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Greek Research & Technology Network

Networking Research and Education

A lightweight OSS/BSS architecture

Moving up the value chain in operations

Yannis Mitsos

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The rational







GRNET as a service provider





Portfolio



R&E backbone

- Carrier L2
- ROADM-capable L1
- L2 VPN on demand
- L1 optical trails (OTN) on demand

High Performance Computing

- National HPC Infrastructure
- HPC services

Middleware

- Digital Certificate Services
- AAI and federated AAI (eduGAIN)

Security

- CSIRT/CERT services
- Coordination of incident handling with national authorities
- Firewall on demand
- Flow-based monitoring as a Service
- SIEM as a Service
- IDS/IPS as a Service

laaS/Cloud computing

- VM and cloud services
 - Virtual Machines service (ViMa)
 - Virtual private servers on demand
 - ~okeanos cloud services
 - VMs on demand
- Storage services

Applications

- HD Video Conferencing (more than 15K meetings held)
 - epresence
- Live Streaming (~27.000 subscribers)
- e-Voting (ZEUS)
- Adacemic IDs





The service era



- 1,000s -> 10,000s of end users
 - Direct access to individuals IMAGE
 - Multiple levels of customer relations within institutions
- NOCs and service managers
- *-as-a-Service
 - VPN as a Service
 - Infrastructure as a Service
 - Firewall as a Service
 - Flow monitoring as a Service
 - - ...
- Composite services/service bundling
- Rapid uptake of services



(Some of) The requirements



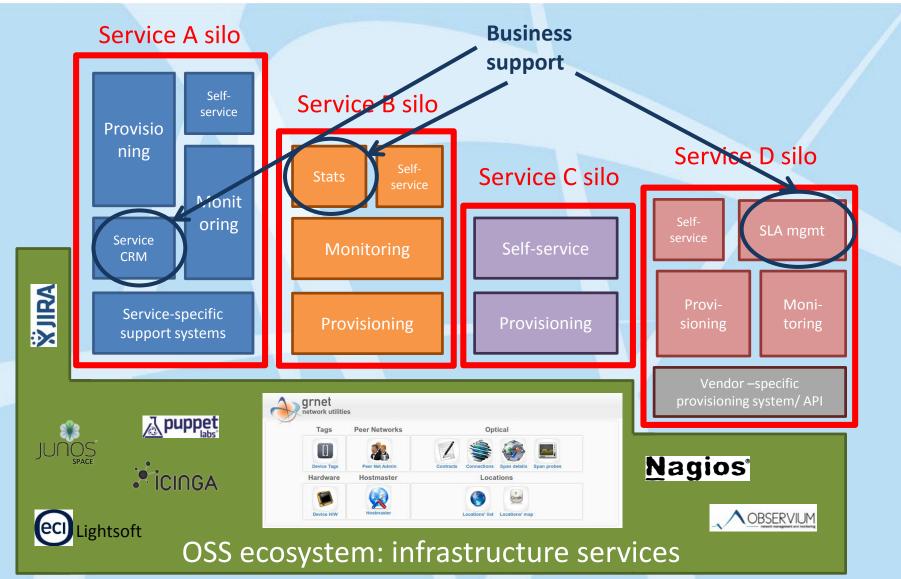
- ✓ Service portfolio management
- ✓ Order management
- ✓ Orchestration
- ✓ Composable services
- ✓ Service assurance
- √ SLA management
- ✓ Re-usability of OSS capabilities
- ✓ User analysis and retention
- ✓ Reduced system integration efforts
- ✓ Targeted marketing
- ✓ Accounting





Legacy architecture



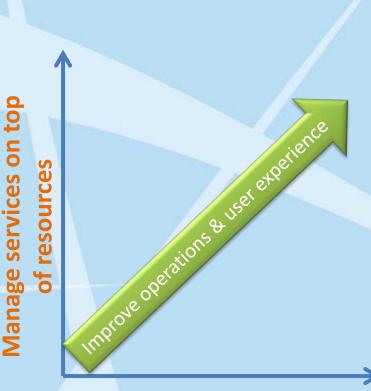




Wish list



- ✓ Consolidation of the OSS-BSS architecture
 - Modular and service oriented
 - Isolate operations from business services
 - Standards' based
- ✓ A coherent data model ('vocabulary')
- ✓ Reusable APIs
- ✓ Orchestration
 - Multi-domain, multi-tenant services
 - Service bundles
- ✓ Consistency in inter-module communication
 - Reliable, 'any-to-any'
- ✓ One-stop shop for services



Consolidate processes & systems





A lightweight OSS/BSS architecture

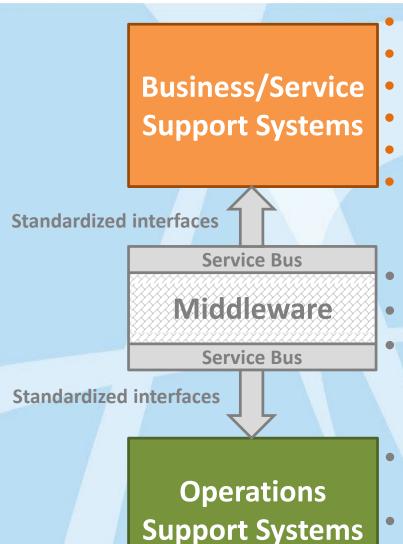






Enforce the split





- One-stop shop
- AAI integration
- Service (& SLA) management
- Order management
- Accounting
- CRM

- Reliable messaging
- Orchestration
- Composition

 Standardized interfaces within the OSS layer

- Modularity
- Resource facing services

SP to SP business integration

Limitless business/ operational requirements supported

SP to SP operational integration

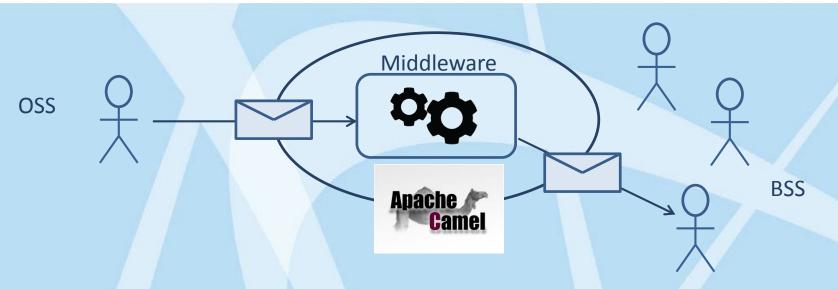






Service Bus – easy integration





- Routing of messages between applications/systems
- Mediation services
- Standardization
 - Unifies data encapsulation and transportation syntaxes under TMF notation
- Reliability: Fault tolerance, load balancing and high availability
- Stateless: Embedding the state of the message into the message itself



Orchestration middleware



- Coordinates the business functions across provisioning, inventory, issue tracking support systems
 - Feasibility, fulfillment, monitoring orders
 - Orchestration of actions to fulfill
- Order data validation-enrichment
- Orchestration plan
 - Managing sequence and dependencies
- Invokes fulfillment systems
- Order state owner
 - Tracks order's state and history
 - Make information available to other systems





Middleware of choice





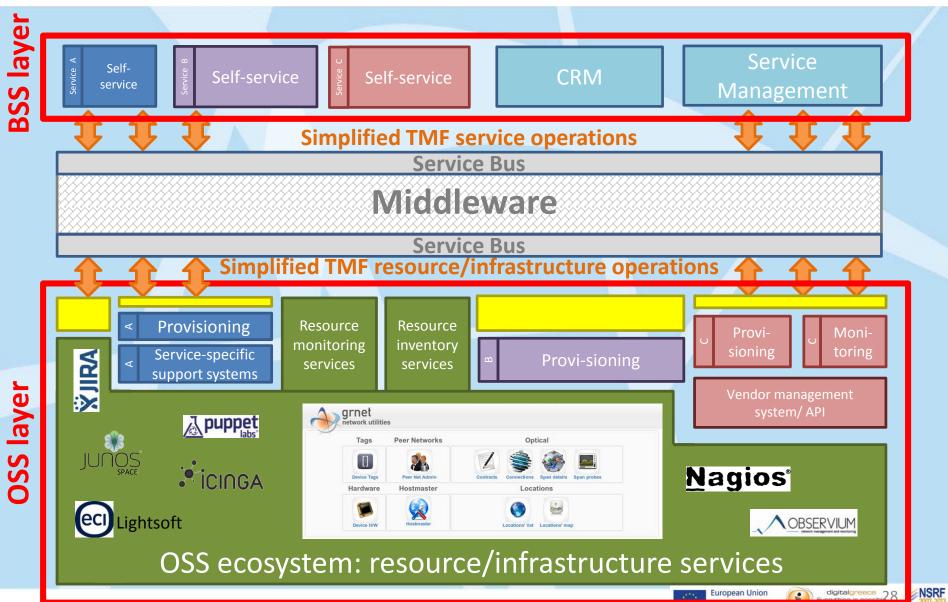
- Open-source, free business process framework
 - concept of a state machine
 - backed by Alfresco
- Lightweight database model and multi-database support
- Robust REST API
- Standard BPMN2.0
- Visual modeling
- Auto-versioning





Architecture overview



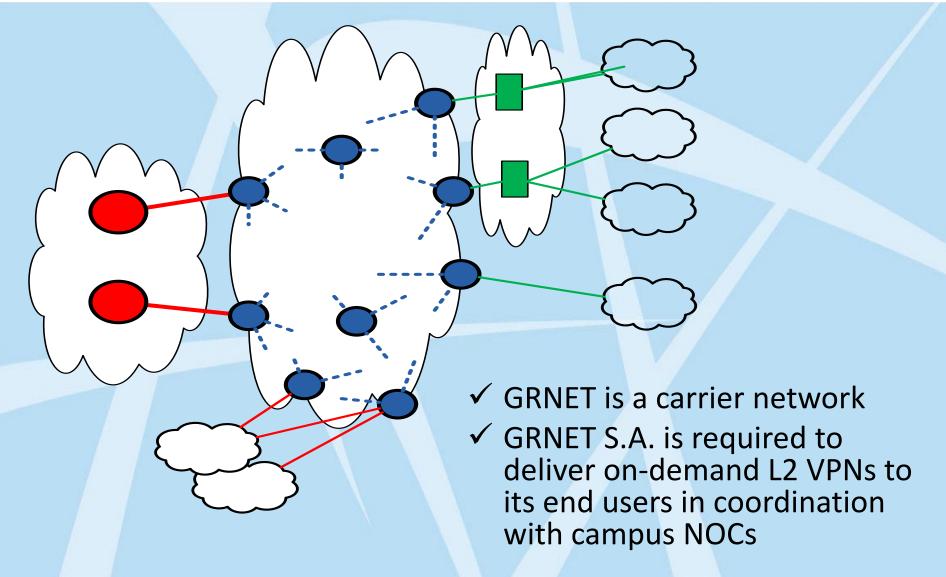




The OSS/BSS architecture in action: L2 VPN service

The service provider







The service



End-user or campus NOC requests a L2 VPN between a local site and a remote end-user site or campus

- Configurable variables:
 - Payload type (untagged, single .1q, any .1q)
 - Permission to rewrite VLAN IDs
 - Use of a existing port or provisioning of a new one
 - MTU size
 - VLAN id
- Challenges
 - Multi-party provisioning
 - Seamless experience to the user
 - Integration with established operational processes
 - Reliable provisioning at the OSS layer
 - Reconciliation of service design parameters

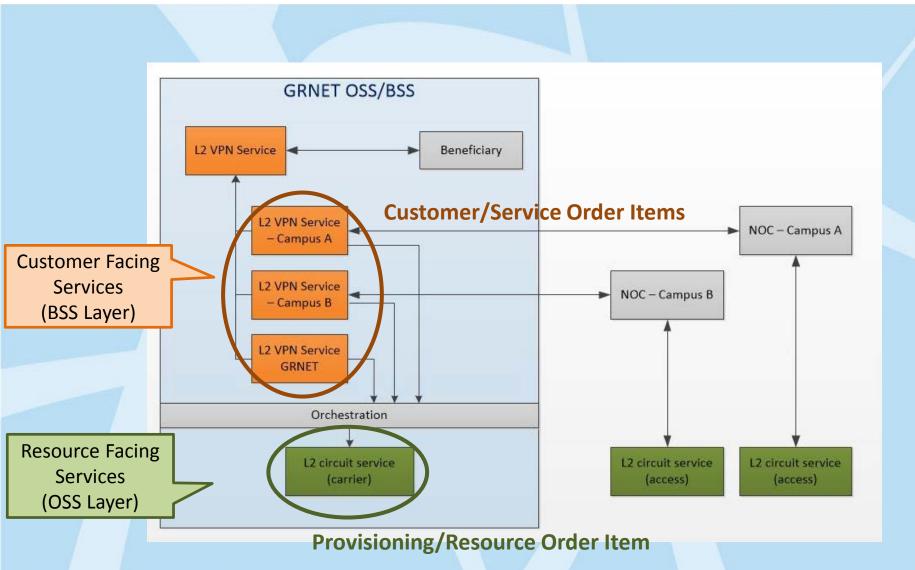




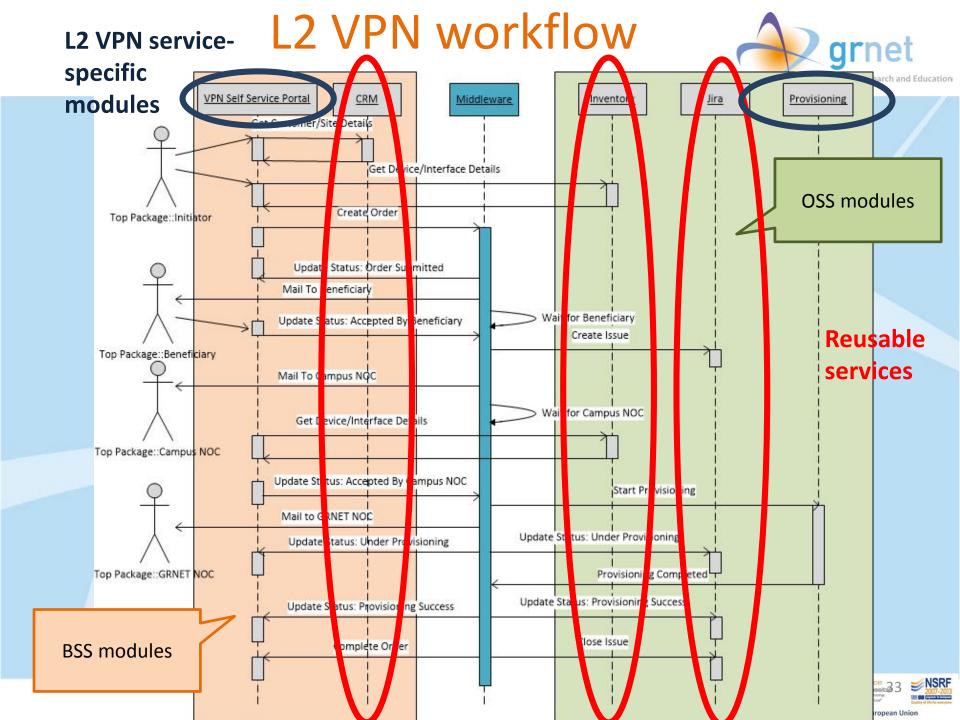


Actors and order items



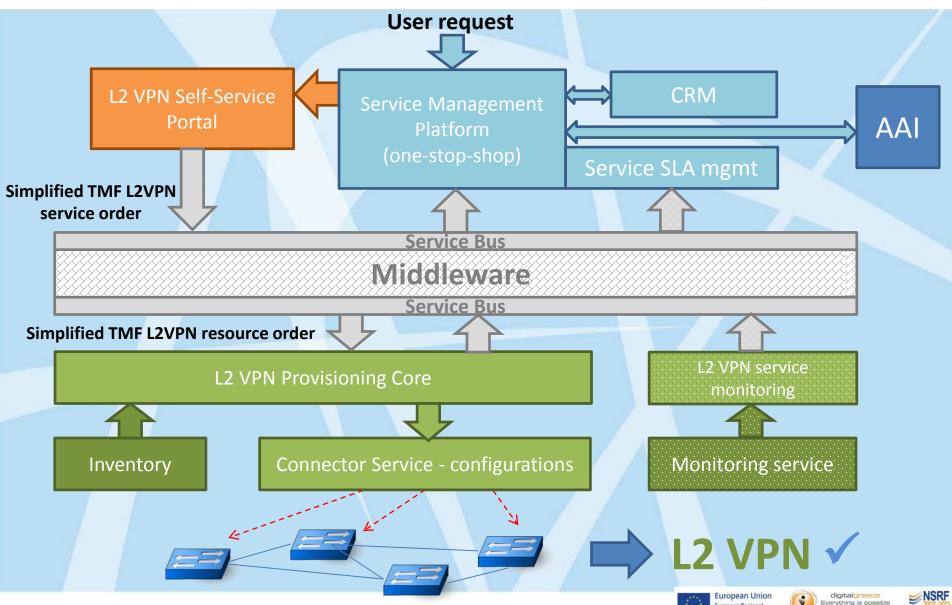






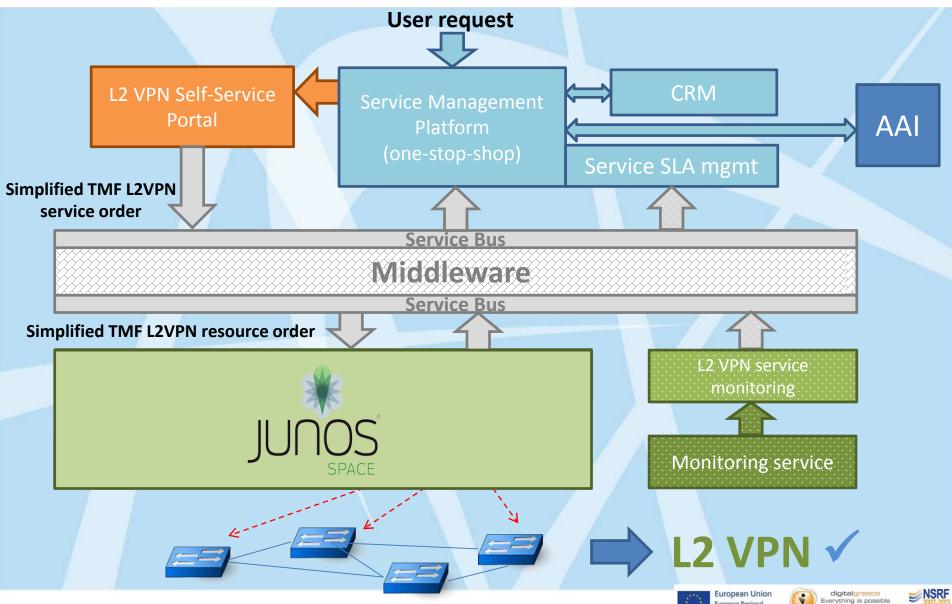
L2 VPN Support Systems: 10k ft view





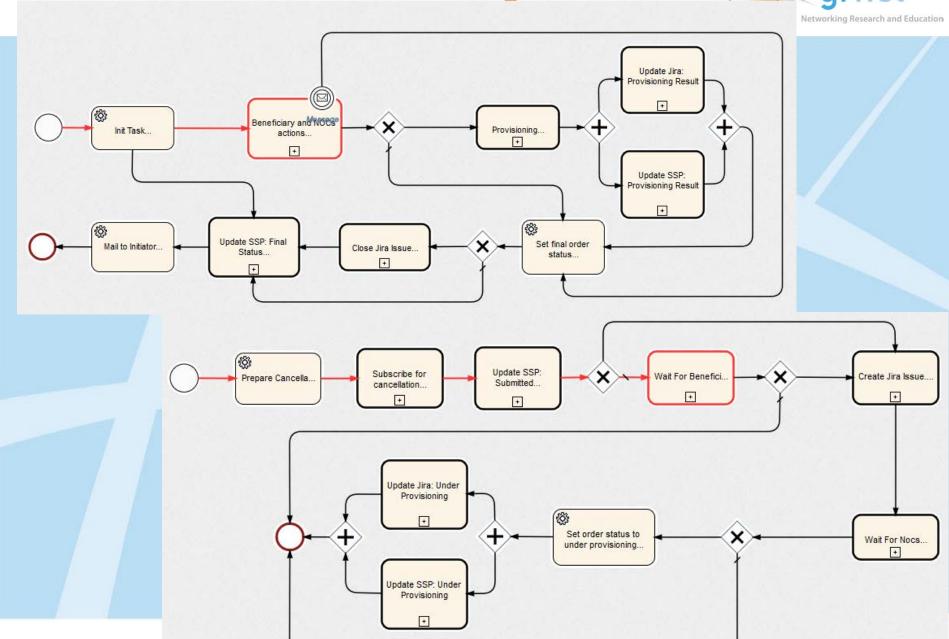
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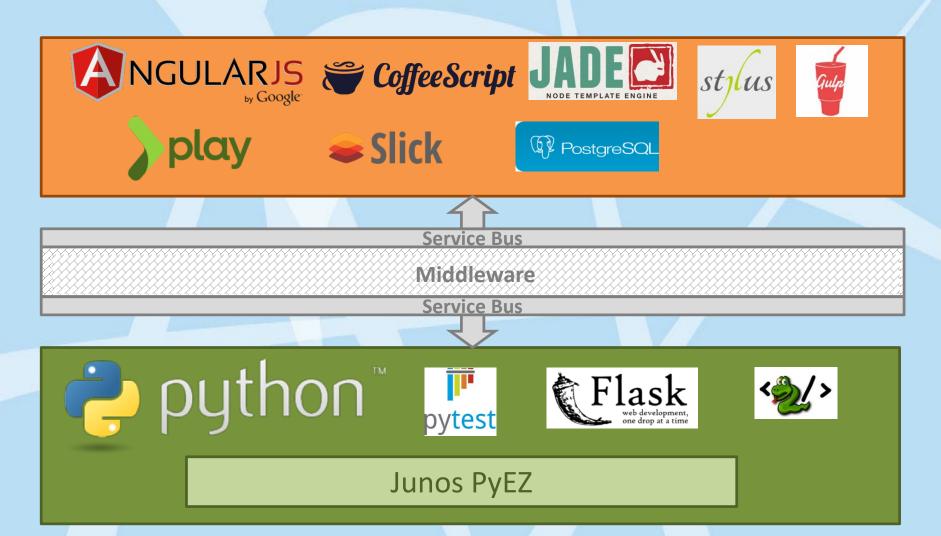
Middleware insight





Technologies







Lines of code



```
def fullPath: String = folder: Option[Folder] = Note | String = folder match | Continue | String = folder match | Continue | String = folder | String = fold
                                                                                                                                                              Case Some(f) => List(f.fullPath, name .m/String)
                                                                                                                                                                          case None => s" ./$name"
                                                                  val resources = Vector[Resource](
    File("ex1.scala", Some(Folder("example", Some(Folder("example"), Some(F
                                                                                                                 Folder("tmp"), Some("/usr"))
Folder("bin", Some("/usr"))
File(".zshrc")
```

- SSP (BSS)
 - Frontend: 1,880
 - Backend: 1,700
- Provisioning (OSS)
 - Total: 1,240
- Common: 570



What next?



- Service Management Platform as proxy SP
 - OSS/BSS architecture integration
 - Request/incident management
 - Accounting/SLA support
- OTN-based optical trail provisioning
 - Data plane: ECI's Apollo family, Layer 0 and Layer 1 (OTN)
 - Management plane: LightSoft NMS
 - 'On-demand lightpaths' service
- ViMa (GRNET VPS service) integration
- Real-time services integration



The end





