

Lenovo Technical / Strategy Update

Lenovo™

Martin W Hiegl | October 1st, 2018

Bio – or: „Why should you believe a word I say?“



Martin W Hiegl

Director, WW HPC&AI Business Line
Lenovo – Data Center Group

- Based in Stuttgart, Germany, home of the Lenovo HPC & AI Innovation Center
- HPC & AI WW Offerings and Sales
 - Product Management
 - Vertical Segment Expertise
 - Performance Engineering
- My background
 - >10Y passionate about customers, HPC technology and solutions
 - Studied Business Informatics at DHBW State University, Stuttgart
 - Joint IBM HPC Sales Team, then several HPC/Sales Mgmt roles
 - Joint Lenovo in 2015 as part of the IBM System x acquisition
 - Joint HPC Business Unit in 2016 to drive customer focus WW
- When not immersed in HPC&AI
 - Family quality time, garden work, travelling to solitary places
 - Pursuing the rehabilitation of the German sense of humor

Lenovo Technical / Strategy Update

Top500 Leadership etc.

Enough with the Marketing already ...

Current Portfolio

All there, all better 😊 ... see lenovopress.com

Artificial Intelligence

Super interesting ... better speakers than me.

ExaScale Technologies

Ex(a)citing ... but all under NDA unfortunately.

Power and Cooling

That's cool! And hot! And Lenovo Neptune™!



Why care about Power and Cooling?

**Data Center
limitations**

**Increasing
Electricity Cost**

**Performance-
Power relation**

**Application
Diversity**

**Waste Heat
Reuse**

Remember the Past, Predict the Future

Eli Lilly and Company

(#75, Nov 2006)

BladeCenter HS21 w/ Xeon 5160
2C 3.0GHz 80W



- Rack: 56 Nodes, 224 Cores
- SPECfp2017 Rate: ~ 338
- HPL RackPower: ~20kW

BSC – Mare Nostrum

(#13, Jun 2017)

Lenovo SD530 w/ Xeon 8160
24C 2.1GHz 150W



- Rack: 72 Nodes, 3.456 Cores
- SPECfp2017 Rate: 14.616
- HPL RackPower: ~33kW

LRZ – SuperMUC-NG

(#?, Nov 2018)

Lenovo SD650 w/ Xeon 8174
24C 3.1GHz 240W



- Rack: 72 Nodes, 3.456 Cores
- SPECfp2017 Rate: 18.000
- HPL RackPower: ~49kW

How much heat can your DataCenter extract from a 19' rack?

Talking about LRZ ...

2012 - SuperMUC

- 9.216 Nodes dx360M4
- SandyBridge E5-2680
 - 8C 2.7GHz
- 3.2 PetaFlop/s

2015 - SuperMUC II

- 3.072 Nodes nx360M5
- Haswell E5-2697v3
 - 14C 2.6GHz
- 3.6 PetaFlop/s

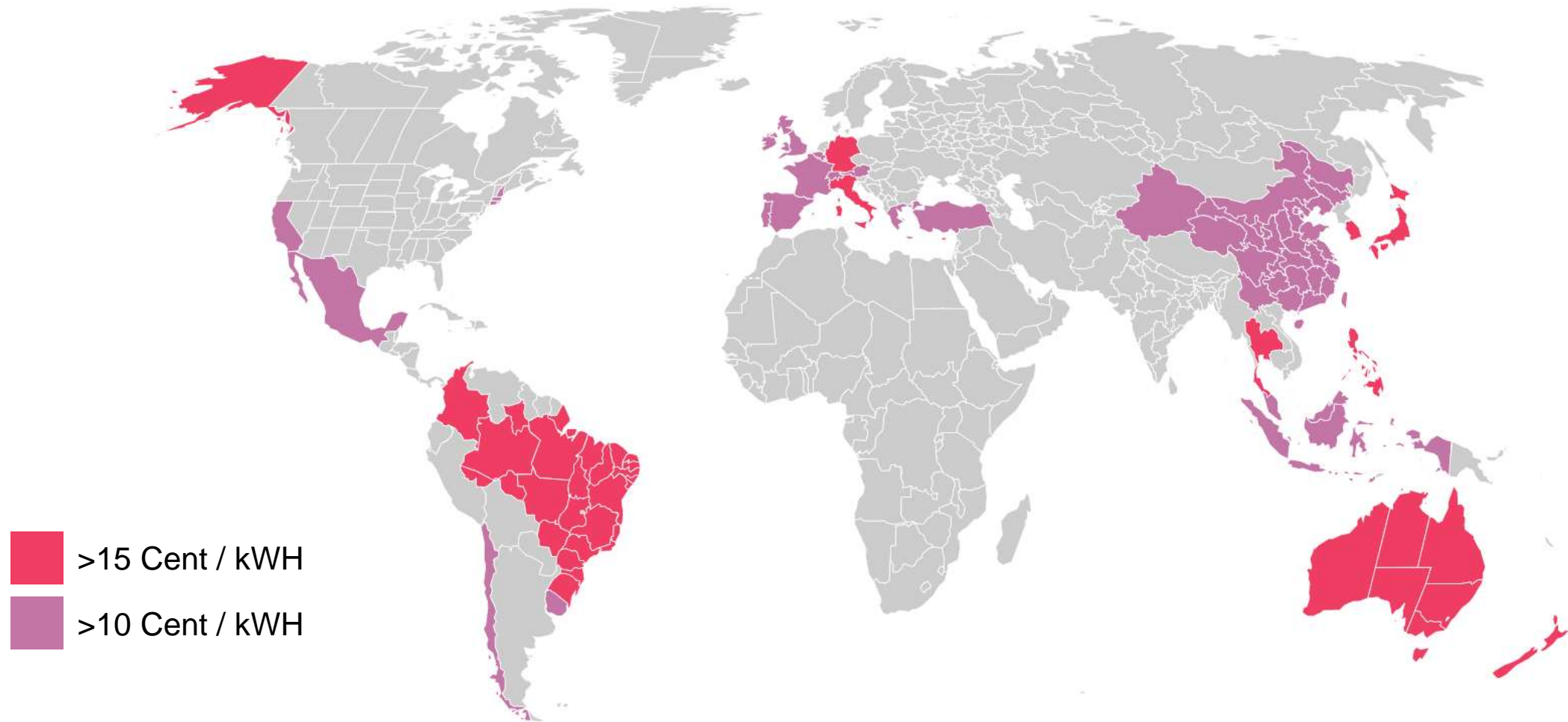
2018 - SuperMUC-NG

- 6.480 Nodes SD650
- Skylake 8174
 - 24C 3.1GHz
- 26.7 PetaFlop/s



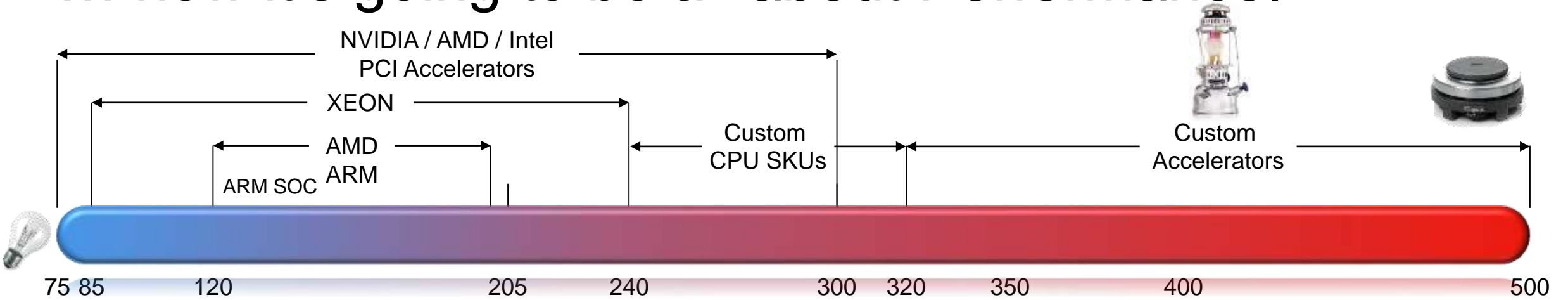
Beautiful: > half a million cores in almost 20.000 nodes / 300 racks.

It was about all about saving Energy / Cost ...

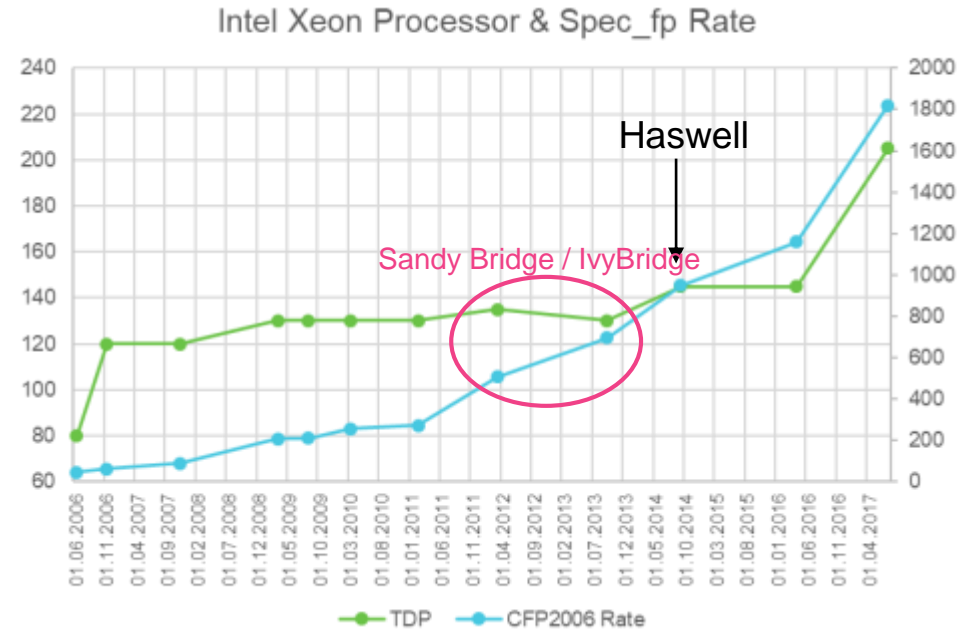


25% of the world has Electricity cost >10 Cents/kWh

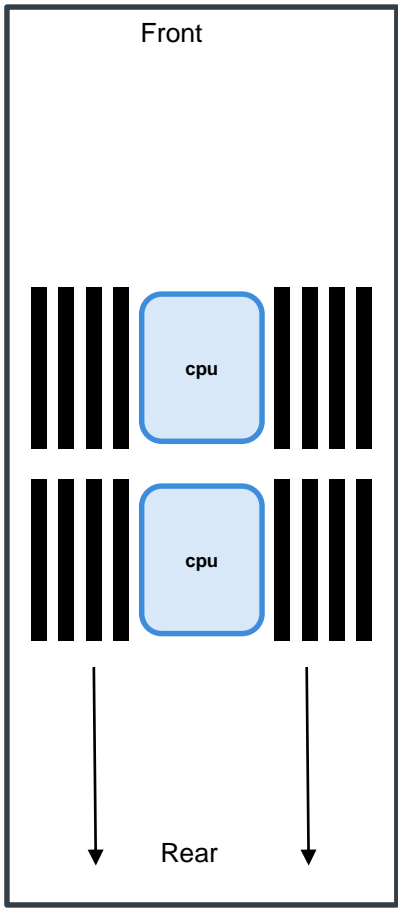
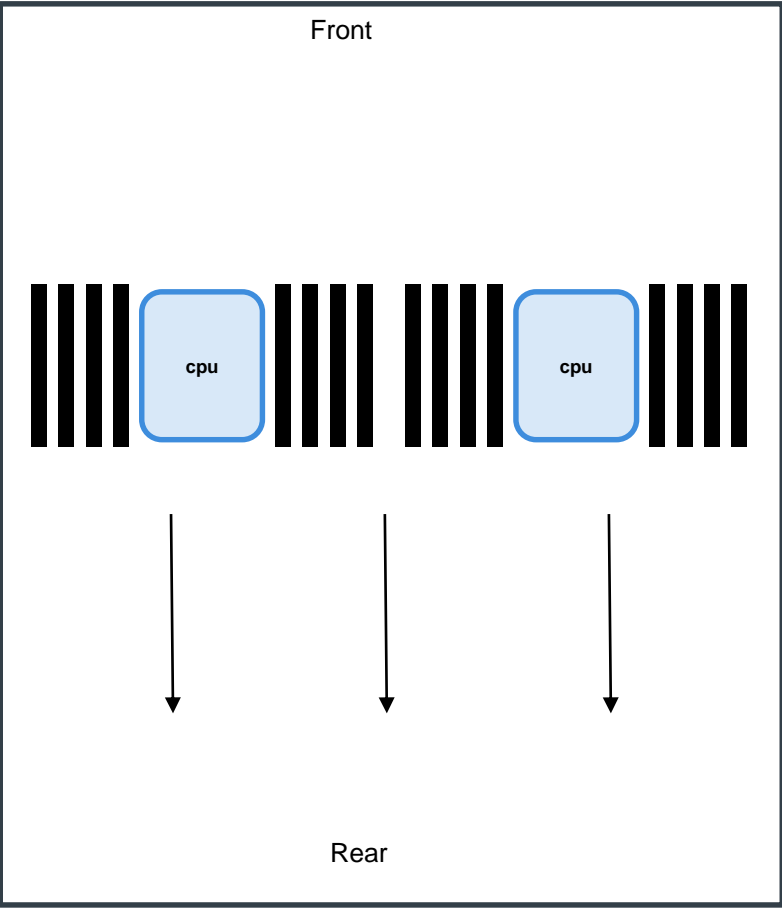
... now it's going to be all about Performance.



- More performance through more power
 - More peripherals add power / limit density
- **Highest performance mandates reduced density or optimized cooling**



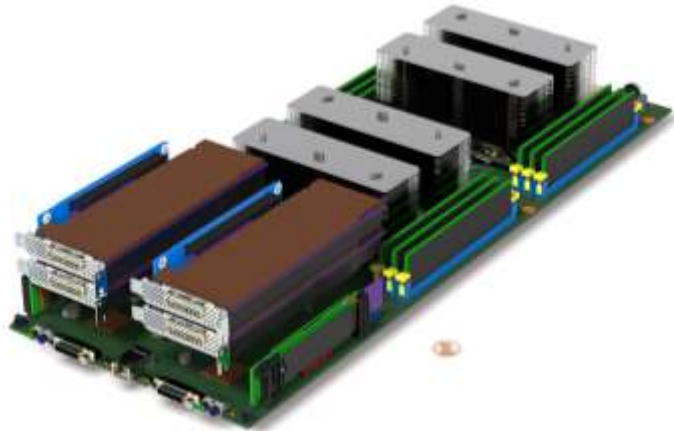
Consider the complexities of current design ...



So what does that mean?

HIGHER

- Grow Heat-Sinks
- Reduce Density
- Why not going wide then instead?



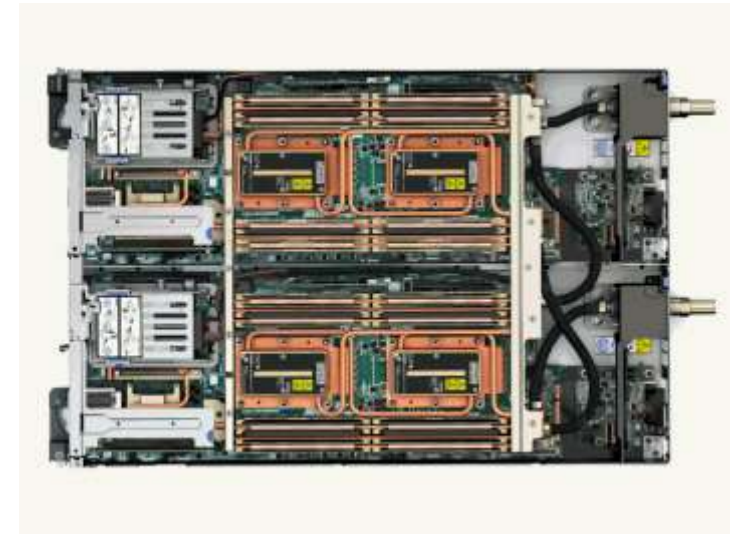
WIDER

- Back to Spread-Core
- Reduce Density
- Ok for „Technical Computing“



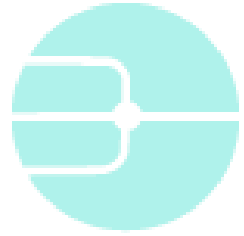
WATER

- Liquid within the node
- Increase investment
- New Supercomputing standard



2012 Direct Water Cooling was called an extravagance – now it's standard!

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Neptune™



ThinkSystem

Lenovo

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What goals guide Lenovo DWC design?

High Heat Recovery

>90% at 45°C inlet temperature

High Cost Effectiveness

As much common parts/design as possible.

High Water Temperature

Up to 50°C inlet for efficient waste heat reuse.

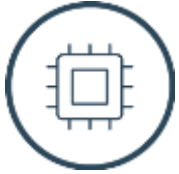
High Material Reliability

Copper avoids leakage or microfractures.

High TDP CPU Support

Up to 500W TDP in the future – new challenges.

What Will Tomorrow's IT Look Like?



Higher Power Processors



Data Center limitations



Increasing Electricity Costs



Thermals Capping Performance



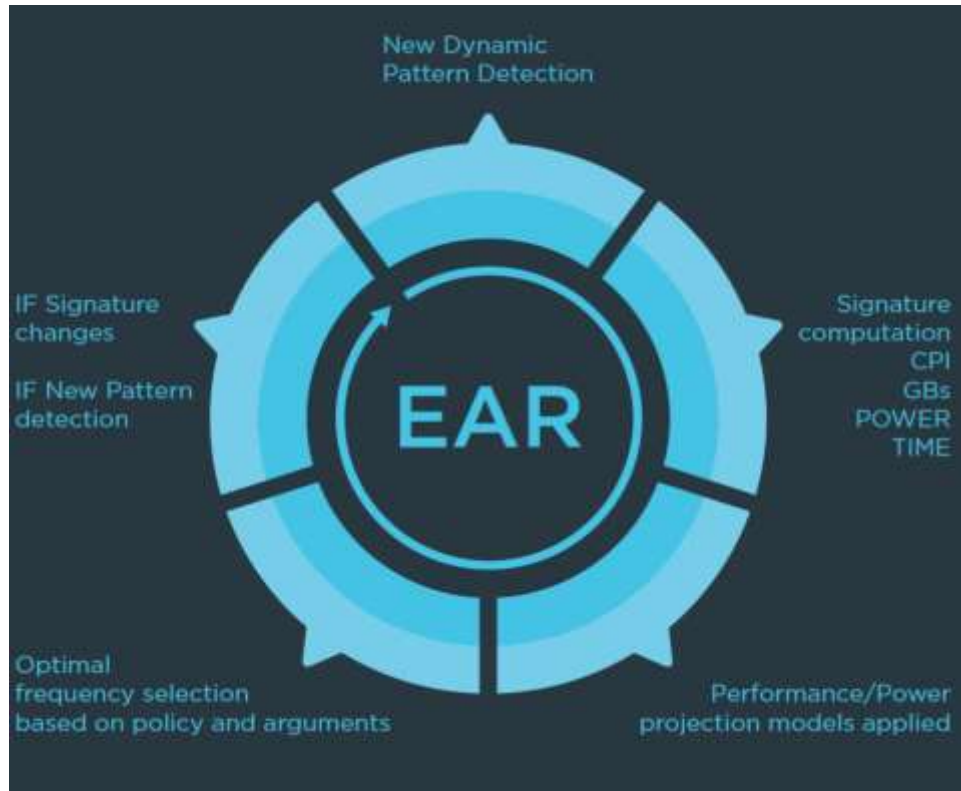
Waste Heat Reuse

CPU TDP Wattage

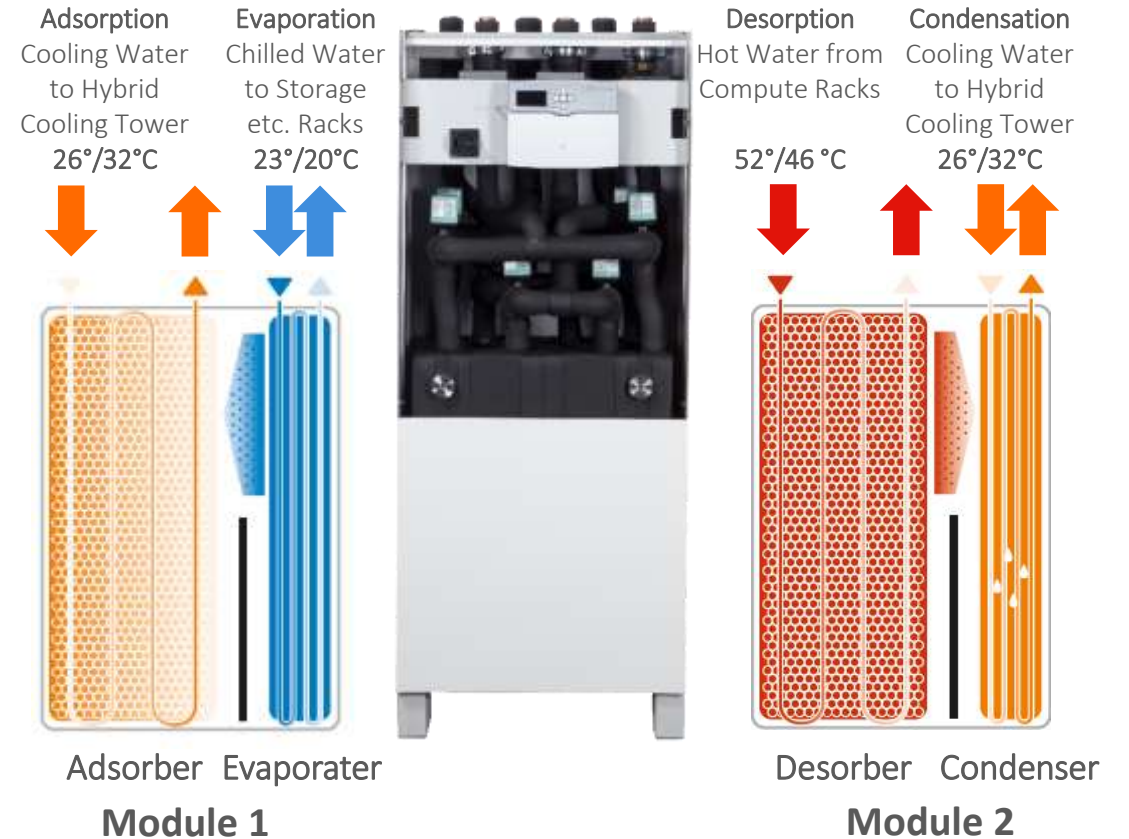
		<=205W	>205W-250W	>250W
Server Form Factor	1U Half Wide	Air/Hybrid	Water	Water
	1U Full Wide	Air	Air/Hybrid	Water
	2U Half Wide	Air	Air/Hybrid	Water
	2U Full Wide	Air	Air	Air/Hybrid

Holistic approach needs control beyond hardware

Energy Aware Runtime Software



Infrastructure Integration - Reuse



thanks.

Different is better

