Composable Services Architecture (CSA) as a platform for Dynamically Re-Configured Virtualised Services

Yuri Demchenko, UvA

GN3 Concertation meeting
16 September 2010
TERENA Offices, Amsterdam

Outline

- Composable Services Architecture
- Composable Services Lifecycle and Workflow
- GEMBus as CSA middleware
- Issues in CSA and GEMBus

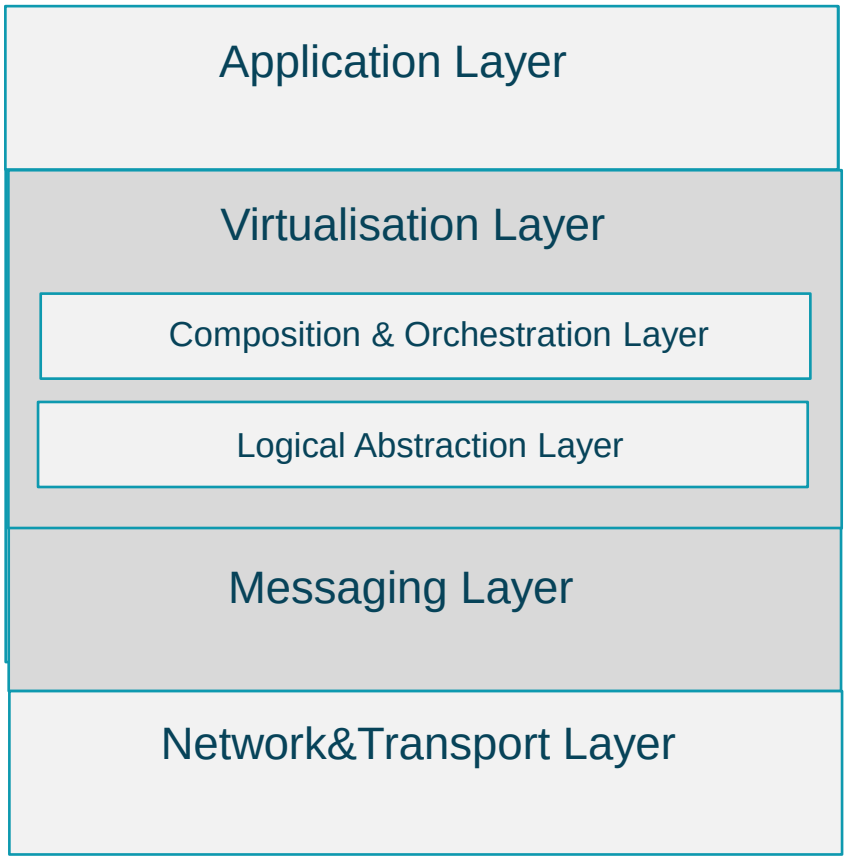
- Additional information (TMF SDF, WS vs REST)

Composable Services

- Composable services defined as “dynamically re-configured virtualised services”
  - *In accordance with SOA and OSIMM (Open Group Services Integration Maturity Model) composable services can be positioned as a highest level*

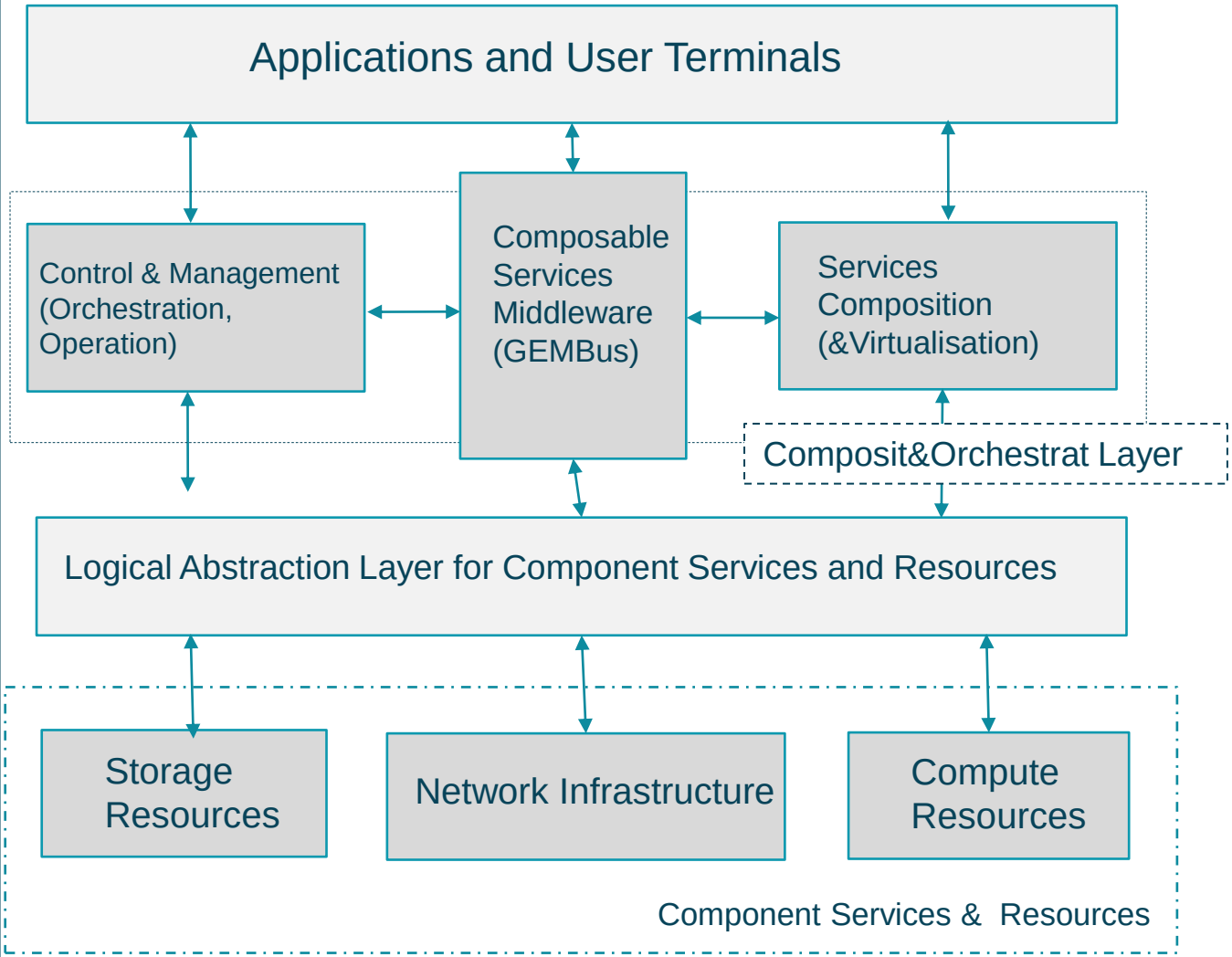
- GEMBus (GEANT Multidomain Enterprise Bus) will address multidomain issues and distributed services composition and orchestration

Composable Services Layered Model



- Application Layer hosts application related protocols
- CSA primary focus on
  - *Messaging Layer*
  - *Virtualisation (Composition&Orchestration) Layer*
- Network&Transport Layer should allow using/binding to standards communication and security protocol
- Composable services are defined as ***"dynamically re-configured virtualised services"*** according to OSIMM model

Composable Services Architecture (CSA) – Version 0.11 – Simplified/Deprecated

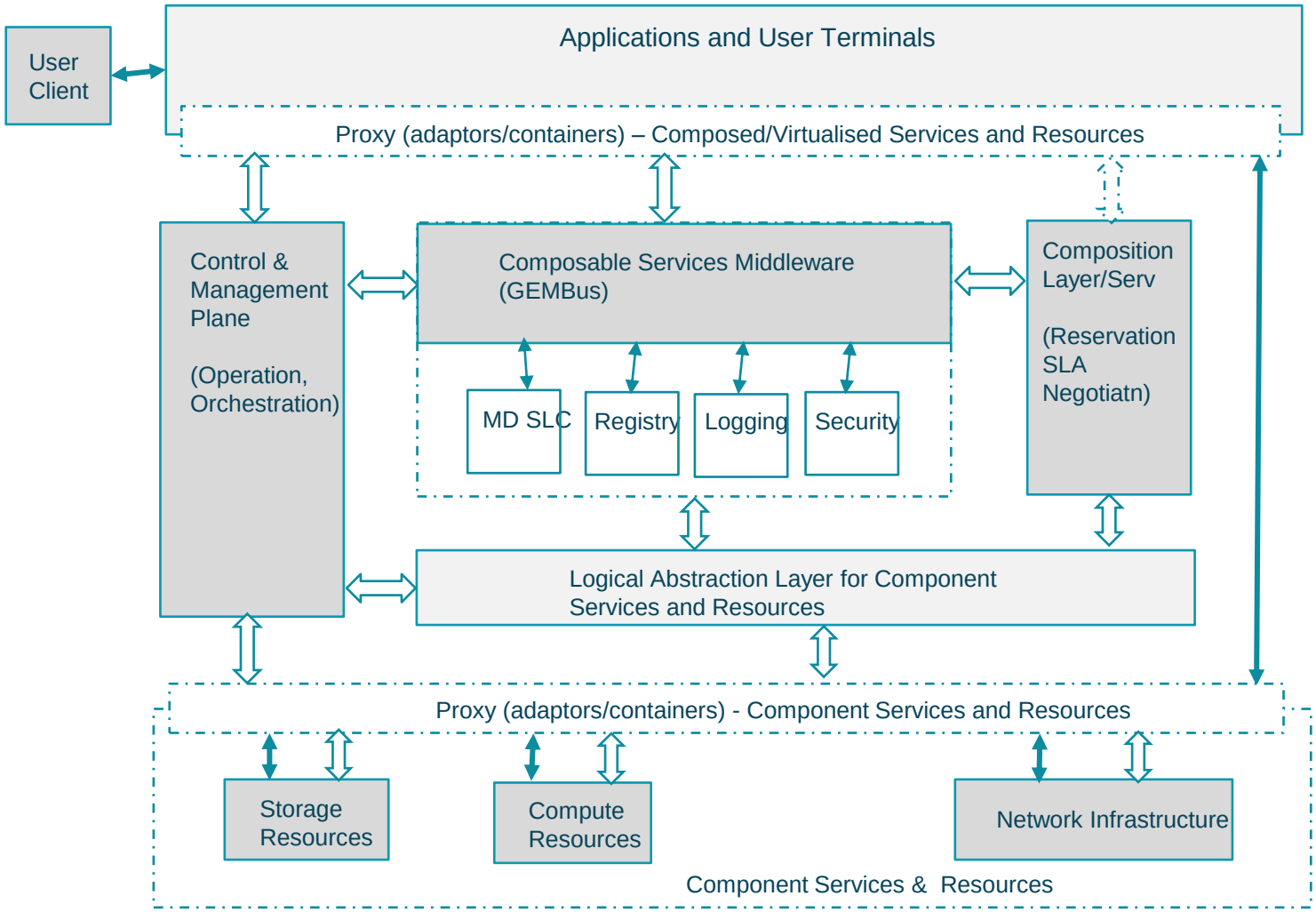


GEMBus provides common dynamically configurable messaging infrastructure for Composable Services communication

Logical Abstraction Layer includes/relies on component/physical services/resources adapters

* Adaptation (sub) layer

Composable Services Architecture – Version 0.13



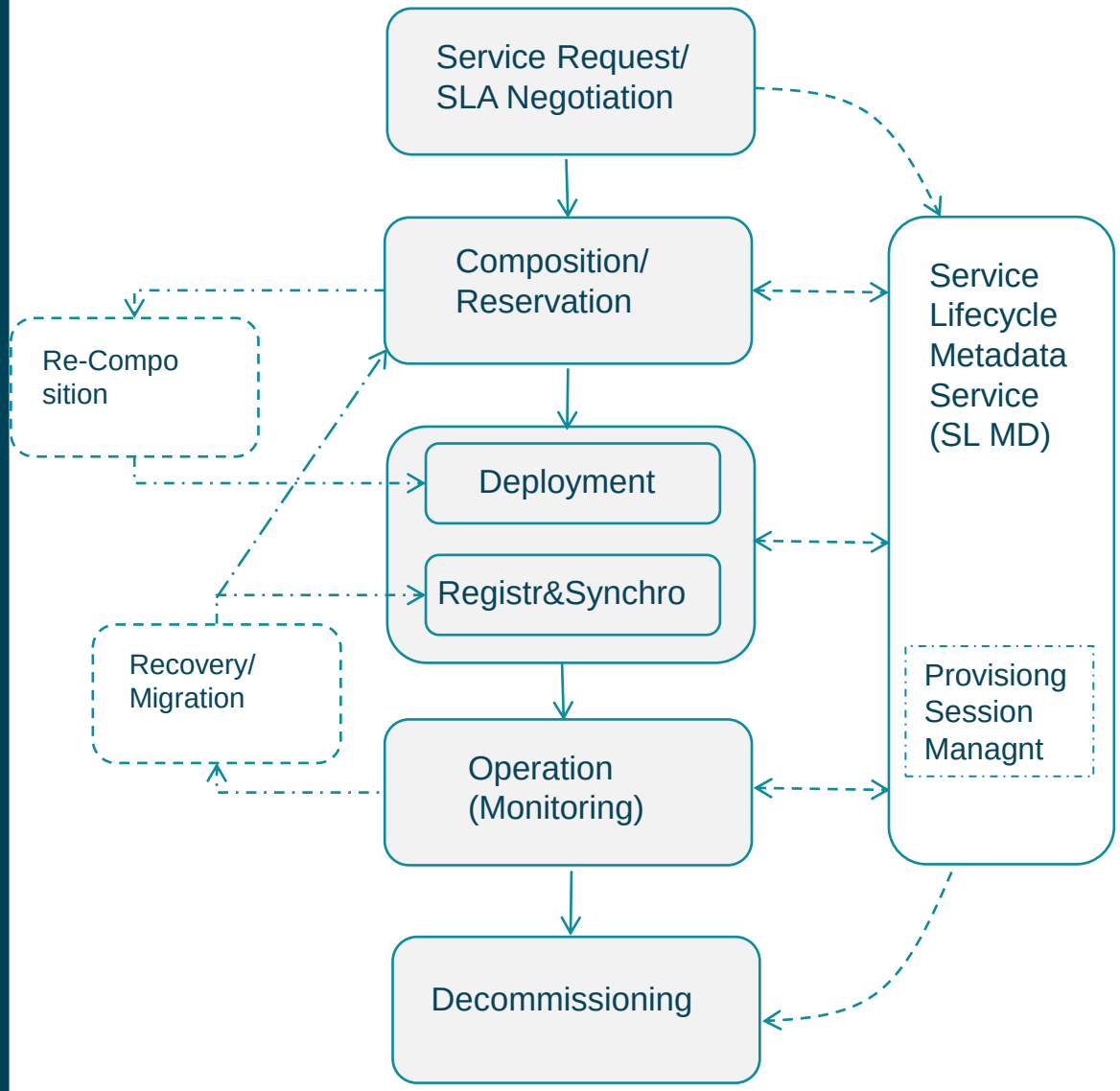
Composable Services lifecycle/provisioning stages

(1) Request
(2) Composition/ Reservation
(3) Deployment
(4) Operation
(5) Decommissioning

Control/ Mngnt Links

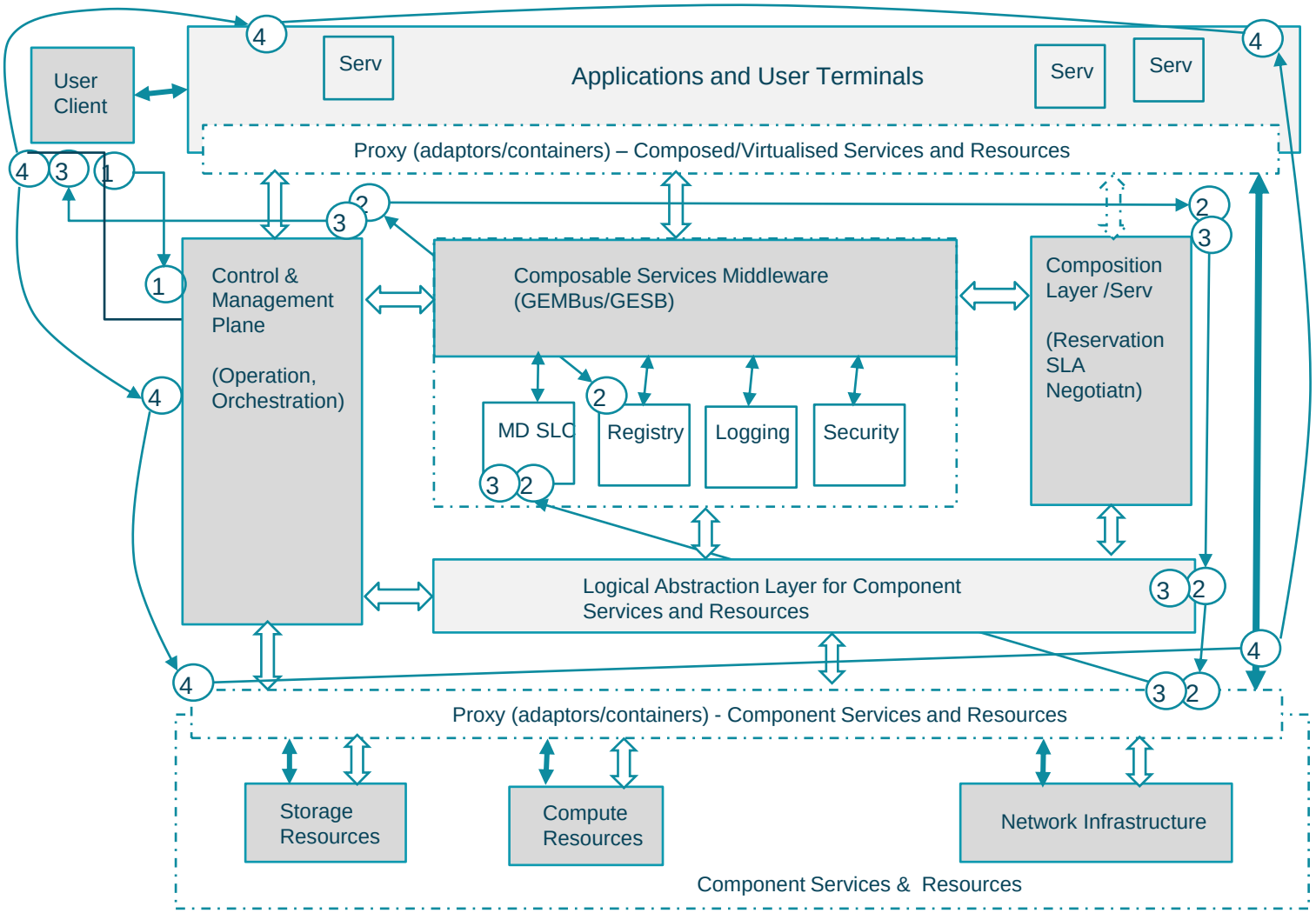
Data Links

Composable Services Lifecycle/Provisioning Workflow



- Main stages/phases
  - Service Request (including SLA negotiation)
  - Composition/Reservation (aka design)
  - Deployment, including Reqistration/Synchronisation
  - Operation (including Monitoring)
  - Decommissioning
- Additional stages
  - Re-Composition should address incremental infrastructure changes
  - Recovery/Migration can use SL-MD to initiate resources re-synchronisation but may require re-composition
- The whole workflow is supported by the Service Lifecycle Metadata Service (SL MD)

Composable Services Architecture – Lifecycle stages workflow



Composable Services lifecycle/provisioning stages

(1) Request
(2) Composition/ Reservation
(3) Deployment
(4) Operation
(5) Decommissioning

MD SLC – Service Lifecycle Metadata

GEMBus – GEANT Multidomain Bus

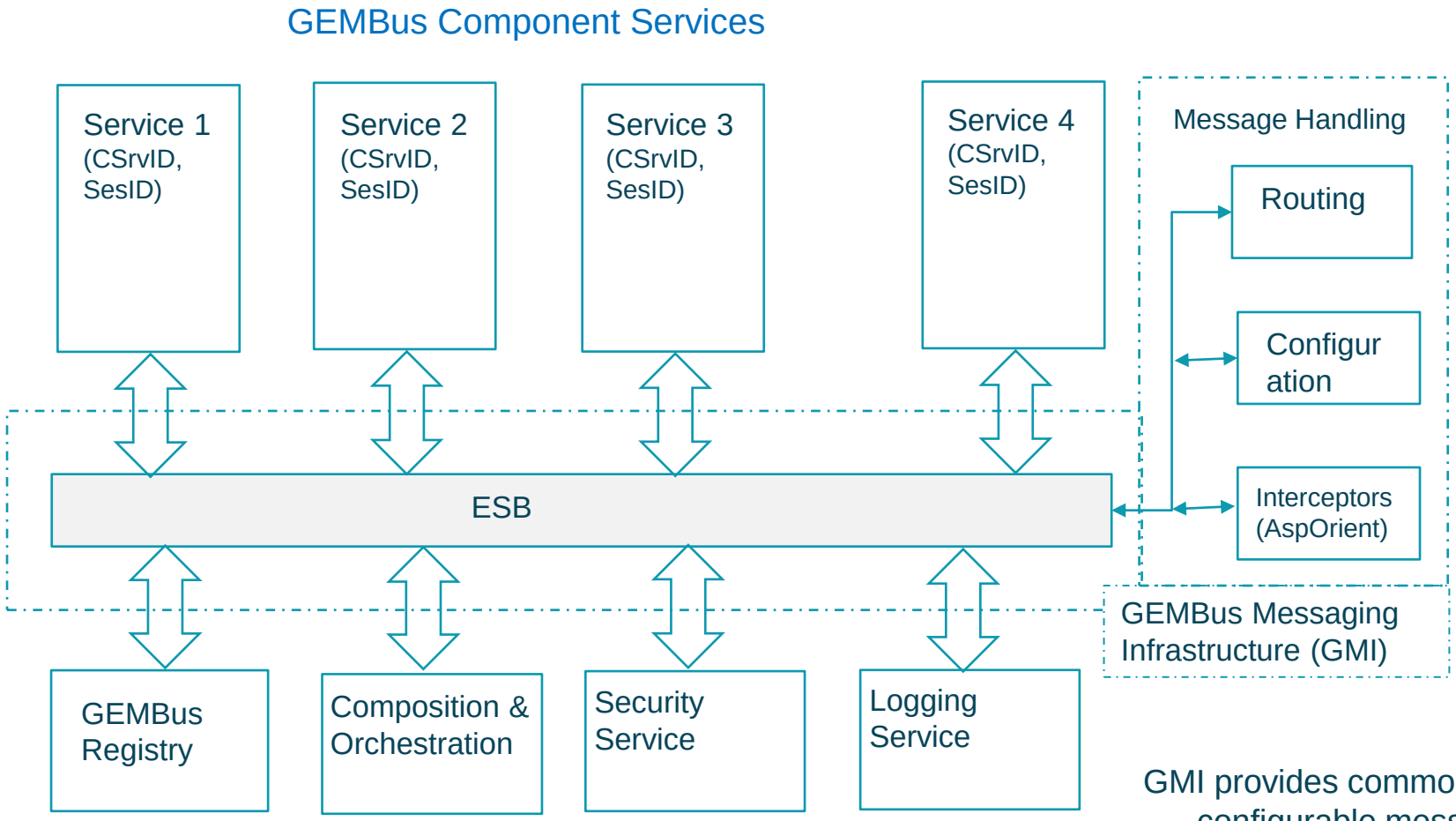
Control/ Mngnt Links

Data Links

CSA functional elements interaction

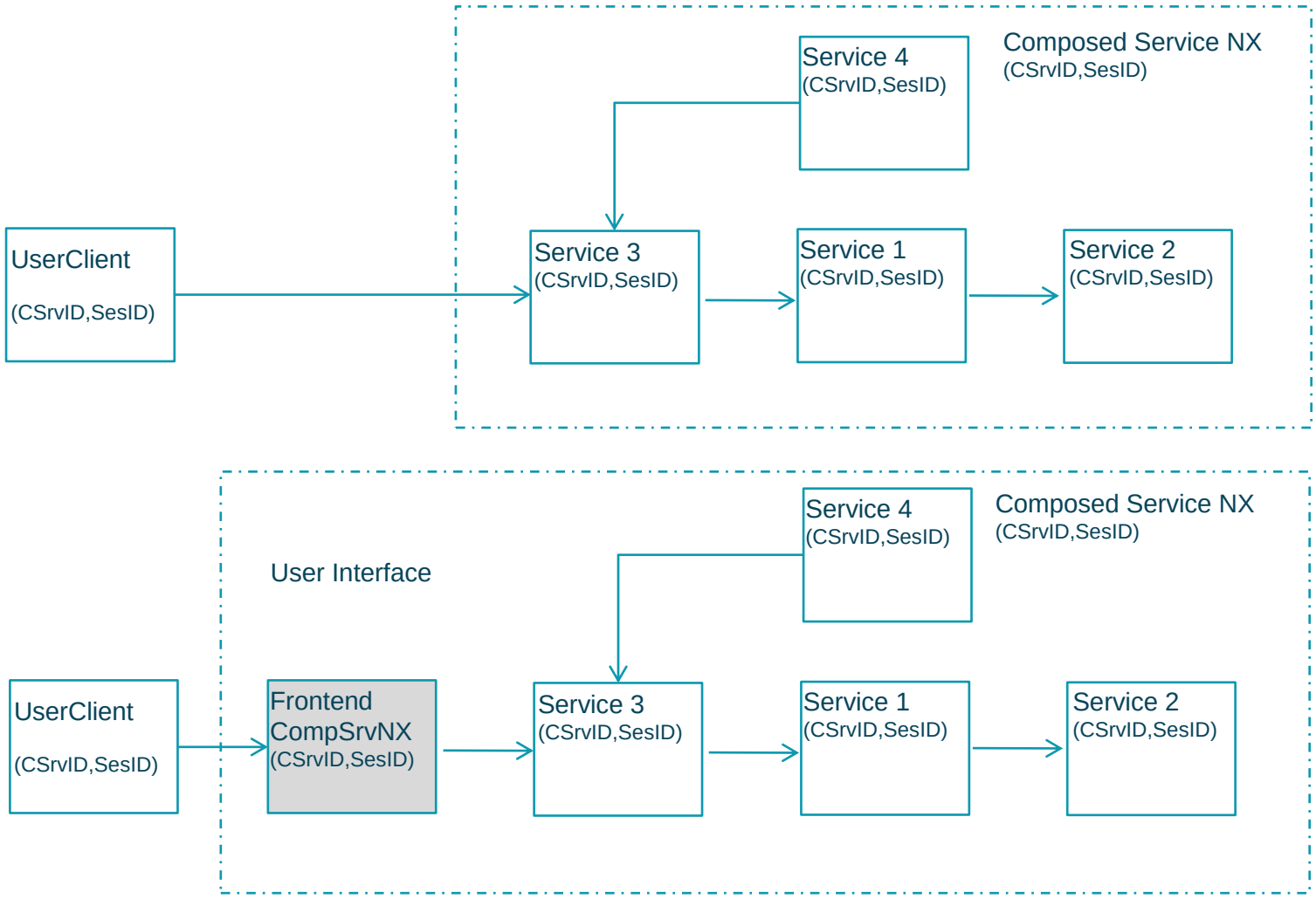
- **(1) Request**
  - User Client -> Control and Management
- **(2) Composition/ Reservation**
  - Control&Mngnt -> Registry -> Composition/Reservation Serv -> (Logical Abstract -> Resr Adapters) -> LC Metadata Serv
- **(3) Deployment**
  - Control&Mngnt -> Composition/Reservation Serv -> (Logical Abstract -> Resr Adapters) -> LC Metadata Serv -> User Client
- **(4) Operation**
  - User Client -> Control&Mngnt (Orchestration) -> Rsr Adapters -> Virtualised/Composed Applications
- **(5) Decommissioning**
  - Control&Mngnt -> LC Metadata Serv -> (Logical Abstract -> Resr Adapters)

GEMBus Infrastructure for Composable Service



GMI provides common dynamically configurable messaging infrastructure for Composable services communication

Example Service Composition – Service NX

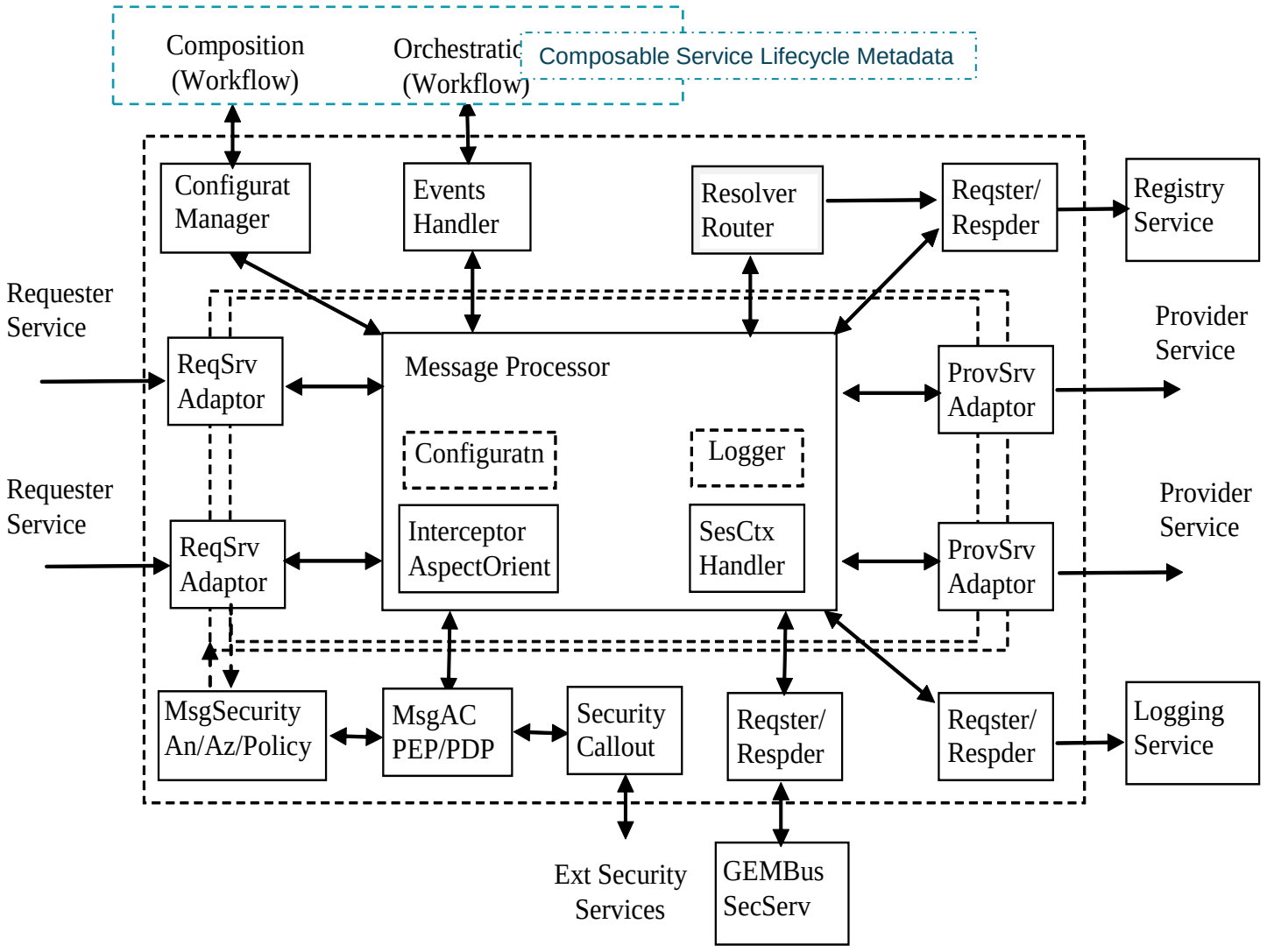


Role and place for Composition and Orchestration

* Composable services or GEMBus infrastructure service

CSrvID, SesID – bind component services into the on-demand provisioned Composed service NX

GEMBus Messaging Infrastructure – Functional Components



- Message Processor provides actual message parsing, analysis and transformation
- Composable/Component services are connected via Adaptors
- GEMBus services are connected via Requestor/Responder (RR)
  - GEMBus security services invoked from RR or called out
- Composition&Orchestration as GEMBus services

Multidomain issues in CSA

- Can be addressed in the properly layered infrastructure and message routing
  - *CSA middleware and GEMBus Messaging Infrastructure*
- End-Point Reference (EPR) and use of Fully Qualified Names (FQN)
- Dynamic security federation/associations and provisioning session management

CSA and Integration with Network Resource Provisioning

- Full convergence is possible if CSA will integrate topology based network infrastructure provisioning
  - *Subject of current cooperation with GEYSERS Project the develops infrastructure services virtualisation architecture an don-demand provisioning*
- CSA should investigate Cloud middleware use, in particular, RESERVOIR and Claudia Frameworks, future GEYSERS infrastructure

Additional Information

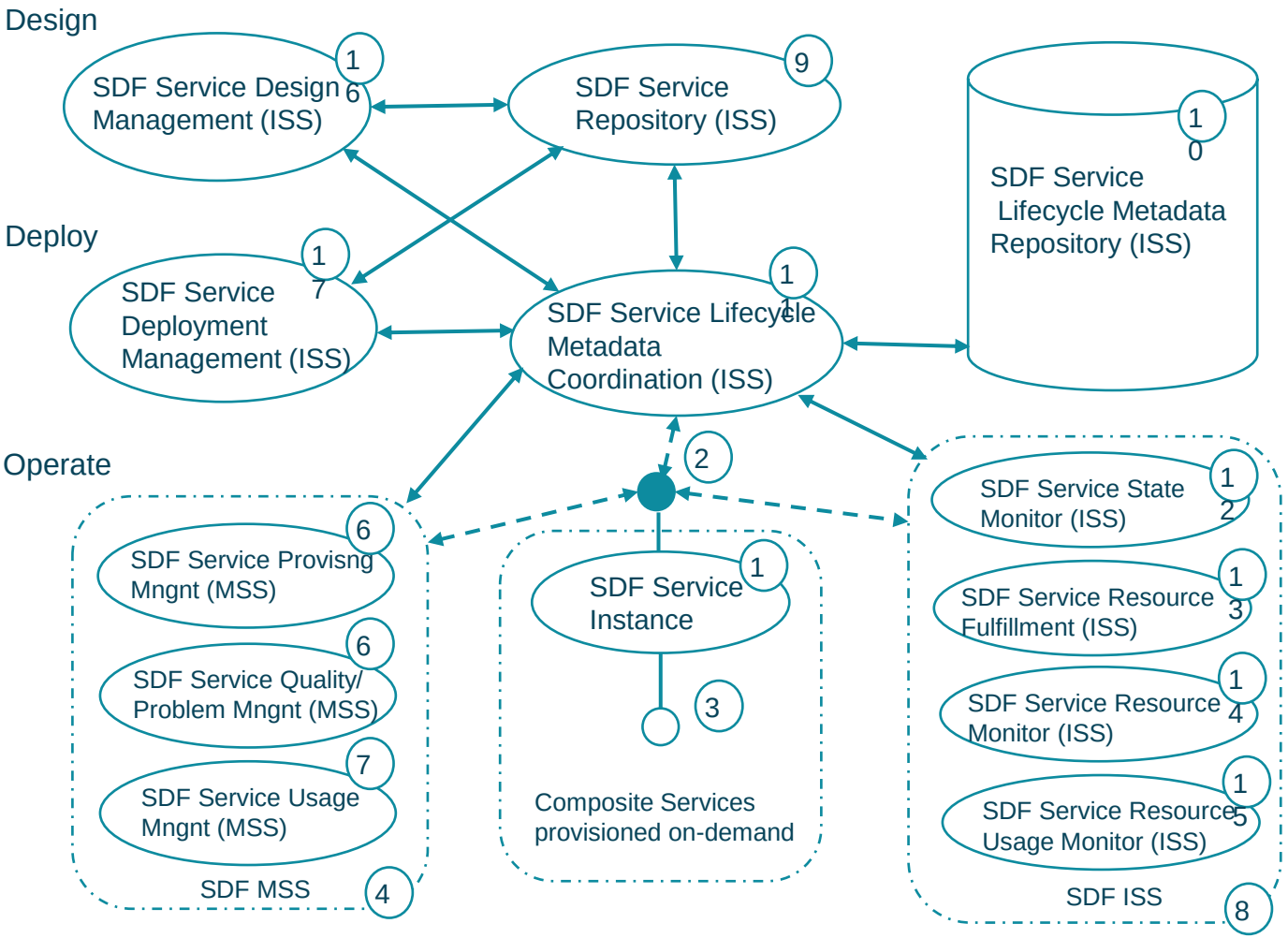
- TMF SDF Lifecycle Management model
- Proposed Security SLM model
- WS vs REST -> UPR vs URI

TMF Service Delivery Framework (SDF)

Goal: Automation of the whole service delivery and operation process (TMF SDF, http://www.tmforum.org/ServiceDeliveryFramework/4664/home.html)

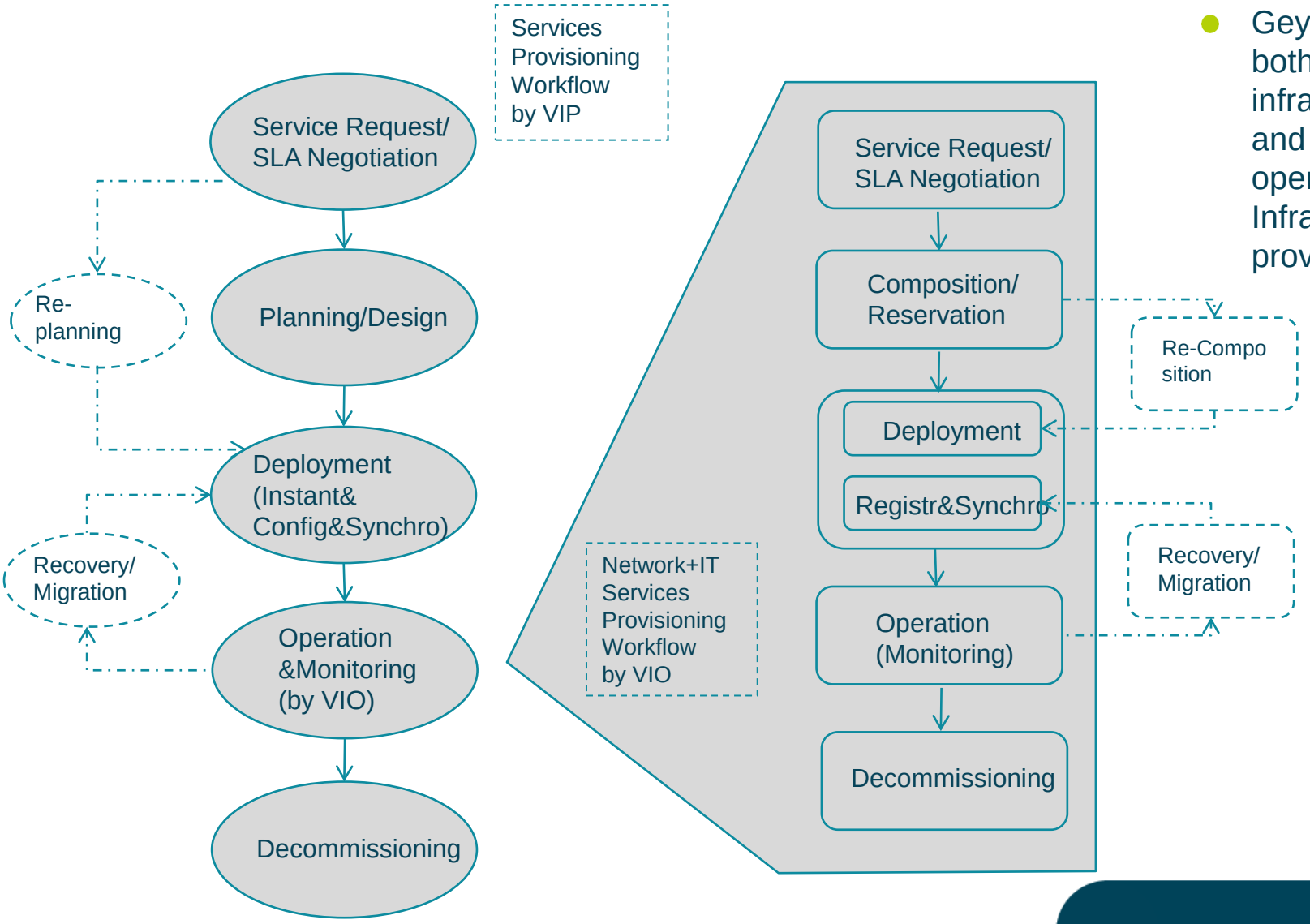
- End-to-end service management in a multi-service providers environment
- End-to-end service management in a composite, hosted and/or syndicated service environment
- Management functions to support a highly distributed service environment, for example unified or federated security, user profile management, charging etc.
- Any other scenario that pertains to a given phase of the service lifecycle challenges, such as on-boarding, provisioning, or service creation

SDF Reference Architecture (refactored from SDF)



1 – Service Instance
2 - Service Management Interface
3 – Service Functional Interface
4 - Management Support Service (SDF MSS)
8 - Infrastructure Support Service (ISS)
DESIGN stage
9 - Service Repository
10 - Service Lifecycle Metadata Repository
16 - Service Design Management
DEPLOYMENT stage
10 - Service Lifecycle Metadata Repository
11 - Service Lifecycle Metadata Coordinator
17 - Service Deployment Management
OPERATION stage
5 - Service Provisioning Management
6 - Service Quality/Problem Management
7 - Service Usage Monitor
12 - Service State Monitor
13 - Service Resource Fulfillment
14 - Service Resource Monitor
15 - Resource Usage Monitor

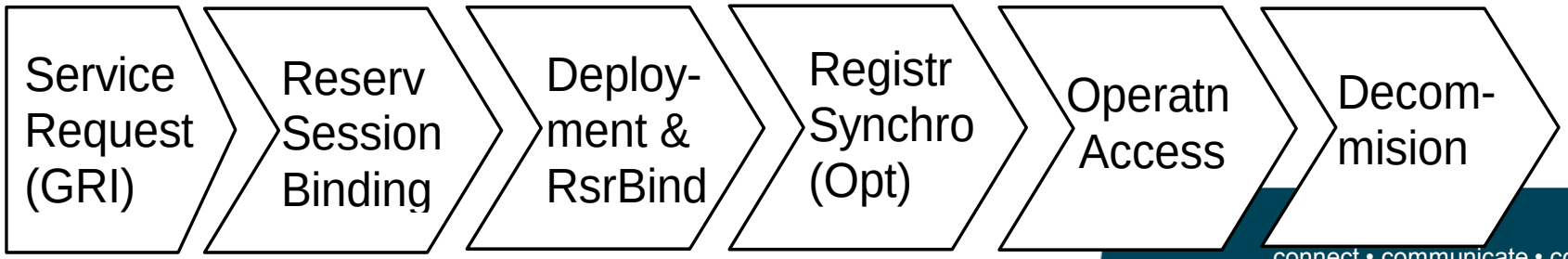
GEYSSERS Service Delivery Workflow (WP2 Deliverable D2.1)



- Geysers SDF supports both Geysers infrastructure development and deployments and its operation for on-demand Infrastructure services provisioning by VIO

Proposed Security Services Lifecycle Management Model

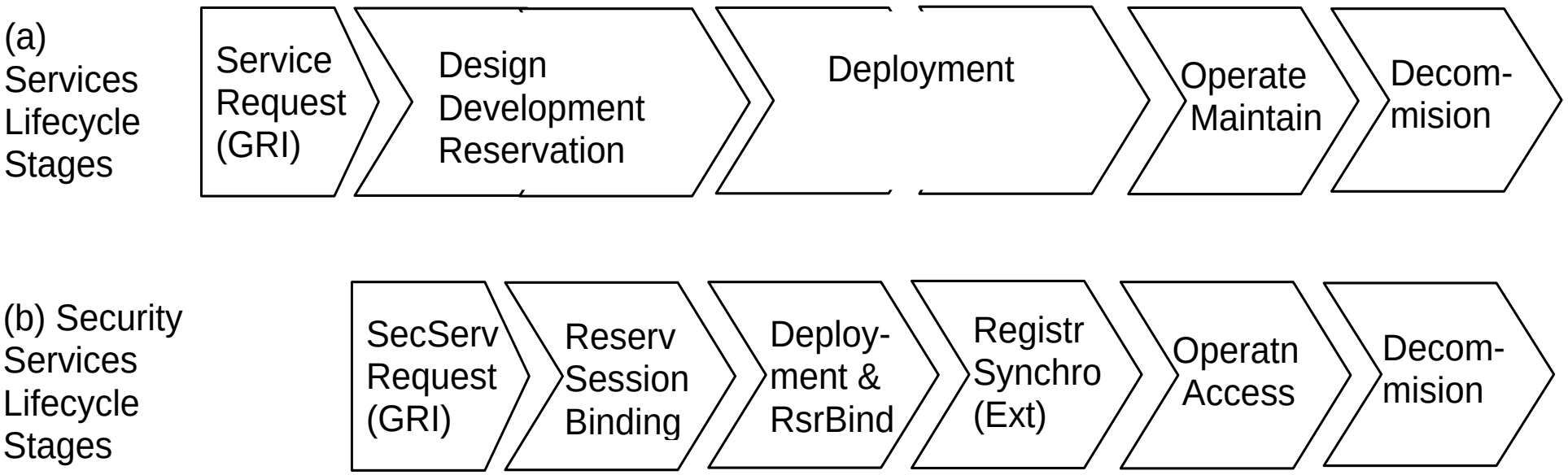
- **Security Service request and generation of the GRI** that will serve as a provisioning session identifier and will bind all other stages and related security context.
- **Reservation session binding** that provides support for complex reservation process including required access control and policy enforcement.
- **Deployment stage** begins after all component resources have been reserved and includes distribution of the security context and binding the reserved resources or services to GRI as a common provisioning session ID.
- **Registration&Synchronisation stage** (optional) specifically targets possible scenarios with the provisioned services migration or failover/interruption. In a simple case, the Registration stage binds the local resource or hosting platform run-time process ID to the GRI as a provisioning session ID.
- **Operation stage** - security services provide access control to the provisioned services and maintain the service access or usage session.
- **Decommissioning** stage ensures that all sessions are terminated, data are cleaned up and session security context is recycled.



Relation between SSLM/SLM stages and supporting general and security mechanisms

SLM stages	Request	Design/Reservation Development	Deployment	Operation	Decomissioning
Process/ Activity	SLA Negotiation	Service/ Resource Composition Reservation	Composition Configuration	Orchestration/ Session Management	Logoff Accounting
Mechanisms/Methods					
SLA	V				V
Workflow		(V)		V	
Metadata	V	V	V	V	
Dynamic Security Associatn		(V)	V	V	
AuthZ Session Context		V	(V)	V	
Logging		(V)	(V)	V	V

Relation between SSLM and general SLM



- Service Request stage may include SLA negotiation
  - *Security service instantiation may use SLA security context*

REST vs Web Services = URI vs EPR

- GEMBus uses own registered namespace branch
  - *urn:geant:gembus*
- CSA requires state management and communication between services
  - *Basic functionality to be supported by WSRF and EPR*
  - *Keep EPR and URI/REST mapping*
- End Point Reference is a part of WS-Addressing and complements WSDL to support the following scenarios
  - *"Dynamic generation and customization of service endpoint descriptions.*
  - *Identification and description of specific service instances that are created as the result of stateful interactions.*
  - *Flexible and dynamic exchange of endpoint information in tightly coupled environments where communicating parties share a set of common assumptions about specific policies or protocols that are used during the interaction."*

Example EPR and mapping to URI

EPR example with service properties and parameters

```
<wsa:EndpointReference>
  <wsa:Address>http://clarin.geant.net/registry</wsa:Address>
  <wsa:ReferenceProperties>
     <gembus:domainID>clarin.geant.net</gembus:domainID>
     <gembus:ServiceRegistryKey>K2349456076</gembus:ServiceRegistryKey>
  </wsa:ReferenceProperties>
  <wsa:ReferenceParameters>
     <gembus:sessionID>1739456234907642348 54</gembus:sessionID>
     <gembus:sessionDuration>8460</gembus:sessionDuration>
  </wsa:ReferenceParameters>
  <wsa:PortType>gembus:RegistryPortType</wsa:PortType> ?
  <wsa:ServiceName PortName="RegistryUpdate">
     urn:geant:gembus:registry:update-service</wsa:ServiceName>
</wsa:EndpointReference>
```

Maping to URI string:

http://clarin.geant.net/registry/update-service/ServiceRegistryKey=K2349456076/sessionID=1739456234907642348 54;sessionDuration=8460