3G-324M *on a Blade*^{TM}

TelcoBridges Product Brief

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Purpose

This document is intended to provide an overview of **TelcoB**ridges' 3G-324M *on a Blade^{TM}* products.

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Intended Applications

TelcoBridges offers a suite of 3G-324M products intended for system integrators and OEMs who wish to build telecommunications systems targeted at the growing market of mobile video on 3G networks.

The 3G-324M building blocks provided by **TelcoB**ridges enable system integrators to create high-performance systems supporting the following applications:

- On-demand video clip playback to mobile subscribers
- Live TV broadcasting to mobile subscribers
- Video mail
- Video ringback tones
- 3G-324M to SIP interworking
- Or any other application requiring video streaming or recording on mobile networks…

TelcoBridges has developed a high-performance 3G-324M implementation which off-loads the server and is easy to integrate through simplified API calls.

TelcoBridges' 3G-324M Products

The following products are part of the 3G-324M product family:

Part Number	Description
TB-VIDEO-120	TB Video System-Blade, 120 channels full/half-duplex
TBSS	TB-StreamServer software (Linux, Solaris, Windows)
TB-SOFT-API	TB System-Blade Server API

The following products are complementary to the 3G-324M product family and may be required for the development of a 3G-324M system depending on the functionality desired:

| Part Number	Description
TB-8	4 to 8 T1/E1/J1 TB System-Blade, supporting TDM signaling
TB-16	8 to 16 T1/E1/J1 TB System-Blade, supporting TDM signaling
TB640	8 to 64 T1/E1/J1 TB System-Blade, supporting TDM signaling
TB-SS7-HA	SS7 HA Signaling for a TB System-Blade (MTP2/MTP3/ISUP)
TB-VoIP	VoIP PTMC Mezzanine for TB System-Blade
TB-VoIP-SIP	SIP Signaling for TB System-Blade

System Diagram

The following diagram illustrates a typical 3G-324M application.

TB *System-Blade*^TM
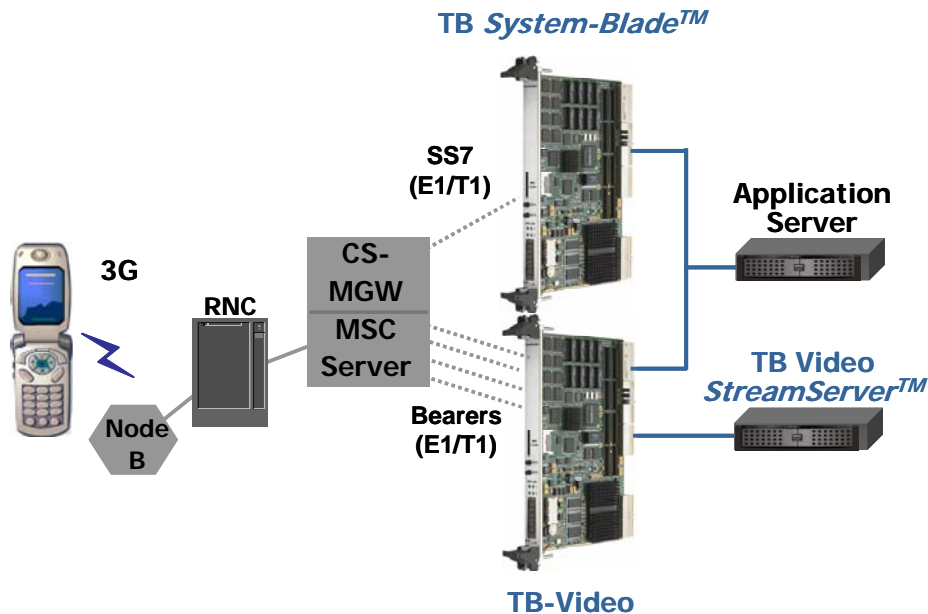
In this diagram, the TB-Video, the TB-*StreamServer*^TM and the application sever are part of the system integrator's solution as an enhanced services system to the 3G mobile network. These three parts act as one to form a system delivering an application such as on-demand video clip playback, video mail, video ringback tones, or live TV mobile broadcasting.

The TB-Video handles the T1/E1/J1 interface to the mobile switch as well as the H.223 protocol, while the application software and **TelcoB**ridges' H.245 protocol run on the server, and the TB-*StreamServer*^TM handles the playback and recording of video clips. The TB-Video *System-Blades*^TM, the TB-*StreamServer*^TM and the application server communicate using IP over a switched Gigabit Ethernet LAN.

Any number of TB-Video *System-Blades*^TM and TB-*StreamServers*^TM can be used to build a highly-scalable system. Supporting more subscribers is as simple as adding additional *System-Blades*^TM. Offering more content is as simple as adding additional TB-*StreamServers*^TM. Note that a single TB-*StreamServer*^TM equipped with a 300 GB can store in excess to 10,000 hours of video content.

3G-324M mobile video applications require a clear channel 64 kbps connection between enabled terminals. This is possible on 3G mobile networks where handsets and 3G infrastructure devices, such as the CS-MGW, support the establishment of 64 kbps clear channel bearers between nodes.

A signaling protocol is required to set up the 64 kbps channels between the mobile switch and the 3G-324M system. The signaling interface to the mobile switch is based on SS7 signaling. A TB-8, TB-16 or TB640 *System-Blade^{TM}* can be integrated to the system to provide this signaling interface. A single *System-Blade^{TM}* running the SS7 protocol stack can provide the signaling for multiple TB-Video *System-Blades^{TM}* – from one to over a thousand TB-Video *System-Blades^{TM}*!

Each TB-Video *System-Blade^{TM}* supports up to 120 full/half-duplex channels per blade. Any number of TB-Video *System-Blades^{TM}* is supported per system – The system has unlimited scalability.

The TB-*StreamServer^{TM}* supports up to 2000 simultaneous video/audio streaming channels per server – whether the files are being played back or recorded, or even played back while being recorded! A single TB-*StreamServer^{TM}* can serve multiple TB-Video *System-Blades^{TM}* – more than 16 blades per TB-*StreamServer^{TM}*! Furthermore, the number of TB-*StreamServers^{TM}* per system is unlimited.

The file format supported is defined by 3GPP and uses the extension ".3gp". A ".3gp" file any contain any combination of supported audio coding, typically AMR or G.723.1 in WCDMA networks, with any supported video coding, typically H.263, H.264 or MPEG-4 video coding. The TB-*StreamServer^{TM}* supports all options.

The TB-*StreamServer^{TM}* supports the playback of a .3gp file while it is being recorded. This feature is important for mobile TV applications where a live television broadcast feed can be fed to the TB-*StreamServer^{TM}* and recorded on disk while the same file is being streamed to mobile subscribers. In this way, a mobile subscriber can watch the same television programming as a conventional TV viewer with only a few seconds of delay.

TelcoBridges' products support a higher quality video codec defined by ITU-T H.264 Recommendation. This new video codec provides higher quality video than both H.263 and MPEG-4 video codecs. The 3rd Generation Partnership Project (3GPP) has recently included the H.264 video codec in a new version of the 3G-324M recommendation.

Both the TB-Video and the TB-*StreamServer*^{TM} are controlled by the application server through a message-based API provided by **TelcoB**ridges. The API provides complete and thorough access to the blade resources and the TDM signaling stacks. The API specific to the 3G-324M features simplifies the integration of the complex ITU-T standards specific to the 3G-324M Recommendation by providing a high-level interface to the 3G-324M functionality.

Application Call Flow

TelcoBridges' 3G-324M building blocks are controlled by an application server.

Control message flow

Data flow
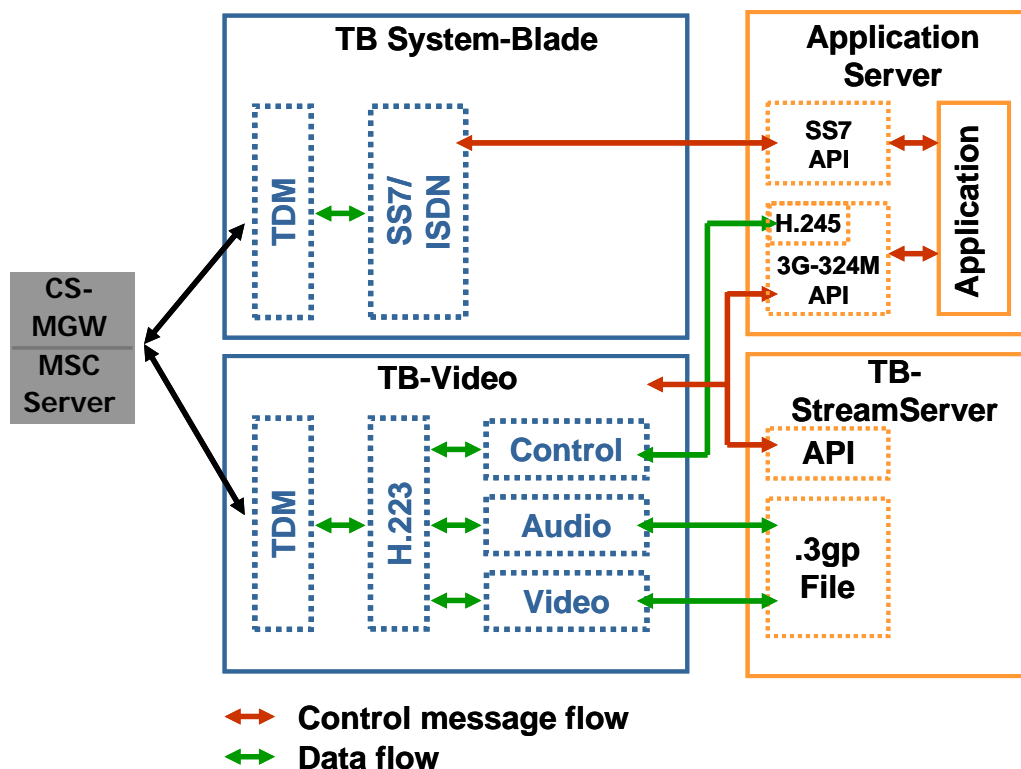
3G-324M Standards

The following table lists the standards relevant to 3G-324M and the extent of their support for a 3G-324M compliant system:

Standard or Recommendation	Standards Body	TelcoBridges Support	Application Support	Notes
H.223	ITU-T	✓		Multiplexing protocol
H.223 Annex A	ITU-T	✓		Mobile level 1
H.223 Annex B	ITU-T	✓		Mobile level 2
H.245 version 7	ITU-T	✓		Control protocol
H.324	ITU-T	✓ (as modified by 3GPP)		Multimedia communications
H.324 Annex C	ITU-T	✓ (as modified by 3GPP)		Multimedia over error prone channels
TS 23.972 V3.0.0	3GPP	✓		General description 3G-324M call setup procedure
TS 26.110 V6.0.0	3GPP	✓		General description for 3G-324M
TS 26.111 V6.1.0	3GPP	✓		Modifications to H.324
TS 26.112 V1.1.0	3GPP		✓	SS7 call setup
TR 26.911 V7.0.0	3GPP	✓		Implementor's guide (includes WNSRP)
TS 29.007 V3.15.0	3GPP		✓	Mobile and PSTN interworking
S.R0022	3GPP2	✓ (circuit-switched)		Video conferencing on CDMA2000 networks

H.223 Implementation

ITU-T H.223, specifically annexes A and B, are implemented on the TB *System-Blade^{TM}*. H.223 is responsible for the multiplexing of video, audio and H.245 control signals in a 64 kbps transparent bearer channel. H.223 supports different error control mechanisms corresponding to different mobile levels. Mobile levels 0, 1, 2 and 3 provide increasing levels of error detection and correction.

The TB *System-Blade^TM* implements the ITU-T H.223 Annex A (mobile level 1) and Annex B (mobile level 2), as specified by the 3G-324M recommendation. These mobile levels are supported by virtually all 3G-324M devices on the market. Furthermore, **TelcoB**ridges' implementation puts the protocol on the blade, thereby simplifying application development, increasing performance, and off-loading the server such that it is available to perform other tasks.

With H.223 on the blade, the TB *System-Blade^TM* performs the following tasks automatically on a call-by-call basis:

- Automatically detects, negotiates and selects the mobile level
- Automatically manages the adaptation layers

H.245 Implementation

Support for the ITU-T H.245 recommendation is required for 3G-324M. The H.245 protocol is responsible for the command, control and indication during a 3G-324M connection. The H.245 messages are multiplexed by the H.223 layer into the 64 kbps clear channel connection established between two 3G-324M terminals. **TelcoB**ridges implements ITU-T H.245 version 7, with selected features up to version 11, on the server and includes a number of automatic functionalities to simplify application development.

TelcoBridges' implementation of H.245 automatically performs the following tasks:

- Automatic mode selection (SRP, NSRP or WNSRP)
- Automatic capability exchange
- Automatic master-slave determination
- Automatic logical channel opening and closing
- Automatic multiplex table entries (MTE) exchange

One of the key requirements of 3G-324M systems is fast call setup. This directly affects subscriber satisfaction and the perceived performance of the mobile video service provided by the operator. The ITU-T and 3GPP have recently standardized a more efficient transmission mode for H.245 messages: Windowed Numbered Simple Retransmission Protocol (WNSRP). This protocol allows the simultaneous transmission and reception of H.245 messages during the call setup procedure, thereby accelerating the establishment of the 3G-324M connection.

TelcoBridges is one of the first suppliers to include WNSRP as part of its H.245 implementation. This ensures that 3G-324M calls to or from the TB *System-Blades*^{TM} to mobile handsets are always set up as fast as possible.

SS7 Implementation

The application will use TelcoBridges' SS7 on-board signaling software to set up and answer 3G-324M calls. As required by the standards, **TelcoB**ridges' SS7 signaling stack accepts incoming calls and establishes outgoing calls where the "User information layer 1 protocol" is set to "00110" (corresponding to "Recommendations H.223 and H.245"). SS7 messages used to set up 3G-324M bearers also indicate the requirement for an unrestricted 64 kbps transparent channel between end nodes. These messages use the appropriate value for "Bearer Capability Information Element" to signal this requirement along the call path.

3G-324M to SIP Interworking

The TB-Video *System-Blade*^{TM} can also be used to build a 3G-324M to SIP gateway. TelcoBridges offers a SIP signaling protocol stack for its TB *System-Blade*^{TM}. On a separate blade, SIP signaling can be used to establish VoIP calls with IP devices. The purpose of such a gateway is to allow the transparent communication between 3G mobile handsets and IP-based videophones and telephones, thereby bridging the circuit-switched mobile world to the packet-based IP world.

Using **TelcoB**ridges' SIP signaling stack on a separate blade, the 3G-324M system is capable of terminating a 3G-324M call on the mobile side and originating a VoIP call on the IP side, and vice versa. The resulting gateway function handles the SIP signaling and manages the connection with the IP terminating device and packetizes the audio (AMR or G.723.1) and video (H.263, H.264 or MPEG-4) over RTP/UDP/IP.

TB-*StreamServer*^{TM}

The TB-*StreamServer*^{TM} is a high-performance software application able to play and record .3gp files. It is capable of supporting more than 2000 simultaneous play and/or record streams per server, as well as storing over 10,000 hours of video content on a single 300 GB disk drive.

The TB-*StreamServer*^{TM} software runs on a standard off-the-shelf server CPU equipped with any of the following operating systems:

- Solaris
- Linux
- Windows

The TB-*StreamServer*^{TM} sends and receives video files over an RTP/UDP/IP connection with the *System-Blades*^{TM}. For maximum performance, the *System-Blades*^{TM} and the TB-*StreamServer*^{TM} are connected over a switched Gigabit Ethernet LAN. The TB-*StreamServer*^{TM} is controlled by the application server through a message-based API.

A 3G-324M system can support one or more TB-*StreamServers*^{TM} according to the amount of video content to be available, and/or for redundancy purposes.

Any number of TB-*StreamServers*^{TM} can be used, thereby supporting any amount of content – only limited by the practical capacity of the switched GigE LAN, which when encountered, can easily be segmented.

Furthermore, the TB-*StreamServer*^{TM} is capable of playing back .3gp files while they are being recorded, thereby enabling mobile TV applications.

Development Environment

TelcoBridges develops its products to be host-agnostic. All software running on servers (or application servers) can be run on standard off-the-shelf computing systems.

Operating systems supported are:

- Solaris
- Linux
- Windows

TelcoBridges implements a message-based application programming interface (API). The API is asynchronous whereby control messages sent from the application server to the *System-Blades*^{TM}, and response messages sent from the *System-Blades*^{TM} to the application server, can be sent or received at any

time. This speeds up system operation by allowing multiple API call messages to be sent without having to wait for a response from the first message.

Simplified Application Development

TelcoBridges' API is very thorough and can provide full control and direct access to low-level signaling protocol parameters and interface management.

However, for 3G-324M, and in order to simplify application development for system integrators, the 3G-324M Call Control API is a high-level interface. **TelcoB**ridges has automated the standard H.223 and H.245 call setup procedures to facilitate system integration and allows developers to focus their efforts on value-adding features.

For instance, streaming a video clip to a mobile handset involves a single API call: play(servername, filename 1, filename 2, …, filename n, trunk#, timeslot#), where servername is the name of the TB-*StreamServer*^{TM} to play the file, filename 1 is the name of the .3gp file to play first, filename 2 is the next file to play, and so on until the last file, and the trunk# and timeslot# identify what 64 kbps bearer a *System-Blade*^{TM} is to multiplex the audio, video and control information on.

TelcoBridges handles the allocation of DSP resources on the appropriate *System-Blade*^{TM}, the H.223 and H.245 call setup and negotiations, controls the TB-*StreamServer*^{TM}, plays/stops/pauses the playback of files, and sends a completion message to the application.

The recording of video is just as simple (i.e. a single API call), as are many other functions needed to build a 3G-324M system.

Further Information

Contact us now to uncover how **TelcoB**ridges can help you win more 3G-324M business with highly-scalable, reliable, and easy to integrate products:

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