

Moving Beyond SNMP

James A. Mazzei
The Aerospace Corporation
James.a.mazzei@aero.org
703-324-0389



Overview: GIG Network Management

- Introduction
- State of the Network(s)
- Steps Being Taken
- ITIL & PBNM
- Recommendations
- Conclusions



Introduction

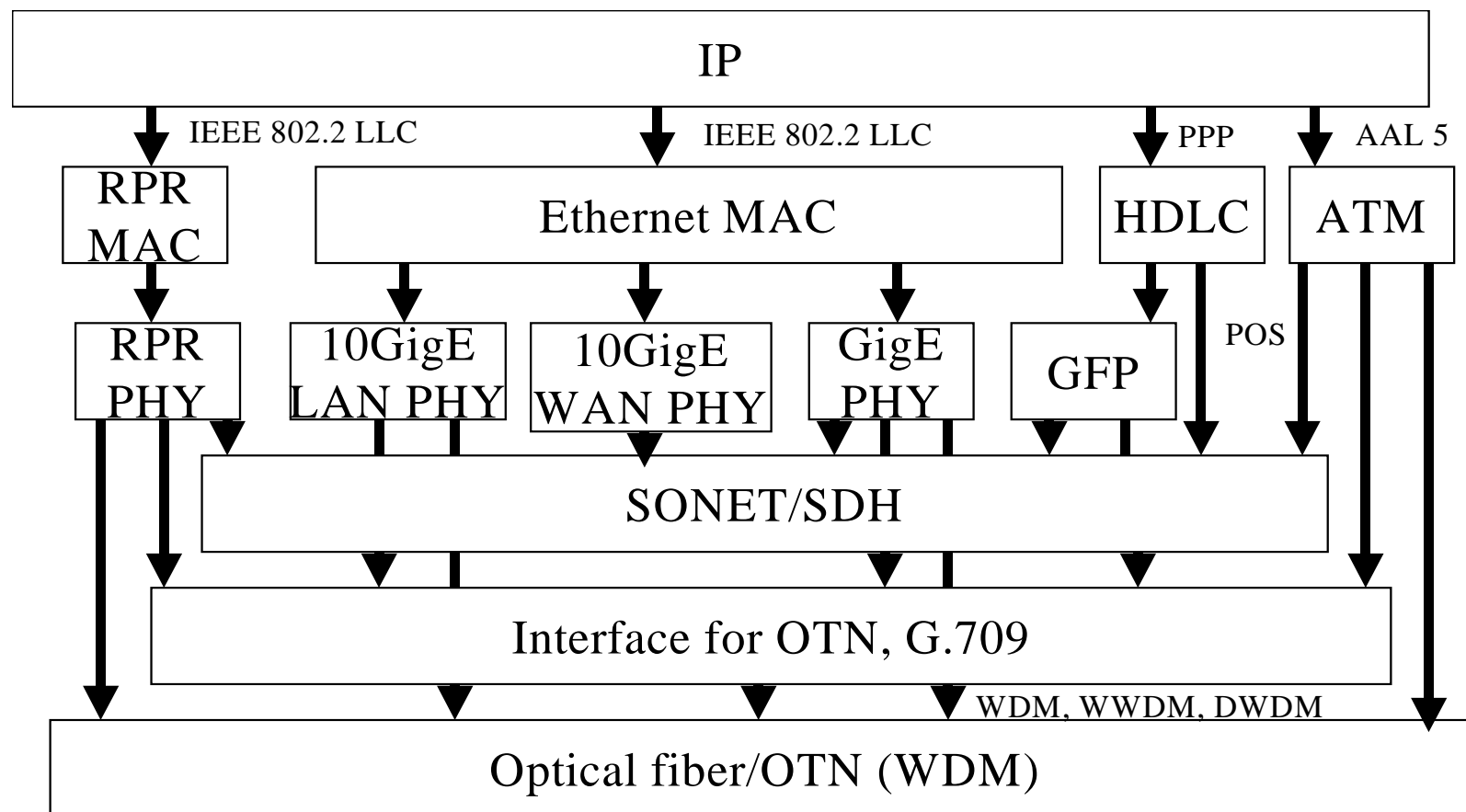
- Requirements for DOD Networks Include:
 - A Integrated transport infrastructure
 - Fully distributed information processing any source to destination
 - Management of legacy command, control, communications, computers, intelligence, surveillance and reconnaissance data.
 - DISA Business Operations & Systems and new MILSATCOM and fiber communications capabilities
- The Global Information Grid (GIG) can be characterized as:
 - A compilation of loose confederation of sometimes-networked elements lacking central authority, oversight or guidance
 - Dramatic movement to packet communications and convergent services that require a more comprehensive and cohesive management system
 - A network of networks that must accommodate the requirement for near real-time control and the automation associated with Net-Centric warfare.



State of the Network(s)

- The GIG is more aptly characterized as a Global Network Information Environment.
- DOD Command and Control capabilities in state of flux and are trying to coalesce
 - The GIG grew as a variety of systems using a multiplicity of technical baselines and protocols to satisfy a group of dissimilar functions.
 - The current environment not only doesn't facilitate Net-Centric Warfare it inhibits it.
 - Concurrently, Network Operations (NetOps) is working to bring Net-Centric Warfare into the infrastructure by ensuring the collaborative operation and management of the GIG by Combatant Commands, Services and Agencies (C/S/A) so that an integrated, seamless end-to-end management structure can optimize the GIG transport capability.
 - An evolutionary net-centric GIG management and operations strategy is gaining acceptance-maybe good, maybe not.

Mapping Process from IP through WDM



Mapping Process from IP through WDM

Acronyms:

- RPR = Resilient Packet Ring, IEEE 802.17
- HDLC = High-level Data Link Control
- POS = Packet over SONET/SDH
- GFP = Generic Framing Procedure (ANSI T1 X1 driven standard)
- OTN = Optical Transport Network
- WDM = Wavelength Division Multiplexing
- WWDM = Wide WDM
- DWDM = Dense WDM

State of the Network(s) (Complexity)

- Different functions and the different levels at which they are applied to different communications media.

IP OSI SONET ATM ATM
 layer layer layer layer sublyr

Functionality

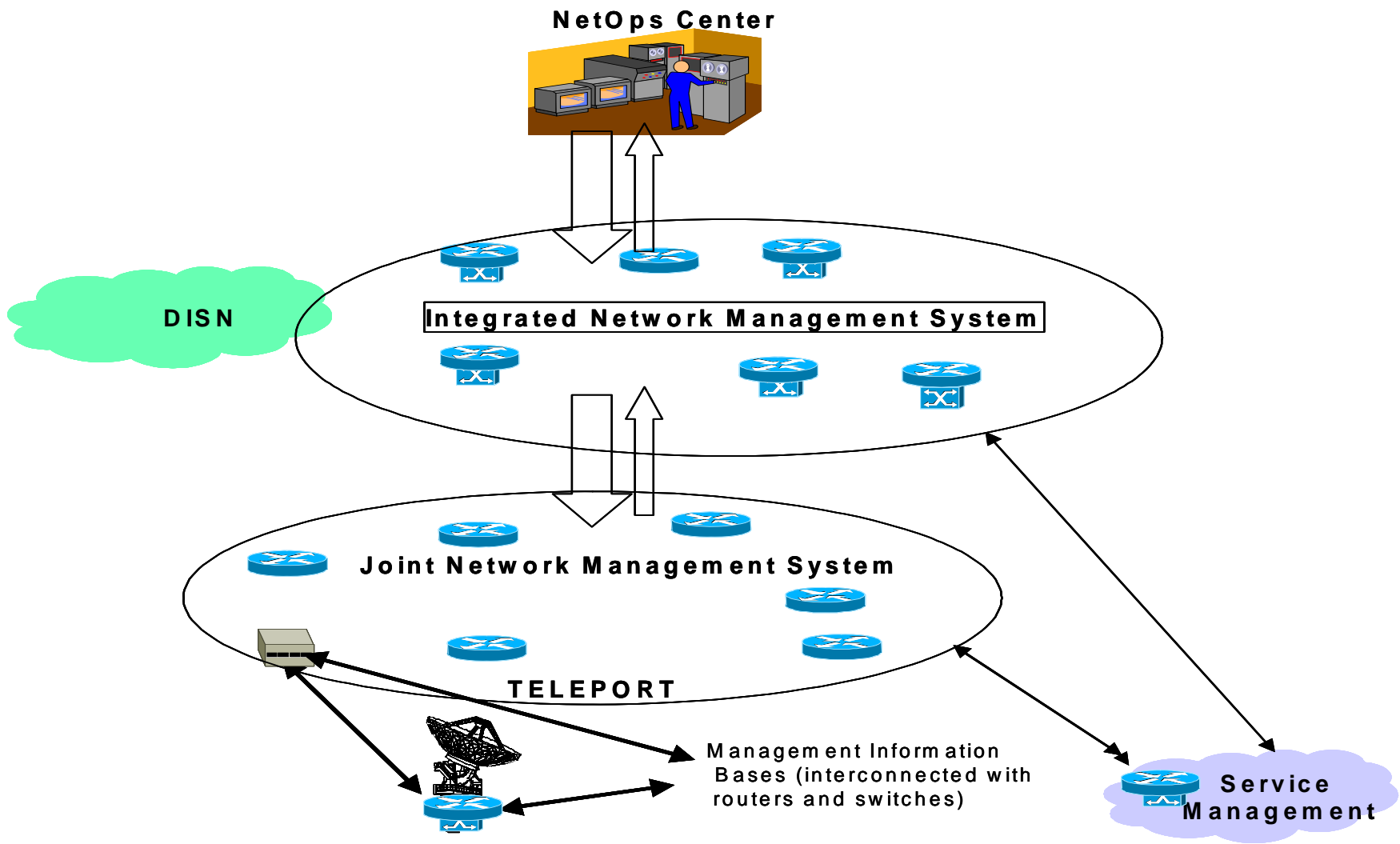
	3/4		CS AAL	SAR	Providing the standard interface Segmentation and reassembly
4	2/3	2	ATM		Flow Control Cell header generation/extraction Virtual Ckt path management Cell multiplexing/demultiplexing
3	2		Phys	TC	Cell rate decoupling Cell generation Header, Checksum & Frame generation Packing/Unpacking cells from enclosing envelope
	1	1		PMD	Bit timing and physical network access



DoD Taking Steps to a Central Authority

- + Status and resource reporting standards and automated reporting capabilities to enhance decision making at all levels (DC top down)
 - Manual reporting and posting of status information, although currently necessary, is not sufficient for more future oriented goals of automated reporting capabilities
 - First create an agreement or a standard as a necessary condition to report and post status information useful for Enterprise Service Management/Network Management (ESM/NM)
- + Implementation Level (COCOM top down)
 - Joint Task Force (JTF) networks, because of their remoteness and highly dynamic nature do not integrate now with DISN infrastructure.
- + For command and control involving mobile war fighters, it should be relatively easy to develop a consensus that planning, situational awareness and common operational picture development are the three areas where standards and automated reporting are critical.

INMS and JNMS





INMS & Two Strategies Have Been Suggested

- (INMS) Integrated Network Management System
 - The First step toward DOD wide network Management
 - INMS contains and expanding the use of SNMP The GIG Network
- (ITIL) IT Infrastructure Library
 - ITIL is a best practice framework initially developed in the UK and primarily distributed in Europe
- (PBNM) Policy Based Network Management
 - PBNM is a holistic policy based management structure in which the policy is represented as a set of classes and relationships that define the semantics of the network building blocks.
 - The semantics usually consist of a minimum
 - Policy Rule
 - Policy Condition
 - Policy Action

The Information Technology Infrastructure Library (ITIL)

- Fundamentally, a service management view of network management that differentiates itself from component management.

ITIL Advantages

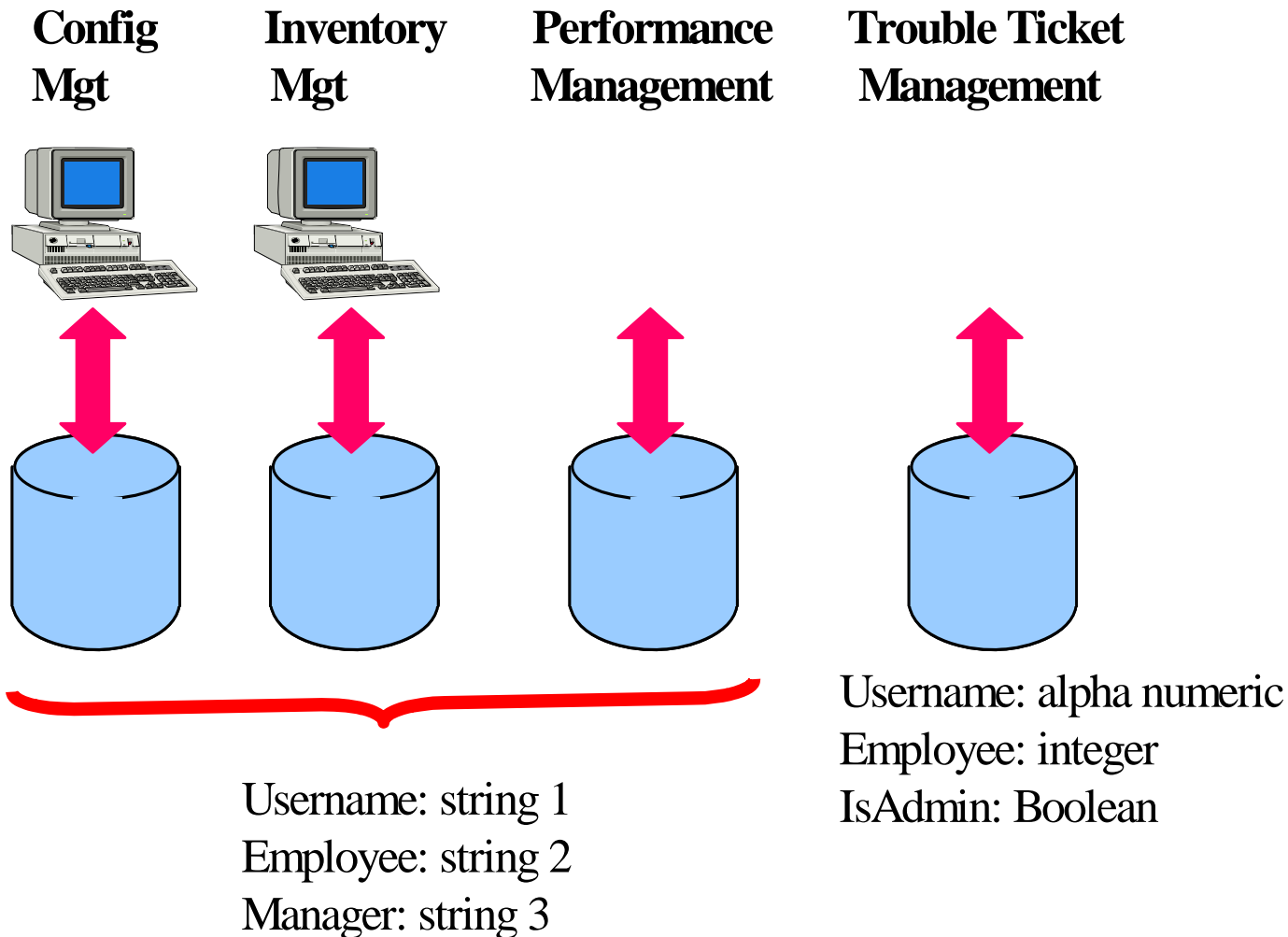
- Adopted by Tivoli, HP, Computer Associates (Remedy), BMC Software, Mercury Interactive & others
- Is baseline for Microsoft's Microsoft Operations Framework (MOF)
- Information about all network devices is brought into a common database called the Configuration Management Database (CMDB)
- ISO is looking at creating a specification based on ITIL



The Information Technology Infrastructure Library (ITIL)

- ❑ **This service management approach also has one substantial disadvantage. No standard means of populating the CMDB**
- ❑ **Another potential problem exists in that ITIL is incompatible with SNMP. Therefore, a strategy where management networks gradually evolve into an ITIL framework isn't realistic.**
- ❑ **SNMP is built on the assumption that it's independent of surrounding protocols and can't easily adapt to new devices. It's also built around a 448 byte message, limiting the size of an individual transaction.**
- ❑ **Finally, the IETF plans to replace the Command Line Interfaces (CLIs) and Web Interfaces with a standard configuration protocol. That protocol would encode configuration information as XML documents and provide basic operations to upload**
- ❑ **Fundamental, high expense issue involved \$\$**

(ITIL) Similar but not the same databases.





ITIL's Brighter Side

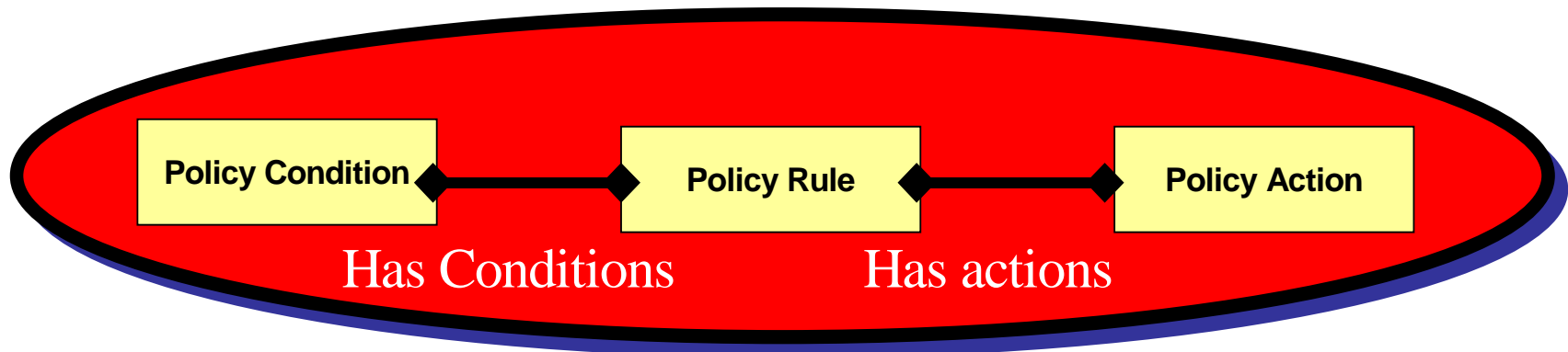
+Conversion to ITIL can be facilitated by using the ITIL toolkit

+ITIL Toolkit Web Page. The toolkit includes:

- A detailed guide to ITIL and service management
- The ITIL fact sheets, which are 12 two page documents, serving as a concise
- summary of each of the ITIL disciplines
- A management presentation, inclusive of speaker notes
- An ITIL audit/review questionnaire and reporting set, based on MS-Excel
- Materials to assist in the reporting of the above results (e.g., presentation template)

PBNM CONCEPT

- Policy Based Network Management (PBNM) is, at its essence, the use of rules to accomplish management decisions.
- The policy is represented as a set of classes and relationships that define the semantics of the building blocks.
- The building blocks, in turn, usually consist of a minimum of a policy rule, a policy condition and a policy action



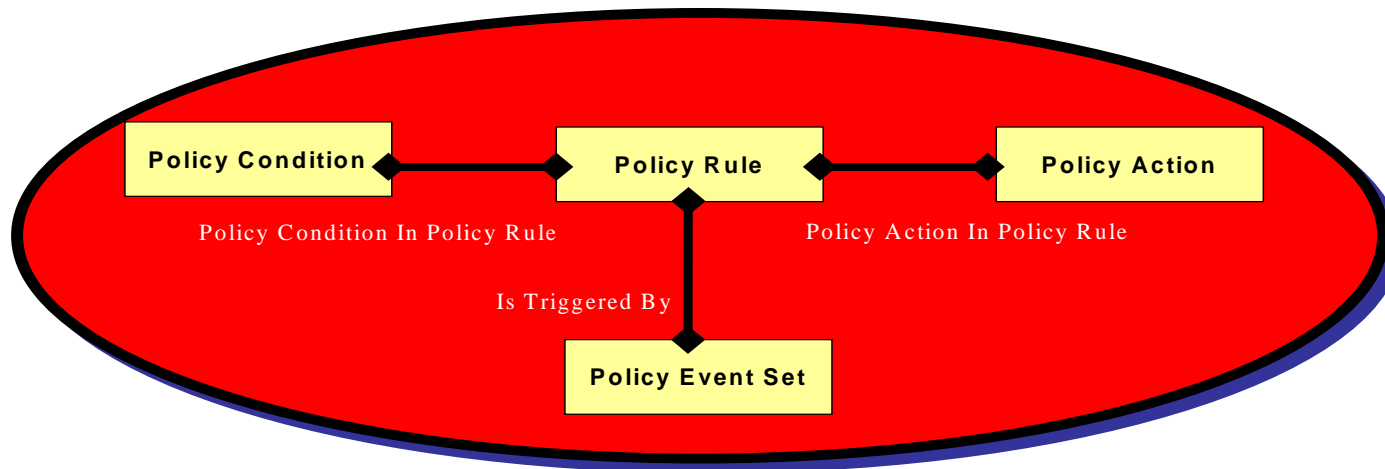


Policy Based Network Management is a.....

- + Abstraction translation mechanism
 - + Define goals not device configurations
 - + Changes in policy lead to changes goals not implementations
- + PBNM is a condition action response mechanism
 - + Provide an automatic response to conditions in the network according to pre-defined policies

PBNM continued..

The Directory Enabled Networks-new generation (DEN-ng) policy management system takes the policy set shown below and triggers it with a policy event set





Current Efforts

- Abstract the best features of ITIL and PBNM and remove them from the transport layer considerations
- You therefore have all the advantages of both ITIL and PBNM
- You therefore have all the costs of both ITIL and PBNM



Long Term Management Solution, SLA's

+The long term solution to effective management is similar to the near term, although with more specificity and therefore more complexity. The solution has two parts.

- First, gradually develop interfaces between networks and management systems.
- Second, negotiate service level agreements (SLAs) between DISN managers, JTF managers and managers of other tactical networks. The negotiating of these SLAs involves multiple levels of understanding, since the individuals involved must:
 - ✓ Recognize the unique nature of each system and each interface
 - ✓ Agree on commonality for status reporting
 - ✓ Develop a management language so the management process can be abstracted from the network



Long Term Management Solution, SLA's

+The SLAs, in order to be warfighter focused, should give priority to latency, availability and throughput (or packet delivery) and might best be segregated into three different categories:

- Packet networks
- Switched circuit networks
- Optical networks.

+ Common elements, examples of which might be:

- Introduction, including parties, dates and specific elements of networks covered
- Problem management, configuration management, accounting management and security management (FCAPS)
- Compensation, to include fees and penalties
- Provider and customer duties and responsibilities



Long Term Management Solution, SLA's

- The packet network SLA would include items such as:
 - NIPRNET and SIPRNET interface control documents
 - Internet “bandwidth” to include maximum and minimum data rates, committed average data rate and burst size
 - Expansion over codec rate for VoIP
 - Jitter, packet loss and other performance parameters
- The switched circuit SLA:
 - User-to-user latency
 - User-to-user availability
 - Identification of maximum possible data rates using Shannon and Nyquist characterizations
 - Identification of other performance parameters and measurement techniques used



Long Term Management Solution, SLA's

- **The optical circuit SLA:**
 - Identification of the specific layering used from data to fiber
 - Identification of the processes used including optical to electrical conversions
 - Bandwidth used vs. bandwidth available
 - Identification of other performance parameters and measurement techniques used



Conclusion

- DoD network management is fragmented, an SNMP quick fix could be implemented with a minimum of strain.
- In the longer term ITIL offers promise, although a possibly expensive common database is an essential ingredient.
- PBNM is another system of promise, although a possibly expensive common information language or middleware is necessary.
- Some have suggested that a combination of the two systems will evolve. That may be possible, but that would be a most expensive option.
- Hopefully, DoD executive management will make and enforce a choice of an intermediate step.