

Open Compute Project - Market Impact Assessment

Final Deliverable (4Q18 – 3Q19 actuals; 4Q19 Forecast)
February 2020

Background

The **Open Compute Project (OCP)** commissioned **IHS Markit** to update its 2019 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:

Categories

- Servers
- Networking
- Storage
- Peripherals
- Rack
- Power
- Other



OCP Non-Board Member Market



Interviewees

End-users

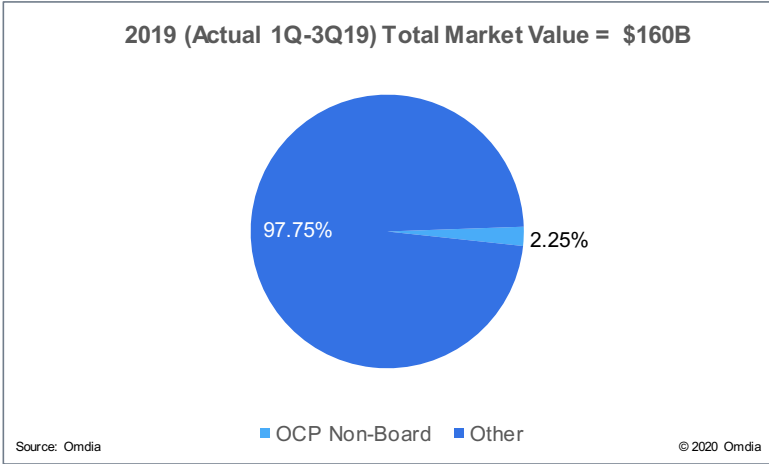
- Incumbent telcos
- Colo providers

Vendors

- OEMs
- ODMs
- Start-ups
- Integrators
- Whitebox

2019 Non-Board OCP revenue hits \$3.6B, \$1B+ 2018, 40% YoY growth

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

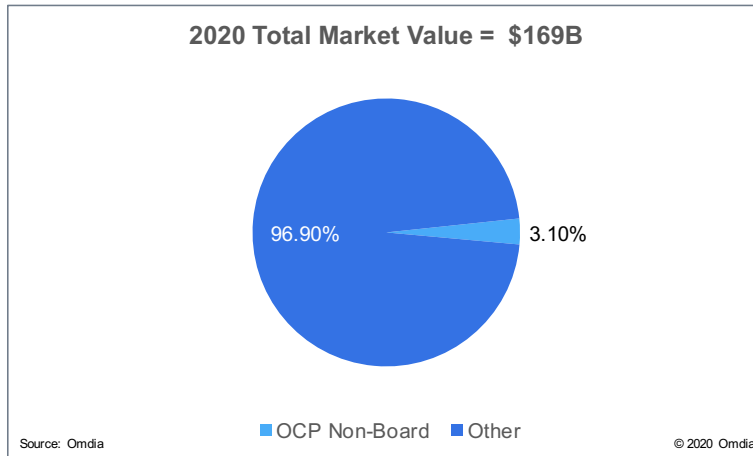


Actual (1Q-3Q19); Fcst 4Q19

- 2019 OCP Non-Board YoY growth 40%
- 2019 OCP Non-Board revenue: \$3.6B

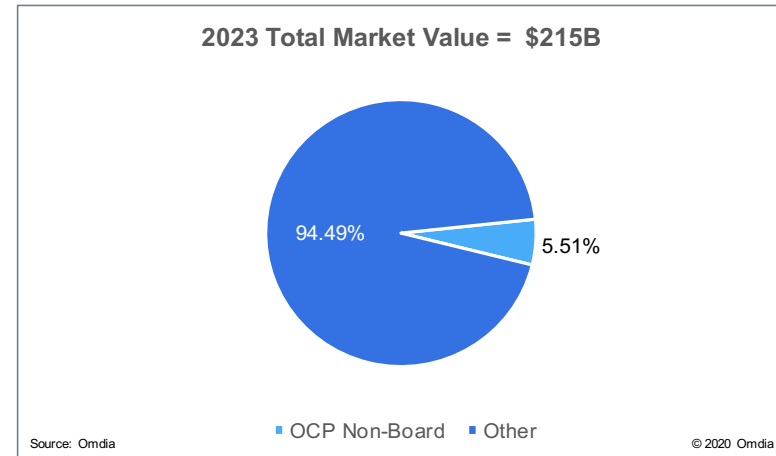
2023 Non-Board OCP revenue share near 5.5%; expect 46% 2020 YoY growth

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



Forecast 2020

- 2020 OCP Non-Board YoY growth 46%
- 2020 OCP Non-Board revenue: \$5.3B

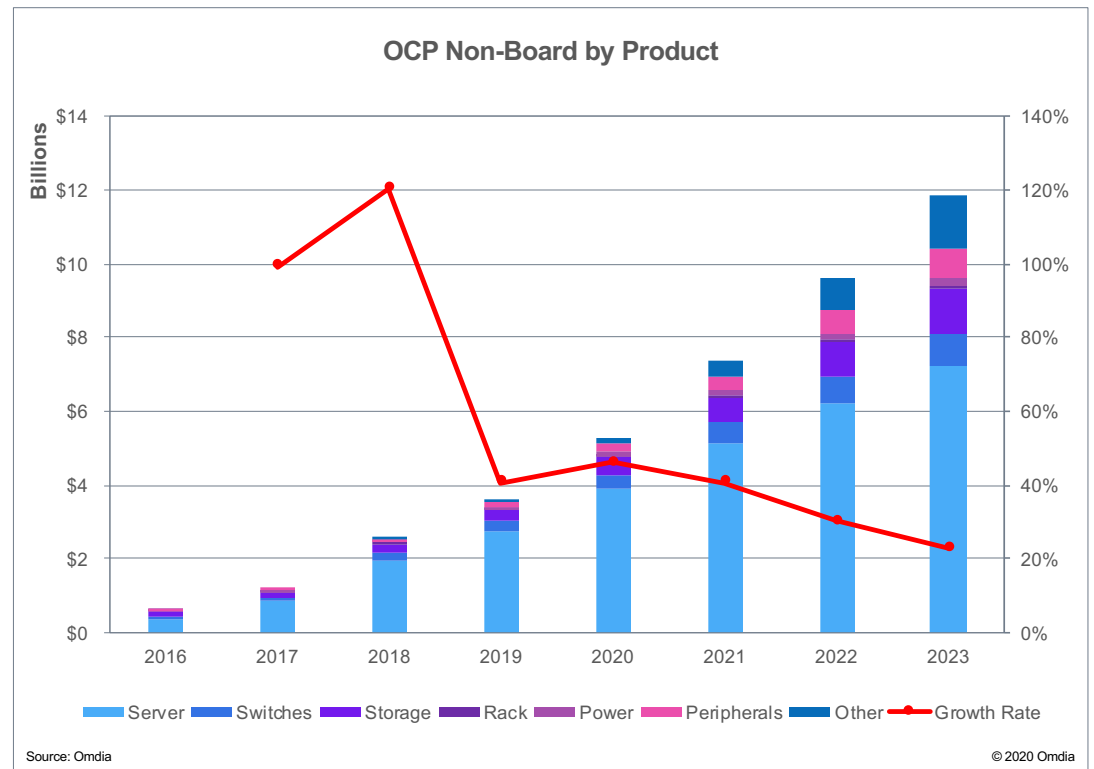


Forecast 2023

- 5YR CAGR 36%
- 2023 OCP Non-Board revenue: \$11.8B

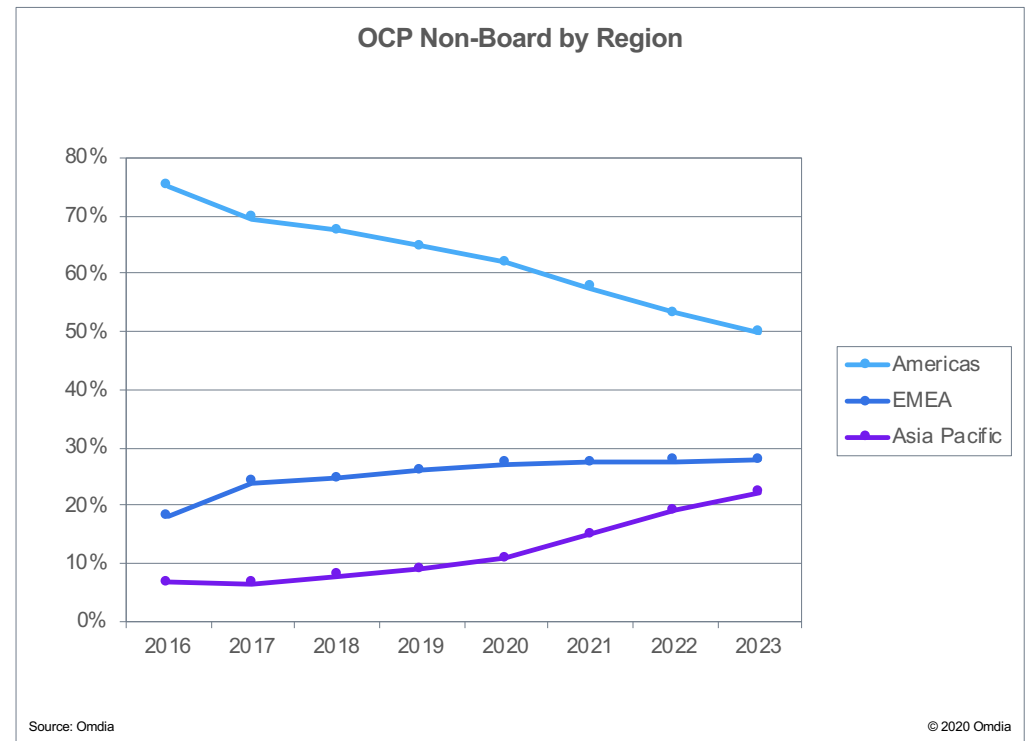
Non-Board OCP revenue expected to top \$11B in 2023

- IT infrastructure [servers, switches, storage] top categories for revenue
- Racks & power need DC building changes & getting denser, resulting in slower growth
- Other [PON and cell site gateway] challengers out to 2023
 - PON remains in POCs
 - Cell site gateway with strong software ecosystem poised for growth
- Other [co-processors] emerging category will be impactful by 2023



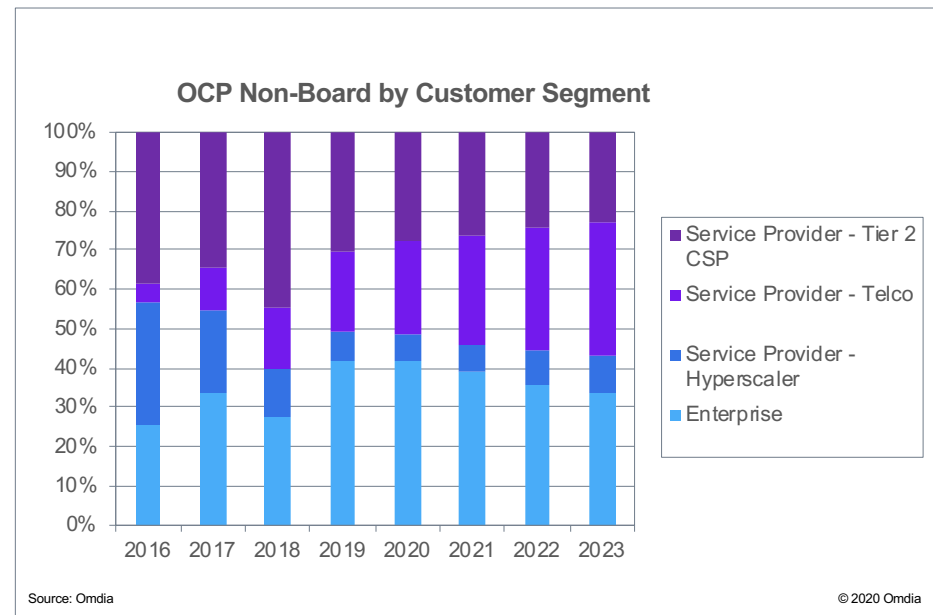
Americas (US) still dominates through 2023

- Americas with strong expansion in DC locations, and adoption by enterprises & government remains dominant out to 2023
- EMEA sees improved growth expectations over last year's study due to interest in circular IT and a more green economy
- EMEA telco has a strong hand in improved non-board revenue growth
- Asia Pacific was slower to adopt with several non-board hyperscale CSPs not submitting designs to OCP as expected



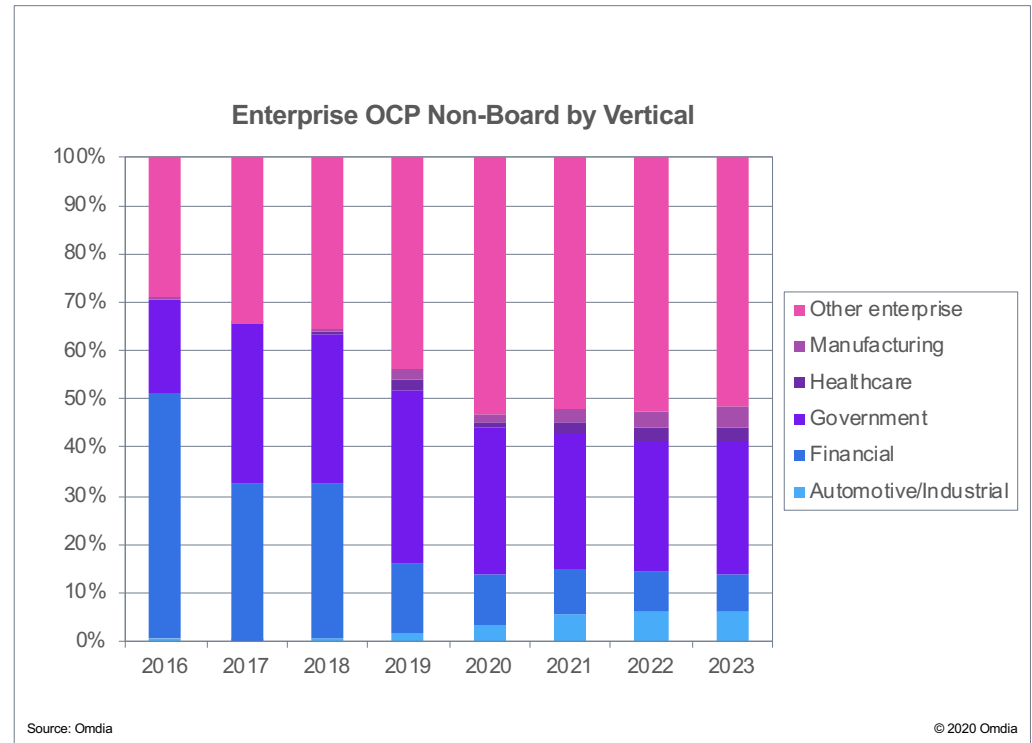
Telco Edge (Central Office and Cell Site) the next wave is to roll out

- Telco (comms SP) expected to be a strong adopter with investment in 5G being a catalyst for central office & disaggregated cell site gateway deployments
- Tier-2 CSPs still important part of market moving forward wanting to copy hyperscale innovations
- Government adoption growing due to specific US and EMEA based initiatives
- Availability of OCP certified colocation facilities expected to drive telco, tier-2 CSP and enterprise adoption



Finance yields to government and Other [gaming and energy]

- 2019 “watershed” year where non-board financial revenue becomes right-sized within the market.
- Other [gaming, e-commerce and energy] were noteworthy contributors to growth in 2019 and beyond
- High performance compute (HPC) was cited across several enterprise verticals as an important growth driver
- Healthcare and manufacturing were still in slow growth mode
- Connected cars and IoT devices need edge computing, to drive automotive and industrial growth; POCs have started



OCP vendor and end user survey results

The following slides present findings from interviews with 21 respondents

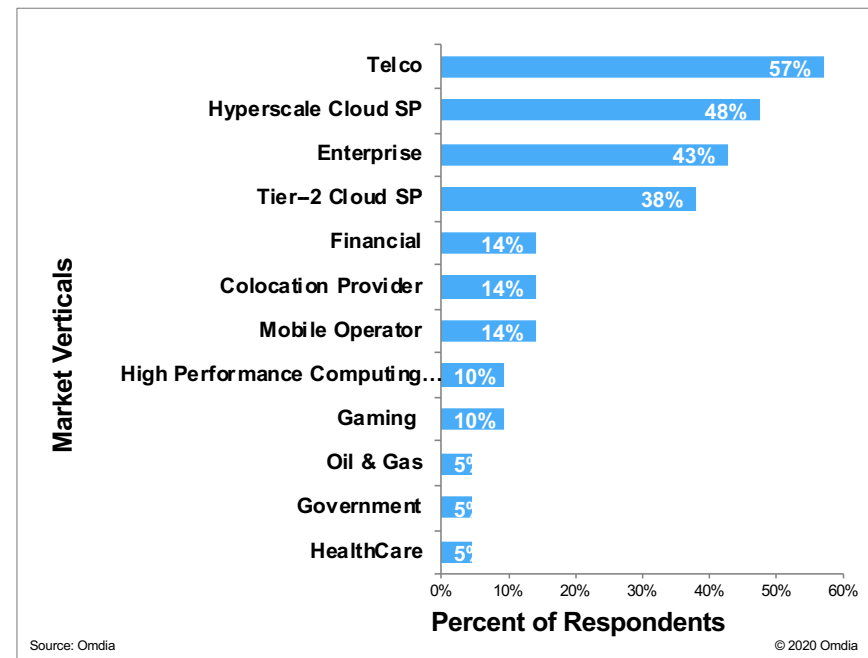


New projects with enterprise, telco and colocation providers promising

Q: From which types of customers (verticals) are you seeing the greatest interest?

- Expansion of telco opportunity within telco to include cell site gateway and moving forward core routing expands OCP influence
- Gaming and HPC “kicking tires” to see if OCP certified equipment can help with computing at scale
- Colocation providers recognize many enterprises on-premises data centers do not “fit” OCP certified equipment, providing alternative
- Open edge via OCP certified equipment getting attention in new verticals such as Energy [Oil & Gas]

Market Verticals Adopting OCP Products

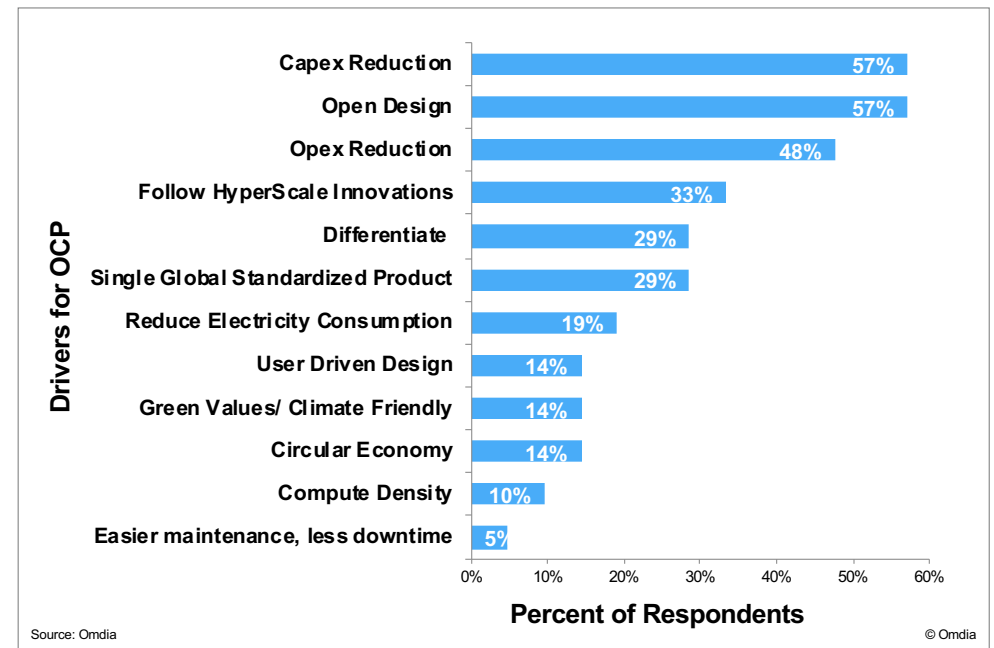


Market looking to benefit from hyperscale innovations, and reduce costs

Q: What are the top reasons for adopting Open Compute certified products?

- There is a strong need to take costs out of the equation
- Customization at scale, ability to choose or change suppliers
- OCP certification is becoming a differentiator
- Global companies want a single WW SKU
- Automation simplifying maintenance; less downtime
- Emerging circular economy, and desire to go green

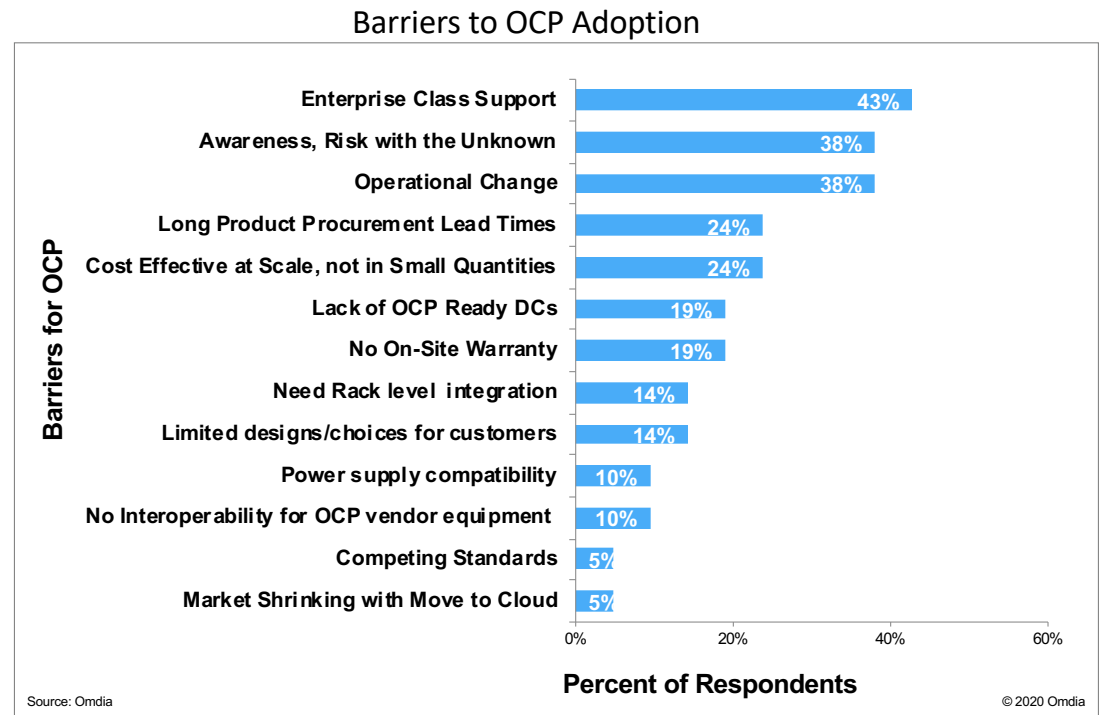
Drivers of OCP Adoption



Still looking for enterprise class supply chain

Q: What are the top barriers when evaluating use of OCP certified products?

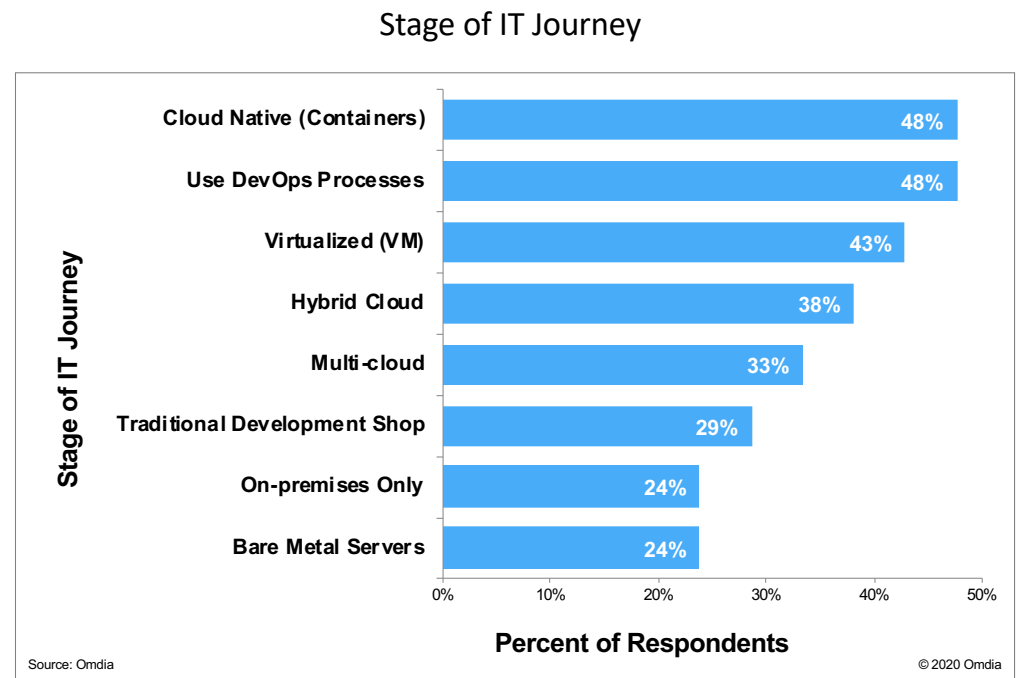
- OCP certified equipment is not known, means higher risk, forces operational change
- Still lacking enterprise class support
- Few local supply chains with support and warranty; local replacement upon failure
- Fully integrated rack options have limited availability
- Interoperability with existing infrastructure critical
- Few OCP certified data centers



OCP certified equipment adopters out in front of market going digital

Q: Where are Open Compute certified equipment adopters on their IT transformation journey?

- Have been virtualized for a long time
- Strong use of DevOps techniques and adoption of software containers
- Also users of cloud architectures [Hybrid-cloud, Multi-cloud]
- On-premises only can be HPC installations which tend to be enterprise operated
- Marginal call for bare metal server-based compute

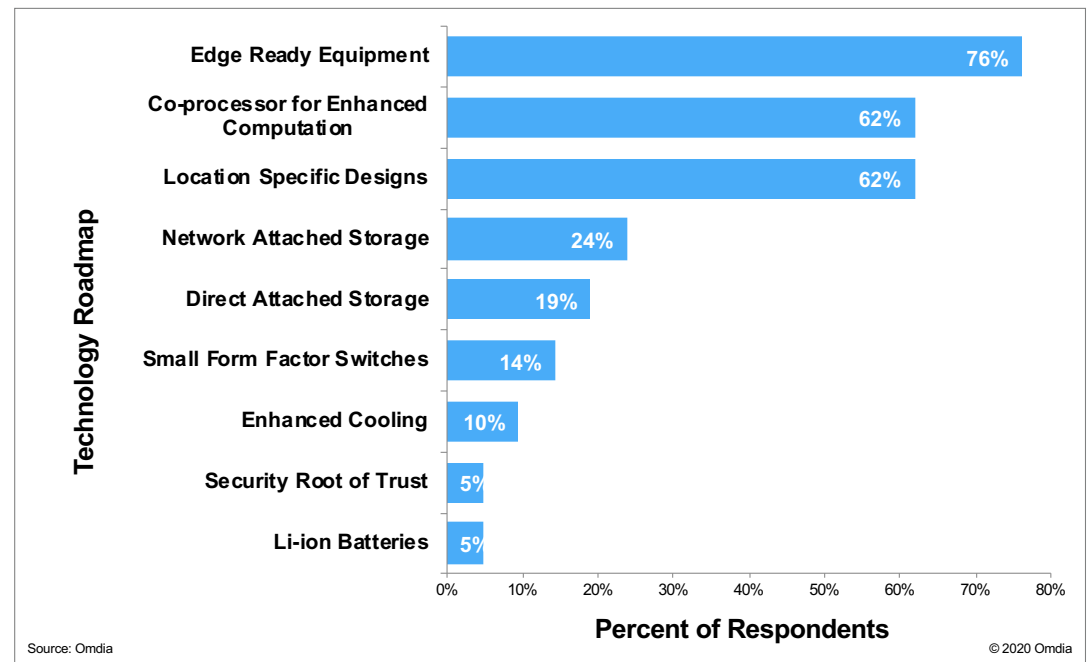


No surprise edge and enhanced computation driving roadmaps

Q: What technologies are you focused on developing?

- Edge ready equipment included rugged designs for industrial deployments, specialized equipment for telco and mobile operators
- Location specific designs targeting retail and financial were cited
- Network attached storage was focused on migration to NVMe-oF on Ethernet
- Enhanced cooling included immersion and fluid cooled designs

Technology RoadMap

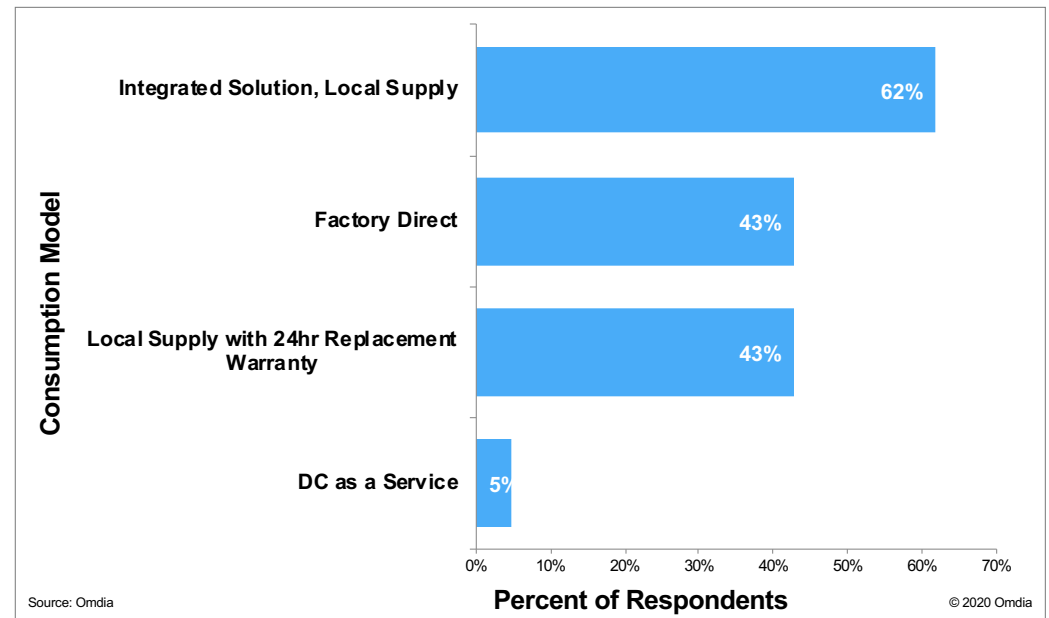


Deployments outside hyperscale CSPs are integrated solutions

Q: What is the preferred method for purchasing open compute equipment?

- Enterprise and telco need integrated solutions with local supply and warranty.
- Factory direct is only for purchases at scale and the highly skilled
- For some larger purchases with skilled workers wanting best of breed local supply with 24HR replacement was acceptable
- With the emerging circular IT economy, DC-as-a-Service is feasible at a small scale.

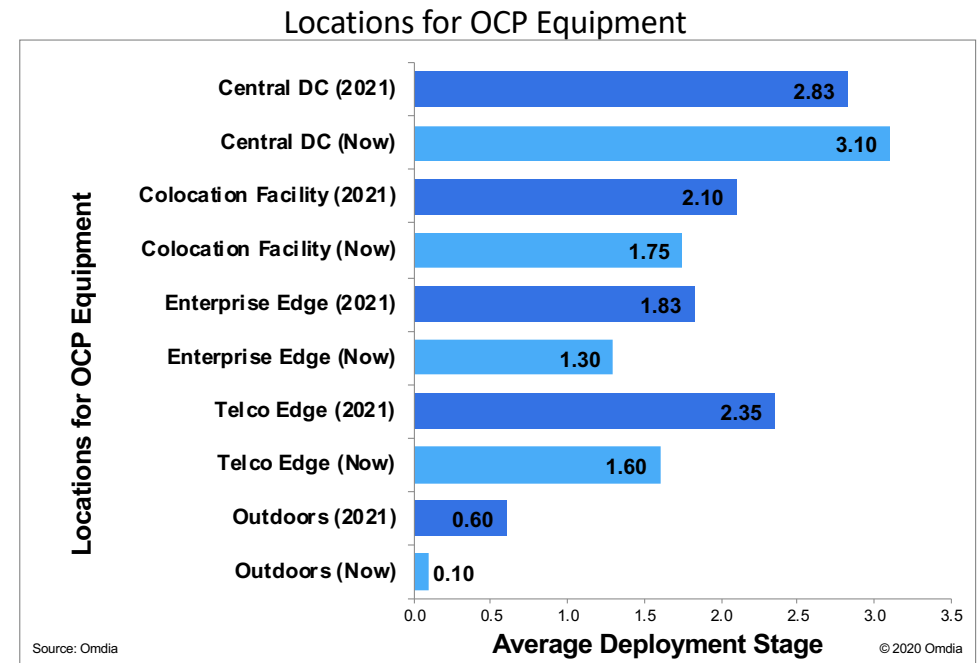
Consumption Model



Edge [CSP, Telco, Enterprise] ripe area for innovation and collaboration

Q: Where is open compute equipment deployed now and in 2 years from now?

- CSPs and enterprise increased use of collocation facilities to get closer to the end user
- Enterprises are moving compute to branch offices, retail outlets, industrial settings; looking for new designs
- Telco edge [CO, Cell Tower] POCs become large scale deployments with ramp expected 2021⁺
- Central DC compute is reduced as a portion of market, still important role to support edge compute

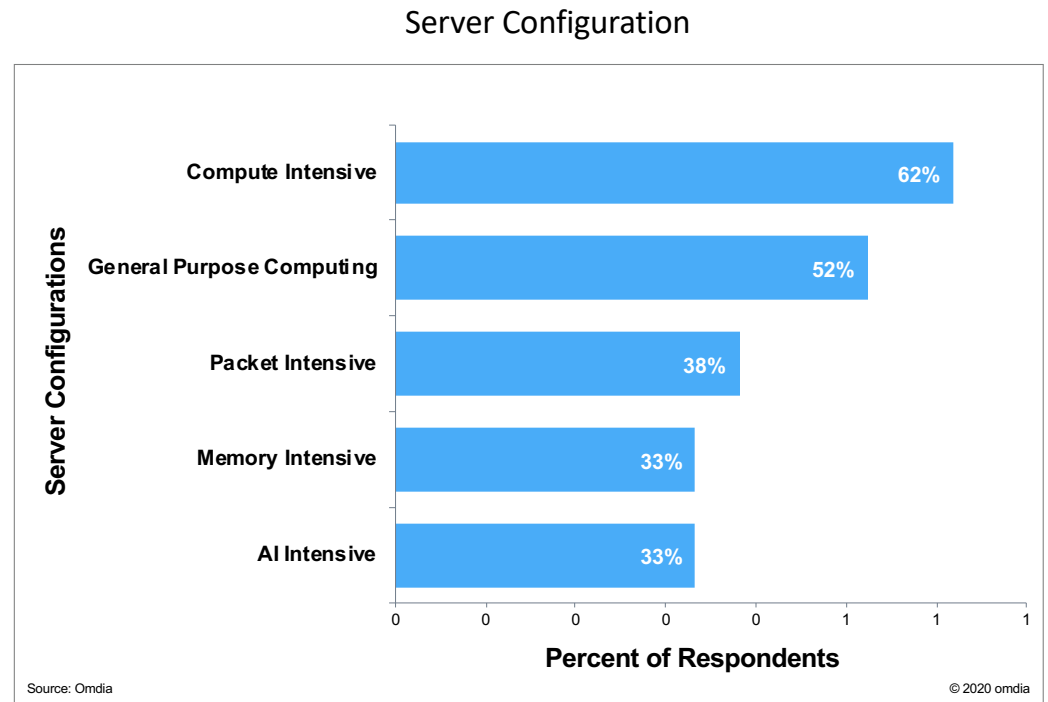


Respondents ranked typical project stages for each location
0) None, 1) Discussions 2) POC 3) Initial Production Deployments
4) Ramping Deployments 5) Fully Deployed

Compute intensive workloads driving OCP certified server adoption

Q: What server configurations are being deployed?

- Demand tops for compute intensive configured servers; aligns with need to compute at scale with high compute density racks (15 to 30 kW), gaming
- General purpose computing remains very important to OCP users
- Memory intensive and packet intensive appeal to specific segments: telco and HPC
- AI intensive still a minority of deployments, but expected to grow



Memorable mentions

“Mistaken believe that OCP ...[certified equipment] ... was only for huge companies”

“Supply chain optimizations for global scale can be too expensive for smaller projects”

“... lot of hope in OCP and name [recognition] of OCP is growing [in Europe] ...[but only] slight “just a little” pull from OCP”

“large US telco... definitely deployed a lot of OCP [certified] gear ... expanding to 5G core ... also European telcos”

“OpenEdge ... still in the early phases of the deployments ...[though] commercial deployments [started]”

“ Tier-2 CSP ... [Japan].. deployed 1,000 servers... planning 1,000 more”

OCP [certified equipment] has been attracting more attention and adoption [in 2019] compared to 2018”

“Hyperscale [operators] viewed as several steps ahead ... others want to duplicate ... good way for us to differentiate”

“OCP remains independent of vendor capture ... critically important”

“target for edge computing .. existing radio sites or central office sites ... far from ... modern DC ... cooling, space [power] ... limited ... not megawatts”

“Open solutions increase development velocity by creating off-the-shelf product offerings”

“How do I change from what I know and what ...works ...[how to adopt] OCP in the context of traditional data center infrastructure?”

“having a lot of edge conversations, fast growing ... OEMs want to tie a specific IT solution to edge OCP could help drive standardization”

Top takeaways

- OCP 2019 non-board member revenue 1B+ 2018, 40% YoY, hits \$3.6B
- Need to drive next \$6B+ revenue with enhanced supply chain
- Credible path for non-board member revenue to top 5% market share by 2023
- Adoption is moving to telco and enterprise [government]
- Good expectations for telco adoption, with large lighthouse edge projects
- Market again showing healthy maturation since last year
 - Early embers of emerging supply chain with circular economy catalyst
 - OCP certification and hyperscale operator driven innovations seen as differentiator
 - Sales via SI and VAR fulfilled deals on integrated racks continue to grow
 - Growing edge discussions and POCs pave way for next wave



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
- Cell site router equipment: IP edge routers and carrier Ethernet switches with Ethernet interfaces for copper and/or fiber deployed at the macrocell site (cell site), and aggregation/hub sites
- Co-processors units: provides a general purpose programmable parallel compute co-processor; including GPGPU, FPGA, Xeon Phi co-processor, PEZY, Deep Learning Unit (DLU), Neural Network Processor (NNP), Machine Learning Unit (MLU), or Deep Learning Unit (DLP)

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. This 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.

Get in touch

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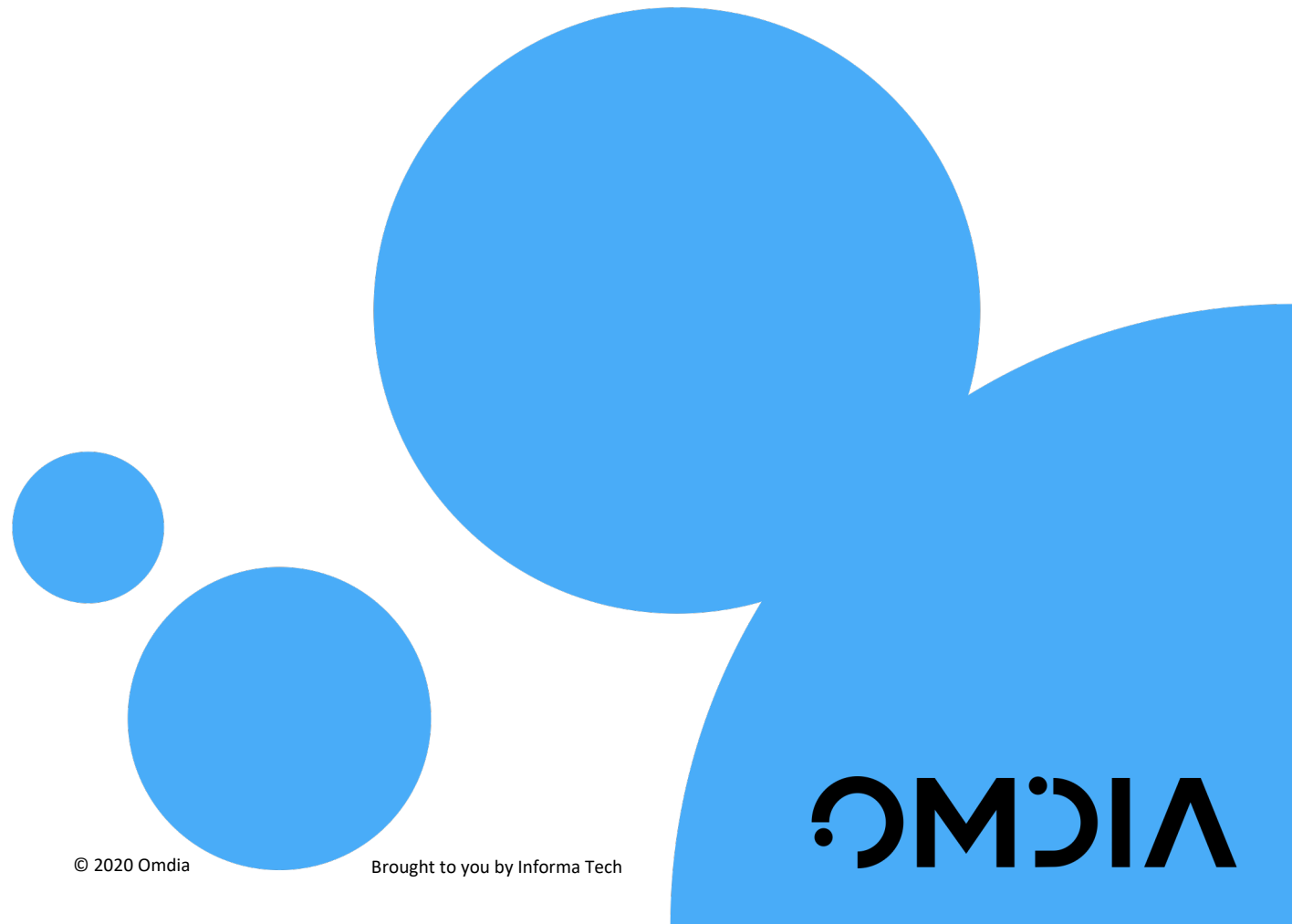
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