Executive Summary

The Dell™ Oracle Database Advisor Tool is an on-line web-based tool created to assist customers in sizing their Oracle databases. The tool is designed to simplify the effort of IT to estimate sizing with an interview set of questions used to capture a customer’s database requirements and output a solution that provides a complete summary of all the components required for their Oracle database solution. The summary provides a detailed description of each component with the intention of providing an appropriate Dell hardware infrastructure that includes servers, network components, storage arrays, software stack, management software, and database software edition. The Dell Oracle Advisor tool is available at www.dell.com/oracle.
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Introduction
Sizing an Oracle database solution requires careful analysis and usually involves the cooperation of several business functions. The requirements of each area must be understood to achieve an optimal database solution design. A typical analysis comprises:

- Capacity planning (capacity to be supported by solution infrastructure).
- Business requirements – (includes continuity, availability, and security features)
- Technology selection – (server, storage, backup, and switch technologies)
- Software requirements (front-end applications)

The Dell Oracle Database Advisor is a tool that assists customers with Oracle database sizing. It accomplishes the creation of a solution stack by collecting customers’ input based on known business requirements such as database size, number of users, IOPS, and throughput expectations. Output from the advisor tool recommends a configuration that has been fully tested and validated by the Dell Database Solutions Engineering team. The recommended solution covers a comprehensive set of components, including servers, storage arrays, switches, and software supported by Dell.

This whitepaper outlines the methodology behind the Dell’s Oracle advisor tool and its sizing concepts to explain how it recommends an Oracle database solution.

Purpose of the Oracle Database Advisor Tool
Database planning involves understanding the business requirements of an organization and carefully determining that which is necessary for current and future growth. Once the database size has been carefully estimated, the magnitude of the underlying hardware must be determined. The Oracle Database Advisor Tool provides customers estimated size and cost specifics for their Oracle database solution. This is achieved by customer responses to prompted input, systematic analysis of the input, and a report of the recommended hardware and software components. Ease of use functionality in the Oracle Database Advisor Tool allows users with no prior experience create sizing estimates to gather quotes on how much hardware and software is required to fulfill their business needs.

Hardware Capacity Planning and Sizing
Capacity planning is the process of determining the resources needed to meet the specifications of the current and future growth of a business. The required resources are estimated based on anticipated end-user demand statistics over a specific period of time.

Sizing is the process of estimating and tuning the individual components to meet the requirements based on the supporting capacity planned. Hardware resources such as memory, processor, number of hard disks, and storage arrays are all key components of this process. When performing the sizing activity, it is critical to perform various performance benchmarks and tests to minimize any single component from becoming a bottleneck either in the hardware sizing or application sizing portions of a solution.
There are two basic types of database workloads: OnLine Transactional Processing (OLTP) and Decision Support Systems (DSS). OLTP workloads often serve transaction-based applications, such as order processing and online banking. By contrast, the DSS workload is used to answer analytical queries such as budgeting, forecasting, and data mining. The Dell Oracle Database Advisor Tool provides the option to select between OLTP/OLAP application types, server form factors, entry-level and enterprise-level storage arrays, and various database parameters including database size, number of concurrent users, IOPs, and throughput requirements. The Oracle Database Advisor Tool takes as input the customer’s workload requirements and recommends the appropriate solution stack based on lab testing and characterization of Oracle’s software on Dell hardware. The data derived from this characterization is the backbone in designing the formulas and algorithms for Dell Oracle Advisor.

**Workload/Application Type**
The workload type is one of the key parameters in capacity planning that is used for sizing the solution stack to address the needs of a particular database application. It is useful in understanding the nature of the workload’s read and write characteristics in order to quantify the appropriate components for the solution. The design of the Dell Oracle Database Advisor was based on the study of OLTP and OLAP application type workloads. OLTP application environments are characterized by small, random I/O requests where potentially tens of thousands of user requests have to be processed in a permissible time slice. OLAP applications on the other hand are identified by a small number of IO and CPU intensive queries that process huge amounts of data, which require high storage bandwidth. Since each workload is different, it is important to understand your application type in order to correctly meet your business specifications.

**Database Size**
Database size is a top priority when analyzing business requirements for critical data storage. The database size is a key input because it directly impacts the calculation of memory and storage requirements. When sizing an Oracle database, it is important to understand the size of the database and the amount of memory to allocate to their PGA (Program Global Area) and SGA (System Global Area) for each Oracle instance. The correlation between PGA and SGA size and the amount of memory to allocate to each area is directly influenced by the size of the database.

**Business Continuity**
Business continuity features are an essential aspect of any database environment. Its purpose is to minimize performance degradation, enhance security, and prevent unexpected application downtime. This is accomplished by implementing features that Oracle provides, such as backup and recovery, disaster recovery, ASM partitioning, and encryption. Dell engineers have tested different Oracle database environments implementing various business continuity options. This ensures a robust advisor tool that is able to appropriately size a customer’s choices when selecting various business continuity features.

**How the Dell Oracle Database Advisor Tool Works**
The Dell Oracle Database Advisor Tool is a web-based tool used to ask a series of questions and collect the information entered by the customer. Once the information is gathered, the advisor tool analyzes the data, using our capacity planning and sizing formulas to generate a tested and validated solution that can be ordered. When analyzing the data, the advisor tool characterizes the data of Dell’s hardware portfolio of servers, switches, and storage arrays. The outcome consists of two possible optimal solutions provided to help customers choose the
best fit solution for their datacenter environment. It is important to note that the solution output generated by the Oracle advisor is intended to be a baseline and should be adjusted accordingly to meet a customer’s specific requirements. A graphical representation of the output displays the various components required for the solution stack. These solutions are derived from the best practices and performance characterizations performed by Dell’s engineers within the corporate Oracle practice. The tool also provides guidelines to help customers to better understand other available options for maximum benefit.

The following sections detail questions within the questionnaire in the advisor tool. The reasons why these questions are asked as well as the working methodology are considered below.

**Dell Oracle Advisor — Questionnaire and Reasoning**

Following question 1 which captures application type, the questionnaire flow is as follows:

- General Questions — Q1 to Q5
- OLTP workload specific questions — Q6 to Q7
- OLAP workload-specific questions — Q8
- Q9 are general questions applicable to both OLTP and OLAP workloads.
Question 1: Is this database designed for Online Transaction Processing (OLTP) or Online Analytical Processing (OLAP)?

As mentioned earlier, the workload plays a critical role in understanding database usage. The Dell Oracle Database Advisor Tool starts the questionnaire by asking about the type of workload you will be driving in your Oracle environment. Most database applications can be placed in one of the following two workload types, the OnLine Transaction Processing (OLTP) and the OnLine Analytical Processing (OLAP) workload. The OLTP workload consists of transaction oriented environments such as e-commerce and banking, while the OLAP workload is selected in environments when trying to solve or gather analytical data such as forecasting future sales, financial reporting, and data mining.

OLTP and OLAP databases are characterized by two different input/output (I/O) characteristics. The OLTP workload is measured by the amount of input/output per second (IOPS) and the OLAP database is measured by its megabytes per second (MB/s) throughput. Since both database workload types differ in I/O characterization,
sizing considerations vary between the two types. By comprehending a client’s workload requirements, we can then adjust the hardware requirements accordingly to meet their environment specifications.

**Question 2: Which of the following capabilities should be achieved?**

![Figure 2: System Capabilities](image)

One of the main focus points when sizing a database workload is an understanding of the type of performance and system utilization that the environment will require. In the sizer tool, customers have the choice between three options—functionality, price/performance, and performance.

The functionality option provides a low-end solution built on optimizing the system for high utilization with respect to CPU processing power (very high CPU utilization) and a 1:1 PGA:SGA memory tuning ratio. The price/performance option delivers a solution that is achieved by allowing a better balance between CPU utilization of and a 1:2 PGA:SGA memory tuning ratio. Finally, the performance option is built around achieving optimal performance for the Oracle database environment. When selecting the performance option, the system
will be optimized for memory intensive workloads providing a 1:4 PGA:SGA ratio for memory tuning and the most optimal CPU utilization.

The next set of questions provides the framework in the process of creating a solution around an Oracle database. Once storage and database requirements are answered in the following questions, the solution will be tailored to increase the number of processors required as well as the memory required to meet the specification selected in order to attain the optimization requirement found in question 2.

**Question 3: How would you characterize your storage requirements?**

Dell offers a wide range of storage portfolio options, spanning iSCSI, SAS, and FC technologies to appeal to both entry and enterprise level customers. Entry level storage has benefits over internal server storage, such as high availability, increased manageability, backup/recovery and higher drive capacity utilization. Enterprise class storage has all of the benefits of entry level storage plus
greater scalability, increased data protection capabilities, and better integration for disaster recovery solutions.

When deciding between an entry-level storage class or an enterprise-level storage class, customers should consider the following in their decision making:

- How much storage capacity will I require?
- What type of performance does my environment require?
- What feature sets will I need?
- Does the maximum IOPs or MB/s still fall in the entry-level storage parameter or will I require enterprise-level storage?
- If I choose entry-level storage, will I grow beyond the storage’s capabilities?
- Is my storage class considered Tier 1, Tier 2, or Tier 3?

By answering the questions above, customers gain a better perspective on how to evaluate their various storage options for their environment.
Question 4: Which server form factor and processor type do you prefer?

![Dell Oracle 11g Advisor](https://example.com/image)

Figure 4: Server Form Factor and Processor Type

Dell’s extensive enterprise server offerings provide customers with the flexibility of choosing a preferred form factor and processor type. This option was created because customers tend to standardize their IT infrastructures with a particular form factor or processor type. In the advisor tool, we allow customers to pick from three form factors: Rack, Tower, and Blade servers. Each form factor offers either the Intel® CPU or AMD® CPU based on preference.

While customers have the option to indicate a preference in form factor and processor type, Dell engineers have put extensive research into testing different combinations of servers and CPUs to correctly characterize performance. These tests are performed using CPU-intensive benchmarks in order characterize a particular CPUs scalability and userload.
Question 5: What is the maximum expected size of the database (include growth for the next three years)?

Figure 5: Database Size

Question 5 deals with understanding the importance of the database size and expectations for future growth. The advisor tool supports database sizes up to 5 TB. For larger databases, Dell services compliment our advisor tool by providing custom-sizing solutions based upon more specific database requirements. Whether you have a database that qualifies within the advisor tool specifications, or additional assistance is required by the Dell Services team, your needs will be met with an accurate solution.

When selecting the appropriate database size, it is critical to take into account future growth of your database needs. This will ensure that your Oracle database solution not only will be optimized for today’s growth but that it is ready to handle future growth and continues to deliver optimal performance. Once the database size is selected, the advisor tool calculates the number of backend storage disks required to meet your database
capacity requirement. However, this will not be the final deciding factor of your spindle count since the throughput required (IOPs or MB/s) will directly affect the spindle count. A common misconception that occurs is that customers do not take into account their IOPS or MB/s requirements. If these requirements are not directly tied to your spindle count formula, your performance may have limitations in providing the correct throughput. For example, if a customer requires a 500GB database and one spindle was purchased to hold that 500GB database, the performance of the database may suffer since a single spindle would not be sufficient to drive the entire database. On the other hand, if the customer added to the spindle count to spread the database across multiple spindles, the performance and thus the overall throughput would greatly increase because multiple spindles are available to access the database simultaneously.

**OLTP workload specific questions: Q6 – Q7**

**Question 6:** What is the maximum number of concurrent application connections to the database?

![Figure 6: Application Usage Requirement](image)
In a typical multi-tier environment, the application tier utilizes a pool of connections to connect to the database server to serve incoming requests. A concurrent connection is an active connection that has access to the database. Users do not typically make a direct connection to the database but are served by an application layer that creates a request on behalf of the user. For instance, the most common scenario is an application layer that serves requests for multiple users as in Figure 1. However, some instances do have users directly querying the database which is depicted in Figure 2.

Figure 1

Figure 2.
Determining the correct scenario used in your environment is vital to allocate the correct amount of CPU and memory resources required. Each connection made to your database consumes a small portion of CPU and memory resources in order to achieve this connection. As more concurrent user connections are established, more data will be retrieved from your database, taking up more of these to make these connections. The calculation done by the advisor tool to correctly establish the correct number of CPUs and memory needed to meet your requirement is directly impacted by how previous questions were answered. For example, in question 2 in which you selected functionality, price/performance, or performance, these three options have different CPU and memory utilization ratios. Thus the advisor tool will adjust the resources based upon your input requirements.

**Question 7: Please enter your IOPs or MB/s throughput requirement (asked only if question 1 OLTP was selected).**

![Image of Dell Oracle Database Advisor interface]

**Figure 7: Storage Performance Requirement**

Characterizing throughput is a critical aspect in understanding how to correctly size storage requirements. While every customer environment and workload is different, the Dell engineering team characterizes both OLTP and OLAP workloads, using industry standard benchmarks such as TPC-C like and TPC-H like workloads to assess a
customer’s throughput requirements. By performing vigorous testing, we are able to understand and distinguish the key requirements to achieve the required throughput. Once these factors are known, formulas are created and built into the advisor tool to determine the factors essential to selecting the correct storage type and spindle count to achieve the required I/O throughput. It is important to understand that each question asked within the advisor tool adds key answers to correctly size an environment. An environment cannot simply be created based on a single question but the series of questions provided with answers to allow for the design of an optimal solution. Question 7 above specifically characterizes OLTP workload environments.

**Question 8:** Please enter your I/O Bandwidth requirement (asked only if question 1 OLAP was selected).

![Image of Dell Oracle 11g Advisor](image)

**Figure 6:** Storage Bandwidth Requirements

This question captures the customers’ storage bandwidth requirements specific to the OLAP environment. OLAP workloads are characterized by complex queries demanding large amount of data retrieval from the database. Storage should be properly sized to enable the server to process the user requests by pulling the data.

**Question 9:** Please select any additional features that may apply.
Dell’s Oracle Database Advisor: Underlying Methodology

Figure 7: Additional Feature Set Requirements

Different editions of Oracle databases provide additional feature sets which improve the application performance and availability. The Dell Oracle Database Advisor Tool is designed to allow the customer to choose the features needed to meet businesses requirements.

**Backup and recovery solution:** This feature allows the customer to capture data backups from the primary storage to the tape devices. The archival of data to tape devices will allow users to keep the most important critical data in the primary storage.

**Business continuity:** Business continuity creates an infrastructure that is highly available in order to reduce application downtime. The Oracle Advisor will recommend at least two nodes to ensure that if one of the Oracle nodes fails, the database instance can failover to another node within the cluster, i.e. Oracle Real Application Clusters (RAC). Once the failed node is operational, the database instance will failback to its original node to load balance the workload.

**Disaster recovery solution:** The disaster recovery solution option will prompt the advisor to recommend a replica configuration of your primary site for your secondary site, i.e. Oracle DataGuard. This creates the highest
availability to ensure no downtime if the primary site was interrupted by a catastrophic event. To sustain consistency across both sites, the data from the primary site is copied to the secondary site at regular intervals, using either an asynchronous or a synchronous fashion to provide business continuity without a degradation in performance.

**Advanced database features:** When advanced features such as enhanced security, better compression, secure files, and transparent encryption are required, our Oracle advisor tool recommends choosing the Oracle Enterprise Edition version of Oracle. Once this option is selected, the Oracle advisor tool will suggest the Oracle Enterprise Edition software as the software of choice to meet these different feature requirements.

**Question 9a: Please describe the database landscape. Check all that apply.**

While the Oracle Advisor tool creates sizings around environments that will be used for production, it is important to understand how each of our sizing creations will be used such as for test, development, or production purposes.

**Question 9b: Which application will be using the Oracle database?**

Each application requires different parameters and settings to be set or changed to have an optimal solution. This question allows our Dell consultants to pinpoint and focus directly on optimization of the best practices of these applications based on the input provided.

**Question 9c: How do you plan on backing up your Oracle database?**

There are two options recommended for backing up an Oracle database—tape backup and disk backup. While each backup methodology has its advantages and disadvantages, the main differences between the two are cost, stability, power usage, and availability. When deciding between the two choices, you need to consider these factors and select which one best meets the needs of the environment. For instance, if you are required to restore data at a particular point in time and have a need for data to be accessed regularly by multiple users, a tape backup solution would not work since these solutions are sequence read-write systems; tape backup solutions allow only one operation at a time. However, a combination of both technologies could be used to create a balance between storing older data on tape and having a disk backup to access current data immediately.

**Dell Oracle Advisor Output**

The Dell Oracle Advisor is separated into six sections—Summary, Solution, Hardware, Software, Services, and Take Action.
Summary: The summary tab displays all the questions and corresponding responses entered by the user. These responses are hyperlinked to their related questions to enable users to directly go back to any specific question to change their input. The tab also provides the outline of the whole solution configuration with details about the server, storage array(s), and backup devices based on the advisor tool’s analysis of the user’s input.

Solution: The solution tab is composed of two recommendations labeled ‘Oracle Solution 1’ and ‘Oracle Solution 2.’ The graphical display will enable the customer to visualize the solution stack which comprises recommended server(s), switches, and storage array(s). Each and every solution generated by the Oracle advisor is uniquely identified by a number displayed under the “Solution Id” label. This unique ID can be used for further communication with a Dell technical sales representative (TSR) to order a particular solution or to gather more information about the solution generated by the Oracle advisor tool.

Hardware: The hardware tab provides technical specifications of the hardware components offered. Details about the specific components within a server or storage array can be found in this section as well as descriptions of the different processor technology, internal storage specification, drive technology, rack space utilization, maximum memory, and hard disk proposed within the solution.

Software: The software tab suggests the required software components to meet requirements of the solution and lists all the software needed to run the Oracle database solution, such as the recommended operating system, management software, and database edition.

Services: The Dell Services team has a wide range of service offerings to ensure an optimal solution. Covered are services for planning, implementation, training, and maintenance for the solution. Dell services and support sites hyperlinks are available in this tab for further reference.

Take Action: The Take Action tab allows a customer to send their customized configuration to a Dell TSR to have further discussions around the solution. Within this tab, customers will also find a feedback/suggestions space to better understand the challenge points within the advisor tool. Customers are highly encouraged to submit their comments to better maintain the Oracle database advisor.

Summary
The Dell Oracle Advisor tool was created to assist customers in their Oracle database sizing efforts. It automates the analysis process by utilizing various parameters such as workload type, server, and storage performance requirements to generate a solution. By addressing the complexities of sizing, Dell has designed an Oracle Database advisor backed by thorough research and experimentation by Dell Oracle engineers. The tool simplifies the sizing effort by asking questions that address customer requirements and provides guidance in helping the customer choose a solution that is right for them.
Dell’s Oracle Database Advisor: Underlying Methodology

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Dell Oracle Database Advisor

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