



Rethinking infrastructure with Open Hardware

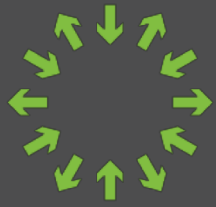
Steve Helvie – VP of Channel – Open Compute Foundation

steve@opencompute.org

@stevhelvie

Consume. Collaborate. Contribute.

£ 20,000,000



Software is eating Hardware



The numbers...

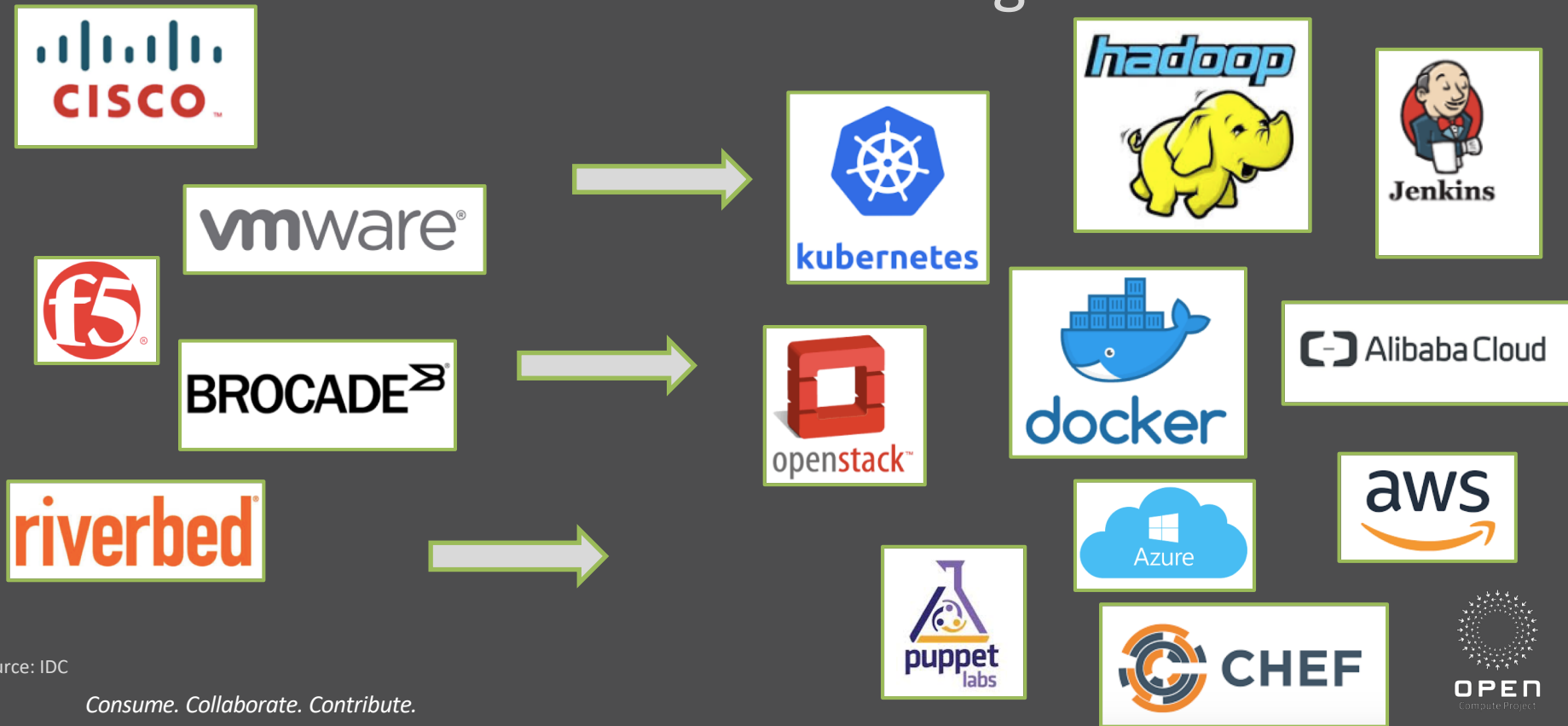


The lessons from Open Source software



What's happening in the “open” data center?

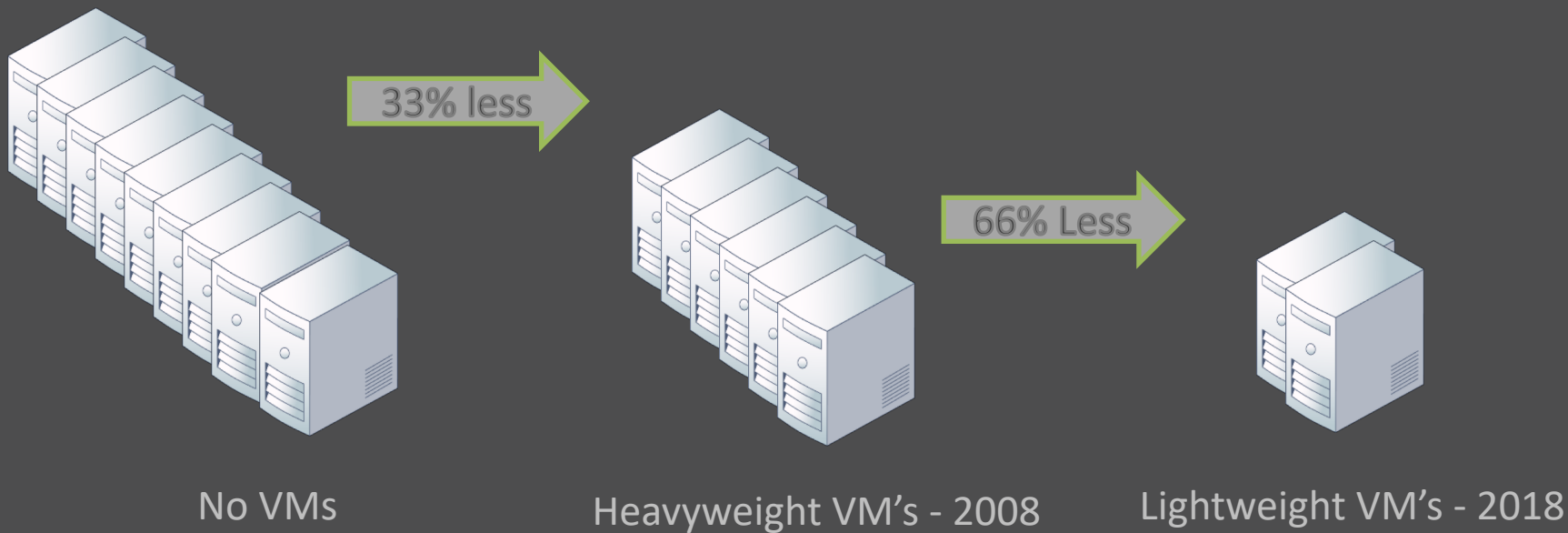
By 2020, 30% of strategic relationships will shift to the right



Source: IDC

Consume. Collaborate. Contribute.

Software eats Hardware – Virtual Machines



Software eats web servers

Hip Hop Virtual Machine & Hack



No Hip Hop VM's



With Hip Hop VM's

<https://en.wikipedia.org/wiki/HHVM>

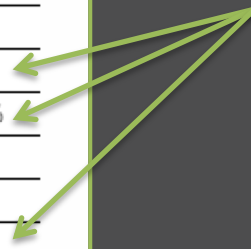
Worldwide Server Market Revenue Grew 43.7% YoY to a Record \$22.5 Billion During the Second Quarter of 2018

Top 5 Companies, Worldwide Server Vendor Revenue, Market Share, and Growth, Second Quarter of 2018 (Revenues are in US\$ Millions)

Company	2Q18 Revenue	2Q18	2Q17 Revenue	2Q17	2Q18/2Q17
		Market Share		Market Share	Revenue Growth
1. Dell Inc.	\$4,246.1	18.8%	\$2,776.2	17.7%	52.9%
2. HPE/New H3C Group**	\$3,740.8	16.6%	\$3,348.5	21.4%	11.7%
3. IBM*	\$1,637.5	7.3%	\$1,042.7	6.6%	57.0%
3. Lenovo*	\$1,549.1	6.9%	\$834.1	5.3%	85.7%
5. Inspur*	\$1,087.9	4.8%	\$512.3	3.3%	112.3%
5. Cisco*	\$1,070.9	4.8%	\$874.9	5.6%	22.4%
5. Huawei*	\$966.8	4.3%	\$545.8	3.5%	77.1%
ODM Direct	\$5,488.2	24.4%	\$3,520.9	22.5%	55.9%
Others	\$2,741.5	12.2%	\$2,227.1	14.2%	23.1%
Total	\$22,528.7	100%	\$15,682.5	100%	43.7%

Source: IDC Worldwide Quarterly Server Tracker, September 5, 2018

The rise of the ODM...



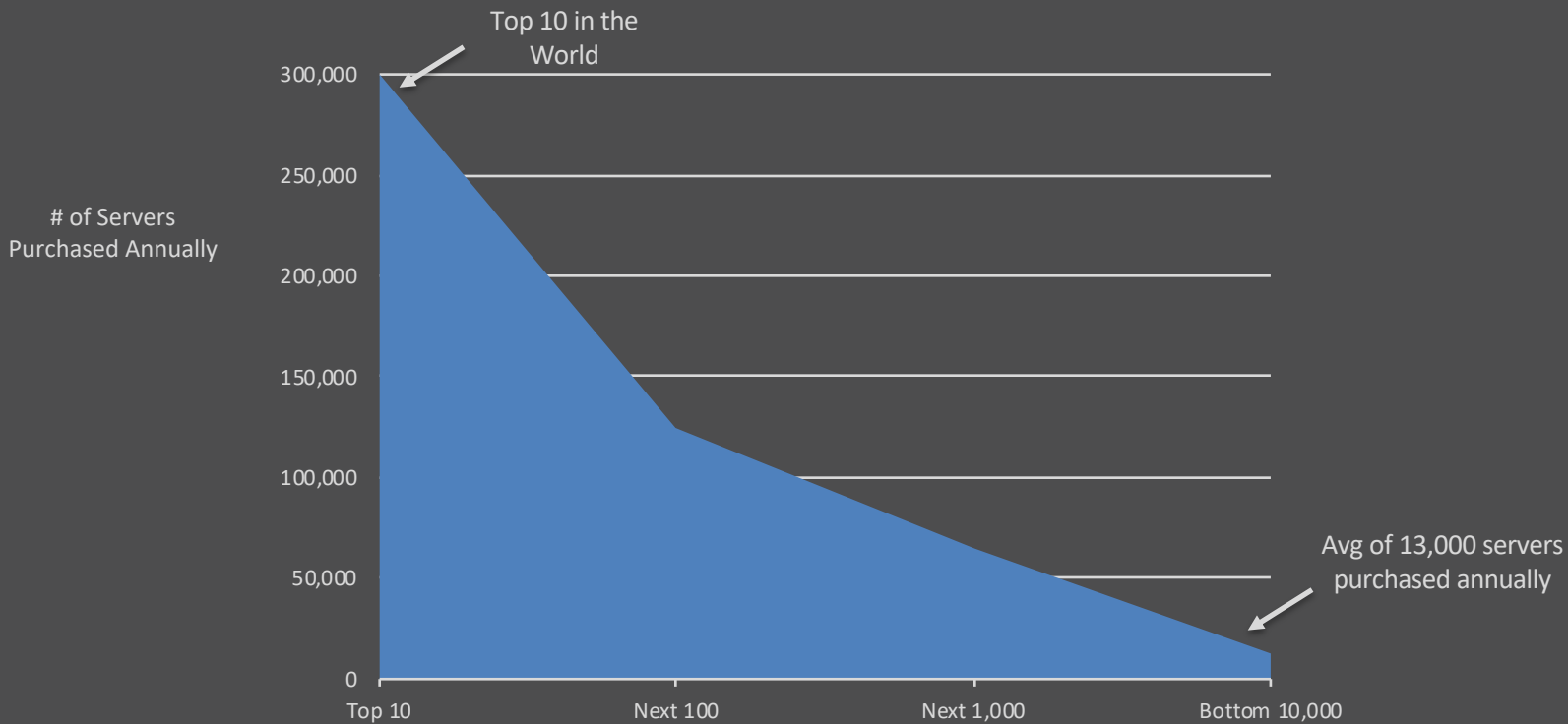
Worldwide Server Shipments Continued...

Top 5 Companies, Worldwide Server Unit Shipments, Market Share, and Growth, Second Quarter of 2018 (Shipments are in thousands)

Company	2Q18 Unit	2Q18	2Q17 Unit	2Q17	2Q18/2Q17
	Shipments	Market Share	Shipments	Market Share	Unit Growth
1. Dell Inc.	574.6	19.5%	492.7	20.2%	16.6%
2. HPE/New H3C Group**	443.7	15.1%	506.8	20.7%	-12.4%
3. Lenovo*	224.1	7.6%	145.7	6.0%	53.9%
3. Inspur*	203.2	6.9%	119.7	4.9%	69.8%
5. Huawei*	187.4	6.4%	133.9	5.5%	39.9%
5. Super Micro*	175.1	5.9%	136.0	5.6%	28.8%
ODM Direct	732.6	24.9%	527.1	21.6%	39.0%
Others	403.0	13.7%	380.6	15.6%	5.9%
Total	2,943.8	100%	2,442.4	100%	20.5%

Source: IDC Worldwide Quarterly Server Tracker, September 5, 2018

The rise of
the ODM



Large internal engineering force
Leading edge technologies
Custom HW and SW

Enterprise Companies

Minimal IT resources
Stable technologies
Standard OEM HW/SW

Is this changing??



Source: Gartner & IDC

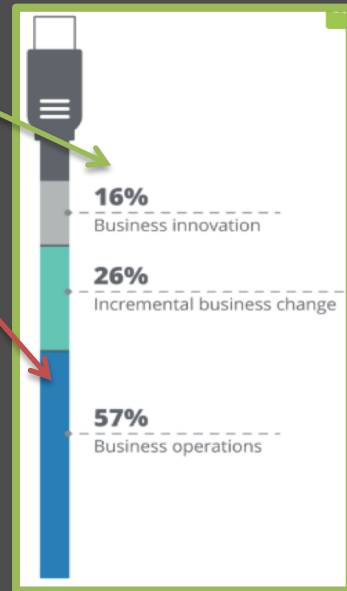
Consume. Collaborate. Contribute.



Technology Budgets as a % of Revenue



Where does it all go?



Source: Deloitte

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Types of Organisations

Standards Organisations

Producers write the specification with voluntary adoption.

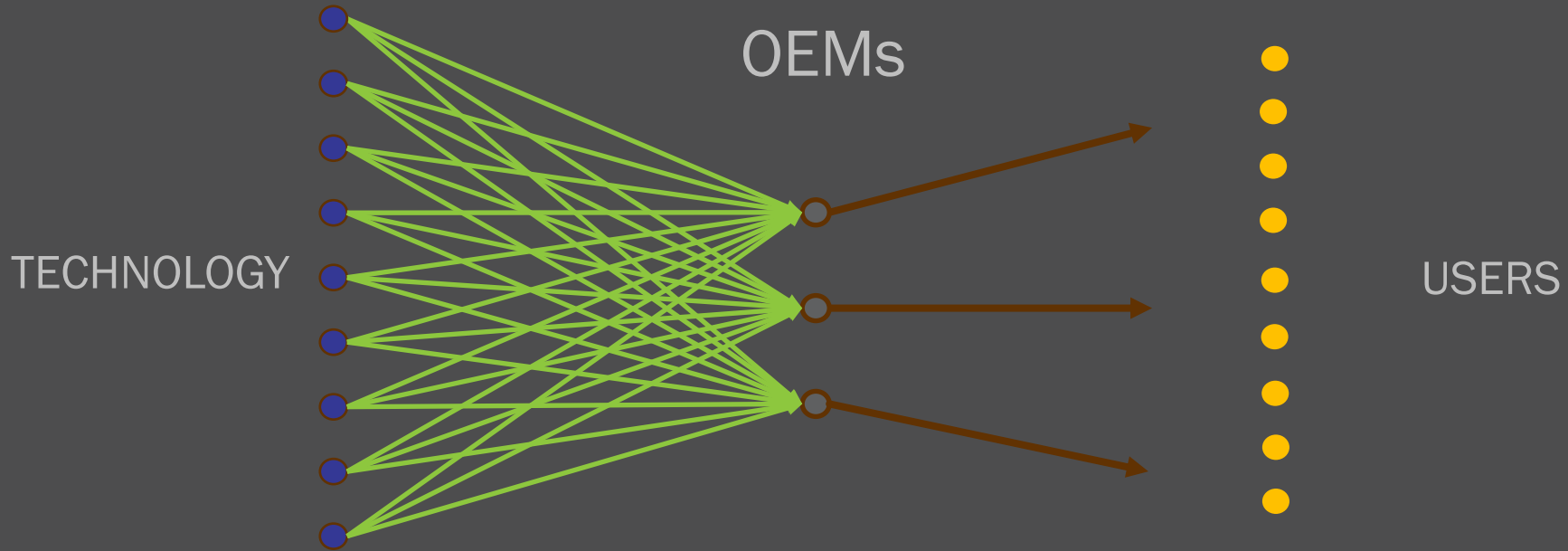
OPEN SOURCE PROJECTS

Consumers & Producers
De facto Standards
Produces Compatible Products

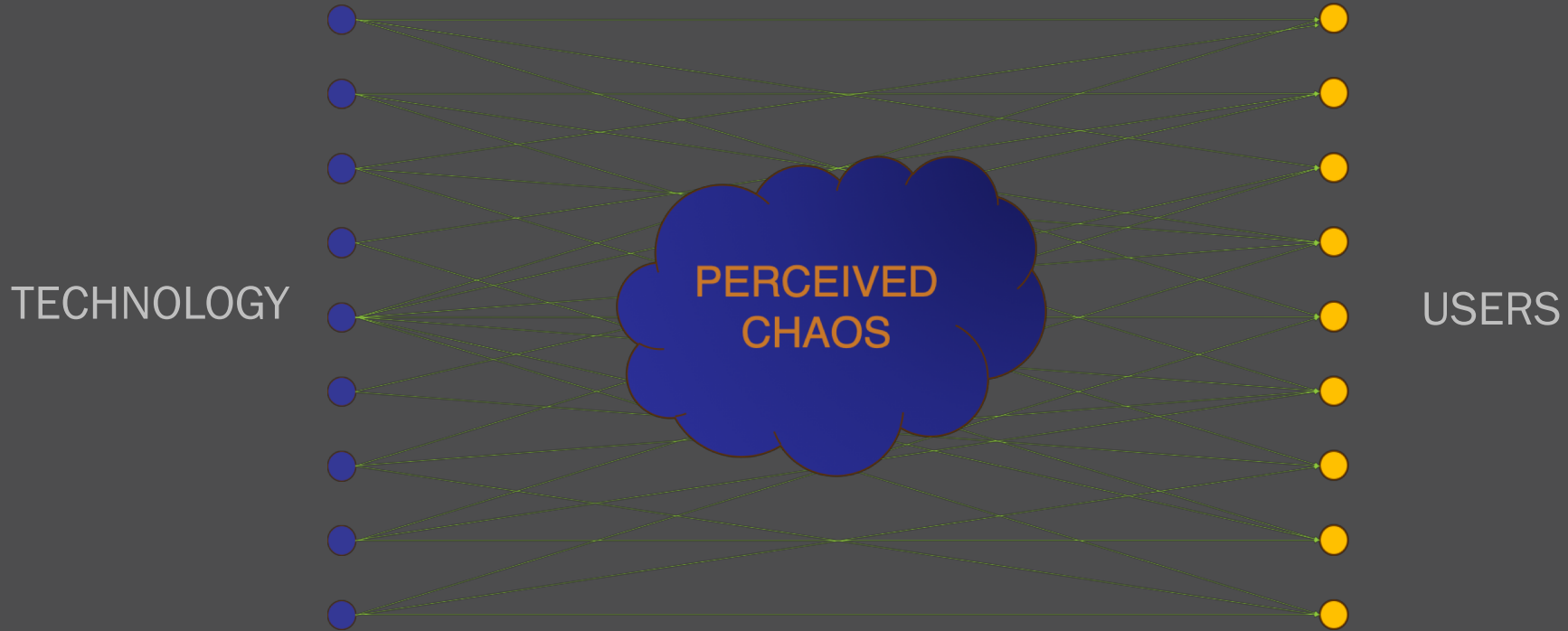
Multi-Party Sourcing Agreements

Consumers pool demand. Producers agree to build a compatible product.

The old innovation pipeline



Open Source Innovation Model





COMPANIES > FACEBOOK

Facebook to Build Its Own Data Centers

Facebook has decided to begin building its own data centers, and may announce its first facility as soon as tomorrow. The fast-growing social network has previously leased server space from wholesale data center providers.

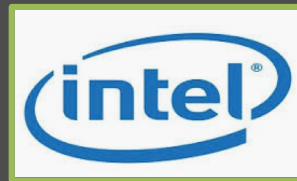
Rich Miller | Jan 20, 2010

What can we remove from the system?

Can we raise operating temperatures and have the servers survive?

Can we increase relative humidity operational ranges to make the system much more efficient?

Do we need a centralized power supplies or chillers?



Consume. Collaborate. Contribute.



Open Compute Project

A collaborative community focused on redesigning hardware technology to efficiently support the growing demands on compute infrastructure.

Enabling the industry to *Consume, Collaborate, and Contribute*



Efficiency



Scale

Impact

Openness



Our Projects



Networking



Server



Storage



Rack & Power



Advanced Cooling



Data Center



Modular DC



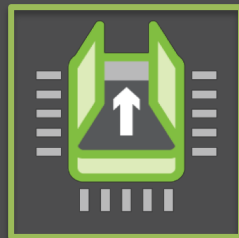
Telco



Edge Sub Project



HW Mgmt



Open System
Firmware



HPC



Security



Security

opensource.com

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Top open source projects in 2018, open source hardware, donation model for sustaining open source projects, and more news

Open-source hardware could defend against the next generation of hacking....

Joshua Pearce – Michigan Tech Univ. October - 2018

*Open-source software **isn't inherently** or **automatically more secure**. But it creates more possibilities, and **market pressure**, for improving security.*

<https://opensource.com/article/18/10/news-october-27>

<https://theconversation.com/open-source-hardware-could-defend-against-the-next-generation-of-hacking-104473>

Consume. Collaborate. Contribute.





Security

Cerberus: Hardware Root of Trust

- Add active hardware Root of Trust (RoT) to motherboard and peripherals. Codename: Cerberus
- Enforces security before platform boots.
- Cerberus performs: Detection, Protection and Recovery.
- Platform and Architecture agnostic: motherboard, headless chassis, expansion chassis etc.
- Platform Firmware Attestation

OCPU SUMMIT | March 20-21 2018 | San Jose, CA

OPEN. FOR BUSINESS

Standard hardware interface and protocols for ensuring boot code integrity

Open-source firmware for dedicated security hardware

Security firmware APIs and protocols

Change of ownership of the IT gear (e.g., resale)





Advanced Cooling

LIQUID COOLING



COMPANIES > GOOGLE (ALPHABET)

When Air No Longer Cuts It: Inside Google's AI-Driven Shift to Liquid Cooling

The company's latest AI processors drove its data center power density to unprecedented levels.

Alphabet CEO Sundar Pichai shows a photo of a liquid-cooled TPU in a pod inside a Google data center at LYO 2018.

DESIGN

Alibaba to Use Own Immersion Cooling Tech in Cloud Data Centers

Plans to contribute technology to Open Compute Project



View of Alibaba's cloud data center in Chen'an County, Zhejiang Province, China. (Image: Alibaba video)

Lenovo bets big on liquid cooling going mainstream, launches Neptune

Liquid cooling in the data center was usually reserved for supercomputing. Lenovo is betting that cooling techniques will go mainstream.

By Larry Dignan for *Between the Lines* | June 19, 2018 — 12:00 GMT (13:00 BST) | Topic: Data Centers

Cold Plate Workstream (Dell)

Door Heat Exchange Workstream (Facebook)

Immersion Workstream (Asperitas)

Leadership



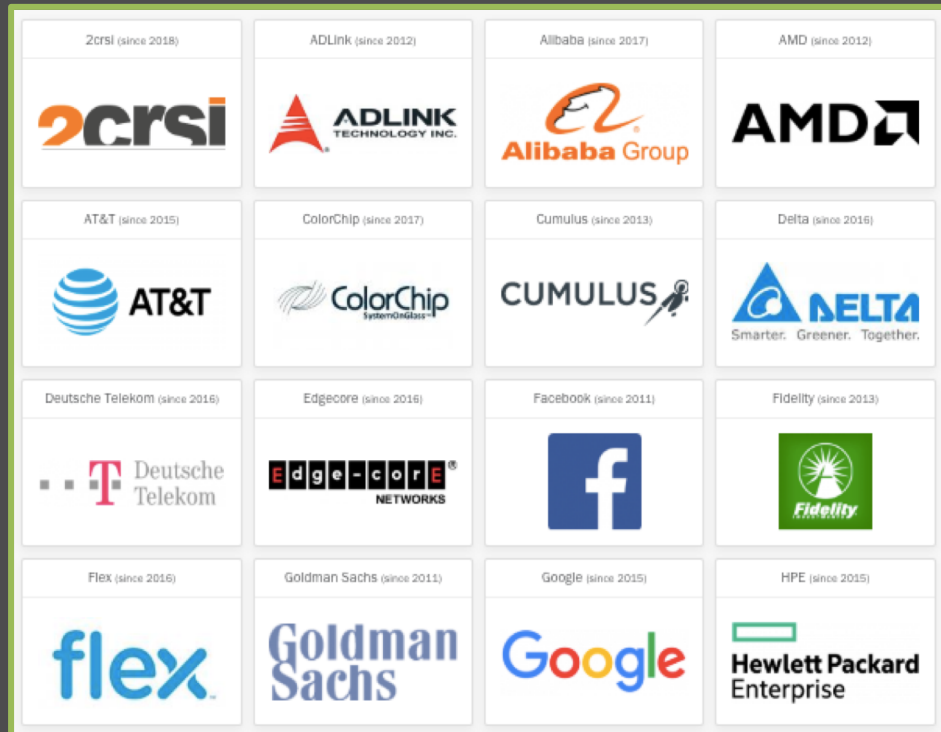
facebook



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What types of companies are participating in OCP?



There are many ways to Contribute to OCP

TRADITIONAL



Specs



Reference
Architecture



Tested Configs



White Papers



Embedded SW



Design
Files



Product
Recognition



Case
Studies



Seminars



Testimonials



Videos

<https://www.opencompute.org/contributions>

Open Source is delivering the new technologies



HOME SERVICES NEWS EDUCATION ABOUT US

Edgecore Networks Introduces 400G Open Networking

Contributes Design of Industry's First 400G Open Network Switch to Open Compute Project

March 20, 2018 12:00 PM Eastern Daylight Time

SAN JOSE--(BUSINESS WIRE)--OCP Summit – Edgecore Networks, the leader in open networking, today announced its contribution to the Open Compute Project (OCP) of the design of a 400 Gigabit Ethernet (400G) data center switch, the industry's first 400G open design, that will enable public and private network operators to increase dramatically the capacity of their infrastructures.

Edge-core
NETWORKS

Microsoft readies new cloud SSD storage spec for the Open Compute Project

Microsoft's latest planned contribution to the OCP is a new spec for standardizing SSD storage firmware interfaces for use in cloud data centers.



By Mary Jo Foley for All About Microsoft | March 20, 2018 -- 18:58 GMT (11:58 PDT) | Topic: Storage



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Europe is leading the way in OCP....



New hardware layer and more suitable Citrix environment
35% Reduction in TCO 30% Reduction in OPEX

<https://www.youtube.com/watch?v=xdZ7vuW1GGU&feature=youtu.be>



First IXP in the world to adopt a disaggregated model

<https://www.youtube.com/watch?v=3DON0en2xGs&feature=youtu.be>



Booking.com : 40% less energy compared to blades

<https://www.youtube.com/watch?v=1qIOptRGL2c&feature=youtu.be>



Started in 2011 building their open source software strategy

<https://www.opencompute.org/events/past-summits>

<https://www.youtube.com/watch?v=J5DQowa3QGc&feature=youtu.be>

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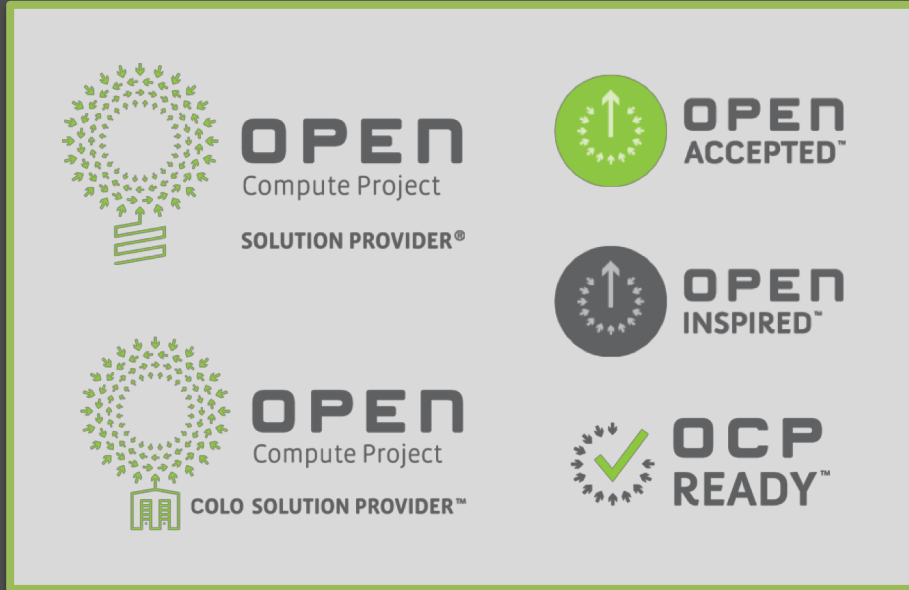




Public vs. Private - “It is not on-prem versus cloud, it’s not an or, it’s an and.”

Dean Nelson – Head of Uber Compute

The OCP Solution Providers and the OCP Marketplace is our “Reseller Channel”



<https://www.opencompute.org/sp/open-compute-project-solution-providers>

OCP Marketplace



<https://www.opencompute.org/products>

Marketplace

Welcome to the OCP Marketplace, where you can research and find out how to purchase OCP-Accepted™ and OCP-Inspired™ products.

What does it mean for a product to be OCP-Accepted™ or OCP-Inspired™?
How can I become an OCP Solution Provider and feature my products here?



Search for Specifications & Design collateral under Contributions >

Status

☐ OCP Accepted (32)

Category

☐ Network (32)

Solution Provider

☒ Cumulus Networks (32)

☐ ITOCHU Techno-Solutions Corporation (50)

☐ Circle B (45)

☐ Edgecore Networks (38)

☐ Hyve Solutions (36)

☐ Wilwynn (21)

☐ Quanta Cloud Technology (19)

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Edgecore Networks Wedge100-32X 100GbE Data Center Switch, AC POWER, US

A commercial product based on Facebook's Wedge 100 design. Top-of-Rack switch optimized for web-scale data centers. Comp...

Solution Providers: Edgecore Networks, ITOCHU Techno-Solutions Corporation, Hyve Solutions, Cumulus Networks

Part #: Wedge100-32X-O-AC-F-US

[Specifications](#)



Edgecore Networks Wedge100-32X 100GbE Data Center Switch, DC POWER

A commercial product based on Facebook's Wedge 100 design. Top-of-Rack switch optimized for web-scale data centers. Comp...

Solution Providers: Edgecore Networks, ITOCHU Techno-Solutions Corporation, Hyve Solutions, Cumulus Networks

Part #: Wedge100-32X-O-12V-F

[Specifications](#)



Filters & Search

Product Details & Spec



EU Legislation – Eco Design Directive

The screenshot shows the European Commission's website interface. At the top, there are navigation tabs: 'Commission and its priorities' and 'Policies, information and services'. A 'Log in' link is in the top right. Below the navigation bar is the European Commission logo and a search bar with the text 'English EN'. The main content area has a blue header with the text 'Home > Law > Have your say > Published initiatives > Environmental impact of enterprise servers and data storage products'. Below this, the title 'IMPLEMENTING REGULATION' is followed by 'Environmental impact of enterprise servers and data storage products'. On the left side, there is a vertical timeline with three stages: 'Roadmap', 'Draft act', and 'Commission adoption'. The 'Roadmap' stage is currently selected and highlighted. To the right of the timeline, under the heading 'About this initiative', there is a table with the following information: Topic: Single market; Type of act: Implementing regulation; Committee: C07900. Below this, under the heading 'Roadmap', there is a 'FEEDBACK: CLOSED' button and a 'Type' section with the text 'Roadmap' and a link 'More about roadmaps'.

Commission and its priorities Policies, information and services Log in

European Commission English EN Search

Home > Law > Have your say > Published initiatives > Environmental impact of enterprise servers and data storage products

IMPLEMENTING REGULATION

Environmental impact of enterprise servers and data storage products

Roadmap

Feedback period
20.06.2017 - 18.07.2017
FEEDBACK: CLOSED

Draft act

Feedback period
03.07.2018 - 31.07.2018
FEEDBACK: CLOSED

Commission adoption

About this initiative

Topic	Single market
Type of act	Implementing regulation
Committee	C07900

Roadmap

FEEDBACK: CLOSED

Type

Roadmap
[More about roadmaps](#)

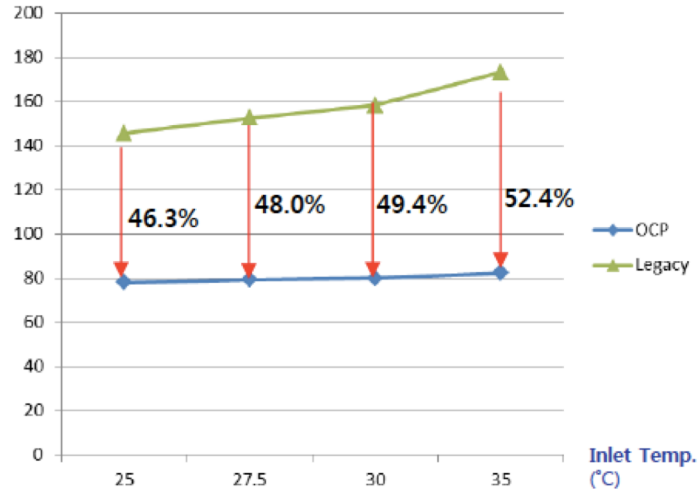
https://ec.europa.eu/info/law/better-regulation/initiatives/ares-2017-3069227_en

OCP Server Power Consumption



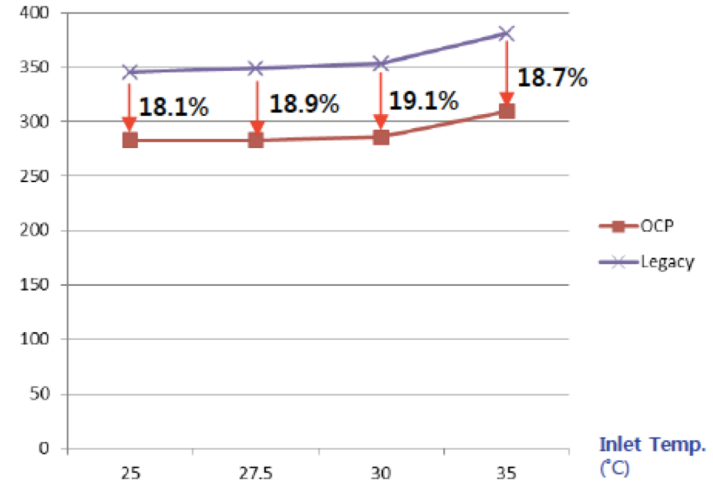
Power Consumption
(W/Node)

Workload 0%



Power Consumption
(W/Node)

Workload 100%



Combined Heat & Compute (CH&C)

DCD News | Analysis | Opinions | Videos | Webinars | Whitepapers | Magazine | Conferences

HOME > NEWS > UK & IRELAND

Facebook's Denmark data center will supply heat to city

Odense's district heating will get 100,000MWh of social hot air

September 08, 2017 By: Peter Judge


[f](#) [t](#) [in](#) [v](#) [G+](#) [e](#) [+](#)

Facebook's planned Danish data center will supply hot air to the district heating system of the nearby city of Odense, when it opens in 2020.

When the site is built, Facebook's waste heat will be boosted by a heat pump, and delivered as hot water into a heating system run by local firm [Fjernvarme Fyn](#). Odense is the third largest city in Denmark, with 175,000 citizens - and Facebook believes it will supply up to 100,000 MWh of energy per year waste heat could warm up to 6,900 homes.

Renewable energy

"At all of our data centers, we look to make our operations as sustainable as possible, but our ability to recycle heat from our servers is unique to our Odense data center," says an announcement on the [data center's Facebook page](#) (of course). "This was made possible due to our close collaboration with the local district heating company Fjernvarme Fyn and its existing district heating network."



Facebook's projected Odense data center
— Facebook

Data Centres used as heat generators

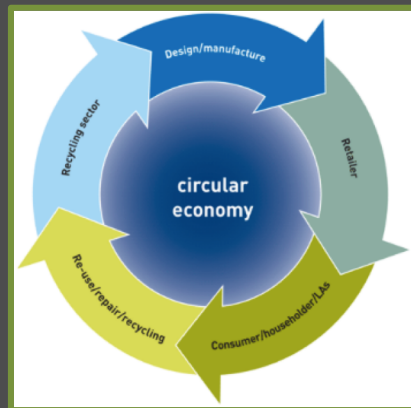
Higher exhaust air temperatures possible on OCP racks

Liquid heat transfer systems being hacked in OCP

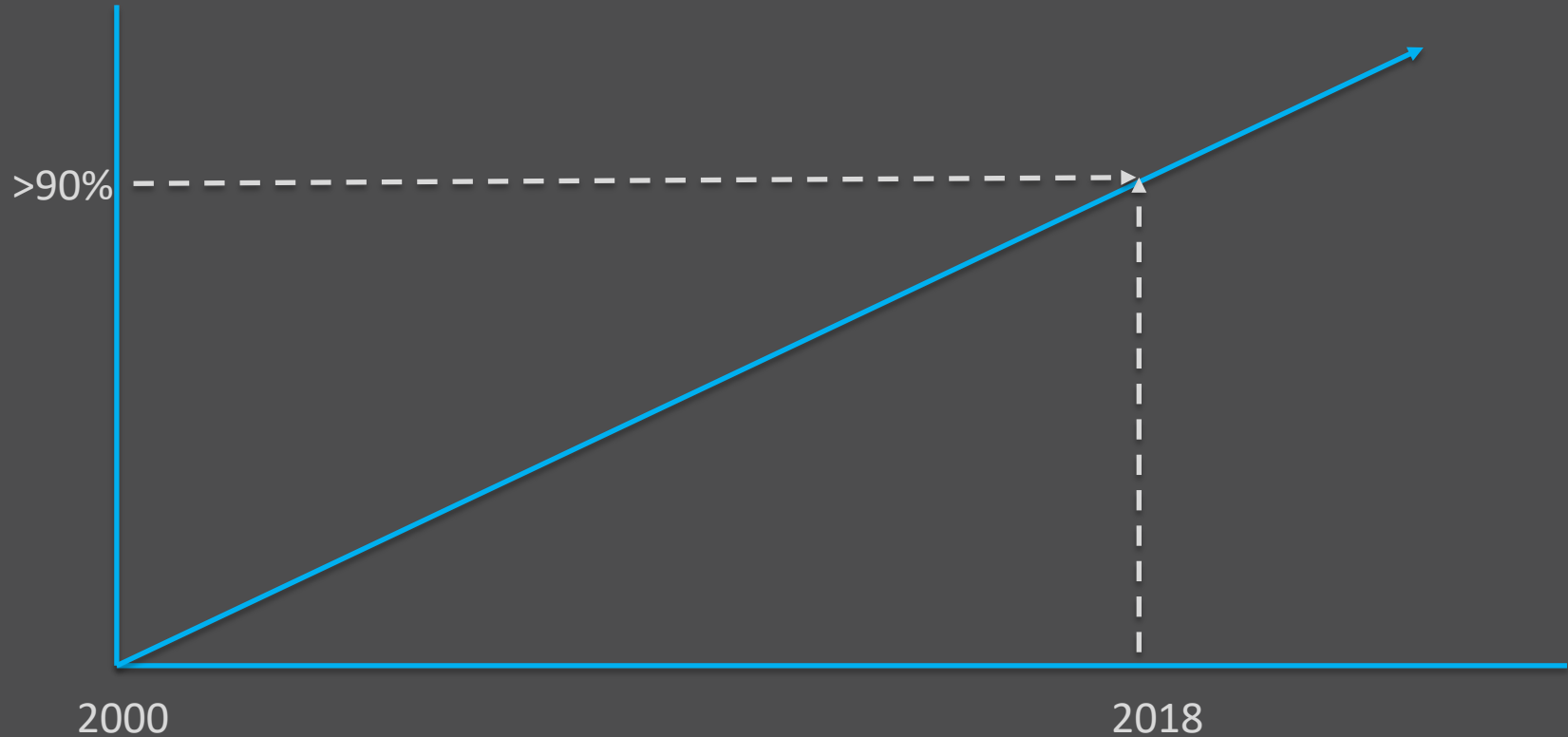


Hyperscaler OCP hardware re-use

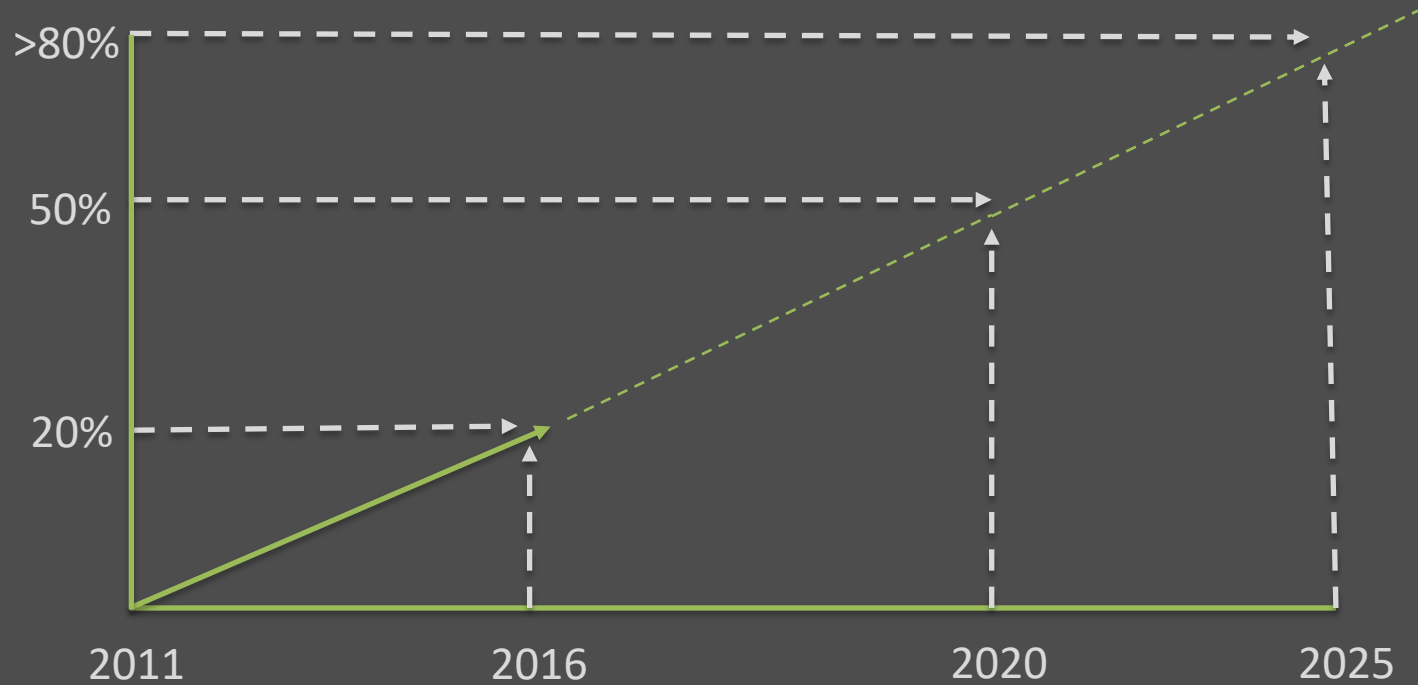
Enabled by the removal of gratuitous product differentiation



Linux Foundation & Data Centre Open Source Software Adoption



OCP Foundation and Adoption



Where can I see OCP in Europe?

CIRCLE B
Revolutionary IT Infrastructures

switch **datacenters**



KAO



CELERIS
INFORMATION

ITRenew



wiwynn

Brno Czech Wiwynn
Mft Facility



NOKIA



**RI
SE**
Research Institute of Systems



OCP Experience Centre

Circle B, Rittal and Switch Datacenters have launched the first European Open Compute Project (OCP) Experience Centre.



<https://www.businesswire.com/news/home/20180929005012/en/Circle-Rittal-Switch-Datcenters-Launch-European-OCP>

Consume. Collaborate. Contribute.



£ 20,000,000

5kw per rack then the IT load is $1,200 \times 5$

If banks were to simply swap out the old gear for OCP gear they would see a saving of electricity of more than £5,000 per year per rack.

We would reduce from four hundred racks in each of the three core data centers down to 200 in each.

Tomorrow: 3:10pm ROOM 6

TCO and technical advantages of open source networking in the data centre

Pete Crocker - UK-based systems engineer for Cumulus Networks



THANK YOU

Consume. Collaborate. Contribute.

