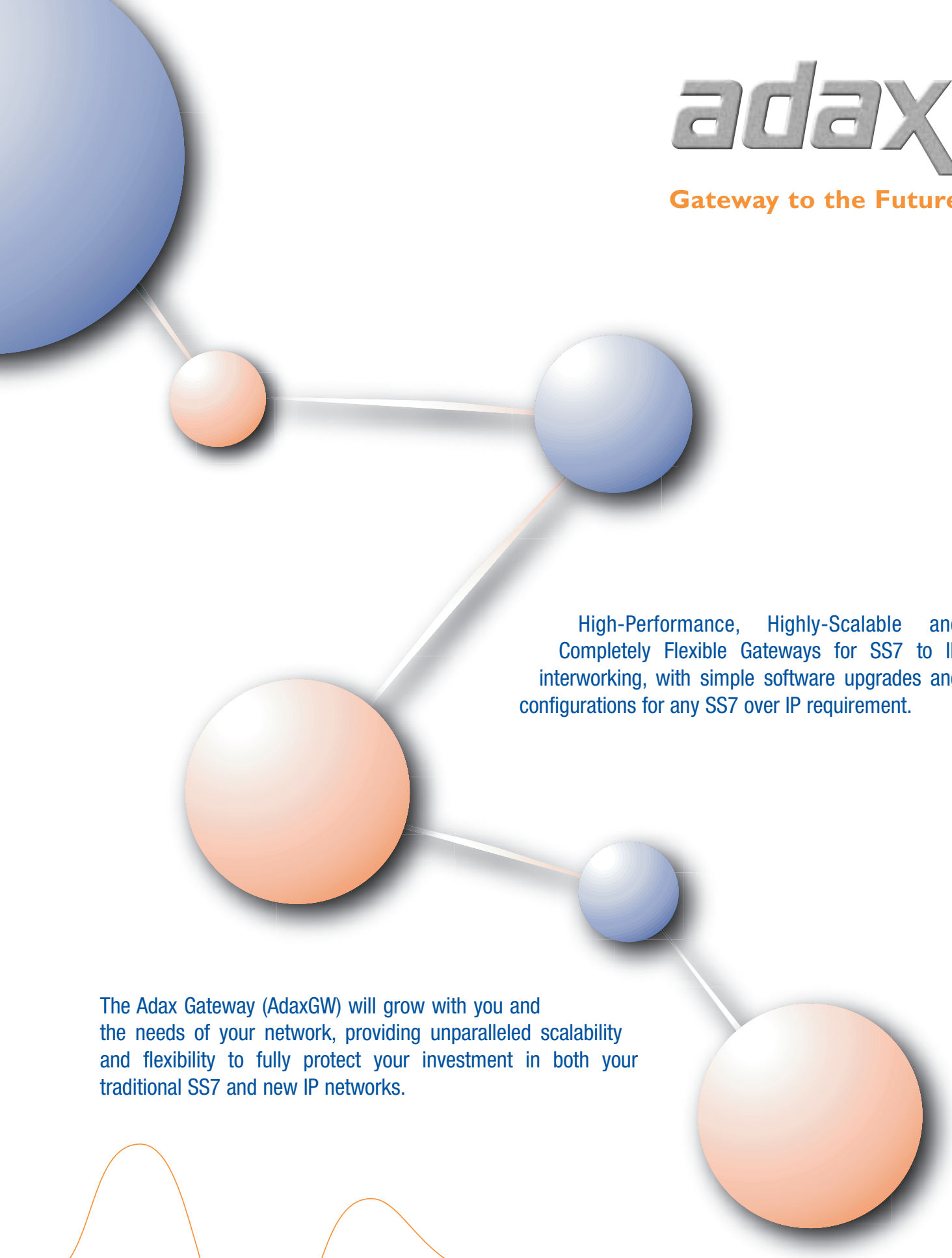
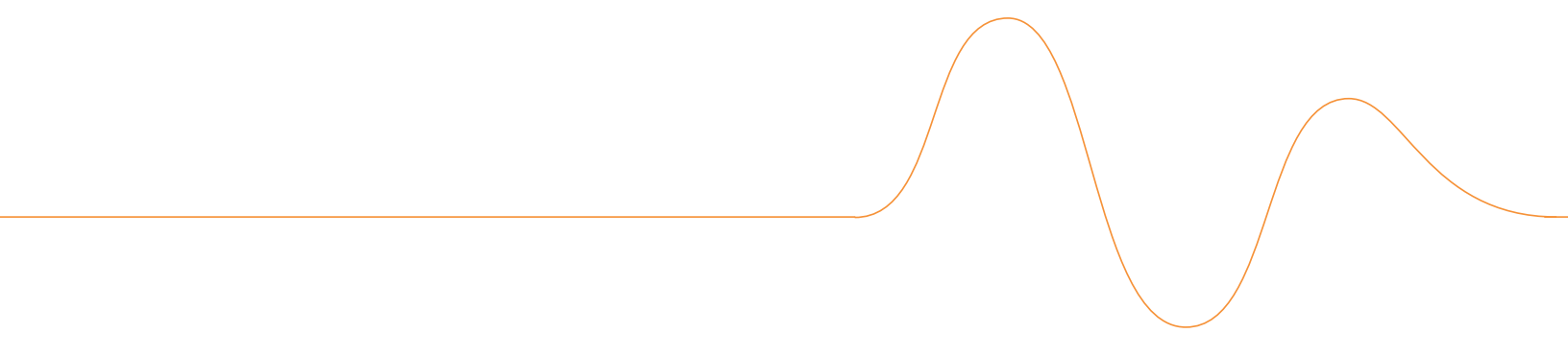
adax

Gateway to the Future



High-Performance, Highly-Scalable and Completely Flexible Gateways for SS7 to IP interworking, with simple software upgrades and configurations for any SS7 over IP requirement.

The Adax Gateway (AdaxGW) will grow with you and the needs of your network, providing unparalleled scalability and flexibility to fully protect your investment in both your traditional SS7 and new IP networks.



# Introduction

Telecom networks are embarking on the most significant and comprehensive design change in their 100-year history. IP-based services for voice, video, data, images, and multimedia are being implemented in every aspect of the telecommunications world. This change is sweeping the entire industry: from wireless to fixed-line, from switches to applications, from management to billing, creating a truly exciting and challenging time for telecommunications companies worldwide.

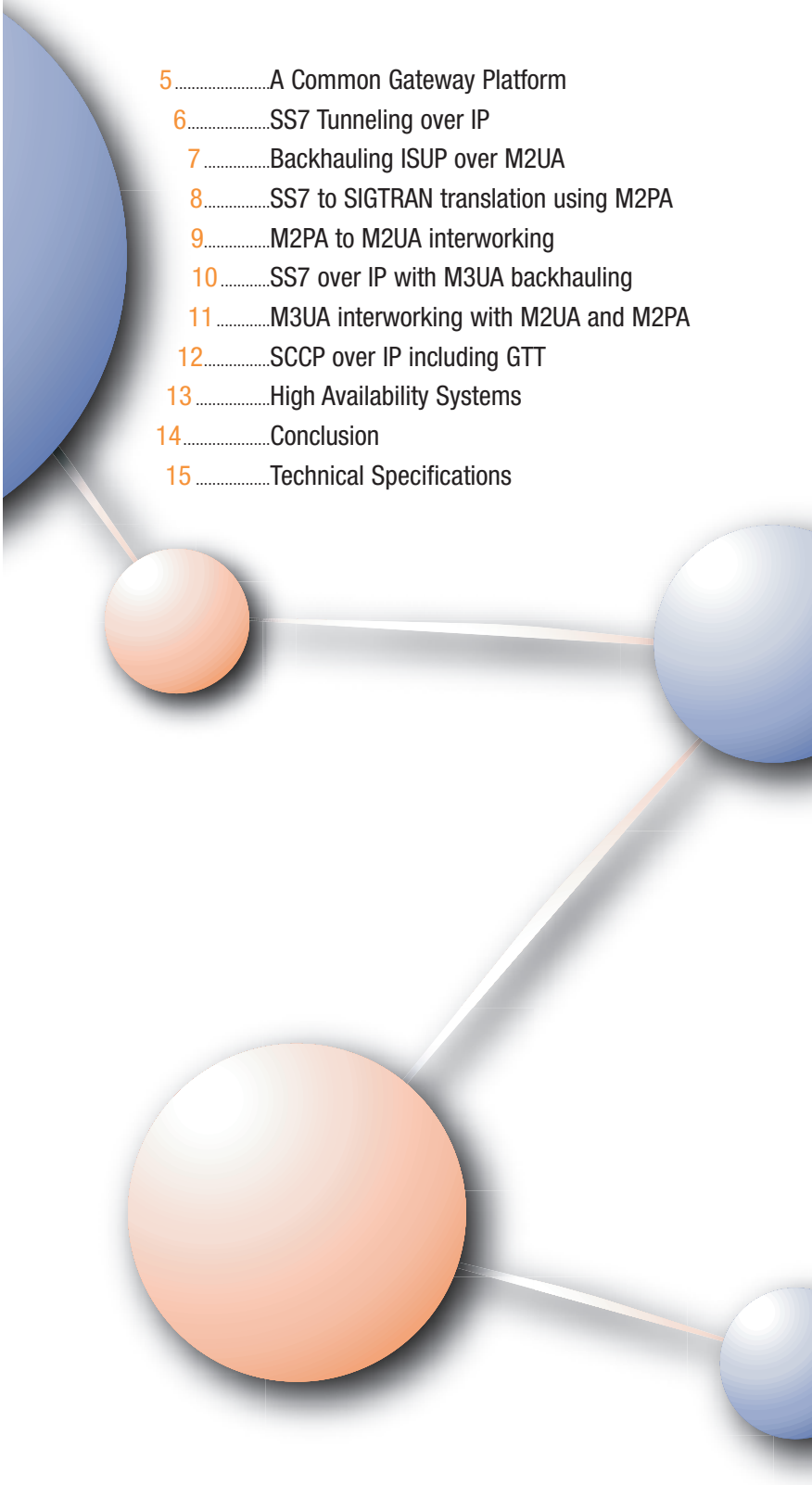
For its part, Adax focuses on the signaling aspects of this new technology. Industry experts respect SS7 and the Intelligent Network as the gold standard for performance and reliability in the signaling network. The IETF's SIGTRAN protocols represent the adaptation of SS7 functionality into the IP world. However, to be successful, SIGTRAN must be as reliable, dependable, and responsive as traditional SS7. Consequently, Telecom Equipment Manufacturers (TEMs) and Service Providers must look to proven SS7 suppliers to bring quality, reliability and performance to SIGTRAN implementations.

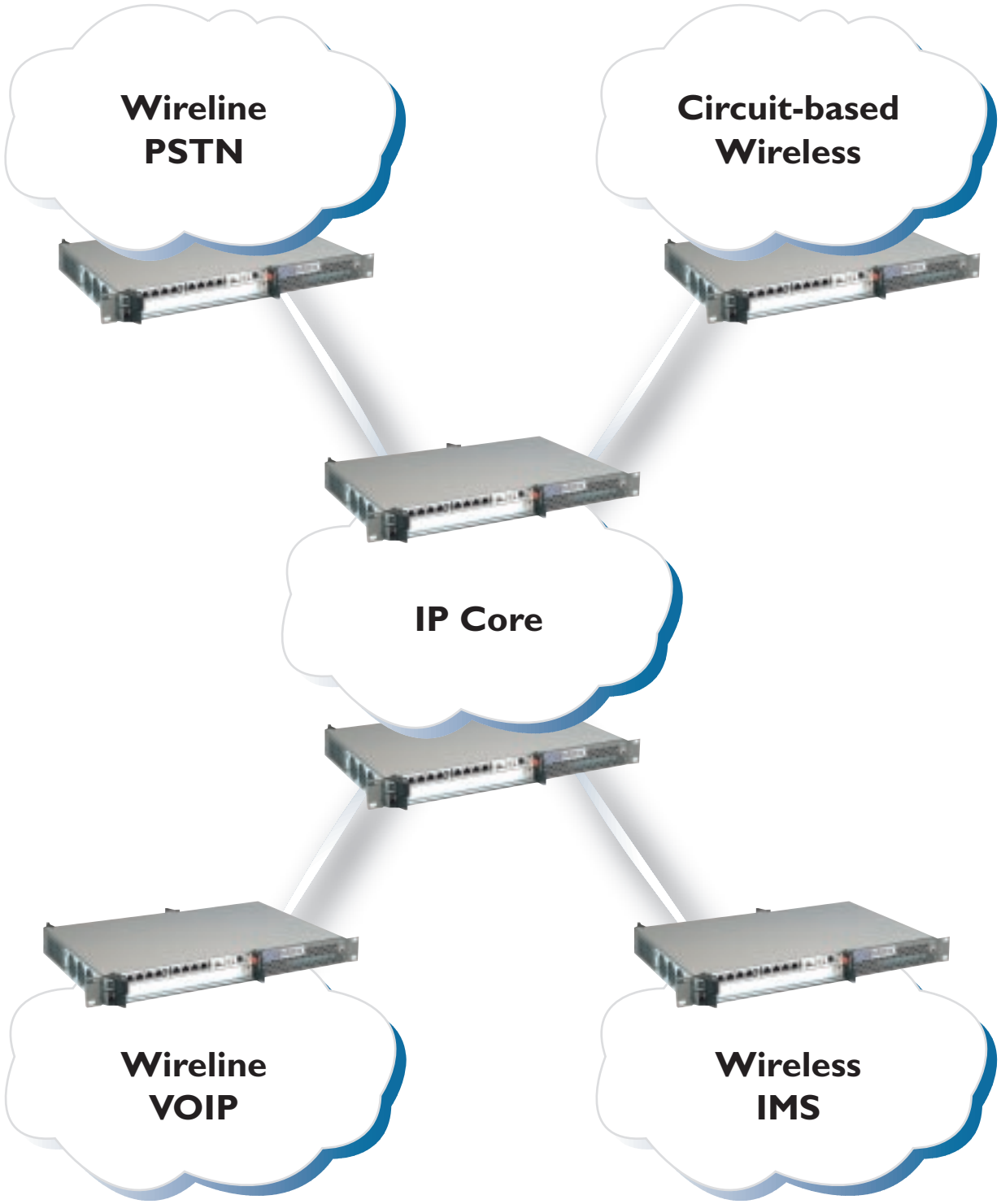
Over the last 20 years, Adax has built a reputation for its high performance SS7 and ATM signaling solutions, providing superior products and services to hundreds of premier telecommunications companies across the globe. We are signaling specialists who understand our market and our customers' requirements. We have applied this valuable experience in both narrowband and broadband signaling technologies to develop a superior set of SIGTRAN products and solutions. These products enable us to offer our high-performance, scalable and completely flexible signaling gateways for SS7 to IP interworking.

Therefore, our customers do not have to choose between reliability and performance. The Adax Gateways (AdaxGW) enable the safe migration to complete IP telecom networks that perform to their fullest potential. When deploying AdaxGW solutions, our customers use the interface, bandwidth and protocol of their choice, and always benefit from reliable, high performance solutions. Adax is the partner you can rely on to meet the challenges ahead.

# Contents






Wireline
PSTN
Circuit-based
Wireless
IP Core
Wireline
VOIP
Wireless
IMS

# A Common Gateway Platform

The AdaxGW is a single software image that can be configured and re-configured to meet any signaling requirement. The AdaxGW is available on 1U, 2U, or 4U systems, with support for up to 256 SS7 LSLs, 64 ATM or Annex A SS7 HSLs, and 12 Ethernet connections per High Availability (HA) node.

The AdaxGWs integrate our core high-performance communications controllers and software modules for SS7 and SS7 over IP. From this single common platform, the gateways provide a software configurable solution for any SS7 over IP requirement that can grow and change with the needs of the network. The AdaxGW product set includes gateways for SS7/IP switching, routing, tunneling and back-haul, enabling a simple and straightforward migration of existing SS7 Nodes to IP transport, and saving the costs associated with leasing or provisioning dedicated long haul SS7 circuits. All AdaxGWs feature carrier grade reliability, NEBS compliance, redundancy via SCTP multi-homing and MTP3 changeover and High Availability options. The gateways also include SSH and SNMP for built in security and easy management and provisioning.

The AdaxGWs utilise SIGTRAN protocols including M2PA, M2UA, M3UA and SUA to perform the SS7/IP translation function in different ways. The most appropriate gateway configuration will depend on how the customer wants the SS7 network to operate. Changing network configurations is not a problem. Via simple software upgrades and configurations, the AdaxGWs can meet the needs of your network, providing unparalleled flexibility and protecting your investment.

The AdaxGW is offered in dozens of configuration options. Please use the reference configurations in this brochure and their associated applications as a guide to how the gateway can make your implementation of Next Generation IP Signaling successful. For further information and assistance in configuring the AdaxGW for your needs, please contact your nearest Adax office as detailed on the back cover.

*Fig 1. 1U High Availability System*

*Fig 2. 4U Distributed System for High Availability*

*Fig 3. 1U Simplex System*

# Tunneling Gateway (TG) Configuration

## *SS7 Link Replacement*

In fixed line networks, Service Providers have long been forced to accept both recurring costs and the delays associated with activating long-haul SS7 digital circuits. SS7 links for SCP to MSCs, SSPs, SEPs etc. can cost local carriers approximately $1000 per month to rent from ex-national carriers – sometimes more. Configured as a Tunneling Gateway (TG), the AdaxGWs minimize disruption to the existing SS7 infrastructure, by simply replacing expensive leased lines between SS7 nodes with IP. By tunneling the SS7 traffic through the IP network without converting the SS7 to SIGTRAN, the TG avoids the complexity of typical Next Generation solutions while still delivering the benefits of future telecom technology today.

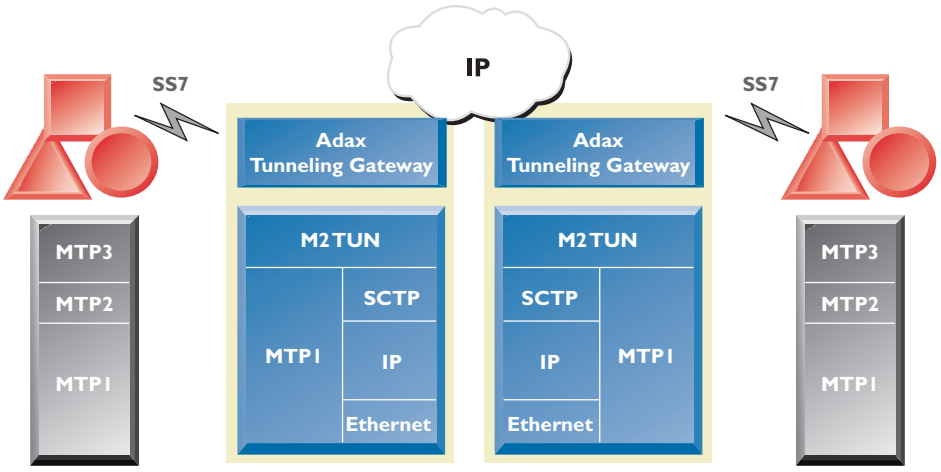



*Fig 4. SS7 Tunneling Over IP Protocol Stack*

The TG configuration offers a quick and economic solution for connecting legacy SS7 network elements together across IP networks, producing very significant savings in network transmission costs for SS7 signaling systems while preserving SS7 at the end points. The TG offers an appealing migration strategy for operators, allowing them to take advantage of packet transport while phasing in native IP signaling connectivity and preserving the same level of services, quality and reliability as a traditional PSTN.


*Fig 5. SS7 Tunneling with the TG configuration*

# M2UA Signaling Extender (SX) Configuration

## *Simple SS7 Migration to IP*

The Signaling Extender (SX) configuration provides an SS7 signaling extension capability by back-hauling ISUP over M2UA (MTP2 User Adaptation Layer). The SX routes SS7 traffic over an IP network to an IP-enabled device, or routes IP traffic over an IP network to an SS7 device. M2UA back-hauls provide transparent connectivity between traditional, circuit-switched SS7 signaling points and next generation, IP-enabled signaling elements. By leveraging MTP2 to M2UA interworking, the SX provides this functionality with no additional point codes and requires no modifications to the MTP3 addresses or routes on either side. The SX provides a method of communication for an MTP3 layer on an SS7 device to reach Media Gateway Controllers, as well as databases and other applications with peer MTP3 layers that run on IP-enabled devices.

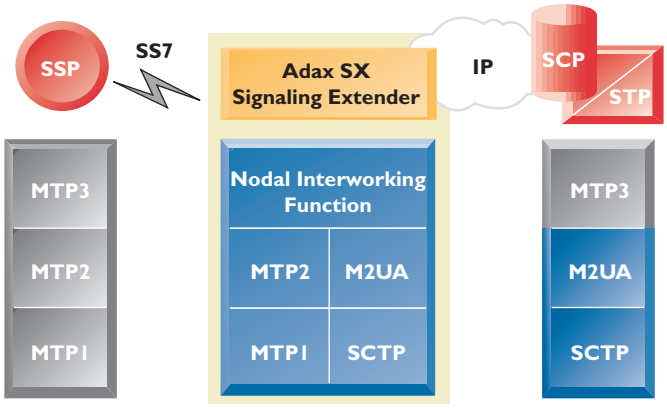



*Fig 6. Protocol Stack for M2UA Backhaul*

The SX utilizes M2UA to backhaul SS7 traffic over IP. M2UA provides an interface between MTP3 and SCTP that enables MTP3 applications to transparently operate over an underlying transport service of SCTP and IP instead of MTP2. This interface provides transparent connectivity between traditional circuit switched SS7 signaling points and next generation, IP-enabled signaling elements, such as a SoftSwitch or Media Gateway Controller.

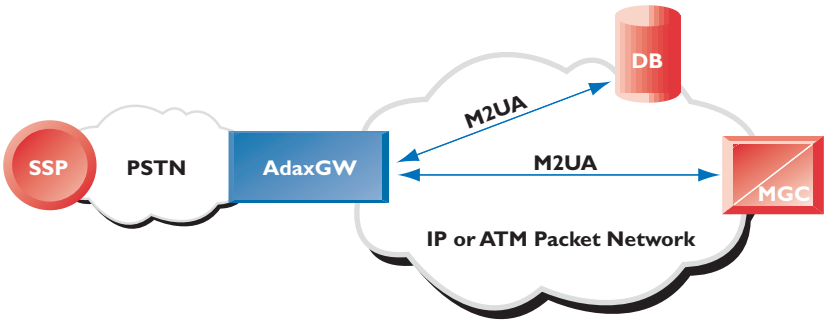



*Fig 7. M2UA Backhaul with the SX configuration*

# M2PA Signaling Router (SR) Configuration

## *Link concentration and enhanced MTP3 network reliability*

However, to some, SS7 tunneling and back-hauling is just an interim solution and the preferred longer term option is to convert the SS7 into one of the SIGTRAN adaptation layers and IP-enable the STP. With a straightforward software upgrade, the AdaxGW can be configured as a Signaling Router (SR) for simple and cost-effective SS7 to SIGTRAN translation using M2PA. The SR can reduce costs by bridging large numbers of T1/E1 circuits onto lower cost IP networks while maintaining service reliability. If the STP is IP-enabled, the SR would be used at the network edge to convert the SS7 to IP. If the STP is not IP-enabled, this conversion can be achieved quickly by placing an AdaxGW in front of the STP. As the AdaxGWs support M2PA, M2UA and M3UA, the STP can then communicate with the full range of IP-enabled devices with enhanced network reliability and robustness.

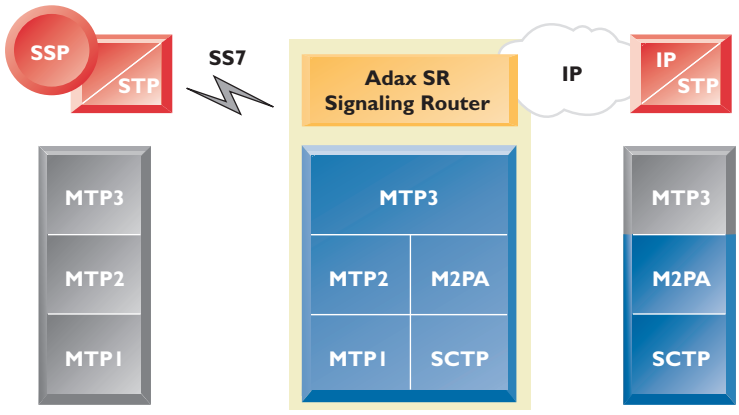



*Fig 8. M2PA to SS7 Interworking Protocol Stacks*

The SR configuration is a multi-protocol solution that performs interworking between full MTP3/MTP2 and M2PA. It terminates SS7 traffic and delivers it directly to either IP-enabled STPs or SS7 devices via another signaling gateway. The SR is designed for companies that need to eliminate costly T1/E1 lines, combine legacy systems with IP-enabled devices and/or need MTP3 routing capabilities. The SR provides complete connectivity for SS7/IP conversion as it incorporates full MTP3 on the SS7 side, and interworking between the MTP3 and M2PA on the IP side. The SR can be used at the network edge to convert SS7 to IP for connecting to IP-enabled STPs, or the SR can sit in front of an STP to IP-enable it.

M2PA (MTP2 Peer-to-Peer Adaptation Layer for SS7 over IP) is at the heart of the SR and is designed to transport SS7 MTP3 signaling messages over IP using the services of SCTP. The MTP3 layer at the IP node communicates with M2PA as if it were regular MTP2. Together SCTP and M2PA perform the functions of, and are almost a direct replacement for, MTP2, providing a highly reliable transmission service to the signaling layer above it. M2PA functionality includes data retrieval to support MTP3 changeover procedure, link alignment procedure, and the reporting of link status changes to MTP3.

The SR can also interwork M2PA and M2UA by receiving M2PA and sending it out as M2UA for connection to remote Media Gateways and other Layer 2 interworking gateways.

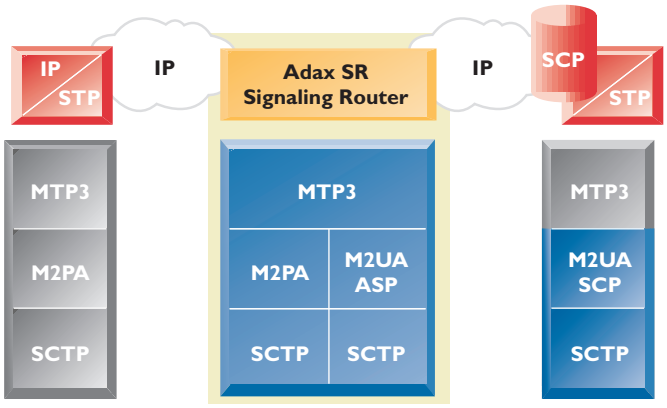



*Fig 9. M2PA to M2UA Interworking Protocol Stacks*

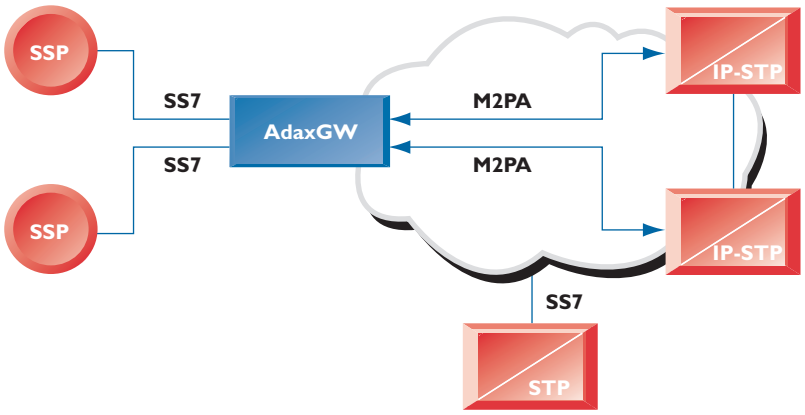



*Fig 10. M2PA Interworking with the SR configuration*

# M3UA Signaling Gateway (SG) Configuration, including M2PA and M2UA

## *M3UA interworking to end nodes*

The AdaxGW Signaling Gateway (SG) configuration is a multi-protocol gateway that extends the SS7 network into the IP domain. By terminating SS7 circuits and routing SS7 application traffic (E.G. TCAP, ISUP and MAP) over M3UA/SCTP, traditional SS7 services such as call setup and teardown, and message transport and routing, can still be provided in the IP domain. The SG uses M3UA back-hauling to route MTP3 traffic over an IP network. The back-haul solution interworks circuit switched SS7 with SCTP/IP based SS7 through a point code within the gateway, and in this instance, there is only one point code for the combined gateway and application platform. This single point code enables IP functionality to be provided to the SS7 network without the need for any additional point codes.

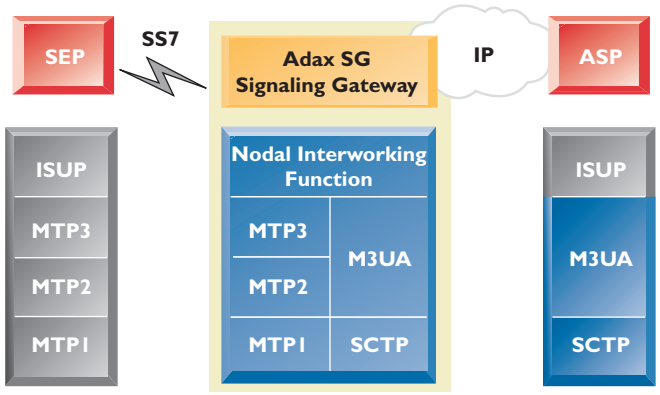



*Fig 11. M3UA Backhaul Protocol Stack*

The SG can be configured as a Signaling End Point (SEP) 'front end' connecting to a 'back end' application platform (ASP) running M3UA. The M3UA layer on an IP-enabled device provides the equivalent set of primitives at its upper layer, as provided by the MTP3 to its local MTP3-Users on an SS7 device. The ISUP and/or SCCP layer on an IP-enabled device is unaware that the expected MTP3 services are offered remotely from an MTP3 Layer on a signaling gateway, and not by a local MTP3 layer. In effect, the M3UA extends access to the MTP3 layer services to a remote IP-based application.

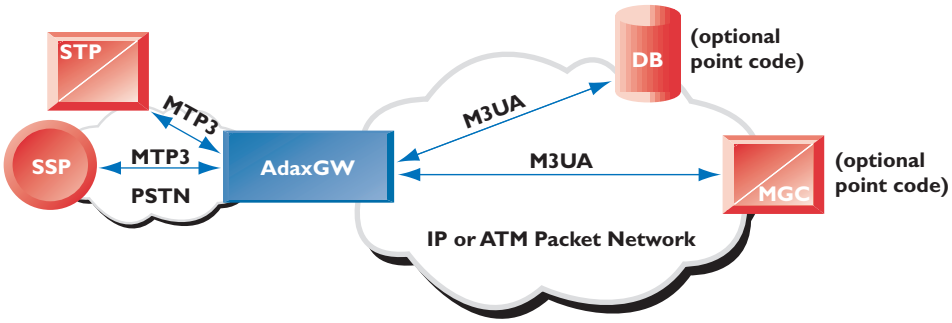



*Fig 12. M3UA Backhaul with the SG configuration*

The SG can also be configured as a Signaling Transfer Point (STP), enabling multiple IP devices such as HLRs and MSCs running M2UA, M2PA and M3UA to be concentrated into a single gateway. This concentration reduces the number of point codes and simplifies the network management.

The interworking of M3UA with M2UA and M2PA are also configuration options with the SG. This configuration can be particularly useful for interconnecting IP nodes based on different SIGTRAN protocols and for gateway to gateway inter-communication over M2PA.

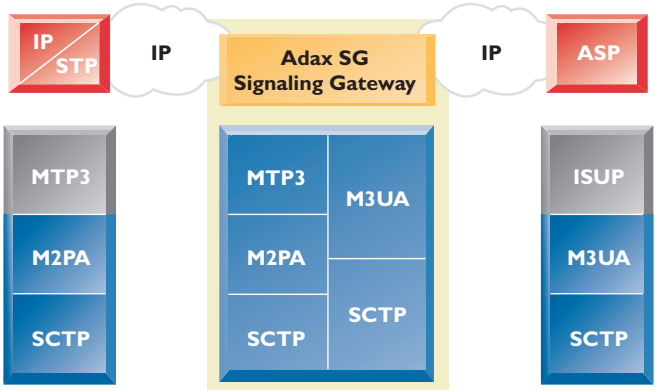



*Fig 13. M2PA to M3UA Interworking Protocol Stack*

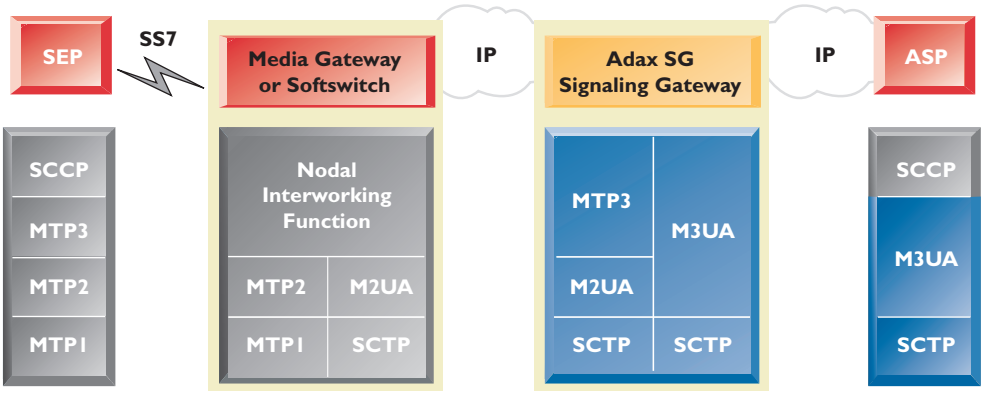



*Fig 14. M3UA to M2UA Interworking Protocol Stack*

# SCCP/GTT Signaling Gateway (SG Plus) Configuration, including M2PA, M2UA, M3UA and SUA

## *M3UA and SUA interworking to end nodes*

In addition to M3UA (see SG configuration) the SG Plus supports SCCP (Signaling Connection Control Part) and the SUA (SCCP User Adaptation Layer) protocols. SS7 SCCP provides network services above MTP3 and is used as the transport layer for TCAP-based services such as freephone, calling card, local number portability, wireless roaming and PCS (Personal Communications Services). SCCP also provides the means by which an SG Plus can perform GTT (Global Title Translation) to enable the destination signaling point and SSN (Subsystem Number) to be determined from the signaling message.

SUA is a SIGTRAN protocol for transporting SCCP signaling messages (e.g. TCAP) over IP using SCTP. SUA is used between a Signaling Gateway and an IP signaling endpoint, or between IP signaling endpoints. It supports unordered and in-sequence connectionless services, bi-directional connection-oriented services with or without flow control, and detection of message loss and out-of-sequence errors. SUA is a signaling solution for companies who are running SCCP on SS7 devices that need to connect to IP devices.

With the addition of SCCP/GTT, the SG Plus configuration provides more STP-like functionality and, together with the High Availability (HA) option, offers the fully redundant, distributed solution that is a must for high-end telecom companies.

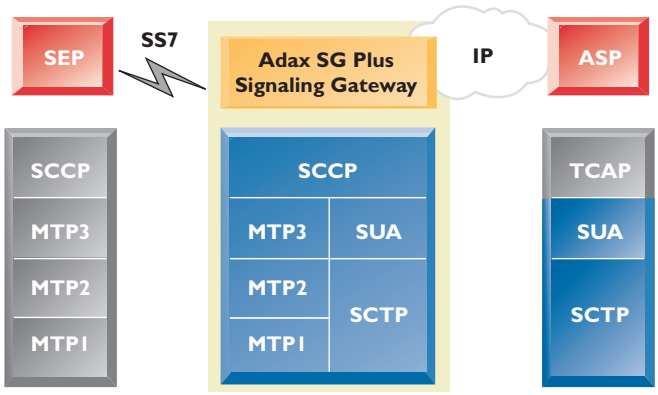



*Fig 15. SCCP Signaling Messages over IP*

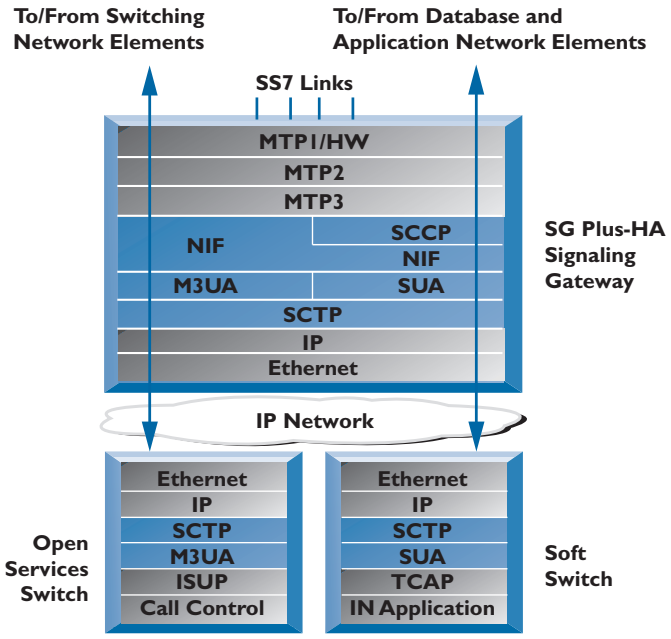



*Fig 16.* *ISUP Query Transmission via SUA* *TCAP Query Transmission via SUA*

# High Availability (HA) System Configuration

## *No Single Point of Failure*

The High Availability System (HA) option is a significant addition to the SR, SG and SG Plus configurations. The HA System configuration is a fully redundant design with no single point of failure that provides a highly reliable SS7 - IP gateway solution. Designed to enable two SR, SG or SG Plus gateways to be implemented with a single point code, the HA configuration can perform STP-like functions, or traditional SS7 End-Point functions in a converged IP/SS7 network. At the same time, the AdaxGWs continue to provide IP interworking with SIGTRAN STPs, End Points, SoftSwitches and Media Gateways.

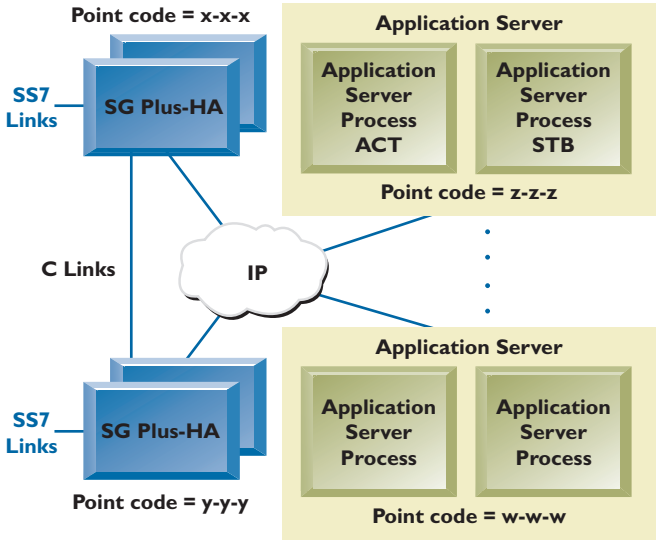



*Fig 17. Overview of an HA System configuration in STP Mode*

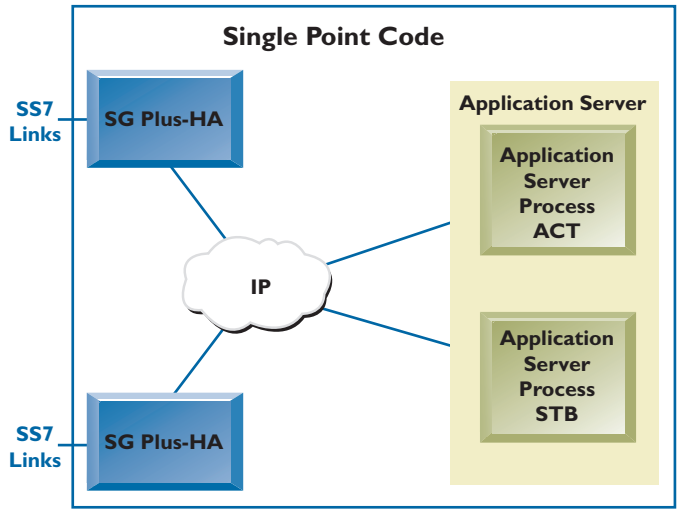


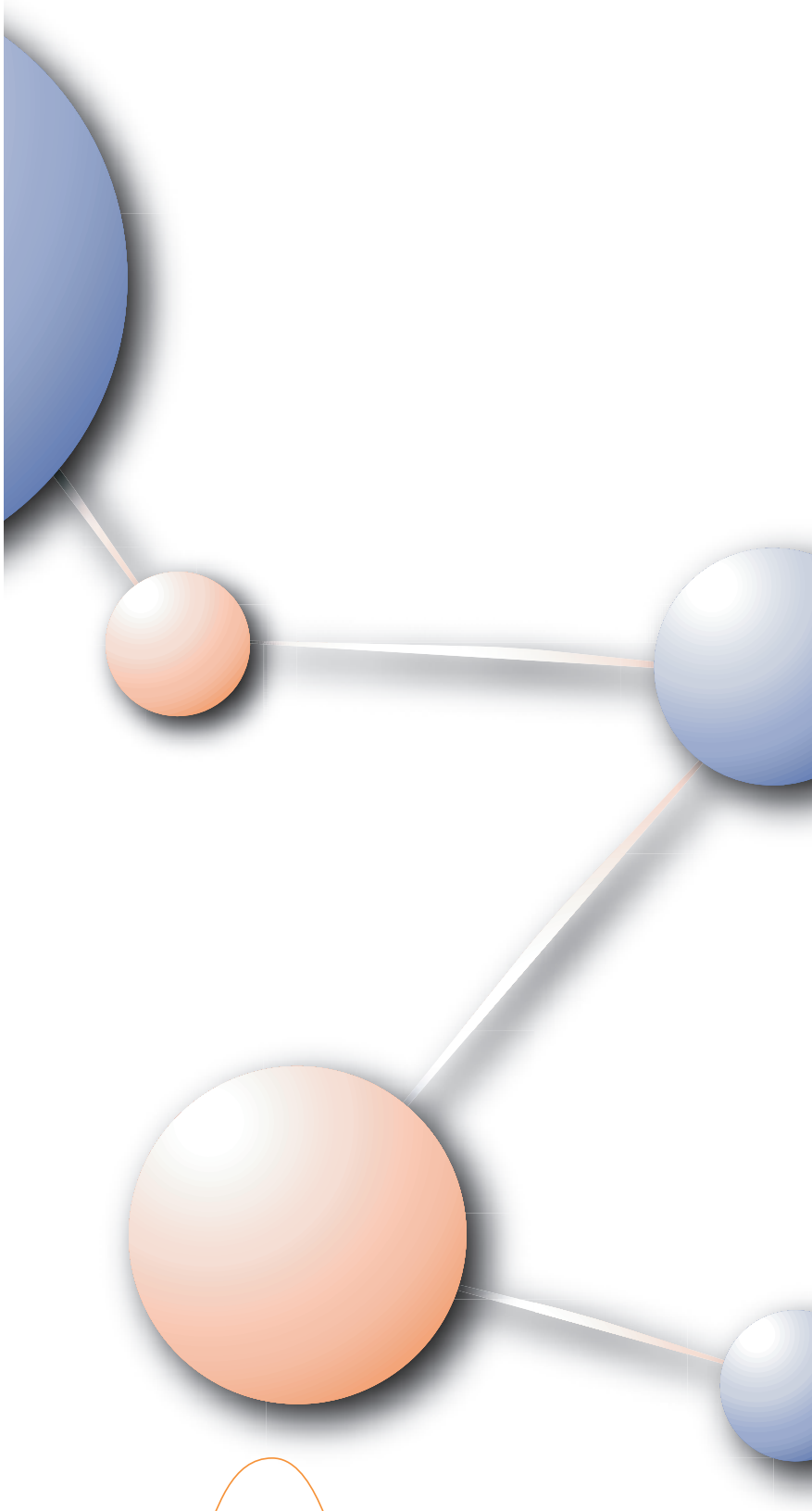

*Fig 18. Overview of an HA System configuration in SEP Mode*

# Conclusion

The growing popularity of IP in telephony networks has brought about the need to inter-operate existing infrastructure with, or build, new IP-based solutions. New requirements encompass connecting IP-based or IP-enabled Media Gateways, Signal Transfer Points (STPs), switches, databases and other Next Generation Signaling applications with legacy circuit switched signaling architecture.

This need to interconnect different networks demands multi-protocol solutions that combine and connect divergent circuit and packet switching architectures. In addition, there are new possibilities for replacing expensive dedicated SS7 circuits with the more cost-effective IP networks.

The AdaxGWs address all of these requirements. The link density, scalability, throughput and high performance of the AdaxGWs enable operators to manage the growth of their networks while maximizing revenues and satisfying consumer demands for new services.



# Technical Specifications

### SS7 Protocols and Standards Compliance

- SS7 MTP2: ITU-T Q.703, ETSI 300 008, 300 008-1, ANSI T1.111, TTC JT-Q.703, ITU Q.703 Annex A 1996, China SS7 YD/T 1125 – 2001
- SS7 MTP3: ITU-T Q.704, Q.707, ETSI 300 008, 300 008-1, ANSI T1.111, Bellcore GR246, GR606, GR82
- SS7 SCCP: ANSI SCCP per T1.112 and Telcordia GR-246-CORE, with conformance testing per T1.235. ITU SCCP per Q.711 through Q.714, with conformance testing per Q.786c. ETSI SCCP per ETS 300 009
- MTP3b, Q.2210
- MTP3 transfer (NIF), MTP2 transfer (NIF)
- A, B, C, D, E, F Links
- Up to 256 links per 4U system (up to 64 links 1U)
- ATM AAL5, ITU-T I.363.5
- SSCOP, Q.2110
- SSCF NNI, Q.2140
- HSL over AAL5, Telcordia GR-2878-Core

### SS7 Application Compatibility

- ISUP, TCAP, GSM MAP, IS-41

### Wireless Compatibility

- 2G, 2.5G, 3G

### SIGTRAN Protocols and Standards Compliance

- SCTP: RFC2960, 3309
- M2PA: IETF Draft 7 – Draft 13
- M3UA: RFC3332bis
  Supports Chinese variant
- SUA: RFC3868
- M2UA: RFC3331

### Management

- AdaxGWManager GUI Interface (Web/Java)
- SNMP v2 for Traps and Statistics
- Telnet/Command Line Interface, password protection
- TFTP for software upgrade

### Hardware (per 1U chassis)

- 1U rack mount CompactPCI
- 17”w x 1.75”h x 13”d
- Internal DC power - 200W (5v @ 20A: 3.3v @ 15A: 12v @ 12A: -12v @ 1A) Dual feed, -36VDC to -72VDC

or

- AC power - 200W (5v @ 20A: 3.3v @ 15A: 12v @ 12A) Single feed, 115/230VAC, 50/60Hz
- MTBF 100,000+ Hours, MTTR < 5 mins.

### Hardware (per 4u chassis)

- 17.2”w x 7”h x 12.5”d
- N+1 (250w per power supply)
- Voltage output +5V@25A, +3.3V@25A, 12V@5A, -12V@1A
- MTBF 68,771 Hours, MTTR < 5 mins.

### Interfaces (per 1U chassis)

- 4 to 12 T1/E1/J1* ports (rear I/O)
- Drop & Insert on all channels
- 2 10/100/1000 Mbps Ethernet ports (rear I/O)
- 4 10/100/1000 Mbps Ethernet ports (front I/O)
- 2 to 8 OC3/STM-1/STS-3c ports (front I/O)*

### Interfaces (per 4U chassis)

- 8 to 32 T1/E1/J1* ports (rear I/O)
- Drop & Insert on all channels
- Dual 9 cPSB port Ethernet 10/100/1000 switches
- 5 10/100/1000 Mbps Ethernet ports (rear I/O)
- 4 to 16 OC3/STM-1/STS-3c ports*

### Safety & Emissions

- NEBS-3 certified, FCC class A (AC/DC), UL 60950, CE compliant

### Environmental Conditions

- Operating -5°C to 55°C • Relative Humidity 5% to 90%
- Storage -40°C to 70°C

*Future release

All specifications are subject to change without notice.

***adax inc***
*614 Bancroft Way,*
*Berkeley, CA 94710*

***Tel:*** *(510) 548 7047*
***Fax:*** *(510) 548 5526*
***Email:*** *sales@adax.com*
***Web:*** *www.adax.com*

***adax europe ltd***
*Reada Court, Vachel Road,*
*Reading, Berkshire, RG1 1NY, UK*

***Tel:*** *+44 (0) 118 952 2800*
***Fax:*** *+44 (0) 118 957 1530*
***Email:*** *sales@adax.co.uk*
***Web:*** *www.adax.com*

***adax china***
*18 Floor Bund Center, Suite 1853, 222 Yan An Road East,*
*Shanghai 200002, China*

***Tel:*** *(86 21) 6132 3834*
***Fax:*** *(86 21) 6335 1336*
***Email:*** *sales@adax.com*
***Web:*** *www.adax.com*