

An Oracle White Paper
December 2011

Cloud Candidate Selection Tool: Guiding Cloud Adoption

Executive Overview	2
Introduction	2
Tool Capabilities and Structure.....	3
Instructions	3
Evaluation Criteria	3
Weighting	5
Component Scoring.....	6
Affinity	8
Analysis.....	9
Understanding Analysis Output	11
Clusters	11
Affinity across Quadrants.....	11
Conclusion	12
IT Strategies from Oracle.....	13

Executive Overview

The introduction of cloud computing is changing the landscape within the corporate IT environment. Cloud computing promises to provide greater flexibility and shorter time to value while also reducing cost and complexity. However, not all systems currently hosted in corporate IT environments are suitable for hosting in a cloud environment. The benefits of cloud are achieved primarily via conformity to a set of cloud provided capabilities (i.e. services). IT systems that do not conform are not readily amenable to cloud hosting.

Oracle has developed an evaluation framework, called the Cloud Candidate Selection Tool (CCST), to help IT organizations determine which applications, services, modules, components, etc. are appropriate for deployment to a cloud, either public or private. This white paper describes this tool and provides examples of the type of analysis that is possible using the tool.

Introduction

Moving from a tradition IT environment to a cloud-based computing environment is a multi-faceted endeavor. Before beginning any serious cloud initiative, the motivation for moving to cloud should be articulated. Is the goal to reduce cost or to increase flexibility? Who owns the initiative, IT or business? How will the initiative be funded? These types of strategic issues are independent of technology and need to be addressed early on.

Once the strategic questions have been addressed, the expected benefits of cloud can be determined and appropriate metrics can be established. This provides concrete measurement for the cloud initiative to gage progress and success (or failure) of the initiative.

Once the motivation for moving to cloud is determined and the expected benefits and associated measurements have been established, the next question that must be addressed is what IT assets should be moved to a cloud computing environment. While many of the current and planned IT assets can be moved to a cloud environment, some IT assets are more readily moved to cloud than others. Some IT assets, at least in their current state, may not be appropriate for cloud computing at all. A successful cloud initiative needs to be able to distinguish between IT assets that are easily deployed to cloud and those that are not. The requirement to provide this determination is the genesis of the Cloud Candidate Selection Tool developed by Oracle.

This white paper provides a detailed description of the CCST and also provides examples of the types of analysis that can be performed using the tool. The CCST should be used within the larger framework of a structured approach to cloud which addresses the larger issues of strategic motivation, expected benefits, etc. *A Pragmatic Approach to Cloud* white paper describes just such a structured approach.

Tool Capabilities and Structure

The Cloud Candidate Selection Tool is a spreadsheet that uses weighted evaluation criteria to score different IT applications, services, modules, etc. (hereafter referred to generically as “components”) for their architectural compatibility for deployment in either a public or private cloud. The criteria, scores, and weights are pre-populated in the tool; therefore, the tool can be used as-is to evaluate components for their cloud suitability. However, it is expected that the evaluation criteria, scores, and weights will be customized to fit the particulars of each IT environment being evaluated.

The CCST is primarily focused on the architectural aspects of the components being evaluated. It should be noted that a component which is not currently architecturally compatible with cloud deployment, could be re-architected for cloud deployment. The CCST makes no attempt to measure the effort, risk, or benefit associated with doing such re-architecting of components. The CCST analysis is based solely on the current state of the components being evaluated for cloud deployment.

The tool consists of six worksheets: Instructions, Criteria, Weighting, Components, Affinity, and Analysis. Each of these worksheets is described in greater detail in subsequent sections.

Instructions

The Instructions worksheet (not surprisingly given the name) provides instructions for using the tool. A description for each of the other five worksheets is provided. A description for the typical customization(s) for each of the worksheets is also provided.

Evaluation Criteria

This Evaluation Criteria worksheet lists all of the evaluation criteria used within the framework. The framework is populated with 23 evaluation criteria. If desired, additional evaluation criteria can be added to provide scoring of component aspects not currently evaluated by the tool. Figure 1 shows the first six criteria.

Evaluation Criteria					
Criteria Name	Criteria Description	Options	Public Cloud	Private Cloud	Option Description
High Availability Approach	What approach is taken to provide high availability?	None	10	10	There is no HA approach being used.
		Commodity HW	10	8	HA is achieved using redundant commodity HW.
		Specialized SW	5	7	HA is achieved using specialty SW to automatically fail-over to different HW.
		Specialized HW	0	2	HA is achieved by using specialty HW with built-in redundancy.
Availability Requirement	What is the availability requirement of this component?	Low	10	8	Can be off-line for extended periods.
		Business Critical	8	10	Considered to be a business critical component.
		Regulated	3	5	Subject to specific regulation (e.g., banking systems).
		Life Critical	0	1	Life critical system (e.g., medical, air traffic).
Latency Requirements	What is the latency requirement for this component?	None	10	8	There is no specific latency requirement.
		Moderate	8	10	The latency requirement is modest and is readily attainable (e.g. minutes).
		Low	3	5	There is a low latency requirement that may be difficult to meet (e.g. seconds).
		Extremely Low	0	1	There is an extremely low latency requirement that is very difficult to meet (e.g. milliseconds).
Integrations	How are integrations to other systems are implemented?	None	10	8	The component is stand-alone requiring no integrations.
		Batch	6	10	Only batch integrations are necessary.
		Standards-Based	8	6	All of the integrations are based on widely used industry standards.
		Complex	0	2	The integrations include complex custom integrations.
Government Regulations	Is this component subject to government regulations?	None	10	8	There are no applicable government regulations.
		Low	8	10	Potential target of discovery, but not actively regulated (e.g. email)
		Medium	5	5	Subject to specific industry or information rights regulation (e.g. HIPAA, EC 45/2001).
		High	1	3	Contains government "classified" information.
Statefulness	What is the statefulness of the component?	None	10	8	Fully autonomous idempotent transactions with no 'state' requirement.
		Low	8	8	State is encapsulated in transactions (e.g. extended URL).
		Medium	6	8	State is handled by an authoritative external service.
		High	2	4	This component acts as a state service for other components.

Figure 1. Evaluation Criteria

Each criteria has a unique name, a description, and a list of options that can be selected for the criteria when scoring components for that criteria. Each of the options includes a description of that option and provides a suitability score for both public and private cloud hosting. A higher score indicates greater suitability for cloud hosting. An initial score for both public and private cloud hosting is provided by the tool.

The scores in the tool are based on “generic” IT environment and “generic” public and private clouds. When applied to a specific environment, the scores should be examined and modified as appropriate based on greater knowledge of the IT environment and the capabilities provided by the public and private clouds being considered.

For example, the public and private scores for the High Availability Approach criteria shown in Figure 1 may need to be modified based on the actual HA approach used within the specific IT environment. Also, the scores may need to be modified based on the HA options available from the targeted public and private clouds. For example, the private cloud may include specialized hardware that provides HA; thus the private cloud score for specialized hardware might be set to 8 (or even 10) instead of 2.

Weighting

The Weighting worksheet provides the ability to weight each of the evaluation criteria in the Criteria worksheet.

ORACLE® Weight Distribution				Example Weighting		Private Bias (Public Handicap)
Criteria Name	Public	Private	Weighting	Coordination Operating Model	Compliance Focus	
High Availability Approach	4.3%	4.3%	1	1	1	1
Availability Requirement	4.3%	4.3%	1	1	3	
Latency Requirements	4.3%	4.3%	1	1	1	
Integrations	4.3%	4.3%	1	4	1	
Government Regulations	4.3%	4.3%	1	1	3	
Statefulness	4.3%	4.3%	1	1	1	
Scalability Limitations	4.3%	4.3%	1	1	1	
Release Process	4.3%	4.3%	1	3	1	
QoS	4.3%	4.3%	1	4	3	
Licensing Model	4.3%	4.3%	1	3	1	
Time to Deploy	4.3%	4.3%	1	1	1	
License Mobility	4.3%	4.3%	1	3	1	
User Security	4.3%	4.3%	1	1	3	
User Locality	4.3%	4.3%	1	3	1	
Parallelism	4.3%	4.3%	1	1	1	
Development Model	4.3%	4.3%	1	1	1	
Development Environment	4.3%	4.3%	1	3	1	
Failure Consequence	4.3%	4.3%	1	1	3	
Demand Predictability	4.3%	4.3%	1	1	1	
Device Dependence	4.3%	4.3%	1	1	1	
Data Locality	4.3%	4.3%	1	3	1	
ROI Runway	4.3%	4.3%	1	1	1	
Public Availability	4.3%	4.3%	1	1	1	
Weight Totals	100%	100%				

Figure 2. Evaluation Criteria Weighting

As shown in Figure 2, a public cloud weight and a private cloud weight is provided (as a percent of the total score) for each of the evaluation criteria. In the example shown, each criteria has equal weight i.e. 4.3% of the total score. Setting a criteria weight to zero effectively removes that criteria from further consideration.

In order to simplify setting the criteria weights, the Weighting column allows for relative weighting between different criteria. So, for example, setting one of the rows in the Weighting column to three will give that criteria three times the importance of a criteria with a weighting of one. Additionally, two example relative weightings are provided by the tool: Coordinated Operating Model, Compliance Focus.

The weighting in the Coordinated Operating Model example sets the weights appropriately for an organization that is best described by the coordinated operating model¹. The coordinated

¹ *Enterprise Architecture as Strategy: Creating a Foundation for Business Execution*, Jeanne W. Ross, Peter Weill, David C. Robertson

operating model puts considerable emphasis on integration between business processes across business units. Thus, for example, the Integrations evaluation criteria has a much higher weight than most of the other evaluation criteria.

The weighting in the Compliance Focus example sets the weights appropriately for an organization that is heavily dependent on being compliant with industry or government regulations. This required compliance translates into greater importance for certain compliance related evaluation criteria such as Government Regulations, User Security, etc.

As the example weightings illustrate, the weighting appropriate for a specific IT environment is frequently driven by business concerns, not technical concerns. Whatever the impacts and drivers for a particular cloud initiative, the weighting for the evaluation criteria should be set to reflect those impacts and drivers.

The Weighting worksheet also provides a Private Bias parameter. If set to a number greater than one, the weighting will favor private cloud over public cloud. Conversely, if set to a number less than one, the weighting will favor public cloud over private cloud. For example, setting the Private Bias parameter to 1.1 will weight the private cloud 10% greater than the public cloud e.g. the values in the Private column shown in Figure 2 would become 4.8% (resulting in 110% total weighting) whereas the values in the Public column would remain 4.3% (remaining at 100% total weighting).

Component Scoring

The Component Scoring worksheet is used to evaluate each component (application, module, service, feature, etc.) for cloud hosting suitability. Figure 3 shows example component scoring for three components: Application 1, Application 2, and Services 3.

ORACLE									
Evaluation Criteria	Application 1			Application 2			Service 3		
	Criteria Selection	Public Score	Private Score	Criteria Selection	Public Score	Private Score	Criteria Selection	Public Score	Private Score
High Availability Approach	Specialized HW	0	2.2	Commodity HW	10	8.8	Commodity HW	10	8.8
Availability Requirement	Life Critical	0	1.1	Low	10	8.8	Business Critical	8	11
Latency Requirements	Extremely Low	0	1.1	None	10	8.8	Moderate	8	11
Integrations	Complex	0	2.2	None	10	8.8	Batch	6	11
Government Regulations				None	10	8.8	Low	8	11
Statefulness	High	2	4.4	None	10	8.8	Low	8	8.8
Scalability Limitations	High	0	2.2	Low	10	8.8	None	8	11
Release Process	Waterfall	0	4.4	DevOps	10	8.8	Beta	10	8.8
QoS	High	0	2.2	None	10	8.8	Low	8	11
Licensing Model	Per CPU	0	4.4	Public Domain	10	8.8	Open Source	10	8.8
Time to Deploy	Weeks	2	4.4	Hours	10	8.8	Hours	10	8.8
License Mobility	Assigned	0	2.2	Unlimited	10	8.8	Unlimited	10	8.8
User Security	High	0	5.5	None	10	8.8	Low	10	8.8
User Locality	Private	0	6.6	Public	10	8.8	Mostly Public	8	8.8
Parallelism	None	0	5.5	High	10	8.8	Low	2	5.5
Development Model							OOP	5	5.5
Development Environment	Isolated	0	0	TDD	10	8.8	Automated	8	8.8
Failure Consequence	High	0	2.2	None	10	8.8	Low	6	6.6
Demand Predictability				Unknown	5	5.5	Predictable	5	5.5
Device Dependence	Irremovable	0	0	None	10	8.8	Substitutable	8	8.8
Data Locality	Private	0	8.8	Cloud	10	5.5	Mostly Cloud	8	5.5
ROI Runway	Extendable	0	5.5	Extendable	0	5.5	Extendable	0	5.5
Public Availability	None	0	5.5	None	0	5.5	Partial	0	5.5
Decision Basis Score		0.20	3.52		8.86	8.20		7.13	8.42

Figure 3. Component Scoring

Figure 3 uses generic names for the components being evaluated. When used in practice, the actual name for each component being evaluated is entered into this worksheet and there would likely be far more than just three components. The tool is preconfigured to evaluate up to 24 components, but can be modified to evaluate more or less components as necessary. If a large number of components are being evaluated, the components can be partitioned and evaluated in separate worksheets.

Once the component names are entered, an option is selected for each of the evaluation criteria. As illustrated in Figure 3, an evaluation criteria selection can be left blank which will result in that evaluation criteria being excluded from the scoring for that component. (Note that this is different than setting the weight to zero which will result in the evaluation criteria being excluded from the scoring for all components.) The criteria selection can be left blank if the criteria is not applicable for that component, or if the proper selection is not known due to incomplete information about the component.

Two Decision Basis Scores are calculated for each component, one score for public cloud hosting suitability and one for private cloud hosting suitability. By default, both the scores are on a scale from 0 (not cloud suitable) to 10 (cloud suitable). The range of possible scores can change based on modifications made to the scores in the Evaluation Criteria worksheet or the weights set in the Weighting worksheet.

In the example shown, Application 1 has a Public Score of 0.2 and a Private Score of 3.52; thus, Application 1 is not suitable for cloud deployment in either a public or private cloud. Application 2 is suitable for cloud deployment with a slight advantage for public cloud (8.86 versus 8.2). Service

3 is also suitable for cloud deployment, but more suitable for a private cloud (8.42) than a public cloud (7.13).

Affinity

The Component Scoring worksheet is used to evaluate components individually, but many components in the IT environment are connected. A component may depend on another component to function properly, e.g., a customer self-service web site might need to pull information from a billing application.

The Affinity worksheet is used to record relationships between components that are being evaluated. The pair-wise affinity between components is rated from none to high based on how much location affinity there is between the two components. The rating scale is shown in Figure 4.

Affinity Scoring Levels	
Level	Description
None	There is no location affinity between the components.
Low	The components have a minor amount of location affinity e.g. infrequent asynchronous communications.
Medium	The components have some location affinity e.g. occasional synchronous communications with little latency constraint.
High	The components have high location affinity e.g. frequent low latency communications.

Figure 4. Affinity Scoring Levels

Since this is a pair-wise evaluation, the scoring is done in a matrix as shown in Figure 5.

Affinity Scoring						
	Application 1	Application 2	Service 3	Service 4	Module 5	Feature 6
Application 1		None	High	None	None	Low
Application 2	None		None	Medium	None	None
Service 3	High	None		None	None	None
Service 4	None	Medium	None		High	None
Module 5	None	None	None	High		None
Feature 6	Low	None	None	None	None	

Figure 5. Affinity Scoring

Only the values in the lower half of the matrix need to be entered since the upper half is automatically duplicated (i.e. affinity reciprocity).

The location affinity can have substantial impact on the suitability of components for cloud deployment. Using the example from Figure 3, Application 1 is not suitable for cloud deployment whereas Service 3 is suitable for cloud deployment. However, Figure 5 shows that Application 1 and Service 3 have a high location affinity i.e. they should either both be deployed to a cloud or neither should. Lacking any other information on Application 1 and Service 3, this would lead us to deploy neither to a cloud. It might be possible to refactor Application 1 and Service 3 to reduce the location affinity which would then change the decision basis.

The Analysis worksheet provides a visualization of the scores from the Component Scoring worksheet and the Affinity worksheet; thereby greatly simplifying the analysis of the components such as was done for the example of Application 1 and Service 3.

Analysis

The Analysis worksheet propagates the scores from both the Component Scoring worksheet and the Affinity worksheet. The scores from the Component Scoring worksheet are graphed as a two dimensional scatter plot as shown in Figure 6.

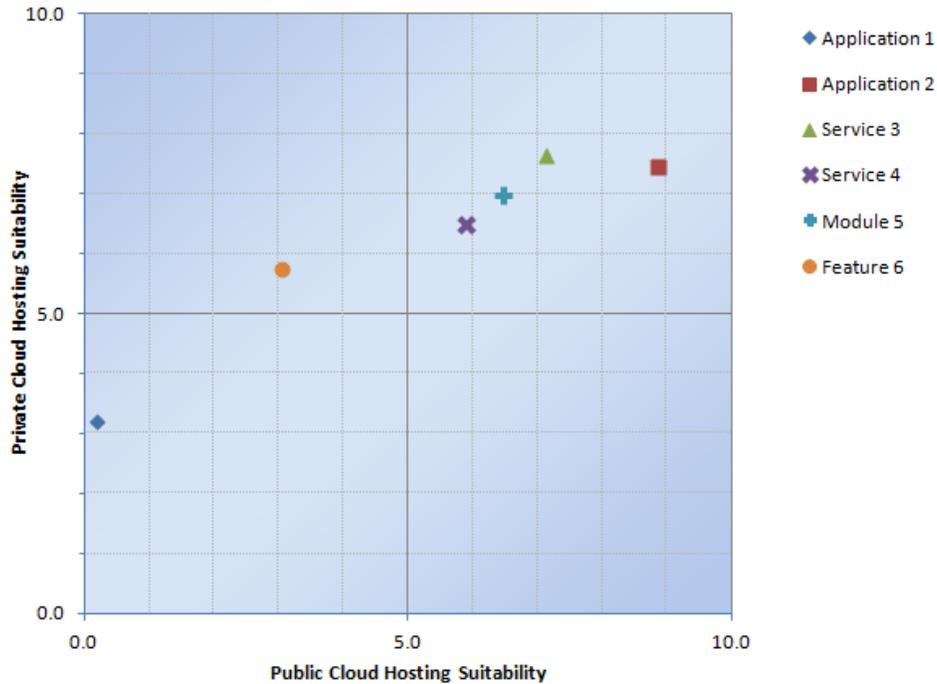


Figure 6. Cloud Hosting Suitability Graph

The vertical axis is used to plot the suitability for deployment to a private cloud; whereas the horizontal axis is used to plot the suitability for deployment to a public cloud. Therefore:

- Lower left quadrant indicates the component is not suitable for cloud deployment
- Lower right quadrant indicates the component is only suitable for public cloud deployment
- Upper left quadrant indicates the component is only suitable for private cloud deployment
- Upper right quadrant indicates the component is suitable for either private or public cloud deployment

The component scores shown in Figure 6 continue the example from Figure 3 by plotting the scores for Application 1, Application 2, and Service 3. The figure also includes the scores for Service 4, Module5, and Feature 6. From this graph, one would likely conclude:

- Application 1 is not suitable for cloud deployment.
- Application 2 should be hosted in a public cloud.
- Service 3, Service 4, and Module 5 could be hosted in either a public or private cloud.
- Feature 6 is marginally amenable to deployment in a private cloud.

However, this analysis does not take into account the relationships between the components.

The Analysis worksheet includes a Graph Affinity button that executes a VBA macro which copies the Cloud Hosting Suitability chart and adds lines showing the location affinity between components as illustrated in Figure 7.

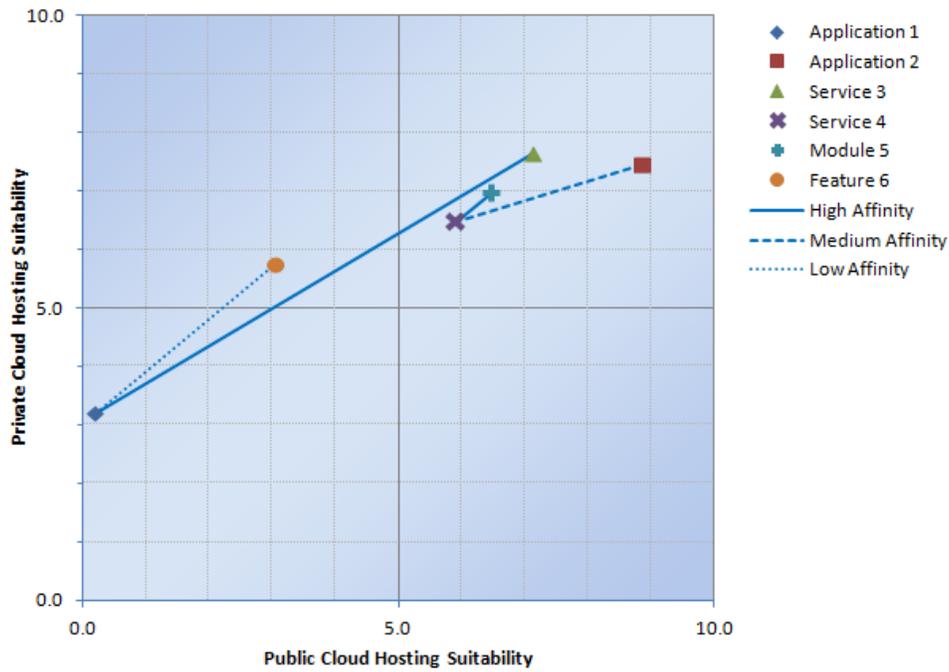


Figure 7. Cloud Hosting Suitability with Affinity Graph

High affinity is shown as a solid line, medium affinity is shown as a dashed line, and low affinity is shown as a dotted line. Taking the location affinity of the components into account, one would likely conclude that:

- Application 1, Service 3, and Feature 6 should not be deployed to either a public or private cloud. It may be desirable to evaluate Application 1 to see if the affinity between components can be reduced or eliminated.
- Application 2, Service 4, and Module 5 can be deployed to a public or private cloud with a small bias toward a public cloud.

Understanding Analysis Output

The previous section showed a simple example of the type of analysis that can be done using the CCST. This section will provide more examples of the type of analysis that might result from using the tool.

Clusters

Clusters are a common pattern seen when the component scores and affinity are graphed. A simple example of clustering is shown in Figure 8.

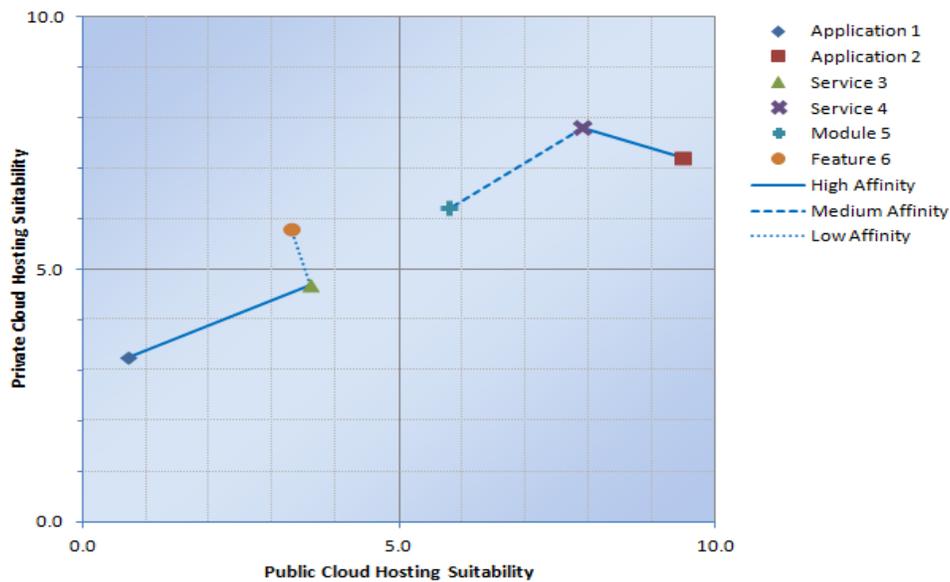


Figure 8. Clustering of Components

These two clusters show that Application 1, Service 3, and Feature 6 should not be deployed to either a public or private cloud; whereas, Application 2, Service 4, and Module 5 can be deployed to a cloud with a preference toward a public cloud.

Affinity across Quadrants

Another common pattern is to see components that score high for cloud deployment have strong affinity with components that score low for cloud deployment as illustrated in Figure 9.

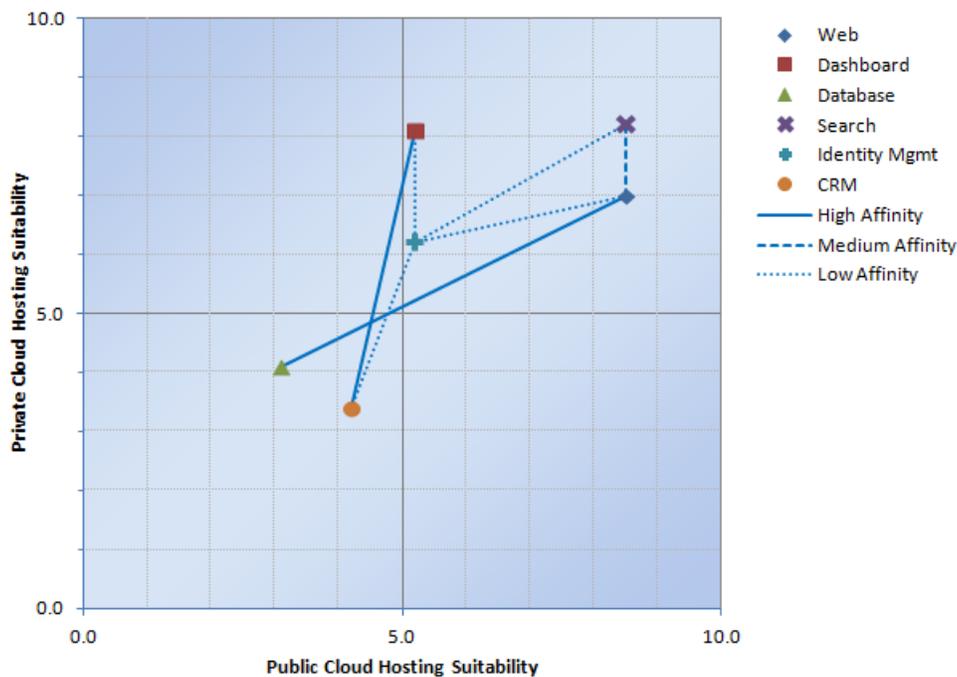


Figure 9. Affinity across Quadrants

An option in this situation is to provide replicas of the non-cloud compatible components. For example, in the situation shown in Figure 9, a replica of the Database component could be deployed to a public cloud and then be used by the Web component deployed to that same public cloud.

Another option is to build a private cloud that directly addresses the issue. For example, the Dashboard component might be deployed to a private cloud that provides a high quality connection with the datacenter containing the CRM component. The private cloud might even be in the same facility. Such an approach could also be used to address the high affinity between the Web and Database components.

Conclusion

Successful cloud adoption requires a structured, pragmatic approach. One important aspect of this structured, pragmatic approach is devising a method to accurately evaluate existing IT assets to determine whether they are amenable to cloud deployment. Oracle created the Cloud Candidate Selection Tool to help companies evaluate the suitability of their IT assets for deployment to a cloud environment, either a public cloud or a private cloud.

The analysis output from the CCST provides a visual representation of the current architectural impacts for the evaluated components with respect to deployment to a cloud environment. Several examples of the types of patterns that are commonly seen when using the tool were presented and discussed.

The analysis provided by the CCST should be viewed as an indicator of what components can or should be deployed to a cloud environment. There are other considerations such as cost, benefit, risk, etc. that should be taken into account as part of the overall cloud approach.

Access to the CCST is restricted to those who have been trained on the intricacies of successfully applying the tool (concepts, built in assumptions, situation specific modifications, etc.). To apply the CCST to some or all of your IT assets, please contact your Oracle account team, or alternatively, send an email to its_feedback_ww@oracle.com.

IT Strategies from Oracle

IT Strategies from Oracle (ITSO) is a series of documentation and supporting material designed to enable organizations to develop an architecture-centric approach to enterprise-class IT initiatives. ITSO presents successful technology strategies and solution designs by defining architecture concepts, principles, guidelines, standards, and best practices.

This document is part of a series of documents that comprise the Cloud Enterprise Technology Strategy, which is included in the ITSO collection. Please consult the [ITSO web site](#) for a complete listing of Cloud documents as well as other materials in the ITSO series.



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December 2011

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