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XRTC

An advanced software technology for reliable, real-time connectivity

v02

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A TECHNOLOGY FORERUNNER

- The roots of XRTC trace back to European Space Agency project.

- High-resilience acceleration of data transmission has been used for remote AR collaboration solution POINTR since 2013.

- A generic XRTC-solution was developed to overcome the exact same communication challenges which are faced with vast of industrial solutions.

XRTC

esa

VTT
Technical Research
Center of Finland

CALLIO BARRICK

KONE WÄRTSILÄ Valmet

Ford

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European Union

CONNECTIVITY DEPEND ON RELIABLE REAL-TIME DATA TRANSMISSION

- Almost every solution in industrial and commercial markets, which uses data transmission via public networks either by fiber or wireless network.

- The more data-intensive or mission-critical communication with real-time requirement the use case is, the more essential this becomes.

Entertainment Services

Real-time broadcasting, sports events, online game streaming, movies, series & gaming
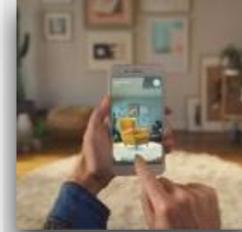
Enterprise Tools

Field Services, Product Design, Marketing Tools & Analytics & Decision-making

Social Applications

Professional communications, multiparty video, messaging platforms & Enterprise Apps

E-commerce Platforms

One of the largest Internet business areas by revenue with commodized stack and offerings

Emerging Markets

Delivery of services to markets that would require changes in network infrastructure

Autonomous Machines

Mining, cargo, fleet management, auxilary services, edge compute part of control loop

Remote Operations

Energy, grid, agriculture, Oil and gas, surveillance, search and resque, teleoperated robots

Distributed Real-time

Design and engineering, review, participatory work with stakeholders and customers

AI Control Loop

Medical, food, chemicals, pulp & paper, distributed process monitoring and control

Extreme Environments

Mining, energy, and maritime are among those that face space-like conditions.

WHAT CREATES CHALLENGES IN NETWORK COMMUNICATION?

- Bad weather conditions

- Telecom tower & mobile network coverage

- Moving physical obstacles weakening the signal

- Capacity & load of public network

- Long distances in intercontinental telecommunications and when using satellite network

- 3rd party signal interference

- Problems occur randomly in different combinations and cumulates the effect.

- None of these can be affected essentially by improving local ICT-infrastructure but can be on the application layer.

HOW ENVIRONMENTAL CHALLENGES ARE SEEN ON USE CASES ?

- Problems in network communication decrease the performance of applications and user experience.

  Why?

- Latency

- Head-Of-Line blocking

- Packet loss

➢ Bad quality video streaming and voice communication
➢ Delays in loading times
➢ Application time-outs
➢ File corruption

➢ Prevent real-time business operations
➢ Slowly response of remote-controlled devices
➢ Energy consumption

XRTC ENABLES

- An application layer solution integrates seamlessly with your existing infrastructure.

- 30x faster data transmission latency compared to other HTTP based REST API technologies.

- 100x better resistance for interference.

- Even, when comparing to fastest UDP-based solutions, XRTC is 3x faster than WebRTC, which is traditionally used for low-latency video transfer.

Performance improvement, reliability and connectivity of existing applications and network environments – across satellite, 4G/5G, WiFi and fibre – in all conditions.

CONGESTION WINDOW

- Congestion window (cwnd) regulates the amount of data before requiring an acknowledgment from the receiver (TCP)

- XRTC is dynamically evaluating reliable network capability by analyzing Round-Trip time for packets

- Single data packet is sliced accordingly to multiple smaller packets and send via multiple TCP-channels simultaneously to ensure throughput

100 %
90 %

Theoretical maximum

cwnd

10 %

0.5 RTT @P99

Time

XRTC
Server

Sliced to multiple packets
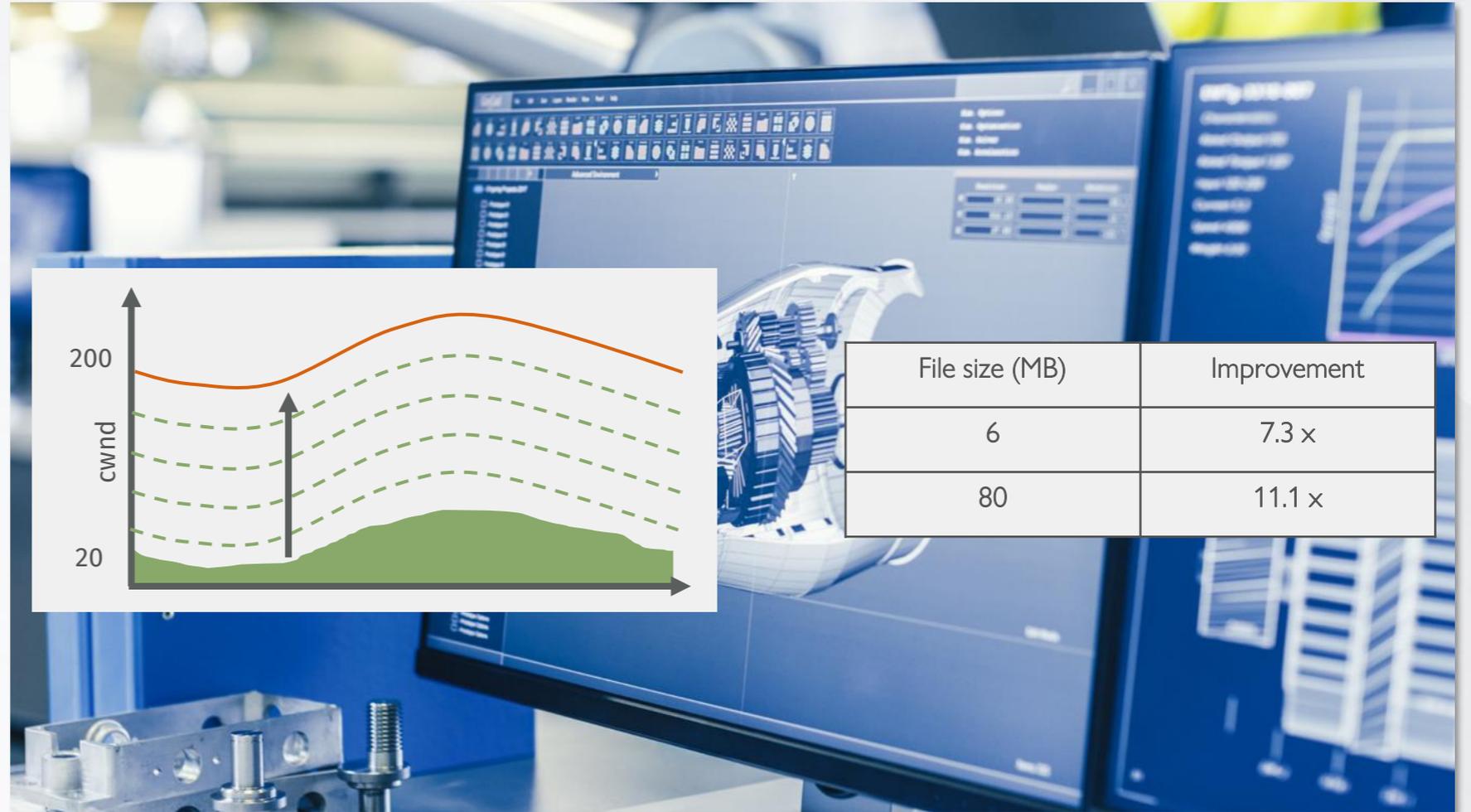
XRTC
Client

Original packet

Original packet
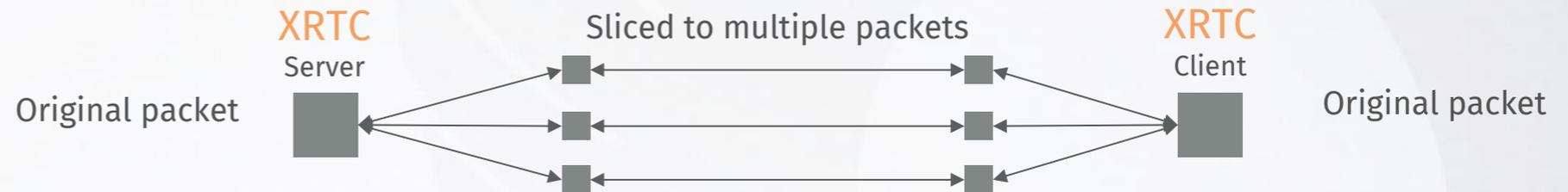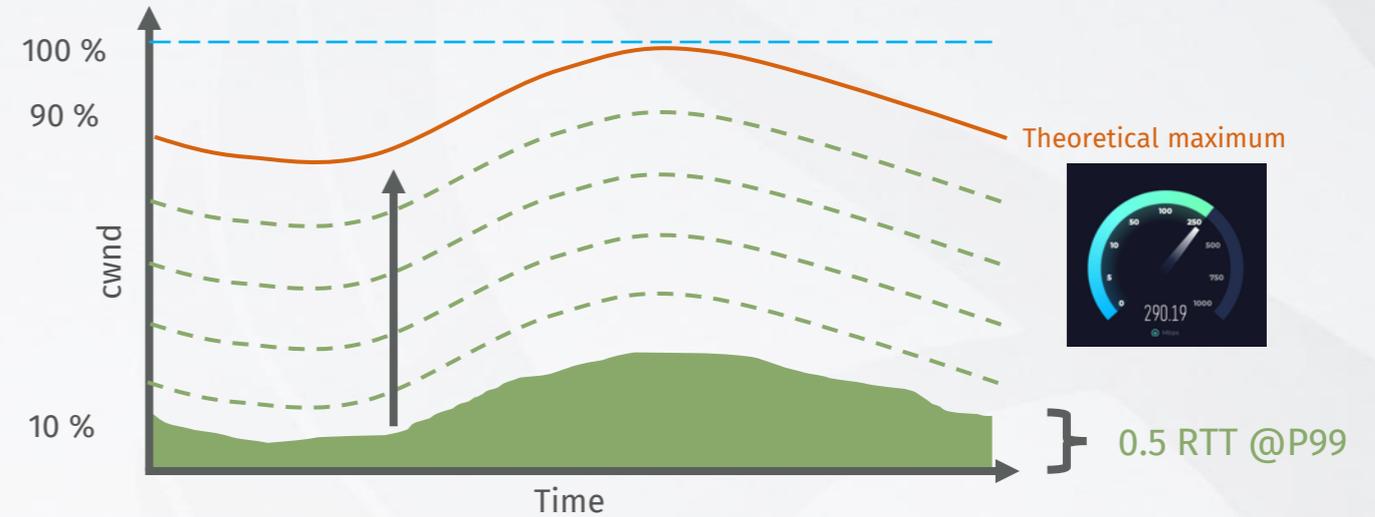
REMOTE VIDEO MONITORING AND TRAINING

- XRTC performance when interference occurs

- Optimal channel capacity fully reached after 7 sec

- Remote monitoring real-time requirement 1.0 sec delay

- With XRTC remote operations distance extended by 10 x, with only 300 msec delay (ping).
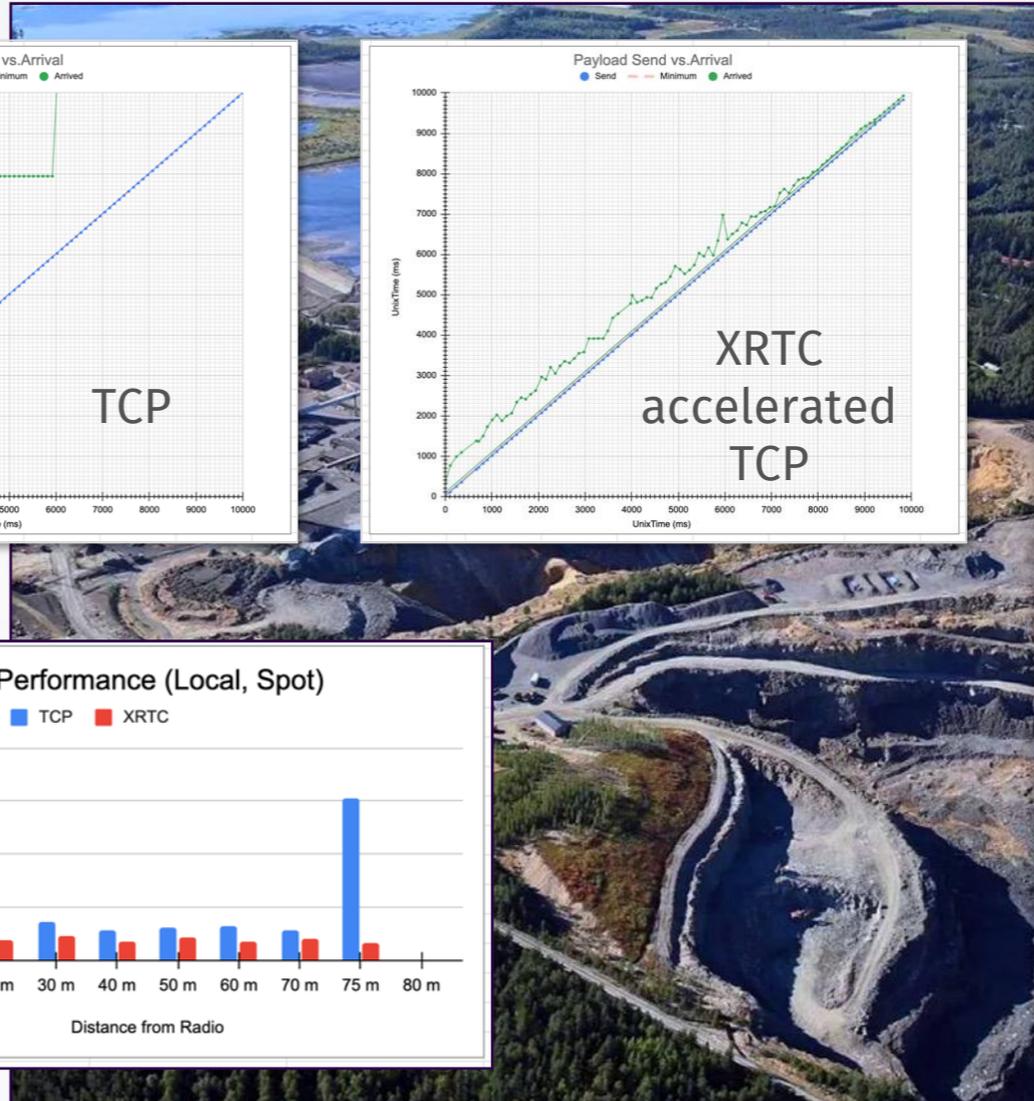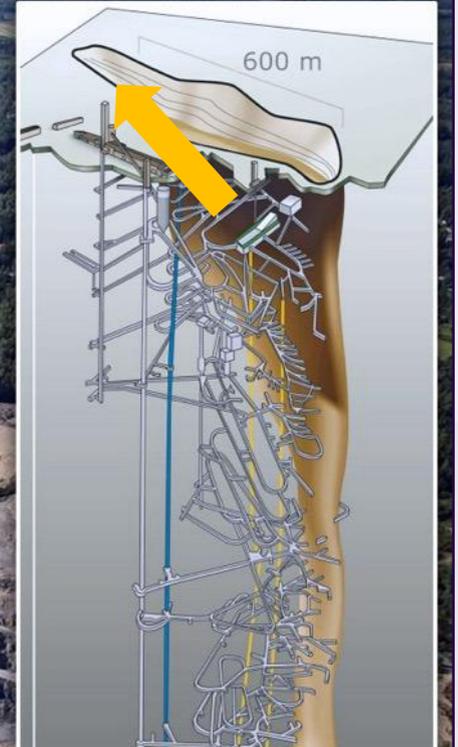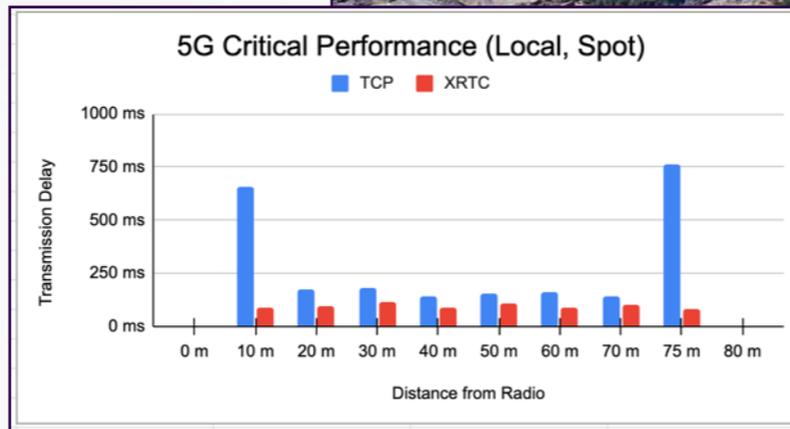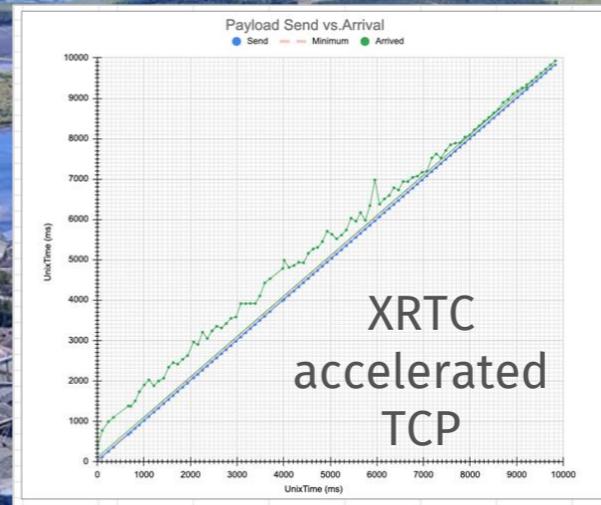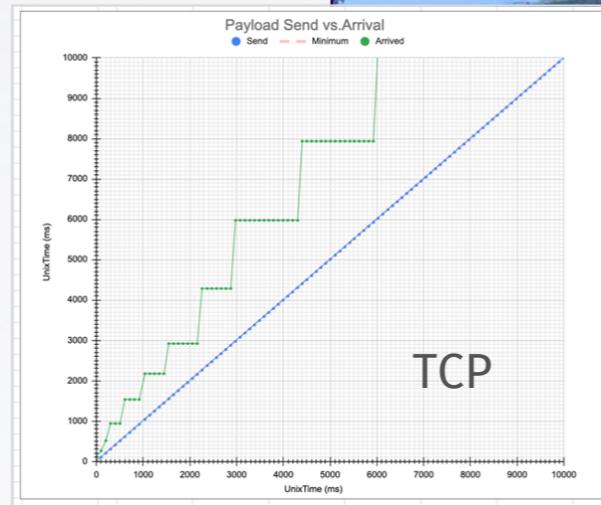
FILE DOWN-LOAD

- PLM/CAD –system file down-loading for edit

- Application server in Finland

- User in Finland

- Theoretical bandwidth 200 Mbps

- Performance on an application layer only 20 Mbps

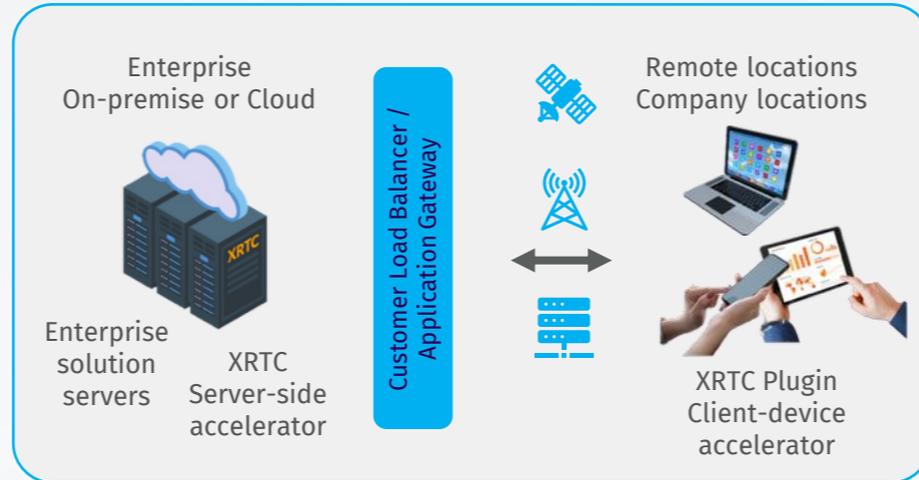| File size (MB)	Improvement
6	7.3 x
80	11.1 x

BENEFITS FOR YOU

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- **Performance:** Fully utilize your current network performance opportunity and increase performance beyond it on the application layer.

- **Resilience:** XRTC dynamically adjusts data transmission based on real-time network conditions – the more interference occurs, the higher magnitude of improvement for reliability.

- **Real-time:** Ensure real-time business operations, communication and remote operations in all conditions.

- **User experience:** XRTC enhances user experience by minimizing loading delays and fluctuations caused by network congestion, ensuring faster and more consistent performance.

- **Security:** XRTC uses TLS 1.3 encryption and end-to-end security protocols for data protection.
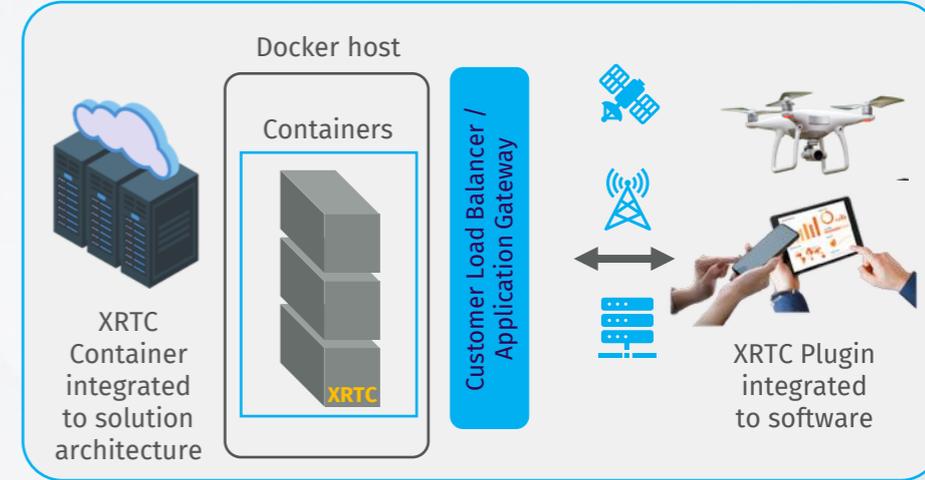
SOLUTION OPTIONS

- XRTC server

  - For all communication between solution servers and clients

- Software integration

  - Application specific communication

- XRTC "box"

  - When not wanted to touch your own application architecture

- XRTC as a Service
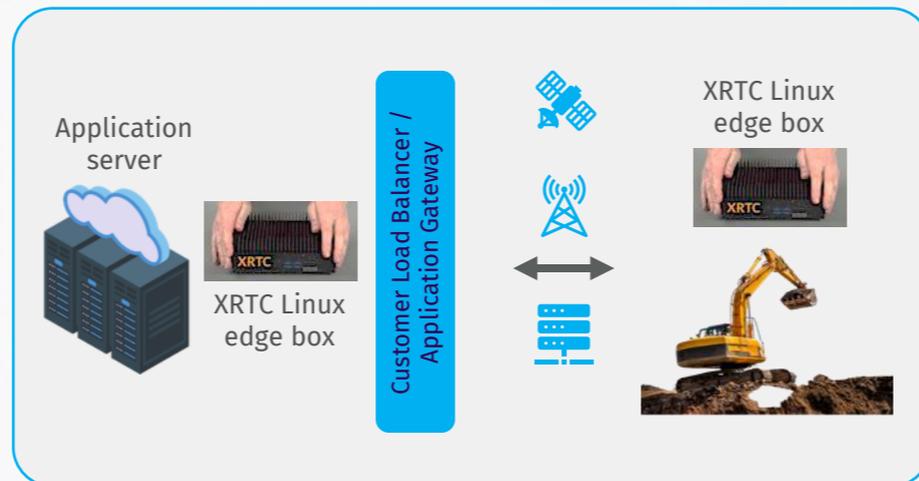
  - DCL hosts XRTC server in AWS

XRTC server

Enterprise On-premise or Cloud

Enterprise solution servers

XRTC Server-side accelerator

Customer Load Balancer / Application Gateway

Remote locations Company locations

XRTC Plugin Client-device accelerator

Software integration

Docker host

Containers

XRTC

XRTC Container integrated to solution architecture

Customer Load Balancer / Application Gateway

XRTC Plugin integrated to software

XRTC "box"

Application server

XRTC Linux edge box

Customer Load Balancer / Application Gateway

XRTC Linux edge box

XRTC as a Service

Enterprise solution servers

XRTC

Remote locations Business sites

XRTC Plugin Client-side accelerator

DCL AWS

PROOF OF CONCEPT

- Understanding current use-case and network performance from the application point of view

- Findings for potential improvement areas

- Verification and validation of improvement with XRTC acceleration

- Readiness for deployment

WP1 Definition workshop	WP2 Demonstration in simulation environment	WP3 Demonstration in customer's environment
• Use cases. • Detailed technical & architecture specification.	• DCL running test scenarios and measuring. performance data. • Vast of samples - statistically reliable. • Review of results.	• DCL together with Customer creates a test environment. • Customer running test scenarios with real use-case applications. • Measuring use case performance. • Deployment plan. • Review of results

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