in a VM or container with one exception. The hardware infrastructure, basic database implementations, management, and patching are done by AWS. There is no automation, enhanced performance, or enhanced database scalability. In fact, performance and scalability are severely constrained by AWS hardware limitations. For example, a database instance is constrained by EC2 limitations of approximately 80,000 IOPS, the same constraints as in the AWS public cloud.

Amazon does not publish Outposts' performance benchmarks, but strangely enough, some of their Outposts storage partners do. Pure Storage claims their FlashArray//X series are 4x faster in latency than native AWS Outposts Elastic Block Storage (EBS). This means that EBS is 4x worse than Pure Storage at approximately 1 ms latency. Pure Storage also claimed approximately 4x faster IOPS. Based on the previous comparisons that revealed Pure Storage FlashArrays//X or XL are not very competitive compared to **Exadata Database Machine X9M**, logical reasoning makes it clear that AWS Outposts at ¼ the performance of Pure Storage, is even less competitive.

It is evident that AWS Outposts was not architected for most Enterprise or even small-to-medium Enterprise requirements. More importantly, Outposts does nothing to address or solve any of the ongoing database problems discussed in this research. Outposts exacerbates several of them including out-of-control database sprawl, database performance degradation as database data grows, prohibitive database cost, user productivity, database management, and database availability. Most importantly, AWS Outposts does not currently have a workaround to the regulations, rules, and laws that inhibit too many organizations from implementing on-premises cloud services. For example, users cannot limit, restrict, or audit AWS personnel.

Because AWS Outposts does not address any of the problems discussed in this research, it actually has a higher total cost, and much lower performance than **Exadata Cloud@Customer X9M**.

Recovery Appliance X9M and Competition

There are a many data protection (DP) and disaster recovery (DR) products and services as well as target backup storage appliances on the market. Most work with Oracle Database's RMAN. However, **Recovery Appliance X9M** is a unique beast. It is the only Oracle Database data protection that specifically:

- Offloads RMAN processes from the Oracle Database saving approximately 25% of the database server resources.
- Continuously replicates the redo log.
- Enables finely granular recoveries.
- Provides end-to-end data validation.

Several of those backup appliances market themselves as high performance deduplication targets focusing on backup performance. Very few come close to matching **Recovery Appliance X9M** in raw performance. None match it in Oracle Database backup performance. Candidly, that only matters for the first full backup. After that, most DP products including **Recovery Appliance X9M** backup or replicate only the changes between backups, which is generally not that much data. **Recovery Appliance X9M** performs continuous backup, backing up every change as it happens.

The most important issue is when a major Oracle Database recovery is required. Most backup target appliances do not publish their Oracle Database restoration speeds. One can infer the reason they do not is because it is likely not very fast. If it were, they would publish, promote it on social media and offer temporary tattoos or T-shirts highlighting their accomplishment. But they don't, and the information omission speaks loudly.

Recovery Appliance X9M recovery capabilities for Oracle Database are in a word "matchless." Starting with the fine-grained recovery capabilities, 5x better compression compared to deduplication target storage and PBBAs, backup consolidation for up to tens of thousands of Oracle Databases, and the 24TB per hour recovery speeds, nothing else contests with the **Recovery Appliance X9M**.

When it comes to providing Oracle Database protection and high availability, the **Recovery Appliance X9M** has proven to be best in class.

Conclusion

Technology vendors generally promote their product or service's performance especially when they release a new version. But performance by itself in a vacuum means little. It only matters in how performance solves significant user problems.

The latest X9M generation of **Exadata Cloud@Customer**, **Exadata Database Machine,** and **Recovery Appliance** has radically upped the database performance ante with significant breakthrough specifications. And this is not just for relational databases, but also schema optional databases a.k.a. NoSQL in layperson's terms, XML-Object, JSON-document, data warehouses, graph, spatial, machine learning, blockchain, time-series, and more. These breakthrough capabilities are impressive for sure; however, it is how Oracle has used them to solve several pervasive and rapidly growing database problems that no one else is solving that's more notable. To summarize, below are the problems the new Oracle **X9M** platform solves and briefly how it solves them.

- Out-of-control database sprawl problem.
  - **Exadata Cloud@Customer X9M** and **Exadata Database Machine X9M's** performance and capacity scalability, facilitate extensive consolidation, with multi-tenancy, for multi-workload, multi-database type, concurrently[10].
  - Radically reducing database sprawl.
  - **Recovery Appliance X9M** further enhances **Exadata Cloud@Customer X9M** and **Exadata Database Machine X9M's** performance, in addition to Oracle Databases running on other hardware, by offloading RMAN data protection from the database servers – giving back up to 25% of the database server processing resources.
- Conspicuous decline in database performance as database data proliferates problem.
  - **Oracle Exadata X9M Database Machine**[10] performance and capacity scalability from a base rack to 12 full racks eliminates this as a problem.
  - **ZDLRA X9M** offloads Oracle Database RMAN data protection processing saving up to 25% of the database server processing resources.
- Mediocre to poor user productivity problem.
  - **Exadata Cloud@Customer X9M** and **Exadata Database Machine X9M's** eye-popping performance by definition reduces database application response times, in turn increasing user productivity.
- Excessive time-consuming database management problem.
  - Extensive automation is built into the Oracle's **X9M** platform in general.
  - Oracle Autonomous Database (ADB) only runs on **Exadata** in Oracle Cloud Infrastructure (OCI) and on-premises in **Exadata Cloud@Customer**. ADB is the only level 5 autonomous database in the market today, eliminating the vast majority of database management, training, troubleshooting, etc.
  - **Recovery Appliance X9M** further reduces backup and recovery tasks by 80% on average for G2000 $5 B Enterprise accounts.
- Regulations, rules, and laws are preventing too many organizations from on-premises cloud services.
  - **Exadata Cloud@Customer X9M** provides users with the means to regain security control for on-premises cloud services with full Operator Access Control. It enables users to meet regulation, rules, and law requirements for on-premises cloud services.
- Sub-optimal database availability from planned and unplanned disruptions/outages problem.
  - Oracle's **X9M** platform is extremely reliable with ≥ six 9s of up time. However, there are always human errors, accidental deletions, site failures, natural disasters, etc. That's where the **Recovery Appliance X9M** changes the game. It is the only database data protection system specifically designed for Oracle Database. Highly automated, it offloads the data protection processes from the database servers. It has finely granular point-in-time and very fast recoveries with no data loss. The net of all this is a massive reduction in recovery errors and downtime costs and much greater database availability.
- Prohibitive database TCO problem.

[10] Exadata Cloud@Customer X9M is currently limited to one rack, whereas Exadata X9M Database Machine scales to 12 racks.

- The **Exadata Cloud@Customer X9M**, **Exadata Database Machine X9M** and **Recovery Appliance X9M** each reduces so much cost from solving the aforementioned problems, that many times TCO calculations indicate that they more than pay for themselves.

Many vendors tout their performance. Performance is a key metric. But when compared to the Oracle **X9M** platform, it's the equivalent of holding a candle against a 20,000 lumens spotlight. There is no comparison. That **X9M** performance changes the game and solves several obstinate database user problems.

Wikibon's recommendation for medium to large to extra-large Oracle Database users, is to adopt this latest Oracle **X9M** platform. The decision is simple and the rewards ample.

More Information

Oracle Exadata X9M

Oracle Exadata Cloud@Customer X9M

Oracle Dedicated Region Cloud@Customer

Oracle's Recovery Appliance X9M

Oracle Autonomous Database

