DIRECT GPS OVER FIBER

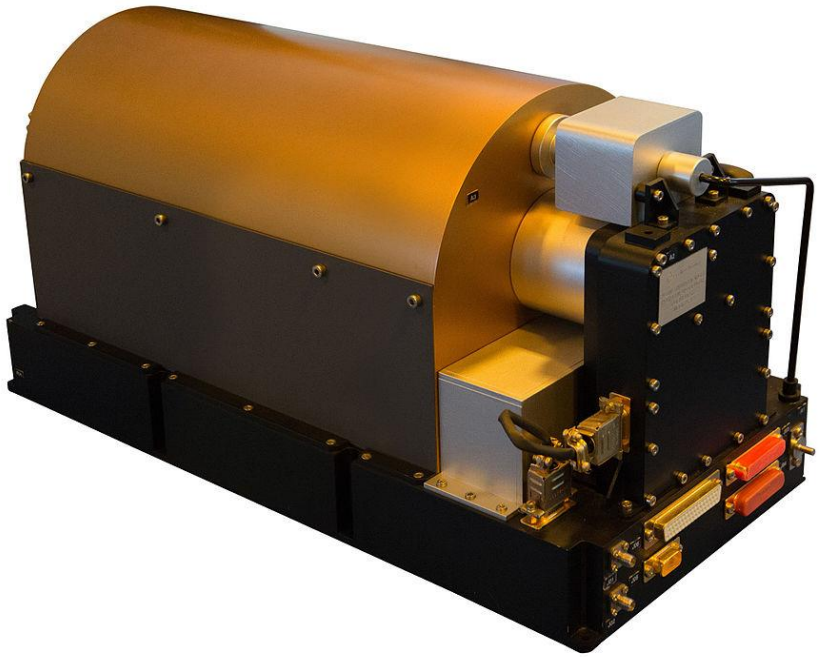
A scalable timing infrastructure solution

Direct GPS-over-Fibre

- How to get precise timing information?
- Why is timing important?
- How is time brought to the datacentre?
- Challenges in coax GNSS timing
- Basic GPSoF links
- Direct GPS-over-Fibre portfolio
- Connection scenarios

How to get precise timing information?

- GNSS satellites are equipped with atomic clocks which utilize internal oscillators to deliver timing measurements accurate to 5 ns.
- GNSS clocks are synchronized with UTC with earth based even more precise atomic clocks.
- This provides us with the world's most precise, stable source of timing information.

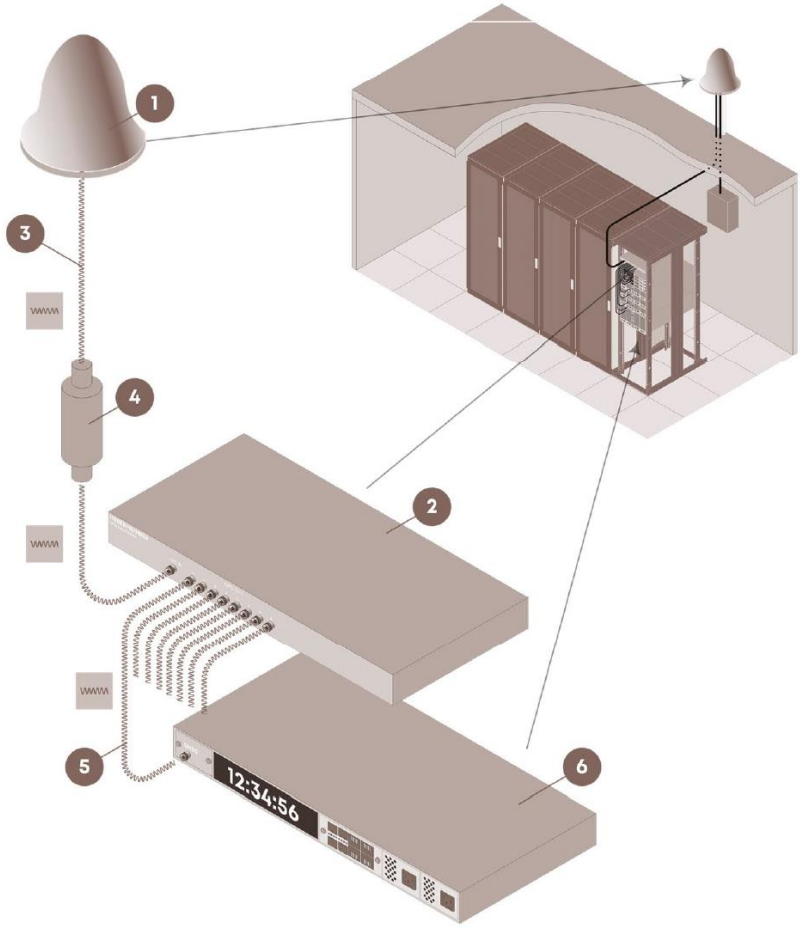


Why timing is important?

- Timing and synchronisation are very important to cloudbased and hosted data services to meet standards that are being set by national or international regulatory authorities, for instance in the financial sector.
- Global Navigation Satellite Systems (GNSS), such as GPS, GLONASS, Galileo and Beidou, provide a worldwide timing service interconnected with all critical infrastructures of our society.

How is time brought to the datacentre?

- Common GNSS infrastructure installed in the field today consists of an active GNSS antenna (1) connected by coaxial cable (3) to the receiver system (2) or the end device (6). End devices are connected via coaxial patch cables (5).
- The connecting coaxial cable requires dedicated lightning protection (4)

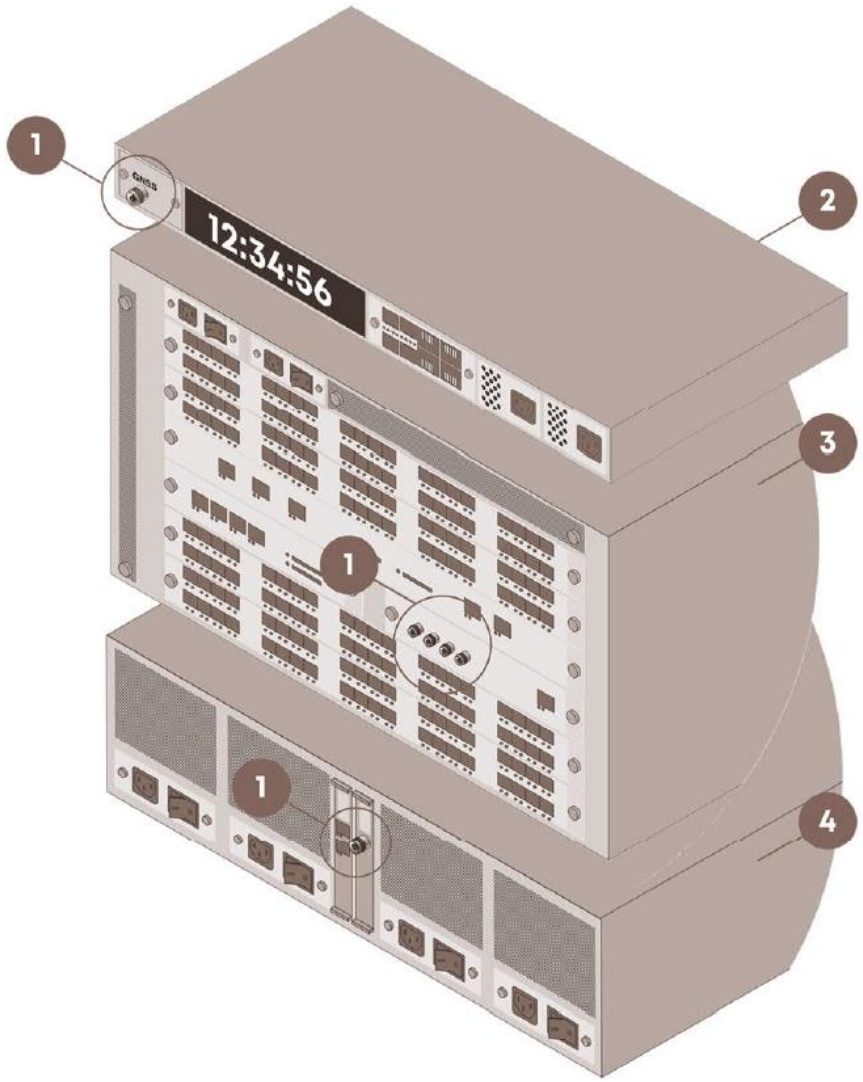


End devices

Global Navigation Satellite System (GNSS) is the infrastructure that allows users with a compatible device to determine their position, velocity and time by processing signals from satellites. Examples of GNSS: GPS, GLONASS, Galileo and others.

GNSS connections (1) in the data center may be required for:

- Grand master clocks, for timing applications (2)
- GNSS line cards of routers (3)
- GNSS PCI cards for timing sensitive servers (4)



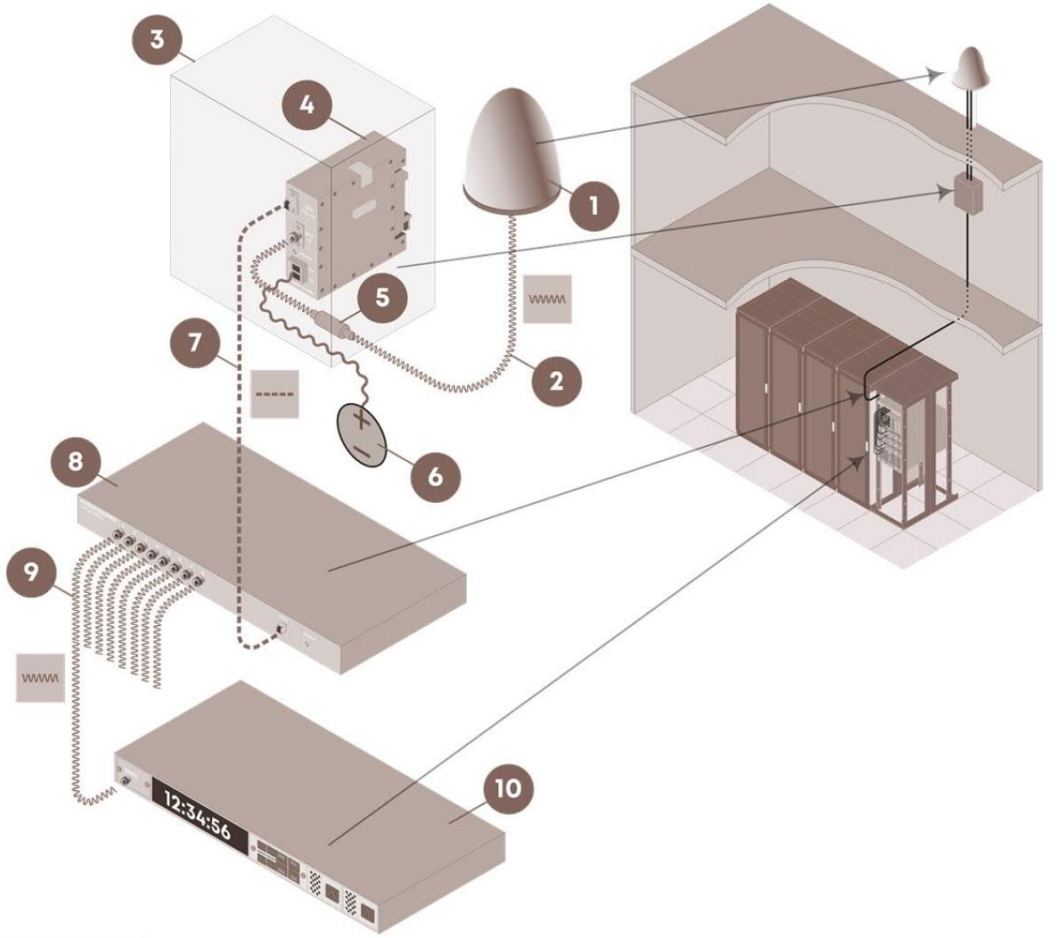
Challenges in coax GNSS timing

- Lack of scalability
- Short distances
- Power infrastructure required
- Lightning protection required

Basic GPSoF Link

GPS-over-Fiber (GPSoF) technology allows the conversion of RF to FO in order to transmit over longer distances via fiber optic cable including:

- GNSS Antenna (1)
- GPSoF Transmitter (Tx) Module (4)
- FO Cable (7)
- GPSoF Receiver (Rx) Module (8)
- Power supply (6) and Lightning Protection (5)



World’s first truly copperless link!

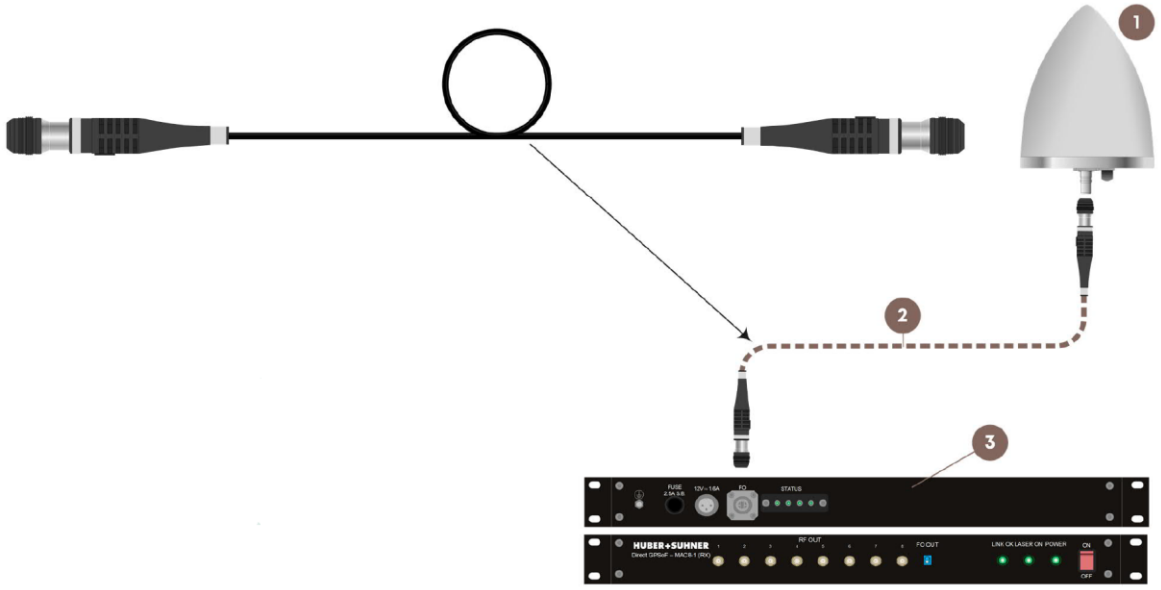
- Uses Fiber Optic cable to distribute both power and signal.
- Allows for greater distance of up to 7km between antenna and receiver system.
- Less hardware due to the antenna integrated GPS-over-Fiber transmitter in addition to a portfolio of various expansion and receiver modules
- NEBS Level 3 Carrier Grade

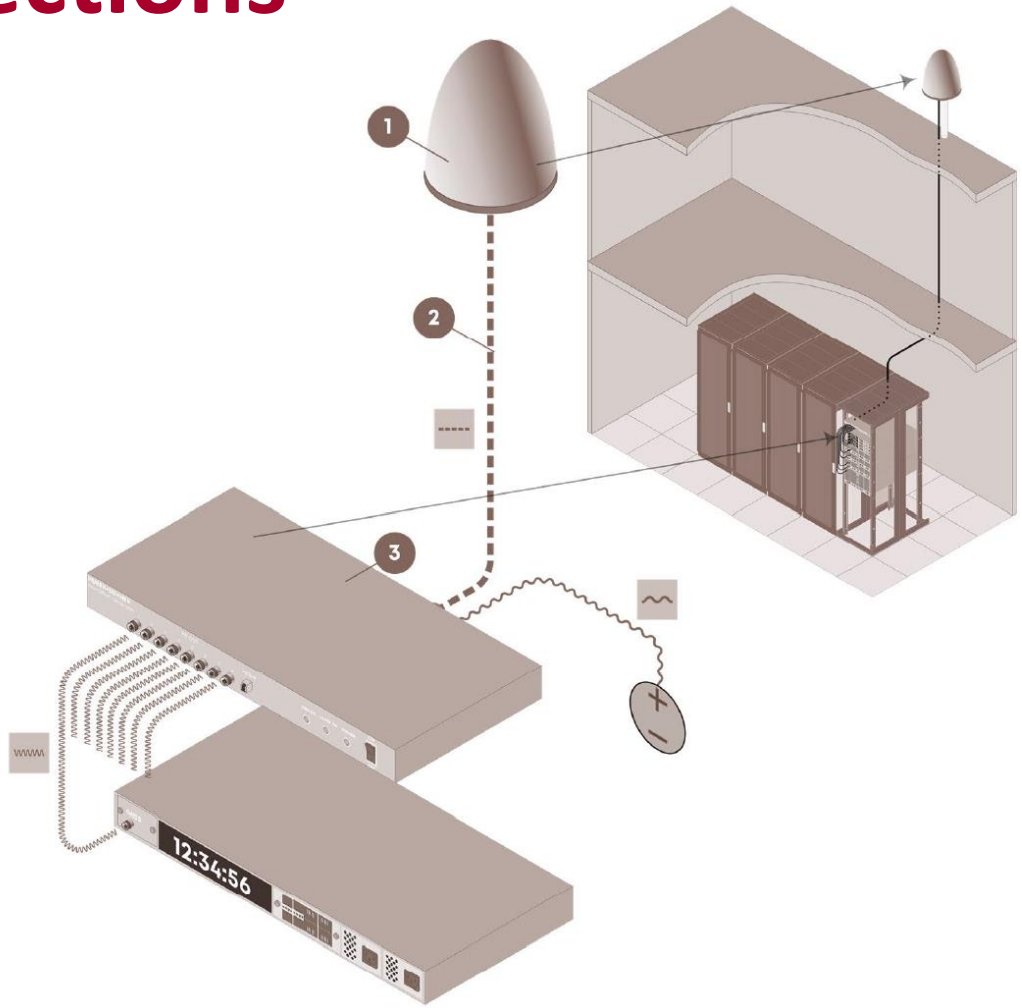
Direct GPS-over-Fiber portfolio

- For telecommunication and datacenter customers in search of scalable timing infrastructure solutions for outdoor remote antenna applications:
  - Offers fast and easy-to-install solutions for timing infrastructure
  - With antenna integrated transmitters which reduce hardware costs by taking away the need for multiple GNSS antennas
  - Can reach longer distances over fiber optic cabling and eliminates the need for costly remote antenna power infrastructure.

Direct GPS-over-Fiber connections

- GNSS Antenna (1)
- FO Cable Q-ODC to Q-ODC (2)
- Direct GPSoF Receiver (Rx) Module (3)

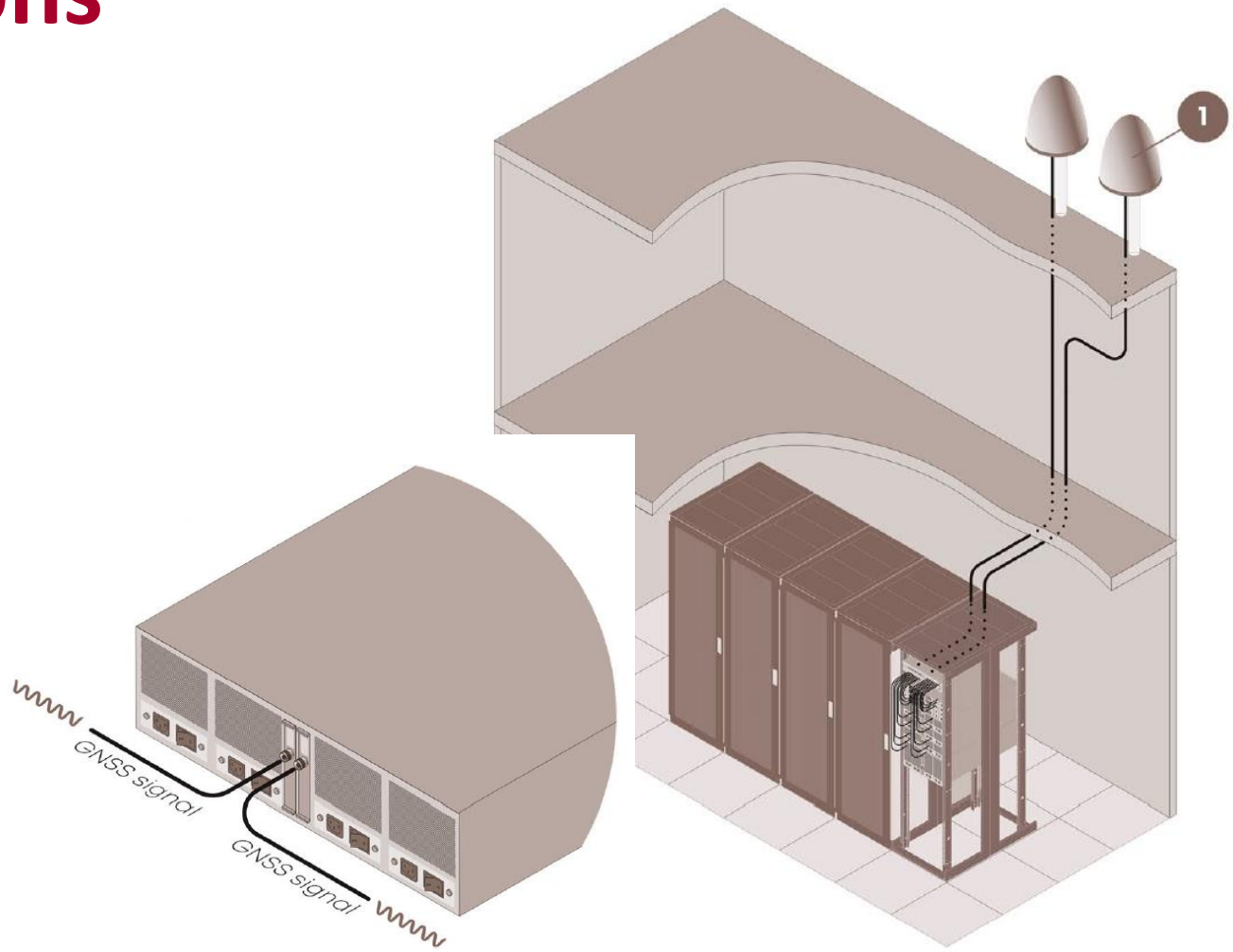




Redundant connections

Simple antenna deployment (just one cable) allows to add more antennas (1) when required, for example to deploy redundant connection to the end device.

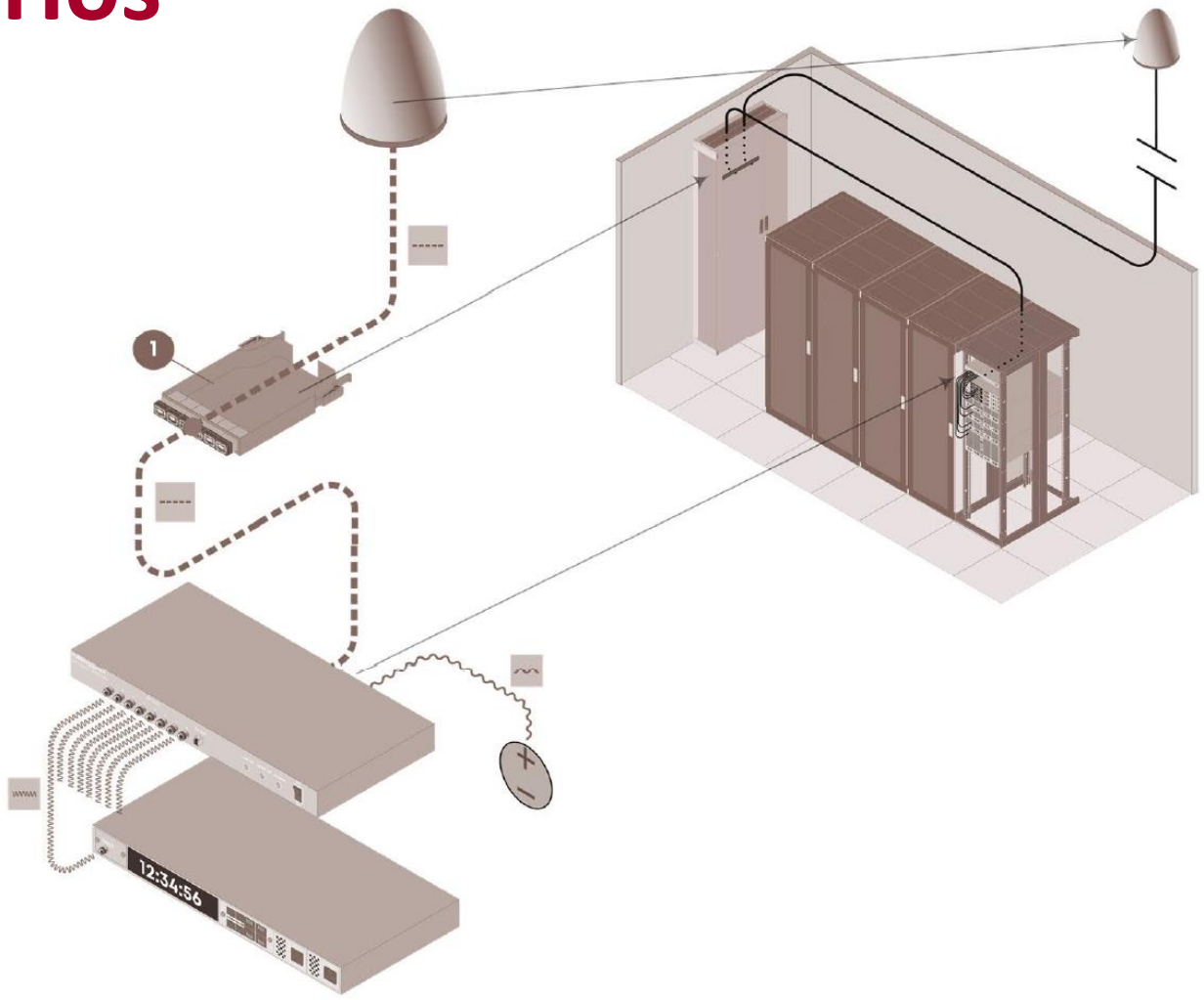
The benefit of this approach is that there are no additional outside boxes, power cables, lightning protection and power switches required.



More connection scenarios

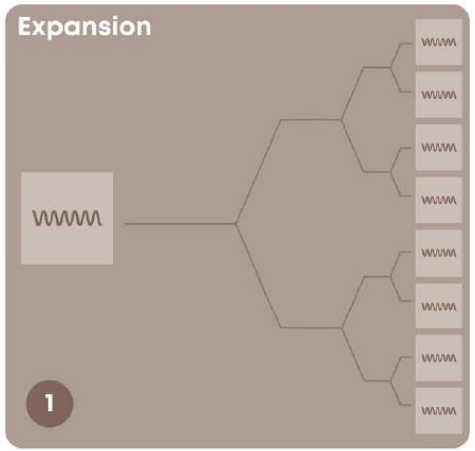
Because only fibre optic cable is connecting the antenna and receiver, it is possible to integrate intermediate distribution points.

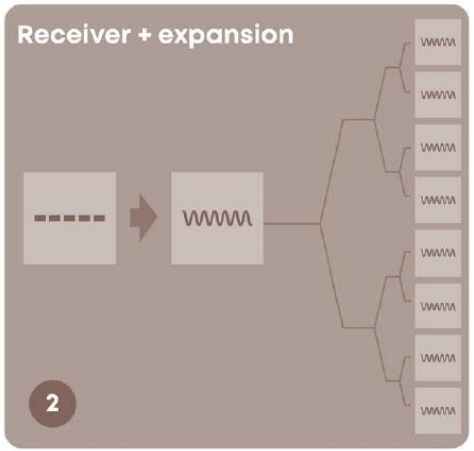
That makes the planning easier, because the location of the receiver may change in the datacentre.



GPSoF building blocks

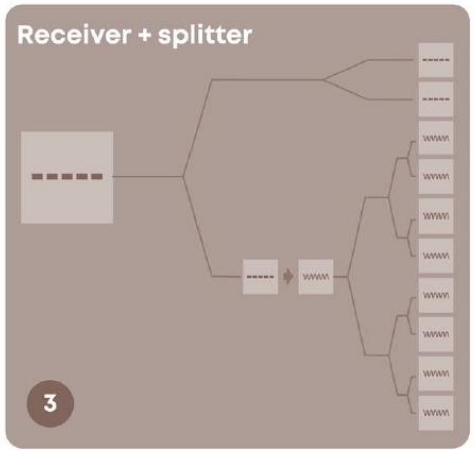
The expansion module allows to split a RF GPS signal with active loss compensation through amplification.

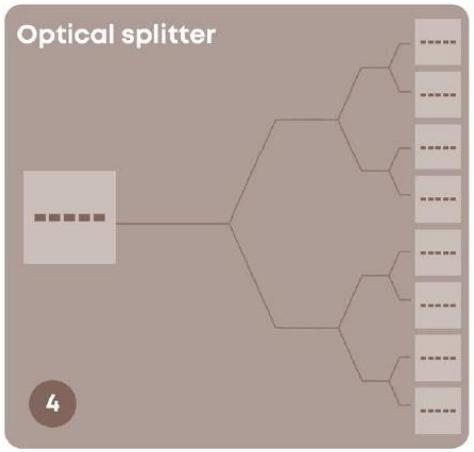




The receiver and expansion module allows to connect to a FO signal which can be converted and split into multiple RF signals.

The receiver and splitter module allows to connect to a FO signal which partially can be split and converted into multiple RF signals.

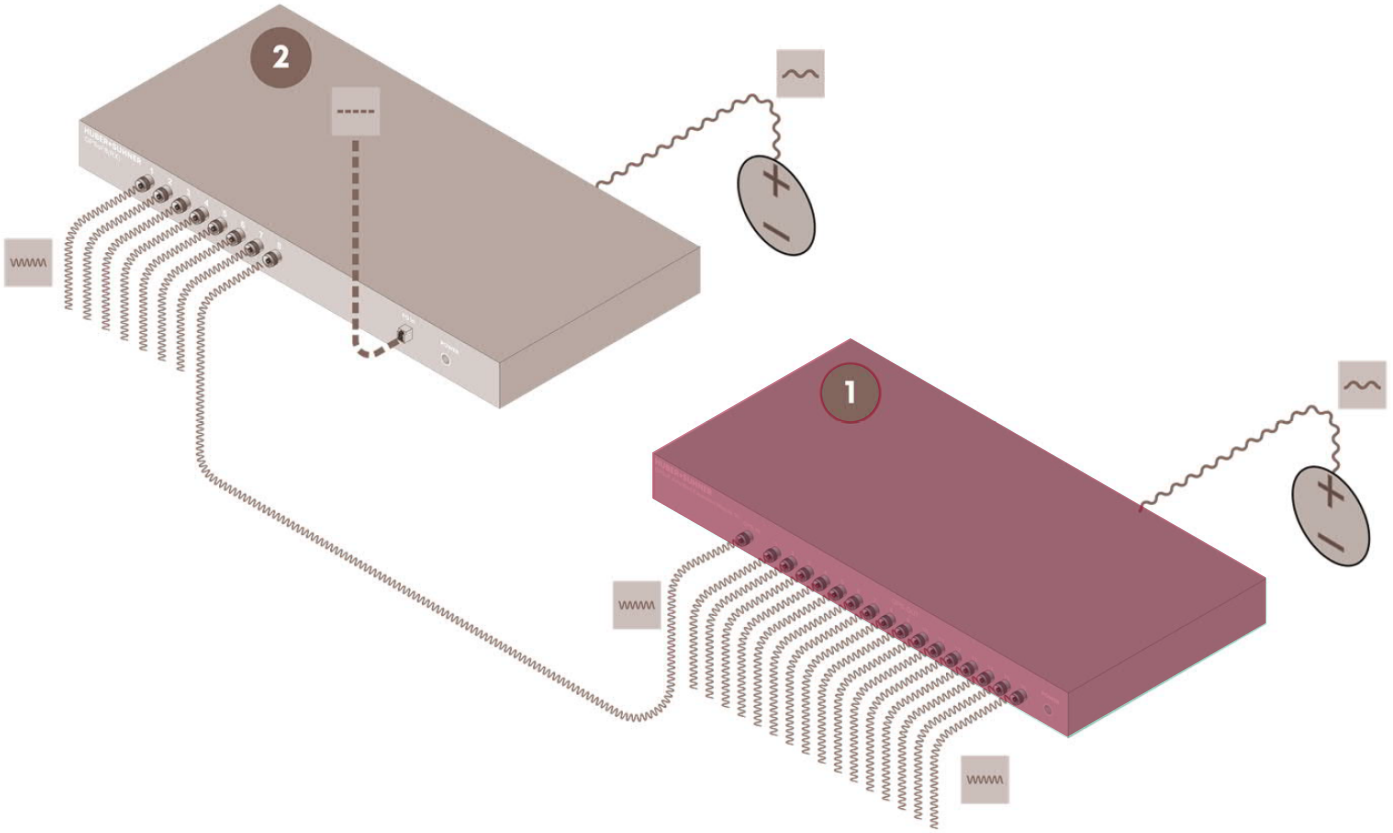




The splitter module allows to connect to a FO signal and split with loss compensation into multiple FO signals.

RF Expansion modules to expand

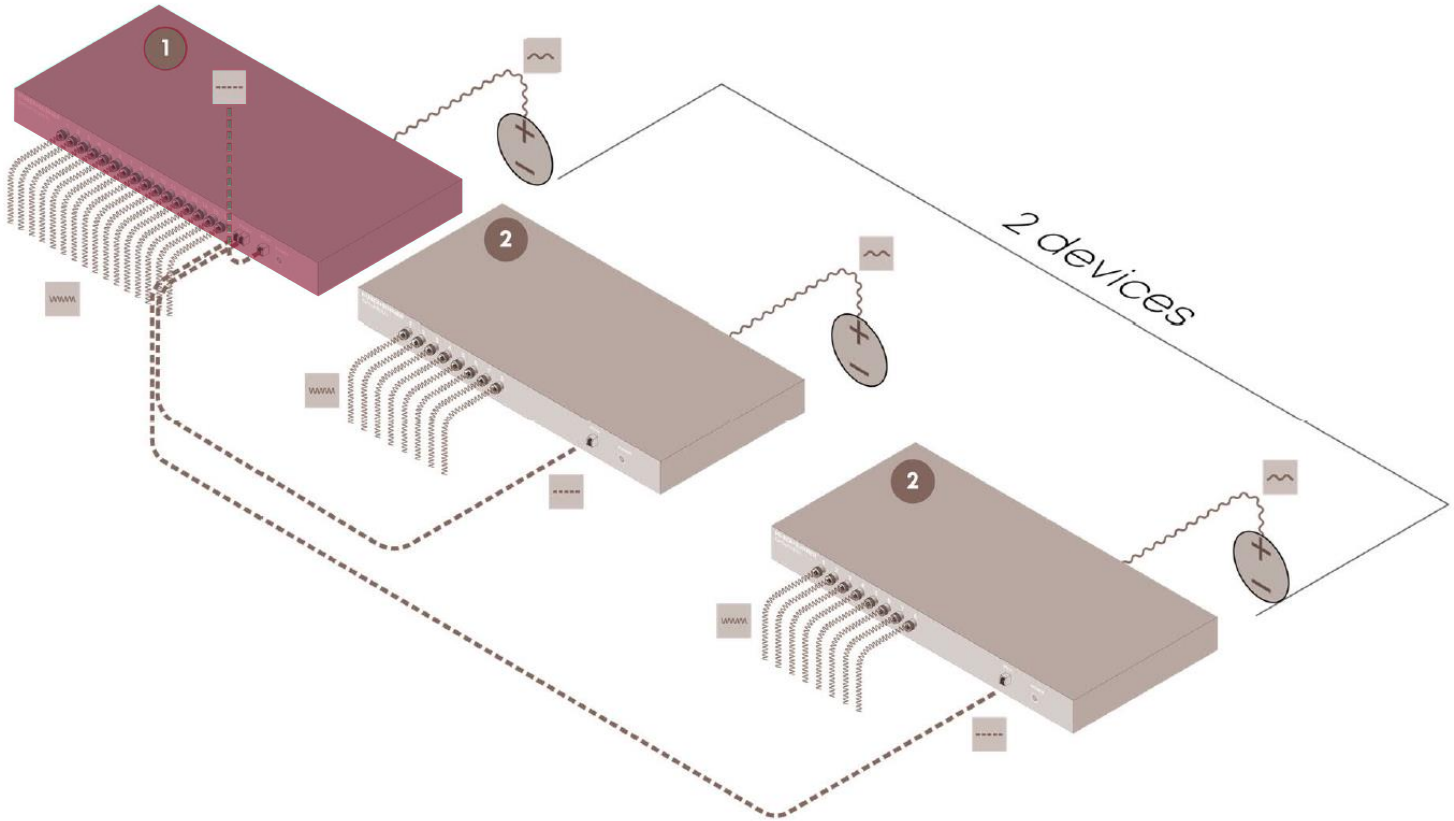
When more coax ports are required inside the rack an expansion module (1) allows splitting the RF GNSS signal of any GPSoF receiver (2) to either 16 or 32 outputs, with active loss compensation.



Cascade receivers to expand

The receiver (1) has additional FO output ports which can be connected to additional receivers (2) to enables future growth of the system.

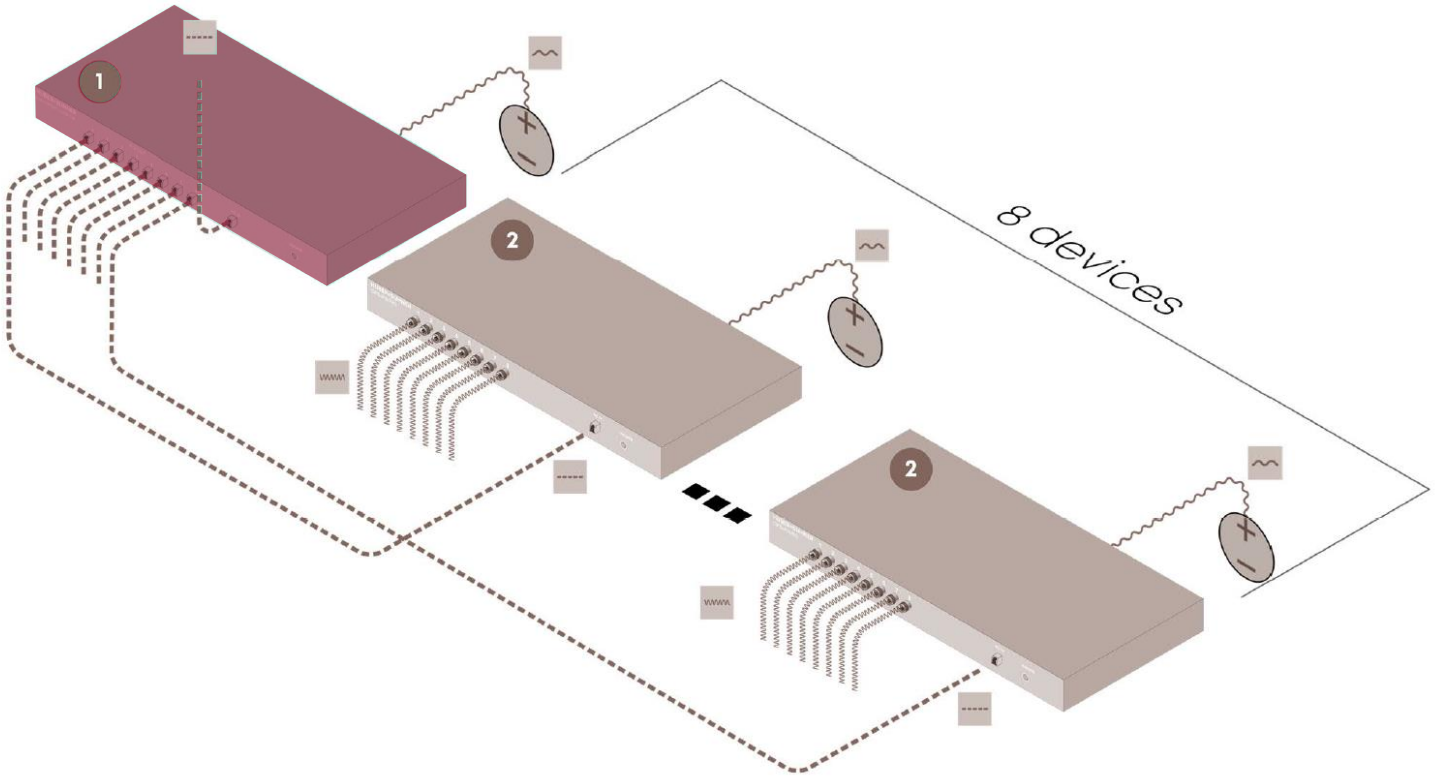
This does however create many ad-hoc, point-to-point links which are not preferred in datacenters which typically use a fully-structured cabling system.



FO Splitter module to add receivers and expand

A signal is received on an optical splitter (1) which is connected to other receivers (2).

This is the recommended solution for datacenters.



Typical cross-connect design

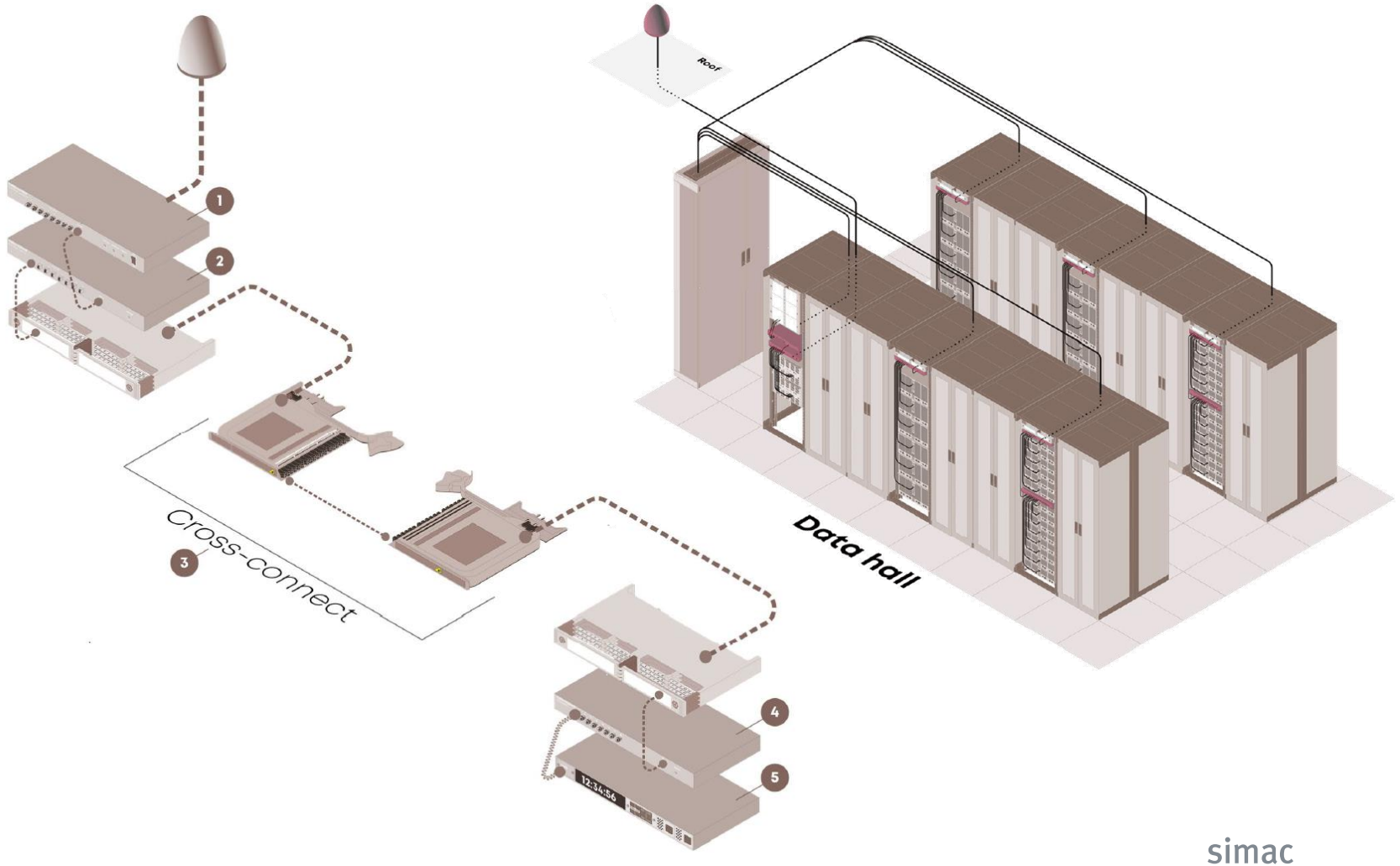
(1) Direct GPSoF

(2) GPSoF splitter

(3) Structured Cabling

(4) GPSoF receiver

(5) End device with GNSS connection



Direct GPS over Fiber benefits

Saving Cost (TCO)

- no power distribution needed on the roof
- less roof penetrations
- easier to install as no lightning protection is needed
- with one single GPS antenna you can cover unlimited end devices.

Flexible time signal expansion

- Unlimited timing signal reference distribution
- Distribution is over fibre therefore you can use existing infrastructure in the DC environment
- Pay as you grow

Safe and Secure timing synchronization

- Redundancy of timing reference possible in different locations to secure for any jamming attack
- Minimize power failure due to dual power supply

CAN WE CLARIFY SOMETHING?

THANK YOU

Please visit us at the Simac Electronics booth