

# Operations

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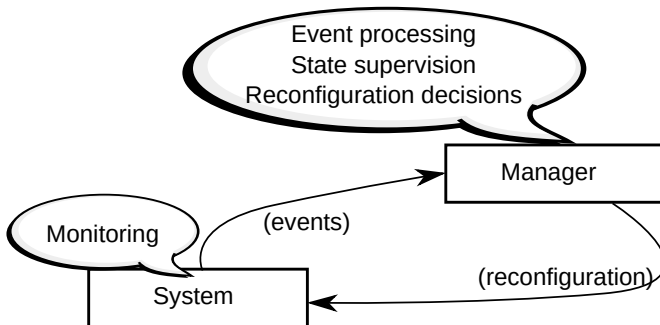
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# Today's Lesson

- Day-to-day activities in 3D
  - General overview
  - The Management Life Cycle revisited
- Pave the way for next weeks
- How data flows between the system and the management
- Keywords
  - FCAPS
  - SNMP
  - MIB

# The Management Life Cycle



# Activities

- What the manager does
- One of the dimensions of the manager cycle

# The Manager Activities

Discovery What's inside my system

- Not as easy as it looks
- Systems change

# The Manager Activities

- Monitoring How the system is behaving
- What's good, what's not
  - State change

# The Manager Activities

- Analysis What the monitoring is telling me
- What is expected, what is not
  - How to fix what is wrong

# The Manager Activities

Report Populate a journal

- For historical, administrative and business related reasons

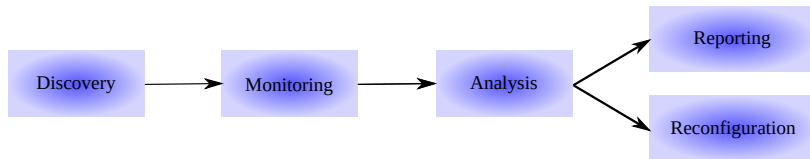


# The Manager Activities

Reconfiguration Tune the system configuration

- To fix problems

# Activities



# Functions

- What the manager must be concerned with
- 2nd dimension

# The Manager Functions

## Faults Management Keep things running

- Mostly boolean
  - Up/Down
- Challenge on understanding what is going wrong and why

# The Manager Functions

## Configuration Management How are things running

- Gather, store (and restore) configurations
- Anticipate problems with reconfiguration updates

# The Manager Functions

Accounting Management Collecting data of the system

- For business perspective
- For clients

# The Manager Functions

Performance Management How well things are running

- Anticipate, find and resolve performance problems

# The Manager Functions

Security Management Control who can do what and when

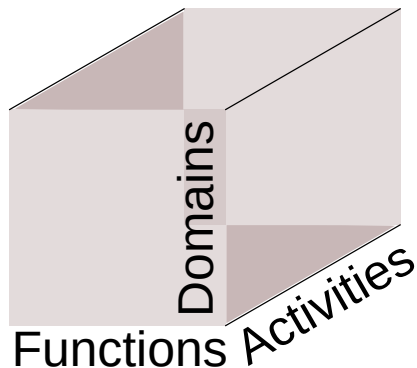
- Anticipate, find and resolve security problems



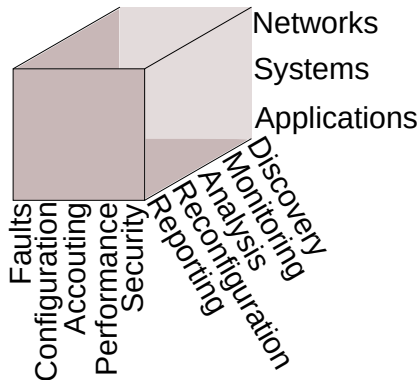
# FCAPS

F    Faults  
C    Configuration  
A    Accounting  
P    Performance  
S    Security

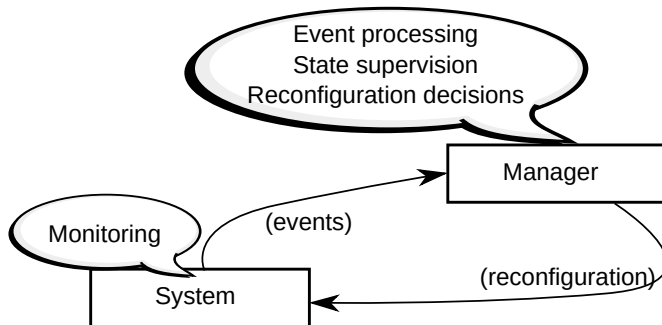
# The Manager Cube



# The Manager Cube



# The Management Life Cycle



# Managed Entity

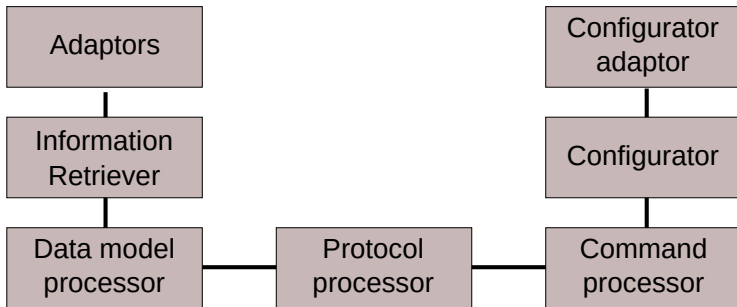
**Managed Entity** any software or hardware that is part of the system

- What provides service inside the system

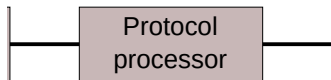
**Management Agent** the management administrator representative on the managed entity

- Part of the managed entity
- What communicates with the administrator
  - Reports status
  - Implements re-configurations

# Management Agent Structure

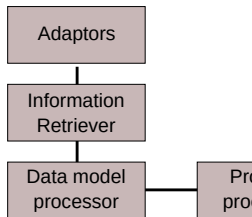


# Protocol Processor



- Entry point to the agent
  - Receives/send messages to the management
  - Routes commands to the Command and Data Model Processors
- May have more than one interface
  - Command line
  - SNMP
  - HTTP

# Data Model Processor



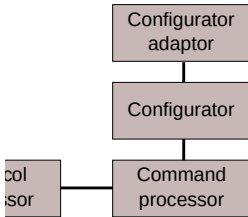
**Data model processor** Formats data according to the protocol representation

**Information retriever** Collects data from the adaptors

**Adaptors** Read device status



# Command Processor

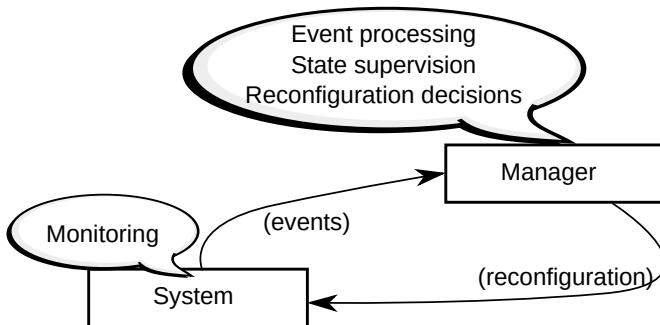


**Command processor** Interprets the commands received

**Configurator** Translates the commands into actions to be applied

**Configurator adaptors** Applies the actions

# The Management Life Cycle



# The Protocols

- How agents talk with the management
- Data representation

# Standard vs Proprietary

- Standard
  - Lower expressiveness and applicability
  - Higher coverage of devices
  - Lower efficiency
  - Harder to update
- Proprietary
  - Higher expressiveness
  - Lower configuration effort
  - Greater advantage in homogeneous systems

# Standard Protocols

- SNMP Simple Network Management Protocol
- CORBA Common Object Request Broker Architecture
- WBEM Web Based Enterprise Management
- WSDM Web Services Distributed Management
- NetConf

To know more

See Moodle's lesson for details

# Networks vs Systems

- Standardization effort mostly concentrated on network devices
- Applications/systems rely mostly on
  - Custom made agents
  - Proprietary solutions
    - E.g. iDRAC

# Information Organization

- How to integrate 1000's of indicators from multiple devices in a consistent view?
- Standards
  - MIB
  - CIM

# MIB

- Management Information Base
- Strongly related with SNMP
- Hierarchical, tree based, approach
  - Tree levels separated by dots
- Extension point on a tree branch for private companies



# CIM

- Common Information Model
- Strongly related with WBEM
- OO, tree based using inheritance
- UML for presentation

# The Management Console

- Gathers information from the system
  - Using multiple protocols and agents
- Configurable according to IT preferences
  - Including alerts

# Wrap Up

- Daily activities can be described by 3 dimensions
  - Functions
    - The branch of the quality of service
  - Activities
    - What must be done
  - Domains
    - Over what is being done

# Wrap Up

- Agents are the representative of the management on the system
- Communication with agents can use multiple protocols
  - A management framework abstracts this from the manager perspective