle and usefulness of each device.
 - System Performance: Accurate and reliable ITS information is crucial for transportation management and traveler information, both important elements in transportation system performance.
 - Organizational Excellence: Internal innovation to improve the safety of travelers and employees, and efficient management of Caltrans assets.
- How does the innovation improve safety and system performance?

In most location throughout the state, ITS elements and data communications systems are the lifeblood of a properly operating transportation management center, E911 call center, and emergency operation center. It is imperative that the data link and elements that generate the data are fully functional, accurate, and reliable. A workforce,



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trained in these corresponding technologies, is necessary to guarantee the greatest return on these investments.

- Did the innovation have widespread interest in the originating district?
The currently developed PCB for rural ITS communication course is always well attended with high demand.
 - Was there immediate acceptance of the innovation?
Yes.
 - To what extent is the innovation being used in the originating district?
Staff in the rural districts has continuously and primarily used the innovation.
- Have you been approached by other districts interested in implementing the candidate innovation?
The PCB has been well received and warrants consideration for adaption by other regions of the state, and to address the myriad technical training that is required to ensure efficient operation of statewide ITS Elements.
 - If the implementation of this innovation been attempted in another district, what was the outcome?
N/A
 - How broad is the interest?
The interest is broad in other districts and other transportation entities such as State DOTs.
- Is the implementation scalable?
Yes, the system is fully scalable although new curriculum would need to be developed based upon statewide and regional need. The methodology and model are tested and proven.

Estimating the cost.

- Cost to implement the innovation in originating district?
- Offsetting factors?
None.



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- Estimated lifecycle/maintenance costs?
Costs of updating course material and developing new curricula.
- Were you able to identified supporting resources?
No
 - Local partners?
No
 - Federal funding?
No
- How long did it take to implement the innovation in your district?

Quantifying the benefits.

- Estimated annualized benefits to the originating district?

Understanding the risks.

- Barriers to implementation of the innovation?
None.
- Risks associated with implementation?
None.

What lessons were learned?

- Lesson learned – What would you do differently?
Nothing
- Do you believe that the innovation is best propagated to other districts by staff or contractor?
Staff/Contractor.

Other considerations.

- Are there any similar processes or products that you considered, but determined to be inappropriate?
There are other training options, but we believe that curricula developed by Caltrans staff and other experts explicitly for Caltrans employees is the most efficient and effective way to provide the training that our employees need.



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N/A

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