MiVoice MX-ONE

MX-ONE Media Server - Description

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Preface

The MiVoice MX-ONE Media Server provides a software emulated version of the Media Gateway Unit board (MGU board) to bring media services like recorded voice announcements and conferencing to a SIP only environment. In such environment, the whole MX-ONE runs in a Linux hosted server and no proprietary hardware is needed.

The interworking of the MX-ONE Media Server is like MGU board and it integrates seamless with the MX-ONE Service Node. Thus, operating the MX-ONE Media Server is virtually identical to the MGU board.

This document describes deployment of the MX-ONE Media Server, its features and how it compares/differs to/from the MGU board.

NOTE: Running the MX-ONE Media Server requires a MEDIA-SERVER license in addition to a MEDIA-GATEWAY license.

Reading Instructions

This document assumes the reader is familiar with the MGU board. If not, then it is recommended to read the MX-ONE - Media Gateway Unit description and related installation documents first.

Description

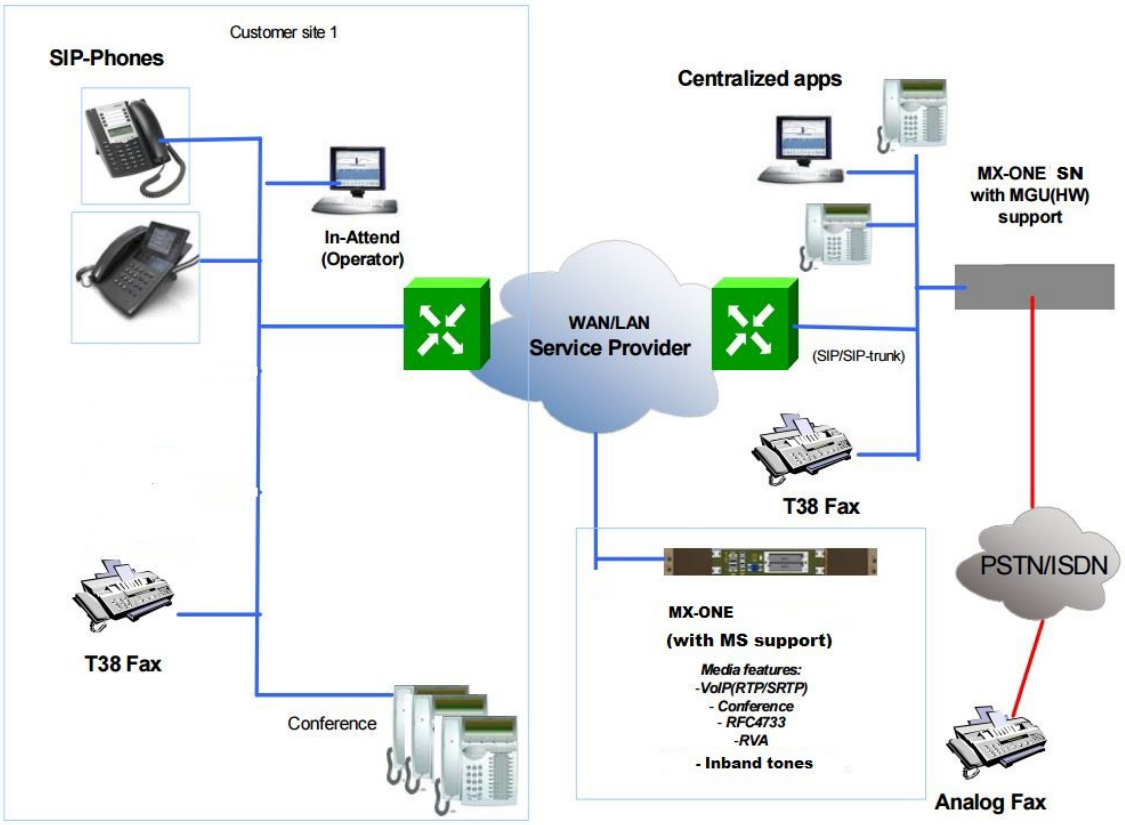
The MX-ONE Media Server provides media features needed to operate MX-ONE in a VoIP-only environment (SIP or H.323) where all media is conveyed by RTP/SRTP streams in an IP network to and from the MX- ONE. These features include:

1. VoIP (RTP/SRTP streams) for SIP trunks and extension media
2. Recorded Voice Announcements and Music-On-Hold/Wait/Idle from local files or audio devices, or files or streams from remote hosts
3. Conference & Intrusion (Multi Party)
4. Call progress tones
5. Operation & Maintenance
6. Support for Mitel InAttend operator (MX-ONE operators are not supported)
7. More details about these features, capacity and limitations can be found in section *Features – MX-ONE Media Server*.

Example Scenario with MX-ONE Media Server

Below is an example scenario for an MiVoice MX-ONE with MX-ONE Media Server.

Figure 2.1: Example Scenario



VOIP (RTP Streams)

NOTE: In MX-ONE Media Server the UDP ports might conflict with UDP ports used by other Linux applications if UDP port range is changed from default settings. Never set a UDP port range that clashes with Linux reserved range.

RTP streams supports different speech codecs which all supports unencrypted as well as encrypted (SRTP) payload. The CPU load on the server varies significantly depending on the codecs in use, and more active codecs (that is, server load) lowers call-rate. For more information on codec types, crypto suites and codec load, see *CAPACITY AND LIMITATIONS*.

The Media Server's media interface uses same interface as the host (server) Media Server runs on, i.e. configure media interface with same addresses (IPv4 and/or IPv6) as server.

DTMF Handling in RTP Streams

The MX-ONE Media Server only supports DTMF detection and sending by RFC4733 events. Inband DTMF tones received in RTP streams are not detected.

DTMF events received at an incoming RTP stream is never relayed to any other outgoing RTP stream (consider e.g. multi-party or forced gateway calls).

Inband DTMF received at an incoming RTP stream is always relayed to all other RTP streams connected to this incoming stream. There is no DTMF removal in MX-ONE Media Server.

SIP trunks and terminals that require inband DTMF sending or detection are thus not supported by MX-ONE Media Server.

Jitter Buffer

Jitter buffer in Media Server is adaptive and not configurable. Configuration parameters provided by MGU are not supported in Media Server. Fixed jitter buffer is not supported either.

QOS (RTCP)

Media Server uses RTCP to provide network statistics for RTP sessions.

T.38 Relay

Media Server does not support T.38 protocol as compared to the Media Gateway Unit (MGU/MGU2). However, T.38 packets sent over UDP can still be relayed between two T.38 endpoints (for example, between a MGU and another T.38 GW or Fax) whenever forced gateway sessions are established through the Media Server.

Recorded Voice Announcements (RVA)

Media server provides RVA playing from local and remote files.

Locally stored RVA files must be installed with the `recorded_voice_announcement` command. Files with incorrect file format get removed from file system at activation time.

NOTE: More formats are supported when SIP based MSCML protocol is enabled (see the *CAPACITY AND LIMITATIONS* Section).

Networked files are stored in a HTTP server. To use networked RVA messages, mapping between message numbers and URIs must be configured with the `media_server_message` command. For more information, refer to the *MEDIA STREAMING* section.

Refer to the *CAPACITY AND LIMITATIONS* section for a list of supported file formats.

If message files are put in this directory manually, these must be activated by command to get visible on MX-ONE Media Server. If any kind of Media Server restarts, this activates all messages found in the `/var/rva directory`.

NOTE: All messages in the `/var/rva directory` with incorrect format will be removed from file system at activation time.

Music-On-Hold/Wait/Idle (MOH/MOW/MOI)

Media Server provides MOH/MOW/MOI playing from local files, remote files and remote streams. Refer the *MEDIA STREAMING* section for remote files and streams.

NOTE: More formats are supported when SIP based MSCML protocol is enabled (see the *CAPACITY AND LIMITATIONS* Section).

Music-on-Hold/Wait/Idle (MOH/MOW/MOI) is virtually the same feature as the RVA feature, but there are dedicated voice prompts that are used for MOH sessions; these sessions are semi-permanently setup, and being played in repeat.

Media Streaming

Media streaming is supported when SIP based MSCML protocol is enabled (see the Streaming Media Server Configuration, Operational Directions).

Media Streaming refers to receiving recorded or live audio from network or audio device sources and transmitting in VoIP streams to SIP clients. These sources are specified with a Unified Resource Locator (URL) formatted per RFC 3896. Supported schemes are listed in section *CAPACITY AND LIMITATIONS*.

Media Server provides streaming of audio files and streams from network servers (using HTTP). Media streaming can be used to play voice announcements (RVA) or Music-On-Idle/Hold/Wait (MOI/MOH/MOW).

Media Server supports HTTP streaming with the MIME-types application/ogg (network streams) and audio/x-wav (network files).

Media Server also supports capturing audio from ALSA or OSS compatible sound devices (connected to same server that Media Server is running in). The URI schemes “alsa” and “oss” respectively are used to specify these devices. For example: alsa:///default:CARD=USB and oss:////dev/audio1.

Media server can take an Ogg/Vorbis or MP3 audio stream from an external media server to allow other sources or streaming formats.

The Media Server performs decoding of received streams and transcoding and re-sampling to chosen VoIP codec. Performance and audio quality is affected by the complexity of transcoding/re-sampling needed. Streams are always intermediately transcoded into 16000 Hz linear 16-bit PCM samples.

To use media streaming, the media server needs to be initiated as media gateway with “type=MS”. This enables `media_server_message` command can be used to map a URI source to a message identity for the legacy MOH/MOW/RVA. For initiating MOI streaming refer to *STREAMING ON IDLE* Operational Directions.

Media Server supports unicast and multicast VoIP streams to SIP clients. Multicast needs to be supported and enabled in network.

Multi Party

Multi Party (Conference) is supported by mixing the RTP (VoIP) streams in a conference bridge in the MX-ONE Media Server. The feature supports from 3 to 8 VoIP participants per conference.

Conference and intrusion tones are generated according to market specification (see *Call Progress Tones* below) and mixed into the conference bridge, i.e. all participants in the conference will hear the same tone and timing. A conference tone can be played each time an individual is added to or removed from the conference, and periodically during the conference, but depends on the market specification and other configurations (that is, `ASPAC` command).

Silent intrusion is also supported.

Call Progress Tones

Call progress tones are defined per market and stored in configuration files under the `/etc/mgw/markets` directory. These are not meant to be modified, although possible.

Networking

General

MX-ONE Media Server supports both IPv4 and IPv6 for media streams (RTP and RTCP) and call control from MX-ONE Service Node (SCTP). Mixed IPv4 and IPv6 environment is supported. This means that a mix of IPv4 and IPv6 media endpoints are allowed, if the Server (running media server) is configured as mixed IPv4/IPv6, then that Server's IPv4 and IPv6 addresses are both setup as media interfaces. Note that the media control interface must be setup with the Server's preferred address, which is the IPv6 address (in a mixed environment).

Network Redundancy

MX-ONE Media Server supports network redundancy through Ethernet bonding. See the feature description for *NETWORK REDUNDANCY* for more information and on how to configure Ethernet bonding.

QOS (DIFFSERV & 802.1Q VLAN)

DiffServ (DiffServe Code Point, DSCP) is supported through setting of Traffic Class header for IPv6 and Type of Service header for IPv4, which both are set on media using the TypeOfServiceForMedia attribute and on control (SCTP) signals using the TypeOfServiceForControl attribute.

NOTE: The DSCP value (6 bits) is contained in the most significant byte of these attributes and need to be specified as a decimal number. See further description of *MGU, MEDIA GATEWAY UNIT*.

802.1q VLAN configuration (of network interface) as described in MGU description is not supported by the Media Server.

Media Processing and Load Supervision

Unlike the MGU boards, there are no dedicated DSPs for the media processing. Instead, all media processing is done by the CPU(s) on the machine it runs on. Thus, any general processing on the server might affect active media processing causing bad speech. To mitigate media issues, the media processing is running at a high priority with real-time scheduling and the Media Server prevents the server from being too high loaded by internal CPU load supervision.

The MX-ONE Media Server supports multi-core CPUs and will adapt the number of media processing threads (referred to as clock threads) to the number of available CPU cores on the machine, which means that higher capacity is reached for servers with many cores, but also means more memory is required.

NOTE: In a virtualized environment, the Media Server will only "see" the number of cores configured for the virtual machine it runs on.

The MX-ONE Media Server checks CPU load periodically to set an overload condition if load is above a “high watermark”. If an overload condition is set, starting new media resources is rejected by Media Server. Service Node will ultimately pause requests to this Media Server until overload has ceased. The overload condition will not cease until Media Server has checked load is below a “low watermark”. CPU load is calculated and checked each 2 second and “high watermark” is at 80% CPU load and “low watermark” is at 75% CPU load. When high watermark is passed, it will be logged as a warning (WARN) message, and when ceased as an informal (INFO) message.

NOTE: The CPU intense short operations on the server might trigger overload situations that can cause these warnings but is generally not a problem. Upgrade and backup operations are typical Service Node operations that can cause this, but there are also Linux operations and periodical tasks like the security check (secheck) that can cause intermediate overload (see Administrator User’s Guide for more information about (secheck). For these reasons, Stand-alone installation is preferred over Co-located installation, and CPU intense tasks on Media Server should be considered for scheduling at low traffic time.

NOTE: As a general recommendation, a server with Media Server installation should have at least 2 CPU cores or more. This is recommended for “Co-located” as well as for “Stand-alone” deployment (See section *Installation*). In a virtualized environment it is important to consider the number of virtual CPUs configured in the Virtual Machine that runs Media Server.

Media Server Load Sharing/Balancing

In larger systems, which have several Service Node servers, and several Media Servers, there is a load sharing functionality for Media Server (and MGU) resources. The function is controlled by the Service Node, see the *ADMINISTRATOR’S USER GUIDE OPERATIONAL DIRECTIONS*, section Media Server.

Media Server Redundancy

When co-located installation and clusters are configured, the standby server provides a co-located media server that will replace the faulty server’s media server at server failure. For proper functioning of redundancy, the Media Server's Control and media addresses must be configured as described in the section-*Configuration*.

NOTE: Local voice prompts in the regular server need to be copied in advance to the standby server manually, see further *RECORDED VOICE ANNOUNCEMENTS OPERATIONAL DIRECTIONS*. For stand-alone Media Servers there are no standby Media Servers.

For more information about server redundancy see the *SERVER REDUNDANCY OPERATIONAL DIRECTIONS*.

Operation & Maintenance

Installation

This section describes installation and basic configuration of a MX-ONE Media Server. Further configuration follows same procedures as for MGU board. The Media Server can be deployed Co-located on same server (or virtual machine, VM) as MX-ONE Service Node, or Stand-alone on a separate server (or VM). For best performance, Stand-alone installation should always be the preferred choice, as running Co-located there is always a risk that CPU intense SN operations might impact media processing (see section *MEDIA PROCESSING AND LOAD SUPERVISION* for more details). Co-located installation should be avoided in all cases with high count of forced GW calls.

In case of VM and Fault Tolerance (FT) setup, Stand-alone deployment is recommended, since FT only supports 1 vCPU to be configured per VM. By using a multi-core server and separate VMs for MX-ONE Service Node and Media Server(s), CPUs will be utilized better.

MX-ONE Service Node (Co-located) Deployment

The MX-ONE Media Server is distributed and installed together with the MX-ONE Service Node software and will be installed (but not activated) on the server when Service Node is installed.

It is only possible to install one Media Server per MX-ONE Service Node. Media Servers may co-exist with MGU boards and controlled by same MX-ONE Service Node.

Stand-alone Deployment

The MX-ONE installation also allows installation of Media Server without MX-ONE Service Node application. Choose to install a “Media Server” and option “Part of the MX-ONE System” from the MX- ONE Initial setup screen to create a Stand-alone server. Refer to the *Installing and Configuring MiVoice MX- ONE* for more details about installation and upgrade.

Configuration

Basic configuration and activation of a Media Server is accomplished with the commands `media_gateway_config` and `media_gateway_interface` (see *EXAMPLES* section). If the SIP based MSCML protocol (for example for streaming on idle extension) shall be active, also the `media_server` command must be used.

The `media_gateway_config` and `media_server` commands indicate which address of Service Node to contact and control the Media Server. The `media_gateway_interface` command indicates which addresses Media Server will use for media (RTP). Media and Control (SIP Control or Control Signalling) must use same address and subnet (CIDR) as used for the server in the MX-ONE initial setup. The address type (IPv4 or IPv6) for Control must be same as the preferred address for the Server. Media may have both address types to allow dual stack operation.

Use MS as Media Gateway type (MGU or MS) for Media Server.

Upgrades

Since the Media Server Software is included in the MX-ONE Service Node binary package it is upgraded when this package is installed. Refer to the *Installing and Configuring MiVoice MX-ONE* for more details about installation and upgrade.

Internal MGU/MS Commands

Like the MGU board, the MX-ONE Media Server provides some “internal” commands that come with its RPM package. These are mostly for fault location purposes and are thus rarely used in normal operation. The list of media server commands is shown by man media server page.

NOTE: Commands are common to the MGU board and thus many of these are not usable when executed on the MX-ONE Media Server.

The internal MX-ONE Media Server commands can be invoked from any Linux login shell on the MX-ONE Service Node where the MX-ONE Media Server is running.

MX-ONE Media Server logs information (including enabled traces) and errors in `/var/log/messages` file on the MX-ONE Service Node it runs on.

Fault Location Guide

Speech Related Issues

1. In case of chopped or dropped speech, or temporary silent calls, check CPU and memory reservations, server load and network performance.
2. In case of no speech or one-way speech, check IP configuration (e.g. media interface settings) and network connectivity.
3. In case of failing to start RTP sessions due to UDP port clashes, check RTP port range configuration.

Voice Announcement Related Issues

1. In case of streaming media, check URL configuration, that URL is reachable (check DNS lookup from server) and source media format is appropriate.
2. In case of local playback, check media file exists in local RVA directory and is activated.

Capacity and Limitations

The MX-ONE Media Server capacity is virtually depending on the capability of the host it runs on. However, there are some legacy MX-ONE limits and other fixed limits that put an upper bound on number of media resources that can be used in one Media Server. These limitations are found in the *Features – MX-ONE Media Server*. The host requirements in terms of operating system, memory and CPU needs are described in the section below.

System Requirements

All measurements in this section have been made in a virtualized environment.

Memory and CPU Recommendations

It is recommended to run Media Server on a multi-core server. A virtual machine running Media Server must be configured with minimum 2 CPU cores.

NOTE: This doesn't consider Service Node requirements, that is, in case Co-located operation even more than 2 CPU cores is likely required.

For more information about resource requirements in a virtualized environment, refer to the *Virtualization Description, MiVoice MX-ONE*.

Network Recommendations

1000 Mbit network interface for media will be needed to achieve maximum SIP capacity.

Features – MX-ONE Media Server

The table below is a summary of the MX-ONE Media Server features, capacity and limitations.

NOTE: There are several features; for example, circuit switch, supported by MGU board that are not applicable with the software only for MGU. These features are not listed here.

Voice-Over-IP (VOIP)

Feature	Capacity / Limitations
Max RTP sessions (see **Note 1**)	2000
RTP Codecs	G.711 (PCMA/PCMU) VAD, CNG, PLC G.729 annex A and B G.722 AMR-WB (G.722.2) Opus

RTP packetization	10,20,30,40,50,60 ms
SRTP crypto suites (encryption / authentication)	AES-CM-128 / HMAC-SHA1 80 AES-CM-128 / HMAC-SHA1-32 AES-CM-128 (no authentication) AES-256-CM / HMAC-SHA1 80 (RFC 6188) AES-256-CM / HMAC-SHA1-32
Adaptive Jitterbuffer	Yes
Fixed Jitterbuffer	No

Note 1: Maximum number of static RTP sessions before congestion. Actual call-rate, server capabilities, and codecs in use will impact this figure.

Codec	Relative CPU load (codec complexity)
G.711 (PCMA PCMU)	1
G.722	2.5
G.729	4
G.722.2 (AMR-WB)	10
Opus	13

Multi Party

Feature	Capacity / Limitations
Max conference inlets	2000
Max participants per conference	8

Call Progress Tone Senders

Feature	Capacity / Limitation
Tone Sender (AUXTS)	Yes, per market. Max 2 frequencies and max 4 cadencies (tone/pause) per tone type.
Max Tone Senders	2000

Recorded Voice Announcements (RVA) and Media Streaming

Default media file support

Feature	Capacity / Limitations
Max RVA sessions	2000
RVA file formats	WAVE audio, ITU G.711 A-law, mono 8000 Hz WAVE audio, ITU G.711 mu-law, mono 8000 Hz WAVE audio, PCM, 16-bit, mono 8000 Hz WAVE audio, PCM, 16-bit, mono 16000 Hz
RVA max files	1000
RVA max file size	120 Mbyte (corresponds to about 3 hours)

Media file support when “media_server” and “media_server_message” configured

Feature	Capacity / Limitations
Max RVA sessions	No fixed limit
File formats (local and remote files, and streams)	WAVE audio, ITU G.711 A/mu-law, mono/stereo WAVE audio, PCM, 16-bit signed/unsigned, mono/stereo Ogg/Vorbis Ogg/Opus MPEG Audio Layer 3 (MP3)
Max files (locally)	1000
Max files (network)	Not limited by Media Server
Max file size (locally)	120 Mbyte
Max file size (network)	Not limited by Media Server
MIME-type (network streaming)	Application/ogg Audio/x-wav Audio/MPEG
Supported URI schemes (streaming sources)	file:///filename (locally stored file in media server) http://host[:port]/stream (remote stream) http://host[:port]/filename (remotely stored file) alsa:///device (ALSA device connected to server) oss:///device (OSS device connected to server)

Networking

Feature	Capacity / Limitations
DiffServ	Yes, configurable per control (SCTP) and media interface (RTP)
VLAN tagging	No
Network Redundancy	Linux bonding

IPv6	Yes, control (SCTP) and media (RTP)

MS Load Sharing Functions

Feature	Capacity / Limitations
Load sharing overflow to different MS within the same LIM/SN server	15 MS can be searched per LIM/SN server.
Load sharing overflow to different MS in other LIM/SN server	A total of 10 overflow LIMs/SN servers, with up to 15 MS each, can be searched. The overflow can also be to other types of media gateways (if the use case allows it).

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Total number of MS that can be searched	All MS, but maximum all MS in 1 + 10 LIMs per set of load-sharing LIMs. For systems bigger than 10 LIMs you can define several sets of load-sharing LIMs, and thus cover all LIMs in the system, if wanted.

Examples

RPM Installation and Configuration

NOTE: The RPM installation is normally made through MX-ONE Service Node upgrade/installation process.

1. Run rpm commands on host:
   mxone_admin@sn1:~> sudo rpm -ih mgw-4.1.7.1-1.x86_64.rpm
   ### [100%]
   ### [100%]
   MS: INFO Media server Co-located installation (no hardening)
   MS: INFO Sourcing Media Server environment...
   Creating default IP configuration -> /etc/mediaserver/system/nvparam.conf ...
   Starting Media Server Management Service (erioma): done
   Starting Media Server Media Control Service (erimca): done
   Starting Media Server Device Board Service (eridbs): done
   Starting Media Server Supervision Service (erisupv): done
   mxone_admin@sn1:~>

2. Insert the Media Server in a MX-ONE Service Node.

   sn-6815:~ #media_gateway_config -i -m 1a --mgw-type MS --cidr 192.168.68.41/24 --default-gateway 192.168.68.1
   sn-6815:~ #media_gateway_interface -i --media-gateway 1a --cidr 192.168.68.41/24 --default-gateway 192.168.68.1

3. Optionally, enable SIP/MSCML interface, for e.g. streaming on music on hold and idle (streaming on idle extension).

   sn-6815:~ #media_server -i --name 1a -l 1 --host 192.168.26.41 --service-name MOH,SOI