Ericsson Expert Analytics (EEA) Overview

Ericsson Expert Analytics (EEA) Product Overview

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Ericsson Expert Analytics (EEA) Overview

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Course Objectives

On completion of this course the participants will be able to:

- understand the benefits and key capabilities of EEA
- understand the architecture
- understand rule basics
- understand the User Interface GUIs
- understand the value of the Service Level Index and the Cell Level Index
- understand how EEA is monitored

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Chapters

1. Introduction
2. Architecture
3. Rules overview
4. User Interfaces
5. Service Level Index (SLI) and Cell Level Index (CLI) overview
6. Monitoring EEA

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Chapter 1
Introduction and release overview

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Chapter Objectives

On completion of this chapter, the participants will understand:

1. What is EEA
2. Key capabilities
3. Key benefits
4. Value Packs
5. Terminology

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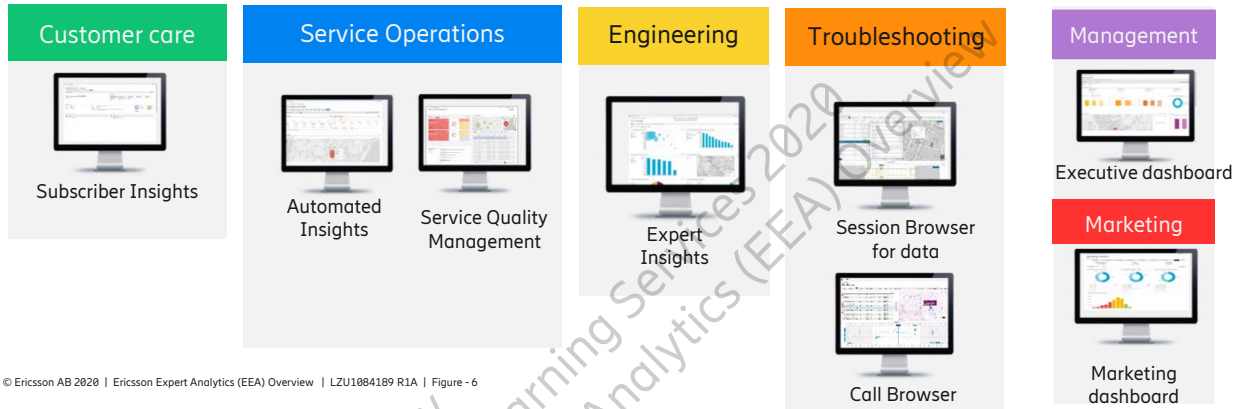
Overview – What is EEA?

— Ericsson Expert Analytics (EEA) is a multi-vendor, real-time customer-centric analytics product for mobile operators to capitalize on their network data
— EEA measures the customer experience of individual service usage for all customers, all the time, in real-time, across the radio access and mobile core networks with high accuracy



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EEA Key capabilities

- Anomaly detection
- VoLTE and VoWiFi support
- NB-IoT (S11 and S11u interfaces) support
- 5G
  - RAT support (S11 and S11u interfaces)
  - Option 3 support for E/// radio nodes
  - Network slicing support
- Subscriber filtering
  - Blacklist exclusion drops all events related to an IMSI
  - Regional inclusion by eNodeB, LAC, TAC
- Encrypt personal identifying information at the collection layer
- Service based deployment
  - Collect only data for selected services: 2G/3G Voice and SMS, 2G/3G/4G Data, IMS VoLTE, ViLTE or RCS
- Reference data
- Customizable aggregations for KPIs
- Localization (date/time format, currency...) and internationalization (fields and messages in local language)
- EEA self-monitoring with Zabbix
- Scalability and distributed deployment

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Key benefits

- Empower ***Customer Care*** to handle complex requests and to reduce call handling time
- ***Session Browser*** *and* ***Call Browser Troubleshooting*** tools reduce resolution time and improve efficiency
- Monitor of ***Service Quality*** and Service Level Agreements
- Automatic ***Anomaly Detection*** based on Subscriber Incidents

Who?
What?
When?
Where?
WHY?

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EEA Packages

Base Service Packages*
- Mobile Broadband
- VoLTE/ViLTE
- WiFi Analytics

Add-on Service Packages**
- Mobile Broadband 5G
- Radio Access Network
- Radio Access Network 5G (NR)

Insights Value Packages
- **Marketing** - identify subscribers at risk for churn and opportunities for upsell
- **Network Service Level Index** NSLI - experience quality for each individual subscriber
- **Cell Level Index** CLI – cell level metric shows the contribution of each cell to the overall performance of the radio network
- **Narrowband IoT**
- **Fast Path -** Rapid delivery of indicators of for VIPs and critical subscriber groups

Applications Value Packages

Subscriber Insights
- Subscriber Insights GUI
- Basic insights enable Customer Care agents to better respond to calls

Automated Insights – Operations
- Automated Insights – Operations GUI
- Automatic anomaly detection of problems affecting multiple subscribers
- Identify probable cause
- Generate operator incidents

Subscriber Insights – Advanced
- Subscriber Insights GUI
- Call Browser GUI
- Session Browser GUI
- Trace all elements of the user flow

Service Quality Management
- SQM GUI
- Analysis of service quality for mobile and fixed services
- Correlates performance, fault, trouble ticketing, and probe system data

Expert Insights
- Expert Insights Dashboard GUI
- Expert Insights Studio GUI
- Explore all KPIs impacting customer experience
- create dashboards of tables and graphs of critical data

Custom Insights
- Export EEA data to a customer's data lake
- Set up of EEA internal data lake for ad hoc data exploration

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*At least one is required
**Optional

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EEA Service base packages and Add-on packages

Mobile Broadband

Enables the service provider to collect information about every transaction the customer has with the network so that analysis can be made of what level of Quality of Experience each customer is receiving.

Core, bearer, Web, TCP, Traffic and Video KPIs

Wi-Fi Analytics

Brings insights to operators to understand their subscribers E2E voice traffic experience on WiFi networks.

VoWiFi traffic, LTE-to-WiFi, WiFi-to-LTE handover KPIs

VoLTE/ViLTE

Enables improved VoLTE, ViLTE, and RCS service through data collection based on probes as well as CDRs and SIP/SDP parsing from IMS

IMS VoLTE, IMS ViLTE, IMS RCS KPIs

Mobile Broadband 5G

Adds 5G capabilities to Mobile Broadband base package.

Radio Access Network 5G (NR)

Adds 5G capabilities to Radio Access Network Add-on Service package.

Radio Access Network

Correlate RAN quality with core and user quality of experience.

Enables improved levels of QoE to enhance and retain revenue and facilitate efficient network operations.

S1 and X2 handover KPIs

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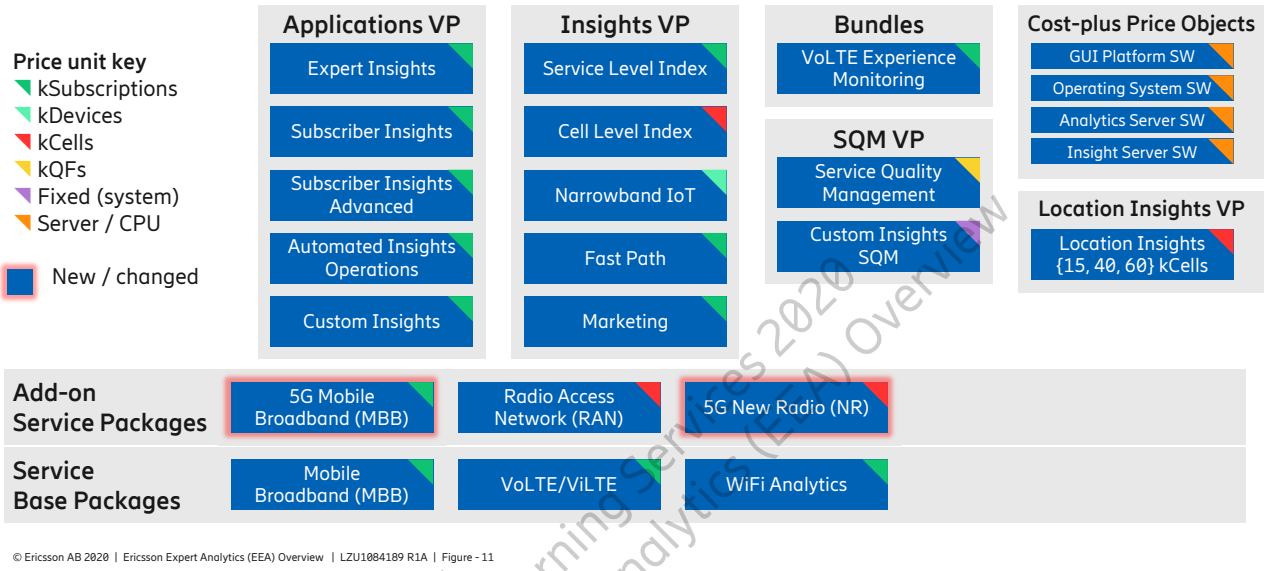
EEA commercial model



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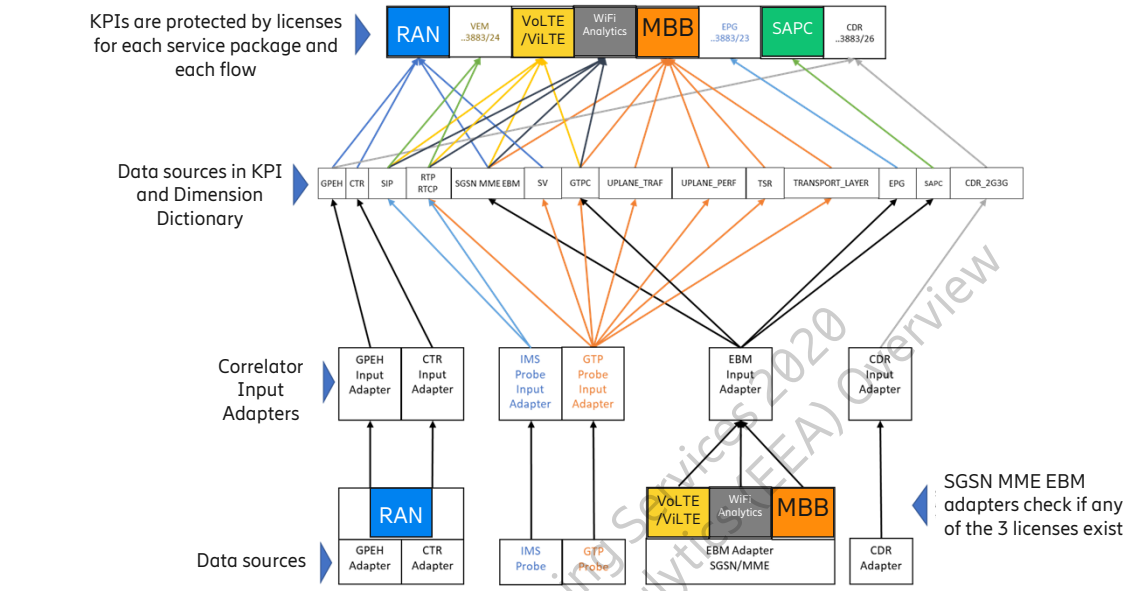

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Terminology

- Ericsson Expert Analytics (EEA)
- Records created by EEA:
  - Incident - a record created to expose a quality issue
  - End-to-end Session Record (ESR)
    - ESRs store information related to one subscriber/active device in a configurable time period (default is 5 minutes)
  - Enhanced Detailed Call Record (E-DCR)
    - Details about VoLTE and ViLTE calls in 5-second slices
- Rules - how EEA knows when to create an incident
  - Rules are configurable
- Quality Indicator (QI) - a measurement of quality of service
- External reference data: cell location, CRM, IMEI-TAC

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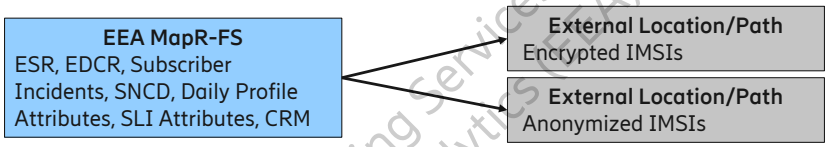
Terminology

- Data Anonymization
  - EEA provides an Export Tool so operators can export data from EEA Offline MapR-FS to their own Data Lakes
  - Customer identifier fields are encrypted and a decryption tool is provided to the operator
  - Some operators want **no possibility** of decryption and want to be able to anonymize additional fields
  - EEA provides an **anonymization** option so data exported from EEA **cannot be decrypted** by the Decryption Tool



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Data source protection and encryption

- IMSI, MSISDN, IMEISV, and optionally the user IP addresses are encrypted in EEA at Probes and Adapters
- Encryption is also applied for external reference data
  - Sensitive IDs are stored and processed encrypted, and they can not be accessed externally, only by authorized users from the GUIs or by using the EEA export tools
- All sensitive data queries are logged

- Personal data of subscribers cannot be deleted on demand, they are deleted when data retention periods for databases and log files expire

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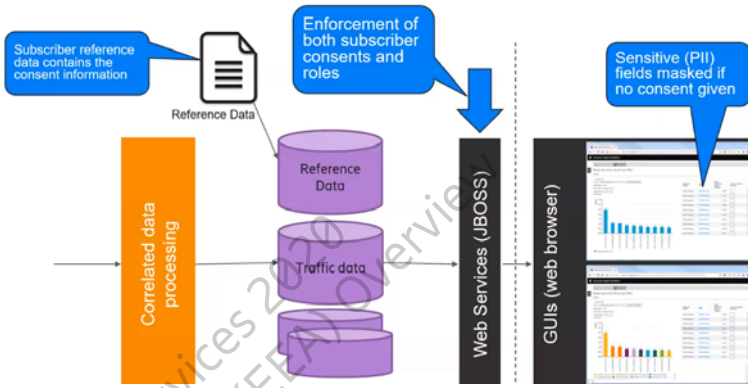
Privacy implementation

- Subscriber privacy motivated by General Data Privacy Requirements (GDPR)
  - IMSI, MSISDN, email addr, IP addr
  - consent types: Troubleshooting, Device Geo-Location, Service Usage (phone number called, website visited), Marketing
- Roles assigned to end users: `aio-user, cb-user, ei-dashboard-user, ei-editor-user, sb-user, sqm-user`
- Consent AND role allows access, otherwise IMSIs etc. are masked



If no LDAP, use native JBoss authentication/authorization

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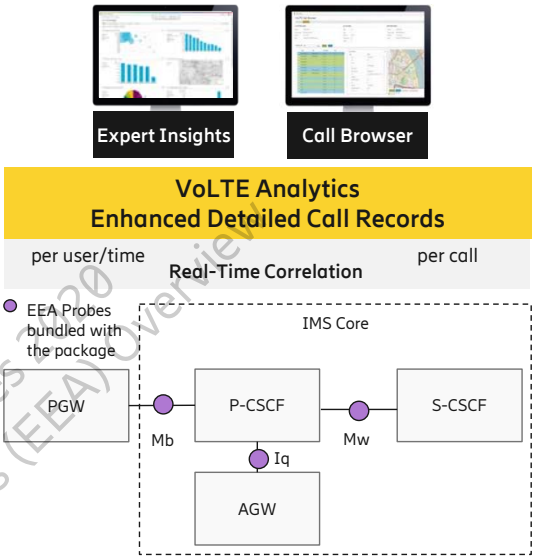
VoLTE Experience Monitoring (VEM) bundle

- VoLTE Experience Monitoring (VEM) is a simple, entry-level subset of VoLTE monitoring KPIs bundled with incident-processing logic, with minimal cost and footprint:
  - E-DCRs feed Expert Insights Studio and Call Browser
  - 48 ViLTE & VoLTE KPIs: signalling, uplink, downlink (call/slice), 21 dimensions
  - Probes are co-located at the same IMS site
    - **Mb_access** IMS User Plane, RTP protocol for user traffic
    - **Mw** SIP call/session signalling, IMS Control Plane
    - **Iq** captures signalling to control voice media resources



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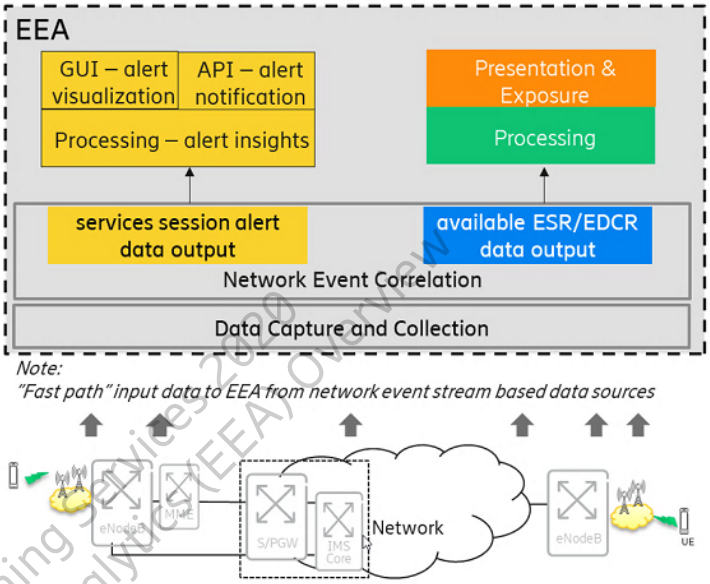
Fast Path Value Pack

- Reduce the time to "recommended next best action"
- Service Alerts
  - Based on streamed data from network
  - Based on ESR triggers
  - Displayed on EEA GUIs within a few minutes of detection



Note:
"Fast path" input data to EEA from network event stream based data sources

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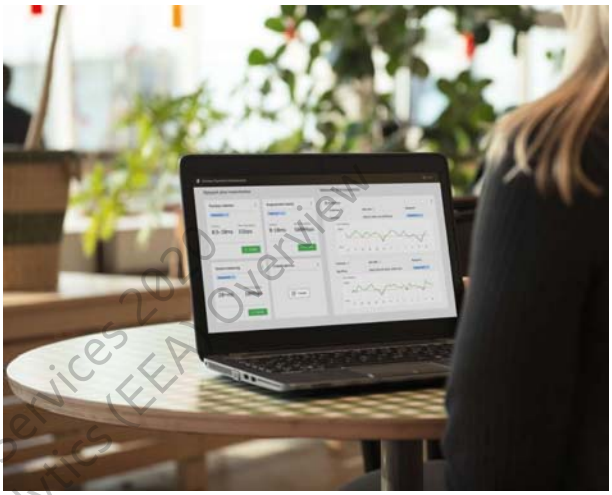
EEAaaS (EEA as a Service)

- EEA offering from Ericsson cloud
- Delivered as a hybrid model with components on-premise and cloud
- These Value Packs will be offered aaS:
  - MBB analytics, Customer care, VoLTE analytics
  - Performance improvements for deployments
  - VM dimensions improvements
  - Marketing, AI-Ops
  - Custom Insights, VoWifi



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5G, NB-IoT

- 5G
  - Site separate CP/UP support
- NB-IoT
  - EEA supports traffic analysis of NB-IoT devices using IP-based communication
  - The data source is the EEA GTP Probe on the **S11** and **S11u** interfaces
  - IoT KPIs are available in Expert Insights and Session Browser GUIs: **Data volume, Number of packets, Average packet size, TCP retransmission, Active time, GTPC signaling**

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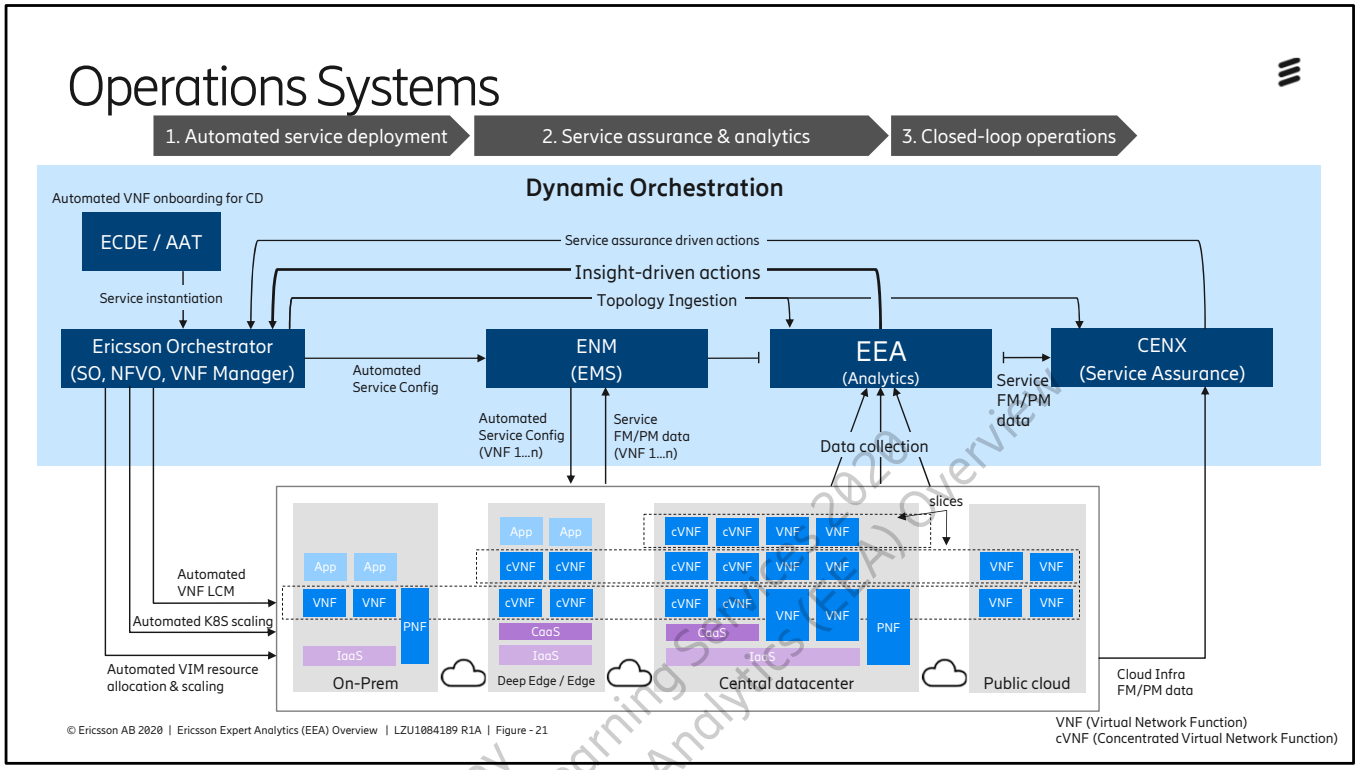

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Quiz questions

1. What can EEA tell a user agent?
   - Who is having a problem
   - What is the problem symptom
   - When did the symptom occur
   - Where is the serving cell
   - Why did the symptom occur
   - All of the above
2. Some of the EEA value packs:
   - Subscriber Insights
   - Expert Insights
   - Automated Insights Operations
3. Which value pack has an “Advanced“ option?
   - Subscriber Insights

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Chapter 2
Architecture

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Chapter Objectives

On completion of this chapter, the participants will understand:

1. EEA architecture
2. Deployment view
3. Data flow to the GUIs

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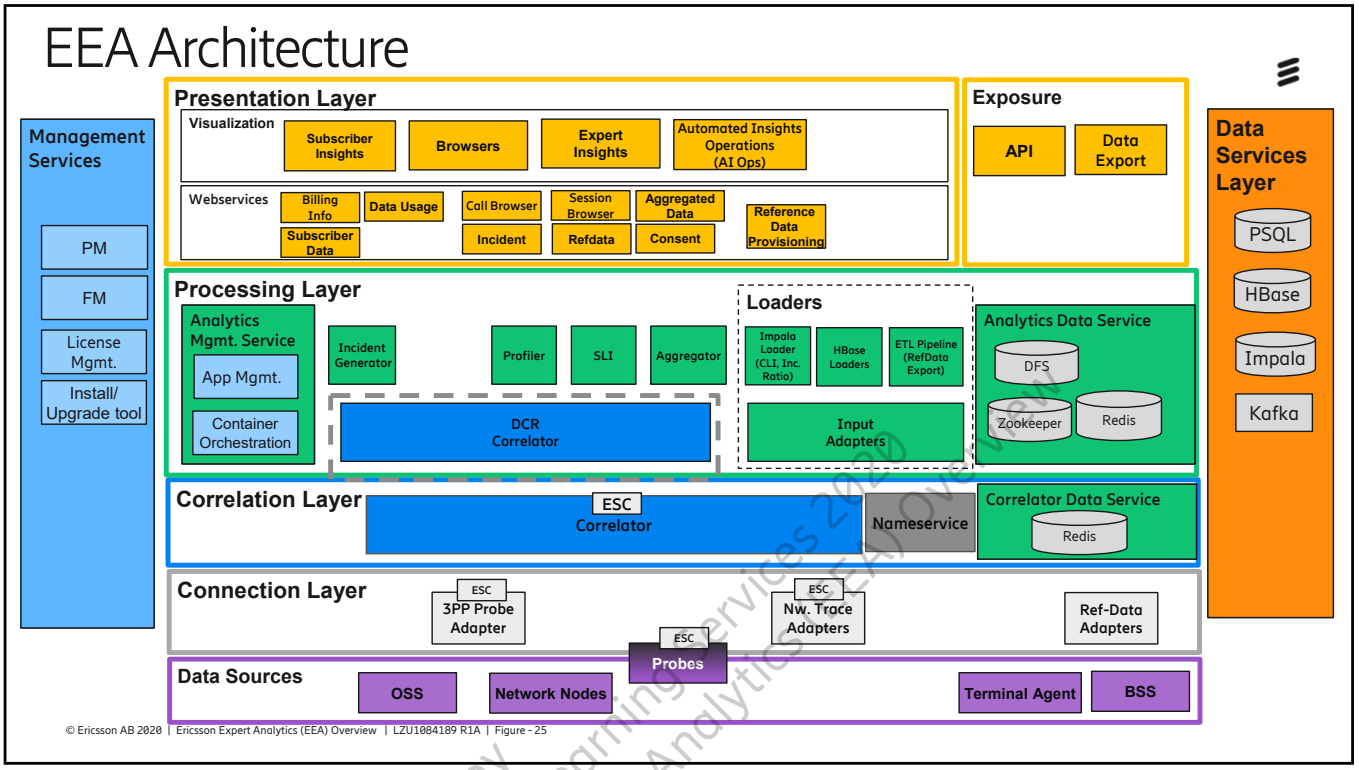

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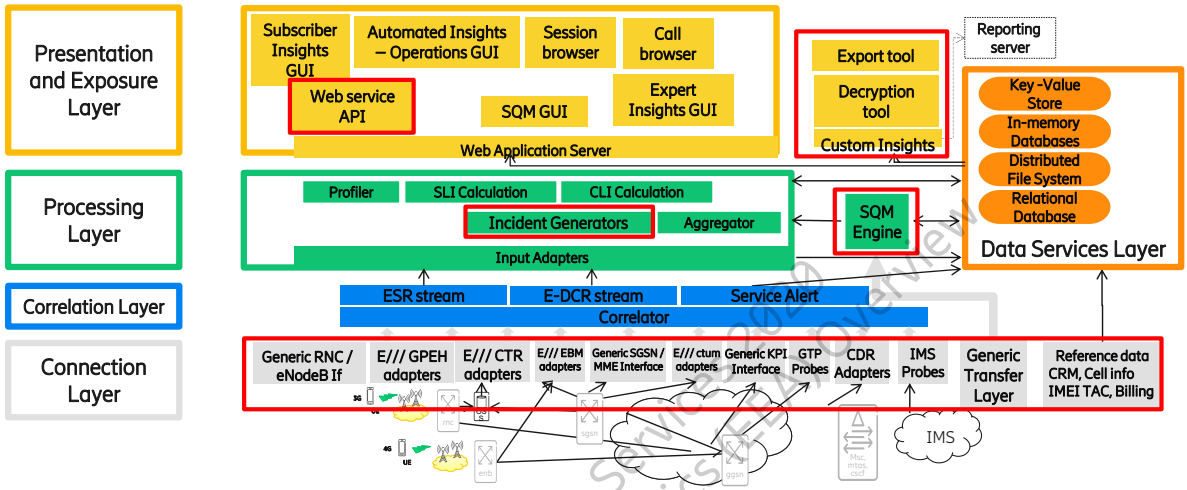
Architecture – integration points



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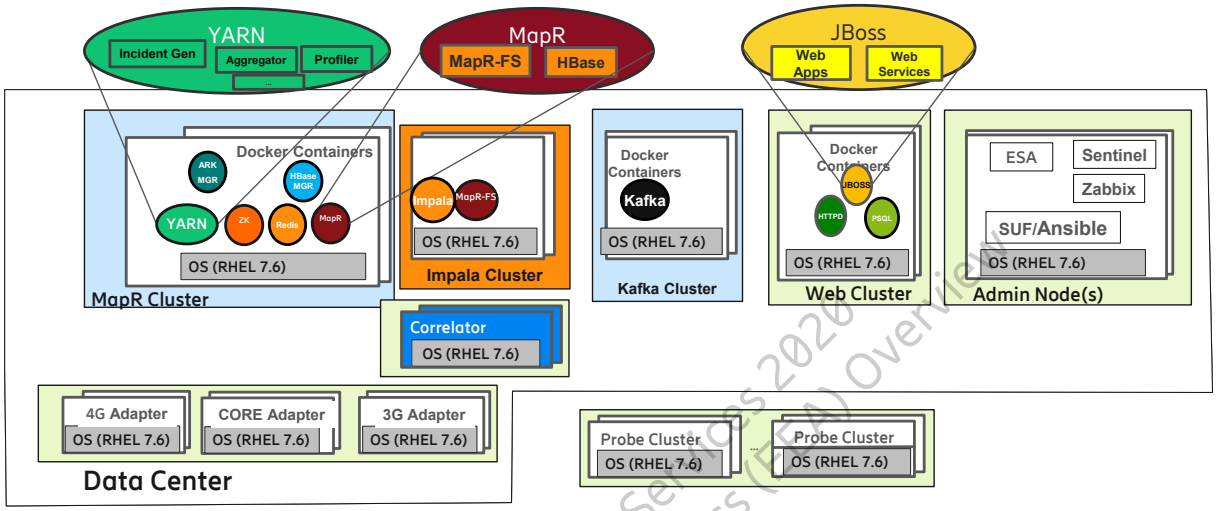
Deployment view



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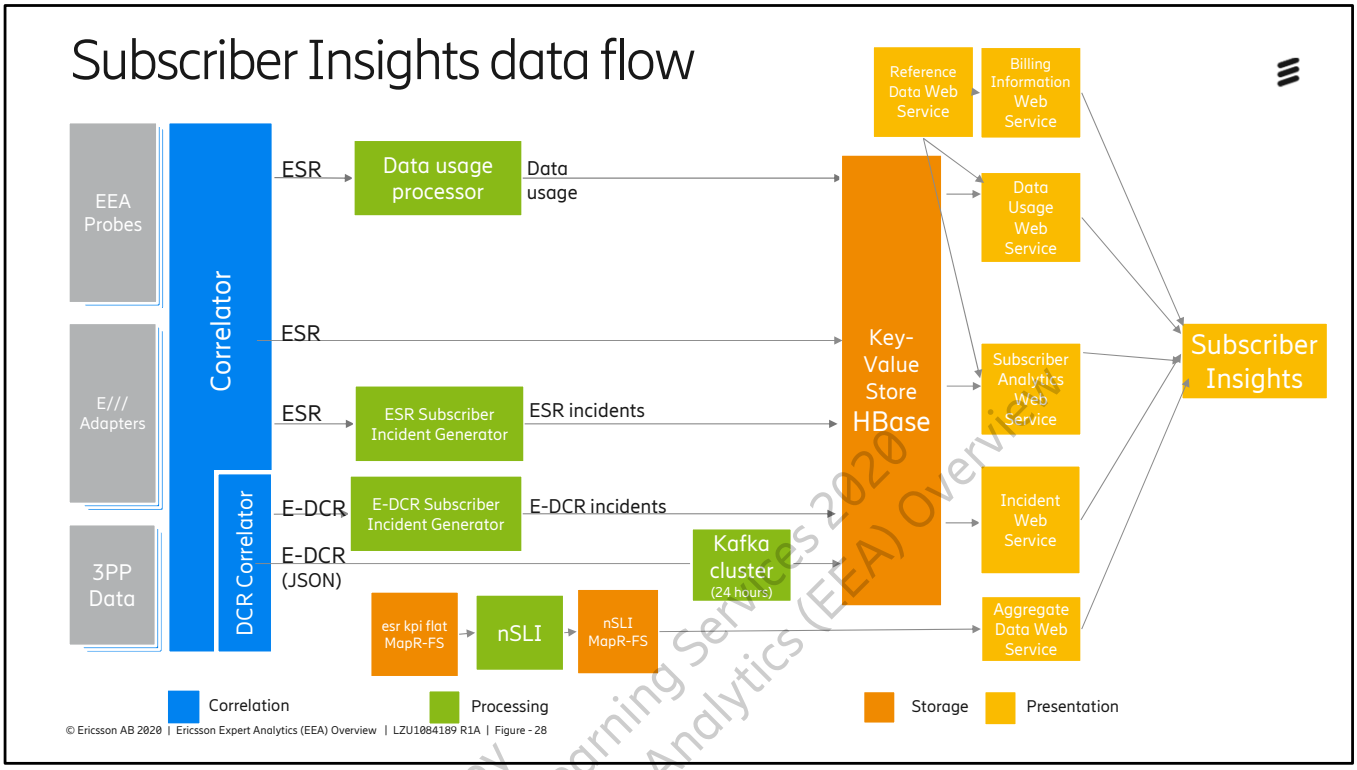

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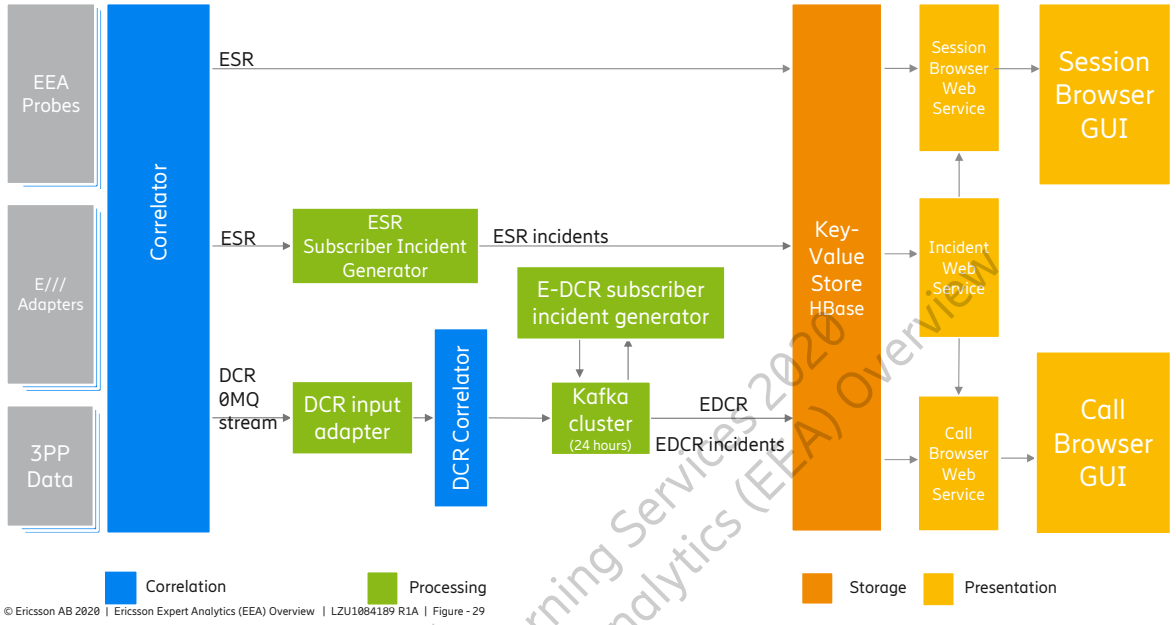
Subscriber Insights Advance data flow



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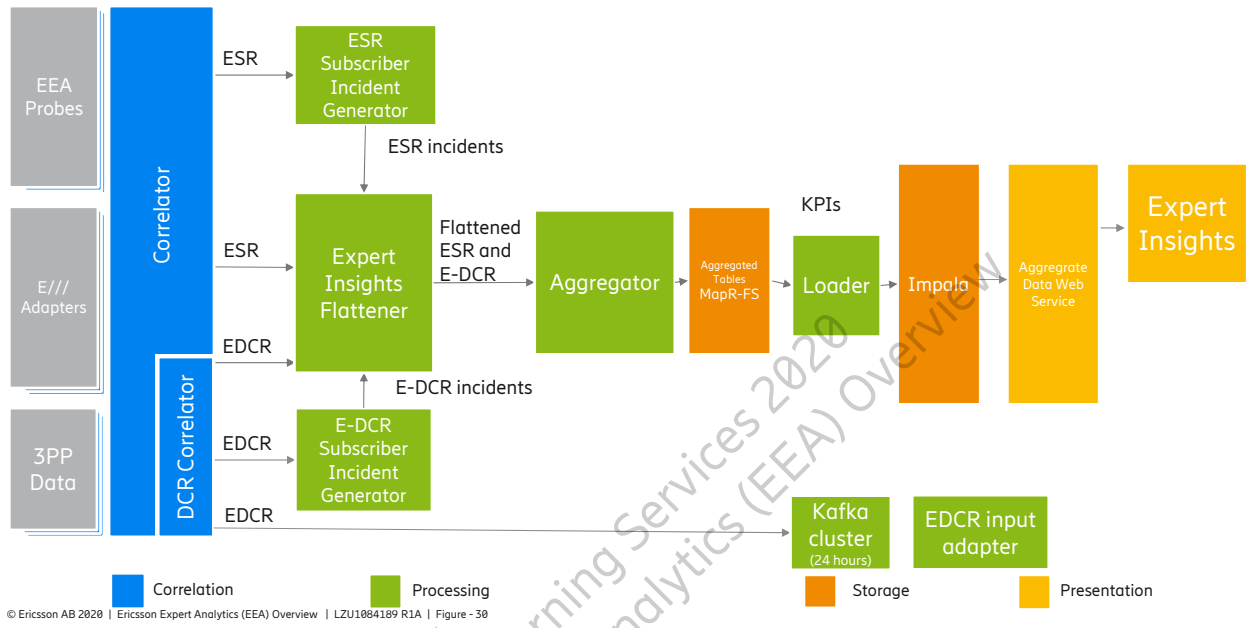
Expert Insights data flow



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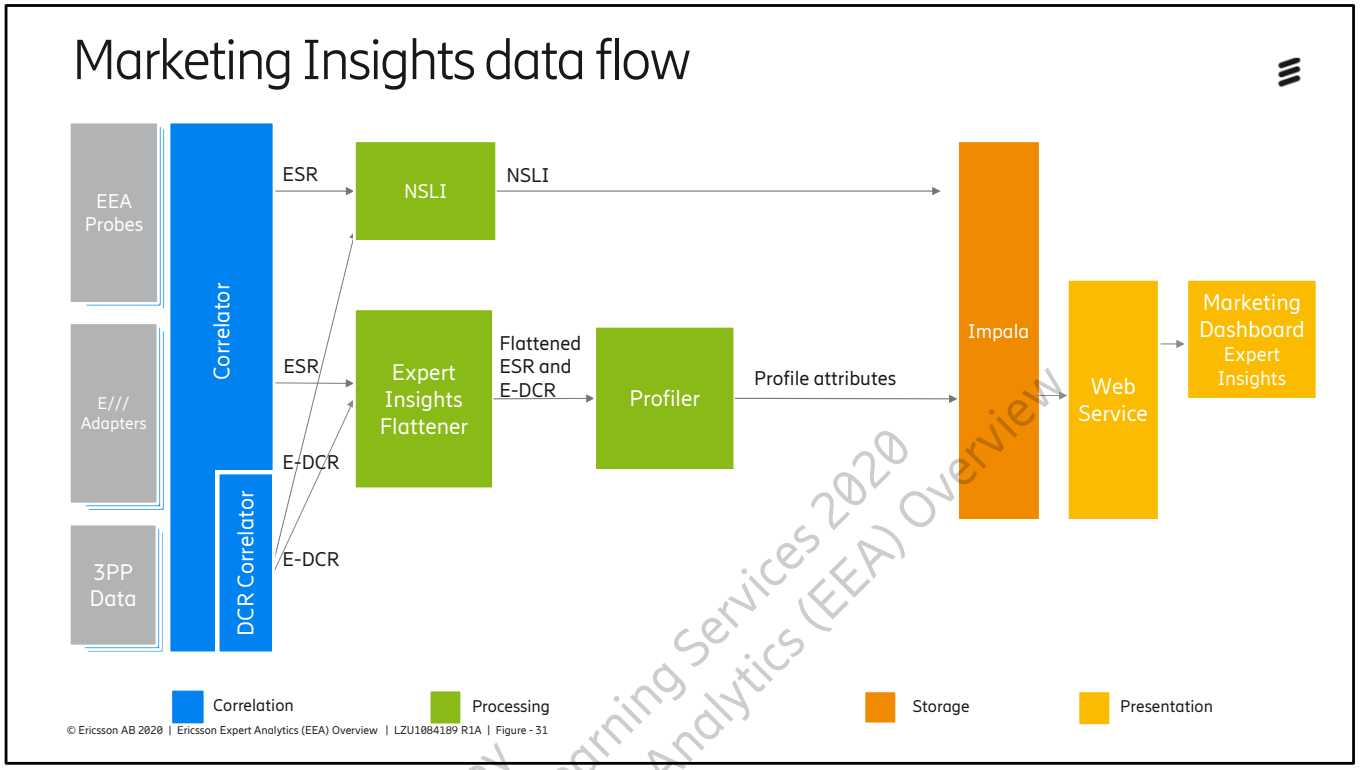

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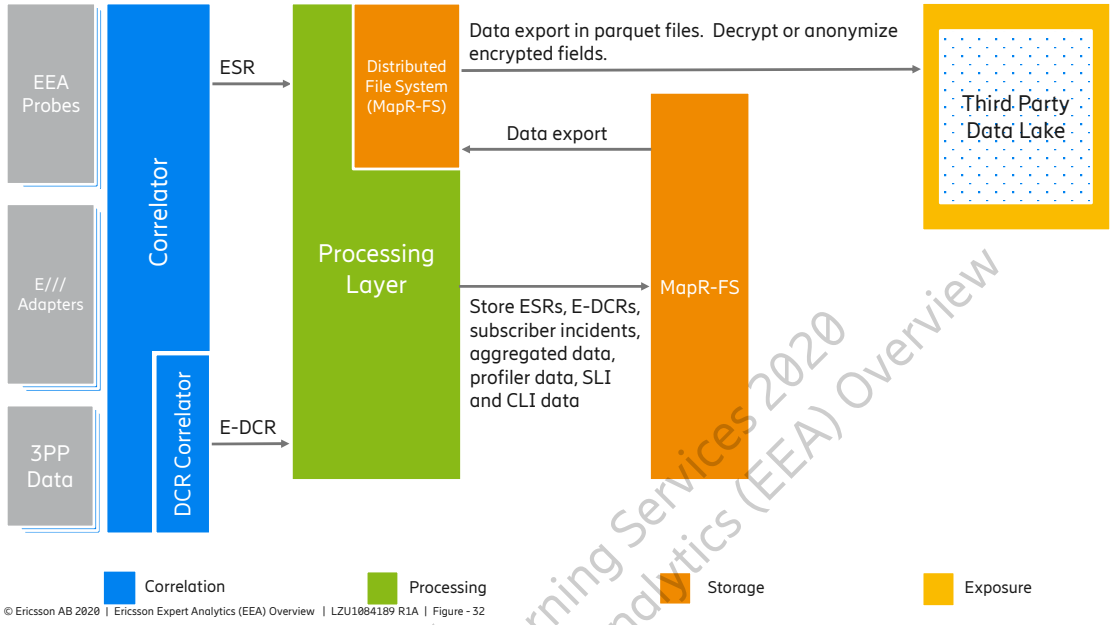
Custom Insights data flow



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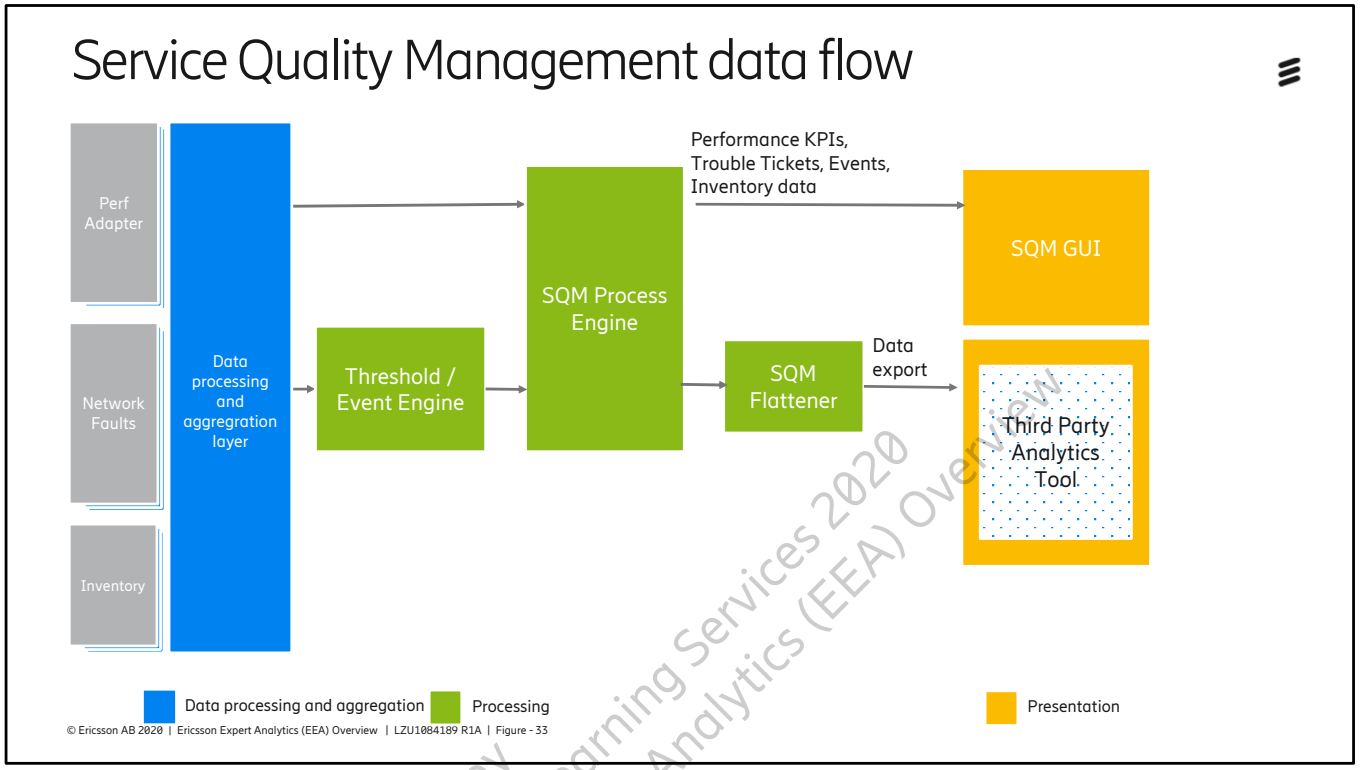

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Quiz questions

1. What are the 5 layers of the architecture?
   Connection
   Correlation
   Processing
   Data Services
   Presentation and Exposure
2. Probes and Adapters are part of which layer?
   Connection Layer
3. Why is the incident generator a point of integration?
   Controlled by rules
4. What software provides a request/response interface between the Data Services and the Presentation Layers?
   Web services

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Chapter 3
Rules overview

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Chapter Objectives

On completion of this chapter, the participants will understand:

1. Rules overview
2. Rule functionality
3. Source and logic data
4. The power of rules
5. Rule logic
6. A Sample rule

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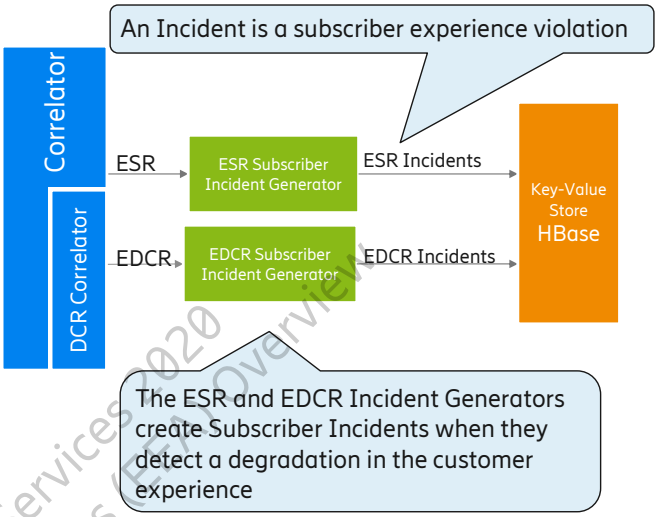
Rules overview

- EEA collects performance and event data from the network and from subscribers' devices, translates the data into Quality Indicators, generates incidents based on defined rules, and provides visualization of the incidents
- EEA uses Drools
  - a business logic integration platform written in Java
  - Open Source from Red Hat JBoss Business Rules Management System (BRMS)
  - Drools is a Rule Engine system



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Rule functionality

- Existing rules:
  - EEA comes with pre-packaged incident rules
- New rules:
  - New incident conditions can be created based on an operator's business needs
- Changing rules:
  - Incident thresholds can be easily modified

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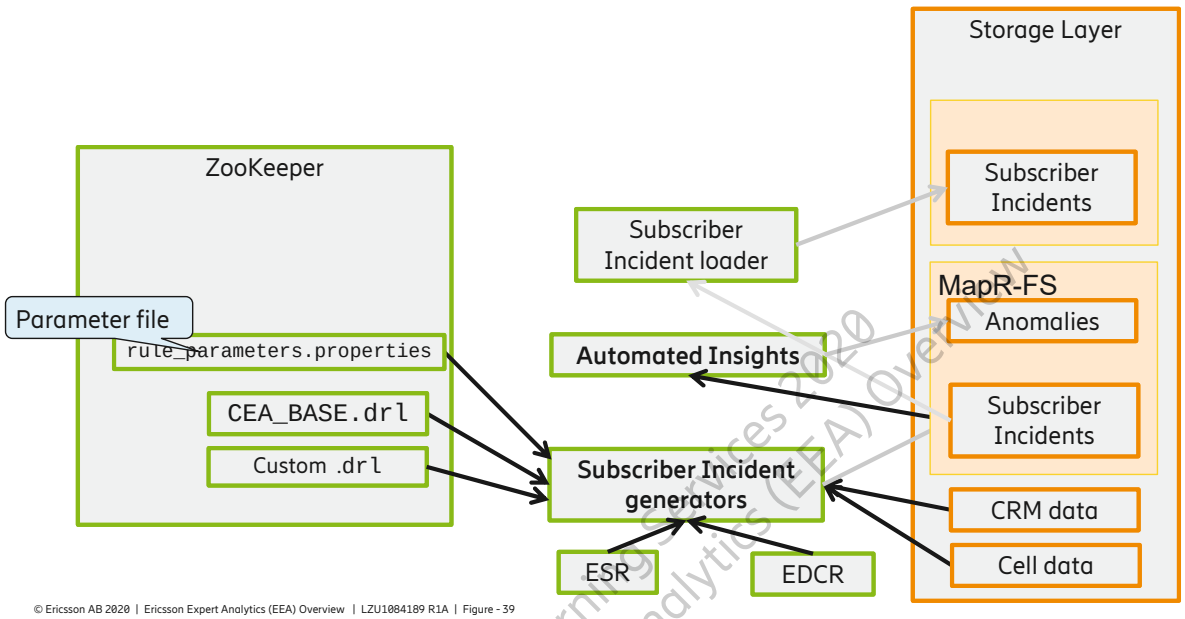
Source and logic data for rules



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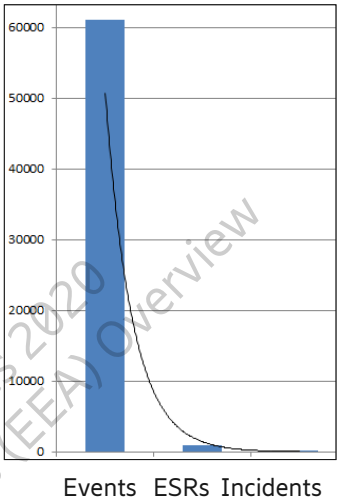
The power of rules

- **61,000** events/second are generated by 1 million active IMSIs
- **1,000 – 5,000** ESRs/second are input to the Incident Generator
- The Incident Generator using rules creates about **50 incidents/second**



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Rule logic - files

- Basic rule file is delivered with EEA and ***cannot be changed***
  - `CEA_BASE.drl` subscriber
- Custom rule file
  - `.drl` file created for an operator and validated
- Parameter file
  - `rule_parameters.properties` controls rules

Rule ID

```
BLOCKINGCAT=15m
WEB_04.BLOCKINGCAT=1m
ME_TIME_DELTA_1=10000
ME_TIME_DELTA_2=5000
VOLTE_ACCESSIBILITY_503.BLOCKINGCAT=0
VOLTE_ACCESSIBILITY_505.ME_TIME_DELTA_2=10000
WEB_01.enabled=false
```

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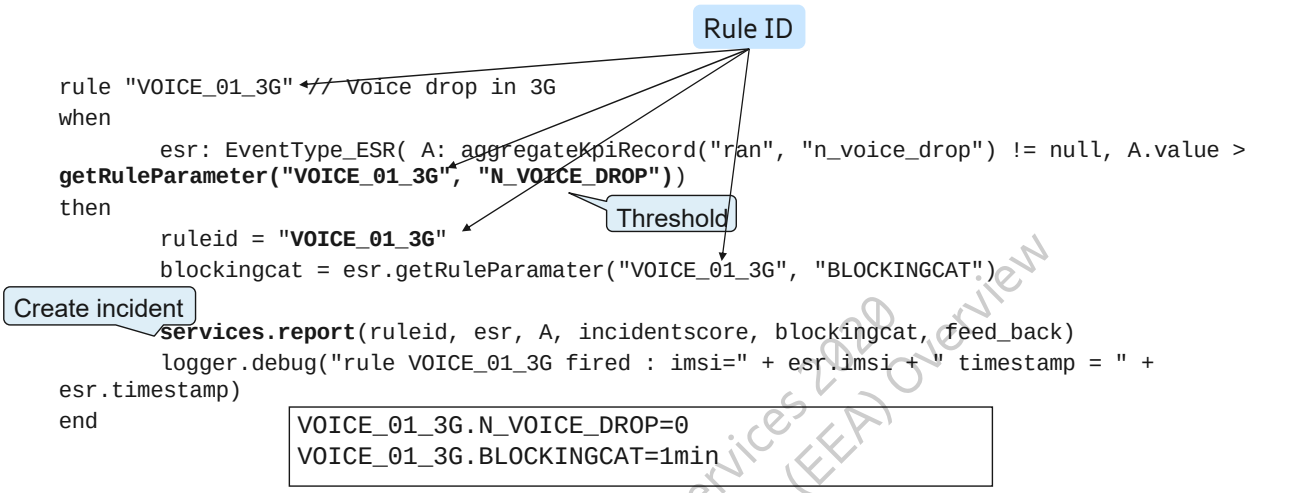
Sample rule




```
rule "VOICE_01_3G" // Voice drop in 3G
when
        esr: EventType_ESR( A: aggregateKpiRecord("ran", "n_voice_drop") != null, A.value >
getRuleParameter("VOICE_01_3G", "N_VOICE_DROP"))
then
        ruleid = "VOICE_01_3G"
        blockingcat = esr.getRuleParamater("VOICE_01_3G", "BLOCKINGCAT")

        services.report(ruleid, esr, A, incidentscore, blockingcat, feed_back)
        logger.debug("rule VOICE_01_3G fired : imsi=" + esr.imsi + " timestamp = " +
esr.timestamp)
end
```

```
VOICE_01_3G.N_VOICE_DROP=0
VOICE_01_3G.BLOCKINGCAT=1min
```

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Quiz questions

True or False

1. EEA comes with a set of rules that cannot be changed — True
2. The thresholds can be changed — True
3. New rules can be written by a developer for a customer — True
4. When a rule fires, an ESR is created — False

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Chapter 4
User interfaces

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Chapter Objectives

On completion of this chapter, the participants will understand:

1. User Interface overview
2. Subscriber Insights
3. Expert Insights
4. Session Browser
5. Call Browser
4. Automated Insights – Operations
5. Service Quality Management (SQM)

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User Interfaces and Value Packs

Subscriber Insights

Subscriber Insights Overview Page

Subscriber Insights Advanced

Subscriber Insights Overview Page

Call Browser (CB)

Session Browser (SB)

Expert Insights

System Dashboards

OTT Application

Executive

Marketing
(Profiler and NSLI)

VoLTE

Incident

NSLI

Core Network

4G Radio

Traffic

Insights Studio

Automated Insights Operations

Automated Insights - Operations

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Overview - EEA login screen

- Access EEA via a browser – Firefox, Chrome or Edge
- Enter a Username and Password

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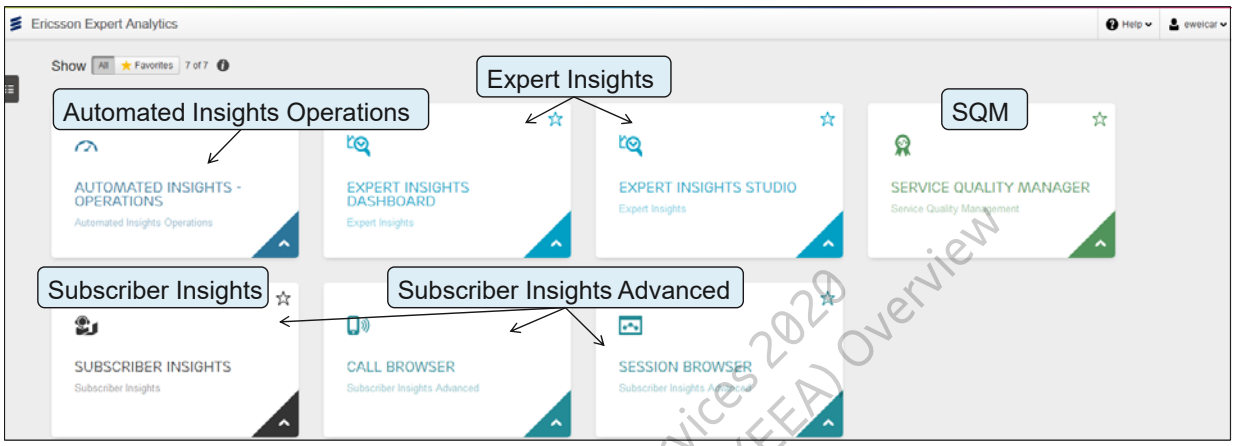
The Launcher



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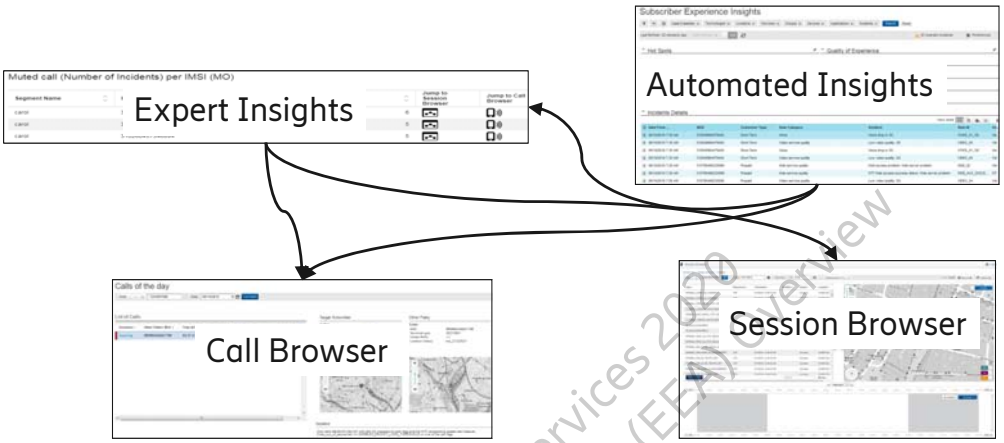
User interface overview - cooperation



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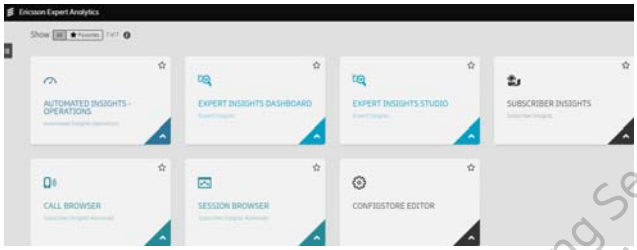
Demo – how to login to EEA

— Open Chrome and navigate to
https://ericsson.sharepoint.com/sites/EEADemo/SitePages/General-product-demos.aspx?web=1
— Select either **Ericsson studio** or **Backup Server**
— Enter **demo/d123** in the login screen and click Enter
— See the launch screen



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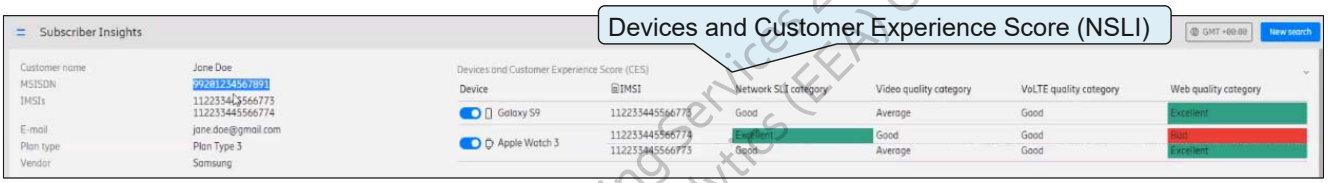
Subscriber Insights

- Basic
  - Overview page
    - Simple overview of customer profile and problems
    - Automated problem identification and root cause analysis
    - Problem exploration
- Advanced
  - Voice Exploration page
  - Data Exploration page



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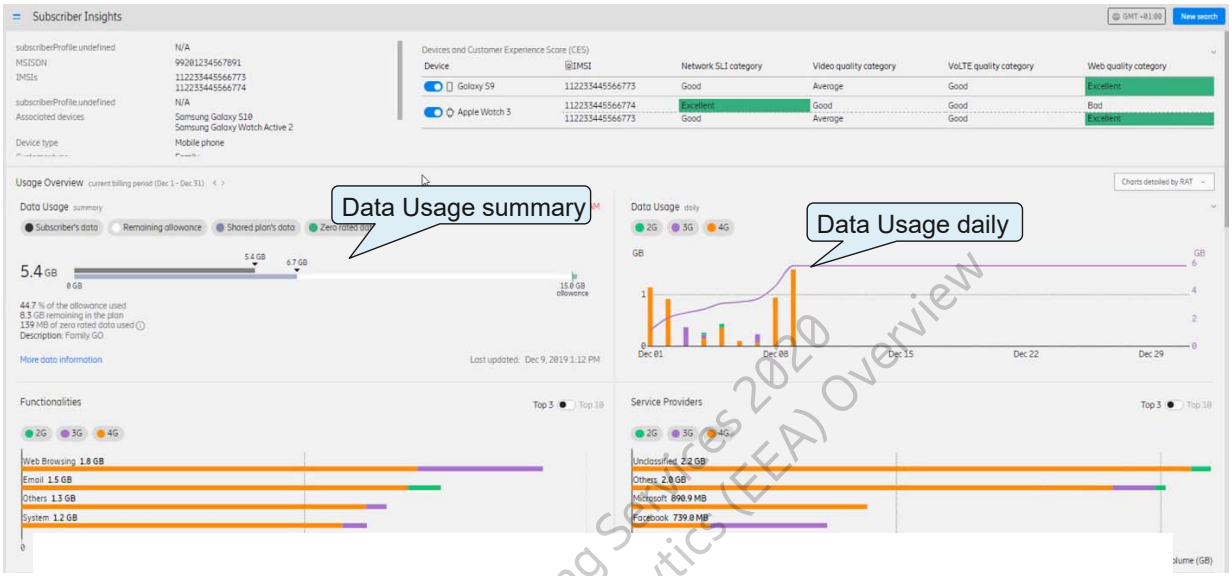
Subscriber Insights



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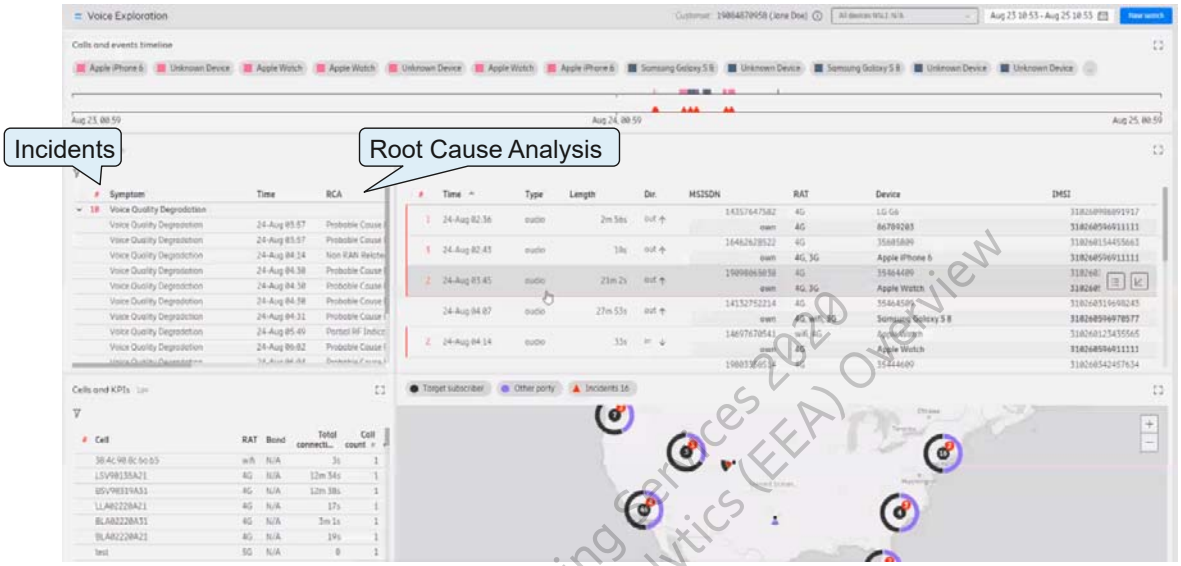
Subscriber Insights Voice Exploration page



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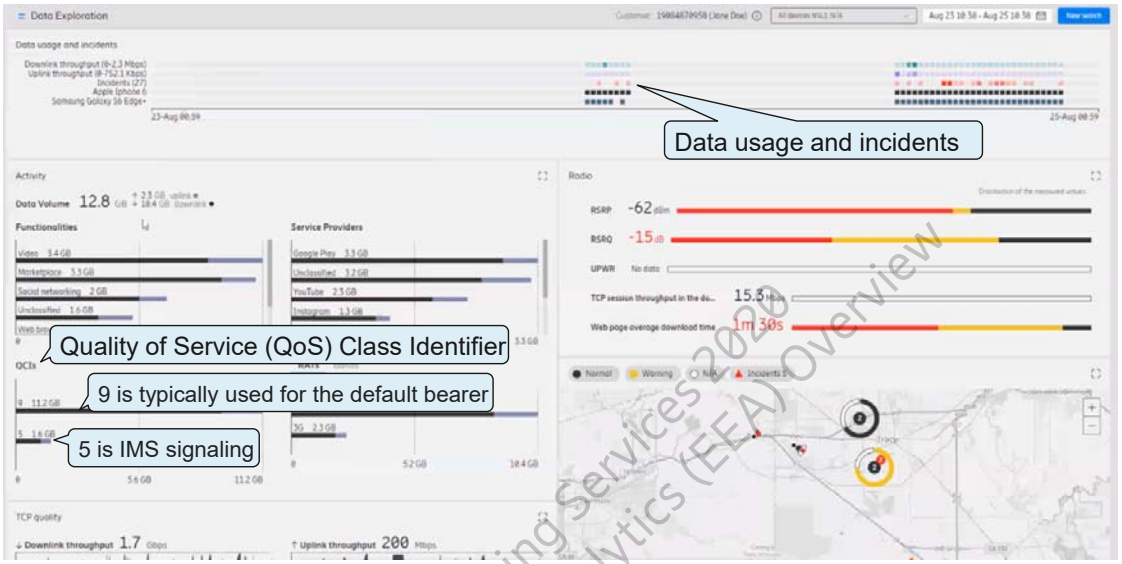
Subscriber Insights Data Exploration page



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Expert Insights

- The Expert Insights GUI can
  - Visualize and Analyze data
- Data sources:
  - End-to-end Session Record (ESR)
  - Enhanced Detailed Call Record (E-DCR)
  - ESR incidents
  - E-DCR incidents
  - Service Alerts (Fast Path)

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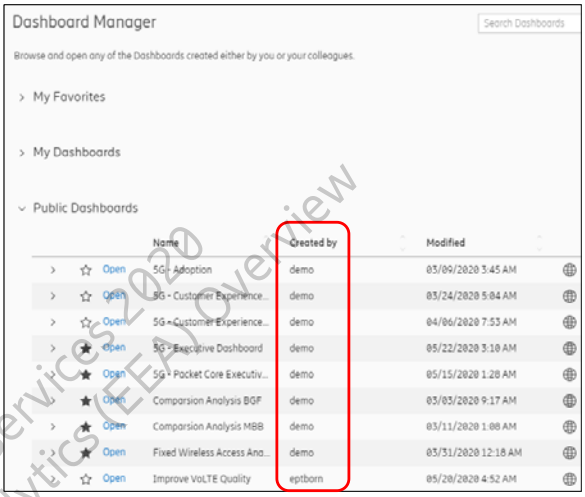
Expert Insights Studio and Dashboard

- The ***Studio***
  - is used by Ericsson, system integrators and expert users to create Dashboards
- The ***Dashboard*** is available to all users
  - "System Dashboards" are delivered with EEA
  - "My Dashboards" are created by your login ID
  - "Public Dashboards" are created by you and other users who chose to make them public for all users to see



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Expert Insights System Dashboards

- System Dashboards are pre-configured, ready-to-use dashboards
- System Dashboards are Ericsson intellectual property
  - Modifying and saving System Dashboards is disabled
  - System Dashboards are always public
  - Some System Dashboards require licenses. If the customer does not have the license, the dashboard is not shown in the Dashboard Manager.

- OTT Application
- Marketing
- NSLI
- VoLTE
- Incident
- Core Network
- 4G Network
- Traffic

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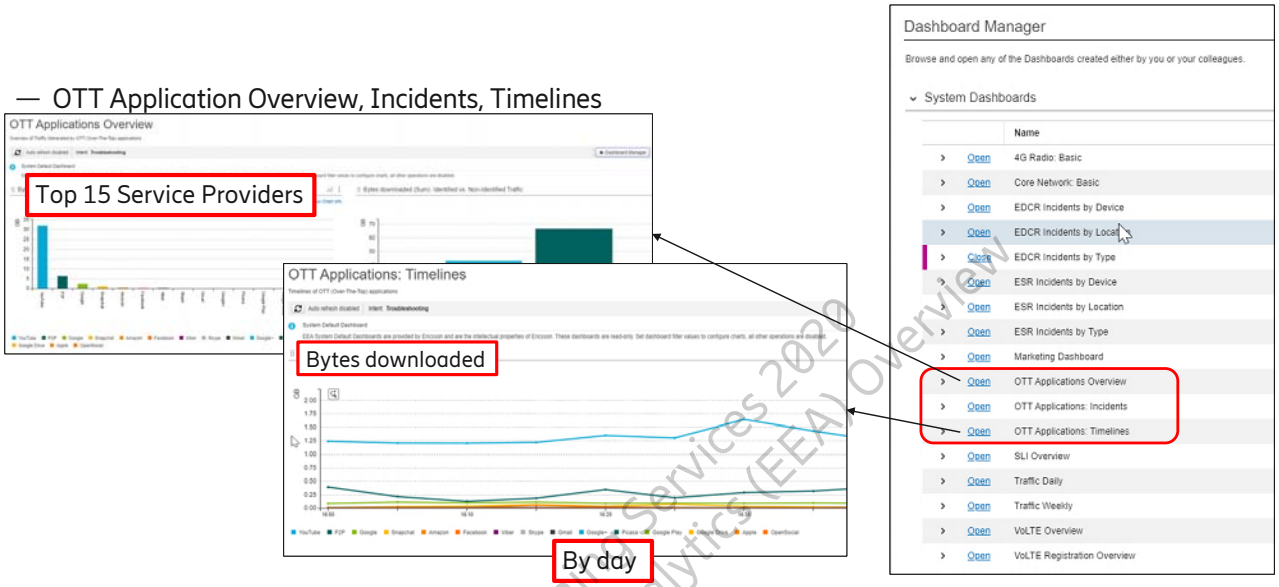
Expert Insights System Dashboard – OTT Application

— OTT Application Overview, Incidents, Timelines



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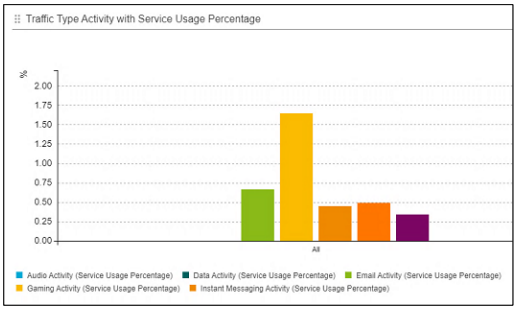
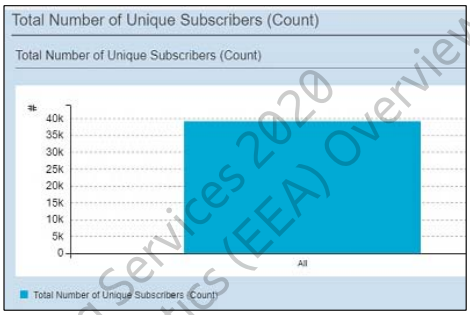
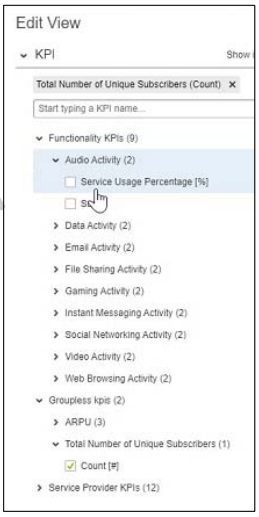
Expert Insights System Dashboard - Marketing

- Users: Marketing
  - Average Revenue per User (ARPU), total number of unique subscribers







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Expert Insights System Dashboard - NSLI

— Users: Managers and Marketing

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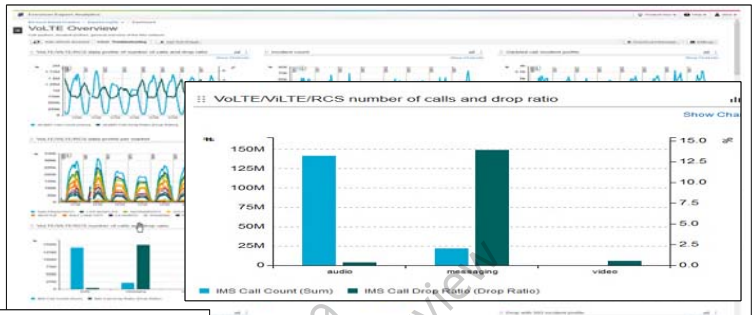
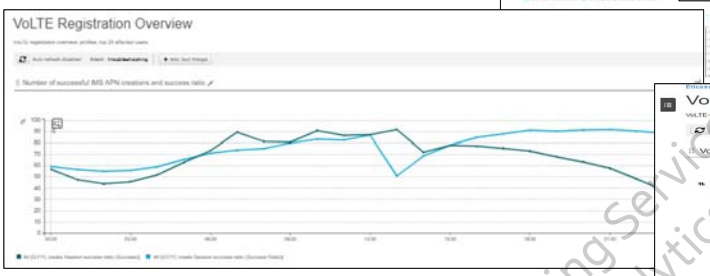
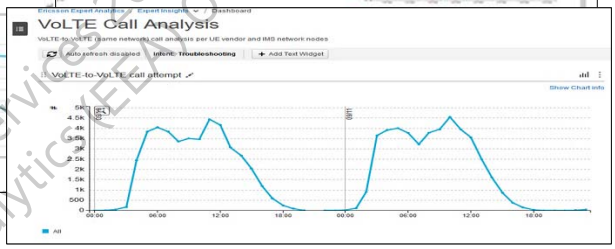
Expert Insights System Dashboard - VoLTE

- Users: Network and Service Operations Centers
  - VoLTE Overview
  - Registration
  - Call Analysis







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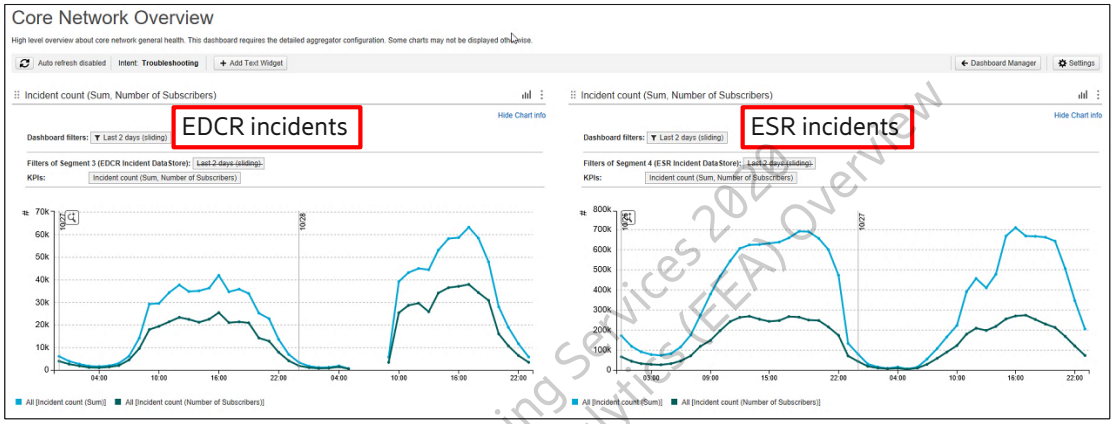
Expert Insights System Dashboard – Core Network Overview

- Users: Network/SOC, Managers
  - High-level view of core network general health



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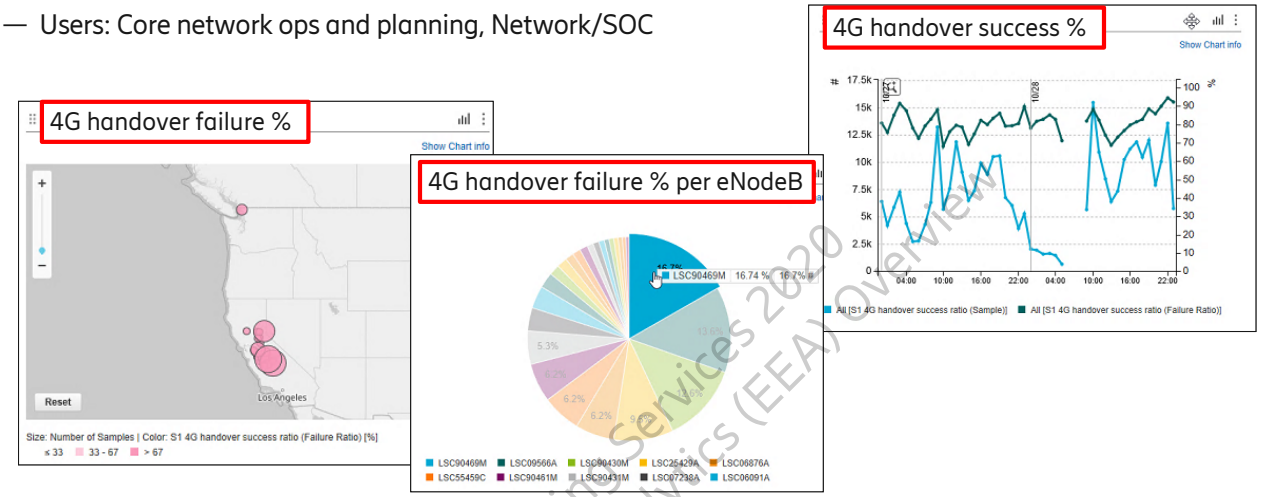
Expert Insights System Dashboard – Core Network Mobility

— Users: Core network ops and planning, Network/SOC



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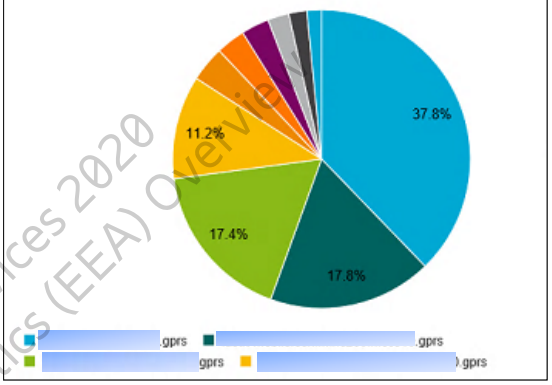
Expert Insights System Dashboard – Core Network Signaling

— Users: Core network ops and planning, Network/SOC

Number of successful attempts per APN (GTPC create session)



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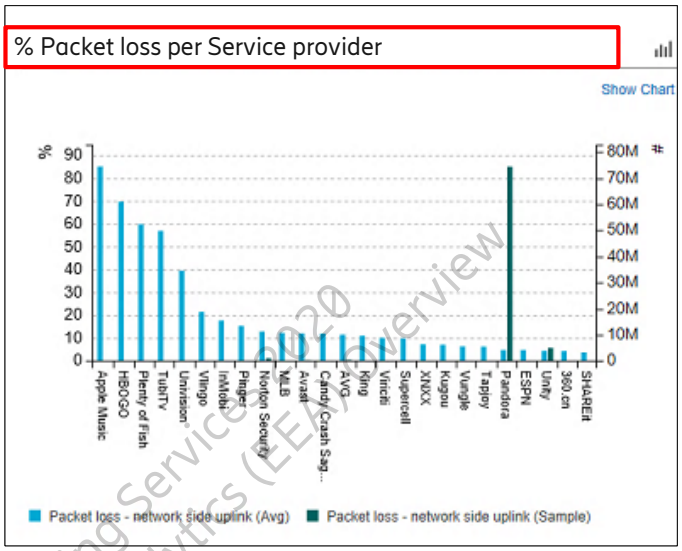
Expert Insights System Dashboard – Core Network User Plane

- Users: Core network ops and planning, network/SOC
  - ESR data
  - Packet loss, round-trip time



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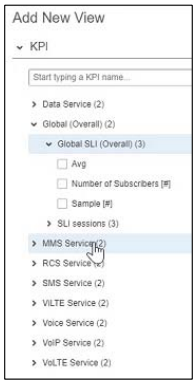
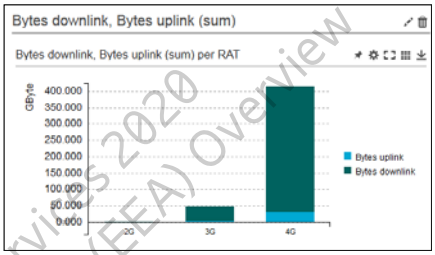
Expert Insights Studio

- The Studio is one of the most popular applications
  - Add view
    - Select a KPI, select a chart type





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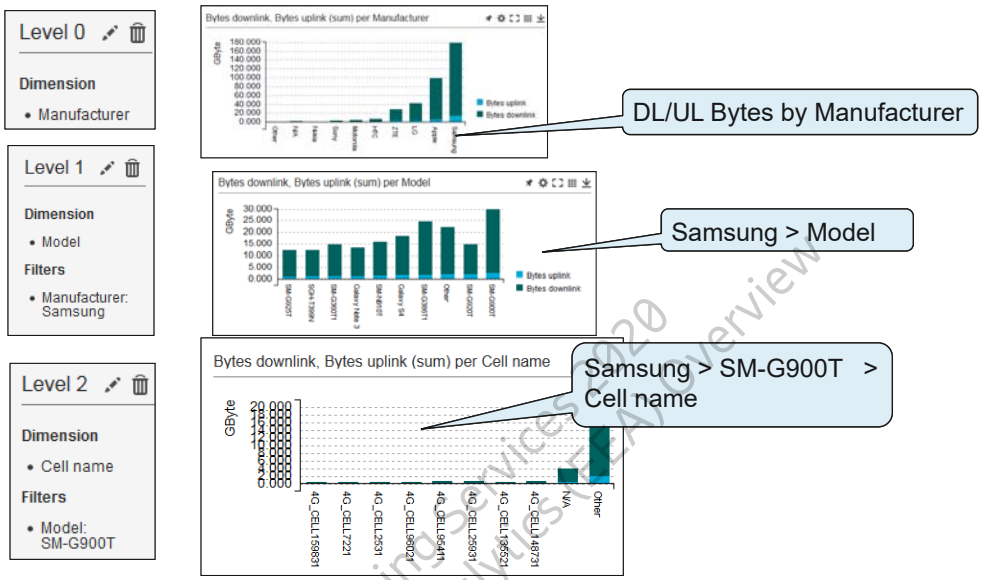
Expert Insights Studio



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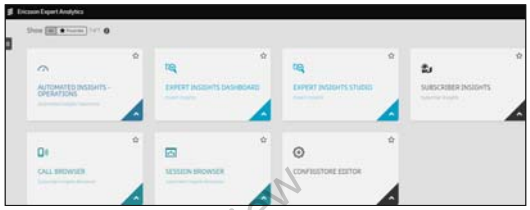
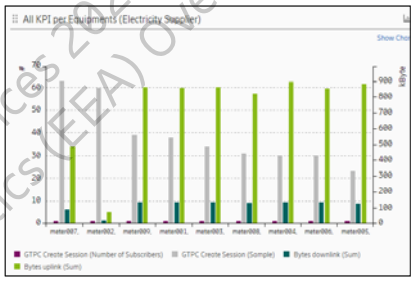
Demo – Expert Insights Dashboard

- Select EXPERT INSIGHTS DASHBOARD from the Launcher page
- Click on **Dashboard Manager**
- Expand **Public Dashboards**, open **Narrow Bank IoT**
- Identify low performing IoT device by following the charts on the left side
  - **GTPC Create Session**
  - **All KPI per Customer (APN)**
  - **All KPI per Equipments (Electricity Supplier)**
  - **Radio performance of the Equipments**





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Session Browser overview

— The Session Browser shows troubleshooting teams detailed event flows

› Key features:
  – Detailed event flow on an individual user level
› Benefits
  – Reduce resolution time and improve troubleshooting efficiency

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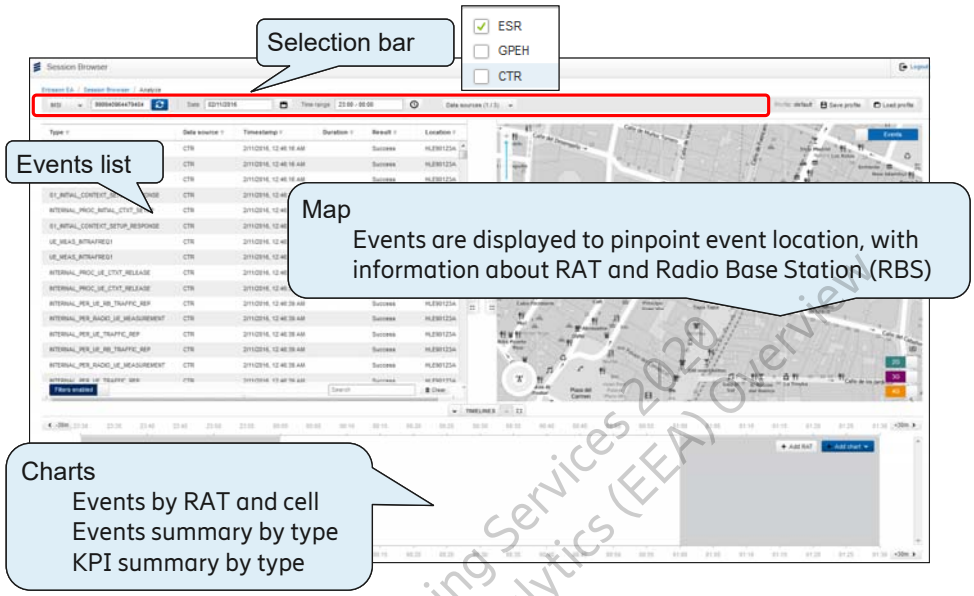
Session Browser sections



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Call Browser overview

- Call Browser is a tool for troubleshooting teams who have end-to-end network responsibility and deep telecommunication domain knowledge
- It offers
  - detailed event flows on an individual call level for VoLTE and VoWiFi calls
  - advanced insight into per-call events and incidents
- The Call Browser can help ***reduce resolution time*** and ***improve troubleshooting efficiency***

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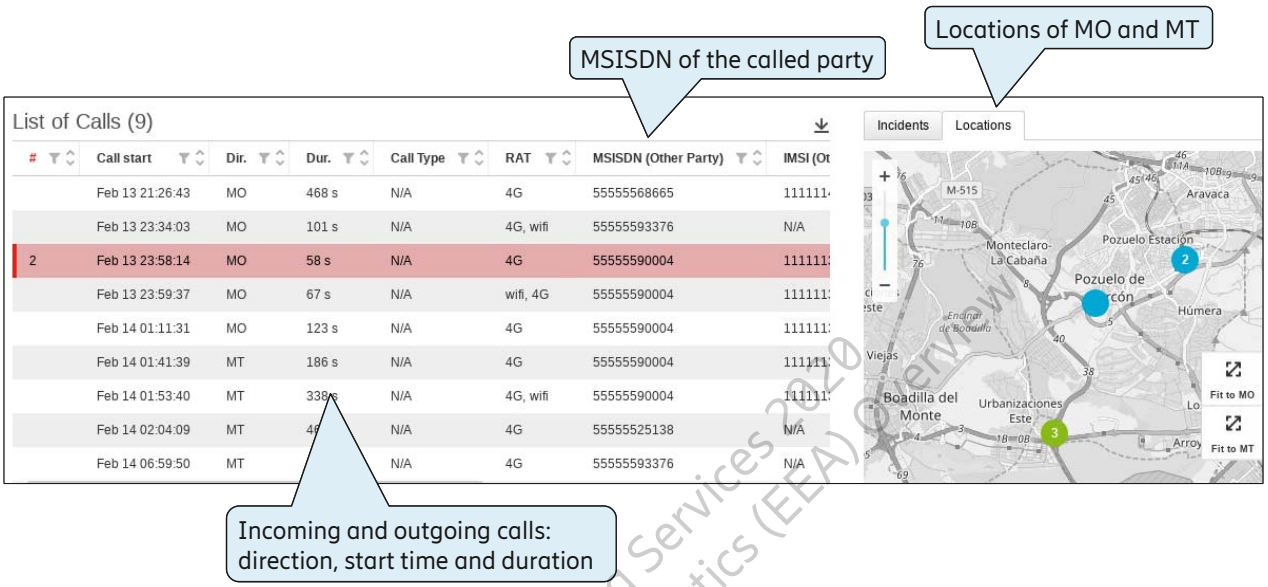
Call Browser user tasks



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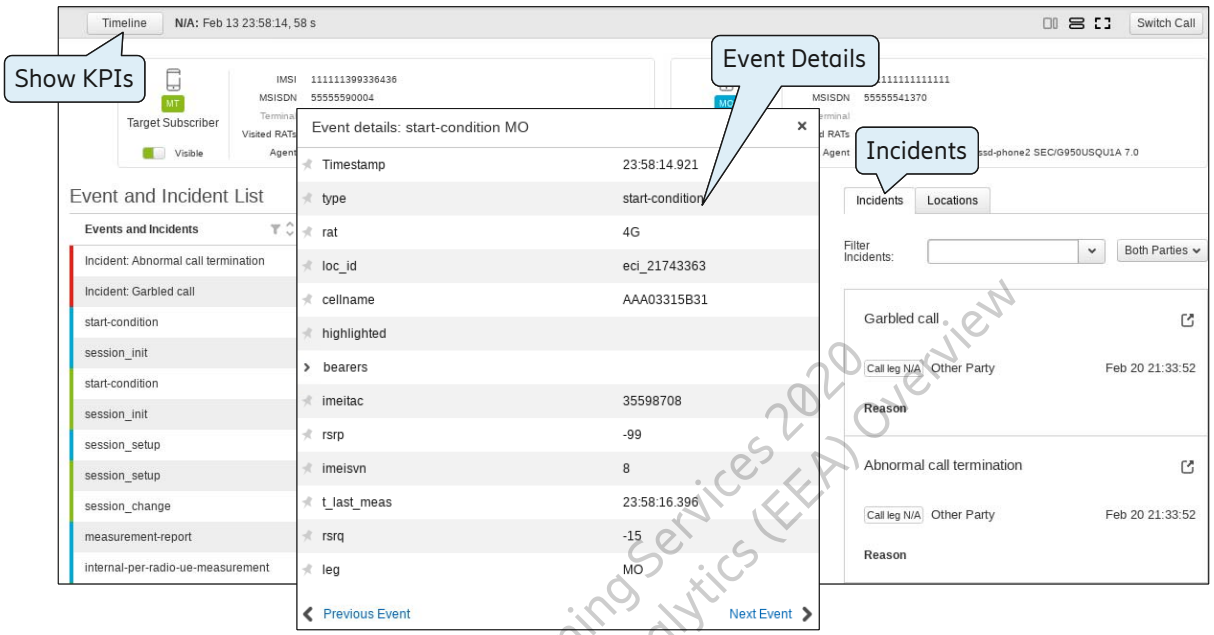
Call Browser user tasks



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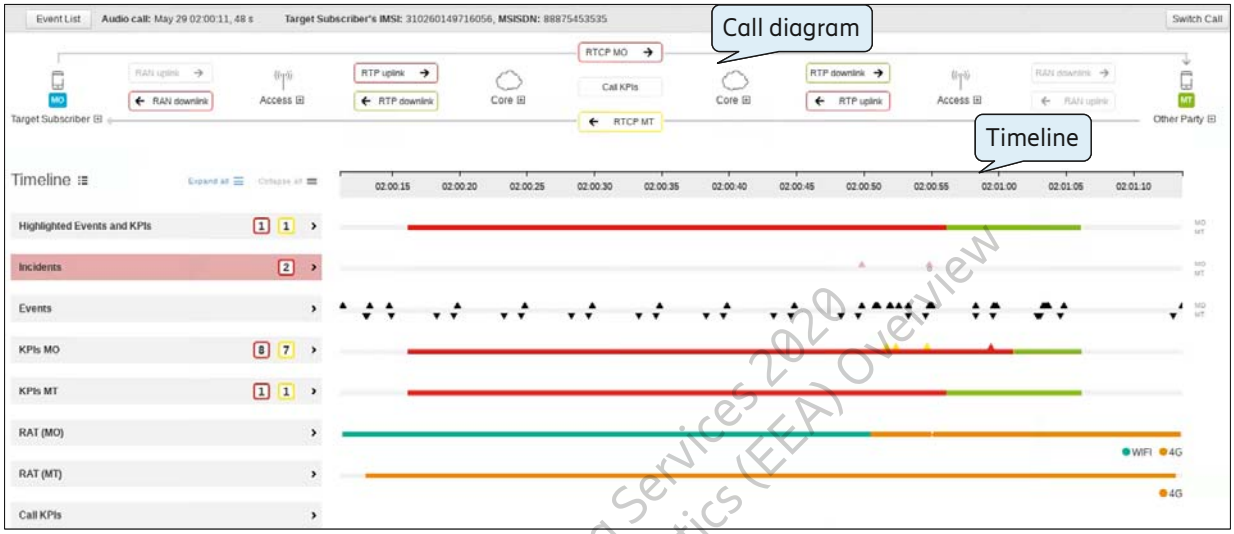
Call Browser typical user tasks – view KPIs



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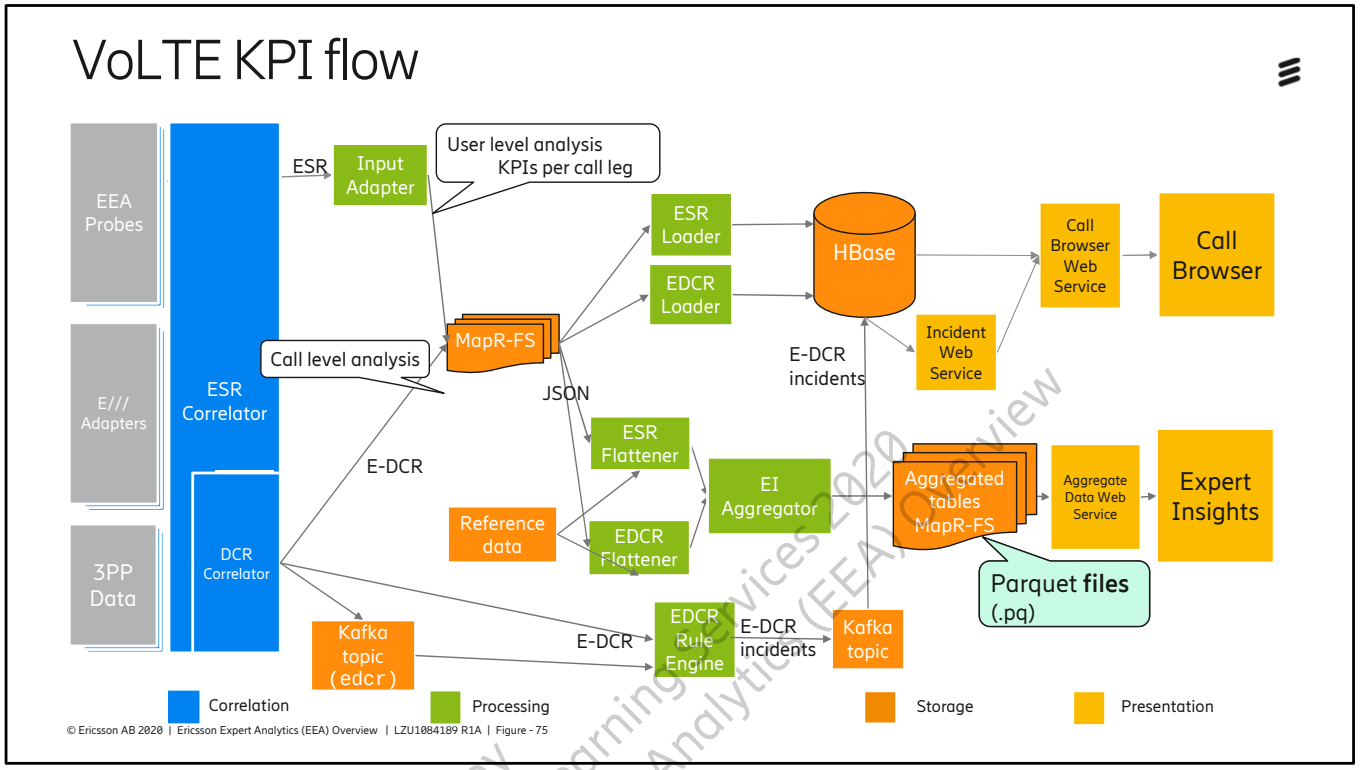

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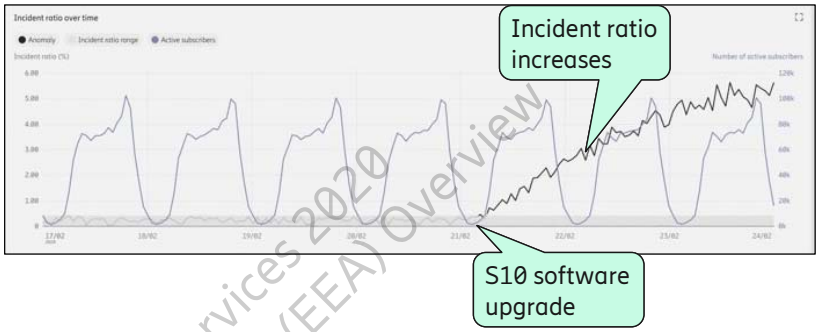
Automated Insights - Operations (AI-Ops)

- Automated anomaly detection example:
  - From millions of combinations AI-Ops detects an anomaly related to **Samsung S10** devices
  - Incident ratio increases with S10 software update rollout
  - Isolates the problem to provide RCA and Next Best Action
  - Detects issues before too many customer complaints (10 min to 2 hours)



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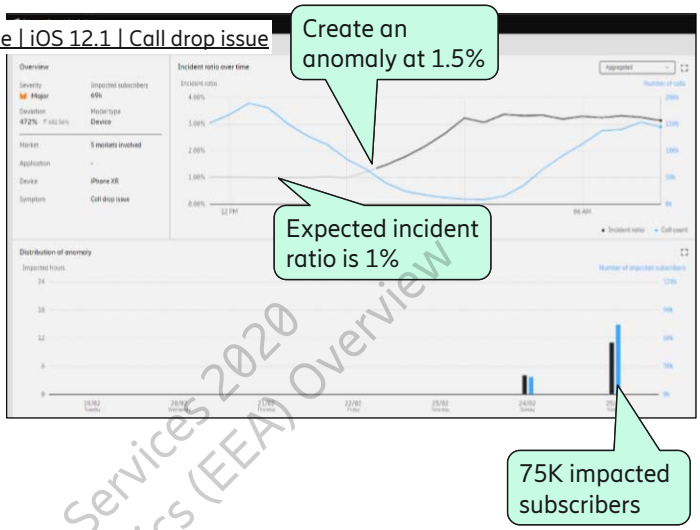
AI-Ops

- Processing: Collect data every hour, calculate **incident ratio** hourly
- Example:
  - **Call drops** typically occur once per 100 calls; incident ratio = 1%
  - Current hourly rate is 1.5%, therefore create an anomaly for
    - iPhone XR, Call drop
- Benefits:
  - 10-20 anomalies detected per day from 20 Petabytes of data
  - Incident ratio is dynamic not fixed, thresholds are updated weekly

iPhone XR | Apple | iOS 12.1 | Call drop issue



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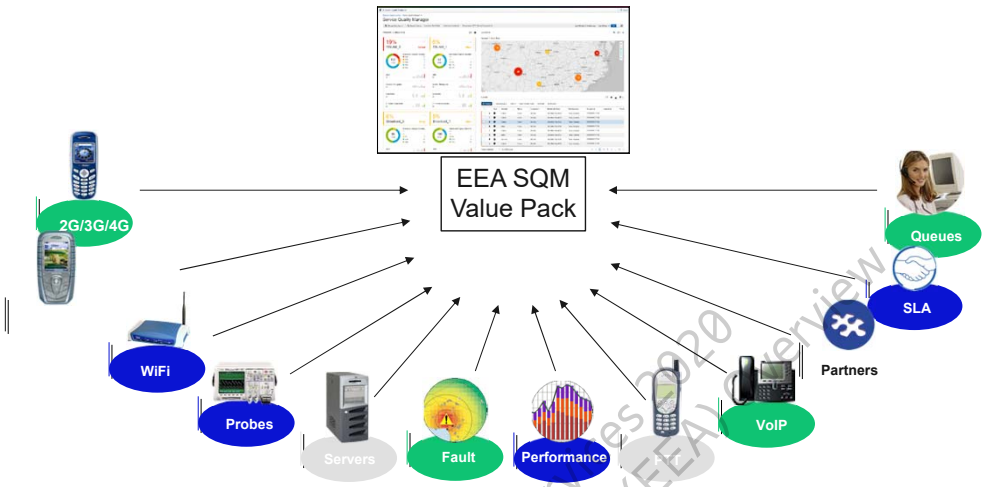
Service Quality Management (SQM) overview



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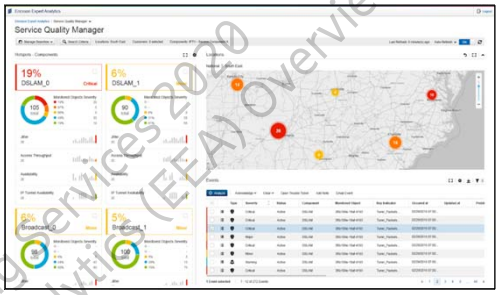
SQM overview

- Service Models
  - Flexible approach to gathering, defining and deriving KPIs. Supports any service, including wireless and wireline
- Impact Analysis
  - Identify impacted customers, as well as root causes
- User groups
  - Service Operations (SOC)
  - Network Operations (NOC)
- Benefits
  - Service quality monitoring
  - SLA compliance
  - Reporting and analytics



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SQM service models

Wireless Services

—Short Messaging Service (SMS)
—Multimedia Service (MMS)
—Voice Service (2G, 3G, VoLTE, VoWiFi)
—Packet Data Service
—Mobile Broadband Service
—Pre-paid Recharging Service

Wireline Services

—Metro Ethernet Service
—Cell Backhaul (CBH) Service
—High Speed Broadband Service
—IPTV Service
—Voice-over-IP (VoIP) Service
—IP VPN Service
—Broadcast Video Service
—Video-on-Demand (VOD) Service
—xDSL Service

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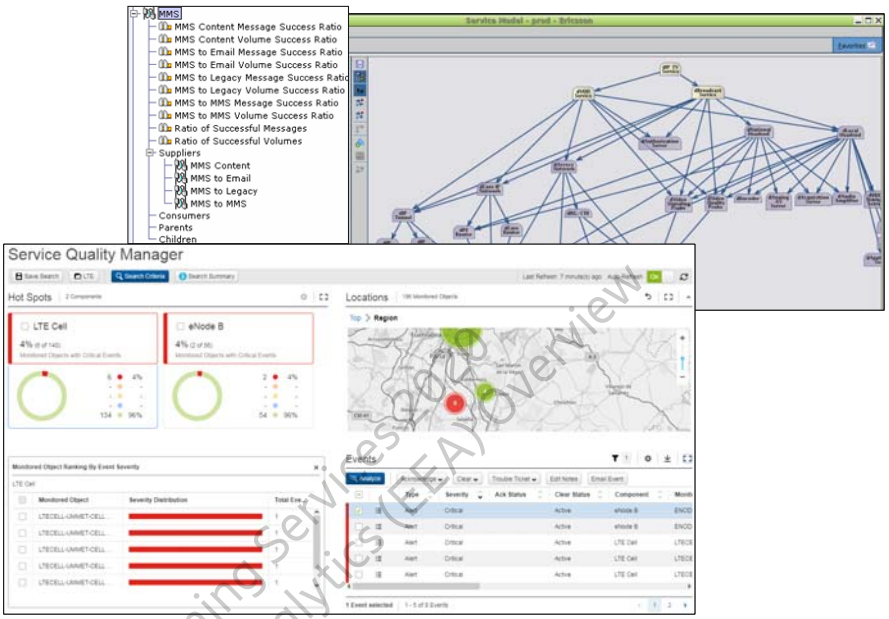
SQM GUIs

- Admin GUI
  - JAVA client
  - Service modeling
  - Thresholds
- SQM GUI is for End Users



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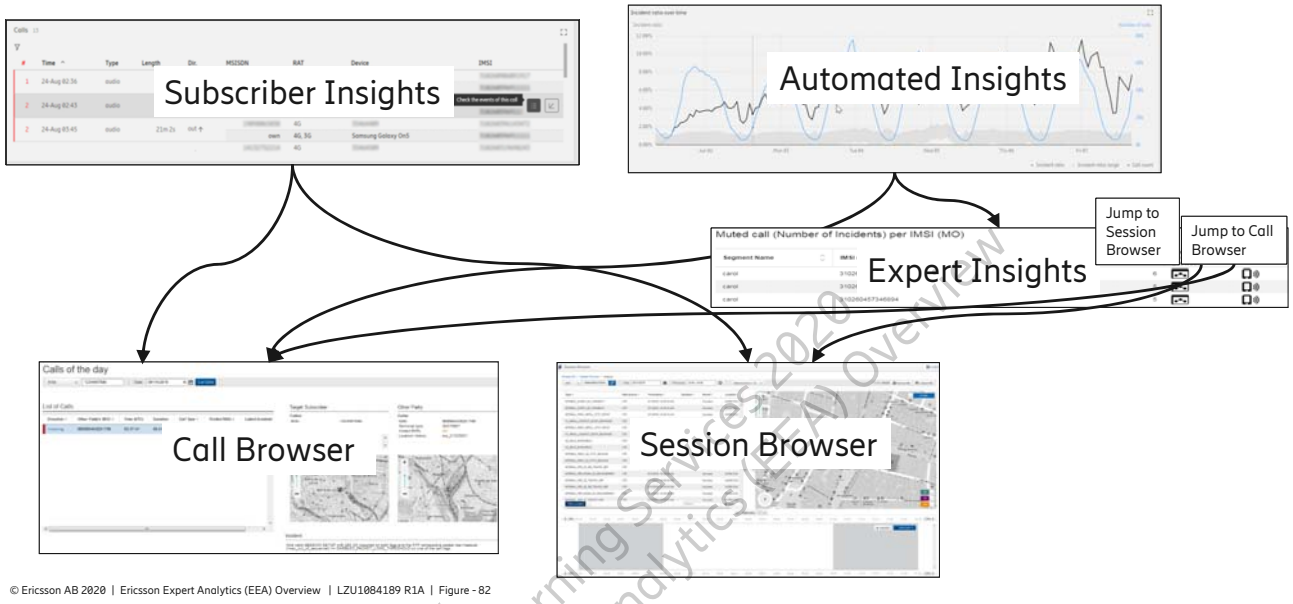
User interface summary



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Quiz questions

1. Which EEA GUIs focus on individual subscribers?
   - **Subscriber Insights**
   - Expert Insights
   - **Session Browser**
   - **Call Browser**
   - Automated Insights
   - SQM
2. Which EEA GUI enables you to create your own charts?
   - Expert Insights Studio
3. What is the main KPI used by Automated Insights – Operations?
   - Incident ratio

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Chapter 5
NSLI and CLI overview

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Chapter Objectives

On completion of this chapter, the participants will understand:

1. Network Service Level Index (NSLI) and Cell Level Index (CLI) overview
2. NSLI calculation and calibration
3. NSLI KPIs
4. NSLI in Expert Insights Dashboard and Studio
5. CLI
6. CLI in Expert Insights Dashboard

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NSLI and CLI overview

Subscriber Insights

Expert Insights

- Network Service Level Index (NSLI)
  - Quantifies a subscriber's satisfaction with their mobile service as number between 0 – 10
  - Generated daily per subscriber
  - Automatic service importance calibration
  - Linked to symptoms and root-causes
- Cell Level Index (CLI)
  - CLI rank cells based on the weighted number of incidents that happened in the cell
  - The **CLI score** is calculated daily and weekly for every cell that carried traffic
  - A **CLI rank** is assigned to cells based on their CLI score. The worst performing cell has a rank of "1".

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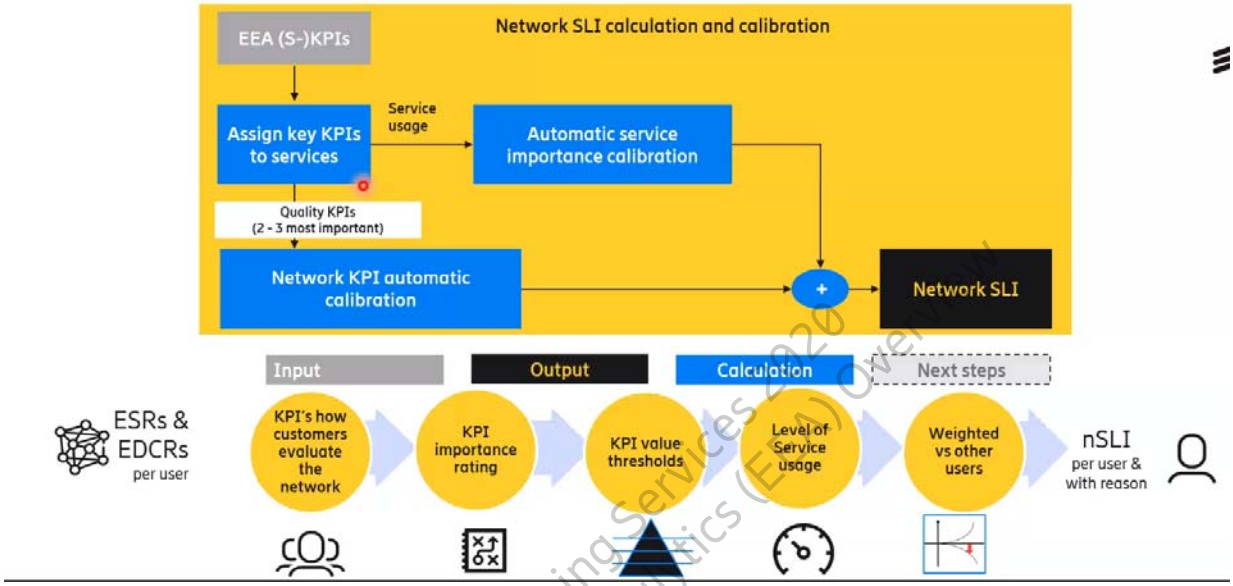
NSLI calculation and calibration



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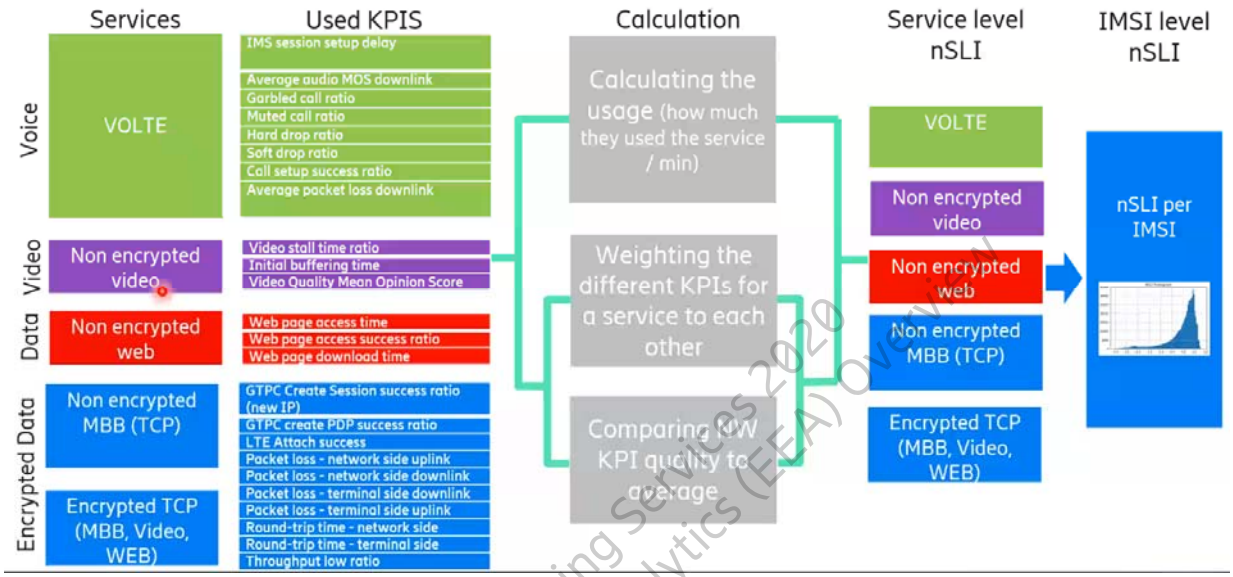
S-KPIs quantify the network effect on services



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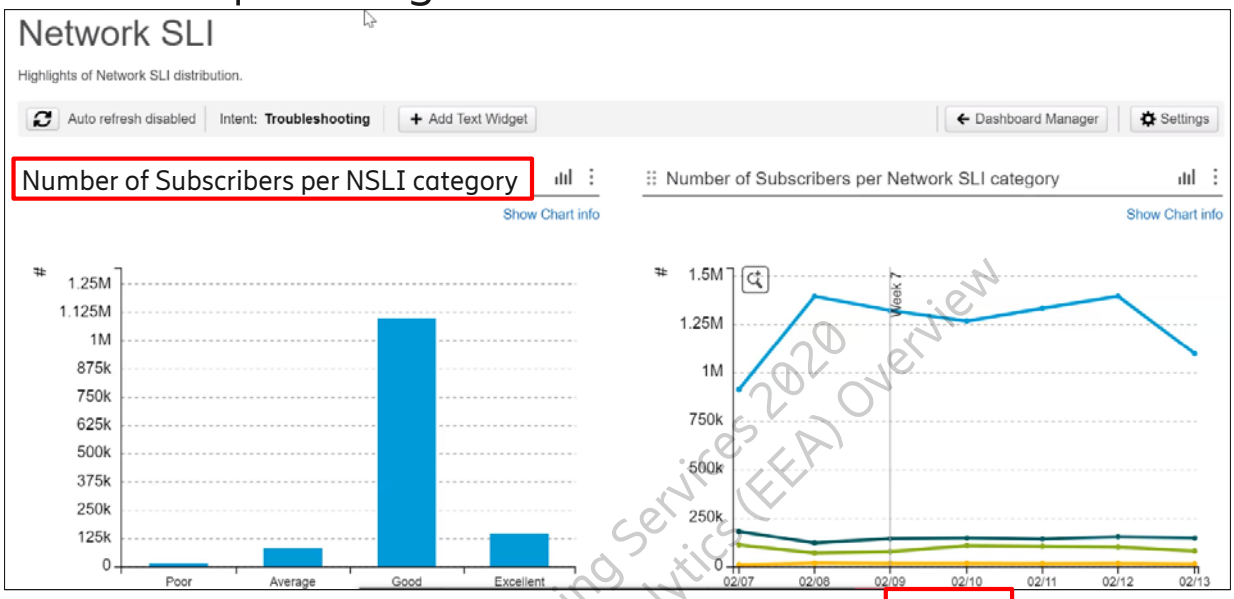
NSLI in Expert Insights Dashboard



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... by day

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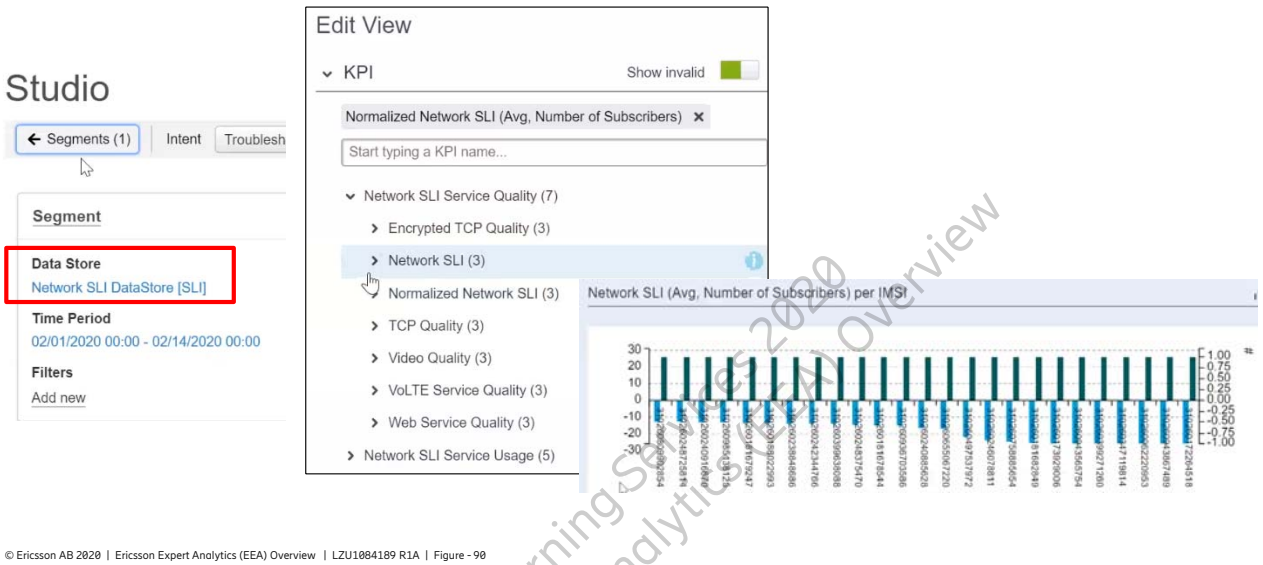
NSLI in Expert Insights Studio



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CLI (Cell Level Index)

- CLI Score
  - Calculated from ESR incidents and the amount of MBB traffic
  - Calculated daily and weekly
  - Network average has a 0 score
    - Cells with positive have worse performance
    - Cells with negative have a better performance
- CLI rank
  - Ordered list of every cell in the network
  - Worst cell is 1, best is highest number
  - Calculated daily and weekly

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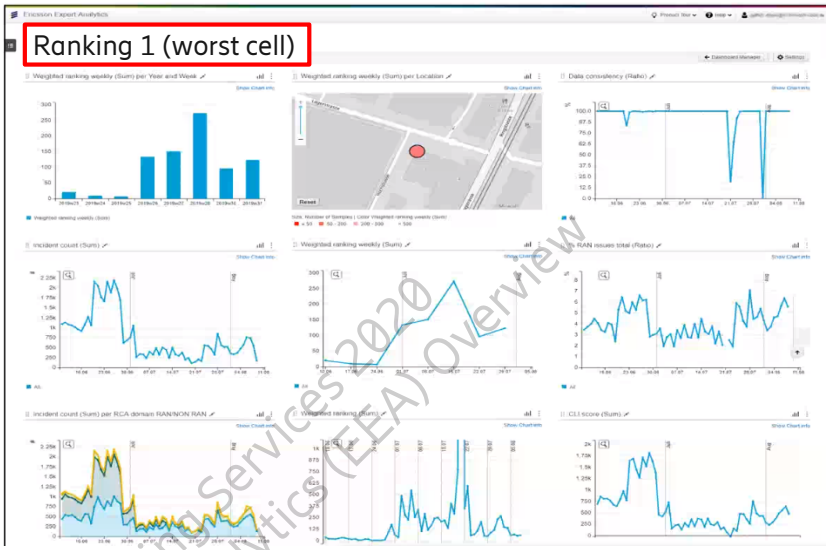
CLI Expert Insights dashboard

- Engineers can optimize the worst cells and check which cells are ranked worst the next week
- No absolute ranking
- Possible to include custom rules/incidents in the CLI



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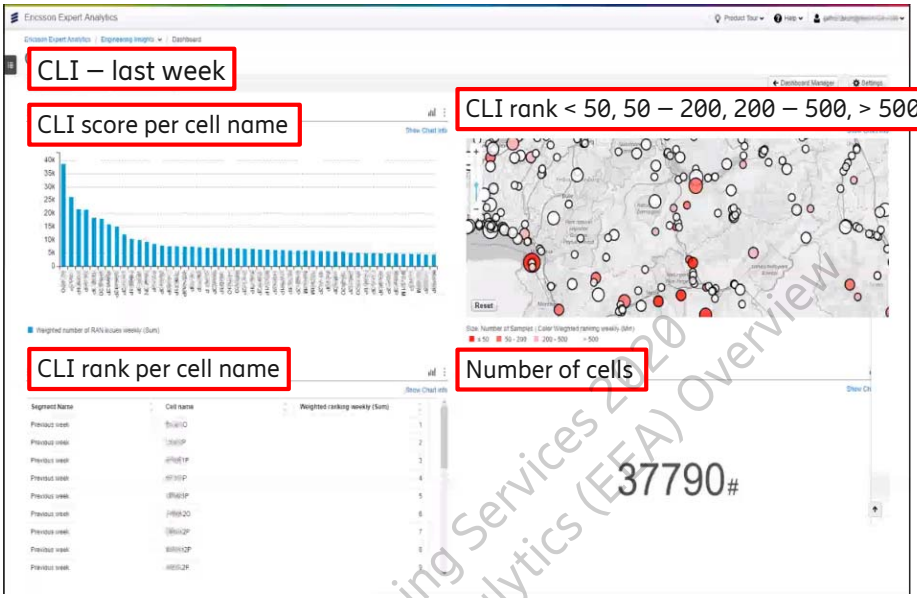
CLI Expert Insights dashboard



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Quiz questions

1. What is the range of the NSLI?
   - **0 - 10**
   - 0 - 100
2. What is the CLI rank of the worst performing cell?
   - **1**
   - 10
   - 100
   - The number of cells in the network
3. How often is the NSLI generated for each subscriber?
   - Every 15 minutes
   - Hourly
   - **Daily**

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Chapter 6
Monitoring EEA

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Chapter Objectives

On completion of this chapter, the participants will understand:

1. EEA monitoring
2. Zabbix Overview
3. Sample Zabbix Dashboard and graphs

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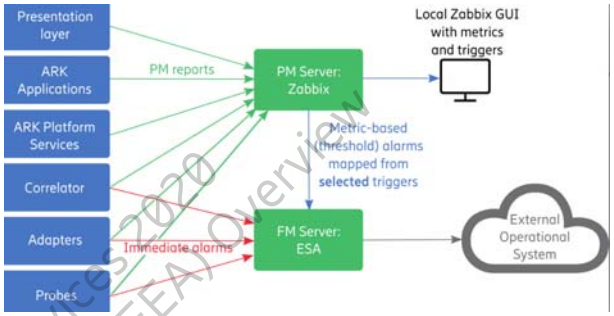
EEA monitoring overview

- **Performance Management** of EEA uses **Zabbix**
  - Zabbix collects counters from the Analytics Cluster, Correlator, Adapters, and Probes, and infrastructural counters from the Host OS, In-Memory Repository, and Application Server
  - Zabbix is an open source framework for monitoring
  - Zabbix uses a Postgres database
- **Fault Management** of EEA uses **Ericsson SNMP Agents (ESAs)**



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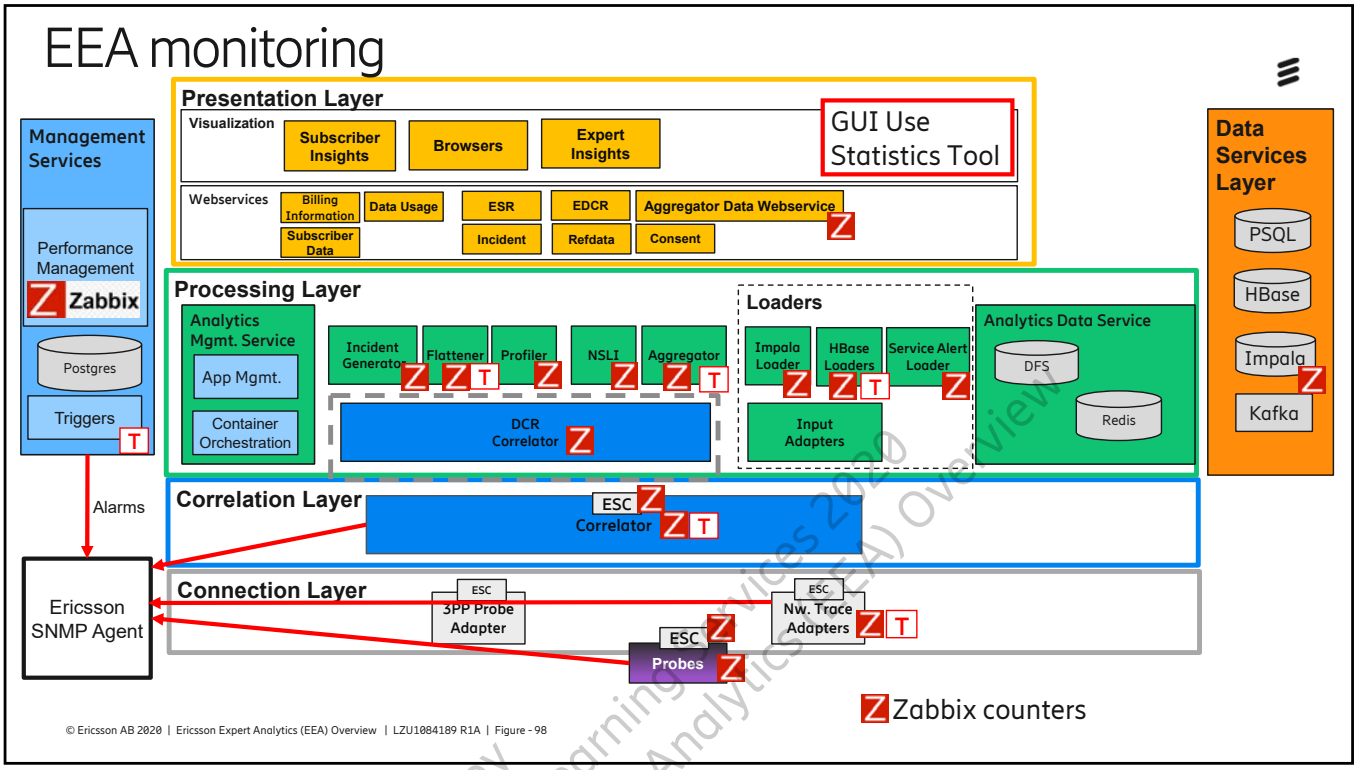

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EEA Monitoring

- **Performance Management** templates
  - Connection and Correlation
    - Probes, Adapters
    - Correlators
  - Processing
    - Aggregator, Loaders...
  - Data Services
    - Impala
  - Presentation and Exposure
    - GUI Use Statistics Tool
    - JBoss
- **Fault Management** Alarms
  - When the data flow from an information source is blocked for more than a configurable amount of time
  - When there is a fault in a major component of the system that affects the provided service
  - When a crash loop is detected for Probe, Correlator, or Adapters
  - When the counter thresholds configured in Zabbix are exceeded

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Zabbix overview

- Define
  - **Items** for data collection
  - **Triggers** to identify problems
  - **Actions** to do when the trigger fires
  - **Hosts** and **Host Groups** to gather the data from
  - data collection/retention periods

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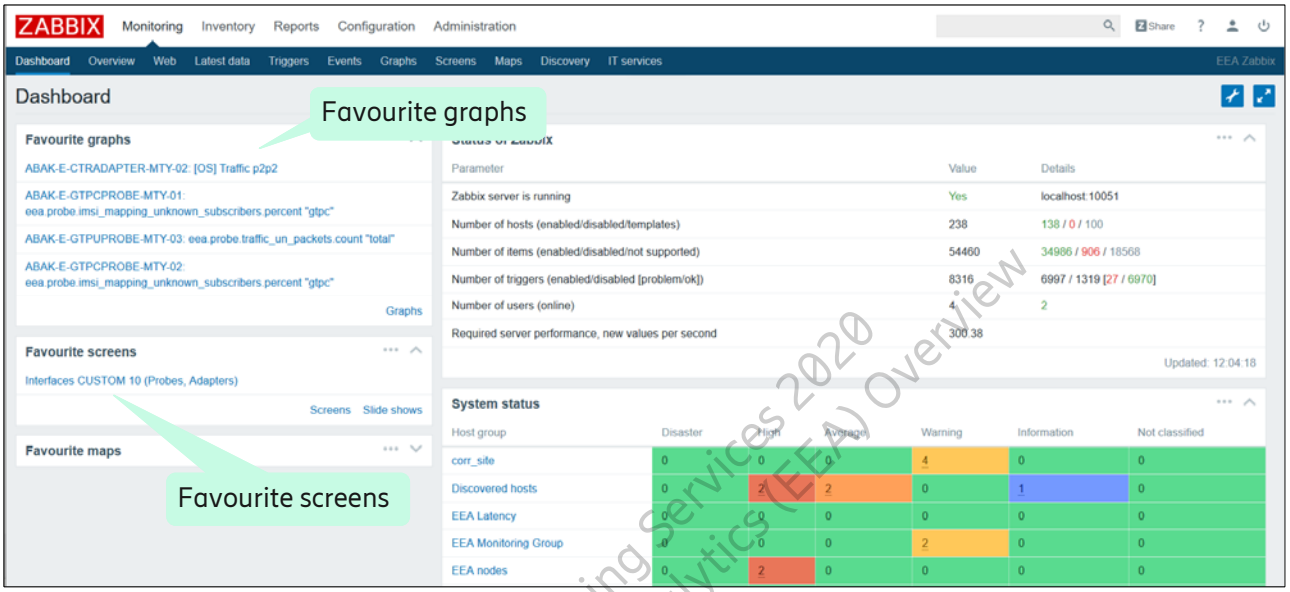
Zabbix dashboard



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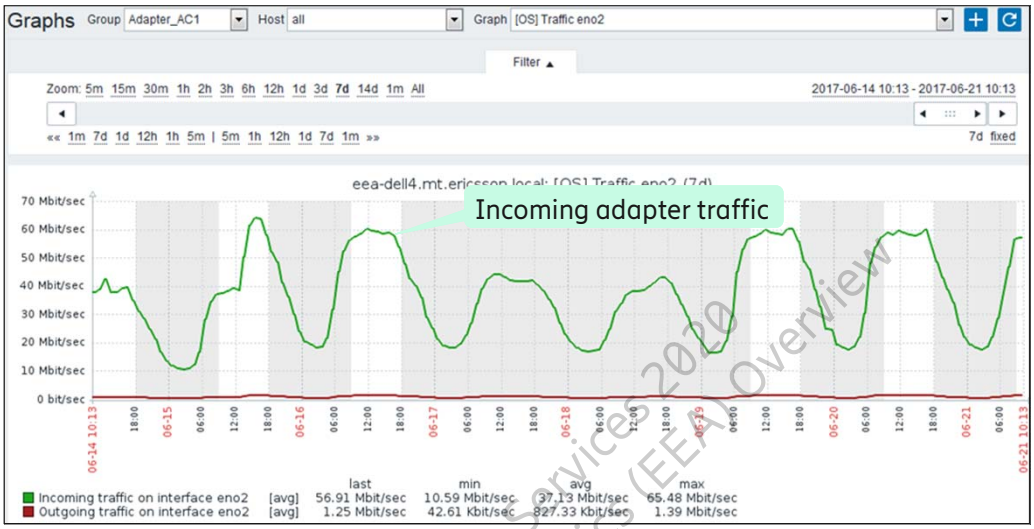
Zabbix graph - adapter traffic 7day



Standard EEA template

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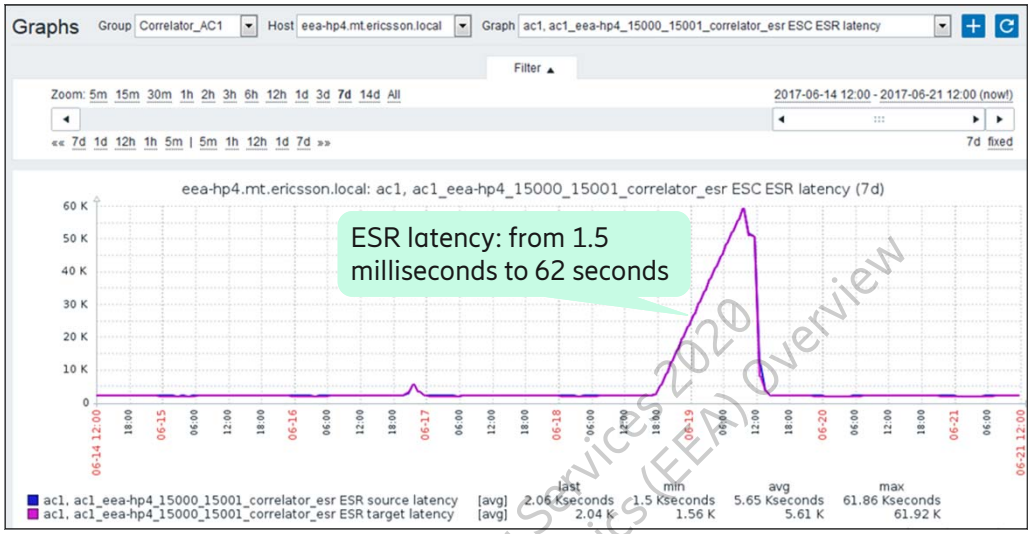
Zabbix graph - correlator ESR latency 7days



`pagctl` command drives Zabbix

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Quiz questions

1. What third-party tool is used for EEA Performance Management?
   - PRTG Network Monitor
   - **Zabbix**
   - Datadog
2. What Ericsson tool collects alarms?
   - Alarm Management System
   - **Ericsson SNMP Agent (ESA)**
   - Ericsson Adaptive Inventory (EAI)

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Summary

You have now attended the EEA Overview course and are able to describe

- Benefits and capabilities of EEA
- High-level architecture
- How the rules are configured to create incidents
- User interfaces and how they are used by the different user groups
- The value of the Service Level Index and the Cell Level Index
- How EEA is monitored

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