

WebRTC-based plug-&-play signal transport for peer-to-peer connectivity between DRTS', IEDs and operators

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PROJECT MOTIVATION

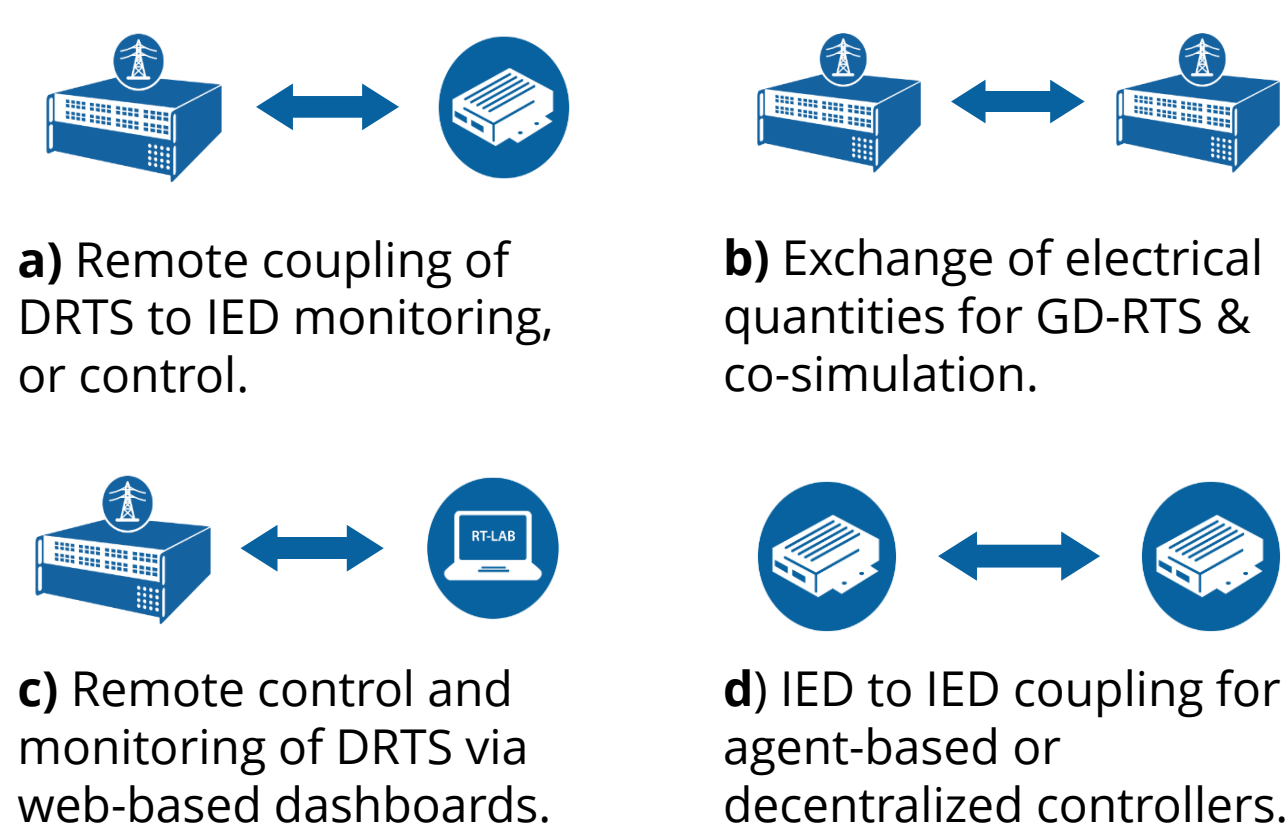


Figure 1) Use cases of remote coupling.

- Simplify setup of real-time data exchange between Research Infrastructures (RIs), Digital Real-time Simulators (DRTS) or Devices-under-Test (DuT).
- Reduce manual configuration workload of network and experimental setup.
- Reduce coordination with IT departments and firewalls.
- Facilitate Geographically-distributed Real-time Simulation (GD-RTS) & Remote-HIL.

Setup of distributed experiments gets as easy as joining a video conference call.

EMPLOYED TECHNOLOGIES

- Implementation of new node-type for VILLASnode.
- Established IETF peer-to-peer protocols: WebRTC, ICE, STUN & TURN
- Default transport via direct UDP protocol
- Automatic fallbacks to relayed UDP, TCP protocols
- Flexible payload formats (Binary, JSON, Protobuf, ...).
- Reproducible research via NixOS-based benchmark setup.

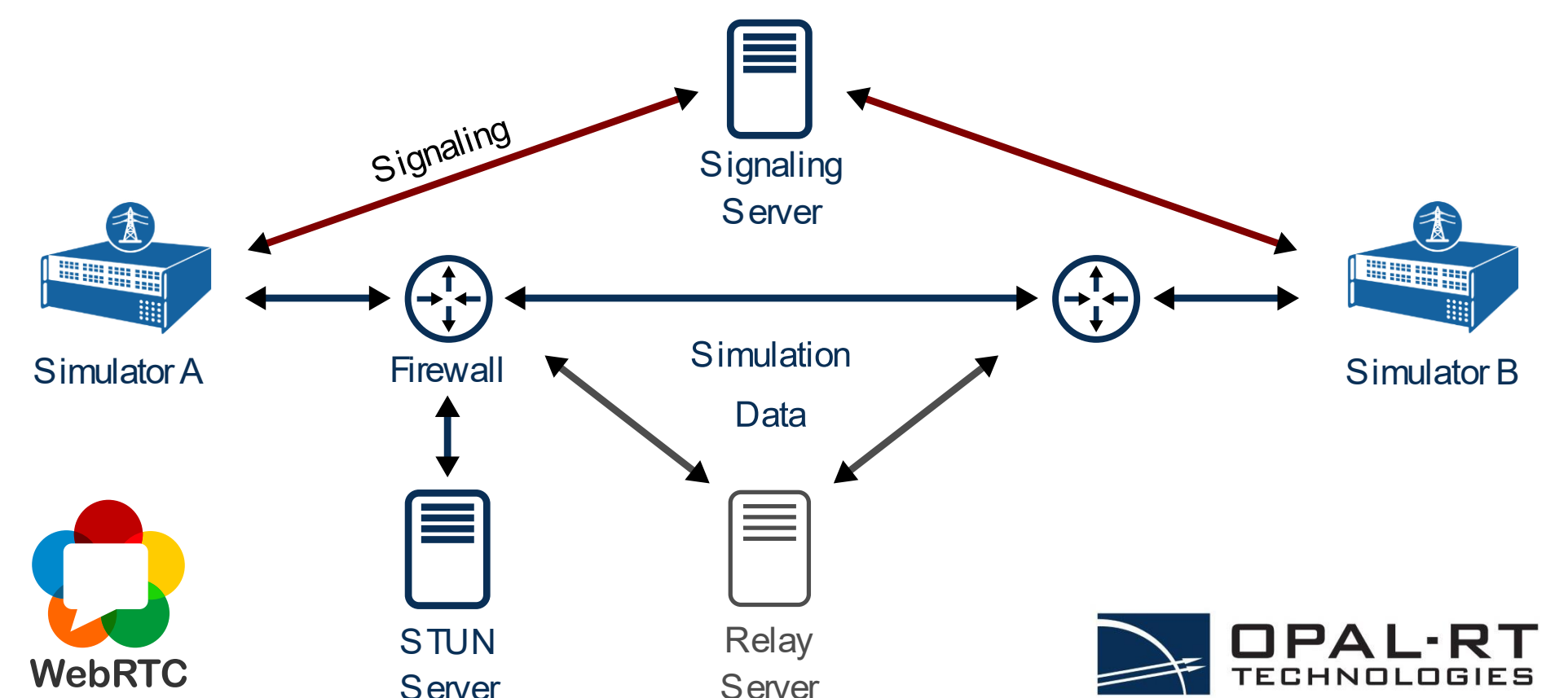


Figure 2) WebRTC connectivity setup supported by STUN, TURN & signaling servers.

RT-LAB INTEGRATION

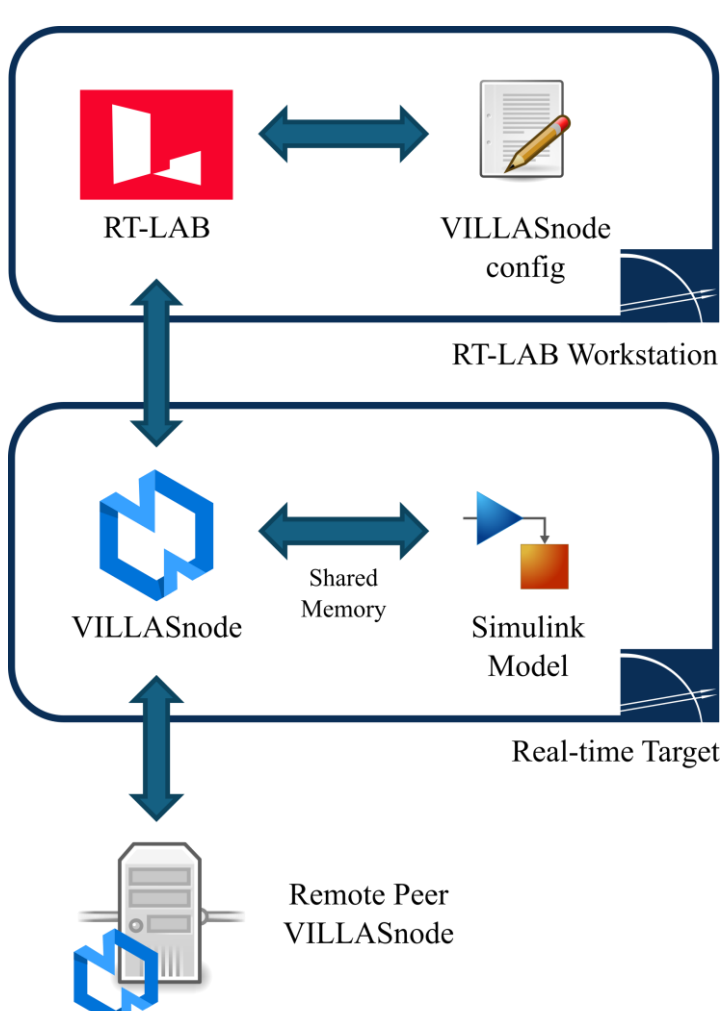


Figure 3) RT-LAB integration.

- Integration into RT-LAB via custom Simulink library block.
- Supports all VILLASnode protocols
- Configuration via Host workstation.

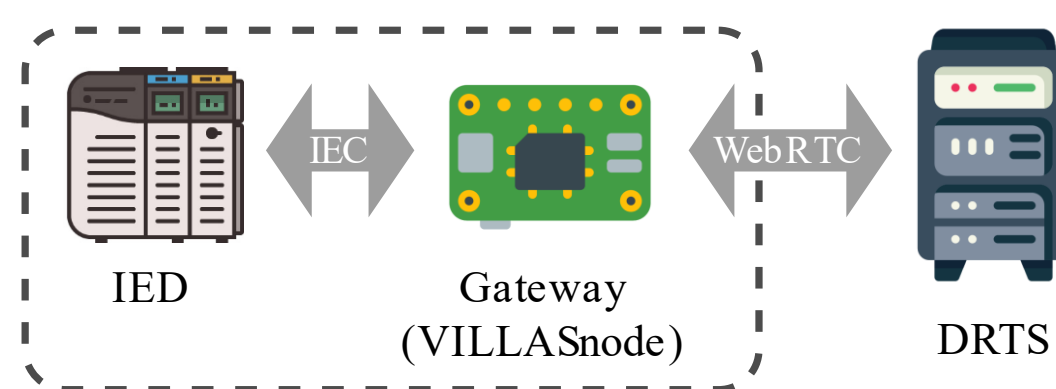


Figure 4) Example setup.

BENCHMARK RESULTS

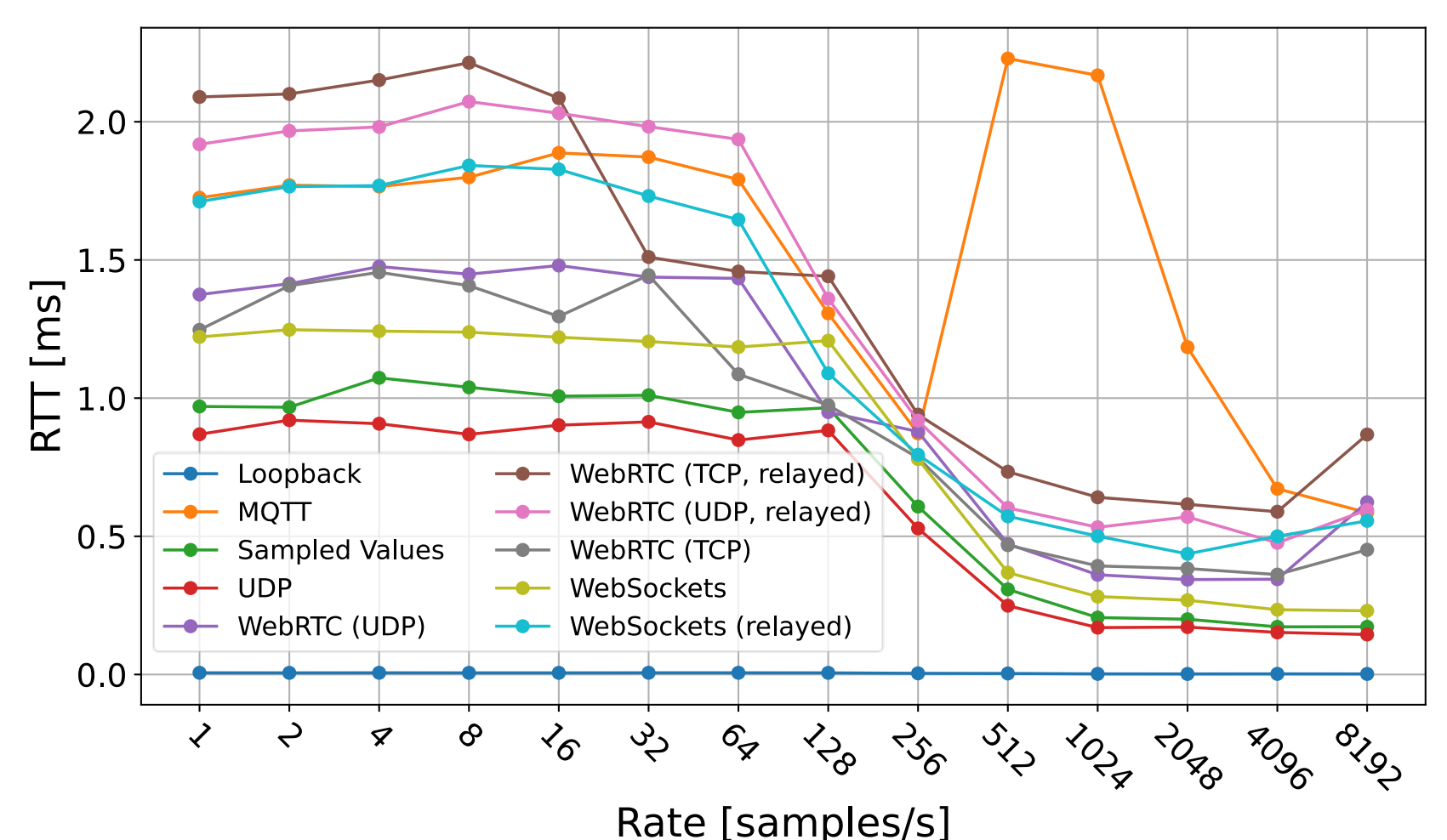


Figure 5) Comparison of round-trip time vs sending rates.

CONCLUSIONS

- Configuration-less setup which only requires exchange of session token.
- WebRTC protocol show round-trip times comparable to raw UDP.
- Single-board computers allow a cheap and quick deployment
- RTT latency is mainly affected by geographical distance.
- Implementation in VILLASnode is open-source, vendor neutral and enables flexible RI interconnections.