



ERICSSON



# Improve service experience with troubleshooting and analytics

Ericsson Expert Analytics:  
Advanced troubleshooting

September 2023

# Executive overview

5G presents more opportunities, higher expectations, and enticing challenges for the industry to solve and manage.

To be cost-efficient, 5G requires a transformation of network operations. Exponentially growing data volumes and diverse datasets across the network must be captured and analyzed in the most effective way. Managing diverse data requirements demands new tactics. And identification of issues affecting the service experience for different use cases needs to happen faster. For these reasons, traditional troubleshooting and analytics strategies are not sustainable long term.

To successfully manage this growing complexity, subscriber centricity for data-driven networks is essential. Ericsson Expert Analytics: Advanced troubleshooting capabilities support Communications Service Providers (CSPs) as they strive to meet customers' expectations for a superior service experience.

This document describes Ericsson Expert Analytics (EEA) with an emphasis on advanced troubleshooting capabilities.



Ericsson's advanced troubleshooting provides real-time, customer-centric insights with actionable intelligence for network and subscriber monitoring. This advanced troubleshooting and analytics use machine learning and AI to maximum effect.

EEA's advanced troubleshooting capabilities provide key visibility into all dimensions, including network functions, slices, cell/locations, devices, and customers. Dedicated and configurable dashboards cover many different use cases, including Mobile Broadband (MBB), Enhanced Mobile Broadband (eMBB), Fixed Wireless Access (FWA), Voice over LTE (VoLTE), Voice over New Radio (VoNR) and massive Internet of Things (IoT).

**Together, these EEA capabilities:**

- Collect and process only what is needed when it is needed to optimize the cloud resource footprint.
- Provide different criteria for data collection, sampling and filtering depending on the use case.
- Support on-demand data collection targeting specific issues detected or initiated by the customer / user or an external application.
- Employ anomaly detection techniques based on Machine Learning (ML) and Artificial Intelligence (AI), linking them to the most probable cause (for example, core, backhaul, radio, billing and the internet).
- Prioritize capital investment using key customer attributes, such as revenue, value, type (for example, VIP or enterprise) and impacted customers.
- Perform advanced troubleshooting with multi-interface correlation between cause, status and response codes, and detailed protocol decoding of each Information Element (IE) and related hex-codes.

EEA collects and correlates data in real time directly from the Network Functions (NFs). EEA relies on NF events as the primary source of information whenever possible to minimize compute resources.

EEA troubleshooting capabilities collect and process data from Ericsson's IMS and dual-mode 5G Core networks and might be extended to cover 4G and 5G Radio Access Networks (RANs) as well as 4G Evolved Packet Core (EPC) networks.

# Market insights - 5G is here!

The advent of 5G and the new cloud-native architecture introduces a paradigm shift in best practices for data collection, analytics, and advanced troubleshooting.

It allows for proactive subscriber-centric analytics to quickly troubleshoot and resolve service experience issues more accurately and efficiently.

5G customer expectations are ever increasing and evolving. And because of the diverse customer base, we are also seeing greater diversity in services and devices. Considering 5G's more complex, advanced capabilities,

establishing accurate customer-centric visibility is more important than ever for 5G's success.

While tools and processes in each dimension are important, in the end it's customer centricity that combines all aspects, eliminates siloed activities and streamlines overall efforts.

Customer centricity connects the dots. It enables proactive personalization, exploration of new revenue segments and innovative business models.



Figure 1. Customer centricity connects the dots.

# Trends impacting network analytics market evolution

Traditional ways of probing - including troubleshooting - are no longer feasible due to the higher complexity of 5G interfaces, the need to do troubleshooting on the Kubernetes layer of the architecture, and the greater "elasticity" of the 5G network, which requires more real-time monitoring. As 5G continues its march towards cloud-native, software-driven architectures, analytics solutions must also be cloud-native to support more dynamic, automated data collection, filtering, and correlation. Integrating software probes into 5G Core is resulting in a significant market shift.

The telecom analytics area is moving from operational silos to an integrated stack incorporating analytics, mainly in pursuit of "extreme automation" across the network, resulting in the need for integrated solutions, both "vertically" and "horizontally".

**Vertical integration** (across different levels of the use case stack) means that pure service experience

management is increasingly uncommon as troubleshooting associated with analytics solutions becomes increasingly important to CSPs.

**Horizontal integration** (across network domains) means that a significant market shift is now visible – from domain-specific, siloed assurance to multi-domain, end-to-end assurance – correlating both service and network data to gain a holistic, end-to-end network view from the customer's perspective.

As network complexity increases, demand for standardization intensifies. For example, 3GPP has introduced the Network Data Analytics Function (NWDAF) and Management Data Analytics Function (MDAF). These aim to drive alignment between the architecture and delivery of analytics and closed-loop automation use cases. O-RAN has also introduced new interfaces that enable QoE (Quality of Experience) optimization and per user equipment traffic steering.

## Ericsson's approach

Ericsson Expert Analytics applies subscriber monitoring to Ericsson's dual-mode 5G Core network to support granular and near real-time analysis of performance, issue detection, troubleshooting and pro-active resolution.

The information provided by this approach will be correlated in near real-time and the resulting output used to monitor service levels, detect incidents in advance,

assist in problem management, provide information to direct network planning and optimization, measure service experience, empower visibility, and provide analytics to allow marketing to target campaigns with improved granularity.

Since the intelligence built into Ericsson Expert Analytics extends its advanced troubleshooting capabilities, it is especially useful for deep troubleshooting as well.

# Introducing Ericsson Expert Analytics

EEA is a subscriber-centric analytics and troubleshooting tool enabling CSPs to capitalize on network data.

EEA continuously measures the perceived subscriber experience for all individual subscribers and their services across the mobile network with exceptional accuracy. This data aggregation provides a deeper understanding of network performance from location, device and service provider perspectives.

It achieves this by collecting and measuring performance data, event records and raw packets from the network. It then correlates the collected data, stores it in databases, and translates it into correlated events and Key Performance Indicators (KPIs) that quantify the Quality of Service (QoS) and Quality of Experience (QoE).

EEA also discerns incidents from the collected data, based on site-configurable rules, and provides a range of data visualizations. Using the different user views provided by EEA, the data can then be analyzed to improve network performance and service experience. Additionally, EEA

applies machine learning algorithms to detect anomalies, checking billions of cross-related points based on subscriber incident data.

EEA provides service experience and advanced troubleshooting information in an open and horizontal architecture with intuitive data visualization. This lays the foundation for an enhanced service experience through better network performance while also contributing to large-scale, operational savings.

In summary, EEA collects data from different sources, performs cross-domain, end-to-end correlation, and detects problems and their probable causes, while fully utilizing intelligence derived from Ericsson's telecommunications expertise. EEA provides both network and subscriber views of this data in an intuitive and efficient way that can be utilized by multiple business functions and CSP stakeholders, including executive management, network operations, network optimization and planning, customer care and marketing.



# Improve service experience with troubleshooting and analytics

EEA brings a different approach to troubleshooting and analytics. It is designed for proactive subscriber-centric analytics that quickly troubleshoots and resolves service experience issues more accurately and efficiently.

The four pillars of EEA address key challenges of 5G analytics and troubleshooting.

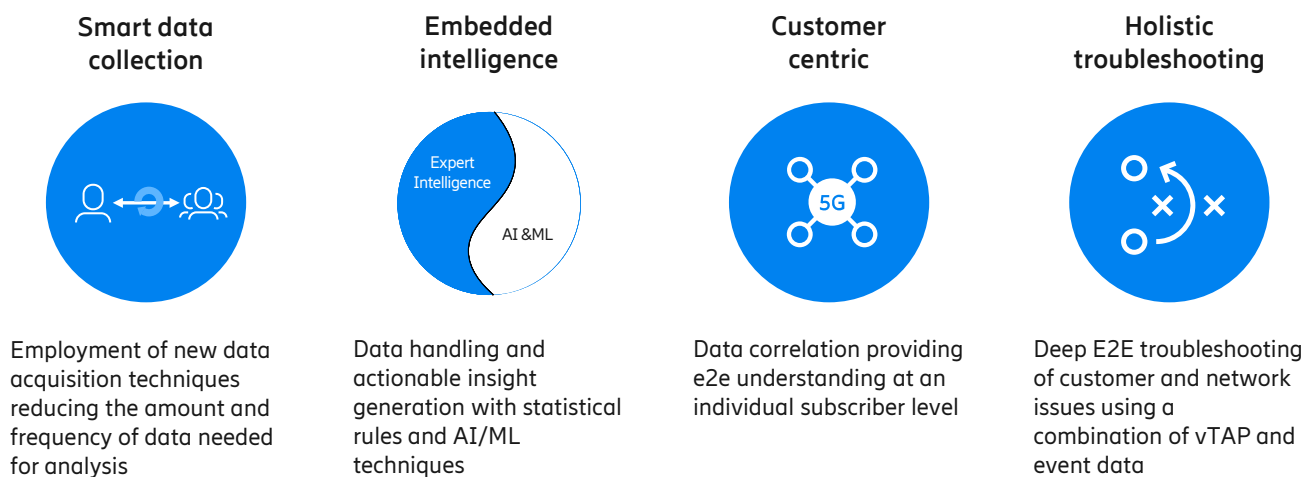


Figure 2. Four pillars of Ericsson Expert Analytics

## Smart data collection

By employing smarter data acquisition techniques, EEA reduces the amount and the frequency of data gathered for analysis as it filters and processes mission-critical traffic. It is not necessary to monitor the entire network continuously. Using different policies, it is possible to process and store only failures, or manage VIP customers through whitelists. Dynamic behavior is also desirable to increase data collection in troubled areas, or during upgrades or special events.

## Customer centric by design

Real-time, end-to-end customer-centric correlation is fundamental to insight creation. EEA correlates data from different domains across control planes (CP), user planes (UP), and Radio Access Networks (RANs). Data records linking QoE degradation are further enriched by correlating reference data from various sources. This enables swifter identification of issues affecting customers across a various use cases.

## Embedded intelligence

Built-in domain knowledge helps automate workflows and manage complexity. All incoming events for each subscriber are continuously evaluated to accurately detect service experience degradation. This automated detection is executed in real time at the correlation layer, thus accelerating the identification of potential root causes for subscriber incidents. Machine learning techniques are also applied to analyze 100 billion combinations of dimensions to address network complexity and detect issues early.

## Holistic troubleshooting

Deep, end-to-end troubleshooting of customer and network issues uses a combination of vTAP and event data. EEA is providing TCO reduction through intelligent and efficient data handling. Workflows are dynamically generated to gather specific data needed for troubleshooting issues.

## Expert Analytics high-level architecture

The high-level EEA architecture is illustrated below.

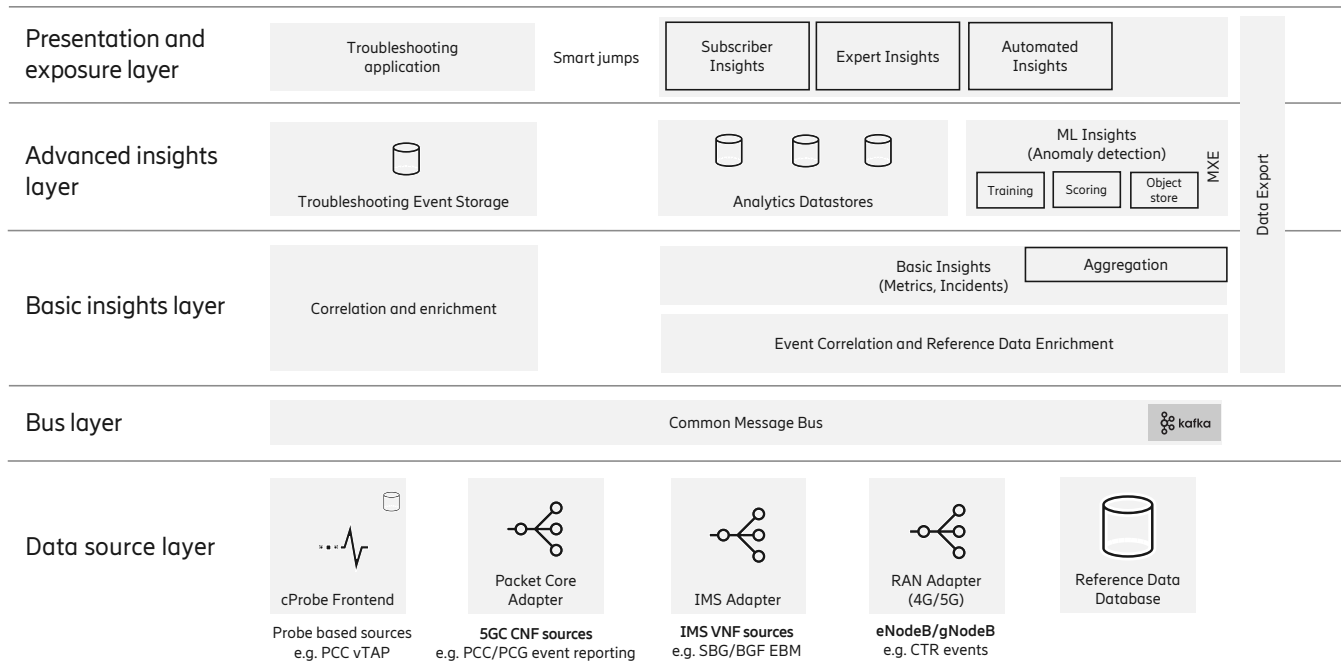


Figure 3. Expert Analytics and troubleshooting high-level architecture

The EEA architecture has five main layers, which are supported by common operations, maintenance, and security functions, including:

- Data source layer
- Bus layer
- Basic insights layer
- Advanced insights layer
- Presentation and exposure layer

With its containerized, cloud-native implementation, EEA is deployed on a Kubernetes cluster that resides either on virtual machines or on bare metal hardware environments.

It is particularly advantageous that the solution is pre-integrated with Ericsson's dual-mode 5G Core nodes using built-in software probes. It uses the event data from the SGSN-MME, or from EPG, or from Packet Core Controller (PCC) or Packet Core Gateway (PCG) nodes.

Data collected from NFs can be enriched with additional reference data, including subscriber, network inventory and topology, MNC-MCC mapping, OpenStreetMap, and device (IMEI TAC) data. This comprehensive visualization of network conditions is the key to achieving a better customer experience.

EEA is also pre-integrated with Ericsson's IMS nodes and RAN with event data and is available for analytics and troubleshooting functions. EEA is available for multi-vendor environments, where its adaptation is done during deployment.



# Expert Analytics applications

EEA is packaged with a wide range of use cases stemming from the four applications listed in the figure below., including newly introduced Advanced Troubleshooting.

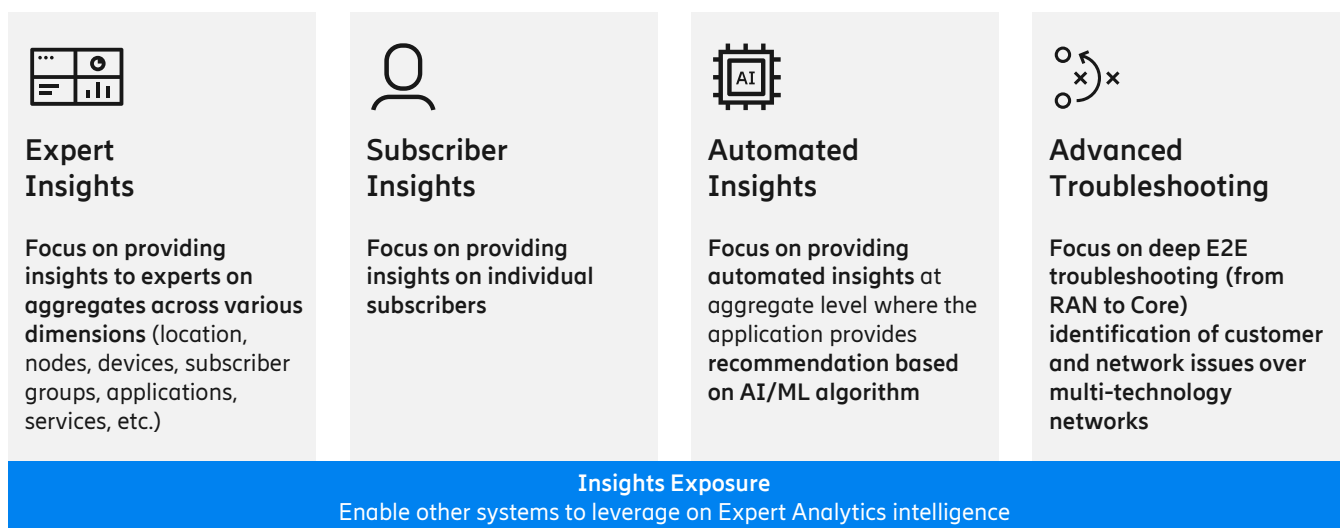


Figure 4. Expert Analytics applications

## Expert Insights

Expert Insights is a business intelligence (BI) application that enables monitoring and dashboarding of use cases. Its pre-defined dashboards can be used for displaying and analyzing data collected by EEA, and industry-standard tools enable systems integrators and others with deep telecom expertise to create customized dashboards and reports.

Expert Insights retrieves, visualizes, analyzes, and reports data based upon the aggregated view of its generated insights using an industry-standard BI stack to implement functionality. The dashboards enable analysis of specific data segments, such as users, services, network elements and locations. Slicing and dicing of data is possible using different filters and drilldowns along a wide range of dimensions. It also allows data visualization based up assorted criteria, including map views, bar charts, stacked bar charts, pie charts, bubble charts and time-series charts.

EEA is delivered with a set of system dashboards that display metrics, incidents, and KPIs in a structured, efficient, and flexible way, fostering a better understanding of the mobile network's overall performance. Since the system dashboards are all based on a common set of elements, EEA ensures usability throughout by maintaining consistent functionality, interaction, and data presentation.

## Subscriber Insights

Subscriber Insights encompasses use cases focused on analyzing the experience of individual subscribers or devices identified by a unique International Mobile Subscriber Identity (IMSI) This application's dashboards support an array of use cases, including detailed analysis and troubleshooting of individual data sessions, calls and subscriber incidents.

Subscriber Insights applications can be accessed directly for an individual IMSI or launched as part of the drill-

down analysis from specific Expert Insights or Automated Insights dashboards.

**Automated Insights**

Automated Insights applies machine learning-based automation to detect anomalies that require the user’s attention and action.

This application analyzes a huge customer dataset in near real-time to identify and pinpoint critical anomalies emerging across the mobile network. These anomalies include: which areas of the network have many

customers showing problems, what key indicators are deviating significantly from their typical measurements, and which devices or locations are showing an exceptional number of degradations.

Automated Insights uses sophisticated machine learning algorithms to quickly spot problems as they occur. Since users are spared the time-consuming exercise of sifting through their own data, they can move quickly to resolve the issues at hand. These algorithms have been tested with real customer data to establish their effectiveness.

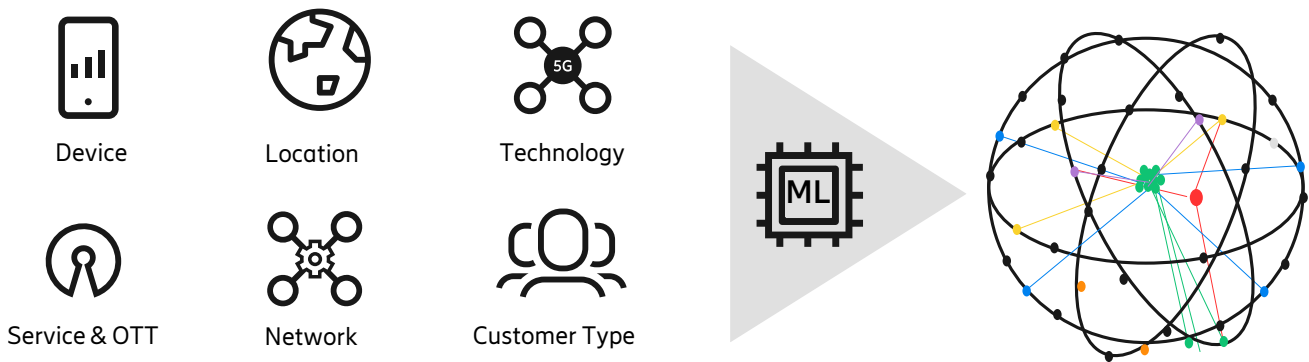


Figure 5. EEA automated anomaly detection

**Advanced Troubleshooting**

Advanced Troubleshooting is used for network and subscriber troubleshooting to quickly resolve issues and optimize service experience. This application provides end-to-end network analysis, giving visibility across the whole network from core to access.

Advanced Troubleshooting provides access to two different types of troubleshooting sessions:

- Historical sessions, where the user browses network and subscriber activities that occurred over the past few days (Standard mode is provided by default).
- Live sessions, where the user browses network and subscriber activities that are occurring in real-time (Optional mode).

Key features of the application include multi-interface flowcharts, end-to-end call flow charts, protocol decoding and data export.

**Insights exposure**

The EEA stream export function allows the export of data to external systems, such as a service provider’s data lake. Different types of data can be exported, such as raw correlated events, subscriber-level metrics and incidents, and aggregated data. It also handles export functionality, including configuration management, license handling, filtering, sampling, decryption, or token mapping back to real content, as well as format conversion and secure communication to the external target.

# Conclusion

The new 5G era and cloud-native architecture introduce a paradigm shift in data collection, analytics, and advanced troubleshooting. 5G Core architecture is a major game changer for analytics and troubleshooting.

Telecom analytics solutions typically measure network performance but have goals for customer experience. With its advanced network analytics, Ericsson Expert Analytics allows for proactive subscriber-centric analytics to accurately troubleshoot and resolve service experience issues faster and more efficiently.

The customer-centric approach aims for a superior service experience by identifying the most probable cause faster, accelerating time to fault resolution by using proactive correlation of subscriber insights, and using dynamically generated workflows to collect relevant subsets of data.

Embedded intelligence offers a smarter approach with built-in domain knowledge. It is processing events with AI/ML, triggering workflows for smart data collection

(meaning less time to repair). It uses less compute resources at the data collection layer and Ericsson Network Functions with typical 50-70-percent OPEX savings.

EEA's smart data collection, which is based on real-time, event-based network data processing, offers valuable visibility of the service experience. It gives smarter, more secure data handling from collection to insights (E2E encryption) while leveraging the full functionality of Ericsson software probes.

With its holistic troubleshooting approach, EEA is optimizing troubleshooting with a 55-80-percent CAPEX saving (footprint and deployment). With real-time anomaly detection (leveraging ML/AI) across multiple dimensions, it addresses network complexity and detects issues early so they can be resolved before the service experience is affected.

## Related links:

1. [Telecom analytics: transform data into action - Ericsson](#)
2. [Expert Analytics - Ericsson](#)
3. [TPG Telecom uses Ericsson Expert Analytics: Advanced troubleshooting to improve service experience](#)
4. [Troubleshooting telecoms: A smarter way](#)
5. [Ericsson 5G Core](#)
6. [Securing 5G experience with software probes](#)
7. [OSS/BSS evolution for successful 5G monetization - Ericsson](#)
8. [Core commerce for superior telecom customer experience - Ericsson](#)
9. [Service orchestration for better service quality - Ericsson](#)
10. [5G monetization to improve top line revenue capture - Ericsson](#)

Ericsson enables communications service providers to capture the full value of connectivity. The company's portfolio spans the business areas Networks, Cloud Software and Services, Enterprise Wireless Solutions, 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.