Programmable networks

Introducing a new kind of network

Executive summary

Today it is customary to talk about digital disruption and its impact on businesses. Businesses are categorised as being either disrupters, having to adapt to disruption, or a victim of disruption. According to Telstra research, over three-quarters of Australian organisations consider themselves threatened by disruption[1].

Yet such is the pace of change that businesses must go beyond reacting to it or risk falling behind. Organisations and their leaders must understand how digitisation is changing the creation and consumption of services, what impact that has on their current model, and prepare for what comes next.

The life-cycle of business models is growing shorter and there are multiple possible futures. What we see working well today, including our technology and networks, may not suit our needs in even just a few years' time. A constant stream of transformative companies are emerging and winning business based on their ability to meet ever-changing user expectations.

More than ever before, organisations need to connect to and experiment with different services and applications simultaneously whilst also ensuring day-to-day operations maintain high standards to meet ever growing expectations from customers, staff and partners.

[1] Telstra Digital Transformation White Paper

The network is the architecture that facilitates the growth of transformative technologies.

Organisations' information technology (IT) must support business ambitions, whether that is connecting to new markets and customers, enabling innovation, or optimising operations to improve efficiency and drive growth. In the future, intelligent, high bandwidth and low latency managed networks will be even more critical.

Traditional networking approaches featuring lengthy, rigid provisioning processes, capital intensive upgrades, and complex management requirements will not be up to the task. In order to prepare organisations for the changing demands in today's markets and deliver better experiences across their business, their leaders need to adopt IT that is **agile** and **responsive, flexible** and **configurable, automated** and **easy to manage**.

We see a new type of networking infrastructure and services becoming dominant as organisations seek to develop and maintain a competitive advantage in a disrupted world.

A programmable network is a new kind of network that can adapt quickly, learn to improve its own performance, and evolve with the organisation. It will be a step change in the efficiency, flexibility and speed with which organisations order and manage their network services and infrastructure.

The defining principles of a programmable network

There are five principles that define the next generation of networks. To meet the requirements of the programmable networks vision, organisations must have:

Programmability that empowers organisations to provision, configure, integrate and manage a variety of services such as cloud, managed services and network infrastructure in near real time.

Analytics-driven intelligence to monitor and prioritise traffic from the network edge to the core, optimising applications performance, and enable the network itself to add value to the business.

The ability to foster **global ecosystems** to power business competitiveness through connectivity and the delivery of virtual services across all network sites.

The power to **transform enterprises' IT experiences** by enabling organisations to respond to changing demands by accessing and consuming network services through flexible approaches including DIY self-service portals, APIs or as a managed service, that suit their business.

Flexible, **consumption-led commercial models** that offer transparency on costs and the ability for organisations to manage contracts for services on timeframes that suit them.

The organisations that will be most successful in the future will be those that prepare the best for the different possibilities they face. They will be organisations that fully leverage all the opportunities of programmable networks to help to empower their growth.

Digital Disruption

Are you disrupted or disrupting?

We are at the beginning of what the World Economic Forum terms the 'fourth industrial revolution'. The mass adoption of digital technologies in nearly every aspect of consumer and business life has initiated disruption of unprecedented pace and scale.

As digitisation transforms established markets and creates new ones, the shifting balance of global economic power is making the ability to reach, and compete, in new markets essential.

As emerging markets grow in importance, we may well see regions such as Asia produce more disruptive companies using technologies and business models honed in their domestic market but deployed globally.

Despite the major disruption already experienced, we are yet to the see the full effect of a series of transformative technologies that are only just reaching scale.

Machine learning and **artificial intelligence** will completely transform our connections with each other, with brands and organisations, and with our technology. **Affective computing** will enable deeper personalisation of services and responsiveness. **Always-on conversational systems** will deliver constant virtual interactions with uses from consumer-grade personal assistants through to enterprise and heavy industry use.

The widespread connectivity of 'things' including cars, drones and passive sensor devices will broaden out the concept of **Internet of Things** to more accurately reflect the internet of everything. Workplaces will be revolutionised, dramatically enhancing the need for smooth user experiences across multiple technology types, as well as the importance for collaboration with partners, peers and even competitors.

Even conservative predictions of these technologies' effects shows disruption is not a 'phase' to be survived, it is the new normal. The lifecycle of a Fortune 500 company in the 1950s was 75 years; now it's 15 and it may get shorter still. The underlying trend that business strategists need to address is the faster turnover of business models. Previously successful models can be upended almost overnight now. Businesses that thrive are those embracing a world of rapid experimentation that allows them to innovate fast and frequently.

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Today's challenges multiplied

How ready are you to meet business transformation goals?

IT teams within organisations already find it difficult to meet their business' expectations. Telstra's recent report *Disruption, Digital Transformation and Effective Technology Strategy* showed that 55 per cent of MNCs were dissatisfied with their IT's ability to support disruption and business transformation goals. **Nearly 90 per cent of companies stated their business goals and performance also suffered due to telecommunications network problems.**

As more transformative digital technologies reach the mainstream, the challenges facing CIOs and IT managers will become more acute if they choose to remain status quo now.

Capacity demand: bursting at the seams

The growth of bandwidth-intensive applications is driving massive demand for capacity. Data volumes are already up 500 fold over the past 10 years. It will continue to grow as technologies such as virtual reality, augmented reality and the Internet of Things become mainstream. Global network capacity requirements are expected to reach 2.3 zettabytes (1 zettabyte is about 1 billion terabytes) by 2020 (Cisco4), yet only 20% of the network capacity we will need in 2020 exists today.

The traditional provisioning model is out-of-date in today's world of spiky, elastic capacity demands. On an organisational level, IT managers are already finding that provisioning bandwidth on a linear basis is an unsuitable strategy. It can take up to three months to provision a single private WAN connection at a branch office. However, demands will 'burst' or spike as new applications are launched or data is backed up. Inadequate capacity at these times will lead to poor user experiences with knock-on negative effects on satisfaction, loyalty and revenues.

> ## Today's customers reward or punish companies based on a single experience — a single moment in time.

Forrester 2017 Technology Predictions

Adding extra capacity to deal with surges using traditional methods leaves the organisation paying for unwanted spare capacity when demand reduces to its usual levels.

Today, many businesses are changing the way they work, offering flexible arrangements designed to motivate staff and increase productivity. As part of their future workplace strategies, 62% of firms see mobile/ remote working from home (or while travelling) as a work style that their organisation will support over the next 12 months; and almost half (47%) will support activity-based working (ABW)[2].

Workforces and partners: diverse and dispersed

Evolving mobile ecosystems are demanding organisations look at new ways to provide secure access to applications and email. Firms have to acknowledge that staff and partners use a mixture of devices and access technologies, not all of which are in use by the organisation itself. Research shows that more than half of 'Gen Y' employees will contravene IT policy to work on their personal devices[3] because doing so 'empowers' their productivity.

Furthermore, businesses need to collaborate with external partners more than ever to succeed. In its 2017 CIO agenda report, Gartner states that 'top performing' companies are those likely to be participating in, and creating, digital ecosystems. Over two-thirds of organisations believe that companies going it alone (without digital partnerships) will soon be a thing of the past and almost half believe such partnerships have "greatly" enabled their organisation to achieve the benefits of digital transformation.

Stephen Miles, CTO of CA Technologies sums it up: "It's a new world and there are no best practices to draw upon. Leaders therefore try innovative approaches, which includes collaborating and co-creating with other businesses." [4]

Organisations need to empower secure and fast connections to various networks of staff and partners to deliver better experiences and realise the benefits of collaboration. Yet many are held back by legacy systems and bottleneck hub-and-spoke infrastructure.

[2] Disrupted or Disrupting? Fast Track Your Future, Telstra / TRA 2016

[3] http://www.zdnet.com/article/gen-y-employees-will-break-byod-rules/

[4] Connecting Capabilities, Economist Intelligence Unit and Telstra, 2016

[4] Cisco Visual Networking Index, Cisco, 2016

Mix and match technology

Businesses today are making use of multiple applications to increase their productivity, each with different requirements and are hosted on multiple clouds. This results in the IT teams having to purchase, configure and maintain multiple connections. Traditionally, these connections are also based on fixed and rigid contracts that locks in businesses.

Combined with existing systems and line-of-business specific requirements, there is a complex mix of platforms that need to be integrated and managed efficiently. This will become more challenging as new machine learning and IoT technologies become available.

Demand up, resources down

These challenges are framed within the context of tight budgets. Research shows that 73 per cent of organisations in Asia Pacific have either no plans to increase, or will decrease, spending on network services in the next 12 months[1]. When IT teams must ensure high levels of application performance without extra resources to meet demand, they must look to drive efficiency throughout their operations.

Security in the World of Things

The maturation of Machine-to-Machine and Internet of Things technologies, complete with the exponential growth of connected devices, will pose significant challenges. How do organisations secure their data when they don't have sight of, or control over, the vast number of entry points to their network? More organisations are being successfully targeted by cyber security attacks than ever before[2]. Traditional approaches to security are already failing, as the recent hacks of connected webcams, DVRs and games consoles can attest. How well organisations respond to this challenge may well be an indicator of how successful they will be in the future.

A new, adaptive security model is needed.

[1] Ovum Asia Pac Market Sizing Survey, 2016.
[2] Telstra Cyber Security Report, 2017.

Programmable networks

Redefining how organisations will create, consume, and adapt connectivity

Technology is changing the world every day and organisations need a network that can keep up with it. **A new kind of network**, to adapt quickly, learn to improve performance, and evolve to suit business needs. A network that helps them deliver better experiences and seize opportunities as they arise.

What if you could deploy virtualised network services around the world at the click of a button? What if you could connect to private and hybrid clouds with set security policy controls and customise your network topology to suit your business, within minutes?

Programmable networking is a new approach to delivering IT that will enable businesses to embrace digital transformation and quickly respond to customers and changing market dynamics with next generation agility, flexible consumption of services, and automated provisioning of network services.

The defining principles
of a programmable network

There are five defining principles of a programmable network. CIOs and IT managers can use these principles to evaluate their own networks, and determine how ready their organisation is for the next wave of digital transformation.

1 Programmability

Organisations will need to provision, configure, integrate and manage a variety of services such as cloud, managed services and network infrastructure on a much shorter timeframe than they do currently. They will also have to do so dynamically as application demands on the network shift rapidly.

In this environment, high performing IT infrastructure and services have orchestration built into their cores to create, automate and provision services in real time across compute, storage and network functions. Much like cloud, programmable networking will leverage APIs and emerging software defined networking (SDN) and network function virtualisation (NFV) technologies to do the same.

With the mass adoption of cloud computing, these networks will also provide organisations with simple, secure access to multiple cloud services - including hybrid public-private cloud, SaaS, corporate WAN, and internet.

Software defined WAN networks can already aggregate the public internet with private IP VPN to securely connect their users to multiple cloud services. This allows organisations to prioritise their data traffic on each transport layer according to their needs and is able to failover to the next best performing route should any layer be disrupted.

SDN and NFV will provide enhanced through-put without adding complexity, enabling managers to easily manage diverse network and IT services across wide area networks, regardless of the WAN size or site numbers. Another benefit that NFV brings is the speed of deployment and commercial benefits. Being a virtualised appliance, provisioning of the service can be achieved quickly while customers need to only pay for what they use, reducing CapEx costs.

For businesses, orchestration will empower them to quickly add new services and capabilities to deliver better end-user outcomes without significant infrastructure upgrades or expansion in network budgets.

The defining principles of a programmable network

2 Analytics-driven intelligence

The next generation of networks will have data analytics at the core to gather network intelligence, monitor traffic flow and performance, identify trouble areas to better manage demand for service availability, and quickly allocate new routes for traffic. This analytics-driven intelligence will enable IT teams to automate processes and dynamically manage bandwidth demands and data flows, enhancing performance and delivering better end-user experiences.

Traditional network architecture connects a to b, but the tomorrow's business world requires the network itself to do more.

Programmable networks will draw intelligence from the network edge to the core to provide businesses with insights about application use and network management that deliver efficiencies, shape decision-making, and create scope for continued business transformation.

3 Global ecosystem enablement

Traditional infrastructure can inhibit businesses from leveraging internal and external networks because connecting with staff, partners, customers and providers can be complex, inefficient and affected by security concerns.

Networks must empower businesses to drive value from their distributed networks in a number of ways. First, programmable networking will have the right global reach to connect organisations to their stakeholders, and deliver network products and services in a consistent manner, on a global scale. The network should not limit an organisation's choices of ecosystems, but enable organisations to seamlessly connect to partners and customers simultaneously.

Second, they will enable the rapid deployment of secure access to public cloud services such as AWS or MS Azure through flexible bandwidth private connectivity, or secure internet through to SaaS applications (e.g. Office 365, Salesforce.com, Cisco Webex, etc).

Third, a virtual network function marketplace will make it possible to deploy, configure, and change virtualised appliances like routers and firewalls from multiple hardware vendors. This new type of network would create an ecosystem in its own right as transformative innovations can be developed and distributed to more places, quicker.

Fourth, they will be compatible with mesh technologies to share automatically the data collected through IoT devices between multiple parties.

Lastly, a programmable network will use adaptive security and virtualised functions such as firewalls to ensure the integrity of an organisation's diverse and distributed network.

The defining principles of a programmable network

4 Transform customer experience

Today, provisioning processes can take weeks or months. When business imperatives change rapidly, organisations need an agile and responsive network.

Next-generation networks will offer enterprises true on-demand services and capacity. After connecting to a programmable network, organisations will have the ability to define the network they want in near real time. IT managers will be able to procure capacity at the speed they require through self-service portals, APIs (to create additional functionality) or as a managed service, doing away with legacy provisioning, They can program custom configurations for their sites, including bandwidth and security policies, and divert traffic to the most economical route to maximise network investment.

This will empower businesses to spin up applications and services quickly and with little or no capital cost, and transform the way they create, manage and adapt connectivity.

High capacity networks will ensure a fast, reliable and always-on customer experience.

The one certainty about the future is that the generation of, and demand for, data will continue to grow. Fast, high capacity, and robust infrastructure, using a range of access technologies - IP VPN, LTE and 5G mobile networks, public internet – will be necessary to meet different application demands efficiently. The leading service providers are investing heavily in faster, higher capacity, cables; shortest-path data centre interconnections; extensive content delivery networks; and peering arrangements with other high-performing networks to ensure organisations can deliver transformative experiences.

5 Consumption-based commercial models

The self-provisioning approach will be supported by flexible commercial terms. Service providers will offer consumption-based models that give customers transparency on costs and the ability to manage contracts on timeframes that suit them. Customers will only pay for what they use, and be able to set-up automated alerts to be informed of usage and avoid incurring unpredictable costs.

The promise of programmable networks

Adapt quickly, learn to improve performance, and evolve to suit your business

The core purpose of any network is to enable an organisation to achieve its goals. Addressing the challenges that will face businesses requires a network that empowers businesses to deliver better outcomes in five areas.

A better end user experience

Accessing innovative new applications, and delivering a high standard of performance, is vital for a good end-user experience. Fast, efficient connectivity drives customer engagement and satisfaction, staff productivity, and ultimately revenues.

Deliver transformative innovation

A new kind of network will enable organisations to maintain business-critical functions while creating space for innovation and experimentation. Agile and flexible provisioning of capacity will enable businesses to pioneer new initiatives, develop new services and seize new opportunities without fear of undermining existing operations.

Reach new markets

With the ability to scale quickly businesses can reach new markets and connect to new customers fast and at low cost. Organisations can deliver consistent experiences to their users and reach new customer segments with new products and services.

Optimise operations

Organisations can streamline operations by configuring services and infrastructure to suit their needs, automating processes, and moving commodity technology infrastructure to a managed environment, enabling IT to focus on supporting business growth and innovation. Businesses can free up capital for strategic initiatives by cutting out CapEx IT investments and moving underlying technology and personnel costs off balance sheets.

Data security

The cost of cyber-attacks is predicted to reach $2.1 trillion globally by 2019[1]. In 2016, 59% of Asian businesses experienced a cyber security incident on at least a monthly basis[2]. Businesses can rely on their network and managed services to keep security measures up-to-date and help ensure data is protected. Instead of building their own security team, businesses should leverage the scale of world-class security operations by service providers to identify and mitigate hostile attacks.

[1] https://www.juniperresearch.com/press/press-releases/cybercrime-cost-businesses-over-2trillion
[2] Telstra Cyber Security Report, 2017.

The pathway to programmable networks

Seize the opportunities of the digital age

Our vision

Telstra is committed to a long-term strategy that will enable enterprises to deliver transformative experiences through network programmability and intelligence. The Telstra Programmable Network represents a paradigm shift in the way businesses will be able to order and manage their ICT service environment. Delivered over one of the fastest and highest capacity networks in Asia Pacific, it will empower organisations to seize the opportunities of the digital age by helping them become more responsive to changing customer and market demands.

Our current solutions and forthcoming innovations are grounded in the defining principles outlined above, and we continue to work on extending our Programmable Network capabilities.

As it evolves, Telstra's Programmable Network will provide a growing range of network, managed service, security, cloud and application services that can be ordered and managed via a portal with a single unified view, or by customer systems interfaced via APIs. The range of services will be extensive and include services delivered from our platforms, plus complimentary third party infrastructure services.

The following solutions form part of the current programmable network and represent opportunities for businesses to begin adopting a new generation of network services and infrastructure.

Data Centre Interconnect

Data Centre Interconnect gives organisations the freedom to move at will between selected data centres across the globe by connecting them to a global network of private and hybrid clouds on demand using SDN.

Cloud Gateway

Cloud Gateway is Telstra's simple way to connect multiple clouds, and create a hybrid environment. It enables organisations to simply and securely connect to one or more cloud environments, via a single, intuitive portal.

Tailored SD-WAN

Telstra's Business Technology Services team can create custom SD-WAN services built using leading technology from partners such as Cisco, Steel Connect, Viptela, and VeloCloud. This enables organisations to securely enhance their WANs with Internet connectivity and private IP VPN connections, providing more control, and enable the dynamic routing of traffic for each business application to the best available path and experience for end users.

Final word

The challenges of digital transformation facing businesses are significant, and will continue to test organisations into the future. The challenges facing businesses in the future state are significant. Ways of working will continue to evolve rapidly. Business models that are currently disrupting markets will themselves be disrupted. The expectations of customers, staff and partners will continue growing.

Yet these are broad brush strokes; it is impossible to predict with certainty the precise factors, innovations and trends that will shape a business's fortunes. It is also unwise to settle on one strategy based on one view of the future. Success will no longer be about changing strategies more often, but about having the agility to execute multiple strategies and models concurrently (Pierre Nanterme, CEO of Accenture).

Unlike traditional networking approaches, the next generation of programmable networks won't limit the scope of businesses' options to whatever the architects predicted at the provisioning stage. Instead, businesses will be able to pursue multiple strategies, develop different models and create new products and services, supported by their IT. These are networks that will empower businesses to prepare for whatever comes next, secure in the knowledge that their underlying infrastructure won't hold them back.

We are committed to exploring and investing in technologies that enable programmable networks to evolve together with your needs. The time is right for organisations to consider how ready you are to meet future business challenges. We are here to help organisations navigate these changes by providing guidance on the future of IT, and create solutions that empower you to thrive.

References

1. Disrupted or Disrupting: Fast Track Your Future, Telstra, 2016

2. Cisco Visual Networking Index, Cisco, 2016

3. Disrupted or Disrupting? Fast Track Your Future, Telstra / TRA 2016

4. Connecting Capabilities, Economist Intelligence Unit and Telstra, 2016

5. Telstra Cyber Security Report, 2017

6. www.juniperresearch.com