Extending the Usage of the PI System in Colocation Data Center Portfolios

Rajendran Avadaiappan, CEO, Energy Metrics
Gregor Vilkner, VP, Energy Metrics

From the Program:

Aligned Energy is an emerging colocation Data Center firm that has strategically implemented a PI System from the outset to address a variety of use cases on the portfolio level.

Ranging from traditional applications, such as:

- performance monitoring of mechanical and electrical infrastructure, to
- mapping of complex contextual relationships of data center assets, to
- covering business functions, like power usage monitoring and
- providing of real-time data feeds for data center customers.

Part 1 – Colo's and Digital Transformation

Rajendran Avadaiappan

CEO

Energy Metrics LLC

Global Opportunity

Data centers are the power plants of the 21st century, so they must evolve to more closely align dynamic IT with business needs.

Market Evolution

Looking through the glass of our Customers

Aligned Energy

Client Challenges

Evolve the static data center to more closely align with your dynamic IT and business needs..

Observed Challenges

- Predicting IT load
- Variable and high densities
- Stranded capacity
- Financial exposure from over-provisioning
- Misalignment between OpEx and revenue
- Limited visibility into data center performance

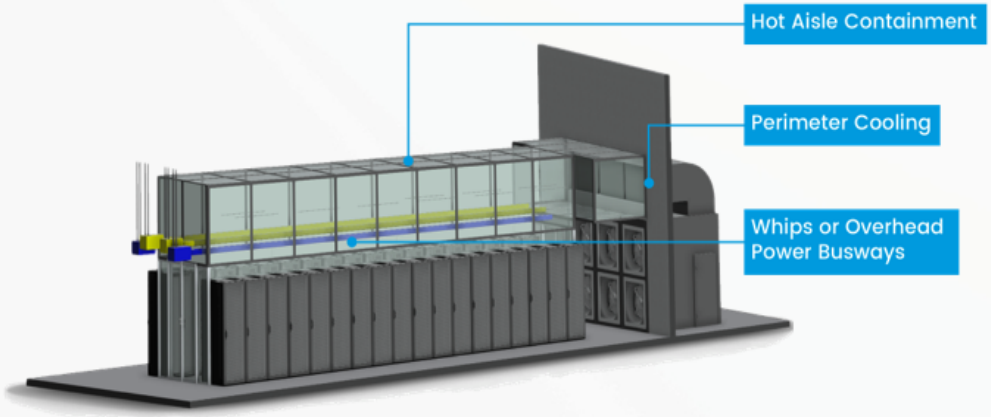
Unique Approach to Clients Needs

Customization is the name of the game

Aligned Energy

Each Footprint is Tailored to Client Requirements

- **Hot Aisle Containment** traps and contains heat at its source. Use our containment or your own
- **Perimeter Cooling** features close-coupled flexible designs, micro-channel coils and highly efficient fans
- **Whips or Overhead Power Busways** A/B-configured, flexible and expandable
- **Variable and High Density Power** up to 50 kW/rack, in the same row, without additional infrastructure
- **Slab Floors.** Our technology eliminates the need for raised floors



The Challenge of Multi-Tenant Space

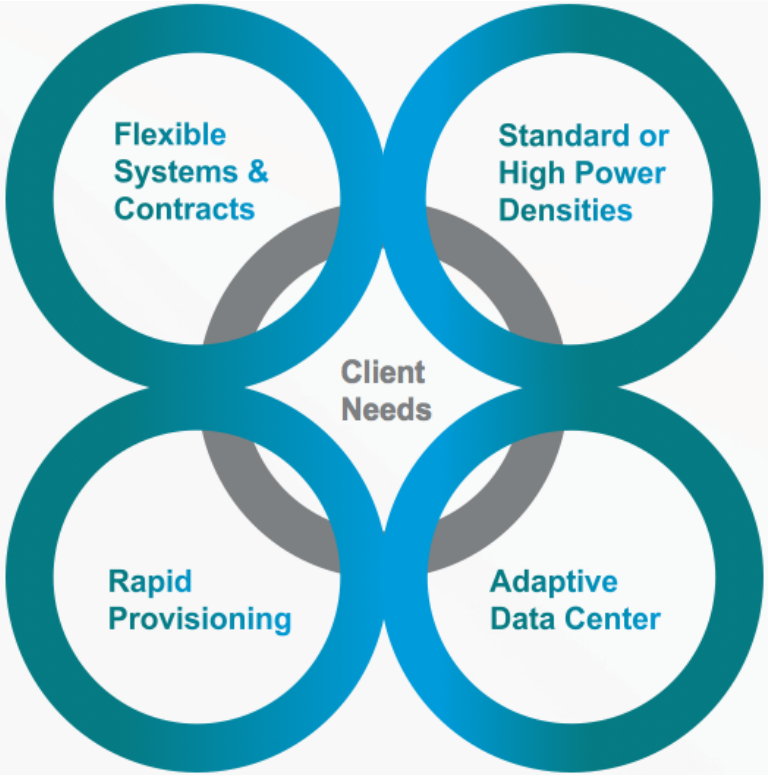
Multiple Target Segments of Customers

Enterprise vs. Multi-Tenant

We build a single "space" and must optimize yield for the business while meeting the needs of EACH client that comes through the door.

- Varied densities
- Varied fabric designs
- Unpredictable schedules
- 'Overlapping' Availability Zones

- Supply chain management
- Capital management



Define “Data Center Partner”

It is more than just space

Clients picking a partner must look beyond space. They’re looking for alliances, extensions or force multipliers for their teams vs. a simple commodity purchase.

Transparency / High Fidelity Data

Warehouse vs. Predefined Trending

Programmatic Access

Impact / M&O Maturity

- Data-informed activities…

Key Business Needs in Data Centers

Complex Challenges All Together

Increase Utilization

(Leverage Existing Infra-Structure)

Use existing power, space, cooling, compute and network capacity more effectively

Increase Efficiency

(Lower PUE)

Optimize existing cooling infrastructure and identify stranded assets that are not generating revenue

Increase Reliability

(Fewer Incidents)

Reduce MTBF using fault detection and analysis to warn of impending failures

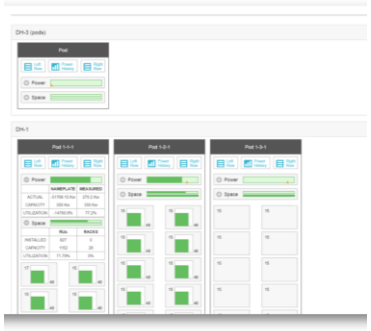
Supply Chain Management

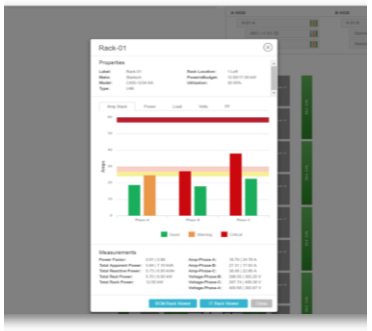
(Deploy Capacity When You Need It)

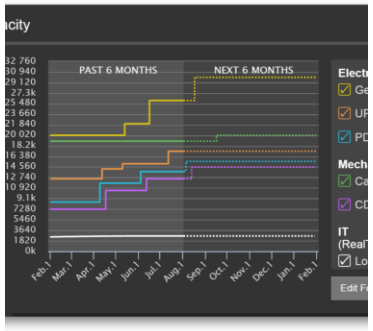
Visibility into infrastructure cost and capacity, dynamic variability of IT Loads, energy and water required to deploy specific IT applications

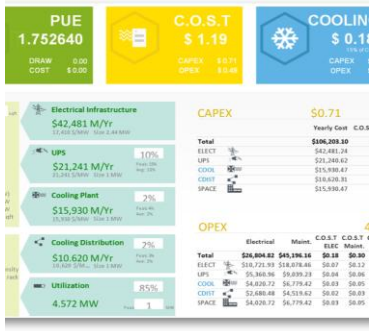
Enterprise Intelligence Needs

Role Based Views – To Take Impactful Actions and Make a Difference









IT Assets

-Multi-Tenant Access and View

-Asset Utilization

-Planning

-Central Repository

Operations

-Situational Awareness

-Predictive Maintenance

-Power Management

-Environmentals

Engineering

-Raw Data Analysis

-Infrastructure Capacity Management

-Performance Analytics

Executives

-Business Intelligence

-Supply Chain Management

-KPI's and Performance Metrics

Enabling Enterprise Intelligence

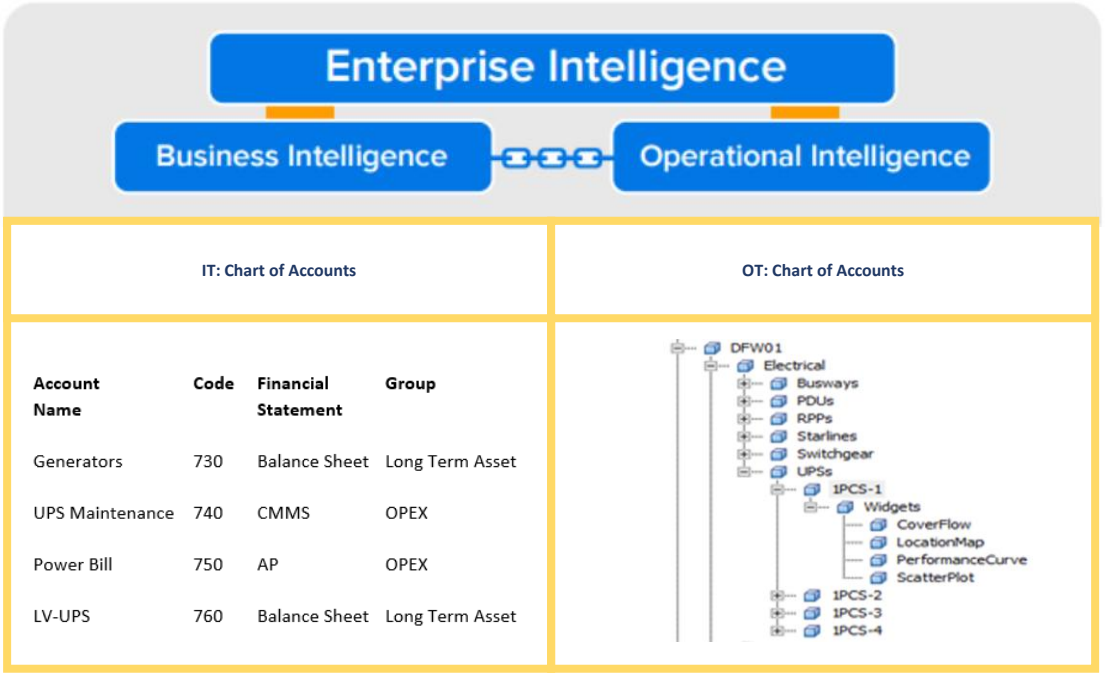
The Need is to Converge Operational Technology with Information Technology

ENERGY METRICS

‘Out of the Box’ tools organize fragmented operational environments into a familiar and extensible operational chart of accounts, enabling OT and IT to work together and maximize business efficiency

Examples:

- Supply Chain Management
- Business Intelligence
- Operations Control Centers



The Approach with PI

Leveraging Scale, Flexibility and Security

ENERGY METRICS

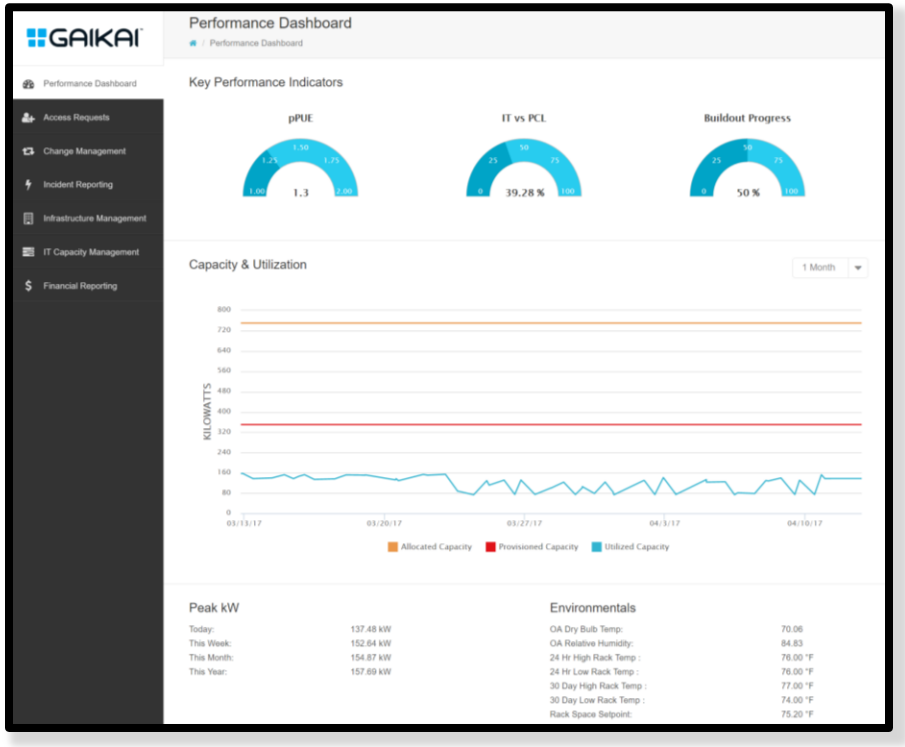
	ENERGY METRICS	BMS	CLOUD BUILDING IOT	DCIM
PROTOCOLS	400+ Software based	30-40 Hardware based	10 Setup required	10 Setup required
SCALE	40MM POINTS Per server, unlimited period	10K POINTS Trended, w/o data history	100K POINTS Limited to 1 year	100K POINTS Limited to 1 year
COST	LOW TCO Vs. BMS: 100X less/pt.	10K POINTS Requires asset replacements	VARIABLE Limited protocols drive up cost	VARIABLE Limited protocols drive up cost
SECURITY	SSL 1-way	SOME RISK Inherent to BMS	NA Left to IT support	NA Left to IT support

Deployment for Aligned Energy

Synopsis of a case study

Hyperscale Colocation Data Centers

- Hyperscale data center colocation provider
- 2 locations – cloud hosted on Azure
- Plano - 330k SQFT – 6 mW (planned 60 mW) – Tier 3 – Modular – 50000 points
- Phoenix - 550k SQFT – 8 mW (planned 120 mW) – Tier 3 – Modular – 50000 points
- Modular, less than 1.1 PUE, highly cost-efficient monitoring and management
- Created ‘single source of truth for all data’
  - BAS, EPMS, SCADA, IT
  - Simplified reporting
- Increased collaboration between:
  - Operations, IT and Executives
- Facilitated standardization
  - Rapid deployment of new IT capacity
- KPI’s
  - Revenue, Cost of IT infrastructure per user

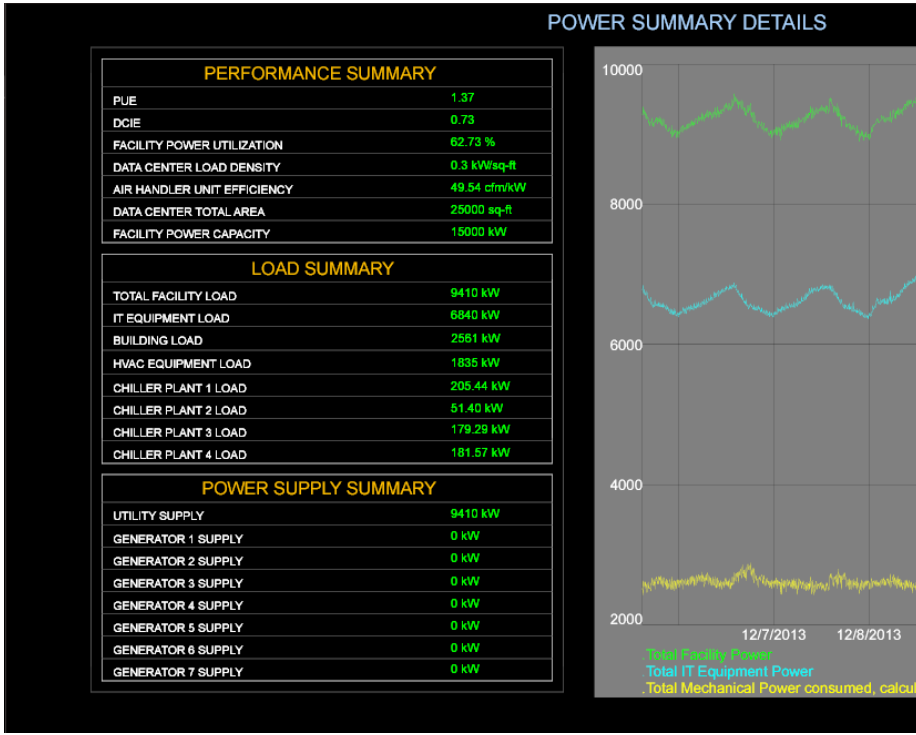


Deployment for an Enterprise Client

Synopsis of a case study

Fortune 100 Global Bank

- Two large DC comprising 5 Data Halls
- 15 Remote Critical Sites
- Over 12MW of PCL
- 750,000 streaming data points
- Lowered PUE from 2.5 to 1.7 in 12 weeks
- Improved performance of cooling systems
- Identified stranded capacity
- Reduced risk of incidents
  - Diagnostics for premature equipment failure
  - Smart event notification
- Better business decision making
  - Key metrics visible to executive team
  - Collaboration between teams
  - $150 M in capital avoidance over 4 years
- Expanded deployment to fifteen other critical sites



ENERGY METRICS

- ~25 strong engineering / tech firm head quartered in New York, NY
- OSIsoft partner for 10+ years, committed to MS technology stack
- Focus #1: PI System and BAS integration experts for Data Centers
- Focus #2: Cloud-based solutions for small distributed real estate
- **Leveraging Controls + IoT Expertise to solve infrastructure problems**

Skills Development Timeline

BAS (ALC) foundation 2009

2010 getting hooked on PI

3 enterprise class DCs 2012

2014 deploying PI in MS Azure

modern web applications 2016

2018 scalable IoT architecture

… conquering the future 2020

Data Center Services

Integrated millions of tags in dozens of major data center sites in the US and Canada.

- CMMS and workflow integration
- Alarming/notifications and analytics
- Dedicated automation processes
- Dedicated apps and BI dashboards

IoT for small Real Estate

Extended pilot with large financial customer managing and monitoring 500+ branches.

- Single web entrance for all assets
- IoT lights, thermostats, meters
- Dedicated LTE appliances
- “Fast In – Fast Out” deployment

Part 2 – Under the Hood

Gregor Vilkner, Ph.D.
VP, Data Center Services
Energy Metrics LLC

EM's Engagement with Aligned Energy

- AE has an aggressive take on lean dc delivery
- AE is EM's first colocation DC customer

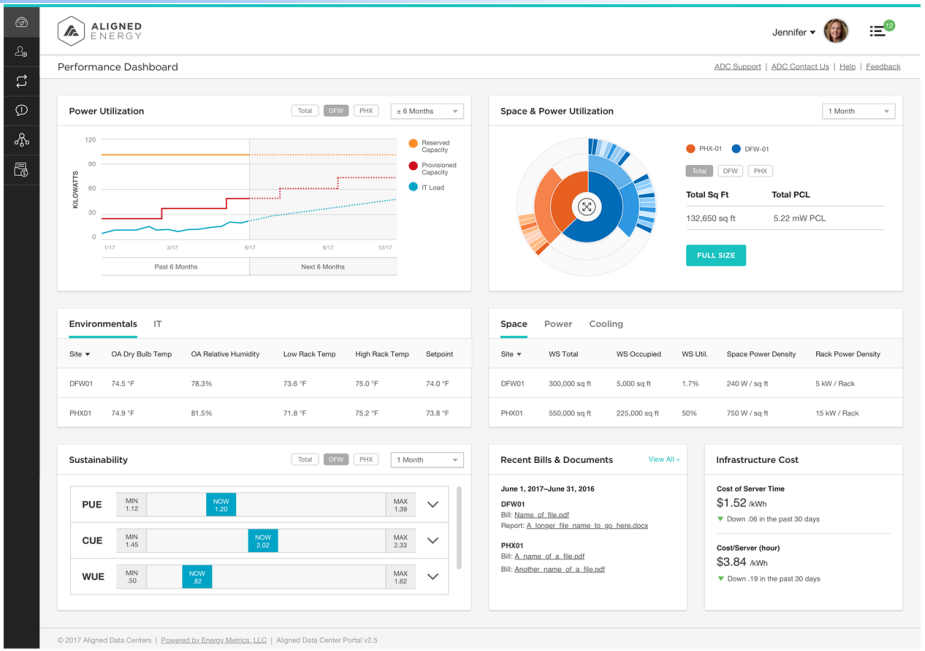
Scope for AE Projects

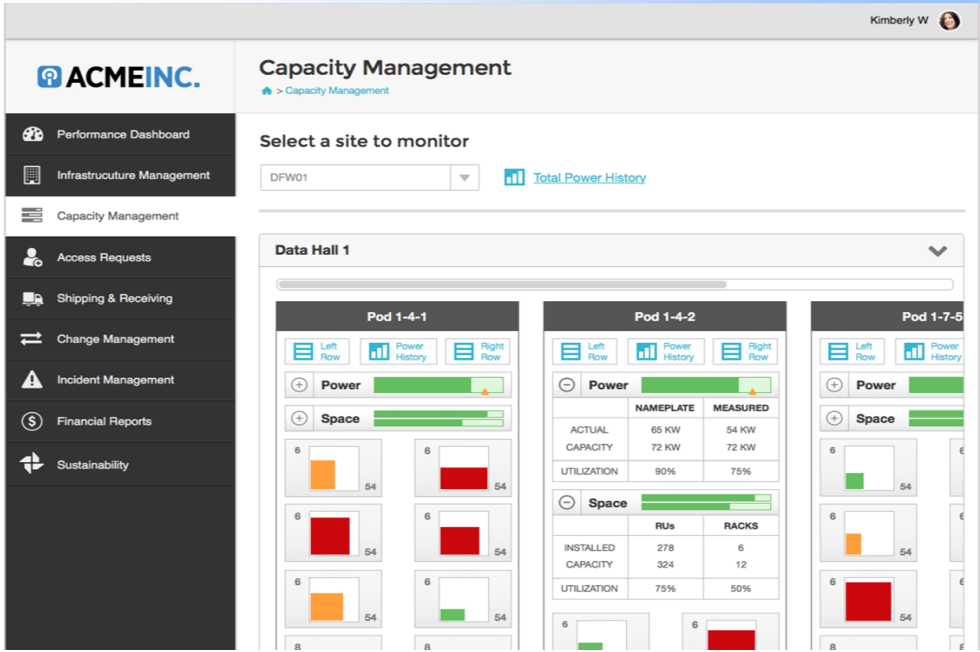
- maintain PI System to transparently track performance
- add-value for continued customer engagement:
  1. metered power for transparency
  2. access streamlined web portal
  3. reporting to fulfill compliance needs
  4. dedicated on-demand data feeds
  5. dedicated on-demand monitoring

Client Portals Built on PI Asset Framework

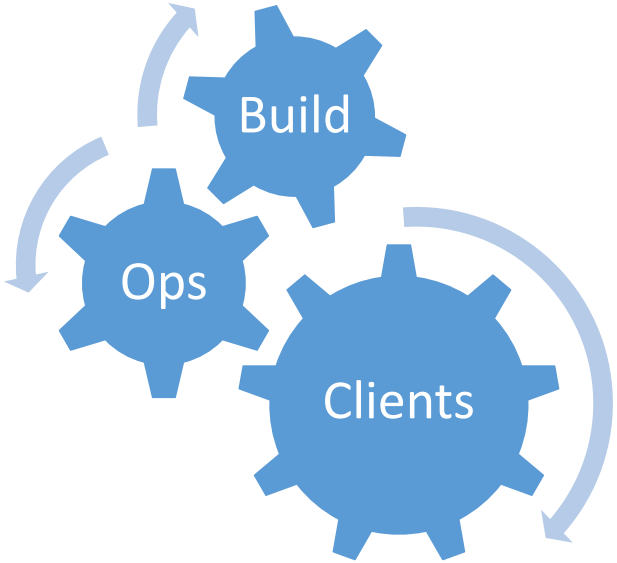
From 30k feet…

… to the individual rack unit.





Tech we Use by Application



Ops

- PI Vision
- PI DataLink
- *Service Now*
- *MS PowerBI*
- *TopView*

Build

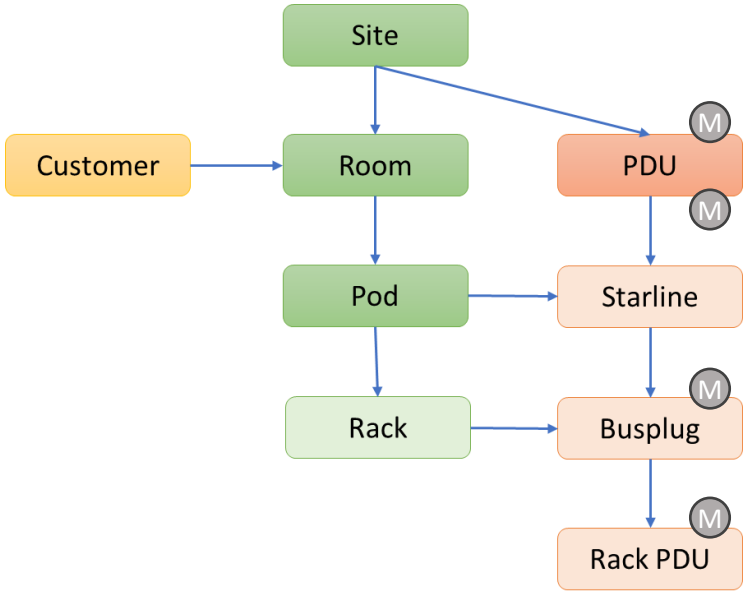
- PI DataLink
- *MS PowerBI*

Clients

- Web Portals
- PI WebAPI
- PI Cloud Connect
- *Service Now*
- *MS PowerBI*

tech bucket list: PI Event Frames, AF Transformer, *BI Integrator, PI Notifications*

Modeling Complex Data Structures in AF



- AF loves trees. This isn't a tree. Approach: cross referencing between multiple structures.
- Not all customers have the same monitoring scope.
- PDUs can service multiple pods and/or customers.
- Reporting confidence by oversampling. If you can get the same kpi in 4 ways – that's 4-n resilient monitoring.

Distribution Networks and OneLines

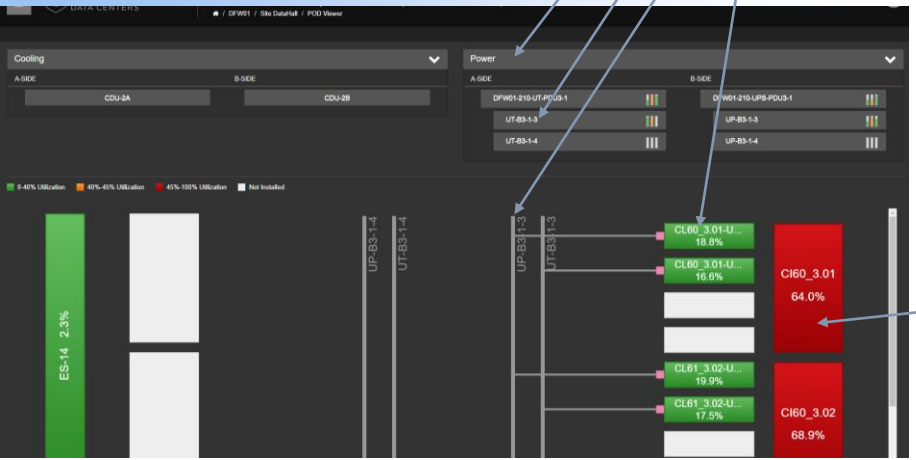
POD

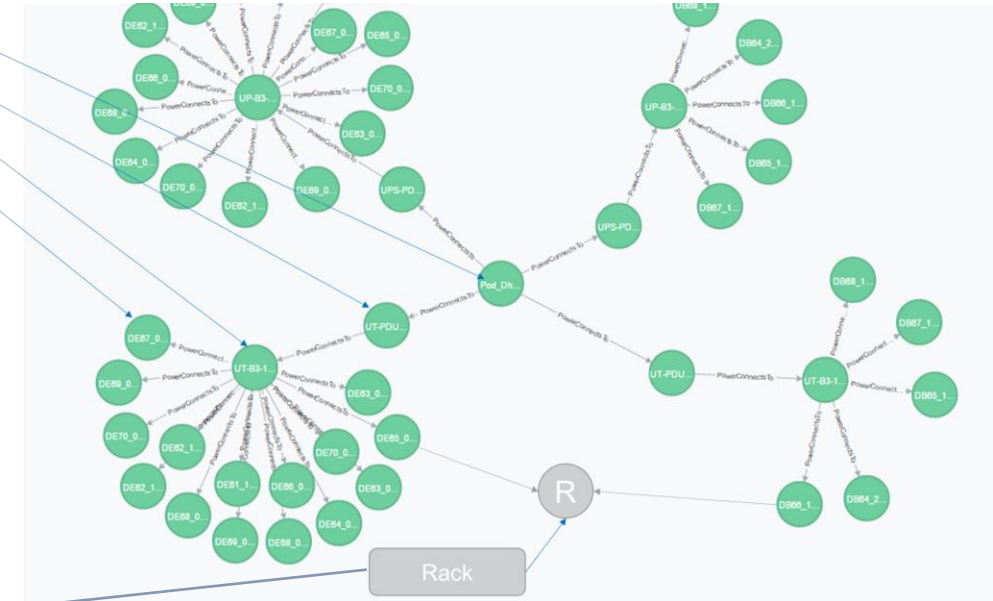
PDU out

Starline

Busplug

Portal view …

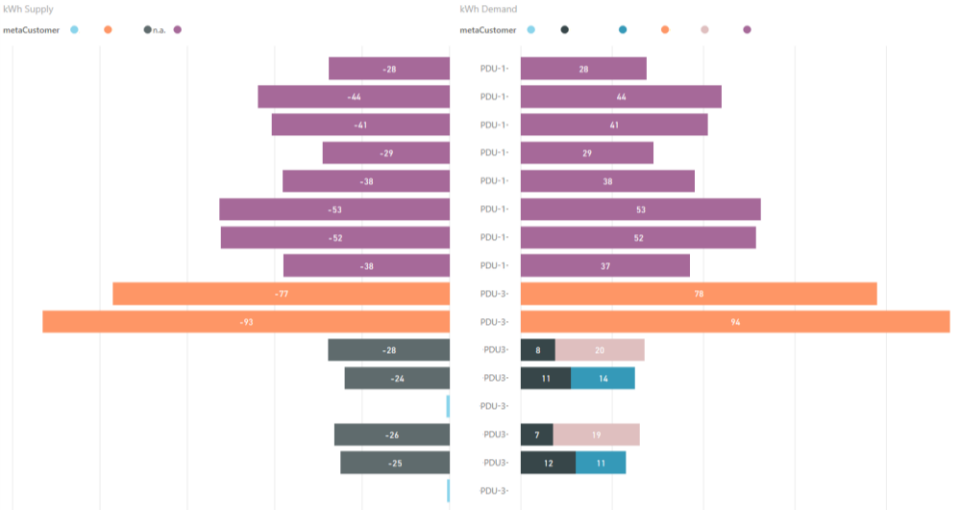


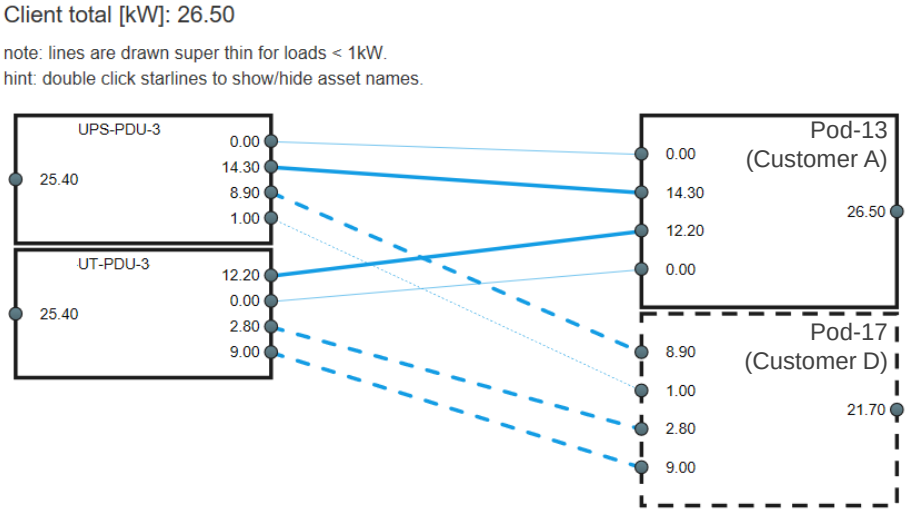


… visualize network with graph DB data dump.

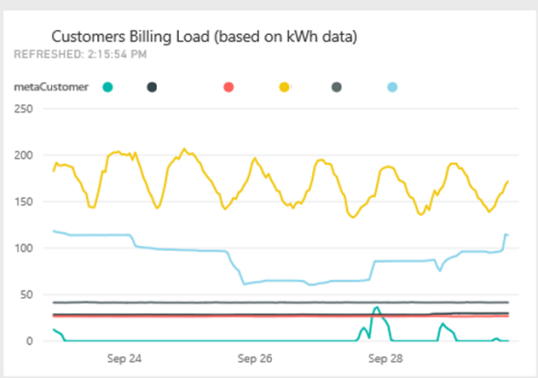
PDUs – the Line between Colo and Customer

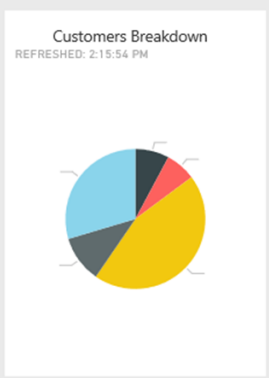
- Hourly web jobs to transfer data into PowerBI streaming dataset.
- Higher dimensionality of data compared to PI Integrator

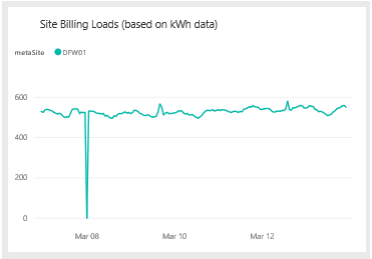




Charge Points – Metering Varies for Clients







DFW Uncertainty Table

BillingPoint	metaCustomer	KwFromKwh	KwFromKw	DeltaAbsolute	DeltaRelative
CL60_3.01-UP-3.41		0.00	2.27	-2.27	200.00
CL60_3.01-UT-3.42		0.00	2.05	-2.05	200.00
CL61_3.02-UP-3.47		0.00	2.62	-2.62	200.00
CL61_3.02-UT-3.48		0.00	2.34	-2.34	200.00
CL62_3.03-UP-2.171		0.00	0.93	-0.93	200.00
CL62_3.03-UT-2.172		0.00	0.78	-0.78	200.00
CL64_3.04-UP-2.173		0.00	0.72	-0.72	200.00
CL64_3.04-UT-2.149		0.00	0.84	-0.84	200.00
CL73_3.08-UP-3.39		0.00	0.87	-0.87	200.00
CL73_3.08-UT-3.40		0.00	0.82	-0.82	200.00
CR68_2.18.01-UP-3.49		0.00	0.30	-0.30	200.00
CR68_2.18.01-UP-3.50		0.00	0.34	-0.34	200.00
CR70_2.16.01-UP-3.33		0.00	0.57	-0.57	200.00
CR70_2.16.01-UT-3.34		0.00	0.73	-0.73	200.00
CR70_2.17-UP-3.31		0.00	0.62	-0.62	200.00
Total		**551.18**	**588.94**	**-37.76**	**8,604.33**

DFW Stale Points

BillingPoint	metaCustomer	KwFromKwh	KwFromKw	IsStale	TimeStamp
CL61_3.02-UP-3.47		0.00	2.62	504.62	03/13/18 10:00:00 PM
CL61_3.02-UT-3.48		0.00	2.34	504.62	03/13/18 10:00:00 PM
CL60_3.01-UP-3.41		0.00	2.27	504.62	03/13/18 10:00:00 PM
CL60_3.01-UT-3.42		0.00	2.05	504.62	03/13/18 10:00:00 PM
CV83_1.03-UP-3.45		0.00	1.99	505.21	03/13/18 10:00:00 PM
CV83_1.03-UT-3.46		0.00	1.93	505.21	03/13/18 10:00:00 PM
CR82_2.04-UP-3.43		0.00	1.55	505.21	03/13/18 10:00:00 PM
CR82_2.04-UT-3.44		0.00	1.44	505.21	03/13/18 10:00:00 PM
CR74_2.12-UP-3.25		0.00	1.01	505.21	03/13/18 10:00:00 PM
CV85_1.01-UT-3.28		0.00	0.96	505.21	03/13/18 10:00:00 PM
CL62_3.03-UP-2.171		0.00	0.93	504.62	03/13/18 10:00:00 PM
CR73_2.13-UP-3.21		0.00	0.87	505.21	03/13/18 10:00:00 PM
CL73_3.08-UP-3.39		0.00	0.87	504.62	03/13/18 10:00:00 PM
CR73_2.13-UT-3.24		0.00	0.87	505.20	03/13/18 10:00:00 PM
CR71_2.15-UT-2.174		0.00	0.85	505.21	03/13/18 10:00:00 PM
Total		**0.00**	**36.07**		

Customers Listing

1 HOUR • REFRESHED: 2:15:54 PM

metaCustomer	188 Count of BillingPoint	123.69 KwFromKw	113.80 KwFromKwh
metaCustomer	32 Count of BillingPoint	41.61 KwFromKw	41.59 KwFromKwh
metaCustomer	2 Count of BillingPoint	169.94 KwFromKw	172.00 KwFromKwh
metaCustomer	40 Count of BillingPoint	26.82 KwFromKw	26.92 KwFromKwh
metaCustomer	36 Count of BillingPoint	30.34 KwFromKw	30.04 KwFromKwh
metaCustomer	20 Count of BillingPoint	0.02 KwFromKw	0.04 KwFromKwh

- Dashboards can bubble up data quality issues.
- Highly granular data is no longer an extra, it's baked into the SLA.

Push URL

https://api.powerbi.com/beta/ /datas

Raw cURL PowerShell


```
[
  {
    "TimeStamp" : "2018-03-13T22:31:33.229Z",
    "metaCustomer" : "AAAAA555555",
    "metaSite" : "AAAAA555555",
    "BillingPoint" : "AAAAA555555",
    "KwFromKw" : 98.6,
    "KwFromKwh" : 98.6,
    "DeltaAbsolute" : 98.6,
    "DeltaRelative" : 98.6,
    "IsStale" : 98.6
  }
]
```

Outlook 1: Dedicated Customer Data Feeds

- PowerBI streaming datasets
- PI Cloud Connect
- Custom REST api's
- *"mini"* AF models and dedicated PI Web API access

Outlook 2: IoT Applications

- How do we get data from other "no PI System" sites?
  - through the colo operator
  - through the colo customer
  - BAS solutions vs. IoT appliances

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Questions

Please wait for the **microphone** before asking your questions

State your **name & company**

Please remember to…

Complete the Online Survey for this session

Merci

谢谢

Danke

Спасибо

Gracias

Thank You

감사합니다

ありがとう

Grazie

Obrigado

Optional: Click to add a takeaway you wish the audience to leave with.

EM Deployment for a Hyperscale Client?

Synopsis of a case study

Well Recognized Internet Retailer

- 20+MW of PCL
- Several additional critical facilities
- 7,000,000 Streaming data points
- Created ‘single source of truth for all data’
  - BAS, EPMS, SCADA, IT
  - Simplified reporting
- Increased collaboration between:
  - Operations, IT and Executives
- Facilitated standardization
  - Rapid deployment of new IT capacity
- KPI’s
  - Revenue, Cost of IT infrastructure per user