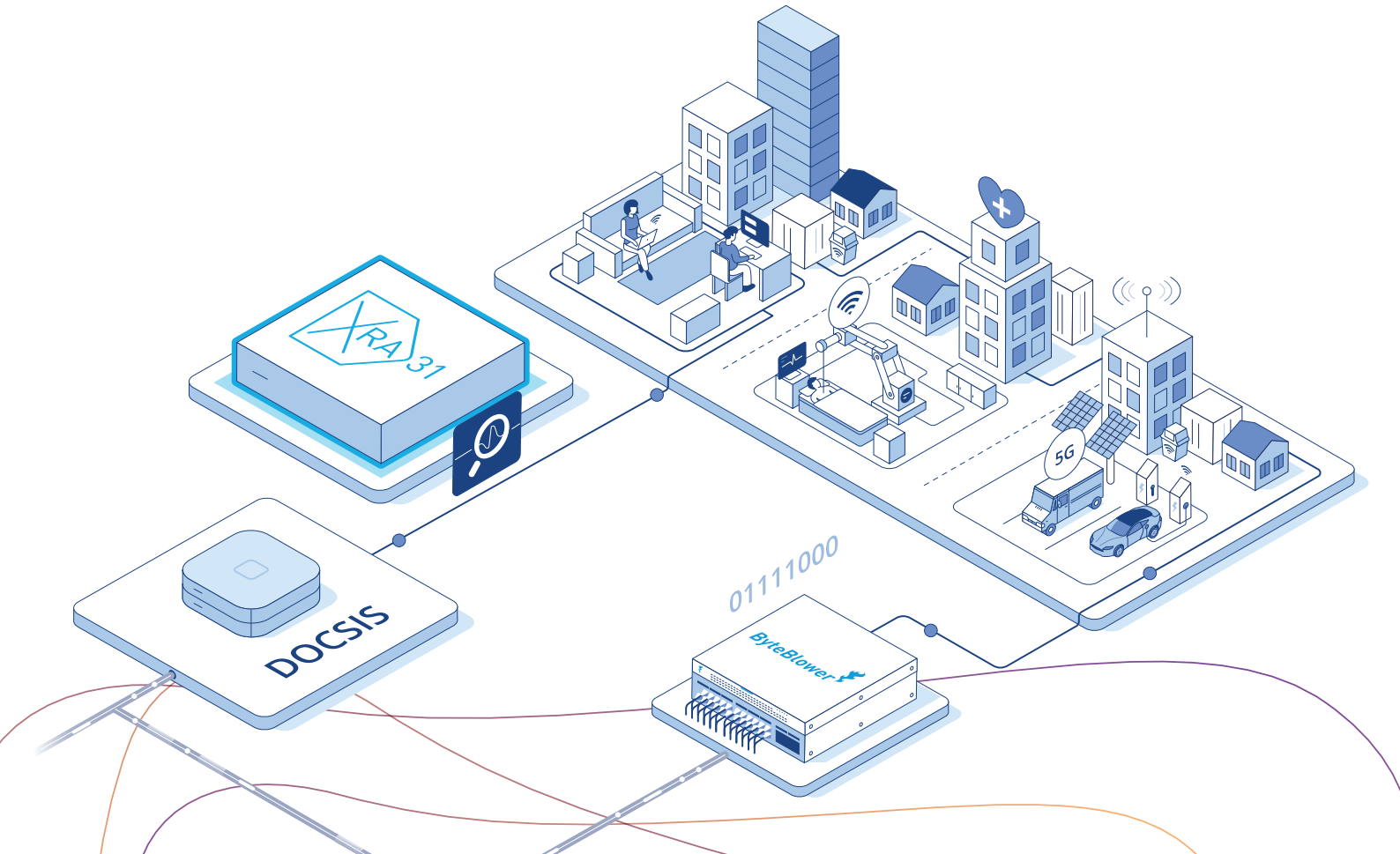
EXCENTIS
EXCELLENCE IN CONNECTIVITY

3 DOCSIS® problem cases where finding the root cause quickly saved big money, headaches and customers!

Unique behind the scenes views on problematic issues, root cause analysis and their solutions.
By the experts at Excentis: Advancing the network of today, paving the network of tomorrow.



3 DOCSIS problem cases where finding the root cause quickly saved big money, headaches and customers!

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INTRODUCTION

With networks increasingly complex and customers ever more demanding, **pressure is high on you as a service provider**.

Managing multiple networks, vendors and device types, demands a great deal of technical expertise and resources and the agility to keep up with new developments.

To provide **customers with the digital experiences** they've come to expect from you, means quickly acting and reacting in case of service outages or connectivity issues. If you're **playing in the B2B arena**, that comes with even higher Quality of Service expectations and requirements.

Fast troubleshooting and automated regression testing can be a big help to **prevent failures**, so that you can quickly address the performance issues that do crop up – all while keeping costs under control.

First see, then believe? Just look at how our XRA-31 DOCSIS protocol analyzer helped in 3 very specific cases to **pinpoint the root cause of 3 different connectivity failures** – saving them big money, headaches and customers...

€ 40.000 per month

is the estimated cost of customer churn as a result of bad service, based on the loss of 1000 customers paying € 40 / month.

Curious for more calculations? Wait for page 7!

3 USE CASES

USE CASE 1:
WHY ARE WE EXPERIENCING PACKET LOSS UNDER HIGH LOADS?

Problem	Analysis	Solution
• Pre-roll-out tests demonstrated **severe packet loss under high loads** • Nothing detected on standard debug ports	• Capture **all packets** in high-load test with XRA-31 • Upstream and downstream SC-QAM, ATDMA, OFDM, OFDMA channel demodulation and decoding	• Detected issues caused by an **error in the scheduling algorithm** • **Software update** fixed the issue • **Verification** resolvement with XRA-31

Problem

This client offers leased line B2B services over DOCSIS.
These clients expect an **even higher standard of speed, operations and service**.
Before roll-out of an update, this client was testing operations and noticed **major packet loss under high loads**.

A DOCSIS network is a carefully orchestrated collection of many different components from different vendors. If one component misbehaves, it causes a cascade of issues throughout the other layers of the network, leading to latency, packet loss, jitter – and very unhappy customers.

That's why **extensive testing** is a must before a multi-vendor network is set up. The more so if you offer **leased line B2B services over DOCSIS**, which require specific modem configurations.

While running a series of modem and CMTS tests, one of our clients bumped into some major connectivity issues, caused by **packet loss under high loads**. The traditional debug interfaces on the CM and CMTS, however, are not capable of **capturing enough data to uncover the root cause of the packet loss**.

Analysis

To pinpoint the root cause of the packet loss, we used our XRA-31 DOCSIS protocol analyzer. XRA-31 provides a real-time 360-degree view of all packets transmitted between the modems and CMTS (I-CCAP, R-PHY or RMD system) offering a **real-time captured view of the exact moment the service goes from working to breaking state**.

Moreover, unlike any other debug interface environment, the XRA-31 allows upstream and downstream SC-QAM, ATDMA, OFDM and OFDMA channel demodulation and decoding in real time, streaming to disk for visualization – without the need for postprocessing.

As the XRA-31 offers **the results in standardized pcap output***, allowing easy visualisation with off-the-shelf Wireshark, zooming in and pinpointing the root cause was easy for the engineer.

** We are proud to be Wireshark contributors to enable this on the industry-standard, open-source tool.*

See everything in real time

The XRA-31 allows upstream and downstream SC-QAM, TDMA, OFDM and OFDMA channel demodulation and decoding in real time – no postprocessing needed.

Solution

The XRA-31 analyzer showed that **a fault in the algorithm** caused the communications between CM and CMTS to fail under high loads, leading to packet loss. **The error was impossible to observe without the XRA-31 because of the huge amount of data.**

Based on these insights, our customer managed to **resolve the issue quickly** with a software update, in cooperation with the software provider, ensuring a fast roll-out of its leased lines, this major bug already squashed before causing all kinds of problems.

And a solid approach for testing all future updates!

YOUR WINS:

SAVE VALUABLE ENGINEERING TIME, CUT THE NUMBER OF SERVICE TICKETS AND KEEP CUSTOMERS HAPPY AND LOYAL

1000 calls per day at € 10 / call:	**€ 10.000 / day**
Delayed resolution by 30 days:	**€ 300.000**
Churn because of unhappy customers:	**€ 40.000 / month**
1000 subscribers leaving at € 40 / month:	**€ 480.000 / year**

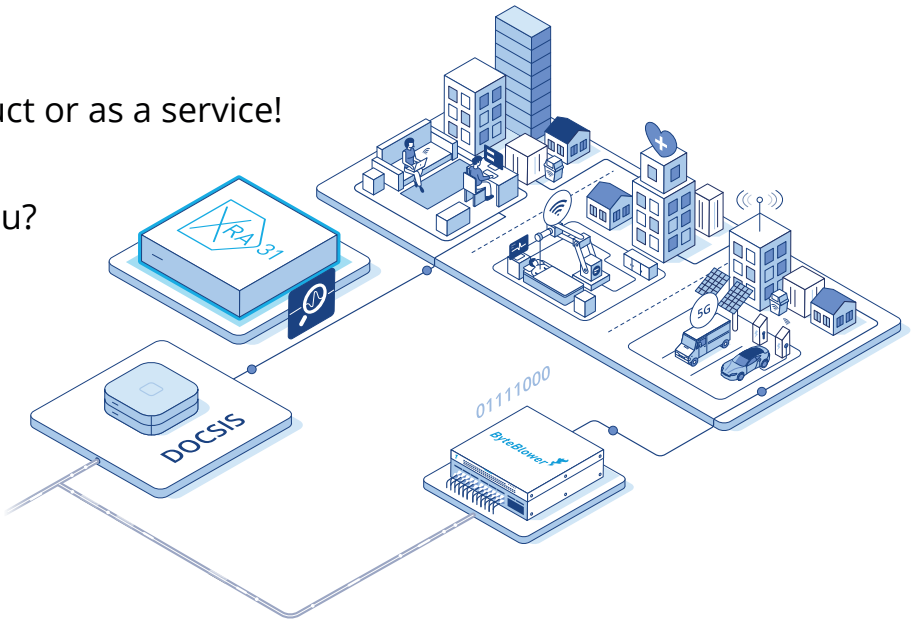
Not having the clear view the XRA-31 brings:

· Extensive trial-and-error
· Painstaking process of elimination, up to weeks
· Much, much more work-hours
· No clear and transparent view of what is actually happening
· Inadequate testing before roll-out

And the good news:
The XRA-31 is available as a product or as a service!

Interested in what it can do for you?

sales@excentis.com



USE CASE 2:
PACKET LOSS: MODEMS ARE INTERFERING WITH EACH-OTHER. WHAT'S GOING ON?

Problem	Analysis	Solution
• An unknown problem was causing modems to interfere which resulted in severe packet loss • Impossible to capture using standard debug ports	• Capture **all packets** in high-load test with XRA-31 • Invididual, in-depth analysis using specialized scripts to zoom in deeply • Conflicting MAP messages uncovered	• CMTS software update • Re-test to validate the effectiveness of the solution

Problem

Cable Modem Termination Systems (CMTS) play a critical role in maintaining uninterrupted connectivity by transmitting **MAP messages**. These messages provide essential instructions for modems, specifying **transmission opportunities, including the channels, time slots and message types for bandwidth and ranging requests, as well as data transmissions.**

When a CMTS outputs conflicting MAP information, modems will interfere with each-other. This results in **packet loss**, causing major connectivity problems.

Detecting conflicting MAP information can help to quickly resolve packet loss, but here's the catch: MAP messages are characterized by their high transmission rate, easily reaching up to 1000 messages per second, per upstream channel. Since traditional debug interfaces are inadequate for such rapid data capture, analyzing these messages can pose a challenge.

Analysis

Unlike traditional debug interfaces, the **XRA-31 allows us to capture the large number of MAP messages**, then conduct individual, in-depth analysis using specialized scripts.

By analyzing the captured messages in this use case, we noticed an overlap of MAP messages that caused colliding transmissions across multiple modems, resulting in the connectivity problems.

Unlike traditional debug interfaces, the XRA-31 allows us to capture the large number of MAP messages, then conduct individual, in-depth analysis using specialized scripts.

Solution

Thanks to the insights from the XRA-31, we could promptly address the conflicts and restore stability of the CMTS. In this case, we tackled the identified issue of overlapping MAP messages by **rolling out a software update on the CMTS**.

To ensure that the problem was successfully resolved, we examined a new set of MAP messages with the XRA-31 – which proved all correct.

USE CASE 3:
MODEM COMMUNICATION STOPPED!
HOW WE MANAGED TO PINPOINT THE CAUSE.

Problem	Analysis	Solution
• Modem communications abruptly stopped, without the modem having crashed or rebooting • Scenario can not be replicated in a lab • Once again, traditional debug ports inadequate	• Capture and filter data in real time using the XRA-31's **rolling file capture functionality**, and **filter MAC management messages in real time** • Capture stopped on event detection for analysis	• Modem software update • Solution validated by testing and monitoring with the XRA-31

Problem

Reliable modem communication is vital for seamless connectivity. When a modem **suddenly stops communicating** in an operational network, it causes severe disruption. And in this case the modems **didn't reboot automatically**, so the problem won't fix itself.

Analysis

To identify the root cause of online modem communication failure in this use case, we used the **XRA-31's rolling-file capture functionality with real-time filtering**, allowing us to store only the MAC management packets. The XRA-31 captured all communication data for multiple days and stored it to a ring buffer that tracks events over a 24-hour period.

When a communication failure occurred, the capture process was halted, and analysis of the captured data could begin. As in most cases, we encounter limitations with traditional debug ports, which proved inadequate for handling high loads. Enabling debug mode causes the entire system to slow down to a crawl, in turn introducing a host of other issues.

Our analysis revealed that the communication failure stemmed from the CMTS, which communicated changes in the used upstream modulations (IUCs). **The modem failed to process these changes correctly**, leading to the breakdown in communication.

The XRA-31's rolling-file capture functionality with real-time filtering, allows storing only the MAC management packets.

Solution

By relying on XRA-31, we were able to **quickly pinpoint and analyze the root cause of the communication failure**. Based on the critical insights gained from the analysis, we could proceed to implement an appropriate solution addressing the identified problem.

By modifying the modem's software, we were able to swiftly resolve the issue. This solution was then **checked and validated by monitoring traffic with the XRA-31** after deployment.

THE TOOL ENABLING QUICK RESOLUTION: XRA-31 DOCSIS PROTOCOL ANALYZER

The XRA-31 is a real-time DOCSIS protocol analyzer, enabling easy, lightning-fast testing and communication troubleshooting.

How? The XRA-31 allows you to capture and analyze all downstream and upstream packets exchanged between DOCSIS 3.1 cable modems and the cable modem termination system (CMTS) in real time and without intrusion. Moreover, its intuitive GUI makes packet capture and analysis a smooth, quick and pleasant experience. Instant insights, prompt results with no effort whatsoever.

XRA-31 Technical Features

- All DOCSIS 3.1 signal configurations
  - Both 3.0 and 3.1 protocols, with continuous updates for future versions
  - 2x OFDM up to 192 MHz
  - 2x OFDMA up to 96 MHz
  - 32x SC-QAM
  - 8x ATDMA
  - All modulations up to 4096 QAM
  - 85 MHz - 1218 MHs DS
  - 5 - 204 MHz US
- Supports both DOCSIS and Euro-DOCSIS
- Multiple profiles, mixed-modulation profiles, profile changes
- Filter capture on message type
- Web-based GUI
- Python API for automation
- Traces in standard Wireshark format

Speedy, (cost-) effective DOCSIS troubleshooting and testing

XRA-31 will help you:
Quickly detect and analyze the root cause, to then quickly solve it – for fast help or roll-out

- No postprocessing needed: thanks to the real-time demodulation, packets and RF metadata are immediately available.
- Efficient: all information can be filtered before saving it into a standard pcap file.
- Easy testing and troubleshooting, thanks to intuitive user interface and familiar formats and tools (pcap, Wireshark).
- Collaborate smoothly: since no special software is required for analysis, you can share traces with third party vendors or customers.
- Analyze to the bone: Accurate timestamping facilitates advanced request/ response and interval analyses.

Store vast amounts of data efficiently

- Real-time filtering before saving the information enables you to reduce the size of your captured file.
- Capture more 'time', as storage space is only used for demodulated packets.
- Easily capture minutes of traffic on fully loaded DOCSIS system.

HOW EXCENTIS CAN HELP

We're the DOCSIS experts

Expertise and experience have made Excentis an **authority in network testing**. We are a specialized team of network, hardware and software engineers, testers and trainers, with decades of lab and field experience, a passion for tech - and a natural aversion to latency.

How we can help you

For over 25 years, we've been delivering **consultancy, testing and training services**. Based on our experience, our engineers also built a series of groundbreaking products, like the XRA-31, to help your engineers do the testing and troubleshooting themselves. And then there's **lab-as-a-service**: our labs, stuffed with cutting-edge-testing equipment, are all available for your experts to use.

And, of course, every offering comes with our support and **expert advice**. You can call in the unbiased help of our smart-ass engineers – on-site or remotely – whenever or wherever you need us!

XRA-31: Buy or Rent, the choice is yours.

Get in touch with our sales team for more information on prices and features of our XRA-31 DOCSIS protocol analyzer. Rather rent the XRA-31 for use on your premises? We'll even bring it over! Need an expert with that? Done.

Contact us at sales@excentis.com and let us show you how we can help.

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Lower your troubleshooting cost significantly with the XRA-31

We are proud to be trusted by the best.

Mediacom · true · Shaw · COGECO · MIDCO · bouygues TELECOM
Telia · CableLabs KYRIO | SCTE · AVM · proximus · Charter COMMUNICATIONS · telenet
DELTA FIBER · TELE2 OBEGRÄNSAD · TATA ELXSI · breezeline · LIBERTY GLOBAL · vantiva Pushing the edge
vodafone · COX · MaxLinear · Virgin media O2 · nbn · COMCAST

Let's advance networks together

We would welcome the opportunity to work with you to optimize, innovate and assure the robustness of your networks. And we put our heart into it, our work is our passion.

Jan De Beule · EMEA
jan.debeule@excentis.com

Charlie Viaene · AMER/APAC
charlie.viaene@excentis.com

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