

Delft Cooperation on Intelligent Systems



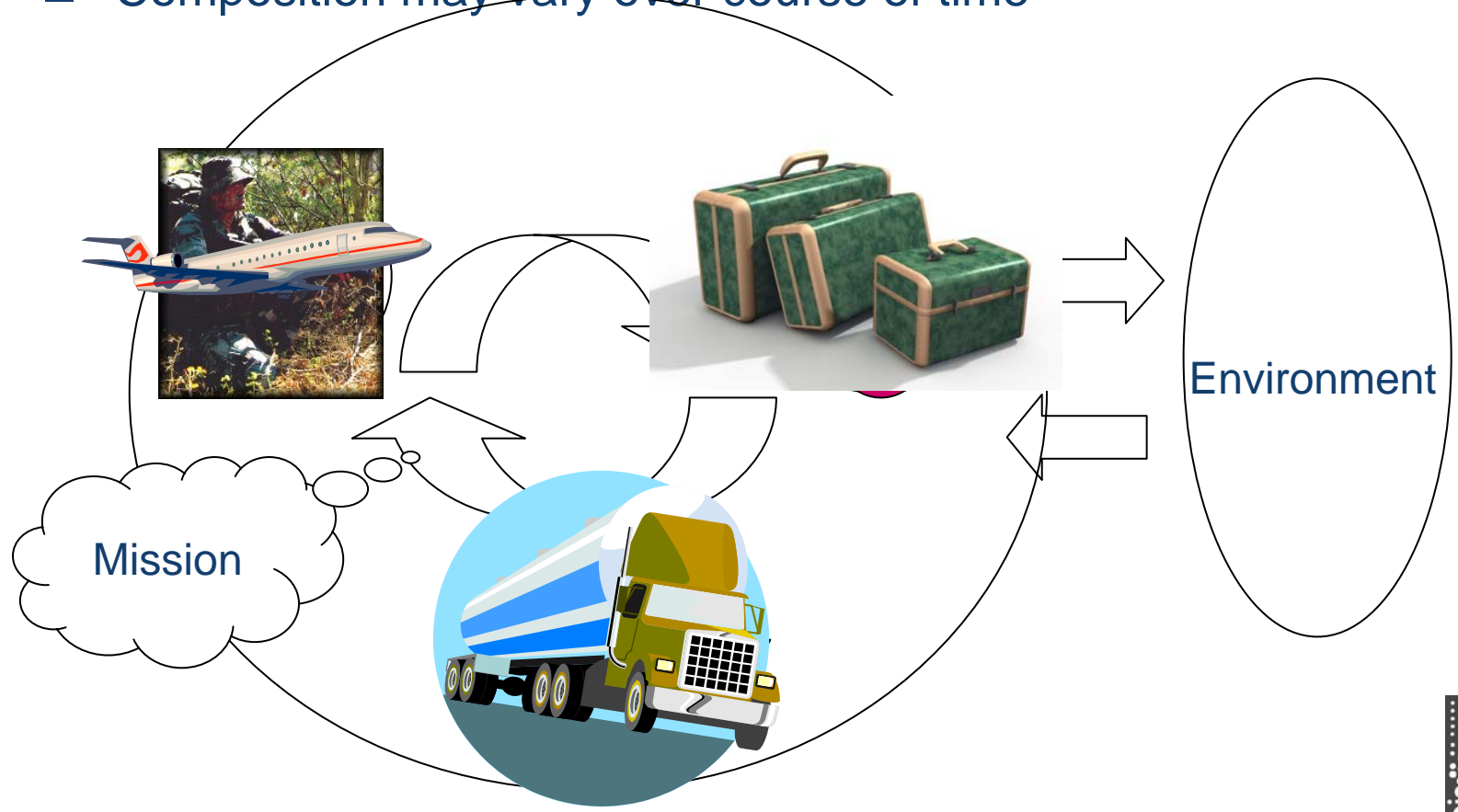
SMDS, a top-down approach to Self-Management for Dynamic Collaboration Systems

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- Context
- SMDS Overview
- SMDS Approach
- Results
- Future Work

Dynamic Collaboration System (DCS):

- Multiple platforms with various resources joining in the pursuit of a common mission
- Composition may vary over course of time



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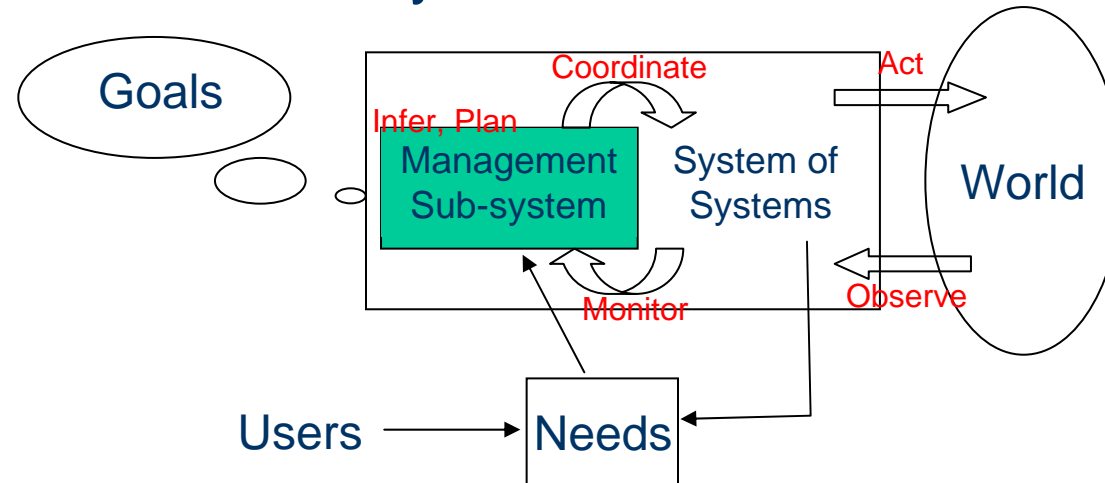


Bottom up approach to DCS,
determine plan, discover peer, contract peers,
(who have to do the same cycle)
Start execution

Will not:

Fit Critical environments (time, safety, mission)
Global Optimization, runtime improvement,
Crossover flexibility (make use of new resources, repair
when resources leave, re-use processing), Convergence,
Escalation-detection

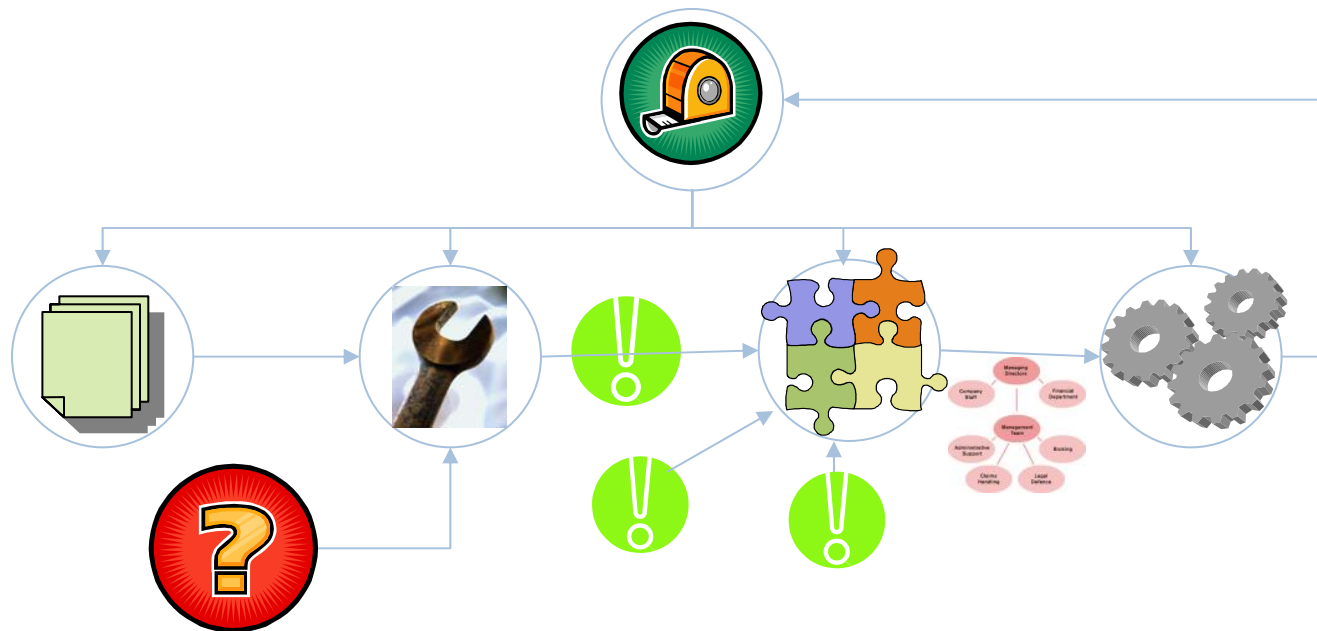
Dynamic Collaboration System



- Triggers on Needs
- Constraints set by Goals (Mission)
- Provide integrated Solutions and coordination
- Monitor and adjust
- Management Sub-system is System of Systems

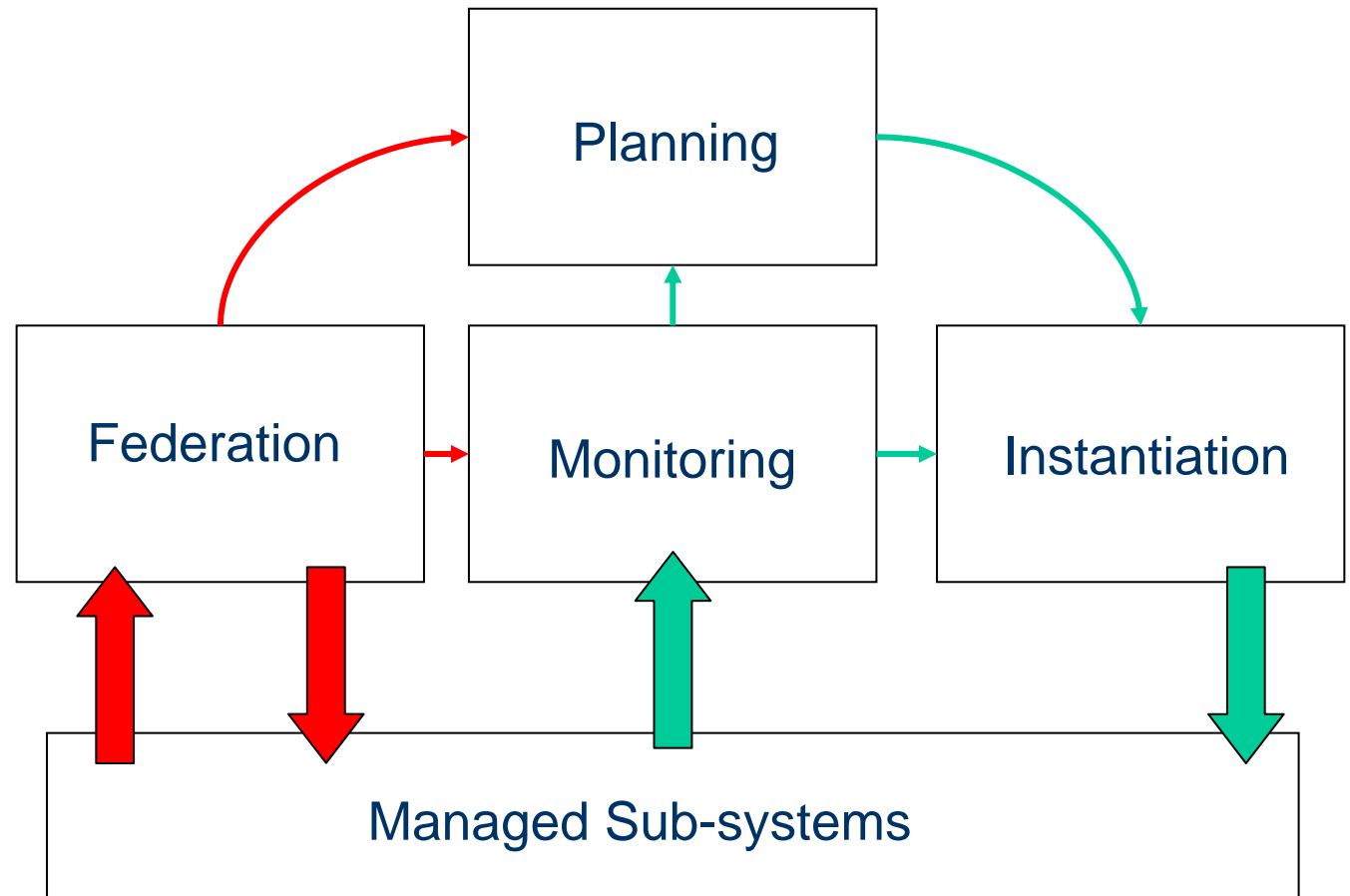


- Use Knowledge Base to document System's capabilities
- Use Automated Reasoning technology to infer collaboration blueprints (solutions) in response to emerging needs
 - Maximize performance
 - Guarantee safety, security and other QoS requirements
- Compile combined solutions, respecting each requirement
- Track progress/quality of Service aspects of combined solution





Segments



Remember:

- Knowledge based
- Delegate Management Responsibilities
- Provide Open but Total, Integrated Solutions
- Quality of Service Management

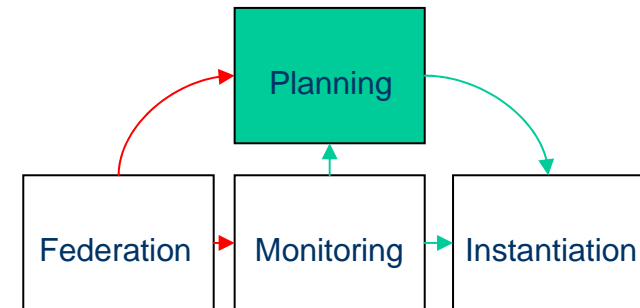
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Context

- Registers Needs, Mission (Goals)
- Disseminates global plan (MasterPlan)



Purpose

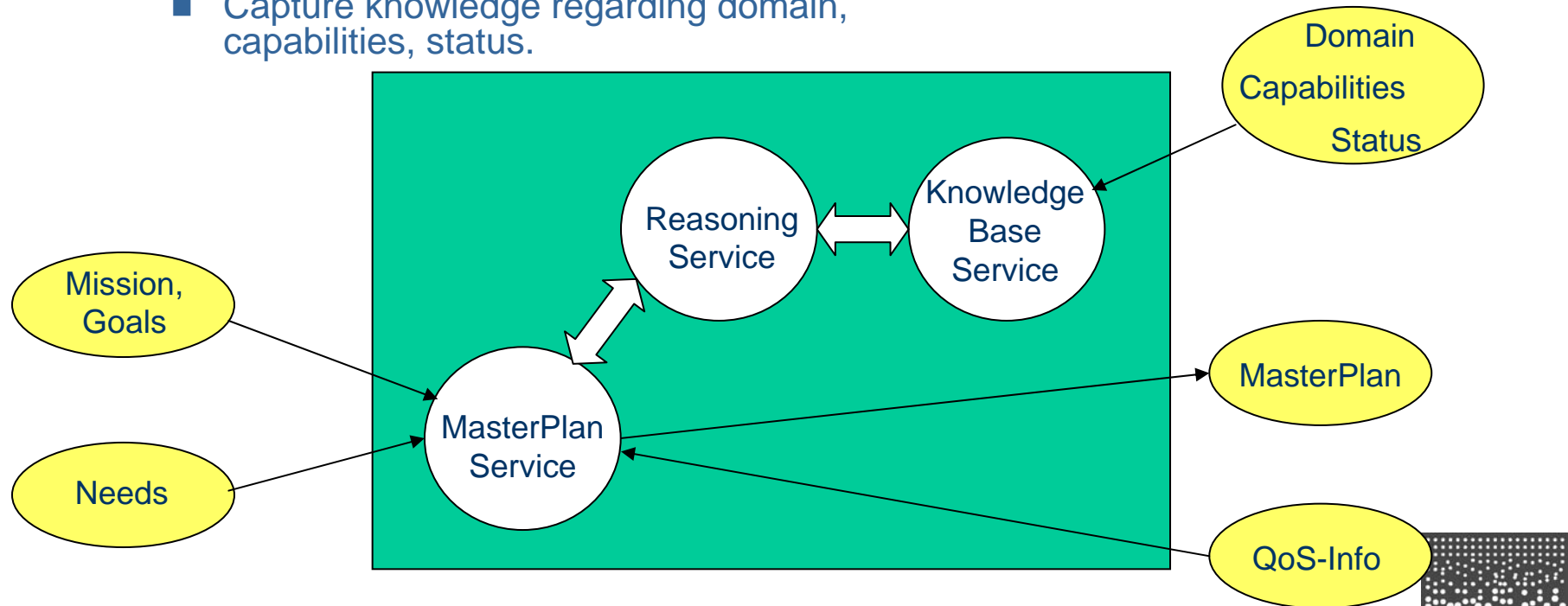
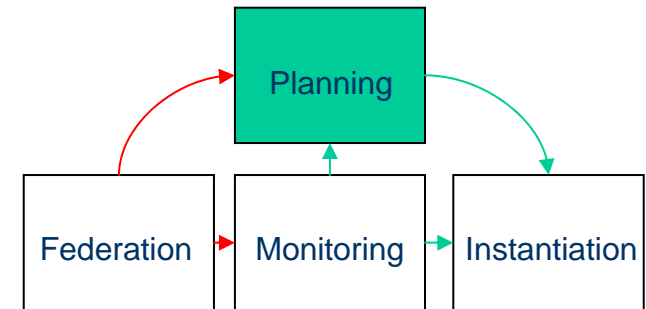
- Provide global plan
 - Match supply/demand
 - Safeguard Mission/Goals

Planning Segment: Functional Decomposition



MasterPlan Service:

- Register Needs and Mission/Goals (global constraints)
- Compile Solutions for Needs into MasterPlan
- Reasoning Service:
 - Determine Solutions for Needs
- Knowledge Base
 - Capture knowledge regarding domain, capabilities, status.

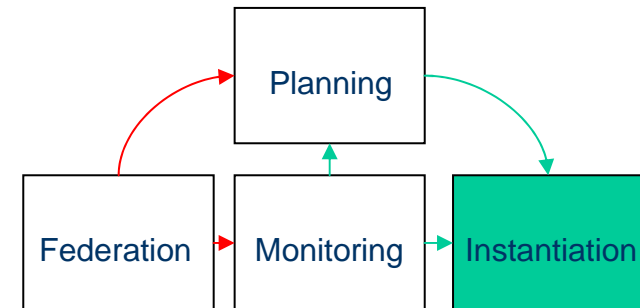


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Context

- Implements MasterPlan
- Instantiates/Configures Sub-systems



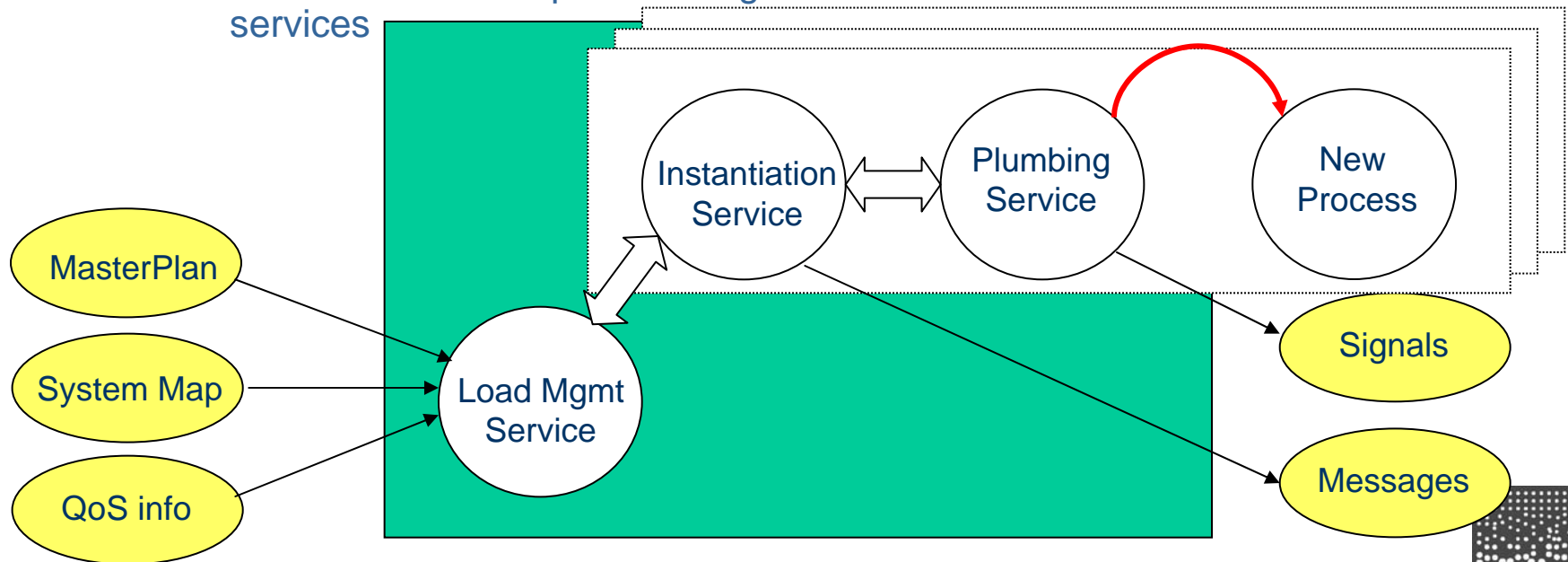
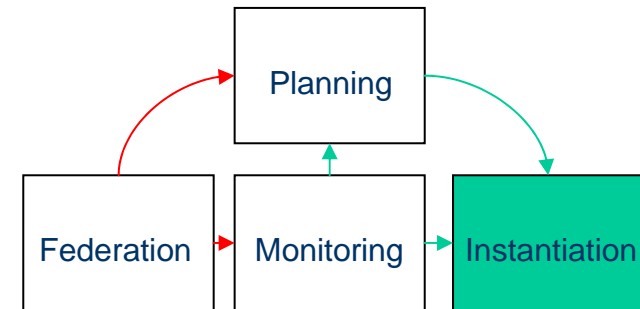
Purpose

- Implement Global Plan
 - Start/stop required services
 - Send signals/messages to sub-systems
 - Configure infrastructure
 - Process transport
 - Load-management

Instantiation Segment: Functional Decomposition



- LoadManagement Service
 - Divide labour among hosts
- Instantiation Service
 - Present on each host
 - Maintain bookkeeping
 - Formulate messages, incantations, etc
- Plumbing Service
 - Low-level start- stop and configuration services

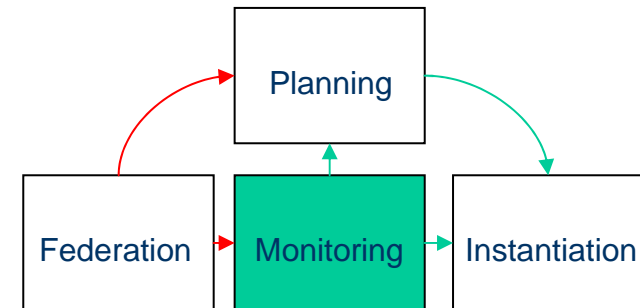


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Context

- Samples Status of sub-systems
- Evaluates Progress of MasterPlan
- Provides QoS information



Purpose

- Guard Quality of Service
 - Monitor System Health
 - Trigger improvement actions:
 - Instantiation Segment
 - Planning Segment

Monitoring Segment: Functional Decomposition



QoS Management Service

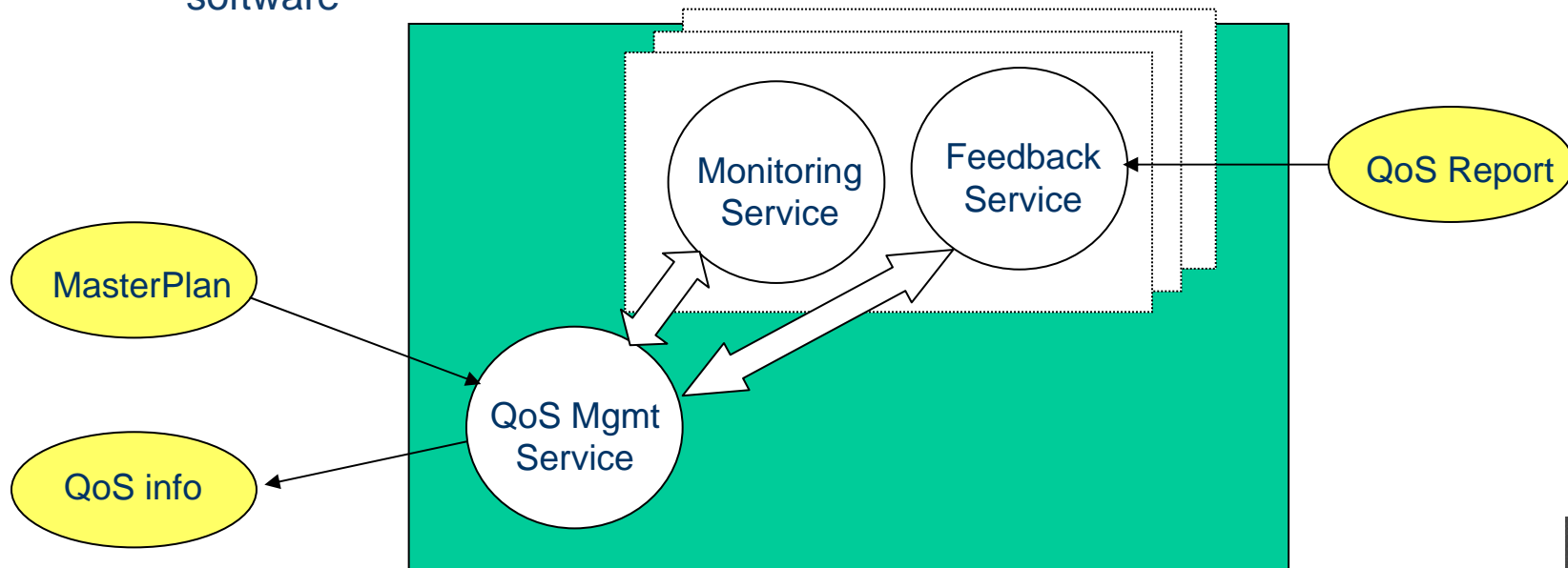
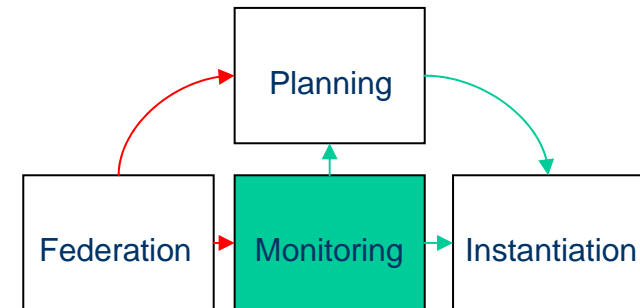
- Evaluate info from Monitoring/QoS Reports
- Decide whether improvement required
- Evaluate Progress of MasterPlan

Feedback Service

- Receive QoS Reports from (intelligent) sub-systems

Monitoring Service (on each host)

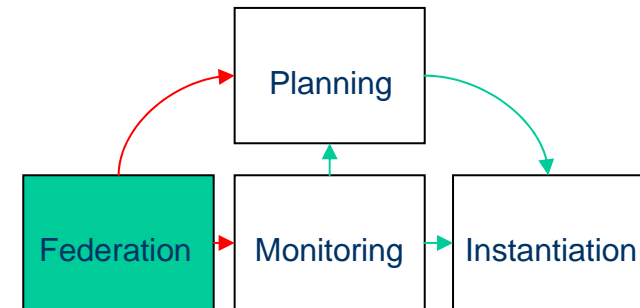
- Sample hardware, communications and software





Context

- Receives contact-information of sub-systems
- Provides System Topology Map



Purpose

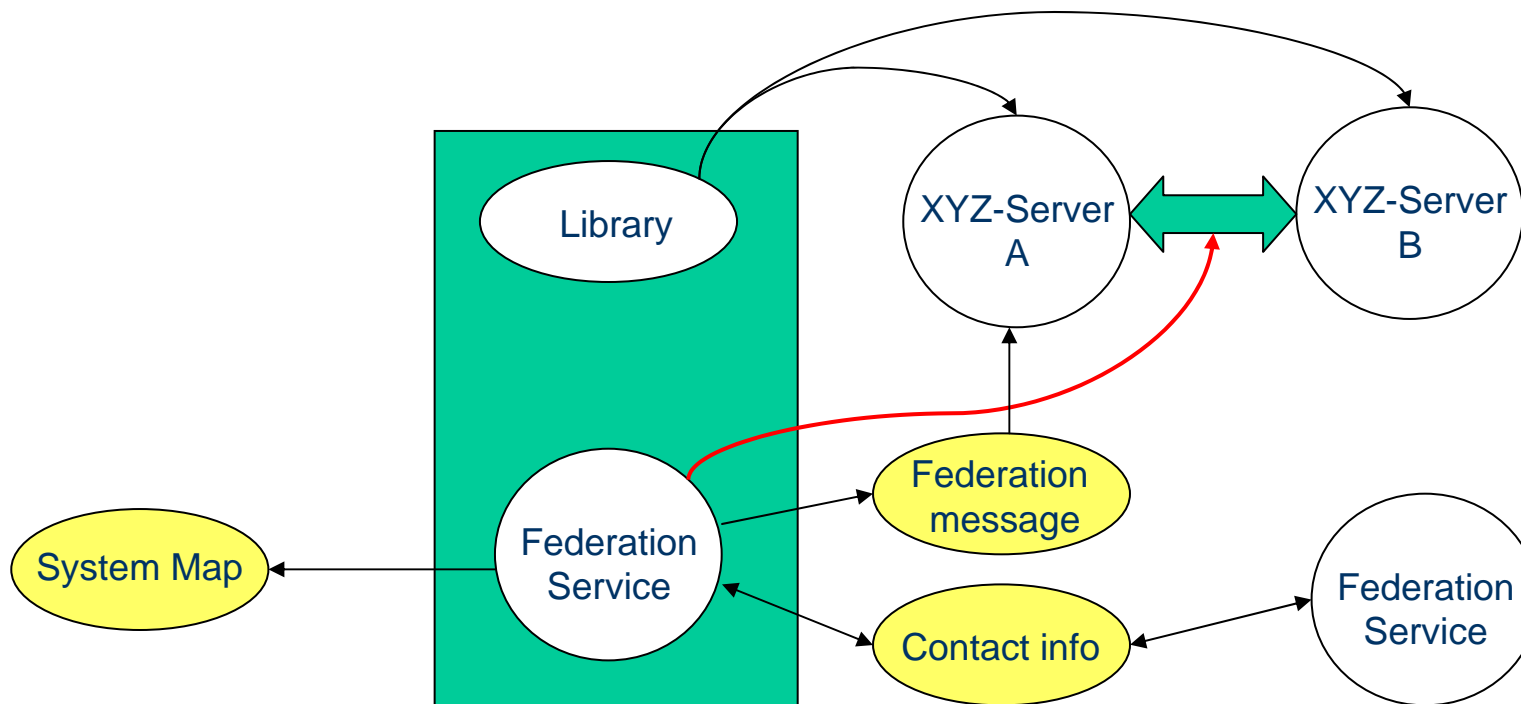
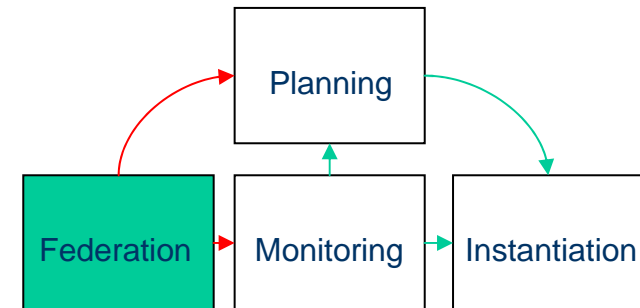
- Federate Systems/Services
 - Map System topology map
 - Notify relevant Services to federate
 - Provide Federation Functionality (lib)

Federation Segment: Functional Decomposition



Federation Service

- Exchange contact info with Federation servers on other platforms
- Federate services
 - Issue federation notifications
- Provide System Topology Map
 - Used by Instantiation segment



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■ Global Overview

- Optimization
- QoS management
- Escalation triggers

■ Flexibility

- Federated Set-up

■ Robustness

- Detect and repair (QoS management)

■ Efficiency

- Batch allocations
- Combine (parts of) Solutions

Prototype: COMPASS

- Configuration, Organization and Management Prototype for Autonomous Systems of Systems

Coordination Challenge at DECIS Lab

- first results.



Coordination Challenge

- Obtain more results for more complex scenarios

ICIS-A work

- QoS management,
- DataGrid Services,
- Security Management

Hybrid Approaches, Layering, etc