The role of NGN Testbed Federations

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Rationale for federating testbeds

- **Large-scale testbeds** are needed for integrating and validating next-generation network technologies.

- The federation of distributed test laboratories and testbeds enables **end-to-end interoperability** testing of platforms, networks and services.

- The federation of laboratories and testbeds helps to **reduce the risks and costs** of large-scale network infrastructure testing.
Federation requirements

- **Openness**
  Federation implies openness at all levels, including provision, implementation and use.

- **Excellence**
  The federation principle aims for “best of breed” and must assure excellence of the capabilities of the federation from various aspects.

- **Management**
  Managing federated testbeds is complex, but necessary for achieving scale, diversity, cost-efficiency and, last but not least, to improve the sustainability and quality of the individual testbeds and the federation as a whole.

- **Governance**
  Interconnecting different testbeds belonging to different administrative domains means granting access to remote resources that are owned by different stakeholders.
Federation framework

- **Operational**
  - Coordination of the activities by a central entity
  - Standard procedures for handling supply and demand of testing facilities
  - Brokerage service for testing facilities and resources
  - Effective procedures for protecting confidential information
  - Transparent classification and rating of testing sites via standardised metrics
  - Incentives for competition between test sites
  - Transparent pricing

- **Legal**
  - Terms & conditions for membership and/or subscription
  - Handling of intellectual property rights
  - Legal procedures for confidentiality issues
  - Process for conflict resolution
  - Legal procedures in case of abuse of rights or neglect of contractual obligations
Federation framework

- Technical
  - Testing process definition
  - Establishing a catalogue of components
  - Specification of testbed lifecycle
  - Testbed search engine Teagle
  - Secure remote access to testbeds
  - Scheduling of testing resources
  - Procedures for analysis and diagnostics
  - Performance monitoring
  - Troubleshooting and fault management
Connectivity ???

- TB1
- TB2
- Virtual TB3

NGN, open Internet, or dedicated network
Connectivity on demand

TB1

GW

TB2

GW

NGN, open Internet, or dedicated network (GÉANT2?)

Virtual TB3

GW

Modular Gateway

Virtual connection
Controlling Connectivity

Application Layer

Abstract control framework (Control & Support Functions)

GW

GW

GW

GW
Testbed federation architecture

- Objectives
  - Creating a federation by interconnecting testbeds of diverse technology in a single communication platform, and
  - Offering federation to the users following a single, harmonized methodology

- Future-proof benefits
  - Network-technology independence; new network technologies would be incorporated in, or excluded from the platform, seamlessly, without architectural modifications.
  - Steady user experience; independent from the supported services, some of which may decay or new ones may be added as the landscape of networks technology changes over time, posing new testing requirements
Common layered architecture

**APPLICs**

**CUSTOMER APPLICATIONS**

**CONTROL & SUPPORT LAYER**

**Service Primitives**

**Network interactions (signaling)**

**CORE & ACCESS**

**Execution environment**

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IMS as a federation tool

- Function blocks on top of the core control framework
  - **User related functions**: Preferences, Presence, and Directories …
  - **Service operator functions (testing services)**: Charging, Session management, Identity, and Service Authorisation …
  - **Network Management functions**: Access control, Localisation, Authentication, and Authorisation …

- The overall process to instantiate a testing configuration requires tools on the application layer to define, search, select, configure and control testbed components. It is a multi-step process starting with an interactive user session to describe the testing requirements, search by the system for available and capable network resources, and finally provision of relevant access tools to the users.
Provision of a testing environment

- Components at the application level realised as specialised application servers
  - **Testing Service Description** providing knowledge and information about the testing service primitives available and how to utilize them. The testing service description server is providing information on demand and according to real resources’ availability
  - **Testing Resources Search Engine** as a specific application to match required testing resources against available assets from a global testbed database
  - **Network topology management** providing the knowledge related to network resources and topologies
Utilization of IMS as a federation tool

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