



System Performance Innovation FACT Sheet

CCTV Information Relay

Description of the Challenge or Opportunity

CCTV Information Relay

Understanding the motivation.

The CCTV Information Relay is designed to provide the system "middle ware" that allows the capture and export of district CCTV images to the web. It also provides scheduling, formatting and image integrity checks that enable the delivery of reliable Traveler Information. In addition, the relay provides real-time failure data and complete up-time statistics, both site-by-site and system wide. This allows technicians to quickly identify problem sites and allows for performance monitoring based on actual measured data.

The relay is the initiating device that polls image data from remote CCTV field elements on a scheduled basis. It then determines if the image is a valid fresh image before further processing. The relay then appends a date and time banner at the bottom of the image and does any formatting, removal of sensitive data and conversions to comply with legacy systems. This quality checked image data is then deposited the Caltrans Commercial Wholesale Web Portal and other remote servers for use by internal and external websites. The relay also provides a "technician dashboard" feature that monitors all critical processes and reports statistics in a clean, effective user interface. This enables system performance monitoring and facilitates system and site troubleshooting.

The CCTV Information Relay concept relies on the "atomic" device model of machine-to-machine communications. This processing device resides at each TMC but close to the field on the district's field element network. It is designed to be a processing engine that does a limited number of functions very well. Because it is an atomic device on a network, interaction with field elements and other devices are "forced" to comply with specific information transfer protocols. This improves reliability, data transparency and greatly simplifies trouble isolation.

Mike Jenkinson, HQ Traffic, has in-depth knowledge about the CCTV Information Relay.

Information Regarding the Innovation

Defining the need.

- How does innovation support the Department's mission, vision, and goals?



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- **Safety:** Integral to exporting CCTV information for winter operations. Used by travelers for pre-trip planning purposes allowing travelers to make better decisions. CCTV used by Caltrans employees for a variety of traffic management operations including incident management. Remote diagnosis and troubleshooting minimizing on-road exposure of equipment maintenance personnel.
 - **Stewardship and Efficiency:** Ability to measure CCTV system performance, to ensure that the CCTV asset is accurate, reliable, and available.
 - **System Performance:** Better travel decision for vehicle and freight operators, reduced incidents and resulting congestion based upon the use of CCTV for pre-trip planning.
 - **Organizational Excellence:** Internal innovation to improve the safety of travelers and employees, and efficient management of Caltrans assets.
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- How does the innovation improve safety and system performance?
The CCTV Information Relay improves both safety and system performance by ensuring that CCTV information and images are readily available to the public on the World Wide Web, and by ensuring that the up-time of the CCTV network in D-2 is maximized. The device provides failure notification and remote troubleshooting, thus minimizing exposure to equipment maintenance personnel.
 - Did the innovation have widespread interest in the originating district?
The CCTV Information Relay has been widely accepted within District 2 as a unique and critically important component of the districts traveler information effort.
 - Was there immediate acceptance of the innovation?
Yes.
 - To what extent is the innovation being used in the originating district?
The innovation has been continuously used by District 2 since its introduction over two years ago.
 - Have you been approached by other districts interested in implementing the candidate innovation?
The CCTV Information Relay is scheduled to be deployed in District 10 as a 2nd beta district and as proof-of-concept for wider deployment.



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- If the implementation of this innovation been attempted in another district, what was the outcome?
Not yet deployed in D-10.
- How broad is the interest?
The interest is broad in other districts and other transportation entities such as State DOTs (the CCTV Information Relay has been discussed at various national events including the Western States Forum). All districts have CCTV cameras and can benefit from this innovation.
- Is the implementation scalable?
Yes, the system is fully scalable and was designed with wider scale deployment in mind. That said, the system would require some effort to populate the system with district specific CCTV devices and minor modification (see the section below titled “Estimates the Cost” for more specific information). For this reason, we suggest that a contractor be identified to complete this effort, thus saving precious human district resources for more meaningful work effort. Further, we suggest to harvest the low hanging fruit by initially focusing on districts whose field element network is IP based.

Estimating the cost.

- Cost to implement the innovation in originating district? All aspects including staff time.

Deployment cost of the CCTV Information Relay will vary significantly between the districts depending on network architecture and the number of CCTV sites to configure. The District 2 deployment for approximately 70 CCTV's all on an existing IP network, cost approximately 150 hours of staff time. This included setting-up and installing the server, configuring sites, some training, and other incidental work required to turn-up the Information Relay. There was no material cost for this deployment. There are several districts with similar network architecture to District 2; the Information Relay could be deployed in those “low-hanging-fruit” districts relatively easily. However, for districts without IP connectivity to the field or with video devices that don't support some sort of image grabbing feature, the cost could increase, especially for a high volume of CCTVs. These districts will have to be looked at on a case-by-case basis. The Information Relay is hosted on a Linux server. Most, if not all TMC's in each district should have a virtual server in which a



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Linux distribution can be loaded. For those districts without a virtual server, or limited capacity, the Information Relay can be run on a standalone server, slightly increasing cost for the deployment.

- Offsetting factors?
None
- Estimated lifecycle/maintenance costs?
Maintaining the CCTV information relay cost us about 50 hours last year. This includes bug fixes, server maintenance, and configuring new sites.
- 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? The District 2 deployment took about 3-4 months. Staff did not work on this deployment exclusively, as we had to integrate the deployment into a demanding workload.

Quantifying the benefits.

- Estimated annualized benefits to the originating district?
 - Polls field element data at regular, configurable intervals
 - Verifies retrieved image integrity
 - Pushes data in 4 common file transfer formats to the Caltrans CWWP2 feed
 - Logs communication diagnostics to aid in network troubleshooting
 - Reports measured network availability

Understanding the risks.

- Barriers to implementation of the innovation?
None known
- Risks associated with implementation?
 - 1.) Network issues vary between districts, integrating this innovation into existing architecture could be a hurdle.
 - 2.) Video encoders that don't support an "image grab" feature.



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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?
Contractor

Other considerations.

- Are there any similar processes or products that you considered, but determined to be inappropriate?
No known equivalent products
- Did the innovation follow a System Engineering process?
Yes, but not the Federally defined System Engineering process.

About the Originating Author/Team

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