CONNECTIONS 37

050.1564

R&M
Convincing cabling solutions

Into the Future with Innovations

Dear Readers

Use of the Internet continues to rise. The constant demand for multimedia content and solutions such as video on demand are indicative of current developments.

Forecasts reveal that data volume will increase fivefold by 2013. FTTx is already a long-term issue. In many places, however, the expansion of fiber optic provision is still in its infancy. One north German network operator proved to be a pioneer by connecting 130 000 apartments to a dedicated fiber optic Ethernet network within just a few months.

The success of a nationwide fiber optic network depends on cooperation between suitable partners who think long-term and bravely develop new solutions. The network operator offers service and quality and the end user benefits from secure, reasonably priced transmissions that are always available. It is at this point that we at R&M can make a significant contribution: with high-quality systems that enable efficient installation thanks to modular construction and that can grow flexibly alongside the network operator's solution.

R&M's investment policy is also future-oriented. Despite the difficult economic situation we have designed our investment strategy for the long term. As a family-owned company we are able to react flexibly to the present economic crisis. We will consciously accept lower profitability in the short term to safeguard jobs. As an entrepreneurial family we can thus assume social responsibility and at the same time safeguard company expertise in the medium and long term.

We invest anti-cyclically in research and development and constantly expand both the product range and our innovations center. At the same time we pursue the claim of remaining the technology leader so that we can offer our customers outstanding products. We see the construction of the new company building at our headquarters in Wetzikon as a long-term investment to increase efficiency. Processes and the flow of goods are optimized all along the supply chain.

Our customers are still the focus of our business. In both good times and bad we set store by the best service, the highest quality and maximum safety. We are creating an even higher level of customer focus by expanding further supply chain hubs in the individual sales regions and as a result can guarantee excellent flexibility and speedy delivery. Our sales teams are on hand all over the world to advise our customers. We take our customers' wishes seriously. They motivate us to develop leading, long-term, customized solutions.

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News

Success

Focus

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Corporate

The Final Word

Picture on cover: FTTH project Norderstedt

Masthead CONNECTIONS 37 / September 2009

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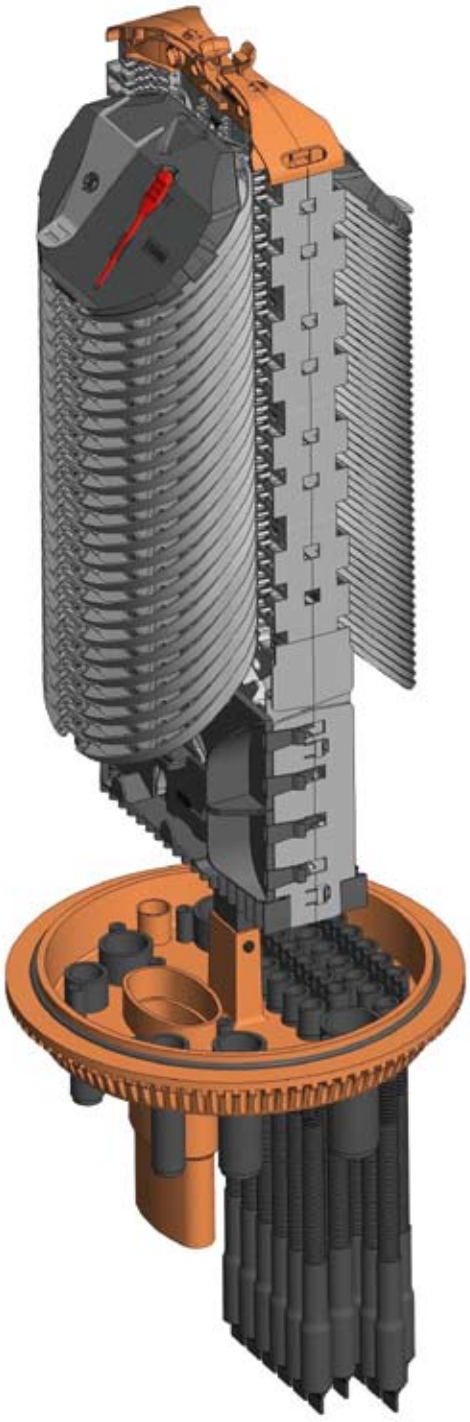
SCM: Fibers for Every Customer

Single Circuit Management (SCM) is the name of R&M's new family of systems for FTTx expansion. Carriers can drive forward their broadband projects faster and with less stress – in all respects – using this modular, compact solution for fiber management.



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It will be possible to use the Single Circuit Management family of systems as a high-power solution on all levels between the main distributor frame and the building providing flexible support at every stage of network expansion. The innovative and easy-to-operate tray solution fits into optical distribution frames (ODF), splice closures, private connection boxes and small distributors. The system is designed for low-profile installation. R&M will first launch the splice closures solution in 2010.

As the name implies, the SCM family will support the management of individual fibers and therefore precision distribution over the last few meters. It will be possible to connect individual end users with very little time and effort, almost in the wink of an eye.

Up to 1152 fibers may be spliced and distributed in one SCM splice closure. The system consists of scalable module holders and sturdy trays that can be plugged in as required. For example, one tray can be provided for each office building, condominium building or apartment.

The outstanding feature is the 40 millimeter bending radius – a unique solution in the market for this area of application. As a result all fibers can be routed without strain. The future belongs to the 40 millimeter radius since future high-power applications hardly permit lower radii. The system is also configured so that it is possible to change the individual fibers smoothly and without stress. The fibers can be fed in from below or from the side and are routed completely crossover-free.

Users can choose between trays with shrink or crimp splice protection. A tray can take up to 24 fibers or splices as a single element tray (SE). The single circuit tray (SC) version supports up to six fibers. This ensures an adequate range of fibers for Fiber To The Home (FTTH). Public utility companies, network operators, property owners and real estate managers can calmly look forward to requests for open access and already be equipped for future applications.

010.3038

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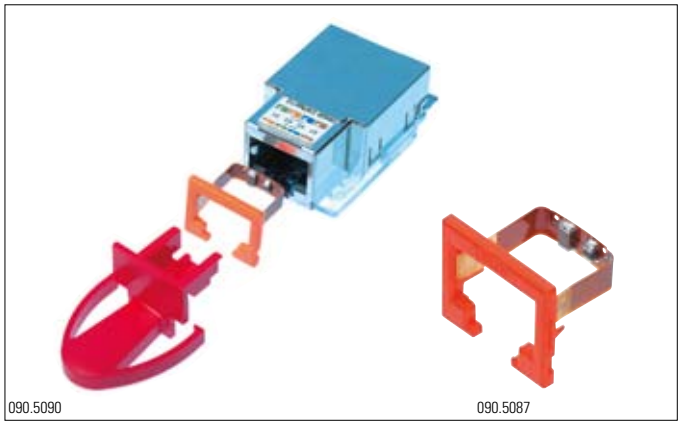
Gap-Free Shielding, Loop-Free Grounding

The Ground Guard resolves the problem of ground loops. This new development from R&M is inserted into the RJ45 module in one easy movement, ensures loop-free grounding and at the same time gap-free shielding.

It goes without saying that shielded cabling already provides excellent protection and is always the best choice for high-performance applications such as 10 Gigabit Ethernet. However, in some situations it may be expedient to additionally improve the shielding effect – in environments with high interference or a high electromagnetic load, for example, or in older buildings where it is not possible to improve the existing grounding system. This is where the retrofittable Ground Guard comes in.

The capacitive shield coupler consists of a plastic frame with Flexprint strips. On these sit contacts, printed circuit conductors, capacitive filter components and an overvoltage protector. This innovation from R&M's development laboratory is globally unique.

The coupler element is designed so that ground loops are interrupted galvanically. At the same time a gap-free shield that repels high-frequency emissions and thus provides additional protection for data transmission is created. Reservations about shielded cabling become unjustified when the Ground Guard is introduced. An additional side-effect is that using the Ground Guard prevents corrosion of the grounding system that may be triggered by roving DC current.



The Ground Guard can easily be inserted into or removed from RJ45 modules using the assembly tool.

Ground Guard: The small plastic frame holds a Flexprint strip, fitted with the dual capacitor and a delimiter element.

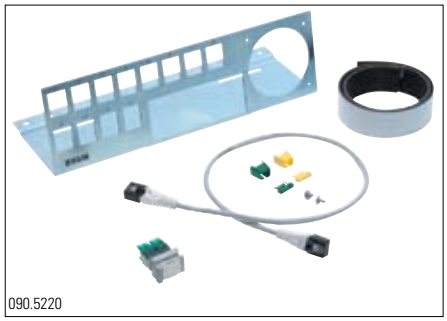
Regina Good, *Product Manager, regina.good@rdm.com*

Home Wiring Kit: One Angle for All

R&M is bringing out two universally usable installation panels for apartment cabling with its Home Wiring Kit. The kit makes light work of supplying broadband to apartment blocks and supports open access strategies.

The installation panels fit into commercially available communication distribution boxes and electrical distribution boxes. In the "FTTH ready" version the sturdy steel angle piece provides 12 cut-outs and in the "Basic" version 16 cut-outs for RJ45 connector sockets and in addition right-angled cut-outs for positioning fiber optic, telephone or DSL distribution as well as a circular cut-out for the R&M multimedia outlet. R&M has developed an "FTTH ready" version for the construction of fiber optic infrastructures in apartment blocks (Fiber To The Home = FTTH). This is where the new FO splice outlet comes into its own.

It is possible to support virtually any concept for supplying apartments with broadband and multimedia using the Home Wiring Kit. Possibilities for use include copper cabling with telephone and DSL connection, coax infrastructures of cable providers and upcoming FTTH installations for ultra broadband networks. Satellite connection can be integrated just as easily as a Gigabit Ethernet home network.



FTTH ready installation panel with option: integrated FO splice outlet and/or multimedia outlet

Basic installation panel with option: DSL modules and/or 10xRJ45/u, ISDN/bus connection module

Marcello Gambone, *Product Manager, marcello.gambone@rdm.com*

R&M Customized Patch Cords – as Required by the Customer

R&M's operations in Poland also encompass patch cord production, and in a groundbreaking new scheme, the production department of R&M Poland is producing numbered cables with custom identification, according to customers' needs.

With this new step into pre-fabricated cords for installation on site, R&M is again highlighting its commitment to ease of installation and certainty of functionality. With numbered cables, R&M customers can speed up the installation process, because each individual cable is ear-marked to fit in one specific location in the networking system.

A highly quality focused production process, coupled with repeated monitoring and verification, ensures the delivery of top-quality customized patch cords from R&M in Poland.

At the production facility, two Komax cable cutting lines are loaded with intelligent software which permits printing of numbers on the cables being produced. This can be either continuous numbers (example: from 1 to 1000) or a sequence of characters (example: from 328930 - - K5500 to 328930 - - K6000).

In addition to this identification, both ends of each cable can be identified with an additional text (such as customer name, location name, project name, etc.).

Mobile platforms

R&M's custom-made mobile platforms are used in the production of numbered cables. Each platform has a vertical panel with hangers. There are 30 hangers on each side of the panel and nine on the base.

Each side of the platform represents a different production order. To make the most efficient use of these platforms, production management ensures that orders assigned to one platform can be handled by neighboring assembly teams so the platform can be positioned between two neighboring assembly tables.

The first step in the production of an order of numbered cables is to print identification labels. These labels identify the range of the cable bundle in each box (example: 1-10, 11-20, 21-30, etc.). 10 cables between 0.5 m and 10 m are packed into the box, and if the cables are longer than 10 m only five cables are packed into the box.

Cutting and identification

Next, cables are cut to the required lengths. Then, in bundles of 5 or 10 cables (depending on cable length) they are hung on the mobile platform hangers and identification labels are put into plastic pockets on the platform panel.

If there are many cable bundles, blue plates are used to identify each bundle (Fig. 1). Each side of the platform can hold 990 cables between 1.5 m and 2 m length or 690 cables between 3 m and 5 m.

Termination and testing

The cut cables are then terminated with connectors (Fig. 2). This task is done bundle by bundle. Each bundle is removed from the platform along with its identification label. After installation of connectors, each contact is tested with CT-6410 or HKT-24 testers, and the bundle is returned to its place on the platform. Cat. 6 cables are additionally subjected to NEXT and RL transmission parameters tests, using FLUKE analyzers (according to the control procedure).

Packing

When all work on the patch cords is completed, the platform with finished patch cords moves to the packing section. Before packing, the range of numbers on the label is checked against the numbers printed on the cables in a particular bundle.

Then the cables are put into a box. The box is sealed with tape and the identification label is glued onto the box.

As shown, each cable bundle is individually monitored during all stages of production, through cutting, termination, and packing.

Fig. 1: Blue plates are used to identify each bundle.

Fig. 2: The cut cables are terminated with connectors.

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Alcatel-Lucent Spanish headquarters office building, Madrid

Much of the reason behind R&M's success, both nationally and internationally, is due to the close relationship it has with its partners who share the same high values of quality, innovation, and customer service.

R&M's Madrid office has long enjoyed a collaborative relationship with Casbar Tecnologia Industrial, S.L., one of Spain's top manufacturers of outdoor cabinets. The two companies are currently working together to supply integrated outside distribution points to one of the world's leaders in solutions and services for the telecoms industry, Alcatel-Lucent.

A trusted partner

Alcatel-Lucent is the trusted partner of service providers, enterprises and governments all around the world, providing solutions for them to deliver voice, data and video communication services to end users. The company's headquarters in Madrid is responsible for the development and commercialization of one of Alcatel-Lucent's flagship solutions, the 1540 Litespan family.

The Alcatel-Lucent 1540 Litespan family is a multi-service access network platform that offers cost-effective voice, data, high-speed Internet access, and video (IPTV, VoD) services for residential and business subscribers and enables service providers to offer any mix of revenue-generating services (POTS, ISDN, ADSL, ADSL2plus, SHDSL and leased lines).

Outside distribution points are an essential feature of this network platform because quality and reliability are of paramount importance, both from the point of view of the cabinet, which must provide strong resistance to the most extreme climatic conditions and excellent technical functionality, and the connectivity solutions within. Casbar, who manufactures the cabinets and supplies the integrated product to Alcatel-Lucent, opts for R&M's VS Compact 8-, 10- and 16-pair connection modules whenever possible due to their high packing density and their suitability for locations with limited space and remote access applications, as is typified by the access nodes offered by Alcatel-Lucent to its clients around the world.

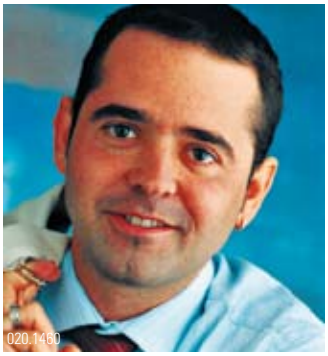
> *"The VS Compact's high packing density allows us to offer cost effectiveness."*

So far this partnership has successfully delivered over 500 street cabinets for more than 660 000 subscriber access ports around the world. "The VS Compact's small size and high packing density allow us to offer cost effectiveness and high performance to our clients without having to sacrifice quality or reliability in the process," says Luis Garcia Miguelañez, Purchasing Manager for Mechanical Parts, Assemblies and Sub-Contracts at Alcatel-Lucent Spain. "These factors, as well as guaranteed fast delivery times, are pivotal in our decision to use the integrated street cabinet supplied by Casbar and R&M whenever it best fits our clients' specific needs," he adds.

For his part, José Manuel Fernández, Director of Engineering at Casbar, also comments that "this is one more example of how Casbar and R&M can and do successfully collaborate to bring high-quality, modular connectivity systems and resistant, high-performance outdoor housing solutions together in a single integrated product designed to suit the needs of operators and telecoms businesses anywhere in the world. We are proud of our partnership with R&M that is built on the core principles of quality, innovation and customer service that both companies share."

As Alcatel-Lucent continues to develop and implement installation contracts for its Litespan solution globally, the partnership between Casbar and R&M Spain will also continue to grow and spread internationally, giving both companies access to new sectors and markets. A positive situation whichever way you look at it.

(Left to right) David López (R&M Spain), Luis Garcia Miguelañez (Alcatel-Lucent), José Manuel Fernández (Casbar)



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The Future is Bright

The first third-generation synchrotron in southwestern Europe selected copper and fiber optic products from R&M

In spring this year, around 130 engineers, scientists, support staff and technicians moved from their temporary offices on the campus of the Universidad Autónoma de Barcelona to the site at the Synchrotron Alba light laboratory near Cerdanyola del Vallès.

As the first third-generation synchrotron in southwestern Europe and jointly funded by the Catalonian Regional Government and the Ministry of Science and Technology, this project represents the biggest and most significant investment in the area of scientific research ever made by the Spanish state. R&M's cabling solutions were selected for the recently completed first phase of the network installation that provides a voice and data infrastructure to the complex's laboratories, offices and administration facilities. So successful was the collaboration that R&M's state-of-the-art fiber and copper products were chosen for the next phase of the network installation – the timing network of the accelerator as well as the data communication and storage facilities - when it was put up for tender.

The first stage is finished

The first stage of the six hectare complex is now finished. Housed in a building shaped like a giant snail shell, the new synchrotron uses arrays of magnets to guide the electrons in an almost circular trajectory in order to generate synchrotron light. Around the synchrotron are a series of experimental laboratories called beamlines where resident and visiting scientists from all around Europe will be able to use the synchrotron light for a wide variety of experiments. These experiments will be carried out in areas as diverse as chemistry, biology, material science, magnetism, and industrial research, as well as the field of macromolecular crystallography which enables scientists to determine the structure of biological molecules such as proteins, viruses and nucleic acids (RNA and DNA).

When the complex becomes fully operational in the years to come, it is predicted that around a thousand scientists a year will visit and carry out experiments using the synchrotron. CELLS, the consortium responsible for the construction and management of Synchrotron Alba, recognized from the first moment that a fail-safe, high-performance voice and data network providing reliable and secure communications was a crucial factor for the successful operation of such an ambitious project, both in its initial stages and in the long-term future.

A complete R&M solution

The voice and data network installation in the CELLS offices, beamlines and outbuildings, built and installed by leading local civil engineering firm Soclesa-Elecnor, was carried out using R&M copper cabling solutions supplied by QPP distribution partners, Atlas Comunicaciones, and selected for their component quality, bandwidth, cost and future expansion possibilities. In order to provide speeds suitable to transmit high-resolution images, the network was designed over 10 Gigabit Ethernet copper cabling with 10 Gigabit FO patch cords and MPO trunk modules. Around 1700 connection points were installed with STAR Real10 Cat. 6 connector modules, and interconnected by over 130 km of Cat. 7 900 MHz S/FTP cabling guaranteed to ISO Class E_A channel standard.

Furthermore, the added value and security offered by R&M's color coding system for the safe identification of the plugs both on the patch panels and the wall outlets, together with the quality of the connections obtained through R&M's solutions, was a decisive factor in CELLS ruling out other options.

With the first phase completed and CELLS already satisfied with the quality and reliability of the cabling products used, the consortium put the contract for the second stage – the computer network controlling the timing of the storage ring inside the synchrotron and the data storage facilities – up for public tender. R&M's Madrid office went on to work closely in collaboration with local systems integrators Ambar Telecomunicaciones on a network design proposal that was eventually selected by CELLS in March this year.

> *"We collaborate with the manufacturers whose products fit our needs best."*

"The particular characteristics of the installation led us to collaborate with those manufacturers whose products best fitted the client's needs, not just in terms of the switches and routers used but also for the passive cabling," says Santiago Cea, Project Manager at Ambar. "In the case of the copper cabling, of which 50 km will be laid just around the synchrotron itself, R&M's latest generation Cat. 6A shielded solution with Category 7 1200 MHz installation cable was chosen because it guarantees optimum performance while protecting against electromagnetic interference."

But it was in the quality and performance of the fiber optic cabling where R&M really shone out. The solution selected as the most efficient in terms of quality, performance and easiness to install is R&M's VARIO*line* preassembled fiber cables. Above all, performance was a key issue for CELLS particularly in the timing network within the ring which ensures that all the synchronization of the accelerator is

The Synchrotron Alba light laboratory represents the biggest investment in the area of scientific research ever made by the Spanish state.

carried out, including the injection of electrons into the ring using magnets and the synchronization of the diagnostic tools to control and stabilize their orbit. For this, the organization established a maximum permissible signal delay in the fiber optic cabling of 10 nanoseconds in 35-meter cables and 14.8 nanoseconds for 200 m ones. Two standard VARIO*line* FO cables were sent from R&M to the consortium for their own analysis – they were found to have a signal delay of no more than 0.5 nanoseconds and 1.1 nanoseconds respectively – well over ten times less than the maximum in both cases.

> *"The results are excellent. Congratulations for the work done!"*

CELLS subsequently tested and verified for themselves the performance of the nearly 200 preassembled 35-meter and 200-meter FO cables supplied by R&M, again through QPP distribution partners Atlas Comunicaciones, and, in a letter sent to the team at R&M Spain, Oscar Matilla of the consortium's Computing and Control Division wrote "The results are excellent as you can see in the attached report (sic). Congratulations for the work done!"

The second phase will start shortly

Work on the second phase will begin shortly and will be well underway by the end of 2009. CELLS' long-term objective is to increase the number of operational beamlines from the current seven to the synchrotron's maximum capacity of 32. The network will require expansion and R&M and Ambar will be on hand to support that. The future of the partnership between the two integrators and R&M Spain, who are already collaborating on other new but unrelated projects, is very promising. The future is bright.

See also "CERN" *www.rdm.com/case studies/telecommunication*

Why R&M?

- Quality
- Guaranteed high performance
- Reliability
- Security
- Preassembled solutions

R&M products used:

- 200 lengths of VARIOLINE (35 & 200 m)
- 82 MPO modules
- 77 FO trunk cables between 20 and 200 m long
- Fiber OM3 MM connectors (SC-RJ and LC Duplex)
- 24 fiber modules 4 LC Duplex
- 40 subrack 19" 72 for up to 3 MPO
- 24 19" 1U Breakout Box FO patch panels
- 215 19" 1U Fibereasy LC Duplex patch panels
- 10 global 3U patch panels 288 FO up to 12 MPO
- 645 FO patch cords OM3 LC Duplex & SC-RJ
- 130 km Cat. 7 900 MHz S/FTP cabling
- 50 km Cat. 7 1200 MHz S/FTP cabling
- 509 19" 1U 24 port Cat. 6A STP patch panels
- 2554 jacks RJ45 Real10 C6A shielded
- 7100 patch cord Real10 C6A SFTP
- Security System Level 1

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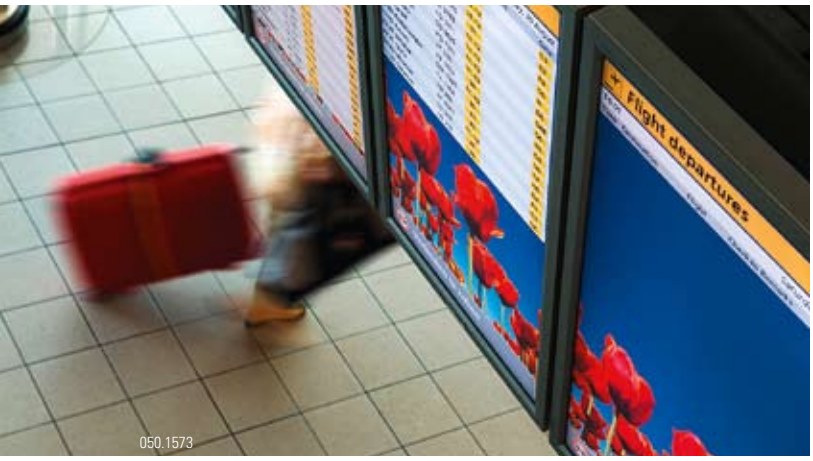
R&M Solution Makes Information Fly at Schiphol Group

Schiphol airport at night



The airports service millions of passengers every year.

The Schiphol Group may be best known for its famous airport in Amsterdam in the Netherlands, but its operations include several other airports, multiple support services, information management and supply, as well as property development and property management. This multitude of operations requires highly reliable and efficient data communications that must be easy to install and maintain, and also environmentally responsible and cost-efficient. The Schiphol Group found that R&M networking systems are an excellent answer to these challenges.

The Schiphol Group developed the concept of "Airport City" that now exists at Schiphol Group locations all over the world, such as New York's JFK Airport, Brisbane Airport in Australia and Arlanda Stockholm airport in Sweden.

These airports service millions of passengers every year, underpinned by a corporate strategy that focuses heavily on quality, reliability and continuity. Schiphol Group's data centers are the basis of the IT systems supporting these services, and it was here that a complete R&M solution turned out to be just the ticket.

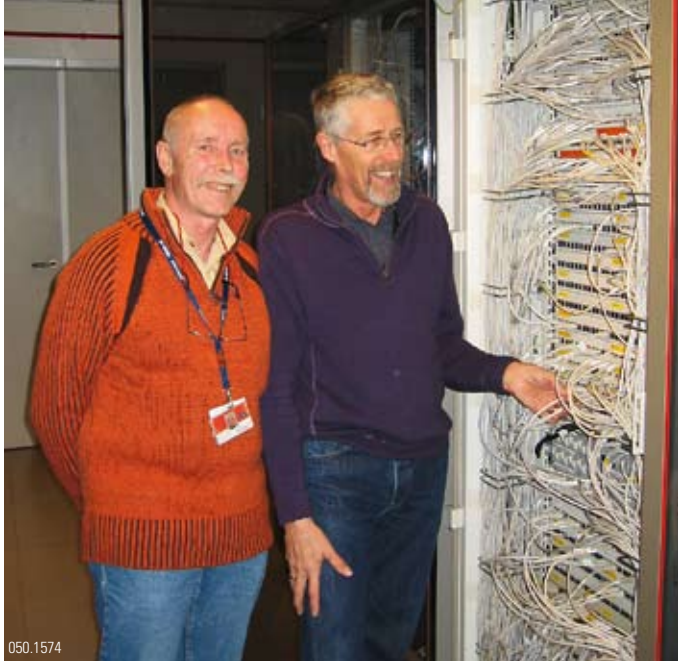
Security and reliability

The Schiphol Group's ICT organization employs a total of 150 staff who are constantly focused on developing and maintaining the infrastructure needed to permit continuous improvement of internal services. There are two data centers designated to these tasks, servicing all of the Schiphol Group.

The backbone of the data delivery is of course the cabling needed for data transmission and energy supply. In total, cabling at the Schiphol Group runs hundreds and hundreds of miles, and it is not only the quality of the cables which matters. In addition, organizational factors relating to systems maintenance and expansion are key considerations due to the strict security regulations for access to the premises.

To fulfill this need, Schiphol Group was looking to find a single supplier for all their energy supply, cooling and data transmission needs. In fact, the solution was right inside their own front door: Elsenga Installatietechniek, a fully certified R&M data cabling partner, was already the supplier of cooling and energy supply services to the data centers.

Thus, Elsenga was already a known supplier to Schiphol Group, and the installer was able to offer a data cabling solution based entirely on R&M systems, highlighting the modular concept of the R&M technology as well as the prefab options.



Two responsible data center managers with a 19“ rack

The network gives the advantage of full 10 Gigabit capacity.

Challenges and interference

Information management in airports is a big challenge. Real-time information must be made available to passengers and operatives on a continuous basis. Ground staff such as caterers and fuel suppliers rely on precise information about expected arrival times and locations of aircraft at the airport.

Needless to say, the data network must also enable efficient operation and administrative routines. At Schiphol Group, more than 2500 staff rely on the data systems for office automation, several hundred of whom also log on while traveling.

In addition to these challenges, airports are almost buzzing with interference. The concentration of radio traffic, aircraft navigation systems, radar, hotspots, GSM and other wireless communication systems at airports is a real challenge to networking systems. All these sources emit signals that must not affect the transmission taking place in data cables inside and outside the data centers.

This was solved in the case of Schiphol Group’s data centers by the use of shielded Cat. 6 cabling throughout the system. Essentially, any open transitions between the cable and the connector must be prevented.

The previous networking system used in the data centers indicated did not resolve this properly and thus represented an additional risk of external interference. With the R&M cabling system chosen, this problem was permanently eliminated by providing a completely shielded connection between the connector and cable.

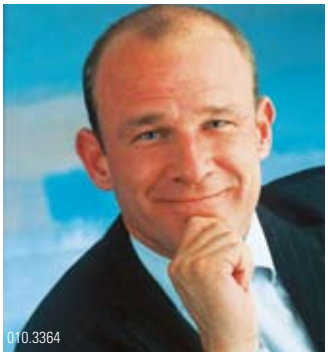
Compact solution

At Schiphol Group the use of R&M Cat. 6 S/FTP cables gives the advantage of full 10 Gigabit Ethernet capacity. In addition, these cables are thinner and more flexible than unshielded U/UTP Cat. 6 cables, which can be a great advantage in cabling installation and in the server room.

Large numbers of RJ45 ports may produce cable bundles so thick that they are difficult to handle and do not allow the use of all the available space. R&M’s innovative system with three RJ45 ports at two units of height dramatically resolved this challenge, while still maintaining the highest possible port density of 24 ports per unit in the rack.

The R&M system’s modularity allowed easy and complete preparation with the cabling being prefabricated, i.e. outside the data center, and pre-mounted. Once in place, all that was left was to click the modules into place inside the frame. This installation procedure was another perfect match with Schiphol Group’s strategy of allowing as few people as possible into the data center for as short a time as possible.

A significant amount of R&M fiber optic cable was also installed where higher bandwidths or longer distances were required. In particular, connections between data centers and to and from Storage Area Networks (SANs) are fiber optic based.



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R&M Networking System for Five-Star Stadium in Ukraine

When the European Soccer Championships take place in 2012, the brand new 50 000 seat Donbass Arena will be one of the venues where stars will show their skills on the pitch. However, the stadium also boasts one of the largest networking installations ever carried out in Ukraine, with a complete R&M networking system encompassing more than 1700 fiber optic and 6000 copper outlets.

Donbass Arena is located in the Leninsky Komsomol Park in the center of the city of Donetsk in eastern Ukraine. The official opening of the stadium takes place in August 2009, after which the stadium will be the home ground of FC Shakhtar Donetsk and also provide space for concerts and cultural events.

This high-spec stadium is the first stadium in Eastern Europe designed and built in line with the Elite-Class UEFA standards (Five-Star Standard, with a natural grass pitch). Designed by Arup Sport Company and constructed by the Turkish company ENKA, the entire project cost was in the region of USD 400 million.

The striking design of the stadium is based on a visual effect which makes the stadium resemble a flying saucer. The roof of the stadium slopes from north to south matching the landscape and contributing to the natural lighting and airing of the pitch. The interior design accommodates all spectators in a single bowl rather than in four separate stands, and the first row of seats is very close to the pitch offering excellent views of the action.

In order to facilitate modern television facilities as well as spectator information, VIP lounges and business facilities, the integrated data networking system was designed and installed during the construction process.

R&M is already well known and respected for its provision of data networking systems for a number of stadia which were used during the European Soccer Championships in 2008, and the networking solution at Donbass Arena once again demonstrates how the flexibility and reliability of R&M networking products can bring benefits to any kind of networking system.

Technology at Donbass Arena

Donbass Arena is equipped with a fiber optic and shielded Cat. 6 copper network, capable of carrying protocols such as Gigabit Ethernet and 10 Gigabit Ethernet. In total, the networking system encompasses more than 400 km of R&M copper cable and some 60 km of fiber optic cabling.

With 6000 ports to the Cat. 6 copper network and 1700 fiber optic outlets, it is one of the largest data networking systems ever installed in Ukraine. This modern network installation will facilitate all computer systems which perform duties in the running of the stadium, including visitor information systems, security and surveillance, as well as providing networking support for media, business events and VIP lounges.

The networking system is based entirely on R&M cabling equipment, and many R&M innovative technologies have been applied. For instance, though mainly designed for telecommunications environments, the VS Compact connection modules were particularly welcome at Donbass Arena.

VS Compact and IDC

The VS Compact connection modules boast some of the highest density in the marketplace, allowing for more connections to be fitted in less space. At Donbass Arena the high number of connections meant that a potential headache in the cabling process was easily eliminated, without any loss of functionality or reliability.

R&M's use of Insulation Displacement Contact (IDC) technology in its networking plugs allows for easy and quick connection of network elements, without any use of solder or screws and with no need for removal

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The 50 000-seat Donbass Arena in Donetsk resembles a flying saucer.

of insulation. Such connections have low transient resistance and are gas-tight and moisture-protected.

This ensures that the network can function for many years free of corrosion or detrimental influence from air pollution or mechanical vibrations.

Standards

While the functionality and the features of the networking solution at Donbass Arena speak for themselves, it is also worth noting the standards compliance and long warranties which apply.

The R&M networking solution provides not only high throughput and productivity but also follows the standards in areas such as electromagnetic compatibility (EN50174, ISO11801), local fire safety regulations (of which fire propagation, toxic materials and smoke density are stricter than similar European Union regulations) and information safety (certificates of Security Service of Ukraine and State Service of Information Security Technologies).

In addition to its well-documented product quality benefits, R&M also boasts well-educated and certified system installation partners in all markets. At Donbass Arena the installation partner was DONBASSINFORMCOMMUNICATIONSERVICE Ltd., a fully certified R&M Freenet installer.

Why R&M?

- Reliability and the best distribution service
- Clear R&M price and partnership policy
- R&M certification of installers and R&M national certifications according to local requirements in different countries

R&M products used:

- Cat. 6 STP cable (more than 440 km)
- FO cable (various, more than 60 km)
- VS Compact panels for voice network
- More than 7300 network point terminations
- All patch cords and connection modules

050.1577

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Reliable Cabling Infrastructure Ensures a Healthy Network

Riyadh-based King Faisal Specialist Hospital and Research Center (KFSH&RC) is an 894-bed multi-facility, multi-entity tertiary care hospital and is one of the leading healthcare institutions in the Kingdom of Saudi Arabia.

Established in 1978, the hospital has doubled its initial size since King Faisal laid the cornerstone for the hospital. Its aim is to provide medical services of a highly specialized nature as well as promote medical research and education programes, including postgraduate education training. Its doctors and researchers also work widely on disease prevention.

Initially administered and operated by the Hospital Corporation of America (HCA), in 1985 it was transferred to a national team. However, the steady growth of KFSH&RC meant over time that the hospital's network infrastructure struggled to cope with increased usage. Bad network connections resulted in user downtime and, more seriously, medical equipment could not be kept connected to the network with any degree of reliability. Links between 600 switches were creating real operational problems.

Clearly, KFSH&RC required a high-end cabling solution that would be able to work efficiently under the heavy workload experienced by the network. In addition, IT staff required the network to be rearranged and tool-free connectors to be installed for the hospital's new cancer tower.

Because R&M cabling solutions and products have a good proven record at the hospital, with good performance parameters, professional local support and extended warranties, the decision was made to use R&M's advanced technology and modular product ranges again, but on a larger scale. In addition, professional training by R&M staff was seen as a clear advantage and key decider in the selection process for this important project.
You will find the full article on our website:
www.rdm.com/applications_healthcare.

The entrance to the hospital

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The Network Takes Off at Marsa Alam International Airport, Egypt

With its history as the birthplace of the modern tourism industry, Egypt has always been conscious of the need to stimulate the tourism sector, looking to open up new developments in order to continue to attract a developing global audience.

Classical sightseeing in Cairo and Nile-based tourism have been supplemented by leisure tourism around the Red Sea. The latest area for development is Marsa Alam in the south Red Sea area. In less than a decade, this town has become a leading destination.

To support the growth of Marsa Alam, the new Marsa Alam International Airport has been key. It is the first privately owned and operated international commercial airport in Egypt and the first airport anywhere in the world operating under a complete Build-Operate-Transfer (BOT) system, granted by the Egyptian Civil Aviation Authority.

The 40-year BOT concession agreement was won by EMAK Marsa Alam for Management & Operation of Airports SAE, a subsidiary of the MA Al-Kharafi Group of Kuwait, with the new airport operating under a separate agreement by Aéroports de Paris.

Launched in 2003, the airport serves destinations across Europe and the Middle East. However, as it expanded to meet increased demand, the airport was facing challenges in covering a large area on one floor with UTP cabling in the airport terminal extension project. The area needed to be divided into zones and more than one rack needed to be installed. After consideration, R&M products were selected primarily due to their high quality and innovative technology, and R&M's partner, Channel Computer Services, was selected to deliver R&M products and was responsible for the network design, delivery and comprehensive testing of the installation with its well qualified and experienced team.

You will find the full article on our website:
www.rdm.com/applications_transportation.

The new Marsa Alam Airport

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One97 Secures Network Availability With R&M Patch Guard

For One97 Communications, reliability and network security are paramount. With customers around the globe and a range of advanced value-added and application services, One97 is a leader in the telecommunications industry. For network cabling at its new headquarters near New Delhi, India, there was only really one choice: R&M.

"A thorough review of leading vendors made it clear that R&M systems offer outstanding features for our needs," says Rajiv Sharma, Head of IT at One97. With 24/7 operations and more than 70 % of the company's 750 strong workforce working from laptops, R&M Patch Guard has proved essential to network availability. The Patch Guards ensure that patch cables are not disconnected and remain at the workstation.

In addition, One97 was thrilled to learn that the more than 2500 R&M information outlets installed may be refitted in a new location.

> "R&M technology secures the bases for our business."

Rajiv Sharma: "R&M technology secures the basis for our business better than any other solution could have done. Installation was convincingly hassle-free and it has worked flawlessly ever since."

You will find the full article on our website:
www.rdm.com/applications_telecommunication.

New headquarters of One97 near Delhi

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MultiroomPro in Combined Residential and Business Premises

MultiroomPro supports the need for convenience even in sophisticated properties with mixed use. Based on the example of a new residential building with a veterinary office in Schaan (Liechtenstein), R&M demonstrated the functionality and installation benefits of this audio distribution system that was used in conjunction with the Home Wiring System.

The intention was to create a consolidated network for the veterinary office on the ground floor and the living area on the upper floors. The task was to integrate lighting, building services management system, telephony and video intercom system, multimedia applications and five audio zones. A 19" distribution cabinet acts as the network control center. The pipe system that is laid in the shape of a star into all the rooms can take additional cables at any time.

> *"MultiroomPro is a really easy-to-install one-stop solution."*

Ospelt Elektro-Telekom AG from Vaduz was able to accomplish a complicated task in a very efficient way. Norbert Schmucki, Ospelt Elektro-Telekom AG (www.ospeltelektro.com): "With MultiroomPro R&M offers a really easy-to-install one-stop solution that is based on standard connection technology and requires no software knowledge in its basic configuration."

You will find the full article on our website:
www.rdm.com/applications_private homes.

The veterinary office with maximum communication convenience

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Top R&M Technology for Discerning Business Guests at the Holiday Inn at Messe Zürich

There had been talk of building a business hotel at the Zurich Exhibition Center (Messe Zürich) since 1997. That dream was finally realized several months ago with the opening of a new hotel.

The 164 rooms in the four-star hotel are geared specifically to the needs of business guests, offering comfort and convenience reduced to the essentials. A variety of flexible spaces are available for conventions, meetings and seminars.

The Swiss franchiser for Holiday Inn, Turicum Hotel Management AG, contracted Hotel Technology GmbH to plan the IT installation starting in the project phase. Planning covered infrastructure, seminar rooms and the hotel rooms, the work environment, entertainment and all the amenities. Top priority was given to achieving maximum stability and functionality for the installation. The end customer did not specify a particular supplier for the network components, so Etavis AG, Zurich, the firm entrusted with installation under project manager Thomas Mesmer, opted for R&M. Once again, the factors that tipped the scales in R&M's favor were the QPP certification program, far-ranging guarantees and excellent product quality.

You will find the full article on our website:
www.rdm.com/applications_tourism.

The new hotel is directly across from the entrance to the Zurich Exhibition Center.

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LzO Chooses Carefully

Landessparkasse zu Oldenburg (LzO), one of Germany's largest and fastest-growing regional banks, had its newly built headquarters equipped with a cabling solution from R&M. A careful multi-phase planning and selection process took place before the equipment was installed.

The object was to create a solid and functional infrastructure with an especially long service life. Sparkasse buildings and the IT inside them must reliably perform their tasks for decades to come. After all, as banks under public law, the regionally organized German Sparkasse savings banks are vital pillars of the local economy.

A multi-phase planning and selection process took place before the equipment was installed in the new building. The recognized level of quality of R&M solutions played a central role. The project team consisted of Roland Otten, head of IT at LzO, consultants Volker Peschke and Wolfgang Wöhler from Finanz Informatik GmbH and Mathias Zorn from the engineering office IBZ Arnstadt as expert IT planners. Following a market analysis and confirmation of the quality parameters, these gentlemen all agreed: network planning would be based on the R&M Catalog.

A new era dawned for LzO and the city of Oldenburg when the bank moved into the new building in the spring of 2009. All the central departments of Sparkasse are now united under one roof. In its 24,000 square meters of floor space, the Sparkasse complex has ample room for 600 workstations.

You will find the full article on our website at:
www.rdm.com/applications_finance.

The new headquarters of Landessparkasse zu Oldenburg called for solid, future-oriented solutions.

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No Museum of Transport and Communication without R&M

The new entrance area for the Swiss Museum of Transport in Lucerne (Photo: PHOTOPRESS/Swiss Museum of Transport)

Swiss history is closely intertwined with the subject of transportation. For centuries, several of the major European trading routes between Northern Europe and the Mediterranean have gone through the Swiss Alps. That may well be why the Swiss Museum of Transport in Lucerne attracts more visitors than any other museum in the country.

Initiated and developed by Swiss transportation companies such as SBB, Swissair and Postautobetriebe, this technical museum has been able to draw on the extensive collections of its founders from the very outset. Over the years, valuable collections or individual items have been added time and again as bequests or on permanent loan and presented to museum goers interested in history and technology.

This institution has been captivating visitors with its exhibitions on the development of transportation and mobility by water, land and air for exactly 50 years. Many of the people who once came to the Swiss Museum of Transport as children with their parents or grandparents are now returning with their own children or grandchildren. About 820 000 people from Switzerland and abroad visit the museum each year at its extensive and idyllic site on the shores of Lake Lucerne.

Looking ahead to the future and back in the past

The classic collection of historical road, rail and water vehicles opened half a century ago has steadily grown over the decades. Since opening the Aviation and Space Travel Hall, the museum has not only been looking back in history but also ahead to possible developments in mobility and technology. Nowadays, transportation in a broader sense involves more than the conveyance of people and goods. The increasing importance of communication in all its many forms has been reflected in the museum's collection for more than two decades with an exhibit hall dedicated to that subject. Another key attraction is Switzerland's first and largest IMAX theater. Art lovers are also in store for a surprise at the Hans Erni Museum within the same complex. And the digitally operated planetarium is the perfect spot to philosophize about past and future, time and space.

The Swiss Museum of Transport wants to remain a top caliber attraction for future generations. That is why it constantly adapts to new advances by installing the latest in exhibition and presentation technologies.

In November 2008 the museum opened the FutureCom entrance building featuring the Media-Factory.

In June 2009 the new Road Transport Hall opened its doors, just in time for the big anniversary. The hall is amazing even from the outside: The 1600 square meter façade is made up of 344 dazzling traffic signs! The exhibits inside focus on the latest technology. A robot-operated high-bay warehouse in the hall contains 80 road transport artifacts. Visitors can vote to decide which of these treasures will be picked and "magically" placed at their feet.

verkehrshaus.ch

The new FutureCom entrance area

A steam-powered locomotive stirs emotions.

Even the exterior of the new Road Transport Hall is a hit.
(Photo: PHOTOPRESS/Christoph Imseng)

The fascination of flight beautifully rendered

Reliable R&M technology for the museum

Frey + Cie Elektro AG was hired to do the installation work for the new building and together with the museum, opted for classic campus cabling. R&M was contracted to supply the copper cabling for the communications cabling system based on its good long-standing relations with the customer and the excellent quality of its products and short delivery times. According to the electricians, work in the Swiss Museum of Transport involves major challenges for man and material: "Since the museum is open daily, much of the installation and maintenance work has to be done at night and under a certain amount of time pressure. You cannot make a mistake with an R&M connector. Just wire it and you are all set to go."

The LAN is a highly complex network with a number of applications such as the office environment, video surveillance, the evacuation systems, telephones and the entire W-LAN cover. Lucerne is one of the few cities in Switzerland to have a city-wide W-LAN. Frey + Cie Elektro AG installed 400 Cat. 6 STP ports and global panels.

A successful installation partner

One of our installation partners, Frey + Cie Elektro AG, Lucerne, can look back on a long history. Founded in 1907, the company offers IT solutions from a single source. Today, Frey + Cie Elektro AG is one of the largest electrical firms in central Switzerland, with 550 employees.

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Belgium's Most Energy-Efficient Office Building

The fascinating architecture of the new Bayer building in Diegem

Energy-efficient technologies and high-tech cabling in new Bayer office building

Record time

That Belgium has always played an important part in the Bayer organization is obvious. The company has production facilities in Antwerp and Tielt, its global innovation center for plant biotechnology in Ghent, marketing and sales activities and a liaison office in Brussels. After 48 years, the Brussels' offices, located on the busy avenue Louise, were in dire need of a serious facelift. An in-depth study of the various options was carried out and, based on its results, decision was made to go for a new building in Diegem, an ideal location in direct proximity to Brussels International Airport, important motorways and the railways. The foundation stone was laid on December 18, 2007 and the official inauguration took place on May 29, 2009, undoubtedly a record time to complete a construction of this type.

50 % energy savings

The Belux (Belgium and Luxembourg) sales organization and local services (HR, finance, IT) for three of the Leverkusen-based group's core activities – Bayer HealthCare, Bayer CropScience and Bayer Material Science – recently moved to the brand-new premises. It is not only an outstanding example of contemporary and sustainable architecture but also one of Belgium's most energy-efficient office buildings. A revolutionary air conditioning concept, based on high-tech concrete, combined with a heat pump, connected to a DES field (Drill hole Energy Storage), and the installation of an energy-saving soil-air heat exchanger for ventilation generate a 50 % energy saving compared to a traditional office building. The design was the work of the architect team Schellen from Bonheiden that specializes in office construction and important buildings projects. Bayer Technology Services was in charge of the coordination of the impressive project which totalizes 8000 square meters of office and service space and 5000 square meters of parking space in an underground garage. Although 350 employees can work on the premises in very pleasant surroundings, only 220 fixed workplaces were installed. For the 150 employees who are mostly on the road, a system with 30 "flex offices" was implemented.

Not only were even the smallest details of the building designed according to the latest and most efficient technologies, the communication network had to match the highest requirements too. "According to Bayer's general policy the preference in terms of network goes to R&M products, because of their proven high quality. However, we carried out a study to determine the company best suited for the installation of our network," Jean-Pierre De Becker, Project Manager Bayer Building Business Brussels,

Fifty kilometers of cables needed to be installed in the new building.

explains. "After a comparison based on price, quality and delivery of the project within the predefined time frame, we called upon Simac, an R&M certified company from nearby Kortenberg. We knew them as they had already worked for Bayer's Antwerp plant. What's more, Simac is not only an installer of cabling, it is an integrator which can help resolve problems if they occur."

Fifty kilometers of copper cabling

For the six-storey building, two racks were installed per floor except on the ground floor and on the sixth floor. The ground floor is linked to one of the first floor's racks and the few connections from the sixth floor are linked to a rack from the fifth floor. Cables lead from the data cabinets on each floor to the consolidation boxes located under the raised floors.

The "flex offices" are equipped with two connection points in one floor box, whereas the fixed workplaces have four connection points. This enables sufficient connection possibilities for a second person to work or if peripheral devices to be added to the network. Even if there was a problem to happen with the VOiP phone system, the network is ready to switch effortlessly to a classical telephone back-up. To ensure a high performance communication infrastructure, Bayer opted for copper Cat. 6A S/FTP to be used for horizontal cabling, combined with multimode twelve-fiber 50/125 OM3 for the backbone or vertical cabling. On the building's third floor, data cabinets were installed from which two fiber optic cables per rack link the remaining floors. These cables also link the server room, located on the third floor. The double cabling was retained as a guarantee for additional security and maximum redundancy. Additionally, each rack is linked to the server room with a VVT cable that is used for the faxes and the ADSL lines. R&M's high-quality material was implemented for the phone cabling too: multi-pair copper (VVT 25 pairs) with RJ45 patch panels. Each workplace was equipped with Cat. 6 connections. Scattered all over the floors, there are over 600 of these connections to the network.

Highest flexibility needed

All in all, in a time frame of just six months, Simac installed a network of more than 50 kilometers of R&M copper cabling and approximately 1.5 kilometers of optical fiber. "It took quite a lot of planning and preparation because we are generally the last ones to work on a building site. In the present case we had to work while other workers were still on the premises. We had to be extremely flexible," says Andy Vanbrabant, Business Manager Cabling & Infrastructure at Simac.

> *"Our supplier did a perfect job."*

"Notwithstanding the pressure of the workload, the implementation was completed within the time frame and following our request. Our supplier really did a perfect job, but there again we didn't expect anything else," concludes Jean-Pierre De Becker.

As the installation was carried out by a certified R&M partner, a five-year warranty was given on R&M Freenet products; a twenty-years warranty was given on R&M Freenet system components and a lifetime warranty was given to R&M Freenet application performance.

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R&M Cabling: Best Option for Tech Mahindra in the UK


050.1612

The entrance to the new office in Newcastle

With its global business based in offices and call center facilities around the world, Tech Mahindra requires the most reliable and best quality cabling systems to deliver its high-end IT services to global customers.

In Newcastle in North East England, Tech Mahindra's new office was fitted with a high-quality Cat. 6 cabling system from R&M that is set to provide a safe and reliable networking platform for the company's growth in the UK.

Tech Mahindra Ltd. (TechM), headquartered in Pune, India, is a global IT service and software development company. TechM's global presence spans 24 locations in 14 countries of which 11 are state-of-the-art development centers. In total, the group employs more than 25 000 staff.

With its decades-long strength in telecom solutions, TechM provides a variety of services ranging from IT strategy and consulting to systems integration, application development & maintenance, infrastructure management and product engineering.

Itself an ISO 9001:2000 certified company, TechM focused on reliability and standards compliance, and it soon found the R&M option the best answer to its needs. This continues a long-standing cooperation between TechM and R&M in the Indian market, since TechM's Bangalore-based development center is already cabled with R&M networking systems.

UK solution

Some of TechM's largest clients are telephone companies such as BT, AT&T, Alcatel-Lucent & O2. A significant portion of its revenues comes from the UK and in order to meet the expectations of its client base, an increase in TechM's capacity in the UK was needed.

At Viking Industrial Park in Jarrow in South Tyneside, TechM chose to locate its sixth UK center of excellence in the newly built three-storey Hawthorne Building on Rolling Mill Road.

"We were already aware of the success of the R&M cabling system at our facility in Bangalore. It was very encouraging to find the same options available in the UK, half way around the globe," said Rajesh Deshpande, IT Manager at TechM in the UK.

"Because we are a global operation it was important for us to be able to replicate specific details of the R&M cabling system we already had in operation in Bangalore. With the support of the R&M team in the UK and its certified installer we are confident that we found the best option," said Rajesh Deshpande.

R&M technology

TechM's new networking platform was installed in the new office, encompassing networking and server rooms with secure access.

The entire network cabling installation consists of R&M patch cables, outlets, panels and level one security products. The simple yet effective color coding of the level one security solution ensures that the entire network is divided into distinctly separate physical domains, allowing TechM to share offices with business partners and tenants.

"We will be running a multitude of development and client applications across the entire infrastructure, so we were very keen to get a network of a high quality. The infrastructure has been performing well and the installation procedure was both professional and flexible," said the IT manager.

Installation

Following a selection process initiated in 2008, the R&M cabling system was installed early 2009 and has now been finalized. This was carried out by LMG in West Thurrock near London, one of the R&M certified installers in the UK, with the support of R&M's UK distributor Blue Helix. For this reason, the installation is covered by the R&M 20-year warranty.

You will find the full article on our website:
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New building of the Fraunhofer Institute for Digital Media Technology in Ilmenau, Germany: Among other things, the new facility boasts an anechoic lab and a high-quality network with Class E_A cabling.

The Fraunhofer Institute for Digital Media Technology (IDMT) is a source of new sounds in music, entertainment and education. It conducts research on acoustic and multimedia applications of the future. Cat. 6/Class E_A cabling from R&M is one factor that ensures great sound in the new IDMT building.

Fraunhofer is a name associated with major advances in digital media. For instance, the MP3 format for the digital compression of audio recordings was developed at institutes of this German research organization. The Fraunhofer Institute for Digital Media Technology (IDMT) in Ilmenau (in the German state of Thuringia) also has an exclusive invention to its credit: the Iosono sound system. It utilizes wave field synthesis to create a spatial sound environment that is as perfect and natural as possible.

A perfect environment for new media technology was also needed when the IDTM was planning its new building. Among other things, the building houses an anechoic laboratory. Class E_A copper cabling in accordance with ISO/IEC 11801 was selected as the structured building cabling. The Fraunhofer Gesellschaft cabling regulations were also taken into consideration.

050.1617

The MP3 format (courtesy of Apple) is one of the advances Fraunhofer has developed.

The network had special requirements to meet and also had to be multifunctional in use. It supports the IT, special research applications and the entire media control system at the institute.

Tough requirements placed on cabling system

A minimum margin of 3 dB at 500 MHz was the acceptance criterion for all measured values in the system (NEXT, attenuation and ACR). A higher than average margin also had to be guaranteed for insertion loss and return loss (IL and RL). The set schedule and budget had to be complied with exactly.

> *"Excellent quality in terms of execution and materials."*

Wolfgang Kupsch from the Teamplan engineering firm based in Appolda and Dresden was contracted by the institute to conduct the selection and contracting procedures. Matthias Ahnert and his firm Syskom GmbH from Chemnitz, a certified R&M partner, took these hurdles with ease. During the formal acceptance procedure in the fall of 2008, Syskom's performance was described in glowing terms: "Excellent quality in terms of execution and materials."

The future research results from Ilmenau will consequently be excellent too, for instance, machine-based semantic recognition of music, image and video content or the development of new biology-based computer models for acoustic and multimedia applications.

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Fiber Optic Pioneers in the North

wilhelm.tel set itself the target of supplying Hamburg with FTTH solutions.

Brave pioneers shape the start of a new era. This also applies to fiber optic provision. Pioneers at many sites in Europe are currently demonstrating that Fiber To The Home (FTTH) and Fiber To The Building (FTTB) are no longer wishful thinking but rather a competitive strategy provided that the network operator acts quickly, practically and offers the market attractive products.

The wilhelm.tel company from Norderstedt, a small town in northern Germany, is just such a pioneer in FTTH. The ambitious local network operator took on no less a task than that of providing the neighboring metropolis of Hamburg with Fiber To The Building, high-speed Internet, telephone and cable TV (triple play) via optical fibers. Hamburg, with its population of 1.75 million, is approximately 25 times the size of Norderstedt, covers 755 square kilometers and due to its predominantly high population density offers the network operator very profitable conditions.

From several points of view, the current large-scale project appears to be a perfect example for towns, the housing industry and network operators, and that is also the reason why R&M is hugely committed to supporting the project within the scope of its broadband initiative. wilhelm.tel started up in summer 2008 following meticulous network planning.

In close cooperation with 38 civil engineering crews, with its Hamburg partner willy.tel and solutions from R&M, wilhelm.tel was able to connect over 1200 buildings in Hamburg to a new, dedicated fiber optic Ethernet network using the high-speed process. Within a few months some 130 000 apartments were catapulted into the ultra broadband era.

This spectacular figure includes the entire housing inventory of SAGA GWG spread around every district. The municipal company SAGA GWG is Hamburg's largest housing company. SAGA GWG has a clear aim of offering renters greater convenience and better quality of life ... and a "quantum leap into the media future" as CEO Lutz Basse puts it.

100 megabits per second in every apartment

It will be possible over the course of 2009 to provide every housing unit with Internet connections with a guaranteed data transfer rate of 100 Mbps downstream and 5 Mbps upstream. wilhelm.tel can guarantee 99.999 percent availability based on the architecture and quality of the gigabit MAN. Added to this are free telephone calls within the wilhelm.tel network. All this is on offer for a low-cost flat rate without minimum contract term.

wilhelm.tel offers over 500 analog and digital TV and radio programs in around 10 languages through the new network. The local service for configuration of the receivers is free of charge. High-definition IP television is also being introduced.

The result: In many Hamburg condos virtually 100 percent of telephone and TV customers are switching to the dynamic provider from Norderstedt. Lutz Basse: "SAGA GWG has found a medium-sized partner in wilhelm.tel that offers our customers its product on favorable terms. The reactions of the renters who have decided to opt for the wilhelm.tel offer are extremely positive."

Venus Box and VS Compact in large-scale use

280 kilometers of cable routes and 1500 R&M fiber optic splice closures were laid underground in Hamburg for the new fiber optic network. R&M supplied 12 000 units of the Venus Box, 25 000 VS Compact connection modules and 1000 distribution cabinets specially designed for wilhelm.tel. The flexible, modular combination possibilities of the Venus Box and VS Compact provided an excellent basis for creating the transfer points in the basements of the apartment blocks in an efficient, safe and straightforward manner.

Within a few months 130 000 apartments were catapulted into the ultra broadband era.

Due to its global commitment, R&M is aware of the most varied FTTH strategies on the market from Europe to the Far East. This experience also benefits project partners in Germany. Network planner Ulrich Scheu endorses the decision in favor of R&M: "We are only interested in solutions that can be implemented smoothly with tried and tested, high-quality technology." As one of the pioneers of the wilhelm.tel projects, he rejects experiments with unknown variables.

wilhelm.tel delivers the individual fibers or Ethernet signals in the Venus Box. VDSL switches or Ethernet gateways and VS Compact connection modules transfer the signals to the in-house networks. wilhelm.tel feeds telephony and Internet into the two-core copper cabling using Ethernet technology – it is possible to provide 100 Mbps bandwidth reliably where distances are less than 300 meters from the transfer point to the end customer's telecommunications outlet. The network operator ImmoMediaNet, a subsidiary of SAGA GWG, looks after the coaxial house distribution systems for the provision of cable television.

Twin-track: freedom of choice for renters

The main attraction of this FTTH project in Hamburg is its twin-track topology: The coaxial cabling that is present almost everywhere is not replaced but continues to be used. ImmoMediaNet has the CATV networks upgraded to meet the needs of HFC technology with 862 MHz bandwidth and return channel. The CATV infrastructure retains its capacity reserves as it need not be loaded with Internet and telephony.

Customers are at liberty to stay with analog TV reception. Even then, wilhelm.tel provides them with a choice of transmitters extended by 60 percent that other cable providers do not offer. Nevertheless, renters could still use cable modems at any time and thus receive television digitally and interactively, make telephone calls and access the Internet via the CATV network – a convenient freedom of choice.

The network operators involved emphasize: "The parallel infrastructure is the most cost-effective solution today with an enormous performance potential for the requirements of the future." Only in this way will it be possible to implement a huge range of TV and radio services together with a virtually inexhaustible transmission capacity for interactive data services at justifiable costs. For the inhabitants of Hamburg the FTTH solution is the "masterstroke" that avoids a patchwork and makes many years of adaptations to increasing capacity requirements superfluous.

Based on this, they are already planning the next stage: The aim is to increase the broadband offer to 1 Gbps for all apartments by 2012. They are convinced that this step must come if you extrapolate the current growth rates in Internet data traffic and the take-up of triple play offers. The Hamburg route allows for complete substitution of old copper networks with fiber optic cabling in the medium to long term and at the same time permits the integration of other suppliers according to the open access model.

A state-of-the-art, structured home wiring system with star topology in accordance with EN 50173-4 has already been installed in some SAGA GWG blocks. More than 1000 kilometers of multimedia hybrid cable - consisting of coax and Cat. 5 cable – were used for this. In addition, empty pipes were laid into which fiber optic cables can be blown at a later date. All the requirements have thus been created for a fully optical supply right into the apartment at a later date.

Ten years of experience and competitive edge

The Norderstedt public utility companies have already been involved in the local telecommunications market for 10 years with their subsidiary wilhelm.tel. In 1999 they were the first in Germany to completely recable an entire town with fiber optics and provide it with a triple play service. A regional backbone with a performance of 50 Gbps links head-ends for feeding in cable television with the POP for the telephone and data network. In »

280 km of cable routes and 1550 R&M splice closures were laid underground for the new fiber optic network.

Norderstedt itself, a circular Ethernet MAN was created with 14 points of presence (POP) and three Gbps backbone rings. Bandwidth bottlenecks such as those with DSL connections are unheard of in Norderstedt.

"We want to help our customers to use the many possibilities of state-of-the-art electronic media. Now more than ever before, information, communication and acquisition of knowledge depend on broadband telecommunication transmission routes. For this reason, we only supply customers via our own fiber optic network," emphasizes Theo Weirich, CEO of wilhelm.tel.

The population of Norderstedt rewarded the commitment of its public utility companies and the attractive offers with an exceptionally high connection rate. Over 85 percent of all households in the small town receive television via wilhelm.tel's fiber optic connection, two thirds of the customers also surf and make telephone calls over this network.

wilhelm.tel recommends that existing customers feed in a Cat. 5 Ethernet cable when refurbishing an apartment. wilhelm.tel has created the requirements for an Ethernet supply for 5000 apartments in condominium buildings in Norderstedt although a good CATV infrastructure already exists. Provision via Ethernet is more cost-effective than via coaxial cable. wilhelm.tel passes the price saving on to the customers. In the news service search-networking.de, Heiko Liebscher, technical manager at wilhelm.tel, is quoted as saying, "Our basic principle is that we want to own the most up-to-date infrastructure and with the appropriate medium for our high-quality and innovative content. And for us the medium is Ethernet."

wilhelm.tel's current partner in Hamburg is also a pioneer: willy.tel – a similar name was chosen deliberately – emerged in 2008 from the multimedia division of the Thiele Group that has been active in the radio and television market in Hamburg for 50 years. In 1999 the Thiele Group installed the first German triple play network based on a CATV infrastructure in selected urban areas. It is still running smoothly.

Electrical termination of the VS Compact in the Venus Box

19" fiber optic technology from R&M

Thiele and wilhelm.tel have been cooperating and utilizing well-defined synergies since 2004. Their first joint project was a multimedia network for 24 000 apartments. Contracts for 40 000 further apartments in Hamburg followed up to the launch of SAGA GWG's large-scale project.

Further towns and communities from the area surrounding Hamburg would like to benefit from the commitment of the alternative network operator. In specific localities they have formed citizens' action groups to exert political pressure and push forward the provision of high-speed Internet. A whole chain of local Ethernet fiber optic networks is being created. Soon several hundred thousand households will be served by wilhelm.tel and willy.tel. The management of the Norderstedt public utility companies is quoted in the *Hamburger Abendblatt* as saying, "If we go in somewhere, then it's blanket coverage."

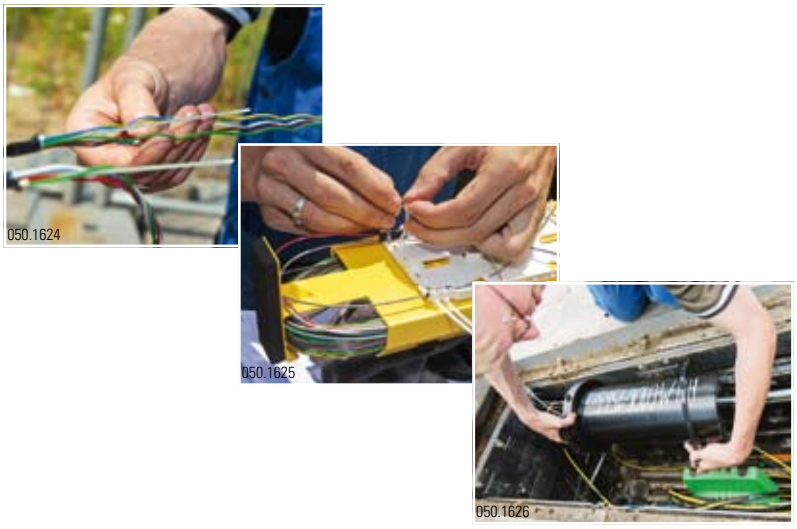
Karl-Heinz Neumann, CEO of the Scientific Institute for Communication Services in Bad Honnef, encourages network operators like wilhelm.tel in their strategy: "Even if a supplier only exceeds a market share of 30 percent after two years, it is still worth expanding fiber optics into the basements of households." Long-standing industry expert Dr. Wolfgang Posewang, Editor-in-Chief of the specialist magazine *Cable!Vision Europe,* adds, "Although wilhelm.tel puts in considerable preparatory work, its strategy is sound and designed for the long term with the focus on top-class technology. As a result wilhelm.tel is positioned just right."

Local success: he who digs wins

Municipal public utility companies and their telecommunications divisions obviously find it easier to bear the cost of such projects. The industry news service *Portel* explains why this is so: "An old truism of the utility companies goes: He who digs wins. This basic attitude of the energy, gas and water suppliers explains the huge success of local and regional telecommunications companies wherever they work closely with municipal suppliers and traffic companies. When the trenches under streets and pavements have to be re-excavated or opened up for maintenance work, empty pipes and fiber optics are simply put in at the same time and written off over long-term periods of anything up to 20 years or more. This immediately results in a whole range of financial synergies for the alternative network operators."

In addition to Norderstedt and Hamburg there are increasing numbers of sites in Germany that are opting for a broadband Internet supply that focuses entirely on fiber optics to the end user. R&M supports the FTTH projects with its own broadband initiative. The 13 sales offices of Reichle & De-Massari are present in all regions of Germany to provide service, expertise and project management. Support for public utility companies, regional and city carriers includes planning and the creation of functional specifications, individual product and system adaptations, sampling, logistics and qualifications for installers.

One challenge is that slightly different conditions prevail at every location. There are no national or international standards for FTTH systems. Generally speaking, it is necessary to plan individually and adapt the solutions. In this case the modular R&M systems can be used flexibly at all levels from the computing center or central network hub of a telecommunications company to the cabling of streets, buildings and apartments. At the same time, they offer a future-proof solution for decades of operation of fiber optic networks as they are easy to maintain and manage.



Various work steps during the installation of a splice closure

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Switzerland's capital is building the infrastructure for Fiber To The Home.

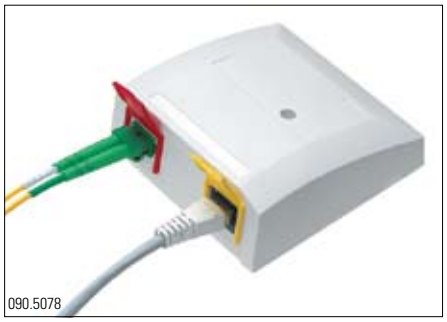
Switzerland is on the way to closing up to the leading fiber optic nations within a few years. Numerous locations such as the capital of Bern are waiting in the wings or already building infrastructures for delivering ultra broadband to every apartment block. Smart, fair solutions such as the four-fiber model make light work of launching the fiber optic era.

The majority of experts agree that the future belongs to fiber optics. It is the universal and almost inexhaustible transmission medium for entertainment and multimedia, business and services in the fixed network. If our communication networks are to withstand the increasing volume of Internet data traffic, they must be updated and the old telephone networks with copper wires must be replaced.

But how can fiber optics be brought into every household with justifiable expense? How can Fiber To The Home (FTTH) be implemented practically and cost-effectively – and profitably for the supplier? There are numerous answers to this. Virtually every country, every location plans its own technical and organizational solutions and forges ahead at different speeds. The greatest speed is frequently seen where local suppliers and regional network operators take charge of the new fiber optic supply.

Strategy: practical, efficient, benefit-oriented

One current example among many is the Swiss federal capital with its public utility company Energie Wasser Bern (ewb). The company wants to invest CHF 140 million and provide 90 percent of the city with fiber optic connections within 10 years. The new FO splice outlet from R&M will bring the optical fibers into Bern's apartments. It is impressive not only because of its capacity and installation benefits, but also because of its aesthetics. It fits in anywhere. As a hybrid solution, it can also accommodate the



Lean and hybrid: The new FO splice outlet from R&M can be fitted with an RJ45 port for copper cabling (on the right in the picture) in addition to the fiber optic connections.

existing copper connection, if required. It becomes the central telecommunications outlet for all applications in the home: for telephone and Internet, video, radio and television, home office and company network, remote monitoring, building automation and many others.

The FO splice outlet from R&M is the best possible solution for existing and new building infrastructures. The intention is to manage the next generation task as practically, efficiently and sympathetically as possible. The existing infrastructure is used for this purpose.

"We can supply a large number of all apartments with fiber optics without any building activity as we can use existing pipes for this purpose. If digging work is necessary to connect a house, we always combine it whenever possible with modernization of electricity, gas or water connections," explains ewb.

As a result, the costs of building work are shared between the different media. This strategy saves the city of Bern a lot of construction work and means its economy is not burdened too heavily in one direction. In fact, an additional economic benefit is anticipated.

> *The company ewb is convinced that, "Fiber To The Home will strengthen Bern as a business location and increase the quality of life of all its inhabitants."*

Investing in FTTH has triggered eightfold follow-up investments in comparable cities. In the case of the city of Bern, this multiplier effect would initiate follow-up investments amounting to billions of Swiss Francs.

Basic conditions: standards, open access, modularity

As in Bern, most Swiss agglomerations provide comparatively favorable basic conditions for the generation change to FTTH. The most recent negotiations of the Swiss Federal Communications Commission (ComCom) have also contributed to this. R&M's solutions comply with the relevant recommendations.

The model facilitates cooperation opportunities for developing the fiber optic infrastructure. Network operators can now plan more cost-effectively due to common standards, e.g. for interfaces and outlets. Due to the provision of several fibers, house owners and end consumers can easily switch providers. Unbundling and competition at the network access – known as Open Access – are largely guaranteed. So overall a model conforming to market requirements.

R&M's fiber optic systems also make light work of entering the FTTH era. As an integrated solution or combined with established copper cabling, they cover the entire communication path – from switching centers and computing centers through network hubs and splitters outdoors to the building and subscriber connection and apartment cabling. The modular principle allows network operators to plan FTTH projects in stages in line with their strategies, investment opportunities and local conditions and to connect up their local market flexibly as required and depending on their competitive position.

> *"The children of today and tomorrow – the network generation – will call for a ubiquitous range of broadband services. They will consider fiber optic connections as their birthright."*

Conclusion: An FTTH connection will soon be as natural as having a supply of water and electricity. Or, as the famous Wikinomics author Dan Tapscott said in February at an industry conference in Copenhagen, "The children of today and tomorrow – the network generation – will call for a ubiquitous range of broadband services. They will consider fiber optic connections as their birthright."

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40/100 GbE is Just Around the Corner

The next evolutionary leap is coming faster than many expected. According to current forecasts, IEEE 802.3ba will ratify the standard for 40/100 Gigabit Ethernet mid-2010. How can network planners, computing centers and carriers prepare for the data networks of the future?

The volume of data continues to increase dramatically in computing centers, trunk and urban networks. An increasing amount of bandwidth is needed to make the many new Internet services usable without loss of quality and friction loss. Experts from Cisco anticipate that IP traffic will increase fivefold by 2013 with the result that an estimated 56 Exabytes will rocket through the Internet each month. According to the authors of the study published in June 2009, that would correspond to an annual increase in bandwidth requirement of 40 percent.

Infrastructure in computing centers must keep pace

The result: Technology in the computing centers and central offices of the carriers, in the distribution and core networks must keep pace. High-speed servers and high-speed links are urgently needed. This is why 40/100 Gigabit/s Ethernet (GbE) is on its way. The relevant standard IEEE 802.3ba ought to be ratified mid-2010.

This evolutionary leap will speed up the convergence to All over IP. Business applications such as Voice over IP, server virtualization or software as a service will gain ground more easily. Data networks will become more efficient with the result that bandwidth-hungry, data-intensive consumer applications such as video, games and IPTV will function reliably. According to a forecast by Intel and Broadcom, work in the nodes of the networks will be carried out at no less than 100 Gbps in ten years' time.

Volume of cables and fibers rising – the importance of calculating space requirements

An evolutionary leap of this kind will involve huge investments. The quantity of servers, switches, memories, racks and cable couplings will have to increase enormously to cope with the volume of data. Planners and operators of computing centers and networks need to make long-term preparations for this and consider more carefully than ever before how, despite the pressure to adapt, they can manufacture profitably and make the total cost of ownership (TCO) favorable.

As the number of cables and fibers installed will multiply, the amount of space that will be required in basements, cable routes and racks should be calculated now and the decision should be made, for example, to opt for cables with the smallest possible diameter. High density will become an important parameter for every stage of planning.

The new standard, however, will lead to a reduction of parallel structures in the highly compacted passive equipment and will thus support the desire for efficiency and better cost-benefit ratios. IEEE 802.3ba places new demands on cabling and will enable new interfaces that result in a substitution of parallel infrastructures. Other new developments such as Fiber Channel over Ethernet (FCoE) can even replace parallel structures completely.

Quality requirements on cabling increase

At the same time quality requirements on the infrastructure are rising yet again. Not one single bit may be lost where the new Internet services and demanding communication and multimedia applications are concerned. Every signal, no matter how small, must be able to get from A to B without interference. Downtime has to be excluded as vital applications, security systems and building automation now also run via Internet protocol and depend on the operation of a computing center.

The consequence is that it is necessary to install particularly reliable and secure connecting and distributive technology. Anyone now choosing an appropriately high-end cabling system that has a modular design and is easily scalable, will be able to increase the performance of his networks faster and more flexibly and guarantee high availability in the future.

The future standard definitely requires the exclusive use of high-end products with the lowest attenuation values. Users can already use high-performance optical fibers that will also support 40/100 GbE later to avoid surprises at a later date and prevent any obstacles to investment.

Application	Medium	Fiber optic			Copper		Description and specification
	Range	**40 km**	**10 km**	**100 m**	**10 m**	**1 m**	
	Technology	**Singlemode**	**Singlemode**	**Multimode**	**Twinax**	**Backplane**	
	40-GbE		**40-GBASE-LR4** 4 x 10-GbE, 4 ports/link = 8 fibers/link, OS1	**40-GBASE-SR4** 4 x 10-GbE, 4 ports/link = 8 fibers/link, OM3, 850nm, based on ITU G.694.1 DWDM	**40-GBASE-CR4** 4 x 10-GbE, 4 channels	**40-GBASE-KR4** 4 x 10-GBASE-KR	
	100-GbE	**100-GBASE-ER4** 4 x 25-GbE, 4 ports/link = 8 fibers/link, OS1, based on ITU G.694.1 DWDM	**100-GBASE-LR4** 4 x 25-GbE, 4 ports/link = 8 fibers/link, OS1, based on ITU G.694.1 DWDM	**100-GBASE-SR10** 10 x 10-GbE, 10 ports/ link = 20 fibers/link, OM3, 850nm	**100-GBASE-CR10** 10 x 10-GbE, 10 channels		

Orientation for network planners: nomenclature for 40/100 Gigabit Ethernet with the interfaces and specifications planned by IEEE 802.3ba

Solutions

for fiber optic and copper infrastructures

The new 40/100 Gigabit Ethernet will run predominantly on optical fibers – in the backbone and in horizontal cabling naturally. The standard will permit both multimode – with OM3 fiber – and singlemode solutions.

Four ports or eight fibers, each transporting 10 Gbps per link, will be needed to be able to use 40 GbE over 100 meters using multimode fiber. In the case of 100 GbE, 10 ports or 20 fibers will be needed. The requirement for this is a highly compacted and precise connection system such as the MPO connector. Preassembled MPO units will be an efficient solution for computing centers in the 40/100 GbE era.

Copper solutions over four or ten 10 GbE channels will also be possible over very short distances in computing centers (see table). Pre-terminated twinax and balanced-shielded copper cables and backplane technology come into consideration for equipment-to-equipment connections. Twisted-pair copper cabling and RJ45 interfaces would no longer be able to meet the high requirements of sensitive and complex data transmission at 40/100 GbE.

Anyone planning investments should already be taking a look at the upcoming nomenclature for the individual interfaces (see table). Expansions of the Ethernet model relate particularly to the physical level. New interfaces for copper and fiber optics are to be anticipated. A numerical prefix (40 or 100) specifies the transmission rate. The letter G stands for Gbps.

The suffix contains the medium and range (letters S, L, E, C, K), coding or interface type (letter R) and the number of wave lengths per fiber or of the parallel cables (figure 4 or 10). The letter S stands for short fiber (multimode up to 100 meters), L for long fiber (singlemode up to 10 kilometers) and E for extra long fiber (singlemode up to 40 kilometers). The letter C stands for copper or twinax, K for backplane. R is used to describe transmission over several parallel cables (lanes) by means of 64B/66B block coding.

Careful planning simplifies the route to 40/100 GbE. Due to the high compression of fibers and demanding shielding of copper cables it is advisable to use precisely pre-assembled and individually tested cards. This saves working time, reduces the time technicians and maintenance staff need to spend in a sensitive environment, simplifies installation and guarantees the anticipated performance. Field termination or adaptation in ongoing operation is not advisable at this demanding level.

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Cat. 6A vs. Cat. 6_A

Cat. 6_A – written with a subscript A – is the key to new peak performances and greater operational reliability in data networks. This future ISO/IEC standard for components raises the bar considerably higher than Cat. 6A by EIA/TIA.

New classes of cabling standards were created with the introduction of 10 Gigabit Ethernet over twisted-pair copper cable (IEEE 802.3an). The EIA/TIA approved the Cat. 6A standard in February 2008 and the ISO/IEC the Class E_A channel standard in the same timeframe. Unfortunately, these two standards do not define the same performance, leading to confusion in the market.

This confusion increases even further when looking at the components, particularly the connection modules. EIA/TIA and ISO/IEC specify different performances for the modules but use very similar designations for the components – that is to say Cat. 6_A with subscript A (ISO/IEC) and Cat. 6A (EIA/TIA).

Different requirements on the channel

The channel NEXT requirements for EIA/TIA Cat. 6A show a relaxed slope of 27 dB/Dec starting at 330 MHz, while the ISO/IEC Class E_A defines a straight line. The ISO/IEC concept thus enables the maximum available and best transmission performance in twisted-pair copper cabling based on RJ45 technology.

This means that at 500 MHz Class E_A requires 1.8 dB better NEXT performance than a Cat. 6A channel. In practice, this higher performance translates to higher operational reliability of the network and thus to fewer transmission errors. This also lays the basis for a substantially longer usage and service life of the cabling infrastructure.

Noticeable difference in components

Once the channel standards are clear, the next step is to define the component standards. EIA/TIA defined the specifications for channel, link and components in one package. Everything is included in the Cat. 6A standard (568B.2-10) that has already been ratified. ISO/IEC first defined the specifications for the channel in Amendment 1 and is currently working on the definitions for the permanent link and for the components that will be published in Amendment 2. This is expected to be released in 2010.

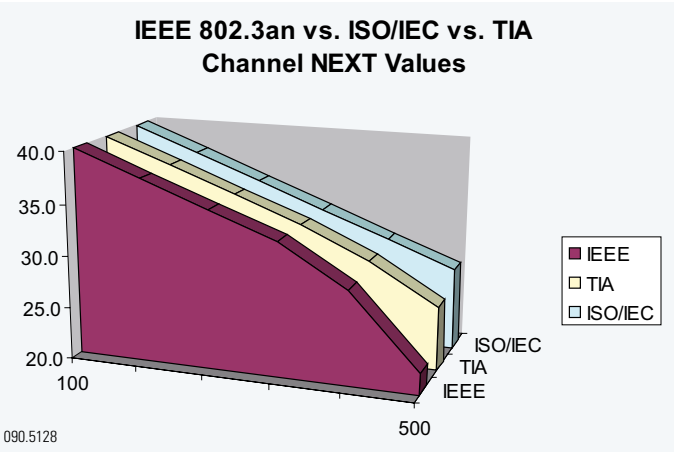
As with the channel, a Cat. 6_A connector as specified by ISO will achieve higher performance than a Cat. 6A connector as specified by EIA/TIA. The current draft specifies a 30 dB slope starting at 250 MHz for Cat. 6_A, whereas Cat. 6A specifies a 40 dB slope. At 500 MHz this means that a Cat. 6_A module must achieve a NEXT performance that is at least 3 dB better than a Cat. 6A module.

Therefore, users who want to have a guaranteed Class E_A channel should use components that meet the future Cat. 6_A specifications in accordance with ISO/IEC. A channel that comprises Cat. 6A components in accordance with EIA/TIA does not guarantee performance in accordance with Class E_A.

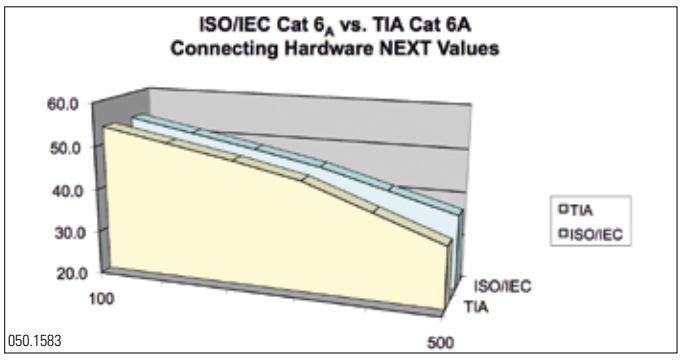
New complexity requires completely new design

ISO/IEC includes different committees which are responsible for the specifications of the cabling, the cables and the connecting hardware. Of course, coordination between these groups requires more time than at EIA/TIA where all the interested parties are in the same group.

Another reason for the longer development period is the technical complexity and the need to forge into new territory. Until now we have understood the behaviors of the components and how they



The channel parameters of the standards committees differ significantly in the higher frequency ranges. A straight line is defined for the channel in accordance with ISO/IEC Class E_A. The ISO/IEC concept thus enables the maximum available and best transmission performance in twisted-pair copper cabling based on RJ45 technology.



Even the component parameters differ considerably. As with the channel, a Cat. 6_A connector as specified by ISO will achieve higher performance than a Cat. 6A connector as specified by EIA/TIA. The current draft specifies a 30 dB slope starting at 250 MHz for Cat. 6_A, whereas Cat. 6A specifies a 40 dB slope. At 500 MHz this means that a Cat. 6_A module must achieve a NEXT performance that is at least 3 dB better than a Cat. 6A module.

work together very well up to 250 MHz. We are now doubling the frequency and the modeling methodology must take into account second and third effects such as cross modal coupling which significantly increases the complexity. These phenomena are not as prevalent with Cat. 7 connecting hardware due to the contact geometry which separates the pairs from each other.

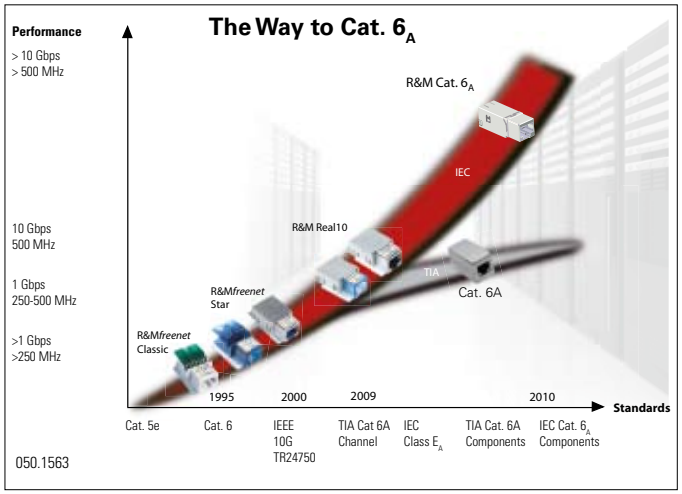
To achieve the Class E_A channel performance, a Cat. 6_A module must, as already pointed out, exhibit a NEXT value that is 3 dB better at 500 MHz than a Cat. 6A module. This is significant. To achieve this, new modules will have to be developed from the ground up because simply modifying the existing design – as is frequently to be seen with Cat. 6A modules currently available on the market – will not achieve the required performance.

Specifically, more compensation elements are needed to compensate for the additional coupling seen. More care needs to be taken to separate the pairs from each other in the termination. Also, the termination process should be very precise and error-proof to ensure consistent performance.

Conclusion and recommendation: those who want Class E_A should use Cat. 6_A

Today a Class E_A channel is the highest performance channel available based on the prevailing RJ45 technology. It not only guarantees support for the 10 Gigabit Ethernet application but also extends the life of the cabling and ensures higher operational reliability. For these reasons, R&M recommends the use of Class E_A channels for new installations for the operation of high-performance data networks.

When interoperability is required, it is important to choose Cat. 6_A components (Cat. 6_A with subscript A in accordance with ISO/IEC). Cat. 6A modules in accordance with EIA/TIA cannot guarantee the higher performance of Class E_A. Although the standardization of the Cat. 6_A components requires more time, it is worth waiting for the additional security and performance that the ISO/IEC concept promises. Ultimately it will mean fewer headaches for the user.



Cat. 6A ≠ Cat. 6_A

	Channel	Components	
		Cabling	Connector
EIA/TIA 0568B.2-10	**Cat. 6A** Relaxed slope ~27 dB/Dec	**Cat. 6A**	**Cat. 6A**
ISO/IEC 11801	**Class E_A** Straight line NEXT slope Amendment 1	**Cat. 6_A** *Not yet defined* Amendment 2	

The new standards for channel and components. The difference in respect to the "A" – primarily whether or not it is subscript – is of utmost importance for the network's long-term performance and operational reliability.

Terminology of current cabling standards

Frequency	IEEE	ISO/IEC		EIA/TIA	
	Channel etc.	Components	Channel	Components	Channel
1–100 MHz	**100Base-T**	**Cat. 5e**	**Class D**	**Cat. 5e**	**Cat. 5e**
1–250 MHz	**1GBase-T**	**Cat. 6**	**Class E**	**Cat. 6**	**Cat. 6**
1–500 MHz	**10GBase-T** IEEE 802.3an	**Cat. 6_A** ISO/IEC 11801 ed 2002 amd. 2 (in preparation)	**Class E_A** ISO/IEC 11801 ed 2002 amd. 1	**Cat. 6A** EIA/TIA 568B.2-10	**Cat. 6A** EIA/TIA 568B.2-10
1–600 MHz	–	**Cat. 7**	**Class F**	–	–
1–1000 MHz	–	**Cat. 7_A**	**Class F_A**	–	–

Anyone now planning data networks with twisted-pair copper cabling that should also function reliably for future, high-frequency applications, must differentiate between several standards and specifications for components and cabling links whereby Class E_A/Cat. 6_A by ISO/IEC offers the largest safety reserves for undisturbed data transmission due to stricter physical requirements. Distinctions must be drawn between:
– IEEE 10GBASE-T 802.3an for channel, active components etc. (since 2006)
– ISO/IEC 11801 ed 2002 amd. 1 for channel, Class E_A (since 2008)
– ISO/IEC 11801 ed 2002 amd. 2 for components, Cat. 6_A (from 2009/2010)
– ANSI/EIA/TIA 568B.2-10 designates channel and components with Cat. 6A (since 2008)

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Pre-Terminated Complete Solutions for Computing Centers

Even experienced planners and operations managers are nervous when cabling work in computing centers is due. Modifications can be managed more easily and safely, more cost-effectively and efficiently with factory-terminated and end-to-end tested trunk cables.

Very few technical fields make high demands on availability similar to those of computing centers. From uninterruptible power supplies and special air-conditioning systems through on-site support or 24-hour specialist standby to the duplication of complete system units, companies take every conceivable precaution to minimize the risk of outages. Little consideration is given to the computing center's cabling - it is often (mis)understood as being an easy-to-manage infrastructure that is practically taken for granted.

Particularly in computing centers that have grown historically, the cabling infrastructure develops its own striking internal dynamics that over the years involve some effects that are downright critical to operation. Conditions in false floors, cable routes or racks are often completely bewildering. Vast quantities of discarded excess cable and the jumble of cables that are connected, open and have been fed in subsequently make clear identification im-

possible and represent potential risks. Unnecessary additional costs arise when infrastructures are redesigned. Pre-terminated trunk cabling solutions come to the rescue.

How things stand: standards for computing centers

Since there were no clear guidelines in the past, EN 50173-5 deals for the first time with the special requirements on cabling in computing centers. Alongside this, ISO/IEC 24764 is currently under development for application-independent, structured cabling systems in computing centers. The equivalent for the US region is TIA 942.

The hierarchical structure known from building cabling systems is adapted from these standards. The computing center is divided into different zones such as network access, main distribution and area distribution. Using this model, computing centers are also better able to meet their responsibility for transparent operation and to comply with legal requirements such as the Basel II Accord or the Sarbanes-Oxley Act.

Cabling subsystems are provided for connecting the individual areas. These are invariably fixed cables - except for the patch cords on patch panels and equipment connections for servers, switches, storage, etc. All in all, EN 50173-5 and the future ISO/IEC 24764 offer practice-oriented principles for the implementation of powerful, transparent, reliable and scalable computing center cabling systems.

Individual solutions with factory-termination

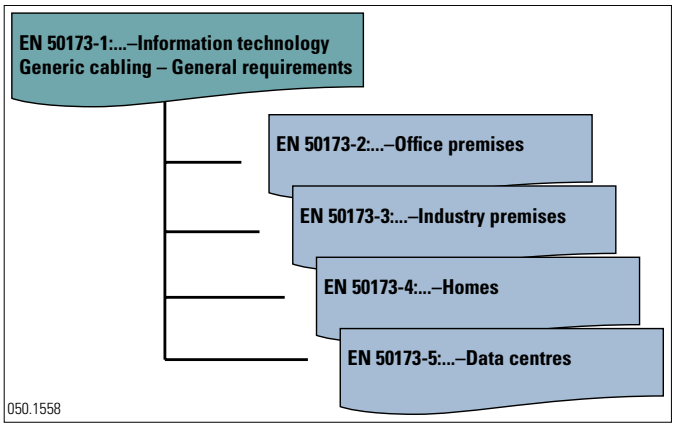
In connection with this, factory-terminated trunk cables offer a range of advantages compared to conventional field termination. Skeptics argue that factory-terminated cabling systems are "off-the-peg solutions" with no freedom allowed for their own planning and that there is also a risk of cables being too short. R&M can produce proof to the contrary with custom-made pre-terminated cabling for computing centers.

Although using these ready-prepared cables requires accurate planning, by the same token it is possible to reproduce the best transmission characteristics reliably and to deliver them "out of the box." Inspection of individual items prior to delivery is among the quality features. It is possible to track the production and quality control data on the basis of long-term documentation. In many cases, pre-terminated cabling saves installation time and thus costs.

This becomes particularly evident with trunk cabling systems in fiber optic technology: Factory-terminated solutions can be installed in a fraction of the time required for splice cabling systems. Time-, cost- and equipment-intensive splicing work is dispensed with completely as are, consequently, any sources of possible error. In addition, the shorter installation time reduces the amount of time third party staff spend in security areas. This reduces risks due to undesirable or willful manipulations.

Installation companies also benefit from the plug and play philosophy and from the added value of factory-terminated trunk cables. You can carry out your work with a higher level of safety, cleanliness and speed, and offer your customers complete solutions for installation and maintenance that are attractive both technically and from the price point of view.

Large-volume cable systems and the historic chaos in false floors also compromise energy-efficient air-conditioning of the computing center. The air flow in the false floor is obstructed. In this respect, a space-saving, orderly cabling system with pre-terminated trunk cables is also the more efficient solution.



The EN 50173-x series of standards

The current EN 50173-1 to EN 50173-5 series of standards is based on EN 50173 developed for office buildings in 1995. The success and rate of dissemination of this standardized passive basis for the office sector and technical developments have caused the standardization committees to extend the approach of a structured, application-independent cabling system to other fields - industrial buildings, residential buildings and computing centers. Part 1 is essential to be able to work with Parts 2 to 5 of the standard as Part 1 specifies the requirements on the cabling components as well as transmission classes and channels.

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Permissible Attenuation Values for Fiber Optic Connectors

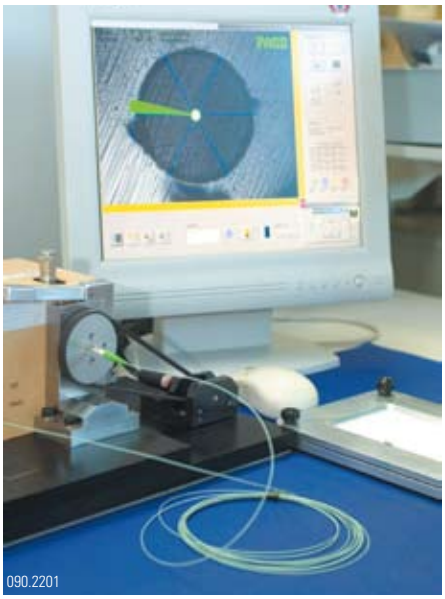
A new quality standard for fiber optic connectors provides users with more security. In accordance with IEC 61753 connectors are now supposed to be classified A, B, C and D according to the degree of attenuation. R&M customers all over the world can already sustainably benefit from this new transparency.

The IEC 61753 standard ratified in March 2007 describes application-oriented grades for connecting elements in fiber optic networks (see table). Clear identification according to grades and the test method required by the IEC help planners and those responsible for networks when selecting connectors, patch cords and pigtails appropriate to requirements. They avoid the purchase of overspecified products that possibly fail to deliver the anticipated attenuation values during operation.

On the one hand, the current catalog of requirements is based on IEC 61753. This standard defines attenuation values. On the other, the IEC 61755-3-1 and IEC 61755-3-2 standards are involved. They define geometric parameters of fiber optic connectors. The combination of these three standards creates the basis for the compatibility of fiber optic connectors of different manufacturers and for the specification of manufacturer-independent attenuation values.

These attenuation values are also described as each-to-each (or random mate) values. Each-to-each means that the attenuation of a connector is measured not in connection with a reference connector but that for testing, each connector is connected once with each other connector and measured.

The idea behind this: The attenuation values specified according to IEC for random connector pairings come significantly closer to the real operating conditions than attenuation values specified on the part of the manufacturer that are based in many cases on a best-case measurement. In-depth information is provided by a white paper see *www.rdm.com/whitepaper_e*. Unlike other suppliers, R&M has universally adopted the IEC 61753 grades and, in addition, has for years used a factory-performed worst-case quality test so as to be able to guarantee the each-to-each values.



Adjusting (also known as tuning) is the key to low attenuation values. Only by storing the fibers stress-free in the standardized sector is it also possible to guarantee the values of the high-grade connectors each-to-each.

Several inspection steps – such as the interferometry test – are necessary to achieve the high requirements.

Worst-case test: The attenuations measured at the factory are higher or the same in use as with a random connector pairing.

Attenuation Grade	Attenuation Random mated IEC 61300-3-34	
Grade A*	≤ 0.07 dB mean	≤ 0.15 dB max. for >97 % of samples
Grade B	≤ 0.12 dB mean	≤ 0.25 dB max. for >97 % of samples
Grade C	≤ 0.25 dB mean	≤ 0.50 dB max. for >97 % of samples
Grade D	≤ 0.50 dB mean	≤ 1.00 dB max. for >97 % of samples

Return Loss Grade	Return Loss Random mated IEC 61300-3-6
Grade 1	≥ 60 dB (mated) and ≥ 55 dB (unmated)
Grade 2	≥ 45 dB
Grade 3	≥ 35 dB
Grade 4	≥ 26 dB

Summary of the performance criteria of the new performance classes for data transmission in fiber optic connections in accordance with IEC 61753. The exact specification of Grade A* has not yet been finalized. The criteria for multimode fibers are still under discussion.

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"Fiber to the Future"

The importance of fiber optics is increasing dramatically.

Background

By the end of 2008, fiber optics (FO) at Reichle & De-Massari had grown to represent a third of total group revenues. The growth of R&M's FO business reflects the overall development of the telecom network, in particular the relative proportion of FO and copper (CU), which has shifted from 40:60 to 60:40 over the last few years. To fulfill R&M's goal of being "No.1 in Layer 1" this relative proportion will be reflected in R&M's technology and business mix.

The geographic profile of R&M's FO business is different to that of CU, reflecting the increased penetration of developing markets. This different geographic profile represents new commercial, operational, and business process challenges.

The goal of R&M's management is to grow the FO business faster than the market, making it a second pillar, equivalent in scale and importance, and complementary to the CU business.

"Configuring Secure Network Connections"

The positioning of R&M's FO business is captured in the statement "Configuring Secure Network Connections". R&M has moved from offering products to offering systems, with an increasing focus on customer value.

Instead of asking "Where do we find customers for our products?" the question will increasingly be "How do we help our customers create value?" With a focus on building systems, R&M is building the competence to configure at all levels – product, system and solution – and has already strengthened its team for customized engineering.

FO as a FOCAL POINT

In early 2009, a fiber optics initiative was launched to confirm the FO product / system development roadmap and identify approaches to fill the gaps in the product and system portfolio.

By mid-2009, the FO activities had been aligned and integrated into R&M's daily business, with plans to strengthen key parts of the organization, especially in Product & System Management.

On the innovation side, R&M has a number of initiatives, targeted developing approaches to "next generation connectivity", for improving and extending existing technologies. For such innovative developments, R&M is working closely with external partners who bring additional know-how and competence, and can allow projects to be accelerated.

For R&M FO is becoming more and more important. With a clear vision and the implementation capabilities being built – both internally and externally – R&M is well-placed to be a key international player in installing "Fiber To The Future".

Martin Rosatzin, *CTO*
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From Invention to Innovation

Innovations are vital for ongoing corporate development. When does an invention become an innovation? – Dr. Martin Rosatzin, CTO at R&M, in an interview with the editorial staff of Connections:

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Mr. Rosatzin, what are innovations and how do they arise?
An invention becomes an innovation when it is marketed successfully. The new product creates added value for the customer and stands out from competitor products. In this sense innovations are future market successes. The basis for developing new products is the drive behind wanting to discover something new – this is in our blood at R&M.

Why are innovations important to R&M and what is the innovative culture all about?
The company's founders developed the first R&M product because they were no longer satisfied with the state of the art at the time. From this emerged the basic attitude of "It's always possible to improve on something good." Our employees observe market trends closely and derive from them new developments and constant product optimizations. This requires curiosity and receptiveness but also team-oriented cooperation beyond national borders and hierarchy levels.

What do customers get out of this?
The customer benefit is always paramount with every new development. Our products and services must deliver relevant added value compared to those of the competitors and must meet the needs of our customers perfectly. Our solutions have to be future-proof so that our customers' investments are protected long-term. All in all our customers should get more for their money. With this maximization of benefits they can also increase their own corporate success.

What are the identifying features of innovative employees?
We select our employees carefully and further their development in a distinctly innovative culture. Innovators at R&M, however, not only stand out due to a high level of professional skill but also because they live by the basic values of the corporate culture. They are receptive to anything new, contribute pro-actively, think outside the box and revel in change. They make customer benefit a paramount feature and work constantly on their own personal development. R&M supports them with training programs and international job rotation opportunities.

How does R&M innovate?
We cultivate the innovative culture as a corporate value – from management down through every stage. In the process we use an innovations network that extends from customers and suppliers to universities and competitors. We know our own key skills and constantly enhance them. As a result our in-house experimental and prototype laboratory allows us to try out new ideas immediately and thus to react quickly to new market requirements.

What is crucial for a successful innovation?
It's the people. Only the right team with the right attitude can turn an idea into a successful innovation.

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In R&M's experimental laboratory resourceful specialists use high-tech to produce everything customers desire but the market does not yet offer. We spoke to Roman Fischer, long-standing manager of the department. Take a peek behind the scenes of this laboratory of small miracles with us!

Roman Fischer, Team Leader Experimental Laboratory (right), with Marcel Stähelin, one of his long-standing colleagues

How do R&M customers benefit from your department?

Roman Fischer: *They get exactly what they want or need faster than anywhere else – regardless of how outlandish the requirement may be. The huge advantage of our experimental laboratory is that we can react very quickly to specific customer wishes. We don't have to rely on external resources when it's a matter of manufacturing a special prototype quickly and in high quality for an individual problem.*

How do you achieve this speed and quality?

This is because firstly we have designated experts with a broad range of specialist knowledge in the team and, unlike our competitors, we also have our own machines with which we can produce certain components ourselves. Secondly, we use the latest rapid prototyping methods with external service providers, mainly stereolithography and laser sintering. In addition, we also have a huge network of various other service providers where our jobs are given maximum priority and are processed with corresponding speed. These external partners are very well-rehearsed and leading suppliers in their relevant specialist fields. Here too we stay faithful to our guiding principle: "We make nothing that others can do better." Nevertheless we sometimes approach the limits of feasibility with our ideas. Our partners appreciate the fact that we challenge them because this constantly gives rise to outstanding achievements – to the advantage of our customers.

Where do you get your inquiries and jobs?

Our sales force employees often hear about the customer's special wishes regarding the construction of products or specific applications and features in discussions. The colleague then comes to us with these requirements – with our state-of-the-art systems and specialized partners we can react very quickly and deliver the desired solution. Customers are usually very surprised at how quickly they can have a high-quality prototype of the desired product in their hands!

However, many orders also come of course from R&M's development department. Here work goes on constantly on further improving the existing product range, finding new solutions and meeting new requirements. We are called for when it's a matter of turning a CAD design into a tangible prototype.

Is it still necessary in these days of computer simulations to produce prototypes?

It's true that a lot of possible problems in engineering can be solved virtually these days before construction of the first prototype. However, if the computer simulation model is based on too many unknowns or assumptions, the calculations are unable to supply any quantitative information. This where the assembly of a prototype leads much faster to meaningful results. In this case you need an extremely efficient prototype laboratory that can produce and assemble individual parts or components quickly, flexibly and with the minimum of fuss. Due to our many years of experience and proximity to product development, we implement these functional models and prototypes in the shortest possible time, manufacture complex components and advise our customers on all matters of production.

What do you consider to be your most important strengths?

One of our great advantages is the rich treasure trove of experience, the specialist knowledge and excellent motivation of our team. On average our employees have already been with R&M for 20 years. I have worked here myself since 1981 – I had the exciting task of being allowed to establish this department at the outset.

The fact that R&M's management is aware of the importance of a dedicated experimental laboratory is another of our strengths. This is not simply a matter of course as the setting up and maintenance of such a business division involves a high level of investment without directly contributing to sales. For example, three new CNC machines will be acquired for our department when the new headquarters building is constructed. Our management appreciates what being able to react as quickly as possible to the customers' wishes means in terms of establishing a competitive edge. And customers too appreciate this – we are constantly receiving very good feedback from the market. That both pleases us and validates us.

Martin Reichle is actively involved in vocational training, among other things as President of the Zurich Oberland and Right Bank Employers' Association (Arbeitgeberverband Zürcher Oberland und rechtes Seeufer): pictured here with R&M apprentices Melanie Limacher and Claudio Corbisieri.

R&M, as a family company independent of the capital markets, has built up a sound financial basis. During the current recession, the company now has time to digest the strong growth of the last five years and to adapt processes and structures.

In the long term, R&M will continue to follow the growth strategy embarked on over the past five years. Despite declining sales the investments scheduled will be implemented so as to be ready to launch powerfully into the next boom.

The focus will center on key projects in order to position the company sustainably in the market even in difficult times. R&M is also implementing necessary cost reduction measures parallel to this. CEO Martin Reichle: "We have decided to keep our current staffing level despite difficult conditions and in return will accept a lower level of profit in the short term."

Along with the assumption of social responsibility, the Reichle family is at pains to safeguard expertise within the company. Martin Reichle is also personally involved in encouraging young talent in the company. R&M will double the number of in-house apprenticeships by the end of 2010.

The innovation volume for FTTx developments was increased by 10 percent for 2009.

In the case of innovations, the focus is fixed on fiber optic technology along with data center solutions. Peter Reichle, COO: "We assume that this business segment is more resistant to crises than others." The volume of investment for the development of innovations in fiber optic technology was actually increased by 10 percent for 2009 compared with the previous year.

Alongside this, however, the company is also focusing on the Zurich Oberland site. The foundation stone for a new company building was laid in Wetzikon in May 2008. An automated high-bay warehouse will be used to optimize supply chain processes in the new building. An innovation center will be created on two floors of the new five-storey building. A new ERP solution will be commissioned at the end of the year to increase efficiency.

The measures referred to above are intended to underpin R&M's long-term way of thinking about being in a position to continue its international expansion. The company is already one of the top three players in Europe and the Middle East, and wants to replicate this success in Asia too.

The R&M Cube will be ready for occupation from mid-2010.

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The Final Word

Look, Listen, Discuss – Simple Principles with a Strong Impact

The three wise monkeys

Who doesn't know the three wise monkeys? While in Asia the significance of the three wise monkeys is actually to **"wisely ignore evil"**, the western interpretation is rather to **"deny evil"**. With the negative change in meaning, the three wise monkeys have also become a symbol in the West for a lack of moral courage. However, for the sake of completeness I would also like to mention the fourth monkey who is only referred to now and then. He has his hands folded in his lap and stands for **"do no evil."** With a positive interpretation, however, the monkeys are a plea to look, listen, discuss and act!

Over the last few months I have exchanged views at length with our employees in Western and Eastern Europe, Asia and the Middle East. The idea behind this was to discuss R&M's strategy and to explain its implementation.

Our conduct in the current economic situation was a further topic. Once again I realized just how important it is to look closely and to analyze the situation. To listen closely to what the concerns and criticisms of the workforce are and discuss the proposals for improvement that have been introduced. This gave rise to many interesting discussions. Opinions were exchanged. Points of view represented. Suggestions put forward. This is the essential ingredient of constructive problem-solving and the key to action.

Solution-oriented thinking

With the necessary courage to address insecurities, uncertainties and fears candidly, problems become challenges, tasks that are asking to be solved. A corresponding attitude can help us both professionally and privately by taking us courageously, pro-actively and positively in new directions. It is a matter of accepting responsibility for one's actions in terms of communication. I appreciate the courage and candor of people who also ask unpleasant questions or who draw attention to weak points.

The three wise monkeys have their origin in Indian culture. I discovered on a trip that the message of the three wise monkeys is taught to children in India at elementary school. Indian colleagues smiled kindly as they explained this to me when I wanted to explain the meaning and the western interpretation of the three wise monkeys to the team in Bangalore ...

At R&M these simple principles live within what we call our evolution drivers, our code of conduct. Look, listen, discuss and act. They are features of our employees' attitudes that have a strong impact both inwardly and outwardly. They create a fertile soil for long-term cooperation with our customers and partners with the aim of developing better solutions together and of being able to achieve more on a sustainable basis.

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