Using JumboSwitch® to Preserve Legacy Devices That Don't Connect to Broadband Networks

A key problem we have been able to solve for many customers is providing solutions that allow them to continue using legacy devices that do not connect to a broadband network. For example, some equipment may have been designed before IP connectivity became standard, and while it may have performed beautifully in the past, it cannot connect to the new network.

Organizations may run into this problem due to simple oversight, but more commonly it is due to equipment replacement timeframes slipping past the original planned dates, requiring a bridge solution. In other cases, leased lines needed to connect legacy equipment are discontinued. Because new, high-speed IP networks are a large investment, stakeholders may be reluctant to invest more money in new equipment, even though their operations still rely on legacy equipment.

In such dilemmas, our JumboSwitch Ethernet solution allows customers to continue utilizing their existing equipment while transporting it over their new IP network.

The rest of this article will overview these types of solutions in more detail and include some specific applications.

JumboSwitch at a Glance

JumboSwitch is a product family of rugged Ethernet solutions with a range of interfaces designed for the seamless migration of SONET and other legacy communications networks.

Common JumboSwitch solutions include teleprotection and SCADA applications for utilities and analog radio over IP and leased line replacement for public safety, among others.

JumboSwitch boasts an MTBF (Mean Time Between Failure) of over 300,000 hours and comes in high and extreme temperature operating ranges spanning -40°C to 80°C.

It features edge and core versatility and hot-swappable cards that can be used with five chassis configurations.

Learn more about JumboSwitch.
Find JumboSwitch on our Product Matrix.

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Key JumboSwitch Solutions for Legacy Devices

JumboSwitch can provide several Ethernet solutions for preserving legacy devices for the following applications:

- **Teleprotection:** Common applications include C37.94 and serial teleprotection, particularly where substations require IEEE 1613-compliant equipment.
- **SCADA:** JumboSwitch supports real-time critical communications on IP networks for virtually every SCADA interface type; in this case, including synchronous/asynchronous RS-232, RS-422, and RS-485 applications.
- **Analog:** Common applications include the connection of modems up to 33.4kbps data rates, as well as analog radio site connectivity.
- **Phone:** The most common applications would be connection of modems to connect existing analog equipment, such as fax machines, extending analog phone lines (FXO to FXS), or linking a pair of crash phones (FXS to FXS).
- **T1:** For customers wishing to use their existing T1 lines over their new IP network, JumboSwitch can provide IP connectivity over T1s, normally resulting in a significant cost reduction.
- **ERPS:** Ethernet Ring Protection Switching helps achieve reliability and network stability in Ethernet ring topologies and avoids loops forming at the Ethernet layer.

Teleprotection Using JumboSwitch

Utilities can use JumboSwitch to connect teleprotection equipment to their new IP network, including C37.94 interfaces and those using serial data.

C37.94 Teleprotection

While teleprotection through C37.94 is a fiber-based solution, the TC3846-2 C37.94-over-IP Gateway allows connection of C37.94 relays over Ethernet and is ideal for linking or extending up to two channels of C37.94 interfaces, such as substation teleprotection relays.

The TC3846-2 is capable of supporting connections for extra-high voltage teleprotection equipment due to its extremely low latency, typically delivering sub-5ms latency, making it suitable for all teleprotection requirements.
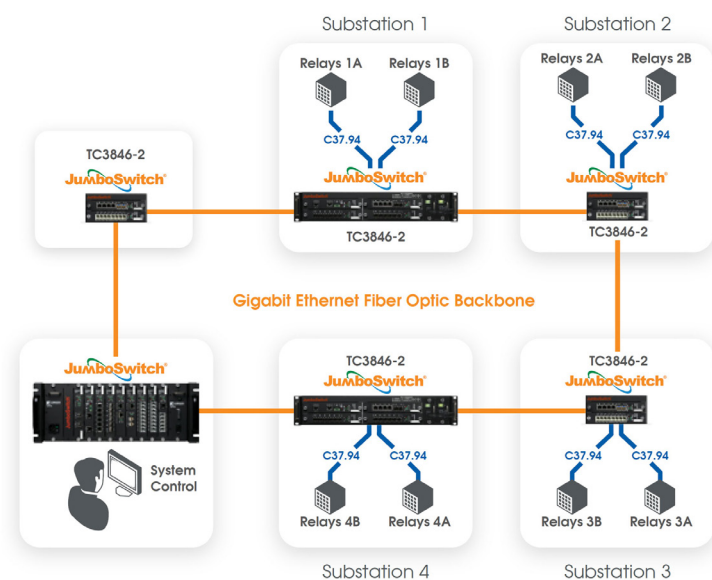
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This is done for a couple of reasons: First, this technique achieves extremely low latency because the JumboSwitch does not receive and transmit full bytes, nor does it store data, allowing information to be packetized and transmitted virtually instantaneously. Since the data is not being stored, this also provides a higher level of security.

Second, oversampling makes setup in the field much easier, as it is not dependent on the customer's data format, nor the number of bits, start bits, stop pits, parity bits, and so on. By treating serial data as more of a wave form, TC3847 products provide more flexibility.

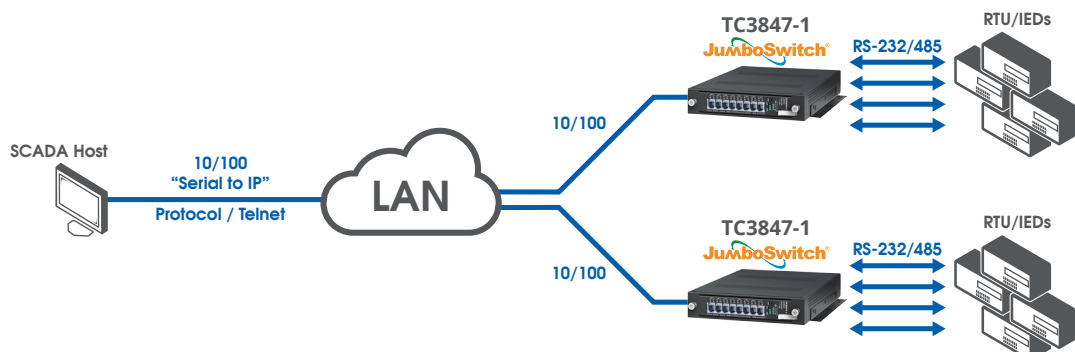## SCADA Applications Using JumboSwitch

The TC3847 product sub-series is not only useful for teleprotection, but also for SCADA systems. Here are two common applications:
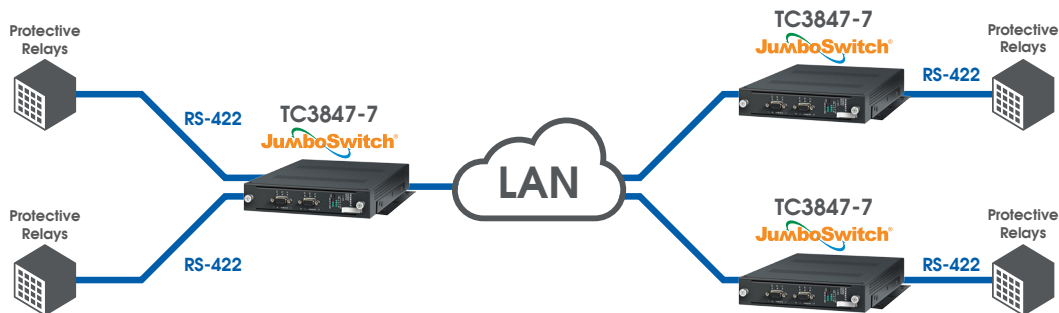
Typical "Serial Tunneling" application using TC3847-7 RS-422

Using a Serial Server

In this application, the TC3847-1 Four-Channel Serial Server is used to connect a device, such as a sensor, valve, pump, or motor, to RTUs (remote terminal units) on one end and to the SCADA host on the other over a LAN. One device communicates with the RTU and sends the rest of the data back in serial format to the SCADA host.

Typical Telnet application using TC3847-1 Serial Server

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Point-to-Point Serial

The TC3847-1 can also be used to provide point-to-point serial connectivity between an RTU and the SCADA host. In this case, it is not acting as a serial server, but to securely connect two devices over a single channel.

As mentioned previously, TC3847 products fully support RS-232, RS-422, and RS-485 protocols and both synchronous and asynchronous messaging for SCADA requirements.

Typical point-to-point application using TC3847-1 Serial Server

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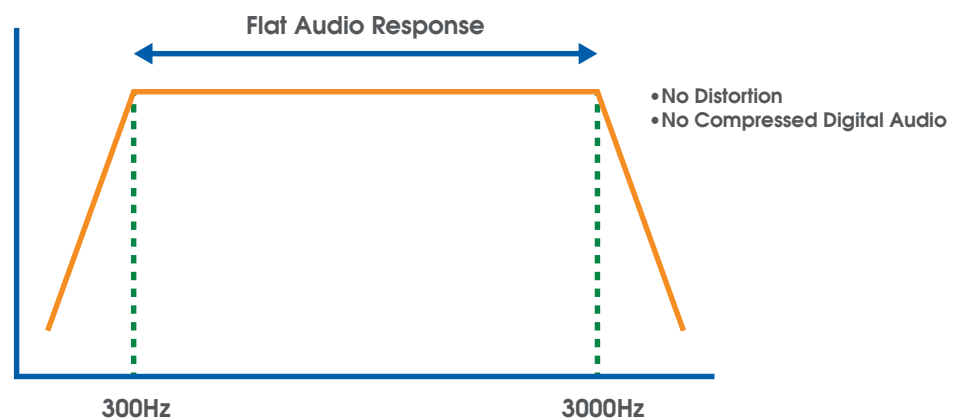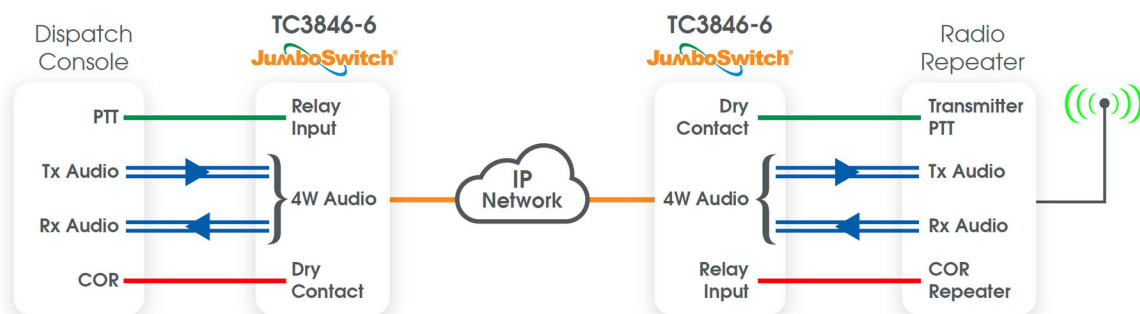
Connecting Analog Devices Using JumboSwitch

Typically, JumboSwitch provides four-wire applications for connecting analog devices over Ethernet/IP. Some of the most common applications include:

Leased Line Replacement for Radio

The TC3846-6 E&M-over-IP Gateway, one of our most popular JumboSwitch products, can be used to replace leased lines, particularly within analog radio networks for organizations in the public safety sector. It provides extremely flat audio with next to zero distortion and no compression within a frequency band between 300 and 3400 Hertz.

In analog radio's case, it also allows for guard tones to, for example, access specific repeaters within the radio network or protect a channel from outside interference.

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Analog Phones

Many customers want to continue using their analog phones. JumboSwitch products in the TC3848 sub-series can connect analog phones to a virtual PBX over VoIP/MoIP (Modem over VoIP) or connect two phones together over a crash phone line.

The TC3848-1/-2 VoIP Virtual PBX cards provide four FXS channels and one FXO channel, or five FXO channels, respectively, to connect up to four analog phones per card over VoIP via a virtual PBX. Meanwhile, TC3848-3/-4 Modem over IP cards can link analog phones or legacy dial-up devices including data modems, fax machines, meter, ATMs, and credit card readers over Ethernet/IP or MPLS networks.
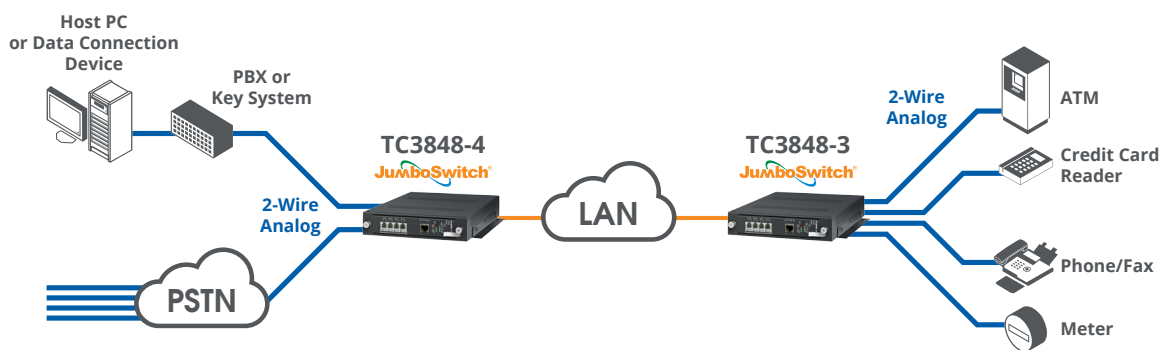
TC3848-1/-2 cards can also be used to provide an FXS-to-FXS hotline connection between two crash phones.

Essentially, when one phone receiver is picked up, it will cause the other phone on the hotline to ring until it is also picked up. This setup can be duplicated several times to create an entire crash phone network, which allows multiple phones to ring simultaneously; a connection is established once the first phone is picked up.

For a more in-depth look at some of our phone solutions, please watch this SLSS (Substation Line Sharing Switch) video.

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## T1-over-Ethernet Connectivity Using JumboSwitch

Although newer technologies such as private LTE, fixed wireless, and fiber have reduced the number of T1 lines in use, many customers still require T1s for their systems. To provide T1 over Ethernet we would use TC3845-1 T1/E1-over-IP Gateway, which offers up to four T1s over Ethernet.
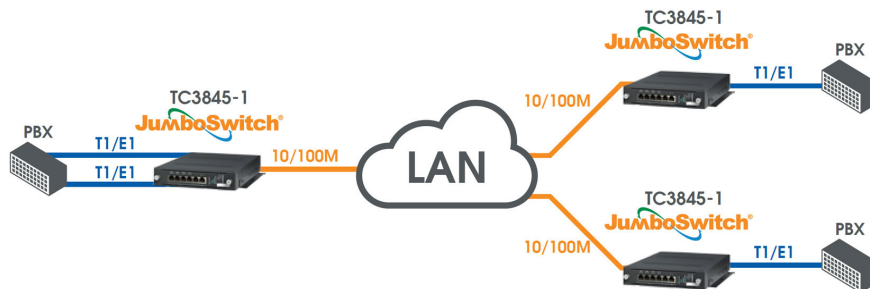
Ethernet Ring Protection Switching (ERPS)

For customers looking for a way to achieve lower-capacity Ethernet rings in their broadband network, the JumboSwitch does provide a full Ethernet switch range for this purpose. Our extremely fast 10G TC3850-1 is our top-of-the-line Ethernet switch, while our standard JumboSwitch models provide 2.5G rings.

Any of them are suitable for Ethernet switching, which provides high network reliability and prevents loops from forming at the Ethernet layer. Except the 10G, which costs more, our Ethernet switches are a cost-effective security solution for an organization's Ethernet backbone network.
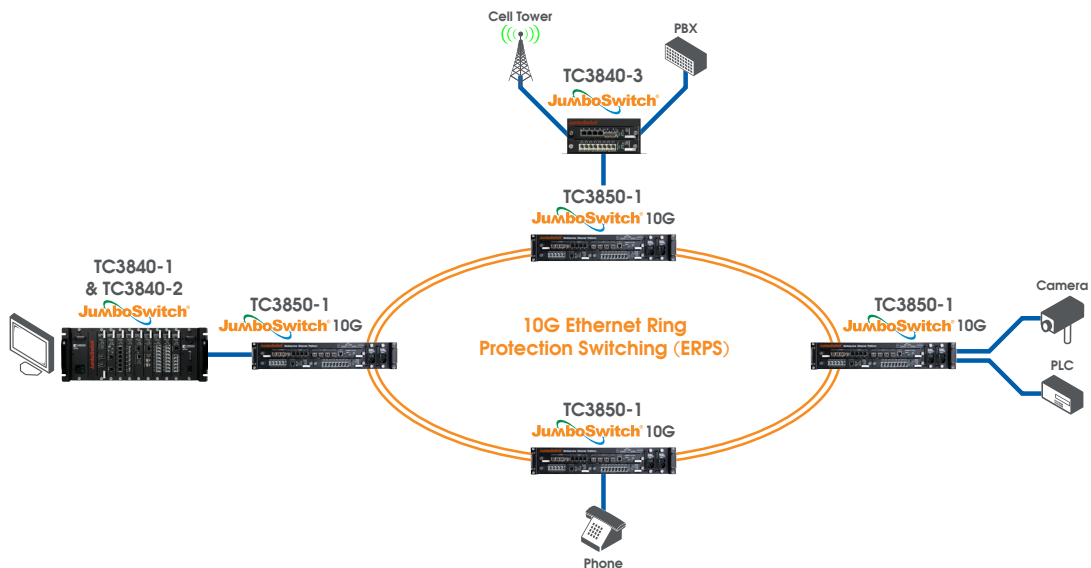
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Conclusion

Our JumboSwitch provides organizations with multiple solutions for preserving their legacy devices and providing connectivity to their IP networks while helping them avoid equipment replacement costs. All our products are designed, manufactured, and supported in the U.S. and come standard with a five-year warranty.

TC COMMUNICATIONS®