



Using Real-Time Data for Datacenter Operations, Energy & Sustainability initiatives

Mark Peterson OSIsoft

#### Agenda

- PI System overview
- Emerging Datacenter Operation Best Practices
  - The Green Grid & the Datacenter maturity model
- Datacenter Benefits using Pl
- Examples of Pl use in Datacenters
- PI in Microsoft Datacenters
- Q&A

## The OSIsoft PI System



The OSIsoft PI System is the highly scalable and secure real-time and event infrastructure that connects people with the right operational and production information at the right time to analyze, collaborate, and act.

## OSIsoft: what we do



PI System





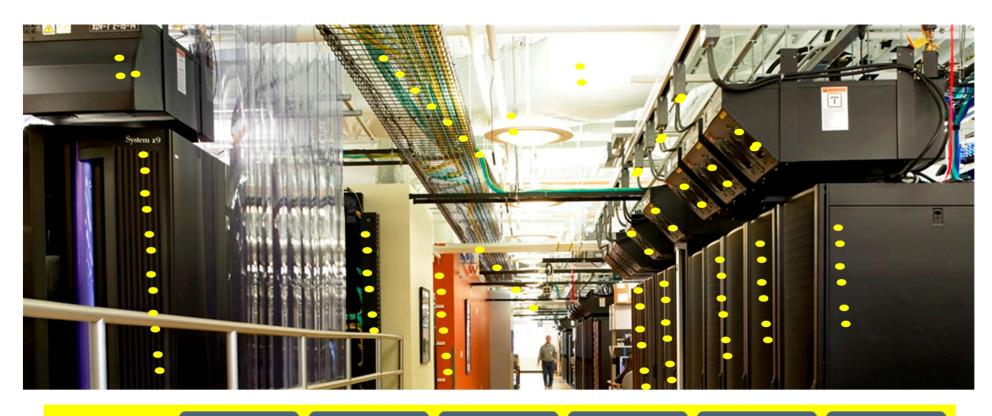








## OSIsoft: what we also do



PI System





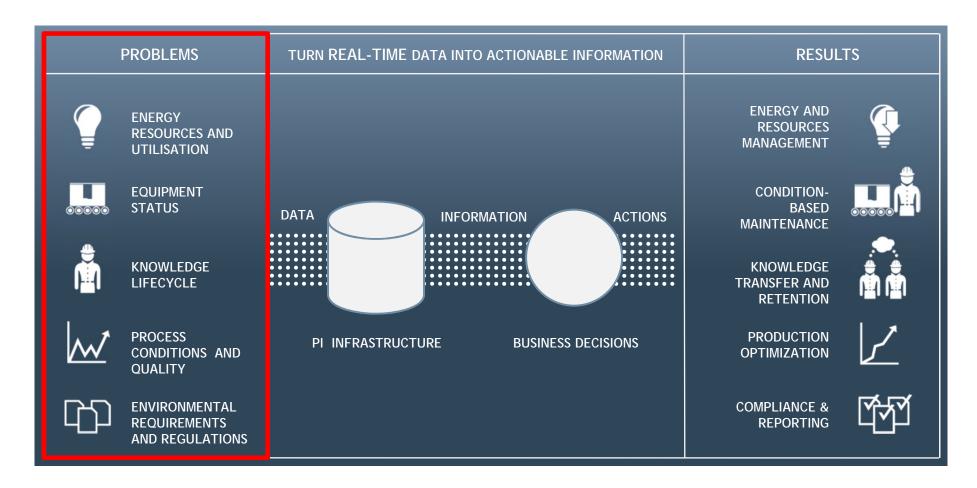






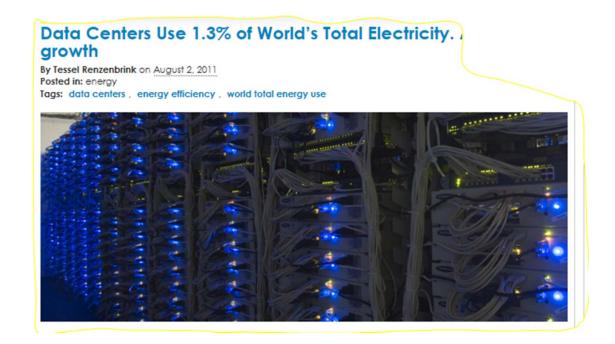


#### PI System: Real-time Data in to Actionable Information



Challenges that apply in process industries also apply in Datacenter environments

## Why PI in Datacenters?



Estimated consumption at 235.5 BkWh annually (2010).

In the US total energy consumption % figure is closer to 2%.

Source: Jonathan Koomey, professor in the civil and environmental engineering department at Stanford University

#### New Datacenter Dynamics Research Study Predicts Global Data Center Energy Consumption Could Increase 19% By 2012

Globally, the new study identifies 31 GW of data center power – enough energy to power all residential households in the United Kingdom, France or Italy.

London, United Kingdom (PRWEB UK) 26 September 2011





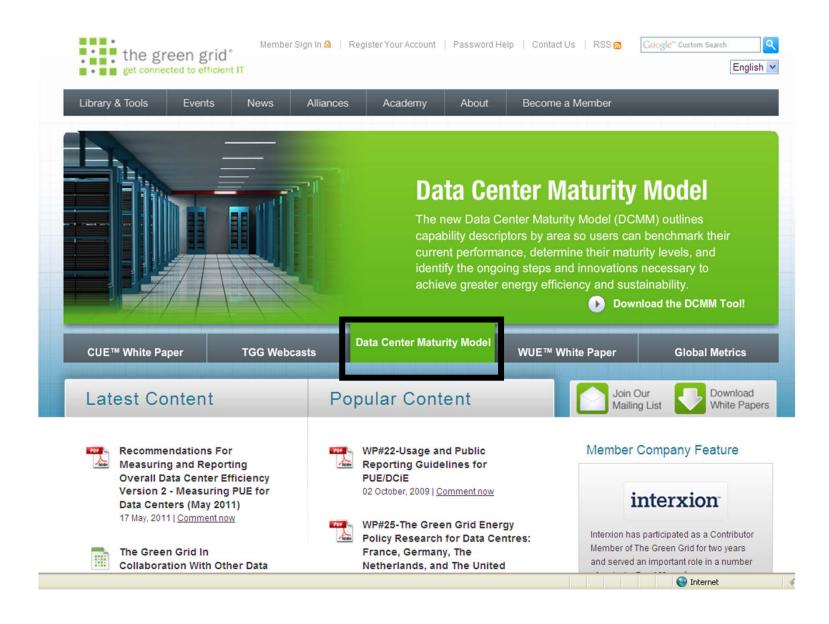




**Improving Uptime** and Service levels are also primary **Datacenter** operation concerns

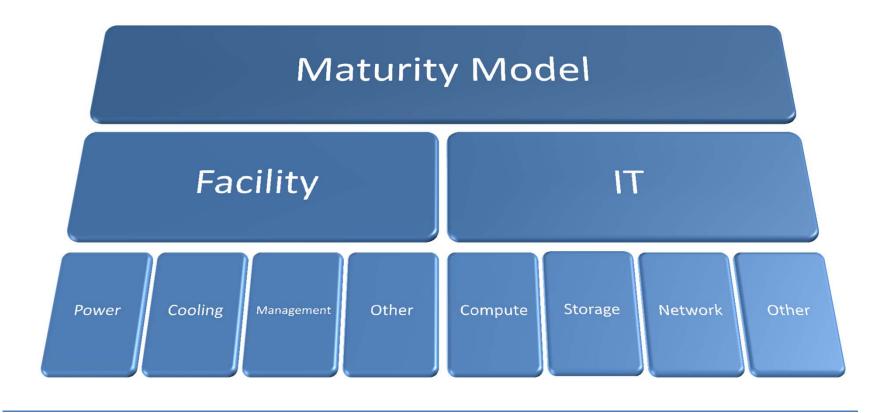
## Green Grid: Data Center Maturity Model





# Green Grid: Datacenter Maturity Model







- Minimal/No **Progress**
- Part Best **Practice**
- Best Practice
- (between Level 2 and 5)
- Reasonable Step Reasonable Step Visionary 5 (between Level 2 and 5)
  - **Year View**

# Data Center Maturity Model: Scope Includes



- Data Center Energy Efficiency
  - Energy demand
  - Energy supply low carbon generation
  - Utilization / Effectiveness
- Data Center Sustainability
  - Carbon
  - Water
  - Waste heat
  - Materials management
    - E-Waste
    - Cradle to cradle approach lifecycle
  - Building sustainability
- Data Center Monitoring/metrics

# Datacenter: IT operations & Workload



Compute

Storage

Network

Management

Utilization

Workload

Utilization

Utilization

Workload Management

Architecture

Workload

IT Sizing

Operations

Operations

Operations

**Internal Power Supply** 

Power management

Technology

Technology

Service Catalogue/SLA's

Server populations

Provisioning

Base Performance

Incentivizing change for efficient behaviour

Provisioning

E-Waste

**Procurement** 

# Datacenter: Facilities Operations & Performance



#### Power

Critical Power Path Efficiency – Building Entrance to IT load

Architecture

Operations

Generation

Real time Monitoring



**Data Intensive** 

#### Cooling

PUE – Cooling Contribution

RCI (hi) & RCI (lo) – if applicable

Mechanical/Refrigerant Cooling reduction

Environmental – set point range at inlet to IT equipment

Environmental – monitoring and control

**Operations** 

#### Other

Operational Resilience

Resilience vs. Need

Lighting

Building/Shell

M&E Waste

Procurement

#### Management

Monitoring

PUE

Waste heat reuse (as measured by ERF/ERE)

CUE

WUE

xUE/additional metrics

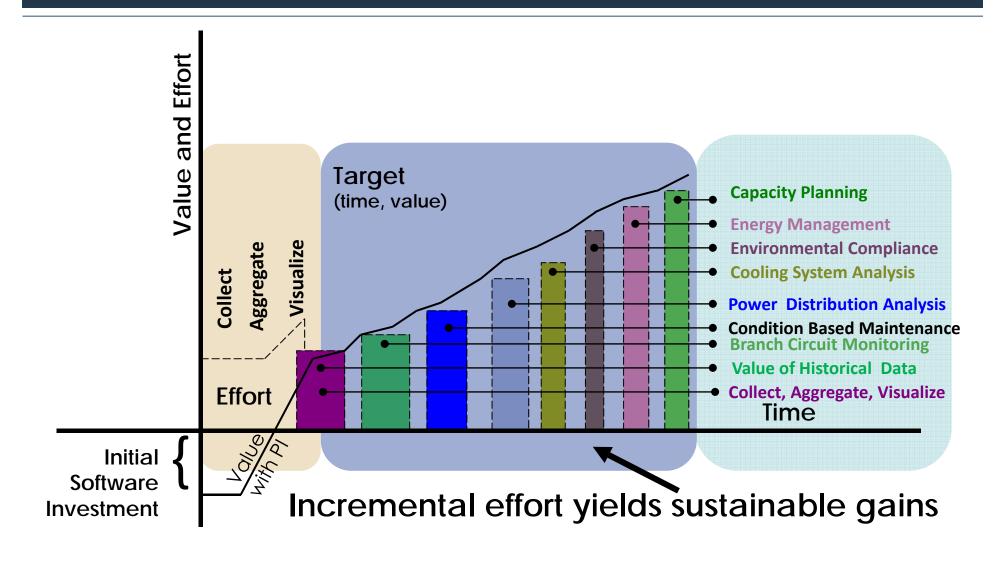
# Data Center Maturity Model



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- Provides clear goals and direction for Datacenter operators to improve energy efficiency and sustainability
- Provides guidelines by data center area such that operators can benchmark current performance, thereby:
  - Understand how far they are from best practice
  - Identify ongoing steps & innovations required to achieve greater energy efficiency & sustainability improvements, both today & into the future.
  - Using the higher levels of the model to inform data center and IT strategy.
- Roadmap for the industry to significantly improve efficiency and sustainability

# Value Now, Value Over Time...



## Data Center Benefits using Pl



# **Benefits**

- Decrease equipment downtime & preventative maintenance via condition-based maintenance.
- Improve Strategic Asset Management & Outage
  Prevention by analyzing real time and historical data to identify root cause of anomalies & equipment failure.
- Provide real-time/ historic data records and trend analysis to support planning.
- Support cost reduction by monitoring and improving efficiency (PUE); reducing carbon footprint (future regulation). Assess design criteria to actual demands
- Establish real time alarming and response plans to reduce off-spec impacts, optimize corrective action. Develop condition assessment algorithms & equipment alarms.
- Increase effectiveness by aggregating time-critical information at Enterprise level in Single Dashboard. Display KPI and facility performance.
- Use Real Time data to support performance claims (validate availability)

#### **Benefit Map by Role/Function**



#### Data Center Monitoring and Metrics

- Branch Circuit Monitoring
- Capacity planning
- Bill back to business units
- Corporate Dashboards
  - Carbon Foot Print, PUE / Energy Efficiency, other metrics
- Benchmark against state-of-theart facilities
- Proactive Maintenance of Assets within the Facility
  - Create a condition based maintenance program vs. a calendar
- Manager of Managers/NOC
  - Alarming
  - Troubleshooting
- Multi-site data aggregation

- Correlation between IT load & the power consumed by IT equipment
- Uncontrolled cooling
- Air blockages
- Air recirculation
- Chiller efficiency
- CRAC unit efficiency
- Cooling tower efficiency
- UPS efficiency
- Reactive power loss
- Correlation between energy cost and energy use

#### **Example: PI System Energy Dashboard**



## Example: Real Time Power Usage & Energy Cost





#### Example: Data Center Transformer load over time





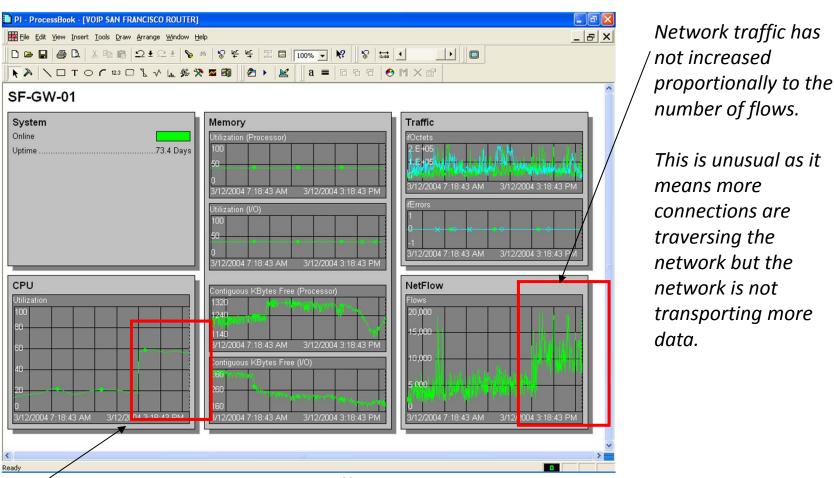
# Example: UPS Monitoring





#### Example: Root-Cause Analysis: Trend Analysis





High CPU and increases in NetFlow traffic are correlated with the time that Jitter reached an unacceptable level.

#### **Customers**







Datacenters & Critical Facilities

**Process Industries** 

**Utilities** 

#### PI System in Microsoft Datacenter's



#### **Europe Region**

Stockholm, Amsterdam,

Vienna,

AT

Paris, FR

Zurich,

CH

#### Microsoft Chooses PI System® to Monitor Critical Facilities Microsoft Technology Centers and Enterprise Engineering Center

Asia Pacific Region

Enterprise Engineering Center (EEC) have chosen the OSIsoft® PI System® to monitor and analyze performance of the MTC's and EEC's critical facilities, including power, mechanical, and IT. OSIsoft (www.osisoft.com) is provider of the PI System, the industry standard enterprise infrastructure for management of time-series data and events.

The 18 MTCs provide customers with experts and resources to envision, plan, build, deploy, operate and optimize secure customized computing solutions based on Microsoft and partner technologies.



The Microsoft Technology Centers (MTCs) and Microsoft's Today, OSIsoft and Microsoft empower enterprise manufacturers and utilities to gain a competitive advantage by presenting users with dynamic operational, business, and energy data they can use to make better-informed decisions while driving excellence across the value chain. With the MTC and EEC, OSIsoft and Microsoft can further drive end customer value with their critical facilities.

> "We are pleased to support Microsoft Technology Centers and its customers," said John O'Shea, OSIsoft Senior Vice President. "Adoption of OSIsoft's PI System infrastructure will help Microsoft increase efficiency and reduce costs across the MTC network to support their sustainability and environmental goals. Together, we can take these 'lessons learned' to our joint customers for their benefit. OSIsoft plans to use the Microsoft MTCs as part of our joint sales and business development engagements with Microsoft and customers."

"Microsoft and OSIsoft have a joint commitment to sustainable IT," commented Michael Valletta, Technical Director, MTC New York, "In meeting this commitment, Microsoft has expanded its use of the PI System by our Global Foundation Services (GFS) unit and the Microsoft Enterprise Engineering Center (EEC) in Redmond, WA, to include the global MTCs. This will enable our customers and visitors to see our joint technology for energy and environmental visualization at work, while we continue to reduce energy use at these facilities."

"The very large scale infrastructure and mission-critical nature of the monitoring required by the Microsoft EEC represents the kind

# Q&A



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