# Ericsson Performance Optimizers

**Solution sheet**

# Network optimization transformed with AI

AI-based network performance diagnostics analyzes communications service providers' Radio Access Network (RAN) to resolve network issues efficiently and provide specific parameter change recommendations. Various advanced AI techniques enable fast and accurate optimization of the end-user performance.

Traditionally, network performance monitoring and optimization is handled by a team of engineers supported by rule-based systems, able to cope with limited areas of the network (typically areas with the worst-performing cells). However, with the rapid introduction of new technologies like 5G, mobile networks are growing and becoming more complex. With this speed of change, performance gains become more difficult to achieve, so optimization efforts must

evolve into broader and more agile solutions that reach beyond human capabilities.

Introducing Ericsson Performance Optimizers, part of Ericsson Cognitive Software portfolio, the first telco-industry, field-proven suite of AI-powered applications to use digital twin technology and deep reinforcement learning (RL), Ericsson Performance Optimizers provide mobile network optimization recommendations to

proactively resolve performance issues. The solution also accounts for the invisible changes in the network caused by each addition to the environment, such as new applications, city growth, new sites or user behavior.

To ensure the coverage of automated optimization across mobile networks constantly increases, Ericsson will be periodically releasing new Performance Optimizers that target different issues.

## Accelerating AI adoption with Cognitive Software

Realizing the value of AI at scale requires overcoming some major barriers. Trust, Flexibility and Agility are among the most challenging, and Cognitive Software can help address these.

### Trust

Explainable AI embedded in the applications increases transparency in AI-driven insights and automations.

### Flexibility

Tailored AI models and user experience. Globally trained AI algorithms can be locally re-trained when it is convenient to prevent model drifting and adapt better to every network. Application workflows and user interfaces can be customized for seamless operational integration

### Agility

Cloud-native architecture that enables highest flexibility for efficient AI-driven operations. Scale up and down as required, and facilitate integration into CI/CD pipelines for in-service software upgrades with 100% uptime

## Flexible offering

Every automation journey is different, and every operator needs to align this with other strategic choices in the area of software infrastructure, management platforms, or the overarching technology evolution.

To accommodate this diverse range of scenarios, Ericsson provides Performance Diagnostics as a dual software solution, supporting both standalone deployments and rApps, together with a diverse set of infrastructure options. Ericsson Performance Diagnostics can be deployed in either dedicated hardware, private cloud, public cloud, or Ericsson premises in a software as a service mode.

This flexible offering allows every operator to decide when and how to take steps forward in their transformation at their own pace and with their own priorities.

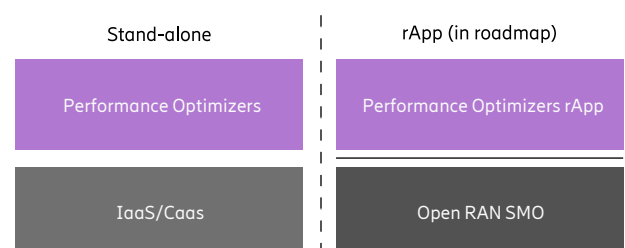**Flexible deployment models for Ericsson Performance Optimizers**

| Stand-alone | rApp (in roadmap) |
|---|---|
| Performance Optimizers | Performance Optimizers rApp |
| IaaS/Caas | Open RAN SMO |

**Figure 1: Ericsson Performance Optimizers solution flow**



Issue optimizers can operate network wide on detected issues and RCA checks. General optimizers in areas impacted by changing traffic conditions as network and user patterns evolve.
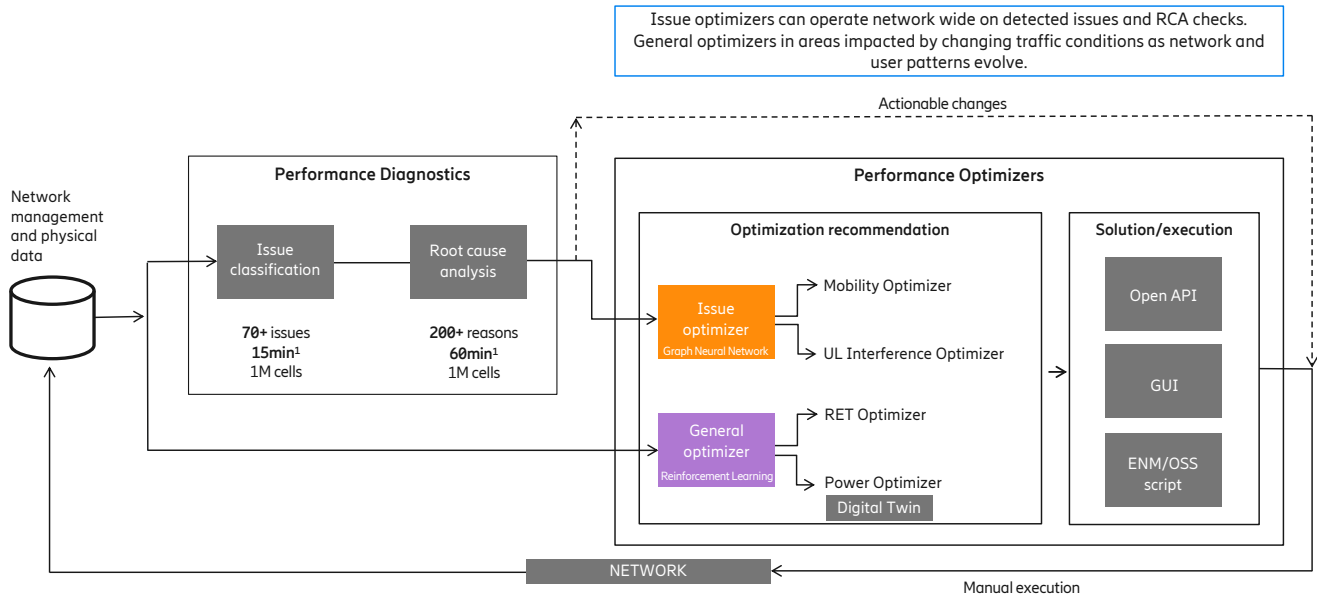
[1] Actual execution time, North America

Figure 1 illustrates the high-level architecture of the solution and introduces the two different approaches: issue optimizers and general optimizers.

Firstly, the data is collected from multi−vendor network management systems and translated into a normalized format as the AI algorithm is vendor-agonistic by design. After data ingestion, AI analyzes over 160 network key performance indicators (KPIs) per cell, across all cells in the network, processing millions of variables in minutes. AI identifies cells with anomalies and clusters those with similar issues, for example, coverage, handover, and external interference among 70+ different issue classes. Once issues are classified, analyzed, and the root cause is identified by Ericsson Performance Diagnostics, issue optimizers then accurately predict network performance improvements and provide one-shot optimization recommendations for targeted cells.

As traffic patterns evolve with new applications, city development, or user behavior, network performance may degrade. This is where general optimizers step in, to proactively optimize network performance and keep up with these changes. General optimizers leverage deep reinforcement learning (RL) and also use digital twin technology.

Ericsson Performance Optimizers benefit strongly from advanced AI techniques. The provided key values — automation, scalability, speed, accuracy, and consistency in network optimization — enable service providers to maintain and improve their network performance at a higher level. Examples of tangible improvements introduced by Performance Optimizers are shown in Figure 2 (all values are from live deployments and proofs-of-concept).

**Figure 2: Ericsson Performance Optimizers' customer case results**

### Issue optimizers

**26%** x40 faster compared to the traditional approach[1]
Rise in uplink SINR[1]

**50%** Rise in uplink traffic data[3]

**42%** Rise in uplink user speed[3]

### General optimizers

**12%** Congestion value reduced to almost zero while traffic slightly increased[2]
Faster downlink throughput[2]

**3%** Reduction in base station energy consumption[4]

**30%** Faster uplink throughput[3]

Based on real customer outcome: [1] Asian service providers. [2] MASMOVIL. [3] Middle Eastern service provider. [4] European service provider.

* Signal-to-Interference-Plus-Noise Ratio (SINR)

# Digital twins for more accurate recommendations

Ericsson's market-proven and AI-powered Performance Optimizers solution uses reinforcement learning and digital twin technologies to provide accurate parameter change recommendations for automated network optimization.

The solution has been used by different service providers globally since its first deployment in 2021.

Taking an issue-based approach, service providers benefit strongly from the Mobility Optimizer and the Uplink Interference Optimizer.

The Mobility Optimizer boosts the performance of cell-edge users with automatic optimization of A2, A3, and A5 event triggers for multiple frequency layers and the Uplink Interference Optimizer improves throughput and phone battery life, while reducing interference through the optimization of uplink power control parameters (PzeroNominalPusch/PzeroNominalPucch/alpha) in the cell area to maximize uplink SINR.

Service providers also benefit from the Remote Electrical Tilt (RET) Optimizer and Power Optimizer, which take a general approach (not targeting a specific predefined issue).

The RET Optimizer improves radio frequency quality and coverage while minimizing congestion, and the Power Optimizer lowers radiated power while improving performance and maintaining coverage.

General optimizers are the first telco–industry applications equipped with digital twin technology and advanced AI techniques, like deep reinforcement learning, which are proven in the field.

Digital twin technology accurately mimics the network behavior upon parameter changes, ensuring an approach that minimizes risk and elevates the optimizer's quality to telco-grade from day one.

Reinforcement learning is a machine-learning (ML) technique that learns from the network, where an agent (Performance Optimizer) interacts with the environment and takes actions toward a long-term goal, then adapts the optimization based on the characteristics of each cell and its influencing area.

**Figure 3: Ericsson Performance Optimizers architecture with RL and a digital twin**
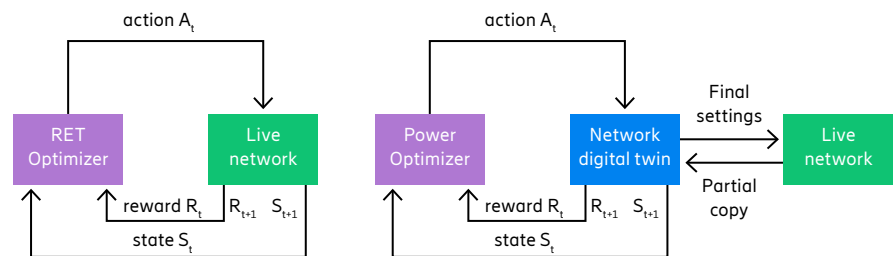


- RL[2] agent-based solution.
- Neural networks propose actions to maximize the long-term reward and receive feedback from the environment through the state, as input for the next action.

- Digital twin allows safe interaction with the network. Highly granular call trace in big data architecture enables offline optimization.

## Key benefits

Ericsson Performance Optimizers enable a systematic and fully automated parameter-optimization approach, boosting scalability and performance.

**Ericsson's domain expertise embedded**
Based in the lab but with their eyes on the real-world, everyday challenges of live networks, our experts are experienced in developing leading AI technology that maximizes network performance and operational efficiency. Due to Ericsson's scale, we have access to vast amounts of highly granular live traffic data, which makes our software perform with exceptional precision.

**High prediction accuracy**
The field verifications show an issue classification accuracy of 98 percent, with the solution's prediction algorithms accurately identifying which cells to tweak for maximum performance impact.

**Learns from the live network**
Digital twin technology and pre-training techniques enable a risk-free approach based on live traffic patterns. In a complete zero-touch approach, RL agents learn on their own after each change and determine the next change toward the long-term goal.

**Go beyond human capability**
When a cell is affected by a combination of issues, it is hard for an engineer to identify them all upfront and resolve them at once. Leveraging non-supervised ML algorithms, the system can detect and optimize both hidden and new issues.

**Scalability and speed**
With impressive scalability and speed, the solution scans the whole network every day, analyzes millions of cells in minutes, and provides recommended changes daily.

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[1] Controls the trigger points for UE to move to a different LTE frequency for improved performance
[2] Read the Ericsson Mobility Report to learn more about reinforcement learning and digital twins:
   https://www.ericsson.com/en/reports-and-papers/mobility-report/articles/reinforcement-learning

Ericsson enables communications service providers to capture the full value of connectivity. The company's portfolio spans the following business areas: Networks, Cloud Software and Services, Enterprise Wireless Solutions, Global Communications Platform, and Technologies and New Businesses. It is designed to help our customers go digital, increase efficiency and find new revenue streams. Ericsson's innovation investments have delivered the benefits of mobility and mobile broadband to billions of people globally. Ericsson stock is listed on Nasdaq Stockholm and on Nasdaq New York.