# Simple Network Integration with XipOS

*Any Topology, Multiple Architectures, Multi-protocol support*

## INTRODUCTION

This document outlines the comprehensive network integration capabilities offered by XipLink appliances, powered by the versatile XipOS. XipLink provides flexible, scalable, and redundant solutions designed to meet diverse network requirements, ensuring optimized and resilient connectivity across various topologies and transport layers.

**Robust Networking Foundation: XipOS Support**

XipOS provides a strong foundation for network integration, supporting a wide array of configurations, functions and protocols. XipLink appliances incorporate several key features to enhance network performance, reliability, and efficiency. The details of each of these functions and features are given below.

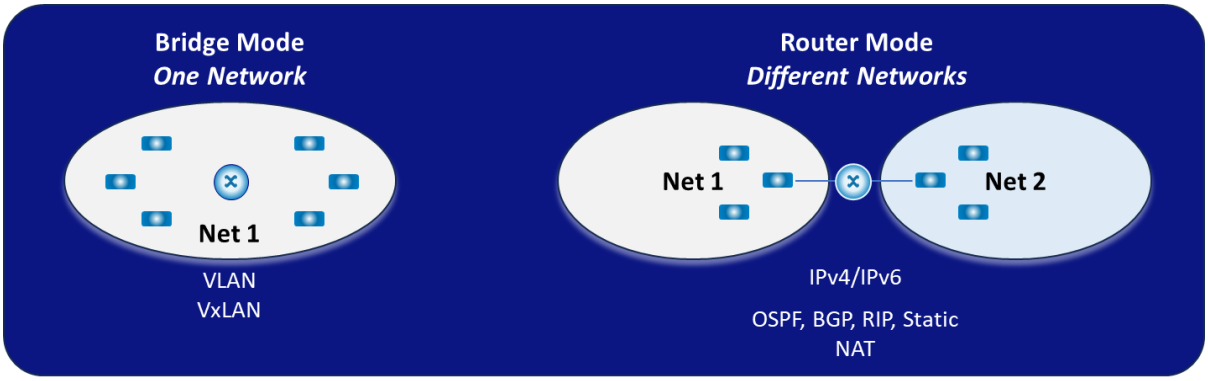
| | | | |
|---|---|---|---|
| Router Mode (L3) | Point-to-Point | IPv4 & IPv6 | Jumbo Frames |
| Bridge Mode (L2) | Star Topology | Static Routes | DHCP |
| VXLAN (L3 over L2) | Mesh Topology | OSPF, BGP, RIP | CARP |
| VLAN | Hybrid / Multi-Orbit | IPv6 over IPv4 | R/STP |
| DNS Proxy | DNS Cache | NAT | LWT Balancing |
| Basic Firewall | IPSec | TACACS+/Radius | Clustering |

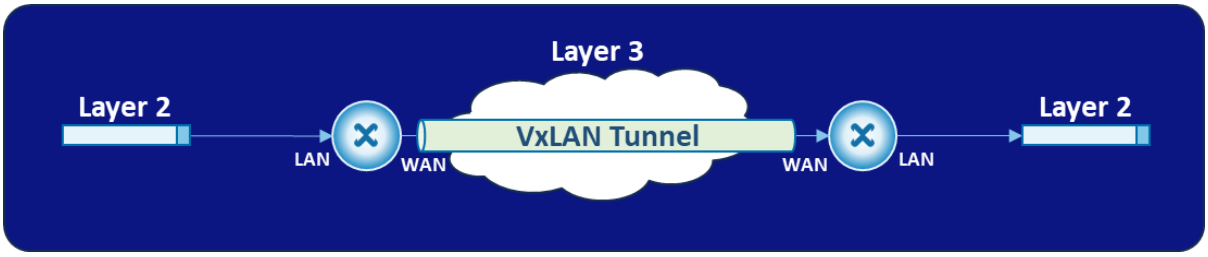
## MULTIPLE TOPOLOGIES

XipOS is highly flexible and supports all widely deployed topologies, including **Point-to-Point**, **Star**, **Mesh**, and **Hybrid/Multi-Orbit** configurations. All XipOS optimization features are fully supported across these topologies, enabling network administrators to seamlessly integrate XipLink into their networks. Additionally, XipOS provides the flexibility to modify topologies as needed.

## OPERATING MODES

XipOS offers the flexibility to operate in multiple modes to suit diverse network requirements. It can function in **Router Mode** (Layer 3) for advanced IP routing capabilities, **Bridge Mode** (Layer 2) for transparent switching between devices, or leverage **VXLAN** (Virtual Extensible LAN) for efficient Layer 2 transport over Layer 3 networks. This versatility enables seamless integration into various network architectures, supporting both traditional and modern deployment scenarios.



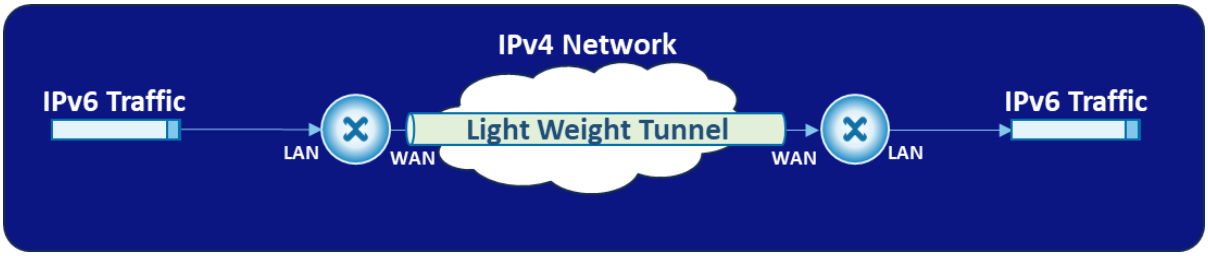




## IP AND ROUTING

Full support for both **IPv4** and **IPv6**, including **static routing** and **dynamic routing** protocols such as **OSPF**, **BGP**, and **RIP**. This comprehensive support enables efficient network routing, ensuring scalability, flexibility, and seamless connectivity across diverse network environments.

## LEGACY AND MODERN PROTOCOL SUPPORT

**IPv6 over IPv4:** XipOS facilitates seamless integration by transparently tunneling IPv6 traffic across existing IPv4 core networks using a lightweight tunnel mechanism.



## LAYER 2 FEATURES

Comprehensive support for **Virtual Local Area Networks (VLANs)** and **VLAN tagging**, enabling efficient network segmentation and traffic management. The implementation includes support for Rapid Spanning Tree Protocol (RSTP), which provides fast convergence times for loop prevention and network redundancy. This ensures high availability and reliability in bridge mode, minimizing downtime and maintaining optimal network performance even in complex topologies.

XipOS can transport and optimize **MPLS packets** over XipLink lightweight tunnels, Generic Routing Encapsulation (GRE), and VXLAN, enabling the transportation of MPLS frames across the internet or core networks.

## NETWORK SERVICES

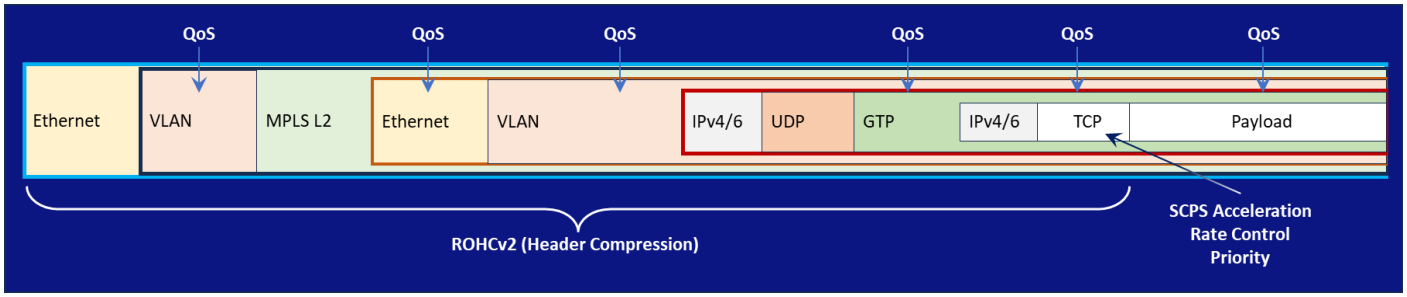
XipOS offers advanced network services, including **Dynamic Host Configuration Protocol (DHCP)** for automated IP address assignment, **DNS Proxy** for efficient domain name resolution, and **DNS Caching** to reduce latency and improve query response times. **Network Address Translation (NAT)** capability further enhances security and connectivity by managing IP address translation for both internal and external network communications.

## MULTIPLE ENCAPSULATION PROTOCOL SUPPORT

The solution supports multiple encapsulation protocols, including **Generic Routing Encapsulation (GRE), VxLAN** and **Lightweight Tunnels**. These features enable flexible and secure tunneling for various network scenarios, facilitating efficient data transport and optimization across different networks and enhancing performance and connectivity for remote sites and virtual environments.

## MULTIPLE LEVEL ENCAPSULATION SUPPORT

XipOS can support multiple levels of encapsulation and transparency, . It can apply QoS and acceleration at various levels of the encapsulated packets. Illustrated below is an example for a multi-level encapsulation.

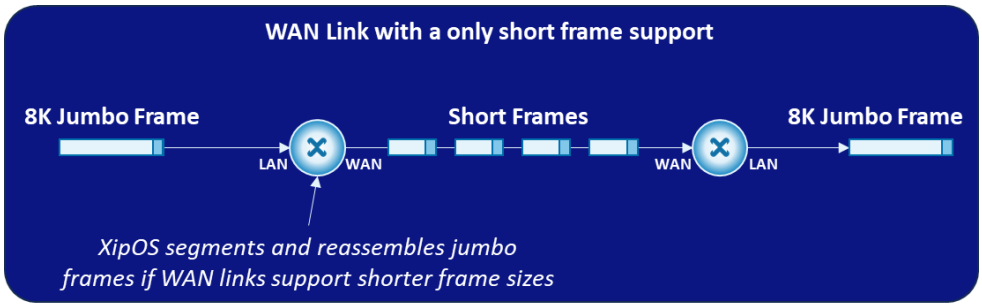



| Encapsulation Stack Options Supported |
|---|
| MPLS Labels – Up to 4 |
| Any 3 combinations of stacked protocols + MPLS |
| No Layer 2 in GRE |
| MPLS only on outer headers |

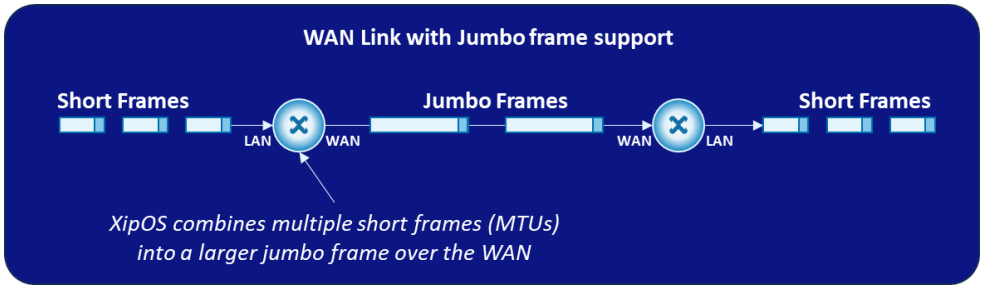
## JUMBO FRAME SUPPORT

XipOS intelligently handles **Jumbo Frames** (up to 8K bytes), both towards the LAN and WAN.

XipOS segments large frames for transmission over WAN links with smaller Maximum Transmission Unit (MTU) sizes, ensuring efficient and reliable data transfer. This process involves breaking down large data packets into smaller segments that conform to the MTU limitations of the WAN link, reducing the risk of packet loss or fragmentation issues. At the destination, the segments are reassembled into their original form, maintaining data integrity and ensuring seamless communication between devices.

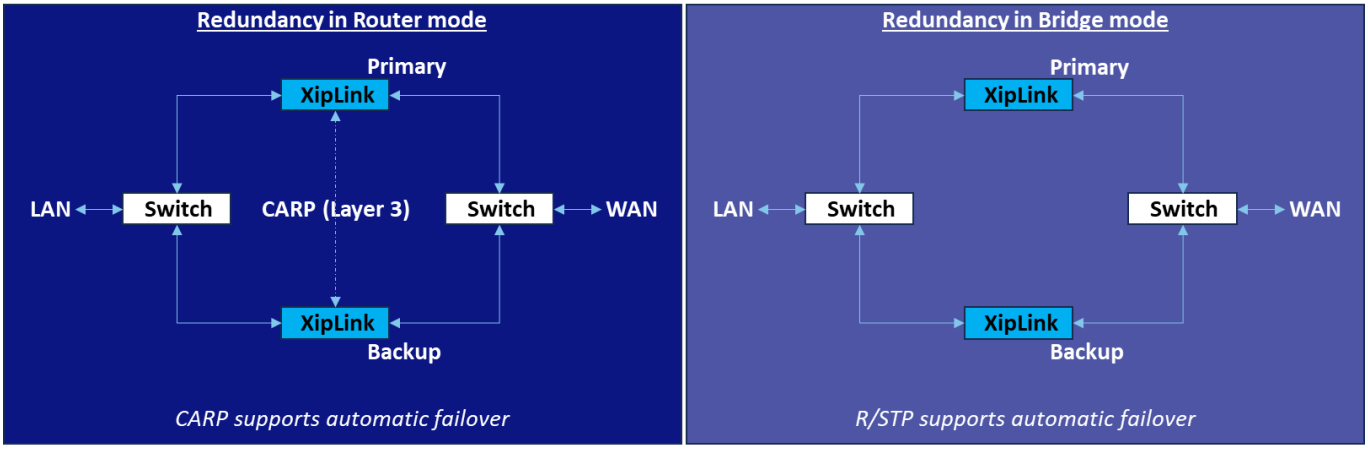



Conversely, it can combine multiple smaller frames into larger jumbo frames for transport over WAN links that support them, significantly reducing packet rates (potentially by 80% or more). This optimizes efficiency without requiring endpoint modification.



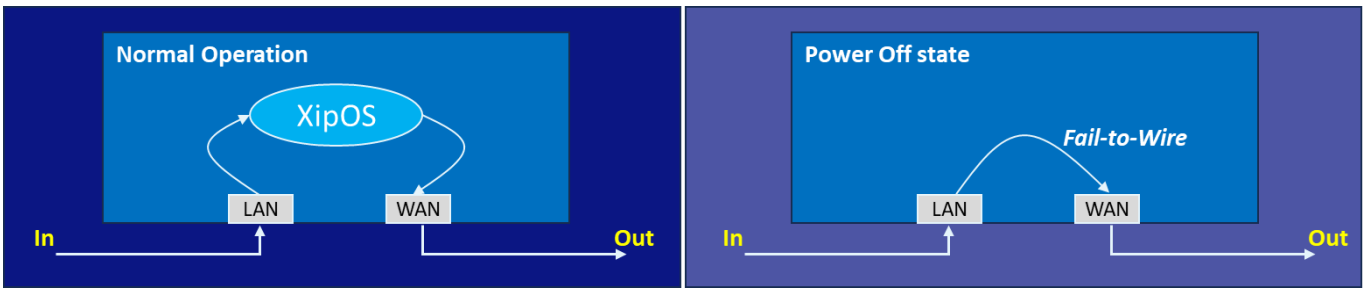

## APPLIANCE REDUNDANCY

XipLink appliances support high availability configurations in both Bridge and Router modes. In Bridge mode, Rapid Spanning Tree Protocol (R/STP) manages redundant paths, ensuring network stability. In Router mode, the Common Address Redundancy Protocol (CARP) provides Layer 3 redundancy to maintain continuous connectivity. Additionally, all appliances feature fail-to-wire port pairs, ensuring uninterrupted traffic flow in Bridge mode during power failures.



## FAIL-TO-WIRE SUPPORT

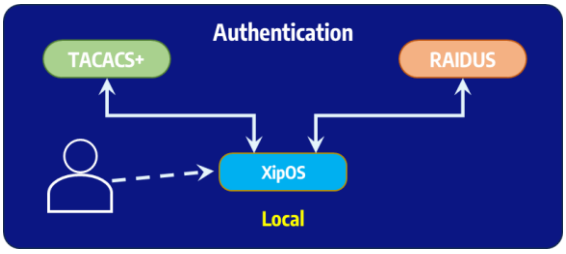
XipLink devices have built-in support for fail-to-wire ports that ensure continued connectivity in the event of a failure in the device's power supply, when operating in bridge mode. Fail-to-wire port maintains an unbroken connection by allowing traffic to pass through without interruption.



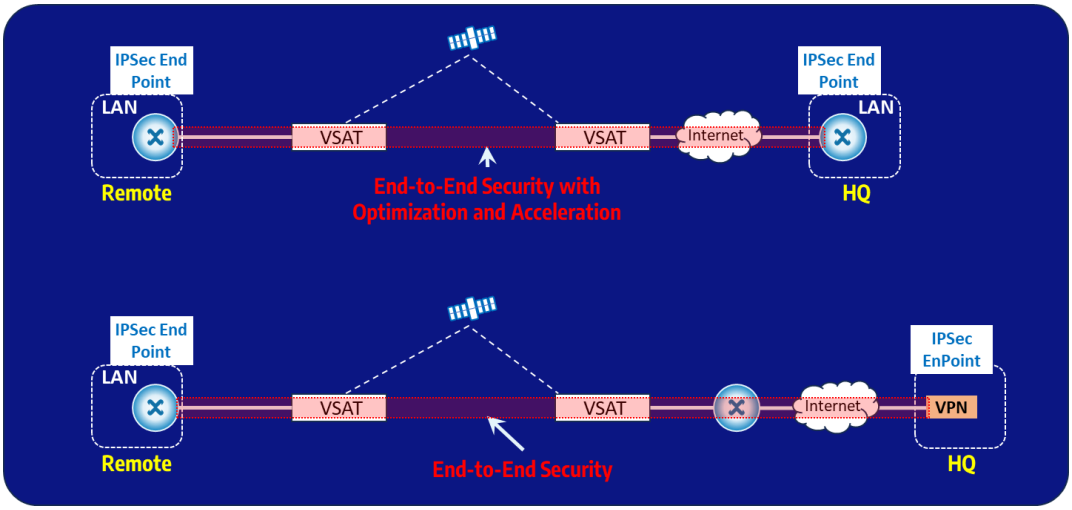

## SECURITY FEATURES

XipOS supports TACACS+/RADIUS, IPSec Encryption and a basic firewall.

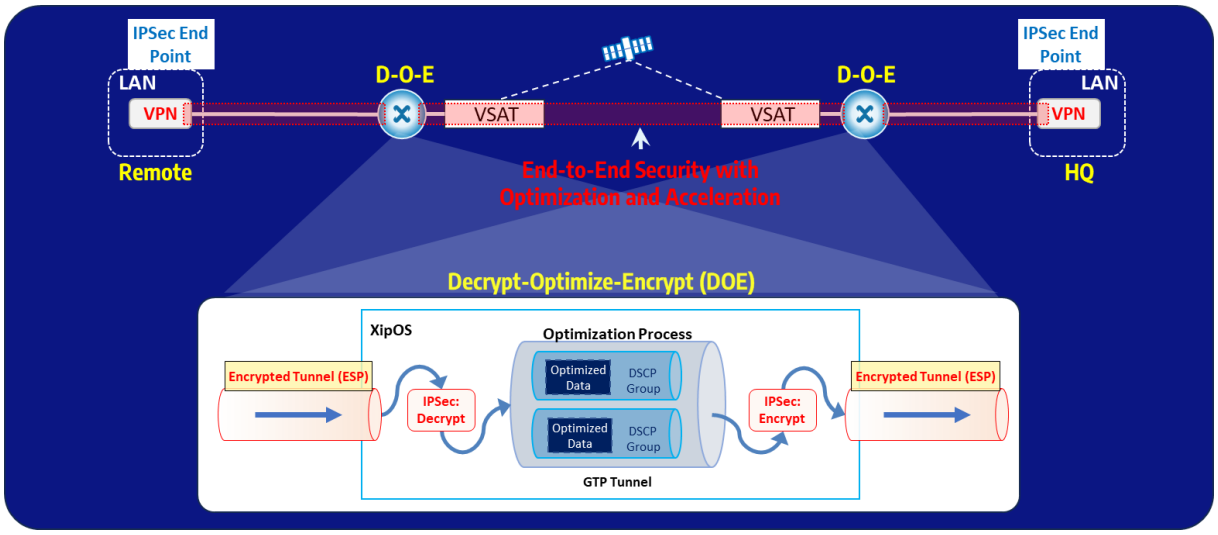
XipOS supports local user management and centralized user management with support for RADIUS and TACACS+ network protocols used for authentication, authorization, and accounting (AAA) services. XipOS uses RADIUS or TACACS+ services to authenticate and authorize users for both the Web UI and the CLI. Users defined in these services are independent of any users in the local XipOS user database. It is possible to have a local user with the same name as a RADIUS or TACACS+ user. One can specify the order in which XipOS uses any authentication services or the local user database, giving full control over how user authentication is handled.



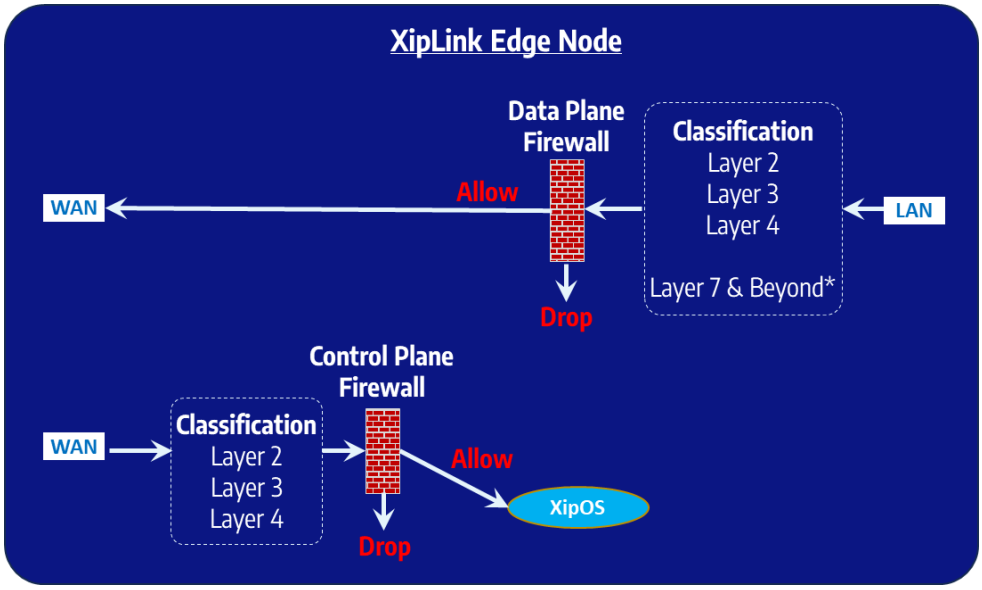

XipOS supports a full IPSec implementation with CMPv2 for automatic certificate management. XipOS' IPSec VPN has options to either authenticate the tunnel with pre-shared secrets, or with the X.509 certification protocol. XipOS IPSec tunnel can terminate either on another XipOS device or a customer IPSec VPN endpoint, providing end-to-end secure connections.



XipOS also supports a Decrypt-Optimize-Encrypt (DOE) option that preserves the security of the backhaul while still offering Optimization and TCP Acceleration. This results in increased throughput and performance. The DOE feature uses X.509 certificates to decrypt / encrypt the IP packets during communication between a remote site and HQ network.




The basic firewall includes can be applied to both the control plane and data plane. It allows traffic classification and filtering based on Layer 2, Layer 3, and Layer 4 information, with options to allow or drop packets.




## CONCLUSION

XipLink's network integration features provide a powerful and adaptable solution for modern networking challenges. With robust support for various modes, topologies, protocols, and advanced features like redundancy, efficient jumbo frame handling, VXLAN, and IPv6 transition mechanisms, XipLink appliances equipped with XipOS offer the flexibility, scalability, and reliability needed for demanding network environments.