NGN Case Study
"Middle East Ministry of PTT"

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Consulting
DETECON

Content

- **Part 1: NGN Strategy**

- **Part 2: NGN Pilot**

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Content

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1. Overview

1.1 Scope of the Project

Starting Point

Project Goal:
 	
■ Planning Assistance for the Integration of Next Generation Network Aspects in the Clients goals for the next five years.
 	
Project Objectives
 	
■ Provide the Client with recommendations for a roadmap, exploiting NGN technology that supports the following:
 	
  ● Expansion of telecommunications services foot-print (providing services to previously non-serviced or under-served regions).
 	
  ● Expansion of telecommunications service portfolio.
 	
  ● Exploitation of the advantages offered by Next Generation Network technology.

1. Overview

1.2 Client Goals

Overall Clients Goals	Percentages to Numbers
Clients had a focus on the next five years to achieve: ■ PSTN service 50% penetration ■ Mobile service 50% penetration ■ Internet access 30% penetration ■ Villages coverage 100 %	The goals equate (dependent on current population) to the following approximate numbers: ■ More than 10 million new PSTN subscriber. ■ More than 15 million dial-up IP access users. ■ ~ 2 million residential broadband IP access circuits. ■ ~ 134,000 large businesses with broadband IP access circuits. ■ ~ 2 million small and medium sized businesses with broadband IP access.

1. Overview

1.3 Constraints and Guidelines for the Project

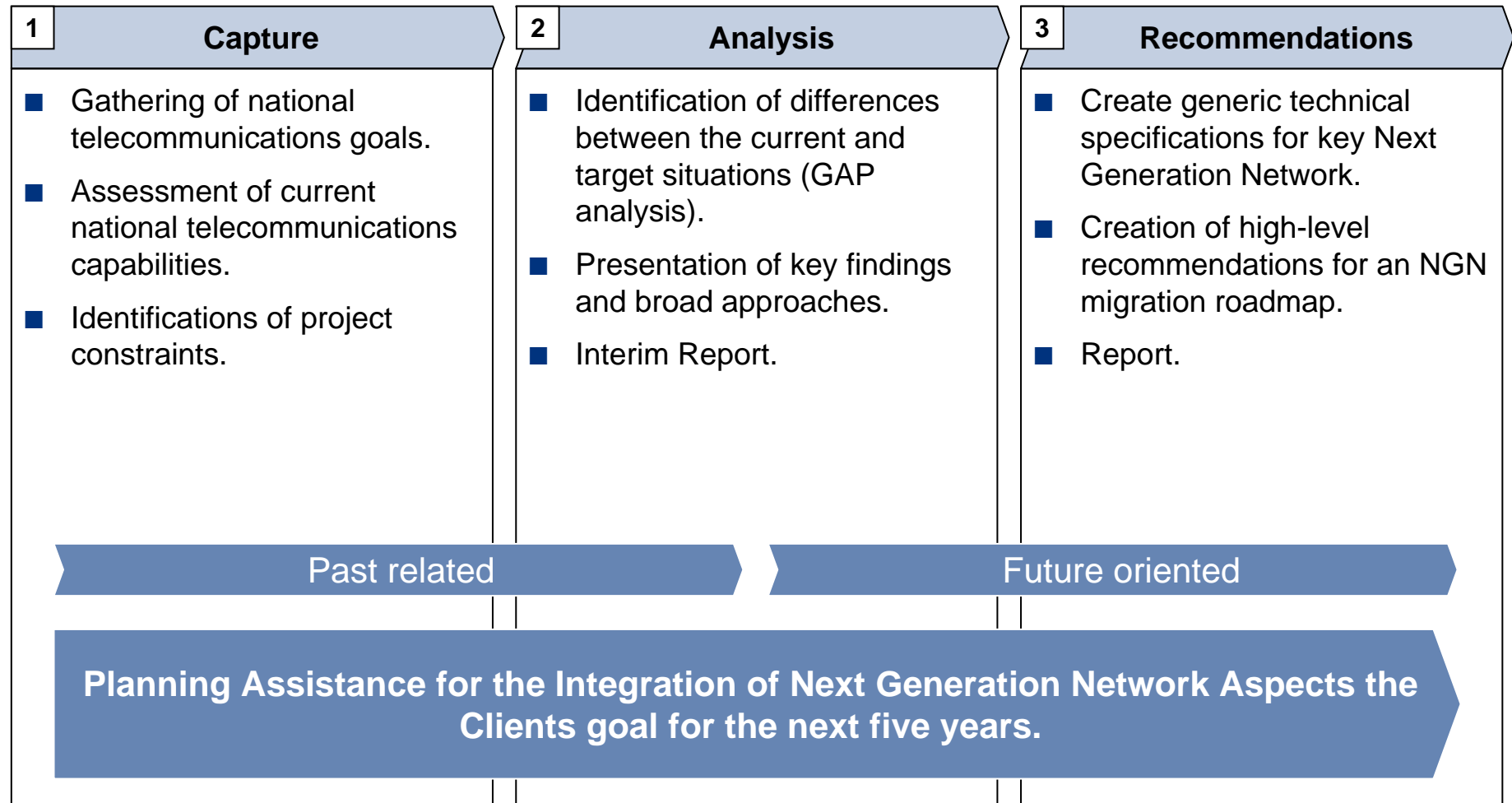| Constraints and Guidelines |
| --- |
| ■ The goals are absolute and are not subject to change. |
| ■ Flexibility of solution for future services is required. |
| ■ Solution should include focus on operational efficiency. |
| ■ Business relationships between governmental holdings responsible to provide telecommunication services in their respective regions are critical but should not be addressed. Project is how to deal with appropriate technology. |
| ■ Focus only on fixed-access.

Mobile (PLMN) services should be integrated in to the NGN environment at a later phase. |
| ■ Recommendations should employ international best practices/standards. |

1. Overview

1.4 Critical Issues for the Project

Critical Issues
■ Business Model must be defined before the detailed design can be started because infrastructure recommendations have to be derived from Business Model and SOP.   ■ The recommendations are based on a key assumption: **The recommended infrastructure provides a consistent set of services across the nation.**

1. Overview

1.5 Project Plan

The actual project had been subdivided into 3 sequential work packages: Capture, Analysis and Recommendations.

1 Capture	2 Analysis	3 Recommendations
■ Gathering of national telecommunications goals. ■ Assessment of current national telecommunications capabilities. ■ Identifications of project constraints.	■ Identification of differences between the current and target situations (GAP analysis). ■ Presentation of key findings and broad approaches. ■ Interim Report.	■ Create generic technical specifications for key Next Generation Network. ■ Creation of high-level recommendations for an NGN migration roadmap. ■ Report.

Past related → Future oriented

Planning Assistance for the Integration of Next Generation Network Aspects the Clients goal for the next five years.

2.   Capture and Analysis

2.1   Findings and Analysis Results for Clients Legacy PSTN Network

Findings in Legacy PSTN
The Capture phase analysis for the legacy PSTN has shown that: ■ PSTN infrastructure is the result of uncontrolled growth. ■ No pre-in-service qualification for PSTN switches. ■ No consistency in service quality. ■ No consistency at a national level for IN services. ■ Too many switch vendors, too many signaling systems, too little consistency. ■ 1 call success in 3 attempts. International benchmark is 999 successes in 1000. ■ Legacy PSTN is not capable of supporting emerging services.   **Legacy PSTN is not recommended as basis for future solution**

2. Capture and Analysis

2.2   Findings and Analysis Results for Clients Legacy IP Network

Findings in Legacy IP
The Capture phase analysis for the legacy IP network has shown that:

- Available IP address space is insufficient for the Clients goals.

- IP footprint is insufficient.

- Security implementation is weak.

- Recovery times on path/route failures are high.

- QoS implementation is non existent.

- Switching/ routing performance is too weak for goals.

Legacy IP network is not recommended as basis for future solution

2. Capture and Analysis

2.3 Findings and Analysis Results for Clients Legacy Back-bone Transmission Network

Findings in Legacy Back-bone Transmission
The Capture phase analysis for the back-bone transmission has shown that: ■ Based on modern DWDM technology. ■ Based on STM 16 and STM 64 trunks. ■ Inner Core Nodes + Further Core Nodes all in a Partly-meshed Network. ■ Good distribution. ■ Good redundancy: One node per city is connected to 2 Core Nodes. ■ Good intra-city concept: Other Nodes in the city connected by rings or full-mesh. **Legacy back-bone transmission is a good basis for future solution**

2.   Capture and Analysis

2.4   Findings and Analysis Results for Client related Market and Vendors

Findings in Market and Vendors
The Capture phase analysis for the market and vendors has shown that: ■ Key vendors in the Clients telecommunication market, have announced end-of-life for their PSTN(TDM) equipment. ■ Clear trend to every-thing-over-IP. ■ Multi-service and converged networks can not be achieved on legacy Circuit Switched infrastructure. ■ Goals of the Clients plan have a clear emphasis on broadband IP access services.

DETECON

3. Recommended Solution

3.1 Overview (1/2)

DETECON recommended to adopt a NGN strategy and recommended a client specify solution based on the findings and analysis results.

Key benefits for the Client to adopt an NGN strategy

■ Single national packet based network supporting nationally consistent:
 	
   ● PSTN type services.
 	
   ● Broadband IP access services.
 	
   ● Corporate data services.
 	
■ Network is an IP / MPLS core sitting on optical transmission network.
 	
■ End-to-end management of network and services.
 	
■ Future PSTN users supported via IP based call servers and access gateways.
 	
■ Provincial PSTN(TDM) will inter-work at local transit level to NGN.
 	
■ Legacy network users will be progressively migrated to NGN.
 	
■ Access networks (copper & optical) need to be developed aggressively.

3. Recommended Solution

3.2 Overview (2/2)

| Key benefits for the Client to adopt an NGN strategy |
| :--- |

■ The target number of IP addresses is best solved by using IPv6 rather than IPv4.

■ However:

- IPv6 is not universally available on telecommunications equipment.

- IPv6 skills are not readily available.

- Interim requirements on IP addresses could be supported by IPv4

It is recommended that the initial NGN is based on IPv4. Equipment should be selected with a view to upgrading to IPv6 at a later date.
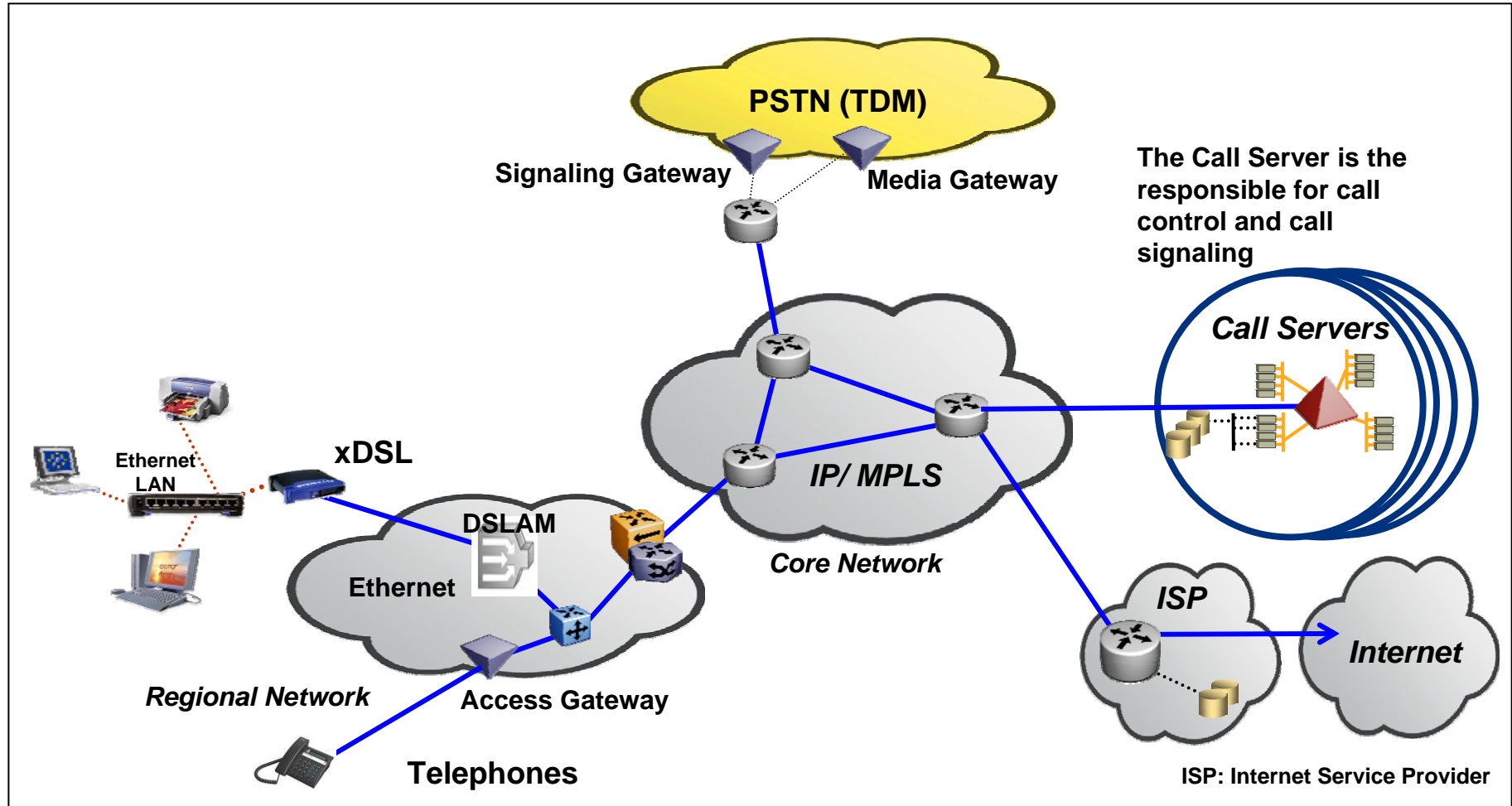
3. Recommended Solution

3.3 Architectural Concept for the NGN Solution

Architectural Concept is conform with international standards on packet based multi-service networks:
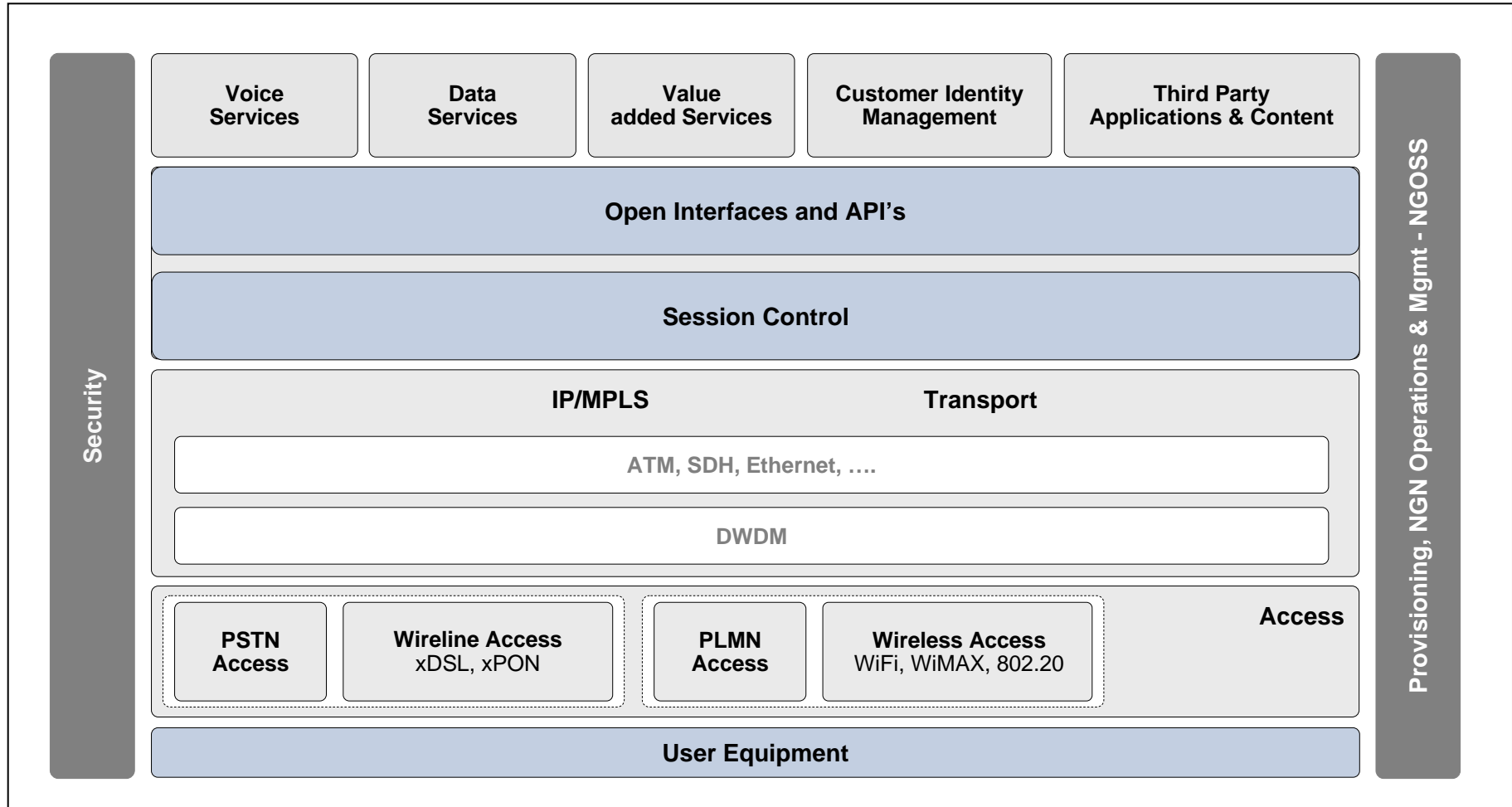
3. Recommended Solution

3.4 Simplified NGN Architecture

3. Recommended Solution

3.5 Broad Approach of NGN Roll-out Strategy

NGN Roll-out Strategy: Broad Approach

■ Prepare IP services immediately on **legacy** infrastructure.
 	
Mass market broadband and dial-up.
 	
■ **Use** existing infrastructure as much as possible, (Copper loop recovery program is a major task):
 	
  ● Internet and PSTN to share access circuits were possible.
 	
  ● Minimize effort on new access circuits installation, ADSL + POTS on one loop.
 	
■ **Minimize** off site effort: End-user installation of CPE to reduce site visits.
 	
■ Centralized management to ensure nationally consistent services and quality.
 	
■ Automated processes to support >12,000 new subscriber adds per day.
 	
■ Maximum use of standards to reduce time to market and process adaptation.

3. Recommended Solution

3.6 Overview of NGN Roll-out Strategy

NGN Roll-out Strategy: Overview

- Drive key services **now** in capital cities (>35% of population). Based on a nationally **consistent** service definition on legacy PSTN(TDM) and IP:
  - xDSL over existing copper for residential and corporate.
  - Create dial-up IP service.

- Define and implement future access networks **now.**
  - Define and implement new access network for 17 million.
  - Start access trails (e.g. fibre, broadband wireless).

- In **parallel** to the above, create the following:
  - National MPLS network.
  - National IP network based on national MPLS network.
  - Processes for national NGN services, operations and roll-out.
  - Start with limited areas of NGN services (voice over NGN and broadband IP).

3. Recommended Solution

3.7 Overall Migration Strategy

Migration Strategy

■ Minimize interim CAPEX on legacy networks to essentials only.
 	
■ Reduce legacy OPEX:
  ● Retire those PSTN switches present in small numbers.
  ● Retire end-of-life-cycle PSTN switches.
  ● Migrate legacy xDSL & dial-up access to NGN as soon as possible.
 	
■ Reduce OPEX, free-up transmission: Off-load PSTN backbone:
  ● Migrate long-distance PSTN traffic to NGN as soon as possible.
  ● Migrate other network interfaces to NGN as soon as possible.

4. Spotlight 1: Processes

4.1 Overview

To achieve the required number of new subscribers per day is only possible using automated and efficient processes and tools.

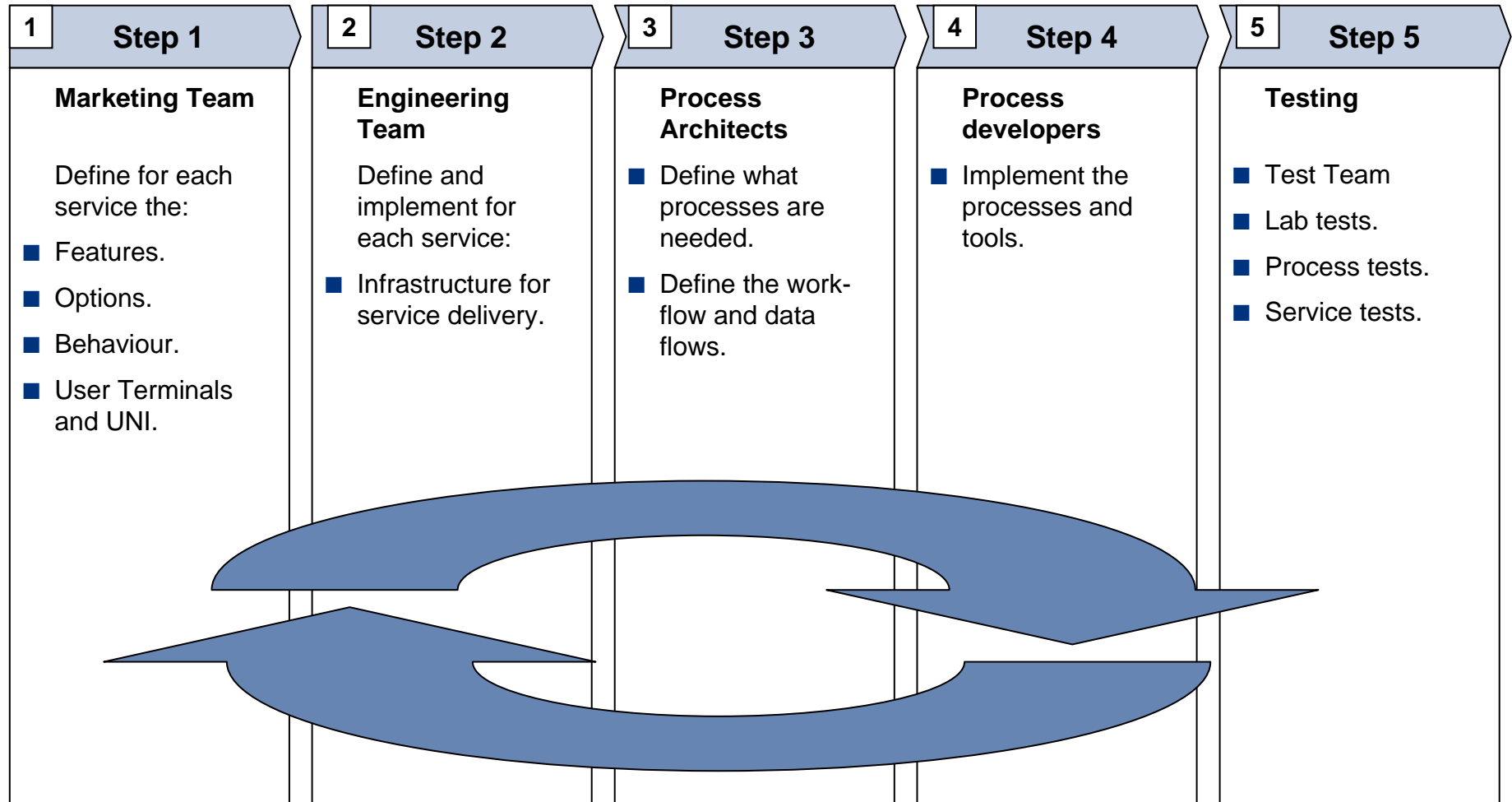| Add of new PSTN Subscribers	Sub-set of process steps in adding subscriber
■ More than 10 million new PSTN subscriber over 5 years requires ● More than **10,000 new subscriber per working** day every day for 5 years. (Averaged out of 5 years). ● More than 15,000 over 3.5 years ■ This is **only** possible using **automated** and efficient **processes and tools**.	■ Validity of subscriber address. ■ Check subscriber for credit worthiness, or bad debt history ■ Availability of copper in to building and of a UNI point. ■ Availability of copper from house to main distribution frame. ■ Job ticket creation for copper connectivity. ■ Availability of access port. ■ Availability of suitable directory number. ■ Updating of used equipment lists so automatic re-ordering can be triggered in needed. ■ Updating of used equipment lists so that traffic estimates can be updated so automatic ordering of transport updates can be made. ■ Prepare billing system for subscriber, tariff package, bank account details,.. ■ Prepare call server for new subscriber.

4. Spotlight 1: Processes

4.2   Resulting Goal

NGN Roll-out Strategy: Overview

■ Highly automated and efficient processes to support >12,000 new subscriber adds per day.
 	
■ Process must operate end-to-end. E.g. inter-province services such as
   ● Corporate VPN services
   ● Corporate voice services

4. Spotlight 1: Processes

4.3 Proposed Solution

1 Step 1	2 Step 2	3 Step 3	4 Step 4	5 Step 5
Marketing Team	**Engineering Team**	**Process Architects**	**Process developers**	**Testing**
Define for each service the: ■ Features. ■ Options. ■ Behaviour. ■ User Terminals and UNI.	Define and implement for each service: ■ Infrastructure for service delivery.	■ Define what processes are needed. ■ Define the work-flow and data flows.	■ Implement the processes and tools.	■ Test Team ■ Lab tests. ■ Process tests. ■ Service tests.

5.   Spotlight 2: Network Management and Customer Care and Billing

5.1   Overview of the NMS/CCBS Specification Conceptual Design project

Project Overview
■ The NMS/CCBS Specification Conceptual Design project is addressing the creation of a conceptual design, for NMS and CCBS systems, that supports: ● Legacy networks (PSTN, IP, GSM and transmission). ● The future NGN.   ■ The end point of this project is to have a detailed design for the target NMS and CCBS systems.   ■ Design goals include: ● Compliance with international best practice concepts. ● Strong emphasis on open international standards. ● Avoid vendor lock-in and costly customization of proprietary systems. ● High performance. ● End-to-end automated tools and view of the systems.

5. Spotlight 2: Network Management and Customer Care and Billing

5.2 Broad Approach

Broad Approach

The broad approach used in this project was based on the following phases:
 	
■ **Capture**:
   ● Identifying NMS and CCBS capabilities of the legacy networks.
   ● Identifying with the NGN technical strategy project the NGN NMS/CCBS needs.
 	
■ **Analysis**: A difference analysis between the legacy capabilities and the international benchmark systems for NMS/CCBS.
 	
■ **Recommendations**: How to move to the target capabilities.
 	
■ **Review**: Obtaining the Clients approval to proceed with **Recommendations** to next phase.
 	
■ **RFI/RFP**: Issuing of appropriate requests to vendors.

5. Spotlight 2: Network Management and Customer Care and Billing

5.3 Proposed Target NMS/CCBS (1/2)

Target NMS/CCBS (1/2)

■ NMS/CCBS based on enhanced Telecommunication Operations Map (eTOM).

- Standard processes and components.

■ Modular system providing interfaces to Master NMC for:

- Fault and Problem Management.

- Performance Management.

- Revenue Assurance.

■ NMS/CCBS structured to support national service goals:

- Mobile.

- Transmission.

- Fixed line.

- Data.

Target NMS/CCBS (2/2)

■ System Flexibility is demanded to support introduction of new services and infrastructure.

- NMS/CCBS system must be independent of network equipment brand.

- Mediation ("translation") layer between network elements and NMS/CCBS system required.

- Mediation layer is major cost driver.

- Mediation cost minimized by demanding adherence to standards.

■ Integration of legacy infrastructure in to target NMS/CCBS systems is dependent on the NGN rollout:

- (Integration cost + remaining book value) of legacy equipment.

   Must be lower than the migration costs!

   If not , do not integrate the systems. Migrate legacy to NGN as soon as possible.

Content

Part 2: NGN Pilot

1. **Overview**

2. **Strategy and Design**

3. **Implementation**

4. **Execution**

1. Overview

1.1 A short introduction into Testing for NGN Carrier

Testing is a key activity for successful NGN carrier business. Different strategies are required to fulfill all needs of an NGN carrier.

Pre-Qualification	Type Approval	Acceptance
A testing or pilot phase that is used before entering a commitment to purchase. The goal is to identify equipment that meets the broad specifications.	Used to identify customer premises equipment that will function correctly with the Telco services. This includes equipment that the customer can obtain from other sources. E.g. IP-PBX	A stringent test process to validate that the contractually specified functionality is correctly delivered.
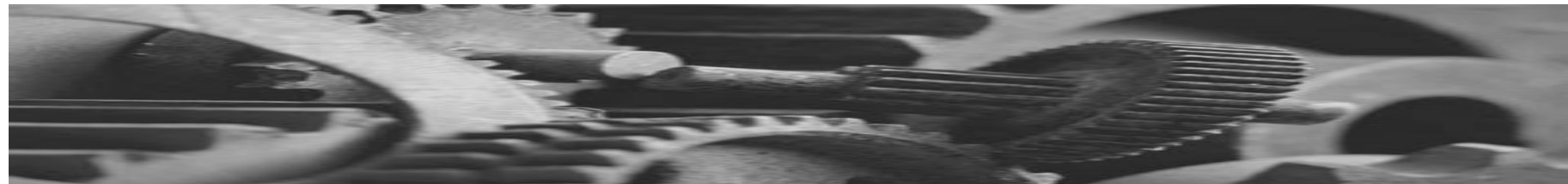
Test issues are discussed with the vendor to identify corrective roadmaps.	Test issues result in the with-holding of Type Approval.	Test issues can have direct contractually/financial impact on the equipment vendor.

"Standards" help, but are seldom interpreted in the same way.
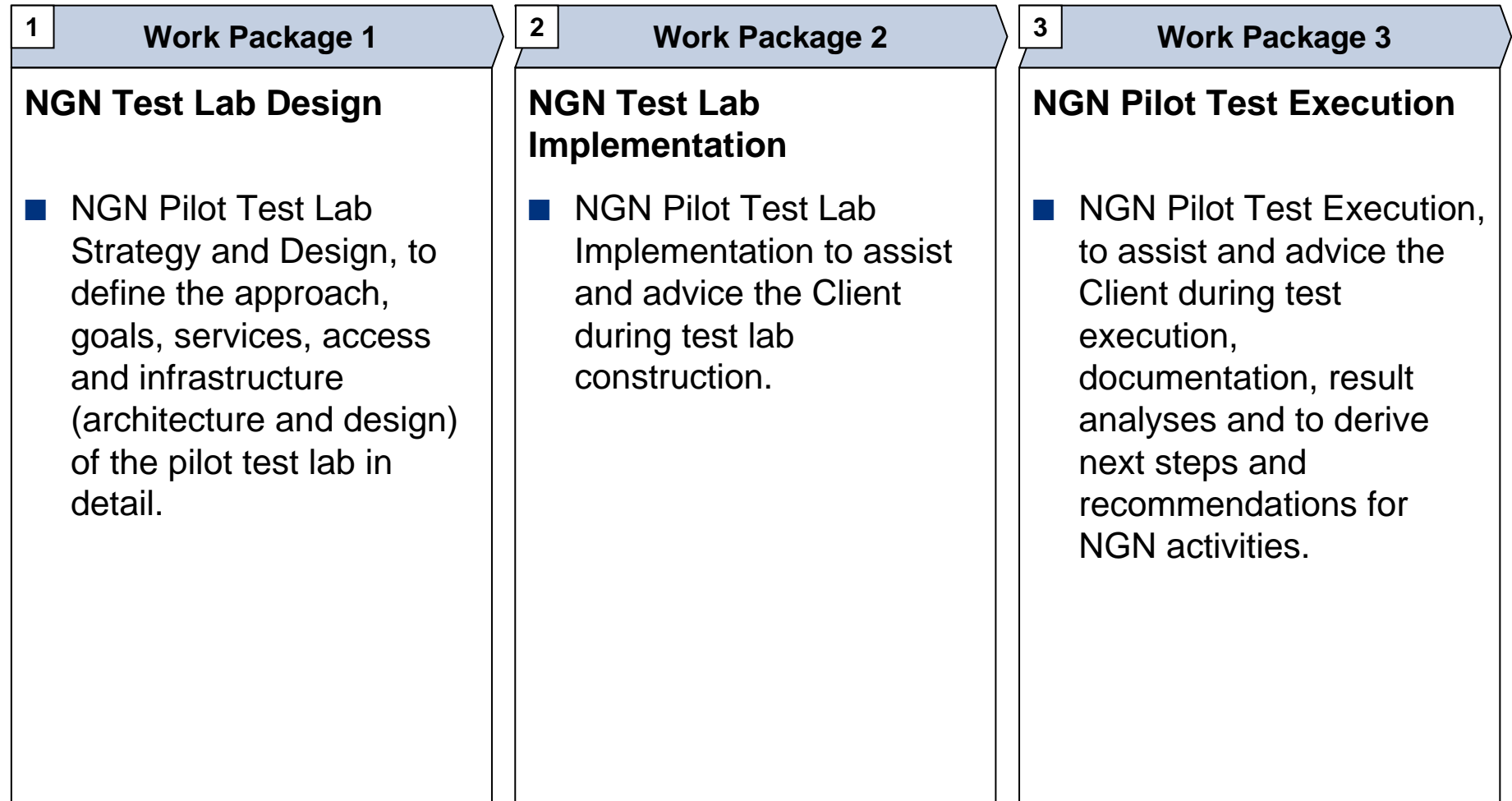
1. Overview

1.2 Scope of the Project

The goal of the project was to expose as quickly as possible the operational, service and technical issues of using Next Generation Network technology to deliver telecommunications services.

Scope of Work	Benefits for the Client
The objective for DETECON in this project was to assist the Client to perform NGN pilot testing in a test lab to identify the key operative, service and technical issues in running a NGN Network including: ■ NGN Pilot Test Lab Strategy and Design, to define the goals, services, access and infrastructure (architecture and design) of the pilot test lab in detail. ■ NGN Pilot Test Lab Implementation to assist and advice the Client during test lab construction. ■ NGN Pilot Test Execution, to assist and advice the Client during test execution, documentation, result analyses and to derive next steps and recommendations for the Clients NGN activities.	■ Obtaining an understanding of issues that must be addressed to plan, build and run a Next Generation Network based platform for the delivery of commercial telecommunications services. ■ The Client gets an excellent knowledge base in terms of supported services, features as well as interoperability or implementation issues to make future business decisions and does not rely on 2nd hand information (e.g. from vendors). ■ Potential risks for NGN deployment/operation are early detected and can be managed. ■ Hands-on training for Client staff is done locally and in-depth NGN skills can greatly improve. ■ Lab environment can be expanded to become a permanent facility for NGN testing (research/design, pilot and/or type approval) of the Clint as part of a full-blown NGN carrier.

1. Overview

1.3   Work Package Overview

The actual project had been subdivided into 3 sequential work packages.

| 1 Work Package 1	2 Work Package 2	3 Work Package 3
NGN Test Lab Design	**NGN Test Lab Implementation**	**NGN Pilot Test Execution**
■ NGN Pilot Test Lab Strategy and Design, to define the approach, goals, services, access and infrastructure (architecture and design) of the pilot test lab in detail.	■ NGN Pilot Test Lab Implementation to assist and advice the Client during test lab construction.	■ NGN Pilot Test Execution, to assist and advice the Client during test execution, documentation, result analyses and to derive next steps and recommendations for NGN activities.

2.   Strategy and Design

2.1   Scope of Work for Work Package 1

Scope of Work
Work Package 1 was concerned with the strategy, detailed design/definition of the goals, services, access and infrastructure (architecture and design) of the NGN pilot lab. The result was a comprehensive understanding with which the Client could approach the vendors for equipment and support. Specifically this work package focused on: ■ NGN Pilot testing Definition ■ Preparation of vendor selection ■ Service capability definition ■ Access definition (required access interfaces and technologies) ■ Infrastructure definition (e.g. architecture and design) ■ Support definition (rooms, interfaces..)
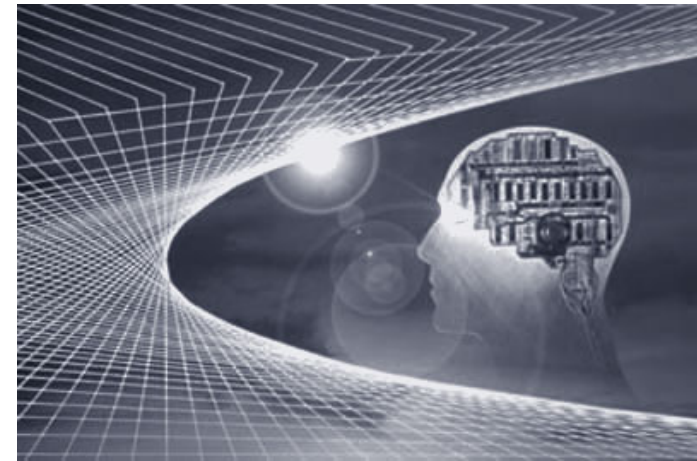
Benefits for the Client
■ Comprehensive understanding with which the Client could approach the vendors for equipment and support ■ Results formed the strong basis required for smoothly test lab implementation and test execution to derive benefit from high quality test results and valuable input for future NGN related business and technical decision.

2. Strategy and Design

2.2   Key Objectives for NGN Pilot Definition

Major objectives for the NGN Pilot Definition
■ Pilot Overall Plan
■ Define Voice Services (incl. Numbering Plan) to be tested
■ Define Broadband IP Services to be tested
■ Functional Description
■ Target Architecture including Interfaces and protocols as well as test scenarios for single vendor and multi-vendor interoperability testing
■ NGN Pilot environment
■ Processes for NGN Testing
■ Role and Responsibilities
■ Component Specifications

2.   Strategy and Design

2.3   Black-box Approach for NGN Pilot Testing

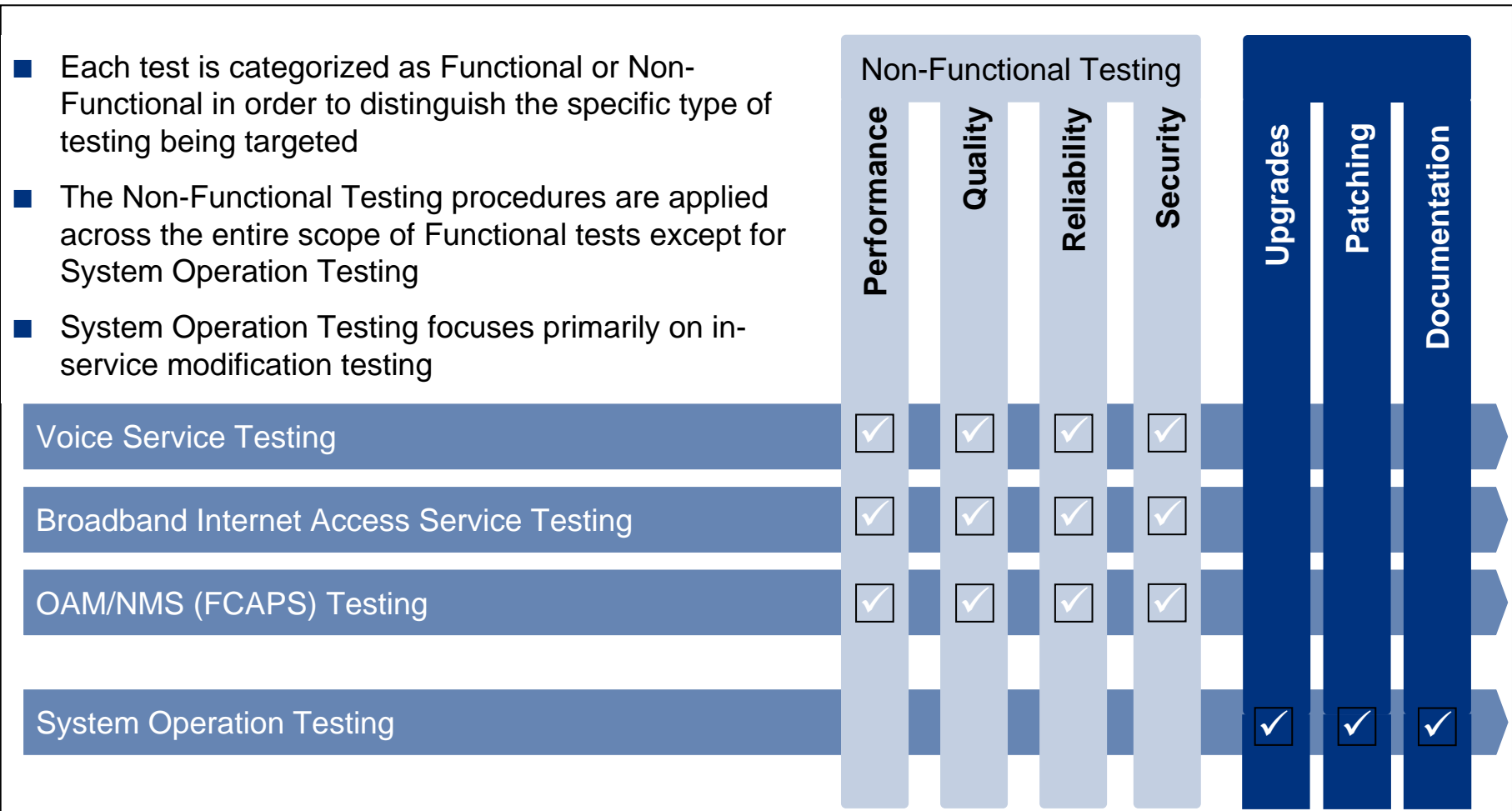**Detecon recommended a Black box testing approach NGN pilot testing to archive end-to-end testing of the systems capabilities.**
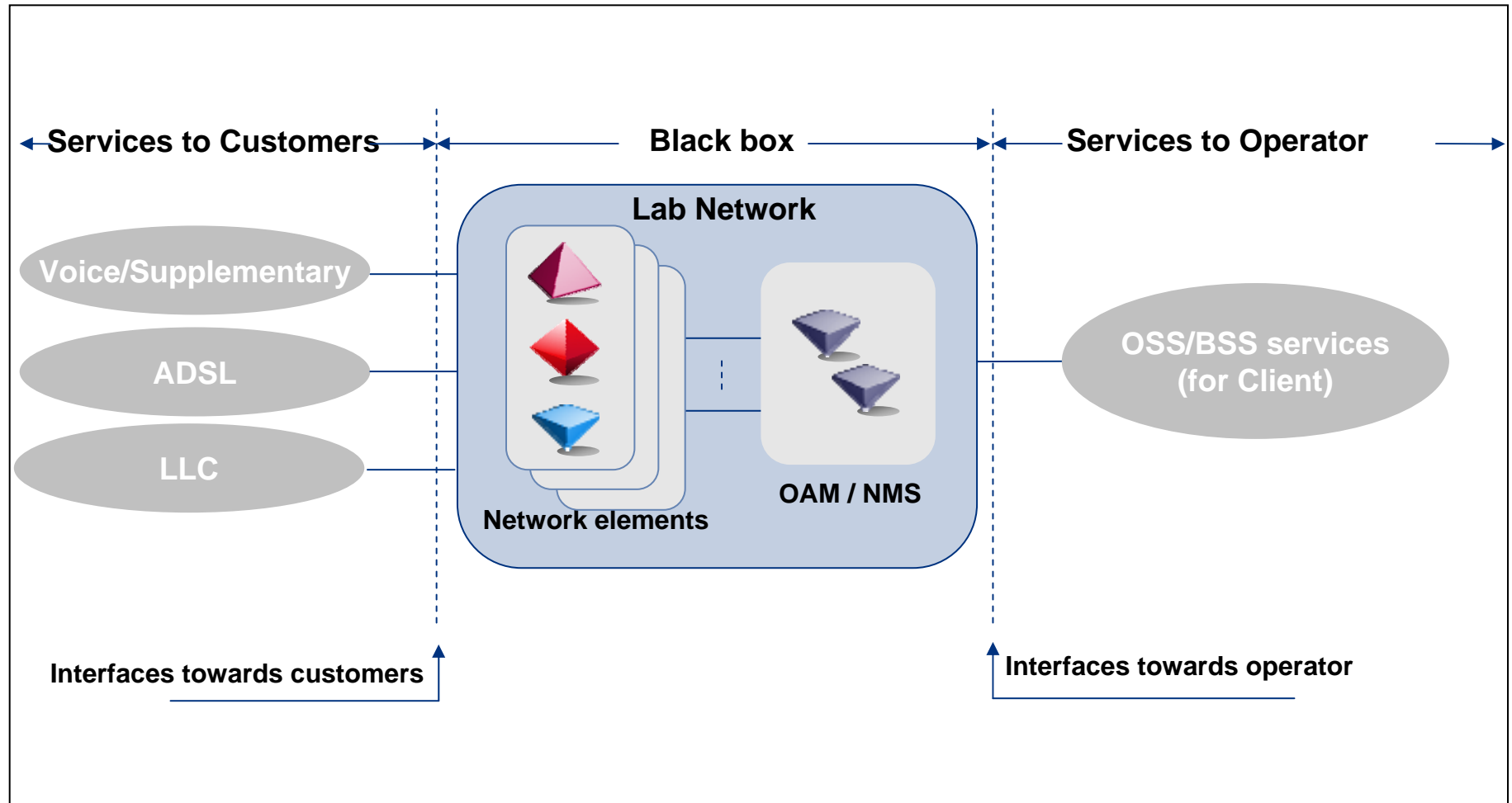
2. Strategy and Design

2.4 Methodology for Test Definition

Functional as well as non-functional tests have to be executed. Non-functional tests are incorporated into each functional test area.

- Each test is categorized as Functional or Non-Functional in order to distinguish the specific type of testing being targeted

- The Non-Functional Testing procedures are applied across the entire scope of Functional tests except for System Operation Testing

- System Operation Testing focuses primarily on in-service modification testing

	Non-Functional Testing						
	Performance	Quality	Reliability	Security	Upgrades	Patching	Documentation
Voice Service Testing	✓	✓	✓	✓			
Broadband Internet Access Service Testing	✓	✓	✓	✓			
OAM/NMS (FCAPS) Testing	✓	✓	✓	✓			
System Operation Testing					✓	✓	✓

3. Implementation

3.1 Scope of Work for Work Package 2

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The construction of the target pilot NGN lab configuration is primarily a function of the Client and the equipment vendors.
DETECON provided suitable qualified personnel to assist the Client in managing the construction of the pilot configuration. Major tasks among other:

- Manage vendor selection for inclusion into the lab testing environment

- Support Client in responding to vendor's questions and issues concerning the pilot

- Manage test lab construction including timeline/schedule development, milestone development, progress monitoring, vendor management, and risk management

Benefits for the Client

- Risk for delays because of major issues before and during test execution can be significantly reduced

- Ease cooperation/communication between Client and vendors during construction phase

- On-the-job training of Client staff in terms of NGN lab construction/implementation

4. Execution

4.1 Scope of Work for Work Package 3

Scope of Work
Work Packages 3 was concerned with the actual execution of pilot testing. In this work package detailed test steps have been executed, analyzed and documented. The results have been consolidated and recommendations for next steps have been defined.

- Support Client test team in understanding, setting up and executing the defined test procedures including appropriate on-the-job training

- Assist and advise Client test team members in evaluation and analysis of test results

- Assist and advise Client to adapt/optimize activities during testing based on actual test results

- Support Client to constantly steer and monitor relevant activities during actual testing to achieve high quality results
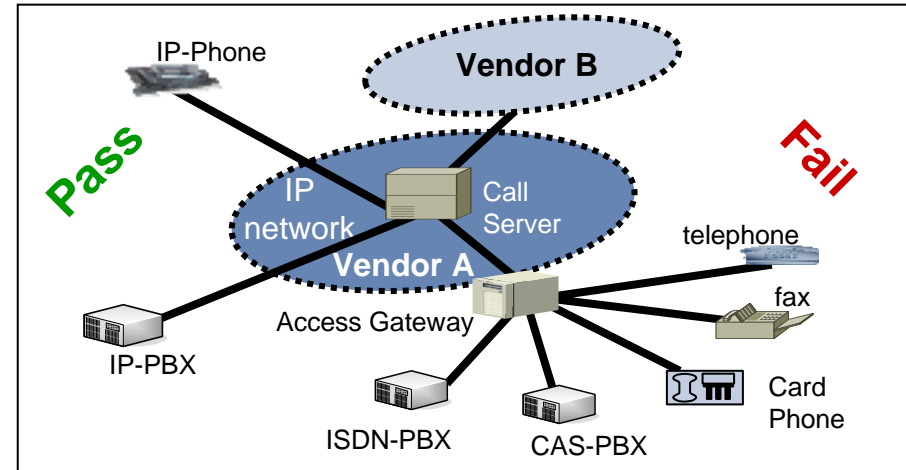
Benefits for the Client

- High quality knowledge base for business decisions in terms of NGN vendor selection and deployment (e.g. RFP) to achieve substantial quality improvements, time and cost savings.

- Lab infrastructure available for further development into a permanent NGN Lab facility for e.g. design/research, pilot and type approval testing.

4. Execution

4.2 Scope of Work for Work Package 3

To allow fast and efficient pilot test execution DETECON developed a web based test support and documentation system based on open source software as part of this work package.

Major Feature of the Test Database System	Extract of Database design for the project
■ Easy creation, monitoring, execution and analysis of test cases. ■ Easy documentation of test results ■ User management including support of different roles during test execution e.g.: Tester, Team leader, Administrator ■ Web based – not additional software required ■ Based on open source software: Apache, PHP, MySQL ■ Reusable for other test activities	
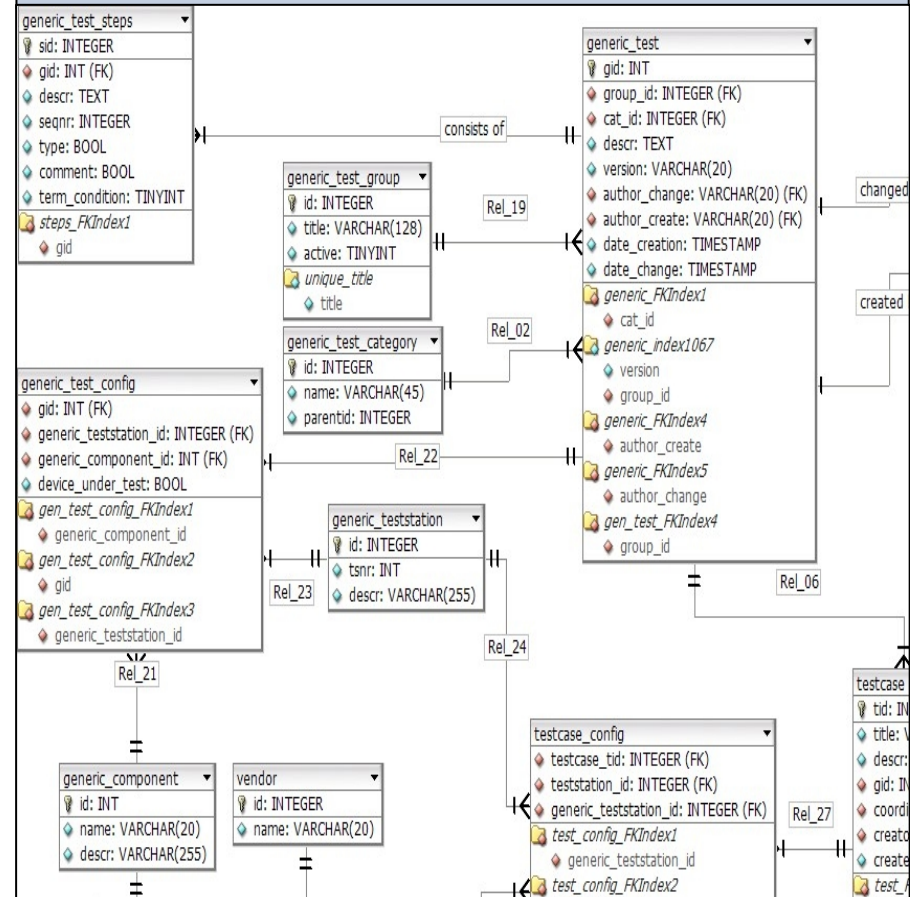
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