

# Automated Network Service Configuration Management

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# Outline

- Automation in network management
- Automated Network Service Configuration Management
  - Framework
  - Network service configuration language
  - Data model
  - Example



# Automation in network management

- Small automation
  - Administrator performing majority of task
    - Time-consuming
    - Error prone;
- Some automation
  - Based in scripts
  - Scripts highly dependent on what was managed
  - Require administrator attention

# Automation in network management

- Some automation

- Network Configuration Protocol: NETCONF\*

- Transport facilities for network device configuration
- Data encoded in XML
- Model definition
  - XML Schema/Relax NG
  - YANG

	Layer	Example
(4)	Content	Configuration data
(3)	Operations	<get-config>, <edit-config>
(2)	RPC	<rpc>, <rpc-reply>
(1)	Transport Protocol	BEEP, SSH, SSL, console

\*RFC 4741

# Automation in network management

- Some automation
  - YANG\*
    - Example

YANG Example:

```
container system {
  container login {
    leaf message {
      type string;
      description
        "Message given at start of login session";
    }
  }
}
```

NETCONF XML Encoding:

```
<system>
  <login>
    <message>Good morning, Dave</message>
  </login>
</system>
```

\*YANG – A data modeling language for NETCONF draft-bjorklund-netconf-yang-02



# Automation in network management

- Some automation
  - NETCONF & YANG
    - NETCONF provides the transport and data management facilities
      - Install, delete, update...
    - YANG defines the configuration data models
    - Not true interoperability:
      - No standardized data models exist
    - So:
      - Different configurations for devices with similar operations

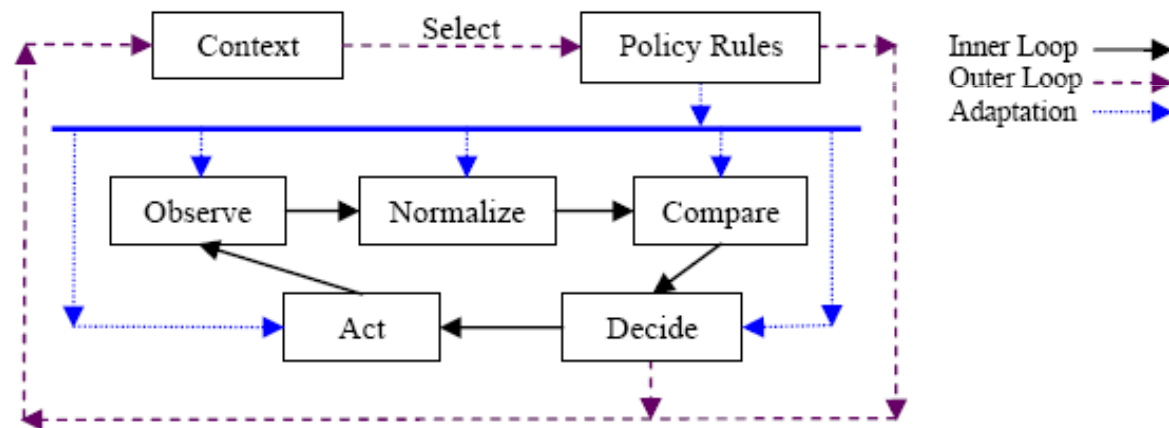


# Automation in network management

- Autonomic network management
  - Based on autonomic computing
  - Self-configuration, Self-healing, Self-optimization and Self-protection
  - Business goals applied to network management
  - Heterogeny of manage resources
    - Ontology & reasoning

# Automation in network management

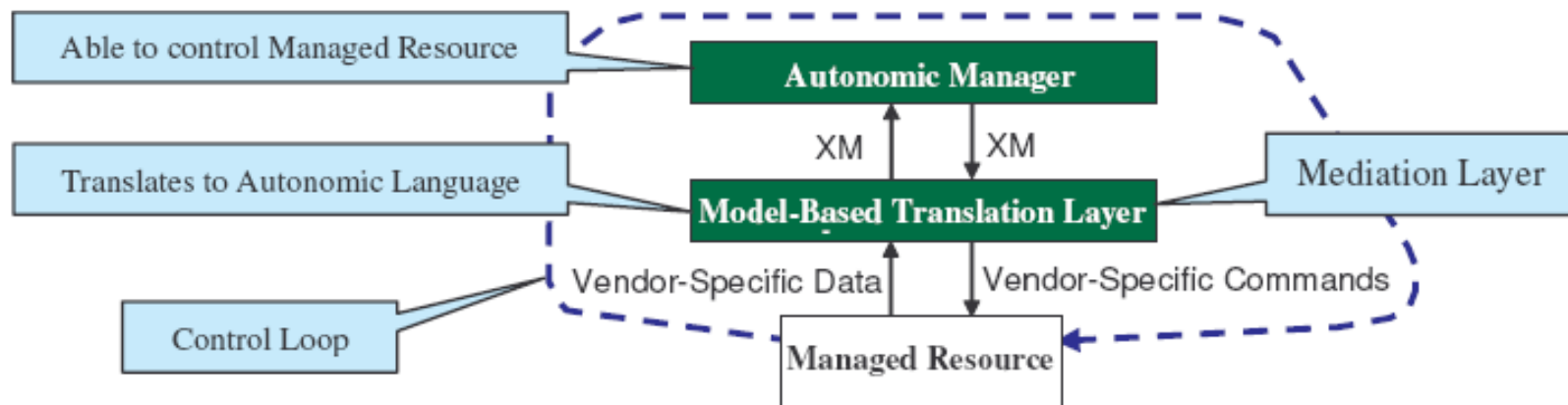
- Autonomic network management
  - Control Loop\*



\*S.-S. K. John Strassner, James Won-Ki Hong, "The Design of an Autonomic Communication Element to Manage Future Internet Services " *Management Enabling the Future Internet for Changing Business and New Computing Services*, pp. 122-132: Springer Berlin / Heidelberg, 2009.

# Automation in network management

- Autonomic network management
  - Model-based Transaction Layer\*



\*John Strassner, N. Agoulmine, and E. Lehtihet. Focale: A novel autonomic networking architecture. 2006



# Automated Network Service Configuration Management

- Proposal
  - Service configuration management and replication procedures
  - Independent about
    - Vendor, language, and software implementation
  - Distributed & hierarchical architecture
  - Standard-based data models

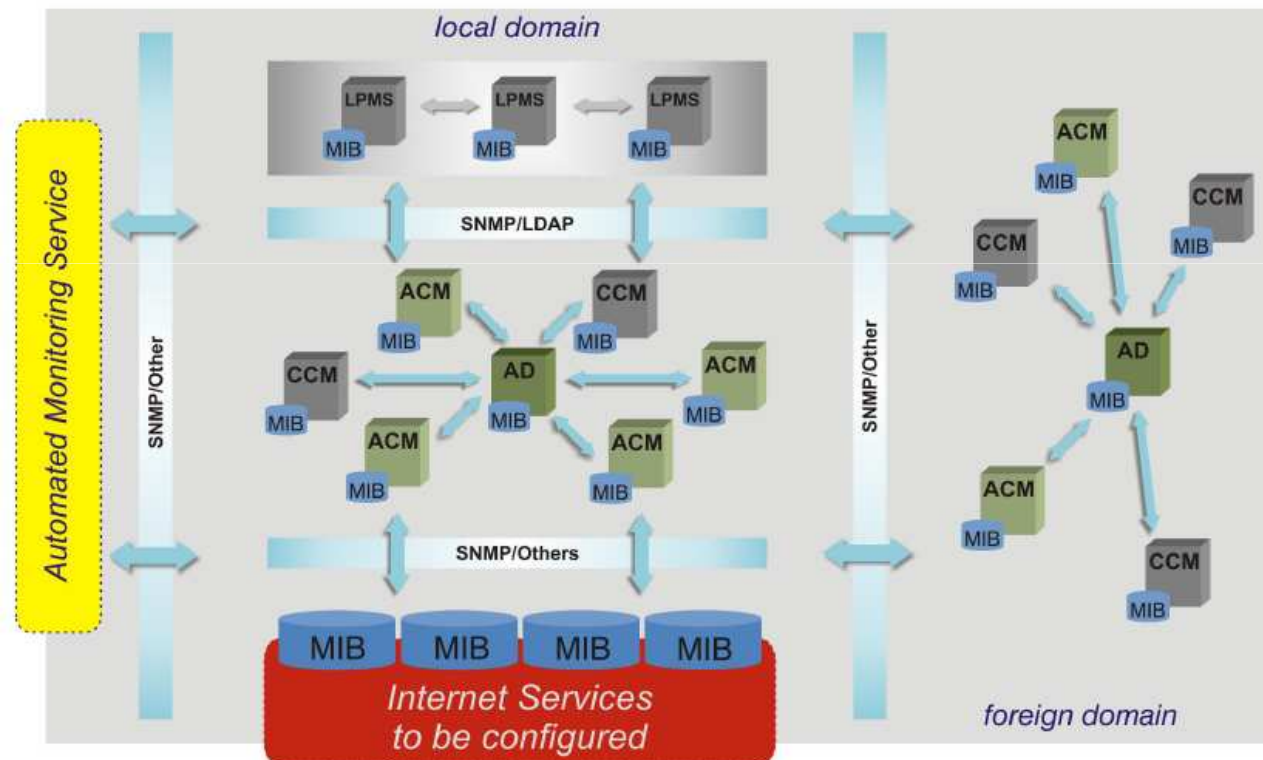


# Automated Network Service Configuration Management

- Proposal
  - **Normalized, Independent and Universal** interface (middleware) to other high-level network management systems
    - Autonomic management
  - Enables
    - Higher-level network service representations

# Automated Network Service Configuration Management

- Framework



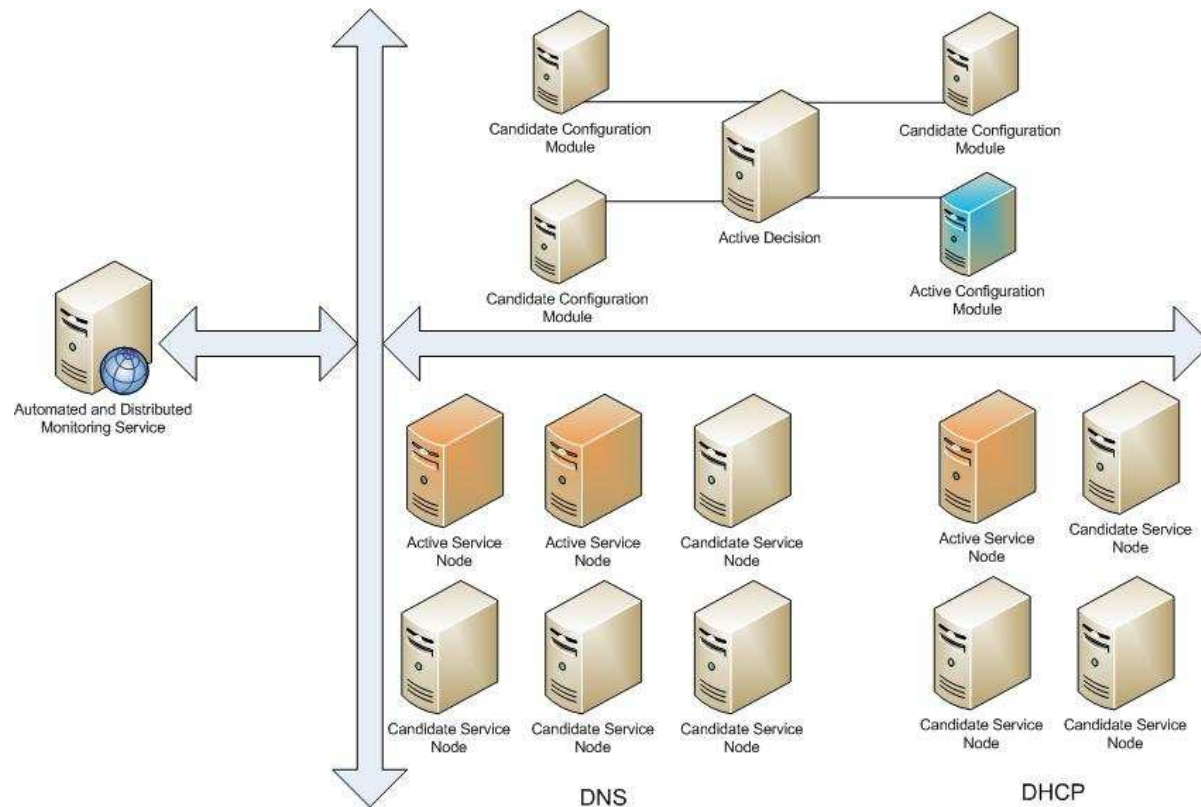
AD – Active Decision

ACM – Active Configuration Module

CCM – Candidate Configuration Module

# Automated Network Service Configuration Management

- Framework
  - Management domain





# Automated Network Service Configuration Management

- Network Service Configuration Language
  - Representation of network service configuration defined by a data model
  - Six main parts:
    - General Description
      - Date, originator ID, destination ID, request ID, reply ID
    - Operation Specific
      - Service Id, version, operation (get, put, notify, reply...)
    - Service Configuration
      - High-level service configuration representation



# Automated Network Service Configuration Management

- Network Service Configuration Language
  - Six main parts (cont.):
    - Service Conditions
      - Resource level conditions
    - Service Management
      - Definition of notifications
      - Representation history
    - Service Policies
      - Service defined policies representation

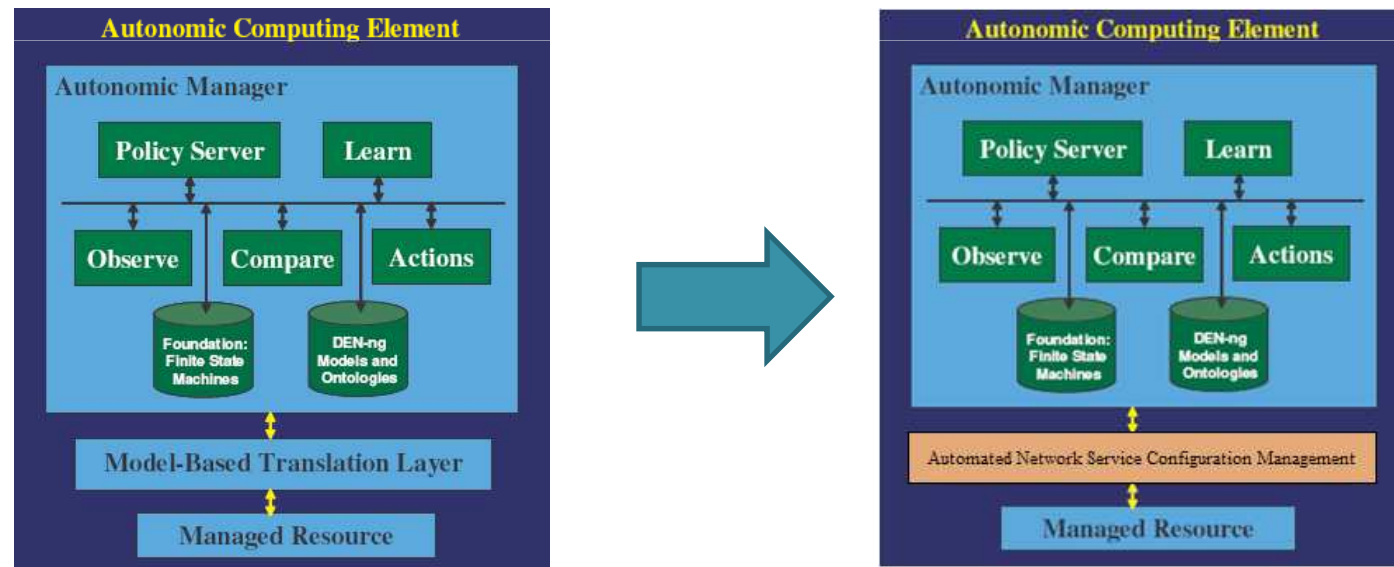


# Automated Network Service Configuration Management

- Configuration data models
  - Based on the standard definitions for
    - Domain Name System (DNS)
    - E-mail
    - Dynamic Host Configuration Protocol (DHCP)
  - Drawbacks
    - Interoperability vs. Vendor functionalities
      - Lose some vendor specific functionalities

# Automated Network Service Configuration Management

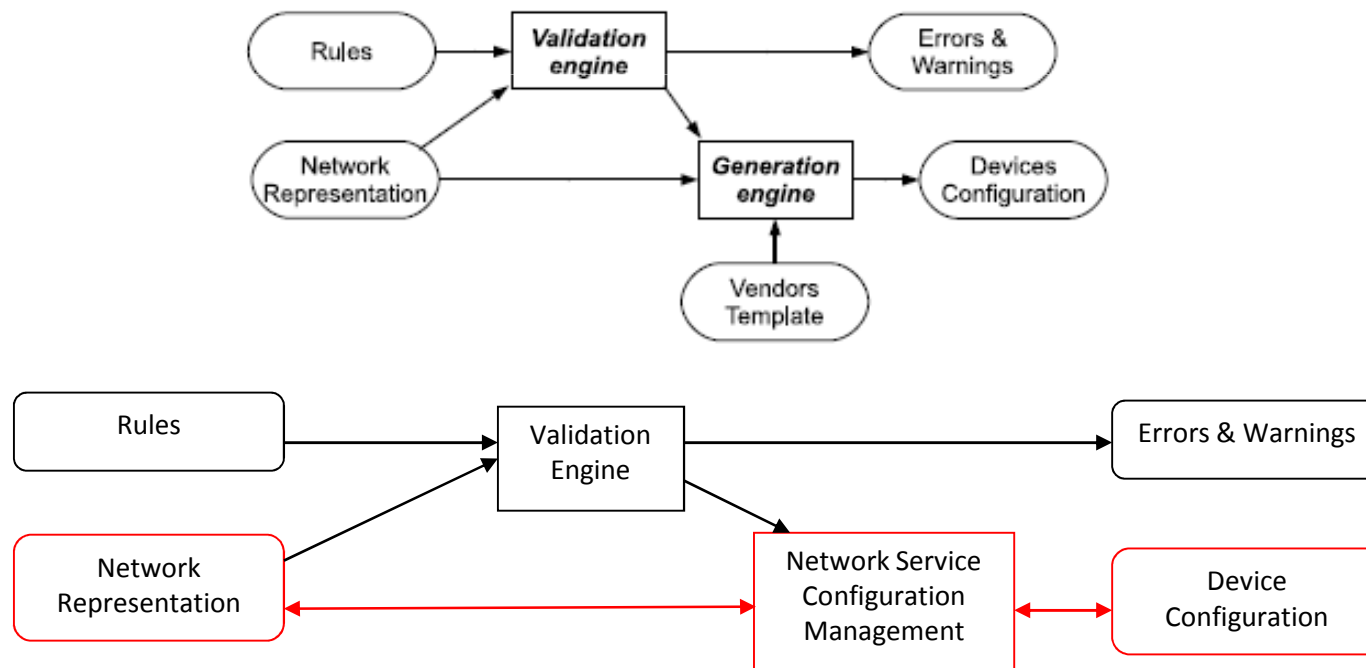
- Example
  - FOCAL Autonomic Management Element\*
  - Normalized interface for configuration management



\*S.-S. K. John Strassner, James Won-Ki Hong, "The Design of an Autonomic Communication Element to Manage Future Internet Services " Management Enabling the Future Internet for Changing Business and New Computing Services, pp. 122-132: Springer Berlin/ Heidelberg, 2009

# Automated Network Service Configuration Management

- Example
  - NCGuard\*
    - Automatic router configurations validation



\*L.Vanbever, G. Pardoen, and O. Bonaventure, "Towards validated network configurations with NCGuard." pp. 1-6.



**The End**

**Thanks for your attention!!**