NORTEL

Product Brief

Nortel Media Gateway

The GSM-UMTS Media Gateway at Release NSS19

Introduction

Nortel's NSS19 VoIP solution introduces a complete Next Generation Network (NGN) for both GSM and UMTS Core Networks. This solution is implemented using All-IP for both the bearer and control plane where the Media Gateway (MGW) provides the bearer plane network element. NGN technology provides cost savings and operational efficiencies through All-IP network consolidation with full support of VoIP networking and both GSM and UMTS access as well as Next Generation IP signalling — SIGTRAN.

The key features of Nortel's GSM-UMTS Media Gateway are:

- MGW-on-a-blade design for optimal gateway performance characteristics
- Market-leading equipment density supporting up to 48,000 ports per rack
- Market-leading scalability from 400 ports up to any capacity in single port increments
- Simultaneous support for enterprise PRI, GSM and UMTS access including circuit switched data and video
- Embedded signalling gateway function supporting M2UA, M3UA and IUA
- Support for centralized or distributed MGW services such as tones, announcements, conferencing and legal intercept
- Fully flexible support for TDM, VoATM and VoIP interfaces without substituting interface blades for MGW blades
- Fully redundant MGW design with redundant TDM, ATM and IP interface ports with interface protection
- Integrated echo cancellation and market-leading voice quality enhancements

Nortel's Media Gateway (MGW19) can be deployed in conjunction with Nortel's MSC Server to implement an All-IP NGN Voice Core according to 3GPP Bearer Independent Core Network specifications. The gateway is both very high density and highly scalable, meaning that far less equipment would be required than with less competitive products. This enables a much simpler and much more cost-efficient network design. The MGW utilizes a 'media-gateway-on-a-blade' architecture such that the Media Gateway can scale up to any size by simply adding further MGW blades or equipment shelves as required. Up to one million subscribers can be supported in a single rack of equipment and multiple racks can be applied to achieve whatever capacity is required at a site.

Figure 1. A Media Gateway shelf at MGW19

Media Gateway Overview

Nortel's Media Gateway 'on-a-blade' design enables an optimum product architecture providing minimum delay and jitter characteristics through the gateway. This is complemented by high performance echo cancellation achieved by integrating optical TDM interface ports directly onto each MGW blade. Furthermore, the gateway also includes a highly advanced and complete suite of voice quality enhancement features capable of operating on both compressed and uncompressed speech. This enables an operator to achieve service differentiation against operators offering only a basic voice service. The MGW blade also provides support for both centralized and distributed services, including circuit switched data/video, tones, announcements, conferencing, legal intercept and legal intercept distribution function.

Each MGW blade is provided with a 3GPP-compliant 'Mc' gateway control interface to the Nortel MSC Server. However the Media Gateway also supports a fully Open Mc interface enabling the gateway to be used with another vendor's server if so desired. Nortel's MGW equipment can be deployed as part of a high-density TDM switch configuration in conjunction with Nortel's MSC Server. In this configuration the MGW and MSC Server can be co-located to provide a direct replacement for a traditional TDM GSM MSC. The same MGW equipment can also be deployed remotely from the MSC Server. In addition to TDM interfaces for PSTN, GSM 'A' interface or legacy network support, the MGW also supports ATM Iu interfaces for UMTS Iu access as well as IP interfaces for full network-wide VoIP Nb interface support. The same MGW can therefore be deployed to achieve a fully distributed 'All-IP' Next Generation Core Network. The same MGW blade is used for all of these configurations. VoATM using ATM interface blades is provided to support a completed suite of fully-featured ATM networking capabilities with blade and interface redundancy. VoIP bearer ports are provided using Gigabit Ethernet interface blades. Gigabit Ethernet interface blades also support blade and interface redundancy.

Network efficiency and voice quality are enhanced through full support for both in-band (Tandem Free Operation - TFO) and out-of-band (Transcoder Free Operation - TrFO) transcoder negotiation mechanisms. These mechanisms enable the gateway to pass speech through the gateway without transcoding, thereby preserving speech quality, avoiding unnecessary delay and making maximum use of the available MGW processing resources.

Media Gateway on-a-blade

Nortel's Media Gateway on-a-blade design utilizes 4th Generation Media Gateway technology in the Voice Services Processor 4 (enhanced) — the VSP4e. All media gateway functions are implemented within this single blade. This design provides the minimum number of blades in the media path, minimizing delay and delay variation within the gateway for real-time applications. The use of integrated optical TDM ports directly onto the VSP4e blade also enables high performance echo cancellation to be combined with transcoding and other voice quality enhancement features in the same DSP such that the speech path only has to be interrupted once.

Each VSP4e blade is controlled by an MSC Server through a 3GPP-compliant Mc interface. Co-located MGW blades do not necessarily have to be controlled by the same MSC Server, although operators may choose to do so for operational simplification. Similarly MGW blades controlled by the same server do not have to be co-located. If it is required to achieve geographic redundancy, then these blades can be located at different sites such that access network traffic is spread across those sites. This ensures that the access network cannot be isolated from its supporting MGW by the loss of a single site through disaster or the complete failure of a node.

Each MGW blade can support a minimum of 400 ports up to a maximum of 3,000 ports per blade in release 19. Each MGW shelf supports up to eight VSP4e blades with two shelves per equipment rack. Further capacity improvements to the same hardware will be provided in future releases. The capacity provided by each blade can also be set anywhere between the upper and lower blade limits through software keying with a granularity of only one port. This means that an operator only needs to buy as much or as little capacity as they actually need. The total Media Gateway capacity at a site can be scaled up by adding further MGW blades, additional shelves or racks accordingly, in order to build whatever MGW capacity is needed. The maximum capacity of the MGW is limited only by the capacity of the MSC Server that is controlling it.

Embedded Signalling Gateway

The Media Gateway blade includes an embedded signalling gateway function supporting a complete suite of TDM, ATM and IP signalling protocols. The purpose of a signalling gateway embedded in a media gateway is to enable 2G/3G access, enterprise or legacy network signalling to be consolidated for efficient packet-based signalling backhaul to a centralized signalling endpoint. The MGW supports a variety of TDM access signalling variants including ANSI/ETSI ISUP and PRI, MTUP and NA MF. Nortel supports signalling backhaul using SIGTRAN, with both M2UA and M3UA options supported. M2UA enables the embedded signalling gateway to act as a simple signalling relay node without requiring a signalling point code. M2UA signal-ling traffic can be converted to M3UA if required using a signalling gateway such as Nortel's Universal Signalling Point (USP). M3UA enables signalling traffic to be backhauled directly to the controlling MCS Server, but this does require the embedded signalling gateway to use a signalling point code. Backhaul of enterprise PRI and QSIG signaling is also provided using SIGTRAN IUA.

MGW features

MGW19 enables an operator to deploy MGWs with either centralized or distributed functionality. This means that MGW blades can be configured to support a single dedicated feature or all of those features may be combined in each MGW blade. This enables an operator to ensure that feature functionality such as 2G/3G access, backbone, PSTN or PRI connectivity is either optimized to the required function or load-shared across the available equipment at an MGW site. MGW features that are also supported in centralized or distributed modes are:

- Multi-party conference bridge
- Lawful Interception (LI) and Lawful Interception Distribution Function (LIDF)
- Tones/Digit Generation
- Announcement Play-out
- Digit Collection

Integrated voice quality enhancements

Voice services markets are becoming increasingly commoditized with little or no scope for service differentiation so that subscribers are able to select the lowest price service with no loss of service capability. Nortel has implemented a suite of advanced and patented voice quality enhancement features in order to provide service differentiation to protect against this trend. These improve the end-user experience of speech fidelity, intelligibility and voice characteristics, which results in longer talk time and improved customer loyalty for the operator. These features provide quality protection for both ordinary uncompressed speech (G.711) and for compressed speech (AMR) without having to perform decompression from G.711 to AMR. The voice quality enhancement features supported in MGW19 are:

- Fixed Echo Cancellation
- Mobile Echo Control (compressed and uncompressed)
- Automatic Gain Control (compressed and uncompressed)
- Background Noise Conditioning (compressed and uncompressed)
- Background Noise Reduction
- Tandem Free Operation (TFO) and Transcoder Free Operation (TrFO)

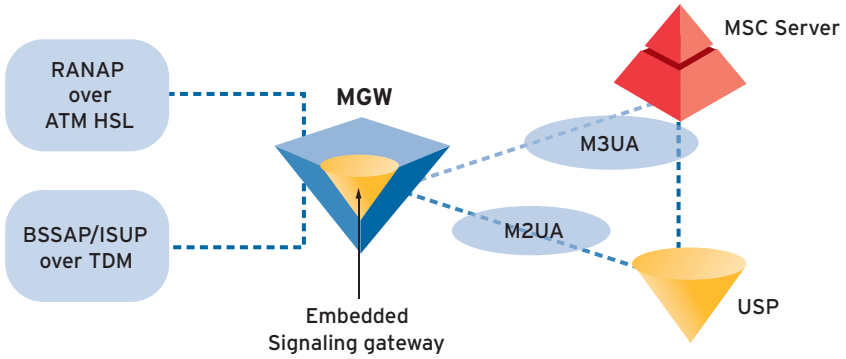

Figure 2. Nortel's embedded Signalling Gateway SIGTRAN capabilities

The efficient use of network resources

The primary requirement for the implementation of a Next Generation wireless core network is to ensure optimum efficiency for network resources. This applies to the available transmission resource as well as to the media gateway resource. Both of these resources can be optimized through the use of transcoder negotiation schemes such as TFO or TrFO. These schemes ensure that the media gateway does not perform unnecessary speech transcoding, which consumes valuable media gateway processing resource, increases delay and degrades voice quality. Where speech is presented to the gateway in

compressed form, TFO or TrFO can ensure that it stays compressed and therefore consumes less backbone transmission capacity. However, where speech is presented in uncompressed form, Nortel also provides an optional compression feature to enable operators to gain this backbone transmission efficiency if so desired. This feature utilizes any of the eight narrowband AMR codec rates; however, the MGW19 supports a complete suite of codecs as follows:

- G.711
- UMTS AMR and AMR2
- GSM EFR, FR AMR and OHR AMR

Transmission network efficiency gains can also be obtained through silence suppression schemes, with or without comfort noise generation, and through optimizing speech sampling for VoIP, all of which are supported in Nortel's MGW19. Further codecs will be supported in future releases where the Nortel MGW will also provide a fully converged MGW capability for 2G/3G/CDMA, Wireline MGW and IMS MGW capabilities.

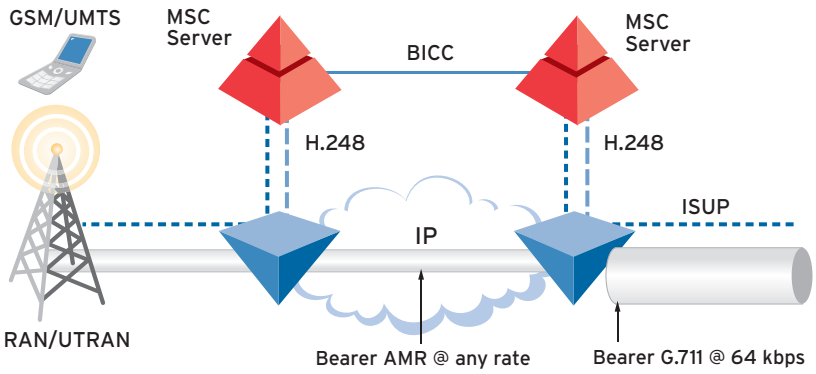

Figure 3. Nortel's optional compression feature for backbone transmission efficiency

Media Gateway reliability

Nortel's market-proven, high-speed multiservice switching (MSS) platform provides the Media Gateway with a highly-reliable and market-proven system architecture combined with very low latency characteristics. The MSS utilizes a fully redundant 57-Gbps cell-based and non-blocking switching fabric, making it ideally suited to high-speed, real-time media applications. This minimizes switching delay and avoids head-of-line blocking. All rack and shelf-level components and interface blades are 1:1 redundant with interface protection supported on all interfaces — TDM, ATM and IP. The MGW blade is normally configured in an N+1 redundant configuration, providing a redundant pool of media handling resources. MGW blade redundancy is also supported using on-board device sparing and with 1:1 blade redundancy in future releases.

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For more information, contact your Nortel representative, or call 1-800-4 NORTEL or 1-800-466-7835 from anywhere in North America.

NN119180-103106

In the United States:
Nortel
35 Davis Drive
Research Triangle Park, NC 27709 USA

In Canada:
Nortel
195 The West Mall
Toronto, Ontario M9C 5K1 Canada

In Caribbean and Latin America:
Nortel
1500 Concorde Terrace
Sunrise, FL 33323 USA

In Europe:
Nortel
Maidenhead Office Park, Westacott Way
Maidenhead Berkshire SL6 3QH UK

In Asia:
Nortel
United Square
101 Thomson Road
Singapore 307591
Phone: (65) 6287 2877