

White Paper

Oracle's Recovery Appliance X8M: Eliminating Data Loss Headaches

Enterprise-class Recovery Capability and Zero Data Loss Peace of Mind for Mission-critical Oracle Databases

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Operational and Solution Overview

Data Headaches...and a Cure: While concerns about new applications, end-user satisfaction, and the costs of IT all rightly get lots of press and IT attention, those concerns vary across businesses and fluctuate over time. Yet there are two constant headaches—"data migraines"—for all IT organizations: data loss and data recovery.

Let's face it, everything else in IT is replaceable. Although it costs a lot of money and time to replace equipment, people, and applications, they *can* be replaced. Data, if lost, cannot be replaced. Furthermore, when looked at in light of today's demands and expectations of IT, the definition of "lost data" can reasonably be expanded to include data that is *inaccessible to the business* for long enough to significantly and negatively impact it. So, preventing data loss *and* providing rapid data/application recovery are equally important.

Databases, which more often than not are Oracle Databases, are foundational for much of what we regard as contemporary IT. So, any data loss in Oracle Database environments—whether of the permanent or temporary variety—is likely to have a disproportionately harmful business impact.

Oracle developed its Zero Data Loss Recovery Appliance (Recovery Appliance for short) to address the most common forms of potential data loss issues in Oracle Database environments. Its eponymous name is something of a rarity in IT marketing, but it emphasizes the system's abilities to avoid permanent data loss and to greatly reduce temporary data lost to the business. The descriptive name also helps bring attention to the fact that the two data migraines that IT professionals have simply grown to accept can in fact be permanently cured. *And* they can be cured with operational ease, surprising cost-effectiveness, and built-in security.

Operational Situation: IT professionals can sometimes feel as if they are barely keeping up with their day-to-day activities. They must support constantly evolving business needs while dealing with increasing complexity, rising data volumes, strict uptime demands, cyber-attacks, and new compliance requirements. Simply put, data powers the digital economy and businesses can't go on without it. However, traditional backup and recovery technologies often aren't capable of helping IT managers fully protect high-value data *and* rapidly recover it without data loss.

Solution: Oracle dramatically improved the protection of Oracle Database environments when it introduced the Recovery Appliance in 2014. Developed by the Oracle Database team exclusively to protect Oracle Databases, it incorporates Oracle engineering's unique knowledge of how its database works and how its protection should be enhanced and optimized. When compared with the "standard alternative" purpose-built backup appliances (PBBAs) and do-it-yourself (DIY) data protection architectures, Oracle's Recovery Appliance helps enterprises eliminate Oracle Database data loss, rapidly recover to any point in time, automate and simplify management, and run production databases more efficiently.

For those in IT who are simply trying to keep up with escalating demands, Recovery Appliance is a labor-saving system that keeps data available and balances the daily workload. For those trying to get a jump on the competition, Recovery Appliance enables more strategic operations by allowing organizations to redeploy IT resources to grow the business. And for everyone responsible for Oracle Database environments, the Recovery Appliance is like a one-time treatment that can indefinitely preclude two major IT data migraines—data loss and data recovery.

Oracle's fifth-generation Recovery Appliance X8M continues to stake out new ground with increased capabilities when compared with PBBAs and DIY solutions. In addition to its core continuous data protection, validation, and rapid-recovery capabilities, Recovery Appliance X8M delivers more compute power, more internal bandwidth, and significantly more storage capacity than its predecessor.¹ It also processes incoming data streams more efficiently. The impact of all this is that customers can consolidate data protection for multiple Oracle Databases, in a reduced data center footprint.

¹ The Exadata X8M underpinnings use the latest Intel Xeon processors, 100 gigabit Ethernet internal networking, and 14TB disk drives.

Data Protection Mandates Are Hard to Meet

ESG has researched the top current data protection mandates driven by IT leadership (see Figure 1), as well as the challenges their IT organizations encounter as they try to satisfy those mandates using their current data protection technologies and architectures.²

Figure 1. Data Protection Mandates from IT Leadership



Source: Enterprise Strategy Group

While improved security and compliance is an unsurprising top need in today's world, it is also clear from IT leadership priorities that the delivery of a range of required data protection improvements must be done in a way that reduces not only overall costs but also the inherent business risks of data disruptions. A concurrent focus, embedded in improved security, is reducing the number of cybersecurity incidents and mitigating their impacts. The development of strong privacy laws, such as the European Union General Data Protection Regulation (GDPR) and other regulations that specify rapid recovery and minimized data loss, together with the emergence of ransomware as a significant enterprise threat have prompted unprecedented levels of executive concern, magnifying the importance of *secured backup and assured recoverability*. It is, therefore, imperative for IT organizations to deploy solutions that incorporate not only security but also validated recoverability into their overall data protection and availability strategy.

The Real-world Dangers of Inadequate Data Protection

Most IT departments are committed to—and measured against—adhering to a slew of SLAs. In the data protection, business continuity, and disaster recovery areas, those SLAs will invariably be defined in terms of recovery point objectives (RPOs) and recovery time objectives (RTOs). Downtime tolerance for high-priority applications has become extremely low, trending toward zero. In fact, 14% of respondents surveyed by ESG said their organizations won't tolerate any downtime at

² Source: ESG Master Survey Results, [2018 Data Protection Landscape Survey](#), November 2018.

all for high-priority applications.³ An old IT adage says “good enough isn’t,” and it’s particularly true when considering data availability.

Downtime and lost data can produce a slew of undesirable consequences, such as lost revenue, potential business, customer confidence, employee confidence, and reputation; increased legal and compliance exposure; and even employment jeopardy.

Key Data Protection Requirements for Oracle Database Environments

[Oracle](#) technologies are used to support the most critical IT workloads at the heart of thousands of businesses. For these workloads, data loss is simply not acceptable. However, many approaches to data protection fall short of meeting the critical requirements for protecting Oracle Database for the simple reason that they were not designed explicitly to recover transactional data. So, what exactly are the granular database data protection and recoverability requirements that have business, operational, and technical implications for an Oracle Database environment?

Business Imperatives for Data Protection

Enterprise data protection is ultimately a means, and not an end in itself; the true motivation for data protection is protecting against *business risk*. When evaluating data protection solutions for Oracle Database, enterprises should consider their business imperatives at least as much as technical and economic factors. After all—and it bears repeating—Oracle Database invariably underpins mission-critical applications.

- **No customer or internal transactions can be lost. Period.** While this is an instantaneous requirement, meaning the latest data can’t be lost, it also applies for the entire duration that backups must be kept.
- **Business applications must resume running as fast as possible after any outage.** The enterprise must always be open for business, so recovery speed must be maximized when a business-critical database is down.
- **All business data must be fully and continually secured against all threats.** End-to-end encryption is a requirement throughout the data lifecycle. Encrypted backups must be protected against ransomware and malicious activities.
- **Business agility should be maximized.** Well thought-out data protection can enhance agility and performance by offloading things like backup processes and the provisioning of dev/test from production systems.
- **TCO must be minimized.** While this is a “given,” it’s surprising how many enterprises overlook the potential costs of both data loss and downtime and only focus on purchase prices. It’s critical to look at the big picture.

Oracle's Recovery Appliance X8M

Oracle's [Recovery Appliance](#) X8M is a fifth-generation, purpose-built, turnkey appliance created by the Oracle Database development team to meet the unique data protection needs of Oracle Database environments. While it performs typical backup functions such as efficiently storing backups on disk, replicating them to offsite locations, copying them to tape, and archiving them in Oracle Cloud, its true focus is on data—and hence *business*—recovery by enabling rapid recovery to any point in time with no data loss exposure.

The Recovery Appliance X8M offers a large number of architectural strengths, but four stand out: providing continuous data protection, offloading backup validation from database servers, eliminating the need for full backups, and automating the creation, management, and recovery of backups.

³ Source: ESG Master Survey Results, [Real-world SLAs and Availability Requirements](#), May 2018.

The key is that Oracle has used its internal knowledge of Oracle Database to deliver a customized data protection solution that offers customers unique business values that are unavailable with traditional PBBAs and DIY solutions. Let's look at how the Recovery Appliance X8M's capabilities combine to address the business imperatives identified above.

Recovery Appliance X8M Benefits versus Traditional Purpose-built Deduplication Backup Appliances

Traditional PBBAs and DIY solutions were invariably designed to optimize deduplication rates for generic file-based workloads. However, deduplication rates are seldom the top consideration for mission-critical database environments—eliminating data loss and minimizing outage durations are inevitably the prerequisites for enterprises. Generic PBBAs are not optimized to protect transaction-oriented mission-critical Oracle Databases and simply cannot have the level of Oracle Database knowledge that is engineered into the Recovery Appliance X8M. When evaluating a data protection solution for Oracle Database environments, users must look at how Recovery Appliance X8M's capabilities address the key business imperatives and how these capabilities can debunk deduplication appliance myths.

Continuous Data Protection

The first business imperative of *"No customer or internal transactions can be lost. Period"* is critical in today's data-driven business world. If your database is down, you can't take orders, make products, manage people, or pay bills—any one of which can be a significant problem. Traditional PBBAs and DIY backup solutions require weekly full backups and daily incremental backups. And, while forward-thinking companies may cut their recovery point objective for a database to a few hours by periodically backing up their archive logs, that only reduces potential data loss from 24 hours to 2-3 hours. That's still too long because you can't predict, for example, when a big order might arrive. In contrast, the co-engineered Oracle Database and Recovery Appliance X8M combination enables continuous data protection and a near-zero RPO—capabilities that are unobtainable with generic PBBAs and DIY backup solutions.

End-to-end Data Validation

The long-term retention corollary to continuous data protection is that once a database is protected, it should be recoverable whenever needed. After all, having a corrupt backup may be worse than having no backup at all since it gives a false feeling of security. Oracle Database best practices are to immediately validate all newly minted backups to ensure they are recoverable. Traditional PBBAs have no visibility into Oracle Database blocks, so their backups must be copied back to the database server and checked against the original data. To be fair, this is a sound technical approach, but operationally it's time-consuming and resource-intensive to the point of being unbearable for many organizations. The result is that enormous numbers of backups are not validated, which substantially increases the odds that an untested backup is corrupt and the recovery will fail, no doubt extending downtime and even likely resulting in data loss.

Recovery Appliance X8M takes a different approach by using its internal knowledge of Oracle Database to offload validation from database servers. It gives users a significantly simpler and shorter way to backup and validate Oracle Databases than PBBAs, increases the efficiency of those database servers, and enables enterprises to get more value out of their database licenses. Recovery Appliance X8M also improves long-term recoverability by scheduling periodic database backup revalidations, so users can be confident that old backups can be accessed for compliance or business reasons. The Recovery Appliance X8M increases the compute performance of critical systems elements to more rapidly process these validations so Oracle's customers can feel secure that their databases are readily recoverable.

Automated Recovery

The second business imperative that *"Business applications must resume running as fast as possible after any outage"* requires that data isn't inaccessible to the business for an extended amount of time, so a solution must deliver against a short RTO. In typical weekly full backup environments, an Oracle Database recovery using a traditional PBBA system requires multiple manual—and potentially error-prone—recovery steps, including recreating a full backup from multiple

deduplicated source files, restoring it, and then serially restoring and applying up to six incremental backups. The tight co-engineering between Oracle Database and Recovery Appliance X8M dramatically reduces RTOs by automatically generating a virtual full backup on the Recovery Appliance before the recovery begins. By eliminating the manual steps, Recovery Appliance X8M can get business-critical databases up and running significantly faster than is possible with generic PBBAs while eliminating data loss risks during the recovery process.

In addition, restoring an Oracle Database using generic PBBAs usually requires DBAs to coordinate activities with other IT teams to access the required backups. This is labor-intensive and riddled with the potential for human error. Compared with generic PBBAs or DIY solutions, Oracle states that the Recovery Appliance X8M automates up to 75% of the steps in the backup/recovery process, which again accelerates recovery and helps mitigate recovery risks arising from potential human errors.

Better Security and Cyberattack Protection

As reported in ESG's research, the business imperative *"All business data must be fully and continually secured against all threats"* is top of mind with IT leadership.⁴ Data theft and ransomware are serious business risks, and attacks are commonplace. Oracle Database best practices are to use transparent database encryption (TDE) and never unencrypt it, even during backups. This creates a dilemma because generic PBBAs and DIY solutions want users to unencrypt their data before deduplication and compression so they can maximize data reduction. In comparison, the Recovery Appliance X8M is created by the same people who build TDE, and the two capabilities work together to ensure users' data is never exposed.

While generic PBBAs can function with TDE data, they do not provide the same level of isolated protection against ransomware attacks as is afforded by the Recovery Appliance X8M. Generic PBBAs are often connected as a storage device to the systems they protect, which increases the risk that malware will propagate from the production environment to the backup system and corrupt it. Some workarounds to this problem focus on creating an "air gap" between the main generic PBBA and a second one. But that approach doubles the cost and creates a complicated manual process that can easily add more costs for specialized consulting services. Instead of linking the functions together, Recovery Appliance X8M maintains system-level isolation between production and backup systems to reduce ransomware risks and protection costs since users won't need the second system and complicated air gap processes that are required by PBBAs.

Better Capacity and Performance Scalability

While it might not be obvious, the business imperative that *"Business agility should be maximized"* is critical for many Recovery Appliance customers. Generic PBBAs can experience both performance and scalability problems that result in individual systems being dedicated to a single database environment—which creates data siloes, PBBA sprawl, and significant IT inefficiencies; they also do not typically offer scale-out performance and capacity, which turns many upgrades into "forklift" exercises with considerable unwelcome disruption and cost. Recovery Appliance X8M enables enterprises to meet more stringent SLAs, validate their data, and reduce IT inefficiencies by offering high out-of-the-box speed together with scale-out performance and capacity upgrades. Given their shared DNA, Recovery Appliance X8M is a perfect match to allow IT organizations to keep up with the dramatic increases in database capacity and performance that are provided by the Oracle Exadata X8M. The combination of Recovery Appliance X8M and Oracle Exadata X8M means that enterprises can effectively consolidate their databases *and* database protection into an integrated solution with high levels of performance and automation.

With Recovery Appliance X8M, Oracle offers up to 949 TB of capacity and 24 TB/hour of both backup and recovery performance *per rack* (it can scale to 18 racks). Recovery Appliance results are for Oracle Database environments (as opposed to more generic email and file storage environments) and do not require users to install "agents" on their

⁴ Source: ESG Master Survey Results, [2018 Data Protection Landscape Survey](#), November 2018.

database servers, which can take cycles away from running the business. The additional performance and storage efficiency benefits of Recovery Appliance include incremental-forever backups, database compression, and database encryption. Altogether, a fully-scaled Recovery Appliance X8M system can protect up to 17 PB of raw data and achieve up to 432 TB/hour of uncompressed backup or recovery throughput (numbers that are orders of magnitude ahead of leading competitors).

Better Value

To list “*TCO must be minimized*” as a business imperative may seem a trite, but when protecting business-critical Oracle Databases, enterprises should consider many value perspectives. Some users focus myopically on the purchase price, while others look more broadly at TCO, but what about all-encompassing ones that evaluate the overall financial impact of increased IT staff and user productivity, shortened outages, and zero data loss? Generic PBBAs and DIY backup offerings may initially look attractive based on a cost per terabyte storage comparison, but they can be significantly less attractive under broader evaluation. It is worth noting that Recovery Appliance X8M is co-engineered backup/recovery software, compute, and storage infrastructure, as well as the Oracle Database, in an easy-to-use appliance versus being one component—storage—of the overall data protection solution.

Storage Efficiency

Anyone familiar with backup and recovery solutions will have probably noticed that this paper has not yet touched on storage efficiency—the claim to fame of PBBAs. The omission is intentional because the theoretical efficiencies of deduplication appliances do not translate well to Oracle Database environments since transactional databases are specifically designed to reduce data redundancies. As a result, deduplication provides little to no benefit for database backups, especially incremental ones; this is in stark contrast to other applications—such as email and file storage—where tens or hundreds of copies of the same document may be stored in different directories.

Organizations should be wary of the actual deduplication ratios realistically achievable on Oracle Databases with generic PBBAs. While the ratios will vary, it is ESG's opinion that “fuzzy math” has pervaded the industry in terms of some vendors' claims of high ratios. Organizations buying into those claims for Oracle Databases may find they need to purchase more capacity to protect their data for the length of time they desire, or that they are severely disappointed with recovery times. Indeed, they may simply have found a different type of headache to endure.

The Bigger Truth

Anyone in IT management who is okay with occasionally losing some data or access to their business-critical applications for extended periods of time will be fine keeping to their usual “backup-and-hope” approach. But that's not the norm these days. For everyone else, Oracle's Recovery Appliance X8M delivers unique near-zero data loss and point-in-time recovery capabilities for Oracle Database. The value is made crystal clear in the name—Zero Data Loss Recovery Appliance.

The fifth-generation Recovery Appliance X8M sets itself apart from competitor PBBA and DIY offerings not only because it was designed and built explicitly by the Oracle Database team for Oracle Database protection, but also because it delivers advanced capabilities such as continuous data protection for sub-second RPO and faster database recoveries. The real-time, ongoing transaction protection offered by Oracle's Recovery Appliance X8M can support an enterprise's most mission-critical workloads in a way that optimizes cost and efficiency, and significantly lowers risk.

Recovery is everything! This cannot be overstated. A backup is useless if a user's Oracle Database can't be recovered when needed. Think about it: No one would spend their hard-earned money on an insurance policy if they knew they'd never need it. People buy insurance for the peace of mind it provides in the event—however unlikely—that something goes wrong. Stored data only has value if and when it is used. Likewise, backup data only has value if and when it's recovered. It is the act of successfully recovering data that delivers value. And it is the act of successfully recovering Oracle Database

data that delivers mission-critical business continuity. Oracle's Recovery Appliance X8M brings peace of mind for Oracle Database users by delivering that data protection *and* recoverability via a purpose-built, turnkey, zero-data-loss solution with performance, scalability, and security designed in.

The IT world continues to change. IT users cannot use antiquated storage backup approaches and appliances for their critical database workloads for the same reasons that no one would win a modern car race with a 20-year-old truck running on solid rubber tires: It's not just the raw specifications; it's that the entire competitive landscape, or race track, has changed. Today, you must plan to avoid ransomware and potential fines if you transgress government regulations. You're going to spend inordinate time restoring your organizational *and* personal reputation if you can't restore your data. In a nutshell, Zero Data Loss Recovery Appliance X8M provides the lowest risk way to protect what is inevitably some of your highest value data.

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