The Oracle Bare Metal Cloud

... why you should care

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Unsafe Harbor

- This room is an unsafe harbor
- You can rely on the information in this presentation to help you protect your data, your databases, your organization, and your career
- No one from Oracle has previewed this presentation
- No one from Oracle knows what I'm going to say
- No one from Oracle has supplied any of my materials
- Everything I will present is existing, proven, functionality

Introduction

Daniel Morgan

- Oracle ACE Director Alumni
- Oracle Educator
  - Curriculum author and primary program instructor at University of Washington
  - Consultant: Harvard University
  - University Guest Lecturers
    - APAC: University of Canterbury (NZ)
    - EMEA: University of Oslo (Norway)
    - Latin America: Universidad Latina de Panama and Technologico de Costa Rica
- IT Professional
  - First computer: IBM 360/40 in 1969: Fortran IV
  - Oracle Database since 1988-9
  - Beta Tester 10g, 11g, 12c, GoldenGate, TimesTen
  - The Morgan behind www.morganslibrary.org
  - Member Oracle Data Integration Solutions Partner Advisory Council
  - Co-Founder International GoldenGate Oracle Users Group
  - Vice President Twin Cities Oracle Users Group
- Principal Adviser: Forsythe **Meta7**

System/370-145 system console

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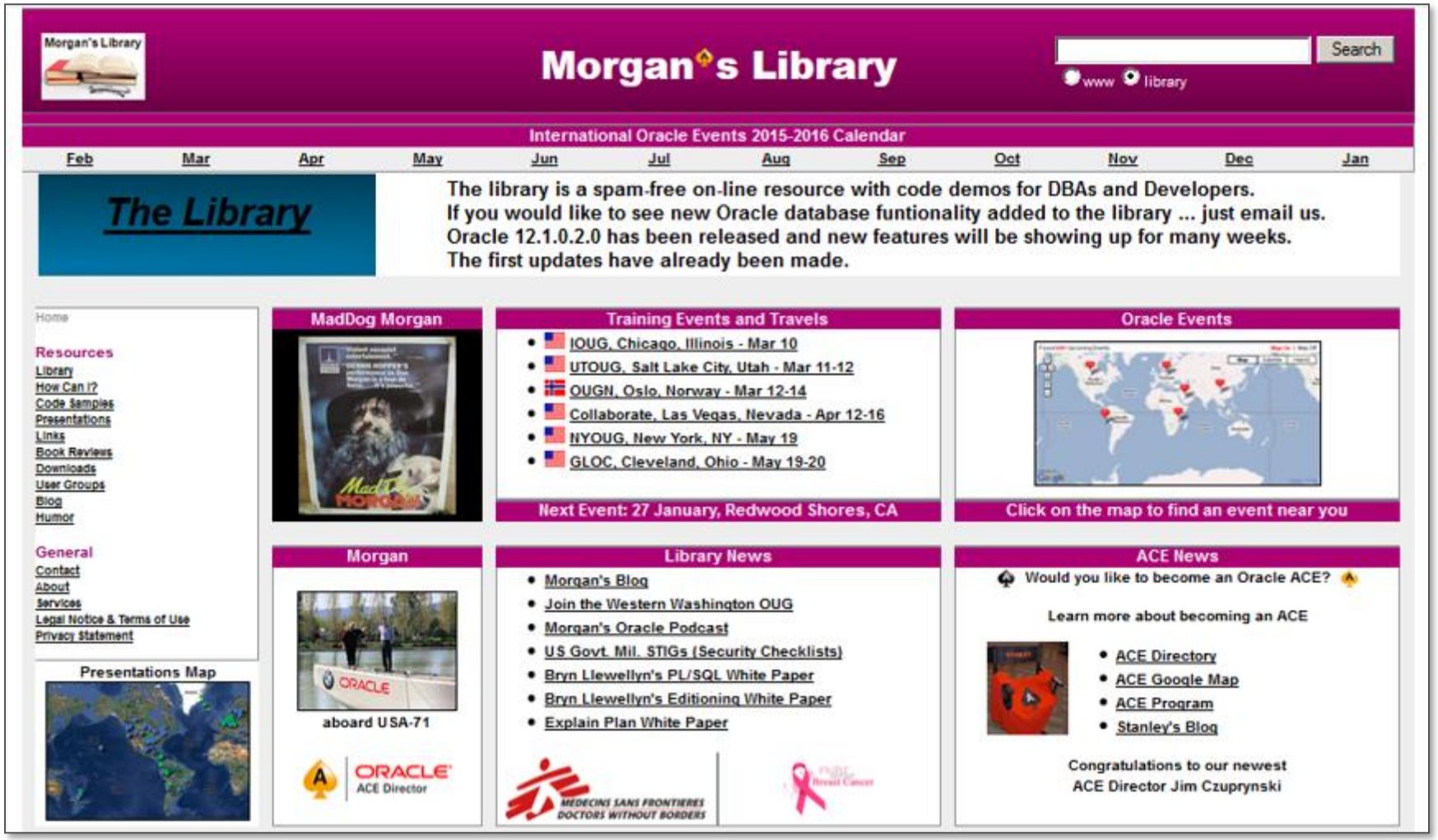
My Websites: Morgan's Library



Forsythe (1:2)

- In business 46 years
- $1.2B in 2016
- Partner with more than 200 technology OEMs

A10 Networks	DataCableTech	Liquidware Labs Logitech	Riverbed Technology
AccessData	Dataram	LockPath	RSA Security
Accutech	Dell EMC	LogLogic	SafeNet
Acronis	Dialogic Dovetailed Technologies	LogRhythm	Sanbolic
ADVA	Digital Guardian	Loop1 Systems	Seagate
Aerohive	Dynatrace	LSI Corporation	Securonix
AirMagnet	Eaton Powerware	Luminex	Server Technology
AirTight Networks	EDGE Memory	Maxell	Service Now
AirWatch	Emulex	McAfee	Silver Peak
AlgoSec	EndRun Technologies	Mellanox Technologies	Software Diversified Services
Amazon	Entrust	Microsoft	Solarflare Communications
APC	Equinix	MobileIron	SolarWinds
AppDynamics	ExtraHop	MRV	Sophos
AppSense	F5 Networks	Multi-Tech Systems	Spectra Logic
Apptio	Fidelis Cybersecurity	nCircle Network Security	Splunk
APTARE	Finisar	Net Optics	STEALTHbits Technologies
Arbor Networks	FireEye	NetApp	SUSE
Arista	FireMon	NetBrain	Symantec
Aruba Networks	Fluke Networks	NetScout	Symmetricom
Avago Technologies	ForeScout Technologies	Netskope	T5
Avant Communications	Fortinet	Network Executive Software	Tele-Communication, Inc.
Avocent Corporation	Fuji	Nimble Storage	Tenable Network Security
Axway	Fujifilm	Norman Data Defense Systems,	Texas Memory Systems
Barracuda Networks	Fujitsu	Inc.	The Written Word
BlueCat Networks	Fusion-io	Northern Software	TierPoint
BMC Software	Gemalto	Novell	Tintri
Boldon James	GIGABYTE	NTP Software	Titus
Box	Gigamon	Nutanix	TransVault
Bradford Networks	Google	NVIDIA	Trend Micro
Brocade	Guidance Software	OCZ Technology	Tripp Lite
CA Technologies	HBGary	Opengear	Tripwire
Cable-Comm Technologies	HDS	Oracle	Trustwave Holdings
Carbon Black	Hewlett Packard Enterprise	Palo Alto Networks	Tufin Software North America,
Catbird Networks	IBM	Panasonic North America	Inc.
CCX Corporation	Imation	Panduit	Variphy

Forsythe (2:2)

- In business 46 years
- $1.2B in 2016
- Partner with more than 200 technology OEMs

Centrify	Imperva	Panzura	Varonis
Cenzic	Index Engines	Peer Software	VCE
Chatsworth	Infoblox	Pivot3	Veeam
Check Point	Intel	PKWARE	Veracode
Ciena	IPsoft	Proofpoint	Veritas
Cisco	Ipswitch	Pure Storage	Vertiv
Citrix	ISI Telemanagement Solutions,	Qlogic	Viavi Solutions
Cloudgenix	Inc.	Qualys	Violin Memory
CommVault	Ixia	Quantum	Viptela
Cortelco	JadeLiquid Software	Radware	Virtual Instruments
Crossbeam Systems	JDSU	Rapid7	VMTurbo
CrowdStrike	Juniper	Raritan	VMware
CTERA Networks	Kingston	RecoveryPlanner	Voltage Security
CyberArk	Lancope	Red Hat	Vormetric
Cylance	Lantronix	RedSeal Systems	Websense
Damballa	Lenovo	Resilient, an IBM Company	Winchester Systems
	Liebert	Reveille Software	Zerto

- Focusing on solutions to business problems ... not products

What Meta7 Brings To The Party

ORACLE Platinum Partner

ORACLE PARTNERNETWORK
FY16 Oracle North America Partner
Outstanding Achievement in Hardware

ORACLE PARTNERNETWORK
FY16 Oracle North America Partner
Outstanding Achievement in Engineered Systems

ORACLE PARTNERNETWORK
FY16 Oracle North America Partner
Outstanding Achievement in SMB Market - Hardware

- Oracle only division of Forsythe
- Platinum Partner
- Focuses on the entire Oracle technology stack
  - The entire line of Oracle infrastructure from x86 through the full stack of engineered systems and storage
  - Oracle Database
    - Design and Deployment
    - Stability
    - Security
    - Scalability
  - Data Integration (GoldenGate and ODI)
  - Oracle Cloud
    - DevOps
    - Infrastructure as Code
- Focusing on solutions to business problems ... not products

Stability: IT Fire Fighting


Oracle Stack Security

Scalability: VLDBs and Partitioning

Database Performance

Zero Downtime Migration

META7™ Solutions for the Red Stack

Just In Time IT Procurement

META7™ Solutions for the Red Stack

Tone Deaf

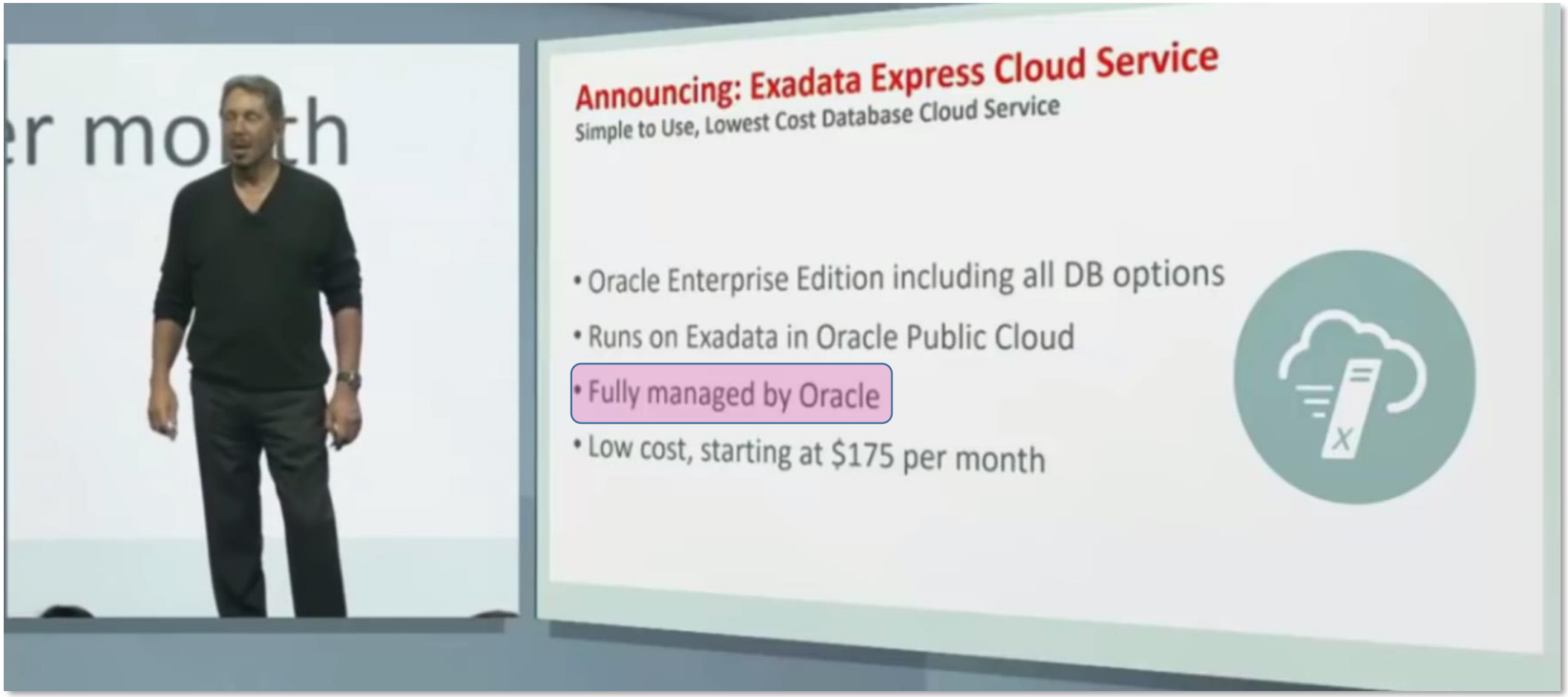
Why Am I Starting Today By Criticizing Oracle?

- Because there are a lot of very good reasons why DBAs should embrace the Oracle Cloud and Oracle has been tone deaf ... I want to change that
- Because no company has done a worse job of explaining the value of the Oracle Cloud's than Oracle Corp.
- Because some of Oracle's messaging at User Group Conferences, and especially last year at OpenWorld, was ... well ... "deaf, dumb, and stupid"
- Because the information I will present today looks nothing like Oracle's message but is precisely what you need to know and should have had 2+ years ago

What Is The Cloud?

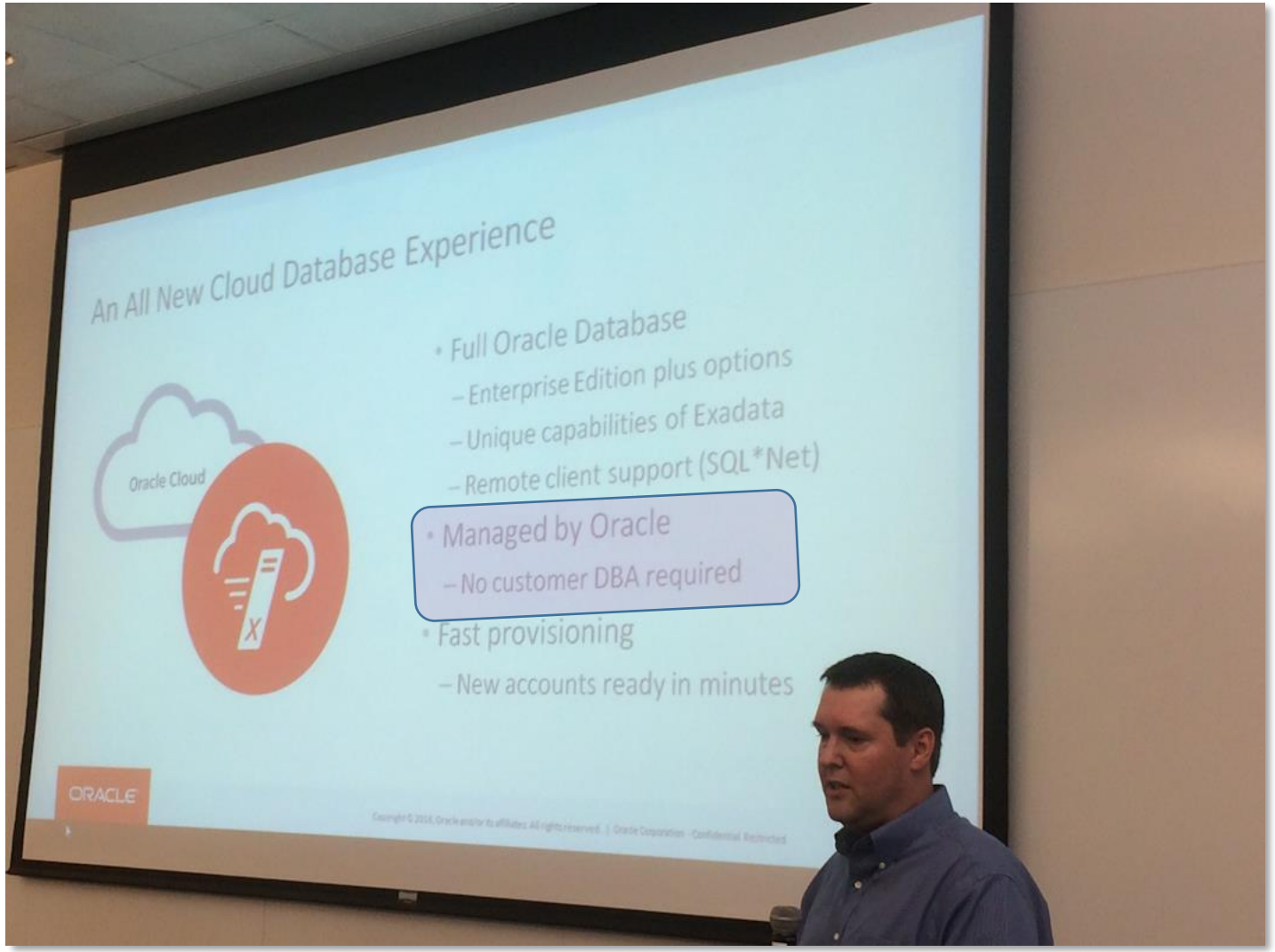
- Surely Morgan you aren't going to explain this to a group of intelligent Oracle professionals
- You're right ... I'm not
- No history lesson on 1950s service bureaus with IBM mainframes such as Service Bureau Corp. providing "Cloud" in 1957
- No explanation about AaaS *aka* SaaS because everyone here knows about Salesforce.com and Oracle's thousands of Cloud application offerings
- I'll waste no time on Amazon AWS's, Microsoft Azure's, etc. etc. *ad nauseum*
- You can't build RAC Clusters in either so nothing to talk about
- But I do want to invest time talking about the Oracle Cloud not as a list of products, not as a page of logos, not from the point of view that X is less expensive than Y
- I want to talk about it from the standpoint of the technology and how DBAs and their organizations can benefit

A Partial Truth At OpenWorld 2016



- What, specifically, is "Fully managed by Oracle?"
- And why is this critically important to Oracle DBAs?

A Non-Truth At The ACE Director Briefings Before OpenWorld 2016



Some People May Have Good Reason to Fear Technology

Oracle DBAs have nothing to fear from the changes coming to our industry

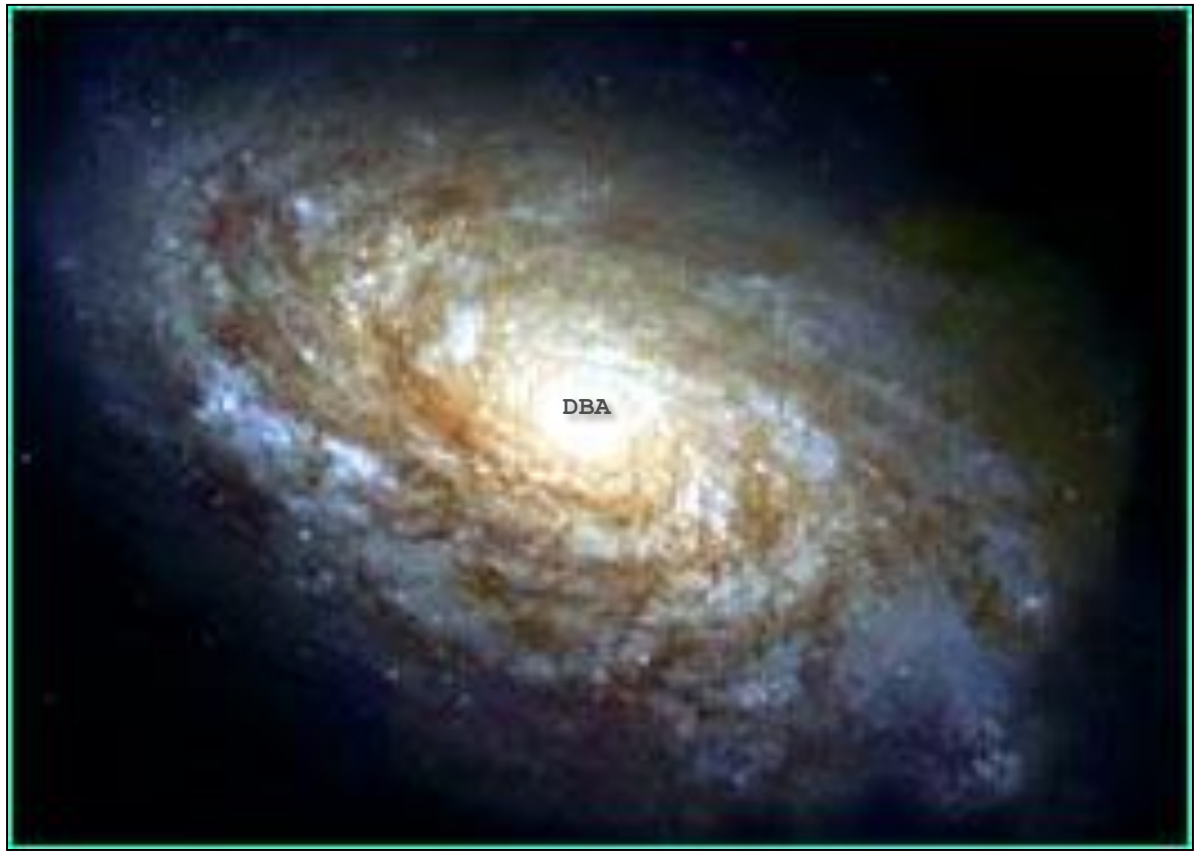
What Is "Fully managed by Oracle?"

- Is Oracle going to rack and stack the hardware in their data center?
- Is Oracle going to provide network connectivity and a firewall?
- Is Oracle responsible for NTP and DNS?
- Is Oracle responsible for infrastructure security?
- Is Oracle going to install and patch the operating system?
- Is Oracle going to install and patch the database?

- Do you think Oracle is going to install your application?
- Do you think Oracle is going to create users on demand? Grant privs?
- Do you think Oracle is going to configure your application's security?
- Do you think Oracle is going to patch and upgrade your application?
- Do you think Oracle is going to tune developer's "bad" SQL statements?

Why It Matters

- Oracle first customer wasn't the CIA it was the first Oracle DBAs
- Oracle's next 100,000 customers were also Oracle DBAs
- And Oracle has always treated our database as the center of its universe



- The Cloud doesn't change that

Oracle's IaaS and DBaaS (1:3)

- Let's consider a historical perspective
- If in the 1970s you would have been working on an IBM or Amdahl mainframe
  - Would you have transitioned your skills to Client Server and Oracle in the 80's?
  - How many mainframe jobs are you aware of today?
- Twenty years later you would have been working in a Client Server environment with applications distributed on client desktops
  - Would you have transitioned your skills to n-Tier architecture with application servers like WebLogic, WebSphere, JBoss, IIS in the 2000s?
  - How many Client-Server jobs are you aware of today?
- It is 2017 and the industry is transitioning again; this time to what we call "the Cloud"
  - What are you going to do?
  - How many n-Tier jobs do you think there will be in another 10 years?

Oracle's IaaS and DBaaS (2:3)

- Do you remember when Oracle introduced the UNDO tablespace?
  - Oracle will never be able to manage rollback segments as well as a DBA
  - Want to go back to `SET TRANSACTION USE ROLLBACK SEGMENT rb1`?
- Do you remember when Oracle introduced OEM?
  - It's a GUI ... we're all going to lose our jobs!!!
- Do you remember when Oracle introduced ASM?
  - DBAs will never be able to manage storage it is too complex!!!
- Do you remember when Oracle introduced Engineered Systems?
  - Would anyone in this room give up their Exadata for a 3U pizza box?

- Is there anyone in this room that thinks their architects and System Admins can engineer more stable, more secure, and higher performing systems than Oracle?
- Is there anyone in this room that thinks their primary job skills as a DBA is typing `./runInstaller`?

Oracle's IaaS and DBaaS (3:3)

- The Oracle Cloud, whether on or off our premises means
  - Not just our servers and databases are engineered by Oracle
  - Our entire operating environment is engineered by Oracle
  - No more LUNS too small to be of value
  - No more interconnects on oversubscribed VLANs
  - No more technically challenged blade servers
- As DBAs we can focus our efforts on
  - Providing architecture and coding advice to development
  - Enhancing application stability
  - Enhancing application security
  - Enhancing application performance
  - Perform a thorough root cause analysis when something goes wrong
  - Reading the docs to keep our skill sets up-to-date
  - Going home in fewer than 60 hours per week
  - Spending time with family and friends on weekends, evenings, and holidays

Where's The Value?

In Enterprise Computing Only Two Things Matter

QoS

TCO

In Enterprise Computing Only Two Things Matter

- **QoS** ... Quality of Service is a simple way of saying a solution is
  - Stabile
  - Secure
  - Scalable
  - Addresses a business need
- **TCO** ... Total Cost of Ownership is a simple way of saying enterprise computing solutions must
  - Not negatively impact the cost or ability to deliver products and services
- Many separate factors contribute to each of these from staffing to complexity ... but ultimately what matters can be summed up in these two acronyms
- At Meta7 we are in the business of solving business problems through the application of technologies that achieve both goals simultaneously

A Short History of Enterprise Computing (1:3)

- In the 1960s databases were flat files on mainframes; application interfaces were dumb terminals; reports were green bar
  - Our customers paid for computing by the tick of the cpu clock

- In the 1980s mainframes with flat files were replaced with client-server computing with relational databases such as Informix, Sybase, and Oracle
  - The database resided on a UNIX server; applications resided on user's desktops; reports came from local printers on standard paper
  - Our customers paid for computing by the number of cpu cores
- In the 2000s client-server was replaced with n-tier architecture with separate database, application, and web servers
  - Databases continued to reside on a UNIX server; applications resided in the data center and were delivered to web browsers
  - Our customers continued to pay for computing by the number of cpu cores
- Beginning in the 2010s it became apparent we were drowning with too much complexity, too little security, and far too much cost

A Short History of Enterprise Computing (2:3)

- In the 2010s it became apparent to industry leaders that the evolution from mainframe to client-server to n-tier had led us to endlessly increasing costs and complexity, and to issues impacting stability, security, and scalability
- And that the exact same problem exists that drove mainframes and COBOL to near extinction: **IT is not responsive to the needs of the business**
- Thus the DevOps and the "Cloud" architecture were born based on the best of breed from previous architectures and new concepts such as Infrastructure as Code (IaC)
  - Stability, often referred to as "high availability" is improved by infrastructure and software that eliminate single points of failure
  - Security is improved by deploying "best practices" too expensive for most enterprises to deploy for themselves
  - Scalability is improved through using IaC to manage a large pool of resources while controlling costs so that we only pay for what we use

A Short History of Enterprise Computing (3:3)

- But the most important benefits from "the Cloud" have nothing to do with "the Cloud"
- Just-in-time (JIT) is an inventory strategy companies first began employing in the 1980s to increase efficiency and decrease waste by receiving goods only as they were needed in the production process, thereby reducing inventory costs
- The most important benefit derived from "the Cloud" is the realization that "Just In Time" provisioning can be applied to IT
  - Purchase only what you need
  - Just before you need it

What is Infrastructure as Code (IaC)?

- Infrastructure as Code is the process of managing and provisioning computer data centers through machine-readable definition files, rather than physical hardware configuration or interactive configuration tools
- Both physical equipment such as bare-metal servers and virtual machines and associated configuration resources are called "infrastructure"
- The concept of IaC is one of using code to design, implement, and deploy application infrastructure with known software best practices
- The ability to treat infrastructure as code allows for a cycle of development, pre-production testing and deployment after quality checks that has been behind the success of essentially all technology-based projects from the Hubble Space Telescope to the mobile phone system

The IaC Business Case

- The value of Infrastructure as Code can be broken down into three, measurable categories
  - Cost (reduction)
    - Cost reduction aims at helping not only the enterprise financially but also in terms of people and effort, meaning that by removing the manual component, people are able to refocus their efforts towards other enterprise tasks
  - Speed (faster execution)
    - Infrastructure automation enables speed through faster execution when configuring your infrastructure and aims at providing visibility to help other teams across the enterprise work quickly and more efficiently
  - Risk (remove errors and security violations)
    - Automation removes the risk associated with human error, like manual misconfiguration; removing this can decrease downtime and increase reliability
    - IaC, by definition, increases the organization's maturity providing built-in Change Management and a single version of truth

Traditional Database Deployment (1:4)

1. Identify resource requirements
   - Storage requirements
   - Network requirements
   - Server capabilities
   - Security requirements
   - High Availability Requirements (DR, SLA, RTO, RPO)
2. Purchase resources at the maximum level you expected for the next 3-5 years
3. Provision infrastructure
   - IP addresses
   - Appropriate quantities of Tier 1 (and Tier 2 storage)
   - Rack space
   - Operating system licenses
   - Database licenses
   - Other licenses

Traditional Database Deployment (2:4)

4. Download Software for Installation
5. Wait while
   - Storage is provisioned
   - Holes are punched in the firewall
   - Infrastructure is racked and stacked
   - Operating systems are misconfigured
5. Install software in the Oracle Home(s)
   - Multiplex the control file
   - Multiplex the redo logs
   - Configure sqlnet, listener, and tnsnames .ora files
   - Configure spfile parameters
   - Configure auditing
6. Go to support.oracle.com and
   - Research the one-off patches that need to be applied
   - Download the patches

Traditional Database Deployment (3:4)

8. Sequentially apply each patch
9. Install the OEM Agent and configure credentials
10. FTP everything to the DR site and repeat steps 2, 4, 5, 7 and 8
11. Register the database with the RMAN repository

Traditional Database Deployment (4:4)

- And it gets more complex and time consuming if
  - It is a RAC cluster
  - GoldenGate or other Data Integration products are not in use
  - The current SAN has insufficient capacity
  - Current VLANs are overprovisioned
  - The initial requirements are were not accurate
  - The system has growth rate outside the expected range
  - Something else is provisioned in the data center as a shared service that starts utilizing your database's portion of any resource
  - Your system architects, System Admins, Network Admins, and Storage Admins do not regularly read the Oracle docs, read Oracle books and blogs, attend user group conferences, and are aware of the many issues that exist when deploying on blade servers and generic converged infrastructure solutions

IaC Database Deployment

1. Identify resource requirements
   - Storage requirements
   - Network requirements
   - Server capabilities
   - Security requirements
   - High Availability Requirements (DR, SLA, RTO, RPO)
2. Write what definition of what you want to deploy in an IaC configuration file
3. Execute the configuration

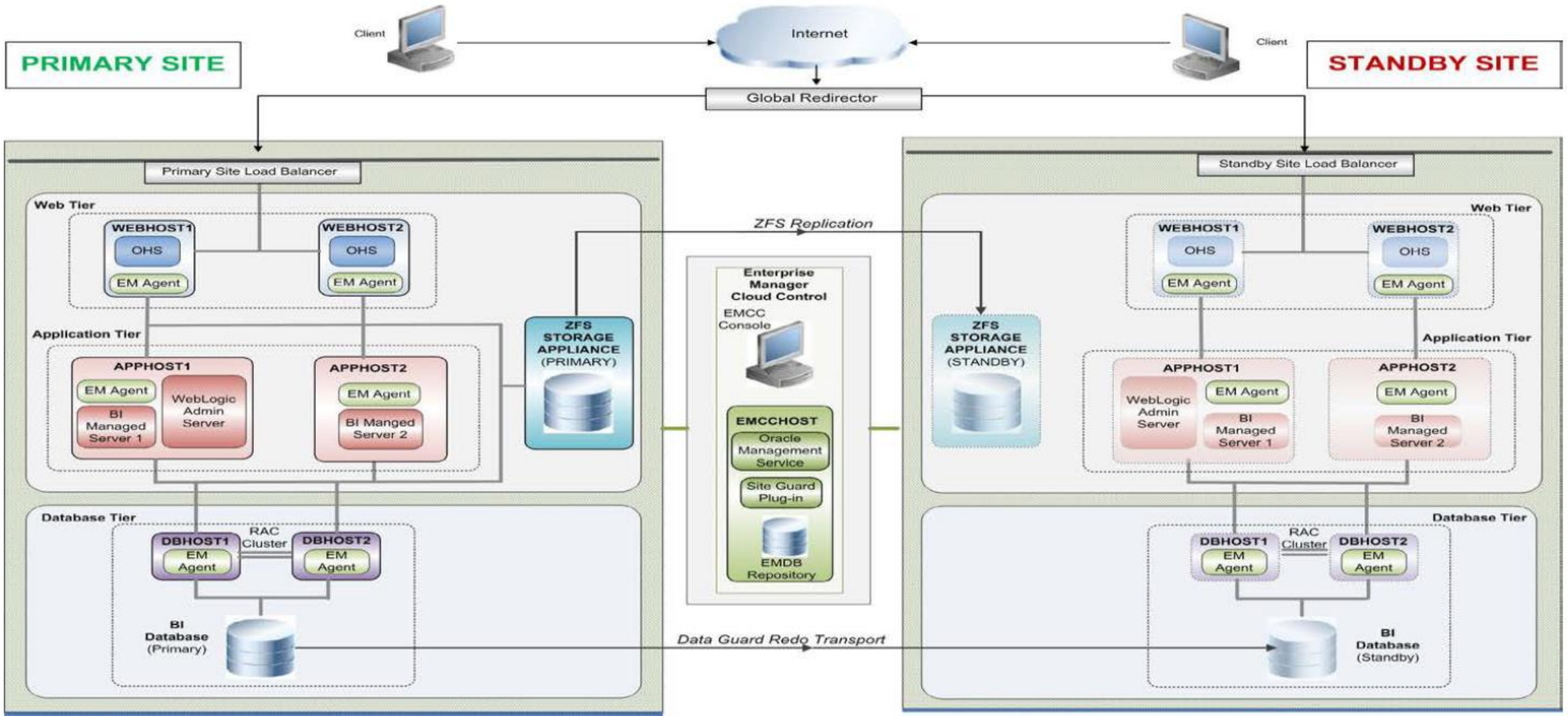
If you need fewer resources ... update the parameters and reconfigure

If you need more resources ... update the parameters and reconfigure

Site Guard (1:3)

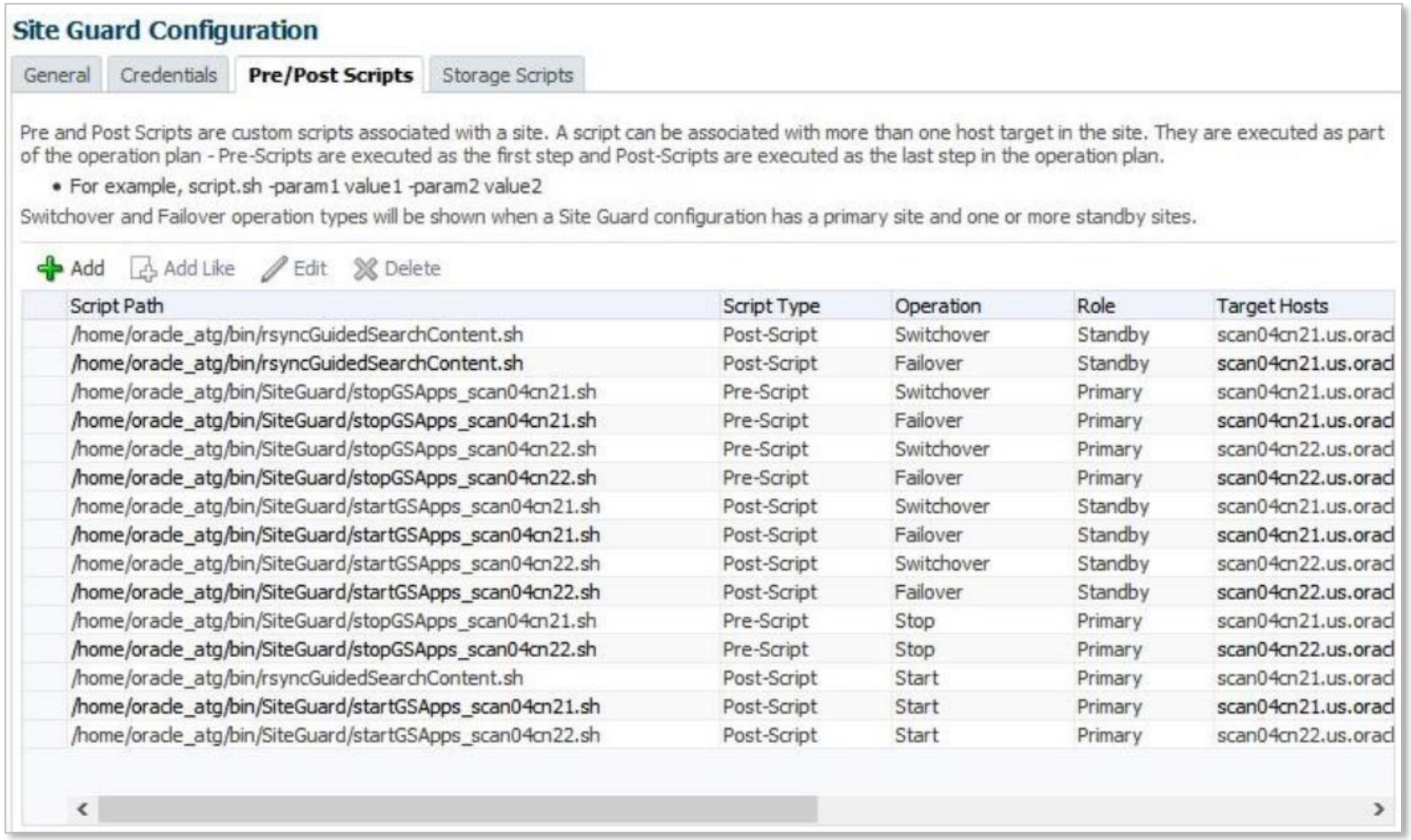
- Oracle has been doing IaC at product for years
- Site Guard is an OEM Plug-In that provides full stack IaC automation for switchover and failover between data centers
- Achieves graceful site level role transitions
- Extensible to integrate with 3rd party infrastructure components
- Reduces the possibility of human errors during a critical operation where failure must be avoided

Site Guard (2:3)



Site Guard (3:3)

- Sample Site Guard script



Site Guard Configuration

General | Credentials | **Pre/Post Scripts** | Storage Scripts

Pre and Post Scripts are custom scripts associated with a site. A script can be associated with more than one host target in the site. They are executed as part of the operation plan - Pre-Scripts are executed as the first step and Post-Scripts are executed as the last step in the operation plan.

- For example, script.sh -param1 value1 -param2 value2

Switchover and Failover operation types will be shown when a Site Guard configuration has a primary site and one or more standby sites.

Add | Add Like | Edit | Delete

Script Path	Script Type	Operation	Role	Target Hosts
/home/oracle_atg/bin/rsyncGuidedSearchContent.sh	Post-Script	Switchover	Standby	scan04cn21.us.orac
/home/oracle_atg/bin/rsyncGuidedSearchContent.sh	Post-Script	Failover	Standby	scan04cn21.us.orac
/home/oracle_atg/bin/SiteGuard/stopGSApps_scan04cn21.sh	Pre-Script	Switchover	Primary	scan04cn21.us.orac
/home/oracle_atg/bin/SiteGuard/stopGSApps_scan04cn21.sh	Pre-Script	Failover	Primary	scan04cn21.us.orac
/home/oracle_atg/bin/SiteGuard/stopGSApps_scan04cn22.sh	Pre-Script	Switchover	Primary	scan04cn22.us.orac
/home/oracle_atg/bin/SiteGuard/stopGSApps_scan04cn22.sh	Pre-Script	Failover	Primary	scan04cn22.us.orac
/home/oracle_atg/bin/SiteGuard/startGSApps_scan04cn21.sh	Post-Script	Switchover	Standby	scan04cn21.us.orac
/home/oracle_atg/bin/SiteGuard/startGSApps_scan04cn21.sh	Post-Script	Failover	Standby	scan04cn21.us.orac
/home/oracle_atg/bin/SiteGuard/startGSApps_scan04cn22.sh	Post-Script	Switchover	Standby	scan04cn22.us.orac
/home/oracle_atg/bin/SiteGuard/startGSApps_scan04cn22.sh	Post-Script	Failover	Standby	scan04cn22.us.orac
/home/oracle_atg/bin/SiteGuard/stopGSApps_scan04cn21.sh	Pre-Script	Stop	Primary	scan04cn21.us.orac
/home/oracle_atg/bin/SiteGuard/stopGSApps_scan04cn22.sh	Pre-Script	Stop	Primary	scan04cn22.us.orac
/home/oracle_atg/bin/rsyncGuidedSearchContent.sh	Post-Script	Start	Primary	scan04cn21.us.orac
/home/oracle_atg/bin/SiteGuard/startGSApps_scan04cn21.sh	Post-Script	Start	Primary	scan04cn21.us.orac
/home/oracle_atg/bin/SiteGuard/startGSApps_scan04cn22.sh	Post-Script	Start	Primary	scan04cn22.us.orac

The Traditional Database Purchasing Algorithm

- Determine the largest resource requirement you anticipate having over the following 12-60 months
  - Add a percentage to that requirement to provide a safety margin
- Purchase infrastructure and licensing capable of meeting that peak load requirement
- Pay for that infrastructure, licensing, and associated support cost 7 x 24 x 365
- If your requirement decreases you are stuck with what you purchased
- If your requirements increase use a forklift to move it out into the parking lot and purchase more
  - more expensive infrastructure
  - more storage
  - more servers
  - more licenses
  - more support

The Metered Services Purchasing Algorithm

- Purchase, each hour precisely what you need for that hour
- If your requirement decreases purchase less lowering your cost of operations
- If your requirements increase purchase more in accordance with your need

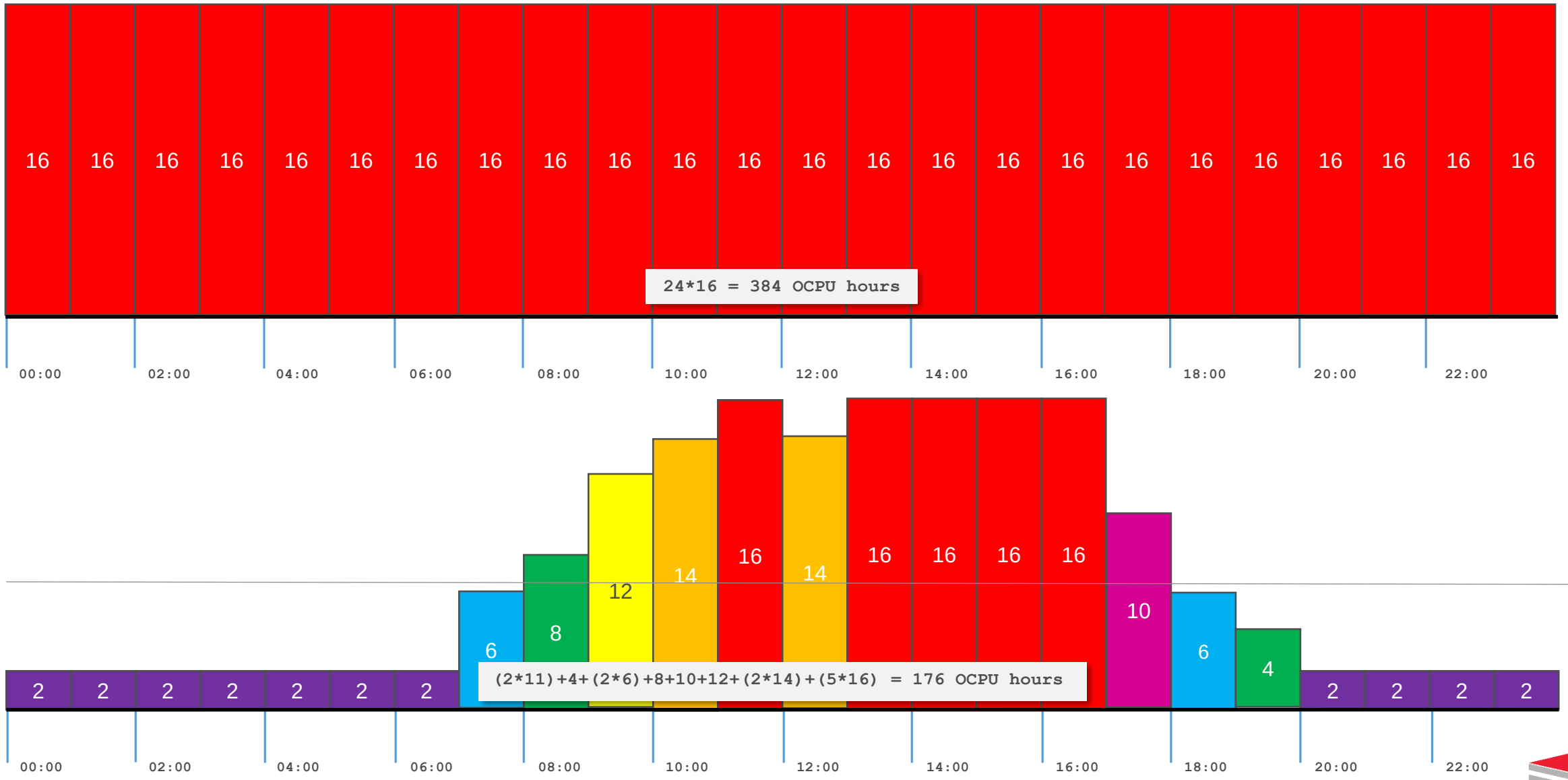
Metered Services - Bare Metal Instances

Buy Now

Instance Type	Shape	OCPU	Memory (GB)	Local Disk (TB)	Price	Metric
Standard Compute Capacity	BM.Standard1.36	36	256	Block Storage Only	$0.075	OCPU / Hour
High I/O Compute Capacity	BM.HighIO1.36	36	512	12.8TB NVMe SSD	$0.12	OCPU / Hour
Dense I/O Compute Capacity	BM.DenseIO1.36	36	512	28.8TB NVMe SSD	$0.15	OCPU / Hour

Price does not including Oracle licenses and support

Fixed vs. IaC (1:2)



Fixed vs. IaC (2:2)

- The following is based on Oracle's published cost of $0.15 Per OCPU per hour for an 8,760 hour year (365 x24) based on a 7 day week

IaaS CPU cores	Cost/OCPU/hour	OCPU hrs/year	Annual Cost
Fixed 16	0.15	140,160	$21,024
Dynamic: Managed	0.15	64,240	$ 9,636

- Calculated on a 5 day business week not paying for maximum capabilities on Saturdays and Sundays

IaaS CPU cores	Cost/OCPU/hour	OCPU hrs/year	Annual Cost
Fixed 16	0.15	140,160	$21,024
Dynamic: Managed	0.15	50,752	$ 7,613

- Dynamic Management brings in addition to providing all of its other benefits provides an annual Cloud deployment saving of between 54% and 64%

DBaaS with IaC vs. x86

- DL580 pricing is based on the fully discounted price of all components over 3 years and an Oracle EE license discount of 35%
- Cloud pricing is based on Oracle's published list price for DBaaS of $6.72 Per OCPU per hour after applying a 15% discount ($5.71/ocpu hr) over 3 years
- Both are based upon bare metal installation and 20 TB of usable storage

Compute Node	Server Cost	Storage	Server Support	O/S Support	DB Support	FTEs	DC	TCO (3 yrs)
HP DL580 16 core	$58,100	$30,000	$2,176	$2400	$163,020	$60,000	$1,736	$317,432
DBaaS 16 ocpu	$289,794	$13,000	included	included	included	$8,000	included	$310,794

- Add to the HP DL580 solution all costs associated with
  - Security including firewalls
  - Network infrastructure including switches and routers, and load balancers
  - Insurance
  - Taxes
- With the HP DL580 if you need 20 cpu cores ... buy another server + licenses
- With the IaC solution if you need 20 cpu cores ... you bring it online in 60sec.

An Additional Options That Can Drive Deeper TCO Savings

- It is possible to subscribe to more than one Oracle option at one time for the same database using IaC to manage subscription usage
- One option that could be very appealing
  - Use a non-metered subscription for the majority of the month when cpu requirements are minimal
  - Use metered service for the small number of days each month where there is a need to scale cpu for peak loads

Oracle Cloud IaC Code Sample (1:2)

```
  sshKeys.#: "" => "1"
  sshKeys.0: "" => "ATS-cluster-ssh"
  vcable:    "" => "<computed>"
opc_compute_instance.web_nodes.0: Creating...
  imageList: "" => "/Compute-a430291/DRAUBA@forsythe.com/Ubuntu.16.04-LTS.amd64.20170307.1"
  ip:        "" => "<computed>"
  label:     "" => "WEB1"
  name:      "" => "WEB1"
  opcId:     "" => "<computed>"
  shape:     "" => "oc3"
  sshKeys.#: "" => "1"
  sshKeys.0: "" => "ATS-cluster-ssh"
  vcable:    "" => "<computed>"
opc_compute_security_ip_list.open-internet: Creation complete (ID: open-internet)
opc_compute_security_list.ATS-cluster: Creation complete (ID: ATS-cluster)
opc_compute_ip_reservation.web_node_reservations.1: Creation complete (ID: 0edc423b-...fd4311f1)
opc_compute_ip_reservation.web_node_reservations.0: Creation complete (ID: 7a72ecf7-...3b0c8701)
opc_compute_security_list.allow-ssh: Creation complete (ID: allow-ssh)
opc_compute_security_rule.allow-ssh: Creating...
  action:           "" => "permit"
  application:      "" => "/oracle/public/ssh"
  destination_list: "" => "seclist:allow-ssh"
  disabled:         "" => "false"
  name:             "" => "allow-ssh"
  source_list:      "" => "seciplist:open-internet"
opc_compute_security_rule.allow-ssh: Creation complete (ID: allow-ssh)
opc_compute_instance.web_nodes.1: Still creating... (10s elapsed)
opc_compute_instance.web_nodes.0: Still creating... (10s elapsed)
opc_compute_instance.web_nodes.1: Still creating... (20s elapsed)
opc_compute_instance.web_nodes.0: Still creating... (20s elapsed)
opc_compute_instance.web_nodes.1: Still creating... (30s elapsed)
opc_compute_instance.web_nodes.0: Still creating... (30s elapsed)
opc_compute_instance.web_nodes.1: Still creating... (40s elapsed)
opc_compute_instance.web_nodes.0: Still creating... (40s elapsed)
opc_compute_instance.web_nodes.1: Still creating... (50s elapsed)
opc_compute_instance.web_nodes.0: Still creating... (50s elapsed)
opc_compute_instance.web_nodes.1: Still creating... (1m0s elapsed)
opc_compute_instance.web_nodes.0: Still creating... (1m0s elapsed)
opc_compute_instance.web_nodes.1: Still creating... (1m10s elapsed)
opc_compute_instance.web_nodes.0: Still creating... (1m10s elapsed)
opc_compute_instance.web_nodes.1: Still creating... (1m20s elapsed)
opc_compute_instance.web_nodes.0: Still creating... (1m20s elapsed)
opc_compute_instance.web_nodes.1: Still creating... (1m30s elapsed)
opc_compute_instance.web_nodes.0: Still creating... (1m30s elapsed)
opc_compute_instance.web_nodes.1: Still creating... (1m40s elapsed)
opc_compute_instance.web_nodes.0: Still creating... (1m40s elapsed)
opc_compute_instance.web_nodes.1: Creation complete (ID: WEB2)
opc_compute_instance.web_nodes.0: Still creating... (1m50s elapsed)
```

Oracle Cloud IaC Code Sample (2:2)

```
null_resource.install-consul (remote-exec): Reading package lists... 0%
null_resource.install-consul (remote-exec): Reading package lists... 100%
null_resource.install-consul (remote-exec): Reading package lists... Done
null_resource.install-consul (remote-exec): Building dependency tree... 0%
null_resource.install-consul (remote-exec): Building dependency tree... 0%
null_resource.install-consul (remote-exec): Building dependency tree... 50%
null_resource.install-consul (remote-exec): Building dependency tree... 50%
null_resource.install-consul (remote-exec): Building dependency tree
null_resource.install-consul (remote-exec): Reading state information... 0%
null_resource.install-consul (remote-exec): Reading state information... 7%
null_resource.install-consul (remote-exec): Reading state information... Done
null_resource.install-consul (remote-exec): curl is already the newest version (7.47.0-1ubuntu2.2).
null_resource.install-consul (remote-exec): 0 upgraded, 0 newly installed, 0 to remove and 23 not upgraded.
null_resource.install-consul (remote-exec): Fetching Consul...
null_resource.install-consul (remote-exec):   % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
null_resource.install-consul (remote-exec):                                 Dload  Upload   Total   Spent    Left  Speed
null_resource.install-consul (remote-exec):   0     0    0     0    0     0      0      0 --:--:-- --:--:-- --:--:--     0
null_resource.install-consul (remote-exec):   0 8559k    0 29473    0     0  33309      0  0:04:23 --:--:--  0:04:23 33302
null_resource.install-consul: Still creating... (1m0s elapsed)
null_resource.install-consul (remote-exec):  28 8559k   28 2463k    0     0  1310k      0  0:00:06  0:00:01  0:00:05 1310k
null_resource.install-consul (remote-exec):  88 8559k   88 7615k    0     0  2645k      0  0:00:03  0:00:02  0:00:01 2645k
null_resource.install-consul (remote-exec): 100 8559k  100 8559k    0     0  2803k      0  0:00:03  0:00:03 --:--:-- 2804k
null_resource.install-consul (remote-exec): Installing Consul...
null_resource.install-consul (remote-exec): Installing Systemd service...
null_resource.install-consul (remote-exec): Starting Consul...
null_resource.install-consul (remote-exec): using systemctl
null_resource.install-consul (remote-exec): Created symlink from /etc/systemd/system/multi-user.target.wants/consul.service to /etc/systemd/system/consul.service.
null_resource.install-consul (remote-exec): # Generated by iptables-save v1.6.0 on Fri Apr  7 15:49:47 2017
null_resource.install-consul (remote-exec): *filter
null_resource.install-consul (remote-exec): :INPUT ACCEPT [4:388]
null_resource.install-consul (remote-exec): :FORWARD ACCEPT [0:0]
null_resource.install-consul (remote-exec): :OUTPUT ACCEPT [4:356]
null_resource.install-consul (remote-exec): -A INPUT -p tcp -m tcp --dport 8400 -j ACCEPT
null_resource.install-consul (remote-exec): -A INPUT -p tcp -m tcp --dport 8302 -j ACCEPT
null_resource.install-consul (remote-exec): -A INPUT -p tcp -m tcp --dport 8301 -j ACCEPT
null_resource.install-consul (remote-exec): -A INPUT -p tcp -m tcp --dport 8300 -j ACCEPT
null_resource.install-consul (remote-exec): COMMIT
null_resource.install-consul (remote-exec): # Completed on Fri Apr  7 15:49:47 2017
null_resource.install-consul: Creation complete (ID: 3750839304722881756)

Apply complete! Resources: 18 added, 0 changed, 0 destroyed.

The state of your infrastructure has been saved to the path
below. This state is required to modify and destroy your
infrastructure, so keep it safe. To inspect the complete state
use the `terraform show` command.
```

TCO Summary

- Unlike the unrealized promises you have heard for years ... the TCO savings are measurable
  - Finance
    - CapEx becomes OpEx
    - Move your IT to Just In Time (JIT) procurement and provisioning
    - Purchase only what you need only when you need it
    - All data center costs reduced to 0
    - Cost of asset insurance reduced to 0
    - State and local taxes on assets reduced to 0
    - Budgeting becomes more predictable
    - If something breaks it is not your problem
  - FTEs
    - Network administration resources required 0
    - Storage administration resources required 0
    - System administration resources required reduced by more than 65%
    - Database administration resources refocused on QoS

QoS Summary

- Stability and reliability enhanced because applications run on infrastructure designed and deployed by Oracle's architects
- Security enhanced because application run in data centers built, certified and operated in compliance with the strictest DOD regulations
  - DBAs and IT professionals have time to concentrate on what is important to the business
- Scalability enhanced because the pool of assets, network bandwidth, storage, memory, and cpu can be immediately, and flexibly, expanded to meet essentially any requirement
- Performance enhanced by more frequent tech refreshes
- Consistent on-demand creation of Dev, Test, and Production environments

In Enterprise Computing Only Two Things Matter

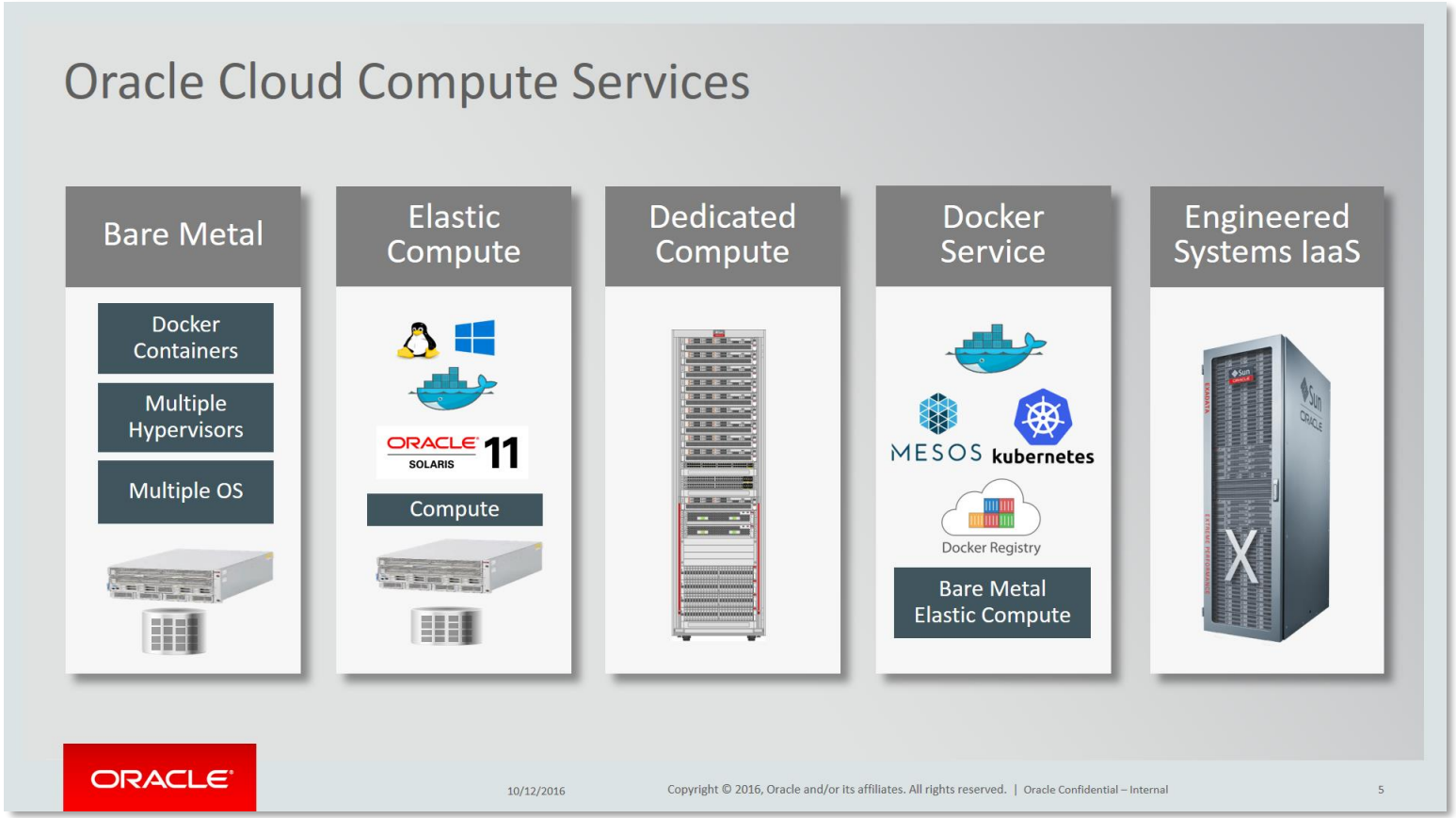
QoS

TCO

Oracle's Bare Metal Cloud

Oracle's Bare Metal Cloud (1:2)

- Of all of Oracle's Cloud offerings the one you want to focus on is the Bare Metal Cloud



Oracle's Bare Metal Cloud (2:2)

- We all know what's wrong with putting databases into virtualized environments
  - Instead of 1 ASM instance per server we get an ASM instance per container
  - Instead of 1 Management Database per server we get a Management Database in each and every container
  - Instead of leveraging all of Oracle's optimizations where the database talks directly to the hardware the database is forced to talk to a hypervisor
  - Instead of patching O/S + Clusterware + Database we get to patch the hypervisor too giving us 25% more patching work and outages
  - Instead of worrying about security at two levels, O/S and Database we get to worry about hypervisor vulnerabilities ... and there are many
  - We know stability is not improved by more complexity
  - We know performance and scalability are not improved by adding the overhead of hypervisors and containers

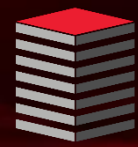
- Oracle's Bare Metal Cloud is just that ... Oracle ASM, Clusterware, and Database installed on bare metal
- And your existing perpetual licenses are fully utilized lowering Cloud costs

The Seven Best Things About The Oracle Cloud

The Seven Best Things About The Oracle Cloud

1. It has bugs
2. You can't use the REST API to find patches
3. It can force a dinosaur to use the new container architecture
4. If you're not careful you can bust your budget
5. You can't install "any" application in the Cloud
6. There are no AS/400s and M5000s in the Cloud
7. It isn't AWS ... or Azure ... or Google

Wrap Up



Conclusion

- Worried about your future after listening to Oracle talk about the Oracle Cloud?
- You've no need to be concerned if you keep your skills up to date
- The advantages to Oracle DBAs in embracing the IaaS Bare Metal Cloud are substantial and mirror the very same advantages we received from embracing
  - Undo Tablespace
  - ASM
  - Engineered Systems
- The Oracle Cloud's security is substantially greater than what you have in your place of employment ... but security within your application is still your responsibility
- As soon as you can you should establish an account with the Oracle Cloud and start learning it just as you learned the technologies you have mastered
- If you need any assistance in navigating version 12.2 or Oracle's IaaS and PaaS Cloud offerings you can contact me by email, text, or phone

```
*
ERROR at line 1:
ORA-00028: your session has been killed
```

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