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W H I T E P A P E R

# Oracle Database Appliance (ODA) X8: **Obliterating the DIY X86 Database Nightmare**

## **ODA X8: Obliterating the DIY X86 Database Nightmare**

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### **Executive Summary**

It's an open secret that the pool of IT skills in the marketplace is shrinking at an accelerating pace. It is well-known about the shortage of proficient programmers, but rarely is the dearth of IT administrators acknowledged in the trade press. HR organizations are highly aware of this growing problem. Hiring proven admins has become increasingly difficult. IT administrators are retiring or leaving the IT world in record numbers. New graduates lack the requisite skills, knowledge, and experience that has been walking out the door. This problem is further exacerbated in declining markets such as UNIX systems like Power and HPUX. Even mainstream IT environments of Linux, Microsoft Windows, VMware ESX, Microsoft Hyper-V, KVM, AWS, Azure, and Oracle struggle to find enough quality personnel. Personnel with server, network, storage, interconnect, operating system, hypervisor, container, AI, machine learning, analytics, and application skills, knowledge, and experience are increasingly rare. It's one of the primary drivers pushing IT organizations to managed services in the public cloud.

As much as the trade press implies public clouds are the answer for every application, not all applications can move to the public cloud. Whether it be performance, regulatory/legal compliance, or data sovereignty, there are valid reasons for keeping applications and their database on-prem.

A key example comes from the very rapid expansion of the Internet of Things (IoT). IoT is expected to grow to over 75.44 Billion devices by the year 2025, up fivefold from 2015, per Statista. These devices constantly capture data. Aggregating and storing that data to provide analytics, AI, and machine learning to deliver actionable information. The problem is latency. These devices have to send their data somewhere. They have limited processing power and storage. This raises the problem caused by speed-of-light latency. Moving that data in a timely manner is an issue when centralizing it. In effect, that latency delays time to actionable information. That's a big problem.

Another major issue is the need for instantaneous analysis and real-time actions. That real-time action has significant monetary value. Brick and mortar retailers are clamoring for it so they can collect and analyze data while the customer is still in the store. Modern healthcare is requiring real-time analysis to provide more effective innovative treatment with better outcomes. Manufacturing is demanding the same to accelerate efficiencies and waste elimination. Hospitality wants to use it to better anticipate customer needs and wants for more timely service. Time is especially critical for robotic and autonomous devices that must act quickly in real-time. These are primary reasons why edge-fog-cloud or core computing has emerged as an IT requirement.

Edge-fog-cloud or core computing does a multi-step aggregation, store, and analytics on a progressive basis. Data is aggregated from multiple IoT devices, storage and analyzed at the edge in real-time. Data AND information derived at the "edge" is aggregated and analyzed in near real-time at the "fog". Finally, all of the data and analytics already derived are aggregated and stored longer term in the "cloud" or "core" while going through further more intensive analytics. This handoff methodology can satisfy the instantaneous data analytics requirements, but raises other issues and problems. Problems such as:

- Implementing, operating, managing, maintaining, patching, troubleshooting, fixing, the database and AI-machine learning in what is likely a lights-out data center and most likely a closet.
- Multiple databases and database types requiring access to the same data or analytic results from other databases such as what occur with microservices.
- Protecting the data and analytics from outages, corruptions, and disruptions.

Regulatory and legal compliance as well as data sovereignty are the other big reasons for keeping databases and database applications on-prem. But perhaps the biggest reason is cost. It frequently costs more for many organizations to run their databases and database applications in the cloud.

That still leaves the problem of implementing, operating, managing, patching, troubleshooting, and updating their database or databases with the market shortage of quality database talent. Do-it-yourself (DIY) X86 systems have been falling out of favor for years partly because of this shortage. But more so because DIY systems lack the performance, simplicity, and lower cost of turnkey database systems and especially the Oracle Database Appliance (ODA).

ODA is co-engineered with the Oracle Database from the ground up to be the simplest lowest cost turnkey X86 database system in the market today. The release of the ODA X8 continues that trend making the ODA simpler to implement, operate, manage, maintain, troubleshoot, patch, and upgrade than ever before.

Previous versions of the ODA smashed X86 DIY database systems. The latest ODA X8 **obliterates** the X86 DIY database system nightmare. This document shows why.

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## Why Oracle Database Appliance (ODA) X8 Obliterates the DIY X86 Database Nightmare

The fundamental X86 database user questions come down to simplicity; database resilience, protection, and security; affordability or total cost of ownership (TCO), and TCO/performance. More specifically, how the ODA X8 and DIY X86 database systems compare, especially when it comes to the expertise and budgets required.

A comparison demonstrates the ODA X8 advantages crystal clear.

### Simplicity

Ease-of-use is all about continually taking the expertise requirements out of the DBA and putting them into the system. Meaning, the system requires less and less human knowledge, expertise, skills, and experience because it has been built-in. Non-expert administrators become just as efficient and effective as the expert administrator with minimal to no training. A big part of this is accomplished via automation. Automation reduces or eliminates time-consuming database administrator (DBA) manual labor-intensive tasks that require expertise. Tasks such as: storage provisioning; storage network orchestration; server implementation, setup, operations, and management; planning, database high availability (HA) and disaster recovery DR implementation, operations and management; patching for the database, database server, database server OS and hypervisor, storage system, and storage network, and troubleshooting. As these tasks are automated, the DBA can focus on the database, database applications, new projects, and time-to-market. All of which empowers more DBA productivity with less expertise.



ODA X8 Exclusive	X86 DIY Whitebox
<ul style="list-style-type: none"> <li>● <b>Auto Deployment Based on Oracle Database Best Practices</b> Grounded in years of production experience.</li> <li>● <b>Built-in Templates</b> Simple point-and-click database implementations.</li> <li>● <b>Very Fast Implementation and Setup</b> 30 to 90 minutes. On average: <b>10X</b> faster than DIY. RAC in 90 mins or less.</li> <li>● <b>Single Patch for the Entire Stack</b> All patches including security patches, for all databases, software, and hardware components are combined in a single patch per quarter (4 per yr). Versus minimally 16 or more patches for the DIY. ODA patches are non-disruptive. Especially important for security vulnerability patches.</li> <li>● <b>Auto Monitoring and Call Home Alerts</b> Automatically monitors and alerts issues within the ODA and calls home based on Automated Service Request (ASR). ASR is an ODA warranty feature and part of the Oracle Premier Support and Oracle Platinum Services. ASR resolves problems automatically and significantly faster by opening service requests for ODA when specific faults occur.</li> <li>● <b>Built-in Storage Mgmt &amp; Oracle Database Snapshots</b> No expertise required. Optimized for Oracle Database.</li> <li>● <b>Integrated &amp; Seamless Backup</b> Again, no expertise required. Backups are automated and simple to execute based on policies.</li> <li>● <b>Minimal Time to Deploy, Maintain, and Support</b> Per Wikibon: ~ <b>36</b> hours over <b>3</b> years. <b>~96% less</b> time than DIY</li> </ul>	<ul style="list-style-type: none"> <li>● <b>Nominal Automation</b> Whatever is found in the database itself. The Oracle Database lends itself to automation as long as the DBA has the expertise to configure, tune, and write the scripts taking advantage of the tools and best practices.</li> <li>● <b>Multiple Vendors</b> Database, servers, storage, networking, storage networking. Multiple expertise, admins (DBA, storage admin, network admin, system admin, facilities/plant admin), and data protection administrator, or multi-department communication and coordination required.</li> <li>● <b>Patching is Complicated and Disruptive</b> Multiple patches for database, servers, OS, hypervisor, network switches, storage network, etc. Typically, 16+ and generally more, per yr. or at least <b>4X</b> more than the ODA X8. Disruptive patching demands scheduled downtime. Which is why most patches tend to be implemented 90 days or more after they come out increasing risk vulnerabilities.</li> <li>● <b>Multiple Systems Monitoring</b> Each aspect of the DIY database system will have its own monitoring and alerting. A 3<sup>rd</sup> party Remote Monitoring and Management (RMM) software platform is also a possibility for extra cost as long as it's integrated with the systems chosen.</li> <li>● <b>Backups are Neither Integrated nor Seamless</b> Must be setup, managed, and coordinated with the storage system or 3<sup>rd</sup> party backup software and likely data protection manager.</li> <li>● <b>Extensive Time to Deploy, Maintain, and Support</b> Per Wikibon: ~ <b>863</b> hours over <b>3</b> years.</li> </ul>

Ease-of-Use Advantage: **ODA X8**

## Database Resilience, Protection, & Security

The Oracle Database is at the heart of many global mission critical applications. Making sure the database is resilient and protected is paramount to CIOs, application owners, and DBAs everywhere. Security is another top priority as malware, especially ransomware, and data breach attacks have been increasing exponentially. Personal identifiable information (PII) protection laws and regulations have made security more important than ever with harsh fines and stock reducing data breach publicity.

Both ODA X8 and DIY whitebox utilizing the Oracle Database get exceptional built-in security. The Oracle Database 19c Enterprise Edition has automated database security including: core database security for users, roles, authentication, etc.; Network Communication Encryption; Transparent Data Encryption (TDE); Column-Level Encryption; Oracle Key Vault; Database Auditing; Oracle Audit Vault; Oracle Database Firewall; Oracle Database Vault; Label Security; Real Application Security; Virtual Private Database; and Data Masking and Subsetting<sup>1</sup>. More detailed Oracle security information can be found here: [Oracle Database Security Guide](#).

All versions of the Oracle Database have exceptional data resilience and data protection capabilities that can be utilized if configured properly. Capabilities such as HA, RAC, Data Guard, RMAN, and more. This is frequently a very difficult, complicated, error-prone and time-consuming process for DIY customers. ODA automates RAC configurations for Enterprise and Standard Edition (11.2, 12.1, 12.2, 18c) databases. ODA also automates configuration of cold failover of SE2 Database for 19c customers, something DIY cannot do without costly 3rd-party software. This is exclusive to ODA and any SE RAC customers running on DIY will find this to be a big issue when they upgrade to 19c, as SE RAC is discontinued.

Only Oracle Engineered systems automate these capabilities and quite a bit more as seen in the table below.



<b>ODA X8 Exclusive – Built-in End-to-End Security, Data Resilience, &amp; Data Protection</b>	<b>X86 DIY Whitebox</b>
<ul style="list-style-type: none"> <li>● <b>Ultra-Secure Oracle OS</b> Defaults to the highest levels of security.</li> <li>● <b>Secure Out of the Box</b> Automatically has the RPM (Red Hat Package Manager) run the stack software scans for vulnerabilities.</li> <li>● <b>Timely Non-Disruptive System Updates</b> Single patch file for entire stack.</li> <li>● <b>Complete In-House Hardware Design</b> Motherboard, BIOS, &amp; service processor firmware designed 100% by Oracle engineers with manufacturing oversight.</li> <li>● <b>Built-in Oracle Database Snapshots</b> Very valuable test/dev feature. ODA automatically puts the Oracle Database into hot backup mode, re-creates the control file with the snapshot file locations and updates init.ora. ODA snapshots are for all intents and purposes instantaneous, enabling far more frequent snapshots with a much smaller recovery point objective (RPO).</li> <li>● <b>Guaranteed Oracle Database Integrity for Cloud Backup</b> The co-engineered Oracle Database, OS, and systems hardware delivers end-to-end integrity.</li> <li>● <b>Integrated &amp; Seamless Backup</b> Backups are automated both on-prem and for the cloud.</li> <li>● <b>Add'l ODA X8 Elite Data Resilience/Protection Features</b>  <ul style="list-style-type: none"> <li>ODABR – Boot disk backup/recovery tool.</li> <li>ORAchk Integration – Patch pre-check enhancements.</li> <li>Out-of-Cycle Patching – For both the Database &amp; OS.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>● <b>Only the Security Inherent in the Whitebox products</b> Oracle Database 19c. Storage system self-encrypting drives. Additional 3<sup>rd</sup> party software.</li> <li>● <b>System Updates are Disruptive</b> Must schedule updates for off hours, weekends, etc. Scheduling commonly takes 3 months or more leaving open software and hardware vulnerabilities.</li> <li>● <b>Non-automated and/or Disruptive Snapshots</b> 3<sup>rd</sup>-party snapshot put the automation on the administrator. Effective snapshots require the Oracle Database be put in hot backup mode, the redo logs then snapshot separately and saved. The administrator can configure and automate this process with effort and time. It does not come that way out of the box. Note that some storage or hypervisor snapshots are more difficult. They may need to quiesce the database and flush the buffers before a snapshot is taken. Otherwise the snapshots are inconsistent and may not be recoverable. The quiescence and flushing typically take a few seconds, the snapshot is taken, and the database reactivated. This limits how frequently snapshots are taken increasing the RPOs.</li> </ul>

<sup>1</sup> Some of these security features are licensed options. For more details go to the Oracle Database Security Guide.

Rolling Patching – For shared storage. BUI/ODACLI – Snapshot Database Clones. Hardware Monitoring Log Usage Reporting OS Repository & Log Cleanup Trace Files Adaptive Classification & Redaction	
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Security, Resilience, DP Advantage: **ODA X8**

### Total Cost of Ownership (TCO)

There is an enduring myth that DIY systems will be less expensive than ODA. This common wisdom is tied to the belief that commodity-off-the-shelf (COTS) hardware will be less costly than the ODA and the Oracle Database license costs will be the same. Like a lot of common wisdom, it’s wrong. There are several underlying premises that are inconsistent with empirical reality. An example is the belief that price and cost are the same. It is obvious that it’s not. The underlying unspoken premise is total costs correlate to the price. They don’t. Operating costs including power, cooling, allocated overhead, personnel costs based on time spent operating, managing, troubleshooting, patching, hot fixing, upgrading, etc. can vary widely depending on hardware utilized. Database licensing costs will vary as well. The Oracle Database is licensed by cores. In a DIY, every database server core is counted as part of the Oracle Database License. The ODA does not license the same way. It licenses on-demand. This means if the ODA system is an HA system running with 64 cores total but only 16 are required initially, then the Oracle Database license is for 16 cores. When more cores are required, the license requirement increases on demand, similar to a database as a service license in the cloud. ODA utilizes the latest Intel 16 core Xeon Gold 2.3 GHz 5218 processors. That’s a significantly lower cost.

That’s just the cost side of the ledger. What about the revenue side? The much simpler ODA means far less time managing, tuning, operating, patching, troubleshooting the system and more time getting actionable information faster, speeding up time-to-market and revenues. That too must be taken into consideration.



ODA X8 Exclusive	X86 DIY Whitebox
<ul style="list-style-type: none"> <li>• <b>Co-Engineered Hardware</b> Server, storage, interconnect, HA, RAC. Pull it out of the box, power it on, configure, and run.</li> <li>• <b>Hybrid Columnar Compression (HCC)</b> Reduces storage consumption by as much as <b>10-15X</b>. Extremely useful for data warehouses, exclusive to Oracle Engineered Systems. Saves storage costs.</li> <li>• <b>Capacity On-Demand Oracle Database Licensing</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>White Box Hardware</b> Servers, storage, networks, etc.</li> <li>• <b>Whatever Dedupe &amp; Compression Comes with Storage</b> Does not work very well with Oracle Database. Gets <b>~ 2-3X</b> data reduction vs. 10-15X. This is because the Oracle Database has unique headers making deduplication and compression much less effective than advertised by the storage vendors.</li> <li>• <b>Must License all Cores Up-Front</b></li> </ul>

Only pay for what's needed when needed, reducing database license costs.

### ODA X8

License On-Demand with Significant Savings

Year	Cores
Year 1	8
Year 2	16
Year 3	40
Year 4	64

- **Multiple Configurations**  
One size does not fit all: 3 different configurations.

ODA X8-2S

- Single-instance
- 16 Cores
- 192 GB Memory, expandable to 384 GB
- Up to 3x Public Network Cards
- 12.8 TB Data Storage (Raw)

ODA X8-2M

- Single-instance
- 32 Cores
- 384 GB Memory, expandable to 768 GB
- Up to 3x Public Network Cards
- 12.8 TB Data Storage (Raw)
- Expandable up to 76.8 TB (Raw)

ODA X8-2-HA

- Single-instance and RAC
- 64 Cores
- 768 GB Memory, expandable to 1.5 TB
- Up to 3x Public Network Cards per Server
- 46 TB SSD Data Storage up to
- 369 TB SSD or up to 92 TB SSD/504 TB HDD (Raw)

- **Saved Time over 3 yrs. Per Wikibon**  
~ **827** hours saved in managing, operating, patching, fixing, troubleshooting etc.

There is no Oracle Database licensing on-demand for white box hardware.

### DIY Whitebox

Must License All 64 Cores for Anticipated Growth

Year	Cores
Year 1	64
Year 2	64
Year 3	64
Year 4	64

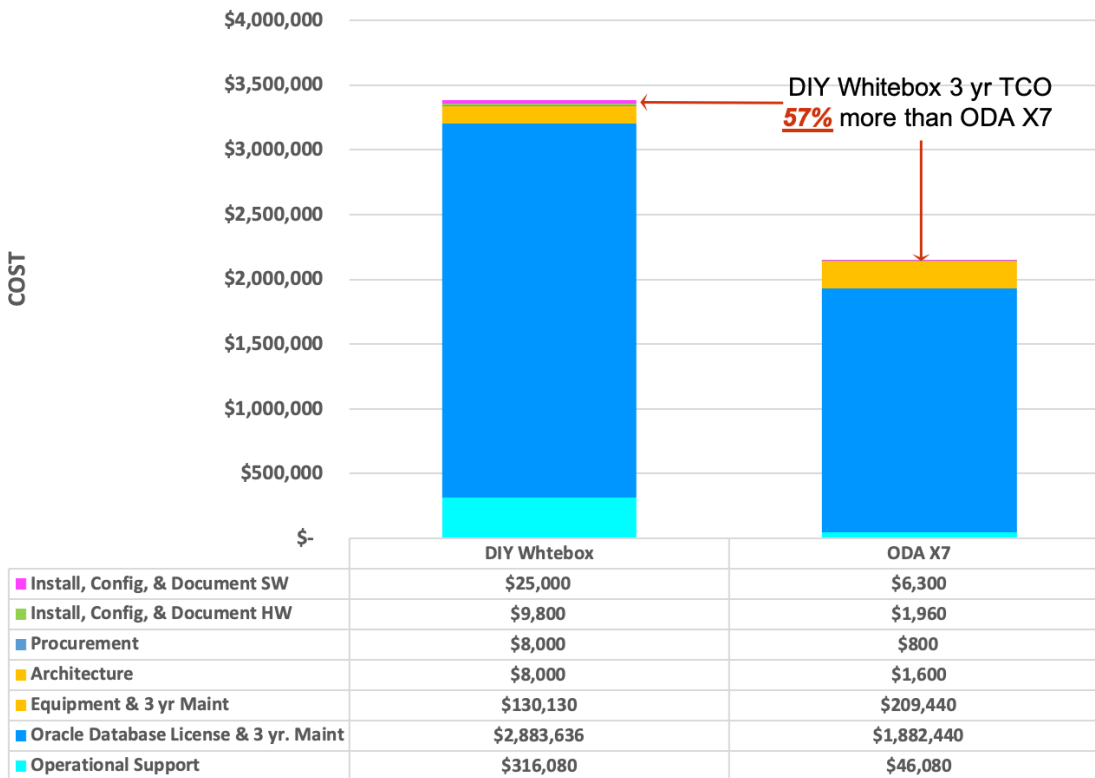
- **Near Infinite Config Permutations**  
Leads to SKU Sprawl making difficult the maintenance, sparing, operations, patching, troubleshooting, hot fixes, patching, etc.
- **Excessive Admin Hours**  
~ 863 hours over 3 yrs. Per Wikibon.  
Equates into ~ **104** more admin days than ODA X8

Unquestionable Affordability Advantage: **ODA X8**

Further proof points: Wikibon did a 3-year TCO comparison in 2018 between ODA X7 and DIY Whitebox Oracle Database configurations. The conclusion of that analysis was that DIY Whitebox equivalent configurations were 57% more costly over 3 years. The newer ODA X8 offers the same cost points than ODA X7 with more automation, more flexible Oracle Database licensing, and as a result lower overall TCO. However, whitebox configurations have also declined in price, but not any other costs. All of this still makes the Wikibon 3-year TCO comparison relevant, but just a bit conservative. The gap widens more with ODA X8.

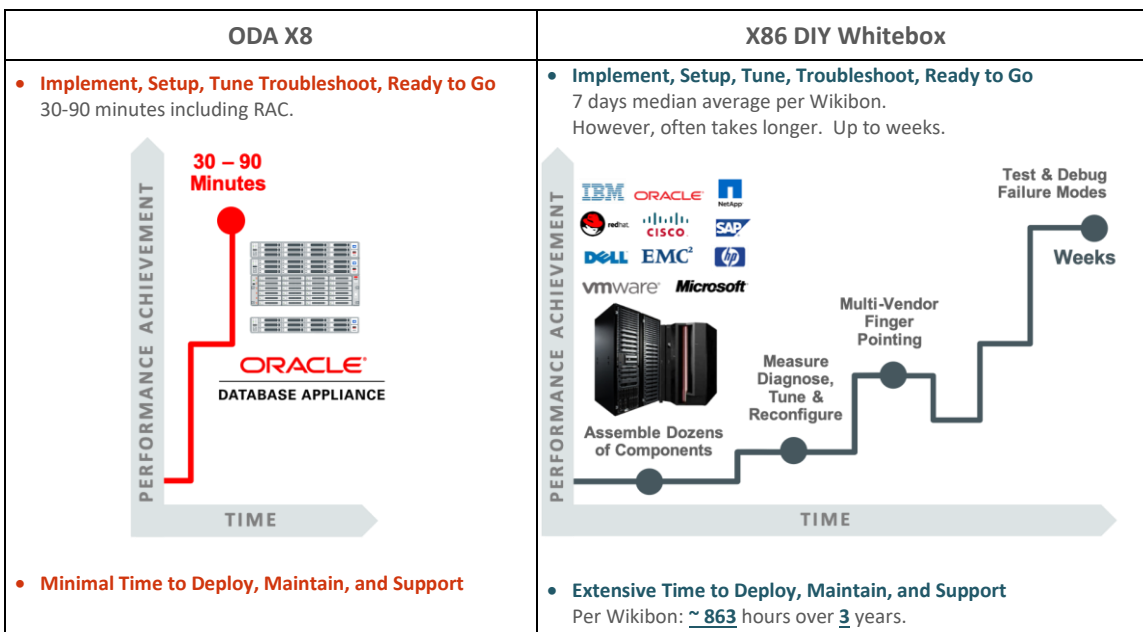


**3 Yr TCO Comparison per Wikibon**



Above-the-Line Value

Just as most financial analysis mistakes price for cost, so too is above-the-line value often ignored. Above-the-line value is comparative. It places financial value to time saved. That value is a combination of costs avoided and unique revenues gained. The costs saved come from time implementing, setting up, operating, managing, patching, troubleshooting, fixing, updating, recovering from malware/ransomware infections because of late patching to vulnerabilities. There is also the cost of lost productivity from disruptions. Additionally, there is the lost revenue from disruptions, downtime, and being late to market. All of this adds up to a substantial amount, usually more than the TCO.



<p>Per Wikibon: <b>~ 36</b> hours over <b>3</b> years.  <b>~ 96% less</b> time than DIY.                  Which equates into <b>~ 104</b> admin days or <b>~ 3.5</b> months.</p> <ul style="list-style-type: none"> <li>• <b>Cost Avoidance Savings</b> Millions \$/£/€/¥.</li> <li>• <b>Time-to-Market Revenue Gains</b> Many more millions \$/£/€/¥.</li> </ul>	
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Above-the-Line Value Advantage: **ODA X8**

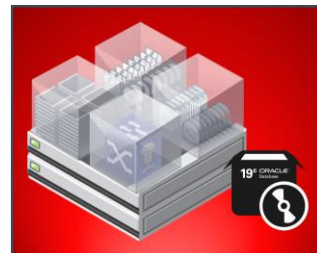
## Performance



Assuming the system hardware is configured similarly and both are utilizing the same Oracle Database version and edition. However, ODA X8 has best practice configurations built into the system. This means the customer gets very good optimized performance right out of the box. Simple, easy, no effort required. DIY white box customers must figure all that out on their own. If they don't do it correctly or make an error, then performance is likely to be sub-optimized and potentially quite poor. ODA X8 is engineered for simplicity and affordability. Extreme performance and scalability that can't be touched requires the Oracle Exadata X8M. Incredibly simple, reliable, resilient, protected, secure, affordable, and high-performance Oracle Database systems require the ODA X8.

## Yeah, But What About Hyperconverged Infrastructure (HCI)?

Hyperconverged Infrastructure vendors will say this ODA to DIY comparison is unfair because it's based only on Oracle Database on Linux X86 servers. Their premise is that it ignores the simplicity HCI systems from Nutanix, Dell VxRAIL, HPE Simplivity, Cisco HyperFlex, Scale Computing, and others. The fact of the matter is that HCI systems only marginally improve DIY at best, while adding significant cost. Here's how HCI affects each of the comparison categories and compares to ODA.



### Simplicity

HCI does simplify hypervisor, storage, and network deployment, operations, and management because HCI integrates virtual compute, storage and networking into the total system providing somewhat more automation. But, it does nothing for simplifying Oracle Database implementations, management, non-disruptive patching, etc. that comes with ODA. And it will complicate configurations. HCI needs more CPU performance, memory, IO, networking, and storage because of the hypervisor overhead, which is as much as 30% of the resources. That makes everything a bit more difficult. And there are still multiple vendors being the HCI vendor and Oracle. So not really simpler or at best marginally so.

### Database Resilience, Protection, and Security

HCI has built-in snapshots and replication. The snapshots tend to be crash consistent, not database consistent with the exception being Microsoft Windows Volume Shadow Services (VSS). Live migration also helps deal with disruptive patching, although cumbersome. But there is no additional security and in fact there's less by enabling malicious actors more attack vectors to steal, delete, or encrypt the data. The Oracle Database protection is much better via RMAN and all of the manual labor required utilizing RMAN on DIY platforms is the same for HCI. Once again, a wash.

### TCO

The key in looking at HCI TCO is cost/performance. It's easy to derive a low cost; however, to attain the proper performance means more, not less hardware. More CPU, memory, IO, networking, and storage in the HCI. More hardware increases rack space consumed, power, cooling, cables, conduit, transceivers,

allocated overhead, time spent managing. Costs are higher not lower. The argument of flexible resources shared by multiple applications fails to recognize the CPU, memory, IO, and storage intensity of mission critical databases. Every survey of HCI customers running Oracle show higher not lower TCO.

**Above the Line Value**

Increasing above the line value means increasing performance while reducing time spent implementing, operating, and managing via automation. HCI is likely to have variable and frequently reduced Oracle Database performance because of its overhead and shared architecture resource allocation. And since it does nothing to close the gap in ODA simplicity, operational and management time are equivalent to the Linux server DIY.

**Performance**

The overhead of the hypervisor and proprietary software in HCI by definition reduces performance. The ability to move an Oracle Database VM in real-time to find greater resources cannot overcome the latencies introduced by the HCI architecture and live migration. It can also lose data or transactions during a move. HCI is meant to simplify for multi-application ecosystems by sharing and allocating CPU, memory, IO, networking, and storage resources on an as needed basis. Databases are resource intensive and not good neighbors in an HCI environment. The architectures clash. HCI delivers worse performance, not better.

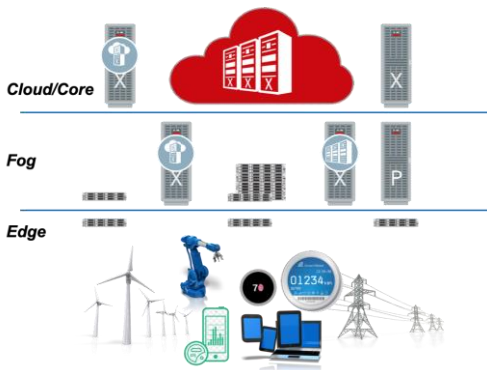
**HCI DIY Conclusion**

HCI does not alter the DIY shortcomings vs ODA debate.

**ODA Superiority to DIY Proof Point: Edge-Fog-Cloud Computing**

The rapid and continuing growth of edge, fog, cloud or core computing is a perfect example of how ODA increases value while decreasing cost. The problem is high latencies analyzing data at the edge. As IoT devices have grown exponentially into the billions showing no signs of abating, this problem has become increasingly acute. The solution has been to move the analytics closer to the data at the “edge” or somewhere in-between in the “fog”.

The remote analytics has to be able to operate in a lights-out or near lights-out data center, i.e. small non-raised floor, remotely managed, likely in a closet. That demands incredible simplicity. It also requires multi-tiered analytics where results and data can be handed off further up the line for deeper analytics and archiving.



The Oracle Database is architected for multi-tier analytics with built-in AI-ML, multi-tenant databases, multi-type databases (relational, SQL, R, Time Series, Jason, XML, Object, Document, Key Value, Spatial, and Graphical), and a high degree of automation. The ODA is architected for simplicity. The combination of the two are ideal for the edge or fog. Exadata delivers more automation, performance, and scalability and is best for the cloud or core and the huge volumes of IoT. This combination solves the edge, fog, core, or cloud analytic latency issues better than any other combination. It is empirically and definitively clearly unbeatable. DIY only has the Oracle Database aspect.

**Conclusion**

The Oracle Database Appliance X8 simply blows away any DIY Oracle Database system in simplicity; database resilience, protection, and security; TCO; and Above-the-Line Value. The ODA X8 is ideal for startup databases, remote offices, branch offices, edge-fog-core or cloud computing, data sovereignty, and more. Most importantly, each ODA X8 is co-engineered with the Oracle Database, Standard or Enterprise Edition and all of the functionality that comes with the market’s only all-inclusive database depending on edition and options. Functionality including multiple database types such as relational, data warehousing, key value, document, object, time series, spatial, and graphical; multi-tenant; multi-database; AI-machine learning, and much, much more.

When it comes to deciding whether to go with an X86 DIY Whitebox Oracle Database system or the ODA X8, the choice is simple.

1. Waste effort, energy, time (especially time), CapEx, OpEx, with more frequent disruptions, lost productivity, and lost time-to-market revenues on a commodity X86 database system.
2. Or get a simpler, more automated, integrated, resilient, protected, secure, and much more affordable X86 database Linux system with more uptime, increased productivity, and faster time to market revenues.

Your call.

### **For More Information on ODA X8**

Go to: [Oracle Database Appliance](#)

Paper sponsored by Oracle. **About Dragon Slayer Consulting:** Marc Staimer, as President and CDS of the 21-year-old Dragon Slayer Consulting in Beaverton, OR, is well known for his in-depth and keen understanding of user problems, especially with storage, networking, applications, cloud services, data protection, and virtualization. Marc has published thousands of technology articles and tips from the user perspective for internationally renowned online trades including many of TechTarget's Searchxxx.com websites and Network Computing and GigaOM. Marc has additionally delivered hundreds of white papers, webinars, and seminars to many well-known industry giants such as: Brocade, Cisco, DELL, EMC, Emulex (Avago), HDS, HPE, LSI (Avago), Mellanox, NEC, NetApp, Oracle, QLogic, SanDisk, and Western Digital. He has additionally provided similar services to smaller, less well-known vendors/startups including: Asigra, Cloudtenna, Clustrix, ConduSiv, DH2i, Diablo, FalconStor, Gridstore, ioFABRIC, Nexenta, Neuxpower, NetEx, NoviFlow, Pavilion Data, Permabit, Qumulo, SBDS, StorONE, Tegile, and many more. His speaking engagements are always well attended, often standing room only, because of the pragmatic, immediately useful information provided. Marc can be reached at [marcstaimer@me.com](mailto:marcstaimer@me.com), (503)-312-2167, in Beaverton OR, 97007.