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# ESS Machine Protection and Timing



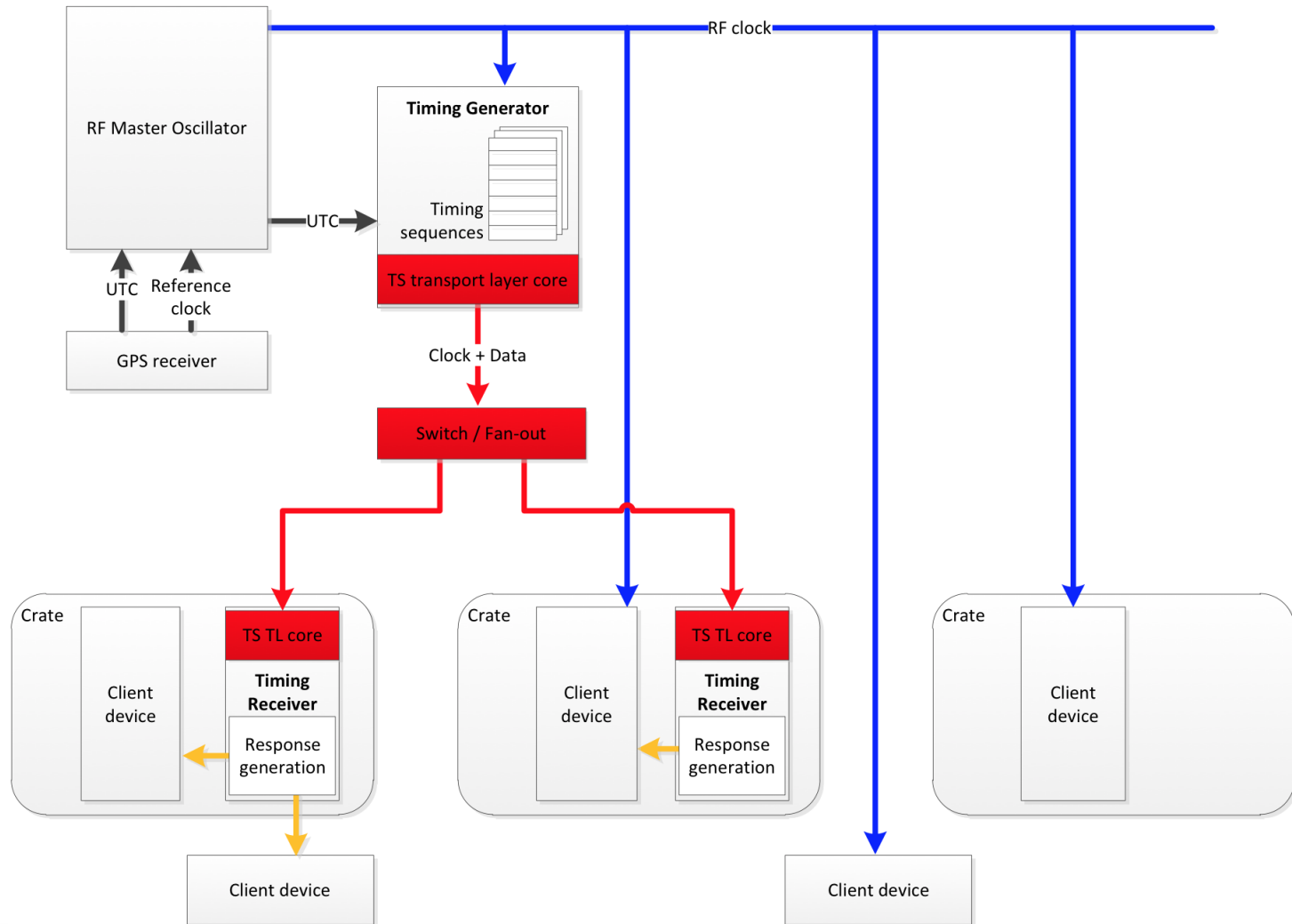
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# Overview

- Timing System
- Machine Protection
- Actions & Conclusions

# Timing System



# Timing System, decisions

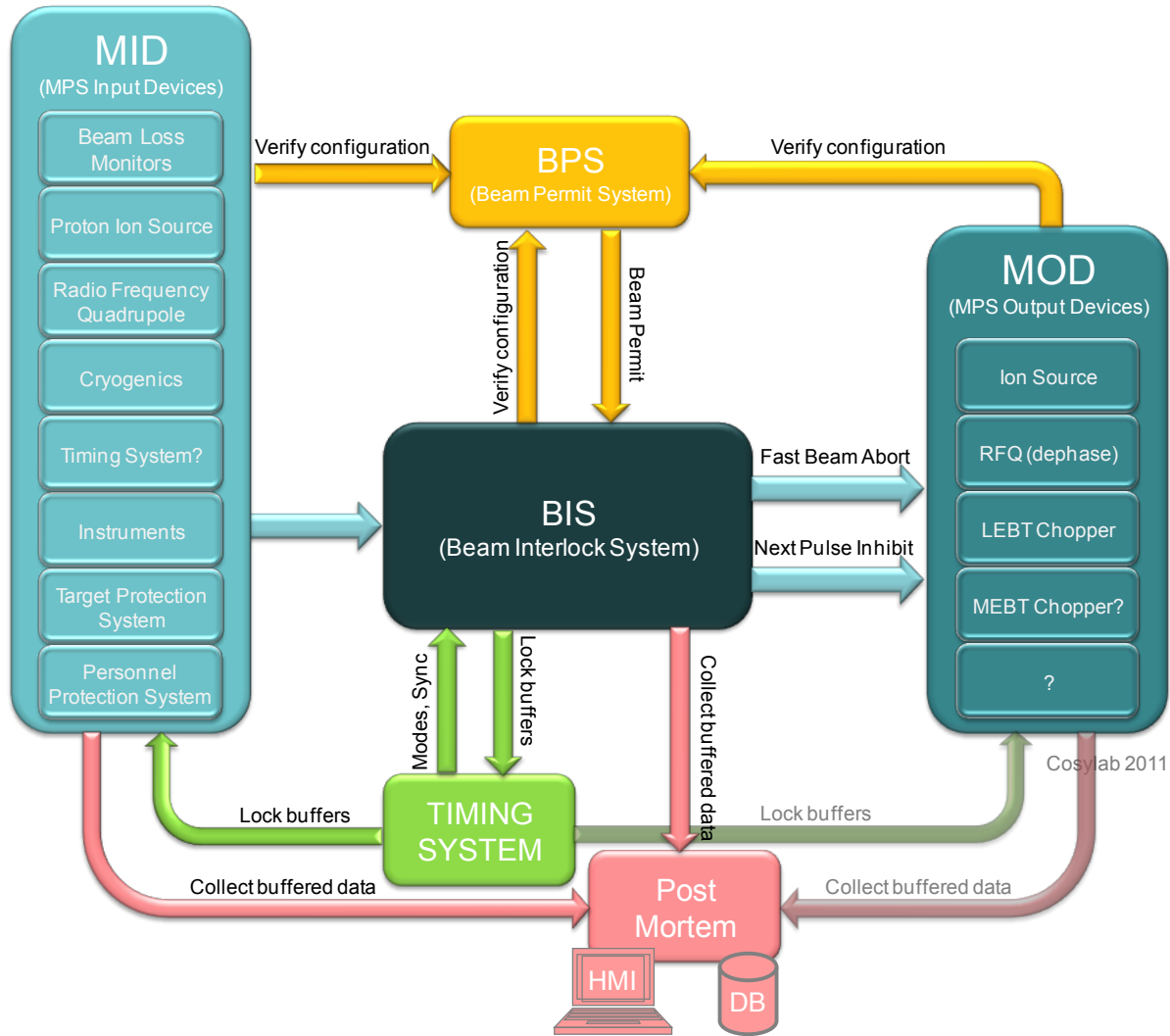
- Primary prototyping transport layer is **MRF** on **cPCIe** and **uTCA** platforms
- Current required **accuracy** is **1 ns** (precision of the timestamp, jitter of the clock)
  - Changing to **1 ps** as we speak
- Currently there is **no need** for a **BI-directional** Timing transport layer
- **Instruments** use **the same** timing transport layer as Accelerator and Target
- The timing master generates '14Hz' phase locked to the clock signal from MO

# Timing System, decisions, continued

- Latest developments
  - Pushing forward uTCA prototype to test the possible platform / HW limitations
  - Proposed numbers (courtesy of Anders J. Johansson):
    - event clock frequency: 88.052 500 MHz
    - event granularity: 11.357 ns
- Current open questions:
  - Who decides if the accelerator has modes of operation
  - Who defines the modes, if they exist
- Ongoing important topics:
  - Integration between post-mortem data acquisition, and MPS, Timing and the Control System



# Machine Protection

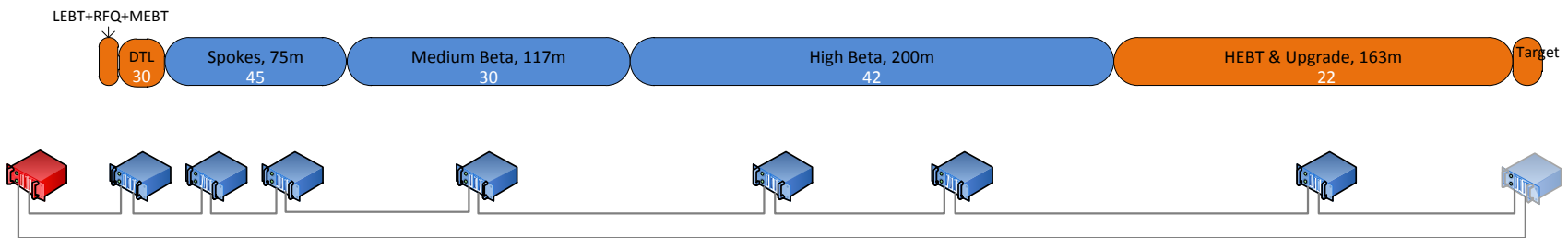


# Machine Protection, decisions

- Overall system responsibility = **ICS**
  - New schema defines interfaces
- Two types of interlock requests
  - **Fast Abort** (intra pulse)
  - **Next Pulse Inhibit** (inter pulse)
- “Excess beam loss” to shutdown response including BLM response time should be:
  - 5 us for RFQ and 1<sup>st</sup> DTL
  - 40 us from end-of-DTL to target
- Interlocks
  - Interlock system input changes should be timestamped
  - Interlock system nodes should be synchronized with the Timing system
  - The interlock system should have a binary interface (1/0, ok/nok)

# Machine Protection, continued

- Identification of mitigation devices
  - LEBT / MEBT chopper, RFQ, ion source
- Currently counting
  - Interlock system inputs
  - Post mortem system outputs
- Started involving the Safety division on the requirements front
- Studying appropriate topology
  - Tree, tree + fast abort connection, daisy chain, **ring**





# Actions & Conclusions

- Define MPS mitigation devices ASAP!
  - Reliability requirements + MPS = ??
- Modes of operation
- Requirements, requirements, requirements
- Prototype, prototype, prototype!

# The End

- Thank you!