

FTTx: Need for Speed

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090.5102

R&M

Convincing cabling solutions

SPEED WINS OUT

Every day our world is becoming more networked; our communication with each other is getting easier. Data volumes are growing and so too is the pressure to transmit data at ever faster rates of speed. Powerful and reliable networks are needed for the task. We at R&M offer first-class solutions in this regard. Our vision is to provide unlimited communication.



Hybrid and fiber-optic access networks are gaining in importance alongside conventional copper cabling. FTTx networks today already allow us to process huge quantities of data quickly. Fiber optic networks are playing an ever more significant role. As bandwidths expand, new possibilities open up. Fiber optic solutions have been in use and under further development for some time, but their potential is far from being fully exploited. Besides speed, a number of other factors are important. R&M products are reliable and easy to use and have a high packing density that makes them advantageous for large-scale installations. We are seeing the emergence of home offices and other new business models offering the same convenience as IT environments in corporate office buildings. Globalization is progressing unabated and business nomads have worldwide access to fast data networks.

But this increased networking is not confined to communication. Cultures are also more interwoven than ever as a result of globalization. In recent years, we have expanded business particularly in the Middle East (MEA) and the Far East. This has been made possible by effective networking and collaboration with local employees and partners. Our main concern is to benefit customers and remain close and responsive to them.

The current year 2009 will be a challenging one for R&M, too. The economic situation will be felt by all industries sooner or later. Given the difficult market conditions, we were especially pleased to have recorded healthy sales growth in 2008. As a family-run company, R&M takes a long-term perspective and has built up reserves we are currently putting into anti-cyclical investments. A new company building is going up at our headquarters in Wetzikon, and last year saw the opening of our first supply chain hub in Singapore, to be followed by others elsewhere. Investments in innovation and development are being stepped up yet again. Considering all these factors, we are confident of rising to the challenges before us and of continuing the long-term success of R&M with this newly gained strength.

A handwritten signature in black ink that reads 'H. P. Legler'.

Hans-Peter Legler

COO Sales, hans-peter.legler@rdm.com

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Picture on cover: FTTx installation on brownfield land

Masthead CONNECTIONS 36 / April 2009

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090.5102

FTTx installation on brownfield land

Fiber-optic access networks are compelling for their enormous bandwidth. They are the ultimate line-bound connection technology for transmitting at top bit rates with current and future applications. These FTTx networks can be created efficiently and affordably with holistic solutions for the passive infrastructure.

Do we really need even better-performing subscriber lines? Current studies, leading communications experts and initial experiences with projects involving NGA (Next Generation Access) provide us with the answer: Fast connection technologies and access networks are indispensable for making efficient future

use of the growing number of bandwidth and transaction intensive applications on offer.

There are already services today that have hit their performance limits with the latest versions of DSL. Against this backdrop, carriers and providers must look beyond copper-based subscription lines and take timely action to prepare their access networks for the predicted bandwidth requirements and new market scenarios in an all-IP world.

International expert bodies and organizations largely agree that the future belongs to fiber optic access networks (FTTx, Fiber-To-The-x). For instance, in its comparison of different access technologies, the Organization for Economic Co-operation and Development (OECD) concluded that FTTH networks offer the best performance per end user in terms of bandwidth and sustainability and are therefore most likely to prevail in the future among all the alternatives considered [OECD Report 2008b, April 2008].

STRATEGY AND EFFICIENCY

This technology fares less well in terms of economy. Relatively high investment costs are cited as a shortcoming, as are critical factors such as operator models and profitability, unbundling and unresolved regulation issues.

Adopting a wait-and-see attitude seems ill-advised, though, given today's fiercely competitive climate. Instead, network operators should develop a medium-term strategy aimed at FTTx. Only a handful of carriers or alternative operators are in a position technologically and economically to convert their access networks to fiber optic technology in a single step. In most cases, FTTx has to be achieved by means of interim solutions and migration phases, all of which put major demands on planners and electricians.

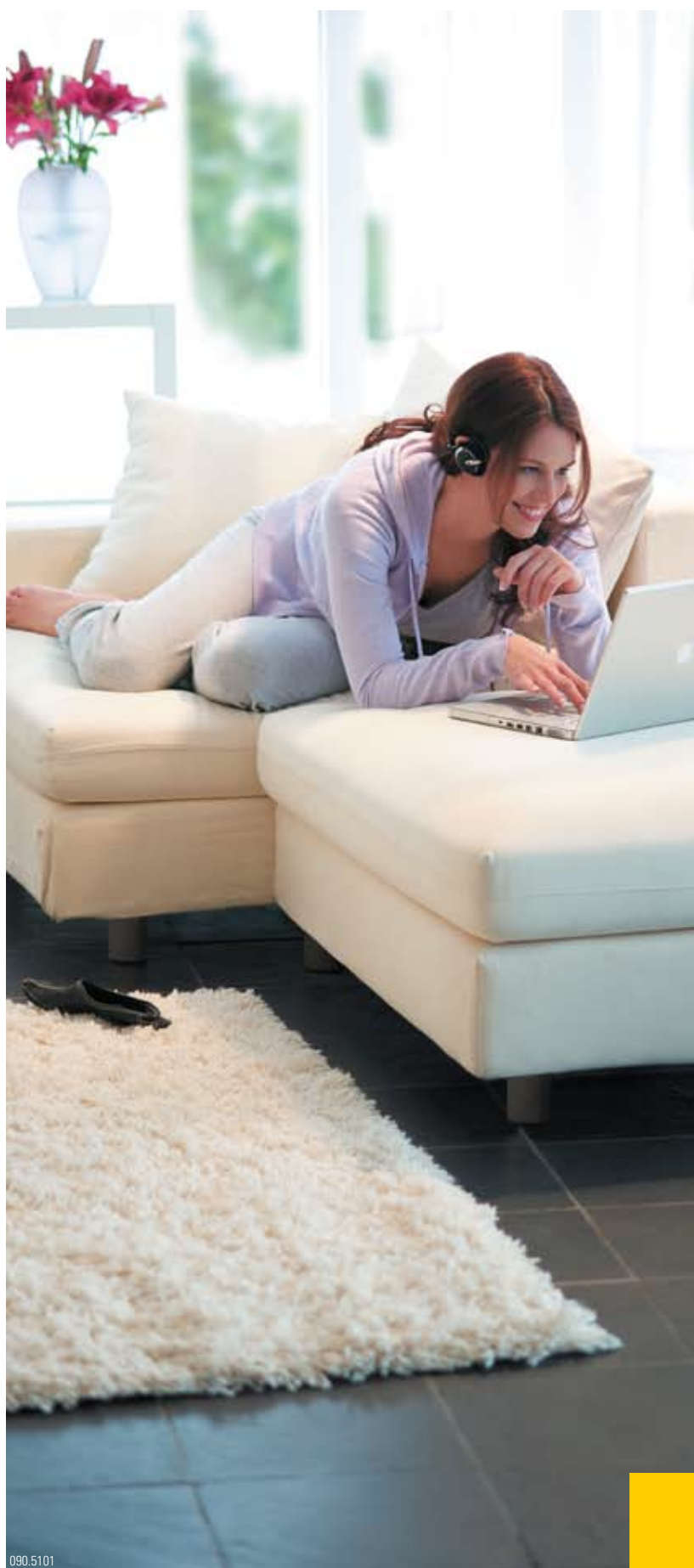
Passive infrastructure solutions capable of supporting legacy networks and fiber optic technology become all the more important. They provide the required flexibility and investment security.

FTTx is the acronym customarily used in the industry for various versions of fiber optic access networks. The terminal point of the fiber optic cable determines what the "x" stands for: FTTC (Fiber to the Curb, i.e. to the next external distributor), FTTB (Fiber to the Building) and FTTH (Fiber to the Home).

Although these acronyms have become quite common, it is important to keep calling to mind their meanings and the various strategies they involve. Otherwise it is too easy to have a distorted picture of topology, fine distribution to the end user and cost-benefit ratios. Caution is in order with publications that talk about concepts like fiber optic network or broadband without providing specifics on the access technology.

The VDSL2 packages offered by Deutsche Telekom and Swisscom are prominent examples of FTTC. The partial substitution of copper segments with fiber optics in combination with the latest DSL technology is an obvious growth strategy for incumbents, i.e. established carriers possessing a virtually seamless system of phone lines (that has evolved organically over time). VDSL2 is merely an interim technology step in the broadband world with fiber-optic Next Generation Access networks.

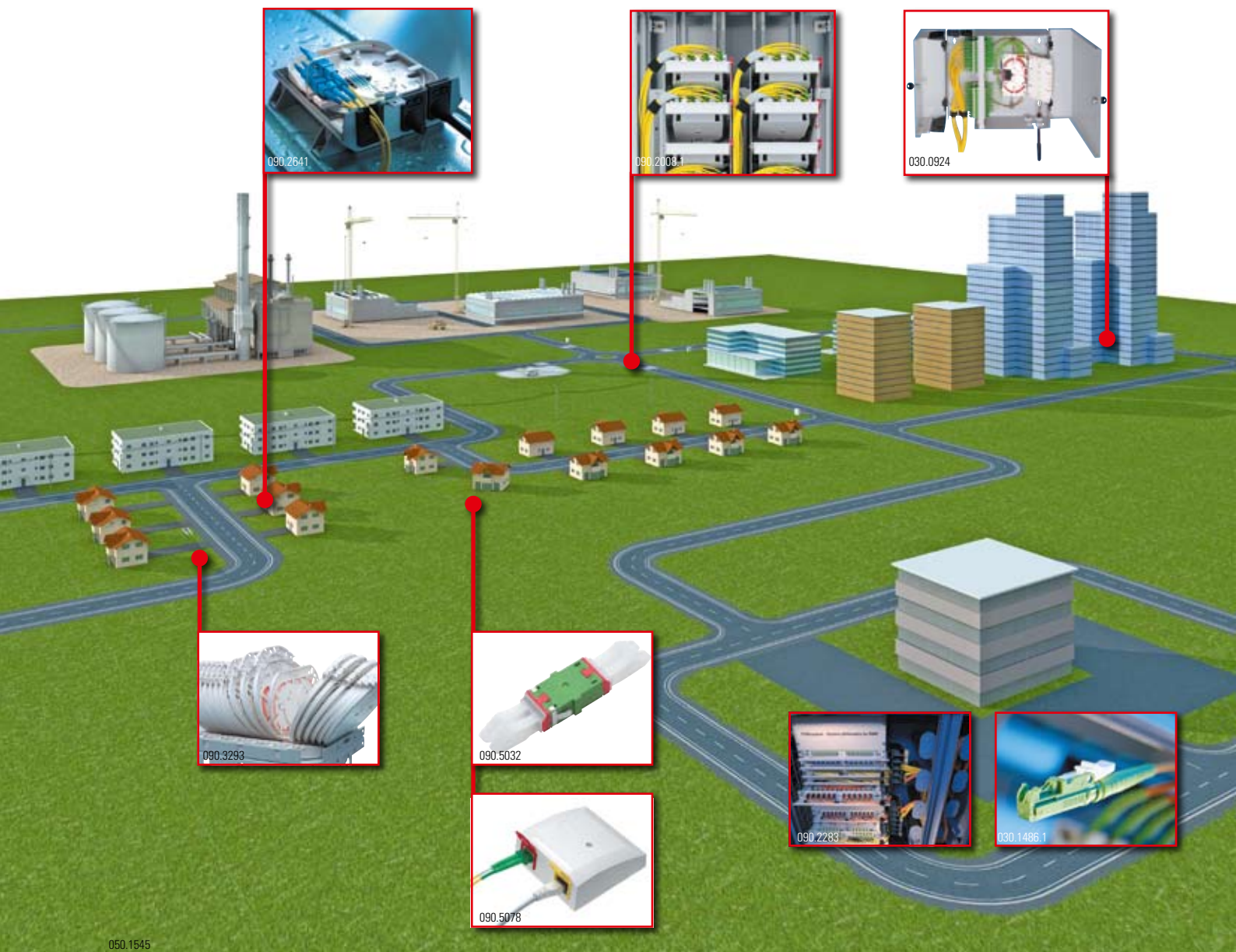
FTTx may offer a transmission rate of 100 Mbps to customers (or even a Gigabit rate to business customers) depending on the expansion version selected. These rates cover foreseeable bandwidth needs for the medium term, even assuming intensive use of IPTV and HDTV. Several city network operators are now developing solutions such as these or already operating them. Rates of 100 Mbps are already feasible if the fiber goes "only" into the building (FTTB) and the traffic is sent on from there over existing building cabling, e.g. over a LAN, to the work space or home living space. FTTB reduces investment costs by about 20 percent compared to an FTTH expansion. In addition, an FTTB »



090.5101

Greater bandwidth for end customers thanks to FTTx

FTTx: NEED FOR SPEED



050.1545
Typical FTTx structure

network can migrate relatively easily into an FTTH network at a later expansion phase.

QUALITY AND AVAILABILITY

The high expectations people have of NGA networks are also affecting the technology of passive network infrastructure. Enormous quantities of data have to be transmitted quickly and reliably. Average characteristics of connections and distribution systems no longer suffice to meet the broadband requirements.

More quality and availability is needed than ever before. It is a matter of complying with agreed service levels, of achieving customer satisfaction and of ensuring sources of revenue. In the development of these networks, the interplay of the passive and active layers must be examined even more closely in the future. Only fully developed total solutions for PON and P2P access networks can do that.

AN EVOLVING MARKET

Fiber optic connections (still) play a subordinate role in most European countries in comparison to other economic regions. Japan leads the way worldwide with more than 10 million FTTH connections. Every month nearly 300 000 new customers opt for FTTH; 60 000 change from DSL to FTTH. In South Korea, FTTB/LAN connections account for more than 35 percent of the total; in Hong Kong for about 28 percent.

“For 2010, we expect about 5,5 million FTTH connections.”

With 3 million connected households and growth rates exceeding 100 percent, the US is also far ahead of Europe in the global FTTH ranking. In an interview with Portel.de, Professor (FH) Hartwig Tauber, Director General of the FTTH Council Europe, explains that the picture is gradually brightening in Europe, too:

"In the early days of fiber optic expansion in 2004, progress in Europe was slow and we forecast about 3 million FTTH connections for 2010. In the meantime, we have about 1.8 million connections in Europe and expect to see that number climb to 5.5 million in 2010 and to about 15 million in 2012."

In terms of degree of service, i.e. number of connections per 100 households, Sweden and Denmark will lead the list of the top 10 FTTH countries in Europe in 2012, with 36.9 percent and 29.2 percent respectively.

According to findings of the FTTH Council, the broadband bit rates in Europe are increasing at an annual pace of more than 50 percent. Broadband use is growing by about 20 percent a year, whereby households with an FTTH broadband connection generate three times more traffic than households with ADSL. That is impressive proof of the thesis that end users make virtually immediate use of higher access bandwidths the moment they are available (provided the price structure is attractive).

Talking about the economic significance of fiber optic expansion, Professor Tauber notes that Greece, Portugal and Finland have now followed the lead of Sweden, Norway, Denmark and the Netherlands and are launching major FTTH programs of their own. In some cases, they are even government programs aimed at supplying genuine broadband access to the general populace. FTTH is also advancing steadily in France and in Slovenia, where the national telecom company has started the national rollout.

Professor Tauber: "With an increasing number of companies selecting their business location based on available ICT infrastructure, the lack of FTTH services could soon become a noticeable disadvantage economically."

HARMONIZATION IN EUROPE

The lack of EU-wide regulations in this area poses the greatest hindrance besides financing to the expansion of fiber optic access networks. In September 2008, the European Commission initiated a public consultation on the regulatory principles to be applied by the EU member states to Next Generation Access networks.

Europe is trying to harmonize certain categories, namely regulated services, access conditions, fees and risk allowances. The object is to ensure standard treatment of the network operators in the EU and thereby create the legal certainty so crucial for investments. The EU recommendation is generally expected to be a signal for future cooperation of telecom companies and alternative network operators. Open access will be facilitated.

"The planning of FTTx networks is a complex matter."

OVERCOMING CHALLENGES

There is a multitude of topologies and approaches to setup and expansion, including hybrid solutions. This fact alone gives us an idea of the many decisions with which FTTx "enriches" the lives of network planners. In many fiber optic projects, network operators have chosen R&M as a partner for passive infrastructure. They want to benefit from its competence in solution creation and from its many years of international experience.

The planning and creation of FTTx access networks is a complex matter. Each network is different. Each operator has its own strategy; each city, its own unique local situation. But in all projects, a top priority is to minimize the personnel costs and time spent on installation. The answer: FTTx challenges can be met by using a completely modular cabling system in combination with competent advice and customer-specific solutions. ■



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090.3015

Solutions by R&M provide the highest communication standards, even in the comfort of your own home.

FIBER OPTICS RIGHT INTO YOUR LIVING ROOM

Broadband access has been finalized and it is knocking at your door. Fiber optics is coming into your living room. For many carriers as well as real estate companies this is the next logical step. And R&M is here to support you all the way.

A new splice outlet augments R&M's program for broadband access for residential buildings and ties in with the Breakout Version introduced in 2008. The FO (fiber optics) outlet has now passed all tests successfully and is due to be launched. Development partners and pilot users expressed enthusiasm. Ease of installation, handling, application, and design had a convincing impact.

The FO splice outlet comprises four connector locations, enough room for two LC Duplex, SC or SC-RJ connectors. In addition, R&M provides the hybrid design for use with fiber optics and copper wiring, since RJ45 modules can also be employed. For safety reasons, the adapters can only be accessed from below and are covered with dust caps. Other safety features: The socket can be sealed and labeled.

The splice tray with four splice holders can be easily mounted and opened and supports a bending radius of 15 mm. R&M recommends the use of the innovative and very flexible G.657.A fiber. It ensures a minimum amount of attenuation loss – in this case 0.1 dB at a radius of 15 mm.

With a footprint of 88x88 mm, the FO splice outlet fits onto all common plugs. Surface-mounted and even next to an existing installation, the smart design always looks good. The control surface is 14 mm deep; the adapter area is 34 mm.

INSTALLATION SOLUTIONS FOR EXISTING BUILDINGS

The connection solution enables network carriers and real estate companies to provide fiber optic access to individual building floors and into apartments. This new outlet is suitable for retrofitting existing buildings where space for additional installations often causes a problem. Here, slim and easy-to-install systems are the only solution.

The FO splice outlet and R&M's well established in-home wiring solutions for copper and fiber optics fit very well together. From central office to individual apartments, network carriers now have access to FTTx and FTTH solutions by R&M that can be configured consistently and in a modular design.



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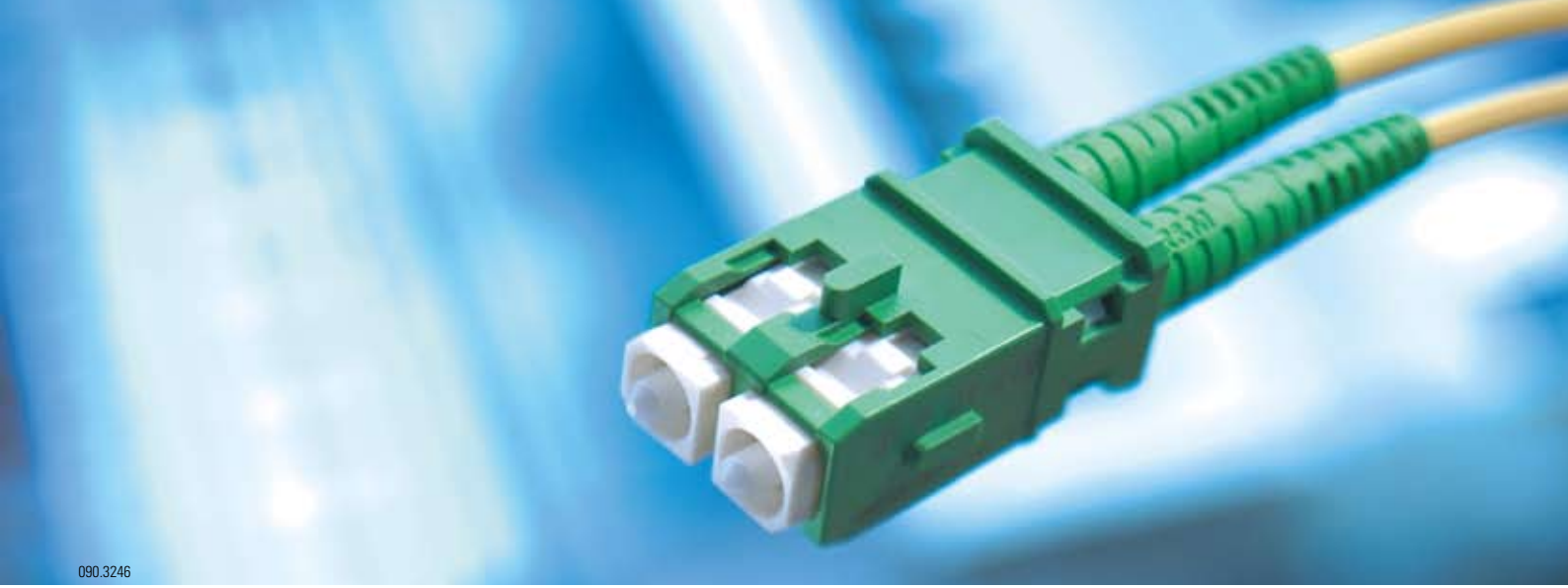
Hybrid design of the FO splice outlet – LC Duplex and RJ45 side-by-side



010.3038

Andreas Klauser

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090.3246

SC-RJ, an original R&M design with coding option

SC-RJ FOR ALL CLASSES

It may be the smallest in its category, but it is a true champion in all classes. The SC-RJ connector by R&M confirms its capacity in all requirement categories of the new IEC 61753 standard – even in premium class A*.

R&M has specified the fiber optic connector SC-RJ for the highest class of fiber optic data transfer. The Duplex plug, an invention by the R&M laboratory in Wetzikon, Switzerland, complies with the requirements of class A* in accordance with IEC 61753. This means: The light transmission in SC-RJ plug connections from fiber optics to fiber optics is the best there is, according to the experts.

This makes R&M the first manufacturer to cover all fiber optics performance categories with one single connector system – a system that can be used for wiring offices, residential buildings, campuses, industrial complexes, and data processing centers. Planning, installation, spare part procurement, and the maintenance of networks are considerably simplified.

A CARRIER OF HOPE FOR THE IT WORLD AND THE AUTOMATION SECTOR
Broad sections of the IT world and industrial automation sector are pinning their hopes on the SC-RJ. This connector is an

efficient and cost-effective solution for the connection and distribution technology in office buildings, data processing centers, and manufacturing plants.

The SC-RJ complies with the Small Form Factor Design. Its connection module fits in any RJ45 cut-out. This means the plug can be combined on a platform as a module with existing copper wiring – a prerequisite for the gradual introduction of fiber optics. A further advantage is its simple installation. In many cases the SC-RJ can be tailor-made on site.

Within the scope of international standardization that the SC-RJ passed, the connector was the first fiber optic plug to be approved for all fiber types. The responsible standard committees have specified the Duplex plug for use with glass optical fiber (GOF), polymer optical fiber (POF), as well as with the plastic clad fiber (PCF) particularly suitable for industrial applications. The plug can be used for multimode and singlemode fibers and is compatible with the widely used SC plugs. By offering the SC-RJ IP67 plug, R&M provides high-quality connectivity solutions for rugged industrial environments.

In addition to the connector's robust body, R&M pays great attention to the inner components of the SC-RJ – the guide sleeves. R&M uses the robust 2.5 mm ferrule technology.

http://www.rdm.com/en/Portaldata/1/Resources/hq/downloads_d_e/flyer_d_e/englisch/Flyer_e_SC_RJ.pdf

Attenuation Grade	Attenuation Random mated IEC 61300-3-34		Return Loss Grade	Return Loss Random mated IEC 61300-3-6
Grade A*	≤ 0.07dB mean	≤ 0.15dB max. for >97% of samples	Grade 1	≥ 60dB (mated) and ≥ 55dB (unmated)
Grade B	≤ 0.12dB mean	≤ 0.25dB max. for >97% of samples	Grade 2	≥ 45dB
Grade C	≤ 0.25dB mean	≤ 0.50dB max. for >97% of samples	Grade 3	≥ 35dB
Grade D	≤ 0.50dB mean	≤ 1.00dB max. for >97% of samples	Grade 4	≥ 26dB

Table: Performance criteria of the latest performance classes for data transmission in fiber optic connections in accordance with IEC 61753. R&M has adopted all classes. The SC-RJ connector also complies with the highly demanding category A*. The exact specification of class A* has not yet been finalized by the IEC. The data is based on discussions to date. As at June 2008.



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THE NEW LC: SAFETY AND SECURITY INSIDE

R&M has put a noble suit of armor on the LC. The new generation of the compact duplex connector system enters the market with unbeatable safety features. Its built-in laser protection is an international first for LC and makes it “dangerously non dangerous.”

R&M paves the way for progress in fiber optic cabling with its new generation of the LC Duplex connector system. The solution is maximum safety in minimal space. With the new LC, telecoms companies interested in pushing their fiber optic networks to the access level can develop public areas and even residential buildings compactly and without risk. Computing centers planning high-density units can enjoy greater operational reliability and safety with the new LC. This R&M product is also strengthened by typical added benefits: Along with taking an evolutionary leap in safety issues, the new LC generation offers reliable quality, modularity and flexibility.

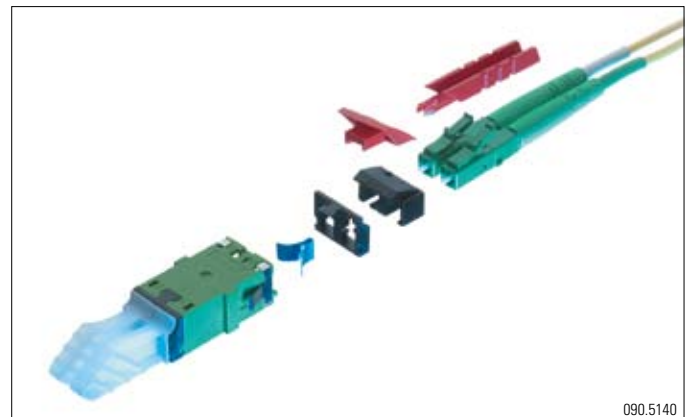
INNOVATION INSIDE AND OUT

The laser shutter provides integrated protection against laser beams, an international first in the product category of LC adaptors. A fine laser protection spring in the adaptor opens when the connector is pulled out and covers the fiber stub inside the sleeve. No laser beam can escape from the adaptor. The risk of injury is nil. That is safety factor number one. Besides that, R&M offers a semi-transparent dust cap that allows a quick, safe visual check of the connection with red light.

The second big innovation is that an LC is now fitted with the three-tier R&M safety system for the first time ever. Tier one is the color coding with colorful plastic frames that can be effortlessly snapped in place at the front of the adaptor. Clear colors provide

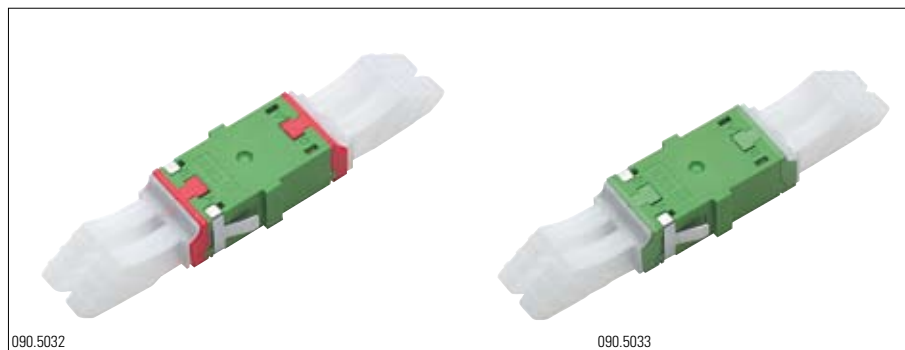
a good overview of a densely used patch panel. Tier two involves mechanical coding featuring additional plastic clips. A connector can only be plugged in if the clips on connector and outlet match. This is an effective way to avoid patching mistakes. Tier three entails plug-out protection, an exclusive advance from R&M. A lock interlocks the connector. It slips easily into the mechanical coding clip and can only be opened by someone holding the key to it. This feature prevents network interruptions caused by connectors being unplugged accidentally or without authorization.

The body of the adaptor is a single piece – an example of genuine Swiss precision in plastics manufacturing. This design makes it much sturdier and more durable than welded plastic parts. The adaptor is available with or without flange and is compatible with all R&M platforms. Combinations with existing SC and E-2000™* infrastructures are possible. Terminal springs and slots speed up installation. In no time at all, the adaptor is firmly in the patch panel. The new LC Duplex connector system is suitable for grade C and D singlemode optical fibers and grade M multimode optical fibers.

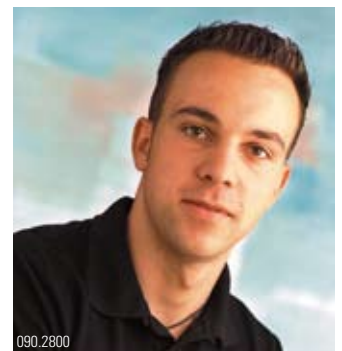


Construction LC-Duplex connector with security

* E-2000™, manufactured under license from Diamond SA, Losone.



The new generation of the LC Duplex from R&M has unbeatable safety features.



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ANGLED PATCH PANEL CREATES SPACE IN THE DATA CENTER

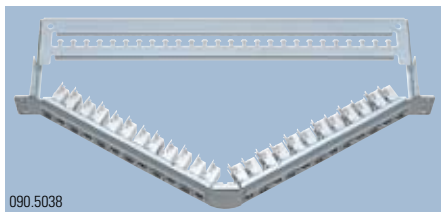
Angled patch panels are particularly popular with operators of data centers. They enable a higher port density in the 19" rack and make horizontal cable management redundant. The patch cords can be routed directly into the vertical cable managers on the side of the frame. Bending radii are maintained.

The new angled patch panels from R&M have the properties that R&M customers expect: Easy installation due to snap-in modules, automatic ground bonding, integrated cable support and optional vertical cable guides. The construction is a solid steel design. The integrated port numbering, a new patch panel identifier in the middle, large labeling areas – also for P-touch labels – and typical R&M color coding ensure safe and easy patching.



090.5041

Good overview: Integrated port numbering and large labeling areas ensure reliable patching.



090.5038

Rugged construction: The cable support is built in.



090.5043

Order both inside and outside. Large bending radii and rounded support edges protect the cables.

Regina Good, Product Manager, regina.good@rdm.com

STYLISH, STURDY, SAFE: CABLE GUIDES MADE OF METAL

R&M extends the accessory range for patch panels with cable management panels and rings. The mechanical dimensions of the ring interface are exactly the same as those of the established plastic components. This opens up any number of possible combinations for horizontal and vertical cable management.

The both stylish and robust metal rings simply snap into the cable management panels and can be secured with a screw for increased stability. Extra large rings guide even large cables reliably and keep undesirable forces away from the connections. Individual cables can be inserted or removed with ease, without compromising security – an advantage for companies that constantly have to adapt their cabling infrastructure to new circumstances.



090.3341

Stylish but nevertheless robust: ring versions in 70 and 90 mm for larger cables. The opening allows cables to be inserted and removed without a hitch.



090.3336

Flexibly combinable: The metal cable rings have the same mechanism as the plastic version.



090.3333

Simply snap in: A spring effect ensures optimum grip. An optional screw provides additional stability.

DUST- AND SPLASH-PROOF PANEL MOUNTING FRAME

Dust- and splash-proof connections are now easily installed in systems, wall ducts or IP boxes: The new IP54 mounting frame from R&M fits into standardized, pre-drilled M32 round holes and accepts virtually all R&Mfreenet modules: RJ45 Cat. 5 and Cat. 6 modules, SC-RJ, E-2000™* and LC. It is also suitable as a cable passage using the RJ45 coupler modules.

Using the IP54 panel mounting frame it is possible to implement industrial cabling and outdoor installations inexpensively as no additional surface- or flush-mounted boxes are necessary. The connector sockets receive an IP54 splash flange with rubber seal and hinged cover which is sealed off if not assigned. If assigned, rubber grommets slipped over the plugs of the connecting cables ensure continuous IP54 protection. Thanks to Smartholes it is also possible to use the entire R&M security system.

* E-2000™, manufactured under license from Diamond SA, Losone.



090.2936

Cost-effective solution: The new IP54 panel mounting frame can be installed directly into systems, wall ducts or IP boxes.

Yingbo Seiler

Product Manager, yingbo.seiler@rdm.com

EUROPE'S MOST UP-TO-DATE HOSPITAL NETWORKED

Multimedia screen at the bedside. The fastest CT scanner in the emergency room. Operating theaters with real-time image transmission. 3500 computers. 850 kilometers of Cat. 7 cable, 20000 ports with Cat. 6 connections and over 2500 fiber optic plugs between them...

These are just some of the features of Europe's most up-to-date hospital. The University Medical Center Hamburg-Eppendorf (UKE) began operating in its new building with 730 beds, 19 wards, 16 operating theaters and a usable area covering 42 000 m² at the beginning of February 2009. The general contractor HOCHTIEF had completed the EUR 188 million project ahead of schedule. Efficient cabling solutions by R&M – executed by the QPP partner Vater KNS – contributed to the speedy execution of the medical center's construction.



060.1500

Europe's most up-to-date hospital is also impressive due to its exemplary architecture.



050.1501

The imposing building site for the new UKE in Hamburg: R&M's solution was convincing due to its advantage in terms of quality, security and ease of installation.

SELECTION PROCEDURE WITH ADDITIONAL TESTING ON SITE

"Network cables are the lifelines of the new medical center. We placed a correspondingly high value on selection of the supplier," says Dr. Peter Gocke, Manager of the University Medical Center's IT Division. Stringent criteria were set up for the selection process. There was more at stake than product descriptions, certificates and guarantees. Among other things, the UKE's IT Department had two cabling systems tested in-depth on site to enable it to compare their quality and suitability for the operation of a sensitive medical center.

Based on the additional test, the UKE decided on R&Mfreenet using the Real10 and Vision range. The installation included 20000 Cat. 6 ports, approx. 850 km of Cat. 7 system cable in two colors for redundant cable runs and approx. 220 fiber optic splice trays each with 12 E-2000™* Compact plugs and thousands of copper and fiber optic patch cables that were supplied labeled on both sides and individually numbered.

"The better the infrastructure, the more precise the diagnoses and therapies."

The mission statement of the UKE project is "Competence grows together." The new medical center unites 17 specialist clinics within an innovative architecture. Doctors are now able to

work together in an interdisciplinary manner with a minimum of red tape – supported by a high-quality network. "The better the infrastructure, the more precise the diagnoses and therapies," emphasizes the UKE. Mobile IT systems, forward-looking EDP, automated processes and innovative management concepts enable fast and flexible treatment and ease the workload on staff so that they can concentrate more thoroughly on attending to the patients. The electronic patient files are always within easy reach for doctors and nurses.



010.3000

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* E-2000™, manufactured under license from Diamond SA, Losone.

WESTSIDE, SUCCESS STORY OF AN EXEMPLARY COLLABORATION



050.1502

Westside – international flair for Bern's multi-experience destination (Photos: Neue Brünnen AG)

A NEW TOWN ON A GREENFIELD SITE

Over the last few years, a completely new district has sprung up from the soil of the last large plot of building land in the west of Bern. Rising out of the sea of recently-built houses is a massive building with a distinctive, spectacular architecture. The Westside by Daniel Libeskind, the first leisure and shopping mall designed by the world-renowned architect. From fall 2005, on what was then the largest private building site in Switzerland, there emerged a mall with 55 shops, 10 food courts, a water park and spa, a hotel with 144 rooms and state-of-the-art seminar infrastructure, a multiplex movie theater with 2400 seats and a care home with 95 apartments and 20 rooms with nursing care. The official opening on October 8, 2008 attracted attention from all over Switzerland.

The cabling of Bern's Westside shopping mall, leisure and conference center presented an extraordinary challenge for all those involved. Thanks to a collaboration characterized by mutual openness and trust

between the installer responsible, the Burkhalter Group, and R&M it was possible to accomplish this huge project successfully within the prescribed time limit and to the building owner's utmost satisfaction.

Westside, which is situated over the freeway, is directly accessible by both private and public transport. Its catchment area covers the cantons of Bern, Solothurn, Freiburg and Neuenburg. The operator anticipates about 3.5 million visitors a year.

The building owner was Neue Brünnen AG, a wholly-owned subsidiary of Switzerland's largest retail trade company Migros. As a specialist, the Burkhalter Group was put in charge of the installation work for weak- and high-voltage current and the control of heating, ventilation and communication.



050.1503

Attila Szabo, Burkhalter, Installation Manager



050.1504

Niklaus Kummeler, Burkhalter, Installation Manager



050.1505

Jürg Gerber, R&M, Key Account Manager Bern

CHALLENGE YES – NERVES, NO THANKS

This massive project – one of the largest in Europe in terms of complexity and scope – was a huge challenge even for Burkhalter AG, which was established over 50 years ago. The numbers of people and quantities of materials used were enormous. On top of this there was also extraordinary time pressure. Project manager Niklaus Kummler: “It was very tight timewise. You can’t afford to have nerves, they have to be steel cables.”

At times there were 230 people working for the installation company on the building site. Many of the temporary employees had to be trained up. For wiring of its own products, R&M supported the installer in the training of suitable people by providing its own training staff on site.

SKILL AND OPEN COMMUNICATION PAY OFF

R&M has worked with the building owner of the Westside project for years as a supplier in the network sector. This collaboration is based on the trust and confidence that can only be generated by a high level of specialist skill on both sides and by mutual openness in communication. Confidence that has also developed during the many years of collaboration with Burkhalter. According to Attila Szabo, the installation company was very satisfied with the R&M products:

“I have never yet had problems with R&M products.”



Daniel Gyger, R&M Switzerland
daniel.gyger@rdm.com



050.1506

The extraordinary architecture of Daniel Libeskind also attracts attention inside.

“I have never yet had problems with R&M products. They’re easy to install and R&M provides top quality in both its products and its service – basically an installer’s best friend.” As a result, Burkhalter and R&M like working together and do so on a regular basis. Not least because our employees will also make the impossible possible for our customers: Nothing is too much for us.

The Westside project was dealt with in 20 ordering sections. The deadline of course was always “the day before yesterday.” Thanks to R&M’s typical flexibility, it was possible to cope with this challenge to the satisfaction of all involved.

THREE INTERNAL GSM NETWORKS

The building owner operates a separate GSM network for Swisscom, Sunrise and Orange respectively so that the customers of the various telecommunications providers can communicate effortlessly anywhere. Added to this is a further installation for the range of communication and media products provided by Cablecom.

THE PEOPLE BEHIND THE PROJECT

IN CHARGE FOR BURKHALTER WERE:

- Marc Lätsch, Manager of Large-Scale Projects in Switzerland and Member of the Executive Board
- Attila Szabo, Installation Manager and Co-Project Leader
- Niklaus Kummler, Installation Manager and Co-Project Leader

IN CHARGE ON R&M’S SIDE WERE:

- Daniel Gyger, Sales Manager Central Switzerland
- Jürg Gerber, Key Account Manager Bern since November 2008

R&M PRODUCTS USED:

- 8500 modules Cat. 6s
- 800 universal elements 5x RJ45 modular
- 130 voice modules for 1300 TT connections
- 10 TT distributors VS Modular

MULTIROOM*PRO*: MUSIC NETWORKED AT HOME

Frank Sinatra in the study. Vivaldi in the lounge. DJ Bobo in the kitchen and Amy Winehouse in the shower.... But as far as the eye can see, no radio or hi-fi equipment. Instead *MultiroomPro* by R&M plays the song request in every room. A young family in Bubikon is using it to experience a new type of living comfort.



090.5007
Unlimited and individual music pleasure in the lounge with the necessary technology in the background

MultiroomPro extends R&M's multimedia home wiring system with a flexible audio solution for the whole house. It consists of three essential units that are networked by way of star cabling:

- control device (switch) in the communication distributor; it is also possible to install peripheral devices there for feeding in music
- concealed speakers or speakers set up as room elements

- modern design keypads that can be placed in every room.

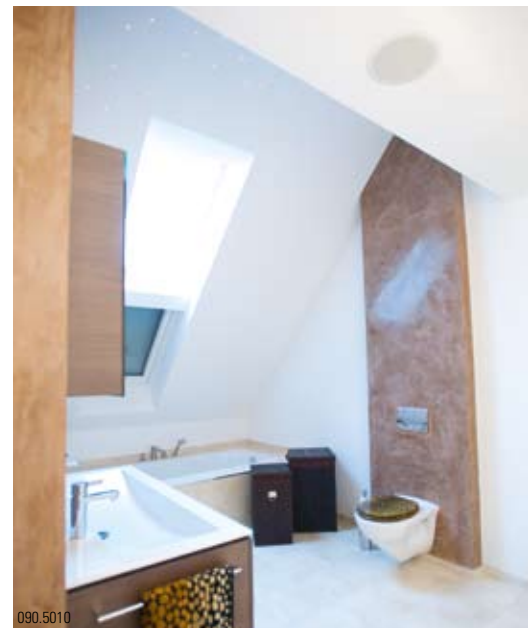
The keypads are as easy to operate as MP3 players. The music source plus artist, song and volume are selected and the music pleasure begins. *MultiroomPro* can supply up to twelve zones or rooms with individual audio signals or - in party mode - all areas with the same sound. As a re-

sult, the solution is also suitable for villas, offices, shops and consulting rooms, hotel suites, leisure and wellness centers or community centers.

R&M only sells the new development in Switzerland through an exclusive country-wide network of certified partners and qualified installers. Satisfied customers confirm that *MultiroomPro* is



090.5019
A young family invests in the multimedia future.



090.5010
The modern bathroom: an oasis of relaxation thanks to R&M *MultiroomPro*



090.5016

iPod and iPhone – the trendy, portable music source for all generations



090.5013

The shapely operating panel with individual design as an eye-catcher throughout the house

a trendsetter. It simplifies the provision of surround sound and allows individuals to listen to music in a consistent and cost-effective way by means of multivendor, standardized and easy to understand networking. MultiroomPro works on the Plug & Play principle and requires no software configurations.

“The apartment in the multi-family house was fitted out completely with MultiroomPro.”

The new customers from Bubikon near Zurich: “The apartment takes on a clear and very modern character. Many individual appliances such as radios are now completely unnecessary. As a result they cannot use any energy and spoil the atmosphere.” In fall 2008, they had their five and a half room duplex apartment on the top floor of a multi-family house completely fitted out with R&M’s home wiring system and MultiroomPro.

In this case, the satellite receiver and iPhone serve as the music source for the four acoustic zones which will shortly be increased to six. Additional sources such as tuners, CD players, Internet radios and music servers can be connected up in the communication distributor. TV signals as well as telephone, EDP and Internet information are also connected up in the same distributor and distributed.



090.2144

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MOTIVES FOR A NEW “MULTIROOMPRO” BUSINESS UNIT AT R&M SWITZERLAND

The motivation for the very interesting and emotional Multiroom topic was the desire and the idea of distributing additional services such as surround sound throughout the house by way of the classic R&M home wiring. A broad, contemporary customer requirement that R&M covers perfectly and cost-effectively with the innovative all-in-one solution R&M MultiroomPro. Our efforts were assisted, on the one hand, in that it was possible to conclude a long-term and exclusive framework agreement for Switzerland with our audio partner NuVo and, on the other, that the key skills of both parties complement each other perfectly (win/win). The existing and already established R&M home wiring sales concept gave rise to new dynamics for cultivating the entire Swiss market. Certified and trained R&M Multiroom partners guarantee that our customers are assured of the necessary local support and service at all times. Our greatest motivation comes from the large number of satisfied R&M Multiroom customers and the steadily increasing sales figures. All in all a successful project which gives us very great pleasure and confirms R&M as an innovative trendsetter in home wiring.

Reto Rudolf, Sales Manager, R&M Switzerland

Elia is responsible for managing the high-voltage grid in Belgium. Elia's data centers play a crucial role in managing and monitoring this network.

When expanding its data center in Merksem near Antwerp, Elia chose R&M's cabling – because in a 24 / 7 environment, reliability and performance are of the utmost importance.

As manager of the Belgian high-voltage grid, Elia is responsible for the transport of electricity from the power plants to the distribution system operators and the major industrial users. Elia manages a power grid covering some 8400 km of overhead high-voltage power lines and underground cables, connected via more than 800 high-voltage substations.

BALANCING SUPPLY AND DEMAND

Properly managing the flow of energy is quite a complex matter. Because electricity can only be stored to a very limited extent, supply and demand have to be perfectly balanced at any time. Quite a complex issue as consumption is subject to major fluctuations (day or night, summer or winter, week or weekend) which cannot always be predicted. Therefore, immediate corrective measures are called for to re-establish that balance if a power plant breaks down or a major consumer goes offline.

On top of that, the Belgian grid also sees a constant flow of cross-border energy transport that has to be coordinated with the system operators in neighboring countries.

DISPATCHING ALWAYS READY TO ACT

Elia's four control centers (or "dispatchings") constantly monitor the energy flow, the balance between supply and demand, and the status of each network node. At all times, they must therefore have the necessary data at their disposal in real time in order to be able to react immediately whenever necessary, because each and every customer must be able to rely on a non-stop supply of energy.

Elia's data centers play a crucial role in this constant delivery of real-time information to the control centers where all the information about the high-voltage grid is collected and subsequently visualized for the dispatchings.

Elia has decided to move one of its three data centers to the existing data center in Merksem where there is still plenty of space and infrastructure. Therefore, one of the server rooms in Merksem is currently being refurbished to have it fully operational by the summer of 2009 once the move is completed.

AVAILABLE 24 / 7

It is obvious that high availability, reliability and performance are key elements in such an environment. There has to be a constant supply of up-to-date information to the dispatchings in order to be able to guarantee the supply of power.

"The layout of the data and communication network has therefore been the subject of extensive reflection," says Ronny de Milliano, TCP/IP Network Projects Leader for Elia.

The network diagram is indeed an impressive grid of redundant connections within the data center and between the data centers of Merksem and Schaarbeek, near Brussels.

"All connections have been duplicated so as to be able to cope with any problem and ensure that the dispatchings have live information at their disposal 24 / 7. Both data centers, which are linked via optical fiber, also act as each other's disaster recovery center," Ronny de Milliano explains.

"R&M emerged as the manufacturer that offers perfect quality."

WHY R&M?

In this context it was quite clear that the cabling of the new server rooms in Merksem would need some very careful planning.

"As far as cabling was concerned, we wanted it to be as functional and as future-proof as possible," Ronny de Milliano adds. "We have carefully scanned the market and eventually decided on R&M. We talked to reference customers, to colleagues both in and outside our sector, and each time R&M emerged as a manufacturer that is both future-oriented and offers perfect quality."

Once R&M had been chosen, Elia went to look for a certified R&M partner for the installation, and in the end it decided on Guana. According to Jan Waegemans, Project Manager for Guana, choosing a certified partner is the most logical thing to do. "That way, the customer gets a 25-year guarantee from R&M for the quality of the cables and the connectors."

In Elia's data center in Merksem, Guana installed 25 kilometers of Real10 U/UTP Cat. 6a copper cabling and 1200 RJ45 network con-



050.1507

Handling the flow of energy is a central matter in managing high voltage grids (Photothèque Elia).

nectors. On top of that, 3.6 kilometers of optical fiber and 1800 connectors were implemented as well. For safety purposes, the cabling has a LSZH cable jacket (Low Smoke Zero Halogen) so as to prevent the release of any toxic fumes in the case of fire.

“Both the delivery and the installation went perfectly as planned,” says Jan Waegemans.

Ronny de Milliano confirms that the cabling was completed as expected and that the timing was well respected too. However, he still has a wait-and-see attitude because the moment of truth is still to come when the new server room in Merksem goes in operation in the summer of 2009.

But obviously the foundation of success has already been laid. “Because of the demand for high availability, we have considerably raised the bar at Elia,” Ronny de Milliano explains. “Therefore we have to work with as reliable products as possible, and as far as cabling is concerned, we are convinced that we have found an excellent partner.”



010.3052

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HIGH-QUALITY NETWORK FOR MICROSCOPIC FIBERS

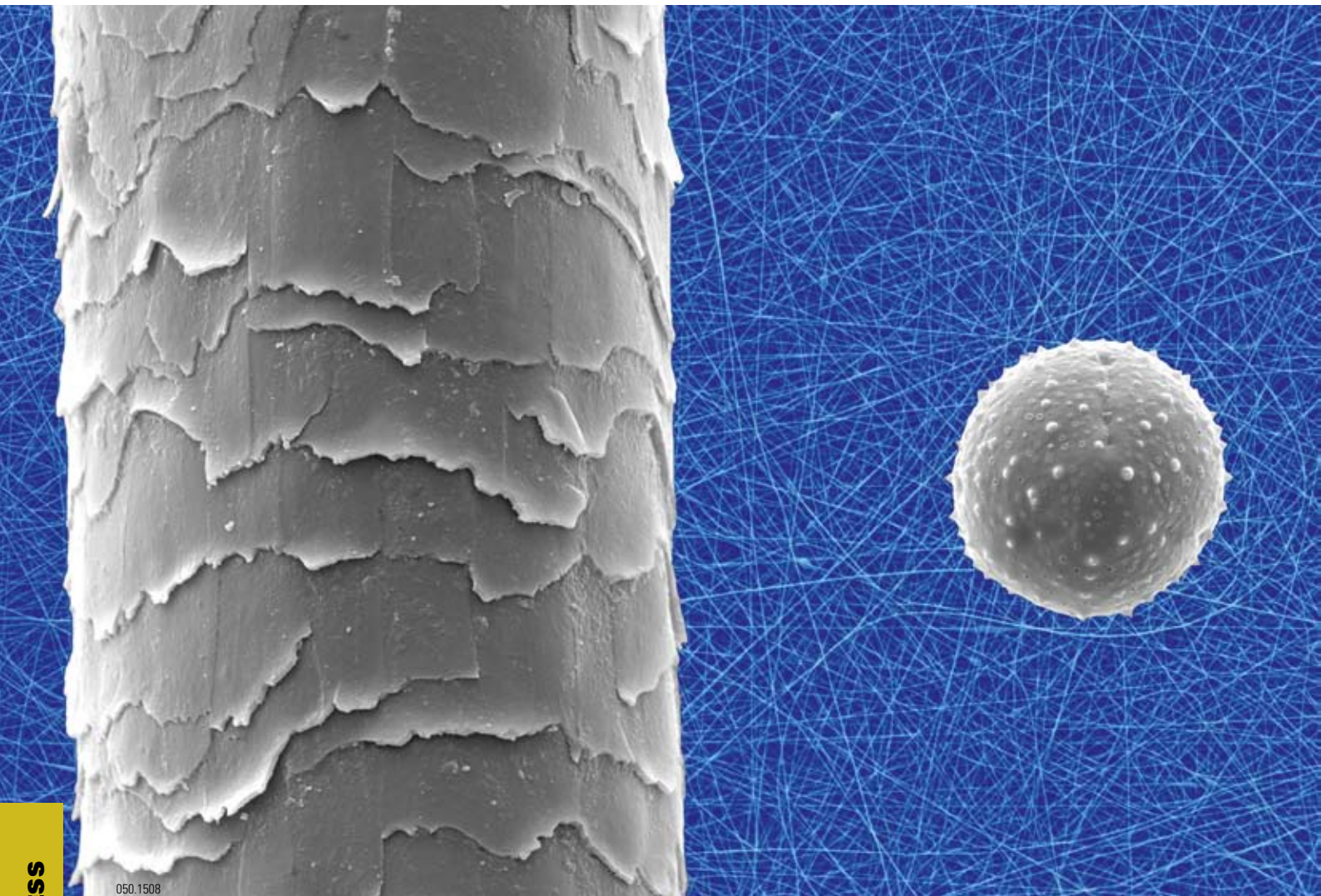
In the city of Liberec in the Czech Republic a development and production center is currently under construction for an exciting class of material of the future: nanofibers. R&M is delivering a network for the plant that more than meets the stringent safety requirements for industrial production.

Liberec, or Reichenberg as it is also known, situated in the north of the Czech Republic, is a town steeped in history. From the 16th century it developed into a significant center for weaving.

From its artisan origins it later devoted itself to commercial and industrial textile manufacturing, a sector that helped the city to become prosperous and famous.

Today, at the beginning of the third millennium, Liberec is once again causing a sensation with fibers; but with fibers that are not even visible under an optical microscope as their diameter is less than that of the wavelength of light. These are known as nanofibers, a material that is deemed to have a very promising future. Whether in medicine, filter industry, construction, automobile industry or other industrial sectors, there are numerous applications for material made from these unbelievably thin fibers (approx. 2 to 5 ten-thousandths of a millimeter).

Today, Elmarco is still the only company in the world that manufactures and markets machines for the industrial production of nanofibers. These machines are referred to as nanospiders and



050.1508

The world of 10^{-9} where human hair and fine dust represent a giant object compared to the nanofibers.



050.1509

New ELMARCO building covered by the first snow of the winter season 2008/2009.

use electrospinning technology to generate the innovative fibers. However, Elmarco not only provides the machines but also manufactures and markets the corresponding products under the brand names Nanospider AcousticWeb™ and Nanospider Antimicrobe-Web™.

Currently, Elmarco is constructing a number of new company buildings comprising an administration center, a manufacturing plant, a training center and a development laboratory. The company is working closely with R&M on the cabling for the entire complex as the campus is to be equipped with 2333 connection points for the R&Mfreenet Real10 program. Shielded Cat. 6 cabling providing Class E_A performance and single mode fiber optic backbones belonging to the R&Mfreenet Vision System are being used for data transmission. The cabling system was planned by IBM in the Czech Republic; responsibility for the installation has been placed in the hands of the certified R&M partner oaza-net.

The first building on the campus, the laboratory, was completed at the end of 2008. This was a building that placed especially high demands on network security and on the protection of components from outside influences. For challenging areas of this nature, R&M, with its comprehensive security system and con-

nection modules developed especially for industrial use, was able to come up with an appropriate solution taken from its program. This means that fast and secure data transmission up to protection class IP67 is catered for. Thus Elmarco has been put on a sound footing in its quest to further expand the development and production of the ground-breaking nanofiber technology.



050.1510

Jan Philip, R&M Czech Republic
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MILLENNIUM BANK CHOOSES R&M FOR FLEXIBILITY AND FUNCTIONALITY



050.1511

A typical modern data center

Millennium Bank in Poland needed functionality on the highest level for networking in the bank's new office buildings. The solution from R&M in Poland was selected against strong competition.



050.1512

Mariusz Solski, R&M Poland
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Millennium Bank is one of Poland's largest and most successful financial institutions. Experiencing growth and continued expansion, the bank needed to consolidate several different office locations into one new building, which was erected in Millennium Park in Warsaw, the capital of Poland.

The challenge facing the bank was to choose the most reliable structural cabling supplier who would be able to meet the stringent project requirements. The project comprised the LAN network across office premises as well cabling throughout the data center.

"R&M was selected against strong competition."

R&M was selected against strong competition as the preferred supplier. Millennium Bank was attracted by the complete R&Mfreenet system and the high level of flexibility and functionality it offers. Another important factor was that R&M is well established in Poland and regarded as a leading supplier in the Polish market, offering telecommunications network components of the highest quality.

It took ten months to implement the network system at the bank, and it has been a success from day one. The modern LAN infrastructure is based on STP Cat. 6 and 6a

cabling, supporting data transfer up to 10 Gb/s, which will provide optimal transmission capacity for any of the specific business requirements at Millennium Park.

"The high quality of R&M products allows us to live up to customer requirements even in a business as demanding as banking. The fact that we have successfully deployed at Millennium Bank, one of the biggest financial institutions in Poland, proves this very well, said Piotr Kiejno, Project Manager at Reichle & De-Massari Polska Sp. z o.o." Our experience tells us that the key to being successful is an individual approach to each project and thorough analysis of requirements on each level of investment," Piotr Kiejno stated.

Among the essential features of R&M solutions are modularity and simplicity of installation. These advantages allow implementation on a professional level in a very convenient manner. This in turn ensures that future maintenance and operation are straightforward, too.

Moreover, the Millennium Bank solution was implemented with cables compliant with LSOH specification (Low Smoke Zero Halogen) which ensures increased standards of fire protection.



050.1513

IP54 Splash range



CEGEDIM ACTIV, the software and services center for personal insurance in the CEDEDIM Group, has moved into its new computing center.

The ambitious project had to be carried out in just one month. This tight schedule required hard work from everyone involved, around-the-clock.

JERLAURE, a planning office specializing in designing secure computer rooms, initiated the project under the direction of Philippe Raulet and commissioned the certified R&M partner EXPRIMM'IT to handle installation and project management. The man in charge of technical planning was Gilles Goasdoué, sales engineer at EXPRIMM'IT and expert for cable infrastructures in computing centers.

24 KILOMETERS OF CABLE!

The structured cabling in the computing center was distributed over a 24 km long meshed raceway network. The system is operated in the 500 MHz channel for 10 GB.



Cyril Doll, R&M France
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The infrastructure is based on R&Mfreenet that ensures trouble-free interaction between copper and fiber optic equipment. STAR REAL10, Cat. 6a UFTP was selected as the copper cabling. The racks are connected via optic fibers (50/125 OM3-qualified); LC Duplex fiber optic connectors are used (OTDR-certified for 850 and 1300 nanoseconds).

"EXPRIMM'IT has been recommending R&M solutions for several years now."

To keep to the tight schedule, the pre-assembled links were simultaneously installed in the central equipment room and connected on-site by a team of technicians.

Jean-Pierre Larroque, Head of Sales for the Southwest Region at EXPRIMM'IT: "EXPRIMM'IT has been recommending R&M solutions for several years now. We especially appreciate our supplier's expertise, high standards and emphasis on top performance. Of course, we are familiar with its computer center projects."

As a specialist in computer solutions for insurance carriers and health insurance funds, CEGEDIM ACTIV gives great priority to ensuring data availability. Jean-Marie Azam, Head of Production at CEGEDIM ACTIV: "With this investment in a new computing center featuring optimum equipment, CEGEDIM ACTIV is well-positioned to handle the growing volume of data and ensures the maximum availability for its information system."

THE R&M SOLUTION FOR CEGEDIM ACTIV

- STAR REAL 10 Cat. 6a UFTP
- Fiber optics
- LC Duplex fiber terminations

A total of 1608 four-pair connections were installed in the computer room and 350 four-pair connections in the adjoining offices.

CEGEDIM ACTIV is part of Software & Services for Personal Insurance, a unit of the CEGEDIM Group. The company and its 500 employees generate annual sales of EUR 62 million. Its 200 customers administer statutory and supplementary insurance for 30 million insured in the sectors of health, nursing care, life, savings and pension with the software solutions from CEGEDIM ACTIV. Other high-quality software and services products from CEGEDIM ACTIV enable it to handle 150 million electronic data flows (EDI) and non-cash benefits.

www.cegedim-activ.com

EXPRIMM'IT is a subsidiary of ETDE, a specialist in designing and integrating technical solutions and services. ETDE belongs to the Bouygues Construction Group. EXPRIMM'IT offers global solutions for voice, data and image integration for private and public enterprises. As part of the Building Management Division (EXPRIMM) at ETDE, EXPRIMM'IT also integrates facility management services for IT, allowing corporate customers to integrate their IT in a global facility management concept. EXPRIMM'IT has its headquarters in the Paris metropolitan region (Les Ulis) and has three regional branches in Lyon, Montpellier and Toulouse. The company and its 300 employees generated annual sales of EUR 37 million in 2007.

www.exprimm.fr

MODERN CELL PHONES IN EUROPE'S FLEDGLING STATE



050.1515

Prishtina, the capital of the Republic of Kosovo, at night

Kosovo is a fledgling republic with great ambitions. The declaration of independence from Serbia in 2008 has created both optimism and dynamism. One of the most successful representatives of the aspiring Kosovar economy is the network operator IPKO.

Kosovo has only been an independent republic since February 17, 2008. Until now, 53 of the 192 UN member countries have recognized Kosovo as an independent state. Economically, the republic would like to achieve the level of the EU member states as quickly as possible. One of the companies that has been instrumental in contributing toward the economic development of Kosovo is IPKO, the leading IT and telecommunications provider in the country. Founded in 1999 as the first Internet provider in the region, IPKO has progressed to become a cutting edge network operator.

IPKO has set out to combine its many years of experience in a dynamic, emerg-

ing market with the desire to make innovative technology available to the Kosovars. As if to underline this, the company has established itself as one of the most successful enterprises in the region. IPKO sees itself as the pioneer of an aspiring telecommunications industry in the country. As such, the company wants to be considered a trailblazer in enabling the young state to take on an equivalent role in the global telecommunications business.

Thanks to the experience, creativity, expertise and personal commitment of the employees, the company finds itself in an ongoing growth process. As one of the leading representatives, the goal is to assist the modern Kosovar economy in expanding further while combining excellent performance with high ethical standards. In this context, creativity and teamwork are issues of great importance at IPKO.

Today, IPKO is part of Mobitel Slovenia. In the course of its expansion, the company acquired new premises in Pristina in June 2008. As a cell phone provider it goes without saying that great value is placed on network stability and security. For the new Cat. 6 network that had to be set up, the R&M Adriatics office was tasked with supplying the components to be installed by the certified R&M partner SRC from Slovenia. "Our experience has shown that R&M's system is able to meet the stringent requirements and achieve an

extremely favorable total cost of ownership," explained SRC project leader Denis Ganoni.

Vanja Gašparšič, supervisor for Mobitel Slovenia and certified R&M planning engineer added: "Thanks to the training offered by R&M and the support provided by the R&M partner SRC, it was possible to complete this project from planning to implementation and go operational within a very short space of time."

Fibernet Slovenia-Fibernet Kosovo acted as distributor. Thus IPKO can now take advantage of the high-quality infrastructure needed to achieve its ambitious goals.

IPKO PRISTINA NETWORK – FACTS & FIGURES:

- 70 km Cat. 6 cable U/UTP (unshielded twisted pair) LSOH
- 1200 UTP Cat. 6 modules
- 60 patch panels UTP for 24 ports, RJ45 Cat. 6
- Patch cords UTP Cat. 6: 300 x 1 m, 300 x 2 m, 300 x 3 m, 300 x 5 m



050.1516

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TECHNOLOGY FOR ALL – ADVANCES IN LOCAL GOVERNMENT IN PORTUGAL

In March 2007, a groundbreaking eGovernment project in the Portuguese county of Évora went operational, bringing life to a partnership between the local municipalities, Évora University, the Regional Development Agency and the County Tourism Agency.

The Évora Digital District project (EDD) was designed to provide eServices to the county's inhabitants through numerous government portals, Extranets, and municipal websites and take the region fully into the information technology age. The installation of the network that made it possible, carried out by civil engineering specialists Ensul Meci, included R&M's fiber optic connection modules and racks, chosen for their high levels of quality and flexibility in design.

Évora, situated 130 km east of Lisbon and in the heart of the Portuguese region of Alentejo, is the second biggest county in Portugal and consists of 14 municipalities whose capital is the medieval city of the same name. Until a few years ago, the region was still lacking a functional eGovernment platform infrastructure. There was no connection at a municipal level between services that were often located in different buildings. There was no regional data center, no Intranet, and the town council websites had not yet been adapted to offer online services, obliging the residents to handle administrative procedures in person at the respective offices or departments.

However, in September 2004, the ambitious EDD project was begun, led by the Évora County Association of Municipalities (AMDE) in partnership with the Alentejo's Regional Development Agency, the University of Évora, the County Tourism Agency and the region's 14 municipalities. In less than three years, EDD established municipal broadband networks, a professional data center, and reformulated 14 municipal websites to a common platform and navigating structure as well as adding online services and Intranets. In the city of Évora, for example, a high-speed metropolitan fiber optic network was implemented connecting five different organizations in 11 buildings and enabling the data center to provide shared services such as: Voice over IP, backups, crash recovery and monitoring.

The project, the biggest of its kind in the country and one that has been held up as an example for other European countries, also developed numerous B2B and A2B portals to guide and inform visitors and investors to the region, including a professional tourism portal where agents can manage and update their information. Furthermore, in order to improve access to the services for the residents, the project built a mobile vehicle with satellite access, making Internet available even in rural areas and



050 1517
Antonio Vinagre (Director financiero) and Luis Miguel Alves (Ingeniero de Proyectos) in front of a rack

created a local Hotspot network, offering new levels of mobility for citizens and visitors in the region and extending the University Campus.

All this was possible thanks to the installation of MAN and LAN infrastructures by the Communications Division of one of Portugal's largest civil engineering groups, Ensul Meci – a company based near Lisbon but with operations in sectors such as energy, transportation, telecoms, and water all around the world. The Communications Division, specialist in the planning, design, construction and maintenance of mobile and landline communications networks, laid over 550 km of optical fiber for the project and in order to ensure failsafe operations from the very beginning, the engineers chose R&M's range of FO distribution products, including LC splice closures and *E2000™ patch panel modules housed in 19"/3U sub-racks. The products were recommended and supplied by local QPP partners Lancom and chosen for their quality, design and the easiness with which they can be installed.

Once again, R&M's core competencies in fiber optic technology have contributed to bringing the information via metropolitan networks to local residents and Évora has joined the long list of eGovernment projects that R&M has participated in throughout Europe and the rest of the world.

For more information see: www.evoradistritodigital.pt

WHY R&M?

- Quality
- Design
- Ease of use

R&M PRODUCTS USED:

- 178 LC splice closures
- 31 x sub-racks 3U/144FO
- 132 x modules 3U/7HP E2000/APC – G652
- 22 x modules 3U/7HP E2000/APC – G655

*E-2000™, manufactured under license from Diamond SA, Losone.



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FIBER TO THE DESK AT LG TELECOM



050.1518

LG's impressive buildings in Seoul in South Korea

LG Telecom has implemented a new fiber optics based working environment for nearly 2100 staff.

With South Korea being one of the most advanced and rapidly developing networking nations in the world, it is worth noting that a newly built office building has been cabled entirely with R&Mfreenet STAR system, ensuring a fully compliant Fiber-to-the-Desk (FTTD) network installation.

Of a population of 49 million there are more than 40 million (2006) mobile phone subscribers in South Korea. LG Telecom belongs to LG Group, the large chaebol (business conglomerate) with activities in electronics, mobile telecoms and petrochemicals, operating in more than 80 countries worldwide. With over 9 million subscribers, LG Telecom is already one of the biggest mobile telephone operators in South Korea.

In Sangam-dong in the Mapo-gu district in Seoul, South Korea, LG Telecom recently completed its new office building, after nearly two years of construction. In total, the building has 20 floors (of which 6 are basements) and nearly 50000 square meters of floor area.

This new building is cabled throughout with a complete R&M-freenet system and fiber optic backbone, connecting more than 2100 outlets in a state-of-the-art FTTD network installation. For LG Telecom, this is not only a groundbreaking new technology installation, it is also intended to help the company encourage and motivate its employees to work better for customers.

"As part of our company vision to maintain high levels of trust from customers, we realized we also have to motivate and encourage our employees. One way of doing this is to secure reliable, efficient high-speed networking to all workspaces," said Jaejun Yeo, IT Manager at LG Telecom.

"R&M's components are of an impressive quality."

He explains that after looking carefully at technology options from network cabling suppliers previously used by LG Telecom, the desired network technology was only identified in R&Mfreenet. It encompasses not only the highly reliable office data network but also a complete solution for voice applications.

"We are very satisfied with the network at Sangam-dong. The components are of an impressive quality, and more importantly we have achieved true high-speed networking to each desk," explained Jaejun Yeo.

The installation was carried out by LG-CNS, a company within the LG Group that appointed staff to go through the necessary R&M certified training and now hold a certificate as qualified R&M planner and installer.

GET MORE – WHY R&M?

RELIABILITY

- 2, 5 and 20 years' warranty on R&M parts in the installation
- R&M certification of installers
- Premium level super highway building emblem from Korean government
- LSOH cabling components

R&M PRODUCTS USED:

- Real 10 UTP cable (more than 175 km)
- Cat. 5 UTP cable (more than 16 km)
- FO cable (various, more than 32 km)
- UniRack panels for data network
- VS Compact panels for voice network
- More than 2100 network point terminations
- All patch cords and connection modules



020.1648

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COMPACT QUALITY WINS THE DEAL FOR R&M AT ZENDAI



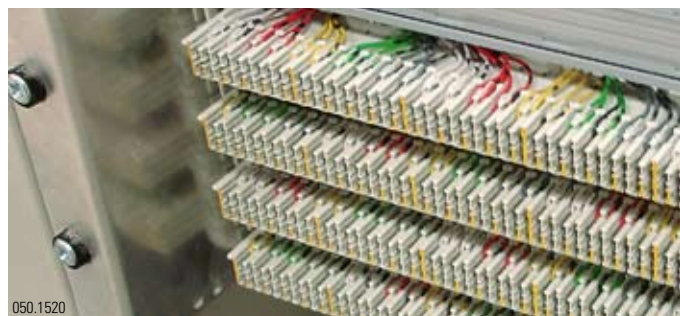
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Zendai Wudaokou Financial Center in Pudong Shanghai

R&M's well-designed and high-quality networking products convinced the network managers at Zendai, one of China's most successful property construction companies in recent years.

Zendai Group has been building and managing commercial and residential properties since it was founded in 1993, and today is one of the most respected and high-profile property companies in its hometown of Shanghai, as proven by several awards handed to Zendai in recent years.

Zendai is a brand known for quality and stylish designs, in fact its residential properties often sell above average market prices since buyers are attracted by the high-level specifications of the homes. Similarly, Zendai sets its aims high when purchasing equipment for its commercial properties.

In 2007, Zendai chose R&M cabling for the Zendai Wudaokou Financial Center in Shanghai in a smart city location adjacent to Pudong Government Office and Century Park. Zendai was attracted to the quality and style of R&M's products and complete LSOH (Low Smoke Zero Halogen) specification. However, it was the minimal formats of the VS Compact cabling panels that clinched the deal.



050.1520
VS Compact high-density voice distribution panel

R&M's VS Compact is a series of unique high-density voice distribution panels and accessories which really make the high-level engineering of R&M products stand out. Compared to other solutions on the market, VS Compact allows as much as double density in telecommunications cabling systems.

"R&M's compact product design meant minimal space requirements, which was a real winner for Zendai's network needs."

"We specifically needed a space-saving solution, but we did not want to compromise on quality and reliability. With R&M, we were able to meet all these requirements," said the IT engineer at Zendai Group responsible for the project.

Zendai Wudaokou Financial Center covers more than 100 000 square meters and is designed as a multifunctional, intelligent, ecological and energy-efficient office building. The whole system comprises more than 10 000 network outlets connected via Cat. 6/UTP and a fiber optic backbone. The installation was completed in October 2007 by systems integrator Youhe that has R&M Quality Partner approval.

"The products from R&M are of an impressive quality, which gave us a very smooth installation process. And we are equally impressed with the transmission qualities that the cabling provides, it has proven to be a very reliable networking platform," the IT engineer said.

The success of the R&M cabling solution at Zendai Wudaokou Financial Center is a direct reason why Zendai Group is currently inviting R&M and its partners to bid to supply networking equipment for other large-scale property projects nearing completion.

GET MORE – WHY R&M?

RELIABILITY

- 2, 5 and 20 years' warranty on R&M parts in the installation
- R&M certification of installers
- LSOH cabling components

R&M PRODUCTS USED:

- FO 6c indoor OM3, 8000m
- SC Fiber Rack OM3 80 pcs
- FO 6c indoor OS1 4500m
- SC Fiber Rack OS1 40 pcs
- Cat. 6 24 ports panel 446 pcs
- VS Compact Module 25 pairs 600 pcs



050.1521

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HOLISTIC APPROACH MADE SIX-STAR RESORT LEONIA CHOOSE R&M



050.1522
Impressions of the luxury resort in India



050.1523

On the edge of the Deccan Plains, 45 minutes outside of Hyderabad in the state of Andhra Pradesh in southern India, you find the vast, 450-acre plus Leonia Holistic Resort. Developed with finesse and a devotion to quality and luxury, this six-star resort relies on R&M networking throughout its guest areas as well as other major parts of the estate.

The Leonia Holistic Resort aims to offer a combination of leisure, business, recreation and healthcare facilities, all brought together in one serene location. The sprawling site at Leonia contains spa, sport, entertainment and health facilities to satisfy even the most discerning visitor and also contains superior conference and business facilities.

After a careful selection process in which several suppliers' products were tested, the IT managers at Leonia decided that R&M was just the solution for the resort. Today, the R&M solution spans 3500 network terminations offering copper and fiber networking connected through a single fiber backbone.

A 10G active network carries a multitude of data traffic supporting the operations at Leonia and making the guests' stay as comfortable as possible. High-speed data connections are offered in each guest room, and across the resort the data network supports services such as IPTV, RFID encoders for guest key cards,

video and information walls, and a complete WiFi service (even the WiFi carries IPTV).

The IT Manager at Leonia explains: "We carried out a testing of products from four vendors, and R&M came out top. The cabling was faster and more reliable. The R&M products also offered advantages such as the ability to re-seal plugs, the fact that they can be pre-terminated for easy installation, and certainly the environmentally friendly LSOH production method was important."

The R&M Plug Guard locking mechanism to network outlets is also a real winner for Leonia. It is a straightforward solution to a well-known problem in the hotel industry: Ensuring that guests do not disrupt network connections, whether by accident or deliberately. The plug locks secure the network's availability and flawless operation, minimizing the risk of unintended network disruptions.

The data network installation at the Leonia resort was completed in September 2008, and it now looks likely that R&M equipment will be used in facilities that are currently being added to the resort, such as Olympic-standard sports facilities.

"R&M's products have turned out to be a very wise investment for us, befitting the superior style of the entire complex. The network connections are easy and quick to terminate, and our experience has been that this helps secure a reliable and easy-to-manage network," says Leonia's IT Manager.

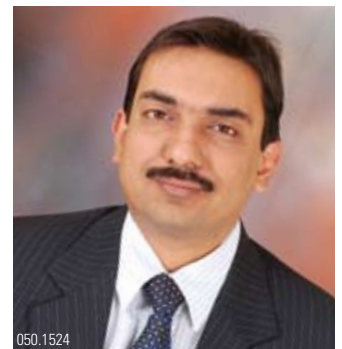
GET MORE – WHY R&M?

RELIABILITY

- 2, 5 and 20 years' warranty on R&M parts in the installation
- R&M certification of installers
- LSOH components

R&M PRODUCTS USED:

- Cat. 6 10 UTP cable (nearly 100 km)
- 2650 Cat. 6 UTP connection modules
- FO Single Mode cable (more than 8 km)
- 610 FO connection modules
- 800 Patch Guard port locks
- All copper and fiber patch cords



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R&M SECURITY IS DECIDING FACTOR FOR CHINA'S LARGEST BANK

The R&M security system was the convincing factor when ICBC, China's largest bank, was looking to purchase networking equipment for a complex of office and data center facilities as well as new branches.

In Hangzhou which is the capital of Zhejiang province, eastern China, the newly built ICBC facility has now been fitted with a complete R&M data network, fiber backbone and voice network.

ICBC is the largest of China's "big four" state-owned commercial banks. It is the largest bank in the world in terms of market value and one of the world's top ten banks by assets. In recent years the bank's success has led to an avalanche of awards and industry praise. In 2008 alone, the ICBC was rated "Best Domestic Bank in China" and "Bank of the Year, Asia." ICBC has more than 2.5 million corporate customers and over 150 million private customers.

At the new Zhejiang office location, ICBC has installed a complete office network across two buildings with over 1200 Cat. 6 UTP network terminations, along with a complete Cat. 5 network for voice applications. The network backbone between office floors is based on R&M fiber optics.

While other vendors were able to deliver similar cabling solutions, it was the high level of physical security which made the

decision in favor of R&M explains ICBC's Infrastructure Manager for Zhejiang province:

"We chose R&M following careful consideration of our security needs. In this process we found that R&M's security system provides the best security and network maintenance facilities," said Zhang Jinsong, Network Department Manager at ICBC.

The notion of enhancing network security at cabling level is true to the R&M philosophy of 'Get More'. R&M's security system is designed to account for faults caused by human error and to minimize these through product design. All R&M outlets and patch panels for copper and fiber optic connectors are prepared for three levels of security, culminating with physical lock mechanisms.

"R&M offers an outstanding level of security."

"The security features of R&M's networking products offer an outstanding new level of security in our physical infrastructure. We are really very pleased with the functionality. Additionally, we find that the cables and the data transmissions are of the highest quality," said Zhang Jinsong.

The ICBC installation was carried out by R&M system integrator Devotecom who also took responsibility for the major parts of planning and design of the cabling solution. Following on from the Hangzhou project, R&M are also set to deliver cabling components for two further ICBC office construction projects in Jiaxing and Haining, also in Zhejiang province.



Newly built ICBC branch at Hangzhou

GET MORE – WHY R&M?

RELIABILITY

- 2, 5 and 20 years' warranty on R&M parts in the installation
- R&M certification of installers
- LSOH cabling components

R&M PRODUCTS USED:

- 1200 ports Cat. 6/u
- 500 ports Cat. 5e/u
- Cat. 6u/utp 24 port panel
- Cat. 5e/u 50 port panel
- FO 6C indoor cable 2500 m OM3
- SC Duplex UniRack OM3
- R&M security system/color coding



R&M security system with color coding



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050.1527

Realistic braking situations are simulated in the brake development at Continental Automotive Systems.

R&M cabling equipment was chosen for Continental's factory facilities in China due to superior technological excellence and reliability, and due to R&M's strong local presence guaranteeing on-time delivery of components and the presence of competent certified installation partners.

In 2008, Continental opened its newest production facility in China, in Changshu City, 100 kilometers northwest of Shanghai. This smart new factory will build hydraulic brake products for vehicles of all classes, highlighting Continental's position as one of the world leaders in automotive products. In China alone, Continental has more than 20 factories and facilities, all belonging to the worldwide Continental Group, headquartered in Germany.

Continental's Changshu facility is modern both inside and out, fully wired with a complete R&M cabling solution to connect and share data between various departments and buildings in the

plant. The networking installation highlights R&M's credentials in supplying products to harsh and demanding industrial production areas: It is the first place in China where R&M's high-quality IP54/IP67 network products for industrial networking have been installed.

Continental made a forward-looking choice of cable grade and implemented a network based on Cat. 7 UTP ensuring data speeds of up to 10G. All termination modules implemented are currently of the Cat. 6 standard and can easily be upgraded when the Cat. 7 standards are in place. The network backbone is based on R&M OM3 Fiber Optic cabling.

"The quality of R&M products is very satisfying."

"The quality and stability of R&M products is very satisfying and R&M's supply chain hub in Singapore ensures reliability of delivery," explained Erwin Dabu who is Regional Infrastructure Team Manager for Continental's IT Center Asia.

R&M was already one of several approved suppliers of cabling solutions to Continental in Germany. When the IT staff at Continental's Asian operations were making their choice of cabling supplier, R&M's local presence and technical training in China weighed heavily in R&M's favor.

"It was not necessarily a decision based on cost that led us to R&M, more so the fact that R&M is able to deliver quality components approved by our headquarters to nearly any location in Asia on a reasonable timescale," said Erwin Dabu.

Following the success of R&M's networking solution at Continental in Changshu, R&M has been recommended as supplier to other divisions of Continental (Conti Tire & Conti Tech). R&M is also involved in LAN networking projects for Continental in other Asian countries such as Japan, the Philippines, Korea, Thailand and India.

GET MORE – WHY R&M?

- 2, 5 and 20 years' warranty on R&M parts in the installation
- R&M certification of installers
- LSOH cabling components

R&M PRODUCTS USED:

- Cat. 7 UTP cable (more than 105 km)
- FO cable (OM3)
- IP54/67 industrial LAN components
- UniRack panels for data network
- All patch cords and connection modules



050.1528

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050.1529

A traditional quarter in Muscat

Petroleum Development Oman (PDO) finds and develops oil fields in the sultanate, drilling wells and constructing and operating various hydrocarbon treatment and transport facilities. The crude oil that is produced from the fields is not sold by the company but rather delivered to a storage facility, where it is loaded onto sea-going tankers.

PDO also finds, develops and operates natural gas fields and their associated production systems — all on behalf of the government of Oman. Its headquarters in Muscat is connected to eight remote sites, all running on LANs that carry voice, data and video services, including office systems, telemetry/SCADA, control and automation. The LANs are operated and maintained by local PDO staff.

In total, more than 3000 users are connected across the company on a fiber optic network leased from OmanTel, with a total WAN bandwidth of STM-1 (155 Mbps). The LAN in the head office runs up to 1 Gbps, whilst the remote LANs only run up to 100 Mbps.

An upgrade to the existing system was driven by the Shell Group which holds a 34 % stake in PDO. Globally, it was specifying E2000™* fiber optic solutions for LANs in all its projects and, after an initial tendering process, R&M's enterprise solution based on E2000™* connectivity across campus, backbone cabling and storage area networking was shortlisted.

"We are an oil and gas company; our core business is not IT," explains Ali Al Lawati, Head of IT Infrastructure Management at PDO. "What we need to do is make sure that we provide what the business needs and work in line with our business requirements. Whether it is a major oil and gas development project or just maintenance work, we make sure that in the end the business terms are met. We work on value creation."

PDO enjoys the support of a large IT department that is focused on supporting the business. Historically, it has used technology

*E-2000™, manufactured under license from Diamond SA, Losone.



050.1530

The modern Oman-French museum in Muscat

intelligently in order to address specific business requirements across remote sites and offices and the head office.

"We have a stringent evaluation process for technology investments."

"We have a stringent evaluation process for every technology investment," Al Lawati is keen to point out. "We have a set of functional requirements that includes things like high reliability, scalability and security. Once we have this done, they are matched to the technical requirements. Only then do we evaluate vendor solutions."

On this basis, R&M's end-to-end solution for all physical network requirements was chosen by PDO. It was implemented by local partner Silver Focus, who undertook all consultancy, design, deployment, testing and support.

The R&M E2000™* fiber optic connectors now form the key components of PDO's fiber optic network, with a low loss broadband data transmission. Designed to be the connector system of the future, the easy handling and unequalled reliability of the E2000™* make it the best investment protection on the market. Please find the complete article on our website: www.rdm.com/applications_manufacturing



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050.1531

The impressive architecture of the mechanical engineering laboratory

Is an eight-year old campus network fit for high-performance data transmission with 10 Gigabit Ethernet? This was the question confronting the Ilmenau University of Technology. Recertification on the basis of the latest standards in the course of a project assessment was to provide the answer.

PROJECT ASSESSMENT CONFIRMS OUTSTANDING QUALITY OF R&M SOLUTION

In order to be able to operate a future-compliant campus network, the Ilmenau University of Technology (TUI) had a Cat. 6/Class E network installed in 2000. Ilmenau lies in the green heartland of Germany in the federal state of Thuringia and is a recognized center of excellence for teaching and research. For this reason, great value is placed on a sound, reliable and durable infrastructure for the students.

Within just a few months, structured building cabling with 4000 ports for Gigabit Ethernet was installed in the central locations. R&M's STAR system with the Cat. 6 modules that, at the time, had just been launched, were used. It was a litmus test – both for R&M as well as planning engineer Wolfgang Kupsch, Managing Director of Teamplaningenieur GmbH in Apolda.



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THE MOMENT OF TRUTH: taking a close look at the TU Ilmenau campus network: Reinhard Bauch (left) and Horst Zink (right) from the university data processing center, Mathias Zorn from IBZ Engineering.



050.1533

Plug & play – a “must” in the lecture hall

RECERTIFICATION AFTER EIGHT YEARS WITH EXCELLENT RESULTS

Recertification should now answer the question as to whether the campus network is still suitable for the next Ethernet generation or not. With the assistance of R&M, Mathias Zorn, representing the engineering office IBZ in Arnstadt, undertook an appropriate project assessment.

The heavily used ports in the foyer of the main building were chosen, among other things, for the tests. This is where the students connect their laptops with their own patch cables to tap into the university's VPN. Each port has been subjected to thousands of plug-in and unplugging operations since installation.

The tester's assessment for the university was more than satisfactory: All the ports examined achieved a resounding “pass” by providing faultless signal transmission and displaying a sound optical loss budget that was almost as good as a brand new installation. The NEXT reserve in the 500 MHz range, for example, was between 2.5 and 5 dB without exception. Measurements were undertaken on the basis of the current EN 501731 and EIA/TIA 568B.210 Cat. 6A (Draft 6.0) criteria.

“R&M's quality philosophy has once again been confirmed.”

In fact, the Ilmenau University of Technology is among the pioneer users of the Cat. 6 / Class E cabling solution that was introduced by R&M in 2000. Thanks to the modularity and downwards compatibility of the system that made it inexpensive at the time to upgrade from Cat. 5e to Cat. 6 and Gigabit Ethernet, and so experience the first “high-speed euphoria”, migration to 10 Gigabit Ethernet now has been made that much easier. The capital investment fulfills its long-term aim and the quality philosophy of R&M has once again been confirmed.



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FINITE ELEMENT SIMULATIONS HOLD THE KEY TO FUTURE PRODUCTS

The quest for innovation presents fantastic challenges to engineers, many of them involving complex geometries and processes as well as advanced physics. Numerical simulations are the standard way to approach these problems.

During the last two centuries the rate of scientific and technological development has increased dramatically, affecting and modifying our lives to an extent never seen before in history.

Modern technological developments are driven by a complex combination or interaction of social and technological factors. For instance, the development of computers and associated technologies (software, Internet, etc.) created the basis for a massive acceleration in the generation of innovative new technologies and in productivity of people and organizations.

The intrinsic characteristics of modern global markets also play a fundamental role in technological evolution. Indeed, innovative and better products developed in less time and at reduced costs are the key

to success in most real-life market conditions.

SIMULATIONS

Simulation-driven product development arose in this context as a way to reduce product development cycles and to lower costs.

The quest for innovation presents fantastic challenges to engineers, many of them involving complex geometries and processes as well as advanced physics. Numerical simulations are the standard way to approach these problems.

The finite element method (FEM) is probably one of the most frequently used numerical approaches. At Reichle & De-Massari, FEM simulations are widely used, and they play an important role in the development of new products and technologies in both optic fiber and copper segments.

EXAMPLES: HOW FEM IS USED AT R&M

A) METALLIC GLASSES

Metallic glasses (MG) belong to a new family of materials which offer interesting properties in the field of isolation-displacement connection (IDC) technologies and optic fiber connectors. The potential of MG for these types of application relies on two points: a) an excellent capacity to store elastic energy, and b) the possibility of using injection moulding as a production route. FEM was used to investigate the conditions under which the material

undergoes brittle fracture. A fracture criterion specifically suited for IDC technologies has been developed. The criterion specifies several guidelines that help designers optimize structural integrity of parts.

B) INNOVATION IN IDC GEOMETRIES

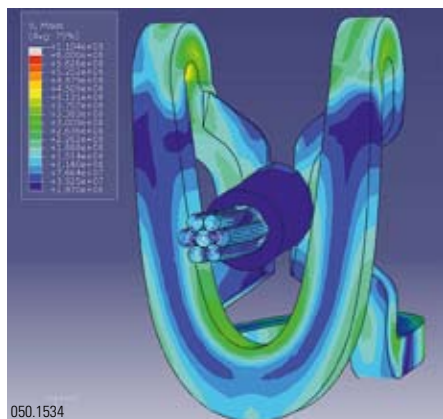
The use of FEM allowed us to develop new IDC geometries that display excellent mechanical performance despite the fact that these IDC are produced using standard copper alloys. In this way R&M can offer an IDC with excellent ability to connect as needed without the use of more expensive high-performance alloys.

C) MECHANICAL OPTIMIZATION OF PLASTIC PARTS

In the single circuit management project the geometry of snap-in elements was optimized to increase part stiffness. As a result, the mechanical attachment between the cartridges improved strongly.

D) ELECTRICAL PERFORMANCE OF COMPONENTS

R&M has recently started using FEM techniques to simulate electrical performance of products (e.g. crosstalk, reflections etc.). We expect this to be fully implemented during 2009. The use of FEM simulations will allow us to improve the geometry of connection blocks for better performance and also the in-house design of new compensation circuits.



FEM model of the Omega IDC connected with AWG 22/7. This geometry was developed in the context of the Cat. 6a project using FEM. In comparison to standard IDC geometries, the Omega contact features an extensively improved elastic range and excellent contact force, allowing not only the connection of a broad range of wire gauges but also a full back-compatibility between AWGG 22 and AWG 26.



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WHAT IS BEHIND R&M'S INSTALLATION PHILOSOPHY?

"Our employees always breathe a sigh of relief when they can install R&M's connection modules. The job gets done faster, the components fit together immediately and are easy to mount." This was yet more positive feedback from a convinced R&M partner. But why do the parts fit together so well?

This statement originates from Rüdiger Falk, project leader with the Vater Group in northern Germany. The fitters from the Vater Group have already installed hundreds of thousands of R&M products in the twinkling of an eye. To ensure the cabling solutions are child's play to handle, intensive and challenging usability tests are carried out early in the development phase and before market launch.

For outsiders this might appear to be exaggerated. But there is a key objective behind the work involving R&M's Technical Applications (TAP): to make the user's work as easy as possible and ensure that he is spared unpleasant surprises on the building site. These usability tests bring to light any weaknesses in the construction so that they can be eliminated before the product is introduced.

The TAP team examines the R&M products from the user's point of view. "We are the fitter's best friend," goes the motto. The five experts making up the team have broad interdisciplinary technical expertise, specialized marketing know-how and extensive practical experience. In realistic field trials, handling, characteristics, design, assembly, mounting and the installation guidelines are tested. This is a challenge to the team's creativity because they have to try to devise the most difficult installation configurations imaginable. After all, even under exceptional circumstances, the product should function just as well as under normal working conditions.

DEVELOPING AND OPTIMIZING WITH THE EYES OF THE USER

The test reports and recommendations from the TAP team help the development engineers and product managers in ongoing optimization. Innovations are assessed by TAP in the initial stages of construction and the prototypes are tested extensively. This is the reason why installation is so easy – so typical for R&M. The TAP team is often on the look out for innovative ideas for new products and occasionally comes up with some amazing solutions.



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New product undergoing a usability test

The TAP team also goes into action when customers require very different samples and specific modifications, when they request a customized development or when they come to R&M with their own suggestions for improvements. Hints and tips for installation activities – discovered and compiled by the TAP team – are included in the installation guidelines, used for internal as well as global QPP training.



Stefan Baumer, Head of Technical Applications (TAP)
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INTRODUCTION

As discussed in an earlier article, ADSL and cable TV networks will soon be unable to keep up with the broadband speeds users demand for Internet services. In this article I want to show in a little more detail why VDSL and, in particular, PON, are ideal for the task, providing the necessary speed for all foreseen high-speed Internet services. This article explains some of the theoretical considerations that apply to fiber optic transmissions, and practical details of characteristics and innovations to be aware of when planning PON networks.

FIBER-TO-THE-HOME (FTTH) OR PREMISES \cong PON

As stated previously, a direct point-to-point fiber connection from each user to an exchange would be technically ideal – but normally prohibitively expensive. The Passive Optical Network (PON) approach offers lower data rates – but still more capacity than any currently predicted requirement, and at a far lower cost.

ECONOMICS

Discussions of networks for domestic consumers often assume a fictitious model in which everyone lives in detached suburban dwellings. In fact, even in developed western countries, multi-unit dwellings (apartments, flats, home units etc.) dominate in many areas, often mixed in with commercial developments, while many homes are situated in semi-rural areas. Each type of development has different network requirements.

HIGH-DENSITY (MULTI-UNIT) DWELLINGS

In a high-density area, the obvious solution to providing service is a fiber connection direct to the development, with end users connected on either copper or fiber. VDSL, PON or simple switched Ethernet would be equally useful: The problems are more practical than technical. Examples are where to site cabinets, what kind of cabling is needed to connect each dwelling, and who owns or operates the equipment. Legal and administrative barriers, different in each country, can also be enormous!

“TYPICAL” SUBURBAN DEVELOPMENT

As described above, this environment is the one PON or VDSL systems are typically designed for.

SEMI-RURAL

This situation has always been a problem for carriers. The distances from an end user to a practical concentration point often average 10 km or more, requiring heavier-gauge copper wire, amplifiers or repeaters within a telephone wire link, or, recently, radio-based systems. This situation is very attractive for PON systems, whose typical support distances of 10-20 km allow full-function attachment.

COMMERCIAL PREMISES

Commercial premises range in size from the “corner store” to very large campus facilities employing thousands of people. In many cases the technologies used for high-density dwellings

are appropriate; in others, point-to-point unshared fiber access will be required.

Using the modern distribution architectures (NGN/PON) can completely change the structure of the metropolitan network. Where a typical medium-sized western city of 2-3 million people may require 200-300 exchanges (or “Central Offices” CO), PON can connect users up to 20 km from an exchange. So cities could in theory be serviced by only one exchange (for practical reasons probably four exchanges) offering huge cost savings. The problem is the cost of installing fiber cable to each user – mainly due to “digging up the road” and “how to connect subscribers.” However, where new cable is needed, the advantage of a fiber-based network is overwhelming.

INDUSTRY STRUCTURE

The introduction of any of the newer broadband technologies can dramatically affect the structure of the telecommunications industry. Historically, a country’s telephone industry normally consisted of a single, often government-owned company that owned the infrastructure and provided all the services. With the proliferation of services, it is often the case that many organizations now compete to provide services. An organization that owns a VDSL or a PON access network structure would be hard to compete against. Services could be offered by many different organizations each leasing the facilities it needs from the infrastructure owner. This might end up in a new business model which is not yet in place.

WHAT MAKES FIBER NETWORKS DIFFERENT?

The speed and capacity characteristics of single-mode fiber are legendary: This is the basic reason for using fibre! It goes without saying that, as it is not electrical, radio interference or earth voltage differences between locations are no problem. What is also very different from copper cables is the way the signal travels, both through the fiber and across splitters and concentrators. The signal can be split many more times: In the case of a 64-way split (assuming loss-free practical components) the signal will suffer a $6 \times 3 = 18$ dB loss.

Fiber also has problems that copper does not, though. If you bend optical fiber too tightly, the signal will leave it, so bend radius is important. In locations where fiber is to be joined or attached to equipment (such as a splitter), it is necessary to loop excess fiber on either side. The problem is ameliorated by single-mode fibers designed specifically for the metropolitan environment (covered by the standards G.652.D and G.657.A and B).

PASSIVE NETWORKS

A previous article discussing VDSL pointed out that a practical VDSL system requires an equipment cabinet containing active equipment at every point of concentration (i.e. almost every street corner). A city of 2-3 million people might require some 3000 such cabinets, all needing regular maintenance and a reliable power supply, making operational costs extremely high. A passive network offers significantly lower operational costs

– but even so, costs arise from changes to the network and repair to damaged cables. A passive optical network also needs to include at least small cabinets (similar to junction boxes) for splitter equipment.

PASSIVE OPTICAL NETWORKS

There are three generic ways of building a passive optical network:

1. Point-to-point: a dedicated fiber (or pair of fibers) between each end user and the exchange. As mentioned above, this is expensive and generally far in excess of requirements.
2. Point-to-multipoint, with a different wavelength for each user on a particular connection. This is also a very good solution, but wavelength sensitive (xWDM) multiplexers and suitable lasers are costly and go beyond the foreseeable requirements. However, xWDM seems to be the technology for the future which is currently “under development”.
3. Point-to-multipoint networks where many users share the same optical wavelength. This solution provides all the needed capacity and functionality but at a significantly lower cost than either of the two alternatives mentioned above. This configuration of the shared fiber network has the big advantage of requiring only one transceiver at each user location and at the exchange. Cabling is also simplified compared to a point-to-point architecture, as only one connection is required at the exchange for up to 64 users (for GPON 128 users are considered). In addition, it provides a stable infrastructure which can be adapted in the future to almost any conceivable architecture without installing new connections to the user.

DESIGN ISSUES

The main topic if it comes to PON development is topography of area which includes type and number of existing and planned buildings as mentioned earlier on. It is also known as “possible subscribers per square meter.” Besides that, and not directly linked to technical issues, the following three design points need to be considered.

OPTICAL POWER BUDGETING

A key factor in the design of a PON is the optical link budget – the difference between the power produced by a laser transmitter and the minimum power required by a receiver for accurate recovery of the signal. That is the amount we can plan to use within the network. For the system to work, the sum of all the losses must be less than the budget. The main losses are:

1. Power reduction over time: When planning the network, the transmission power of the laser must be calculated as its operational power level at end-of-life.
2. The receiver’s sensitivity must also be estimated on its end-of-life performance.
3. Power used by attenuation in the fiber, joins in the fiber (very low if well-made, high if not!), splitters and combiners (both logical and construction-related) and data rate.

In general, when you double the data rate, you halve the sensitivity of any given receiver. Most PON standards offer different

transmission rates as options. With everything else being equal, a move from a 1 Gbps transmission rate to a 2 Gbps rate will incur a link budget decrease of 3 dB.

LASER CHARACTERISTICS

When a semiconductor laser is turned on, it tends to “chirp” (vary rapidly in wavelength) for a short time until it settles down. To minimize the effects of chirp, it is standard practice to keep a communications semiconductor laser in the on (lasing) state all the time. However, in a shared medium network, when one user is transmitting, others transmitting (even at a very low level) will cause interference, so it is necessary to extinguish each laser at the end of a block or frame of data allowing a time gap between one user ending and another beginning transmission.

CONNECTION SPEED

Both upstream and downstream channels are shared among all connected users. Each user is allocated a share of the available capacity. For example, a PON with 10 users running at 1 Gbps both downstream and upstream might allocate 100 Mbps of capacity to each user. The available connection speeds from the GPON standard are shown below. In 2008 the dominant choice seems to be 1.24416 Gbps upstream with 2.48832 Gbps downstream.

Upstream	Downstream
155.52 Mbps	1.24416 Gbps
622.08 Mbps	1.24416 Gbps
1.24416 Gbps	1.24416 Gbps
155.52 Mbps	2.48832 Gbps
622.08 Mbps	2.48832 Gbps
1.24416 Gbps	2.48832 Gbps
2.48832 Gbps	2.48832 Gbps

CONCLUSION

Most developed countries are experiencing rapidly increasing demand for very high-speed Internet access to be delivered to homes and businesses. In addition, the nature of television distribution seems to be on the brink of revolutionary change. Of course, the demand for reliable access to traditional telephone service is as strong as ever. Existing copper-wire access networks are simply not adequate to support the evolution in services. The use of optical fiber in one form or another is a good technical solution to the problem. In places where copper TTP exists to the customer premises, a FTTN (Fiber to the Node) solution is possible by using VDSL technology for the last 350-1000 meters. Where new infrastructure is to be installed, PON systems (especially GPON) offer an immediate, complete and economic solution with an open-ended ability to develop into the future.



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CREATION OF A NEW ETHERNET STANDARD

The growth of Ethernet technology follows the market and the market follows Ethernet technology. No sooner has one technology level been reached than a cry is heard for the next level. Right now, 40 and 100 Gigabit Ethernet are on the agenda.

If we take 10BASE-T as our starting point in 1990, bandwidth increased ten-fold over five years and therefore followed Moore's Law. Gigabit Ethernet came more quickly and was bid adieu just three years later. Developed in just four years, 10 Gbps was also on the scene more quickly than Moore's Law would have suggested. Assuming a constant rate of development, 100 Gigabit Ethernet should have arrived in 2006. At the moment, its completion is predicted for 2010, which brings it right in line with Moore's Law.

The market is apparently articulating its demands for larger bandwidths with increasing clarity. They are coming from all directions resulting in a chain reaction.

With high-speed DSL, Fiber-to-the-Home and not least, mobile Internet access, today's users can choose from a growing number of bandwidth-devouring services such as IPTV or YouTube. Gigabit Ethernet interfaces on PCs are the standard and the number of 10 Gigabit Ethernet servers is growing. The launch of the first 10GBASE-T interfaces in 2009 will accelerate the process.

Bottlenecks arise in aggregation nodes and long-haul networks. Service providers are beginning to connect strategic nodes together in a higher bandwidth than 10 Gb/s. High-speed computing centers are also demanding higher bandwidths, complaining

that 10 Gbps no longer suffices. 40 Gbps could meet current needs. This requirement is expected to rise to 100 Gbps in the next two to three years.

The switching technology sector also wants higher speeds. Increased use is made of switches with a large number of 10 Gbps ports. They, in turn, require higher-speed uplinks.

GOALS OF STANDARDIZATION

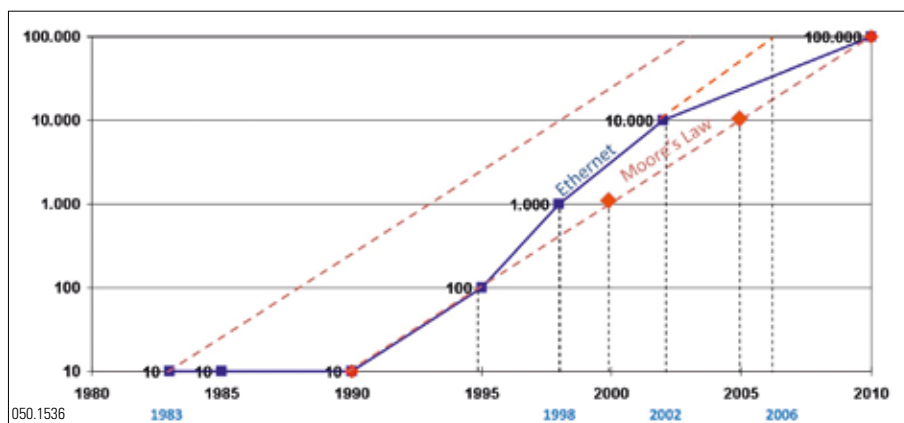
Consequently, the IEEE P802 Project Group established the Higher Speed Study Group in November 2006. In December 2007, it was assigned the task as the IEEE 802.3ba Task Force to develop a 40-100 Gbps Ethernet standard based on the following objectives:

- Exclusive support for full duplex
- Both frame formats (CSMA/CD and Ethernet V2.0)
- Retention of the min. and max. frame length
- Bit error rate better than 10^{-12}
- Support for OTN optical transport network
- Data rates of 40 and 100 Gbps

Draft 2.0 will be finished this spring and is scheduled to contain all the features of the standard. The vote on the final draft (Draft 3.0) will be able to be conducted in November 2009. The standard could be enacted as early as June 2010. The first 40-100 Gbps equipment will hit the market by 2011 at the latest.

Are you interested in the subject of 40-100 Gigabit Ethernet? You can find a more detailed version of our guest author's article on the Internet at: www.rdm.com/privatenetworks

MOORE'S LAW AS APPLIED TO ETHERNET DEVELOPMENT



Moore's Law obviously applies not only to processors, but also to the development of bandwidth in data networks. Ethernet is approaching the 40-100 Gbps level. Diagram: 2009 © Hans Lackner



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Power over Ethernet (PoE), the bundling of electricity and data transmission in a single cable, is rapidly growing in the market. With higher power capacities the possible applications would multiply which is why PoEplus will be launched in 2009.

Increased electrical power over data cables is the goal of Power over Ethernet plus (PoEplus). The upcoming standard IEEE 802.3at allows 24 Watts at the powered device. Until now, a maximum 12.95 Watts were permitted (IEEE 802.3af). This change has consequences for the planning, design and operation of data networks, as R&M points out in a white paper just published (available at: www.rdm.com).

A warmer wire is the physical consequence of using PoEplus. This is a risk factor. Anyone wishing to operate data networks with PoEplus should be careful when selecting the cabling system. Under certain circumstances the maximum link length may be shortened.

After thorough studies, R&M has drawn the following conclusion: The problem of increased heat can be brought under control provided there is strict compliance with current and future standards. If this is done, there will be no disadvantages for data transmission. The White Paper has a summary table that helps planners and electricians make appropriate adjustments to the cabling links. Refer to www.rdm.com > Service & Support > Downloads > Whitepaper

CONTACT QUALITY AS A DECISIVE FACTOR

There is, however, a further risk that should not be ignored, namely the risk of contacts being damaged during insertion operations on live equipment. Although current is distributed among all wires and RJ45 contacts, sparks from frequent insertion operations can damage contact surfaces. This aspect has thus far been ignored in the standardization process for PoEplus.

It would therefore be premature to give guarantees for a cabling system operating with PoEplus.

Our studies show that high-quality and stable solutions ensure lasting contact quality. The results are presented in a technical report co-authored by R&M and to be published by IEC SC48B.

The old adage "A chain is only as strong as its weakest link" applies in general to a transmission system and particularly to the interfaces and branching points of twisted pair (TP) cabling. R&M has invested heavily in researching and developing quality contacts of long-lasting durability in order to ensure the signal quality of IP Ethernet.

The desire to have Ethernet fulfill a dual function, namely to transmit both data and power for the end devices, was voiced early on. This approach reduces wiring cost and increases the reliability and efficiency of the entire system. In mid 2003, the PoE standard IEEE 802.3af specified the maximum admissible current level based on the physical characteristics of the cross section of twisted-pair cable and the contact surfaces in the RJ45 connectors.

The experts settled on a low voltage range of 44 to 57 V, a level posing no danger to humans, and on a current of 0.35 A. If the twisted-pair cable segment between the source and the powered equipment is no longer than 100 meters, a loop resistance of 20 Ohm can be assumed. Owing to the line voltage drop of 7 V, the powered equipment has a minimum of $(44 - 7) V = 37 V$ available to it, which corresponds to a wattage of $37 V \times 0.35 A = 12.95 W$.

A variety of devices can be operated with that wattage: IP cameras, WLAN access points, IP phones, print servers, magnetic cards and bar code scanners, etc. Despite steady gains in energy efficiency, this level of wattage will not suffice to operate future applications such as eco-notebooks, thin clients or a flat screen for playing IP video streams. The new 802.3at standard for PoEplus is meant to mitigate this problem for Gigabit Ethernet.

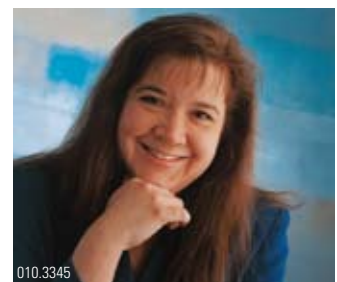
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Object surveillance



Periphery surveillance



Regina Good, Product Manager
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Chris Langer took over as Head of Global Product Quality at R&M in the spring of 2008. *Connections* spoke with him about the background and goals of the new quality initiative at R&M.



Chris Langer
Head of Global Product Quality
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Connections:

Mr. Langer, what do you see as being the most important strategic points when it comes to increasing the high standard of quality at R&M even further?

Chris Langer:

You can find strategic points everywhere! We can say that now against a positive background because we have always valued top quality highly. And because R&M has always demanded this quality of itself, we know that quality doesn't just happen and that it is a factor that is relevant to the whole company and that must be aimed for over and over again. We want to emphasize that in the future, even more so than we've done in the past.

Connections:

Could you give us concrete examples of what the quality initiative is all about?

Chris Langer

First, communication with the customers. A product should be of top quality to offer the user added value. Whether or not it does is decided long before the product is produced. Our objective is to communicate with customers, to listen to them and understand their needs. That is the best way to determine which new requirements are out there on the market. In other words, quality in this context has to do with human communication, also within the company.

Second is technology. It is not enough to detect the potential for innovation in our communication with customers. We also have to realize that potential. Quality in this context is based on a wealth of expertise and experience. We know we are among the global leaders in this regard, but we are also aware that there is room for improvement. And that is what we are tackling now. We have started to build up a quality planning system to support Purchasing and Development. An important element

in these efforts will be to standardize the product release process and focus even more effort on defining quality requirements.

Third, we will increase the quality of our output by applying global standards in quality assurance and improving our inspections of incoming merchandise. Internal auditing will also be expanded to cover all processes.

Fourth, we must increase our monitoring of products in the market and deal more transparently with complaints so we can use them as efficiently as possible to bring about improvements. Concurrently, we are launching a continuous improvement process called "R&M – get better."

Fifth, our goal is to create a corporate management system allowing all processes worldwide to be coordinated with each other and globally certified. Finally, to reiterate the point yet again: Our major aspiration is to anchor quality as an idea and a fundamental attitude even more firmly in the minds of ALL employees regardless of their position in the company.

Connections:

Mr. Langer, thank you for the interview.

QUALITY POLICIES AT R&M

- Quality is our most valuable asset
- Each and every individual is responsible for quality
- No compromises
- Identical quality standards in force worldwide
- The zero-error principle is our ideal
- We constantly learn from our mistakes
- We have a comprehensive understanding of quality: We plan, assure and control quality

R&M OPENS SUPPLY CHAIN HUB IN SINGAPORE

Close and responsive to customers: The first Supply Chain Hub in Asia puts R&M closer to customers and shortens delivery times, allowing it to meet customer needs even more effectively.

R&M has been growing dynamically for years with the aid of its 30 Market Organizations on five continents. With the opening of its first Supply Chain Hub, R&M is taking yet another step toward achieving strong growth worldwide. The new facilities in Singapore are nearly 3000 square meters in size and consist of the hub itself, the offices, a warehouse and a production hall.

The new Singapore location was officially inaugurated in November 2008 under the patronage of R&M CEO Martin Reichle and with a congratulatory speech by the Swiss Ambassador to Singapore. Singapore will serve as the regional office for the Asia-Pacific area, which includes Korea, India, Japan, China, Australia and Singapore.

The core markets for R&M in Asia are first India and China, then Singapore, South Korea, and Japan. Singapore was chosen for a number of reasons. Besides its favorable geographic location and excellent logistical connections to the international transport system, Singapore has a simple and straightforward legal system and pro-Western attitudes.

R&M plans to open additional hubs in the years ahead. With this local presence, it can be responsive to customers, ensure short and efficient delivery times, and offer specific solutions to meet customer and national needs. The guiding principle is to produce in the region for the region.

Core products and technologically advanced products will continue to be manufactured in Switzerland. This approach ensures that



050.1540
Left to right: Martin Reichle, CEO; Jörg Al. Reding, Swiss Ambassador to Singapore; Laurent Amestoy, Executive Vice President Asia-Pacific

R&M can maintain quality standards. The global quality assurance program guarantees that no compromises are tolerated even though production will become more decentralized.

Becoming Number 1 for Layer 1

Laurent Amestoy, R&M Executive President Asia-Pacific is convinced that the R&M Asia Hub will help the company to attain its vision of becoming "Number 1 for Layer 1" in the region. Amestoy: "Besides a long service life and a high degree of reliability (with minimal network failures), high quality standards and user friendliness are the crucial preconditions for succeeding in the fiercely competitive Asian market. R&M has exhibited precisely these traits time and again in its long record of success in worldwide network business. R&M is one of the three most important players in Europe and the Middle East, and the company wants to have that same success in the Asian-Pacific region."



050.1539
Tour of the assembly line



010.2698

Laurent Amestoy
Executive Vice President Asia-Pacific
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FIVE GENTLEMEN WHO KNOW WHAT THEY WANT



050.1488
The R&M management team (from left to right): Martin Reichle, CEO; Martin Rosatzin, CTO; Peter Reichle, COO Operations; Martin Gasser, CFO; Hans-Peter Legler, COO Sales.

Martin and Peter Reichle have been managing the family-run company in the second generation since 1999. As CEO, Martin is responsible for strategic and operational management while Peter, as COO, is in charge of the entire supply chain. Hans-Peter Legler heads up Sales and the entire international sales organization. CFO Martin Gasser is responsible for Finance and IT and ensures sustained growth at the company. The most recent member to join the team is Martin Rosatzin, who is responsible for Innovation and Marketing. The CTO position was created to deal with the complex requirements on international markets and the demands associated with being the innovation leader in the industry.

The five leaders are all dynamic and highly motivated individuals. As role models, they practice the values R&M embraces, namely respect, honesty and unpretentiousness, while giving their employees responsibility and the freedom of action they require. The top creed of the company is clear orientation toward customers. The entire corporate strategy is based on that premise. Hans-Peter Legler: "Our solutions are optimally tailored to meet

In September 2008, Martin Rosatzin joined the management team in the newly created position of CTO (Chief Technology Officer). His appointment is reason enough for *Connections* to focus the spotlight once again on the top management team.

customer needs or even developed individually for specific customers. Our success stems from our constant efforts to generate added value."

"We have built up the necessary reserves in past years."

Although the current uncertainty in the global economy has naturally also been felt at R&M, the management still looks with optimism to the future. Sales growth for 2009 is expected primarily in Asia and the Middle East. Martin Reichle: "We have worked very profitably in recent years and have built up the necessary reserves."

Consequently, the company is now investing anti-cyclically in new innovations, lucrative markets and in projects to increase efficiency such as SAP and the construction of a new building at headquarters. R&M will thus remain fit to continue its growth.

Esther Derendinger, Public Relations
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MARTIN ROSATZIN, CTO AT R&M

Martin Rosatzin has a doctorate in physics and an executive MBA from the University of Zurich. The 47-year-old manager has broad experience in product development and innovation management. R&M has named him the new Head of Innovation and Marketing. He is focusing on creating new projects in the areas of innovation and development. His main tasks will

be to set up the structures necessary for these projects and to ensure smooth coordination between the individual departments. His declared goal is to give the innovation culture of the company a higher profile and to position R&M as an innovation leader in the market.

I am an avid mountaineer and have also traveled to the world's highest mountains, the Himalayas. I fondly remember the trek I took there. The landscape is overwhelming in its diversity and beauty. But nature was not the only thing that impressed me there. What made the trip unique were my encounters with local people.



Far from civilization and major transport routes, we often crossed paths with local mountain dwellers. Despite their lack of material possessions, they would invite us in for a cup of chai in a spontaneous and generous gesture. Their faces, weathered by the elements, beamed with contentment at such times, the many wrinkles bearing witness to the harsh mountain climate and rugged living conditions in this region.



Back in the West with those memories still on my mind, I thought time and again that poverty has more than just a material aspect. I see so many people who go to great lengths to attain status. They buy things they do not need with money they do not have in order to be recognized by people they do not like. Ideals based on materialism and superficiality are pursued with the greatest zeal.

It is time that we concentrate again on truly fundamental values. By being honest, unpretentious and respectful toward others, each of us can lay the groundwork for attaining natural and sustained inner growth. I believe it is our duty to recognize the highest potential in each individual. If we succeed in doing so, we will have a sense of fulfillment that gives rise to joy and gratitude. These feelings, in turn, engender genuine motivation, richness and meaning in our lives.

The somewhat harsher mountain climate in the economy should help us as individuals, suppliers or customers to remember these fundamental values. R&M is there for you regardless of the climate, even if all you want to do is come in and drink a cup of chai with us.

M. Reichle

THE FINAL WORD

A HARSH CLIMATE HAS ITS GOOD SIDES



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