An Architecture to Develop Network Management Standards

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Scott F. Migaldi & Joerg Schmidt
Motorola
1303 East Algonquin Rd
Schaumburg, IL. 60194

Voice: +1.847.576.0574
Fax: +1.847.576.6758
E-mail: w10265@motorola.com

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Purpose:

This presentation outlines an architecture for developing protocol neutral network management standards

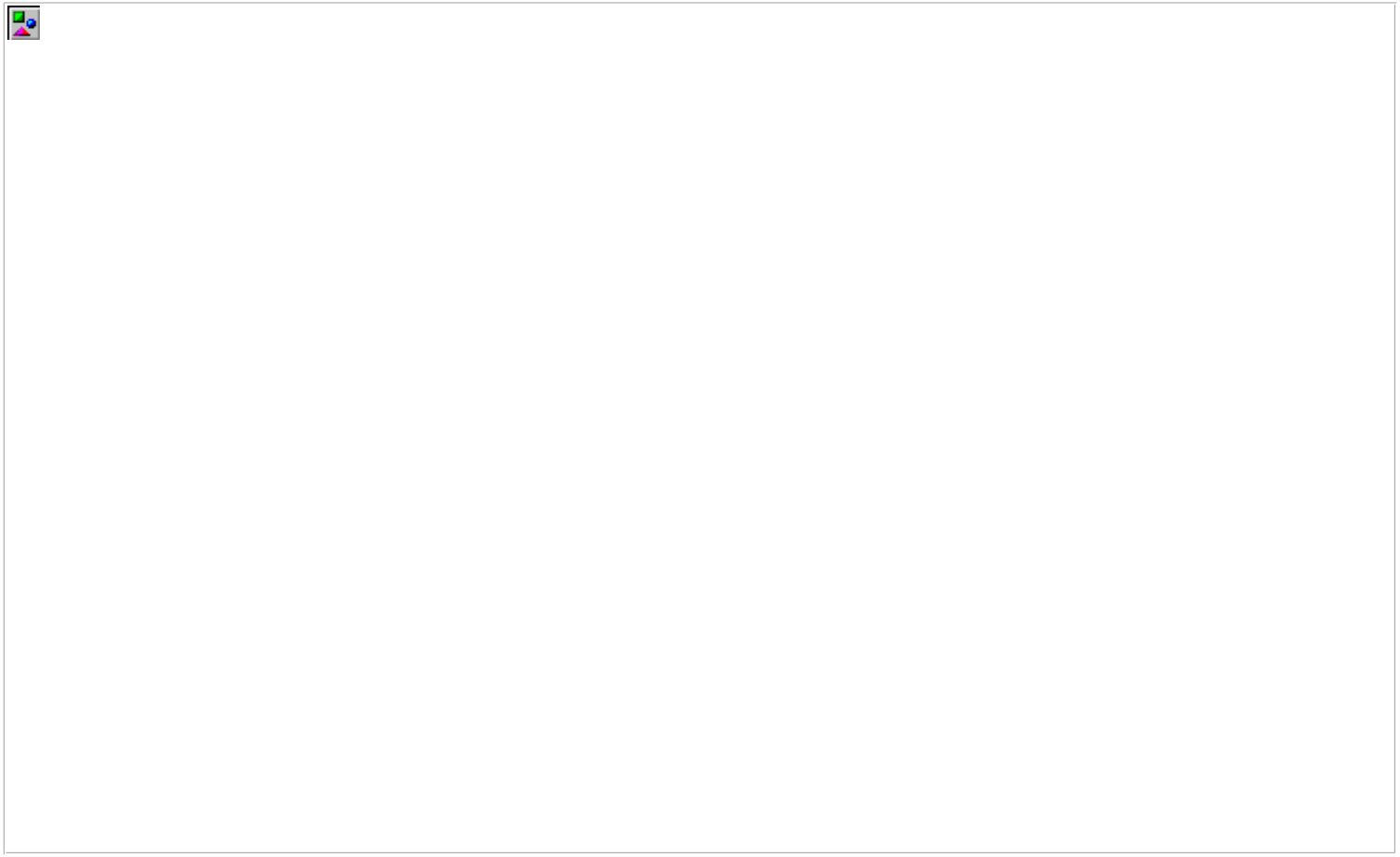
Operators

2 types of likely IEEE 802.16 Operators

1. Incumbent Wireless
   - The operators already have at least one type of wireless technology e.g. cellular, 802.16a, DVB, etc.

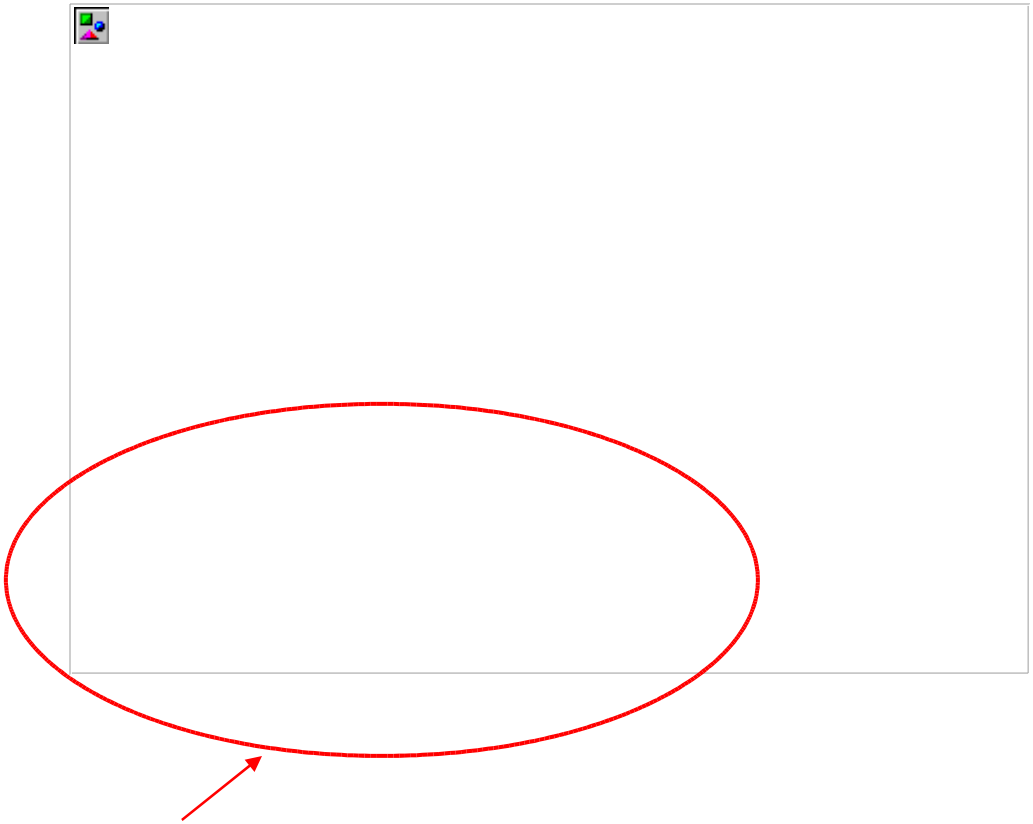
2. New Wireless, Incumbent Wired
   - These operators have networks but are adding new wireless access nodes such as IEEE802.16

Operators will desire a single system to manage their different networks

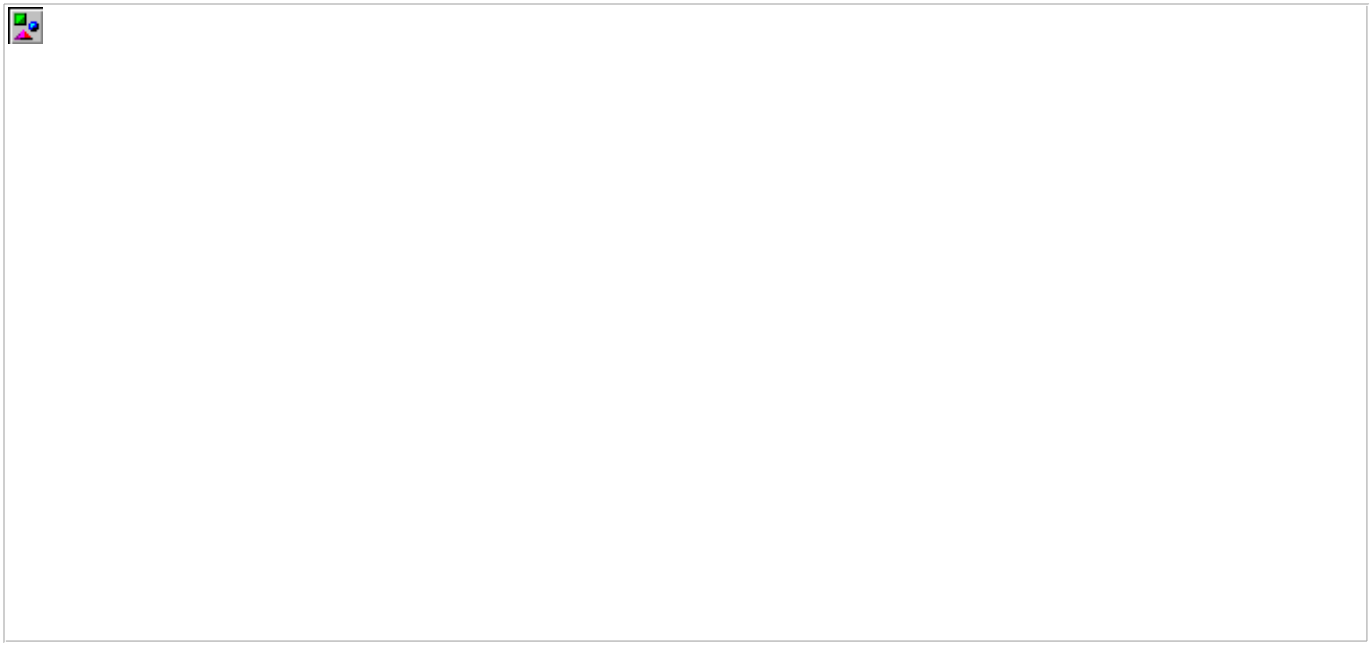


Types of Network Management Interfaces

1. between the Network Elements (NEs) and the Element Manager (EM) of a single broadband wireless network;
2. between the Element Manager (EM) and the Network Manager (NM) of a single broadband wireless network;
3. between the Network Managers and the Enterprise Systems of a single broadband wireless network;
4. between the Network Managers (NMs) of a single broadband wireless network;
5. between Enterprise Systems & Network Managers of different broadband wireless network;
6. between Network Elements (NEs).



Three Types of IRP's



1. Interface IRPs – These typically provide the definitions for IRP operations and notifications in a network agnostic manner. These enable independent development as well as reusable across the industry
2. NRM IRPs – providing the definitions for the Network Resources to be managed (commonly named "Network Resources IRPs"). These enable technology & vendor specific NRM extensions
3. Data Definition IRPs – provide data definitions applicable to specific management aspects to be managed via reusing available Interface IRPs and application to NRM IRPs as applicable. These enable a wide applicability, phased introduction capabilities & broad industry adoption.

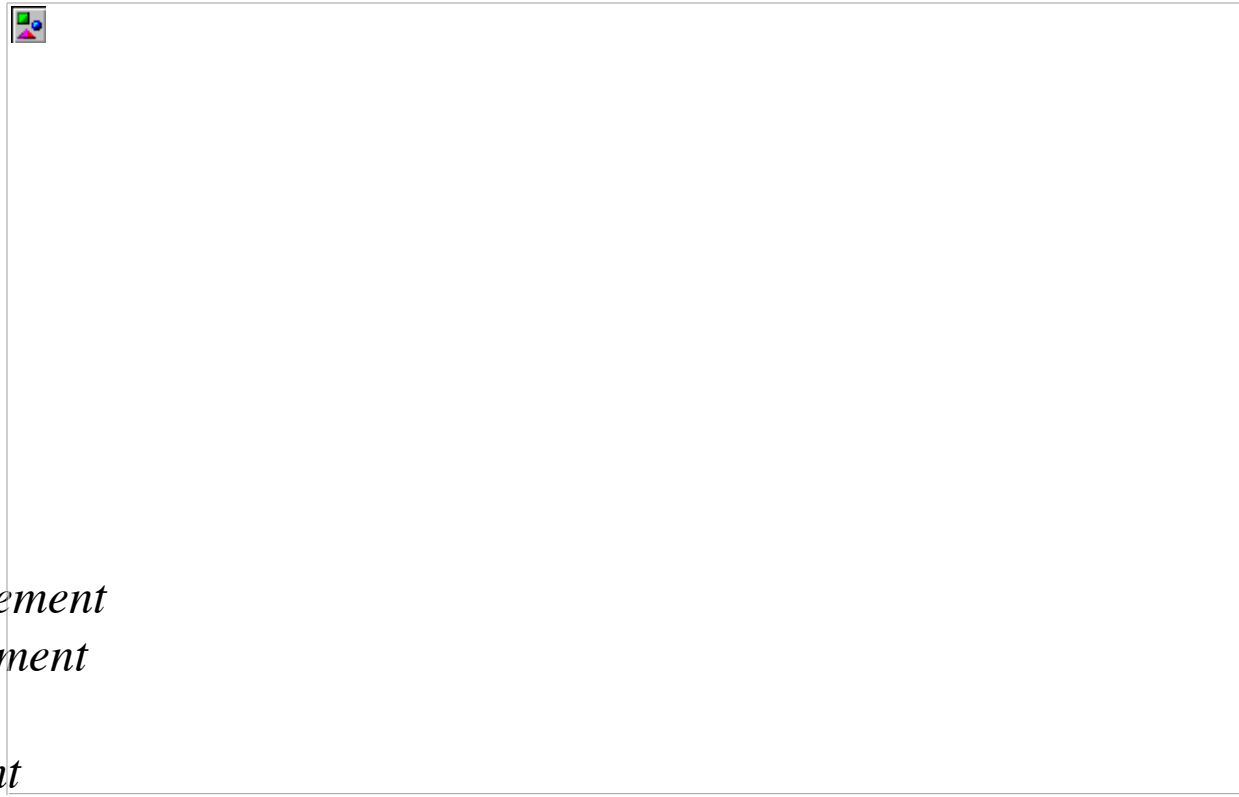
Information Reference Point (IRP) Methodology Approach

1. Top-down, process-driven modeling approach
   - The process begins with a requirements phase, the aim at this step is to provide conceptual and use case definitions for a specific interface aspect as well as defining subsequent requirements for this IRP.

3. Technology-independent modeling
   - The second phase of the process is the development of a protocol independent model of the interface. This protocol independent model is specified in the IRP Information Service.

5. Standards-based technology-dependent modeling
   - The third phase of the process is to create one or more interface technology and protocol dependent models from the Information Service model. This is specified in the IRP Solution Set(s).

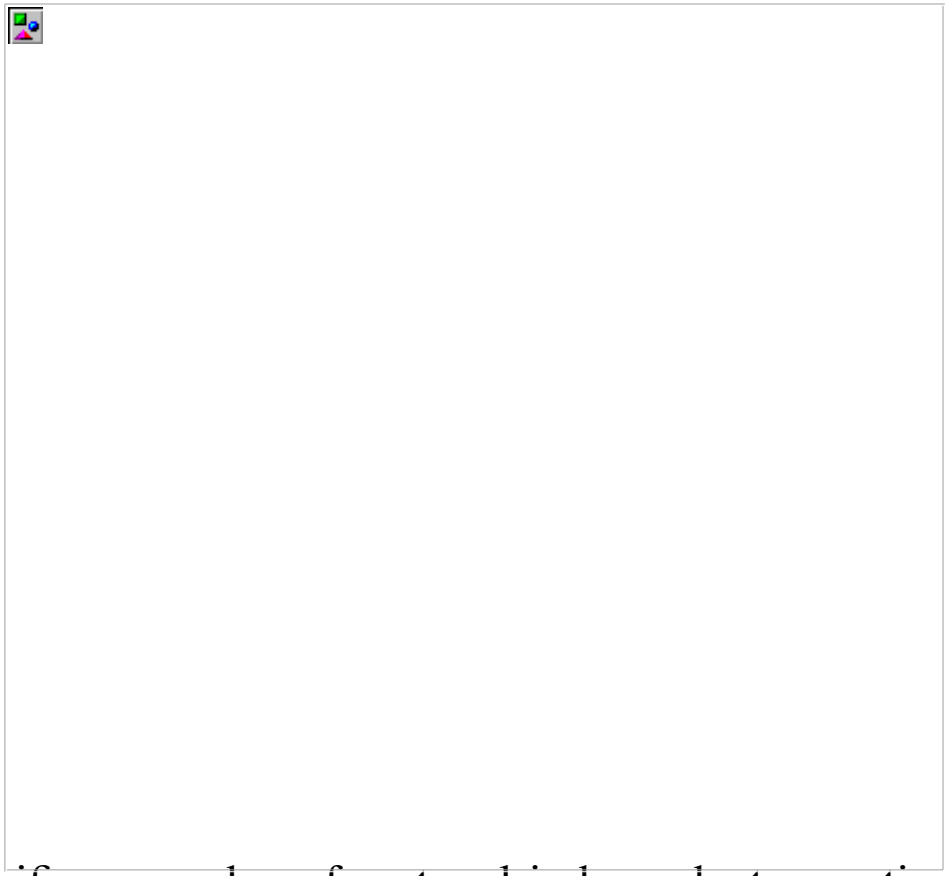
Interface IRP's for Application Integration



Enabling:

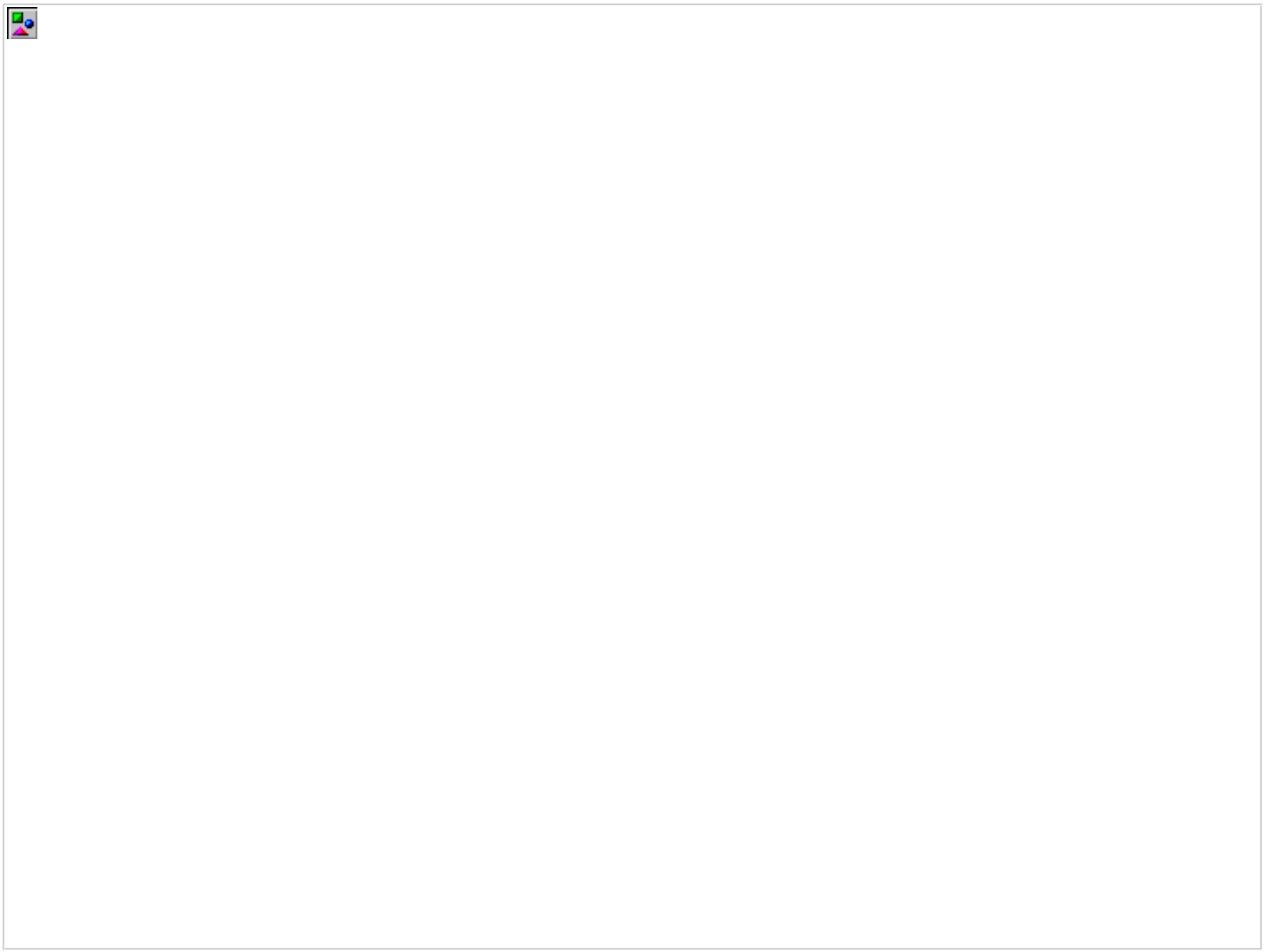
- *Alarm Management*
- *Configuration Management*
- *Performance Management*
- *State Management*
- *Inventory Management*
- *Test Management*
- *Log Management*
- *Security Management*
- *Subscription Management*

Basic CM IRP Information Service (IS)



1. IRP IS specifies a number of protocol-independent operations that are needed by an IRPManager to retrieve CM information from an IRPAgent as well as to enable provisioning of network resources
2. Once Defined object definitions can be developed and then mapped to a protocol

Sample NRM IRP For 802.16f



Cooperation

The NRM describes the specifics of the network to be managed. This modular approach has enabled different organizations to re-use the Interface IRP's, and even some of the high-level, network-technology independent NRM IRP's

- 3GPP defines standard Northbound Interfaces based on Integration Reference Point (IRP) methodology
- 3GPP2 re-uses 3GPP's Interface IRP's as well as the Generic portion of the NRM IRP's – and is adding CDMA/CDMA2000 NRM IRP's
- One set of NBI Standards for all 2G, 2.5G, 3G and future wireless technologies!

- Established a relationship already between 802.16 NETMAN and 3GPP/3GPP2 – extending this industry-wide cooperation

Conclusions

- The IRP Interface Methodology give a standards developer, vendor, and operator:
  - modular, re-usable, protocol neutral NM specifications
    - ability to quickly change protocols when necessary – w/o changes to management applications!!,
    - take technology and adopt into different deployed networks and
    - have it interoperate seamlessly.
- SDOs may re-use extension of one specifications by another.
- It is possible to use a protocol neutral approach to develop management standards
- Implementers of the network management systems will have the choice as to whether they desire to use SNMP, XML, SOAP, HTTP, CORBA, JAVA, etc. based on their particular need.
- The benefit to developers of both the systems and the standards are that as protocols are revised the information contained in a standard would not need to concurrently updated and revised.

Impacts to 802.16 NETMAN

- Definition of Protocol-neutral Network Resource Model IRP *(IS -> semantics/behavior)*
  - based on 802.16e,
  - using 3GPP IRP methodology
  - reuse 802.16f as applicable (*separation of resource model from operations*)

- Considerations for corresponding Solution Set development (SS -> syntax only)
  - SNMP MIB, CORBA IDL, XML XSD - Other?
  - Is Solution Set in scope of 802.16 NETMAN?

- Guidelines on reuse of 3GPP/3GPP2 Interface IRP's
  - Using delta specification method (if needed) and existing liaison agreements

Potential Time Line

- What happened already
  - Established liaison relationship with 3GPP/3GPP2
  - Initial technical content provided for Draft 802.16g
  - Discussion on new PAR started (to separate definitions for network element related resource management/handover aspects from network management definitions)
- IEEE#39
  - ”refresh” IRP approach
  - Identify whether mobile 802.16 network management is defined in 802.16g or via new PAR (latter is preferred)
- IEEE#40-42/43
  - Definitions/conclusions on Protocol-neutral 802.16 Mobile Network Resource Model IRP
- IEEE#42-44/5
  - Definitions/conclusions on Solution Sets for 802.16 Mobile Network Resource Model IRP
  - Documenting guidelines on reuse of 3GPP/3GPP2 Interface IRP’s