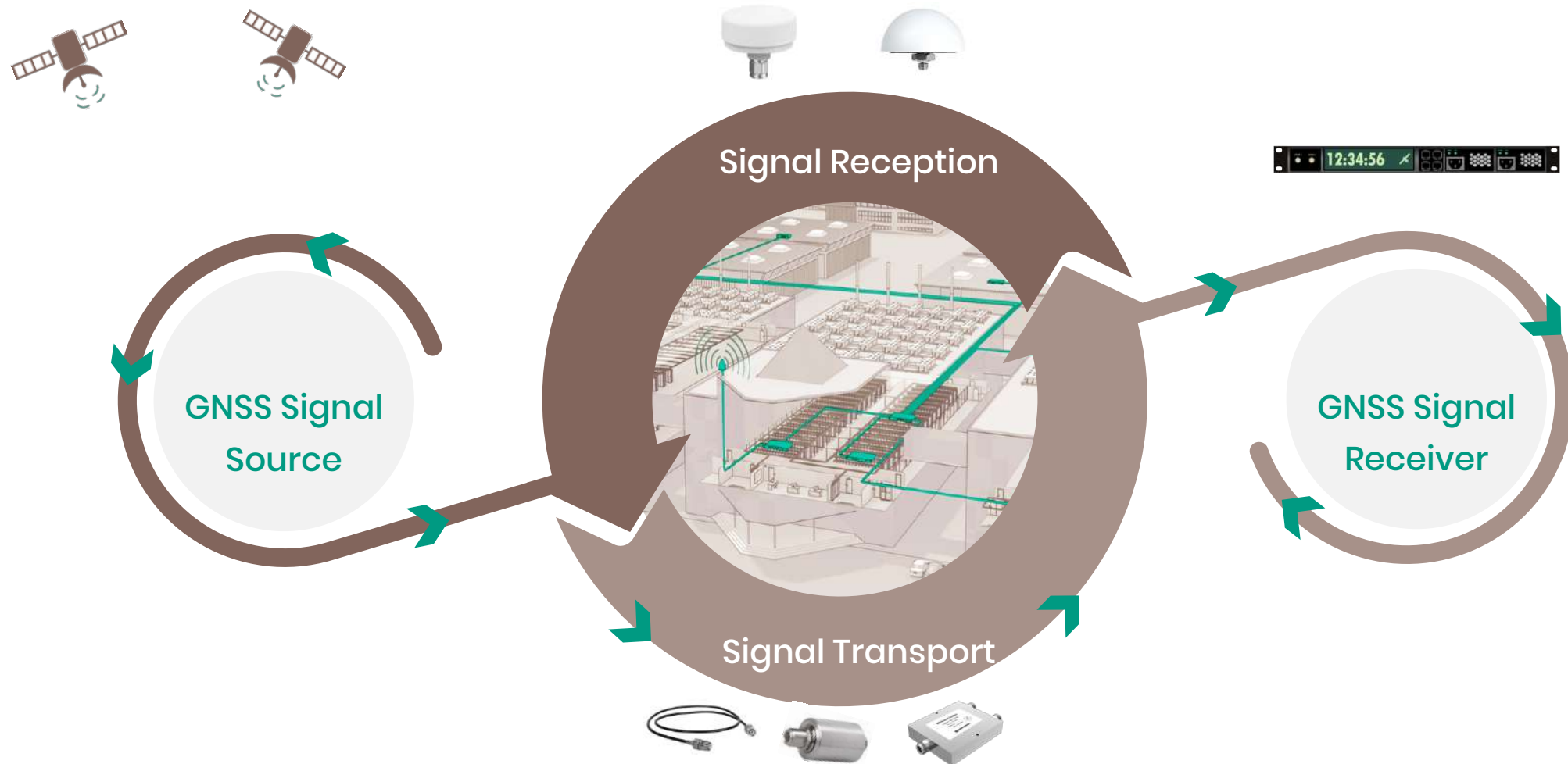


HUBER+SUHNER

Fiber-Enhanced GNSS Distribution

GNSS Signal Journey

Satellite to Synchronised Packet



GNSS deployment – today...

Hyperscale



Colocation



Enterprise



Current solution

Today's challenges and limitations

Solution

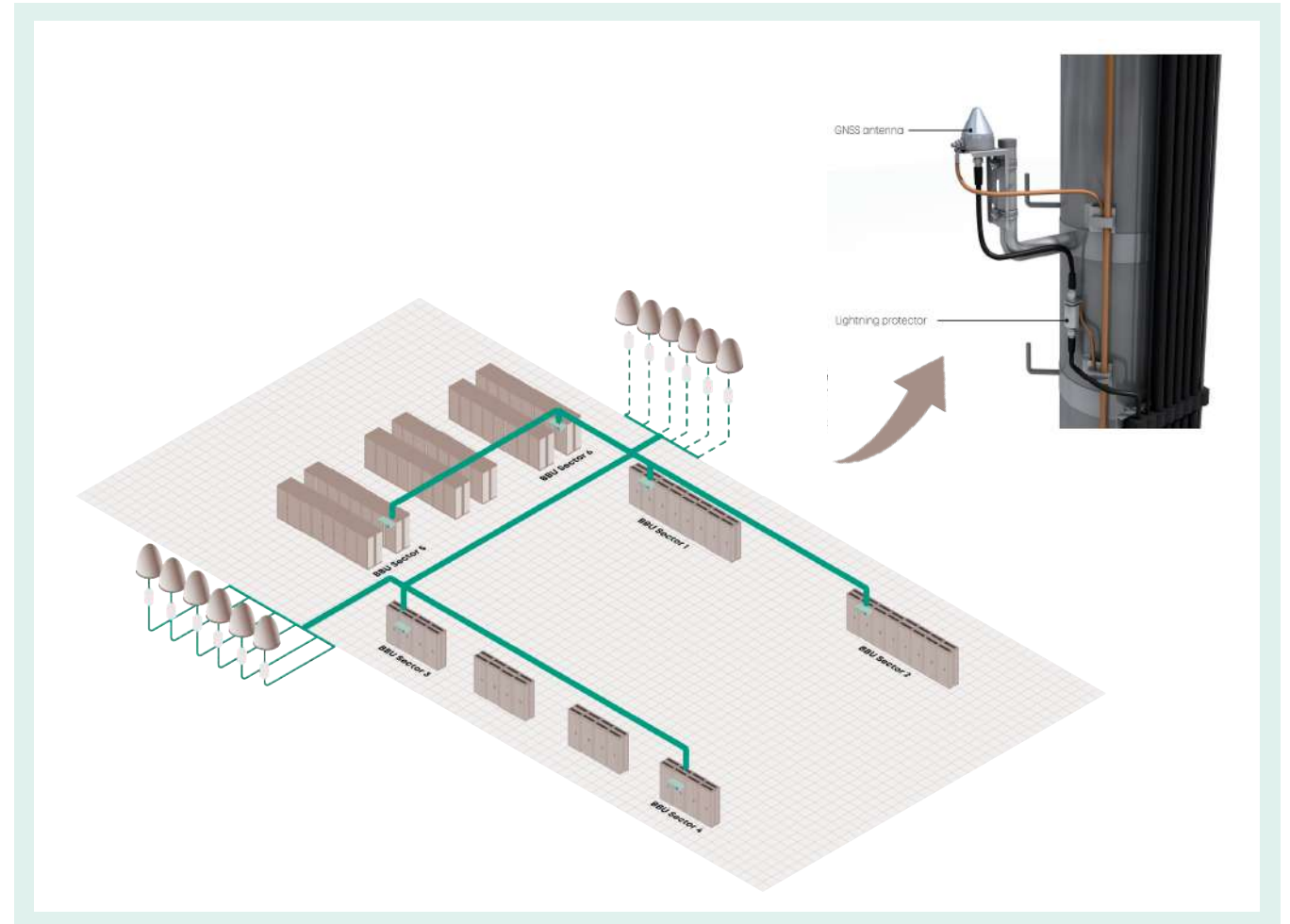
- Passive antenna, Coax and Lightning arrestor setup

Infrastructure

- Single shaft (cable riser) to run all the cables
- No powering needed at rooftop
- challenge to find RF trained installers

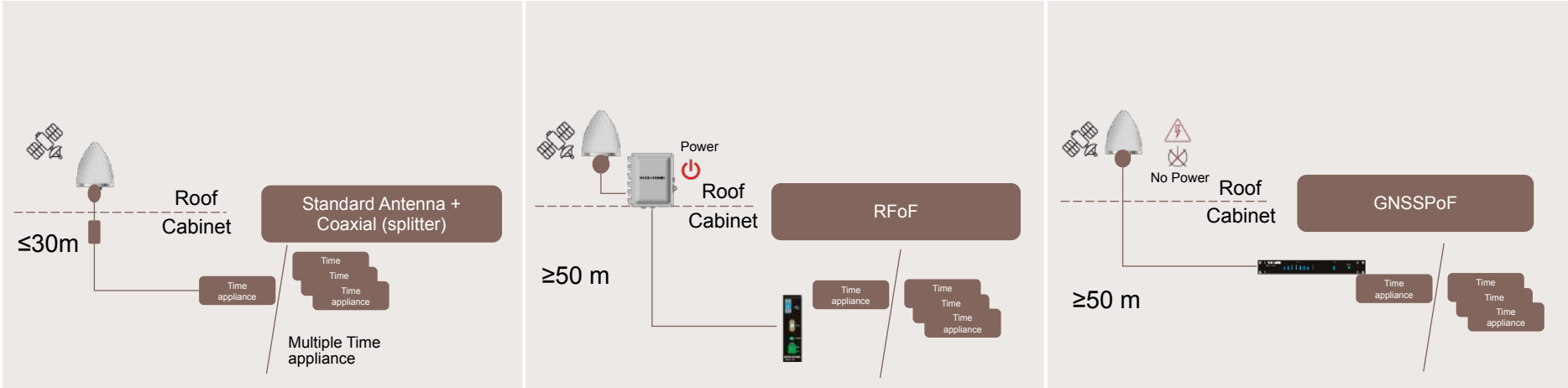
Technical challenges

- Coaxial limitations: high attenuation leads to shorter range and reduced scalability.
- Susceptibility to electromagnetic interference
- Mandatory additional lightning protection
- Reduced service life due to environmental and electrical stresses



Fiber-Enhanced GNSS Distribution

Solution Comparison

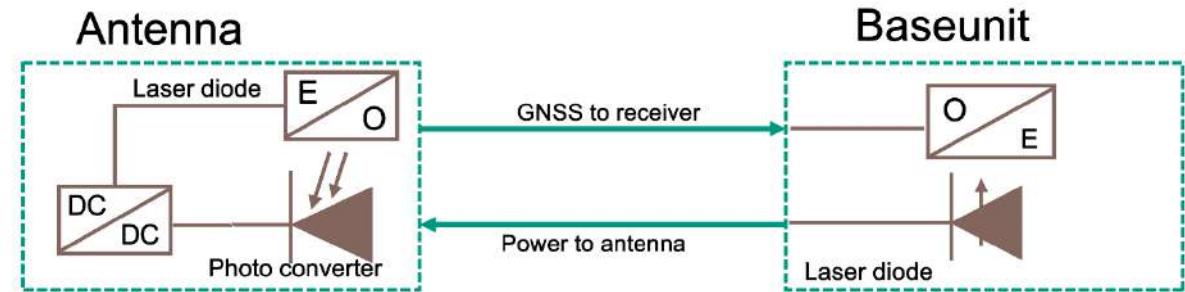


Solution type	Legacy Solution	RF-over-Fiber	RF and Power-over-Fiber
Long distance ($\geq 50\text{ m}$)	✗	✓	✓
Lightning / Grounding	✗	✗✓	✓
Scalability	✗	✓	✓
Remote powering (External)	✓	✗	✓
Ease of installation	✗	✗	✓
Antenna positioning	✗	✗✓	✓

Infrastructure Challenges

Antenna Power Supply via Power-over-Fiber (PoF)

- Power and GNSS signal utilises the **same fiber**
- A **high-power laser** converts electrical power to optical.
- The antenna converts **optical power back to electrical** to feed active components.
- **Multiple fibers** in one cable reduce optical hazard level.
- GNSS power needs result in **Laser Class 1M** – safe for standard use.
- **No special safety measures** needed, except switching off laser during connector inspection.
- Compatible with **standard building fiber infrastructure**.



GNSS Signal Transmission for Timing Application

Management of Fiber Link Parameters

Monitoring parameters

- Laser current, Received optical power
- Antenna status
- Receiver power consumption

Integrated GNSS receiver

- supports install and diagnostics/ troubleshooting
- detects jamming and spoofing threats.
- Possible integration of hold over time

Critical timing indicators:

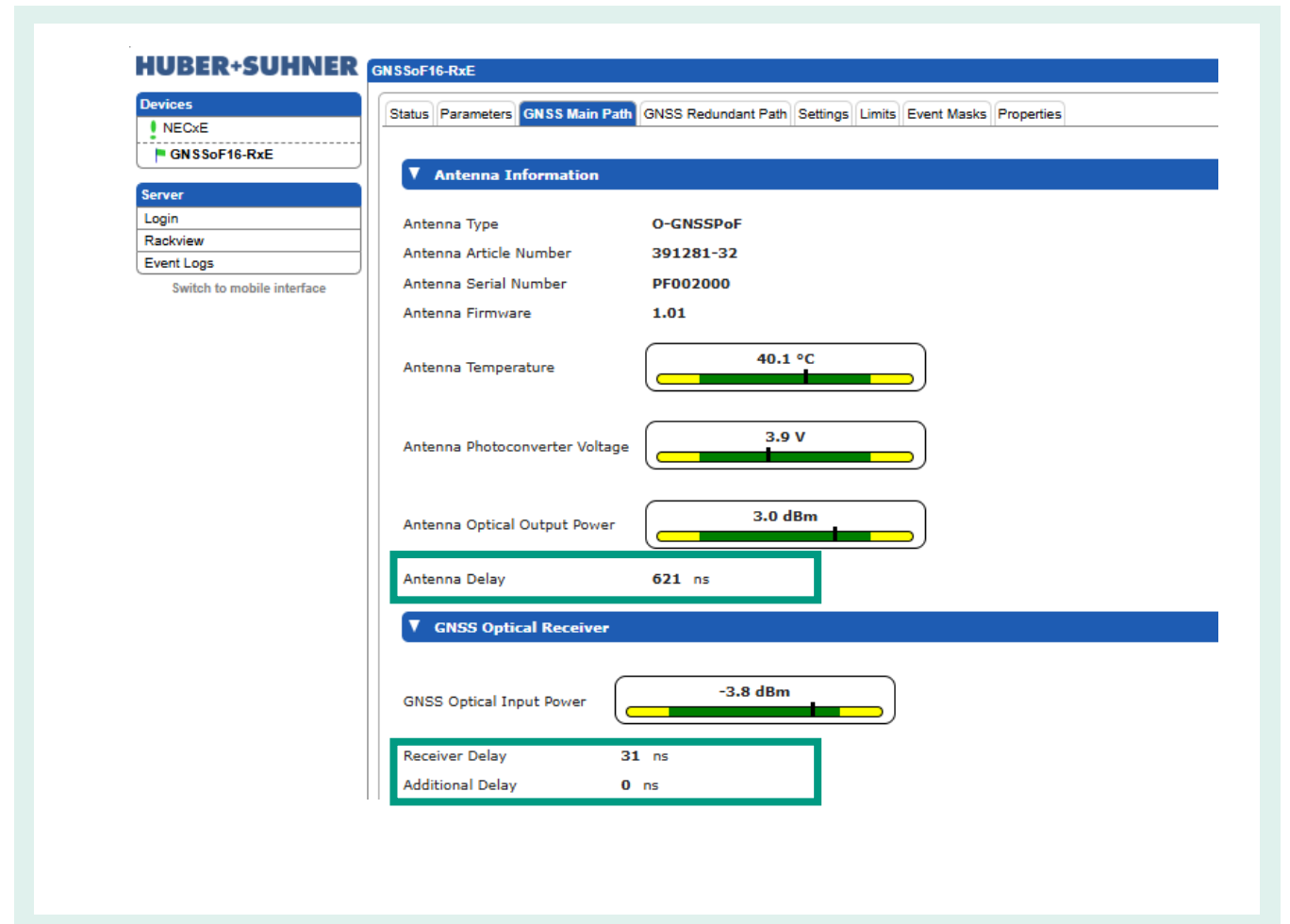
- Number of received satellites
- Signal-to-noise ratio (SNR)
- 3D accuracy & dilution of precision
- GNSSoF link delay

Access options:

- Local: WebGUI, CLI
- Remote: SNMP, Restconf/YANG, Netconf/YANG

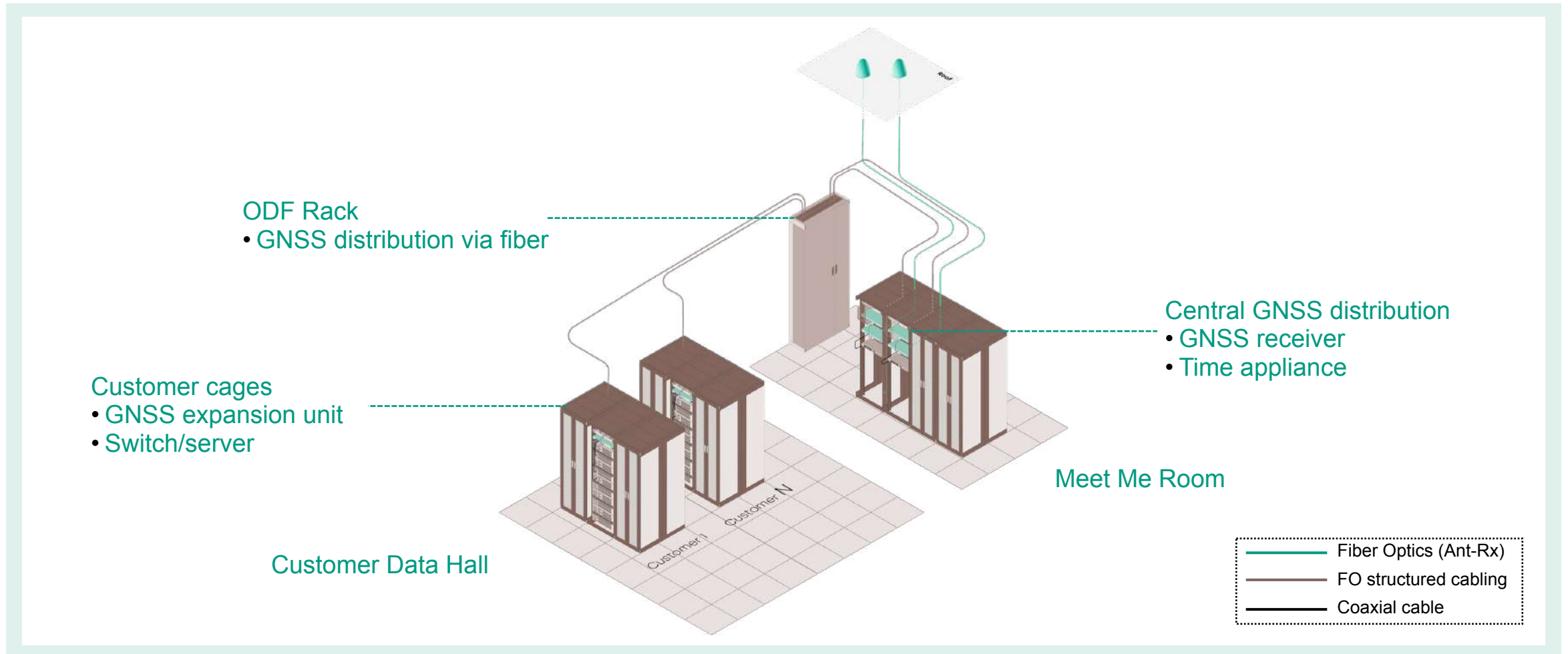
Future development

- Automatic detection and mitigation of impairments.



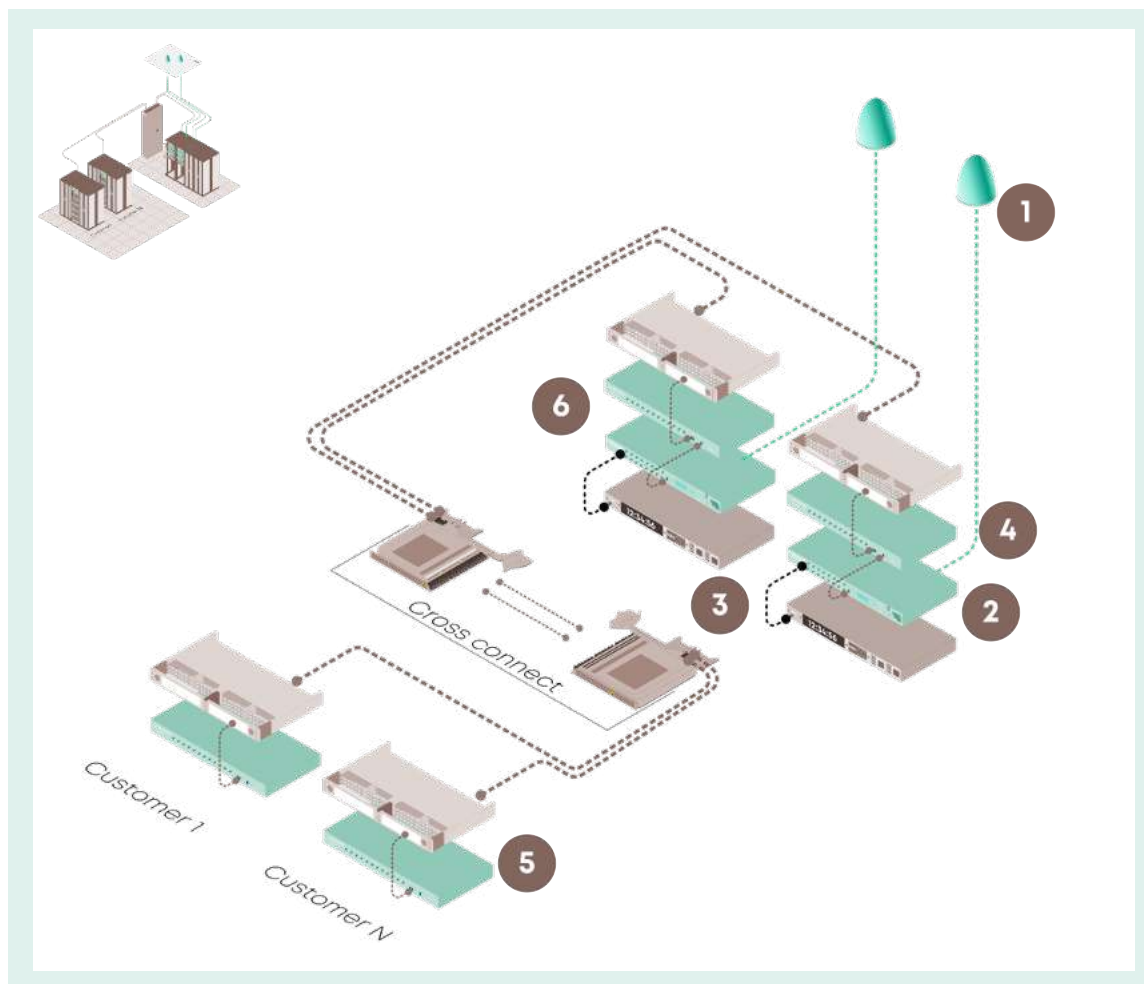
Use Case

Colocation (Multi-tenant)



Use Case

Colocation (Multi-tenant)



Typical deployment setup

- 1 shared GNSS PoF system (1,2)
- Coaxial connection to host time server (3)
- GNSS distribution via Fiber (patch panel or optical splitter) to tenant's cage (4)
- Expansion module at the tenant cage (5)
- **Optional:** Additional GNSS PoF module for redundancy (6)

Practical advantages

Shared infrastructure: One rooftop antenna and PoF transmitter can serve multiple tenants

Tenant isolation: Fiber can be easily routed to tenant cages without exposing the raw coax or complicated signal splitters

Scalable growth: Adding new tenants only requires running additional fiber drops.

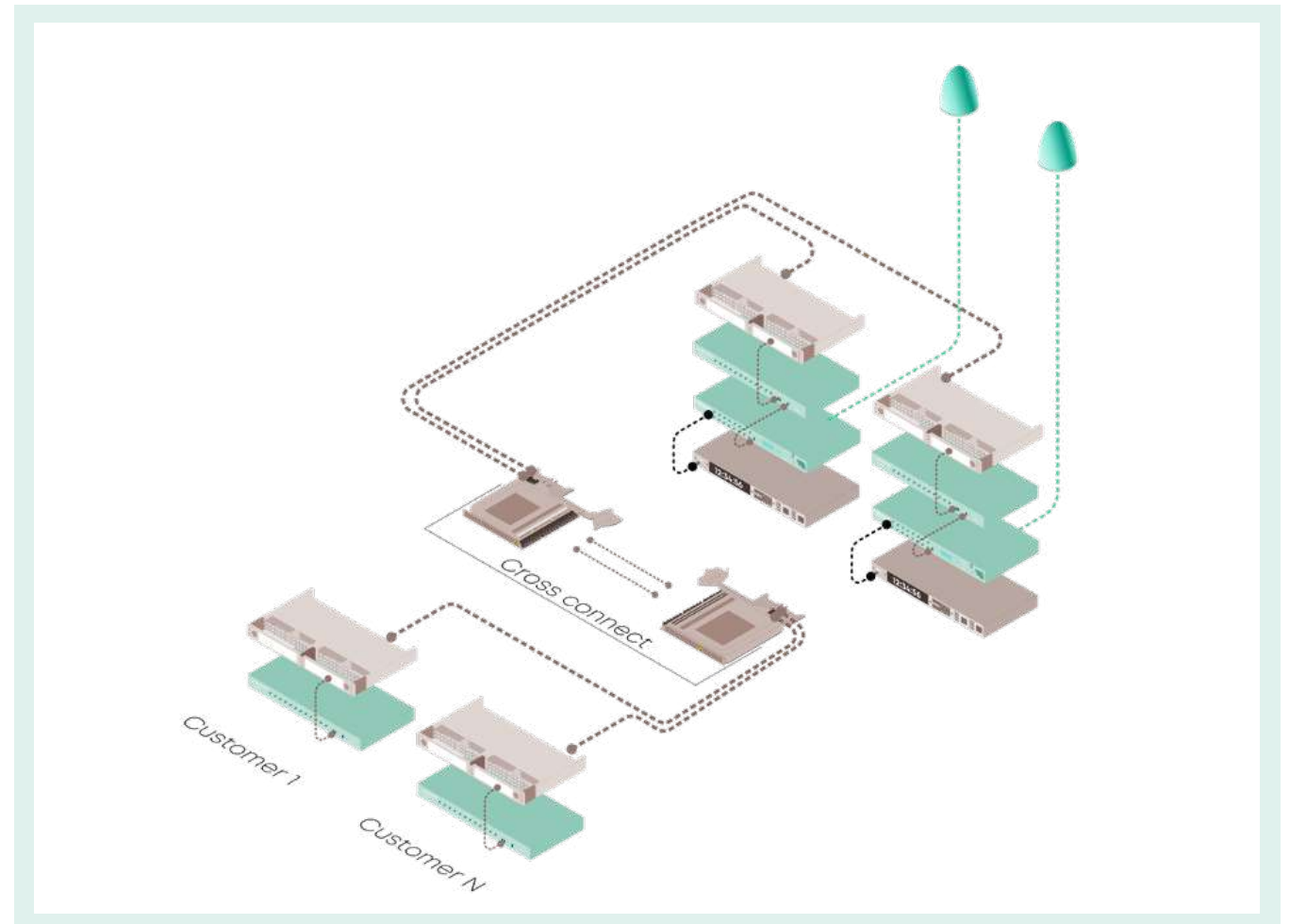
Implementation tip

“GNSS timing service” as part of the colocation package – tenants simply plug into their fiber patch for immediate, accurate timing

GNSS Signal Transmission for Timing Application

Link Redundancy and Security

- **Different antenna positions** help detect and mitigate jamming/spoofing.
- **RF filters** in the antenna reduce out-of-band interference, enable Multi band reception for improved accuracy
- **Two separate fiber cables**, each with its own antenna to two separate receivers
- A **redundancy switch** selects the best-performing signal at the receiver.
- If both main and backup signals degrade, the system enters **holdover mode** to maintain timing quality.



Summary

- **Fiber-enhanced GNSS** distribution delivers precision, scalability, and reliability for demanding timing applications. Overcomes **legacy limitations**: longer range, simplified infrastructure, safer installation, and minimal maintenance requirements.
 - 40× longer reach - no repeaters needed
 - ≥ 10 dB improvement in GNSS SNR
 - 80% reduction in installation time
 - No infrastructure upgrade required
 - Instant scalability and plug-and-play integration for future growth
- **Power-over-Fiber (PoF)** enables resilient, location-agnostic antenna deployment to ensure true operational redundancy.
100% fiber optic based - Zero electrical hazards at the antenna
- **Modular design** supports diverse infrastructure needs - from hyperscaler data centers to colocation facilities and Enterprise datacenters, from RAN hub to DAS and many more—enabling future-proof growth and cost-effective expansion.
- **Integrated diagnostics / threat detection features and redundancy** add another level of safety, guarantee continuity and security for mission-critical timing services.



Connecting – today and beyond