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Open Compute Project
Market Impact Assessment (2019)

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Background

The **Open Compute Project (OCP)** commissioned **IHS Markit** to update its 2018 study on the impact the Open Compute Project Foundation community has had and will continue to have on the technology industry and its member organizations:

Product categories

Servers

Networking

Storage

Peripherals

Rack

Power

Other

Update forecast for OCP Market from IHS Markit forecast data, extend to 2022

OCP Non-Board Member Market

Conduct interviews with OCP suppliers and service providers
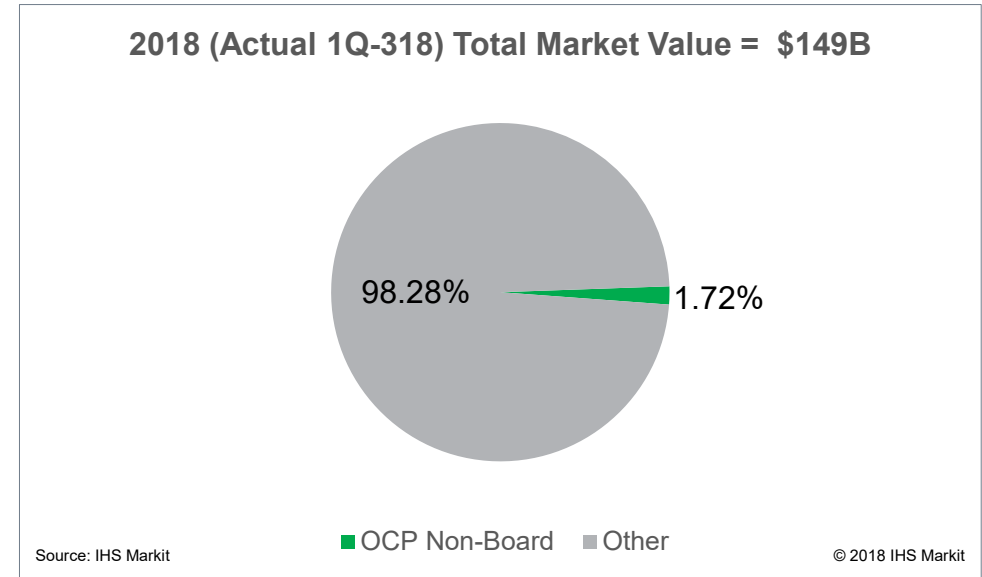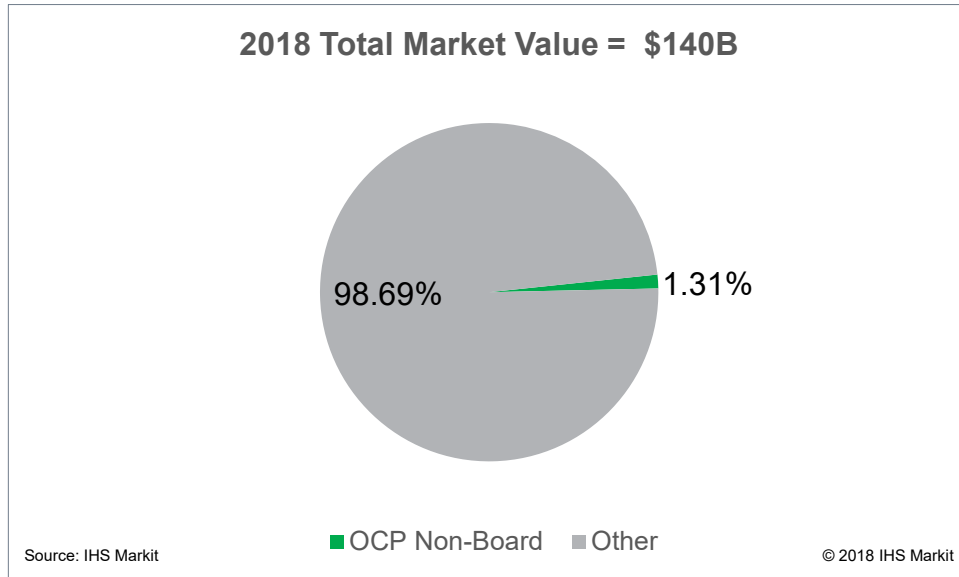
Interviewees

End-users

- Incumbent telcos

- Colo providers

Vendors

- OEMs

- ODMs

- Start-ups

- Integrators

- Whitebox

2018 Non-Board OCP revenue tops 2017 forecast, hits $2.56B for 2018

Total market includes: Server, Storage, Network, Rack, Power, Peripheral, and Other Revenue

2018 Total Market Value = $140B

98.69%   1.31%

Source: IHS Markit   ■ OCP Non-Board ■ Other   © 2018 IHS Markit

2018 (Actual 1Q-318) Total Market Value = $149B

98.28%   1.72%

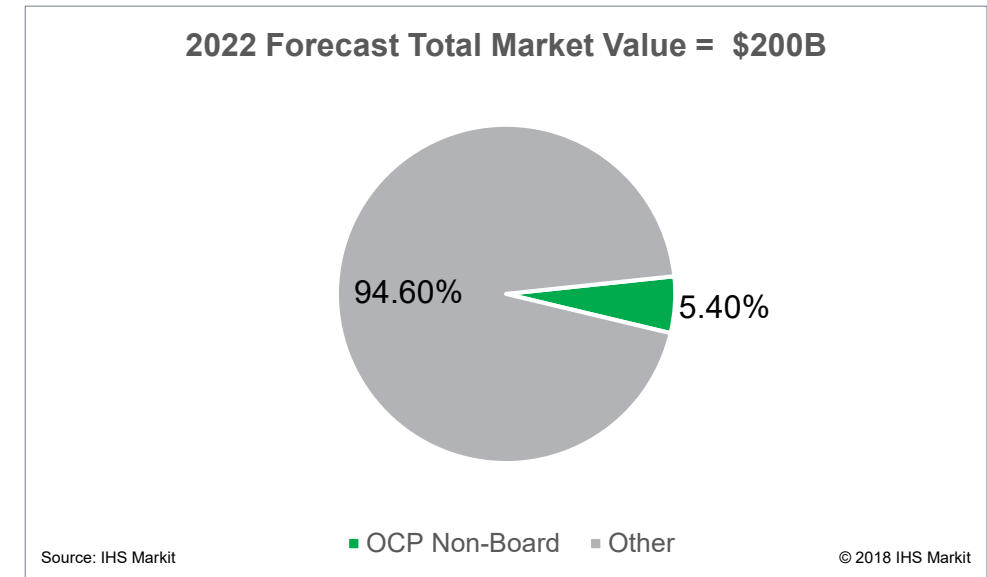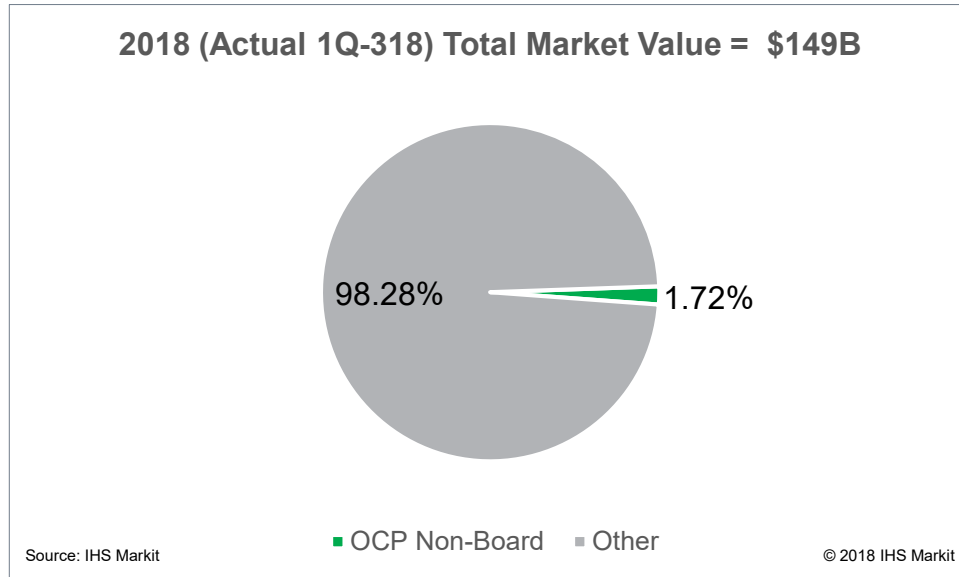Source: IHS Markit   ■ OCP Non-Board ■ Other   © 2018 IHS Markit

Projected

- 2018 OCP Non-Board YoY growth 55%
- 2018 OCP Non-Board revenue: $1.84B

Actual (1Q–3Q18)

- 2018 OCP Non-Board YoY growth 120%
- 2018 OCP Non-Board revenue: $2.56B

2022 Non-Board OCP revenue share over 5% by 2022

Total market includes: Server, Storage, Network, Rack, Power, Peripheral, and Other Revenue

2018 (Actual 1Q-318) Total Market Value = $149B

98.28%   1.72%

Source: IHS Markit   ■ OCP Non-Board ■ Other   © 2018 IHS Markit

2022 Forecast Total Market Value = $200B

94.60%   5.40%

Source: IHS Markit   ■ OCP Non-Board ■ Other   © 2018 IHS Markit
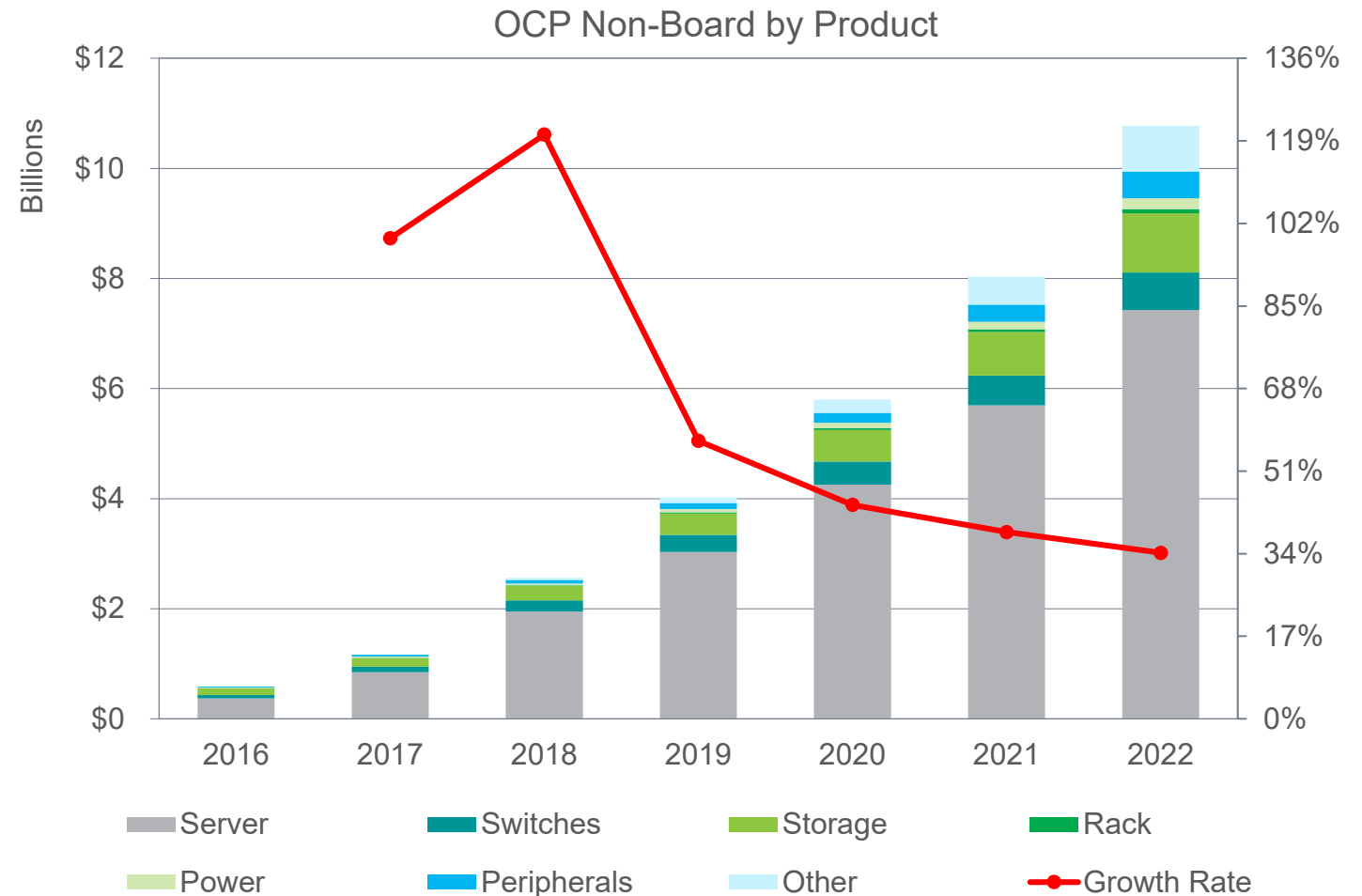
Actual (1Q–3Q18)

- 2018 OCP Non-Board YoY growth 120%

- 2018 OCP Non-Board revenue: $2.56B

Forecast

- 5YR CAGR 56%

- 2022 OCP Non-Board revenue: $10.7B

Non-Board OCP revenue expected to top $10B in 2022

- Servers then storage, followed by networking top categories for revenue

- Growth rate of OCP Non-Board revenue in high double digits out to 2021

- Total market growing in low single digits

- PON potential high growth area

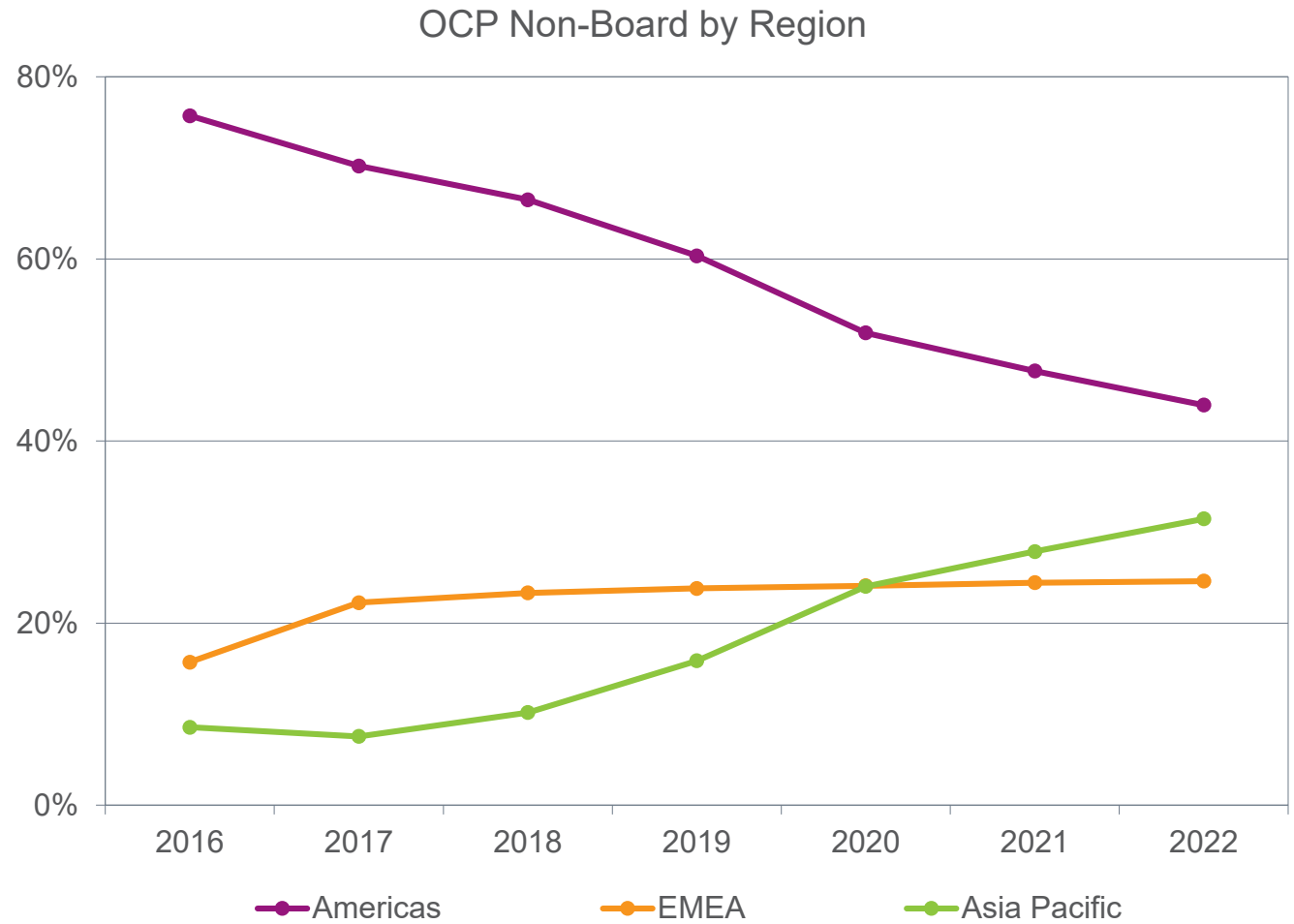- Market just forming for disaggregated cell tower equipment

OCP Non-Board by Product

Legend: Server, Switches, Storage, Rack, Power, Peripherals, Other, Growth Rate

Source: IHS Markit

© 2018 IHS Markit

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Americas (US) still dominates through 2022

- Americas' early domination due to Non-Board hyperscaler and financial adoption, now driven by telco, CAGR 42%

- APAC will surpass EMEA on strength of hyperscaler and Tier-2 CSP adoption, CAGR 108%

- EMEA growth driven by telco, CAGR 59%
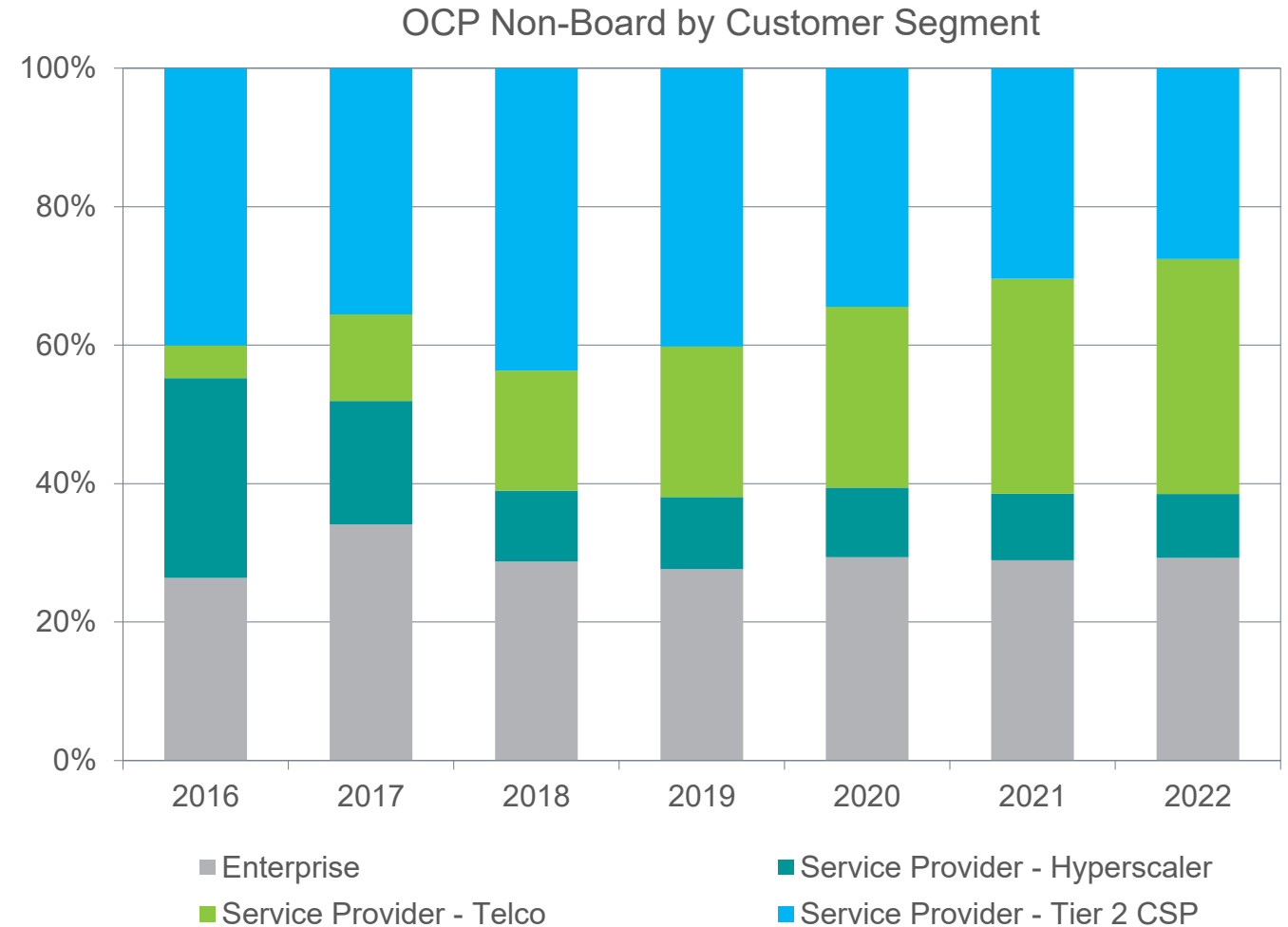

OCP Non-Board by Region

Source: IHS Markit

© 2018 IHS Markit

Telco Cloud: the next wave is rolling out

- Non-Board hyperscaler projects stalled in 2018, but tier-2 CSPs now ready to drive growth

- Telcos 2017 POCs moved to limited production in 2018 expecting ramp in 2019+, especially in Europe

- Telco total OCP spend will surpass Non-Board hyperscalers in 2021

- Top segments for 2022 are Telco, Tier-2 CSP and Enterprise

OCP Non-Board by Customer Segment

Legend:
- Enterprise
- Service Provider - Telco
- Service Provider - Hyperscaler
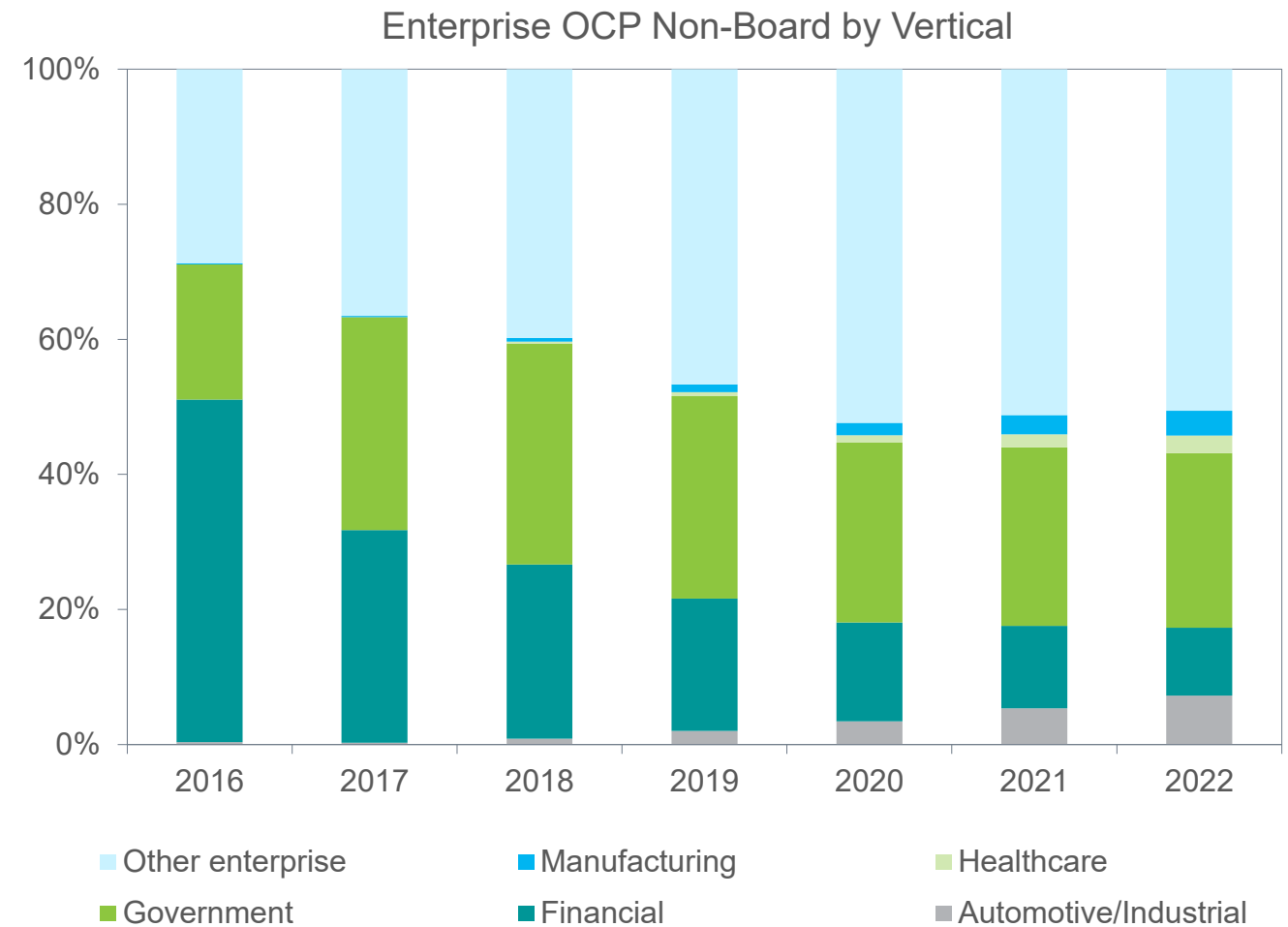- Service Provider - Tier 2 CSP

Source: IHS Markit

© 2019 IHS Markit

Finance yields to government and Other (retail and education)

- Government passes Financials spending on Non-Board enterprise OCP products in 2017

- Financial growth slows as use of OCP equipment becomes more wide spread

- Automotive and Manufacturing have highest 5YR GAGR

- Healthcare in very early stages of adoption

Enterprise OCP Non-Board by Vertical

Legend:
- Other enterprise
- Manufacturing
- Healthcare
- Government
- Financial
- Automotive/Industrial

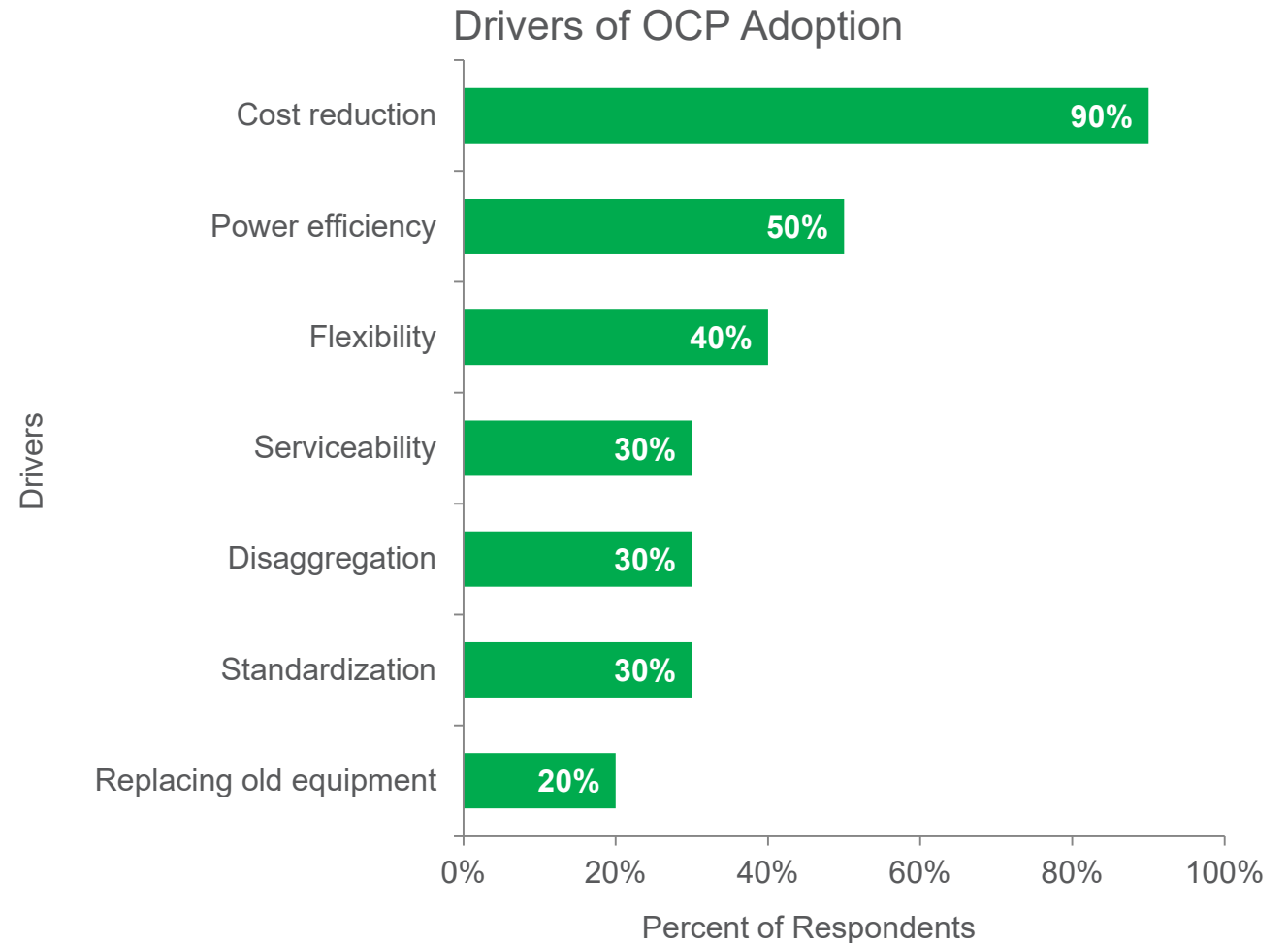Source: IHS Markit

OCP vendor and end user survey results

The following slides present findings from interviews with 10 respondents

Adoption drivers get more diverse

Q: What are the top reasons your customers give for adopting Open Compute products?

- Cost reduction and power efficiency remain biggest drivers for OCP

- Market now recognizing feature flexibility offered by open hardware

- Disaggregation becoming recognized as a value for OCP equipment

- Standardization around OCP certifications provides measure of "comfort" to the market

- Equipment going end of life sparking evaluation of OCP

Drivers of OCP Adoption

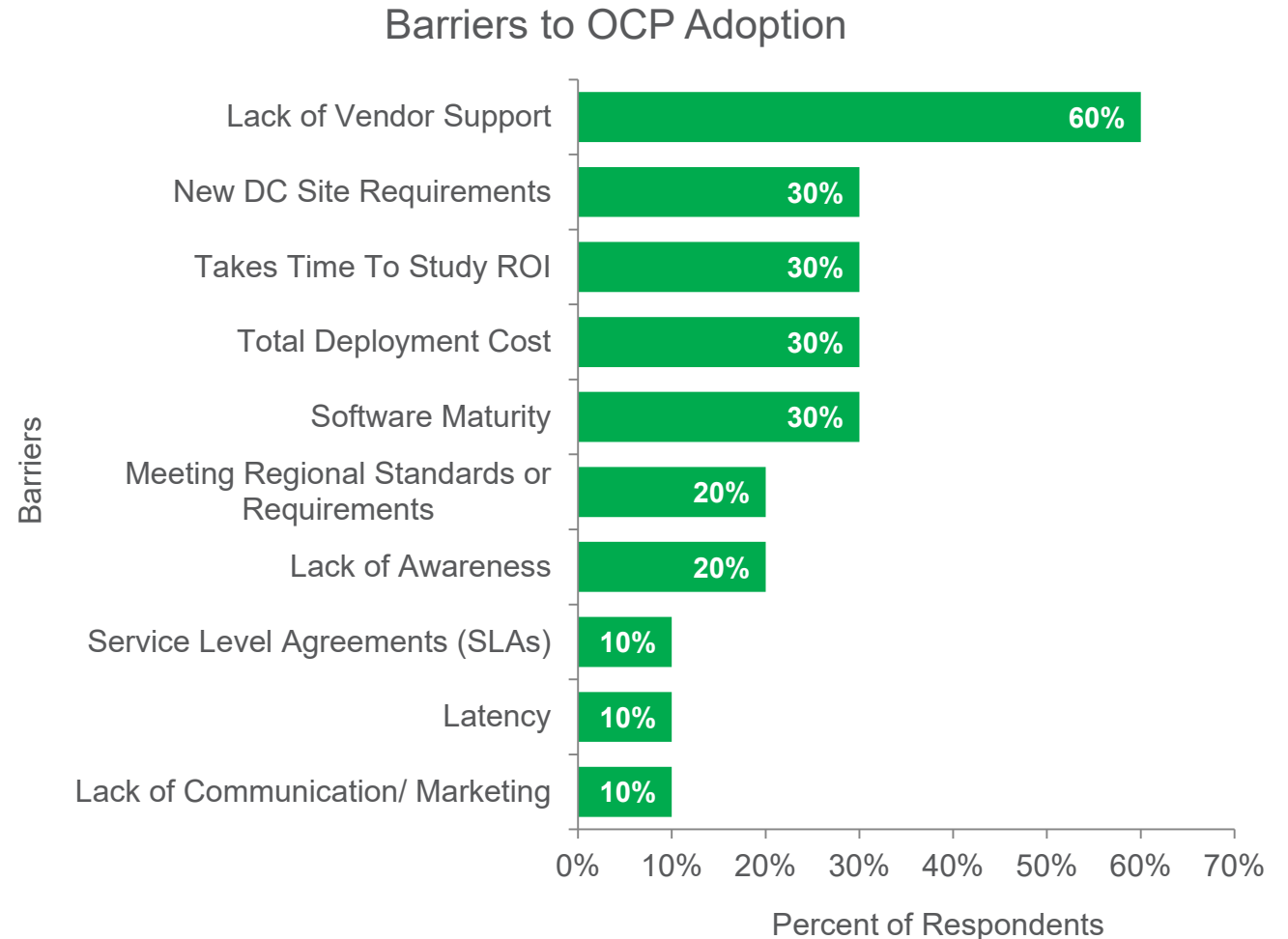| Drivers	Percent of Respondents
Cost reduction	90%
Power efficiency	50%
Flexibility	40%
Serviceability	30%
Disaggregation	30%
Standardization	30%
Replacing old equipment	20%

Source: IHS Markit

Adoption barriers become more business related

Q: What are the top barriers your customers and/or target customers raise when evaluating use of OCP products?

- Lack of local vendor support moves to top concern over last year

- Business related challenges join technical issues, signs of maturity

- Vendors still challenged to educate the market and develop awareness

- Trouble sourcing compatible OCP products are a primary barrier

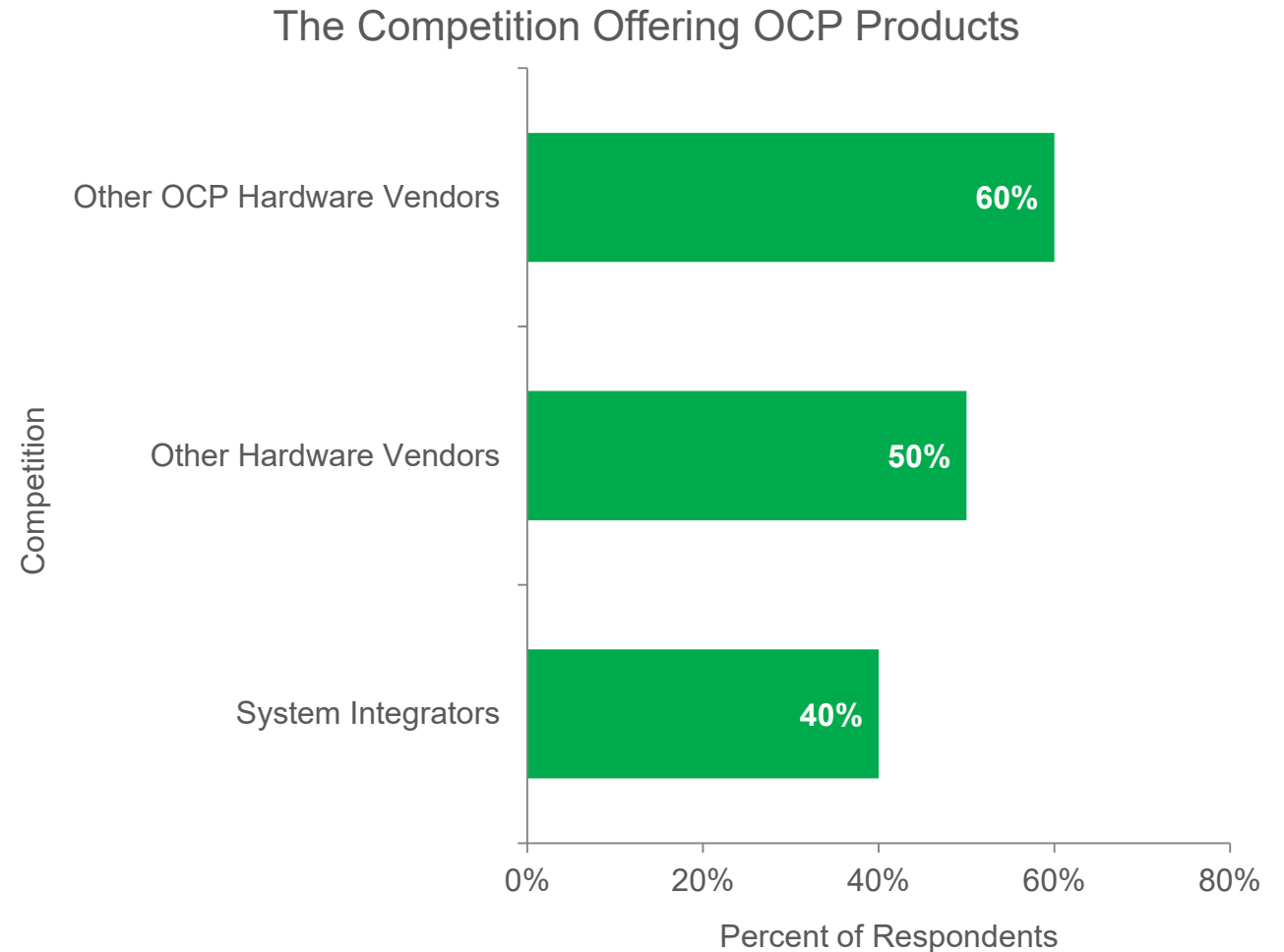- Latency appears as a discussion point with edge computing

Barriers to OCP Adoption

Barrier	Percent of Respondents
Lack of Vendor Support	60%
New DC Site Requirements	30%
Takes Time To Study ROI	30%
Total Deployment Cost	30%
Software Maturity	30%
Meeting Regional Standards or Requirements	20%
Lack of Awareness	20%
Service Level Agreements (SLAs)	10%
Latency	10%
Lack of Communication/ Marketing	10%

Barriers (y-axis)

Percent of Respondents (x-axis: 0% 10% 20% 30% 40% 50% 60% 70%)

Source: IHS Markit

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Increased competition shows sign of a maturing market

Q: Whom do you see as your competition for offering OCP products?

- Vendors citing competition by other OCP vendors indicates the choice of products continues to expand, a healthy phase for this market

- Increased competition from traditional vendors also a sign the market is moving away from early adopters to more mainstream buyers

- System integrators offering complete solutions now play dual role, partners for select vendors and competition for others
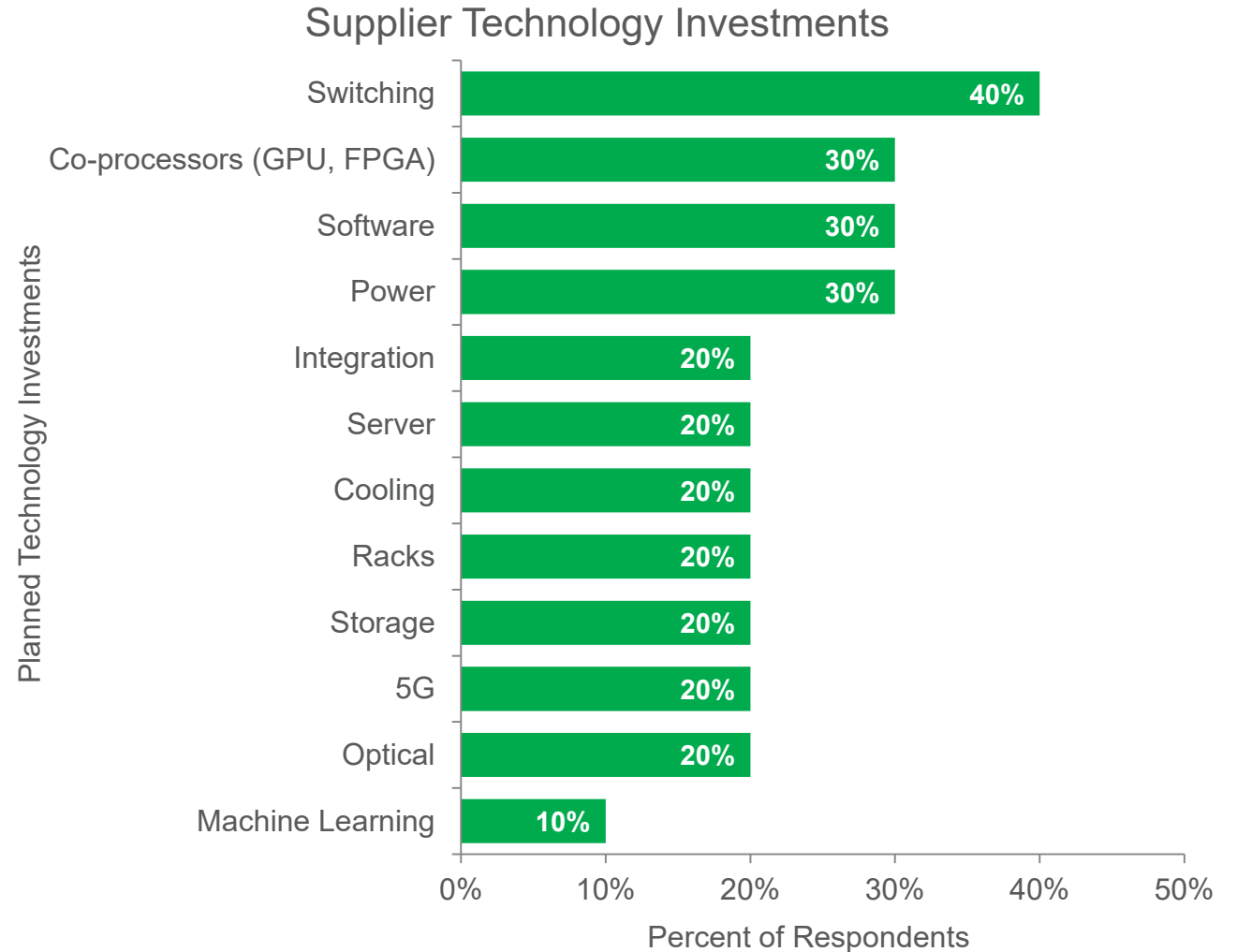
The Competition Offering OCP Products

Competition

Other OCP Hardware Vendors	60%
Other Hardware Vendors	50%
System Integrators	40%

0%   20%   40%   60%   80%

Percent of Respondents

Source: IHS Markit

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Vendors target AI & ML with co-processors, 200/400GE for switching

Q: What technologies are you focused on developing?

- Software is new, recognition that market still lacks mature software ecosystems

- Many new server designs using Arm CPUs and AMD EPYC now available, co-processor options multiply, edge form factors emerging

- 400GE switching and optical components shipping in 2019

- Closed loop automation investments target DC power and cooling systems

Supplier Technology Investments

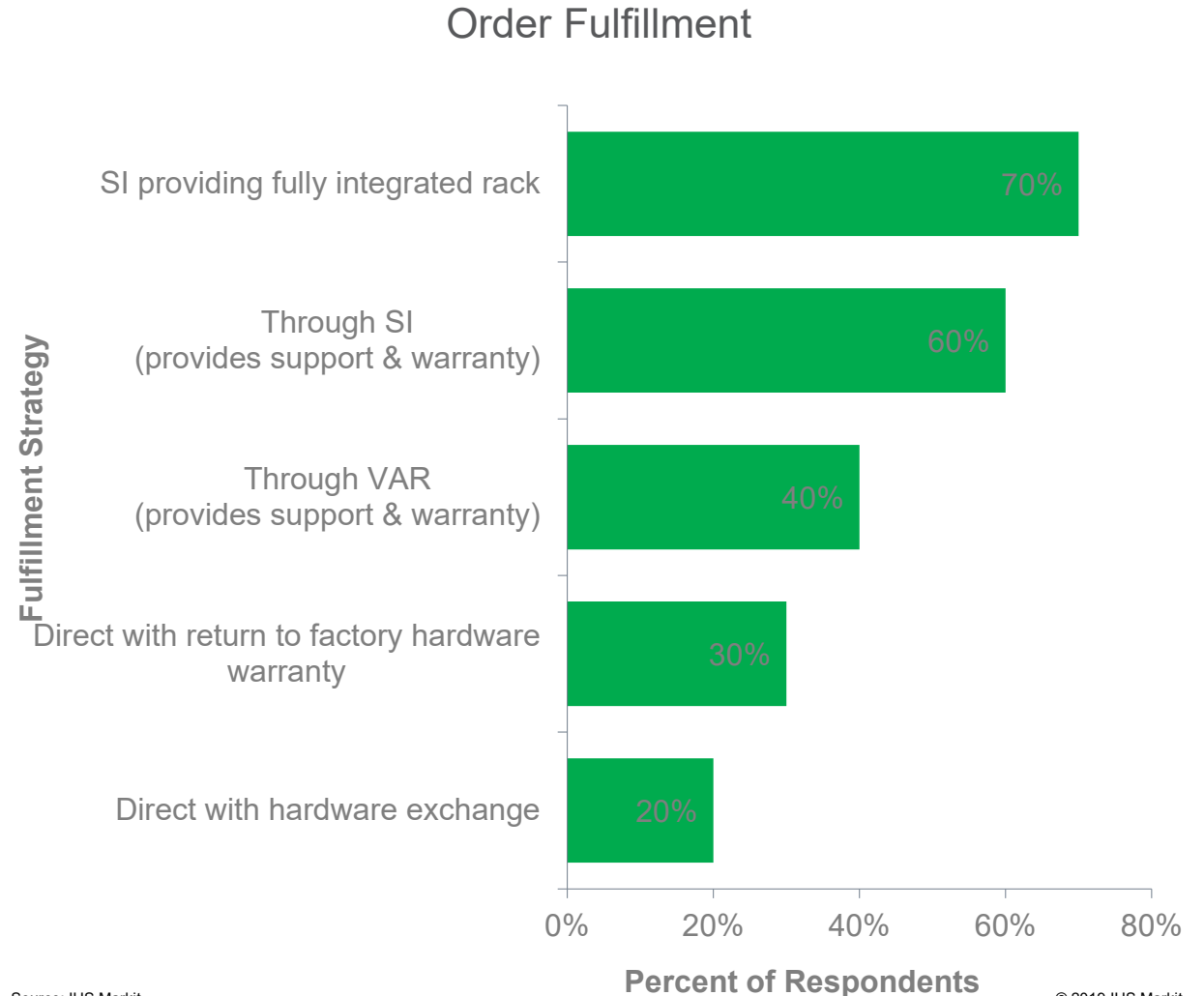| Planned Technology Investments	Percent of Respondents
Switching	40%
Co-processors (GPU, FPGA)	30%
Software	30%
Power	30%
Integration	20%
Server	20%
Cooling	20%
Racks	20%
Storage	20%
5G	20%
Optical	20%
Machine Learning	10%

Source: IHS Markit

Fully integrated rack systems rise to the top, another sign of maturity

Q: How is order fulfillment done?

- As the market shifts to tier-2 CSPs and Telco, fully integrated racks are preferred

- Direct moves to bottom this year, opposite for last year, relegated to small scale PoCs

- Telco's prefer to purchase at scale from SIs

- Local warranty and support a must as customers move to live production

Order Fulfillment

Fulfillment Strategy

Strategy	Percent
SI providing fully integrated rack	70%
Through SI (provides support & warranty)	60%
Through VAR (provides support & warranty)	40%
Direct with return to factory hardware warranty	30%
Direct with hardware exchange	20%

Percent of Respondents

Source: IHS Markit

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Memorable mentions

"[Seeing Inquires] …from born of the web kind of organizations .. major customers of the hyperscalers … looking to control more of their own platform"

"…ISPs and teleco are the main drivers of OCP adoption in Japan… looking at GPU servers"

"Telcos .. are looking for a 12U rack …because they want to place OCP equipment in their CO"

"Industry wants open, agnostic and flexible… disaggregation… solutions for both HW and SW products"

"Big challenge is that unless DC is designed on Day 1 for OCP equipment, you end up with a data center overengineered for hosting OCP"

"Tier 2 [CSP] use standard distribution model … via VAR …Telcos are dealt w/ ..via … preferred vendors and integrators…enterprises are sold via long-standing OEM relationships"

"Most customers in APAC (Indonesia and Philippines and South Pacific region customers), aren't aware of or participate in OCP foundation"

"..increasing integration partnerships .. [Large Telco].. has an unnamed [IT integration] partner for open networking"

"OCP has created necessary competition in the traditional market"

"[use] .. machine learning …to model and predict PUE …move away reactive maintenance"

"New use cases .. use of aggregation switch and cell-site gateways @the edge"

"Disaggregated OLT is another use case plus 10G PON solutions… currently demoed solutions"

Top takeaways

- OCP 2018 non-board member revenue significantly surpassed expectations

- OCP 2018 non-board member market share, tops forecast

- Credible path for non-board member revenue to top 5% market share by 2022

- Adoption is moving past hyperscalers with tier-2 CSP and telco deployments

- Good expectations for enterprise adoption, with large lighthouse projects in APAC

- Market showing healthy maturation since last year

  - Drivers for adoption more diverse and attention turns to business cases

  - Competition between vendors is increased offering more choice to customers

  - Investments broaden to include commercial software

  - Direct sales give way to SI and VAR fulfilled deals

Definitions

Definitions

Product scope

Open compute: Equipment certified (OCP-ACCEPTED™ and OCP-INSPIRED) by OCP; includes equipment in certification process.

Manufacturers' revenue (US$): Reported for units shipped for revenue recognized during the calendar year. OEM revenue is attributed to the original manufacturer. We do not include revenue from service and support, product maintenance, managed services, and professional services.

Product categories

Servers: A networked physical device that provides shared compute functionality; typically contains a central processing unit (CPU), random access memory (RAM), storage, physical network interface, power supply, and management.

Switches: Ethernet switches that forward traffic based on layer 2 information; used to build LANs enterprise / service provider data center networks; does not include switches deployed for carrier metro Ethernet applications.

Storage: A set of storage elements where data is held in an electromagnetic, digital circuitry, or optical form and can be loaded into server memory to be used for computation; can include hard disk and solid state storage devices and can be located within a server or a separate enclosure.

Racks: Physical support infrastructure designed to hold power, cooling and IT equipment (servers, storage and network).

Definitions *continued*

Power: Power delivery at the rack level that can include power distribution, battery back-up, and power conversion.

Peripherals: Includes optical transceivers and Ethernet network adaptors.

- Optical transceivers: Pluggable modules supporting a single logical connection with an electrical system interface and an optical or electrical TX/RX line interface.

- Ethernet network adaptors: I/O cards used to connect servers and storage devices to Ethernet networks; can provide CPU offload; include stand-up and piggyback cards.

Others: Includes passive optical and WiFi network equipment

- Passive optical network equipment: Including OLTs [optical line terminals] and ONTs [optical network terminals]

- WiFi network equipment: Enterprise-class wireless networking devices based on the 802.11 standard, including WiFi access points and controllers.

Definitions *continued*

Verticals

Market segment: Organizations purchasing Open Compute Certified (Accepted and Inspired) equipment

> **Service provider**: Provide IT, communications or physical data center infrastructure services

>> **Cloud**: Provide IT and communications services over 3rd party networks; typically does not own end user access networks

>>> **Hyperscaler**: Operate data centers totaling to >3 million square feet

>>> **Tier 2:** Operate data centers totaling to <3 million square feet

>> **Telco:** Traditional telecommunication network providers including MSOs and mobile carriers

> **Enterprise**: Provides products and services to target select markets

>> **Healthcare**: Organizations that provide medical and healthcare goods or services; this sector includes hospital management firms, health maintenance organizations (HMOs), biotechnology and pharmaceutical firms

>> **Financial:** Companies that provide financial services to commercial and retail customers; this sector includes banks, investment funds, insurance companies and real estate firms

>> **Government**: Provides municipal, state and country wide services to its citizens

>> **Manufacturing:** Companies engaged in the fabrication, processing, or preparation of products from raw materials and commodities (includes all foods, chemicals, textiles, machines, and equipment)

>> **Automotive/Industrial**: Companies that produce goods used in the manufacture of automotive products as well as goods used for construction and manufacturing; specifically aerospace and defense equipment as well as industrial machinery, tools, lumber production, construction, waste management, manufactured housing, cement and metal fabrication

>> **Other:** all other enterprise verticals, such as hospitality, education, retail, etc.

Questions? Please feel free to email us

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