UNISYS

The Unisys Hybrid Enterprise

A Smarter Approach to Cloud Computing for Federal IT Transformation

White Paper

Cloud computing is, arguably, the most important shift in IT strategies the industry has seen in the last 25 years. And while the economies and business agility promised by this new computing paradigm may prove too compelling to deny, organizations that do choose to enter the cloud often find themselves asking such critical questions as:

- Is a public or private cloud solution better suited to our unique business needs?
- Can enterprise-level applications take advantage of the cloud without compromise to regulatory and compliance mandates?
- How can we integrate cloud computing into our existing IT operations without compromising what's already in place or increasing our operating costs?
- Can we integrate cloud resources without adversely affecting security?

Although the challenges may appear daunting, Unisys stands ready to help you bring cloud computing into your traditional IT environment in a way that is efficient, integrated, and operationally sound. This embodies a strategy we call the Hybrid Enterprise – the foundation for a future-state data center environment that is borderless, virtual, automated, visible, and secure.

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Abstract

Cloud computing is a strategic area of focus for CIOs and senior business leaders due to the overwhelming agility and economic advantages of this new model of IT delivery. In fact, due to the significant cost savings compared with traditional IT deployments, many government agencies, as well as commercial organizations, now have a “cloud-first” mandate when evaluating new IT services. Recently the U.S. Office of Management and Budget (OMB) released guidance directed at the adoption of “light technology” like cloud computing while at the same time calling out for a large reduction in the number of traditional data centers through consolidation and virtualization. It seems clear that by the year 2015, CIOs will be managing a complex mix of resources and technologies all in the pursuit of lower costs and greater agility.

Cloud computing is highly disruptive to traditional data center operations due to its on-demand, pay-per-use, flexible and scalable model for service delivery over the Internet. This instant-on utility model for IT services is very similar to the electrical power grid as we know it today and often compared. After having seen cloud computing technology prove itself for tactical and departmental enterprise applications in recent years, many organizations are now ready to exploit the benefits of the cloud in the context of their data center operations for mission-critical workloads. Before this can occur, however, organizations need to address the barriers to cloud adoption in three core areas of applications, data centers and IT management.

Since enterprise IT workloads have highly varying requirements—some suited to cloud deployments and others to traditional deployments within the data center and outsourced—we believe that the data center of the future will need to operate not solely in a cloud model or in a hybrid cloud model comprised of multiple cloud entities, but in a hybrid enterprise model. This hybrid enterprise model consists of internal and external infrastructure—some deployed as clouds and others more traditionally operated with a mix of general purpose and specialized functions.

To address the barriers to cloud adoption and enable organizations to truly exploit the benefits of cloud computing, a Hybrid Enterprise framework is required that comprehensively addresses strategic considerations across applications, data centers and management. Within this framework, a workload placement decision model is required to characterize applications and drive placement decisions so workloads can run on the optimal infrastructure. A consistent approach is required for building and evaluating data center characteristics– one that meshes with the application demands – and which optimizes the data center footprint across cloud and non-cloud delivery models, and which minimizes complexity. Finally, a single management environment is required that provides a set of controls to manage governance, risk, compliance, services and costs across all infrastructure types.

Trends, Challenges and Opportunities

Starting with the emergence of Software as a Service (SaaS) delivery models a decade ago, and continuing with the Infrastructure as a Service (LdaaS) and Platform as a Service (PaaS) explosion of the past few years, cloud computing has benefited IT organizations and the businesses they serve in several fundamental ways. Firstly, there is an enormous gain in agility and flexibility through cloud-based delivery models. IT’s capacity to quickly provision and deliver new systems via traditional models is often severely constrained, even in good economic times. When IT value can be realized in days or even minutes through elastic resource provisioning via the cloud, a business’s ability to respond to changing market conditions or to capture new opportunities is dramatically elevated. Secondly, a cloud model can also lead to economic advantages. Most traditional IT investment is fixed in nature – capital expense for hardware and software, long-term leases for data center space, and so on. These are harder costs to eliminate in a downturn, adding additional pressure on IT staffing. In contrast, cloud-based services can often be procured with no long-term commitment, allowing capacity to scale down as soon as it is no longer needed. This “elasticity” reduces pressure on staffing during a

downturn and allows for high levels of control over how much capacity is used and paid for – often down to the hour.

For example, in a private cloud scenario, where cloud infrastructure is hosted within the organization as opposed to externally, economics are gained through key factors such as automation, consolidation, virtualization and a move to self-service provisioning. All of these factors reduce the need for labor in the data center, with more and more of the functions being performed through scripts and automation solutions. Consolidation and virtualization reduce data center footprint including real estate and energy costs. A private cloud, done right, is just a far more cost-efficient model for IT infrastructure delivery than traditional models.

An Abundance of Challenge

Despite the compelling benefits of cloud computing, by the year 2015 much of our infrastructure will still remain behind the "firewall" and relatively unchanged. The new IT delivery models mentioned above will create both a positive impact and a considerable number of challenges for senior IT leadership and their staff. New IT operations management tools will be needed to manage these more efficient environments, new security challenges will emerge, changes to processes, budgeting and policy all will be part of the transformation thrust upon CIOs. See more CIO challenges in Figure 1.

The Evolution of the Hybrid Enterprise

In addition to gaining the agility, economic and service benefits of cloud computing, today's organizations recognize that they will continue to maintain a lot of on-premise infrastructure and will continue to operate existing applications and require methods to integrate them with services in the cloud. In addition, these organizations typically run a variety of application workloads ranging from administrative to mission-specific – each with their own unique requirements for service levels and support. By their nature, these workloads have varying degrees of suitability for cloud or non-cloud deployment models. The future of the data center is therefore a hybrid model – with a combination of internally and externally managed IT resources, some cloud, some outsourced and others more traditional as illustrated in Figure 2.

By way of Unisys definition, a Hybrid Enterprise is a composition of cloud, non-cloud, internal and external IT service delivery models that remain unique entities but are bound together by an integrated management environment, and common technology, processes and policies to optimize agility, enable data and application portability, and reduce risk.

By 2015 Federal CIO Challenges will be in abundance

- Security
- Responding to regulatory rules, audits and compliance in the new delivery models
- Infrastructures outside of their control
- Resistance to sharing resources by their customers
- Difficult to move legacy and enterprise applications into the cloud
- Concerns over data segregation (silos)
- Changes to the budgeting and cost recovery models
- Vendor lock-in
- Funding and acquisition process that matches the pace of change
- People skills and availability

Figure 1 – CIO Challenges in 2015

Not all organizations will utilize all deployment models (and in fact there are more than this simple illustration shows), but this hybrid approach will be prevalent in larger commercial enterprises, federal and public sector entities.

Hybrid Enterprise – Building the Data Center of the Future

The Office of Management and Budget (OMB), December 9, 2011- 25 Point Implementation Plan to Reform Federal Information Technology Management outlines a number of practical directives and recommendations including two major initiatives for federal CIOs. The effort to accelerate the consolidation of data centers across the federal government and the movement to adopt "light technology," specifically cloud-based resources, are the most ambitious of all. The fact that the plan calls for both of these initiatives to happen simultaneously is a significant acknowledgement

that most federal IT organizations will retain a considerable (although smaller) inventory of on-site resources through the year 2015, while cloud adoption will continue to penetrate the infrastructure, permanently changing the way IT resources are managed.

As server virtualization and cloud computing has emerged, so have the potential number of IT delivery models, resulting in a mix of internal and outsourced data centers resources. Internal private cloud, hosted private cloud, federal government and public cloud models all present different cost and performance implications giving federal IT leaders a choice in where workloads are placed and new capabilities for the future. Federal IT organizations can't ignore the potential benefits of cloud computing nor can they compromise on their mission. But the adoption of cloud-based resources is met with some resistance due various issues including security, compliance and complexity.

This has led to the emergence of a new way of thinking about the IT architecture and the business models for the year 2015. The new model, the Hybrid Enterprise helps avoid creating an isolated "cloud in a corner" environment that does not integrate with an organization's existing mission-critical systems and allows IT organizations to take full advantage of the cloud business model in its many forms.

The Hybrid Enterprise Strategy

To help federal IT organizations maximize the value of cloud-based resources, Unisys has created a Hybrid Enterprise framework and 8-Track cloud adoption methodology enabling you to establish a roadmap and detailed implementation plan that is tailored to your organization's specific business needs and desired outcomes. We bolster this approach with a perspective that takes special care to manage the cloud transformation across people, processes, policies, and technologies – enabling you to maintain control, manage governance and compliance, reduce IT costs, and address both current and emerging operational requirements with confidence. To this end, our Hybrid Enterprise framework pays close attention to your IT operations, policies and security.

The Hybrid Enterprise strategy suggests that three core strategic principles be applied using an integrated approach. The three core principles focus on applications, data centers and IT management and suggest that IT organizations should:

- **Applications** – Apply a formalized "fit-for-purpose" approach to ensure that workloads – mission-critical and otherwise – are analyzed and placed into the most appropriate environments.
- **Data Centers** – Have a consistent evaluation and integration methodology for any IT resource including internal private clouds, cloud providers,

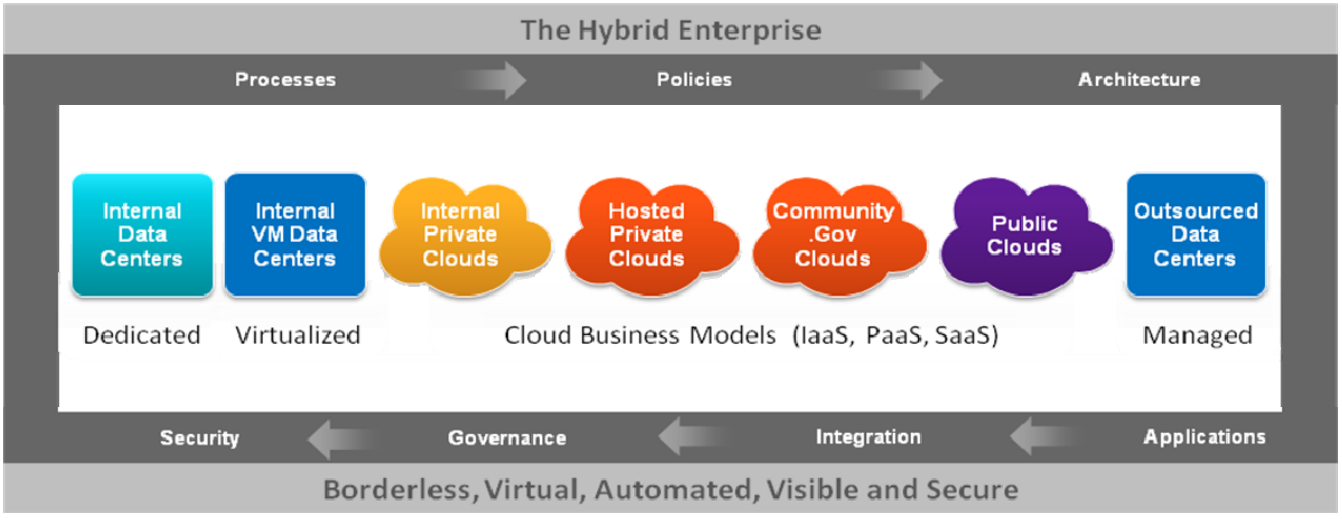

Figure 2 - The Hybrid Enterprise

managed services and outsourcing. The new Hybrid Enterprise should optimize the data center footprint across all delivery models – minimizing complexity without compromising control.

- **IT Management** – Employ a comprehensive approach that unifies the management of the Hybrid Enterprise and consistently addresses key process areas for all traditional and cloud delivery models

Moreover, the Unisys vision for the Hybrid Enterprise is supported by an enterprise-class, technology- and vendor-neutral portfolio of services and public and private cloud solutions that helps you realize the business and IT benefits this compelling computing model has to offer.

enterprise strategy – one that employs multiple IT service delivery models, not just cloud, and which considers cloud computing in the full context of the data center – is for CIOs to consider three core areas within their hybrid enterprise framework: Applications, Data Centers and Management (Figure 4). It's only when this common hybrid enterprise framework has been applied that the cloud really starts to make sense for mission-critical systems.

- **Applications** – Since no single deployment model is right for all workloads, a formalized "fit-for-purpose" approach is needed to ensure that workloads of all types are analyzed and correctly placed into the appropriate delivery environments within the Hybrid Enterprise. A workload placement decision model will be or dynamic placement decisions so workloads can run on the optimal infrastructure.

Figure 3 – Hybrid Enterprise Framework

Introducing the Hybrid Enterprise Framework

Cloud computing touches nearly every aspect of IT. Any foundational cloud strategy needs to address considerations related to governance, security, integration, processes, policies, applications, and architecture. The next step as you progress to a hybrid

- **Data Centers** – In the context of the data center, you need a consistent approach for building and evaluating data center characteristics – one that meshes with the application attributes – the placement decision model – and that optimizes the data center footprint across cloud and non-cloud delivery models without breaking processes, and which minimizes complexity. The Unisys 8-Track

methodology (Figure 5) is designed to apply to all delivery models and covers management tools and processes, financial policies, tools and approaches, physical and virtual architecture design, security, storage, network engineering, ITIL / ITSM, and support services. This comprehensive methodology goes beyond the deployment of the "cloud-in-a-box" vendor implementations by integrating new infrastructure resources such as internal private clouds or public clouds into your existing infrastructure and operations.

- **IT Management** – You need a comprehensive approach to unify the management of the Hybrid Enterprise as opposed to a single product or technology. Management needs to provide an integrated framework that addresses five key process areas for all traditional and cloud delivery models: security and risk management, monitoring and event management, financial management, service management, and policy and governance. The goal is to promote consistency on how each of the five process areas is managed across the complete Hybrid Enterprise model.

Overall, the Unisys vision for the Hybrid Enterprise provides static and dynamic workload allocation to the most optimal infrastructure, a reduced and optimized data center footprint via cloud technology, and a "single pane of glass" management stack for both cloud and traditional infrastructure.

Figure 5 – Unisys 8-Track Methodology

Addressing the Challenges

As multiple cloud models emerged alongside traditional delivery models, CIOs will need to grapple with fundamental issues such as less control over infrastructure and service levels, greater risk of exposure to security, governance and compliance pitfalls, organizational change and process issues, and potentially higher costs due to complexity, skills and resource issues. While the benefits of cloud systems are very compelling, no shift in computing models is without its challenges and risks so CIOs need to address the following areas within the broader context of multiple deployment models – cloud and non-cloud:

- **Governance** – When systems are deployed inside the on premise data center, IT staff have nearly complete control over factors such as capacity, service levels, security, access, and data. In a public or hosted private cloud model, many of these factors are no longer directly under IT's control. Instead,

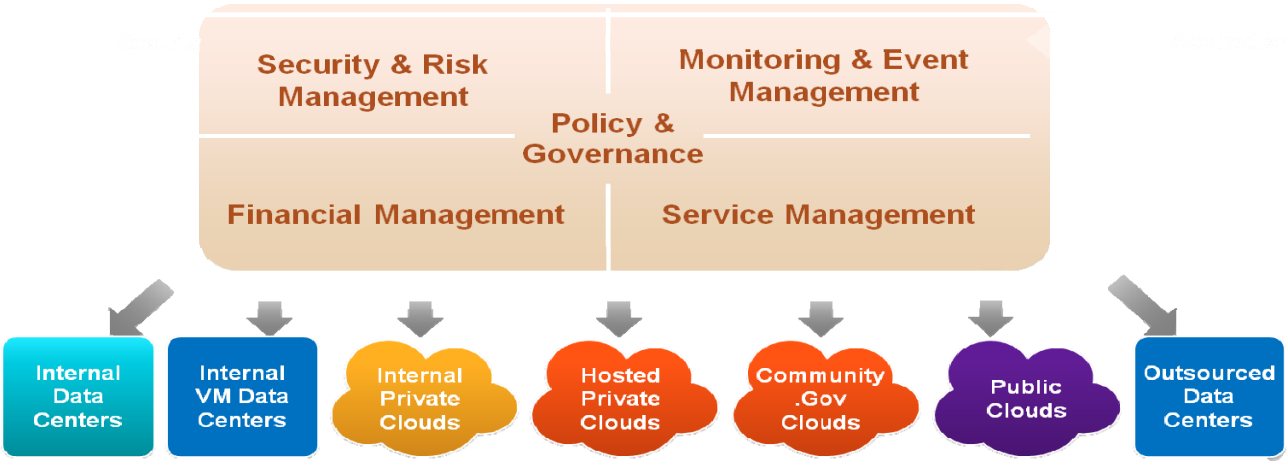

Figure 4 – Due Diligence Continuity

these factors are now managed by external service providers with greater or lesser degrees of transparency. An (on premise) internal private cloud, however, provides some of the benefits of public clouds while minimizing the impact on these control factors. But even an internal cloud will require new skills, tools, and changes to procedures and policies.

  - Maintain the same level of due diligence for security, operations and planning when incorporating resources outside the direct control of your staff. Governance continuity across all of these delivery models is key to resource management in the Hybrid Enterprise
  - Establish a governance framework that will adapt to new IT operations management tools and delivery models as they emerge
  - Leverage automation software, secure managed services or a combination of both to maintain consistent standards for service management
  - Monitor cloud standardization efforts from organization such as NIST, DMTF and CSA

- **Security** – In addition to the well-known security concerns with regard to cloud, it's important to look at the broader picture around Governance, Risk and Compliance. GRC extends beyond just physical control, but also deals with access, information security, audits, regulatory and policy compliance. A heterogeneous hybrid cloud and data center environment increases the complexity and level of difficulty of achieving GRC goals as well as security goals.
  - Establish consistent GRC policies for both on-premise and vendor controlled resources
  - Continually monitor and evaluate security threats for service providers as you would your internal systems – don't assume vendors provide the same level of GRC discipline as you would

- **Integration** – Cloud deployment increases both the importance and difficulty of integration between systems. SaaS applications have varying levels of integration capabilities with little to no control over the underlying data models. Integrating in-house applications with those running in IaaS and PaaS environments can be impacted by Internet latency and other performance issues.
  - Leverage emerging monitoring, analysis and IT control tools from cloud service providers and third party vendors
  - Create and maintain a Concept of Operations (ConOps) document as a supplement to your enterprise architecture plan – A robust ConOps provides a guide for integration, performance and capabilities as new tools are introduced over time
  - Be prepared to integrate best-in-class software on your own or through an experienced systems integrator like Unisys – today no one vendor does it all, so integration often falls to IT staff

- **Interoperability** – Few, if any, true standards exist in the cloud today. The user interfaces, APIs, and data models can vary widely between even outwardly similar cloud solutions. PaaS environments, in particular, often result in very high levels of vendor lock-in. Code written for one PaaS environment can only run in that framework and cannot be made to operate elsewhere. IaaS, on the other hand, rarely results in more than a minimal amount of lock-in. Even with incompatible virtualization and deployment models, IaaS-based applications and data can almost always be moved to another cloud provider or even brought back in-house if needed. Interoperability is critical for the long term should a provider default on their Service Level Agreement (SLA) or become financially unstable or expensive.
  - Incorporate portability into your backup and recovery plan; test your procedures before you are forced to test them during a failure; clouds are yet to be proven to be as reliable as traditional infrastructures
  - Maintain a working knowledge of interoperability standards and ask service providers to adopt standardized APIs and protocols

- Consider open source providers when integrating elements of your hybrid architecture; open source providers tend to lead adoption of standards in their products but beware -- sometimes you get what you pay for with open source products

- **Applications & Architecture** – One of the biggest challenges in cloud adoption is moving existing enterprise applications to the cloud. Besides remote administration, integration and multi-tenancy challenges, applications that will be migrated to the cloud often need to be re-architected to take full advantage of the elasticity of the underlying infrastructural resources. In addition, some applications are simply best-suited to remain on traditional infrastructures – something that is recognized and addressed by the Hybrid Enterprise approach.
  - Applications which are being considered for migration to the cloud should be attributed for infrastructure and business dependencies
  - Establish a standardized process for application assessment of dependencies
  - Maintain an extended configuration and dependency catalog for each application – as new providers or capabilities emerge, reevaluate applications for migration
- **Processes** – Recent years have seen significant advances in the ability to automate IT processes and systems management tasks. Configuration management, key to many compliance standards, has also progressed. Most of these technologies, however, are poorly configured to work with cloud-based systems and deployment models. Conversely, new cloud management and automation tools rarely apply to internal systems. Until a unified IT automation approach that spans a hybrid environment is developed, IT will be forced to maintain a collection of tools, scripts and skilled resources to address management needs
  - Leverage best-in-class IT process automation software to maintain a library of management automation scripts – document the related process flows carefully and completely so that these processes can be interoperable
  - Establish a policy for the rigorous use of the services catalog and Configuration Management Data Base (CMDB)
  - Use industry APIs and open source tools to automate cloud service providers for a single-pane of glass and integrated monitoring
- **Policies** – When IT is running the infrastructure and application, they can provide assurances that performance, availability and data quality commitments are met. When some or all of your infrastructure or applications are running in the cloud, IT has very little control over the delivery quality. Different vendors take different approaches to contractual service level obligations, and often the contractual penalties for failing to meet SLA terms don't really compensate for losses suffered by such failures. And, how do you coordinate SLAs between cloud and traditional IT if they differ?
  - When documenting system scripts or operations significant changes to policies, procedures and authorizations may be required as you move to a public or private cloud business model
  - Proactively establish policies and procedures which can apply to alternate business models or vendors if needed. Doing so will inevitably save time, cost and exposure to risk.
- **People** – As IT moves to a model where more and more is managed outside of the in-house data center, the composition, skills and attributes of the CIOs workforce might require adjustment. Concerns over the impact of cloud on job security and roles, whether justified or not, can affect morale during transformation.
  - Include all stakeholders in the transformation process – policy driven processes may be poorly documented or out of date making dependence upon knowledgeable staff critical
  - Executive sponsorship and support from both IT and the user community management is key to

successfully sharing resources and reducing costs – especially for internal private cloud deployments

The key challenges for the Hybrid Enterprise can thus once again be distilled into those three core principles: applications, data centers and IT management.

In terms of applications, organizations will need to determine an approach to characterize their applications, to drive placement decisions in terms of where in their Hybrid Enterprise infrastructure these workloads best belong, and to help them build or update applications with deployment flexibility in mind.

In terms of data centers, organizations will need to create a consistent methodology for building their Hybrid Enterprise data centers, evaluating service provider delivery models, and to ensure the most efficient overall footprint.

Finally, in terms of management, organizations will need to define an integrated management environment that addresses a set of cross-model controls and which leverages tools to manage governance, risk, compliance, service and costs.

Unisys Cloud Point of View

Unisys believes that cloud computing should be a strategic area of focus for CIOs and senior business leaders due to the overwhelming agility and economic advantages of this new model of IT delivery. We believe in the inevitability of large-scale movement of applications and systems to a cloud-delivered model over the next decade by way of the Hybrid Enterprise.

There will always be cloud and non-cloud applications within the Hybrid Enterprise environment, but the relative mix will gradually shift more and more over time toward public or private cloud-based applications.

Initial cloud deployments focused on moving those applications that were not considered “mission-critical” or of “enterprise-level” complexity. It is only a matter of time, however, before many enterprises gain the confidence and assurances needed to take the next step.

Cloud offerings will be considered just as safe as managed hosting and traditional IT outsourcing delivery models that have handled the needs of mission-critical systems for many years.

To understand why this is so likely, we only need to look at the history of other large IT transitions, such as mainframe-to-midrange-to-commodity Intel servers, network-to-relational databases, and client-server-to-Web applications – just to name a few.

When considering public clouds, hosted private clouds, or private clouds, part of the specialization of the market will result in clouds with greater or lesser degrees of suitability for mission-critical enterprise systems. What might work for general purpose web hosting may not be well-suited for running ERP and other mission-critical systems in a highly available and service level-governed model.

Differentiating factors such as governance, security, support for enterprise application frameworks and middleware, and the ability to integrate and interoperate with existing enterprise systems will all contribute to mission-critical suitability.

360-Degree Cloud Perspective

Finally, at Unisys we take a holistic, 360-degree view of the data center – no matter where it resides. Where cloud is concerned, most people focus on the new technology – cloud stacks and tools. That is sufficient if the clouds you use are side projects and not a core IT capability.

However, if the goal is for cloud solutions to be an integral and integrated IT capability, and not a “cloud-in-a-corner” that’s isolated from the rest of the IT environment, then a more holistic approach is called for. We have developed an approach to building and employing clouds that addresses a whole range of issues beyond the “stack.” Consistency of architecture, financial policies, security, data management, networks, ITSM, and operations are all equally important across the broader view of both traditional and cloud service delivery.

Unisys Advisory Services for Cloud and Data Center Transformation

Designed to help you define a clear strategy and follow that plan to a successful completion, our Advisory Services for Cloud and Data Center Transformation include the following offerings:

- **Cloud Strategy Services** – Helps you differentiate between cloud delivery models and understand the ways each approach can enhance business services. This executive level workshop engages members of your leadership team to create innovation and strategy consensus. (4 hours)
- **Cloudbuild Accelerator Workshop** – This 4-5 day workshop is an accelerated pre-design engagement for IT organizations planning on deployment of an Internal Private Cloud. Leveraging our experience in building commercial clouds, cloud architects and subject matter experts will look at all aspects of cloud building and deployment inside your organization.
- **Application Migration Assessment** – This comprehensive assessment service is used to attribute workloads and defines the dependencies of applications being considered for deployment in the Cloud. Two engagement options exist – one provides a high level inventory of your most active applications - the second facilitates your staff in determining the best possible applications for a pilot deployment of private cloud or migration to a cloud, based upon a deeper assessment of the applications dependencies.
- **Cloud Email Readiness Assessment** – Typically 30 days, this facilitated, participant-driven activity provides you an assessment of your organization's readiness to adopt and migrate your enterprise email and collaboration tools into a cloud-based environment. We conduct a series of workshops with selected stakeholders in three core areas of business, technology and risk to address: impacts on daily operation, training and productivity; current technology -- infrastructure, network and applications; potential transition impacts on support services; security and business policies; and leadership commitments and change acceptance.
- **Chargeback Strategy Workshop -** A one/two day workshop that defines which chargeback models should be evaluated by the organization, what types of resource costs should be included in a cost recovery budget and what investment model would be used in a Hybrid Enterprise where mix of delivery models may exist.
- **Value Assessment Service** – Enables you to develop the business case for all aspects of your cloud transformation and justify it to key financial stakeholders.

It's not that all elements have to be the same–that would not be possible especially where external service providers are concerned. Instead, the goal is to treat these elements consistently across all deployment models.

Most importantly, where differences do exist, the specific differences and related implications need to be documented. Where possible, common tools, policies, security models and rules to manage and monitor these different elements should be used.

These are just a few of the many factors that will need to be in place before large-scale migration of mission-critical enterprise systems to cloud-enabled environments can take place. In the interim, these systems can be moved to internally and externally managed private clouds as a first step in the larger Hybrid Enterprise journey.

Unisys Research & Development

Behind every service, solution, or capability we provide is the knowledge and expertise of Unisys Research & Development organization. And the cloud is no exception. Our global R&D function has sharpened its focus on the cloud, and is leveraging the insights and skills acquired over the last several decades to create secure, enterprise-class cloud solutions that are well equipped to manage the mission-critical workloads of today and tomorrow.

Why Unisys?

As the viability and value of cloud computing becomes more and more apparent, we remain committed to supporting your journey to the Hybrid Enterprise with public and private cloud environments that integrate with traditional infrastructures to optimize agility, enable data and application portability, and reduce risk.

This unique approach leverages the best technology and tools the market has to offer – as well as time-tested experience and best practices, our mission-critical computing heritage, a history of innovation, and a unique 8-track methodology – to create a customized solution roadmap that is tailored to your desired business and IT outcomes.

In this way, our broad portfolio of cloud services and solutions deliver on the vision of the Hybrid Enterprise, helping you manage internal, external, and cloud delivery models in a way that is borderless, virtual, automated, visible, and secure.

To learn more about how Unisys can help your organization build its own Hybrid Enterprise, contact your Unisys representative or visit www.unisys.com.

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