Market Forecast

Asia Pacific (Excluding Japan) Wireless SD-WAN Market Forecast & Analysis 2017-2021

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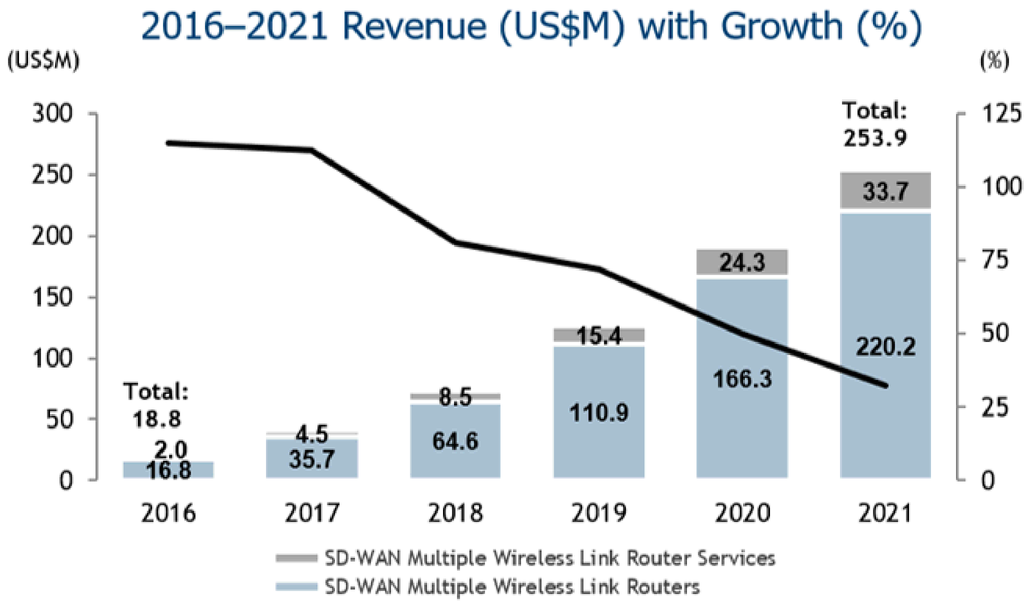
IDC MARKET FORECAST FIGURE

FIGURE 1

Asia/Pacific (Excluding Japan) Wireless SD-WAN Revenue Snapshot, 2016-2021



Selected Segment Growth Rate

- ▲ SD-WAN Multi-Wireless Link Routers CAGR 67.3%
- ▲ SD-WAN Multi-Wireless Link Services CAGR 75.6%

Total Market CAGR 68.2%

Source: IDC, 2017

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EXECUTIVE SUMMARY

The Internet of Things (IoT) is expected to add an exponentially higher number of distributed connections to the enterprise network. A rising percentage of the global workforce is mobile or remote, dependent on accessing applications on the cloud via a mobile device, as enterprise applications continue their migration to the cloud. Increasingly applications are being delivered from the Internet — as SaaS, IaaS, or PaaS. A highly distributed enterprise connecting humans and machines to cloud-based applications with a never-ending appetite for bandwidth characterizes the enterprise network driven by cloud data services and PaaS.

The wide area network (WAN) must evolve to support these new paradigms as manufacturers and/or operators of products (ranging from bicycles to motorcycles to automobiles to railroad cars to airplane engines) will need to have their products in the field connected via an IoT process in order to collect data for quality of service and for improving future products. Regardless of how they are connected, users and mobile/IoT sensors expect mobile-friendly applications to be delivered with a consistent level of performance, security, reliability, and availability.

Enterprise network traffic growth continues unabated as more business processes are digitized and more apps are accessed on mobile devices. The challenge for enterprises and their service provider partners is to deliver the higher quantum of network traffic while satisfying policy and user experience expectations for these new cloud/mobile/IoT applications without substantially increasing the cost of the network infrastructure. A hybrid WAN that incorporates all possible WAN connectivity options is not a luxury but a necessity and creates an opportunity for optimizing application performance and improving efficiencies.

Industrial IoT is the Internet of Things applied to industrial/enterprise use cases such as manufacturing and operational resources, retail distribution, public sector, healthcare industries, energy and minerals industries including oil and gas and mining. For industrial IoT adopters, wireless is oftentimes the only way to connect remote assets. The emergence of the wireless SD-WAN router product, in which SD orchestration and control is done via virtual network functions (VNFs) residing on hosts to control endpoints via single or multiple wireless links, is a new and exciting way to further optimize and improve products and services.

This IDC study analyzes the Asia/Pacific (excluding Japan) wireless SD-WAN market and provides IDC's first forecast for this networking segment. "As enterprises adopt IoT processes in their internal operations as well as for the products and services they provide, it is becoming clear that the WAN needs to advance to include the important features of bandwidth and lower latency in the evolving wireless broadband technologies such as 4G, 4.5G, 5G, and satellite," says Bill Rojas, adjunct research director, IDC Asia/Pacific. "We are still in the early stages of wireless SD-WAN adoption in terms of applications and use cases across many verticals including discrete manufacturing telematics, connected vehicles, public safety, precision farming, smart utility grids, and smart buildings," he added.

ADVICE FOR TECHNOLOGY SUPPLIERS

For enterprises, systems integrators (SIs), and network designers, the challenge that IoT presents is that many of the critical assets are in the field, whether stationary or mobile. As a result, until SD-WAN products became available, enterprisers and SIs often have to develop custom solutions that were not scalable and not configurable. The current generation of wireless SD-WAN products provides additional features depending on the vendor, such as video jitter removal, sub-second failover, LPWAN data aggregation, various levels of encryption, and cellular and VPN bonding.

Manufacturing Machine Tools and Robotics

For SIs designing factory environments, the possibility of including 4G LTE small cells in the factory floor instead of WiFi makes for a much more robust environment. In this model, automated guided vehicles (AVGs) can be connected without the disruptions that often occur when all machines are connected via WLAN at the same time.

Systems Integrators

For SIs looking to provide highly resilient communications for mission-critical systems the wireless SD-WAN router + cloud-SDN control provides additional flexibility and scalability while ensuring a secure network that changes security parameters (authentication, encryption, and so on) from a central cloud-based SD control server.

Communications Service Providers

Satellite and/or cellular roaming and universal connectivity will be among the requirements in several industries and use cases, such as automotive, heavy machinery, cargo shipping, luxury vessels, and airplane parts and maintenance. IT will need to integrate the communications service providers' (CSPs') billing, call detail records, and IP Detail Record (IPDR).

It is not inconceivable that mobile virtual network operators (MVNOs) will emerge in some markets as they have in Japan, with a focus primarily on the IoT market and most likely with specific vertical focus, such as smart homes, connected cars, and so on.

End-to-End Specific IoT Use Case Solutions

Leading manufacturers will find wireless SD-WAN a powerful concept in managing, monitoring, and improving the design of future products. Customers will come to expect that manufacturers are monitoring and collecting relevant operational statistics in order to improve products during their service lives.

MARKET FORECAST

IDC estimates that as of the end of 2016, Asia/Pacific (excluding Japan) (APEJ) spending on multi-cellular link SD-WAN routers was US$19.3 million (see Table 1). IDC forecasts that this will grow at a compound annual growth rate (CAGR) of 68.2% to reach US$253 million in 2021. The spending figure includes the cost of the cloud-based SD controller, which is typically charged as an annual percentage of SD-WAN router cost and resembles a managed service charge. We distinguish here between wireless SD-WAN solutions depending on whether they can support multiple cellular connections. Note that in terms of the engineering needed, multiple wireless connections are much more difficult to implement when carrying out cellular, VPN bonding, and video jitter management, and thus multiple-cellular solutions support higher average selling prices (ASPs).

As shown in Table 2, the number of global connected IoT devices will continue to grow at a CAGR of 19% from 2016 to 2021 while cellular connections in APEJ will grow at an even faster pace, at a CAGR of 32.3%. Cellular connections will account for roughly 13.7% of all global IoT connections in 2021 and roughly 9% of total IoT connections in APEJ. We note that satellite, LPWAN, and other radio access technologies will also see some devices connected via a wireless SD-WAN. For the initial forecast years of 2016–2021, single 3G/4G wireless-enabled SD-WAN routers will be the dominant install base. By 2021, multi-link SD-WAN will be on par with single wireless link routers in terms of spending because of the higher ASPs.

In APEJ, the number of cellular enterprise/industrial, buildings and public infrastructure IoT connections will reach 151 million connections by 2021 (see Table 3). The group of buildings, public infrastructure, and enterprise/industrial represents the majority of the addressable market for wireless SD-WAN.

TABLE 1

Asia/Pacific (Excluding Japan) Multi-Cellular SD-WAN Spending, 2016–2021 (US$M)

	2016	2017	2018	2019	2020	2021	CAGR 2017–2021
Wireless SD-WAN	16.8	35.7	64.6	110.9	166.3	220.2	67.3%
Wireless SD-WAN Services	2.0	4.5	8.5	15.4	24.3	33.7	75.6%
Grand Total	18.8	40.2	73.1	126.3	190.6	253.9	68.2%
Growth		112.3%	80.8%	71.8%	50.0%	32.4%	

Note: This forecast is for Multi-Cellular Link SD-WAN including cloud-based SD controller spending

Source: IDC, 2017

TABLE 2

Worldwide IoT Connections by Access Technology, 2016-2021 (Millions)

	2016	2017	2018	2019	2020	2021	CAGR 2017–2021
Wired	3,492.2	3,936.5	4,393.9	4,851.5	5,186.2	5,497.9	9.5%
Cellular	2,327.8	2,990.5	3,459.4	3,938.4	4,409.6	4,983.6	16.4%
LPWAN	687.4	958.2	1,338.2	1,878.0	2,572.9	3,440.2	38.0%
WLAN	8,356.2	10,139.6	12,309.5	14,962.1	18,208.7	22,196.4	21.6%
Satellite	2.5	3.0	3.6	4.4	5.6	7.3	23.9%
Other	0.2	0.2	0.2	0.3	0.3	0.3	8.4%

TABLE 2

Worldwide IoT Connections by Access Technology, 2016-2021 (Millions)

	2016	2017	2018	2019	2020	2021	CAGR 2017–2021
Total	14,866.3	18,028.0	21,504.8	25,634.7	30,383.3	36,125.7	19.4%
Growth		21.3%	19.3%	19.2%	18.5%	18.9%	

Source: IDC Worldwide IoT Installed Base Connectivity (IDC #42331917, March 2017)

TABLE 3

Asia/Pacific (Excluding Japan) IoT Cellular Wireless Connections (Thousands) and Spending (US$M), 2016–2021

	2016	2017	2018	2019	2020	2021	CAGR 2017–2021
Animals	8,063.8	10,086.4	12,607.0	14,423.7	15,580.9	16,854.0	15.9%
Buildings	15,473.7	21,345.8	29,379.5	40,308.5	55,091.8	75,169.1	37.2%
Enterprises/ Industrials	27,085.5	33,021.8	40,313.2	49,725.9	61,767.2	70,469.8	21.1%
Home	24,429.9	31,653.9	40,923.3	52,088.6	65,979.7	88,738.4	29.4%
Public Structures	2,219.1	2,550.9	2,955.5	3,456.4	4,079.8	4,833.6	16.8%
Telecom Infrastructure	362.5	414.0	471.3	536.7	613.1	680.7	13.4%
People	1,833.4	4,746.0	11,588.2	22,651.3	37,276.6	65,857.7	104.7%
Total	79,467.9	103,818.7	138,237.9	183,191.0	240,389.1	322,603.3	32.3%
Growth		30.6%	33.2%	32.5%	31.2%	34.2%	

Source: IDC, 2017

Drivers

Accelerating Digital Transformation of Field Operations

- **Assumption**: Critical assets in the field can be connected reliably with broadband connectivity including video streaming.
- **Impact**: Stationary and mobile assets in an organization — including manufacturing machines; testing equipment; logistics and transport equipment; and field assets such as gas pipelines, environmental sensors, surveillance cameras, and so on — will be connected to central repositories as more and more enterprises understand the operational benefits of being able to acquire real-time data from their physical products and other assets. For missional-critical applications, fault-tolerant communications with sub-second failover becomes a necessary requirement.

Securing Enterprises at the Edge

- **Assumption**: New ways of securing endpoints that make the IoT, SD-WAN control layer more feasible for the SI to embed functionality that can be used for the dynamic management of endpoints; identity and access management; web, messaging, network, and encryption protocols, are attracting greater attention.
- **Impact**: The importance of endpoint security depends on the industry, but if there is a direct monetary or competitive value to the data or live streaming video feed coming from cameras and other types of sensors in the field, then the threat to the enterprise will be high until security is further enhanced. The numerous and different ways that endpoint devices can connect to a corporate network also introduce additional security risk.

Wireless Broadband Coverage Including Satellite

- **Assumption**: Internet usage, particularly mobile internet usage, is skyrocketing across many regions around the globe, driven by LTE deployments covering more and more of the population. High-throughput satellite (HTS) provides another layer of bandwidth for remote communications such as cell towers in remote mountainous areas, merchant shipping, and offshore oil and gas rigs.
- **Impact**: The proliferation of LTE broadband combined with satellite broadband means that enterprises will have various ways to ensure that their mission-critical data can be uploaded or streamed as needed and with adequate quality of service.

Significant Market Developments

A number of network equipment providers (NEPs) are developing WAN optimization solutions to provide alternatives to legacy multiprotocol label switching (MPLS)-based WANs. However, a newer trend is to try to provide enterprise-class security and connectivity over existing private-WAN MPLS, xDSL, fiber optic FTTx, and 3G/4G cellular connections that will enable the construction of lower-cost multi-WAN VPN backbones. These can replace or supplement the more expensive MPLS network technologies. IDC expects that enterprises will use commodity links alongside MPLS in order to offload bulk traffic and minimize the cost of bandwidth expansion.

The early entrants in the multi-cellular SD-WAN space are utilizing technologies including Layer 2 interception, sub-second path decisions, congestion detection via deep packet inspection, hot failover, cellular bandwidth aggregation or bonding, caching, dynamic load balancing, and multi-path bandwidth smoothing. SD control is then realized with VNFs that are typically hosted in a cloud datacenter or embedded in the network via edge computing mini or micro datacenters. The advantage of incorporating the SD control layer is that optimization and product customization can be developed quicker to meet specific needs of clients with unique communications problems such as satellite, high-speed moving vehicles, and poor signal quality.

Some of the early entrants that have developed next-generation, wireless (single and multi-cellular link) SD-WAN products:

- **Peplink (HKSE: 1523):** Founded in 2007; products include SD multi-WAN routers, cellular routers, WAN bonding, bandwidth aggregation, and WAN smoothing
- **Cisco Systems (NASDAQ: CSCO):** Industrial Integrated Service Routers
- **Cradlepoint Networks (Boise, Idaho):** Founded in 2006; has shipped over 1.4 million routing platforms; product portfolio includes cloud-based wireline and wireless networking solutions for distributed and mobile enterprises.
- **Sierra Wireless (NASDAQ: SWIR):** Airlink dual-LTE-Advanced routers such as MG90
- **Mushroom Networks:** Founded in 2004; products include load balancing appliances, wireless bandwidth aggregation, WAN orchestration, and VoIP/SIP bonding for WAN to cloud, networking security, application delivery controller (ADC) and load
- **Icomera:** Acquired in May 2017 by ENGIE Ineo, which specializes in intelligent transport systems, and offers 1Gbps aggregated LTE solution for trains

Changes from Prior Forecast

This is IDC APEJ's first forecast for Wireless SD-WAN.

MARKET DEFINITION

SD-WAN enables an enterprise to deliver an automated, application-optimized, and integrated hybrid WAN. It is a solution to the quickly evolving application and WAN traffic characteristics and an opportunity to rationalize network costs in the face of rapidly growing data traffic. It incorporates both automated software intelligence and a hybrid WAN. Per IDC's definition, a hybrid WAN includes at least two WAN connections and leverages two or more different networks (MPLS, broadband internet, 3G/4G, etc.)

SD-WAN leverages hybrid WAN in an active/active configuration, and it also includes:

- a centralized, application-based policy controller
- analytics for application and network visibility
- a secure software overlay that abstracts underlying networks
- an SD-WAN forwarder (routing capability)

Technically speaking, an SD-WAN solution provides dynamic application policy and traffic management through leveraging a central controller. This enables it to deliver:

- application-defined intelligent path selection across WAN links (MPLS, broadband internet, LTE, etc.) based on policies defined on the SD-WAN controller
- flexible and agile policy definition across all dimensions (security, performance, COS, reliability, availability) for all apps

Wireless SD-WAN is a special case of SD-WAN designed to address the needs of non-consumer, industrial operations and manufacturing companies. Most initial deployments of SD-WAN in an industrial/manufacturing context utilize multiple wireless links, and in some cases, fixed links — all disparate networks integrated to form a hybrid WAN. Wireless links that could be utilized include cellular networks (4G/LTE) of different service providers, satellite networks or networks based on unlicensed spectrum such as WiFi, Bluetooth, LoRa, or SigFox.

As is the case with a typical SD-WAN deployment, wireless SD-WAN includes all four components found in enterprise SD-WAN but with two key differences:

- The presence of an SD-WAN forwarder with wireless routing capability
- An IoT aggregation/concentrator gateway function that aggregates data streams from multiple sensors.

In most wireless SD-WAN deployments (similar to SD-WAN deployments) the policy/orchestration controller is a VNF hosted on a server in a centralized cloud datacenter. Application policies are defined on the central controller. Based on these policy definitions and based on the visibility gleaned across connections on the network, the controller implements dynamic routing of application traffic across connection types, thus driving appropriate application policy outcomes in terms of performance, reliability, security, and availability.

Industrial IoT

Industrial IoT is the Internet of Things applied in an industrial setting. Industrial IoT is about bringing IoT concepts to the manufacturing and operations industries, including discrete manufacturing; process manufacturing; and resource industries such as oil and gas, mining, and agriculture. The industrial setting comes in two forms:

- The application of IoT within the industrial plant, in which IoT is used to track and monitor assets
- As a "service component" to the manufactured equipment. This enables the manufacturer to offer its products as a service, in which the customer pays for the service provided by the equipment, rather than for the ownership of the equipment.

The drivers for IoT adoption in the industrial setting are threefold:

- The drive for ever greater efficiencies in manufacturing
- Improvement of health and safety
- Changes in customer behavior, in which customers want the assurance of the service of the equipment but do not want to own the equipment and the associated maintenance and service commitments

IDC estimates that just the process manufacturing, discrete manufacturing, upstream energy production, and resource industries will already account for 35–38% of IoT spend in APEJ in 2019.

Examples of IoT in the factory or manufacturing setting would include tracking of such assets as people, equipment, and work in progress (WIP), supporting improvements in efficiency and health and safety. Actual examples would include the WIP tracking of semiconductor wafers in the manufacturing line using ruggedized RFIDs that can handle high processing temperatures; using automated guided vehicles (AGVs) to move parts, tools, and samples autonomously on the factory floor; sending work orders for maintenance directed to the closest engineer; improving the response time of the engineer; and reducing downtime.

Another area gaining a lot of attention is around preventive and predictive maintenance. Here, sensors on the equipment provide real-time data to an analytics server, which, by using various algorithms, alerts workers of either an actual breakdown or an impending breakdown, allowing a fast response to replace a part and to adjust the manufacturing schedule for minimal disruption to the manufacturing process. A good example of where preventive maintenance can have significant financial impact is the autonomous haul trucks deployed by mining companies such as Rio Tinto. Each of the Komatsu haul trucks, which can weigh up to 500 tons and are in close proximity to other trucks, is equipped with close to 200 sensors in the power train, tires, and engine. The data is transmitted via cellular to a private cell site owned and operated by the mining company. In Australia, the regulator, Australian Communications and Media Authority (ACMA), issues on a case-by-case basis private LTE network licenses to allow remote sites to build LTE networks to manage the connectivity to field assets. The backhaul can be provided by fiber, LTE, or very small aperture terminal (VSAT) depending on the remoteness of the location.

For the product-as-a-service type of product, we are starting to see industrial equipment, such as earth movers, sold on an "as-a-service" model, in which the customer pays for the amount of earth moved, or the availability of the piece of equipment to move earth, depending upon the contract. This requires the manufacturer to have visibility into the operating health of the equipment, through sensors and connectivity, and have a deep understanding of the behavior of the equipment, so it can either predict or respond very quickly to an issue with the equipment to keep it up and running.

METHODOLOGY

The methodology is based on an estimated number of unique IP industrial IoT connections. Furthermore, in APEJ, research has been done to create a market model that estimates the number of unique IP connections across 43 device segments (see Table 4) that represent a broad view of application categories.

The overall trends for each country are then fine-tuned based on discussions with vendors, telecom operators, systems integrators, ICT companies, content companies, device companies, and enterprises involved in specific industry sectors such as healthcare, manufacturing, and transportation.

The adoption rates that are based on demographic and use case denominators are used to compute the number of IoT IP connections for each country market; the IP connections represent the number of actual physical access communications ports deployed for IoT. An IoT connection is defined as a device that has a unique identifier such as an IP address that enables it to be remotely accessed from the public or a private IP network/internet via a wireline Ethernet/digital subscriber line (xDSL)/fiber connection, wireless WiFi/cellular/LPWAN/near-field communication (NFC)/RFID, satellite, or microwave connection.

An IoT device may or may not always be connected to the network at all times depending on what type of asset is being monitored or controlled. As an example, consider a typical animal tracking system in which each animal is tagged with an RFID that is read/activated when the animal enters a specific zone, such as a feeding area.

TABLE 4

Asia/Pacific (Excluding Japan) Internet of Things Ecosystem Taxonomy

Network	Device Segment	Network	Device Segment
Buildings	Intelligent Building Systems	Animals	Pet Collars
	Environmental Sensors		Livestock Tracking Devices
	Location-Deterministic Devices		
	In-Bldg IP Connected CCTVs		
Public Infrastructure & Utilities	IP CCTV Cameras & Motion Detectors	Personal Consumer IoT	Tablets
	Electric Power AMI		Smartphones
	Gas & Water AMI		Basic Accessories
	Digital Signage		Smart Accessories
	Public Environmental Sensors		Cameras & Video Cameras
	Location Awareness Devices		Games
			People Other
Telecom Infrastructure	Network Servers & Storage	Home	Fixed Line Consumer IP Phones
	Cellular Base stations		Household Appliances
	WiFi Access Points		Broadband Modems
			PCs/Laptops
			Passenger Cars
			Toys
			TVs & IPTV Set-Top boxes
			Music Devices
			Smart Meters

TABLE 4

Asia/Pacific (Excluding Japan) Internet of Things Ecosystem Taxonomy

Network	Device Segment	Network	Device Segment
Enterprise & Industrial	Fixed Line Business IP Phones		
	Commercial Vehicles		
	Displays		
	Enterprise/Industrial wearables		
	Healthcare Devices		
	Industrial IoT		
	Customer Premise Equipment		
	Printers, Copiers & Imaging Systems		
	Vending & Ticketing Machines		
	ATMs		
	Gas Pumps		
	POS		

Source: IDC, 2017

RELATED RESEARCH

- *IDC Worldwide Internet of Things Installed Base by Connectivity Forecast, 2017-2021* (IDC #US42331917, March 2017)
- *Migrating to the Cloud – Rewriting Applications with PaaS* (IDC #US42186916, January 2017)

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