The National Broadband Network: a glossary of terms

Alcatel·Lucent

The National Broadband

The National Broadband Network will impact every Australian, linking every premises and changing the way we connect with the important things in our lives.

As an enabler of innovation, the NBN will shake-up the way services are developed, how they are delivered and how organisations relate to each other and to their end-users. It will improve the efficiency of many of the things we do today and raises the potential for a whole range of productive future services and applications that we can hardly imagine – in health, in education, in business and right across the economy.

The NBN is also a massive engineering undertaking and like any project of this kind, is surrounded by a whole world of unique terms and jargon. Indeed, it could be said that the telecommunications industry has its very own language, seemingly intent on confusing any innocent and unwary individual straying into its technical realm.

This document aims to summarise some of the key terms and jargon used to describe the various parts of the NBN, and telecommunications more generally. It's certainly not the definitive list, but we hope you find it a useful tool when navigating the technical specifics of the NBN.

Network

A glossary of terms

Access Technology

Used to connect people and organisations to telecommunications services, bridging what is often called the 'last-mile' between the user and a point of interconnect to the telecommunications network, such as an exchange.

Examples of broadband access technologies include FTTP, DSL, HFC Cable, 3G Mobile, Satellite and other Fixed Wireless systems. Access technologies have different strengths and characteristics, some of which are defined throughout this paper.

Backbone and Backhaul

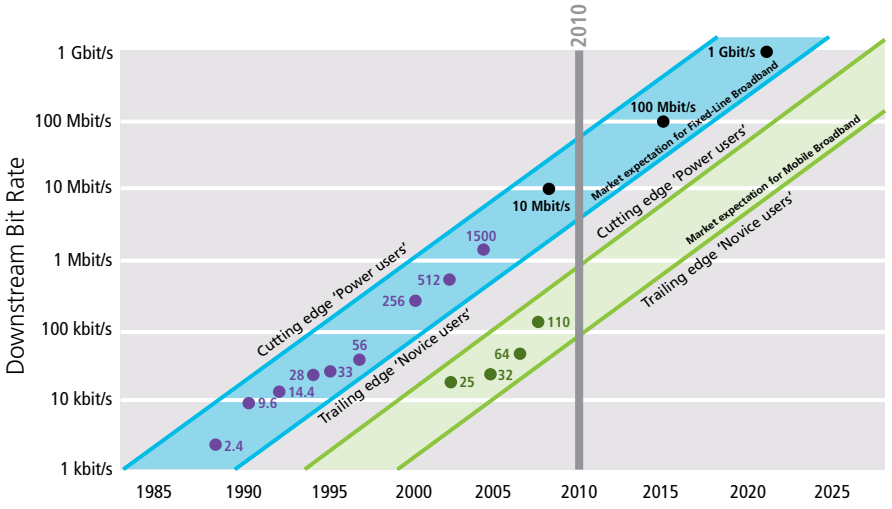
Just as a major highway carries vehicles that started their journeys on many smaller roads around the country, a backbone network carries aggregated data across mid-to-long distances and between major centres. Gathering together data from many users and transporting it via a backbone network to its desired destination, for example an exchange or data centre, is often referred to as backhaul.

Bandwidth

Usually measured in kilobits, Megabits and Gigabits per second, bandwidth is the common way to describe the rate of data transfer over a network (eg. 100 Mbit/s = 100 megabits per second).

ENOUGH BANDWIDTH IS NEVER ENOUGH

Market pricing and demand combined with technology capability



Bit (as in bits and bytes)

A single, basic piece of information or data used in relation to computing and telecommunications. It has only two values: either a "1" or "0". Bit is an abbreviation of Binary Digit.

Bitstream Service

A method of providing and managing a wholesale open access broadband network. Aims to emulate a physical connection between a Retail Service Provider and end-user, providing secure and reliable transfer of data and applications as if the service was built on a dedicated physical network.

The National Broadband Network will offer a wholesale bitstream service to Retail Service Providers.

A bitstream service can be modified, moved, disconnected or reconnected without requiring any changes to the physical infrastructure, which is shared by many users and providers. This means that an end-user can switch providers easily, add and delete service features quickly and even receive multiple services from different providers at the same time.

Blackspot

Used to describe an area, usually remote or rural and sometimes on the edges of cities, in which broadband or other communications services do not function adequately or are unavailable. Reasons for blackspots are normally related to the limitations of technologies, geography or a lack of investment.

Broadband

First introduced to define an Internet service providing data transfer at rates in excess of traditional 'dial-up' services. Often described as 'narrowband', dial-up services were first introduced at 50 bit/s (50 bits per second) and were ultimately developed to 56 kbit/s (56 kilobits per second) – a snail's pace by today's bandwidth standards.

Over time, the bandwidth capacity of broadband has vastly increased and services of 1 Gbit/s (1 gigabit per second) are now quite feasible. In this environment, there are calls to revise the definition of broadband and to eliminate lower speeds such as 256 kbit/s (256 kilobits per second) from the category altogether.

It is important to note that broadband is often used to describe high-bandwidth access to the Internet, but in reality, the term more generally applies to access to any data network, not specifically the Internet.

Broadband Services and Applications

At its most basic, this might refer to the delivery of data bandwidth to a location or device. In practice though, these are the things that broadband enables, the things that turn bandwidth into something relevant and useful to the user.

Currently, broadband services and applications include things like Internet access, email, voice and video calling, networked gaming and the ability to transfer files through applications such as peer-to-peer (P2P) networking. In the future, as higher bandwidth broadband is made more widely available and new business models evolve, an increasing array of services and applications will emerge.

A few early examples include Internet TV, IPTV and high-definition video conferencing and over time we can expect to see a whole world of services and applications we cannot even imagine today, utilising broadband to meet specific business or consumer needs.

Imagine the potential benefits of a health specialist monitoring and adapting treatment for diabetes patients in their own home. How about a social service or finance provider managing a distributed workforce of personal consultants across the country, dealing directly with clients via high-definition video and immersive communications techniques? Think about how an energy retailer could use its direct relationship with consumers to market a new set of applications to control appliances and drive energy efficiency.

The opportunities are virtually endless, limited only by the imagination.

Byte

Used to describe how much data is contained in a file or computer hard disk. A collection of eight bits makes up one byte. Common usage would see a 500GB computer hard disk holding 500 gigabytes of data, or a 2MB PDF document containing 2 megabytes of data. Most Internet service plans offer an 'allowance' for the number of bytes that can be downloaded each month.

Carrier

Another term for a telephone company or telecommunications operator – that is, a company that operates a telecommunications system. In Australia, carriers are licensed and must abide by regulations administered by the Australian Communications and Media Authority. NBN Co is a licensed carrier and so too are Telstra, Optus, Vodafone, Macquarie Telecom and many others.

Digital Divide

The gap between people with effective access to digital and information technology and services, and those with very limited or no access at all. It refers both to a person's physical access to technology and the resources and skills available to effectively use the technology. Often used in Australia to describe the different levels of communications service available between metropolitan and regional areas.

Digital Economy

The digital economy is the world around us, business and social, enabled by broadband and digital technologies. It includes the infrastructure and access technologies, it includes the devices and all the online services and applications that we use as part of our daily lives. It includes the digital tools that businesses across all sectors of the economy use to be more productive and efficient. It includes the vast amount of Government and other information that is being made available for access and adaptation by citizens and emerging businesses.

Digital economy is often used to describe the future environment that will be enabled by ubiquitous high-speed broadband. In areas such as business process, health and education we can already see early examples of how these services may operate in the future, however over time we can expect to see a whole world of services and applications we cannot even imagine today, utilising broadband to meet specific business or consumer needs.

As digital technology and broadband-enabled services and applications become more entwined in all the things we do, it will be difficult to separate Australia's digital economy from the economy as a whole.

DSL (Digital Subscriber Line)

A family of broadband access technologies that transfer data over existing copper telephone lines between a premises and its local exchange, and can be used to provide access to the Internet. The majority of Australia's fixed-line broadband services are currently delivered using DSL.[1]

DSL performance is limited by the distance a user is located from an exchange. For the most common variety of DSL, Asymmetric Digital Subscriber Line (ADSL), the performance of the technology becomes poor at distances greater than 1.5km. DSL performance and availability can also be limited by the degraded quality of some copper network infrastructure and technical constraints such as Remote Integrated Multiplexers (RIMS), which were installed on about 10% of the Australian copper network over past decades.

Other varieties of DSL include ADSL2+ and VDSL (Very-High-Bitrate Digital Subscriber Line).

Ethernet

A common network language, or 'protocol', used for the orderly transport of data – often inside the home or office premises. In fact, Ethernet is the most common type of wired link between computers and telecommunications networks.

As well as the protocol, Ethernet also covers a definition of the plug/socket arrangement and type of cable used. Your current desk-top computer is likely to be connected from an Ethernet port via an Ethernet cable to your modem or home/office network.

[1] Australian Bureau of Statistics, Internet Activity, Australia, Dec 2009: http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/8153.0Main+Features1Dec%202009?OpenDocument

Exchange

A network hub, connecting premises in a local area into the telecommunications network. Exchanges are usually the terminating points for access networks and the point from which backbone networks extend to other major hubs. Typically also used to describe the physical building in which telecommunications equipment is housed.

Fibre Optic or Fibre

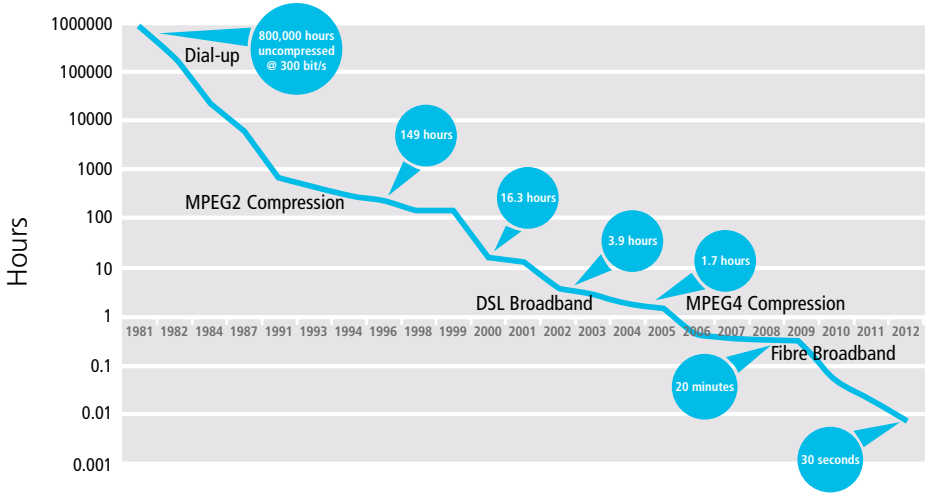
Fibre-optic cable (commonly just referred to as fibre) is often considered the 'end-game' when it comes to broadband access infrastructure. The cable is made up of super-thin threads of glass that carry beams of light. In telecommunications, data is translated into pulses of laser light that can be transmitted along the fibre cables.

Fibre-optic technology is less susceptible to 'noise' and 'interference' than other data-transfer mediums such as standard copper telephone lines and can be used more reliably over longer distances without loss of quality.

Fibre is used extensively in backbone and international submarine networks, and to connect the base stations of mobile and wireless networks. It is increasingly being used for the last mile connection for home and business premises, and over time will become the most common form of fixed-line access technology leveraging passive optical systems. See also FTTH/FTTP/FTTB.

DVD QUALITY MOVIE DOWNLOAD

Relentless improvement of broadband and video compression technologies



Hours to Download a 100 minute Standard Definition movie

Fixed-Line

Telecommunications networks have traditionally been based on fixed-line technologies, connecting locations such as homes and offices using physical infrastructure such as copper wires. Recent enhancements to copper fixed-line networks have included adding DSL technologies that operate alongside normal voice services.

Today, most new fixed-line installations, for example new housing estates, use fibre-optic cable. Replacing the existing copper fixed-line access network in Australia with fibre is the largest part of the work to build the National Broadband Network.

Fixed Wireless (as opposed to Mobile Wireless)

A family of access technologies that are often used to deliver telecommunications services and broadband to a particular premises or fixed location. These services are sometimes called 'point-to-point' or 'point-to-multi-point', and require an antenna that is generally permanently attached to the user's building.

Fixed wireless can be used for backhaul in certain cases but also as an access technology, particularly in rugged or remote terrain and areas with low population densities that may make a fixed line alternative impossible, or at least, uneconomic.

Fixed wireless technologies are limited by the availability of wireless spectrum and physical impediments such as hills and valleys interrupting signals.

FTTH/FTTP/FTTB

FTTH (Fibre-to-the-Home), FTTP (Fibre-to-the-Premises) and FTTB (Fibre-to-the-Building) refer to a broadband access network design that delivers a fibre optic cable connection direct to the home, building or other premises.

FTTH/FTTP/FTTB can offer the highest bandwidth to users, and is considered to be the most energy efficient way of providing broadband services. Countries such as Japan, South Korea, Singapore, France and the United States are all rolling out networks of this type.

GPON (Gigabit Passive Optical Network)

A network technology standard that allows multiple premises to share a single piece of fibre optic cable for broadband access.

The current generation of GPON technology provides 2.5 Gbit/s (2.5 gigabits per second) that typically is used to support 32 premises. The emerging XG-PON standard supports evolution to 10 Gbit/s (10 gigabits per second) while future enhancements can be expected to increase bandwidth much further by increasing the number of wavelengths transmitted on a single fibre.

HFC (Hybrid Fibre Coaxial) **Cable**

A fixed-line access technology combining fibre running to suburban nodes and then coaxial cable for the final network link between the street and the premises. Originally deployed in Australia to support analogue subscription television services in parts of Sydney and Melbourne in the 1990s.

Broadband services over HFC were introduced in 1996 but bandwidth is limited according to the number of concurrent users. More recently, HFC-based pay TV services have been upgraded for digital transmission, high-definition and even 3D.

Internet

The global system of interconnected networks and computers communicating using the Internet Protocol standard and supporting applications such as file transfer, email and World Wide Web browsing.

IP (Internet Protocol)

A set of communications and data routing standards, supporting the interconnection of networks and computers.

IPTV (Internet Protocol Television)

Used to describe different approaches to delivering video content using IP (Internet Protocol) standards. Various approaches include dedicated video-on-demand or broadcast services, web TV, video downloading and streaming video.

ISP (Internet Service Provider)

A provider of Internet connections and services. ISPs employ a range of access technologies to enable users to connect to the Internet and often provide access to a range of additional services and applications such as software, data hosting, email and video entertainment.

ISPs may employ a combination of their own and third party infrastructure and broadband access technologies, or simply resell services provided by a wholesale carrier.

Existing ISPs can be expected to become Retail Service Providers (RSPs) in the National Broadband Network environment.

kbit/s (kilobits Per Second), Mbit/s (Megabits Per Second), Gbit/s (Gigabits Per Second) and so on…

Measures of bandwidth – how much data can be transferred over a network. Often used to advertise a broadband service or to demonstrate the superiority of one access technology over another.

Terms describing speed or bandwidth are often used incorrectly. Here is a list of correct (and some incorrect) speed definitions. 'Correct' means that it is the form used by the International Telecommunications Union (ITU).

CORRECT TERM	MEANING	COMMONLY USED INCORRECT VARIANTS
kbit/s	Thousands of bits per second	k, K, kbps, Kbps, kb/s, Kb/s
Mbit/s	Millions of bits per second	M, mbps, Mbps, mb/s, Mb/s
Gbit/s	Billions (1000 millions) of bits per second	G, Gbps, Gb/s

LAN (Local Area Network) **and**
WLAN (Wireless Local Area Network)

A LAN is a computer network limited to a small area such as an office building, university campus, or residential home. Most mid to large-sized businesses today use LANs, making it easy for employees to access shared applications and share information. Though most LANs are Ethernet-based, Wireless LANs using technologies such as Wi-Fi, have become a popular alternative, including in the home.

LTE (Long-Term Evolution)

LTE is the common emerging standard for mobile wireless telecommunications technology. The current generation of mobile telecommunication networks are collectively known as 3G (third generation). LTE is sometimes referred to as a 4G (fourth generation) technology designed to increase the capacity and speed of mobile telephone networks to transmit data by taking advantage of clever engineering techniques.

The main advantages of LTE, compared to existing mobile wireless technologies, are higher upload and download speeds, support for larger numbers of active mobile devices per antenna site (cell), an improved end-user experience and a simple architecture.

Of course, wireless technologies are limited by the availability of wireless spectrum. The bandwidth available in a cell is highly dependent on a user's distance from the antenna and the number of active users competing for the same bandwidth, and will typically be at least an order of magnitude less when compared to a fixed network service.

Modem

A device that converts computer data into a form suitable for transmission over a telecommunications network, and vice versa.

Modems are designed to support specific access technologies and often provided by an Internet Service Provider as part of their service offering.

Mobile Wireless and Mobile Broadband
(such as 3G and LTE)

Mobile wireless networks (sometimes known as 3G networks) are complementary to fixed-line telecommunications networks. Mobile wireless networks now commonly support broadband services, offering mobility and flexibility for users of handheld and laptop devices.

Limitations to mobile broadband include the availability of wireless spectrum and available bandwidth being shared between concurrent users in the same area, resulting in bandwidth typically at least an order of magnitude less when compared to a fixed network service. Physical impediments such as hills and valleys interrupting signals, and the distance of a user from the cell antenna are also constraints.

ONT (Optical Network Terminal)

A device used to connect each premises to an FTTP network, located on either the exterior or interior of the premises. The ONT is the terminating point for the fibre-optic cable and provides a connection point for various in-building services, including Internet, telephone, video, wireless LAN and other emerging services and applications.

Also often referred to as an NTU (Network Termination Unit).

Open Access

Describes an infrastructure operating model where multiple service providers are offered wholesale leased access (use) of the infrastructure and associated services.

Protocol

The technical language and rule formats used to facilitate communications between computers. The most well-known protocol is Internet Protocol (IP). Within local area networks, a simpler protocol, defined as part of the Ethernet standard, is used.

RSP (Retail Service Provider)

RSPs and application/content service providers are those that have a direct relationship with users and provide them with services and applications.

In the context of the National Broadband Network, an RSP could be responsible for any or all of customer sales and assistance, products, pricing, billing and the customer premise equipment that will enable phone calls, Internet, video services and other emerging applications to be delivered. A user may employ multiple RSPs for the provision different services and applications at the same time.

Satellite Broadband

Often deployed in areas with rugged or remote terrain and with very low population densities that may make a fixed line alternative impossible, or at least, uneconomic.

Satellite broadband can be negatively impacted by the large physical distances between satellites and the earth's surface, which results in latency (delay) in the sending and receipt of data.

Wholesale Service Provider (WSP)

A provider of infrastructure and services that deals only with other providers and does not have a commercial relationship with end-users or consumers. In telecommunications, a wholesale service provider allows other companies to lease access to equipment and services, and avoid the expense of building their own infrastructure. These retailers may choose to 'add value' to a wholesale service and develop services and applications that generate competition and market appeal for their branded offerings.

Wi-Fi

Wi-Fi is a trademark used to describe certain wireless technology products used to support Local Area Networks. Home or office computers are often connected to Internet modems via Wi-Fi instead of an Ethernet cable. As well as many personal computers, Wi-Fi technology is common in an increasing array of devices such as mobile phones, MP3 players, printers and game consoles.

TIME TAKEN TO DOWNLOAD DIFFERENT FILE TYPES AT VARIOUS DOWNLOAD SPEEDS[2]

	300 bit/s	56 kbit/s	1Mbit/s	12 Mbit/s	100Mbit/s
Email	13 min	4.3 s	0.25 s	0.02 s	0
Photo	18 h	6 min	20 s	1.7 s	0.2 s
3 min YouTube video Std	267 h	86 min	4.8 min	24 s	3 s
3 min YouTube video HD	1200 h	6.4 h	22 min	108 s	13 s
2 hr SD IPTV MPEG4 video	6000 h	32 h	107 min	9 min	64 s
DVD	32000 h	170 h	10 h	48 min	5.8 min

Wireless Broadband

A family of access technologies (sometimes known as Fixed Wireless) used to deliver broadband without the use of fixed wires. Often deployed in areas with rugged or remote terrain and with low population densities that may make a fixed line alternative impossible, or at least, uneconomic.

An important characteristic is that, as opposed to Mobile Wireless, these technologies generally connect to a particular premises or location using an antenna that is generally permanently attached to the user's building.

Wireless broadband technologies are limited by the availability of wireless spectrum and physical impediments such as hills and valleys interrupting signals.

Wireless Spectrum

Often referred to as Radio-Frequency Spectrum, this is the array of electromagnetic radio frequencies used for communications, including mobile broadband, television, AM and FM radio, defence and any other service employing a wireless technology. The spectrum is divided into many frequency ranges, or bands, and usually allocated for a specific technology, device, use or service.

Wireless Spectrum is a finite and regulated public asset, and in Australia is administered by the Australian Communications and Media Authority, often through a licensing regime.

World Wide Web (WWW or The Web)

The system of interlinked hypertext documents accessed used a web browser (such as Internet Explorer or Mozilla Firefox) and transmitted via the Internet.

[2] Institute for a Broadband-Enabled Society. Ayre, R., Hinton, K., Gathercole, B. and Cornick, K. (2010) 'A Guide to Broadband Technologies', *Australian Economic Review*, 43: 200–208

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About Alcatel-Lucent

Alcatel-Lucent (Euronext Paris and NYSE: ALU) is the trusted transformation partner of service providers, enterprises, strategic industries such as defense, energy, healthcare, transportation, and governments worldwide, providing solutions to deliver voice, data and video communication services to end-users. A leader in fixed, mobile and converged broadband networking, IP technologies, applications and services, Alcatel-Lucent leverages the unrivalled technical and scientific expertise of Bell Labs, one of the largest innovation powerhouses in the communications industry. With operations in more than 130 countries and the most experienced global services organisation in the industry, Alcatel-Lucent is a local partner with a global reach. Alcatel-Lucent achieved revenues of Euro 15.2 billion in 2009 and is incorporated in France, with executive offices located in Paris.

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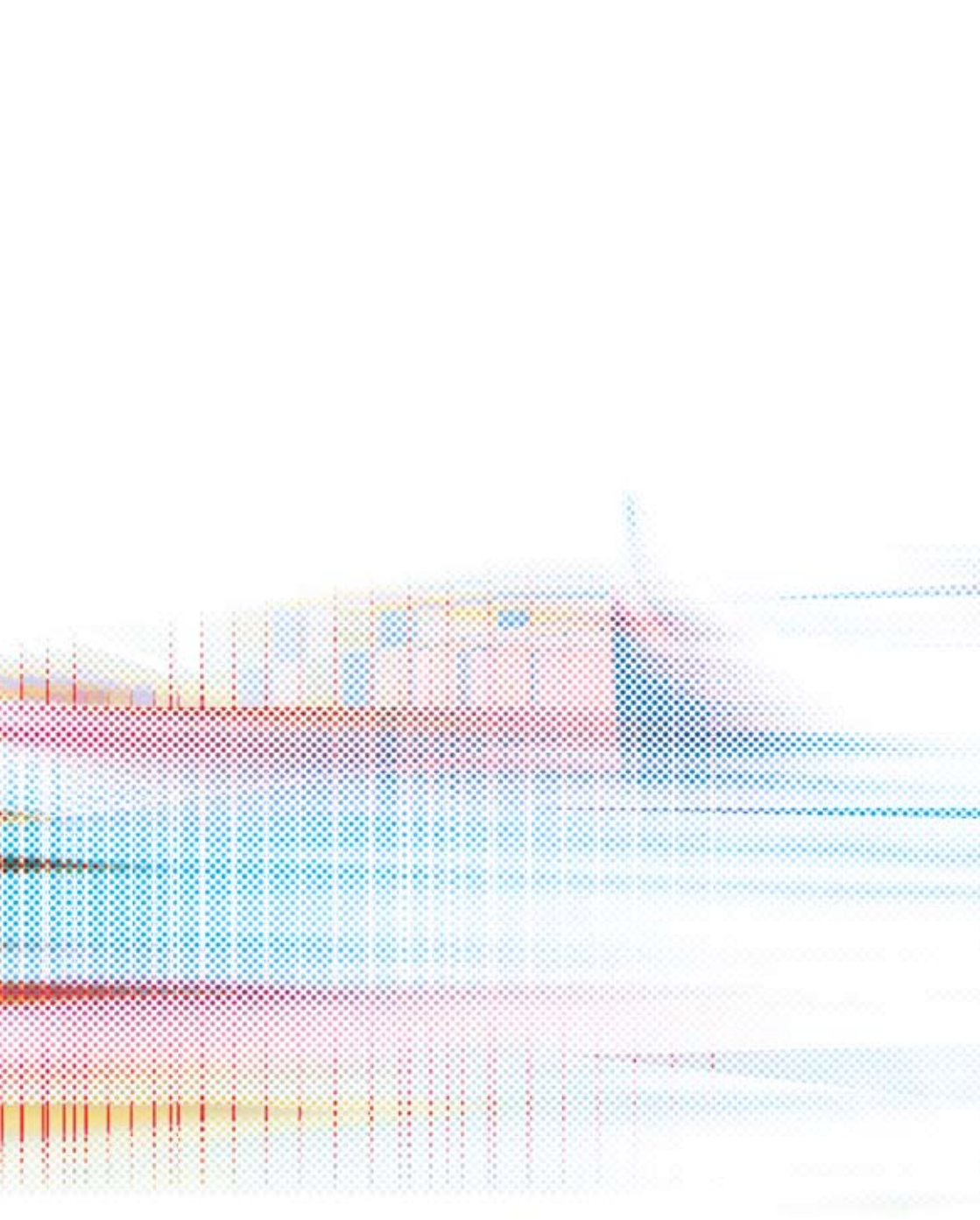

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