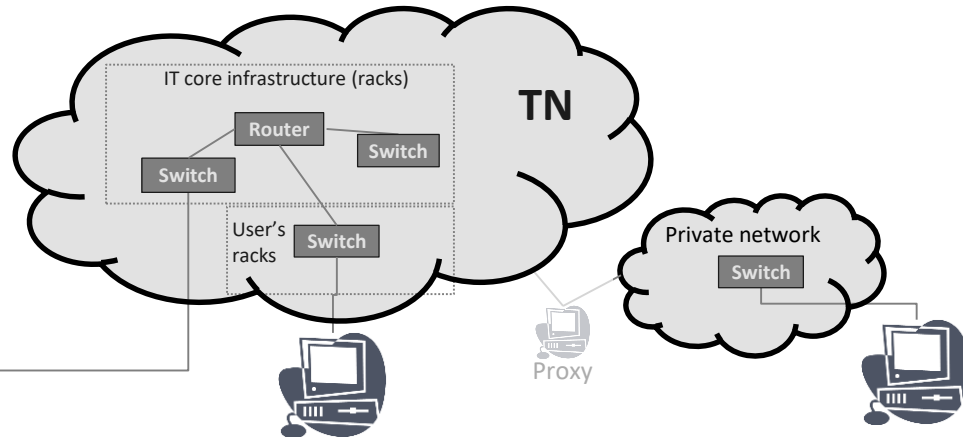# POTENTIAL
PTP support in IT switches
for us-level synchronisation

Electronics forum discussion #14: Synchronisation at ms and us level

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3 use cases for connectivity using IT switch

(current and future)

End-stations: FEC, SoC, PC

Use case 1

Connected to IT/TN switch in IT rack

- Pay by socket
- Full IT support, SLA
  - Working hours: 1h15min
  - Non-working hours: 3h

Use case 2

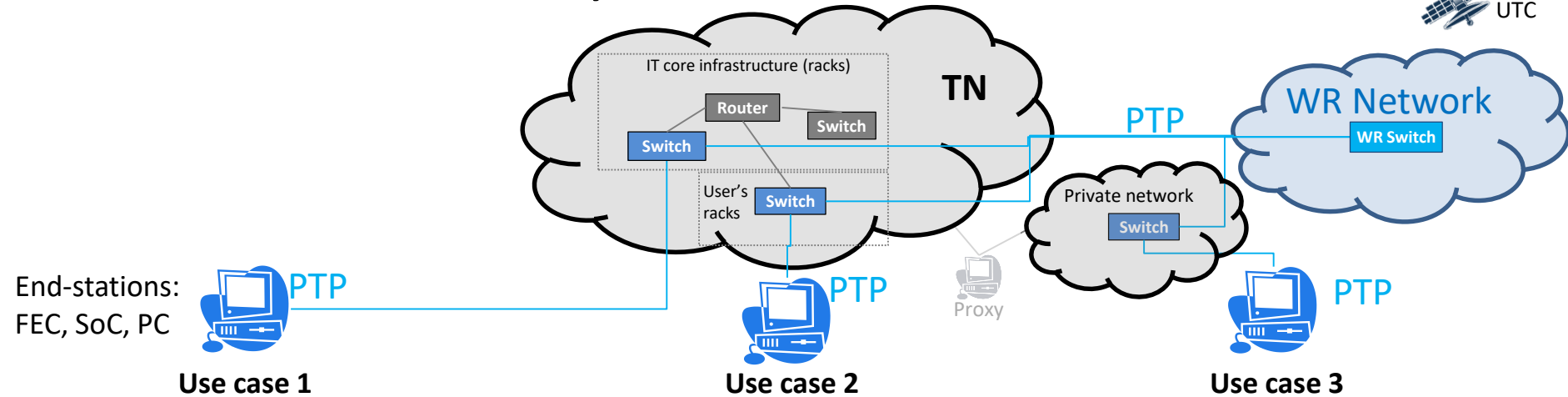**Connected to IT/TN switch (e-switch) in user's rack**

- Pay by switch
- IT provides:
  - Help with configuration
  - Redirect of monitoring to user
  - Spares for replacement by user
  - Possible assisted replacement during working hours

Use case 3

Connected to isolated IT switch in user's rack

- Pay by switch
- IT provides
  - Help with configuration
  - Redirect of monitoring to user
  - Spare for replacement by user

2

Potential future solution for
# PTP us-level synchronisation to end-stations

The basic concept: when an end-station (FEC, SoC, PC) needs PTP synchronisation and it connects to an IT Switch, assuming this IT switch supports PTP, connect this IT switch to a WR Switch in the WR Network

- WR Switch is configured to provide PTP on the port connected to the IT switch
- IT switch must support PTP and is configured as a PTP Boundary Clock
- The link interconnecting the IT Switch and WR switch is blocked for other data than PTP

Feasibility study

Answer questions:

- Does IT offer currently switches with PTP support? Which use cases can be covered?

- Can IT switch(es) with PTP support interoperate with WR Switches?
  - WR Switch support Default PTP Profile
  - WR Switch has been proven to work with devices implementing Default PTP Profile

- Could this solution be used in the future?
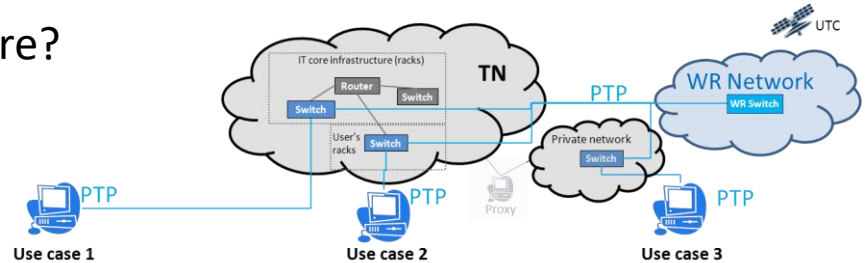
Does IT offer currently switches with PTP support?

- IT switches currently installed in TN do not support PTP

- From Data Center contract with Juniper, one model with PTP support is available from IT on request
    - Model QFX5110-48S with 48 ports
    - Can potentially cover use-cases 2 & 3
    - Use-case 1 not is supported (Juniper switches are not deployed in the core TN infrastructure)
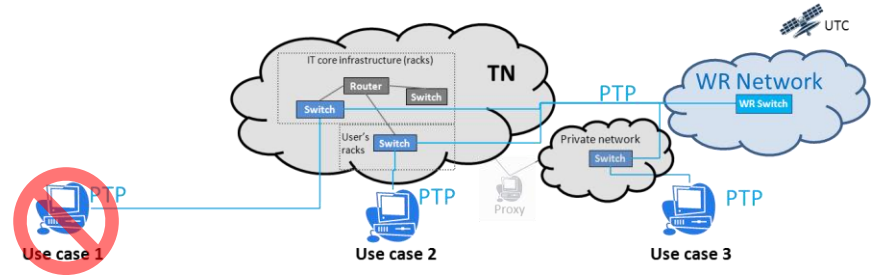
Can Juniper QFX5110-48S synchronise 🛰 UTC over PTP with WR Switches?

- Juniper QFX5110 does not support Default PTP Profile

- WR Switch does not support profiles implemented on Juniper

- Interoperable configuration found:
  - **WR Switch**: PTP Default Profile, IPv4, multicast, Sync rate 32 packet/s, PTP v2.0
  - **Juniper** : AES67 Media PTP Profile, IPv4, multicast

- Caveats
  - WRS Switch: IPv4 currently requires manual configuration
  - Juniper: multicast configuration available only in debug mode

- Result
  - Offset between WR switch and end station: << 1us
  - Measured offset was < 100ns

- To make it operational
  - Centralized IPv4 configuration support to be added on WR Switch and in CCDE
  - Multicast configuration to be added on Juniper
    (request on-hold, estimated delivery: 1 year)
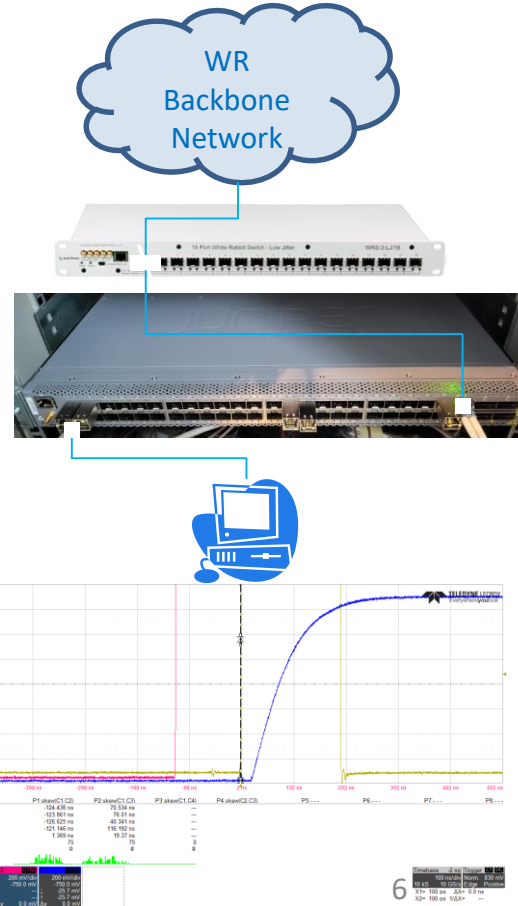
Could this solution be used in the future (1)?

- Current DC contract with Juniper expires 2026/2027
  (only support beyond, unless awarded next DC tender)
- Replacement of TN switches scheduled for LS3, ongoing tender for new TN switches
  - PTP support not a requirement in the tender, yet included in the survey to be aware of available support
  - We will know around May 2025 whether PTP support could be available in new TN, or switch family with PTP support available in the contract
  - To make it compatible with WR, new TN switch must support
    - Default PTP Profile or similar
    - 1 Gbps

Could this solution be used in the future (2)?

- Two scenarios
    1. **Optimistic:** New TN contract **DOES** include <u>as baseline</u> switches with PTP support and 1Gbps ports
        - Quite straightforward path for PTP support
        - All 3 use cases could be potentially covered
    2. **Less optimistic:** New contract **DOES NOT** include <u>as baseline</u> switches with PTP support and 1Gbps ports
        - Two sub-cases:
            a) New TN or DC contract **DOES** allows to buy switch with PTP support and 1Gbps
            b) Otherwise:
            – **Mitigation:** in mid-2025 purchase from IT the number of Juniper switches required for Run4 (inc. spares), quantity limited by remaining money available within the current contract (TBC)
            – Request Juniper to add multicast support (request on-hold, estimated delivery: 1 year)
        - Only use case 2 & 3 covered

- In both scenarios:
    - **Official request to IT for PTP support is needed** (note: IT is overwhelmed with requests)
    - **Important to provide estimate of number of possible switches to be deployed**
    - **Important to offer help and expertise in PTP (short/mid/long-term)**
    - IT provides for Run4: configuration/monitoring and hardware support, not debugging
    - Procedures and monitoring tools to handle PTP issues needs to be developed (integration with WR monitoring?)

Conclusions

- **Most reasonable solution for us-level synchronisation using PTP:**
  - Use IT-supported switch with PTP support (whether connected to TN or not)
  - Connect IT-supported switch to WRT Network for PTP synchronisation
  - Prepare with IT comprehensive monitoring of PTP operation/issues
  - Establish responsibilities/procedures in case of PTP-related issues
- **Discussion needed in this Forum:**
  - Whether the above solution should be endorsed by the Forum
  - Available/possible alternative (plan B) options ? (if no IT support for PTP switches)
  - If the above solution is endorsed by the Forum:
    - Number of use-cases and switches needs to be estimate
    - The subject needs to be presented to CTTB, to be followed up later with IT

Thank you