A PARADIGM SHIFT IN DATA CENTER SUSTAINABILITY

Greg Meiser – Vice President, Enterprise Accounts
Alex McManis – Senior Applications Engineer
OUR NEW DATA CENTER IS COMPLETE.

THE ONLY WRINKLE IS THAT THE POWER COMPANY WON'T GIVE US THE KILOWATTS WE NEED.

WHAT ARE OUR OPTIONS?

WELL, WE CAN RUN THE SERVERS WITHOUT AIR CONDITIONING.

UNTIL THEY MELT INTO A TOXIC BLOB.

THEN WE CAN TURN THE BUILDING INTO A MUSEUM THAT CELEBRATES POOR PLANNING.

OR WE COULD ALL QUIT OUR JOBS AND EAT BUGS TO SURVIVE.

LET'S GO WITH THE TOXIC BLOB, BUT WE NEED TO CALL IT SOMETHING ELSE.

CONVERGENCE!
Hardware Density is Rising

CPU Thermal Design Power (TDP) Trend
Rack Density Growth Has Been Slower

Source: ASHRAE TC 9.9 equipment power projection
The Tipping Point

Intel Skylake (~200W)
Co-Processors
VR / AR
GPUs

AMD Naples (180W)
IoT

AI / ML/DL Applications
ASICS
FPGAs
AI Work Horse: NVIDIA DGX-1

• 3.2kW per 3U box
• 14 of these servers would take up a full 42U rack and require ~45kW of power
• In a traditional air-cooled data center these 14 boxes would need to be spread across 3 or more racks
• That’s a lot of blanking plates!

Source: Nvidia.com
How This Will Affect Costs?

Not Just an increase OPEX but a rise in CAPEX as well:

According to Uptime Institute, the Average Cost of Building a Data Center is:

- $11.5/W of critical (IT) load

  +

- $300/sq ft for site preparation

How This Will Affect Costs?

- A 100% increase in Power Consumption would mean an additional $11.5M / MW
  - 3x Space requirement to manage density for air cooling @$300/ sq ft

- And This is for technology that’s being deployed right now
- Data Centers infrastructure is designed to last 15-20 years
  - Hardware refreshes every 3-5 years

What Does The Future Hold?
We Can’t Predict The Future

“Google Cloud-powered Pokémon Go struggles under heavy demand”

-DatacenterDynamics
12th July 2016
But We Can Future Proof Our Data Centers
What Businesses Need From Their IT Infrastructure

- Cost-effective
- Future Proof
- Scalable
- Agile
- Resilient
- Efficient
IT Defines Everything

- We no longer have the luxury of making facilities decisions in a vacuum.

- Application, hardware, and density roadmaps will define infrastructure needs.

- The boundaries between facilities and IT need to be broken.

- A systems approach towards data center design is the way forward, as has been exemplified by some Hyperscale players.
Cooling Technologies

- Aisle Containment
- Cold Plate / Liquid to Chip
- Rear Door Heat Exchanger
- Single Phase Immersion Cooling
- Traditional CRAC / CRAH
- 2 Phase Immersion Cooling
MAYBE WE COULD BE A LITTLE MORE EFFICIENT?

HELP?
Cooling Capacity & Efficiency

Cooling Approaches: Efficiency Vs Density

Supported Density (kW/Rack)

Component: Cold Plate
Rack: RDHx
Row: In Row
Room: CRAC/CRAH

System: Immersion

PUE
Cooling Capacity & Efficiency

Cooling Approaches: Efficiency Vs Density

- Room: CRAC/CRAH
- Row: In Row
- Rack: RDHx
- Component: Cold Plate
- System: Immersion

Supported Density (kW/Rack) vs PUE

- PUE: 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8
- Supported Density: 0, 20, 40, 60, 80, 100, 120, 140
“[liquid-cooling] is the wave of the future, and it will transform the data center industry...”

- Vali Sorell, Sorell Engineering,
  Mark Hourican, Syska Hennessy Group
Choosing What’s Right For you

Things to Consider

- Application Roadmap
- Hardware / Density Roadmap
- Power & site constraints
- Number of hardware refreshes
- Scalability & Capacity Planning
- Total cost of design, construction, and ownership
Choosing What’s Right For you

Questions to Ask

- What other infrastructure is required? Eg. Chillers, CRACs / CRAHs, air / water treatment
- What does a hardware refresh look like?
- What happens in the case of a leak?
- What does serviceability look like?
“Within 5 years, 10 on the outside, there will be no alternative to immersion cooling”

- Dr. Satoshi Matsuoka,
Tokyo Institute of Technology
Oil Immersion Cooling – How It Works
How GRC Can Help

- Cost-effective
  - Enables build out at <$5/W
- Future Proof
- Scalable
- Agile
- Resilient
- Efficient

- Eliminates Chillers, CRACs, CRAHs, raised floors, etc.
- Downsize power infrastructure
How GRC Can Help

Cost-effective
- Enables build out @ <$5/W
- Eliminates Chillers, CRACs, CRAHs, raised floors, etc.
- Downsize power infrastructure

Future Proof
- High Density Support: Customer achieved over 130kW/rack

Scalable

Agile

Resilient

Efficient
How GRC Can Help

Cost-effective
- Enables build out @ <$5/W
- Eliminates Chillers, CRACs, CRAHs, raised floors, etc.
- Downsize power infrastructure

Future Proof
- High Density Support: up to 130 kW / rack

Scalable
- Economies without scale
- Each rack is a micro data center (fully integrated)
- Build as you go

Agile

Resilient

Efficient
How GRC Can Help

Cost-effective
- Enables build out @ <$5/W
- Eliminates Chillers, CRACs, CRAHs, raised floors, etc.
- Downsize power infrastructure

Future Proof
- High Density Support: up to 130 kW / rack

Scalable
- Economies without scale
- Each rack is a micro data center (fully integrated)
- Build as you go

Agile
- 6-8 weeks to deploy
- Plug and play infrastructure
- Flexible platform supports any OEM

Resilient

Efficient
How GRC Can Help

Cost-effective
- Enables build out @ <$5/W
- Eliminates Chillers, CRACs, CRAHs, raised floors, etc.
- Downsize power infrastructure

Future Proof
- High Density Support: up to 130 kW / rack

Scalable
- Economies without scale
- Each rack is a micro data center (fully integrated)
- Build as you go

Agile
- 6-8 weeks to deploy
- Plug and play infrastructure
- Flexible platform supports any OEM

Resilient
- Oil protects servers from dust, moisture & oxidation
- Build anywhere
- Insource Edge & core

Efficient
How GRC Can Help

- **Cost-effective**
  - Enables build out @ <$5/W
  - Eliminates Chillers, CRACs, CRAHs, raised floors, etc.
  - Downsize power infrastructure

- **Future Proof**
  - High Density Support: up to 130 kW / rack

- **Scalable**
  - Economies without scale
  - Each rack is a micro data center (fully integrated)
  - Build as you go

- **Agile**
  - 6-8 weeks to deploy
  - Plug and play infrastructure
  - Flexible platform supports any OEM

- **Resilient**
  - Oil protects servers from dust, moisture & oxidation
  - Build anywhere
  - *Insource Edge & core*

- **Efficient**
  - 1.02 PUE
  - 10-20% server load reduction
  - Total peak and average power reduction of ~50%
How GRC Can Help

Our system as a whole consumes less power than the server fans we turn off!

Cost-effective
- Enables build out @ <$5/W
- Eliminates Chillers, CRACs, CRAHs, raised floors, etc.
- Downsize power infrastructure

Future Proof
- High Density Support: up to 130 kW / rack

Scalable
- Economies without scale
- Each rack is a micro data center (fully integrated)
- Build as you go

Agile
- 6-8 weeks to deploy
- Plug and play infrastructure
- Flexible platform supports any OEM

Resilient
- Oil protects servers from dust, moisture & oxidation
- Build anywhere
- Insource Edge & core

Efficient
- 1.05 PUE
- 10-20% server load reduction
- Total peak and average power reduction of ~50%
Global Installed Base

Select List of Public Installations
“With GRC’s submersion technology we are able to push operational limits of our GPU-based SuperServers even further while reducing overall energy requirements.”

“Immersion-cooled systems do not require chillers, CRAC units, raised flooring, etc. This method has the potential to cut in half the construction costs...”

“We saturated the power envelope by putting twice as many systems as we would normally have, if it had a normal way of cooling”
What We Build Today, Will Support The Technologies of Tomorrow. Let’s Make IT Limitless!
Questions?

Greg Meiser
Alex McManis
Green Revolution Cooling
You can find us at gmeiser@grcooling.com and amcmanis@grcooling.com
Phone: +1 (512) 692-8003