

# **Planning for CMDB Design and Adoption: An Industry Colloquium**

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# Planning for CMDB Design and Adoption: An Industry Colloquium

## Executive Summary

The notion of a Configuration Management Database (CMDB) remains a confusing and sometimes even arcane topic to many in the enterprise management industry today. However, the CMDB as the IT Infrastructure Library (ITIL) characterizes it, is rapidly growing in importance to both IT adopters and solution vendors, as it can provide a core enabling capability to promote more cohesive service management, or as ITIL defines it – IT Service Management (ITSM).

The CMDB is somewhat misnamed, in that it stretches far beyond traditional “configuration” or even “change” management to support – at least potentially – a full array of IT disciplines, from service assurance to capacity planning and application service provisioning. As a consistent, dynamic and trusted data source – the CMDB can provide much enhanced business alignment and potentially help IT to reap enormous advantages in operational effectiveness – both in terms of cost efficiency and service quality.

ITIL’s vision of the CMDB is not new. However, ITIL focuses only on best practices for ITSM, and so presents a process-centric picture of the CMDB. The CMDB’s evolution into shipping products, management software design, and architected reality is just beginning. Achieving the full promise of ITIL’s CMDB vision will require many years of technology evolution, standards development and implementation experience. Early adopters stand to reap significant benefits, but only if they proactively assess meaningful business targets, technology options and process objectives.

This report examines critical parameters of CMDB design and adoption in order to help IT planners better assess vendor solutions in context with some of the most critical issues surrounding CMDB implementations. The objective of the report is to clarify best approaches and alternatives for IT adopters, as well as for the enterprise management industry in general.

The report will cover:

- CMDB value and focus for near-term IT adopters
- Recommendations for phased implementation
- The federated CMDB model
- Data schemas and database design
- Issues in data integration and reconciliation

- Standards directions and requirements
- Auto-discovery and CMDB population
- Policy-based automation
- Directory Services and other issues

While the report reflects EMA’s experience and perspectives, it is also designed as an industry colloquium. The vendors included in the commentary to provide a mosaic of industry opinion and perspectives are: BladeLogic, nLayers, Voyence, Managed Objects, and mValent. As such, the report offers multiple views and contexts with which to understand CMDB design and adoption issues.

## How to Use this Report

This report is designed to provide you with a set of guidelines for planning your CMDB implementations. Each section has a set of questions that can be used to develop and clarify directions, and which provide a baseline for implementation planning and technology selection. These questions are augmented by contextual background and vendor comments that provide insight on technology possibilities and real industry practice.

## Methodology

Enterprise Management Associates has developed this white paper in large part as an extension of its extensive research beginning in Q4 2004 and continuing throughout 2005 on CMDB issues, adoption patterns, and vendor offerings. This research is available in three reports:

- ITIL’s Configuration Management Database: Panacea or Pandora’s Box
- The CMDB Landscape: Market Directions, Vendor Solutions and IT Deployments
- The ITIL Configuration Management Database: Strategic Recommendations

In addition, EMA did a series of in-depth interviews with BladeLogic, Managed Objects, mValent, nLayers, and Voyence, to solicit their perspectives and recommendations regarding CMDB design and adoption requirements. As these perspectives were generally complementary, the report presents a largely consistent and cohesive set of perspectives. However, where differences of focus or point of view were apparent, these were preserved.

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## Introduction

The notion of a Configuration Management Database as it is currently capturing the attention of the industry has its roots in the best practices recommendations of the IT Infrastructure Library or ITIL ([itil.itsm-world.com](http://itil.itsm-world.com)). With its origins in the UK, ITIL has established itself as a leading global source of best practices for what it calls IT Service Management – or ITSM. ITSM best practices direct enterprise IT towards increased business alignment and improved operational efficiencies.

ITIL's seven libraries, the most well-known being Service Support and Service Delivery – define process interdependencies in such a way as to enable more effective collaboration in the delivery of business services through IT. ITIL provides IT organizations with a common lexicon or vocabulary in communicating ITSM processes, as well as common metrics or objectives, so that siloed traditions with differing technical skill sets and differing levels of technical expertise can communicate and work together more efficiently. This collaborative environment is reinforced by ITIL's view of enterprise IT as a virtual service provider within the business – in a way that mirrors the demands on service providers for accountability and quality in delivering service products to customers

## ITIL's Definition of the CMDB

ITIL's notion of the CMDB goes far beyond providing a trusted data source for traditional configuration management. It suggests that the CMDB should “hold the relationships between all system components including incidents, problems, known errors, changes and releases. It also contains information about employees, locations, suppliers and business units.” In essence, ITIL's CMDB becomes a composite mapping of all infrastructure and

other operational resources as they relate to specific business services with defined clienteles and pre-established business metrics. As such, it can become an enabler for not only all the disciplines in ITIL's category of Service Support, but a trusted resource for virtually all IT disciplines.

ITIL, however, is purely process centric. While the term Configuration Management Database clearly suggests an architected entity, ITIL is deliberately silent on actual product implementations in order to retain a neutral posture in support of best practices.

ITIL also presents two terms that are critical for understanding this report.

The first is Configuration Item or CI: CIs, as defined by ITIL, can be components of the network, system, or application infrastructure, as well as organizational and business-related entities.

The second is Definitive Software Library (DSL): where “the definitive versions of all software CIs are stored and protected.”

## The CMDB's Other Roots

In the spring of 2004, EMA developed a “Next-Generation Architecture” report in which a “Semantic Model” for next-generation product solution design was developed. In this report, EMA posed the following:

- The need for effective and non-redundant data gathering across disciplines – analogous to the requirements in the CMDB for consistently gathering information through best-of-class sources (e.g. for configuration, or topology, or performance information, etc.)

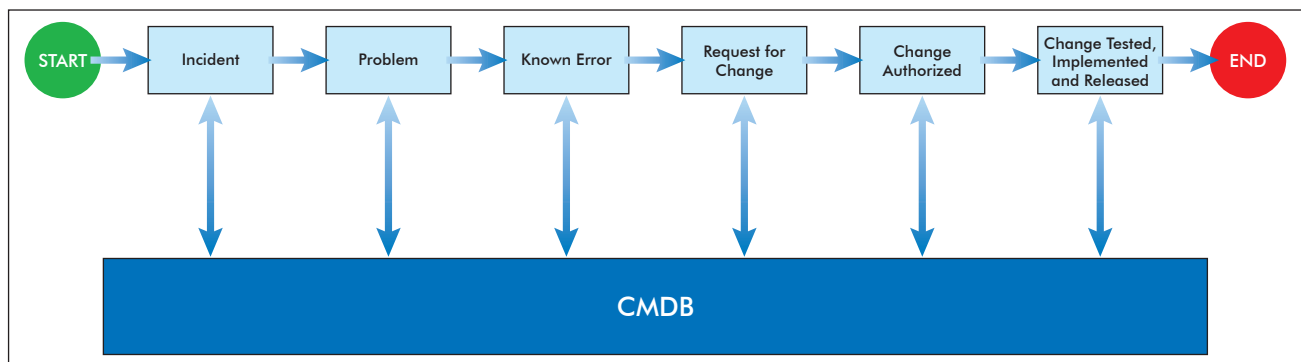


Figure 1 ITIL's CMDB as it maps to Service Support

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- The need for a distributed or federated data store to support multiple management disciplines
- The need for cooperative analytic engines to be able to access this data store in a fluid and flexible manner in support of policy-based automation
- The need for coherent visualization with role-based sensitivities to exploit the values of this integrated data store
- The need for dynamic mapping to service and business objectives

ITIL's CMDB is clearly not unrelated to EMA's architectural notion of a federated data system to support cooperative analytic actions. And in fact, most of the vendors developing a CMDB strategy are not doing so only to support ITIL process objectives. Enlightened vendors have already recognized that developing an effective approach to storing and sharing data in support of operational and business goals is becoming a top-of-mind requirement in its own right. In other words, the CMDB has architectural roots that are in themselves just as deep and meaningful as ITIL's process objectives.

## Why the CMDB is Becoming a Market Shaper

The combination of the focus on best practices with architectural evolution is potentially a powder keg for the enterprise management marketplace. This is so because it directs attention to a coordinated intersection of influences and objectives that, while present under the cover for years, are just now becoming visible. These intersections include:

- The recognition that effective best-practices for service processes demand increasing levels of automation
- The recognition that such automation will in large part require cooperation across vendors and across brands
- The understanding that structural investments in product design need to be scrutinized even more than traditional functional "checklists"
- A rising attention to IT-to-business alignment, as is evidenced, for instance, by a dramatic uptake in ITIL initiatives, and recent EMA data showing that accountability to the business is a prime motivator for making service management investments

- Vendor movement to partner (or to drive mergers and acquisitions) with objectives that are fundamentally different than those in the past, which were less structural in nature and focused more on simply occupying "hot markets"

All of these trends and others, such as the rising attention to Service Oriented Architecture (SOA), are bringing the enterprise management industry towards an inflection point as crucial as that in the early 1990s, with the advent of SNMP and LAN management. If anything, this new inflection point is even more significant, more complex and will take even longer to unfold than its predecessor focused on managing the distributed computing environment.

## Factors to Consider When You Want to Implement a CMDB

IT adopters looking to invest in a CMDB should appreciate the importance of this confluence of architecture and process. There are many good reasons (and many not so good reasons) to invest in a CMDB, but all of them should have some roots in process and business objectives. The architectural underpinnings of CMDB implementations and product visions, however, are equally important if they are understood as enablers for integration and automation.

## The Positive Opportunity

Assessing the positive opportunity for CMDB implementations can span a variety of differing operational and business objectives, with pain points ranging from service assurance, to configuration and change management, to asset management, to application service evolution. However, there are core advantages that are common to all. These include viewing the CMDB as a holistic enabler for managing across boundaries in support of service management processes, as well as aligning IT more closely with the business.

### Questions to Consider: CMDB Opportunity

- What are the goals (operational, business-related, or other) that I want to accomplish with a CMDB?
  - Short-term?
  - Long-term?
- How can I best quantify these goals?

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- What internal IT constituencies are impacted by these goals and objectives?
- What external (customer/consumer) constituencies are likely to be impacted by these objectives?
- What outside supplier relationships will likely be impacted by these objectives? (e.g. WAN services, application hosting, etc.)
- What current IT processes will be affected by this CMDB initiative?
- What are the short-term and long-term CMDB requirements for my company?
- What do I need to do to prepare my IT organization for the cultural and process changes that a service management/CMDB initiative will require?
- What are the organizational implications of investing in a CMDB? For instance, to what degree will my IT organization evolve in focus and value to the business by leveraging the CMDB as a catalyst? What are the organizational implications of becoming more “service provider like” and more “accountable?” For operational or business alignment reasons or both, do I need to define a separately accountable organization around the CMDB?
- Which constituencies in the company are needed to provide input into the CMDB initiative?
- What are the frequency of changes in your network, applications and SLAs.
- What existing IT systems should interface with the CMDB?

These questions and directions are supported by all of the vendors in our colloquium, for instance:

“We find that IT Organizations are looking to transform their operations model. They want to be a service provider as opposed to being a provider of services. Having a CMDB strategy is the pre-requisite to such a transformation that allows mapping of a business process to its supporting IT services and their operational management processes.” (BladeLogic)

“In planning a CMDB implementation, IT is best served by focusing on business alignment. For instance, an implementer may want to ensure CMDB support for an order entry process. This approach directs the implementer through a series of useful questions: How do you map order entry to the IT service for maximum efficiency? How do you know what IT services are needed to support order entry – across the entire IT

stack? How do you map all of that back into one single database system?” (nLayers)

## Assessment

The CMDB opportunity must be evaluated and clearly defined for your company. A CMDB initiative is a major undertaking, and the goals and objectives must also be clearly defined. Like most IT projects, CMDB initiatives will typically be measured on meeting goals and objectives. Setting these goals with an eye to near-term as well as longer-term success is critical to ensure ongoing and future investment. This includes understanding the short- and long-term goals that your company is seeking to attain through the use of the CMDB, as well as the short- and long-term requirements, so you can ensure that your CMDB is being built not only for the present but for the future.

## Planning a Phased Implementation

While the long-term evolution of the CMDB will present a broad foundation for multiple management disciplines, near-term implementations need to be more focused, and in some cases may even be tactical. The ideal CMDB strategy will combine clear, tangible and reachable objectives, with a longer-term blueprint for growth.

### Questions to Consider:

#### Planning a Phased Implementation

- Which of the following areas are priorities for my company’s CMDB initiative and why? How do they prioritize in ranked order and why? (These are documented options in EMA consulting engagements with IT and service provider organizations.)
  - Change and Configuration Management
  - Disaster Recovery Planning
  - Security Audit and Compliance
  - Consolidation (Business Application, Server, and Application)
  - Service Assurance
  - Asset Management
  - Capacity Planning
  - Life-cycle Application Planning/ and Service Planning
  - Other
- Which IT processes do I need to/want to integrate through the CMDB initiative?

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- What internal and external constituencies are most likely to be impacted by these initiatives? How will they be impacted and what measurable objectives can be associated with these changes?
- What specific supplier relationships do I have to consider as they map to these specific initiatives? What processes and metrics do I have to put in place as a result?
- What internal constituency should likely own the overall corporate CMDB and why? What specific process and organizational concerns result once I've arrived at this answer? What resource issues do I have to consider once I've defined CMDB ownership?
- As an extension of the above, do I need to define a separate, "new" organization to own the corporate CMDB with its own metrics for accountability? (Note this can work well in certain environments but it is by no means a universally recommended policy.)
- What existing management related resources do I have in support of my CMDB initiative? What's missing and why?
- What solutions exist that complement my own investments the best to help drive a successful CMDB initiative?
- What vendor solution set do I wish to leverage as the core of my CMDB initiative? (Note this is increasingly becoming a litmus test for making a core strategic platform investment.)
- What pieces of the CMDB initiative do I wish to build in-house based on specific requirements and existing skill base? (Note, appropriate third-party solutions should take priority if they exist as EMA has documented long-term efficiency and cost gains from third-party solutions.)

Below are a few selected comments from the colloquium vendors:

"The CMDB needs to be evolutionary, using what customers already have, and it needs to be a catalyst to enable process maturity. In order to succeed, the CMDB needs to be a natural and realistic outgrowth of current IT processes and technology investments, as opposed to simply starting from scratch." (Managed Objects)

"We find our customers require integrations across management tools and data to achieve a complete, authentic and accurate management coverage and visibility. Correlating our configuration change data with fault isolation systems' data and associating it with a helpdesk ticket is something that customers do regardless of their CMDB strategy. The CMDB is widely seen as the single point that will bring together these disparate data sets together." (BladeLogic)

"We tend to see a '60/40' rule at work in most companies in terms of CMDB priorities today, with 60% continuing to favor an 'operations' focus for their CMDB. In other words, they are looking at CMDB technologies primarily in search of solutions for managing CIs for network, hardware, people and other more traditional components of the information system. Over time, we see a major shift in this equation. Increasingly, IT is being asked to take a more 'business supporting' perspective, which means the CMDB will need to become more application aware." (mValent)

"Our largest customers require scalability, real time change tracking and comprehensive data gathering. They realize that a CMDB is always as good as the data it contains." (nLayers)

## Assessment

In EMA dialogs and engagements with IT organizations, CMDB implementations have typically been driven by ITIL initiatives targeting critical pain points within the organization, such as change management and configuration management. This clearly defined first focus is natural and should be viewed as positive and healthy.

One of the surest ways to fail at a CMDB rollout is to focus on best-practices for best-practices sake – those objectives that sound good but which relate to real operational and business goals in only an abstract manner. IT implementers should make sure that their CMDB objectives are directly aligned with critical problem areas that, in and of themselves, have the attention of their executive management teams.

Once those problem areas have been identified, the key is to lay out a well thought out plan that defines logical CMDB phases, taking into account pragmatic implementation considerations, as well as the enterprise's priorities. Developing a phased implementation plan requires input from various constituencies in the company, in order to determine the company's priorities. Then, a logically sequenced plan must be developed, based on the company priorities and "what makes sense" from an implementation perspective.

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## Designing a CMDB

The question of how to design an effective CMDB, or more accurately, an effective CMDB system, is still a “work in progress.” While there are many points of consensus between vendors, there are still many fundamental areas of disconnect that have not yet been “vetted” by the industry because the CMDB is still in the early stages of its evolution. While the vendors in this colloquium are very different in focus, they are consistent in not representing pure framework perspectives, on the one hand, or narrowly defined or traditional point solutions on the other hand. Moreover, they are all innovators in CMDB support and design. These factors have produced a fair amount of commonality among them, even as they reflect some differing priorities based on process and market focus.

This section will address perspectives across the broad and significant issues of CMDB system design, data schema, auto-discovery, standards, policy-based automation, and other core technical issues.

## The Federated CMDB

Most of the industry has been surprisingly united in the belief that a federated system that includes multi-vendor sources of configuration data is, at a minimum, what is needed for CMDB design to succeed. CMDB demands integration across multiple management sources, virtually all of which have their own data stores with their own data schema. The issues inherent in this relatively simple fact present probably the single greatest challenge to planning and evolving an effective federated CMDB system.

The central goal is for the CMDB to be able to provide a single, cohesive source for multiple management applications to support multiple processes – in a way that is dynamically current, accurate, secure and deconstructable – i.e. the IT organization can retroactively audit management actions taken and even the contexts in which they were taken for purposes of planning, optimization, compliance and security. However, there is no such unanimity within the general industry about what a federated system means, or how it should be achieved. The suggestions throughout this report are, therefore, perhaps most notable for the overall consensus of directions and requirements across these five vendors.

## Questions to Consider: Federated CMDB

- Which of my existing management tools must be integrated into the CMDB?
  - Are they designed-for, or sufficient for CMDB integration?
  - How reliable are they in terms of the accuracy and accountability of data gathered?
  - How effective are they in terms of deconstructing data to show contexts for actions taken?
- What standards are used and how committed are my vendors to standards for the CMDBs being considered?
- How do the vendors of my management products define federation, and is my investment protected?
- How do CMDB-related management products integrate with other CMDB products?
- What are my priorities for CMDB federation in terms of:
  - Level of complexity versus quick deployment (e.g. many successful CMDB implementations build towards federation from a core, central CMDB that is, itself, largely sufficient for the initial CMDB task or discipline at hand. For example, a configuration DB focused specifically on change management for the data center.)?
  - Level of complexity versus resource available for administration and support – near-term and long-term?
  - Timeliness (e.g. how important is true real-time awareness for my top CMDB priorities?)
  - Scope – (breadth and complexity of CI's included)?
  - Data base design, performance and scalability – (for instance, in some cases vendors actually replicate data, in others, data is accessed dynamically and reconciled through policies)
- How does the notion of federation map to:
  - Pre-existing processes?
  - Existing or planned organizational dynamics?
  - Pre-existing or planned supplier relationships?

Since federation is at the heart of the CMDB industry discussions, as is evidenced below:

“A federated CMDB approach relies upon the integration of distributed asset, configuration, and CI management data into a single centralized command and control view without the need for replicating persisted data. An effective federated CMDB implementation provides capabilities to analyze, manage, and manipulate distributed CMDB data through mechanisms of bi-



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directional communication. Some vendors have changed the definition of federation and take the approach of populating a central database from different stores. This presents a number of significant challenges – ownership of data being just one example. In our view, this is replication rather than federation.” (Managed Objects)

“We provide an SDK with Web Services, and a shim code around our data store that will help translate and map our device-centric configuration information to broader CMDB service parameters. This shim code will enable us to support the metadata requirements for the various partner products with which we integrate. We see this shim code as being distinctive for each vendor we partner with, given the lack of standards today.” (Voyence)

“Federated models create multiple types of integration issues. Many of these focus around differences in the currency of data. We believe that the only way to solve this is time series data, so that data can be contextually integrated from a time of occurrence perspective. The access to such time series data can then be made available via a standards based SDK or a data exchange engine.” (BladeLogic)

And it’s worth noting that ITIL, itself, views the CMDB as a pragmatically federated system drawing from a breadth of existing information in various form factors:

“Many organizations are already using some elements of Configuration Management, often using spreadsheets, local databases, or paper-based systems. In today’s large and complex IT infrastructures, Configuration Management requires the use of support tools, which includes a Configuration Management Database (CMDB). Physical and electronic libraries are needed along with the CMDB to hold definitive copies of software documentation. The CMDB is likely to be based upon database technology that provides flexible and powerful interrogation facilities.”

## Assessment

In summary, CMDB federation is a widely accepted concept, but the details of what federation means and how it is to be accomplished across diverse products has not yet been agreed upon as an industry. The development of industry standards in this area is paramount to its success. IT adopters should therefore not expect to have a total, “hard-wired” answer today for what their

federated CMDB should look like five or ten years from now. Some thorough, long-term strategic planning, combined with pragmatic adoption based on near-term priorities, both need to be done in balance. This is an area to watch in the industry, and look for standards to emerge, while being demanding of existing vendors and suppliers reluctant to keep pace with industry change. Never select a CMDB vendor that is more interested in preaching than in listening to you. Your CMDB program will demand ongoing cooperation and dialog with your vendor suppliers to succeed.

One of the most important steps in effective CMDB planning is, in fact, defining exactly what overall resources need to be incorporated. While this will vary based on business objectives and their relevant CIs, virtually all CMDB implementers can expect to look for some basic coordinates. The following sections offer guidance on how to best determine these coordinates.

## Perspectives on Defining an Information Model: Configuration Items and Data Schema

Understanding the issues surrounding an information model within the CMDB are clearly of central importance in assessing technology options and planning CMDB deployments. But the first place to look for this is within ITIL itself – and its concept of Configuration Items (CIs), which, as defined above, must touch a wide array of sources within and beyond traditional IT – and map them to services and service management requirements. The next section presents some vendor perspectives on CI choices:

A critical activity for building a CMDB is determining the configuration items that should be included in the CMDB, based on the company’s objectives. Structuring the information model to handle the management functions that the CMDB will support is essential. The definition of the CIs is important from the vendors’ perspectives.

Closely related to the question of Configuration Items or CIs is another issue – how to represent them? At this point there is no singular answer to this in the industry, although the Distributed Management Task Force (DMTF)’s Common Information Model (CIM) is the most frequently referenced standard, and this report will delve more in depth on standards for data schema representations and other concerns. One of the more pervasive issues surrounding CIM, however,

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is that it is not complete when it comes to describing service and customer groups. It evolved initially as a means of instrumenting management systems devices for management – not as a means for defining service groups in all their infrastructure, operational and business complexity.

## Questions to Consider: Configuration Items and Data Schema

- What CI types are or will be included in the CMDB?
- What CIs are necessary to support the purposes for which the CMDB will be used?
- What purposes is the CMDB designed to support?
- What is the time sensitivity of the CIs required to support the end objective? (e.g. how often do they have to be updated to stay current?) Note – in some cases the answer is every 24 hours. In some cases, such as active service assurance, or dynamic infrastructure optimization, it's virtually real-time.
- What information can reside outside the scope of my initial CI's but still inform on it? (For instance, in many implementations, contractual information, or asset specific financial information, or trouble ticket details, reside outside the CMDB and are not treated as a CI – but the CMDB is linked to these resources so that when they impact critical parameters of CI status – e.g. SLA violations, an open trouble ticket on a CI, etc.)
- What kind of modeling or schemas do my CI's require and at what level of complexity – near and longer term? What kind of relationships must be captured and why? What standards are most likely to be relevant for me near-term and long-term?
- How dynamically and automatically can my CIs be populated?
- How can my CIs and their schema best optimize:
  - Immediate impact to services?
  - Immediate impact to consumers?
  - Automated triggers to operational policies?
  - Automated triggers to business policies?
- Is there a “skill set” or “services tax” to be paid for either integrating CIs and/or supporting complex modeling schema? (Be sure to understand what's provided via your vendor's own R & D versus what you need to do on your own, or pay for through extra services. One rule of thumb given the tendency for complexity in CMDB implementations – never invest in anything that you, yourself, don't first understand.)

Some vendor perspectives on defining CIs and their schema from the colloquium are as below:

“The decision about which assets are represented in the CMDB cannot really be made until companies arrive at a decision on what they need their CMDB to do. Once they decide this, they can start to envision how they will use it and come to decisions about what areas of operations and application management should be included and in what priority. Early adopters are starting out by evaluating current SLAs and slating assets that are directly tied to these agreements for CMDB inclusion first.” (mValent)

“The detail level of the CIs may not be equal across all entities in the CMDB. This granularity level is dynamic and is based on the business priorities (new projects, defected devices, troubled applications, data centers move, etc...).” (nLayers)

“Defining an information model and the CIs around management of a network is critical. The components must be modeled granularly, with distinction for where they live (in the network or a logical construct applied to the network) as well as logical entities in the network all the way up to logical entities in the business world and the relationships between the entities. If the components have been modeled granularly then the model will be extensible for growth of new services that rely upon the network.” (Voyence)

“Data schemas for the CMDB will have to integrate descriptive information with policy-related information in a meaningful modeled fashion. The managed entity, its context within the service, and the context for taking actions related to that entity all need to be modeled in a cohesive data schema,” (BladeLogic)

## Assessment

The definition of the CIs is a critical step for CMDB implementations. It is akin to laying down the foundation of a building, in terms of importance. Users should be very careful during this phase to make sure that the information model of the CMDB and the CIs that are included in it are designed to support all of the necessary management functions. Once again, success here will be predicated around a balance of near-term pragmatism with longer-term strategic vision.

You should also be aware that while you may incrementally build the scope and range of CIs included, settling on a

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data schema for your core CMDB is one of those strategic decisions that you can't put off – even knowing that it may evolve over time. Once again, look for vendors that are willing to work with you to communicate their approach and map it to your requirements in a way that address both functional needs, and administrative resource and overhead on your end.

## Integration and Data Reconciliation

It goes without saying that a CMDB demands integration across multiple management sources, virtually all of which have their own data stores with their own data schema. The issues inherent in this relatively simple fact present probably the single greatest challenge to planning and evolving an effective federated CMDB system. And these issues will be examined at various points throughout this report.

At core, however, it's important to keep the central goal in mind before getting lost in a sea of technical detail. The goal is for the CMDB to be able to provide a single, cohesive source for multiple management applications to support multiple processes – in a way that is dynamically current, accurate, secure and deconstructable – i.e. the IT organization can retroactively audit management actions taken and even the contexts in which they were taken for purposes of planning, optimization, compliance and security.

One core requirement is some level of data normalization – so that data can be accessed by management applications in a single consistent way. Similarly, data normalization provides a common landscape for representing CIs so that services can be more effectively modeled.

Data reconciliation is another challenge. Because many IT shops have a lot of management tools that provide discovery capabilities that are redundant to one another, the challenge is to reconcile the collective data so that the wealth of data is available, while maintaining the integrity and quality of the CMDB data as data is added, updated and removed from the CMDB. Data reconciliation must address the unification of disparate data that is reported for the same CI, ensuring that a CI is correctly identified despite the fact that different management tools have named the same CI differently, reconciling the time dependencies and disparities of the data, as well as maintaining the ability to link and synchronize to extended data about a CI in response to a request from the enterprise level CMDB.

### Questions to Consider:

#### Data Integration and Reconciliation

- Where is integration and reconciliation required, near- and long-term – and where is it not as much a priority? (Note: This is at the core of planning a phased implementation of a CMDB. Integration for its own sake is not necessarily good. Integration in support of operational and business requirements as defined initiatives is what makes sense.)
- How big a bite across heterogeneous data sources am I willing to take near-term? Long-term? Based on:
  - Meeting my key objectives for phase one CMDB implementation and beyond?
  - Existing and planned resources for CMDB administration?
  - Existing and planned management software investments directly relevant to the CMDB?
  - Database performance and scalability?
- If I do have a “core” CMDB already in place, how does it currently address integrating and accessing other data sources? How is that likely to change or improve over time?
- If I have not yet selected a “core” CMDB, what vendors best meet my data integration and reconciliation needs?
- What standards, existing and emerging, must my CMDB solutions address?

Following are some of the vendor perspectives on data integration and reconciliation:

“There are time dependencies for certain types of tasks – such as polling or generating a syslog and SNMP traps. This information may need to impact information in the CMDB and will require a reconciliation engine that is based on source. In particular, if the same device is showing up differently from different sources – in terms of discovery or events.” (Voyence)

“The biggest task of the CMDB is reconciliation and data quality index management. Integrating many sources of data, physically and referentially, you have different classes of data with different data models and topologies but with some common similarities. Reconciliation is required to determine if you're fulfilling the requirement for attributes to have the information that you need about the CI. The data quality – is it accurate? And how up-to-date is the data? What is your confidence level, or your data quality index? Am I fulfilling the requirements for this class of CI? If the data is not what it needs to be, that means managing a re-delegation of the data back to the data owner to cleanse it or keep it up-to-



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date. The index is variable depending on the customer's requirements – which CIs are most important, and different CIs have different granularity of information.” (Managed Objects)

## Assessment

Data integration and data reconciliation are, like planning a data schema, at the very heart of a federated CMDB. And once again, we are in early phase answers across the industry, as standards and technology are catching up. There is virtually a one-to-one correlation between the breadth of CIs supported, and even more so – the breadth of tasks or management processes supported – and the need to address the challenges of data integration and reconciliation near-term. A phased approach will allow you to address these challenges in a staged manner, over time, and the place to begin is, once again, by prioritizing based on process/task/discipline/business objective. Once you have your answers in those areas, you can plan and stage next step actions.

## Auto-discovery

Dynamic, current, accurate, service-relevant, adaptive, scalable, etc. auto-discovery is one of the holy grails surrounding the CMDB. (It is a testament to the challenges of the CMDB that it holds more than one “holy grail” requirement.) Theoretically, this would introduce a consistent and current set of insights across:

- The physical and logical network
- Systems and application components
- Detailed configuration information for each device or software component
- Relevant modeling of infrastructure to service
- Relevant modeling of service to consumer population
- Relevant modeling of business impact
- Relevant modeling of associated dependencies (service contracts and objectives)
- Relevant modeling of operational dependencies (who does what and when)
- Relevant insights into consumer consumption behavior so that operational and service planning can be optimized
- Etc.

In other words, in the perfect world, auto-discovery would provide nothing less than the complete, cohesive and totally current population of a federated CMDB system. Moreover, the technology that would support this “auto-discovery” would be facile to deploy and adaptive to change with minimal administrative overhead. (Alright, virtually no administrative overhead.) And while this is clearly a long way out, the industry has produced a significant set of innovations already.

## Some Questions to Consider: Auto-discovery

- What existing auto-discovery capabilities do I have and how might they support my CMDB plans?
- What are my real-time versus non-real time requirements for populating and updating CIs within my CMDB? (Note, depending in primary emphasis, a central CMDB may be updated every 24 hours, while more operationally focused tasks are dynamically populated in real-time. Conversely, in some deployments, the core CMDB is real-time with access to less real-time sources which provide updates at defined intervals, and which can be accessed on-demand.)
- What CIs, or CI qualities, can be manually updated near-term and long-term?
- What is my comfort level with agents and agent deployments?
- How important is configuration detail versus overall topology and service health for my phase one needs? (Note, it may be more important when the first phase CMDB implementation is directed at change management versus service assurance.)

Below are several vendor perspectives addressing auto-discovery and the CMDB placed in context.

“Within the industry, there are in general three approaches:

- Agents are probably the most traditional. Agents can provide critical detail and at times actually actively manage devices, but in very large and complex data center, installing thousands of Agents is a significant and unnecessary effort.
- Agentless Polling – can be another rich source of information, but it can create time gaps. No polling, including traditional SNMP provides real time change tracking. In most cases each particular server would be polled once a day and all changes happen in between would be lost or not monitored immediately.

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- Agentless Passive – provides a continuous picture of the networked infrastructure, its interdependencies and service usage in real time. However, it can not always provide the detail needed in looking at configuration specific information, for instance, within a device. It is the best approach for scalability and ease of use, but should be complemented with Agents or Agentless Polling to provide detailed information

Therefore, the best approaches to auto-discovery typically include mixed approaches, or hybrids.” (nLayers)

“One way to look at discovery requirements is across three tiers. Tier 1 is represented by the technology elements and the way they are related to one another (siblings). Tier 1 tools are largely in place today. Tier 2 is the association and grouping of technology elements to formulate composite applications and defining the associated element interrelationships. It’s also important to incorporate referential links back to associated business processes, so that the perspective becomes not purely technical – but rather a logical representation of a larger IT or business service. The third tier is the actual service definition – the logical representation of the actual business service being managed. You can’t discover that. The interesting challenge is how you glue the business logic to layers 1 and 2, and how they all get mapped to the service layer.” (Managed Objects)

“To the greatest extent possible, automation is critical. It is important to be able to automate the existence of CIs (through auto-discovery), as well as populate their properties, and their interrelationships – how they support the topologies.” (mValent)

## Assessment

An effective auto-discovery strategy is required for a successful CMDB deployment, but auto-discovery can mean many things and support multiple types of objectives. Once again, prioritizing what your core CMDB requirements are for initial phase deployment will dictate choices in auto-discovery. You should be aware that there is a high volume of technical innovation in the auto-discovery arena in both the discovery of application ecosystems and their interdependencies, and in systems and network device configuration discovery and management. If you’re serious about a CMDB implementation, you should take the time to investigate these developments.

## Policies and Policy-based Automation

Policies, while a core part of CMDB planning, go far beyond the data store itself and become realized in application software and human actions based on business goals and process. In other words, the CMDB can be a central departure point for codifying and maintaining policies, and even for initiating automated (and non-automated) actions surrounding them. However, the CMDB remains a core enabling component – not the full story here.

### SLA Policies

Familiar to most in IT, but still an area in much need of growth and evolution, SLA policies are central concerns within the CMDB – as they become the inflection point between committed service (and technical performance) objectives and shifting states within the actual IT infrastructure, or conversely, the consumer/customer behavior. SLA policies need to be able to include multi-tiered relationships in which supporting services and their performance are mapped to end-business services and objectives. This includes in-house and outsourced services. Similarly, they will need to capture user experience versus raw technical objectives that are measurable, but at best only remotely relevant to business and consumer impact.

Modeling these policies in relation to their constituent CIs will be critical to the long-term success of a CMDB, especially where service assurance is one of the core objectives.

### Policies for IT Governance

IT governance is a core objective for any CMDB implementation – in that the CMDB is “all about” enabling a trusted and consistent way of working. Whether the focus is asset management, service assurance, configuration and change management, or application provisioning, or whatever, failing to leverage the hard work put into a CMDB in terms of tracking, optimizing, and auditing operational best practices would be a huge oversight. Modeling hooks for “deconstructing” how actual workflows and actions taken across the IT organization are impacting service quality and cost are therefore a must for vendors serious about participating in the CMDB marketplace. Governance should also include insights into the customer side – into patterns of service consumption as actual service providers have been doing for years – as one of the vendors here points out.



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## Compliance Policies

Closely aligned with IT governance, and in many respects dependent upon it, are compliance policies directed at external legislation and internal business behavior – e.g. “thou shalt not install Kazaa.” In reality, IT governance policies are a form of compliance, just as SLAs reflect compliance of a very different kind. But for clarity’s sake, “compliance” is being used here to refer to IT compliance with legislation such as Sarbanes Oxley, Graham-Leach-Bliley, and HIPAA. In general, CMDB modeling that captures IT governance policies can provide auditing in support of this legislation – in many cases without requiring significant or even any extensions. However, there are some distinctive requirements to audit, for instance, end user or consumer access, or monitoring data privacy for certain types of data – that once again will require effective schemas for modeling compliance-sensitive CIs in relevant contexts.

## Policies and automation

Policies are also the key to enabling automation within the environment in a consistent and on-going manner. The policies define what needs to be done in response to an existing condition, which allows actions to be taken as the environment changes. Many users are suspicious of allowing automated actions to be taken without human intervention, while other users know that they cannot live without automation helping them to do their jobs. However, within the CMDB context, as best practices are defined and tested, and in some cases, stored in the CMDB, this may be a catalyst to encourage the use of automation in a controlled and prescribed way. Automation that is applied in intelligent ways can have a big impact on the effectiveness of management of the IT infrastructure. So it is through policies that automation can be defined intelligently, consistently and selectively.

### Questions to Consider:

#### Policies and Policy-based Automation

- What policies do I already have in place and how do they relate to my CMDB initiative?
- What vehicles do I have to enforce current policy and how can my CMDB initiative enhance those vehicles?
- What work needs to be done to define policies relevant to my CMDB initiative? Who owns this challenge? What executive stands behind it? What resources are available to support it?

- What is my current comfort level with automated approval versus software-centric automation?
- If I am willing to invest in software-centric automation, are the solutions I’m investing in able to show a deconstructed context for why and how automated actions were done? In other words, can I generate a report to audit how both my software and my staff “behaved?”

Policy-based automation is another area that is already stimulating significant innovations within the industry. Some vendor perspectives from the colloquium are presented below:

“Currency of information and change tracking are the key current challenges for automation. The discovery of assets, detailed configurations, and dependencies on services and applications – and creating a baseline around the application for ‘normal behavior.’ What, in general, it behaves like and how the supporting elements contribute to that behavior. If things change in ways as anomalies – then of what magnitude are they? How will it impact the business application? Continuous and real-time discovery of server and service relationships and dependencies, and also demand and usage let you build a foundation for analysis and capacity planning. So the two keys are real-time and continuous discovery, and currency of information.” (nLayers)

“Keeping track of changes (authorized and otherwise), their type/frequency is key to evaluating CIs for: their usage; contribution weightage to service uptime (and downtime) with respect to the services they support and compliance levels achieved (and compromised). All this helps in measuring overall IT alignment against business objectives.” (BladeLogic)

## Assessment

Defining relevant policies in association with a CMDB initiative is another primary requirement. Policies differ from processes in that they are proscriptive, where as processes are a descriptive lexicon of what types of actions need to be taken and how they are interrelated. It is in the descriptive arena that ITIL is focused. Levels of automation need to be assessed in terms of comfort level and requirements. EMA research has documented that comfort levels with automation tend to lag behind technology advances. So don’t pre-censor potential innovations in integrating software automation to

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enable policies, especially those that are routine or operational in focus.

## CMDB Standards

The CMDB must leverage the management data that already exists in customer environments, despite the fact that this management data may be produced by a variety of management vendors' tools and formats. Industry standards also allow IT organizations to protect their existing investments in management tools, by allowing the integration of their existing management data into their CMDB strategy.

The need for standards is especially important because as vendors develop their approaches to the CMDB, many are using ITIL as a guideline, but they are extending beyond ITIL. Once again, this is because ITIL is process oriented and descriptive, not architectural in nature, on the one hand, or proscriptive, in terms of policy – on the other.

However, the roadmap beyond ITIL remains rocky, indeed. The evolution of the CMDB is still in its infancy, and as such, there are no CMDB specific standards that have been developed. Most management vendors have been developing their CMDB strategies and CMDB products using existing standards, in the hope that they will be well positioned as the evolution of the CMDB continues to develop. Many vendors are using the Distributed Management Task Force's (DMTF) Common Information Model (CIM) as the basis for their CMDB schema, in the absence of a CMDB specific data model standard.

For the purpose of interoperability, the data is either kept in XML format or is offered in XML format through an API. And in some cases, these APIs have been web-enabled. However, beyond standards such as CIM and XML, there are no CMDB specific standards.

This isn't to say that there aren't industry standards initiatives that may be applicable to the CMDB, but the evolution and adoption of these approaches still remain to be seen. It is advised that IT pay attention to some of the more notable standards actions in order to gain insights into where CMDB development could be headed.

Overall, the developing web services specifications hold promise for many in the vendor community as the standards that will enable interoperability and integration for the CMDB. These include, for example:

- **DCML (Data Center Markup Language)** - An open, vendor-neutral language developed under sponsorship of the OASIS DCML Member Section, used “to describe data center environments, dependencies between data center components and the policies governing management and construction of those environments. DCML provides a structured data format to describe, construct, replicate, recover, and communicate about data center environments. DCML encompasses a wide array of data center elements, including UNIX, Linux, Windows, and other servers, software infrastructure and applications, network components, and storage components.” (Source: OASIS, with slight modification by EMA)
- **WS- CIM (Web Services Common Information Model)** - A Distributed Management Task Force (DMTF) standard. As described by the DMTF, the Common Information Model defines “a common data model of an implementation-neutral schema for describing overall management information in a network/enterprise environment.” (Source: DMTF)
- **WSDL (Web Services Description Language)** - A W3C standard for defining an XML format for describing network services as a set of endpoints operating on messages containing either document-oriented or procedure-oriented information. The operations and messages are described abstractly, and then bound to a concrete network protocol and message format to define an endpoint. Related concrete endpoints are combined into abstract endpoints (services). WSDL is extensible to allow description of endpoints and their messages regardless of what message formats or network protocols are used to communicate; however, the only bindings described in WSDL Version 1.1 reference how to use WSDL in conjunction with SOAP 1.1, HTTP GET/POST, and Multi-purpose Internet Mail Extensions (MIME). Version 2.0 of the standard is currently in draft. (Source: W3C, with slight modification by EMA)
- **WSDM (Web Services Distributed Management)** - An OASIS standard for defining a Web Services architecture to manage distributed resources. WSDM embraces two sets

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of specifications: WSDM: Management Using Web Services (MUWS); and WSDM: Management Of Web Services (MOWS). WSDM MUWS defines how to represent and access the manageability interfaces of resources as Web Services. WSDM MOWS defines the manageability model for managing Web services as a resource and how to describe and access that manageability using MUWS. WSDM Version 1.0 was adopted as an OASIS standard in March 2005. (Source: OASIS, with slight modification by EMA)

## Directories and Security

The integration of configuration data from disparate sources, coupled with the need for integration between a plethora of management tools that touch the CMDB data, as well as the need for employing automation that leverages the CMDB, sets up a scenario where the integrity and security of the management data is essential, as well as having the assurance that the source of the data or management action requests is authentic. Since many IT organizations already have at least one, if not many directories in existence within their infrastructure, integrating with LDAP-compliant directories or vendor specific directories like Microsoft's Active Directory, is a logical integration point for authentication and authorization issues. Identity management solutions also play as key pieces of the authentication and authorization puzzle, in addition to the issues related to provisioning of identities.

## Conclusion

The intent of this colloquium of vendors and EMA was to shed some light on current perspectives on the CMDB, as well as what can be expected in the future. As IT organizations evaluate their alternatives for the CMDB, it is important to first understand the role that a particular CMDB plays. There are CMDBs that will be at the enterprise level, that serve as a higher level view of configuration data. There are also other specialized CMDBs that contain more detailed and specific kinds of configuration data.

For the enterprise level CMDB, architecture is an essential consideration, in order to ensure that as the CMDB matures, that its architecture has the ability to evolve and morph with the change that it will undoubtedly undergo as the CMDB and the market

progress. In addition, standards and integration with other management technologies are core to the ultimate success of the CMDB.

Then for the specialized CMDBs, the architecture is also essential, as well as the flexibility to integrate with other management technologies. Interestingly, all of the vendors involved in this CMDB colloquium focus on automation – this is because of their view that automation will be enabled by the CMDB, and it is also an essential part of leveraging the value from the CMDB. Their approaches are model-based because the models provide the necessary structure to better control and manage configurations and changes to those configurations, as well as repeatable and consistent actions that can eventually be automated if the user chooses to do so. And although architecture is important, even more essential for specialized CMDBs is the ability and willingness to embrace standards, integration and interoperability with management tools at the enterprise level, as well as other specialized management tools.

As discussed in the paper, IT organizations must raise the call for the development of CMDB standards. The maturation of the CMDB must take place within the context of standards, rather than as a retrofit because vendors were too slow to begin the development of standards. Without standards, the CMDB is doomed to deal with severe limitations, forced groupings of management solutions, or even failure to achieve its potential.

The ideas discussed in this paper offer a starting point for sorting out the important considerations despite the confusion that is in the market regarding CMDBs today. The CMDB holds the potential for being a disruptive force that can change the way that IT management will be done in the future. The key for IT users is to understand where it is headed and what they need to do today to prepare for the future.

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