

# CONNECTIONS 53

## Next Generation Optical Connectivity

Istanbul New Airport:  
**Network Cabling for Largest  
Airport in the World**

Solutions for Shipbuilding:  
**Fit for the Ocean**

**Cat. 8.1: R&M is Ready**



## Innovative Together



050.6489

Dear Business Partners

Increasing digitalization is constantly necessitating new approaches, particularly in the areas of IT and connectivity. Next-generation networks are going to be the basis for future innovative products and solutions yet to be discovered on the world market. Last year R&M established an innovation process which entails the observation and implementation of customer requirements and technological developments into future applications. In this latest edition of our customer magazine, we examine some examples of this process in various background reports. These include the trend toward flat electronics and the end of manual patching. Scientist Lars Jaeger also agreed to be a guest author once more and has written a feature on the second generation of quantum technologies.

For some years now, R&M has been developing software solutions for network monitoring. This has reached a whole new level now with Activeport Monitoring. And copper has been written off a number of times. With the feasibility study for a Cat. 8.1 module, R&M is proving there is definitely still a place for

this tried and tested technology – even in the post 10 Gbit Ethernet era. Find out more in this magazine.

Investments of this kind are only possible thanks to the healthy financial basis of our family company. This basis enables further targeted growth out of our own resources, but also with smart acquisitions in the FO business. This magazine features a report on our latest acquisition with the Brazilian company PETCOM in the FO sector. In North America, where two years ago R&M successfully ventured into the market with an acquisition, the BEF 60 splice cabinet for hyperscale data centers has recently been launched and is now finding favor on the world stage. More and more frequently our employees are developing solutions in international networks and at different locations.

### **On the high seas with R&M cabling**

R&M is increasingly realizing solutions for vertical markets. For example, connectivity solutions for ships on the high seas are becoming more and more important and, in this area too, the company is a reliable partner. Top quality standards are particularly important in this business field – our range fulfills all requirements and standards. Take a look at the details of the range.

Further success stories, such as the cabling of the new Mall of Switzerland, due to open at the beginning of November, show just how close to the customer R&M is. In this case, R&M was responsible for cabling the building envelope but also worked together with Swisscom to develop the customized solution OTO@BEP which will be making a name for itself in other applications in the future.

Thank you for placing your trust in our company. We hope you enjoy reading this latest edition of the customer magazine.



Patrick Steiner, CFO

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Conditions are tough out at sea on a ship. But the IT has to work just as well on board as it would on land. Cabling solutions from R&M make sure of that.

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## More Data through the Optical Fiber

### Next Generation Optical Connectivity – Diversity for Individual Solutions

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Increasing data rates and volumes using as few fibers and as little energy as possible, with a high density configuration and at the lowest possible cost. Set out by the ICT industry this goal is resulting in more and more connectivity solutions. Here, R&M takes a look at current trends and solutions for data center and access networks.

Using glass fiber as a medium for rapid data transmission via light modulation is currently more fascinating than ever. Research and development teams from around the globe are working on the evolution of transmission methods, network and connection technology. Ethernet data rates that used to be barely imaginable, such as 10, 25 or 40 Gbit/s (GbE), have been a reality for quite some time now. New hyperscale and mega data centers already use 100 GbE infrastructures.

Well-known mega trends are the driving force behind these developments. Virtualization, cloud computing, video streaming and others now require infrastructures that are larger, faster, more stable and more flexible. Operators of data centers, Internet

hubs and transport networks have to cope with an annual growth in data traffic of 25%. The demand for fiber-optic systems is thus growing accordingly. According to the market researchers at LightCounting, this demand will double again by 2022.

#### **When 100 Gigabits is not enough**

As the latest trade conferences such as OFC 2017 (the largest event in the fiber-optic industry) have made clear, even 100 GbE is too slow for big players such as Amazon and Google. In the medium term, the industry is already planning for 200 and 400 GbE networks. The researchers at the Dell'Oro Group expect the first 400 GbE switches to be launched to the market starting in 2019. This also alters the requirements when it comes to cabling and connectivity.

The big players have reported that handling of the cabling and the packing density of the optical connections barely meet their productivity requirements. The call here is for more miniaturization, lower energy consumption on the optical transceivers, and cabling solutions that are more efficient and less expensive.

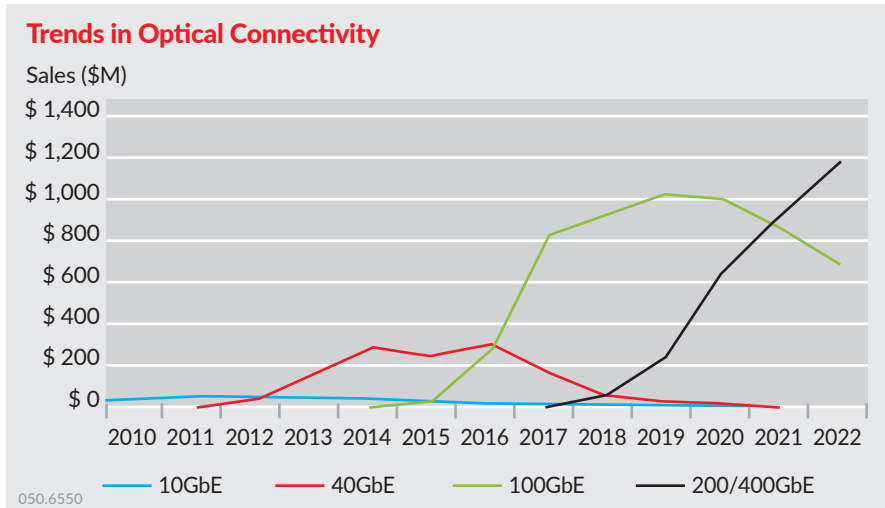
#### **Multiple innovations**

In parallel to these trends, well-known manufacturers are constantly developing new technologies and products for the next generation of optical connectivity. The new QSFP transceiver modules with higher channel-data rates for 200 and 400 GbE are more compact, faster and more efficient. Multi-source agreements (MSA) such as QSFP-DD and OSFP are paving the way

here. The providers involved will be bringing important new developments into the market from 2018 onwards.

On-Board Optics (OBO) is another solution for the next generation of optical connectivity. They replace the pluggable transceiver modules by moving the optics inside the active equipment. The optical modules are placed close to the processors onto the printed circuit boards of servers or switches. The light signal is fed from the inside out onto the housing. The passive optical connectors at the faceplate enable a further increase in the packing density of the connections.

The Consortium for On-Board Optics (COBO) was founded in 2015 to create specifications for On-Board Optics, which R&M joined this year. The ratification of the first standards for



**Demand is currently growing for pluggable fiber-optic modules for 100 Gigabit Ethernet (GbE). Modules for 200 and 400 GbE will soon dominate the market.**

Source: LightCounting

on-board connectors is already planned for 2017. A wider market penetration of OBO technology is expected in the next three years.

In all three MSAs, the LC and CS connector series (a new development by Senko) are currently being mooted as the optical interface for duplex cabling and as well as MPO solutions with 8, 12, 16, 24 and 32 fibers.

**An exciting time**

Our initial conclusion? When it comes to optical data transmission, the situation remains very exciting. Whether for Ethernet, InfiniBand or Fiber Channel, or in terms of the passive network and the active components – the race to offer higher data rates with lower energy consumption and the competition for an optimal cost-per-bit ratio remain wide open.

**Ethernet Interfaces and Nomenclature**

	Electrical Interface	Backplane	Twisted Cable	Twisted Pairs	MMF	Parallel SMF	2 km SMF	10 km SMF	40 km SMF
10BASE-				T					
100BASE-				TX	FX			LX	
1000BASE-		KX	CX	T	SX			LX	
2,5GBASE-		KX		T					
5GBASE-		KR		T					
10GBASE-	SFI, XFI	KX4, KR	CR	T	SR			LR	ER
25GBASE-	25GAUI	KR	CR	T	SR			LR	ER
40GBASE-	XLAUI	KR4	CR4	T	SR4		FR	LR4	ER4
50GBASE-	50GAUI(-2?)	KR	CR		SR		FR	LR	
100GBASE-	CAUI10	KR4, KR2	CR10		SR10	PSM4	10X10	LR4	ER4
	CAUI4		CR4		SR4		CWDM4	10X10	10X10
	CAUI-2		CR2		SR2		CLR4		
200GBASE-	200GAUI-4	KR4	SR4		SR4		FR4	LR4	
400GBASE-	CDAZI-16				SR16	DR4	FR8	LR8	
	CDAZI-8								

Black Text = IEEE standard      Red Text = Standardization      Green Text = Under consideration in IEEE  
 Blue Text = Non-IEEE standard but complies to IEEE electrical interfaces

Source: Ethernet Alliance

More Ethernet standards than ever before specify the transmission and connectivity solutions on the path towards 400 Gigabit Ethernet.

Source: Ethernet Alliance

## «It took 40 years for the IEEE to standardize six Ethernet rates and we are now working on six new rates at the same time!»

*John D'Ambrosia, Ethernet Alliance*

At present, the market offers more transmission methods and connection options than ever before. Nonetheless, the question arises as to which connectivity solution will succeed in making the leap successfully to 100 and 400 GbE.

### A holistic approach

With this in mind, R&M advocates following a farsighted and thorough approach. Instead of first looking for the very latest products on the market, we recommend an approach based on the physical variables seen in optical signal transmission.

The three options for achieving higher data rates are more fibers, more wavelengths and higher modulation. The advantages and disadvantages of the variables and specifications have to be weighed up first according to the specific project and the individual preferences.

### More fibers

If the option of «more fibers» is considered, then the points to be discussed include the following. Parallel optical connection technology will be the most obvious technical solution. It is considered as being robust, well established and versatile – yet also complex. When planned correctly it is easily and logically scalable. The data throughput can be increased immediately via plug and play. Migrations to 100 or 400 GbE could be implemented gradually and systematically.

However, more fibers also results in more space, more manual work and more cable management is necessary. This means that user-friendly solutions must be found – with maximum packing density, variable and migration-capable equipment possibilities, and the possibility of automation. Moreover, multi-fiber connections also must be manufactured with great precision and operated with care. Cleaning the fibers is a complex

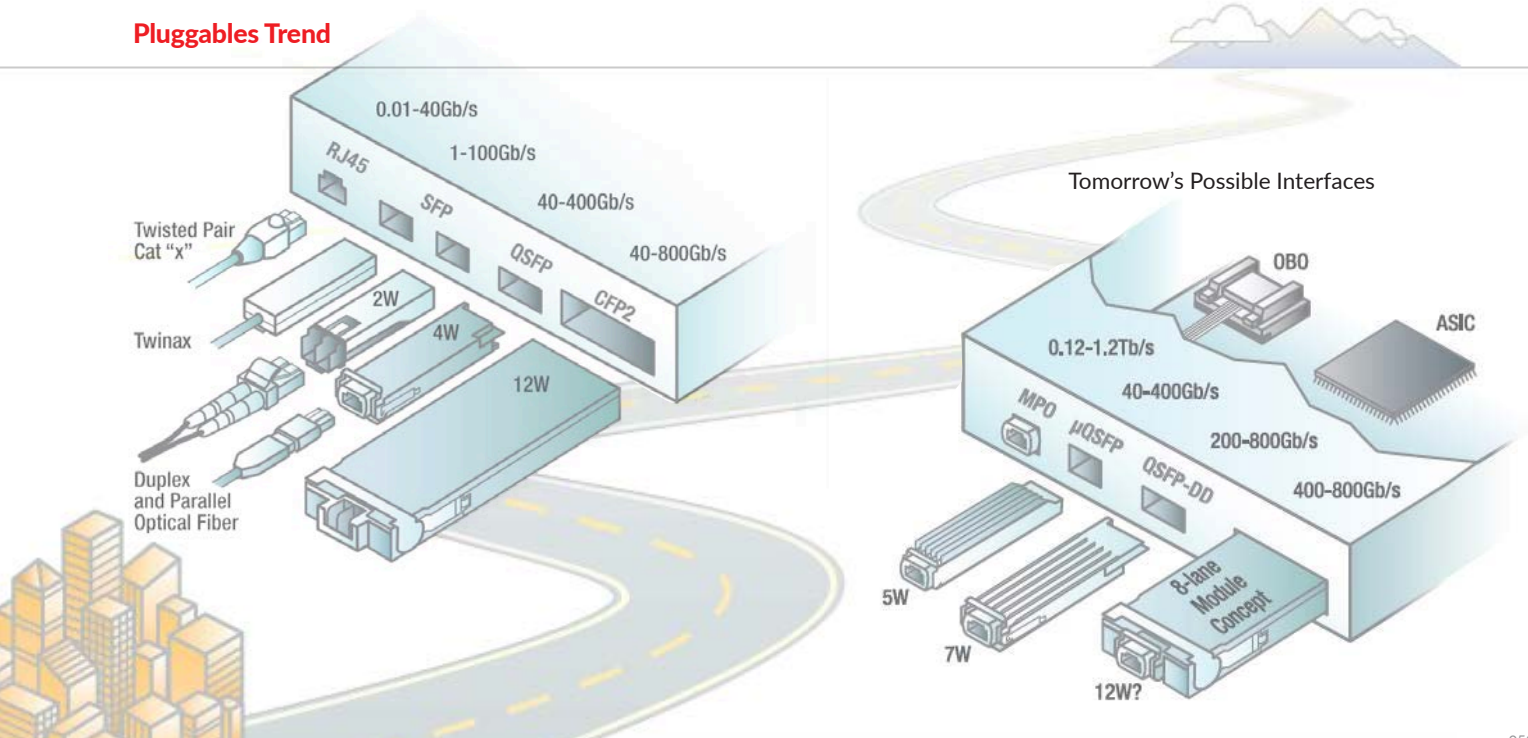
process. This also needs to be considered during planning.

Finally, we also must consider whether the preferred option is fit for the future. MPO technology definitely has potential for innovation. The performance, handling and maintenance can be optimized. For example, R&M is developing an expanded beam technology based on micro lenses for multi-fiber connectors. The transmitting area of the connector is increased thus making it less sensitive to dirt and misalignment. Additionally, the fibers no longer have to be pressed for physical contact.

### Higher modulation

The latest transceiver generations follow the path of higher modulation. Among these are QSFP-DD (Quad Small Form Factor Pluggable Double Density) and OSFP (Octal Small Form Factor Pluggable).

### Pluggables Trend



This graphic from the Ethernet Alliance shows just how varied the current standards for fiber-optic modules are (as of 2015).

Source & Graphic: Ethernet Alliance

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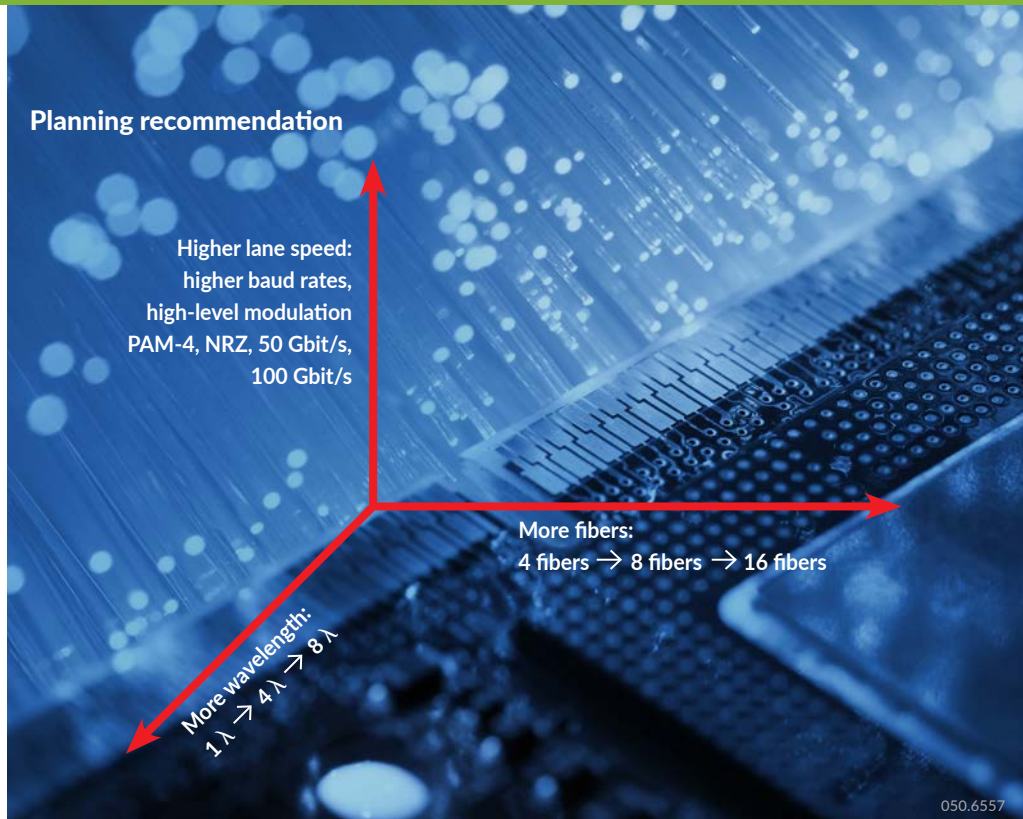
QSFP-DD modules should deliver 50 Gbit/s per channel with four-level pulse amplitude modulation (PAM-4). With eight channels, they can then transmit up to 400 Gbit/s on each port. The competing solution OSFP should transmit 50 or 100 Gbit/s per channel to support 400 and 800 GbE.

This is a major step forward, and one which is accompanied by high energy and cooling demands. Similarly, the demands also increase when it comes to the precision and quality of the connectors. The higher the data rate, the more reliable the optical interface needs to be.

### More wavelengths

Standardized in 2016, the wideband multimode cable category OM5 raised many expectations. When combined with the latest lasers and shortwave division multiplexing on four wavelengths (SWDM4), OM5 should open the door to increased capacity on longer fiber links. Up to 40 Gbit/s on a fiber pair, 400 Gbit/s on four fibers pairs, 1.2 Tbit/s via a 24-fiber MPO plug and a range of up to 500 meters are feasible.

This would offer an alternative to singlemode infrastructures. The number of cables could be reduced by a factor of four. However, on links of up to 100 meters, existing OM4 cabling could offer similar performance as an OM5/WDM infrastructure under certain circumstances. The same principle also applies to OM5 – higher data rates can only be achieved when the connectivity is of suitable quality and performance.



The variables of optical signal transmission: more fibers, more wavelength and higher modulation. Comparing the variables in all three areas results in a mix of technologies that represents the most suitable cabling solution in each case for transmitting more data.

Graphic: R&M

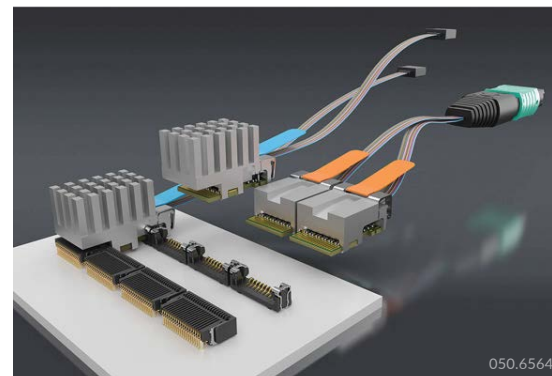
### Support during evaluation

Whether more fibers, higher modulation or wavelength multiplexing – the quality and performance requirements increase on all active and passive components.

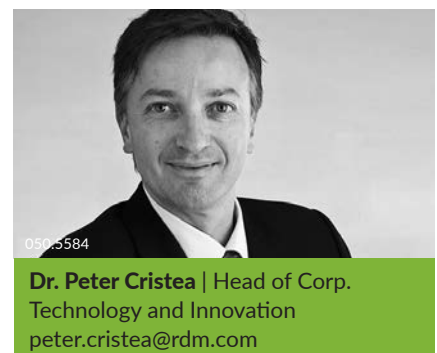
In certain circumstances, the evaluation will show that new equipment is required so that the cabling and transceiver work in harmony. Some of the systems may be able to be modernized using the «pay as you grow» principle. In others, the existing cabling can continue to be used.

Whichever way you look at it, there is no long-term solution that can cover all requirements and applications at the same time. More likely is an economically viable mix of technologies that corresponds to the status, area of application and business case.

Optical connectivity is one of the strategic fields of innovation at R&M. The globally oriented innovation and technology management at R&M exploits all available potential and is at the leading edge of development. R&M accompanies and supports its customers in the evaluation and planning process as a trusted advisor for network infrastructures, and guarantees quality-oriented and performance-oriented solutions.



On-Board Optics (OBO) are a promising solution for Next Generation Optical Connectivity. Signal conversion takes place on the circuit board, the light is fed directly into fibers and on to passive connections in the housing. Source: Samtec / Consortium for On-Board Optics (COBO)



050.5584

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## Everything from a Single Source for the Mall of Switzerland



The largest shopping mall in Central Switzerland is due to be opened in Ebikon near Lucerne in November 2017. A thrilling attraction – for the project partners during construction as well as the future visitors. R&M was one of those project partners and supplied everything from a single source.

Mall of Switzerland: The name says it all. And indeed the shopping mall and leisure center with a usable area of 65,000 m<sup>2</sup> in Ebikon near Lucerne is an outstanding project for the whole of Switzerland. Its trademark: a facade like a soft, translucent flowing skin that arouses the emotions. It is scheduled to be opened in November 2017.

The investors are aiming to create a unique destination featuring, as it does, a combination of shopping, gastronomy, entertainment, wellness and living. They are expecting to attract people from all over the region as well as tourists. Attractions such as the surfing wave simulator and the multiplex movie theater with twelve auditoriums and the largest IMAX screen in Switzerland are likely to turn a visit into an unforgettable experience.

When renting out the approximately 150 business premises, the operators are setting store by local retailers, regional products and Swiss brands. The venture will be creating around 1,000 jobs. There is a freeway junction close by so that visitors and employees enjoy direct access.

### Copper + FO = new options

Providing the building complex with a strong communication infrastructure was a challenge. Expansive areas had to be networked. The plan was for all tenants and visitors to enjoy optimal conditions. For example, the mall offers a full-coverage high-speed WLAN, digital payment systems and video surveillance.

A further goal of planning was to supply end devices with Power over Ethernet as a standard – which required copper cabling. «The structured building cabling was originally supposed to be based entirely on copper,» remembers Roland Bachmann, electro project lead at total contractor Halter AG.

Over the course of the project, however, totally new possibilities arose. Thanks to a Swisscom initiative, fiber-optic cabling inside the building also became an option. It was when Swisscom teamed up with R&M on product development that the breakthrough came. For more details, refer to the article on the following pages. The change of plan meant that the project partners had to demonstrate their flexibility and extended expertise – something they mastered superbly.

### The R&M solution

- Structured building cabling with R&Mfreenet
- 200 km copper cable Cat. 7<sub>A</sub>, AWG 22, shielded (S/FTP)
- 35 19” racks
- 2,500 R&M modules Cat. 6<sub>A</sub> EL shielded
- 1,500 patch cords



f.l.t.r.:  
Andreas Spörli, Project Lead at Swisspro AG;  
Roland Bachmann, Project Lead at GC Halter  
AG; Thomas De Steffani, R&M Switzerland





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### The Mall of Switzerland

Strong emotions. Strong Swiss vitality. Daring design. This is the Mall of Switzerland. With its light facade resembling a soft, flowing skin, it is a new magnet in Ebikon near Lucerne. The architects from Burckhardt + Partner AG deliberately created an arc of suspense between the organic shape of the mall and the more quadratic neighboring buildings.

The auspicious name Mall of Switzerland is a promise and arouses expectations. Based on the vitality and diversity of Switzerland, the guiding idea was to create a realm of facets, genuine Swissness, interpretations of Swiss values and innovations, paired with classy understatement.

Original materials, such as oak and elm, terrazzo, asphalt and quartz, are a link to the naturalness of the country. Traditional Swiss graphic elements are to be found in modern wall patterns. The design concept conveys the atmosphere and feel of Switzerland. Inside, you get the impression that this is a downtown area that has evolved naturally.

The pioneering concept unites around 150 shops and restaurants/bars with a children's area, leisure and sporting facilities, such as the first indoor wave simulator in Switzerland, the largest IMAX screen in the country and a multiplex movie theater with 12 auditoriums.

[www.mallofswitzerland.ch](http://www.mallofswitzerland.ch)

**«With a key project of this kind, there are not many suppliers that can deliver. R&M has a wide standard range, is well known and has an important role to play due to the quality of the products as well as the warranty and services provided.»**

**Andreas Spörli, Project Lead at Swisspro AG**

### Everything from a single source

R&M had already been selected as supplier of the copper cabling. «Various companies were approached. But with a key project of this kind, there are not many suppliers that can deliver. We were looking for a manufacturer who can offer everything from a single source,» says Andreas Spörli, project lead at installation partner Swisspro AG, explaining why the company opted for R&M.

Ultimately the key criteria were the wide standard range for structured building cabling, the quality of the products as well as the warranty and services provided. And the R&M range is also perfect for Power over Ethernet. For Roland Bachmann it was above all the quality that clinched it. He describes his trust in R&M in a very straightforward way: «What can go wrong if you choose R&M?» Another positive factor was the fact that R&M, as a partner of Swisscom, could also supply the products for the optical access side.

### The right cable

In spite of the change of plan, around 200 kilometers of copper cable were laid. Due to the long cable lengths, Cat. 7<sub>A</sub> cables with an AWG 22 cross-section from the R&M *freenet* range were laid throughout. «The cable diameter was an area of concern,» says Andreas

Spörli. «With such long links and when using Power over Ethernet, you have to use the right cable, not the least expensive.»

With a wire cross-section of AWG 22, voltage drop and heat development are limited. Maximum use can be made of both applications – data transmission and Power over Ethernet. At the same time, the Cat. 7<sub>A</sub> cabling is capable of guaranteeing data rates of more than one gigabit per second long term. Another reason for choosing R&M.

### «Just in time» required

The rest of the project was no less exciting. Roland Bachmann reports: «We don't have extensive access here and have to pass each other quickly. And for the supplier that means «just in time» is key.» Andreas Spörli confirms that the collaboration with R&M was successful under these conditions: «The material was always on time, even when things were a bit tight in terms of time. Special requirements were fulfilled efficiently.» «Everything was great,» says Roland Bachmann.

Philip Kiefer, overall project lead for Mall of Switzerland at Halter AG, is very confident about the owners approving the building. The property is due to be handed over on October 27, with the official opening planned for November 7, 2017. «Everything works according to plan.»

### The project partners

- General contractor: Halter AG, Zurich
- Structured cabling: Swisspro AG, Baar
- Planners: Thomas Lüem Partner AG, Dietikon



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## OTO@BEP Fiber-Optic Access that Saves Time and Money

Putting new ideas into practice – to do so, everyone has to agree. And this ideal situation was the case for the Mall of Switzerland. Together with Swisscom, R&M developed a fiber-optic solution which is a major source of relief for carriers, installers and tenants. And it could well become a standard for large projects.

Experience shows that a large project such as the Mall of Switzerland results in lots of new ideas. That is not only true for architects and designers, but also for technicians and electrical planners. In the case of the Mall of Switzerland, the partners developed a surprising solution for connecting business tenants to the Swisscom FO network.

«In a project of this magnitude, we always have to ask ourselves how the many sub-

scribers can be connected as efficiently as possible», says René Imholz, describing the initial situation. He is a technical consultant at Swisscom for the inhouse area and the person who had the idea of finding an optimized connection solution. Because as he says: «It is important for Swisscom to support projects such as the Mall of Switzerland. With this project, Central Switzerland is gaining a unique destination that will appeal to various customer segments».

### Pilot project started

The solution was to be simple, efficient and future-oriented. And in this case that meant providing fiber optics as far into the building as possible. The conventional strict separation between the building entry point and structured building cabling was to be broken down. Each individual lot in the complex was to be reached with fiber throughout, from the network operator's head office to the individual floors.

The crux was that Swisscom required a platform that would merge the advanced,

decentral building entry points (BEP) and optical termination outlets (OTO) to minimize installation. R&M was given the unique opportunity of starting a pilot project with Swisscom as an innovative and forward-looking partner.

Within just a few weeks, a concept, a prototype and a product had been developed: the OTO@BEP. In a wall rack, it unites newly developed patch inserts, which act as OTOs, and a distribution module for fiber, splice and splitter management that works as a BEP.

### Getting simpler for everyone

The decisive progress: From the OTO@BEP, subscribers can determine the subsequent installation path and the position of the final connections for themselves. For business customers within the Mall, Swisscom will be able to provide bandwidth of up to 100 gigabits per second in future. Redundant fibers are available everywhere in order to enable access for other network operators and service providers. This is in line with the Swiss Open Access Model.

### OTO and BEP united

OTO@BEP: This acronym stands for an innovation which was developed to provide fiber optics to the Mall of Switzerland where it was successfully implemented. In a simplification of the Swiss OFCOM reference model, the optical termination outlet is integrated in the building entry point. And now a customized solution has become a product: OTO@BEP.

The new development is based on the successful Optical Distribution Frame (ODF), the CombiMODULE with its modular inserts and the Single Circuit Management (SCM) family from R&M.

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From the OTO@BEP, the fibers lead either directly to the network elements or routers of the customers or to a freely positionable OTO outlet on the tenants' premises. In addition, a minimum of copper wire was laid to be able to serve customers with older hardware components. The aim was to provide as many subscribers as possible with fiber optics, new digital communication standards and Gigabit speed.

The OTO@BEP minimizes the network operator's internal efforts considerably, explains René Imholz: «Since we are already providing a sufficient number of OTO outlets at a defined location before tenants move into the business premises, we don't need the specification and realization process per customer. The proximity of the outlet at the end customer optimizes availability. The ordering process is massively reduced for the end customer».

At the same time this solution facilitates an installer's work. «The effort involved in splicing the fibers in a regular BEP is minimized,» says René Imholz. The installers in the rented areas can now start with the final assembly of the cables from an outlet installed and activated in advance. Furthermore, pre-terminated or



**«For Swisscom, R&M is an innovative and extremely reliable partner. One idea resulted in an optimized solution for Swisscom, but also for installers.»**

**René Imholz, Technical Consultant Inhouse, Swisscom**

field-terminable cables and outlets can be used. This results in more favorably priced and more flexible solutions for end users.

**Benefit for future projects**

The concept can be transferred to large projects with similar characteristics, e.g. in smart cities and smart buildings. The new product, initially introduced as a prototype and then approved by Swisscom, can be used universally. R&M has included the OTO@BEP in its range.

R&M sees the successful Mall of Switzerland project as a step on the road to developing further fiber-optic solutions with Swisscom which have the potential of unfurling a wide range of uses for an expanding market.



f.l.t.r.: Thomas De Steffani, R&M Switzerland; René Imholz, Technical Consultant Inhouse, Swisscom; Markus Steinmann, R&M Switzerland; Roland Bachmann, Project Lead Halter AG



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## Fit for the Ocean: Ship cabling

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Salt water, high levels of humidity, constant vibrations and temperature fluctuations, very little space. Conditions are tough out at sea on a ship. But the IT has to work just as well on board as it would on land. Cabling solutions from R&M make sure of that.

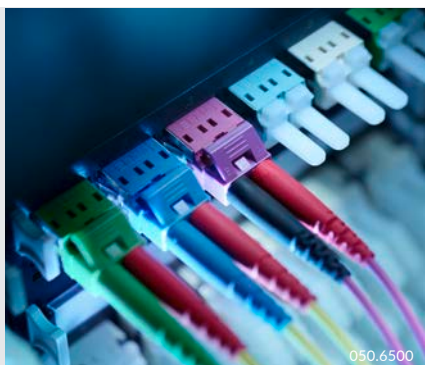
The advantages of modern IT and Ethernet based communication are playing an increasingly important role in ship building and operation. At sea, fast and reliable data transmission helps to make freight traffic more efficient, automate ship operations and offer passengers more convenience. But data networks on board have to withstand extreme requirements and an aggressive environment.

For this area of application, R&M has developed a DNV-GL certified cabling range suitable for use out at sea. It consists of products which correspond to the specific requirements of ship building: space-saving solutions, Power over Ethernet cabling, field-mountable products, solutions for network monitoring and administration, vibration-resistant products, solutions for the increased protection against moisture

and dust (IP protection), solutions for the securing of cables and solutions for the safety and security infrastructure.

The space-saving solutions are based, among other things, on particularly compact connecting and distributing components, but also on special developments. The cable-sharing solution RMS45 enables outlets in cabins to be used twice over, which means fewer cables have to be laid. The R&M solutions for Passive Optical LAN (POL) also help to minimize the cabling volume because fewer distribution nodes are required than with conventional structured cabling.

Power over Ethernet (PoE), supplying end devices with power using data cables, is a major source of relief for ship building. PoE makes electrical cables unnecessary in many areas thereby saving on weight and money. The unsurpassed Insulation Displacement Contact (IDC) technology for solid wires and stranded cables is one reason why R&M fulfills the security requirements of PoE



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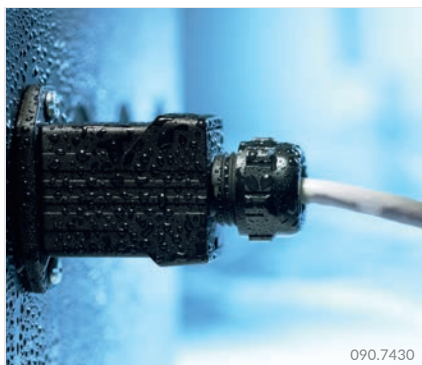
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In the case of FO components, R&M achieves the required robustness in particular with select plastics and precise manufacturing.

applications to be used at sea. Vibrations, humidity, gases and salt simply cannot attack the IDC contacts. This is why these copper connection solutions from R&M are perfect for use at sea and for PoE applications up to 90 Watts. Furthermore R&M components with IDC wiring are easy to handle, simplifying installation and maintenance work.

All R&M components for in-ship data networks – both the copper and FO systems – have passed the testing and certification procedure of the classification organization DNV-GL (DanskeNorskeVeritas - Germanischer Lloyd). This enables the creation of data channels suitable for the high seas which consist entirely of certified R&M components. R&M also provides mounting frames and housing compliant with protection class IP67 which protect connectors from moisture, dust and impact.

FO systems from R&M extend the possibilities for the use of IT, multimedia and high-speed data transmission on board. These include, in particular, SC and LC connectors and adapters. The fiber-optic R&M components are particularly suitable for maritime use because precision manufacturing and strength of shape ensure that the plug connectors are protected from moisture and weathering.



**Robust and flexible: the FM45 from R&M. The field-mountable RJ45 connector for copper cabling on ships can be protected with waterproof IP67 housing. The FM45 is also easy for non-specialists to install. If the need arises, the members of a ship's crew are thus in a position to repair the in-ship data network themselves.**

The field-terminable copper and fiber-optic FM45 and FO Field connectors provide more flexibility. This means ship chandlers can select individual cabling paths during installation. The personnel on board can use field-terminable connectors for repairing defective networks themselves while at sea. In addition the maritime range includes distribution cabinets for top hat rails and 19" racks.

The R&M offshore portfolio is also complemented by training sessions for installers and by an expert advisory service in the planning phase. If the need arises, R&M will work together with shipyards, designers, planners and system integrators to develop specific infrastructures tailored to the tasks of a ship. For passenger cabins, R&M develops installations which provide the same convenience

you would expect in hotels, offices and smart homes. The monitoring system R&MinteliPhy facilitates automated infrastructure management. This makes network administration a much more efficient task. All over the world, R&M branches are providing shipyards and suppliers not only with expertise, connection and distributor solutions, but also with completely pre-terminated units.

For decades now, R&M systems have proved their worth in applications which require uninterrupted network operation. And the benefits of R&M products are becoming more and more appreciated in shipbuilding where the climatic conditions make tough demands of the passive IT infrastructure.



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## Built for Hyperscale Data Centers: BEF 60

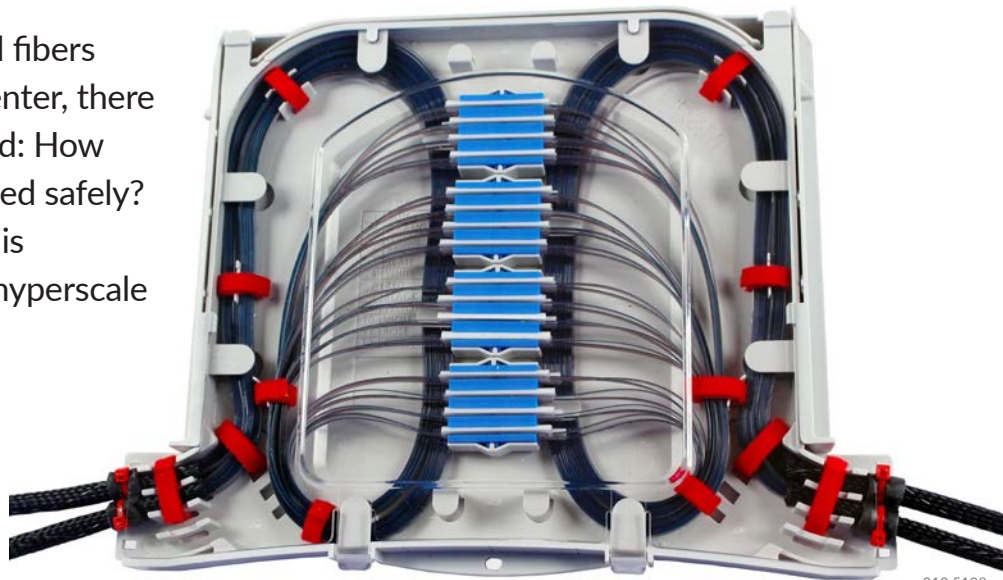
When large numbers of optical fibers are introduced into the data center, there is a crucial question to be asked: How can they be managed and spliced safely? R&M USA has the answer and is opening up a new chapter for hyperscale data centers.

The new Building Entrance Facility (BEF 60) splice cabinet, developed by R&M USA, outshines conventional building entrance solutions for hyperscale data centers. Its total capacity is 23,040 fiber optic splices. 384 fibers can be spliced and managed in each of its 60 stackable splice drawers. The platform offers a range of unique features which simplify installation, modular expansion and maintenance.

The new developments which R&M has realized with the BEF 60 include:

**Open architecture:** Housing parts and splice trays can be removed. This reduces the assembly weight and also gives installers easy access to the rear wall and cable entries.

**Wall holders:** Stable mounting brackets hold the cabinet. It can be assembled flush with or



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at a distance from the wall. This leaves space for rear cable entries. Existing conduits can be covered.

**High Count Fanout Kit (HC FOK):** The flat breakout box distributes the fiber bundles of cables with up to 6,912 fibers to the splice trays. A U-shaped guide takes care of fiber distribution and protects the fibers. The kits can be stacked and are assembled in the rear wall.

**SD-08 splice drawer:** A transparent plastic cover protects the fibers. During servicing, all an engineer has to do is look through the cover to assess the situation in the tray.

**Convenient installation:** The cable entry ports can be removed and split. This means the cables can be inserted and secured in next to no time. Time-consuming threading through holes is no longer necessary.

Finally: The BEF can be stacked. The new R&M solution solves the problem of cramped space in the data center and maximizes the permissible length of cables coming from the outside. The rigid high count fiber cables are attached to the wall and, if required, inserted into the BEF through the rear wall. In this way up to 100,000 splices can be accommodated in a very limited space.

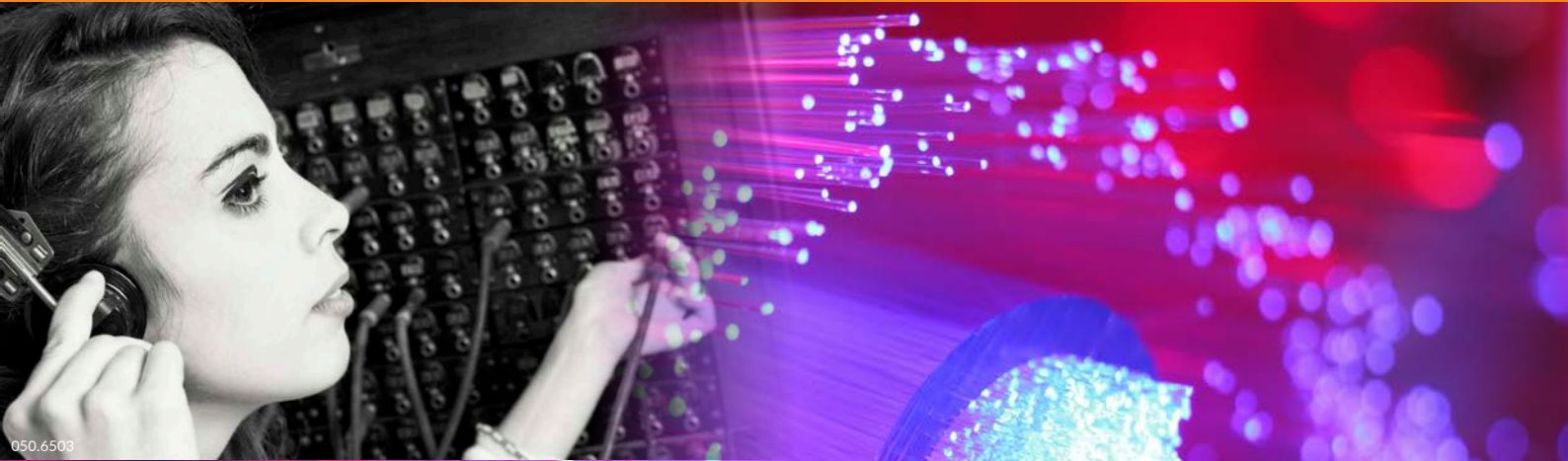


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## The End of Manual Patching?

Cloud services and their availability to users with demands that range from micro to huge require a flexible allocation of resources. This also applies to large data centers that need to efficiently reallocate capacity. But how can all this be managed fast and efficiently?

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Architectures that allow automatic rearrangement require so called Software Defined Networks (SDN). The electronic switch has been around and in use for some time. For optical communications, with switching done at fiber level, the optical switch is one key element.

Optical switches that make it possible to redirect one optical signal to a choice of several others are widely available and in use in various applications. Recently, highly integrated switches with full fabric reconfiguration have been presented by several companies. The solutions proposed are based on several different technologies. The main trends R&M has observed range from fully

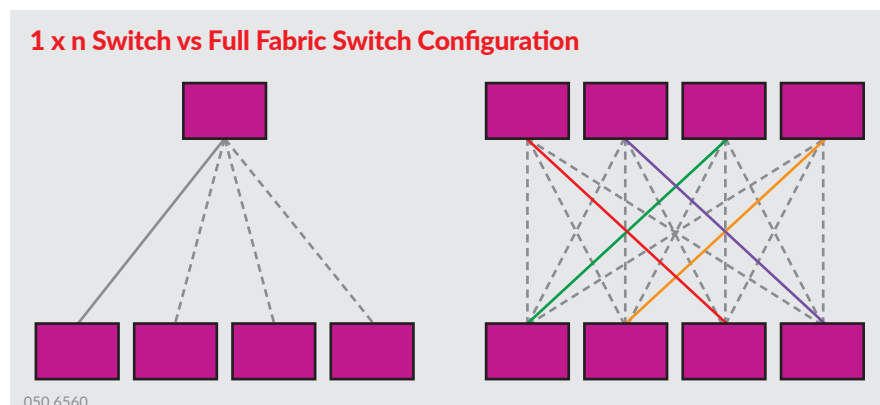
mechanic, robotic solutions to MEMS based optics and electronically controlled gratings and mirrors (MEMS = Micro Electronic Mechanical Systems). The size and level of integration and performance vary widely at this point.

Some key aspects to consider, besides the number and configuration of available ports and performance, are the switching technology and the future-readiness of connections for multiple wavelengths and higher order modulation schemes. The solutions presented at the OFC 2017 show ranged from performance similar to that of conventional patching to losses of up to 3 dB per connection.

Although the optical switching times are still significantly larger than that of electronic switches they certainly offer a dramatic improvement from manual patching in terms of both time and reliability. Traditional basic cabling tasks remain a job for the installer although installers will no longer have to physically rearrange the configuration of a network.

One additional perk is that automated fiber management and monitoring are supported adding an additional layer of security to cross-correlate with external rack based management systems.

In conclusion, although IMAC (Install, Move, Add, Change) patching will remain manual, optical switches promise to take over the bulk of everyday network reconfiguration.



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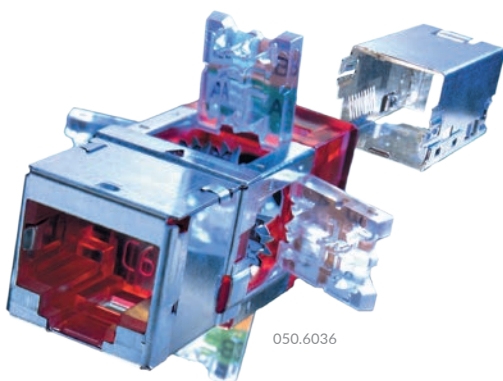


## Top Ratings for Beyond.pl



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Two architectural awards bear witness to the fact that there is far more to the new Data Center 2 from Beyond.pl than pure IT. The data center and cloud computing provider in Poznan is aiming to make its mark in the Polish market and beyond. It wants to be unrivaled in every respect. And that also applies to the cabling.



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«The most attractive new building in Poland.» This is the view of participants in a nationwide online voting held by the architectural and design magazine Bryła in May 2017. It was defined as the «best facade of the year» in a further Polish architectural competition that had taken place not long before. The committee praised the new data center's consistency of form and function.

«Our Data Center 2 not only perfectly fulfills the functional demands and security requirements of the IT customers but also has top aesthetic credentials,» say the staff at Beyond.pl. The architects at ELD Poland Sp. z o.o., general contractor Budimex S.A. and certified R&M partner B&K Power Division Sp. z o.o. in Poznan have realized an outstanding project in every sense of the word.

Perfection is the highest goal of the innovative data center operator Beyond.pl, a company striving for market leadership in Poland. Its site in Poznan was to be exemplary throughout Europe from the outset and produce the very best security and efficiency levels. The planning implemented in 2015 required a level-4 rating compliant with the ANSI/TIA-942 standard for operational reliability and availability. Depending on tenant

requirements, the system was to fulfill energy efficiency classes PUE 1.1 or 1.4. Beyond.pl had already achieved both goals on commissioning. Data Center 2 is the only data center in Poland to date with this level-4 rating in accordance with ANSI/TIA-942.

Beyond.pl also defined strict standards for the infrastructure and connectivity of the carrier-neutral data center. «Quality and stability of connections within our data centers and to the network providers were always a top priority. We only use the very best components available worldwide,» says Bartłomiej Danek, Beyond.pl Vice President.

### Search for qualified partners

For the cabling, Beyond.pl was looking for a partner who had experience executing data center projects and could adhere precisely





### The customer: Beyond.pl

Beyond.pl Sp. z o.o. is the first carrier-neutral data center operator in Poland and a pioneer in the area of cloud computing. The company founded in 2005 operates two state-of-the-art data centers in Poznan with more than 12,800 m<sup>2</sup> of usable space. Data Center 2, opened in 2016, is said to be the largest of its kind in Central and Eastern Europe. The operator decided to commit to this enormous investment due to new trends and technological possibilities. Beyond.pl provides sought-after IT infrastructures and innovative cloud services. The company's own development team supports the public, private and hybrid cloud solutions. The IT product range extends from colocation and connectivity through disaster recovery to managed services, outsourcing and rental solutions. A local FO ring connects the two data centers with 20 national and international carriers.



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to given schedules. Furthermore, Beyond.pl expected the partner not only to see to the data center cabling but also provide the LAN infrastructure for the offices in the new building. The company had made Data Center 2 its new head office and wanted a network for the offices that would guarantee interruption-free working. R&M fulfilled all conditions and embarked on the ambitious project together with installation partner B&K Power Division.

Four fundamental criteria distinguish the cabling recommended by R&M:

- It guarantees the reconfigurability of the system.
- The passive infrastructure is fully scalable and easy to upgrade.
- The assembly solution facilitates fast and uncomplicated installation.
- The FO trunks with MPO connectors and OS2 resp. OM4 fibers are delivered completely pre-terminated. On-site splicing is thus no longer necessary.

The customer was also impressed by further benefits offered by R&M which support long-term investment planning and an increase in performance:

- Automated infrastructure management: The R&M*MinteliPhy* system can be implemented during operation in the network already installed at a later date. The non-contact RFID sensors are compatible with the racks and patch cords and can be assembled without interrupting the plug connections.

### The partner: B&K Power Division

B&K Power Division Sp. z o.o. in Poznan with President Daniel Kowalczyk at the helm is one of R&M's long-standing certified partners in Poland. The specialists at B&K Power Division support investors by providing consulting services in all aspects of network technology through to installing

and commissioning networks. The service portfolio includes documentation, measurements for formal acceptance procedures and certification. The company is committed to attaining top goals in terms of security, reliability, quality, efficiency, flexibility and cost effectiveness.

**«We are pleased to have a global partner such as R&M at our side that has such an impressive portfolio.»**

### Bartłomiej Danek, Vice President Beyond.pl

- Security: The three-level R&M security system with color coding, mechanical coding and lockable connectors can be retrofitted.
- Modularity: Copper and FO cabling can be combined and mixed to suit all requirements in a single 1U 19" panel. Cat. 5, Cat. 6 and Cat. 6<sub>A</sub> copper modules fit into the panels, as do SC or LC Duplex FO adapters. The panels can be maintained and configured conveniently from the front.
- High density: With the 48-port 1U HD panel, Beyond.pl accommodates a large number of copper ports on the valuable space.

investments in our branch throughout Europe in recent times. Together with long-standing partners such as R&M, we have created an unrivaled infrastructure. We are pleased to have a global partner with such an impressive portfolio at our side.»



To round out the perfect solution, R&M confirmed the free 25-year system warranty. Measurements and acceptance tests took place during the installation so that Beyond.pl could start operation immediately.

Vice President Bartłomiej Danek concludes: «Data Center 2 is one of the most significant



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## ODF Modules Cut Down by Half

Ten height units or five? People setting up optical distributors are often looking for greater flexibility. R&M is opening up a range of new choices with the 19" 5U CombiMODULE for all new and existing 19" network infrastructures.

The 5U solution is a variant of the 10U ODF MODULE solution cut down by half. Its trump cards: flexibility and packing density when equipping or retrofitting optical distribution cabinets – without any concessions having to be made with respect to the technical properties, without any limitation of the overview.

Both ODF modules – the 5U and 10U version – extend the R&Mfoxs range by providing further possibilities of integrating the flexible distribution solutions in 19" infrastructures. The two distribution modules perfectly fit into all 19" rack spaces, whether at major distribution sites, in data centers, in street cabinets, or in FTTH infrastructures.

The two-part housing of the ODF modules has room for any combinations of splice and patch units to connect and distribute optical fibers reliably. They can be equipped with ODF patch and splitter inserts as well as trays from the Single Circuit Management (SCM) system. The connector part can be equipped with six path inserts on 5U and with twelve on 10U. This means that up to 144/288 fiber connections with E-2000™ or SC adapters can be offered on 5U and up to 288/576 fiber connections with LC adapters on 10U.

Both 19" ODF modules are available as a strictly cable-to-cable splicing solution. This consists of two separately lockable, swiveling splice units with stress-free, low-movement fiber routing. It offers convenient handling with direct access to the SCM trays and fibers. Fibers can be transferred easily from the left-hand to the right-hand splice unit via a direct connection. The splice solution can be equipped with two splice units with up to 48/96 SC trays or 24/48 SE trays. This means up to 576/1152 FO splice connections can be established in one box.



The trays facilitate easy fiber management. The carrier tray can be folded out and serves as a work table during installation and maintenance. A minimum fiber bending radius of 40 mm is guaranteed for all variants – for a maximum error-free installation as well as maximum network availability.



## Flat, Flatter, More Intelligent Electronics Slimming Down

A modern smartphone is actually an entire computer. And nevertheless, the multifunctional, hyperintelligent cellphone is incredibly thin. And that is all down to the trend toward flat electronics – a trend that is still very much in its infancy. Network technology too is set to benefit from flat innovations.

Flat, flatter, more intelligent. This is a current trend in chip and electronics research. All over the world, engineers and scientists are currently developing pilot models for what are being called flat systems. Their intention is to drive forward digitalization in miniaturized and, to date, untapped dimensions. Unlike classical PCB technology, electronics will in the future be able to be accommodated on unusual substrates. These can be flexible, transparent or uneven. Even human skin is a suitable carrier for electronic circuits.

A popular example is the electronic plaster. It consists of a plastic film with integrated sensors, conductors and microchips. The plaster can permanently measure a person's blood sugar levels through the skin. That is a great help in the medical supervision of diabetes patients. Flat and flexible electronics

or conductors woven into textiles provide a range of fascinating possibilities. Articles of clothing thus feature additional digital functions – they are becoming truly smart clothes. Today, it is already possible to print conductors on paper, plastic and glass.

### Research project underway

R&M has recognized that passive network technology can also benefit from flat systems. Theoretically, cabling hardware could be given additional intelligent features. The surface of network components offers plenty of space that can be used creatively.

This is why R&M is working together with renowned research partners to develop new possibilities for using flat electronic systems. The aim of this project, which started recently, is something that all R&M innovations

have had in common since the company was founded: To make network connections even more reliable and to improve data network management. Users will ultimately be able to increase the efficiency of their network operation as well as reduce costs.



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## Network Cabling for the Largest Airport in the World

R&M starts implementing network cabling for Istanbul New Airport – the largest airport in the world.

Istanbul New Airport will be constructed over an area of 76.5 million square meters to the north of Istanbul and will be completed in four phases. The first phase will be finalized in 2018 with the opening of two runways and a terminal with a 90 million passenger capacity. Once complete, the new airport will host flights to more than 350 destinations with an annual passenger capacity of up to 200 million. On completion

of all four phases, Istanbul New Airport will have six active runways, 250 aircraft and parking facilities for 18,000 cars.

With the increased utilization and dependence on IT systems in modern air travel, a high-performance cabling network is the critical platform for airports' entire internal and external telecommunications plus other operational applications and services. The quality and reliability of the products were crucial reasons for choosing the R&M solution.

On completion of the first phase, R&M will have supplied a total length of 4,500 km of copper and over 1,600 km of fiber-optic cables as well as more than 90,000 RJ45 ports. Leveraging its extensive expertise in large-scale projects for the aviation sector, R&M aims to finish the installation of the cabling infrastructure by the first quarter of 2018. This network will connect and support the key airport systems. Each of the systems has required customization of the cabling including specific color coding.

Istanbul Grand Airport Construction (IGA), the company building the new airport, has already designed its mission-critical data center infrastructure with R&M's latest and most innovative products. This includes the high-density fiber platform Netscale and the automated infrastructure management solution R&M*inteliPhy*. This greatly simplifies management and will allow IGA's IT team to rapidly and conveniently scale the network as needed.

R&M assigned a dedicated specialist team to be present on-site throughout the deployment of the solutions. By developing specific products and product modifications according to the requirements of the project, R&M can provide the customer with added value. The cabling is designed for a lifetime of 25 years and unconditional reliability. As a testimony to this quality, R&M is offering its 25-year R&M*freenet* systems warranty on the cabling infrastructure deployed at the new airport.



Yusuf Akcayoglu, CEO IGA, and Michel Riva, CEO R&M

**«The R&M specialists understand our needs and customize their solutions according to these. This is the biggest advantage for us as it separates them from the other cabling vendors.»**

**Ersin Inankul, CIO Istanbul Grand Airport Construction (IGA)**



### **Decisive criteria**

Explaining his decision to select R&M for the project, Ersin Inankul, CIO at IGA, underlines that Istanbul New Airport will be the largest in the world. The new airport will be the first TIER 3 certified and completely digital-first airport of the world. «We are developing lots of innovative solutions and our airport will be a technological benchmark. We started our work with the cabling as it is the basis for all the running infrastructure. The announcement system, fire alarms, cameras, card access systems, flight management, ATC systems will run on R&M's fire-resistant copper cables.»

Ersin Inankul mentioned that the elimination of signal interference through the transmission and high-performance of the cabling are critical areas wherein the quality of R&M's cabling is a key benefit. «We didn't have any problems in the tests we carried out at R&M's labs at its Headquarters in Switzerland, or in our tests in the field. We can therefore run 9,000 CCTV cameras and 3,000 card access sockets on R&M's cabling system in real time with confidence that they will be protected against any transmission interference or loss.»

The CIO of IGA also appreciates the incredible support he and his team received from R&M through the entire engagement, saying: «They understand our needs and customize their solutions according to these. This is the biggest advantage for us as it separates them from the other cabling vendors. Availability, security, modularity, flexibility, capacity and cost-effectiveness were also all key reasons why our project team chose R&M's solutions for the project.»



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## The Future after 10 Gigabits

Fiber optic networks still have a lot more potential. 10 Gbit/s downstream is not the end of the performance road for FTTH customers. ITU and IEEE workgroups have now raised the bar. What can we expect of EPON and NG PON2?

Growing user demands are increasing the pressure on Passive Optical Networks (PONs), which have to deliver the pictures and videos of our latest family event on time. The industry is also reacting on time by creating new standards that will help implement modern networks in an efficient and backward-compatible way. It is mainly the ITU and the IEEE who are pushing their respective standards to reach higher bandwidths.

After the GEPON and 10GEPON standard (which allowed transmission at 10Gbit/s in both directions), the IEEE is now working on a 100 Gbit/s solution.

In the meantime, the ITU has evolved the GPON standard to XG-PON and now XGS-PON, which allows symmetric transmission at 10 Gbit/s over a 20 km range. The XGS-PON can indeed be seen as a part of a bigger network architecture, the Next generation PON

or NG-PON2. In this new scheme, up to 4-8 channel pairs can be used in such a way that multiplexing is not only happening in time, but also in wavelength.

The implementation of such a network may require the use of tunable lasers which are currently still expensive. However, this network architecture can be organized on a «pay as you grow» basis, meaning that not all the wavelengths or channels need to be



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**References to standards and task forces mentioned in the text**

	Standard
GPON	ITU-T G.984
XG-PON	ITU-T G.987
XGS-PON	ITU-T G.9807.1
NG-PON2*	ITU-T G.989
GE-PON	IEEE 802.3ah
10G-EPON	IEEE 802.3av
100G-EPON*	IEEE P802.3ca

\* Wavelength Division Multiplex 050.6562

there from the very beginning. This will allow carriers to incorporate new wavelengths as they need more bandwidth, due to the addition of new OLTs (optical line termination) and ONUs (optical network unit), while using the pre-existing passive network.

These schemes will make FTTH a more competitive service allowing carriers to take fewer

risks while opening up new perspectives, such as extending their networks as back- and fronthaul for the forthcoming 5G services.

**Standards for the next PON evolutionary steps**

XGS-PON = ITU-T G.9807.1  
 NG PON2 = ITU-T G.989  
 as well as IEEE P802.3ca 100G-EPON



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## Persistently Pursuing FTTH



Panorama of the Rhine Valley, Switzerland (Buchs on the right). Photo: Stefan Kaiser 050.6515

«We serve the citizens.» EWB Director Markus Schommer and his team resolutely work on their mission of guaranteeing local customers the best possible supply. And that includes Fiber to the Home.

The electricity company and waterworks in the town of Buchs (EWB) in Eastern Switzerland has been serving local citizens for 115 years. Ambitiously, the municipal company seizes every opportunity it can at an early stage to incorporate future trends as part of its mission to supply the local community. The authorities and citizens of Buchs are open to innovations.

Currently Fiber to the Home (FTTH) is becoming a further milestone. Together with R&M and experienced cabling partners, the supplier is connecting one area of the town after another. EWB is investing considerable sums of money in a highly efficient network for the digital era. And the company's inno-

vative spirit can be seen here, too: The EWB team is taking care of project management itself instead of commissioning a general contractor.

### Ninety percent by 2020

By 2020 90% of the town of Buchs will have an FO network. That represents nearly 7,000 dwelling units. And EWB is not prepared to be slowed down by high civil engineering costs, rocky ground or any other topological obstacles. If required, individual solutions are found for cabling. For example, it is possible to switch to the power grid. For FO installations and connections within buildings, EWB and Rii-Seez-Net are providing support in collaboration with local tradespeople.

Most private households and local companies are enthusiastic and are booking complete packages: Telephone, Internet, IP TV/radio, web hosting and more – everything from Rii-Seez-Net, everything over EWB fiber optics or coaxial cable. «The customers are interested in the innovative products which run on the net such as flat rates, fixed lines and the networking of company sites,» says Markus Schommer.

EWB is forecasting a Return on Investment period which is just half as long as in comparable projects. Others can learn from this. EWB is offering suppliers who are building their own FTTH networks the chance to exchange experience.

### How a cable TV network became top-flight FTTH

The former cable TV network and its gateway exchange form the germ cell for the FTTH network of the town of Buchs. Four new or at least modernized POPs distribute the signal over 50 street cabinets, feeder network and drop cable to the building or households. EWB builds up to the building entry point (BEP).

On its own initiative, EWB invests more than regulations require. The company lays four fibers into each house. At the POP locations, there is even space in the pioneer shaft for colocation partners so that the digital services can be extended in the future.

Herbert Huser, Head of Strategic Projects at EWB, explains the above-average commitment as follows: «We follow the best possible standard at all times and have thus been implementing the four-fiber module from the outset. The fact that R&M is a good, long-established partner of Swisscom also played a role in the choice of R&M as supplier. For us Swisscom is an indicator; we want to offer exactly the same standard.»

### R&M solution for Buchs: innovative, modular and tailor-made

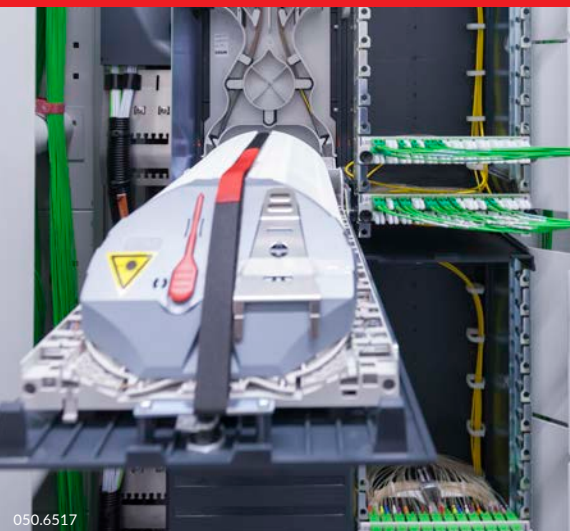
EWB does not just see innovation readiness and total commitment for the customer as being purely its own mission. Both are also expected of suppliers and project partners.



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f.l.t.r.: Franklin Fust, Planning and Communication Rii-Seez Net; Markus Schommer, Director of EW Buchs; Herbert Huser, Project Lead for Strategic Projects at EW Buchs; Peter Meier, R&M Switzerland





«R&M's high innovation readiness was, and is, really important for us as is the fact that we are talking about a Swiss company here. Modularity and warranty are also of major importance in our collaboration,» says the EWB management. R&M supported the FTTH expansion to suit the customer's needs, long term and innovatively, and also contributed to process optimization.

EWB feels that the R&Mfox range is perfect for the use of the four-fiber model and gradual network expansion. Due to the modular principle of the R&M solution, EWB can plan the roll-out in manageable stages instead of having to invest in full expansion at the beginning. The cabling in the POP locations can be scaled at a later date with very little effort.

Optical Distribution Frames (ODF) from R&M are the most important distribution platform for the FTTH network in Buchs. In the gateway exchange, the POP buildings and street cabinets, a total of 50 ODF cabinets are installed, that is eight to 13 cabinets per station. They are equipped with 110 ODF splice boxes, the CombiMODULE and inserts.

## Rii-Seez-Net

### Rii-Seez-Net: up to 300 Mbit/s

Since 2001 there has been an independent telecommunication network in Eastern Switzerland along the border to Liechtenstein which has set itself up in competition to market-dominating carriers. Rii-Seez-Net (Rii stands for Rhine Valley, the Seez is a river in Eastern Switzerland) is the umbrella organization of 17 local cable network operators. EWB took on the function of provider and coordinates technical operations.

[www.rii-seez-net.ch](http://www.rii-seez-net.ch)

### EWB: We supply Buchs

The electricity company and waterworks in the town of Buchs (EWB) in Eastern Switzerland was founded in 1902. It has more than 90 employees working in eight business areas. «We guarantee the safe full supply of electricity, water and communication,» is the self-declared mission of the public company owned by the town. The Communication Division, which takes care of the cable network and the new FTTH network in Buchs as well as the regional Rii-Seez-Net, makes a considerable proportion of the annual turnover.

As early as 1975, EWB built the first cable TV system – at the time with coaxial cable. The first FO cables were laid in 1987. Shortly after the turn of the millennium EWB started to drive forward the joint setup of the regional telecommunication network Rii-Seez-Net.



Further stages: In 2011 the company created its own IT department which provides IT services to 3,200 business customers. In 2016 EWB opened up the first public and free WLAN access point in downtown Buchs.

EWB not only works in an exemplary manner in terms of communication technology, but also in ecological terms. Electricity for the customers in Buchs is exclusively from renewable energy sources. Proprietary water-power plants and photovoltaic systems satisfy a quarter of the local electricity requirement. Furthermore, EWB promotes electromobility, environmental protection and health protection. The director himself goes out to local schools to teach students about saving energy.

[www.ewbuchs.ch](http://www.ewbuchs.ch)

## «R&M is a reliable partner and saves customers a lot of work.»

### Franklin Fust, Planning and Communication Rii-Seez Net, EW Buchs

The nodes usually have a capacity of 23,000 to 28,880 fibers. Overall EWB attains a favorable relation between high packing density and the costs or investments per port.

EWB also found the R&M Raceway System for fiber routings in the POP locations compelling. «It gave us great advantages in assembly and the laying of cables,» says project lead Huser.

EWB required a special construction for fiber routing and cable management in some cabinets. «Together with R&M we were able to realize specific solutions. And that's something you don't often find in this form,» says Herbert Huser. «R&M did some fine-tuning and had immediately adapted a component. And now it is also available to other custom-

ers,» says Franklin Fust from Planning and Communication of Rii-Seez-Net, EW Buchs. In other cases, R&M was immediately willing to adapt ODF cabinets and raceway components. R&M gave the splice company practical training sessions on site and instructed them on the right installation.



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## New Quantum Leaps

### The Second Generation of Quantum Technologies

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Almost one hundred years after its evolution quantum physics still has plenty of areas that can confuse non physicists – and sometimes even physicists. It is proving to be virtually impossible to comprehend with common sense. The nature of quantum objects, with properties such as wave/particle dualism, superpositions of distinctly different states, observer-dependent test readings, timeless wave function collapse and the disembodied entanglement of spatially separate particles, is very difficult to reconcile with our existing, intuitive ideas and the philosophical concepts of our thinking.



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#### Part of our life

And yet quantum physics has been part of our life for a long time now. All electronic devices, all digital technologies, lasers, cell phones, satellites, TVs, radios and even modern chemistry and medical diagnoses are based on it. We trust in its laws every day when we get into a car (and rely on the on-board electronics), start up the computer (which consists of integrated circuits, i.e. electronics based on quantum phenomena), listen to music (CDs are read by lasers, a pure quantum phenomenon), have an X-ray or MRI, or communicate using our cell phones (also full of microelectronics). And, last but not least, all nuclear technology is based on it. The very first technical application of the new quantum theory was also the most dreadful weapon that has ever been used in military combat: the atomic bomb. It has to be

said that the quantum theory was the most influential theory of the twentieth century.

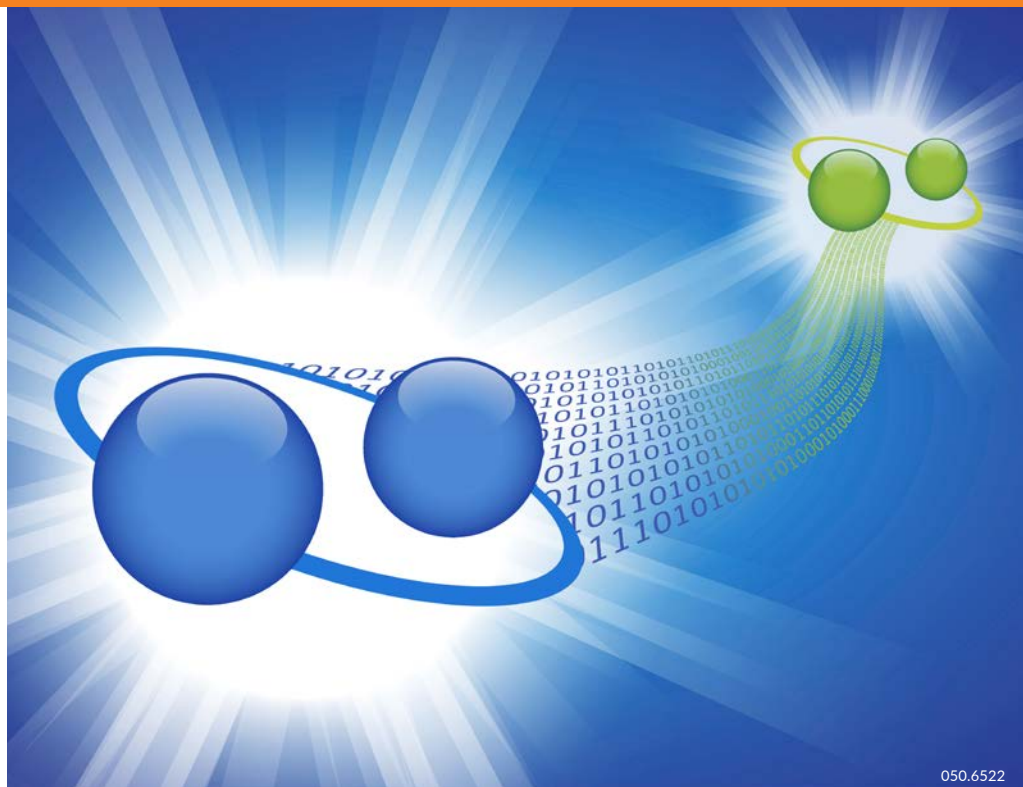
And it could have a decisive impact on the twenty-first century, too. Because there is still an incredible amount of technological potential in quantum physics. In modern times we are presented again and again with surprises and innovations from the area of quantum physics. And in equally regular intervals, we hear about technological innovations based on quantum effects. Examples include the high-temperature superconductors discovered in 1986 (Nobel Prize 1987), the quantum Hall effect also discovered in the 1980s/1990s (Nobel Prizes 1987 and 1998), LED light (Nobel Prize 2014), the technology of quantum cryptology developed only in recent years (Nobel Prize 2012), and also new miracle materials such as graphene (Nobel

Prize 2010) which could prove to be the basis of even more high-performing electronics in the future.

But new quantum technologies could also open up the way for implementing two technological visions from no less a person than Richard Feynman: First of all, that it should be technically possible to manipulate individual atoms (Feynman 1959). Today we call this nanotechnology, a technology which has already been described by many technological advocates as one of the most exciting future technologies. Secondly, the perhaps even more exciting vision of what is referred to as a «quantum computer» (Feynman 1981). This would be able to process numerous quantum states, called quantum bits or qubits, in parallel instead of processing information bit by bit as is the case with classical computers. With its help we would be able to solve problems which are still far too complex for the supercomputers used today in physics, biology, weather research and other areas.

### Highly interesting relations

Specifically, quantum computers are based on the phenomenon of entanglement, probably the most bizarre phenomenon in the quantum world: A number of quantum particles can be brought into a state in which they behave as if they were linked to each other by an invisible hand, even if they are a long way away from each other in spatial and physical terms. Each particle knows, as it were, what the others are doing. They all belong to a common physical entity (physicists refer to this as the wave function). This results in a correlation between the particles, enabling an instant forecast about the state of one particle, when another particle has been measured - even if there are lots of kilometers between them.



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That is as if somebody in Germany would be able to sense instantly what was happening to his or her twin in Australia.

With this kind of collection of entangled qubits, physicists will be able to operate simultaneously, or so they hope, on all possible states. Whereas a normal computer has to handle all the bits it has to process one after the other in many, many steps, i.e. from 0 to 1 or 1 to 0, a quantum computer can process all these steps at the same time. This high degree of parallelization of operations increases the computing performance of the computer exponentially with the number of qubits, unlike a classical computer working sequentially, the computing performance of which increases only linearly with the number of available computing devices.

Another new quantum technology ensures the efficient and interruption-free transmission of qubits: quantum teleportation, in other words the transport of qubits between two places. The basis of this technology is that two quantum particles (e.g. photons) are entangled into one common quantum-physical state and then spatially separated without their common status being destroyed. One of the particles is sent to the receiver, the other is superimposed at the transmitter with the (quantum) information (qubit) to be teleported. In accordance with the laws of quantum physics, the state of the distant entangled particle is determined in a measuring process at the transmitter automatically and

immediately even though there has been no direct interaction between the two particles. The result of this measurement is then transmitted conventionally to the receiver. With this information, its qubit can then be transformed so that it has the same state as the sender qubit. In this way, the required (quantum) information was transferred from the transmitter to the receiver without the particle being transported physically. With quantum teleportation, it would seem that not only the quantum computer but also the quantum Internet is just around the corner.

Whereas most of us are still struggling with the epistemological and philosophical implications of quantum physics, we should nevertheless pay attention to its ongoing unprecedented revolutionary technological future potential. Because this understanding of the new quantum technologies opens up a view into the distance - into a future we will very soon be facing.



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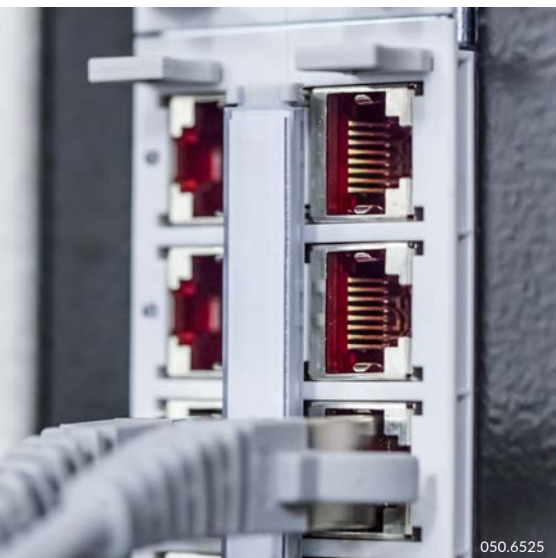
## Complete Connectivity Solution from R&M for NTT Communications Bangalore Data Center

NTT Communications is a subsidiary of Nippon Telegraph and Telephone (NTT) Corporation, the largest telecommunications company in Japan and one of the largest worldwide. Headquartered in Tokyo, Japan, with subsidiaries and offices in more than 40 countries, NTT Communications provides a wide range of innovative global information and communications technology (ICT) solutions, including cloud, network and security services.

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### Strong growth in India

Data centers are an important part of network infrastructures. Sectors such as e-commerce and banking are becoming more aware of disaster recovery, resulting in an increased use of data centers. Focusing on the wholesale business, NTT invests in emerging markets such as India. The company has mega plans for the country, fully in line with its credo of thinking globally but acting locally. In India, NTT is affiliated with the well-established brand of Netmagic. Netmagic is one of the fastest growing companies in India and is a leader in the Indian data center market.



**«Rajesh and his team did a great job in this first project and fulfilled our high expectations completely.»**

**Moncy George, Head of Global Business Development and Alliance, NTT Communications India Pvt. Ltd.**

Several data center migration and consolidation projects are planned. The old leased data center in Bangalore had to be replaced and was fully rebuilt phase by phase. The project leader for the Bangalore project knew R&M as a reliable partner and quality leader from the past which is why the leading Swiss connectivity provider was selected for this project. Previously, NTT had worked with competitors. «The cooperation with a new provider was a risk for me. But Rajesh and his team did a great job in this first project and fulfilled our high expectations completely,» says Moncy George, Head of Global Business Development and Alliance at NTT Communications India Pvt. Ltd.

The product delivery timeline was very tough. NTT planned all steps in a timeframe of two to three weeks. R&M set up a special team to meet these demands and organized training on site for all people involved.

The design and implementation of this project was taken care of by R&M India, NTT USA and NTT India.



### Convincing quality

R&M delivered pre-terminated fiber and copper solutions containing Cat.6<sub>A</sub> shielded cabling solutions including patch cords, connection modules, installation cables, face plates, multi-mode OM4 fiber cables, MPO trunk cables and accessories (color coding). The project was certified with a 25-year system warranty compliant with R&M's unique Qualified Partner Program.



## Slim-Line Top Hat Rail Adapter

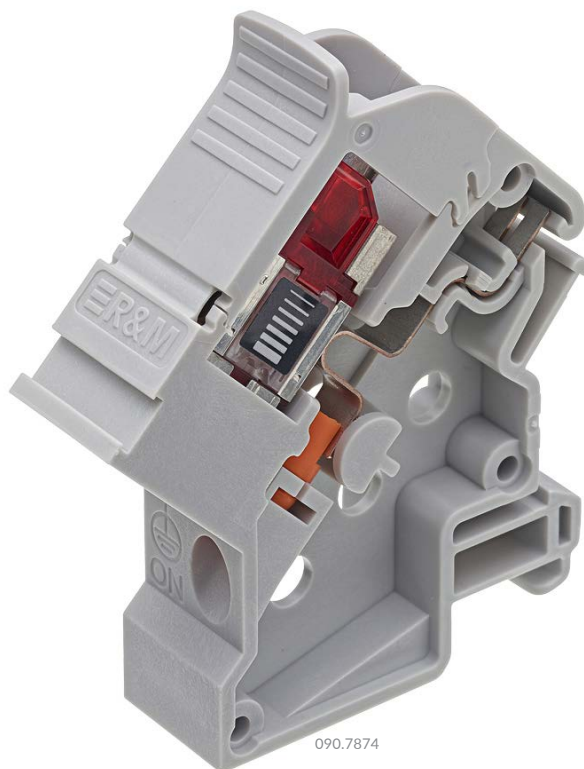
The second-generation top hat rail features a slim-line design. It makes space for greater packing density on standard rails. Installers can now accommodate considerably more network connections in switch cabinets and small building distributors.

Greater packing density! Planners, installers and property owners are increasingly demanding compact solutions when it comes to structured cabling for local data networks. And greater packing density is not only required for office landscapes and data centers. More and more RJ45 network connections have to be provided even in smaller distributors and switch cabinets for industry as well as functional and residential buildings. In such cases, the 35 mm standard top hat rail (DIN EN 50 022) is often the installation platform of choice.

R&M has further developed top hat rail adapter DRM45 to cater to this trend. The new variant is two thirds slimmer than the first generation. Its 18 mm width corresponds to 1 HP (horizontal pitch), the typical pitch pattern on top hat rails. This boosts packing density enormously. The broader first-generation DRM45 will remain available.

Both feature extremely simple handling and front operation. The individual modules can be clicked in and snapped out without the need for any tools. Copper and fiber optic adapters can be assembled, replaced or removed in next to no time. The RJ45 copper modules Cat. 6<sub>A</sub> EL and Cat. 6<sub>A</sub> ISO as well as Cat. 6<sub>A</sub> coupler fit in the DRM45 – each as shielded and unshielded versions. In FO installations the adapter supports LC-duplex and SC-simplex connections.

And access is still convenient even if a number of adapters are lined up closely together. The integrated ground spring can also be enabled or disabled from the front. A hinge connects the dust cap with the adapter so that the cap does not get lost. There are nine cap colors available to denote individual network services. If the adapter is not in operation, the dust cap can be closed in a flash. The labeling window is also accessible from the front. The labels can either be written by hand or printed.



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## Future-Proof Solutions for the Netherlands' Largest Office Network

BAM, SPIE and R&M developed a network for the government office of the future.

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The extensive renovation of the former Ministry of Housing, Spatial Planning and Environment is almost complete. The landmark Rijnstraat 8 building in The Hague is the first collective government office and one of the largest in the Netherlands. It has been designed to be used by multiple governmental organizations and to meet the widest possible variety of organizational and personal needs.

Societal and technological developments are changing civil servants' work. The government's policy for working environments is based on the idea that buildings should focus on providing facilities for meeting, networking, consultation and collaboration. Rijnstraat 8 has been optimized for exactly these tasks.

Making the existing property suitable for its new purpose was a vast undertaking, realized by the Poort Centraal Partnership involving Royal BAM Group (BAM), ISS Facility Services and the Office for Metropolitan Architecture (OMA). The project featured stringent requirements for construction, IT infrastructure and logistics processes, as well as a contract form that is relatively new to many parties in the construction business: the Public-Private Cooperation. BAM, SPIE and R&M, responsible for the extensive network infrastructure, managed to get this enormous job done thanks to close collaboration, fresh ideas and smart use of technological resources.

The new government office is built and managed under a DBFMO (Design Build Finance Maintain and Operate) contract, which implies that BAM and its partners are responsible for construction and long-term building maintenance and development. The government required a 25-year warranty, as the network concept had to provide a platform for tomorrow's services and technologies.

### Design first, then build

«BAM set up the entire project, including new construction work, in detail in a BIM (Building Information Model) environment. This type of digital model allows a construction to be virtually built up of objects to which informa-

tion is linked,» explains Ron Meester, Project Manager BAM Large Projects. «BAM is a leader in this type of virtual building and we were able to prepare the network and cabling in detail. Potentially troublesome connections could be identified in advance using BIM. Routes were accurately defined and lengths and tolerances precisely calculated. R&M and SPIE were able to confidently prefabricate the network based on BIM data. Design of the network and all cabling in the BIM matched up with the final installation perfectly, with virtually no material loss: Every meter of cable was used. In addition, a significant amount of time was saved by prefabrication of the cabling away from the project location.»



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f.l.t.r.: Robert Post, R&M Netherlands; Ron Meester, Project Manager BAM Grote Projecten; Richard Zijleman, Project Manager SPIE Nederland; Abdellah Ahassad, Head Mechanic SPIE Nederland; Frans van Westen, R&M Netherlands; Fatih Kucukunal, Planner SPIE Nederland

**«All work and planning was specified in advance. Logistically speaking, we were able to ensure that each part and each cable bundle were in the right place precisely on time. SPIE and R&M provided smart and reliable integrated communication infrastructure solutions, which meet the requirements of both BAM and the end customer.»**

**Ron Meester, Project Manager BAM Grote Projecten**

### **Ambitious schedule and architectural highlights**

BAM, SPIE and R&M worked closely together from the preparation of the project to its implementation. In certain periods, the three parties held daily consultations to monitor progress, look for solutions and speed up the process where possible. The project site is in a busy area next to The Hague's central station, which makes deliveries very difficult. Furthermore, available storage space was limited. Construction schedules were very tight and multiple construction projects had to be managed simultaneously.

In developing the network proposal, R&M had to take into account the Dutch state's formal requirements regarding availability and scalability. And allowances had to be made for the strict security requirements of the Ministry of Foreign Affairs and secret services.

### **Far-reaching digitalization**

The IT network has to support a wide variety of devices and platforms: office PCs, network connections, WiFi, camera security, internal presentation systems, narrowcasting, sunblinds, ticketing and numbering systems, access and purchasing systems. Even the lockers are connected to the network. In order to address bandwidth needs, which are

#### **The R&M solution: a future-proof infrastructure**

- U / FTP Cat. 6<sub>A</sub> network
- Voice over IP (VoIP) telephone network
- Power over Ethernet (PoE)
- DC network supplies both data and power to all active office equipment
- Energy and climate control using the latest sustainable technology and material



expected to grow rapidly, R&M recommended several network modifications. For example, instead of the tender-specified multimode fiber optic cable for the backbone, R&M advised the more future-proof singlemode. The building's network foundation offers plenty of scope for later expansion of services, and it also facilitates increasingly smart building management.

### **Ready for R&MinteliPhy**

BIM offers all parties a highly detailed building-specific knowledge base. A must-have in this case, as all the parties involved will jointly be taking care of the building for the next 25 years, including extensions and adjustments.

The next phase will be the implementation of R&MinteliPhy Manage. For this reason, a project with BAM's BIM team was implemented to investigate whether the BIM environment could be linked to the R&MinteliPhy system for Automated Infrastructure Management. Another possible future expansion of the network will be the implementation of R&M Monitoring, in which parts of the network can be monitored in real time, and changes and mutations on the network performed more efficiently and cost-effectively. All R&M panels in the network are R&MinteliPhy ready, which allows them to be customized at a later stage.



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## Cat. 8.1: R&M is Ready

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Four times as fast. That is the next goal on the copper cabling Ethernet roadmap. Tests carried out by R&M show that it is physically possible! The transmission channel is ready. But are users really going to feel the benefit?

The goal has a name: Cat. 8.1. The IEEE standard 40GBase-T is on the table. The transmission speed in the twisted-pair copper cable is to be increased from 10 to 40 Gbit/s, the test frequencies to 2,000 MHz. RJ45 is

still the format of choice for connections. But the link has to be shortened to 30 meters to be able to handle attenuation losses and interfering signals. This length would be good for data centers. They could use 40GBase-T for many end of row and all top of rack configurations.

The developments of R&M show that a Cat. 8.1 transmission channel on an RJ45 basis is feasible in accordance with the requirements of IEEE and the cabling standards of ISO/IEC. But to be able to move on to Cat. 8.1, new technologies, approaches and manufacturing procedures will have to be developed to be able to master transmission frequencies of up to 2,000 MHz and reproduce them. R&M is ready to launch a pioneering solution as soon as there is recognizable value added for the customer on the application side.

That takes care of the starting conditions for the quantum leap to Cat. 8.1! However, the named fields of application already have well integrated transmission technologies. And that begs the question how well will the solution be accepted by the market? Surprisingly, the answer to this question may come from the 25GBase-T protocol which was developed by the IEEE at the same time. This uses lower transmission frequencies with the same coding procedure, theoretically enabling longer transmission distances of up to 50 meters. This would then allow the use of 25GBase-T in around 60% of LAN cabling and exponentiate the possible area of use of Cat. 8.1. But as yet there has been no final statement from IEEE on the maximum transmission distance of 25GBase-T.



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## Deployment of Hospital Network with Maximum Installation Guarantee

R&M has been awarded the contract for the maintenance of the Servizo Galego de Saúde (SERGAS) and is also its preferred supplier when it comes to projects centering on hospital network expansion.

Servizo Galego de Saúde, also known by its acronym SERGAS, is the agency of the autonomous administration of Galicia (Spain) in charge of public healthcare in the region. It is ultimately responsible for all health centers and services of the Galician regional administration in order to guarantee healthcare.

The relationship between R&M and SERGAS goes back to 2014. Since then, the relationship has been consolidated and the network of certified partners expanded to cover the needs of each particular project.

### Remodeling the hospital network

The Ministry is committed to remodeling and deploying its hospital network. For this, it launches independent projects that it has contracted with its building maintenance partner. And it is the construction company

that decides which products are the most suitable according to the requirements.

### Broad partner network with a single solution

The Galician hospital network has executed its last three hospital projects with R&M material, albeit with different integrators. The first project was the installation of the network of the new hospital located in Vigo, Alvaro Cunqueiro. This is the largest public health project that has been undertaken in recent years in Spain making one of the most modern public hospitals in Europe available to the metropolitan area of Vigo.

In April 2017, construction work was started on the new hospital complex in Orense, CHIJO, with R&M being awarded the project data network. Galeni, an R&M certified partner, had just the right expertise to install the products.

Already in the middle of this year, R&M was awarded the contract of maintenance for the successive installation of wiring at the EOXI (Estructura Organizativa de Xestión Integrada) Center in Pontevedra.

The next step is the Burela Hospital in Lugo. Undoubtedly, the customer is homogenizing its network with a single manufacturer particularly due to the reliability and the transmission capacity as well as the 25-year warranty.



### The solution: R&Mfreenet Advance

- Cat. 6<sub>A</sub> EL S/FTP
- OM4 optical fibers
- LC connectivity
- UniRack trays



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## Intelligent Network for UVP TECHNICOM

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The Technical University of Košice is blazing a trail into the future. With its new University Science Park TECHNICOM (UVP TECHNICOM) it has created an interdisciplinary center for the transfer of intelligence and innovations. Both the building and its network infrastructure are also extremely intelligent.

TECHNICOM's mission extends far beyond conventional research and development. The aim is for the Science Park of the Technical University of Košice (TUKE) to help lead the eastern part of Slovakia into the technological

***«I am increasing my productivity considerably with the R&M solution.»***

***Peter Gerda, Head of Network and Operational Services, ICT, Technical University Košice***

### **Technical University of Košice (TUKE)**

With nine faculties and 9,000 students, the TUKE is the second largest technical university in Slovakia. Several special areas make it unique in Central Europe. Alongside providing outstanding teaching services, the 1,800 people working there focus on the research and development of state-of-the-art technologies.

future. The university, town, region and the EU are investing EUR 40 million. They expect sustainable impulses for the transfer and deployment of innovations. The ICT, Technical University, will give rise to high-tech start-ups which will be able to mutually inspire each other. It will guide start-ups with business expertise and promote cooperation between research and industry.

A new building with technical intelligence is to create the perfect productive atmosphere. This includes a modern communication and data network controlled with R&MinteliPhy. This solution manages the infrastructure entirely automatically in real time. The innovative power of the UVP TECHNICOM will benefit greatly because automated infrastructure management saves time and expenses.

Academics, technicians and founders of new businesses can devote their full attention to their own projects.

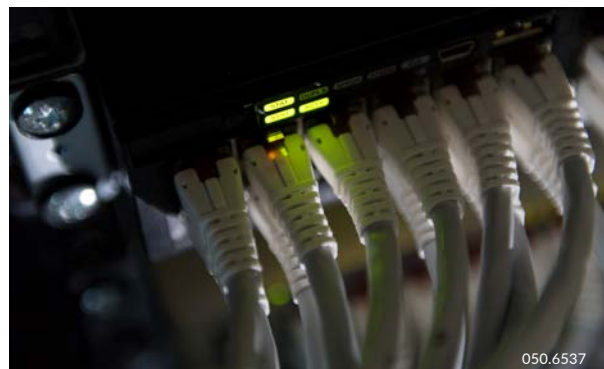
This solution also supports the documentation of the cabling of other buildings on the campus. This means that planners and administrators can design the university network in an innovative way and monitor it centrally and highly efficiently.

«I am increasing my productivity considerably with the R&M solution. Taking care of tasks in the server room is now much easier and faster,» says engineer Peter Gerda, Head of the Network and Operational Services Department.

Martin Chovanec, doctor of engineering and Head of the Institute for Computer Technology at the Technical University of Košice, was quick to confirm this on commissioning: «The R&MintelIPhy system gives the managers a detailed overview of the network topology and the status of individual tasks in real time.»

### From 1 to 40 Gigabits

R&M's intelligent cabling solution for the Technical University of Košice was fitted in just a few months in 2016 and was completed before the UVP TECHNICO M itself was commissioned. Alongside OM3-category FO connections, 80 kilometers of Real10 Cat. 6<sub>A</sub> copper cable were laid, 220 HD patch panels were installed and equipped with R&MintelIPhy sensor strips, 29 R&MintelIPhy analyzers positioned and more than 5,000 patch cords connected. The data center alone accounts for more than 50 patch panels with more than 2,400 ports.



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### Installed R&M products

- 1U HD 48-port patch panels
- 1U UniRack2 24x LC Duplex
- Cat. 6<sub>A</sub> ISO patch cords
- Real10 Cat. 6<sub>A</sub> U/FTP installation cables
- R&MintelIPhy infrastructure management



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## Vocational Education in Bulgaria



Students from the «Mechanoelectrotechnical school Nikola Vaptsarov» in Sofia at the beginning of their school year with representatives from companies partnering in the DOMINO project; representatives of the Bulgarian Ministry of Education and science; Rosen Plevneliev – the Bulgarian President at that time; the Principal of the school Nikola Vaptsarov; the Managing Director of R&M Bulgaria Production.

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Over the last two years, Bulgaria has been reforming its education system in line with the Swiss model. The aim of these reforms is to establish the Swiss dual-track system across the country and thereby ensure young people can develop the specialist skills they need in today's employment market and economy. The dual-track system combines teaching at

a vocational college with practical education within a company. Switzerland is supporting the so-called DOMINO project for five years and has invested CHF 3.5 million. The name DOMINO is an abbreviation of the Bulgarian for: «Dual-track education system to meet the demands and requirements of today's society.» To date more than 60 companies have agreed to offer placements and the necessary support structures.

with R&M in Bulgaria. The young people have been educated as electrical engineers since September 2017. The apprenticeship lasts four years. Experienced mentors will be assisting the apprentices throughout the program.

In addition R&M has launched an internship program designed to attract four ambitious graduates from Bulgarian universities. Interns will spend six months learning about product development, production engineering and human resources before finishing their internship with a case study.



The pupils from the «Mechanoelectrotechnical school Nikola Vaptsarov» in Sofia visiting R&M Bulgaria Production at a special event – Open Day in May 2017 (in the center: Irina Ribarova, HR Manager R&M Bulgaria Production).

R&M has supported the project from the pilot phase. A training contract was concluded with the «Nikola Vaptsarov» Vocational School of Mechanical and Electrical Engineering in Sofia in the summer of 2016. The Bulgarian President at the time, Rosen Plevneliev, was in attendance when the program was first launched. In January 2016, a delegation from the Bulgarian parliament visited Switzerland, including the R&M Headquarters, and was provided with extensive information about the dual-track system.

Now the time has come for the first five students to start their vocational training



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## A Sporting Challenge

Fischer Sports, the global market leader in Nordic skiing equipment and one of the world's largest ski manufacturers, makes choices based on the reliability and high performance of its strong partner R&M.

**«The R&Mfreenet solution was chosen because it shows the best correlation with complicated project targets and requirements.»**

**Yosyp Sich, Head of the Computer Service and Communications Department, Fischer-Mukachevo Ltd.**

Founded in 1924 in Austria, Fischer Sports is well known for its innovations and state-of-the-art technologies. Today it is the global market leader in Nordic skiing equipment and one of the world's largest ski manufacturers. Fischer is proud to offer only premium quality products. The Ukrainian/Austrian enterprise Fischer-Mukachevo Ltd. is a leading, highly successful manufacturer of Alpine and Nordic skis, as well as hockey sticks both for the Ukrainian market and for export purposes.

A reliable, high-performance IT infrastructure along with stable finances and a strong brand are required to maintain successful

business and ensure efficient business processes. Fischer's top management has thus defined cabling network modernization and reconstruction as one of the company's top priorities. R&M's solutions had been used by Fischer before this project implementation so the customer was fully aware of the advantages of the brand.

«The R&Mfreenet solution was chosen because it shows the best correlation with complicated project targets and requirements. More than half of the new solution was going to be implemented in the production area so we needed an excellent system with stable characteristics and a significant reserve even in extreme and limited infrastructure conditions, also in harsh environments. A further

### The R&M Solution

- Total number of ports – 534
- Patch panels, 24 x RJ45, Cat. 5e, shielded, fully populated – 24
- Connection modules Cat. 5e, RJ45/s – 534
- Patch cords Cat. 5e, SF/UTP – 534
- Installation cabling Cat. 5e, F/UTP, 4P, 200 MHz, LSZH – more than 22 km



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advantage of using R&M components is getting unified cabling systems from the same brand,» says Yosyp Sich, Head of the Computer Service and Communications Department, Fischer-Mukachevo Ltd.

The project was accomplished in just six months. The total capacity comprises more than 500 copper ports; the standard cable length is about 22 km. The complete cable network features 14 distribution points. «Both office and industrial zones were to be modernized. There were three stages of project realization to gradually upgrade the common network and thus not interrupt the production process. The most difficult aspect was to implement the network reconstruction concept without causing any production breaks and delays,» comments Vadim Popovich, Director of Zakarpatpolyteh, system integrator for Fischer-Mukachevo Ltd.



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## The U-Box Fit for POLAN

Consolidation points are a pragmatic solution when it comes to using structured cabling in offices more flexibly. They also facilitate faster network access adaptation to changes at the workplace. And that also applies to Passive Optical LAN.

In modern offices, the combination of consolidation points (CP) and Passive Optical LAN (POLAN) is an alternative to FTTD (Fiber to the Desk). POLAN delivers high bandwidths to the individual floors and rooms at a favorable price. The last meters «to the desk» feature tried and tested zone cabling with copper cables.

In this solution, consolidation points take care of the stationary distributor and transfer functions on the floors. The optical fibers are led right to the CP. The copper cables run from the CP to the RJ45 connections on the wall or at the desk. There is an ONT (Optical Network Termination) at the CP for optical-electrical signal conversion.

The U-Box from R&M is the perfect basis for CP infrastructure. The universal connection housing line is outstanding thanks to its modularity and scalability. The boxes fit in raised floors or can be mounted on the ceiling. In the U-Box 4210 CP-POL format, R&M designed the housing specially to suit POLAN configurations.

In this solution, the ONT is either close to or directly on the U-Box because it does not have to be freely accessible at all times. Short

patch cords connect the ONT with the ports in the housing. The U-Box 4210 CP-POL is designed for two different connection techniques. Pre-terminated or field-terminated FO cables can be connected or cables to be spliced on pigtailed. There are four RJ45 ports available for zone cabling with copper cables. Users can choose between shielded and unshielded modules of categories 6 and 6<sub>A</sub> from the R&Mfreenet program.

The U-Boxes can be set up in rows which makes it possible to extend a CP with a purely conducting connecting box. Power supply and data traffic are clearly separated. The advantages: Electric and LAN cabling can be installed by different installation teams and designed flexibly to suit customer requirements.

Once again R&M is proving its expertise and offering solutions from one source for budget-friendly office cabling. The modular product principle from R&M ensures simple planning, error-free installation and maintenance-friendly operation

### The U-Box 4210 CP-POL in brief:

- Consolidation point platform for POLAN installation
- Splice tray with overlength deposit for fiber optic cables
- Up to four freely configurable R&Mfreenet RJ45 connections
- Integrated and easy-to-apply ONT assembly

### Advantages:

- Simple and reliable installation
- Creates order and security
- Short distances from the ONT to the individual workplaces



## R&M Strengthens its Position in Brazil

The fiber optics business of the Brazilian corporate group PETCOM has belonged to R&M since April 2017. With this latest acquisition, R&M is aiming to further consolidate its market position in the area of structured cabling for data centers in Brazil.



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Furthermore, R&M now has access to the rapidly growing market of public networks. With its communication solutions, R&M can make an important contribution to broadband development in Brazil and the entire Latin American market. A production plant is part of the acquisition making it possible for R&M to satisfy customer requirements efficiently on site.

With its combined solution portfolio, R&M can cover the strategic segments Data Center, LAN and Public Networks perfectly. The synergies resulting from the takeover will further strengthen the position of R&M in Brazil and the entire Latin American market. As consumers are actively seeking modern communication infrastructure, this is the perfect time to expand R&M's portfolio with PETCOM's top-quality, competitive products. R&M manages the entire region from its branch in Brazil.

Peltier Comércio e Indústria LTDA (PETCOM), headquartered in Santa Rita do Sapucaí, has been a leading, top-quality fiber optic supplier for more than 25 years and enjoys an excellent reputation. The company also implements smart city projects in Brazil. The production plant is located in what is referred to as the Electronics Valley in Minas Gerais. PETCOM's customers include authorities, telecommunications providers, Internet service providers as well as manufacturing companies.



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**f.l.t.r. : Bruno Moreira and Mário César Moreira, Owners of PETCOM; Paulo Campos, MD R&M Latin America**



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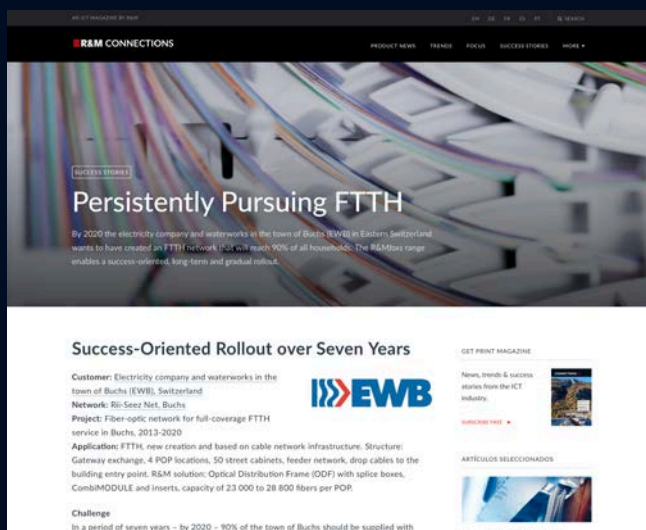


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The screenshot shows the R&M CONNECTIONS website interface. The main article is titled "Persistently Pursuing FTTH" and discusses a project in Buchs, Switzerland, where a fiber-optic network was created for full-coverage FTTH service between 2013 and 2020. The article highlights the use of R&M solutions like Optical Distribution Frame (ODF) with splice boxes and CombiMODULE and inverts, which have a capacity of 23,000 to 28,800 fibers per PDR. The challenge was to supply 90% of the town of Buchs within a seven-year period.

**Success-Oriented Rollout over Seven Years**

**Customer:** Electricity company and waterworks in the town of Buchs (EWB), Switzerland  
**Network:** Ri-Sez-Net, Buchs  
**Project:** Fiber-optic network for full-coverage FTTH service in Buchs, 2013-2020  
**Application:** FTTH, new creation and based on cable network infrastructure. Structure: Gateway exchanges, 4 POP locations, 30 street cabinets, feeder network, drop cables to the building entry point, R&M solution: Optical Distribution Frame (ODF) with splice boxes, CombiMODULE and inverts, capacity of 23 000 to 28 800 fibers per PDR  
**Challenge**  
In a period of seven years – by 2020 – 90% of the town of Buchs should be supplied with

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**ARTICOLI SCELTI**  
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