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Debug Communications Faster℠

BPA 500™

Meeting the *Bluetooth*® Challenge with Frontline Tools and Services

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Frontline Test Equipment
The *Bluetooth* Experts

- **25 years** of protocol analysis experience
- **84 of the Fortune 100 companies** use our products
- **Involved with *Bluetooth* wireless technology** initiatives from the beginning (~10 years)
- **Work closely with the *Bluetooth* SIG** – specifications, working groups, technology committees
- Frontline products support **every *Bluetooth* specification, profile and protocol**

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Frontline Customers

CSR (Cambridge Silicon Radio)
Qualcomm
Broadcom
Motorola
Infineon
Intel
Texas Instruments
Siemens
Atheros
Marvell
Alps
MSI
Apple
ISSC
Sony
Sony Ericcson
Kyocera
VW
Ford
Audi
Microsoft
Panasonic
Hitachi
Symbol Technology
NXP
Continental
Plantronics
BenQ
MiTek
Sybase
Sybase
Cisco
Visteon
BMW
Daimler Chrysler
Delphi
Nissan
Johnson Controls
US Government
Toyota
IVT
Samsung
LG
MP

Meeting *Bluetooth* Challenges

How to fix problems with your *Bluetooth* solution

The BPA 500 is to a developer what an X-ray machine is to a doctor.

Meeting *Bluetooth* Challenges

How to fix problems with your *Bluetooth* solution

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Use a protocol analyzer to

Pin-point the problem.

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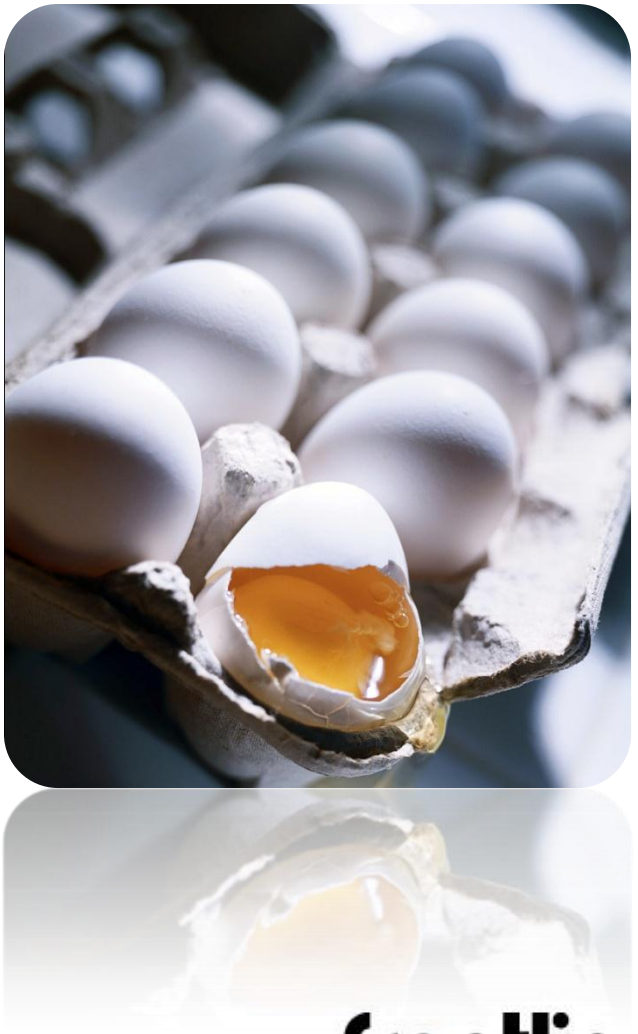
Find and Fix Problems Early

- The earlier in the development process bugs are found, the cheaper they are to fix
- Avoid expensive product recalls



Find and Fix Problems Early

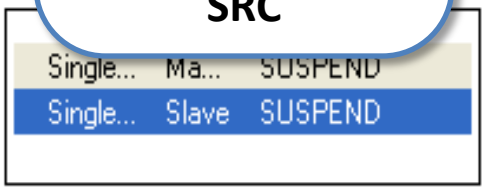
Examples

Bad audio quality on *Bluetooth* device

Audio extraction in BPA 500

A2DP music doesn't pause

A2DP, AVDTP decoders show you if "SUSPEND" command is being sent from SRC



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Find and Fix Problems Early

Examples

Battery life on *Bluetooth* device too short

LMP decodes allow you to see if device goes into Sniff mode to conserve battery power

Hands-free call being hung up too early

Hands free decoder shows AT+CHUP from HF device being sent at incorrect time

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BPA 500 ™ Dual Mode Protocol Analyzer

- ✓Dual mode – “Classic” (BR/EDR) and low energy
- ✓Live decoding and decryption
- ✓Made for Developers and Test Engineers
- ✓Easy to use
- ✓CSR Corporate standard
- ✓Debug, Test and Verify ***FAST!***

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BPA 500 ™ Dual Mode Protocol Analyzer

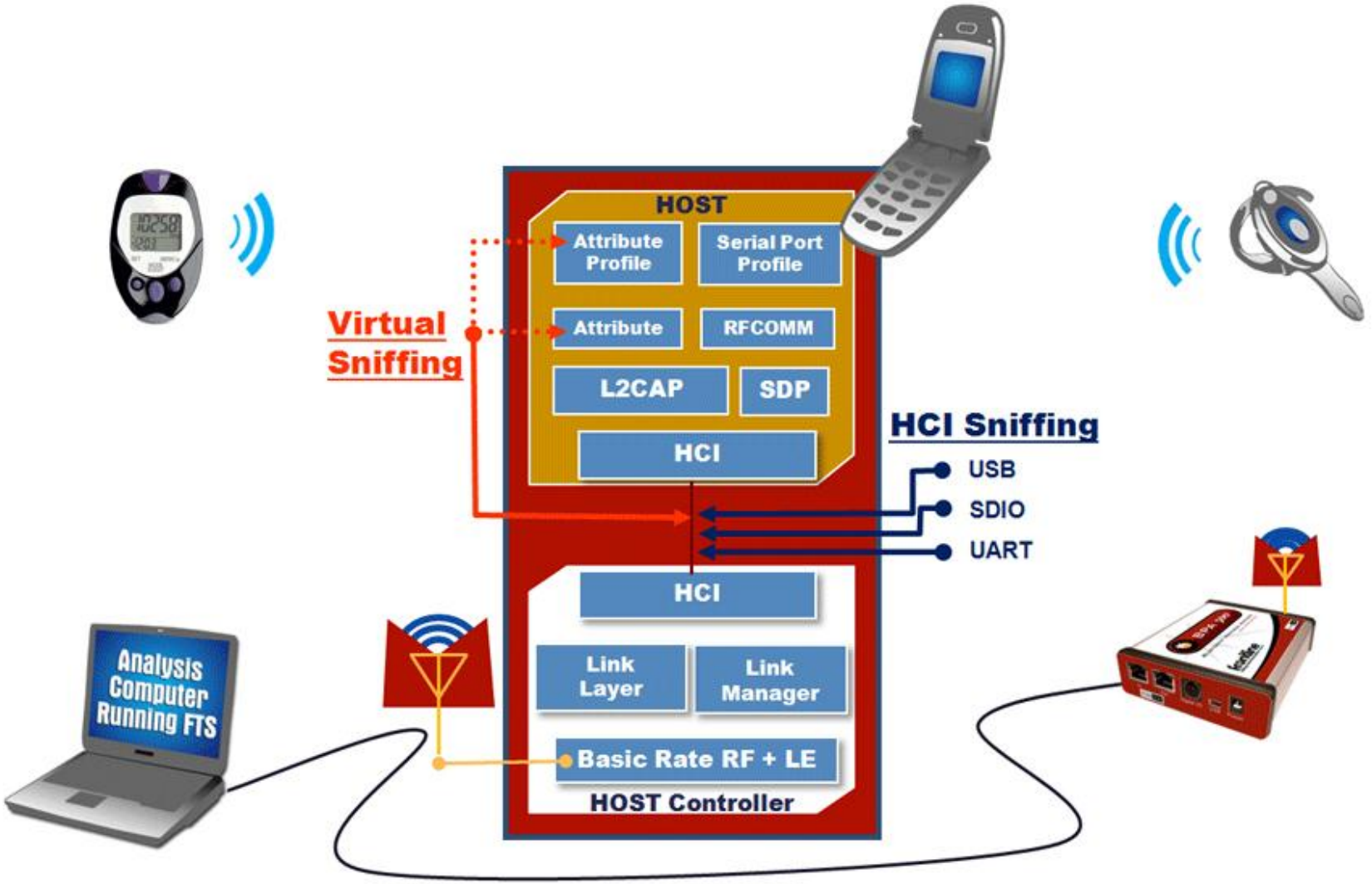
Key Benefits

- Visibility into *Bluetooth* Dual Mode (le or BR/EDR) stacks
- Supports every *Bluetooth* specification, protocol and profile
- Extracts audio into WAV files: ***supports A2DP, HSP and HF profiles***
- Includes Frontline's **DecoderScript™**
- Improved capture of pre-connection traffic
- MSC (Message Sequencing Chart)

low energy Features

- Easy setup – **JUST START CAPTURING**
- No need to synchronize to devices
- Scans and captures all three advertising channels concurrently
- Decodes all traffic:
    - Advertising packets
    - Data packets
    - LL control packets
    - …and more!
- Includes DecoderScript which allows writing decoders for custom protocols
    - Advertising packets
    - Data packets
    - LL control packets
    - …and more!

Points of Observation



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Sniffs “Virtually”

- The Live Import feature permits any application to feed data into BPA 500
- Use virtual sniffing instead of rudimentary hex dumps and traces

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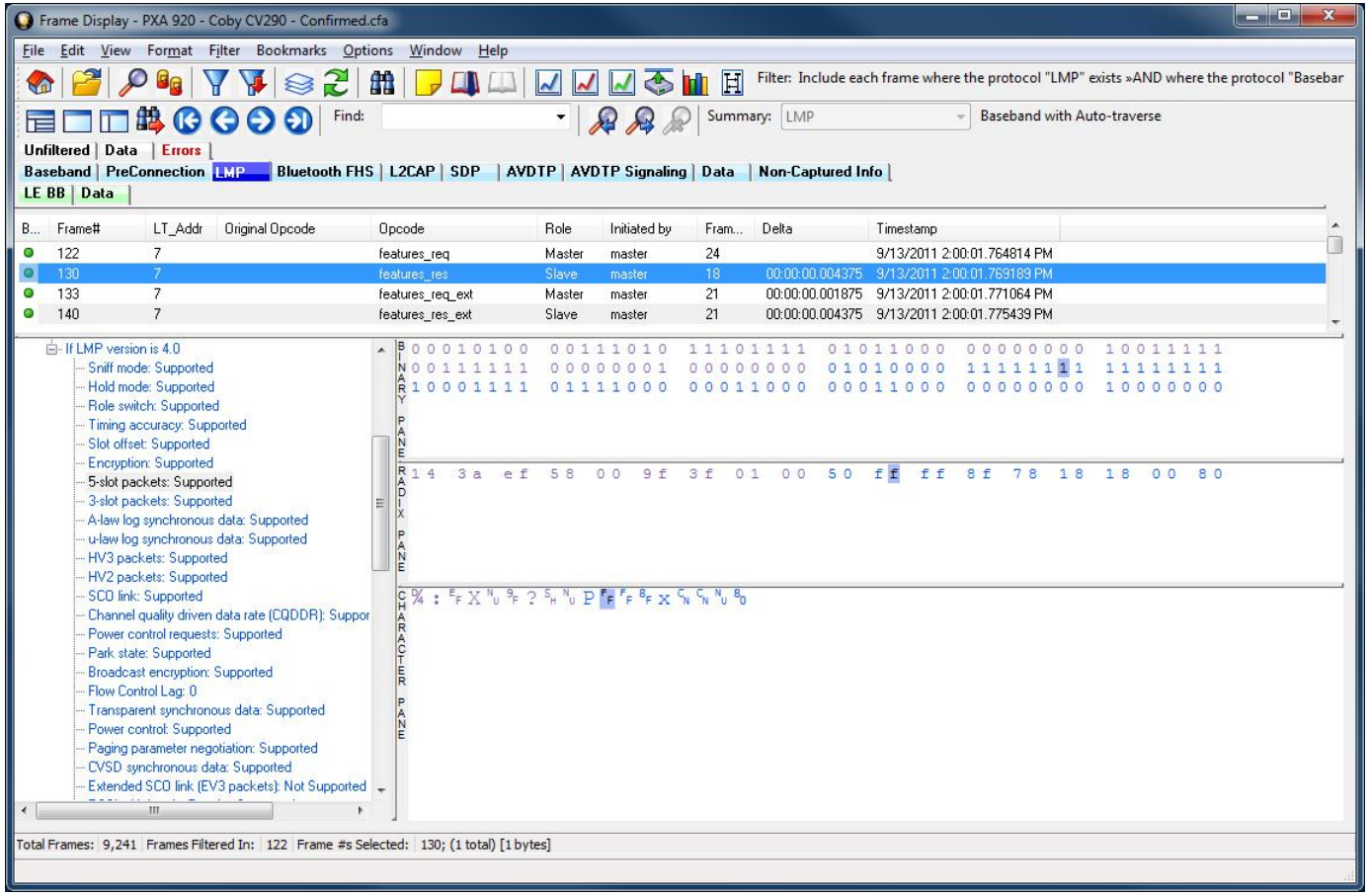
Frame Display

- Easy to “drill down” to bit level on a selected frame
- Single Tab Protocol filtering
- Flag errors in **RED**
- Protocol visibility in a selected frame
- Includes Frontline’s DecoderScript™

Frame Display

- Panes:
  - Summary
  - Detail
  - Radix
- Protocol Filter Tabs
- Errors are flagged in **RED**



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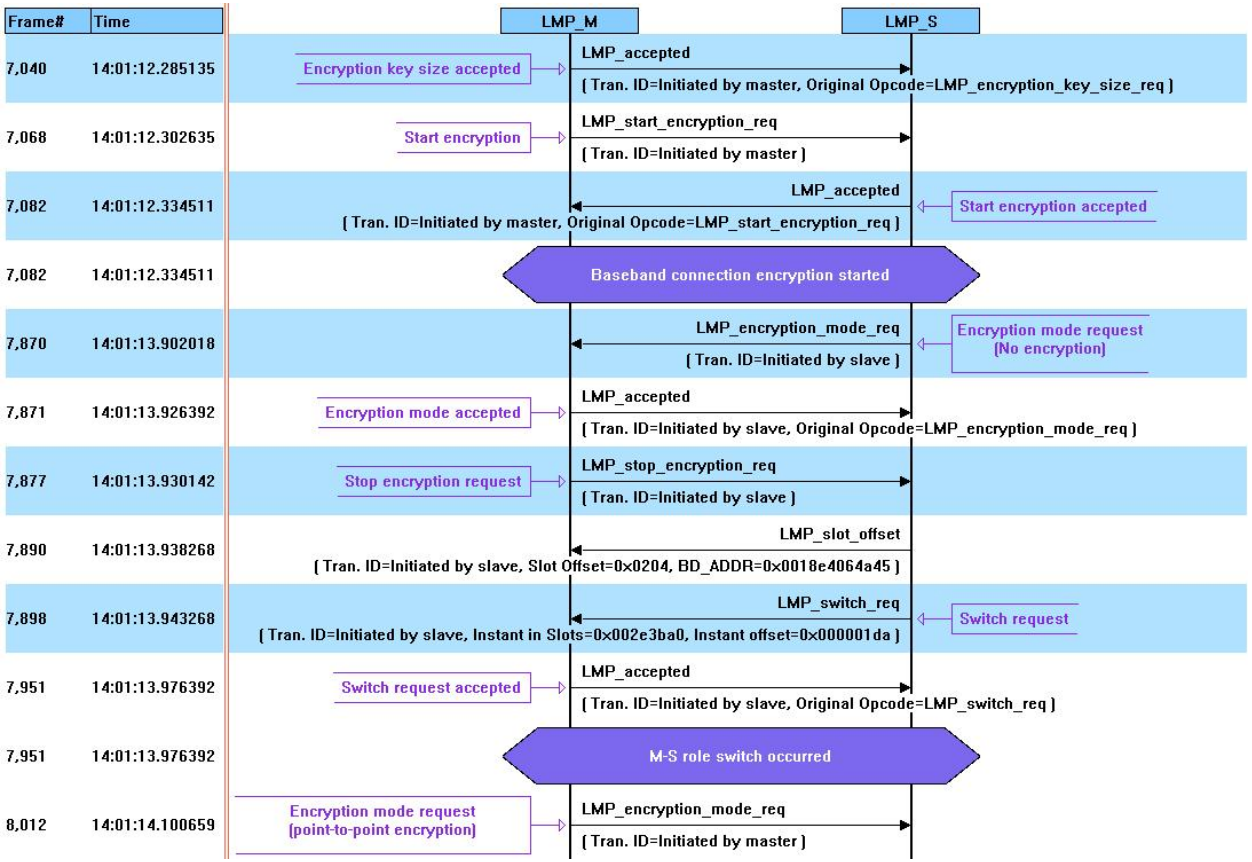
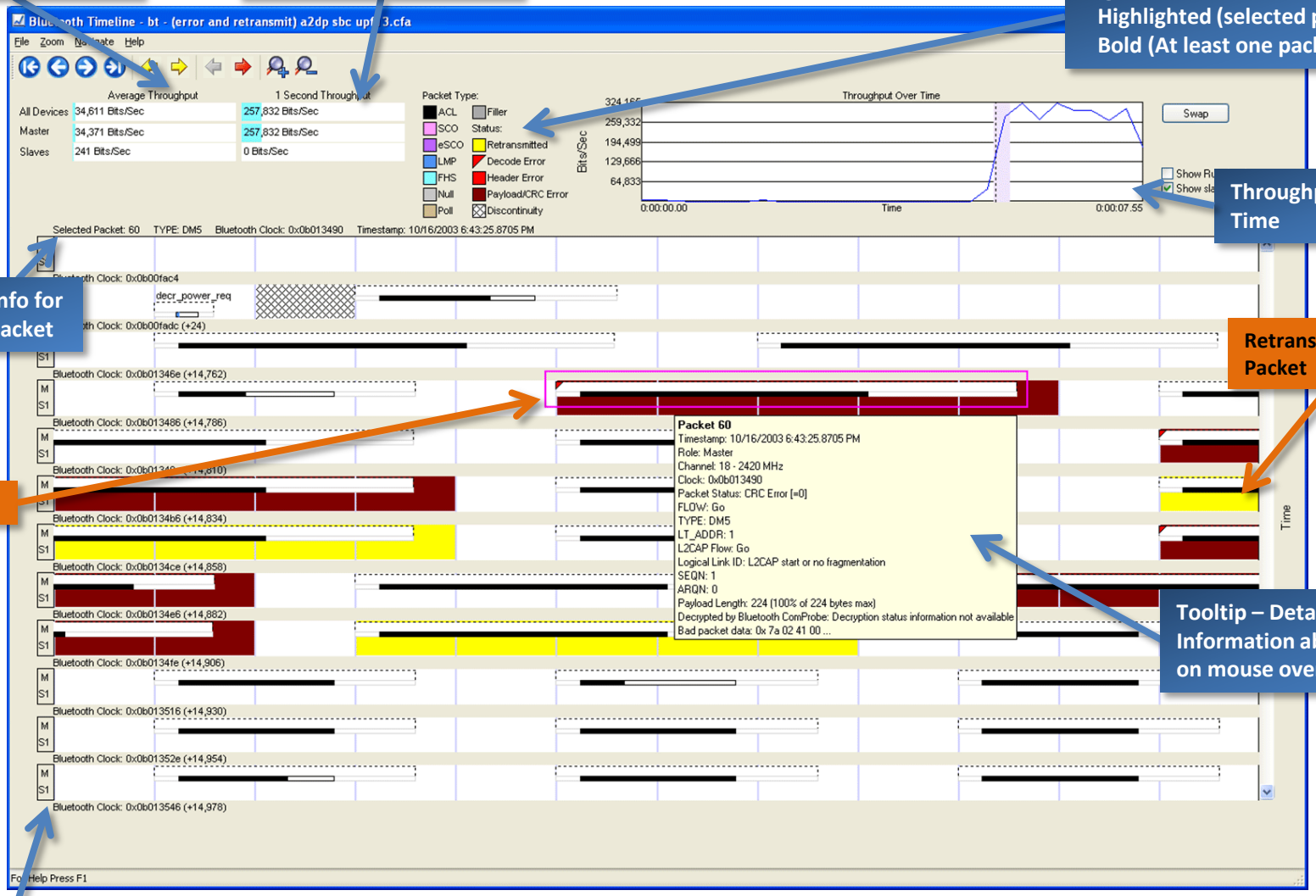
MSC

Message Sequencing Chart

- Simple and easy-to-understand terms
- MSC makes it easy to see:
  - Physical links
  - Logical links
  - Protocol level activities
  - Profile level activities



Bluetooth Classic Timeline



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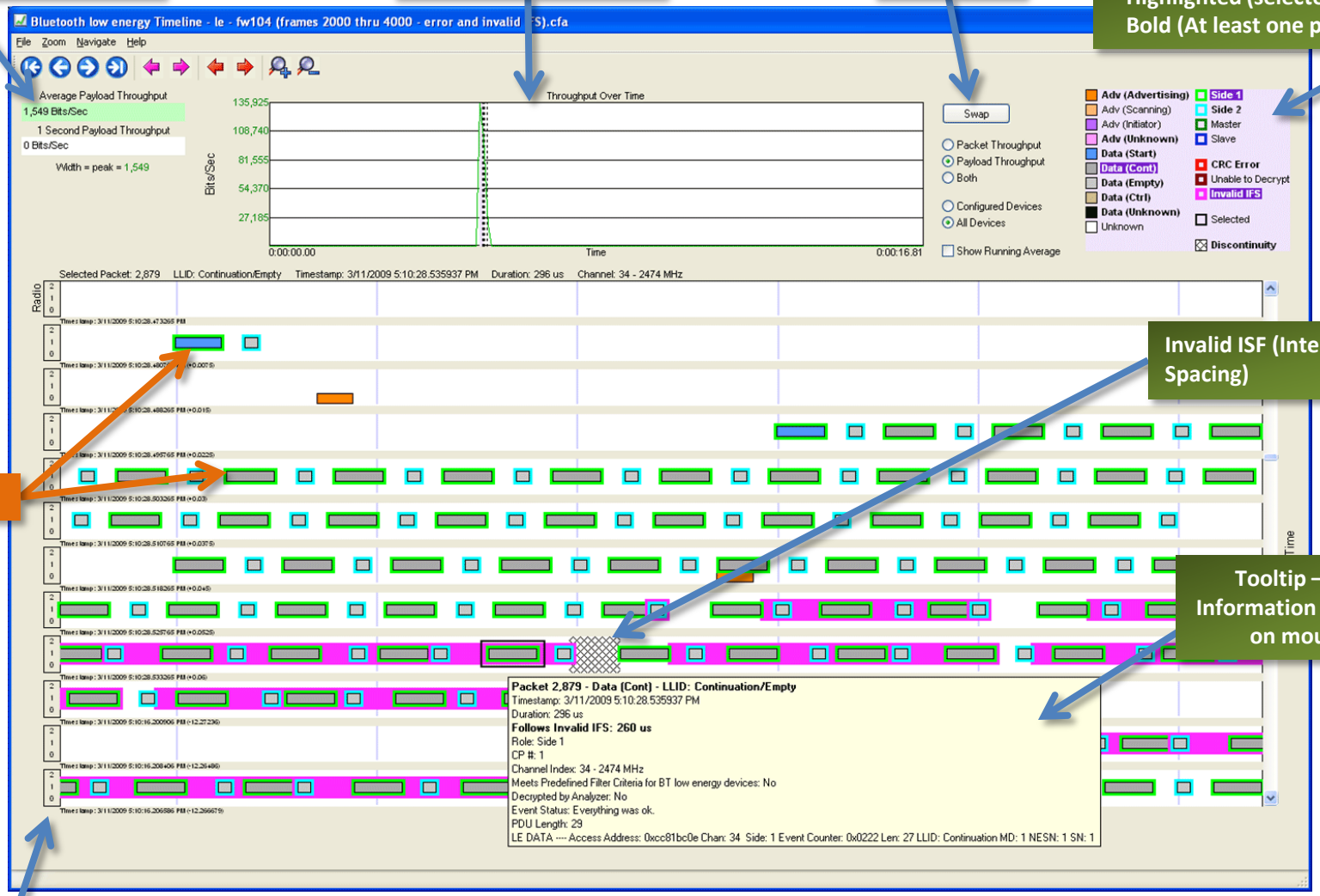
Bluetooth LE Timeline

All Packets Payload

Throughput Over Time

Selection

Legend –
Highlighted (selected packet)
Bold (At least one packet seen)



Invalid ISF (Interframe Spacing)

Packet

Tooltip – Detailed Information about packet on mouse over

Radio Numbers

Time flows left to right and down

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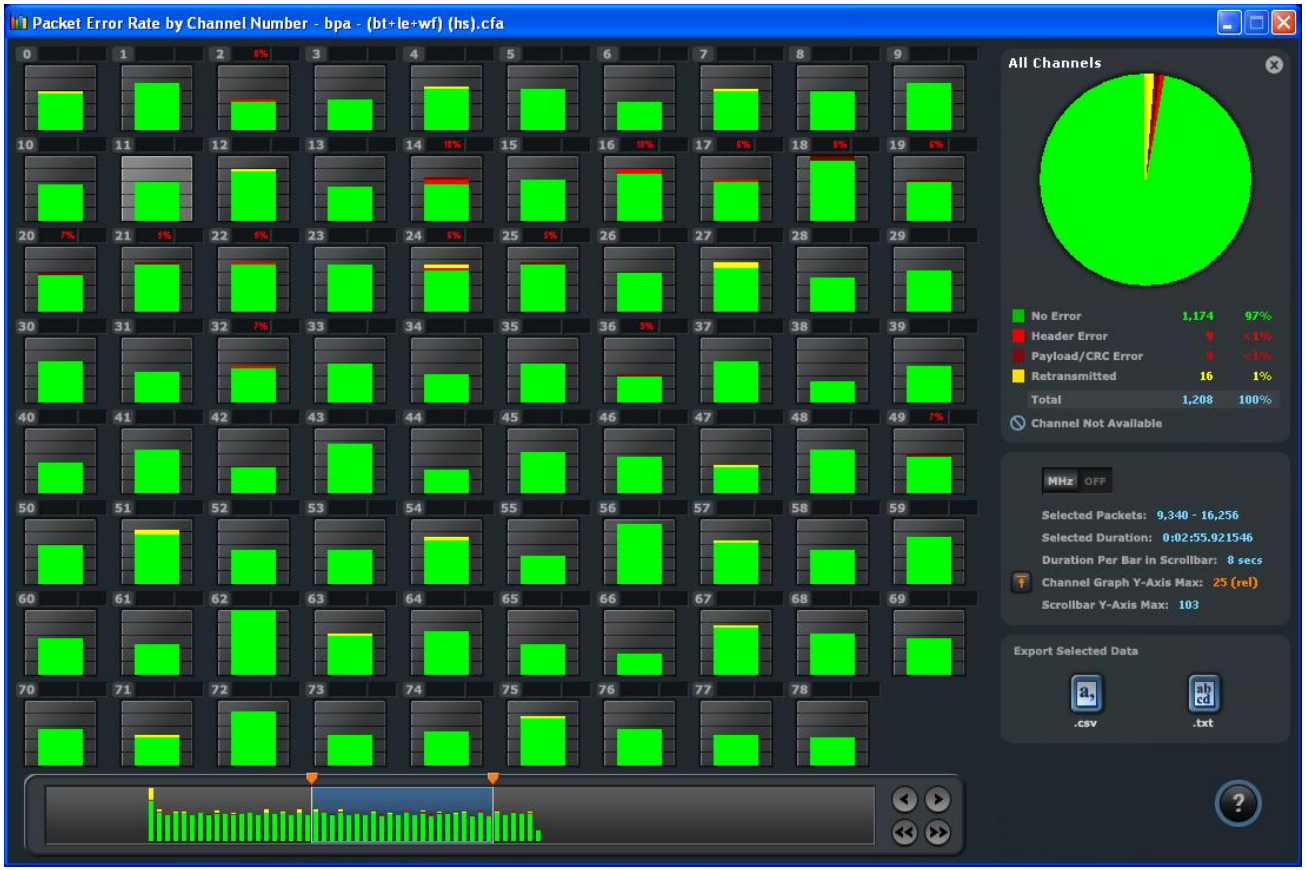
Other Useful Features

- Real-time packet error analysis
  - CRC and Header errors for all 79 RF channels
  - Understands performance around other 2.4GHz devices



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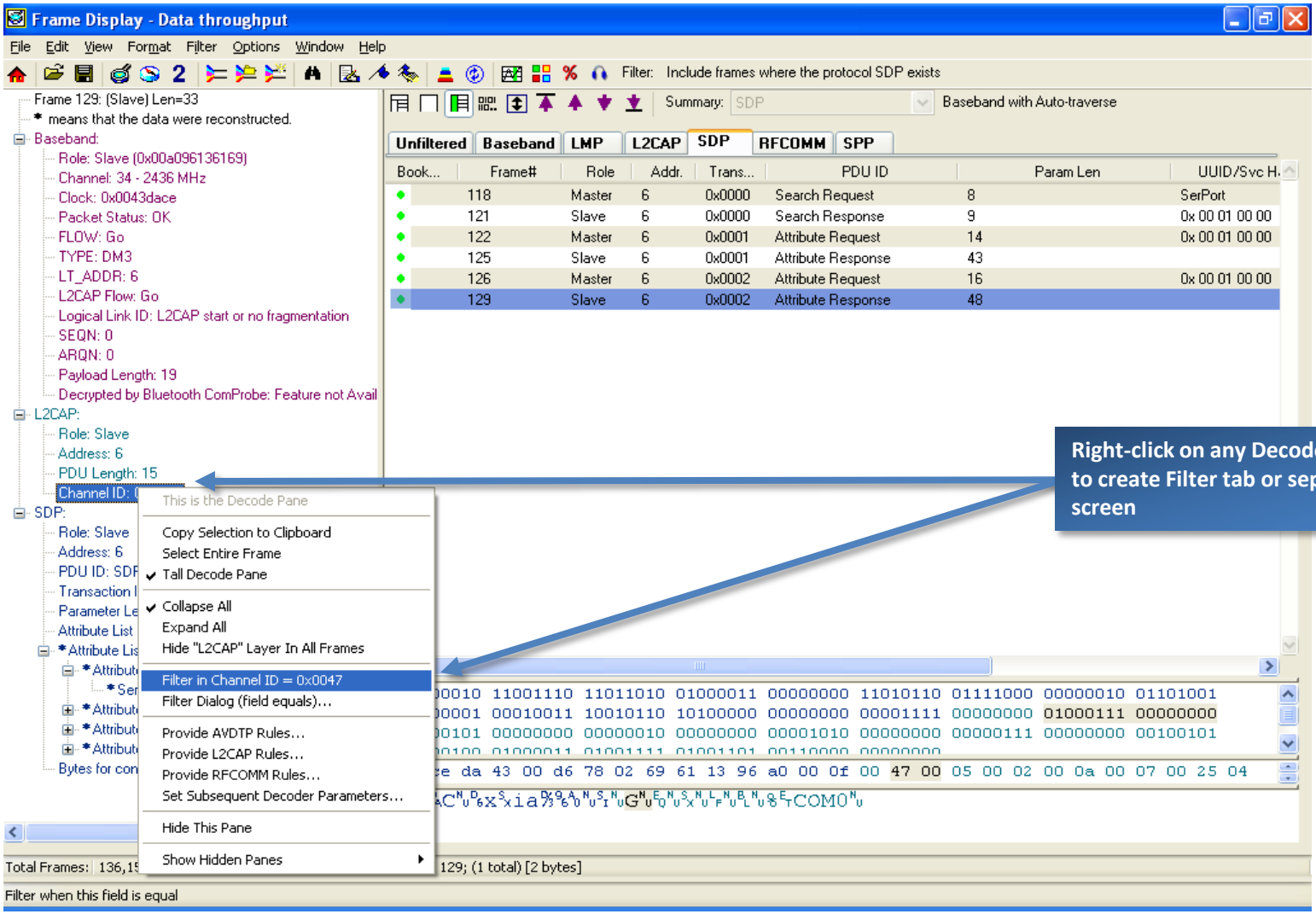
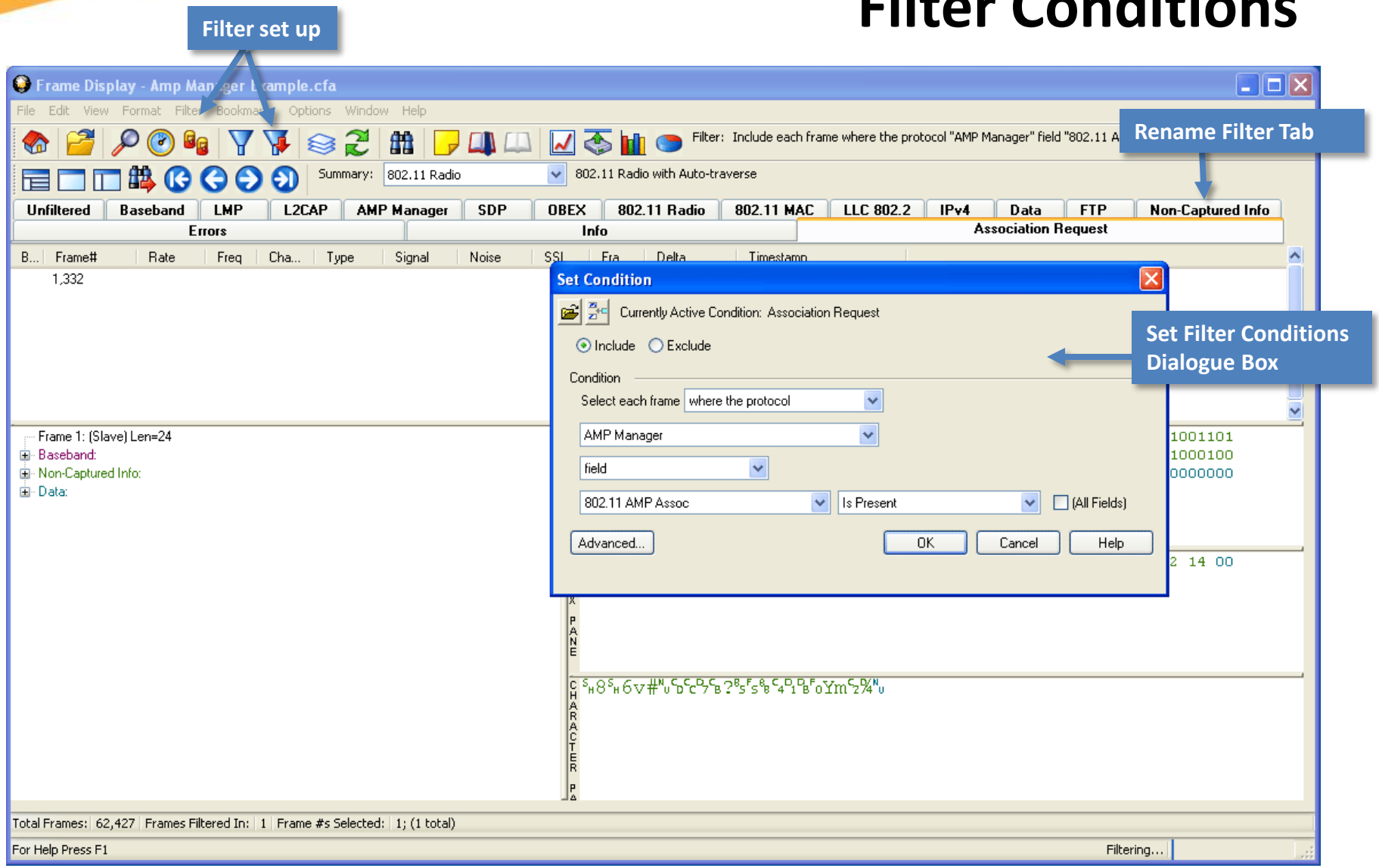
Audio Extraction

- Ability to capture SCO data and replay it in a **WAV** file format
  - Great to verify audio quality of your *Bluetooth* device
  - BPA 500 will create one stereo file or two mono files

Filter for Decoded Fields



Filter Conditions



Additional Features

- Counts retransmitted packets
- Export into CSV and other formats
- Graphic display of packet error rate
- Automation API
- Reads BTSnoop files

DecoderScript™

User-Defined Protocol Decoding

- Vendor extensions are easily decoded with Frontline's built-in DecoderScript
- DecoderScript Development Kit included **FREE** with BPA 500

Supported Profiles and Protocols

802.11 MAC
802.11 Radio
Bluetooth PRP
802.11 AMP
NMEA_0183
Virtual Sniffer
PTS
WiMedia
BlueCore Serial Protocol
Three-Wire UART
A2DP
AMP Manager
AVRCP
AVCTP
AVDTP Media
AVDTP Recover
AVDTP Report
AVDTP Signaling
AVDTP
AVRCP Browsing
Baseband
BNEP

CAPI
CMTP
Extended Inquiry Response
FAX
Bluetooth FHS
GAP (Generic Access Profile)
H4DS
Hands-Free
HCI SCO/eSCO
HCI UART
HCI
HCRP Control
HCRP Data
HDP (Health Device Profile)
Headset
IEEE11073
BT-HID
L2CAP
LMP
LPMP
Non-Captured Info
BIP

BPP
FTP
MAP
OPP
PBAP
SYNC
OBEX
RFCOMM
SCO/eSCO
SDIO
SDIO-HCI
SDP
SIM Application
SIM ACCESS
SPP
TCS
UDI
Bluetooth USB
VCP
VDP
Bluetooth Virtual Transport Frame Info

Encapsulated AsyncPPP
mSBC
MCAP Control
SyncML
WUSB
ATT
LE ADV
LE BB
LE DATA
LE LL Ctrl
LE PKT
SMP

Sniffs Air – Classic

- Simple and easy piconet synchronization
- Decodes all *Bluetooth* protocols and profiles

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Sniffs Air – low energy

- Virtually no setup
- Scans and captures on all three advertising channels concurrently
- Decodes all traffic: advertising traffic, data packets, LL control packets and more…

low energy *Bluetooth* Device

Bluetooth Device

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Sniffs Air – Dual Mode

- Sniffs low energy and “Classic” Bluetooth devices
- Displays all packets into a single view

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BPA 500 Add-Ons

ComProbe 802.11

802.11 ComProbe and antennas to monitor *Bluetooth* packets across a Wi-Fi transport

USB ComProbe Add-on

USB HCI sniffer hardware using the USB ComProbe II

SDIO ComProbe Add-on

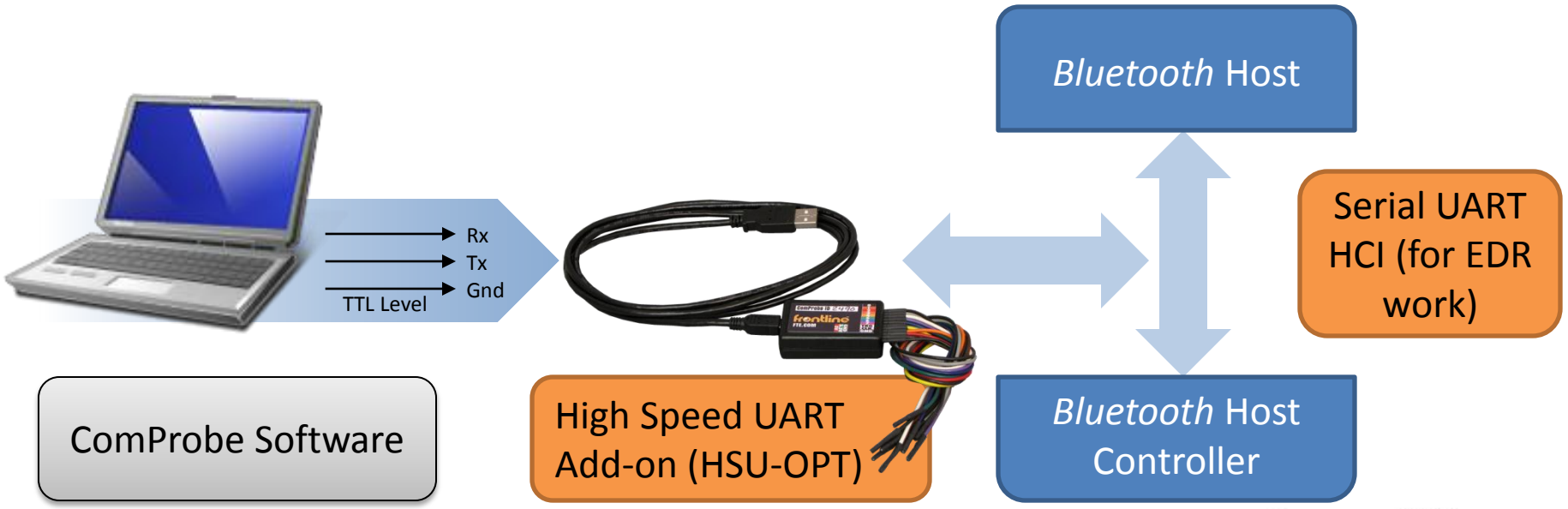
SDIO sniffer hardware using the SDIO ComProbe

High Speed UART Add-on

UART HCI sniffer hardware

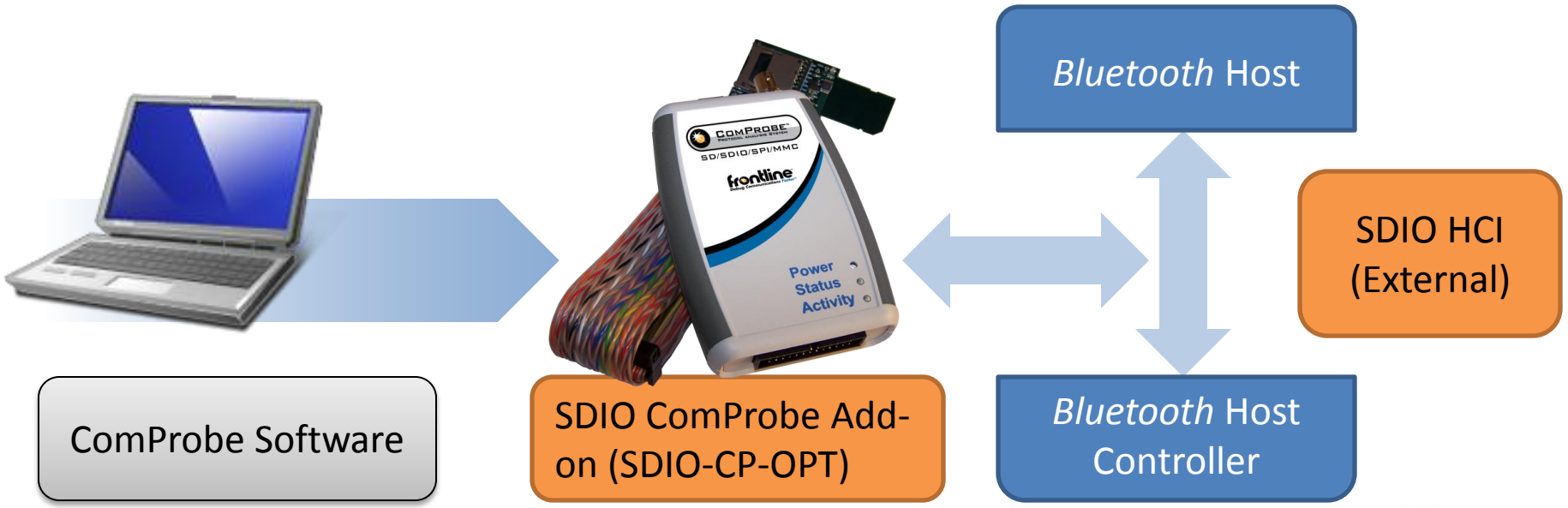
HCI Sniffing – High Speed UART (HSU) Add-on

- HSU-OPT can sniff HCI UART, up to 8Mb/s
- Essential tool for HCI UART sniffing when using V2.0 + EDR



HCI Sniffing – SDIO Add-on

- Decodes all *Bluetooth* data over SDIO transport
- Supports 1-bit and 4-bit transfer modes
- Supports clock frequencies up to 50 MHz
- Non-intrusive and continuous data capture



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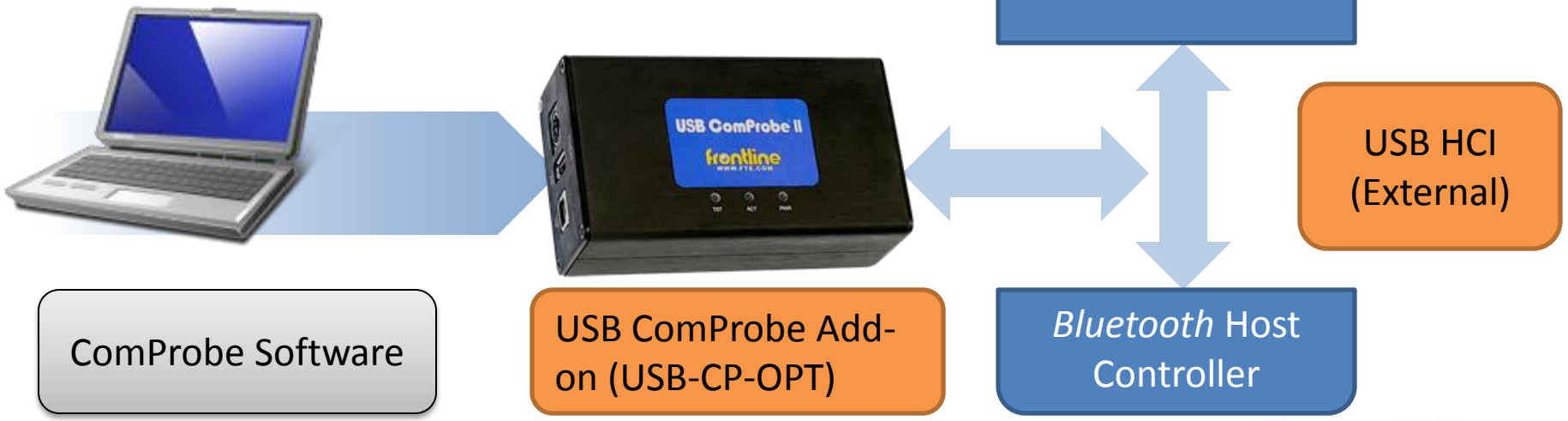
HCI Sniffing – USB Add-on

- Decodes all *Bluetooth* data over USB transport
- Supports all three USB speeds: Low (1.5 Mbps), Full (12 Mbps) and High Speed (480 Mbps)
- No loss of packets with 64 MB on-board buffer
- Portable and affordable



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Bluetooth / 802.11 Coexistence

ComProbe 802.11 Protocol Analyzer

- Never drop a packet - ~250 GB data buffer
- *Bluetooth* Coexistence easier than ever with ProbeSync
- Precise timestamps
- Full, stand-alone Wi-Fi decoding and protocol analysis

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ProbeSync™ Technology

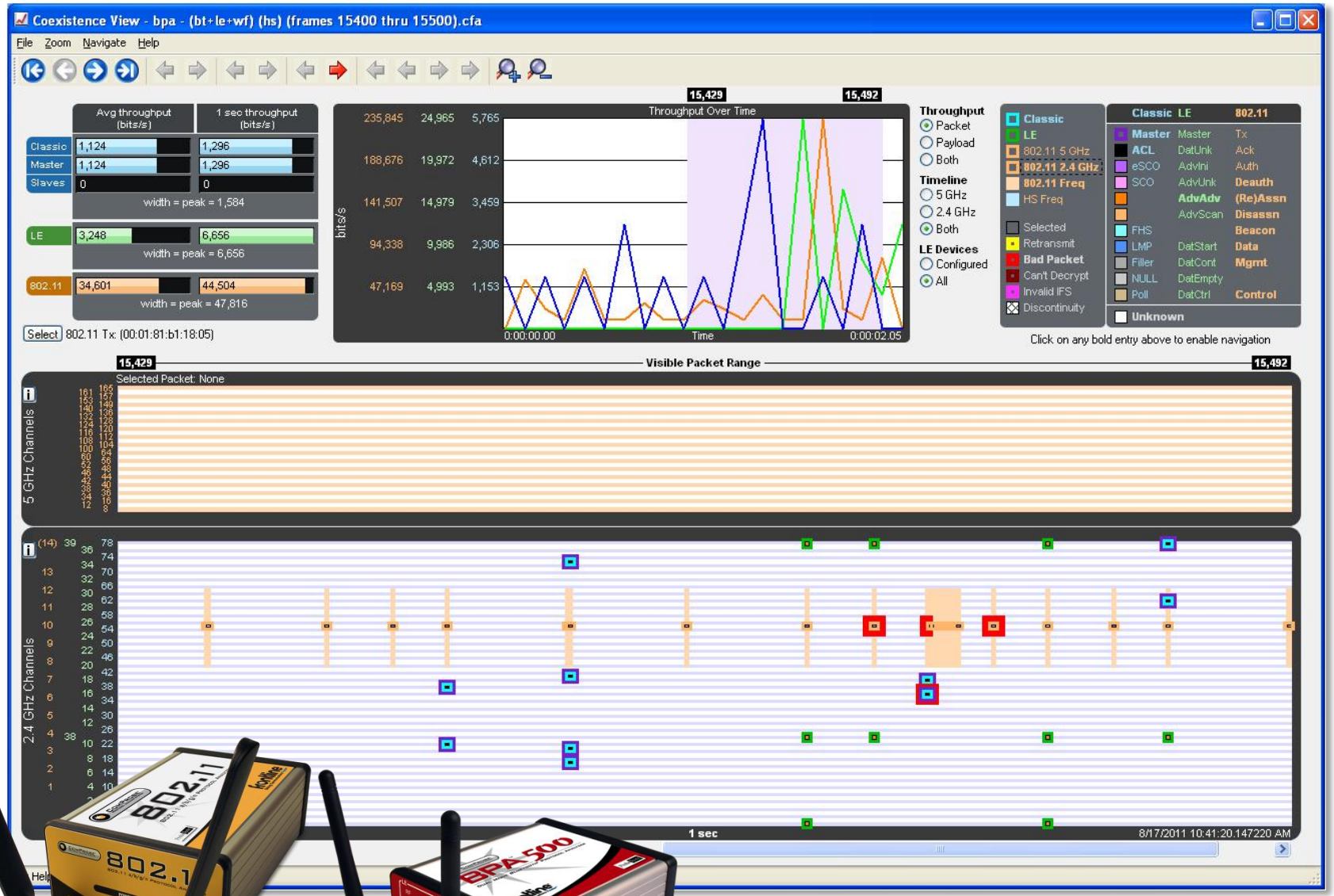
The technology that allows Frontline analyzers to work seamlessly together and share a common clock.

With ProbeSync ComProbe analyzers can precisely synchronize communication streams and display the resulting packets in a single, shared or coexistence view.

ProbeSync™ Technology

Example: **ComProbe BPA 500 and ComProbe 802.11 connected via ProbeSync provide precise packet timestamps for both *Bluetooth* and 802.11 packets together in a single coexistence view.**

Coexistence



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Frontline *Bluetooth* Interoperability (IOT)

- Biggest device library in the industry (1500+ devices)
- Lots of OEMs and cars
- 10 years of *Bluetooth* experience, instantly in your QA team
- International supply of Bluetooth devices, including China, Japan, Brazil, Europe and North America

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Why the need for IOT?

You need to know your device will work with other devices.

Frontline has a comprehensive, current, and ever-expanding device library in-house. You can have confidence that your devices will work seamlessly with other key components in the ecosystem.

You need to know your device will work in different markets.

Our testing facility is located in Charlottesville, VA where we test using North American mobile networks.

You want to leverage Frontline as an extension of your QA department.

We have the experience and expertise in-house and have pre-existing relationships with all of the key chip manufacturers, phone companies, and peripherals companies. If there is a problem, we'll help you solve it.

Why use Frontline IOT services?

You want to improve your “out-of-box” experience.

We use pre-defined and customized test plans that will thoroughly test your device so that you can be sure it will work for your customers the first time and EVERY time.

You need to test your products in automotive environments.

Frontline is building a comprehensive library of *Bluetooth* car kits used in mass produced vehicles. When we can’t get the car kit, we buy the car.

You want to reduce the costs involved with testing.

No more sending your employees around the world to test specific networks or devices. We’ve got everything you need in our labs.

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The Frontline Edge

Outstanding Technical Support

Trusted *Bluetooth* Expertise

Frontline Test Equipment

Thank you!