Unlocking infrastructure potential with Intel® Rack Scale Design

INTRODUCTION

Intel® Rack Scale Design — The future of the data center

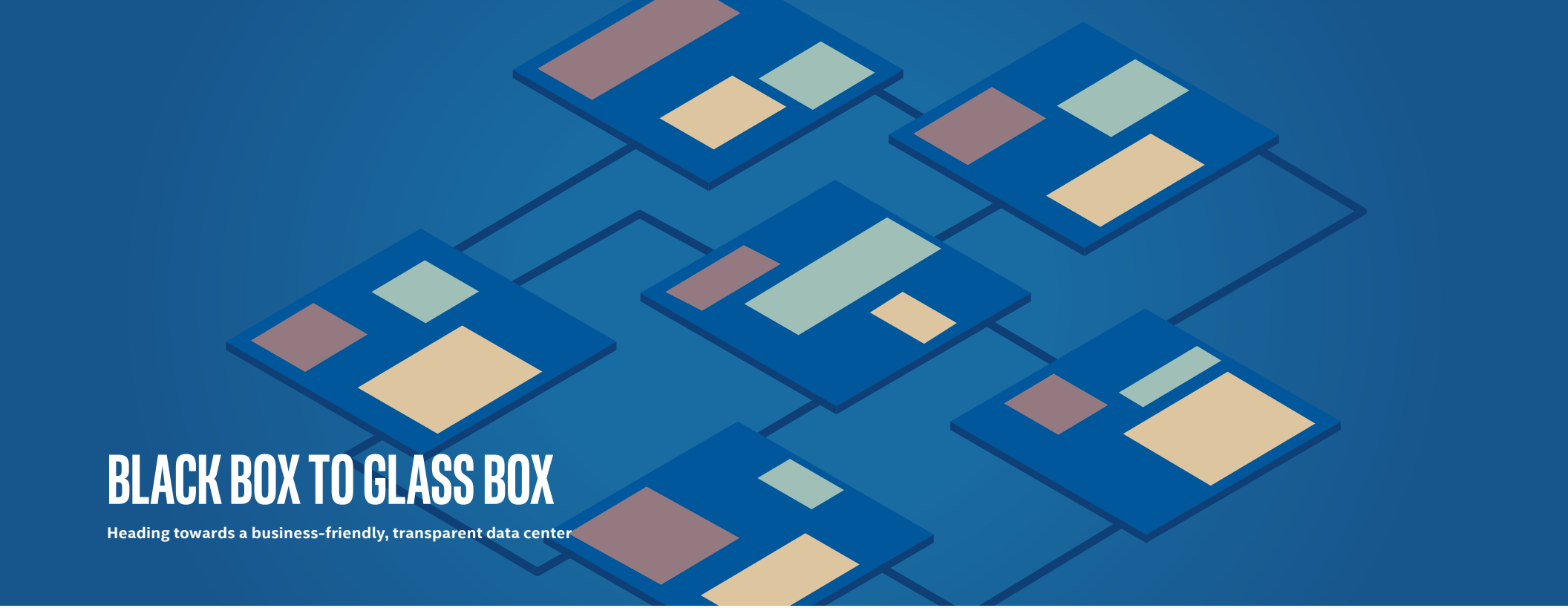
Over the last decade, huge growth in demand for Internet and mobile services has driven rapid transformation in digital businesses. This growth has been highly disruptive; it has created new business opportunities, and challenged the status quo. In the data center, two forces have created much of this change: the evolution of virtualization and the rise of cloud computing. However these forces represent only two of the three key elements that will drive competitive advantage going forward. The third element—and missing piece—is a flexible computing, storage, and network fabric that will usher in an age of truly agile digital infrastructure.

Virtualization has set the stage for agile infrastructure. It has enabled elastic horizontal scaling, planted the seeds for cloud computing, and created new standard units of computing, such as virtual machines, which could be installed on one server or span many.

The growth in virtualization has been complemented by the expansion of various flavors of cloud computing infrastructure services: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and the most prevalent form, Software as a Service (SaaS). By creating the potential for massive scalability, cloud computing has created new business models and changed the context for existing ones. Businesses are counting on the cloud not simply for lower total cost of ownership (TCO), but also greater return on investment (ROI), as they increasingly try to use the flexibility of the cloud for business advantage — reaching their users anywhere in the world and accelerating their ability to evolve to meet customer needs.

However, today's cloud infrastructure doesn't effectively deal with the complexity of managing increasingly large numbers of computing resources that might reside anywhere in the world, nor does it help address the need for rapid change and the introduction of new product features and capabilities.

The next era of agile infrastructure has arrived with the advent of Intel® Rack Scale Design. Intel® Rack Scale Design promises to address both of those needs and go further still, enabling faster response to business demands for ROI and higher performance all while lowering costs and simplifying complexity for IT and the overall business. Join us as we plot the future of the data center.



BLACK BOX TO GLASS BOX

Heading towards a business-friendly, transparent data center

Businesses need a clear combined view of applications and infrastructure

The applications hosted in data centers today are critical to overall business performance. In spite of this, very few businesses have a clear view of what is happening inside. The data center is essentially a business-critical black box.

Intel® Rack Scale Design brings transparency to the data center, offering a single combined view of what's happening with hosted software applications and their underlying infrastructure resources. This visibility enables executives to clearly understand what's taking place in the data center and to predict impacts to overall business performance. Developers and product owners can use enhanced transparency to better understand system scaling dynamics and deliver products to market more rapidly. Finally, operations and infrastructure teams are more able to identify, prevent, and predict bottlenecks and system faults to ensure maximum performance and reliability.

Intel ® Rack Scale Design delivers insight at any scale and resolution

To be useful, system management frameworks need to be as dynamic and scalable as their underlying systems. Intel® Rack Scale Design enables system views that range in scale from elements as small as a single application instance or an individual hardware resource to "galactic scale" views that span the multitude of software and infrastructure resources that comprise an entire data center.

Rack scale also offers frameworks to conduct resource accounting and reporting at a more granular level than is possible with traditional systems. Compute, network, and storage resources can be defined, allocated, and measured at an individual application level. This enables businesses to better understand how and where their resources are being consumed and to make informed decisions about how best to allocate and manage their overall resources.

Introducing a standards-based, open source management framework

Rack scale's management tools are built on a new platform of industry standards and open source reference implementations. Gone are the days of inflexible, closed, and noninteroperable systems that are locked to specific vendor hardware—these tools simply cannot handle the rapid pace of development and change present in the modern data center.

Rack scale replaces these legacy tools with a platform of standardized APIs and an emerging ecosystem of management solutions to meet a broad spectrum of customer needs. Openness fosters innovation, accelerates the pace of product development, and stimulates new value creation opportunities for Intel partners. Software vendors, system integrators, and customers can now build simplifed management and powerful automation solutions that increase performance, boost efficiency, and speed time to market.

ACCELERATING TIME-TO-MARKET

Meeting the challenge of the Agile, DevOps-driven organization

Agile product development methods emphasize increasing the overall cadence—the speed at which new capabilities can be introduced—that an organization can maintain. Getting products and services to market quickly enables companies to compete more effectively, so it stands to reason that the digital infrastructure that drives those products needs to keep up.

Hand in hand with Agile is the DevOps movement, an approach to automating and integrating the process of transforming requirements into live production code. For Development and Operations teams to work their best, their digital infrastructure shouldn't be holding them back.

Intel® Rack Scale Design complements the Agile and DevOps processes, enabling developers to prototype, test, and put code into production as fast as they can configure it in rack scale deployment tools. This is because the flexibility provided by Intel® Rack Scale Design elastic approach to storage, network, and compute resources allows them to sidestep time-intensive capital procurement processes by reusing existing capacity or adding new capacity incrementally.

Automating the art of architecture

The promise of Intel® Rack Scale Design blueprints for common application types is a game changer, turning what's been a slow, largely experience-driven process of defining application architecture into a more interactive, codified, improvable one.
In the past, once an application's architecture had been defined and built using static, hard-wired servers and networks, it stayed that way until the next major release. Ideally the architecture performed well. If not, then major firefighting ensued to address major problems and keep everything running. Now, with Intel® Rack Scale Design, changes to the overall system architecture can be tested and introduced in a fluid manner without causing major disruptions to the day-to-day operations of IT and the business.

"AS AN INDUSTRY, WE HAVE THE OPPORTUNITY, TOGETHER, TO REALIZE A VISION WE HAVE ALL BEEN WAITING FOR."

ACCELERATING TIME-TO-MARKET

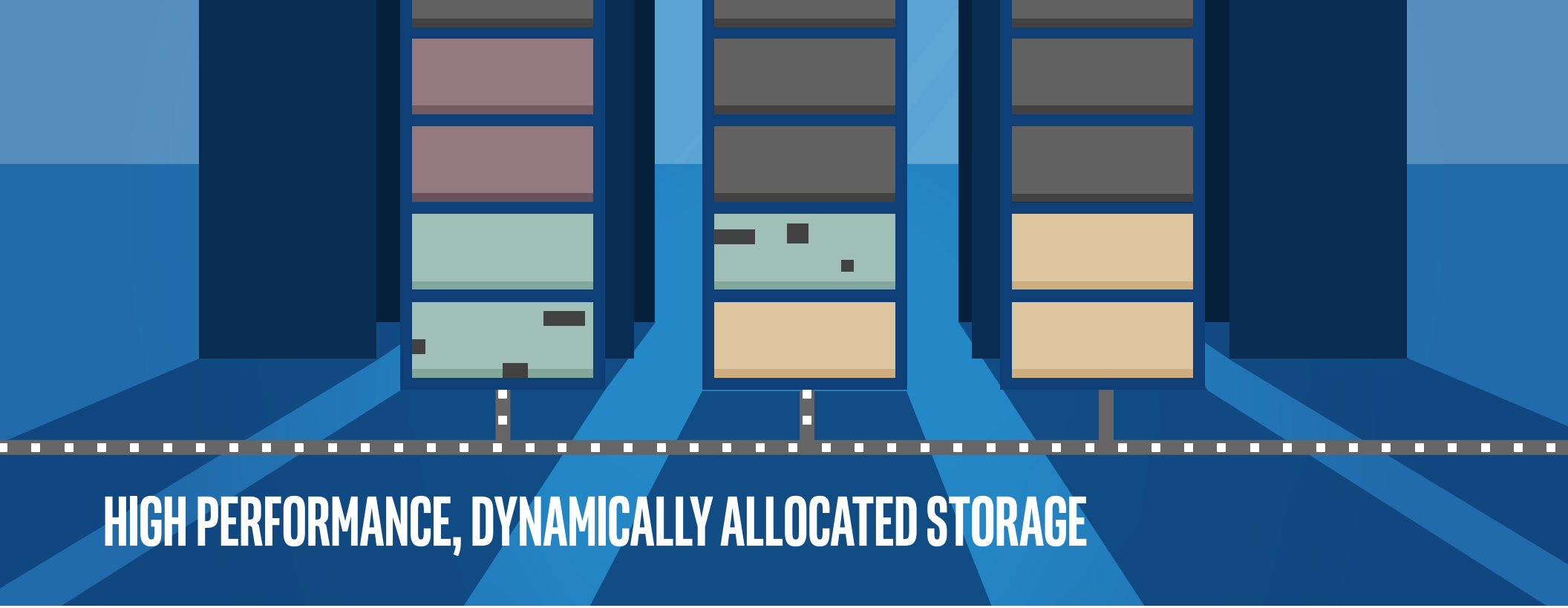
Changing with the times—and the customer's needs

No initial application design survives contact with the customer. Whether it's the evolving usage patterns of a product that's "forever in beta" or the continual challenge of keeping up with spikes in demand such Black Friday or major world events, being able to seamlessly meet the changing needs of users is a serious competitive challenge.

The conventional method of managing this problem is to buy enough infrastructure capacity to meet peak demands or to arrange for "bursting" when needed. Both of those methods depend on having enough foresight about what peak demands will be, as well as the trickier problem of predicting what possible bottlenecks might arise when applications approach capacity. Needless to say, both are risky and don't account for the unexpected.

Intel® Rack Scale Design makes it possible to look at this challenge in a completely different way. As customer needs change, infrastructure can change with them, reallocating storage, compute, and network resources in near-real-time. Not only can ottlenecks can be addressed as they arise, but underutilized capacity is easily allocated instead of lying idle in the data center while the rest of the infrastructure runs hot.

"IF I DON'T GET IN FRONT OF CUSTOMER NEEDS, MY COMPETITION IS GOING TO DO IT. IT'S ABOUT BEING AGILE."



HIGH PERFORMANCE, DYNAMICALLY ALLOCATED STORAGE

Storage is the bottleneck

Customer research suggests that in many real world applications, storage performance is the main limiter of application performance. This effect is compounded by the fact that storage capacity and performance growth have fallen behind the pace seen in compute and networking. To combat these storage challenges, architects are turning to decentralized storage systems and multitiered storage. Decentralized storage solutions can lift the performance ceiling, but the added system complexity can create large debugging challenges. Tiered storage approaches also boost performance and cost efficiency by combining heterogeneous storage technologies, but this comes at the expense of even greater complexity.

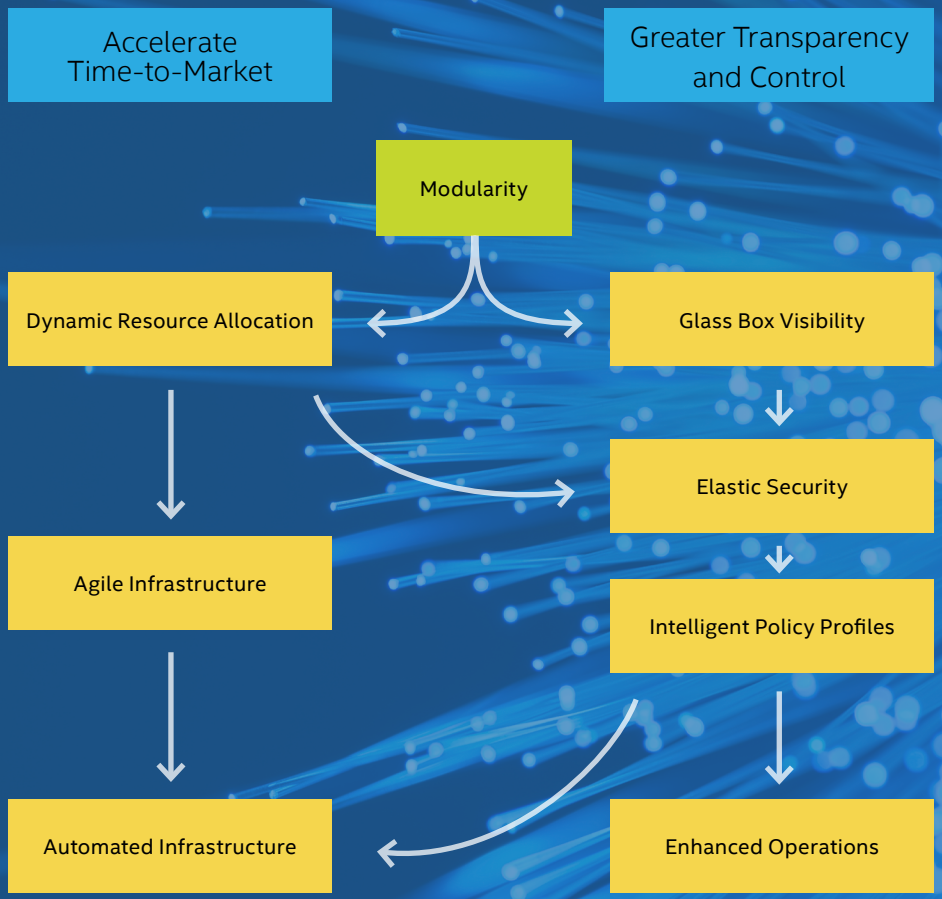
"THERE IS A SHIFT FROM 'HOW MUCH DO I HAVE TO SPEND TO MEET THE SLA' TO 'WHAT CAN I AFFORD TO INVEST TO ACCELERATE MY BUSINESS'."

Boosts storage performance while controlling cost

Intel® Rack Scale Design enables large gains in storage performance and cost without imposing a significant cost burden. Like compute and network resources, storage resources are software defined, meaning that application developers can quickly allocate and reallocate resources to deliver optimum performance. When storage speed and latency are critical, users can allocate rack-level next generation nonvolatile memory to their applications to create high-speed cache and data stores. In additional to this high-speed memory, Intel® Rack Scale Design offers six additional storage tiers to maximize cost efficiency.

To ensure that complexity stays in check, Intel® Rack Scale Design also provides extensive automation and open management frameworks that help customers easily configure and tune storage resources. This enables users to build robust and efficient storage solutions without the complexity usually associated with deeply tiered storage. One further advantage to Intel® Rack Scale Design is that its disaggregated design allows storage resources to be upgraded independently of other devices, as higher performance and lower cost technology becomes available.

INTEL® RACK SCALE DESIGN



ROADMAP

Starting with the baseline modularity provided by its core architecture, over time Intel® Rack Scale Design will continue to evolve conceptually, along two major branches of business value:

- **Accelerate time-to-market**
- **Greater transparency and control**

INTEL® RACK SCALE DESIGN

The acceleration of time-to-market means getting your product into the market sooner by reducing the barriers to product development and scaling. To enable this, Intel® Rack Scale Design was designed to closely match the needs and workflows of the Agile Development, DevOps-driven organization. Intel® Rack Scale Design will introduce capabilities to speed time-to-market in a stepwise fashion, supporting companies as they learn how to be more flexible and adaptable over time.

- **Dynamic Resource Allocation** is the first step. Having the ability to fluidly assign and change storage, network, and compute resources—without having to physically rewire racks and servers—is a big benefit for the enterprise.
- **Agile Infrastructure** is what comes next. A big part of this agility comes when rack scale tools alert operators to bottlenecks or hotspots in the infrastructure, forecast and predict where these hotspots may occur, and recommend changes to the allocation of particular resources.
- **Automated Infrastructure** is the fulfillment of this part of the rack scale vision. Imagine routine alterations to the configuration of the data center—like responses to increased demand or graceful recovery from partial failure—being conducted automatically, with minimal oversight by staff. Better yet, imagine rack scale tools learning how to take action by monitoring how the staff adapts and changes the infrastructure, and then replicating best practices and even improvising better solutions, saving the staff's time and energy for the most interesting problems.

EVOLUTION

Greater transparency and control is all about creating a unified view of applications and resources, and this too is a process that increases in scope and capability over time as Intel® Rack Scale Design's product roadmap evolves.

- **Glass Box Visibility** is the where it starts. The current version of Intel® Rack Scale Design will provide standards-based interfaces that enable a real-time view into how and what storage, network, and compute resource are being used across the data center.
- **Elastic Security** will transform how applications and networks are secured. Intel® Rack Scale Design's ability to dynamically reconfigure and reallocate resources will enable vendors to instantly deploy virtual security measures that will keep attackers out of any application or service they might try to compromise.
- **Intelligent Policy Pro iles** will be the standard way to express security and performance profiles, along with any critical nonfunctional requirements, like measures of service availability and response levels. These profiles will allow businesses to specify how they'd like applications to behave, and have Intel® Rack Scale Design comply automatically.
- **Enhanced Operations** is the culmination of the vision for transparency and control, because it will merge Glass Box Visibility, Elastic Security, and Intelligent Policy Profiles with the ability to manage and operate assets that exist outside of Intel® Rack Scale Design as well. This will radically simplify operations because staff will have one place to go to see what's happening and make the infrastructure do what they need it to do. On top of that, this capability will be open source, allowing unlimited extensibility and inclusion of any vendor's platform.

The Intel® Rack Scale Design vision:

Greater agility and accelerated time-to-market for greater business growth

Intel® Rack Scale Design enables businesses to create hardware infrastructure that is software-defined — free to change, grow, and evolve with the flexibility of software. As the digital transformation of the world continues, and business growth is increasingly driven by time-to-market and time-to-scale, application and infrastructure dynamism ultimately will drive overall business results. Organizations that embrace Intel® Rack Scale Design can realize agility, speed, and operational advantages and leverage these attributes to improve their competitive position in the marketplace.

To learn more about how Intel® Rack Scale Design can accelerate your time to market and increase your datacenter transparency, visit:

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