

**Project MESA;
Service Specification Group - Services and Applications;
Statement of Requirements Executive summary**



MESA

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The Public Safety Partnership Project (PSPP), Project MESA (Mobility for Emergency and Safety Applications), is an international collaborative effort for the coordination and development of next-generation high-mobility wireless broadband data specifications, standards, and capabilities. A MESA-capable system and applicable standards are envisioned to cover the transfer of digital voice, data, video (including infrared), and other digital data applications at high data rates between and among MESA-capable user devices and external network components. Various applications and services that the Project may benefit, as both an ad hoc or day-to-day operational environment, include all MESA users¹ involved in traditional Public Safety/Public Protection (PS/PP) entities such as law enforcement, fire protection and suppression, and emergency medical services (i.e. First Responders to incidents).

For the purposes of the present document, the term "MESA user" is construed to also include all compensated and volunteer PS/PP services, agencies, and entities that are involved in the aforementioned traditional activities and natural and manmade emergency and disaster mitigation and response, homeland security, peacekeeping activities, national/international crime and terror investigative services (including mass destruction and bio-terrorism investigation, mitigation, and response), transportation provision and management, and natural resources management. The term MESA user also includes those traditionally non-public safety governmental services that acquire a PS/PP role, activity, or tasks in preparation for or in response to an emergency event or a pre-planned large-scale event. This would include all military services that become engaged in support of any of these activities or roles.

The Statement of Requirements (SoR) development, technical specification, and standards development activities of Project MESA are currently supported through two Organizational Partners (OP), representing Europe and North America—the European Telecommunications Standards Institute (ETSI) and the Telecommunications Industry Association (TIA). The final Project MESA deliverables will be used by the supporting Standards Development Organizations (i.e. TIA, ETSI, or others who join later) for regional development and publication. Other technical organizations and entities are also encouraged to consider MESA activities, specifications, and resulting standards that are published.

The initial Project MESA SoR document was approved by the Project MESA Steering Committee in 2002 and represents the first trans-Atlantic consolidated view expressed directly by the professional users of advanced wireless data communications equipment and systems. The SoR was developed as part of a global effort to identify and develop uniform capabilities, scenarios, specifications, and eventually a suite of open technical standards that can be used for the elaboration of next-generation wireless broadband data communications equipment and systems. These voluntary standards will be used to achieve the objectives of the MESA user communities. Project MESA's activities support the efforts of the member organizations from many countries in meeting their own PS/PP and public service wireless data telecommunications requirements.

The Project MESA SoR reflects the vision of a mobile broadband network (shared and/or ad hoc) that can be simultaneously accessed by multiple users, using various applications and levels of security, in a specified geographical area, and that may operate potentially independently from the availability of public networks and the supply of commercial electrical power. Specifically, the SoR describes the services and applications (involving air interface user data rates up to 2 megabits per second [Mb/s] or greater)² that a future advanced wireless telecommunications system should be able to support, in order to realize the most effective operational environment for the users. Emphasis has been placed on those applications and technological platforms that current technology has not yet satisfactorily addressed, but which have been identified by the users and their agencies as key requirements for applications and services.

Consistent with the MESA users' missions, it is also expected that the Project MESA SoR and the resulting technical specifications will:

- Emphasize transparent and seamless wide-area network applications.
- Include multiple levels of security and data encryption schemes.
- Offer robust operational management and control systems capabilities.
- Reflect the requirements of MESA users to have priority operational services and priority system restoration.
- Provide an extremely reliable service model and ubiquitous coverage within a user's defined service area.

¹ Including federal, national, regional, state, local, tribal and non-governmental organizations, as applicable.

² This corresponds to the ITU definitions of 'broadband' viz. beyond the primary rate which is 1,5 Mbps to 2 Mbps

Additionally, the MESA SoR is intended to describe a functional and open standards-based platform that can be installed as either a private system owned by the government or a governmental-commercial partnership that provides authorized service to MESA user agencies and possibly secondary service to other commercial clients. The Project MESA specifications are not intended to specifically identify particular frequency spectrum for use, thereby allowing standardized technology to be used in any authorized and available spectrum consistent with the required channel bandwidth.

Within the SoR document, a general outline of the MESA user community's technological needs for the transport and distribution of rate-intensive data, digital video, infrared video, and digital voice for both service-specific and general applications is categorized into six distinct sections:

- Technology needs of each type of MESA user discipline.
- General technology requirements.
- General, functional, and operational requirements.
- Technology and applications.
- Use of technologies.
- Compatibility requirements for the various applications.

Each section details requirements used in different national and international PS/PP programs. Additionally, four annexes are incorporated into the SoR document, providing additional informational materials to further the reader's understanding of the requirements and how the resulting technology might be applied in "real-world" applications. The annexes include national and international PS/PP programs; standards, specifications, and requirements; known North American federal, state, and county requirements; and two law enforcement scenarios—a courthouse murder and a state and urban police response to an earthquake event.

The SoR document is not written specifically to be studied end-to-end; rather it represents a unique source of information with the aim of providing an understanding of the unique and often very difficult and dangerous working environments that the MESA user community is facing, that industry can use in providing the most innovative, effective, and accurate technical solutions to meet this unique operational environment. It also represents the establishment of the clear understanding that the advanced needs of this user community should be based on a highly mobile, interoperable, broadband wireless network that allows the provision of dynamic bandwidth, self-healing characteristics and secure network access.

Within Project MESA, the SoR document will be updated at regular intervals and represents the focal source of information for Project MESA's industry members in their work toward the realization of next-generation, globally applicable communications capabilities, specifications, and the future standards that evolve from them.

The intention is that the corresponding MESA Technical Specification Group will utilize the evolving SoR in order to map existing and needed capabilities, standards and gaps, progressing toward the development of corresponding technical specifications. A "System of Systems" approach is being utilized, leveraging current and evolving communications technology and user requirements.

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MESA output will be transposed by supporting standards development organizations (i.e. TIA, ETSI, etc.) for regional development and publication. Other technical organizations and entities are encouraged to consider MESA activities and approved specifications, as well as resulting standards that are published.

Summary of MESA user community's technological needs

General mission statements and the technology needs of each type of MESA user discipline

This clause of the Project MESA SoR describes the overall requirements of most MESA user agencies in Europe and North America. The Project MESA specifications and requirements created from the document should include, but are not limited to, the following security and PS/PP providers, services, and functions provided throughout the world. Project MESA participants have indicated the need for the providers, services, and functions stated below because the type of wireless communications support is crucial to ensure quality services can be provided to the constituents they serve. The following providers, services, and functions are included, along with their "Mission Statements" relative to the Project MESA SoR:

- **Criminal Justice Providers:** Project MESA should provide the technology necessary to support new telecommunications and automation tools that are aimed at reducing crime and its impact on the health, welfare, and safety of the citizenry.
- **Emergency Management or Disaster Response/Recovery Agencies:** Communications system requirements for emergency management and disaster services are characterized by a very low usage pattern during routine operations and extremely high usage patterns during major disasters or events. Special operations needs include response functions to an event requiring specialized training for safe and effective operations, consisting of hazardous materials leak and/or spill remediation, mountain rescue and associated technical rescue, collapse search and rescue, swift water rescue, blue water rescue, trench and confined space rescue, and heavy rescue.
- **Health Services:** This service encompasses the missions of two areas, including Emergency Medical Services (EMS) and disaster medicine. Doctors, paramedics, medical technicians, nurses, or volunteers can supply health services, including critical invasive and supportive care of sick and injured citizens and the ability to transfer the people in a safe and controlled environment.
- **Fire Services:** With variations from region to region and country to country, the primary areas of responsibility of the fire services include structural fire fighting and wild land fire fighting, fire safety and prevention, life saving through search and rescue, rendering of humanitarian services, management of hazardous materials and protection of the environment, salvage and damage control, safety management, and mass decontamination.
- **Coast Guard Services (and related PS/PP functions):** These services include search and rescue (at sea and other waterways), protection of coastal waters, criminal interdiction, illegal immigration, and disaster and humanitarian assistance in areas of operation.
- **Airport Security Services (and related PS/PP functions):** Airport security should include the capability to communicate by secure radio or wireless data services with "Airport Management" and "Control Tower" operations. Airport operations must be able to effectively communicate with various PS/PP organizations for routine and disaster incident communications.
- **Hazardous Materials (HAZMAT) (and related PS/PP functions):** HAZMAT incidents can be complex and may involve resources of many different PS/PP organizations, including coordination and management, analysis and material classification, handling, and cleanup and rectification.
- **Correctional Institutions:** The Project MESA SoR should include specifications and proposed standards to ensure the enhanced long-term wireless communications needs of prisons, jails, and other correctional institutions.
- **Correctional Enforcement and Probation Officers:** Project MESA specifications and standards will provide correctional and parole officers a full range of high-speed, high-data-rate wireless public safety/public protection services and applications to effectively support their mission.
- **Special Event Planning Groups:** The Project MESA SoR outlines some of the more urgently needed mobile data communications tools that will help PS/PP agencies be prepared and effectively coordinate response with efficient communications tools to predictable large-scale events simultaneously at various locations.
- **General Governmental and/or Government Administration:** The technological requirements included in the Project MESA SoR will greatly assist general government services providers in their efforts to offer effective and innovative water, sewage, electrical, public parks, schools, pest abatement and control, building code enforcement, planning and zoning and enforcement, and public health services.

- Land and Natural Resource Management: Governmental agencies at all levels are responsible for the oversight of a nation's environmental, land, forestry and conservation, and agricultural development. These entities fall into this unique but broad-based PS/PP category. The specifications and standards should define technology capable of operating in these sometimes extremely harsh conditions.
- Transportation's Organizational Mandates and Missions: Organizations at all levels of government are responsible for the planning, construction, management, and maintenance of many forms of transportation systems. To meet this requirement, these agencies must be able to effectively communicate and respond to events such as snowstorms, mudslides, flooding, earthquakes, and hazardous material spills that impact the world's transportation infrastructures.
- Intelligent Transportation Systems (ITS): Many PS/PP transportation organizations interact with what is commonly designated as an ITS, which provide a plethora of information about transportation systems, corridors, and transport vehicles traversing these arteries. The services and applications defined in the Project MESA SoR are intended to enhance, not replace, the existing wireline, fiber-optic, or microwave infrastructures used to provide the traveling public with an ITS.

Introduction and general technology-requirements

The objective of the Project MESA SoR is to establish a suite of specifications and proposed technical standards that are created from the user's perspective. Some of the primary capabilities of a Project MESA network may include, but are not limited to, the following:

- Improvements in spectrum efficiencies.
- Incorporation of frequency neutrality and/or agility.
- Life-cycle procurements.
- Security requirements.
- Economical and ergonomically friendly design.
- Digital migration in place.
- Consistency with existing standards.
- Compatibility with multiple international standards.
- Two-way communication.
- Multiple levels of security.
- Multiple levels of availability of service.
- End-to-end network integrity.
- High-speed, error-free service.
- System and network access.
- Compliance with the need of the participating nations.

General, functional, and operational

The Project MESA specifications and technical standards developed in response to the SoR are intended to provide the baseline technology requirements to allow for the identification and development of universal specifications and standards. The specifications and standards will be regionally transposed to accommodate the implementation of local, wide-area, national, and international high-speed PS/PP data networks. The following issues related to requirements are presented and discussed to further the definition of the requirement and the compilation of the technical specifications:

- Requirements of the Project MESA SoR.
- Interface requirements.
- Transparent interfaces.

- End-to-end transmit time.
- Interface protocol requirements.
- Dynamic partitioning.
- High-speed simultaneous network or system access.
- Network pre-emption.
- First-In, First-Out (FIFO).
- Transparent transfer.
- Over-The-Air Rekeying (OTAR).
- Automated information requirements.
- Blocking of unauthorized access.
- MESA network component identification.
- Optional site-by-site implementation and management.
- Dynamic remote partitioning.
- System and/or network transaction audit trail.
- Ability to provide statistical reports.
- Agency-by-agency and site-by-site reports.
- Dynamic transfer rates and bandwidth allocation.
- Degradation and redundancy.
- Duty cycle requirements.
- Pre-testing technology proposals.
- Compliance with national and international rules, regulations, and standards.
- High-speed access to national databases.

Technology and applications

The Project MESA specifications and technical standards are being designed to accommodate, but not be limited to, the transfer of information from multiple digital applications, the use of existing protocols and platforms, in-building and portable service, regional and national interoperability, and interoperability between Project MESA user devices applications and Project MESA compliant systems. Some of the primary attributes of a Project MESA network(s) include, but are not limited to, the following:

- Use of standardized technology.
- Use of open architectures.
- Migration.
- Service platform.
- Priority services.
- Traffic (data) distribution.
- Network and data base interconnectivity.
- Dynamic network optimization.

- Frequency neutral technology.
- Adequate interference protection.
- Regulatory compliance.
- Environmental safety.
- Compliance with Project MESA SoR.
- Open interfaces.
- Related documents, standards, policies or requirements.
- Network transmission requirements.
- Location determination.
- Delayed transmission and remote stops.
- Dynamic updating of data fields.

The Use of technologies and the compatibility requirements for the various applications

Project MESA's analysis and development efforts should elicit specifications and proposed standards that comply with the SoR's basic requirement for immediate, error-free transfer and display of all forms and types of data. These would include, and not be limited to, text, voice, video, infrared video, photographs, and detailed graphical information. Examples of the data and information that may be supported include maps, engineering plans or drawings, fingerprints, text and graphical files, reports, and all other data, information, or representations developed by applications as may otherwise be specified in the present document. The operational needs to address these issues are incorporated in the Project MESA SoR, providing the user's perspective of the types of applications, services, and technologies that are expected to be needed to continue improvement of both the performance and safety of PS/PP agencies. Some of the systems, applications, and information and data elements to be considered for inclusion are:

- Data to be transported.
- Electronic messaging.
- Encryption.
- Transparent network and system access.
- Access, switching, and rebroadcast of ITS and other real-time video sources to field resources.
- Transmission of complex files.
- System integration and interoperability.
- Transmission of user and patient monitoring telemetry.
- Transmission of geographical location data.
- Transmission of full-motion video, still photographs, and images.

Informational material in annexes A to D

The four annexes serve as informational material to educate interested parties regarding Project MESA's efforts.

- Annex A describes national and international PS/PP programs, and existing potentially applicable standards, specifications, and requirements. Topics of discussion include, but are not limited to, the implementation of interoperable technologies, the impact of the U.S. Government's Public Safety Wireless Advisory Committee's (PSWAC) general requirements on Project MESA, the impact of recent major events, i.e. New York World Trade Center bombing, on the Project MESA SoR, the administrative control of transportation and other related public safety/public protection telemetry, the use of global location system in Project MESA, EMS video applications, and search and rescue applications of robotics.

- Annex B describes known North American federal, state, and country requirements. The informative material includes, but is not limited to, the Federal Bureau of Investigation's (FBI) National Crime Information Center (NCIC) 2000 System Requirements, the FBI's Technology Planning Guide, and the Federal Manual on Approaches to Implementing an Incident-Based Reporting System (Volume 3).
- Annex C details a possible law enforcement scenario, i.e. a courthouse murder, in which Project MESA requirements can be used to effectively and efficiently control the incident using Project MESA standards, specifications, and requirements set forth in the SoR.
- Annex D details a second possible law enforcement scenario, i.e. state and urban police response to earthquake damage, in which Project MESA requirements can be used to effectively and efficiently control the incident using Project MESA standards, specifications, and requirements set forth in the SoR.