
INDUSTRY OVERVIEW

Unless otherwise indicated, the information presented in this section is derived from various publications and from the market research report prepared by Quocirca, which was commissioned by us.

We believe that the sources of such information are appropriate and we have taken reasonable care in extracting and reproducing such information. We have no reason to believe that such information is false or misleading in any material respect or that any fact has been omitted that would render such information false or misleading in any material respect. The information has not been independently verified by us, the Sole Sponsor, the [REDACTED], the [REDACTED], the [REDACTED], or any of our or their respective directors, officers, representatives, advisers or any other parties involved in the [REDACTED], and no representation is given as to its accuracy and completeness. As such, investors are cautioned not to place any undue reliance on the information and statistics set out on this section of this document. Such information and statistics may not be consistent with other information and statistics compiled.

THE QUOCIRCA REPORT

We commissioned Quocirca, an independent market researcher and consultant, to conduct an analysis of, and to report on, the software defined WAN (“**SD-WAN**”) router market at a fixed fee of GBP30,000 which we consider reflects market rates for similar services. Founded in 1994, Quocirca is engaged in information technology industry research and provision of other services. The Quocirca Report includes information on the SD-WAN router market such as the business Internet traffic volume and the outlook of the industry, which have been quoted in this document.

Quocirca’s independent analysis was undertaken through primary and secondary research obtained from various sources. Primary research involved interviewing with multiple industry sources. Secondary research involved gathering, refining and confirming information from multiple and relevant published data sources as well as data from the research database of Quocirca. Such methodology utilises a multi-level information sourcing process in which information gathered is cross-referenced to ensure accuracy.

Quocirca made the following major assumptions in the preparation of the Quocirca Report:

- there will be no massive changes or radical disruption in technology, geopolitical or social factors and that the current trend in the use of SD-WAN routers globally will continue at a similar rate and pace to how they have performed in recent years;
- estimates and associated assumptions are based on historical experience and various other factors that are believed to be reasonable under the circumstances, the results of which form the basis for making the judgments about the industry sector that are not readily apparent from other sources; and
- except as otherwise specified, all of the data and forecasts contained in this section of this document are derived from the Quocirca Report.

Our Directors confirm that, after reasonable and due inquiry, there has been no adverse change in the market information which may limit, contradict or affect the information in this section of the document since obtaining the data from Quocirca.

INDUSTRY OVERVIEW

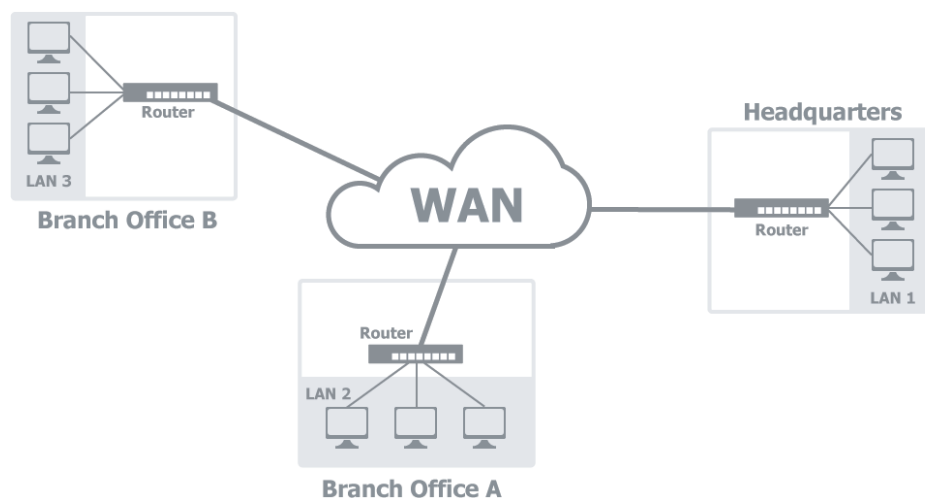
INTRODUCTION TO THE ROUTER MARKET

Overview

A router is a telecommunication networking device that routes data between computer networks and is used to connect private LAN to public networks, such as Internet service providers, and/or to connect one part of an enterprise network to another to form a WAN.

Personal routers provide individual users with Internet connectivity whereas enterprise routers are used by enterprises which require powerful and sophisticated routers to provide scalability, reliability, high speed and secured communication across WAN to support all day-to-day business IT activities, such as email, enterprise resource planning, file sharing, and video-conferencing. Enterprise router WAN connections may be fixed wired, such as leased lines or broadband Internet (MPLS, T1/E1, Fibre and DSL), or wireless, such as cellular (3G/4G LTE) and satellite (VSAT).

The diagram below illustrates how WAN functions:



INDUSTRY OVERVIEW

Enterprise routers

Enterprise routers can be categorised into:

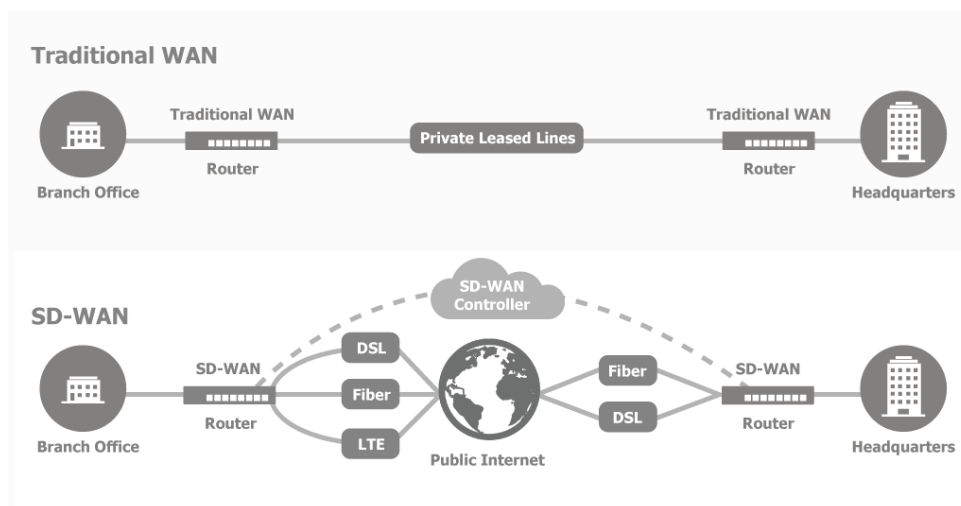
Traditional WAN routers

A traditional WAN router is connected to one single WAN connection using private leased lines. However, it is difficult to scale and relocate. If the only connection fails, it will affect business operations due to the suspension of services such as emails and file sharing; and

SD-WAN routers

To address the shortcomings of traditional WAN routers, SD-WAN routers have emerged as an alternative to traditional routers and replace expensive leased lines by using multiple affordable wired or wireless WAN connections which enable software to select the best performing WAN connection automatically. This does not only reduce enterprise network expenses, it also increases the reliability, flexibility, and bandwidth.

The diagram below illustrates connections using traditional WAN routers and SD-WAN routers:



Source: Quocirca

Key features and benefits of SD-WAN routers

SD-WAN routers use multiple WAN connections to select the best available connection and have the following key benefits when compared with traditional WAN routers:

- **Cost Reduction:** SD-WAN routers distribute traffic between multiple WAN connections by following application-based rules. By using multiple affordable Internet connections simultaneously, they can achieve link reliability exceeding that of traditional WAN routers at a fraction of the cost. According to the Quocirca Report, WAN connections through a SD-WAN router costs, on average, approximately 10%-20% of WAN connections through a traditional WAN router. This leads to organisations to expand their networks to additional locations.

INDUSTRY OVERVIEW

- **Increase in Bandwidth:** According to the Quocirca Report, leading SD-WAN routers can support bonding technology, which combines multiple WAN connections to increase bandwidth. This benefits organisations in that it ensures a speedy transfer of data between data centres and branch offices, such as file transfer, video streaming, and data backup. This enables organisations to increase bandwidth in remote, mobile or temporary locations, such as cruises, mobile clinics and retail pop-up stores, which is difficult using traditional WAN routers.
- **Network Connection Flexibility:** SD-WAN routers enable WAN connections to be added or removed easily in order to accommodate changes in bandwidth demand. In addition, WAN connections can be added for backup purpose. Branch offices typically add cellular as a back up to fixed lines to ensure a continuous connection if connection is lost using fixed lines. Retail operations find this solution useful for adding another layer of protection to their critical point of sale and IP phone systems. This application is particularly important for keeping unmanned deployments, such as digital signage and ATM online, especially when the fixed lines they use lose connectivity.
- **Simplified Central Management:** Unlike traditional WAN routers which are individually managed, all SD-WAN routers in the same organisation are centrally managed by a SD-WAN controller which enables network administrators to view and manage their entire network as well as perform maintenance of hundreds of devices remotely.

The disadvantage of using SD-WAN routers is that the administrators of information system need to spend time and effort to learn the new functionalities offered by SD-WAN routers. As SD-WAN routers use more advanced technologies than traditional WAN routers, administrators could be reluctant initially to deploy SD-WAN routers in their networks and it take a longer period of time for the users to benefit from the advantages of the SD-WAN routers.

GLOBAL ENTERPRISE ROUTER MARKET

The global router market was US\$19.75 billion in 2015. The global enterprise router market is a subset of the global router market, its market size was approximately US\$3.65 billion in 2015 in terms of revenue value and is expected to reach approximately US\$3.9 billion in 2020 in terms of revenue value with a CAGR of approximately 1.36% from 2015 to 2020.

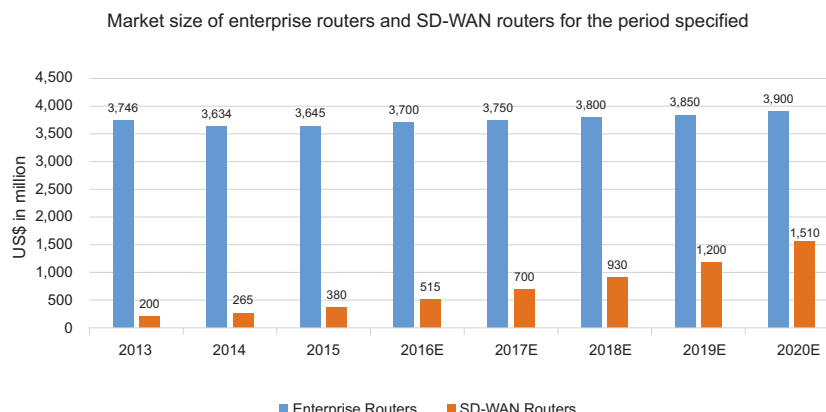
The SD-WAN market is comprised of (i) some large diversified network equipment providers with revenues generated from the sale of SD-WAN routers forming only a small fraction of their total revenues; and (ii) a number of rapidly growing network equipment providers which focus on the sale of SD-WAN routers.

The current global market size of SD-WAN routers represents only a small fraction of the global enterprise router market. For instance, the global market size of SD-WAN routers was approximately US\$0.38 billion in 2015 in terms of revenue value, which accounted for (i) approximately 10.4% of the global enterprise router market that recorded approximately US\$3.65 billion; and (ii) approximately 1.9% of the global router market that recorded US\$19.75 billion in 2015 in terms of revenue value.

However, Quocirca estimates that the global market size for the SD-WAN routers will grow and increase to approximately US\$1.51 billion by 2020 in terms of revenue value with a CAGR of approximately 31.8% from 2015 to 2020. Quocirca estimates that as more equipment providers look to add SD-WAN capabilities into their products and as replacement rate of expensive leased lines increase, the global market size of the SD-WAN routers will account for approximately 38.0% of the global enterprise router market in terms of revenue value by 2020.

INDUSTRY OVERVIEW

The graph below sets out the global market size of the enterprise routers and the SD-WAN routers in terms of revenue value:



The table below shows the geographical distribution as a percentage of total market size of SD-WAN routers from 2013 to 2015.

	2013	2014	2015
	%	%	%
North America	48.0	46.0	47.0
EMEA	25.0	27.0	28.0
Asia	20.0	21.0	20.0
Others.	7.0	6.0	5.0
	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>

Source: Quocirca

Geographic markets for SD-WAN routers have been affected by the availability of networks and competition among local operators. Open and competitive supply of networks are more receptive to SD-WAN, but economic conditions also affect growth. According to the Quocirca Report, the distribution of SD-WAN routers has been stable and is forecasted to remain stable. EMEA is expected to have slightly higher growth comparing to other geographic markets while a slight decline in other parts of the world is forecasted, for instance, South America.

KEY DRIVERS FOR THE SD-WAN ROUTER MARKET

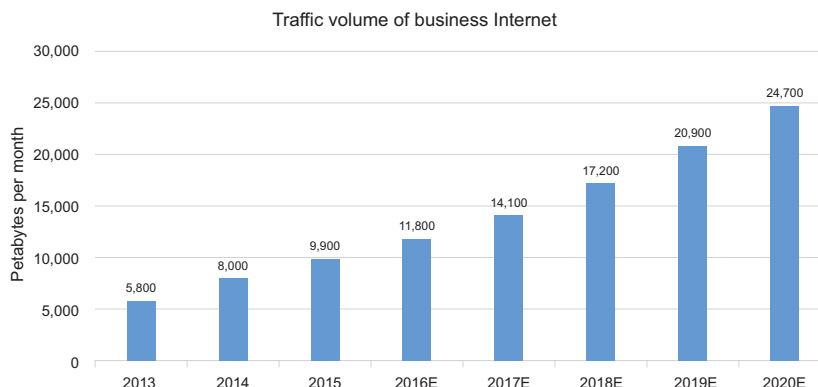
According to the Quocirca Report, the following key market drivers and factors affect the demand for SD-WAN routers:

New opportunities for small and medium-sized enterprises (the “SMEs”)

According to the Quocirca Report, due to the increase in the utilisation of Internet by organisations and the general reduction in the subscription cost of Internet services, the monthly business Internet traffic volume is forecast to grow from approximately 5,800 petabytes in 2013 to approximately 24,700 petabytes in 2020 with a CAGR of 23.0%.

INDUSTRY OVERVIEW

The graph below sets out the growth of the traffic volume in business Internet:



Source: Quocirca

Continued expansion of business Internet traffic volume will drive the demand for wide area network connectivity for organisations. The technology of SD-WAN enables and facilitates organisations to establish connections among their branches in various locations.

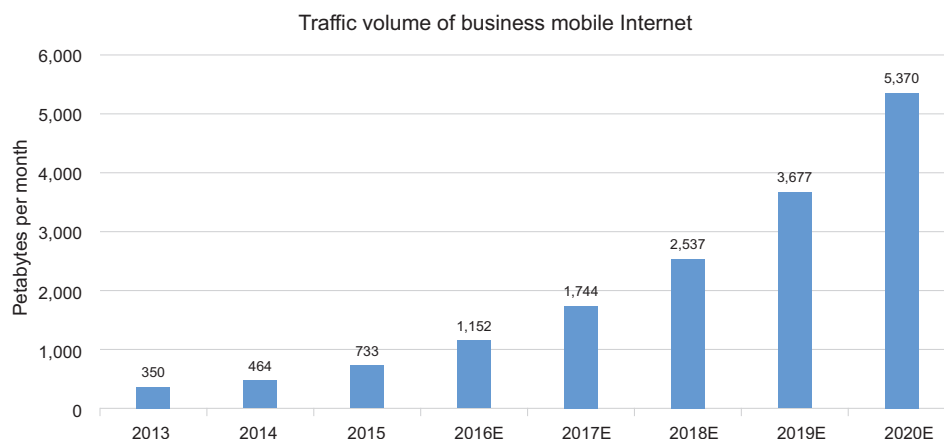
SMEs generally seek more efficient and cost-effective ways to provide services to their customers. To respond swiftly to capture market share and gain profits, these SMEs are increasingly using applications in their business operations that require reliable and secure Internet and network connections. Accordingly, cost effectiveness is a key factor when SMEs evaluate their connections to the outside world. While traditional leased private line solutions provide stable and fast connections, the initial set-up time is long, and both setup and data usage are costly. As an alternative, SD-WAN routers provide fast, flexible and improved connectivity through the bandwidth bonding capabilities of SD-WAN routers with lower costs.

SD-WAN supports increased mobility

Improving mobile access is crucial for organisations in order to expand their business coverage. An increase in mobile workforce, connected vehicles, remote location connections and the huge volume of device-to-device communication generated by communications, mobile and Internet of Things technologies has led to an increase in the demand for wireless Internet connectivity.

INDUSTRY OVERVIEW

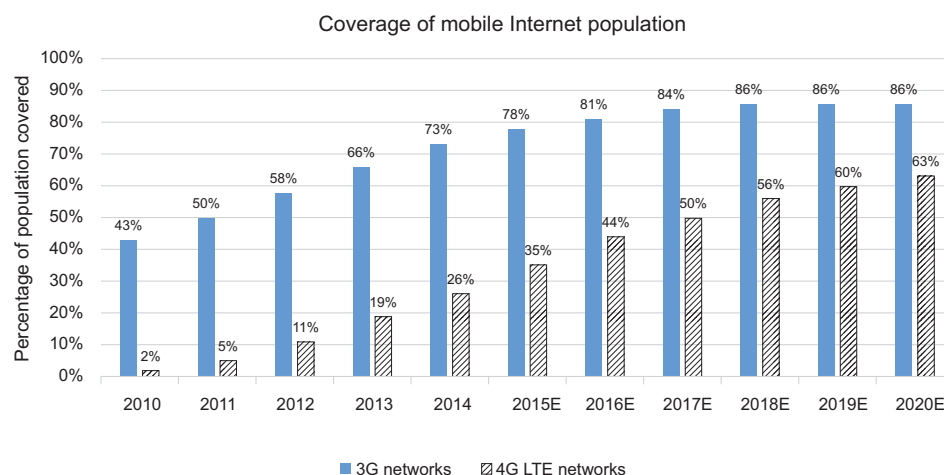
The graph below sets out the historical and forecast growth in the traffic of mobile Internet business:



Source: Quocirca

Vehicle connectivity is a fast growing area of development with unique challenges. Quocirca estimates that there will be approximately 250 million connected vehicles by 2020, representing an increase from approximately 50 million in 2015. Moving vehicles will frequently switch between 3G and 4G LTE connections whilst also moving through the coverage areas of multiple operators. As 4G LTE coverage is forecast to increase, the use of SD-WAN solutions in moving vehicles is becoming viable and attractive.

The table below sets out the historical and forecast coverage of mobile Internet population:



Source: GSMA

(The GSMA represents the interests of mobile operators worldwide, uniting nearly 800 operators and more than 250 companies in the broader mobile ecosystem).

In-vehicle computing devices require reliable Internet data connectivity to support everything from basic telemetry to critical data for emergency vehicles, tracking in freight haulage and Internet connectivity for passengers. When deployed in vehicles, wireless SD-WAN routers can provide reliable connectivity for black boxes, Internet access, entertainment and mobile enterprise applications.

INDUSTRY OVERVIEW

Continuous development of new communication technology

In addition to SD-WAN router vendors, the SD-WAN router market consists of providers of software, cloud, and managed services. These service providers comprise start-up enterprises that build a dedicated service, as well as established telecommunications providers adding SD-WAN capabilities into their portfolios. They offer Internet-as-a-Service in a package that includes multiple WAN connections, bonding technology to increase bandwidth and reliability, and cloud-based management platforms. As these service providers do not have their own SD-WAN routers, they source for SD-WAN routers from the SD-WAN hardware vendors in order to enable their services. The emergence of these service providers has driven the demand for SD-WAN routers. In the case of established telecommunications providers, the growing presence of these service providers in the SD-WAN market is expected to accelerate the adoption and acceptance of SD-WAN based networking solutions.

THE COMPETITIVE LANDSCAPE

Vendors competing in the SD-WAN router market comprise:

- specialised vendors that focus on providing highly available connectivity through multiple WAN connections, bonding and wireless routers; and
- diversified vendors which typically have a strong legacy in the telecommunications carrier sector as well as the enterprise sector, where they have been providing traditional routers and other networking solutions. These vendors are in the process of adding SD-WAN capabilities through internal product development supplemented by acquisitions, such as Cisco’s acquisition of Insieme Networks in 2013 for US\$863 million, and Riverbed’s acquisition of Ocedo in January 2016 for an undisclosed amount.

The table below sets out the top 10 SD-WAN router vendors in terms of revenue value attributed to SD-WAN routers in 2015:

Vendor	Background	Revenue in 2015 (US\$ million)	Market share (%)
Competitor 1	Specialised vendor	146.8	38.8
Competitor 2	Specialised vendor	58.0	15.3
Competitor 3	Diversified vendor	28.0	7.4
Competitor 4	Specialised vendor	27.9	7.4
Our Group	Specialised vendor	24.2	6.4
Competitor 5	Specialised vendor	15.0	4.0
Competitor 6	Diversified vendor	13.5	3.6
Competitor 7	Diversified vendor	11.3	3.0
Competitor 8	Diversified vendor	8.2	2.2
Competitor 9	Diversified vendor	7.5	2.0

Source: Quocirca

The SD-WAN sector is dominated by a few specialised vendors whose revenues are relatively small when compared to the global enterprise router market. The top five specialised vendors accounted for approximately 75.3% of the entire market share of SD-WAN routers in terms of sales value in 2015. As the SD-WAN market gathers pace, additional players will likely enter the market and the diversified vendors will likely add SD-WAN capabilities through organic product development or acquisitions. As such, the market share of specialised vendors may

INDUSTRY OVERVIEW

decrease and lead to a more competitive market environment. However, exponential growth of the SD-WAN router market revenues should be able to offset against the potential loss of the market share of existing market players.

The price performance of specialised vendors is more appealing to the SME segment compared to the diversified vendors. While it is expected that more diversified vendors will continue to enter the SD-WAN router market, they lack specialist focus and skills. With the increasing focus on communication technology, larger organisations, which are used to depending on the services of diversified vendors, will be more willing to turn to specialised vendors due to their innovative and specialist skills in this sector.

BARRIERS TO THE MARKET

According to the Quocirca Report, intellectual property combined with channel focus and expertise are the barriers to entering into the SD-WAN router market.

The production of SD-WAN routers depends on various hardware and software designs which are often protected by intellectual property laws. This poses an entry hurdle to new entrants unless they have a high level of technical expertise in developing products which are distinct from those of the existing market players.

In addition, the SD-WAN router industry is a relatively niche market where top and specialised talent is limited. While new entrants may have adequate financial resources, they may not be able to attract and recruit talent with a high level of technical expertise to develop competitive products.

Router manufacturers typically rely on an established and extensive network of distributors to market and sell their routers, including the provision of other business functions such as regulatory compliance, opportunity identification, and localised sales effort. One requires a long period of time and financial commitments to build up an established and extensive network of reputable distributors which are reliable and familiar with the router products. This creates an entry barrier to new entrants to the router market.

INDUSTRY OVERVIEW

TYPICAL PRICING

SD-WAN Routers

We offer both entry level and high-capacity SD-WAN routers. According to the Quocirca Report, the typical manufacturer suggested retail price of entry level SD-WAN routers and high-capacity SD-WAN routers from 2013 to 2015 are set out below:

SD-WAN Routers	2013	2014	2015	CAGR 2013 to 2015
Typical manufacturer suggested retail price for wired entry level routers	US\$1,595	US\$1,352	US\$1,287	-19%
Typical manufacturer suggested retail price for wireless entry level routers	US\$200	US\$190	US\$155	-23%
Typical manufacturer suggested retail price for wired high-capacity routers	US\$51,900	US\$49,250	US\$49,690	-4%
Typical manufacturer suggested retail price for wireless high-capacity routers	US\$2,100	US\$1,689	US\$1,416	-33%

Note: In general, manufacturer suggested retail price is the price listed by distributors for their customers and is usually higher than the selling price vendors sold to distributors

General vendor pricing strategy has been to maintain product pricing levels by increasing product functions and processing capacity. During the period between 2013 and 2015, the pricing level of entry-level products has decreased. This indicates that vendors are lowering the cost-of-entry partly due to commoditisation such as mass production of products aimed at SMEs. However, the pricing level of wired high-capacity SD-WAN routers remains relatively stable in that while vendors continue to make improvements in performance and functionality, their average selling price remains flat. Going forward, the price of SD-WAN routers is expected to remain stable during the rapid growth of SD-WAN routers from now until 2020 as any pricing reduction, which is rendered possible as a result of hardware commoditisation, will continue to be offset by further increases in software functionality. In general SD-WAN wireless routers are priced lower than SD-WAN wired routers because most SD-WAN wireless routers are not designed for high-capacity use that less expensive components can be used in most SD-WAN wireless routers comparing to SD-WAN wired routers.

Average Price of Raw Materials

The key raw materials in SD-WAN routers are semiconductor chips, such as System on Chip/CPU, and wireless communication modules, such as 4G LTE modules, which generally make up to approximately half of the total raw materials cost of SD-WAN routers. In general, the continuous improvement in electronic components will lower the cost of SD-WAN routers.

INDUSTRY OVERVIEW

The average historical prices of CPUs used in SD-WAN routers for every 1000 units between 2013 and 2015 is set out below:

	<u>2013</u>	<u>2014</u>	<u>2015</u>	<u>CAGR 2013 to 2015</u>
CPU module	US\$7	US\$6.8	US\$6.8	-1.4%

The average historical price of wireless communication modules used in wireless SD-WAN routers between 2013 and 2015 is set out below:

	<u>2013</u>	<u>2014</u>	<u>2015</u>	<u>CAGR 2013 to 2015</u>
4G LTE module	US\$120	US\$90	US\$77	-19.9%

While CPU modules prices have been stable, 4G LTE modules have followed a similar price fall to that previous generations of wireless communication modules, as unit volumes grow and the technology continues to be refined and improved.

According to the Quocirca Report, the continuous consolidation of the wireless communication module supplier market leads to the exit of a number of players in the wireless communication module supplier market, which, in turn, affects the price of wireless communication modules. With any market dominance in the wireless communication module supplier market, there is always a risk that innovation will stall or prices may increase. However, according to the Quocirca Report, this is unlikely to happen given the increasing size of the opportunity for wireless routers.