# PolyNet Ltd.

# Company, Product and Service Presentation

2020

Network
Synchronization
solutions

# Facts and figures

**Venture form: Limited (Liability) Company**

**Established in: 1994**

**Owners: 3 private individuals**

**Headquarters: Budapest, Hungary**

**Web: www.polynet.eu**

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# The country we are from

**14 Nobel Prize winners**

**John von Neumann**
Inventor of Computer

**Tivadar Puskás**
Inventor of telephone switch

Ernő Rubik

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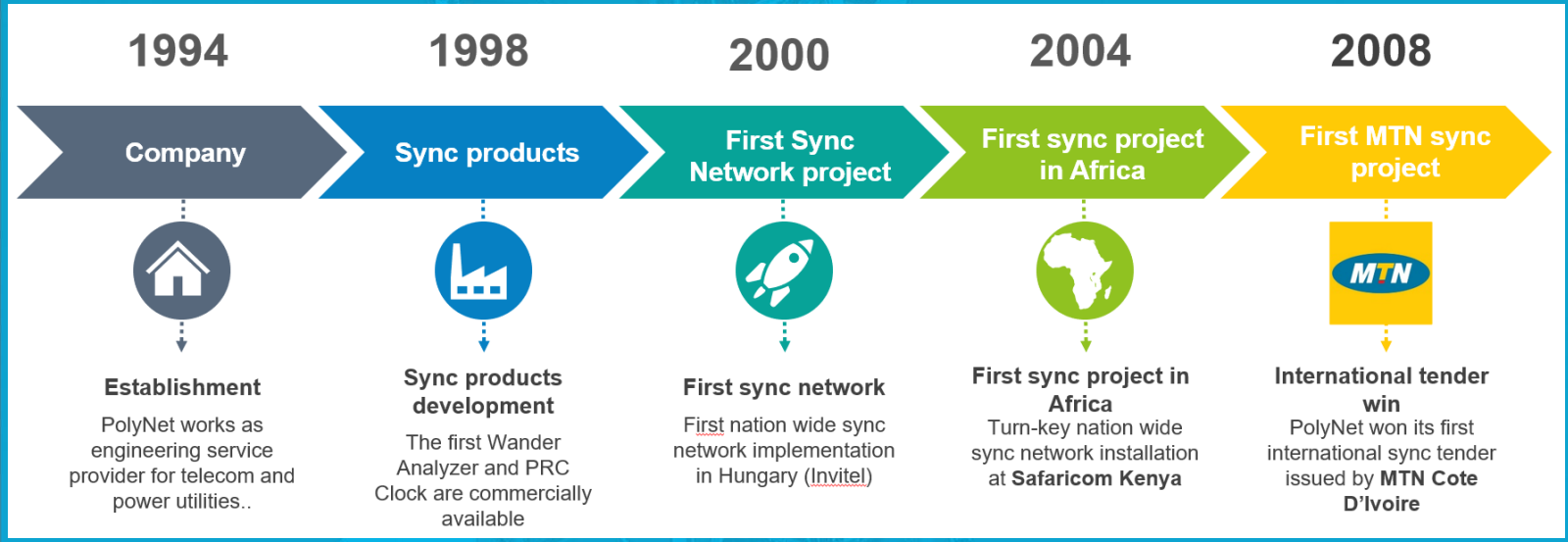
# PolyNet major milestones

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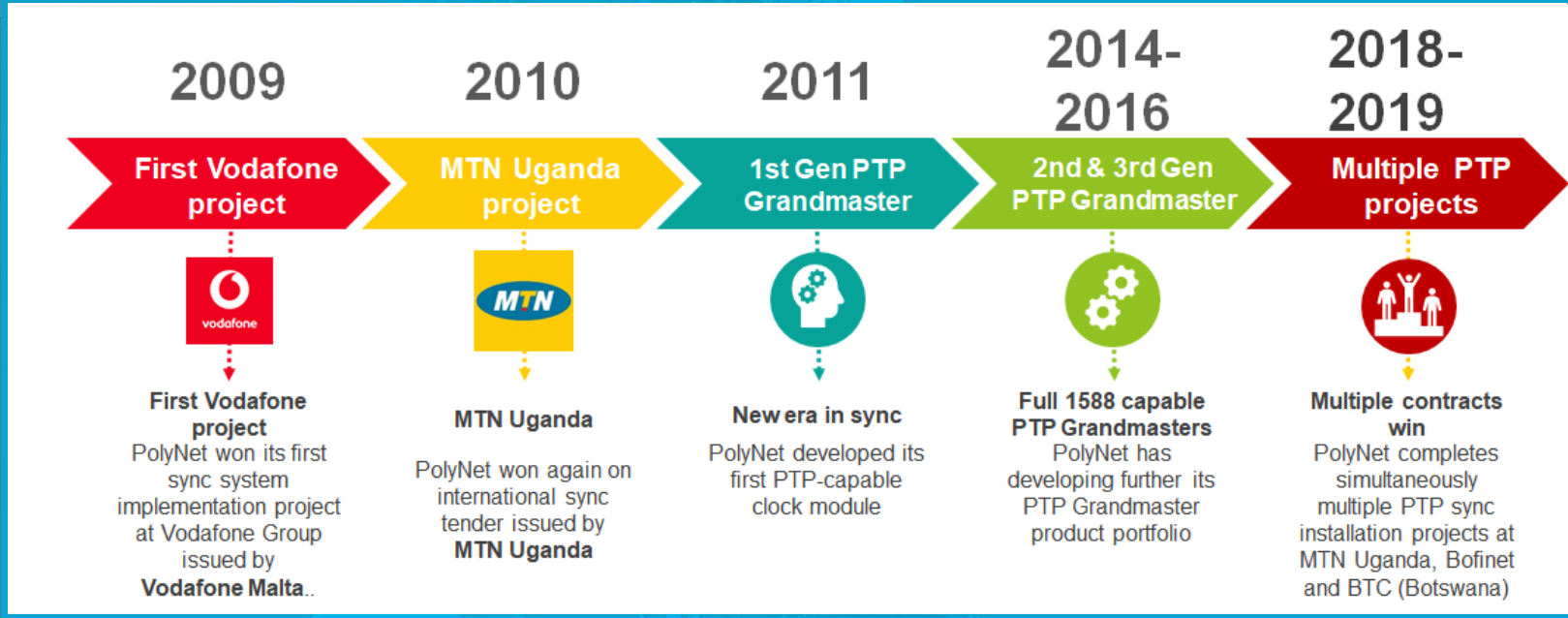
# PolyNet major milestones

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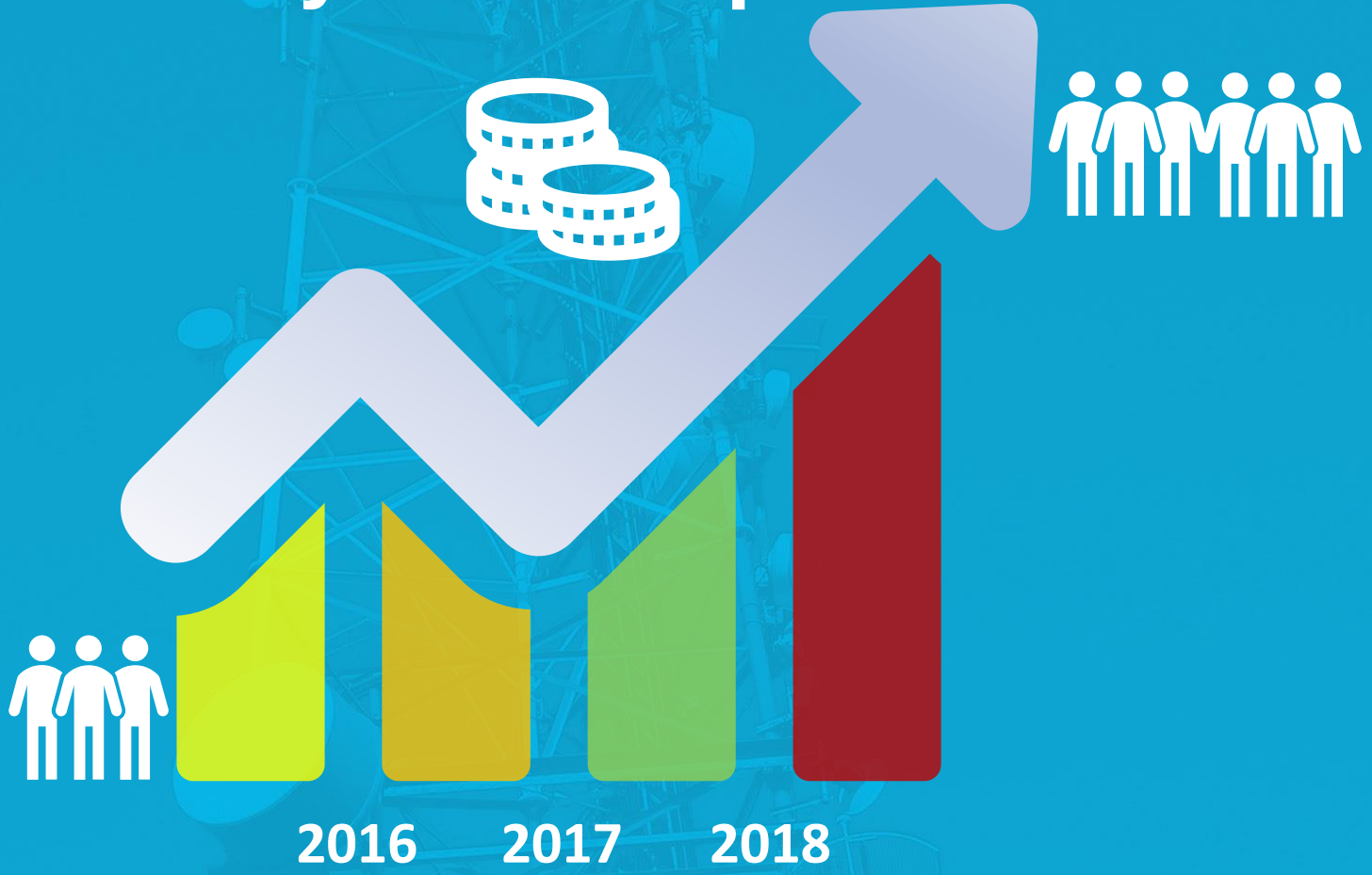
# PolyNet in expansion

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# Network Synchronization Products

- 1588V2 PTP Grandmaster clock
- GPS Controlled Primary Reference Clock with Rubidium atomic source (PRC)
- Synchronization Supply Unit (SSU)
- Wander Analyzer measuring equipment
- Sync network management system
- NTP Server (Stratum 1) + NTP Tester
- E1 Splitters

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# PolyNet Services

- Network synchronization trainings and workshop
- Synchronization Network Planning and Consulting
- Planning, repairing and optimizing existing sync network
- Network Synchronization Audit + Quality measurements
- System Conformance Testing
- Remote Support trough VPN
- Support, Maintenance (Help desk, Spare Part mgt.)

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# PolyNet clients in the world


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# Selected customer references

















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# Interworking with other vendors

















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# Why PolyNet? – Our values

- **Prime focus on network synchronization**
  - The network synchronization is the primary focus of the company since established back to 1994 – we are Sync Specialists.
- **Box provider vs. solution partner**
  - PolyNet not only deliver the network clock elements, but works together with your engineers – we are Turn-key synchronization solution provider.
- **Not a one-off show**
  - To maintain the synchronization quality at optimal level requires **continues and regular activities**: it will not end with the system implementation. PolyNet sync experts are willing to travel on-site.
- **Local knowledge and experience**
  - Being the proud synchronization vendor of several telecom companies, we have valuable on-the-field experience working with the operators' engineering team.

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# Why PolyNet? – Our values

- **Build own equipment**
  - Deep knowledge/better service provider
- **In-house development**
  - No dependence on any third-party sync solution provider
- **Development criteria in mind**
  - Designed for Africa >> Military grade components (over heat protection mode)
  - „Plug&forget” simplicity >> no over complicated and unwanted features
  - Real solutions to real telecom world problems

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# Why PolyNet? – Our values

- **Flexibility**
  - Quick and effective response for support questions
  - Fast response for change requests
  - Short development time for the clients' specific technical requests
- **Specialized laboratory**
  - Able to test any telco equipment & simulate 1000's of PTP clients
- **Huawei Certified Partner status**

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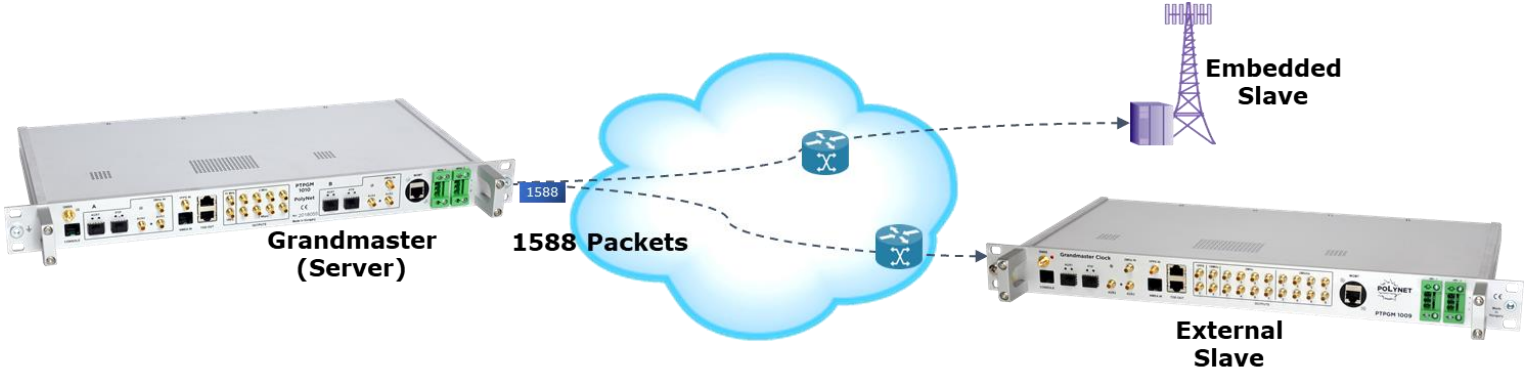
# General PTP Sync Architecture

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# IEEE1588V2 PTP Grandmaster/Boundary Clocks


## PolyNet's 3rd generation PTP Grandmaster Servers


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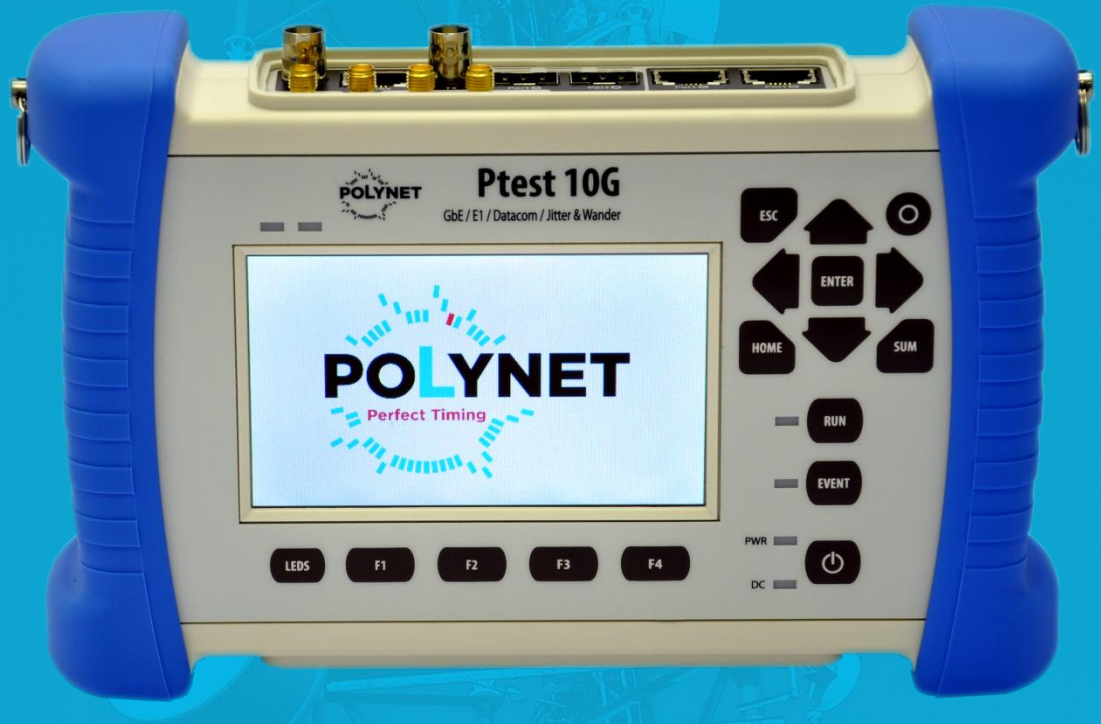
# Ptest 1G/10G Synchronization Analyzer and Ethernet Tester

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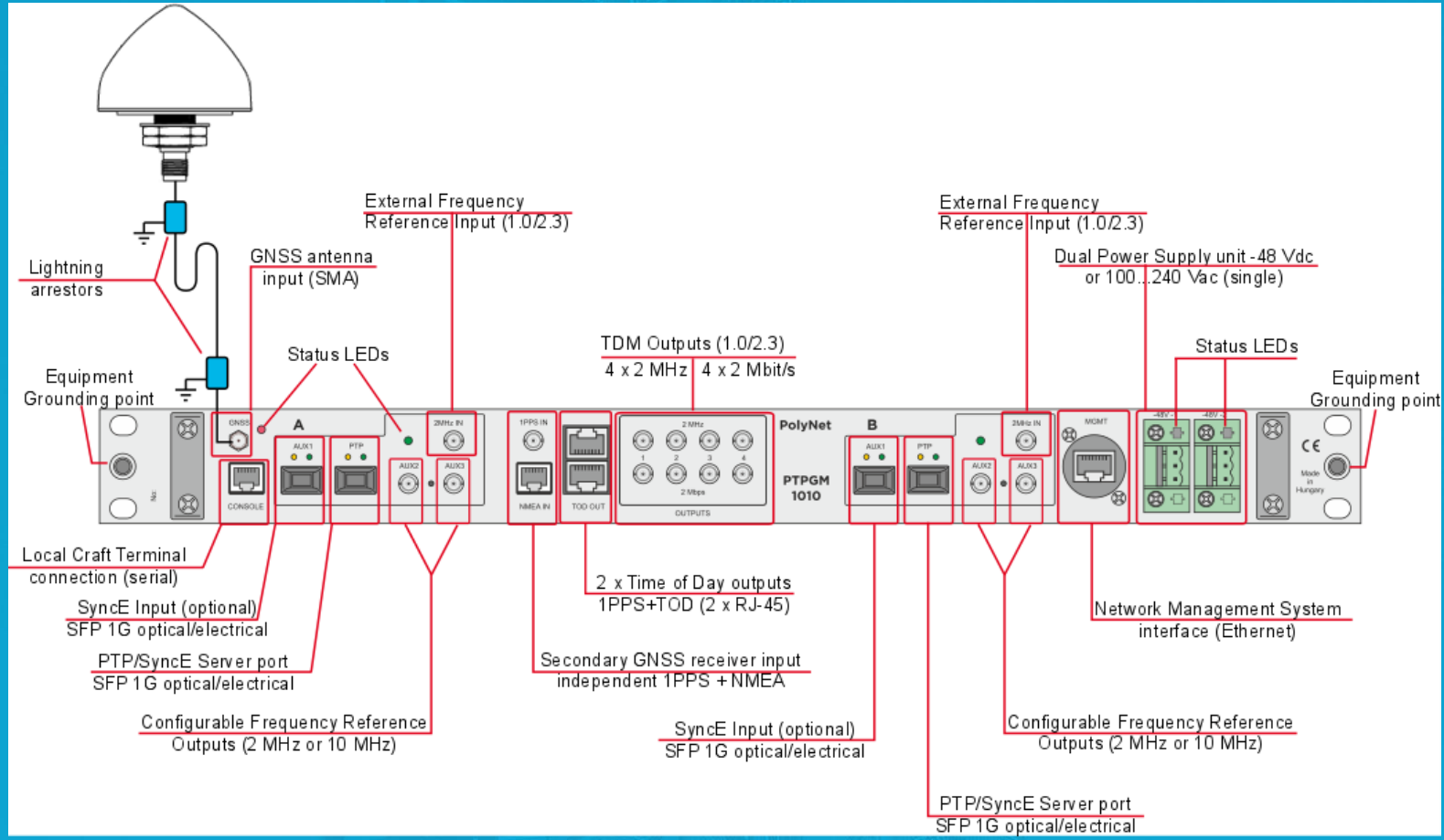
# IEEE1588V2 PTP Server PTPGM1010

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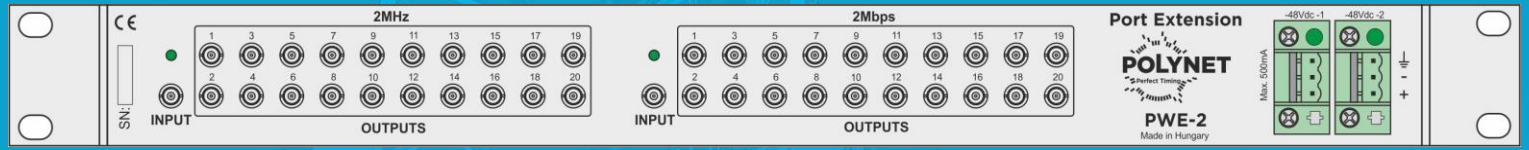
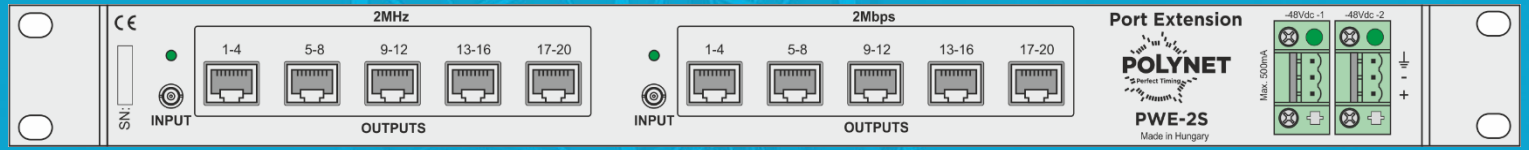
# PWE-2 Port Extension modules

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# PTPGM1010 – Main features

- **Multi service unit**: provides timing for both the TDM and IP network segments. PTP, SyncE, TDM clock and NTP Server.
- **Serves up to 2 x 1,024 PTP clients** with full packet rate (up to 256 sync, 256 delay request reply and 256 announce packets per seconds)
- Non restricted multiple VLAN support (up to 1,024 VLAN)
- Full featured solution: every functions available – **no further license fees, no hidden cost** items. The unit price includes every required feature.

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# PTPGM1010 – Main features

- **Small footprint** and power requirements:
  - The 1U high unit in a standard 19” rack cabinet.
  - Power consumption is 35 W.
- Every **interface is on the front panel** – easy access to the port connections;
- PTPGM10xx Servers can be DC or AC powered;
- In addition to the GNSS receiver the PTPGM10xx Servers can synchronize to external PTP, 2 MHz, 1PPS and SyncE references
- **Redundant GNSS** receiver can be connected to the 1PPS + NMEA ports

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# IEEE1588V2 PTP Server PTPGM1010 Technical Specifications

**Network protocols:**

- IEEE1588-2008 Precision Time Protocol (V2)
- ESMC for SyncE quality messaging
- IP, Native Ethernet, multiple VLAN support

**Server precision:**

- PRTC-A, PRTC-B (one-step, hardware timestamps)

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# IEEE1588V2 PTP Server PTPGM1010 Technical Specifications

## Supported PTP profiles:

Default profile
Telecom Frequency: ITU-T G.8265.1
Telecom Time: ITU-T G.8275.1, ITU-T G.8275.2
Unicast, Multicast and Hybrid modes are supported
Hardware Timestamp Engine
PTP clock quality messaging
(Priorities, ClockClasses, ClockAccuracy, Variance)
Delay request-response and peer delay
mechanisms (E2E, P2P)
Support for transparent and boundary clocks
Unrestricted 1024 VLAN support on every
PTP interface

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# IEEE1588V2 PTP Server PTPGM1010 Technical Specifications

## PTP performance:

- Sync rate: up to 256 Hz
- Number of slaves: up to **2 x 1024 clients** at full packet rate

## SyncE parameters:

- SyncE capabilities on every SFP port
- ESMC levels conforming to all stratum and ITU quality levels
- Compliant to the relevant sections of ITU-T G.8261/ G.8262/G.8264

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# IEEE1588V2 PTP Server PTPGM1010 Technical Specifications

**Ethernet connection:**

- Server ports: 4 x SFP 1G optical and/or electrical
- Management port: 10/100/1000 Mbit/s RJ45 Ethernet

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# IEEE1588V2 PTP Server PTPGM1010 Technical Specifications

**Oscillator selection:**

- OCXO or Rubidium internal oscillator

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# IEEE1588V2 PTP Server PTPGM1010 Technical Specifications

## Inputs:

- GNSS antenna: SMA connector – Support for GPS, Glonass, QZSS, Beidou satellite systems
- SBAS supported
- 1 x 1PPS: 1.0/2.3 connector
- 1 x 2MHz: 1.0/2.3 connector
- NMEA: RJ12 serial connector
- External Caesium clock supported

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# IEEE1588V2 PTP Server PTPGM1010 Technical Specifications

## Outputs:

- 1 x 1PPS
- 2 x ToD RJ45
- 1 x 10MHz 1.0/2.3 connector
- 4 x 2MHz and 4 x E1 (2Mbps) 1.0/2.3 connector
- 4 x AUX port (configurable: 2.048MHz, 5MHz, 10MHz)
- Option: IRIG-B

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# IEEE1588V2 PTP Server PTPGM1010 Technical Specifications

**Management:**

- CLI – through serial or SSH connection
- ClockView NMS software
- User levels and privileges
- Local log files and error indications

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# IEEE1588V2 PTP Server PTPGM1010 Technical Specifications

## Dimensions and Power requirements:

- Weight: 3.2 kg
- 19 inch 1U rack size (428 x 225 x 43.5 mm)
- -48VDC redundant (ETSI EN 300 132-2)
- Optional: 230 VAC version
- Power consumption: 35 W

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# IEEE1588V2 PTP Server PTPGM1010 Technical Specifications

## Environmental ranges:

- Operating temperature range: -5...+45 C
- Relative humidity: 5%...90%
- ETSI EN 300 019-1-3 Class 3.1E

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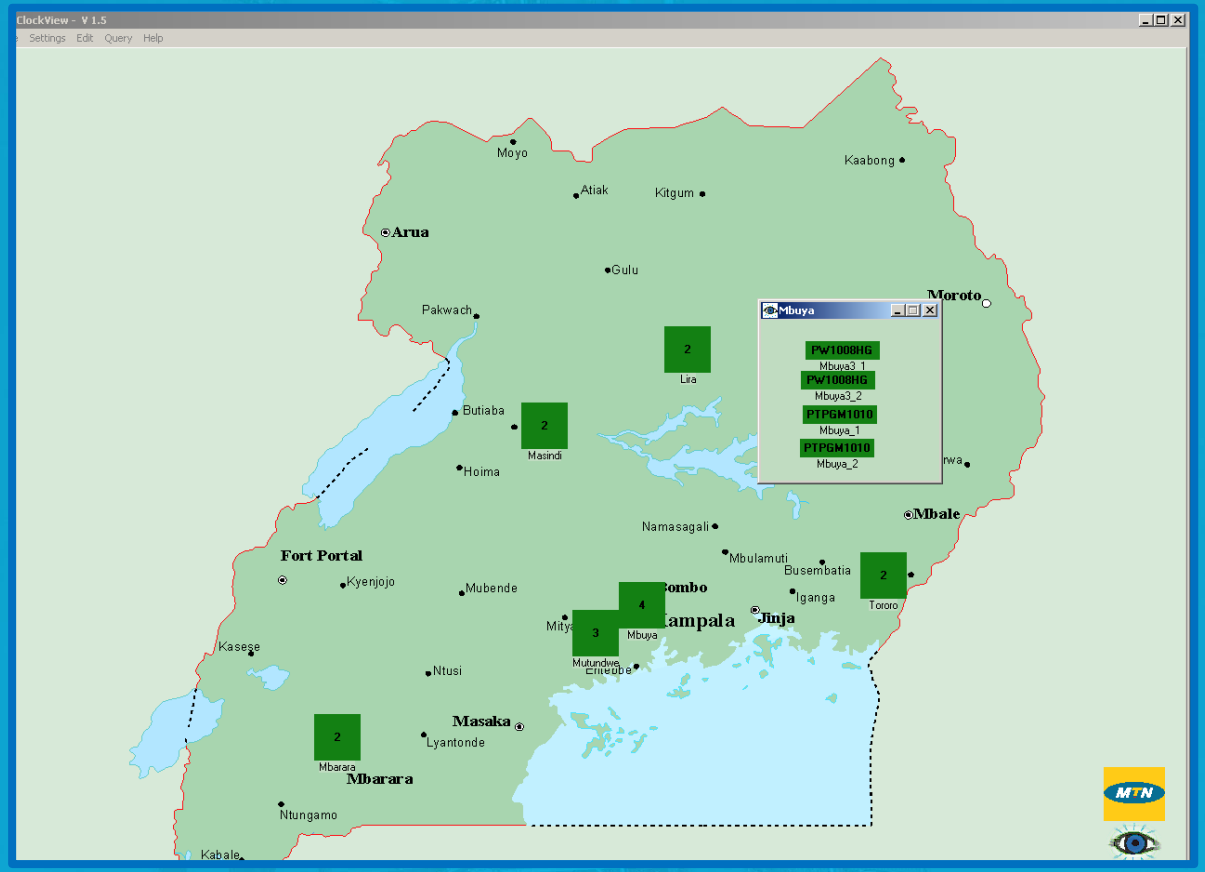
# ClockView NMS

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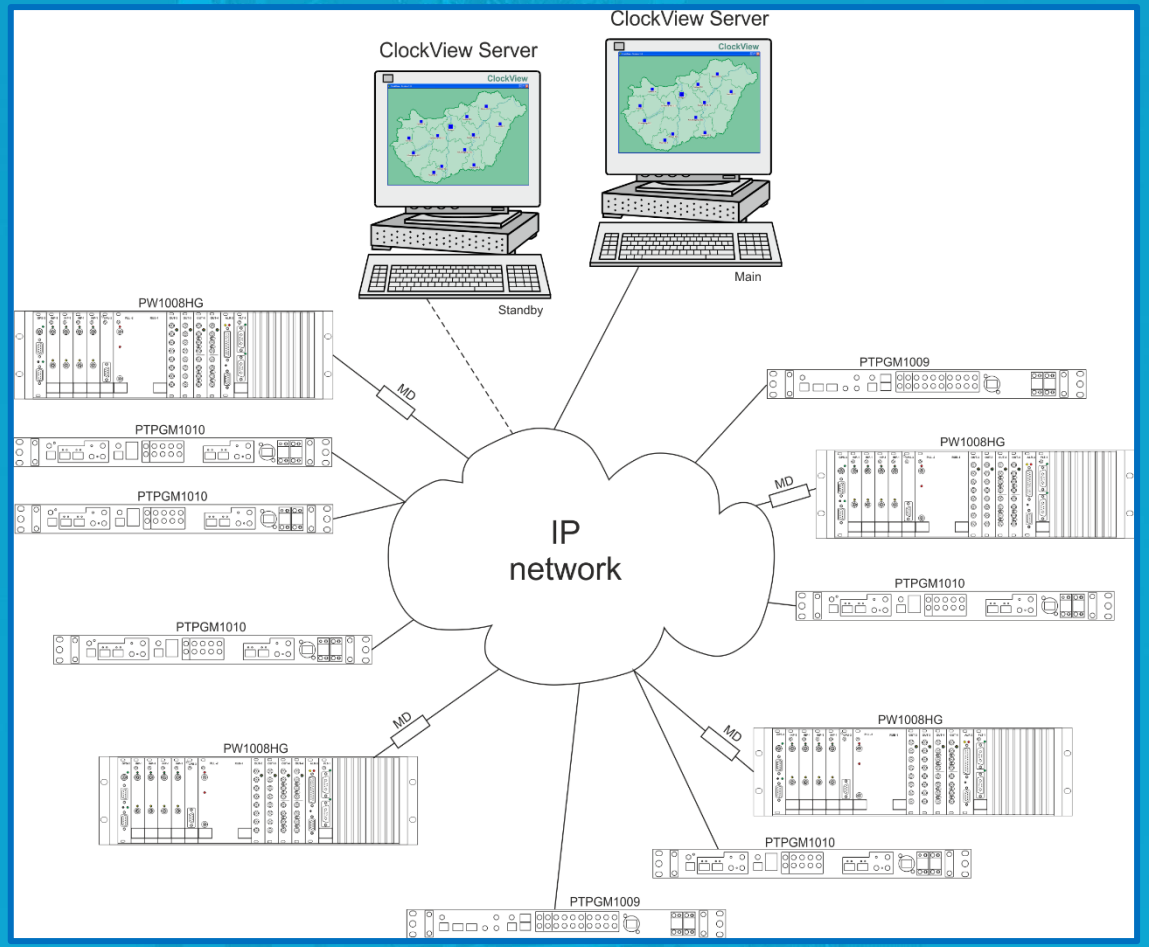
# ClockView NMS - Architecture

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# ClockView NMS - Licensing

**ClockView NMS SW License fee** (up to 100 network clock)

**Equipment ClockView License fee**

**ClockView NMS runs on dedicated hardware** (1U rack-mount industrial computer)

**Option: installing on Virtual Machine environment**

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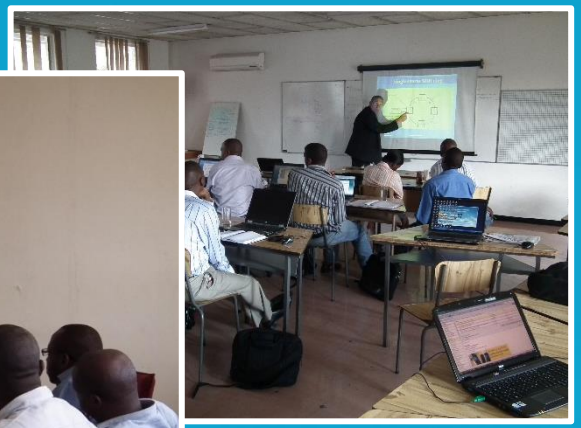
# Network synchronization training and workshop

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# Synchronization training options

**On-line (remote) Training** (PTPGM + ClockView NMS user training)

**On-site Synchronization Training course** (5-day for up to 20 engineers – Sync Theory + Sync Quality measurements Hands-on)

**Advanced Sync Training** (in PolyNet laboratory, Budapest)

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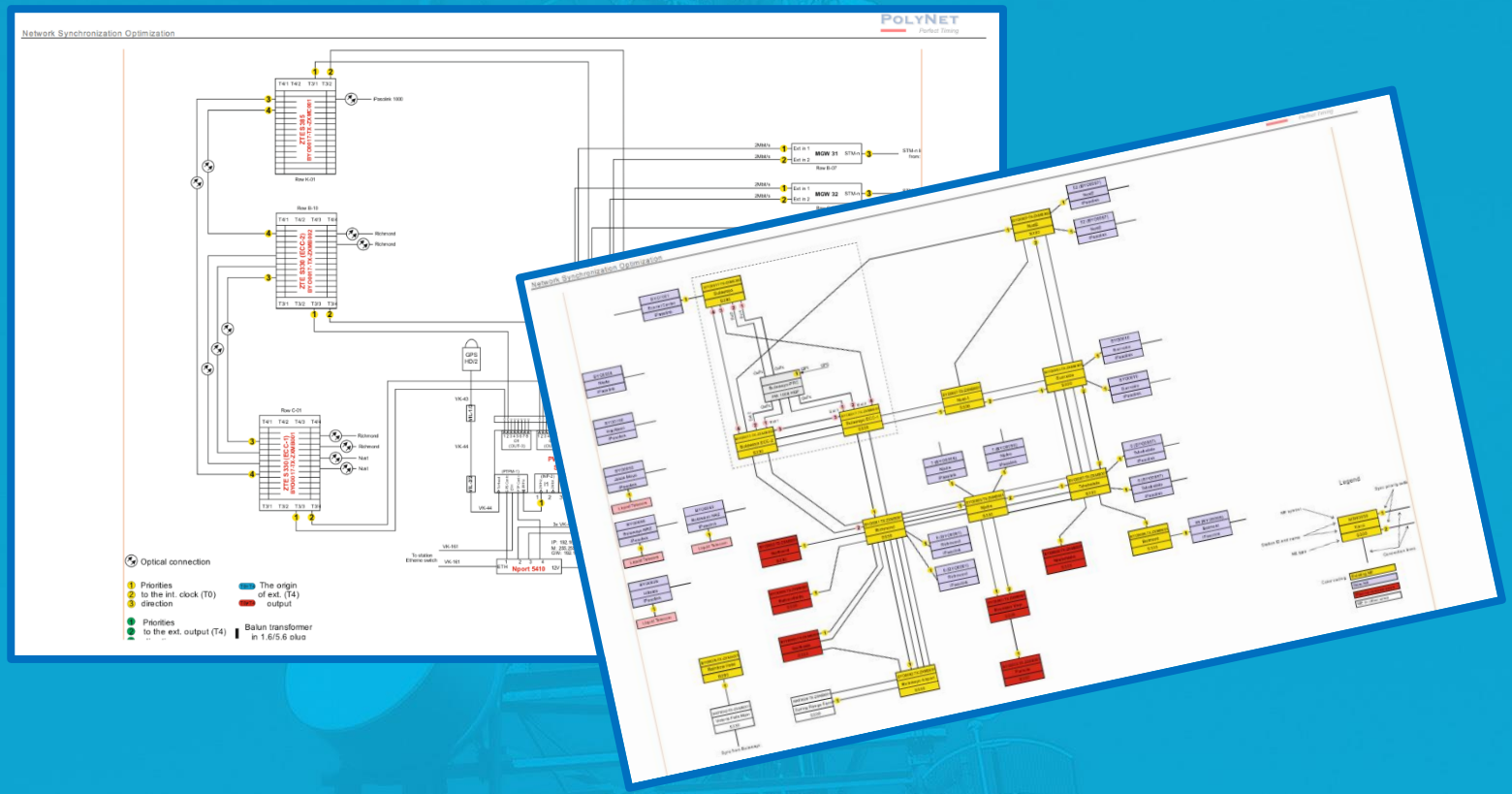
# Synchronization Network Planning and Consulting

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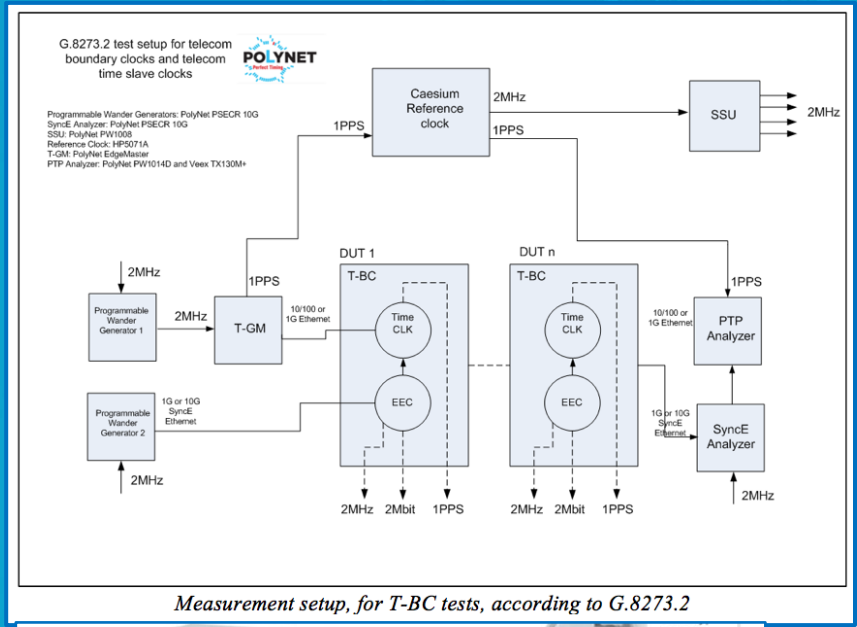
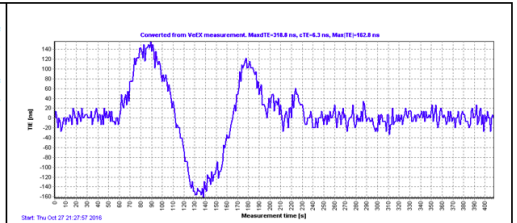
# System Conformance Testing




*Measurement setup, for T-BC tests, according to G.8273.2*


t TE result (time
e output of the ra-
ander with 250ns.
observed that the
frequencies
are clipped.



Wander generated
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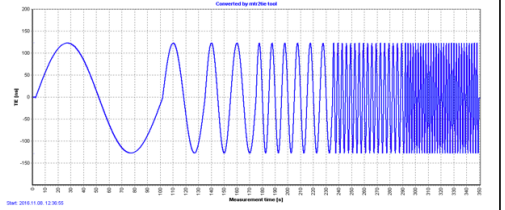
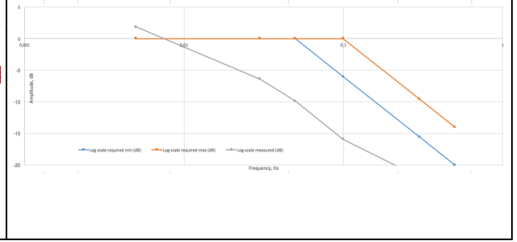
0mHz, 100mHz,
500mHz



nsfer calculations
8273.2 figure III
case a.)
The frequency clipping is out of the limits.



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# Sync Audit and Optimization

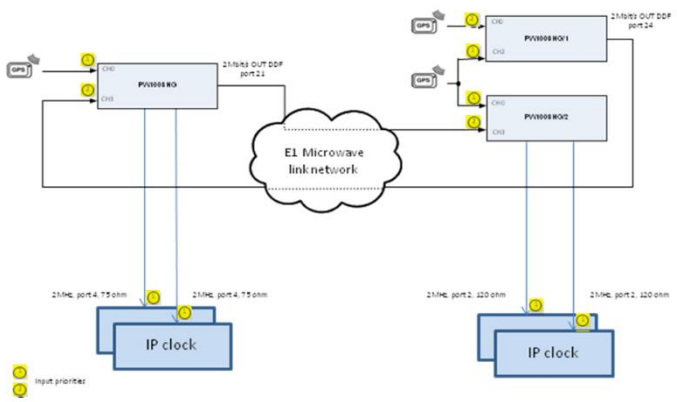
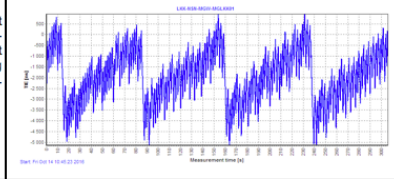
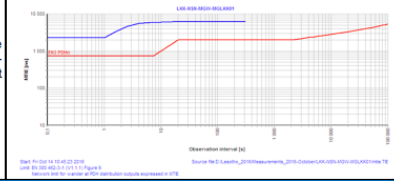
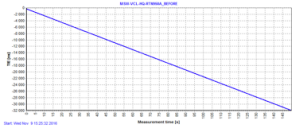
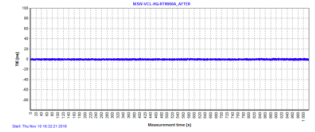
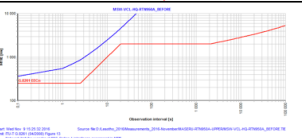
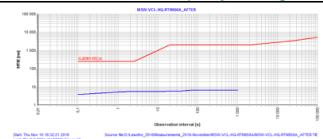
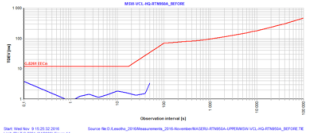
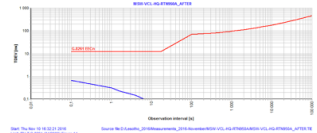



***Figure3: Clock Connection Diagram***

| | |
|---|---|
| TIE result measured at the LKK NSN MGW element's synch output port for testing the tracking quality of the network element.<br><br>Degraded quality |  |
| MTIE derived from the previous TIE and the relevant PDH network limit curve.<br><br>Degraded quality |  |

| Before | After |
|---|---|
| Time Interval Error result recorded at the synch output of the sync gateway RTN element. Frequency offset is 2.1E-7 | Time Interval Error result recorded at the synch output of the sync gateway RTN element. Good quality tracking |
|  |  |
| Maximum time interval error curve and limitcurve according to ITU-T G8261 EECn network limit Free run operation, not for use | Maximum time interval error curve and limitcurve according to ITU-T G8261 EECn network limit Good quality tracking |
|  |  |
| Time deviation curve and limit according to ITU-T G8261 EECn network limit | Time deviation curve and limit according to ITU-T G8261 EECn network limit. Well tracking. Good quality tracking |
|  |  |

The first result pair shows the measured Time Interval Error (TIE). The second row is the calculated Maximum Time Interval Error (blue, MTIE) and the relevant EECn limit curve according to the ITU-T G.8261 recommendation. The third row represents the calculated Time Deviation (blue, TDEV) and the relevant EECn limit curve (red) according to the ITU-T G.8261 recommendation.

After the external clock connected to the network element and reconfigured, the network element is synchronized well, and it is ready for transfer the synch Ethernet timing transfer to the connected synchE capable network elements.

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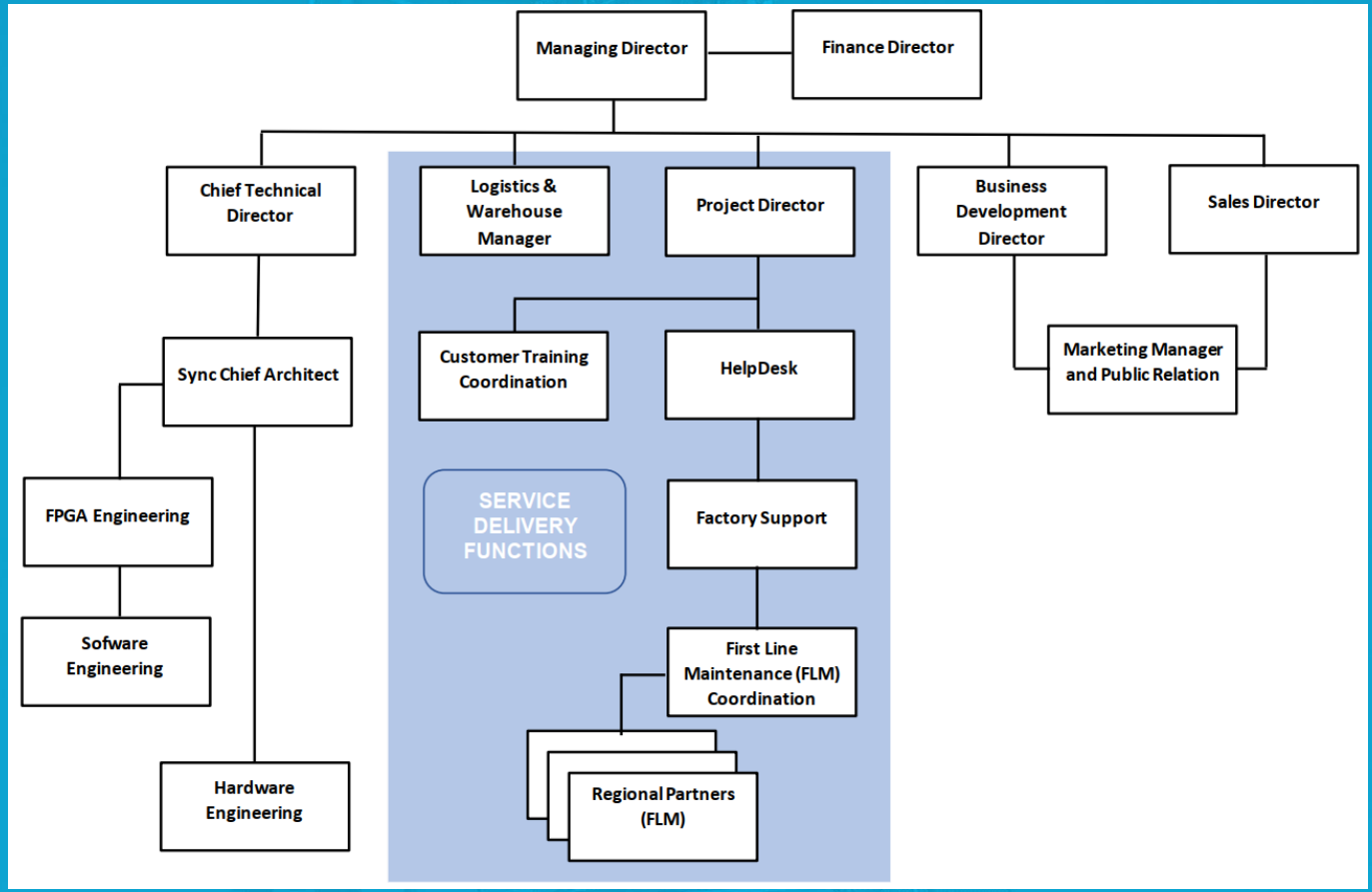
# PolyNet Org Chart – Support functions

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# Questions & Answers

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