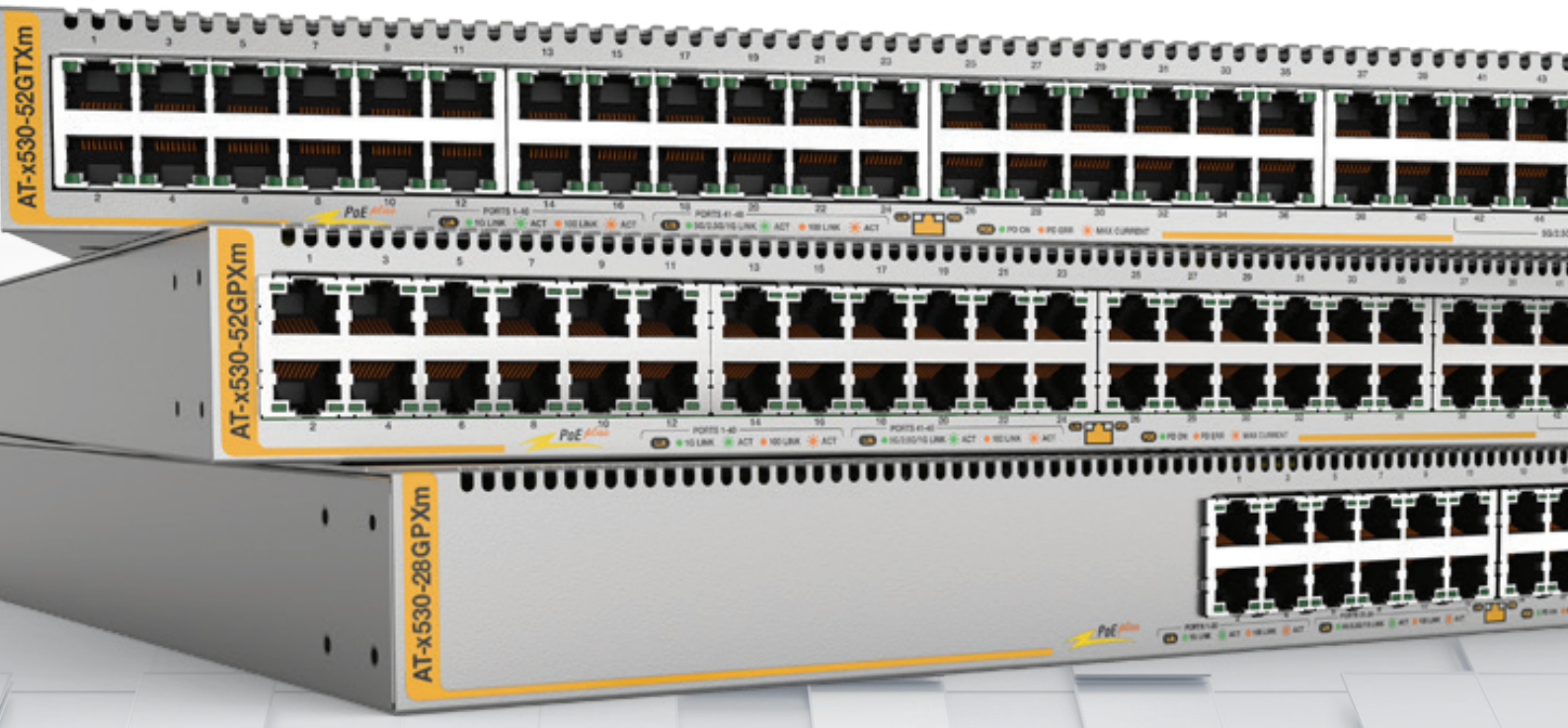
Solution Guide

Allied Telesis

Resilient Networking with EPSR



NETWORK SMARTER

Introduction

IP over Ethernet is now a well-proven technology in the delivery of converged services. Ethernet-based Triple-Play services have become an established commercial reality worldwide, with service providers offering advanced voice, video and data packages to their customers. This requires a highly available network infrastructure for service providers to meet Service Level Agreements (SLAs), and meet the expectations of customers for a seamless multimedia experience.

Now, the convergence of services and applications in the enterprise has led to increasing demand for high availability in the Local Area Network (LAN). High bandwidth is also required for the multiple applications simultaneously using the network. For many businesses, real-time applications like surveillance, automated control, video streaming and Voice over IP (VoIP) are used right alongside data and Internet access.

The key to providing maximum network uptime is extremely rapid failover in the event of link failure. Allied Telesis' carrier-grade resiliency feature, Ethernet Protection Switching Ring (EPSR), ensures mission critical services are not interrupted in the event of link or node outages. EPSR provides failover times as low as 50ms, and can be coupled with today's fastest Ethernet speeds of 10, 40, or 100Gbps.

A number of Allied Telesis products also support the standards-based G.8032 Ethernet Ring Protection, which similarly provides high-speed ring connectivity and failover as low as 50ms. G.8032 Ethernet Ring Protection can be deployed stand-alone, or interoperate with Allied Telesis ESPR.

Equally as at home in the enterprise network as it is in demanding service provider metro networks, EPSR provides a solution that meets the modern network requirements of high bandwidth and high availability. This advanced self-healing network technology provides 'always-on' access to online resources and applications.

Allied Telesis supports this technology on a wide range of sophisticated switching platforms, as well as advanced telecommunication chassis.

EPSRing™

Ethernet Protection Switching Ring

EPSR is Allied Telesis' premier solution for providing extremely fast failover between nodes in a resilient ring. EPSR enables rings to recover within as little as 50ms, preventing a node or link failure from affecting customer experience, even with demanding applications such as IP telephony and streaming video.

The Technology

Putting a ring of Ethernet switches at the core of a network is a simple way to increase the network's resilience—such a network is no longer susceptible to a single point of failure. However, the ring must be protected from Layer 2 traffic loops. Traditionally, Spanning Tree (STP)-based technologies were used to protect rings, but they are relatively slow to recover from link failure. This can create problems for applications that have strict loss requirements, such as voice and video traffic, where the speed of recovery is highly significant.

EPSR enables rings to recover rapidly from link or node failures within as little as 50ms, depending on port type and configuration. This is much faster than STP at up to 30 seconds, or even Rapid STP (RSTP) at 1 to 3 seconds. EPSR, much like STP, provides a polling mechanism to detect ring-based faults and failover accordingly. But unlike STP, EPSR uses a fault detection scheme to alert the ring that a break has occurred. The ring then takes immediate action, instead of going through an STP-like reconvergence.

Extremely low-latency signalling between the switches in the ring enables very rapid detection of lost connectivity. The simple topology enables immediate remedial action by the master switch, with no requirement to spend any time exchanging further signalling to confirm the network status. This almost-instant decision making makes EPSR a powerful solution, with failover under fault conditions unnoticed by network and application users.

The Allied Telesis EPSR solution is extremely robust, with patented technology providing the ability to handle unlikely complex fault situations, like multiple failures.

The key proof of technology is customer experience. The strong uptake of EPSR in demanding applications is testament it has provided a superior solution to service providers and their end users.

Diagram 1 shows a ring of switches that could be employed as a network core or distribution solution for an enterprise business, or service provider network. EPSR maintains 'always-on' network availability by monitoring the health of the ring, and utilizing a reverse path for traffic almost instantaneously in the event of a link or node failure.

EPSR in a ring of switches

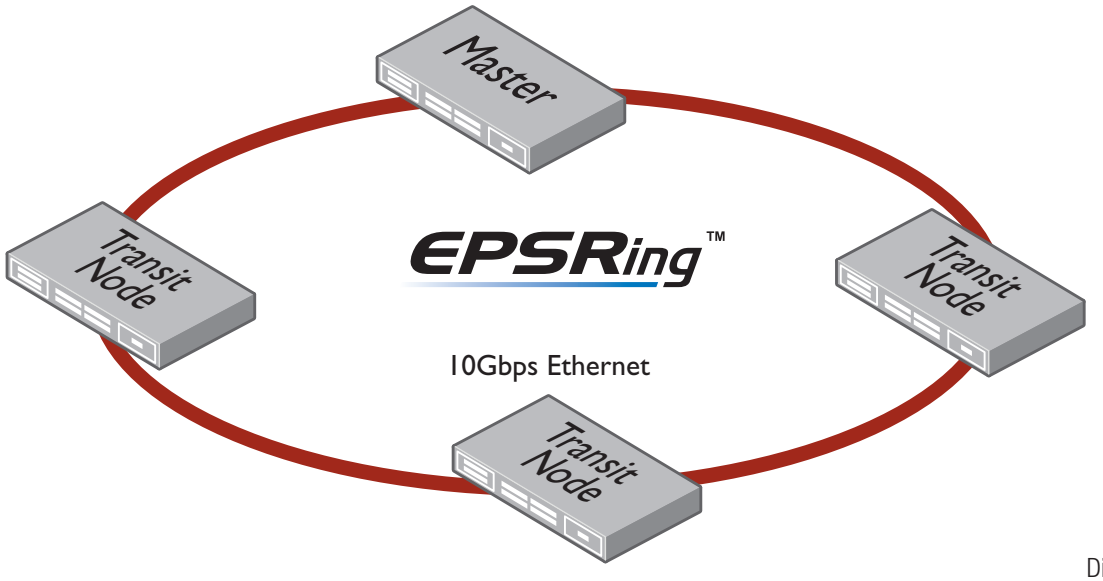


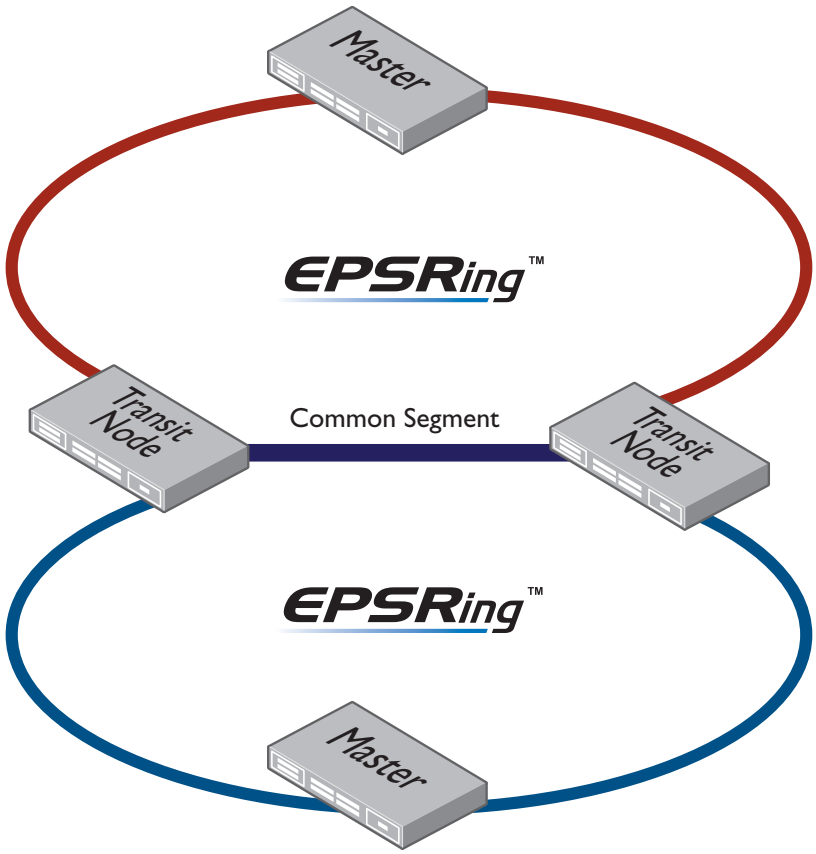
Diagram 1

In some scenarios it is useful to implement an EPSR multi-ring topology. For example, a service provider may have an access ring connecting customers, and a distribution ring connecting to services. A multi-ring topology is an excellent way to provide a broadly distributed network that is still high performing, and may require different bandwidth in different parts of the network.

The multiple EPSR rings are likely to share a set of protected VLANs. If these rings share a common segment, as shown in diagram 2 below, there is the possibility of an undesirable loop forming out of both EPSR rings if the common segment was to fail—this is known as a SuperLoop. The resultant SuperLoop would leave a network storm state, with traffic circling the SuperLoop indefinitely causing performance issues and outages.

To prevent any possibility of a SuperLoop being formed, Allied Telesis EPSR solution provides SuperLoop Prevention (SLP). EPSR-SLP ensures that multi-ring topologies are managed, and in the event of any common segment failure no network loop can be formed. The network gracefully handles any fault condition, and ensures access to online services is always maintained.

Multi-ring topology using EPSR-SLP



Both EPSR instances carry the same Data VLANs, therefore the shared link is called a Common Segment, and this is a SuperLoop topology which requires SuperLoop Prevention.

Diagram 2

EPSR in the Enterprise

EPSR in enterprise network solutions makes the benefits of this technology available for corporate, education, hospitality and other customers requiring maximum network uptime. The following enterprise networks showcase the many benefits of EPSR.

Corporate EPSR network

As the corporate world comes to rely more than ever on Information Technology resources and applications, a high availability infrastructure is vital. An EPSR ring at the core of the network provides the following key advantages:

- **High bandwidth:** An EPSRing can run at 1, 10, 40, or 100Gbps, utilizing today's fastest Ethernet standards for maximum data throughput.
- **Immediate access:** Seamless connectivity via voice, video or email is maintained, and network servers are accessible with no delay.
- **High availability:** With no single point of failure, continuous access to critical business data and network resources is maintained.
- **Application versatility:** High bandwidth and ultra-fast failover lend themselves to multiple applications simultaneously using the network. Real-time applications like surveillance, video streaming and VoIP can be used right alongside data and Internet access.
- **Easier troubleshooting:** Unlike STP, EPSR fails over with minimal changes to network topology. The simplicity of the ring structure, combined with useful log messages, makes it easy to determine the point of failure.

Diagram 3 shows a corporate network based on a central EPSR ring. The inclusion of an Allied Telesis SwitchBlade x8112 next generation chassis switch at the core of the network adds a further layer of resiliency. The high availability dual controller chassis ensures access to online resources and applications.

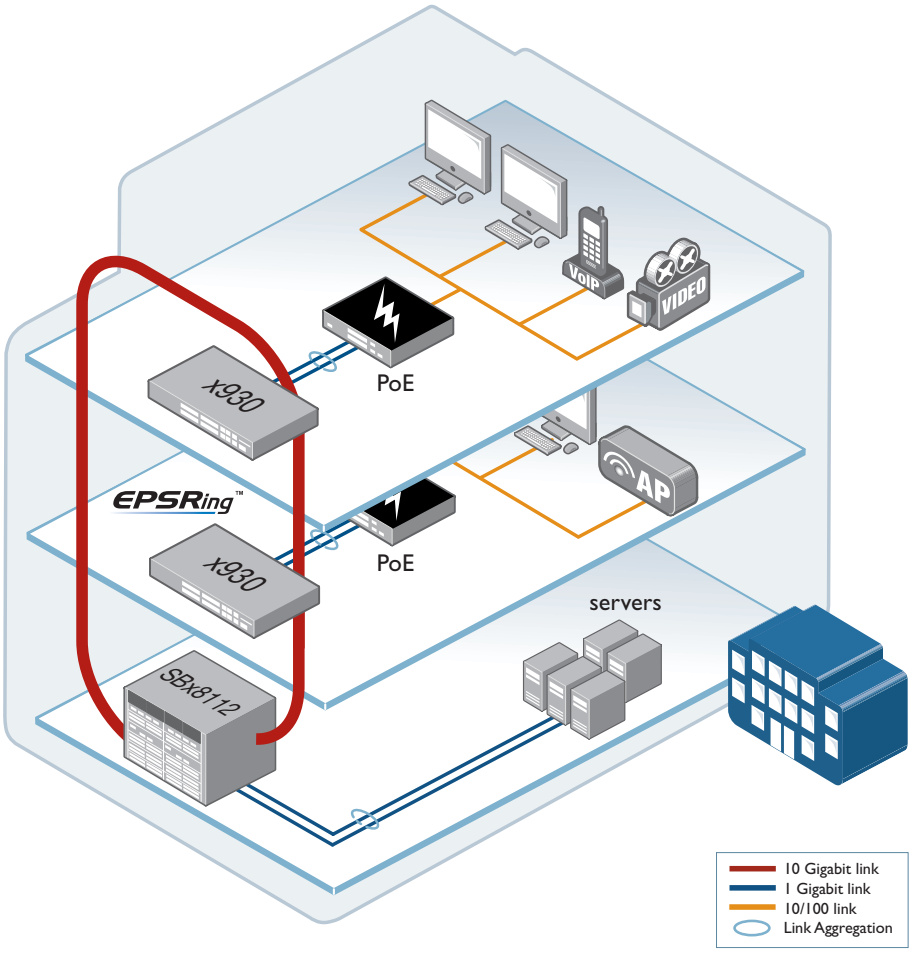


Diagram 3: Corporate EPSR network

Campus EPSR network

Some characteristic requirements in a campus network are:

- Ability to roam (at least within certain zones of the campus)
- Security against network attacks and virus outbreaks
- A design for scalable growth
- Support for converged services
- Flexibility to allow different sets of users to operate in the way that best suits their needs

A design that supports these requirements is shown in diagram 4. In this design, the Campus is partitioned into a set of Layer 2 switching domains, each of which is centred on its own EPSR ring. To travel from one ring into another, traffic is Layer 3 switched. For example, Art department traffic is Layer 3 switched when moving to Science or Administration.

The key advantages of this design are:

- **Roaming:** Users can easily roam within the zone covered by any one of the Layer 2 domains.
- **Efficient use of bandwidth:** The Layer 3 switching between domains will reduce the proliferation of broadcast traffic through the network.
- **Security:** Strict rules can be established for which traffic may pass between domains, and these rules can be enforced by the Layer 3 switches.
- **High availability:** Dual points of connection between neighboring domains provide resiliency in the inter-domain connectivity.
- **Easier maintenance:** Clear demarcation between zones simplifies troubleshooting, and facilitates staged network upgrades.
- **Fast failover:** Use of EPSR throughout the network ensures ultra fast recovery from link failures, as demanded by converged services.
- **High bandwidth:** The core servers can be provisioned with a dedicated ring of extremely high bandwidth with high resiliency.

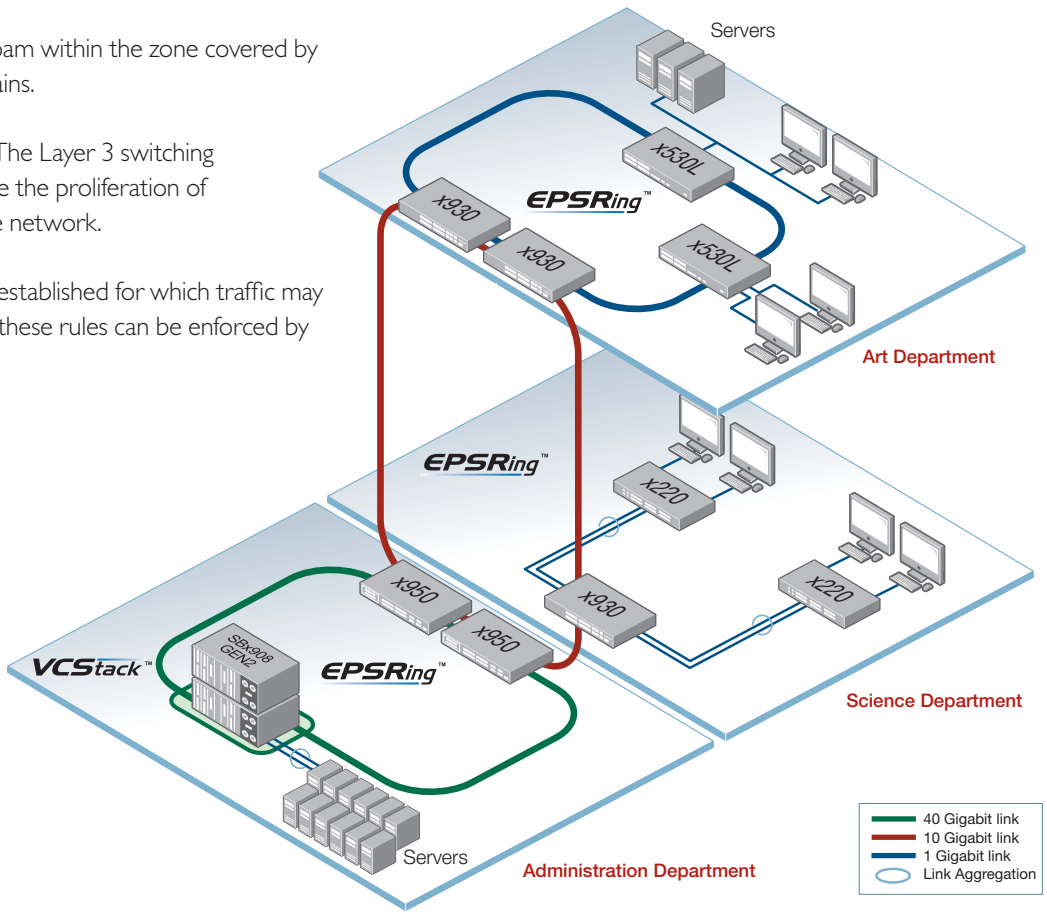


Diagram 4: Campus EPSR network

EPSR in Metro Networks

Service Provider Metro networks require extremely high reliability, as these city-wide networks provide online access to many businesses, and multi-media Triple-Play services (data, voice and video) to many homes. With SLAs to meet, any outage is both costly to the service provider, and disruptive for customers.

EPSR is an ideal solution for the delivery of converged services in the Metro environment with the following key advantages:

- **Long distance:** Geographically spread out nodes are supported as fiber allows long distance connectivity.
- **High availability:** With no discernible outage in the event of a link or node failure, EPSR provides the perfect solution for service providers meeting SLAs.
- **High performance:** Connectivity to voice, video and data services is always maintained for a seamless customer experience.
- **Multi-speed support:** The distribution and access rings can run at different speeds appropriate to the amount of network traffic.
- **Network protection:** The use of EPSR SuperLoop Prevention (SLP) ensures there is no chance of a loop forming, or any subsequent network storm, in this multi-ring environment.

A multi-ring EPSR-SLP protected design is shown in diagram 5. This city-wide Metro network provides high performing online access for businesses, and advanced Triple-Play services to residential customers.

The 'always-on' network

The proven benefits of EPSR have been widely deployed in both enterprise and service provider networks. Advanced solutions provide high bandwidth and maximum uptime.

Business owners can be sure that their network infrastructure is always available for the many online activities that are part of the modern work place. Service providers can confidently meet the demanding requirements of a converged environment, and provide a superior customer experience.

EPSRs advanced self-healing technology provides 'always-on' access to online resources and applications.

Service Provider Metro network using EPSR-SLP

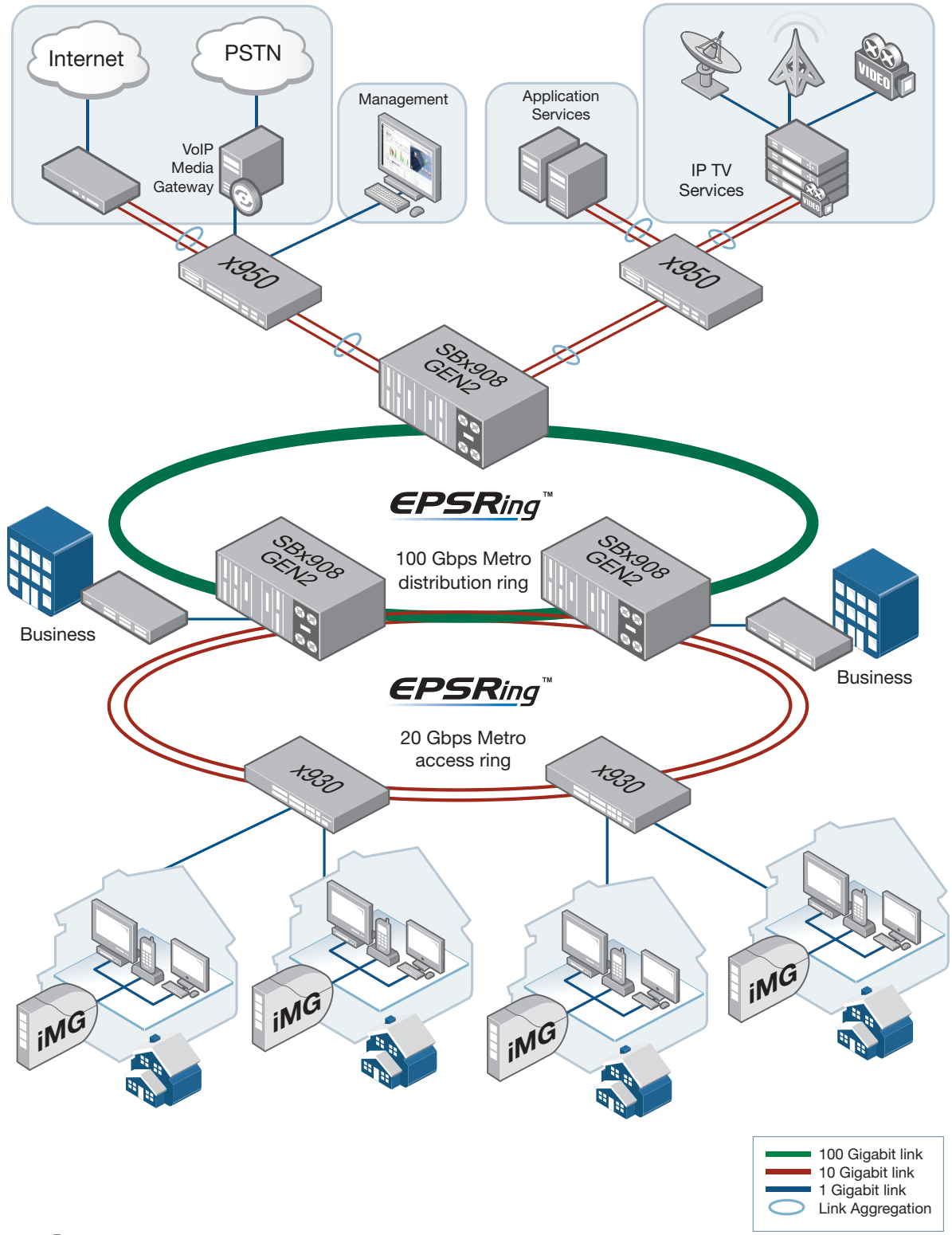


Diagram 5

About Allied Telesis

For more than 30 years, Allied Telesis has been delivering reliable, intelligent connectivity for everything from enterprise organizations to complex, critical infrastructure projects around the globe.

In a world moving toward Smart Cities and the Internet of Things, networks must evolve rapidly to meet new challenges. Allied Telesis smart technologies, such as Allied Telesis Autonomous Management Framework™ (AMF) and Enterprise SDN, ensure that network evolution can keep pace, and deliver efficient and secure solutions for people, organizations, and "things"—both now and into the future.

Allied Telesis is recognized for innovating the way in which services and applications are delivered and managed, resulting in increased value and lower operating costs.
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