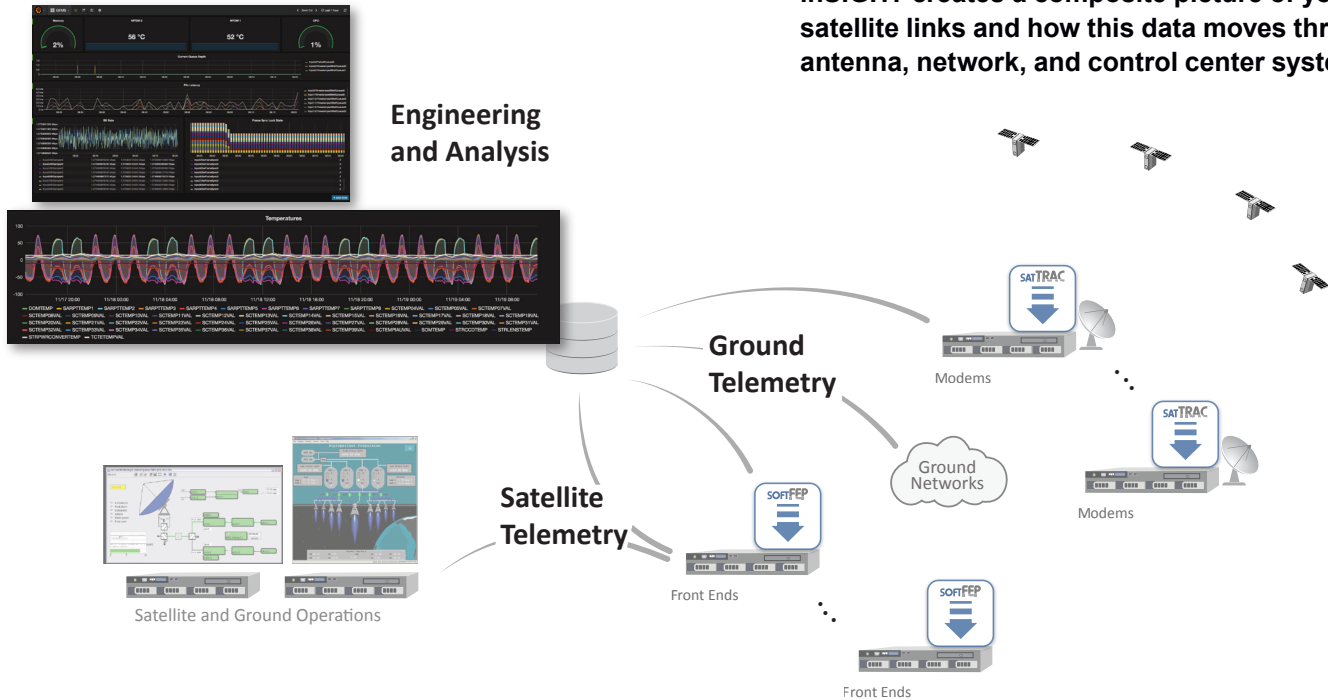


The inSIGHT Application allows your engineers to quickly uncover and get to the root cause of problems, saving valuable time and resources.

inSIGHT creates a composite picture of your satellite links and how this data moves through antenna, network, and control center systems.



### The Insight Needed for Analysis

Today's satellite and ground system operations require increased data to analyze and resolve operational issues. There can be an overwhelming number of interrelated status parameters. Debugging issues with satellite contacts can be challenging, having to sort through signal strength, bit errors, network loading, processor utilization, operator actions, etc.

inSIGHT augments traditional control center M&C and T&C software with a flexible engineering analysis tool for use outside of day-to-day spacecraft operations. The inSIGHT Application collects and manages large data sets collected over long periods of time allowing you to have a historical record that is fully searchable as part of engineering analysis. The analysis tools allow you to extract useful information, make sense of the data, and take corrective action.

### Grafana and InfluxData Tools

At the heart of inSIGHT is the concept that all reportable statistics, many of which are normally discarded during operations, should be tagged and recorded as time-series data. inSIGHT leverages a combination of the Grafana,

Telegraf, and InfluxDB tools to monitor computer systems and network equipment and to perform analytics on the data.

Grafana provides for visualization and analysis of this data as time-series data—how parameters varied over time and how these variations might be interrelated. inSIGHT leverages Grafana's rich feature set of graphing tools for dashboards and investigative analysis.

InfluxDB works in conjunction with Grafana, providing the underlying database where the time-series information is stored. It supports the high ingest speed needed for telemetry data and equipment monitoring.

### Application inSIGHT

inSIGHT extends this powerful visibility to the software applications and hardware components of a ground system. inSIGHT captures the inner workings of our softFEP and satTRAC Applications, and therefore, ties together link and processing status from the modem, network gateway, recording, and front end processing of satellite links, antenna sites, ground networks, and control centers. Agents for antenna controllers, HPAs, and other ground equipment can be used to create an even more complete picture of operational issues.

**inSIGHT allows operators and engineers to visualize ground system and link data in ways that heretofore was simply not available.**



The settings and status parameters from each App's software devices are captured, given a time-series representation, and stored in real time to a database. Status parameters include data quality indicators such as lock states, device configuration setting, data rates, and data formats. CPU loading and Internal queue depths are examples of processing performance statistics. Collectively they provide an in-depth look at the state of each front end, data recorder, gateway, and modem—providing you with the data needed to analyze how data moves through your ground system.

### Data inSIGHT

Bringing in metrics and measurands from the telemetry being processed adds a third dimension to this powerful analysis capability. Measurands from telemetry streams are processed within inSIGHT into a time-stamped sequence of decommutated and processed measurands for the spacecraft.

Archived raw telemetry is a gold mine of data that can be quickly reprocessed for historical analysis. This feature decommutates measurands from the stored raw telemetry files at much faster than real time data rates. For example, two years of satellite telemetry that might range from 1 to 20 GB can be processed and displayed in a few minutes.

The metrics and measurands from the telemetry streams can be combined with processing, network, and software statistics. As the number of satellite contacts and corresponding potential issues grow along with constellation size, inSIGHT's look into the entire link along with data correlation between spacecraft, across contacts, between stations, etc. becomes increasingly critical.

### Analysis and Troubleshooting

The visualization enabled by inSIGHT has been used to uncover and isolate issues that might have taken weeks or months to unravel. Having composite data stored and available when needed is invaluable in trouble-shooting both one-time and recurring issues. CPU processing is correlated with queue depths, network outages with data loss, receiver lock with signal strength.

inSIGHT generates markers in the time-series data on various control settings or selected status parameters. These markers aid in the analysis of “what happened before, during, and after when things went wrong.”

### Triggered Data Collection

Triggered data collection is another troubleshooting aid available with our softFEP and satTRAC Apps. Ring buffers contain a sliding window of the link data being processed. When a trigger event occurs, the ring buffer's contents are captured and moved to permanent storage. This solves the elusive problems of first getting an anomaly to reoccur, and then second, to know that the associated fix has solved the problem.

satTRAC Modems use event triggers to capture the raw digitized input samples that are processed in the modem's software. With data stored from a ring buffer triggered by unexpected loss of carrier lock, the input samples can be replayed and inSIGHT used to analyze the root cause of the problem. The captured data can be replayed again to prove out the fix without the need to wait on a future satellite pass.