

Spirent InTouch

Customer and Network Analytics Solution

The InTouch Customer and Network Analytics Solution helps operators gain an edge over their competitors through the use of analytics. Specifically, it helps operators proactively identify and resolve customer experience hotspots before they drive customer care calls (\$20+/incident) or churn (\$300+/event). InTouch also expedites the root cause analysis process itself, which further minimizes engineering mean time to repair and/or customer care handling times.

A few key capabilities, discussed further in this product definition document, are instrumental in delivering this value.

Data fusion and correlation: While operators have reams of data at their disposal, it is usually trapped in disconnected tools (“silos”) spanning domains such as RAN performance, core signaling, application performance, provisioning, etc.. Hence, when problems arise, engineers must “swivel chair” between systems to identify root causes which is painstakingly slow and expensive process (especially for junior engineers). InTouch overcomes this problem by automating the process of fusing, analyzing, and extracting insights from data across these domains.

Proactive customer experience analysis: InTouch computes and extensively leverages rich quality of experience (QoE), revenue, and other scores that enable operators to identify network, device, application, and other hotspots based on the number of customers negatively impacted and their value. This enables operators to focus their limited engineering resources on those activities that will have the greatest impact in terms of avoiding customer care calls or churn.

Decision support: InTouch rules-based alerts, visualizations, and other tools are all designed to help novice engineers approach the productivity of experts. The result is faster, cheaper workflows with better outcomes.

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InTouch Solution Architecture and Key Features

The InTouch solution consists of three layers as shown in Figure 1 below; Data Collection and Fusion, Analytics, and Visualization and Reporting.

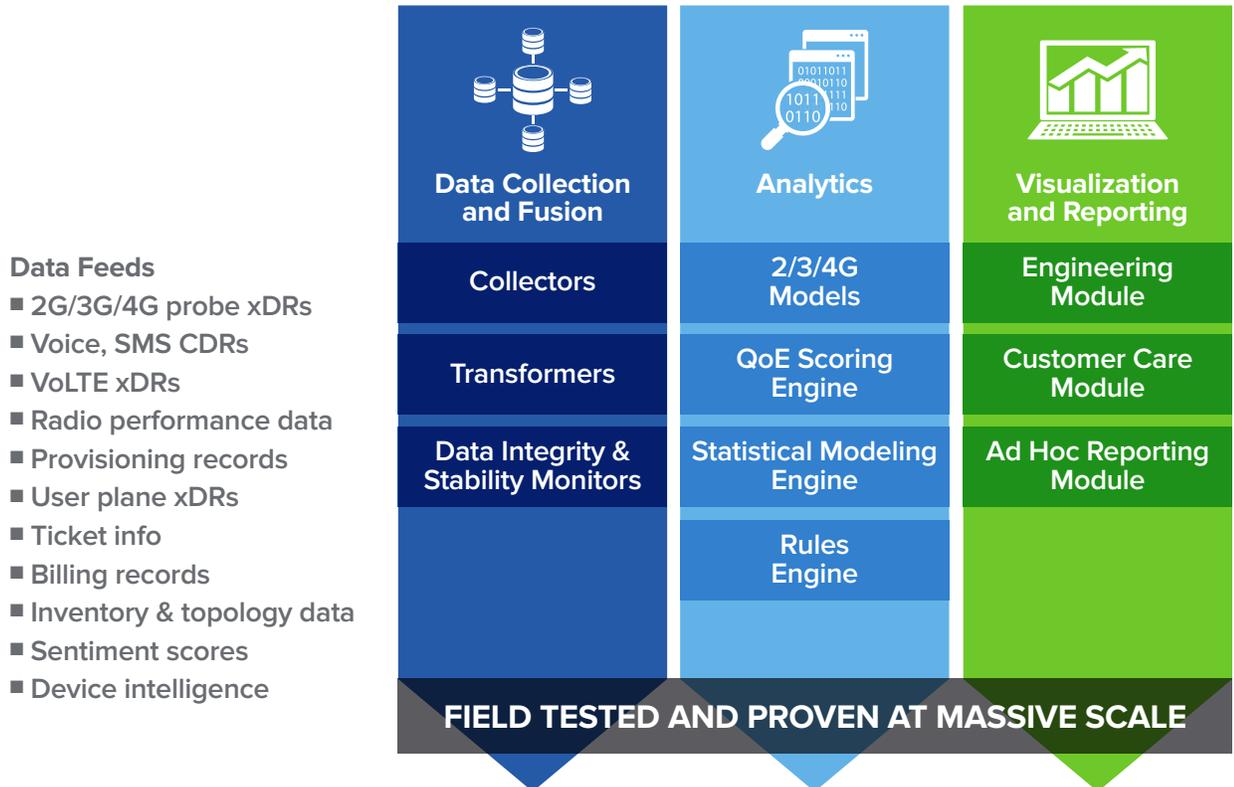


Figure 1.
Functional view of InTouch
Customer and Network
Analytics Solution

Data Collection and Fusion Layer

This layer handles data collection, extraction/transformation/loading (ETL), enrichment, pre-aggregation, and related functions. It is designed to scale up and down (our largest deployment spans > 90M subscribers and 30 data sources, our smallest deployment spans < 1M subs and 3 data sources), support high availability, and robustly handle missing or corrupted data. Over our 15 years of experience in data mediation, InTouch has handled a wide range of data types and sources including voice and VoLTE CDRs, SMS records, 2/3/4G probe data, user plane records, network performance data, customer care/ticket information, provisioning data, handset agent records, turn-up/test records, and many others.

Specific functions of this layer include:

- Collection of files or records from data sources (FTP, SFTP, HTTP, SQL DB)
- Diagnostics, reporting, alerting, & troubleshooting the status of data collection activities
- Load balancing of collection tasks across servers
- Data source specific transformation of input data into revised records
- Ability to detect and reject bad input data
- In-memory enrichment of data using large scale dimensional caches
- Bulk data insertion into Oracle or Vertica databases (depending on system configuration)
- Generic data loading via JDBC connectors

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Analytics Layer

This layer ingests enriched data from the Data Collection and Fusion layer, applies a variety of analytical techniques, and exposes the result of these analytics to northbound and westbound functions such as reports/visualizations, alerts, and other notifications. Several key InTouch analytical functions are covered below and depicted in Figure 2.

Comprehensive 2/3/4G wireless data model

InTouch CNA maps enriched source data into a wireless data model spanning customer, network, and reference information. This keeps pre-launch configuration activities to a minimum. The model consists of:

- Fact tables containing enriched time series records loaded by the ETL engine. These fact tables are optimized for particular types of records such as 2/3/4G control plane, user plane, etc.
- Dimensional tables covering invariant information such as device types (make, model, other information), subscriber group affiliations, network element information (identifiers, geolocation information, topological relationships, vendor information, technical information, etc.), user plane reference info (APN and URL groupings, etc.), etc.
- Aggregations that compute and store:
 - KPIs across key reporting dimensions and time periods (a full list of InTouch KPIs is beyond the scope of this document) such as subscriber, device, network element, etc.
 - KQIs and QoE impacted counts for each time period across a range of dimensions (see **Figure 3**)

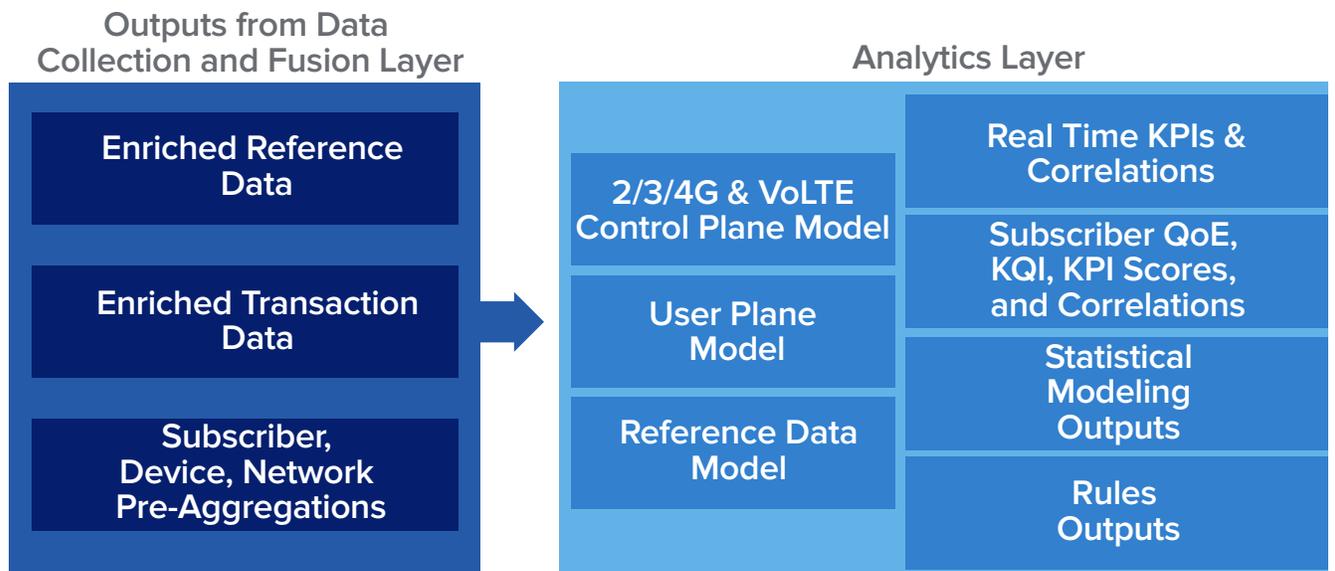
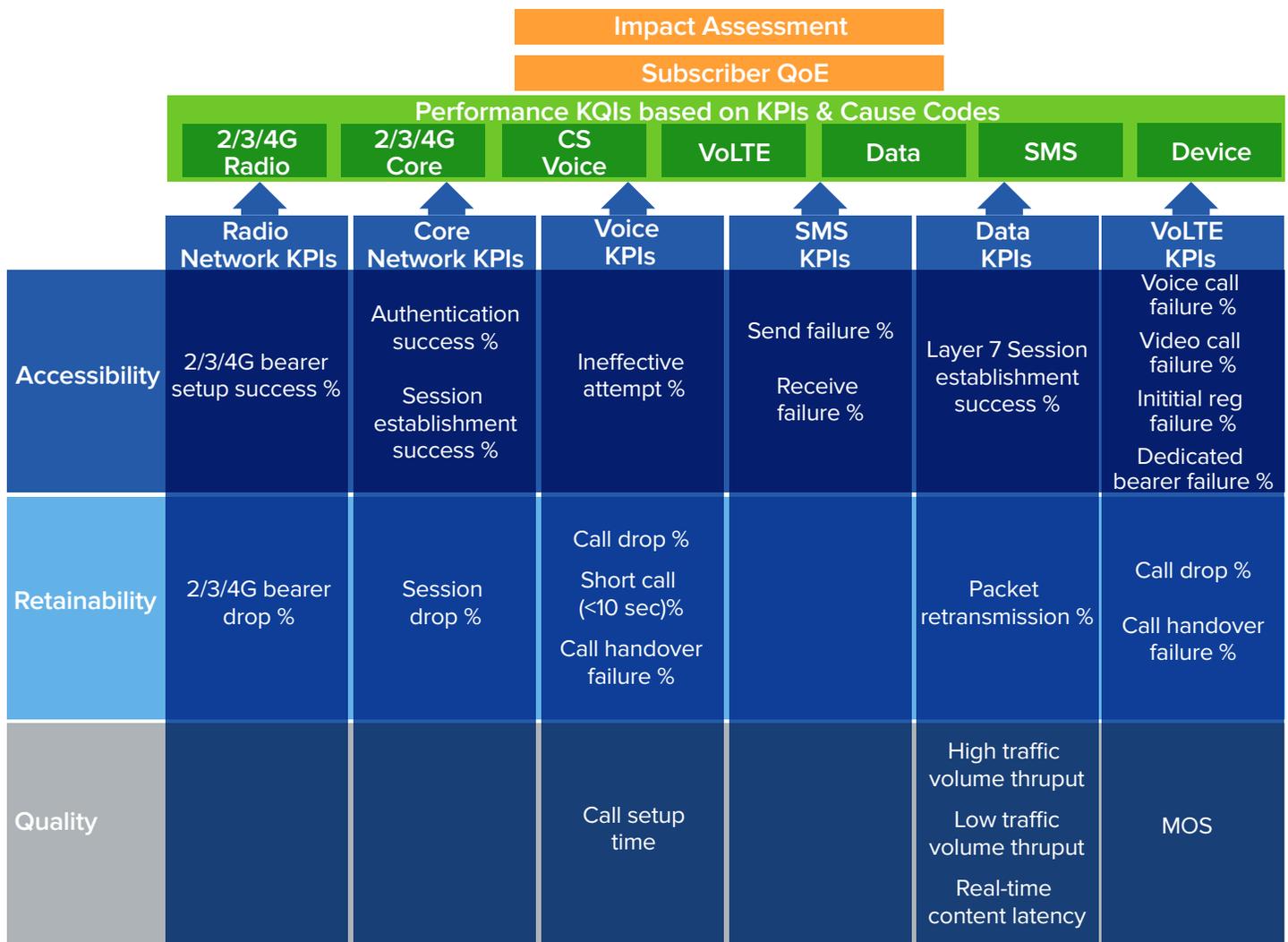


Figure 2.
Architecture of InTouch
Analytics Layer

QoE scoring engine:

InTouch CNA computes KPIs for every subscriber on the network during all time periods. These KPIs are then used to compute KQIs across key dimensions such as radio performance (2/3/4G session establishment, retention, etc.), core signaling performance (session establishment and retention), and service performance (voice, SMS, VoLTE, data, content groups, etc.). These KQIs assess whether, based on the KPI values measured, the subscriber realized acceptable quality across the KQI dimension. Finally, a single QoE score is computed for the subscriber and time period. If the QoE score falls below a minimum threshold, the subscriber's is said to be impacted.



InTouch then aggregates the counts and percentages of subscribers with QoE impacted and poor KQIs across key dimensions such as devices, network elements, and regions. This enables operators to quickly identify and drilldown into customer experience hotspots. A summary of the different QoE reporting dimensions supported within InTouch is shown in Figure 3.

Figure 3.
InTouch CNA QoE Scoring Model

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Revenue Scoring

In addition to detecting network hotspots based on the number or percentage of subscribers with poor QoE, InTouch can also prioritize issues based on the value (revenue) of subscribers impacted. This enables another commercial lens through managers can prioritize scarce engineering resources.

As shown in **Figure 4**, revenue scoring can also (as with QoE) be reported across a range of dimensions.

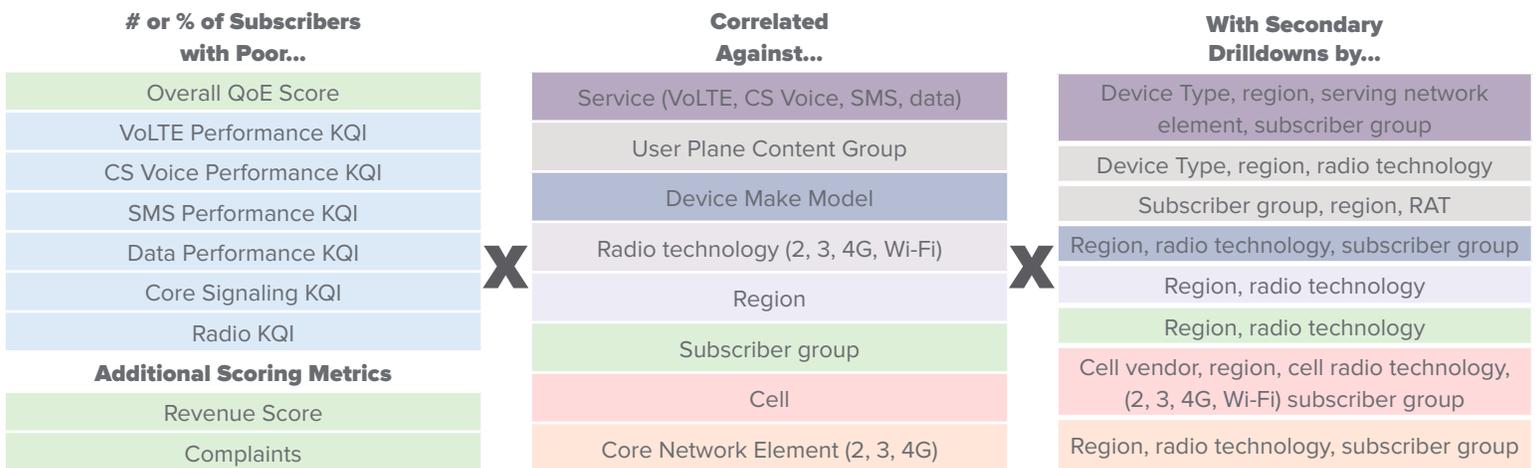


Figure 4.
QoE Reporting
Dimensions & Drilldowns

Rules Engine

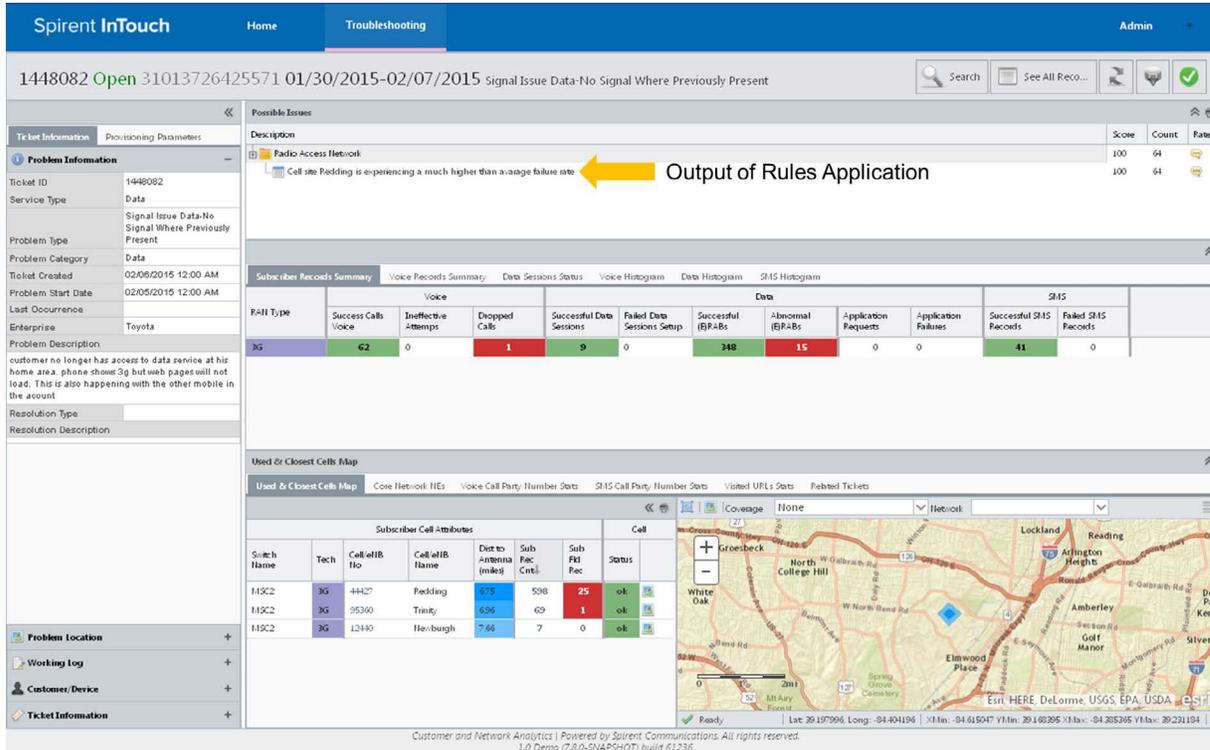
InTouch contains an end-user configurable rules engine that allows system users to create/edit/delete, apply, and leverage rules in both the customer care and operations/engineering modules. The rules engine consists of a rules manager and an engine that applies the rules created in the manager. The rules manager is designed to allow semi-technical users to create if/then/else style rules based on facts and dimensions in the data model using dropdown menus.

Rule outputs can form the basis of alerts or be visualized within InTouch application modules. For example, in the case shown below, a rule was triggered based on the states of customer provisioning, RAN/signaling/application performance KPIs, location, device, and other data associated with a particular subscriber.

Statistical Modeling Engine

For a range of elements in its data model (subscriber groups, device types, cells, core network elements), InTouch builds statistical models for key properties such as load and performance KPIs. These models enable the system to define upper and lower KPI bounds upcoming time periods based on prior performance (i.e. how many calls should cell 1234 have between 2-3PM on Friday afternoon?). When incoming measurements fall outside expected bounds, alerts are generated and presented within InTouch or exported to third party systems.

These alerts enable operators to gain early warning indications of emerging problems that may ultimately drive down customer satisfaction and lead to costly care or engineering activity. Alerts can be further processed by the InTouch rules engine to prioritize issues (for example, flagging a cell with both anomalous traffic, growing levels of impacted subscribers, and growing customer complaints).



Visualization and Reporting Layer

Here, outputs of the analytics layer are visualized and within structured workflows geared around solving specific problems. Within the presentation layer, InTouch Customer and Network Analytics currently features two application modules which will be covered in additional detail below.

Beyond the preconfigured application modules, the presentation layer also includes ad hoc reporting engines that allow system users to rapidly develop their own custom analysis atop the aforementioned pre-existing InTouch data model. Depending on the system configuration, these ad hoc reports are facilitated by either Tableau (desktop or server-based report authoring) or Oracle BI.

Figure 5. Screenshot of Rules Appearing in InTouch CNA for Customer Care

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Engineering and Operations Module

Here, system users are interested in how customer QoE is faring overall and within key segments such as VIP groups, enterprises, devices, applications, etc. They also want to proactively identify and hotspots along these or other dimensions, and quickly and efficiently drilldown into the root causes of the QoE degradation.

Our application is therefore designed to enable users to navigate between high level QoE trending information to low level root cause analysis in a matter of clicks. For example, in Figure 6, a QoE hotspot associated with enterprise users of the iPhone 6 is visualized. In one view, the system user is able to ascertain that a high percentage of enterprise users have poor overall QoE on the iPhone 6, and that this problem is particularly problematic for VoLTE subscribers. The user is then able to rapidly drilldown into specific VoLTE KPIs and cause codes tied to these users, revealing device initiated SIP failures driving VoLTE call drops. InTouch can also visualize contextual events against load or performance metrics, which in this case reveals a firmware update coincident with the onset of this problem. At this point, network engineers can take action, such as rolling back or updating the firmware on the affected devices.

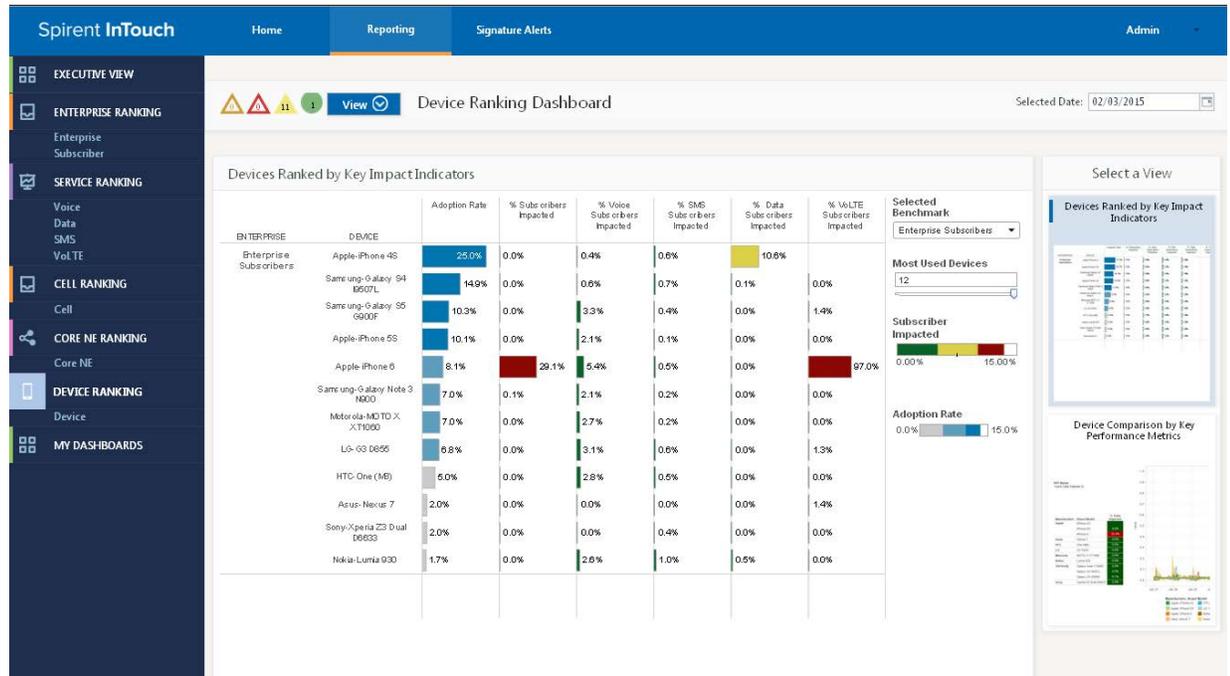


Figure 6. Screenshots from the Engineering and Operations Module

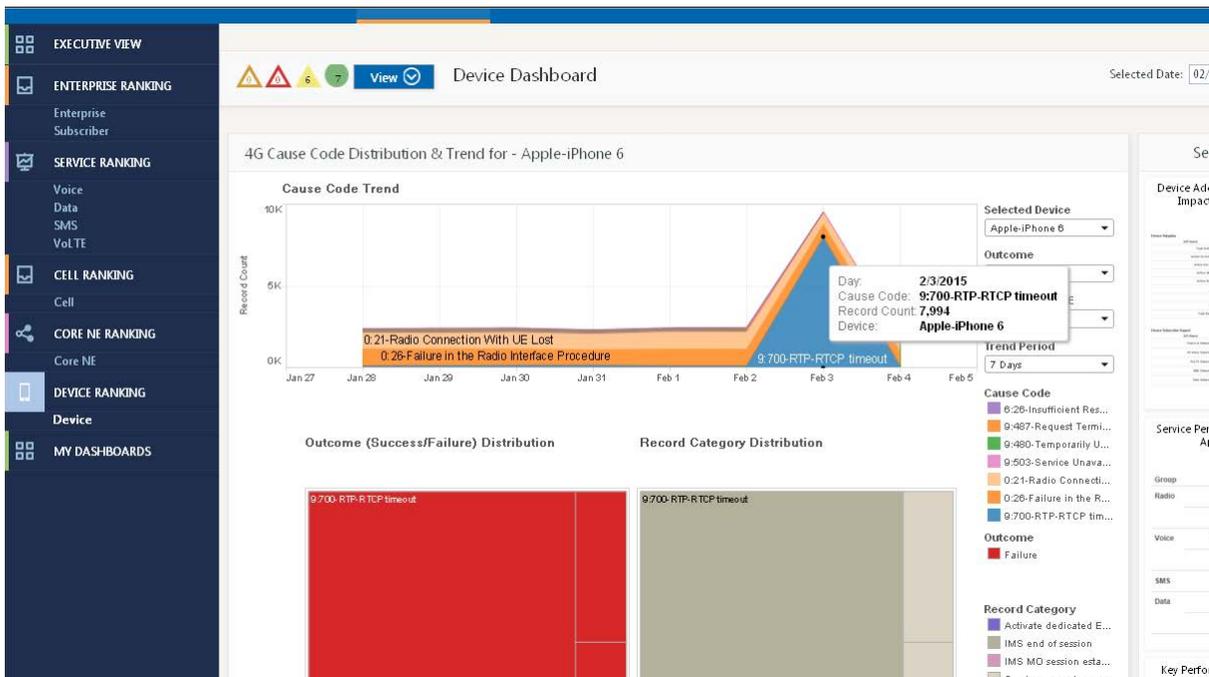
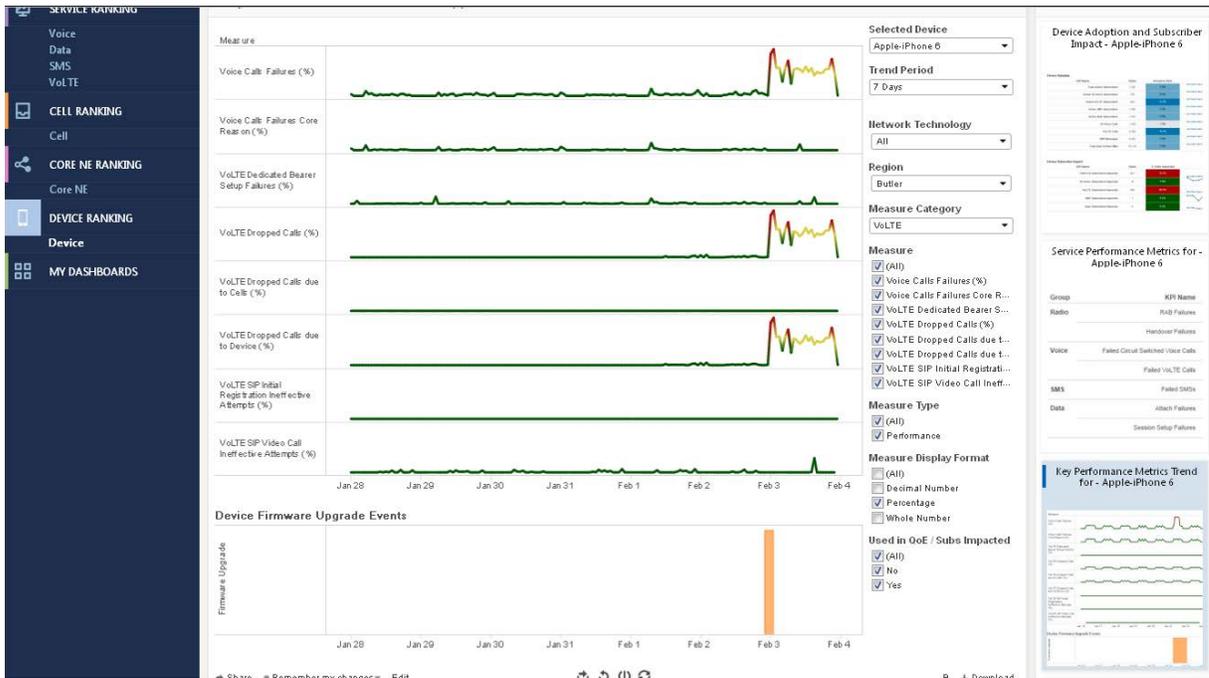


Figure 6. Screenshots from the Engineering and Operations Module

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InTouch Customer and Network Analytics for Customer Care

Here, system users wish to identify the root cause of a single subscriber's issue in the minimal amount of time and fix it immediately if possible.

Our application is therefore designed to present all aspects of the customer's experience for the time period in question in an easy to navigate console that clearly denotes problem areas. Specifically, this can include:

- Subscriber QoE scores and underlying radio, signaling, service (VoLTE/voice, SMS, web, other), user plane, and other KQIs/KPIs for the user in question and other/benchmark users for comparison
- Customer care log, ticket or other history if applicable
- Provisioning information

Further, the outputs of the InTouch rules engine are presented to the user suggestion potential root causes and/or actions that can be taken.

Data from 25+ sources presented in seconds | Guided workflows speed problem resolution



Figure 7. Screenshot of InTouch CNA for Customer Care, outlining key elements and data types within the console

System monitoring and management

The Administration dashboard provides administrators with system-level tools that allow them to view and manage functions such as:

- **Data Transfer**– admin view for Transfer Jobs and Unstable Data Intervals
- **Application Logs and Alerts**– admin view for system health alerts, application alerts, reporting logs
- **User Feedback**– Provide a method/process for the admin to easily view feedback from user base.
- **Notifications**– notifies users about important information, such as pending system maintenance
- **System Status**– System Status is provided by InTouch Process Manager, a process that runs on every InTouch server and provides live statistics of OS parameters

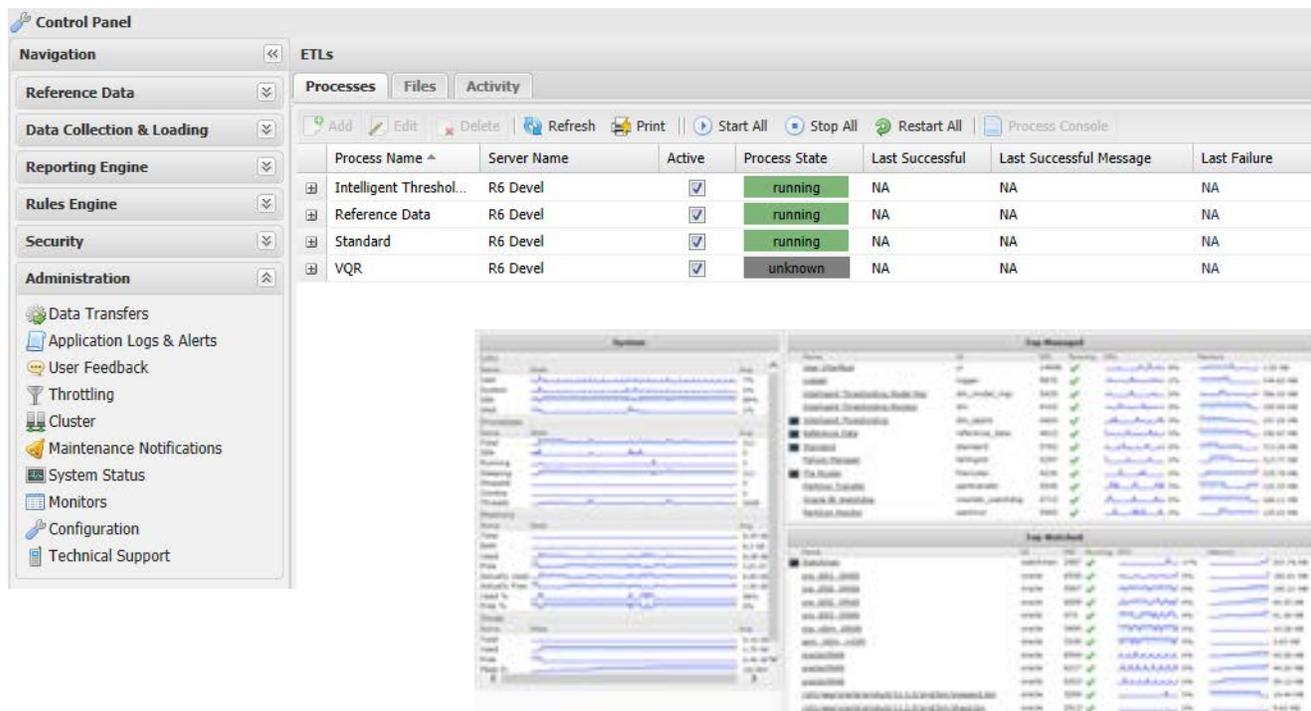


Figure 8.
Administration
Control Panel Views



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Access control/user permissions

InTouch supports a range of access control and user permission features:

- Only appropriate people can log on and access InTouch.
- User/Employees can access only the data that is appropriate to them. This is achieved by applying data access control in the form of permissions.
- Users/Employees have the ability to perform only those actions that are appropriate to them. This is achieved by applying user rights in the form of privileges.

spirent.com

AMERICAS 1-800-SPIRENT
+1-818-676-2683 | sales@spirent.com

EUROPE AND THE MIDDLE EAST
+44 (0) 1293 767979 | emeainfo@spirent.com

ASIA AND THE PACIFIC
+86-10-8518-2539 | salesasia@spirent.com

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