



JPL DCIM Lessons Learned

Presenters: Amanda Hezel, Jim Chu

March 1, 2017

© 2016 California Institute of Technology. Government sponsorship acknowledged.



Jet Propulsion Laboratory
California Institute of Technology

Background Info

- The Jet Propulsion Laboratory (JPL) is a federally funded research and development center and NASA field center located in La Cañada Flintridge, California and Pasadena, California, United States.
- The JPL is managed by the nearby California Institute of Technology (Caltech) for NASA. The laboratory's primary function is the construction and operation of planetary robotic spacecraft, though it also conducts Earth-orbit and astronomy missions. It is also responsible for operating NASA's Deep Space Network.
- Among the laboratory's current major active projects are the Mars Science Laboratory mission (which includes the Curiosity rover), the Cassini–Huygens mission orbiting Saturn, the Mars Exploration Rover Opportunity, the Mars Reconnaissance Orbiter, the Dawn mission to the dwarf planet Ceres and asteroid Vesta, the Juno spacecraft orbiting Jupiter, the NuSTAR X-ray telescope, and the Spitzer Space Telescope. They are also responsible for managing the JPL Small-Body Database, and provides physical data and lists of publications for all known small Solar System bodies.
- The JPL's Space Flight Operations Facility and Twenty-Five-Foot Space Simulator are designated National Historic Landmarks.

Wikipedia contributors. "Jet Propulsion Laboratory." Wikipedia, The Free Encyclopedia. Wikipedia, The Free Encyclopedia, 10 Oct. 2016. Web. 10 Oct. 2016.

Managing the Data Center

- Current industry best practices in the commercial data center industry were introduced and, most importantly, *enforced*. This represented a paradigm shift in the thinking of IT infrastructure at JPL as we had the ubiquitous mission-centric thinking coupled with a ‘*server hugger*’ attitude, which as we all know in this room, is prevalent within our industry.
- DCIM for JPL has been not so much a methodology as another paradigm shift in how we operate data centers.
- It allows us to achieve our CIO’s vision of ‘***One Data Center***’ that incorporates legacy as well as new data centers, outsourced as well as in-house managed data centers and cloud integration.

DCIM Project

- 2014 Kicked off our DCIM software selection project
- All the major research groups now highlight DCIM:
 - IDC
 - Yankee Group (now 451 Group)
 - Forrester Research
 - Gartner Group
- Of these, IDC's "*Worldwide Data Center Infrastructure Management (DCIM) Analysis*" is the most mature (updated and in production since 2011).
 - 2013 Report, Doc ID 241280, May 2013 used as reference

DCIM Project – Vendor Selection

- From IDC’s “Leaders” and “Major Players” categories, all vendors were selected and include:

Emerson	Panduit
Schneider	iTracs
CA	Cormant
Raritan	Future Facilities
Fieldview	Siemens
Nlyte	ABB
RF Code (added as an adjunct to DCIM to highlight add-ons)	Geist (added due to Niagara framework used / similar to Tridium solutions utilized by Facilities)

DCIM Project – Vendor Selection (con't)

- Overall, fourteen (14) vendors were selected, mirroring IDC report (2013) of “Leaders” and “Major Players” in the DCIM industry.
- All invited to introduce their software and company to stakeholders at JPL that represented OCIO and Facilities during one hour introductory WebEx's. Time limit was enforced to allow equality amongst vendors and spanned three vendor presentation slots (see vendor summary on next slide).
- Findings showed the wide disparity between products; notably “*suite-based*” products versus “*specialist*” products. They also showed how the applicable company handles DCIM internally as to product function and serviceability / upgrade / lifecycle.

DCIM Project – Vendor Selection

Next steps (after vendor introductions):

- Use Cases—where core team determines current DCIM software capabilities.
- DCIM for Managers—where core team puts together “Wish List” for JPL OCIO DCIM.
- Capabilities Matrix—where core team ties together vendor capabilities, Use Case and DCIM for Managers into core document used to differentiate vendors.

DCIM Project – Use Cases

Use Cases were created by core team and centered around ten (10) key areas of industry best practices within the DCIM application

1. Configuration Management (rack/row assignment), who is where, start and sunset, expansion plans, capacity utilized / available, asset management and integration with legacy configuration databases.

Association of POC (point of contact) with equipment and functions hosted in the data center.

Association of Projects / Client to equipment and/or hosted function (i.e. when statusing an item, how many projects are being directly supported by the data center?)

Association of function to equipment (rack, row, RU)

Power Consumption, Energy efficiency, reporting, metrics, etc.

2. Integration / common dashboard as integration point across numerous reporting and executive information and decision platforms.
3. Service oriented goals. Right things in right places.

DCIM Project – Use Cases (con't)

4. Optimize data center performance
5. Adapt to technical and business change more readily.
6. Reduce waste and over-provisioning.
7. Assist in planning data center / IT investments and data center capacity.
8. Reduce the risk of data center and IT downtime via consistent infrastructure monitoring, management and integration.
9. Optimize energy consumption.
10. Integrate numerous disparate IT / Facilities / Energy reporting platforms.

DCIM Project – DCIM for Managers

DCIM for Managers was a core team approach, enlisting professionals from outside the OCIO as well, to determine feature set desirable for JPL DCIM. It included three categories: ***Must Have***, ***Like to Have*** and ***Nice to Have***

Must Have

1. Simple UI and easy to use
 1. Data visualization and graphic reporting
 2. Unified interface
 3. Batch processing and updating
 4. Consistency across all screens and modules
2. Dashboards, custom reporting and notification
 1. Monitoring and trending including alerting
 2. Real time data center metrics: energy, power (room, row rack), mechanicals, environmental, weight, etc.
3. Integrate existing infrastructure systems with DCIM (i.e.SynapSense, Niagara/Tridium, ION etc.)
4. Support natively and/or API generate reports
 1. Multiple output types
 2. Multiple input types

DCIM Project – DCIM for Managers (con't)

5. IT Asset management—ability to integrate with other systems (legacy)
6. Full power and data connectivity
7. Plan views / Rack views / Isometric Views
8. Work planning and visibility
 1. Provisioning and de-provisioning
 2. What-If Scenarios
 3. Predictive analytics
9. Fully user-configurable and vendor agnostic
10. Interface with Remedy / Heat (Help Desk System)
11. Strong user permissions / authentication / VLAN / Authorization by Roles
12. Licensing—model must be cost effective for JPL
13. Miscellaneous future requirements as DCIM industry matures

DCIM Project – DCIM for Managers (con't)

1. *Like To Have*

1. Device control—management specifically visible to state/status)
 1. Plug level—KVM, IT management
 2. EMCS/BAS/BMS integration
2. Scripting ability
3. Enhanced Dashboards
4. Custom Reporting and Notifications
5. Computational Fluid Dynamics (CFD)—real time preferred over calculated
6. Personalize-able (“My DCIM”)
7. Enhanced Interface with Remedy—ability to do remedy closures

2. *Nice To Have*

1. RFID / Barcode mobility and full tablet support
2. Fully customizable (non-proprietary) read/write API's
3. Ability to interface with Life Safety Systems

DCIM Project – Capabilities Matrix

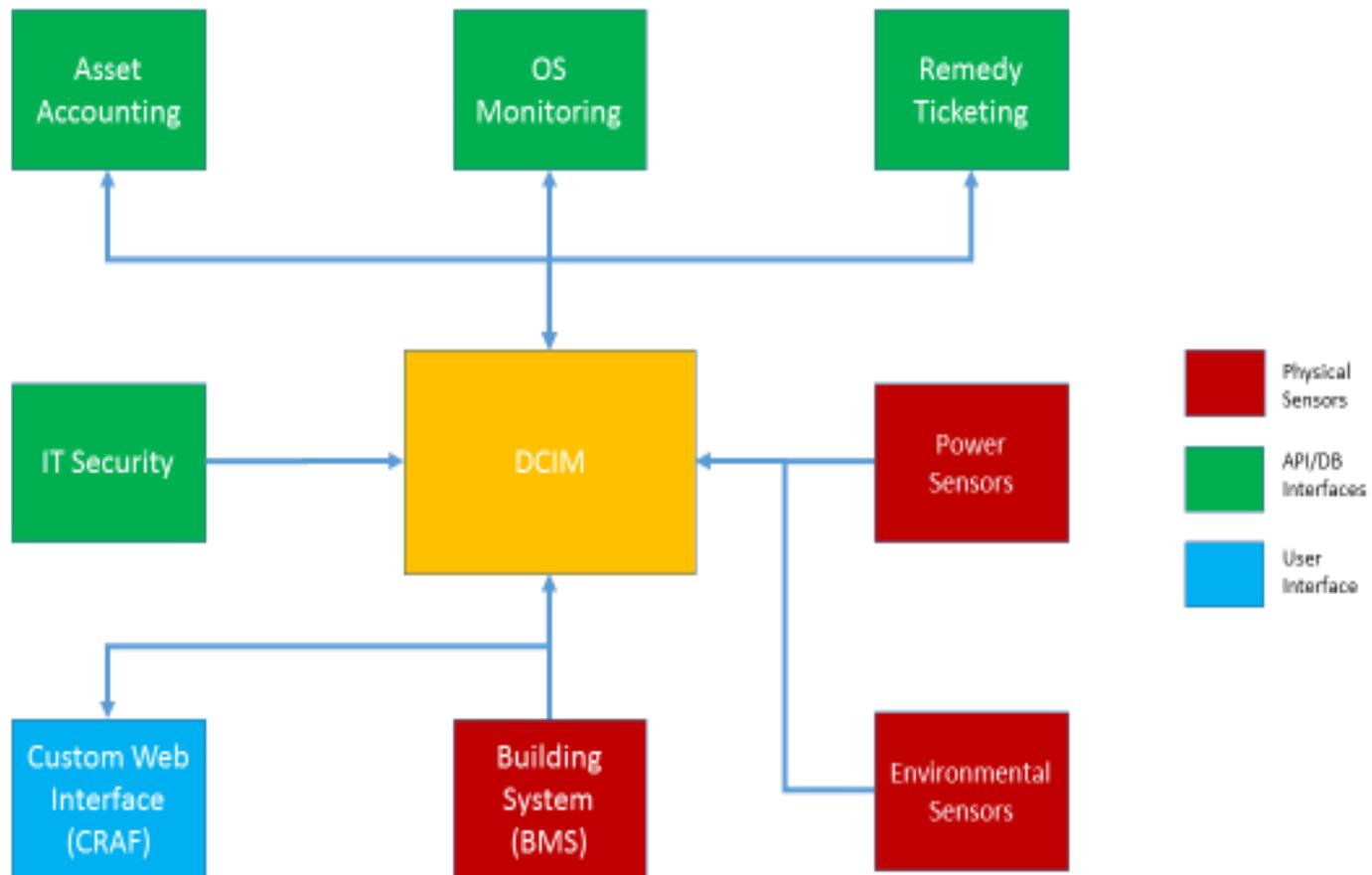
- The **Capabilities Matrix** ties together the **Use Cases**, the **DCIM for Managers** requirements into a single, comprehensive spreadsheet.
- The **Capabilities Matrix** incorporates 150+ line items broken out by architecture, workflow, change management et al and is created from all of the vendor's cut sheets of their technical capabilities.
- Each vendor was be queried (the list is confidential and will not be sent to the vendors) as to their capabilities within the **Capabilities Matrix**.
- Differentiators are built into the spreadsheet that reflect important benefits gleaned from vendor demonstrations, the **Use Case** model and the **DCIM for Managers** model.
- Weighted Scores will then be derived to determine final one (1) to three (3) vendors, based on differentiators outlined above.

DCIM Project – Capabilities Matrix (con't)

Master List of DCIM Requirements / Use Case (internal OCIO) / DCIM w/Mgrs (internal OCIO) -- Merged					
Run Date: 8/11/2014					
Data Center Infrastructure Management (DCIM) Requirements					
Project: JPL B230 DCIM		Date of response: FINAL DATE OF RESPONSE TBD / AFTER OCIO "Standard Review", 8/21/2014			
Category	Req #	Requirement	Req Type (Required / Optional, Future)	Vendor Response (Comply, Not Available, Roadmap)	Description / Additional Comments
Architecture					
	ARCH-01	Architecture: Virtual Server Support	OPTIONAL		
	ARCH-02	Architecture: System should be available for operations 24x7x365	REQUIRED		
	ARCH-03	Architecture: System should not have a limit/software restriction on entered data	REQUIRED		
	ARCH-04	Backup: Automated Backup processes	OPTIONAL		
	ARCH-05	Use Case--Linux Support	OPTIONAL		
Asset Management / Configuration Management					

DCIM Project – The Final Two

- Sent a data file with 3 racks loaded with equipment
- Gave each supplier 24 hours to complete the task
 - Model the data
 - Create a Floor Plan
 - Rack layout
 - Predicative analysis
- Complete the DCIM capability matrix
- Single discriminator determined supplier chosen
 - Remedy connector already established



DCIM Project – Lessons Learned

- Learn the software capabilities
 - Take overview training before software set up and any data entry
- Understand how your asset information will port over to the software
 - Rack level
 - Component level
- A dedicated team for implementation and upkeep