



OCP SUMMIT

March 20-21
2018
San Jose, CA

OPEN. FOR BUSINESS.



HYPERSCALE AT VERY SMALL SCALE

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OPEN. FOR BUSINESS.



ARCTIC CIRCLE
data center

The logo for Arctic Circle, featuring a stylized blue and white graphic that resembles a bar chart or a series of vertical bars of varying heights, with a white swoosh underneath.

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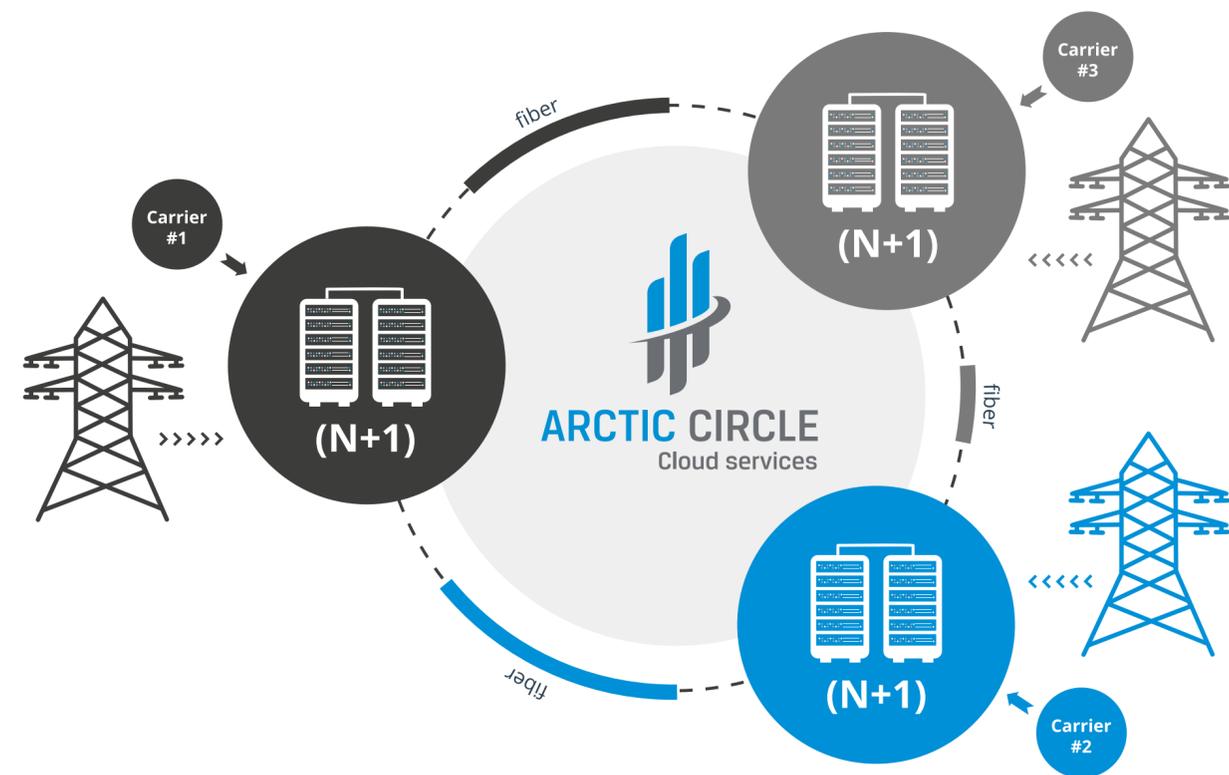
Business areas:

- › Data Center Campus
- › Public Cloud Services
- › Edge Computing
- › and more

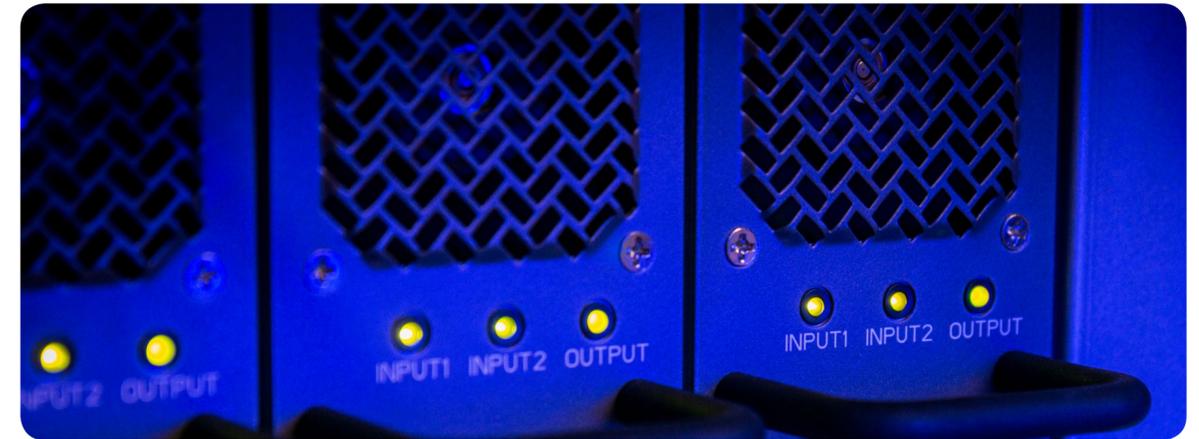
ARCTIC CIRCLE

cloud services

- › Public cloud service provider
- › **Edge Cloud:** Edge Computing + Public Cloud service provider
- › Bringing the cloud to the data
- › Designed for small, decentralized units rather than large centralized DC
- › Self-service IaaS and PaaS for big data
- › Based in Norway, run under Norwegian legislation
- › Redundancy and availability designed into infrastructure and IT layer
- › Designing our own infrastructure solutions, controlling the complete stack



What we use



- › Open Rack v1 and v2
- › Local Energy Store (LES)
- › Leopard (server)
- › Knox (JBOD)
- › Networking gear is non-OCP
- › Planned (Q2'18): Lightning (JBOD)
- › OpenStack and lots of other open source software

Why we chose OCP

- › Smart & efficient designs, ease of operation
- › Open source with momentum always wins
- › Piggybacking on hyperscale innovations
- › Preparing for the future – improved economies of scale
- › We're small scale (now), but we build by hyperscale design principles

What hyperscalers do: Optimize!

- › **Optimize hardware costs:** Avoid lock-in, enable supplier competition
- › **Optimize energy efficiency:** Minimize AC<->DC conversions
- › **Optimize cooling costs:** Allow running at higher-than-usual temperatures
- › **Optimize operational costs:** Simplify maintenance & manual work
- › **Optimize availability (uptime):** Holistic approach (include IT & software)

How OCP aids in optimizing hardware costs

- › Simplified hardware (e.g. no power supplies)
- › Open specifications
 - avoid lock-in
 - make suppliers compete on price & time
 - mix parts shopped from different manufacturers
- › Many manufacturers/suppliers of the same HW => shorter delivery times
- › Open designs don't go obsolete;
can order replacements / stay homogenous

Our experience purchasing OCP HW

Some challenges:

- › Small customer => buy from small supplier
- › Supplier is helpful, service-minded and professional, but have <5 items in stock
- › Need more? Shipment from Asia; long lead times (~12W)
- › Few customers to share shipping costs with => shipment is \$\$
- › Newest designs not generally available for small customers
 - Order 100 000 units produced for you, no problem.
 - Moore's law consequence: Not running on the latest CPU lines is a cost

Open Rack + Local Energy Store

- › Uncommon configuration outside of hyperscale world
 - Difficult request for small-scale suppliers
- › In-rack battery solutions are \$\$\$\$ in low volumes
 - More expensive than centralized UPS
 - Lithium batteries considered hazardous material => complicates shipping
- › Still an advantage for us:
 - LES is not only about \$\$ for batteries, but also about reducing the failure blast zone, saving space, and simplifying your DC design
 - Fits well with our holistic approach to redundancy and availability
 - Our container-based deployment units have no space for a UPS room

What «Open» means

- › Spec details certain parts of the design
 - Example: interface between server and bus bar
 - Will work: Server from manufacturer A in rack from manufacturer B
- › Some things are **not** a specified interface. Implementations are free to differ.
 - Example: Interface between bus bar and rack
 - Equipment from different manufacturers is not necessarily interchangeable

Memorable experience: Buying rack and LES from different manufacturers

Open Rack specifies:

- Interface between servers and busbar: YES
 - Interface between busbar, power/battery shelves and rack: NO
 - Should be bought as a unit, but...
- › Rack manufacturer #1: Doesn't produce battery shelves
 - › Rack manufacturer #2: Produces battery shelves, but requires particular switches & software for management
 - › Rack manufacturer #3: Produces battery shelves, but long rack delivery time

Solution: We bought racks from #1 and battery shelf from #3. Result?

**Fitting a
«vendor #3»
bus bar in a
«vendor #1» rack**



Optimizing energy costs

- › AC input to rack
- › Single AC->DC conversion in power shelf
- › DC on busbar
- › All servers & rack HW get DC from busbar

AC delivery to rack –

a peculiar case
in Norway



- › Different power distribution systems exist:
 - IT: Isolated Terra
 - TN: Terra Neutral
- › Not dictated by spec, but in practice, OpenRack = TN
 - No OpenRack power shelf manufacturer supports IT (yet)
- › If IT distribution on site: Transformer installation required
 - Transformers can't be scaled with installation
- › Too large? Wasted capital
- › Too small? Must replace later with larger capacity requirements
 - Not energy efficient
- › IT power common in Norway (legacy infrastructure) and Albania, Not a problem elsewhere!

DC delivery in rack

– in practice

Generally works great - but:

- › Non-OCP equipment in rack needs AC power
 - E.g. Top of Rack switches
 - Open Rack provides raw AC => LES of no use
- › Our solution: We added a 19-inch rack for networking gear
- › Bought extra in-rack (19-inch) UPSes
 - Small investment: Just enough battery for switches etc. (fraction of total power consumption)

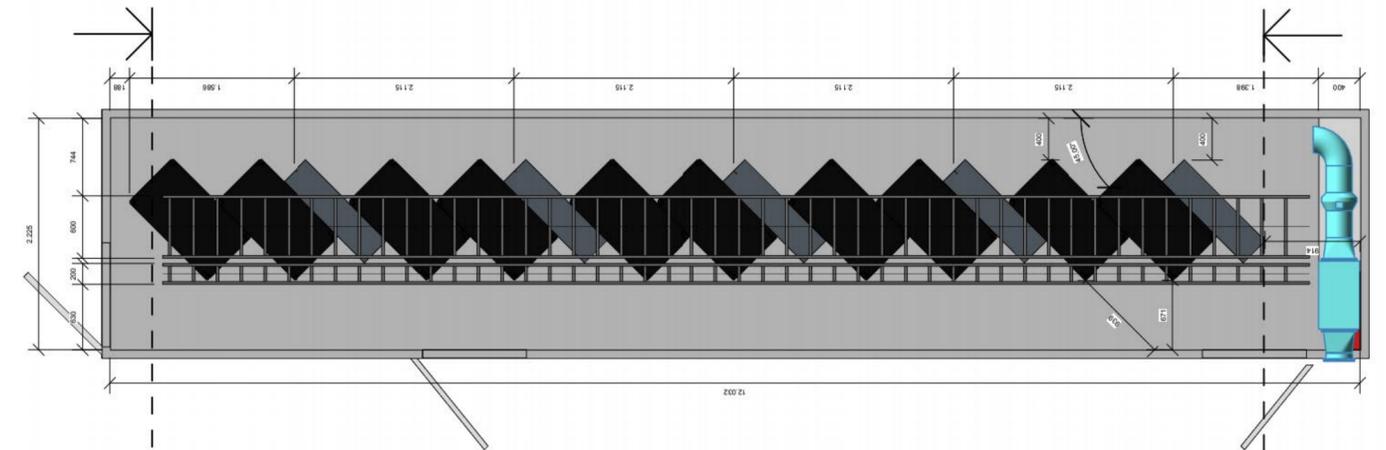
Optimize cooling

- in practice



- › OCP servers specified to operate with high-ish temperatures
- › We are in Northern Norway... Cool climate!
- › We use two-stage indirect free cooling via water
- › We allow up to 35°C in cold aisle
- › Works well for us!

Front-operated HW is great for small scale



- › No need to go to back of rack
 - Hot aisle can be made narrow
 - Racks fit in standard industry containers. Great for easy transportation of our ready-to-deploy Edge Cloud units

Operations are a breeze

- › **Tool-less design:** Change components in minutes without a screwdriver
- › Hot-swappable components



OCP wish list

- › Would like to see more proprietary products (e.g. switches) come in busbar-integrateable format
- › Bus bar-integrated DC->AC converters to use LES as UPS for AC equipment
- › Bus bar «emulator» for working with servers outside of rack area
- › Rack power supplies for IT power (Norway and Albania would love you!)

How to make your small-scale OCP adoption a success

- › Plan purchases well and place orders early
- › Consider your existing power distribution
- › Mix vendors only at interface boundaries defined in specifications
- › Have a plan for dealing with a mix of OCP and non-OCP gear
- › Pick a supplier with whom you have good chemistry



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