

Reimagining the data-driven telecom provider

Modernizing mission-critical systems is an urgent priority for forward-looking telcos

RESEARCHED BY

OMDIA

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ORACLE

Executive summary

Today's telecom service providers seek to achieve the seemingly impossible. Like many organizations, they need to meet constantly shifting customer expectations by exploiting a continuous stream of new ideas and technologies to develop new products and services. Yet, because telecom providers operate within a highly regulated, cost-competitive marketplace, they must do more than simply “innovate” by turning on new services like 5G. They must pioneer new ways to break through the confines of an IT infrastructure that's fragmented, rigid, fragile, and difficult to manage. Thanks to decades of expansion and acquisition, these IT environments are awash in disparate and vast data silos that continue to grow exponentially, making it difficult to comply with complex security requirements and myriad regulatory mandates.

How then can telecom providers modernize their legacy data infrastructure investments without exponentially increasing operating costs or incurring the potential compliance risks of simply moving everything to the public cloud?

The answer lies in bringing the best of public cloud services and benefits to the telecom provider's own data centers. This approach can greatly accelerate IT modernization by reimagining on-premises infrastructure as a cloud service: flexible, responsive, secure, consumption-based, and easily governed. With this re-imagined infrastructure, telecom providers

now can innovate across top business priorities such as customer churn prediction, billing optimization, advertising placements, and content recommendations.

Of the cloud players promising this kind of modernization, Oracle offers a unique strategy that melds a powerful converged, self-driving database and high-performance engineered systems with cloud-native managed services that run within the telecom provider's own data centers. In this way, Oracle helps customers experience the benefits of the cloud while retaining control of both their applications and data. Telecom providers can now take full control of their biggest business challenges—driving innovation, streamlining operations, improving customer engagement, meeting compliance requirements, and reducing overall costs.

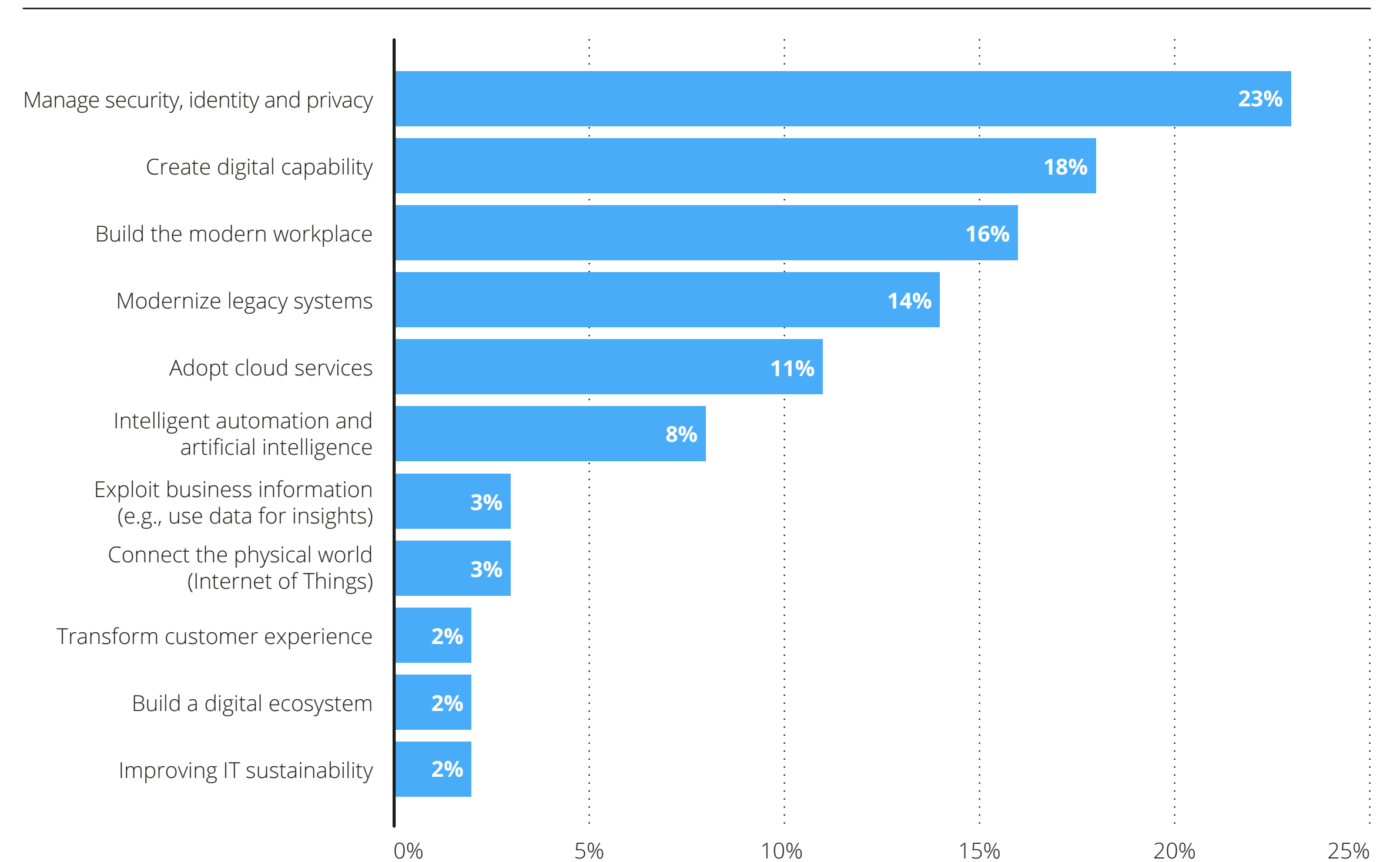
The need to invest in IT business modernization

The global telecom sector is a complex and highly regulated industry that is uniquely and inextricably woven throughout industry and society. The sector continues to undergo massive and relentless change as telecom providers strive to align significant infrastructure investments with strenuous regulatory demands, slow-growing revenues, competitive pressure, and ever-shorter cycles of technology innovation. Against this backdrop, telecom providers now face an unprecedented increase in demand for media services emerging from pandemic-driven changes in consumer behavior.

In response to these challenges, telecom providers are actively seeking to modernize their legacy systems and critical applications (see Figure 1), hoping to cut operational costs so they can create new digital capabilities that open up additional business opportunities. Without change, the cost of managing and maintaining legacy infrastructure only increases with the operating cost of data storage, processing integration, and analysis of siloed data. This interplay of IT management costs and ongoing license and maintenance costs in turn inhibits new investments. This ultimately constrains the pursuit of innovation.

How widespread is this problem? A recent Omdia survey of telecom IT stakeholders ranked operations (in other words, keeping the lights on) as one of the costliest areas of IT spend, outweighing research and development by nearly a factor of three (see Figure 2).

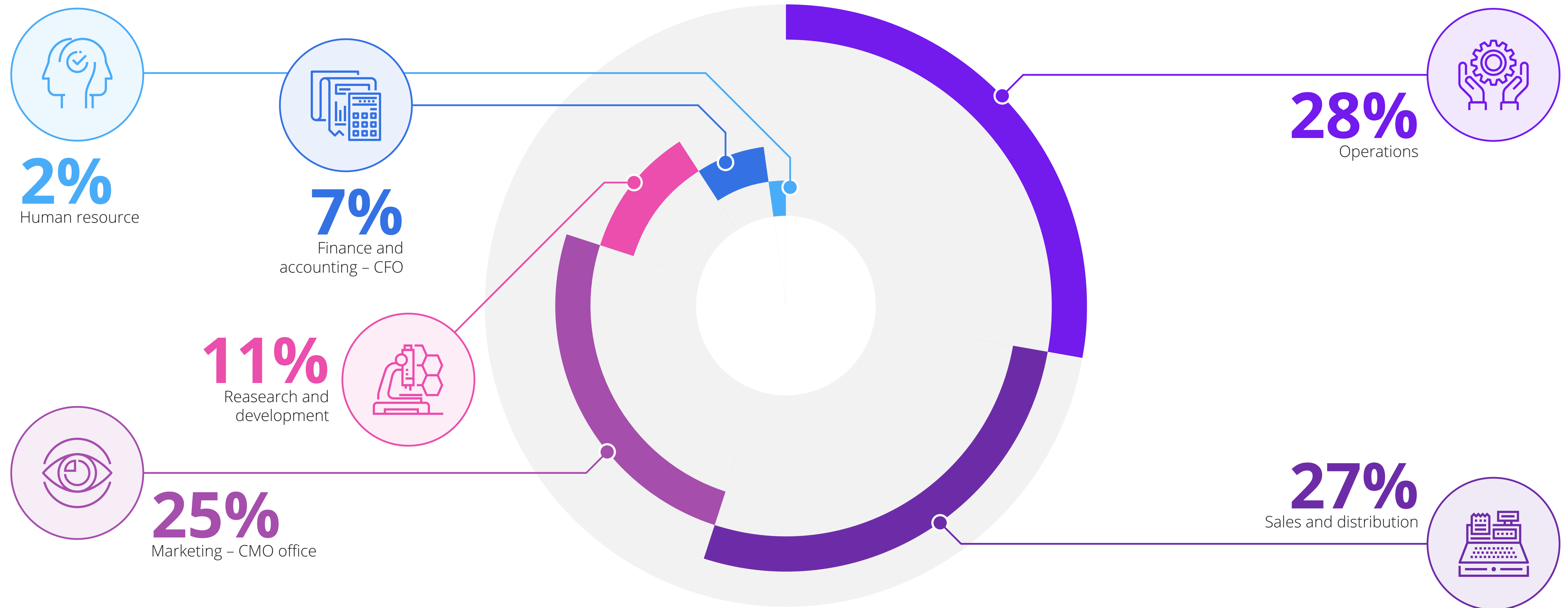
Figure 1: Top IT priorities for telecom providers



QUESTION: HOW IMPORTANT ARE THE ABOVE TECHNOLOGY AREAS TO YOUR ORGANIZATION? (SHOWING % RANKED AS #1)
N = 408

SOURCE: OMDIA IT ENTERPRISE INSIGHTS 2022

Figure 2: Telecom IT spending by department



QUESTION: WHICH ARE THE TOP THREE DEPARTMENTS IN TERMS OF SPENDING ON IT? (NORMALISED TO 100%)
N= 103

SOURCE: OMDIA IT ENTERPRISE INSIGHTS 2020

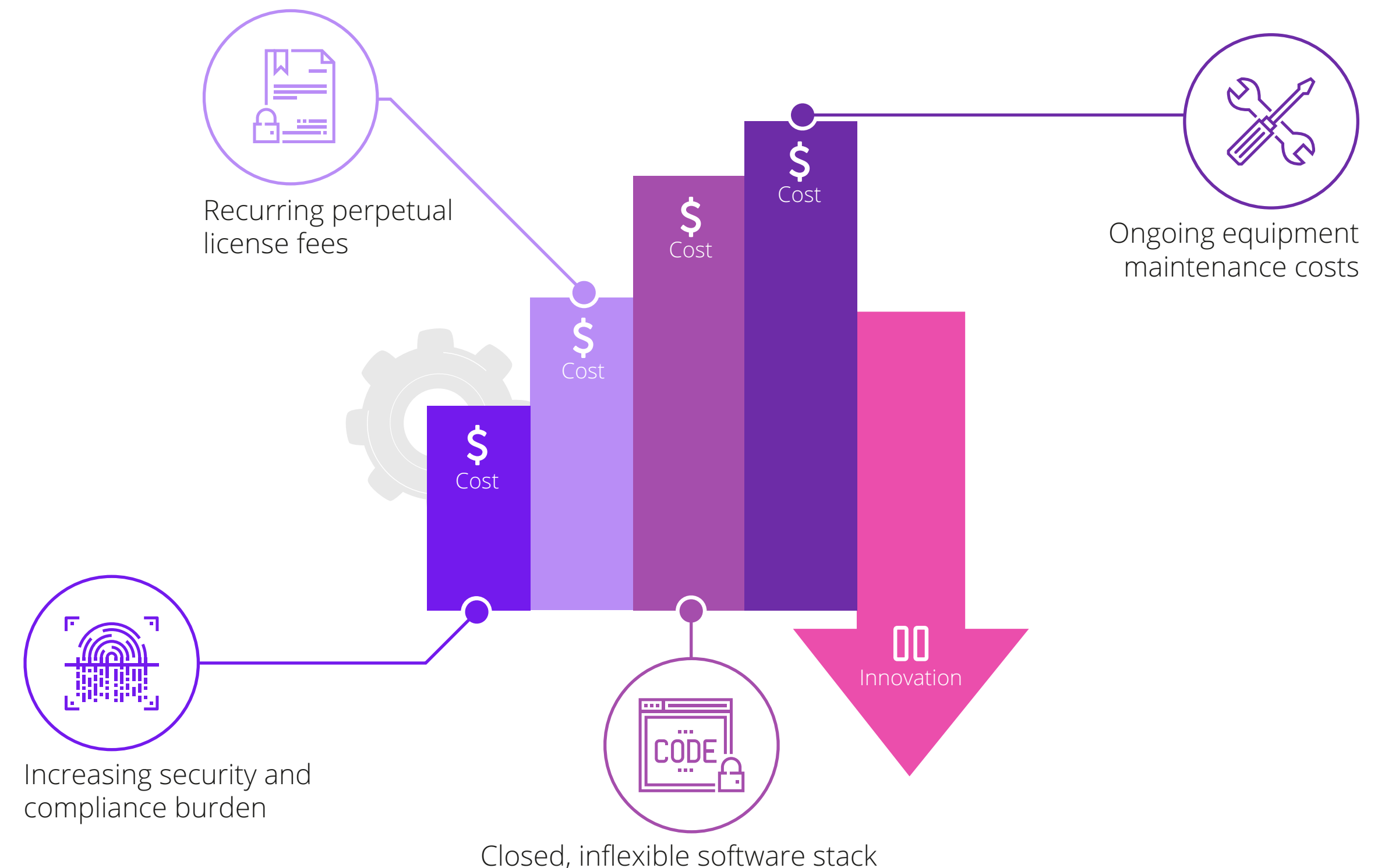
Unifying chaotic architectures

How can telecom providers change the investment equation from keeping the lights on to building a solid application and analytics platform that can make room for innovation by simplifying operational requirements without sacrificing performance, security, and governance? This is easier said than done, of course, as telecom operators cannot simply stop and re-architect their entire IT infrastructure. Instead, many functional and departmental organizations within a telecom provider end up building their own platforms, creating their own data warehouses as a way to facilitate the growth of a specific business project. Sadly, the proliferation of these well-intentioned projects ultimately leads to further data sprawl, additional infrastructure complexities, and more maintenance spending.

To make matters worse, this fragmentation makes it nearly impossible for telecom providers to gain a timely and complete view of their business. Moreover, business applications workloads are often throttled because the underlying infrastructure supporting them is incapable of delivering performance, availability, and security at scale—not to mention the increased risk of data breaches or data loss as demand for services drives fragmented growth.

For many companies, one solution is to move databases and applications to public cloud services and hybrid cloud-native hardware/software architectures—nowadays a common, board-level objective. Doing so makes perfect business sense as it reduces data center space, management, and maintenance overhead while increasing

Figure 3: The impact of increasing IT management costs on innovation spend



SOURCE: OMDIA

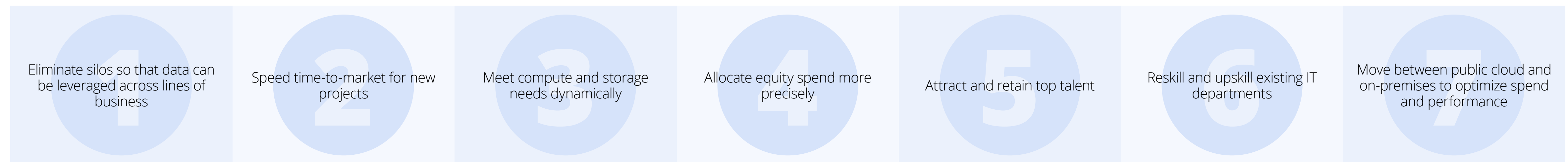
reliability at scale. By having all systems deployed and operated on identical platforms across the cloud and on-premises, it avoids the complexity of maintaining, tuning, and securing bespoke hand-built systems and moves expenses from CAPEX to OPEX, making room for a more flexible, responsive approach to IT investment (see figure 3).

Experienced telecom enterprise IT practitioners, however, must adopt a more nuanced perspective on IT modernization. A one-size-fits-all strategy of deploying in a single location or centralizing on a single cloud won't meet performance expectations, nor does it disentangle tightly woven on-premises applications or address data sovereignty/data residency requirements. For telecom providers,

regional security and privacy regulatory requirements alone rule out any sort of lift-and-shift attitude toward the cloud.

The key to solving this challenge is to adopt an architectural and operational identity capable of delivering the benefits of the cloud across all deployment options. This means taking on a public cloud-first mindset but building a physical architecture that can continuously select the most appropriate path (cloud, on-premises, edge, etc.) based on business, operational, and regulatory requirements. The aim is to increase transactional and analytical capacity while lowering overall infrastructure costs and, in so doing, create enough room for investment in innovation (see figure 4).

Figure 4: Business benefits of cloud-on-premises



SOURCE: OMDIA

Deploying cloud-native capabilities on-premises

Given the speed and agility required, architecting and building a do-it-yourself environment is no longer viable. It takes too much time, resources, and money to build. Once built, it's labor-intensive and expensive to operate, maintain, and keep up with both new technologies and applications. For this reason, many telecom providers looking to create next-generation solutions are increasingly turning to integrated systems-based hybrid cloud deployments such as those offered by Oracle.

These engineered systems, as Oracle refers to them, feature fully integrated software and hardware—co-engineered at the source code level—that can be fully or partially managed by the customer. And, they can be deployed with minimal effort and risk, eliminating the cost of paid integration services and the issues of do-it-yourself development. In essence, Oracle's engineered systems create a cloud-on-premises

infrastructure. In addition, since these systems can directly mirror public cloud service architectures, they bring together the best of both cloud and on-premises deployments in a hybrid cloud architecture (see Figure 5).

In response, some cloud providers are increasingly seeking to build better cloud to on-premises connectivity—even going so far as to extend their services architectures to the on-premises world. Similarly, systems vendors are creating tight linkages with the public cloud at least in terms of connectivity and management. Unfortunately, many of these solutions do not yet provide actual parity between cloud and on-premises. In contrast, Oracle's cloud-on-premises engineered systems run Oracle Autonomous Database on-premises and in Oracle Cloud Infrastructure, automating many traditionally manual IT functions, including performance, availability, and security.

Figure 5: Characteristics of cloud-on-premises



SOURCE: OMDIA

Introducing the Oracle way to cloud deployment flexibility

The Oracle logo, consisting of the word "ORACLE" in a bold, red, sans-serif font.

Telecom providers need to run network management, billing, ERP, CRM, and other workloads on private, hybrid, and public clouds that provide the same or superior capabilities than are currently in use while meeting evolving regulatory and security requirements. Oracle's pioneering Exadata systems integrate servers, storage, networking, and system software while incorporating unique hardware and Oracle Database optimizations that deliver high levels of performance, scalability, and availability. Of course, it takes more than databases to run a telecom provider, so Oracle created the Oracle Private Cloud Appliance (PCA) to support applications, middleware and the rest of the IT stack.

Most leading telecom providers already have customer records and transactions in Oracle Database, using Oracle Exadata to support business-critical workloads while also hosting their own and client-developed over-the-top services. Many of these companies take advantage of public cloud database automation and economics in their data centers with Exadata Cloud@Customer and use Private Cloud Appliance to run enterprise applications, middleware, and cloud-native workloads. Telecom providers as diverse as [AT&T](#), [Telefonica](#), [NTT West](#), [Entel](#), and [Algar Telecom](#) use Exadata Cloud@Customer to accelerate OLTP workloads and improve customer experiences and marketing response rates with advanced analytics.

In addition, the growth of 5G-enabled services provided by telecom providers or independent companies is fueling the growth of real-time data management for

Internet of Things (IoT), gaming, and streaming services. To optimize application and business results, 5G's low-latency and high throughput must be matched with data management solutions that provide similar capabilities. Oracle's ability to provide fully compatible and scalable deployment options eliminates the need for telecom providers to create different do-it-yourself solutions for each environment while making it easier to deliver consistent and reliable services to end-user clients while reducing costs.

Unifying data and application workloads

Oracle created its first Engineered Systems over a dozen years ago, delivering Exadata Database Machine in 2009, Private Cloud Appliance in 2014, and Exadata Cloud@Customer in 2016. As a result, Oracle has enjoyed a noteworthy head start in the development of the high performance, reliability, and easy management that telecom providers require in their data centers. Since then, Oracle has enhanced the performance, scalability, database functionality, and management automation of its portfolio, with the Exadata X9M providing over 500 times the SQL Read IOPS and 70 times more analytical throughput than the initial Exadata systems. Likewise, Oracle Private Cloud Appliance X9-2 delivers more than 5x the compute power, 5x the networking bandwidth, and 1000x the storage capacity than the initial PCA system. Together with Oracle's adoption of a cloud-native application development philosophy, these two platforms provide highly integrated infrastructure for enterprise applications, databases, and middleware that increase the productivity of users, developers, and administrators alike.

Oracle Private Cloud Appliance X9-2 includes a significantly enhanced development and management environment that provides OCI-compatible APIs and tools for developers, users, and architects. With the Private Cloud Appliance X9-2, telecom providers can consolidate the deployment of applications and middleware running on Linux, Oracle Solaris, or Microsoft Windows operating systems using "wire once" software-defined infrastructure. With the Oracle Private Cloud Appliance X9-2,

customers can deploy containerized applications as well as VM-based workloads on the same infrastructure.

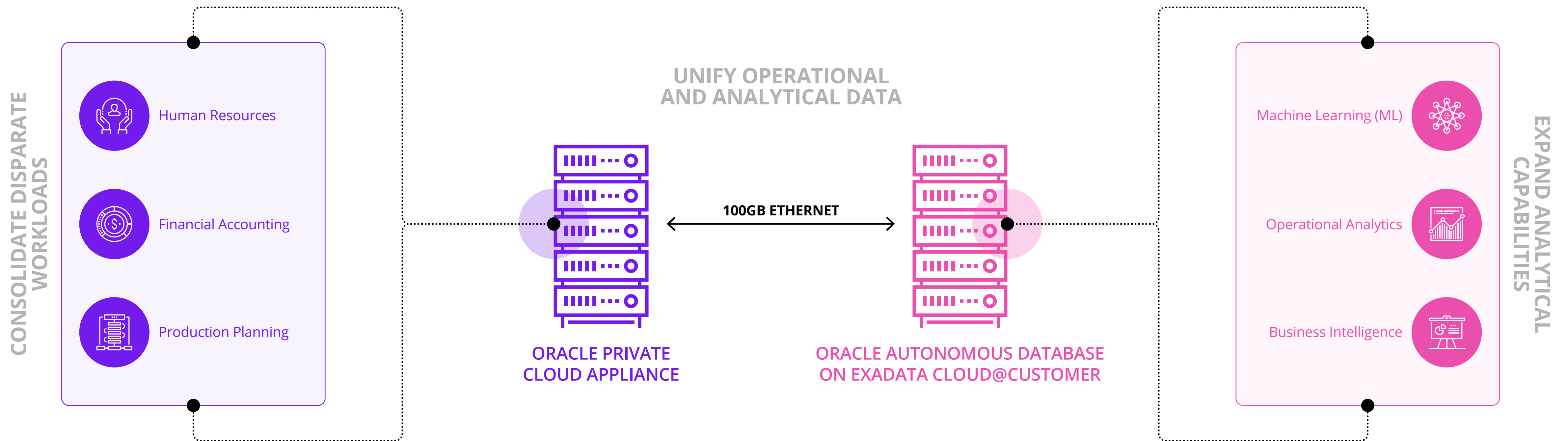
The Oracle Private Cloud Appliance X9-2 can be directly connected to the Exadata client network using multiple 25GbE connections. Further, by using Private Cloud Appliance's OCI-compatible APIs in conjunction with Exadata's industry-standard data management APIs that include SQL and JSON, telecom providers have an integrated, full-stack environment that's easy to deploy, maintain, manage, and secure. As a result, cloud-native applications can be developed and deployed anywhere. This enables organizations to maintain full data sovereignty and improve security for their database and application IT stack while also:

- Eliminating manual database lifecycle management tasks
- Simplifying workload movement between cloud and on-premises environments
- Gaining low, predictable, and easy-to-understand database costs along with cost-effective licensing of Oracle software
- Improving developer, administrator, and user productivity
- Enhancing data protection

Oracle’s solutions enable telecom providers and their customers to have a truly consistent experience across cloud and on-premises deployments without requiring applications and data to move outside local data centers. These solutions allow companies to improve network availability, real-time operations, and billing by using robotic process automation (RPA) and other AI/ML-enabled solutions

with a common set of data. Telecom providers can use these solutions to grow their businesses by supporting clients looking to roll out new 5G-enabled services including diverse over-the-top workloads ranging from voice-assisted customer service to automated billing and order fulfillment.

Figure 6: Oracle Autonomous Database and Oracle Private Cloud Appliance, a killer combination of simplicity, performance, and insight



SOURCE: OMDIA

Reducing management requirements

Telecom providers are facing a shortage of infrastructure architects, developers, and DBAs that are essential for the smooth and continuous operations of their networks and information systems. To compensate for labor shortages, they need to use automation to reduce labor-intensive IT management tasks and focus scarce resources on high-value projects. Using the same management APIs, tools, and underlying capabilities across cloud, on-premises, and hybrid cloud deployments allows telecom providers to optimize management efficiency. Critical daily tasks automated by Oracle Autonomous Database include:

- Provisioning, deprovisioning, and cloning databases
- Managing, tuning, patching, backing up, and securing databases
- Ensuring that high availability system failover routines operate reliably
- Configuring and then monitoring data privacy and security settings

AI-driven automation is an area where Oracle stands alone among its peers, aggressively using machine learning to codify best practices built on many thousands of human-years of experience running business-critical applications. With Autonomous Database, Oracle has created an environment that automatically monitors, tunes, secures, and repairs itself, helping customers improve business efficiency and drive growth. In fact, customers like Sky Brasil have reported that using Autonomous Database has [reduced operational costs by up to 90%](#) (see figure 7).

The value proposition of Autonomous Database running on Exadata Cloud@Customer in telecom providers' data centers revolves around eliminating most database and infrastructure manual management while still meeting data sovereignty and security requirements—which isn't always possible when running in cloud provider's data centers. The fully managed Autonomous Database service and the highly optimized Exadata Database services simultaneously run on the same Exadata Cloud@Customer infrastructure, succeed in doing just that by making it easier for customers to consolidate database operations and implement distributed cloud architectures in a way that maximizes cloud automation and cost benefits. These function as true cloud services in the customer's data center with Oracle owning and managing the infrastructure and the telecom provider paying for hardware subscriptions and consumption-based pricing. There are a number of distinct advantages to this approach, including the ability to:

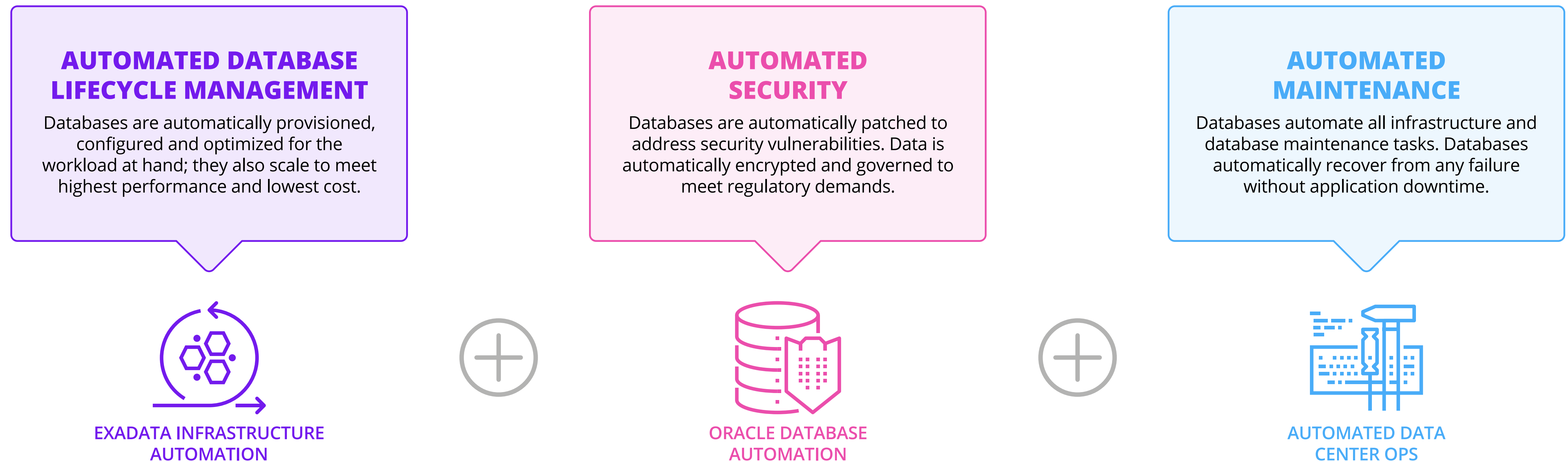
- Keep systems up-to-date with no downtime by automating database and infrastructure management and maintenance
- Rapidly respond to issues and outages by combining data from different sources in real-time
- Rapidly develop cloud-native workload capabilities and deploy them in cloud, on-premises, and edge environments with minimal tuning and management

- Provide scalable, high-performance databases for transactional, analytic, and mixed workload environments
- Improve operational efficiency by using a pool of shared resources within a single data governance framework

- Minimize downtime and costs with automatic, online resource scaling and pay-per-use database consumption

All Autonomous Database and Exadata Database environments running as Cloud@Customer deployments benefit from enhanced availability, scalability, and performance.

Figure 7: Oracle Autonomous Database: three degrees of automation



SOURCE: OMDIA

Maintaining data sovereignty and control

The location and accessibility of data is of paramount importance for highly regulated telecom providers. Private data often must be retained within geographic boundaries and secured behind an organization's firewalls while also being protected against outages, disasters, accidental disclosure, the activities of disgruntled employees, and ransomware. However, it is also critical that data be appropriately accessible to optimize network operations, customer interactions, enterprise planning, and marketing campaigns.

Oracle's approach to this challenge hinges upon the use of Exadata Cloud@Customer and the Oracle Private Cloud Appliance to secure, control, and protect data while meeting data sovereignty and security requirements by keeping all data copies inside the customer's data centers. Databases, replicas, backups, and data-in-motion are always encrypted with customer-owned encryption keys to prevent unauthorized access. Data never leaves the data center unless the telecom provider chooses to replicate it or protect it in another location for disaster recovery. Data is also protected against unauthorized access by Oracle Cloud Infrastructure (OCI) operators through Operator Access Control, which gives the customer strict oversight and control over remote Oracle management of resources in the telecom provider's data center.

Telecom providers that want to run other Oracle Fusion SaaS applications, Oracle Communications core network and B/OSS solutions and other industry application suites in their data center can also do this by deploying a Dedicated Region Cloud@Customer environment. These solutions provide secure infrastructure that implement all Oracle Cloud Infrastructure services in a telco's data center. In essence, this allows telecom providers like [Vodafone](#) to enjoy the full OCI public cloud experience while running on infrastructure that meets their data sovereignty and security requirements.

Protection of telecom provider data against failures, disasters, and ransomware is further enhanced by using Oracle's Zero Data Loss Recovery Appliance, which can be used to protect critical Autonomous Database and Exadata Database data. The Recovery Appliance provides continuous data protection for Oracle databases and helps customers recover databases to less than a second before a failure or ransomware attack. In addition, the Recovery Appliance's automated recoveries eliminate many of the typically manual steps DBAs must take, dramatically shortening the time it takes to bring the databases back online and reducing the potential for human error while backup validation ensures that databases are recoverable.

Vendor selection challenges

While other vendors portend to offer cloud on-premises solutions designed to help address telco challenges -- just like Oracle Exadata Cloud@Customer X9M and Dedicated Region Cloud@Customer -- their offerings fall into one of two categories:

Limited cloud delivered on-premises: In this category we have solutions like AWS Outposts, Microsoft Azure Stack and Google Anthos. With AWS Outposts, for example, telcos cannot obtain many of AWS' flagship database services, such as Aurora, Redshift, DynamoDB, Document DB, Keyspaces, Neptune or Timestream, making it an IaaS subset of AWS rather than an identical deployment in a telco data center. With Azure Stack, telcos must fund their own Azure Stack Operator to directly manage the service, and select their own hardware. This requires that they also use a version of software that is frozen in time and therefore not identical to that running on Microsoft Azure public cloud. In addition, having to manage multiple parties and manually integrating systems, the Azure Stack requirements of a Azure Stack Operator mean that no telco will limit itself to only one, thereby placing an extra 3-4 headcount burden on its overall IT cost structure. Google Anthos runs on Cisco servers, an architecture that Google does not use within its own Google Cloud Platform, and is more suited to supporting Kubernetes-based development requirements than running mission-critical telco applications.

Financially engineered cloud consumption on-premises: In this category we have solutions like HPE Greenlake and Dell APEX, which take legacy hardware infrastructure and charge customers using a consumption-like licensing model. Make no mistake, these standalone systems priced as cloud services are not managed by a cloud control plane from a public cloud network operations center. This financial engineering approach is the functional equivalent of leasing a car rather than purchasing it outright, with some creative rebates thrown in.

Conclusion

For today's telecom providers, improving operational efficiency, reducing infrastructure costs, and accelerating the deployment of 5G enabled services are of paramount importance. The case for taking advantage of these opportunities by moving core, mission-critical systems to a cloud-on-premises environment is clear and urgent, with each provider plotting their own course based on local needs, competitive pressures, and regulatory requirements. There are several guidelines that all organizations should rely on to create a clear pathway to success:

- Adopt a data-centric strategy that builds on cloud technologies. Platforms and processes should be built around a unified data infrastructure to remove departmental data silos, optimize the value of the firm's internal data, and facilitate integration of external data sources.
- Data and deployment architectures, whether public, private, or hybrid, should be consistent regardless of physical location, so that telecom providers can deliver uniform service levels, automation, management, and governance. This enables the deployment of applications, core processing, data analytics, and AI workloads in the most advantageous locations as dictated by demand, performance, security, regulatory needs, and costs.

- Leverage cloud-based management environments with embedded AI/ML capabilities to protect the organization, its data, and customers from continuously evolving fraud and cybersecurity threats. Using a solution that eliminates error-prone manual tasks like system patching, system monitoring and alerting, and maintaining security profiles will help improve resilience while reducing TCO.
- Use consistent, cloud-native infrastructure across public cloud and on-premises deployments to quickly develop and deploy applications with CI/CD methodologies while meeting data sovereignty requirements.

Through the adoption of an integrated software and hardware platform on-premises that can still confer the many benefits of the cloud, telecom providers can indeed do the seemingly impossible -- both modernize their data infrastructure and reduce the costs of running it. Oracle helps telecom providers on this pathway to success with a unique strategy that melds a powerful converged, self-driving database and high-performance engineered systems with cloud-native managed services in the customers' own data centers.

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Integrated Cloud Applications & Platform Services

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