Software Defined Everything

The future for Oracle DBAs and Developers

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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

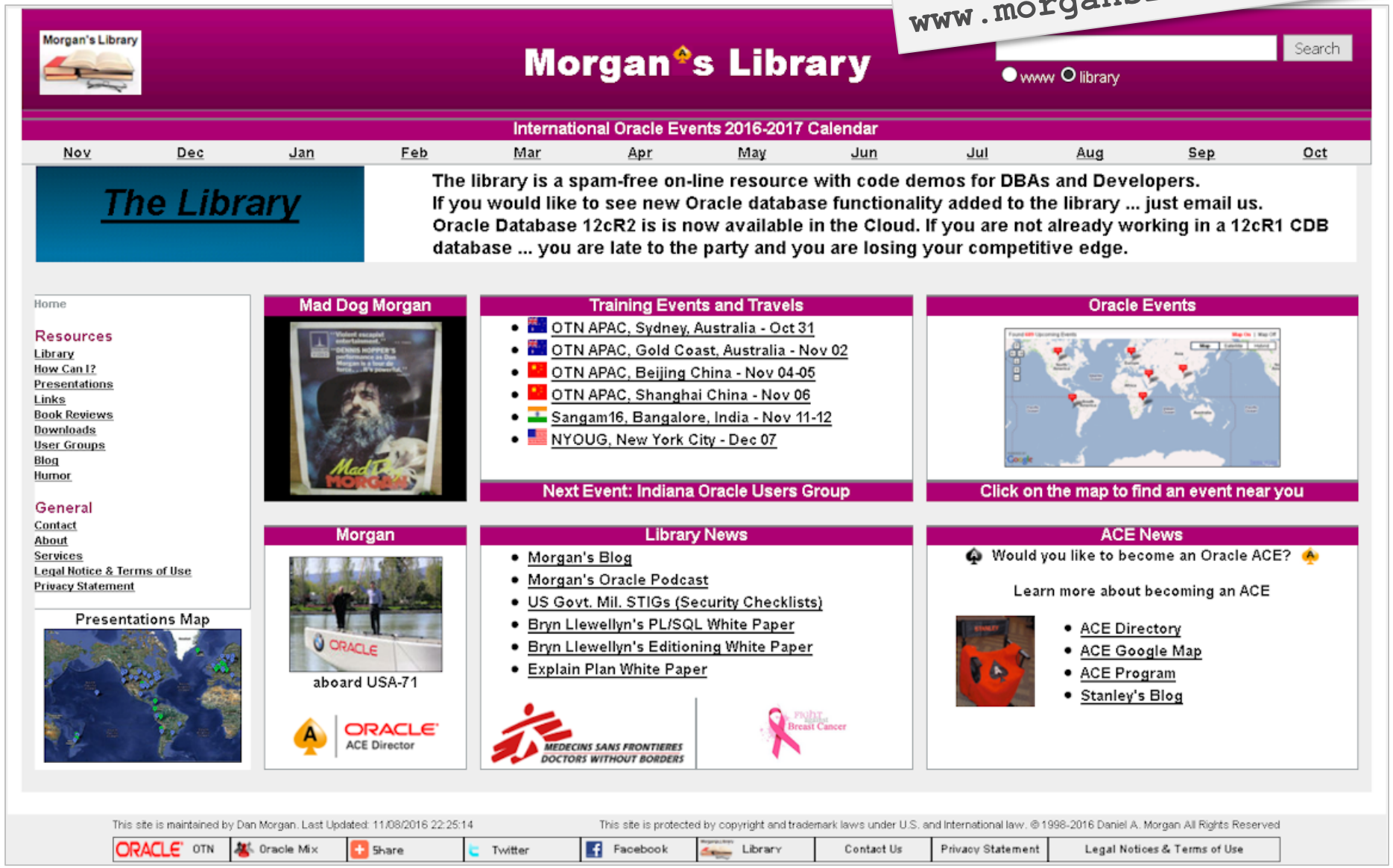
Daniel Morgan

- 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 Cenfotec, Universidad Latina de Panama, Technologico de Costa Rica
- IT Professional
  - First computer: IBM 360/40 in 1969: Fortran IV
  - Oracle Database since 1988-9 and Oracle Beta tester
  - The Morgan behind www.morganslibrary.org
  - Member Oracle Data Integration Solutions Partner Advisory Council
  - Vice President Twin Cities Oracle Users Group (Minneapolis-St. Paul)
  - Co-Founder International GoldenGate Oracle Users Group
- Principal Adviser: Forsythe **Meta7**

System/370-145 system console

My Websites: Morgan's Library

www.morganslibrary.org



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Just In Time IT Procurement

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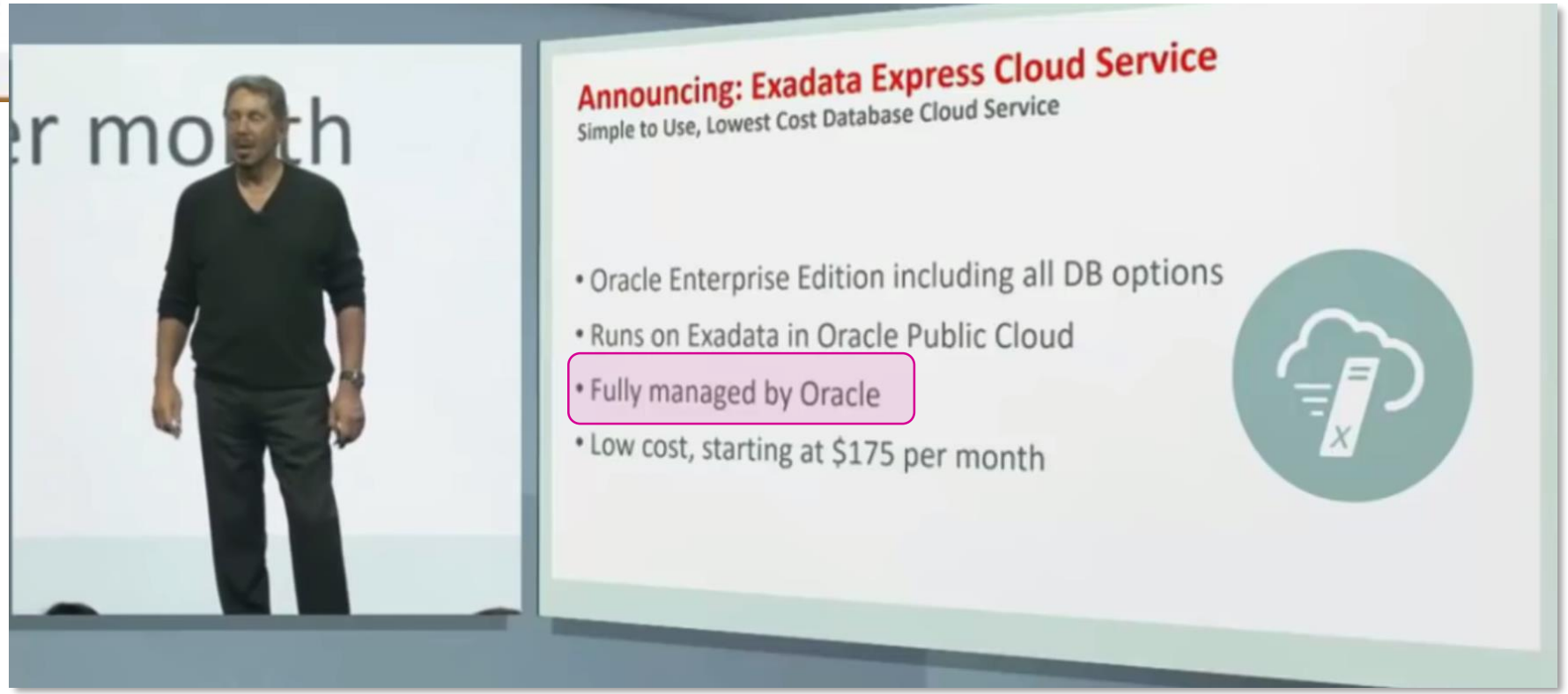
Learning Experience Alert

A Presentation In 5 Parts

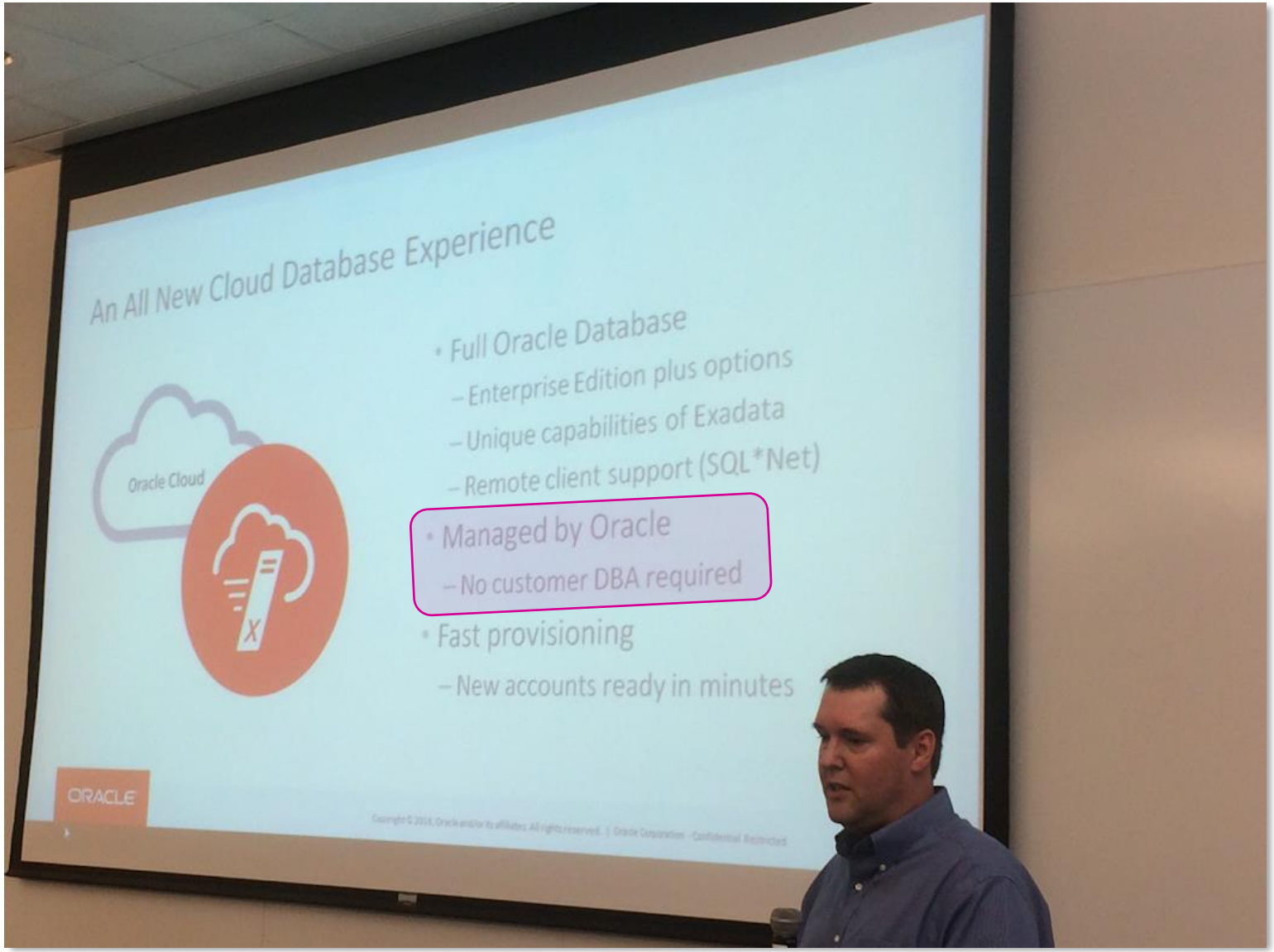
- Capriccio: Tone Deaf
- Rondo : Software Defined Everything
- Oracle Cloud Infrastructure
- Sonatina: The Seven Best Things ....
- Rubato: Wrap-Up

Tone Deaf

Tone Deaf

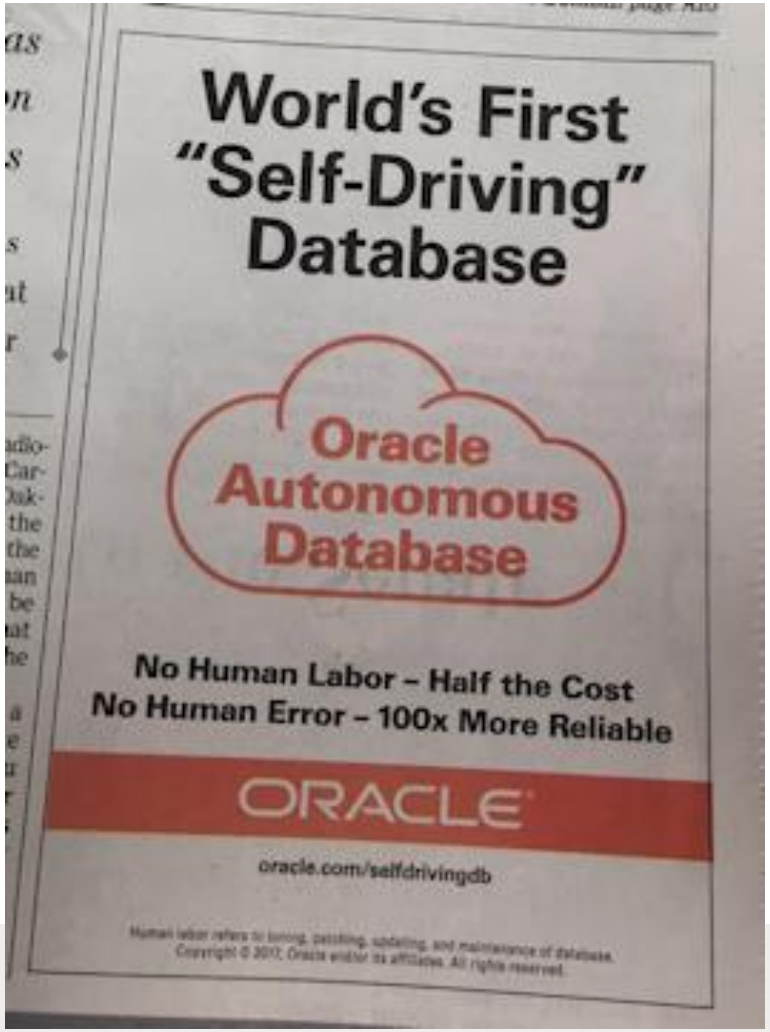

Announcing: Exadata Express Cloud Service
Simple to Use, Lowest Cost Database Cloud Service
• Oracle Enterprise Edition including all DB options
• Runs on Exadata in Oracle Public Cloud
• Fully managed by Oracle
• Low cost, starting at $175 per month

Tone Deaf


An All New Cloud Database Experience
Oracle Cloud
• Full Oracle Database
– Enterprise Edition plus options
– Unique capabilities of Exadata
– Remote client support (SQL*Net)
• Managed by Oracle
– No customer DBA required
• Fast provisioning
– New accounts ready in minutes
ORACLE

THE WALL STREET JOURNAL.

DOW JONES | News Corp ★★★★ THURSDAY, NOVEMBER 16, 2017 ~ VOL. CCLXX NO. 117 WSJ.com ★★★★ $4.00



Some People Have Reason To Fear Technology

Oracle DBAs have nothing
to fear from the changes
coming to our industry
if they keep their skills current

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?

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
  - Do you 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 an Exadata for a 3U pizza box?

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

Software Defined Everything

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In the past we've based our careers on product expertise

Hardware
&
Software

That is not a viable path to the future

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We are as responsible for our organization's success as the CEO

To be successful we need to focus on "business solutions"

We need to help our organizations invest in solving business problems

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We need to ask ourselves the following question

What is the value of "the cloud"?

What is the value of "the cloud"?

And have an answer!

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 licensing and staffing to complexity and flexibility ... 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 (1:2)

- In the 1960s applications ran on mainframes; databases were flat files, application ran on dumb terminals; reports were green bar
  - IT's customers paid for computing by the tick of the cpu clock

- In the 1980s we replaced mainframes with client-server, flat files with relational databases such as Informix, Sybase and Oracle and applications resided on millions of Windows desktops
  - IT's customers paid for computing by licensing cpu cores
- In the 2000s client-server was replaced with n-tier architecture with separate tiers hosting databases, applications, 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 licensing cpu cores
- Beginning in the 2010s it became apparent we were drowning; too much complexity, too little security, far too much cost

A Short History of Enterprise Computing (2:2)

- In the 2010s with the realization that once again "**IT was not responsive to the needs of the business**" industry leaders began the search for a new paradigm based on lessons learned from previous deployment architectures and lessons learned in manufacturing
- What we learned from previous deployment architectures:
  - IT works for the business ... the business does not work for IT
  - Central deployment and management enhances QoS and reduces TCO
- What we learned from manufacturing:
  - "Just-In-Time Delivery" reduces costs and cycle times (1977)
  - Continual Process Improvement (1986)
  - Lean Manufacturing (1988)
  - Delivery must be rapid, seamless and flexible
  - Process automation reduces costs, risks and human errors
- The same pressures that drove mainframes and client-server to near extinction are now driving the adoption of Software Defined Everything (SDE)

Software Defined Everything (SDE)

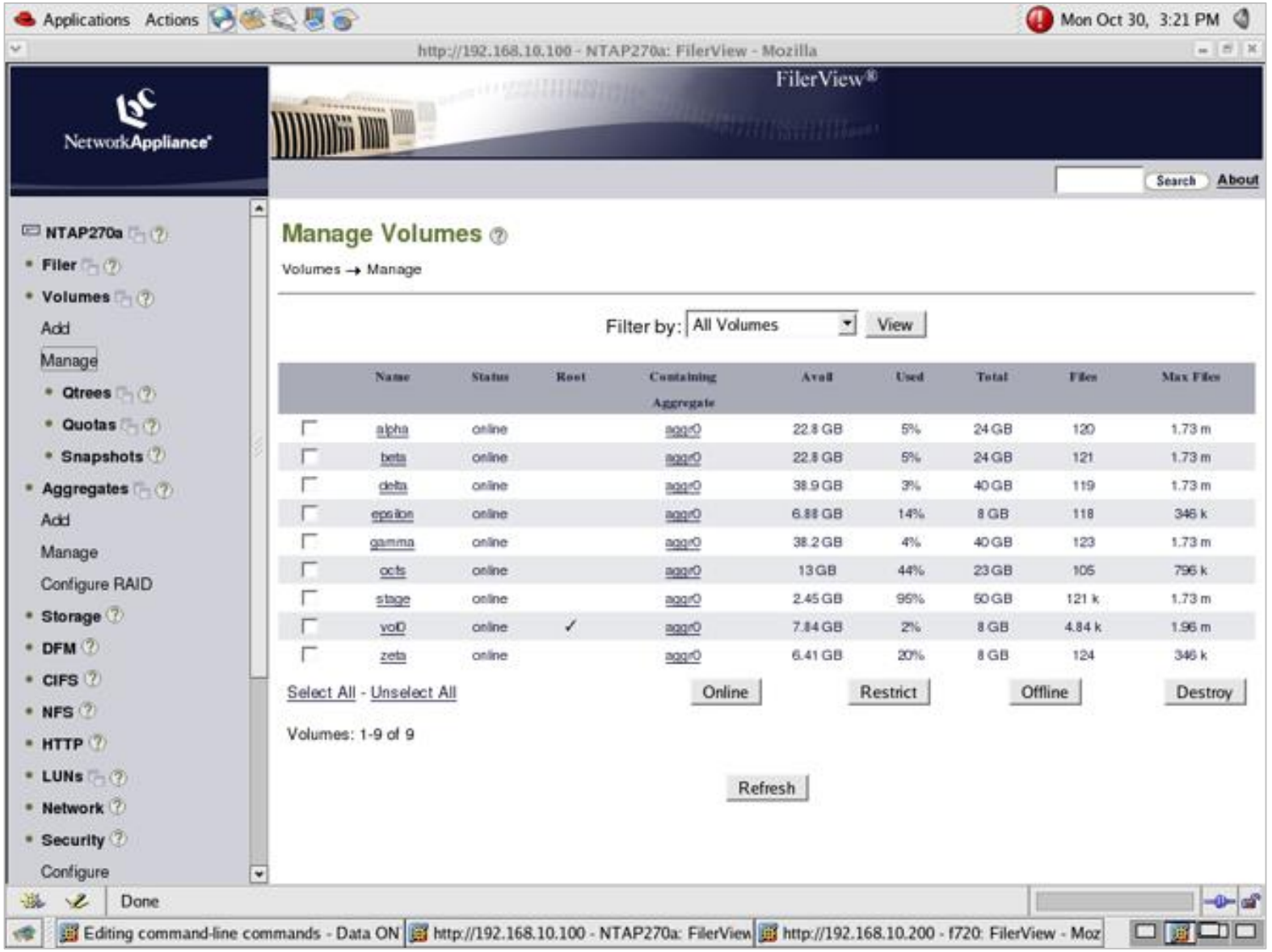
- Enterprise software defined deployment began with Oracle database response files 30+ years ago
- Next was software defined storage ... EMC, NetApp, Oracle ZFS
- Followed by Software Defined Networks (SDN) ... Oracle Xsigo (2012)
- The Cloud has brought software definition to compute and load balancing, storage and backups
- Which led to discussions of Software Defined Data Centers
- And now it is all being consolidated into the concept of Software Defined Everything

SDE: Database Deployment

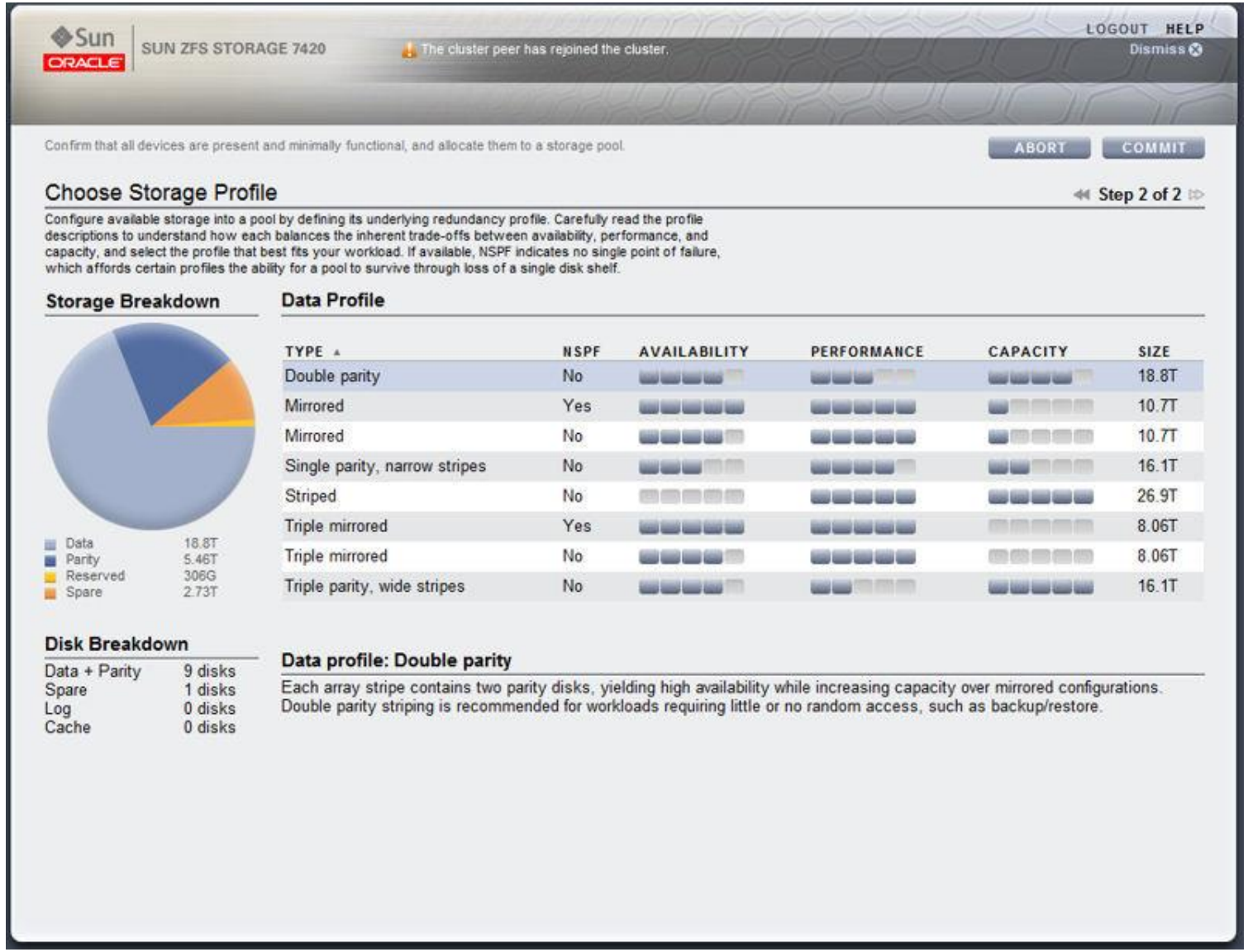
```
[oracle@db12r2 u01]$ more db.rsp
##################################################################
## Copyright(c) Oracle Corporation 1998,2017. All rights reserved.##
##                                                              ##
## Specify values for the variables listed below to customize   ##
## your installation.                                           ##
##                                                              ##
## Each variable is associated with a comment. The comment      ##
## can help to populate the variables with the appropriate      ##
## values.                                                      ##
##                                                              ##
## IMPORTANT NOTE: This file contains plain text passwords and  ##
## should be secured to have read permission only by oracle user##
## or db administrator who owns this installation.              ##
##                                                              ##
##################################################################


#------------------------------------------------------------------------------
# Do not change the following system generated value.
#------------------------------------------------------------------------------
oracle.install.responseFileVersion=/oracle/install/rspfmt_dbinstall_response_schema_v12.2.0

#------------------------------------------------------------------------------
# Specify the installation option.
# It can be one of the following:
#   - INSTALL_DB_SWONLY
#   - INSTALL_DB_AND_CONFIG
#------------------------------------------------------------------------------
oracle.install.option=INSTALL_DB_SWONLY

#------------------------------------------------------------------------------
# Specify the Unix group to be set for the inventory directory.
#------------------------------------------------------------------------------
UNIX_GROUP_NAME=oinstall

#------------------------------------------------------------------------------
# Specify the location which holds the inventory files.
# This is an optional parameter if installing on
# Windows based Operating System.
#------------------------------------------------------------------------------
INVENTORY_LOCATION=/u01/app/oraInventory

#------------------------------------------------------------------------------
# Specify the complete path of the Oracle Base.
#------------------------------------------------------------------------------
ORACLE_BASE=/u01/app/oracle
```

```
oracle@db12r2 u01]$ more dbca.rsp
##################################################################################
##                                                                              ##
##                            DBCA response file                                ##
##                            ------------------                                ##
## Copyright(c) Oracle Corporation 1998,2017. All rights reserved.              ##
##                                                                              ##
## Specify values for the variables listed below to customize                   ##
## your installation.                                                           ##
##                                                                              ##
## Each variable is associated with a comment. The comment                      ##
## can help to populate the variables with the appropriate                      ##
## values.                                                                      ##
##                                                                              ##
## IMPORTANT NOTE: This file contains plain text passwords and                  ##
## should be secured to have read permission only by oracle user                ##
## or db administrator who owns this installation.                              ##
##################################################################################
#-------------------------------------------------------------------------------
# Do not change the following system generated value.
#-------------------------------------------------------------------------------
responseFileVersion=/oracle/assistants/rspfmt_dbca_response_schema_v12.2.0
#-------------------------------------------------------------------------------
# Name          : gdbName
# Datatype      : String
# Description   : Global database name of the database
# Valid values  : <db_name>.<db_domain> - when database domain isn't NULL
#                 <db_name>             - when database domain is NULL
# Default value : None
# Mandatory     : Yes
#-------------------------------------------------------------------------------
gdbName=orcl.example.com
#-------------------------------------------------------------------------------
# Name          : sid
# Datatype      : String
# Description   : System identifier (SID) of the database
# Valid values  : Check Oracle12c Administrator's Guide
# Default value : <db_name> specified in GDBNAME
# Mandatory     : No
#-------------------------------------------------------------------------------
sid=orcl
#-------------------------------------------------------------------------------
# Name          : databaseConfigType
# Datatype      : String
# Description   : database conf type as Single Instance, Real Application Cluster or Real
Application Cluster One Nodes database
# Valid values  : SI\RAC\RACONENODE
# Default value : SI
# Mandatory     : No
#-------------------------------------------------------------------------------
databaseConfigType=SI
```

SDE: NetApp Configuration

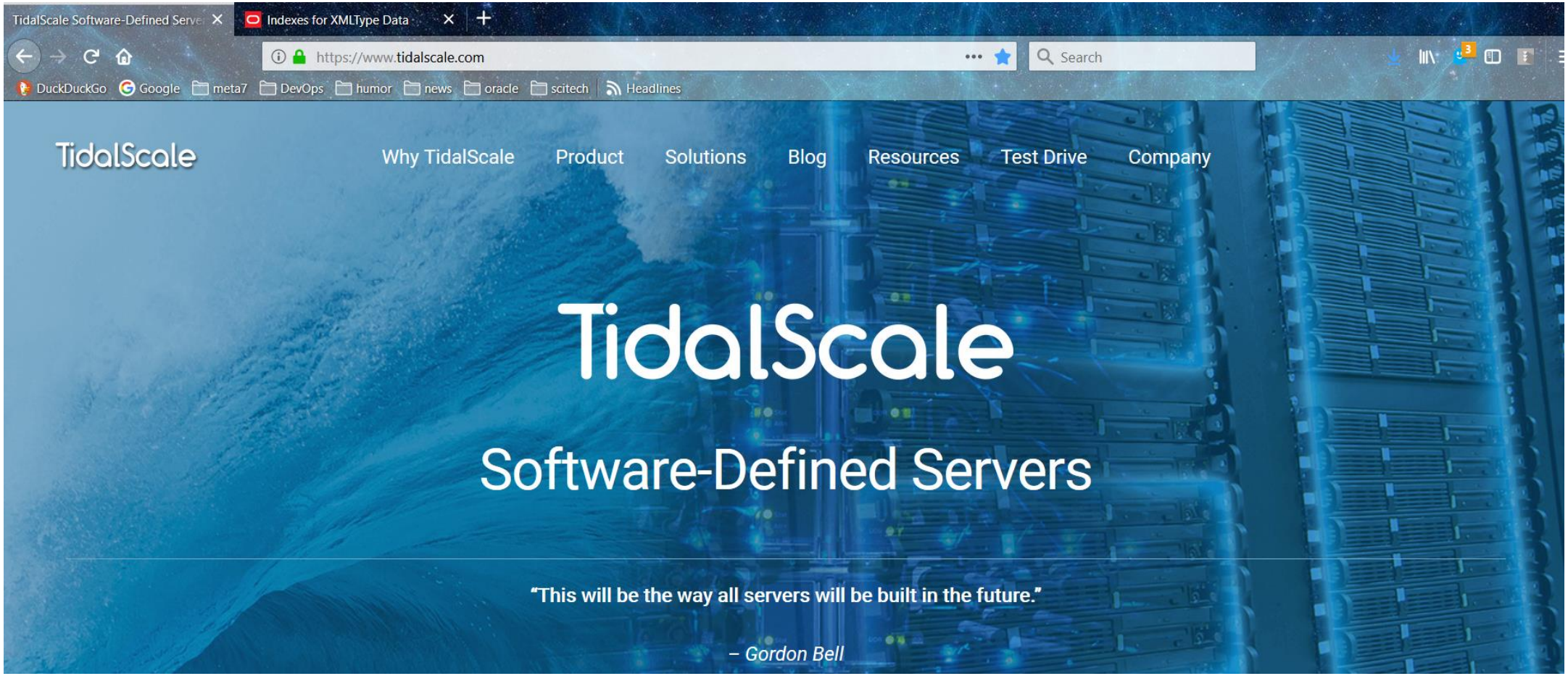


SDE: ZFS Configuration



SDE: Server Configuration

- Combines multiple physical into a single logical server that can be carved up dynamically for cpu, memory, and parallel processing



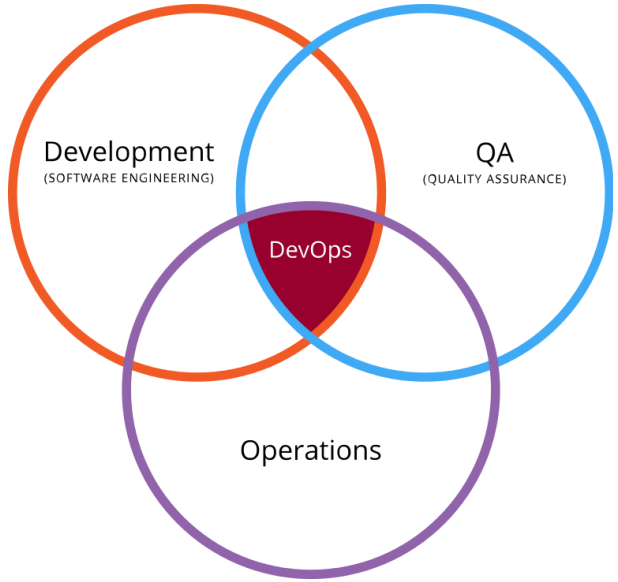
Orchestration Tools

- Software defined deployment requires the use of tools that allow us to take an action one in a development environment, run it through a QA cycle, then implement it repeatedly in production with lower cost and higher reliability
- At Meta7 we have years of experience with orchestration tools and have used them for a wide variety of projects to address business challenges

- We know which tools do what, which introduce security issues, which are designed for on-premise use, which for the Cloud, and which provide the most value
- These tools support alignment with the DevOps concept referred to as Infrastructure as Code (IaC)

DevOps & IaC

- DevOps
  - A software development and delivery process that emphasizes communication and collaboration between product management, software development, and operations
  - It supports this by automating and monitoring the process of software integration, testing, deployment, and infrastructure changes by establishing a culture and environment where building, testing, and releasing software can happen rapidly, frequently, and more reliably



- Infrastructure as Code
  - The process of managing and provisioning computer data centers through machine-readable definition files, rather than manual hardware configuration and interactive configuration tools
  - The concept is to use code to design, implement, and deploy with known 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 is best viewed by focusing on three measurable categories
  - Cost (reduction)
    - Cost reduction is measured not only on its impact on the enterprise financially but also in terms of its impact on people and level of effort
    - By removing the manual component people are able to refocus their efforts towards away from routine activities to higher value tasks
  - Speed (faster execution)
    - Automation enables speed through faster execution when configuring your infrastructure and provides 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, caused by manual misconfiguration which decreases downtime and increases reliability
    - IaC, by definition, increases the organization's maturity providing built-in Change Management and a single version of truth

IaC = Just In Time Procurement

Purchase what you need when you need it
Stop paying for it when you no longer need it

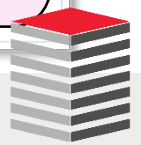
The Metered Services Purchasing Algorithm

- 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



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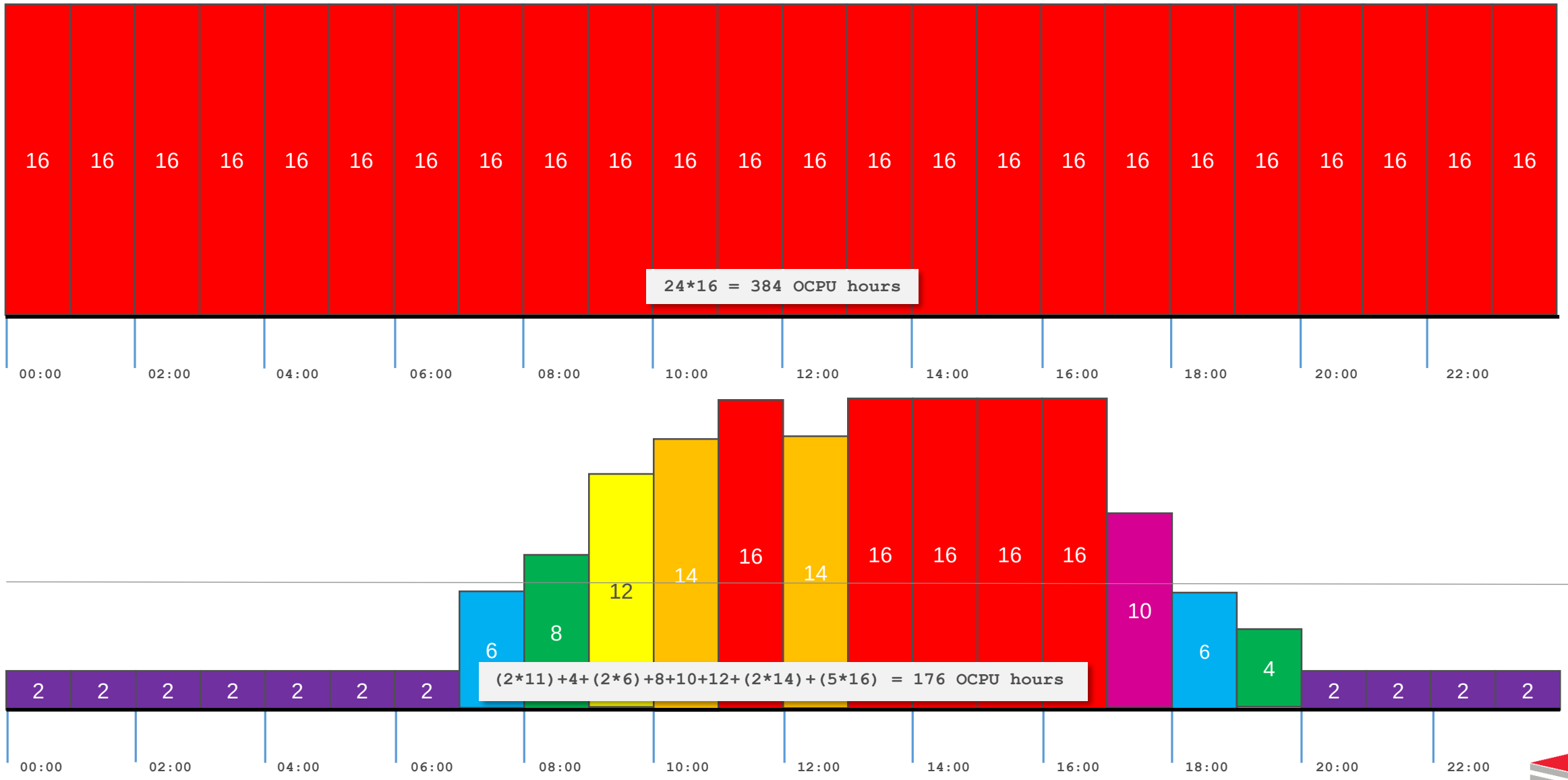
Fixed vs. IaC (1:2)



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%

- Because you can dynamically provision with IaC in the Oracle Cloud you can accomplish a 3:1 or 4:1 consolidation because during peak periods you can dynamically burst to immediately provision required resources

x86 vs. IAC

- 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

- Now add to the HP DL580 solution all costs associated with
  - Oracle Database licensing (16 x $45,000 list) $720,000
  - Network infrastructure including switches and routers, load balancers, firewalls
  - 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 make one incremental change to the configuration file and it is online 60 seconds later
- Again consider the ability to accomplish a 3:1 or 4:1 consolidation

To Provision a 21st Century Data Center

- You need to consider far few components and your vendor takes the risks
  - Oracle Cloud Infrastructure (OCI)
    - Flexible, load balanced, pool of compute and storage resources with the full stack engineered by Oracle
  - Oracle Management Cloud (OMC)
    - Provides a single pane of glass for monitoring and managing ... OEM in the Cloud
  - Cloud Application Security Broker (CASB)
    - Provides Governance and Continuous Adaptive Risk & Trust Assessment (CARTA)
  - Cloud Identity Service
    - Provides Single Sign-on (SSO and LDAP)
  - Backup Services
  - DR
  - Training

TCO Summary

- Unlike the unrealized promises we have heard for years ... with IaC 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

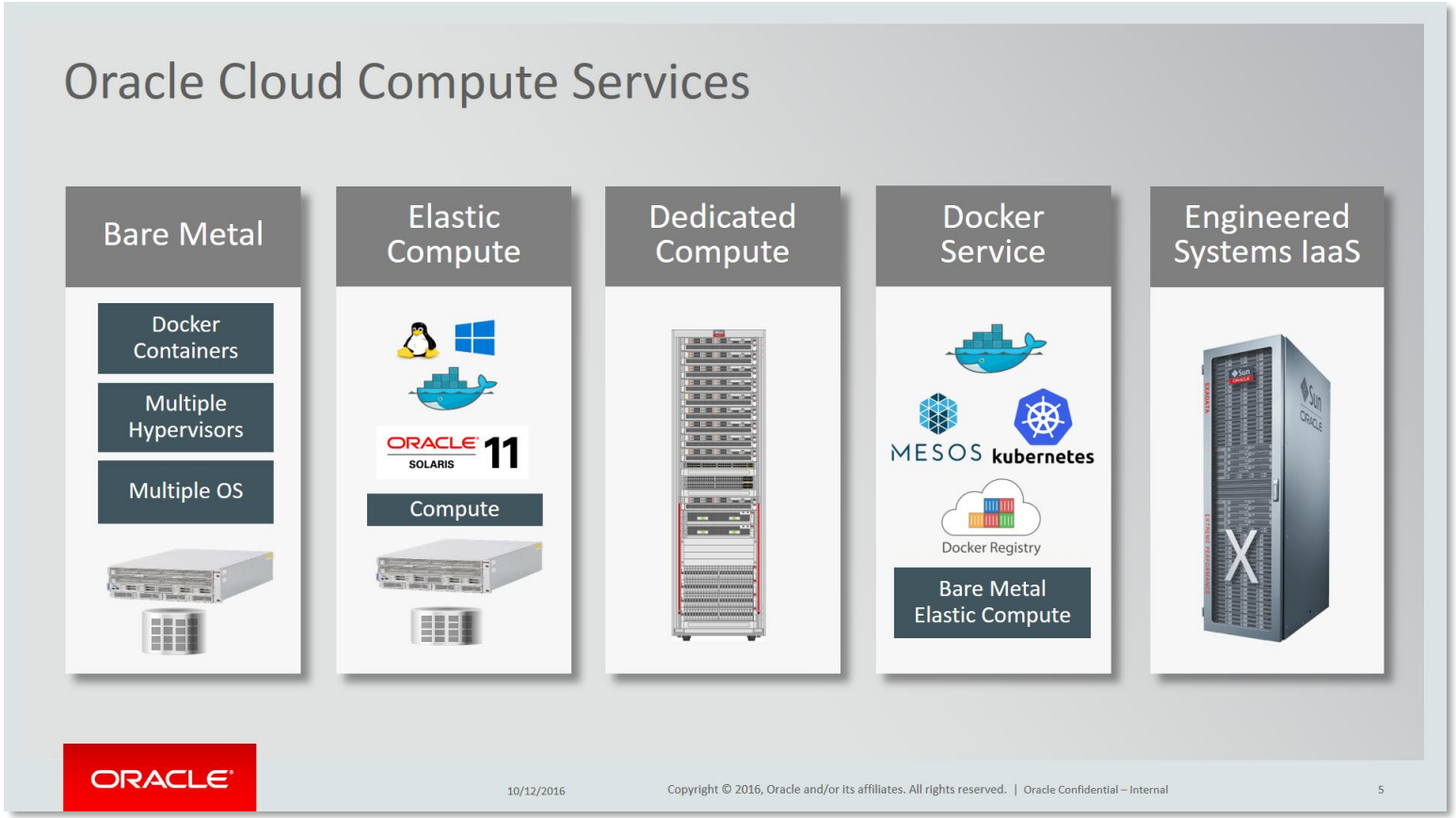
&

TCO

Oracle Cloud Infrastructure

Oracle Cloud Infrastructure (1:2)

- Of all of Oracle's Cloud offerings the one you want to focus on is the bare metal cloud



Oracle Cloud Infrastructure (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

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The Seven Best Things About The Oracle Cloud

1. It has bugs
   - Which allowed us to open an SR and find out how fantastic Cloud support is
2. We couldn't find patches using the REST API
   - Because when we created a new database ... it was already fully patched
3. It can force a dinosaur to use the new container architecture
   - DBaaS deployment forces use of the new, vastly superior, container architecture
4. If you're not careful you can bust your budget
   - Cloud deployment allows DBAs to better appreciate costs and help control them
5. You can't install "any" application in the Cloud
   - The limitations will force our organizations to dump legacy apps older than we are
6. There are no AS/400s and M5000s in the Cloud
   - 5+ year old hardware with its stability and performance issues is automatically eliminated
7. It isn't AWS ... or Azure ... or Google
   - We can use metered services to substantially cut the costs of database licensing

Wrap Up

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Conclusion

- Worried about your future after listening to Oracle talk about the 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 other Oracle technologies
- Oracle Engineering substantially improves stability and performance
- Oracle Security is substantially greater than what you have in your place of employment ... but security within your application is still your responsibility
- IaC and metered licensing puts DBAs in the position of becoming part of the financial conversation (but we need to learn to talk to the business about $)
- As soon as you can you should establish an account with the Oracle Cloud and start learning it just as you learned other technologies you have mastered
- If you need any assistance in navigating version 12.2 or Oracle's IaaS, PaaS Cloud offerings and orchestration tools, contact me by email, text, or phone

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

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