

# The Alcatel-Lucent 15xx Business Access Portfolio

Addressing  
Your Business-Critical Challenges

Alcatel·Lucent 



If you're a service provider — either fixed or mobile — with business-critical requirements, or an organization with mission-critical challenges, you can meet these demands with the Alcatel-Lucent 15xx Business Access portfolio. Our world-renowned portfolio includes multiservice access platforms, cross-connects, network termination units and optical line systems — everything you need to mitigate risk, while keeping your mission-critical services up and running.



# Satisfying Service Providers and Vertical Markets

The Alcatel-Lucent 15xx Business Access portfolio addresses the requirements of service providers — both wireline and wireless — and vertical market customers. If you're a vertical player from transport (e.g., railways, highways, air traffic control), energy (oil and gas exploration/production/transport, power generation/ transmission/distribution), defense and security (Ministry of Defense [MoD], police, homeland security), and government, among others, you may already be benefiting from the Alcatel-Lucent 15xx in your network. Along with countless service providers worldwide, you have helped to make the Alcatel-Lucent Business Access portfolio one of the most successful platforms ever built for the professional market.


With the Alcatel-Lucent 15xx Business Access portfolio of products, you can take advantage of network solutions that are:

**MANAGEABLE >> easy to deploy, provision, manage and maintain**

**AVAILABLE >> field-proven with greater than 99.999 percent reliability**

**PROFITABLE >> cost-effective**

What's more, the Alcatel-Lucent 15xx Business Access portfolio delivers stable, reliable, and field-proven products. Equally important, the portfolio delivers the key benefits that you are looking for today: consolidation, cost savings, investment protection, simplified operations, and more.



*The Alcatel-Lucent 15xx Business Access portfolio...one of the most successful platforms ever built for the professional market.*



# Compelling Features, Compelling Benefits

The Alcatel-Lucent 15xx Business Access portfolio includes high-value access and customer premises products designed to help you take advantage of current and future telecommunications opportunities. As shown in Table 1, the Alcatel-Lucent 15xx Business Access portfolio contains a feature-rich and comprehensive range of products, including multiservice access platforms, flex muxes, digital cross-connects, optical line systems and network termination units (NTUs).

**Table 1. Features and Benefits of the Alcatel-Lucent 15xx Business Access Portfolio**

FEATURES	BENEFITS
<ul style="list-style-type: none"> <li>• Full support for analog voice and legacy data interfaces, including:               <ul style="list-style-type: none"> <li>→ voice: E&amp;M, FXS (LGS), FXO (LGE), MRD, GEN-GEN and loop-GEN</li> <li>→ data: V.35, V.36, X.21, RS-449, and RS-232</li> </ul> </li> <li>• Resource cards allow for voice and data multiplexing</li> <li>• Bridging, multiplexing and transport of 10/100Base-T Ethernet services</li> </ul>	Voice, data and video convergence in a single product
<ul style="list-style-type: none"> <li>• Multiple sub-rate interfaces can be multiplexed into a single time slot</li> <li>• Data interfaces can support sub-rate and super-rate data at varying speeds from 300 b/s to 2 Mb/s</li> <li>• E1, optical and copper (SHDSL) line system interfaces can be accommodated in the same platform</li> <li>• Multiservice, multi-technology platforms that deliver advanced services for global carrier and enterprise customers, including TDM, xDSL, IP, ISDN and other services</li> </ul>	Cost savings through network consolidation  Cost savings through multiplexing
<ul style="list-style-type: none"> <li>• Enables customer networks to take up emerging technologies, such as SHDSL and IP, through integration or network consolidation, as opposed to migration</li> <li>• Easy migration to higher speed interfaces for an existing installed base</li> </ul>	Protection of infrastructure investment while supporting network evolution
<ul style="list-style-type: none"> <li>• Fully managed by element managers which provide user-friendly support for end-to-end installation and maintenance</li> <li>• Easy-to-use GUI means operations are consistent across nodes and services, for faster service delivery</li> <li>• Continuous synchronization with the network</li> <li>• Solves problems before customers even know about them through proactive management</li> </ul>	Simplified and cost effective operation
<ul style="list-style-type: none"> <li>• Field-proven performance, with greater than 99.999 percent availability — letting service providers offer low risk service level guarantees</li> <li>• The most successful digital overlay and business access platforms ever built</li> </ul>	Increased reliability
<ul style="list-style-type: none"> <li>• Alcatel-Lucent 15xx products aggregate multiservice traffic, eliminating the need for multiple leased lines</li> <li>• Alcatel-Lucent 15xx products are key elements for network optimization</li> </ul>	Higher value

# The Alcatel-Lucent 15xx Business Access Portfolio

## MULTISERVICE ACCESS PLATFORM



**Alcatel-Lucent 1511 MAX** – The Alcatel-Lucent 1511 Media Access X-connect (MAX) is a flexmux — a flexible time division multiplexer (2.048 Mb/s) combined with a cross-connect. Like the Alcatel-Lucent 1511 BA, the 1515 CX or 1515 CX-C, it provides the necessary cross-connections, transport cards and subscriber interfaces for any leased or private line network offering services at sub-rates, Nx64 kb/s and 2 Mb/s per subscriber connections.



**Alcatel-Lucent 1511 Business Access (BA) Multiplexer** – The Alcatel-Lucent 1511 BA multiplexer is a flexible, scalable and intelligent networking node that combines the functions of a multiservice voice and data multiplexer, an intelligent channel bank, and a digital cross connect switch. It offers fiber optic, copper and electrical interfaces at multiple E1 speed and supports a wide range of voice and data services just by adding new cards, protecting equipment investment.



**Alcatel-Lucent 1540 Leased Lines (LL) Flexible Multiplexer** – The Alcatel-Lucent 1540 LL is a flexible time division multiplexer (2.048 Mb/s). Like the Alcatel-Lucent 1511 BA, it provides the necessary cross-connections, transport cards and subscriber interfaces for any leased line network offering services at sub-rates, Nx64 kb/s and 2 Mb/s per subscriber connections.

## NETWORK TERMINATION UNITS

### Alcatel-Lucent 1511 Versatile Access Modem (VAM)

– The Alcatel-Lucent 1511 VAM is an attractive desktop unit for the Alcatel-Lucent 1511 BA, providing services of up to 128 kb/s to remote sites through a single copper pair. The flexible design, with one motherboard and two small plug-in units, allows the creation of several service types with a combination of any two of the following interfaces: V.35, V.36, RS-232, X.21, 64 kb/s G.703 co-directional and analog voice.



### Alcatel-Lucent 1512 Symmetric High Speed Digital Subscriber Line (SHDSL)

– The Alcatel-Lucent 1512 SHDSL transports data interfaces with a speed of up to 2 Mb/s through a single or dual copper pair. The desktop unit (DTU) comes in 3 variants: with G.703 & X.21 interfaces, with a V.35 interface or with a 10Base-T Ethernet interface.



### Alcatel-Lucent 1521 Fiber Optic Line System (FL or FLIP)

– The Alcatel-Lucent 1521 FL or FLIP are optical line modems transporting 4 x 2 Mb/s, optionally with a 10/100BaseT Ethernet interface. They act as network termination units (NTU) for either the Alcatel-Lucent 1511 BA or the Alcatel-Lucent 1521/31 FL sub-racks.



### Alcatel-Lucent 1540 LL NT

– The Alcatel-Lucent 1540 LL NT is an NTU for the Alcatel-Lucent 1540 LL system, and provides from 64 kb/s up to 512 kb/s or 2 Mb/s transport over copper wire. Two types are available: classical and SHDSL. Multiple interfaces are supported: V.28, V.11, V.35, X.21, E1/G.703 and Ethernet.



## CROSS-CONNECTS



### Alcatel-Lucent 1515 Compact 1-0 Digital Cross-Connect (CX-C) –

The Alcatel-Lucent 1515 CX-C is a compact fully non-blocking cross-connect of up to 32 ports. It combines 2 Mb/s access, grooming, drop/insert, bypass, hubbing and cross-connect functions in a very compact design. The hardware modularity

allows the product to be cost-effective with just a few 2 Mb/s ports. It can grow to a maximum of 32 ports of 2 Mb/s each, depending on your requirements. Although the Alcatel-Lucent 1515 CX-C supports only 2 Mb/s interface boards, it can be expanded with locally or remotely installed Alcatel-Lucent 1511 BA access node boards, providing all access types offered by these boards. As a result, the Alcatel-Lucent 1515 CX-C represents the most flexible and compact cross-connect unit available.



### Alcatel-Lucent 1515 Digital Cross-Connect (CX) –

The Alcatel-Lucent 1515 CX is a medium-capacity fully non-blocking cross-connect system for up to 128 E1 (2 Mb/s) ports, providing an ideal node element for public and private networks of any structure. It combines 2 Mb/s access, grooming, drop-and-insert, bypass, hubbing and cross-connect functions. The advanced network management system software combined with the modular design of the hardware makes the Alcatel-Lucent 1515 CX a flexible cross-connect unit. The granularity can be lowered to the sub-rate level (8 kb/s).

## OPTICAL LINE SYSTEMS



**Alcatel-Lucent 1521 Fiber Optic Line System (FL or FLIP) –** The Alcatel-Lucent 1521 FL transports 4 x 2 Mb/s from the access point to the central office over optical fiber. The Alcatel-Lucent 1521 FLIP transports 4 x 2 Mb/s and 4 x 10/100Base-T Ethernet with a maximum capacity of 100 Mb/s from the access point to the central office over optical fiber.

### Alcatel-Lucent 1531 Fiber Optic Line System (FL) –

The Alcatel-Lucent 1531 FL transports 16 x 2 Mb/s from the access point to the central office over optical fiber.



**Alcatel-Lucent 1531 Electrical (EL) Multiplexer –** The Alcatel-Lucent 1531 EL multiplexes 16 x 2 Mb/s connections into a 34 Mb/s electrical connection.

## ETHERNET FIRST MILE



**Alcatel-Lucent 1521 Copper Line IP (CLIP) –** The Alcatel-Lucent 1521 CLIP is an Ethernet first mile access product delivering up to 45 Mb/s over 1 to 8 bonded copper pairs.



**Alcatel-Lucent 1531 Copper Line Access Switch (CLAS) –** The Alcatel-Lucent 1531 CLAS is a stackable high-density Ethernet First-Mile product. It provides aggregation and is fully compatible with Alcatel-Lucent 1521 CLIP CPE devices. The connection between an Alcatel-Lucent 1531 CLAS and an Alcatel-Lucent 1521 CLIP CPE device can consist of 1 to 8 copper pairs bonded into a single connection.

# A Rich Range of Applications

If you're a service provider — either wireline or wireless — or a private network operator, the Alcatel-Lucent 15xx Business Access portfolio meets the challenge of your business-critical requirements. Indeed, the multiservice Alcatel-Lucent 15xx Business Access portfolio covers a full range of applications. While a comprehensive list of applications can be found in Table 2 (see page 21), here are a few that address the needs of vertical market customers for high reliability and proven technology.



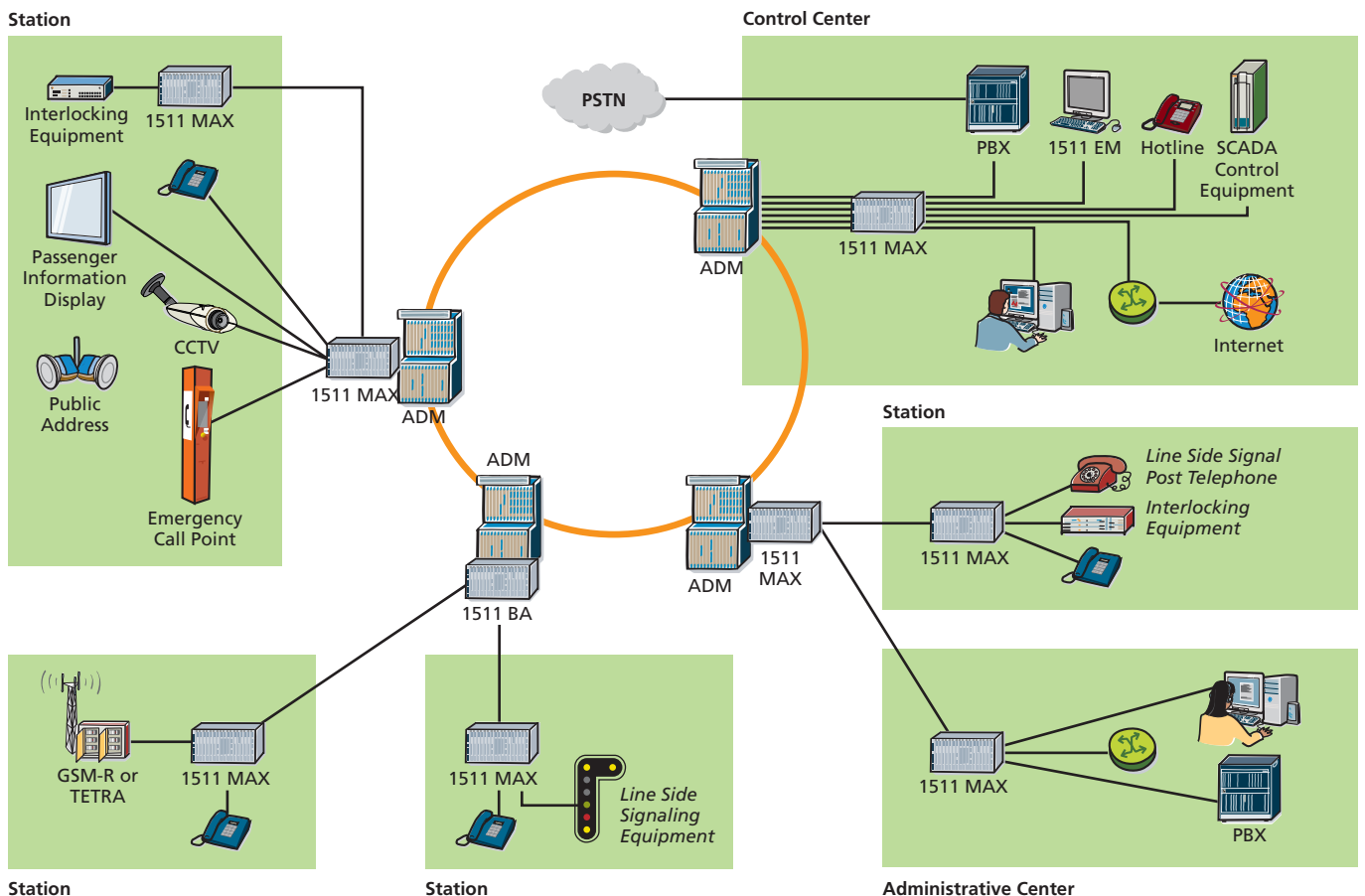


# Transport – Railway Utility



Railway, light rail, and metro operating companies rely on a converged digital transmission network for their operations. Mission-critical applications — clock synchronization, controlling level crossings and line-side signaling, interlocking equipment, traction power tele-protection, operational telephony and radio, line-side signal post telephones, emergency call points, supervisory control and data acquisition (SCADA) systems, CCTV surveillance, etc. (see Figure 1) — are all critical to railway operations and safety, and require a highly reliable telecommunications network.

Figure 1. Alcatel-Lucent 15xx Rail Transport Application



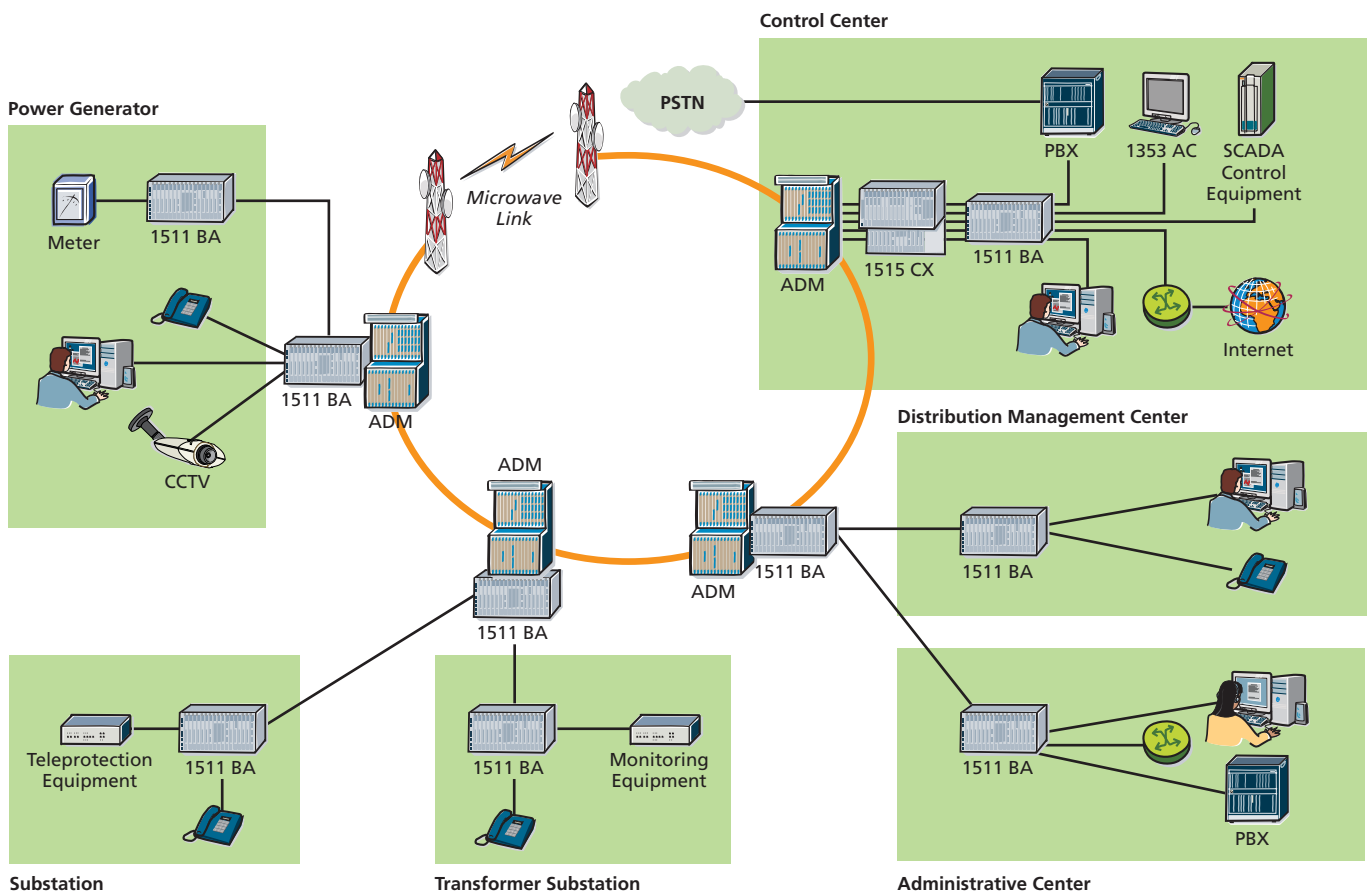


# Energy – Power Transmission Utility



Utility companies are uniquely positioned to leverage their established rights-of-way (ROW) to accommodate their enterprise network requirements. An example of a key application that addresses the requirements of a utility network is the digital transmission backbone application depicted in Figure 2. The digital transmission backbone application is common in utility networks where voice and data circuits from various locations are inserted and dropped along the route. The Alcatel-Lucent 15xx products support linear drop-and-insert ring mode, as well as point-to-point configurations. Figure 2 depicts a typical utility network where connectivity between a central site and numerous remote sites is required. Common requirements include voice services, data terminal-to-server connections, telemetry monitoring, SCADA telecontrol and remote LAN connectivity.

Figure 2. Alcatel-Lucent 15xx Power Utility Application

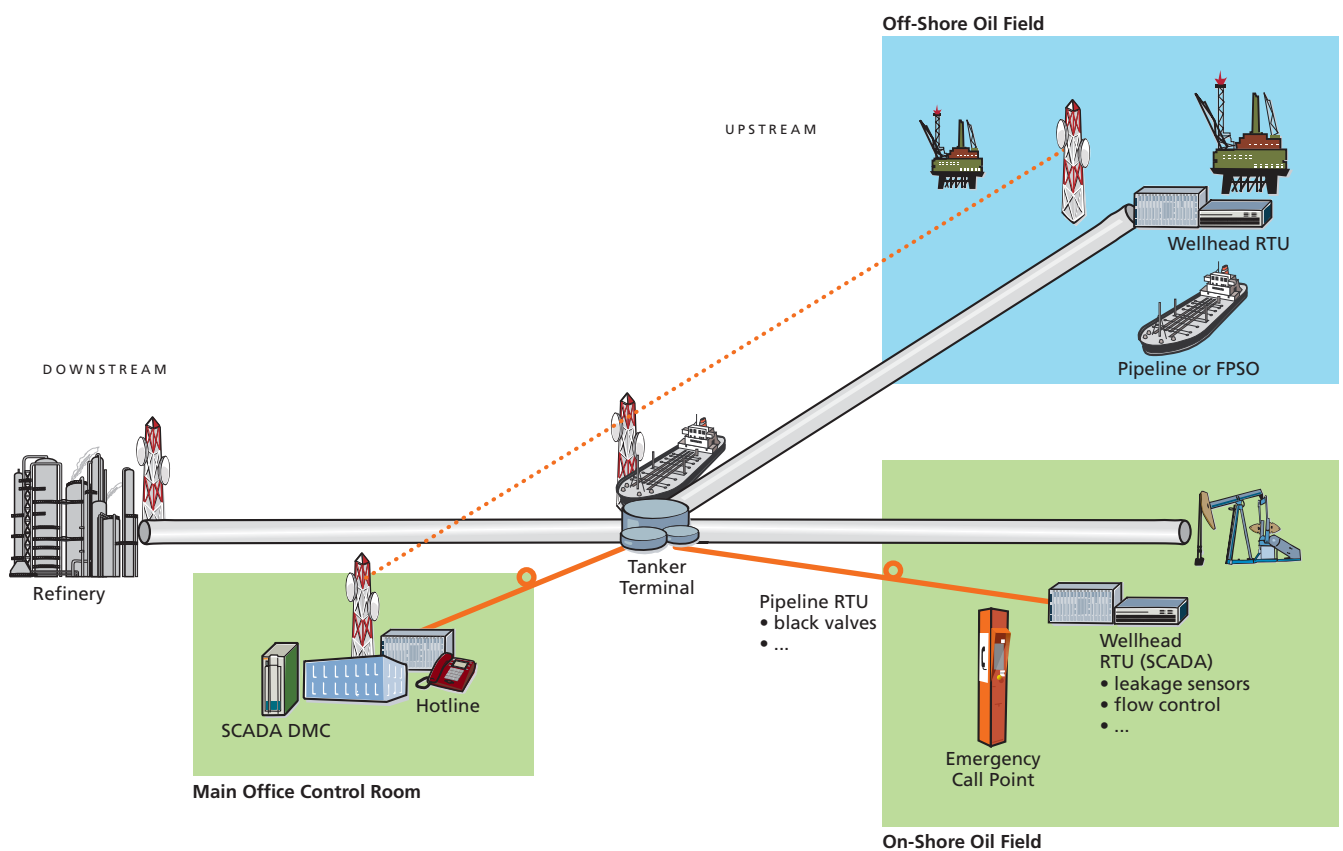


# Energy – Oil and Gas Exploration and Production



Oil and gas exploration companies have network requirements similar to other vertical markets. They require reliable, robust networking solutions for their internal traffic. A variation on the railway or high-voltage power line application is often a good fit for these high-value customers to deliver mission-critical data to remote locations. One of the world's largest producers of crude oil is deploying Alcatel-Lucent 15xx Business Access multiplexers to extend the reach of its network to remote locations along the pipelines and even on offshore drilling platforms, while providing absolute reliability. In this case, it is the Alcatel-Lucent Optical Multiservice Node (OMSN) solution together with the Alcatel-Lucent 9600 series SDH microwave radios that provides the wireless portion of the network.

Figure 3. Alcatel-Lucent 15xx Oil and Gas Application

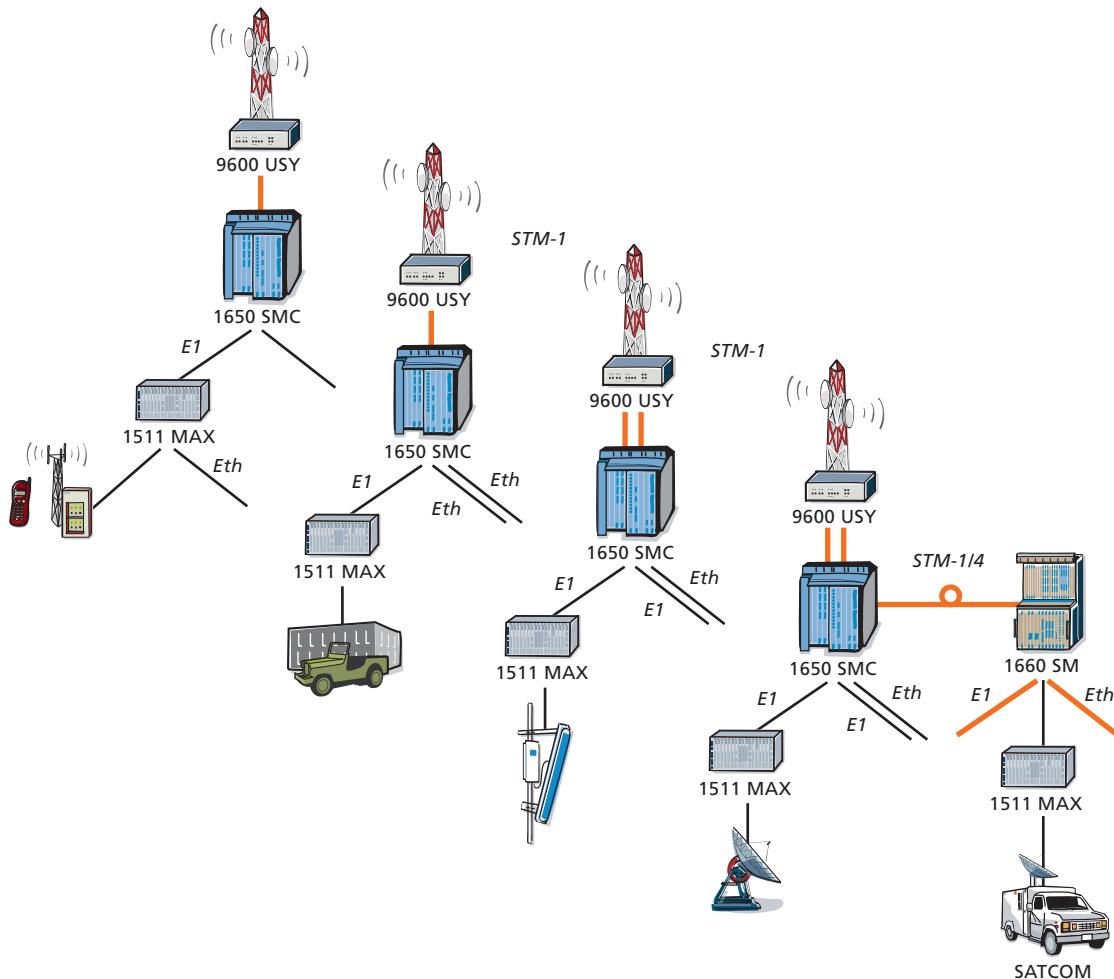


# Defense and Security



In the Defense and Security segment, customers such as the Ministry of Defense (armed forces, military air traffic control), law enforcement agencies, homeland security/national safety services (police, fire brigades, civil protection, ambulances, etc.) all require a highly reliable and robust backbone and access network to support security and safety critical applications. VHF/UHF/TETRA radio, voice communications, data communications, data acquisition (radar, border control, sensors, etc.) are all examples of applications running over such a reliable and secure multiservice but cost-effective network.

Figure 4. Alcatel-Lucent 15xx Defense Application

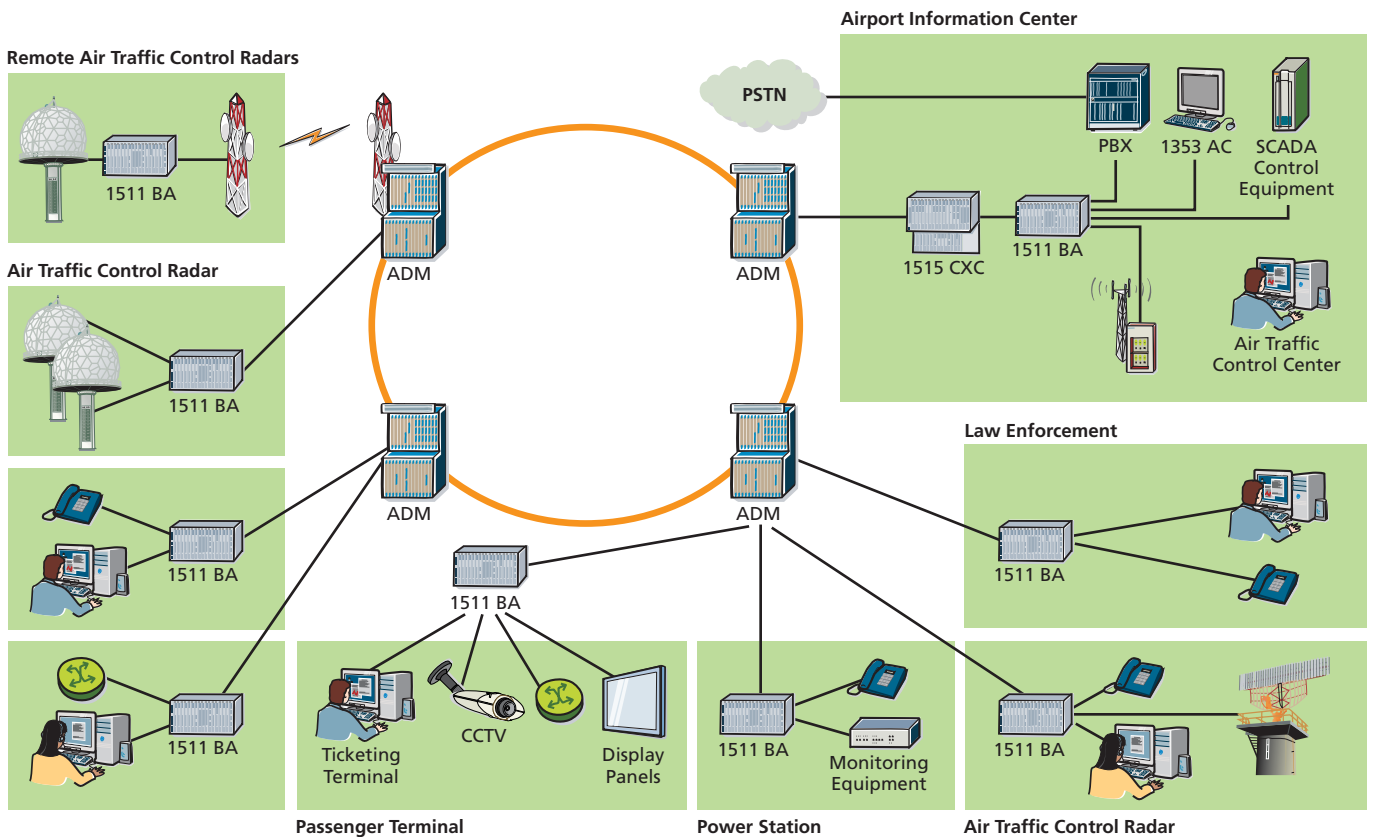


# Government – Air Traffic Control Authority



Figure 5 depicts a typical network used by air traffic control authorities to meet their stringent availability requirements, because safety is paramount. The Alcatel-Lucent 15xx Business Access portfolio is used to convey radar data from the different air traffic control radar sites towards the central control tower. The same network is used to convey ground voice communication interfacing with ground-to-air radio communications equipment and TETRA emergency communications, and also perform data acquisition from meteorological stations. Inside the terminal building, flight information display panels, public address, closed-circuit television (CCTV) surveillance, etc. are also conveyed over the converged backbone network.

Figure 5. Alcatel-Lucent 15xx Airport and Air Traffic Control Application



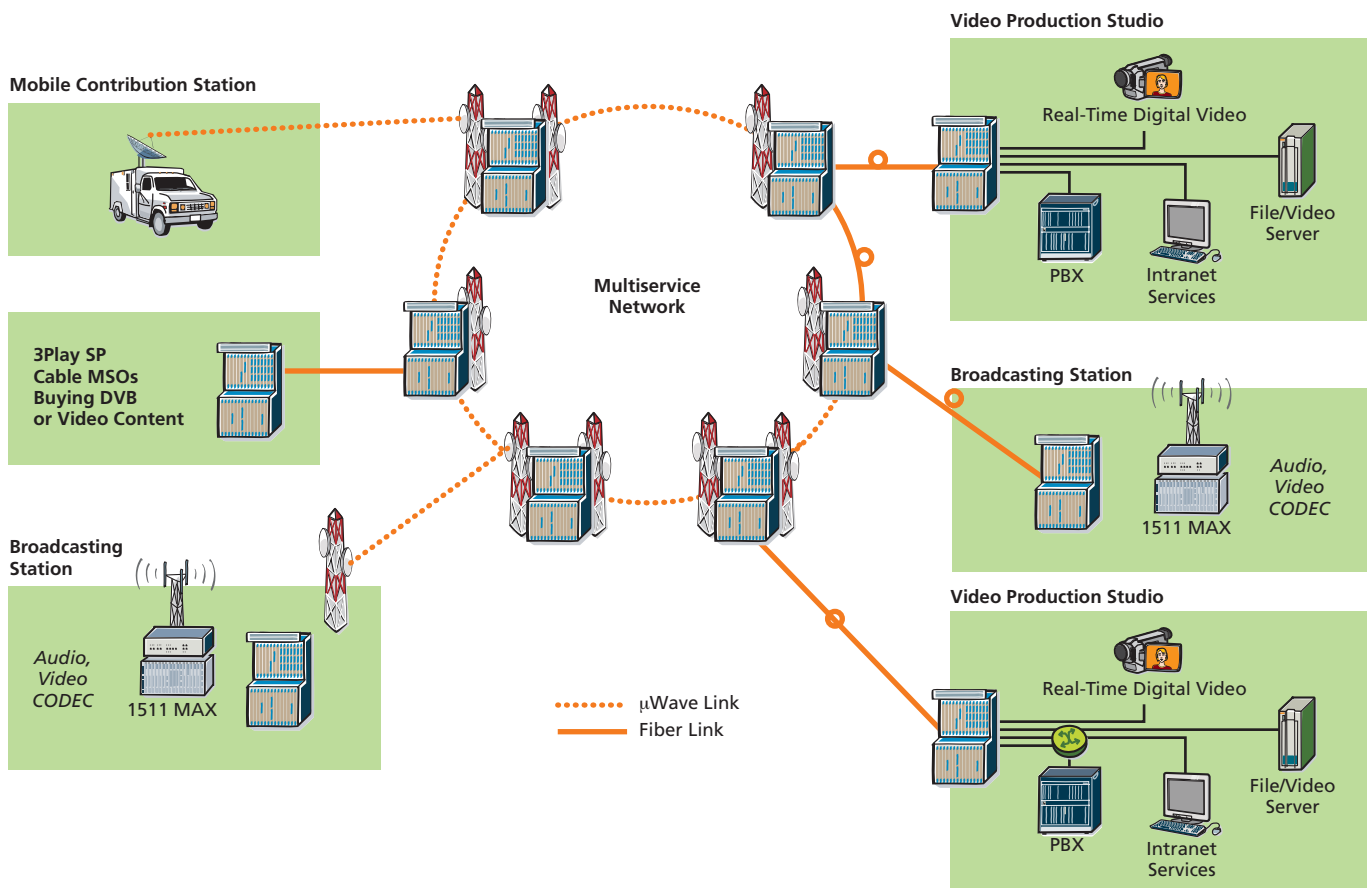


# Digital TV and Radio Broadcasting



Broadcasting operators are investing in the migration from analog to digital TV and radio broadcast systems. At the same time, they upgrade their transmission network to a highly reliable network. A broadcasting network typically consists of a contribution network (from mobile or regional production studios to a main production/play-out studio) and a distribution network (from the play-out studios to the digital TV (digital video broadcast-terrestrial [DVB-T]) and radio (digital audio broadcasting [DAB]) broadcast transmitters. The Alcatel-Lucent 15xx Business Access portfolio is often used to flexibly drop and cross-connect channels to particular (regional) broadcast transmitters, and to control TV and radio coders/decoders (codecs).

Figure 6. Alcatel-Lucent 15xx Digital TV and Radio Broadcasting Application



## Fixed Service Provider

A few applications that address the needs of service providers for high reliability and proven technology in their wireline and wireless networks are described here:

- Private line/leased line
- Mobile aggregation and backbone networks
- Enterprise access services
- Voice and data convergence
- Flexible small-to-medium enterprise (SME)/ multi-tenant units (MTU) access distribution and aggregation
- Signaling System No. 7 (SS7) signaling transport



# Private Line/Leased Line

One of the main applications of the Alcatel-Lucent 15xx Business Access portfolio is private line/leased line services (shown in Figure 7), which allow the service provider to offer customers customer premises equipment (CPE) that is connected into the network to backhaul data from the remote site to the headquarters. Often, this is used for LAN-to-LAN or LAN-to-host connections where the remote site is accessing database information, headquarters-controlled applications, and the Internet. The Alcatel-Lucent 15xx Business Access portfolio can be used in voice, data, or integrated voice and data networking, and may be deployed in point-to-point, point-to-network, and point-to-multipoint topologies.

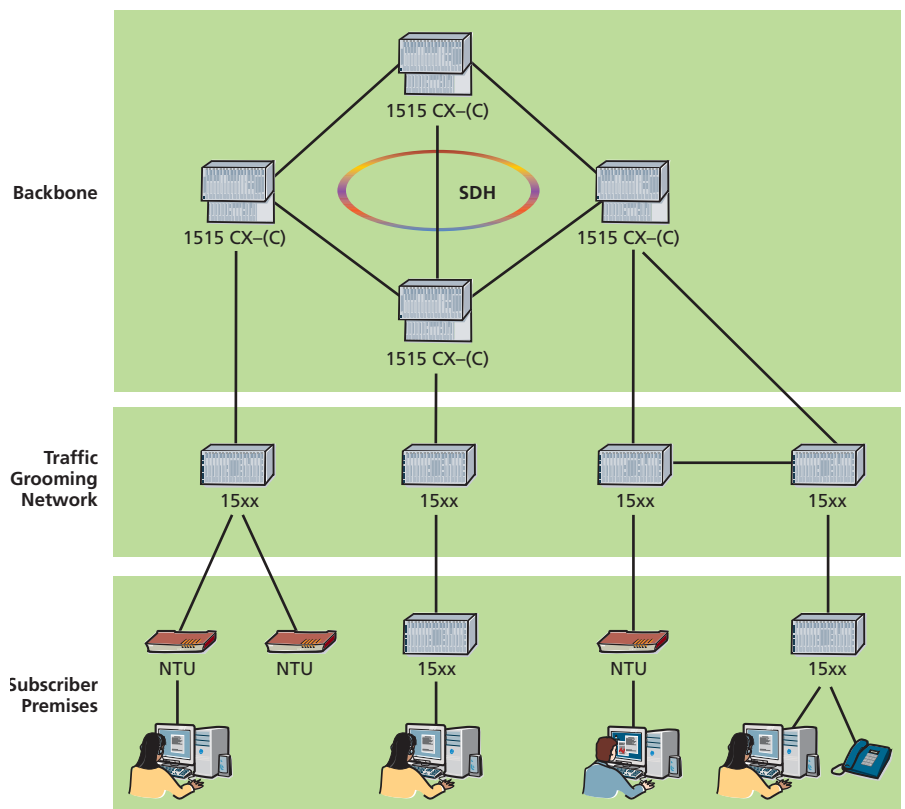
Benefits of this type of configuration include centrally controlled firewalls, version control of applications, and control of Internet content and access speeds.

Figure 7 depicts a typical leased-line network requiring business site connectivity. Common requirements include dedicated voice services, data terminal-to-server connections, and remote LAN connectivity. Bandwidths among the various

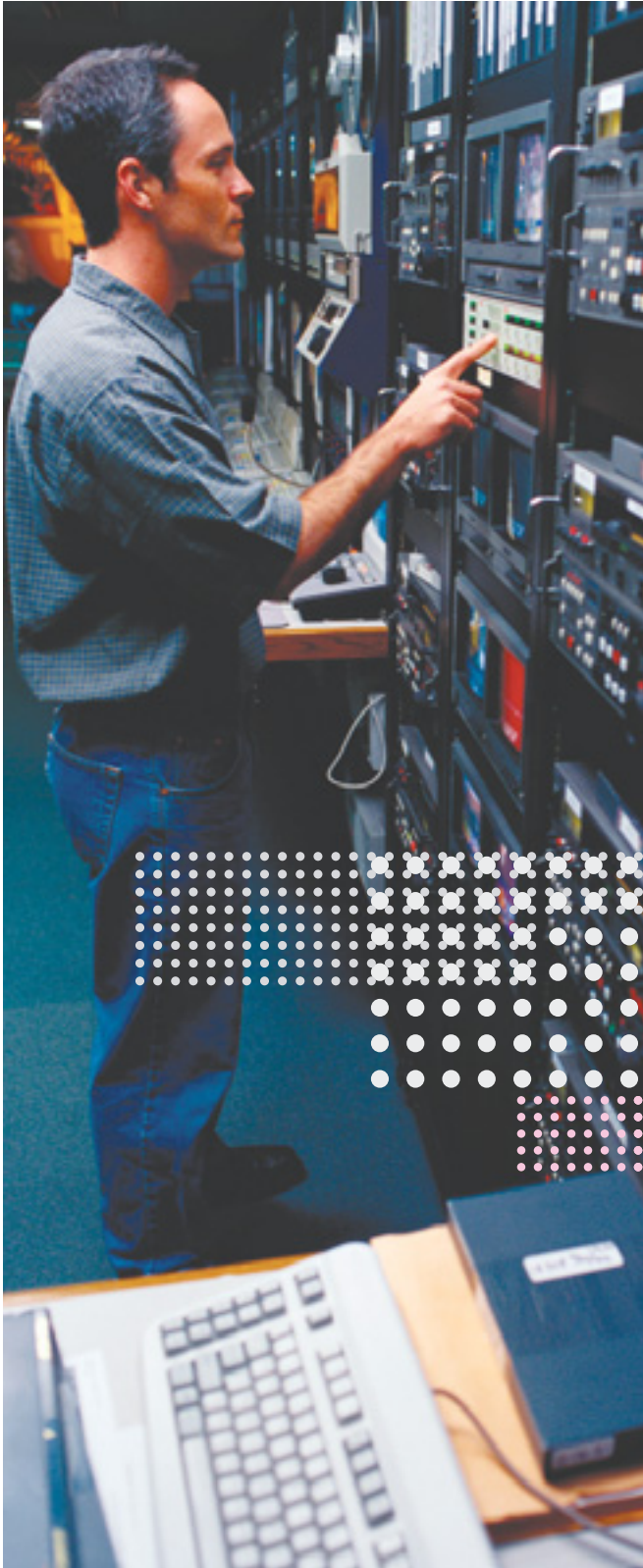
locations are leased from telecom carriers. These lines are connected to the local point of presence (PoP) within the enterprise network. SHDSL, which is fast becoming a dominant standard for private line and leased-line applications, provides low latency, guaranteed bandwidth and low cost through a standardized protocol. The Alcatel-Lucent 1511 BA Business Access multiplexer offers a fully managed,

end-to-end SHDSL solution that further lowers service providers' costs through superior service provisioning, performance monitoring, and service level assurance (SLA) capabilities. The SHDSL solution may be deployed with a CPE that is compatible with the SHDSL standard, enabling a migration path for carriers to offer symmetric DSL services to their customers.

Figure 7. Alcatel-Lucent 15xx Leased Line Application



# Mobile Aggregation and Backbone Networks



The Alcatel-Lucent 15xx Business Access portfolio offers the opportunity to take advantage of the aggregation and backbone network support requirements of mobile networks.

Figure 8 illustrates how, in a 2G mobile network, the Alcatel-Lucent 1511 BA or the Alcatel-Lucent 1511 MAX is used to consolidate and groom voice and low speed data traffic from many base transceiver station (BTS) sites onto an aggregate E1 for transport to the mobile switching center (MSC). The Alcatel-Lucent 1511 BA and the Alcatel-Lucent 1515 CX or Alcatel-Lucent 1515 CX-C have a fully interconnected, non-blocking switching matrix that allows connection of incoming, underutilized BTS E1 lines to be switched to any time slots on the aggregate E1 going to the MSC. One of the strengths of the Alcatel-Lucent 1511 BA is its ability to switch down to the E0, and to 800 b/s granularity when certain resource cards are present.



The same equipment can also be used to backhaul BTS traffic over fiber or by using SHDSL over copper wires, protecting equipment investment. The compactness of the CPE equipment even allows it to be deployed in an outdoor BTS.

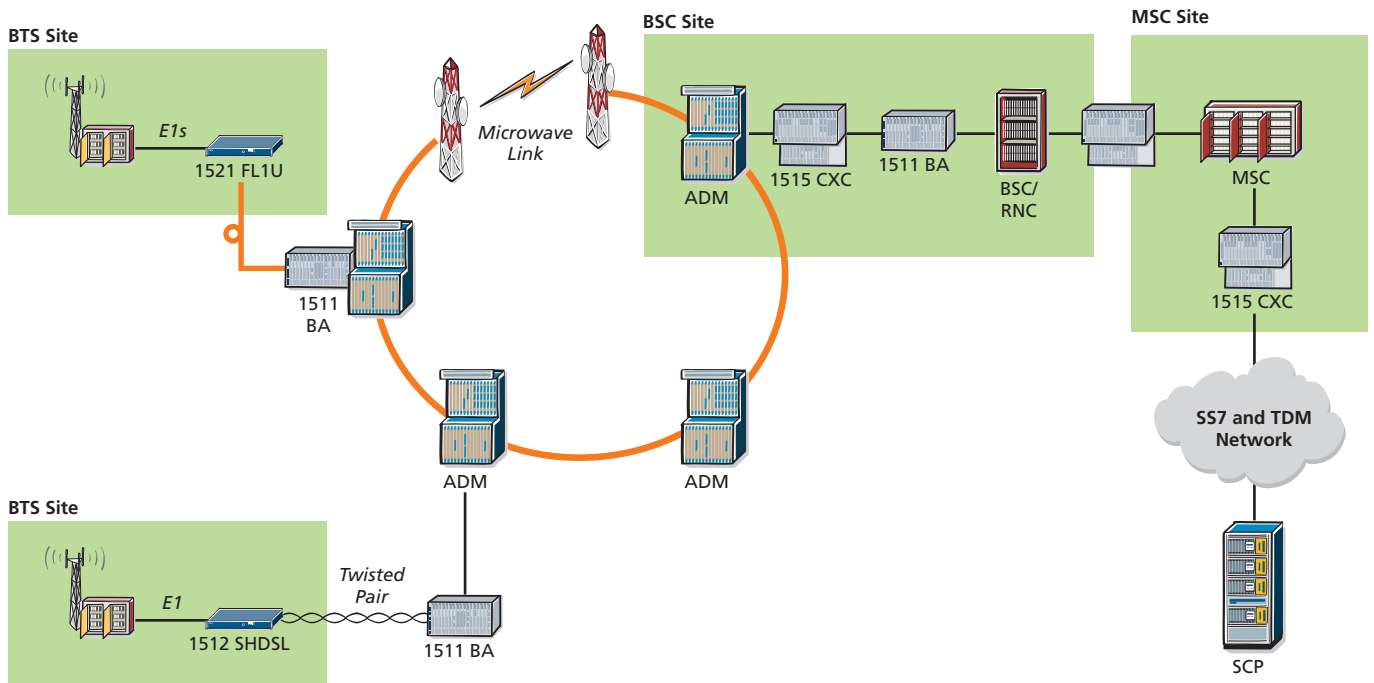
If optical fiber is available, the Alcatel-Lucent 15xx can offer an alternative solution based on the Alcatel-Lucent 1521 FL (4 x E1), Alcatel-Lucent 1521 FLIP (4 x E1 plus 4 x Ethernet) or Alcatel-

Lucent 1531 FL (16 x E1) optical modems at the BTS/Node-B site (indoor or outdoor) and the Alcatel-Lucent 1521 FL/1531 FL sub-rack equipment (star configuration). The latter is either co-located to a first level aggregation node or to the BSC/radio network controller (RNC). A second fiber optic line can be used for protection (1+1). In alternative applications both terminals can either be housed in sub-racks (tree configuration) or both can be housed in the desktop

units (point-to-point configuration). The sub-rack solution can accommodate a mixture of the Alcatel-Lucent 1521 FL and Alcatel-Lucent 1531 FL.

Equally TETRA, UMTS, CDMA or WiMAX base stations can be backhauled using the Alcatel-Lucent 1521 CLIP/Alcatel-Lucent 1531 CLAS over bonded copper pairs.

Figure 8. Alcatel-Lucent 15xx Aggregation of Voice of a 2G Mobile Network



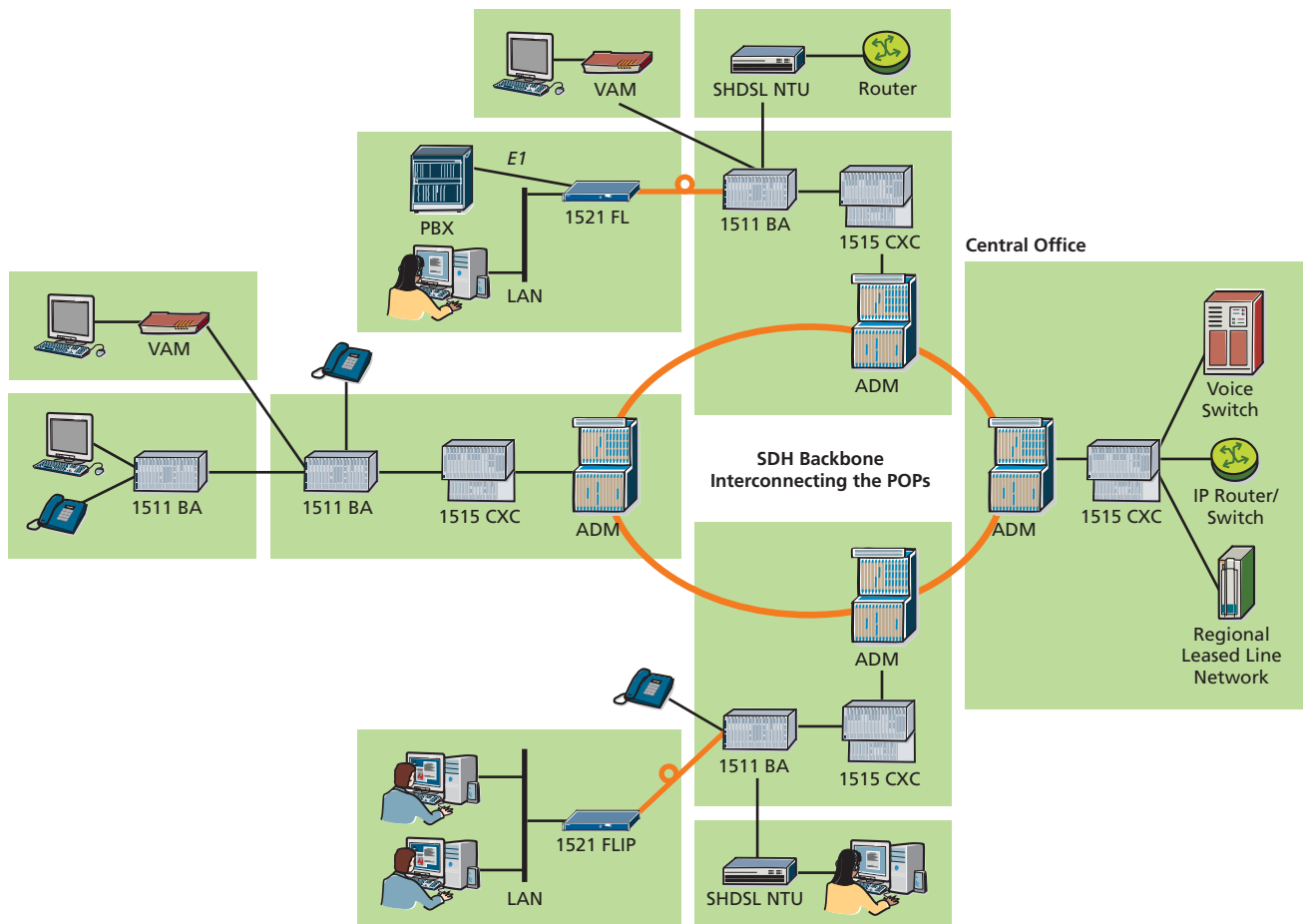
# Alcatel-Lucent's Multiservice Access – Flexible SME/MTU Access, Distribution and Aggregation



Reliable and flexible access to remote sites — whether small office/home office (SOHO), small and medium enterprise (SME) or multi-tenant unit (MTU) — is a fundamental requirement in every public network.

As illustrated in Figure 9, the Alcatel-Lucent business access portfolio supports a wide range of scalable, cost-effective solutions that support traditional E1, voice, data and combined voice and data services. Usually the backbone consists of a protected synchronous digital hierarchy (SDH) ring, interconnecting the central office with some PoP. Plesiochronous digital hierarchy (PDH) fiber, SHDSL copper and integrated services digital network (ISDN) copper transport are used to access the remote small- and medium-sized business sites. The meshed network of Alcatel-Lucent 1515 CX-C cross-connects located in the PoPs adds the required flexibility to the network.

Figure 9. Alcatel-Lucent 15xx Flexible SME/MTU Access, Distribution and Aggregation



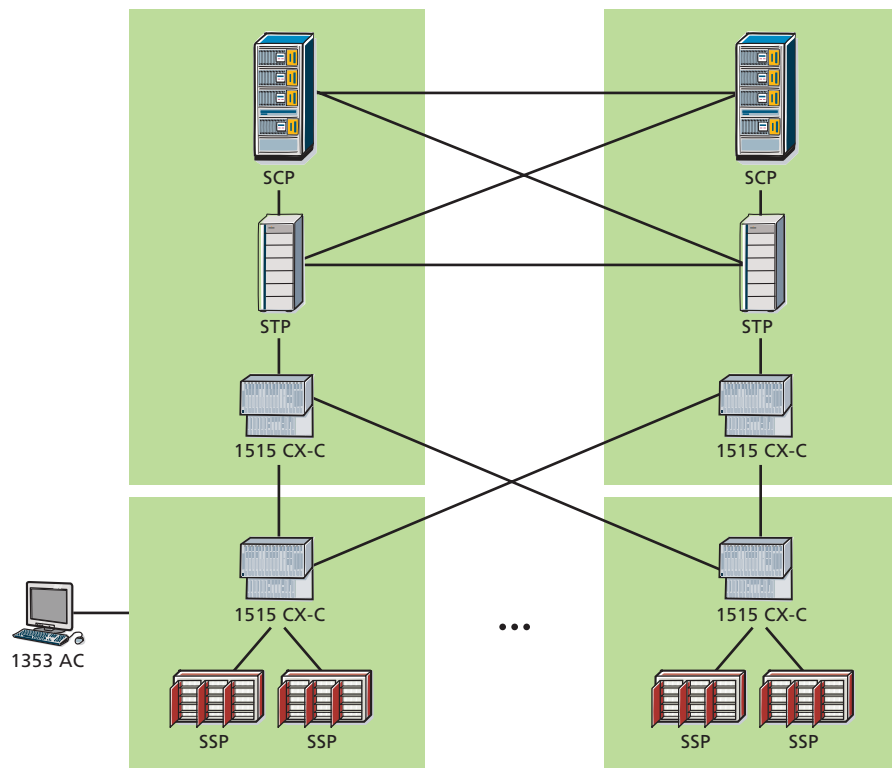
# SS7 Signaling Transport



All basic and advanced services rely on SS7 networks, which carry signaling for all landline and mobile telephone service providers. The SS7 network is the basis for transporting information that service providers use for billing. It is mission-critical, demanding the highest standards in reliability and maintainability.

The Alcatel-Lucent 1511 BA multiplexer and the Alcatel-Lucent 1515 CX/CX-C cross-connects, offering a wide variety of user interfaces, have proven to be reliable in SS7 networks around the world. Figure 10 shows the Alcatel-Lucent 1515 CX-C SS7 application in a wireline environment.

Figure 10. Alcatel-Lucent 15xx Wireline SS7 Application



*The Alcatel-Lucent 15xx business access portfolio addresses the mission-critical needs of wireline and wireless service providers as well as private network operators.*





**Table 2. Alcatel-Lucent 15xx Business Access Portfolio Applications, Architecture and Interfaces**

PRODUCTS	1511 MAX	1511 BA	1515 CX-C	1515 CX	1540 LL	1521 FL	1531 FL
<b>UTILITIES APPLICATIONS</b>							
SCADA (telecontrol, telemetry, etc.)	✓	✓	✓	✓	✓	✓	✓
Teleprotection	✓	✓	✓	✓	✓	✓	✓
Passenger/Public Information Display	✓	✓	✓	✓	✓		
Public Address/General Alarm	✓	✓	✓	✓	✓		
Voice	✓	✓	✓	✓	✓	✓	✓
Dispatching and conferencing	✓	✓	✓	✓			
Hotline and emergency communication	✓	✓	✓	✓	✓		
CCTV surveillance	✓	✓	✓	✓	✓		
TETRA/GSM-R backhauling and grooming	✓	✓	✓	✓	✓	✓	✓
VHF/UHF radio transport and grooming	✓	✓	✓	✓	✓	✓	✓
Linear add/drop networks	✓	✓	✓		✓		
PDH optical		✓			✓	✓	✓
<b>DEFENCE &amp; SECURITY APPLICATIONS</b>							
TETRA backhauling and grooming	✓	✓	✓	✓	✓	✓	✓
Microwave aggregation	✓	✓	✓	✓	✓		
Lawful intercept	✓	✓	✓	✓	✓		
Radar transport	✓	✓			✓		
Leased line/private line	✓	✓			✓		
<b>AIR TRAFFIC CONTROL APPLICATIONS</b>							
Microwave aggregation	✓	✓	✓	✓	✓		
Radar transport	✓	✓			✓		
TETRA backhauling and grooming	✓	✓	✓	✓	✓	✓	✓
<b>GOVERNMENT APPLICATIONS</b>							
Regional government	✓	✓			✓	✓	✓
Education networks	✓	✓			✓	✓	✓
Integrated communications solutions	✓	✓			✓	✓	✓
Multiservice consolidation	✓	✓	✓	✓	✓	✓	✓
<b>FINANCIAL APPLICATIONS</b>							
Financial dealer boards		✓					
Leased line/private line	✓	✓	✓	✓	✓		
Branch office networking	✓	✓			✓		
Voice and data convergence		✓					
<b>SERVICE PROVIDER APPLICATIONS</b>							
Private line	✓	✓	✓	✓	✓	✓	✓
Mobile aggregation, grooming and backhauling	✓	✓	✓		✓	✓	
Enterprise access services	✓	✓	✓	✓	✓	✓	✓
Voice and data convergence	✓	✓			✓		
Flexible SME/MTU access distribution and aggregation	✓	✓	✓	✓	✓	✓	✓
Leased line	✓	✓	✓	✓	✓	✓	✓
SS7 signaling grooming and transport	✓	✓	✓	✓	✓		
Add/drop multiplexing	✓	✓			✓		
Digital access and cross-connect (DACs)	✓	✓	✓	✓	✓		
Business-class xDSL access		✓			✓		
Managed data services	✓				✓		
Rural communication	✓	✓	✓	✓	✓	✓	✓
<b>GENERAL (MAXIMUM)</b>							
Number of universal card slots	19	15	8	64	17	12	12
Number of E1 ports	132	2	32	132	8		
Maximum speed	2,048 Mb/s						
<b>AGGREGATE INTERFACES</b>							
E3							✓
2,048 Mb/s E1 (CAS, CCS, 64 kb/s chan.)	✓	✓	✓	✓	✓	✓	

**Table 3. Alcatel-Lucent 15xx Business Access Portfolio Interfaces**

PRODUCTS	1511 MAX	1511 BA	1515 CXC	1515 CX
<b>VOICE INTERFACES</b>				
E1 CAS and CCS, R2D (E&M)	✓	✓	✓	✓
E&M	✓	✓		
FXS (LGS)	✓	✓		
FXO (LGE)	✓	✓		
MRD		✓		
U BRI		✓		
ISDN-So		✓		
GEN-GEN		✓		
LOOP-GEN		✓		
SHDSL		✓		
<b>DATA INTERFACES</b>				
RS-485	✓			
RS-422	✓	✓		
RS-232	✓	✓		
E1 G.703	✓	✓		
ISDN (for NTU/VAM connections)		✓		
64 kb/s G.703 co-directional	✓	✓		
64 kb/s G.703 contra-directional	✓	✓		
X.21	✓	✓		
V.35	✓	✓		
V.36 (V.10 & V.11)	✓	✓		
SHDSL		✓		
Sub-rate multiplexing	✓	✓		
Switching of compressed voice and data				✓
Voice conference bridging	✓	✓		
Multidrop PCM data bridging	✓	✓		
10/100Base-T Ethernet multiplexing	✓	✓		
10/100Base-T Ethernet bridging	✓	✓		

**Table 4. Alcatel-Lucent 15xx Optical Line Systems Interfaces**

PRODUCTS	1521 FL	1521 FLIP	1531 FL	1531 EL
Aggregates	Fiber optic links at: 1,310 nm 1,550 nm		✓	✓
			✓	✓
		E3 electrical		
Tributaries	E1 ports	4	4	16
	10/100Base-T Ethernet ports			4
	X.21	4		16

**Table 5. Alcatel-Lucent 15xx Ethernet First Mile Systems Interfaces**

PRODUCTS	1521 CLIP	1531 CLAS
Tributaries	10/100Base-T Ethernet ports	✓
Aggregates	Multiple SHDSL lines: 4 pair	✓
	8 pair	✓
	2BaseTL	✓

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