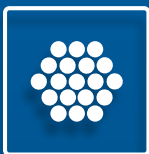




High Density Optical Platform

FROM HYBRID FIBER COAX TO FTTx AND DIGITAL FIBER COAX NETWORKS



OPTOPUS Engineered to Perform



Solutions with **OPTOPUS**



HFC

From the Headend to the wall-outlet:
Everything for the cable network.



RF OVER GLASS

RFoG is the solution for FTTH networks
based on DVB and DOCSIS.



RF OVERLAY

Solutions for video services in GPON
and Active Ethernet networks.

OPTOPUS

One Platform for All Networks

The WISI optical platform Optopus is a highly flexible and high density platform for all kinds of RF optical networks. The system is used in any network such as HFC, RF over Glass or RF Overlay in FTTX applications.

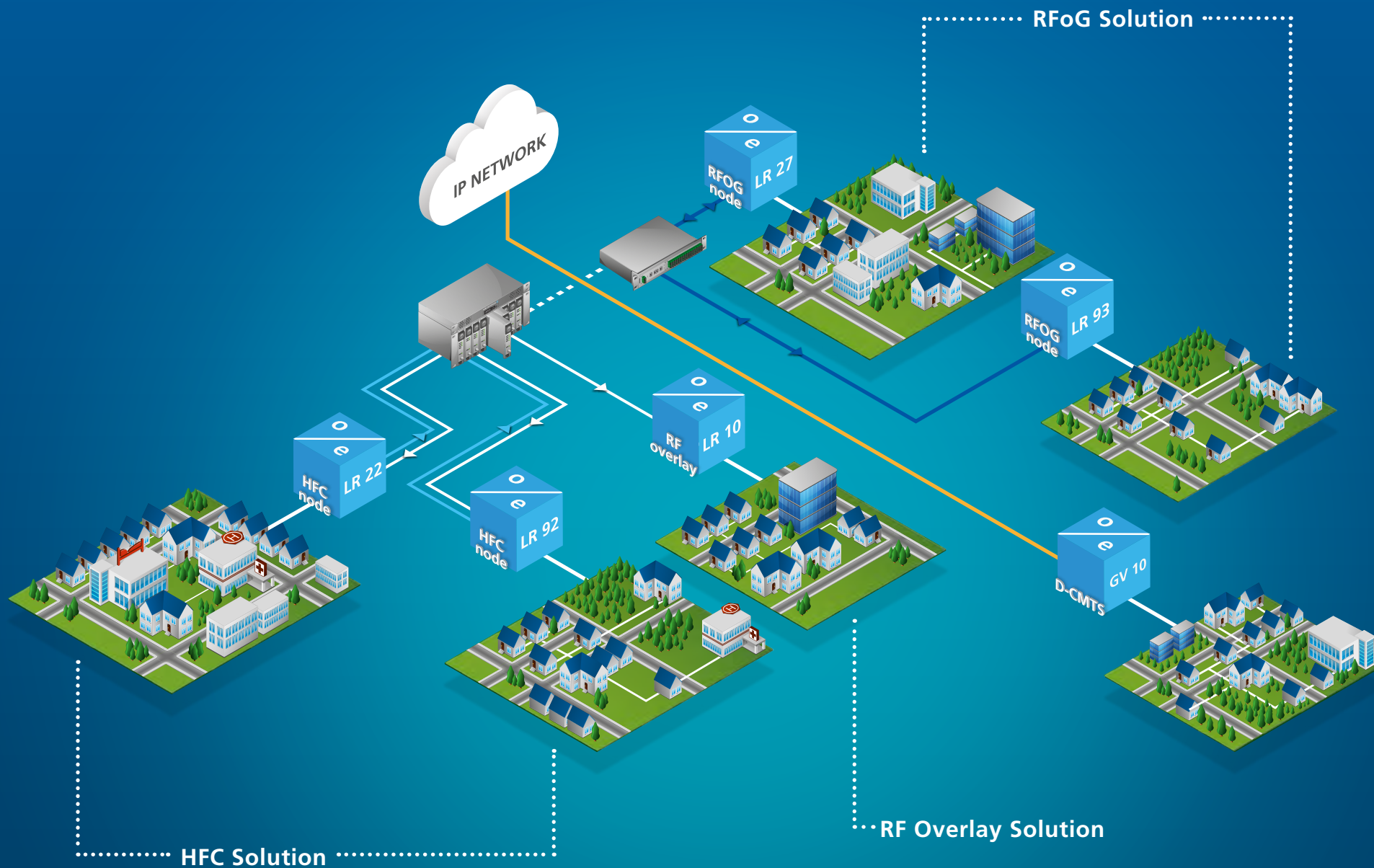
Optopus is designed to meet the high requirements and reliability necessary for today's networks. State-of-the-art features such as redundant AC and DC power supplies, pluggable fan units and advanced management features meet the carrier-grade demands of telecommunication and cable operators.

The Optopus platform allows to mount any module into any slot, thus giving the possibility for individual configuration depending on the desired applications.

With its 14 slots in a 4 rackunit chassis it utilises up to 28 transmitters, 56 receivers or a mixture of them including passive optics, power supply and management unit. Optopus is the system of choice for every operator enabling powerful, flexible and cost efficient optical access networks.

WISI Optopus at a glance:

- Full modular concept allows every application mix
- Hot swappable modules simplify upgrades
- DOCSIS 3.1 capable
- Passive backplate for easy cabling and maintenance simplification
- Redundant power supplies guarantee system availability
- Dust-free passive module cooling enlarges module lifetime
- Advanced management features for easy installation and operation



OPTOPUS Solutions

Everything for the
cable network



HFC

The HFC networks of network providers and city carriers are anymore solely designed to the broadcasting of analogue and digital TV programmes. In the last few years communication services such as broadband internet access, video-on-demand and telephony have been added.

Beyond that, customers want to use more and more high definition content on their mobile end devices, which have to be provided by the network operator.

These new interactive TV and data services in particular increase the requirements for flexibility and bandwidth in the backbone as well as the access network.

Fiber-to-the-Home with
DOCSIS and DVB



OBI-Free RFoG

Cable providers and city carriers are looking for cost-efficient solutions to upgrade their existing network infrastructures to the level of FTTB (Fiber To The Building) or even FTTH (Fiber To The Home).

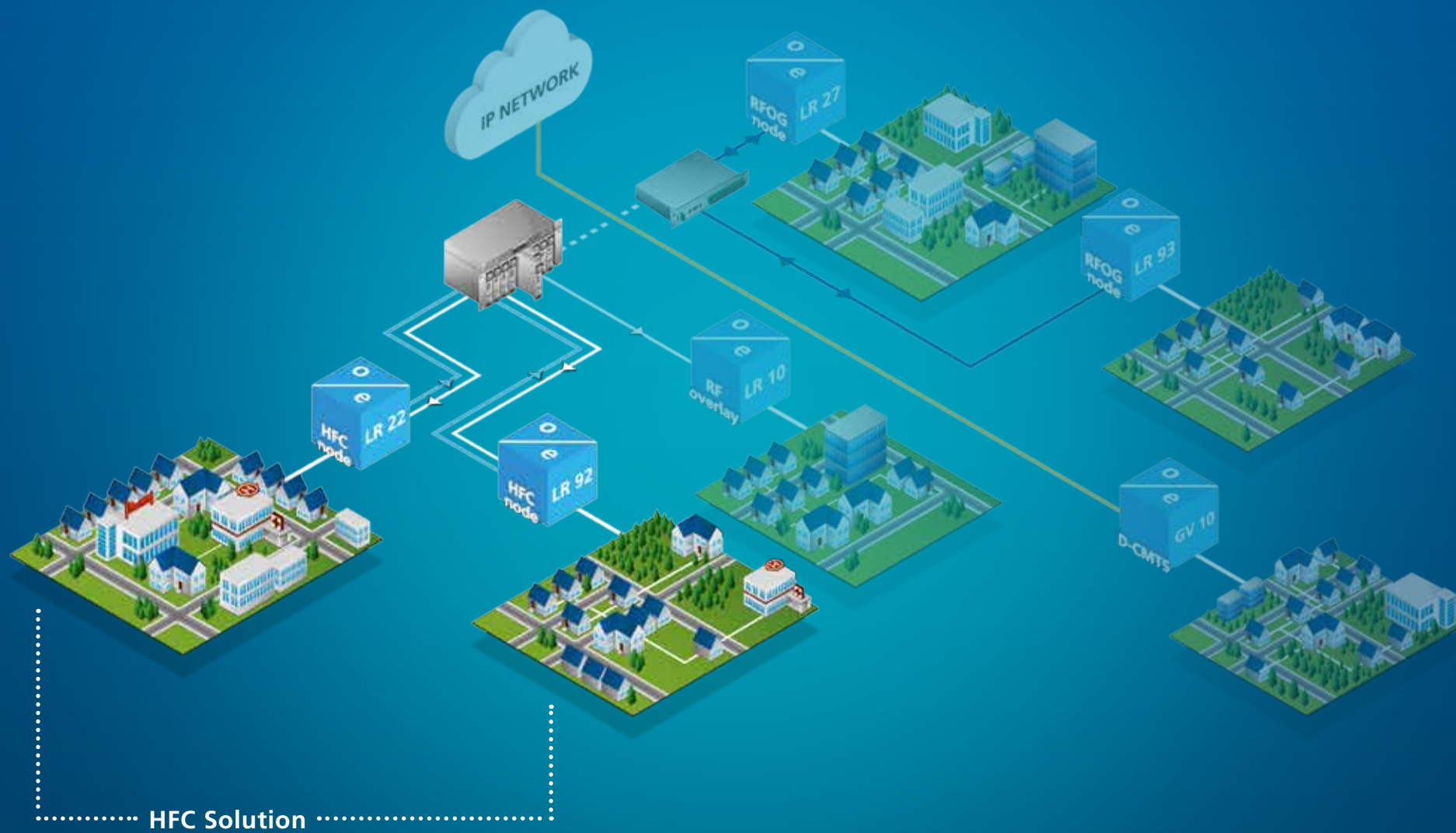
RFoG is a passive optical network that transmits HF signals via fiber to the subscriber, similar to a HFC network in the downstream direction. And therefore a key requirement to the RFoG implementation is to keep the existing DOCSIS infrastructure and provisioning services.

Simple TV distribution
with Open Access



RF Overlay

The days of good old linear TV are far from being numbered. On the contrary, over the last years TV viewing time in private households has even further increased from an already high level. However, the way how and especially where viewers use their TV is changing. In the course of Video-On-Demand, MultiScreen, SmartTV, and HbbTV viewing habits and needs change from generation to generation. As a rule TV becomes more interactive and mobile the younger the viewer is. At the same time there is a trend towards HD technology. As a consequence, bandwidth requirements are rapidly increasing. Telecommunications service providers and city carriers have to take this development into account when expanding their existing network infrastructure.



Everything you need for your cable network

HFC Solution

With the release of the new DOCSIS 3.1 standard, the requirements for cable operators have been increased drastically.

Due to new modulation schemes and higher frequency ranges a complete new set of requirements is facing the network operators. The increasing amount of bandwidth is key to keep the pace with other service providers and to avoid subscriber churn.

Beside an extended bandwidth the signal quality shall stay unimpaired.

To overcome these new challenges, network operators have to evolve their existing network infrastructure with new intelligent and cost effective components.

Solutions how to meet the bandwidth requirements of providers which have developed their network with HFC technology in combination with DOCSIS cable systems are in demand. WISI has the ideal answer with its optical high-density platform Optopus for HFC networks. This includes amongst other things a portfolio of optical transmitters and amplifiers as well as return path receivers for any HFC application.

The use of O-band WDM technology with corresponding WISI components for example minimises the HFC cluster and maximises the bandwidth for connected customers extremely cost-efficient without using additional glass fibre.

- **DOCSIS 3.1 compliance with frequency ranges up to 1.2 GHz**
- **Full Spectrum Transmitter for easier service group clustering**
- **High linearity for bit error free transmission in full digital load network**
- **Complete range of DWDM downstream transmitter and CWDM and DWDM upstream transmitters**
- **Ultra dense and low power consuming return path receivers (quad)**
- **Highly scalable EDFA output configurations (power and no. of output ports)**
- **Compact fiber node for in-/outdoor usage incl. DOCSIS 3.1 compliance**

Products used for HFC solution



LX 10
Longhaul Broadcast Transmitter



LX 15
Broadcast Transmitter



LX 17
Narrowcast Transmitter



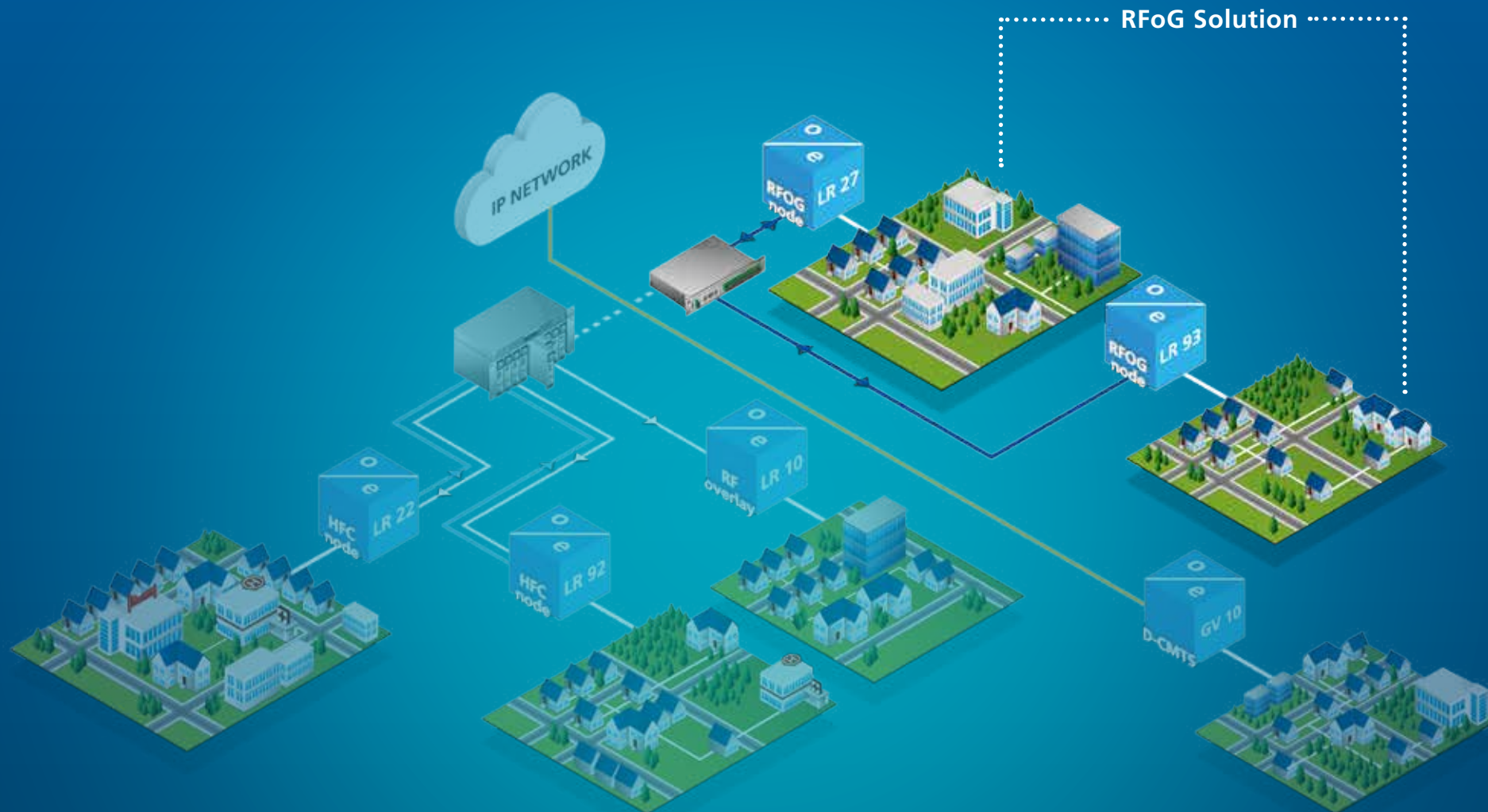
LX 30
Optical Amplifier
(EDFA)



LX 22
Return Path Receiver



LR 22
HFC Fiber Node



Fiber-to-the-Home with DOCSIS and DVB

OBI-Free RFoG Solution

Cable providers and city carriers are looking for cost-efficient solutions to upgrade their existing network infrastructures to the level of FTTB (Fiber To The Building) or even FTTH (Fiber To The Home).

RFoG is a passive optical network that transmits HF signals via fiber to the subscriber, similar to a HFC network in the downstream direction. And therefore a key requirement to the RFoG implementation is to keep the existing DOCSIS infrastructure and provisioning services.

As many providers experienced difficulties during the ramp up of new RFoG networks, which were based on Optical

Beat Interference (OBI), the massive rollout of new networks has been paralyzed.

To overcome these odds, WISI has developed the OBI FREE solution within the OPTOPUS platform. This enables network providers to heal existing OBI infected RFoG networks without any need to swap existing end user equipment. The solution will even work with any upstream wavelength and laser mode.

Optopus and its OBI-free RFoG technology offer network providers a complete future proof advantage while opening the doors into new fields FTTx.

- DOCSIS 3.1 compliant OBI-free solution
- Suitable rack dimensions for street cabinet usage
- Split ratios for 8, 16 and 32 ports
- WDM filters for open access network compliance
- Electrical or optical upstream for coax or fiber uplink
- Works with existing infrastructure
- Ultra low noise RFoG node with switchable output level for miscellaneous inhouse architectures
- Pluggable diplex filters for easy migration towards DOCSIS 3.1

Products used for RFoG solution



LX 15
Broadcast
Transmitter



LX 23
RFoG Upstream
Receiver



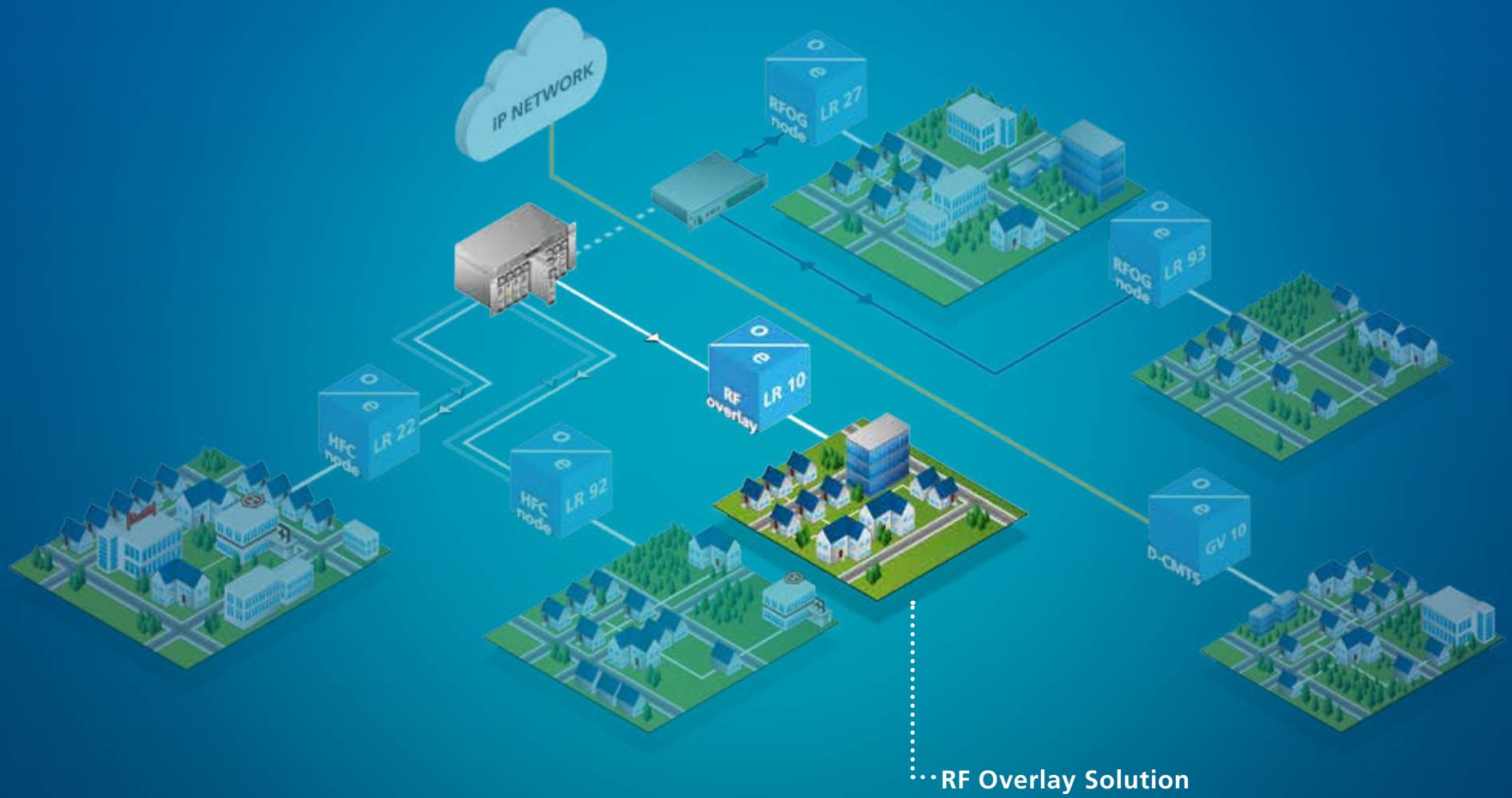
LX 30
Optical Amplifier (EDFA)



LX 24
Multidiode Receiver



LR 93
RFoG Node



Solution for video services in open access networks

RF Overlay Solution

TV as basic broadcast service is still mandatory even for newly deployed facilities.

In the course of Video-On-Demand, MultiScreen, SmartTV, and HbbTV viewing habits and needs change from generation to generation. To provide those services along the same distribution network, RF Overlay is key because of the Open Access capabilities for miscellaneous service distribution technologies like Passive Optical Networks.

Economically efficient expansion strategies are needed. For more distribution services – such as TV – a point-to-multiple-

point solution like RF Overlay is advisable. All analogue and digital TV channels are transmitted to the customer via an additional wavelength (1550nm) or through a dedicated fibre.

With its high-capacity optical platform Optopus, WISI offers system operators a technically mature solution for the realisation of optical TV distribution in FTTx networks. The platform includes a wide range of 1550 nm transmitters as well as powerful EDFAs whose capacity vary with the dimension and topology of the respective network thereby providing system operators with an ideal solution which is equally efficient and sustainable.

- **Highly integrated EDFA and splitter solution for blast & split architectures**
- **Very high internal power of up to 38 dBm (YEDFA)**
- **Up to 32x 20 dBm in a single rackunit**
- **64 output ports in two rack units (LX 37)**
- **Management via SNMP, web-interface and handset**
- **Redundant hot pluggable power supplies and fans**
- **Different connector styles available (SC/APC, LC/APC, E2000/APC)**

Products used for RF Overlay solution



LX 30

Optical Amplifier (EDFA)



LX 37

Standalone optical amplifier
with integrated splitter



LP 90

Passive optical splitters



LR 10

RF Overlay Receiver
with integrated
Fiber Termination



LR 91

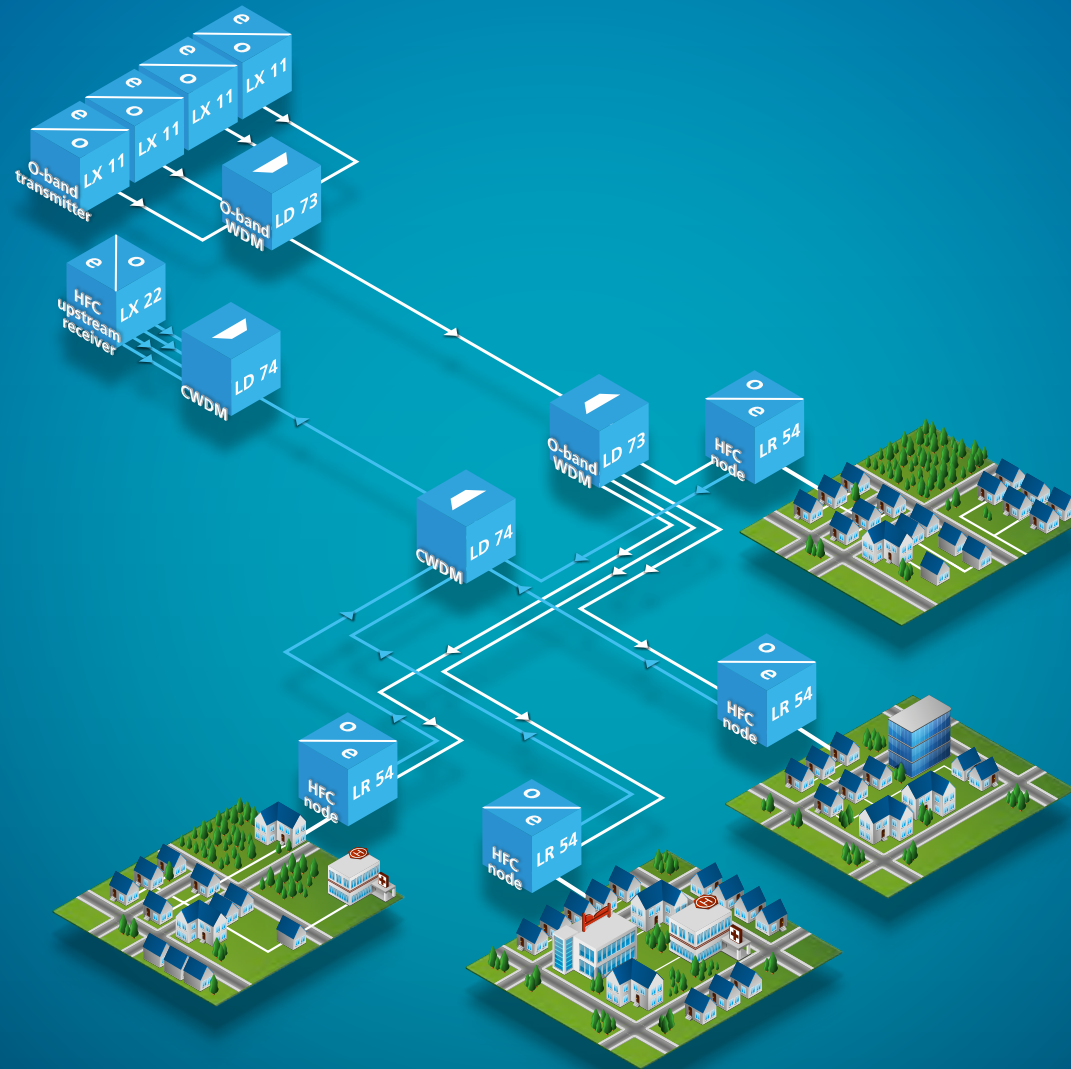
RF Overlay Receiver

OPTOPUS Applications

HFC Distribution Networks

Optopus includes the full range of transmitters, return receivers and optical passives for every HFC application.

By using O-Band WDM technology with the fullband transmitters LX 11, it is possible to reduce HFC cluster sizes without deployment of additional fiber. This reduces the cost of a bandwidth increase significantly.

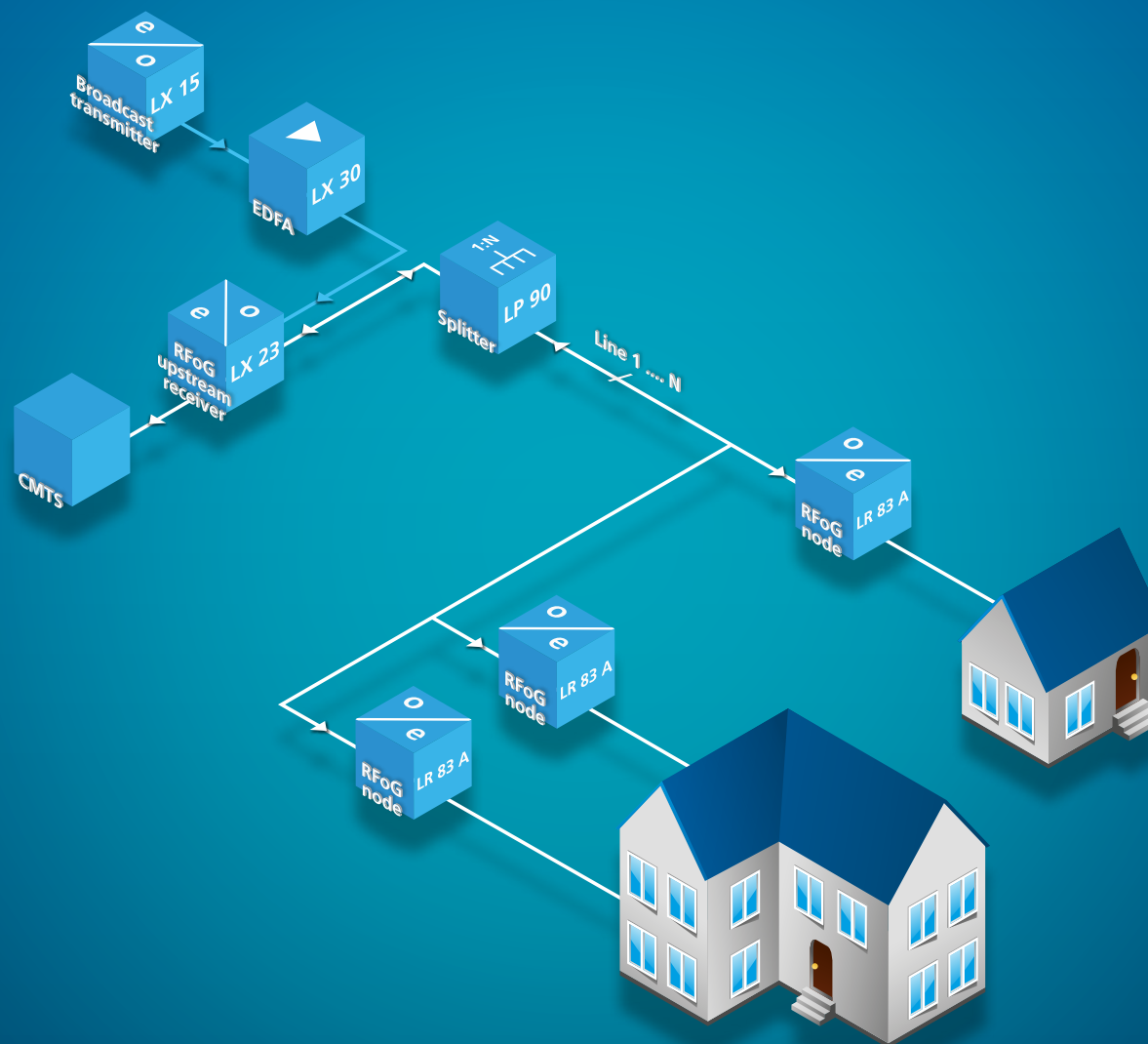


OPTOPUS Applications

FTTH - RF over Glass

Optopus includes the components for RF over Glass networks, the cable operators' choice for FTTH applications.

Depending on the size of network and distances to cover, Optopus offers a range of externally or directly modulated transmitters and high power YEDFAs. The RF over Glass receiver LX 23 with its very low noise receivers ensures optimization of the network even in challenging topologies.

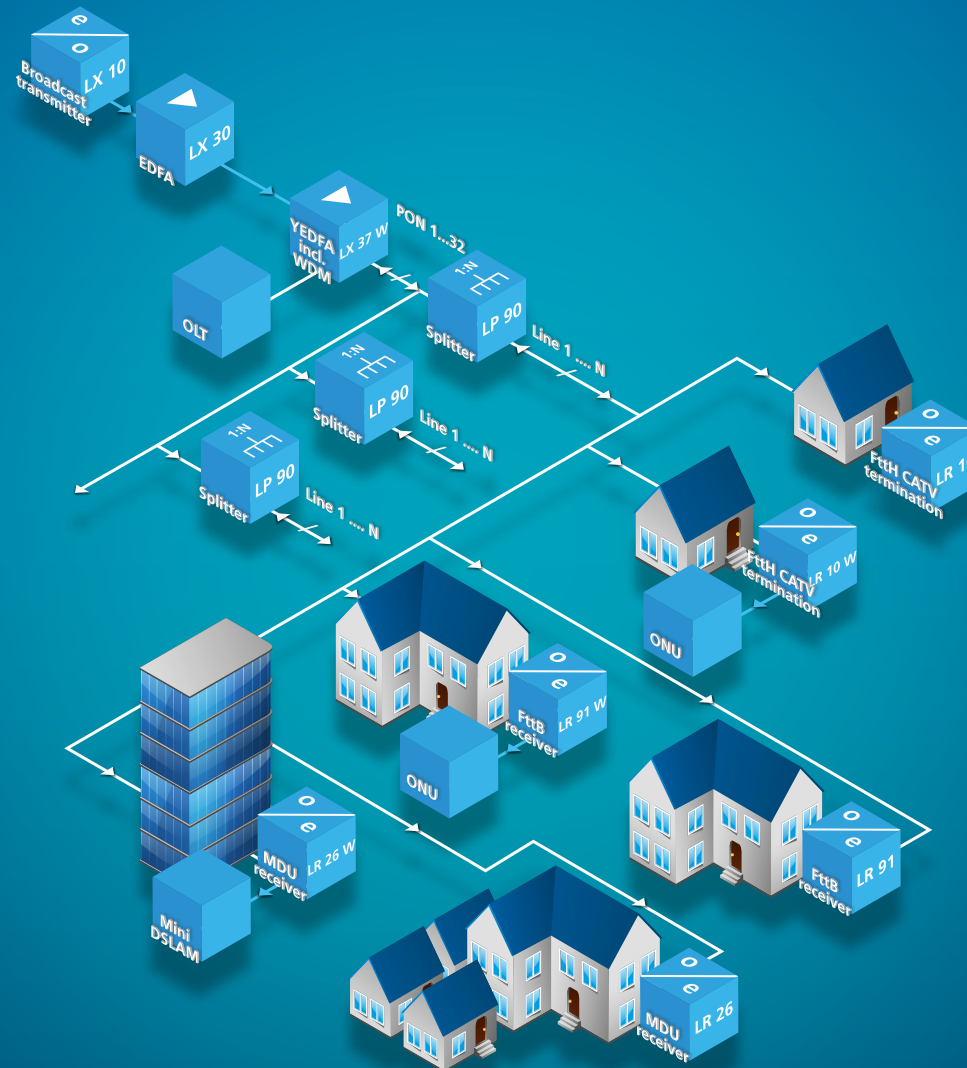


OPTOPUS Applications

FTTx - RF Overlay

Offering broadcast TV services in today's FTTx networks is easily realized using 1550 nm transmitters together with high power YEDFAs.

The Optopus product family includes externally modulated transmitters LX 10 and very high power YEDFAs LX 37 for large scale deployments. For smaller networks a variant with directly modulated LX 15 transmitter is also possible.

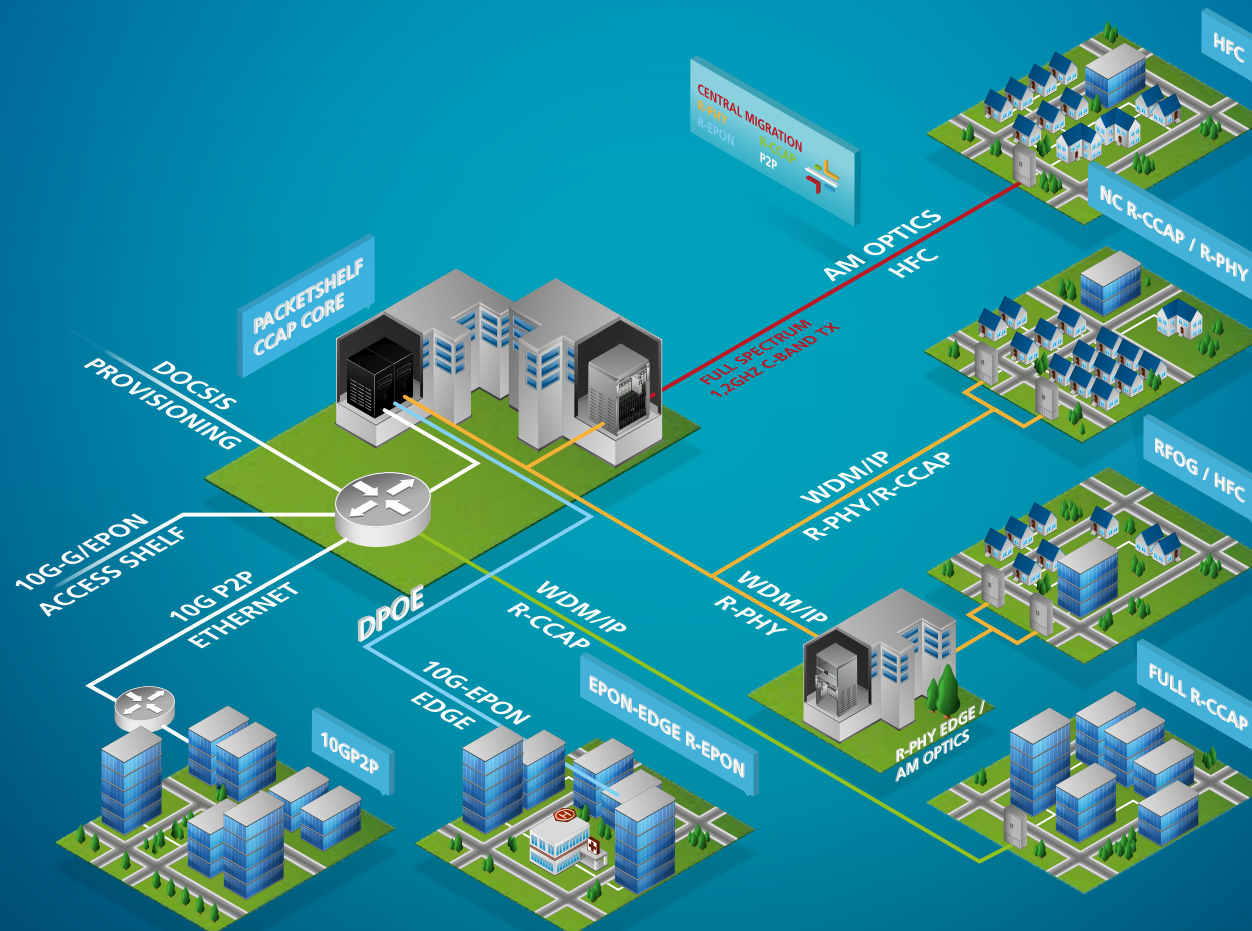


CCAP - Converged Cable Access Platform

Paving the way towards digital fiber networks, the OPTOPUS platform is well prepared to provide the necessary support for these architectures.

Existing core architectures are divided into packet and access based functions to allow more flexibility in scaling. This allows further digital feeds towards the subscriber, while using existing OPTOPUS features to adapt to existing architectures like HFC or RFoG. With the use of Full Spectrum Transmitters, the handling of service groups will be simplified along with the cabling.

Furthermore, decentralized implementations will become more important with the availability of Remote-CCAP and Remote-PHY devices, while central components turn in multidimensional scaling architectures with the help of NFV (Network Function Virtualization) Features.



OPTOPUS Base Units

Visit wisi.de for more info about our products

LX 50

4 Rack Unit Chassis



BENEFITS

- Scalability: single platform for all RF networks
- Modularity: ost-effective modules for all applications
- Ease of use: simplified planning, operation, sparing

KEY FEATURES

- Carrier grade functionalities
- High density: up to 14 modules per shelf
- Very low power consumption

LX 52

1 Rack Unit Chassis



BENEFITS

- 2 OPTOPUS slots in a single rack unit
- Cost and space efficient solution for smaller networks

KEY FEATURES

- Carrier grade functionalities
- Hot-swap of modules, fans and power supplies
- Redundant power supply
- Management via SNMP or web-UI

LX PS 0230/

LX PS 0048

Power Supplies



KEY FEATURES

- Hot pluggable
- Redundant usage
- Carrier grade DC supply 48V

OPTOPUS Transmitter Modules

**LX 15 S 3000/
LX 15 S 4000**
Full Spectrum
Transmitter



LX 12
Dual 1310 nm
Transmitter



LX 13
Dual CWDM
Upstream
Transmitter



KEY FEATURES

- DOCSIS 3.1 compliant
- Long transmission reach
- Price advantage compared to standard ExMods
- High density
- Up to 28 transmitters in one OPTOPUS chassis
- Adjustable optical output power
- DWDM, fixed and tunable version available

KEY FEATURES

- Extended DOCSIS 3.1 frequency range 10 ... 1218 MHz
- Uncooled isolated DFB laser with +3 dBm or +6 dBm
- Adjustable OMI and Automatic Level Control (ALC)
- Very low power consumption
- Only 6 W per service group
- Test point toggling
- Monitoring the input signal or the OMI after ALC

KEY FEATURES

- Future proof frequency range
- 5 ... 500 MHz
- DOCSIS 3.1 compliant
- Output power +3 dBm or +5 dBm
- Adjustable OMI for optimized operation
- Dual-Stage isolated DFB-laser ensures CNR performance

OPTOPUS Receiver Modules

LX 21

Downstream
Receiver



KEY FEATURES

Frequency range 47 ... 1006 MHz

Automatic level control (ALC) for constant output level

Optical input power -7 ... +3 dBm

High output level

90 dBμV @ 4% OMI (ALC on)

LX 22

Upstream Receiver



KEY FEATURES

Wide input power range

-17 ... 0dBm

Low noise receiver

2 pA/√Hz for best CNR performance

4 independent upstreams per unit or 1 combined for cluster segmentation

Optical ALC for constant RF level or manual configuration

LX 24

RFoG Upstream
Receiver



KEY FEATURES

OBI-free RFoG solution

Legacy network/node support

Management capabilities

Electrical or optical uplink

Street cabinet sizing

OPTOPUS Optical Amplifiers

LX 30

Optical Amplifier
Module (EDFA)



LX 35

Standalone Optical Amplifier (EDFA)



LX 37

Standalone Optical Amplifier (EDFA)



KEY FEATURES

High power Efficiency

up to 24 dBm total output power in an Optopus module
(4x 17.5 dBm)

Carrier-grade functionalities via Optopus chassis LX 50 / LX 52

Signal connections on the rear

KEY FEATURES

High power, high density

Up to 38 dBm total output power in 1 RU (32x 20 dBm)

Stand-alone operation with remote management, redundant power
supplies and fans

Optional: Integrated multiplexers for PON overlay

64 output ports in two RU (LX 37)

Management via SNMP, web-interface and handset

Redundant hot pluggable power supplies (AC/DC) and fans

Different connector styles: SC/APC, LC/APC, E2000/APC

VARIANTS*

■ 1x 14 dBm, 2x 14 dBm

■ 1x 17 dBm, 2x 17 dBm, 4x 17 dBm

■ 1x 21 dBm, 2x 21 dBm

■ 1x 14 dBm, 2x 14 dBm

■ 1x 17 dBm, 2x 17 dBm, 4x 17 dBm, 32x 17 dBm

■ 1x 21 dBm, 8x 21 dBm, 16x 21 dBm, 32x 21 dBm

■ 54x 17 dBm

*Other versions on request

COMPACT LINE/GLOBAL LINE Nodes

Visit wisi.de for more info about our products

LR 54/ LR 55

HFC Node

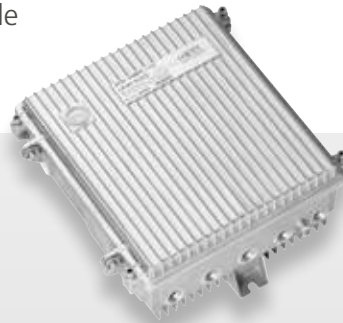


KEY FEATURES

1x1 Fiber Node for HFC / CATV applications
Optical automatic level control for constant output level
Easy handling with handset
Integrated fiber management
Output power CENELEC: 110 dBuV (flat) / 113 dBuV (9 dB slope)
Power consumption: < 25 W
Local power (LR 54) or remote power (LR 55)
Various pluggable upstream transmitter LT 4x
HMS management

LR 43

HFC Node



KEY FEATURES

1x2 fiber node with high output power
Pluggable optical transmitter and receiver modules meeting individual application
Electronic upstream clustering for bandwidth increase
Output power CENELEC: 2x 114 dBuV (6 dB slope)
Power consumption: < 45 W
Local power (LR 43) or remote power (LR 63)
Pluggable Upstream Transmitter LT 4x
HMS management

LT 4x

Pluggable Upstream Transmitter



TECHNICAL INFO

Laser type	Dual stage isolated DFB laser
Optical output power	+3 dBm/+6dBm
Wave length	CWDM Grid
Frequency range	10 ... 85 MHz
Relative intensity noise	< -145 dB $\sqrt{\text{Hz}}$
Nominal input level	75 dB μV

VALUE LINE Nodes

LR 22

HFC Fiber Node



KEY FEATURES

High output level for MDU applications 117 dBμV (6dB slope) / 114 dBμV (flat)

Two configurable RF outputs with pluggable splitters/taps

DOCSIS 3.1 compliant with Downstream up to 1.2 GHz and Upstream up to 204 MHz

Pluggable duplex filters for migration

Full adjustment control via wireless bluetooth app or handset OH 41

Full adjustment control via wireless bluetooth app or handset OH 41

Compact housing for outdoor use (IP66)

Locally powered (LR 2x 2xxx) or remote powered (LR 2x 6xxx)

LT 22

Optical Upstream Module



KEY FEATURES

Laser type isolated CWDM DFB lasers

Optical output power +3 dBm output power

Frequency range 5 to 204 MHz

Wave length 1270 ... 1610 nm CWDM grid

Nominal input level (5 % OMI) 75 dBμV

LR 27

RFoG Node



KEY FEATURES

High output level for MDU applications 117 dBμV (6dB slope) / 114 dBμV (flat)

Two configurable RF outputs with pluggable splitters/taps

DOCSIS 3.1 compliant with Downstream up to 1.2 GHz and Upstream up to 204 MHz

Pluggable duplex filters for migration

Full adjustment control via wireless bluetooth app or handset OH 41

Remote control (compliant to IEC 60728-14) via FSK receiver module

Compact housing for outdoor use (IP66)

Locally powered (LR 2x 2xxx) or remote powered (LR 2x 6xxx)

OPTOPUS Micronodes

LR 91

RF Overlay Fiber Node



KEY FEATURES

- Optical input power -8 ... +1 dBm
- Output power 100 dBuV (3 dB slope) or 80 dBuV (flat)
- Variable input attenuator (20 dB)
- Electrical downstream test port
- LED monitoring of downstream input power
- LR 91 W: integrated optical filter for PON-loop-through

LR 92

HFC Fiber Node



KEY FEATURES

- Optical input power -8 ... +1 dBm
- Output power 98 dBuV (6 dB slope) or 80 dBuV (flat)
- Variable input attenuator (20 dB)
- Switchable downstream / upstream test port
- LED monitoring of downstream input power and upstream laser operation
- LR 92 W: integrated optical multiplexer for US and DS on one single fiber

LR 93

RFoG Fiber Node



KEY FEATURES

- DOCSIS 3.1 compliant
- Optical input power -6 ... +2 dBm
- Output power 98 dBuV (5 dB slope) or 80 dBuV (flat)
- Pluggable Diplex Filter
- Switchable downstream / upstream test port
- LED monitoring of downstream input power and upstream laser activity
- LR 93 W: integrated PON filter for open access architectures

OPTOPUS Attenuators etc.

LD 95

Variable Attenuator



KEY FEATURES

- Easy alignment of optical power level
- Perfectly suited for merging broadcast and narrowcast signals
- Two independent attenuators in one passive OPTOPUS module
- Insertion loss 1...30 dB

LP 40

Optical module tray



KEY FEATURES

- Up to 4 passive optical modules LD in 19" 1RU
- Different optical modules available, e.g. WDM filters, splitters

LP 90

PLC splitters for RFoG and FTTx networks



KEY FEATURES

Optical PLC splitter module LP90 for FTTx applications in 1RU

1:8 splitter LP90 0108

1:16 splitter LP90 0116

1:32 splitter LP90 0132

1:64 splitter LP90 0164

Insertion loss:

- ≤ 10.5 dB (1:8)
- ≤ 13.8 dB (1:16)
- ≤ 17 dB (1:32)
- ≤ 21 dB (01:64)

OPTOPUS System Advantages

Reduction of maintenance outages because of
FULL MODULAR CONCEPT



The modular concept of Optopus allows every application mix in a single system.

Modules can be inserted or exchanged during operation thus simplifying extension and reducing maintenance outages.

OPTOPUS System Advantages

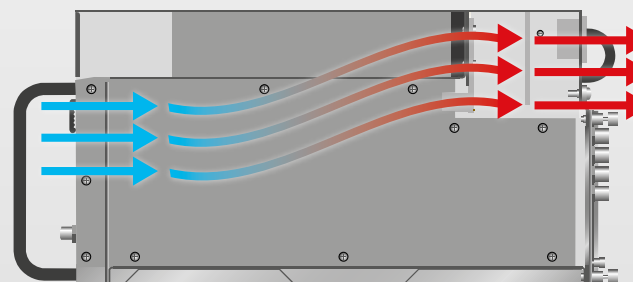
Advanced **MANAGEMENT FEATURES**

The system offers **comprehensive local and remote monitoring features** for each and every module. Supervision and operation is realized using state-of-the-art SNMP features and/or a web interface.



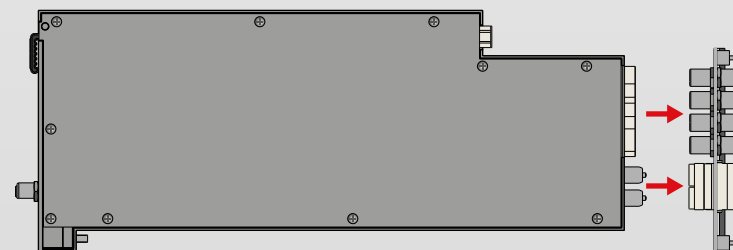
Prolonging the lifetime of modules because of **PASSIVE MODULE COOLING**

The **cooling and ventilation system** of Optopus is designed to prolong the operating lifetime of modules. The equipment uses a passive cooling without active fans or ventilation holes in the modules.



Reduction of maintenance outages because of **PASSIVE BACKPLATE**

The **passive backplate system** allows exchange of modules during operation without re-cabling. The system therefore reduces maintenance outages significantly.



OPTOPUS References



Deutsche Telekom AG: TV and Internet for housing association

Project Description

Deutsche Telekom AG connects the facilities of a nation-wide operating housing association. Many thousands households got access to TV and internet services using the new fiber infrastructure of Deutsche Telekom.

Application

EDGE Headend with Tangram providing digital and analog video and audio services. The optical broadband network is built with Optopus using a Broadcast / Narrowcast architecture and CWDM return path.



“WISI has proven technical competence in some projects for us and convinced by its solutions”

Guido Schwarzfeld, Leiter PM, Deutsche Telekom

Engineered
to Perform



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