
White Paper

Enterprise Communication with VoIP-GSM Gateway

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Executive Summary

This white paper discusses the communication requirements of modern enterprises and then focuses on the role and need of a VoIP-GSM gateway in enhancing their communication set-up. The white paper also details about the Matrix VoIP-GSM gateways, their features and how the enterprises can leverage these gateways for enhanced communication along with lower TCO and realize an early ROI.

Enterprise Communication Challenges

The fixed phone lines have been around for many decades. Enterprises may have multiple of these lines running into an EPAX system with hundreds of extensions behind it.

The telecom networks evolved from analog PSTN to digital ISDN, the wireless GSM and then the packet IP network. Superior voice quality, faster communication, better and more services and reduced communication cost are the fruits of these technological developments. The way of work has also radically changed and so is necessary to adapt the enterprise communication systems with the new technologies and features to fulfill the every-day growing and diversifying communication needs.

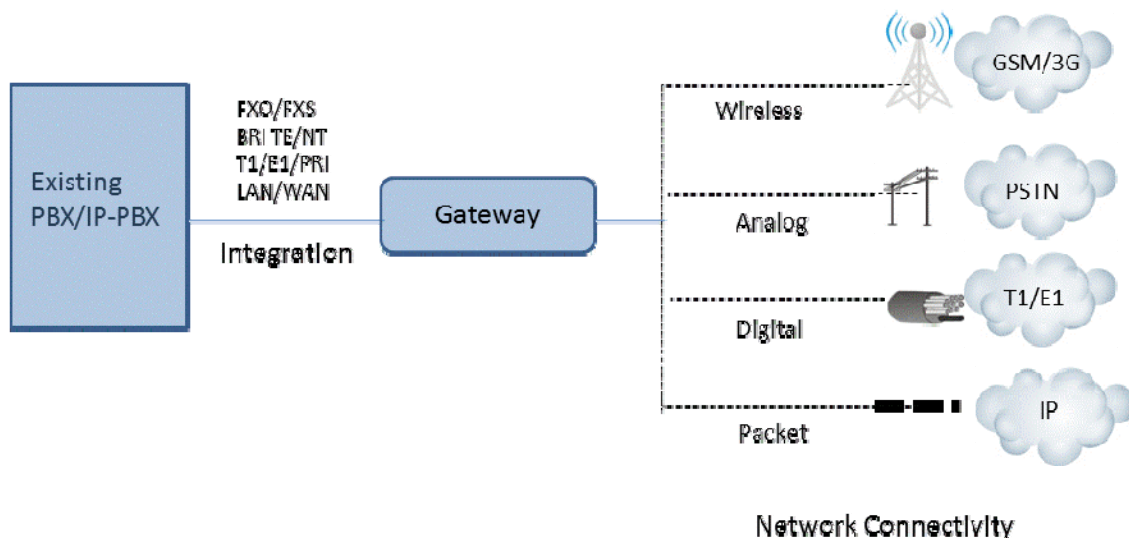
Improving productivity and reducing operational expenses still remain the basic necessities of any business organization-small or large. For the larger ones, the communication cost mounts in-parallel to the size and so it is very necessary to control the mounting communication cost. With globalization comes the additional challenge to operate as a single unit from dispersed locations, not allowing the distances to reflect as operational delays or professional incompetency.

Role of a Gateway in Enterprise Communication

Understanding the necessity to change, there are different ways to adapt. One option is to replace the existing communication system with a completely new one using the latest technologies and offering the required features and services. But, replacing means a new system comes at an exclusive cost and the older one becomes absolutely unusable. This becomes the major concern with the enterprise IT/Telecom supervisors, as replacements are difficult and with any technological advancement, the same situation would imitate.

The second alternate is to adapt to these new technologies, but, on a smoother plane. Such a migration is possible with an intermediary system that can integrate with existing interfaces and at the same time offer access to the newer technologies. Comparatively, the investment in such devices is much lower than a complete infrastructure and equipment change and much lower is the intricacy level. The existing system remains in place and these devices offer the vital link between the old and new technologies and are thereby rightly called as the “Gateways”.

A gateway may connect an existing business telephone system to varied telecom networks like GSM/3G, ISDN BRI/PRI or IP. The gateway interfaces with an existing system using any of the telephony interfaces such as FXO/FXS, ISDN BRI TE/NT or via T1/E1/PRI or over the LAN/WAN interface.



Benefits of VoIP-GSM Gateways for Modern Enterprises

Enhanced Network Connectivity for an Existing System

A VoIP-GSM gateway sits in-line between the existing PBX/IP-PBX and offers connectivity to GSM and IP network. This allows the users behind the PBX/IP-PBX to directly place calls over GSM and IP networks using their regular telephone handsets.

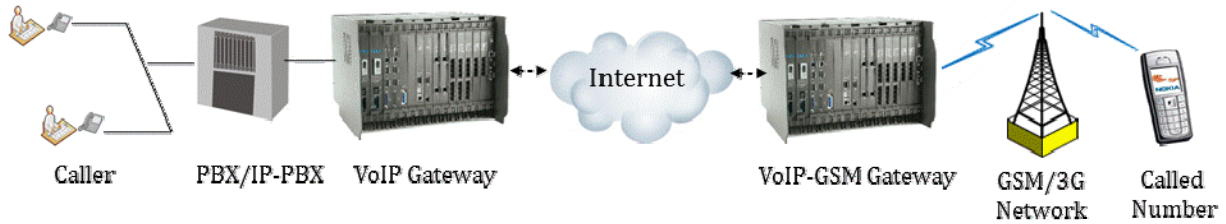
The gateways enhance existing system connectivity, allowing a call to be routed via the cheapest possible network route. Several routing algorithms are pre-fed into the gateway devices to select between available networks before placing the call. The direct network connectivity offers significant cost savings, with the convenience of using existing telephony devices and retaining habitual dialing methods. The IP network connectivity facilitates VoIP telephony for long-distance calling. Several mobile SIMs can be placed within the gateway to take advantage of varied operator plans as per location or time of call.

Simplified Multi-Site Connectivity

With continuous expansion of business horizons across geography, organizations tend to have more and more regional offices. A VoIP gateway facilitates easy and low cost communication between these geographically distant branch offices over cost-effective IP network. This would eliminate long distance call charges between these locations as the calls would now be carried over the Internet at much lower call rates. It thereby eliminates the enormous communication cost incurred while placing long distance calls between branch-offices; over PSTN network or ISDN lines.

Virtual Trunking

With VoIP gateways installed at various office locations, users of one branch-office can virtually access trunk connectivity of the other branch office. The VoIP gateway routes a call over cost-effective IP network till the last mile of termination and facilitates users at one location to access the local GSM network of a remote branch-office and thus eliminates heavy inter-network toll charges, relaying calls over IP till the last possible mile of termination.



Lower TCO

Demanding a much lower capital expenditure, the gateways extend network connectivity of existing telephony system. This preserves the value investment already made and offers the flexibility accessing new networks and features.

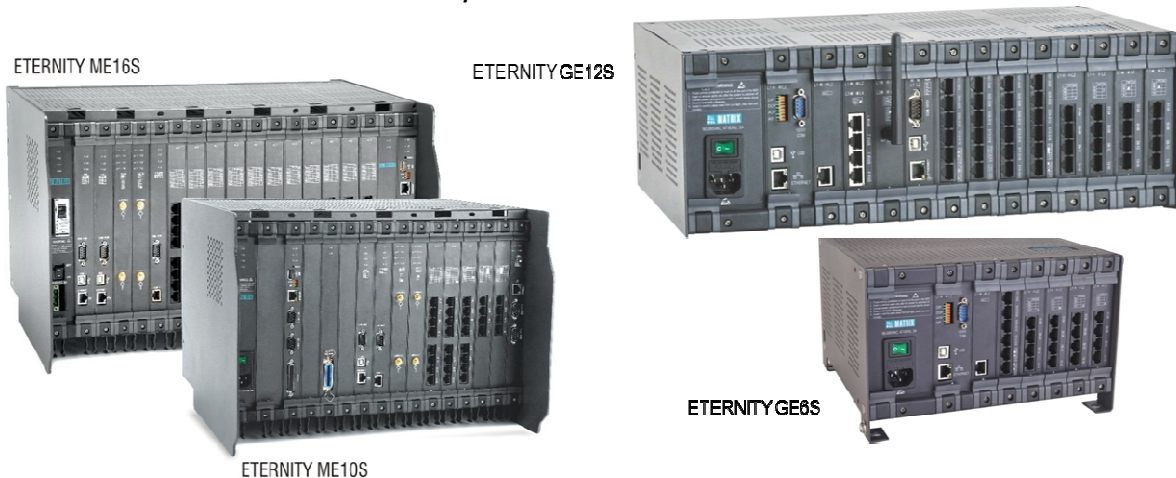
Also a VoIP gateway brings inherent benefits of IP technology, allowing the resources of PBX/IP-PBX at one location to be virtually accessed over IP from a remote location. For instance, digital leased lines are expensive and also lack connectivity in remote locations. A VoIP gateway can extend the digital network connectivity and ISDN DDI services from one location to other remote locations via the IP network. This makes the gateway a perfect solution for the locations, where either leasing T1/E1 PRI connectivity is a costly affair or availability of fixed network is intricate.

Reduced OPEX

With the new networks-GSM and IP being integrated into a limited connectivity system, every call being placed from the system can now choose to travel via the direct and more cost-effective path. For instance a call made to a GSM number can be routed via the GSM SIM card in the gateway while a long-distance call can be routed over the IP network. The gateways can automatically take such decisions, relieving the users from remembering complex dialing patterns. These algorithms are variedly termed as least cost logic or automatic route selection schemes.

Matrix VoIP-GSM Gateways and the Competitive Advantage

Matrix offers VoIP-GSM gateways with capacity and features required by Enterprises. These gateways offer the requisite interfaces to access the widespread GSM network and low-tariff VoIP networks directly.



Competitive Advantages:

Scalability

Having made an investment in gateway an enterprise not only preserves existing communication infrastructure, but, the capital expenditure is also lowered. But, what if the gateway suffices now but can't be scaled for future capacity expansions? Buying or replacing the gateways for a minor but unavoidable capacity expansion is neither ideal nor practical. A gateway must therefore be bought keeping in mind the future expansion possibilities.

With Matrix ETERNITY gateways one can scale up to as many as 64 GSM/3G ports. The high-density VoIP card provides up to 32 simultaneous VoIP channels per card. With Universal Slot Architecture, the VoIP card can be scaled in equivalence to the maximum number of slots available with the ETERNITY variant. The count of simultaneous VoIP calls increases by a multiple of 32, per VoIP card added.

All the expansion slots of Matrix ETERNITY are universal in nature. Any interface card can be inserted in any slot and the system will configure it automatically. This scheme eliminates configuration bottle-necks because any slot can be used for VoIP, GSM/3G, T1/E1/PRI, ISDN BRI or PSTN and thus allowing completely flexible configuration.

Gateway Configuration	Connectivity	ETERNITY GE6S	ETERNITY GE12S	ETERNITY ME10S	ETERNITY ME16S
VoIP-GSM/3G-T1/E1 PRI	VoIP Calls	192	384	320	512
	GSM/3G Ports	24	40	64	64
	T1/E1 PRI	6	8	8	8
VoIP-GSM/3G-ISDN BRI	VoIP Calls	192	384	320	512
	GSM/3G Ports	24	40	64	64
	ISDN BRI Ports	24	32	32	32
VoIP-GSM/3G-FXO-FXS	VoIP Calls	192	384	320	512
	GSM/3G Ports	24	40	64	64
	FXO Ports	96	128	128	128
	FXS Ports	120	240	320	512
VoIP-GSM/3G	VoIP Calls	192	384	320	512
	GSM/3G Ports	24	40	64	64

Flawless Integration and Connectivity

A gateway sits between existing system and the telecom networks. While integrating with the existing system issues of incompatibility are key concerns. A gateway should be flexible enough to match the connectivity requirements as the existing systems usually have little or no room of adjustments. Also when it comes to offering alternate network connectivity, a gateway should justify its role offering seamless connectivity to varied telecom networks and transparently routing calls from one to another.

Note: The values represent the maximum port capacities.

Exact capacity varies as per the gateway configuration selected.

Matrix ETERNITY works as an adjunct to your existing telephony infrastructure. There is

no need to replace any equipment like PBX, Operator Consoles, Key Phones, Standard Phones, Power Supply and Wiring. This not only saves lot of equipment cost, but also saves time and efforts required for re-training.

ETERNITY gateways interface with an existing PBX system via multiple interfaces such as FXO/FXS, ISDN BRI TE/NT, T1/E1/PRI or over existing LAN/WAN. The support of industry standard protocols helps to avoid any probable interoperability issues.

TE/NT mode configuration eliminates integration blocks with existing ISDN PBX system. The signaling on digital interface is also software configurable to T1/E1/PRI. Open-standard SIP for VoIP makes the gateway interface open to any SIP PBX/Proxy.

GSM or IP –both the forms of network connectivity can be availed with ETERNITY with calls being seamlessly routed from traditional devices to GSM and IP network and from GSM to IP or vice-versa. The Automatic Number Translation feature of the gateway can modify any dialed number to match the dialing pattern on termination network, which may be selected as per the least cost routing logics for cost-effective calling.

The gateway's GSM card supports a quad-band of frequencies on GSM network. This guarantees flawless connectivity for varied frequency standards operable across the globe. Matrix ETERNITY GSM 3G Card offers accessibility to 3G networks for Voice communication. It supports fallback compatibility and hence offers flexibility to access any available network-2G or 3G. Users are always assured for connectivity using the alternate network in case of preferred (3G) network signal is weak or unavailable. With power of 3G, organization can experience the Noise-free, Stanch and Crystal Clear Voice Quality, Enhanced Security and Utmost Coverage.

ETERNITY allows for simultaneously registering with 32 SIP ITSPs for VoIP Calling. Each SIP trunk can be programmed for either making outgoing calls, receiving incoming calls or both. Various allocation methods like First Free, Round Robin are supported to select the most appropriate SIP ITSP for a given call. Proxy calls via an ITSP's proxy or direct IP calls between locations-both can be handled simultaneously.

Universal Routing

A gateway's basic role is to route calls between various networks. And the routing should be transparent and unaffected by the number of such inter-network calls. Heavy call traffics often affect the call routing capacities and result in blocked calls. Also, at times the routing between gateway's own ports is in fixed configuration, limiting the flexibilities in call routing.

ETERNITY supports port-agnostic routing. A call received on a GSM/3G port or SIP trunk, can be routed on any channel of a T1/E1/PRI NT port, T1/E1/PRI TE or even another GSM/3G port. Similarly, a call received on any channel of T1/E1/PRI NT port can be placed on a GSM/3G port, any SIP trunk, any channel of T1/E1/PRI TE port or even another channel of T1/E1/PRI NT port. Matrix ETERNITY monitors availability of all the ports continuously. If a port is not available for any reason, ETERNITY routes the call on the next best-fit port.

Matrix ETERNITY internally manages different protocols required to interface with different telecom networks and provides a consistent interface to all its users. When connected with any existing PBX, the gateway remains completely transparent to the users and allows them to easily make and receives calls and also use PBX features as previously.

Reduced Communication Cost

As emphasized, one of the basic and most prominent requirements of any enterprise is to bring down the communication cost. With the enterprises themselves, springing into multiple branches across geographies not only the external but even the inter-branch communication costs are huge.

The most tangible benefit of Matrix ETERNITY is the significant reduction in the telephony cost. There are many opportunities for savings without compromising the quality of connection.

For every call ETERNITY selects a port that offers the least cost for an outgoing call. It supports different LCR algorithms viz. when call is originated from GSM/ 3G port, T1/E1/PRI port or SIP trunk.

Different routing options like CLI Based, Fixed, Dialed Number Based and Called Number Based are provided to select the most cost-effective route. Programming an Allowed-Denied list helps to control call cost restricting calls to specific numbers.

Service providers offer different schemes to enhance their services. For example, customer can make call free for first 500 minutes, every month. In such cases, ETERNITY allows you to define call budget in terms of amount and minutes on the Trunks i.e. TWT, DS1, BRI, GSM and SIP. Once budget gets exhausted, it will not allow further outgoing calls. Amount and minutes consumed on each trunk port can be cleared either manually or automatically on specified date of every month, to a specified value.

The GSM/3G card offers interfaces for multiple GSM/3G Ports in steps of 4 or 8. ETERNITY dynamically routes the outgoing calls through respective service provider networks offering cost saving and improved Quality of Service (QoS). Closed User Group (CUG) is one such case where mobile companies allow free calling amongst a group of specified users. The CUG SIM Card can be inserted in the Matrix ETERNITY allowing all the PBX users to make and receive free calls to their colleagues who are not in the office – traveling, at home, on vacation, at plant or at a customer site.

Matrix ETERNITY offers VoIP connectivity with multiple ITSP servers giving flexibility of using separate ITSP for each country/region like USA, Europe, etc. VoIP can also be used to provide free calling between different locations of a company – head office, branch offices, factories, warehouses, etc. The VoIP gateway also supports peer-to-peer calls between the distant locations without going through any proxy server. It establishes easy and direct communication path between the offices, utilizing existing IP connectivity, avoiding charges incurred while routing calls via the ITSP's Proxy.

The gateway also maintains complete log of all the calls in its memory. Details like Port, Date, Time, Caller Number, Answer Time and Call Duration are stored in the database. Reports can be filtered for specific details using filters like Port, Number, Date, Time, Duration of the Call, etc and printed for reference.

Superior Voice Quality

When a gateway sits ahead of a PBX, multiple interface junctions and varied networks come into picture. So the challenge is to maintain the toll-grade voice quality irrespective of the network or interface junctions. Problems of noise and hum generation and even dropped calls surround such multi-device architectures.

Matrix ETERNITY supports all industry standard voice codecs. Diffserv and Precedence are supported for QoS. Features like Comfort Noise Generation, Echo Cancellation and configurable audio gain aids in getting uninterrupted, toll-quality voice. Voice Activity Detection with adjustable codec priorities allows effective bandwidth utilization to ensure maximum throughput.

The new intelligent GSM AMR codec allows a network operator to prioritize capacity or quality per base station. An AMR equipped network is more resilient to errors and interferences. The gateway seated in customer premise also needs to be AMR equipped in this case. ETERNITY supports AMR voice codec which can adapt itself to the network and traffic conditions offering superior voice quality, call coverage and network performance.

Easy Management

Integration of two devices is a challenge by itself. With a gateway, a call initiated from an analog terminal may get routed via GSM SIM in the gateway. If the gateway can't be flexibly configured, modifications might be required in the already through configuration of the PBX, which is again cumbersome. So it's more sensible to choose a gateway model that is not only simple to manage but offers ready integration with existing interfaces. Also, large enterprises tend to have dedicated rooms and rack arrangements for voice and data communication infrastructure, so the gateway

Matrix ETERNITY is very easy to install and operate. Built-in web-server allows the system engineer to configure various parameters locally or remotely using any Internet browser. Visual status indicators and the port-wise status view from the web GUI helps in anytime system monitoring.

ETERNITY gateways interface with an existing PBX system via multiple interfaces such as FXO/FXS, ISDN BRI TE/NT, T1/E1/PRI or over existing LAN/WAN. The support of industry standard protocols helps to avoid any probable interoperability issues.

ETERNITY GE12S and ME10S models can be placed in standard 19" racks. TE/NT mode configuration eliminates integration blocks with existing ISDN PBX system. The signaling on digital interface is also software configurable to T1/E1/PRI. Open-standard SIP for VoIP makes the gateway interface open to any SIP PBX/Proxy. Antenna mixer (4 to 1) is built-in each GSM/3G Card and hence only one or two antenna are required per card.

Reliable Operation

Sitting ahead of the PBX, the gateway becomes an important link of the communication setup. Any failure may upset the chain and bring down the complete communication to a standstill.

Matrix ETERNITY deploys multi-processor architecture, wherein each card has its own processing units. This greatly enhances the flexibility and reliability. The fault points are localized and save the unnecessary system downtime in case an individual unit failure.

Any card in ETERNITY ME can be replaced (Hot Swapping) during the system ON condition, without disturbing the functioning of the system. ETERNITY ME10SDC offers redundancy for its all-important functional blocks - Control, Switching and Power.

The gateways maintain a complete activity log. Administrator can easily find out when a particular card was removed from the system or even when a particular port was not detected by the software.

Glossary

19" Rack A 19-inch rack is a standardized frame or enclosure for mounting multiple equipment modules. Each module has a front panel that is 19 inches (482.6 mm) wide, including edges or ears that protrude on each side which allow the module to be fastened to the rack frame with screws.

3G 3rd generation mobile telecommunications is a generation of standards for mobile phones and mobile telecommunication services specifying higher data rates than the first two generations.

AMR Adaptive Multi-rate codec-Audio data compression scheme optimized for speech coding, adopted in October 1998 as the standard speech codec by 3GPP (3rd Generation Partnership Project) and now widely used in GSM (Global System for Mobile Communications).

CUG Closed User Groups are groups of GSM mobile telephone subscribers who can only make calls and receive calls from members within the group at minimal or call cost, at flat monthly rates.

FXO In telecommunication, foreign exchange service (FX) is a network-provided service in which a telephone in a given exchange area is connected, via a private line, to a central office in another foreign exchange, rather than the local exchange area where the device is located.

FXS It stands for foreign exchange station. It offers interface for connecting analog phones.

Hot Swapping To pull out a component from a system and plug in a new one while the main power is still on. It is also called "hot plug" and "hot insertion".

IP Telephony IP telephony (Internet Protocol telephony) is a general term for the technologies that use the Internet Protocol's packet-switched connections to exchange voice, fax, and other forms of information that have traditionally been carried over the dedicated circuit-switched connections of the public switched telephone network (PSTN). The one who offers such services is referred to as an ITSP.

SIP The Session Initiation Protocol (SIP) is an IETF-defined signaling protocol, widely used for controlling multimedia communication sessions such as voice and video calls over Internet Protocol (IP).

VoIP Voice over Internet Protocol (Voice over IP, VoIP) is one of a family of internet technologies, communication protocols, and transmission technologies for delivery of voice communications and multimedia sessions over Internet Protocol (IP) networks, such as the Internet.

Matrix ComSec

Matrix is India based leading manufacturer of IP-PBXs and Gateways for small to large enterprises. Matrix IP-PBX is an integrated communication solution offering universal connectivity with unique design and encompassing advanced features for the businesses of all sizes. Matrix IP-PBX offers benefits of reduced communication costs, seamless connectivity and simplified management for small to large enterprises, institutions, call centers, hotels and many other industries through industry specific solutions. With the global presence in more than 30 countries through an extensive network of more than 500 channel partners, Matrix has gained customer trust and admiration across the world and has won several awards and recognition for its innovative products and processes.

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