

Z2 Computer Solutions

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Worldwide Distributed Database Network (WWDN)

Executive Summary

Simple single-Server databases like MySQL are fine for small businesses. But when your business plans include having thousands of Internet customers online at the same time, then you need a database architecture much more robust.

No online business can afford having their Internet sales operations down, nor suffer loss of data due to disk or computer failure. Typically large Internet enterprises look to Oracle running on Clustered Servers for their solution. And typically Oracle charges millions of dollars as they base their licensing fees on the number of users and CPU-Cores. Here is an example of the cost of an Oracle Database on just one Server and one backup.

“(Quoting from http://www.dba-oracle.com/oracle_news/news_oracle_prices_2007.htm)

Oracle guru Tony Jambu has these interesting observations about Oracle pricing: As an example, let's take a 2 Node RAC cluster consisting of 4 CPUs (ignoring multi cores) per node plus the following options:

- Real Application Clusters (\$20,000 per processor)
- Active Data Guard (\$5,000 per Processor)
- Partitioning (\$10,000 per Processor)
- Real Application Testing (\$10,000 per Processor)
- Advanced Compression (\$10,000 per Processor)
- Total Recall (\$5,000 per Processor)
- Advanced Security (\$10,000 per Processor)

Taking these options into account, the software **cost per CPU would be US \$110,000.**

For the 2 Node RAC, that would come to be (2 nodes) x (4 CPU) x US \$110,000 = US **\$880,000.**

The secondary site where your Active Data Guard is being replicated is missing. That would be double your cost to US **\$1,760,000** (list). Likewise, adding support of 22 percent brings the figure to US **\$2,147,200** (list). You would not pay this price, as discounting has not been applied. Using figures from Oracle's Store, **we get a discounted figure of US \$1,610,400.**”

Discovery Begins
by looking at the same thing as everyone else,
but seeing something differently

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The outlay of **\$1.6 million** just for a single Server and backup is quite staggering. Contemplate the cost of a truly large Internet-Presence, when your Internet sales traffic grows to demand scores of online Servers and backups.

What Z2 Computer Solutions offers is a strategic partnership. We offer the same level of Internet-Presence capabilities but we provide them as a strategic partner so that you do not have to finance nearly as much money.

As demonstrated below in Question #18, forming a strategic partnership with us to provide just a 10-Server Internet-Presence will save you about **6.5 million over five years**, that is, about **78%** of the huge cost of an Oracle-based Solution. The larger your International Internet-Presence becomes, the more significantly you save over time.

We offer a strategic partnership in which **the task of redundantly spanning the world to allow thousands of concurrent online customers is our responsibility**, while the task of fulfilling the customer's orders to satisfaction is yours. It does not matter if you are starting out small and plan to grow large, or are planning on being big right away, we are the alternative to deploying an expensive solution.

The Oracle-Based Server-Cluster Solution

Because nearly 73% of all Internet Server-Clusters use Oracle as their database software, this paper will ignore the many different types of hardware Cluster configurations provided by Sun, IBM, HP, and others, and simply refer to the entire concept as the "**Oracle Solution**". This will help keep this paper simple.

Z2 Computer Solutions is not in competition with Oracle or the hardware vendors providing Servers. We are not in competition because we are offering something different. We provide **low cost and customized** Worldwide Distributed Database Networks (**WWDN**) for businesses that would like to be International Internet Business Enterprises (**IIBE**).

For example, Google is a huge company which has a very significant International Internet-Presence, and has deployed their own customized Server-solution. Hundreds of thousands of Browsers make connections to their website every day. How does Google handle all of this International Internet traffic?

"Google uses several Server farms, with each farm having one or more Server Clusters. Each Server Cluster will consist of several hundred, **even thousands**, of low-cost machines. A 2006 estimate cites **450,000 Servers** around the world." The data capacity of these run into a few hundred petabytes (1 petabyte = 1024 X 1024 Gigabytes)."

Jeffrey Dean, Google Fellow in the Systems Infrastructure Group: "To provide some structure to all that data, Google uses BigTable. **Commercial databases from companies such as Oracle and IBM don't cut the mustard here. For one thing, they don't operate the scale Google demands, and if they did, they'd be too expensive**, Dean said."

Z2 Computer Solutions also deploys our own customized Server-solution. We offer the same level of Internet-Presence as is required by companies even as large as Google, but using lower-cost computer Servers, and not using the Oracle licenses. We also add customized application software to specifically manage your Internet-Presence to exactly meet your current and future business plans.

If you need an Oracle Solution, then we are not a competitor. But if your business plans would like to avoid financing the huge up front costs, and the yearly Oracle software licensing fees, or if you need new technology and innovation to capitalize on creating a competitive edge over your competition, then Z2 Computer Solutions is your strategic partner to make this happen.

What Z2 Computer Solutions Does

Z2 Computer Solutions creates low cost customized Worldwide Distributed Database Networks specific to your business plans. We provide the following core capabilities needed for a truly significant Internet-Presence:

- Our WWDN will never go down, as **Failsafe Switching** is fully automatic and performed in Real-Time. Our WWDN provides 24/7 availability.
- Our WWDN provides infinite **Scalability**, allowing your Database and Servers to grow to any size. Expand by adding more CPUs, more Servers, larger disks.
- Our WWDN is fully **Redundant**, as your Data is automatically mirrored to any number of other Servers, automatically and in Real-Time.

This means that no matter what happens:

- Whether a Server dies, or a software Application dies, or a disk dies,
- Switching to an alternate backup Server/Application/Database-partition is accomplished automatically and in Real-Time.
- **Your online customers will never even know that it happened.**

Further:

- Our WWDN is fully **Load-Balanced**, as new Data Records are evenly (or unevenly) distributed across any number of Servers residing anywhere in the world.
- Our WWDN is fully **Secured**, with data-access security at every level, all the way down to the field-level. All Internet transmissions are encrypted.
- Our WWDN manages **All Types of Data**: Relational Data, Unstructured Data, and Multi-dimensional Data, for both transaction processing and data warehousing.

This means that no matter what is your international business enterprise, we together will form a strategic partnership and build a customized WWDN specifically designed for your profitability.

SUMMARY

Z2 Computer Solutions will form a strategic partnership with your business to provide you with a significant Internet-Presence, even as large as Google. This International Internet-Presence will be an infinitely scalable Distributed Database and Network of simple-configuration Servers spanning the globe, and it will never go down. We solve the headache of how to let your worldwide customer base concurrently access your online database. This lets you concentrate on managing your business.

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Question 1: How Does The WWDN Work?

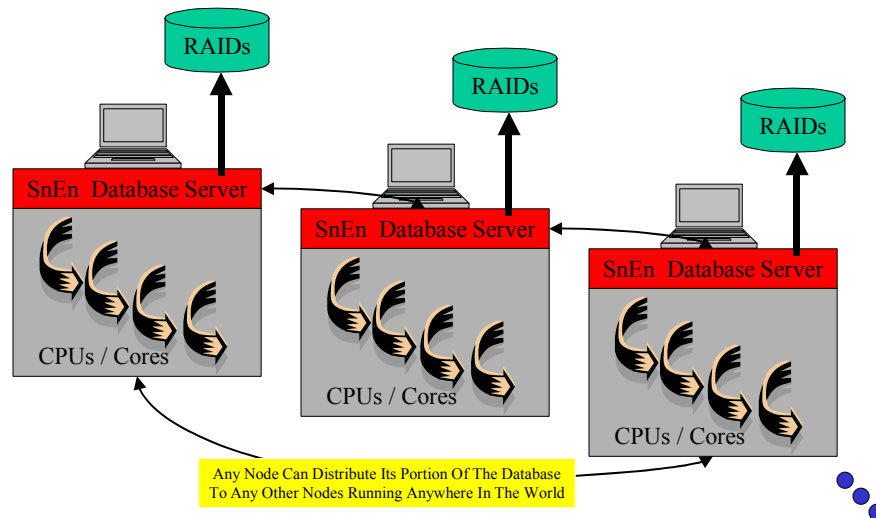
Z2 Computer Solutions bases its core design on the Snippet Engine Technology. For a full explanation of the Snippet Engine Technology, read the papers at www.Z2CS.com.

Briefly here is how the WWDN works:

- **Computers**: each hardware-node is one-computer-platform with one RAID disk array. A Server-node of this simple configuration is very cost effective. The WWDN may have any number of these simple-configuration Servers placed anywhere in the world. Having many computers in diverse locations increases network reliability.

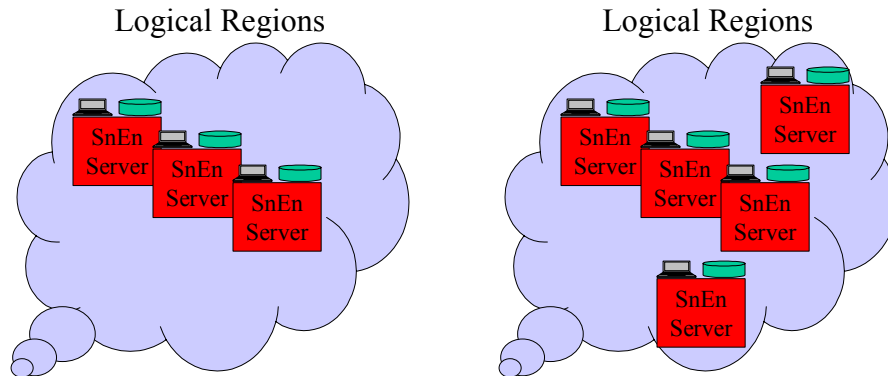
These computers run Snippet Engine (**SnEn**) Applications which isolate the Database into autonomous and asynchronous **SnEn Nodes** that execute at the lowest thread-level of CPU execution. Thus the entire Database is always isolated for concurrent access.

Simple-Configuration Building Blocks



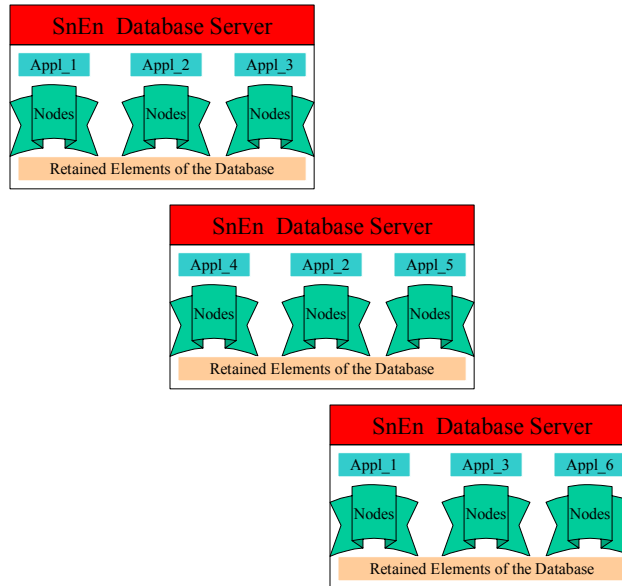
- **Regions**: the WWDN is split into any number of arbitrary Regions. Regions are not “physically real” they are “logical breakouts” of the whole network. More Regions are added as the database and Internet-Presence grow.

Servers Are Arranged Into Regions



- **Servers**: each logical-Region may have any number of simple-configuration Servers. A Region's Servers / Applications will share in the Load-Balancing and Database Mirroring as a cooperative group. To avoid catastrophic failure, each Server may have any number of ISP interfaces, and may be placed anywhere in the world. More Servers are added as the database and Internet traffic grow.
- **Applications**: each Server may have any number of database-related software Applications running on them. For example: one Server may provide online customers with only one software Application for eCommerce processing; while another Server has two software Applications running, one to provide order entry and another to provide emailing. The exact same Applications may be concurrently running on any number of other Servers, added as the database and Internet traffic grow.

Applications Are Arranged Into Servers

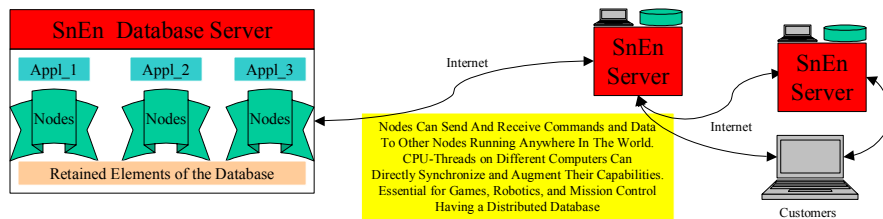


- **Networking:** each software Application may **directly interact** with any other software Application located on any Server anywhere in the world. Fetching and storing Data-Records between the software Applications is accomplished by direct Tcp/Ip Internet connection between them. Thus any Application may be directly connected to any other Application without software overhead.

In this manner the autonomous SnEn Nodes that manage their own small portion of the Database running on different Servers and Applications may directly and without overhead monitor, coordinate, and distribute data between each other regardless of where in the world they are located. No software overhead component needs to be involved as each Node knows how to schedule itself and augment with the other Nodes of the Database.

Any Node Talks To Any Node

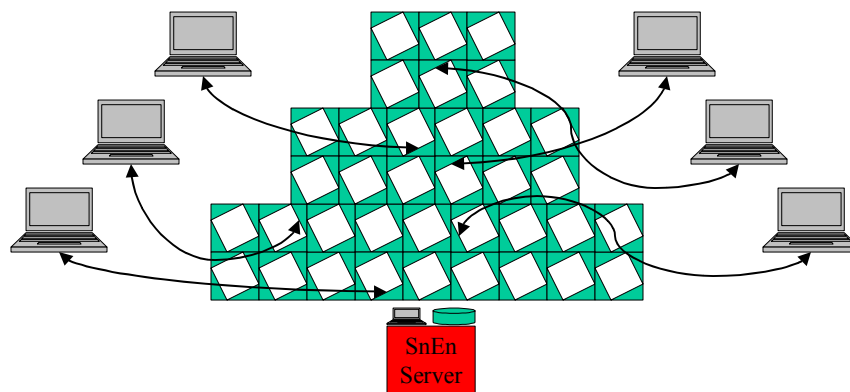
Any Node may talk to and synchronize with any other Node running anywhere in the world. To the programmer, sending a data packet directly to another Node running on another computer is done the same way as sending the packet to a “local Node”. Thus, any execution-thread may directly communicate with any other execution-thread, even on a completely different computer. Creating applications that share synchronized data and capabilities between networked computers is very easy.



- Data Distribution:** each software Application may manage any portion, subset, or volume of the whole database. All Data-Records are managed by its own code that always executes as a CPU-thread. This ensures that the entire Database is automatically concurrency-safe by design, no overhead. The mirroring of Data-Records to other Servers is performed between Applications at this lowest level of code execution.

Nodes Are The Database Servers

Each Browser can communicate directly with its own Node, so that, each submenu can individually and concurrently work directly with only its smaller portion of the whole Database. Each Browser transaction is automatically distributed.



This means that an Application running on a Server in Denver may be mirrored to a Server in Portland, and working on data records stored on a Server in Chicago. If the Chicago Server dies, the WWDN automatically and in Real-Time switches online customers to the Server in Denver. The WWDN is truly infinite in scalability.

It is very important to understand why it makes no difference in overhead where the data is physically stored. Because by definition a distributed database always requires at least one Tcp/Ip connection to be made between the component wanting the data and the component having the data. No matter who is the database software company, even Oracle, one connection is the absolute minimum overhead. However, as is demonstrated in #18 below, in Oracle Solutions multiple Tcp/Ip connections (at least five) must be made to handle each Browser request. Therefore the WWDN design provides a significant speed advantage as it only needs to make one connection regardless of where the data is stored.

Question 2: Are you claiming to provide the same capabilities as Oracle?

No. Oracle has millions of lines of code, and scores of options, reports, capabilities, and features which are not provided by a standard WWDN Solution. We do not offer a generalized generic off-the-shelf SQL based database. Even so, the WWDN provides the same, and even better, Internet-Presence capabilities, and at about only 22% of the cost. These Internet-Presence-capabilities are:

Real Time Failsafe Switching, no down time:

Analysis shows that for each 4-node set of Servers you are saving between \$367K and \$1,335K in the first year alone (see #17 below).

Infinite Scalability:

We use low cost simple configuration Servers. Analysis shows that for each 4-node set of Servers you are saving about \$1.862 million in the first year alone (see #17 below).

Fully Mirrored / Redundant, (across Geographically Dispersed Servers)

We replicate all data across multiple Servers in diverse locations. Each is a hot-backup automatically switched to in Real Time. What is the cost savings associated with never having any lost data, nor ever having to restore the Database from archive?

Evenly Load-Balanced,

Evenly balanced data-storage and computer-workload means that you are in complete control of your hardware costs. No need to buy more hardware when the New York Servers start to become overwhelmed because you can divert data and workload to the North Dakota Servers instead. We allow dynamic changing of the formulas used for load balancing. What is the cost savings associated with never having to buy more hardware than what is actually needed?

Fully Secured,

Besides normal and prudent security measures, we offer security and privacy blocking all the way down to the field level. What is the cost savings associated with never having any privacy violation lawsuits?

and Allows All Types of Data.

These are standard capabilities in all modern databases. But we allow the database designers to treat any type of data-scheme just as any other type. Blog-data and image-data is managed just like a table-record. No longer required are special partitions just for image-data. What is the cost savings associated with working within a simplified database schema?

These are the core capabilities you need in order to have a truly significant Internet-Presence. On top of this core foundation Z2 Computer Solutions will enhance, customize, and create software Applications specific to your business plans. These customized Applications will provide you with any other options, reports, capabilities, and features you need.

Further, if necessary your WWDN can provide its online data to a single offline Oracle Database Server so that you may use some of Oracles offline database capabilities.

Question 3: Are you proclaiming a new technology breakthrough?

Yes. The core technology enabling the WWDN is called “The Snippet Engine”. For a full explanation of this technology please read the papers at: www.Z2CS.com .

This new technology allows Z2 Computer Solutions to approach the problems associated with Distributed Database Networks in a completely different manner. For example, using the Snippet Engine Technology designers may isolate each data record and have them stored evenly distributed across any number of Servers. This and many other technology innovations allow us to say that it is just a matter of fact; that the Oracle Solution to providing Internet-Presence is based upon 1980’s computer-science theory. Much overhead is needed to support multi-CPU and multi-Core architectures. Z2 Computer Solutions’ WWDN Solution is based upon 21-Century computer-science theory expecting multi-CPU and multi-Core architectures.

Question 4: How does a WWDN Solution differ from an Oracle Solution?

Imagine thousands of customers around the world, all concurrently online ordering your products. The first issue is not “database”. The first issue is “distribution of data and workload”. The first problem is how to keep all of these concurrent customers from colliding with each other as they all access the same Data Tables at the same time.

At the core the WWDN uses the “Snippet Engine Technology”, which isolates the individual records within each of the many Data Tables so that the individual data

records can be evenly distributed around the world. It is the Snippet Engine Technology which enables the WWDN to provide its core capabilities.

It is not necessary to compare Oracle with the Snippet Engine because the two are not in competition. But from the point of view of understanding what a WWDN Solution can offer that an Oracle Solution cannot offer a little comparison is provided below:

Side By Side Comparison Between Oracle and the Snippet Engine

(the full comparison can be read at www.Z2CS.com)

Oracle 9i / 10g Database Server	Snippet Engine Database Server
<p>1.) The primary focus of Oracle is to provide a general-purpose Relational Database solution suitable to most applications. The Oracle Database is not the project's application, it is the repository of the project's data.</p> <p>2.) The design structure is that the software code associated with being the application, all the code required to provide the intelligence of the application itself, the PHP, Java Script, or ASP code executing within the HTTP Host Server process, this code is executed separately from the Database Server.</p> <p>When the ASP-application-related code needs data it connects to a local Oracle Database Server. When the local Oracle Database Server needs data from another Oracle Database Server, it connects to the remote Oracle Database Server. Eventually the needed data is given to the application-related code.</p> <p>3.) It is the project specific PHP, Java Script, or ASP code executing in the HTTP Host Server process which is the primary provider of the application's intelligence. It is the Stored Procedures stored within the Oracle Database and this software executing within the HTTP Host Server process which provides the intelligence of the system, otherwise the Oracle Database Server is only housing data.</p> <p>4.) Of course the PHP, Java Script, or ASP code required to manage the Client-side interaction is also part of the HTTP Host Server process.</p>	<p>1.) The primary focus of the Snippet Engine (SnEn) is to provide a very specific application and Database Server solution, and is not inherently a general-purpose Database Server. A SnEn Database is both the project's application and its repository of its data, the application is not separate from the database, they are one and the same.</p> <p>2.) The design structure is that the software code typically associated with the application, all the code required to provide the intelligence of the application itself, the PHP, Java Script, or ASP code that Oracle projects would require, almost all of this code no longer exists, but is now C++ code executing outside of the HTTP Host Server process.</p> <p>When the C++-application-related code needs data it connects directly to the local or remote Server-Application-Node which has the data. There is no intermediary, no overhead. The needed data is given directly to the application-related code.</p> <p>3.) The SnEn Database Server is not just housing data. The SnEn is the primary provider of the application's intelligence too. What little PHP, Java Script, or ASP code that is left to be developed in the HTTP Host Server is primarily there to interface with the SnEn. It is the SnEn which provides both the intelligence of the system and houses the data.</p> <p>4.) Of course the PHP, Java Script, or ASP code required to manage the Client-side interaction is still in the HTTP Host Server process.</p>
The Oracle Solution is designed for creating a	The SnEn is designed for creating a Distributed

<p>Distributed Database having any level of failsafe redundancy. The Oracle Solution follows the “Server-Clusters” model.</p> <p>To create a project with a database that is distributed anywhere in the world you add more Server-Clusters. Each Server-Cluster adds more capacity, greater failsafe redundancy, load-balancing, and greater performance.</p> <p><u>Oracle is a</u> <u>general-purpose,</u> <u>high powered,</u> <u>Transaction oriented,</u> <u>SQL based,</u> <u>Relational Database,</u> <u>Managed by Stored Procedures,</u> <u>while the SnEn is not.</u></p>	<p>Database having any level of failsafe redundancy. The SnEn Technology follows the “same-form-building-blocks” model. A “block” is a single Web Hosting Server with the SnEn and a RAID-like disk.</p> <p>To create a project with a database that is distributed anywhere in the world you just add more “blocks”. Each “block” adds more capacity, greater failsafe redundancy, load-balancing, and greater performance.</p> <p><u>The SnEn is a</u> <u>specific-purpose,</u> <u>high powered,</u> <u>Command oriented,</u> <u>XML based,</u> <u>Object/Process Database,</u> <u>Managed by C++ thread-level code,</u> <u>while Oracle is not.</u></p> <p>The SnEn allows the Designers to create whatever database capabilities they require to satisfy the project goals. To compare the two Database Servers on a capability-by-capability basis is not “possible”, as they do provide similar Internet-Presence capabilities but do not provide similar Database architectures.</p>
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Question 5: Can you really convince others that you can do what Oracle can do?

No, and understanding why is very important.

It is not that a WWDN Solution can do everything that an Oracle Solution can do. It is that a WWDN Solution can do what an Oracle Solution cannot do. We are not providing the same kind of solution, and that difference is why your business needs to partner with Z2 Computer Solutions for a WWDN Solution.

Now what is the difference, in very simplistic terms?

To understand this keep separated in your mind the distinction between:

The **Internet-Presence Infrastructure**

and

The **Database Infrastructure.**

The **Internet-Presence Infrastructure** depends upon:

Hardware and **Networking Software.**

Whereas:

The **Database Infrastructure** depends upon the:

Data-Storage-Architecture and **Data Accessing Software**.

Regarding the **Internet-Presence Hardware**: everyone uses the same hardware. The WWDN uses a simple configuration hardware solution, whereas Oracle uses a more complex Server-Clusters hardware solution.

Regarding the **Internet-Presence Networking Software**: the Snippet Engine Technology dramatically simplifies and solves the concurrency issues surrounding large scale concurrent-networking. **Node to Node direct communication is the innovation which will eventually supplant today's networking solutions.** Our WWDN concurrent-networking software provides a better solution than the concurrent-networking software used by an Oracle Solution.

Regarding the **Database's Data-Storage-Architecture**: Oracle is primarily a general purpose Relational Database scheme, enhanced to include the other types of data-structures accessed by SQL commands. The Snippet Engine is primarily an empty box, it is not general purpose, it is customized by us to specifically manage whatever database schemes are required by your specific business plan.

Regarding the **Database's Data Accessing Software**: Oracle is primarily a SQL based **Store-and-Fetch interface**. Complex processes are performed by Stored Procedures. The Snippet Engine is primarily an **XML Command-and-Process interface**. Complex processes are performed by very fast C++ thread-level software.

We are comparing a WWDN Solution to an Oracle Solution from the point of view of your future business plans and your Internet-Presence. For example:

Internet-Presence Hardware - The simple configuration computer Server architecture is less expensive.

Internet-Presence Networking Software - The WWDN offers Infinite Scalability, Fully Mirrored / Redundant, Evenly Load-Balanced, Fully Secured, 24/7 Failsafe networks that switch in Real Time. The Oracle solution offers the same thing, but not everything is done automatically nor in Real Time.

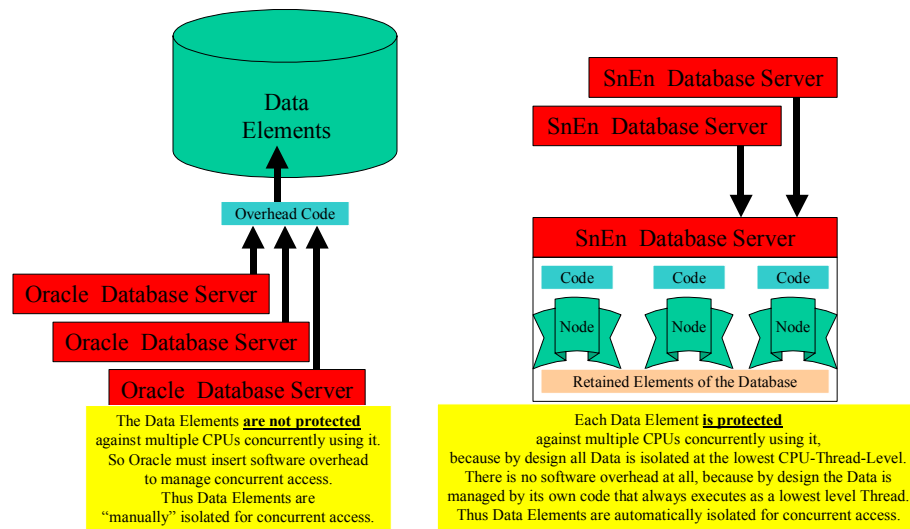
Database's Data-Storage-Architecture - If all your business plans need is a typical Relational Database, then Oracle offers an expensive but a very good solution. But if your plans want to avoid financing the large up front costs, and create a competitive advantage by going outside of the box, then the WWDN offers an empty box which can be customized specifically for your needs. Your Internet Presence will be better than the competition's because you innovated and they did not.

Database's Data Accessing Software - This is the lowest-level of comparison, performance measured in nanoseconds, how well does each solution access the data. This access has two levels, one is at the disk-access-level, and the second is at the

network throughput level. For better performance Oracle has created their own proprietary File System, so at the disk-access-level Oracle should win most benchmarks.

But after the data is accessed it then must traverse all of the layers of networking overhead until it finally gets out to the customer's Browser. Herein is where the WWDN can make a claim. The WWDN does not have the same complexity of networking-overhead-layers as Oracle and Server Clusters.

Isolation Of Data Elements



In simplistic terms: within the WWDN the Node which wants the data communicates directly with the Node that has the data, without any overhead, anywhere in the world, so that once the data is accessed by the Node that has it, it is immediately given to the Node that wants it, and then out to the customer's Browser. This is obviously much faster than using layers of Server-Clusters.

From the practical point of view the customer does not really care if his Browser is connected to an Oracle Solution or to a WWDN Solution. All the customer cares about is the website's performance and the final results of his keystrokes. From this point of view we compare the WWDN Solution to an Oracle Solution, and win.

Question 6: How does a WWDN avoid needing Server Clusters?

Imagine thousands of customers around the world, all concurrently online ordering your products. The first issue is not: "what is the internal bit-structure of the database". The first issue is: "what is the internal structure of your worldwide network of Servers". This

is because the first problem is not what is inside of the Tables, the first problem is how to get those thousands of concurrent customers to the Tables in the first place. To do this Oracle typically recommends using Server Clusters.

The WWDN does not need Server-Clusters because it uses the Snippet Engine Technology. This technology allows the database designers to isolate each of the individual records within each of the many Data Tables. By isolating the records the WWDN can then store the many individual data records so that they are evenly distributed around the world. This means that with a WWDN Solution the thousands of concurrent customers are not all converging upon a single Server for data, but instead their data access is evenly disbursed across the many Servers of the WWDN.

For example, a customer list may have a million loan-borrowing records, way too many for any one Server to act as the single point of access. So the database designers may elect to have only the most recently used records stored in one Server, but all of the rest of them evenly distributed across 200 other Servers. Likewise the database designers may decide to evenly or unevenly distribute data and computer-workloads as they need. Later these Load-Balancing decisions can be changed in Real Time without reprogramming. Thus the most critical aspects of data-distribution and computer-workload may be intelligently balanced across the entire WWDN.

Question 7: How is all this in comparison to “Cloud Computing”?

Wikipedia: The term **Cloud Computing** derives from the common depiction in most technology architecture diagrams, of the Internet or IP availability, using an illustration of a cloud. The computing resources being accessed are typically owned and operated by a third-party provider on a consolidated basis in Data Center locations. Target consumers are not concerned with the underlying technologies used to achieve the increase in server capability, and is sold simply as a service available on demand.

From the point of view of your core business, Z2 Computer Solutions is offering a “black-box” solution to your Internet-Presence. But there is more. From the point of view of your business plan, both you and Z2 Computer Solutions are cooperatively developing a customized solution. The software Applications running on the Servers are customized to meet the specific needs of your business enterprise and database. It is like intentionally deciding to partner with a Cloud Computing company in order to enable the union to establish a customized solution specific to your unique worldwide business. In this manner you are in control of your entire business plan, including every aspect of your Internet-Presence.

Question 8: What businesses would want to partner with you?

Businesses that plan to use the Internet to allow their customers or clients online access to their business database face the problem of how to finance the hardware and software cost for the required Servers and backup infrastructure. Depending on the volume of Internet traffic, this infrastructure may represent a huge amount of capital investment.

Businesses which envision their volume of Internet traffic to become significant will find a strategic partnership with Z2 Computer Solutions to be very advantageous. Not only will a customized solution allow you to create some competitive advantages over your competition, but you do not have to finance nearly as much up front money to get started.

Question 9: What do you do in this strategic partnership?

Z2 Computer Solutions becomes your Internet arm of your business. Both in the short term and in the long term we work directly with you to ensure that the software Applications you need are customized and enhanced to meet the unique requirements of your business plans. We provide the software programming and the daily management of the required Servers and backup infrastructure. As your Internet-Presence grows, we respond. We handle the Internet, you handle the customers and clients.

Question 10: How do you service the strategic partnership?

Based on your specific business plans, and adjusted over time as the amount of Internet volume increases, Z2 Computer Solutions sets up offices and computer Server-sites for you. The physical locations of these offices and computer Server-sites can be anywhere in the world. We manage the day-to-day operations of the entire worldwide distributed network, that is, at every office and for every piece of hardware, everywhere in the world.

Question 11: Is this strategic partnership like using a Hosting Company?

No. A Hosting Company only provides a generic solution. As long as your business plans fit within their common-to-all infrastructure you can contract with them. Forming a partnership with Z2 Computer Solutions allows your business plans and Internet-Presence to move “outside of the box”. Not being limited to a generic solution allows your business to create competitive advantages. Having one or more competitive advantages is what sets your business apart.

Question 12: What does a business need to do to form a strategic partnership?

The strategic partnership is based on a well defined division of responsibility. Z2 Computer Solutions is responsible for providing your Internet-Presence, and you are responsible for satisfying your customers and clients with products and services. There is an intersection of these two responsibilities, in the area of providing your office staff with workstations and menu-interfaces into the WWDN for reports and customer service duties. Z2 Computer Solutions is also responsible for providing these capabilities to your office staff as well.

Therefore what is required to form a strategic partnership is your willingness to engage in the mutually advantageous personal-interactions required to envision and formulate the short and long term capability-requirements which lead towards the success of your long term business plans. Once your unique capability-requirements are understood, we will then customize the software Applications and begin to manage the WWDN for the years to come.

Question 13: What does a business need to do to migrate to a WWDN?

Businesses having an existing large Internet solution, such as an Oracle infrastructure, have the option of migrating slowly by, over time, moving portions of the existing database into their new WWDN. Z2 Computer Solutions will create custom software Applications to interface with the existing Oracle infrastructure. Over time the WWDN will either replace or co-exist with your existing solution.

Businesses having a smaller Internet solution, or which are just getting started, can immediately move their existing database into their customized WWDN. Z2 Computer Solutions will create custom software Applications to transfer the existing data into the new WWDN.

Question 14: How does a WWDN compare with a Teradata Solution?

(quoting from <http://www.teradata.com/enterprise-data-warehouse>)

This Teradata solution allows you to analyze business operations and drive better, faster decisions by providing a complete view of your business and giving you the flexibility and agility to compete. Teradata provides integrated, optimized and extensible technology for a single **application-neutral repository** of your current and historical data, forming the framework of the business intelligence architecture.

Teradata 12.0, the latest database release, includes advanced features such as high-performance parallel database technology, a cost-based optimizer, the most sophisticated mixed workload management tool available, a full suite of data access and management tools and robust data mining software.

Teradata provides a collection of UDFs that emulate the most-commonly used Oracle built-in SQL functions. **By combining Oracle's Business Intelligence and Performance Management products with Teradata, companies can get an enterprise view of their business.** Many Oracle customers have **migrated their data warehouses** from Oracle to Teradata. Why? Because Teradata knows enterprise data warehousing.

Teradata provides a data analyzer and warehousing technology in competition with Oracle and others. Teradata is not trying to compete in terms of providing a significant Internet-Presence, but rather competes in terms of providing a better data-warehousing / analyzing environment.

If needed, a WWDN can share or provide its online data with a Teradata warehousing environment so that you can utilize some of its enhanced warehousing capabilities.

Question 15: Doesn't Amazon, Yahoo, and Google offer something similar?

Yes, and No. For example Amazon offers web hosting services within their existing Internet-Presence infrastructure. This is an impressive offering, and many new businesses may want to take advantage of developing their website applications using already existing SQL based 24/7 infrastructures.

However, essentially they are still offering an Oracle Solution. The WWDN offers businesses an empty-box solution, so that their website Applications can provide significant competitive advantages. Once a customer connects to your Website, if they can see and do things which your Oracle Solution competitors do not provide, then you have a competitive advantage.

Question 16: What are the conceptual cost benefits of a WWDN?

The WWDN is based on the concept of using the same hardware configuration for each Server. A Server is a simple computer platform with a RAID disk array. This configuration is very cost effective. In a WWDN all Servers are "Active", there are no "Passive" Servers just sitting around doing nothing. Thus a WWDN architecture does not have to buy as many hardware Servers as compared to Server-Clusters which require "Passive" Servers. And a WWDN does not have any Oracle yearly license fees.

Oracle supports the concept of Clustering Servers together. To accomplish this clustering you must purchase more Oracle software options and additional hardware. Whereas within a WWDN the concept of clustering the Servers is automatic, inherent in the technology and design, so there are no extra costs.

Oracle supports the concept of Data Distribution and the Caching of heavily used Data-partitions. To accomplish these capabilities you must purchase more Oracle software options and additional hardware. Whereas within a WWDN the concept of Data Distribution and the Caching of heavily used Data-partitions is automatic, inherent in the technology and design, so there are no extra costs.

Z2 Computer Solutions offers the same high-volume Internet-Presence-capabilities, but based upon new modern software technology, allowing simple same-form Server configurations to be augmented together to form a lower cost Worldwide Distributed Database Network of Servers. Partnering with Z2 Computer Solutions allows a business to have a lower cost solution for a very significant Internet-Presence.

Question 17: What are the comparative cost benefits of a four-node Cluster?

An Oracle Solution will have you buy a four-node Server Cluster, where one of the Servers is “Passive”, not servicing customers. Therefore buying four-Servers only gives you the power of buying three-Servers.

A WWDN Solution will have you buy four-Servers, but all of them are “Active” and servicing customers. Therefore buying four-Servers actually gives you the power of buying four-Servers.

Using an online Cost Calculator found at:

<http://www.hp.com/wwsolutions/linux/download/tco/oracle/HPLinuxOracleTCOCalculator.html>

With settings to purchase four (4) Servers to handle 1,000 GB and 1,000 end-users:
 Proliant DL700 Servers (8 x 2.8 GHz Intel Xeon MP Processors, 8 GB RAM)
 Oracle Real Applications Clusters 10g (for 32 processors **at 30% discount**)
 (and noting that this calculator did not include any other typical Oracle options)

The cost of purchase is estimated to be:

ACQUISITION:

Hardware & Storage	\$ 677,200
O.S. Software	\$ 12,000
Oracle Software	\$1,344,000
Management Software	\$ 20,000

ANNUALLY:

Software Licenses	\$ 275,200
IT Operations	\$ 111,020
IT Administration	\$ 94,041
Facilities	\$ 8,000

PREDICTED:

Downtime (@ \$45K/hour)	\$ 18,000
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TOTAL \$2,559,461

Understand that this \$2.559 million is simply one four-node Cluster configuration. This Cluster has not purchased the other Oracle licenses to handle multiple Clusters within a larger network, nor large numbers of concurrent end-users. The online calculator did not purchase: **In Memory Database Cache, Real Application Testing, Oracle Advanced Compression, Total Recall, Oracle Active Data Guard, Oracle Grid Computing, Oracle Database Management Packs, Oracle Partitioning, Oracle Content Database Suite, Oracle OLAP, Oracle Data Mining, Oracle Database Vault, Oracle Advanced Security, Oracle Label Security, Oracle Spatial, Oracle Times-Ten Memory Database, Oracle Warehouse Builder, Virtual Private Database, Fault Tolerance**

Now compare this same four-Server configuration, but for a WWDN:

ACQUISITION:

Hardware	\$ 677,200	(assume it is the same)
O.S. Software	\$ 12,000	(assume it is the same)
Oracle Software	\$ 0	(this is part of the partnership)

Management Software	\$	0	(this is part of the partnership)
ANNUALLY:			
Software License	\$	0	(this is part of the partnership)
IT Operations	\$	0	(this is part of the partnership)
IT Administration	\$	0	(this is part of the partnership)
Facilities	\$	8,000	(assume it is the same)
PREDICTED:			
Downtime (@ \$45K/hour)	\$	0	(a WWDN never goes down)
TOTAL	\$	697,200	

In summary, the four WWDN Servers will cost only about (697 / 2559) **27%** of a four-node Oracle Solution Cluster in the first year. The WWDN strategic partnership is providing a savings of about \$1.862 million just in the first year. And this four-Server estimate represents only a small fraction of the number of Servers required to provide a business with a truly significant worldwide Internet-Presence.

But there is more.

The importance of Downtime Cost is demonstrated in a technical study conducted by Techwise Research Inc., and can be read at:

http://h71000.www7.hp.com/openvms/whitepapers/tco_clusters/TCO_WP_Feb04.pdf .

Significant statements in this study are:

- Three-Fourths ($\frac{3}{4}$) of all Clusters use the Oracle Database software. Other database providers are SAP, PeopleSoft, BEA, DB2, and SAS.
- A four-node (Oracle Solution) Cluster services about 3,600 end users per day.
- The Total Cost of Ownership (TCO) includes:
 - Acquisition and Service Costs,
 - Start-up Costs,
 - Management Costs, and
 - Downtime Costs.
 (notice that the online calculator included all of these TCO costs, including Downtime)
- If you ignore Downtime Costs, then:
 - the cost of Acquisition, Service, and Start-up about equals
 - the cost of Management.
- Company's average cost per hour of downtime is around \$145,000.
- TCO over a three year period for the initial purchase of the Servers and the Service Agreement was only 7%. Downtime is the most significant factor in the TCO. **Regardless of Cluster configuration, the vast majority of the TCO is due to Downtime Costs.**
- A Crash is defined as any event that causes one of the Cluster's primary Applications to become unavailable to end-users. Some crashes are for only a few seconds as the Cluster software "failes over" to another node. Others caused Applications to be down for minutes, even hours.
- Cluster Crashes (hours per year):

Hardware Failure	2.92 to	5.14
Planned Maintenance	0.45 to	3.98
Storage Array Failure	0.31 to	1.41
Software Failure	1.80 to	6.89
End-User Application	1.39 to	9.20
System Management	0.78 to	3.16
TOTAL	8.16 to	29.66 hours/year

Notice that the above online calculator only estimated the Cluster's Downtime to be 0.4 hours in the first year. This appears to be significantly low. Using this study's minimal Downtime estimate of 8.16 hours, the predicted cost for Downtime should have been listed as (8.16 x \$45K) \$367,200. If we use the highest Downtime then we would list (29.66 x \$45K) \$1,334,700.

Using the lowest estimate of \$367K instead of the calculator's \$18K value means that the summary should be adjusted to read: the four WWDN Servers will cost about (697 / 2908) 24% of a four-node Oracle Solution Cluster in the first year. The WWDN strategic partnership is providing a savings of about \$2.211 million just in the first year.

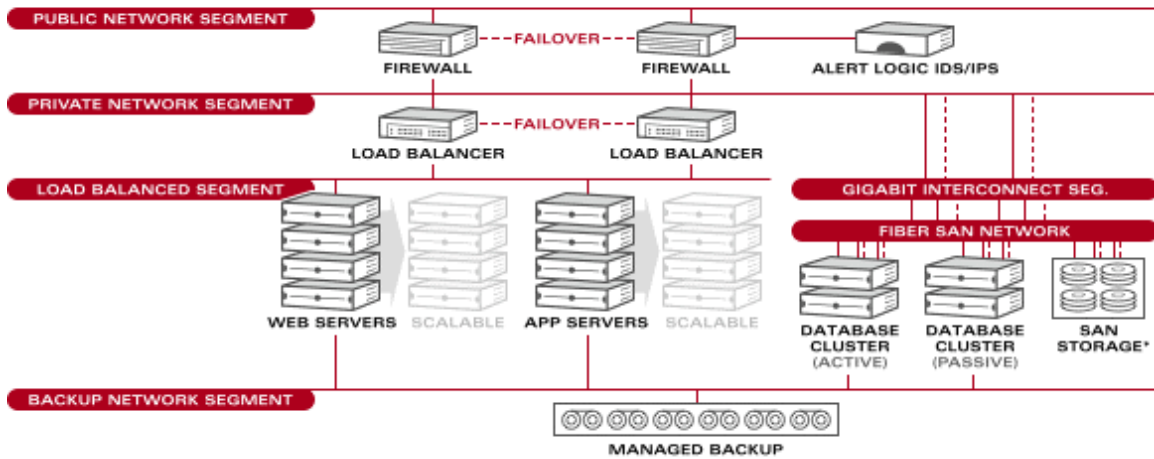
Using the highest estimate of \$1.334 million means that the summary should be adjusted to read: the four WWDN Servers will cost about (697 / 2908) 18% of a four-node Oracle Solution Cluster in the first year. The WWDN strategic partnership is providing a savings of about \$3.178 million just in the first year.

The intent of the above is not to play with numbers of estimated Downtime. The purpose is to emphasize the significance of the WWDN providing a business with 24/7 availability. The "No Downtime" capability of a WWDN means your business might save between \$367K and \$1,335K in the first year for each set of four-Servers.

Question 18: Show a cost comparison of a full Oracle versus WWDN Solution?

The Oracle Solution will look something like this:

Complex Sample One



The following two tables are not just going to show the cost comparison, but also demonstrate the much lower overhead within a WWDN. The first column will describe the typical Data Flow going from the Client’s Browser through the network and back out to the Browser again.

Prices are based upon the online calculator found at:

<http://www.hp.com/wwsolutions/linux/download/tco/oracle/HPLinuxOracleTCOCALculator.html>

Oracle Solution

Follow The Data Flow	Hardware / Software	Acquisition Costs	Yearly Costs
Thousands of Client-Browsers Tcp-connect to one-of-many HTTP Load Balancing Routers	HTTP Load Balancing Routers (such as the D-Link DI-LB604 Express EtherNetwork 4-Port Load Balancing Router)	150/ea	0
One HTTP Load Balancing Router Tcp-connect to one-of-many HTTP Web Servers			
One HTTP Web Server Tcp-connect to one-of-many HTTP Application Servers	HTTP Web Servers Hardware	82,000/ea	0
	HTTP Application Servers Hardware	82,000/ea	0
	Oracle Software Database Enterprise Edition	47,500/cpu	10,450/cpu
	Typical O.S. and System Management Software	16,000	5,000
	IT Operations and Staffing	100,000	100,000
	Option: Real Application Testing <i>Optional purchase, not part of analysis</i>	11,500/cpu	2,530/cpu
	Option: Virtual Private Database	11,500/cpu	2,530/cpu
	Option: Oracle Spatial <i>Optional purchase, not part of analysis</i>	11,500/cpu	2,530/cpu

	Option: Oracle Label Security	11,500/cpu	2,530/cpu
	Option: Oracle Advanced Security	11,500/cpu	2,530/cpu
	Option: Oracle Database Vault Optional purchase, not part of analysis	23,000/cpu	5,060/cpu
	Option: Oracle OLAP Optional purchase, not part of analysis	23,000/cpu	5,060/cpu
Chosen HTTP Application Server inter-process-connects to one-of-many Application-Instances (running within this Server)			
	Application Programs	Development	Maintenance \$
Application-Instance	Uses software component called “mod_plsql” or “PL/SQL Gateway”	Computer sized to handle 1 to N Instances	Maintenance \$
Chosen Application-Instance calls PL/SQL Gateway to Tcp-connect to one-of-many Real Application Clusters (RAC)	PL/SQL Gateway keeps a Pool of open Tcp-connections to the RACs, and writes/reads to its own File System		
	Oracle Real Application Clusters (RAC) Hardware	82,000/ea	
	Oracle Real Application Cluster and Clusterware Software and Grid Computing Concept	23,000/cpu	5,060/cpu
	Option: Oracle In-Memory Database Cache	41,500/cpu	9,130/cpu
	Option: Oracle Times Ten In-Memory Database	41,500/cpu	9,130/cpu
	Option: Oracle Partitioning	11,500/cpu	2,530/cpu
	Option: Oracle Active Data Guard	5,800/cpu	1,276/cpu
	Option: Oracle Content Database Suite	57,500/cpu	12,650/cpu
	Option: Oracle Total Recall	5,800/cpu	1,276/cpu
	Option: Oracle Advanced Compression	11,500/cpu	2,530/cpu
	Option: Oracle Warehouse Builder Optional purchase, not part of analysis	29,000/cpu	6,380/cpu
	Option: Oracle Data Mining Optional purchase, not part of analysis	23,000/cpu	5,060/cpu
	Option: Oracle Database Management Packs Optional purchase, not part of analysis	29,000/cpu	6,380/cpu
	Option: Records Database	57,500/cpu	12,650/cpu
Chosen RAC Stacks the incoming Concurrent SQL Requests	Concurrency Guard		
Next Concurrent SQL Request Tcp-connects to one-of-many Active Server Nodes (one computer within this RAC)	Active Server Nodes	82,000/ea	

	Active Server Node		
	Oracle's Proprietary File System		
Server-Node Stacks the incoming Concurrent Disk-Access Requests	Concurrency Guard		
Next Disk-Access Request uses a fiber channel (very fast) to the RAID/Disk (writes and reads)	RAID-array	300,000	
	Hardware / Software manages duplicate RAID-array-Mirroring	300,000	
	In-Memory Database Cache and Times Ten In-Memory Database and Oracle Partitioning manages Data, Tables, and Partition Caching		
	Software manages Checkpoint Files		
	Software manages Transaction Logging		
	Oracle Data Guard duplicates to another Standby-RAC		
Waiting Active Server Node replies back to waiting SQL Request software			
Waiting SQL Request software replies back to waiting PL/SQL Gateway software			
Waiting PL/SQL Gateway software replies back to waiting Application-Instance			
Waiting Application-Instance Processes / Calculates an answer going back to the Browser		Development	Maintenance \$
Waiting Application-Instance replies back to waiting HTTP Web Server			
Waiting HTTP Web Server replies back to waiting Client-Browser			
	Predicted Cost due to Downtime (15 hours / year at \$45K)		675,000
<u>TOTALS</u>	Total Cost 10-Servers making 40 CPU-Units	\$2,886,700	\$1,077,088

WWDN Solution

Follow The Data Flow	Hardware / Software	Acquisition Costs	Yearly Costs
Thousands of Client-Browsers Tep-	HTTP Load Balancing Routers	150/ea	0

connect to one-of-many HTTP Load Balancing Routers	(such as the D-Link DI-LB604 Express EtherNetwork 4-Port Load Balancing Router)		
One HTTP Load Balancing Router Tcp-connect to one-of-many HTTP Web Servers			
	HTTP Web Servers Hardware (It should be noted that for simplicity this analysis has the WWDN Solution buying the same hardware. <u>But actually the WWDN Solution does not need to buy such expensive Servers.</u>)	82,000/ea	0
One HTTP Web Server Tcp-connect to one-of-many WWDN Application Servers			
	WWDN Application Servers Hardware	82,000/ea	0
	Oracle Software Database Enterprise Edition	47,500/cpu	10,450/cpu
	Typical O.S. and System Management Software	16,000	5,000
	IT Operations and Staffing	100,000	100,000
	Option: Real Application Testing Optional purchase, not part of analysis	11,500/cpu	2,530/cpu
	Option: Virtual Private Database	11,500/cpu	2,530/cpu
	Option: Oracle Spatial Optional purchase, not part of analysis	11,500/cpu	2,530/cpu
	Option: Oracle Label Security	11,500/cpu	2,530/cpu
	Option: Oracle Advanced Security	11,500/cpu	2,530/cpu
	Option: Oracle Database Vault Optional purchase, not part of analysis	23,000/cpu	5,060/cpu
	Option: Oracle OLAP Optional purchase, not part of analysis	23,000/cpu	5,060/cpu
Chosen WWDN Application Server inter-process-connects to one-of-many SnEn Node-Instances (running within this Server)			
	SnEn Application Programs	Development	Maintenance \$
SnEn Node		Computer sized to handle 1 to N Instances	Maintenance \$
Chosen SnEn Node Tcp-connects directly to Target or Responsible SnEn Node running on any Server anywhere in the world	SnEn Application keeps a Pool of open Tcp-connections to other SnEn Applications, no File System required		
	Oracle Real Application Clusters (RAC) Hardware	82,000/ea	
	Oracle Real Application Cluster and Clusterware Software and	23,000/cpu	5,060/cpu

	Grid Computing Concept		
	Option: Oracle In-Memory Database Cache	41,500/cpu	9,130/cpu
	Option: Oracle Times Ten In-Memory Database	41,500/cpu	9,130/cpu
	Option: Oracle Partitioning	11,500/cpu	2,530/cpu
	Option: Oracle Active Data Guard	5,800/cpu	1,276/cpu
	Option: Oracle Content Database Suite	57,500/cpu	12,650/cpu
	Option: Oracle Total Recall	5,800/cpu	1,276/cpu
	Option: Oracle Advanced Compression	11,500/cpu	2,530/cpu
	Option: Oracle Warehouse Builder Optional purchase, not part of analysis	29,000/cpu	6,380/cpu
	Option: Oracle Data Mining Optional purchase, not part of analysis	23,000/cpu	5,060/cpu
	Option: Oracle Database Management Packs Optional purchase, not part of analysis	29,000/cpu	6,380/cpu
	Option: Records Database	57,500/cpu	12,650/cpu
Stacking incoming Concurrent Requests is automatic as each SnEn Node has its own command-queue and executes as a lowest-level CPU-thread. Thus all data-access Requests are "Concurrent-Safe" by design, not overhead.	Concurrency Guard		
Next Concurrent SQL Request Tcp-connects to one-of-many Active Server Nodes (computers in RAC)	Active Server Nodes	82,000/ea	
	Active Server Node		
	Oracle's Proprietary File System		
Server-Node Stacks the incoming Concurrent Disk-Access Requests	Concurrency Guard		
Next Request is processed by the Target SnEn Node and uses a fiber channel (very fast) to the RAID/Disk (writes and reads)	RAID-array	300,000	
	Hardware / Software manages duplicate RAID-array-Mirroring	300,000	
	In-Memory Database Cache and Times Ten In-Memory Database and Oracle Partitioning manages Data, Tables, and Partition Caching		
	Software manages Checkpoint Files		
	Software manages Transaction Logging		
	Oracle Data Guard duplicates to another Standby-RAC		

Target SnEn Node directly Processes / Calculates an answer going back to the Browser		Development	Maintenance \$
Target SnEn Node directly Tcp-Connects to each of the (2 or 3) other SnEn Nodes on different Servers that are responsible for being this Node's "Hot-Backup".	If this Target SnEn Node dies, the Originator SnEn Node automatically and in Real Time starts to use any one of these other "Hot-Backup" SnEn Nodes instead.		
Target SnEn Node replies back to waiting Originator SnEn Node			
Waiting SQL software replies back to waiting PL/SQL Gateway software			
Waiting Active Server Node replies back to waiting PL/SQL Gateway software			
Waiting PL/SQL Gateway software replies back to waiting Application-Instance			
Waiting Originator SnEn Node directly replies back to waiting HTTP Web Server	(Notice that the intermediate WWDN Application Server was bypassed.)		
Waiting HTTP Web Server replies back to waiting Client-Browser			
	Predicted Cost due to Downtime (0 hours / year at \$45K) Because a WWDN never goes down.		0
TOTALS	Total Cost 10-Servers making 40 CPU-Units	\$1,236,300	\$105,000
Notice that the Data Flow overhead is dramatically lower.	Notice that 8 of the 10 Servers are now used as SnEn Application Servers		

Comparing The Two Costs

	Oracle Costs (from above)	\$2,886,700	\$1,077,088
DELTA	Oracle minus WWDN	Saving \$1,650,400 up front capital	Saving \$972,088 in first year
		Saving 57.17%	Saving 90.25%

Comparing The Two Costs Over Five Years

	Oracle Costs (from above)	\$2,886,700	\$5,385,440 in five years
			\$8,272,140

			over five years
<u>DELTA</u>	WWDN Costs (from above)	\$1,236,300	\$525,000 in five years
			\$1,761,300 over five years
	Over Five Years WWDN Saves		\$6,510,840 saved in five years
			Saving 78.71%

Question 19: Summarize

When your business plans include having thousands of Internet customers online at the same time, then you need a Distributed Database Architecture that can span the world. But if you deploy an Oracle Solution than for only a 10-Server Internet-Presence you are typically looking at financing about \$2.887 million up front, plus about \$1.077 million in yearly license fees and operations, every year.

However, by forming a strategic partnership with Z2 Computer Solutions and deploying a WWDN, **only about 53%** of this needs to be capitalized up front, and most significantly the first year’s operational costs will be only about **97% of an Oracle Solution**.

But as time goes on the savings becomes even more significant. Over a five year span our strategic partnership will save you about \$6.5 million, costing only about 22% of what would be expected to be paid with an Oracle Solution. All of this savings with only the first 10-Servers. Imagine the savings if your International Internet-Presence became as significant as Google, which requires about 450,000 Servers !

Further, as the Data Flow Column in the above two tables demonstrate, the WWDN Solution has far less software and hardware overhead. This means that a 10-Server Solution will handle significantly more Internet traffic, meaning that over time less Servers will have to be added as your Internet-Presence grows.

Contact Z2 Computer Solutions and make us part of your business plans.