# Project MESA: Broadband Telecommunications for PPDR

**Telecommunications Industry Association (TIA)**

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# Introduction

o Project MESA is about advanced mobile Broadband for PPDR (also Public Safety/Disaster Response/Emergency Communications)

o International Partnership Project for globally applicable PPDR User requirements and technical specifications for digital mobile broadband technology

- Combined work efforts provide a forum in which key players and users can contribute actively to the elaboration of user requirements (*e.g.*, SoR) and corresponding technical specifications.

- Involving advanced and future PPDR communications

- Current OPs: TIA (N. America) and ETSI (Europe)

- Agreement ratified Jan, 2001 in the City of Mesa, AZ

- MESA = **M**obility for **E**mergency and **S**afety **A**pplications

o Website: www.projectmesa.org
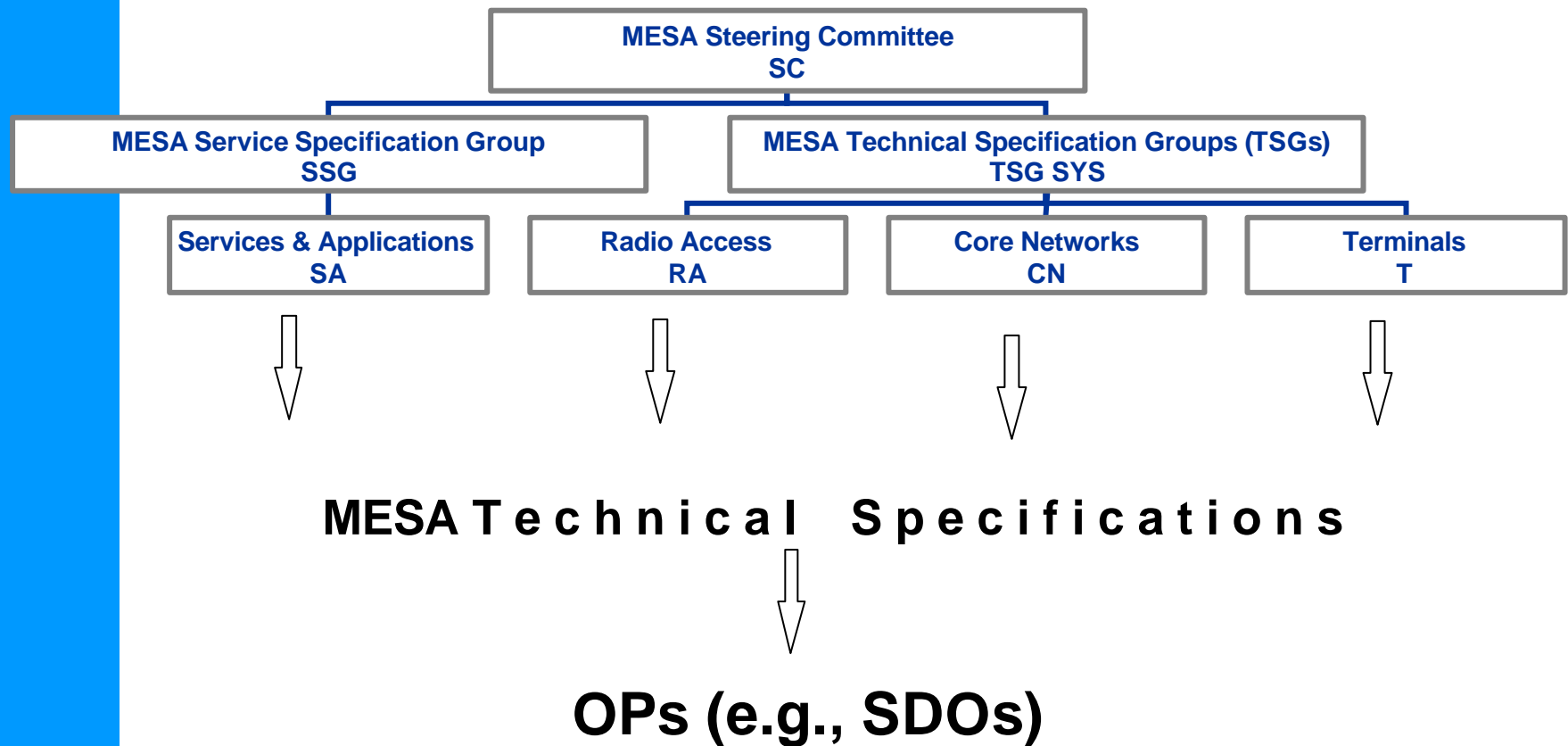
- Documents are publically available

# Introduction

o  MESA goals:  Implementation of advanced digital services based on a very high bit-rate mobile platform (over 2 Mb/s)

- Ad-hoc mobile and fixed networks/components
- Mobile and remote communications/sensor/other applications
- Interoperability/Interworking capabilities
- Highly secure and robust
- Coordinated specifications, for Broadband Terrestrial Mobility and SatCom applications and services, driven by common scenarios, requirements and spectrum allocations
- Note that an actual Project MESA network will be RF based and many of the applications and functions will reside off-network
- MESA RF Network layers:
  - The first layer allows network access to Users
  - The next layer will be its management, distribution, and control functions

# Project MESA Structure

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┌─────────────────────────────────────┐
│     MESA Steering Committee          │
│              SC                      │
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| MESA Service Specification Group<br>SSG | MESA Technical Specification Groups (TSGs)<br>TSG SYS |
|---|---|

| Services & Applications<br>SA | Radio Access<br>RA | Core Networks<br>CN | Terminals<br>T |
|---|---|---|---|

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## MESA T e c h n i c a l   S p e c i f i c a t i o n s

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## OPs (e.g., SDOs)

**Project MESA**

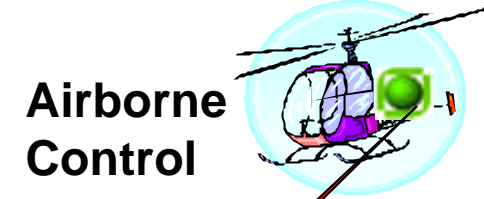**Airborne Control**

**Backhaul Satcom Link**

- **Quickly deployable, compatible, interoperable**

- **Auto-est. network (terminal recognition)**
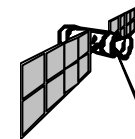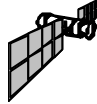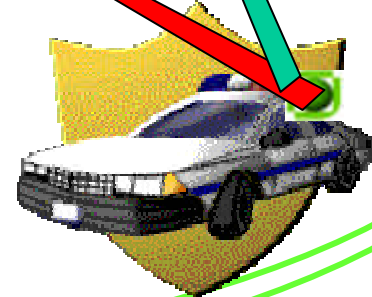
- **Self-healing**
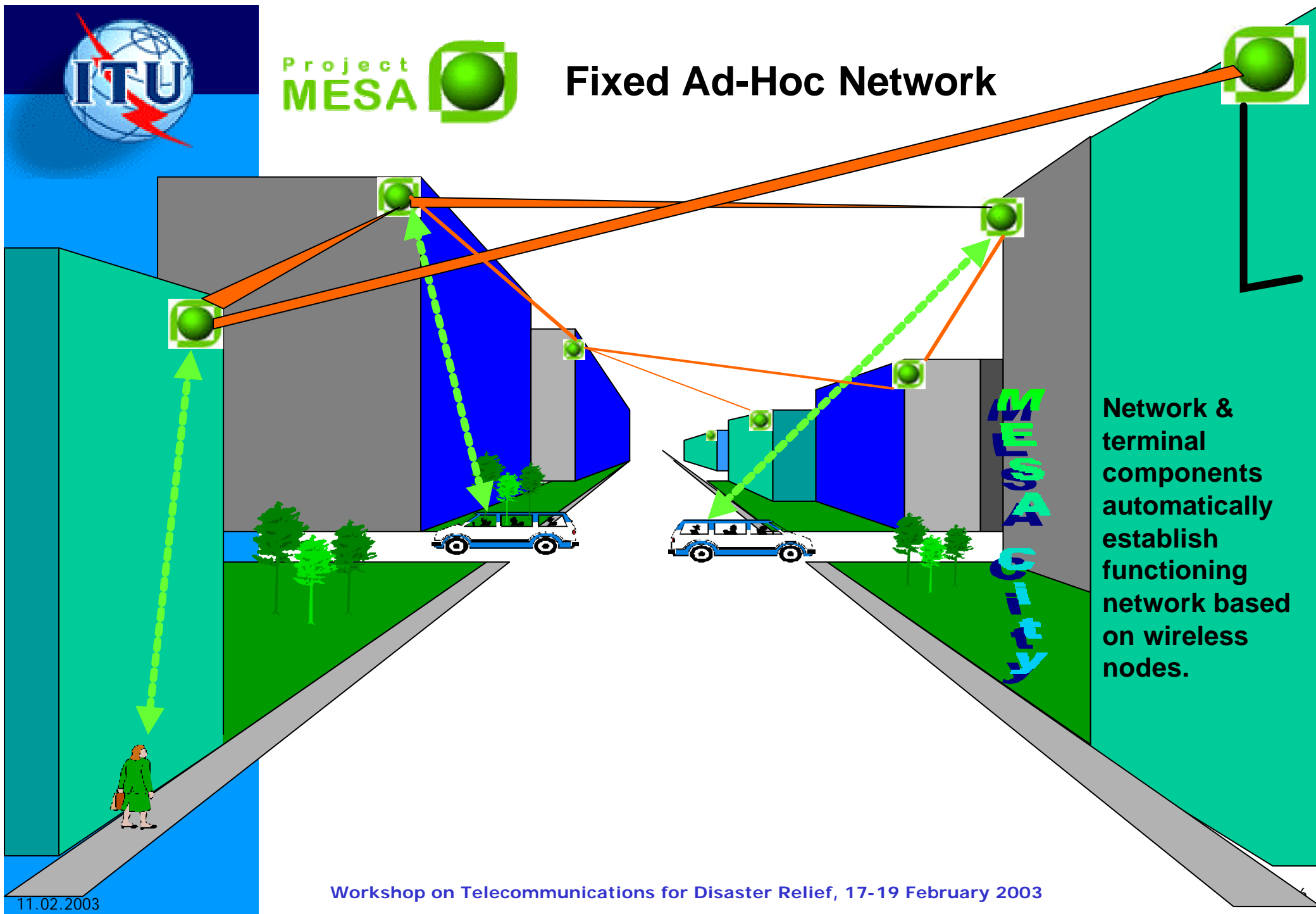
**The MESA Firefighter**

**Telemedical Assistance**

# Fixed Ad-Hoc Network

**Network & terminal components automatically establish functioning network based on wireless nodes.**

11.02.2003

# User Requirements

o Project MESA efforts have focused initially on the advanced "User" requirements of the PPDR and related sectors/agencies

- Criminal justice services: Police/Law Enforcement/Anti-terrorism, National and International

- Advanced Surveillance and Security (Airports, Nuclear Power Plants, etc)

- Emergency and Medical Services (including emergency management and Telemedicine)

- Advanced Firefighting

- Land/natural resource/wildlife management

- Civil Defense and Disaster Response, etc.

- Military

- Transportation (*i.e.*, ITS)

- … and other similar governmental functions that have a *need for aeronautical and terrestrial*, *high-speed, broadband, digital, mobile wireless communications*.

o PPDR User requirements and services (also applicable scenarios) are defined in the MESA Statement of Requirements (SoR) Document

# User Requirements: MESA SoR

o First document to specifically involve direct & consolidated (trans-atlantic) PPDR User input, within an International Standardization Partnership Project

   • Users of advanced wireless telecommunications equipment

o Intended to describe functional requirements and technical specification needs for future broadband PPDR communications systems

   • Emphasis placed on applications which current technology cannot carry out in full, but identified by users/agencies as key broadband requirements for future systems

   • A realized system could be installed as either a private system owned by the government or a governmental/commercial partnership that provides priority service to PPDR-related agencies

# User Requirements: MESA SoR

o Part of a global effort to create uniform specifications and eventually a suite of open standards that could be used for the creation of the next generations of wireless equipment/systems that will be needed to achieve the objectives of the PPDR community

- Specifically, the SoR involves the PPDR community's technological needs for the transport and distribution of rate-intensive data, high resolution digital video, infrared video and digital voice for both service-specific and general applications

- SoR requirements are also intended to clearly chart a migration path from today's analog PPDR systems to the next generations of wireless, high-speed, digital transport system specifications

- Planning for the future, *NOW!*

# User Requirements: MESA SoR

o It is about PPDR users driving technology, not technology (standards) driving users

- Direct User input before standardization activities begin

o MESA will leverage existing technology and systems

- Opportunity for coordinative efforts (*other SDOs & Orgs*)

o Interoperability and interworking with identified networks/other systems and equipment is key

- Continued opportunity for coordinative efforts

o MESA Steering Committee approved latest SoR at September 2002 MESA #5 Meeting

o Also approved MESA Technical Reports—

- **SoR Matrix**: Mapping document that defines initial requirements to be used as a basis for the elaboration of the MESA SoR into TSGs

- **Definitions, Abbreviations and Symbols Document**: Will be used in documents prepared by Project MESA (*provides common, cross-regional understanding*)

  - Matrix may also be a useful SoR/User mapping tool for other interested parties
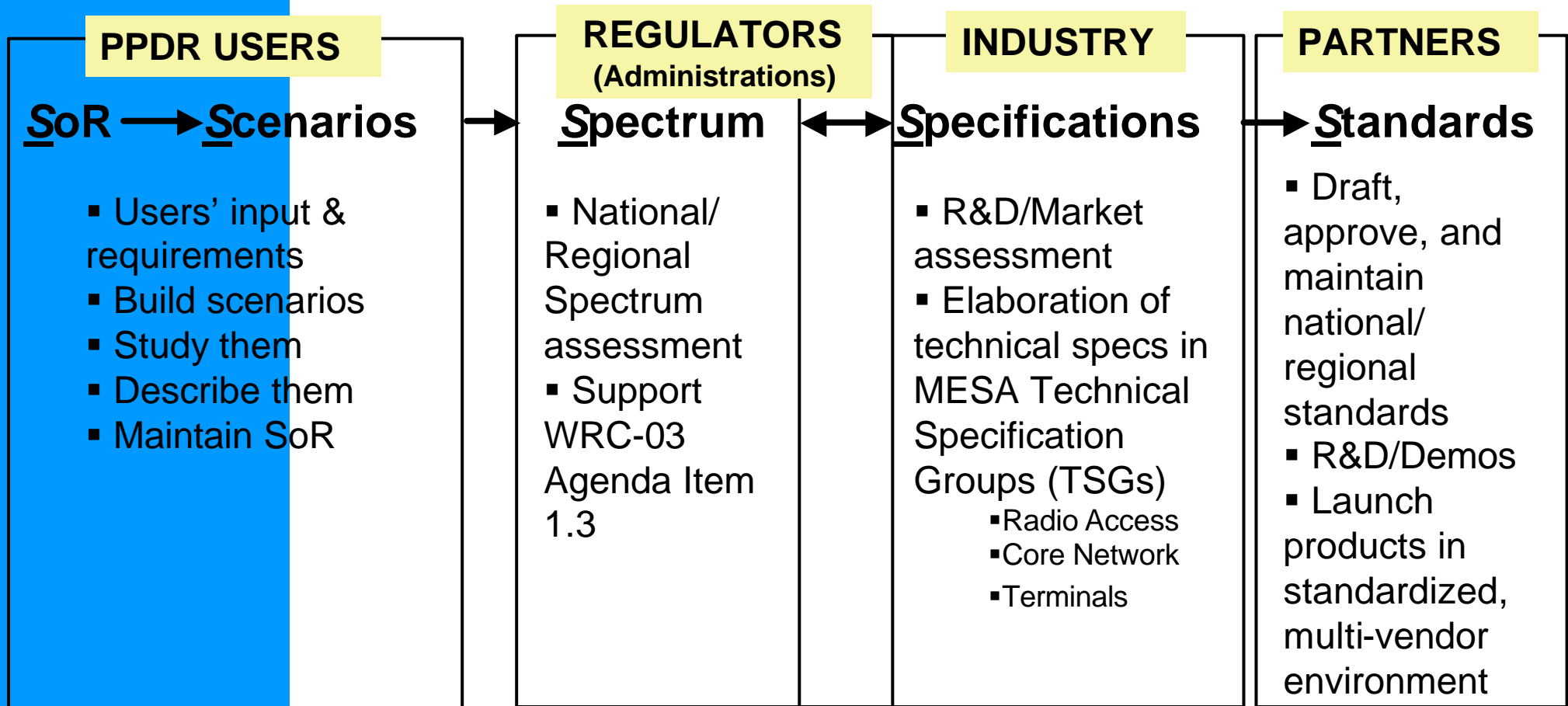
# User Requirements: MESA SoR

o SoR is a "Living document"– Updated at regular intervals

o Not meant to be studied end-to-end; specific specs/scenarios for specific applications

o MESA TSGs/Industry will now utilize the SoR as a blueprint for future emergency communication specifications and standardization work that is part of Project MESA

  • In response to approved SoR/other mentioned output

  • Discussions will include current/future PPDR spectrum/technologies

o For more information and to view the latest SoR document, please go to:

  • http://www.projectmesa.org/SoR.htm

# PPDR Users in the Driver's Seat
## *Process and relationships (The 5 "S" principle)*

| **PPDR USERS** | **REGULATORS**<br>**(Administrations)** | **INDUSTRY** | **PARTNERS** |
|---|---|---|---|
| **SoR ➝ Scenarios** | **Spectrum** | **Specifications** | **Standards** |
| ▪ Users' input & requirements<br>▪ Build scenarios<br>▪ Study them<br>▪ Describe them<br>▪ Maintain SoR | ▪ National/ Regional Spectrum assessment<br>▪ Support WRC-03 Agenda Item 1.3 | ▪ R&D/Market assessment<br>▪ Elaboration of technical specs in MESA Technical Specification Groups (TSGs)<br>  ▪Radio Access<br>  ▪Core Network<br>  ▪Terminals | ▪ Draft, approve, and maintain national/ regional standards<br>▪ R&D/Demos<br>▪ Launch products in standardized, multi-vendor environment |

# Some Key MESA Requirements

o Ad-hoc, rapidly deployed, mobile broadband networks
- Integral part of equipment deployed
- Emphasize transparent and seamless applications
  - Including multiple levels of security and encryption
- Applications available on an individual or system-wide basis

o Independent of public infrastructures and public supply of electrical power (*Rural and Urban settings*)
- Can be complementary to and interwork with wireline/other infrastructure components

o Independent of public radio frequency spectrum
- A reasonable tuning capability must be included in the key technology to accommodate regional requirements
  - For example: 4 GHz band (4.2, 4.4 or 4.9)

o Globally/Regionally deployable and interoperable
- Globally/Regionally coordinated spectrum allocation is goal

o Auto establishing/self-healing/re-establishing wireless ad-hoc network elements
- "Plug and play;" Resilient; Robust

# Some Key MESA Requirements

o Wireless interconnection/switching into dedicated Broadband Infrastructures

- *I.E., F*iber backbone and/or Broadband satellite constellations

o Crypto transparent communications protocol hierarchy

- System does not care about the content of the actual "payload" data, which can be encrypted exactly to the specification of the network owner

o Single site "hot-spot" to "street-level" services

- MESA routers/repeaters can be applied as part of a mobile rescue squad (hot spot) or fixed mounted to accommodate coverage along a street, etc
  - *I.E.,* mounted on lamp posts or on building walls

o Large bandwidth requirements to facilitate broadband 2-way communications, data transfer, simultaneous multiple users, etc.

- Draft ITU-R CPM text indicates up to 60 MHz

- Other spectrum assessments available; support this bandwidth range

# Some Key MESA Requirements

o Interoperability/interworking with existing/other PPDR (private radio) systems and technology

o Interoperability/interworking with and between public switched and commercial communications systems in support of PPDR activity/connectivity

- MESA is intended to perform the wireless interconnection function
  - Anything that must be transmitted or received beyond a primary access point would either need to access a private network or a public network
  - Capabilities to include lawful interception and preferential traffic features

- Intended that a MESA ad-hoc network will have full capability to interface at a number of levels to both public and private networks and carriers
  - This includes capabilities for priority treatment of PPDR communications (*i.e.*, prioritization service)

- Standardized interfaces to public and private networks
  - Including PSTN, CMRS, private networks, public and private microwave systems, DS1 and DS3 Common Carrier services, ISDN circuits, etc

# Some Key MESA Requirements

o Interoperability/interworking … (*Continued*)

- Project MESA networks will need a standardized interface to both the public and "private" Internet transport services

- MESA network interfacing to Wide Area Networks (WAN) or Local Area Networks (LAN)

  - Many local PPDR applications and files will be managed, updated and used on a strictly local basis and used on a daily, as well as an emergency basis

  - Therefore, their transport over a WAN or LAN would seem to be a logical assumption

- MESA is a mobile and portable access tool, to a broad array of technologies, applications and protocols, that may require new standardized interfaces and protocols

  - The security level, transport vehicle and redundancy requirements would be dependent on User and application needs

  - Many of current PPDR applications reside on regional and national levels

    - o Assumed that there will be a very high dependence on interconnection to existing public and private networks

# Some Key MESA Requirements

o   The specifications and future standards developed in the Project MESA process will be capable of extremely high levels of security and support a range of encryption options (*for Users and systems*)

- **MESA Security Aspects (from SoR):**

    - **Security requirements:**  Permits effective, efficient, reliable, and, as may be required, secure (authenticated and/or encrypted) intra- and interagency communications (interoperability). The basic security platforms should be capable of being expanded and enhanced to meet each nation's individual requirements without degradation to overall system performance

    - **Multiple levels of security:**  All specifications and standards written to comply with the Project MESA SoR should allow for multiple levels and jurisdictionally specific types of security

    - **Compliant with the needs of participating nations:**  Specifications and standards written to comply with the Project MESA SoR will also be written to comply with the specific baseline requirement of the national governments that are active within the Project MESA process

    - **Blocking unauthorized access:**  The specifications and standards written to comply with the Project MESA SoR should include the ability to block access by unauthorized users

MOBILITY [m/sec]

Aero-
nautical

Vehicle

Walk

Fixed

**2 G** **2.5 G**

- P25 - TETRA

**Advanced PS Digital 2-Way Standards**

**3G**

MESA

High Speed Wireless Access

Carrier Frequency

| | | | | |
|---|---|---|---|---|
| 0.02 | 0.2 | 2 | 20 | 200 |

**Bit Rate [MB/ps]**

Narrowband ← Wideband Broadband →

**Bandwidth Positioning of MESA**

# Advanced/Future System

• *Not replacement for existing and evolving systems*

- **MESA combines mobility up to aeronautical speeds with broadband data rates**

- **Complements and interworks with known/planned narrow to broadband wireless standards & projects around the world**

- **The technology will call for a variety of advanced research (*e.g.*, Industrial, Academic)**

- **Recognized by entities like ITU, UN, NATO, FBI, NTIA, APCO, EU Commission, GSC (GTSC/GRSC), etc.**

# MESA Next Steps

o **Users have done first part of their homework**

- Approved SoR is here
- Users' input will continue to be crucial (scenarios, additional requirements, next version, etc.)

o **OPs are now officially adopting/publishing mentioned MESA Output docs**

o **MESA technological research and TSG work in progress**

- Opportunity for external coordination efforts

o **MESA participants to continue assisting Regulators and Administrations in preparation for WRC-2003 PPDR spectrum matters**

o **MESA #6, Spring 2003 in Ottawa, Canada**

- Additional SoR work (*i.e.*, revisions, etc.) by Users
- Industry Members (TSGs) to work on technical specs in response to approved SoR
- Open discussions of spectrum and technologies

o **To join Project MESA, visit:**
**http://www.projectmesa.org/IE/gen_info/join.htm**

- Public Safety (PS) member, Individual Member (IM), Observer, Guest, Organizational Partner (OP)-*Standards bodies*

**Advanced Mobile Broadband**

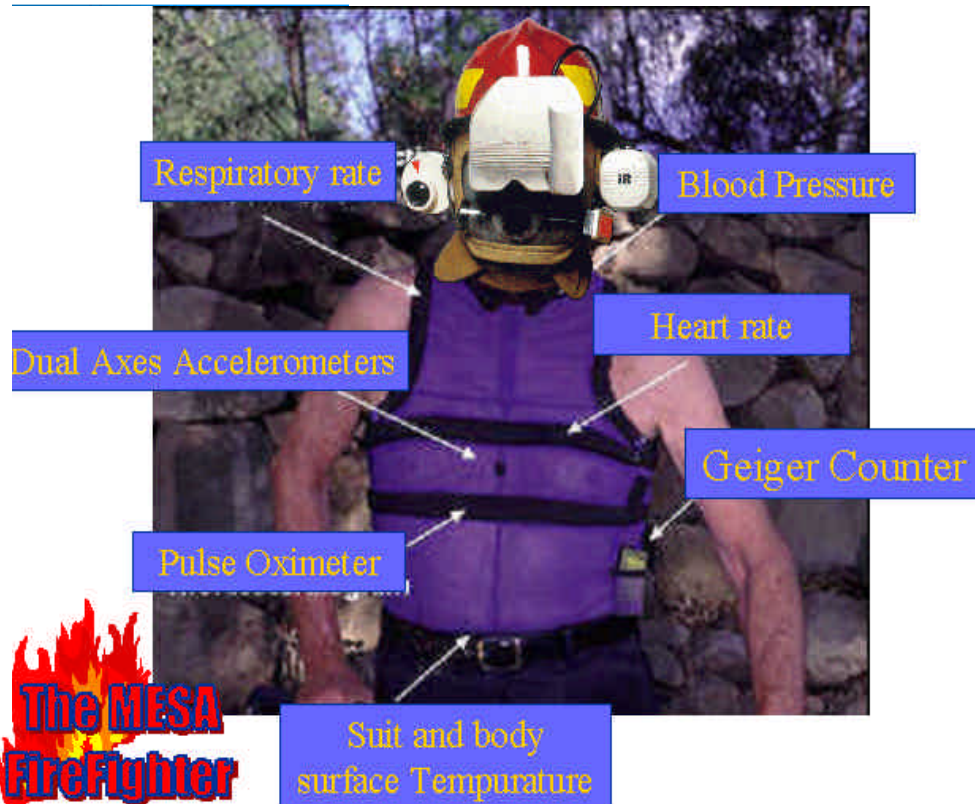**For**

**PPDR Professionals**

**---**

# The End!

## *Thank you for your time!*

**For more information, visit:**

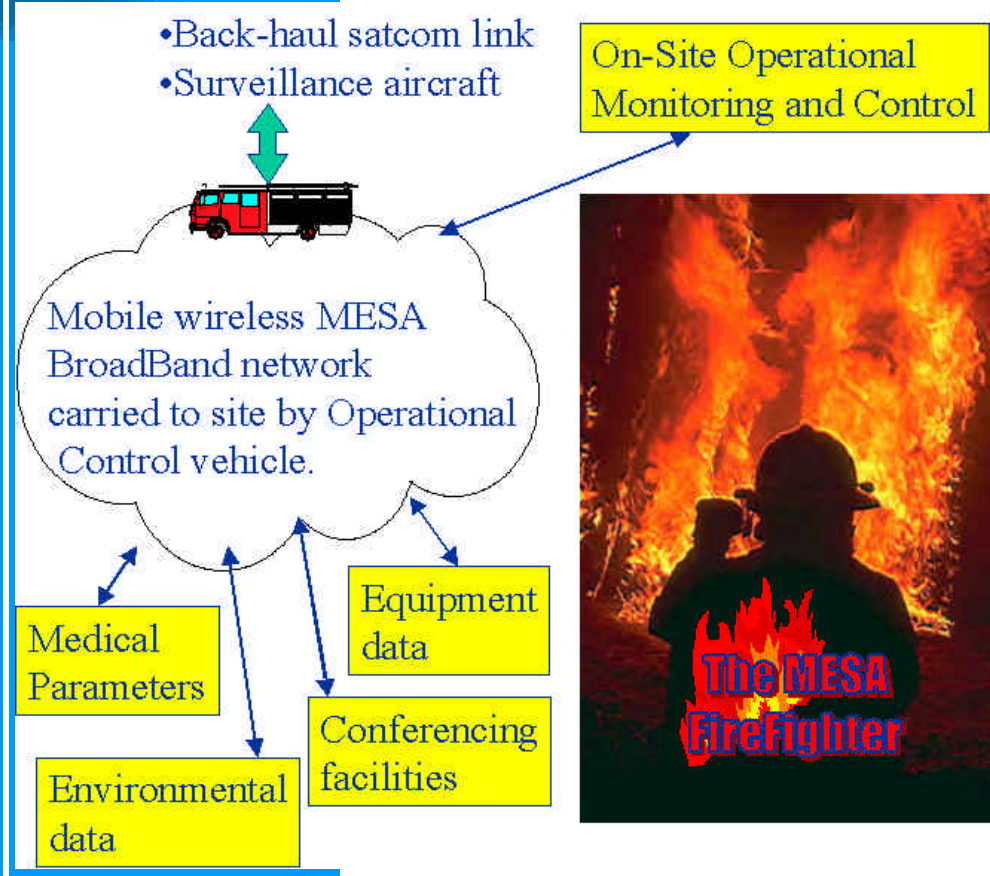**www.projectmesa.org**

**Additional slides follow:**

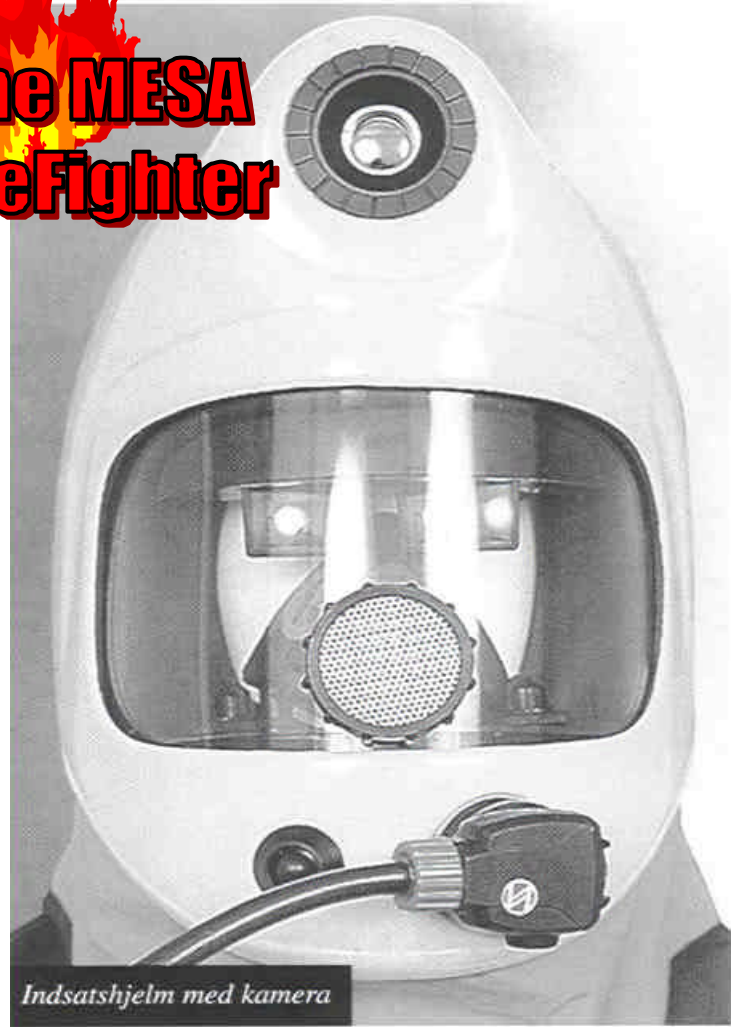•**Spectrum; Scenarios; Examples of technology**

The MESA Firefighter

# The MESA FireFighter

- **Full Command, Control, and Communications (C3) to all MESA Firefighters**

- **Online, realtime broadband interlinking**

- **Infra-red as well as visible light video monitoring**

- **Vital parameters surveillance**

•Back-haul satcom link
•Surveillance aircraft

On-Site Operational Monitoring and Control

Mobile wireless MESA BroadBand network carried to site by Operational Control vehicle.

Medical Parameters

Environmental data

Equipment data

Conferencing facilities

The MESA FireFighter

**Example of full on-site Command Control and Communication**

The MESA FireFighter

Indsatshjelm med kamera

# Emergency and Medical Services (EMS)
## Remote Patient Monitoring
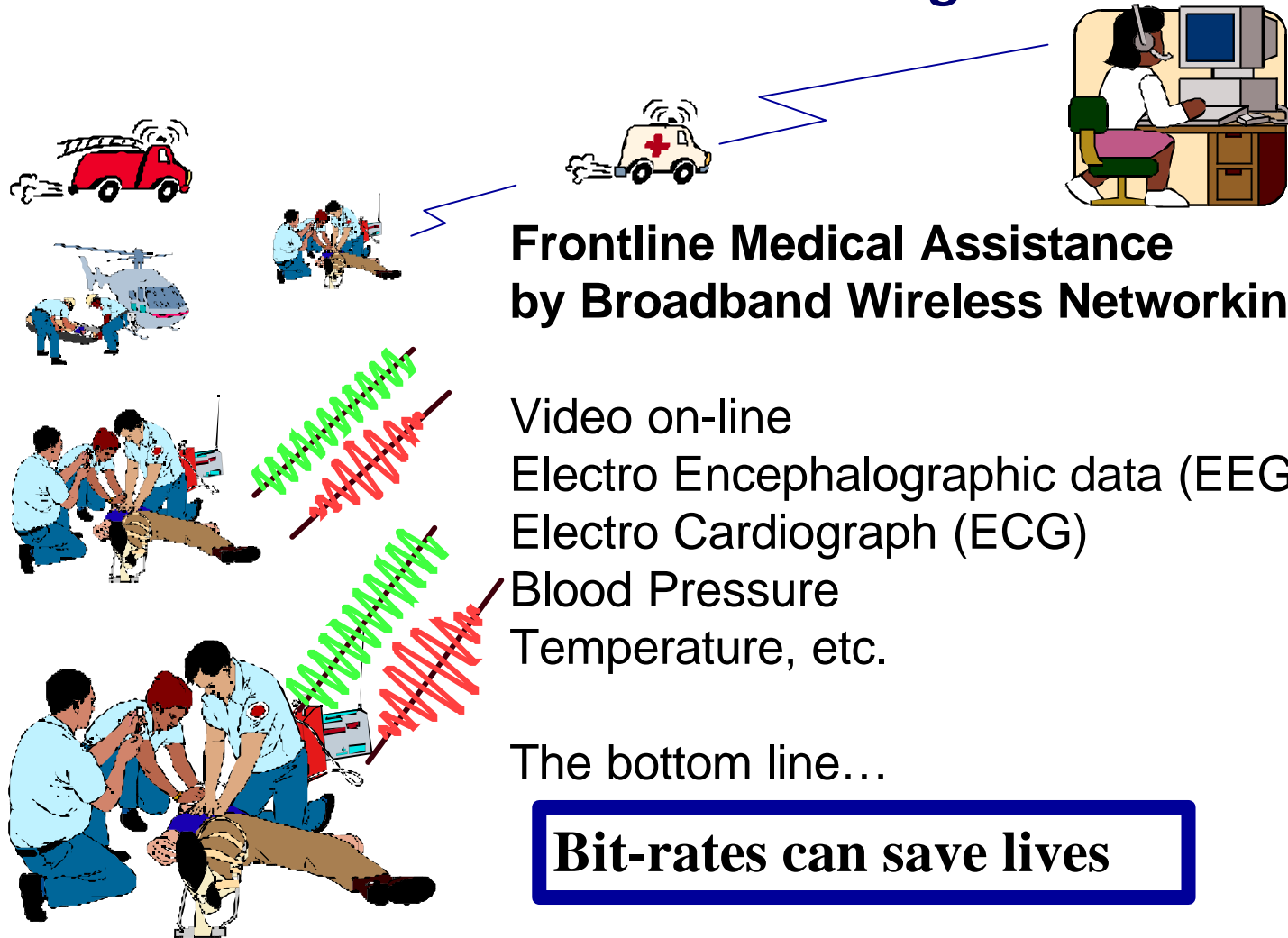
**Frontline Medical Assistance
by Broadband Wireless Networking:**

Video on-line
Electro Encephalographic data (EEG)
Electro Cardiograph (ECG)
Blood Pressure
Temperature, etc.

The bottom line…

**Bit-rates can save lives**

# Camera is Calling
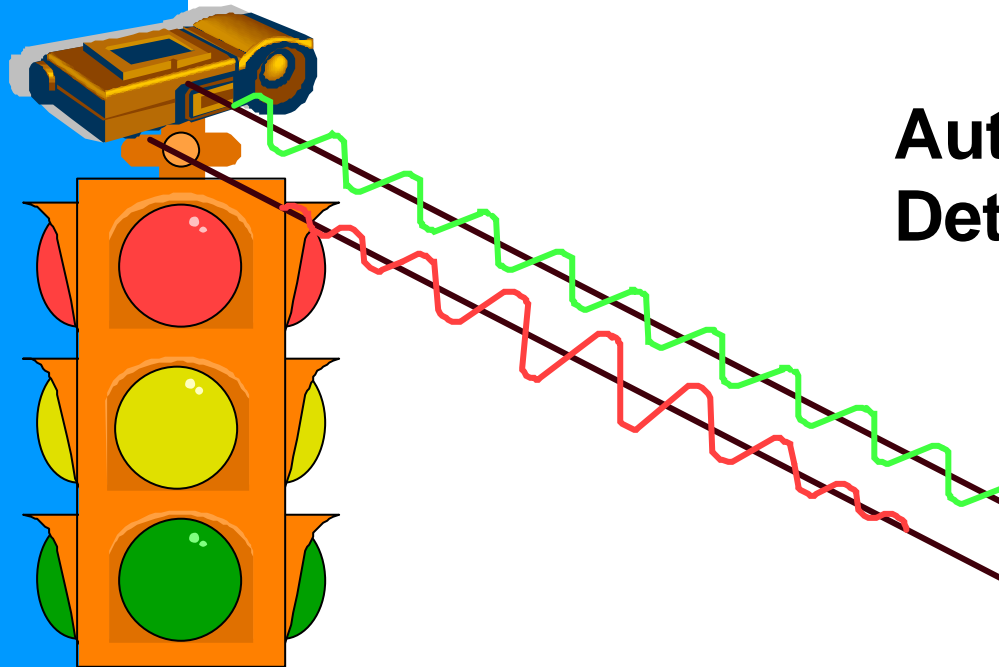
**Automatic Recognition &
Detection Capabilities:**

- **Sound**
- **Image**
- **Movement**
- **Material**
- **Radiation**

# Mobile Robotics

- **Automated inspection of non-accessible or hazardous areas**
- **Rescue of people from hazardous areas**
- **Anti-terrorist actions**
- **Incident response both tactical and non-tactical**
  - **Urban warfare**
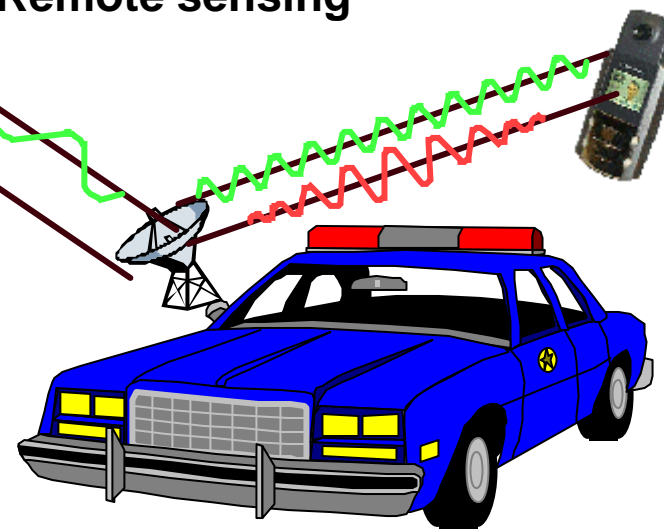  - **Haz-Mat Handling**
  - **Airborne control**
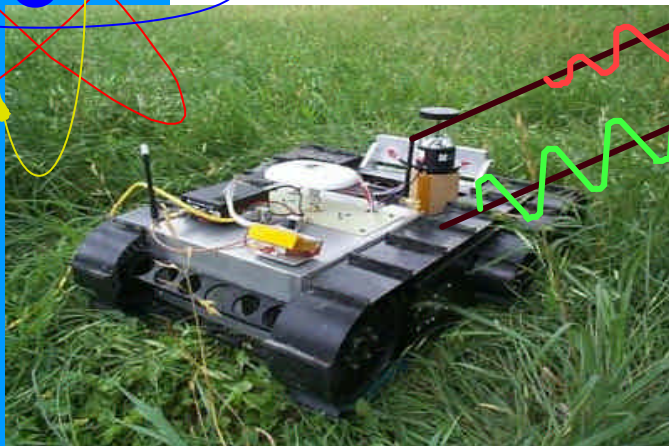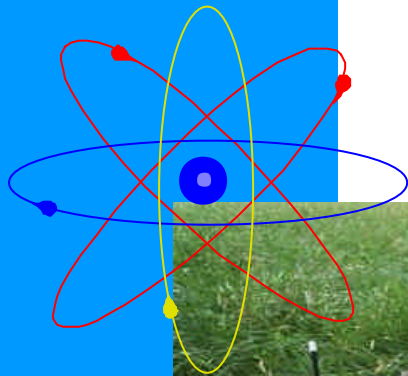
# Broadband out there
### "the hot spot scenario"

**Rural terrestrial SATCOM support**

- **Megabit Up/Down links**
- **Mobile Broadband Repeater**
  - **Remote Disasters**
  - **Evidence gathering**
  - **Real-time ID**
  - **Surveillance**
  - **Remote sensing**

# Spectrum Matters
## *Worldwide and Regional Activities*

o **ITU-R WRC-2000 RESOLUTION [GT PLEN-2/5] Global harmonization of spectrum for public protection and disaster relief**
- **High Data Rates - Video - Multimedia for cross-border operations**
- **ITU-R WP 8A to study the matter, for action, at WRC-03 (Item 1.3)**

o **FCC and NTIA addressing issues**

o **FCC allocates 764-776/794-806 MHz & 4940-4990 MHz (4.9 GHz) Bands to Public Safety**

o **Coordination of CEPT input to WP 8A**

o **Report on Mobile Broadband**

o **NATO C3 Agency**

o **Sharing Possibilities under evaluation**

# Spectrum Matters

## Train Crash Scenario
## - a draft spectrum assessment example -

### Project MESA:
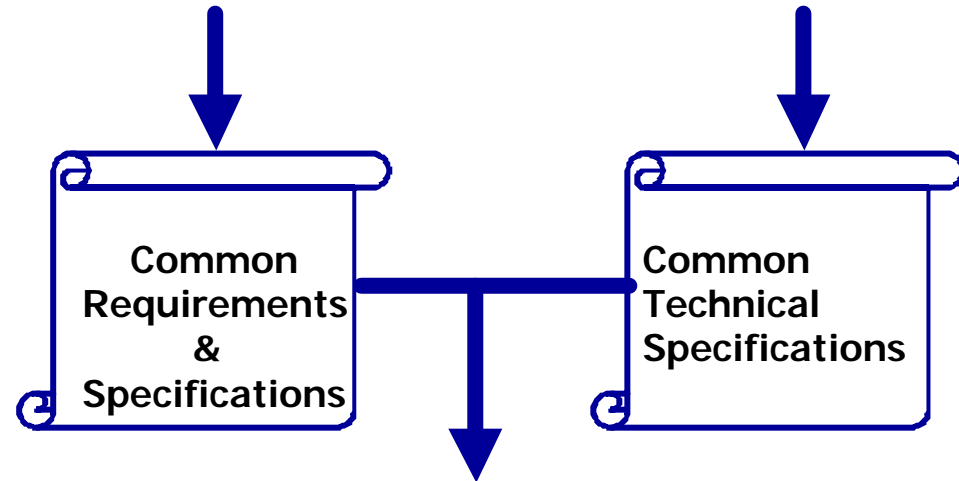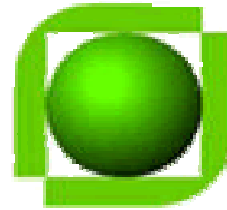### User needs and scenarios drive spectrum requirements

**by**
**Steffen Ring**
**1st Chairman-Project MESA Steering Committee**


## Visit:

### http://www.projectmesa.org/spectrum.htm

**OUTPUT:**

Harmonized/coordinated specifications, for Broadband Terrestrial Mobility and SatCom applications and services, driven by common scenarios, requirements and spectrum allocations.