Regional Community Network (RCN)
Roles and Responsibilities

Version 4.~~6~~7

Developed by the:

RCN Working Group
ITS Committee
Technology Advisory Group

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MARICOPA ASSOCIATION of GOVERNMENTS

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REVISION HISTORY

Last Updated: ~~1/5/2010~~10/23/2015

Date	Version	Author	Description
6/22/2009	1.0	AWT	Initial creation of the document.
8/4/2009	2.0	AWT	Revision

9/4/2009	3.0	SJ	Revision
9/11/2009	4.0	AS	Revision
10/6/2009	4.1	SJ	Revision – address review comments
11/10/09	4.2	SJ	Revision – address review comments
11/11/09	4.3	AS	Revision – address review comments
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12/10/09	4.5	SJ	Revision – address review comments
1/5/10	4.6	AS	Revision – address review comments
10/23/2015	4.7	RG	Revision – added non-governing partner

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DEFINITIONS, ACRONYMS, AND ABBREVIATIONS

Item	Definition / Example
AC	Architecture Consultant
ATM	Asynchronous Transfer Mode
GPS	Global Positioning System
IA	Implementing Agency
IGA	Intergovernmental Agreement
ITS	Intelligent Transportation Systems Committee
IP	Internet Protocol
ISDN	Integrated Services Digital Network
MA	Member Agency
NAT	Network Address Translation
NBD	Next Business Day
NM	Network Manager
NGP	Non-Governing Partner
OSPF	Open Shortest Path First
OTDR	Optical Time-Domain Reflectometer
PAT	Port Address Translation
PM	RCN Program Manager at MAG
POC	Point of Contact
QOS	Quality of Service
RCN	Regional Community Network
RCN WG	RCN Working Group
RTP	Regional Transportation Plan
RVS	Regional Videoconferencing System
SLA	Service Levels Agreement
SMF	Single Mode Fiber
SONET	Synchronous Optical Networking
TAG	Technology Advisory Group
TIP	Transportation Improvement Program
TT	Trouble Tickets
UPS	Uninterruptible Power Supply
UPWP	Unified Planning Work Program
VDS	Video Distribution Server
VLAN	Virtual Local Area Network

1 INTRODUCTION

1.1 Background & Purpose

The Regional Community Network (RCN) is a high-speed optical fiber based communication system designed primarily to facilitate the exchange of video, data, and other information between traffic management centers at the Arizona Department of Transportation (ADOT), Maricopa County Department of Transportation (MCDOT), and at cities and towns in the Phoenix metropolitan region. The RCN is considered an essential component required for safe and efficient operation of the regional transportation system. Other applications that will utilize the RCN network initially include the Regional Videoconferencing System (RVS) that is owned and operated by Maricopa Association of Governments (MAG), and other videoconferencing applications at a few local agencies. The RCN is NOT intended to be used for mission critical data transmissions between agencies on the network. Applications proposed and implemented on the RCN require that the member agencies supply end to end security levels for their applications and that the non-mission critical network reliability be acceptable in their usage.

The original RCN concept was developed by MAG in 2001. However, the project was not programmed, as the $34 million that was required for full implementation was not available. The Arizona DOT, a stakeholder supportive of the original RCN concept, carried out the design of the first phase of RCN using funds from a United States Department of Transportation (USDOT) Intelligent Transportation Systems (ITS) integration grant awarded to Arizona. The RCN project still lacked funds for building Phase 1. In 2005, $1.6 million that had been programmed in the Transportation Improvement Program (TIP) as a place holder project for the original RCN project became available to the ITS program and was directed to ADOT for implementing the already designed RCN Phase 1A. The status of funding for future RCN implementation has not changed. Its completion remains unfunded at this time. However, many segments of the proposed regional network have also been built through local agency fiber projects.

The RCN is currently being developed as a regional communications infrastructure to be owned and operated by MAG and its Member Agencies (MA). Hence, it is very likely that future regional resources will be directed for completion of the RCN and linking all MAG MA's.

The primary purpose of this document is to outline the framework for future expansion, operation and maintenance of the RCN by identifying the roles and responsibilities of each participant. In addition to this document, a companion document on RCN Governance was adopted by MAG on April 22, 2009.

1.2 Stakeholders

The RCN is being developed by member agencies of MAG in the Phoenix metropolitan area. The primary stakeholders and users of RCN are traffic management staff at agencies that are linked through the network. All participating agencies have agreed to work together in an effort to reduce the cost and time required for the implementation of the system. Where available, agencies have dedicated a portion of their existing fiber infrastructure to the RCN and have agreed to provide space in existing agency facilities for the installation and housing of RCN equipment. The construction of the initial phase of the RCN, Phase 1A, carried out with ADOT as the Implementing Agency (IA) was funded with regional transportation funds. This procurement involved the purchase and installation of the active electronics, construction of fiber segments that are required to complete the initial phase and management of the network for the first year of operations.

1.3 RCN Planning, Programming, Development and Ownership

All planning and programming activities related to the RCN will be carried out by MAG with oversight provided by the ITS committee and the Technology Advisory Group (TAG). A planned schedule for RCN expansion and completion will be developed and updated annually by ITS/TAG. All RCN planning studies will be based on recommendations of ITS/TAG and undertaken by MAG as projects identified in the annual Unified Planning Work Program (UPWP). All new projects that are required for the expansion, rehabilitation and maintenance of the RCN will be programmed in the Transportation Improvement Program based on recommendations from ITS/TAG. The RCN will be identified in the Regional Transportation Plan (RTP) as a key component of the regional ITS infrastructure. Any MA desiring to build a local fiber path shared with the RCN and funded with state, local or a federal grant is required to coordinate with MAG to ensure that all such projects comply with the RCN design, regional standards and adopted practices. The introduction of any such project shall not alter the MAG approved schedule or sequence of RCN expansion projects, unless such a change has been recommended by ITS/TAG and approved by MAG.

All active electronics devices installed at various secure locations within MA facilities will be owned by MAG and will carry an RCN inventory number. Their warranties, repair and replacement will be monitored and maintained by MAG. Agreements will be developed between MAG and MAs linked to the RCN to provide access to RCN equipment installed at secure facilities.

All fiber infrastructure of the RCN located within the jurisdictional boundaries of a MA will be owned by that agency/jurisdiction. Any interruption of RCN services due to damage to such fiber will be repaired by the MA based on regionally agreed upon procedures.

1.4 Legal and Liability Information

The Regional Council approved the governance structure for this project on April 22, 2009. As part of this structure, MAG will have title to the electronic equipment provided for the project. A contracted agent will maintain and repair the electronic equipment. This agent will need permission to access the appropriate facilities. This agent's ability to execute repairs will be limited by the availability of technical staff at participating agencies where troubleshooting and facility access is required and by the terms of the underlying warranty agreement. Repairs will be executed through a best effort approach. Additionally, this network relies on previously agency-owned fiber and project laid fiber which has been transferred to the agency within which it resides. Agencies will be responsible for repairing this fiber through a best effort approach. Future regional investments in the RCN may make greater service levels available, but the service level provided by Phase 1A is adequate for data transmissions required for current traffic management activities.

- Each Agency and NGP will provide timely access to MAG and its contracted agent to install and maintain RCN equipment housed in its facilities.
- Each Agency and NGP will provide appropriate space, power and environmental conditioning for the network equipment necessary to establish the RCN, and furthermore will provide the necessary technical personnel support (agency representative) as the single point of contact for any network/equipment installation or maintenance issues. The site requirements are detailed in the ADOT Regional Community Network Design Concept Report for Phase 1 prepared by Kimley-Horn and Associates, Inc. and dated November 2004.

- Each Agency and NGP will provide the necessary technical personnel support (agency representative) as the single point of contact for coordination of any fiber repair or maintenance issues and to make a best effort at timely repair of such issues.
- Each Agency and NGP understands that MAG, its authorized agent and the other participating agencies will make every effort to affect repairs as quickly as possible, but that the initial implementation will not guarantee a service level.

1.5 Standards and Specifications

Standards and specifications used on the RCN will be adopted by ITS/TAG and will be made available via the MAG website. Any changes to the standards and specifications will be made on the recommendation of ITS/TAG and will be accompanied by an analysis of short- and long-term cost implications.

1.6 Descriptions & Roles

This section provides a high level description of the different groups within the RCN management structure and their key functions. This is also graphically depicted in Figure 1.

1.6.1 Member Agency (MA)

This includes all current and future MAG member agencies that wish to be connected to the RCN. It is not based on whether an agency has infrastructure to share with the RCN or not. Staff at MAs are the ultimate end users of the system.

1.6.2 Intelligent Transportation Systems Committee & Technology Advisory Group

The ITS Committee and TAG are comprised of representatives of the local member agencies. Together, these committees are responsible for the review and recommendation of all policies and guidelines related to the RCN for formal adoption by MAG. Some actions of these two committees will be based on the recommendations submitted by the RCN Working Group (WG) which functions as a joint subcommittee of the ITS and TAG committees.

1.6.3 RCN Working Group (WG)

The RCN Working Group (WG) develops recommendations for the management of the RCN and its future expansion. All recommendations for RCN expansion, modification or repair that require funding will be carried forward through the MAG approval process jointly sponsored by the ITS committee and the TAG. No cost changes may be approved by the ITS/TAG committees on the recommendation of the WG.

1.6.4 RCN Program Manager (PM)

A MAG staff position will be assigned to function as the overall Program Manager (PM) for the RCN. The responsibilities of the PM will be as follows:

- Provide reports to ITS/TAG on all RCN related projects that are being carried out directly by MAG or through other agencies. Identify issues that need to be addressed by ITS/TAG and ensure they are included in ITS/TAG meeting agendas.
- Incorporate the RCN as a key regional infrastructure within MAG planning documents such as the Regional Transportation Plan (RTP), TIP and the UPWP.
- Execute planning studies related to the RCN expansion based on direction and funding support from MAG.

- Make presentations to MAG committees based on ITS/TAG recommendations related to the RCN.
- Serve as the primary Point of Contact (POC) for the Network Manager (NM) and the interface to the MAs thru the WG. If the decision is to outsource the NM role to perform the full time technical and expert services that will be required, the PM will also be responsible for the solicitation, funding, and management of this contract. If the NM function is designated to a MA, the PM will coordinate the required IGAs between MAG and the MA, and their approval by the Regional Council.
- Participate in all RCN projects procured through any other MA, and serve as a member of the consultant/contractor selection committee for all RCN projects. Provide oversight to design and construction of all new RCN phases.
- Maintain a record of all standards, specifications, procedures established for the RCN by the ITS/TAG technical committees.
- Ensure the execution of required Agreements. Maintain a record of all IGAs and agreements entered with MAs in connection with the RCN – such as access to Active Electronics located in MA secure facilities, and to ensure that the design and construction of RCN projects will maintain regional compatibility through the adherence to established RCN standards.
- Receive formal reports on all RCN related procurement contracts carried out by other agencies on behalf of MAG. This work may be carried out by ADOT (similar to the Phase 1A project) or MAs for RCN projects that are within their jurisdictions.

1.6.5 Network Manager (NM)

For the initial year, the Network Management function will be provided by Kimley Horn and ~~Asscoaites~~Associates and ITS Engineers. After that period, the Network Manager (NM) will be either a qualified contractor or a local agency, designated by the Regional Council, with staff dedicated to the RCN NM function. The NM will be primarily responsible for ensuring that the RCN functions without any serious interruptions to service, but will be responsible only for Active Electronics. The NM will be providing ongoing maintenance of the active electronics associated with the RCN. The NM will also manage all repair work carried out under warranties. In the case of other repairs, the NM will purchase, install, and configure RCN active electronics components. The NM will attend all WG meetings, and ITS/TAG meetings when necessary as indicated by the PM.

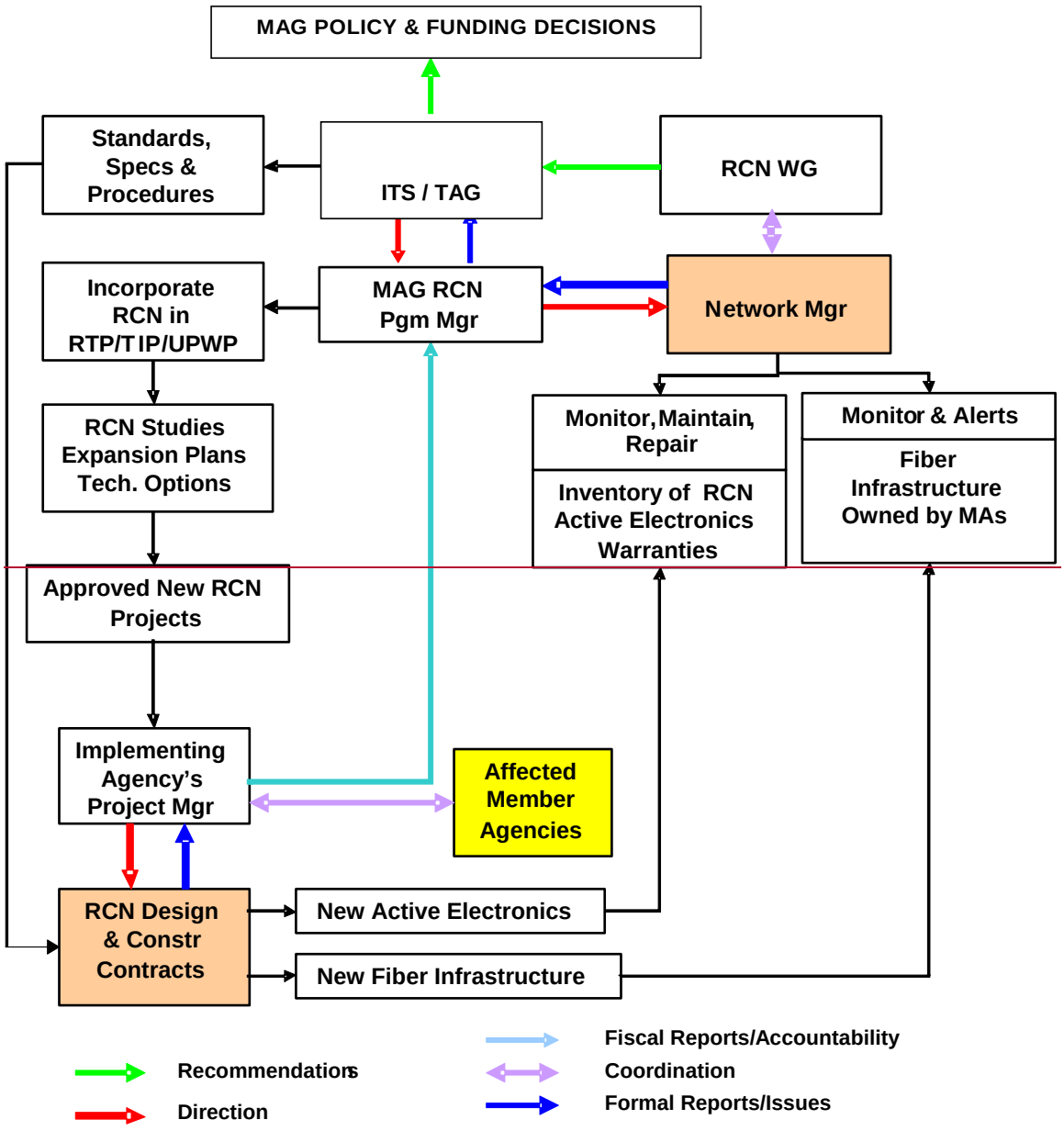
1.6.6 Implementing Agency (IA)

The IA will be responsible for hiring contractors to design and build new segments of the RCN. The IA could be ADOT, Maricopa County or any MA interested in helping implement any of the planned RCN projects that are funded and programmed in the TIP as MAG projects. Upon the identification of an IA, project funds will be transferred to the IA based on an IGA between MAG and IA that specifies accountability requirements.

The IA's project manager will closely coordinate of all such projects with the PM and shall comply with all established RCN standards and specifications.

Any new fiber infrastructure built by the IA becomes the property of the MA upon completion of the project. Any new Active Electronics that are installed at MA facilities remain the property of

MAG with an RCN inventory number. All warranties for RCN active electronics will be assigned to MAG for administration by NM.



1.6.7 Non-Governing Partner (NGP)

An NGP refers to all current and future entities that wish to be connected to the RCN, but are not MAG member agencies. An NGP connection must be sponsored by an existing MAG member agency to be connected to the RCN, and the terms and length of the sponsorship will be at the discretion of the sponsoring agency, subject to the approval of the TAG and ITS committees. Each class of NGP must be approved jointly by the TAG and ITS committees and provide a clear benefit, direct or indirect, to MAG member agencies. The request from an NGP must clearly state

how the RCN connection will be used and identify the name, title and contact information of the person who will be responsible for the RCN connection.

The first approved class of NGPs, Educational Institutions, consists of institutions meeting all of the following criteria:

- Must be a publically-funded university
- Achieve connectivity through an existing member agency
- Maintain ABET accreditation in a relevant Engineering Program – e.g., Civil Engineering or Systems Engineering
- Use the connection in coordination with a sponsoring agency for a defined purpose
- The request must be endorsed by the Dean of the School of Engineering.

Future class approvals will take place at the TAG and ITS committees and a summary will be included in the RCN Program Manager's reports to the other committees.

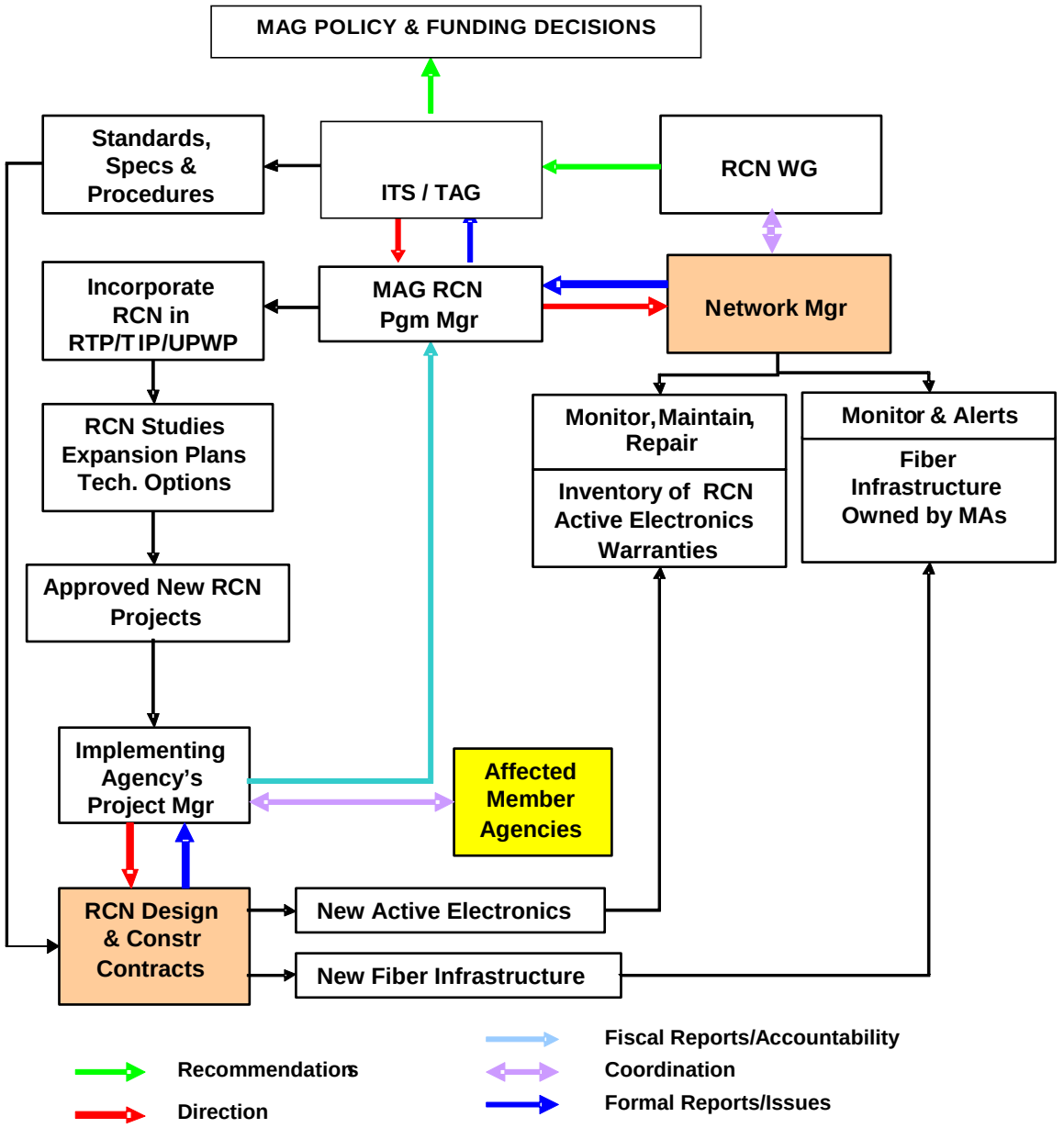


Figure 1. Overall RCN Management Structure & Key Functions

2 LONG RANGE PLANNING

This section describes the responsibilities of those involved in the planning of the RCN.

PM will:

- Be responsible for coordinating all planning activities related to the RCN.
- Obtain input to planning efforts from ITS/TAG, WG, MA and NM.
- Actively seek comments and recommendations for the improvement of the RCN from the WG.
- Obtain consultant support for the preparation of planning documents and complex technical discussions at WG.
- Develop a long range plan for the RCN, updated every year, and contain the following:
    - Identify all fiber paths that are required to provide the desired RCN connectivity.
    - Identify existing fiber infrastructure that may be used to support/expand the RCN.
    - Identify current or planned road construction projects that may be used to implement new fiber that is required for the RCN.
    - Identify gaps in the fiber network that needs to be addressed through new RCN projects.
    - Provide a prioritized list of new RCN projects.

The ITS/TAG will:

- Be responsible for reviewing all planning documents and recommending them for adoption by MAG.
- Review recommendations from WG and produce action items to be addressed during plan updates.
- Assign tasks to WG on complex RCN related issues that needs to be investigated.

The WG will:

- Receive direction from the ITS/TAG committee, and work closely with the MAs they represent to make sure the RCN provides the functionality they need.
- Review the long range plan developed and updated by MAG, provide feedback and recommend improvements.

The MA will:

- Designate primary contacts for the NM at the MAs (These should be WG participants).
- Identify the initial and future nodes that will require connectivity to the RCN and forward that information to the WG.
- Provide documentation on existing and new fiber infrastructure to MAG to help identify fiber that can be used for the expansion of the RCN. For planning, this is limited to the

path, the number of available strands, and the location of splice points. There is no requirement for splice details for the planning phases.

- Identify and relay RCN related issues and concerns through their ITS/TAG or WG representative.

3 REQUIREMENTS DEVELOPMENT

This section will identify the roles and responsibilities of those involved with the requirements development for the RCN. These requirements will be used as the basis for the architecture and design that are described in later sections of this document. During the initial warranty period, changes may be limited if no funding source is identified to enable the network manager to perform the required assessments.

The MA will:

- Identify the specific requirements for each connection to the RCN. This includes items such as those listed below:
    - Entry and exit point
    - Requirements for dedicated fiber strands and/or wavelength (if applicable)
    - Bandwidth
    - Latency and jitter
    - Quality of Service (QOS)
    - Switching
    - Virtual Local Area Network (VLAN)
    - Internet Protocol (IP) addresses
    - Unicast / Multicast
    - Due Date
    - Routing Protocols
- Work closely with the NM and PM to accurately describe the expectations of the MA as it relates to the service levels that are expected of the RCN. These expectations will be the basis of Service Levels Agreements (SLA) and the resulting requirements that drive the design and operation of the RCN. This could have a significant impact on the selection of equipment, need for additional fiber paths, and the availability of technical support staff to respond to problems.
- Help identify requirements and clarify expectations related to the RCN.
- Forward all requests for service to the WG through their representative.

The WG will:

- Recommend the service level to be guaranteed by the RCN.

The ITS/TAG will:

- Approve the service level to be guaranteed by the RCN.

The PM will:

- Assign and manage RCN requirement development activities to the NM.

The NM will:

- Receive and confirm receipt of all requests for service.
- Review all requests to determine the budget impact of all new requests and review the impacts on the system with the PM.

- Evaluate the requests received from the WG to determine if the RCN is capable of meeting the requirements.
- Provide comments back to the WG about the feasibility of their request.
- Request additional information from the WG or MA thru their representative to clarify the request if required.

4 RCN DOCUMENTATION

This section describes the responsibilities of those involved in the documentation of the equipment and fiber used for the RCN. For the initial year of deployment, this information is already in place.

The MAs will:

- Be responsible for maintaining documentation of their respective fiber assets. This includes documentation related to the route, installation depth, conduits, fiber, location of splice enclosures, and complete splice details. Complete and accurate records are important since they impact the ability to repair quickly and accurately, in the event of any damage to the fiber plant.
- Maintain accurate records that can be used by the MA to locate RCN fiber infrastructure as part of the Bluestake process.
- Clearly mark and label all RCN fiber optic patch panels. While some variations are expected between agencies, the labels should clearly identify fiber paths used by the RCN as illustrated in Figure 2.
- Provide a warning sticker or sign at the fiber patch panel with contact information for the NM.
- Track all fiber assets with a system such as OSP Insight or another fiber documentation software application. This software product shall be used to maintain comprehensive as-built documentation of the RCN network. A copy of this documentation will be provided to the PM.
- Identify their agency representative and provide his/her contact information to other agency staff that are involved with any work related to the RCN.
- Identify the need for improvements in the documentation of existing fiber infrastructure and communicate those needs to the ITS/TAG through their WG member or the PM.

Site: ADOT TMC - Room # 312												
Row 5 - Rack 3 - Fiber Panel 3												
	A	B	C	D	E	F	G	H	J	K	L	M
1	1 RCN 7A	7 spare	1 MDN	7 VID	1 Fire	7 spare	13 spare	1 SONET	7 spare	1 empty	7 empty	13 empty
2	2 RCN 7B	8 spare	2 MDN	8 VID	2 Fire	8 spare	14 spare	2 SONET	8 spare	2 empty	8 empty	14 empty
3	3 video	9 spare	3 VID	9 VID	3 Police	9 spare	15 spare	3 spare	9 spare	3 empty	9 empty	15 empty
4	4 video	10 spare	4 VID	10 VID	4 Police	10 spare	16 spare	4 spare	10 spare	4 empty	10 empty	16 empty
5	5 video	11 ATM	5 VID	11 IP	5 spare	11 spare	17 spare	5 spare	11 spare	5 empty	11 empty	17 empty
6	6 spare	12 ATM	6 VID	12 IP	6 spare	12 spare	18 spare	6 spare	12 spare	6 empty	12 empty	18 empty
	Backbone North		Backbone South		Distribution West			Backbone East		Empty		

Figure 2. Patch Panel Labels

The WG will:

- Recommend guidelines and identify issues to be researched and addressed by the NM.
- Make recommendations to the PM regarding the scope of work and assignments to the NM.
- Review and comment on recommendations made by the NM as they relate to the RCN design, implementation, operations, and management.

The ITS/TAG will:

- Establish guidelines and identify issues to be researched and addressed by the NM.
- Make recommendations to the PM regarding the scope of work and assignments to the NM.
- Approve recommendations made by the NM and forwarded by the WG as they related to the RCN design, implementation, operations, and management.

The PM will:

- Maintain documentation of work carried out by the NM.
- Participate in all required meetings related to the documentation of assets used for the RCN.

The NM will:

- Maintain proper documentation for all fiber paths used by the RCN. This includes drawings that provide an overview of each fiber path, and properly identify the demarcation point between the NM and MA. The NM will not be responsible for maintaining complete as-built drawings of the fiber plant unless this responsibility has been delegated to the NM by the MA and approved by the PM.
- Maintain complete documentation of the RCN electronics. This includes drawings that identify all ports that are in use and the MA equipment it is connected to.
- Maintain a complete accounting of all IP addresses that are used on the RCN.
- Maintain a complete accounting of all VLANs that are used on the RCN.
- Maintain a complete accounting of all IP Multicast addresses that are used on the RCN.
- Maintain documentation that shows the physical connection between all RCN equipment. This includes documentation of the slot and port number. This includes type of module, link speed, and duplex mode.
- Identify and document Ethernet trunk and station ports.
- Identify gaps in the documentation of the fiber plant and help identify a strategy to fill in the missing information.
- Coordinate with the WG to evaluate and recommend a software program to document the fiber optic cable and related infrastructure such as conduit, boxes, splice enclosures, etc.
- Coordinate with each MA representative to gather information about how new and existing fiber infrastructure is documented and lessons learned from previous projects. Information may include items such as the spacing between Global Positioning System (GPS) measurements along the conduit route.

- Utilizing agency experience and best industry practices as input, prepare a white paper that recommends how to document fiber assets during new construction, and the best approach for documenting existing fiber assets. The focus of this white paper is to make sure the fiber used as part of the RCN is properly documented to assist in the planning of future projects and to make sure there is adequate documentation to facilitate repairs.

5 RCN ARCHITECTURE

This section identifies the responsibilities of those involved in the development and maintenance of the RCN architecture. For the initial year of deployment, this information is already in place.

The MA will:

- Inform and coordinate with PM on architecture issues or requirements that impact local functions.

The WG will:

- Review and recommend the architecture and high level design provided by the NM or Architecture Consultant (AC).
- Evaluate the detailed designs prepared by the NM or AC and submit comments and recommendations for improvement.
- Review and recommend the equipment standards recommended by the NM or AC.

The ITS/TAG will:

- Review and approve the architecture and high level design recommended by WG.
- Review and approve the equipment standards recommended by the WG.

The PM will:

- Document the RCN architecture as currently defined in the Phase 1A project.
- Execute tasks for generating architecture improvements through the NM or an .AC

The NM or AC will:

- Evaluate current telecommunications technology for potential use in the RCN.
- Develop an overall architecture that can be used to guide the design of future phases of the RCN and provide updates as new technology becomes available. This includes key decisions such as the use of Single Mode Fiber (SMF) and the selection of key technologies such as Synchronous Optical Networking (SONET), Asynchronous Transfer Mode (ATM), Ethernet, and IP. While many of these decisions have already been made for the initial deployment of the RCN and are not likely to change, these decisions should be revalidated as the RCN is expanded and as equipment is upgraded or replaced over time.
- Develop an overall architecture for the transport of video across the RCN. This includes an approach for the replication of video, the selection of video compression technologies, and an approach to deal with the rapid and continuous improvements in compression technology.
- Work with the WG to make long-term design improvements to the RCN and generate suggestions for improvements within the agency networks that will allow agencies to exchange video without the use of Video Distribution Server (VDS) technology. The use of a VDS is often driven by the fact that agency networks were implemented well before plans could be put in place for a regional network such as the RCN. While that is the reality of today, the NM should consider long-term planning and design that will minimize the requirements for a VDS over time.

- Work with WG to develop and update existing standards related to the interface with the RCN. While many of these standards such as Ethernet and IP are set and not likely to change in the near future, other standards such as video compression will change quickly.
- Develop a high level design of the RCN and update that design as new technology becomes available.
- Develop a detailed design of the electronics used for the RCN.
- Develop a layer 3 network design.
- Develop an IP Address plan for use on the RCN and the interface with the MAs. This includes issues related to the use of Network Address Translation (NAT) and Port Address Translation (PAT).
- Develop a routing design based on the use of open standards such as Open Shortest Path First (OSPF).
- Develop a layer 2 switch design that includes the assignment of VLANs that will be used on the RCN and details on the use of spanning tree.
- Develop a security plan for the RCN and present the plan to the PM and WG for review and approval.

6 RCN DESIGN

This section identifies the responsibilities of those involved in the design of the RCN. RCN design and implementation projects may be undertaken by either (1) a MA for RCN components within their jurisdiction OR (2) by a IA on behalf of MAG.

(1) On MA design projects:

The MA will:

- Have primary responsibility for the design of all fiber infrastructure installed by the MA. This includes all existing and new fiber infrastructure that is used for the RCN.
- Coordinate with the PM and the MA representative to ensure that the designs are carried out to be compatible with regional RCN standards.
- Provide documentation about the IP address space that is already in use within the agency network to help identify overlaps and a plan for NAT and PAT as needed.
- Provide documentation of the VLANs that are being used.

The WG will:

- Evaluate the detailed designs prepared by the NM and submit comments and recommendations for improvement thru the IA.
- Review and recommend new equipment standards recommended by the NM.

(2) On IA design projects:

The IA will:

- Review the requirements that are the result of the planning and requirements development process described earlier and use that information as the basis for the initial and ongoing design process.
- Coordinate with the MAs thru the WG to get the information required to complete the design of the RCN equipment.

The NM or AC will:

- Have primary responsibility for the design of the electronics used to support the RCN.

The PM will:

- Coordinate with the MA ’s Project Manager regarding all design activities.
- Coordinate with the MAs and WG to collect comments on the designs developed by the IAs.

7 IMPLEMENTATION

This section will identify the responsibilities of those involved in the implementation of the RCN. During the initial warranty period, changes may be limited if no funding source is identified to enable the network manager to perform the required assessments.

(1) On projects implemented by MA:

The MA will:

- Follow all existing regional standards and specifications for the RCN.
- Have primary responsibility for all aspects of the implementation of the fiber optic cable, including the conduit, boxes, splice enclosures, and patch panels. This includes the management and payments to the contractor.
- Manage the inspection of conduits and boxes installed during the construction.
- Be responsible for the end-to-end testing done as part of the post construction acceptance.
- Work with agency staff to get construction updates and notify the NM of the scheduled availability for all new fiber segments that will be used by the RCN.
- Coordinate fiber testing (Optical Time-Domain Reflectometer (OTDR) and power meter) done by the network manager immediately before connecting RCN equipment to the fiber managed by the MA.

The WG will:

- Receive briefings from NM on project progress and address any issues.

The NM will:

- Test all fiber using an OTDR and power meter immediately before the fiber is put into service for the RCN. Testing should be done in both directions and on all wavelengths that are expected to be used. Compare the results with the calculations prepared during the design process and account for any significant differences. Forward the test results and comparison information to the MA thru the PM.
- Archive the test results for comparison with future test results.
- Provide and install all fiber jumpers and optical attenuators that are required. This includes the fiber jumpers installed between the RCN equipment and the patch panel that is installed by the MA.
- Have primary responsibility for the installation and configuration of all RCN active electronics equipment. This may include firewalls, routers, switches, video conference system, video distribution servers, etc.
- Identify any unexpected items that are needed to complete the installation. Coordinate with the PM to identify a resolution.

The PM will:

- Manage all activities done by the NM.

(2) On projects implemented by an IA:

The PM will:

- Coordinate with the IA to ensure that all existing RCN standards are followed.
- Make periodic reports to WG and ITS/TAG on project progress.
- Upon completion document the handover of fiber infrastructure to MA and addition of active electronics to the MAG equipment inventory.

The NM will:

- Monitor project progress and report on any issues to PM.
- Ensure that RCN standards are followed.
- Have primary responsibility for the installation and configuration of all RCN active electronics equipment.

8 BUILDING INFRASTRUCTURE

This section identifies roles and responsibilities related to buildings used to house the RCN electronics and provide access to the outside fiber cable infrastructure.

The MA will:

- Provide space within an existing building that is appropriate for the installation of equipment. This may include an existing computer room or equipment closet.
- Provide a minimum of one (1) enclosed equipment rack for the installation of RCN equipment. In most cases, racks should match existing rack systems.
- Provide a climate control system to maintain proper temperature, humidity, and dust control.
- Provide a building service entrance for the installation of fiber optic cable. This may include items such as a vault or pull box outside of the building and conduit into the equipment room. The MA will be responsible to make sure the conduits are properly sealed to prevent the entry of water, smoke, or rodents into the building.
- Provide a minimum of two (2) dedicated circuits at the RCN equipment cabinet. The voltage, amps, and plug requirements will be provided by the NM.
- Pay for all power used at the RCN node.
- Ensure that all electrical and safety standards are followed.
- Make sure primary power is provided from a regular commercial power source and should not rely on solar panels or a local generator.
- Provide a secondary source of power such as a diesel or natural gas generator with an automatic transfer switch.
- Provide access to a building Uninterruptible Power Supply (UPS) if available and in good operating condition. The UPS should be capable of providing power from battery for a minimum of one (1) hour if a secondary power source is available or eight (8) hours if a secondary power source is not available.
- Provide an additional equipment rack for the installation of batteries if a secondary source of power is not available. This rack space requirement will change depending on the final power requirements of the equipment.
- Provide secure access to the computer room where the RCN equipment is located. A card reader should be used when possible to provide a method to reporting the date and time that people have entered the area. Access to critical nodes should be available at all times (24x7x365) and during business hours for secondary locations.
- Provide locks for the equipment cabinets used for the RCN equipment when a card reader system is not available.
- Coordinate with the NM to identify the procedure for access into agency buildings. This includes information about requirements for an escort by agency staff.
- Provide a dedicated rack mounted UPS when a building UPS is not available
- Provide additional batteries for the rack mounted UPS if a secondary power source is not available. The batteries should provide power for eight (8) hours. Changes to the Service Level Agreements may increase this requirement and should be carefully considered.

The NM will:

- Follow agency procedures related to building access.
- If provided to the NM, maintain control of all access cards and keys and immediately report to the MA if anything is lost or stolen.

9 MAINTENANCE AND REPAIR

This section identifies roles and responsibilities related to maintenance and repair of the RCN.

The MA will:

- Maintain all outside plant fiber assets such as conduit, fiber cable, boxes, slice points, and fiber patch panels.
- Monitor agency related Trouble Tickets (TT) reports and facilitate agency related repairs.
- Utilize the work order tracking system to manage TTs that are related to the fiber optic cable managed by the MAs.

The WG will:

- Review performance reports submitted by the NM.
- Coordinate with MA representatives to help prioritize and assist with critical repairs.

The PM will:

- Manage all activities done by the NM.
- Review performance reports submitted by the NM to verify proper response times.

The NM will:

- Have primary responsibility for maintenance and repair of the RCN electronics.
- Monitor all critical components on the RCN.
- Provide a primary and secondary contact telephone number for approved agency staff to report problems with the RCN.
- Utilize the work order tracking system to alert the MA of problems with the fiber.

10 RCN OPERATIONS

Operation of the RCN should be modeled after a carrier network with a clear demarcation point between the RCN and the MA network as shown in Figure 3.

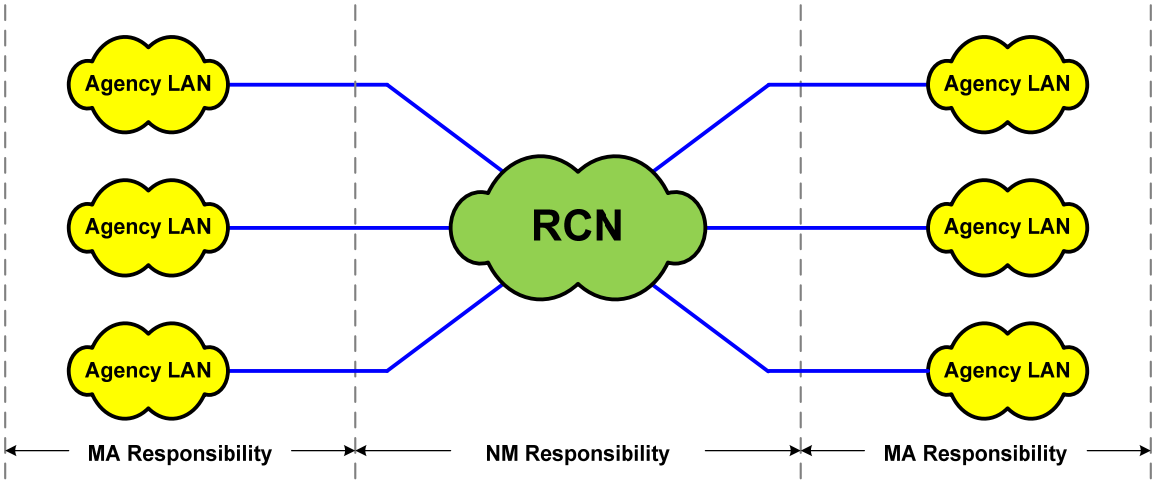


Figure 3 – Division of Responsibility

This diagram is only intended to show the division of responsibility and is not intended to suggest a design for the RCN.

The MA will:

- Have primary responsibility for the operations of the fiber network.
- Participate in the Bluestake program to locate all agency fiber in order to prevent damage.
- Provide a list of authorized users who can submit requests for service.
- Coordinate with the NM to provide notifications of events that might affect the operations of the RCN. All requests should be made thru the PM.

The WG will:

- Discuss and endeavor to resolve issues such as priorities, schedules, and responsibilities that may arise between agencies, members, or other parties.

PM will:

- Coordinate with the ITS/TAG to identify and provide funding for ongoing operations.

The NM will:

- Have primary responsibility for the operation of the RCN electronics.
- Make all approved configuration changes to the RCN electronics in accordance with previously submitted and approved design documents.
- Monitor the status of all RCN electronics to determine the condition of the power supplies, operating temperature, etc.

- Monitor the status of each link in the RCN network to ensure proper operations, and address failures as required.
- Maintain a calendar of planned system downtime to perform maintenance activities. The NM will notify the WG and MAs of any planned downtime with detail such as the date, time, expected duration, and impacts on the RCN.
- Coordinate with PM and the MAs to provide transport across the RCN for the RVS installed and maintained by MAG.
- Perform general network administration oversight and preventative maintenance functions as they relate to the RCN electronics equipment.
- Manage and enforce equipment warranties and operational support service provided by the equipment manufacturers.
- Close out TTs and document changes that have been made to the RCN configuration, and maintain RCN maintenance records and drawings.
- Generate and track the progress of TTs for each system related problem reported by the MAs (or problem identified by the NM during routine preventative maintenance checks). Upon request by a MA representative, generate a report on TTs for any agency. This may also be addressed via the TT tracking software.
- Observe equipment trouble shooting activities, corrective measures taken, and testing of the corrective measures taken.
- Post diagrams and documents that describe any changes made to the RCN configuration.

11 CENTRAL WORK ORDER TRACKING SYSTEM

This section will identify the roles and responsibilities related to the Central Work Order Tracking System.

The MA will:

- Proactively respond to RCN failures that fall within the responsibility of the agency (e.g., fiber cut).
- Notify NM of repairs, issues, or related coordination activities through its representative as appropriate.
- Provide a list of authorized users who can makes requests for service.
- Facilitate agency repairs as may be required.

The PM will:

- Obtain MAG funding for the initial installation, maintenance, and operations of a Central Work Order Tracking System.
- Facilitate the development of a web based system to create and track work orders and TTs.
- Review summary reports of TTs and assist with issues and delinquencies as may be required.
- Make policy recommendations to ITS/TAG and arbitrate issues that may arise.
- Coordinate with the other RCN partners.

The NM will:

- Track and respond to work orders assigned to the NM.
- Track all RCN hardware and the inventory of spare parts that are assigned to the NM, if any.
- Provide monthly reports to the PM for distribution to the WG. The report should include information about open and closed tickets, response times, and the time required to close tickets.

12 GOVERNANCE

This section describes the RCN Management Reporting Structure that has been approved by MAG.

The Regional Community Network (RCN) is a fiber optic communications network that, when completed, would connect all MAG member agencies for the primary purpose of coordinating traffic control operations between neighboring agencies. The RCN communications network will allow the sharing of video and live traffic count data, and would help each jurisdiction manage its signal network more efficiently, thus improving safety, and reducing traffic delay and emissions. In addition, the RCN may be a significant communications asset in the event of a regional emergency evacuation due to a natural or a man-made cause. The network will also be available to support other interagency data sharing applications, including videoconferencing, Information Technology, and possibly public safety communications.

A number of larger cities and towns in the region have developed Traffic Management Centers that serve as the coordination centers for traffic management. Efficient management of the regional road network relies heavily on efficient communications between these centers. At present, a number of local agencies rely on local fiber networks as well as expensive leased phone lines for their agency-to-agency electronic communications. The RCN would eliminate the need for some leased fiber and/or phone lines and result in cost savings for those agencies. The RCN will also link ADOT's Freeway Traffic Operations Center, City of Phoenix's Transit Control Center, and METRO Rail's LRT Control Center to the rest of the regional traffic management network. The following is a subset of the information that will be shared:

Real-time traffic conditions
Crash bottlenecks
Plans for relief routes
Freeway cameras showing traffic heading towards local streets

The initial RCN design was developed as part of a study in which MAG examined ways to increase access to telecommunications and leverage existing agency infrastructure investments. Each agency agreed in principle to provide at least two fiber strands in key locations to allow the creation of a network connecting all MAG member agencies. The design called for filling key gaps to connect one agency's fiber to another's.

ADOT is currently overseeing the construction of Phase 1A of the RCN. This project will create the core ring and abbreviated East Valley and West Valley rings that will eventually be expanded into the full RCN. The original RCN concept specified a network carrying both general information technology data and transportation data, using advanced equipment to create multiple networks on a single pair of fiber. Limiting Phase 1A to accommodate the available budget reduced the scope to a single network carrying transportation data and supporting the RVS. The advanced electronics may still be added at a later date without discarding any equipment provided in Phase 1A.

The RCN Working Group (WG) is comprised of representatives of the member agencies serving on the Technology Advisory Group (TAG) and Intelligent Transportation Systems (ITS) Committee. This group currently develops recommendations for the management and future expansion of the Regional Community Network. The Working Group forwards recommendations

to the TAG and ITS committees for approval and from there the recommendations move through the normal MAG committee structure.

Following completion of Phase 1A of the RCN, the design consultant, Kimley-Horn and the selected turn-key solution provider, will manage the network for one year. This will give member agencies time to develop a funding mechanism for ongoing maintenance, a plan for the ongoing management of the network, and policies for its operation and expansion.

The RCN Working Group will work to identify a number of policies and procedures to assure that the network will fulfill the promise of increased access for Information Technology uses without compromising the primary transportation requirement imposed by the use of FHWA funding for construction and purchase of equipment. Additionally, the Working Group will recommend a network manager after the completion of the first year.

The TAG, ITS, and the RCN WG envision a formal structure whereby the day-to-day operations and routine addition of services to the network would be efficiently managed. To that end, the committees propose that they draft an initial set of policies and delineation of tasks to provide a framework for timely decisions while maintaining the oversight and policy role of the existing MAG process. The following details a suggested program.

Regional Council, Management Committee, Transportation Review Committee
Approve the initial set of policies.
Approve annual funding to support network management activities, including a small budget for incidentals as identified and included through the TIP process.
Review and approve any requests for additional funding for system maintenance.
Review and approve any requests for expansion funding.
Review and approve any policy changes.
Review and approve any removal of a previously approved agency service.
Receive annual reports on the status and function of the RCN.

ITS and TAG
Approve new services that have passed the RCN WG assessments.
Review and recommend approval of RCN WG policies to the TRC.
Approval of RCNWG guidelines.
Proposed Regional Community Network Management Reporting Structure
Review and recommend approval of annual funding to support network management activities including a small budget for incidentals.
Receive annual reports on the status and function of the RCN generated by the Network Manager and recommend them to the TRC.
Identify expansion projects and recommend approval to the TRC.
Approve no-cost expansions of the RCN on recommendation from the RCN WG.
Approve new classes of NGPs.
Approve individual requests for NGP connections.

RCN WG
Recommend initial policies and guidelines.
Develop a risk assessment procedure for new services.
Develop a risk assessment procedure for expansions.
Oversee the Network Manager and receive quarterly status reports.
Recommend additional service support.

Recommend expansion support.
Recommend annual funding levels.

Network Manager
Oversee the day-to-day operations of the RCN.
Coordinate repairs and maintenance.
Maintain the safety of the RCN.
Act as a resource for the connected agencies in troubleshooting applications.
Perform risk assessments for new services.
Perform risk assessments for expansions.
Generate quarterly status reports.
Monitor bandwidth and enforce restrictions on usage per the defined policy.
Identify bandwidth limitations and issues.

Member Agency RCN Representative
Coordinate access to agency facilities for repairs and maintenance.
Act as the main resource in troubleshooting applications and determining if the problem lies with the RCN.
Act as the single point of contact for the Network Manager.

13 POLICIES

This section defines the polices under which the ITS and TAG committees will make the decisions delegated to them under the adopted governance structure.

No Cost Additions of Applications

Policy: The TAG and ITS committees will approve no cost additions of applications that respect the funding requirements, technical limitations, regional nature and equitable use of the RCN.

Purpose: This policy allows the timely addition of applications to the RCN while providing for fair accommodation to participating agencies.

Applicability: This policy applies only to no cost application additions by existing participants in the RCN.

Procedure: The TAG and ITS committees will review all requests that seek to add additional applications based on the following criteria.

Area	Description
Compatibility with funding requirements	Transportation uses must be given priority because construction of the facilities relies on federal transportation funding. Additional uses are permitted as long as they do not affect the transportation use. Projects must demonstrate that they are either compatible with the transportation use or that they will not impact that use in order to be considered.
Bandwidth Usage	The proposed use should be shown to not exceed the available bandwidth of the network, including burst traffic.
Regional Use	Regional uses of the network for interagency communication should be given preference over individual use.
Agency Distribution	The project should reflect a reasonable distribution of bandwidth among agencies.
Cost	Agencies should demonstrate that there will be no additional costs borne by the RCN for the implementation of the application. The agency will have the option of doing this by assuming the costs associated with implementation.

Requests for applications must include the understanding that non-transportation applications may have to be removed from the network in the future or may have to upgrade equipment to maintain the ability to execute transportation related applications.

A request must be approved by both committees before the additional application is added to the RCN.