PHOENIX DATACOM

NETWORK PERFORMANCE AND SECURITY

Solutions to **enhance** the performance & security of your networks & applications

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IPTV Problems – What the data can tell you

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About Phoenix Datacom

Phoenix Datacom is an independent ISO9001 certified UK business that specialises in the provision of solutions that enhance the Security, Performance and Availability of Networks and Applications.

Addressing key issues that large scale IT infrastructures face; from combating the complexity and ever changing threat of cyber-attacks, to ensuring that business applications are tuned and available, as well as empirically testing that networks, applications and security systems are robust and fit for purpose.

We address these challenges with specialist knowledge, experience and solutions in the following network and security areas:

Advanced network access for monitoring and analysis tools

Network & application performance monitoring & analysis

Next generation Security & protection systems

Stress testing of both network and security systems

Established nearly 30 years ago, Phoenix Datacom has built an excellent reputation as a highly trusted integrator with unrivalled technical expertise - providing a pre and post-purchase service that is reliable and frequently exceeds customer expectations.

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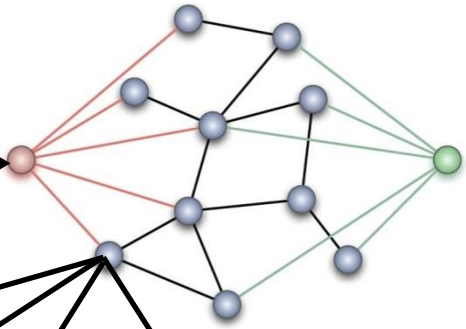
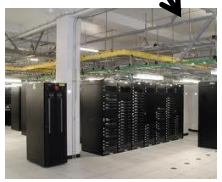
IPTV Transmission Basics

Reception

Conversion

Distribution





Regional reception for delivery via HFC network

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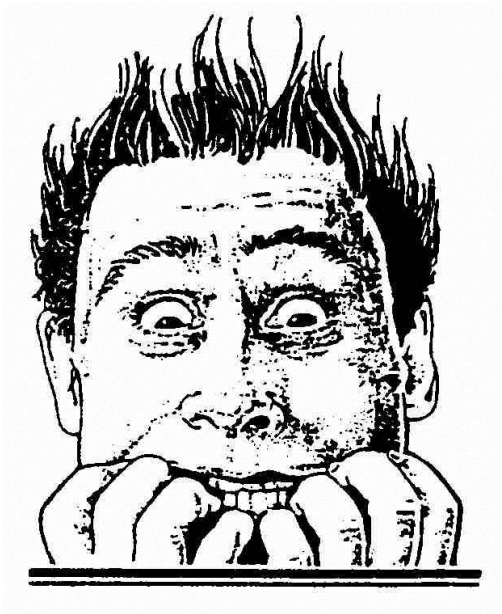
Where do the problems come from?



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Problems at the Head End?

Unwanted interference...

Old or outdated equipment...

Improvised/temporary solutions

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Trouble in the network?

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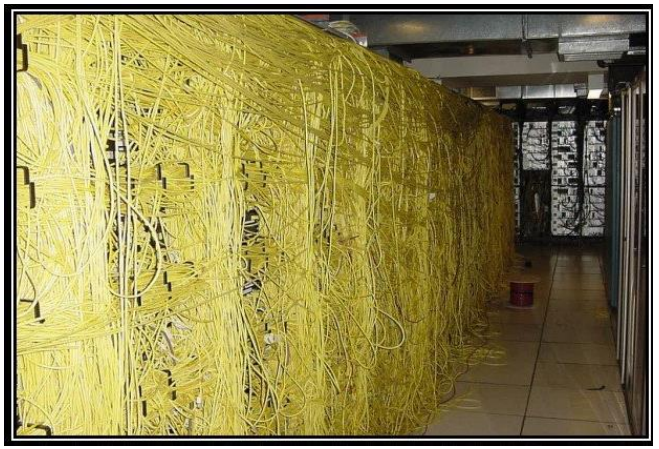
Congestion and poorly configured devices



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How do we detect and measure problems?

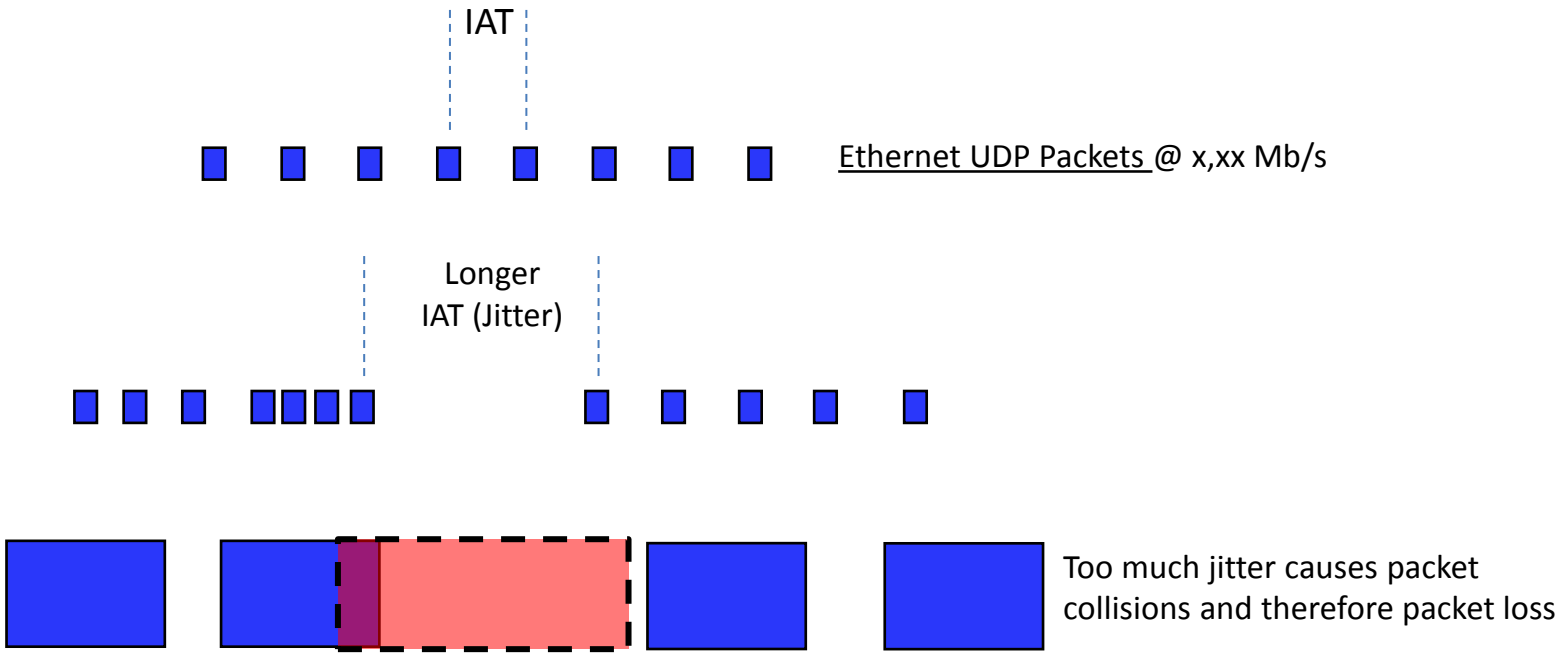
In the Network - What to measure

- IP Packet Drops
- IP Packet Jitter
- Signal outages

•ETSI TS 102 34: “Digital Video Broadcasting (DVB); Transport of MPEG-2 Based DVB Services over IP Based Networks” states the following two important parameters in terms of quality of television carriage over IP networks to subscriber premises:

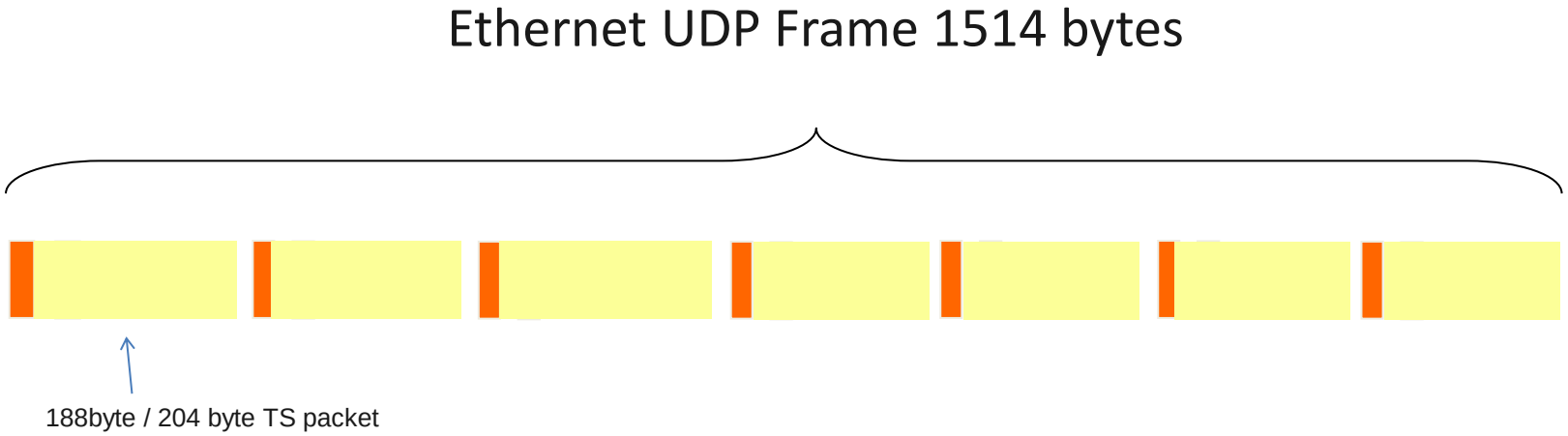
- Section 7.2.1.1: **MAXIMUM Jitter - 40 ms peak-to-peak**
  - “Packet jitter is defined as the variation in delay between the source of the stream and the end device.”
- Section 7.2.2.1: **MAXIMUM one noticeable artifact per hour**
  - “The IP packet error rate that results in this quality level depends on the transport stream bit rate. For a 4 Mb/s transport stream with seven transport stream packets per IP packet, one error per hour is equivalent to an IP packet error rate of less than 1 × 10-6.”

What is Jitter: Inter Arrival Time



- IAT – Inter Arrival Time: The time between neighbouring IP frames
- The variation of IAT is a measure of packet jitter
- The peak value of IAT is of interest when measuring jitter

What is “Media” Packet loss?

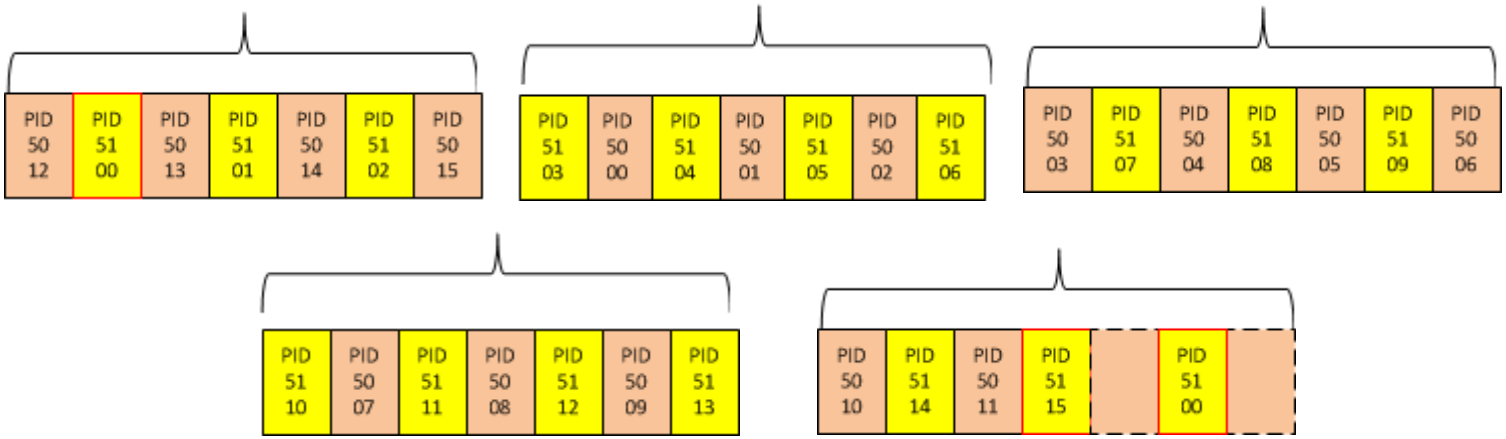


Ethernet frame can be max 1514 bytes resulting in maximum of 7 TS per UDP frame (UDP payload length = 1316 bytes)

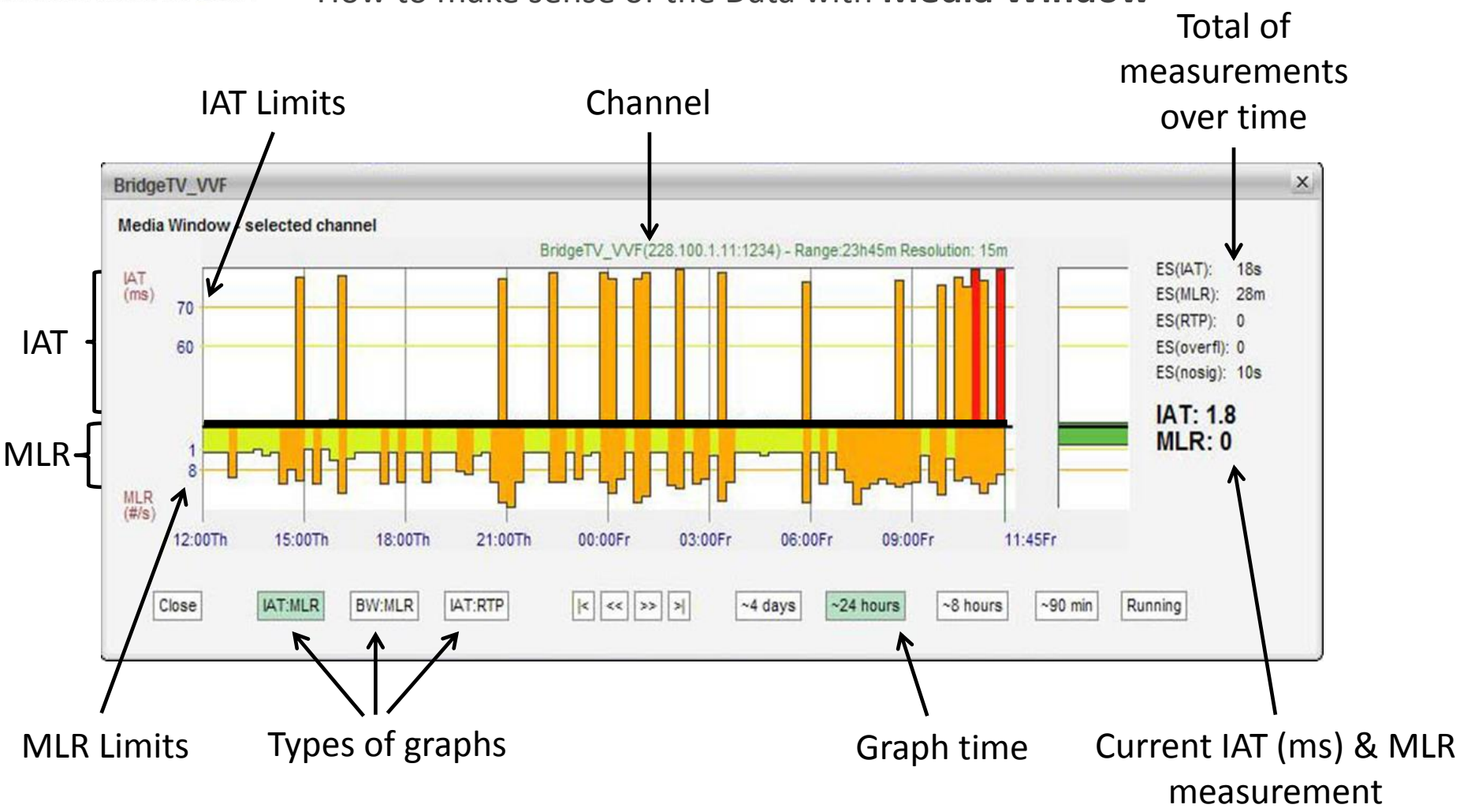
- Industry standard for IPTV is still 7TS/UDP

Packet Drops

- With 7TS/UDP there exists no sequence counter on IP or UDP layer so it is impossible to detect packet drops unless you look into application layer.
- We derive packet drops from the sequence counters inside MPEG-2 Transport Stream
- Each program identifier (PID) has its own 4-bit sequence counter.
- When losing one whole IP frame due to network issues you will normally drop 7 MPEG-2 TS packets at a time but not always (NULLs or Stuffing have invalid CC fields)
- When losing TS packets due to bad input signal it is usually sporadic

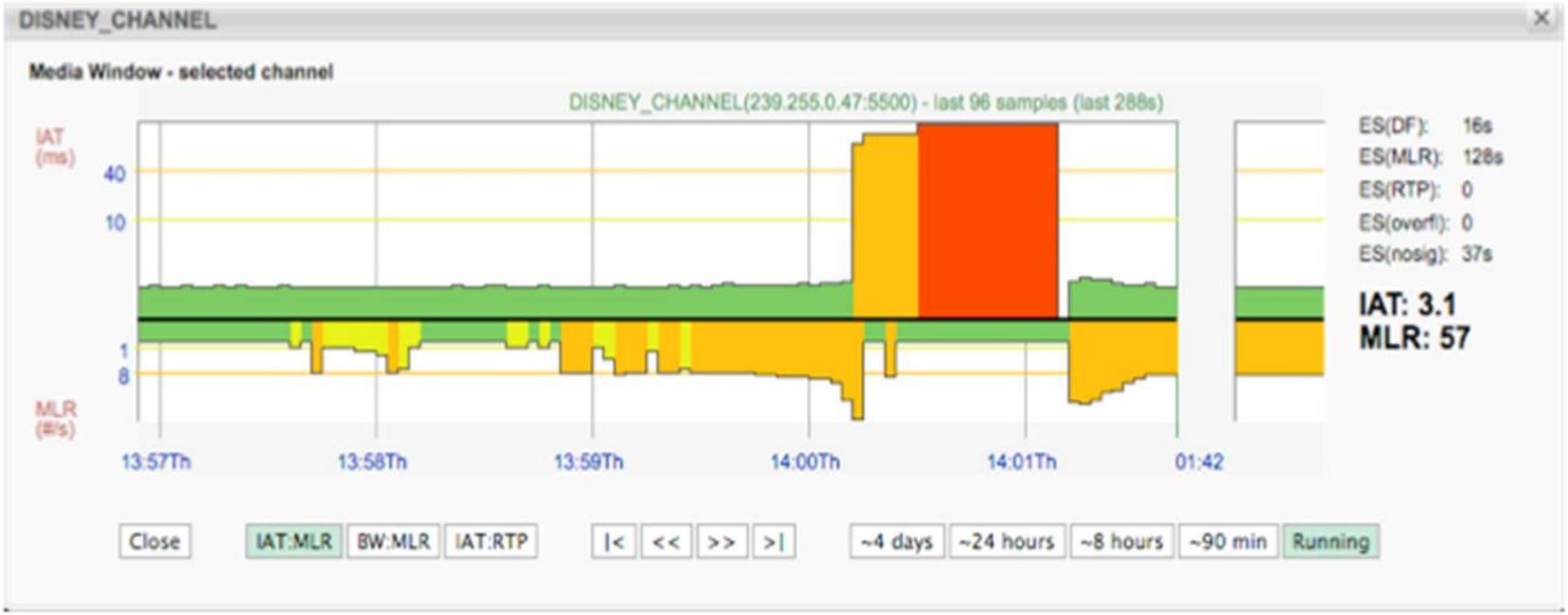


How to make sense of the Data with **Media Window**



At the Source - Contribution Data

Bad weather, rain fade



MLR Errors increase steadily until they're so bad it causes jump in IAT followed by No Signal alarm. Signal starts to recover after about one minute

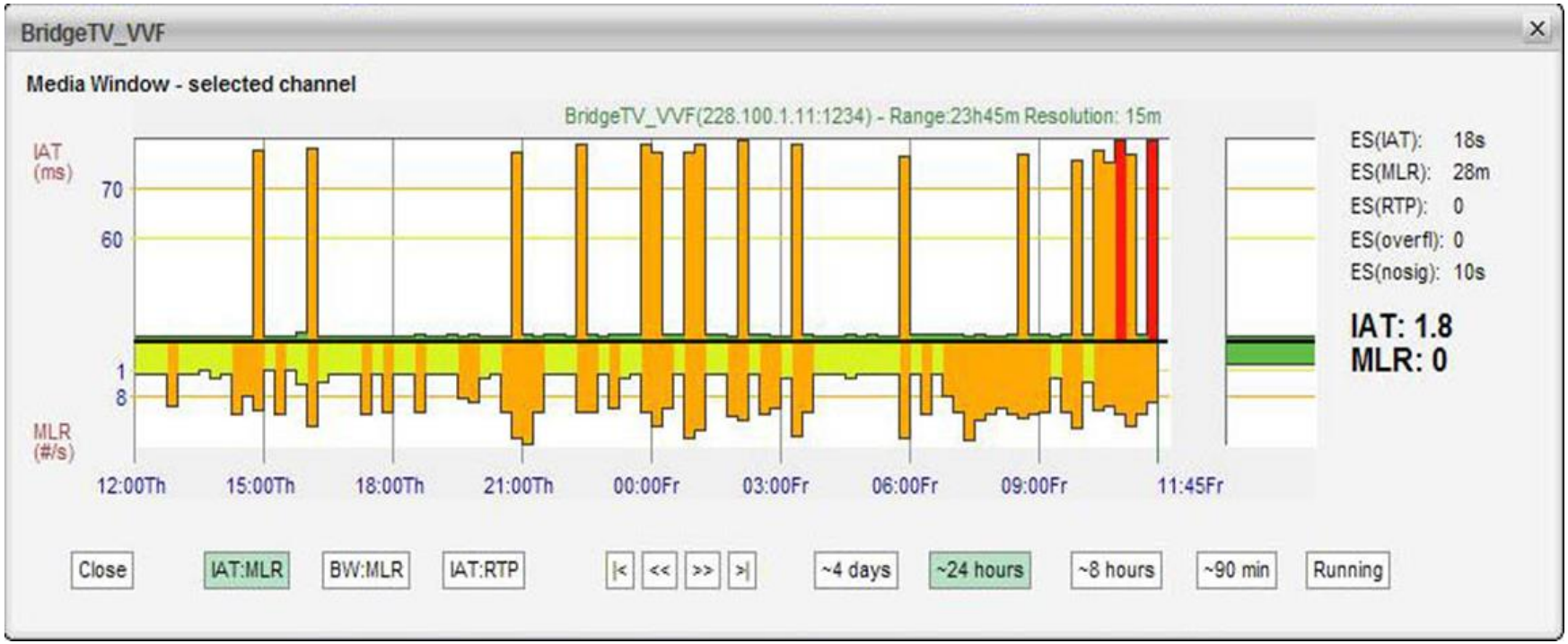
Downlink

Snow on the Satellite Antenna

High IAT associated with no MLR over 24 hour period. Typical of snow.

Detailed Examples

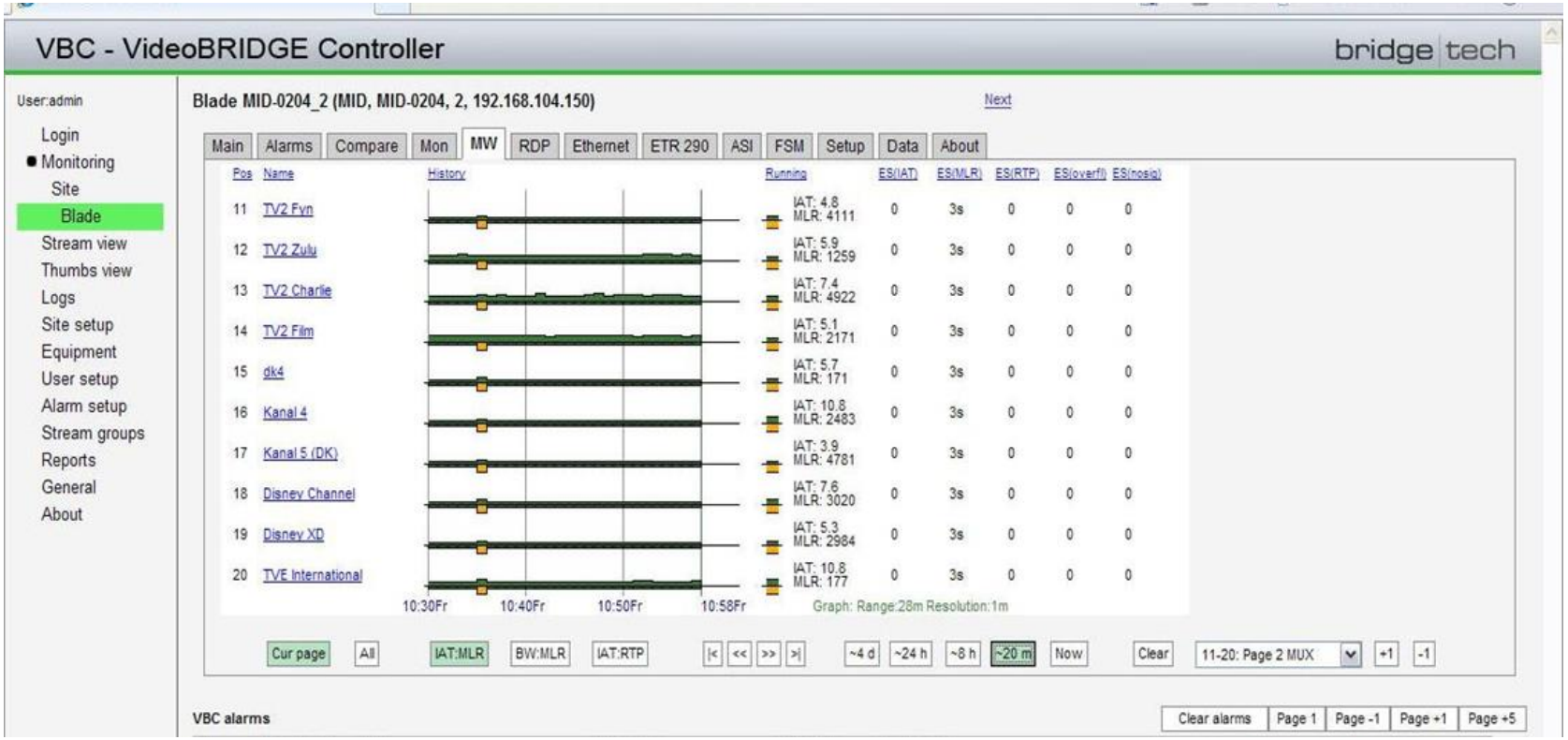
Bad Line Card



Continuous and worsening IAT & MLR errors over 24 hour period finally with 2 No Signal events. Caused by a faulty line card in a switch.

The power of a helicopter view of all channels

Network event or poor line card?



Simultaneous error repeated across multiple streams all serviced by same line card.

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Problems with the video

Video- What to measure

ETSI TR 101 290

- Specification describing a set of checks to use when monitoring Transport Streams in DVB systems
- The checks are divided into three priorities according to severity
- The tests are designed to detect errors that can cause problems for STBs
- Independent of media - same checks for IP, cable, satellite, terrestrial.
- Usually abbreviated to ETR 290

ETSI

ETSI TECHNICAL REPORT

ETR 290

May 1997

Source: EBU/CENELEC/ETSI-JTC

Reference: DTR/JTC-00DVB-22

ICS: 33.020

Key words: Broadcasting, digital, video, DVB, TV

European Broadcasting Union

Union Européenne de Radio-Télévision

Digital Video Broadcasting (DVB);
Measurement guidelines for DVB systems

ETSI

European Telecommunications Standards Institute

ETSI Secretariat

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Why is ETR 290 so Important?

- It is the monitoring standard known by traditional digital TV operators
  - They all require this functionality
- ETSI TR 101 290 can detect signal errors that can cause problems for STBs
  - Not just transmission problem
  - Requires full analysis of transport stream
  - Can be performed on scrambled services too

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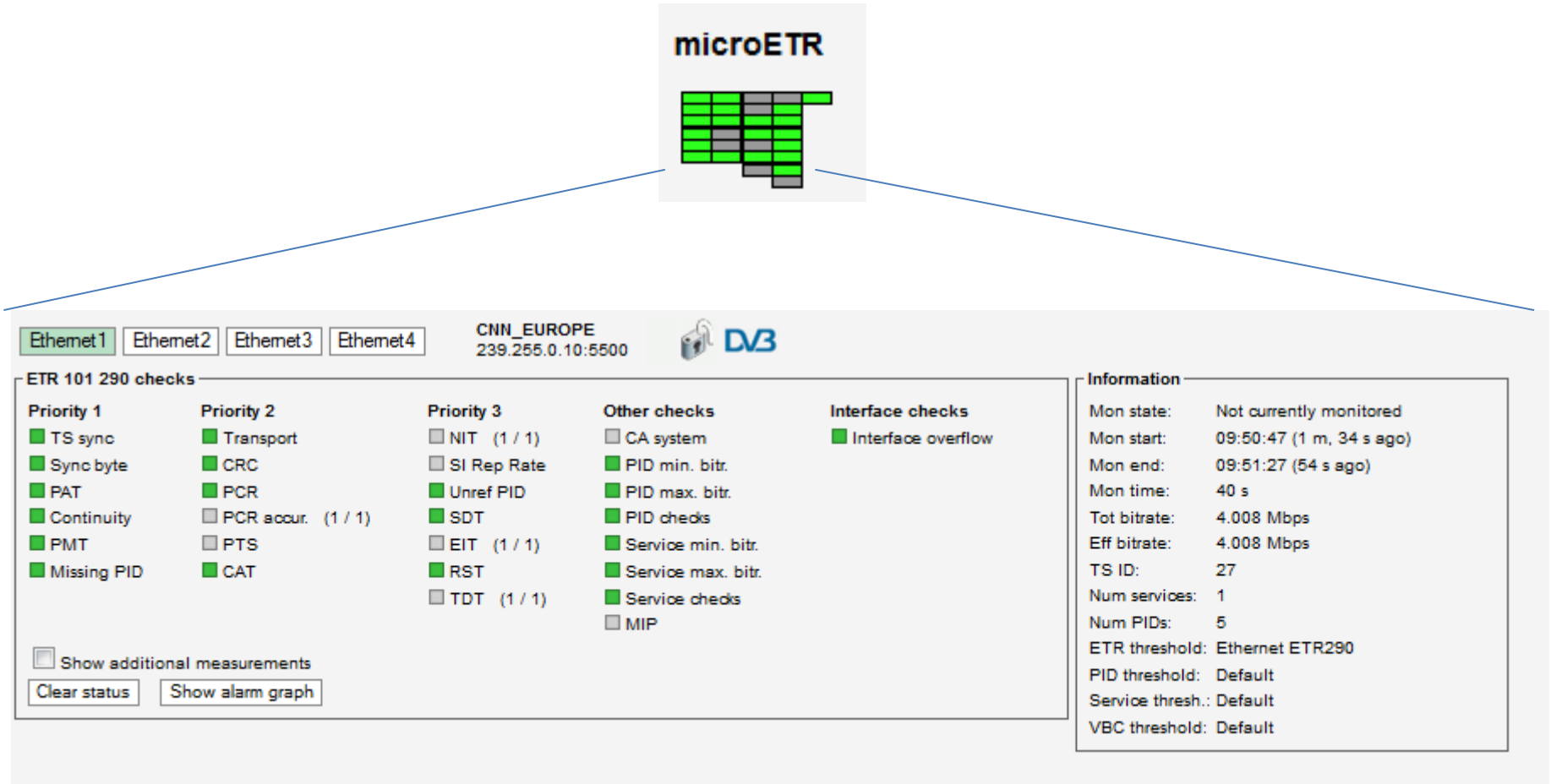
Visualizing ETR 290 with **microETR**



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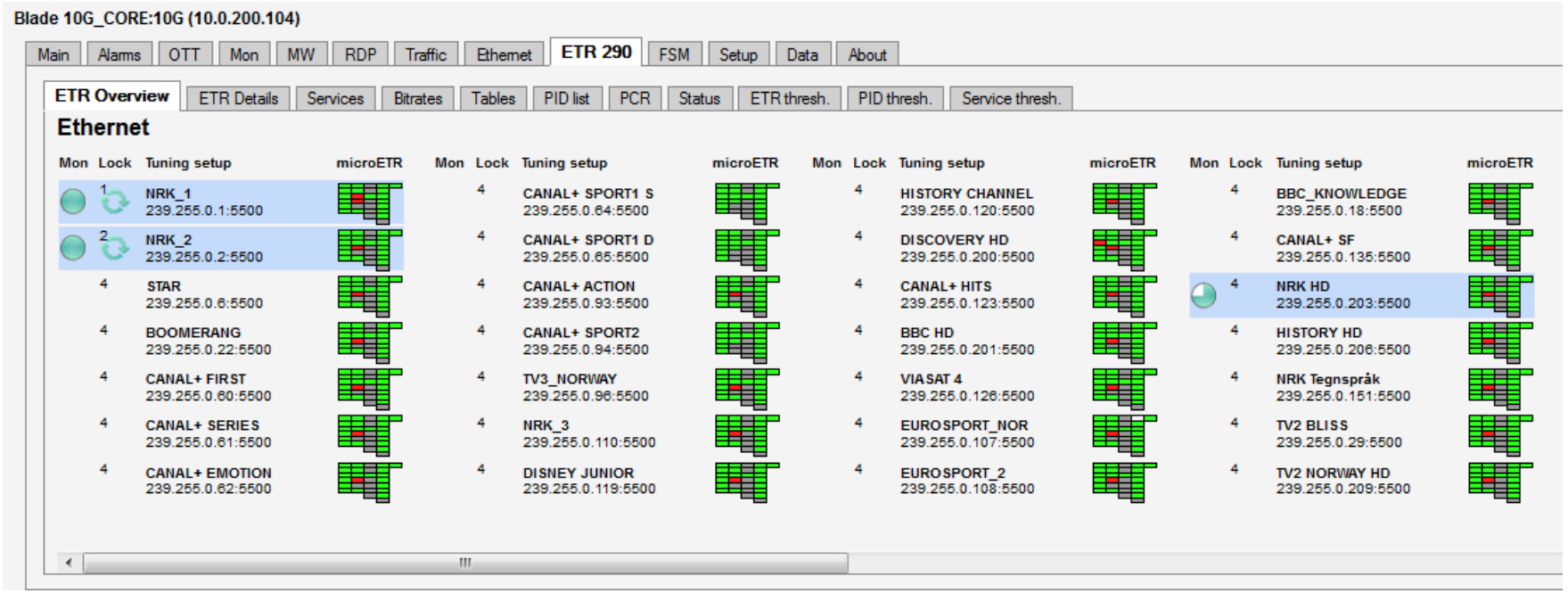
Visualizing ETR 290 for the complete channel lineup



Summary

- Video issues can be from the transmission network or the received signal.
- Poor reception equipment can/will impair the quality.
- Ethernet network issues can only be packet drops due to IAT or over congested devices.
- Video content is check with ETR 101 290 to ensure the signal is usable by STB.
- Its important to have a view of all channels and devices to ensure you can diagnose the route cause.

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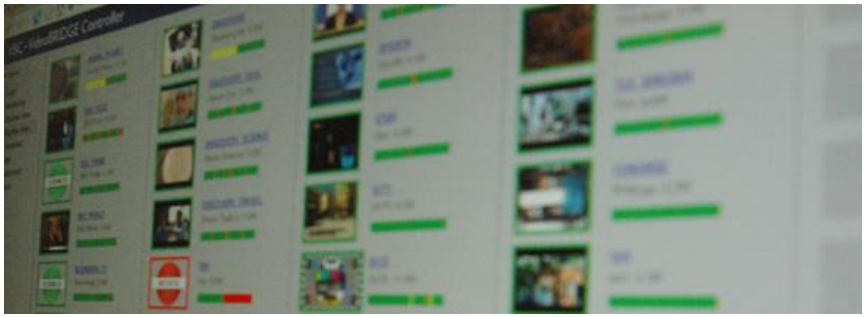

Questions?