



NGM

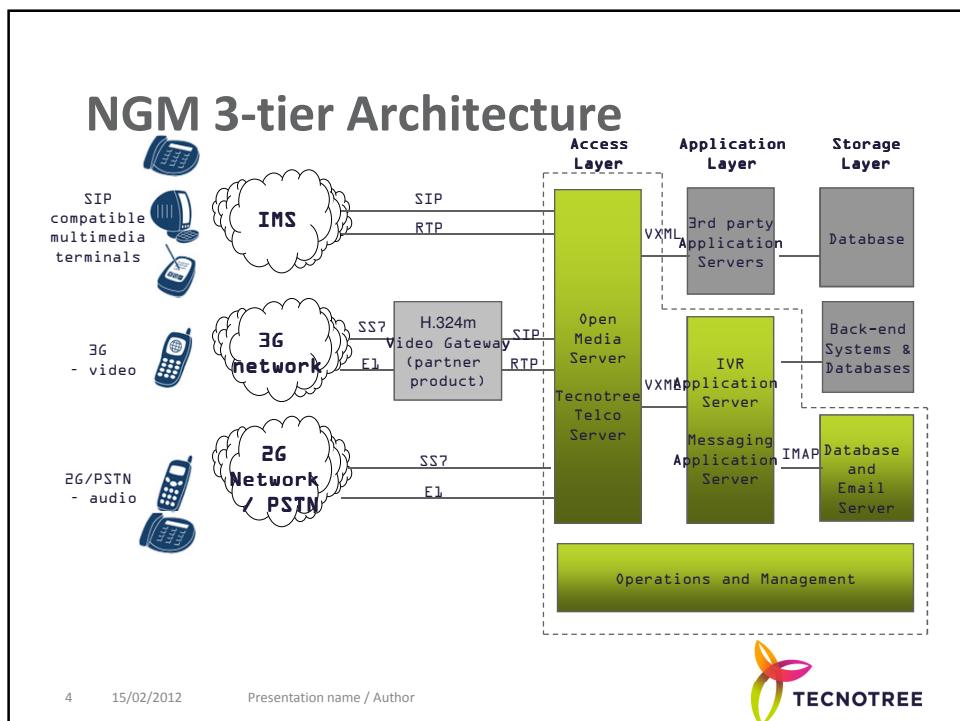
Basic Technical Course

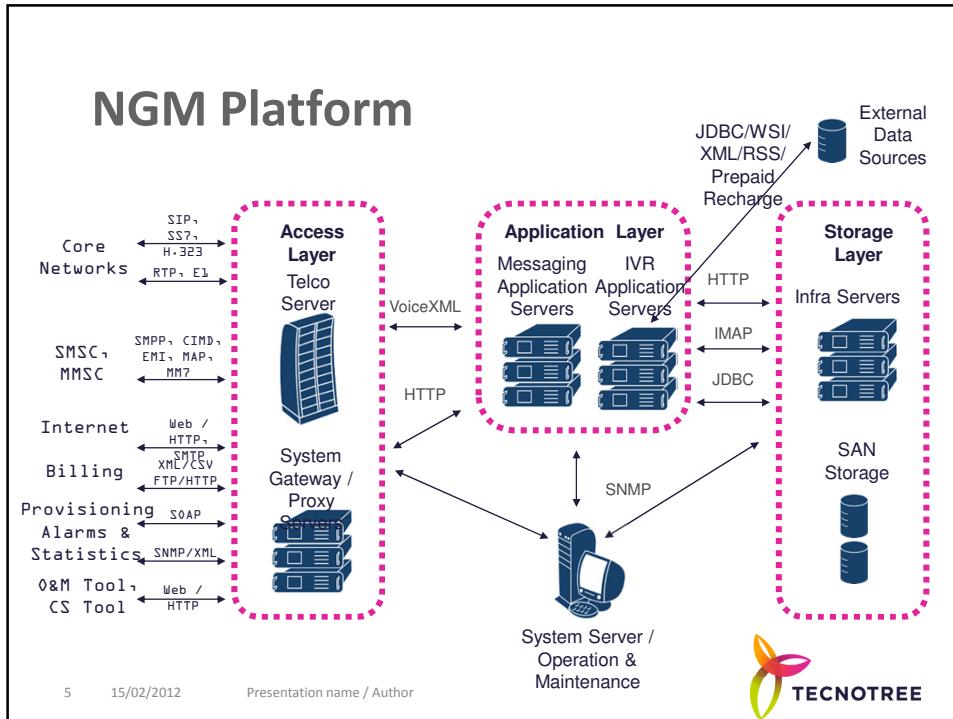


Contents

- Review of Intro Course
- Platform Components Hardware
- Software, including main frameworks
- NGM Networking
- Call Flow
- Services
- Dimensioning Principles, Redundancy Aspects
- How to operate the System
- Documentation Walkthrough
- O&M Tool Practice
- General System Administration Practice







Next Generation Services

Video Call Completion Services

- **Video Mail**
- **iCalled Video**
- **Video Announcements**
- **Video-Audio Fallback**

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Next Generation Services

Video Content Services

- **Video Portal**

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Next Generation Services

Short Media Messaging Services

- iMessaged Video

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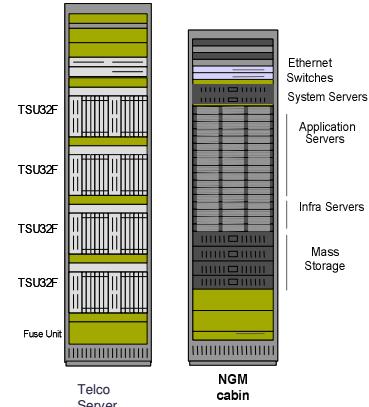
Platform Components

Hardware



Hardware Structure

- Tecnotree NGM 5.1 has a modular structure supporting various configurations and dimensions. Usually the configurations have two cabinets:
 - one cabinet for the access: the Telco Server System (TSS) cabinet
 - one cabinet for the Messaging Application and Storage system: the Application and Storage Cabinet
 - In some cases, the Telco Server Unit can be integrated to the Application and Storage Cabinet.



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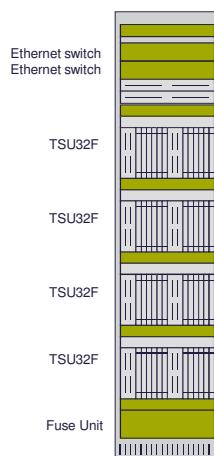
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Telco Server Cabinet

- The Telco Server System (TSS) consists of Telco Server units (TSUFBs), Ethernet switches, fan units, fuse units and a cabinet.
- The Telco Server units are installed into 42 U high 600 mm deep, 600mm wide non-EMC cabinets.
- One system cabinet can fit four TSUFBs.
- The standard Telco Server cabinet is delivered prewired for E1s, power feeds and Ethernet for easy expansions.
- There are options for top cable entry or bottom cable entry.



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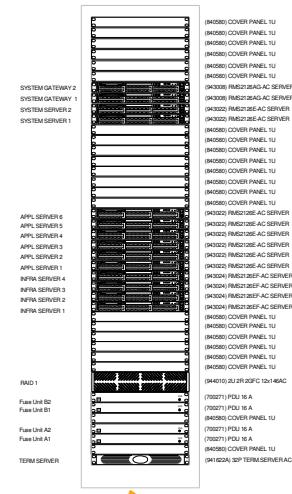
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Application and Storage Cabinet

- The Messaging Application System supports 14 Application Servers, four Infra Servers and four RAID disk arrays in one cabinet, interconnected with two gigabit Ethernet switches.
- The AS platform is available with DC or AC supply voltage.
- The Messaging Application and Storage system cabinet is 2155 mm high, 600 mm wide and 830 mm deep. The cabinet takes cool air from the front and blows hot air to the back through perforated front and back doors. There must be at least 600 mm free space both in front and back side of the cabinets.

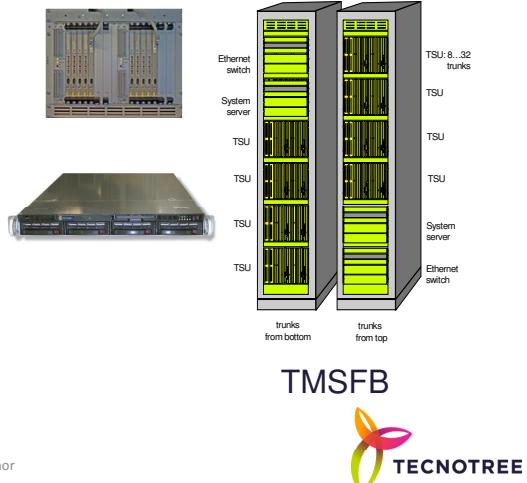


Telco Server (TSS) Hardware



TMSFB

- The Telco Server Platform is sold separately as well
 - System server is needed for software loading, fault monitoring, configuration, and diagnostics purpose



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TSS Hardware Specifications



TSS200

- Compact PCI based architecture
- Based on TMSFB (32E1) or TMSG (64E1)
- Density: 32-64E1 / 8U,
- Utilises DSP62D+TIC4D or DSP64EPM PMC modules for E1 connections



TSS100

- x86 rack mount server architecture, 1 RU, very high processing power, 2 options:
 - SUN X4100 server HW
 - SIP only deployments (HMP)
 - Max 240 ports per server
 - Tecnotree RMS2126E server HW
 - Utilizes DSP64EPC for E1 connectivity
 - Max 120 TDM ports (4E1) per server
 - Max 240 SIP ports per server

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TSU32F, Telco Server Unit

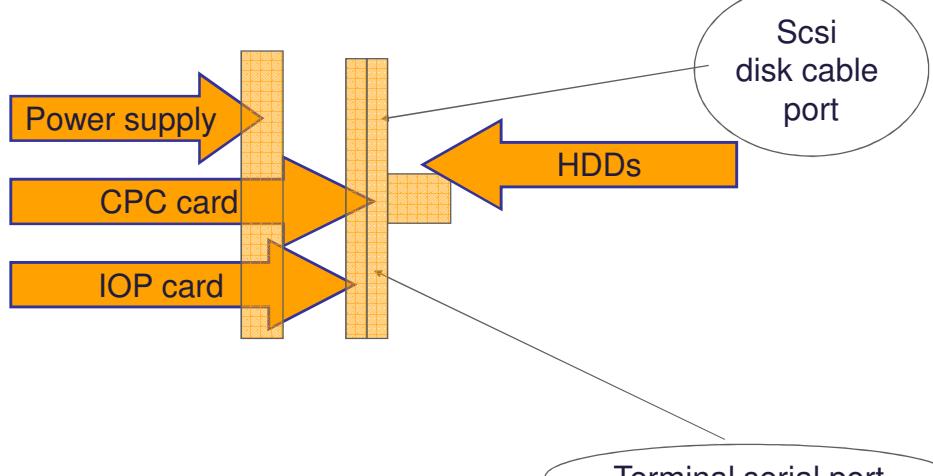


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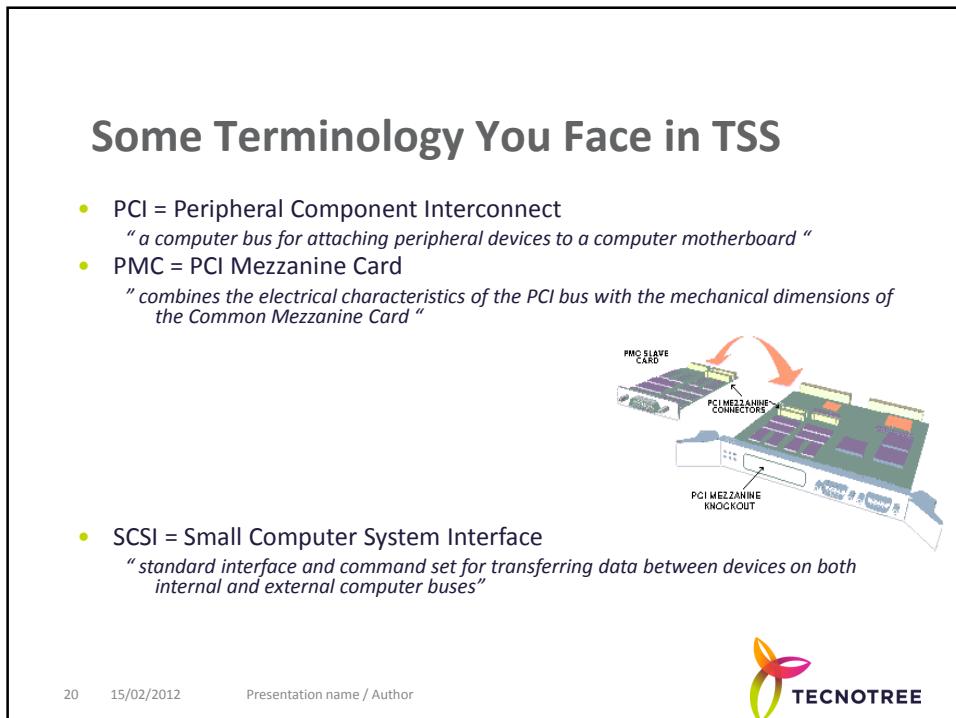
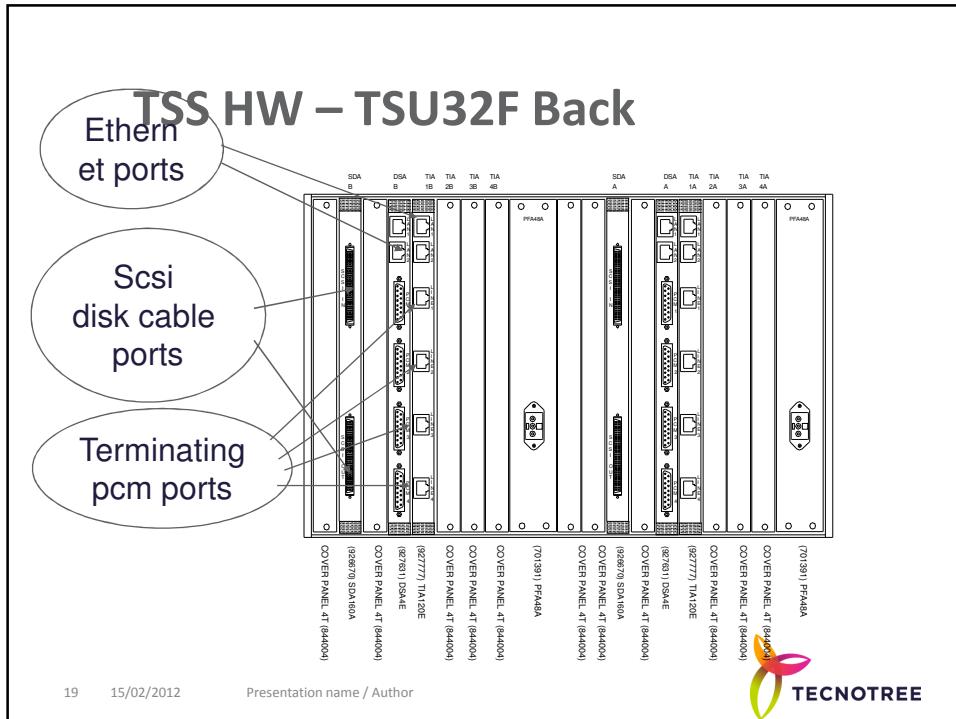
TSS HW – TSU32F Front



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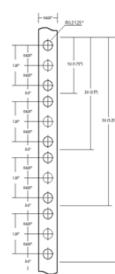
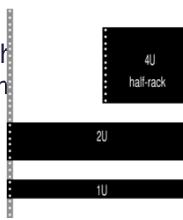


Some Terminology You Face in TSS

- CompactPCI

“CompactPCI is an adaptation of the Peripheral Component Interconnect (PCI) Specification for industrial and/or embedded applications requiring a more robust mechanical form factor than desktop PCI. cPCI is electrically identical to the PCI specification, except it uses the Euro (VME) card 3U/6U format with 2mm connectors”

- 3U and 6U are 19-inch rack height fraction
Measures,
1U = 1,75 inch:



CompactPCI bus pinout



Some Terminology You Face in TSS

- ECC = Error Code Correcting Memory

“A memory system that tests for and corrects errors automatically, very often without the operating system being aware of it”

- IDE = Integrated Drive Electronics

“standard interface for connecting storage devices such as hard disks and CD-ROM drives inside personal computers”



- IPMI = Intelligent Platform Management Interface

“defines a set of common interfaces to computer hardware and firmware which system administrators can utilize to monitor system health and manage the system”

“IPMI operates independently of the operating system (OS) and allows administrators to manage a system remotely even in the absence of the OS”



Telco Server 200 HW Components

- **SDU35A73 Hard Disk Unit**
 - SDU35A73 has a 73 Gb 80-pin SCA Ultra160 SCSI drive in a 6TEs wide unit. The SDU is hot-swappable.
- **CPC686D System Controller**
 - CPC686D has CompactPCI card with a 1.4 GHz Pentium-M processor, with 2 Gbytes RAM, two PMC sites and four 100/1000BASET Ethernet interfaces.
- **IOP686D I/O Processor**
 - IOP686D I/O processor has CompactPCI card with a 1.4 GHz Pentium-M processor, with 2 Gbytes RAM, two PMC sites and four 100/1000BASET Ethernet interfaces.
- **SDC320D SCSI Disk Controller**
 - SDC320D has one front panel VHDCI Ultra320 SCSI interface on a PMC module.

Telco Server 200 HW Components

- **DSP62D Digital Signal Processor**
 - DSP62D has four 300 MHz C6203 DSPs with 8 Mbyte RAM on a PMC module.
- **TIC4D Trunk Interface Controller**
 - TIC4D has four E1/T1 trunk interfaces on a PMC module.
- **TIA75F/TIA120F/TIA100F Trunk Interface Adapter**
 - TIA75F, TIA120F, and TIA100F are rear transition modules (RTM) with four trunk interfaces. TIA75F has 75 ohm E1 interfaces in BNC connectors, TIA120F has 120 E1 interfaces in RJ45 connectors, and TIA100F has 100 ohm T1 interfaces in RJ45 connectors. The TIA also has two 100/1000 BASET Ethernet interfaces in RJ45 connectors.
- **DSA4E LAN Adapter**
 - DSA4E is a rear transition module with two 100 Mb Ethernet RJ-45 connectors.

Telco Server 200 HW Components

- **SDA320A SCSI Disk Adapter**
 - SDA320A is a 4 TE wide SCSI adapter panel with two male 68-pin connectors.
- **SDB2A SCSI Disk Backplane**
 - SDB2A is a backplane for two SDU35A units and the SDA160A. It has two female 80-pin SCA connectors for each SDU on the front side, and two female 68-pin D-connectors for the SDA on the rear side.
- **PMB5A Bus Board**
 - PMB5A is a five-slot 6U*20TE CompactPCI backplane without H.110.
- **PSU CPCI Power Supply**
 - PSU 400 230VAC CPCI provides 5V/20A, 3.3V/40A, 12V/3A and 12V/3A from -40...-70VDC.

Telco Server 200 HW Components

- **PSA501A Power Supply Adapter**
 - PSA501A is a mother board for the DDC7040 power supply.
- **PSA601A Power Supply Adapter**
 - PSA601A is a mother board for the CompactPCI AC power supply in AC version.
- **PFA48B Power Filter Adapter**
 - PFA48B is an 8T wide EMC cover panel with filtered connectors for the DC supply input and a 12V 1A voltage output for the fan unit.
- **PFA220B Power Filter Adapter**
 - PFA220B is an 8T wide EMC cover panel with filtered connector for the AC supply. PFA220B has a 12V 1A DC output for the fan unit.

TSU Specific

- Only first card (slot1, CPC) has hard disks and there is no floppy-drive
- Cards 2-5 (IOPs) mount disk space from card 1 (DHCP server), System Server (SSR) used as DHCP for slot1 during installation.
- On TSU each card (slot) has individual ethernet address (MAC Address) and can have 4 ethernet connections each (2 of these are used).
- Communication between cards goes over ethernet.

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TSU32FB

- TSU32FB is based on proven Tecnotree TMS-series HW.
- The high density TMS-FB HW provides 32 E1 capacity in a single 7 U rack, with full VoiceXML capability.
- The optional resources, like ASR/TTS servers run in clustered Commercial Off the Shelf (COTS) Telco-grade servers.

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IOP & CPC blade – Based on Concurrent PP 332

- High performance single slot Compact PCI module that operates as either a host or task processor
- 6U CompactPCI, single slot
- Hot-swappable
- 1.4 GHz Intel Pentium-M
- 2 GB PC133, ECC RAM
- Four 10/100/1000BaseTX
- UltraDMA/66 IDE
- TecnoLinux, based on 2.4.xx kernel
- IPMI, watchdog timer
- 2 x 32 bit, 33 MHz PMC sites



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IOP & CPC blade – Based on Radisys EPC-3311

- The EPC-3311 is a high performance single slot Compact PCI module that operates as either a host or task processor
- 6U CompactPCI, single slot
- PICMG 2.0 R3.0, Hot-swap R2.1, PICMG 2.16
- 1.2 GHz Intel Pentium III Processor-M
- 1 GB PC133, ECC RAM
- Dual 10/100/1000BaseTX
- UltraDMA/66 IDE
- Linux, based on 2.4.xx kernel (2.6.xx coming)
- IPMI, watchdog timer
- 2 x 32 bit, 33 MHz PMC sites
- Typical Power requirements 20 W



→ Not in Production Anymore !

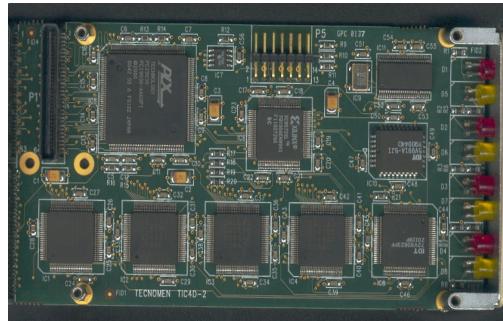
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Quad E1 Trunk Interface card - TIC4d



- cPCI mezzanine module (PMC)
- 4 X E1/T1 connections
- Framer circuitry & Cross-point -switch
- Integrated Signaling link termination

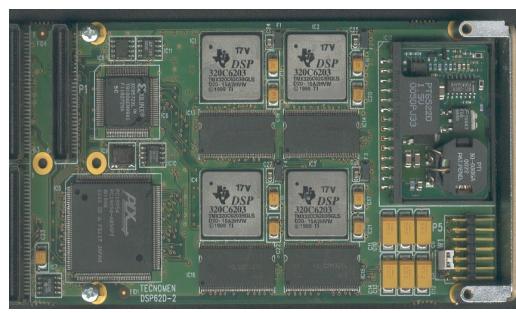
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DSP card – DSP62d



- cPCI mezzanine module (PMC)
- 4 X TI C6x DSP

per chip:

- 8 MB external SDRAM
- 512 kB internal data RAM
- 384 kB internal program RAM

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IOP card, (TSU32FB), 1/3

- The IOP cPCI card contains a 1.4 GHz Intel Pentium processor and it has 2GB of RAM.
- This card has two PMC modules attached to it: The Trunk Interface Card module (TIC) and the DSP card module.
- The TIC module has the interface for 4 E1 PCM trunks for TDM network connections. The incoming and outgoing voice trunks are processed by the DSP PMC module.
- The signalling links are processed by the MTP2 software, which runs on the IOP card. The MTP2 is further connected to MTP3 layer in CPC card via TCP/IP connection.

IOP card, (TSU32FB), 2/3

- The voice channels are processed by the DSP PMC module. This module has Texas Instruments C6x high-performance fixed point DSP. It performs the following functions:
 - Voice channel coding & decoding. Supported formats are: GSM 06.10, ADPCM, G.723.1, G.711, AMR.
 - Voice Activity detection & Silence detection, based on energy level detection
 - Pre-buffering (connected to Voice Activity Detection) for streaming out voice after detection to ASR server.
 - Echo cancellation based on G.168 standard (up to 128ms)

IOP card, (TSU32FB), 3/3

- Barge-in function
- Fax detection
- Fax reception and sending functions
- The DSP module is controlled by the DSP Loader task.
- The DSP Loader task is controlled by MTP2 task.
- The MC task is responsible for call setup and clearance. MC is further connected to Dialog Controller (DC) task.
- Finally, the call is handled by the VoiceXML interpreter.

CPC-Card, (TSU32FB)

- 2 CPC cards in a single rack.
- MTP3 layer upwards of SS7 stack and SIP / H.323 stack.
- The SS7 stack in one of the cards is active and the other is in standby mode. Heartbeat controlled.
- The GMI Short Message Gateway also resides in the CPC card. It provides the Messaging interface to Application Server for sending & receiving short messages.



Servers' Hardware

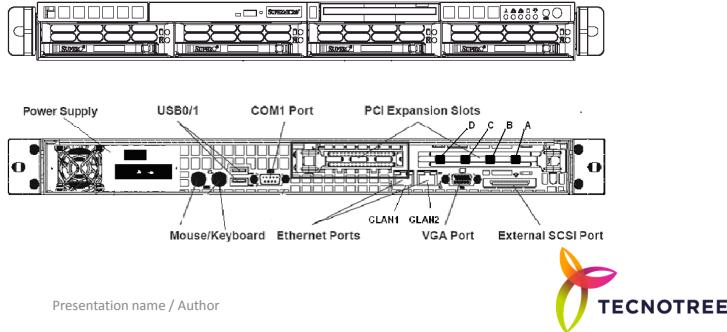


System Gateway

- The SyGW hardware is the Tecnotree RMS2126EG OEM manufactured server. This server is available as an AC version and as a DC version.
- SyGW has the following properties:
 - one 3,2 GHz Intel Xeon CPU
 - two 73 GB Ultra320 SCA hot-swap 10000rpm disks
 - 1024 MB memory (2 x 512MB, DDRII-400 ECC SDRAM)
 - two 100/1000 Mbit Ethernet ports
 - Four 10/100/1000 Mbit/s on PCI (Peripheral Component Interconnect) card.
 - HW ZCR RAID controller
 - DVD-RW +/- Combo -drive
 - 1.44 MB low profile diskette drive.

System Gateway

- The physical dimensions are as follows:
- 19" rack, 1U = 43 mm height, 651 mm depth, 427 mm width, weight 10 kg



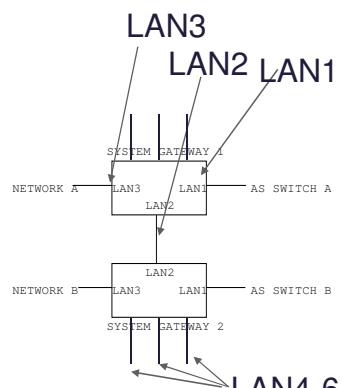
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About System Gateway Ports

- The main function of System Gateway (SyGW) is to act as a firewall between the NGM system and the external network.
- Standard SyGW HW has 6 LAN ports
- 3 of those are reserved:
 - SyGW ports LAN1 are connected to the NGM Subnet.
 - SyGW ports LAN2 are interconnected with a cross-connected cable.
 - DMZ is connected to LAN3
→ maximum three external customer networks can be connected.



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Proxy Server

- The optional Proxy Server (PS) provides HTTP proxy capabilities.
- The Proxy Server hardware is the Tecnotree RMS2126E OEM manufactured server. This server is available as an AC version and as a DC version.
- PS has the following properties:
 - two 3,2 GHz Intel Xeon CPU
 - two 73 GB Ultra320 SCA hot-swap, 10000rpm disks
 - 2048 MB (2 x 1024MB, Registered DDRII-400 ECC SDRAM)
 - two 100/1000 Mbit Ethernet ports
 - HW ZCR RAID controller (Adaptec 2015S)
 - DVD-RW +/- Combo –drive
 - 1.44 MB low profile diskette drive

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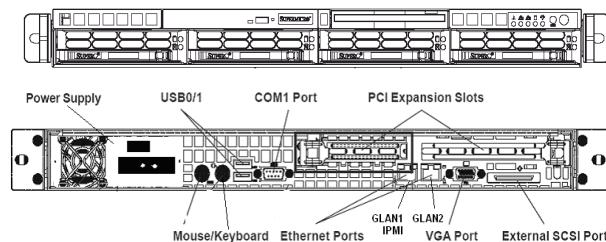
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Proxy Server

- The physical dimensions are as follows:
- 19" rack, 1U = 43 mm height, 650 mm depth, 438 mm width, weight 10 kg



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System Server

- System Server (SyS) provides the configuration for each system element, details about the network and its layout, system's status, and also the foundational operating software for the elements. All running software in other system elements is initially provided from System Server.
- The SyS hardware is the Tecnotree RMS2126E OEM manufactured server. This server is available as an AC version and as a DC version.
- SyS has the following properties:
 - two 3,2 GHz Intel Xeon CPU
 - two 73 GB Ultra320 SCA hot-swap, 10000rpm disks
 - 2048 MB (2 x 1024MB, Registered DDRII-400 ECC SDRAM)
 - two 100/1000 Mbit Ethernet ports
 - HW ZCR RAID controller (Adaptec 2015S)
 - DVD-RW +/- Combo –drive
 - 1.44 MB low profile diskette drive

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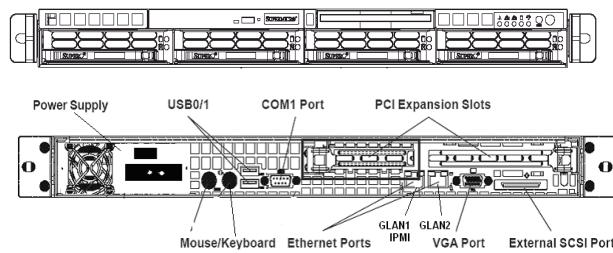
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System Server

- The physical dimensions are as follows:
- 19" rack, 1U = 43 mm height, 650 mm depth, 438 mm width, weight 10 kg



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Messaging Application Server

- Messaging Application Server (MAS) provides the subscriber services in Tecnotree NGM. It contains the service's business logic, main O&M functionality, rules for subscriber information manipulation and logic for the platform's outbound messaging.
- The MAS hardware is the Tecnotree RMS2126E OEM manufactured server. This server is available as an AC version and as a DC version.
- MAS has the following properties:
 - two 3,2 GHz Intel Xeon CPU
 - two 73 GB Ultra320 SCA hot-swap, 10000rpm disks
 - 2048 MB (2 x 1024MB, Registered DDRII-400 ECC SDRAM)
 - two 100/1000 Mbit Ethernet ports
 - HW ZCR RAID controller (Adaptec 2015S)
 - DVD-RW +/- Combo –drive
 - 1.44 MB low profile diskette drive.

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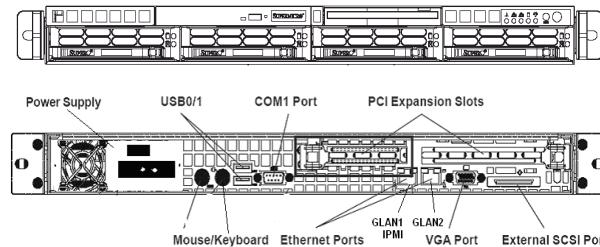
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Messaging Application Server

- The physical dimensions are as follows:
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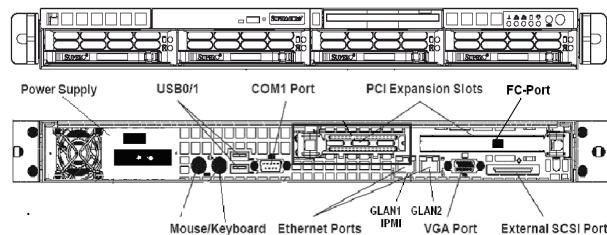


Infra Server

- Infra Server (IS) provides the persistent data storage interface. There are three types of stored data:
 - E-mail server
 - General-purpose file repository
 - Relational database management system (RDBMS)
- This data is stored in the storage array.
- The IS hardware is the Tecnotree RMS2126EF OEM manufactured server. This server is available as an AC version and as a DC version.
- IS has the following properties:
 - two 3,2 GHz Intel Xeon CPU
 - two 73 GB Ultra320 SCA hot-swap, 10000rpm disks
 - 4GB (4 x 1024MB Registered DDRII-400 ECC SDRAM)
 - two 100/1000 Mbit Ethernet ports
 - ZCR RAID controller (Adaptec 2015S)
 - DVD-RW +/- Combo –drive
 - 1.44 MB low profile diskette drive
 - 1-port 2GB Fibre Channel Adapter (QLA2340L-CK) 64-bit 133MHz PCI-X.

Infra Server

- The physical dimensions are as follows:
- 19" rack, 1U = 43 mm height, 650 mm depth, 438 mm width, weight 10 kg

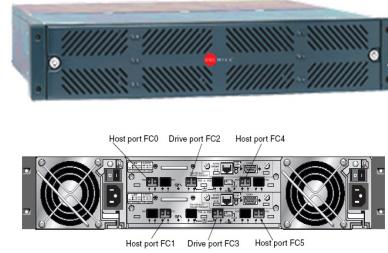


Storage

- The permanent storage is connected to the Infra Servers (ISs) with fibre.
- The storage array is DotHill SanNet-II Fibre Channel RAID array with twelve 146 Gb 15 K disks. RAID arrays can have dual (2R), or no (OR) RAID controllers. 2R RAID array is used when two or more Infra Servers are connected to the disk array in a redundant configuration. OR RAID array is used for expanding a 2R RAID array for more disk space.
- DotHill SanNet-II is available as the AC and as the DC powered version.

→ Learn more about RAID levels for instance:

http://en.wikipedia.org/wiki/Redundant_array_of_independent_disks



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Dilithium Video Gateway

PROTOCOL SUPPORT

- 3GPP and 3GPP2 3G-324M
- ITU-T H.324 Mobile levels 0, 1 and 2
- ITU-T H.323 V4
- ITU-T RA1/RAC H.323 Load Balancing
- ITU-T H.245 V7
- IETF SIP (RFC3261)
- DTMF support for 3G-324M, H.323, and SIP
- Call data records (CDR)
- Audio VAD/SID support
- SNMP Traps for monitoring & diagnostics

PACKET NETWORK INTERFACE

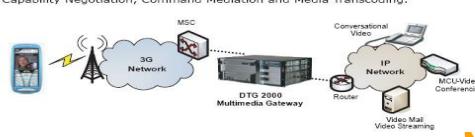
- 10/100 Base-TX for Host Controller, Transcoding Engine Modules, and Ethernet Switch card
 - 1000 Base-SX (Ethernet Switch)
- CIRCUIT SWITCHED NETWORK INTERFACE**
- Octal ISDN PRI / E1
 - Euro-ISDN PRI
 - ETSI / ITU-T ISUP (White Book)
 - SIGTRAN

TRANSCODING (UNICODING) SUPPORT

- AUDIO: GSM-AMR ⇔ G.711
GSM-AMR ⇔ G.723.1
GSM-AMR ⇔ GSM-AMR
- VIDEO: H.263 ⇔ H.263
MPEG4 SP ⇔ H.263 P0

DTG 2000 BENEFITS

The DTG 2000 can be deployed to enable video conversation/access services between 3G-324M, H.323 and SIP endpoints as well as to offer high revenue generating services like video mail and streaming. The DTG 2000 performs all necessary negotiation and mediation between network entities and client devices to allow effortless communications across network boundaries including Circuit Switch to Packet Switch Mapping, Capability Negotiation, Command Mediation and Media Transcoding.



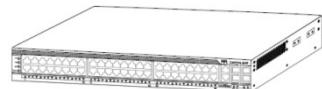
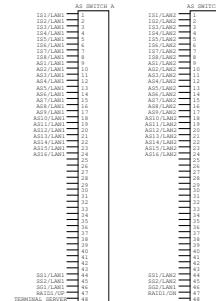
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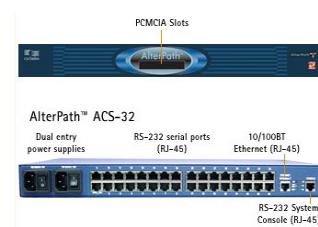
Ethernet Switch

- Ethernet switch is Cisco Catalyst 4948 layer 3 switch with 48 pcs 10/100/1000 Mbit/s ports. For redundancy, two switches are always used.
- Cisco switch is available as the AC powered and the DC powered version.
- All servers and RAID array 1 are connected to both switches with straight cables, first ports to switch A and second ports to switch B. The terminal server is connected to port 48 of switch A.



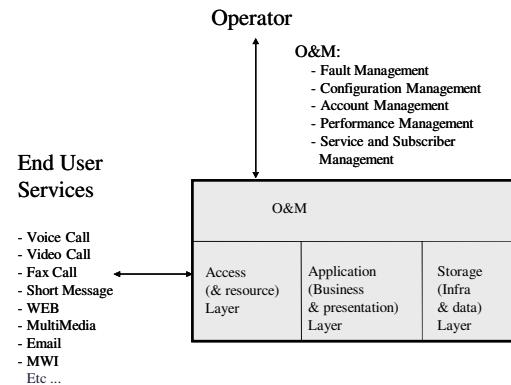
Terminal Server

- Terminal Server (TS) provides a secure remote data management and out-of-band management access all servers. The used terminal server type is Cyclades AlterPath ACS 32 -port terminal server with 32-port asynchronous RS232 serial to 10/100 Mbit Ethernet terminal server.
- Cyclades terminal server is available as the AC and the DC powered version.
- All servers, except System Gateway, are connected to the TS.



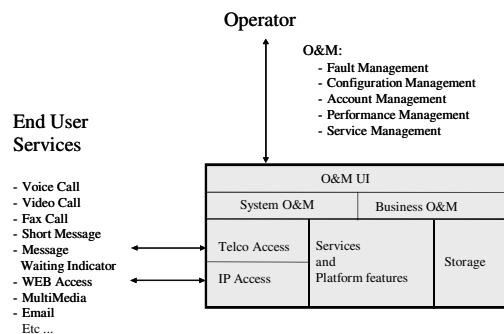


Layers of NGM ...

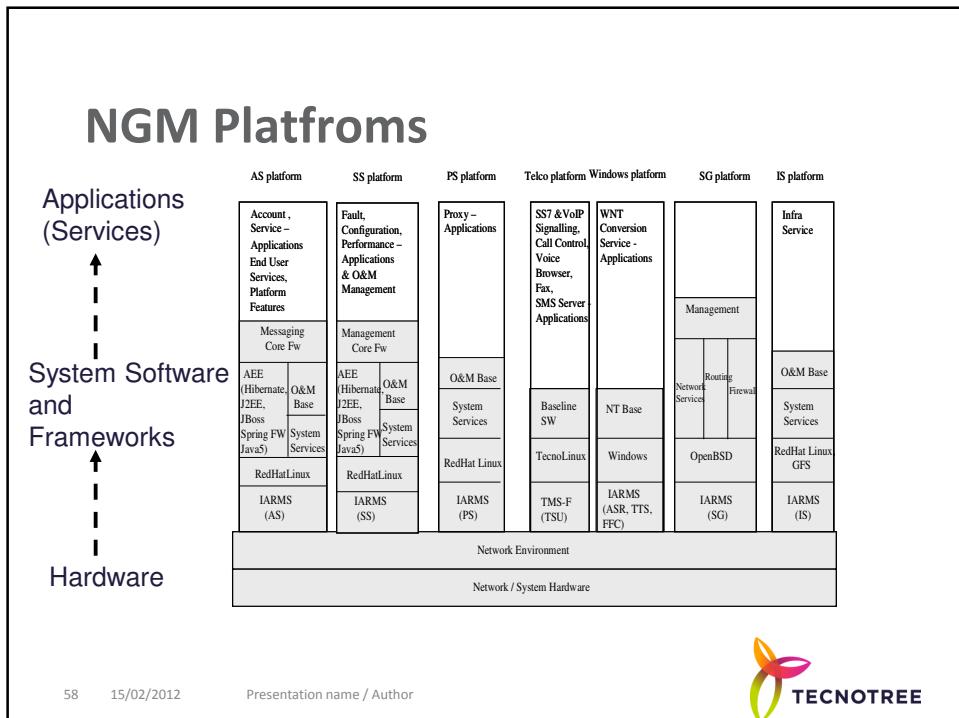
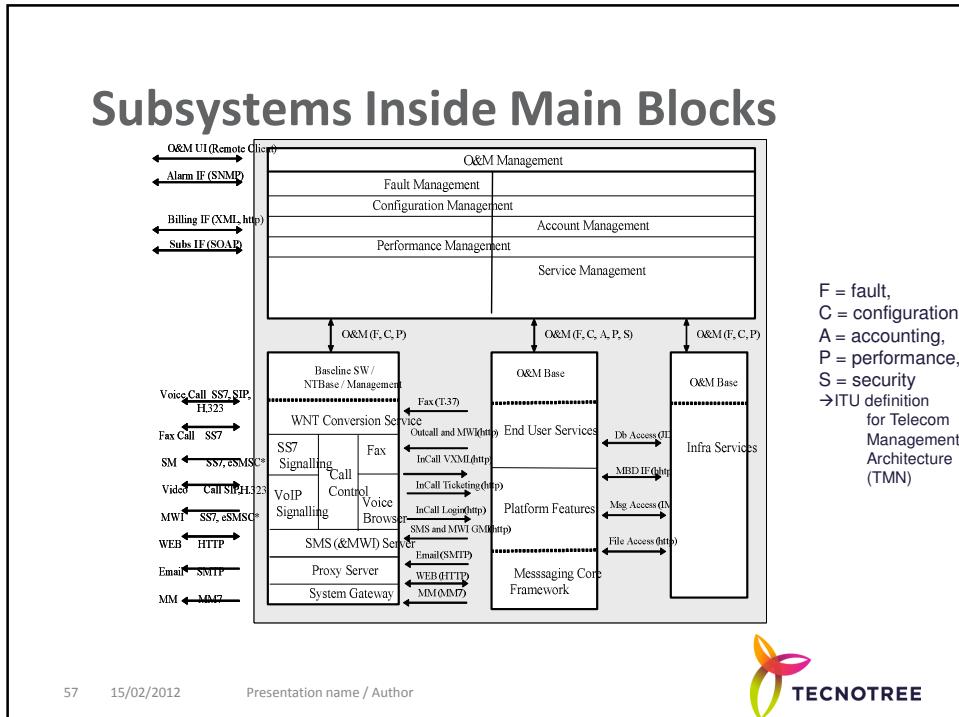


Each layer provides needed functionalities for NGM services ...

... and main blocks of NGM



... Like the main blocks inside the layers do it as well



Some common NGM SW Terminology You will often face:

- LVS/LSB
- WebDAV
- Hibernate
- HA-JDBC
- Squid
- Apache HTTP Daemon
- jBoss Application Server
- Tomcat
- OMF (Tecnotree specific framework)
- Address Analysis (Tecnotree specific framework)

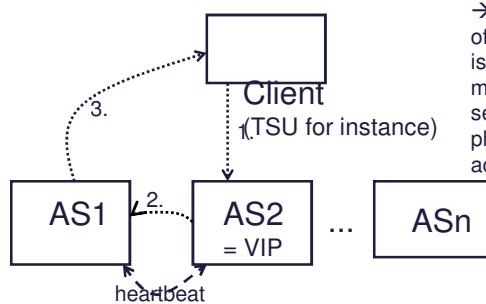
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LVS / LB Principle

→ AS2 happens to be the active AS load balancer, so VIP is owned by AS2



→ LVS is part of Linux kernel functionality

→ Heartbeat is a product of the linux-ha project. It is a controlling mechanism between the servers, controlling which physical server is the active one.

1. The Client is making a new TCP connection to the VIP address
2. AS2 (the LB) chooses AS1 to handle the request. LVS forwards the IP packet to AS1.
3. AS1 responds directly to the client.

→ Same Principle in ASs, ISs, and SSs LVS/LB

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WebDAV



- Extension of Apache web server:

→ Takes care of prompt management between AS and IS: The file repository holds both subscriber-specific and service-related files. The subscriber-specific files are the personal greetings recorded by the subscribers. Service-related files are, for example, telephony or video user interface prompts and announcements, descriptions and definitions of customized interfaces, and media files included in notifications. The repository contents are interfaced via WebDAV and administered via an HTTP-based protocol.

www.webdav.org says:

WebDAV stands for "Web-based Distributed Authoring and Versioning". It is a set of extensions to the HTTP protocol which allows users to collaboratively edit and manage files on remote web servers.

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Hibernate



- Excerpt from www.hibernate.org:

- Hibernate is a powerful, high performance object/relational persistence and query service.
- Hibernate lets you develop persistent classes following object-oriented idiom
 - including association, inheritance, polymorphism, composition, and collections.
- Hibernate allows you to express queries in its own portable SQL extension (HQL), as well as in native SQL, or with an object-oriented Criteria and Example API.

→ Framework which takes care of AS – database interfacing
 → 'Interoperator' between object world and relational database

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HA-JDBC

- JDBC = Java Database Connectivity
- Provides interfacing between SQL-databases and MAS, which is based on Java-software
- So purpose similar to Hibernate, but more powerful to mass operations, like mass deletions, etc.



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Squid

- There are two major HTTP-level links in Tecnotree NGM:
 - one between Telco Server and MAS handling TUI prompts and voice-xml pages, in order to improve performance
 - and the other between external IP networks and MAS serving end user web pages
 - For both links, a web proxy cache is applied, the solution being provided by Squid.
- Squid Web Proxy Cache is a free, open-source software package, which provides a full-featured Web proxy cache.
- It is designed to run on Unix systems. Telco Server has an internal installation of Squid to handle web resources external to it.
 - Fundamentally, most voice prompts referenced from VoiceXML are served transparently via Squid.
- Please find more information on Squid on its home page: <http://www.squid-cache.org/>.



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Apache HTTP daemon

- Apache HTTP Server is a free software/open source HTTP web server for Unix-like systems
 - Runs in AS and IS



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jBoss Application Server

- 'heart' of AS: sw component which upon services are built
 - Runs in top of Java 5 environment, serving Java EE (Enterprise Edition) purpose
 - <http://java.sun.com/javaee/>
 - <http://jboss.com/products/jbossas>



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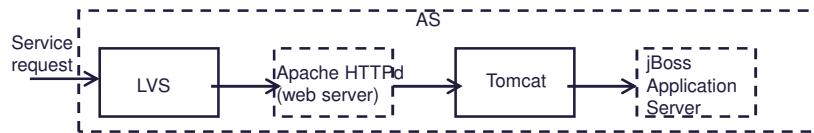
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Tomcat



- Provides an environment for Java code to run in cooperation with a web server.
- In AS it takes care of presentation layer of the different entities requests (TOM Proxy, end user services, ...)
- Tomcat software library is integrated to jBoss



Courier IMAP daemon

- Courier-IMAP is a fast, scalable, enterprise IMAP server that uses *Maildirs*. Courier-IMAP can handle hundreds of thousands of mail accounts.
 - Maildir is a format for an e-mail spool that does not require file locking to maintain message integrity because the messages are kept in separate files with unique names.
 - In NGM used for subscribers' voice/video mails management, which are stored like emails



OMF

- Outbound Messaging Framework (OMF) in AS is a subsystem responsible for notification-related issues:
 - Communication with messaging servers, internal or external. This refers to GMI, MMSCs/SMSCs, E-mail Gateways etc.
 - Formatting outgoing notifications.
 - Configuring notification logic, i.e. notification strategies.

OMF Use Cases

OMF USERS:

End User

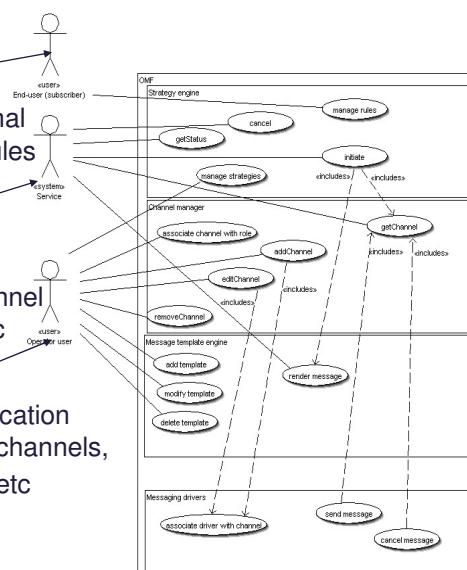
-manages personal notification rules

System (Service)

-initiate, cancel, notification channel functionality, etc

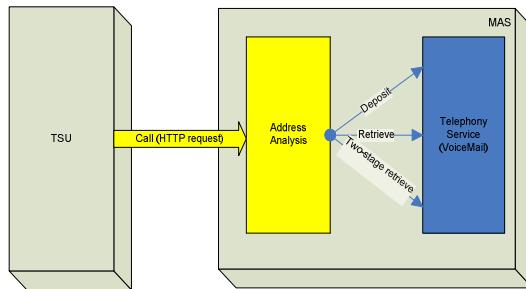
Operator

-Manages notification templates, channels, strategies, etc



Address Analysis

- Address Analysis in AS acts as a middleware interface between the Telco Server Unit (TSU) and the Service to process the inbound calls, control and manage call sessions, and customize any address information presented to end users in a sophisticated way.



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Address Analysis Use Cases

Address Analysis USERS:

Telco Server

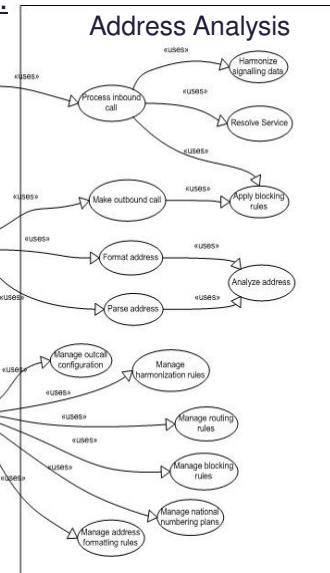
- Address Analysis resolves incoming call: should service be established or not

AS Service

- triggers outbound calls, formats and analyses addresses

Operator

- manages: address formatting/harmonisation rules, blocking/routing rules, numbering plans, etc



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Some other sw tools used in NGM..

- TOM tool is developed based on 'eclipse rich client development platform'
 - Written in Java
 - More info from <http://www.eclipse.org/>
- SM notification templates used in TOM are based on 'Velocity template engine'
 - Java based
 - More info from <http://jakarta.apache.org/velocity/>



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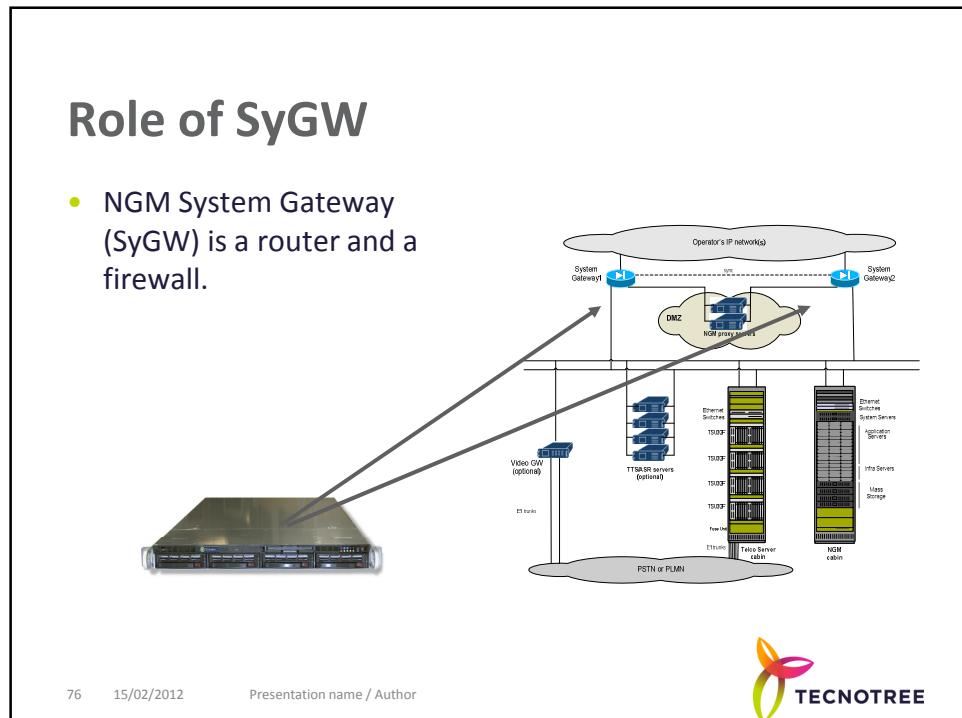
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Platform Components' Software



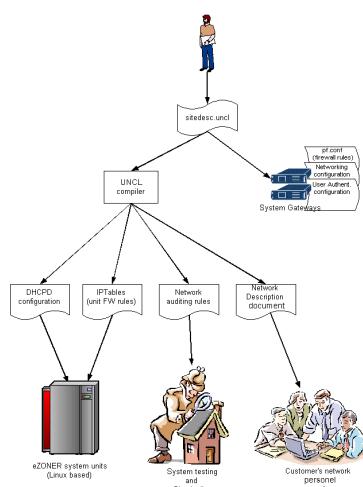


SyGW Operating System

- **OpenBSD Operating System (version 3.8)**
 - OpenBSD (BSD = Berkeley Software Distribution) is a free UNIX operating system.
 - It has been mainly designed for security applications, particularly for firewalls
- **Firewall software is OpenBSD Packet Filter (PF)**
- **All management and diagnostics are available with one control script `sgwctl`**

SyGW's uncl-file

- The NGM system autoconfigures itself from an UNCL network description file which is created by SyGW uncl-compiler
 - The same file is used to create customer network documentation, hosts-files, NGM node properties and many other things.



SyGW uncl-file contents

- uncl-file's main contents:
 - Used Domain information, for example *lab.tec*
 - Used tcp/udp-ports for each TCP/IP service, like http uses port 80/tcp, ssh uses port 22/tcp, dns uses port 53/tcp/udp, ...
 - Networks' definition: operator's networks, NGM internal network, synchronisation network between SyGWs, DMZ-network
 - Hosts' definition: System Servers, Application Servers, ...
 - SyGW access rights (public SSH key required for each added user)

SyGW High Availability Principles

- System Gateway uses two-machine master/backup style high availability scheme. The master machine handles all traffic and the backup is ready to take over should the master fail.
- High availability is based on following components:
 - Shared Virtual IP addresses with **CARP**
 - Shared firewall state information with **pfsync**
 - Network status monitoring with **nethealth**

SyGW CARP

- **CARP** = Common Address Redundancy Protocol
- Allows two (or more) hosts to **share a common IP** and MAC addresses in one network
- The address is active in one machine, others are passive
- All hosts have priorities for all CARP addresses. 0 is the highest priority and 255 is the lowest possible. The machine with the highest priority is the **MASTER**
- The master host sends one CARP advertisement message in every second into the network announcing its priority
- Promotion from **BACKUP** to **MASTER** happens when higher priority announcements are not seen for 2 seconds

SyGW CARP, cont.

- All hosts have priorities for all CARP addresses. 0 is the highest priority and 255 is the lowest possible. The machine with the highest priority is the **MASTER**
- First SyGW has priority 0 for its CARP interfaces and backup SyGW has priority 50.
- When SyGW detects the a problem in its network connectivity, it will lower its priority by 75.
- When at least one network cable is without a link the OS kernel lowers the priority of all CARP interfaces to 240

SyGW pfsync

- **pfsync** = Packet Filter Synchronisation
- SyGWs synchronize their **firewall states** with pfsync
- pfsync messages are sent in a private synchronization network (a cross over cable between the two SyGWs)
- When a SyGW boots up, it will be in CARP priority 240 until pfsync has obtained a state mass update from the other gateway

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SyGW nethealth

- **nethealth** = Network Health Monitor
- The nethealth process is used to determine whether the SyGW has connection to each of **its connected network**
- It pings aliveness of defined hosts in every 5 seconds (pinged hosts for each network are defined in UNCL configuration file)
- If none of the checked hosts in a network answers, the SyGW lowers its priority by 75
- Priority is restored when at least one host answers to ping

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SyGW like DHCP Relay

- DHCP = Dynamic Host Configuration Protocol is used during unit installations for finding first time booting information
- DHCP doesn't normally work between different networks (since using Etherner broadcast method)
 - Telco servers may exist in different geographical location = different network, than NGM servers
 - As well Proxy server (which exists in DMZ network) installation requires DHCP communication between different networks
 - In both cases SyGW is connected to both networks directly
- So SyGW can be utilised like DHCP relay between networks

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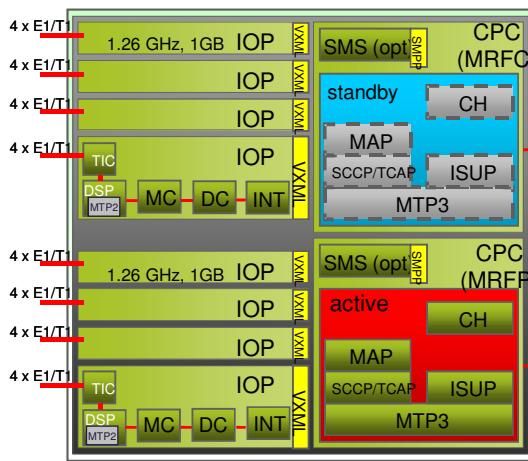
Telco Server Software



TSS consists of CPC and IOP Cards/Servers

- CPC (Central Processing Card)
 - Higher level signalling handling, controls as well IOP-card
 - GMI (generic messaging interface) functionality for outbound notifications
 - Supports both SS7 (MTP3 layer and upwards) and SIP
- IOP (IO-Processing Card)
 - Lower level of signalling handling, as well call data stream handling
 - Supports both SS7 (MTP2 layer and downwards) and RTP
- In TSS 200 HW CPC/IOP cards
- In TSS 100 HW CPC/IOP servers

TSS 200 Internal Structure



- High processing power: 10x1.26GHz / 10GBbytes
- Trunk interface (quad E1 TIC) and DSP (TI C6x) PMC boards
- Based on cPCI, hot-swappable board technology, with DSP & TIC PMC add-on cards.
- Telco grade SS7 technology
 - 100 cps / stack (Voice Mail)
 - 500 cps / stack (IN)
 - Up to 128 E1 / SS7 stack & 32/64 links / SS7 stack
- Ability to do parallel record or playing of audio files with all channels with compressed codecs.

TSS 200 Architecture

- The Telco Server System consists of one to several of 7 U Telco Server Units (TSU32F) and supporting units for ASR/TTS and O&M.
- One Telco Server Unit has 2-8 Compact PCI (cPCI) based IOP cards and 2 cPCI based CPC cards with functions described below.
- The TSU32F unit provides following capacity & system services:
 - Connectivity to 1-32 E1 PCM trunks.
 - VoIP connectivity with SIP & H.323 protocol.



TSS Architecture

- Fault tolerant SS7 stack.
 - All major signalling variants supported
 - Internal MAP based SMSC functionality with MO/MT short messages
 - Proven SS7 technology with hundreds of commercial high capacity installations.
 - Outgoing trunks resource handling
- Internal SMSC.
- VoiceXML v1.0/v2.0 compliant VXML interpreter for all channels.



TSS 200 Architecture

- Voice Resources for all 32 PCM trunks (960 channels). Including full support for low bitrate codecs (e.g. GSM-FR, AMR and G.723.1)
- Advanced DSP based features, like voice activity detection, silence detection, barge in (= DTMF feeding possible during prompt play), standards based echo cancellation, FAX handling and multipoint conferencing.



TSS 'Standalone' Internal Structure

Software:

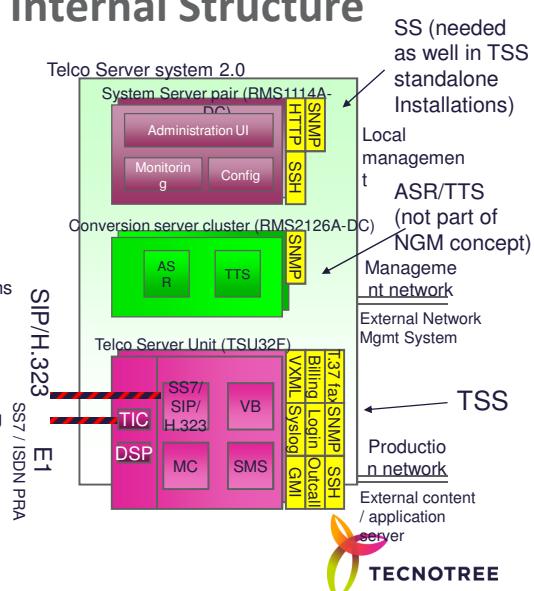
- VoiceXML 2.0 compliant interpreter
- T.37 compliant Fax gateway
- ASR / TTS server cluster (optional)
- VoIP with SIP / H.323
- Support for 3GP video
- Integrated SS7 / ISDN PRA signaling
- Integrated SMSC (optional)

Interfaces:

- SS7 / SIP / H.323 interface
- VoiceXML 2.0 + call control extensions
- T.37Fax interface
- iSMSC interface
- Management interfaces

HW:

- Telco server unit TSU36F: 32 E1 / 7U cPCI
- ASR/TTS servers: 1U Intel/Linux
- System Servers: 1U Intel/Linux



TSS 200 Internal Structure

- SS7 or ISDN interfaces for normal calls.
- SIP (Session Initiation Protocol) / H.323 for VoIP (Voice Over IP) calls.
- Separate optional clusters for ASR (Automatic Speech Recognition), TTS (Text to Speech).
- Based on optimised Tecnotree TMS hardware, having capacity for 32 E1's (960 channels) in a single 7 U rack, with full VoiceXML v2.0 resources, with low-bitrate codecs.

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TSS Interfaces

- Provides access to telephony networks via TDM (Time division multiplexing) or VoIP.
- Interfaces:
 - VoiceXML over HTTP to Application Server for user dialogues.
 - Tecnotree General Messaging Interface (GMI) for SMS.
 - T.37 based Fax interface.
 - Additional interfaces include call control interfaces like outcall interface, login interface and billing interface.

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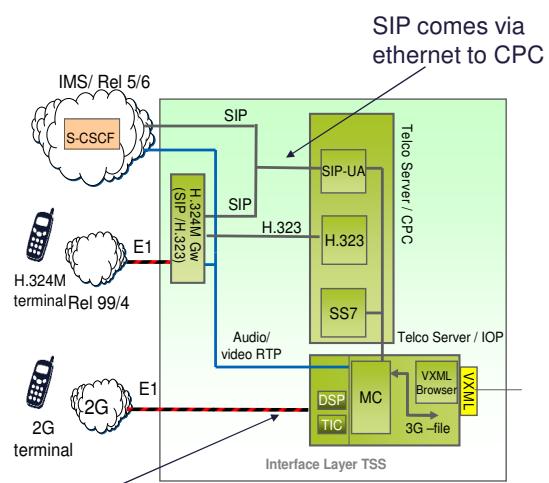
TSS H.324M based Video support

- Based on external H.324M video GW component.
 - connectivity to 3G network and either a H.323 or SIP interface towards the Telco Server.
 - Additionally there can be a H.323 based Gatekeeper or a SIP proxy for doing call management and routing functions.
- The Video call dialogue handled the same way as normal voice call dialogue with VoiceXML scripts.
- The combined audio/video stream is seen as a new media type and the incoming video is stored to the single mailbox in the form of .3GP file format. The subscriber specific video greeting is also handled like a normal greeting, and played out with normal VoiceXML <audio> tag.

TSS 3G H.324M based Video support

As the Telco Server supports the SIP signalling it is ready for 3G-IMS when that becomes available and the same unit can be used as front end for TDM as well as IMS (SIP) based calls.

→ CPC selects available IOP and informs that to client in call setup



TSS VoiceXML

- Tecnotree TSS has VoiceXML v2.0 compliant interpreter, which is enhanced with several features important for Messaging applications.
- Multipoint conferencing, with unlimited one-way streaming. Services: Streaming info services, Multipoint announcement service, Multipoint conference calls, Voice games, voice chat rooms.

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TSS VoiceXML

- Background recording service. Possibility to record and log conversations. Services: Voice Logging IVR (banks, insurance companies, stock traders etc.), Unwanted call voice logging, Voice notebooks, Conference call recording, etc.
- Ambient -voice –technology. This technology means a possibility to create an ambient sound (e.g music, recording, sound clip) over normal dialogues for advanced user experience. Services: ‘voice branding’ your current voice service, voice games, advanced ringback tones.

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TSS VoiceXML

- Advanced media types (like AMR, G.723.1) for all voice channels.
- Multi-vendor speech recognition architecture. Possibility to mix different vendors speech recognition engines to match customer language requirements.
- Live service development & debugging environment.
- Fax support (incoming & outgoing) via T.37 fax interface.
- These enhancements are possible because of advanced architecture of Tecnotree Telco Server.

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TSS VoiceXML

- Useful information about VoiceXML can be found in <http://www.voicexml.org>
- Tecnotree has a separate training course for VoiceXML.
- Tecnotree also has a VoiceXML Debugger tool DT for VoiceXML application developers.

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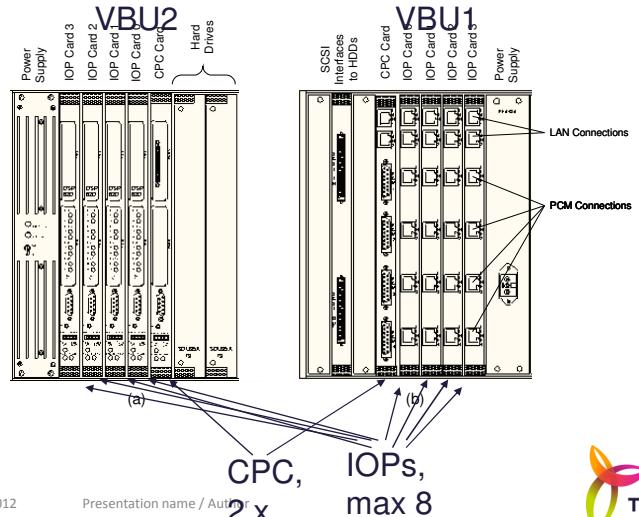
System Server SW modules and Functions for TSS

- System Server functions as the central O&M host for Telco Server system.
- It provides the following resources:
 - Acts as the Installation Server from where software is installed (via SSH) to the whole TSS system
 - Centralised configuration utilities to distribute and control configuration files on the TSU units (via SSH)
 - Centralised logging repository (via syslog)
 - Centralised alarms and events repository
 - Provides an O&M GUI to view status info, alarms, events and logs from the whole TSS system
 - Usually System Server is duplicated for the sake of redundancy.
- Redhat linux OS. Active server – backup server configuration.
- Database
 - MySQL database.
 - Automatic replication from active to backup.

TSU SW Modules and Functions

- Tecnolinux as Operating System in TSS 2.0., in TSS 2.1 Redhat Linux
- TSU units manage the signalling and VoiceXML processing.
- They interface with the SS#7 network, voice channels on the PCMs, and the Application Server and ASR/TTS servers.
- Signalling software is distributed between cards. Each IOP card terminates incoming telephony PCMs and has SS#7 signalling links running locally. Higher-level SS#7 layers (MTP3 and up) are operating on two dedicated CPC cards (as an active-backup pair, with failover by SW).

TSU 200 Cards Structure Revised



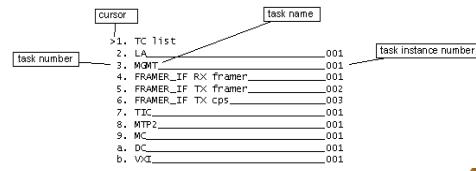
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What is TCattach?

- **TCattach** is the main tool for TSS local task management. With it you can check which tasks are alive and issue commands directly to the task. Commands that individual tasks support vary, but they all implement the help command to see the possible actions.
 - **TCattach** is located in `/opt/xpu/bin` and can be simply started by typing `TCattach` anywhere.
 - **TCattach** provides terminal interface to different SW in units. If **TCattach** is started without any parameters, it will show a list of all current tasks (see Figure below).
 - From the task window it is possible to change to a task in the list by pressing the number or character preceding the task name. Also, you can move the cursor on the list with arrow keys and access selected task by pressing `<enter>`.
 - It is possible from any task to change to another by pressing `<ctrl>-a` followed by the task number or character. The task list window is shown with `<ctrl>-a` followed by **1**.



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CPC SW Modules and Functions

• VBU, CPC Card

- Two roles:
 - Disk host for the IOP cards on the same VBU (voice browsing unit = half of the TSUF-unit).
 - Signalling Controlling Unit, SCU, s/w that implements the upper levels of SS7 signalling stack in a fault tolerant configuration.
- Application tasks that are running on the CPC card. The output of TCattach on a CPC card is shown below.



CPC/IOP SW Modules and Functions

- LA is the proprietary messaging interface between signalling software on CPC card and Media Controller, MC, on IOP card.
 - LA doesn't exist anymore in TSS 2.1
- LA is part of the baseline s/w that is installed on all the TSS2.0 units to provide the basic infrastructure common to all applications.
- The baseline s/w contains also additional components that are not shown in TCattach menu:
 - BM Baseline Manager, the application watchdog task, monitors tasks are alive, and restarts a task that has died. that all the
 - TT Timer Task, provides timer services for other tasks.
 - SRM Resource Manager, provides connectivity to external, optional Text-To-Speech servers resources, e.g.,



CPC/IOP SW Modules and Functions

- SDS (System Diagnostics Server), provides applications with resources to generate alarms based on the statistics (e.g. % of calls failing, etc.), see chapter 'Configuring System Alarms with SDS' in TSS Operations Guide. Additionally, SDS is responsible of sending TSU's status to System Server (see chapter 'Troubleshooting Unit Status' in TSS Operations Guide)

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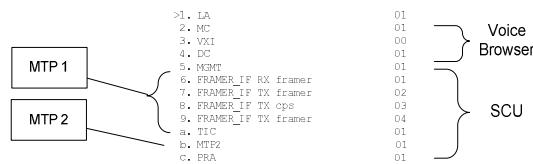
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IOP SW Modules and Functions

VBU, IOP Card:

- All IOP cards run VoiceXML Browser (consists of Dialog Controller, *DC* and VoiceXML Interpreter *VI*) and Media Controller, *MC*. Additionally, if there are any PCMs connected to the card, it runs also the lower layers of signalling software.
- The TCattach menu of an IOP card is shown below



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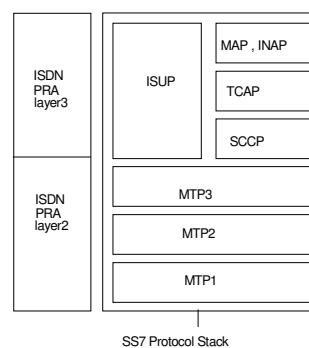


IOP SW Modules and Functions

- (Voice Browser -> VoiceXML Browser)
- LA is as in the CPC card.
- MGMT, FRAMER_IFs, TIC, PRA, and MTP2 comprise the lower layers of SCU that implement the MTP1 and MTP2 layers of SS#7 stack.
- MC, the Media Controller, provides the VoiceXML Browser with the interface to the PSTN network. Additionally MC converts codecs, when required and handles fax reception and transmit.
- DC, Dialog Controller, and VXI, VoiceXML Interpreter, form the voice browser that is responsible for interpreting the VoiceXML documents it receives from the Application Server to the caller.

Signalling s/w in TSS

- The TSU supports mixed ISUP/ISDN PRA signalling systems. SS7 is the main signalling system used and it consists of a protocol stack as shown in the illustration:



Signalling s/w in CPC

CPC

- SS7 layers above MTP2 and other support modules.
- The CPC card contains the main signalling stack. The CPC software will control the call related signalling all IOP cards.
- The CPC card on the other side operates in standby mode and control will be given to this card if an error condition is detected in the active CPC card. The transfer of control will be controlled by HA.
- The stack is modularised; this will allow the re-allocation of software modules to different cards, which may increase capacity.

MTP3

- The MTP3 module consists of two distinct processes both with communicate using TCP/IP or TCP/UDP. These are the L3OM process and the MTP3 process. While the MTP3 process handles the core SS7 signalling functionality the L3OM process acts as a user interface to the module, facilitating the monitoring and configuring of the logical module.

Signalling s/w in CPC

• CALLIUP, IUP – Call Handler

- IUP and the Call Handler (CH7) form one process in the modularised SS7 stack. Together they support connection orientated calls. This process handles the call states and signalling associated with connection-orientated calls (i.e. voice calls).
- For incoming calls the CH7 module receives all the signalling information for the call and can perform number analysis on the received call information. The information will be sent MC using the CH-CM interface.
- For out calls the CH7 and the IUP module can perform analysis to select the outgoing circuit taking into consideration certain routing criteria.

Signalling s/w in IOP

- **MAP, Mobile Application Part**

- The modules SCCP, TCAP, MAP/MWI make up the process. This module handles the call states and signalling associated with connection-less calls (i.e. short message notification/message waiting indication).
- This process is responsible for the enquiring routing information from the network and the delivery of short messages to mobile subscribers.

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Signalling s/w in CPC/IOP

- **MGMT**

- The Stack/Card Manager (MGMT) supports the monitoring of distributed processes.
- MGMT controls signalling processes.
- MGMT is configured to monitor processes and will re-start non-critical processes rather than cause a swap-over situation.
- This process can
 - detect whether active or backup side by polling HA
 - indicate to all configured processes Active/Backup state
 - detect the termination of a process by failure to respond to explicit polls
 - be configured to start-up sequence a process list

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Signalling s/w in CPC/IOP

- **MGMT** continues...
 - be configured to contain a list of processes to monitor
 - be configured to allow the re-start of non-critical processes on detection of termination
 - be configured to force a swap-over on detection of critical process terminating
- This process runs on the CPC and IOP cards. Each MGMT process monitors its locally registered processes and the CPC MGMT process monitors MGMT processes on the various IOP cards.

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Signalling s/w in CPC

- **ALAD**
 - All generated alarms are reported to a single Alarm daemon, which is running on the “active” IP address of the CPC card.
 - The daemon will format a given alarm and report it to System Server.

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Signalling s/w in CPC

DIAG

- The diagnostics module is concerned with the SS7 resources/hardware on IOP cards.
- The diagnostic configuration details where PCMS are and the sequence of the PCMs. The sequence of PCMs in this configuration will represent the logical number that is used to represent this PCM by the signalling software.

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Signalling s/w in IOP

IOP

- Each IOP has two PMC slots, one for DSP card the other for 4 Trunk Interface Devices.
- The IOP SW architecture allows the application level software (i.e. TIC/MTP2/PRA) to reside on a remote card/server.
- The remaining software the framer interface process and the driver have to remain co-located with the Transceiver device.

TIC Software

- The TIC software terminates the PCMs and runs on all IOPs.
- The TIC software will support partial registration and will only register instances that are appropriate to that IOP card.
- One TIC process supports a maximum of 4 PCMs.
- The TIC interfaces to the device drivers (e.g. the framer driver) over a TCP/IP interface.

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Signalling s/w in IOP

MTP2

- MTP2 process only runs on IOP cards where at least one PCM is configured for a signalling link. Only one link per PCM is supported so the maximum number of links that an IOP card can support is 4.

Framer IF (TX/RX/CPS Interface) Process

- The framer device is a quad device, for each interface there exists a transmit and a receive (Framer_TX, Framer_RX) process.
- The transmit process supports the transmission of messages/configuration/commands from the application processes to the device driver.
- Framer_IF_CPS process controls the cross-point switch, which connects external trunk lines to DSP card and Framer circuits.

Signalling s/w in IOP

Framer IF (TX/RX Interface) Process, cont.

- The receive process supports the reception of alarms/signalling messages from the device driver to the application.
- The interface between the application and the framer interface processes is TCP/IP. This allows the applications to be remotely located in relation to the actual HW.

PRA

- The PRA module provides primary rate ISDN link functionality

TSS/GMI call log generation on notification delivery to external SMSC

Telco Server generates call logs on the notification delivery requests. This is needed as NGM has to be able to show if the SMS notification request was successfully delivered to external SMSC or not. Call log's also contain the failure code on failed SMPP requests.

- Call logs shall be generated on requests sent towards external SMSCs
- Call logs shall be generated on successful requests and requests terminated with permanent failure
- Call logs shall include all the relevant information of the request including session id, error code on failed requests, subscriber identities, and date&time
- Call logs shall be sent to the configured address of MAS cluster via the HTTP based Billing Interface
- it shall be configurable whether TSS/GMI generates these call logs

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TSS/GMI call logs on notification requests to external SMSC

Telco Server generates call logs on the notification delivery requests. This is needed as NGM has to be able to show if the SMS notification request was successfully delivered to external SMSC or not.

MAS supports these call logs and delivers those to the Billing Server for storing into call log database. These call logs are visible in O&M Tool and CS Tool call log views.

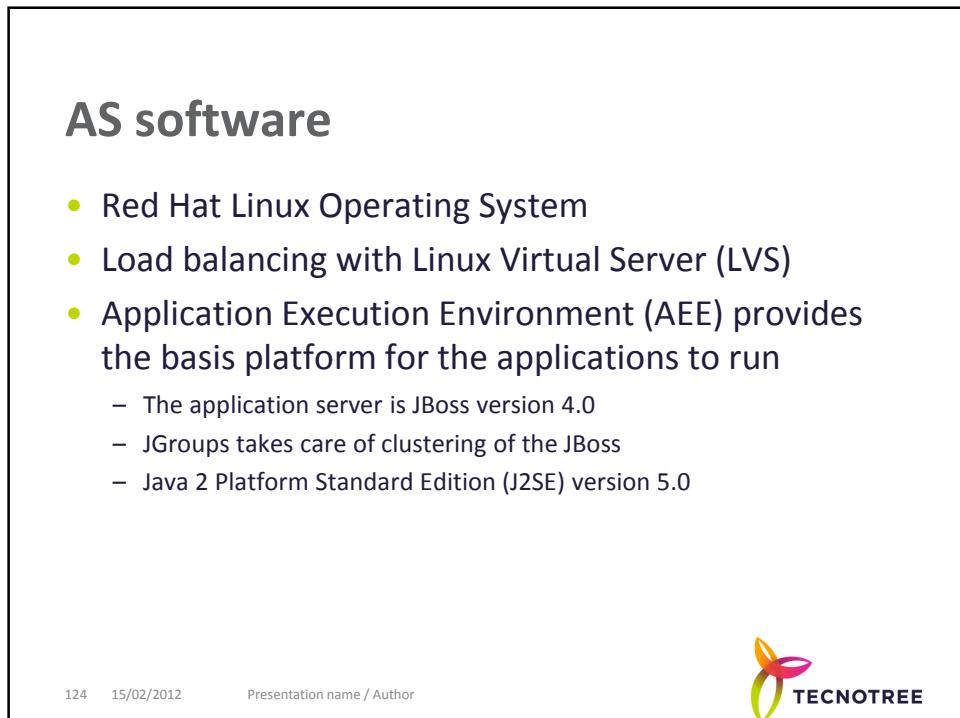
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AS, SS, IS Software



AS software

- Red Hat Linux Operating System
- Load balancing with Linux Virtual Server (LVS)
- Application Execution Environment (AEE) provides the basis platform for the applications to run
 - The application server is JBoss version 4.0
 - JGroups takes care of clustering of the JBoss
 - Java 2 Platform Standard Edition (J2SE) version 5.0

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AS Software

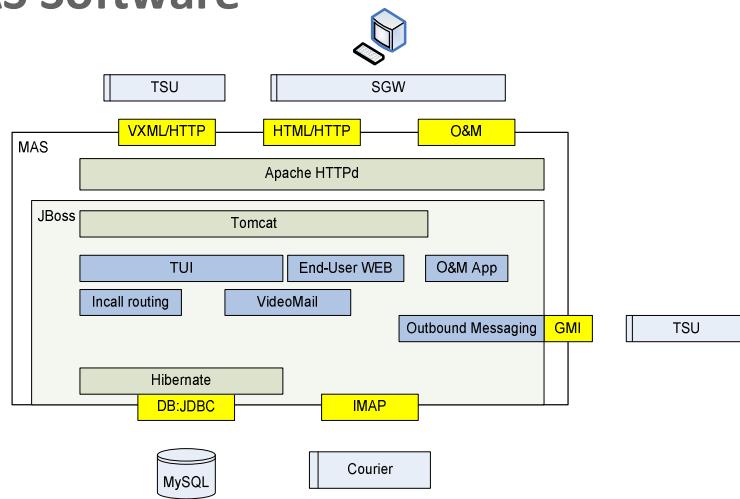
- Java 2 Platform Enterprise Edition (J2EE) version 1.4
- Spring framework
- Database abstraction with Hibernate/JDBC
- SNMPD for Fault and Performance Management
(System Server works like controlling part)

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AS Software



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AS Software

- Functionality is divided to subsystems
 - End User Services
 - Platform Features
- End User Services are real services
 - Voice Call Completion Services
 - Next Generation Voice Mail
 - iCalled SM
 - iCalled Voice
 - Video Call Completion Services
 - Video Mail
 - iCalled Video
 - Video Announcement
 - Video-Audio Fallback
 - Video Content Services
 - Video Portal
 - Short Media Messaging Services
 - iMessaged Video

AS Software

- General services for End User Services
 - Call Control and Address Analysis Framework (CAF)
 - Call Dispatcher – Incoming call processor, routing rules to services
 - Address Analysis – address formatting, parsing and conversions
 - Call Blockers – Signalling Harmonization
 - Outbound Messaging Framework (OMF)
 - Provides notification strategies, text templates and several services as short message, email and MMS

AS Software

- **Message store**
 - Service that is used for voice and video message administration
- **AS provides part of O&M functionality**
 - ‘Class of Service’ - management
 - Service management
 - Subscriber management and provisioning
 - O&M tool
 - Machine to machine interface
 - Security management

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SS Software

- Red Hat Linux Operating System
- Load balancing with Linux Virtual Server (LVS)
- Main Software modules are
 - MySQL (version 4.1) relational database system
 - Application Execution Environment (AEE) provides the basis platform for the applications to run
 - Same as in Application Server
 - Installation server for automatic installations
 - Configuration server (cfengine)

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SS Software

- Provides part of O&M functionality
 - Fault management
 - Statistical reports
 - System monitoring (node status etc)
 - Logging
- SW management (automatic SW and OS installation)
 - Configuration management
- SS provides many network-level services e.g.
 - NTP
 - DNS

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SS Software

- Billing server
 - Aggregates billing information from the platform events
 - Converts charging events to suitable presentation
 - Provides suitable interface to event/ticket information for the O&M application
 - Mediate billing tickets to external system

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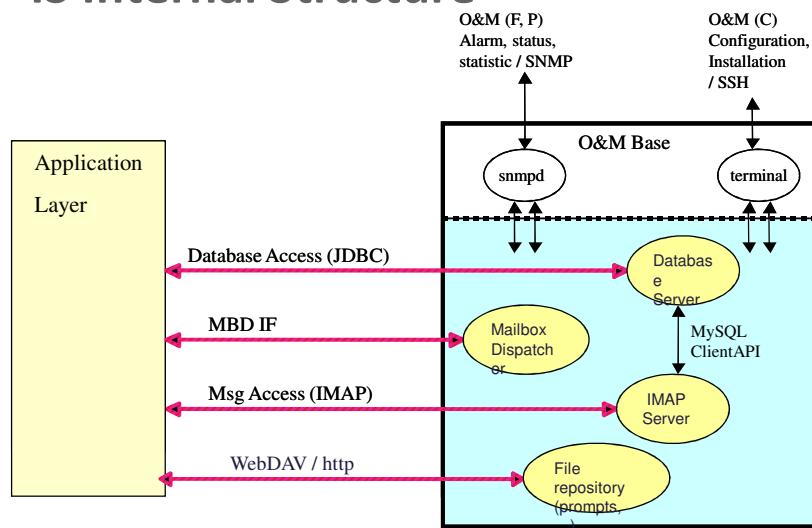
Presentation name / Author



IS Software

- Red Hat Linux Operating System
- Load balancing with Linux Virtual Server (LVS)
- Redundancy and disk clustering with Red Hat Global File System
- Main software modules are
 - MySQL (version 4.1) relational database system
 - Courier-IMAP server
 - Apache HTTP daemon with WebDAV support
 - MailBox Dispatcher (MBD)

IS Internal Structure



IS Database

- The MySQL relational database management system is the main repository for:
 - System
 - Service
 - Subscriber data
- The database also holds references and meta-information on data in other repositories
 - For instance, the email server performs IMAP authentication against the relational database. (when called to mailbox, authentication is done through database)

IS File Repository

- The file repository holds both subscriber-specific and service-related files
 - Subscriber-specific files are personal greetings.
 - Service-related files are e.g
 - Telephony or video user interface prompts
 - Announcements,
 - Descriptions and definitions of customized interfaces,
 - Media files included in notifications
- The repository contents is interfaced via WebDAV and administered via a HTTP based protocol.

IS (MBD)

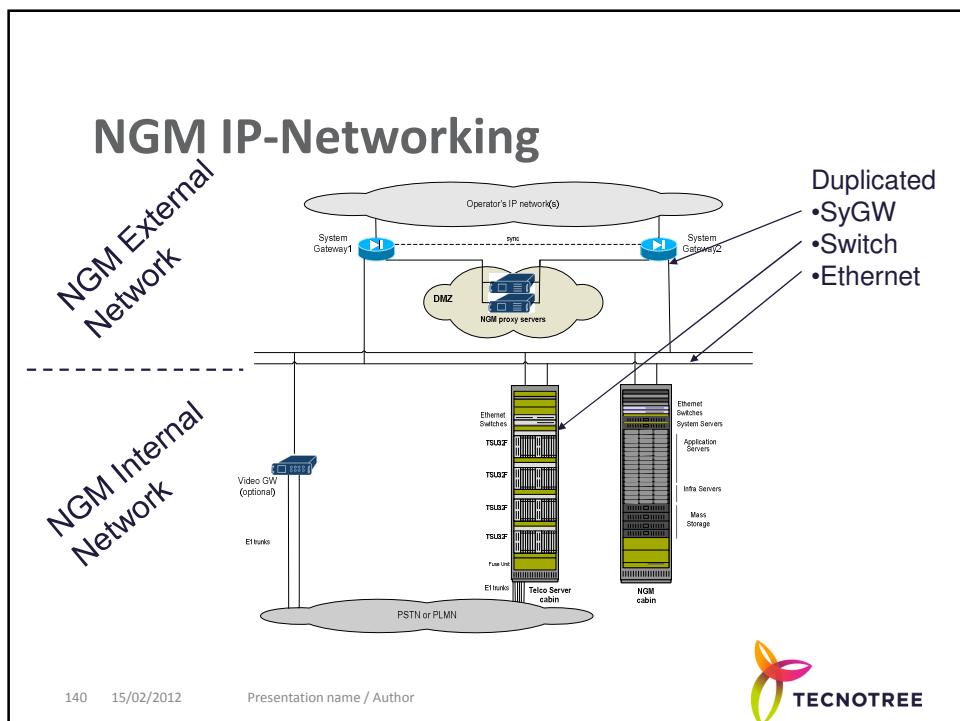
- Mailbox Dispatcher (MBD) takes care of mailbox creation and deletion.
 - MBD takes care of the directory structure of the mailbox directories
- MBD listens to a port on Infra Servers
 - creates or deletes directories according to the requests coming from Application Servers



IS (IMAP Server)

- The email server is provided by Courier IMAP daemon
 - The primary user of the email storage is the voice mail service
- Every voice mail subscriber will have their own mailbox in the storage
 - All subscribers' voice, fax, and video messages are encapsulated as attachments in emails
 - The contents of a mailbox represent all messages left for a subscriber





NGM IP-Networking

- The network can be divided from the Tecnotree NGM point of view into
 - External Network
 - Private Network
- Network is one physical network
 - But in many cases it includes several individual networks that are connected via secure access, routers, switches etc
- Normally the private network is a so-called flat network,
 - i.e. all devices are in the same subnet.
- However, the system can also be grouped into several subnets
 - Where different system element groups are in different subnets

NGM IP-Networking

- Ethernet network elements (i.e. System Gateways and switches) are duplicated
- Each system device has a duplicated Ethernet connection to the network
- Channel bonding feature is used Ethernet duplicating.
 - Channel bonding is a Linux feature, where the IP-address used for the communicating is active on one of the physical Ethernet links Interfaces
- When the operating system notices a failure on the working interface,
 - it changes it to passive mode and activates the other one.
 - From the switch point of view, it looks like the computer had changed from one port to another.
 - MAC-address and IP-address remains the same for that SyGW

Hostnames and IP Addresses

- Hostnames play a vital role in the IP networking, making them more important than used IP addresses. Default addresses for the units are normally used when the network is a so-called flat network. Flat network means that all Telco Server units and NGM servers are in the same subnet.
- Following should be remembered when IP addresses are allocated for the Tecnotree NGM system:
 - The used addresses can be whatever, that is, they are not tied to any specific address space.
 - Default addresses are only a recommendation. The operator may decide to use the addresses that are suitable for them.
 - The used address space must be continuous.
 - There must be enough addresses for system elements and their Virtual IP (VIPs). Also future expanding should also be taken into account.
 - The used addresses should be routable in the operator's network. The SyGWs can handle also network address translations, but often NATed networks are difficult to maintain.
 - If addresses for the whole system which is already in use are changed, it will mean significant downtime for the system.



Hostnames and IP Addresses

IP-address

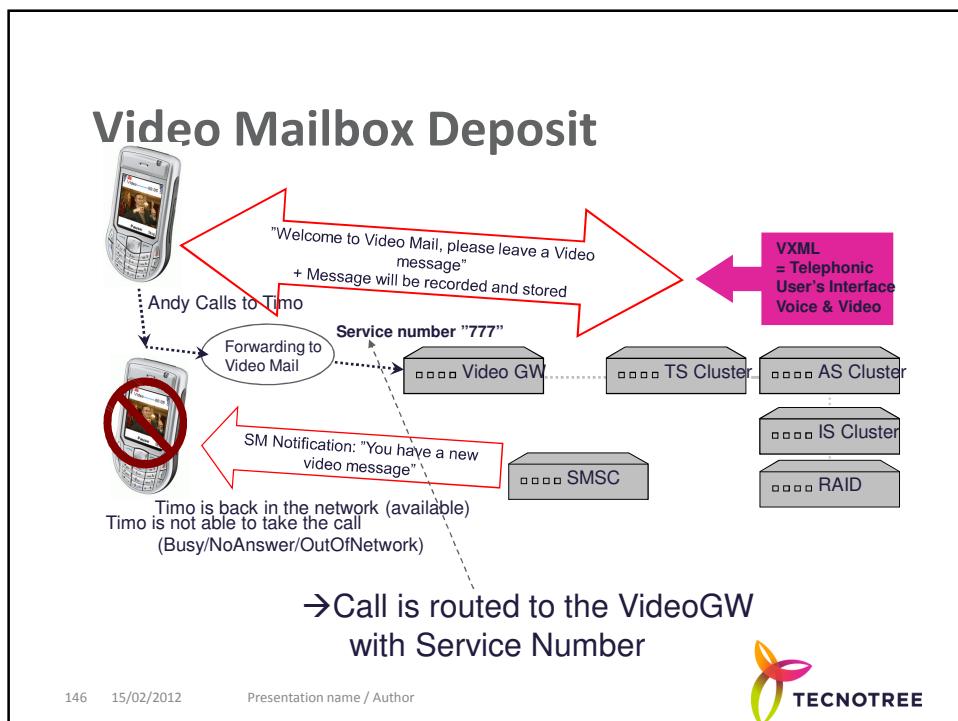
Address	Host/Network	FQDN	Description
192.168.18.21	pl-vbu2-slot1	pl-vbu2-slot1.lab.tec	CPC Card in VBU2
192.168.18.10	pl-scu-active	pl-scu-active.lab.tec	Active SCU
192.168.18.20	pl-scu-backup	pl-scu-backup.lab.tec	Backup SCU
192.168.18.10	pl-gmi-active	pl-gmi-active.lab.tec	Active GMI
192.168.18.20	pl-gmi-backup	pl-gmi-backup.lab.tec	Backup GMI
192.168.18.12	pl-vbu1-slot2	pl-vbu1-slot2.lab.tec	First IOP Card in VBU1
192.168.18.13	pl-vbu1-slot3	pl-vbu1-slot3.lab.tec	Second IOP Card in VBU1
192.168.18.22	pl-vbu2-slot2	pl-vbu2-slot2.lab.tec	First IOP Card in VBU2
192.168.18.71	pl-as01	pl-as01.lab.tec	Application Server 1
192.168.18.72	pl-as02	pl-as02.lab.tec	Application Server 2
192.168.18.73	pl-as03	pl-as03.lab.tec	Application Server 3
192.168.18.74	pl-as04	pl-as04.lab.tec	Application Server 4

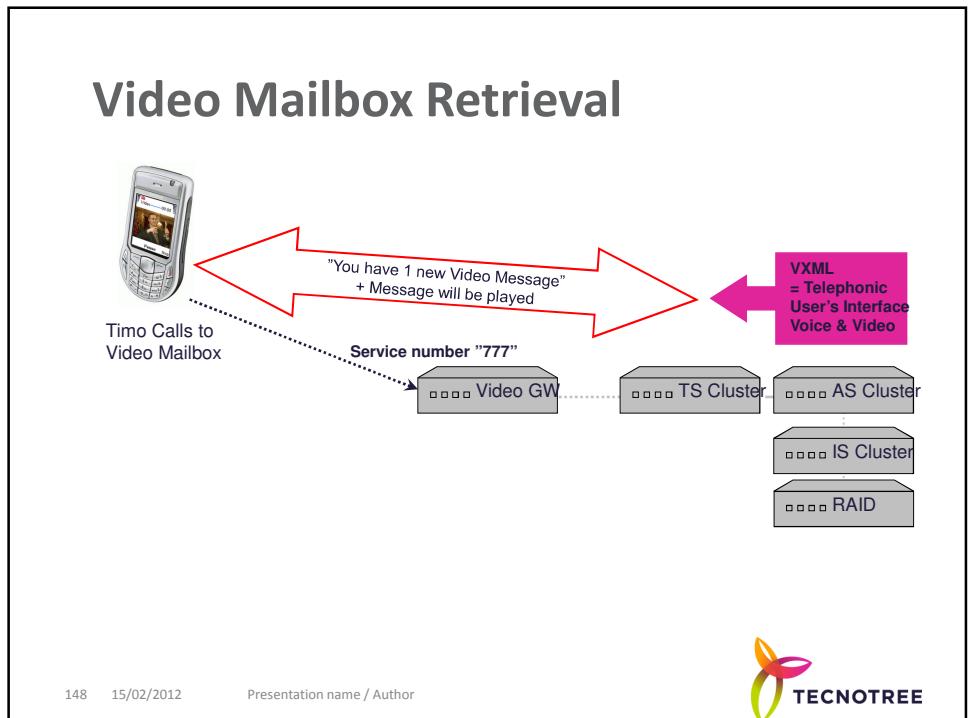
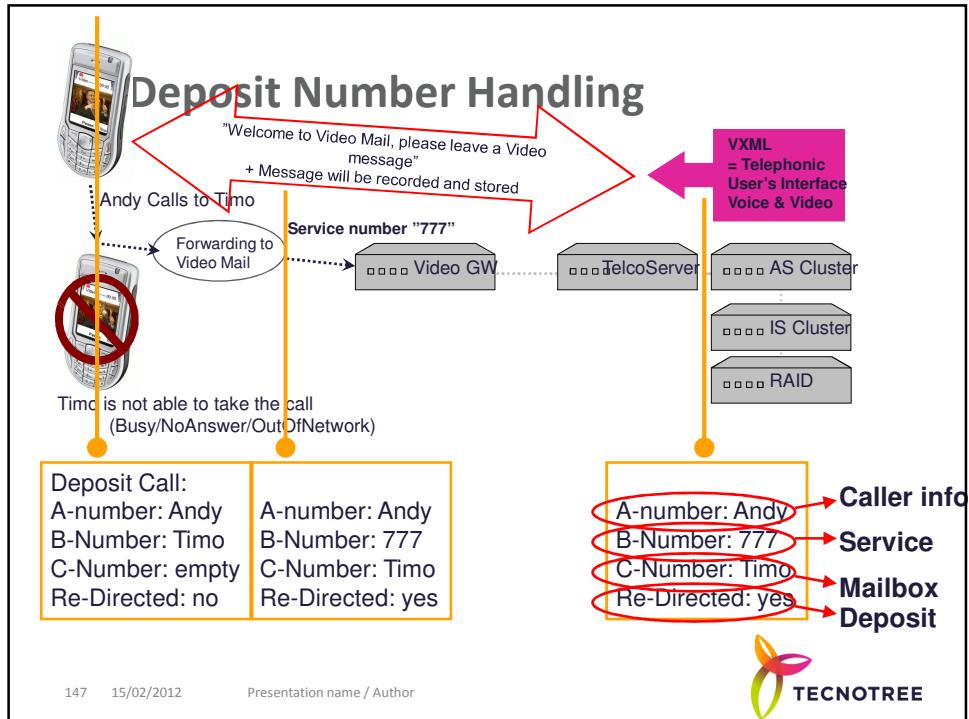
Hostname

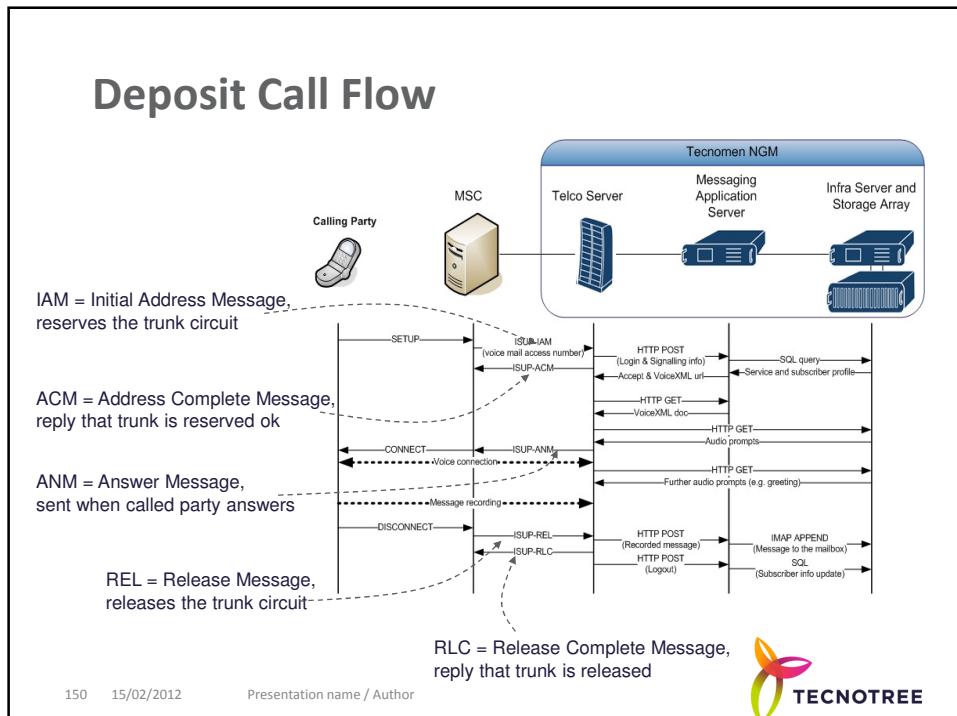
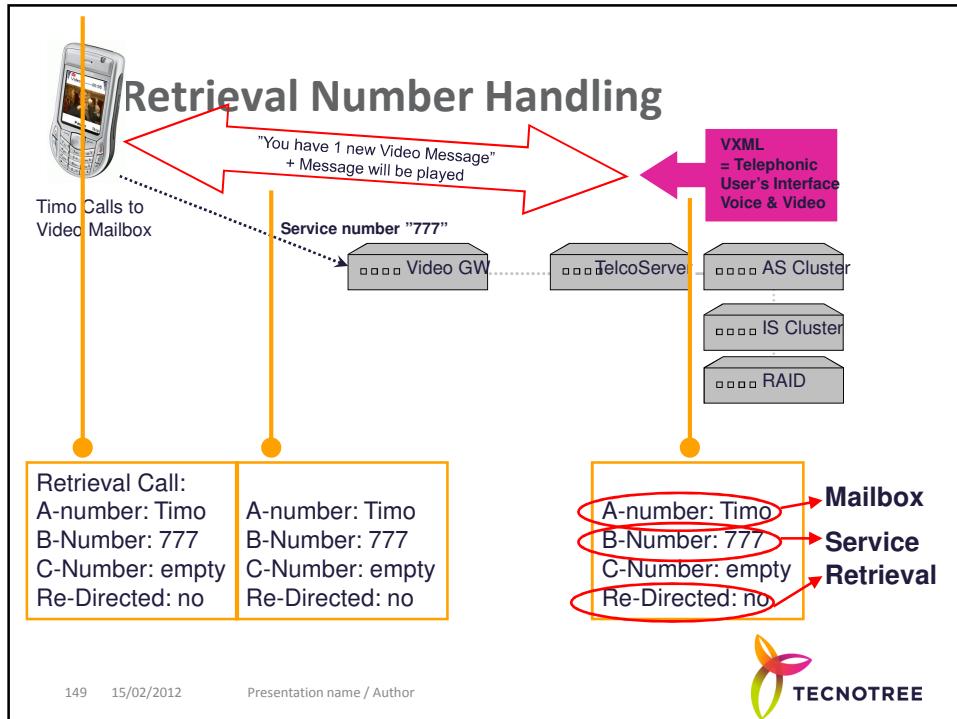
Fully Qualified Domain Name, including hostname+domainname (lab.tec.in this example)

→All NGM network elements have this naming principle

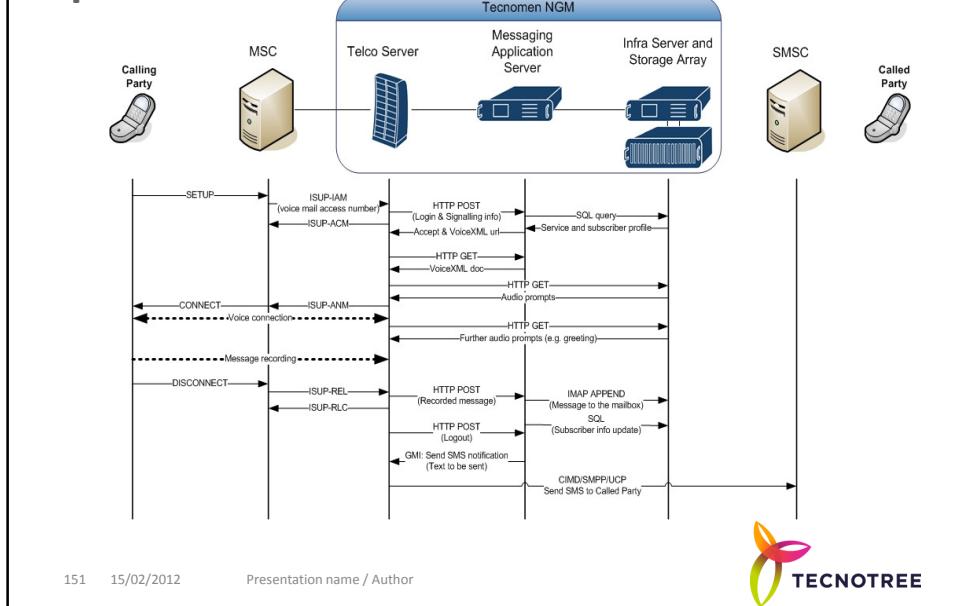




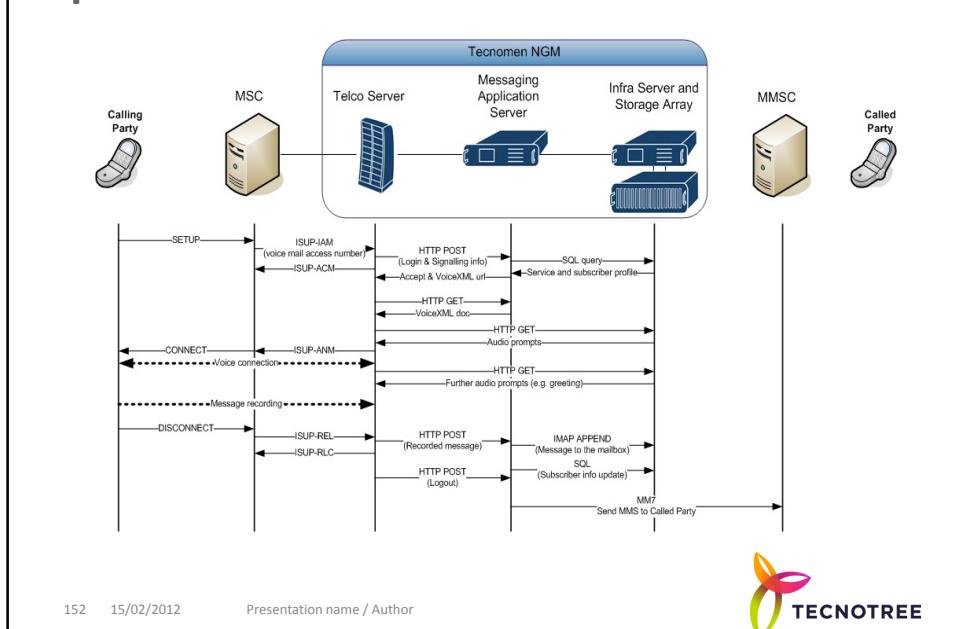




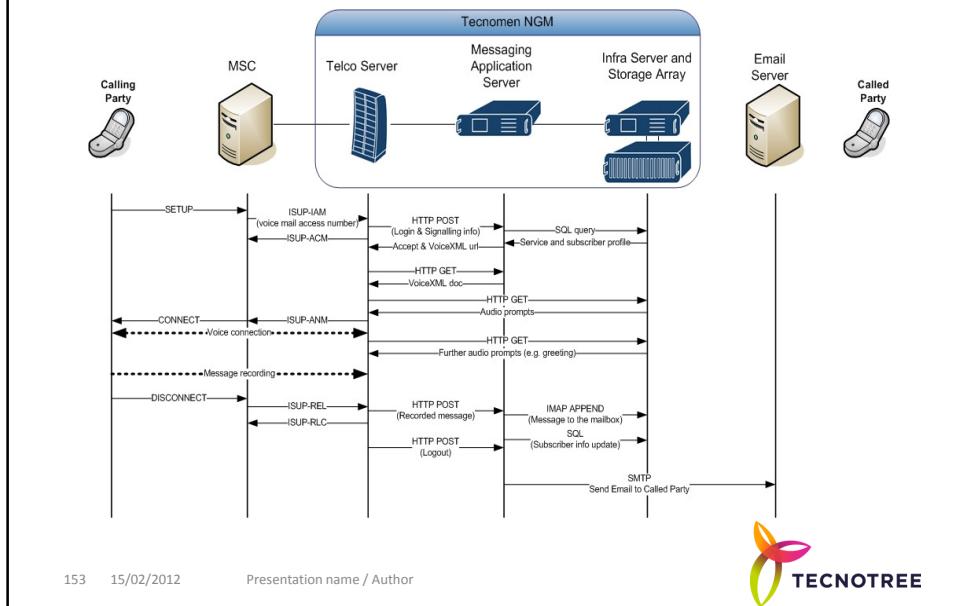
Deposit Call Flow with SMS Notification



Deposit Call Flow with MMS Notification



Deposit Call Flow with Email Notification

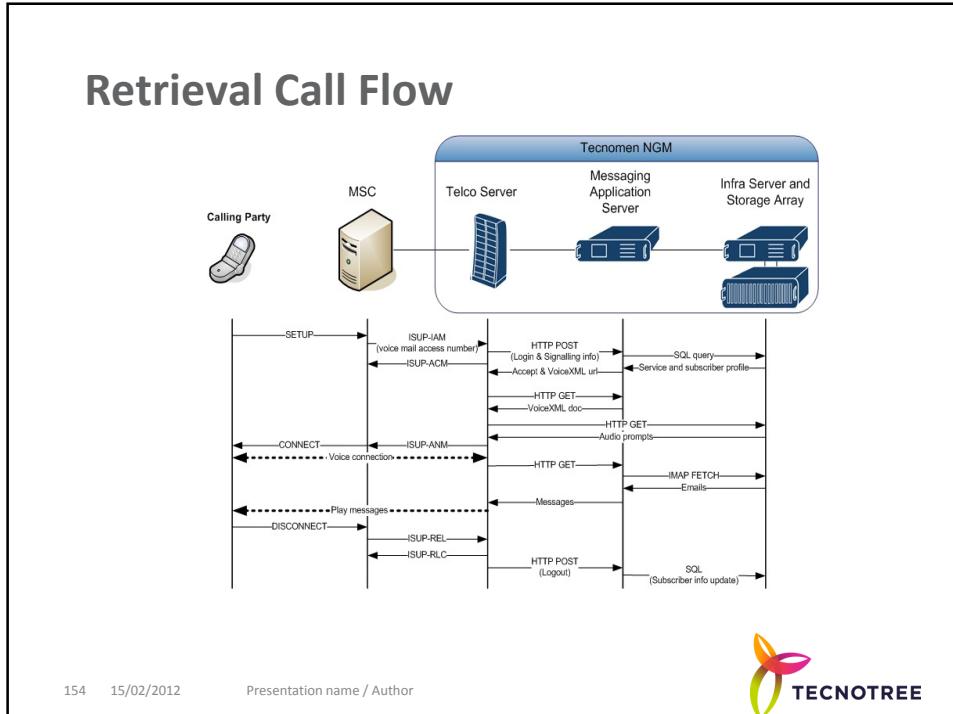


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Retrieval Call Flow

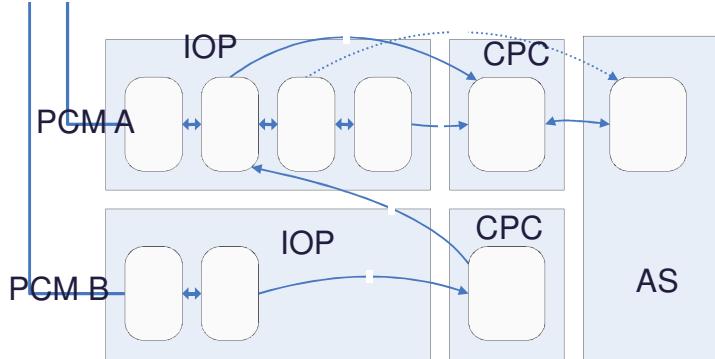


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Call Flow Example, Incoming PCM Call Setup in TSS

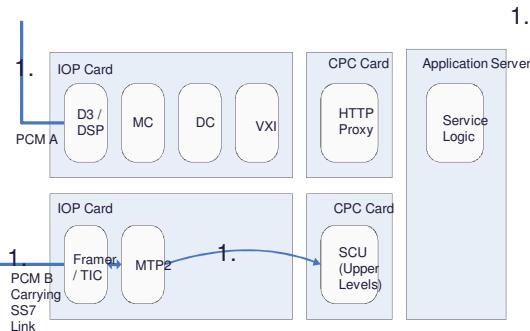


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Call Flow Example, Incoming PCM Call Setup in TSS, step 1/9



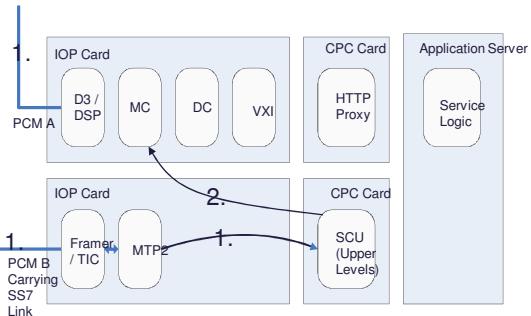
1. Call is set up via the SS7 signalling link in PCM B. The speech path is connected to PCM A. MTP 2 task in IOP extracts the signalling messages from the incoming stream and forwards the information to the active SCU (running on a CPC card; note that IOP card and CPC card do not have to reside on the same VBU).

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Call Flow Example, Incoming PCM Call Setup in TSS, step 2/9

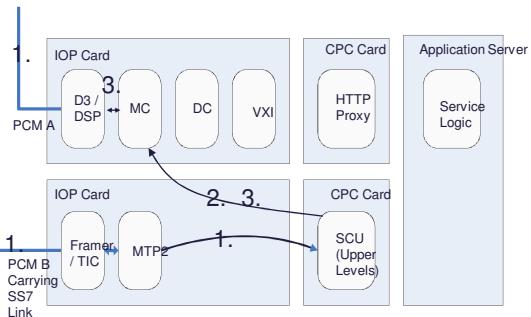


2. Once SCU gets the PCM and timeslot information of the speech path, it looks up, to which IOP the PCM is connected to.

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Call Flow Example, Incoming PCM Call Setup in TSS, step 3/9

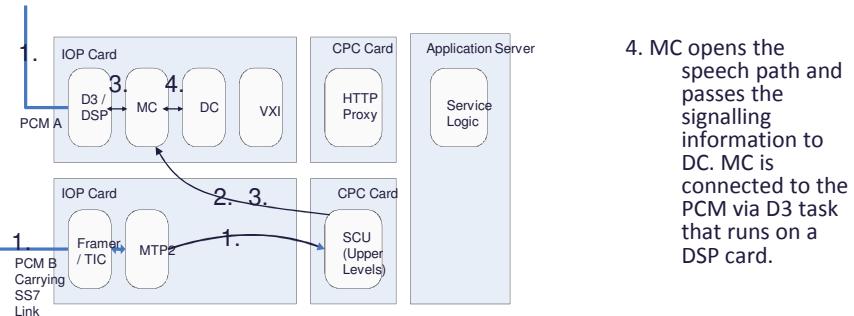


3. SCU passes the information about incoming call to the MC on that IOP, and asks it to handle the speech path. The information includes, e.g., PCM, timeslot, phone numbers, and other relevant data.

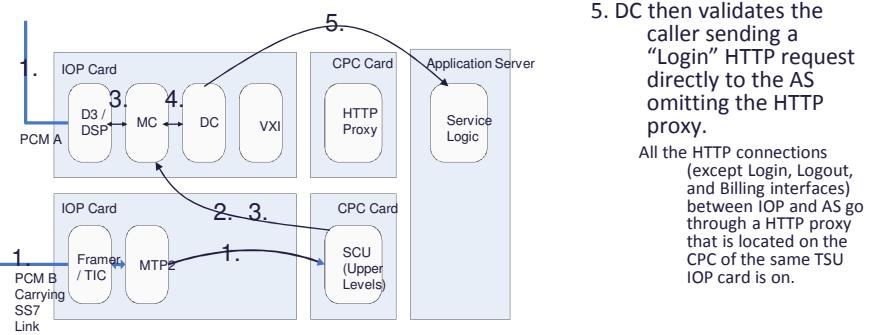
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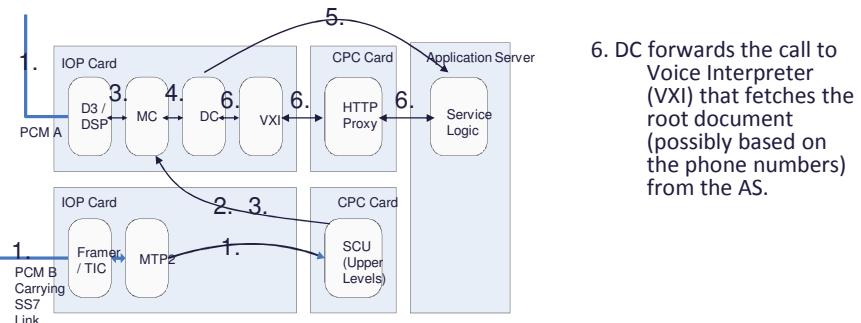
Call Flow Example, Incoming PCM Call Setup in TSS, step 4/9



Call Flow Example, Incoming PCM Call Setup in TSS, step 5/9



Call Flow Example, Incoming PCM Call Setup in TSS, step 6/9

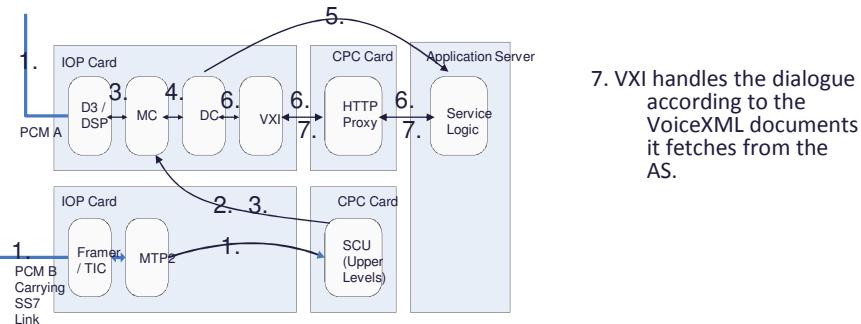


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Call Flow Example, Incoming PCM Call Setup in TSS, step 7/9

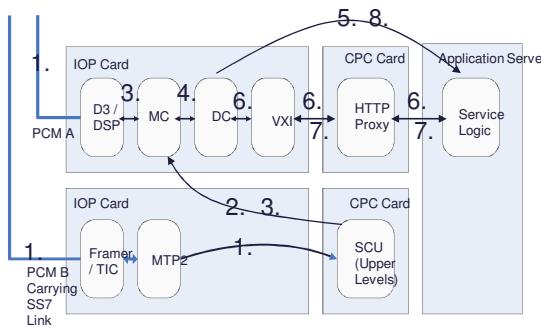


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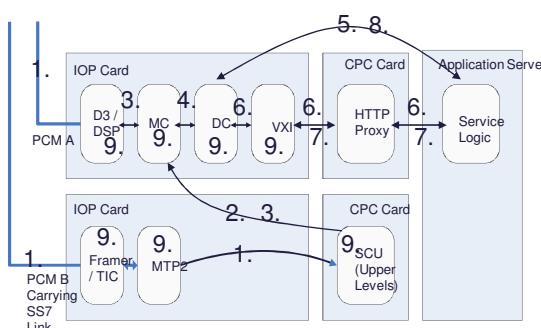


Call Flow Example, Incoming PCM Call Setup in TSS, step 8/9



8. after the call is completed DC sends a "Logout" HTTP request to the AS. Also, if configured to do so, DC sends a billing ticket for the call through the billing interface

Call Flow Example, Incoming PCM Call Setup in TSS, step 9/9



9. Call is cleared on the MC and SCU. The session is terminated in DC and VXI. If a message was left, VXI forwards it to the AS.

SIP Call Flow Logic

- RTP and SIP are coming through distinct Ethernet connections:
 - RTP comes to IOP
 - SIP comes to CPC

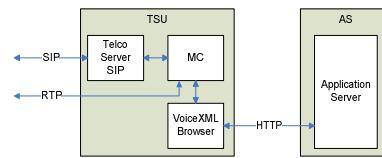
→ SIP sw running in CPC selects free IOP which will serve the call session

→ Client asking the service will get this IOP IP-address in call setup

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Incoming SIP Call Flow

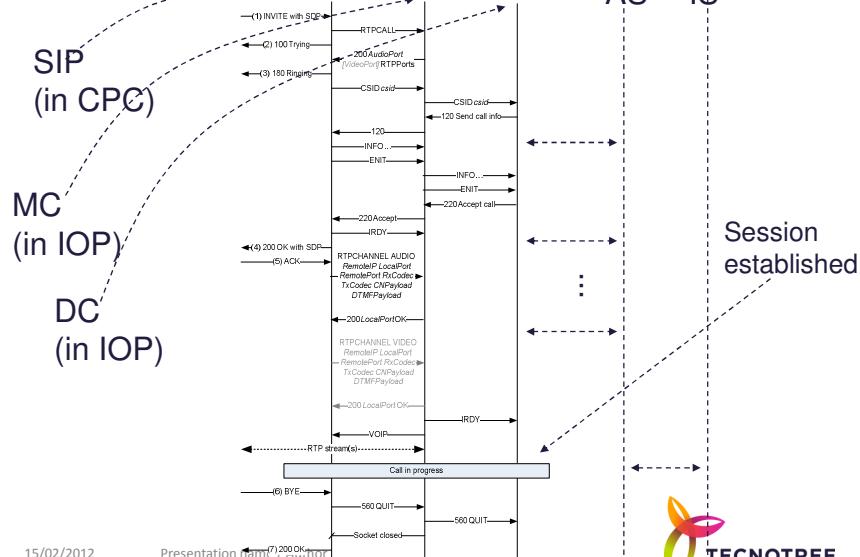
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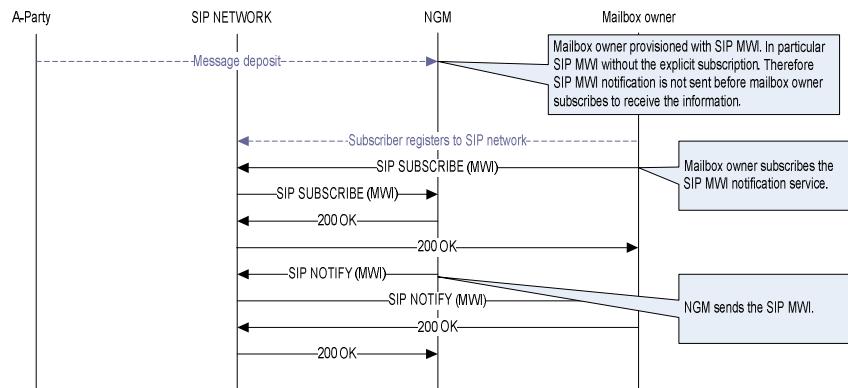
AS

IS



SIP MWI

Successful MWI delivery



The SIP Message Waiting Indication (MWI) feature enables the SIP based network, upon the subscriber request, to indicate that there is at least one message waiting.

SIP MWI

The previous figure illustrates the typical flow of events for SIP MWI. This flow is based on subscriber client informing the NGM about willingness of receiving SIP MWI information. This is performed with SIP SUBSCRIBE method.

Upon receiving the subscription request for SIP MWI, NGM is mandated to provide immediate notification in which the current message summary of the subscriber's mailbox is provided. After that, NGM is to automatically send notification on changes on the mailbox status. This applies for the duration of subscription.



TECNOTREE

Services

A large, stylized graphic of overlapping leaves in shades of green, orange, and red, resembling a stylized flower or a rising sun, is positioned on the right side of the slide.

Current NGM Services

Voice Call Completion Services

- Next Generation Voice Mail
- iCalled SM
- iCalled Voice

Video Call Completion Services

- Video Mail
- iCalled Video
- Video Announcement
- Video-Audio Fallback

Video Content Services

- Video Portal

Short Media Messaging Services

- iMessaged Video



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Voice Call Completion Services

Next Generation Voice Mail

- Personalised and subscription-based service for forwarded calls.
 - When the called party is busy or does not answer, or the phone is turned off or out of coverage, the voice mail answers the call for the subscriber.
 - Callers are prompted by a greeting to leave a voice or fax message (fax tone is automatically detected).
 - After a successful deposit call, the mailbox generates an appropriate notification to the mailbox owner
 - Based on the notification, the subscriber knows when a message is waiting for retrieval.

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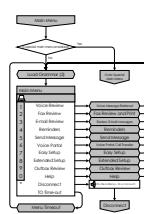
Presentation name / Author



Voice Call Completion Services

Next Generation Voice Mail

- During retrieval access, the subscriber can listen to and view messages, in addition to personalising the mailbox settings.
 - The Telephonic User Interface (TUI) and the web user interface of the Voice Mail service can be customised to meet the operator's requirements. It also offers branding opportunities to service providers.



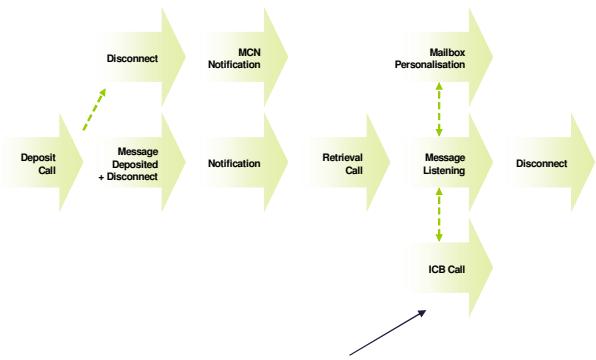
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Next Generation Voice Mail

Example call flow with voice mailbox usage



Next Generation Voice Mail

Message Deposit Process

- Voice or fax calls can be forwarded either to a short code number or to the mailbox number. In addition, it is possible to leave a message by directly calling to the mailbox number without call forwarding.
- If the call is allowed, there are two possible scenarios:
 - No mailbox is found for the B-number
=> Automatic Subscriber Creation (ASC) is started
 - A mailbox is found for the B-number
=> The mailbox capacity for new messages is checked. If there is not enough space for a new message, the caller is informed about the situation and the call is disconnected.
- Once a call is accepted, the system plays the mailbox's active greeting and the caller is prompted to leave a message.
 - (The caller can change the active greeting through TUI and web user interfaces).
 - If a fax tone is detected during the greeting, the system assumes a fax message is being sent and switches to the fax deposit mode.
- After leaving the message, the caller can go to an optional deposit menu to listen, delete, re-record, accept or exit after finishing the message recording.
- If the caller has disconnected the call during the greeting or the deposited message was too short, the Missed Call Notice (MCN) feature is activated.



Next Generation Voice Mail

Message Deposit Modes

- The Tecnotree Voice Mail supports two different deposit access modes:
 - Short code number
 - Direct/forwarded call to the mailbox number



Next Generation Voice Mail

Message Deposit Modes

- Short Code Number:
 - Short code deposit access to the mailbox is made through a single access number (short code) which acts as a shortcut to the mailbox.
 - The call is redirected to the short code number after which the actual mailbox number is identified based on the Redirecting Number. After the call has been routed to the correct mailbox, it is handled as a normal deposit call.



Next Generation Voice Mail

Message Deposit Modes

- Direct / Forwarded Call to Mailbox Number:

- Voice Mail users can also have a personal number to their own mailbox. The mailbox can be accessed either with a direct call or as a forwarded call to the mailbox number.
- If the caller calls directly to the mailbox number range (defined to the system), the service resolves the actual mailbox on the basis of the B-number. If the caller is not identified as the mailbox owner through the A-Number Identification (ANI) number check, the service connects the caller to the mailbox enabling message deposit.
- In the forwarded deposit call case, the subscriber has forwarded calls from the mobile number to the mailbox number. When calling to the subscriber's mobile number, the call is directed to a service which resolves the subscriber's mailbox on the basis of the Redirecting Number and connects the caller to the subscriber's mailbox enabling message deposit.

Next Generation Voice Mail

Greetings

- Once a call is directed to the Voice Mail service, the system plays a voice greeting and the caller is prompted to leave a message.

- Both system and personal greetings are supported
 - The system greeting refers to the default operator announcement
 - Personal greeting is recorded by box owner, or it can be provided by operator as well (imitations, music, ...)
 - When Absence Greeting is activated by box owner, message deposit isn't possible (only system absence greeting)

Next Generation Voice Mail

Number Blocking

- The system enables prohibiting the service from a single MSISDN or a phone number range.
 - This is useful for, for example, preventing certain operator's customers from accessing the system.
- The validity of both the Calling and Called Party (or Redirecting) Numbers are checked with the Number Analysis system service, as with the other service. White and black lists define which numbers or number ranges are allowed to continue with the Voice Mail service.

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Next Generation Voice Mail

Automatic Subscriber Creation

- The Automatic Subscriber Creation (ASC) feature creates a mailbox for a new subscriber and all the relevant database entries when there is no subscription available (provisioned by the operator or ASC) beforehand.
- The overall ASC logic:
 - The call is routed to the system.
 - The Called Party (or Redirecting) Number is validated. If the subscription already exists in the system, the call is normally routed to that mailbox.
 - If no subscription is found, a new mailbox is created for the B-number.
 - The default values are read from the template and new mailbox data is stored to the memory.
 - After above steps are completed successfully, the caller hears a standard system greeting and can leave a message. After a successful voice or fax message deposit, the corresponding database entry, that is, the mailbox, is created.
 - Alternatively, if the caller is the mailbox owner, he or she can enter the set-up mode, listen to the tutorial and possibly make the desired changes to the default values (for example, language and Personal Identification Number (PIN) settings).
 - The service is now available for the subscriber and the subscriber data can also be modified using Customer Service Tools.

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Next Generation Voice Mail

Automatic Subscriber Creation

- There is an exception to the ASC mailbox creation: No mailbox or database entry is created for the subscriber if the caller hangs up during the greeting. When this happens, the actions that follow depend on the redirection reason with the original call:
 - With “user busy” or “mobile subscriber not reachable” redirection reasons or when a call is made directly to the mailbox:
=> Missed Call Notice service is activated.
 - With other redirection reasons:
=> No actions are taken.

Next Generation Voice Mail

Missed Call Notice

- The mailbox owner can receive a separate notification for missed calls in case the calling party did not leave a message.
 - As the terminal may display the missed call information in some cases (for example, when the called party did not answer), it is possible to configure the redirection reasons for triggering the Missed Call Notice (MCN) feature.
 - Typically, the MCN is initialised when the calling party hangs up during greetings, or the voice message is too short to be deposited.
 - In these cases, the MCN is responsible for storing the information of missed calls and initiating notifications to the called party.

Next Generation Voice Mail

Missed Call Notice

- The MCN SM notification provides three different basic notification schemes:
 - Notification with Single A-number: Each call generates a separate SM notification with a single A-number
 - Notification per A-number: Notification includes only one A-number and its call information (number of call attempts, date and time of last attempt)
 - Notification with A-number List: The SM notification shows a list of the callers' A-numbers for all recent calls. The list is updated and resent after each new call, typically as replace SM.

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Next Generation Voice Mail

Missed Call Notice

• **Notification with Single A-number**

- Sending a separate SM notification with a single A-number for each call allows easy call back to the original caller with any mobile phone. Compared to the A-number list solution, however, it will in certain situations create a considerable number of separate SM notifications.

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Next Generation Voice Mail

Missed Call Notice

• Notification per A-number

- The SM notification includes one A-number with its specific data (number of call attempts and the last call attempt's time and date) and a separate SM is generated for each A-number leaving "missed calls".
- SM-replace works per A-number i.e. possible to update information per A-number. The sender field of the SM notification is same as A-number within the message itself.



Next Generation Voice Mail

Missed Call Notice

• Notification with A-number List

- The A-numbers in the list are presented in the order when the call was made. The A-number of the latest call is the first one in the list, and the oldest call is the last in the list.
- Each A-number is presented only once in the list. If the A-number is already in the list, it will be moved to the top of the list.
- The maximum length of the A-number list is restricted by the number of characters available in the SM notification. If necessary, the A-numbers for the oldest calls are dropped from the list. The A-number list is cleared periodically, so that it includes information only for a service-configurable time period in the past.



Next Generation Voice Mail

Notification

- Notifications are used to inform the called party that a new message was left in the mailbox or a missed call has occurred (with MCN only SM notification).
- The following notification methods are supported:
 - SM notification
 - E-mail forward
 - MMS forward

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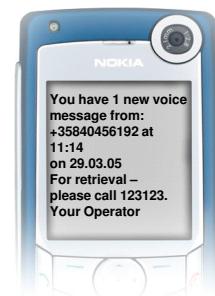
Presentation name / Author



Next Generation Voice Mail

SM Notification

- The Short Message (SM) notification can include an information about the message(s) and the mailbox itself,
 - for example the message type,
 - A-number of the calling party,
 - retrieval instructions,
 - date and time when the message was left.
- The SM notification texts are based on templates that are operator configurable.



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Mailbox Locking

- Mailbox gets locked after configurable number of wrong PIN attempts.
Default login attempts before lock-out: 6.
- While a mailbox is locked callers can leave messages.
- If you call a locked mailbox with the mailbox number, access is still granted and the counter reset.
- Mailbox can also be unlocked by operator from CS Tool.



Next Generation Voice Mail

SM Notification for MCN

- If the MCN feature is also in use, the SM notifications are sent for missed calls as well.
 - These notifications typically include at least the caller's phone number and possibly also other information, such as the time of the call and/or the number of call attempts.



Next Generation Voice Mail

E-mail Forward

- The mailbox owner can receive the message as an attachment via e-mail to the address he or she has specified. The e-mail notification template is operator configurable.

Next Generation Voice Mail

MMS Forward

- Alternatively, the voice message can also be pushed to an external Multimedia Messaging Service Centre (MMSC) to be delivered to the mailbox owner as a standard multimedia message with an attached voice message.
- After recording the message, the Voice Mail service pushes the message over a 3GPP standardised MM7 interface to an external MMSC. The MMSC will handle the notification, delivery and content adaptation as for any other multimedia message.
- The handling of the original voice message after MMS forward can be configured in two different ways:
 - The voice message is treated as new
 - The voice message is treated as old

Next Generation Voice Mail

Message Retrieval

- The messages can be retrieved by using:

- **Retrieval via Telephonic User Interface (TUI)**

- Once the retrieval has begun, the subscriber hears the number of new messages, and listens to the voice messages. In case of a fax message, the subscriber can choose the destination for printing.

- **Retrieval via Web User Interface**

- If web user interface access is used for message retrieval, the subscriber needs to log in either through the operator's web portal or directly to the web user interface pages of the mailbox (with the mailbox number and password). The subscriber can then access all the messages and listen to or save them.

Next Generation Voice Mail

Message Retrieval in General

- Regardless of the retrieval method or the message type, all waiting messages are rendered to the subscriber. The retrieval order of the messages can be customised by the operator.
- After a subscriber has listened to or viewed a message – or its envelope information (A-number of the caller, date and time of the deposited message) – the mailbox automatically marks the message as 'old', in other words, they can still be revisited during the system-configurable validity time. The subscriber also has the possibility to 'save' (via TUI) selected messages in order to save them for a longer period of time.
- Once the validity time of the message expires, it is removed from the system. The validity time depends on the message status ('new', 'old' or 'saved').

Next Generation Voice Mail

Message Retrieval via TUI

- The Tecnotree Voice Mail supports three different retrieval access modes:
 - Short code number
 - Direct call to mailbox number
 - Two-stage access number
- The caller can access the messages in the mailbox either directly, by calling the mailbox number, or through one common short code (service number).
- The call is identified as a retrieval call based on signalling parameters.

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Next Generation Voice Mail

TUI Message Retrieval by Short Code Number

- Short code retrieval access to the mailbox is made through a single access number (short code) which acts as a shortcut to the mailbox.
- If the caller calls directly to the short code number, the service resolves the subscriber's mailbox on the basis of the A-number and connects the subscriber to his or her own mailbox.
- The A-Number Identification (ANI) check is used to prevent unauthorized access to the mailbox. Each mailbox has one ANI number (same as mailbox owner's MSISDN) in use, that is, number that is allowed to have direct retrieval access into the mailbox without requesting entering PIN.
- If the A-number is missing (for example, when roaming abroad) or there is no mailbox found based on the caller's A-number, the call is treated as a two-stage call to enable mailbox access.

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Next Generation Voice Mail

TUI Message Retrieval by Calling Mailbox Directly

- Voice mail users can also have a personal number to their own mailbox. The mailbox can be accessed either with a direct call or as a forwarded call to the mailbox number.
- If the caller calls directly to the mailbox number range (defined to the system), the service resolves the actual mailbox on the basis of the B-number. If the caller is identified as the mailbox owner through the ANI check, the service connects the caller to his/her own mailbox enabling message retrieval.

Next Generation Voice Mail

TUI Message Retrieval by Two-Stage Access

- All calls to a two-stage access number are handled as retrieval calls enabling the subscriber to place a retrieval call from any phone number when the mailbox number cannot be dialled directly. The caller dials the two-stage service number for retrieval access, which connects the call to the service.
- The service plays a prompt instructing the caller to enter the mailbox number. If the caller enters a valid mailbox number, the service transfers the call to the mailbox and proceeds with caller authentication. Authentication is done based on the PIN check
- The two-stage access is also used with those incoming calls that are missing some critical signalling information, so it is not possible to identify which mailbox the caller is trying to reach.

Next Generation Voice Mail

TUI Message Retrieval with Intelligent Call Back

- The Intelligent Callback (ICB) service is an enhancement to the Voice Mail service. It allows the subscriber to make a return call to the number that left the particular message with a single key press. After the ICB call, the user can continue message retrieval.

Note: ICB is to come in 5.1.2.1 release

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Next Generation Voice Mail

Fax Retrieval

- The following delivery and printing options for fax messages are available:
 - Automatic printing – no mailbox access required
If enabled by the subscriber, the system automatically forwards a copy of any new fax to the default fax delivery number defined by the subscriber.
 - On-demand printing – during mailbox access
The subscriber can request printing of all new faxes. During the message review, the subscriber can select specific faxes for printing with the following options:
 - Printing to a predefined fax number
 - Printing to a temporary fax number
 - Printing to the current phone line

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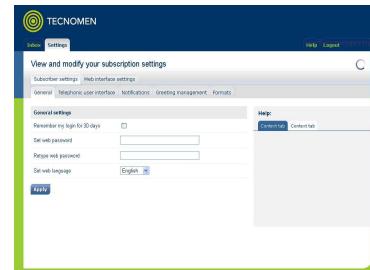
Presentation name / Author



Next Generation Voice Mail

Mailbox Personalisation

- Subscribers can provision their personal mailbox settings through both TUI and Web User Interface.
- An interactive TUI tutorial menu is typically used when the subscriber accesses the Voice Mail service for the first time. The tutorial guides the subscriber through basic settings, such as language selection, recording the personal greeting and setting the PIN.
- Through Web User Interface the subscriber can manage and view messages. The subscriber can also change mailbox and personal settings e.g. choose greeting types (personal or system greeting), change PIN, change mailbox language, and enable or disable the Missed Call Notice feature.



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Next Generation Voice Mail

Mailbox Personalisation

- The following settings can be personalised for every retrieval access in TUI interface:
 - Change the default language
 - Change the PIN
 - Change the active greeting
 - Activate/deactivate the MCN
 - Record a personal greeting

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Presentation name / Author



Next Generation Voice Mail

Mailbox Greeting Selection

- The subscriber can select one of the following greetings as the active one through both the TUI and web user interface:
 - system greeting (refers to the default operator announcement):
 - standard system greeting (there can be several different ones to select from – also funny and celebrity greetings supported)
 - standard system absence greeting (followed by an automatic call disconnect, that is, does not give the deposit option to the caller)
 - personal greeting (refers to the individual greeting recorded by the mailbox owner)

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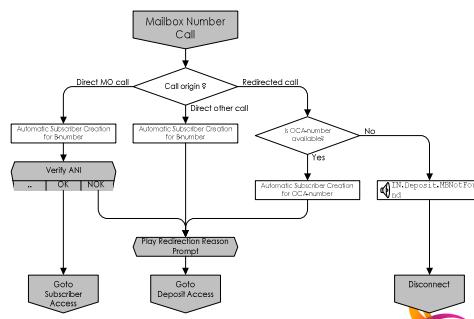
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Next Generation Voice Mail

GTUI

- See detailed step by step Call Flow Description in document 'Voice, Fax and Video Mail' – Caller's Interface Description (CID)
 - Voice Prompt contents are described as well in this same document



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Fax Mail

Fax Mail option within Voice Mail

Subscribers are able to

- Receive fax messages - automatic fax tone detection
- Review fax messages by envelope information
- Print fax messages
 - Automatic printing to configured destination
 - On-demand printing to a predefined number, to number entered by subscriber or to the phone number from which the subscriber is calling
- Forward fax messages to a provisioned personal e-mail address from TUI during the retrieval call.

One common service and mailbox for voice, fax and video

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Presentation name / Author



Fax Mail

SMS notification on fax print failure/success

An SMS notification on print failures in current Comverse system is available - simply saying "The fax message printing failed".

Also an SMS notification on when the print succeeded.

- NGM Voice Mail sends the SMS notification informing the mailbox owner on the fax printing failure. - SMS notification is sent only after the possible retry scheme has been processed.

- NGM Voice Mail sends the SMS notification informing the mailbox owner on the fax printing success.

- The use of these notifications is configurable on CoS basis separately for "fax print failed" and for "fax print succeeded" notifications

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Next Generation Voice Mail

Prompts

- **Voice Prompts**
 - Output Format:
 - .wav A-law mono 8000Hz

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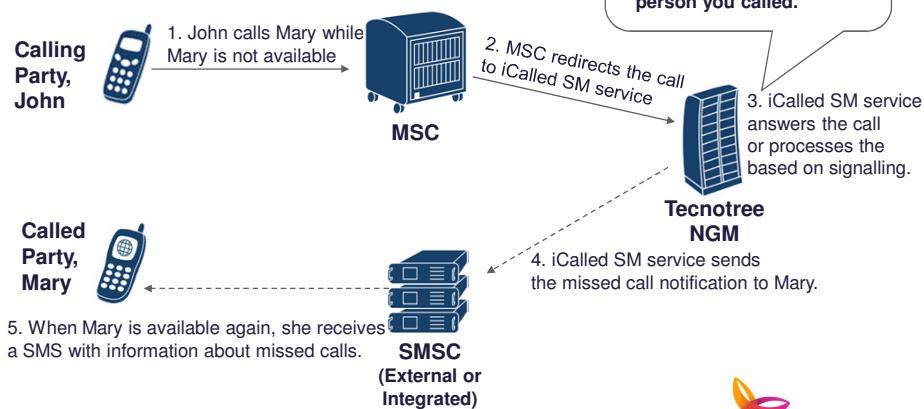
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Voice Call Completion Services

iCalled SM



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Voice Call Completion Services

iCalled SM

- The iCalled SM is a missed call notification or a callback request service aimed at mobile users who do not have their own voice/video mailbox.
 - When the subscriber cannot be reached, the call is diverted to a service through which the caller can initiate a Short Message (SM) notification to the called party about when he/she is reachable again.
- The iCalled SM service logic is responsible for storing a list of call attempts and initiating SM notifications to the subscriber. Upon an accepted incoming call, new call attempt information is appended to the received call attempts list, and a notification is initiated.
 - The SM notification may include the caller's phone number and other information, such as the time of the call, number of attempts from the same caller, etc.
- The iCalled SM is a complementary service to the mobile phone's missed call functionality. Typically, the iCalled SM service is activated only in situations where the phone cannot provide information of missed calls, such as when the called party is out of coverage or the phone is switched off.

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Presentation name / Author



iCalled SM

Service Access

- The iCalled SM service can be associated with one or more service numbers. The operator can define different service numbers for, for example, different service languages, user segments, or virtual operators or service providers.
- The iCalled SM service supports three different service access interfaces (can be selected by the operator):
 - Interactive interface
 - Automatic interface
 - Signalling only interface

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iCalled SM

Service Access: Interactive Interface

- With the interactive interface the caller is informed that the called party is not available, and an option is given to send an SM notification including the phone number of the caller, or another phone number the caller wants to be reached from.
 - The SM recipient number is obtained from call signalling, either from B-number or from the Redirecting Number field.
 - The caller number is obtained from the A-number field.
 - If the number is not available, the caller is given an option to enter the number, or if the number is marked with the Calling Line Identity Restriction (CLIR), the caller has the possibility to allow this number to be sent or to enter a new number.
- If the caller hangs up before making a selection, the call is disconnected and no further actions are taken. The caller can hang up at any stage of the service.

iCalled SM

Service Access: Automatic Interface

- The automatic interface does not provide any interaction with the caller other than playing an announcement letting the caller know that a short message will be sent, for example:

"The person you tried to reach is not available. Your number will be sent as a short message to the person you called."

- The short message recipient number is obtained from call signalling, either from the B-number or from the Redirecting Number field.
- The caller number is obtained from the A-number field.
- If the number is not available or it is marked with Calling Line Identity Restriction (CLIR), the short message is not generated.

iCalled SM

Service Access: Signalling Only Interface

- The signalling only interface behaves similarly to the automatic interface, except that the voice channel will not be connected to Tecnotree NGM at all
 - the service just collects the required number information from call signalling and then releases the call.
- If desired, the network can play an appropriate announcement based on the release code given by the Tecnotree NGM system.



iCalled SM

Service Activation

- The iCalled SM service activation is based on call redirection reason. The operator can freely configure the signalling redirecting reasons that activate the iCalled SM service.



iCalled SM

Number Blocking

- Although the iCalled SM service is not provisioned per subscriber, the system enables prohibiting the service from a single MSISDN or a number range.
 - This can be done, for example, to limit the service only to the operator's own customers.
- The validity of both the A-number and the B-number is checked using the Number Analysis core service.
- Service number dependent tables define which numbers or number ranges are allowed or not allowed as either the A-number within the SM or as the SM recipient number.
- No SM notification is generated in the automatic interface if either number is disallowed. With the interactive interface, the caller can have the option to enter another A-number.

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Presentation name / Author



iCalled SM

Notification

- An SM notification can be sent using either an internal or external Short Messaging Service Centre (SMSC).
- The iCalled SM provides three different basic notification schemes:
 - Notification with Single A-number: Each call generates a separate SM notification with a single A-number
 - Notification per A-number: Notification includes only one A-number and its call information (number of call attempts, date and time of last attempt)
 - Notification with A-number List: The SM notification shows a list of the callers' A-numbers for all recent calls. The list is updated and resent after each new call, typically as replace SM.
- The notification templates can be configured per service number by the operator.

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iCalled SM

Notification with Single A-number

- Sending a separate SM notification with a single A-number for each call allows easy call back to the original caller with any mobile phone.
- Compared to the A-number list solution, however, it will in certain situations create a considerable number of separate SM notifications.

iCalled SM

Notification with per A-number

- The SM notification includes one A-number with its specific data (number of call attempts and time and date of the last call attempt). A separate SM is generated for each A-number that has left “missed calls”.
- SM-replace works per A-number, i.e. it is possible to update information per A-number. The sender field of the SM notification is the same as the A-number within the message itself.

iCalled SM

A-number Notification with List

- The A-numbers in the list are presented in the order when the call was made. The A-number of the latest call is the first one in the list, and the oldest call is the last in the list.
- Each A-number is presented only once in the list. If the A-number is already in the list, it will be moved to the top of the list.
- The maximum length of the A-number list is restricted by the number of characters available in the SM notification. If necessary, the A-numbers for the oldest calls are dropped from the list. The A-number list is cleared periodically, so that it includes information only for a service-configurable time period in the past.



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iCalled SM

Language configurability for iCalled SM

The NGM system is able to override the default language of the iCalled SM prompts based on the country code of the calling party number.

It's possible to provision a small number of country codes for which this apply. If a particular country code is not provisioned, the default language shall be used

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Presentation name / Author



iCalled SM

Use of the Sender Field

- The use of the sender field in the SM notification is optional and can be configured on a service number basis. There are the following three possibilities to select from:
 - The sender field is left empty.
 - The sender field number is fixed (for example, the service number).
 - The sender field number is the same as the A-number included in the SM notification.
 - Thus, the person who receives the SM notification can easily call back to that number – used especially with Notification with Single A-number.

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Voice Call Completion Services

iCalled Voice

- iCalled Voice offers the convenience of a Voice Mail service to the calling party even when the called party does not have a voice mailbox.
 - When the subscriber cannot be reached, the call is diverted to the iCalled Voice service where the caller has the possibility to leave a message to the called subscriber.
 - The service dynamically creates a temporary voice mailbox to the subscriber, and sends that subscriber an SM notification of the new message.
 - After all messages have either been deleted or expired, the temporary voice mailbox is also removed from the system.
 - When being redirected to the iCalled Voice service, the caller hears a standard voice mail greeting and is prompted to leave a message.
- If the caller hangs up without leaving a message, or the message is shorter than the predefined length, the call information can still be stored and a separate notification for the missed call is sent
→(just as with the iCalled SM service).

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15/02/2012

Presentation name / Author



iCalled Voice

Service Access

- The iCalled Voice service can be associated with one or more service numbers.
 - The user interface and the service logic are configurable per service number, making it easy for the operator to define a different look and feel for, for example, different service languages, user segments, or virtual operators or service providers.

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Presentation name / Author



iCalled Voice

Service Activation

- Any call diverted to the iCalled Voice service will activate the service and the caller is prompted to leave a message.
 - If the caller hangs up without leaving a message, a Missed Call Notice (MCN) can be sent based on the call redirection reason.
 - The operator can freely configure the redirecting reasons that activate the notification, typically only in situations where the phone cannot provide the missed call information, such as when the called party is out of coverage or the phone is switched off.

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Presentation name / Author



iCalled Voice

Number Blocking

- The validity of both the A-number and the B-number is checked using the Number Analysis core service as with the iCalled SM service.
- Service number dependent white and black lists define which numbers or number ranges are allowed or not allowed as either the A-number included in the SM notification or as the SM recipient number.

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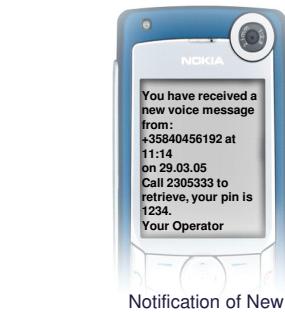
Presentation name / Author



iCalled Voice

Notification

- The iCalled Voice service provides two separate SM notifications:
 - Notification of a new message
 - Notification of a missed call without a message
- The notification of a new message also includes information on how to retrieve the message.
- The notification of calls without a message typically includes the caller's phone number and some other information, such as the time of the call and/or number of call attempts.



Notification of New Message



Notification of MCN

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Presentation name / Author



iCalled Voice

Notification

- These two notification types are handled and sent separately. They also have separate notification templates and separate SM-replace settings in order to update the possible earlier status and prevent cumulating messages.
- The notification templates can be configured per service number, enabling different service languages and different look and feel for different user groups or virtual operators and service providers.
- The use of the sender field in the SM notification is optional and can be configured on a service number basis. There are the following three possibilities to select from:
 - The sender field is left empty.
 - The sender field number is fixed (for example, the service number).
 - The sender field number is the same as the A-number included in the SM notification. Thus the person who receives the SM notification can easily call back to that number – used especially with Notification with Single A-number.

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Presentation name / Author



iCalled Voice

Message Retrieval

- The iCalled Voice service offers voice message retrieval via various fixed and wireless terminals:
 - Initialising a voice call to the retrieval number sent in the notification. If the caller's A-number is not detected, the service will ask for a PIN. After that the system plays the messages stored to the temporary mailbox.
 - Listening the messages through web by using the URL and password sent in the notification.
- All messages have a configurable validity period, during which they are available for retrieval and re-visit. Once a message expires, whether it has been listened to or not, it is removed from the system. After the last message has expired, the temporary mailbox will also be removed.

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Presentation name / Author



Video Call Completion Services

Video Mail

- Video Mail extends the familiar Voice Mail service to a wider context: Subscribers are able to deposit, retrieve and manage all their voice, fax and video messages from one mailbox.
 - The Video Mail service automatically answers when the B-number is busy or does not answer, or the phone is turned off or out of coverage. Callers are prompted by a greeting to leave a video, voice or fax message.
 - Video User Interface (VUI) can include either static or dynamically changing video content within its menus. Operator can use e.g. own logo and tunes, re-use advertisement video clips, etc. in order to give life to video mailbox VUI.



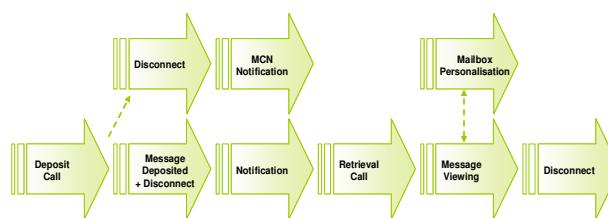
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Video Mail

Example Call Flow with Video Mailbox Usage



→ Flow Logic Similar to Voice Mail

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Presentation name / Author



Video Mail

Message Deposit

- Any type of call (voice, fax or video) can be forwarded either to a Video Mail specific generic service number (short code number) or directly to a mailbox number. In addition, it is possible to leave a message by directly calling a mailbox number without call forwarding.
- If the call is allowed by Number Blocking feature, there are two possible scenarios:
 - No mailbox is found for the B-number
=> Automatic Subscriber Creation (ASC) is started
 - A mailbox is found for the B-number
=> It is checked if there is enough mailbox capacity for new messages. If there is no space for a new message, the caller is informed about the situation and the call is disconnected.
- Once a call is accepted, the system plays the mailbox's active greeting and the caller is prompted to leave a message. The caller can change the active greeting through TUI, WWW and Video User Interfaces.
- If a fax tone is detected during the greeting, the system assumes a fax message is being sent and switches to the fax deposit mode.
- After leaving the message, the caller can go to an optional deposit menu to listen, delete, re-record, accept or exit after finishing the message recording.
- If the caller has disconnected the call during the greeting or the deposited message was too short, the Missed Call Notice (MCN) feature is activated.

→ Deposit logic similar to Voice Mail

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Video Mail

Greetings

- Once a call is directed to the Video Mail service, the system plays greeting and the caller is prompted to leave a message. The same greeting is used on both audio and video calls.
- Both system and personal greetings are supported.
 - The system greeting refers to a default operator announcement, and the personal greeting is the either individual greeting recorded by the subscriber or predefined greeting selected from a list provided by the operator. These predefined greetings can be celebrity imitations, music, humour, etc. – freely configurable for the operator.
 - It is also possible to use a system absence greeting in case the called party is not available for a longer period. When the calling party accesses the Video Mail service, he/she can view or listen to the absence greeting which informs the caller that messages are not expected at this time. This option does not leave the deposit possibility to the caller.

→ Personal, System, Absence Greeting service logic similar to Voice mail

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Video Mail

Number Blocking, ASC

- Service Logic similar to Voice Mail:
 - Number Blocking
 - ASC
 - MCN

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Presentation name / Author



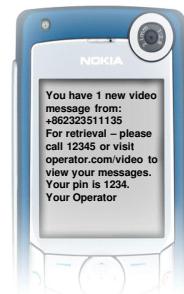
Video Mail

Notifications

- The following notification methods are supported:
 - SM notification
 - For MCN as well
 - E-mail forward
 - MMS forward



SM for MCN



SM for Video Deposit

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Video Mail

Message Retrieval

- **Retrieval via the Telephonic User Interface (normal voice call)**
 - If the message is retrieved through the legacy call, the subscriber can listen the normal voice message(s) and additionally also the audio track of the video message(s). In case of a fax message, the subscriber can also choose the destination for printing.
- **Retrieval via the Video User Interface (video call)**
 - On accessing the retrieval menu, an interactive menu guides the subscriber through to view the video message(s). The subscriber can listen to voice messages and choose to print a fax through the same interface.
- **Retrieval via Web User Interface**
 - If the message is retrieved using Web User Interface, the subscriber needs to log in either through the operator's web portal or directly to the web user interface pages of the mailbox (with the mailbox number and password). The subscriber can then access all the messages and listen to or view them



Video Mail

TUI Retrieval

- The Tecnotree Video Mail supports three different retrieval access modes:
 - Short code number
 - Direct call to mailbox number
 - Two-stage access number

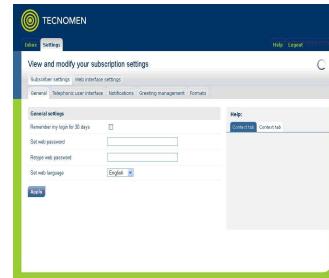
→ Logic Similar to Voice Mail



Video Mail

Mailbox Personalisation

- Subscribers can provision their personal Video mailbox settings through TUI, VUI or Web User Interface
 - An interactive TUI and/or VUI tutorial menu is typically used when the subscriber accesses the video service for the first time. There are basic settings guided in the tutorial, such as language selection, personal greeting recording, name tag recording and PIN setting.
 - Through Web User Interface the subscriber can manage and view messages. The subscriber can also change mailbox and personal settings e.g. choose greeting types (personal or system greeting), change PIN, change mailbox language, and enable or disable the Missed Call Notice feature
- Personalisation service logic similar to Voice Mail



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Video Mail

Greeting Selection

- The subscriber can select one of the following greetings as the active one – through TUI, VUI or web user interfaces:
 - system greetings (refers to the default operator announcement) – separately for legacy and video calls
 - standard system greeting (there can be several different ones to select from – also funny and celebrity greetings supported)
 - standard system absence greeting (followed with automatic call disconnect, that is, does not give the deposit option to the caller)
 - personal greeting (refers to the individual greeting recorded by the mailbox owner)

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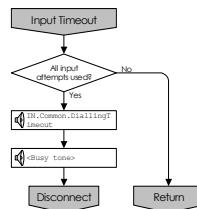
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Video Mail

VUI

- See detailed step to step Video User Interface description in document 'Videomail, Caller's Interface Description'
 - Video prompt contents are described in this same document



Prompt reference key	Typical content
IN.Common.DiallingTimeout	 TECNOMEN

Video Mail

Prompts

Video Prompts

- Size: QCIF (176 x 144)
- Frame Rate: 1-5 fps unless specified otherwise
- Output Format
 - Video: .3gp H.263
 - Audio: AMR-N (mono)
- Bit rate
 - Video: 37.8 kbps
 - Audio: 12.2 kbps

Video Call Completion Services

iCalled Video

- iCalled Video offers a basic Video Mail service for any mobile phone subscriber regardless of the mobile type, providing video telephonic services to the operator's entire subscriber base from day one.
 - When a subscriber cannot be reached, the caller will see a system video greeting and has the possibility to leave a video message.
 - The message is stored in a temporary video mailbox.
 - The called party is notified by an SM notification of the video message, and given instructions for retrieving it.
 - After the message has been retrieved or it has expired, the temporary mailbox is also removed from the system.
 - If the caller hangs up without leaving a message, or the message is shorter than the predefined length, the call information can still be stored and a separate notification for the missed call can be sent.

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iCalled Video

Service Access

- The iCalled Video service can be associated with one or more service numbers.
- The user interface and service logic can be configured per service number, making it easy for the operator to define a different look and feel for, for example, different service languages, user segments, or virtual operators or service providers.
- Each of these service subdivisions can be administered independently by different parties as required.

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Presentation name / Author



iCalled Video

Service Activation

- Any call that is diverted to the iCalled Video service will activate it and the caller will be prompted to leave a message.
 - If the caller hangs up without leaving a message, a missed call notification can be sent based on a call redirection reason.
- The operator can freely configure the redirecting reasons that activate the notification, typically only in situations when the phone cannot provide the missed call information, such as when the called party is out of coverage or the phone is switched off.

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Presentation name / Author



iCalled Video

Number Blocking

- The validity of both the A-number and the B-number is checked using the Number Analysis core service.
- Service number dependent white and black lists define which numbers or number ranges are allowed or not allowed as either the A-number within the SM notification text or as the SM recipient number.

244 15/02/2012

Presentation name / Author



iCalled Video Notification

- The iCalled Video service provides two separate SM notifications:
 - Notification of a new message
 - Notification of a missed call without a message
- The notification of a new message also includes information on how to retrieve the message.
- The notification of calls without a message typically includes the caller's phone number and some other information such as the time of the call and/or number of call attempts.
- These two notification types are handled and sent separately.
 - They also have separate notification templates and separate SM-replace settings in order to update the possible earlier status and prevent cumulating messages.
 - The notification templates can be configured per service number, enabling different service languages and different look and feel for different user groups or virtual operators and service providers.



SM Notification
of New Video
Messages



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Presentation name / Author

iCalled Video Message Retrieval

- The iCalled Video service offers video message retrieval via various fixed and wireless terminals:
 - Initialising a video call to retrieval number sent in the notification. If the caller's A-number is not detected, the service will ask for a PIN. After that the system plays the messages stored to the temporary mailbox.
 - Making a retrieval call with any legacy or fixed phone, and listening to the audio part of the messages.
 - Viewing the video messages via WWW by using the URL and password sent in the notification.
- All messages have a configurable validity period, during which they are available for retrieval and re-visit.
 - Once a message expires, whether it was listened to or not, it is removed from the system.
 - After the last message has expired, the temporary mailbox will also be removed.



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Video Call Completion Services

Video Announcements

- The Video Announcements service enables playing informative video announcements when the video call fails and for other appropriate use cases.

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Presentation name / Author



Video Announcements

Service Activation

- The Video Announcements service is provided to call cases where the video call has not ended properly.
 - The call redirection or routing is handled by the MSC or IN services and there may be differences in the features available in the networks of different MSC suppliers.
- Typically the service has a separate access number for all different video announcements to be used.
- It is also possible to have one access number and use the signalling redirection causes to identify the right video announcement.
- The creation of new video announcement numbers is simple as only the new access number has to be created and then the appropriate video announcements can be uploaded using WWW based administration tools.

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Video Announcements

Video Content Uploading

- The authorised persons in the operator's organisation can upload new content to the service using WWW based administration tools provided by Tecnotree. The file format for the content is .3gp.

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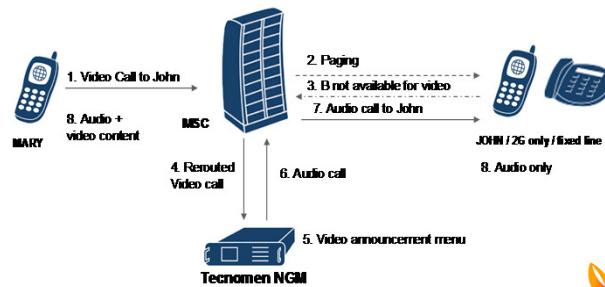
Presentation name / Author



Video Call Completion Services

Video-Audio Fallback

- The Video-Audio Fallback service not only ensures the user video experience but also maximises the operator revenue from video calls. If a video call fails because the called person is roaming in 2G network or has no video subscription, the call is redirected to the Video-Audio Fallback service that enables the caller to get connected with an audio call instead of video.



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Presentation name / Author



Video Call Completion Services

Video-Audio Fallback

- The Video-Audio Fallback service terminates the initial video call and starts a separate audio call to the called party.
- As the call from the calling party to the Video-Audio Fallback service remains as a video call, the service will stream operator defined content to the caller during the audio conversation.
- The content can be, for example, operator commercials, movie trailers or external commercials.
- When external commercials are used as the video content, the operator can resell the media time for external companies.
 - The alternative is to use the media time for other promotion or just for providing the caller a superior video user experience.
- The calling party is given an option to activate the service and have the call to the service as a video call.
 - This enables the operator to charge premium for the service compared to normal audio calls.

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Video-Audio Fallback

Service Access

- The Video-Audio Fallback has two complementary service scenarios:
 - Incoming video calls to home network subscribers
 - Outgoing video calls from home network subscribers to external network subscribers

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Video-Audio Fallback

Service Access

- If the call failed because the called person is e.g. roaming in 2G network or has no video subscription, the caller can view/hear following prompt:
“The person you tried to contact is not able to take video calls at the moment. To connect the call as voice call, press 1, or just disconnect the call.”
- The prompt contents are configurable per different redirection reason received from the network

Video-Audio Fallback

Service Access

- With outgoing video calls from home network subscribers to external network subscribers, the Video-Audio Fallback can be offered as a standalone service for calls that are not terminated at the external network.
 - This enables subscribers to establish video calls to any number, also to non-video numbers and fixed networks.
 - It also increases the number of successful video calls, and thus creates more chargeable originating video calls.

Video-Audio Fallback

Failed Audio Calls

- When connecting the call as audio, it is still possible that the called party may not be reached with audio. There can be various reasons for this, for example:
 - The called party does not answer the audio call
 - The called party is busy
- Providing that the call is not terminated to other call completion services for voice calls (such as the traditional voice mail), the caller can be informed of the reason why the call failed, and offered the option of leaving a video message.

*"The person you called does not answer your call.
You can still leave him or her a video message."*



Video-Audio Fallback

Service Activation

- The Video-Audio Fallback option is provided only to call cases where the called party has been not available to receive video calls due to roaming in 2G network or because there is no video subscription.
 - The call redirection or routing is handled by the MSC or IN services and there may be differences in the features available in the networks of different MSC suppliers.
- A typical way to implement the call routing is by using the end of selection services in MSCs, which are normally used as a last resort number analysis when there is no other way to redirect or reroute the call.
 - End of selection is typically used for connecting the call to the announcement service.

Video-Audio Fallback

Video Content Uploading

- The authorised persons in the operator's organisation can upload new content to the service by using web-based administration tools provided by Tecnotree.
- The file format for the content is .3gp.
- The files used for streaming content to the calling party should not include sound track as this may disrupt the voice conversation.

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Presentation name / Author



Transfer to Operator support

Transfer to Operator support is a service where the visitor is able to transfer a call to an operator helpdesk number during deposit. The caller invokes the feature with a key press.

A system prompt notifies the caller about this option after the greeting and before "the beep" (if the feature is active). The forwarding number is provisioned on a CoS basis by the system administrator and is not changeable by the mailbox owner.

Transfer To Operator is a special case of Outcall. The mailbox owner has the possibility to toggle the feature on/off on a CoS basis.

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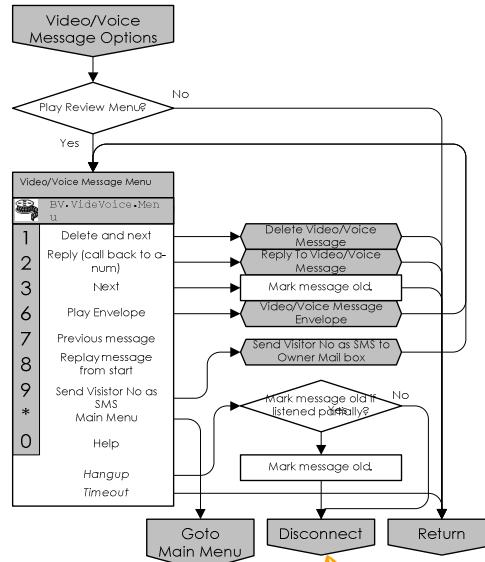
Presentation name / Author



Mailbox visitors number as SMS

A mailbox owner retrieving a message shall have the possibility to have an SMS sent to himself/herself with the CLI of the person that deposited the message.

The sending of the SMS is triggered by the owner pressing a key on his/her keypad while listening to the message.



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Forward Message

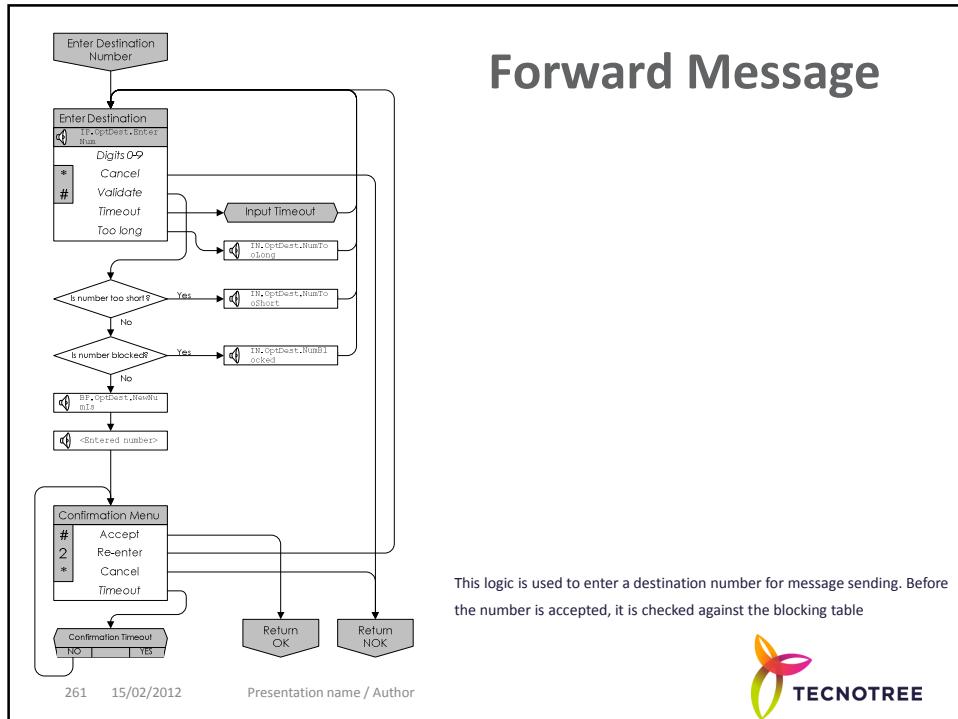
The TUI offers an option to forward message to an other mailbox. No option to forward to phone number or no distribution to group of people available

- Forward message can operate only system inside. Meaning forwarding can be done in same node only.
- There is a normal notification process done after generating message to box.
- Box needs to exist. ASC can't be used. Only existing box in same system node can be forward target.
- Forward Message event should generate call log with specific Call Type CDR can be then generated for this CT so operator will be able to bill the subscriber who forwarded the message. Number to be used as visitor (or A number) in call log should always be the box owner who forwarded the message

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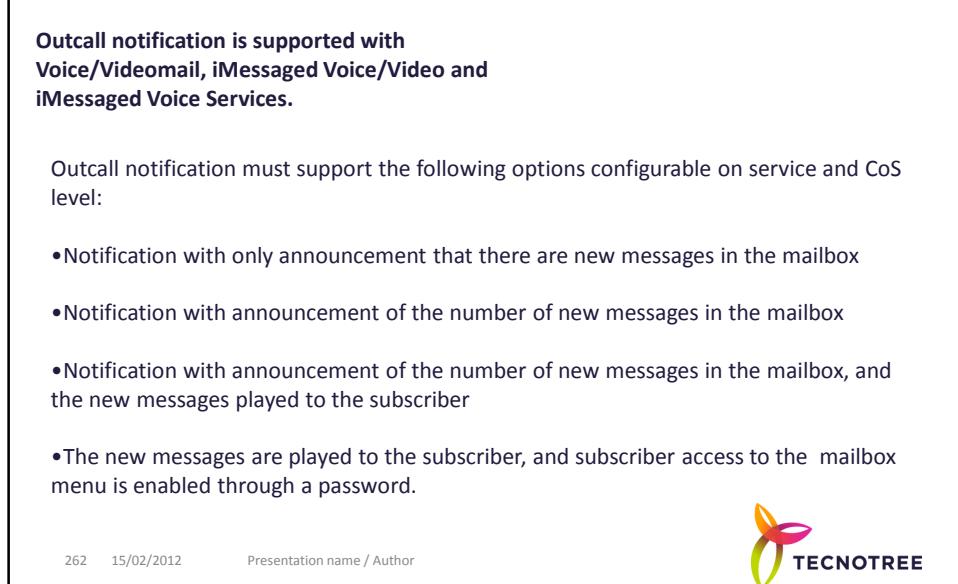


Outcall Notification

**Outcall notification is supported with
Voice/Videomail, iMessaged Voice/Video and
iMessaged Voice Services.**

Outcall notification must support the following options configurable on service and CoS level:

- Notification with only announcement that there are new messages in the mailbox
- Notification with announcement of the number of new messages in the mailbox
- Notification with announcement of the number of new messages in the mailbox, and the new messages played to the subscriber
- The new messages are played to the subscriber, and subscriber access to the mailbox menu is enabled through a password.



Outcall Notification

Outcall notification supports timer based retries. It must be possible to configure on service level both

- The max. number of retries, and
- The delay/time between retries.

You can to configure the following notification options/combinations for subscribers on service and CoS level:

- Outcall notification only
- SMS notification only
- Combined outcall and SMS notification (if outcall notification is not successful after max. number of retries, SMS is sent)

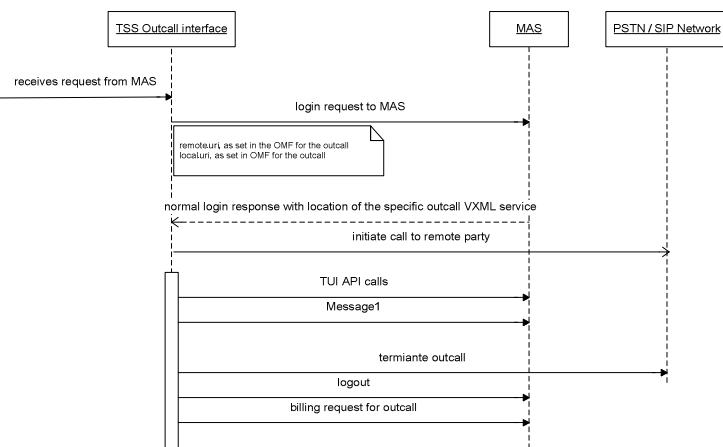
Outcall notification and SMS notification are done/sent to the same telephone number.

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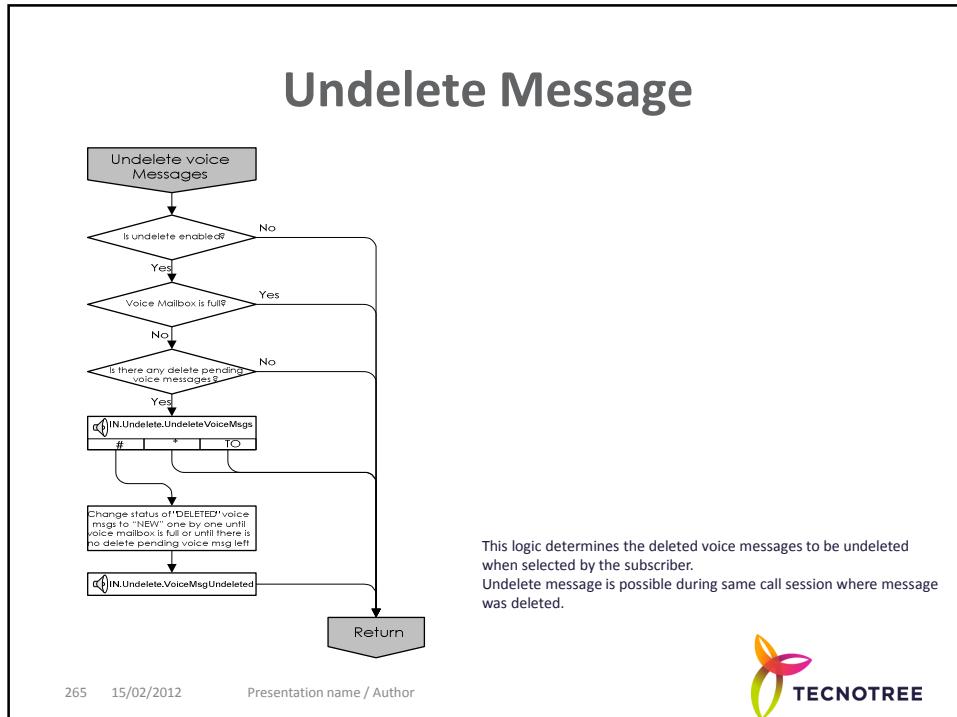
Outcall Notification



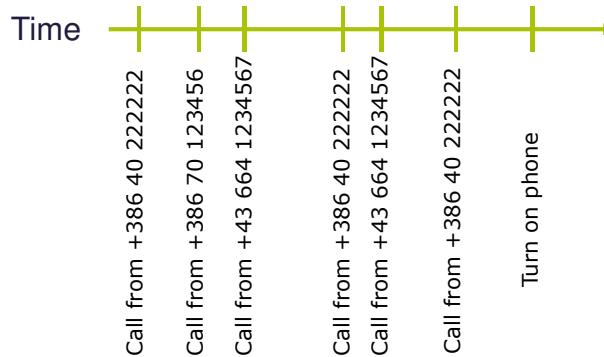
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Call scenario



MCN SMS aggregated option

- Aggregated mode

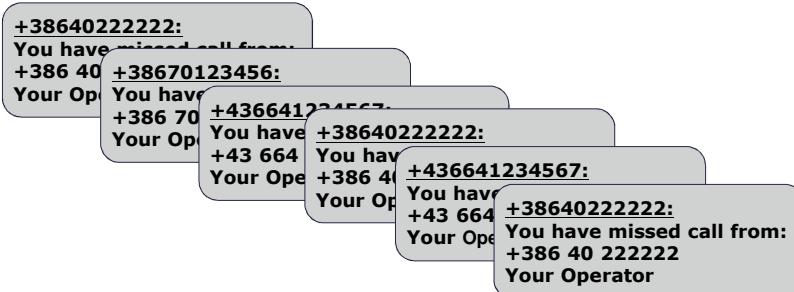
- **Alphanumeric** service address or number as sender address, e.g. „Who Service 444“
- Replace mode: configurable
- Only 1 message will be sent with complete list of all missed call information
- Call information list clearing: configurable
 - List cleared after successful delivery
 - List not cleared, information for latest calls/callers displayed
- Use of long/concatenated SMS: configurable

Who service 444:
You have missed calls from:
+386 40 222222 (3),
+386 70 1234567 (2),
+43 664 1234567 (1),
Your Operator



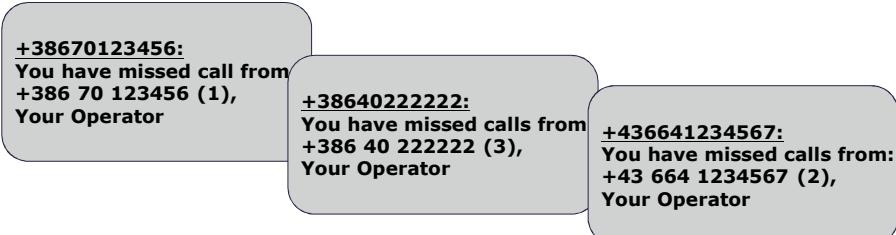
MCN SMS non-aggregated option 1

- Non-aggregated mode 1
 - A-number as sender address, e.g. +386 40 222222
 - Replace mode: no
 - Separate SMS notification per each call



MCN SMS non-aggregated option 2

- Non-aggregated mode 2
 - A-number as sender address, e.g. +386 40 222222
 - Replace mode: yes
 - Separate SMS notification per each caller/A-number
 - Each notification SMS includes information of all calls from the same caller/A-number



New: Dynamic MCN SMS Aggregation

- Service switches automatically from non-aggregated SMS format to aggregated (list) mode after a configurable threshold based on the used non-aggregated mode
 - Non-aggregated mode 1:
 - Switched to aggregated mode after sending N separate MCN SMS
 - Non-aggregated mode 2:
 - Switched to aggregated mode separate MCN SMS for N different callers/A-numbers
- N is configurable between 1...10
- Switch back to non-aggregated mode automatically after successful delivery of aggregated MCN SMS
- Call information list clearing is based on the aggregation (list) mode setting.
 - List clearing affects non-aggregated notification as well, i.e. all call counts are cleared



New: Dynamic MCN SMS Aggregation

+38670123456:
You have missed call from:
+386 70 123456 (1),
Your Operator

+38640222222:
You have missed calls from:
+386 40 222222 (3),
Your Operator

+436641234567:
You have missed calls from:
+43 664 1234567 (2),
Your Operator

Who service 444:
You have missed calls from:
+43 664 1234566 (1)
+386 70 123456 (2),
+386 40 222222 (3),
+43 664 1234567 (2),
Your Operator

Miscellaneous

- Successful delivery of non-aggregated MCN SMS nulls the threshold counter.
- When switching to the aggregated mode the previously sent non-aggregated MCN SMS notifications have not been delivered to terminal but are waiting in either ISMSC or ESMSC buffer
 - The pending MCN SMS messages must be cancelled/cleared from the SMSC
 - Note: The pending MCN SMSs have different sender numbers/IDs
- The service must support parallel two different MCN SMS notification templates
 - Aggregated and non-aggregated MCN SMS
- Support for alphanumeric SMS sender address required



Announcement-Only Mailbox

In Net-Voice Mailboxes (sometimes referred to as Announcement-Only Mailbox or Dialogue Mailbox) an announcement is played but messages can not be deposited. It shall be configurable how many times the announcement is repeated and the time between repeats.

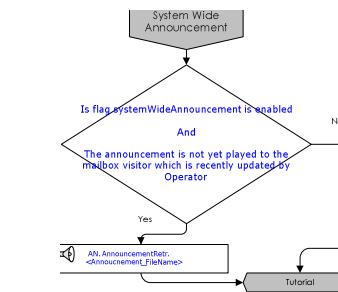
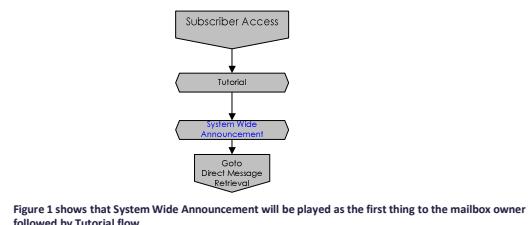
The Net-Voice Mailbox is typically used for subscriber numbers that have become vacant and the caller is given an option to be transferred to the new number. Therefore Net-Voice Mailbox is a "Transfer call" function with the new number being provisioned as transfer number. The activation of this "Transfer Call" function is configurable.



System Wide Announcements

The NGM system supports system wide announcements. These announcements are recorded by the system administrator and played once as the first thing when a mailbox owner enters the mailbox.

The use of this announcement shall be configurable via TOM on a CoS basis.

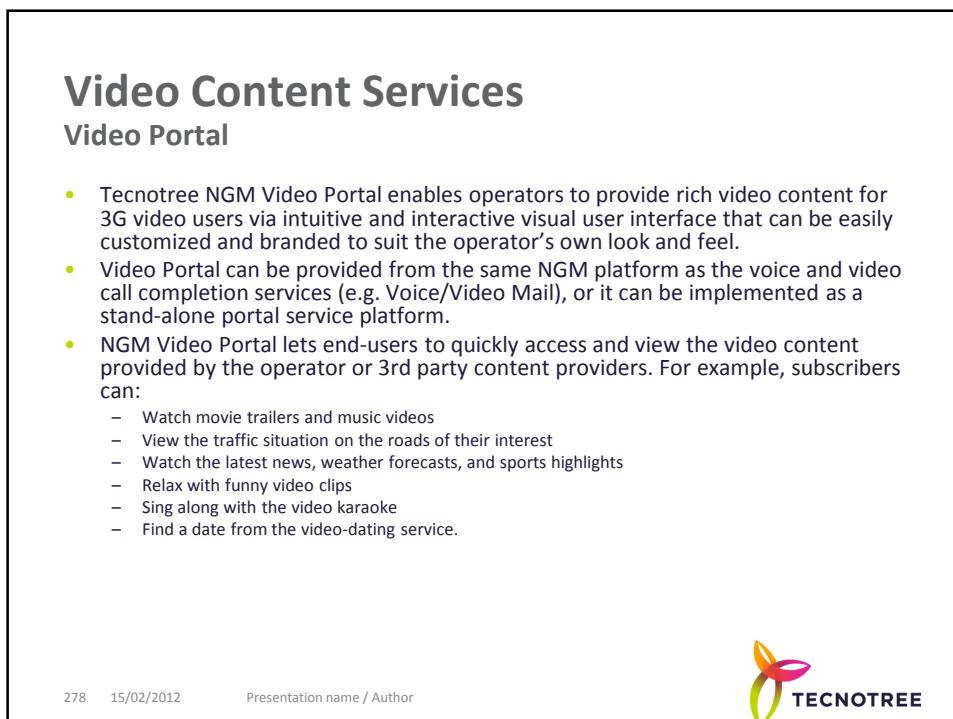


Pre-prompt Announcement

If a subscriber calls to retrieval short code (122) and does not yet have a mailbox, the service will ask whether subscriber wants to have subscription created.

If subscriber chooses to have the subscription, it will be created and service proceeds to main menu.

If subscriber chooses not to have the subscription, then prompt is played and call is disconnected



Video Portal

Service Access

- The Video Portal service is accessed by making a video call to a service number. There can naturally be different Video Portal services with differentiated video content behind dedicated service numbers.
- Once the subscriber accesses the Video Portal service, he or she will be greeted with an operator-defined welcome prompt and instructed with options available via the visual user interface.
- Subscribers can traverse through the provided video menus and choose to view the video content of interest. Each video stream can be stopped with a press of a button to return to the menu for further selection.



Video Portal

Service Access

- Utilization of VoiceXML based logic ensures high quality and low costs in the user interface design and high user satisfaction.
- An interactive conversation between the end-user and Video Portal is enabled via DTMF.
- Several content levels are enabled and limited in practice by the keypad capabilities provided by 3G handsets.
 - Thus, typically up to 10 choices (i.e. digits from 0 to 9 to choose from) can be enabled at each level of the content menu hierarchy.



Video Portal

Video Content Uploading

- NGM Video Portal provides different means for video content storage and delivery:
 - File based
 - RTSP streaming
 - HTTP streaming
- File based content provides access to offline video content files that are uploaded, stored in the NGM, and streamed to the end-user depending on the selection.
- Video content files can be managed using Web based graphical user interface provided as part of the solution.
- The file format for the content is 3gp, the 3GPP standard supported by all the 3G terminals.
- Online video streams can be provided via RTSP and HTTP streaming linked to the Video Portal VoiceXML scripts.
- Links are as URLs and direct the requests to the content provided by the external streaming server (e.g. Real Networks Helix).
- Streaming server enables providing the video streams from live web cameras (e.g. traffic cameras) connected to the Internet, for example. NGM Video Portal provides a visual end-user interface for the dynamic content available.

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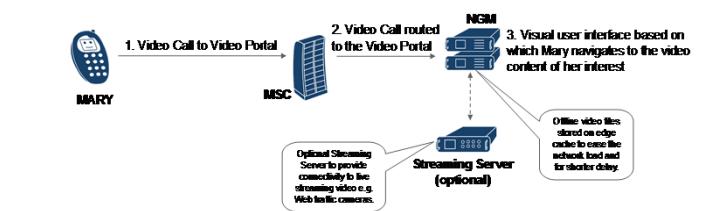
15/02/2012

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Video Portal

Video Content Uploading



- NGM Video Portal comes with a Video Portal service example with VoiceXML scripts which can easily be modified to meet the exact requirements of the operator, and deployed to be utilized by the entire subscriber base.
 - To enable easy service customization, the solution comes with VoiceXML documentation and VoiceXML tag reference guide illustrating the capabilities available.
 - Separate portals can easily be created on the same NGM platform for different market segments with specific content needs.

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Short Media Messaging Services

iMessaged Video

- The Tecnotree iMessaged Video is a service in which the caller can send a short video message (for example, a reminder) to someone else without engaging himself/herself into the discussion. The iMessaged service concept is very similar to Short Messaging but instead of typing, the message is recorded and then delivered to the other party.

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iMessaged Video

- The message sending is very easy:
 1. Subscriber dials a '*' followed by recipient's mobile number and leaves a video message. The call is automatically released.
 2. An SM notification is sent to the recipient informing him/her that a new message is waiting with instructing how to retrieve it.
 3. The recipient dials in to the access number and views the video message.

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iMessaged Video

1.



2.



3.



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iMessaged Video

- **Direct Deposit:**

- With the direct deposit feature it is possible to call directly to the iMessaged service without engaging the recipient into the discussion. This is convenient for leaving short reminders or greetings to the recipient.
- The direct deposit is made by dialling a fixed prefix before the recipient's MSISDN. The operator network needs to recognise the prefix, and route the call directly to the iMessaged service platform. The direct deposit is possible only for the subscribers in the operator's own network, but the recipient can be a subscriber in any mobile network nationwide.

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iMessaged Video

- **Greetings:**

- The iMessaged service features a standard system deposit and retrieval video greeting, manageable by the operator. Personal greetings are not needed, as the iMessaged service is not a call completion service.

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iMessaged Video

- **Temporary Storage for Messages:**

- The iMessaged service platform provides a temporary mailbox for depositing and storing the messages until they have been listened or viewed. The message saving time is configurable by the operator, and temporary mailboxes are automatically deleted from the system after the saving time expires.
- The operator can define the profile for the temporary mailbox. The maximum length, number and saving time for the messages can be freely defined.

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iMessaged Video

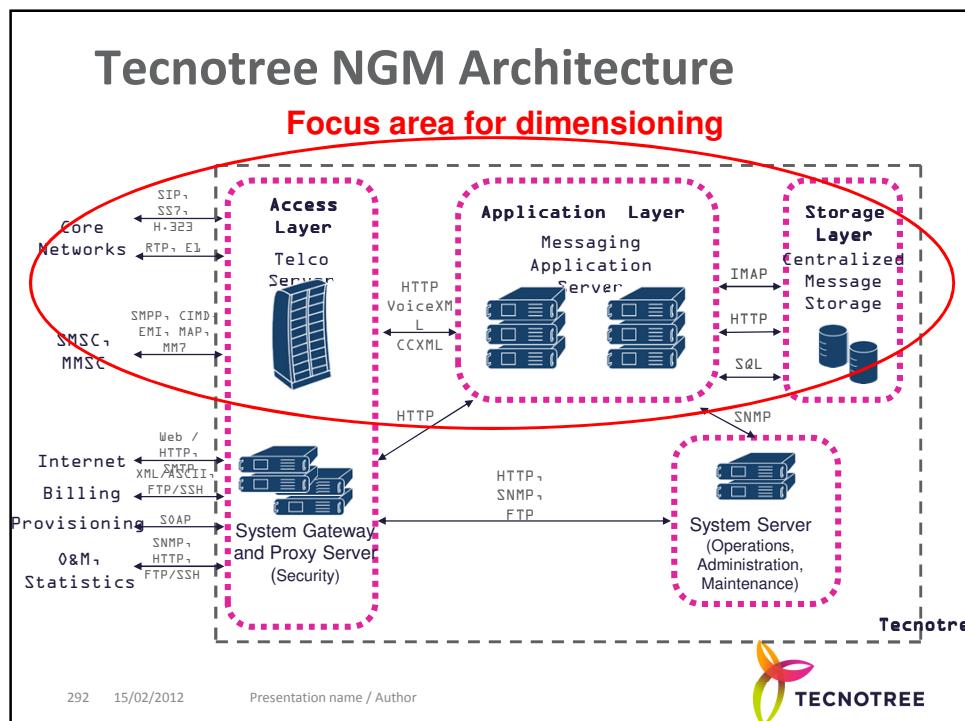
- **Notification:**

- The SM notification is a text message sent to the recipient's mobile phone. The text may include information about who left the message and when. The header of the short message (Sender field) includes the service number, which indicates that the SM notification came from the iMessaged service. By dialling the sender's number, the recipient makes a call to the iMessaged service to retrieve the message.

iMessaged Video

- **Retrieval:**

- While the recipient is listening or viewing to the message, he/she can activate the call back to the original caller. The system generates the video call, and after the call the recipient returns to his/her temporary mailbox.



NGM Dimensioning Principles

- The Telco Server dimensioning is based on the busy hour call rate and the average call duration. When using Integrated Short Message Service Centre (ISMSC) the generated SMS traffic needs to be taken into account also.
- The Messaging Application Server layer dimensioning is typically based on the maximum service transaction rate. This depends on the services in question, and the subscriber service and traffic profiles.
- The Centralised Message Storage dimensioning is based on the maximum message storage/retrieval rate, and the required overall storage capacity. These depend, again, on the services in question, and the subscriber service and traffic profiles.

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NGM Dimensioning Factors

- Access Layer
 - Erlangs (BHCA x ACHT / 3600)
 - Calls per second
 - Notifications per second
 - Application Layer
 - Calls per second – Service dependent
 - Notifications per second
 - MMS & e-mail forwards per second
 - Web accesses per second
 - Storage Layer
 - IMAP operations per second
 - Database operations per second
 - Storage Space
- (BHCA = Busy Hour Call Attempts
ACHT = Average Call Holding Time)

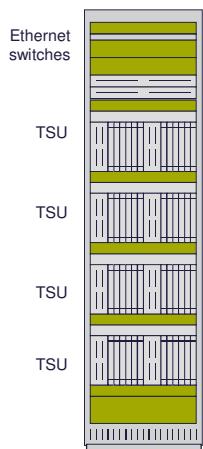
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Access Layer



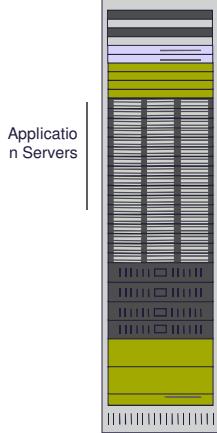
Service	Capacity	Description
Number of PCMs in TSS200 unit	Up to 32 PCM	4 E1s per IOP, up to 8 IOPs in one Telco Server Unit (TSUFB chassis).
Call rate per CPC	200 cps	
SS7 call rate per IOP server	25 cps	
SIP call rate per IOP server	25 cps	Used in NGM for video services to connect to the Video Gateway
SIP/RTP ports per IOP	120	1 port required for SIP voice call and 2 ports for SIP video call. Used in video services to connect to the Video Gateway.
Signalling links	16	16 links are supported per IOP, as well as one signalling point code per TSS200 unit.
Integrated SMSC (iSMSC)	25 SMS/s	
External SMSC without delivery reports	100 SMS/s	
External SMSC with delivery reports	30 SMS/s	

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Application Layer



Messaging Application Servers

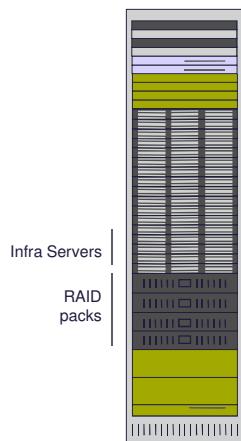
- Calls per second per server
 - Voice and Video Mail 15 cps (calls per second)
 - **iCalled Voice and iCalled Video 15 cps**
 - iCalled SM 25 cps
 - Video-Audio Fallback 25 cps
 - Video Portal 25 cps
- Minimum redundant configuration: 2 servers
- Scales by 1 server with almost linear capacity increase
- Maximum configuration: 12 servers in one system

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Storage Layer



Infra Server

- 30 IMAP transactions per second per server (for a Voice Mail type of service: deposit = 2 transactions, retrieval = 1, hangup/MCN doesn't load IMAP interface)
- Minimum redundant configuration: 2 servers
- Maximum configuration: 6 servers in one system

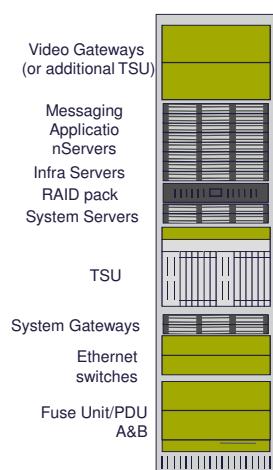
Common Storage

- Storage space
 - 1.75 TB gross storage capacity
 - ca. 1 TB net space for messages
 - Expandable to ca. 7 TB in 1.5 TB increments



NGM configuration example

Small Scale System



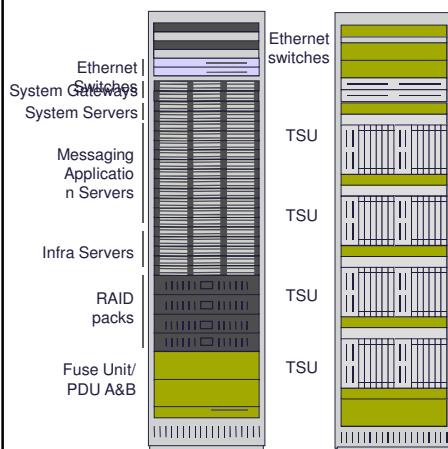
Small scale redundant one cabinet system

- Up to 90 Calls Per Second (e.g. Voice/Video Mail)
- Up to 150 Calls Per Second (e.g. iCalled SM)
- Up to 32 E1s or 960 VoIP ports or 480 video ports or a combination of these with one TSU
- 1 TB storage for messages
 - 69 000 hours of voice or 34 500 hours of video
- Supports up to 2 Million Voice Mail subscribers with a typical service profile



NGM configuration example

Large Scale System



Separate Telco Server and Application Server cabinets

- Up to 180 Calls Per Second (Voice/Video Mail)
- Up to 300 Calls Per Second (iCalled SM)
- Up to 128 E1s or 3840 VoIP ports or 1920 video ports or a combination of these with one Telco Server cabinet (four TSUs)
- 7 TB storage for messages
 - 480 000 hours of voice or 240 000 hours of video
- Supports up to 10 Million Voice Mail subscribers with a typical service profile

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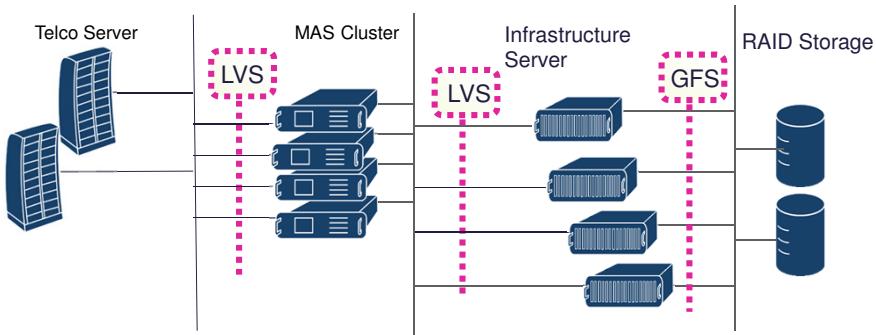
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Redundancy Aspects

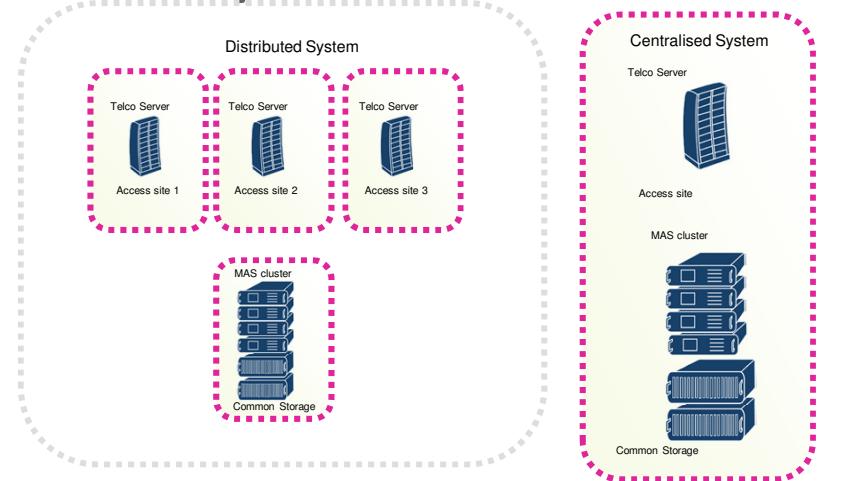


Reliability



→ If any of physical component in 3-tier architecture fails, service will continue (with less capacity)

Scalability



→ Distributed system comes normally in question
When operator wants to have TSSs in various geographical locations

Redundancy

Element or Unit	Main Task	Redundancy	Comments
IP Network	Connects different network elements together	2N	Redundant central switches and cabinet switches. Critical network elements have at least two Ethernet connections.
Proxy Server	Provides WWW accesses	N+1	When more than one server is used and one goes down, only capacity is decreased
System Gateway	Acts as a firewall in the NGM system	2N	Hot-standby
Telco Server Unit	Handles all signaling, switching and call processing from and to PSTN	2N, distributed	Hot-standby. Has two independent CPC cards running signaling information.

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Redundancy

Element or Unit	Main Task	Redundancy	Comments
System Server	Responsible for installation and some O&M functions	2N	Not a service-critical unit: if one is down, the systems function normally
Common Storage	Permanent storage	Redundant	Service-critical unit to subscribers. Has RAID 5 disks. Redundant controllers, FC connections and PSU's.
Application Server	Cluster running business logic	N+1	If one unit goes down, only capacity will decrease
Infra Server (Unit in MAS and / or CMS)	IMAP Server Database server	N+1 1+1, active-active	If one unit goes down, only capacity will decrease. Two parallel servers serving requests. Writes are parallel and reads are distributed. If one unit goes down, the read capacity will decrease.

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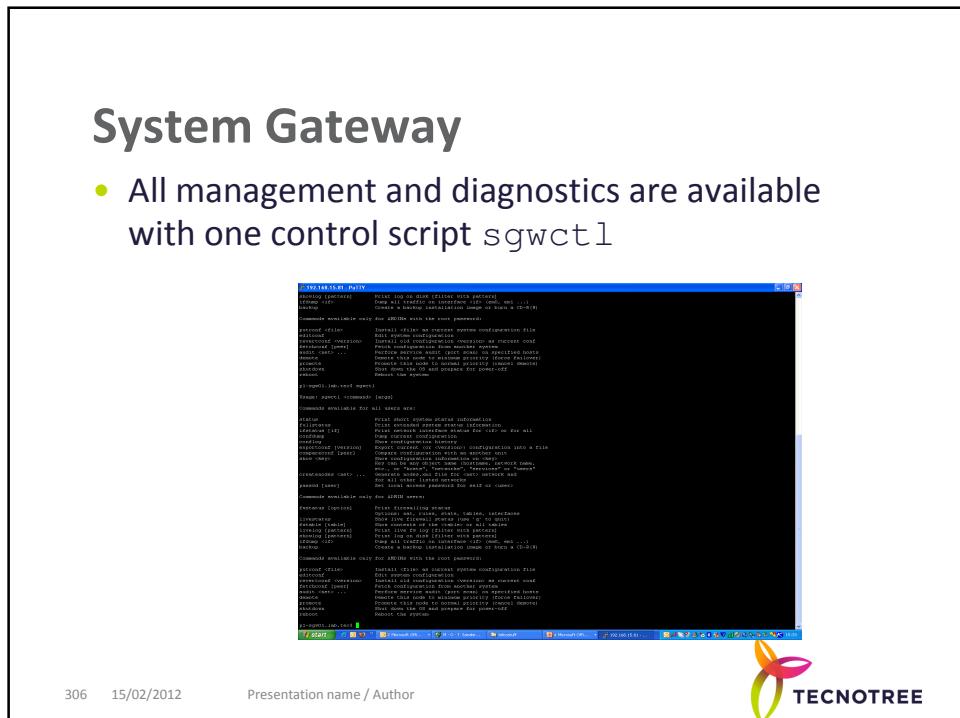
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Operating the System



SyGW sgwctl command access levels

- Available sgwctl commands depend of user's access level (USER, ADMIN, ADMIN+ROOT, Local ROOT)

sgwctl Command	USER	ADMIN	ADMIN+ROOT	Local ROOT
status	•	•	•	•
fullstatus	•	•	•	•
ifstatus	•	•	•	•
confdump	•	•	•	•
show	•	•	•	•
passwd	•*	•*	•	•
conflog	•	•	•	•

etc ...

SyGW Logging

- SyGW utilises standard Unix syslog facilities, /var partition of SyGW is used for logs
- System logs are mostly generated by syslogd, and they are stored to /var/log
 - Remote logging = System logs can be configured via UNCL-file, which modifies /etc/syslog.conf accordingly, to be forwarded to System Server
- Firewall logs are stored to /var/log/pflog, and they are generated by pflogd
 - Stored in binary format, since there can be even 100000 events/s in abuse situations, reading possible by tcpdump
- Log rotation is controlled by newsyslog

SyGW Alarms

- System Gateway can raise and clear SNMP alarms on some hardware and software faults.
- SNMP alarms are sent to SNMP trap server (normally System Server) configured via UNCL-file, which modifies `/etc/mysnmpserver` accordingly
- The alarm system supports the following alarms:
 - 15 minute CPU load average is above 2.7
 - CPU temperature is above 60C
 - Kernel static memory utilization is above 90%
 - Swap is more than 90% full.
 - Disk partition `/fill`, `/config`, `/home`, `/tmp`, `/usr`, or `/var` rate is above 90%
 - Ethernet interface is configured, but has no link.

SyGW Status Reporting

- You can obtain a short status report on the gateway by running the following command:
`$ sgwctl status`
 – The printout will look like this:

```
NGM System Gateway Status
=====
Node: p1-sgw01, Part of cluster: p1-sgw-vip01 11:25AM up 14 days, 34 mins, 1 user, load averages: 0.37, 0.42, 0.41
Status of cluster shared interfaces:
VHID VIPIF PRI REAL-IF STATE IP-Address  REAL-IF-STATE NETWORK
===== ====== ====== ====== ====== ====== ====== =====
 1  carp0  0  em0  MASTER 192.168.168.90  -active  intermed-net
 2  carp1  0  em3  MASTER 192.168.169.100  -active  Tecnotree-net
--- pfsync0 ---  em5  ---- 192.168.238.1  -active  sync-net
Latest configuration change: Jan 23 12:24
System Gateway Software Release: $Name: SGW_1-1a $
Operating System Version: OpenBSD 3.8 GENERIC#50
```

AS log files

- Most important log files in AS are server.log files that can be found from:
 - /usr/java/jboss/server/jboss-clustered/log/
- Apache web server logs can be found from:
 - /var/log/httpd
- Linux system level error messages can be found from:
 - /var/log/messages
- Load balancer log file can be found from:
 - /var/log/ldirectord.log
- High availability log file can be found from:
 - /var/log/ha.log

IS log files

- MySQL log file can be found from:
 - /var/lib/mysql/<hostname>.err
- Courier email server log can be found from:
 - /var/log/maillog
- Linux system level error messages can be found from:
 - /var/log/messages
- Load balancer log file can be found from:
 - /var/log/ldirectord.log
- High availability log file can be found from:
 - /var/log/ha.log

SyS log files

- Jboss server.log files can be found from:
 - /usr/java/jboss/server/jboss-clustered/log/server.log
- Other logs:
 - /var/log

Accessing databases

- The NGM5.1 system has the following databases:

Database	Running on	Used for
jalladb	Infra Servers (used by the Application Servers)	Main database for subscriber and service data and settings
sconfdb	System Servers	Used by the System Configurator Tool (SCT)
simppfdb	System Servers	Used for storing alarms and statistics
billingdb	System Servers	Used for billing data
tomdb	Infra Servers	Used for O&M

- To access a database, use the following command on the corresponding server:

```
mysql -ujboss -pjboss <DBNAME>
```

Using JMXCONSOLE

- The JMX console is used to set up debug level in AS, check AS alarms, and many other features.
- Useful JMX console commands are described in the following table
 - To open the JMX console with the web interface:
 - <http://<as-vip>:8080/jmx-console/>
 - Normally the port 8080 is blocked by SyGW, therefore you need to forward the port over SSH connection.

Command	Description
jmxconsole -h	Help information.
jmxconsole logging	Sets up the debug level.
jmxconsole alarms	Checks alarms.
jmxconsole -s <server_name> alarms	Checks alarms in the server.
SHIFT+Q	Exits the console.

void setDebugging()			
MBean Operation.			
Param	ParamType	ParamValue	ParamDescription
p1	java.lang.String	signalling	(no description)
p2	boolean	<input checked="" type="radio"/> True <input type="radio"/> False	(no description)
<input type="button" value="Invoke"/>			

Operating SyS

- The following are useful commands for SyS:

Command	Meaning
/etc/init.d/xjboss start stop restart	Starts/stops the Jboss application server.
ps ax less	Verify that the following processes are running: <ul style="list-style-type: none"> • Idirectord (only in active server) • heartbeat (ss01 and ss02) • java (jboss) • httpd.worker
rpm -q -a	Lists installed packages and their versions.
rpm -q -i Tecnotree-base	To check the platform SW version (see the Release and URL attributes).

Operating AS

- The following are useful commands for AS:

Command	Meaning
/etc/init.d/xjboss start stop restart	Starts/stops the Jboss application server.
ipvsadm -l	Gives a list of the currently active AS nodes. It works only on one node (px-as01 or px-as02, try to run on both).
ps ax less	Verify that the following processes are running: <ul style="list-style-type: none"> • ldirectord (only in active application server) • heartbeat (as01 and as02) • java (jboss) • httpd.worker
rpm -q -a	Lists installed packages and their versions.
rpm -q -i Tecnotree-base	To check the platform SW version (see the Release and URL attributes).
rpm -q -i ngmmas-ear	To check the MAS SW version (see the Release and URL attributes).

Operating IS

- Look for possible database errors from MySQL error logs.
- Detailed information about the GFS clustering, while it is running:
 - cat /proc/cluster/nodes
 - cat /proc/cluster/services
 - cat /proc/cluster/status

Operating IS

- The following are useful commands for IS

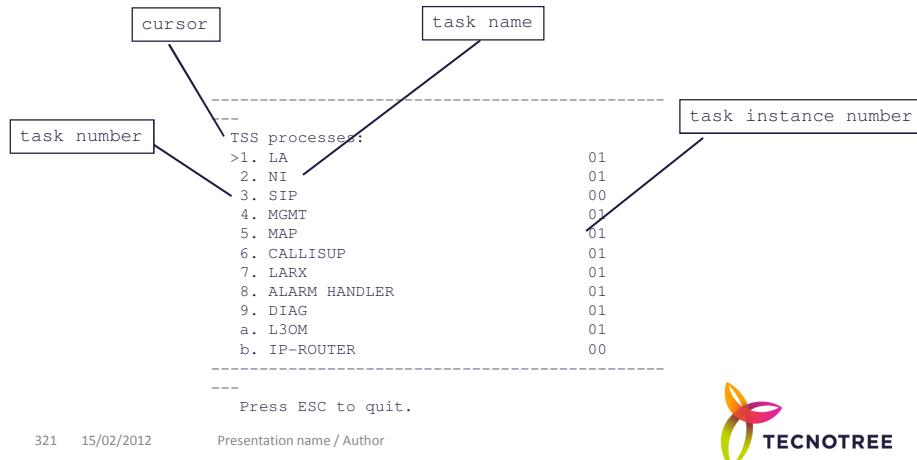
Command	Meaning
service mysql start stop	Starts / stops the mysql server.
service courier-imap start stop service courier-authlib start stop	Starts / stops the courier email server.
ipvsadm -l	Gives a list of the currently active IS nodes and their services. If there are four infra servers, is01 and is02 are serving database and is03 and is04 are serving email-server. There are separate load balancers for both server pairs. The command will only work on one node in each pair.
ps ax less	Verify that the following processes are running <ul style="list-style-type: none"> heartbeat createdird courier-imap MySQL Note that MySQL should only be running on the same node that gives 'ipvsadm -l' output.
mount -t gfs	Verify that the GFS file systems are mounted after a reboot (/usr/db/mail).
rpm -q -a	Lists all installed packages.
rpm -q -i Tecnotree-base	To check the platform SW version (see the Release and URL attributes)

Telco Server, O&M, TCattach

- TCattach* is the main tool for local task management.
- Login to IOP or CPC as **mmsadm** and type '**TCattach**'
- TCattach* is located in **/opt/xpu/bin** and can be simply started with just typing *TCattach* anywhere.
- TCattach* provides terminal interface to different SW in units. It shows a list of all current tasks.
- From the task window it is possible to change to a task in the list by pressing the number or character preceding the task name.
- From any task it is possible to change to another by pressing Ctrl-A followed by the task number or character. The task list window is shown with Ctrl-A followed by 0.
- You may exit TCattach by pressing CTRL-C in the main menu or in the window of any task. You may exit TCattach also by pressing ESC in the main menu.

Telco Server, O&M, TCattach

An example view of TCattach task list window on an IOP card.



Telco Server, O&M, xpu.rc

- *xpu.rc* is the startup and shutdown script for all the VBU tasks.
- It invokes all the individual task scripts according to the unit configuration.
- With *xpu.rc* you can start and stop all the unit tasks, as well as check the task status (is the task running or not).
- When *xpu.rc* is invoked without any arguments, it prints out the usage message; possible arguments are start, stop, status and restart. The *xpu.rc status* output of an IOP card is shown below.

Telco Server, O&M, xpu.rc

```
mmsadm@p26-vbul-slot2:~$ xpu.rc status
TC status: [ RUNNING
]
TT status: [ RUNNING
]
LA status: [ RUNNING
]
SRM status: [ RUNNING
]
SDS status: [ RUNNING
]
MC status: [ RUNNING
]
VXI status: [ RUNNING
]
DC status: [ RUNNING
]
MGMT is [ RUNNING
]
FRAMER_IF RX is [ RUNNING
]
FRAMER_IF TX is [ RUNNING
]
FRAMER_IF CPS is [ RUNNING
]
FRAMER_ERROR RX is [ RUNNING
]
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1
```



Machine to Machine Provisioning

- The Machine-to-Machine (M2M) provisioning interface is designed to allow external systems to interact with the NGM system without human interaction
- The M2M provisioning interface is provided for an external operator machine to maintain subscriber accounts and to provision them the NGM services. The interface enables to perform the following operations:
 - create a subscriber
 - modify an existing subscriber
 - delete an existing subscriber
 - search subscribers



Machine to Machine Provisioning

- The protocol of the M2M provisioning interface is SOAP messages. For further information on SOAP, see <http://www.w3.org/TR/2003/REC-soap12-part0-20030624/>
 - SOAP is a standard for exchanging XML-based messages over a computer network, normally using HTTP. For further information on XML, see Extensible Markup Language (XML) 1.0 (Second Edition), W3C Recommendation 6 October 2000, <http://www.w3.org/TR/2000/REC-xml-20001006>
 - The M2M provisioning interface requests are routed internally in the system to a Messaging Application Server (MAS) cluster. The exact URL of the HTTP interface is defined when the system is deployed.
- See document 'Machine-to-Machine Interface Description' for detailed M-to-M parameters and provisioning examples

Alarms and Statistics

- The network elements of the NGM system provide alarms and statistics using SNMP.
 - Simple Network Management Protocol (SNMP) is a widely used UDP-based protocol for monitoring the health and welfare of network equipment.
(UDM = User Datagram Protocol. By Using UDP, programs on networked computers can send short messages known as *datagrams* to one another)
 - In the NGM system, the internal communication protocol is SNMPv2c (rfc1901).
 - The alarms from nodes are sent (SNMP trap operation) to the System Server, which stores and optionally forwards them to a foreign NMS (NMS = Network Management System). SNMPv2c or SNMPv3 (rfc2571) are available for this function.
 - Statistics are collected (SNMP get operation) from all registered nodes by the System Server.

Alarms and Statistics

- Both alarms and statistics are stored to a local System Server database.
- From statistics, also aggregated reports are generated.
 - The aggregated statistics report is based on statistics SNMP variables and it contains a subset of all statistics defined in the SNMP interface.
 - The aggregation procedure derives extra information based on the collected time series.
 - Adding variables from the SNMP interface to the report is easy and can be done by request.

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Alarms and Statistics

- Alarm and statistics variables are defined using a set of MIB (MIB = Management Information Base) files. Each MIB follows ASN.1 notation. The alarms follow IETF recommendation (Alarm Reporting Function - X.733).
- The file Tecnotree-SMI.mib defines the root of the MIB addresses of Tecnotree. The number 2451 is the enterprise address of Tecnotree.
 - Thus the root of all Tecnotree MIB addresses is 1.3.6.1.4.1.2451.

OID	Object identifier	Description
..2451.7	tecMgmt	Contains management MIBs from functional view.
..2451.8	tecEntityExp	Contains management MIBs from physical view - EXPERIMENTAL.
..2451.9	tecMgmtExp	Contains management MIBs from functional view - EXPERIMENTAL.

... etc

→ See document
'Alarms and
Statistics, Interface
Description', for
detailed MIB
description of
Alarms and
Statistics Objects

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Alarms and Statistics

Aggregated Statistics Report

- The aggregated statistics report is generated by using the collected SNMP statistics data from the local System Server database.
 - The aggregated time series data consist of the following:
 - role of the node (e.g. as-role)
 - name of the node (e.g. p1-as01)
 - IP address of the node (e.g. 192.168.169.181)
 - timestamp
 - variable name (e.g. cpuUsage), which corresponds with the OID name of the SNMP object
 - variable value, which can be of the type *snapshot*, *differential* or *cumulative*, computed using the collected SNMP values as a basis.
 - The details of how the time series is presented depend on the report format (XML/CSV).

→ See document 'Alarms and Statistics, Interface Description', for detailed Aggregated Statistics Report description

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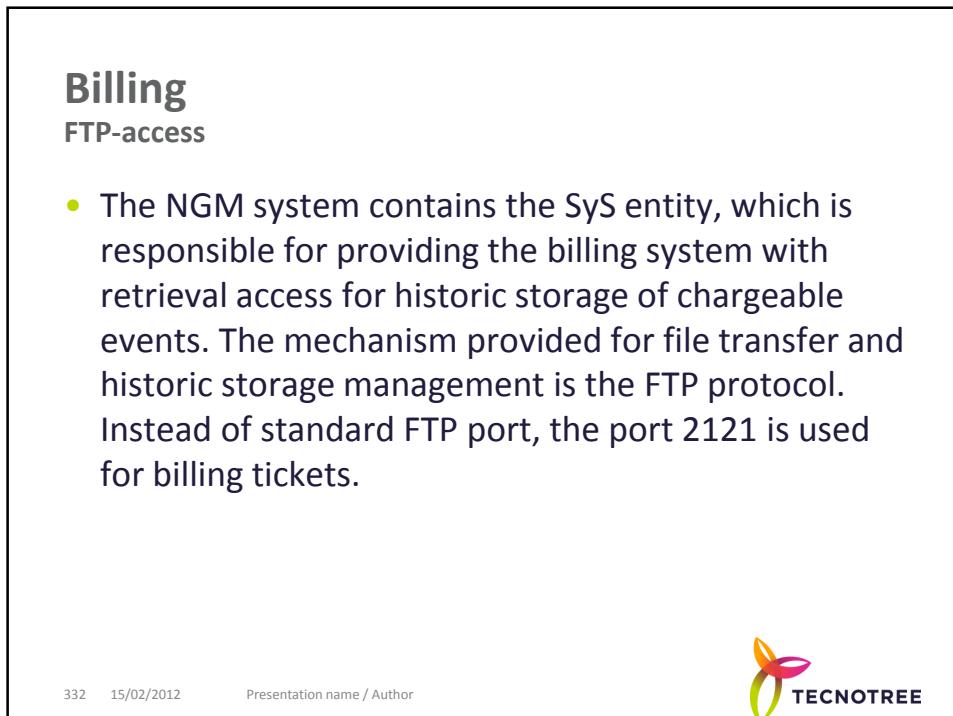
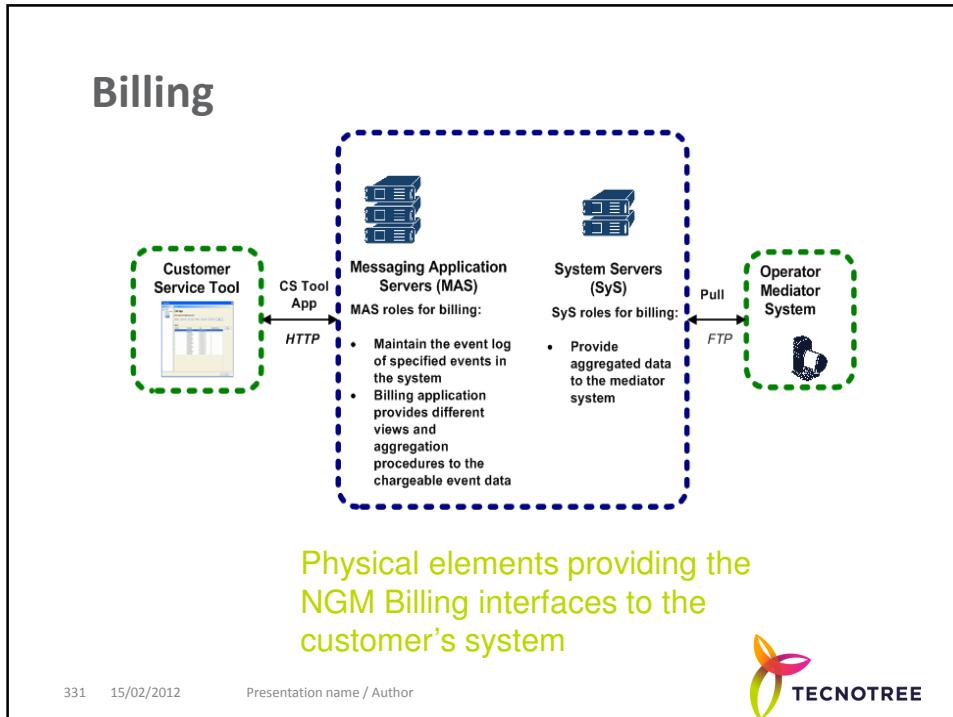
Billing

- The Next Generation Messaging (NGM) Billing system generates billing information for charging and analysis purposes.
 - The billing information is aggregated from the NGM system using chargeable events, and those events are converted into suitable presentation for mediation and system monitoring purposes.
 - Chargeable events are produced on the specified events within the application.
 - Chargeable events contain relevant information in order to produce sophisticated statistical analysis, debugging information, and charging information from the system usage.

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Billing

FTP-access

- CDR files are available via FTP but they do not exist as concrete files on the System Server. After a successful FTP login, change into subdirectory billing.
- Batch file names are in the following format:
- billing-yyy-MM-dd-HHmm.txt
- Batch files are created every 10 minutes. The maximum batch file size is 1 MB and if this limit is exceeded, multiple files are created.
- Chargeable event batch file housekeeping period is **one month**. Files older than one month are permanently deleted.
- After a successful fetch of a ticket batch, it is automatically renamed. The file names suffix is changed from .txt to .trans.

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Billing

FTP-access

- CDR storage is meant only for the billing information storing. Therefore it cannot be used as a generic FTP server.
- The following is supported:
 - listing existing files
 - downloading them
 - FTP passive mode must be used

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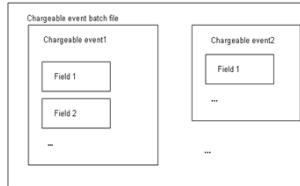
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Billing

Event Content

- All specified events in the NGM system are gathered into chargeable events, which are combined into a chargeable event batch file to chargeable event historic storage.
 - They are accessible from the Customer Service Tool call log view.
- A call type of a chargeable event is used to identify different types of charging records.
 - The call type allows the operator's billing system to separate different chargeable events and apply, for example, different charging methods or rates to them.
- Each chargeable event contains a set of fields.
 - Fields contain necessary information to identify call details for charging, statistical analysis, and debugging purposes.
- Chargeable events that arise during one phone call or a web session include a session identifier, which can be used to collate tickets belonging to the same call/session in the operator's billing system.



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Billing

Event Content

- Detailed Description of Chargeable events and fields inside events, is available in document 'Billing Interface, Interface Description'

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Billing

CDR Formatting

- The CDR output format is XML. You can choose the chargeable fields shown in them.
→ Selection of fields happens via TOM-tool

```
<?xml version="1.0" encoding="UTF-8" ?>
<cdrbatch>
<cdrrecord>
<calledAddress>2000</calledAddress>
<callingAddress>358401234567</callingAddress>
<callingAddressPrivate>false</callingAddressPrivate>
<callType>47</callType>
<creationTimeMillis>1158158351564</creationTimeMillis>
<disconnectionType>0</disconnectionType>
<domainId>0</domainId>
<eventTimeMillis>1158159239000</eventTimeMillis>
<originalCalledAddress />
<otherNumber>358401234567</otherNumber>
<otherNumberPrivate>false</otherNumberPrivate>
<ownerNumber>358405452154</ownerNumber>
<redirectingAddress>358405452154</redirectingAddress>
<redirectingAddressPrivate>false</redirectingAddressPrivate>
<sessionId>0819988983C1E67F605EF33CAB6C</sessionId>
</cdrrecord>
</cdrbatch>
```



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O&M Tool Practice



The Structure of TOM

- Tom has three components:
 - Tom client,
 - Tom proxy
 - and "the server side".
- Tom client is the UI.
- The client talks to the proxy over Spring HTTP remoting.
- The proxy forwards these HTTP requests (as another Spring HTTP remote call) to the server side depending on the nature of the request.
- For example, if the request is a call to the alarms facade, the request is forwarded to the system server.
- If the request is a call to the subscribers facade, the request is forwarded to the messaging application server (mas).

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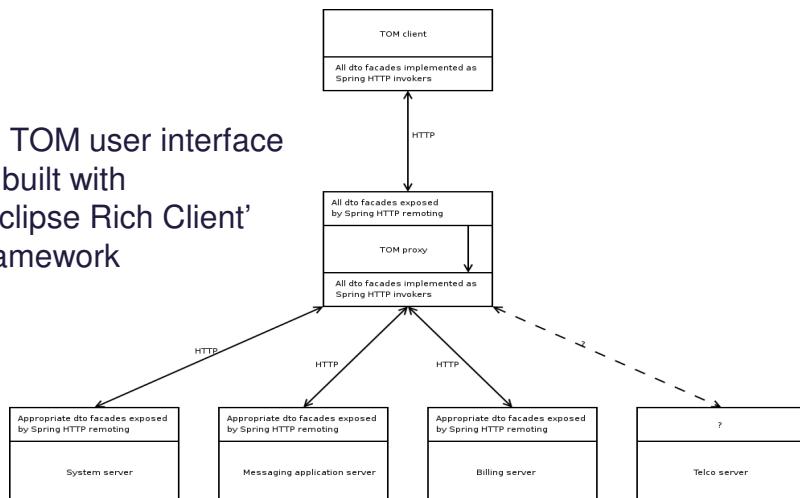
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The Structure of TOM

→ TOM user interface
is built with
'Eclipse Rich Client'
framework



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Setting up the O&M Tool

- Verify Operating System Requirements
- Verify System Requirements
 - Sun J2SE 5.0 needed
- Set up Security Requirements for the Client Machine



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Tecnotree NGM O&M Tool

- Intended for monitoring, managing and configuring the services running on the Tecnotree NGM platform
- The application is web-based and is used with a standard Java-compliant web browser

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O&M Tool



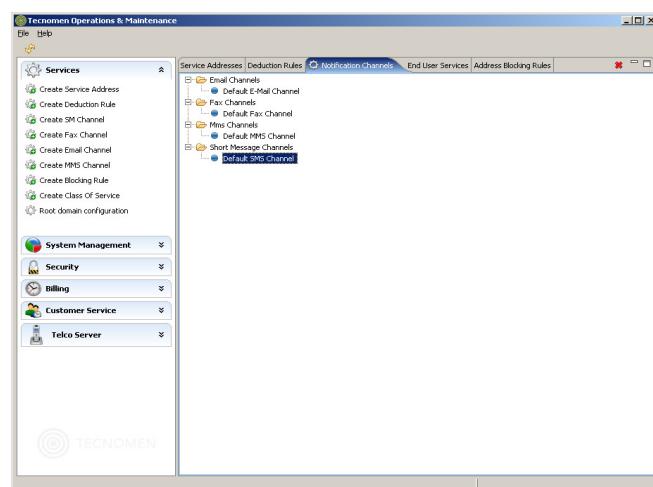
- Click **Launch Operations and Maintenance Application**.
- Log into the client by entering your username and password. Click **OK**.

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O&M Tool



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Perspectives

- O&M Tool can be navigated by switching between the seven main perspectives:



- Each perspective contains sub-views to control different functions related to the perspective

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Subscribers

Id	Segment	State
0401234567	Default	INACTIVE
358401111111	Default	INACTIVE
3580456399777	Default	INACTIVE
35807212646	Default	ACTIVE
358401111111	Default	INACTIVE
358401111111	Default	INACTIVE
358401111111	Default	ACTIVE
358401111111	Default	INACTIVE
436507777777	Default	INACTIVE
INRA_TEST	Default	INACTIVE

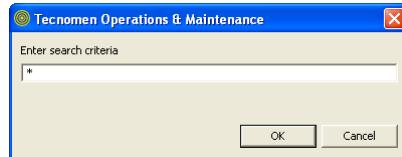
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Search Subscribers



- Enter search criteria
- Use * to replace characters

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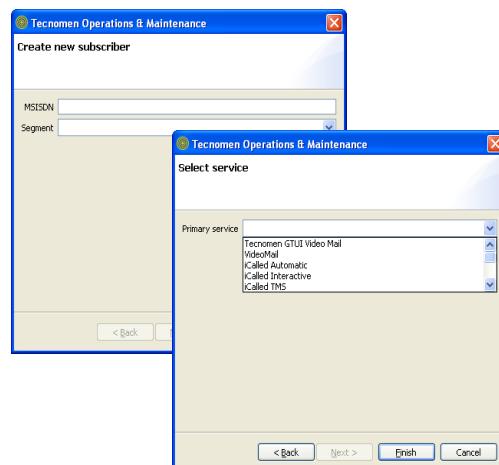
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Create a Subscriber

- Enter MSISDN and select Segment
- Click Next
- Select the primary service
- Click Finish



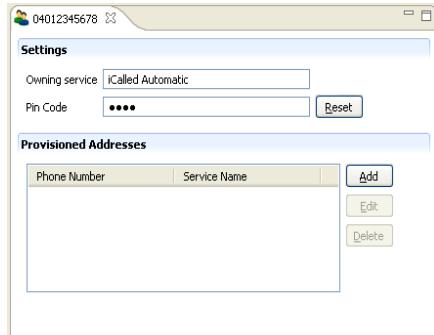
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Manage Subscriber Settings



- Reset the PIN code
- Manage provisioned addresses (add/edit/delete)

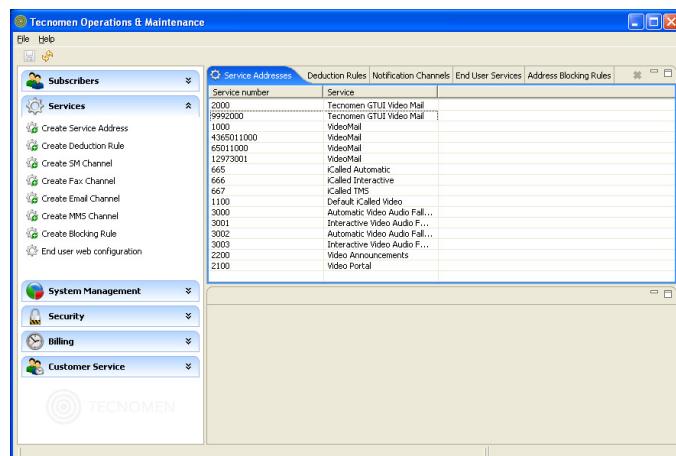
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Services



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Manage Service Addresses

Service Address

Settings

Service number: 2000

Service: Tecnomen Voice/Fax/Video Mail

Redirecting reason: ANY_CALL

Class of Service Settings

Enable or disable automatic subscriber creation (ASC). If ASC is disabled, callers without existing subscription are disconnected. Select class of service for new account subscription.

ASC Enabled

Class Of Service: (Default) Tecnomen Voice/Fax/Video Mail

- Create/edit/delete subscriptionless service addresses -> link the service to a service number



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Manage Deduction Rules

- Create/edit/delete deduction rules
- Deduction rules can be created and managed separately for each operator

Deduction Rule

Settings

Operator Name: Test

Service: Tecnomen Voice/Fax/Video Mail

Service Number Prefix: 99942

Personal Number Prefix: 99940

Class of Service Settings

Enable or disable automatic subscriber creation (ASC). If ASC is disabled, callers without existing subscription are disconnected. Select class of service for new account subscription.

ASC Enabled

Class Of Service: (Default) Tecnomen Voice/Fax/Video Mail



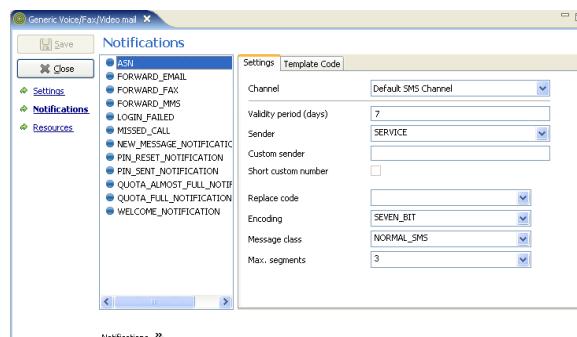
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Manage Notification Channels

- Create/edit/delete notification channels
- Four types of channels:
 - SM
 - Email
 - MMS
 - Fax



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Manage End-user Services

- Services:
 - Voice, Fax and Video Mail
 - iCalled SM
 - iCalled Voice
 - iCalled Video
 - Video-Audio Fallback
 - Video Portal
 - Video Announcements

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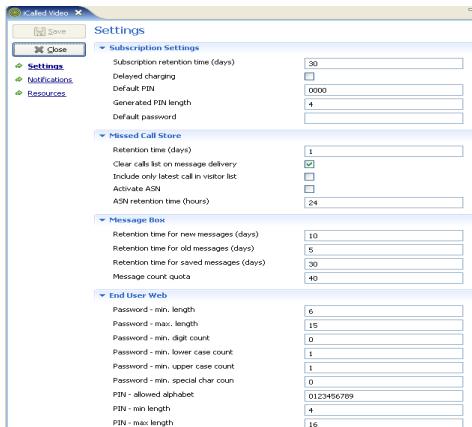
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Example of Service Management

- Manage settings for iCalled Video



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TECNOTREE

Subscription Settings

- Subscription retention time (days): 30
- Delayed charging:
- Default PIN: 0000
- Generated PIN length: 4
- Default password:

Missed Call Store

- Retention time (days): 1
- Clear calls list on message delivery:
- Include only latest call in visitor list:
- Activate ASN:
- ASN retention time (hours): 24

Message Box

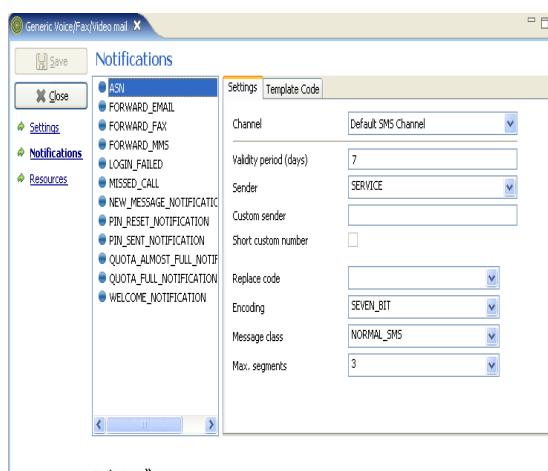
- Retention time for new messages (days): 10
- Retention time for old messages (days): 5
- Retention time for saved messages (days): 30
- Message count quota: 40

End User Web

- Password - min. length: 6
- Password - max. length: 15
- Password - min. digit count: 0
- Password - min. lower case count: 1
- Password - min. upper case count: 1
- Password - min. special char count: 0
- PIN - allowed alphabet: 0123456789
- PIN - min length: 4
- PIN - max length: 16

Manage Notification Templates

- Manage settings for notification templates related to services



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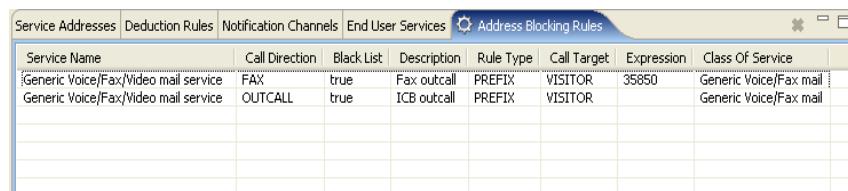
TECNOTREE

Notifications

ASN	Settings	Template Code
FORWARD_EMAIL	Channel: Default SMS Channel	
FORWARD_FAX	Validity period (days): 7	
FORWARD_SMS	Sender: SERVICE	
LOGIN_FAILED	Custom sender: <input type="text"/>	
MESSED_CALL	Short custom number: <input type="checkbox"/>	
NEW_MESSAGE_NOTIFICATION	Replace code: <input type="text"/>	
PIN_RESET_NOTIFICATION	Encoding: SEVEN_BIT	
PIN_SENT_NOTIFICATION	Message class: NORMAL_SMS	
QUOTA_ALMOST_FULL_NOTIFICATION	Max. segments: 3	
QUOTA_FULL_NOTIFICATION		
WELCOME_NOTIFICATION		

Manage Address Blocking Rules

- Block a call to the system or from the system by defining address blocking rules



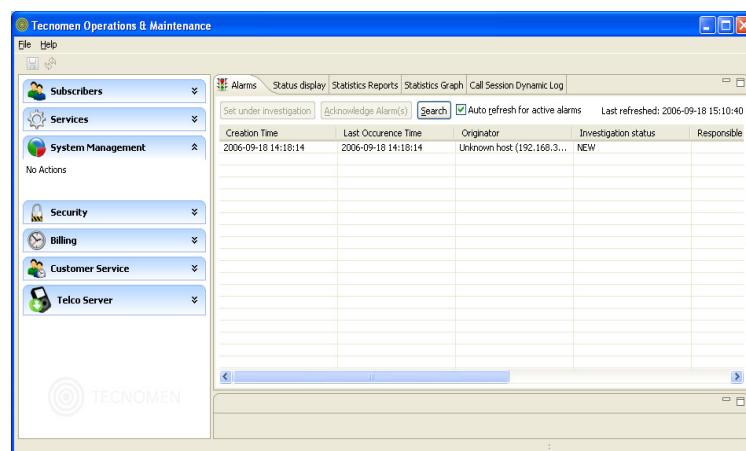
Service Name	Call Direction	Black List	Description	Rule Type	Call Target	Expression	Class Of Service
Generic Voice/Fax/Video mail service	FAX	true	Fax outcall	PREFIX	VISITOR	35850	Generic Voice/Fax mail
Generic Voice/Fax/Video mail service	OUTCALL	true	ICB outcall	PREFIX	VISITOR		Generic Voice/Fax mail

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System Management



The screenshot shows the Tecnomen Operations & Maintenance software interface. On the left, there is a navigation tree with nodes like Subscribers, Services, System Management (which is expanded to show Security, Billing, Customer Service, and Telco Server), and a 'No Actions' section. The main pane is titled 'System Management' and displays a table of alarms. The table has columns for Creation Time, Last Occurrence Time, Originator, Investigation status, and Responsible. One row is visible: '2006-09-18 14:18:14', '2006-09-18 14:18:14', 'Unknown host (192.168.3...', 'NEW', and an empty Responsible field. At the top of the main pane, there are tabs for Alarms, Status display, Statistics Reports, Statistics Graph, and Call Session Dynamic Log. There is also a search bar and a checkbox for 'Auto refresh for active alarms'.

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Manage Alarms

- Search and view alarms
- Set alarms under investigation
- Acknowledge alarms

Creation Time	Last Occurrence Time	Originator	Investigation ...	Responsible pe...	Severity	Description
2006-06-02 14:38:28	2006-06-02 15:12:57	Unknown host (192.168.0...)	NEW		MAJOR	No heart beat from host 192...
2006-06-02 13:52:48	2006-06-02 13:52:48	Unknown host (192.168.3...)	NEW		CRITICAL	Test

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Monitor the Node Status

- Every registered Tecnotree application sends status heartbeat of its status

Status	Name	Roles	Address	Time of Last Heartbeat	Time Since Last Heartbeat
OK	Name	Role1	127.0.0.1	2006-04-20 11:27:53	00:00:03
Heartbeat stopped	Name2	Role1, Role2	127.0.0.2	2006-04-20 12:27:53	00:10:03

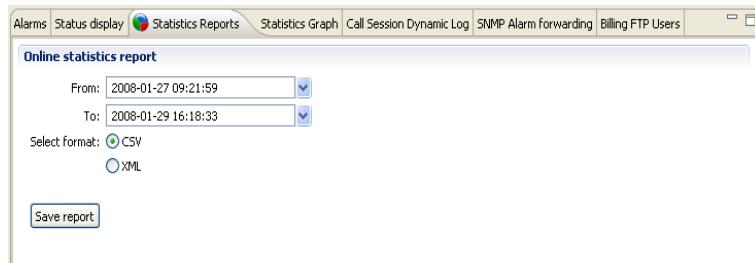
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Generate Statistics Reports

- View online statistics by generating reports in:
 - CSV format
 - XML format

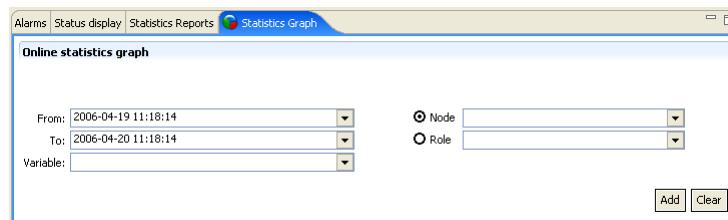


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Generate Statistics Graph

- View statistics in a graphical format

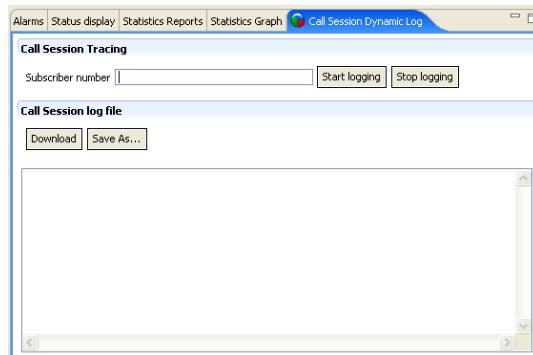


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Log Call Sessions

- Trace call sessions by logging

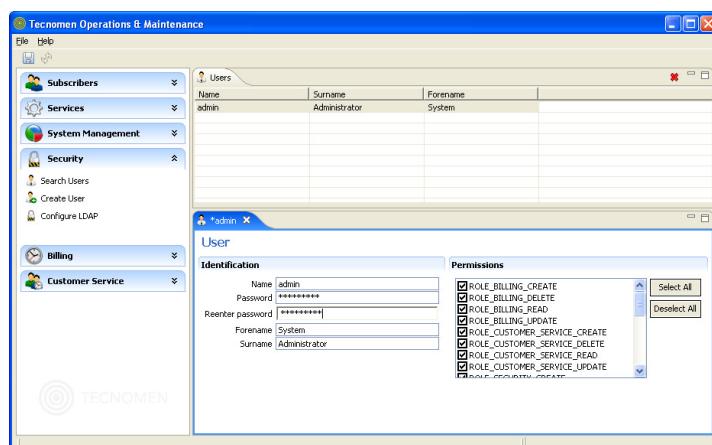


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Security



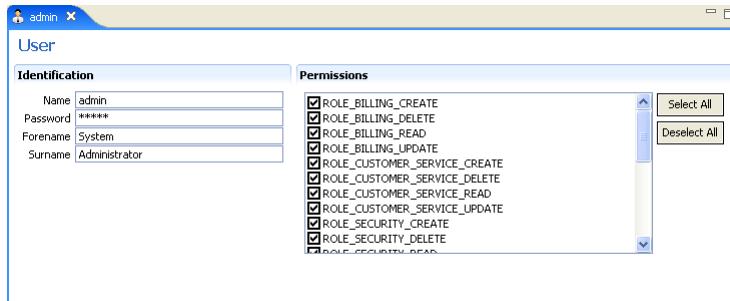
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Manage Users

- Create/edit/delete users
 - Manage user identification data and permissions for O&M Tool



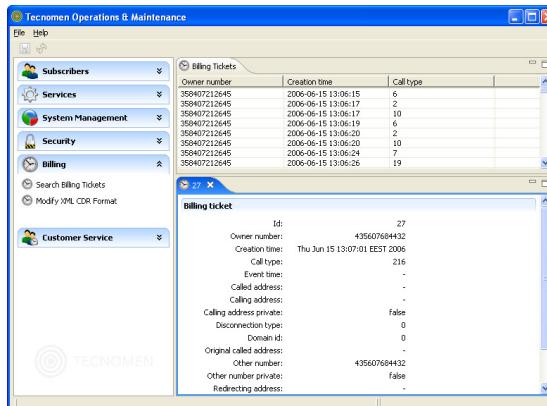
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Billing



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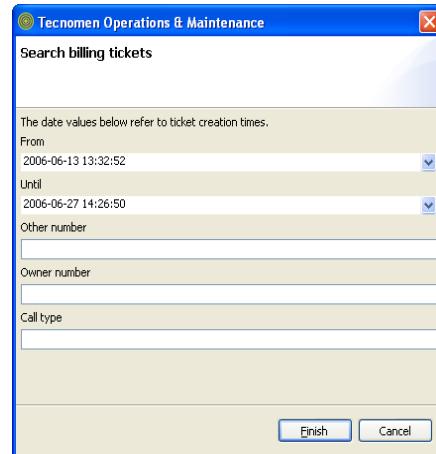
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Search Billing Tickets

- Search for billing tickets based on:
 - Date
 - Number
 - Call type



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Manage Billing

- View detailed information about billing tickets

Billing Tickets		
Owner number	Creation time	Call type
123456	1970-01-01 02:00:00	2
1234567	2006-04-20 11:45:11	3

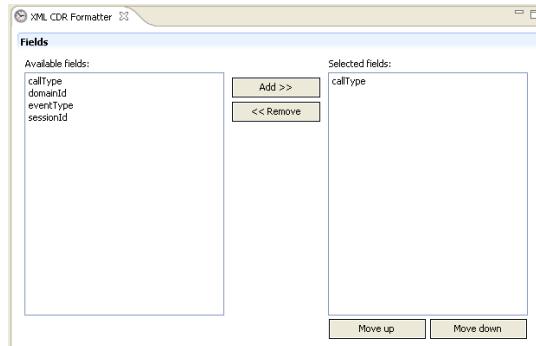
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Manage CDR Format



- Select the XML CDR fields and their order

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Customer Service Tool

- Tool intended for subscriber management for customer service agents
- Available:
 - via O&M Tool (the Customer Service perspective)
 - as its own application (CS Tool)

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CS Tool



- Click **Launch Operations and Maintenance Application**.
- Log into the client by entering your username and password. Click **OK**.

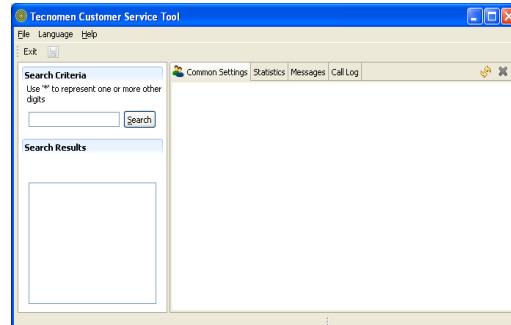
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CS Tool

- Search, view and manage subscribers and service settings



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Views in CS Tool

- Modify service and subscriber settings in **Common Settings**
- View statistics in **Statistics**
- View and delete messages in **Messages**
- View the call log in **Call Log**

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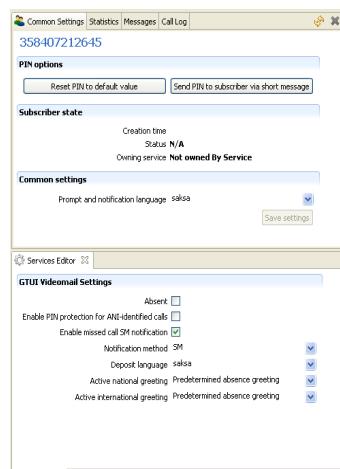
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Manage Common Settings

- Manage PIN settings
- View subscriber state
- Manage language settings
- Manage service-specific settings



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View Statistics

- View subscriber statistics
 - Total message counts
 - Voice message counts
 - Fax message counts
 - Video message counts

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Manage Messages

- View and delete subscriber's messages

Type	Status	From	Received	Size
Audio	New	123	1970-01-01 02:00:00	100
Fax	Seen	456	1970-01-01 02:00:00	200
Video	Saved	789	1970-01-01 02:00:00	300

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View Call Log

- Search for calls
- View call log
- View call details

Caller	Call type	Call time	Disconnect type
123	MissedCallNotification	2006-03-29 11:42:33	Call cleared by system
123	MissedCallNotification	2006-03-29 11:42:33	Call cleared by system

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Telco Server Management in TOM

Address	Name	Status	Started at

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Telco Server Management in TOM

- Communication between Telco Server and TOM is done via SNMP
- Users with ROLE_TELCO_READ rights can access the Telco perspective in TOM
- Information/actions related to Telco Server and its components:
 - Server statistics
 - Server management
 - Monitored processes

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Documentation Overview



Following NGM documentation will be delivered to customer in project CD

- General Documentation
- Services Documentation
- Platform Documentation
- Operation and Maintenance Documentation
- Interfaces Description Documentation

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General Documentation

Document name
Documentation Overview, AMW 054149/x
Glossary of Terms, AMW 003873/x
Solution Description, AMW 054137/x
System Specification, AMW 054126/x
Hardware Life Cycle Statement, AMW 053114/x
Capacity and Reliability Statement, AMW 054329/x
IP Networking Overview, AMW 053029/x
Video Gateway Integration, AMW 054135/x
Acceptance Test Cases, AMW 054330/x
Training Courses, Service Description, AMW 053627/x
Migration Scenarios, AMW 053273/x

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Services Documentation

Document name
Next Generation Services, Service Description, AMW 052576/x
iCalled Video, CID, AMW
Video Mail, CID, AMW
ICB, GTUI Specification, AMW 053353/x
Generic WEB UI Specification, AMW 054116/x

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Platform Documentation

Document name
Tecnotree NGM Platform, Technical Description, AMW 053026/x
Telco Server 2.0, Technical Description, AMW 047810/x
Network Description, autogenerated from uncl-file
Application and Storage Server System, HD, AMW 054228/x
Telco Server 2.0, Hardware Description, AMW 047809/x

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Operation and Maintenance Documentation

Document name
Operation and Maintenance, TD, AMW 052746/x
Machine-to-Machine Provisioning, ID, AMW 054248/x
Alarms and Statistics, Interface Description, AMW 054249/x
Billing Interface, Interface Description, AMW 054246/x
Operation and Maintenance, User Guide, AMW 054257/x
Customer Service Tool, User Manual, AMW 054258/x
TSS 2.0, Operation Manual, AMW 053125/x
TSS SCU Operator's Manual, AMW 5025985/x

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Interfaces Description Documentation

Document name
Signalling, Technical Description, AMW 5015191/x
ISUP Signalling Compliance, AMW 5033266/x
MTP Conformance Specification, AMW 5033074/x
SCCP Compliance Statement, AMW 5033088/x
TCAP Compliance Statement, AMW 5033243/x
VoiceXML Tag Reference, User Manual, AMW 051620/x
Outcall Interface, AMW 051150/x
GMI HTTP Interface, AMW 050435/x
Telco Server Login and Billing Interfaces, AMW 051155/x

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