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PayPal’s Centralized Data Infrastructure for Management of Data Center Operations

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PayPal Overview | Data Center Landscape

PayPal has grown rapidly over the last decade and our data center landscape has become increasingly complex. A key challenge was to maximize data center efficiency to ensure available capacity and optimize operational stability

Salt Lake City, UT

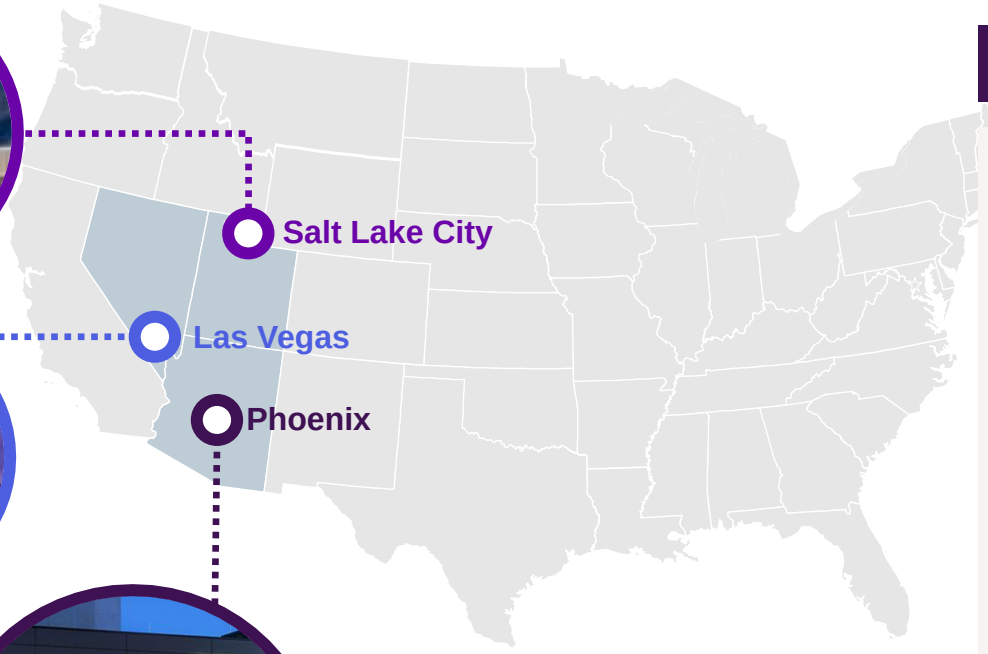
- Colocation Provider
- Tier III Design

Las Vegas, NV

- Colocation Provider
- Tier IV Design

Phoenix, AZ

- Colocation Provider
- Tier IV & Tier II Design



Key Facts and Figures

- 16 Countries
- 33 Data Centers; 3 primaries
- ~2,500 Racks
- 27 Megawatts
- 3,000+ DC Facilities Assets
- 1M+ Monitoring Endpoints
- 3 primary DC partners
- 13 Tools & Platforms
- ~130 People
- 900+ DC Procedures

CMRS Program | Definition of CMRS

Visualization and automation are at the center of the Control, Monitoring, and Reporting Systems program. Achieving these goals allows PayPal to manage the data centers more efficiently and effectively

Planning

Modernizing Data Center infrastructure is all about being able to plan effectively and operate efficiently

Visualizing

Visualizing key metrics and seeing operations at a glance allow for faster decision making with accurate data

Automating

Automating standard processes optimizes time and lets resources focus on more pressing concerns

Alerting

Receiving alerts for critical events and identifying resources to respond is vital to operational stability

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CMRS Program | Challenges and Goals

The program addresses specific challenges that data center operations face, namely consolidating facilities and knowledge management, and introducing real-time visualization of data center space and power

Challenges

Delayed **mission critical reporting** as a result of manual tracking of critical information on space, power, and cooling

Inability to **make reliable capacity planning decisions** due to a lack of real-time data

Limited visibility into **vendor performance and validation** resulting from data center components, work orders, and procedure documentation tracked outside of PayPal tool sets

Lack of detail in **capacity planning and forecasting** processes

Disconnected **view of operations** resulting from historically fragmented ticketing, monitoring, alarming, and data across multiple platforms

Goals and Outcomes

1. Highly Available and Resilient Architecture
- Highly available architecture using load balancing and WSFC
- Redundant and distributed system for disaster recovery

2. Single Pane of Glass and Continuous Monitoring
- Centralized data collection using the PI System
- Templatized AF structure for deployments and acquisitions
- PI Vision with CBA for users to monitor systems in real time

3. Proactive Alerting and Work Order Creation
- Alarm rationalization and centralization of alarms
- Email alerts with maintenance mode function for downtime
- Automatic work order creation in ServiceNow

4. Plan for Growth
- Shared, accurate, real-time forecast of capacity / demand
- Integrate planned installation and decommission activities
- Data driven plan for expansion and growth

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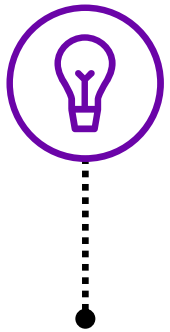
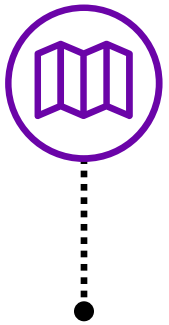
CMRS Program | Approach

Our approach to implementing CMRS is focused on driving a consistent and maintainable architecture using real-time accurate data.



Vision and foundation

Identify Business Drivers and create prioritized opportunities for DCIM automation, monitoring and visualization

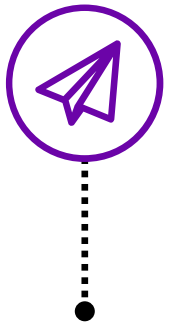


Architect and Design

Tailor Data Modeling Architectures and roll-up logic to address your use cases, requirements and standards

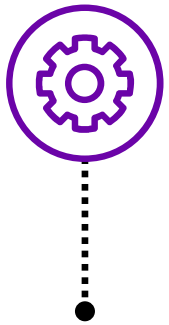
Model and Integrate

CMDB Development and population requires data center design as well as rigorous data quality analysis and cleanup based on automated quality testing



Deploy and Commission

Leverage interactive visualization and planning tools to see into the future of your facility or resolve today's capacity challenges

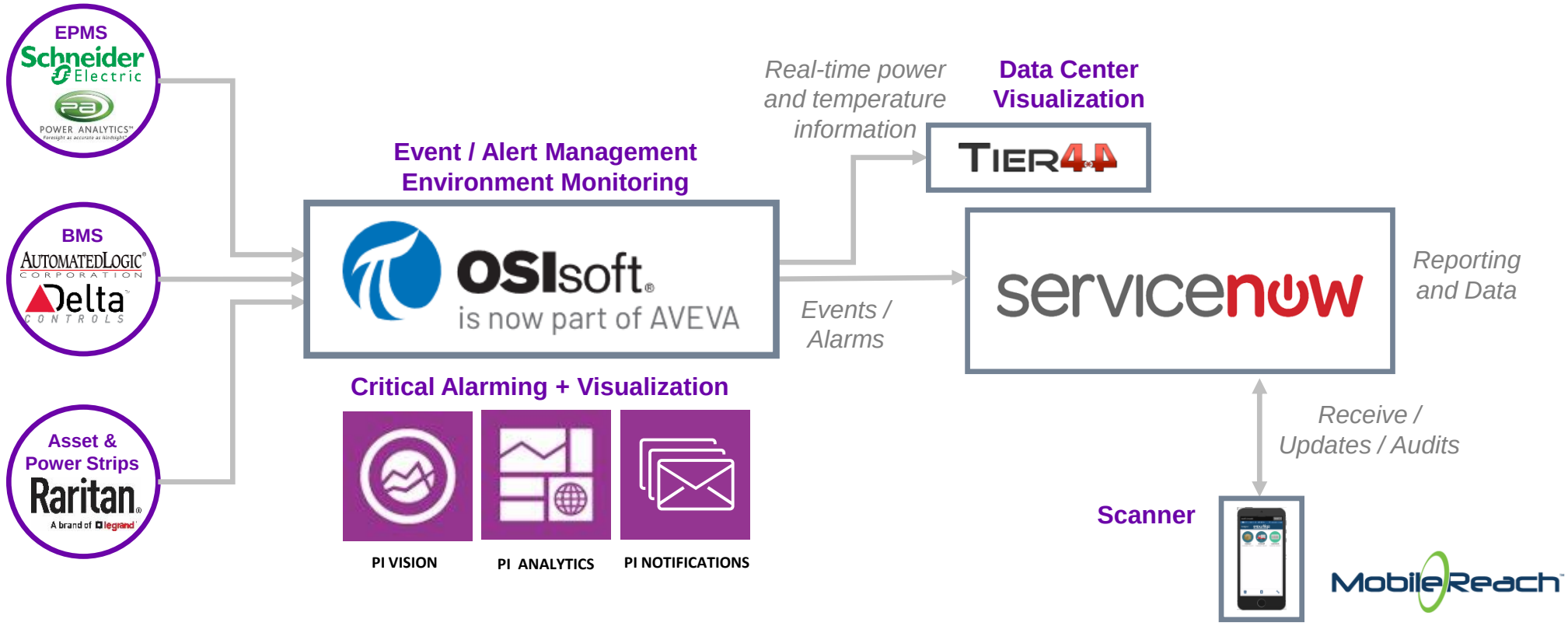


Run and Optimize

Post implementation DCIM enhancements and configuration, training and support as required by policies and standards

CMRS Program | High-Level Architecture

A central single pane of glass experience provided by the PI System enables planning and management of assets and facilities. Visualization is provided by PI Vision while critical alarming is provided by PI Notifications.



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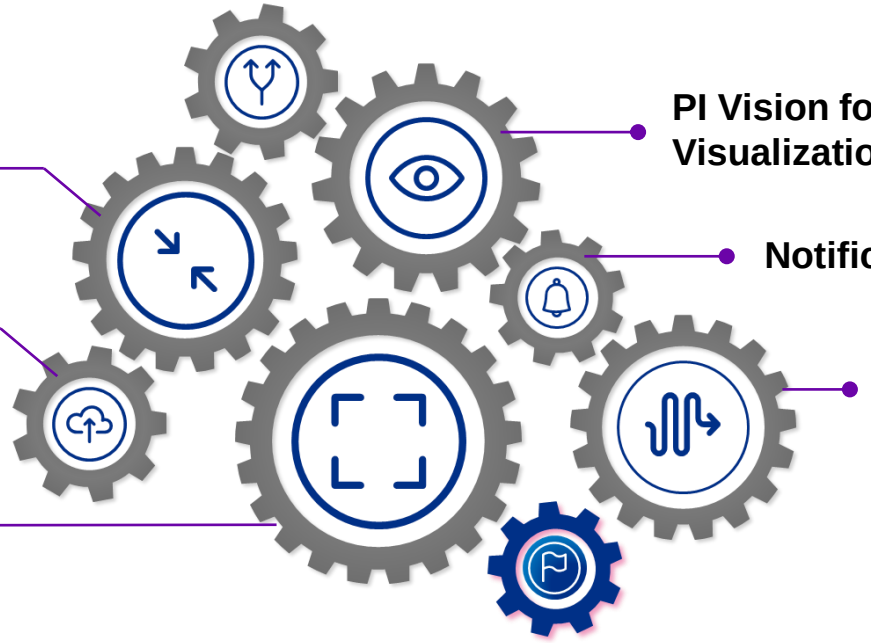
OSIsoft Solution | PayPal's Ask

The specific requirements for real-time data center operations are a key ask from PayPal. These include real-time awareness and visualization of data center space and power to make critical decisions quickly based on accurate data



Minimize data gaps

Share PI System data from shared facilities via PI Cloud Connect between PayPal and CoLo providers/tenants

Develop "single pane of glass" for PayPal Data Center Operations using PI System

PI Vision for Visualization

Notifications for Alerts

Integrate PI System with ServiceNow and Tier44

Simplify and automate everything!

OSIsoft Solution | Requirements

Network Load Balancing

Redundant Architecture

High Availability

Centralized Data Integration

Continuous Monitoring

CBA Integration to PayPal SSO for PI Vision

Alarms based on SEV level

Automatic Work Order creation in ServiceNow

Maintenance Mode

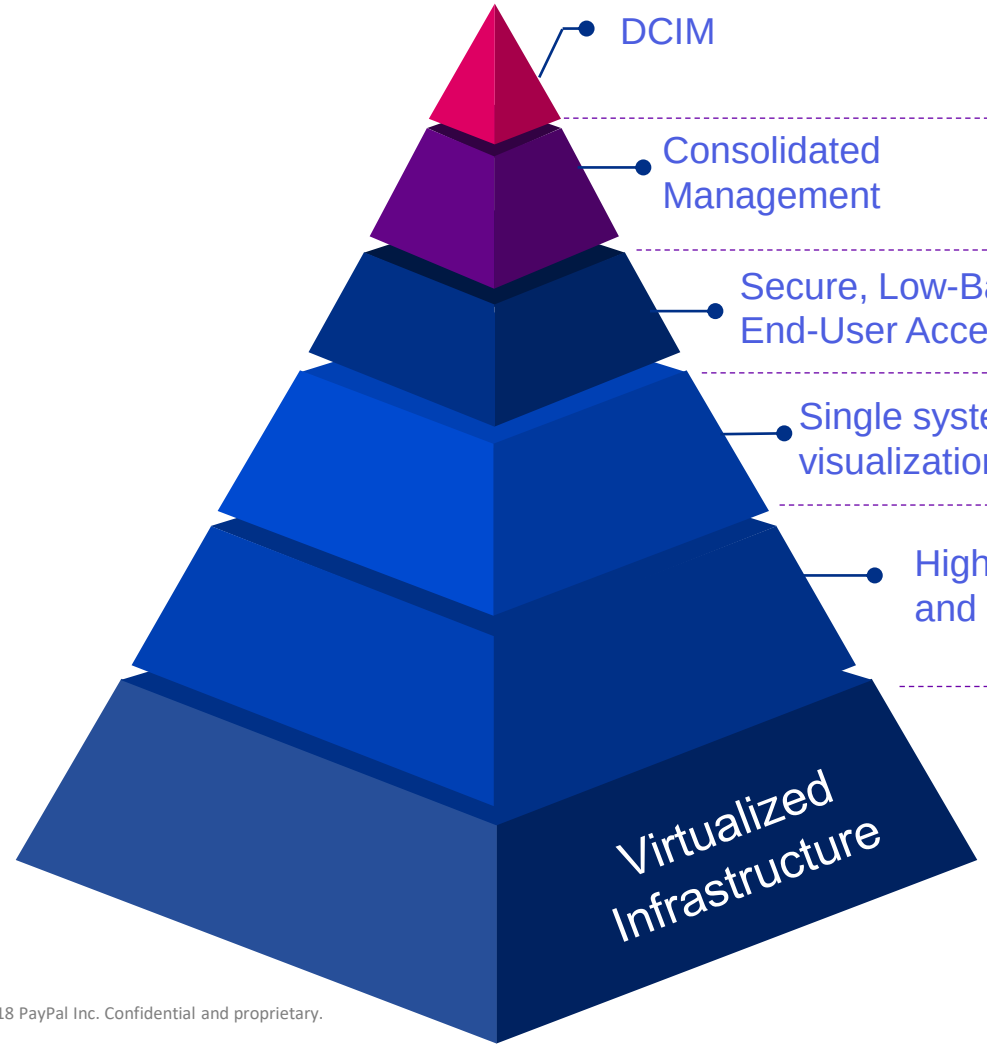
Forecast capacity + demand

Plan for expansion

Tier44 Integration with PI Web API

OSIsoft Solution | Building Blocks

The OSIsoft PI System is installed on a redundant, highly available virtualized infrastructure, providing reliable, easy-to-access real-time operational data to client applications and end users



Real Time Operational Data from PI System(via Web API)

Ticket Creation via PI Web Service

SSO Access via Claims Based Authentication

Notifications

SQL Always On Availability Group

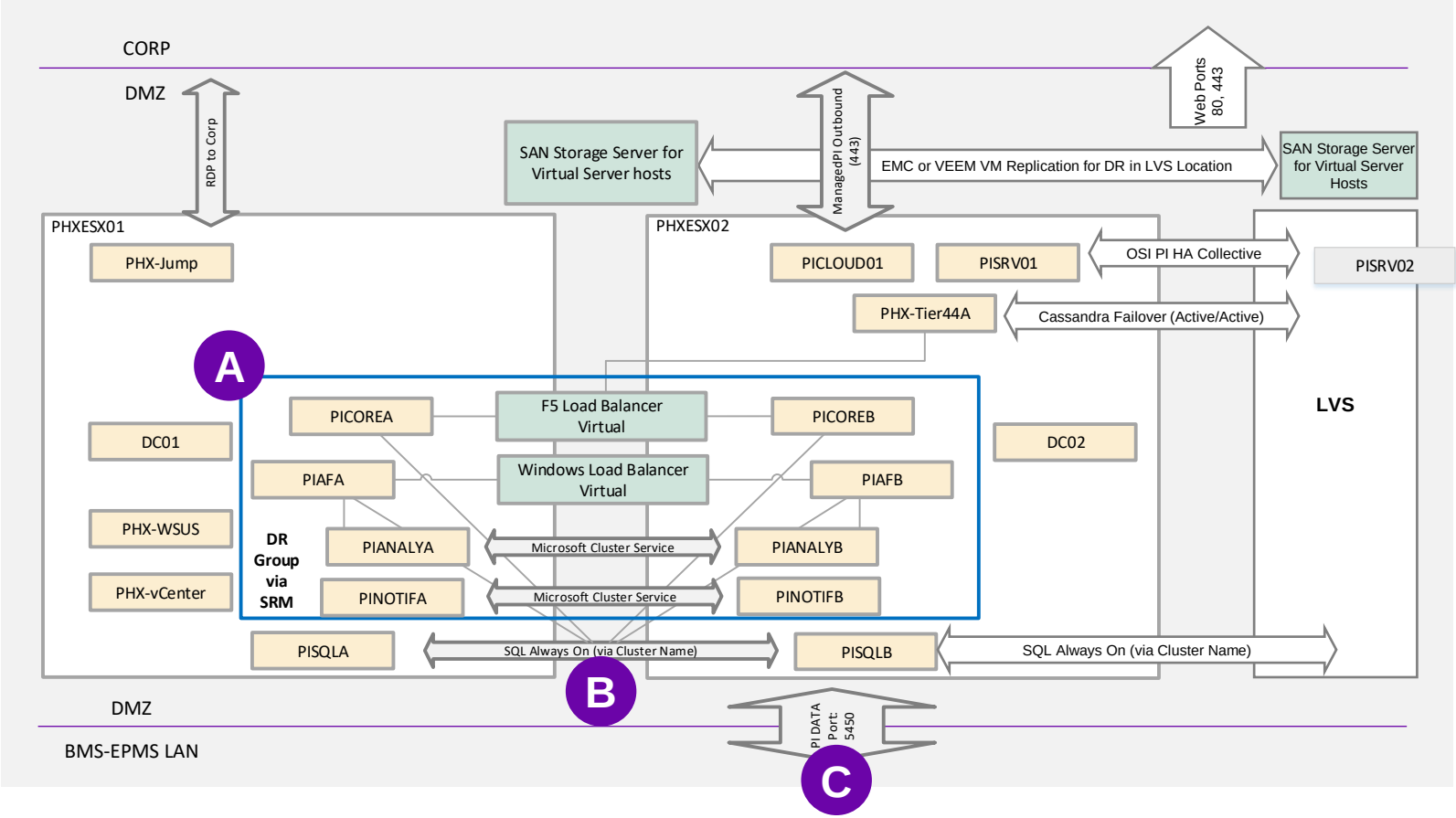
Virtual Load Balancer

Physical Hosts + SAN

OSIsoft Solution | Detailed Architecture

PayPal's system architecture takes advantage of all of the best-in-class options for redundancy, failover, and high availability to ensure maximum availability and integrity of data

PayPal OSIsoft Architecture



Key Features

A Primary PI System in Phoenix
Disaster Recovery System Deployed in Las Vegas

B SQL Always On Availability Group
Providing n+3 redundancy to Asset Framework (AF) and PI Vision backend databases

C Redundant Interfaces to Data Center Devices
Thousands of Mechanical, Electrical, and Plumbing Assets

OSIsoft Solution | Use Case Overview

OSIsoft is the platform that is able to meet PayPal's specific requirements and allows PayPal to address their pain points. The platform features cutting edge capabilities and integrates well with other key components of the CMRS solution

Visualization

Claims-based authentication allows PayPal users to logon to PI Vision with their PayPal Single Sign On (SSO)

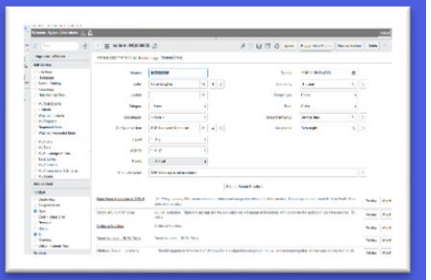
Critical Alarming

Real-time analysis of operational conditions using PI Analytics. Centralized alarming and email notifications enable proactive response.

OSIsoft. is now part of AVEVA

Ticket Creation

Web Service Delivery Channel in PI Notifications is used to initiate tickets in Service Now via JSON for work order creation



RT Data to DCIM

Tier44 Application retrieves real time data from PI using PI Web API calls to Asset Framework (AF)

PI WEB API

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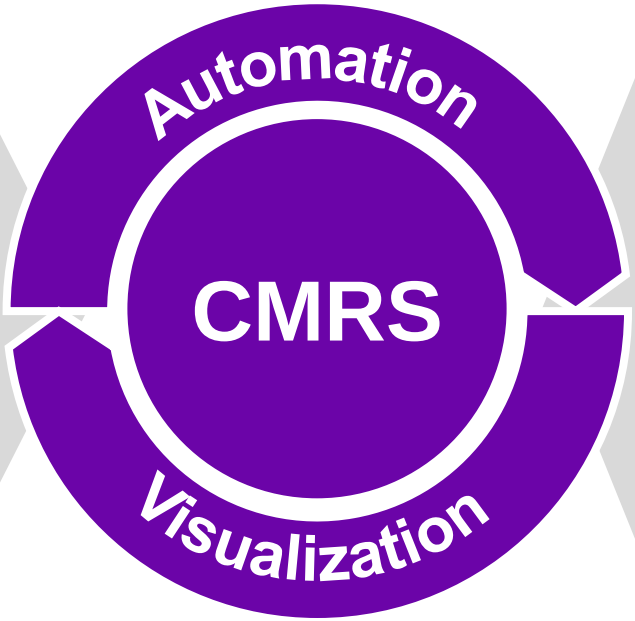
Summary | Key Features and Business Value

OSIsoft is a critical aspect of the Control, Monitoring, and Reporting Systems program which allows PayPal to automate key activities and visualize mission critical information

Key Features

- ServiceNow Orchestrated Data Center Management and Maintenance
- Real-time Environment Information and Alerting
- Relationship driven physical infrastructure CMDB
- Real-time Space and Power Visualization
- Shared, accurate, and real-time forecast of capacity and demand



Business Value

- ✓ Reduced probability of manual errors
- ✓ Efficiencies that drive cost reduction
- ✓ Optimized procedures through continuous improvement
- ✓ Improved speed of delivery of infrastructure
- ✓ Minimized risk and business impact
- ✓ Model and validate changes in real-time
- ✓ Data driven decision making
- ✓ Proactive management of demand, constraints and costs
- ✓ Increased availability + faster incident remediation
- ✓ Ability to assess impact changes and outages

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What's Next?

Plan for **expansion and growth** to additional colocation facilities worldwide

Fully **mirrored** dev and testing environments for **load testing** and expansion

Big Data Analytics for fleet monitoring, deployments, and capacity planning

1 Continuous Integration and Expansion

2 Monitor Colocation Facility Data

3 Fully mirrored dev and testing environments

4 Out of Band monitoring

5 Big Data Analytics

Monitor colocation facility data for improved insight and **proactive awareness**

Integration with **out-of-band** data for enhanced server monitoring

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ABOUT AVEVA

AVEVA, a global leader in industrial software, drives digital transformation for industrial organizations managing complex operational processes. Through Performance Intelligence, AVEVA connects the power of information and artificial intelligence (AI) with human insight, to enable faster and more precise decision making, helping industries to boost operational delivery and sustainability. Our cloud-enabled data platform, combined with software that spans design, engineering and operations, asset performance, monitoring and control solutions delivers proven business value and outcomes to over 20,000 customers worldwide, supported by the largest industrial software ecosystem, including 5,500 partners and 5,700 certified developers. AVEVA is headquartered in Cambridge, UK, with over 6,000 employees at 90 locations in more than 40 countries. For more details visit: www.aveva.com

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