COMMSCOPE®

FTTX CASE STUDY SERIES

FTTX CASE STUDY SERIES:

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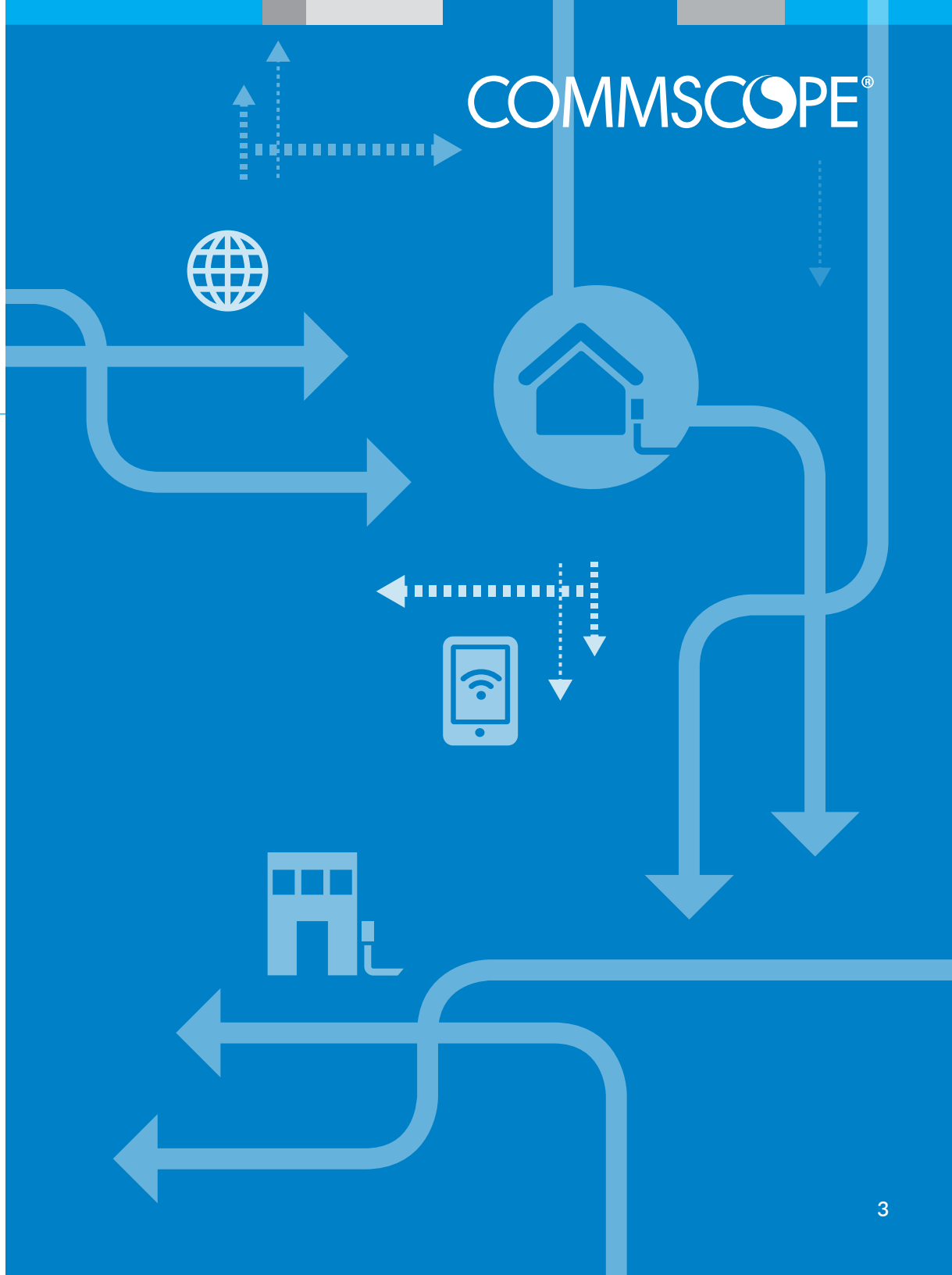


FTTX case study series

A lot of businesses can tell you they're good at what they do. But very few can boast the longevity of their experience and innovation. CommScope can do both. With 40 years in the service provider space, we know a thing or two about rolling out FTTX networks all over the world.

For me, this eBook serves as trip down a memory lane of sorts, recalling how we helped standardize one MSO's network after several mergers, or how we trained fiber optic technicians on an ambitious broadband rollout. What we did a decade ago or yesterday – or what we will do five years from now – matters. And our customers matter.

CommScope has a proven track record of innovation, world-class engineers and problem-solving ingenuity to bring powerful ideas to market. We couldn't do any of this without customers' input and requests. Their networks are constantly changing, and we want them to know that they can trust CommScope to know what's next.

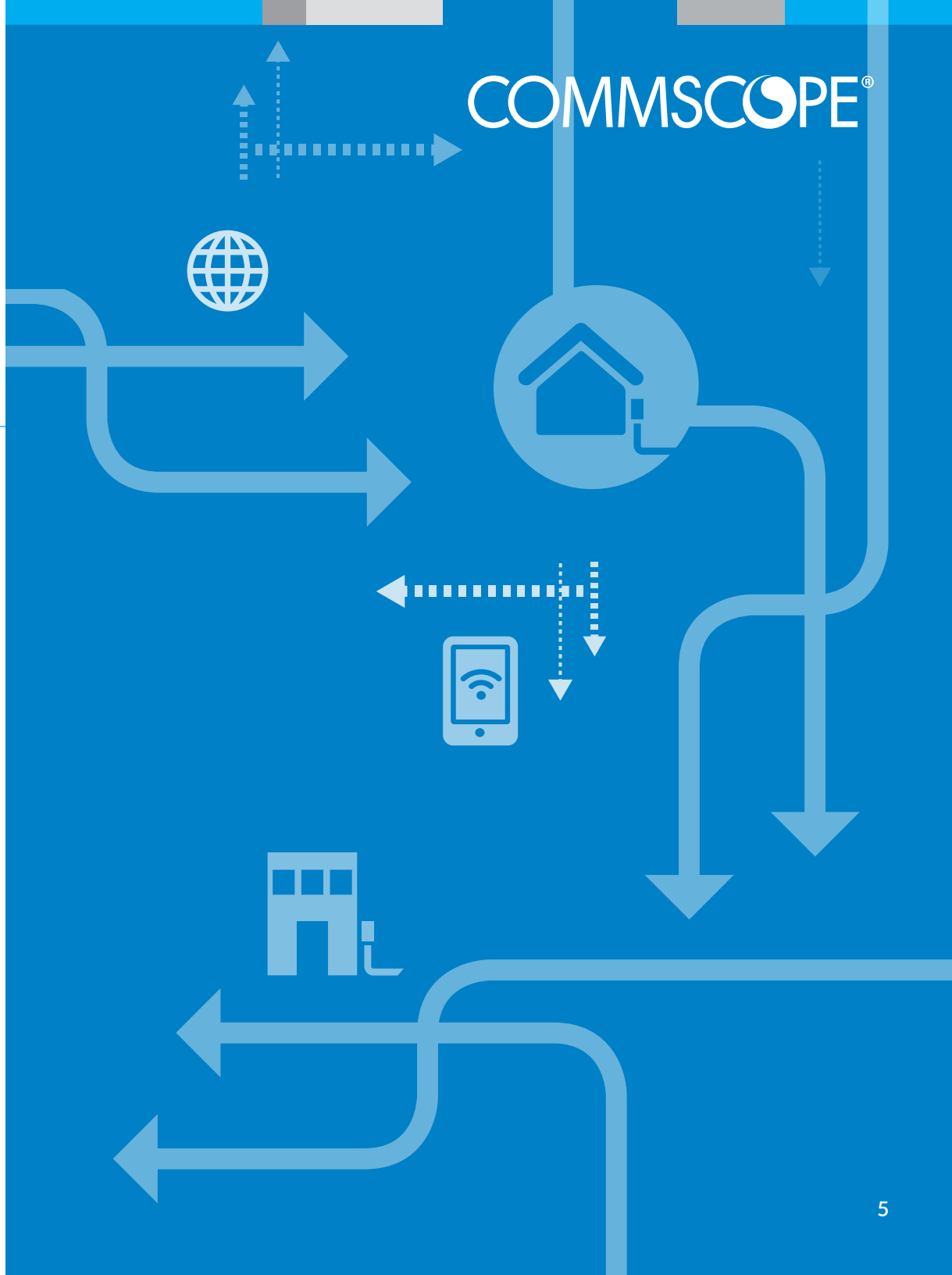
These next pages demonstrate just that. We can be part of building every aspect of a network with end-to-end solutions from the central office to inside customer premises. We listen to customers' demands and can quickly adapt. Our team can train people who have never built a network, and can partner with the customers moving from a coaxial or copper network to a full FTTH network. Our solutions are built to withstand the rugged environments in any part of the world. This is what we do.

Forty years is a long time. It's a long time to commit to our customers and help them navigate their networks. We don't follow the trends; we pioneer them. This eBook is dedicated to our esteemed customers who made these success stories happen. Thank you for showing the world what we can do together.

Jaxon Lang
SVP, Connectivity Solutions

CASE STUDY

#1 Innovation on a paper napkin



THINKING AND DESIGNING OUTSIDE THE BOX

Located in Asia-Pacific, this service provider is deploying FTTH in urban and suburban areas across the country. Reusing manholes, conduits, and other aspects of the existing telephony infrastructure would help speed up the deployment and keep costs under control.

THE CHALLENGE: CONSTRUCTION COSTS & DELAYS

It started with a solid plan—upgrade key parts of the underground infrastructure to make room for the new fiber equipment.
As construction work began, it became apparent that the aging infrastructure was in worse condition than expected.
Prolonged and unbudgeted civil works would be required.

So, back to the drawing board.

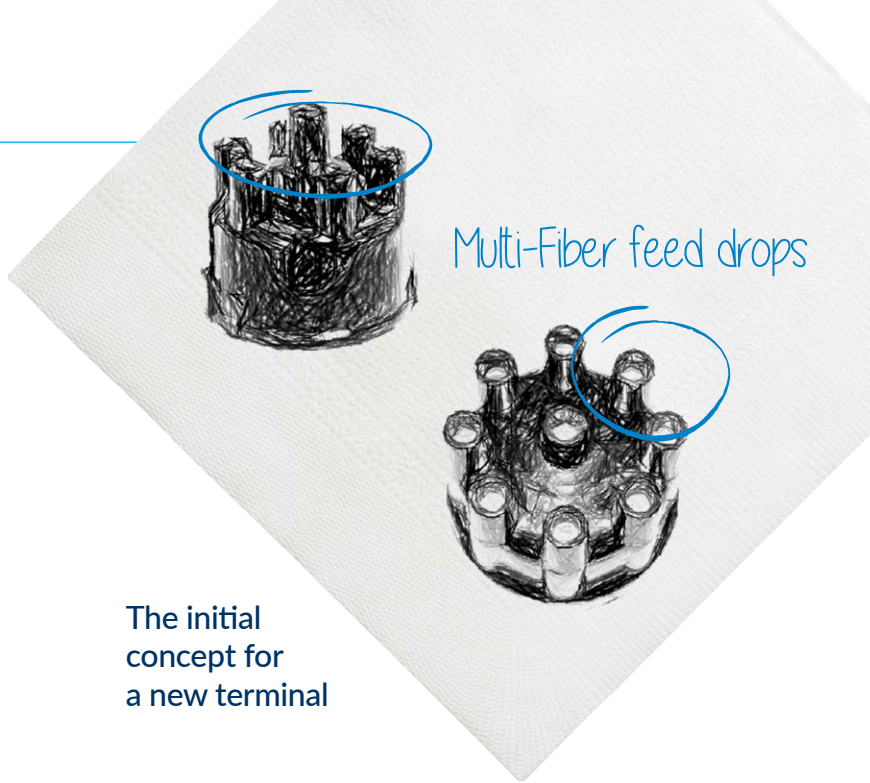
Was it possible to design a new, significantly smaller fiber terminal that fit into the existing hand holes in order to avoid construction?

WHEN SPACE IS AT A PREMIUM

"You've got to roll with the punches—sometimes you just have to work with what you've got," said a project engineer. That meant designing a fiber-optic terminal with the same functionality as the MST, the product originally specified, but one with a much smaller footprint. Given that the form factor of the MST was already optimized, this was not a simple task.

BRAINSTORMING ... IN A RESTAURANT

"Our first idea came to us at a dinner winding down after work. We literally sketched it on the back of a paper napkin," said a CommScopeR&D engineer. "It wasn't the design we ended up with, but there were a couple of key ideas in there that made it into the final product."

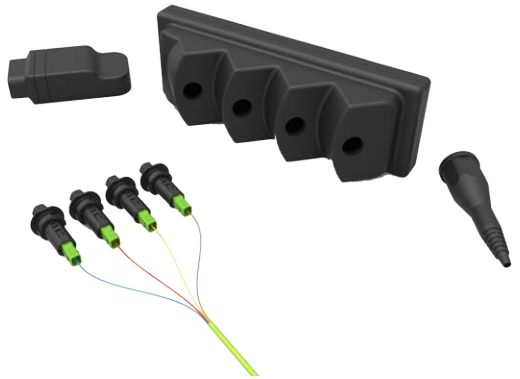


The initial concept for a new terminal

TEAR IT DOWN, THEN BUILD IT BACK UP

Another idea was a ball-shaped 3D design that provided maximum connector density. It had the smallest possible footprint, but ease of access to the connectors during installation would have been comprised. The manufacturing process would have been more complicated and costly, with a higher risk of field failures.

The R&D team then took a "deconstructionist" process in stripping the fiber terminal down to its core functional elements, then regrouping these elements into different configurations for different designs. Ultimately, the final design resulted from this approach.



Deconstructing the functional elements

THE FINAL DESIGN

The space/footprint constraint was solved by extending the connectors outside the terminal, literally an out-of-the-box solution. The terminal became less compact but far more flexible, and hence easier to fit into congested spaces. The cables were staggered in length, thus allowing installers easier access to perform installation and maintenance work.

It took six months, from the first design on a paper napkin to a working prototype used for initial testing by the service provider.

The final design: Flexible service terminal

SUMMARY

With this new product, specifically designed for space-constrained environments, the service provider was able to avoid tens of millions of dollars in unforeseen construction costs, and months of delay in the network deployment.

The choice of products can sometimes have a large impact on overall deployment costs and schedules.

Plan for the right product …
but be prepared to adapt when the situation changes.

FEATURED RESOURCES

>>>> click below

FTTH WHITE PAPER >

WEB PAGE >

VIDEO >

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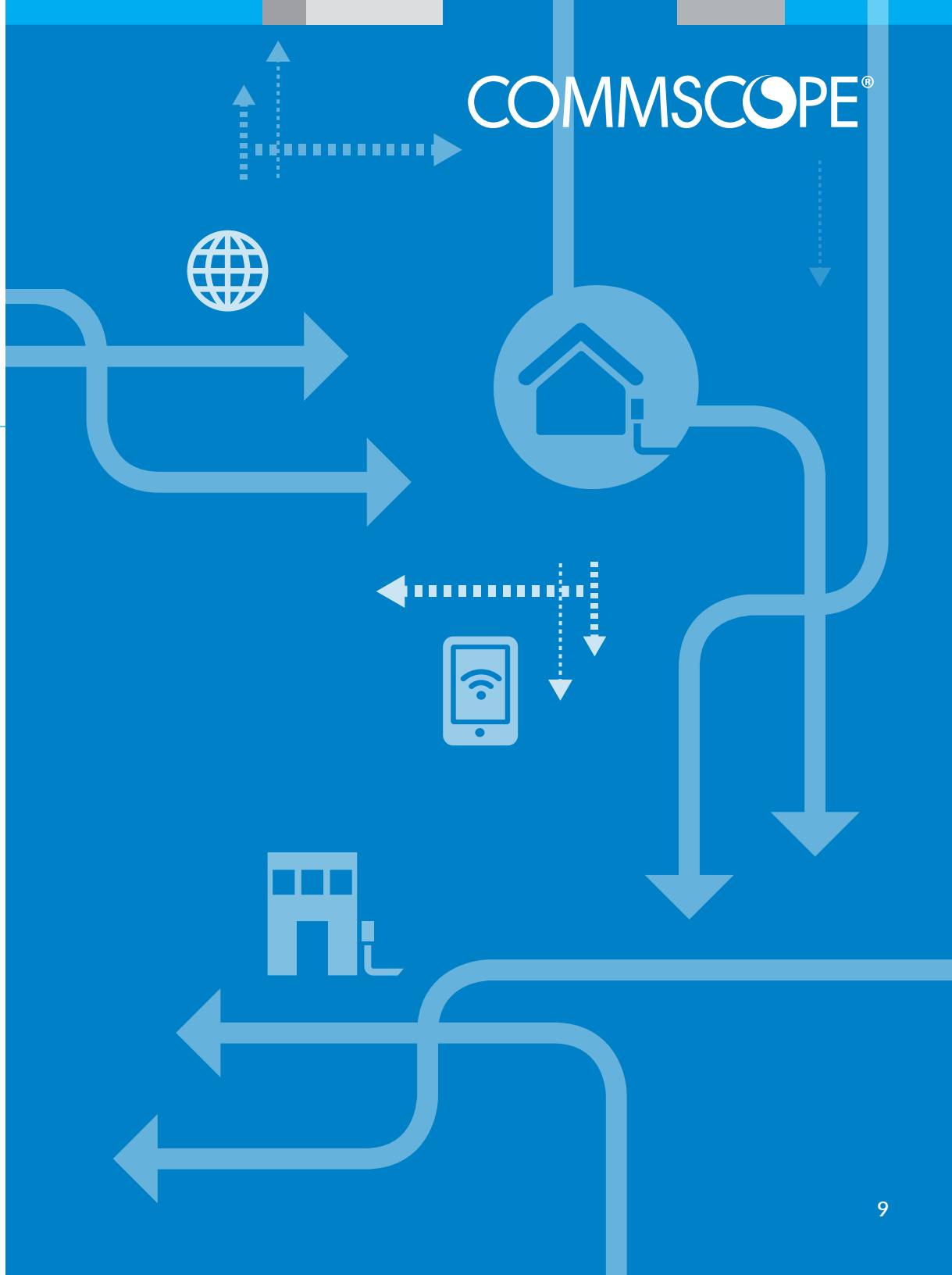
PRODUCTS IN THIS NETWORK

- FST (Flexible service terminal)
- MST (Multi-port service terminal)
- FOSC (Fiber optic splice closure)
- TENIO splice closure
- Rapid mini-RDT and Rapid faceplate

CASE STUDY

#2 One cabinet, 5000 configurations



MSO EXPANDS, WITH FLEXIBILITY IN MIND

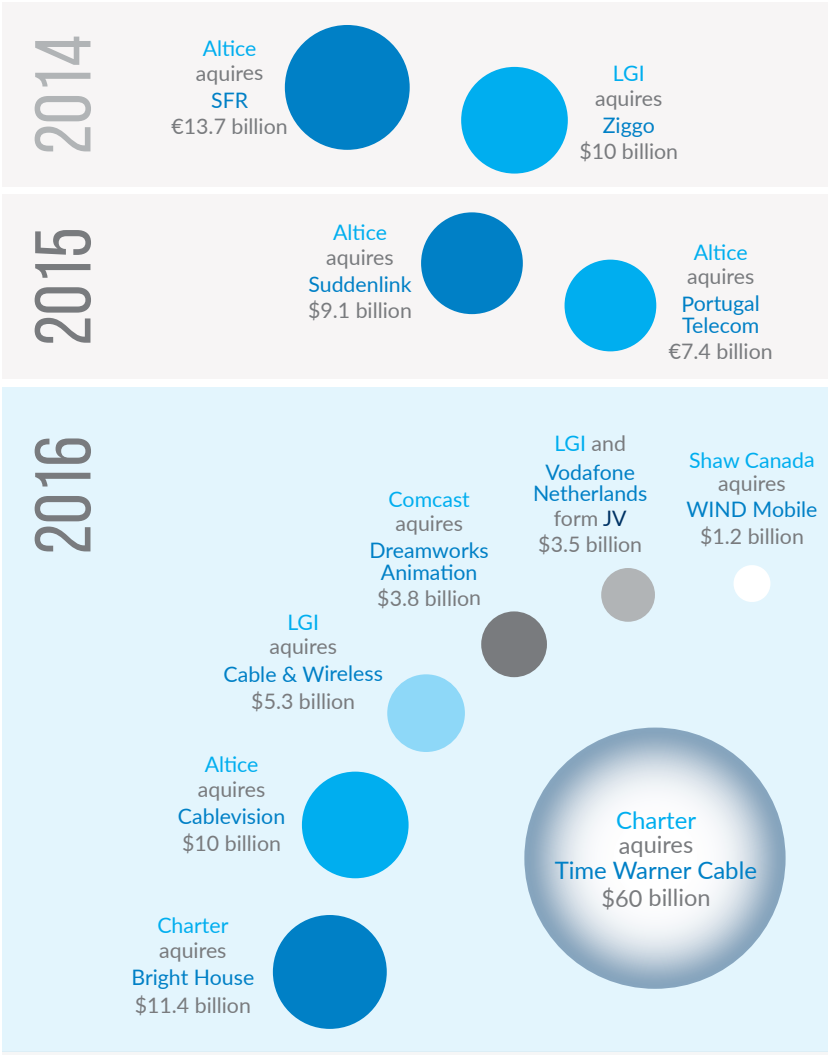
This global MSO offers triple-play services in numerous countries. Their aggressive expansion plans include both HFC and FTTH, with fiber optics providing the foundational capacity irrespective of the last-mile access technology. Key to business success is a network upgrade and migration plan flexible enough to realize the benefits of DOCSIS 3.1, yet ultimately upgradeable to FTTH and adaptable to the timelines of individual markets.

THE MIGRATION CHALLENGE

A combination of organic growth and M&A activity had increased this MSO's subscriber base and footprint over the years—and with it came disparate network architectures, equipment, operating standards and practices. Standardization and convergence would drive significant operational efficiencies and economies of scale. Yet a one-size-fits-all approach would be too rigid since industry dynamics and regulatory compliance vary depending on the country.

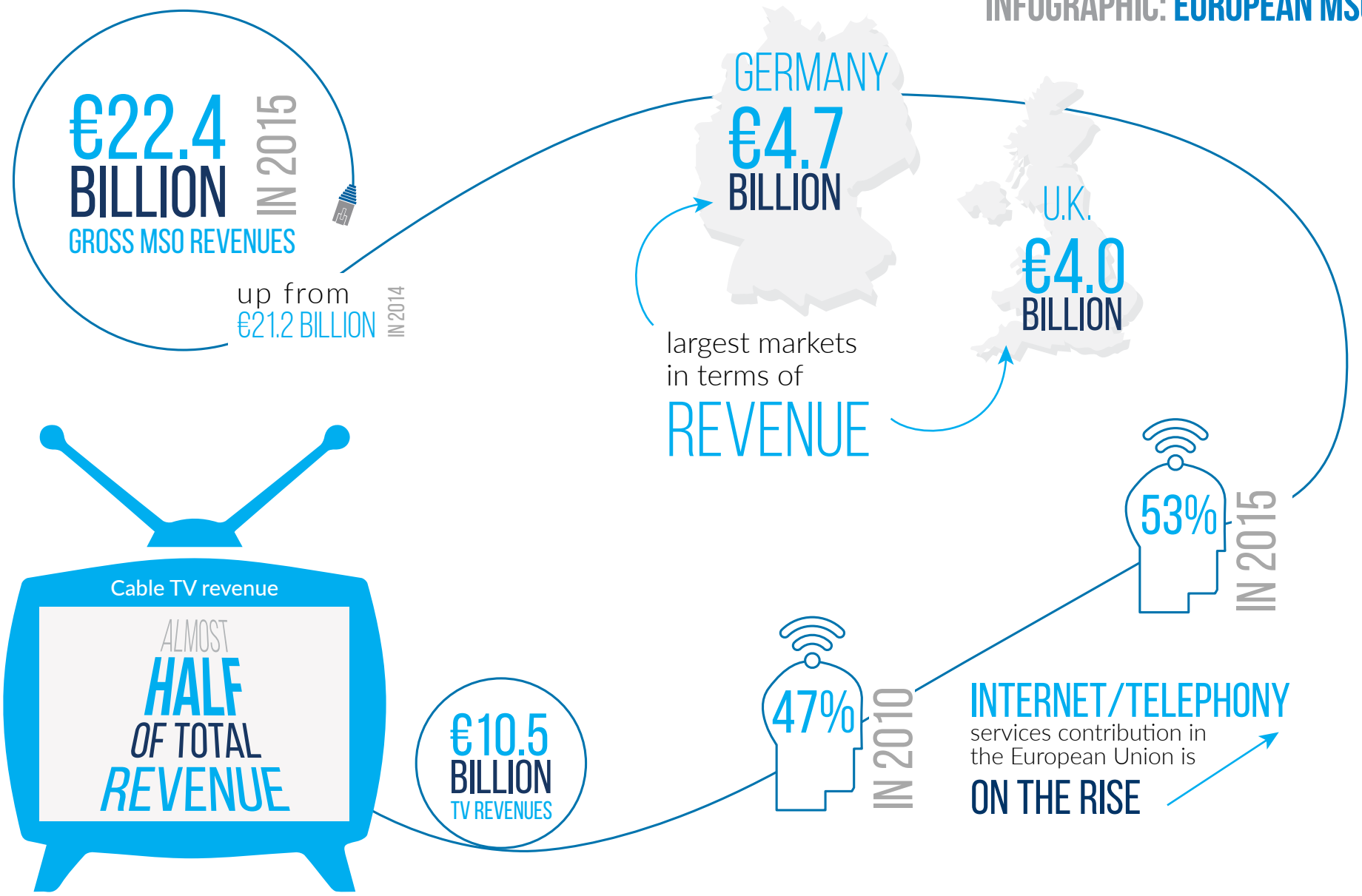
BILLION-DOLLAR DEALS

MSOs consolidate and expand



How did this MSO standardize and simplify its network migration with a single outdoor cabinet?

INFOGRAPHIC: EUROPEAN MSO



Source: 2016 European Broadband Cable Yearbook, IHS

STANDARDIZE THE NETWORK—BUT KEEP IT FLEXIBLE

Key to a successful network migration was a simplification of the different architectures. "I just can't overstate how much trouble the differences in our networks were causing us," said the MSO's network planner. "Each country had different equipment and configurations, and we struggled with inventories. There was a lot of overhead and time spent on dealing with important but niche issues."

Located at the start of the distribution network, cabinets were identified as a key element for a unified access architecture. **They needed to accommodate coaxial and fiber cables, cable management, power, and active equipment.**

UPGRADE PATHS

Technical requirements and local regulations also vary widely—in one country, cabinets must be made from stainless steel, but in the next they must be polycarbonate. Agility was another factor, as the upgrade paths to DOCSIS 3.1 or FTTH would vary depending on the local market.

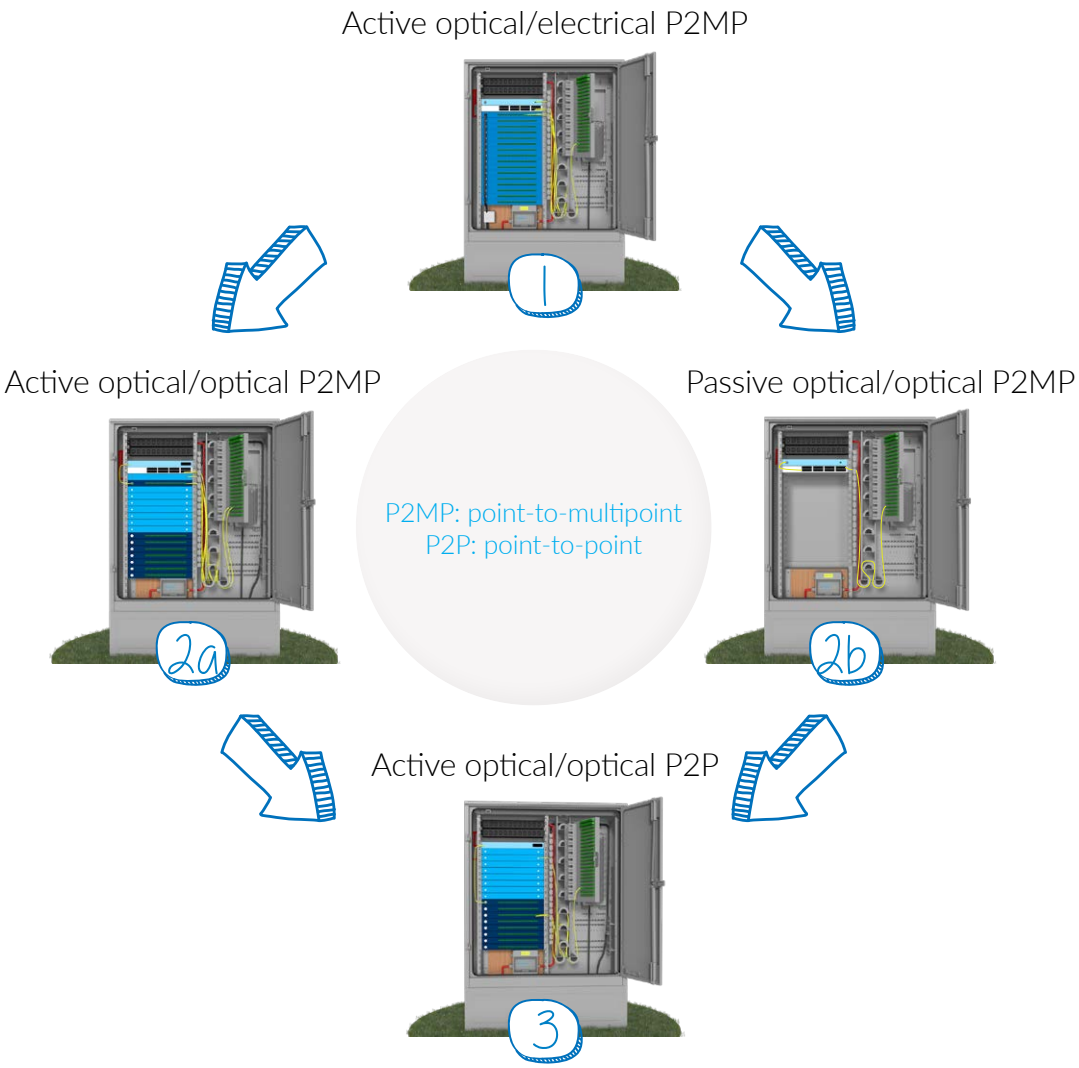


Diagram:
One cabinet, multiple migration paths

DESIGNING A HIGHLY MODULAR CABINET

With a projected 25-year lifespan, the cabinet would need to live through multiple technology upgrade cycles. Legacy trunk coaxial cables had to be supported, as well as RFoG (radio frequency over glass) as an transitional step towards FTTH. The subscriber-facing cables would be all fiber—whether to a PON ONT, an HFC optical node, or active Ethernet to a business or enterprise. Further ahead, introducing wireless services is a possibility.

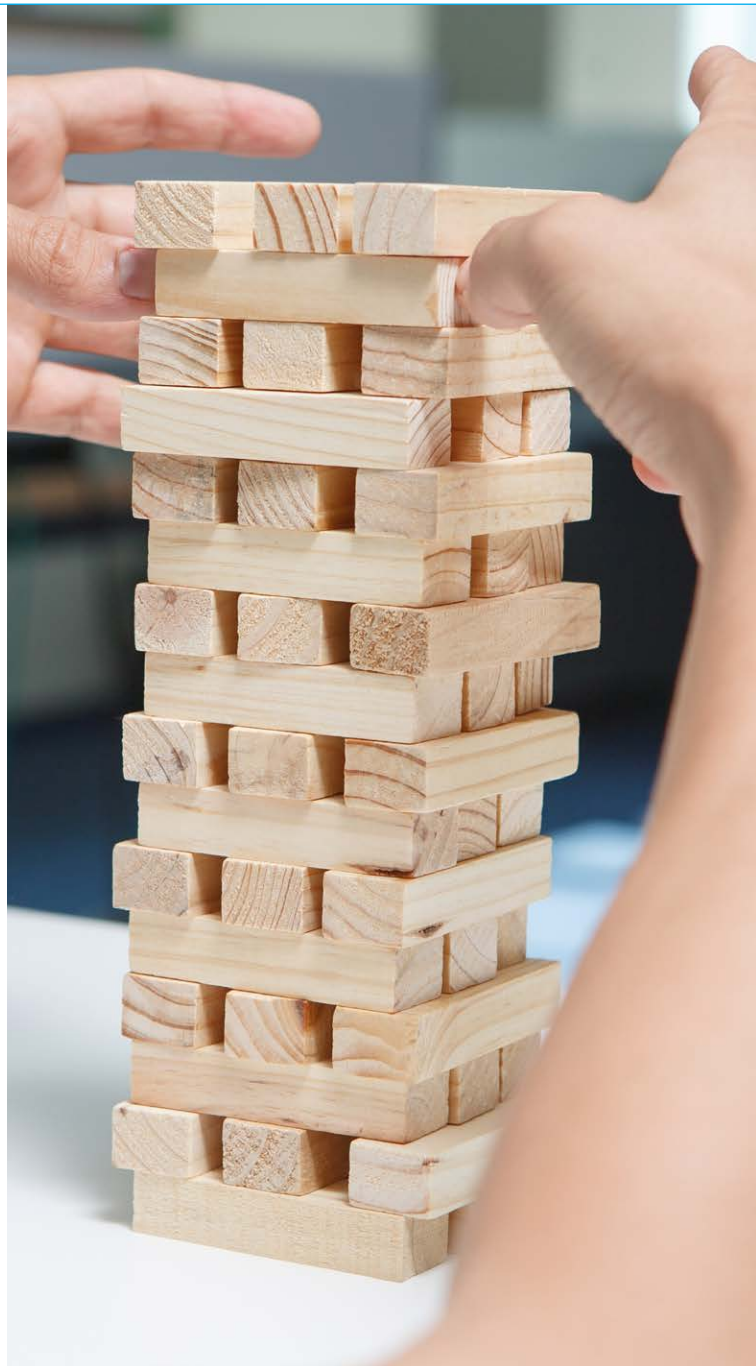
A CABLING HUB

As a cabling hub, the cabinet supports fiber and coaxial with multiple cable entry sealing options. Multiple mounting options allow placement in a variety of environments. The fiber management, trays, and splitter modules inside provide flexibility in deploying P2P (point-to-point) and P2MP (point-to-multi-point) access topologies. C/DWDM modules provide additional capacity by multiplexing several wavelengths onto the same fiber strand.

A TRAFFIC AGGREGATION HUB

The cabinet also serves as a traffic aggregation hub. Routers, switches, and OLTs (optical line terminals) can be located inside and are passively cooled with optional forced-air ventilation.

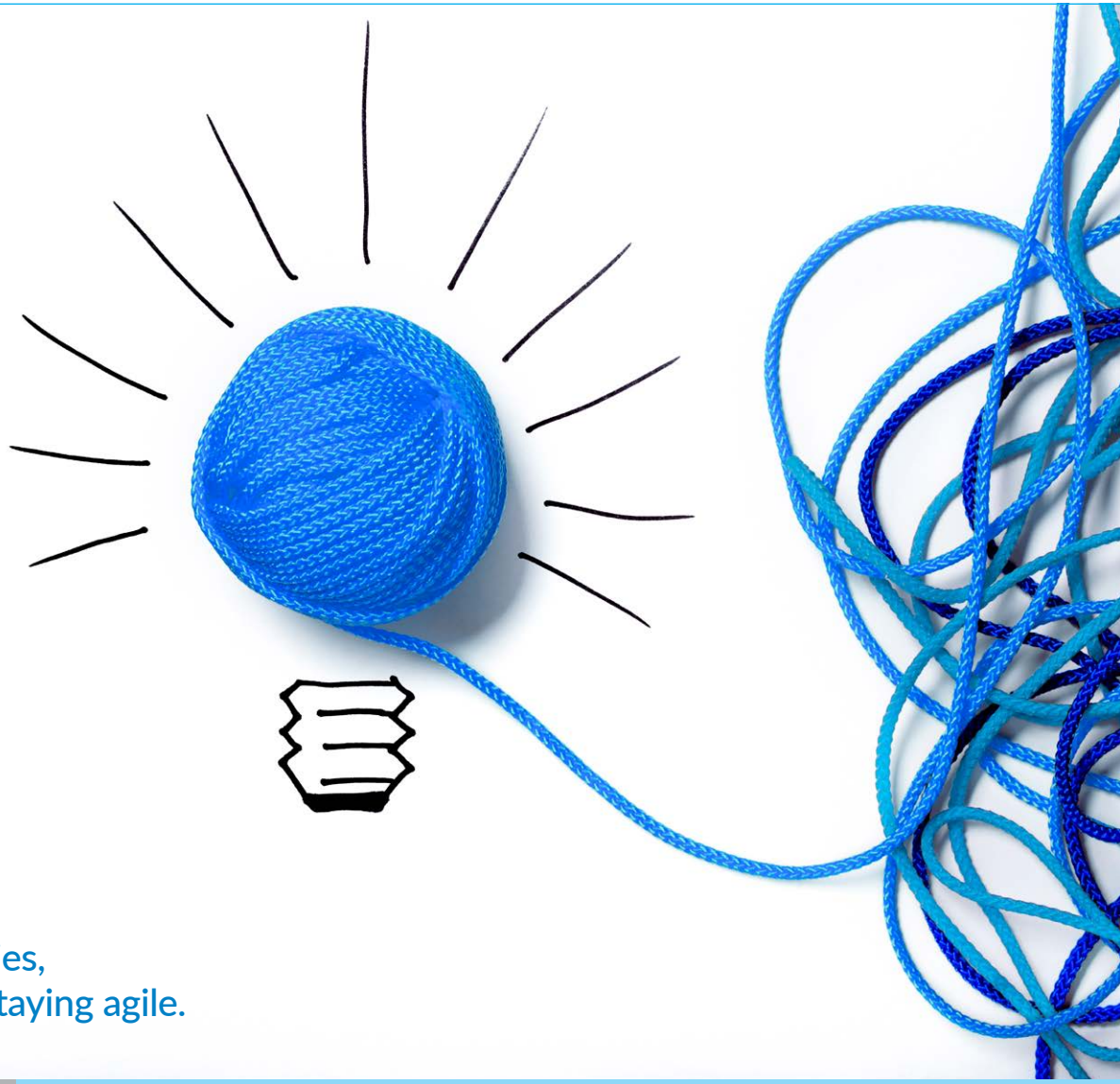
Satisfying such diverse requirements necessitated a highly modular design where key building blocks could be swapped in/out or upgraded quickly and easily. While the total number of possible configurations may be large, centralizing multiple network functions in a single cabinet reduces overall network complexity and reduces deployment and maintenance costs.



SIMPLICITY IN COMPLEXITY

Working closely with the MSO, CommScope designed and developed a new cabinet. “Our mantra was flexibility and modularity, so it would be easy to upgrade,” says the CommScope engineer. “We managed to bring down over 5,000 possible configurations to a set of six plug-and-play building blocks. A configurator supports network planning and logistics. With a few clicks, a planner can select the type and volume of each building block required for a specific deployment.”

“CommScope knocked the ball out of the park.” says the MSO’s network planner. “Our situation is unique and they took the time to listen and learn about us. That was crucial to the success of this project.”



As you expand across territories and technologies, modular and upgradeable solutions are key to staying agile.

FEATURED RESOURCES

>>>> click below

WEB PAGE >

BLOG 1 >

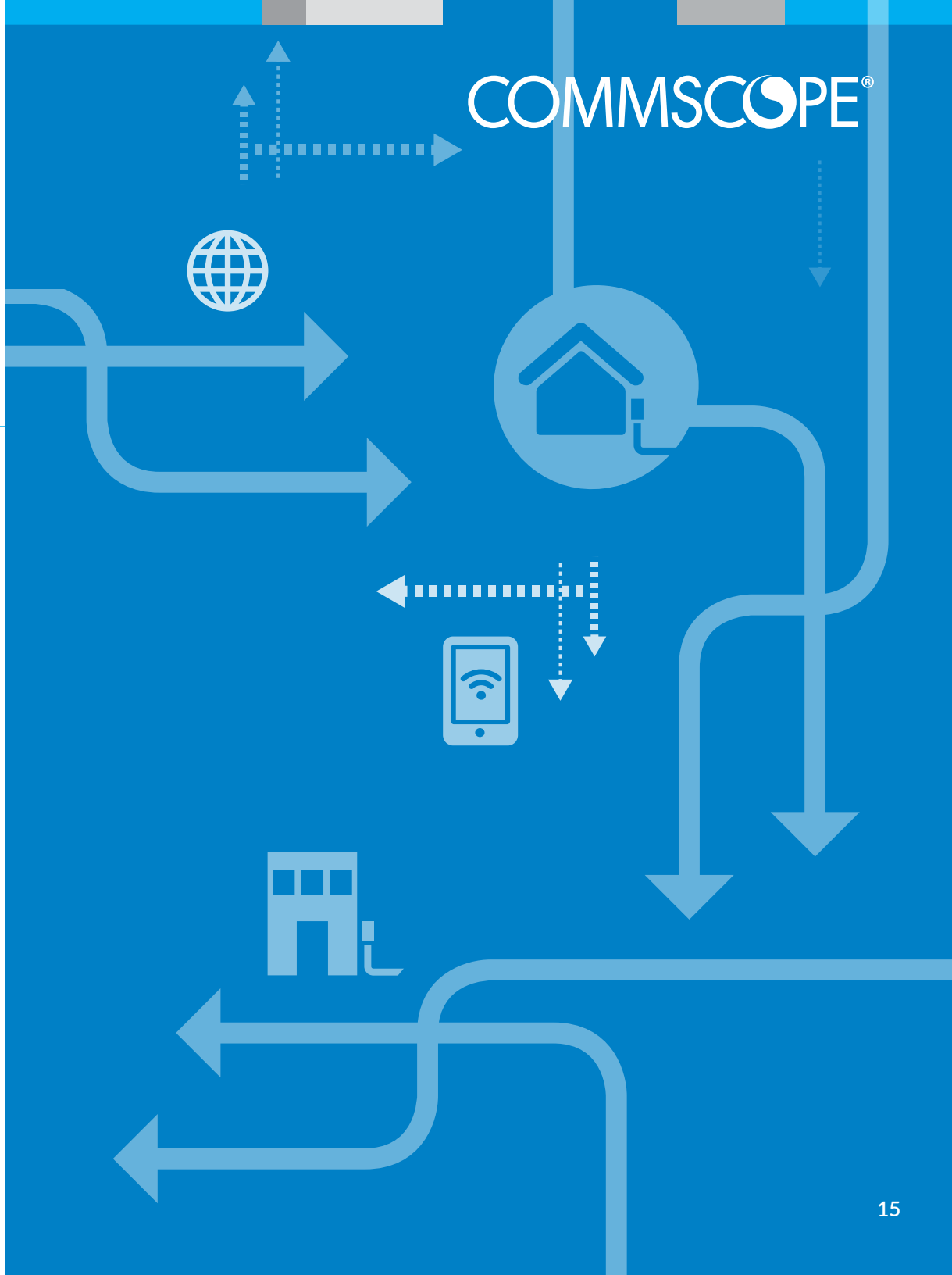
BLOG 2 >

PRODUCTS IN THIS NETWORK

- FIST fiber management
- Splitters
- Shelves and patch panels
- Fiber panels
- Fiber cable assemblies

CASE STUDY

#3 National utility goes broadband



INTERNET AS A UTILITY?

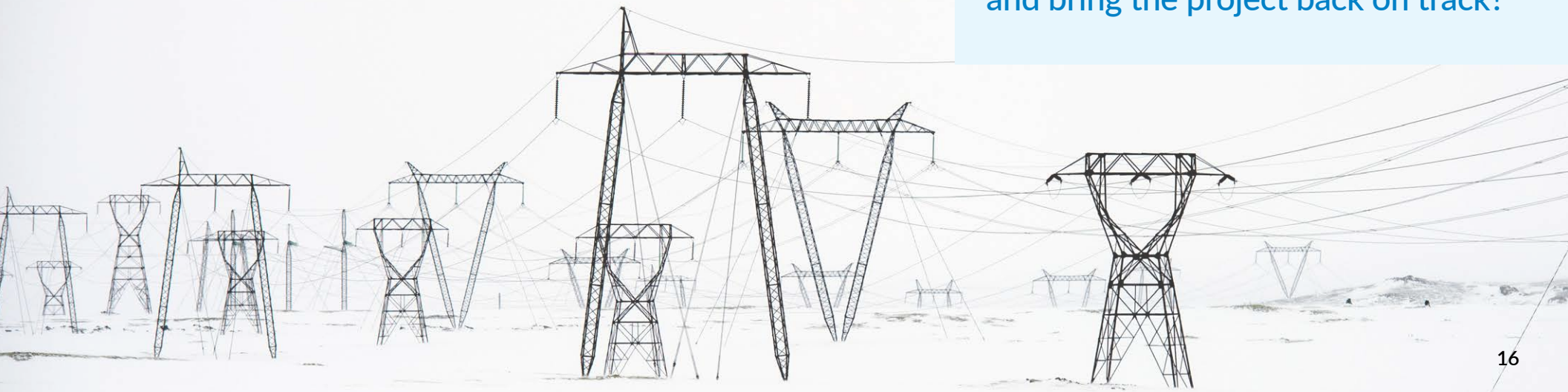
Recognizing that the digital economy would be a key pillar of the country's future growth and competitiveness on the world stage, this European electrical utility decided to bring high-speed internet access to homes and businesses across the country. The utility would build and own an open-access FTTH infrastructure and lease it to partners—who, in turn, offer retail internet and other services to subscribers.

THE CHALLENGE: COST OVERRUNS

The first phase of deployment covered approximately half a million premises. The utility had an extensive electrical grid infrastructure, rights of way, experience in outside plant deployments, and even a fiber backbone supporting leased fiber services. However, FTTH was a new technology for them.

As deployment started, the utility began to see cost and budget spikes.

How did they deal with the costs and bring the project back on track?



REDESIGNING THE NETWORK

"There are some unique challenges in building FTTH on top of a live electrical distribution system," says the CommScope engineer. "The utility had to minimize service disruption. Installer safety was of paramount concern when working in close proximity to high-voltage equipment. And, on top of all this, the grid maps were sometimes out of date." The unexpected scope of these issues pushed installation costs well above budgetary estimates.

RAINY DAYS

Another factor was the wet weather. The amount of rainfall and the propensity for flooding meant the equipment had to be well sealed to provide water-resistant or waterproof protection.

"In situations like these, there is rarely a magic bullet or a one-size-fits-all approach," said the CommScope account manager. “What was needed was a set of economical solutions that fit well with their existing grid infrastructure.”

"The initial network was designed for maximum flexibility and growth… and this comes at a price. We conducted detailed field surveys and, once armed with the data, we could then optimize the network architecture and product selection.”

PROTECTING THE NETWORK AGAINST WATER

IP ratings represented by combining the first and second digits of the following columns. See examples below.

1st digit - SOLID		2nd digit - LIQUID
No protection	0	No protection
Protection against a solid object greater than 50mm, such as a hand	1	Protected against water drops
Protection against a solid object greater than 12.5 mm, such as a finger	2	Protected against water drops at a 15 degree angle
Protection against a solid object greater than 2.5 mm, such as a wire	3	Protected against water spray at a 60 degree angle
Protection against a solid object greater than 1.5 mm, such as a thin strap	4	Protected against water splashing from any angle
Dust protected. Prevents ingress of dust sufficient to cause harm	5	Protected against water jets from any angle
Dust tight. No ingress of dust	6	Protected against powerful water jets and heavy seas
	7	Protected against the effects of temporary submersion in water (30 minutes at 3 feet)
	8	Protected against the effects of permanent submersion in water (up to 13 feet)

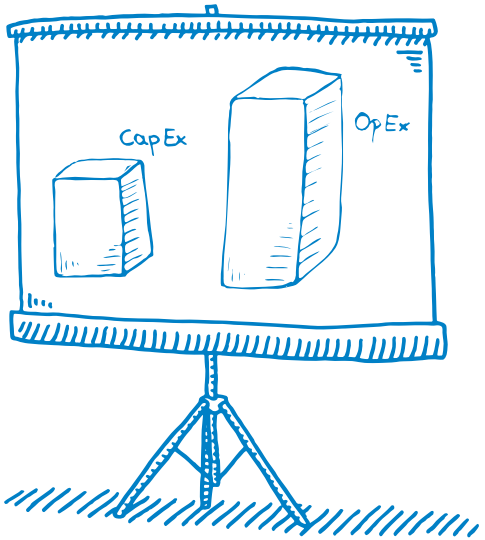
Example:

IP65

- Protected against water jets from any angle
- Dust tight. No ingress of dust

REDUCING INSTALLATION COSTS

"We reduced the number of the smaller cabinets and replaced them with closures and splitters. But it wasn't just the equipment cost –labor costs were a big part of the equation. So we increased the use of hardened connectivity products (for which fiber splicing is not required) and reduced labor costs significantly, because these products are far quicker and easier to install, with minimal training. Being environmentally hardened, they also provide excellent protection against the elements."



SUMMARY

A network redesign, an optimized set of products, and a focus on labor savings helped bring the project back on budget. By the end of 2016, service had been rolled out to seven cities across the country. The utility's network planner said, "CommScope showed they were true partners. We worked with them on our leased fiber network in the past, so it was natural to bring them onboard for FTTH. They were quick and responsive, and their global experience provided a welcome perspective."

When unforeseen costs spiral out of control, a trusted partner can get you back on track.

FEATURED RESOURCES

>>>> click below

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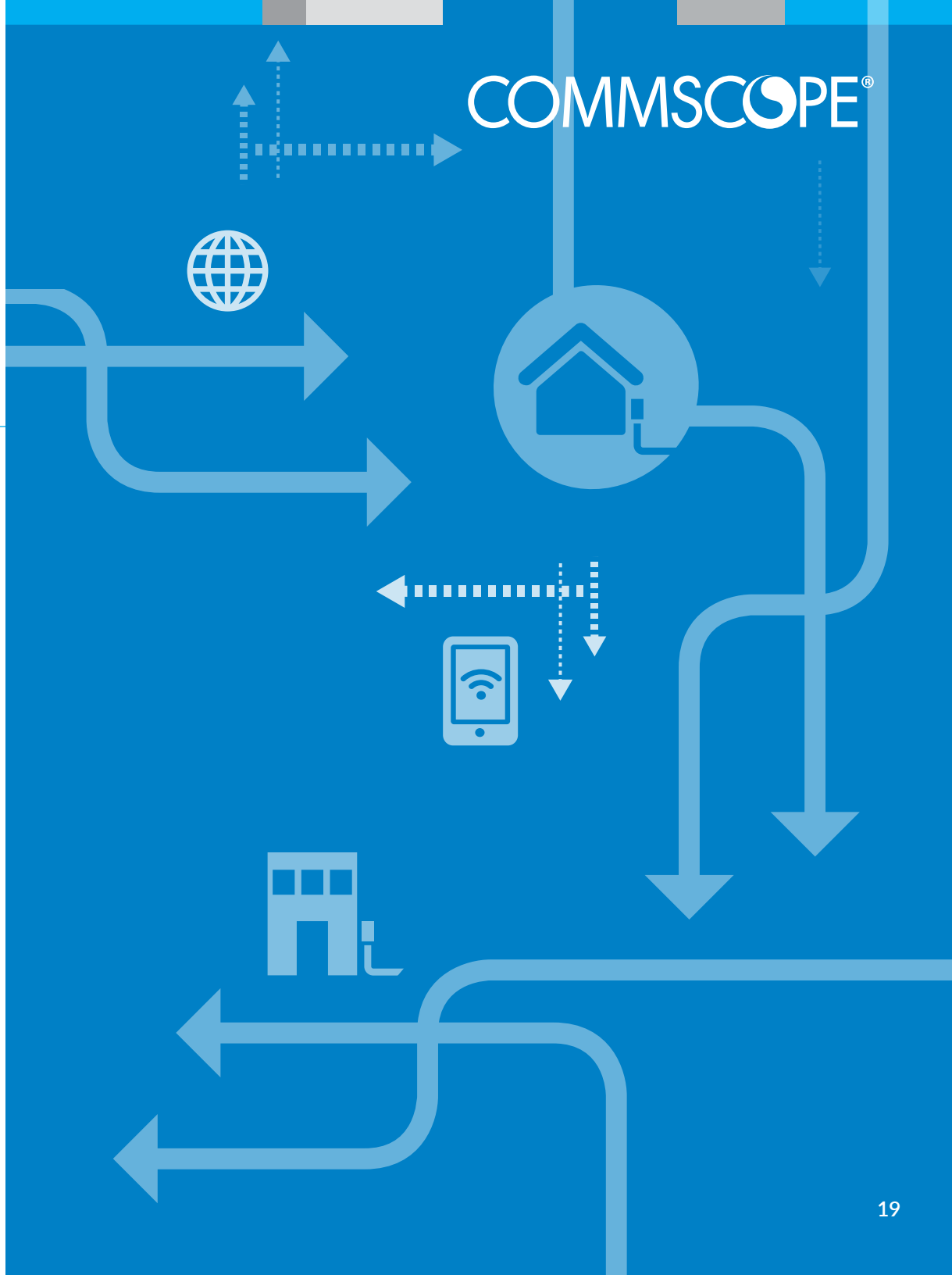
PRODUCTS IN THIS NETWORK

- FACT ODF
- FiberGuide optical raceway
- FDH (Fiber distribution hub)
- FOSC (Fiber optic splice closure)
- TENIO splice closure
- Hardened connectivity
- Mini-OTE terminal
- Premises box

CASE STUDY

#4 Rural company, urban footprint



RURAL BROADBAND

Founded over 50 years ago, today this small, local service provider serves several thousand customers. Rural broadband is particularly challenging, as low population density means higher deployment costs. “The demand has always been here,” said a telco manager. “But carriers must be willing to invest the time and money to deliver the service. Our willingness to do that has meant higher levels of customer loyalty, and it’s allowed us to grow.”

THE CHALLENGE: COMPETING AGAINST THE "GOLIATHS"

Over the years, this local service provider has attempted to expand its service area to more urban and profitable areas. But a small company going head-to-head against much larger carriers is not an easy proposition. “If we went into a new market, the ‘big boys’ would just swoop in to take all the accounts. It’s difficult to compete,” said the telco manager.

How to compete and differentiate against much larger carriers with deeper pockets?

"GENIUS" LAYOUT

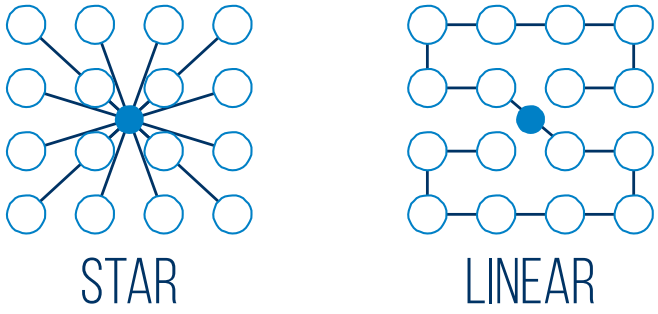
To find a new way to compete with the larger carriers, the telco created a specialized broadband business. “They wanted to do a test case with our fiber indexing solution,” said a CommScope account manager, “to see if it would allow faster deployments with less fiber.” The results were encouraging: the telco called the no-splice, connectorized technology “genius” for its layout, loss calculation, and speed of deployment.

In the deployment that followed, the telco installed aerial distribution hubs that allowed fiber cable to cascade down streets on pole lines. The pilot phase of this project involved six locations, serving 150 homes. Fiber indexing terminals were placed on telephone poles and linked by multi-fiber cables in a linear, cascaded fashion.

50 PERCENT FIBER CABLE SAVINGS

The total scope of the project was 3,000 homes passed, and the savings in fiber cable was considerable. “We’re so small, we can’t inventory as much material as we’d like,” said the telco manager. “CommScope’s fiber indexing technology let us connect these homes with less than half the usual amount of cable. That’s been a huge help.”

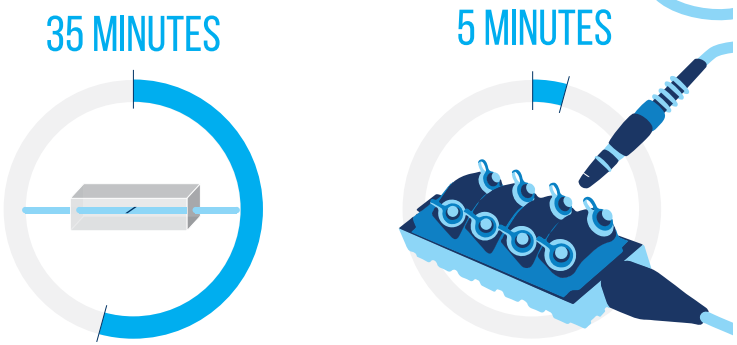
NETWORK ARCHITECTURE



Linear topology of terminals led to

50% LESS CABLE USAGE

FIBER SPLICING VS HARDENED CONNECTORS

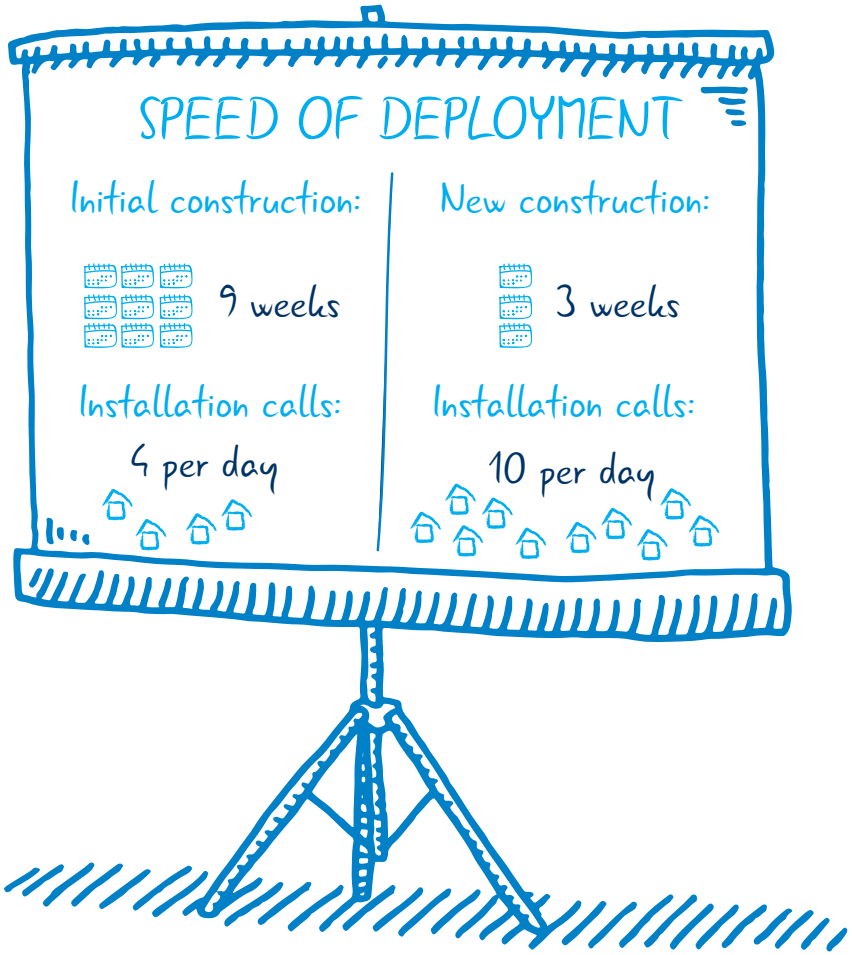


Use of pre-terminated connectors eliminates splicing, thus reducing the total time of connecting a customer to the fiber network

NO GOING BACK

"It's worked so well, I don't think we'd ever go back to the traditional methods," said the telco manager. Fiber indexing has allowed the small firm to compete with much larger companies because they can deploy faster, with less labor, using less material. "We can focus on giving our customers better service, and hook them up faster than ever before. Initial construction now takes three weeks instead of nine, and, instead of four install calls a day, we can schedule as many as 10. I tell you, this has been a game-changer for us."

The right technology can create a competitive edge.



FEATURED RESOURCES

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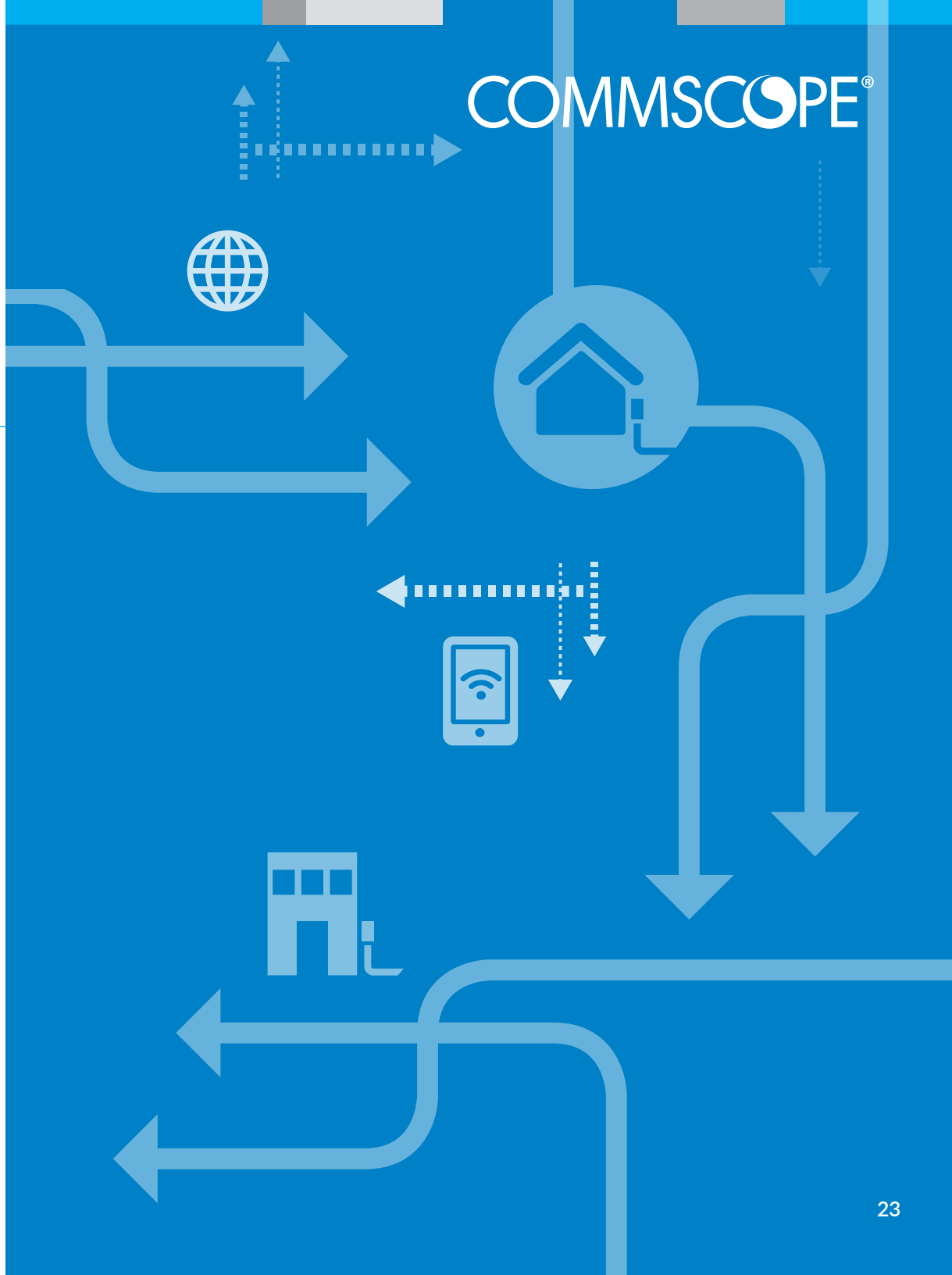
PRODUCTS IN THIS NETWORK

- Hardened connectivity
- MST (Multi-port service terminal)
- Hardened connectors
- Fiber distribution hub

CASE STUDY

#5 Building fiber expertise



AN AMBITIOUS PLAN

This state-owned incumbent telecom operator began as a postal and telegraph service more than 125 years ago. Today, they serve millions of citizens with telephony, mobile, and broadband services. Recognizing the importance of high-speed internet to economic growth and global competitiveness, the nation's president supported an ambitious FTTH program to cover the entire country.

THE CHALLENGE: A LACK OF FIBER KNOWLEDGE

The initial phases—research, planning, standards setting, network design, and vendor selection—were completed by a relatively small group of experts. But large teams of fiber-optic technicians and installers would be needed for the deployment.

Since fiber expertise was limited to a small number of optical backbone specialists, and the telco did not even have a program to train technicians, this would prove to be their biggest challenge.

How did this telco develop an accelerated program to train field installers?

KNOWLEDGE TRANSFER

Before the actual training began, townhall-style meetings were held. Putting a human face to this new technology was important, so local CommScope engineers who had worked on deployments in other countries shared their experiences. A train-the-trainers program was developed together with the local university; installation manuals and training materials were supplied in the local language. CommScope engineers supervised the initial installations, sharing practical advice and tips as well as ensuring that high standards and industry best practices were adopted.

IT'S ALL ABOUT YOUR PEOPLE

"Many of the older technicians, who'd worked with copper for decades, felt threatened by the new fiber technology," said the telco's training manager. "Working with fiber requires higher skill levels than working with copper. They thought they were obsolete. There was resistance at first, but drawing the parallels between fiber and copper allowed them to tap into their past experience and helped them feel more comfortable. The hands-on product training went a long way, and, ultimately, our technicians embraced the new technology. It just takes time to change people's mindsets."

SEEDING
KNOWLEDGE TRANSFER

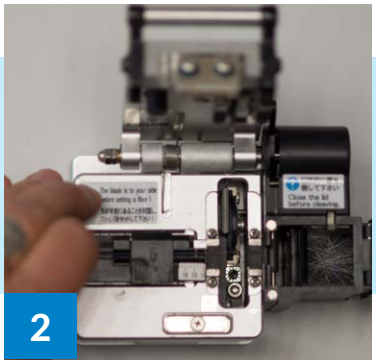
500 CommScope trained TRAINERS & TECHNICIANS

who went on to train

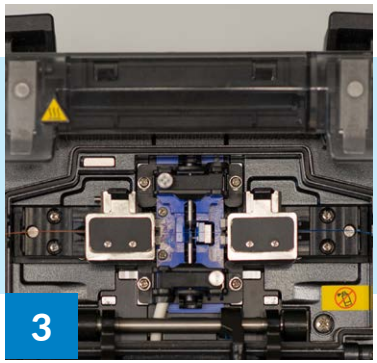
3,000 INSTALLATION TECHNICIANS

FIBER FUSION SPLICING IN FIVE STEPS

Fiber stripping & cleaning

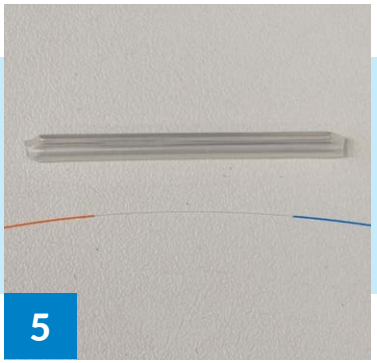


Fiber cleaving



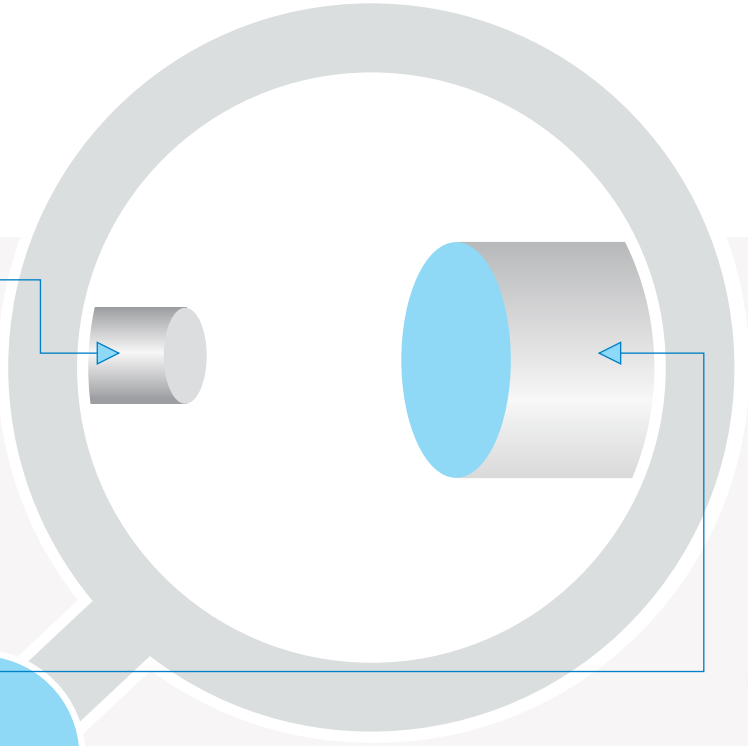
Fibers are joined in a fusion splicer

The display shows the quality of the fusion splice



Spliced fibers and protective sleeve (SMOUV)

Fusion splices are used to join two pieces of fiber-optic cable. Two strands of filament, each about 125 microns in diameter, are welded together so the laser light signals pass through the cable without interference. This complex process demands a high degree of precision.



Human hair:
50 microns in diameter

Fiber optic filament:
125 microns in diameter

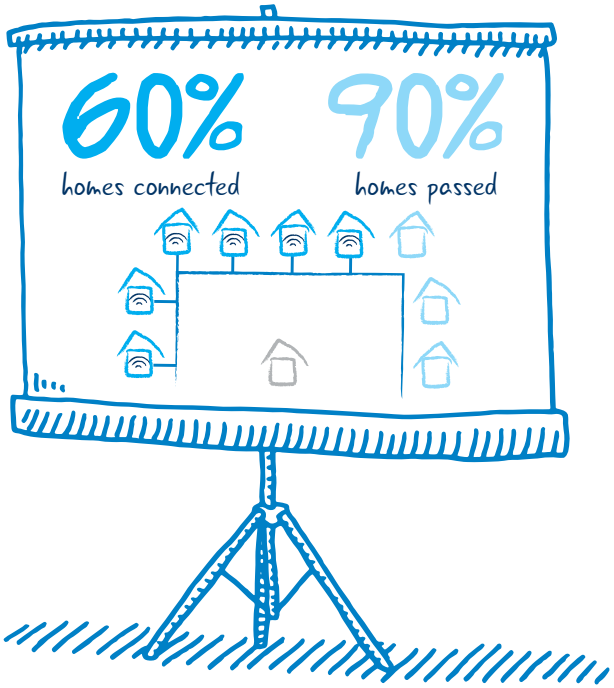
PRODUCTS THAT DON'T NEED SPECIAL TOOLS

Working with fiber generally requires special cable and splicing tools. But the telecom operator was able to deal with the shortage of experienced technicians by choosing products that could be installed by technicians with limited experience and a basic set of mechanical tools. One example is the FOSC 450 fiber-optic splice closure. Its cold seal gel technology does not require any electrical tools.

WORLD LEADER IN HOMES CONNECTED

Deployments began in the big cities of the country, then moved out into the rural areas. CommScope directly trained more than 500 technicians for the project, who went on to train more than 3.000 installers. In deploying this network, the state-owned incumbent telco has achieved something remarkable: the country now has the highest FTTH penetration rate in the region, and it is widely recognized that their ICT (Information and Communications Technology) strategy has had a real impact on the country's economy and future development.

Invest in training your staff. Outside plant fiber will provide service for decades to come, so protect your investment by doing the job right the first time.



Country-wide fiber rollout

FEATURED RESOURCES

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WEB PAGE >

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COMMSCOPE INFRASTRUCTURE ACADEMY >

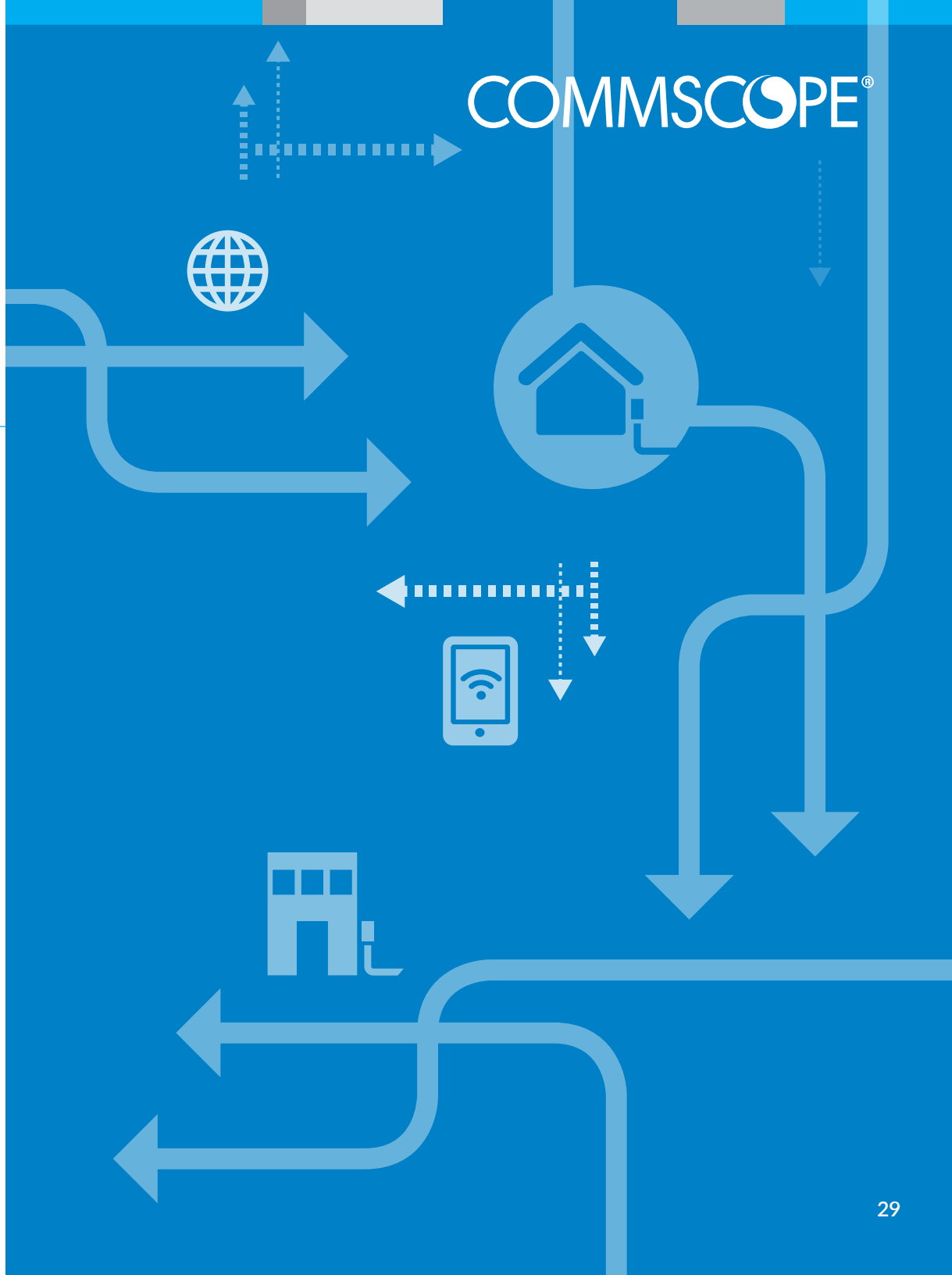
VIDEO >

PRODUCTS IN THIS NETWORK

- Last mile access solutions
- FOSC
- Fiber splice closures
- Splitters

CASE STUDY

#6 Open and interoperable



The country was ready for ultra-high-speed internet: this large, incumbent mobile and fixed-line service provider decided to introduce fiber-to-the-home (FTTH) to 40 cities and begin migrating their access network from copper-based xDSL. Smaller local players may have been first to market with FTTH, but the incumbent's dominant installed base and extensive coverage put them in pole position.

THE CHALLENGE: WILL THE PIECES FIT TOGETHER?

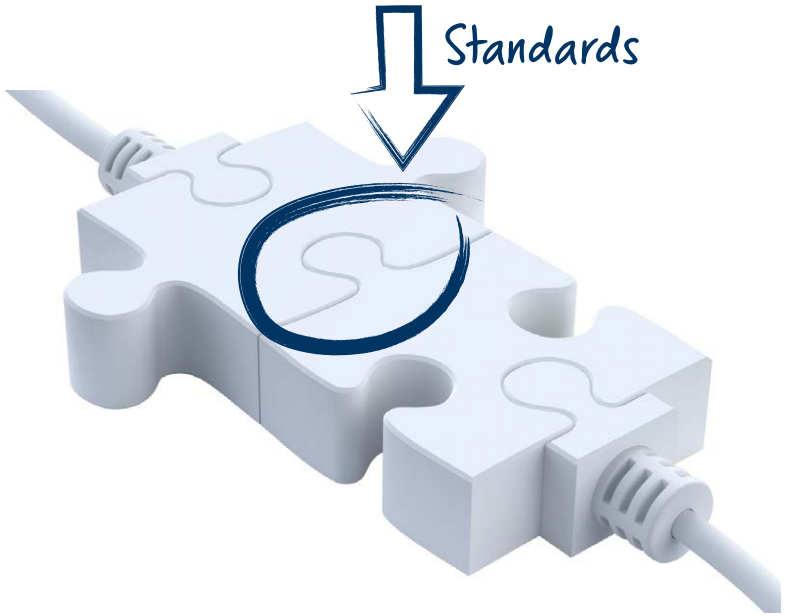
Local guidelines called for a mix of national and international vendors for the FTTH infrastructure. To ensure multi-vendor interoperability, the telco established compliance to standards as a fundamental principle.

Similar to other incumbents around the world, this service provider had extensive experience with copper access and fiber backbone networks—but not with FTTH network standards.

How did they build a standards-compliant, open and interoperable network?

UPGRADING NETWORK INFRASTRUCTURE BRINGS UNIQUE CHALLENGES

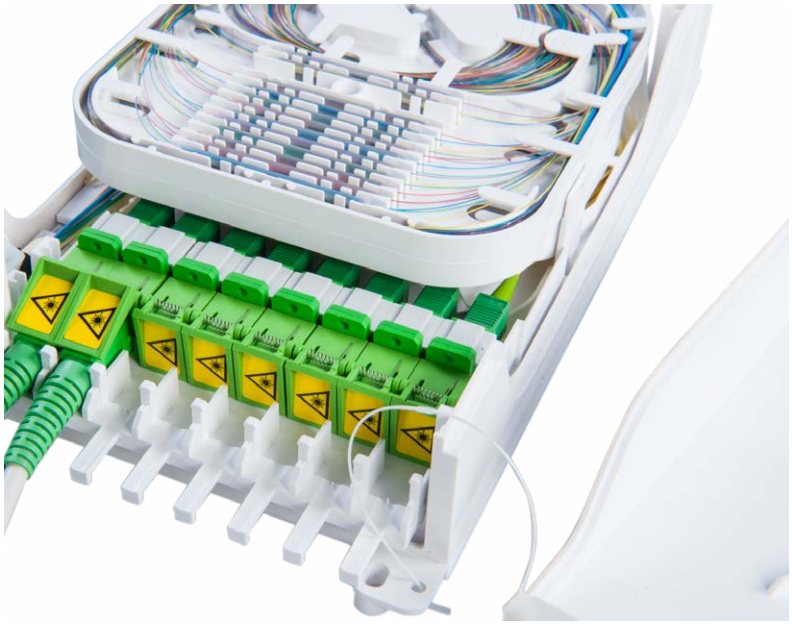
A multi-vendor network must be flexible and upgradeable to new products as the technology evolves. “The scale of the national deployment meant that fiber interoperability had to be built up as an ongoing process. We worked with our customer to create internal standards guidelines that helped to streamline their bidding process,” said a CommScope account manager. Once the network design process got underway, the local team began fiber technology training for installers and technicians.



MDU FIELD TRIALS

Many of the installations were slated for older multidwelling units (MDU), where the cable shafts were small and hard to work in. CommScope’s IFDB floor box was selected as it was compact enough to fit into these congested shafts, and its hinged connector panel allowed easy access for maintenance.

Bringing together different vendors won’t work without clear open and interoperable standards. “In this case, the IFDB and the fiber cables were from two different vendors,” said the account manager. “The standards and specifications defined at the beginning, followed by field trials, ensured that equipment would work together without any performance or installation issues.”



IFDB floor box

TOP 10 FIBER STANDARDS FOR FTTH

PERFORMANCE

General and guidance for performance standards

IEC 61753-1

TEST & MEASUREMENT

IEC 61300-2 and -3 SERIES

Fiber-optic interconnecting devices and passive components—Basic test and measurement procedures

PRODUCTS: CABLES

Optical fibers—part 2-50: product specifications—sectional specification for class B single-mode fibers

IEC 60793-2-50

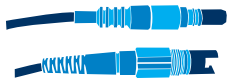
IEC 60754-2-50

Optical fiber cables—part 2-50: indoor cables—family specification for simplex and duplex cables for use in terminated cable assemblies

PRODUCTS: CONNECTORS

Fiber-optic connector optical interfaces—optical interfaces for single mode fibers

IEC 61755 SERIES



IEC 61754 SERIES

Fiber-optic interconnecting devices and passive components—fiber-optic connector interfaces

PRODUCTS: CLOSURES

Generic requirements for fiber-optic splice closures

TELCORDIA GR-771

Product specification for category A and S butt type closures

EN 50411-2-4

EN 50411-2-10

Product specification for category G closures (FTTH and distribution closures)

ITU-T L.13

Performance requirements for passive optical nodes—sealed closures for outdoor environments

STANDARDS BODIES

ITU

The International Telecommunication Union (ITU) is a specialized agency of the United Nations (UN) that is responsible for issues that concern information and communication technologies. Standardization was the original purpose of ITU. ITU-T standardizes global telecommunications (except for radio).

EN

European Standards (ENs) are documents that have been ratified by one of the three European Standardization Organizations (ESOs), CEN, CENELEC or ETSI; recognized as competent in the area of voluntary technical standardization as for the EU Regulation 1025/2012. A European Standard (EN) automatically becomes a national standard in each of the 34 CEN-CENELEC member countries.

IEC

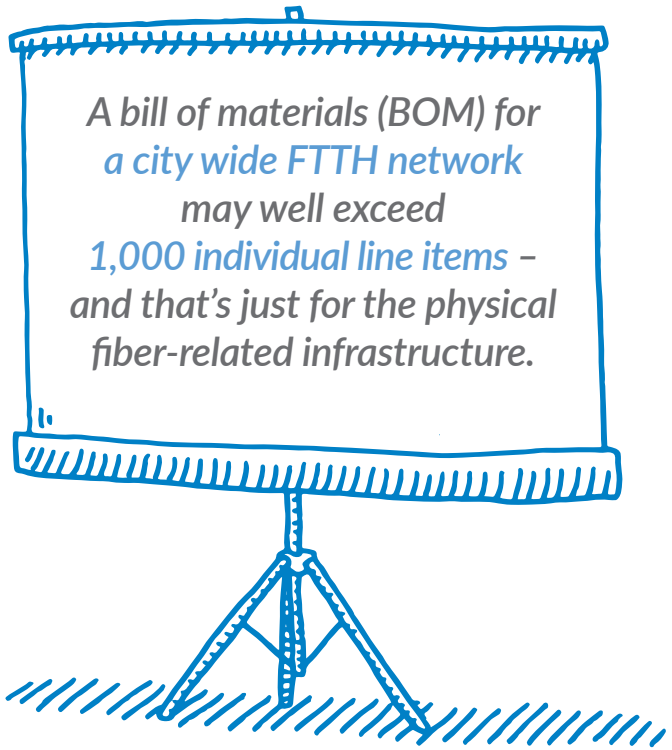
The IEC (International Electrotechnical Commission) is the world's leading organization for the preparation and publication of International Standards for all electrical, electronic and related technologies. These are known collectively as "electrotechnology".

Telcordia

Telcordia is a subsidiary of the telecommunications company Ericsson. The company provides interconnection technology and clearinghouse solutions for numbering plan, routing, call billing, and technical standards coordination between competing telecommunications carriers.

MAINTAINING A HEALTHY VENDOR ECOSYSTEM

"The team worked very closely with our customer to find products that best fit their needs—modular, easy to install, and compliant to the relevant IEC and EN standards," said the CommScope account manager. "Establishing and maintaining standards keeps the vendor ecosystem healthy as well. When a problem comes up, a clear demarcation facilitates troubleshooting and avoids finger-pointing and conflict between vendors."



SUMMARY

"Today, this FTTH network has hundreds of products from dozens of different vendors. Openness and interoperability are the key to making it work. Our customer is confident they can upgrade or introduce new products into the network without impacting existing services."

Standards provide the framework for an open, multi-vendor network that can grow as technologies evolve.

FEATURED RESOURCES

>>>> click below

MDU > | CENTRAL OFFICE > | FIBER CLOSURES >

WEB PAGES

WHITE PAPER >

VIDEO >

PRODUCTS IN THIS NETWORK

- IFDB
- FOSC 350, FOSC 450
- Splitters
- NG4access
- FiberGuide system
- Copper closures

Everyone communicates. It's the essence of the human experience. ***How*** we communicate is evolving. Technology is reshaping the way we live, learn and thrive. The epicenter of this transformation is the network—our passion. Our experts are rethinking the purpose, role and usage of networks to help our customers increase bandwidth, expand capacity, enhance efficiency, speed deployment and simplify migration. From remote cell sites to massive sports arenas, from busy airports to state-of-the-art data centers—we provide the essential expertise and vital infrastructure your business needs to succeed. The world's most advanced networks rely on CommScope connectivity.

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