



OPEN
Compute Project



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ENG. WORKSHOP: Power Considerations for Open Rack

Doug Sandy

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OPEN HARDWARE.

OPEN SOFTWARE.

OPEN FUTURE.



Abstract:

Open Rack has proved to be a powerful platform for cost-effective data center scale-out. Focus on vanity free technology, coupled with an open source hardware model has changed the landscape for rack scale computing infrastructure.

However, next-generation server/networking architectures, combined with increasing demand for data center operational and capital efficiencies, put extreme pressure on continued improvement of the rack power subsystem.

Trend #1 – Moore's Law

MIT
Technology
Review

Computing

Moore's Law Is Dead. Now What?

Shrinking transistors have powered 50 years of advances in computing—but now other ways must be found to make computers more capable.

by Tom Simonite May 13, 2016

Forbes

Economics Is Important - The End Of Moore's Law

JUL 26, 2016 @ 10:28 AM

nature International weekly journal of science

The chips are down for Moore's law

The semiconductor industry will soon abandon its pursuit of Moore's law. Now things could get a lot more interesting.

M. Mitchell Waldrop

09 February 2016

CIOReview

Getting Moore Out of Your Cloud

Doug Sandy, Chief Architect, Hyperscale & Cloud Solutions, Artesyn Embedded Technologies

“The challenge that a slowdown of Moore's law poses to cloud and hyperscale growth should not be underestimated”

For decades, server manufacturers relied on semiconductor technology improvements to provide higher performance, lower power chips. This can no longer be assumed.

Trend #2 - Adjunct Accelerators



Intel Begins Shipping Xeon Chips With FPGA Accelerators

By Jeffrey Burt | Posted 2016-04-13

Intel officials have said they expect FPGAs will be used in as much as 30 percent of data center servers by 2020.



THE NEXT PLATFORM

THE AGE OF THE GPU IS UPON US

May 31, 2016 Todd Mostak

Having made the improbable jump from the game console to the **supercomputer**, GPUs are now invading the datacenter. This movement is led by Google, Facebook, Amazon, Microsoft, Tesla,



THE NEXT PLATFORM

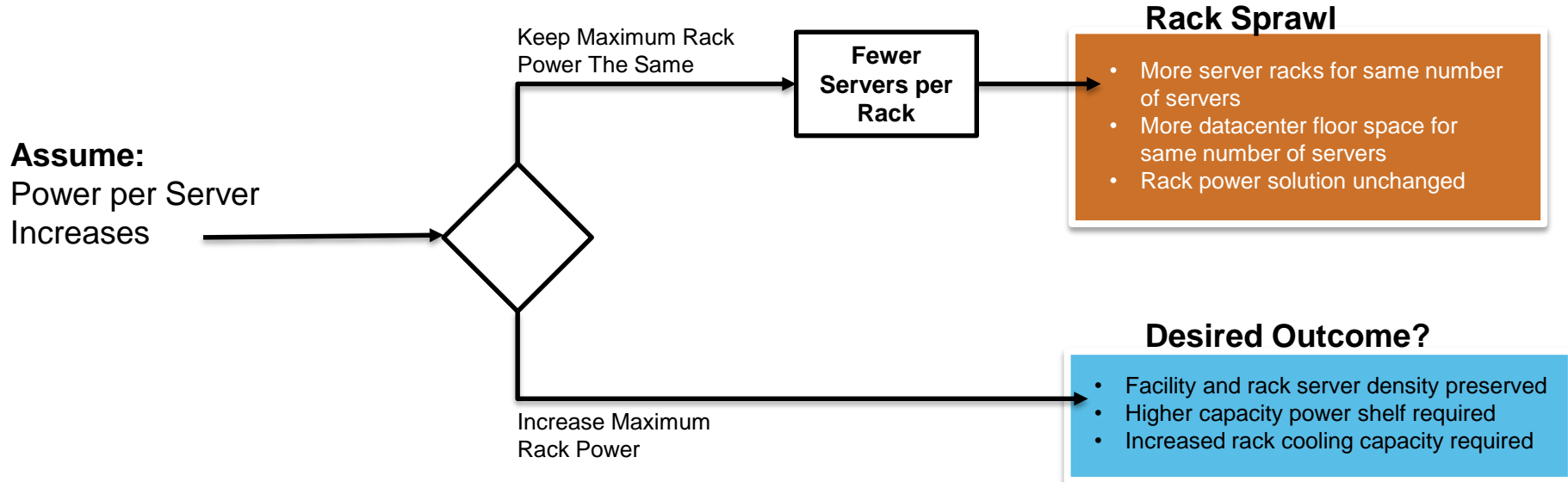
INTEL MARRYING FPGA, BEEFY BROADWELL FOR OPEN COMPUTE FUTURE

March 14, 2016 Nicole Hemsoth

For those who read here often, there are clear signs that the FPGA is set to become a **compelling acceleration story** over the next few years.

Acceleration engines help provide higher performance and performance per Watt, however, power per server is expected to increase.

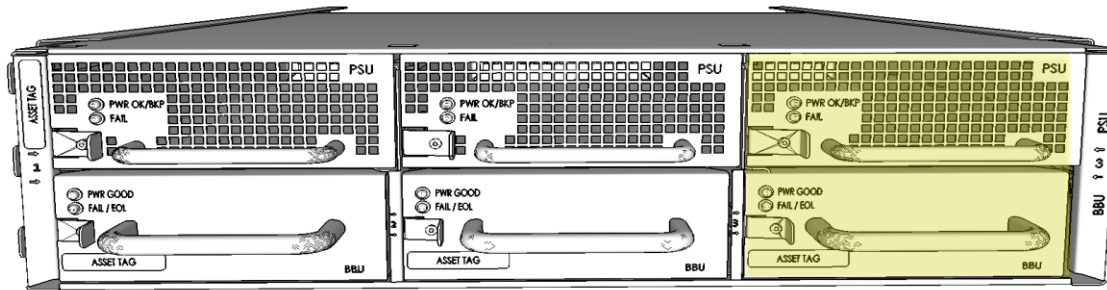
Implications of Trends on Rack Architecture



Avoiding rack sprawl will require higher capacity rack power stations. What other improvements could be incorporated with this change?

Opportunity: Reduce Stranded Power?

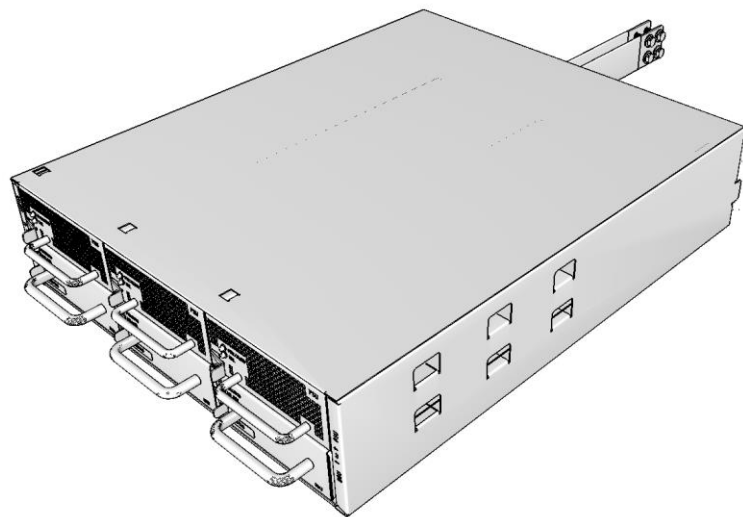
- Stranded Power is capacity within the rack that is present but cannot be utilized by IT loads
- Stranded power directly impacts rack equipment cost
- Largest source of stranded power in rack (33%) is caused by redundant supply
- Redundant stranded power cost = thousands \$ per rack



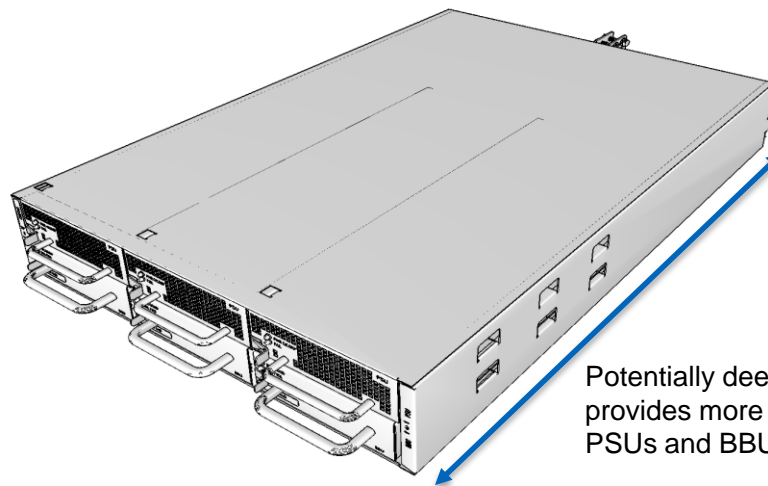
Opportunity: Improve PSU Energy Efficiency?

- Reduces energy-related operational expenses
 - 0.5% efficiency improvement may save hundreds \$ per rack over the lifetime of the equipment
 - OpEx savings are offset by higher CapEx for high-efficiency parts
- Higher efficiency supplies are larger sized than lower efficiency supplies → more rack space
- Diminishing returns for each additional improvement

Opportunity: Change Power Station Footprint



2 x 30U



1 x 20U

Potentially deeper footprint
provides more volume for
PSUs and BBUs

Smaller footprint allows for up to 40U of additional IT equipment. Is this useful?

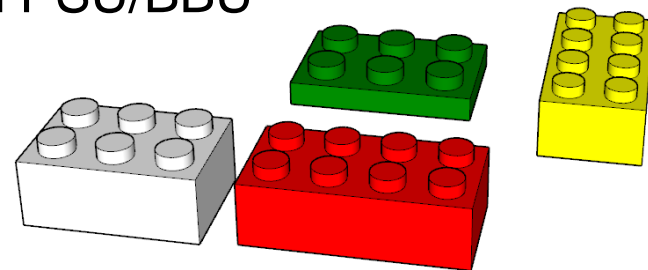
Opportunity: Utilize stored energy?

- Open Rack V2.0 BBU delivers charge during loss of input power only
- Can additional value be provided by utilizing this stored energy at other times?
 - For example: peak shaving
- May unlock additional stranded power in supplies
- Increases system complexity



Opportunity: Improve Vendor Interoperability?

- What is the desired level of interoperability?
 - Rack
 - Power Station
 - PSU/BBU
- Currently vendor interoperability for power occurs at the rack level
- Interoperability complexity increases toward PSU/BBU



Call to action

	Open Rack 1.0	Open Rack 2.0	Open Rack Next
Total Rack Power	12,600W	13,200W	TBD
Number of Power Stations	3	2	TBD
Rack Footprint	9 OU	6 OU	TBD
Redundancy Model	6 + 1	2 + 1	TBD
Local Energy Storage	None	Yes	TBD
Efficiency Target	94.5% (40%-80% Load)	95% (30%-90% Load)	TBD

Artesyn seeks other interested parties to comprehend and prioritize next generation power requirements.

Contact Information

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