How your capacity provider can help address the demands of the digital-driven economy

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Network operators are the backbone of today's digital economy. Led by explosive demand for bandwidth and connectivity from consumers and businesses, the opportunities available to them are numerous. However, finding the right balance between meeting this demand, stimulating further revenue growth via new services, and maintaining a consistent Quality of Experience throughout, will not be straightforward.

To tackle the challenge ahead, the existing relationship between service provider and wholesale partner needs to adapt. This paper looks at how and why this will become a reality. It also assesses the several areas where a wholesale partner can help drive new business models and prepare network operators for what's coming next.

CONTENTS:

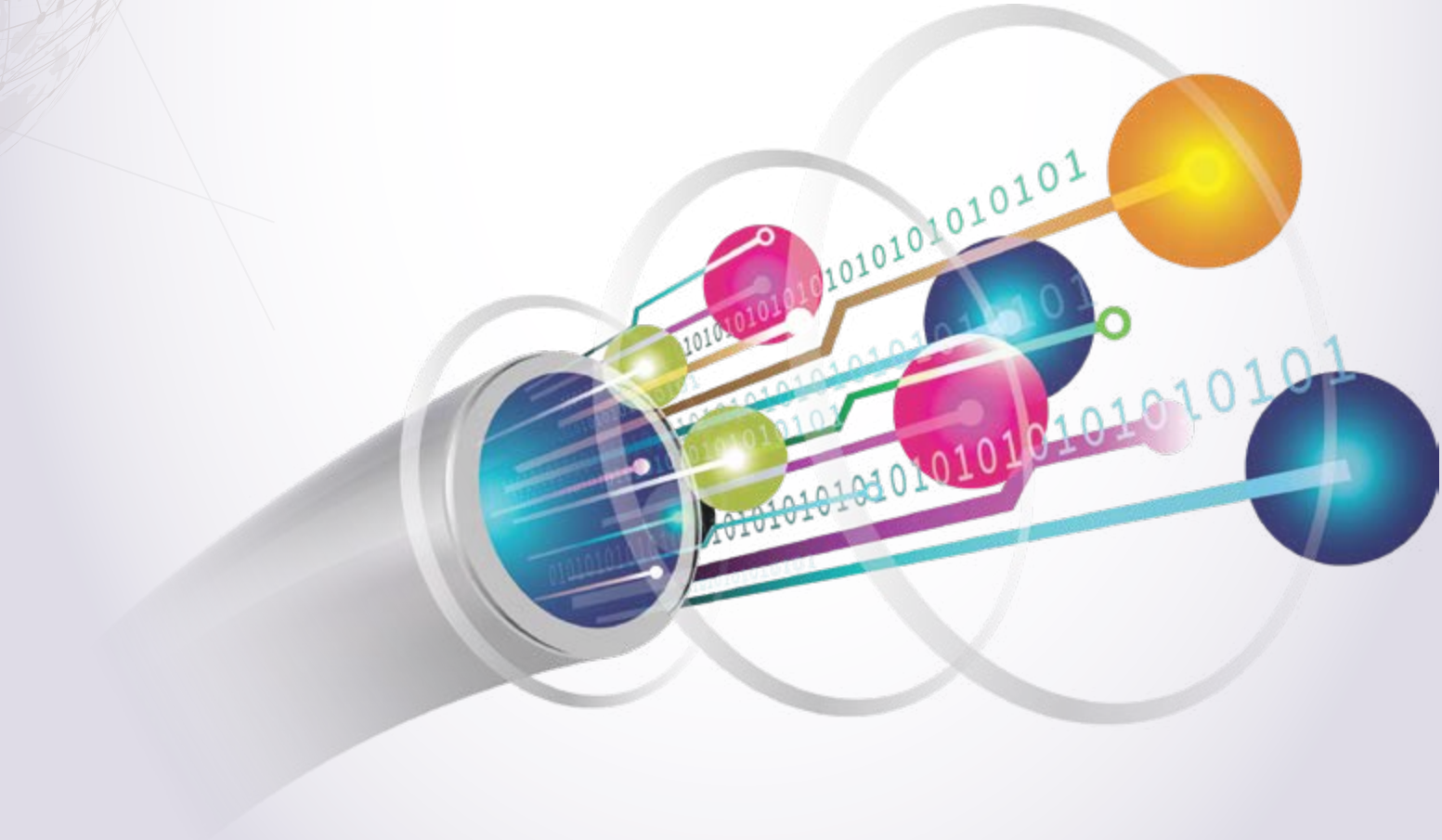
INTRODUCTION

Data traffic on today's networks is at unprecedented levels, driven by consumers' global digital lifestyles and enterprises shifting to cloud services and Software Defined Wide Area Networks delivered over the public internet.

These trends have resulted in global traffic rising by over 60% in 2016 alone. Mobile data usage has also grown 18-fold in the last five years[1].

Network operators have a key role to play in supporting this data led ecosystem, and tremendous growth awaits those that get it right. Their first task should be to re-imagine the wholesale capacity provider relationship to meet these emerging needs.

By recognising the avenues where a wholesale provider can offer both Quality of Experience (QoE) and value, network operators will be able to gear up for future growth and possess the tools to generate additional revenue from new services and markets.



[2] Cisco's Visual Networking Index (Feb 2017)

TRAFFIC DRIVERS AND HOW WHOLESALE NETWORKS DELIVER

4 key drivers are behind this growth in data traffic

I. The changing nature of enterprise communications

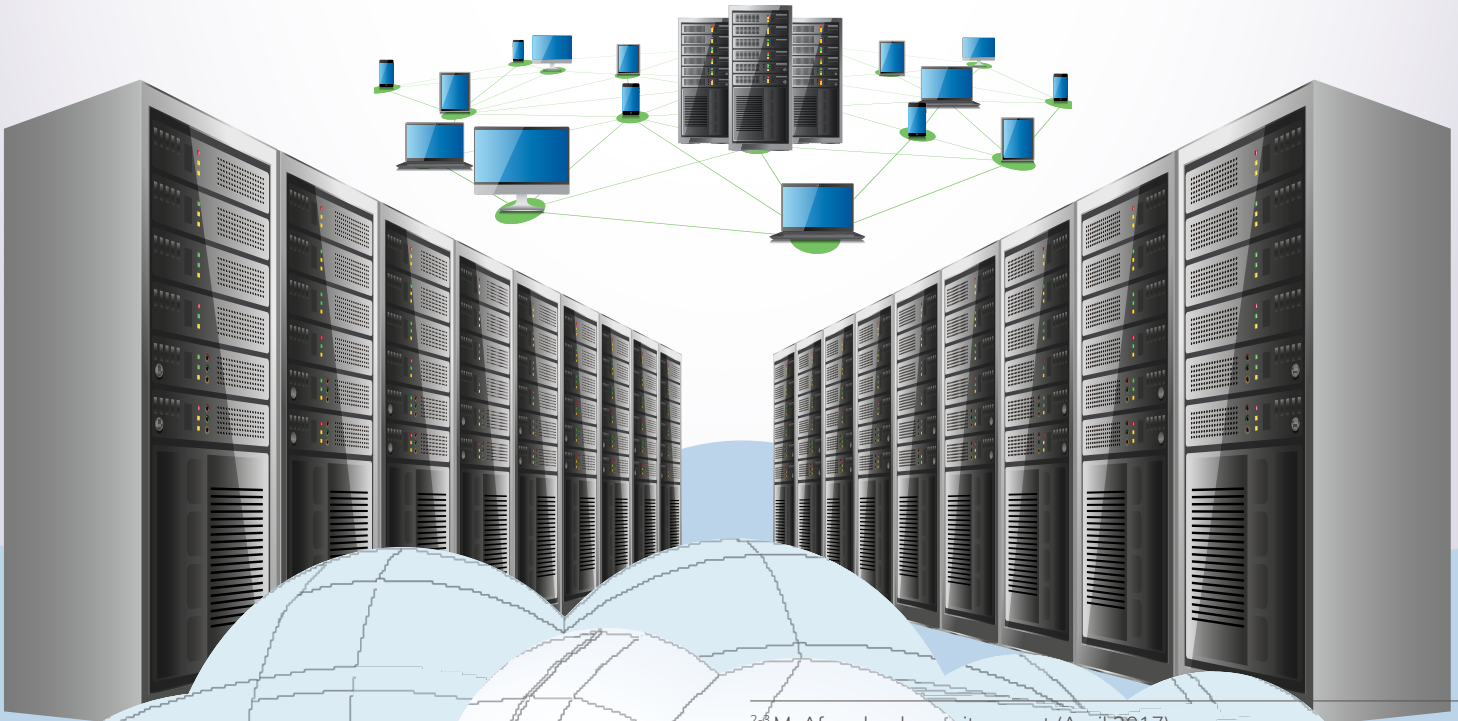
93%[2] of all global organisations use cloud services in some form. And by 2018, it's expected that 80% of IT budgets will be committed to cloud apps and internet-based enterprise solutions[3].

Enterprises with geographically dispersed employees are also increasingly relying on mobile devices to conduct business. For them, high quality connectivity is essential to achieve improved service and communication at a low cost, creating a QoE challenge for the network operator.

II. The M2M/IoT revolution

The Internet of Things (IoT) will drive another huge spike in traffic volumes, particularly mobile data. It is predicted that IoT devices will represent more than 50% of total global devices and connections by 2021[4]. IoT devices depend on a constant stream of inbound and outbound communication and need connectivity wherever they are.

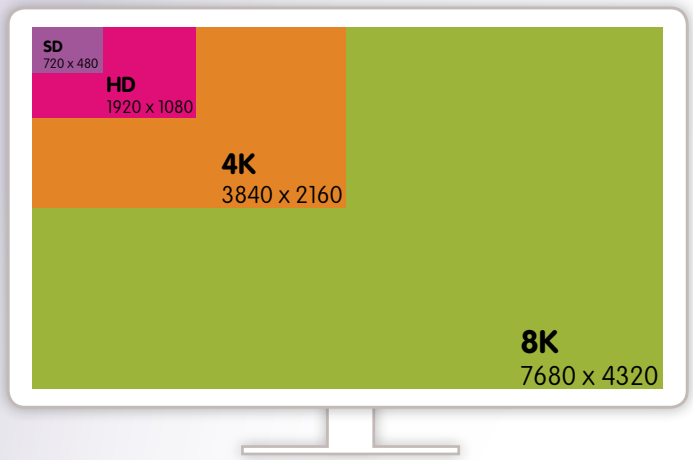
Global IoT poses special challenges for network operators. First, they must put into place the interconnect agreements needed for a global footprint, and second, it also they must be able to support mission-critical QoE demands: for example, for medical devices or connected vehicles.



[2-3] McAfee cloud security report (April 2017)
[4] Cisco VNI Forecast (June 2017)

III. Increasing traffic from digital services

Streaming services and over-the-top (OTT) platforms from digital content providers have proved to be game changers in data traffic. Cisco has predicted that 80% of the world's internet traffic will be data-intensive video by 2019[5].



Various other commercial platforms that drive internet traffic, including online retail and banking, and the heavy commercialisation of internet-based services are also behind this increase in data traffic. Networks have to rapidly expand their capability in order to meet fluctuations in demand, for both business needs and consumer demands.

Format	Resolution (width x height)	Frame Rate (fps)	Data Rate (Mbps)	Storage Capacity/Hour (GB)
SD TV	720 x 480	~30	6.25	22
HDTV	1920 x 1080	24	49.8	179
2K	2048 x 1080	24	199	716
4K	4096 x 2160	48	1,910	6,880
8K	7680 x 4320	120	23,890	86,000

IV. Shortest routes for cloud based services

Finally, the delivery of cloud-based internet services is also an important consideration for operators. Business-to-business internet applications often take a long, convoluted route across the open internet before they reach the consumer, and in many cases this is a 'best-effort' approach.

This can cause a number of issues such as packet loss, variable bit rate, and delay in delivery. Consumers do not accept declines in service quality, which often results in churn, complaints and reputation loss. This creates a QoE challenge around interactive applications, for example.

[5] Cisco VNI Forecast (June 2017)

WHAT OPERATORS AND CONTENT PROVIDERS NEED FROM THEIR CAPACITY PARTNERS, BOTH NOW AND IN THE FUTURE

Traditionally, wholesale providers delivered long-distance capacity and carried international voice traffic. But given the data demands of the digital eco-system, they now have to shift to deliver offerings with assured Quality of Experience for different applications.

Network operators and their wholesale capacity partners must work together to drive innovation, launch new services, reach new markets and ensure a global presence.

What can you now expect from your wholesale capacity provider?

The service portfolio of a wholesale capacity provider is changing in response to this shift in the marketplace. What can network operators expect in the future?

IP and Ethernet services

Wholesale providers have always provided the routes and connections to the internet back-bone that a network operator requires to meet user demand and grow. While this fundamental need still exists, it has evolved in the new data-driven world.

The IP interconnection ecosystem that powers and facilitates the delivery of IP content is now poised for development. It must adjust to meet the pressures applied not only by network operators, but also application and content providers.

What's next?

GROWTH	DEEPER INTERCONNECTION	SIMPLICITY	NEW USE CASES DRIVEN BY SDN
To support rising data demands and shifting traffic patterns, wholesale providers must keep growing their offer. Global reach and connectivity is vital for competitive advantage. By becoming intra-continental, wholesale providers will be able to offer network operators a single route for quickly rolling out services to new markets.	Capacity providers must provide highest service quality to network operators with connectivity to Digital Service Providers, cloud systems, and IXPs for smoother connectivity esulting in better managed QoE.	Wholesale providers must develop APIs to make it easier for network operators to tap into their networks, and new systems that will ease initial deployment and capacity management.	Capacity providers must use the flexibility offered by Software-Defined Networking to develop innovative new use cases for operators to tap into the enterprise segment. For example, automatic prioritisation of bandwidth quality depending on whether the user is making a video call, or backing up transaction records.

REMOTE PEERING

Remote peering is essential for dealing with the increased demand for capacity as it enables ISPs to connect with other networks without needing a physical presence at the peering point.

Advanced wholesale providers, such as BICS, can offer this functionality as part of transport infrastructure – creating a dedicated tunnel between networks. The operator gets all the benefits of traditional peering without the complexity, or high operational costs typically associated the deployment of dedicated infrastructure in multiple locations..

Wavelength services

Wavelength services allow capacity providers to increase bandwidth by multiplexing a number of signals onto a single optical fibre. They were traditionally used by Tier-1-2 players to build their own backbone networks. Until recently this was a very stable market and operators used to take up exact point-to-point connections for an average of 1-3 years.

Modern data traffic patterns mean wavelength services need to be far more agile, flexible and operationally faster than ever before.

Another driver of change is the entry of non-traditional players creating highly customised 'white box' solutions with only those features they need at the lowest price point. For example, Facebook announced in December 2016 that its 'Voyager' optical switch would be the industry's first white box transponder and routing device for optical networks.

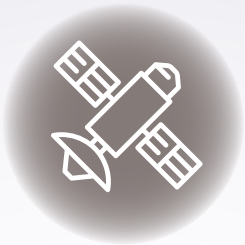
What's next?

TECHNOLOGICAL EVOLUTION	SCALABILITY	OPEN SOURCE
Apart from white box solutions, a number of other new technologies to increase capacity and decrease latency are in the pipeline.	Wholesale providers will need to offer greater scalability to keep pace with international business requirements. Customer interfaces will have to be able to carry high peak loads and low average traffic, alongside a shift in cost structure.	Capacity providers will migrate their development mindset from proprietary to open source, enabling them to move from vendor dedicated to vendor agnostic solutions in order to drive economies of scale.

We will soon see the emergence of 'meet me' rooms that automate connectivity between service providers, condensing a process from days to just a few hours, revolutionising the ability to create new connections on demand.

Satellite services

Satellite services provide reliable backup for mission-critical applications in areas with limited connectivity or limited route diversity. They are often vital to provide business continuity and network redundancy for national and international communications.



Reputable capacity providers today offer operators consultancy services and turnkey, fully managed connectivity solutions with strong SLAs, backed up with local support.

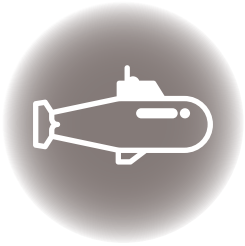
What's next?

HIGHER CAPACITY TO ADDRESS INCREASED TRAFFIC VOLUMES	LOW-LATENCY CONNECTIVITY	SATELLITE INTEGRATION INTO THE 5G ECOSYSTEM
Operators can expect their wholesale capacity partners to offer higher capacity and improved cost efficiency through new high-throughput satellites, which will enable them to manage exponentially-growing traffic volumes.	To address the increasing need for large amounts of quickly scalable, low latency IP capacity we will see wholesale providers tapping new satellite technologies such as the LEO and MEO satellite constellations (Low and Medium Orbit satellites).	Operators and enterprises will begin to integrate satellite connectivity into their 4G/5G deployments as a means to access wider backhaul coverage and provide a failsafe back-up for mission-critical connectivity use cases.

Terrestrial / sub-sea cable routes

Terrestrial and sub-sea cable routes originated as separate cables dedicated to TDM services (voice services) and data services. Today they are giant networks of super-high capacity cables crisscrossing the oceans and connecting different continents – and form the foundation of the entire internet.

Wholesale providers usually deploy terrestrial and sub-sea cables routes, which act as the long-haul backbone of their networks, to deliver capacity when there is a spike in usage. However, as data traffic requirements grew, demand has outstripped capacity, compelling wholesale providers to look for a new approach.



Additionally, the world's largest digital service providers including internet video and TV platforms, social networking platforms and many others are investing directly in their own infrastructure in order to optimise cost and have full control of their networks.

What's next?

NEW ROUTES	NETWORK OPTIMISATION	NEW SERVICES
Wholesale providers will need to use data analysis to identify pressure points on their network, identifying where they need to increase throughput, enhance QoE, improve network resiliency, and eliminate points of failure. They will then need to create new low-latency routes to address these bottlenecks.	Sub-sea cable landing points are moving to carrier neutral data centres: bringing down costs, increasing competition and making capacity accessible to multiple customers.	Wholesale capacity providers will start rolling out new services to serve evolving customer demands. These include services such as automation of service provisioning, or on-demand traffic management, and more.

OTHER AREAS WHERE WHOLESALE PROVIDERS CAN ADD VALUE TO YOUR NEEDS

A more advanced wholesale partner can also offer further value. For example, BICS has built upon its heritage in this space to develop a range of value-add solutions that make it easier for network operators to turn traffic data into actionable insights, further drive QoE, and enhance customer loyalty.

The internet has become commercially mission-critical for business.

This has led the future of wholesale to be intertwined with several other key operator considerations, including:

Robust, secure data transport

Privately managed wholesale networks provide a secure, high-quality alternative to the public internet for important traffic. Combined with interworking and interconnection through the use of hubbing platforms, an approach like this can be tailored toward a non-traditional wholesale customer such as a content provider. Network operators can offer shorter traffic delivery times and better resilience as a value-added service.

Managed service delivery

Wholesale providers allow operators to deliver flexible services without up-front investment. In essence, it's the value chain from end-to-end. Since many wholesale providers are working directly with third-parties and specialist telecoms players, operators can rest assured that the Quality of Experience will be what their users expect. Given this setup, wholesale partners can host and manage the delivery of services for smaller operators, or for content providers that don't have their own network infrastructure.

CONCLUSION

As service providers need to serve their customers end-to-end across the globe, wholesale providers are an essential piece of the telecoms puzzle. Without them, this market will not be able to develop. But the role of a wholesale provider is no longer limited to bandwidth and connectivity.

Wholesalers are ideally positioned to enable new communications services and solutions for network operators. They have the relationships, the technical capabilities, and the existing network infrastructure in place to make this a reality. And their private networks present a truly valuable asset for mission-critical communications that can't be left to the 'best effort' alternative offered by the open internet.

For more information on how BICS can add value to your business contact us at **www.bics.com.**

BICS GLOBAL NETWORK PRESENCE MAP

Reachable Internet Exchange Points & Cloud Service Providers

EU internet exchanges

Amsterdam	Madrid	Amsterdam
Brussels	Paris	London
Frankfurt	Marseille	Frankfurt
Marseille	London	Sofia
Kiev	London	Warsaw
Geneva	Milano	Torino
Zurich	Moscow	Vienna
Paris	Marseille	

US internet exchanges

Los Angeles	
New York	
Ashburn	
Chicago	
Dallas	
Los Angeles	
Ashburn	
New York	

Asia & Africa IXPs

Hong Kong
Singapore
Johannesburg
Dubai
Nairobi

EU Cloud Service Providers

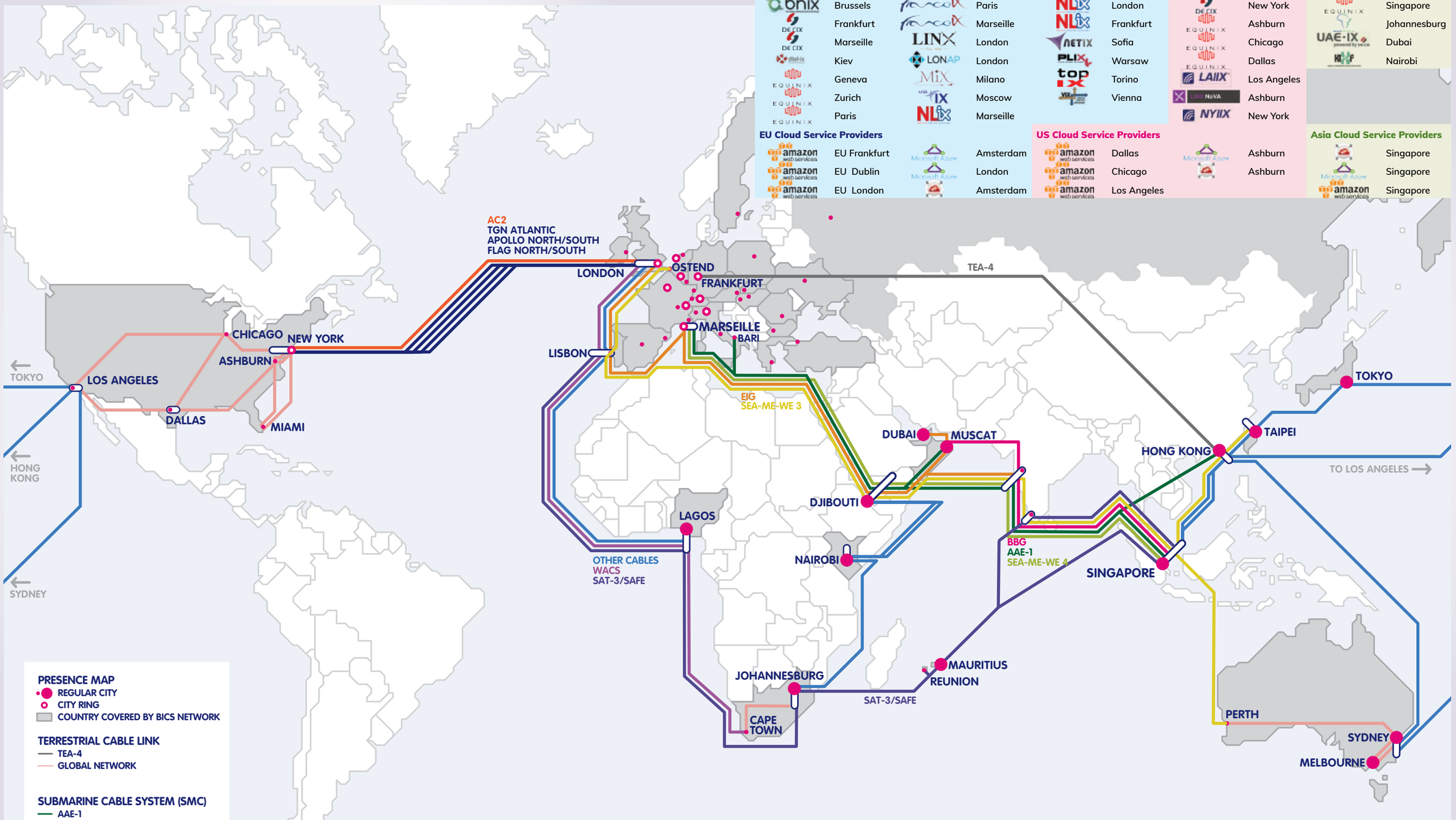
EU Frankfurt	Amsterdam
EU Dublin	London
EU London	Amsterdam

US Cloud Service Providers

Dallas	Ashburn
Chicago	Ashburn
Los Angeles	

Asia Cloud Service Providers

Singapore
Singapore
Singapore



PRESENCE MAP
- REGULAR CITY
- CITY RING
- COUNTRY COVERED BY BICS NETWORK

TERRESTRIAL CABLE LINK
- TEA-4
- GLOBAL NETWORK

SUBMARINE CABLE SYSTEM (SMC)
- AAE-1
- BBG
- EIG
- SEA-ME-WE 4
- SEA-ME-WE 3
- WACS
- SAT-3/SAFE
- TRANSATLANTIC SUBMARINE CABLES
- OTHER CABLES

BICS POINTS OF PRESENCE

Country	Postal Code	City	Address	Colocation provider	Campus
Austria	1210	Vienna	Louis Hafliger Gasse 10	InterXion	VIE1
Belgium	1000	Brussels	Rue Lebeau 2	BICS	-
	1000	Brussels	Rue du Canon 36	BICS	-
	1930	Zaventem (Brussels)	Wezembeekstraat 2	InterXion	BRU1
	1140	Evere (Brussels)	Rue de Carly 2	BICS	-
	1140	Evere (Brussels)	Avenue Leon Grosjean 3	Level 3	-
	8400	Oostende	Rue de la Confederation 6	Equinix	GV1
	1217	Geneva	Rue de Meyrin 385	CERN	-
	4051	Basel	Wallstrasse 22	Swisscom	-
Bulgaria	1303	Sofia	Todor Alexadrov 85-87	TTI	-
Czech Republic	10600	Slatiny (Praha)	Nad Elektramou 411	Sitel	-
France	93290	Tremblay (Paris)	Avenue des Nations 227	Level 3	-
	75002	Paris	Rue des Jeuneurs 38	Telehouse	1
	75001	Paris	Boulevard Voltaire 137	Telehouse	2
	93500	Paris	Bis Avenue du General Leclerc 110	Equinix	PA4
	93300	Paris	Rue des Gardinoux 20	Interxion	PAR2
	93534	Aubervilliers (Paris)	Avenue Victor Hugo 45	InterXion	PAR1
	93200	Saint-Denis (Paris)	Avenue Ambroise Croizat 114	Equinix	PA2
	92400	Courbevoie (Paris)	Boulevard de Verdun 124	SFR	-
	13005	Marseille	Avenue de la Bauxite 5	Telehouse	West
	13003	Marseille	Avenue Roger Salengro 40	Interxion	MRS1
	13015	Marseille	Chemin du Littoral 136	Interxion	MRS2
	13600	La Ciotat	Avenue de la Coriandre 110	BICS	-
	13016	Marseille	Chemin du Passet 70	Jaguar	MRS-01
	69200	Venissieux (Lyon)	Rue Georges Maranmes	LDCOM	-
	93200	Saint Denis (Paris)	Rue Ambroise Croizat 114	Equinix	PA3*
Germany	60326	Frankfurt	Kleyerstrasse 82	Level 3	-
	60327	Frankfurt	Kleyerstrasse 90	Ntenos	-
	60326	Frankfurt	Kleyerstrasse 90	Equinix	FR5
	60314	Frankfurt	Weismullerstrasse 19	InterXion	FRA1-10
	60388	Frankfurt	Friesstrasse 26	Equinix	FR2
	60313	Frankfurt	Taubenstrasse 7-9	Equinix	FR1
	65933	Frankfurt	Larchenstrasse 110	Equinix	FR4
	60327	Frankfurt	Gutleutstrasse 310	Equinix	FR7
	77694	Kehl	Hafenstrasse 1	Stadt Kehl	-
Greece	14452	Athens	Metamorfosis Ermou 37	MedNautilus	-
Hungary	1117	Budapest	Neumann Janos utca 1	Infopark	-
Italy	20153	Milan	Via Caldera 21	Infracom	-
	20153	Milan	Via Caldera 21	Enter	-
	1412	Rome	Via Simone Martini 127/129	Colt	-
	10149	Torino	Corso Svizzera 185	Enter	-
Ireland		Dublin	New Nangor Road 22	Data Electronics Group	-
Luxembourg	L-8080	Bertange (Luxembourg)	Rue de Luxembourg 177	Tango	-
	L-1543	Luxembourg	Boulevard Peirre Frieden 45	BCE	-
	L-3235	Bettembourg (Luxembourg)	Rue Graham Bell 4	Datacenter Luxconnect	DC1
Netherlands	1096 AX	Amsterdam	Joop Geesinkweg 401-404	Level 3	-
	1101 EC	Amsterdam	Luttenbergweg 4	Equinix	AM1, AM2
	1098 SJ	Amsterdam	Science Park 121	Sora / Vancis	-
	1098 XG	Amsterdam	Science Park 120	Digital Realty (Telecity)	AMS1
	1101 AE	Amsterdam	Kolperbergweg 13	Equinix (Telecity)	SE AMS2
	1105 AT	Amsterdam	Schepenbergweg 42	Equinix (Telecity)	SE AMS5
	1066 VH	Amsterdam	Johan Huizingalaan 759	Global Switch	-
	1098 XH	Amsterdam	Science Park 610	Equinix	AM3
	1119 PA	Amsterdam	Tupolevlaan 101	Interxion	AMS5
	1096 AM	Amsterdam	Hit Wenckebachweg 127	Digital Realty	-
	3044 CK	Rotterdam	Vlaardingweg 62	Level 3	-
	2031 BE	Haarlem	J.W. Lucasweg 35	Evoswitch	AMS1
	1119 NJ	Schiphol Rijk (Amsterdam)	Cassnalaan 1-33	Interxion	AMS3*
	1098 XG	Amsterdam	Science Park 105	NIKHEF	*
	1096 AH	Amsterdam	Dulventechtselaide 80A	Equinix	AM6*
Poland	05-500	Piaseczno (Warsaw)	Jana Pawla II 66	Energis	-
		Warsaw	Al. Jerozolimskie 65-79	LIM	-
Portugal	2685-338	Lisbon	Rua Severino Falcao Quinta do Francelho 14	Telvent	-
Romania	20237	Bucharest	Dimitrie Pompei 8	NX Data	1
Russia	117485	Moscow	Buffarova 7	MV	-
Slovakia	851 01	Bratislava	Kopcianska 24	Sitel	-
Spain	28108	Alcobendas (Madrid)	Valgrande II 6	Telvent Carrier House	-
	08038	Barcelona	Calle Acero 30-32	Telvent Carrier House	-
Sweden	16865	Bromma (Stockholm)	Mariehallsvagen 36	Equinix (Telecity)	-
Switzerland	8048	Zurich	Binzring 17	Swisscom	-
	8005	Zurich	Josefstrasse 225	Equinix	ZH2
	8152	Glattbrugg (Zurich)	Sagereistrasse 35	InterXion	-
	1202	Geneva	Rue Richard Wagner 6	Level 3	-
	1204	Geneva	Rue de Lo Confederation 6	Equinix	GV1
	1217	Geneva	Rue de Meyrin 385	Proximus	-
	4051	Basel	Wallstrasse 22	Mobistar	-
Turkey	34394	Esentepe Istanbul	Buyukdere Caddesi 112	Vodafone	-
United Kingdom	E14 9YY	London	East India Dock Road 240	Level 3	-
	E14 9YY	London	East India Dock Road 240	Global Switch	-
	E14 2AA	London	Coriander Avenue	Telehouse	North
	E14 2AA	London	Coriander Avenue	Star Suite Europe	-
	E14 2AA	London	Coriander Avenue	Telehouse	East
	E14 9GE	London	Harbour Exchange 8/9	Equinix (Telecity)	-
	E14 9SD	London	Marsh Wall 227	Digital Realty (Telecity)	SOV
	SE1 4AX	London	Buckingham Avenue 8	Equinix	LD5
	E14 2AA	London	Coriander Avenue	Telehouse	West
	EC2A 4NW	London	Paul Street 69-77	Equinix	Global Hub
	SE1 4NB	London	Buckingham Avenue 2	Equinix	LD4
	SE1 4NB	London	Buckingham Avenue 2	Equinix	LD6
	E14 2AX	London	Marsh Wall 215	Global Switch	North
	E14 9GE	London	Harbour Exchange Square 6-7	Digital Realty	Meridian Gate
	E14 9GE	London	Paul Street 69-77	Equinix	LD8
	EC2A 4NW	London	Clifton Street 80	Telehouse	*
	EC2A 4HB	London	Haddrra 50	Redcentric	*
Ukraine	01033	Kiev	8th Avenue 111	New Telco	-
USA	10011	New York	8th Avenue 111	Telx	NYC2
	10013	New York	Hudson Street 60	Telx	NYC1
	60616	Chicago	East Cermak Road 350	Equinix	CH2
	75207	Dallas	North Stemmons Fw	Equinix	DA1
	75201	Dallas	Bryan Steet 2323	Partner	-
	20147	Ashburn	Filigree CT 21715	Equinix	DC2
	90017	Los Angeles	S. Grand Ave 624	One Wilshire	LA1
	33132	Miami	NE 9th Street 50	NAP	-
Djibouti		Djibouti City	Boulbos Street	Djibouti Data Center	-
Mauritius		Ebene	Cyber Tower I	DCL	Wing A
OMAN	112	Ruwi (Muscat)	Telecommunication Tower Bldng (TCC)	Omantel	-
UAE		Dubai	Warehouse F90-F92 (IMPZ)	Equinix	-
South Africa		Isando (Johannesburg)	Brewery Street 5	Teraco	-
Nigeria		Lagos			-
Kenya		Nairobi			-
Australia	2020	Mascot	Gardeners Road 639	Equinix	SY1
	3207	Melbourne	Lorimer Street 600	Equinix	ME1
Hong Kong		Chai Wan (Hong Kong)	Chai Wan Road 399	Megri Advantage	9F
Hong Kong		Chai Wan (Hong Kong)	Chai Wan Road 399	Megri Advantage	10F
Japan	142-0043	Shinagawa-ku (Tokyo)	NF Park building, 3F 2-9-15 Futaba	Mind	-
Singapore	139964	Singapore	Ayer Rajah Crescent 20	Equinix	SG1
Singapore	139964	Singapore	Ayer Rajah Crescent 20	Equinix	SG3
Taiwan		Taipei	Yongguang street 250	Chief Telecom	-

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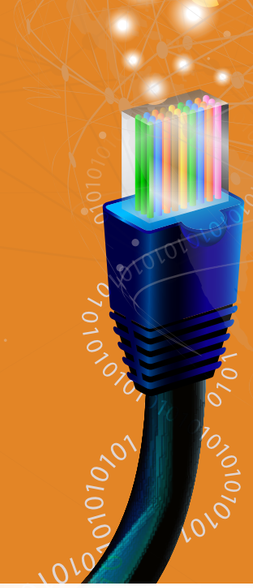

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