

Minnesota Department of Transportation Agreement Number: 73807P

Minnesota Intelligent Transportation Systems

Statewide Intelligent Transportation Systems As-Is Agency Reports for Minnesota



Volume 1 Mn/DOT Metropolitan Division

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August 1996

Statewide ITS As-Is Agency Report for Minnesota

Volume 1

Mn/DOT Metropolitan Division

Volume 1 Mn/DOT Metropolitan Division

- 1.1 Generic Closed Loop Traffic Control Signal System
- 1.2 Mn/DOT Advanced Portable Traffic Management System
- 1.3 Mn/DOT Portable Traffic Management System
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1. INTRODUCTION

The purpose of the Polaris Project is to define an Intelligent Transportation Systems (ITS) architecture for the state of Minnesota. An architecture is a framework that defines a complex system, in terms of a set of smaller, more manageable systems which are fully defined in terms of their individual boundaries, functions, physical components, and interfaces. They illustrate how each of the systems interrelate and contribute to the overall ITS objectives and requirements.

A well defined architecture provides many benefits for a complex system. It defines and optimizes the location of system functions. It identifies critical interfaces, and illustrates how associated systems can be integrated to share resources and information. It establishes standards for communications and physical components so that inter-operability can be maintained as the system evolves to incorporate new capabilities and technologies.

The Minnesota Statewide ITS Architecture is a tailored version of the National ITS Architecture. Tailoring incorporates the prioritized wants and needs of the state's transportation users and stakeholders, as well as its existing ITS infrastructure. The functional architecture, physical architecture, system requirements and implementation plan are fully documented in the following project deliverables:

ITS Traveler Wants/ Needs - Information obtained from Minnesota residents in ten end user sessions held across the state. Used to establish and prioritize end-user requirements.

ITS Transportation Wants/ Needs - Information obtained from ITS stakeholder institutions. Used to establish and prioritize ITS service provider requirements.

ITS Wants/ Needs Analysis - Final results and recommendations of the wants and needs research.

Statewide ITS As-Is Agency Reports for Minnesota - Information about existing transportation systems that establish the starting point for the Architecture Implementation Plan.

ITS System Specification - Incorporates the results of the functional and physical architectures into specification format. The specification will clearly identify ITS system level requirements for the identified Minnesota ITS services.

ITS Component Specification - Incorporates the results of the functional to physical allocation in specification format. The specification will clearly identify the Minnesota ITS component systems requirements.

ITS Architecture Implementation Plan - A recommended ITS deployment strategy for future state initiatives.

2. SCOPE

This document, *Statewide ITS As-Is Agency Reports for Minnesota*, consists of a collection of individual system survey reports related to transportation systems. The Polaris Project will use the survey information collected to derive the existing architectural framework. After the existing architectural framework is derived, this information will be used as the baseline for developing the Minnesota Statewide ITS Architecture.

Agencies identified and contributed to this document were:

- Minnesota Department of Transportation Office of Advanced Transportation Systems
- Minnesota Department of Transportation Traffic Management Center
- Minnesota Department of Transportation Metropolitan Division
- Minnesota Department of Transportation Electrical Services Section
- St. Paul Department of Public Works
- Minneapolis Department of Public Works
- Hennepin County Department of Public Works
- Ramsey County Department of Public Works
- Minnesota State Patrol
- Hennepin County Medical Center
- Metropolitan Council Transit Operations
- Metropolitan Airports Commission
- Gopher State One Call
- Minnesota Office of Tourism

2.1 Document Overview

This document presents the methods, assumptions and procedures used to collect the baseline information. The documentation of systems that were inventoried is presented in Section 3.

2.2 Methods, Assumptions, and Procedures

2.2.1 System Identification

Agency and system candidates were based upon several factors prior to survey. Through market research, the highest wants and needs priorities for traveler and transportation related agencies identified the functional areas to be improved (i.e. Travel Conditions). The Polaris Project took the functional wants and needs and associated the wants and needs functions to current Minnesota Agencies. Another factor that contributed to identifying the candidate agencies was the presence of existing Intelligent Transportation Systems infrastructure that has been deployed to support integrating open systems for travelers, inter-agency and intra-agency needs.

One hundred twenty one pre-survey candidate systems identified by the process described previously, are listed in Appendix A. The pre-survey candidate list represents systems that were known by members of the Polaris Architecture working team, Mn/DOT Guidestar, and SRF Consulting Group, Inc. Of the 121 candidate systems, 38 system surveys were performed and

included in this document. The 38 systems were selected as best representatives of the 121 pre-survey candidates and provided a diverse base of information to use for developing the Minnesota Statewide ITS Architecture.

2.2.2 Data Collection Guide

The survey of systems required that a standard data collection approach be applied for the *Statewide ITS As-Is Agency Reports for Minnesota*. A data collection guide was prepared to help this effort.

The data collection guide was developed to provide interviewers with an overview of relevant information that needed to be collected during the survey for each system. The data collection effort focused on the following:

- A block diagram of the system and interfaces to external users and systems.
- All hardware elements that are interconnected to form the bounds of the system.
- All software components used by the hardware elements.
- All system interfaces that connect hardware components together and external systems to the system.
- All personnel using the system.

The Data Collection Guide is presented in Appendix B.

2.2.3 Field Data Collection

The survey collection activities were completed by two teams of interviewers. Prior to an on-site interview, an agency or system contact person was briefed as to the nature of the survey. In some cases, generally where agencies knew little of the Polaris project, a follow-up letter was sent to further outline the desired level of information.

The on-site interview was generally a free format discussion of the specific system elements. The data collection guide was only used to ensure all components were discussed. The interviewers recorded the audio portion of the interview in order to help with the documentation of the system. Where possible, the actual system components were also recorded on videotape, again, to help with the system documentation. In some cases, written documentation from the agency was reviewed to help describe the system.

A report of the surveyed system followed a standard format and consisted of two basic parts: 1) a system block diagram and 2) a data collection template. The block diagram is intended to depict the system components and interfaces while the template thoroughly describes the system configuration. The template is organized to step through the system related personnel, hardware, software and interfaces. All systems documented for the project used this standardized approach. The system documentation was separated by agencies into eight volumes.

The system reports contained in this volume follow in Section 3.

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3. AS-IS BASELINE SYSTEM DOCUMENTATION

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3.1 MN/DOT METROPOLITAN DIVISION

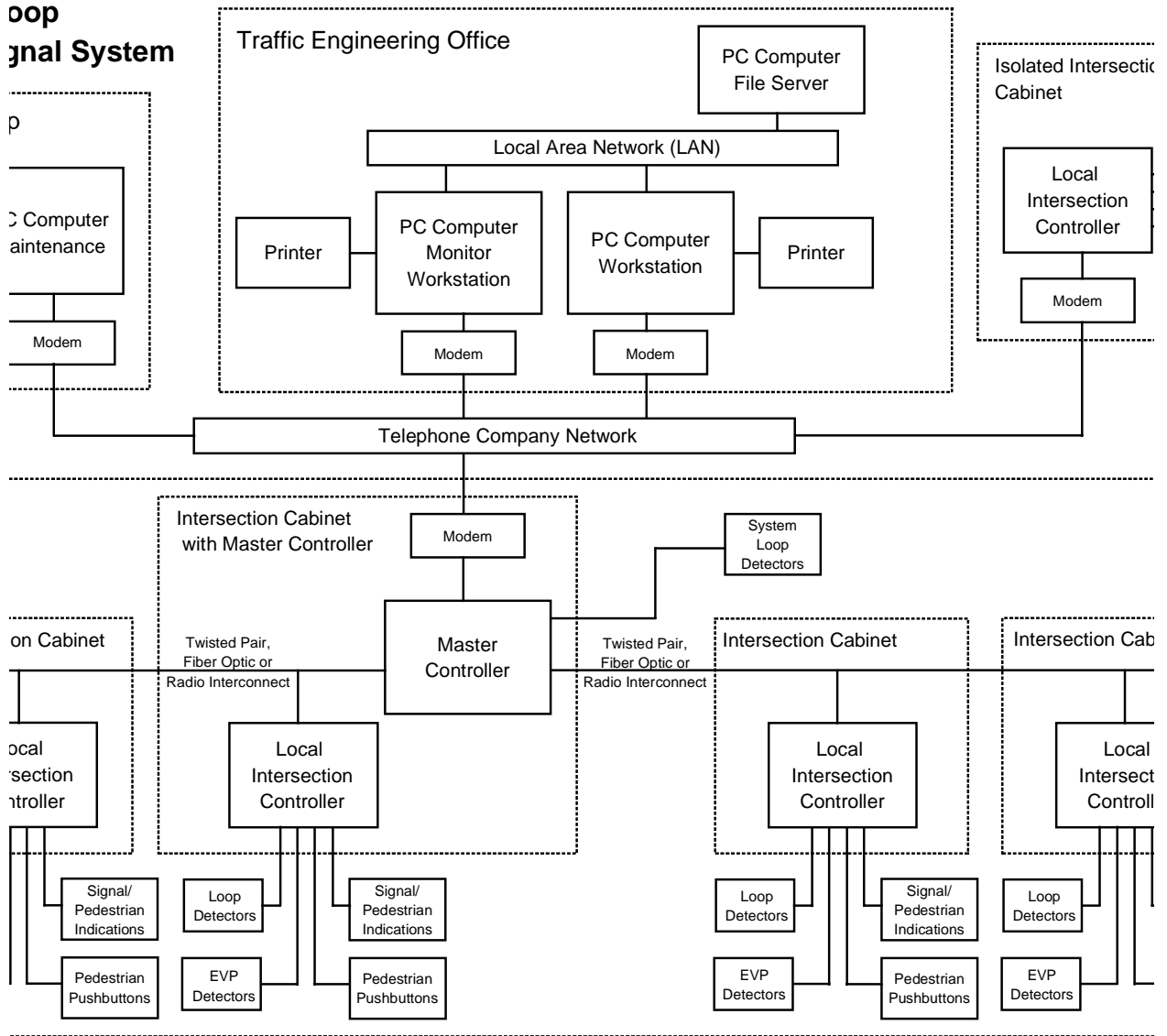
- 3.1.1 Generic Closed Loop Control Signal System
- 3.1.2 Mn/DOT Advanced Portable Traffic Management System
- 3.1.3 Mn/DOT Portable Traffic Management System
- 3.1.4 Mn/DOT Metro Division Lane Closure Information System
- 3.1.5 Mn/DOT Metro Division Construction Information System

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3.1.1 GENERIC CLOSED LOOP TRAFFIC CONTROL SIGNAL SYSTEM

Baseline Data Collection

Loop Signal System



1.0 AGENCY ASTATE, COUNTY, CITY-TRAFFIC ENGINEERING OFFICE@

- Agency Type Department of Public Works - Traffic Division
- Agency Functions Operate and maintain traffic control signal systems.

2.0 SYSTEM AGENERIC CLOSED LOOP TRAFFIC CONTROL SIGNAL SYSTEM@

- Date of As-Is Data Collection 2-23-96
- Purpose Provide central management of isolated and arterial traffic control signal systems.
- Hours of Operation 24 hours per day
- Geographic Coverage Intersections within governmental boundaries.
- Contacts Ray Starr
Minnesota Department of Transportation
Mail Stop 320
117 University Ave Room 252
St. Paul, MN 55155
Ph (612) 296-7596
Fax (612) 215-0409
- Status Existing
- Policies Agencies may have policies concerning coordination of streets controlled by another agency crossing a coordinated arterial.
- Constraints
 - 1) Coordination of arterial intersections at greater than 2 mile spacing does not benefit traffic operation along the arterial.
 - 2) The cost of interconnect systems, if not done during roadway construction, can be expensive if located in an urban area with sidewalks.
 - 3) The high cost of master controllers, dial-up modems and phone line connection.
- Block Diagram See attached
- Other New National Electrical Manufacturers Association (NEMA) standard TS 2 for traffic signal controllers. There is no compatibility of closed loop signal software and hardware components between different manufacturers. For example, an Eagle intersection controller can not be connected to an Econolite master controller.
- Typical Operational Scenario
 - 1) Maintenance computer monitors intersections for Maintenance related problems. Master controllers can be programmed to call maintenance facility.
 - 2) Monitor workstation computer monitors events. It can be programmed to retrieve data including event reports and loop detector data from the master controller and local intersection controllers.
 - 3) Workstations are used for upload, download and to

manage databases as well as printing reports. Workstation machines are also used for graphical display of intersections and arterial zones. Graphical displays include real-time information of major movement greens and reds, intersection status, actuation status of system detectors, preemption events and coordination errors. 4) System software maintains a database of master controller and local intersection controller data.

THIS IS AN ESTIMATE OF THE TYPE OF PERSONNEL AN AGENCY MIGHT HAVE TO OPERATE/MAINTAIN CLOSED LOOP AND ISOLATED TRAFFIC CONTROL SIGNAL SYSTEMS.

2.1 PERSONNEL ASYSTEM TRAFFIC ENGINEER@

- Personnel Function Oversee traffic control signal systems within the agency. May have other responsibilities relating to traffic and transportation within the agency(signing, lighting, or non-signalized intersection activities).

2.2 PERSONNEL ASIGNAL TIMING ENGINEER/TECHNICIAN@

- Personnel Function Responsible for timing, re-timing and monitoring traffic control signal systems. Most likely uses computer based intersection and arterial signal timing software to develop timing plans for input into traffic control signal controllers and master controllers.

2.3 PERSONNEL ATECHNICIAN@

- Personnel Function Technician is responsible for maintaining the traffic control signal system database, detector log files and monitoring systems. They may conduct speed and turning movement studies and other related studies for use in signal timing and planning projects. They may also prepare signal justification reports. This may be the same personnel as described in section 2.1 or 2.2 above.

2.4 PERSONNEL MAINTENANCE TECHNICIAN@

- Personnel Function Respond to maintenance calls on traffic control signal systems. Typical problems include :
 - 1) loop detectors not working
 - 2) interconnect error
 - 3) re-lamping indications
 - 4) knock downs
 - 5) hardware failures (controller, load switches, loop detector amplifiers, pedestrian push button isolators, EVP hardware or conflict monitors)

3.1 HARDWARE MASTER CONTROLLER@

- Hardware Type Master controllers
- Functions Control and coordinate up to 24 intersection controllers, 32 system detectors and 8 speed traps (numbers vary by the manufacturer of the controller).
- Location In field normally
- Data Name/Contents Signal timing parameters, loop detector logs and event logs
- Data Type Data
- Status Existing
- Other
 - 1) Major manufacturers of master controllers are:
 - a) Econolite
 - b) Eagle
 - c) Traffic Control Technologies, Inc.Most controllers contains an internal (1200bps FSK) modem for communication with the master controller.
 - 2) Master controllers can be located in the engineering office and interconnected to the intersection controllers.

3.1.1 SOFTWARE MASTER CONTROLLER@

- Software Type Traffic control software
- Software Standards Proprietary
- Functions Contains all timing and control logic. Econolite controllers have a MC 68302 microprocessor, battery-backed CMOS RAM, EPROM or flash EEPROM, as an example. User data is stored in plug-in EEPROM data module.
- Status Existing

3.2 HARDWARE ALOCAL INTERSECTION CONTROLLER@

- Hardware Type Traffic signal controller that meets or exceeds NEMA TS1-1989 or NEMA TS2-1992 specifications. Some older controllers may not meet above referenced standard.
- Functions Operates traffic control signal system
- Location In field
- Data Name/Contents Signal timing parameters, loop detector logs and event logs
- Data Type Data
- Status Existing
- Other Major manufactures of controllers are:
 - a) Econolite
 - b) Eagle
 - c) Traffic Control Technologies, Inc.All controller types basically operate in the same manner because of NEMA specifications. The difference between the controllers lies in what they will do beyond the NEMA specifications such as communications between the controller and the master controller, preemption capabilities, number of loop detectors and timing plans. Local intersection controllers contains an internal (1200bps FSK) modem for communication with the master controller.
Controller operates on a 24 volt logic signal to operate peripheral equipment.

3.2.1 HARDWARE/SOFTWARE AECONOLITE CONTROLLER@

- Software Type Traffic control software
- Software Standards Proprietary
- Functions Contains all timing and control logic.
Econolite controllers have a 32-bit microprocessor, battery-backed CMOS RAM, EPROM or flash EEPROM, for example.
User data is stored in plug-in EEPROM data module.
- Status Existing

3.3 HARDWARE AINTERSECTION CABINET and EQUIPMENT@

- Hardware Type Traffic signal cabinet likely to contain:
 - 1) Malfunction Management Unit (MMU) or Conflict Monitor Unit which will cause intersection to flash if it detects that two conflicting signal indications are on.
 - 2) Detector rack and detector amplifier cards which takes the change in inductance from field loop detectors and send a signal to the controller.
 - 3) Load switches - (3) solid state relays for each phase.
 - 4) Pedestrian isolator which receives a signal from the pedestrian push-button and relays the pedestrian call to the controller.
- Functions Environmental enclosure for traffic control signal system hardware
- Location In field (intersection corner)
- Status Existing

3.4 HARDWARE ALOOP DETECTOR WIRE@

- Hardware Type Loop detector
- Functions Measure change of inductance
- Location Under pavement
- Data Name/Contents Change of induction
- Data Type Data
- Status Existing
- Policies Some agencies specify that loop coils be placed in conduit in the sub-grade as part of new construction.
- Other
 - 1) Typically #12 or #14 wire is placed in a saw cut of pavement with 3-4 turns of wire in the loop (depending on pavement depth and type).
 - 2) Most common method of vehicle detection is loop detectors. Other methods are also used including microwave and video detection systems such as Autoscope.

3.5 HARDWARE ALOOP DETECTOR CARD/AMPLIFIER@

- Hardware Type Loop detector
- Functions Detects presence of a vehicle and sends a signal to the traffic signal controller.
- Location In field
- Data Name/Contents Change of induction
- Data Type Data
- Status Existing
- Other Some cards/amplifiers have the ability to delay calls for a programmable period of time (3 seconds to 30 seconds).

3.6 HARDWARE AEMERGENCY VEHICLE PREEMPTION (EVP) DETECTORS@

- Hardware Type Detector
- Functions Detects strobe light signal a from the emitter on an emergency vehicle or bus and sends a signal to the traffic signal controller to begin preemption timing.
- Location Typically on mast arm pole
- Data Name/Contents Signal
- Data Type Data
- Status Existing
- Other
 - 1) In Twin Cities metro area, an EVP indicator light (standard flood light) is mounted on top of the detector to indicate to the driver of the emergency vehicle that the signal controller and system has gone into preemption.
 - 2) Some signal systems also have railroad preemption to clear queued traffic from the railroad tracks as a train approaches. The railroad company will provide a signal to the traffic signal controller a predetermined time before the train crosses the intersection.
 - 3) In some areas, buses with low priority emitters are being used to obtain better transit performance.Two manufacturers of Emergency Vehicle Preemption equipment are:
TOMAR Electronics Inc.
2100 West Obispo
Gilbert, Arizona 85233
3M Safety and Security Systems Division
Traffic Control Systems
3M Center, Bldg. 225-4N-14
St. Paul, Minnesota 55144-1000

3.7 HARDWARE APEDESTRIAN PUSH BUTTONS@

- Hardware Type Push button
- Functions Send signal to pedestrian isolator card and then the card sends a call to the intersection controller.
The controller displays a walk indication when the phase is serviced.
- Location On signal pole or pedestrian push button station.
- Data Name/Contents Pedestrian call to intersection controller.
- Data Type Data
- Status Existing

3.8 HARDWARE ATRAFFIC SIGNAL AND PEDESTRIAN INDICATIONS@

- Hardware Type Red, yellow, green, walk, flashing don't walk or don't walk indication.
- Functions Control vehicular and pedestrian flow
- Location In field, on mast arms, mast arm poles and/or pedestals.
- Data Name/Contents On/off
- Data Type Data
- Status Existing

3.9 HARDWARE ACONTROLLER CABINET MODEM@

- Hardware Type Modem - 2400bps
- Functions Communicate from master controller to maintenance shop and engineering office.
- Location Intersection controller cabinet with master controller.
- Data Name/Contents System information
- Data Type Data
- Status Existing
- Other
 - 1) Master controller has its own communication software.
 - 2) This modem should be able to withstand the environmental conditions of the intersection cabinet.

3.10 HARDWARE AMAINTENANCE/TRAFFIC ENGINEERING OFFICE MODEM@

- Hardware Type Modem - 2400 bps
- Functions Communicate from master controller to maintenance shop and engineering office.
- Location Maintenance shop and traffic engineering office.
- Data Name/Contents System information
- Data Type Data
- Status Existing
- Other
 - Zone Monitor program has its own communication software.
 - Quantity varies depending on the number of machines that are running Zone Monitor.

3.11 HARDWARE ACOMPUTER - MAINTENANCE@

- Hardware Type Computer
- Functions Runs Zone Monitor software
- Location Maintenance shop
- Data Name/Contents System operation/status data
- Data Type Data
- Status Existing

3.12 HARDWARE ACOMPUTER - MONITOR WORKSTATION@

- Hardware Type Computer
- Functions Runs Zone Monitor software.
- Location Traffic engineering office
- Data Name/Contents
 - 1) Wait for master controllers to call in with event reports and detector logs.
 - 2) Make preprogrammed calls to receive event reports and detector logs.
 - 3) Make preprogrammed calls for automatic system status reports, comparison of controller and database files or to download controller database files.
 - 4) Update event and detector log files on disk.
- Data Type Data
- Status Existing

3.13 HARDWARE ACOMPUTER - WORKSTATION@

- Hardware Type Computer
- Functions Runs Zone Monitor software.
- Location Traffic engineering office
- Data Name/Contents
 - 1) Graphically display different intersection and arterial systems.
 - 2) Upload, download and manage controller data bases.
 - 3) Generate system status reports.
- Data Type Data
- Status Existing

3.13.1 SOFTWARE ACLOSED LOOP SYSTEM@

- Software Type Transportation software application
- Functions Provides database management and surveillance for traffic control systems with a capacity of up to 5,760 intersections (number varies by manufacturer). Communicates to master controllers through telephone lines and modems.
 - A) Displays real-time intersection information including:
 - 1) Vehicle phase and overlap greens, yellows and reds.
 - 2) Pedestrian walk, pedestrian clearance and don't walk.
 - 3) Vehicle and pedestrian detector calls.
 - 4) Master controller number and mode of operation (free, time of day or traffic responsive).
 - 5) Cycle, offset and split in effect.
 - 6) Cycle length and cycle countdown.
 - 7) System special function status.
 - 8) On-line, sync, preempt and alarm status.
 - 9) Intersection offset
 - 10) Coordination alarms and failures
 - 11) Communication failures.
 - B) Displays real-time arterial systems information including:
 - 1) Display up to 24 intersections and 32 system detectors (number varies by manufacturer).
 - 2) Once per second communication during display.
 - 3) Real-time information on each intersection including phase greens and reds for up to 12 phases, detector actuation-s, controller status and communication status.
- Status Existing
- Policies Agencies may have policies regarding use of the system by engineering personnel. For example, the agency traffic engineer may approve all signal timing plans before they can be downloaded to the master controller and intersection controllers.
- Issues System software is proprietary and the user needs a license agreement.

3.13.2 SOFTWARE ALOCAL AREA NETWORK@

- Software Type Network
- Functions Network interface
- Status Existing
- Other A network is not needed, system can run on single computer.

3.14 HARDWARE APRINTER@

- Hardware Type Printer
- Functions Prints data
- Location Signal shop
- Data Name/Contents Intersection controller and traffic count data
- Data Type Data
- Status Existing

3.15 HARDWARE ALOG PRINTER@

- Hardware Type Printer
- Functions Prints data
- Location Signal shop
- Data Name/Contents System event and error data including communication errors, controller failures, emergency vehicle preemption events and coordination errors.
- Data Type Data
- Status Existing

4.1 INTERFACE

- Connects to ... Interconnect
- Interface location Master controller/local intersection controller
- Interface Type In field
- Interface Direction Data
- Interface Direction Both
- Interface Component Daisy chained on any one of these types of interconnect:
 1) Twisted pair wire (2 pair #19)
 2) Spread spectrum radio
 3) Fiber optic
- Protocol/Standard Proprietary
- Information Type/Content Signal system information
- Information Direction Both
- Information Frequency 1/second
- Other Telemetry utilizes time-division-multiplex, frequency-shift-keying techniques for serial data communications. Each controller is assigned an address that is different from all others.

<p>4.2 INTERFACE</p> <ul style="list-style-type: none"> - Connects to ... - Interface location - Interface Type - Interface Direction - Interface Component - Information Type/Content - Information Direction - Information Frequency 	<p>Local intersection controller</p> <p>Loop detector card/amplifier</p> <p>Intersection</p> <p>Data</p> <p>Input</p> <p>Wire lead</p> <p>Vehicle detected</p> <p>Input</p> <p>On occurrence</p>
<p>4.3 INTERFACE</p> <ul style="list-style-type: none"> - Connects to ... - Interface location - Interface Type - Interface Direction - Interface Component - Information Type/Content - Information Direction - Information Frequency 	<p>Local intersection controller</p> <p>Emergency vehicle preemption detector card</p> <p>Intersection</p> <p>Data</p> <p>Input</p> <p>Wire lead</p> <p>Emergency vehicle with active emitter detected</p> <p>Input</p> <p>On occurrence</p>
<p>4.4 INTERFACE</p> <ul style="list-style-type: none"> - Connects to ... - Interface location - Interface Type - Interface Direction - Interface Component - Information Type/Content - Information Direction - Information Frequency 	<p>Local intersection controller</p> <p>Signal and pedestrian indication load switch</p> <p>Intersection</p> <p>Data</p> <p>Output</p> <p>Wire lead</p> <p>Signal and pedestrian indication</p> <p>Output</p> <p>As needed</p>
<p>4.5 INTERFACE</p> <ul style="list-style-type: none"> - Connects to ... - Interface location - Interface Type - Interface Direction - Interface Component - Information Type/Content - Information Direction - Information Frequency 	<p>Local intersection controller</p> <p>Pedestrian push-button isolator</p> <p>Intersection</p> <p>Data</p> <p>Input</p> <p>Wire lead</p> <p>Pedestrian call</p> <p>Input</p> <p>As needed</p>

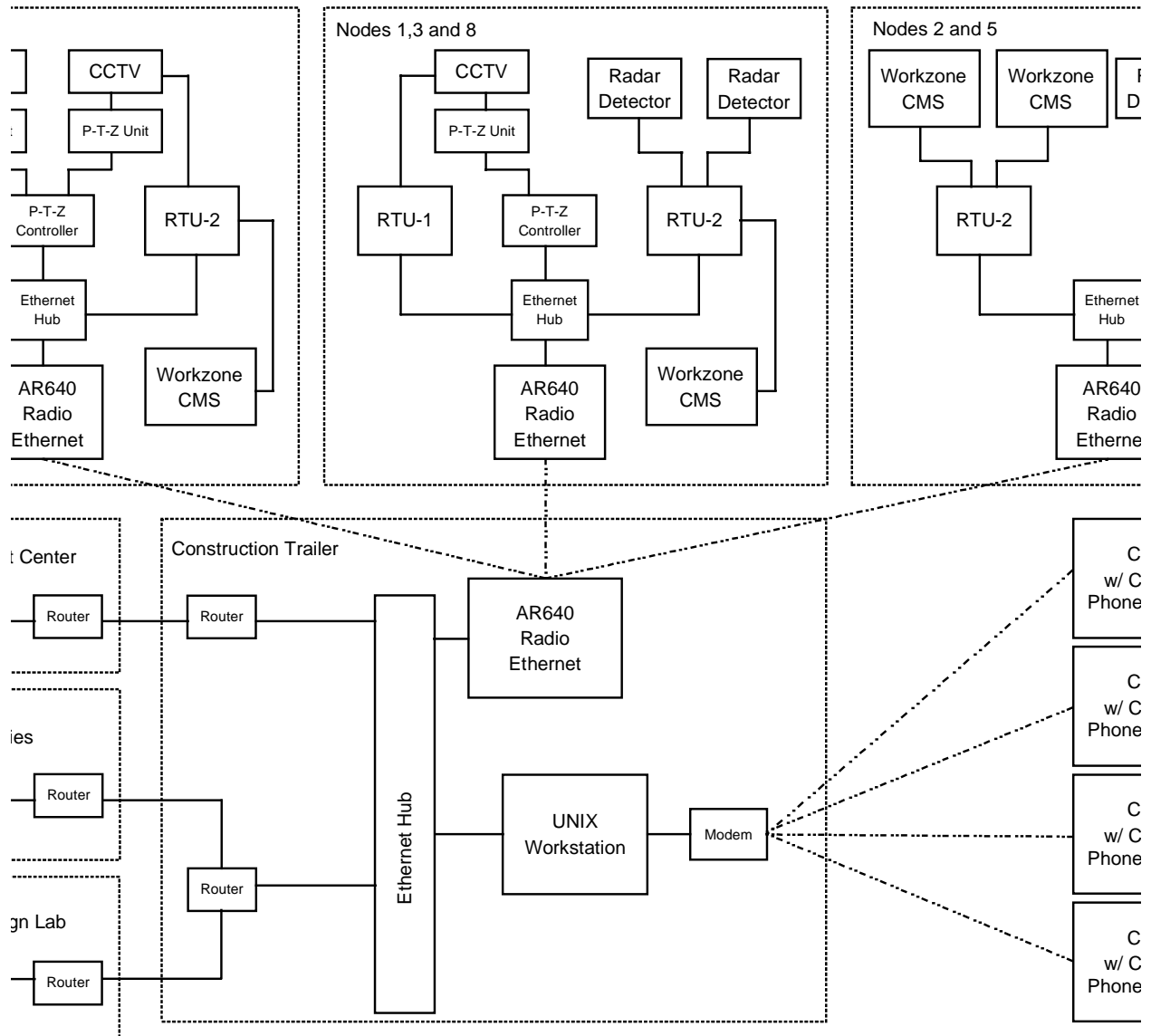
4.6	INTERFACE	Master controller
- Connects to ...		System loop detector card/amplifier
- Interface location		Master controller cabinet
- Interface Type		Data
- Interface Direction		Input
- Interface Component		Wire lead
- Information Type/Content		Vehicle detected
- Information Direction		Input
- Information Frequency		On occurrence
4.7	INTERFACE	Master controller
- Connects to ...		Cabinet Modem
- Interface location		Master controller cabinet
- Interface Type		Data
- Interface Direction		Both
- Interface Component		RS 232
- Protocol/Standard		Proprietary
- Information Type/Content		Intersection and master controller information.
- Information Direction		Both
- Information Frequency		1 per second
- Information Standards		Proprietary
4.8	INTERFACE	Maintenance shop / engineering office modem
- Connects to ...		Cabinet modem
- Interface location		Maintenance shop/engineering office and master controller cabinet
- Interface Type		Data
- Interface Direction		Both
- Interface Component		Service provider
- Information Type/Content		Intersection and master controller information.
- Information Direction		Both
- Information Frequency		1 per second
- Information Standards		Proprietary

4.9	INTERFACE	PC Computer Maintenance shop/engineering office
- Connects to ...		Maintenance shop/engineering office modem
- Interface location		Maintenance shop/engineering office
- Interface Type		Data
- Interface Direction		Both
- Interface Component		RS 232
- Information Type/Content		Intersection and master controller information.
- Information Direction		Both
- Information Frequency		1 per second
- Information Standards		Proprietary
4.10	INTERFACE	PC Computer Maintenance shop/engineering office
- Connects to ...		Printer
- Interface location		Maintenance shop/engineering office
- Interface Type		Data
- Interface Direction		Output
- Interface Component		Centronics or RS-232
- Protocol/Standard		N/A
- Information Type/Content		Intersection and master controller data bases, detector counts, event and log information, system status reports.
- Information Direction		Output
- Information Frequency		On occurrence or as requested

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3.1.2 MN/DOT ADVANCED PORTABLE TRAFFIC MANAGEMENT SYSTEM

Baseline Data Collection
Advanced Portable Traffic Management System



AS-IS DATA COLLECTION TEMPLATE

1.0 AGENCY MINNESOTA DEPARTMENT OF TRANSPORTATION@

- Agency Type Department of Transportation
- Contacts Marthand Nookala, P.E.
Project Manager
Minnesota Department of Transportation
3485 Hadley Avenue North
Oakdale, MN 55128
voice (612) 779-5194
fax (612) 779-5170

2.0 SYSTEM ADVANCED PORTABLE TRAFFIC MANAGEMENT SYSTEM@

- Date of As-Is Data Collection 4/96- Data collected from the ITS America paper and other system design documents.
- Purpose The overall purpose of the operational test is to integrate innovative new technologies into an advanced portable work zone traffic management system.
- Hours of Operation An operator will monitor the system from 6:00 to 9:30 A.M. and from 3:00 to 6:30 P.M. on weekdays.
- Geographic Coverage The work zone where the system will be tested is on I-94 between approximately 24th Avenue South and Trunk Highway 280 just east of the Minneapolis central business district. The system will also include the placement of changeable message signs along freeways prior to the work zone to alert/advise motorists of current traffic conditions through the work zone.

- Contacts
 - Project Manager
Marthand Nookala - Mn/DOT
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John W. Dillingham, P.E.
Director of Engineering
1117 East Franklin Avenue
Minneapolis, MN 55404
voice (612) 871-5521 fax (612) 871-1746
 - Minnesota Department of Transportation
Allan Pint, P.E.
Assistant Division Engineer
1500 West County Road B2
Roseville, MN 55113
voice (612) 582-1343 fax (612) 582-1302
 - Minnesota Department of Transportation
Anthony J. Winiacki, P.E.
Signal Operations Engineer
2055 North Lilac Drive
Golden Valley, MN 55422
voice (612) 797-3134 fax (612) 797-3152
- Status

System component implementation and baseline data collection is underway, operational testing and data collection to begin in May and continue through September. The final report will be completed in December of 1996.
- Block Diagram

See attached
- Typical Operational Scenario

The operational test is expected to begin in May 1996 and continue through September 1996. Data will be transmitted to the Mn/DOT Traffic Management Center (TMC) including video images, volume, speed and incident detection. The video images will refresh at the rate of approximately once per second. Nine video cameras will be operational during the operational test, up to six of these cameras may be occupied by machine vision applications. The pan/tilt units have been constructed to exacting specifications which will enable them to return to within one half degree of their former settings. This allows the camera views to be adjusted at any time to view an incident or a certain portion of the roadway. When the system operator is satisfied that an incident has cleared, the operator can readjust the camera and continue to utilize the machine vision capabilities. The system operator will monitor the video images, volume and speed data for both directions of traffic. When the speeds drops below a certain predetermined threshold, the operator is notified by a signal from the

computer. The operator can then make changes to both types of the changeable message signs via either the computer software(work zone changeable message signs) and cellular telephone(located outside the work zone). The full size trailer-mounted changeable message signs are placed to give motorists advanced warning of delays in or near the construction area.

These signs are also utilized to give the traveling public time to make alternative route decisions. The work zone changeable message signs are located in the construction zone and are utilized to give the motorist advanced warning regarding incidents, lane changes, advisory speed or construction operations information. The system operator will monitor traffic operations through the construction zone at the TMC from 6:00 to 9:30 A.M. and from 3:00 to 6:30 P.M. The system components maintenance is the responsibility of ADDCO, Inc and Warning Lites of Minnesota.

2.1 PERSONNEL ASYSTEM OPERATOR@

- Personnel Function (1) The operator will monitor system cameras, volumes and speed from workzone.
(2) The operator can make changes to the messages that are displayed on both the workzone changeable message sign and the standard changeable message signs.
- Quantity 1
- Location Mn/DOT Traffic Management Center
1101 4th Avenue South
Minneapolis, MN 55404
- Working hours 6:00 to 9:30 A.M. and 3:00 to 6:30 P.M.
- Status Existing

3.1 HARDWARE AWORKSTATION - UNIX@

- Hardware Type Computer
- Functions 1) Control network system
2) Modem link to connection to trailer mounted CMS
3) File server
- Location Construction Trailer
- Data Type Data
- Status Existing
- Other P-60 computer running UNIX

3.2 HARDWARE AP-60 WORKSTATION - WINDOWS95@

- Hardware Type Computer (quantity 3)
- Functions View video images and traffic data, operate camera pan/tilt and zoom functions, communicate with workzone CMS and access trailer mounted CMS.
- Location 1) Traffic Management Center
2) Center for Transportation Studies (CTS)
3) ADDCO Manufacturing Co., Inc.
- Data Type Data
- Status Existing
- Other P-60 computer running Windows95
The system operator will be located at the traffic management center. The other workstation locations will be used to monitor the system.

3.3 HARDWARE AROUTER@

- Hardware Type Route (quantity 5)
- Functions These devices connect the ethernet to ISDN phone lines
- Location Construction trailer (2)
TMC (1)
ADDCO (1)
CTS (1)
- Data Type Data
- Status Existing
- Other ASCENDP 25

3.4 HARDWARE AETHERNET HUB@

- Hardware Type Ethernet hub (quantity 9)
- Functions Allow multiple devices to share ethernet.
- Location 1) Portable nodes (one per node)
2) Construction trailer
- Data Type Data
- Status Existing

3.5 HARDWARE AAR640 RADIO ETHERNET@

- Hardware Type Radio Tx/Rx (quantity 9)
- Functions Communication remote nodes and UNIX workstation/server.
- Location 1) Portable nodes (one per node)
2) Construction trailer
- Data Name/Contents Operates on 4 channels, power output of 500 mW and data rate of 96,000 bps.
- Status Existing
- Constraints Line of sight radio transmissions are required between pairs of radios.
- Other AR640

3.6 HARDWARE AMODEM@

- Hardware Type Modem
- Functions Allows communication to trailer mounted changeable message signs.
- Location Construction trailer
- Data Name/Contents Commands to changeable message sign.
- Data Type Data
- Status Existing
- Other Microcomm analog modem

3.7 HARDWARE ACHANGEABLE MESSAGE SIGN (CMS)@

- Hardware Type Trailer mounted portable changeable message sign consisting of : CMS board, 120 VAC generator/solar, trailer and cellular phone.
- Functions Display traffic related messages.
- Location In field
- Data Name/Contents 3-8 character lines of messages, each character consist of 18 inch high, 5x7 LED disk matrix.
- Data Type Messages
- Status Existing
- Other ALS-1000 - Unit contains custom microprocessor controller with 64K of ROM and 32K of CMOS RAM and can store up to 25, 6-frame message sequences. Messages are stored in CMS but can be changed or updated using computer with custom ADDCO software and cellular telephone link.

3.8 HARDWARE AWORKZONE CHANGEABLE MESSAGE SIGN (WZCMS)@

- Hardware Type Changeable message sign (quantity 10)
- Functions Display traffic related messages.
- Location Remote node locations
- Data Name/Contents 48 pixel wide by 24 pixel high full matrix sign. The signs are capable of displaying up to 3 lines of 5x7 character messages of 7 characters each. The characters are 9.5 inches high. Full graphics are also supported.
- Data Type Messages
- Status Existing

3.9 HARDWARE ACLOSED CIRCUIT TV CAMERA (CCTV)@

- Hardware Type Camera (quantity 9)
- Functions Provide real-time monitoring and detection of traffic conditions.
- Location Remote node locations
- Data Name/Contents Video, incident and volume detection.
- Data Type Video
- Status Existing
- Other COHU camera unit with environmental enclosure and 4:1 zoom.

3.10 HARDWARE APAN / TILT / ZOOM CONTROL UNIT@

- Hardware Type Electro-mechanical pan/tilt/zoom unit (quantity 9)
- Functions Allows control of camera movement and zoom
- Location Remote node locations
- Data Type Data
- Status Existing

3.11 HARDWARE APAN / TILT / ZOOM CONTROLLER@

- Hardware Type Controller (quantity 6)
- Functions Allows control of camera movement and zoom.
- Location Remote node locations
- Data Type Data
- Status Existing
- Other ADDCO custom pan/tilt control module
Dedicated controller which can handle up to 5 camera pan-tilt units and has a serial interface for command and control.

3.12 HARDWARE AUTOSCOPE MACHINE VISION@

- Hardware Type Video detection system (quantity 3)
- Functions Vehicle detection
- Location Remote node locations
- Data Type Data
- Status Existing
- Other Similar to the AUTOSCOPE Model 2004 system.

3.13 HARDWARE RADAR DETECTOR UNIT@

- Hardware Type Radar detection system (quantity 10)
- Functions Vehicle speed detection
- Location Remote node locations
- Data Type Data
- Status Existing
- Other Single field of vision speed detection unit.

3.14 HARDWARE AREMOTE TERMINAL UNIT - TYPE 1 (RTU-1)@

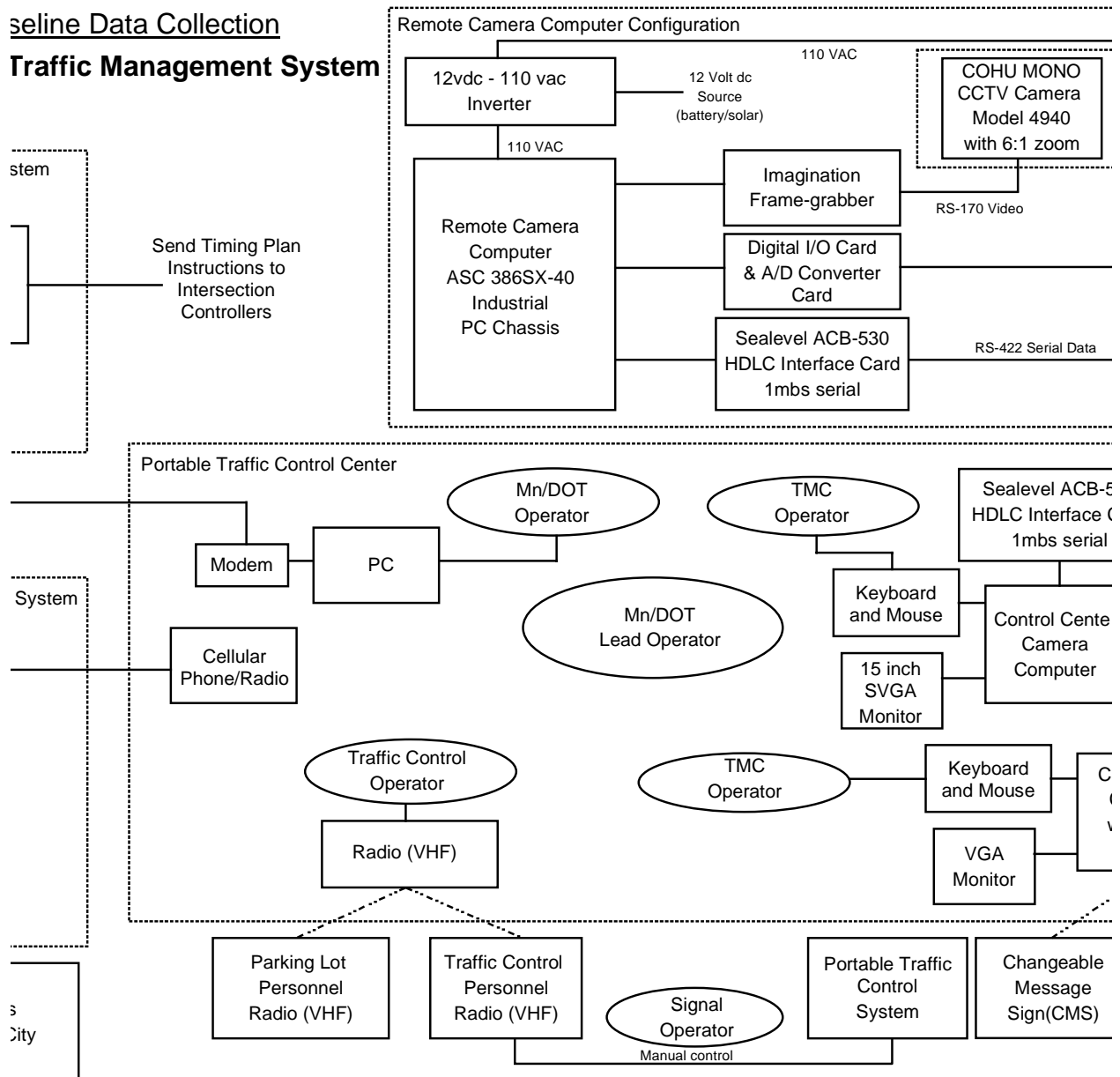
- Hardware Type Computer (quantity 6)
- Functions Relays digital video images
- Location Remote node locations
- Data Name/Contents Video images
- Data Type Video
- Status Existing
- Other DOS based computer with video digitizer, 2 serial ports and ethernet-TCP/IP interface (10BT).

3.15 HARDWARE AREMOTE TERMINAL UNIT - TYPE 2 (RTU-2)@

- Hardware Type Computer (quantity 12)
- Functions Relays video images
- Location Remote node locations
- Data Name/Contents CMS control, vehicle detection device outputs
- Data Type Data
- Status Existing
- Other DOS based computer with 2 serial ports and ethernet-TCP/IP interface (10BT).

3.1.3 MN/DOT PORTABLE TRAFFIC MANAGEMENT SYSTEM

Baseline Data Collection
Traffic Management System



AS-IS DATA COLLECTION TEMPLATE

1.0 AGENCY AADDCO MANUFACTURING@

- Agency Type ADDCO Manufacturing Co. is a Sales/Service Traffic Control Products company. This project is a cooperative partnership between FHWA, the National Sports Center, Mn/DOT, Law Enforcement agencies, the cities of Blaine, Coon Rapids, and Roseville, Anoka and Ramsey County, ADDCO, Warning Lites of Minnesota, the Burnet Senior Classic, the Minnesota State Fair and Rosedale Shopping Center
- Contacts Gordon Melby
ADDCO Manufacturing Co., Inc.
69 Empire Drive
St. Paul, MN 55103-1856
voice (612) 224-8800
fax (612) 224-1411
- Other ADDCO owns most of the system components.

2.0 SYSTEM MN/DOT PORTABLE TRAFFIC MANAGEMENT SYSTEM@

- Date of As-Is Data Collection 2/21/96- Data collected from Final System design document (June 1995). This document contains information on system components and operation that is specific to PTMS and its use at the National Sports Center (NSC). The system was tested at other events in the Twin Cities region including the U.S. Senior Open, the Minnesota State Fair and at the Rosedale regional shopping center.
- Purpose To test the feasibility of applying portable Intelligent Vehicle Highways Systems (IVHS) technologies for management of major event traffic.
- Hours of Operation System is operated as needed to manage traffic during special events.
- Geographic Coverage Area surrounding NSC in the City of Blaine in Anoka County bounded by I-35W to west, 109th Street to north, TH. 65 to east, and I-694 to south.
- Contacts Operational Test Manager
Marthand Nookala - Mn/DOT
Operations Center Manager
Larry McKenzie and Kerry Edmund (Backup) - Mn/DOT
Equipment Operation
Patty Bednarz and Dave Tronstad - TMC
Signal Supervisor
Bob Betts and Amr Jabr - Mn/DOT
Signal/Signing
Jane Pemble-Anoka County and Charles Lenthe-City of

- Blaine
Equipment Management/Support
Gordon Melby-ADDCO and John Story-Warning Lights
Traffic Control Officers
Tom Fraser - State Patrol
National Sports Center
Kris Bjerkness and Chris Parsons
Parking Systems Inc.
Doug Hoskins and Mark Hendricks
- Status System is currently available for rent/lease from ADDCO. Similar system components are being developed/used for the Mn/DOT SMART Work Zone operational test.
- Block Diagram See attached
- Typical Operational Scenario
- 1) PTMS equipment is deployed on roadways leading into the event site usually a day or two prior the commencement of the event.
 - 2) TMC operator monitors roadway system via CCTV camera for congestion/incidents.
 - 3) A message is broadcast on Highway Advisory Radio (HAR) which broadcasts a message containing general event information to vehicles on roadways near the event.
 - 4) The Changeable Message Signs (CMS) display initial messages indicating which route the motorists should follow to get to the event.
 - 5) The cameras are located at points of potential congestion to aid the PTMS personnel in determining what changes should be made to the CMS, HAR and the timing plans when congestion is detected on roadways near the event site.
 - 6) For example, this set of instructions was implemented by the operations center personnel when traffic congestion was detected on the northbound arterial into the National Sports Center
 - Adjust signal timing along TH. 65 to allow additional northbound green time.
 - Contact field traffic control personnel to instruct them to give additional preference to northbound TH. 65 traffic.
 - Contact parking lot personnel to increase the rate at which vehicles are accepted into the lots.
 - Coordinate activities with traffic control personnel at other intersections along TH. 65.
 - Broadcast HAR bulletin regarding TH. 65 traffic conditions and encourage vehicles to use I-35W.
 - Update changeable message sign C on I-35W to read AExit at 95th Avenue 2 miles.@

- 7) Operational descriptions were developed for each camera location when congestion is observed. Each description has predetermined messages for CMS, HAR and instructions to traffic control and parking personnel.
- 8) The system is monitored until traffic levels returned to normal during the event.
- 9) During the event, system component(s) may be repositioned to appropriate locations for outbound event traffic.
- 10) The same procedures are used for outbound event traffic.

- 2.1 PERSONNEL AMN/DOT LEAD OPERATOR@
- Personnel Function Overall responsibility for management and supervision of operations center. Makes decision on when operational plans are to be invoked.
 - Quantity 1
- 2.2 PERSONNEL ATMC OPERATOR@
- Personnel Function Monitor CCTV and modify/change messages on Changeable Message Signs.
 - Quantity 1
- 2.3 PERSONNEL AMN/DOT OPERATOR@
- Personnel Function Monitor CCTV and adjust signal timings on TH. 65
 - Quantity 1
- 2.4 PERSONNEL ACITY / COUNTY OPERATOR@
- Personnel Function Adjust signal timing at county road intersection as directed by control center personnel.
 - Quantity 1
- 2.5 PERSONNEL ATRAFFIC CONTROL OPERATOR@
- Personnel Function Relay instructions of operational plans to field traffic control officers from operations center manager. Responsible for all interaction with field traffic control personnel and any information/observations from field personnel that need to be relayed to Operations Center Manager.
 - Quantity 1
- 2.6 PERSONNEL ATRAFFIC CONTROL PERSONNEL@
- Personnel Function Direct traffic at key intersections.
 - Quantity 8-11 people depending on size of event and off site-parking needs.
- 2.7 PERSONNEL APARKING CONTROL PERSONNEL@
- Personnel Function Take parking fees if required and assist with directing inflow and outflow of parking vehicles.
- 2.8 PERSONNEL AMAINTENANCE PERSONNEL@
- Personnel Function Put equipment in place before event, move equipment from inbound to outbound locations and remove equipment at end of event.

3.1 HARDWARE ACCTV CAMERA@

- Hardware Type Camera
- Functions Provide real-time monitoring of traffic conditions at key locations.
- Location Portable camera unit
- Data Name/Contents Video with target rate of regeneration of 1.6 seconds or faster
- Data Type Video
- Status Existing
- Other COHU MONO CCTV Camera - Model 4940 with 6:1 zoom in environmental closure with sunscreen and I/F filter.

3.2 HARDWARE AFRAME GRABBER@

- Hardware Type Frame grabber
- Functions Collect video images from the CCTV; converts video signal to PC inputs.
- Location Portable camera unit
- Data Name/Contents Video images
- Status Existing
- Other Imagination Systems Frame Grabber - Cortex-1

3.3 HARDWARE APAN/TILT CONTROLLER@

- Hardware Type Pan/tilt unit
- Functions Provides remote control of camera movement and has a pan speed of 6 degrees per second and a tilt speed of 3 degrees per second.
- Location Portable camera unit
- Data Type Data
- Status Existing
- Other Pelco pan/tilt Model PT570/PP

3.4 HARDWARE APAN/TILT CONTROL MODULE@

- Hardware Type Pan/tilt module
- Functions Allow control of camera movement
- Location Portable camera unit
- Status Existing
- Other ADDCO custom pan/tilt control module

3.5 HARDWARE ADIGITAL I/O AND A/D CONVERTER CARD@

- Hardware Type I/O and A/D converter
- Functions Interface and communicate with camera mount
- Location Portable camera unit
- Status Existing
- Other Digital I/O and A/D converter card
PCL 723 Digital I/O, CYPCB24 Cable, CYPB24 Relay Panel, Relays (12 ea.), CYR DAS8 8chan A/D, CBL3702 Cable, CYRSTA 08PG A/D Panel

3.6 HARDWARE AREMOTE CAMERA COMPUTER@

- Hardware Type Computer
- Functions Relays camera control information, digital video images to spread spectrum radio unit and compresses video images.
- Location Portable camera unit
- Status Existing
- Other PC Arise Systems ASC 486SLC, math co-processor, 4MB RAM, Flash disk SSD-SHD, 1.44 MB Flash memory and enclosure

3.6.1 SOFTWARE ACOMMUNICATIONS SOFTWARE@

- Software Type Communications software
- Software Standards Proprietary
- Functions Communication between camera computer and spread spectrum radio
- Status Existing
- Other ADDCO Manufacturing Co. custom developed all communication software.

3.7 HARDWARE AINTERFACE CARD@

- Hardware Type Interface card
- Functions Interface between camera computer and spread spectrum radio.
- Location Portable camera unit
- Status Existing
- Other Sealevel ACB-533 HDLC Interface Card

3.8 HARDWARE ASPREAD SPECTRUM RADIO@

- Hardware Type Radio Tx/Rx
- Functions Communication between CCTV and Control center
- Location Control center and portable camera unit
- Data Name/Contents Operates on 4 channels, power output of 500 mW and data rate of 96,000 bps.
- Status Existing
- Constraints Line of sight radio transmissions are required between pairs of radios.
- Other Hughes Spread Spectrum Radio (902-928 MHZ)
No FCC license required

3.9 HARDWARE ACONTROL CENTER CAMERA COMPUTER@

- Hardware Type Computer
- Functions Display video images and provide camera control.
- Location Control center
- Data Name/Contents Video images, control pan/tilt/zoom
- Status Existing
- Other PC 486-66mhz DX2 w/ 200MB Disk

3.9.1 SOFTWARE AGRAPHICAL USER INTERFACE (GUI)@

- Software Type Custom Windows based graphical user interface (GUI).
Up to three images were displayed during operational test.
- Functions Displays video images and camera settings.
- Status Existing
- Other ADDCO Manufacturing Co.

3.10 HARDWARE ACMS AND HAR COMPUTER@

- Hardware Type Computer
- Functions Control Changeable Message Signs messages displayed and create new messages for the changeable message signs.
- Location Control center
- Status Existing
- Other PC 486-based, vga, keyboard, dot matrix printer, modem

3.10.1 SOFTWARE ACHANGEABLE MESSAGE SIGN (CMS)@

- Software Type CMS software
- Functions Allows operators to develop new messages, send new or existing messages, or log into CMS and retrieve a record of the equipment status.
- Status Existing
- Other ADDCO Manufacturing Co. custom Dos-based CMS controller software

3.11 HARDWARE APORTABLE CHANGEABLE MESSAGE SIGN (CMS)@

- Hardware Type Portable changeable message sign consisting of : CMS board, 120 VAC generator, trailer and cellular phone.
- Functions Display traffic related messages.
- Location In field
- Data Name/Contents 3-8 character lines of messages, each character consist of 18 inch high, 5x7 LED disk matrix.
- Data Type Messages
- Status Existing
- Other Unit contains custom microprocessor controller with 64K of ROM and 32K of CMOS RAM and can store up to 25, 6-frame message sequences. Messages are stored in CMS but can be changed or updated using computer with custom ADDCO software and cellular telephone link.

3.12 HARDWARE APORTABLE HIGHWAY ADVISORY RADIO (HAR)@

- Hardware Type Portable radio, trailer, transmitter, digital recorder, antenna, roll-up ground system, cellular phone, batteries and 120 VAC generator.
- Functions Communicate traffic and route information to event patrons.
- Location In field (range of approximately 5 miles)
- Data Name/Contents Voice message over radio
- Status Existing
- Other Mn/DOT license at frequencies of 1610 Khz or 530 Khz with adjustable 0-10 Watts power output (normally set to 5W). Digital recorder provides up to 12, 1 minute messages. Messages are stored in HAR and can be changed and new messages added via cellular telephone link.

3.13 HARDWARE APORTABLE TRAFFIC CONTROL SYSTEM@

- Hardware Type Portable traffic control system
- Functions Traffic control, used mainly to stop vehicles at pedestrian crossings located at either uncontrolled intersections or mid block crossings.
- Location Where portable traffic control is needed at event.
- Data Name/Contents Timing plans, phase intervals (green yellow red)
- Data Type Data
- Constraints Current system allows for only two way signal control. A four way traffic control system is currently under development by ADDCO.
- Other ADDCO PTS-2000 portable traffic control signal system consisting of : two trailers, a diesel engine generator, signal heads and micro processor. Radio link allows two trailer to communicate information.
System allows six modes of operation including: 3 manual control options, a vehicular sensing mode (when connected to vehicle detector), flashing red and fixed time.

4.1 INTERFACE

- Connects to ... CCTV Camera
- Interface location Imagination Frame Grabber
- Interface Type Portable Camera Unit
- Interface Direction Video
- Interface Direction Both
- Interface Component RS-170
- Information Type/Content Video image
- Information Direction Output
- Information Frequency Continuous

4.2 INTERFACE

- Connects to ... Pan/Tilt Control
- Interface location ADDCO Custom Module
- Interface Direction Portable Camera Unit
- Interface Direction Both
- Information Direction Both
- Information Frequency As needed by operator

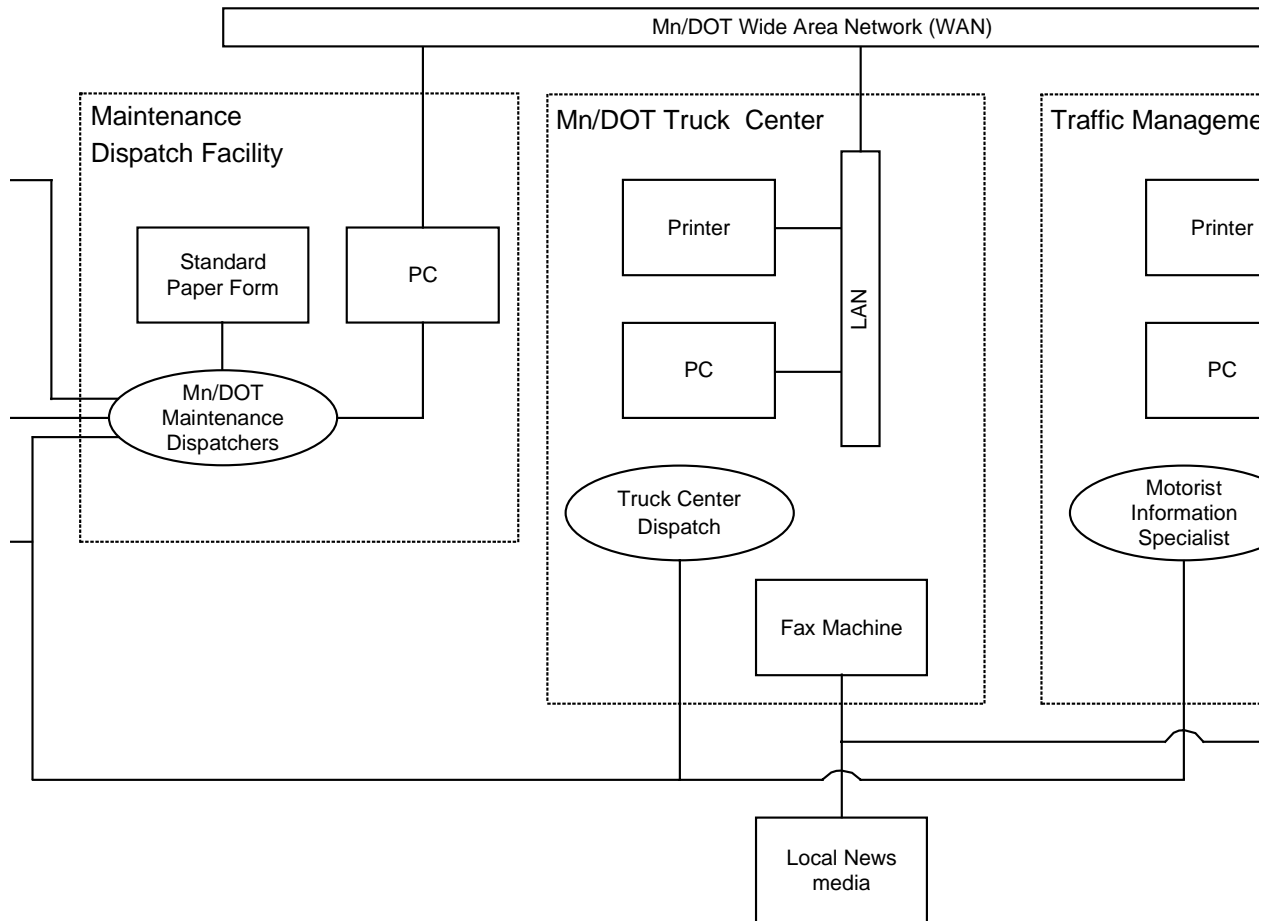
<p>4.3 INTERFACE</p> <ul style="list-style-type: none"> - Connects to ... - Interface location - Interface Direction - Information Direction - Information Frequency 	<p>ADDCO Custom Module Digital I/O Card Portable Camera Unit Both Both As needed by operator</p>
<p>4.4 INTERFACE</p> <ul style="list-style-type: none"> - Connects to ... - Interface location - Interface Type - Interface Direction - Interface Component - Information Type/Content - Information Direction - Information Frequency 	<p>Hughes Spread Spectrum Radio Sealevel ACB-530 Interface Card Control center and Portable Camera Unit Data Both RS-422 Serial Compressed CCTV images and camera control commands Both Continuous</p>
<p>4.5 INTERFACE</p> <ul style="list-style-type: none"> - Connects to ... - Interface location - Interface Type - Interface Direction - Interface Component - Information Type/Content - Information Direction 	<p>Hughes Spread Spectrum Radio - Remote Camera Computer Unit Hughes Spread Spectrum Radio - Portable Traffic Control Center Control center and remote camera unit Radio Both FM Compressed CCTV images and camera control commands Both</p>
<p>4.6 INTERFACE</p> <ul style="list-style-type: none"> - Connects to ... - Interface location - Interface Type - Interface Direction - Interface Component - Information Type/Content - Information Direction - Information Frequency 	<p>CMS and HAR PC CMS and HAR Control center, CMS and HAR Data Both Cellular telephone Messages for CMS and HAR Both As needed</p>

4.7	INTERFACE	Traffic control operator
- Connects to ...		Traffic control and parking personnel
- Interface location		Control center and field
- Interface Type		Audio
- Interface Direction		Both
- Interface Component		VHF Radio
- Information Type/Content		Instructions and observations
- Information Direction		Both
- Information Frequency		As needed
4.8	INTERFACE	Mn/DOT lead operator
- Connects to ...		City/County Traffic control Personnel
- Interface location		Control center and field (intersection cabinet)
- Interface Type		Audio
- Interface Direction		Both
- Interface Component		Cellular phone or VHF Radio depending on availability
- Information Type/Content		Instructions to change signal timing plans and observations on traffic operations.
- Information Direction		Both
- Information Frequency		As needed
4.9	INTERFACE	Mn/DOT Operator PC
- Connects to ...		Mn/DOT Traffic control signal system master controller
- Interface location		Control center and field (arterial system master controller cabinet)
- Interface Type		Data
- Interface Direction		Both
- Interface Component		Service provider
- Information Type/Content		Signal timing plan changes
- Information Direction		Both
- Information Frequency		As needed

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3.1.4 MN/DOT METRO DIVISION LANE CLOSURE INFORMATION SYSTEM

Baseline Data Collection
vision Lane Closure Information System



AS-IS DATA COLLECTION TEMPLATE

1.0 AGENCY AMINNESOTA DEPARTMENT OF TRANSPORTATION@

- Agency Type State transportation administration/operation department
- Agency Location(s) Headquartered in St. Paul, MN with offices elsewhere

2.0 SYSTEM AMN/DOT LANE CLOSURE INFORMATION SYSTEM@

- Date of As-Is Data Collection 5/6/96
- Purpose Disseminate information about lane restrictions in the Metro area.
- Hours of Operation This system operates daily, but information about the following day-s closures should be sent to the Traffic Management Center (TMC) no later that 3:00 p.m..
- Geographic Coverage Mn/DOT Metro District
- Status Existing
- Policies The TMC attempt to verify all lane closure data prior to release
- Block Diagram See attached
- Typical Operational Scenario Most lane closure data comes from one of four sources:
 - 1) The Mn\DOT Permit office, which reviews all requests to do work in the right-of-way
 - 2) Project engineers, who oversee the progress of a construction project
 - 3) Area or shop supervisors, who are directly involved in physically closing lanes
 - 4) The TMC, which also does construction maintenance work in the right-of-way.All of these sources report lane closure information to the dispatchers at the Mn/DOT Maintenance dispatch facility where information is recorded onto a standardized paper form. The information on this form is re-keyed into the OfficeVision Mn/DOT WAN e-mail system for distribution to other Mn/DOT departments.
At the TMC, the information from the OfficeVision system is verified by a Motorist Information assistant and re-keyed into a WordPerfect document template.
The information is sent via fax to traffic reporters (see attached distribution list) and is used internally at the TMC for the KBEM Traffic Announcer and the Trilogy motorist information system.
Information is also provided to the local news media via fax by the Truck Center facility, this is largely a legacy function and was not developed as a specific responsibility as part of this system.

2.1 PERSONNEL AMAINTENANCE DISPATCHER@

- Personnel Function Receives lane closure information
 Records information on paper forms
 Keys information into OfficeVision system
- Location Mn/DOT Maintenance Dispatch facility
- Status Existing

2.2 PERSONNEL AMOTORIST INFORMATION SPECIALIST@

- Personnel Function Receives and verifies lane closure information.
 Oversees production of lane closure bulletins, also
 may enter data in OfficeVision system
- Quantity 3
- Location Mn/DOT TMC
- Working hours Normal workday
- Status Existing

2.3 PERSONNEL ATRUCK CENTER DISPATCH@

- Personnel Function Receives lane closure information and keys information
 into the OfficeVision system
- Quantity 1
- Location Mn/DOT TMC
- Working hours Normal workday
- Status Existing

3.1 HARDWARE ASTANDARD PAPER FORM@

- Hardware Type Paper hard copy
- Functions Entry of lane closure of information into a standard form
- Location Mn/DOT Maintenance Dispatch Center
- Data Name/Contents Location (given as street/interstate name), direction,
 number of lanes, and approximate times of closures
- Data Type Text
- Status Existing
- Other TMC contact indicated that a standardized form used by
 all sources of information would be desirable. Currently
 only Maintenance uses this form

3.2 HARDWARE APC@

- Hardware Type Intel-based desktop computer
- Functions Entry of the information on the Standard Paper Form into the OfficeVision e-mail system
- Location Mn/DOT Maintenance Dispatch
- Data Name/Contents See attached Example
- Data Type Data
- Status Existing

3.2.1 SOFTWARE AMS-DOS@

- Software Type Operating system
- Status Existing

3.2.2 SOFTWARE AOFFICEVISION@

- Software Type WAN communications/scheduling software
- Functions Distribution of the lane closure information through the OfficeVision e-mail system.
- Status Existing
- Other This is a comprehensive WAN integration package. Lane closure information is a relatively minor function

3.3 HARDWARE AMN/DOT WIDE AREA NETWORK (WAN)@

- Hardware Type Wide area communications/data sharing computer network
- Functions For this system, the WAN allows transmission of the lane closure data to other Mn/DOT entities
- Data Name/Contents See attached Example
- Data Type Data
- Status Existing

3.4 HARDWARE ATRUCK CENTER LAN@

- Hardware Type Local area computer network
- Functions Communications between computers
Access to peripheral devices such as printers
- Location MN/DOT Truck Center, South St. Paul
- Data Name/Contents See attached Example
- Data Type Data
- Status Existing

3.5 HARDWARE APC@

- Hardware Type Intel-based desktop computer
- Functions
Accesses OfficeVision e-mail system to retrieve lane closure information.
Allows operator to re-key lane closure information into a WordPerfect template and print a paper copy.
- Location Mn/DOT Truck Dispatch facility
- Data Name/Contents See attached Example
- Data Type Data
- Status Existing

3.5.1 SOFTWARE AMS-DOS@

- Software Type Operating system
- Status Existing

3.5.2 SOFTWARE AOFFICEVISION@

- Software Type WAN communications/scheduling software
- Functions
Access e-mail system for retrieval of lane closure information keyed-in at the Maintenance Dispatch facility
- Status Existing

3.5.3 SOFTWARE ANETWARE CLIENT@

- Software Type Network operating system/communications protocol
- Software Standards NetWare IPX/SPX
- Functions
Allows PC to communicate with other computers and peripherals connected to the Local Area Network (LAN)
- Status Existing

3.5.4 SOFTWARE AWORDPERFECT@

- Software Type Word processor
- Software Standards Corel WordPerfect (.wpd) standard
- Functions
Lane closure information is re-keyed from an e-mail message into a WordPerfect template to improve readability
- Status Existing

3.6 HARDWARE APRINTER@

- Hardware Type Laser Printer
- Functions Output of hard copy lane closure bulletins
- Location Mn/DOT Truck Dispatch facility
- Data Name/Contents See attached Example
- Data Type Data
- Status Existing

3.7 HARDWARE AFAX MACHINE@

- Hardware Type Facsimile machine
- Functions Transmits lane closure data to a pre-determined list of recipients
- Location Mn/DOT Truck Dispatch facility
- Data Name/Contents See attached Example
- Data Type Data
- Status Existing

3.8 HARDWARE ATMC LAN@

- Hardware Type Local area computer network
- Functions
 - 1) Connects to Mn/DOT WAN to retrieve lane closure data
 - 2) Permits data sharing and communication between computers at the TMC
 - 3) Permits access to peripherals, such as printers
- Location Mn/DOT TMC
- Data Name/Contents Lane closure data, see attached Example
- Data Type Data
- Status Existing

3.9 HARDWARE APC@

- Hardware Type Intel-based desktop computer
- Functions Allows operator to retrieve lane closure information from the Mn/DOT WAN OfficeVision e-mail
Information is re-keyed from OfficeVision into a WordPerfect document template
- Location Mn/DOT TMC
- Data Name/Contents See attached Examples
- Data Type Data
- Status Existing

3.9.1 SOFTWARE AMS-DOS@

- Software Type Operating system
- Status Existing

3.9.2 SOFTWARE ANETWARE CLIENT@

- Software Type Network operating system/communications protocol
- Software Standards NetWare IPX/SPX
- Functions Allows PC to communicate with other computers and peripherals connected to the Local Area Network (LAN)
- Status Existing

3.9.3 SOFTWARE AOFFICE VISION@

- Software Type WAN communications/scheduling software
- Functions Access e-mail system for retrieval of lane closure information keyed-in at the TMC
- Status Existing

3.9.4 SOFTWARE AWORDPERFECT@

- Software Type Word processor
- Software Standards Corel WordPerfect (.wpd) standard
- Functions Lane closure information is re-keyed from an e-mail message into a WordPerfect template to improve readability
- Status Existing

3.10 HARDWARE APRINTER@

- Hardware Type Laser printer
- Functions Print hard copy lane closure information sheets for distribution
- Location Mn/DOT TMC
- Data Name/Contents See attached Example
- Data Type Data
- Status Existing

3.11 HARDWARE AFAX MACHINE@

- Hardware Type Telephone facsimile machine
- Functions Sends lane closure information from the TMC
- Location Mn/DOT TMC
- Data Name/Contents See attached Example
- Data Type Data
- Status Existing

3.12 **HARDWARE AFAX MACHINE@**

- Hardware Type Telephone facsimile machine
- Functions Receives lane closure information from the TMC
- Location At each recipient on distribution list. See listing under interface 4.11
- Data Name/Contents See attached Example
- Data Type Data
- Status Existing

3.13 **HARDWARE AFAX MACHINE@**

- Hardware Type Telephone facsimile machine
- Functions Receives lane closure information from the Truck Dispatch facility
- Location At each recipient on distribution list. Exact content of distribution list is not known other than the local news media receive information from the Truck Dispatch facility
- Data Name/Contents See attached Example
- Data Type Data
- Status Existing

4.1 **INTERFACE MN/DOT MAINTENANCE DISPATCHERS**

- Connects to ... 1) Mn/DOT Permit Office
 2) Project Engineers
 3) Area/Shop Supervisors
 4) TMC Work Crews
- Interface Type Voice or data as fax hard-copy
- Interface Direction Input
- Interface Component Generally a telephone conversation, although fax use is becoming more common. Either method uses US West voice grade telephone lines
- Information Type/Content Location, approximate start time and duration, number of lanes affected and direction of lanes closed
- Information Direction Input
- Information Frequency As needed, but generally daily
- Other Project engineers and area/shop supervisors in some cases contact the Truck Center and/or the TMC directly with lane closure information.

<p>4.2 INTERFACE</p> <ul style="list-style-type: none"> - Connects to ... - Interface location - Interface Type - Interface Direction - Interface Component - Information Type/Content - Information Direction - Information Frequency 	<p>MN/DOT MAINTENANCE DISPATCHERS</p> <p>Standard Paper Form</p> <p>Mn/DOT Maintenance Dispatch facility</p> <p>Text (handwritten on paper)</p> <p>Output</p> <p>Paper hard copy</p> <p>See attached Example</p> <p>Output</p> <p>As needed</p>
<p>4.3 INTERFACE</p> <ul style="list-style-type: none"> - Connects to ... - Interface location - Interface Type - Interface Direction - Information Type/Content - Information Direction - Information Frequency 	<p>MN/DOT MAINTENANCE DISPATCHERS</p> <p>PC</p> <p>Mn/DOT Maintenance Dispatch facility</p> <p>Data</p> <p>Output</p> <p>See attached Example</p> <p>Output</p> <p>As needed</p>
<p>4.4 INTERFACE</p> <ul style="list-style-type: none"> - Connects to ... - Interface location - Interface Type - Interface Direction - Information Type/Content - Information Direction - Information Frequency 	<p>PC</p> <p>Mn/DOT WAN</p> <p>Mn/DOT Maintenance Dispatch facility</p> <p>Data</p> <p>Both</p> <p>See attached Example. Transmitted as OfficeVision e-mail</p> <p>Both</p> <p>As needed</p>
<p>4.5 INTERFACE</p> <ul style="list-style-type: none"> - Connects to ... - Interface location - Interface Type - Interface Direction - Information Type/Content - Information Direction - Information Frequency 	<p>Mn/DOT WAN</p> <p>Truck Dispatch LAN</p> <p>TMC LAN</p> <p>At Truck Dispatch and TMC</p> <p>Data</p> <p>Both</p> <p>See attached Example</p> <p>Both</p> <p>As Needed</p>

4.6 INTERFACE TRUCK DISPATCH LAN

- Connects to ... PC
- Interface location Mn/DOT Truck Dispatch facility
- Interface Type Data
- Interface Direction Both
- Interface Component Ethernet (assumed 10BaseT)
- Information Type/Content Input is OfficeVision e-mail lane closure information from Maintenance Dispatch
Output is formatted information releases
- Information Direction Both
- Information Frequency As needed

4.7 INTERFACE TRUCK DISPATCH LAN

- Connects to ... Printer
- Interface location Mn/DOT Truck Dispatch facility
- Interface Type Data
- Interface Direction Output
- Interface Component Ethernet (assumed 10BaseT)
- Information Type/Content Lane closure information for release to the local new media.
- Information Direction Output
- Information Frequency As needed

4.8 INTERFACE TMC LAN

- Connects to ... PC
- Interface location Mn/DOT TMC
- Interface Type Data
- Interface Direction Both
- Interface Component Ethernet (assumed 10BaseT)
- Information Type/Content Input is OfficeVision e-mail lane closure information from Maintenance Dispatch
Output is TMC lane closure information
- Information Direction Both
- Information Frequency As needed

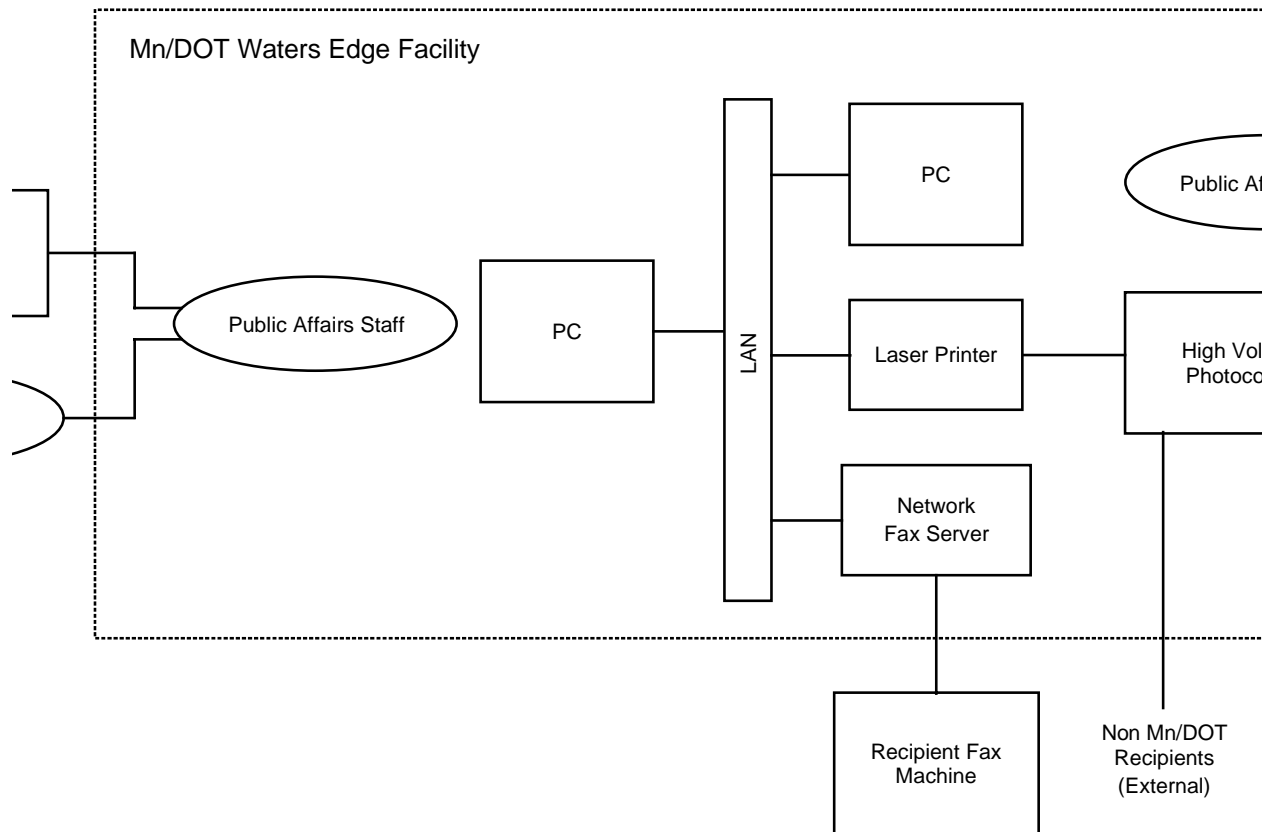
4.9	INTERFACE	TMC LAN
- Connects to ...		Printer
- Interface location		Mn/DOT TMC
- Interface Type		Data
- Interface Direction		Output
- Interface Component		Ethernet (assumed 10BaseT)
- Information Type/Content		TMC lane closure information
- Information Direction		Output
4.10	INTERFACE	TRUCK DISPATCH FAX MACHINE
- Connects to ...		Local News Media Fax Machines
- Interface Type		Data
- Interface Direction		Output
- Interface Component		US West voice grade telephone line
- Information Type/Content		Truck Dispatch lane closure information
- Information Direction		Output
- Information Frequency		Daily

4.11	INTERFACE	TMC FAX MACHINE
- Connects to ...		Fax machine of information recipients
- Interface Type		Data
- Interface Direction		Output
- Interface Component		US West voice grade telephone line
- Information Type/Content		TMC lane closure information
- Information Direction		Output
- Information Frequency		Daily (or as needed)
- Other		There may be some duplication of distribution between the TMC and Truck Dispatch. This is primarily due to the fact this system is evolutionary and was not created as a whole. The various components are not tightly coordinated. Distribution list for this interface is as follows: 1) KSTP Radio 2) Metro Traffic 3) WCCO Radio 4) WIMN Radio 5) M.S.N. 6) KSTP-TV 7) WCCO-TV 8) Minneapolis Star-Tribune 9) St. Paul Pioneer Press 10) Metropolitan Council Transit Operations (MCTO) 11) Mn/DOT Public Affairs Coordinators

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3.1.5 MN/DOT METRO DIVISION CONSTRUCTION INFORMATION SYSTEM

Baseline Data Collection
Division Construction Information System



AS-IS DATA COLLECTION TEMPLATE

1.0 AGENCY AMINNESOTA DEPARTMENT OF TRANSPORTATION@

2.0 SYSTEM AMN/DOT METRO DIVISION CONSTRUCTION INFORMATION@

- Date of As-Is Data Collection 5/13/96
- Purpose Collect and distribute information about current Mn/DOT construction projects
- Geographic Coverage Seven county metro area
- Contacts Public Affairs Coordinator
- Status Existing
- Recommended Improvements Public Affairs Department is currently exploring various forms of electronic distribution, including e-mail and HTML via the World Wide Web; fax distribution to reader is less costly than mailing.
- Block Diagram See attached
- Typical Operational Scenario This system draws its information primarily from the project engineers who are responsible for the progress of the project. The initial list of projects for a given construction season is generated by the Mn/DOT Metro division's Planning Department. Each year, the planning department determines the highest priority projects based on available funding and informs the Public Affairs Department of it's conclusions. The Public Affairs Department the begins a series of meeting with the affected county governments to identify potential conflicts with construction scheduling. After all conflicts have been resolved, a final list of projects with approximate start and finish dates is disseminated via press releases to all major media, hospitals, law enforcement agencies, travel information centers, local units of government, affected Mn/DOT employees and other Mn/DOT Districts.
- Typical Operational Scenario A press release is also issued to affected entities prior to the beginning of any individual project. During the construction season, Public Affairs personnel are assigned a subset of the projects lists on the annual construction plan. Each person is then responsible for tracking the progress of their project during the course of the construction project. This generally means making telephone contact with the project engineer to verify the beginning date of a project, and then weekly contact to monitor progress thereafter until the completion of the project. The project engineer supplies the current status of the project and any change to the project completion date. The Public Affairs staff collaborate on a Microsoft

Word document which is ultimately paginated and formatted by the Public Affairs Coordinator and faxed or mailed to a wide variety of recipients.

2.1 PERSONNEL APROJECT ENGINEER@

- Personnel Function Reports progress of construction projects
- Quantity Variable (12-15)
- Workload The reporting function is a minor part of the Project Engineers workload
- Working hours Regular workday
- Status Existing
- Other Project Engineers are not directly involved in the creation of the HOT SPOTS bulletin. Their responsibility is primarily to communicate with the Public Affairs staff about ongoing construction.

2.2 PERSONNEL APUBLIC AFFAIRS STAFF@

- Personnel Function
 - 1) Receives updates on construction progress from Project Engineers
 - 2) Enters updated information into MS Word Document
- Quantity Four, Three inputting data and one editor
- Location Mn/DOT Waters Edge Facility, Roseville, MN
- Workload The reporting function is a minor part of the Public Affairs Staff workload
- Working hours Regular workday
- Status Existing

2.3 PERSONNEL APUBLIC AFFAIRS COORDINATOR@

- Personnel Function
 - 1) Receives updates on construction progress from Project Engineers
 - 2) Enters updated information into MS Word document
 - 3) Paginates and formats document for distribution
- Quantity
 - One
- Location
 - Mn/DOT Waters Edge Facility, Roseville, MN
- Workload
 - The reporting function is a minor part of the Public Affairs Coordinator workload
- Working hours
 - Regular workday
- Status
 - Existing

3.1 HARDWARE APC (PUBLIC AFFAIRS STAFF)@

- Hardware Type
 - Intel-based desktop computer
- Functions
 - Edit HOT SPOTS document stored on LAN
- Location
 - Mn/DOT Waters Edge Facility, Roseville, MN
- Data Name/Contents
 - See attached Example
- Data Type
 - Data
- Status
 - Existing

3.1.1 SOFTWARE AMS DOS/WINDOWS@

- Software Type
 - Operating system
- Status
 - Existing

3.1.2 SOFTWARE AMS WORD@

- Software Type
 - Word Processor
- Software Standards
 - MS Word (.DOC) format
- Functions
 - Allows multiple users to access and update the information in the HOT SPOTS document
- Status
 - Existing

3.1.3 SOFTWARE ANETWORK CLIENT@

- Software Type LAN client software
- Software Standards Specific network configuration was not collected
- Functions Allows computer to communicate and access peripherals connected to the LAN
- Status Existing

3.2 HARDWARE ALAN@

- Hardware Type Local Area Network
- Functions Stores and allows multiple users to access the HOT SPOTS document
- Location Mn/DOT Waters Edge Facility, Roseville, MN
- Data Name/Contents See attached Example
- Data Type Data
- Status Existing

3.3 HARDWARE APC (PUBLIC AFFAIRS SUPERVISOR)@

- Hardware Type Intel-based desktop computer
- Functions Edit HOT SPOTS document stored on LAN
Format and paginate HOT SPOTS document for distribution
- Location Mn/DOT Waters Edge Facility, Roseville, MN
- Data Name/Contents See attached Example
- Data Type Data
- Status Existing

3.3.1 SOFTWARE AMS DOS/WINDOWS @

- Software Type Operating system
- Status Existing

3.3.2 SOFTWARE AMS WORD@

- Software Type Word Processor
- Software Standards MS Word (.DOC) format
- Functions Allows multiple users to access and update the information in the HOT SPOTS document
- Status Existing

3.3.3 SOFTWARE ANETWORK CLIENT@

- Software Type LAN client software
- Software Standards Specific network configuration was not collected
- Functions Allows computer to communicate and access peripherals connected to the LAN
- Status Existing

3.4 HARDWARE ALASER PRINTER@

- Hardware Type Plain paper laser printer
- Functions Print hard copy of HOT SPOTS bulletin for photocopying
- Location Mn/DOT Waters Edge Facility, Roseville, MN
- Data Name/Contents See attached Example
- Data Type Text/data
- Status Existing

3.5 HARDWARE AHIGH VOLUME PHOTOCOPIER@

- Hardware Type Electrostatic photocopier
- Functions Reproduce HOT SPOTS bulletin for distribution
- Location Mn/DOT Waters Edge Facility, Roseville, MN
- Data Name/Contents See attached Example
- Data Type Text/paper hard copy
- Status Existing

3.6 HARDWARE ANETWORK FAX SERVER@

- Hardware Type Network client PC with Fax board installed
- Functions Transmits HOT SPOTS in fax format
- Location Mn/DOT Waters Edge Facility, Roseville, MN
- Data Name/Contents Fax data transmission of HOT SPOTS. See Example
- Data Type Data
- Status Existing

3.7 HARDWARE ARECIPIENT FAX MACHINE@

- Hardware Type Telephone-based fax machine
- Functions Receives HOT SPOTS bulletin
- Location At recipients who have requested fax distribution
- Data Name/Contents HOT SPOTS- see attached Example
- Data Type Data
- Status Existing

4.1 INTERFACE

- Connects to ... Project Engineer
- Interface Type Public Affairs Staff
- Interface Direction Voice or text
- Interface Component Output
- Information Type/Content Generally telephone, but fax is occasionally used
- Information Direction Updates on construction project progress
- Information Frequency Output
- Information Frequency Weekly or as necessary

4.2 INTERFACE

- Connects to ... Preconstruction Meetings
- Interface Direction Public Affairs Staff
- Interface Component Output
- Information Type/Content Attendance at meetings
- Information Direction Overall plans and time lines for a construction project about to begin. (i.e. type of work to be performed, approximate dates of start and finished of each phase, approximate location of project)
- Information Frequency Output
- Information Frequency As needed

4.3 INTERFACE

- Connects to ... PC (Public Affairs Staff)
- Interface location LAN
- Interface Type Mn/DOT Waters Edge Facility, Roseville, MN
- Interface Direction Data
- Interface Component Both
- Information Type/Content Ethernet (10BaseT)
- Information Direction Updates to the HOT SPOTS document
- Information Frequency Both
- Information Frequency Interface operates continuously, updates are made as needed

4.4	INTERFACE	LAN
- Connects to ...		PC (Public Affairs Coordinator)
- Interface location		Mn/DOT Waters Edge Facility, Roseville, MN
- Interface Type		Data
- Interface Direction		Both
- Interface Component		Ethernet (10BaseT)
- Information Type/Content		1) Updates to the HOT SPOTS document 2) Final formatting for the HOT SPOTS weekly bulletin
- Information Direction		Output
- Information Frequency		Interface operates continuously, updates are made as needed, formatting is done weekly
4.5	INTERFACE	LAN
- Connects to ...		Laser printer
- Interface location		Mn/DOT Waters Edge Facility, Roseville, MN
- Interface Type		Data
- Interface Direction		Both
- Interface Component		Ethernet (10BaseT)
- Information Type/Content		Final, formatted versions of HOT SPOTS
- Information Direction		Output
- Information Frequency		As needed
4.6	INTERFACE	LAN
- Connects to ...		Network fax server
- Interface location		Mn/DOT Waters Edge Facility, Roseville, MN
- Interface Type		Data
- Interface Direction		Both
- Interface Component		Ethernet (10BaseT)
- Information Type/Content		Final, formatted versions of HOT SPOTS to be faxed to recipients
- Information Direction		both
- Information Frequency		Weekly

- 4.7 INTERFACE Laser Printer
- Connects to ... High volume photocopier
 - Interface location Mn/DOT Waters Edge Facility, Roseville, MN
 - Interface Type Physically moving the hard copy
 - Interface Direction Output
 - Interface Component Paper hard copy
 - Information Type/Content HOT SPOTS - see attached Example
 - Information Direction Output
 - Information Frequency Weekly
-
- 4.8 INTERFACE High Volume Photocopier
- Connects to ... Non-Mn/DOT recipients
 - Interface Type Paper
 - Interface Direction Output
 - Interface Component US Postal Service
 - Information Type/Content Copies of HOT SPOTS
 - Information Direction Output
 - Information Frequency Weekly
 - Other HOT SPOTS is generally mailed out on Tuesdays to
make many publications= Wednesday deadline.
-
- 4.9 INTERFACE High Volume Photocopier
- Connects to ... Mn/DOT recipients
 - Interface Type Paper
 - Interface Direction Output
 - Interface Component Inter-office mail service
 - Information Type/Content Copies of HOT SPOTS
 - Information Direction Output
 - Information Frequency Weekly

4.10	INTERFACE	Network Fax Server
- Connects to ...		Recipient fax machines
- Interface Type		Data
- Interface Direction		Output
- Interface Component		US West voice grade telephone line
- Information Type/Content		HOT SPOTS
- Information Direction		Output
- Information Frequency		Weekly
- Other		HOT SPOTS is generally mailed out on Tuesdays to make many publications= Wednesday deadline.

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APPENDIX A

As-Is Agency Reports Pre-Survey Candidate Systems List

PRE-SURVEY CANDIDATE SYSTEMS

Traffic Signal Control Systems

- City of St. Paul Computran traffic signal control system
- City of St. Paul traffic signal intersection hardware (field equipment)
- City of Minneapolis Fortran traffic signal control system
- Mn/DOT Metro Division/District traffic office closed loop traffic signal system(s)
- County closed loop traffic signal systems (Hennepin, Ramsey, etc.)
- City closed loop traffic signal systems
- Video detection/control of signal system (T.H. 65 & 53rd, Lyndale and Franklin Ave)
- Pre-emption of traffic signals for emergency vehicles (EVP)
- Pre-emption of traffic signal at fire stations
- Pre-emption of traffic signals at railroad crossings (20 locations in Metro area)
- Minneapolis AUSCI operational test

Freeway Management System

- Mn/DOT TMC ramp meter system
- Mn/DOT TMC video surveillance system
- Mn/DOT TMC CMS control system
- KBEM radio broadcast system
- Mn/DOT TMC cable TV information system - (Triple Vision system)
- Mn/DOT Metro Division/District portable changeable message signs
- TMC traffic history database (volume and occupancy data)
- TMC incident log database
- U of M Autoscope incident detection system
- Genesis operational test
- Trilogy operational test
- Mn/DOT workzone traffic management system operational test

Transit Management Systems

- MCTO "Trapeze" scheduling/planning system (creates bus/driver schedules)
- MCTO "radio" system (computer assisted radio system, 7 channels)
- MCTO automatic passenger counters (on some buses)
- MCTO electronic fare collection boxes (on all buses)
- MCTO TIC BusLine system (voice responses system, customer service system)
- MCTO customer service system for route/schedule planning (live telephone operators)
- MCTO transportation section (provides construction information to MCTO)
- MCTO bus stop database (contains the attributes of each bus stop)
- MCTO Police crime/incident tracking system
- MCTO Opticom emitters (EVP on 80 buses)
- MCTO speed light system (ramp meter pre-emption on selected ramps)
- MCTO Route-O-Matic system - vectors around incidents and congestion
- Metropolitan Council Rideshare system (Mn dial-a-ride)
- MCTO funded paratransit systems
- Metropolitan Council Metro Mobility passenger registration system
- Metropolitan Council Metro Mobility passenger reservation system
- U of M transit management
- Southwest Transit
- Minnesota Valley Transit
- Plymouth Metrolink
- School bus dispatch systems

Incident Management Program

- Mn/DOT TMC Highway Helper program (including AVL system)
- Private tow contracts
- U of M police incident management
- St. Paul DIVERT operational test

Electronic Fare Payment Systems

- City of Minneapolis Parking fare collection (smart card)
- City of Minneapolis electronic parking meter maid system
- Smart Darts operational test

PRE-SURVEY CANDIDATE SYSTEMS (CONTINUED)

Electronic Toll Collection Systems

- Toll road proposals (5 proposals in MN)
- Congestion Pricing Study
- Mileage based tax study

Multi modal Traveler Information Systems

- Travlink operational test

Administrative Systems

- Mn/DOT Electrical Services maintenance management system
- Mn/DOT Electrical Service gopher state one-call access system
- Mn/DOT TIS
- Mn/DOT automatic traffic recorder system
- Mn/DOT ISTEA management systems
- Mn/DOT CVO administrative systems
- DPS CVO administrative systems
- City of Minneapolis sign database

Other Information Systems

- Airline flight arrival/departure information - NW
- Airport rental car kiosk - Hertz
- MN Office of Tourism travel information center kiosks
- Mn/DOT TMC road weather information system access
- Mn/DOT Metro Division weather information access
- Mn/DOT Aeronautics weather information system
- Mn/DOT statewide road weather information telephone information
- Mn/DOT Pavement Condition and Weather Reporting System - future
- Internal distribution system Distribution of TMC loop data via the Internet
- RWIS - Mn/DOT future Road/Weather Information System

Emergency Response Systems

- Motorist call box system
- Mobile Data Terminals (MDT) in all State Patrol cars
- Laptop PC's in State Patrol cars to replace MDT's - pilot project in 1996
- Emergency 911 log system at State Patrol
- State Patrol information desk
- State Patrol South St. Paul information desk
- State Patrol access to drivers license information. via 911 center
- Mn/DOT Mayday operational test
- Demand response dispatch systems - numerous standalone systems

Parking Management Systems

- Metropolitan airports commission parking management
- City of Minneapolis parking management systems
- U of M parking management
- St. Paul Advanced Parking Information System operational test

Miscellaneous

- Mn/DOT portable traffic management system
- City of Minneapolis police special event management
- City of St. Paul special event management
- U of M special event management
- Mn/DOT pilot differential GPS broadcast base station
- Mn/DOT maintenance vehicle AVL
- Mn/DOT Metro Division/District maintenance dispatch
- Hennepin County Medical Center emergency vehicle dispatch
- MN Pollution Control Agency air quality monitoring sites
- Met. Council Forecasting models - uses data from Mn/DOT TIS database
- U of M traffic management system proposal

Interagency Systems

- ICTM - Integrated Corridor Traffic Management System operational test
(includes Autoscope)
- ARCTIC - operational test in Virginia, MN

PRE-SURVEY CANDIDATE SYSTEMS (CONTINUED)

CVO Systems

- List of systems from MN Guidestar
- CVO call-in number
- State Patrol toll free Information number

Construction Information/Notification Systems

- Gopher State One Call system for utility locations
- Mn/DOT construction information dissemination
- Counties' systems (Hennepin County)
- Counties' systems (Ramsey County)
- City system (Minneapolis)
- City system (St. Paul)
- Utilities' systems

Communications Systems

- Mn/DOT TMC Fiber optic data communications system
- Mn/DOT Microwave Communication System
- Mn/DOT T1 system
- Mn/DOT Wide Area Network
- MNET (STARS)
- Voice radio - State Patrol, Mn/DOT Maintenance, DNR
- 800 MHZ Trunked Radio system (Metro area)
- Internet Communications
- Traffic Signal Interconnect systems
- RBDS - Radio Broadcast Data Systems
- Mn/DOT Video Conferencing

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APPENDIX B

As-Is Agency Reports Data Collection Guide

APPENDIX C

As-Is Agency Reports
System Documentation Attachments

