Cloud vs On-Premise: Explaining Pros & Cons

Jason Wells, MDY

Senior Research Computing Consultant

Bentley University

Waltham, Massachusetts

My Perspective

- Bentley is a non-profit business university, anchored in accounting.
- FTE is 5000.
- ~225 full time faculty (almost entirely business).
- 2 PhD programs… in business.
- Due to IRS' non-profit rule, my budget up till now has come from other department's excesses at the end of the budget year.
- We do have I2, and used XSEDE's CRI group (Thanks Eric!) to get started.
- We are planning our Gen3 cluster, this time in the cloud.

The Bentley Data Center

Racts for Servers

Battery Backups - Redundant

The Storage Area Network - Redundant
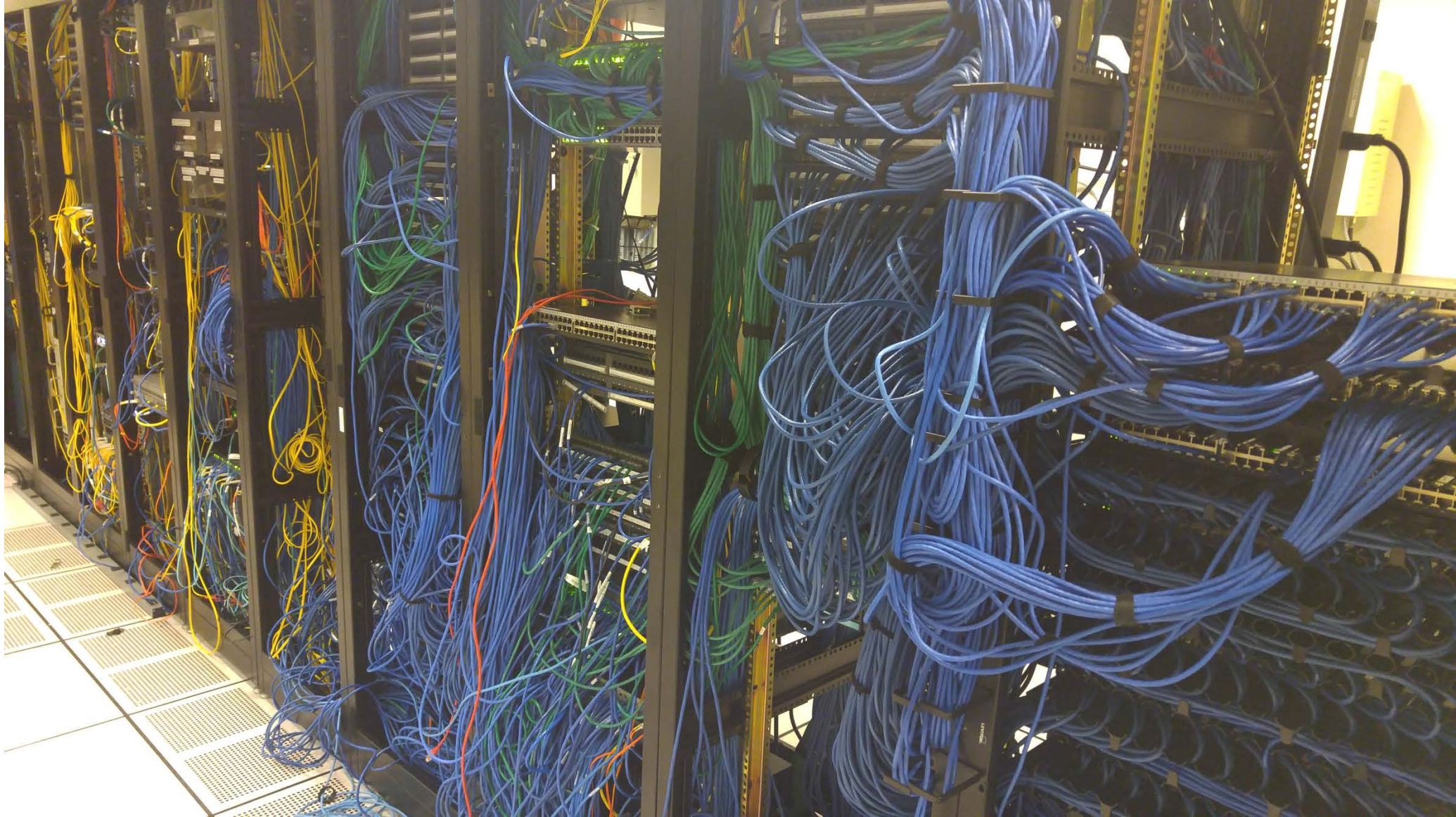
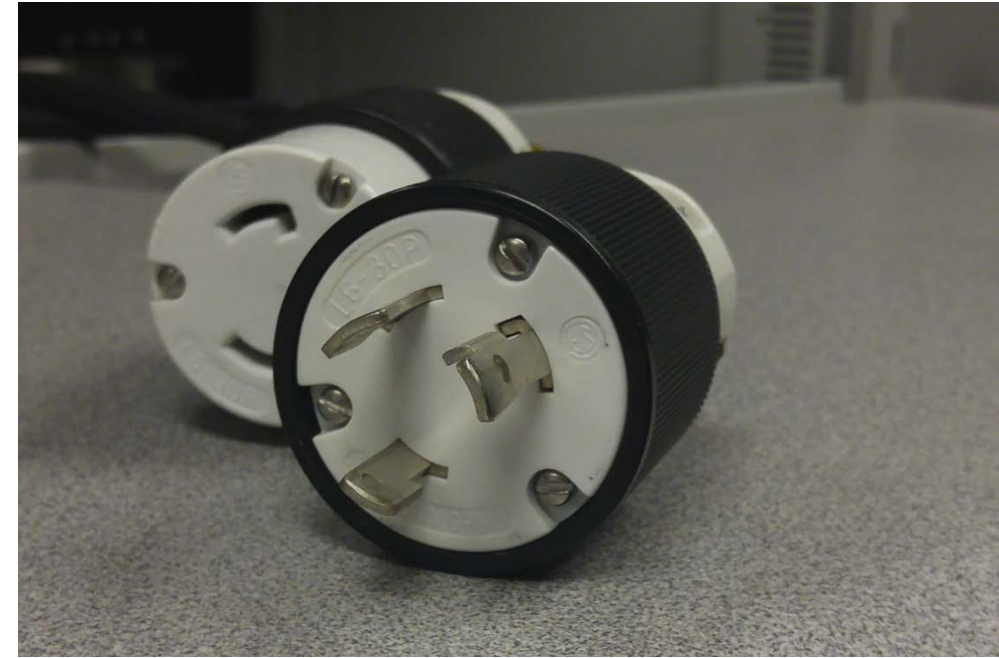# Cooling - Redundant

Fire Suppression

Networking (I really miss Pete)

Power

Total Output Loading
kW: 14.2   pf: 0.97
kVA: 14.4   %LD: 24
Freq: 60.0

Total Output Loading
kW: 11.9   pf: 0.99
kVA: 12.0   %LD: 15
Freq: 60.0

So many hard drives…

Annual Costs

- Infrastructure
  - Racks
  - Battery Backups
  - Storage
  - Cooling
  - Fire Suppression
  - Network
- Energy
- Maintenance (like the hard drives)
- Space costs
- Add others like Salaries and License costs, which you won't recoup with a move to the cloud.

- For Bentley's 63 servers, it's **$4,500** a server per year!
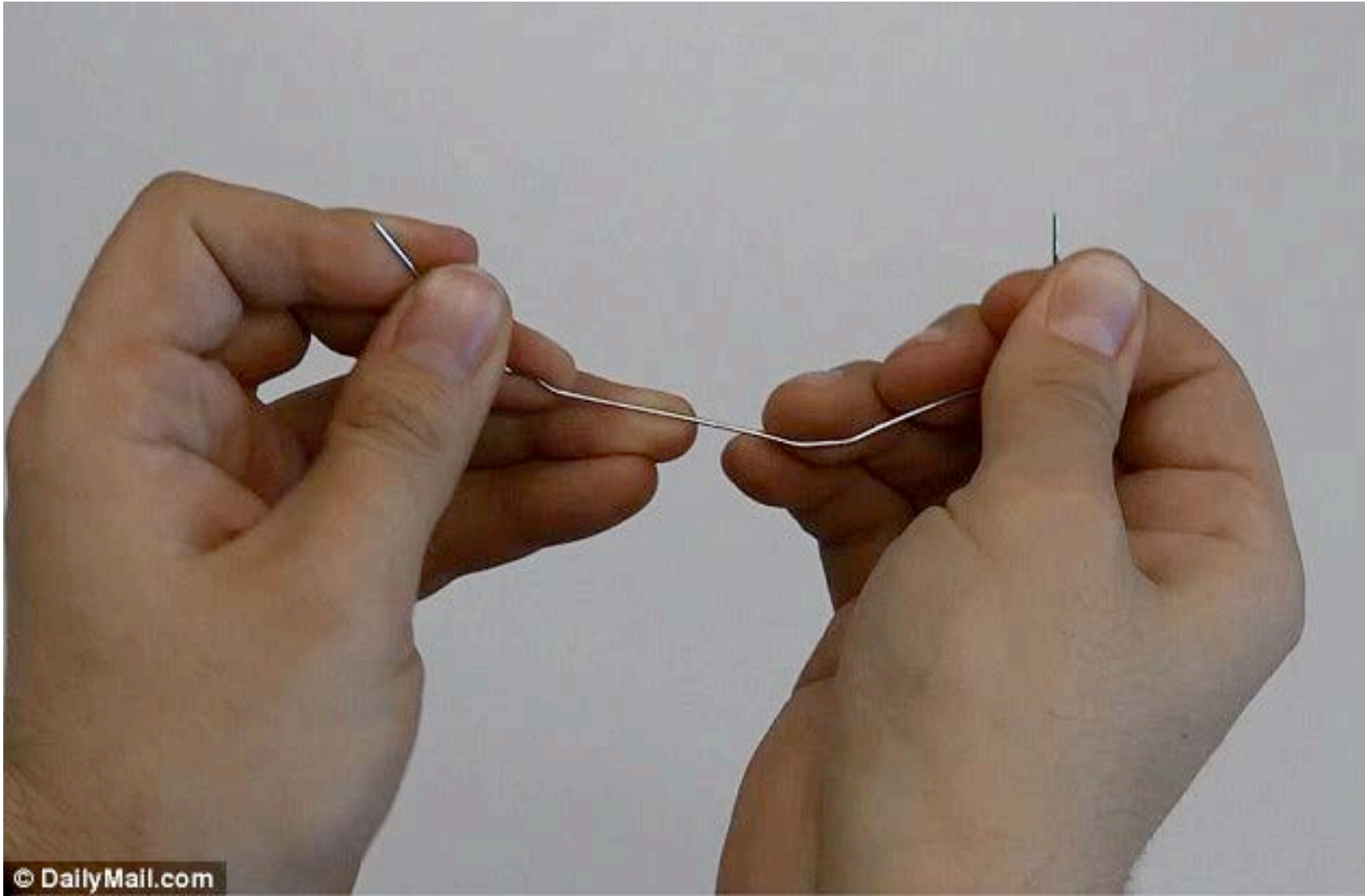- For my 12 Research Computing nodes, that totals **$54,000** per year.

Number of Nodes & Yearly Node Cost
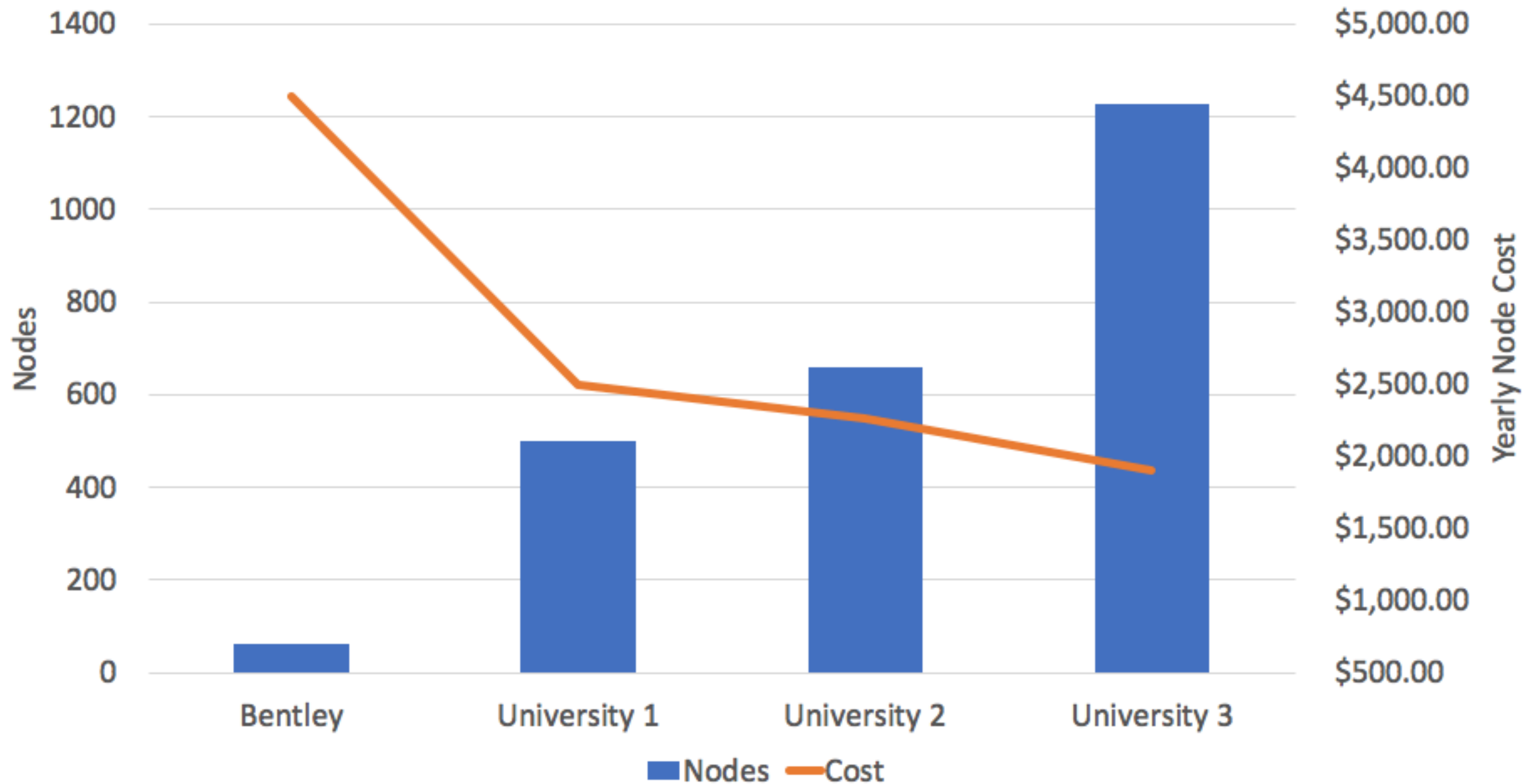
Economics of Scale (small = inefficient)

Economics of Scale (large = efficient)

Rudolf Grauer AG's
BK-1500
via Youtube.com

"Put Your Head in the Cloud p52"

Oracle Corp has developed an ambitious array of cloud computing services in a bid to catch up with

Amazon.com & Salesforce.com

Flexiant Intros
Downloadable Cloud with
Free Trial

5 ways to improve customer service
CEO's share stories of using Cloud Computing to Enhance
Customer Experience

There's a Storm Brewing

The Cloud Is Everywhere!
We'll Help You Navigate
And Get What You Need

What is
Hybrid
Cloud
and how are companies using it?

Exploring the Myths and Realities of Hybrid IT Hosting

CLOUD

M   A   Z   I   N   E

ISSUE 1, VOL 1 - MARCH / APRIL 2012

WHY YOUR

IT GUY
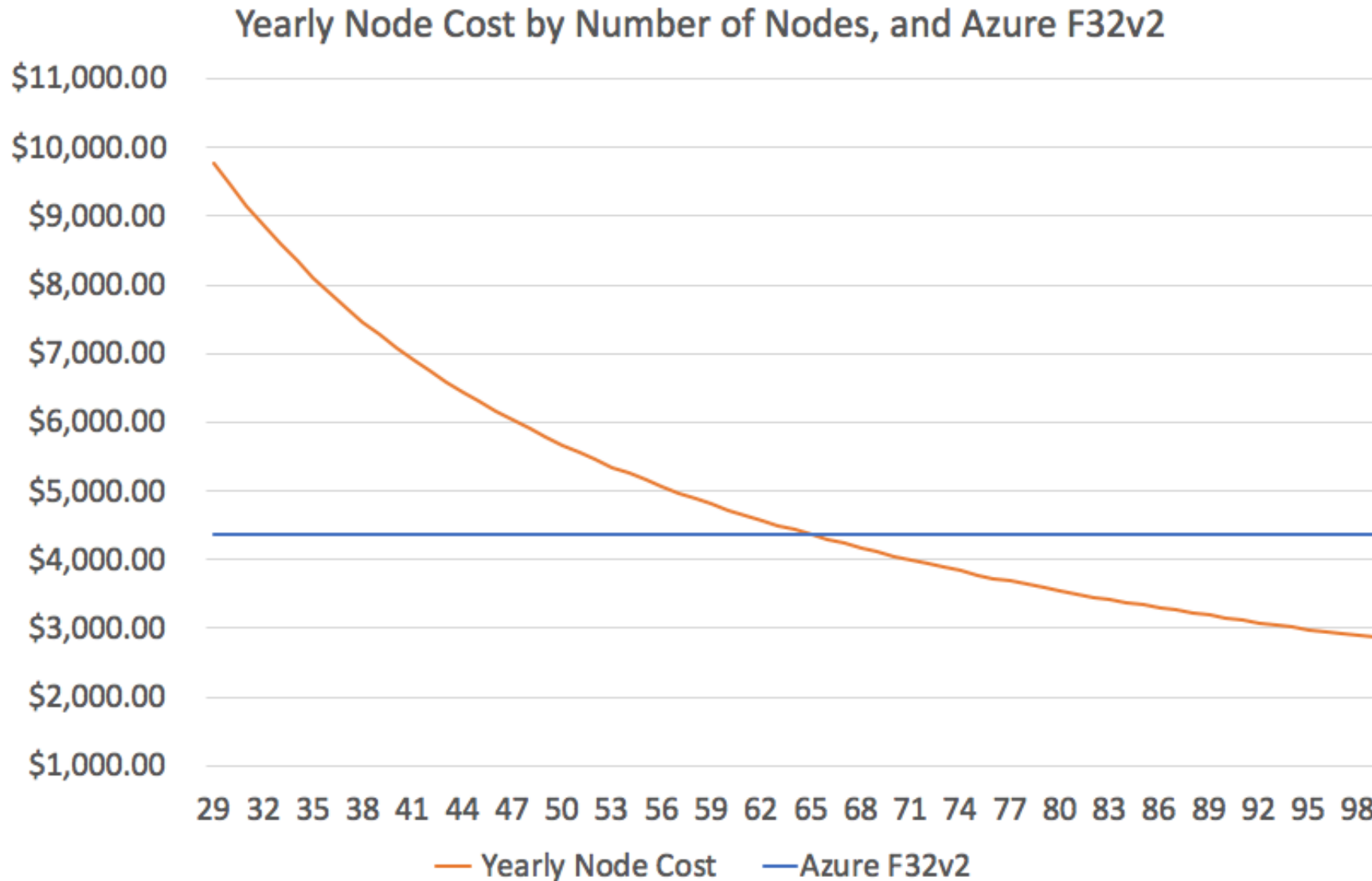## THE HATES
CLOUD

STORY BY
JARED STAUFFER
JOHN-SCOTT DIXON

Crossover for Bentley (63 nodes, CO=65)

Yearly Node Cost by Number of Nodes, and Azure F32v2

Bentley's RC Move to the Cloud (vs. $4,500 local)

Azure Instance	Cluster	East 1+ Data Lake (East 2) Cost	Term	State	Expected Usage	Yearly: East 2/1 + Data Lake	Applications
F32 v2	Development	$0.497	3 year	Always	8760	$ 4,353.72	R/Python/Etc.
H8	Ericom	$0.354	3 year	Always	8760	$ 3,101.04	SAS/Stata/SPSS
H8	Ericom	$0.354	3 year	Always	8760	$ 3,101.04	SAS/Stata/SPSS
NC6	Ericom - GPU	$0.400	3 year	Always	8760	$ 3,504.00	Matlab
H8	Ericom - Compliance	$0.354	3 year	Always	8760	$ 3,101.04	SAS/Stata/SPSS
F32 v2	Ericom - Large Core	$1.353	Pay as we go	Elastic	1000	$ 1,353.00	GCAM
NC6	Windows HPC	$0.400	3 year	Always	8760	$ 3,504.00	Matlab
NC6	Windows HPC - Scale	$1.800	Pay as we go	ScaleSet	1200	$ 2,160.00	Matlab
NC6	Windows HPC - Scale	$1.800	Pay as we go	ScaleSet	1200	$ 2,160.00	Matlab
NC6	Windows HPC - Scale	$1.800	Pay as we go	ScaleSet	1200	$ 2,160.00	Matlab
NC6	Windows HPC - Scale	$1.800	Pay as we go	ScaleSet	1200	$ 2,160.00	Matlab
NC6	Windows HPC - Scale	$1.800	Pay as we go	ScaleSet	1200	$ 2,160.00	Matlab
Misc	Data Science		Pay as we go	Elastic		$ 5,000.00	Data Science
Azure Data Lake	Hadoop	$35.000	Monthly Commit.	Always	12	$ 420.00	
Data Transfer	Transport	$0.087	Per GB	Variable	10000	$ 870.00	
Total						$ 39,107.84	

$3,008.30 per server

Advantages

- Nothing in the Bentley pictures you saw would be necessary any longer.
- No more time spent worrying about power management, hard drives, networking, storage, etc.
- We can roll out new services very easily (a 128 core server, an army of 2 core machines, etc.).
- Disaster Recovery is easier.
- We would be saving money.
- The CIO would be happier with me!

Disadvantages

- With ScaleSets/Elastic, Success = Blown Budget!
- No control of technologies below the OS layer.
- No experience with technologies below the OS layer.

•BUT BE CAUTIOUS!!!

University 2 – On Premise vs. Cloud

On Premise	Cost	Number	Total	Per Node
Infrastructure (per year)	$ 1,000,000.00	1	$ 1,000,000.00	
Salaries (per year)	$ 70,000.00	4	$ 280,000.00	
Licenses (per year)	$ 100,000.00	1	$ 100,000.00	
Energy (per year)	$ 175.56	660	$ 115,869.60	
			Total **$ 1,495,869.60**	$ 2,266.47

Cloud	Cost	Number	Total	
Cloud Servers (per year)	$ 4,356.70	577	$ 2,513,817.05	
Storage (per year)	$ 35.00	1000	$ 35,000.00	
Salaries (per year)	$ 70,000.00	4	$ 280,000.00	
Licenses (per year)	$ 100,000.00	1	$ 100,000.00	
			Total **$ 2,928,817.05**	$ 5,075.94

Crossover for Uni 2 (660 nodes, CO=344)

Yearly Node Cost by Number of Nodes, and Azure F32v2
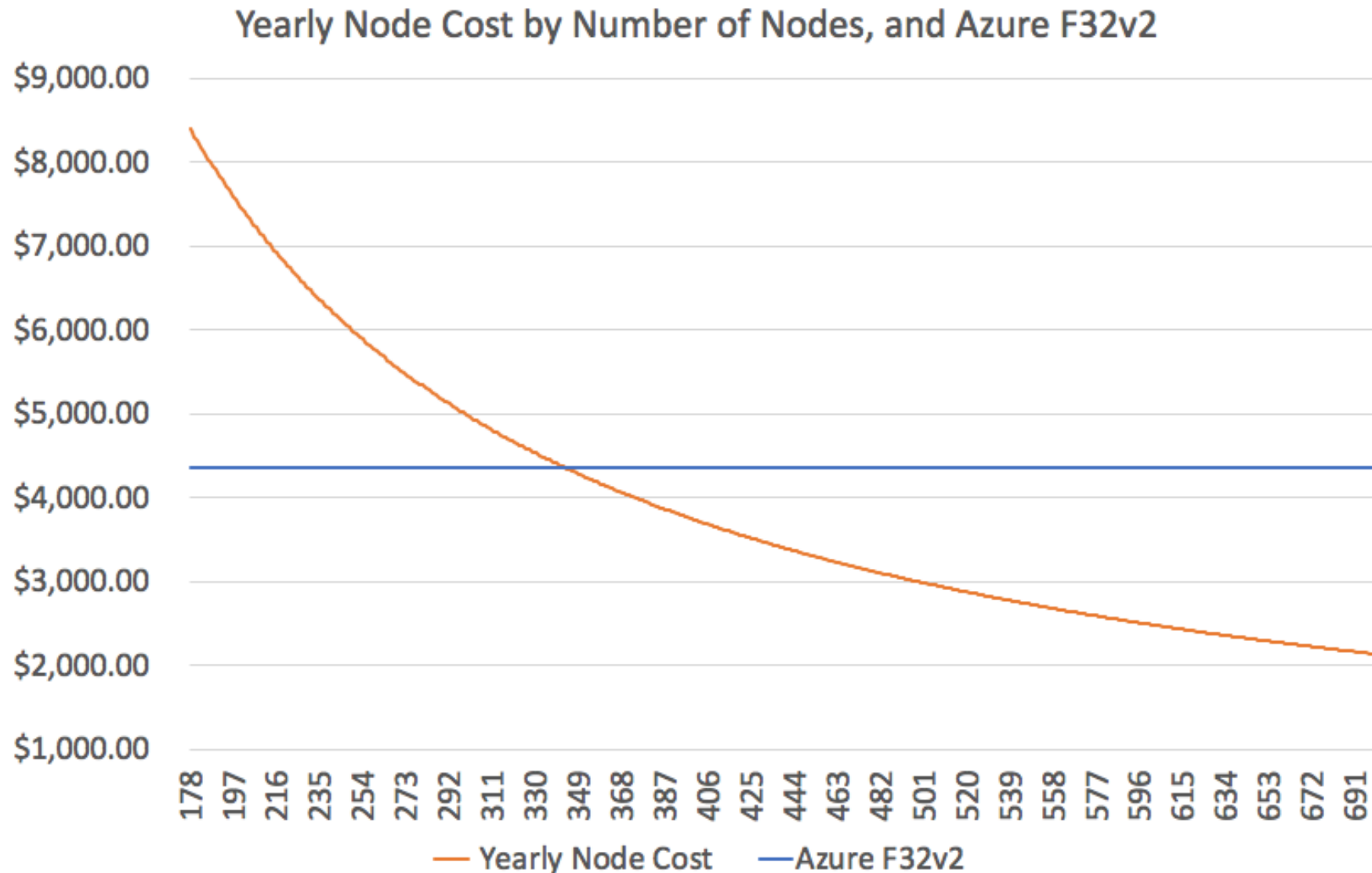
Lessons Learned – so far

- Bentley's move works because our number of servers is so small, and infrastructure is so expensive.
- If moving, Scale sets and elastic computing are your friend.
- 3 year reserved prices seem to be cheapest but compare costs per core. Some instance types are cheaper than others. Be aware this will throw off your per server costs too.
- Your shop will be different. Reducing servers makes cloud more attractive.
- The cloud is great for R&D and special projects.

Our Panelists

- Hussein Al-Azzawi
University of New Mexico

- Aaron Bergstrom
University of North Dakota

- Jason Simms
Lafayette College

- Dan Voss
University of Miami

Panel Topics

- What are your experiences?
- Those mandated, why?
- What strategies have you considered and why (Local, public, partial, or hybrid)?
- What parts (storage, compute, GPU, R&D, special projects, etc.) and why?
- Were/Are there legal, security, and compliance concerns?
- Success stories?
- Non-AWS/Azure Resources (Jetstream? Science Gateways?)
- Other Lessons Learned
- Is there an all-inclusive method for the math?