MICROSOFT UC VOICE SERVICES PRODUCT GUIDE

CPE Products & Solutions for Microsoft

Products & Solutions for Microsoft-Based Communications Services

Patton offers comprehensive, robust and complimentary hardware, software and cloud products enhancing the value simplicity and efficiency in the deployment and use of IP integrated-voice implementations for Microsoft 365, Skype-for-Business and Microsoft Teams.

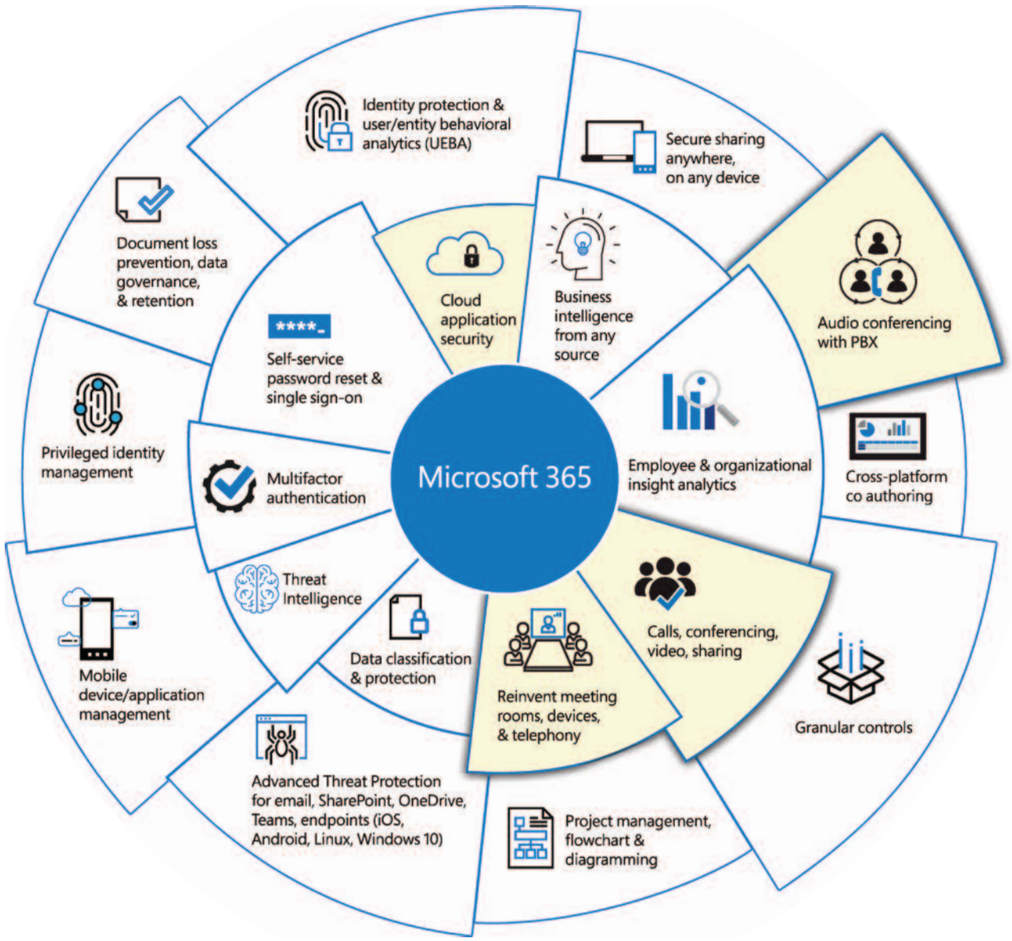
A wide range of products have proven, certified, lab and field tested interoperability with Microsoft. Regardless of the readiness, state and pace of migration of your voice applications and infrastructure, Patton is ready to assist. We deliver seamless connectivity and offer decades of experience assisting service providers and enterprises with network transformation, migration, SIP and TDM interoperability.

Microsoft
Skype for Business
Office 365
Microsoft Teams

PATTON®
let's Connect!™

Contents

Patton SmartNode VoIP Gateways, Routers, IADs and eSBCs are reliable, cost-effective, and certified interoperable with Skype for Business (including Basic Gateway, Enhanced Gateway and Session Border Control accreditation). Patton offers a complete portfolio of on-premise access devices and Cloud-based services for service providers, integrators, and businesses connecting—and managing—telephony, audio conferencing, and intercoms equipment to Skype for Business and Cloud-based networks.



Patton's Microsoft-approved qualified-interoperable portfolio of hardware, software and cloud solutions offers integrated voice services for Microsoft 365, Skype for Business and Microsoft Teams easy to implement, monitor, manage and support. Suitable for all UC architectures, Patton's solutions deliver efficient adoption, management and control for on-premises, Cloud and hybrid calling scenarios.

Patton's hardware, software, and Cloud Services offer direct SIP and TDM connectivity between existing voice infrastructure, Skype for Business, the PSTN, and SIP trunks. The portfolio provides solutions for any customer need supporting various call and port densities with a flexible software feature license model.

Patton SmartNode enables customers to connect legacy telephony equipment, PSTN lines, and non-compatible SIP endpoints to Skype for Business.

Benefits Overview

- Certified interoperable with Skype for Business
- Easy migration to All-IP
- Cost effective SIP trunk demarcation, and service and device management
- Multi-WAN survivability and load balancing
- PSTN trunks and hybrid trunk connectivity
- TDM and IP-PBX integration
- Legacy device connectivity (modem, fax, emergency phones, intercoms, access control terminals)
- Multisite and branch office integration with fixed and mobile end-points
- Assured QoS and quality monitoring
- Full device and service management in the Cloud
- SIP trunk demarcation, security, service and Cloud-based management
- Advanced routing, add-on software and solution including call forking
- PSTN trunks and hybrid trunk connectivity
- Centralized device and service management in the Cloud
- Protocol conversion including SIP IPv4 to IPv6, SIP UDP to TCP and SIP TLS to UDP

More than a DECADE of certified interoperability with Microsoft!

Office Communicator 2007	Lync Server	Skype for Business / Microsoft Teams / Office 365	
OCS Certification 2007	**Lync 2010 & Lync 2013**	**Skype for Business 2018**	**Teams & Office 365**
SmartNode Gateway Certification	SmartNode Basic Gateway Certification	SmartNode Basic Gateway Certification	SmartNode Basic Gateway Certification
		Enhanced Gateway Certification	Enhanced Gateway Certification
		eSBC Certification	eSBC Certification

Unique Selling Points

CPE with Cloud Orchestration

SmartNodes fully address the Network Integration needs of various vertical markets. Touchless provisioning, self-learning automated survivability, cloud-powered orchestration and license management are just a few of advantages of the SmartNode for Microsoft. The Patton Cloud adds value by delivering license management, security certificate management, remote access, device and other OA&M Services.

- Rapid & Fully-Automated Deployment of Services
- "Canned" Popular Use-Case-Based modeling & Wizard-based deployment
- Cloud-based MOS Scoring & Quality Monitoring (on all Models)
- Cloud-based Device Management, Orchestration & License Management with easy to integrate APIs
- An "in-common" software platform for all devices & Patton Cloud Services
- Highly integrated & scalable solutions.

Virtual Software and Cloud CPE Breaks You Free from Hardware Limits

The same, feature-rich software used on the purpose-build hardware devices is now virtualized delivering a high level of scalability and service availability. Patton's Virtual SmartNode (vSN) delivers the features you need for advanced voice network applications without any hardware based limitations.

- Virtualizes Network Edge Infrastructure
- Delivers converged Voice & Data Security with Network Separation, Intrusion Protection, DoS Prevention, Firewall and Encrypted Voice Signaling and Payload.
- SIP Interworking, IP routing, including IPv4 and IPv6 interworking
- Session Control and Call Routing

Enabling Pro-AV Conferencing, Intercoms & Emergency Notification Integration

Patton enables a wide variety of legacy and modern IP based conferencing, intercoms and notification systems to fully integrate with Skype for Business. This includes delivering TDM interface interoperability, SIP over TCP to SIP over UDP conversion, codec transcoding, SIP dialect normalization and voice security interoperability. SmartNodes enable communication with conferencing, intercom and notification systems such as Dolby, Dante (Audinate), QSys (QSC), P300 (Shure), Biamp, AMX, RTS, Code Blue, Hill-Rom, Rauland Borg and many others.

- Connect any SIP, analog or digital paging, alerting, intercoms, annunciator, access control or door phones systems to Skype for Business
- Allows incompatible & non-certified equipment and telephone network elements to interoperate & validly interconnect with Microsoft Skype for Business, Office 365 & Teams
- Integrates different SIP "dialects" such as Voice-over-TCP for Microsoft with Voice-over-UDP
- CODEC transcoding with QoS traffic-shaping enhance in-house voice quality while optimizing utilization of the WAN connections
- Flexible call routing & dialed-number manipulation provides numbering-plan continuity & eases integration

Facilitating a Pain-Free Migration to ALL-IP

Patton empowers Service Providers to migrate subscribers from legacy infrastructure to ALL-IP all at once or at a controlled or staged pace. We offer a variety of integrated WAN interfaces, including SFP for Native Fiber Ethernet or a variety of xDSL interfaces. With the simple addition of licenses those same units can be transformed into SIP Trunking Gateways, Edge Routers, Survivability Appliance and/or eSBCs.

- Total TDM & SIP connectivity & interoperability
- Flexible software-licenses for a future proof ALL-IP transformation
- Automated self-learning Multi-WAN & TDM survivability
- Patton Cloud CPE licensing, management & orchestration

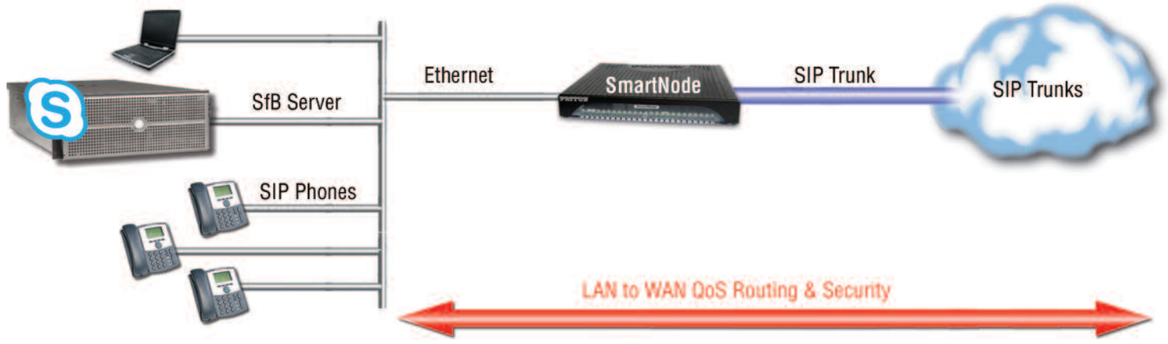
SmartNode Use-Cases for Microsoft

Primary Use-Cases

- Secure SIP Trunking
- Virtualized Secure SIP Trunks
- Secure SIP Trunk Consolidation & Federation
- PSTN Trunk Migration, Hybrid Trunking & Survivability
- PBX Integration
- Pro-AV Networked Audio Conference/Huddle Room Integration
- Legacy Telephone & Fax End-Point Integration
- Paging System Integration
- Virtualized eSBC, Access Router, VPN Server & Network Gateway

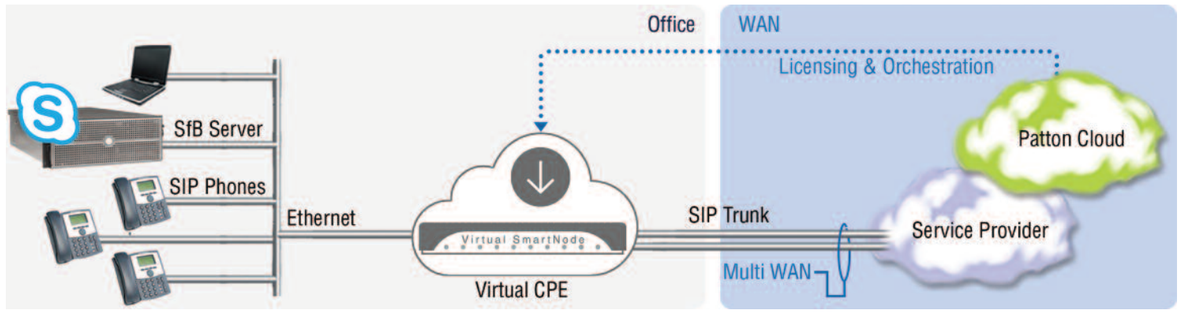
Secure SIP Trunking

Enterprise organizations are increasingly adopting SIP trunking services as a necessity for adoption of ALL-IP services and as a flexible and economic alternative to TDM based voice trunks. SmartNodes enable secured and reliable connectivity to SIP Trunking Services; whether or not those SIP Trunks are specifically designed for Skype for Business. SmartNode eSBCs are fully certified interoperable with the suite of Microsoft UC products and offer highly cloud-scalable solutions for addressing large office, small office and changing SIP trunk capacities.



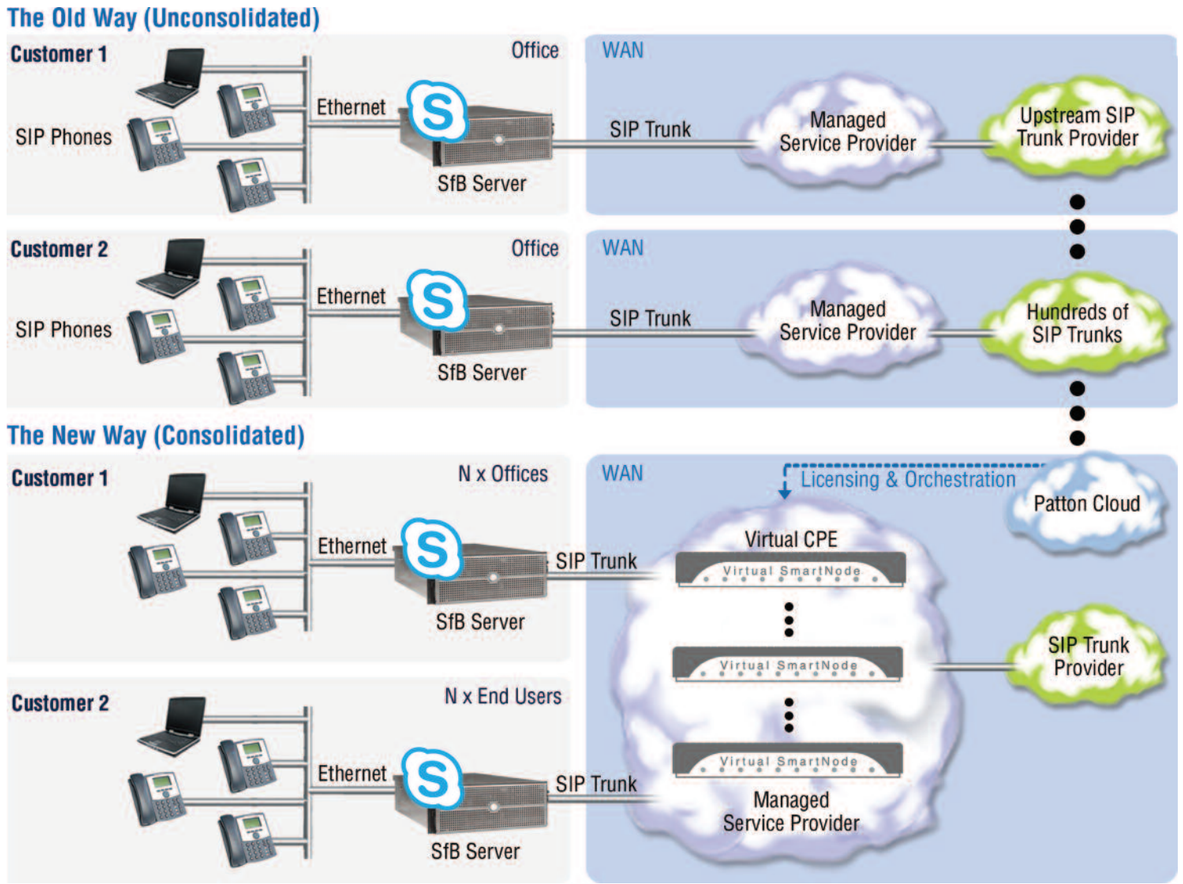
Virtualized Secure SIP Trunks

Patton's Virtual CPE provide SIP Trunk features without dedicated hardware on premise. The solution offers the same feature sets of a hardware eSBC including LAN & Telephony Security, Service Demarcation, SIP normalization, QoS, and Survivability. In addition, the vCPE can be used for protocol conversions including SIP IPv4 to IPv6, SIP UDP to TCP and SIP TLS to UDP. The installation of the vCPE, called the Virtual SmartNode, is Simple, Scalable, Flexible and highly reliable supporting high-availability via virtualized hardware.



Secure SIP Trunk Aggregation & Federation

The SmartNode vCPE can be used by Enterprises and Managed Service Organizations to consolidate or federate SIP Trunks from upstream Service Providers. In this use-case the Cloud-based virtualized CPE enables service organizations and service providers to reduce the number of SIP Trunks required by aggregating traffic. This enables SIP Trunk cost reductions and better SIP trunk utilization by deploying a centralized cost optimized solution for Secure SIP Trunking. The Patton Cloud enables further cost control and scalability by allowing SIP session licenses to "float" or be dynamically allocated according to actual need and usage.

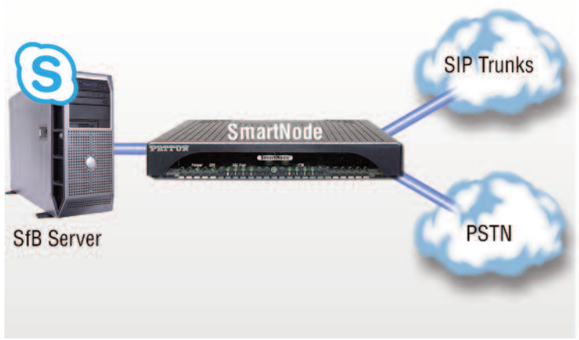


SmartNode Use-Cases for Microsoft

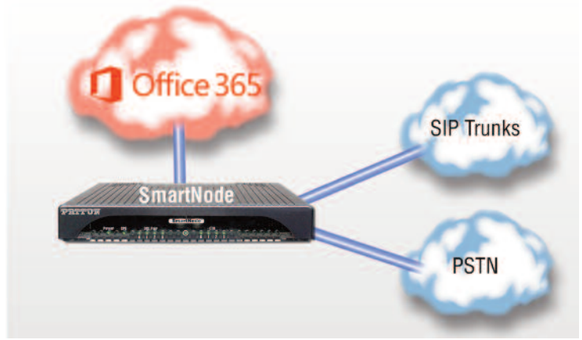
PSTN Trunk Migration, Hybrid Trunking and Survivability

Offering a wide variety of integrated TDM interfaces, SmartNodes eSBCs enable coexistence, support phased migration or survivability in a hybrid trunking environment. Leveraging Patton's Cloud Edge Orchestration Service, devices can be transformed from TDM Trunking Gateways, to SIP Trunking Gateways or SIP Trunking Gateways with TDM Survivability.

Skype for Business Server

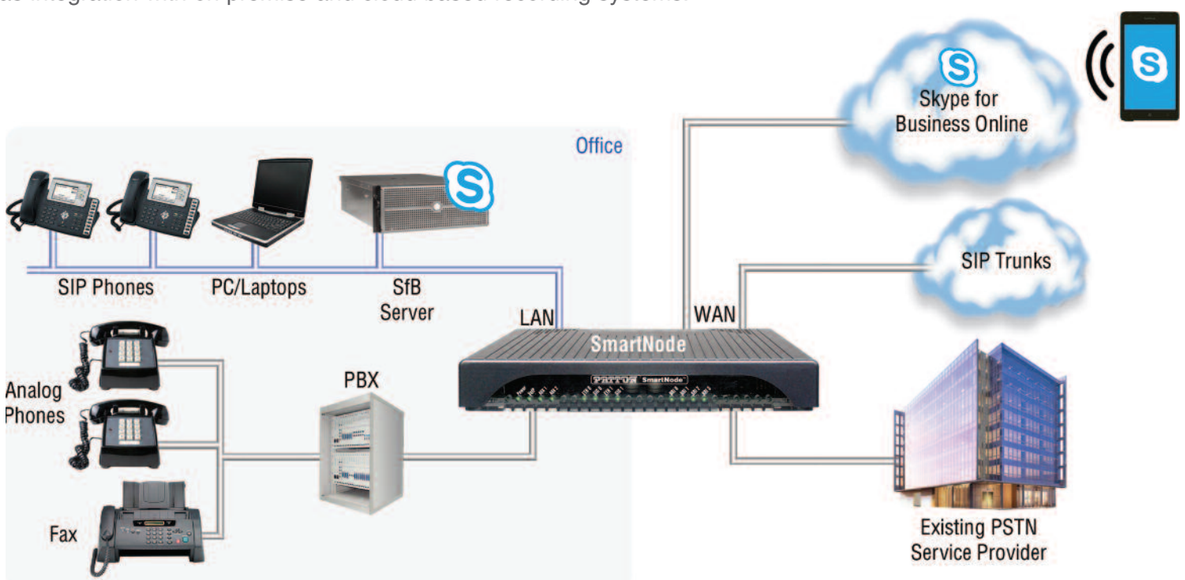


Microsoft Teams with Direct Routing



PBX Integration

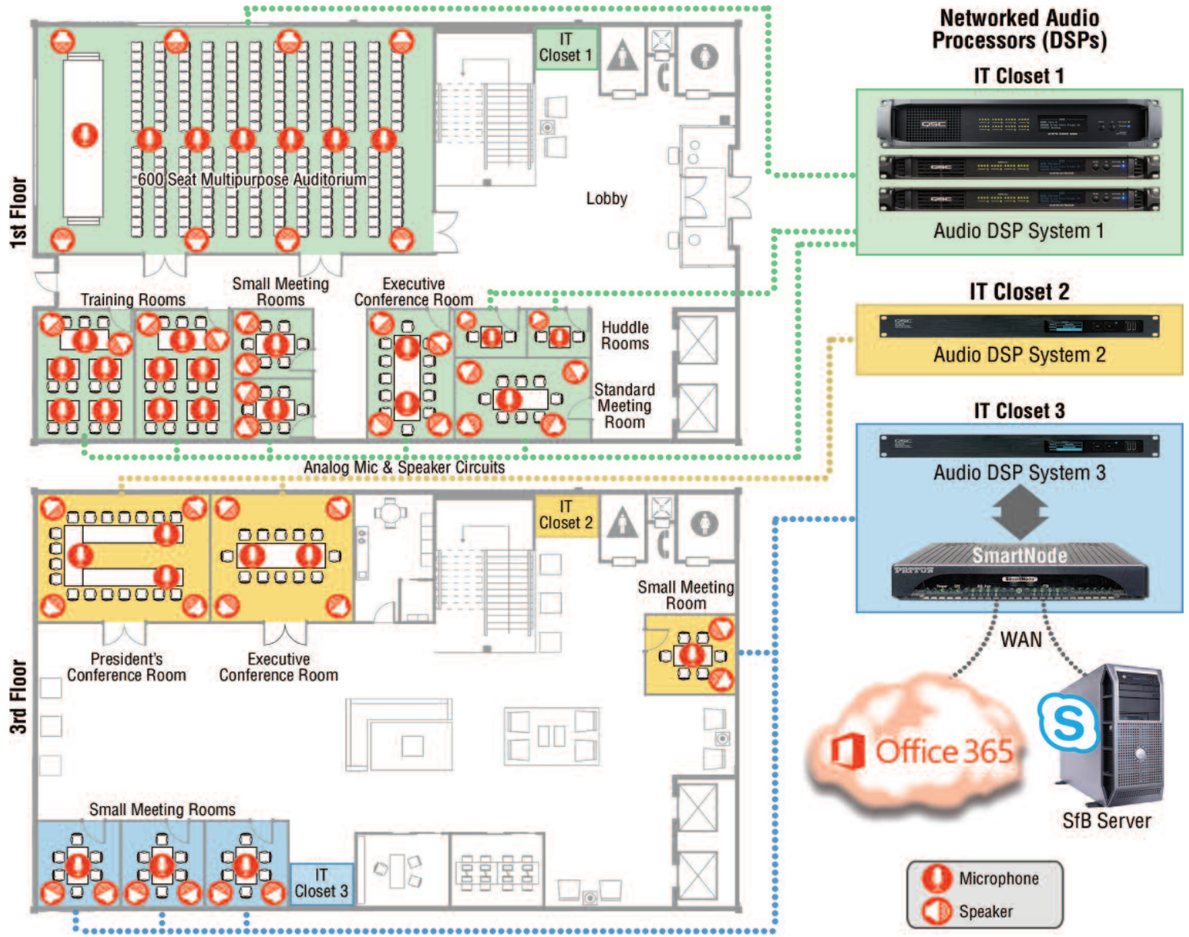
For 25+ years Patton's SmartNode has achieved near universal interoperability with almost all brands of traditional TDM, DECT, IP-PBX and Cloud PBX/UC IMS platforms. Patton offers seamless integration between business PBX systems and Skype-for-Business including migration support with advanced call routing, call forking, E911 as well as integration with on premise and cloud based recording systems.



Pro-AV Networked Audio Conference/Huddle Room Integration

Networked Audio and DSP Audio Processors are widely used by Pro-AV professionals in the build-out of Conference Rooms, Huddle Rooms, Training Facilities, Hospitality Spaces and Sporting Venues. These systems mix and aggregate multiple audio inputs then matrix and distribute them to audio outputs across the network. DSP systems offer audio gain controls, echo cancellation, noise reduction, and other audio quality functions. Manufacturers of Audio DSP solutions include QSC, Biamp, BSS, Symetrix and many more. None of the DSPs solutions on the market directly support Skype for business connectivity.

Patton's SmartNodes enable seamless integration and bi-lateral certifications to enable these Audio DSP systems to be inter-connected with Skype for Business. Not only can you use SmartNode to handle Skype for Business translation, you get to take advantage of the SmartNodes eSBC functionality, which provide critical security protection for these SIP based audio networks. Enhanced routing and security deliver features such as access control list (ACL), payload encryption, IPv4 to IPv6 translation, and more.

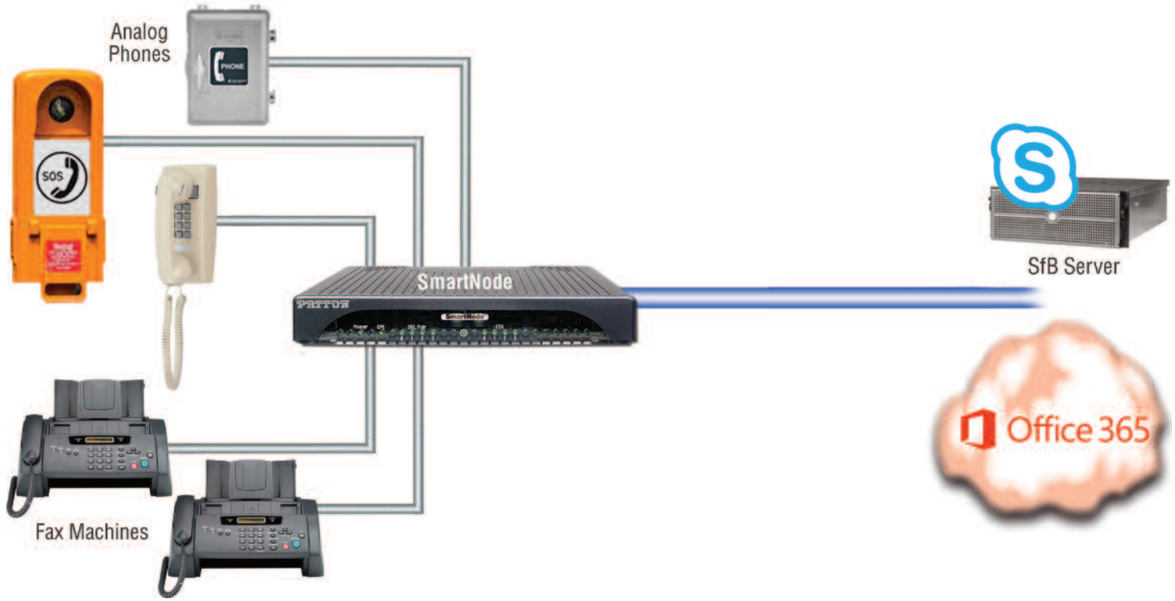


SmartNode Use-Cases for Microsoft

Legacy Telephone & Fax End-Point Integration

Analog and similar phones are often installed in service elevators, parking lots, along roadways, in tunnels and along corridors of large facilities. Customers find upgrading these to Microsoft Certified SIP end-points can be cost prohibitive.

Fax Machines are not going away and are often used to legally transmit healthcare and legal documentation. SmartNodes enable these legacy Key Systems, Phones, Fax Machines and other traditional telephony devices to connect to Microsoft UC systems. Customers who would like to keep using existing telephone or voice end-points can use a Patton SmartNode and enable those devices to appear with extensions or DIDs on a IP based communication platform.

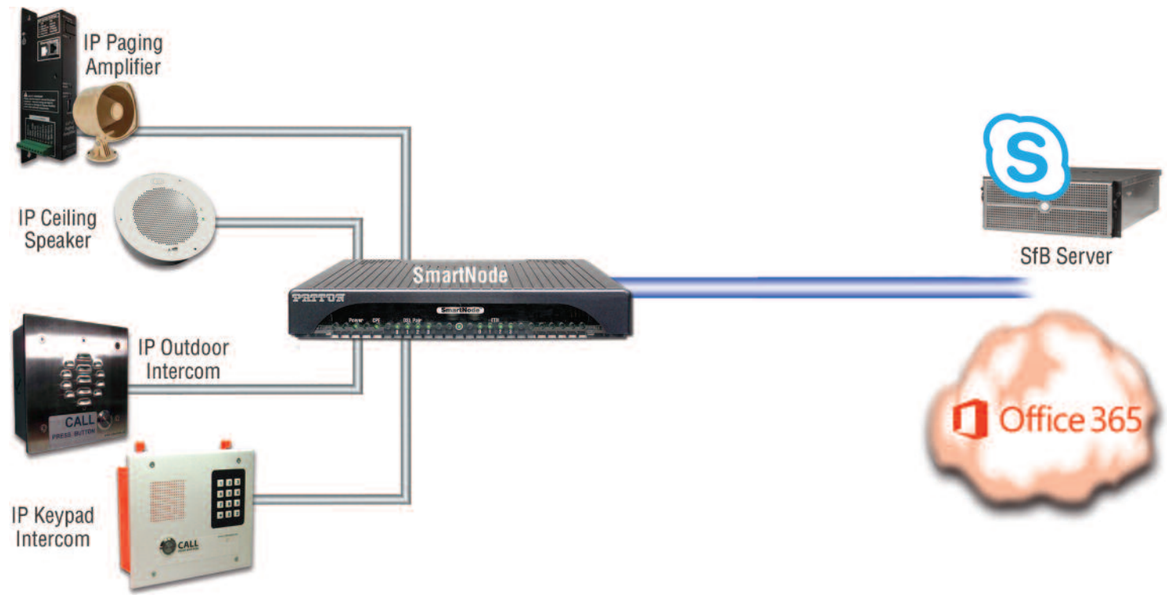


Paging & Security System Integration

Existing analog and non-certified SIP Paging and Access Control End-Points need to be made to interconnect and interoperate with Microsoft in a permissible and supportable manner. Patton SmartNode Gateways enable legacy Analog and Digital paging systems, alerting systems, intercoms, annunciators systems and access control door phones for either 1-way or 2-way communication with Microsoft.

Similarly, Patton SmartNode eSBC allows incompatible and non-certified voice equipment and telephone network elements to interoperate with Microsoft Skype for Business, Office 365 and the Teams Phone System.

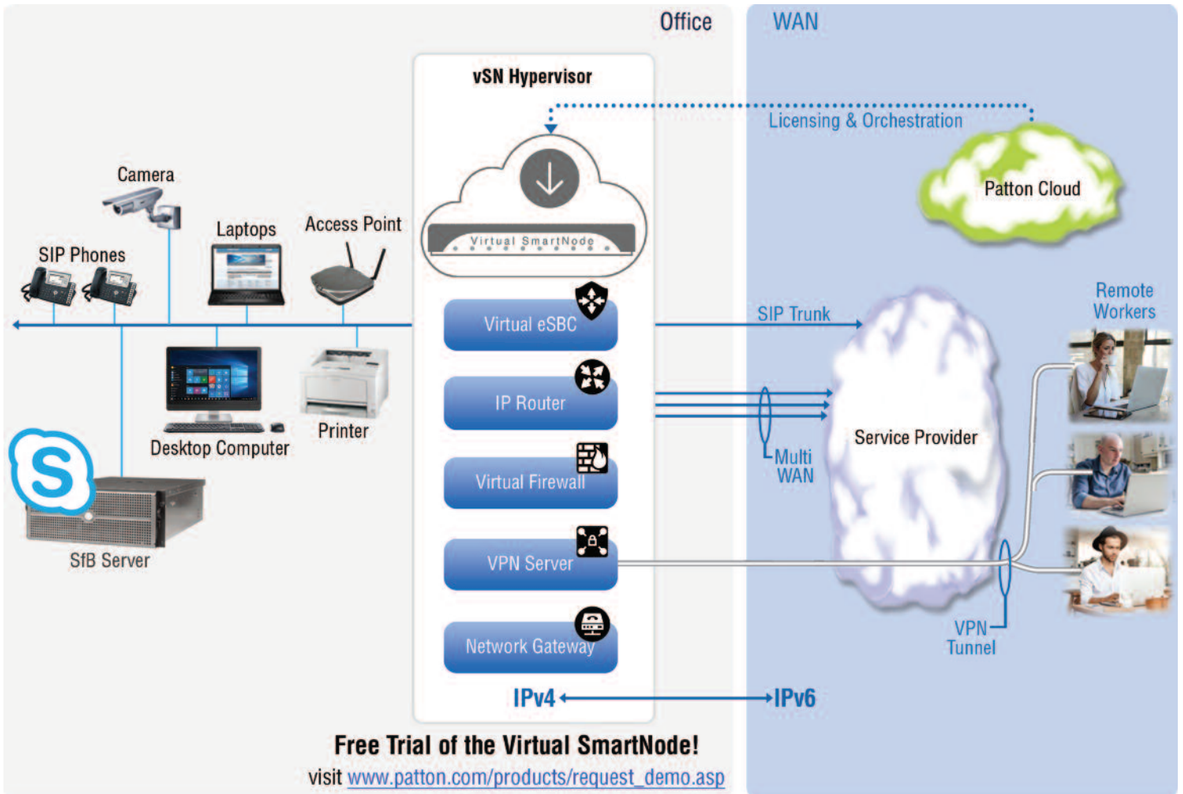
SmartNodes speak all different SIP “dialects” such as voice over TCP for Microsoft and TCP over UDP for most others. Codec transcoding with QoS traffic-shaping enhance in-house voice quality while optimizing utilization of the WAN bandwidth. Flexible call routing and dialed-number manipulation provides numbering-plan continuity and eases integration.



SmartNode Use-Cases for Microsoft

Virtualized eSBC, Access Router, VPN Server and Network Gateway

The Virtual SmartNode vCPE (vSN) provides a centrally managed (via Patton Cloud) scalable and adaptable solution for connecting enterprise locations with connectivity to Hosted Skype for Business, Office 365 and Teams. It delivers the service demarcation, SIP normalization, device Interop, QoS and Multi WAN survivability protecting against WAN outages. At the same time, the software delivers Edge Routing services including Load balancing, High Availability (HA), Network Address Translation (NAT), Network Address and Port translation (NAPT), DHCP server, Access Control List (ACL) as well as enterprise class routing (VRRP, GRE, RIP, BGP, etc.). VPN Services secure remote workers and enable remote offices to be easily integrated into cloud-based networks. The vSN performs VPN link termination & aggregation with IPsec or OpenVPN feature sets providing access to main office infrastructure. The vSN can be used to perform IPv4 to IPv6 conversion and interop. All services delivered by the vSN are managed and controlled from a single user interface provided from the Patton Cloud.



SmartNode Value Proposition

- Converged Voice and Data Security
- Secure Session Border Control
- Cyber Protection Against Attacks and VoIP-Related Threats
- Assured Quality of Service
- Any-WAN Access Network Services
- Multi-WAN (TDM & IP) Survivability
- Interoperability & Performance
- Phased Migration
- Management and Orchestration
- Trusted Partner

Converged Voice & Data Security

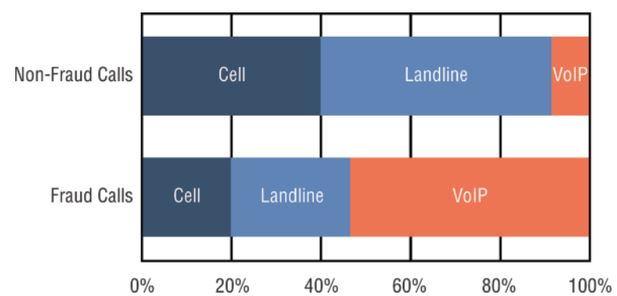
Unified Communications (UC) involves delivering voice, video and data over a single converged network. In order to deliver these converged services securely and efficiently, SmartNodes have been designed to support both industry-standard security features and propriety security feature sets, delivering both Voice and Data Security.

SmartNodes support configurable Public Key Infrastructure (PKI) and certificate authority. Transport layer security (TLS) with symmetric cryptography strengthens and provides authentication protection for UDP and TCP transport and encrypted voice. The Patton Cloud automated certificate management service enhances security regimes and makes security management easy for Enterprise and Service Providers. Secure real-time protocol (SRTP) encryption protects the digitized voice within the RTP data unit. Of course, features such as SSH, HTTPS, NAT, DMZ (port forwarding), MAC and port filtering, ACL (stateful firewall), IPsec and OpenVPN are all standard. With the industry's richest suite of security features for voice and data, SmartNodes help protect your ALL-IP communication system from intrusion, eavesdropping, tampering and/or traffic capture.

Secure Session Border Control

Why do you need an eSBC? Because a data firewall is just not Session Border Control. Firewalls are necessary for elements of a secure network deployment, but these appliances do not provide adequate protection when VoIP traffic is introduced to the network.

Perhaps the biggest problem with a firewall is that it functions by denying network access to unsolicited traffic. A VoIP call is unsolicited, so firewalls block voice traffic, breaking the IP telephony system. Admitting voice traffic into the company LAN requires disabling certain firewall mechanisms in order to create "pinholes" that give packet-based (VoIP) phone calls access to the IP network. Session Initiation Protocol (SIP) signaling and Real Time Protocol (RTP) media ports must be unblocked, leaving the enterprise network vulnerable to snooping, hacking, and toll fraud.



Employing a robust, feature-rich eSBC at the subscriber premise addresses intrusion prevention while providing TLS security and voice encryption as well as network separation/demarcation using a split domain software architecture.

SmartNode Value Proposition

Unfortunately, the ALL-IP revolution has a downside. Converged communication networks widen the attack surface for malicious players on the Internet. IP telephony opens the enterprise network to such vulnerabilities as toll fraud, denial of service (DoS) and distributed denial of service (DDoS) attacks, among others.

Denial of Service—With denial of service (DoS) and distributed denial of service (DDoS) attacks the loss of network resources is quickly apparent, yet the disruption of business operations is costly, and may take hours or days to resolve. The eSBC offers several network-layer "force fields" against such malicious events. Overload protection prevents a total breakdown of the enterprise network. To prevent DOS/DDOS attacks, the maximum packet volume threshold can be specified in the eSBC device configuration. When the threshold is exceeded, further incoming traffic is blocked until the volume returns to a normal expected level.

Fraud Prevention—Toll fraud, which is sometimes called VoIP fraud, is when a hacker is able to access your phone system and make fraudulent long distance calls from your account. Long distance per-minute charges add up fast.

A rich set of mechanisms defined within the SIP standard can be leveraged to prevent toll fraud (as well as DOS/DDOS) attacks. SIP Authentication, SIP-Trust-Remote, and SIP-Peer-Flood work together to create a "moat around the castle", so to speak, against would-be toll-fraud attackers. SIP-level call-routing attributes offer further defenses against illicit callers.

Secure Authentication (TLS) Encryption—The SBC can provide SIP-native encryption for not only the voice traffic, but for signaling (authentication) traffic as well.

- Transport Layer Security (TLS) encrypts the *signaling* (header information) of the SIP PDU. The encryption prevents invasive parties from capturing calling or called party information for malicious purposes.
- Secure Real-time Transport Protocol (SRTP) encrypts the digital media (*voice traffic*) enclosed in the RTP PDU (RFC 3550). The encryption prevents snooper and hackers from listening in on sensitive voice calls and exploiting that information. The encryption also helps prevent address spoofing.

Monitor, detect, alarm, alert, and react—When connected to the Patton Cloud (www.patton.com/cloud) the eSBC becomes super-powered. Cloud-based services include monitoring functions that can help detect security threats, generate alerts and alarms that empower technical teams to take any necessary remedial actions to prevent a security catastrophe.

Cyber Protection Against Attacks and VoIP-Related Threats

As a high-quality eSBC, SmartNode provides a rich set of security features that protect the provider WAN network and the customer LAN from each other, as well as from external security threats. Serving as a clear (physical and logical) demarcation (demarc) point, Patton's eSBC solutions provide a divided configuration architecture (a.k.a. split domain) that isolates WAN-facing parameter settings from the LAN-facing configuration. Such separation protects each side of the demarc from legal and professional liabilities, as well as tampering or human operator errors.

SIP Firewall Voice Security

The built-in SIP aware firewall ensures messages and data are transmitted safely over Transport Layer Security (TLS)-encrypted channels. SIP RFC 3261 articulates the mechanisms employed to improve SIP-session security. These standards defend SIP communications against eavesdropping or tampering with message transmission or content, helping companies connect enterprise communication systems to the outside world, while establishing real-time VoIP, SIP-protected messaging and data-exchange.

Voice Encryption

Patton's fully secure eSBC solution employs data encryption for both the signaling information and the encoded media (voice). Transport Layer Security (TLS) encrypts the signaling (header information) of the SIP PDU. The encryption prevents invasive parties from capturing calling or called party information for malicious purposes. The encryption also aids in preventing address spoofing. Secure Real-time Transport Protocol (SRTP) encrypts the digital media enclosed in the RTP PDU (RFC 3550). The encryption prevents snooper and hackers from listening in on sensitive voice calls and exploiting that information. SRTP uses two types of keys: session keys for the content and master keys like the lock on your door.

Topology Hiding

SIP-based communication from outside the enterprise must first traverse firewalls and/or routers implementing Network Address Translation (NAT). The Firewall prevents inbound communications from unknown sources. An essential component of the firewall security fabric, NAT hides private IP addresses on the LAN, inhibiting access for LAN-users by stopping them from being addressed from the outside.

Failing to encrypt the SIP signaling data can expose such information as user credentials, phone numbers, IP addresses and aspects of the company network topology to malicious intruders. To prevent such "man-in-the-middle" attacks as wire-tapping, eavesdropping, and hacking, the eSBC protects (hides) SIP signaling information—as well as media content (digitized voice)—by encryption. To ensure secure business-class VoIP, SmartNodes employ state-of-the-art encryption standards designed specifically for IP telephony: the Transport Layer Security (TLS) protocol for signaling and the Secure Real-time Transport Protocol (SRTP) for media content.

Call Admission Control (SIP and TDM)

To control which calls are admitted to the network, the Access Control List (ACL) provides security/firewall functions that span three of the OSI layers: 2) Frame, 3) Packet, and 4) Transport:

- **Layer Two: ACL MAC filtering**. One aspect of the ACL is filtering on the Media Access Control (MAC) address. Defining known and trusted Ethernet devices—hardware SIP phones, software SIP phones on PCs and laptops, skype-for-business (S4B) endpoints and other unified communications (UC) client endpoints—provides a way to block unknown (suspicious) devices from entering the enterprise LAN and wreaking havoc.
- **Layer Three: ACL IP filtering**. The access control list supports filtering by Internet Protocol (IP) addresses. Trusted (friendly) and suspicious or known malicious IP addresses are called out and either allowed or blocked accordingly.

SmartNode Value Proposition

ACL call initiation filtering. Another ACL feature that may be configured involves blocking voice traffic associated with calls that were not initiated by a SIP endpoint within the enterprise LAN or the trusted remote peer, the ITSP Domain or IP.

- **Layer Four: Transport Layer Port Blocking**. UDP or TCP ports exploited by malicious entities (notably 5060 and 5061) can be blocked. Attackers often use these ports to locate a weakly-configured IP-PBX system and brute-force SIP passwords. Once the attacker has access to the account, they may use it to make or resell unauthorized calls. The attacker may also use the access to conduct a voice phishing campaign. Port blocking can obviate such attacks.

Monitoring and Alerting (Report Unusual Behavior)

Patton eSBCs offer link-monitoring and alerting capabilities (provided by the Patton Cloud), which enable interested parties (subscriber, OTT provider, etc.) to analyze, troubleshoot, and fault-isolate quality issues (packet loss, jitter, etc.) related to the delivered connection—and hold the operator accountable for providing remedial measures.

7 Application: Encryption	SIP-Trust-Remote—Only allows SIP messages from trusted peer User Agent header check Call Routing—Reject calls with odd destinations or source ID
6 Presentation: CODECS	RTP CODEC restriction—Reject calls with odd CODECS
5 Session: SIP/B2BUA	SIP Authentication—Username/Password authentication SIP-Peer-Flood prevent—Rejection of SIP messages in case of DoS attacks
4 Transport: RTP/TCP/UDP	ACL—TCP or UDP port filtering SRTP—Encrypt network signaling (SIP header encryption) TLS—Encrypt digital media (voice encryption)
3 Network: IP	ACL—IP filtering ACL—Allow traffic only for connections set up from inside (LAN to WAN)
2 Frame: Ethernet	ACL—MAC filtering
1 Physical: Media	Device—Unused ports can be disabled

Stateful Firewall

The integrated stateful firewall ensures incoming traffic is only accepted once the connection has been initiated. Traffic may be allowed or disallowed based on the state of the transport connection. Connection Established? Gate open. Connection Terminated? Gate closed.

Assured Quality & Service

Assuring that VoIP call quality is maintained is mission-critical for the enterprise customers served by converged service and OTT offerings.

Patton SmartNodes are designed as intelligent edge and service demarcation devices to guarantee this quality, even if you don't control the Access Network. SmartNodes support a host of native QoS feature sets including TOS, DiffServ labeling, Active QoS with traffic scheduling and classification, weighted fair queuing & shaping of traffic classes with configurable burst tolerance. And when data floods the downstream link, DownStreamQoS™ can throttle incoming data to ensure time-sensitive voice traffic gets through to you promptly. SmartNodes include both DownStreamQoS and upstream QoS to deliver consistently clear voice in both directions. The Patton Cloud leverages deep packet inspection on premise to provide full visibility into network end points. Measuring, analyzing and reporting, in real time, quality impacting events such as packet loss, latency, jitter and MOS score. SmartNodes assure QoS and enable delivery of a superior quality experience.

Multi-WAN & Access (TDM & IP) Survivability

SmartNode can perform access network terminations, service termination, or both. Equipped with a wide variety of WAN access options including ADSL2+, VDSL2 vectoring, 2/4/8-wire bonded G. SHDSL, fiber SFP and 3G/4G/LTE, the SmartNode can replace various access network termination devices for access network providers and provide a platform for converged service delivery. With up to 4 WAN interfaces available, the SmartNode enables providers to deliver redundant, load balanced, wired or wireless IP broadband links for ALL-IP services.

Using our automated onboard survivability features, end-point registrations are monitored, enabling instantaneous failover to redundant TDM or Multi-WAN broadband links, without the need for dual-registration or any changes to the network, on premise, hosted service or end point device configurations. Re-direction, license services, quality monitoring and link monitoring are also available from the Patton Cloud for fully managed survivability.

Interoperability & Performance

Patton SmartNode eSBCs and Enhanced Gateways offer Interoperability feature sets for Skype for Business enabling SIP connectivity between existing enterprise voice systems, Skype for Business, the PSTN and SIP Trunking Service.

Over 25+ years Patton's SmartNode has achieved universal interoperability with almost all brands of traditional TDM, DECT, IP-PBX and Cloud PBX/UC IMS platforms. Patton offers seamless integration between business PBX systems and Skype-for-Business including migration support with advanced call routing, call forking, E911 as well as integration with on premise and cloud based recording systems.

Similarly, Patton SmartNodes enable pure Skype for Business or hybrid Skype for Business sites to connect to PSTN Trunks, SIP Trunks or both. The Patton Cloud can orchestrate transitions between trunks and trunk types and can facilitate active trunk and cloud connectivity monitors to ensure that any site can maintain services even in the event of an outage of broadband services.

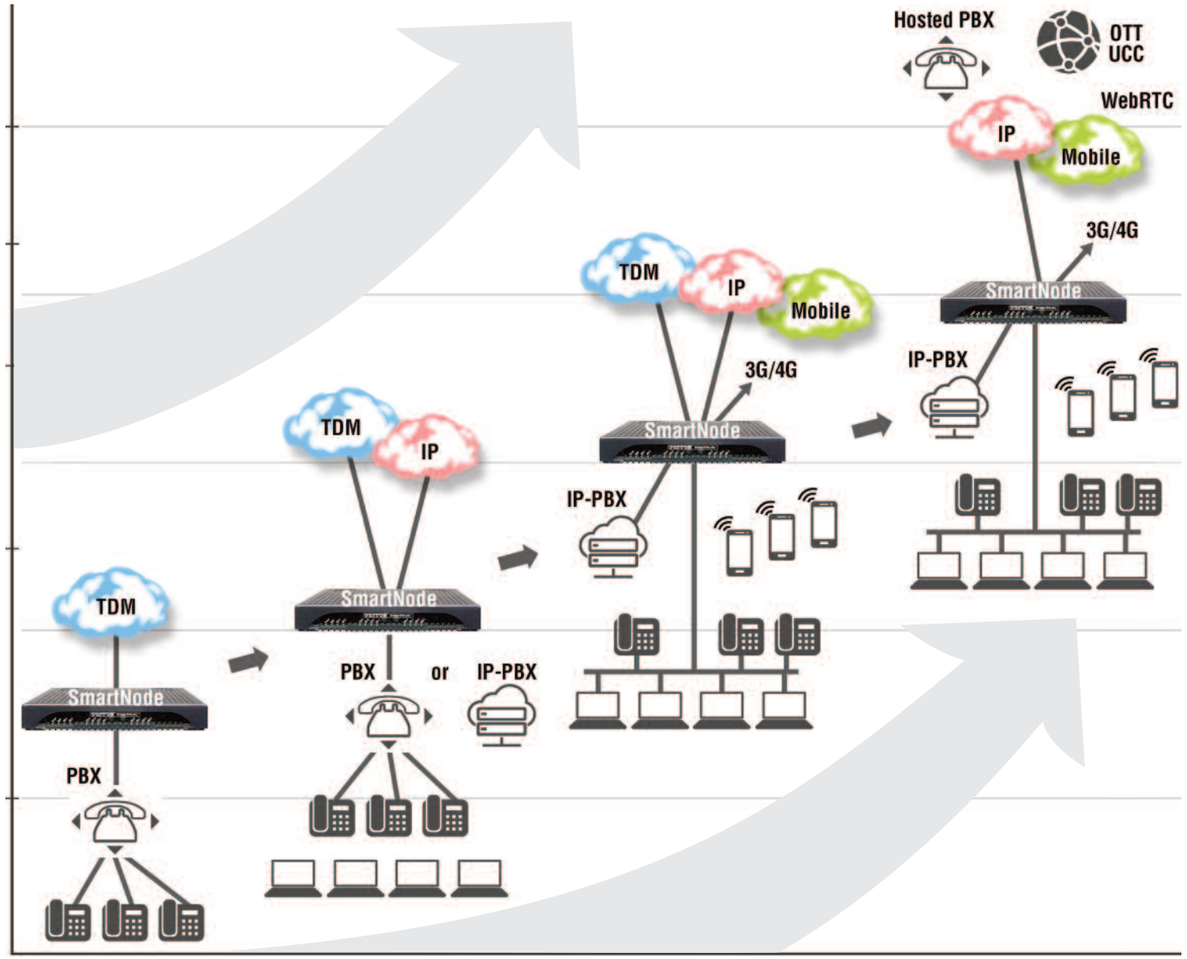
SmartNode Value Proposition

Phased Migration

The world of business communications has been evolving, migrating from TDM to IP and on-premises solution to the cloud. Mobile communications is exploding. These trends create the need for CPE devices that enable and empower this transformation. The market requires CPE that incorporate network demarcation, service termination, legacy device integration, multi-WAN, cloud-connectors, eSBC functions and virtualization (SDN/NFV), as illustrated below.

The Patton SmartNode portfolio addresses all the challenges involved in migration from TDM to All-IP—regardless of how incrementally or rapidly it is performed.

Whether you need a VoIP gateway to connect TDM-based equipment to an IP network, or a fully-managed and monitored CPE that delivers Internet-access, voice and data services and everything in between, Patton has you covered.

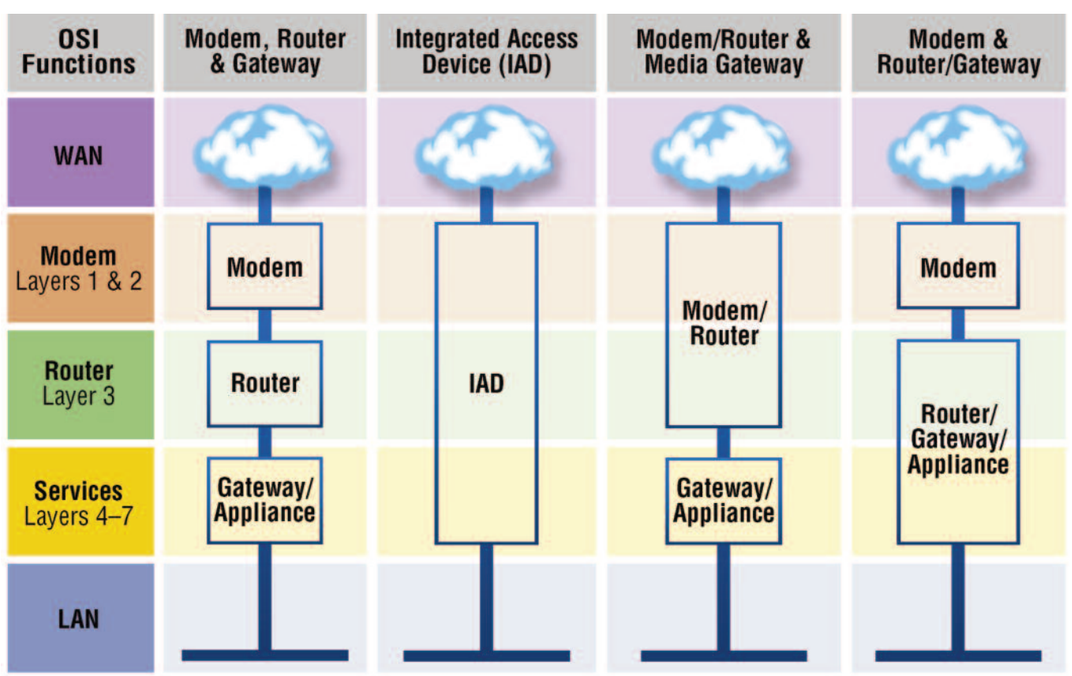


Patton's SmartNode units are available to support any level of integration or dis-integration at the customer premise. SmartNode offers cost-effective and efficient solutions for service providers that save money, reduce hardware requirements, and simplify network architecture at the customer premise. The graphic below shows a schema of the options. The "1-box solution" integrates as many functions as possible into a single device, which we call an Integrated Access Device (IAD).

As the diagram below shows, L1/2 transmission technology, L3/4 routing and security features—as well as higher layer service functions such as media gateway and signaling—are all built into the same box.

"Multi-box-solutions" divide different OSI Layer functions among separate devices. The CPE setup may easily include 4 or 5 dedicated devices for transmission, routing, firewall, bandwidth-optimization, media gateway functions and signaling. Patton's SmartNode products deliver all of these functions in a single low-cost platform. Any or all functions can be turned on or off through cloud-based licensing services.

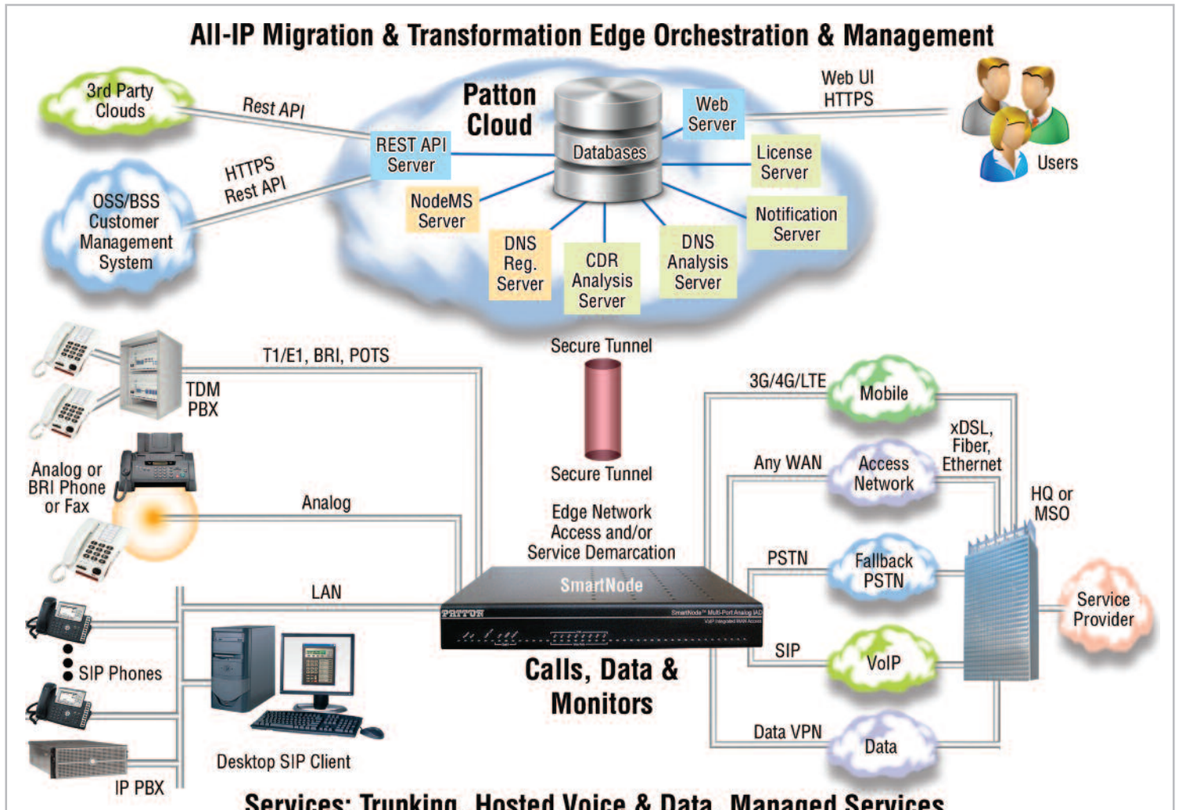
Highly-integrated CPE come with advantages and disadvantages. Same with multi-box CPE solutions. These pros and cons can vary based on both the service provider type (access, service OTT) and based on the target subscriber market (residential, SME, enterprise).



SmartNode Value Proposition

Management & Orchestration

The Patton Cloud is a new and revolutionary service to aid and accelerate migrations to converged ALL-IP networking, IoT and telephony services. The Patton Cloud Service provides a centralized interface to manage, monitor, secure, alert, troubleshoot, analyze and optimize services by leveraging a SmartNode appliance or Virtualized CPE. When a SmartNode is connected to the Patton Cloud it provides deep insights into what is happening with connectivity, networking, quality and services traversing the WAN and LAN networks. It also provides views of device status, health, call loads and much more.



The Patton Cloud provisions, configures and manages devices, services and solutions at the edge or point of service demarcation. It enables proactive management of devices, device licenses and configurations on any device from any location. Debugging tools, active monitors and event triggers allow Service Providers to secure services and provides a means to proactively alert, troubleshoot, analyze, and optimize devices and the services delivered by and traversing the SmartNode. Cloud based License services empower Service Providers to proactively extend, update and upgrade services delivered to subscribers with just a few clicks.

Visit the Patton Cloud Microsite at www.patton.com/cloud

The Patton Cloud lets you easily deliver remote, real-time support leveraging insightful diagnostics available at the Edge using a SmartNode. The Patton Cloud provides remote configuration, zero touch provisioning, monitoring, reporting, and troubleshooting, as well as mass software upgrades for efficient, cost-effective network orchestration. The Patton Cloud also allows network elements to be controlled from the cloud for license and firmware management. That means any SmartNode CPE, powered by the Patton Cloud, can be scaled, transformed or re-purposed, by switching on new security protocols, routing protocols, TDM channels, SIP Sessions or NFV/SD WAN support.

Trusted Partner

SmartNodes are time-tested products in the market for almost 30 years, by a company with almost 40 years of pedigree in data communications, networking, and telecom. The products are made in the USA, and millions of units have been deployed by service providers and large enterprise customers in 150+ countries. Thousands of Certified SmartNode engineers have been trained and are supported by Patton's technical assistance centers and offices around the world. Here at Patton, our engineering team is focused on protecting your UC network, traffic, and users.

SmartNode Features for Microsoft

Interoperability Features

Call Routing: Call routing refers to the procedure of sending voice calls to a specific queue based on predetermined criteria. A call routing system is also known as an automatic call distributor (ACD).

Call Normalization: Phone number normalization is used to translate a phone number into a standard, desired or normal form.

SIP Normalization: SIP normalization allows various SIP services and devices to interconnect by means of normalizing different SIP implementations and by translating various “dialects” of SIP signaling to enable interworking.

DTMF Method Normalization: Dual Tone Multi-frequency (DTMF) tones are signals that are sent when you press a telephone keys. Implementations of SIP use various methods for signaling digits including in-band (as a beep) or out-of-band via SIP or RTP signaling messages.

Codec Normalization or Transcoding: A codec is an algorithm used to convert voice (in the case of VoIP) signals into digital data during a VoIP call. Codecs encode/decode, compress/decompress. There are many types of voice codecs. Codec normalization or Transcoding is required when two communicating IP-based systems are using different codecs.

IPv4 to IPv6 “Dual Stack” Protocol Conversion: As the industry moved from IPv4 to IPv6, the two standards must co-exist. Patton’s SmartNode is a full “dual stack” router that can be configured with both IPv4 and IPv6 connectivity capabilities including DHCPv4 & v6. For example, SmartNodes can connect using IPv6 to network operators, while connecting to IPv4 on the enterprise LAN.

Direct Routing. Direct Routing allows customers to choose their telecom provider and enables users to make and receive calls in Teams. With Direct Routing, you can connect the SmartNode eSBC or Virtual eSBC to any telephony trunk or interconnect including SIP Trunks or PSTN Trunks.

Performance Enhancing Features

QoS and QoS Management: QoS (Quality of Service) is a major issue in VOIP implementations because real-time packet traffic for voice or other media is sensitive to any delay in packet delivery. Voice traffic needs to be prioritized and things like latency, jitter and packet loss need to be measured and controlled. SmartNodes use a variety of methods and protocols to ensure Voice quality, while the Patton Cloud delivers call quality metrics and analytics to identify network issues affecting call quality.

Voice Prioritization: Prioritizes VoIP traffic by slowing less important data packets down. Patton SmartNodes can shape traffic by queuing packets, delaying low priority packets while giving preference to priority packets. Most routers can perform this “upstream” QoS prioritization function. Patton also offers proprietary DownStreamQoS™, which dynamically creates a virtual bottleneck against the incoming packet stream, throttle non-VoIP traffic by exercising the flow-control mechanisms of the routers in 3rd party networks.

COS/TOS tagging: Class of Service (CoS) is a way of managing traffic in a network by grouping similar types of traffic (for example, e-mail, streaming video, voice, large document file transfer) together and treating each type as a class with its own level of service priority. Type of Service (ToS) is a byte in the IPv4 header which is used for Precedence, or in other words categorizing traffic classes and is one of the tools available for QoS implementation.

Performance Enhancing Features (cont.)

Media bypass (enabled or disabled). Media bypass is a feature that allows calls to flow from the end users’ Skype for Business client to SIP Gateway, IP-PBX or other Telephony Services. The ability for Enterprise Voice calls to travel from one destination to another without the media traffic traversing the Lync Mediation Server increases the chances for a better audio experience.

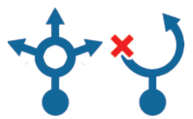
Caller ID Restriction: Caller ID blocking is the common term for a service where a caller can prevent the display of the calling number on the recipient's telephone. If you disable caller id on your Skype for Business phone or softphone, Patton SmartNode will be able to handle the call properly, and to pass your call without your number identification.

Call Park and Retrieve: Call Park is a feature that allows a person to put a call on hold at one telephone set and continue the conversation from any other telephone set. The feature is activated by pressing telephone button or sequence of buttons. This puts the caller on hold in a way that the call can later be retrieved or transferred to another phone or extension.

Simultaneous Ringing: This feature enables calls to ring on several different phones at once. Simultaneous ring is a variation on call forwarding that enables a system to be configured so that soft phones, desk phones, and mobile phones associated with an individual or team can all be ringing at the same time.

Call Forking: This feature enables an incoming call to be “forked” to multiple destinations, whether the destination is a single user or different users. Call forking is supported because the SmartNode can register multiple SIP clients and user phone contacts (mobile and fixed-line extensions) under the same Skype for Business Address of Record (AOR).

Conference (ad-hoc and Dial-in): Ad-hoc conferences allow a conference organizer to add participants to the conference. Dial-In Conference call is a conferencing service that allows multiple participants to be connected together over a conference bridge. Patton SmartNodes facilitate the setup of either Ad-hoc or Dial-In conferencing between Skype for Business and other calling platforms.



DNS Load Balancing and Failover: Load balancing refers to distribution of traffic across multiple servers. DNS in your network can be setup in such a way that you use the same FQDN for multiple IPs (different servers) and, according to their availability/priority, FQDN can be translated by DNS to certain IPs.

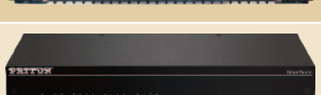
TCP/TLS and SRTP: TLS provides communication security over insecure networks such as the Internet. TLS allows transport connections such as TCP to be safe from eavesdropping and tampering. For this purpose, TLS uses a Public Key Infrastructure (PKI) for authentication and confidentiality of the key exchange. Payload confidentiality is ensured with symmetric encryption using the exchanged keys. Message authentication and integrity is achieved by adding authentication codes to each message.

SmartNode Products for Microsoft

All-IP eSBCs

	Model	Certification Category	Patton Cloud Connected	SIP Sessions	Transcoded Calls	IP Router	Number of Ethernet Ports	WAN Access	Survivability	More Information
	vSN	eSBC	✓	Thousands	N/A	Layer 3, Firewall, QoS, VPN, DHCP, etc.	HW dependent	Ethernet	Multi-WAN • 3G/4G Back-Up	patton.com/session-border-controller/vsn/
	SN5300		✓	4 to 60	N/A		4 x 10/100	Ethernet • G.SHDSL-EFM/ATM		patton.com/session-border-controller/sn5300
	SN5500		✓	4 to 200	Up to 16		2 x 10/100/1000	Gigabit Ethernet • G.SHDSL-EFM/ATM • ADSL/VDSL • Fiber SFP		patton.com/session-border-controller/sn5500
	SN5600		✓	4 to 1,000	N/A		2 x 10/100/1000	Ethernet		patton.com/session-border-controller/sn5600

Analog Gateways Hybrid eSBCs

	Model	Certification Category	Patton Cloud Connected	Telephony Interfaces	Number of Telephony Ports	Call Capacity	VoIP Gateway (TDM to SIP)	USB Support (WiFi, Cellular Modem etc.)	IP Router (Routing, QoS, VPN, etc.)	Number of Ethernet Ports	WAN Access	Survivability	More Information
	SN200	Enhanced Gateway	✓	FXS (or 1 FXS+1FXO)	1, 2 or 4	Up to 4	✓	N/A	N/A	1 x 10/100	N/A	PSTN Failover	patton.com/voip-gateway/sn200
	SN4140		✓	FXS & FXO	2, 4 or 8	Up to 8	✓	✓	Optional	1 or 2 x 10/100/1000	N/A	Multi-WAN • 3G/4G Back-Up • PSTN Failover	patton.com/voip-gateway/sn4140
	SN5540	Enhanced Gateway and eSBC	✓		2, 4, 6 or 8		✓	✓	✓	2 x 10/100/1000	Fiber SFP • G.SHDSL-EFM/ATM • ADSL/VDSL • ADSL/ADSL2+ • Gigabit Ethernet		patton.com/session-border-controller/sn5540
	SN5550		✓	FXS/FXO and BRI S0/T0	2, 4, 6, 8 or 12	Up to 12	✓	✓	✓				patton.com/session-border-controller/sn5550
	SN4741	Enhanced Gateway	✓	FXS or FXO	12, 16, 24 or 32	Up to 32	✓	✓	N/A	1 or 2 x 10/100/1000	N/A		patton.com/voip-gateway/sn4741

SmartNode Products for Microsoft

T1/E1 Gateways and Hybrid eSBCs

	Model	Certification Category	Patton Cloud Connected	Telephony Interfaces	Number of Telephony Ports	Call Capacity	VoIP Gateway (TDM to SIP)	USB Support (WiFi, Cellular Modem etc.)	IP Router (Routing, QoS, VPN, etc.)	Number of Ethernet Ports	Transcoding (Interconnect multiple VoIP networks)	WAN Access	Survivability	More Information
	SN4170	Enhanced Gateway	✓	T1/E1/PRI	1 or 2	15 to 30	✓	✓	Optional	1 or 2 x 10/100/1000	✓	N/A	Multi-WAN • 3G/4G Back-Up • PSTN Failover	patton.com/voip-gateway/sn4170/
	SN4970		✓		1 or 4	15, 24, 30, 48, 60, 96, or 120	✓	N/A		1 x 10/100/1000	✓	N/A	Multi-WAN and PSTN Failover	patton.com/voip-gateway/sn4970
	SN5570	Enhanced Gateway and eSBC	✓		1 or 2	15 to 30	✓	✓	✓	2 x 10/100/1000	✓	Fiber SFP • G.SHDSL-EFM/ATM • ADSL/VDSL • Gigabit Ethernet	Multi-WAN • 3G/4G Back-Up • PSTN Failover	patton.com/session-border-controller/sn5570
	SN4980	Enhanced Gateway	✓		1 or 4	15, 24, 30, 48, 60, 96, or 120	✓	N/A	✓		Optional	N/A	Multi-WAN and PSTN Failover	patton.com/voip-router/sn4980
	SN4990		✓			15, 24, 30, 48, 60, 96, or 120	✓	N/A	✓			G.SHDSL-EFM/ATM • Serial X.21 • Fiber • ADSL		patton.com/voip-iad/sn4990

ISDN BRI Gateways and Hybrid eSBCs

	Model	Certification Category	Patton Cloud Connected	Telephony Interfaces	Number of Telephony Ports	Call Capacity	VoIP Gateway (TDM to SIP)	USB Support (WiFi, Cellular Modem etc.)	IP Router (Routing, QoS, VPN, etc.)	Number of Ethernet Ports	WAN Access	Survivability	More Information
	SN4130	Enhanced Gateway	✓	BRI	2, 4 or 8	4, 8 or 16	✓	✓	Optional	1 or 2 x 10/100	N/A	Multi-WAN • 3G/4G Back-Up • PSTN Failover	patton.com/voip-gateway/sn4130/
	SN4150		✓	BRI with FXS/FXO	4 or 8	4 or 8	✓	✓		1 or 2 x 10/100/1000	N/A		patton.com/voip-gateway/sn4150
	SN5530	Enhanced Gateway and eSBC	✓	2, 4 or 8 BRI	4 to 12	Up to 8	✓	✓	✓	2 x 10/100/1000	Fiber SFP • G.SHDSL-EFM/ATM • ADSL/VDSL • Gigabit Ethernet		patton.com/session-border-controller/sn5530
	SN5550		✓	BRI with FXS/FXO		Up to 4	✓	N/A	✓	2 x 10/100/1000	N/A		patton.com/session-border-controller/sn5550

www.patton.com

Patton Electronics Co.
7622 Rickenbacker Drive
Gaithersburg, Maryland 20879
USA
Phone **+1 301 975 1000**
Fax **+1 301 869 9293**
E-mail **sales@patton.com**

Patton-Inalp Networks AG
Meriedweg 7
CH-3172 Niederwangen
Switzerland
Phone **+41 (31) 985 25 25**
Fax **+41 (31) 985 25 26**
E-mail **we@patton.com**

Patton Hungary Zrt
Gábor Dénes utca 4.
Infopark Building C, Budapest H-1117
Hungary
Phone **+36 1 439 4840**
Fax **+36 1 439 4844**
E-mail **ce@patton.com**

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