

Presentation of and discussion around SpaceWire Decoder prototype

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Roland Gamper

Employed at LeCroy for 22+ years until 2009

as software project leader...but

The 2009 crisis induced some changes...

...and the creation of Lahniss as my own company

Lahniss and LeCroy operate under a license
agreement

Lahniss Sarl / GmbH / Ltd

Located in Geneva, Switzerland

- LeCroy Oscilloscopes add-ons
- Software Engineering
- Consulting in the field (measurement campaigns)
- Consulting from the office
- Training
- Teaching (UoWS, Geneva)
- At the moment, most:
 - exciting protocols is SENT (Single Edge Nibble Transfer)!
 - glamorous is BroadR-Reach (automobile)
 - potentially profitable MVB (trains and trams)
 - bizarre PSI5 (automotive)

Lahniss was founded based on the observation ...

....that this patent was a useful thing

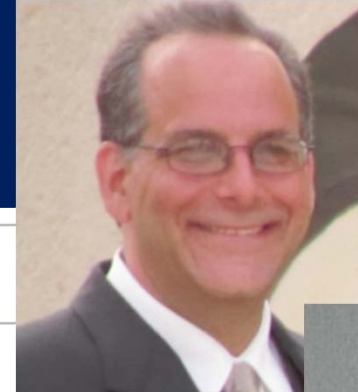
United States Patent
Gamper, et al.

Simultaneous physical and protocol layer analysis

Abstract

A method and apparatus for capturing an analog waveform on a serial bus. The method comprises the steps of designating a predetermined digital data sequence, decoding a serial data signal carried on a serial data bus, and comparing the decoded serial data signal to the predetermined digital data sequence. When it is determined that a portion of the decoded serial data matches the predetermined digital data sequence, the portion of the serial data signal corresponding to the matching portion of the decoded serial data signal is marked.

Inventors: **Gamper**; Roland (Meyrin, CH), **Johnson**; Kenneth William (Brewster, NY), **Ritter**; Gilles (Ollon, CH), **Salant**; Lawrence Steven (New Hempstead, NY)



That is now governing the analysis of 50+ protocols, across all domains of science and industry

Genesis of the SpW Decoder Project

Request for a SpaceWire Decoder started in 2009: ESA , Astrium, IAS, CEA, JenOptik, Axon, Sydeal, etc...
Some of whom are in the room, like ...

But.... market is too limited and too risky for traditional business model

Lahniss started on old protocols (1553, ARINC) but has interest in supporting new “protocols such as SpW, SENT, SPI5, and others

Discovered in 2/2011 that Switzerland supports Space related activities by Swiss companies through a government agency (via Peter Erni). Things got moving in the right direction, in spite of tons of red tape in Bern and Noordwijk and now with the help of TEC-ED

Outline Proposal submitted on 3/2011

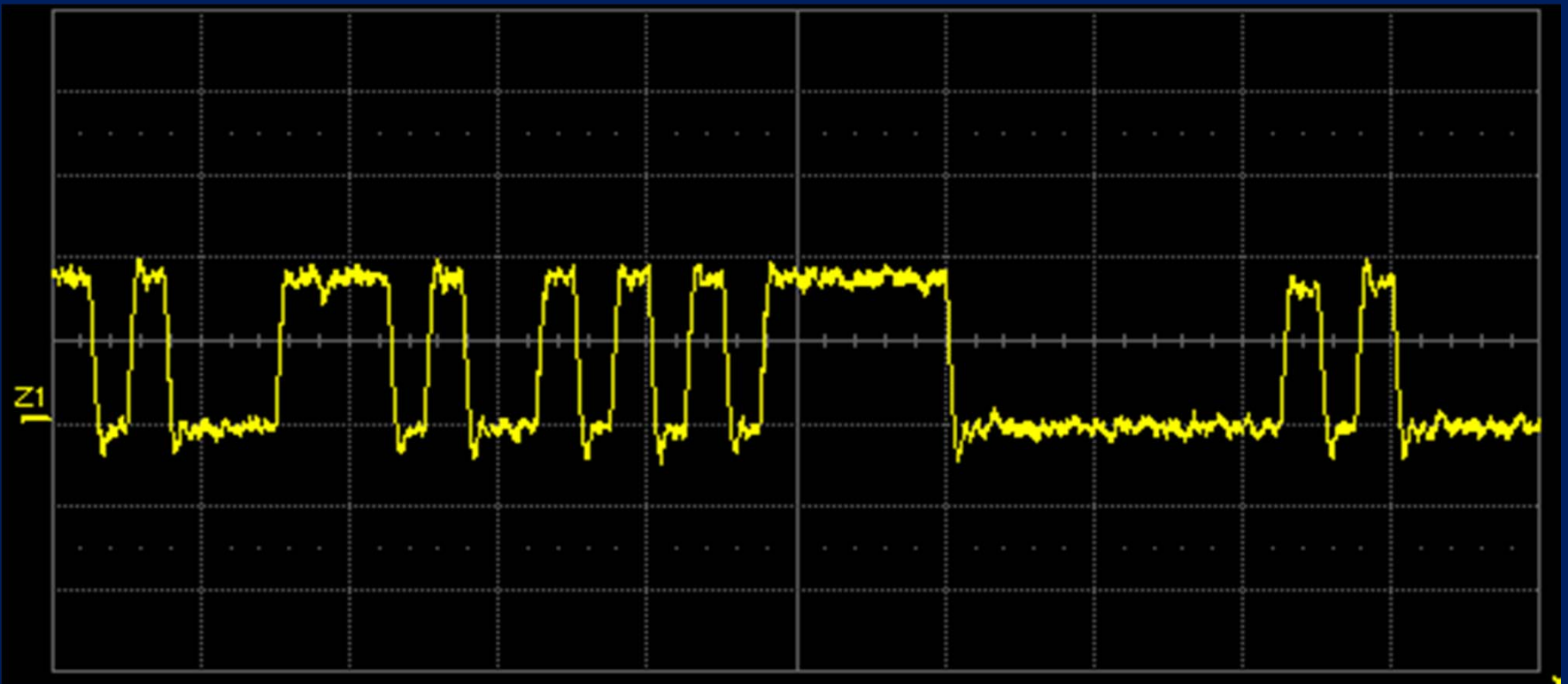
Essence of proposal submitted was ... 2 pictures of ancient protocols + budget



So we now have room to identify core features within budgetary envelope.

Examples of SpW Decode

15 years ago....



Examples of SpW Decode

... and now



The SpW decoder is fully integrated into the scope, and coexists with other analog signal quality monitoring tools, such as Parameters, Eye diagrams, masks.

Modified Development Strategy(1)

Normal Method is to consult various customers in various contexts to generate a specification, implement, Alpha test, Beta test, release.

This method leads to good products, but is slow, and tends to iterate and never gets all stake holders together. Tell me what is useless also!

Since ESA organizes Working Group Meetings, with presumably all stake holders, and sometimes competitors, why not use opportunity to gather early feedback, improve quality and feature set, and outline future projects

Modified Development Strategy

This idea of this presentation came recently, and ESA agreed to it.

In spite of the fact that the tool is a prototype and contract not signed yet..we believe that ...

The benefits (Identify core features, discussion) outweigh the risks..(Blue Screen, leaks to competition, etc...)

Your feedback and ideas are welcome now.....and/or later.

Key Features of Decoder

Data + Strobe Lines or Data Line + Bit Rate

Decodes at any speed

Shows 2 Char types & Sub-Char bits

Annotates Time Codes (not yet)

Annotates EOP, EEP, ESC, NULL

Annotates Packet level: ID + Cargo (not yet)

Show Decode Table with Zoom on click

Search on Control and Data Chars

Export, Scroll, Sparse Table

Inter Stream Analysis (for Routers and Hubs)

Feature: D+S or D + Bitrate

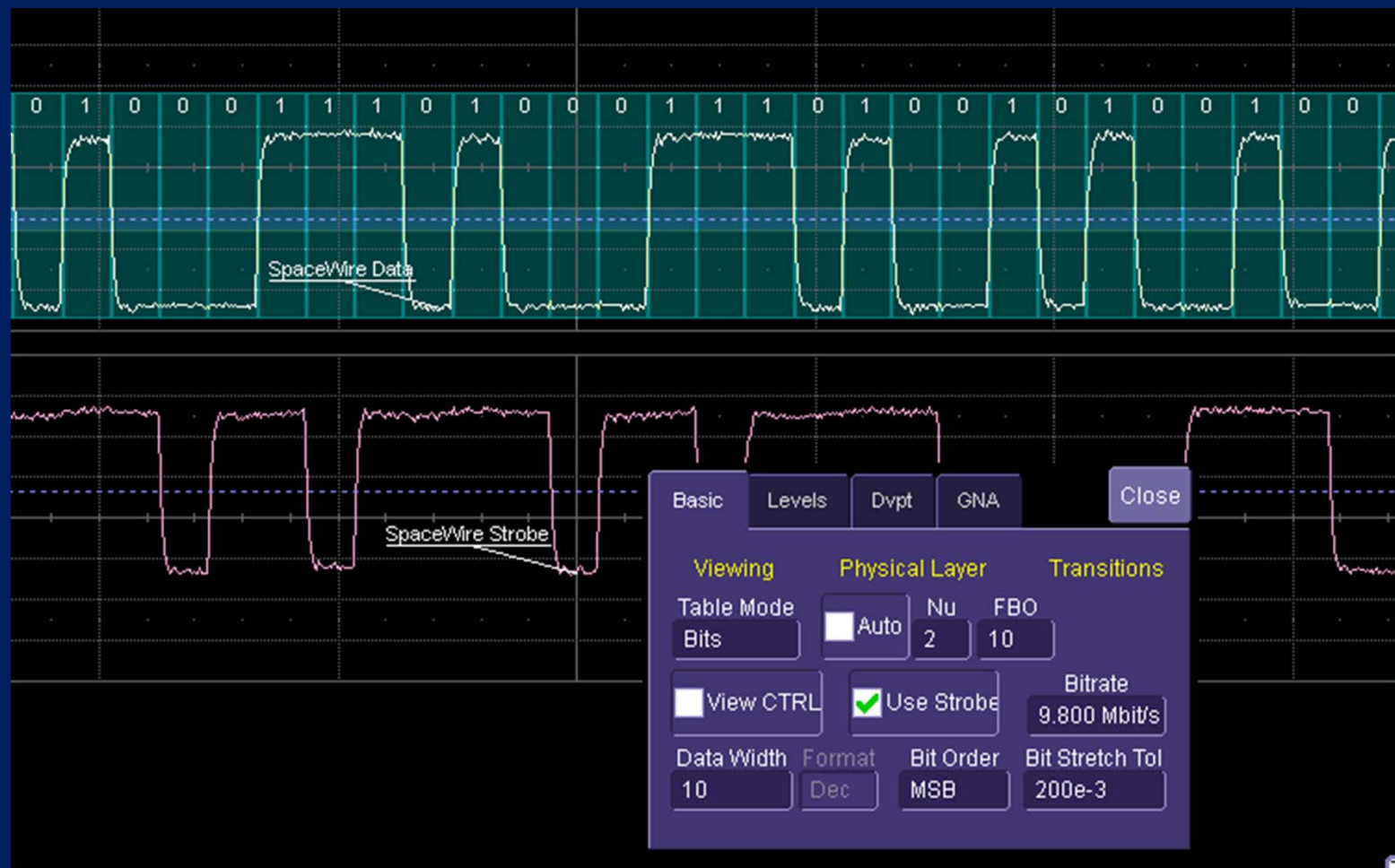
SpW uses 4x2 wires: Din, Sin, Dout, Sout.

When all lines are probed, uses all 4 channels of DSO, **with a differential probe on each**

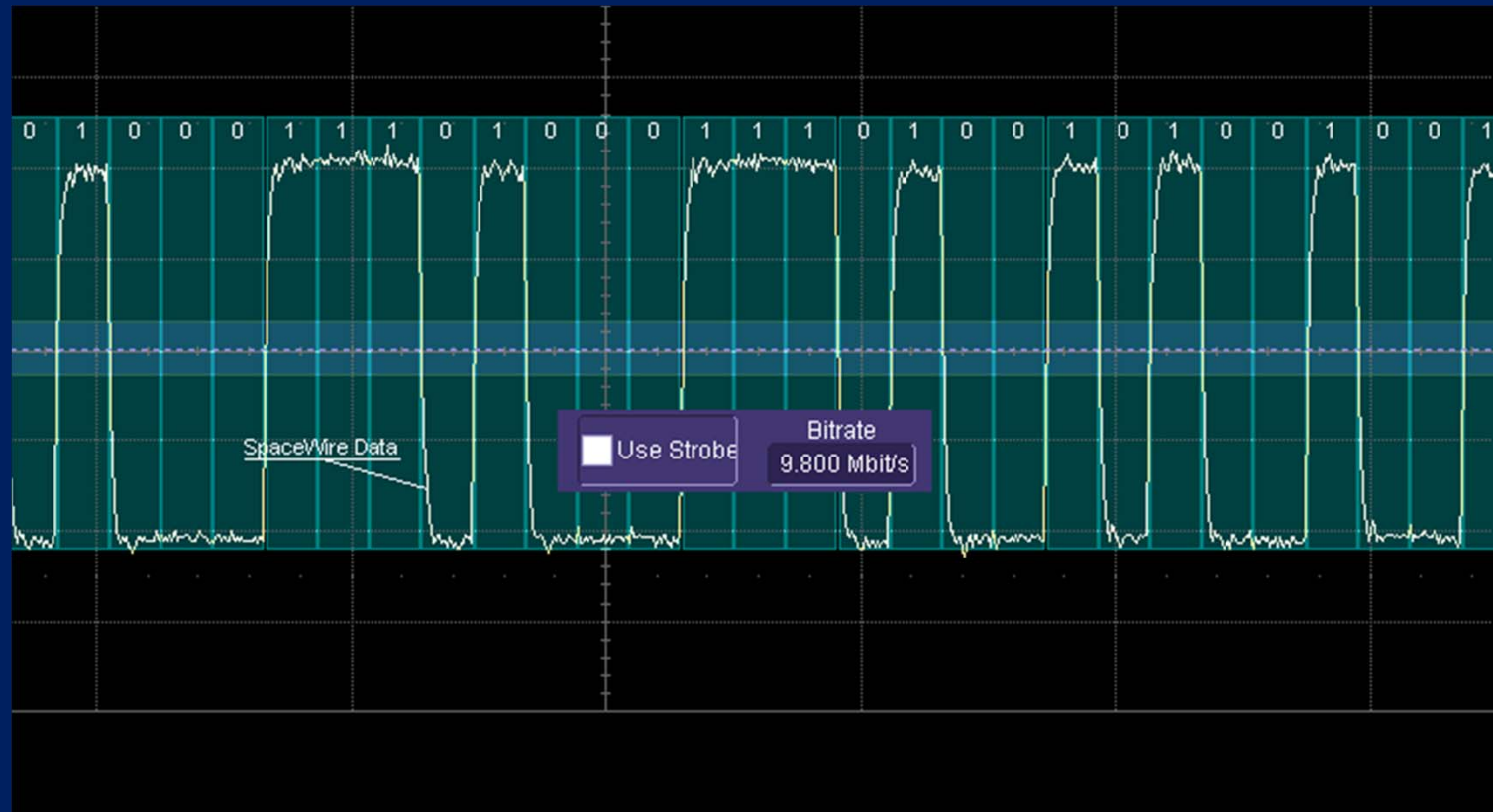
On steady bitstreams, it is possible to do without the Strobe, and use the Bitrate to interpolate the Data.

This saves channels for other relevant signals.

Feature: Use Strobe



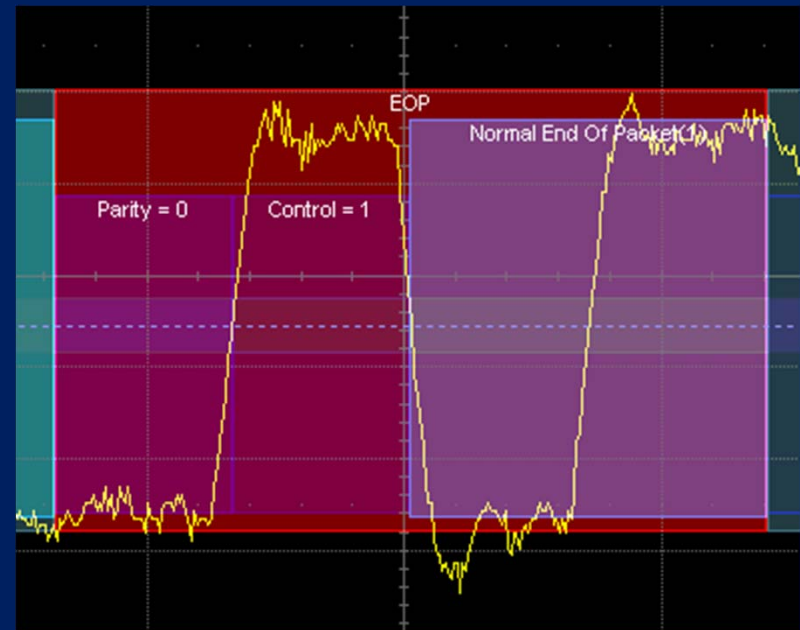
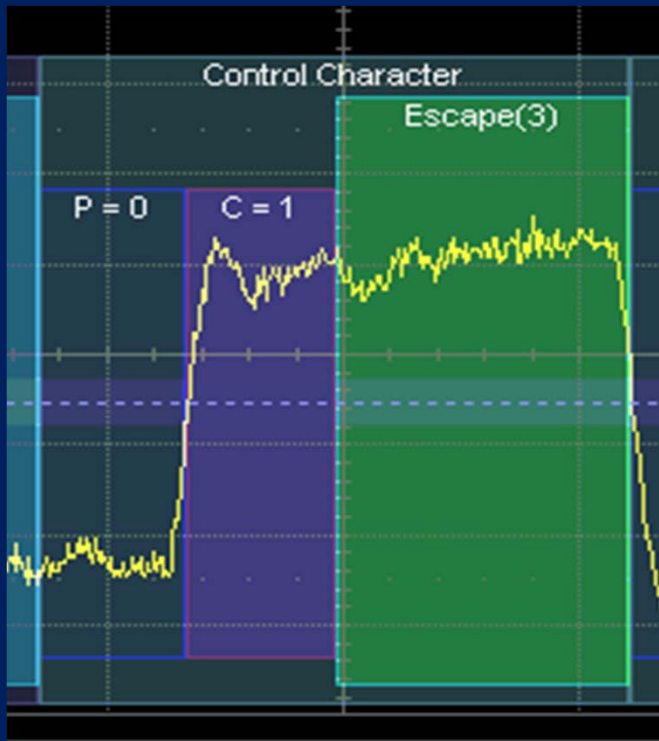
Feature: Use Data and BR



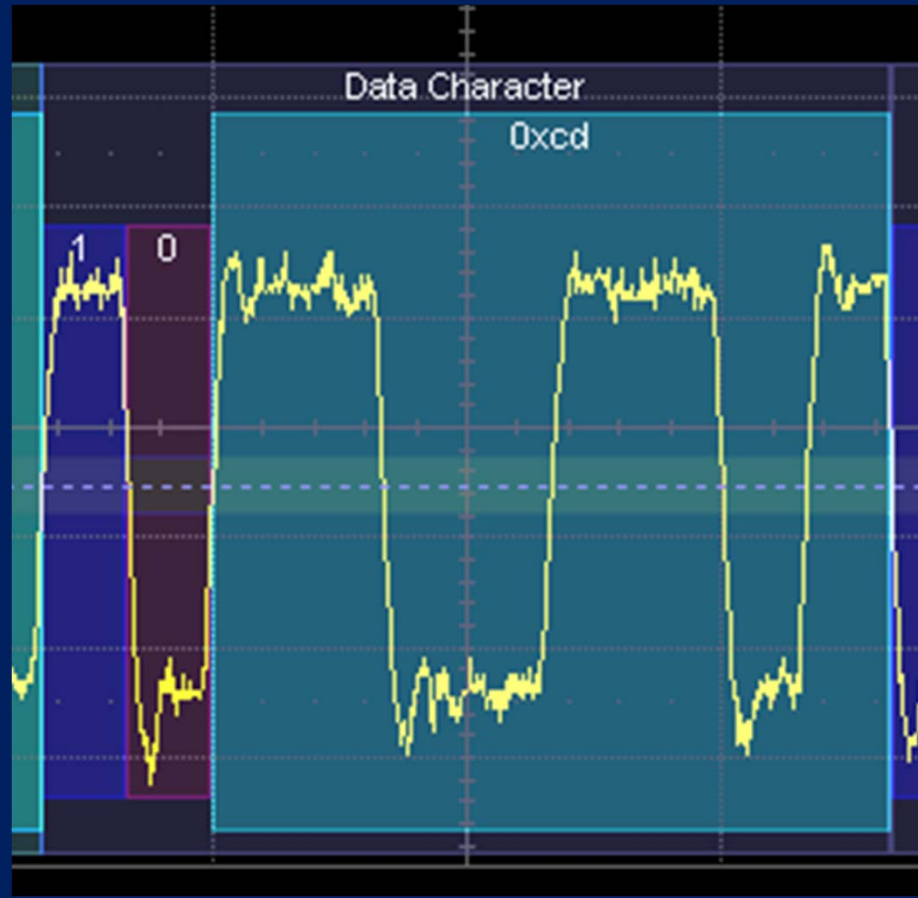
Feature: Precise Threshold Level Control



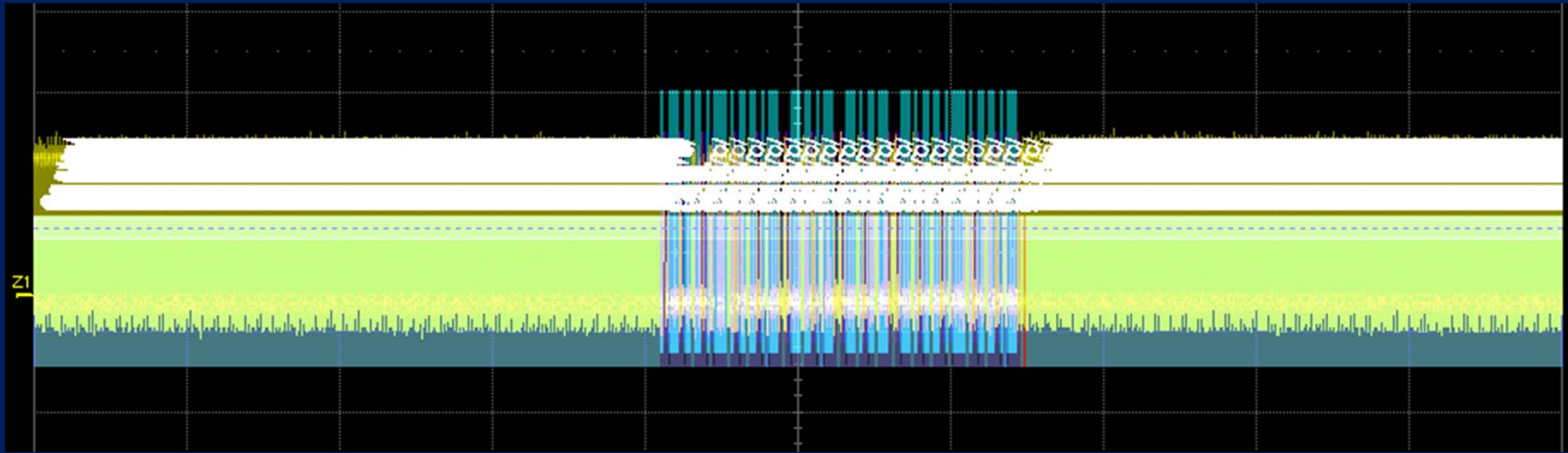
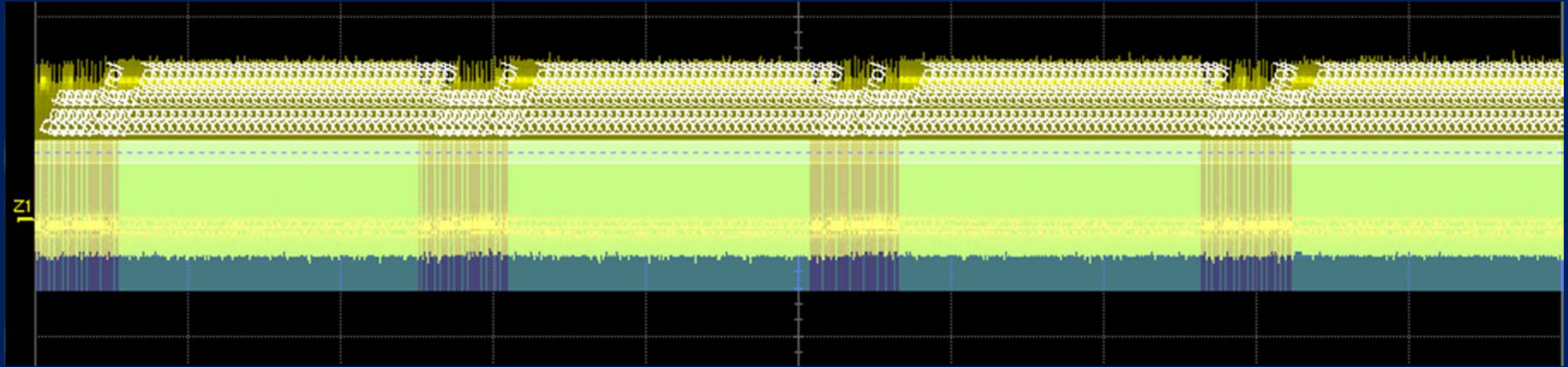
Feature: Control Character Decoding



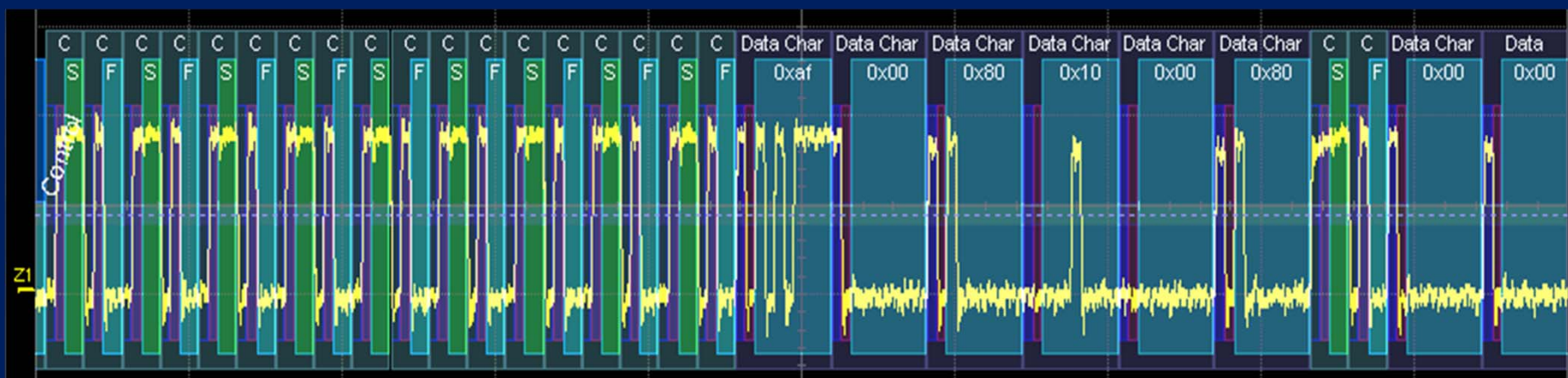
Feature: Data Character Decoding



Feature: 100 % time coverage of record



Feature: 100 % time coverage of record



Feature: Coexistence with other Processing



Slide 20

t5

mention here or there that you have used differential probes for the signal acquisition

test, 01/10/2012

Applications of single Decoder

The tool can be used throughout the life cycle of a project

- Prototyping of signals

- Validation of IC's

- Development of sensors or actuators or bus devices

- System level work with several nodes active on the bus

- Maintenance on existing systems

- Trouble shooting on the field, debug in the lab

- System extension, upgrades, integration of new nodes

- Training of staff or students unfamiliar with the protocol

- Documentation of all kinds

Single Decoder and Analog View

Since the tool shows both the analog signal and its “logical” contents

It is easy to analyze in both directions, top down vs. bottom up.

From **physical to protocol**, and see what impact analog quality has on data contents.

physical to protocol. i.e. one case is when poor analog quality is observed, it is easy to identify the culprit by looking at the packet ID.

From **protocol to analog**. When high level error is observed, is the cause at the physical layer level or elsewhere?

protocol to analog. When i.e. CRC errors are seen at the protocol level, can they be explained by some analog misbehavior ...or not (line ok, but Xmitter or Receiver?)

Applications of multi-Decoder

Look at gateways, bridges, hubs, routers, etc...

Look at input packets

Look at output packets

Verify translation latency, jitter, etc

See if translation is correct

When going i.e. from slow to fast, Lin to FLX

Handle vastly different time scales by using
the deep memories and the zooms.

Slide 23

- t1 I will stress the fact that with a DSO we can look at the signal quality aspects and make real time measurements - stress the fact that Lecroy DSO has several tools that will allow to evaluate jitter and eye diagram characteristics as jitter characterization (TIE), ISO-BER--- Please consider that in the audience there is Star Dundeed and 4 links that already produce protocol analyzer--- you should stress the pros of your solutions that can operate together with other already developd signal processing functions. you can mention that we (i mesn the user &/or Lecroy or together...) can define a eye mask for SpW signals

test, 01/10/2012

more features
but no more time

Signal confidentiality ?

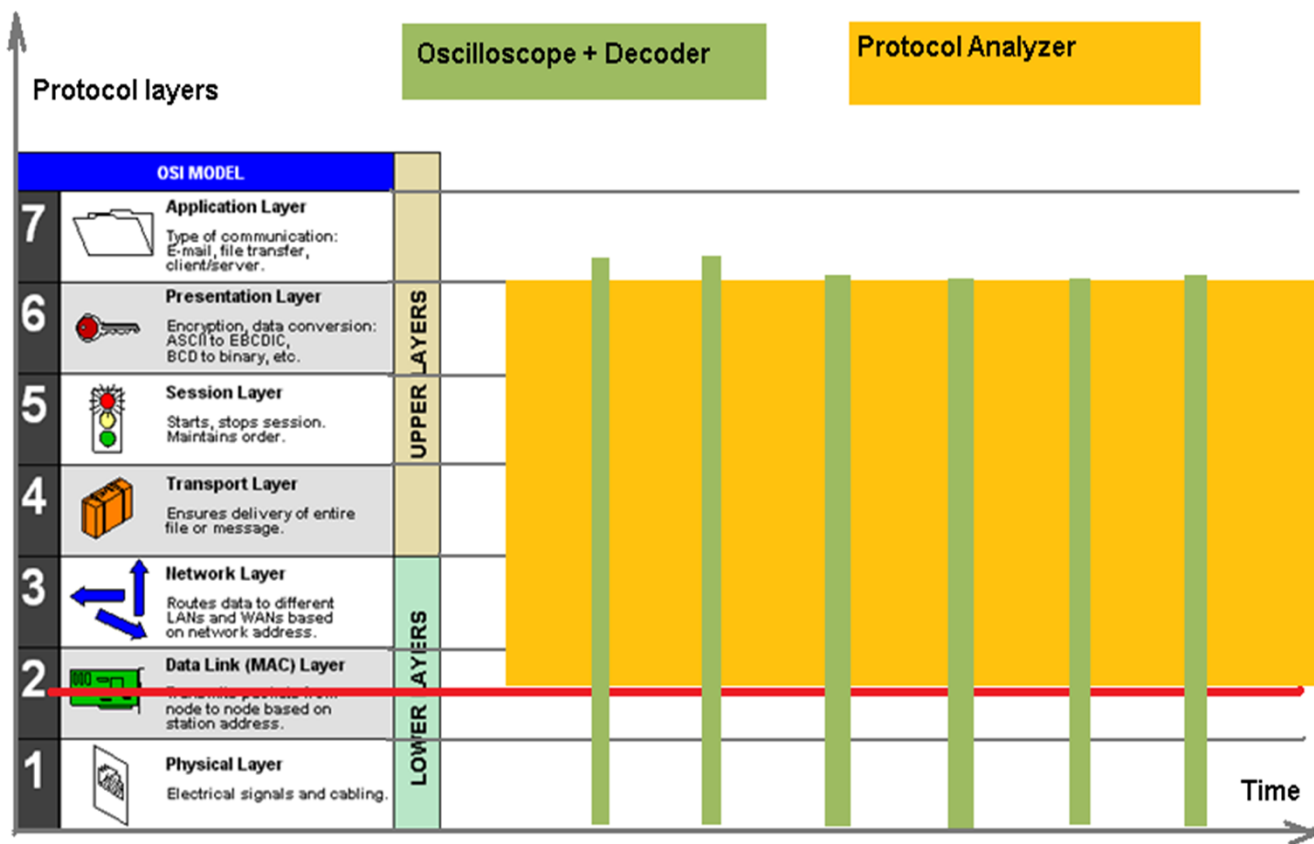
Can we exchange signal files freely ?
IP issues in the signal content, revealing
developments that should not be?

Errors specific to SpW?

Errors are more interesting!

Lets look at signals!

Protocol Analyser vs DSOs



1) Time continuous vs. snap shots

2) Upper layers vs. physical layer

3) PA are genetically protocol specific through their dedicated hardware

4) LeCroy DSOs are genetically protocol independent, because they have no specific h/w to decode. Therefore allowing multi protocol decode

Thank you!

Questions?