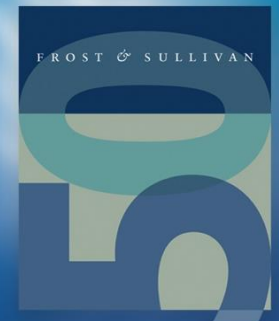# Frost Perspective on Edge Computing in Asia-Pacific, 2018

Rising demand for IoT deployments driving the adoption of edge computing solutions

Global Digital Transformation Team at Frost & Sullivan

November 2018

FROST & SULLIVAN

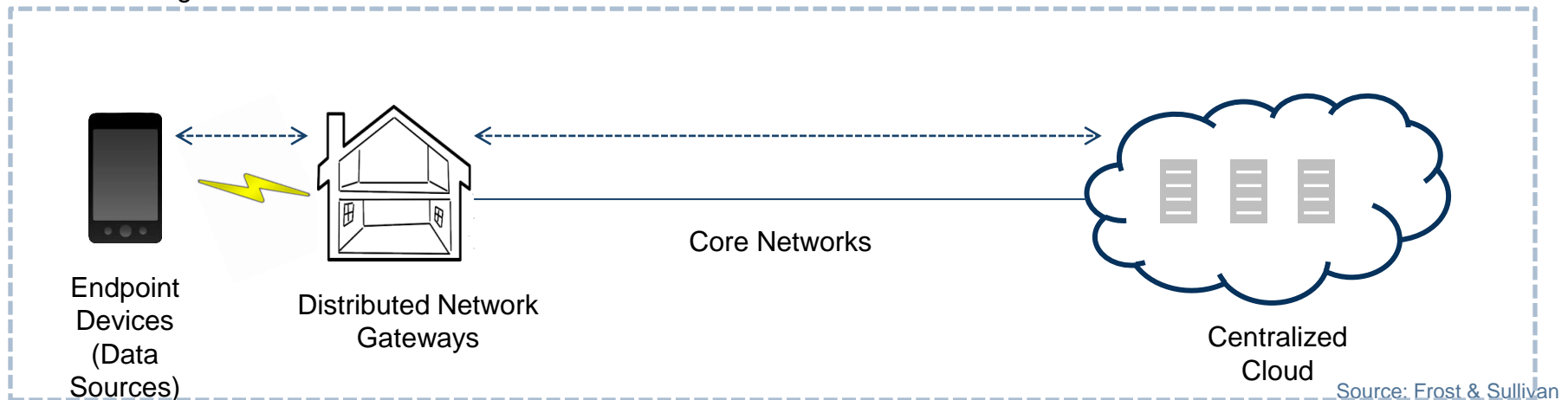# Table of Contents

Source: Frost & Sullivan

FROST *&* SULLIVAN

Overview

Defining Edge Computing

The term edge computing refers to computing that pushes intelligence, data processing, analytics, and communication capabilities down to where the data originate, that is, at network gateways or directly at the endpoints. The aim is to reduce latency, ensure highly efficient networks operation as well as service delivery and offer an improved user experience.

- By extending computing closer to the data source, edge computing enables latency sensitive computing, offers greater business agility through better control and faster insights, lowers operating expenses, and results in more efficient network bandwidth support.

- Key Characteristics

  - On premises

  - Proximity

  - Real time

  - Wide geo-distribution

Endpoint Devices (Data Sources)

Distributed Network Gateways

Core Networks

Centralized Cloud

Source: Frost & Sullivan

FROST & SULLIVAN

Comparison – Edge versus Cloud

	Edge Computing	Cloud Computing
Target User	Internet of Things (IoT) devices and enterprise users	Enterprise application users
Data Characteristic	Distinguishing characteristics are its proximity to end users and dense geographical distributions. It is based on the principle of isolation of user data that live on the edge.	Distinguishing characteristics are virtualization, accessibility, flexibility and scalability. All of your data is not "physically" close to you. All data is centralized within one or more data centers.
Service Type	Services are hosted at the network edge or end devices like set top boxes or access points.	Services are hosted in virtual servers, over the internet and not your hard drive. All data and programs are accessed over the Internet and there is no dedicated service in residence.
Advantage	An edge network with several locations creates a geographically dense structure that supports mobile computing and Big Data applications.	Scalability, flexibility and accessibility make the Cloud suitable for project test and development, big data analytics, data storage, backup, disaster recover, archiving, application services, mobile services and virtual desktops, among others.
Application	It supports Internet of Everything applications that demand real time or predictable latency.	It supports server hardware, applications and almost any type of data.
Hardware	Limited storage, compute power and wireless interface.	Ample and scalable storage space and computing power.
Working Environment	Outdoor (streets, parks, and so on) or indoor (restaurants, shopping malls, and so on)	Warehouse-size building with air conditioning systems.
Deployment	Centralized or distributed in regional areas by local business (local telecom vendor, shopping mall retailer, and so on)	Centralized and maintained by companies like Amazon, Google, and so on.

FROST & SULLIVAN

Tech-Trend Evolution

Traditional IT

Companies and organizations build, operate and manage their own data centers for internal applications, known as captive data center.

In captive data center, all data is stored, computed and processed in enterprise location. This can ensure the privacy of data but at the same time raises challenges in cost and security.

- Virtualization
- Higher scalability, accessibility and flexibility
- Low infrastructure cost

Enterprise Location

Outsourced DCs &Cloud

In both outsourced data centers and cloud, data is not "physically" on premise. Data is computed and stored in 3rd party service provider locations.

Colocation service and managed hosting service are the 2 options of outsourced DCs services. PaaS, SaaS and IaaS are the 3 kind of services existing in the cloud computing market.

- Dense geographical distribution
- Proximity, lower latency and better connectivity

virtualization centralization

3rd Party Service Provider Location

Edge Computing

Edge computing provides real-time data processing. The majority of data storage and compute will be done at the edge with a smaller computing power than the cloud
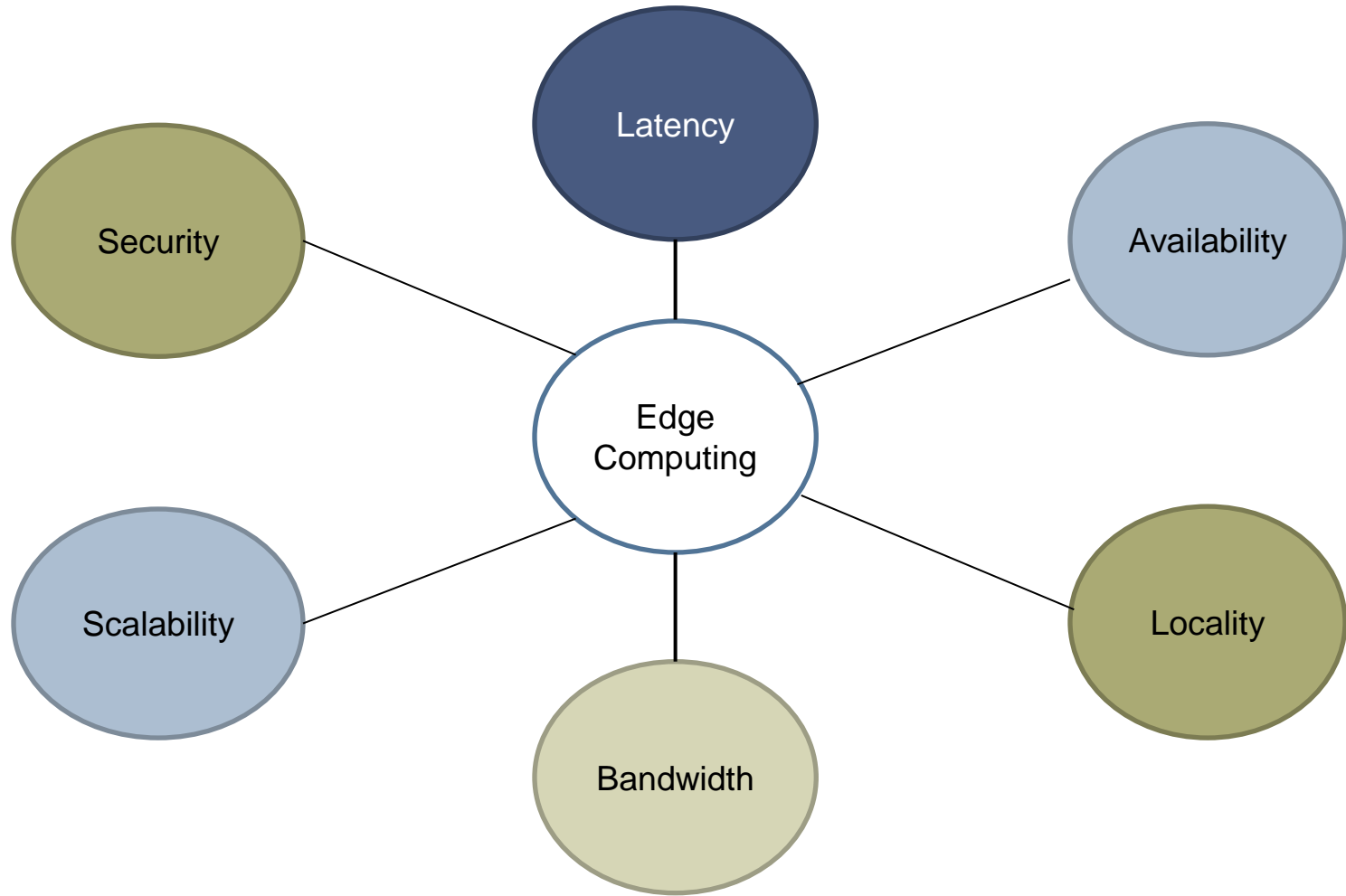
The service market in edge server/processors and IoT applications has a large potential to be explored.

Distributed Location

FROST & SULLIVAN

Factors Impacting Edge Computing Workloads

Source: Frost & Sullivan

Adoption Analysis

Edge Computing: Adoption Drivers, APAC, 2018

Total Talent Management Solutions Market: Key Adoption Drivers, Asia-Pacific, 2018–2024

Drivers	1–2 Years	3–4 Years	5-7 Years
Growing Adoption of IoT resulting in increased demand for Edge Infrastructure	H	H	H
Implementation of Edge Infrastructure resulting in lower operational expenses	H	H	H
Increased availability of enabling infrastructure	H	H	M
Increased demand for high definition video streaming and video-on-demand services	H	M	M

Impact Ratings: H = High; M = Medium; L = Low

FROST & SULLIVAN

Drivers Explained

Growing Adoption of IoT resulting in increased demand for Edge Infrastructure

- IoT (The Internet of Things) is one of the key drivers for the upward trend in edge computing adoption across Asia-Pacific.

- Internet of Things (IoT) will be a key enabler for the Smart Cities initiatives currently being implemented by developing nations across APAC.

- Provisioning of robust edge infrastructure will be important to secure the required latency and connectivity for successful IoT implementations. Therefore, the growing adoption of IoT will eventually drive the demand for edge computing solutions in the Asia-Pacific.

Implementation of Edge Infrastructure resulting in lower operational expenses

- Edge computing allows data center vendors to perform analytics on the gateways which lessens the bandwidth burden and reduces the operational costs, as only meaningful data are filtered and sent to the centralized cloud.

- Similarly, the edge infrastructure requires modular data centers or containers which comprise of not more than 20 racks. Such modular infrastructure does not require premium data center facilities and can be placed at client premises or at the base of telecom towers.

- This is especially beneficial for developing nations across APAC, especially in the ASEAN region with weak connectivity and infrastructure as it allows the service providers to expand their infrastructure and connectivity at much lower upfront costs.

Source: Frost & Sullivan

FROST & SULLIVAN

Drivers Explained (continued)

Increased availability of enabling infrastructure

- Adoption of edge computing is bound to be boosted owing to easy availability of supporting infrastructure to ably support the edge solutions.
- Availability of converged edge systems such as HPE's Edgeline series will allow service providers to place edge infrastructure at customer premises as well as inside the base stations which can enable edge solutions such as Multi Access Edge Computing (MEC).
- Companies such as ABB, Huawei, and Schneider Electric are developing innovative modular infrastructure solutions to ably support the service providers' distributed infrastructure strategy.
- Similarly, service providers can leverage the edge gateways to enable data encryption, thereby ensuring security and also to save the bandwidth costs by transferring only the meaningful data to the core data center.

Increased demand for high definition video streaming and video-on-demand services

- With the growing internet penetration across Asia-Pacific and the expected inception of 5G, the demand for high quality video streaming and OTT content is expected to continue its upward trend.
- The high traffic growth in content delivery can be supported by edge computing which can lessen the explosive data pressure in the network, thereby decreasing the latency.
- Solutions such as MEC allow Content Delivery Network (CDNs) providers like Akamai to distribute content directly from telecom base stations to the end-user devices, which considerably reduces the response time and enhances user experience.
- Therefore, the growing consumption of high definition video and OTT content in developed nations across APAC is bound to spur the demand for MEC solutions from the CDNs.

Source: Frost & Sullivan

FROST & SULLIVAN

Edge Computing: Adoption Challenges, APAC, 2018

Total Talent Management Solutions Market: Key Adoption Challenges, Asia-Pacific, 2018–2024

Challenges	1–2 Years	3–4 Years	5-7 Years
Integration in a multi-cloud environment	H	H	M
Increased security threat	H	H	M
Heavy initial capital investment	M	M	L
Lack of Awareness amongst SMEs and government sectors	M	L	L

Impact Ratings: H = High; M = Medium; L = Low

FROST & SULLIVAN

Challenges Explained

Integration in a multi-cloud environment

- Integrating edge computing applications and platforms into the existing cloud architecture is vital for realizing the true potential of edge computing.

- Edge computing is the missing link and the middle layer between devices (original data source) and cloud computing (core network). The limited storage and compute capability of edge nodes requires a well-performing co-existing system between edge and cloud.

- Cloud vendors will have to revisit their IT infrastructure in order to accommodate the high bandwidth as well as the redundant data reporting and routing requirements.

- With the growing adoption of multi-cloud environments amongst enterprises, establishing a redundant edge network to handle the incoming data traffic from multiple nodes will be a challenge for the cloud vendors.

Increased security threat

- The distributed architecture of edge computing consisting of a multitude of edge nodes being connected over a variety of networks presents an expanded vulnerable surface area for cyber attackers to exploit.

- When a service provider employs widely distributed nodes for computing, the ecosystem loses the compactness of a closed core data center. An edge backed IoT ecosystem comprises of numerous smart sensors which the cyber attackers can exploit to gain entry into the network.

- Newer security resources at the edge of the network such as edge gateways would therefore be required to comprehensively secure data compute and flow.

- Considering the growing focus on data sovereignty across the APAC, the adoption of edge computing could be adversely impacted owing to its security issues.

Source: Frost & Sullivan

FROST & SULLIVAN

Challenges Explained (continued)

Heavy initial capital investment

- R&D in software frameworks and hardware devices must be assisted by substantial capital investment which will build up the initial costs of edge computing.
- This is required to support tasks and execute workloads taking into account the heterogeneity of hardware and platforms, and the capacity of resources in the workflow.
- The initial capital required for availing the necessary infrastructure as well as expertise will be amplified in Asia-Pacific owing to the weak connectivity and network provisions in developing countries like Indonesia, Thailand and Vietnam amongst others.

Lack of awareness amongst SMEs and government sectors

- According to a 2017 research conducted by Vertiv consisting of IT and data center executives amongst others, 30% of the respondents were not fully aware regarding the scope and end uses of edge computing.

- Some of the developing countries in the Asia Pacific are still getting familiar with the cloud computing as a technology and the adoption of edge computing functionalities will require considerable amount of time. A decent portion of the service providers in APAC are still using micro data centers as a backup to their core data center facilities rather than for edge workloads.

- However, the introduction of Smart Cities initiatives across multiple countries in Asia-Pacific is expected to act as the catalyst for the uptake of edge computing in the region.

.

Source: Vertiv: The Edge in Asia, Frost & Sullivan

Edge Computing: Adoption Trend Prediction, APAC, 2018
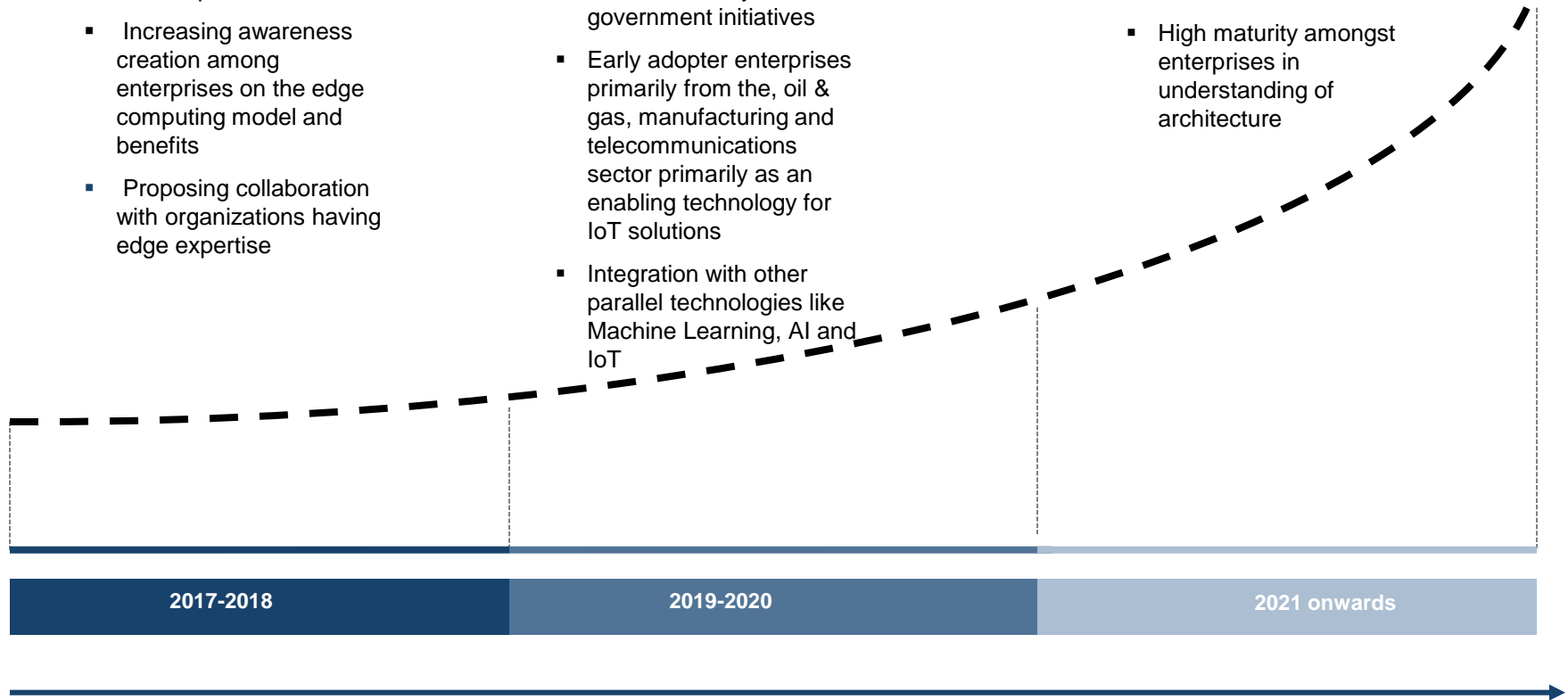
Awareness

- Phase of proposition development by technology vendors and service providers

- Increasing awareness creation among enterprises on the edge computing model and benefits

- Proposing collaboration with organizations having edge expertise

Early adoption

- Well established product and services offerings by technology providers to serve smart city and government initiatives

- Early adopter enterprises primarily from the, oil & gas, manufacturing and telecommunications sector primarily as an enabling technology for IoT solutions

- Integration with other parallel technologies like Machine Learning, AI and IoT

Mainstream adoption

- Adoption of edge computing for innovative solutions like connected cars and 5G

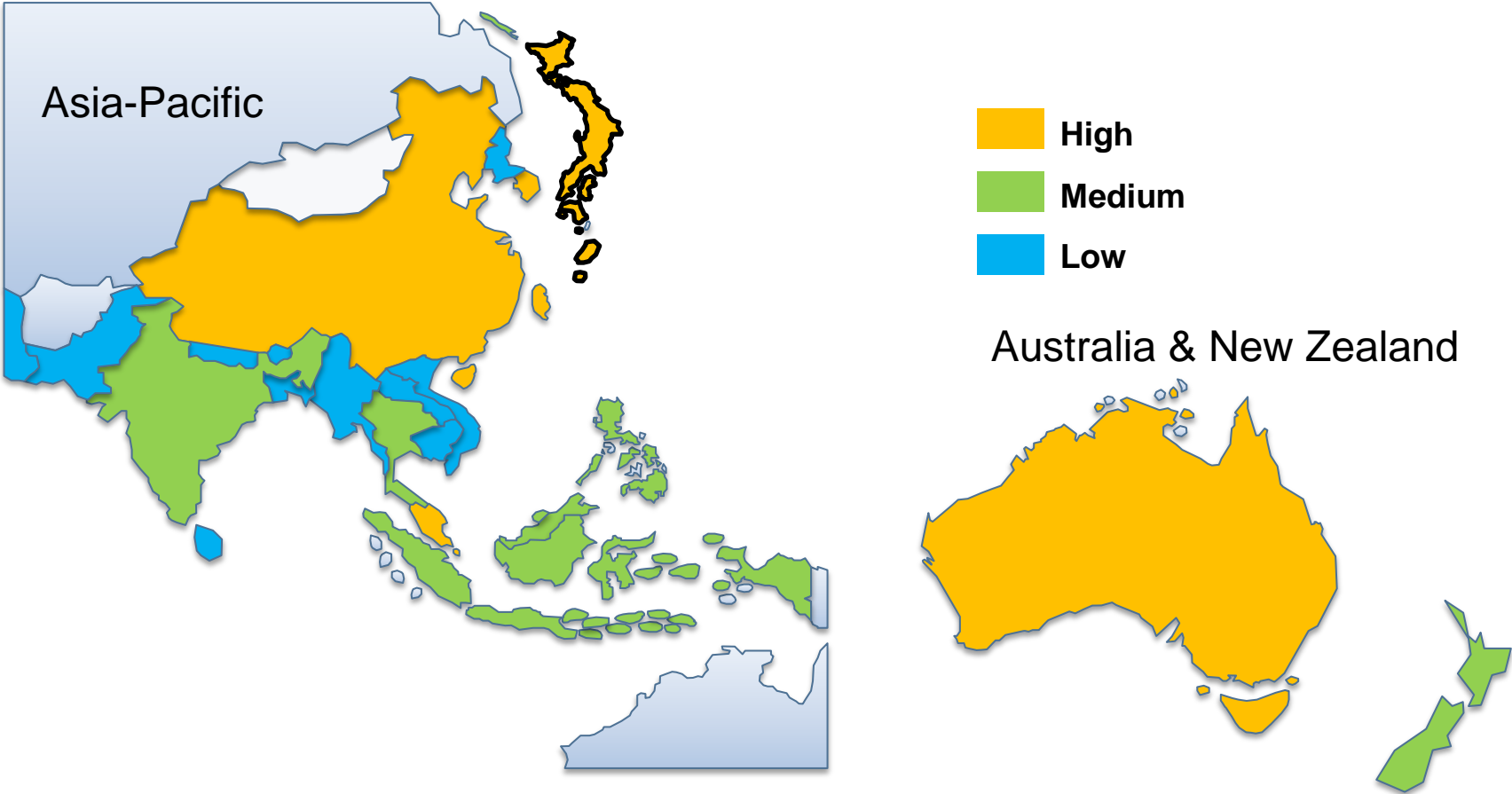- High maturity amongst enterprises in understanding of architecture

2017-2018	2019-2020	2021 onwards

Source: Frost & Sullivan

FROST & SULLIVAN

Edge Computing Awareness Level — APAC, 2018

Country Analysis

Comparative level of awareness amongst enterprises in edge computing architecture

Asia-Pacific

Australia & New Zealand

- High
- Medium
- Low

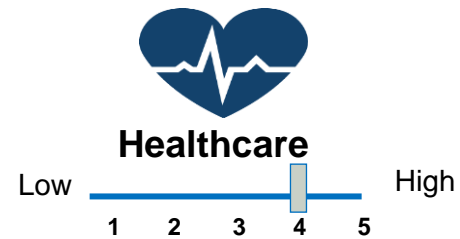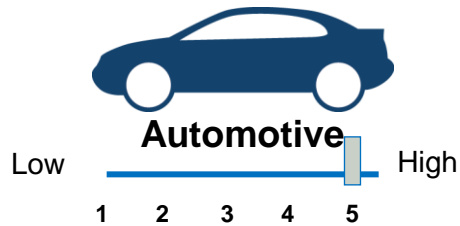Source: Frost & Sullivan

Edge Computing Awareness Level — APAC, 2018 (continued)

Vertical Analysis

Level of potential for edge computing

Automotive

Low   High

1   2   3   4   5

Healthcare

Low   High

1   2   3   4   5

Drivers

- Mobile Edge Computing(MEC) is the key enabler of 5G, Car2X Communication and automated driving, which in turn enhances car-to-car connectivity.
- NTT along with Toyota, DENSO, Ericsson and Intel amongst others have launched the Automotive Edge Computing Consortium to explore edge functionalities to support services such as intelligent driving and real-time maps.
- Edge computing can enable solutions such as infotainment, car-to-car communication and smart traffic management.

- The increasing deployment of healthcare IoT devices have created great mass of poorly standardized Patient-Generated-Health-Data (PGHD).
- Huge volumes of healthcare data requires real-time analysis to achieve better outcomes in patient care, patient engagement, health management and remote monitoring.
- Adoption of edge solutions in healthcare can enable shortened diagnosis time, connected medical devices and smart health tracking and management.

Source: Frost & Sullivan

Edge Computing Awareness Level — APAC, 2018 (continued)

Vertical Analysis

Level of potential for edge computing

Media & Entertainment

Low ———————————— High
  1   2   3   4   5

Manufacturing

Low ———————————— High
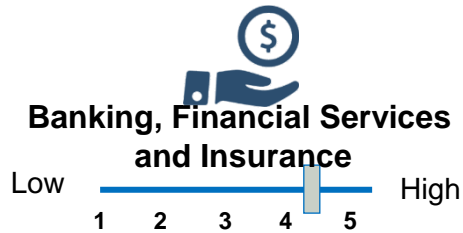 1   2   3   4   5
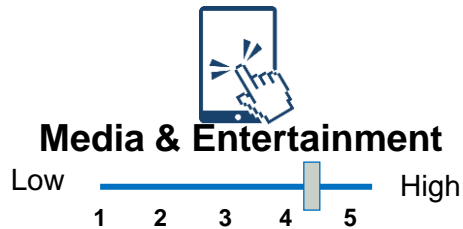
Drivers

- The demand for high quality video streaming and video-on-demand continues to be the upper curve.
- CDNs are aligning marketing messages around edge computing while evolving their distributed systems into full-fledged edge computing platforms.
- Mobile Edge Computing makes it possible to distribute content directly from base stations, which considerably shortens response time and improves user experience.

- Convergence of Operation Technology (OT) and Information Technology (IT) requires the support of edge computing solutions.
- The robust connectivity enabled by edge computing can play a big role in the emergence of industrial automation and data exchange required to support Industry 4.0 initiatives of governments across APAC.
- Fujitsu has created its Intelliedge Hardware and Appliances specially focused on leveraging edge computing capabilities for Industrial IoT.

Source: Frost & Sullivan

Edge Computing Awareness Level — APAC, 2018 (continued)

Vertical Analysis

Level of potential for edge computing

Banking, Financial Services and Insurance

Low ——————— High
1   2   3   4   5

Public Sector

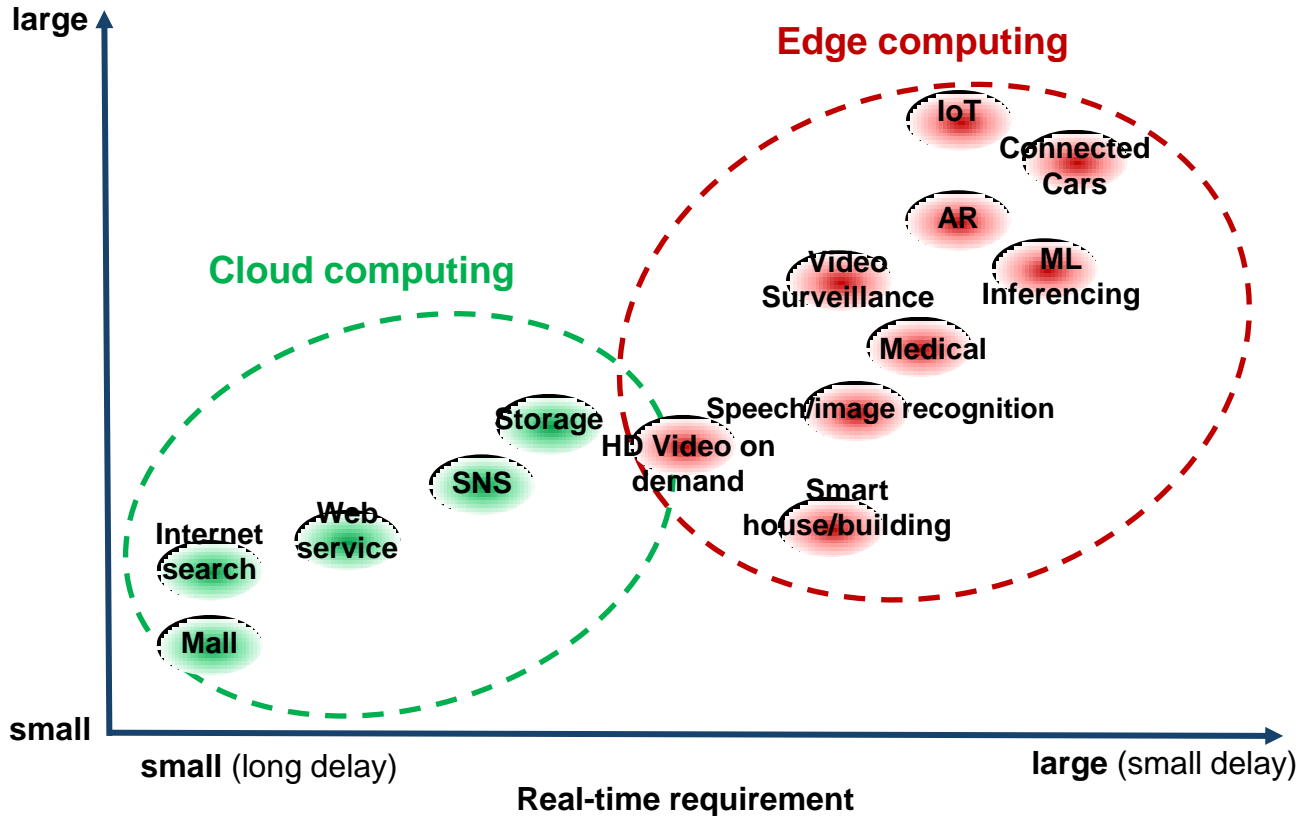Low ——————— High
1   2   3   4   5

Drivers

- Data sovereignty has received a keen focus from cloud and data center markets across APAC with countries like Indonesia and Vietnam recently implementing their data security laws.
- BFSI sector is one of the key adopters of data center and cloud computing services and service providers, therefore have to ensure effective network security provisions to prevent data breaches.
- Edge computing combined with secure gateways ensures enhanced security and privacy which allows financial institutions to comply with the strict data security norms.

- As a key component of the next generation communication ecosystem, edge computing can accelerate the digital transformation roadmap of governments in countries such as Taiwan, Thailand, the Philippines, Singapore and Malaysia amongst others..
- Real-time analysis done in distributed devices and gateways around the city will contribute to Smart City in transportation, security etc.
- The requirements of high-resolution video can be addressed by edge-based surveillance system. It allows detailed, in-depth but cost-effective analysis of video content.

Source: Frost & Sullivan

FROST & SULLIVAN

Key Applications of Edge Computing, APAC, 2018

Applications that are suitable for edge computing

Volume/frequency of data transmission to the server

large

Edge computing

Cloud computing

- IoT
- Connected Cars
- AR
- ML Inferencing
- Video Surveillance
- Medical
- Speech/image recognition
- Storage
- HD Video on demand
- SNS
- Smart house/building
- Web service
- Internet search
- Mall

small

small (long delay) — **large** (small delay)

Real-time requirement

Edge Computing Platform

Real time application

The communication delay is shortened by executing real-time applications near to the edge-servers.

M2M/ big data applications

The network bandwidth is reduced by local data processing of M2M or big data applications.

Improve the user's experience

Offloading computation intensive processing from the user's device to edge servers.
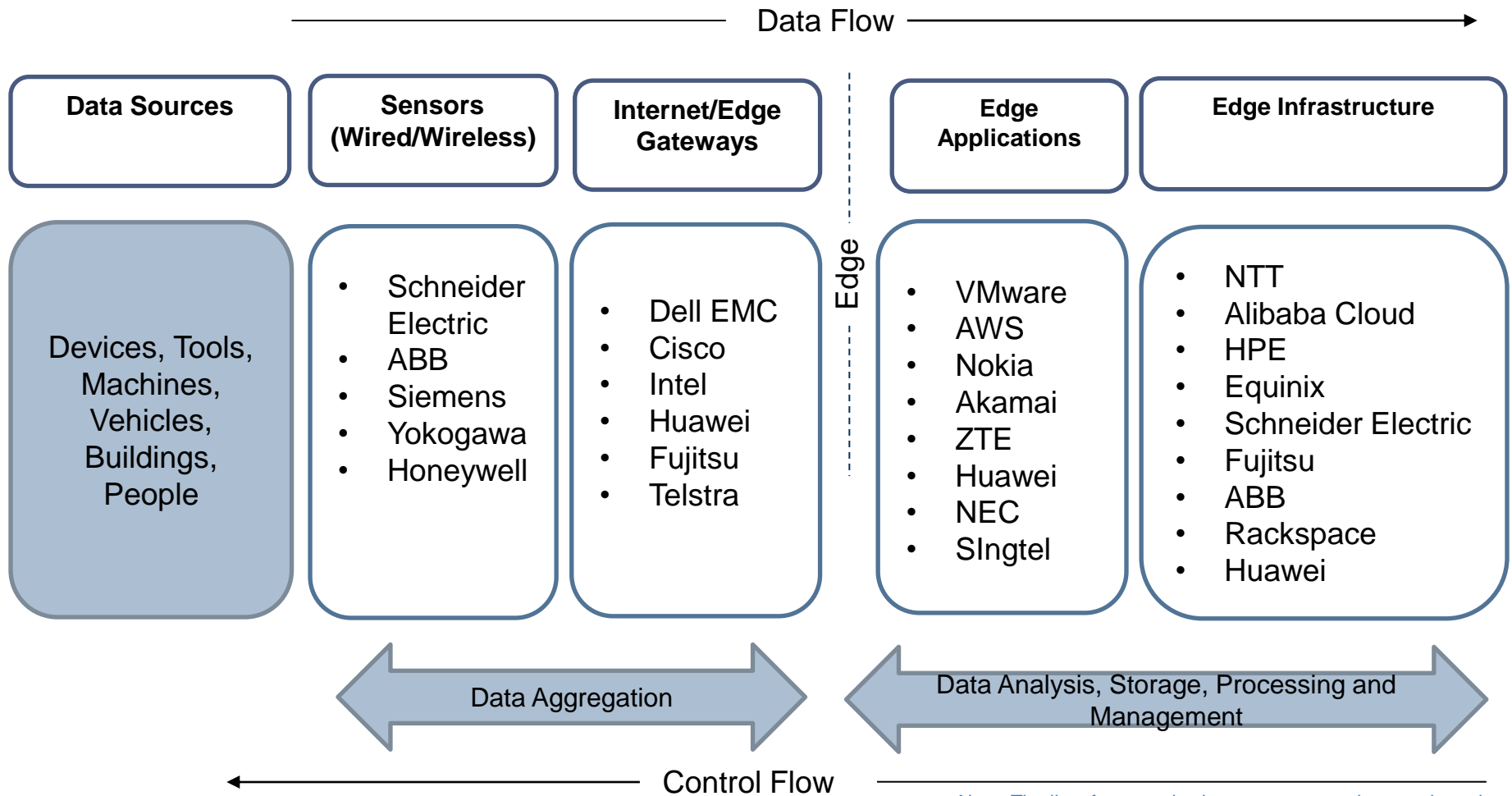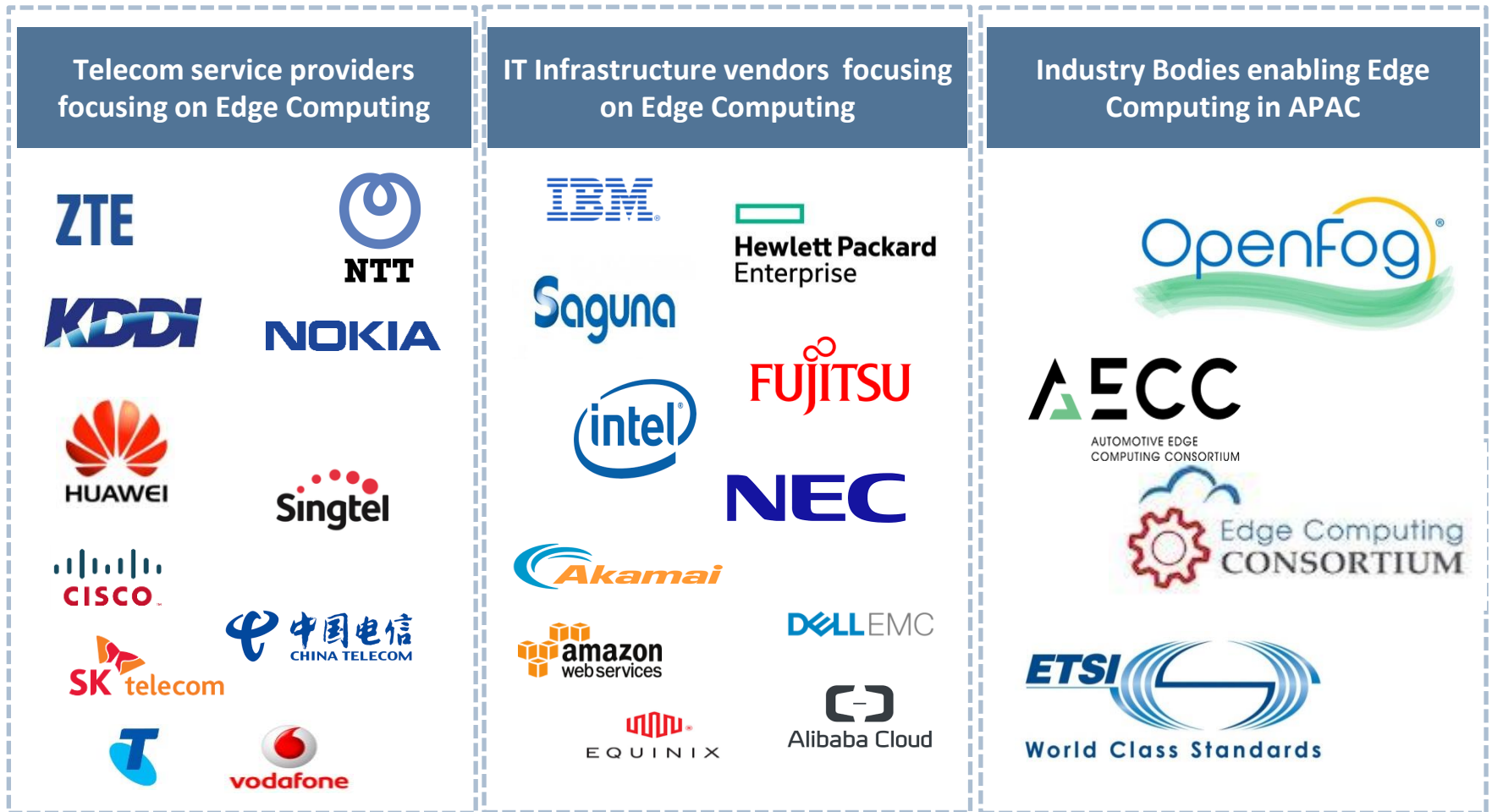
Source: Frost & Sullivan

Ecosystem Analysis

Edge Computing Ecosystem, APAC, 2017

Data Flow →

Data Sources	Sensors (Wired/Wireless)	Internet/Edge Gateways	Edge Applications	Edge Infrastructure
Devices, Tools, Machines, Vehicles, Buildings, People	• Schneider Electric • ABB • Siemens • Yokogawa • Honeywell	• Dell EMC • Cisco • Intel • Huawei • Fujitsu • Telstra	• VMware • AWS • Nokia • Akamai • ZTE • Huawei • NEC • SIngtel	• NTT • Alibaba Cloud • HPE • Equinix • Schneider Electric • Fujitsu • ABB • Rackspace • Huawei

Edge

← Data Aggregation →

← Data Analysis, Storage, Processing and Management →

← Control Flow

Note: The list of companies in every segment is not exhaustive
Source: Frost & Sullivan

FROST & SULLIVAN

Ecosystem – Industry Players, APAC 2018

Telecom service providers focusing on Edge Computing

ZTE
NTT
KDDI
NOKIA
HUAWEI
Singtel
CISCO
中国电信 CHINA TELECOM
SK telecom
vodafone

IT Infrastructure vendors focusing on Edge Computing

IBM
Hewlett Packard Enterprise
Saguna
FUJITSU
intel
NEC
Akamai
amazon web services
DELL EMC
EQUINIX
Alibaba Cloud

Industry Bodies enabling Edge Computing in APAC

OpenFog
AECC
AUTOMOTIVE EDGE COMPUTING CONSORTIUM
Edge Computing CONSORTIUM
ETSI
World Class Standards

FROST & SULLIVAN

Key Industry Participants, APAC, 2018 - Highlights

Player	Highlights
ABB	• ABB is focusing on providing robust edge infrastructure solutions to the customers with its Secure Edge Data Centers which will ensure customer readiness to run enterprise grade IT close to the operational technology environments.
Alibaba	• Alibaba Cloud and Intel launched the Joint Edge Computing Platform which uses computer vision and AI to convert data at the edge into business insights • Alibaba along with NXP is working towards developing secure smart devices to provision edge computing solutions. • Alibaba and Via Systems from Taiwan developed Link Edge platform (open edge computing platform) which provides customers with secure and seamless connections to the cloud computing, cloud security and integration services delivered by Alibaba Cloud.
AWS	• Launch edge focused software AWS Greengrass which allows effective integration of edge computing, machine learning and Internet of Things (IoT). • AWS Greengrass facilitates ML inferencing which when combined with industrial IoT allows insightful deployments by performing predictive maintenance and analytics
Dell EMC	• Dell EMC is striving to foray into modular edge infrastructure space with the launch of its 'PowerEdge MX' portfolio to serve the emerging data center workloads

FROST & SULLIVAN

Key Industry Participants, APAC, 2018 – Highlights (continued)

Player	Highlights
Equinix	• Equinix with its ECX Fabric rollout in APAC in 2018 coupled with 'Platform Equinix' , largest global platform of connected data centers and IT ecosystems can provision edge enabling solutions like multi-cloud connectivity, back-up and disaster recovery and distributed edge IT.. • In 2017, Equinix acquired Australia's major data center provider 'Metronode' which primarily employs a modular data center strategy, which could be a key tenet for the Equinix's edge computing strategy.
Fujitsu	• Fujitsu has designed its Intelliedge Hardware and Appliances focused on provisioning edge computing functionalities for Industrial IoT
HPE	• HPE introduced Edgeline converged edge systems which can run full workloads at the edge via new hardware offerings that can combine storage, cooling, software and computing efficiently.
HUAWEI	• Huawei introduced edge computing IoT gateway (AR500 series router) platform as a part of its Edge Computing-IoT portfolio

Source: Frost & Sullivan

Key Industry Participants, APAC, 2018 – Highlights (continued)

Player	Highlights
IBM	• IBM has integrated its edge analytics offering in Watson IoT platform allowing enterprises to perform analytics in the cloud.
Intel	• Launched a comprehensive mobile edge computing portfolio that enables communications service providers to transform their networks to support 5G workloads. • Intel's introduced the new Xeon processors that are designed specifically for telcos wanting to provision MEC solutions.
Microsoft	• Microsoft announced support for edge intelligence with Azure IoT Edge, partnering with Cisco to make it possible for the Azure IoT Suite to connect to and interoperate with Cisco edge computing deployments
Nokia	• Augmented global IoT communication with multi access edge computing platform, providing viable and cost-efficient solutions that would accelerate the adoption of Vehicle to Vehicle (V2V) and Vehicle to Infrastructure (V2I) communications from road infrastructure authorities and automakers • Nokia with its Multi-Access Edge Computing solutions and by leveraging NTT's low-latency communications has been able to shorten facial recognition time from security cameras, thereby enhancing the video surveillance capabilities.

Source: Frost & Sullivan

FROST & SULLIVAN

Key Industry Participants, APAC, 2018 – Highlights (continued)

Player	Highlights
NTT	• Launched IoT Testbed to accelerate IoT commercialization by implementing Mobile Edge Computing (MEC) • Launched "FANUC Intelligent Edge Link and Drive system (FIELD System)", which is an open platform for the delivery of advanced analytics at connected edge devices and sensors • NTT launched the Automotive Edge Computing Consortium with various global partners such as DENSO Corporation, Ericsson, Intel and Toyota, in order to develop and implement technologies for connected car solutions using edge computing and automotive big data.
NEC	• NEC launched the 'IoT service enabler' which can deployed as an Multi Access Edge Computing (MEC) platform as well as can be used for automatic network control and management.
Saguna Networks	• Saguna launched the new 'MEC Starter Kit' which merges edge based applications with other APIs as well as supports real time services. • Saguna will collaborate with Tech Mahindra to provide optimization and acceleration solutions based on MEC for IoT and video services.

Source: Frost & Sullivan

Key Industry Participants, APAC, 2018 – Highlights (continued)

Player	Highlights
Singtel	• Singtel has launched 'Liquid Infrastructure' which is a network management platform designed to use for edge oriented functions such as IoT connectivity, quick remote site deployments, virtual network management and flexible bandwidth arrangements.
Telstra	• Telstra is redeploying considerable amount of its local exchanges in the region as data center facilities to support the distribute cloud IT strategy, which will thereby compliment its edge initiatives.
VMware	• VMware alongside other industry stakeholders like Wipro and Axis Communications launched edge computing solutions for use cases such as Asset Management and Smart Surveillance • These solutions were based on other Vmware offerings such as VMware vSAN hyper-converged infrastructure (HCI) software, VMware vSphere and VMware Pulse IoT Center
ZTE	• Partnered with carriers in China on MEC deployment and provided carriers with 4G/5G integrated solution for the commercialization of MEC in 2018 • ZTE successfully implemented MEC indoor positioning trial within an accuracy of 5 meters

Note: The list of companies is not exhaustive
Source: Frost & Sullivan

FROST & SULLIVAN

Edge Computing – Key Service Provider Focus Areas

Key Service Providers	Edge Enabling Portfolio/Solutions	Edge Ecosystem Initiatives
NTT Communications	MEC platform, Modular data center solutions, Multi-cloud management platforms	●
Equinix	Data center interconnection, Modular data center solutions, Data center management platforms	●
NEC	Smart data center services, Smart data management services, MEC platforms, Modular data center solutions	◕
Singtel	Multi-cloud management platforms, IoT ecosystem and device management applications, Cloud connect solutions	◔
Fujitsu	Edge solutions for IIoT, Edge gateways, micro data center solutions, Data center interconnection	◑
Telstra	Data center interconnection, Cloud Gateway Services, Edge enabling hardware solutions for IoT deployments	◑

Note: Edge Ecosystem Initiatives refers to collective efforts to improve and support edge adoption in the target region

Intensity: ● Very High ◕ High ◑ Medium

FROST & SULLIVAN

Key Edge Computing Industry Bodies, APAC, 2018
ECC – Edge Computing Consortium

1 Objective

- ECC, Edge Computing Consortium, serves as an edge computing industry cooperative platform, which promotes open cooperation in the OT and ICT fields, nurtures the industry's best application practices, and advances sound and sustainable development of the edge computing industry.
- The ECC's purpose is to foster industry coordination in an open and innovative way, and promote prosperity and development for all parties.

2 Members

ECC is initiated in China with the cooperation of 6 Chinese and non-Chinese companies and institutes:

- Huawei Technologies Co., Ltd.
- Shenyang Institute of Automation of the Chinese Academy of Sciences
- China Academy of Information and Communications Technology (CAICT)
- Intel Corporation
- ARM Holdings
- iSoftStone Information Technology (Group) Co., Ltd.
- Honeywell
- National Instruments, etc.

3 Activity

- Industrial Internet Consortium (IIC) and Edge Computing Consortium (ECC) signed a MOU to explore shared capabilities in Industrial Internet of Things (IIoT) and edge computing.
- ECC and the IIC conducted a joint workshop in Beijing on August 30, 2017, for ECC and IIC members to share use case information have agreed to meet regularly to exchange information

Source: Frost & Sullivan
Note: The members list is not exhaustive

Key Edge Computing Industry Bodies, APAC, 2018
OpenFog – Fog Computing

OpenFog®

1 Objective	**2** Members	**3** Activity
• OpenFog Consortium offers open architecture framework and enables innovations by fog computing. • OpenFog consortium believes cloud and fog computing are on a mutually beneficial, inter-dependent continuum as certain functions are naturally more advantageous to carry out in fog nodes, while others are better suited to cloud. • OpenFog aims at enabling advanced IoT, 5G and AI with fog computing.	Members include leading tech & networking players, entrepreneurs and universities. The following is distinguished members: • ARM • Cisco • Dell • Intel • Microsoft • Princeton University • ZTE • GE • FOXCONN • SAKURA Internet • ShanghaiTech University	• OpenFog launched its first industry conference on fog computing, which named as Fog World Congress, from Oct 30 to Nov 1, 2017. • OpenFog released landmark reference architecture for fog computing in February, 2017. Technical document defines an open framework for designing fog-based solutions to accelerate innovation in IoT, 5G and AI and provide a foundation for industry standards

Note: The members list is not exhaustive
Source: Frost & Sullivan

FROST & SULLIVAN

ETSI — World Class Standards

1 Objective

- The Multi-access Edge Computing (MEC) initiative is an Industry Specification Group (ISG) within ETSI.
- The objective of the ISG is to create a standardized, open environment which will allow the efficient and seamless integration of applications from vendors, service providers, and third-parties across multi-vendor Mobile-edge Computing platforms.

2 Members

The following is distinguished members:
- HPE
- IBM Europe
- Huawei
- VODAFONE
- Intel Corporation (UK)
- NTT Corporation
- Saguna Networks
- Juniper Networks
- Vasona Networks
- ZTE Corporation
- NEC Europe Ltd.
- Docomo Communications
- ITRI

3 Activity

- ETSI Multi-access Edge Computing (MEC) group released the first package of standardized APIs to support edge computing interoperability in July, 2017.
- ETSI released three foundation-level Group Specifications which define MEC terminology and specify the framework and reference architecture of MEC.

Source: Frost & Sullivan
Note: The members list is not exhaustive
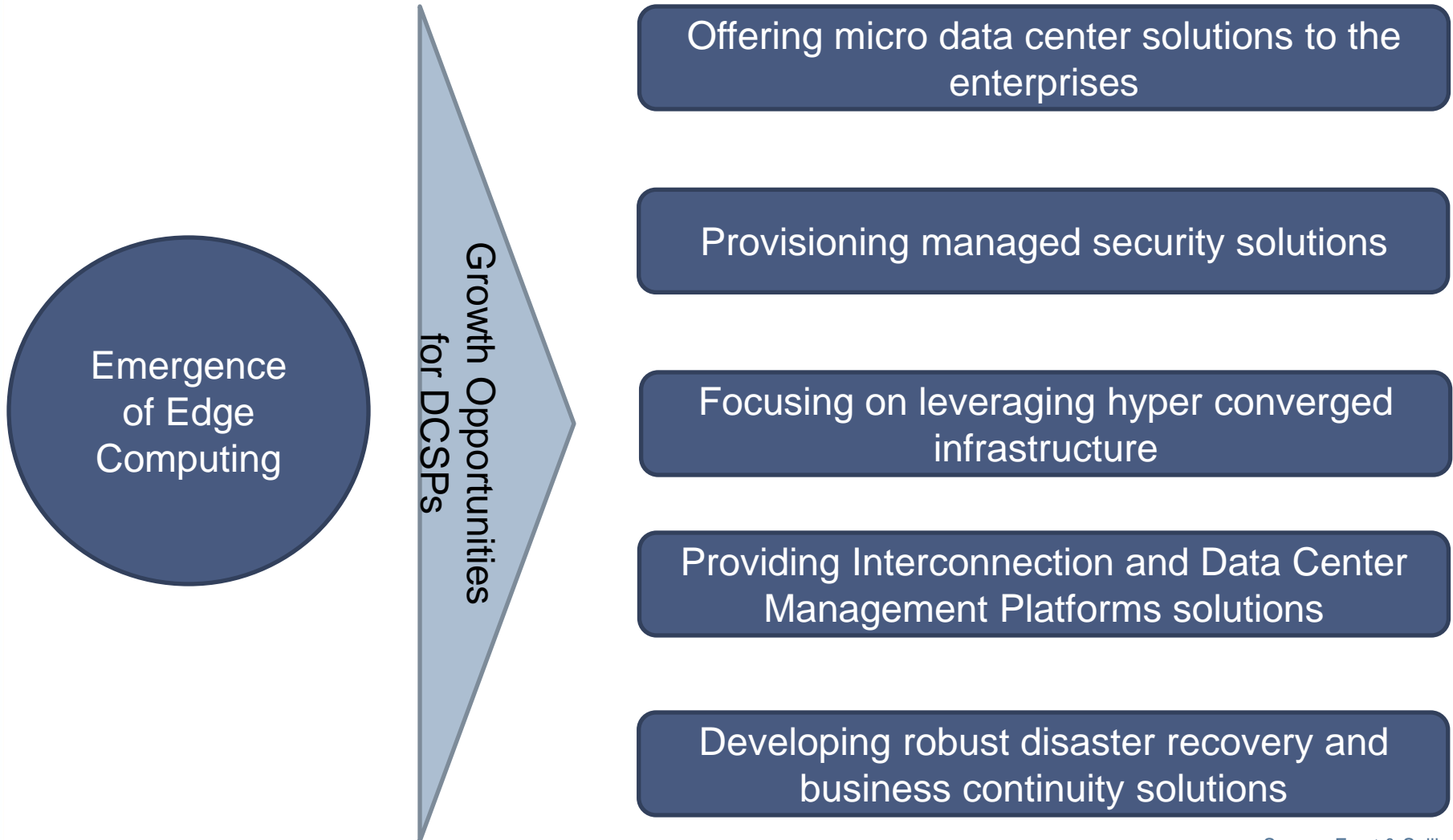
Key Edge Computing Industry Bodies, APAC, 2018
AECC - Automotive Edge Computing Consortium

1 Objective

- The objective of the consortium is to form an ecosystem for connected cars to support emerging services such as intelligent driving, the creation of maps with real-time data, and driving assistance based on edge cloud computing

2 Members

- NTT Communications
- NTT Data
- NTT Docomo
- Fujitsu
- Intel
- DENSO
- Toyota
- Toyota Infotech
- HPE
- Cisco
- Ericsson
- AT&T
- KDDI
- Sumitomo Electric

3 Activity

- NTT launched the Automotive Edge Computing Consortium with various global partners, namely, Intel Corporation, DENSO,Toyota, NTT Docomo, Cisco and Ericsson amongst others , in order to explore potential capabilities for connected cars using edge computing and automotive big data.

Source: Frost & Sullivan
Note: The members list is not exhaustive

Growth Opportunities for Data Center Service Providers, Asia-Pacific, 2018

Emergence of Edge Computing

Growth Opportunities for DCSPs

Offering micro data center solutions to the enterprises

Provisioning managed security solutions

Focusing on leveraging hyper converged infrastructure

Providing Interconnection and Data Center Management Platforms solutions

Developing robust disaster recovery and business continuity solutions

Source: Frost & Sullivan

FROST & SULLIVAN

Growth Opportunity 1: Offering micro data center solutions to the enterprises

- The design of edge computing is moving toward modular units which will impact the infrastructure planning and promote scalable infrastructure of data center, given that edge information technology needs to operate via integrated software definitions and protocols.

- To enable the low latency provided by edge computing solutions, enterprises are adopting a distributed infrastructure strategy, thereby driving the demand for micro or edge data centers.

- Micro data centers are data centers with typically not more than 20 racks usually deployed at the base of telecom towers. These data centers are connected to the core data centers and carry out data processing and analysis at the edge closer to the point of data generation and transfer it to the core data centers.

- Adoption of edge data center strategy would be especially ideal for the data center vendors across mature but geographically limited data center markets like Singapore and Hong Kong as well as for the vendors in developing countries like Indonesia and Vietnam with limited availability of resources.

- In APAC, vendors such as NTT Communications and Equinix amongst others are increasingly focusing on provisioning modular infrastructure solutions for the enterprises

Source: Frost & Sullivan

Growth Opportunity 2: Provisioning managed security solutions

- Growing adoption of IoT solutions and the resultant increase in deployment of edge computing solutions by the enterprises, will drive the need for distributed IT infrastructure strategy across the Asia Pacific region.

- Enterprises are preferring to deploy multiple micro data centers rather than huge core data centers. Edge solutions are primarily deployed to sustain IoT environments which consists of multiple sensors and endpoint devices.

- Therefore, edge infrastructures presents a wide base for potential cyber attackers to gain an entry into the network which could lead to data breaches.

- Enterprises will therefore need to harness effective network security solutions for their distributed network infrastructure. Data center vendors, can potentially exploit this space and provision managed security solutions to the enterprises employing edge infrastructure.

- Data center vendors can leverage their expertise in the micro data center space to design specific managed security solutions based on the client requirements and technology usage.

FROST & SULLIVAN

Growth Opportunity 3: Focusing on leveraging hyperconverged infrastructure

- The distributed IT strategy enables edge computing solutions and the service providers should focus on ramping up their modular infrastructure which can effectively handle all the aspects of a core data center within a containerized box such as computing, storage, cooling and analytics amongst others at the edge.
- Such hyperconverged arrangement will allow data center service providers to place their infrastructure much closer to the source of the data such as client location or inside the base stations for multi access edge computing (MEC).
- This will ensure an improved turnaround time while reducing the number of endpoint devices, thereby limiting network vulnerability.
- Hyperconverged infrastructure systems also allows faster deployment as well as scalability for the service providers. Thus providing hyperconverged storage solutions to the enterprises will better position the data center vendors to serve the incoming demand for edge computing solutions.
- IT vendors like HPE with their Edgeline systems, Nutanix and VMware have already made inroads in the hyperconverged server market. Data center vendors with their micro data center strategy are better positioned to offer enterprise grade hyperconverged infrastructure solutions.

FROST & SULLIVAN

Growth Opportunity 4: Provisioning Interconnection and Data Center Management Platforms

- The emergence of edge computing can result in a shift from the traditional data center offerings to allow service providers to fully support the evolving network infrastructure and management requirements.
- With the rise in the adoption of micro data center strategy across APAC, data center vendors can provide interconnection as well as managed services to ensure smooth network integration and resource management for the enterprises.
- Data Center Management-as-a-Service (DCMaaS) which shifts data monitoring process of an enterprise's data center operations to the service provider's cloud, is expected to be a key part of the service provider portfolios in the near future.
- Similarly, data center vendors are deploying usage analytics for networks to gain insights from the data center resources in order to identify operational pain points to optimize operational expenses as well as enhance service delivery.
- In APAC, Equinix has been investing significantly in provisioning effective interconnect solutions for the enterprises enabling them to deploy a distributed IT infrastructure at the edge and privately connect it with the core data center.
- Similarly Keppel Data Centers and PCCW Global jointly launched the new International Carrier Exchange (ICX) to provide robust interconnect solutions for the enterprise facilities.

FROST & SULLIVAN

Growth Opportunity 5: Developing robust disaster recovery and business continuity solutions

- With their close proximity to the Pacific Ring of Fire, countries within APAC and especially ASEAN countries are extremely prone to natural disasters.
- In order to provision robust edge computing solutions, IT vendors will have to invest in considerably in deploying a distributed infrastructure which includes micro data centers and interconnect fibers.
- Edge infrastructure which is more open as opposed to closed core data centers increases the vulnerability of the network and damage due to natural mishaps could be tremendous.
- Therefore, leveraging effective backup and business continuity solutions becomes a necessity for the edge vendors.
- Solutions such as Disaster Recovery as a Service (DRaaS) and Business Continuity as a Service (BCaaS)can become an integral part of data center service providers' portfolio in APAC owing to their already established infrastructure background. Service providers can easily facilitate these services from one of their micro data centers.

Source: Frost & Sullivan

FROST & SULLIVAN

Last Word

The Last Word—Predictions

1   Edge computing is expected to become mainstream in the Asia-Pacific region given the ever-increasing requirements for higher bandwidth and faster speeds. Demand is anticipated to come from enterprises requiring micro data centers located closer to end users for data collection, processing, and storage.

2   With the anticipated inception of 5G technology, the adoption of multi access edge computing (MEC) will be accelerated to support the low latency requirements and real-time processing of high volumes of data.

3   Enterprises across APAC are increasingly adopting edge functionalities and there will be a sustained demand for application support as well as integrated platforms for efficient management of distributed IT and multi-cloud environments in an edge infrastructure..

Source: Frost & Sullivan

Legal Disclaimer

Frost & Sullivan is not responsible for any incorrect information supplied to us by manufacturers or users. Quantitative market information is based primarily on interviews and therefore is subject to fluctuation. Frost & Sullivan research services are limited publications containing valuable market information provided to a select group of customers. Our customers acknowledge, when ordering or downloading, that Frost & Sullivan research services are for customers' internal use and not for general publication or disclosure to third parties. No part of this research service may be given, lent, resold or disclosed to noncustomers without written permission. Furthermore, no part may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the permission of the publisher.

For information regarding permission, write to:
Frost & Sullivan
3211 Scott Blvd, Suite 203
Santa Clara, CA 95054

Source: Frost & Sullivan

FROST & SULLIVAN