MiVoice Business Multi-Instance

ENGINEERING GUIDELINES

Release 2.0

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Mitel MiVoice Business Multi-Instance
Engineering Guidelines
Release 2.0

December, 2014

Table of Contents

About this Document

This document provides guidelines for deploying the Mitel MiVoice Business Multi-Instance solution, the Mitel Media Server (MMS) and the Mitel MiVoice Border Gateway (MBG). You will find the following information in this document:

- Overview of the MiVoice Business Multi-Instance Media Server and Border Gateway solutions
- Licensing Information
- System Requirements
- Supported Configurations
- System Capacities
- System Performance

About the Documentation Set

MiVoice Business Multi-Instance is a solution that allows multiple instances of the MiVoice Business software to be run on Industry Standard servers. The MiVoice Business Multi-Instance solution has two major components, the Mitel MiVoice Business Multi-Instance (MiVoice Business Multi-Instance) server component and the Mitel Media Server (MMS) component.

The MiVoice Business Multi-Instance server component is responsible for call control functions and the Media Server component is responsible for providing digital signal processing functions such as audio conferencing, G.729 voice compression, Music on Hold (MoH) capabilities, Embedded Voice Mail, and Recorded Announcement Devices (RADs).

Note: MiVoice Business introduces separate brands for the Mitel range of hardware and software-only solutions for the IP communications market. MiVoice Business is the brand name of the call-processing software that runs on hardware platforms such as the 3300 ICP and industry standard servers. The 3300 ICP name continues as the brand for Mitel hardware platforms that run MIVoice Business.

When deployed, the two components that make up the MiVoice Business Multi-Instance solution are installed on separate servers; the MiVoice Business Multi-Instance server and the Media Server.

The MiVoice Border Gateway (MBG) is an optional component that provides a NAT function, network isolation, enhanced voice quality, and enhanced security.

Because the MiVoice Business Multi-Instance server runs multiple instances of the MiVoice Business software, the MiVoice Business documentation is for the most part relevant to MiVoice Business Multi-Instance. However, since MiVoice Business Multi-Instance runs on industry standard computing platforms rather than on the MiVoice Business and 3300 ICP hardware platform, any documentation that relates specifically to the 3300 ICP hardware platform will not be relevant to the MiVoice Business Multi-Instance solution.

For more information about MiVoice Business Multi-Instance and MiVoice Business software refer to the Product Documentation section of Mitel On Line.

How to Access Mitel Product Documentation

To access Product Documentation:

1. Go to http:/edocs.mitel.com.
2. Select a documentation suite from one of the following drop-down menus:
   - Communications Platforms
   - Messaging
   - Applications & Solutions
   - Software Development
   - End User Documents
3. Log in if asked to do so.

Note: For Technical Bulletins (TB) and Release Notes (RN), click **Knowledge Base** in the **Other Resources** window in the left-side navigation bar.

Available Documentation

The following documentation can be found on Mitel On-Line.

Mitel Multi-Instance Communications Server and Mitel Media Server

- *Engineering Guidelines (This Document)*
- *MiVoice Business Multi-Instance Engineering Tool (MET)*
- *MiVoice Business Multi-Instance Engineering Tool User's Guide*
- *MiVoice Business Multi-Instance 1.2 Installation & Administration Guide*
- *MiVoice Business Multi-Instance MCD Manager Administrator Online Help*
- *MiVoice Business Multi-Instance Media Server Manager Administrator Online Help*
- *MiVoice Business Multi-Instance Site Survey*

Mitel Standard Linux

- *Mitel Standard Linux Installation and Administration Guide*

MiVoice Business and the 3300 ICP

- *System Administration Tool Help*
- *General Information Guide*
- *Engineering Guidelines*
- *Resiliency Guidelines*
- *System Engineering Tool (3300 ICP SET)*
- *Site Planning Guide*
- *Troubleshooting Guide*

MiVoice Border Gateway

- *Online Help*
- *Installation and Maintenance Guide*
- *Remote IP Phone Configuration Guide'*
- *Engineering Guidelines*

Prerequisites

This document discusses the selection of appropriate Industry Standard Servers on which to run the Mitel MiVoice Business Multi-Instance.

Note: Before you engineer an MiVoice Business Multi-Instance site, it is recommended that you read the following product documentation and fill out the MiVoice Business Multi-Instance Site Survey (available on Mitel On-Line).

- Service Provider deployments of MiVoice Business Multi-Instance are required to be covered under the Mitel's Service Provider Program. Please see Mitel-on-Line for more information on this program and associated requirements.(Associated document: "*Mitel Managed Service Provider Program Eval")*
- *MSL Qualified Hardware List*

The MSL Qualified Hardware List indicates which severs are suitable for running MiVoice Business Multi-Instance, the MiVoice Border Gateway and other Mitel applications. This list also indicates which version of Mitel Standard Linux (MSL) is required and the list provides links to Engineering Guidelines for specific applications. A self certification process may be available for MiVoice Business Multi-Instance using a customer preferred server platform that may not be on the MSL list. Please contact your Mitel Account Manager for more information.

When MiVoice Business Multi-Instance is deployed some other guidelines may also apply, however, these guidelines (MiVoice Business Multi-Instance Engineering Guidelines) must also be taken into consideration.

See How to Access Mitel Product Documentation on page 2.

System Overview

MiVoice Business Multi-Instance

MiVoice Business Multi-Instance is a solution that allows multiple instances of the MiVoice Business software to be run on Industry Standard Servers. When deployed, the MiVoice Business Multi-Instance solution is distributed across two servers; the MiVoice Business Multi-Instance server, which includes multiple MiVoice Business instances, and the Mitel Media Server (MMS).

MiVoice Business Multi-Instance uses the same software that is used with the MiVoice Business/3300 ICP family of controllers which allows for the following benefits:

- MiVoice Business Multi-Instance employs the same resiliency model as the MiVoice Business/3300 ICP; if resiliency is required, MiVoice Business can be deployed in a 1+1 configuration.
- MiVoice Business Multi-Instance uses the same networking and management tools as the MiVoice Business/3300 ICP.
- The MiVoice Business Multi-Instance solution allows the administrator to deploy and simultaneously run different revision levels of MiVoice Business software. Because the administrator is not required to upgrade all instances of MiVoice Business software at the same time, upgrades can be carried out with minimal disruption to service.
- The MiVoice Business Multi-Instance Server provides an overall provisioning and management interface for the individual MiVoice Business instances.
- Interact with other MiVoice Business variants and applications within the product family

For large installations MiVoice Business Multi-Instance takes less physical space and requires less power and cooling capacity than an implementation based on 3300 ICP controllers.

At sites where MiVoice Business Multi-Instance is already installed, new services can be rapidly deployed because there is no new hardware to order and install, within server capacity limits

The MiVoice Business Multi-Instance solution is built on the solid legacy of Mitel's field proven call control software; the product evolution that led to the MiVoice Business Multi-Instance solution started with the 3300 ICP and has evolved as described in the following section.

3300 MXe ICP

The MiVoice Business or Call Processing software and Media processing software components were integrated as a single application on top of the VxWorks RTOS. This solution runs on the PowerPC processor in the Mitel 3300 MXe ICP. The Mitel 3300 MXe ICP is a Mitel proprietary hardware platform.

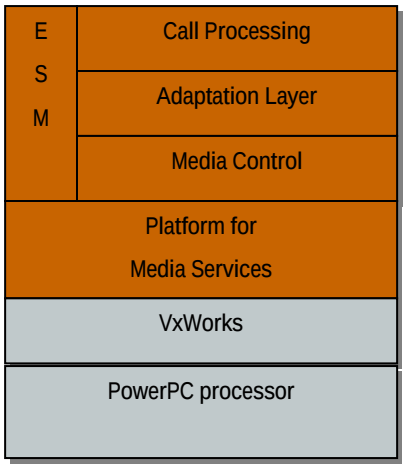


Figure 1: 3300 MXe ICPMXe Server

The MiVoice Business or Call Processing software and the VxWorks RTOS were ported to run on top of Mitel Standard Linux on an Intel Multi-core processor based server platform.

The Media processing software which provides media services continues to run on the PowerPC processor based 3300 MXe ICP.

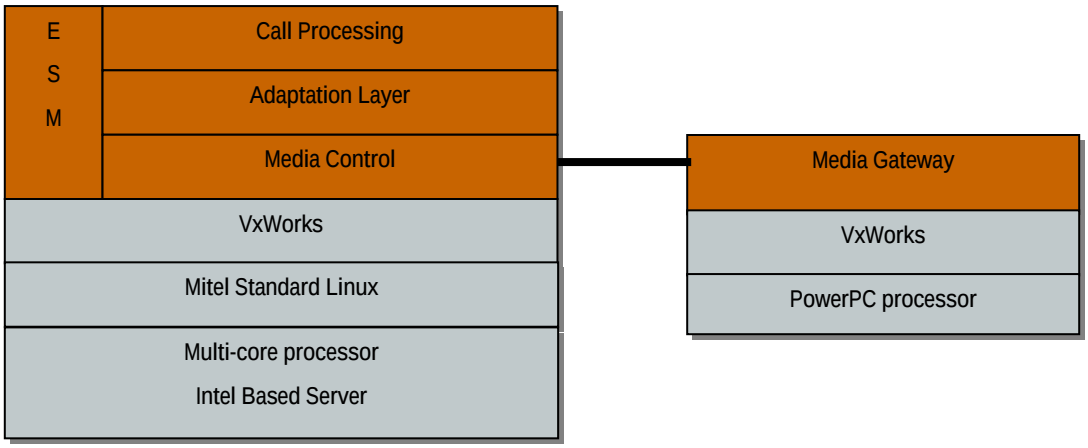


Figure 2: MXe Server

MiVoice Business on ISS (Industry Standard Server)

The MiVoice Business or Call Processing software and VxWorks RTOS from the MXe Server continue to run on top of Mitel Standard Linux.

The Media Server software also runs on the VxWorks RTOS which in turn runs on top of Mitel Standard Linux.

The MiVoice Business on ISS solution differs from the MXe Server in that all of the software runs on a single Intel Multi-core processor based Industry Standard Server.

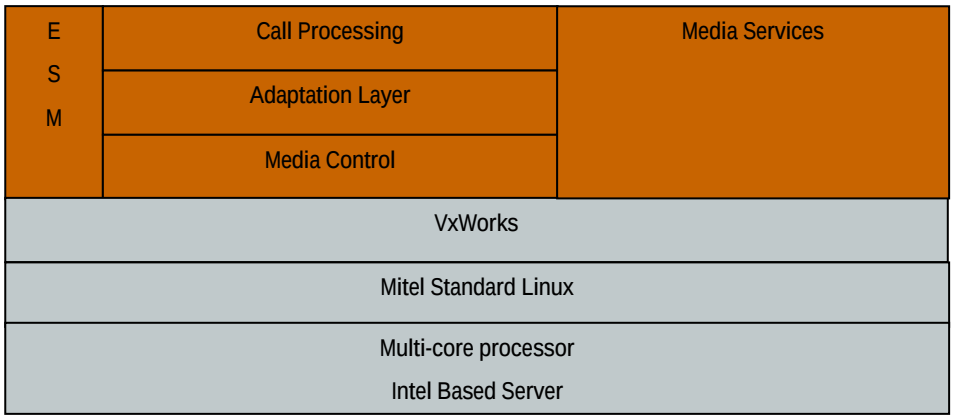


Figure 3: MiVoice Business on ISS

MiVoice Business Multi-Instance

The MiVoice Business Multi-Instance solution allows multiple instantiations of the MiVoice Business application to run in a virtualization environment on an Intel Multi-core processor based Industry Standard Server.

The current MiVoice Business Multi-Instance solution requires the Mitel Media Services to be run on a separate Industry Standard Server which is referred to as the Mitel Media Server.

Note: These Engineering Guidelines for MiVoice Business Multi-Instance only apply to server configurations that have been approved by Mitel. The number of users supported and performance will vary depending on the server that is being used.

For further information on qualified servers, check the 'MSL Qualified Hardware List' at http://edocs.mitel.com

Upon request, Mitel can qualify servers that are not currently qualified.

The MiVoice Business Multi-Instance and MMS are shown below.

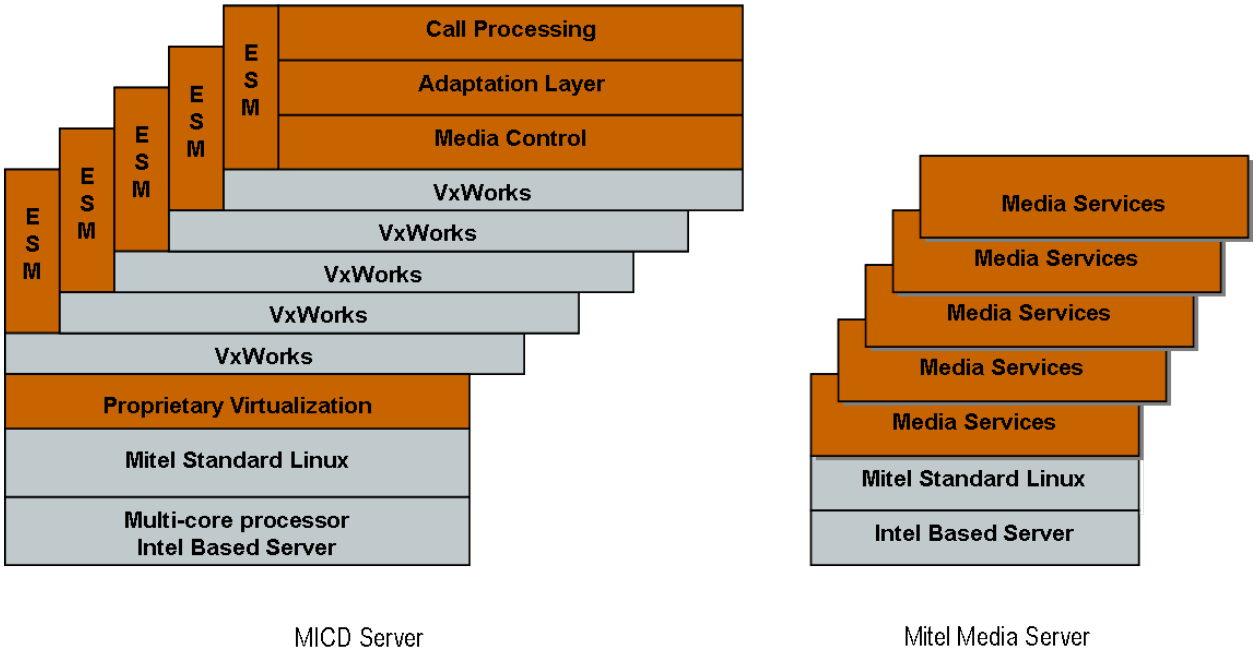


Figure 4: MiVoice Business Multi-Instance and MMS

Mitel Media Server (MMS)

The Mitel Media Services software performs functions that previously were performed by the Digital Signal Processors (DSPs) modules which were integral to the 3300 ICP. The Media Services software runs on the Mitel Media Server (MMS).

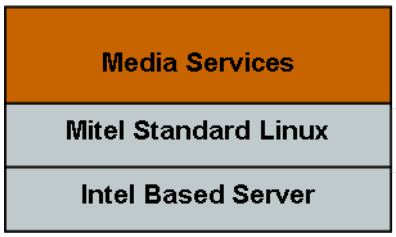


Figure 5: Mitel Media Server

The Mitel Media Server provides the following media (voice) related functions that are not handled by the MiVoice Business for audio streams that terminate on the MMS. The Mitel Media Server cannot intercept media streams that are not directly terminated at the media server:

- Audio Conferencing
- Voice compression (G.729)
- Embedded Music on Hold (MOH) – Note1
- Recorded Announcement Devices (RADs)
- Call progress tone detection
- Call progress tone generation
- In-Band DTMF monitoring (RFC4733)
- Paging
- Embedded Voice Mail – See Note below
- Record A Call (RAC) – See Note below

Note: These Engineering Guidelines for MiVoice Business Multi-Instance only apply to server configurations that have been approved by Mitel. The number of users supported and performance will vary depending on the server that is being used.

Note: Live MOH is not supported on the MiVoice Business Multi-Instance, only embedded MOH. Live MOH is supported on the 3300 ICP trunking gateways.

For calls that include in-band features, i.e. call features resulting from DTMF tones sent during an established call, use of an MBG may be required to detect the RFC4733 messages and direct these to the appropriate MiVoice Business. It is necessary for the end phone(s) and/or the SIP gateway to indicate in-band tones with RFC4733 messages. The audio stream must pass through the MBG for any in-band RFC message to be detected. The media server is not part of this point-to-point connection and cannot detect tones in this non-terminated stream. RFC4733 detection and insertion is included with the 3300ICP TDM trunking gateways and Mitel Phones.

The Mitel Media Server application is run on a hardware platform on top of Mitel Standard Linux.

Each MiVoice Business instance on an MiVoice Business Multi-Instance server must be associated with a single Media Server to provide full functionality

The MiVoice Business Multi-Instance server will handle a number of MiVoice Business instances. The Media Server can support a number of MiVoice Business instances.

The exact number of physical servers required is dependent on a number of factors, including:

- Server Type
- Configuration of server and available resources
- CPU type and core availability
- Traffic and resource requirements from the MiVoice Business instances

The minimum deployment of the MiVoice Business Multi-Instance solution requires one server for the MiVoice Business Multi-Instance server and one for the Media Server. As the system grows, some will require more Media Servers and some more MiVoice Business Multi-Instance servers. The ratio may not therefore stay at 1:1. These two scenarios are highlighted in Figure 6 (more Media Servers) and Figure 7 (more MiVoice Business Multi-Instance Servers).

For further information see the *MiVoice Business Multi-Instance Media Server Manager Administrator Online Help* at Mitel Online.

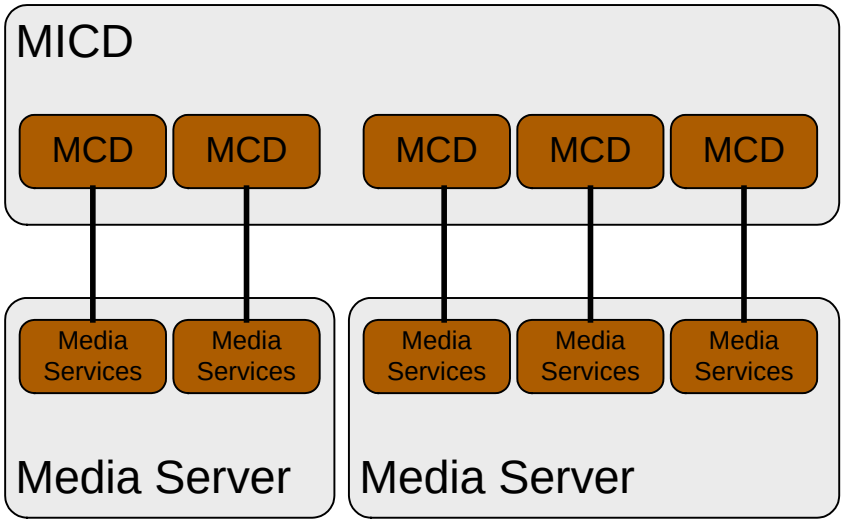


Figure 6: Multiple Media Servers to MiVoice Business Multi-Instance

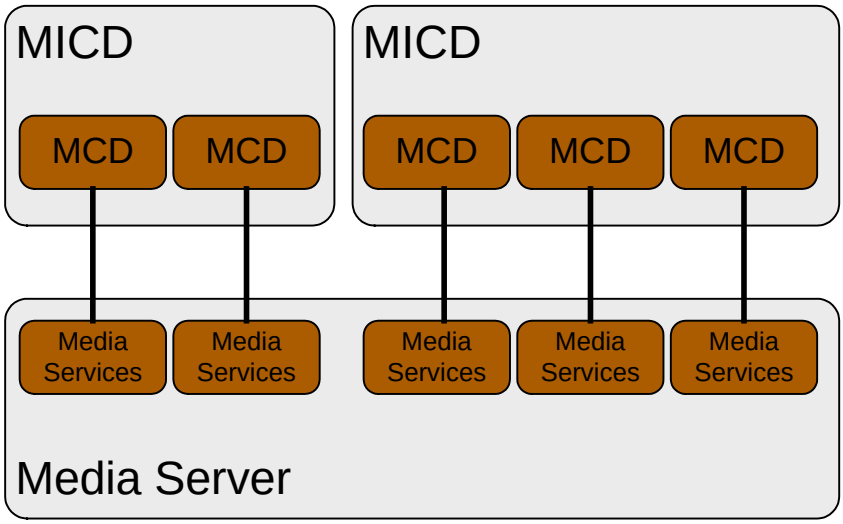


Figure 7: Single MMS Serving Multiple MiVoice Business Multi-Instance Servers

The figure above shows how a single MMS can provide Media Services to multiple MiVoice Business Multi-Instance Servers.

The number of servers required for a deployment can be determined using the rules within these Engineering Guidelines. The MiVoice Business Multi-Instance Engineering Tool (MET) along with the System Engineering Tool (SET) includes these rules in user configurable spreadsheets. These tools also include a server selection based on the MSL Qualified Server list.

Other Components

MiVoice Business Multi-Instance and MMS are completely IP based solutions; as a result some other components may be required to build a system wide solution. These components are discussed below.

PSTN Gateways

To connect to the PSTN the MiVoice Business Multi-Instance solution requires PSTN gateways. The PSTN gateway can provide both digital and/or analog connectivity to the PSTN.

The MiVoice Business Multi-Instance solution supports the use of both Mitel's 3300 ICP based gateways and 3rd party SIP based gateways.

Multiple customers or tenants can be supported per gateway.

Mitel Multi-protocol Border Gateway (MBG)

The MiVoice Border Gateway is an optional component that runs on an X86 platform on top of the Mitel Standard Linux operating system. The MBG provides the following functions and benefits:

- Management of Network Address Translation (NAT) and overlapped IP addresses
- Enhanced security between end customers because the MBG provides a layer of separation between different customers that are being hosted on the same MiVoice Business Multi-Instance.
- Enhanced security between the end customers and the Hosted Service provider (HSP) because MBG provides a level of isolation between the HSP and the end customers and vice versa.
- Voice quality enhancements are provided by the jitter buffers provided by the MBG, especially for Teleworker users.
- The MBG can also be used on the Trunking side of the network to consolidate trunks and also provide basic routing to MiVoice Business based on the DID number.

Note: Typically, separate MBG will be used for separate end user and SIP trunk connectivity, but may be combined for smaller installations.

The MBG supports clustered servers for Mitel Minet phones allowing load balancing and N+1 resiliency. SIP connections to phones and trunks must use 1+1 MBG resiliency. For details refer to the *MBG Engineering Guidelines*.

MiVoice Business Multi-Instance Deployment Scenarios

Mitel's MiVoice Business Multi-Instance solution is designed to solve a diverse number of customer requirements; this section summarizes a number of the intended applications for MiVoice Business Multi-Instance, as well as highlighting the two main operating modes introduced with MiVoice Business Multi-Instance Release 1.2: VLAN Mode and non-VLAN Mode.

Hosted / Managed VoIP PBX Services

TELCOs and IP telephony service providers who wish to provide hosted or managed VoIP PBX services for direct sale or resale to end customers can do so with MiVoice Business Multi-Instance. This can be either via public hosting through a common MBG or with private hosting in VLAN mode and direct connection to the customer private network.

Hosted Hospitality Services

There is a strong trend in the hospitality industry to centralize PBX services for multiple hotels in one location and MiVoice Business Multi-Instance is well suited to this application.

Large Enterprise Hosting

MiVoice Business Multi-Instance can be used by companies that are interested in hosting PBX services for their enterprise customers, or consolidating into common data centers.

An Integrated Hybrid solution

MiVoice Business Multi-Instance allows a customer to locate Customer Premise Equipment (CPE) at their head office and provide hosted PBX services for the branch offices from the head office. 3300 ICPs running MiVoice Business software can be deployed at the branch office to provide local gateway functionality.

Leased Offices

Large office buildings, office parks and managed offices can realize many administration and cost benefits by centralizing PBX functions with the MiVoice Business Multi-Instance solution.

Franchise Businesses

Many franchised businesses have geographically distributed locations but they require voice resources to be centralized at their head office, MiVoice Business Multi-Instance can solve this problem and provide isolation between the various branch locations.

Disaster Recovery Services

Companies that provide disaster recovery services to other corporations can use the MiVoice Business Multi-Instance solution to rapidly provide their customers with PBX capabilities should a disaster disable their own PBX infrastructure.

MiVoice Business Multi-Instance Deployment Configurations

The deployment scenarios highlighted above can be covered by specific deployment configurations. The MiVoice Business Multi-Instance can be configured in two modes:

- Non-VLAN
- VLAN

In non-VLAN mode, the MiVoice Business Multi-Instance operates in the same manner as previous versions of MiVoice Business Multi-Instance, and these earlier versions can upgrade to MICD1.2 in non-VLAN mode, with the same configurations.

In VLAN mode, the MiVoice Business Multi-Instance now introduces additional VLAN tagging with each MiVoice Business instance. It also allows the use of overlapped IP addresses that are unique to each

VLAN. This allows for both a single deployment where MiVoice Business software instances are identified via VLANs as well as a hosted solution where the deployments are common and the individual hosted customers are identified via the VLAN tag.

There are additional configuration rules that apply with the VLAN operation and these are described in more detail in the Guidelines section.

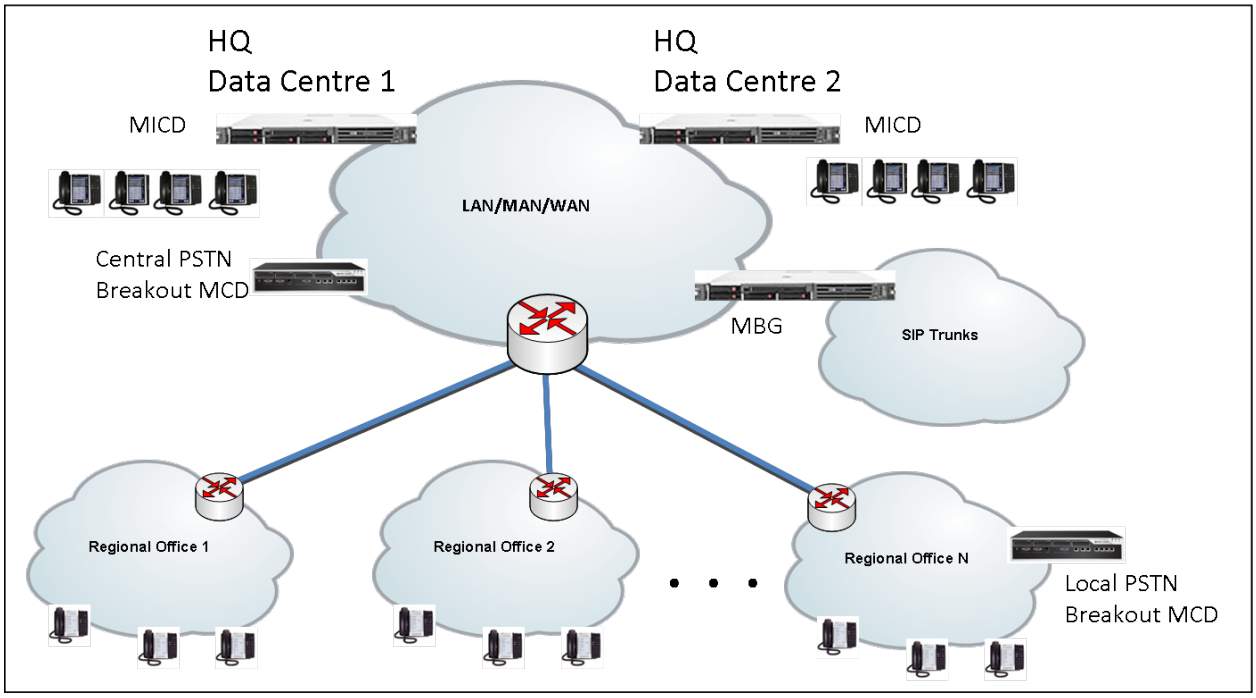
Typical configurations for deployment are:

- Non-VLAN mode, Enterprise operation, single network
- Non-VLAN mode, public hosted via common MBG to public network
- VLAN mode, private hosted to many customers across private networks

The configurations are described in more details below:

Enterprise: Non-VLAN mode

In this configuration there is one common network. The MiVoice Business Multi-Instance is being used to consolidate a number of MiVoice Business instances onto a reduced number of platforms and potentially to a reduced number of data centers. Operation in VLAN mode is possible with this deployment, but there is little benefit as all MiVoice Business instances will belong to the same network address space. Therefore non-VLAN mode is the preferred option.

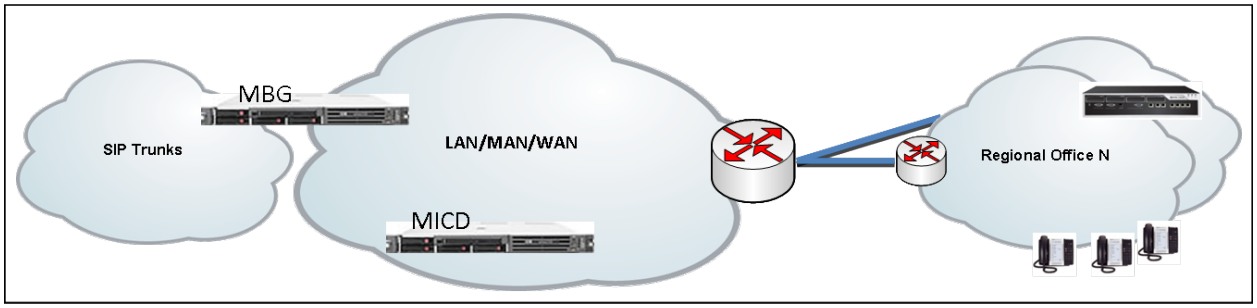


The phones at the HQ sites will have primary and secondary controllers in the two main data centers. The phones at the remote sites may do likewise, or they may include a local MiVoice Business as either primary or secondary controller to give continued operation in the event of WAN failure. This can also provide local PSTN access. Regional offices may also deploy multiple VPN connections back to HQ to negate the impact of a single WAN failure. Typically most trunk calls to the business will arrive, or originate, at the central sites either through common PSTN gateways, or via a common SIP trunk provider. Use of an MBG, or SBC, is likely to be required for address isolation between the private Enterprise network and the external SIP Service provider network. The SIP service provider may also employ an additional SBC.

Note that when consolidating existing MiVoice Business/3300ICP equipment onto common MiVoice Business Multi-Instance servers, it may be desirable to continue to use the same MiVoice Business IP addresses to minimize configuration changes. Use of MiVoice Business Multi-Instance in VLAN mode will

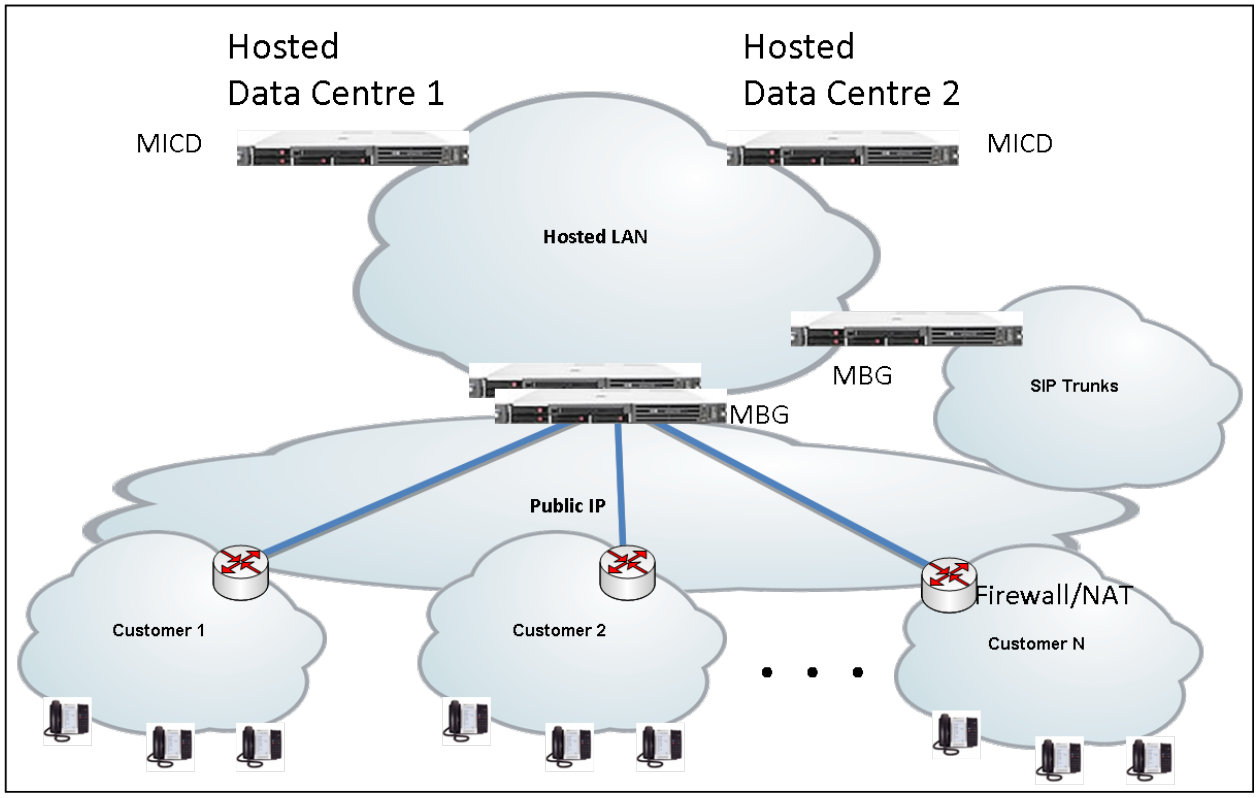
allow different subnets and non-sequential IP addresses to be used, and may be a consideration when migrating systems. Otherwise it would be normal to deploy an Enterprise solution with non-VLAN mode. See below for further details around use of VLAN mode.

The horizontal view of this network from trunk to end user is shown below:



Hosted: Public Network, non-VLAN mode

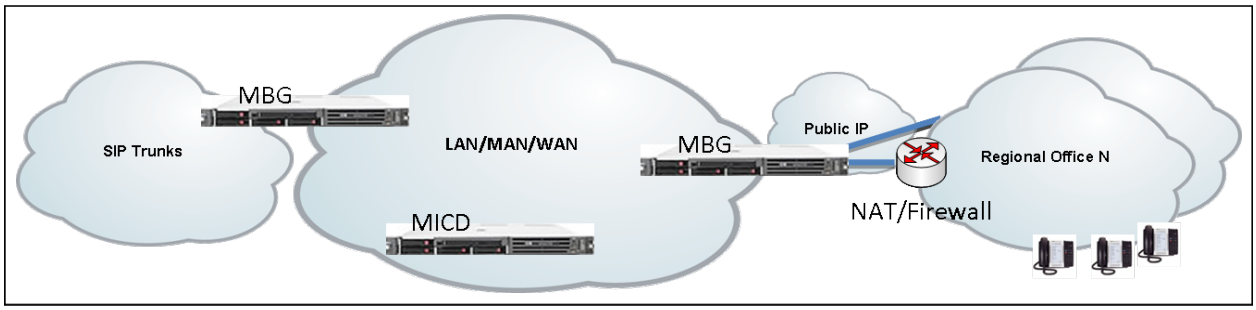
In this configuration there is only one hosting network to consider at the hosted service provider. The carrier or public network may, or may not, belong to the hosted service provider. The isolation from the hosted service provider network to the public network is via a common MBG. Since there is only one hosted network, there is no requirement for customer isolation between the MiVoice Business instances and non-VLAN mode is the preferred option.



This deployment is similar to the Enterprise solution, except that the access to the remote sites and customers is across a common public network, rather than a private connection. The public network may also not provide SLAs that could be expected and demanded with private networks. The isolation of the hosted network to the public network(s) is achieved through an MBG, or MBG cluster. The MBG provides isolation and NAT. Each remote site, or customer, is also uniquely identified via the public address at the local firewall/NAT router. SIP trunks are consolidated at the hosted network. Isolation of the hosted

network to the SIP Trunk service provider may involve an MBG, or SBC. The SIP Trunk Service Provider may employ an additional SBC in this connection.

The horizontal view of this network from trunk to end user is shown below:



This deployment is very similar to that of the Enterprise deployment, except that the common VPN router is replaced with the MBG, or MBG cluster and the remote VPN routers replaced with firewall/NAT routers. This deployment is good for SMB type deployments. However, larger hosted enterprise deployments may also require the addition of applications and local gateways. This is described in the next section.

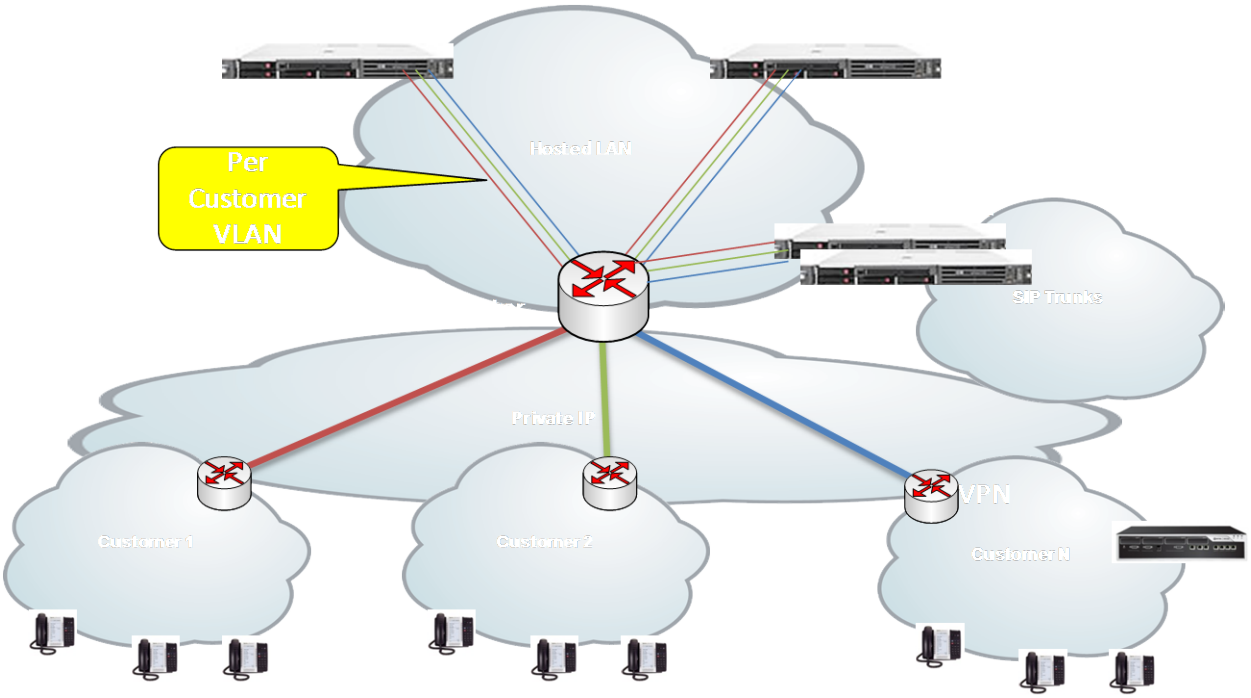
Hosted: Private Network, VLAN mode

In this configuration there are multiple networks to consider. There is the local address space for the hosting provider as well as the multiple address spaces from each customer that have been extended across a private carrier network into the physical hosting environment. The hosting network and private carrier network need not belong to the same provider. Each customer now has an extension of their private network extended into the hosted site. Each customer network must remain isolated from other customer networks and also the hosted address space. The reverse is also true, in that the hosting address space must also remain isolated from the customer networks.

For ease of deployment and management, there is also a high possibility that each hosted deployment will be similar to others. This eases the hosted provider management burden, but results in potential overlap of IP addresses to each of the customers. To maintain isolation and allow use of overlapped IP addresses, each customer is isolated with a unique customer VLAN and the MiVoice Business Multi-Instance must operate in VLAN mode.

Simple rules of thumb:

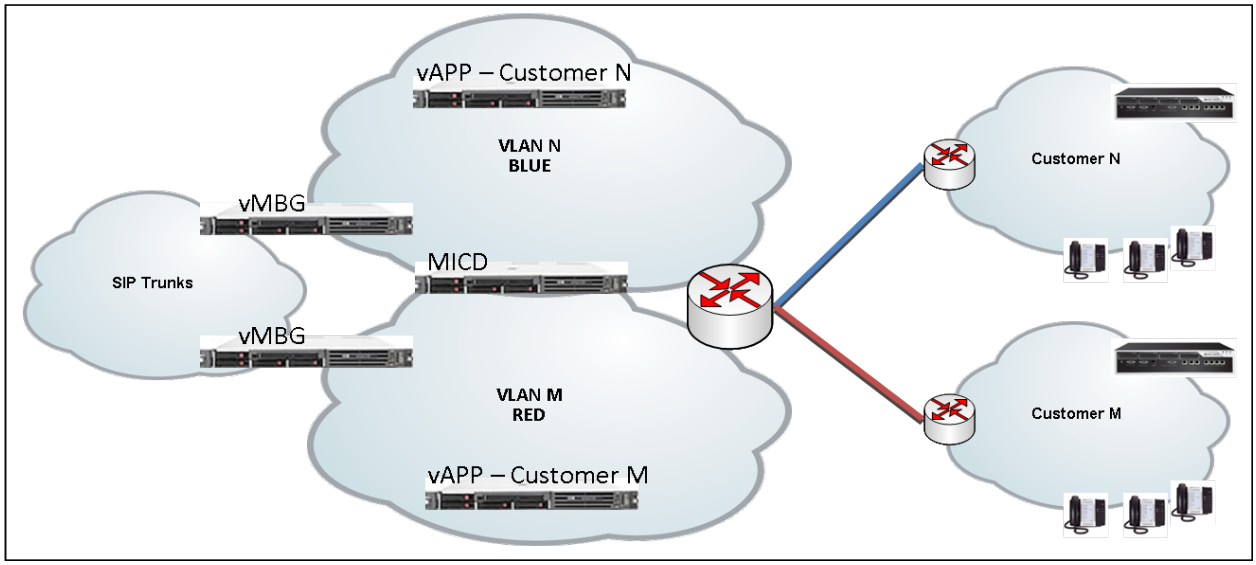
- If the hosted space is a single address space – Use non-VLAN
- If the hosted space includes multiple address space and IP overlap is possible – Use VLAN



This deployment is similar to the Enterprise deployment, except that it is in effect an overlay for each customer, with each customer being assigned a unique VLAN. The connection to the SIP trunks may also be a little different. Each customer will require an MBG, or SBC, per customer, including any resilient configuration for independent trunk connections. In the common hosted deployment there are benefits of scaling when determining the quantity and size of the MBG. Each customer, in this private hosted solution, will require less SIP trunks than the overall hosted provider, and so the MBG needs to be scaled accordingly per customer. The MBG may be a physical MBG or more likely one, or more, virtual MBGs assigned to addresses within the customer address space.

The common connection to the private network at the hosted location needs to deal with many virtual routes, and routers, within a common space. This could be achieved with many physical routers, but is more easily covered with a common VRF capable router. The VPN connection for the customers is likely to exist already and simply needs to be extended in the interconnecting carrier network. This network may be private, or public, typically MPLS.

The horizontal view of this network from trunk to end user is shown below:



This deployment is very similar to the Enterprise deployment, for each individual customer. The main difference from the hosting provider is that the MiVoice Business Multi-Instance, in VLAN mode, can now present a unique MiVoice Business instance, or instances, to each customer from a common infrastructure location. The other advantage with this network is that it allows other services and applications to also be hosted, as indicated by the vAPP servers per customer, as well as interworking with other MiVoice Business or local PSTN gateways and 3300ICP directly.

Hosted Deployment MiVoice Business Multi-Instance Management

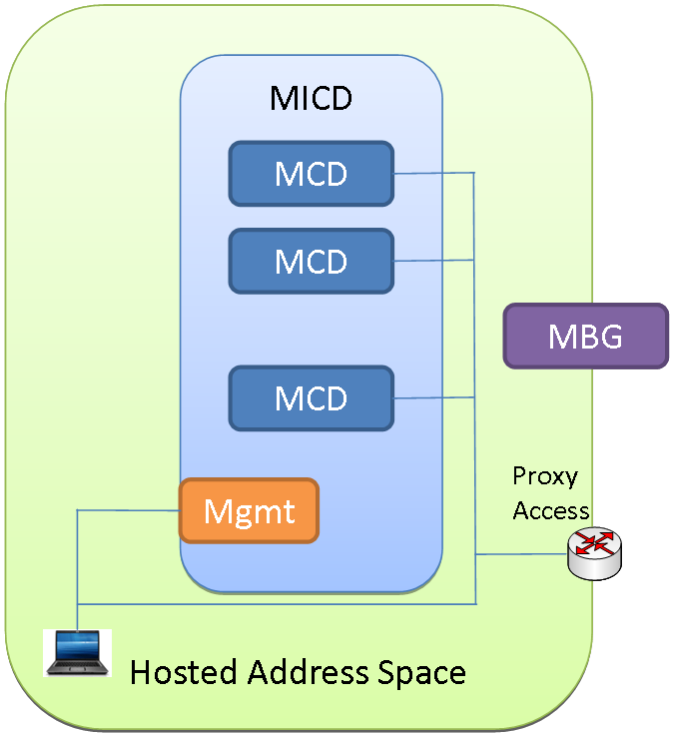
The use of VLAN mode also introduces some additional overheads with respect to management of the hosted solution for both a hosted provider and also for customers that require individual control.

With the Enterprise solution there is no real management issue, since all MiVoice Business instances can be accessed from within the single customer address space.

With the Hosted Public network solution, there is one common address space for the hosted provider to manage. However, the customers can only access their MiVoice Business instances by an external proxy that controls access for allowed configurations.

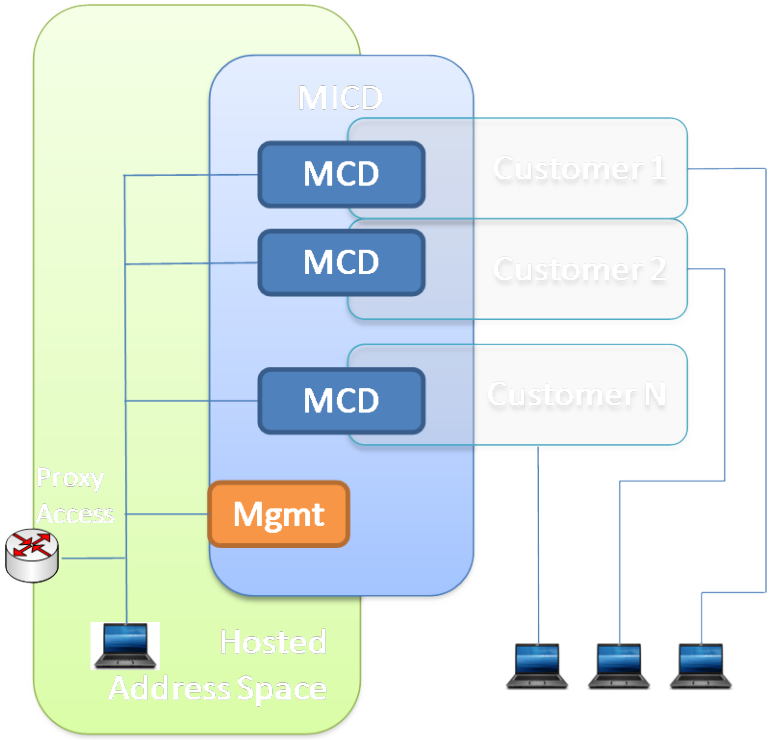
With the Hosted Private network solution, there are many address spaces within the hosted infrastructure. The hosted provider will need to access the MiVoice Business for configuration and the customer may also need to access their local MiVoice Business instances, or may be restricted. Depending on the MiVoice Business Multi-Instance configuration these options can be provided. The proxy access may also be required within the hosted provider address space, should direct access for the customer be restricted.

The following diagram illustrates the management access to the MiVoice Business Multi-Instance with non-VLAN mode of operation.



Access is possible from within the hosted provider's address space to both the management interface for the MiVoice Business Multi-Instance and to each of the MiVoice Business instances. A Proxy Access is also provided for external access for the users to their individual MiVoice Business instances.

The diagram below illustrates the VLAN mode of operation of the MiVoice Business Multi-Instance.



Access to the MiVoice Business Multi-Instance management is possible from within the hosted provider's address space. Access to the MiVoice Business instances within the MiVoice Business Multi-Instance server is also possible from within the hosted provider's address space to assigned MiVoice Business addresses within the hosted space. Access is also possible via proxy access to the same specific MiVoice Business instances. Access is not possible via this route to other MiVoice Business instances or devices within the customer network that are not on this particular MiVoice Business Multi-Instance.

The customer has access to devices within their own network, including any customer specific MiVoice Business within the customer network. The customer will also be able to access those MiVoice Business in the customer address space on MiVoice Business Multi-Instance, depending on the MiVoice Business Multi-Instance management settings. The customer does not have access to other MiVoice Business instances, not in the customer network, nor to the management interface of the MiVoice Business Multi-Instance.

Access to the MiVoice Business on MiVoice Business Multi-Instance can be restricted to the management plane, in the hosted network, or to the customer network. Access to the MiVoice Business instances, from the customer network, can also be restricted to specific devices and specific subnets within the customer network.

Further details on addressing requirements and configuration of the management access from within the hosted carrier and customer address spaces is detailed in the guideline sections, below.

MiVoice Business Multi-Instance Capabilities

This section highlights some of the following capabilities that can be provided by the MiVoice Business Multi-Instance solution:

- A virtual call server per tenant
- Complete independence between tenants
  - Dialing plan
  - Software revision
  - Call routing configuration
- Virtual call servers are provisioned and managed through a single management interface.

  Virtual call serves can also integrate with 3300 ICP based call servers. For instance a customer's call server needs might be provided off site by an HSP and a 3300 ICP might be installed on site to provide services locally should there be a Communications failure with the HSP.

  Virtual call servers can each run different versions of software releases, this allows core software releases to be run for mainstream tenants and software patches for new functionality and specific bug fixes to be run for individual tenants.
- MiVoice Business Multi-Instance can scale to many thousands of users and provide a complete enterprise feature set.
  - Information on capacities for a specific software phase can be found in the *MiVoice Business Multi-Instance Release Notes* at Mitel Online.
  - When determining capacities the administrator should also refer to the *MSL Qualified Hardware List* and the *MiVoice Business Multi-Instance Engineering Tool* (both available at Mitel Online).
  - A significant upside is realized from leveraging server industry power curves.
  - Maximum number of users per instance is 5,000, based on MiVoice Business limits. (See MiVoice Business/3300 Engineering Guidelines for other limits and configurations).
  - Multiple instances can be supported per server.

- A two CPU Quad core 2.9GHz Intel Nehalem server with hyperthreading enabled will support an MiVoice Business Multi-Instance with up to the following deployments (with minimal applications installed):
  - 100 instances of 150 users per instance (15000 users)
  - 25 instances of 1000 users per instance (25000 users)

Note: Depending on required media services, a higher speed CPU may be required.

- A two CPU Hex core 2.9GHz Intel Nehalem server with hyperthreading enabled will support MiVoice Business Multi-Instance with up to the following deployments (with minimal applications installed):
  - 200 instances of 100 users per instance (20000 users)
  - 150 instances of 150 users per instance (22500 users)
  - 35 instances of 1000 users per instance (35000 users)
- A two CPU Octal (8) core 2.9GHz Nehalem server, with hyperthreading will suport a MiVoice Business Multi-Instance with up to the following deployments (with minimal applications installed):
  - Same configurations as for the 2 x Hex core CPU server, above
  - 250 instances of 100 users per instance (25000 users)

Note: Depending on required media services, a higher speed CPU may be required

- Licensing is accomplished via Mitel's online AMC licensing mechanism.
- The MiVoice Business Multi-Instance solution can be engineered for 99.999% availability using resiliency and application load sharing.
  - Virtual call servers support the same resiliency model as other MiVoice Business instances and physical 3300 ICPs.
  - MiVoice Business Multi-Instance supports geographic separation between endpoints and severs and primary and secondary servers.
  - Media Servers resiliency is provided via the Media Server associations with its MiVoice Business instance.
  - MBG servers can be clustered with application load sharing.
- The MiVoice Business Multi-Instance solution can be engineered to provide differentiated Service Level Agreements (SLA) for system availability.

ACD Deployments

It is possible to use MiVoice Business Multi-Instance to provide ACD type deployments. ACD deployments can range from small installations to large call-centers. Due to the many variations and the performance requirements for ACD deployments, any installation that includes ACD should be verified before installation.

Any ACD deployment should be pre-verified with the SET and MET tools, and verified through Mitel Professional Services.

Some considerations for ACD include the following:

- Traffic will nominally be either all incoming or outgoing.
- Traffic will nominally be at 27CPH, about 4 to 5 times higher than office traffic.
- Requirements on the Media Server will increase. The default per MiVoice Business settings may need to be increased to compensate.

- The Media Server is limited to 256 channels per MiVoice Business, which may not be sufficient for larger deployments.
- A larger ACD deployment may require resources that result in minimal number of instances per MiVoice Business Multi-Instance. An alternative deployment for a larger deployment might be a dedicated MiVoice Business for ISS platform.
- Addition of ACD applications will increase the effective call rate of the system and impact overall quantities and resource usage.
- Ensure that if an MBG is included in the deployment that it will support the added functions as well as the increased call flow.
- Use of EHDA will further increase the number of trunks as well as the MiVoice Business traffic. Review the MiVoice Business/3300 Engineering Guidelines for further details.

Licensing

The overall MiVoice Business Multi-Instance solution is licensed on multiple layers, these various layers work together to provide the customer's final configuration as shown below:

MiVoice Business Multi-Instance Solution

The MiVoice Business Multi-Instance Base Kit includes Mitel proprietary virtualization licenses to support up to the permitted number of MiVoice Business instances on the MiVoice Business Multi-Instance Server platform. The number of MiVoice Business instances will be governed by the specific hardware configuration of the server.

Table 1. MiVoice Business Multi-Instance Base Software License

Part Number	Description	Notes
54004602	Multi-Instance Communications Director Base Package	Includes allowances for instances up to limit of hardware
54004606	Multi-Instance Communications Director - Media Server Base Package	Needed to enable associated Media Servers – can only be enabled in conjunction with MiVoice Business Multi-Instance Base Package (54004602)

The packages above are needed to enable the MiVoice Business Multi-Instance configuration. Media functions that are associated with each MiVoice Business instance are licensed through that particular MiVoice Business instance. These include functions such as compression, EMEM, RADs, etc. See below for more details.

Installation of the MiVoice Business Multi-Instance Server and Media Server software are carried out as separate actions, being installed on separate servers. The software can be downloaded from the product CD or via AMC.

Refer to the *System Capacity* section, below, for product limits with the different software configurations.

MiVoice Business Instance Licensing

Each MiVoice Business instance is licensed in the same way a standalone MiVoice Business instance is licensed, for details refer to The Mitel Communications Director on Industry Standard Server Engineering Guidelines.

The following diagram shows how the MiVoice Business Multi-Instance License Model could be used by a Hosted Service Provider or Enterprise to offer services to multiple customers or groups.

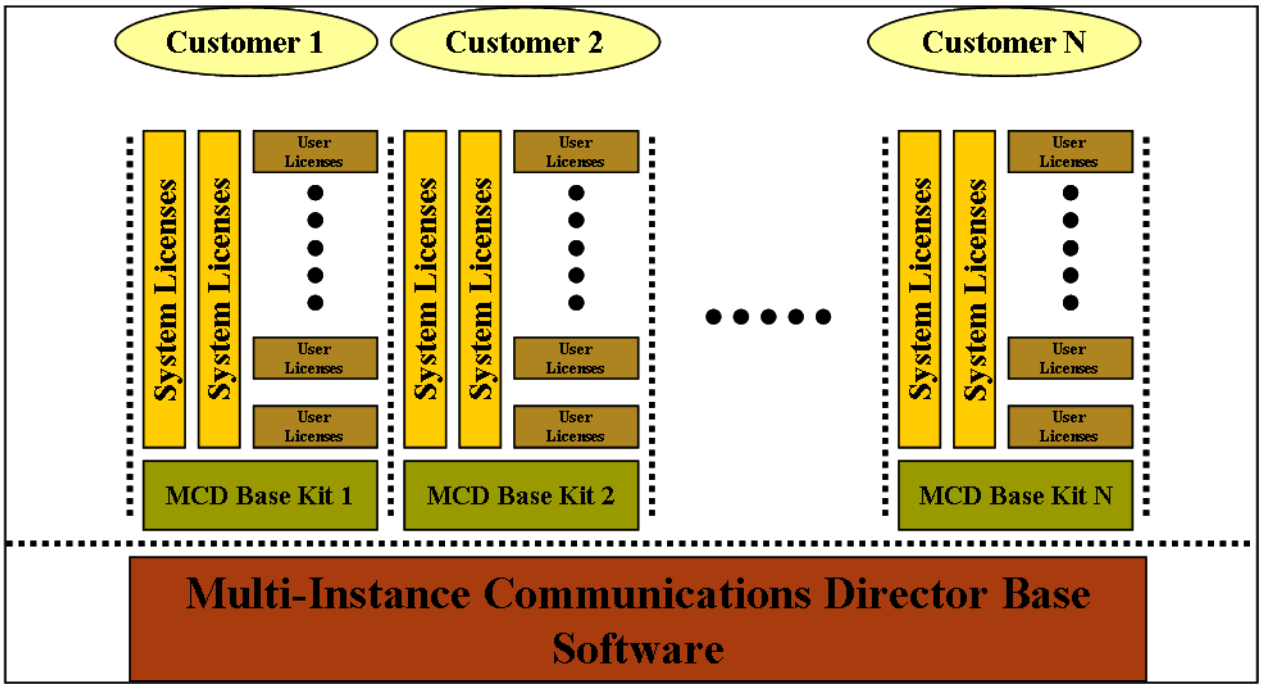


Figure 8: MiVoice Business Multi-Instance License Model

Server Specific Engineering Guidelines

This section provides recommendations and guidelines that should be considered when planning and engineering a MiVoice Business Multi-Instance installation.

MiVoice Business Multi-Instance Computing Platform Capacities

The MiVoice Business Multi-Instance solution is designed to be run on Industry Standard Servers (ISS) including those offered by corporations such as Oracle America Inc. (formerly Sun Microsystems), Hewlett Packard, Dell or IBM. The selection of the correct ISS depends on many factors; the following guidelines discuss a number of these factors and can be used to assist in the preliminary selection of an appropriate ISS for a particular application.

However, a more accurate and confident ISS selection can be made by using the MiVoice Business Multi-Instance Engineering Tool (MET) in conjunction with the 3300 ICP System Engineering Tool (3300 ICP SET).

MiVoice Business Multi-Instance Server Provisioning

To determine the number of MiVoice Business Instances that can be supported on a particular ISS the administrator will need to consult the MSL Qualified Hardware List, the MET and the SET. Additional information on limitations per MiVoice Business instance can be found by referring to the 3300 ICP Engineering Guidelines, available from http://edocs.mitel.com.

Every installation will be unique, but the following table can be used to identify some working limits for the available server capabilities. It should be noted that different business usage, type of phone and linkage to applications may reduce some of these numbers. The SET and MET should be used to cross check specific deployments.

These server limits are based on standard traffic usage of 6CPH per phone and minimal phone applications. The MSL operating system is 64bit. The number of users and phones per MiVoice Business instance will be modified by business usage of that MiVoice Business instance.

Parameter	2 x Quad core E5570 (2.9GHz) with hyperthreading enabled	2 x Hex core E5670 (2.9GHz) with hyperthreading enabled	2 x Octal core E5-2690 (2.9GHz) with hyperthreading enabled
Maximum MiVoice Business instances	100	200	250
Maximum Users per instance	5000 (see MiVoice Business/3300 Guidelines for deployment limits)	5000 (see MiVoice Business/3300 Guidelines for deployment limits)	5000 (See MiVoice Business/3300 Guidelines for deployment limits
Maximum Users per server	25000	35000	35000
Failover limit[1]	12500	17500	17500
Typical scenario limits	100 MiVoice Business instances x 150 users 25 MiVoice Business instances x 1000 users	200 MiVoice Business instances x 100 users 150 MiVoice Business instances x 150 users 35 MiVoice Business instances x 1000 users	250 MiVoice Business instances x 100 users (1 device per user)

[1]:This is the maximum number of phones that can fail over to a MiVoice Business Multi-Instance server in a single burst, such as when another MiVoice Business Multi-Instance server is removed unexpectedly from service. Users and phones should be allocated to primary and secondary MiVoice Business instances, across the MICD servers, such that a single server outage will not result in this number being exceeded on the backup MiVoice Business Multi-Instance server(s).

The Media Server can run base functionality (conference, MOH and voice mail) with the same processor type, but will require a higher speed for added services or use with compression.

Note: When determining server capacity the Software Release notes should be consulted since capacity may vary depending on the supported configurations.

Rules of Thumb

The following rules of thumb are provided to assist in the ISS selection and configuration process.

Processors

- There should be a maximum of 6 Call Control instances per CPU thread. More Call Control instances per thread may be possible depending on overall traffic loading. Up to 10 instances per thread is possible if none of the instances has more than 200 users.
- Hyper threading may be configurable in BIOS providing additional “virtual” cores, in effect it increases the number of threads per core. This allows the number of instances per physical core to double, subject to other core reservation, i.e. IO operations.
- Maximum CPU Loading per physical core should not exceed 75%.Note that when running with hyperthreading, more care is needed to determine exact core usage. It is possible for the tools to report CPU at 50% usage. As two virtual cores, or threads, are locked to a single physical core (Intel 55XX), a usage of 50% may correspond to a real 100% per physical core.

  Note: While enabling hyperthreading may double the number of threads, it does not double performance. Typically the server *may* show a performance boost *up to* 140% over the number for a non-hyperthreaded machine. The level of boost is also dependent on the loading per thread. Capacity per thread may also decrease, but because the thread count doubles, overall performance on a multi-instance machine effectively increases, i.e. on a 5000 user/device instance, maximum calls per hour may decrease when hyperthreading is enabled. Use the System Engineering Tool and MiVoice Business Multi-Instance Engineering Tool to verify performance, especially with instances above 1000 users.

- For MiVoice Business Multi-Instance, one CPU core is reserved for IO operations per CPU device, e.g. a four core CPU requires one IO core, leaving three cores available for the MiVoice Business application. A hex core machine still requires one core for IO, leaving five available. The operating system core count includes virtual cores as provided through Hyper threading, and typically two virtual cores are associated with a single physical core.
- Support of PCI 3.0/PCI-X (3.0) will give much improved streaming and interrupt handling performance. An example processor that supports this architecture is the Nehalem (e.g. E55xx) processor cores. A non-PCI3.0/PCI-X (3.0) server will be limited to one active core for MiVoice Business use.
- Information on the CPU technology can be found on http://www.intel.com. A summary can also be found at the following location: http://en.wikipedia.org/wiki/Nehalem_(microarchitecture)

MiVoice Business

Each MiVoice Business instance will require a percentage of the physical and logical cores available on the system. A single MiVoice Business instance is bound to a single logical core during operation. A single MiVoice Business instance cannot exceed the performance available on a single physical core, even in a multi-core server. Therefore the MiVoice Business rules and limits, as per the MiVoice Business Engineering Guidelines, apply to every MiVoice Business instance in the MiVoice Business Multi-Instance Server. A MiVoice Business instance cannot also exceed the PI rating of a single physical core, based on CPU speed.

- A MiVoice Business instance running at 100% PI (PI determined in SET) will consume a complete physical core (based on 75% CPU recommended usage).
- A MiVoice Business Multi-Instance Server with hyperthreading enabled can provide an additional boost to the overall server of 20 to 40% and handle more instances. However, the penalty is that

each active core must be de-rated to 70% PI, and therefore the MiVoice Business instances should be equally de-rated. (There are some exceptions. The MET can take these into consideration, and may flag a high PI warning in this situation).

- Enabling hyperthreading is strongly recommended when there are more MiVoice Business instances than physical available cores. (See below for calculation of physical available cores.)
- One physical core per CPU is reserved for general use and not available to MiVoice Business instances.
- Total Physical Available Cores = (Physical Cores per CPU – 1) x number of CPUs. As an example, for a 2 CPU Quad Core (Intel 55XX) there are 6 physical available cores (2 x (4 –1)). For a 2 CPU Hex Core (Intel 56XX) there are 10 physical available cores.
- The PI for a 2.8GHz CPU is around 500,000 per physical available core. Scale maximum PI based on expected CPU speed to this ratio. Thus a 2.2GHz CPU will be 390000PI (500000 x 2.2/2.8).
- As a rough guide take the PI value for each active MiVoice Business from the calculations in the SET. Apply the above cap limits and divide into the available server PI. As an example:
  - Hyperthreading enabled. 2 x CPU Quad Core @ 2.8GHz = 6 physical available cores.
  - One MiVoice Business instance at 480,000 PI. Seven MiVoice Business instances at 100,000PI are required.
  - The one instance is more than 70%PI with hyperthreading limits, so should be split into two MiVoice Business instances, for example 240,000 PI each.
  - Total required PI is 1,180,000 PI.(240,000 x 2 + 100,000 x 7).
  - Server capacity is 3,600,000 PI (6 x 500,000 x 1.2 (20% hyperthreading)).
  - This fits!

Note: The MET carries out more complex calculations and it is possible that end numbers may vary slightly from these rule of thumb calculations. The above rules will provide a useful guide to determine when more accurate analysis is needed.

System Memory (RAM)

- Mitel Standard Linux requires 2.0GB of RAM.
- Memory allocation sizes depend on several factors including Maximum Elements per Cluster, and Maximum Configurable IP Users and Devices.

  The following table shows how the new memory allocation is implemented and calculated. This only applies to new MCD tenant deployments.

MiCD Release	**1.2**	**2.0**	**2.0**
# of Configurable Users and Devices	700/5600	700	700/5600
Max # of Elements per Cluster	30/60/250/999	30	60/250/999
Tenant Memory Size (MB)	512	425	768
Java (MB)	75	75	75
Atlas (MB)	12	12	12

MSL Footprint per MiCD server	1500 MB

- 0.096 GB of RAM needs to be allocated for Recorded Announcement Devices (RADs).
- 17.6KB of RAM needs to be allocated for media streaming per stream.
- Media Server requires 12G to handle up to 100 MiVoice Business instances.

The memory size for the Call Server instance can be changed. For example, in cases where there are 5000 user instances, each call server instance requires 768M of RAM. To start an instance with increased RAM, use the following command from the MSL command line interface:

```
[root@triale ~]# mcdram
```

This is a utility to show/set MiVoice Business Tenant VxWorks RAM size. The usage is as follows:

```
mcdram [show|set]
```

where

```
show
```

```
set all|tenant2 N
```

will set *tenant2* VxWorks RAM size to *N* MBytes.

Note: 5000 user instance support requires Release MCD 6.0SP2 or later software.

Note: Once entered, the RAM increase change is persistently stored and will survive reboots and upgrades of either the MiVoice Business Multi-Instance server or the MiVoice Business instance.

At MiVoice Business Multi-Instance Release 2.0, the default memory per instance is reduced to 425Mbytes per instance. This is a reduction in memory over previous versions. However, the instance should also be limited to less than 700 devices and the license options configured for 700 *users* and 30 cluster members. (The licenses settings assume 1 user = 1 device. In a Unified Communications environment, there may be multiple devices associated with a single users and MDUG). For installations with many smaller MiVoice Business instances, this is an improvement in memory resource requirements.

For systems that were installed prior to MiVoice Business Multi-Instance Release 2.0, the memory settings will remain. This will allow upgrade without the requirement for additional memory. In order to take advantage of memory reductions, for a previously installed system, will require database backup, memory configuration adjustments on the instance with a restart, followed by database recovery. The database should not have more than 700 devices configured and less than 30 Network Elements in order to carry out this conversion. Data loss may occur if these limits are exceeded prior to conversion.

MiVoice Business Multi-Instance Computing Platform Configuration Recommendations

The following recommendations should be observed when configuring the ISS platform:

- Run all processes in RAM, don't rely on virtual memory – page hits and disk accesses are slow.
- Use multiple LAN connections and use IEEE 802.1ad for redundancy.
- Use iLO (integrated Lights Out management) for remote control and management.
- For power redundancy, run Dual power supply units from different power sources e.g. one via UPS and one from a dedicated branch circuit.
- Run NICs at the fastest speed, 1000MHz, or higher.
- Jumbo packets should not be enabled for the MiVoice Business Multi-Instance solution.
- Configure the Layer 2 switch for VLAN support, including tagging of untagged data and acceptance of VLAN tagged data from the server.
- Configure the port for 802.3ad if NIC bonding is enabled at the server.

MiVoice Business Multi-Instance Hard Disk Drives

The following recommendations should be considered when selecting disk drives. The disk drives are primarily used for Voicemail storage and Call Server software storage.

- The hard disk drives must be in a single partition for all services. Multiple partitions are not currently supported. For blade servers this may require the addition of external co-located storage blades for the MiVoice Business Multi-Instance Server.
- The MSL Operating System is limited to 2TBytes of access. Installations that require more storage will require the use of multiple servers.
- RAID technology should be deployed.
- Higher speed server grade disk drives are recommended, 10k rpm or higher. 15k rpm is preferable for the MiVoice Business Multi-Instance server due to increased accesses for voice mail.
- For each MiVoice Business Instance, the recommended disk space requirements are:
  - For the MiVoice Business Multi-Instance base platform (i.e. MSL): 10GB for the whole platform.
  - For instances with less than 150 users with and without Embedded Voicemail: 8GB per instance.
  - For instances with more than 150 users and with no requirement for Embedded Voicemail: 20GB per instance.
  - For instances with more than 150 users and requires Embedded Voicemail: 32GB per instance.

Mitel Standard Linux (MSL) Operating System

The MiVoice Business Multi-Instance Server has the following recommended number of instance limits, based on the installed MSL version. The 32-bit MSL Operating System supports up to 32G of RAM which is sufficient for approximately 50 MiVoice Business instances. To access large quantities of RAM, and also higher number of MiVoice Business instances, the 64-bit MSL Operating System must be installed. (There is no upgrade path between the 32-bit and 64-bit operating systems. They are different - choose the correct version when starting out.) New MiVoice Business Multi-Instance installations should only use the 64-bit MSL for both MiVoice Business Multi-Instance Call Server and Media Server.

- MSL 32bits: No more than 50 instances per server platform (backwards compatibility).
- MSL 64bits (MSL 9.2.27.0 or higher): No more than 250 instances per server platform.

These limits apply irrespective of whether there are sufficient other resources such as RAM and HDD. Recommended limit for 2 x Hex core CPU is 150 instances.

Traffic Ratios

The following are some ratios that are useful for traffic planning:

- Typical Office, 6 calls per hour, 33% incoming, 33% outgoing, 33% internal.
- For a typical system the number of incoming to outgoing calls should be about equal, although in some cases, e.g. ACD, this rule may not apply.
- ACD traffic is typically much higher than office traffic, typically around 27CPH and either 100% incoming or 100% outgoing.
- MOH traffic will be 13% of overall traffic; this is based on 50% of calls originating on incoming trunks. 25% of these calls are attendant answered, 25% of these calls are directed, call rate is 27 CCS and the call hold time is 30 seconds.
- The conference to trunk ratio is 5.4%.
- MiVoice Business Multi-Instance will support 100,000 IP CPH per unit; this is based on a normal office traffic rate of 6 CPH per user. e.g. 64 instances with each instance supporting 100 users = 38,400 CPH.

- Paging channels will default to 8 channels within the SET. This may need to be increased or decreased according to the size of the instance and requirements for paging. Typically this would be up to 4% of users for smaller systems decreasing to 1% for larger systems.

Media Server Guidelines

- The Media Server requires its own server that is separate from the MiVoice Business Multi-Instance Call Server.
- See the Mitel MSL Qualified Hardware list for an appropriate server selection.
- The Media Server can support up to 1024 G.729 compression sessions with 2 Quad core E5570 (2.9GHz) processors. The Media Server can support up to 1300 G.729 compression sessions with a 2 Hex core E5660 (2.8GHz) processor. Scale to CPU speed as appropriate.
- The Media Server can support up to 3500 G.711 Streams with a 2 Quad core E5570 (2.9GHz) processor, and 4500 G.711 Streams with a 2 Hex core E5660 (2.8GHz) processor. Scale to CPU speed as appropriate.
- There should be one Media Services instance associated with each MiVoice Business instance on the MiVoice Business Multi-Instance server.
- The maximum number of streams per MiVoice Business instance is limited in software to 256 streams (or channels), however if so desired the administrator can decrease this limit at initial configuration. The Media server provides the following suggested settings (Note: 'Up to 5000 users' includes a system with say 90 users where more streams are needed based on system functionality and higher traffic rate):
  - Up to 100 users: 32 media channels (64 IP Ports)
  - Up to 500 users: 64 media channels (128 IP Ports)
  - Up to 1000 users: 128 media channels (256 IP Ports)
  - Up to 5000 users: 256 media channels (512 IP Ports)
- The Media Server supports a number of voice functions including Conference, Embedded Voice Mail, Embedded Music on Hold, Embedded RADs and Paging. Media Servers configured for 128 channels, or less, share all these functions across all the channels during operation. For Media Server configurations with 256 channels, these functions are equally shared across all channels, with the exception that conference is limited to 128 channels.
- Paging groups should be limited to less than 200 end points, and typically less than 64 end points..
- The number of RAD channels is limited by the number of EMEM channels available to the system, and channel use is mutually exclusive with Embedded Voice Mail.
- The Media Server can support 30 Voice Mail channels (or ports) per MiVoice Business instance. (For more details on Voice Mail capacity, refer to the *MiVoice Business System Administration Tool Help*, and search for Voice Mail Port Capacity.)

MiVoice Border Gateway, MBG 5.0

- See the Mitel MSL Qualified Hardware List for an appropriate server selection: http://edocs.mitel.com.
- The MBG server can support 2500 Phones (based on an office traffic rate of 6 CCS).
- The MBG server can support 500 connections, i.e. 500 full duplex conversations.
- For resilient operation of Mitel Minet Phones the MBG sever can be deployed in an N+1 clustered configuration.
- For other configurations, i.e. SIP, the MBG will be deployed in a 1+1 arrangement.
- The MET can also calculate MBG requirements against the selected server. The results may differ from the limits currently specified above, depending on the selected server and processor speed.

Network Configuration Guidelines

Depending on the eventual deployment, the MiVoice Business Multi-Instance can be deployed in non-VLAN mode or in VLAN mode. There are some differences and requirements associated with these two configurations. These will be described below.

When deciding which mode to use depends on whether the deployment is a single IP address map deployment, or multiple IP address map with overlapped IP addresses. If it's the latter, i.e. multiple address maps, then VLAN mode must be used, otherwise the recommendation is to use non-VLAN mode (although VLAN mode can be used in this case as well).

Rule of thumb: If multiple IP address spaces, or overlapped IP addresses, then use VLAN mode.

Rule of thumb: For MiVoice Business Multi-Instance1.2 and any new installations use the 64-bit MSL Operating System. Exceptions for existing installations are described below.

Another determinant is whether to use the 64-bit MSL Operating System for *existing* MICD1.0 and MICD1.1 installations. This is needed when there is a requirement to install more than 32GB of RAM. This will typically occur when more than 50 instances are required.

MICD1.2 is supplied with and operates with the 64-bit MSL operating system. The 64-bit MSL OS must be used for new MICD1.2 installations, even when there are less than 50 instances and less than 32G of RAM. This will ensure forwards compatibility and ability to expand.

Rule of thumb (MICD1.0 MICD1.1 and existing installations): If more than 50 instances (and more than 32GB of RAM required), then use the 64-bit MSL OS.

Some common network rules include:

- Ensure that there is sufficient backplane bandwidth to handle the media streams and number of packets at MBGs and Media Servers.
- Ensure that the routers have enough Packet Per Second (PPS) handling to deal with the number of streaming packets between different devices on different subnets.
- Keep any routing rules simple to minimize overhead on the CPU in the router.
- Use of a hardware accelerator at the router, or Layer 3 switch, will also improve throughput, especially if routing is based on simple rules, e.g. IP address only.
- Default operation for MiVoice Business Multi-Instance and Media Server is non-VLAN mode.
- The MiVoice Business Multi-Instance and Media Server components should run on separate servers and should not share with any other applications.
- It is recommended to select the appropriate media server channels at initial configuration. For example, the media server may be able to provide 256 media channels per MiVoice Business Instance, but for an MiVoice Business Instance with only 100 users this is over-allocation. It would be more appropriate to select a smaller number, as an example, 64 in this case. This ensures that the MiVoice Business instances do not over-allocate their use of media services and impact other sharing instances. Each media server has an overall media server channel capacity. Sample settings are provided in the setup configuration based on standard office traffic rates.

Non-VLAN Mode

This is the operating mode of the initial MICD Release 1.0 and will continue through subsequent releases as well. The following rules are associated with this deployment:

- There are no overlapped IP addresses on any of the instances.
- Each MiVoice Business Instance requires 4 IP addresses on a /30 boundary (255.255.255.252).
- The MiVoice Business Instance is addressed at the second IP address, offset 0.0.0.1.
- The remaining MiVoice Business Instance addresses in the sub-subnet are reserved and not available for use. These are addresses at the offset of 0.0.0.0, 0.0.0.2 and 0.0.0.3.

- The instances must all be in the same subnet.
- The MSL management address for the MiVoice Business Multi-Instance server must be in the same subnet.
- All connections are untagged, so the Layer 2 switch must apply any VLAN requirements.
- DSCP settings are honored through the MiVoice Business instances to the connections.
- Ensure that the management access mask is correctly set at installation to allow appropriate connections. The default setting may result in unexpected restricted access.
- Each MiVoice Business Instance must be able to reach the AMC, either via the customer or hosted network.
- A MiVoice Business Instance on MiVoice Business Multi-Instance may become a Distributed Licence Manager (DLM).
- Applications specific to the customer, including E-mail and Active Directory must reside on the customer's physical network. Customer specific applications cannot reside in the hosted address space. Access to some of these applications may not be possible in a hosted deployment as this cannot be transferred over the NAT function of the MBG.
- MSL must be installed in Server-only mode.
- Ethernet Interface bonding is supported.
- The MiVoice Business Multi-Instance Management IP address cannot be the same as a MiVoice Business Instance address.

The associated Media Server(s) need not exist in the same subnet. Access will be needed via a Router or Layer3 switch. Having the Media Server in the same subnet will reduce the signaling messages to only be in the Layer2 switching domain, where the backplane speed is highest.

VLAN Mode

This operating mode allows for the use of overlapped IP addresses and also introduces the use of VLANs directly at the server. The following are some changes with respect to the Management Network access, since certain connections may not be readily accessible, and they will exist on other networks:

- The network access router for the customers must support multiple external connections. This can be achieved with multiple routers or through the use of routers with virtual router capability, such as through VRF settings.
- The network access router needs to deal with the performance requirements of all customers coming through it as well as customer specific applications that might be included.
- The VRF router must support VLANs.
- Each customer will typically be associated with a single VLAN (and possibly VRF router) even where multiple MiVoice Business instances are involved, for example with resiliency on multiple servers.
- Typically, a single subnet, with a single VLAN, will be associated with a customer, and typically this will be a /24 subnet.
- The MiVoice Business can be located at any IP address once the MiVoice Business Multi-Instance is in VLAN mode and a VLAN has been assigned to the MiVoice Business. This removes the previous requirement to locate the MiVoice Business address in a /30 address space.
- Any IP address conforming to customer requirements can be associated with the MiVoice Business Instance, subject to the following local restrictions:
  - The VRF router IP address and any associated backup routers may already be defined by the carrier.
  - Any applications included with the hosting deployment may have pre-assigned IP addresses that cannot be used.
  - The carrier may define standard deployments for ease of management.

- Each MiVoice Business Instance must be allocated a single IP address within the Customer Network.
- Each MiVoice Business Instance must also be allocated a single hosted management IP address (non-overlapped with any other MiVoice Business Instance IP address, hosted or customer) within the hosted address space.
- The hosted management IP addresses on the MiVoice Business Multi-Instance server must all be unique and within the same subnet.
- The server MSL management IP address must be in the same management subnet as the MiVoice Business Instance hosted management IP addresses.
- The customer MiVoice Business Instance IP addresses must not overlap the hosted management MiVoice Business Instance IP addresses on the same server.
- ESM Management access to each MiVoice Business Instance can be defined, or "switched" via the MSL management access settings to be either:
  - Management from the hosted management IP address
  - Management from the Customer Network
- MiXML management of the MiVoice Business Instance, FTP, SNMP, and Telnet are possible from both the hosted provider management plane and also from the Customer Network (irrespective of the ESM access point).
- Application access not listed above, to and from the MiVoice Business instances is via the Customer Network.
- ESM reach through is not possible from the hosted management plane; it is only possible from within the Customer Network.
- Devices using IP addresses in the range 169.254.0.0/16 should not be connected to the MiVoice Business Multi-Instance.
- Hosted management access must use untagged VLAN L2 connections. This untagged VLAN can be assigned to a hosted management VLAN at the network Layer 2 connection. For example VLAN100 might be the hosted management VLAN, but will be untagged on the connection to, and from, the MiVoice Business Multi-Instance.
- All customer MiVoice Business instances MUST be assigned a customer specific VLAN, and this must be honored through the network to maintain the customer isolation and address range.
- The same VLANs associated with the MiVoice Business Multi-Instance call control must be present on the associated media servers.
- The Media Server instances should be assigned the same customer VLAN as the associated MiVoice Business instance.
- It is recommended that the media servers be in the same subnet as the associated MiVoice Business Instance. This will minimize routing between subnets and additional programming in the common VRF router.
- The internal routers of the network will need to route based on a VLAN instance as well as internal customer IP addresses. Ideally these routers should be VRF capable, as should the hosted edge router(s).
- The default setting is to allow ESM (MiVoice Business Instance management) from the Customer Network.
- Each MiVoice Business Instance must be able to reach the AMC via the Customer Network.
- A MiVoice Business Instance on MiVoice Business Multi-Instance may become a Distributed Licence Manager (DLM) for a specific customer.
- Applications specific to the customer, including E-mail and Active Directory must reside on the customer logical or physical network. Customer specific applications cannot reside in the hosted address space.

- A MiVoice Business instance cannot initiate a network connection to devices on the Management network. Do not program an IP address into the MiVoice Business instance that is a required service by the end customer, e.g. trunking gateway, FTP server, etc.
- The SIP gateway, or MBG/SBC providing connection to the SIP gateway, must reside in the customer IP network. The MiVoice Business instances and Media Server instances must have access to the gateway to provide trunking functions, even if the customer network is isolated for other functions (i.e. beware of ACL settings in the customer VRF router).
- When in VLAN mode the DNS server, in MSL, will not be accessible from the MiVoice Business instances, since they reside in different networks. A DNS service must be provided from the individual customer networks.

When access to the MiVoice Business Instance from the Customer Network is blocked, the following user accessible ports will have limited access. An access “white-list” (see the *MiVoice Business Multi-Instance Installation and Administration Guide*) will allow particular subnets, or specific devices to gain access, blocking all others. The user accessible blocked ports include:

- 22, 23, 80, 443, 1750-to-1754, 2000-to-2002, 8080, 8443, 15373

Media Server Configuration

The Media Server includes a number of instances to match up with the MiVoice Business instances to provide services including:

- Voice Mail
- Conference
- Music on Hold
- Paging
- RADs

One Media Server Instance is matched to one MiVoice Business Instance to complete the functionality for media and call control. Normally the number of servers will also be equally matched, but in some cases, due to traffic patterns or number of users this may not always be true. The number of media servers and instances should be planned to determine that there are sufficient media streams. The MET and SET should be used to determine these quantities. Additional assistance can also be obtained through professional services.

As stated earlier, some typical numbers to work with, based on a server with two 2.9GHz Intel Xeon processors with hyperthreading enabled, are:

- 1024 G.729 streams
- 3500 G.711 streams

A single stream is a bidirectional speech connection.

As a guideline the following number of streams consumed against the expected number of users is highlighted, based on a traffic rate of 6CPH and a hold time of 120 seconds per call:

Quantity of Users	Number of Media Streams (@ 6CPH)
5000	220
2500	110
1500	70
1000	45
500	24
300	15
150	12
100	8

The Media Server Manager will provide a selection of media channels based on system size with the following ranges:

- 5000 (256 audio channels) – for systems of 5000 users, or less
- 1000 (128 audio channels) – for systems of 1000 users, or less
- 500 (64 audio channels) – for systems of 500 users, or less
- 100 (32 audio channels) – for systems of 100 users, or less

These settings will provide sufficient media capacity for systems running high office traffic, 12CPH and 120 seconds hold time. The settings can also be adjusted to a higher setting if running higher traffic, or set lower if running lower traffic rates.

For MiVoice Business instances running ACD traffic, place the setting at the maximum value.

If the deployment requires more than 256 media channels, then it's possible that the deployment is also too large for a single MiVoice Business instance and further design work is needed to split the load to multiple networked MiVoice Business instances.

When installing the Media Server, especially for VLAN-Mode operation, the following is required:

- Configure the MSL in server-only mode, and bond the NICs, if needed.
- Provide a unique IP address for MSL on the Management Network.
- Install the Media Server and configure it for VLAN mode.

As each Media Server instance is created, it will require the following additional settings to be provided:

- VLAN ID (customer specific).
- Gateway IP address (customer gateway).
- Media Server Instance IP address within customer address space.
- Associated MiVoice Business Instance IP address.

In non-VLAN mode the media server instances will use a common IP address and not require a VLAN ID to be specified.

Hosted Public end customer deployment network considerations

Additional considerations for network configurations and deployment need to be taken into account with the remote site when dealing with the hosted public type of deployment. The main reason for this is that the connection is primarily across the public IP (Internet) network. There may also be no guarantees in place to honor QoS settings or to provide a Service Level Agreement (SLA). QoS and SLA can usually be specified for Enterprise VPN and also extending these customer networks for Hosted Private deployments.

Often the Internet is considered as fallible, but in practice, it's the last access link to the customer that has the most issues. A service provider may provide access across their own public network which will be well controlled. Peering arrangements between network providers will allow direct connections with a potential to honor QoS settings. These networks also have public Internet facing gateways, so even failure of the redundant peering gateways will not result in lost connection, as the path will now simply re-route through the internet gateways.

The main issue impacting the Hosted Public deployment is the limited bandwidth at the customer access point. Often it is possible to provide voice and data scheduling for traffic leaving the site, but there is often minimal control over data returning to the site.

Some considerations for the remote site are:

- Voice connections are symmetrical, so the same bandwidth is up and down the WAN link.
- Some delay on signaling is tolerable, but not voice. Delay and jitter impact voice quality.

- Where are IP addresses assigned? Statically at the phone or via local DHCP?
- Can the local network support QoS queuing and scheduling?
- Use the Bandwidth management functions of the MiVoice Business instance to identify the remote site that are in a different zone to use compression as well as provide bandwidth management.
- The firewall and internet router may need to be separate devices, often these may be combined.
- How is power provided to the local phones?
- Are there peering gateway between the hosted provider and the remote site service provider? Will these peering gateways honor QoS settings?

QoS and scheduling can be provided in a number of ways:

- Place all PCs behind the phones (ok for small sites, one or two phones).
- Provide QoS at the Layer 2 switch.
- Provide QoS at the Layer 3 router, if one is available. The router may also be able to re-mark traffic based on IP port information, if this is not possible at the end devices.
- Include a traffic shaping device between the network and outgoing router. This can traffic shape outgoing data as well as conditioning incoming data to ensure that voice is provided with sufficient bandwidth. A client side MBG can be deployed in such a configuration. Similar traffic shaping devices may be available from other vendors or the service provider.
- Get the service provider to honor DSCP settings on the last access router with a Service Level Agreement (SLA) (some providers will, some may not).
- Provide a separate dedicated connection and router for voice connections, independent from the Internet. This connection will still use a public address. (This also provides a level of backup should the primary voice link fail, using the existing internet link as a secondary backup.)

It may not be necessary to install to all these considerations at a site, but they are provided as possible items to consider, depending on the end customer requirements. Often the requirements and capabilities change depending on size of the deployment, geographic location and type of services from service provider(s).

System Wide Resiliency

MiVoice Business Multi-Instance provides many advantages by allowing a large number of users to be supported on one server, however if a server should experience a failure then a large number of users would be affected. To alleviate this risk, system wide resiliency should be implemented.

MiVoice Business Multi-Instance

- For MiVoice Business Multi-Instance, resiliency can be provided within the server from instance-to-instance using the MiVoice Business resiliency mechanism, however this form of resiliency will not provide protection if the ISS itself fails.
- More robust resiliency can be provided by using server-to-server resiliency when MiVoice Business Multi-Instance is deployed in a 1+1 configuration, this operation also uses the MiVoice Business resiliency mechanism.
- An even more robust form of resiliency can be provided by using server-to-server resiliency when the servers are physically located in different geographic regions.
- Typically for a larger installation multiple MiVoice Business Multi-Instance servers would be deployed. For these situations the normal operating practice is to cross share the primary and secondary MiVoice Business instances, and users, between the two MiVoice Business Multi-Instance servers, i.e. Server 1 is primary for 50% of users with the secondary on Server 2; Server 1 is secondary for 50% of users with their primary on Server 2. This also minimizes disruption across the number of users.

The administrator can consult the MiVoice Business/3300 ICP Resiliency Guidelines (located at http://edocs.mitel.com) for more detail on how the MiVoice Business resiliency model operates; these

guidelines also provide a number of recommendations regarding networking, deployment and power distribution to obtain a high level of system availability.

Mitel has also published a series of whitepapers that discuss how to achieve a high level of system availability, these can be found through the Knowledge Base at http://edocs.mitel.com.

MBG

- The MBG can be made resilient by deploying MBG in an N+1 configuration for Mitel phones, and a 1+1 configuration for SIP phones and trunks.

Media Server

- Media Server resiliency is provided via its association with the MiVoice Business instance.

LAN Infrastructure and Voice Quality

Please refer to the MiVoice Business/3300 Engineering Guidelines for recommendations on:

- Ensuring adequate bandwidth
- Ensuring voice quality
- Ensuring system availability
- Local breakout for E911 services
- Designing a PoE installation
- Installing wireless devices

System Requirements

This section lists hardware, software, ICP, and licensing requirements for MiVoice Business Multi-Instance, Media Server and the MiVoice Border Gateway.

MiVoice Business Multi-Instance Server Hardware Requirements

To select an appropriate server for deploying MiVoice Business Multi-Instance the administrator should consult the MSL Qualified Hardware List, which can be found at http://edocs.mitel.com.

Mitel recommends that the server be configured with redundant hardware options. A server can be configured with redundant hardware through the installation of an additional hard disk, power supply and CPU. The additional components must be complementary to the existing components.

The MET (MiVoice Business Multi-Instance Engineering Tool) should be used to verify the MiVoice Business requirements against the selected server hardware and configuration.

Caution: Although it is theoretically possible to fit a second CPU at a later date, in practice the devices change so rapidly that this may not be possible. An upgrade may also require specialist tools and techniques. Incorrect installation could result in damaged components. *Therefore it is strongly recommended that the correct number of CPUs be purchased pre-installed in the unit.*

Note: Verification for product licensing is bound to the hardware. Hardware upgrades that involve reformatting the hard drive will result in the existing license keys becoming invalid.

Note: Upgrades that require a new NIC card will result in the license keys becoming invalid because the MAC address will have changed.

Mitel Media Server Hardware Requirements

To select an appropriate server for deploying MMS the administrator should consult the MSL Qualified Hardware List and select a mid to high end server. The MSL Qualified Hardware List can be found at http://edocs.mitel.com.

MiVoice Border Gateway Hardware Requirements

To select an appropriate server for deploying MBG the administrator should consult the MSL Qualified Hardware List and select a mid to high end server. The MSL Qualified Hardware List can be found at http://edocs.mitel.com.

Software Requirements

Table 2. Minimum Software Requirements

Item	Minimum Requirement
Web Browser	Internet Explorer Release 9.0 or later, and Firefox 17 or later.
Mitel Standard Linux	10.0.51.0 **Note**: MSL 9.3.x and MSL 9.4.x will not support MiVoice Business Multi-instance 1.2 SP2 and greater.

Table 3. Minimum Software Requirements for MiVoice Business Multi-Instance Releases

MiVoice Business Multi-Instance Release	Associated MiVoice Business Release (Recommended minimum)	Associated MSL Release (Recommended minimum)
MiVB-MI 2.0	MiVB 7.0	MLS 9.3 (64-bit)
MICD 1.2	MCD 5.0 SP1	MSL 9.3 (64-bit)
MICD 1.1	MCD 4.0 SP2	MSL 9.2 (64-bit)
MICD 1.0	MCD 4.0	MSL 9.1 (32-bit)

Note that the 64bit MSL Operating System is needed to address greater than 32G of RAM. More than 32G of RAM is needed when dealing with more than 50 MiVoice Business instances. For MICD1.2 only use the 64-bit MSL OS, supplied with the release.

Note: When operating MICD1.2 in VLAN mode the MCD must be at release MCD5.0 SP1 in order to take advantage of the embedded SI and MICW tools.

IP Networking with the 3300 ICP

MICD Release 1.2 will be deployed with MCD Release 5.0 SP1, which is only compatible with MCD running MCD Release 4.0 in System Data Synchronization (SDS)sharing/GDM mode or higher. MCD and 3300 ICP with release versions prior to MCD Release 4.0 should be updated before integration with the current MiVoice Business Multi-Instance. Note that at MCD Release 4.0 there is a shift in database operation to using the embedded SDS. The MCDs that are networked must meet the release rules for this operation.

Browser Support

MiVoice Business Multi-Instance supports Internet Explorer 7.0, 8.0 and 9.0, and Firefox 3.6.

AMC Connectivity

MiVoice Business Multi-Instance needs to communicate with the AMC server in order to verify licenses. The following connections are required to an internet access point:

Table 4. MiVoice Business Multi-Instance Internet Firewall Settings

Port Range	Direction	Purpose and Details
TCP22 (SSH)	Server → Internet	**AMC Communications.** Allow outbound packets (and replies) on TCP port 22 between the MiVoice Business Multi-Instance and the Internet to enable server registration, software and license key downloads, alerts and reporting.
UDP53	Server → LAN/Internet	**DNS.** Allow outbound packets (and replies) on UDP port 53 between the MiVoice Business Multi-Instance and the Internet to enable domain name registration/recognition.

Note: Prior to establishing an AMC connection a 'ping' test is used to verify that a connection exists. It is necessary to ensure that ICMP Echo and return signal can be made from the MiVoice Business Multi-Instance and MiVoice Business Instance to the AMC.

MiVoice Business Multi-Instance Ports

The ports in use are mainly those that apply to MiVoice Business and can also be found in the MiVoice Business/3300 Engineering Guidelines.

Additionally the following ports are also required:

Table 5. MiVoice Business Multi-Instance Port Requirements

Port Range	Direction	Purpose and Details
TCP22 (SSH)	Server → Internet	**AMC Communications.** Allow outbound packets (and replies) on TCP port 22 between the MiVoice Business Multi-Instance and the Internet to enable server registration, software and license key downloads, alerts and reporting.
UDP53	Server → LAN	**DNS.** Allow outbound packets (and replies) on UDP port 53 between the MiVoice Business Multi-Instance and the Internet to enable domain name registration/recognition.
TCP 80	Client → Server	**Web browser (http).** Management of MiVoice Business Multi-Instance
TCP 443	Client → Server	**Web browser (https).** Management of MiVoice Business Multi-Instance
TCP 7011	Media Server → MiVoice Business	**Data Services.** Internal connection between Media Server to MiVoice Business to establish data connection
TCP 49000 to 49499	MiVoice Business → Media Server	**Data Services data connection on Media Server** Communication link to services of Media Server from MiVoice Business
UDP 1024 to 65535	Client → Media Server Media Server → Client	**RTP.** Voice connections to and from Media Server. Established as required.

System Capacities

The *MiVoice Business Engineering Guidelines* provide information regarding what the system limits and capacities are for a single MiVoice Business Instance. The *MiVoice Business Engineering Guidelines* can be found at http://edocs.mitel.com.

To determine system capacities for a particular server the administrator should consult the MiVoice Business Multi-Instance Engineering Tool (MET) available at Mitel Online.

IP Address Allocation

The IP address allocation for the MiVoice Business Multi-Instance Server and Media Server are described in the MiVoice Business Multi-Instance Installation and Administration Guide, Appendix A. They can also be found under the On-Line help under “Adding and Modifying MiVoice Business Instances” and “IP Address Allocation”.

The sections are summarized here:

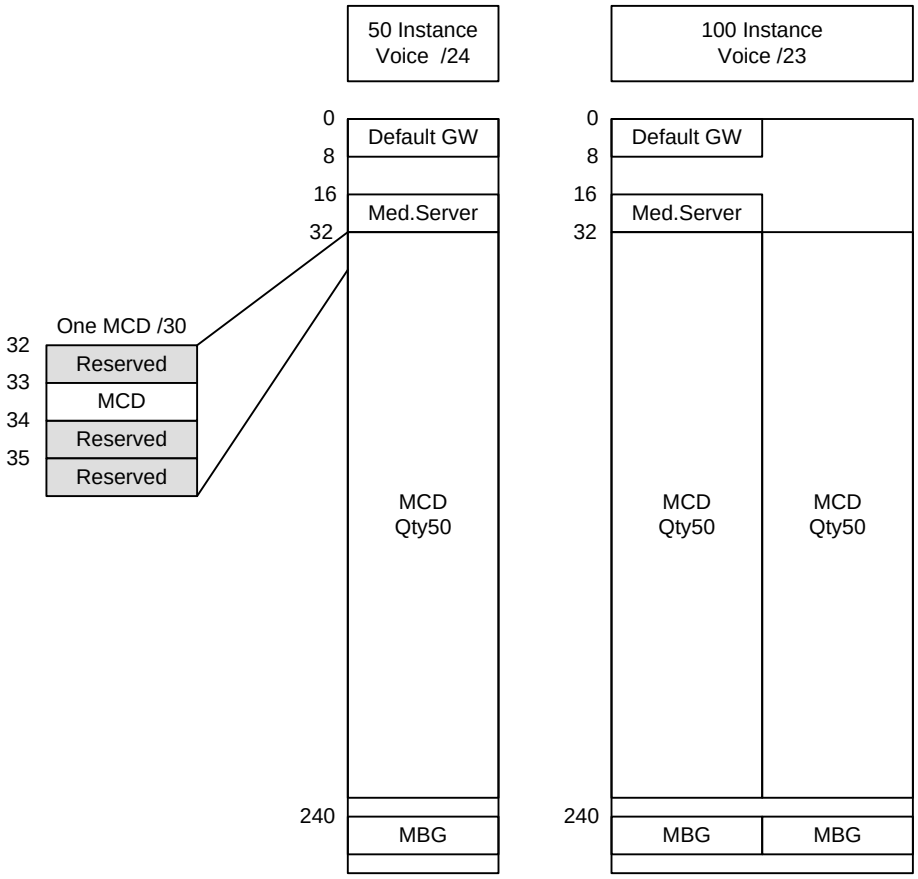
Non-VLAN Mode

The number of required instances plays a big part on the number of IP addresses that require to be allocated to the installation. Some of the key points include:

- The MiVoice Business Multi-Instance Server and all associated MiVoice Business instances ***must*** be in the same subnet with the same default-gateway. Multiple MiVoice Business Multi-Instance Servers (and associated MiVoice Business instances) may reside in different subnets with connections via their local default-gateways/network routers.
- Each MiVoice Business instance consumes a contiguous block of 4 IP addresses and these must align with a /30 (255.255.255.252) boundary within the MiVoice Business Multi-Instance subnet.
- The subnet and broadcast address of the /30 space per MiVoice Business instance is inaccessible
- The MSL on the MiVoice Business Multi-Instance consumes a single address
- The subnet will require two reserved addresses, one for subnet and one for broadcast
- The external gateway will require at least one IP address (with VRRP or HSRP it may consume three addresses)
- The Media Server consumes one IP address
- The MiVoice Business Subnet + 1 address is used to communicate with the MiVoice Business instance. The MiVoice Business Subnet + 2 address is reserved.
- If may be necessary to extend the working MiVoice Business Multi-Instance subnet, if there are insufficient available addresses, for example a /24 subnet may need to be extended to a /23 subnet. Subnets larger than /22 are not recommended.
- In practice, Layer2 switches tend to have higher throughput and available bandwidth compared to routers. Ideally other applications and MBG(s), associated with the MiVoice Business Multi-Instance, should be deployed in the same Layer2 domain, or subnet. This solution helps to maximize local switching (hardware based) rather than routing (CPU based). However, routing also provides advantages in reducing other network broadcast traffic, the ability to segregate traffic, and potentially provide packet re-marking and blocking. The network advantages and costs need to be considered at the initial planning stage. An installation larger than 100 MiVoice Business instances is likely to require the use of routers.

With maximum MiVoice Business packing and minimal address use by applications, it is possible to allocate 62 MiVoice Business instances within a /24 (255.255.255.0) address range.

A potential IP map is presented in the following diagram for a 50 MiVoice Business instance installation and a 100 MiVoice Business instance installation:



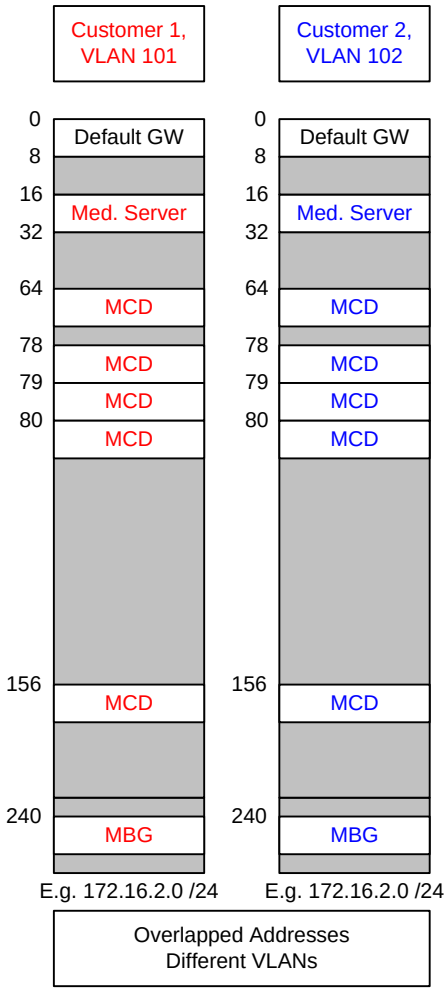
The diagram is merely for illustration purposes and is purely to show how a 50 MiVoice Business instance or a 100 MiVoice Business instance MiVoice Business Multi-Instance installation might be deployed. The MiVoice Business Multi-Instance Administration and Installation Guide includes a different example.

VLAN Mode

The use of VLAN-Mode requires that each MiVoice Business instance be associated with a unique customer VLAN. The only stipulation is that the assigned IP addresses fit into the customer network plan and that the earlier rules for deploying MiVoice Business Multi-Instance are also followed in terms of what addresses can be assigned on a server.

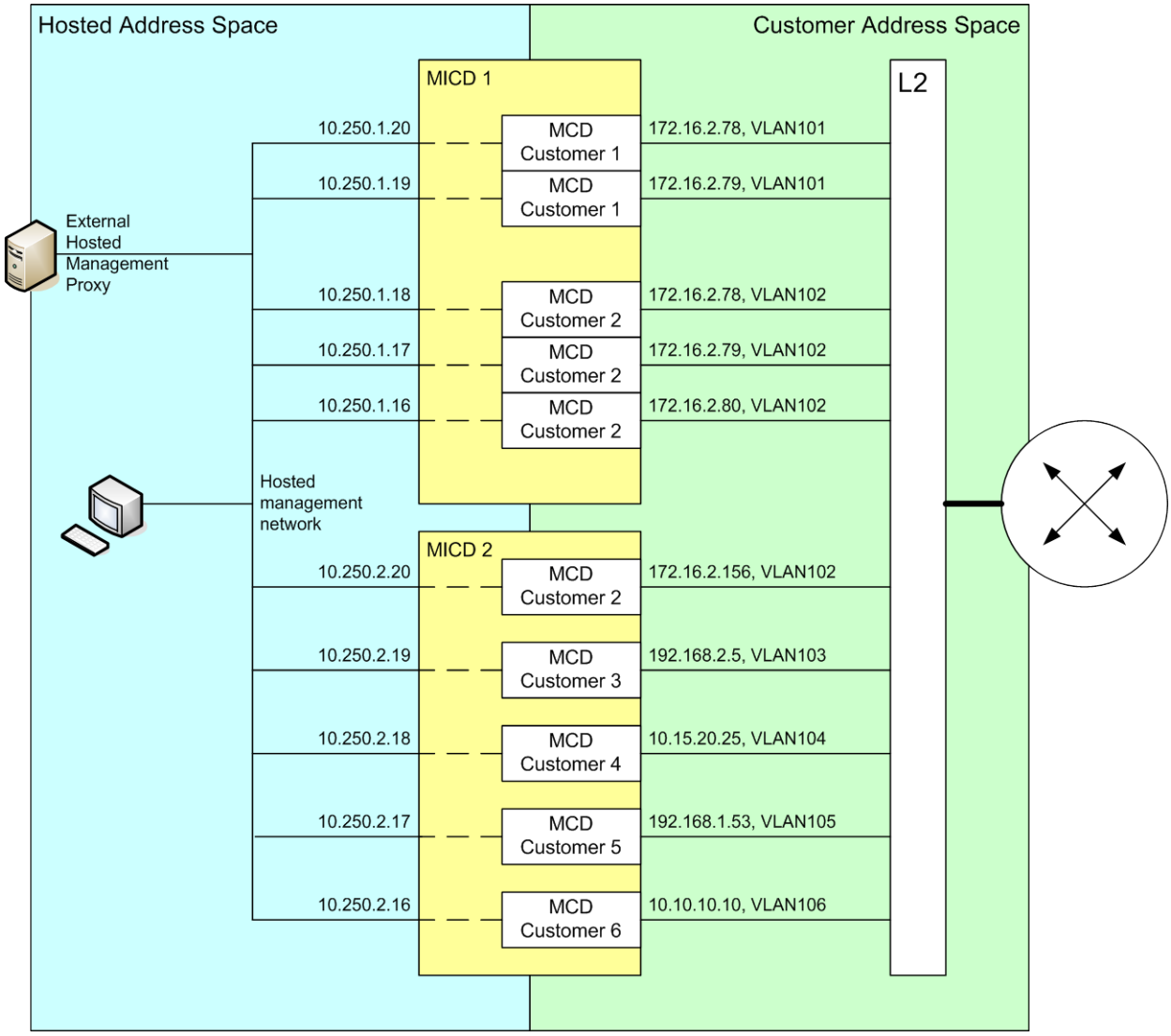
The IP addresses between customers can overlap, as long as they are uniquely identified via VLAN.

A worked example is shown below. This creates a /24 subnet for the customer. It identifies the default gateways, any MBG trunk gateways, the associated Media Server(s) and MiVoice Business instances. These MiVoice Business instances do not have to reside on the same physical server, but must be accessible from the customer edge/VRF router.



The diagram is merely for illustration purposes and is purely to show how multiple customers may use a common IP plan (overlapped IP addresses), yet remain independent through use of VLAN tagging. Note also that when VLAN mode is in use and the MiVoice Business instances have an associated VLAN, there is no requirement to locate the MiVoice Business instance at a specific IP address within a /30 address field.

From the hosting provider there are also requirements on management access. An example IP map is shown below:



When upgrading the Management network is not allowed to span subnets.

In VLAN mode, the netmask must be set large enough to host the MiVoice Business instance.

For example, if the server netmask for the Manangement network is 255.255.255.0, perform the following procedure in order to support more than 250 tenants after upgrading to MiVoice Business Multi Instance release 2.0:

1. Enlarge the netmask for the Manangement network in the network switch, for example, change to 255.255.254.0.
2. Stop all the MiVoice Business instances.
3. Change the MSL netmask to the new netmask.
4. Reboot the server, then perform a bulk change netmask for all the servers.
5. Start all the MiVoice Business instances.
6. Begin creating new MiVoice Business instances based on the new netmask.

As well as customer isolation between MiVoice Business instances, use of VLAN can also be used to improve scaling in the situation where all instances are in a common service provider address space, as per the non-VLAN mode situation. By using a common VLAN number for all instances, all instances belong in the same address space. The instances are no longer bound to specific /30 address allocations,

and more instances can be deployed in a smaller subnet, since only one address is needed per instance, rather than four. The one change is that the management address of each instance must also be provisioned onto a different subnet from the instances, and this uses the untagged connection.

For example: Instances could be deployed on 10.100.10.0/24 subnet with tagged VLAN 110 with 250 instanced squeezed into that single subnet. The management addresses could then be deployed on 10.100.11.0/24, with untagged VLAN. This makes routing simpler and allows improved use of subnet and limited IP addresses.

Deploying the MiVoice Business Multi-Instance with VLAN mode also offers the service provider the option for both deployment models of overlapped IP addresses with MPLS connections for customers that require dedicated links, as well as the common Over-the-Top (OTT) Internet based model. These are important considerations when considering the addition of UC and UCC applications. Use of VLANs and MPLS allows the customer full access to hosted applications and full UCC deployments. The OTT model allows a lighter level of UC deployments. Service providers can then offer a range of services from basic voice only, voice with light UC and premium voice and full UCC, from a single platform. See MiCloud 2.0 Blueprint Solutions for further details.

System Engineering Tool and MiVoice Business Multi-Instance Engineering Tool

The MiVoice Business Multi-Instance Engineering Guidelines (this document) and the *MiVoice Business Engineering Guideline*s should be used in conjunction when planning an MiVoice Business Multi-Instance system installation. The guidelines contain information on limits and areas of operation to consider during an installation.

The documents are quite complex with many items to take into consideration. Two spreadsheet calculations tools are available to assist in planning both MiVoice Business and MiVoice Business Multi-Instance. These tools are:

- System Engineering Tool (SET) for MiVoice Business planning
- MiVoice Business Multi-Instance Engineering Tool (MET) for MiVoice Business Multi-Instance planning

The two tools work together when planning an installation and allow a high degree of customization for the different MiVoice Business instances, rather than using a standard template, although this can also be used.

Design Sequence

System Engineering Tool (SET)

Each of the MiVoice Business instances in a MiVoice Business Multi-Instance can be treated as though it was an independent application. For each of these MiVoice Business instances a separate SET file can be created with a unique name. Or a common file can be created that will later be used as a template.

Certain settings of the SET are defaulted and may drive up MET requirements unnecessarily, typically Media Server and storage requirements. These default limits may not impact a similar ICP deployment, but will soon accumulate in an MiVoice Business Multi-Instance with many instances.

Some key parameters to consider are:

- Number of IP phones and type
- Traffic Rate
- Number of voice mail channels and auto-attendant
- Number of RADs
- Number of MOH
- Number of conferences and channels
- Number of paging channels

Observe any warnings, or errors, and correct these prior to saving the results. Use the “MiVoice Business on ISS” setting if the MiVoice Business on MiVoice Business Multi-Instance is not available. Note that the “MiVoice Business on ISS” may not include Embedded Voice Mail at this release and may flag errors in this area. The SET will continue to calculate the values.

MiVoice Business Multi-Instance Engineering Tool (MET)

The MET combines the information from a number of SET files and cross checks these against the performance of a single server, based on the user selections and configurations. If the number of instances cannot be accommodated with the server configuration, an estimation of number of servers with this configuration is also highlighted. More detailed analysis can also better determine the exact number of servers needed. Both the MiVoice Business Multi-Instance Server and Media Server are compared. In the situation where an MBG is also included in the installation some additional calculations are also provided for this.

First the information from the SET files is updated and included. The user identifies the SET files and location within the MET. A common file can be highlighted a number of times, thus enabling this file to be used as a template for multiple instances.

Once the data is included into the MET, the calculations are carried out to determine required performance. This is then matched against the server and configuration selected by the user. An “OK/Not OK!” analysis is carried out with suggestions of why failures occurred so the user can compensate, for example insufficient RAM.

Tool Location

The two tools, SET and MET are available on Mitel On Line under the training section. It is recommended that users undertake training in use of these tools before using, although some basic understanding can be gained from the attached documentation.

The tools and associated documentation can be found at the following location:

http://training.mitel.com/cw/WebSite/toolbox.html, under **SE_Tool.zip**.

Example Configurations

The following tables are for illustration purposes only, as each installation will be unique both in terms of numbers of users, number of MiVoice Business instances, business traffic and server hardware and configuration.

For each deployment use of the SET and MET should be used to verify the proposed installation.

Trial or Test Lab Environment

This is a server arrangement that will allow users to verify the operation of the MiVoice Business Multi-Instance solution. It will allow minimal call handling and minimal networking between MiVoice Business instances but will allow a small demonstration system.

Server Configuration: Lab/Trial System			
Component	**MiVoice Business Multi-Instance Server**	**Media Server**	**Notes**
CPU Grade	2.3GHz	2.3GHz	Minimum Speed grade - Quad core CPU
CPU Quantity	2	2	Assumes Hyperthreading enabled
RAM	8G	8G	Some server configurations may require more RAM to fill in different memory lanes
HDD	2 x 146G	2 x 146G (RAID1)	RAID1 Configuration

25 Instance System

The 25 instance system is based around a typical Enterprise deployment rather than a service provider deployment. The requirement is lower number of instances, but higher number of users per instance. Two versions are shown with 1000 users per instance and also 2000 users per instance using different server configurations.

The primary drivers for the server configurations are:

- Number of users: This drives the number of media channels on the media server and voice mail storage on the MiVoice Business Multi-Instance server
- Number of instances: This drives the quantity of RAM on the MiVoice Business Multi-Instance server and also Hard Disk Storage. Voice Mail storage also drives additional hard disk storage requirements on the MiVoice Business Multi-Instance server.

Reference configurations are shown below for 25 instances of 1000 users and 2000 users per instance. It is possible to adjust the users per instance to maintain these average values as long as the total number of users and instances is not exceeded. When using non-default configurations it is recommended that the MiVoice Business/3300 ICP Engineering guidelines be consulted for individual MiVoice Business instance limits, as well as using both the SET and MET to determine individual MiVoice Business instance performance as well as MiVoice Business Multi-Instance server performance. These tools may also be used to evaluate less pre-packaged solutions as well, but may result in different server configurations from those shown in this document.

25 Instances on a 2 x Quad Intel Server

This deployment uses an Intel 2 x Quad core server. The 25 instances are limited to 1000 users each.

Server Configuration: 25 Instance System (2 x Quad core CPU)			
Component	**MiVoice Business Multi-Instance Server**	**Media Server**	**Notes**
CPU Grade	2.4GHz	3.2GHz	Minimum Speed grade - Quad core CPU
CPU Quantity	2	2	Hyperthreading enabled
RAM	20G	8G	Some server configurations may require more RAM to fill in different memory lanes
HDD	600GBytes	2 x 146G (RAID1)	RAID Configuration

25 Instances on a 2 x Hex Intel Server

This deployment uses an Intel 2 x Hex core server. The 25 instances are limited to 2000 users each.

Server Configuration: 25 Instance System (2 x Hex core CPU)			
Component	**MiVoice Business Multi-Instance Server**	**Media Server**	**Notes**
CPU Grade	2.9GHz	2.9GHz	Minimum Speed grade - Hex core CPU
CPU Quantity	2	2	Hyperthreading enabled
RAM	20G	8G	Some server configurations may require more RAM to fill in different memory lanes
HDD	600GBytes	2 x 146G (RAID1)	RAID Configuration

Note that the number of additional users is catered for by the increased number of cores available on this server compared to the 2 x Quad core server. Voice mail is also restricted to 30 consecutive channels which are generally sufficient for 1000 users. Therefore this system may be short of voice mail capacity. For an Enterprise solution, the voice mail is likely be centralized, and therefore less of an impact on MiVoice Business Multi-Instance. The maximum voice mail (1000 users) is still shown in these calculations.

50 Instance System

The 50 instance system is based around a typical deployment of 100 users per instance. Increased number of users per instance will require more performance and may not be possible with this server configuration. Again, cross verify with the SET and MET.

Server Configuration: 50 Instance System			
Component	**MiVoice Business Multi-Instance Server**	**Media Server**	**Notes**
CPU Grade	2.3GHz	2.3GHz	Minimum Speed grade - Quad core CPU

CPU Quantity	2	2	Hyperthreading enabled
RAM	32G	12G	Some server configurations may require more RAM to fill in different memory lanes
HDD	450GBytes	2 x 146G (RAID1)	RAID Configuration

100 Instance System

The 100 instance system is based around a typical deployment of 100 users per instance. Increased number of users per instance will require more performance and may not be possible with this server configuration. Again, cross verify with the SET and MET.

Server Configuration: 100 Instance System			
Component	**MiVoice Business Multi-Instance Server**	**Media Server**	**Notes**
CPU Grade	2.9GHz	2.9GHz	Higher grade cores required - Quad core CPU
CPU Quantity	2	2	Hyperthreading enabled
RAM	64G	12G	Some server configurations may require more RAM to fill in different memory lanes
HDD	900GBytes	2 x 146G (RAID1)	May require locally attached storage for blade systems

150 Instance System

The 150 instance system is based around a typical deployment of 150 users per instance. Increased number of users per instance will require more performance and may not be possible with this server configuration. Again, cross verify with the SET and MET.

Server Configuration: 150 Instance System			
Component	**MiVoice Business Multi-Instance Server**	**Media Server**	**Notes**
CPU Grade	2.9GHz	3.4GHz	Higher grade cores required - Hex core CPU
CPU Quantity	2	2	Hyperthreading enabled
RAM	96G	24G	Some server configurations may require more RAM to fill in different memory lanes
HDD	1.2TBytes	2 x 146G (RAID1)	May require locally attached storage for blade systems

The Media Server includes Voice Mail, Paging, Conference and Music on Hold.

200 Instance System

The 200 instance system is based around a typical deployment of 200 users per instance, and will have less users per instance than the 150 and 100 instance systems. Increased number of users per instance will require more performance and may not be possible with this server configuration. Again, cross verify with the SET and MET.

Server Configuration: 200 Instance System			
Component	**MiVoice Business Multi-Instance Server**	**Media Server**	**Notes**
CPU Grade	2.9GHz	3.4GHz	Higher grade cores required - Hex core CPU
CPU Quantity	2	2	Hyperthreading enabled
RAM	128G	28G	Some server configurations may require more RAM to fill in different memory lanes
HDD	1.2TBytes	2 x 146G (RAID1)	May require locally attached storage for blade systems

The Media Server includes Voice Mail, Paging, Conference and Music on Hold.

250 Instance System

The 250 instance system is based around a typical deployment of 100 users/devices per instance, and will typically have less users per instance than the 150 and 100 instance systems. Increased number of users per instance will require more performance and may not be possible with this server configuration. Again, cross verify with the SET and MET.

Server Configuration: 250 Instance System			
Component	**MiVoice Business Multi-Instance Server**	**Media Server**	**Notes**
CPU Grade	2.9GHz	3.4GHz	Higher grade cores required – Octal core CPU (E5-2690 recommended minimum)
CPU Quantity	2	2	Hyperthreading enabled
RAM	128G*note	32G	Some server configurations may require more RAM to fill in different memory lanes * Note: This memory allocation assumes reduced instance memory requirements.
HDD	1.2TBytes	2 x 146G (RAID1)	May require locally attached storage for blade systems

The Media Server includes Voice Mail, Paging, Conference and Music on Hold.

Configurations not covered in this Example Configurations section

MiVoice Business Multi-Instance can be deployed in a number of different configurations and some standard MiVoice Business configurations and server configurations are shown in the examples above. It is possible to use MiVoice Business Multi-Instance in different configurations that are different from those already described. Some examples may include increased number of users per instance, or maybe less instances, more users per instance, or more instances, less users on a different server platform.

Where a configuration is required that is not covered, some additional engineering work will be required. For these configurations, these Engineering Guidelines, as well as the MiVoice Business/3300 ICP Engineering Guidelines should be consulted for server and MiVoice Business limits, respectively.

Both the System Engineering Tool (SET) and MiVoice Business Multi-Instance Engineering Tool (MET) should be used to evaluate the system and fine tune the expected resource usage from both MiVoice Business and server configurations. Additional assistance can also be obtained via professional services.

Glossary of Applications Suite Terms

Term	Name	Description
AMC	Mitel Applications Management Center	The Mitel Applications Management Center (AMC) is an online service accessed via the Internet that provides licensing, monitoring, management, and a variety of other services for installations of Mitel software applications.
BIOS	Basic Input/Output System	Firmware used to boot a PC and provide basic input and output connections to peripherals.
CPE	Customer Premise Equipment	A term used by TELCOs to describe equipment that is located on the customer's property rather than in the Central Office.
CPH	Calls Per Hour	Number of calls a user make on phone during the defined busy hour period
CPU	Central Processing Unit	Processing unit carrying out software instructions to provide user applications.
DIMM	Dual Inline Memory Module	Memory Module used in servers and PCs to store temporary data.
DMZ	DeMilitarized Zone, or DeMarcation Zone	A physical or logical subnetwork that contains and exposes an organization's external services to a larger, untrusted network, usually the Internet.
DTMF	Dual Tone Multi Frequency	Tones used for signaling purposes in telephony networks.
DVD	Digital Video Disk	Optical Storage Disk media
ESDMI	Enhanced Simplified Message Desk Interface	SMDI is a protocol used between PBX and Voice Mail to all the Voice Mail system to process the calls correctly. Enhanced allows connection to multiple PBX systems.
FTP	File Transfer Protocol	Protocol used to transfer file data between server and client
G.711	ITU-T Speech Codec	Translation between analogue and digital voice using ITU-T telephony codec in specification G.711
G.729	ITU-T Speech Codec	Translation between analogue and digital voice using ITU-T telephony codec in specification G.729. This provides reduced data rate compared to G.711
HSP	Hosted Service Provider	A service provider that 'hosts' a service for their end customers, such as a hosted PBX service provider.
ICP	Integrated Communications Platform	IP-PBX that includes a number of key functions including Call Control and PSTN gateway access.
iLO	Integrated Lights Out	Remote Management to servers allowing access without being on site, i.e. the lights are out.
IP	Internet Protocol	Data-oriented protocol used for communicating data across a packet-switched network.
ISS	Industry Standard Server	A name used to describe a Commercial Off The Shelf computing platform.
LCS/OC	Live Communications	Microsoft Unified Office Communications Server

Term	Name	Description
S	System	
MAS	Mitel Application Suite	Software solution that includes a number of key telephony applications on a single server
MBG	MiVoice Border Gateway	A software solution that provides NAT, enhanced network security and voice quality improvements. MBG runs on an industry standard server.
MiVoice Business	Mitel Communications Director	Larger version of Call Control used on Server platforms.
MCS	Mitel Communications Suite	Software solution that enables Call control and applications to be co-resident on one server
MiVoice Business Multi-Instance	Multi-Instance Communications Director	Software solution that allows multiple instances of the MiVoice Business product to be run on a server.
MiNet	Mitel Network Protocol	Proprietary network protocol providing business functionality to end devices
MiXML	Mitel XML Protocol	XML protocol modified to meet Mitel requirements
MoH	Music on Hold	The typically boring music or announcements that are played to callers while their call is placed on hold. The source can be an external analog signal connected to a gateway or it can be a digital file which is called embedded MoH.
MMS	Mitel Media Server for use with MiVoice Business Multi-Instance	Also referred to as simply Media Server (MS)
MSL	Mitel Standard Linux	The operating system that supports MAS and MCS software; along with Mitel SDK components,
Multi-Instance CD	Multi-instance Communications Director	Another name for MiVoice Business Multi-Instance, see MiVoice Business Multi-Instance.
MPLS	Multi-Protocol Label Switching	WAN network technology with ability to provide dedicated and isolated network connections between defined end points, essentially a fixed VPN
NAT	Network Address Translation	A function that remaps or translates private network addresses into a single public network address.
NIC	Network Interface Card or circuit	Connection to network, typically Ethernet. Used to be on a separate card before becoming integrated
NPM	NuPoint Messenger	Server-based voice processing system that provides voice messaging and paging support.
OTT	Over-the-Top networking	Internet based connection, where is no dependency on a single carrier to transport data.
PMS	Property Management System	Computer system used often in hospitality to manage guest check-in/check-out and room services, including telephone and video usage
PSTN	Public Switched Telephone Network	The telephone network.
RAC	Record A Call	A PBX feature that allows a call to be recorded, usually used for customer quality audits.

Term	Name	Description
RAD	Recorded Announcement Device	A device that plays recorded announcements to callers, this functionality can also be provided by a software only solution.
RAID	Redundant Array of Independent Disks	An array of disks that together provide a common data storage and error correction capability.
RTOS	Real Time Operating System	A computer operating system that is designed to deal with tasks that must be performed in close to real time.
SAP	System, Application and Product in Data Processing	Company that designs and produces business software
SDS	System Data Synchronization	MiVoice Business Management protocol for sharing database information within a cluster of MiVoice Business instances
SET	System Engineering Tool	A software tool provided by Mitel that allows a System Engineer to determine what system resources are required to support a particular customer.
SIP	Session Initiated Protocol	A signaling protocol used on IP networks.
SLA	Service Level Agreement	An agreement to provide data services according to a specified standard or agreement, typically for delay, jitter and packet loss
SNMP	Simple Network Management Protocol	Network protocol to obtain basic statistics and modify alarms on network device
TELCO	Telephone Company	A corporation that historically provided telephone service, TELephone COmpany.
UC	Unified Communications	Convergence of voice, messaging and presence systems
UCC	Unified Communications and Collaboration	UC plus additional Collaboration tools, including web sharing, conferencing and video
URL	Uniform Resource Locator	A domain name or Internet Address used to access pages on the Internet, e.g. example.com
USB	Universal Serial Bus	Computer serial connection that allow many devices to interact through a common connection scheme
vAPP	Virtual Application	An application that runs in a virtual environment, allowing many similar applications to run on shared hardware and servers
VM	Voice Mail	A place to leave a voice message for a particular user, e.g. if the user is not available.
VoIP	Voice over IP	A technology that allows telephony signaling and voice Communications to occur over an IP network.
VPN	Virtual Private Network	Dedicated external network connection between geographically dispersed locations, allowing a business to link multiple LANs in a common network.
XML	eXtensible Markup Language	Software used to provide documents in user and machine readable format