



Intel® NetStructure™ Host Media Processing Software Release 1.1 for the Windows* Operating System

Media Processing Software for Building Cost-Effective IP Media Servers

Intel in
Communications

Features	Benefits
Implemented as a software-only product with a variety of media processing configurations	Minimizes investment, development, deployment, and operational costs
Provides support for computing platforms with Pentium® III, Pentium® 4, and Intel® Xeon™ processors including dual-processor configurations in PCI and CompactPCI* form factors; scales up to 120 concurrent user sessions, with media processing, per system	Presents a choice of processing platforms on which to build cost-effective IP media servers
Uses built-in Ethernet card for network connectivity	Offers a choice of network configurations and speeds of 100 MB or 1 GB Ethernet
Compliant with the ITU H.323 and H.450.2 specifications and IETF SIP for call control	Provides easy interoperability for call control with a wide range of gateways, gatekeepers, and other IP endpoints
IP multicast support (transmit only)	Enables large listen-only conferences, announcements, music on hold
Provides a mechanism for integration with any third-party call control or connection control over IP stack	Lets developers use any call control stack of their choice
Support for streaming media over Real Time Transfer Protocol (RTP) using the G.711 (packet size 10 ms, 20 ms, and 30 ms), G.723.a, G.729a, G.729b voice coders, as well as the H.245 and RFC 2833 DTMF packets in a fully transparent fashion	Provides the interoperability needed for high-quality media streaming with a wide variety of industry-standard IP gateways and endpoints
Support for programmatic control of inbound RTP stream gain and outbound RTP stream volume	Enables developers to improve the end-user experience with a wide variety of IP phones and other endpoints
Support for Global Call and R4 APIs	Allows easy migration of existing applications by providing compatibility at the API level with other Intel® communications products
Includes administration tools like configuration manager and SNMP software	Integrates tools that help speed time-to-market and reduce total cost of ownership
Supports voice record/play with AGC control and volume control in a variety of file formats including OKI ADPCM, linear A-law and μ -law PCM, and Wave	Enables the building of high-quality voice applications such as IVR and voice mail
Detects and generates standard inband DTMF and user-defined tones	Lets developers use advanced call progress analysis and media processing functionality
Conferencing features include coaching, active talker notification, tone clamping, echo cancellation, and scalability with a maximum of 120 parties per system	Facilitates development of advanced conferencing applications
QoS threshold alarms, packet loss reduction, RTP/RTCP timeouts, and Type Of Service (TOS) byte setting	Improves Quality of Service (QoS) and provides specifically minimized latency and high voice quality
T.38 fax termination support	Enables building of unified messaging applications with fax support
Support for Intel® Dialogic® Continuous Speech Processing technology	Use speech engines in the same fashion as with other Intel communications products
Supports semi-automatic startup for System Service	Enables increased flexibility when starting the system
Allows customers to modify the default Registry setting of the TOS byte during installation	Enables more flexible VoIP QoS

Introduction

Intel® NetStructure™ Host Media Processing (HMP) software performs media processing tasks on general-purpose servers based on Intel® architecture without using specialized hardware. The software provides media services for building flexible, scalable, and cost-effective next-generation IP media servers.

HMP software is an Intel® communications building-block technology. When installed on a system, the customer application “sees” an Intel® Dialogic® board with DM3 architecture, but all media processing occurs on the host processor. To help customers accelerate their time-to-market and migrate existing applications to IP, the software also supports two direct application programming interfaces (APIs): R4 for media processing and Global Call for call control.

Release 1.1 uses a built-in network interface card (NIC) to provide IP connectivity. It supports the industry-standard H.323 and Session Initiation Protocol (SIP) protocols for call control, and call transfers using the H.450.2 supplementary services protocol. IP multicast support (transmit only) facilitates implementation of features like announcements and listen-only conferences with a large number of participants.

HMP software v1.1 also supports RTP/RTSP protocols for media streaming over IP in the G.711, G.723.1, and G.729ab formats, using a standard Ethernet NIC for network connectivity. To help improve the quality of media streaming over the network, the software supports frame sizes of 10 ms, 20 ms, and 30 ms (for G.711), and features such as Quality of Service (QoS) threshold alarms and packet loss concealment. Other QoS features include the ability to detect and report timeouts in RTP and RTCP sessions to the application, and the ability to change the default TOS byte setting in the Windows Registry during installation.

Other important features include

- The ability to integrate any third-party call or connection control protocol stack if the H.323 and SIP protocol stacks provided with the product are not satisfactory

- The ability to programmatically control the volume of RTP sessions in order to improve the end-user experience
- Support for a variety of media processing functions such as
 - Play with volume control
 - Record with automatic gain control (AGC)
 - Dual-tone multifrequency (DTMF)
 - User-defined tone detection and generation, including industry-standard RFC 2833 and H.245 user input indication (UII) mechanisms
- Support for outbound call progress analysis with positive voice detection and positive answering machine detection algorithms
- Support for continuous speech processing functionality with APIs fully compatible with other Intel Dialogic cards so HMP 1.1 can integrate with automatic speech recognition (ASR) and text-to-speech (TTS) engines
- Ability to scale up to 120 concurrent user sessions with a mix of voice, speech, T.38 fax, and conferencing media processing resources per system, with at least 50% of CPU and memory remaining for use by an application
- Support for dual-CPU configurations and hyper-threading on single-CPU as well as dual-CPU systems
- Flexible licensing — runtime licenses can be created for any user-defined configuration within the product scalability limits

In order to guarantee real-time media processing performance, HMP software is implemented as a Windows* operating system kernel-mode driver that runs at real-time priority. The software is optimized to run on Pentium® III, Pentium® 4, and Intel® Xeon™ processors.

Since HMP software is implemented as a software-only product, it can be installed and upgraded as easily as

Applications

- IVR and announcements
- Voice mail and unified messaging server
- Conferencing server
- Speech-enabled media server applications

other software. The software is licensed using an industry-standard model in which the MAC address is used to node-lock the software to a particular computer.

HMP software can be licensed and deployed in any combination of call control and media processing channels, so customers can choose the combination of media processing resources they need. Locate the media processing channel modes you need and reference the Item Market Name when ordering.

Item Market Name	Type of Resource	Features
DMIPS10C11W	Conferencing	Includes advanced features like coach/pupil mode, tone clamping, and active talker notification
DMIPS10E11W	Enhanced RTP	Adds the capability of streaming voice over RTP using the G.723.1, G.729a, and G.729b coders to the RTP G.711 resource. <i>Add on top of the RTP G.711 resource.</i>
DMIPS10F11W	T.38 fax termination	T.38 fax termination (over UDP)
DMIPS10I11W	IP call control	Provides call control stacks for the H.323 with H.450.2 supplementary services, and SIP protocols, with Global Call API support. <i>Can only be used together with the RTP G.711 resource.</i>
DMIPS10R11W	RTP G.711	Provides the capability of streaming digitized voice over RTP, using the G.711 coder with 10 ms, 20 ms, 30 ms frames. <i>Required for each RTP session.</i>
DMIPS10S11W	Speech integration	Integrates HMP with speech engines for ASR and TTS support by using the continuous speech processing APIs. <i>Add on top of the voice resource.</i>
DMIPS10V11W	Voice	Play with volume control, record with AGC, DTMF, user-defined tone detection and generation, including RFC 2833 and H.245 UII

Configurations

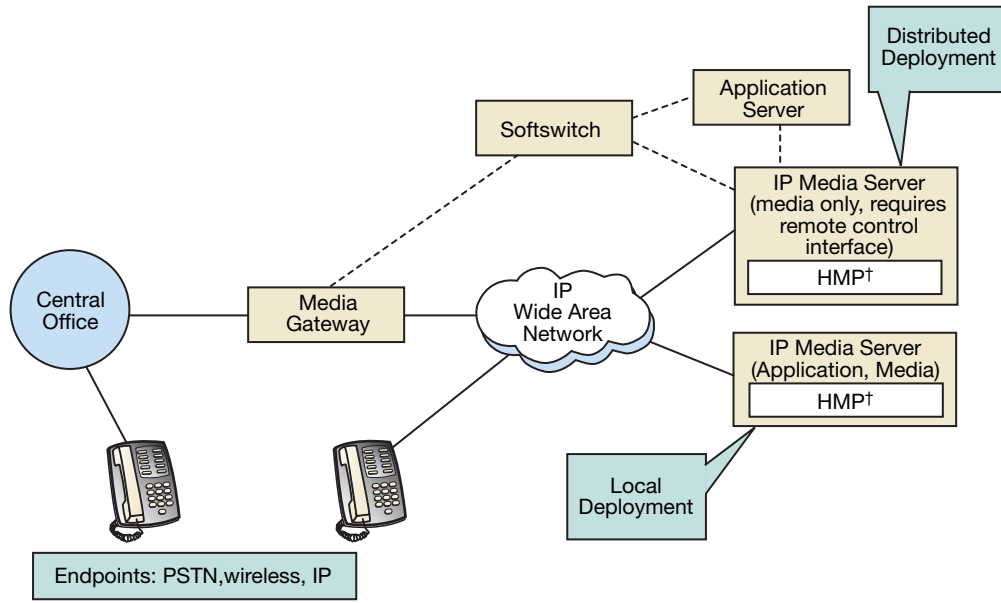
Sample configurations for IP media servers developed with HMP software include network announcements, interactive voice response (IVR), voice mail, and conferencing servers.

An IP media server is always the endpoint that terminates an IP connection in the network. Depending on the customer environment (service provider or enterprise), the IP media server can be deployed in a number of ways. The following figures illustrate typical deployment environments.

Service Provider Configuration

Figure 1 illustrates how an IP media server based on HMP software can be deployed in a typical service provider environment for IVR, announcements, voice mail/messaging, speech, or conferencing applications.

An IP-PSTN gateway terminates PSTN connections. A softswitch manages all aspects of call establishment and teardown over IP. Once the call is established, an RTP connection is created between the IP media server and an endpoint. The softswitch tells the media server, IP endpoints, and IP-PSTN gateway when to establish or drop connections.



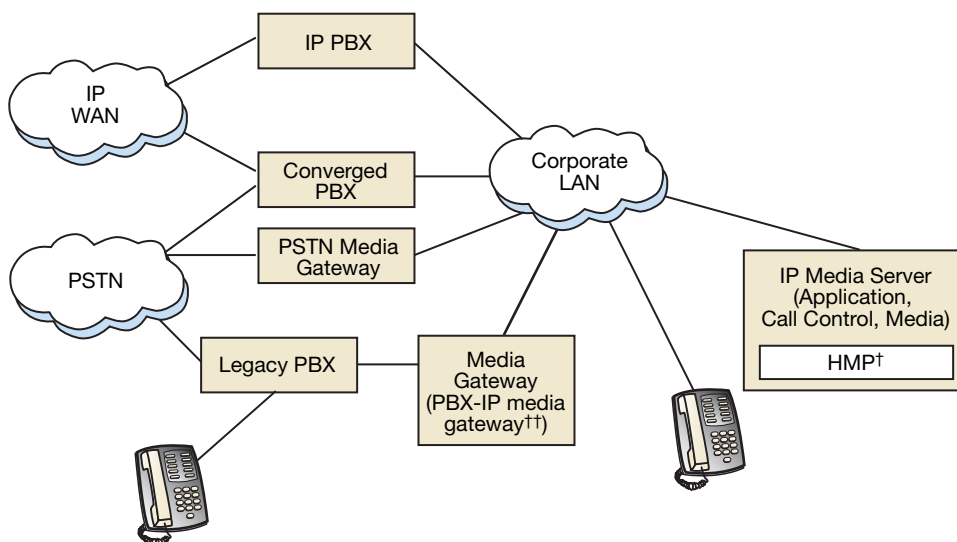
†Intel® NetStructure™ Host Media Processing software

Figure 1: HMP Software in a Service Provider Environment

IP media servers are deployed according to two main models.

- **Local** — The application resides in the media server and controls the media processing functionality of the HMP software via direct APIs such as R4 and Global Call.
- **Remote** — The application server controls the IP media server via remote interfaces, which can be implemented using standard protocols such as SIP or HTTP and a scripting environment such as VoiceXML. As Figure 1 shows, the customer must implement the remote control interface on top of the direct APIs because the HMP software does not provide such an interface.

Service providers often use remote deployment because scalability and availability can be easily increased by adding more servers. Remote deployments also work better in the hosted environments frequently used by service providers. However, remote deployments do have drawbacks: they are more complex and additional layers of software must be deployed to provide the remote interfaces needed to control media servers.



† Intel® NetStructure™ Host Media Processing software
 †† Intel® NetStructure™ PBX-IP media gateway

Figure 2: HMP Software in an Enterprise Environment

Enterprise Configuration

Figure 2 shows how an IP media server with HMP software can be deployed in an enterprise environment for IVR, auto attendant, voice mail, unified messaging, speech, or conferencing services.

Although many legacy private branch exchanges (PBXs) are currently connected to the circuit network, new types of PBXs are evolving.

- Converged PBXs which are connected to both circuit and packet networks
- IP PBXs which are connected only to the packet networks

Inside the enterprise

- Legacy PBXs are connected to traditional stations using analog or digital interfaces, or to the corporate intranet through gateways such as the Intel® NetStructure™ PBX-IP Media Gateway
- Converged PBXs are connected to both traditional stations and the intranet
- IP PBXs are connected to the intranet only
- IP stations and IP media servers are connected to the intranet

The corporate intranet can also be connected to the PSTN via PSTN-IP media gateways. The increasing use of Voice over Internet Protocol (VoIP) in the enterprise has created a growing need for IP media servers.

In the enterprise environment, applications are typically deployed locally; that is, on the same computer as the IP media server because such a configuration is easier to create and maintain. However, remote deployment can also be used.

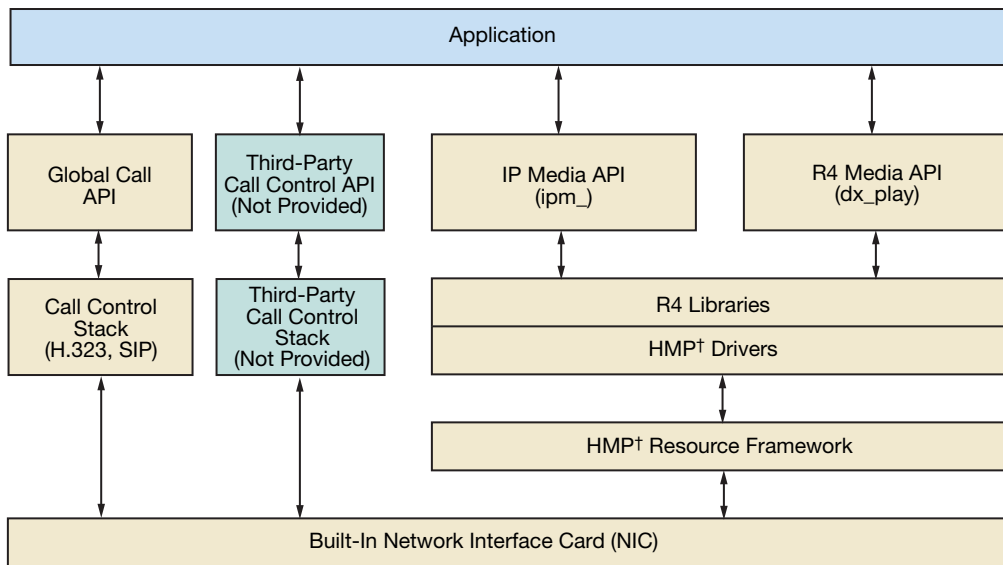
Software Support

HMP software is a standalone product. It requires only the Microsoft* Windows 2000* or Microsoft Windows XP* operating systems to function.

Functional Description

Figure 3 shows the block diagram for HMP software. HMP software is built in the same way that an Intel Dialogic board with DM3 architecture is built, but without any specialized hardware components.

The application deployed on top of HMP software is written to the same R4 and Global Call APIs that are used for Intel Dialogic boards with DM3 architecture. In fact, for an application there is no noticeable difference between using an Intel Dialogic board with DM3 architecture or HMP software.



†Intel® NetStructure™ Host Media Processing software

Figure 3: HMP Software Block Diagram

For media processing, the application will use the R4 media API.

For call control, there are two options.

1. The H.323 or SIP stacks, distributed as part of the HMP software product and the Global Call API, simplifies development and helps in the migration of existing applications
2. A third-party call or connection control protocol stack (SIP, MGCP) and the IP media library provides the functionality necessary to integrate the third-party call control stack with R4 media APIs

The HMP software APIs are enabled through the same libraries and drivers as Intel Dialogic boards with DM3 architecture. The drivers sit on top of the HMP software resource framework, the core of the product. The framework implements media processing algorithms such as DTMF detection and generation, media stream mixing, etc. The algorithms, in turn, are aggregated into resources (such as player and recorder) in the same way they are on Intel Dialogic boards with DM3 architecture.

The call control stacks and the resource framework sit on top of the standard network drivers and the NIC that are built into the computer.

Technical Specifications

Network Interface

IP over a standard Ethernet connection

Call Control over IP

Call control protocol	H.323 H.450.2 SIP
Integration with third-party call and connection control stacks	Provided via the IP media library

Media Streaming over IP

Protocol	RTP Encoding formats: G.711 A-law, μ -law 8-bit 8K (64 Kb/s); frame sizes 10 ms, 20 ms, and 30 ms G.723.1 G.729a G.729b
QoS	Alarms Frames per packet control Packet loss concealment RTP/RTCP timeouts Ability to modify the default TOS byte setting in the Registry
Tone generation and detection	RFC 2833 H.245 UII
Media control over RTP	Programmatic control of inbound RTP stream gain and outbound RTP stream volume

API Support

Call control	Global Call over H.323, SIP, H.450.2 Third-party stack integrated via IP Media Library
Voice processing	R4 voice (dx_)
Virtual CT Bus routing	R4 routing (sc_)
Conferencing	R4 conferencing (dcb_)
Fax	R4 fax (fx_)
Continuous speech processing	R4 EC (ec_)
IP media (QoS, etc.)	R4 IPML (ipm_)
Event reporting, device enumeration, and other related functionality	R4 SRL (sr_)

Channel Density

120 concurrent user sessions with a combination of RTP streaming, voice, fax, speech, and conferencing resources per system

Voice Processing Features

Features supported	Play, record, and tone generation and detection
Play	Volume control and index play
Record	AGC
Audio file formats for play/record	OKI ADPCM 24 K, 32 K G.711 A-law, μ -law 48 K, 64 K All of the above in Wave format Linear PCM 8b 11 K (Wave format only) Linear PCM 8b 8K
Tone generation and detection	Inband DTMF generation and detection User-defined global tone generation and detection (GTG, GTD) RFC 2833 tone generation and detection H.245 UII tone generation and detection

Technical Specifications (cont.)

Conferencing Features

Total parties per server	120
Advanced features	N-way summing Coach/pupil mode DTMF detection DTMF clamping Active talker notification

Interoperability with Other Equipment over IP

Media gateways	Intel® NetStructure™ PBX-IP Media Gateway Elite Gateway* Cisco* 5300 Mediatrix 1204
IP endpoints	Polycom SoundPoint* series phones Siemens OmniPoint* 400 Microsoft NetMeeting* client Grandstream BudgetTone* 1xx series SIP phones
IP boards	Intel® NetStructure™ DM/IP IP boards Intel® NetStructure™ IPT6720C IP board (Note: Boards must be installed in a different computer.)

Licensing

Enabling method	Node-locked using MAC address of the built-in Ethernet NIC
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Hardware System Requirements

Memory Requirements

512 MB recommended

System Requirements

Single- or dual-processor PCI platform with an Ethernet NIC (Note: 100BaseT is recommended.)

Processors Supported

Pentium III, Pentium 4, and Intel Xeon processors

HMP 1.1 provides a very high level of flexibility in choosing media processing configurations, making it impossible to list all the available combinations of media processing resources. The following table references media processing configurations and required processing platforms as an illustration. Please contact your authorized Intel distributor to configure your system and get detailed system information specific to your configuration.

In all cases, at least 50% of the CPU can be used by the application. Hyperthreading is not taken into account.

Solution Configuration	RTP	Play	Full	CSP	T.38	Conferencing	G.723/ 729	Recommended Processor(s)	Speed
Announcement	96	96	0	0	0	0	0	Pentium 4	2.4 GHz
IVR/VM	120	0	120	0	0	0	0	Dual Xeon	2.4 GHz
IVR/VM	96	0	96	0	0	0	32	Dual Xeon	2.4 GHz
UM	80	0	80	80	8	16	0	Xeon	3.1 GHz
UM	96	0	96	96	16	40	32	Dual Xeon	3.1 GHz
VP	96	0	96	96	0	0	0	Xeon	3.1 GHz
VP	96	0	96	96	0	0	32	Dual Xeon	2.8 GHz
Conf Server	80	0	40	0	0	80	0	Xeon	2.88 GHz
Conf Server	96	0	48	0	0	96	32	Dual Xeon	3.1 GHz

Operating System Requirements

Microsoft Windows 2000 Service Pack 2, Microsoft Windows XP, or Microsoft Windows 2003 Server.

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