What is a Media Gateway, Yesterday, Now and Tomorrow?

TelcoBridges

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Abstract

- Media gateways have come a long way since its origins with prepaid calling, enterprise toll by-pass and service providers utilizing voice over IP for long-distance interconnections.
- The media gateway market is now mature however recent innovations have emerged in response to continued customer demand for APIs & Data Queries, Integrated Media Processing, Network Quality Monitoring and more.
- New use cases have also emerged for Network Transformation, SIP Trunking to TDM Customers, SaaS Delivery, Robocall / TDoS with TDM Trunking and Lawful intercept.
- With more than 20 years of experience making carrier grade telecommunications hardware and software (and a no End of Life policy), continued customer demand for TelcoBridges Media Gateways is paving the way for more innovation.

About TelcoBridges Inc.

TelcoBridges is a leader in the design and manufacture of carrier grade, high performance, and high-density Session Border Controllers and VoIP media gateways which bridge telco operators. TelcoBridges and its Alliance Partner Program partners have deployed TelcoBridges solutions, with remote or onsite installation, as well as personalized 24/7 support in more than 100 countries worldwide. Ask us about our new Tmedia for Metaswitch gateways!

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Media gateways are a fundamental building block of voice communication networks, interconnecting legacy TDM circuits with VoIP networks. Found in service provider and enterprise networks, media gateways range in scale and capabilities meeting a range of diverse applications.

However, with increasing adoption of SIP and VoIP networks, what role will media gateways play going forward? Will they become obsolete and join the VCR and the dustbin of technology? Or will they evolve and take on new roles in converged voice networks?

In this guide, we delve into the media gateway market, examining recent innovations and exploring new use cases to discern the evolving role of media gateways in the telecommunications.

This guide is based on the "What is a Media Gateway?" webinar.
You can watch recording here and download slides here.

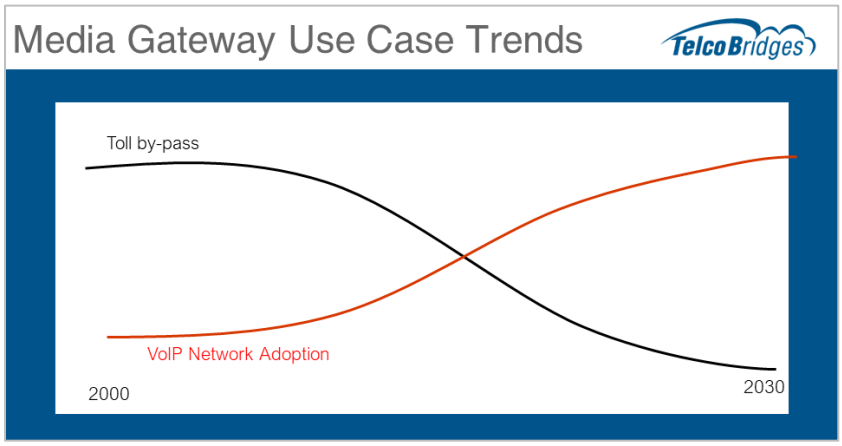
Chapters

1. Trends In the Media Gateway Market
2. Media Gateway Fundamentals
3. Gateway Innovations
4. New Use Cases
5. TelcoBridges Media Gateway Portfolio

Trends In the Media Gateway Market

We developed a graph that illustrates our understanding of the market trends. When telecom manufacturers all entered the market in 2000, the dominant trend was toll by-pass, driven by a significant demand for a single major use case.

During this period, prepaid calling, enterprise toll by-pass, and service providers utilizing voice over IP for long-distance interconnections were particularly popular. However, many VoIP applications struggled to gain traction. As toll by-pass became oversaturated and declined, the focus shifted towards VoIP networks and related applications. The net of the overall market continues to be fairly steady and seems to be continuing on well into the future.



Market trends (2000 – 2030) predicted by TelcoBridges

In the early 2000s, there was a boom in the calling card business. Convenience stores and airports had kiosks offering a wide selection of international calling cards. Everyone was eager to get into the business, and it was a popular trend back then.

Since those days, we've noticed a significant shift in the service provider industry. Voice over IP technology has become increasingly prevalent in the core networks of service providers. However, there's still a need for these providers to connect with traditional TDM infrastructure. This could involve TDM trunks or dealing with customers who use TDM equipment. This demand for compatibility is what's fueling the market for media gateways.

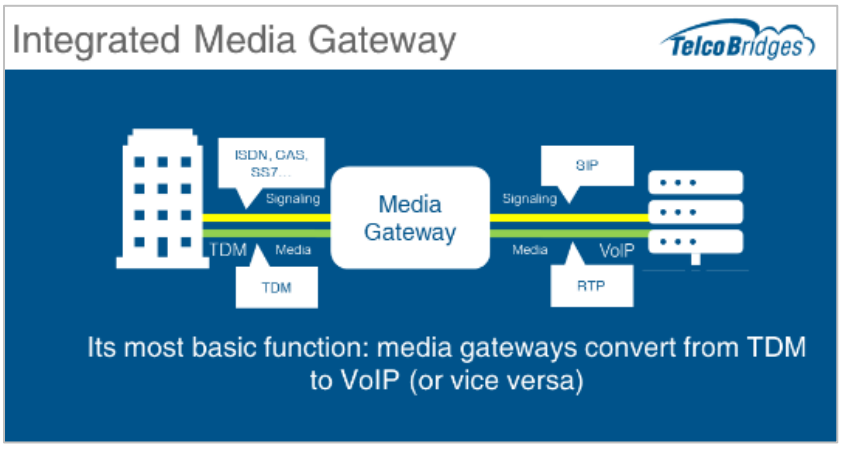
Download VoIP Media Gateways Brochure >

Media Gateway Fundamentals

There are two different ways in which you can deploy a media gateway, and it has an impact on the network architecture.

1. Deployment Architectures: Integrated Media gateway

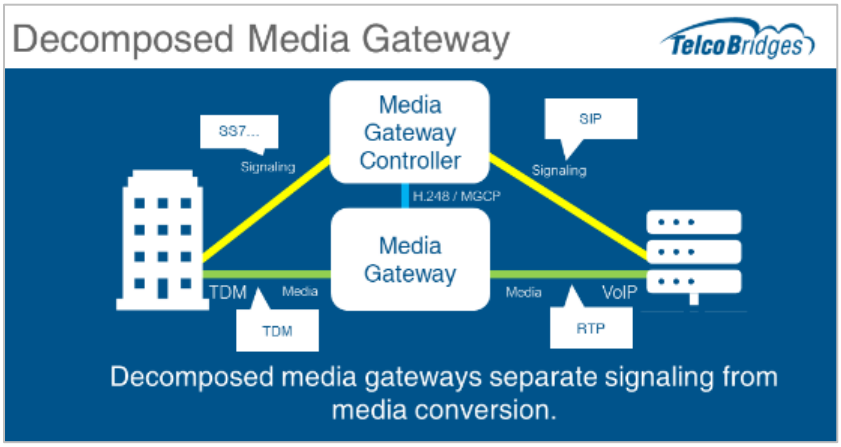
The integrated media gateway functions as a bridge between TDM and VoIP networks, handling both signaling and media transfer in a single appliance. On the TDM side, it manages various signaling types like SS7, ISDN, and PRI, along with TDM media connections. On the VoIP side, it uses SIP signaling and RTP for media transmission. This setup allows the gateway to efficiently route incoming calls on both networks, making it a versatile solution for seamless communication integration.



Integrated media gateway architecture

2. Deployment Architectures: Decomposed Media gateway

In the decomposed media gateway model, the media gateway and it's ~~a~~ media gateway controller are separate entities. The media gateway exclusively handles media conversion, while the controller oversees signaling conversion.



Decomposed media gateway architecture

In this diagram, the left side involves SS7 signaling and TDM media, and the right side utilizes SIP signaling and RTP. Protocols like H.248 and MGCP enable the controller to manage media ports, bridging them across the gateway. As shown, the media gateway is controlled by the controller, which handles signaling, call routing, and accounting.

TelcoBridges' gateway supports both architectures, allowing flexibility based on network requirements and advantages of each approach.

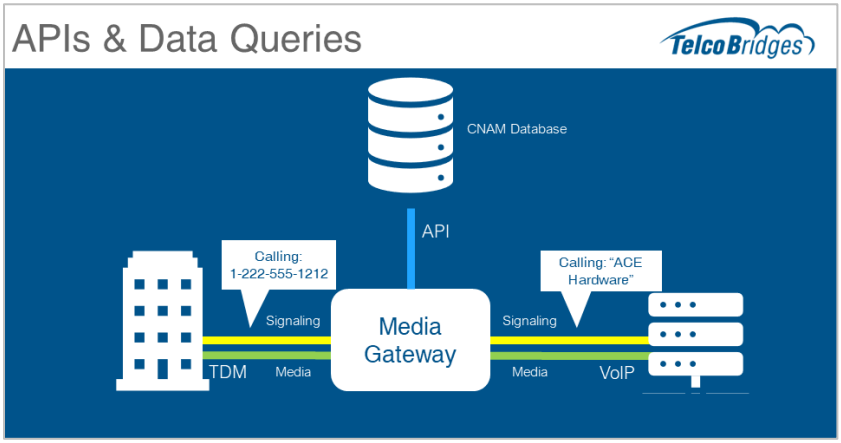
Gateway Innovations

In the mature media gateway market, recent innovations have emerged in response to customer demands. TelcoBridges and other vendors are addressing real challenges faced by customers, leading to innovative solutions that are reshaping the telecom industry.

- ### APIs & Data Queries

  The first innovation we're discussing involves APIs, or application programming interfaces. These APIs empower media gateways to interact with external systems, such as caller-named databases or local number portability databases.

  For instance, when an incoming call reaches the media gateway on the TDM side, it can query an external system using interfaces like REST API or SIP protocol. In the given example, the media gateway queries a database to retrieve the caller's name, like "ACE hardware," to display to the called party. This innovation is crucial for networks lacking the ability to access external databases for caller information.



Application programming interface interaction with a media gateway

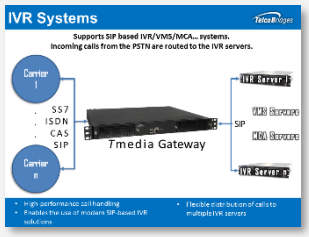
Beyond obtaining caller names, these APIs can serve various purposes. They can also be used to provision, configure, and remotely manage Media gateways. For instance, our gateway supports a REST API, enabling integration with back-office systems for seamless configuration and management, a process often referred to as flow-through provisioning.

- Integrated Media Processing

  As discussed earlier, the Media gateway handles media, sometimes with signaling and sometimes without, depending on the specific architectures being discussed. Given that media gateways manage media, they serve as ideal platforms for:

  - processing media,
  - inserting announcements,
  - detecting tones,
  - generating tones,
  - implementing IVR functionalities.

  With TelcoBridges gateways, you can create basic IVR menus, collect digits, and set up conferencing capabilities. Additionally, these gateways offer the option to record calls for troubleshooting or archival purposes. It's important to note that media processing also involves transcoding, allowing media gateways to adapt codecs or transport DTMF tones on the Voice over IP network.

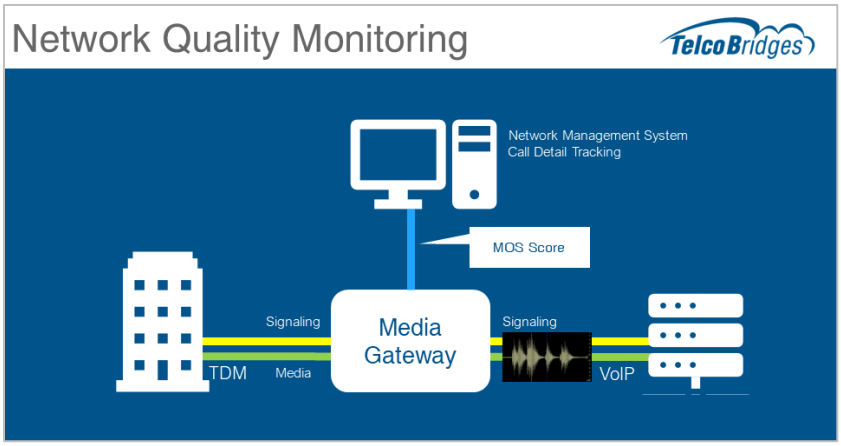


[Learn more about IVR Solutions >]

  This integrated approach eliminates the need for a separate device or Media Resource Function (MRF) solely for minor tasks like playing ring back tones or brief announcements. By leveraging the DSP and media processing capabilities inherent in the gateway, it maximizes the use of existing resources. This approach avoids deploying dedicated media resource processes or functions. Implementing new announcements or similar tasks is simply a matter of configuration, making the process efficient and streamlined.

- Network Quality Monitoring

  Voice quality is critical for both service providers and enterprises. Glitches in important calls often need identification and documentation of the underlying issues. Media gateways, have a unique position to measure voice quality, calculating Mean Opinion Scores (MOS), and report scores in Call Detail Records (CDRs) for analysis. This data can then be used to influence call routing decisions.

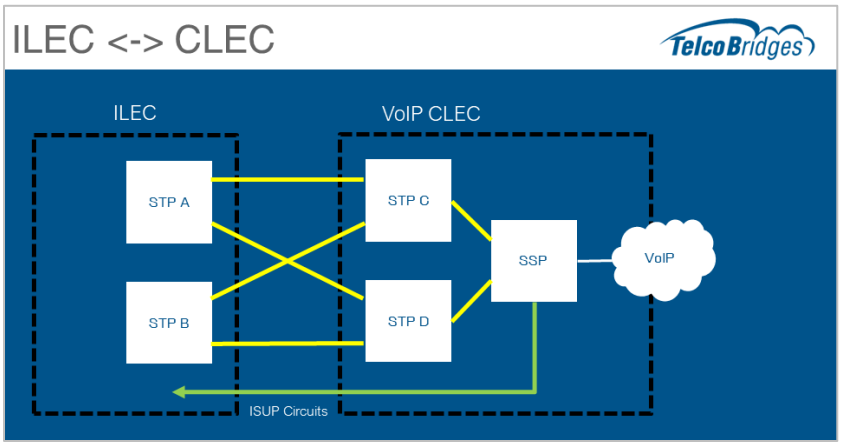


Network Quality Monitoring

In TelcoBridges' gateways, network quality measurements are crucial, especially in international networks with multiple routes. By dynamically selecting the best route based on real-time MOS scores, our gateways ensure top-quality voice transmission. Though this feature isn't new, its creative application is becoming more popular.

- ILEC <-> CLEC

  In the diagram below, depicting the interface between incumbent and competitive carriers, the standard interconnection method is illustrated without a media gateway.



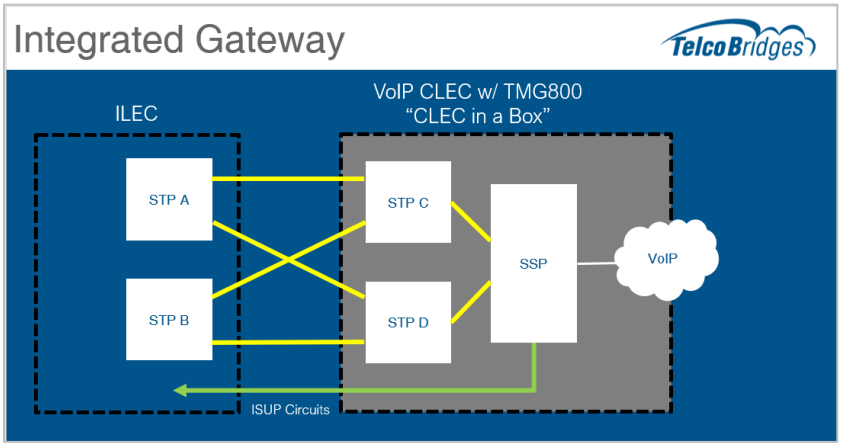
incumbent local exchange carrier (ILEC) and competitive local exchange carrier (CLEC) interfaces

It showcases the typical TDM interconnect used globally, facilitated by Signaling Transfer Points (STPs) on both sides. STPs function like IP routers for SS7 messages, managing voice communications and SMS transport. These STPs handle signaling exclusively, while voice circuits, represented as ISUP circuits, are separate. This TDM interconnection, with fully redundant SS7 connections through STPs and voice circuits terminating at an SSP switch, has been a standard practice in service provider interconnections.

- Integrated Gateway

Here's the basic architecture: TelcoBrides' gateways have the unique capability to function as both an STP and an SSP. Through configuration, the Media gateway can be set up to act as a signaling transfer point, essentially functioning as an SS7 router. Simultaneously, it can be configured as a switch, bridging the gap between TDM and Voice over IP.

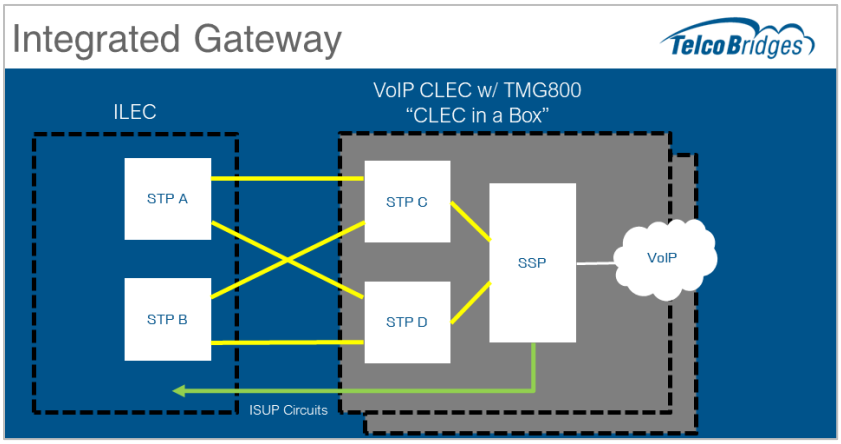
What sets this innovation apart is the seamless integration of these functions into a single device. This means that for the incumbent carrier on one side, there's a pair of STPs and a switch, providing a familiar and robust interconnection setup with fully matched SS7 links between the ILEC and the CLEC.



Integrated media gateway

For the Competitive Local Exchange Carrier (CLEC), this integration is a game-changer. It simplifies the entire process, eliminating the need to deal with multiple vendors for STPs, media gateways, and switches. All the complexities of traditional TDM connections are encapsulated within this single device. Consequently, once this integration is in place, everything else operates seamlessly in the realm of VoIP, streamlining the deployment process significantly. This approach not only reduces costs but also brings unparalleled simplicity to what was once a cumbersome and complicated procedure.

Regarding reliability, as previously mentioned, there's an option to replicate these platforms. In the illustration, we've represented this redundancy with two gray boxes.



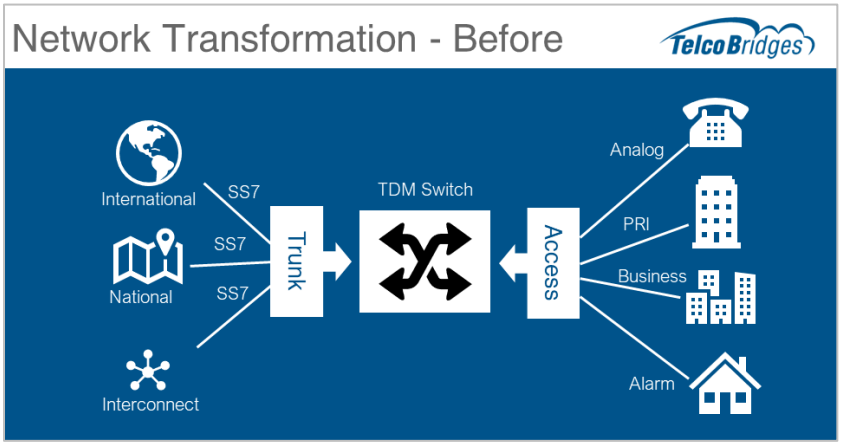
Integrated media gateway - replicated

Deploying a pair of STP functions in a single hardware unit for redundancy would be impractical. A failure in such a setup could jeopardize the entire sophisticated SS7 architecture, which relies on seven layers of redundancy.

Our approach involves deploying redundant devices and distributing the SS7 layers across these devices. This ensures that if an SS7 connection goes down, the system remains operational. The same principle applies to the ISUP circuits at the bottom of the setup. We distribute the voice circuits across the two redundant devices. Consequently, if a problem arises with one device, the service continues without disruption.

New Use Cases

1. Network Transformation

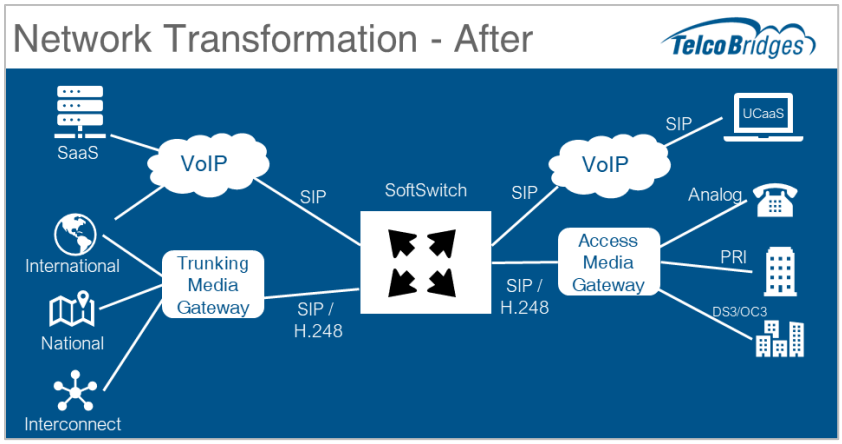


Network transformation - before

Let's begin with the network transformation concept. In the diagram, we've depicted the typical structure of old legacy TDM service providers. Many providers, numbering in the tens of

thousands globally, still operate in this manner. The central element is a traditional TDM switch, featuring trunk and line sides.

Traditionally, trunk connections handle international and national traffic, such as mobile carriers and interconnections with other providers. On the right, the line side delivers services to subscribers, encompassing various service offerings. What's noteworthy is the ongoing shift toward network transformation. Service providers are increasingly migrating to leverage Voice over IP technology, retiring these older switches in favor of updated architectures.



Network transformation - after

In this transformation, the trunk side of the switch often remains intact, connecting to international or national networks and competitive providers due to their availability, reliability, long-term contracts, or favorable pricing.

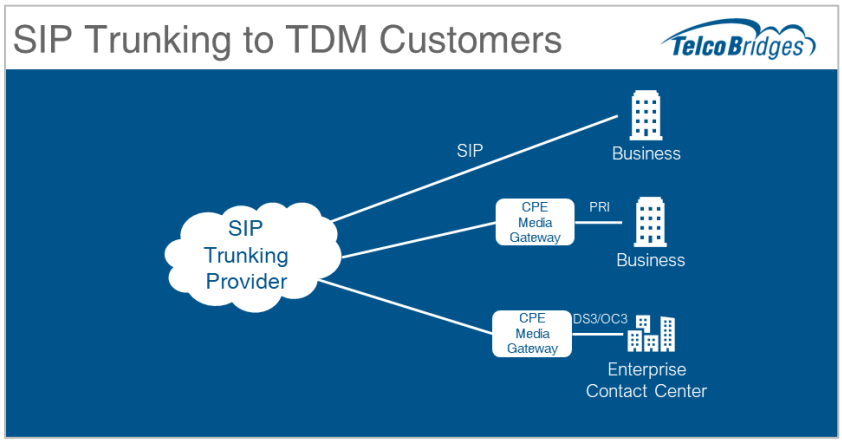
By transitioning to an IP core with a central soft switch, a media gateway is essential to convert TDM trunk connections to Voice over IP using SIP or H.248. This shift opens opportunities for SIP interconnections with other providers and cloud-based communication platforms offering services like conferencing and IVR.

On the line side, challenges arise in maintaining traditional services for subscribers, necessitating an access media gateway. The goal is to minimize customer disruption during this process. Service providers aim to make the transition seamless, often preserving the existing setup until there's a clear advantage in migrating to Voice over IP. This approach ensures a smooth evolution without inconveniencing the customer.

Access Network Transformation Case Study in PDF >

2. SIP Trunking to TDM Customers

Let's explore another scenario involving SIP trunking for TDM customers. Startup SIP trunking providers have found success in offering SIP services directly to businesses. However, challenges arise when dealing with businesses using legacy PRIs or more complex interfaces like DS3 or OSC3 in their contact centers. Waiting for these businesses to upgrade their platforms isn't ideal. To address this, media gateways are deployed at customer premises, facilitating the conversion from SIP trunks back to the legacy interfaces.



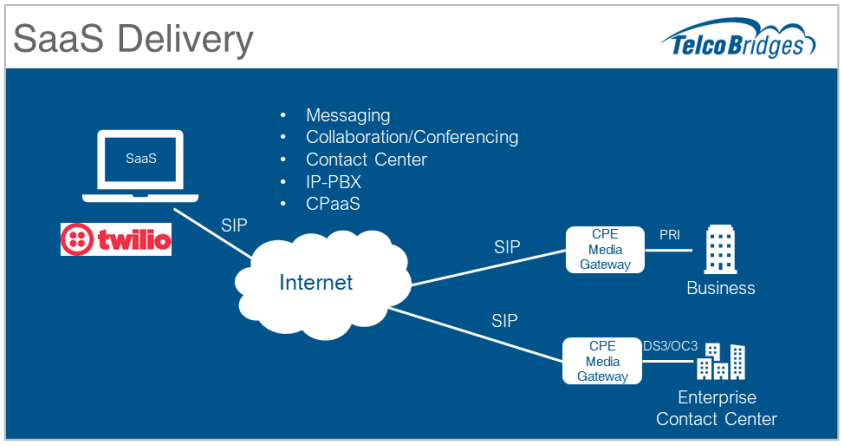
SIP trunking to TDM customers

By crunching the numbers, these gateways prove financially beneficial for customers. The cost savings from SIP trunking quickly offset the gateway infrastructure costs. Many businesses, especially those with established on-premises infrastructure including PBX, ACD, call center systems with IVR, and queues, are hesitant to migrate fully to Voice over IP.

They prefer retaining their ISDN lines and PRIs, often due to geographical factors and long-held phone numbers, including 1-800 numbers. The fear of disrupting their longstanding communication setups motivates these businesses to deploy media gateways, ensuring seamless conversion between Voice over IP and traditional ISDN and PRI technologies.

3. Use Case: SaaS Delivery

Innovative solutions like Software as a Service (SaaS) have introduced various applications, including messaging, collaboration tools, and contact centers, all operating on SIP technology through CPaaS platforms like Twilio. Yet, many established businesses still rely on legacy technologies such as PRIs and traditional contact centers.



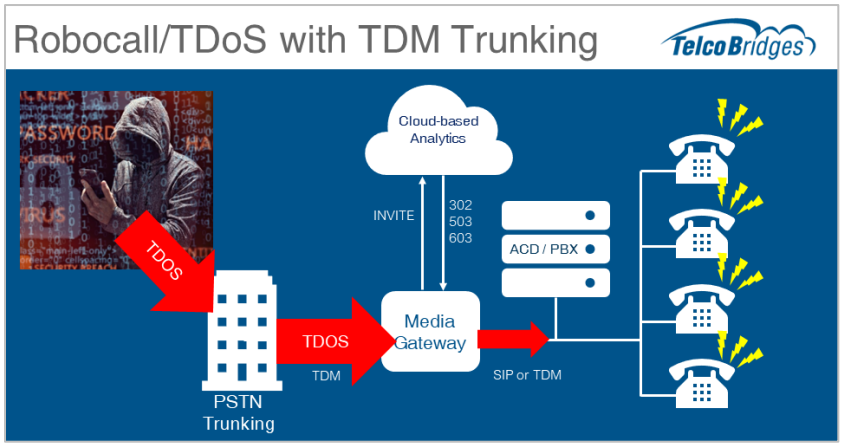
SaaS delivery solution

The challenge arises when these businesses want to integrate new SaaS offerings, like messaging or conference calling, into their operations. Media gateways play a crucial role here, converting SIP-based applications into PRI. This allows users to access these applications through traditional phone lines by dialing an access code.

For businesses, this approach offers benefits like global telephone number availability, easy IVR menu implementation, and efficient outbound dialing, all without on-site infrastructure. When successful, these businesses can route calls to in-house agents using traditional TDM systems, bridging the gap between modern cloud-based services and established business processes.

4. Use Case: Robocall / TDoS with TDM Trunking

In our recent webinar, we delved into the challenges posed by Robocalls and Telephony Denial of Service (TDOS) attacks.



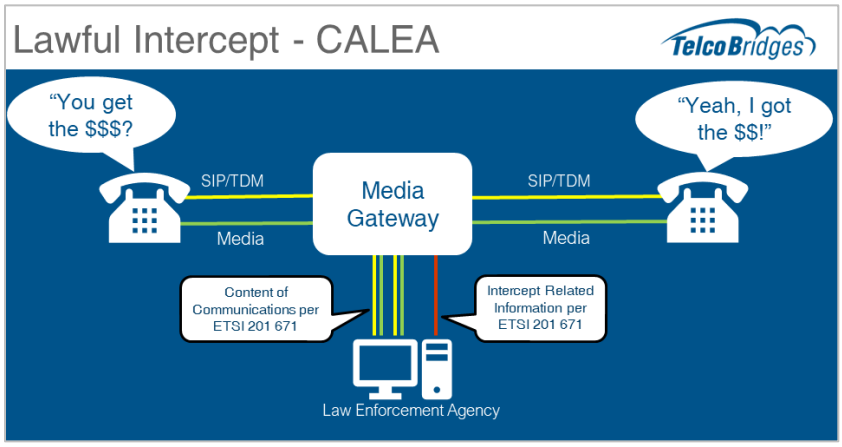
Robocall / TDoS with TDM trunking

When TDM service providers unknowingly transmit this traffic, a critical decision point occurs at the media gateway. By utilizing cloud-based reputation and robocall mitigation databases, questionable traffic can be either rejected or screened.

Ongoing innovations in this area are dedicated to addressing the pressing issue of Robocalls and TDOS attacks.

5. Use Case: Lawful intercept functionality in media gateways

Another crucial use case is lawful intercept. Situated uniquely within the network, TelcoBridges' media gateway offers the potential to assist law enforcement, sometimes mandated by legislation, in intercepting calls between suspects.



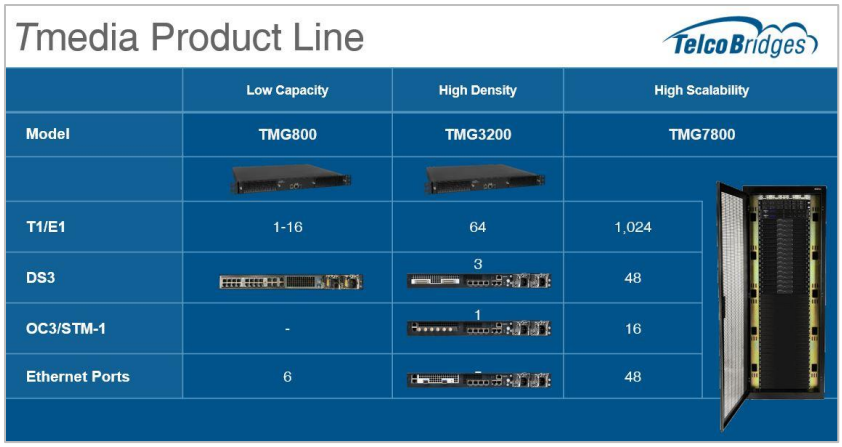
Lawful Intercept use case

In this scenario, the Media gateway handles both signaling and media, making it ideal for the required functions of lawful intercept. It can collect call detail records, listing calls to and from the target number, and intercept the media, allowing law enforcement to listen in or record the conversation. This feature is available in our media gateways and can be activated through configuration settings.

TelcoBridges media gateway product portfolio

TelcoBridges' Tmedia product line consists of three different hardware platforms: TMG 800, TMG 3200 and TMG 7800. Each of these hardware platforms is available in several different configurations within.

Tmedia MEDIA GATEWAYS



Tmedia product family overview

- TMG 800

  For example, TMG 800 is targeted towards low capacity and smaller implementations, such as remote branch offices. TMG 800 scale from 1 to 16 T1s/E1s or a single DS3. It also provides up to six Ethernet ports on the device.

- TMG 3200

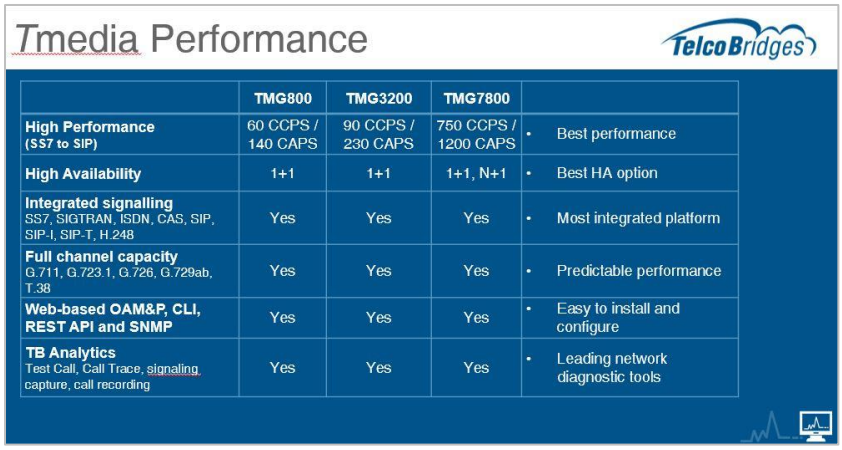
  Then we move up to our TMG 3200, which is a larger capacity. It can support up to 64 T1/E1s or 3DS3s or single OC3/STM-1. This is a good fit for the medium to high density environment. TMG 3200 is still in a 1U package, but quite a bit of performance in that environment.

- TMG 7800

  But at the very high end for large central offices, we have our TMG 7800, which is essentially a rack of 3200s that are networked together into a large configuration. It could do up to 1,024 T1s or E1s, 48 DS3s, or 16 OC3/STM-1s with a shelf that controls these devices and provides full HA switchover capability.

So, a different solution for different capacities. It helps service providers find the right fit based on the size of their central office. As a result of such a consistent architecture, our customers can use these different platforms across the entire product line and learn it once and use it across all products.

From a performance standpoint, TMG 800 has a little bit lower capacity at 60 calls per second (CCPS) and 140 CAPS. TMG 3200 is the higher capacity with 90 CCPS/230 CAPS, and TMG 7800, of course, is the highest capacity with 750 CCPS/1200 CAPS. All Tmedia products come with 1+1 high availability as an option. The 7800 also comes with N+1 as an option for high availability. So full redundancy is possible across the entire line. All the other features are consistent: integrated signaling, channel capacity, web-based management, and of course, our analytics package.



Tmedia product family performance

We revamped the design of our media gateways around 2016, updating components like CPUs. TelcoBridges commitment lies in ensuring the continued availability of these gateways.

Recognizing that our customers integrate them into their networks for extended periods, we uphold a no End-of-Life Policy. We pledge to maintain and offer these gateways for as long as possible, especially considering their recent updates. Moreover, these Media gateways not only facilitate TDM to IP transition but also support various functions like announcements and transcoding. They represent a long-term investment that can continue to serve our customers' networks effectively.

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