BUILDING A BETTER NETWORK BY ASSEMBLING THE SERVICE JIGSAW: The GEMBus

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Yesterday, Saith We… It’s the Services, Stupid!

- Big pipes are only half of the equation
- Applications fill the pipes
- Applications require services
- Services keep the NREN competitive edge
- Services require management
  - Central/Shared/Distributed/P2P/…
- Services require development
  - Software lifecycle
- Services require deployment
  - Coupling
  - Composition
Any conceivable networked service needs some basic services to run
- Access control
- Location
- Accounting
- Message passing
- ...<Put your desperate need here>

If the network is going to offer such services the basic services must be part of the network core infrastructure

Core middleware services, that is

Applications are users as well
- Foster the role of prosumers
Core Services in GN[d]

- GN2 saw the first attempt to offer these core services as part of a multi-domain network infrastructure
  - Not perfect, but many lessons learned
  - Actual services and working examples
  - Taking advantage of previous collaborative initiatives
- GN3 is continuing this trail
  - Enhancing those already deployed or piloted
  - Addressing more core services
  - Providing dynamic integration and invocation
  - Considering SLAs as part of the process
  - Better development and deployment cycles
  - A service integration model: the multi-domain ESB
- Keep the NREN competitive edge
Composable Network Services
The GEMBus Promise

- A framework to define, discover, access, and combine network services
  - From the infrastructure up to application elements
  - Federated, multi-domain ESB
  - Able to integrate any service within the GÉANT infrastructure
  - Flexible negotiation of service provision capabilities

- Addressed to
  - NREN staff
  - e-Science service providers
  - and users!!

- Collaborative architecture
  - Open to collaboration beyond the academic community
  - Prosumer-oriented
    - Plug-and-play plus Plug-and-be-played
A Couple of Archetypal Use Cases

- An institution willing to distribute an arts performance subject to IPR to a variable number of sites needs to:
  - Create a multicast group
  - Generate keys for controlling access to the group
  - Distribute keys to participant sites according to their attributes and the institution authorization policy
  - Monitor the usage and performance of the distribution at several points of the network

- A research team defining a workflow to gather and publish a data flow originated by a singular instrument through a federated repository needs to:
  - Make informed real-time decisions on the route to be used for storing the data
  - Enforce certain properties in the selected links
  - Provide the data processors with appropriate credentials to access data stores
  - Obtain general, location-independent pointers, to the final data
Building by Composition

Standard interfaces and support for policy agreements

Compositional procedures and orchestration

Interface descriptions

Service Components
- AutoBAHN DM
- perfSONAR MA
- eduGAIN AuthN
- ...

Composite Services
- e-science workflow
- A&H performance
- eduGAINized repositories
- ...

Service Frameworks
- Other NRENs
- Governmental
- Commercial
- ...

connect • communicate • collaborate
Service Interfaces

- **α-interfaces**
  - Directly usable by applications
- **β-interfaces**
  - Govern systems and resources
- **γ-interfaces**
  - Abstract access to resources
- **δ-interfaces**
  - Actual control over the resources

Source: MANA Position Paper, 2009
What Service Interfaces

- GEMBus will provide a set of α-interfaces
  - Plus the corresponding orchestration systems
- Specify how β-interfaces have to be published and registered
  - From individual GÉANT (and external) services
- γ-interfaces for core services
  - Those required for direct integration support
  - Usable by individual services

Source: MANA Position Paper, 2009
Core (Federated!) Services

- Directory
  - Register new services and discover those available
- Messaging
  - Offer a common base for routing and (possibly) transforming requests and responses
- Logging
  - Collect events and allow their correlation in a coherent manner
- Security
  - Establish the rights of a certain request and/or prepare the credentials for it
- Orchestration
  - Define how and when individual services are called inside a composed one.
Integrating/Federating Services

- Services to be provided by other GN3 activities and other projects
- Most of current GÉANT (prototype) services are already well suited
  - AutoBAHN, cNIS, eduGAIN, PerfSONAR, …
- Seamless integration framework
  - Standard wrappers
  - Simple registration procedures
  - Optional reflection interfaces
- Available through
  - Service endpoints
  - Generic API(s)
  - Composition portal(s)
- Work needed in capabilities description and semantic information to allow composition and matching
Compositional Styles

- Lightweight SOA
  - REST
  - Composition based on the mash-up paradigm
  - Web 2.0
- Heavyweight SOA
  - SOAP
  - Composition based on formal languages
  - Semantic Web
- Bundle platforms
  - Software components kept in repositories
  - Loaded and instantiated by the application using them
  - OSGi
- At least, the two first will be addressed
The Timeframe

- Shape it in the first year
  - Identify initial use cases
  - Define core services
  - Determine supporting framework(s)
- Make it evolve along the coming years
  - Refine use cases
  - Identify framework enhancements
  - Implement and validate
  - Demonstrate use cases
- And move into service when mature
Networked Systems are predominant, with various forms
Virtual Worlds are emerging
Moving from connectivity to content (who cares about packets?)
An enabler for service creation with increased variety of applications
An enabler for competition
Increased heterogeneity of devices and networks
Mobility and Dynamic adaptation everywhere
Increased management complexity, Managed and unmanaged systems
Security and Trust vs freedom and privacy
User-centric approach to system design
The Network is a Database
The network is both physical and virtual (geo-location)
The Network is increasingly Wireless based
The Network is the People
The Network is a global Virtualized resource
Other factors than technology are instrumental
- Economics, Privacy, Security, Social behaviors, Entry cost, Regulation

Source: Joao da Silva (European Comission)
ICT MobileSummit 2008 Opening Address.
In the Context of Future Internet Initiatives

- In the terms used by the Future Internet publications, GEMBus will become a Service Delivery Platform
  - Part of the proposed Global Service Delivery Platform
- Intended to be aligned with industry initiatives
  - IPSphere/TMF Service Delivery Framework
  - General SOA interoperability
- Usable for:
  - Architecture validation
  - Initial service deployment
  - Integration of initiatives and communities
  - Direct experimentation
- Keep the academic networking leading edge