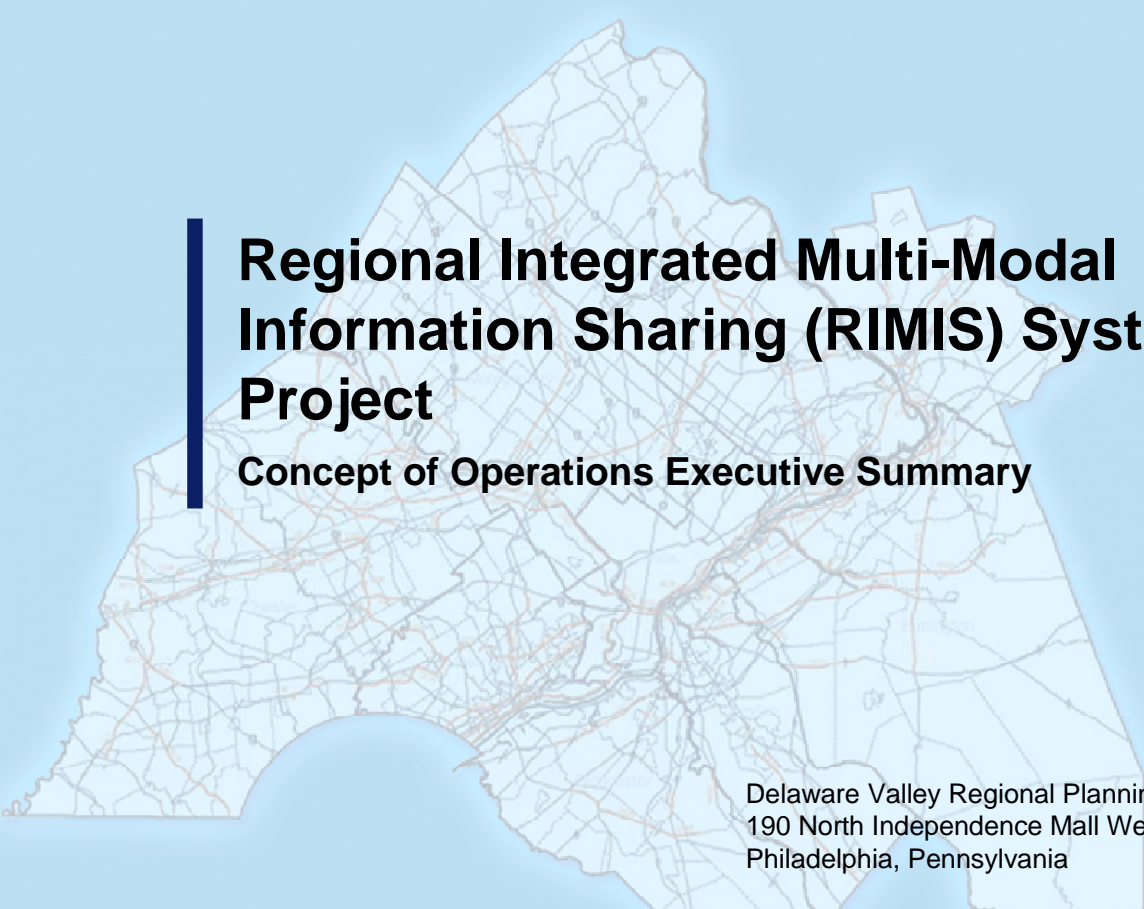


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Regional Integrated Multi-Modal Information Sharing (RIMIS) System Project

Concept of Operations Executive Summary

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EXECUTIVE SUMMARY

Background

This project is to begin development of a Regional Integrated Multi-Modal Information Sharing (RIMIS) system for the Delaware Valley region. RIMIS' objective is to link transportation agencies, emergency management agencies, traffic reporting services and others for the purposes of sharing transportation information and managing events through resource sharing.

Since June 1998, the Delaware Valley ITS Technical Task Force (TTF) has been responsible for coordinating ITS activities in the Delaware Valley. It is composed of technical staff from over 30 different organizations including departments of transportation, highway and bridge toll authorities, transit agencies, the City of Philadelphia, state and local police departments, transportation management associations, Federal Highway Administration, and other organizations involved in transportation operations.

A subcommittee of the TTF, composed of core regional agencies, was formed to actively guide RIMIS' development. This RIMIS Subcommittee includes representatives from the Delaware River Port Authority (DRPA), Delaware Valley Regional Planning Commission (DVRPC), New Jersey Department of Transportation (NJDOT), Pennsylvania Department of Transportation (PennDOT), the City of Philadelphia, SEPTA, Pennsylvania Turnpike Commission (PTC), and Federal Highway Administration (FHWA).

Regional agencies responsible for the safety, efficient operation, and management of the transportation network in the Delaware Valley have recognized the need for reliable inter-agency information sharing and coordination via enhanced communication technology. This need has become very clear in recent years, as the regional transportation network has reached, and -- at many times and locations -- exceeded its capacity.

In developing the Regional ITS Architecture, the TTF identified RIMIS as the mechanism to foster interagency information sharing and coordination. Six alternative coordination scenarios were evaluated to improve information sharing among the agencies; a decentralized approach utilizing a message-based information exchange network (IEN) was selected as most appropriate. It was recognized that existing ad hoc communications do not work; however, creating a centralized regional operations center or a new regional agency similar to TRANSCOM would not be very practical from an institutional perspective.

Concept of Operations is the first step in advancing IT systems projects. The Concept of Operations for RIMIS identifies the needs for the system and provides a general architecture to meet those needs. In addition, key features and development principles are described and justified, along with discussion of issues and high-level requirements that address typical operating situations experienced by regional agencies.

The current situation

The Delaware Valley region includes nine counties in the Philadelphia metropolitan area and supports a residential population of over 5 million people, with employment of over 3 million. These people are served by an extensive intermodal transportation network consisting of expressways and toll facilities, key arterial highways, light and heavy rail lines, and express and local bus routes. A large sports and entertainment complex in South Philadelphia, the Philadelphia International Airport, 30th Street Station, and major freight terminals are some of the key nodes on the transportation network. The major bridges crossing the Delaware River in the region are among the key “links” on this network.

The population shares the network with commercial and industrial transporters of goods, bulk materials, and other commodities as well as with long-distance, inter-regional highway and rail traffic. This combined network demand regularly causes traffic congestion and delays, particularly during peak periods for weekday commuting, and directly before and after scheduled special events. Emergency events and incidents exhibit magnified impact in this environment, and their effects propagate rapidly throughout the network and beyond.

In this complex transportation environment, management and communications roles are shared by many agencies and institutions with various jurisdictional boundaries:

- Three state Departments of Transportation
- Philadelphia Streets Department
- Three State Police forces
- Five major transit agencies operating bus and rail services
- Four authorities operating Delaware River bridges
- Four Turnpike Authorities
- Philadelphia Police and Fire departments
- County 911 centers, Local Fire, Police and EMS
- County public works agencies
- Traffic reporting services, and multiple county and sub-regional transportation management associations (TMAs)

For the most part, the agencies involved in managing regularly occurring events and minor incidents within the transportation network, have extensive experience in managing these situations. Some agencies have procedures and protocols for action and coordination with other agencies. Other agencies coordinate on a more ad-hoc basis. But these communication challenges are magnified greatly during major incidents and unanticipated events. For effective action, the key is timely notification to all parties with responsibility for responding -- and timely access to dependable information on status and conditions on the transportation network.

Most of the inter-agency transportation management communications in the Delaware Valley today is via telephone service, with some use of e-mail, fax, radio, Nextel phones, and Internet resources. Communications are usually one-to-one, with limited ability to simultaneously broadcast information to multiple agencies. Agencies' radio

communication systems operate on various frequencies and technologies, and are generally not depended upon for widespread communications. The I-95 Corridor Information Exchange Network (IEN), a computer network which links state departments of transportation between Maine and Virginia, is available in some agencies' transportation management facilities, but it operates on a separate, dedicated platform, and is generally under-used.

The need for RIMIS is demonstrated by several characteristics of today's communication practices in the region. Agencies use different terms to describe transportation situations and events, and no common referencing system is in place that doesn't need interpretation during inter-agency communications. To describe locations, some agencies use nearest addresses or block numbers; others use the nearest intersection or interchanges; others use mile markers; and still others refer to grid sectors or simple place names. Therefore, there is significant opportunity to misunderstand messages¹, or not understand them at all. The same is true for agencies' use of unique operational terms and language. Agencies do not have capability today for consistent real-time message interpretation and/or use of common message language for some critical communications.

Direct interagency calls and notifications are mostly by phone and depend on numerous factors: the communicator having all the right points of contact (POCs); availability of all the POCs when the calls are made; correct interpretation of the messages; and consistency of the message as it's passed along. These have all been factors in slowing down and confusing communications. Today, there is no way for agencies to reliably "broadcast" emergency or event notifications, or other critical information to multiple agencies at the same time, or to ensure that the notifications or information have been received by the intended parties.

Motivation to establish RIMIS

Agencies involved in management of the transportation network have worked together through countless events and incidents that have challenged the limited available channels of inter-agency communication. *The overall motivation for RIMIS is to foster better communications and information sharing between the many agencies in the region.* This is perhaps the most critical ingredient of effective management of the complex transportation network in the Delaware Valley. With respect to **overall network management outcomes** desired, there is consensus that improved and dependable inter-agency communications will:

- Speed up communications and information gathering, which can be especially difficult and costly during emergency situations, when normal agency functions may be interrupted
- Streamline effective response to unexpected incidents and events
- Add to the value and utilization of ITS assets already deployed in the region.

¹ Messages include notices, confirmations, information, a sender, and receiver(s). They can be transmitted face-to-face, on paper, or by wire or wireless means. RIMIS would transmit messages over a network. Broadcast messages are simultaneous transmission of a message to multiple receivers.

Agency managers also see RIMIS as a means to increase decision-making confidence and limit operating risks. With respect to **improved management of agency operations** RIMIS will assist by:

- Enabling agencies to act on timely and clear incident notifications and information on the transportation situation.
- Enabling agencies to also provide timely and clear notifications and information to other agencies needing these.
- Enabling improved knowledge of the transportation “big picture” when needed
- Reducing the cost of obtaining needed information in emergencies
- Helping to improve interpretation of data through common access and experience with the formats and protocols used by the “source” agencies.

RIMIS development principles

RIMIS stakeholders have reached practical consensus and decisions on general principles and development policies for RIMIS. These are outlined below.

- *Promote inter-agency communication* – RIMIS’ objective is to establish improved regional coordination through communication. The highest-priority near-term objective is to facilitate basic inter-agency messaging throughout the region, and to establish the RIMIS infrastructure. More comprehensive RIMIS features can be phased in later.
- *Decentralized RIMIS* – While shared equipment and system management person(s) might reside in one or more “central” locations, no centralized RIMIS transportation management operations are contemplated. This means that agencies would treat RIMIS as a passive system, which is utilized (or staffed) by each agency as appropriate to each agency’s operational requirements. However, RIMIS will most likely need some ongoing-shared investments to support the system as user needs evolve.
- *User control of filtering, data selection, and use of RIMIS* – RIMIS access and functions should be available to all stakeholders in RIMIS development, but stakeholders want full control of messaging and information that they chose to send or receive on the network.
- *Ownership of ITS assets* – Agencies owning or investing in deployed ITS assets on the network will retain ownership and control of their use
- *Corridor compatibility* RIMIS should be developed and configured so that it is likely to be compatible with future versions of the I-95 corridor IEN.
- *Accommodate user and use levels* – RIMIS should be developed to accommodate agencies that mainly provide information to the network, or agencies that mainly receive and utilize network data, or agencies that interface with the network in both ways.

- *Flexibility to adapt to ITS development* – Agencies may or may not establish new Transportation Management Centers, and/or invest in deployment of new ITS assets on the transportation network. RIMIS is expected to be scalable and able to accommodate these developments over the long term.

RIMIS operational capabilities

RIMIS is expected to provide important inter-agency communications capabilities. Key features that are expected by RIMIS stakeholders include:

- Ability to communicate simultaneously with multiple agencies – in order to ensure full and timely notification of events and situational status to all concerned parties, rather than the selective and sequential one-to-one process we now have
- Use of “standard” messaging for communications – improving the content, completeness and clarity of some communications that now often pass word-of-mouth through a chain of individuals
- Provision of “big picture” transportation information – allowing agencies to determine actions needed, rather than relying too heavily on the judgment and initiative of others, as sometimes happens today
- Access to video of incidents and other unusual conditions – allowing agencies to visually assess conditions in the field. Also provides information to emergency responders and others on the best routes to reach the scene of an incident.
- Providing immediate access to available background data – that today requires time for requests, responses, and analysis
- Ability to confirm message notifications and actual situational information in real time – that now often requires tedious follow-up communications or requests, when time for action is short
- Translation of differences in agencies’ “languages”, referencing systems, or protocols – ensuring that information can be better understood and used by each agency’s operating personnel
- User-filtering and control of the communications system interface – that would reduce the burden of unnecessary or unwanted transmissions, and enable agencies to use their own criteria for internal notifications and processes

Information to be handled by RIMIS

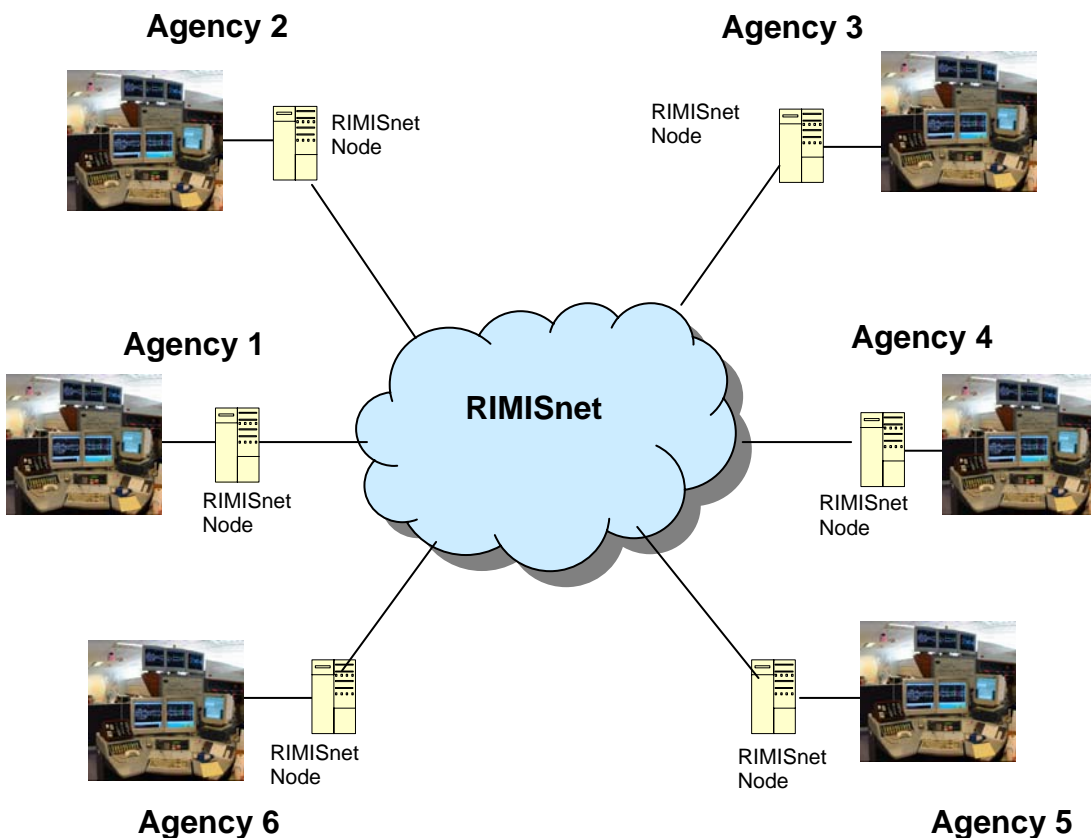
RIMIS would enable the following types of information to be pooled and shared among regional transportation stakeholders to full potential:

- Incident notification as soon as a problem is detected or reported
- Incident severity and expected duration
- Incident response decisions and activities

- Status on incidents and map-based “big picture” transportation context
- Special events and management plans
- Traffic and transit conditions including route performance data
- Traffic management resources, such as VMS, and the status of current notifications and warnings
- Construction and maintenance activity that close lanes on expressways, detour routes, and bus routes

Description of the proposed system concept

The preferred RIMIS architecture is based on a distributed peer-to-peer network, which is not dependent on any centralized components; a high-level representation is shown below. This architecture provides for a designated node at each agency that will facilitate an interface to the RIMIS network for the purpose of sharing information and processing messages. The nodes will also provide repository capability for agency-specific



(Figure 1)
RIMIS Distributed Architecture

information that can be extracted from existing agency systems. With this localized interface feature, it is anticipated that the nodes will have at least some limited network connections to partner agencies' internal networks to permit automated data transfer.

Features for RIMIS operators

RIMIS will ultimately operate on workstations or interfaces with new capabilities and processing tools. The "look and feel" of these workstations are expected to include:

Electronic Message Management

- Templates to streamline message composition with pull-down menus for efficient and standardized addressing, description of incident types, expected durations, locations, resources required, time of day, etc. These can include convenient "standard" messages, as needed
- Manual and automated broadcast messages, alerts, and notifications
- Directed-recipient messaging
- Automated alerts and messages triggered by the RIMIS system based on network status information [see comment on Page 9]
- Scenario-based (e.g., accidents, road construction, weather conditions, etc.) message templates, user groups, and resource-sharing support capabilities
- Filters for message recipients to select which broadcast messages may be applicable to their organization, and a feedback mechanism to inform message senders regarding messages accepted, read, or not accepted. Senders should be able to override the filters in emergencies or special circumstances.

Transportation Network Status Display

- A map-based regional transportation network display
- Spatial analysis tools associated with the transportation network display
- Incident types and locations displayed automatically, including accidents, major incidents, special events, weather conditions, vehicle breakdowns, etc.
- Traffic flow information
- Network ITS device status, current VMS and HAR messages
- Transit vehicle location, route schedule, and delay information

Incident Tracking

RIMIS will have the capability to zoom in on incidents and track response progress by generating a message log and by alerting and initiating correspondence between various pre-determined user groups based on the mode and jurisdiction of the incident.

Data Archiving

- Serve as a valuable record of transactions, messages exchanged, and information transferred. This function will allow users to better utilize the system and respond to or manage future transportation scenarios.

Summary

The overall benefits to operational personnel and to decision-makers that can be expected from the RIMIS concept are:

- (a) Access to broader and more reliable information to assess network management actions needed,
- (b) Information keyed to map displays for better visualization of the “big picture” in high-pressure situations, and
- (c) Greater certainty that timely communications and data are getting to agencies needing it, and that communications and data are coming in when needed.

The RIMIS concept outlined in this document will not require staffing for a central operating location, and it will not prompt specific actions by agencies. Some indirect coordination and training costs for the system will be likely. The cost to acquire and manage RIMIS and to develop agency interfaces will be addressed in the next phase of the project. RIMIS has been programmed on DVRPC’s Transportation Improvement Program (TIP). RIMIS is likely to be phased in over time, focusing initially on few critical features and data items, and the most pressing needs of user agencies.

RIMIS would provide ready access to external information managed by other agencies when needed, so that information gathering does not add time and effort just when quick reference is needed most. The map navigation interface will enable each user to zoom in and out of the regional situation, and to visualize overall transportation conditions in the region. Any agency may at the same time need to visualize transportation situations both on a localized level – and on a regional level. Finally, RIMIS will enable communications to be broadcast or directed quickly and reliably to where they need to go.