Illuminate Technologies

Cellular Virtual Monitoring Platform

Data Sheet

Key Features

- Supports multiple Virtual Probes and Applications on a single platform enabling cost-efficient scaling and footprint reduction as data rates increase

- Network independent and with the flexibility to support multiple Cellular Technologies and protocols across different physical interfaces and framing types in hybrid networks

- High reliability architecture including RAID disk storage, dual redundant DC or AC power, and Enterprise Linux

- Expandable with a selectable number of acquisition cards to grow as requirements change with the monitored network providing a future proof platform

![illuminate technologies — accelerating informed decisions]

Introduction

The Illuminate Technologies Cellular Virtual Monitoring Platform provides Law Enforcement, Government and Commercial bodies with the means to efficiently capture and process control and user plane information from a wide range of modern cellular networks.

A probe-based solution is vital for passive monitoring of a telecom network. Traditional probing solutions are being challenged to meet new demands as network elements transition to Network Function Virtualization (NFV) and Software Defined Networks (SDN). By supporting virtualization of the probe and applications, the Cellular Virtual Monitoring Platform is an important step in meeting these challenges.

Numerous vendor variants and evolutionary changes from 2G circuit switched networks to 3G and 4G packet switched networks, including UMTS, HSPA, HSPA+ and LTE have made the network operator's job even more complex. Illuminate supports all these changes on a single platform, enabling fast setup and operation.

Real-time passive monitoring in a virtual probing environment

The latest release of Illuminate's monitoring platform adds support for multiple software only Virtual Probes on a single platform creating a uniform and scalable monitoring capability across 2G, 3G, LTE and IP network technologies up to 10 GbE input rates. When used in conjunction with the Illuminate Flow Explorer, data rates up to 100 GbE can be supported.

A Virtual Probe provides a real-time feed of event reports derived from control and user plane information which may be used to drive Illuminate's Content Intercept Manager or CDR Analytics System, or used by third parties to provide Lawful Intercept or Location Based Services.

The Virtual Probe is passive, meaning its operation is totally independent of telecom network elements, as well as handset type and service provider. Being passive also means that it does not interfere with the operation or performance of the network or active network elements.

Illuminate has designed the Virtual Probe API to be developer-friendly and has the training and support processes in place to fully support third-party developers.

In addition to the Virtual Probe, the new Illuminate Platform also supports Virtual Applications including:

- Media Server (to enable the Content Intercept Manager)
- Flow Explorer, which enables efficient troubleshooting and management of 2G, 3G and 4G mobile network traffic. Flow Explorer automatically discovers the network elements and protocols of these mobile network technologies.

Supported Technologies

- UMTS (Iub, Iur, IuCS, IuPS, and MAP links)
- GSM (Abis, A-interface, Ater and MAP links)
- GPRS/UMTS (Gb, Gn and Gs links)
- LTE (S1-U, S1-MME, S6a, and S11)

The acquisition cards support a range of physical interfaces including TDM/HDLC, ATM (bulk filled and channelized), and Ethernet 1 GbE and 10 GbE.

They also allow for different optical standards (such as Long Reach and Short Reach) to be accommodated in straightforward manner, along with copper interfaces. Direct attach cabling is also supported.

Architecture

The Illuminate Cellular Virtual Monitoring Platform is a high-performance small footprint 2U server that provides the hardware and software necessary for detecting signaling and voice or data presented on various interfaces through acquisition cards inside the server. It automatically discovers all protocols presented on the monitored network and generates records for upstream applications. Multiple record streams can be delivered simultaneously to multiple upstream applications depending on complex filtering and triggering techniques that can be set up independently and in real time.
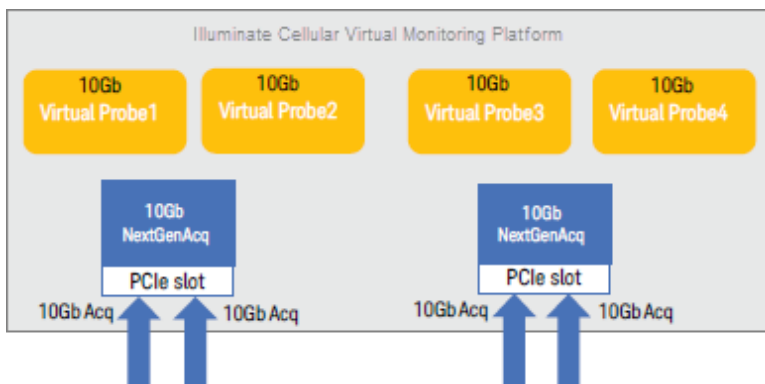
By supporting four Virtual Probes, the Platform offers a significant footprint and scaling improvement

The Illuminate Virtual Monitoring Platform supports up to four unique Virtual Probes providing a substantial scaling benefit relative to Illuminate's previous Cellular Passive Probe, which supported the equivalent of a single Virtual Probe processing capacity. This enables significant footprint improvements and reduction in power consumption.

Also, because each Virtual Probe looks and feels like an existing probe, the new architecture is easy to incorporate into an existing deployment, simplifying any hardware replacement or expansion of current solutions.

The solution is flexible enough to allow a combination of quantities of acquisition cards and virtual probes on a single platform to meet required probing needs. Below examples show a Cellular Virtual Monitoring Platform with four virtual probes:

- The first example below shows the platform receiving data from 4*10Gb links

- The second example below shows the platform receiving data from 16*STM-1 links, which could be processed by a single virtual probe or spread across all four virtual probes depending on the required loading.
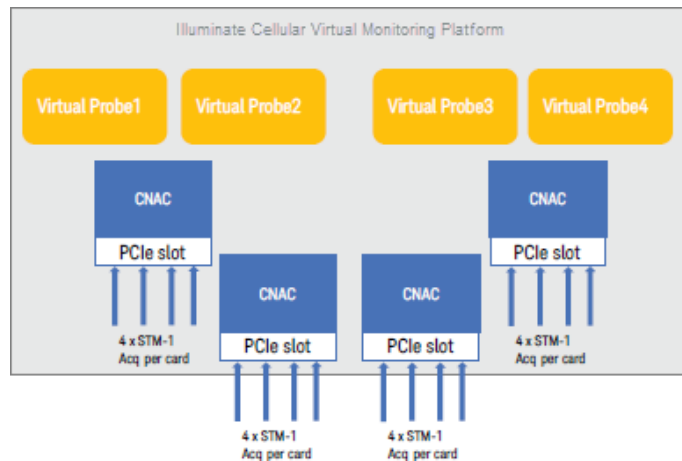
Please contact your local Illuminate representative for advice on the optimal configuration to meet your network requirements.

Illuminate applications such as the Virtual Media Server or Flow Explorer, can run on the same platform as the Virtual Probes. The example below shows 2 x 10Gb Virtual Probes and Flow Explorer running co-resident on the same platform.
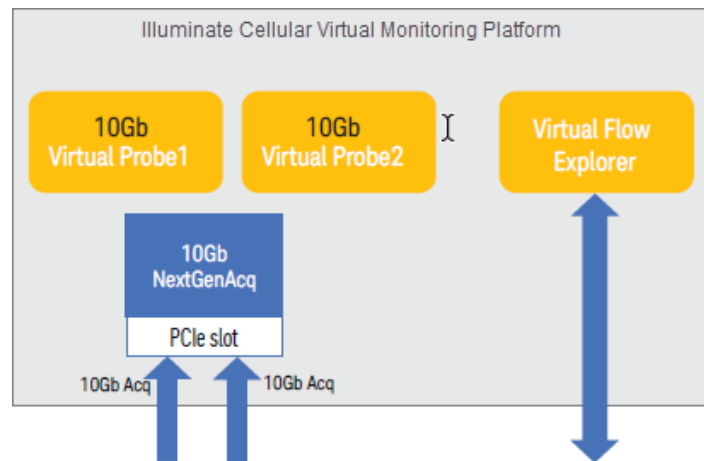
Hardware Platform and Operating System

The Illuminate Cellular Virtual Monitoring Platform runs CentOS Enterprise Linux on both the host and the client Virtual Probes. The benefits include high availability through on-board HW RAID with premium feature key to add RAID 5 and 50, dual or hot swappable power supplies, and redundant hot-swap fans.

Standard server hardware configuration	
Memory size	128 GB RAM
Number of processors	2 x Intel Xeon E5-2600 processor (14 cores/processor)
Hard disk size	2 x 1.2TB
Network interfaces	6 x GbE (1000BaseT) plus 2 x 1GbE/10GbE

Acquisition Cards

The Illuminate Virtual Monitoring Platform offers high density through its capability to host up to four acquisition cards. Two different types of card are supported:

- 1GbE/10GbE Next Generation Acquisition Card (NGAC).

- 1GbE Converged Network Acquisition Card (CNAC) for HDLC and ATM.

The cards are hosted in the server in flexible arrangements. The following diagram shows the combinations supported if all the slots in the platform are utilized:
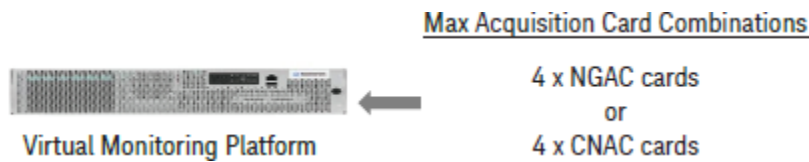
Each NGAC has 4 ports and supports 1GbE or 10GbE interfaces with the following key characteristics:

- Use of standard SFP+ interfaces (4 per card) or direct attach cables.
- Support for 2-bi-directional 1Gb or 10 Gb Ethernet links per card.

Each CNAC also has 4 ports and has the following key characteristics:

- Use of standard SFP interfaces (4 per card). This allows different optical standards (such as Long Reach and Short Reach) to be easily accommodated. It also supports copper interfaces. Direct attach cables are also supported.

- Support for 2 bi-directional STM1/OC-3 links per card

- Support for TDM/HDLC and ATM (bulk filled and channelized) framing structures

The final configuration of cards depends on different factors including:

- The number of physical interfaces

- API requirements

- Loading and throughput on each card

Your local Illuminate representative can provide guidance.

Application Programming Interfaces

Each Virtual Probe supports an easy to use flexible API:

- Event report output API Real-time TCP/IP stream. Provides event detail reports formulated from analysis of the monitored signaling links, e.g., based upon analysis of Abis and A-interface signaling links.

- Control API Allows the back-end application to specify the content of event detail reports.

- Content output API, for example, RTP stream for content forwarding.

The API has been specifically designed to facilitate integration with third party systems (e.g. Lawful Intercept and Geolocation suppliers) and Illuminate has experience in integrating with and supporting a large number of third-party application providers.

The acquisition cards perform filtering and offer additional processing to enable the solution to scale. The cards enable the system to passively monitor a multitude of protocols and network interfaces including the following:

- Abis over HDLC
- Abis over IP
- A-interface over HDLC
- A-interface over high speed clear channel SS7
- A-interface over high speed SS7 over ATM
- A-interface over IP
- Ater
- MAP over HDLC
- MAP over IP
- Iub over MLPPP over HDLC
- Iub over IMA over ATM
- Iub, Iur, IuCS, IuPS interfaces over ATM
- Iub, Iur, IuCS, IuPS interfaces over IP
- Gn over IP
- Gb over IP
- Gs over HDLC
- Gs over IP
- S1-MME over IP
- S1-U over IP
- S6a over IP
- S11 over IP

Due to the Network Equipment Manufacturer independent nature of the platform many vendor specific versions of the above protocols are also supported.

Note that different transport types can be mixed within the probe, for example IP, ATM and HDLC.

The Illuminate Mux is used when the physical link is electrical E1. It converts up to 63 E1s to two optical OC3/STM1s. The mux also has built-in bridging isolation, so there is no need for separate isolation.

Software Scalability

Scalability of the Illuminate Platform is achieved through the virtualization of Illuminate's successful high-density family of multi-technology passive probes and applications.

The Illuminate Platform and Virtual Probes are designed to be deployed in a distributed manner to cover either a subset or the entirety of telecommunications networks. The probes track all events simultaneously and report data to Illuminate or third-party applications based upon set filter criteria. The filter criteria are extremely broad and can be changed dynamically without the need to stop and start the probe.

As mentioned previously the probe API can connect to third party applications (back-end systems). The back-end system is responsible for providing the probe with the correct filter criteria and acting as a collection point for resulting event detail reports. The back-end system may be connected to a single probe or many probes depending upon the physical size of the network being monitored.

When the Illuminate probes are connected to a network, they automatically discover the underlying network configuration. This is a key requirement when connecting to (for example) Abis signaling links for the purposes of providing measurement data for geolocation. There may be hundreds of E1s carrying the Abis links and the assignment of the links within the E1s is dynamic, making configuring these links manually unrealistic. Auto-discovery ensures that the system is providing useful data in the shortest possible time and, since it is an ongoing activity, ensures that the probes are always in synchronization with the network configuration.

Acquisition Card SFP/SFP+ Options

1000BASE-T Copper	SONET OC-48/SDH STM-16 & 1000 BASE-LX	10 G BASE-LR & 1000 BASE-LX
− RJ-45	− LC connector	− LC connector
− Hot-pluggable	− Hot-pluggable	− Hot-pluggable
− Up to 100 m Cat 5 UTP	− 1310 laser	− 1310 Laser
− Auto crossover detection	− Typically 10 km on 9/125 μm SMF	− Up to 10km on SMF
	− Receiver sensitivity −8 dBm to −19 dBm	− Receiver sensitivity -12.6 dBm to -19 bBm

Environmental

Samples of this product have been type tested in accordance with the Illuminate Environmental Test Manual (ETM) and verified to be robust against the environmental stresses of Storage, Transportation and End-use; those stresses include but are not limited to temperature, humidity, shock, vibration, altitude and power line conditions. Test Methods are aligned with IEC 60068-2 and levels are similar to MIL-PRF-28800F Class 3.

Specifications			
Dimensions	Height	3.45 inches	87.6 mm
	Width	17.14 inches	435.3 mm
	Depth	20 inches	508 mm
	Front clearance	2 inches	51 mm
	Side clearance	1 inch	25 mm
	Rear clearance	3.6 inches	92 mm
Power	850W AC or –48 V DC hot-swap, redundant power supplies		
Cooling	Hot-swap, redundant fans		
Temperature operating	Type tested from 5 °C to 40 °C (41 °F to 104 °F)		
Temperature non-operating	Type tested from –40 °C to 70 °C (–40 °F to 158 °F)		
Altitude	0 to 1,800m (0 to 5,905 feet) @ 40 °C; 0 to 3,200 m (0 to 13,123 feet) @ 30 °C		
Regulatory	EMC: Complies with the essential requirements of the European EMC Directive as well as current editions of the following standards (dates and editions are cited in the Declaration of Conformity): AS/NZS: EN 300 386 v1.6.1 Europe: ETSI EN 300 386 v1.6.1 Japan: VCCI US: FCC 47 CFR 2, 15 Canada: ICES/NMB-003 This ISM device complies with Canadian ICES-003. Cet appareil ISM est conforme a la norme NMB-003 du Canada		
Safety	Complies with the essential requirements of the European Low Voltage Directive 2014/30/EU as well as current editions of the following standards (dates and editions are cited in the Declaration of Conformity): IEC 60950-1 / EN 60950-1 USA/Canada UL 60950-1 CSA C22.2 No. 60950-1-07 International CB Certificate and Report to IEC60950-1, and all international deviations		
Acoustic	Acoustic statement: (European Machinery Directive) Acoustic noise emission LpA <70 dBA Operator position Normal operation mode per ISO 7779 During the product's power-on cycle, the acoustic noise may exceed 90 dBA in the operator position and 78 dBA at 1 m distance.		