SysMan

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AEG

Object Oriented Management and Monitoring in heterogeneous Systems and Networks

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ATM Management Tools

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Provision of a Common Object Oriented View

- **Object Broker**
- **Management Browser MCM**
- **Knowledge Server**
- **Monitoring Service**
- **Domain & Policy Enhancements**
- **SNMP Adapter**
- **UNIX / DOS System Adapters**
- **CMIP Adapter**

Common O-O View

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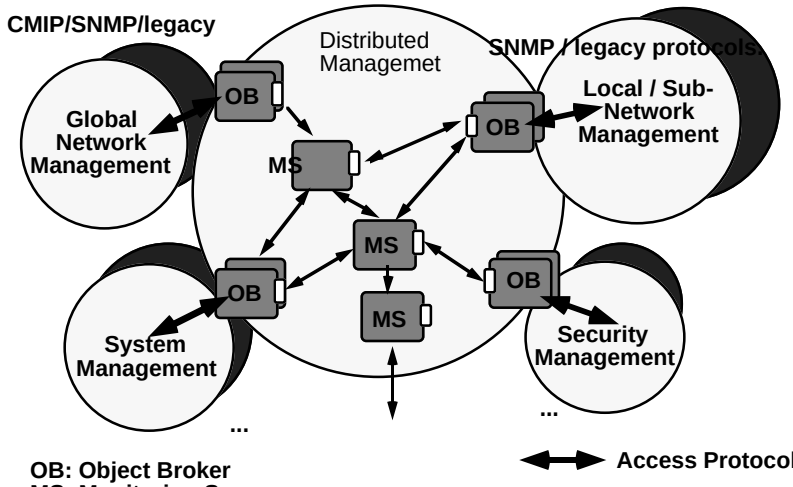

Requirements

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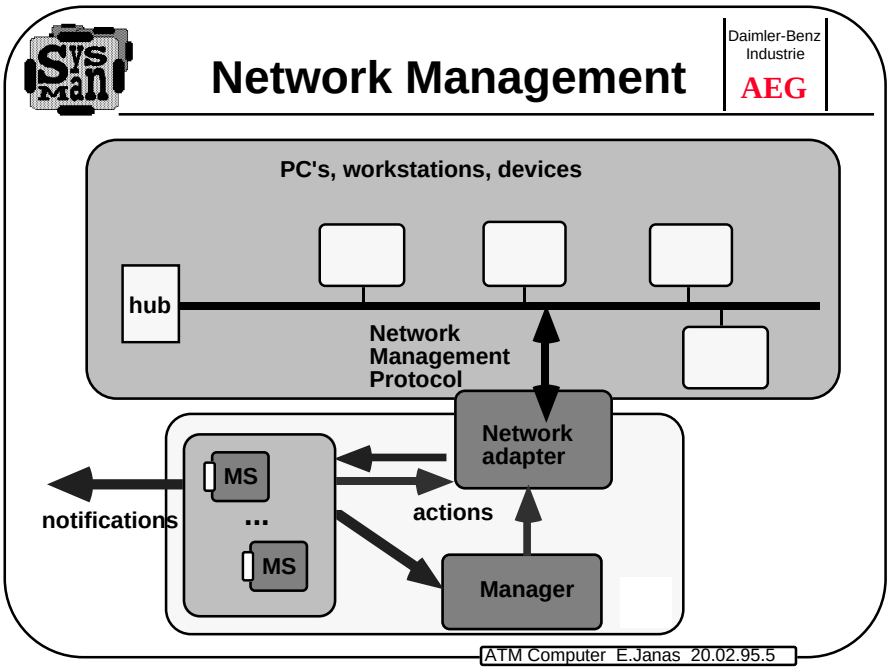
Management and monitoring of (quality of) services

- **Subnetwork Management**
  Utilisation, errors, node reachability, health
- **Local Network and Cluster Management**
  Backbone utilisation, errors, hub management, health, subnetwork reachability,
- **Local Service Management**
  NFS, mailing, printer, application services
- **Global Network Management**
  Routing management, accounting
- **Global Service Management**
  Mailing, security, application services
- **System Management**


Network Management
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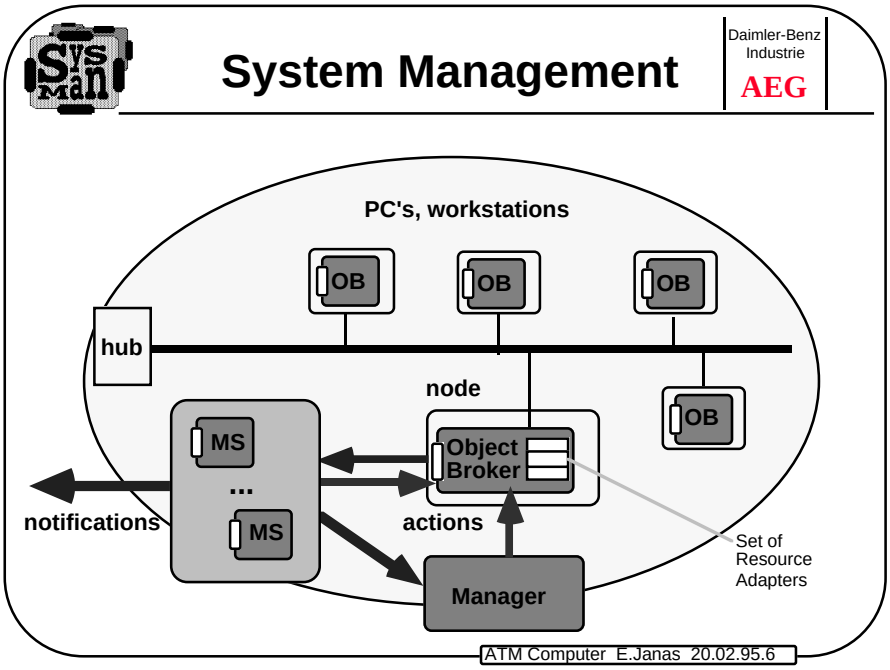
PC's, workstations, devices
hub
Network
Management
Protocol
Network
adapter
MS
...
MS
notifications
actions
Manager
ATM Computer E.Janas 20.02.95.5


System Management
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Industrie
AEG
PC's, workstations
OB
OB
OB
hub
node
OB
MS
...
MS
Object
Broker
notifications
actions
Manager
Set of
Resource
Adapters
ATM Computer E.Janas 20.02.95.6

Integrated Management

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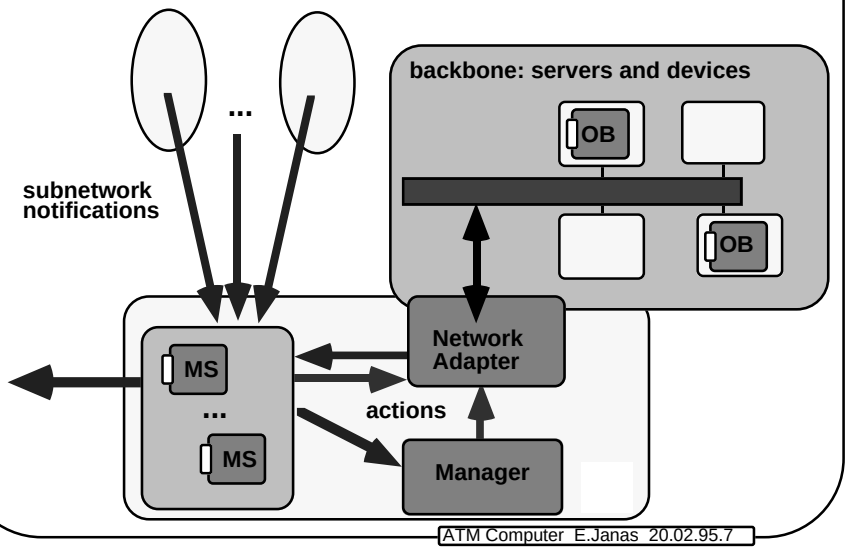

Object Broker

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Modelling of real-life resource as managed objects

- Interface implements IS-9595 (CMIS)
- Architecture and operation implements IS-10040 and IS-10165-1 (OSI management architecture and object model)
- ANSA server
- Operation validation performed through SMK server
- Portable on any UNIX OS and DOS/Windows
- Low memory requirements

- No resource specific code ☞ resource adapters
- Local event detection

☆ Required on every system which needs system management

Object Broker-2

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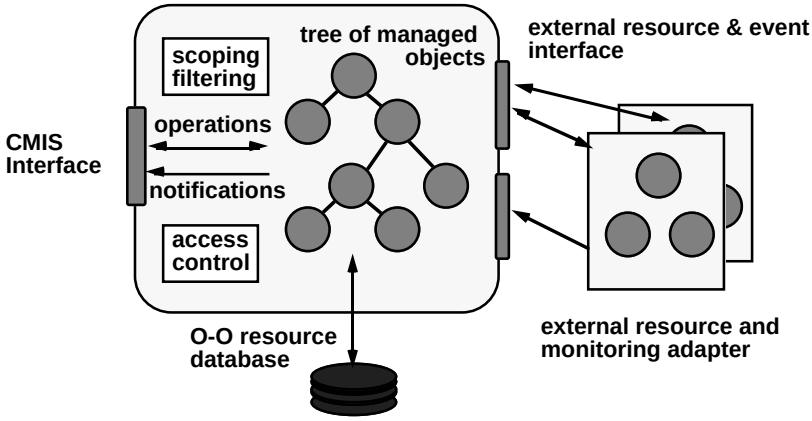

Resource Adapter

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Here's the real work to do!

- Mapping of real resources to managed object abstraction
- Implementation of local event detection
- External process invoked through Object Broker in order to

  process a CMIS operation
  check for an event condition

- No operation validation ☞Object Broker
- Specific resource adapters for:

  processes
  file systems
  printers
  users
  applications
  ...

SNMP Adapter

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LAN Management is SNMP Management

- Transformation of RFC-MIBs into O-O view (GDMO)
  traditional: in the user interface (sorry: too late!)
  SysMan: at the outer boundary of the management system
- Proxy: CMIS-Agent + specialized resource adapter (SNMP Client)
- Implements RFC 1157 (SNMP) plus any RFC-MIB
- Conformance to ISO Internet Management Coexistence, tested with:
  - MIB-II (RFC 1213)
  - Character/Serial/Parallel-MIB (RFC 1316-18))
  - RMON (RFC 1271)
  - Vendor MIBs (e.g. Chipcom, CISCO, Fibronics)

☆ Required once in a subnetwork

SNMP Adapter-2

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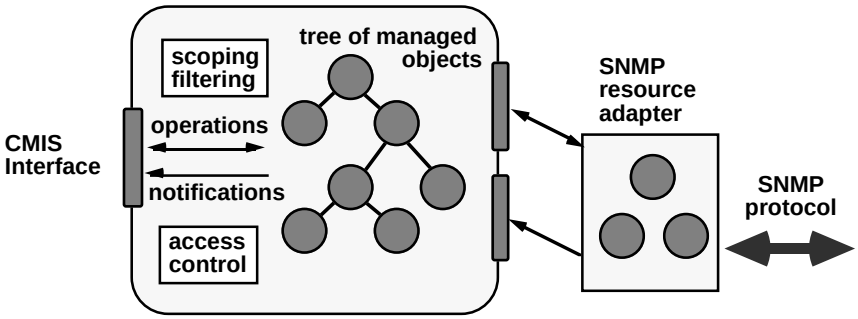

Knowledge Server

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Object Definitions: Management Knowlegde

- Storage of object definitions (MIBs):

  attribute syntax (string, integer ...)
  textual definition of semantics (behaviour)

- Database and parsers are distributed applications
- Parsers available:

  ASN.1/GDMO: IS-8824, IS-10165-4
  RFC-MIBs: IS-8824, RFC-1155, RFC-1212

- Hypertext browser

☆ Required once in a network

Knowledge Server-2

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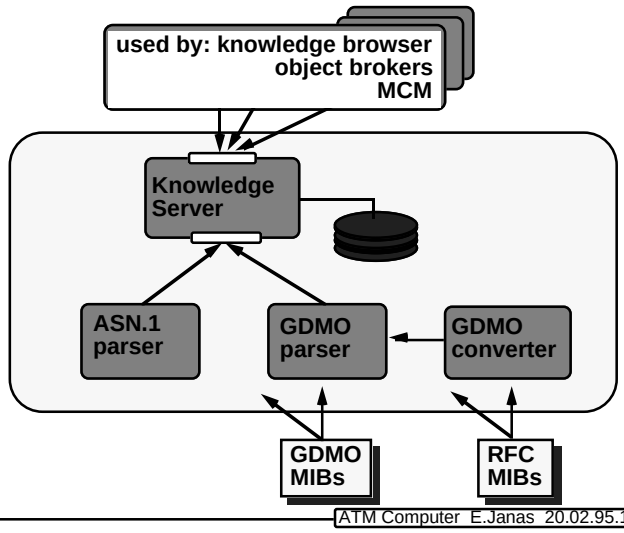

Knowlege Server-3

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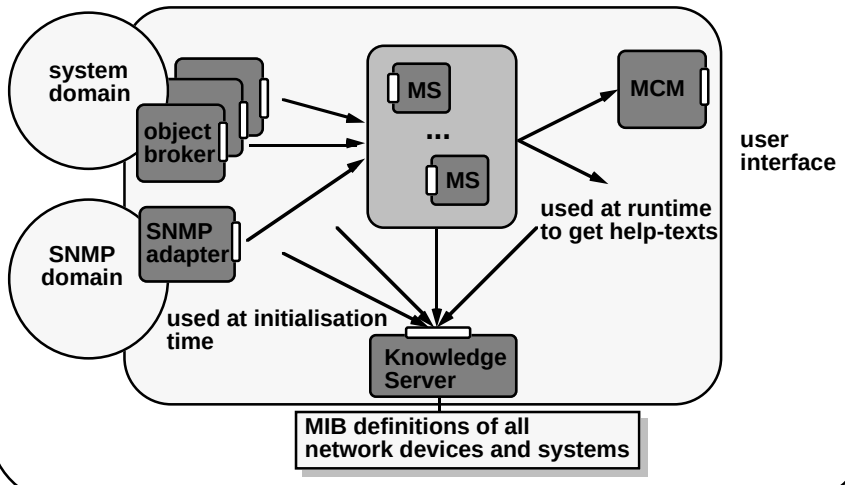

Monitoring Service

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Monitoring is the prerequisite for management

- Distributed event processing pipeline
- Monitoring server is a TCL interpreter (itcl)
- Overall configuration with SysMan configuration service
- Event notifications are received from different sources
- Named output queues disseminate to all registered parties
- Event information conforms to OSI and SNMPV2 event model

time
type
source name
source class
info (attribute list)

Monitoring Service-2

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Monitoring activities ⇨ monitoring object classes

- **Generation**

  Monitoring adapters of ☞ Object Broker
  GMS initiated object polling

- **Processing**

  Filtering: time, source, type, info
  Splitting and merging
  Event combination: [e1=>e2=>e3] |10 s|
  Database updating
  Validation & Analysis: health functions

- **Dissemination**
- **Visualisation ☞ MCM**

MS Configuration

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How to configure the monitoring service

⇨ MS server Configuration

Configuration of a tree of monitoring objects with MCM specific TCL programming

⇨ Distributed MS Configuration

Configuration of the distributed MS service with the SysMan configuration service

⇨ Configuration alternatives

one MS server with many TCL monitoring objects
multiple MS servers with just one monitoring objects

MS Configuration-2

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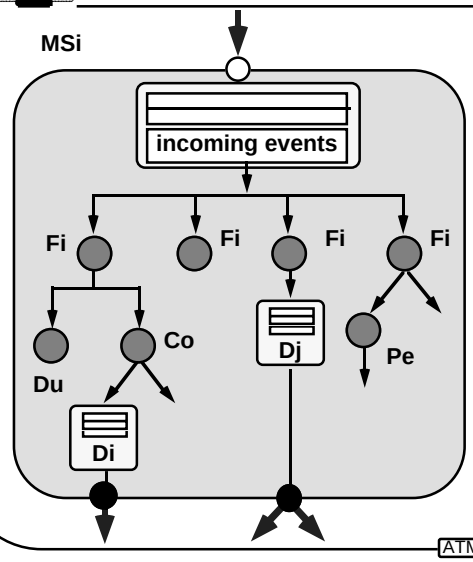
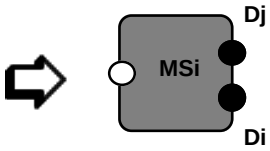


- Fi: Filters
- Co: Combinators
- Du: Database updaters
- Pe: policy executers
- Di: Disseminators

Representation in a configuration domain:



Configuration Service

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Configuration of distributed services

- SysMan workpackage of ICSTM
- A distibuted service is regarded as a composite object
- Darwin: textual configuration language & configuartion interpreter
- A composite object is represented by a configuration domain
- Graphical configuration tool implements interactive configuration management with drag&drop
- Implementation on top of the SysMan domain service

Configuration Service-2

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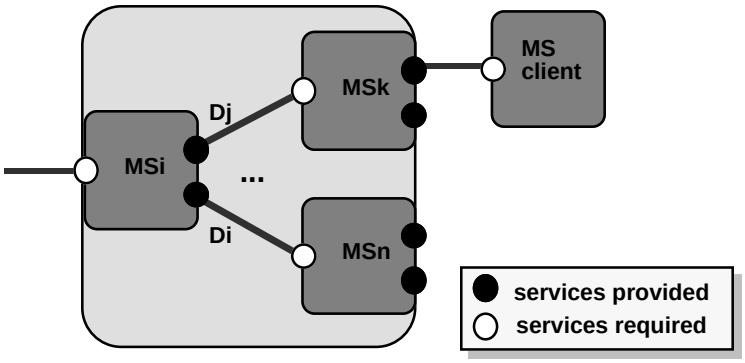
Monitoring service = composite object



MCM

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The MCM is the integrated Management Cockpit

- Graphical motif look-alike user interface
- Browsing and manipulation of objects (MIBs)
- Event browsing and animation
- Online access to object (MIB) definitions

- Integrated domain browser and manipulator
- Multiple and overlapping views

☆ Required at least once in a network

MCM-2

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The user designs and edits his network views

- Views: specific domains for visualisation
- Domain objects: other domains or any managed object
- Dynamically configurable domain objects including a final event filter which uses simple *pattern* matching
- Visualisation of resource state (color, blinking)
- Object specific event summary
- Object specific visualisation widgets (event animation)
- Generation of secondary events for unacknowledged events
- Global event summary for each view

MCM-3

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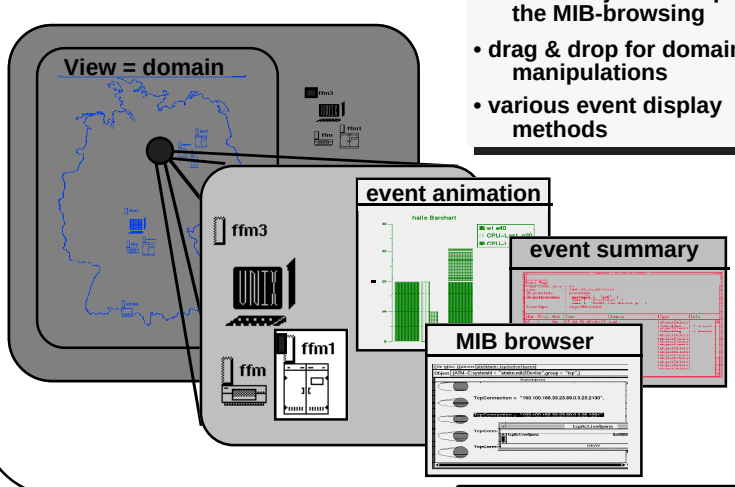
- domain objects startpoints for the MIB-browsing
- drag & drop for domain manipulations
- various event display methods



Domains

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Grouping of objects according to some criteria

- A domain may have an associated policies
- Domains may spawn a tree of overlapping domains
- Views are implemented as domains
- Domain service is implemented as distributed service
- Access to domain service from MS
- Domain browser operations:

  access to the domain hierarchy
  creation and deletion of domains
  movement of members through drag&drop

- Full integration with MCM (mouse-click, drag&drop)

Policies

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Policies control management behaviour

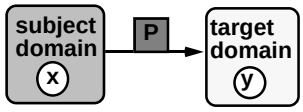
- A Policy defines a specific relationship between the members of a subject and a target domain
- Authorisation policies define

  what operations the managers x in a subject domain may invoke on the objects y in a target domain

- Obligation policies define

  what activities the managers x in a subject domain y must / must not do with respect to the objects y in a target domain

- A policy specification include constraints (param. / temp. / precond.)



Policies-2

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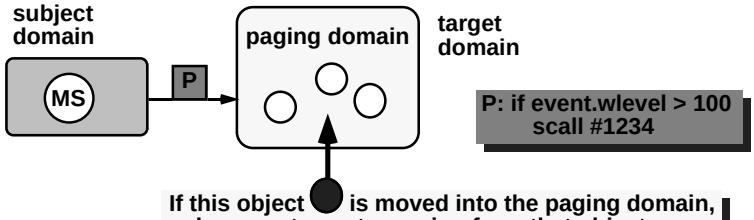
- Management operations upon a managed object are validated in the context of the policies, which apply to it
- Management behaviour can be changed by moving objects in the domain hierarchy
- The MS can interpret obligation policies P, when receiving events from managed objects e.g:



P: if event.wlevel > 100
scall #1234

If this object is moved into the paging domain, subsequent events coming from that object will trigger a paging alarm