

Case Study

Data Center Networking Solution

FS 100G LR4 Solution Enables Stable Transmission for Broadcast Network


A Finnish broadcast tech provider partnered with FS to build dual 100G links across a high-loss fiber route. By recommending 100G LR4 modules and ensuring compatibility with Arista devices, FS delivered a reliable, scalable network to support professional broadcasting operations.

FS 100G LR4 Solution Enables Stable Transmission for Broadcast Network

Country

 Finland

Industry

 Sports, Media and Entertainment

Network Type

 Enterprise Data Centers

Solutions

 Internet Data Center

Highlights

- Utilized 100GBASE-LR4 modules (10dB link budget) to tackle transmission challenges in multi-level patch panel environments.
- Deployed LC duplex patch cords to simplify port connectivity and reduce link insertion loss.
- Conducted comprehensive compatibility verification with Arista switches to prevent faults and performance issues caused by mismatches.

Key stats

- Maximum transmission capacity: 200 Gbps (dual links), meeting bandwidth demands for 8K/16K ultra-high-definition applications.
- Link insertion loss approximately 10dB, supporting stable transmission over high-attenuation paths.

Overview

A Finland-based broadcast technology provider specializing in solutions for mobile production units, remote broadcasting, and studio infrastructure. To address the massive data flow of the 4K/8K UHD production era, the client planned to build dual 100 Gbps active-standby links over approximately 1 km between two buildings, enabling uncompressed ultra-HD video and real-time AR data transmission. The client aimed to deploy dual 100 Gbps wide channels on a single fiber link but faced risks of excessive bit error rates due to cumulative insertion loss and dispersion effects caused by multi-level patch panels. Confronting nonlinear impairments in long-distance transmission and device compatibility challenges, the client contacted FS in March 2024 for expert support. Through close technical collaboration, FS guided the client in product selection and successfully deployed a reliable fiber optic network.

Challenge

- Connector and splice losses
Multiple patch panels and connection points increase insertion loss, potentially exceeding transceiver power budgets and raising bit error rate risks.
- Synchronization and latency requirements
Broadcast applications demand extremely low latency and tight synchronization; dual-link design must ensure latency consistency to avoid impacting live production.

- Transmission reliability requirements
Dual 100G links require 1+1 protection switching to guarantee fast, reliable failover, with physical layer redundancy to prevent service interruption from fiber cuts.
- Multi-vendor interoperability
Ensuring interoperability between different vendors' equipment (e.g., Arista switches and optical modules) to avoid compatibility issues affecting link stability.

Solution

After receiving the client's initial inquiry about building a 100G long-distance link, FS's technical team responded promptly. The client shared a rough schematic of the link, indicating multiple fiber patch panels along the path. Each distribution frame contains multiple fiber connectors and patch cords, and these physical connection points inevitably introduce insertion loss. Additionally, factors such as connector end-face quality, patch cord type, and interface matching also affect signal attenuation. When multiple distribution frames are connected in series, the losses accumulate progressively, resulting in a significant increase in total link insertion loss. Based on the client's estimate of approximately 0.5dB insertion loss per distribution frame, FS assisted in evaluating the worst-case scenario—a total attenuation of up to 10dB, which exceeds the typical power budgets (6–8dB) of most commonly used 100G modules for 1km deployments, such as SR4, CWDM4, or PLR4L.

To ensure stable transmission under such high-loss conditions, FS recommended using 100GBASE-LR4 10km optical modules with a higher power budget (up to 10dB), providing sufficient margin to accommodate

potential attenuation. Since the client intended to build two parallel 100G links, FS proposed a solution based on a backbone networking architecture between buildings, designating the left building (Building A) and the right building (Building B) as core nodes. The physical connection was established by deploying a 1,000-meter single-mode optical fiber. Arista data center switches were configured at both ends of the link, equipped with 100GBASE-LR4 QSFP28 optical modules (center wavelength 1310 nm, transmission power -4.3 to 4.5 dBm, receiving sensitivity -10.6 dBm). The interface conversion between the equipment and the patch panel was completed using LC duplex fiber patch cables.

To meet the stringent latency and synchronization demands of broadcast applications, FS prioritized latency consistency across the dual links in the solution design. By precisely assessing fiber lengths, optical module performance, and relay node structures, FS ensured end-to-end latency alignment between the two 100G links, effectively preventing data stream asynchrony from impacting live production. The solution also implemented 1+1 protection switching with physical layer redundancy to guarantee fast, reliable failover and avoid service disruption caused by single fiber breaks.

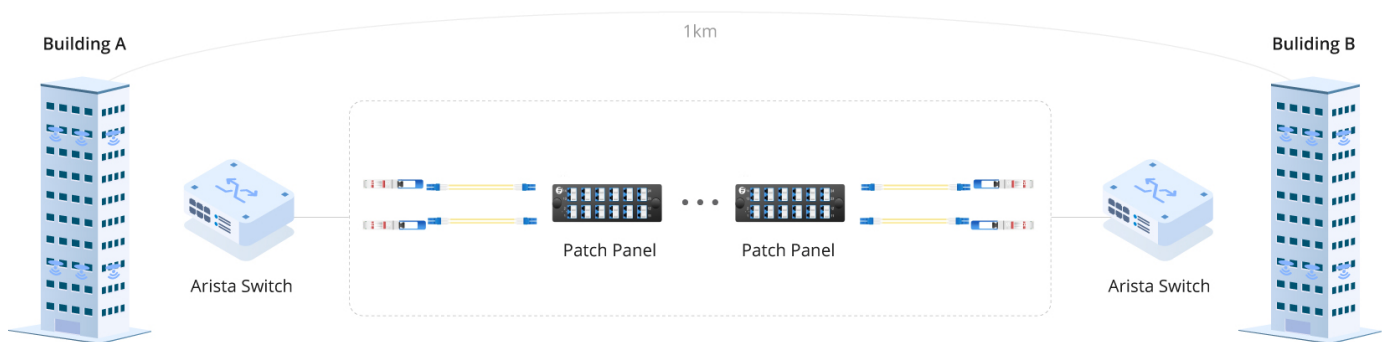
Beyond product selection, FS collaborated closely with the client to verify compatibility with Arista switches using QSFP28 ports, confirming key parameters such as coding and interface type to guarantee plug-and-play functionality.

To further enhance understanding, FS provided a customized network topology diagram, clearly illustrating the application of each optical module, fiber link direction, and interconnection between devices. This visual aid not only accelerated the client's internal approval process but also strengthened their confidence in the solution.

Throughout the engagement, FS supported the client from initial uncertainty to decisive action. With expert technical consultation, compatibility assurance, and clear visual guidance, FS helped the client confidently finalize their configuration. The team's scenario-based recommendations addressed both technical constraints and compatibility needs, significantly streamlining the design and purchasing process. In addition, FS's standard return and warranty policies further reinforced the client's trust, providing a worry-free procurement experience that supported a smooth and secure implementation of the long-distance 100G network.

Results

With FS's expert guidance and rapid support, the broadcast technology client successfully deployed dual 100G links over a fiber path with approximately 10dB insertion loss, ensuring ultra-stable, low-latency transmission essential for live and remote broadcasting applications. The solution also eliminated device compatibility issues while enabling flexible networking to support diverse broadcast workflows and future expansion.



Product List

Product	ID	FSP/N	Description
100G Module	104847	QSFP-LR4-100G	Arista Networks QSFP-100G-LR4 Compatible 100GBASE-LR4 QSFP28 1310nm 10km DOM Duplex LC/UPC SMF Optical Transceiver Module
Fiber Patch Cable	40191	SMLCDX	1m (3ft) Fiber Patch Cable, 2 Fibers, LC UPC Duplex to LC UPC Duplex, Single Mode (OS2), Riser (OFNR), 2.0mm, Tight-Buffered, Yellow



United States

Address: 380 Centerpoint Blvd, New Castle, DE 19720, United States

Tel: +1 (888) 468 7419

Email: US@fs.com

For more information, welcome to visit www.fs.com

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