Quality assurance and monitoring of demanding IP networks in lab and real life


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Quality assurance and monitoring of demanding IP networks

- **5G** works well in a lab network, in optimised conditions, but will inevitably fail in a live network unless appropriately tested in advance.
- To test the 5G network in a Lab you need to
  1. Simulate live network conditions by deviating the IP data passing through it (Rude).
  2. Provide heavy traffic loads, emulated cyber attacks, and malicious traffic for negative testing (Ruge)
  3. Monitor and analyse the network (PreScope®)
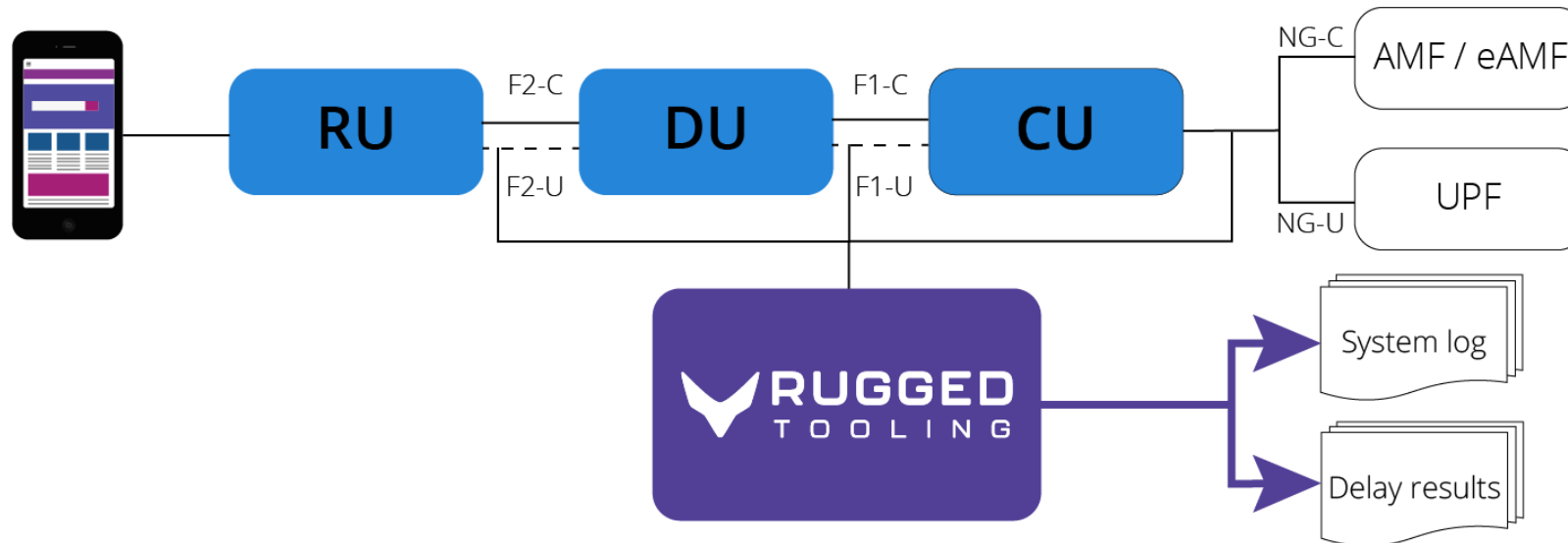
TEST CASES
- ✓ Emulates any IP network conditions
- ✓ Measures any critical latencies

KEY BENEFITS
- ✓ Saves time and money by simulating live network conditions and finding problems before network deployment.

# 5G brings networks diverse architecture and diverse risks

- **5G networks** are software-defined and virtualised – a significant change to previous wireless networks. Experience of distributed software under load advises that things will fail, services will drop, and any vulnerability will be wide open for exploitation.

- Stability, interoperability, availability, throughput, latency performance, noisy neighbours, cyber-attacks; what previously was dealt with in the backhaul needs to be tended to in the 5G midhaul and fronthaul as well.

- **Latency** is one of the top 5G key performance indicators (KPIs). The many elements of latency assessment (e.g., user plane and control plane latency, transmission delays is backhaul or transport) are essential for meeting the overall E2E latency target in different network slices.

5G PROBLEMS

- ✓ Software defined and virtualized solutions
- ✓ Interoperability
- ✓ Latency performance
- ✓ Network slicing
- ✓ Noisy neighbours
- ✓ Cyber attacks

VRUGGED
TOOLING

Rude emulates varying IP network conditions

- **5G** works well in a lab network, in optimised conditions, but will inevitably fail in a live network unless appropriately tested in advance.
- Rude is a man in the middle (MITM) device. It simulates live network conditions by deviating the IP data passing through it.
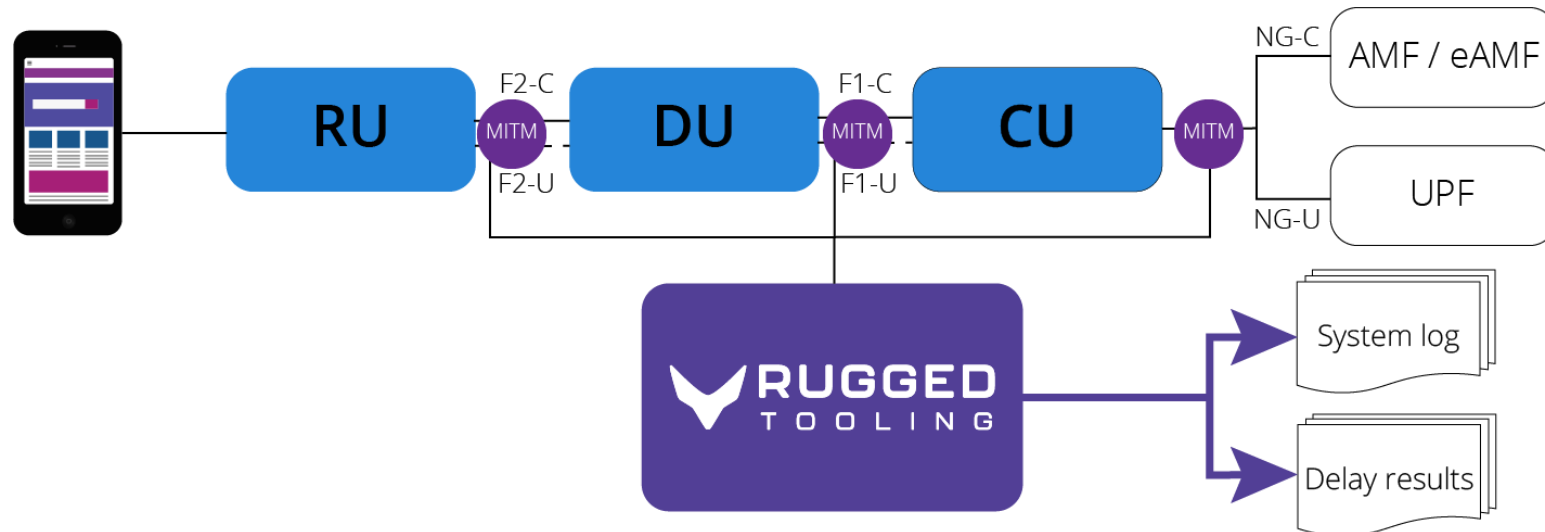
TEST CASES
- ✓ Emulates any IP network conditions e.g., delaying or corrupting PTP/NTP, priorities, or any other data in midhaul and/or backhaul.

KEY BENEFITS
- ✓ Saves time and money by simulating live network conditions and finding problems before network deployment.

# Functional safety/resilience of autonomous vehicles

Safety measures of IP/UDP/Lidar payload	Matching Rude network emulations
Corruption	Corruption
Unintented repetition	Duplication
Incorrect sequence	Reorder
Loss	Drop
Unacceptable delay	Delay and Jitter
Insertion	Data content modification

Customer case from a mine with 5G network.

Ruge generates heavy IP load

- 5G RAN tester (e.g., Siemens Veloce X-STEP) or real RU/DU/CU generates RAN traffic.

- **Ruge is an IP load generator.** It acts as a traffic source to provide heavy traffic loads, emulated cyber attacks, and malicious traffic for negative testing.

- **Combining Ruge and 5G RAN traffic generator** enables testing the target SUT, for instance as a noisy neighbour simulation. They can simulate different-intensity network traffic scenarios:
  a) regular-intensity-every-day traffic, b) network traffic close to the limits of its capacity, up to c) a relentless cyber attack data bombardment.
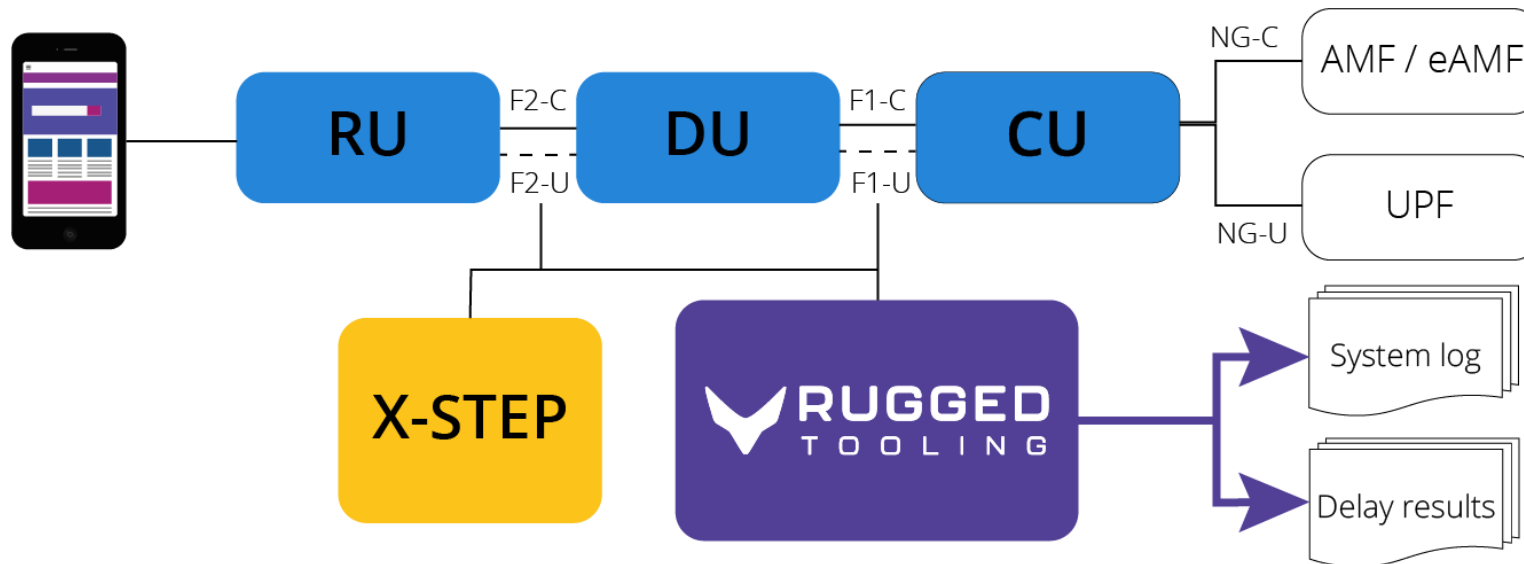

TEST CASES

- ✓ Thorough verification of system capacity and throughput
- ✓ Reliable testing of robustness and system recovery

KEY BENEFITS

- ✓ Saves time and money by simulating live network conditions.
- ✓ Finds problems before network deployment.

# Cyber ranges demand saturated lines with problems

Cyber ranges are not realistic without simulations of true crisis data loads and anomalies.
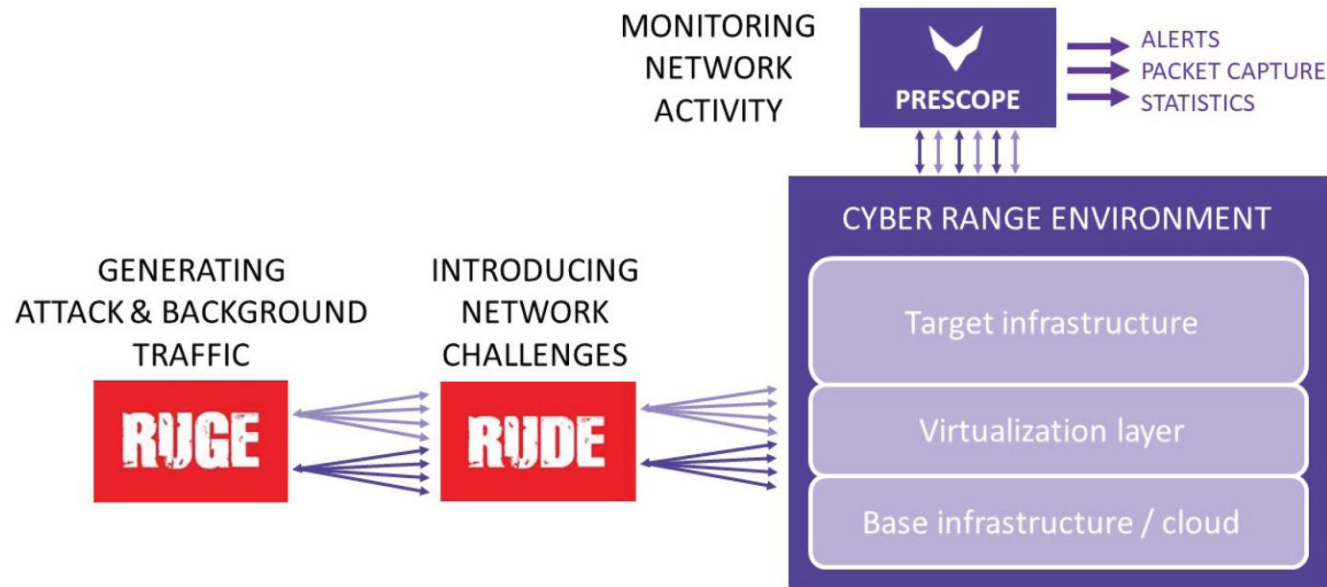
Hiding important messages by saturating the line rate with generic network traffic is just a good start. We can do much more.

PreScope® captures data from high-speed networks

- **Low latency** communications are a critical enabling factor of various 5G use cases and one of the KPIs that measure a system's quality of performance necessary to monitor wider operational goals.

- **PreScope®** is a cyber security sensor. It monitors and time-stamps high-speed, high-volume internet traffic, and captures any desired data for further analyses.

- **Network slicing** allocates the appropriate amount of network resources to a specific slice. It's crucial for operators to validate that slicing works as promised.
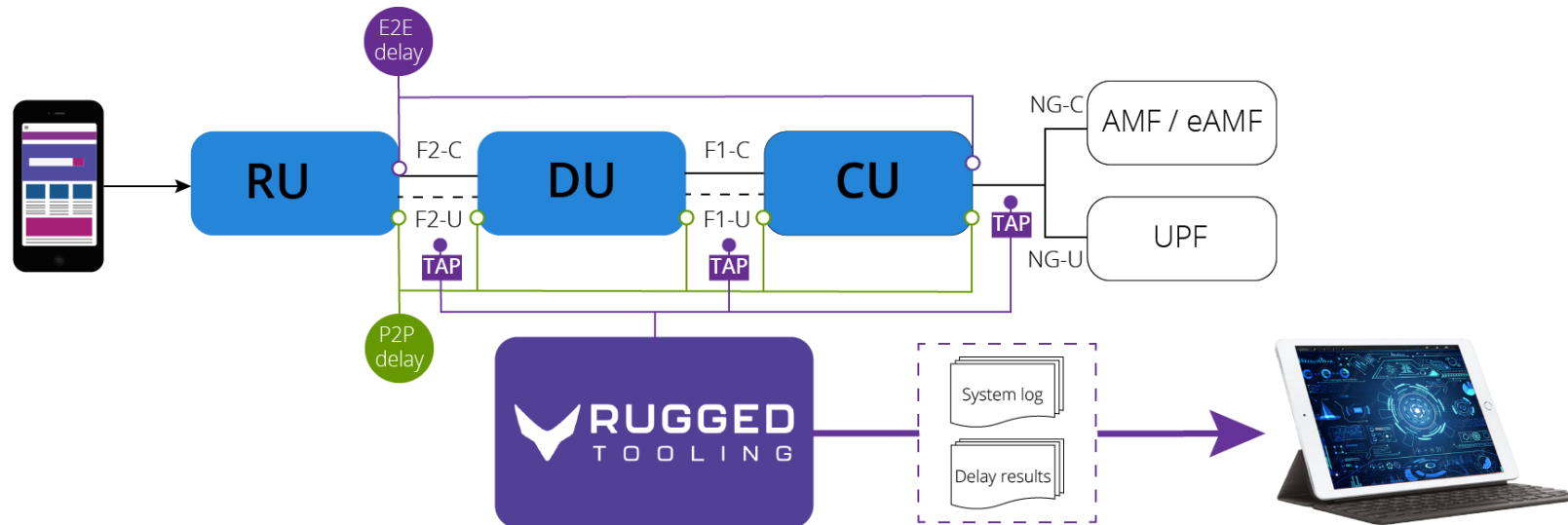

TEST CASES (roadmap)

- ✓ Detailed P2P, E2E, and roundtrip-delay measurement

- ✓ Priority testing

KEY BENEFITS

- ✓ Confidence of getting maximum security, robustness, and system recovery with minimum investment.
- ✓ Certainty of critical communications needed e.g., for first responders or for advanced safety features in automated driving.

Rugged Tooling 5G IP network test and analysis solution
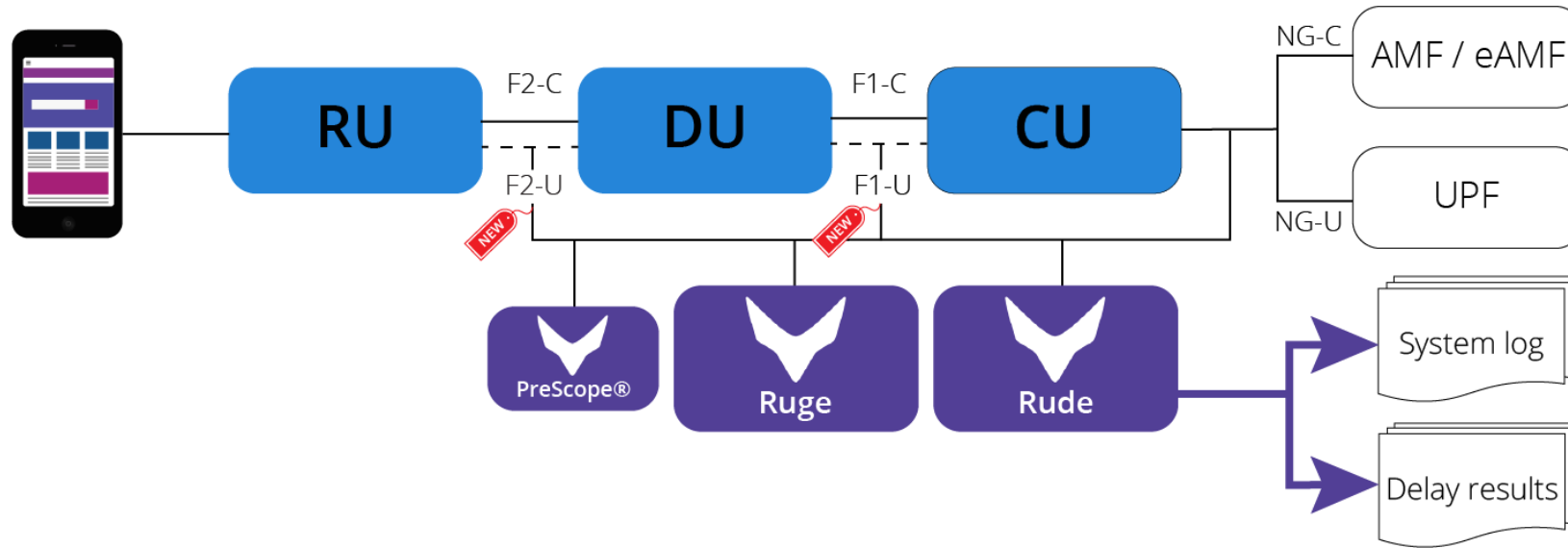
BENEFITS

- ✓ Significant savings in time and money by simulating live network conditions and finding problems before network deployment.

- ✓ Competitive advantage with guaranteed customer satisfaction.

- ✓ Extended product life cycle.

Rugged Tooling customers

NOKIA

ERICSSON

DRDO
Indian defence
R&D organisation

EXFO

arm

NOHAU

X
A manufacturer of
autonomous vehicles

NIXU cybersecurity.

NATO Cooperative Cyber Defence Centre of Excellence

F-Secure.

VTT

UNIVERSITY OF TAMPERE

CR14 NATO Cyber Range

Etteplan

Bittium

A!

TRACKER

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RUGGED TOOLING

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