Alcatel·Lucent

Protecting Your Business, Service, and Time Critical Applications in a Cost-effective Way

By J. Walravens

Ensuring that business operations continue regardless of any circumstance is itself big business. Whether potential disruptions come as a result of natural disasters; sabotage (malware); technical failures in data storage or networking components; or service provider shortcomings, most organizations rely on their ICT infrastructure to ensure business continuity. However, there are some sectors of business and government where the loss of operational continuity doesn't just mean lost revenues or tarnished reputations: for some, it means lives and livelihoods placed in jeopardy.

Some sectors – such as energy, transportation, defense, government and certain areas within education, finance and healthcare – have an even sharper focus on the continuity of operations and business. In these environments, continuity is founded on not only service availability, but also on service *performance*, defined in terms of:

- The ability to transport and protect synchronization of time-critical information.
- The ability to protect and integrate a plethora of voice, data or service-critical interfaces.
- The requirement to guarantee throughput, delay and variations in delay.
- When networks fail, recovery times measured in microseconds, rather than hundreds of milliseconds or seconds.

Fueling the Energy Sector with Business-critical Services

The energy sector, which includes the production and distribution of oil, gas and electricity, offers an interesting case in point. The industry is under pressure to meet escalating demand fueled by economic growth. This is driving the process of exploration and extraction of new fossil fuel resources, some of them in distant locations and governed by politically unstable regimes.

The process of finding, extracting and transporting fossil fuels requires advanced applications like geophysical imaging and complex telemetry. Any downtime during production and transportation is financially damaging. So, if an anomaly is detected, that information needs to be sent to control systems as quickly as possible, with time-sequence information preserved and with absolute fidelity. These requirements are prompting investment in new, mission- and time-critical networking infrastructures.

Another key trend in the industry revolves around diversity and complexity. The days when a nation's energy needs could be provided by a relatively small number of large generating plants are fading. This means that there is a need for more telemetry to track and control more sites around the globe.

Finally, there is the re-emergence of the *utility-telco* as an attractive economic business model. Traditionally, utilities have built and owned their own copper and fiber telecom plants, taking advantage of the fact that the civil engineering costs (around 70% of total costs) can be amortized across their entire infrastructure build.

Today, the provision of broadband services to homes and business at speeds of 25, 50 or indeed 100 Mbit/s is challenging even the most adventurous, cash-rich telco. Utilities now have the chance

to play in this market, either by providing such services to smaller cities and towns (traditionally a long way down the telcos' pecking order) or by becoming a provider of passive infrastructure (ducts, masts, buildings, perhaps dark fiber) to the telcos. The re-emergence of the utility-telco model is driving new network investment.

The energy sector has a huge investment in highly optimized and reliable circuit-switched and TDM networks, which have uniquely provided the service performance demanded by specialized telemetry and control systems. That infrastructure is not easily replaced, and it now has to accommodate the aforementioned growth and change.

Accelerating the Transport Sector

The similarities between the energy and transport sectors are striking. Transport is equally reliant on mission-critical, time-sensitive telemetry in the form of signaling and traffic monitoring systems. Other communications systems are also important. These include trackside telephone systems, emergency phones at the roadside and communications between air traffic controllers. Just like energy, growth is a continued phenomenon, and investment in TDM systems is considerable.

Protecting the Homeland

Defense is a sector where lack of continuity in mission-critical ICT systems costs lives. There is a large installed base of legacy circuit-switched and TDM systems. These remain in place, not just because of their reliability in the transmission of mission-critical information, but also because they are almost immune to cyber attacks.

In summary, large sections of the economy and government take continuity of business requirements to a level well beyond that commonly understood within general commerce and need to support specialized signaling, telemetry and control applications. They typically have a large investment in circuit-switched and TDM systems, yet must accommodate growth and a technology migration path into the future.

Is the Future IP?

The extended family of protocols that we collectively call IP has transformed the economics and experience of ICT services and networks.

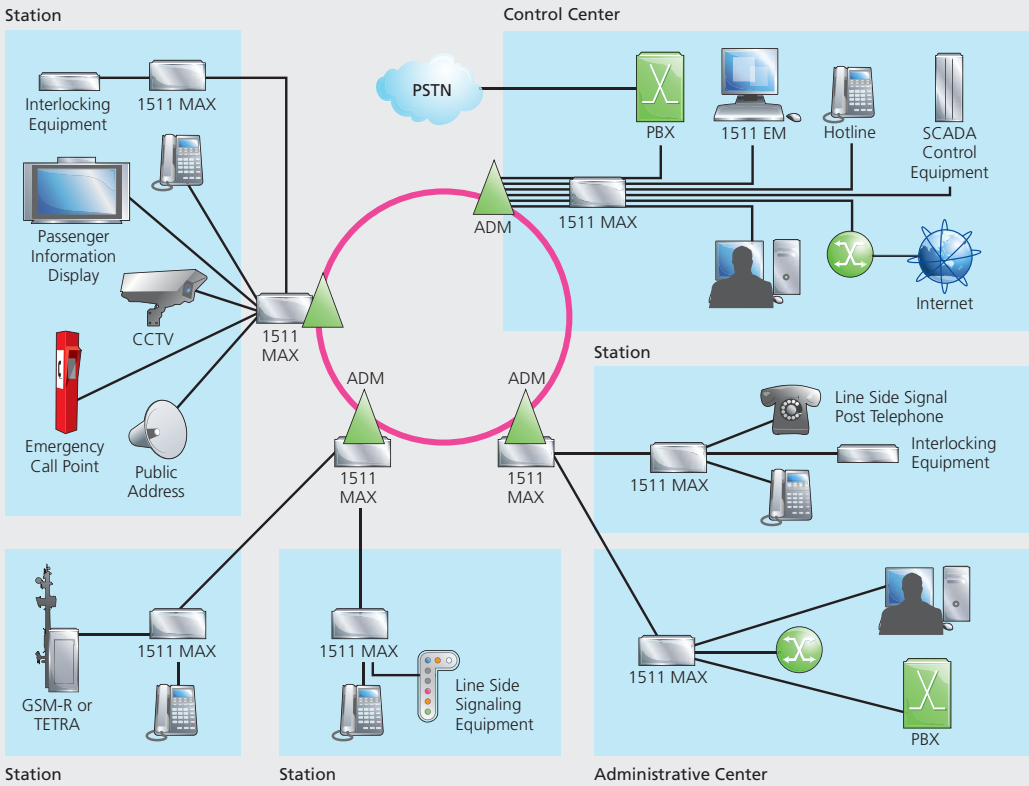
We know that IP networks will let us make telephone calls, stream videos and purchase goods and services. We also know that the cost of using those services is very low. Consumers and business customers will pay market rate for digital content, but the cost of transporting the data is negligible, regardless of distance. Although the Internet exaggerates the "death of distance" in network economics, all areas of business and government need to find a way to benefit from this new networking paradigm.

So what are the options for those sectors that demand the kinds of critical business continuity mentioned – while still leveraging the opportunities offered by IP? A pure IP network could be a decent choice and has its proponents within the sectors discussed. However, it is important to look at the behavior of pure IP networks under duress before deciding if they are a good fit for specific service-critical, time-critical and business-critical purposes. In this light, the pure IP network is not such a clear-cut decision. Consider this:

- The tougher you make things for a pure IP network, the less predictably it tends to behave. For instance, the higher the traffic load, the lengthier the delays and variations in delay. Although protocols like MPLS allow for 'class-of-service', that is not the same as underwriting a known and fixed delay on any particular network path. This is a serious concern for the kinds of critical telemetry and other network services discussed earlier.

Network Rail is responsible for all railway infrastructures in the UK, including tracks, signaling and passenger facilities. The railways are used by the UK's 30 independent train-operating companies to carry almost three million passengers every day, i.e. more than a *billion* passengers per year. As part of an extensive upgrade of network infrastructure, Network Rail has deployed the16xx OMSN and 1500 series Business Access solution (Figure 1).

Figure 1: **Support for mission-critical rail transport operations**



- There is no sense of centralized route control in IP networks. The routers interact autonomously to determine the logical network topology and alternative paths. That can be a great advantage, of course, but mission-critical networks need all paths vetted for suitability in advance.
- The time taken to fail-over to new paths – the so-called convergence time – can be as long as several seconds, versus the sub-250 milliseconds needed to make path outages undetectable by critical applications.
- There often needs to be central control and coordination of the "restore" from a backup path to the primary path, and again this is not easily achieved in a pure IP network.

So, when we behavior-test pure IP networks for this extra-demanding environment, there can be some risks in following this strategy. In addition:

- The cost and disruption of a 'rip-and-replace' strategy is much higher than a paced or phased migration strategy.

- There may well be interface types that the IP networking equipment don't yet support (e.g. specialist control systems like Supervisory Control and Data Acquisition – SCADA).
- The IP family is the most published, ubiquitous and best understood set of protocols ever; consequently, it is also the most easily and frequently attacked through both subtle and brute-force hacking techniques.

Abu Dhabi Water and Electricity Authority

The Abu Dhabi Water and Electricity Authority (ADWEA) is responsible for providing a safe, secure, water and electricity supply to the Abu Dhabi Emirates (within the United Arab Emirates). ADWEA has deployed a 1500 series Business Access solution as part of its commitment to increasing efficiency, reducing costs and improving customer service.

An Alternative Approach

Alcatel-Lucent, an IP networking leader for both service providers and vertical markets, realizes that a migratory, hybrid approach is the best way to deliver some of the benefits of IP and other new networking technologies while protecting customers' mission-critical needs.

The Alcatel-Lucent 1500 series Business Access portfolio has continued to evolve to incorporate technology innovation, while protecting past investments and current business continuity needs.

The IP-TDM 1500 series Business Access portfolio offers ongoing support for mission-critical and time-critical services while incorporating the benefits of IP networking. The approach is one of consolidation, integration and evolution, rather than replacement and revolution.

The 1500 series Business Access platforms have been field-proven in some of the most critical networks on the planet, sometimes under conditions of extreme duress. Against that background, they deliver 99.999% availability and, with a synchronous TDM core, offer cast-iron quality of service (QoS) regardless of network load.

The IP-TDM approach is inherently cost-effective. By preserving existing infrastructure and requiring incremental re-investment, return on investment (ROI) is significantly more attractive than the "total replacement" alternative. ROI is further amplified when the opportunity cost of total replacement is factored in.

Over the lifetime of a network, the operational costs can be even more significant than the capital outlay. A powerful network management station, harnessing circuit-switching intelligence built into every 1500 series Business Access platform, greatly simplifies and accelerates the process of service provision and re-provisioning, saving operational costs and securing service and application performance. The system calculates ideal paths with known QoS and creates alternative fail-over routes and policies in advance. This slashes network convergence times on time-critical or mission-critical applications.

Organizations and businesses in vertical markets worldwide rely on 1500 series Business Access platforms to support mission-, service- and time-critical applications while offering a way to take advantage of new technologies and services. Examples include Belgian Railways, Network Rail (UK) and ADWEA (UAE).

"Telecommunications are the nervous system of a railway network. If we are to transport passengers and freight in a secure, reliable and efficient way, then the transport of our data and voice should have the same qualifiers. As we are operating a modern signaling network, the data transported by our telecommunications network include Solid State Interlocking System command and signaling messages."

Frans Temmerman, Director Telecommunications, Belgian Railways Group

Continual Evolution

The 1500 series Business Access platforms will continue to evolve, further enhancing the value of current investments. Some recent examples include:

Ethernet First Mile

Ethernet is beginning to transform the access and metropolitan infrastructures of 21st-century public networks. The 1521 CLIP and 1531 CLAS products add Ethernet capability to private networks, utilizing traditional copper pairs as the transmission medium.

Teleprotection

Teleprotection systems maintain the integrity and continuity of power distribution networks. By supporting industry-standard teleprotection interfaces, 1500 series solutions extend IP-TDM multi-service platform benefits to the most mission-critical elements of the power utility network. As an example, support for the IEEE C37.94 interface renders teleprotection signals within substations immune to electrical and radio frequency interference.

SCADA

With Ethernet support, SCADA systems can now also inter-connect with newer Remote Terminal Units or Programmable Logic Controllers alongside more traditional interfaces.

Conclusion

In some sectors, business continuity affects not just brands and profits, but lives and livelihoods. For some organizations, the continuous availability of mission-critical and time-critical applications cannot be a "best-effort" scenario. An IP-TDM solution allows such organizations to take advantage of the benefits that IP networking can deliver, while continuing to ensure 99.999% availability and investment protection. The Alcatel-Lucent 1500 series Business Access portfolio is an ideal candidate for the role. ▸▸

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