Policy Based Network Management

- IN THE ATN ENVIRONMENT

Current Policy Guidance

From Internet Communications Service SARP, 5.9

- Recommendation: ATN managed resources should be grouped in management domains in order to assign responsibility for control of the resources
- Recommendation: states and organizations should assign an administrative authority to establish and maintain respective management of each of their management domains, and to manage the transfer of control of resources from one management domain to another

Current Policy Guidance

Continued

- Note: The definition and implementation of a global ATN systems management solution may be specified in future amendments to the SARPs currently:
  - No exchange of systems management information is required between routers of different administrative domains
  - No exchange of systems management information is required by means of a management protocol over the air/ground links. This does not preclude the exchange of routing information, by means of routing information exchange protocols

Current Policy Guidance

Continued

- The exchange of systems management information within an administrative domain is considered a local matter and can be achieved by any means deemed appropriate

ATN Encompasses

- AIR to GROUND
- GROUND to GROUND
- INTERNET/INTRANET

Policy From Sarps

- Policy derived from guidance provide in SARPS
  - System level (sub-volume I)
  - Air to ground (sub-volume II)
  - Ground to ground (sub-volume III)
  - Upper layer (sub-volume IV)
  - Internet (sub-volume V)

System Level Requirements

from SARP

- The ATN shall use international organization for standardization (ISO) communication standards for open systems interconnection (OSI)
- The ATN shall provide a means to facilitate migration to future versions of application entities and/or the communication services. *Note.— It is an objective that the evolution towards future versions facilitates the backward compatibility with previous versions*
- The ATN shall enable the transition of existing AFTN users and systems into the ATN architecture

System Level Requirements

continued

- The ATN shall make provisions whereby only the controlling ATS unit may provide ATC instructions to aircraft operating in its airspace
- The ATN shall accommodate routing based on a pre-defined routing policy
- The ATN shall provide means to define data communication that can be carried only over authorized paths for the traffic type and category specified by the user
- The ATN shall offer ATSC classes in accordance with the established criteria.

Air To Ground

from SARP

- Context Management Application
- Automatic Dependent Surveillance Applications
- Controller Pilot Data Link Communication (CPDLC) Application
- Flight Information Services Application

Ground To Ground

from SARP

- ATS Message Handling Services (ATSMHS)
- ATS Interfacility Data Communications

Internet

from SARP

- Routing
- Addressing Specification
- Transport Service and Protocol Specification
- Internet Service and Protocol Specification
- Subnetwork Dependent Convergence Functions
- Routing Information Exchange specification
- System Management Provisions

Effective Network Utilization

- QUESTION? How do we make the most efficient and effective use of a heterogeneous network comprised of multiple administrative domains, and mobile clients/routers, delivering diverse complex messages, and voice?
- ANSWER. Develop and define POLICIES that guide and control the efficient use of the network, through applications that convert policy to network directives.

- Concept of Policy Based Network Management (PBNM) is evolving and capable products are available to support PBNM
- Network Owner/Managers create policy to define how network resources or services can or cannot be used.
- Policy applied to management platform

Why Policies?

- Quality of Service (QoS) and Security needs increase as networks grow and complexity increases.
- Policies provide concepts to simplify management of QoS and Security.
- Policies establish a bridge between SARPs and the network elements configured to deliver desired performance and service.
- Policies reflect the environment

Essential Elements of Network Management

- Performance
- Configuration
- Accounting
- Fault
- Security

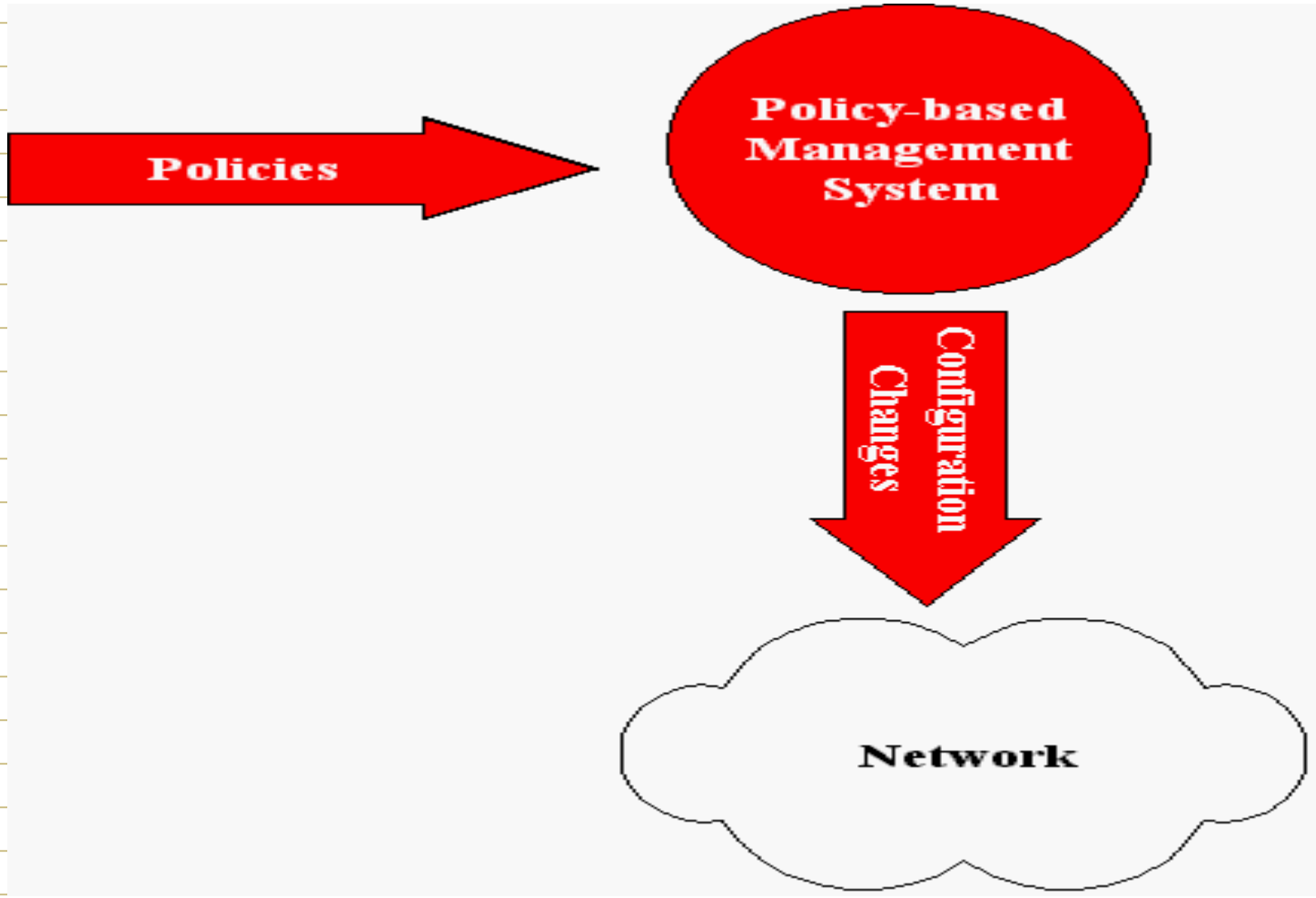
General Network Management Practice

- Manage a device or situation, one at a time
  - element management
  - Fixed configuration management of network elements
  - Configuration changed on a device by device basis, often requires system rebuilds, operator intervention
- Fixed **not** dynamic, does not respond well to changing needs

General Network Management Practice

- Utilization of bandwidth, fixed
- Different Applications identified to manage performance, configuration, accounting, fault, and security (lacks integration)
- Security not administered in coordination with other network uses

Essence Of PBNM



PBNM What's it About

- From the Network Operations point of view PBNM is about minimizing the complexity of end-to-end management and security.

Definitions

- Policy
  - Defines one or more rules. Each rule binds one or more actions to conditions that describe; who, what, and in what circumstance actions may be initiated.
- Policy console
  - User interface, to construct, deploy, and monitor policy environment

Definitions

continued

- Policy decision
  - Rationale of how (if at all) a resource should satisfy a request based on policy governing use.
- Policy enforcement Point (PEP)
  - Network resource/element that enforces a policy decision ex. Router, switch
- Rule
  - Division of policy that ties an action to conditions that govern whether the action is performed.

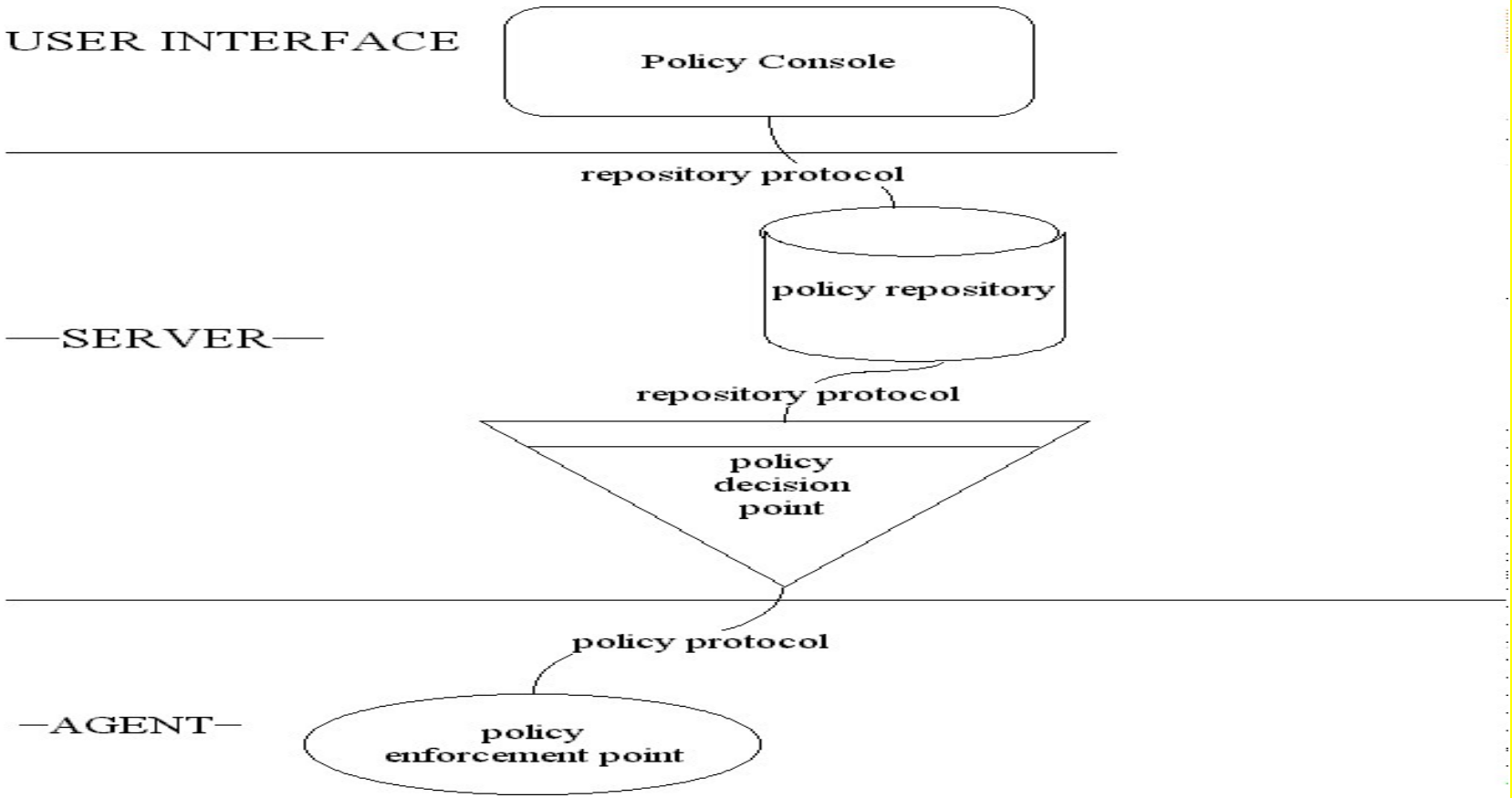
Policy Example

- CPDLC messages will be given the highest network transmission priority.

Rule Example

- 1. Assure bandwidth between a controller and mobile domain (aircraft) .
  - If (conditions) then action
    - if ((source address = xxx.xxx.xx.xx and destination address =xxx.xxx.xx.x then
      - set rate : = 256 kbps
- 2. Give priority to CPDLC message.
  - If source address = xxx.xxx.xx.xx
    - then
      - set priority : = 2 (of 13)

General Architecture for a Policy Management System



Essential Elements of a PBNM product

- Extensibility
- Functionality
- Heterogeneity
- Scalability
- Standards Based
- Usability

Essential Elements of a PBNM product.

- Extensibility
  - Customization
  - Expansion
  - Management and Provisioning of Other Services
  - Support extensions through Interfaces

Essential Elements of a PBNM product.

- Functionality
  - Configure QoS
  - Assure Bandwidth
  - Control Bandwidth
  - Provide application performance analysis
  - Control Access
  - Configure Usage (authentication and/or encryption)
  - Define QoS treatment of encrypted flows (Combine security and Qos Policies)

Essential Elements of a PBNM product

- Heterogeneity
  - Manage QoS in multi-domain networks
  - Enable end-to-end QoS management
  - Configure security services with gateways from different domains on each side.
- Scalability
  - Support hierarchical policy management
  - Enable policy management across multiple policy domains

Essential Elements of a PBNM product

- Standards Based
  - Support Key Standards (IETF, ISO, DiffServ, IPSes, etc) as they are accepted.
- Usability
  - Integrate with existing management solutions.
  - Hide the detail and present useful concepts and interfaces

Conclusion

- PBNB paradigm is sound
  - Policies provide concepts to simplify the configuration management of QoS, and security.
  - Organizations need to differentiate hardware vendors motivations and organizations operational needs
  - reduce costs associated with individual element management
  - efficient management of Bandwidth.

Document Development

What is needed?

- Concept of Operations
- Network Management Policy

Questions?