Network loading practices and HFC update, RIS ecosystem and CATVisor Argus. Teleste Distributed Access update focusing on Remote PHY

Sat-Trakt event, Hotel Falkensteiner
19.02.2017
Rami Kimari

Agenda

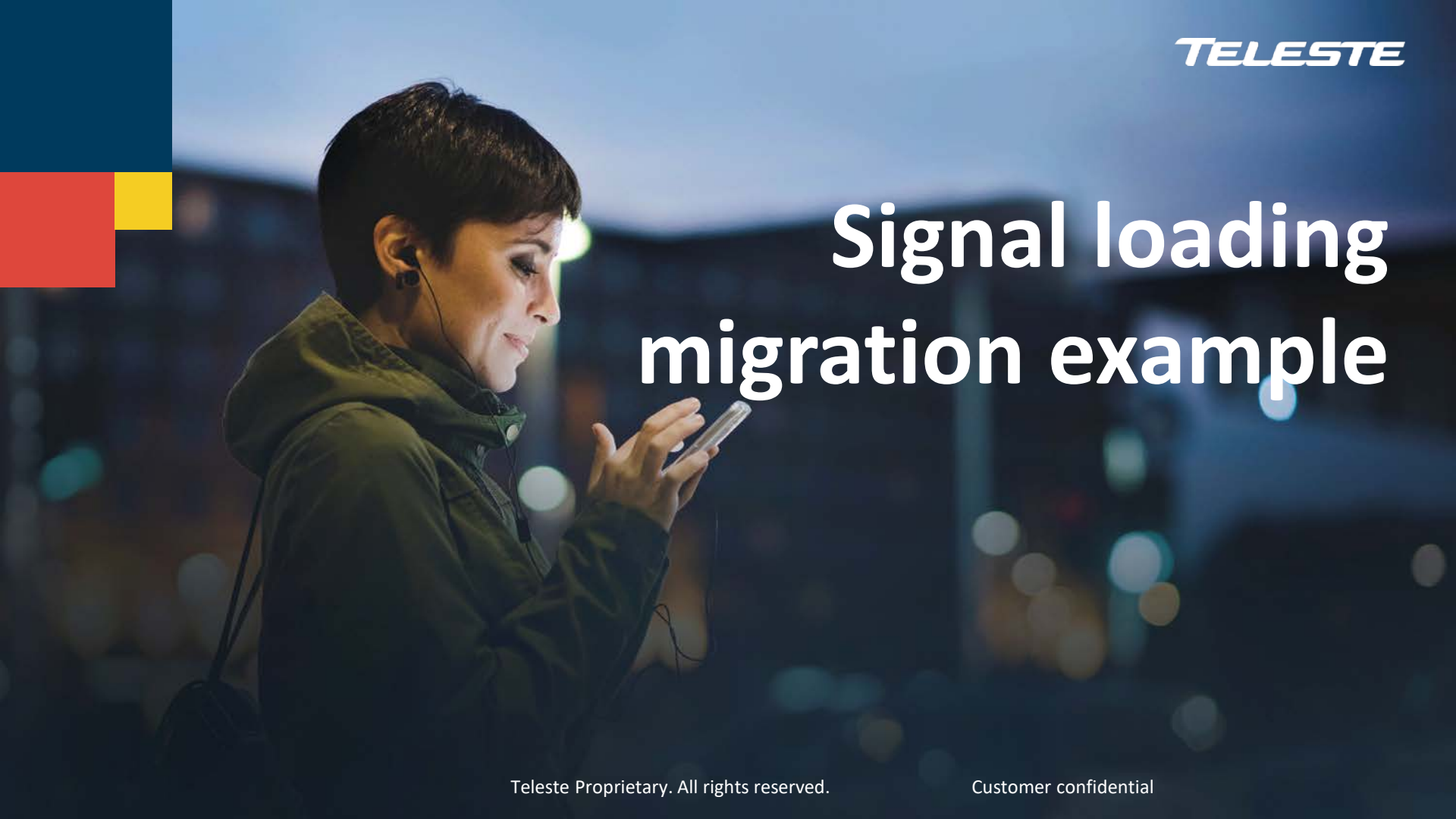
Network loading practises and HFC update

- Signal migration path example towards D3.1
- HFC product update

RIS ecosystem and CATVisor Argus

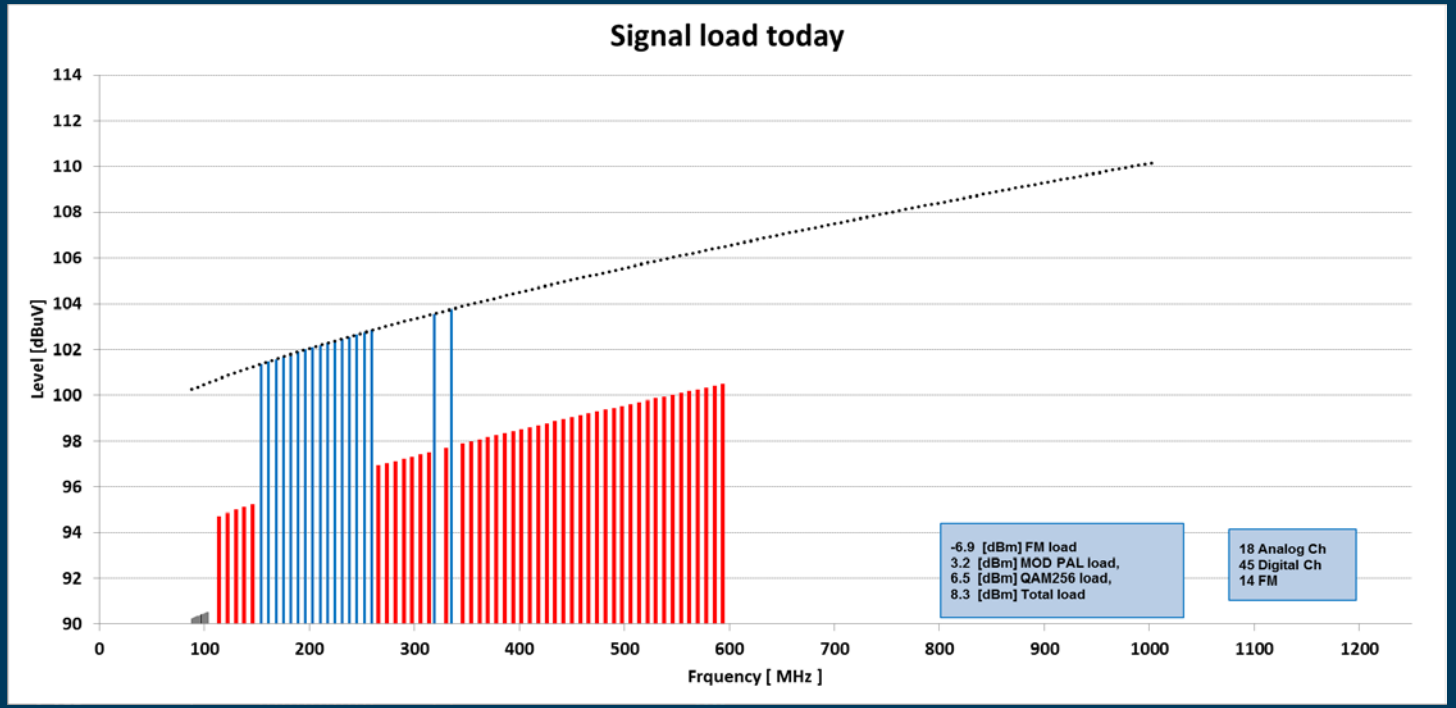
- CATVisor software family
- RIS ecosystem

Teleste Distributed Access update focusing on Remote PHY

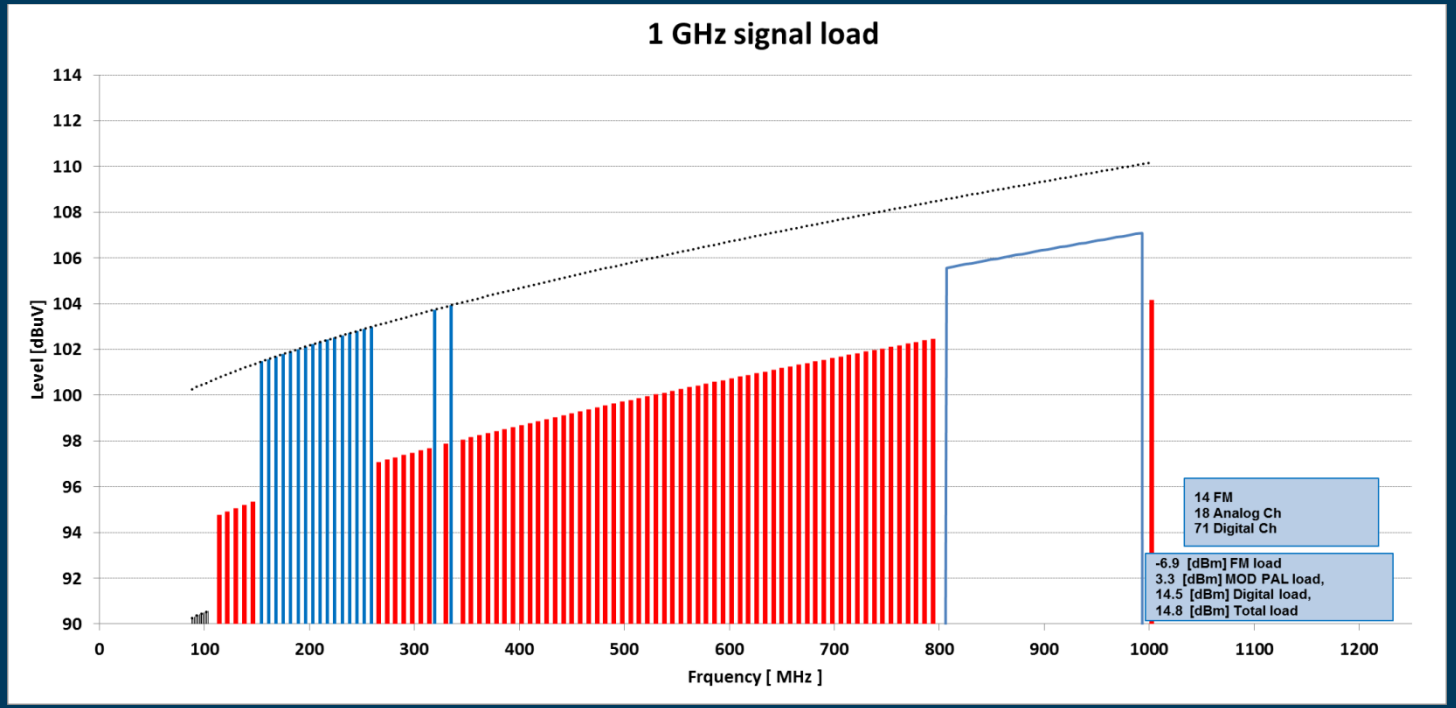


Signal loading migration example

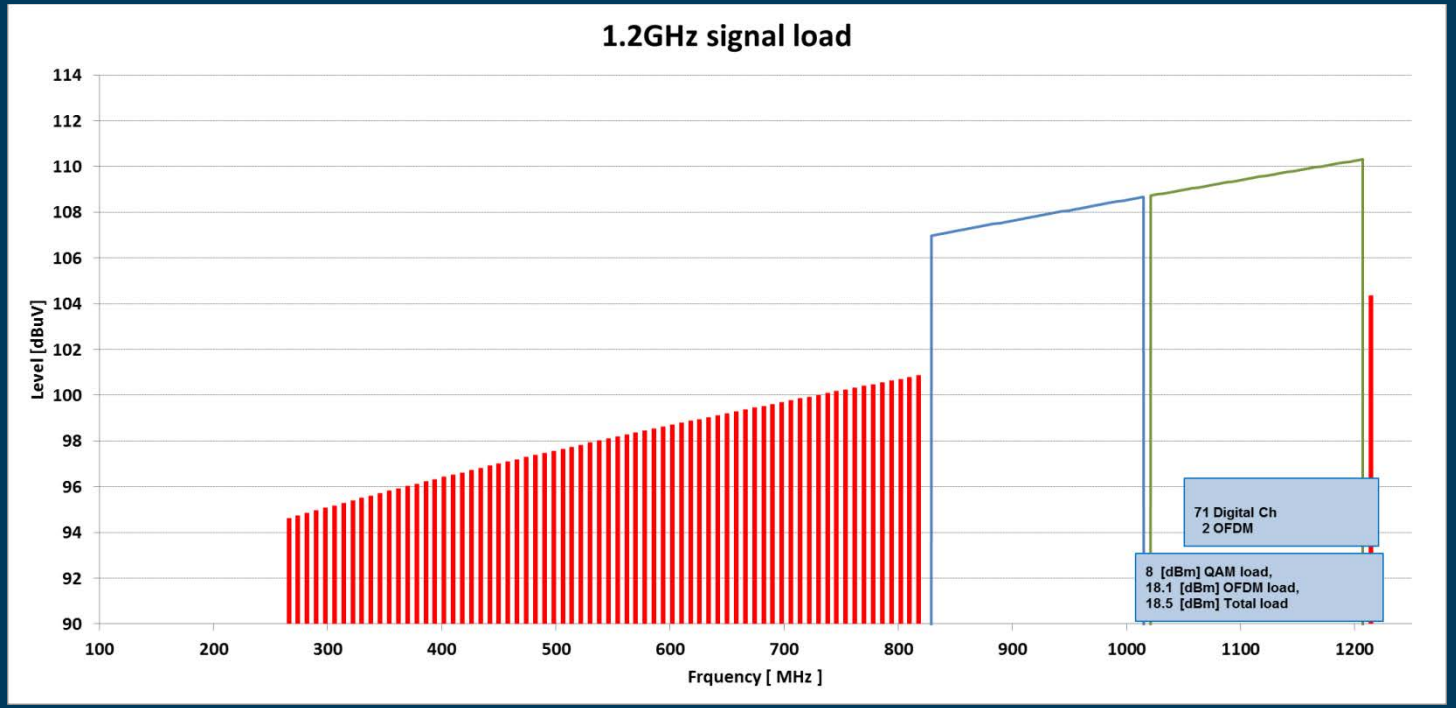
Signal load today, up to 600 MHz



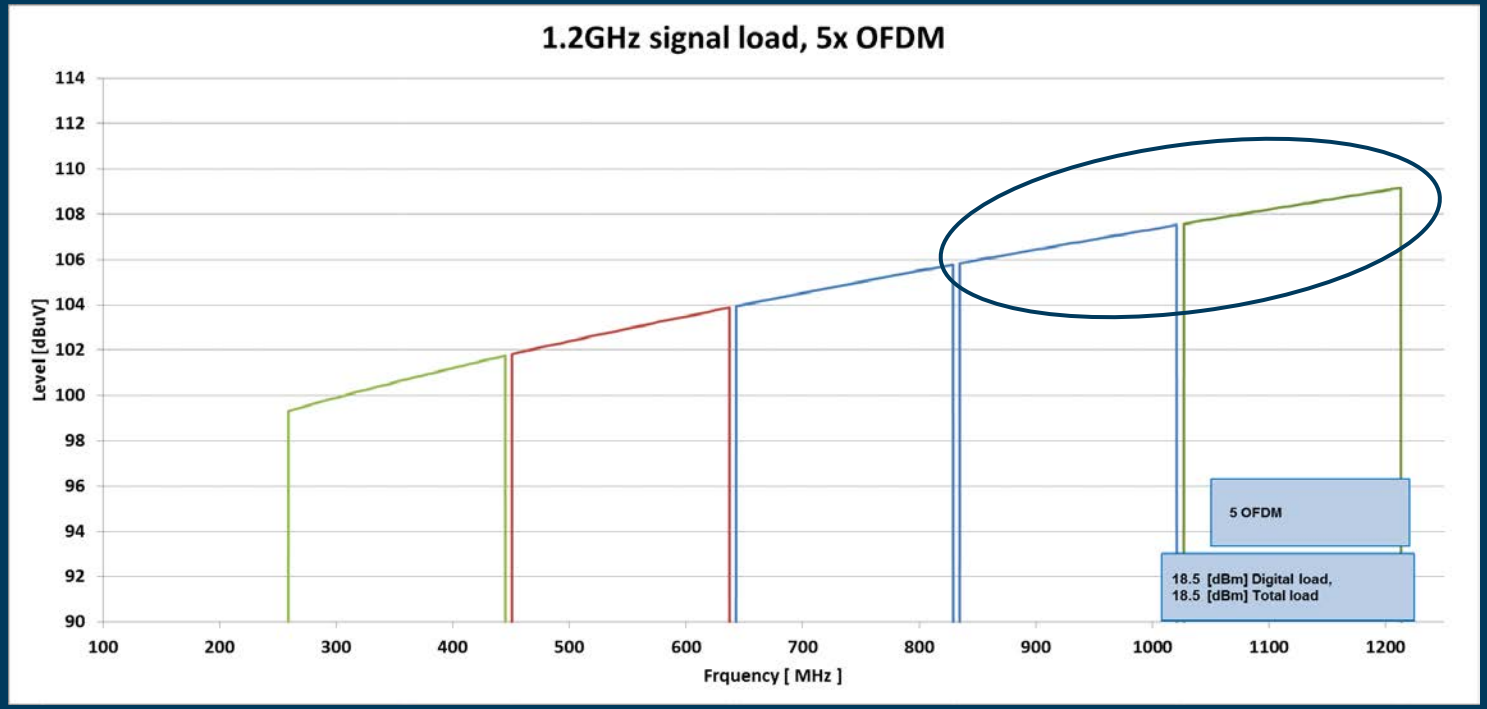
1GHz Signal Load



1.2 GHz Signal Load, DS/US split: 204/258



1.2 GHz Signal Load



Amplifier output level selection

- AC3200 specified Umax:108.5 dBuV with 112ch

”Channels have 10 dB cable equivalent slope between 110…1006 MHz and signal level has been defined at 1002 MHz”

Total signal power is 16.8 dBm at output.

- AC3210 specified Umax:112.0 dBuV with 138ch

“Channels have 13 dB cable equivalent slope between 85…1218 MHz and signal level has been defined at 1210 MHz”

Total signal power is 20.5 dBm at output.

HFC product update

Status – Available DOCSIS 3.1 compliant products

Headend optics	
Single / Dual 1310 nm downstream Tx	HDO907 / HDO921
O-band DWDM downstream Tx	HDO908
C-band DWDM downstream Tx	HDO774 / HDO775 / HDO776
Dual / Quad return path receiver	HDO202 / HDO206 / HDO204 / HDO212
Headend RF amplifier DS / US	HDO613 / HDO421
Headend optics for Hub	
Downstream receiver	HDO803
RF back-up switch	HDO103
Return path transmitters	HDO302 / HDO371
1.2 GHz spectrum analyser option	HDO803 / HDO907 / HDO613 / HDO775 / HDO908 / HDO774
Optical nodes	
Quad output intelligent 2x4 node	AC9100
Dual output intelligent 1x2 node with route backup	AC8810
Dual output intelligent fibre deep node	AC8710
Single output intelligent node	ACE8
Dual output Fibre deep node (FTTLA)	AC810
RF amplifiers	
Single / Dual output intelligent amplifier	AC3010 / AC3210
Single / Dual output amplifier	AC1500 / AC2500
Single output intelligent amplifier	ACE3
Single output intelligent amplifier	ACE2
Compact single output amplifier	E3
Compact single output amplifier	CX3

New release – HE optics, 1550 nm transmitters

1218 MHz

HDO774 – Externally Modulated C-band DWDM Transmitter

- Optimised for QAM / OFDM loading
- Cost and power consumption clearly lower than todays externally modulated transmitters
- High SBS suppression +19 dBm
- Output power +5 dB
- General 1555 …1560 nm wavelength
- 8 different fixed ITU chs in range of 25...33

Roadmap – HE optics, 1550 nm transmitters

1218 MHz

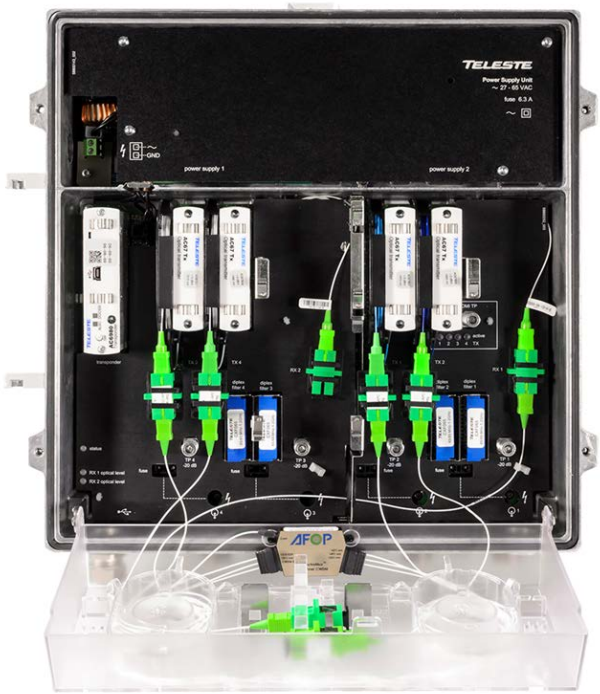
HDO761 – Dual Directly Modulated C-band DWDM Transmitter

- Improved rack density, power consumption and CAPEX
- Optimised for QAM / OFDM loading
- Short distance model 10 km
  (Relaxed specification up to 25km)
- Output power 2 x +10 dB with individually selectable
  ITU wavelengths (Ch 21 – 59)

Availability Q1/2017

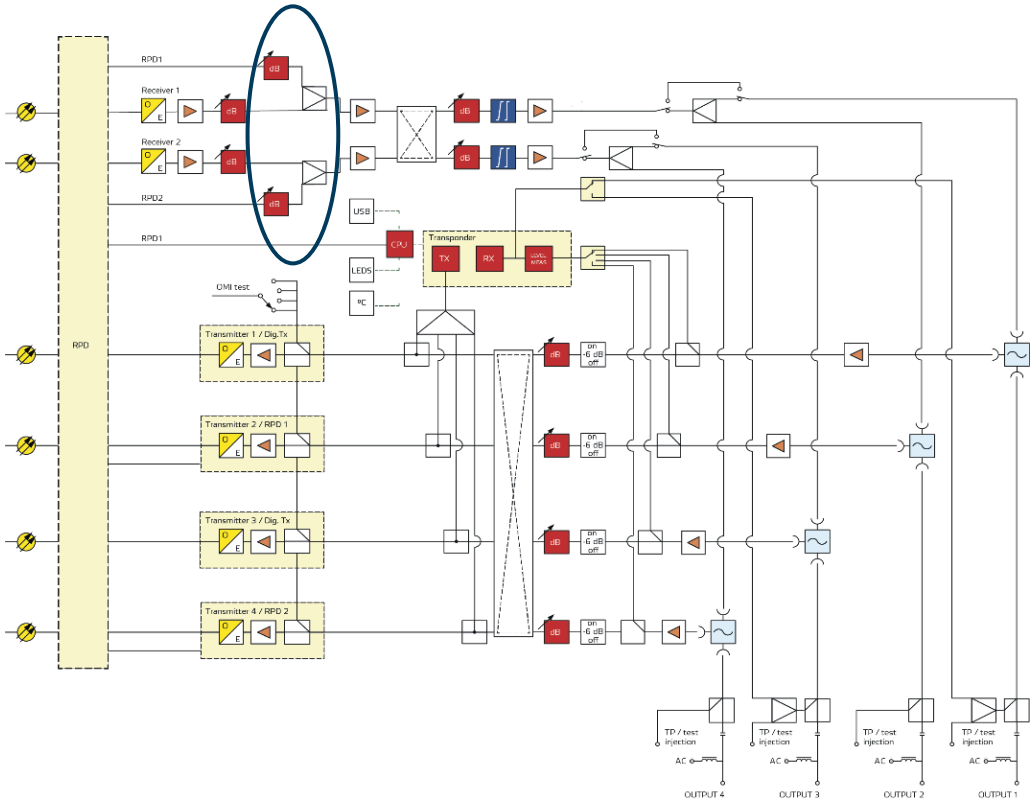
AC9100 NEO – Intelligent 2x4 optical node with RPD migration compatibility

- Upgrade project to AC9100
  -> HFC operation and functionality remain same
  - Configuration can be changed remotely
  - 2nd generation GaN hybrids
    U_{max} (138 ch, @ 1.2 GHz) 111.5 dBµV
- Supports migration to RPD up to 2x2 configuration with lid change
  - 1x2 with current RPD technology
  - 2x2 with future generation RPD

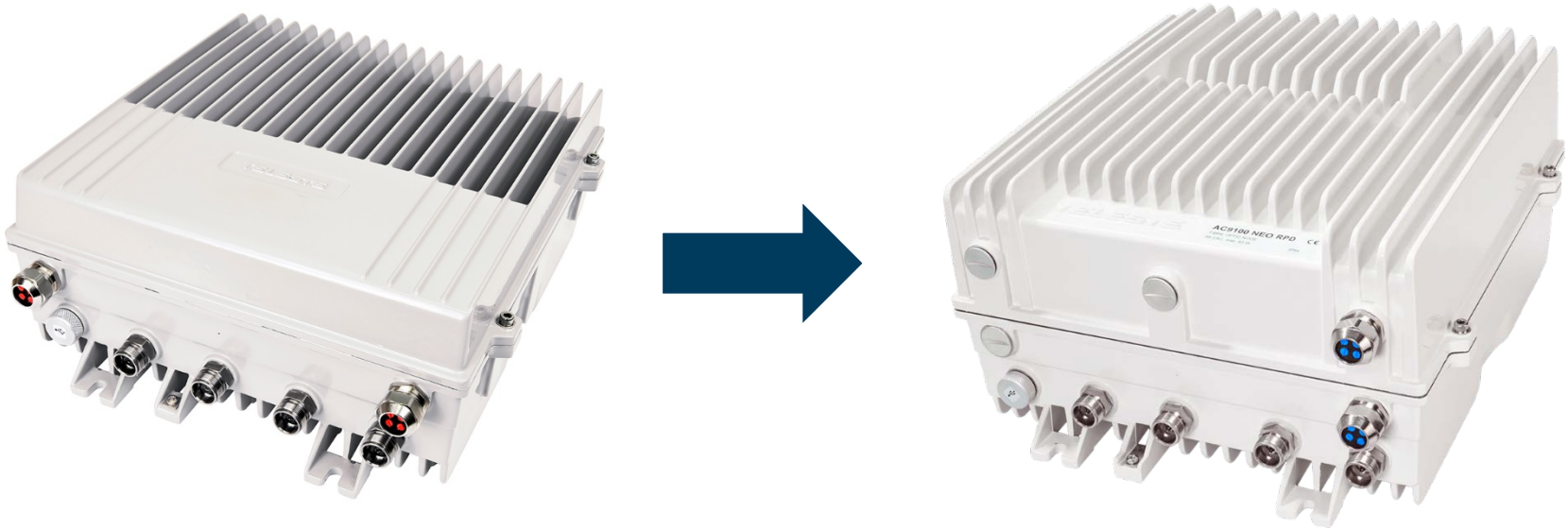


HFC node availability (AC9100 NEO): Now
RPD lid availability (AC9100 NEO RPD): Q3/2018

AC9100 NEO – Block diagram



AC9100 NEO migration to AC9100 NEO RPD



Roadmap – Intelligent nodes

ICON9000 – Intelligent 2x2 optical node with RPD migration compatibility

- Strand mount form factor
- 4 active outputs, 1G2 / 204M
- RPD migration compatible
- 3rd generation GaN hybrids

  -> U_{max}(138 ch, @ 1.2 GHz): 114 dBµV

Availability H1/2018

E3 – Compact distribution amplifier

RIS 1218 MHz 204 MHz

- Gain 42 dB / 28 dB
- Performance
  - Cenelec 41 Ch: 117 dBµV
  - U_{max} (112 ch, @ 1.0 GHz): 113.5 dBµV
  - U_{max} (138 ch, @ 1.2 GHz): 110.5 dBµV
- Electrical adjustments in US / DS with temperature compensation
- Local control with push buttons or via RIS module with USB port (Laptop or Android)
- Remote ingress switch control via E61 RIS module

CX3 – Distribution amplifier

- Gain US 43 dB / DS 28 dB
- Performance
  - Cenelec 41 Ch: 116 dBµV
  - U_{max} (138 ch, @ 1.2 GHz): 106.5 dBµV
- Electrical adjustments in US / DS
- Local control with push buttons
- Changeable diplex filters

1218 MHz 204 MHz

1.2 GHz HFC amplifier categorisation

	CX3	E3	ACE2	AC1500 AC2500	ACE3	AC3010 AC3210
Purpose of use	Line extender / Distribution	Line extender / Distribution	Distribution	Trunk / Distribution	Distribution /(Trunk)	Trunk / Distribution
Amplifier type	Single output	Single output	Single output	Single / dual output	Single output	Single / dual output
"Intelligence level"	• Electrical controls • Local interface • Manual / UI	• Electrical controls • Local interface • Manual / USB UI • RIS	• Electrical controls • Local interface • USB UI • RIS, QUATTRO	• Plugs, pads • Local interface • Manual UI • RIS, ALSC, (Transponder)	• Electrical controls • Local & remote interfaces • USB UI • RIS, ALSC, Transponder	• Electrical controls • Local & remote interfaces • USB UI • RIS, ALSC, Transponder
RF performance (U_{max}138 ch)	106.5 dBµV	110.5 dBµV	112 dBµV	108.5 dBµV	108.5 dBµV	112 dBµV

E8 – Compact node

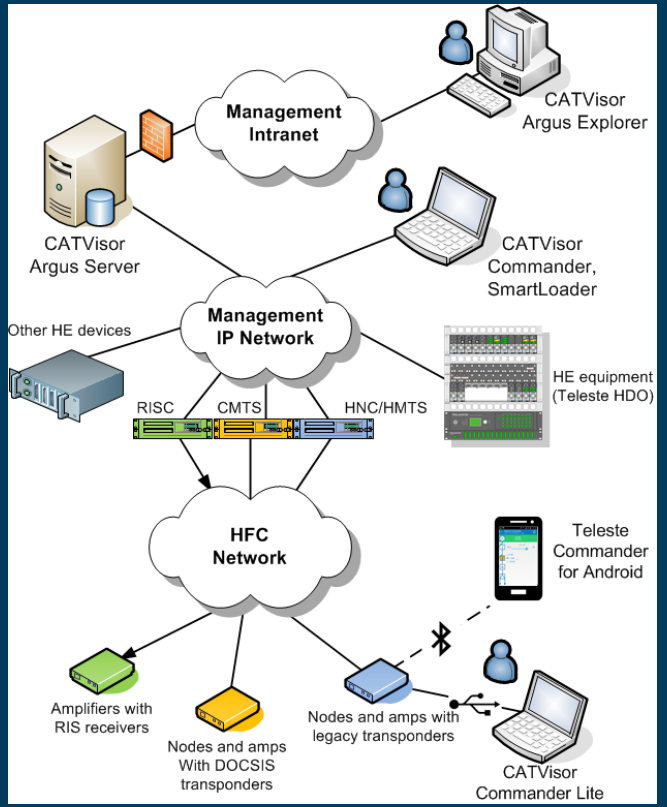
RIS 1218 MHz 204 MHz

- Fixed receiver and US transmitter
- No fibre organiser
- RF performance same as in E3
- Electrical adjustments in US / DS, OLC
- Local control with push buttons or via external USB (Windows or Android)
- Remote ingress switch control via E61 RIS module

CATVisor software family

CATVisor software family products

- Argus NMS (1.1)
  - Network Management System
- SmartLoader (1.5.24)
  - Network Configuration Utility
- Commander (3.0.5)
  - Local Management Terminal and/or Element Manager
- Teleste Commander for Android (1.12)
  - Service Terminal Application for Smartphones

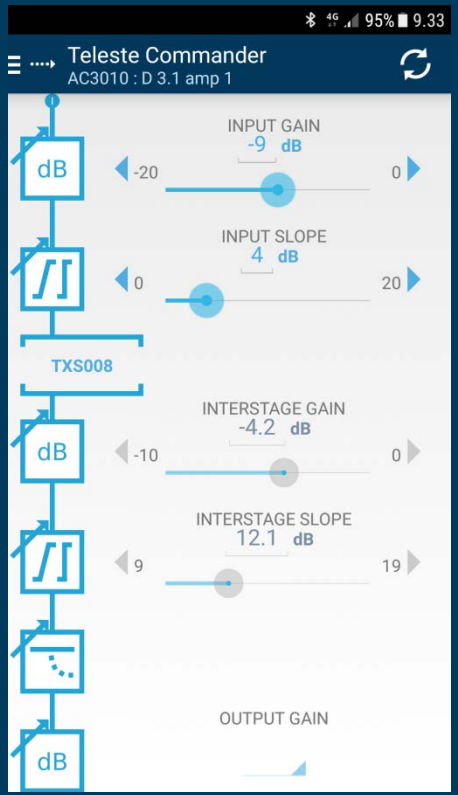


Teleste Commander for Android

- Available from Play store free of charge
- Bluetooth and USB communication
- Supports entire AC3K, ACE and E family
- Software downloads, software files are included
- Product manuals are included
- RIS element support

To be developed

- Spectrum / Ingress graphs
- Configuration save / load



CATVisor Commander 3.0 for Windows

- Commander Free is available from MyTeleste free of charge
  - Functionality equal to Commander Lite Basic
- Commander Premium is licensed per PC, site license is available
  - Remote IP connections
  - Settings saving and loading
  - New: HMS software download
  - New: SNMPv3 support
- Commander Secure has been requested for ‘cyber security’
  - Start-up passwords
  - File encryption
  - Release still TBD

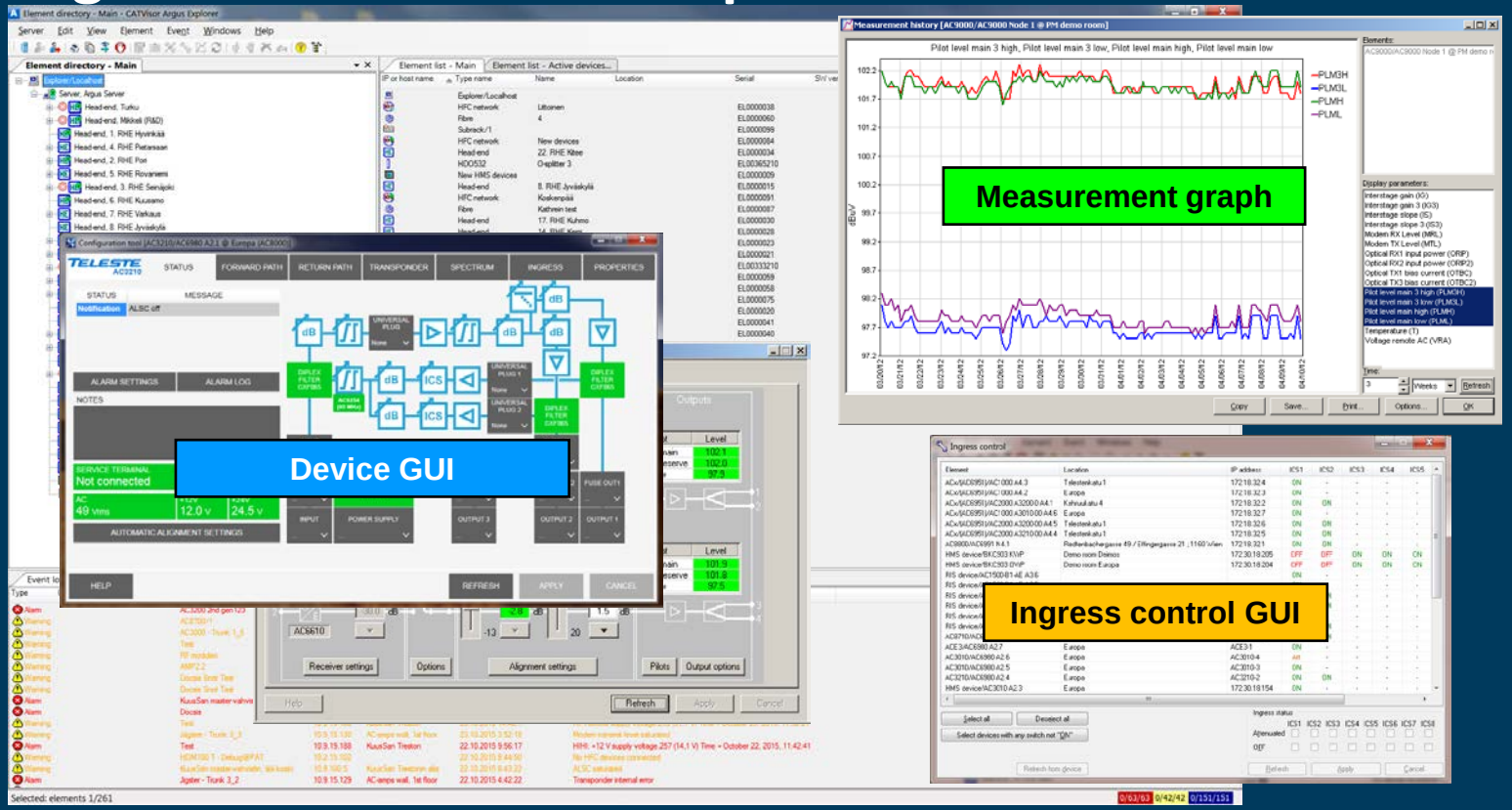
CATVisor Argus versus EMS

EMS 4.3 will be maintained at least during 2017
- Service releases will be published, currently SR3

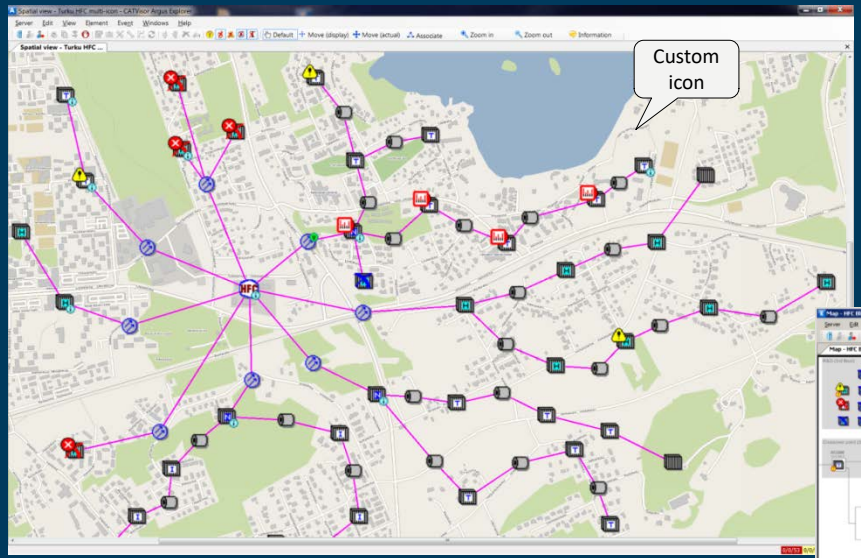
Argus was released in Q1 2017
- Simple migration from EMS
- EMS – Argus upgrade is included in SLAs
- Familiar GUI – Argus Explorer
- Coexistence with EMS is possible

All new functions are added to Argus
- RIS device support
- SmartRIS ingress control application
- Enhanced FTTB/FTTLA support
- Web client - desktop, mobile (under development)
- RADIUS and LDAP user authentication

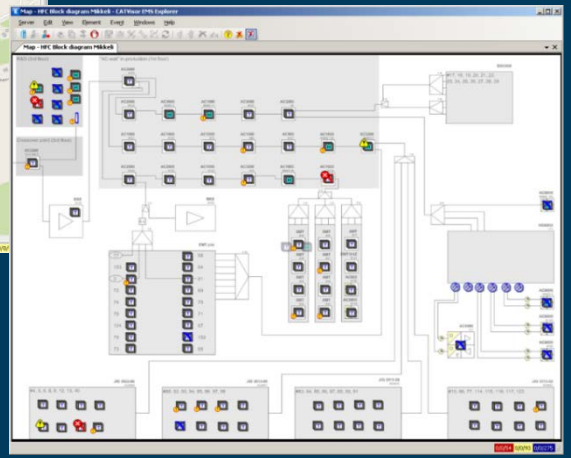
Argus functional GUI samples



Spatial view examples

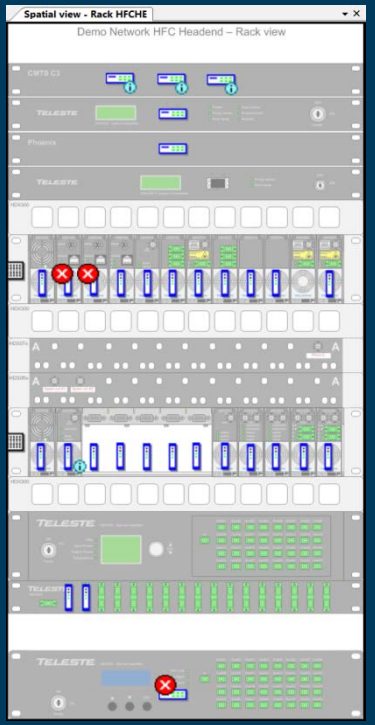


Network map



Network diagram

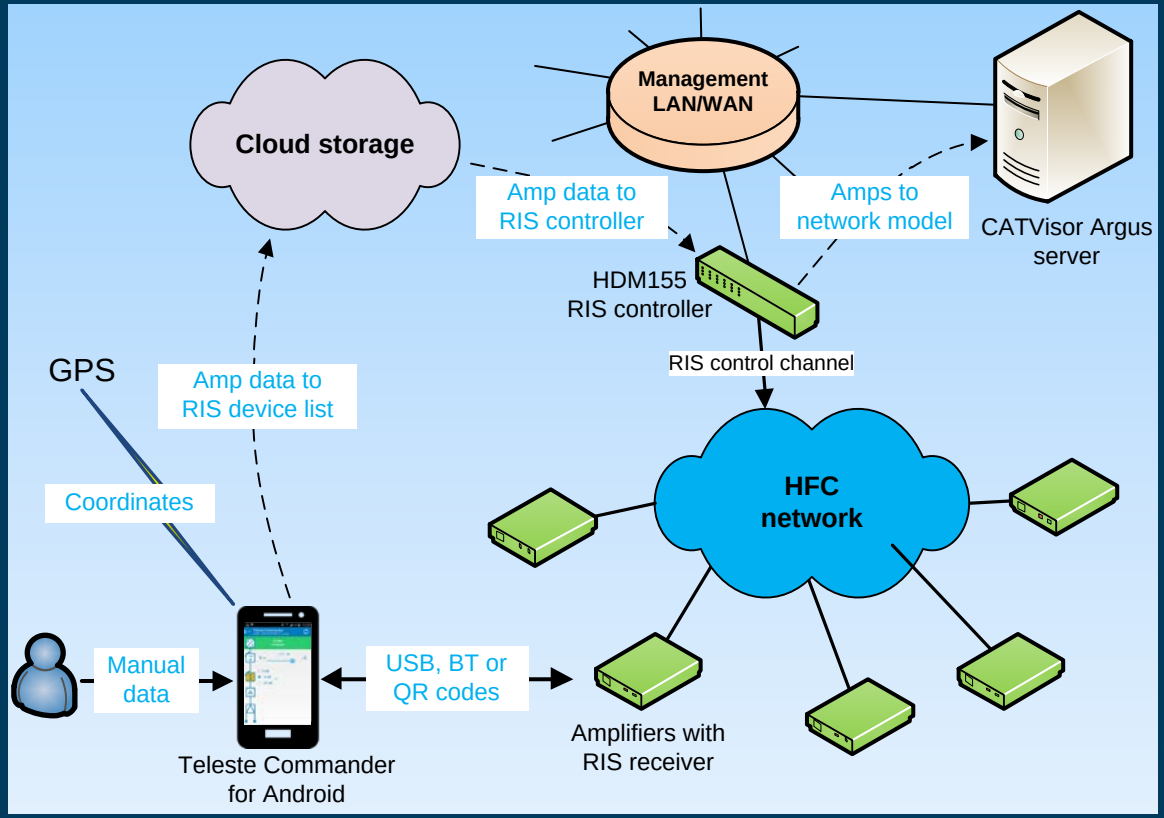
Rack layout



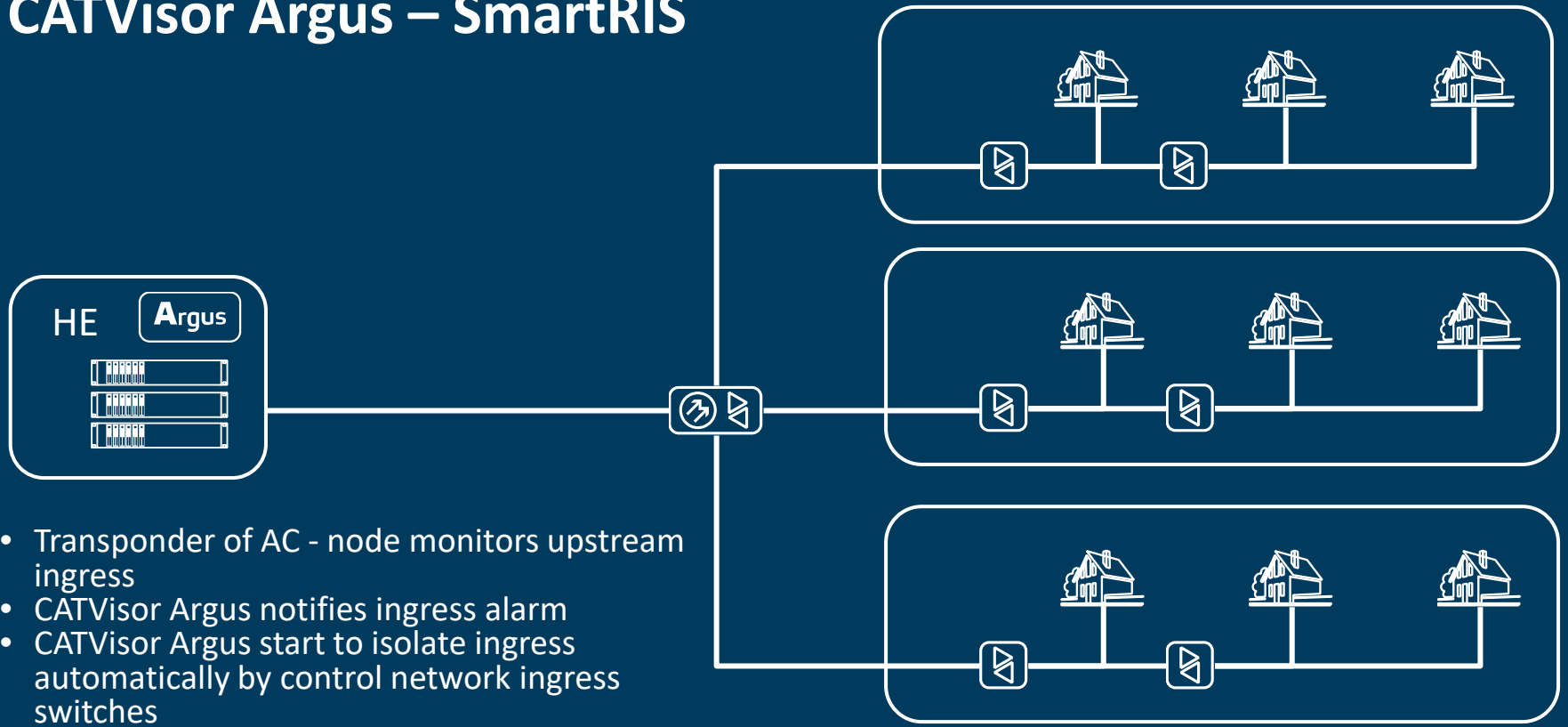
CATVisor Argus products and prices

Functions	Evaluation (60 d)	Starter	Basic	Premium
Element updates		x	x	x
Configurable views	x		x	x
Ingress control	x		x	x
SNMP agent	x		x	x
Measurement logging	x			x
Attachments	x			x
Spatial views	x			x
Software updates (SLA)				

‘RIS ecosystem’ with Argus and HDM155



CATVisor Argus – SmartRIS



- Transponder of AC - node monitors upstream ingress
- CATVisor Argus notifies ingress alarm
- CATVisor Argus start to isolate ingress automatically by control network ingress switches

Distributed Access Remote PHY update

1x1 and 1x2 Node modules

Compliant with MHAv2 Cablelabs specifications

2 x 10GbE SFP+ (second for redundancy, daisy chain)
Full spectrum Downstream up to 1.2 GHz
- 6 OFDM, 160 QAM
- Any QAM channel can be used either for DOCSIS or video

Full spectrum Upstream up to 204MHz
- 2 OFDMA, 12 SC-QAM
- One or two upstream segments (2 x up to 204MHz)

OOB
- 3 x downstream and 3 x upstream OOB blocks
- SCTE 55-1, SCTE 55-2, NDF/NDR, HMS (SCTE 25-1)
- Pilot, alignment and leakage tones

Cablelabs Speciation's
- Remote PHY Specification
- Remote Upstream External PHY interface Specification
- Remote Downstream External PHY interface Specification
- Remote PHY OSS interface Specification
- Remote DOCSIS Timing interface Specification
- Remote Out-of-Band Specification
- Generic Control Plane Specification
- Downstream RF Interface Specification

AC9100 NEO RPD & DAN300

Migration Node - 1x2 RPD

- 4 RF ports - 2 active
- Forward and return overlay options, transponder option
- Umax (138 QAM ch)@1.2 GHz 4 x 108 dBµV
- Power consumption 93 W (1x1 RPD)

Fiber Deep - 1x1 (1x2) RPD

- 2 RF ports - 1 active
- Forward RF overlay option
- Umax (138 QAM ch)@1.2 GHz 2 x 108 dBµV
- Power consumption 75 W (1x1 RPD)

Limited availability for trials Q2/18.
Availability Q3/18.

Teleste RPD Compact Shelf – Preliminary Plan

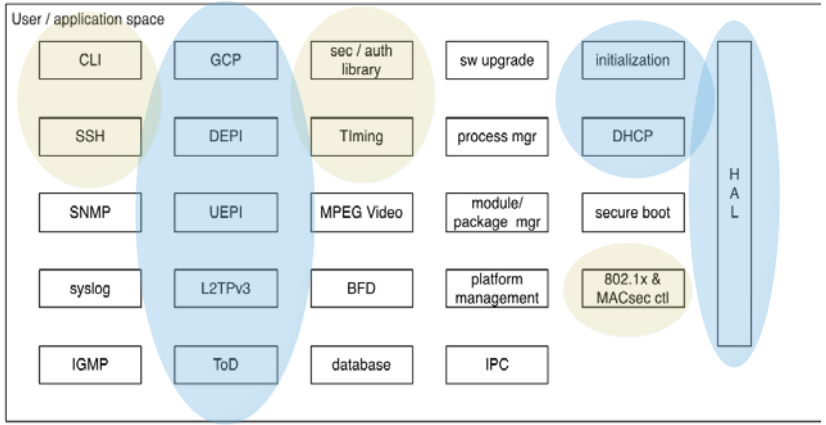
- Two RPD modules in 1RU 19 inch rack mechanics
- Output Level 25 … 55 dBmV per 6 MHz channel
- Slope adjustement 0...18 dB @85...1218MHz
- Controlled FAN cooling (front to back)
- Temperature range 0 ... 50°C
- 2x redundant PSU (100...230VAC 50/60Hz or 48VDC)

- The Teleste Compact RPD shelf (CRS) is designed for two use cases
  - Then main use case is in a MDU (fiber to the building) type of installation where the unit is connected in high gain mode to the building coax directly and can still be installed into a 19 inch rack.
  - In traditional shelf RPD application the unit is connected to optical receivers and transmitters and runs in standard gain mode

Interoperability

Interoperability

- **True multivendor market requires proven interoperability** (IoP). CableLabs qualification process is the main vehicle to verify standards compliancy . Teleste is participating in the Cablelabs IoP procedure.
- Cablelabs driven **open source OpenRPD** project implements DOCSIS specific signaling and control functions to ensure IoP. Teleste RPD SW is based on the OpenRPD SW.
- **Teleste and Cisco** have an additional agreement in place to speed up the joint IoP



Implemented in OpenRPD

Partially implemented in OpenRPD

Migration to Remote PHY

RPD & OOB

FM radio

→ RF overlay or NDF

RPD node management

→ Through IP

HFC element management

→ Controller implemented in RPD. Optionally NDR and NDF.

Remote Ingress Switch controls

→ Controller implemented in RPD. Optionally NDF.

Return monitoring

→ NDR and Upstream spectrum support

Forward and return sweeps

→ Return sweep: Upstream spectrum and NDR + NDF

→ Forward sweep: Sweepless sweep (using payload)

Pilot carriers

→ CW (Continuous Wave) carriers

Leakage detection signals

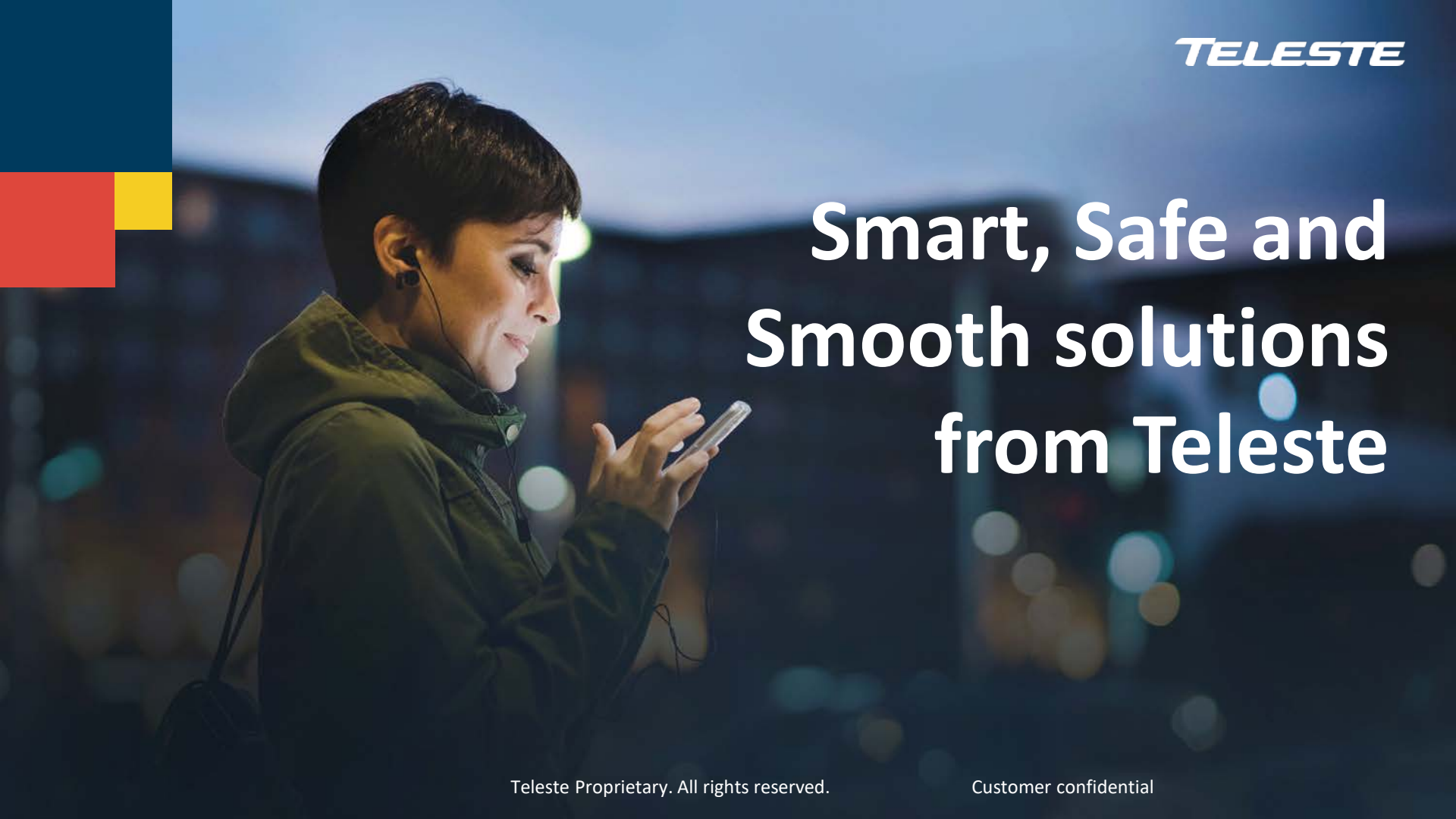
→ CW carriers

Technology Development

RPD / FDX / RMD

Technology development

- **1st generation products - Today**
  - 1x1 and 1x2 RPD
  - 36 / 40W RPD power usage
- **2nd generation products – Late 2019**
  - 1x1 and 1x2 RPD with 20...25 % less power compared to gen 1
  - RPD 1x1, 1x2, 2x2.
  - FDX support, expected power consumption slightly higher than gen 1 1x2 RPD
  - DPD support, focus for US market products.
  - Supports MACPHY
  - **MACPHY specification at Cablelabs starting now**



Smart, Safe and Smooth solutions from Teleste