



Bluetooth® Vanguard™

Advanced Wireless
Protocol Analysis System

Innovative ■ Cutting-Edge ■ Integrated



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Wideband BR/EDR and Bluetooth LE sniffer, with synchronized capture of Wi-Fi®, WPAN IEEE 802.15.4, spectrum, HCI (USB, UART, SPI), Generic UART and SPI, SWD, I2C, SPMI, CAN bus, UCI, WCI-2, logic signals, and Audio I2S

Innovative Tool for Demanding Users

The most advanced, most comprehensive Bluetooth protocol analyzer ever made. Building on a legacy of innovation, the Bluetooth Vanguard All-In-One Wireless Protocol Analysis System delivers new advances designed to ease the increasingly complex tasks of Bluetooth developers.

With its **revolutionary wideband Digital Radio and integrated All-in-One hardware approach**, Ellisys has changed the way Bluetooth protocol capture and analysis is done, by radically overcoming the drawbacks of legacy approaches. The Ellisys wideband capture approach robustly records any packet, at any time, from any neighboring piconet, with zero-configuration and without being intrusive.

Reconfigurable Bluetooth Digital Radio

The reconfigurable radio concept for Bluetooth analysis is another major innovation from Ellisys. Reconfigurability means that the analyzer can be **updated by software to support new features**, without any change to the hardware. This cost-saving flexibility allowed for the addition of Bluetooth features such as Channel Sounding, LE Audio, Coded PHY, and 2Mbps Bluetooth LE many months (years in some cases) before these features were released in an updated specification.

Additionally, Ellisys analyzers come with **free lifetime software updates** and no restrictions on sharing the application software with co-workers, so our customers can benefit from these great additions hassle-free.

Bluetooth tZERO™ Tracking Technology

Bluetooth LE Audio includes two types of transports for audio—broadcast and connection-oriented, called Broadcast Isochronous Streams and Connected Isochronous Streams. Each transport presents new challenges to Bluetooth test and analysis equipment due to complex protocol requirements involving the establishment and security of isochronous connections.

To address these challenges, Ellisys engineers developed tZERO™ Technology, a proprietary design feature that delivers high-fidelity capture of isochronous traffic from the initial audio transmission, without gaps or any other limitations. This technology, available only on the Bluetooth Vanguard, also eliminates the cumbersome requirement for engineers to provide the security keys to the analyzer in advance of an isochronous capture process.

Industry's First Bluetooth Wideband Capture

Bluetooth wireless technology was originally designed to be robustly impervious to interference on the crowded 2.4 GHz ISM band. It was also designed to be difficult to sniff, for security reasons. To meet these criteria, a Bluetooth radio uses various communications technologies, such as pseudo-random hopping, adaptive frequency hopping, and other schemes.

Ellisys created the industry's first wideband sniffer, adding revolutionary features which opened new horizons for Bluetooth debugging and interoperability testing. The wideband capture approach is as simple as it is powerful — instead of listening to just a few channels, **the sniffer captures all channels concurrently**. The sniffer thus does not need to synchronize to a piconet; it will listen passively to all nearby Bluetooth piconets, scatternets, broadcasts, and other topologies.

LC3 Auto-Detect

This innovative feature, based on an Ellisys-designed test equipment-grade LC3 codec, allows for automatic determination of LC3 configuration parameters. Historically, test equipment implementations have required a complete and error-free capture of audio codec configuration parameters to properly capture, characterize, and replay audio.

With this auto-detect innovation, even with otherwise critical configuration packets corrupted by interferences or low signal strength, LC3 audio can be recognized, understood, captured, and available for further analysis.

Bluetooth Capture Diversity

Bluetooth Capture Diversity is an advanced capture robustness technique that replicates our whole-band capture engine (another Ellisys innovation). Both antennas can be angularly displaced on the analyzer unit, externally cabled for placement at optimal locations to improve the spatial volume of the capture, or placed nearer specific devices under test to reduce packet error rate.



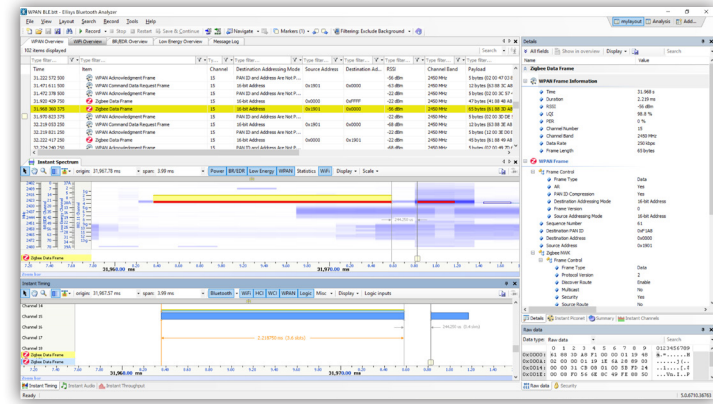
Powerful Ellisys Features

- **All-in-One:** Fully hardware-integrated, time-synchronized, and concurrent capture of BR/EDR, Bluetooth LE, Wi-Fi, WPAN IEEE 802.15.4, spectrum, HCI (USB, UART, SPI, Injected), Generic UART and SPI, SWD, I2C, SPMI, CAN bus, UCI, WCI-2, logic signals, and Audio I2S.
- **Widely Acclaimed Software:** Operating on Windows, Mac OS, and Linux, the popular Ellisys software platform provides intuitive rendering of complex protocol and RF behaviors, and flexible configuration and control to give engineers the insights they need.
- **Bluetooth Wideband Capture:** Easy and rock-solid capture of any traffic on all channels, including discovery/connection traffic, complex topologies, mesh, broadcast, and more.
- **Bluetooth Capture Diversity:** Proprietary feature for dual, concurrent Bluetooth capture paths to increase capture quality with spatial and angular diversity.
- **Wi-Fi 802.11 Capture:** Synchronized Wi-Fi capture accelerated by Ellisys hardware protocol engine for best-in-class performance.
- **WPAN 802.15.4 Wideband Capture:** Concurrent capture of all 16 WPAN 2.4 GHz channels.
- **Bluetooth tZERO™ Tracking Technology:** Proprietary technology to deliver high-fidelity capture of isochronous traffic from the initial instance of isochronous traffic, without gaps or other limitations.
- **LC3 Auto-Detect:** Proprietary technology to detect and decode LC3 traffic even without capture of configuration parameters.
- **Connection/Power Flexibility:** Control, and power the system locally or remotely via GbE or USB 3.2 over USB Type-C® (with USB Power Delivery). Onboard battery for mobility.
- **Emerging Features Support:** Early support for pre-specification features – test early and often to reduce iterations and shorten development.
- **Reprogrammable Bluetooth Digital Radio:** Evolvable by software to protect your investment.
- **All Protocols and Profiles:** Best-of-breed protocol decoding. Includes Ellisys Decode Language (EDL) for custom decodes and scripting for capture of user debug ports (Ellisys Debug Port, EDP).
- **Integrated Audio Analysis:** Comprehensive feature set for audio developers. Listen to captured wireless audio, and audio over HCI and I2S. Audio Grabber accessory for analog audio inputs.
- **RF Spectrum Display:** Characterize the raw wireless environment and visualize co-ex issues.
- **Automation and Console Control:** Remote automation capabilities. Command Line Interface (CLI).
- **Free Maintenance:** Hassle-free, no-cost lifetime software updates.

All-Channels 802.15.4 WPAN

IEEE 802.15.4 is a technical standard that provides lower-layer support for higher-layer network specifications like Thread and Zigbee. Increasingly, this Low-Rate Wireless Personal Area Network (LR-WPAN) technology is being used on devices, modules, and SoC's that also employ Bluetooth and/or Wi-Fi radios, and in applications where Bluetooth and Wi-Fi are also present.

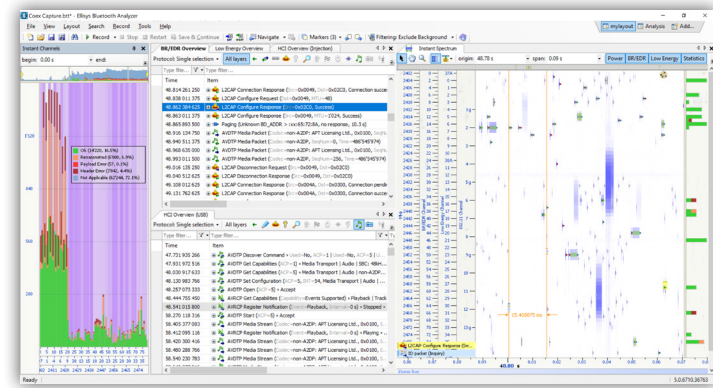
These circumstances present coexistence challenges. **Bluetooth Vanguard uses an innovative wideband approach to capture all 16 WPAN channels** that are used in the 2.4GHz band, including associated RF characteristics, in precise synchronization with all other traffic streams captured by the analyzer.



Visualizing Coexistence Issues

In addition to Bluetooth Classic and Bluetooth LE, Vanguard supports capture of Wi-Fi 802.11 (3x3), WPAN 802.15.4, and raw RF spectrum, **in precise synchronization with each other and all supported wired transmissions.** These technologies are frequently sources of interference and contention with Bluetooth communications, as they share the 2.4 GHz ISM spectrum used by Bluetooth. Increasingly, these technologies are co-resident on the same end devices and SoC's.

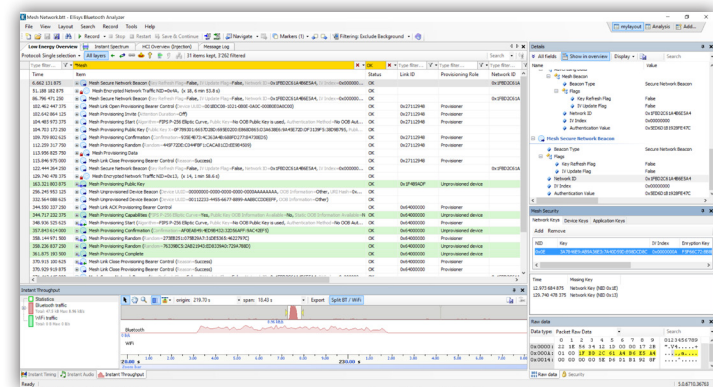
To fully characterize coexistence issues, Vanguard provides a variety of features that make this task easier. The user is presented with a precise understanding of RF signatures, sources, and power, various timings, device performance indications, and other related metrics.



Bluetooth Mesh Networking

The Bluetooth Mesh Networking specifications define a broad spectrum of device and system requirements for a large-scale many-to-many network using Bluetooth LE wireless technology. Bluetooth mesh networks can greatly increase the range of Bluetooth communications by using a message relay approach and are inherently uncomplicated and inexpensive to deploy, as there are no requirements for a central router or computer.

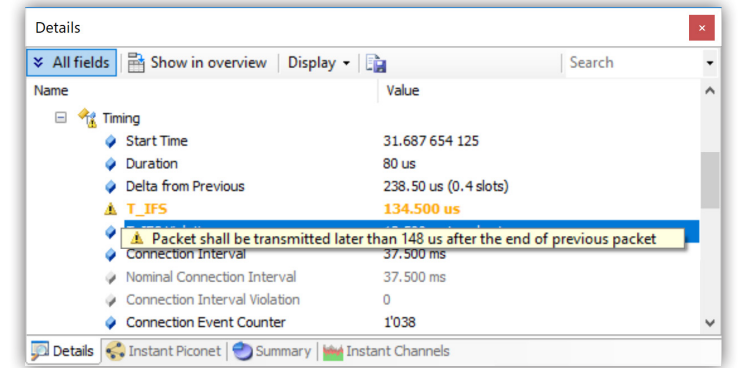
Bluetooth Vanguard provides **comprehensive support for capture of mesh network protocol**, related packet and transactional decodes, encryption and key management features, and error detections. Mesh traffic is captured concurrently and in precise synchronization with all other supported traffic streams.



Automated Error Detections

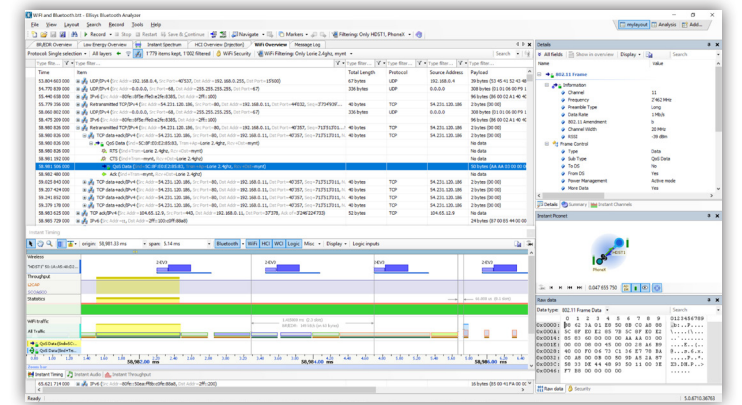
The analyzer software alerts the user to a variety of errors detected for both wired and wireless captures. Physical, protocol, and profile layer errors, including packet and transactional errors, are **automatically highlighted without any need to search through the capture.**

Errors are highlighted on a color-coded system to indicate the relative severity of the errors, summarized in a dedicated status column, and described in the Details view or with pop-up messages on flyovers. Error indications include incomplete payloads, missing or incorrect field values, center frequency violations, timing violations, missing responses, CRC errors, and much more.



Wi-Fi Capture - Accelerated

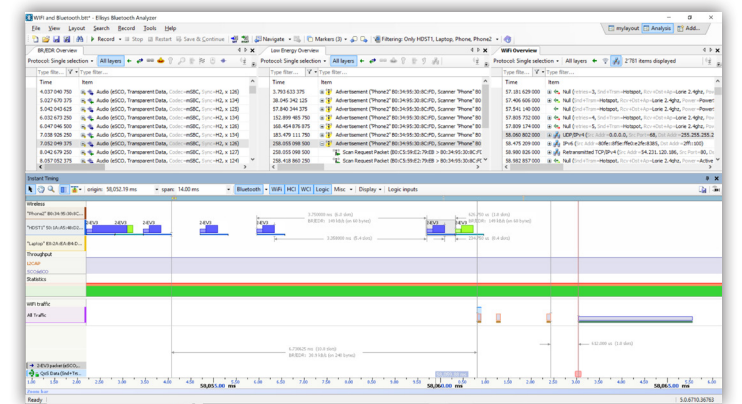
With Vanguard, **Wi-Fi traffic is captured using a hardware-accelerated protocol engine.** Wi-Fi capture is driven directly and without processor dependence to optimize throughput and minimize latency. Importantly, the Wi-Fi traffic is captured concurrently and in precise synchronization with all other supported wired and wireless capture streams.



Timing View

Many timing parameters defined by the Bluetooth specification are system critical. It is important to characterize these timings efficiently and accurately. Hardware and software timing issues are often the source of interoperability and performance issues that can challenge Bluetooth engineers.

All wired and wireless traffic streams captured are presented in the Timing View along a common and precise timestamp. Data throughput, packet transmission statistics, and other information is included to complete the approach.



One-Click Record

Capture starts instantly without any configuration. Devices under test are automatically detected.

Protocol Overview

Low-level and stack protocol elements are hierarchically displayed in easily configurable views.

Spectrum Analysis

Visualize hopping sequences, AFH dynamics, statistical per-channel error characteristics, timings, and RF characteristics.

In-Depth Data Mining

Detailed meta-data and protocol fields are clearly displayed and linked to the selected item in the overview.

Piconets View

Actual piconet and scatternet topology is shown with throughput and other various hints. Works in Live or Replay mode.

The screenshot displays the main interface of the Ellisys Vanguard software. At the top, there is a menu bar (File, View, Layout, Search, Record, Tools, Help) and a toolbar with various icons. Below this is a tabbed interface with 'HCI Overview (Injection)' and 'Message Log' selected. The 'Message Log' shows a list of protocol events with columns for Time, Item, and Communication. The 'Spectrum' panel shows a frequency spectrum plot with a zoomed-in view of a specific channel. The 'Timing' panel shows a detailed view of packet timing and throughput for different devices. The 'Channels' panel shows a bar chart of transmission quality over time. The 'Piconets' panel shows a network topology diagram. The 'Security' panel shows a table of link keys and their associated devices.

Innovative Data Groups

Relationships between packets are made clear, by assembling data per piconet's central device, peripheral, channel and more.

Timing View

Time-ordered, color-coded display of air and HCI traffic, statistics, data throughput and logic signals, with precision timing measurements.

Channels View

Understand per-channel transmission quality with a variety of statistics, over a user-specified time range.

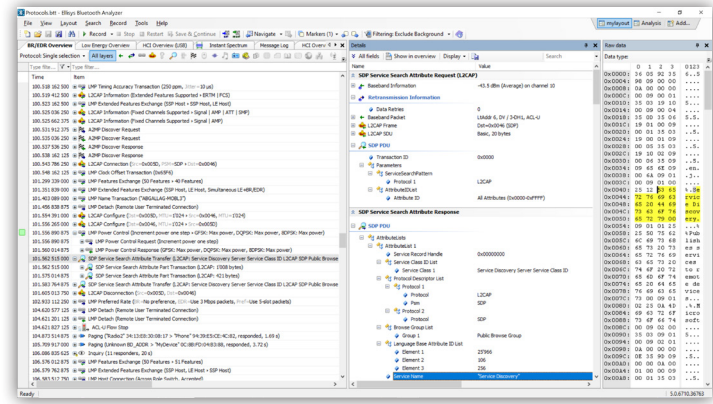
Security Management

Manage addition of link keys here. See when a Start Encryption exchange happens and navigate there with a single click.

Protocol & Profiles Analysis

Protocols and profiles are displayed in an easy-to-understand, high-level procedure-oriented chronological format in the Overview windows and fully detailed to the lowest bit/byte level in the linked Details view. All supported traffic streams are displayed (and configurable) in designated Overviews real-time, as the capture progresses.

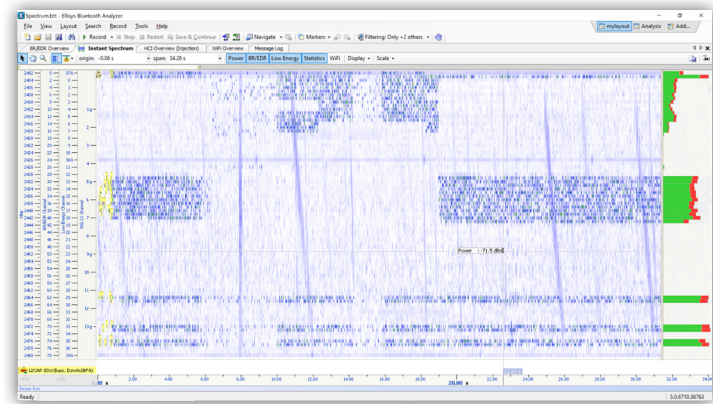
The user is provided many controls to easily customize any Overview, including powerful filter, search, and coloring capabilities designed to quickly isolate items of interest. Traffic can be presented at the highest transactional layers, intermediate layers, and down to the most basic elements, such as packet-only views. Debug port inputs (Ellisys Debug Port, or EDP) are allowed for UART and SPI. Using Ellisys Decoding Language (EDL), and all traffic streams can be directly edited for custom protocols using a script approach provided in the application.



Spectrum Analysis

The Spectrum view chronologically displays Bluetooth and packets from other supported technologies packets by channel. **Raw RF spectrum information from any emitter in band(s) used by Bluetooth** is provided, such as Wi-Fi, IEEE 802.15.4, microwave ovens, and much more. These emitters can and do interfere with each other, and it is often necessary to gain a precise understanding of the wireless environment.

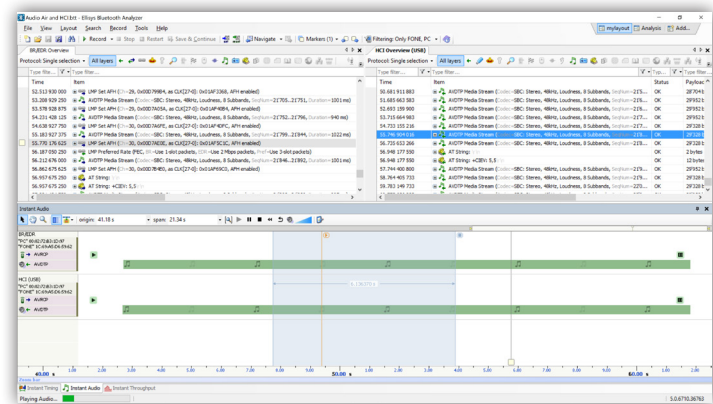
The signal strength of all emitters (RSSI) is displayed at a range of selectable resolutions. Adaptive Frequency Hopping (AFH) and Channel Mapping behaviors are overlaid, enabling a keen understanding of the complexities of coexistence characterization and debug.



Integrated Audio Analysis

Captured audio streams can be easily played back, even during capture. Audio imperfections and associated protocol sequences can be correlated easily. Audio captured over HCI or from Audio I2S inputs [PRO] can be played back and viewed concurrently.

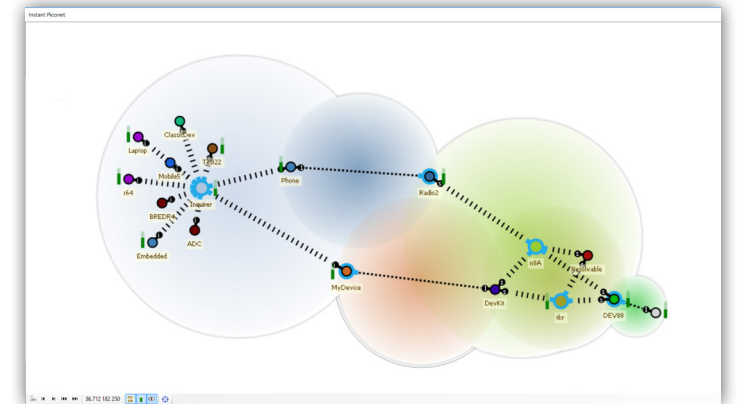
An **optional Audio Grabber accessory** is available to allow for input of analog audio streams. These features enable characterization of the complete audio chain, including the uncompressed audio provided to the source, DAC and ADC outputs, and audio transmitted wirelessly. Audio streams are exportable to WAV format.



Topology Analysis

Bluetooth technology has become very popular among consumers and continues to evolve into new applications and markets, leading to more complex use cases. The only way to support these new use cases is to create more complex topologies, for example, Mesh Networking.

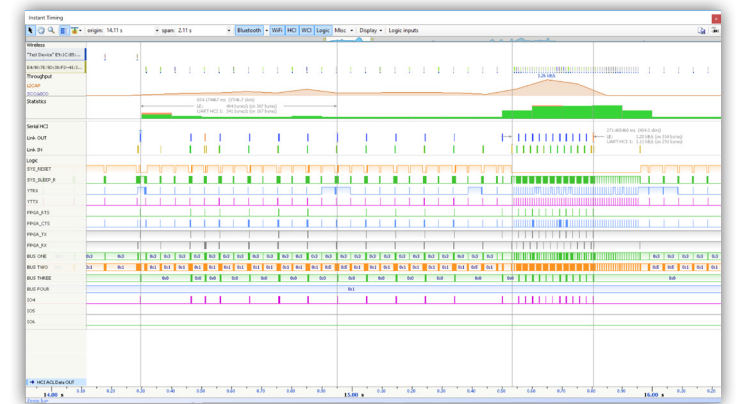
Debugging complex topologies has always been a difficult task, but Bluetooth Vanguard is up to the task with its **powerful wideband radio capable of capturing any traffic from any device**, including the most complex topologies. The Piconet view helps developers visualize topologies live while capturing, and provides a play-back feature showing step-by-step evolution of topology changes. Several filters, such as show/hide broadcast, allow for distillation of the many devices typically present in development environments.



Logic Analysis

The logic analysis feature allows for synchronous capture of external logic signals. Any digital signal is supported, including general-purpose inputs/outputs (GPIOs) or dedicated pins such as TX/RX Active, CTS, RTS, etc. A convenient color-coded probe is supplied.

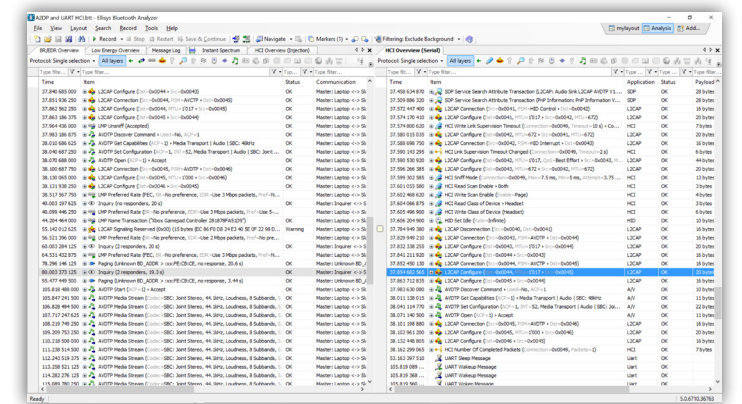
These **signals are visualized with 5-nanosecond precision** and displayed in the Timing view synchronized with all over-the-air and wired traffic streams. Signals can be assigned custom names and colors for easy identification. Custom signal groups can be created and displayed as buses, in addition to the display of discrete signals. Users can create simple external comparators and observe thresholds being crossed for various metrics, such as power consumption.



HCI Analysis

Wireless traffic is the primary element of debug information for Bluetooth engineers, but Host Controller Interface (HCI) traffic can be an equally important complement of information for getting a clear and complete picture of a given situation. Bluetooth Vanguard supports capture of HCI transports over USB, UART, and SPI.

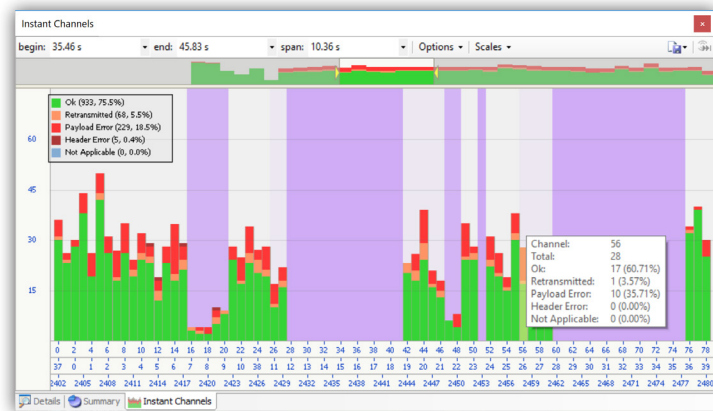
HCI traffic is captured concurrently with the wireless traffic and other wired streams using the same precision clock for perfect synchronization and timing analysis. This traffic is fully decoded and displayed in various formats. Conveniently, the Ellisys software **automatically extracts any Link Key exchanged over HCI** and uses it to decrypt the wireless traffic, all without any user interaction. Injected HCI traffic is also available.



Channels View

The Channels view provides **easy-to-understand visual and statistical analyses on various per-channel transmission characteristics**, including packet retransmissions, header errors, and payload errors. This information can be useful in understanding where in the Bluetooth spectrum all devices, or specific devices, are communicating and the spectral areas (channels) they are avoiding, generally due to external interferences.

Visual cues are provided to give the user an understanding of the propensity of a given device, or aggregate devices, to avoid channels. This information is provided for the duration of an entire capture and can be configured to characterize all devices in the vicinity or specific devices.



Throughput and Airtime

Understanding device throughput and airtime utilization are common tasks for wireless engineers. **These characterizations are managed by the Throughput and Airtime views.** A statistical analysis overlays graphics in both views to provide information on how various transmission inefficiencies relate to performance.

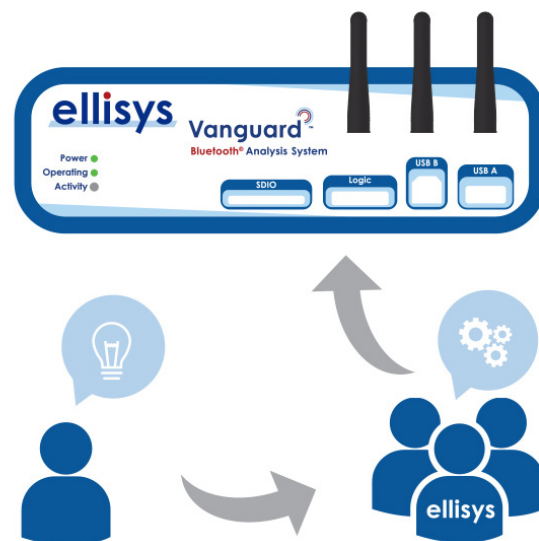
A navigation bar is provided to allow the user to select a time range to pan through the entire capture to see trends, including high and low peaks on throughput or airtime utilization. **Various controls are available to drill down to device connections**, individual transmitters, L2CAP channels, and audio channels. A synchronization feature allows for precise tracking with other views.



Emerging Features Support

All Ellisys Bluetooth analyzer systems are reconfigurable with software updates. Ellisys is engaged with technical working groups and early adopters to provide support for upcoming Bluetooth extensions and specifications.

This approach allows new features and technologies to be added and tested, even in the conceptual stages, long before they become standardized in a public release of the Bluetooth specification. This is a significant advantage to Bluetooth radio and IP developers, and to the Bluetooth developer ecosystem in general, as new features can be refined and validated well before they are committed to silicon, greatly reducing chances of re-spins or post-spin discoveries of issues in the marketplace.



Configurations and Purchase Information

Radio Configuration	EDR	LE	DUAL
Bluetooth Classic capture	✓		✓
Bluetooth LE capture		✓	✓

Editions	Standard	Pro	Enterprise
Wideband Bluetooth capture	✓	✓	✓
Bluetooth Capture Diversity	✓	✓	✓
Bluetooth tZERO™ Tracking Technology	✓	✓	✓
LE Audio / ISOC support	✓(1)	✓(1)	✓(1)
LE Channel Sounding Support	✓(1)	✓(1)	✓(1)
LE HDT	✓(1,2)	✓(1,2)	✓(1,2)
LE Higher Bands (UNII-1/3/4/5)	✓(1,3)	✓(1,3)	✓(1,3)
HCI capture		✓	✓
Logic capture		✓	✓
I2C, UART, SPI, SWD capture		✓	✓
FiRa UCI capture		✓	✓
CAN bus capture		✓	✓
Spectrum capture		✓	✓
Audio I2S and Analog capture		✓(4)	✓(4)
WCI-2 capture		✓	✓
Wi-Fi capture			✓(5)
WPAN 15.4 capture			✓
Warranty	2 years	2 years	3 years

- (1) LE Capture requires LE or DUAL radio configuration
- (2) LE HDT beta available, contact us for more information
- (3) LE Higher Bands available as hardware option, contact us for more information
- (4) Analog Audio capture enabled by the Audio Grabber Accessory
- (5) Default configuration for Wi-Fi is Wi-Fi 5 (802.11ac). See BV1-ENT/OPT-W6E below for Wi-Fi 6E (802.11ax)

Description	Code
Ellisys Bluetooth Vanguard Standard BR/EDR	BV1-STD-EDR
Ellisys Bluetooth Vanguard Standard LE	BV1-STD-LE
Ellisys Bluetooth Vanguard Standard Dual Mode	BV1-STD-DUAL
Ellisys Bluetooth Vanguard Pro BR/EDR	BV1-PRO-EDR
Ellisys Bluetooth Vanguard Pro LE	BV1-PRO-LE
Ellisys Bluetooth Vanguard Pro Dual Mode	BV1-PRO-DUAL
Ellisys Bluetooth Vanguard Enterprise BR/EDR	BV1-ENT-EDR
Ellisys Bluetooth Vanguard Enterprise LE	BV1-ENT-LE
Ellisys Bluetooth Vanguard Enterprise Dual Mode	BV1-ENT-DUAL
Ellisys Bluetooth Vanguard Pro Upgrade	BV1-PRO/UPG
Ellisys Bluetooth Vanguard Enterprise Upgrade	BV1-ENT/UPG
Ellisys Bluetooth Vanguard Dual Mode Upgrade	BV1-DUAL/UPG
Ellisys Bluetooth Vanguard Higher-Bands Option	BV1/OPT-HB
Ellisys Bluetooth Vanguard Higher-Bands Upgrade	BV1/UPG-HB
Ellisys Bluetooth Vanguard Wi-Fi 6E Option [Add Wi-Fi 6E option to Vanguard Enterprise]	BV1-ENT/OPT-W6E
Ellisys Bluetooth Vanguard Wi-Fi 6E Upgrade [Upgrade existing Vanguard Enterprise unit from Wi-Fi 5 to Wi-Fi 6E]	BV1-ENT/UPG-W6E

Technical Specifications

Bluetooth Capture Characteristics

- Ellisys Rainbow™: Wideband concurrent capture of all Bluetooth channels
- Frequency band: 2.402-2.480 GHz
- Sensitivity range: From -90 to +15 dBm
- Gain: Programmable from -30 to +30 dB
- Modulations: All BR/EDR/LE modulations (GFSK 1/2Mbps, p/4-DQPSK, 8-DPSK)
- Baseband: Support of Bluetooth 5.x, via software upgrade. Preliminary support of non-released specifications available.
- LE Channel Sounding
- LE HDT
- LE Higher Bands (UNII-1/3/4/5)*

Wi-Fi 5 Capture Characteristics

- IEEE 802.11 a/b/g/n/ac (3 streams)
- Channel width 2.4GHz: 20MHz, 40MHz
- Channel width 5GHz: 20MHz, 40MHz, 80MHz
- 11n MCS: 0 to 23 (up to 3 streams)
- 11ac MCS: 0 to 9 (up to 3 streams)
- Guard Interval: 800ns (long) and 400ns (short) GI
- Frame encoding: BCC, LDPC, STBC, Greenfield
- Max AMPDU size: 65,535 bytes
- Timing accuracy: 125 ns

Wi-Fi 6E Capture Characteristics

- IEEE 802.11 a/b/g/n/ac/ax (3 streams)
- Band 2.4GHz: 2.400GHz-2.4835GHz
- Band 5GHz: 5.150GHz-5.825GHz
- Band 6GHz: 5.925GHz-7.125GHz
- Bandwidth 2.4GHz: Up to 40MHz (2x2)
- Bandwidth 5/6GHz: Up to 160MHz (3x3)
- HT MCS: 0 to 15 (2SS, up to 64-QAM)
- VHT MCS: 0 to 9 (2SS, up to 256-QAM)
- HE MCS: 0 to 11 (2SS, up to 1024-QAM)
- Guard Interval: 800ns (long); 400ns (short)
- Frame encoding: BCC, LDPC, STBC, Greenfield
- Max AMPDU size: 65,535 bytes
- Timing accuracy: 125 ns

WPAN Capture Characteristics

- IEEE 802.15.4-2011
- Channels: All 16 2.4 GHz channels (11 to 26)
- Data rate: 250 Kbps
- Modulation: O-QPSK
- Timing accuracy: 125 ns

Logic Capture Characteristics

- Maximum bandwidth: 20 MHz
- Sampling precision: 5 ns
- Supported input voltage: 1.8 to 3.3V

*available as hardware option

HCI Capture Characteristics

- USB transport: Low, Full, and High Speed, with automatic detection
- UART transport: Up to 8 Mbit/s, automatic detection of all parameters
- SPI transport: Up to 8 Mbit/s, automatic detection of all parameters

Embedded Memory

- 512 MB of FIFO memory
- Data is stored in highly optimized format
- Analyzed data is uploaded in real time

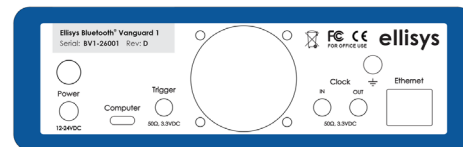


Front-Panel Indicators

- Power: unit powered on
- Operating: unit performing requested task
- Activity: blinks when wireless or wired activity detected

Front-Panel Connectors

- RF (x3): Shared between Bluetooth, Wi-Fi and WPAN
- USB HCI: USB 2.0 Standard-A and Standard-B
- Logic: Supports UART/SPI HCI, WCI-2, generic UART/SPI, I2S, SWD, UCI, I2C, CAN bus, SPMI, and logic analysis
- SDIO: External trace storage and unit recovery



Rear-Panel Connectors

- Computer: USB 3.2, Type-C, Power Delivery
- Ethernet: 1GbE, PoE+
- Power: 12-24 VDC, max 36W
- Trigger: SMA in/out, 50 Ω, 3.3VDC (RFU)
- Clock IN: SMA, 50 Ω, 3.3VDC, 10MHz (RFU)
- Clock OUT: SMA, 50 Ω, 3.3VDC, 10MHz (RFU)
- Earth: Optional, to ground the unit

Power Inputs

- DC input (12-24 V)
- USB Type-C Power Delivery
- Power-over-Ethernet (PoE+)
- Backup Battery (60 Wh)

Low-Speed Serial Capture Characteristics

- Generic Maximum Capture Rate 8Mbps
- Technologies supported include: UART/SPI HCI, generic SPI and UART, I2C, SWD, SPMI, WCI-2, Audio I2S, UCI, Ellisys Debug Port (UART and SPI), CAN bus, and logic signals.

Timing

- Clock: ±10ppm frequency accuracy over -10 to +60 degrees Celsius range
- BR/EDR/LE timestamp accuracy: ±125ns
- Wi-Fi timestamp accuracy: ±125ns
- WPAN timestamp accuracy: ±125ns
- USB HCI timestamp accuracy: ±16.7ns
- Logic timestamp accuracy: ±5ns

Power Adapter

- Input: 100-240 VAC
- Output: 24 VDC
- Power: 40 W
- Plug: 5.5 x 2.1 x 12 mm barrel straight
- Safety: CB, TUV, UL, CCC, PSE
- EMI: CE, FCC, VCCI, RCM

Enclosure

- 180 x 170 x 58 mm (7.1 x 6.7 x 2.3")
- 1.5 kg (3.3 lbs)

Hardware Updates

- The Ellisys Rainbow™ engine is automatically updated with each software release (no user intervention required)

Maintenance and Licensing

- Free lifetime software updates – no maintenance fees
- Free full-featured viewer software – easily share annotated traces between computers and colleagues
- Use Ellisys hardware on any computer – no additional licenses needed

Warranty

- Two-year limited [STD and PRO]
- Three-year limited [ENT]

Minimum Requirements

- Windows® 10 (minimum recommended) & .NET framework 4.6.1
- MacOS and Linux also supported via Ellisys Runtime
- 8 GBytes of RAM
- USB 2.0 EHCI host controller
- Ethernet: 100Mbps (minimum), 1 GbE supported, DHCP required