XtreemOS

Enabling Linux
for the Grid

XtreemOS Applications

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XtreemOS Summer School
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Information Society
Technologies

Overview of Applications in the XtreemOS Project

XtreemOS
Enabling Linux for the Grid

19 applications demonstrating and evaluating XtreemOS from the perspective of industrial and academic end-users

Information Society Technologies

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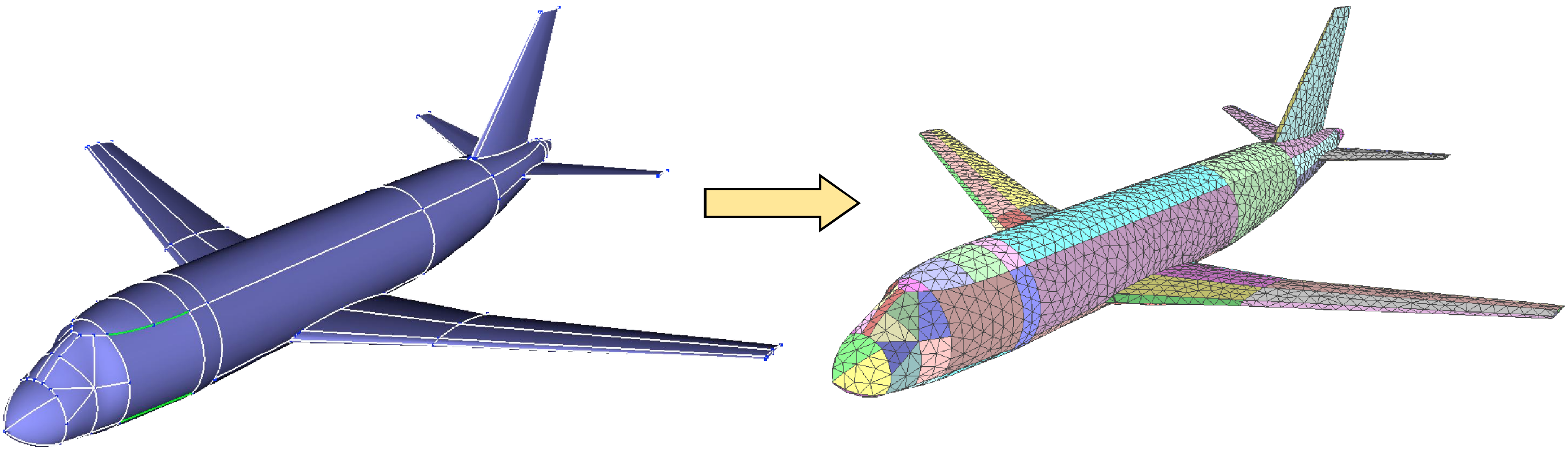
Examples

- jCAE (EADS)
- Elfipole (EADS)
- Rule-Based System Management (SAP)

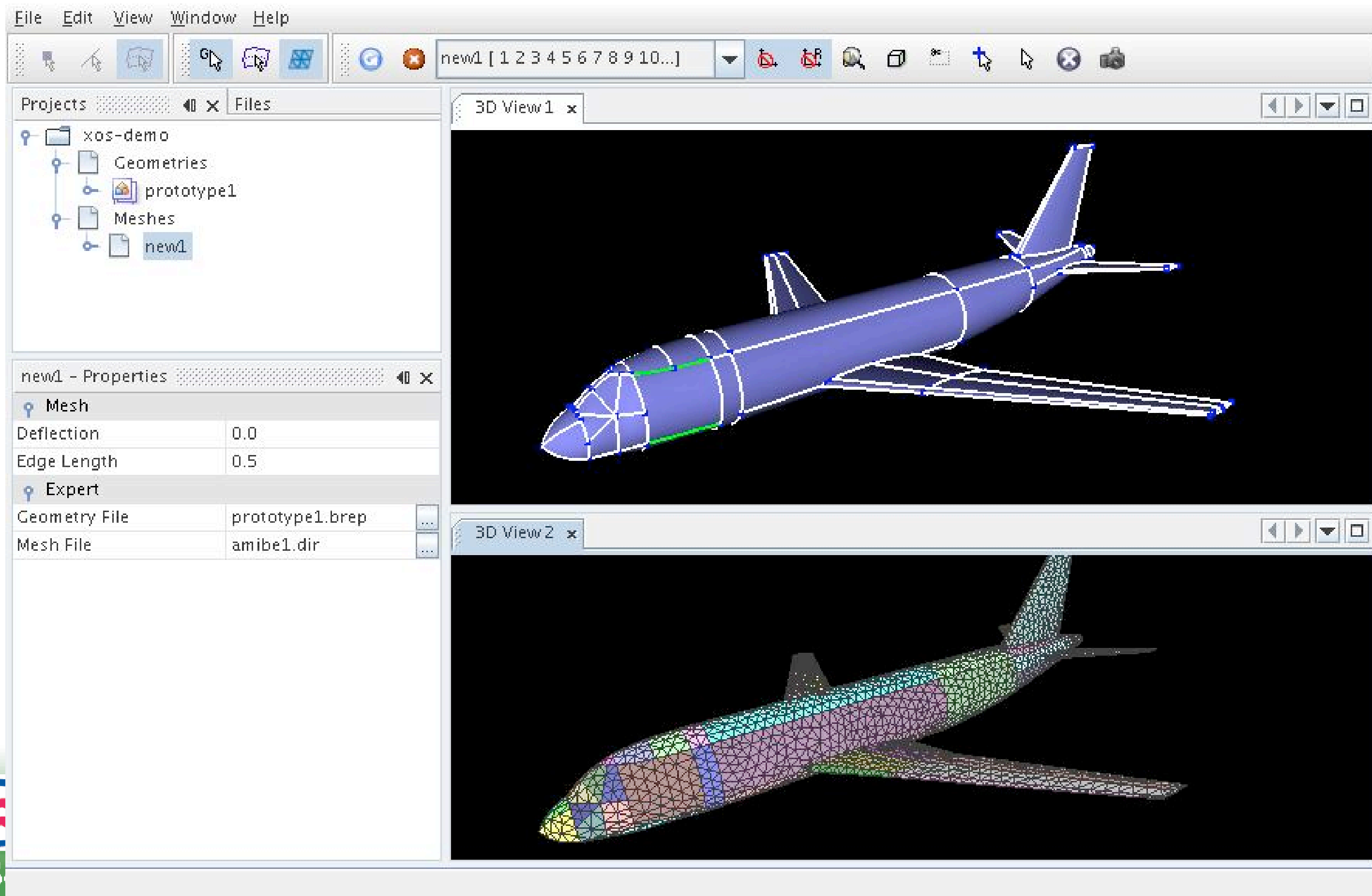
jCAE (EADS)

- jCAE is a surface 3D mesher
- Create triangles from CAD (NURBS)



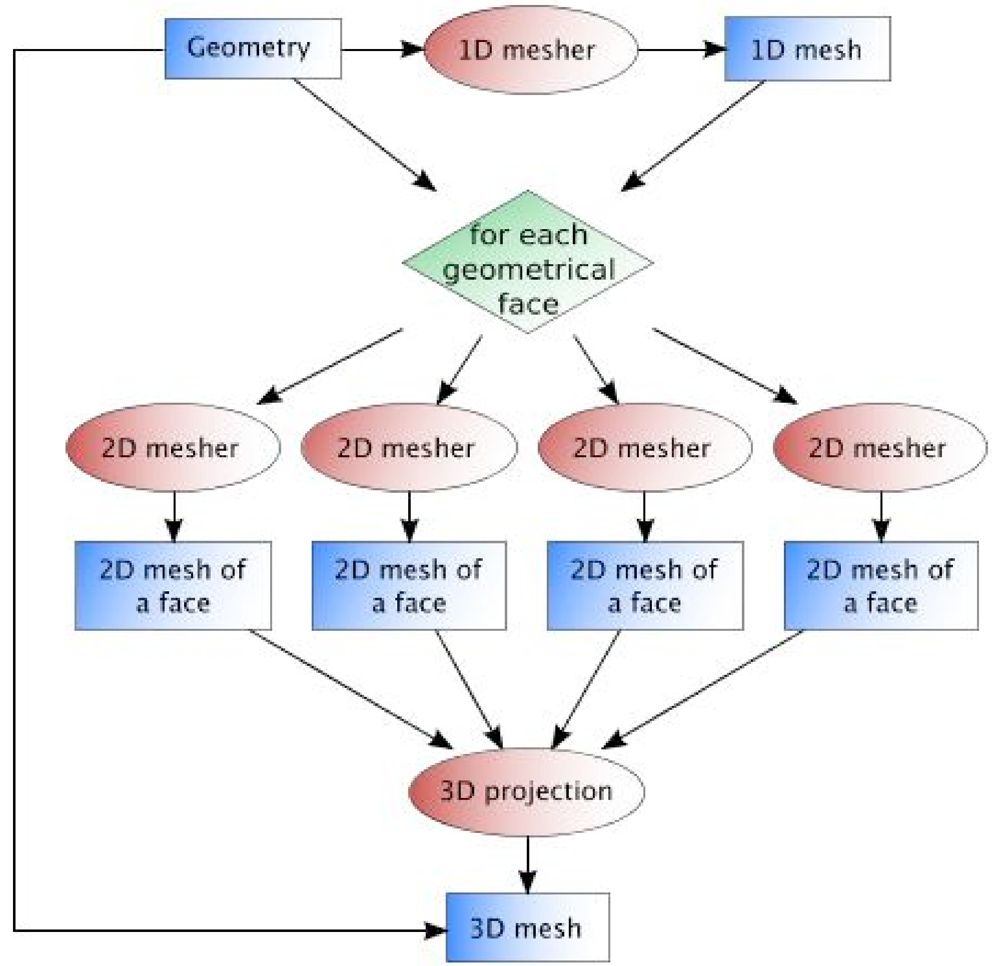
Brief Application Description

- The mesher kernel is named Amibe
- Amibe is a command line application
- jCAE is the graphical front end



Brief Application Description

- **Amibe work can be splitted into distributed jobs**



Benefits from XtreemOS

- **To create large meshes Amibe must be distributed**
- **Amibe will benefits from the PC flavor of XtreemOS to:**
  - Select best node to start meshing
  - Make input files (CAD) available on the grid
  - Start elementary meshing jobs
  - Gather elementary meshes at the end

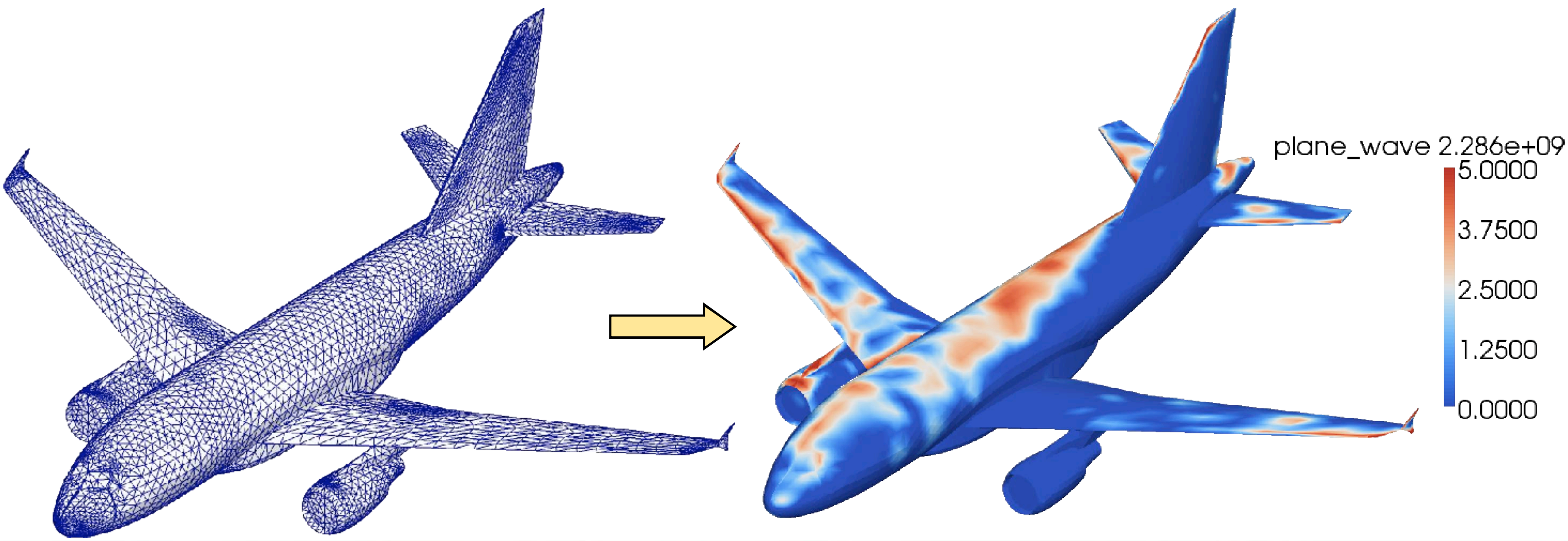
Elfipole (EADS)

- **Electromagnetic solver (Maxwell equations)**
- **Main applications are**
  - Lighting effects on plane
  - Antenna calculation

- **Command line application only**
- **Rely on third party software for 3D visualization**
- **Distributed with MPI**
- **Multi-threaded**

Brief Application Description

- Input is a 3D triangle mesh
- Output is a set of values of triangles



Benefits from XtreemOS

- Elfipole benefits from LinuxSSI scheduling and process migration.

- And also LinuxSSI thread migration.

XtreemOS Cloud Deployment with SAP RBSM

Empowering system administrators with useful, reliable tools

SYSTEMATIC THOUGHT LEADERSHIP FOR INNOVATIVE BUSINESS

Bernd Scheuermann
SAP Research
08/07/2010

Agenda

1. **Automated System Management**
   1.1. Why do we need it?
   1.2. How does it work?
2. Rule-Based System Management
   2.1. RBSM architecture
   2.2. Implementation aims
3. XtreemOS on the Cloud
   3.1. Use case
   3.2. Demonstration

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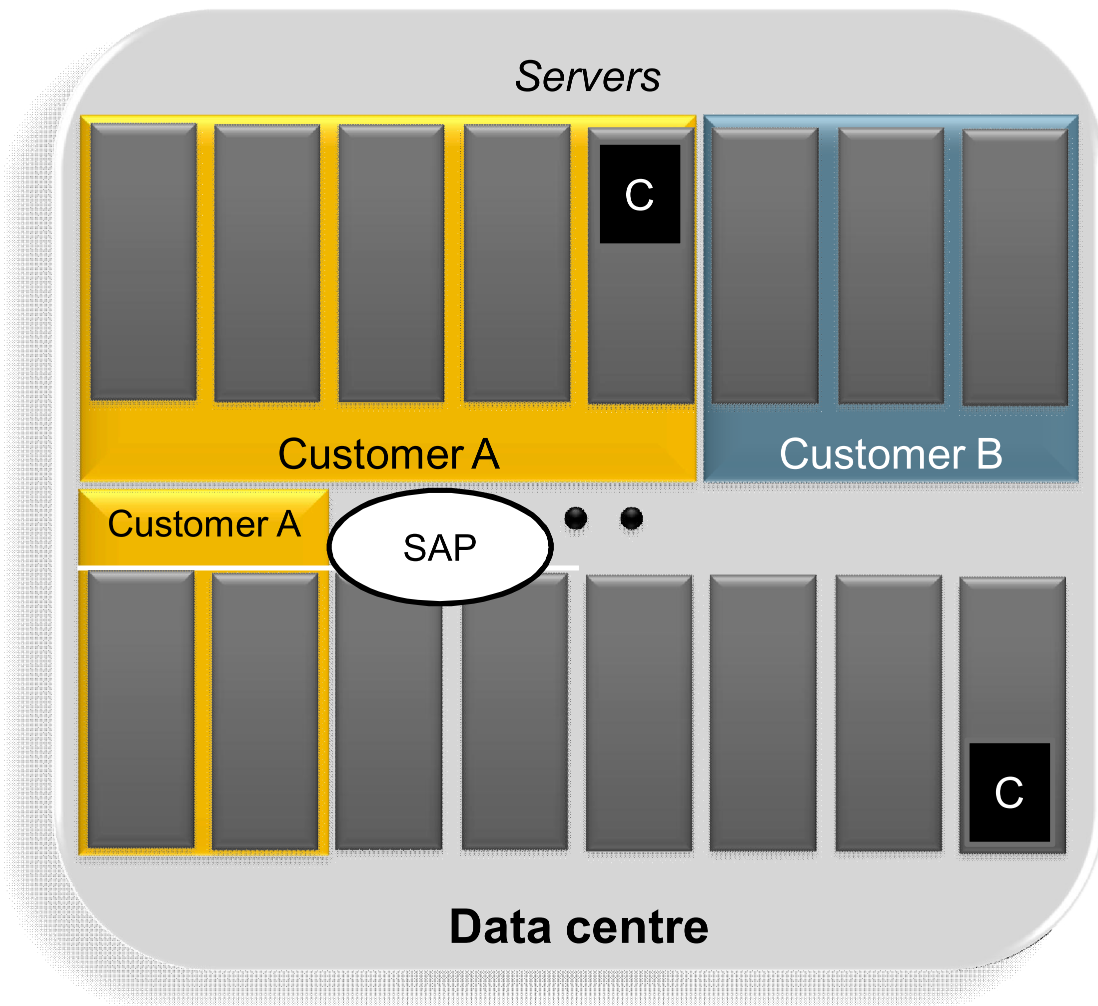
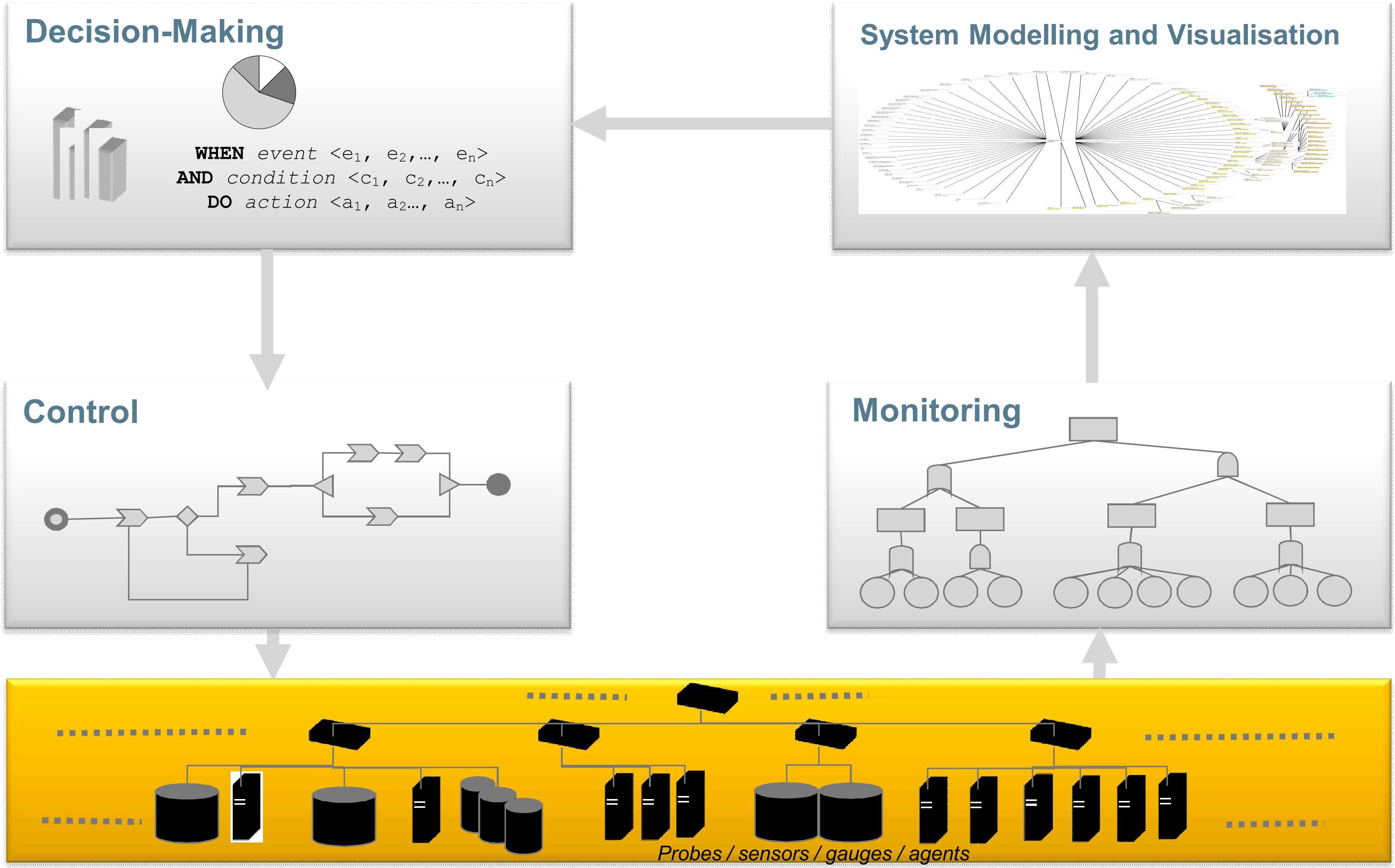
Why do we need Automated System Management?



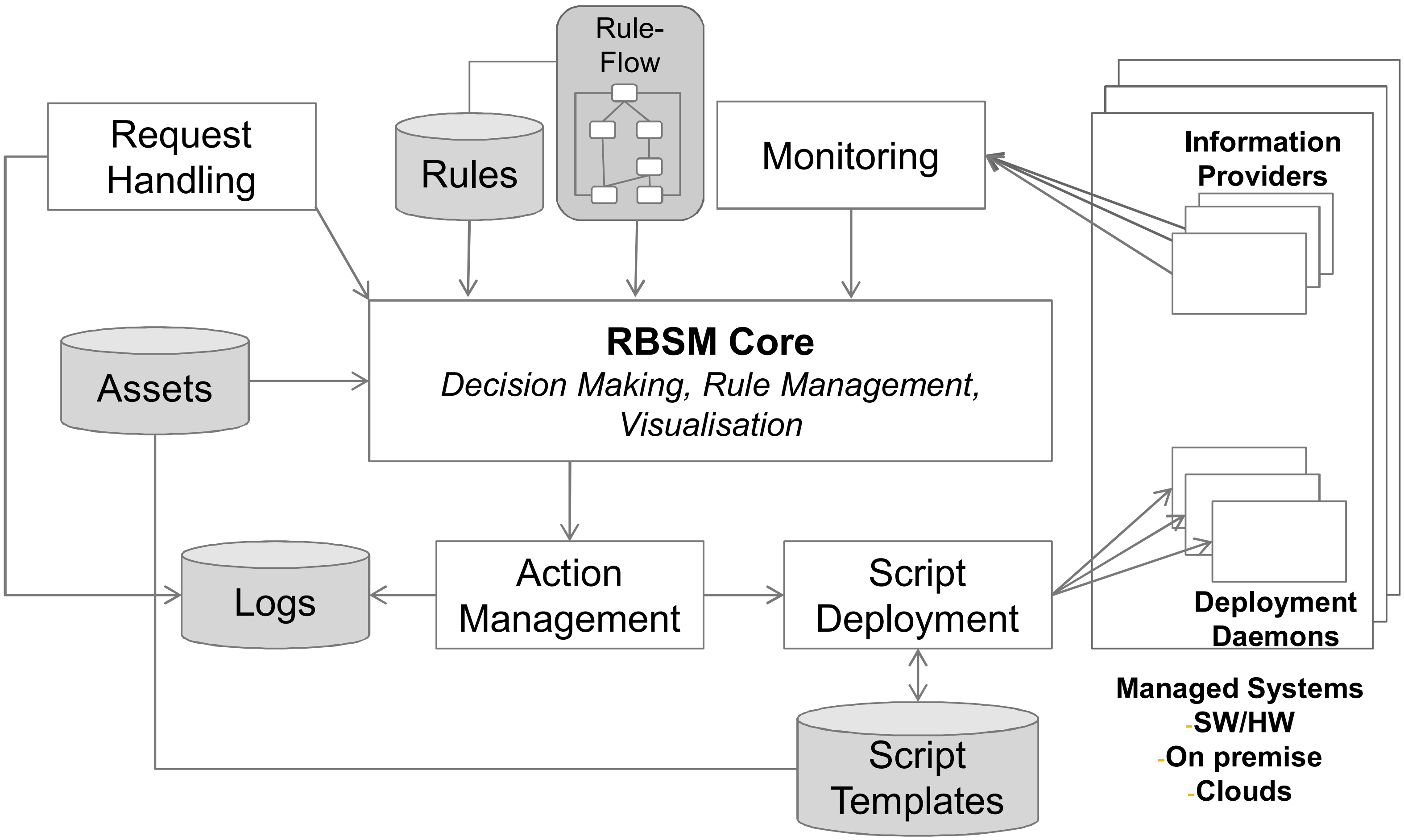
A common use case for automated system management is the data centre:

- Large number of nodes
- Provisioning of resources
  - Capacity planning
  - Performance/efficiency balance
- Application deployment
- Resource monitoring
- Fault tolerance

How does Automated System Management work?

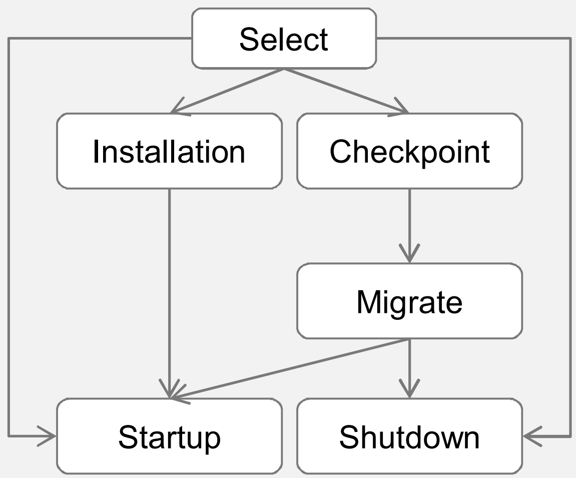


Architecture of Rule-Based System Management (RBSM)

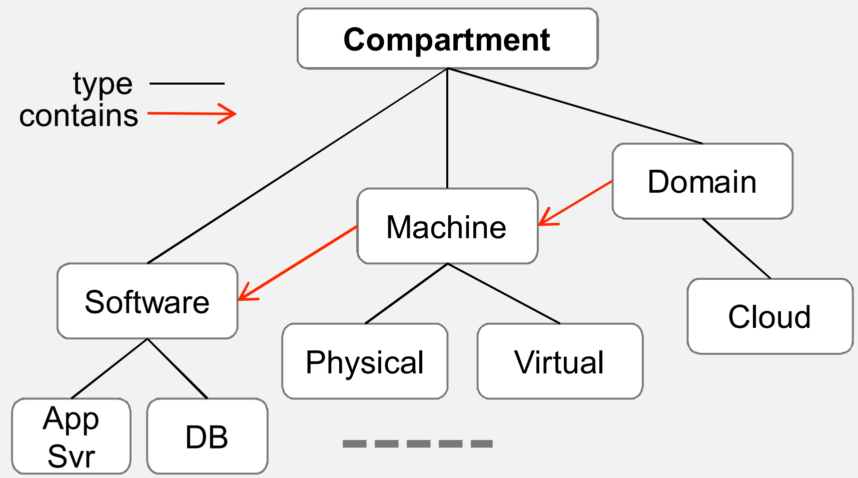


Implementation aims

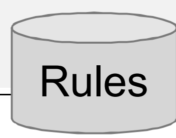
Separation of Management Concerns



Container-centric Reasoning

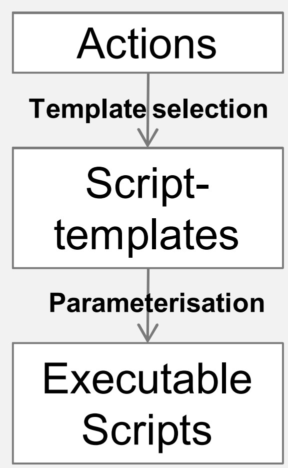


Declarative Rules




```
rule "Add Software to Machine"
ruleflow-group 'Installation'
when
   $request : InstallationRequest (deadline==now)
   $software: Software (name==$request.asset)
   $host : Machine (isAvailable, CPU >=
             $request.Constraints.minCPU, MEM >=
             $request.Constraints.minMEM, HDD >
             $request.Constraints.minHDD)
then
   Action a = AM.createNewAction("install", $software, $host,
   $request.objectType)
   DM.addAction (a)
   $software.addAssociation($host)
end
```

Action-refinement




```
{Action-type, target, params,
        deadline}

Command $<param>
Command $<param>
    :

Command 123
Command 345
    :
```

Use case: Rapid Cloud deployment of XtreemOS Grid

This use case shows deployment of an XtreemOS Grid infrastructure within a cloud environment. It entails the automated creation of appropriately-sized VMs on the cloud and deployment of XtreemOS images.

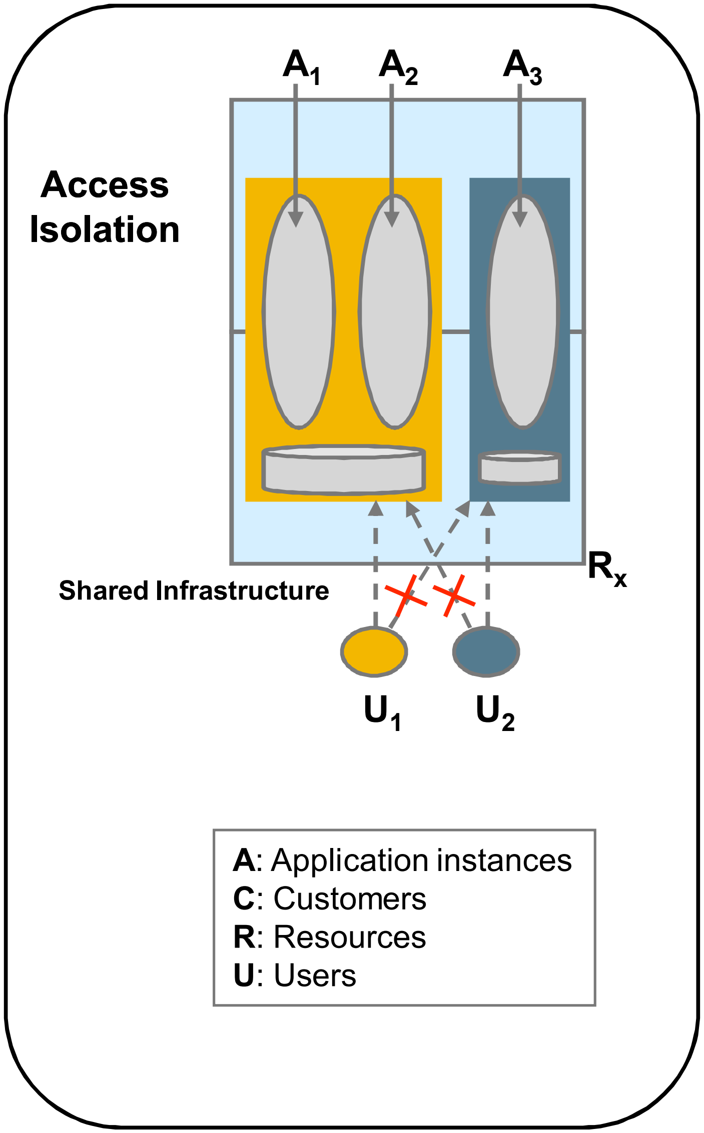
Setup phase

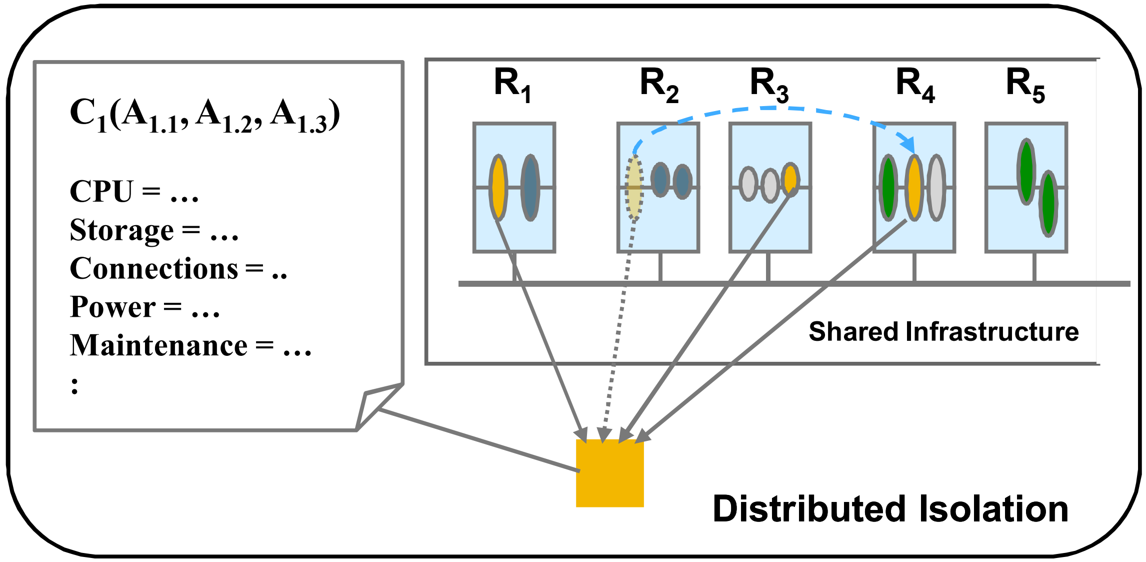
1. Setup RBSM management system
2. Configure Cloud connection (this demo will use our internal cloud using the OpenNebula platform)
3. Prepare pre-configured XtreemOS images (Core, Resource)

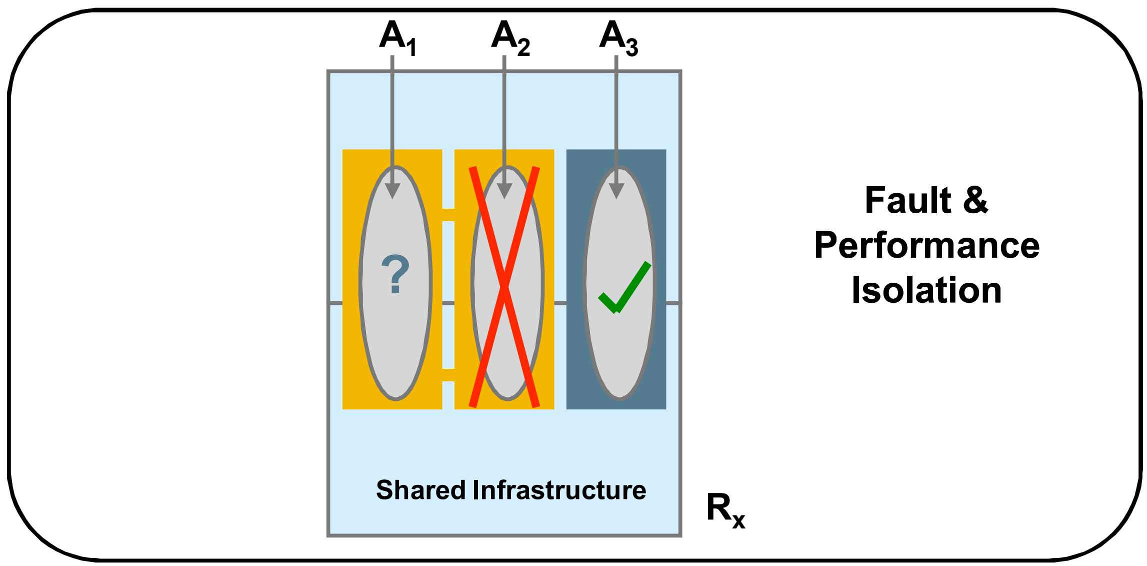
Deployment phase

1. Collect requirements and size Grid (i.e., number of resource nodes required)
2. Deploy XtreemOS Core node
3. Deploy as many XtreemOS Resource nodes as required

Managed Isolation in XtreemOS using SAP RBSM







Isolation Challenges and Opportunities

- Isolation impacts on performance/ costs
  - Use Isolation mechanism only when required
  - Understand tradeoffs between isolation and performance

- Different isolation solutions for different profiles e.g.
  - Localisation (Isolation/ restriction of network span)
  - Physical Machine (restricted access to machine)
  - Virtualization (e.g. Xen, VMWare)
  - Containers
  - Namespaces

- Improve manageability
  - Consolidated management
  - Finer-grained control of resources
  - Basic security model for distributed resource management

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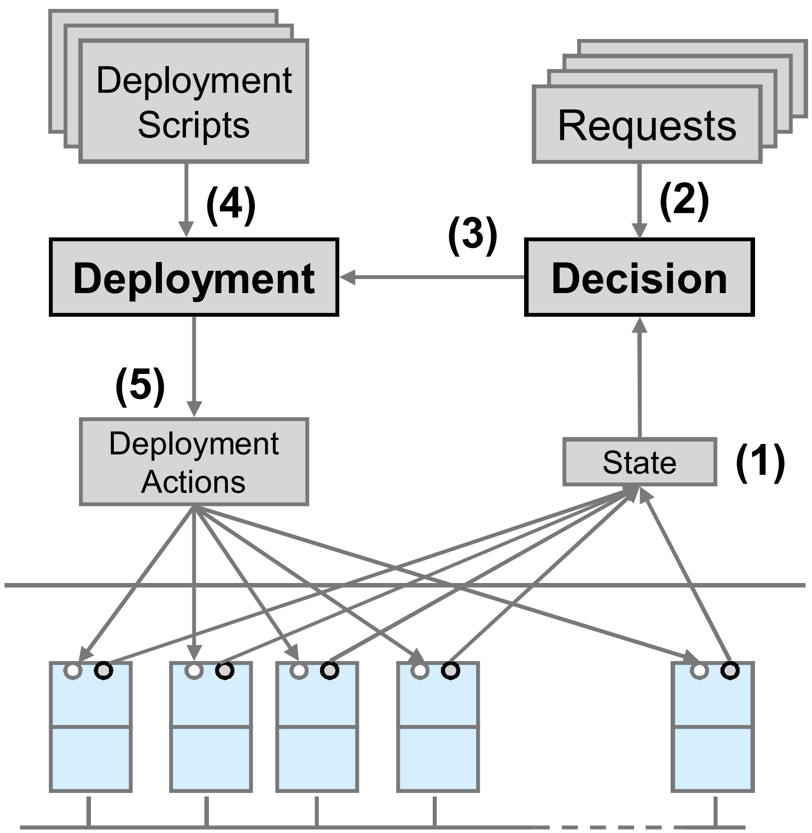
Managed Isolation process and architecture



(1) Query/ Monitor overall system state

- Number of nodes/ CPUs
- Operational capabilities (memory, processing)
- Isolation capabilities (physical, virtual)

(2) Receive installation requests

- Install software
- Number of instances
- Isolation guarantees

(3) Decision rules: WHEN <Request? & State…?> DO <DeploymentAction…?>

(4) Select relevant deployment scripts and update parameters

(5) Execute deployment actions using scripts with parameter values

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