Pomona Valley
ITS Project

Project Deliverable 5.6.2

Communication User and Functional Requirements Report

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HISTORY OF REVISIONS

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PROJECT DESCRIPTION

The County of Los Angeles, in cooperation with the cities within the Pomona Valley, has determined that development of an Intelligent Transportation System (ITS) in the Pomona Valley would help to reduce congestion, enhance mobility, provide traveler information during non-recurring and event traffic congestion, and manage event traffic. The Pomona Valley Intelligent Transportation Systems (PVITS) project was conceived as a recommendation from the Pomona Valley ITS Feasibility Study completed by the LACMTA in 1995. The ultimate objectives of the Project are to:

- Improve mobility by optimizing traffic management on arterials and freeways;
- Enhance Route 60 capacity by better coordinating freeway traffic with parallel arterials;
- Improve agency efficiency by coordinating management of operations and maintenance efforts among and between agencies; and
- Increase agency staff productivity by providing low-maintenance, high-quality communications and computational tools to assist in daily management and coordination activities.

Phase 1 of the PVITS project is the development of a conceptual design that defines solutions to enhance capacity, reduce congestion, and improve traveler information in the Pomona Valley.

1.0 BACKGROUND

1.1 Purpose of Report

This report identifies the requirements of the communications system that will be developed and installed to support Intelligent Transportation Systems (ITS) for the PVITS subregion. The communications system will support Advanced Transportation Management Systems (ATMS), a subregional Advanced Traveler Information System (ATIS), and other planned ITS components.

The communication requirements identified in this report are based upon the existing and planned traffic control devices, other field elements, local city control site (LCC) workstations and a subregional TMC as identified in various reports submitted in Task 5. The interagency communication requirements are compatible with the Information Exchange Network (IEN) architecture and planned deployment, designed for LA County under a separate project.

Each cities' ATMS system and the County's would interface and exchange traffic and traveler information with each other by connecting to the LA County IEN. This network utilizes the public telephone company frame relay services to connect the various systems using NTCIP's Center-to-Center protocol. Some of the primary features of the IEN are:

- Enables multiple/heterogeneous traffic control systems to exchange traffic information on a second-by-second basis;
- Uses CORBA middleware for transport; and
- Operates on a Microsoft-NT server platform.

Some of the functions supported by the IEN include, but are not limited to:

- Incident Tracking;
- Planned Events in the network;
- Data Archiving;
- Command Data Interface (CDI)) to Traffic Control Systems for data exchange. The CDI enable incompatible legacy ATMS to communicate;
- Reporting Functions; and
- Alarm Distribution

While the IEN does not provide any user services directly, it will provide the links required for the different agencies to talk to each other, share information, and share control capabilities as desired.

1.2 Methodology

The communication requirements were derived as follows:

- Information on existing and planned communication facilities, central traffic control systems, ITS field elements, and stakeholder needs and objectives was gathered through various means in previous tasks.

- A draft area architecture was developed for the Pomona Valley subregion.
- Draft user and functional requirements for systems that are supported by the communication system (such as ATMS, ATIS, and local LCC) were developed.
- The communication requirements were developed, taking into consideration the above information and the characteristics of communication technologies currently used for ITS.

1.3 Report Organization

The information in this report is presented in the following sections:

Section 1 – Introduction

Section 2 – Planned Area Architecture Summary

Section 3 – Communication System Requirements

2.0 PLANNED AREA ARCHITECTURE SUMMARY

The area architecture shown in **Figure 2-1** depicts the different agencies, stakeholders, systems, subsystems and communication networks that comprise the Pomona Valley ITS program. In order for these components to communicate with one another, share monitoring ability and share potential control of field elements, communication networks need to be established that connect the systems with their field devices and with each other.

A key component of the architecture for the Pomona Valley is the Information Exchange Network (IEN). The IEN is a county-wide communication network that has been designed by LA County as a part of the San Gabriel Valley pilot project. The IEN will act as the primary communication network for exchange of data between systems (center-to-center) and sharing of monitoring and potential sharing of control of field devices. Since the IEN has not been designed to carry video (it will be designed into the IEN in the future) a second communication network is depicted in the architecture diagram that will allow the agencies to share video center-to-center. Each agency will also require center-to-field communications that allow them to monitor and control their own field devices.

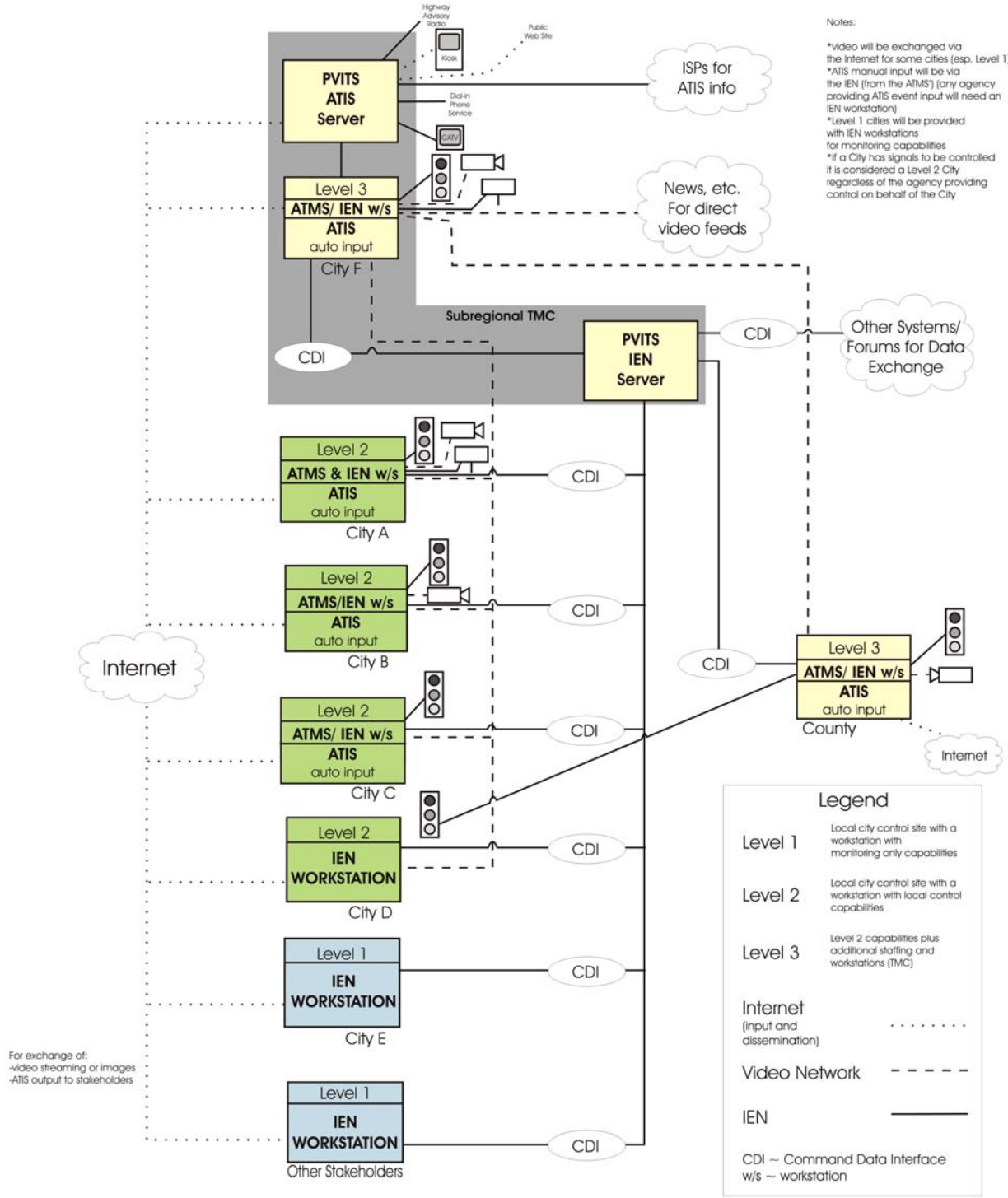
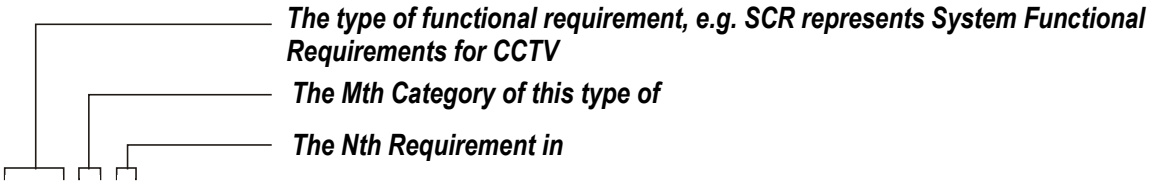


Figure 2-1 Planned Pomona Valley Area Architecture

3.0 COMMUNICATION SYSTEM REQUIREMENTS

This section presents the system requirements for the Pomona Valley ITS communication system. Communication requirements for an ITS network essentially break up into two domains: center-to-field (communication between an LCC and its signals and other field devices) and center-to-center (between LCCs and the subregional TMC). Both components have been defined in this report.

All functional requirements are uniquely numbered so that they can be tracked during all phases of the project. Requirements tracking is necessary because it is anticipated that the functional requirements for the Pomona communication system will continue to evolve during the course of the project. Changes in functional requirements can occur when users desire additional system capabilities based on new information that had not come to light during an earlier stage of the project, or perhaps the recognition that satisfying a particular requirement is not technically feasible. The following numbering convention is adopted in this document with regards to the requirement numbers:



For example, SCR 2.3 represents the 3rd requirement in category 2 of the System Functional Requirements for CCTV

The requirements tracking process will be utilized through the design, implementation, and testing phases of the project. By establishing and maintaining a relationship between the requirements, design, implementation, and test plans for the system, the impact of any changes to the requirements can be immediately identified and assessed.

In many cases, the communications requirements for different field elements has been previously defined in other Task 5 requirements reports. In these cases, the requirement here references the original requirements in those related documents.

3.1 Communication Bandwidth (SCR.1)

Functional Req #	Name	Requirement Statement
SCR.1.01	Bandwidth center-to-field	The PVITS communication network shall provide the bandwidth required to service the type and quantity of devices to be supported (both existing and in the future).
SCR 1.02	Bandwidth center-to-center	The PVITS communication network shall provide the bandwidth required to exchange data and video (including device control) among stakeholders in the subregion.

3.2 LCC/ Subregional TMC (SCR.2)

Functional Req #	Name	Requirement Statement
SCR.2.01	LAN	Each LCC and the subregional TMC shall have an internal local area network (LAN) for support of the information systems elements of that center.
SCR.2.02	Interface to subregional TMC	Each LCC shall have an interface to the subregional TMC to provide sharing of IEN information and video signals.
SCR.2.03	Communication to field elements	Each LCC and the subregional TMC shall have communication to all field elements that the LCC/ TMC supports based on the requirements set forth in this report and other project requirements documents.

3.3 Center-to-Field (SCR.3)

Functional Req #	Name	Requirement Statement
SCR.3.01	Center-to-CCTV	Each LCC and the subregional TMC shall support the communications requirements of the CCTV as set forth in **Deliverable 5.2.1 ATMS Functional Requirements**.
SCR.3.02	Center-to-Signal	Each LCC and the subregional TMC shall support the communications requirements of the traffic signal controllers as set forth in **Deliverable 5.2.1 ATMS Functional Requirements**.
SCR.3.03	Center-to-Vehicle Detector	Each LCC and the subregional TMC shall support the communications requirements of the vehicle detection systems as set forth in **Deliverable 5.2.1 ATMS Functional Requirements**.
SCR.3.04	Center-to-DMS/ Trailblazers	Each LCC and the subregional TMC shall support the communications requirements of the DMS and Trailblazers as set forth in **Deliverable 5.2.1 ATMS Functional Requirements**.
SCR.3.05	Center-to-ATIS Outputs	The subregional TMC shall support the communications requirements of the ATIS dissemination media, including HAR, kiosks, public web site, 511 dial-in phone service, and CATV, as set forth in **Deliverable 5.7.1 ATIS User and Functional Requirements**.
SCR.3.06	Center-to-CCTV – quality video	Provide good-quality video at 15 –30 frames per second (fps) (30 fps is considered full motion.).
SCR.3.07	Center-to-Field – polling	Allow second-by-second polling of field devices.
SCR.3.08	Open interface	Provide a flexible open[1] interface to remote users and devices to allow for varying bandwidth requirements.

[1] An *open system* is defined throughout this document to mean a system that is non-proprietary and meets all applicable and adopted industry standards.

3.4 Center-to-Center (SCR.4)

Functional Req #	Name	Requirement Statement
SCR.4.01	Center-to-Center	Each LCC and the subregional TMC shall meet the communications requirements as set forth in **Deliverable 5.4.1/ 5.5.1 Integration System User and Functional Requirements**.

3.5 Performance (SCR.5)

Functional Req #	Name	Requirement Statement
SCR.5.01	Performance	The communication network shall furnish error free transmission of data according to the specific performance requirements of each subsystem.
SCR.5.02	Open system	The communication system shall be open.
SCR.5.03	IEN standards	The communication system shall use the IEN design standards and protocol for center-to-center data exchange.
SCR.5.04	Open video standards	Video will use open standards.

3.6 Expandability (SCR.6)

Functional Req #	Name	Requirement Statement
SCR.6.01	Geographic Expandability	The communication system shall be capable of expanding geographically.
SCR.6.02	Functional Expandability	The communication system shall be capable of expanding to include additional number (at least 50% more than the planned system) and types of field elements and software subsystems.

3.7 Reliability (SCR.7)

The communication system shall meet the typical industry standard reliability requirements for the type of communication type used.

3.8 Communications System Access Points Requirement (SCR.8)

The communication system access point requirements will be determined following the selection of the communication media to be used in the Pomona Valley, for example TWP will be available at pull boxes within 50' of the field devices and fiber optic will only be accessible at hub locations.

3.9 Operations and Maintenance Issues (SCR.9)

Functional Req #	Name	Requirement Statement
SCR.9.01	Training	Training shall be provided to staff in order to maintain the communication system as necessary.

3.10 Resource and Cost Sharing (SCR.9)

The communication system should be deployed to allow for resources to be shared by the partner agencies. The expansion of the communication system should be shared by the participating agencies, proportional to the expected usage of the system.

LIST OF ACRONYMS

ACE	Alameda Corridor East Construction Authority
ATIS	Advanced Traveler Information System
ATMS	Advanced Traffic Management System
Caltrans	California Department of Transportation
CAMS/IEN	Los Angeles County Countywide Arterial Management System/ Information Exchange Network
CCTV	Closed Circuit Television
DMS	Dynamic Message Sign
ITS	Intelligent Transportation System
LA	Los Angeles
LACDPW	Los Angeles County Department of Public Works
LACMTA	Los Angeles County Metropolitan Transportation Authority
MOU	Memorandum Of Understanding
NTCIP	National Transportation Communications for ITS Protocol
O&M	Operations and Maintenance
PC	Personal Computer
PTZ	Pan, Tilt and Zoom
PVITS	Pomona Valley Intelligent Transportation System
TMC	Traffic Management Center
TOD	Time-of-Day
UFR	User Functional Requirements
UIR	User Interjurisdictional Requirements
UOR	User Operational Requirements
USR	User Supplementary Requirements
WWV	National Institute of Standards and Technology Time & Frequency shortwave radio station that broadcast accurate real time