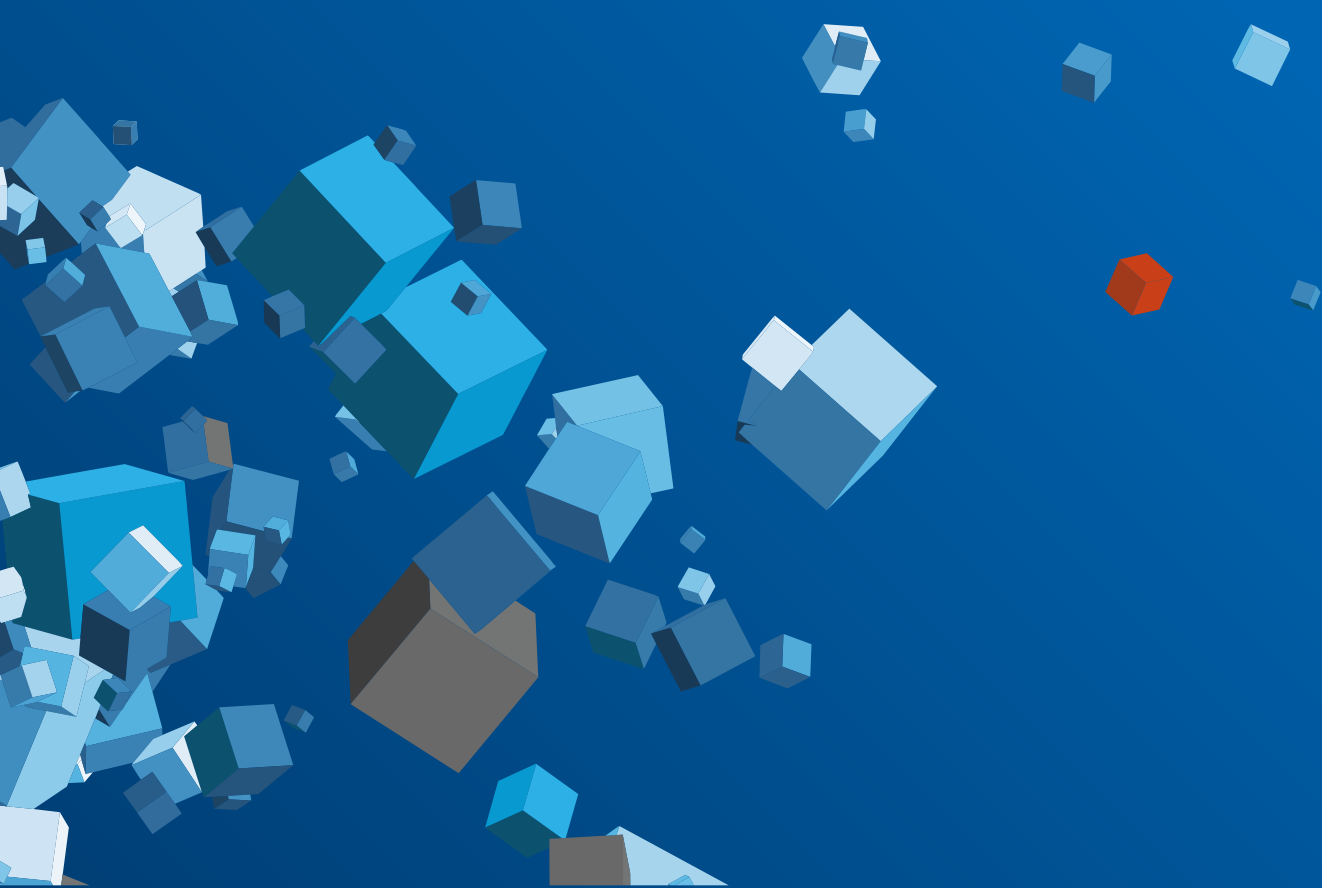


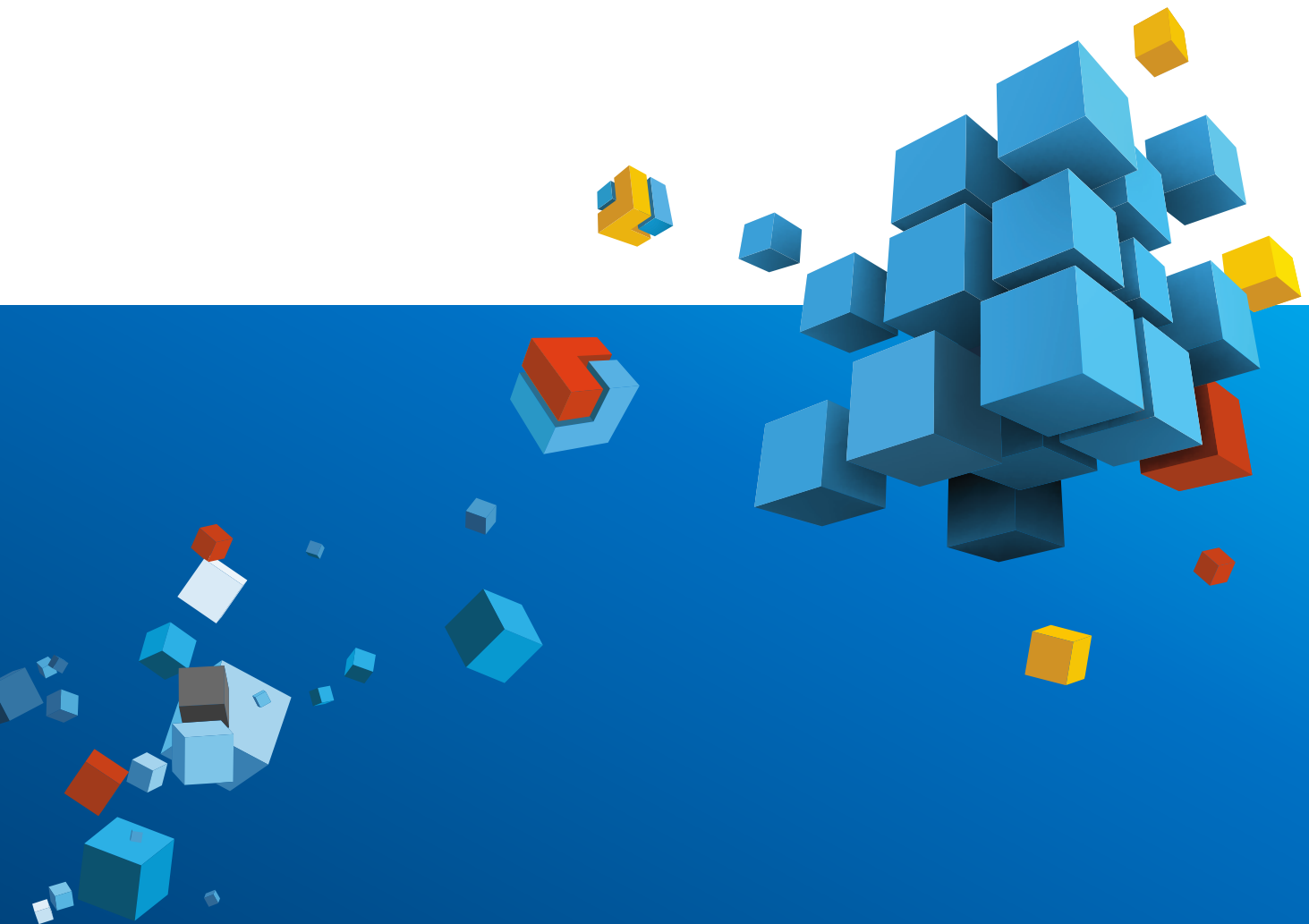
THE CASE FOR ORCHESTRATION OF CLOUD INFRASTRUCTURE

How Intelligent and Automated Resource
Provisioning Enables Business Agility



SUMMARY

An agile business demands an agile infrastructure. Orchestration is a key step toward an efficient, cost-effective, cloud-ready data center built on software-defined infrastructure (SDI). Orchestration can reduce costs and increase efficiency through intelligent, automated resource allocation across your compute, storage, and network infrastructure. That means fewer human touch points and faster, more efficient service deployment. Discover how Intel® technology built into solution platforms from leading software vendors and open-source developers delivers orchestration capabilities for SDI to accelerate deployment of enterprise clouds.



DATA CENTER AS AN INNOVATION ENGINE

All CEOs share an imperative: Grow the business. Today that means making the right investments in technology and infrastructure that can drive business velocity.

More than ever, the C-suite is turning to technology to help them get a leg up on their competitors. Businesses are searching for ways to thrive in a world where cloud, data analytics, and the Internet of Things are offering new opportunities to drive revenue and evolve their business models.

What does it take for businesses to be able to capitalize on these opportunities and bring viable ideas to market rapidly, while fending off competitive threats?

The Need for a Modern Infrastructure

An agile business demands agile infrastructure. Unfortunately, the vast majority of enterprise data centers are still running on static, proprietary, purpose-built systems that limit flexibility and responsiveness. IT continues to be asked to do more with less and hasn't been able to truly deliver self-service agility and multitenant services to their developers and business users.

What's missing is the capability to optimize operations across the enterprise data center for compute, storage, and networking to increase efficiency and leverage a cloud architecture that provides the flexibility that businesses need to innovate.



54% OF LINE-OF-BUSINESS EXECUTIVES (NON-IT DEPARTMENTS) BELIEVE THAT THE IT GROUP IS AN OBSTACLE TO THEIR MISSION.¹

Moving Forward to SDI

Orchestration is a major evolutionary step forward in data centers moving to SDI, where applications and the physical hardware they run on are separated and entirely controlled by software. SDI delivers the full promise of automated, scalable, and self-service infrastructure control within your data center, enabling agile delivery of cloud applications while maximizing efficiency of workloads. In an SDI environment, orchestration drives a high level of intelligence across your data center with a policy engine that uses platform and application telemetry data

to improve infrastructure utilization, optimize workload placement, accelerate application performance, and provide central data center oversight.

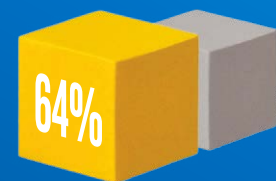
Orchestration platforms available in-market today enable policy-driven management and movement of cloud-native and legacy workloads across resource pools, aligning service requests with available resources and monitoring the health of the physical and virtualized environment. Most importantly, the orchestration platform can accumulate learnings that can help make better decisions in the future.

As data centers increasingly serve a world of dynamic applications, it is critical to manage and deliver the right levels of performance and infrastructure capability to different classes of service offerings and associated service level agreements (SLAs).

With orchestration, you can:

- Connect and automate workflows for specific services.
- Manage configuration, capacity, metering, and chargeback.
- Track and report on infrastructure and application performance and availability.
- Monitor system and application health.
- Monitor security threats and adherence to security policies.
- Take effective actions.

- Predict potential issues early.
- Ensure proper workload placement for SLA compliance.



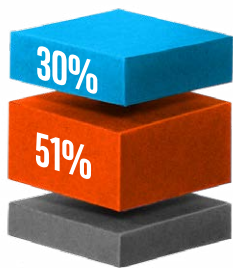
64% OF THOSE INDICATING THAT THEY WERE "EXTREMELY SUCCESSFUL" WITH CLOUD WERE CURRENTLY USING CLOUD ORCHESTRATION.²

GAIN AGILITY WITH AUTOMATED PROVISIONING

Orchestration can reduce costs through intelligent resource allocation across your compute, storage, and network infrastructure. Because you are using software to automate provisioning, management, and coordination of services dynamically, you can often deploy services faster with fewer human touch points.

Resources can be precisely provisioned—for example, with the right capabilities in the right geographic areas. Orchestration enabled across your SDI allows you to set global policies that permit applications to engage the right type of storage depending on access requirements, provision the right networking levels to ensure network quality-of-service needs, and ensure that CPU and memory resources are allocated as needed based on application requirements.

Orchestration ultimately enables you to better manage capacity by establishing the pathway to a cloud architecture where you can control multiple workloads and institute policies with required levels of security, performance, and governance dynamically across on- and off-premises cloud resource pools.



30% ARE USING CLOUD ORCHESTRATION AND 51% PLAN TO WITHIN THE NEXT 12 MONTHS.²

Intel® Technology Foundation: Silicon + Software

Intel's silicon and software innovations are the foundation of a growing portfolio of solutions that are helping data centers move to SDI and dynamic, policy-based, on-demand services.

Beyond workload-optimized silicon for SDI-based data centers, Intel also offers key platform technologies and software capabilities that enhance the value of Intel architecture to lines

of business as well as enterprise IT. Intel based platforms expose telemetry data so automation tools and application software can make better decisions about provisioning, resource allocation, service tiering, and quality-of-service levels to drive data center efficiency.

Key telemetry-related technologies include:

- **Intel® Resource Director Technology (Intel® RDT)** (available in the Intel® Xeon® processor E5-2600 v4 product family) provides orchestration and automation

capabilities to manage shared platform resources (such as L3 cache and system memory) dynamically across compute, networking, and storage.

- **Intel® Trusted Execution Technology (Intel® TXT)** (available in the Intel Xeon processors E5 and E7 families) measures and verifies that virtual servers boot into "known good states," enabling security automation and compliance monitoring.
- **Intel® Cloud Integrity Technology (Intel® CIT)** works with the OpenStack* platform to ensure that cloud

applications run on trusted servers and virtual machines whose configurations have not been altered. Integrity is verified remotely using Intel TXT and Trusted Platform Module (TPM) technology on Intel Xeon processors.

- **Snap** is an open-source platform-telemetry framework that improves intelligent use of data center infrastructure in cloud environments by enabling exceptional data center scheduling and workload management through access to underlying telemetry data and platform metrics.

FINDING THE RIGHT PLATFORM FOR YOUR BUSINESS

Orchestration changes the way you manage your data center infrastructure. IT staff familiar with managing purpose-built systems must shift their mind-set to running a broader software-defined domain of physical and virtual environments. This ultimately provides a self-service application development environment that delivers line-of-business benefit from new, cloud-native applications. If you are just beginning to map out your SDI strategy as part of your broader enterprise cloud initiatives, you have a growing landscape of solution approaches and choices.



Software Platform Options

Orchestration capabilities are available today across a broad array of hardware and software platforms. Intel has deep collaborations across hardware and software vendors, ensuring optimization of a wide range of enterprise-ready solutions.

If your IT environment supports VMware* or Microsoft* platforms, consider building your SDI with their orchestration solutions. Your staff already has domain expertise in these platforms, which helps you mitigate risks by implementing from a familiar source.

If you've integrated open source into your data center strategy, the OpenStack platform offers rapidly maturing solutions to control data centers via open APIs and open interfaces, making it another compelling option for building SDI solutions. Key vendors such as Red Hat and Mirantis provide OpenStack distributions optimized for Intel architecture features and enterprise capabilities.

To give you insight on deploying an SDI and help you take advantage of orchestration capabilities, [Intel® Builders](#) offers solution briefs, proof-of-concept publications, and reference architectures. Intel Builders highlights the landscape of vendors and Intel collaborations to help you move forward.

Deployment Options— Do-It-Yourself or Integrated SDI Solutions

Once you've chosen your cloud platform, solution deployment presents two approaches for moving forward.

- **Do-it-yourself (DIY) approach.** Build your SDI with discrete solutions available from the portfolio of various hardware and software vendors, including open source. This gives you the flexibility that comes with an environment that is not defined by a single vendor.
- **Converged and hyperconverged solutions.** Leading vendors and new entrants in the market today offer a simplified approach compared to DIY solutions. With these solutions, you have the choice of all the software-defined components—compute, storage, networking, and orchestration software—in a single box. Integration is preconfigured and prevalidated, providing a simplified approach to SDI deployment today.

GETTING STARTED WITH SDI: A CHECKLIST

If you've decided to move to an SDI to enable cloud deployments, here's a high-level checklist to help you get started.

✓ Understand the business problem.

Work with your business users. What is the business problem that SDI can help solve? Are there specific workloads that support key business initiatives that need to be moved to your cloud infrastructure once you have it up and running? Are there new projects that would benefit from the agility of self-service infrastructure?

✓ Assess which specific infrastructure subcategory within your data center will benefit most from SDI.

Is your biggest IT need around lowering storage costs? Or increasing efficiencies of legacy applications? Or improving network security at its core? Identifying your biggest pain point will help you decide where to implement SDI principles for maximum business impact.

✓ Identify a pilot project.

Consider asking your DevOps group for a project they want to run on an on-premises cloud that solves a key business problem. Start small, build on key learnings, and then expand your scope of cloud projects.

✓ Choose your platform.

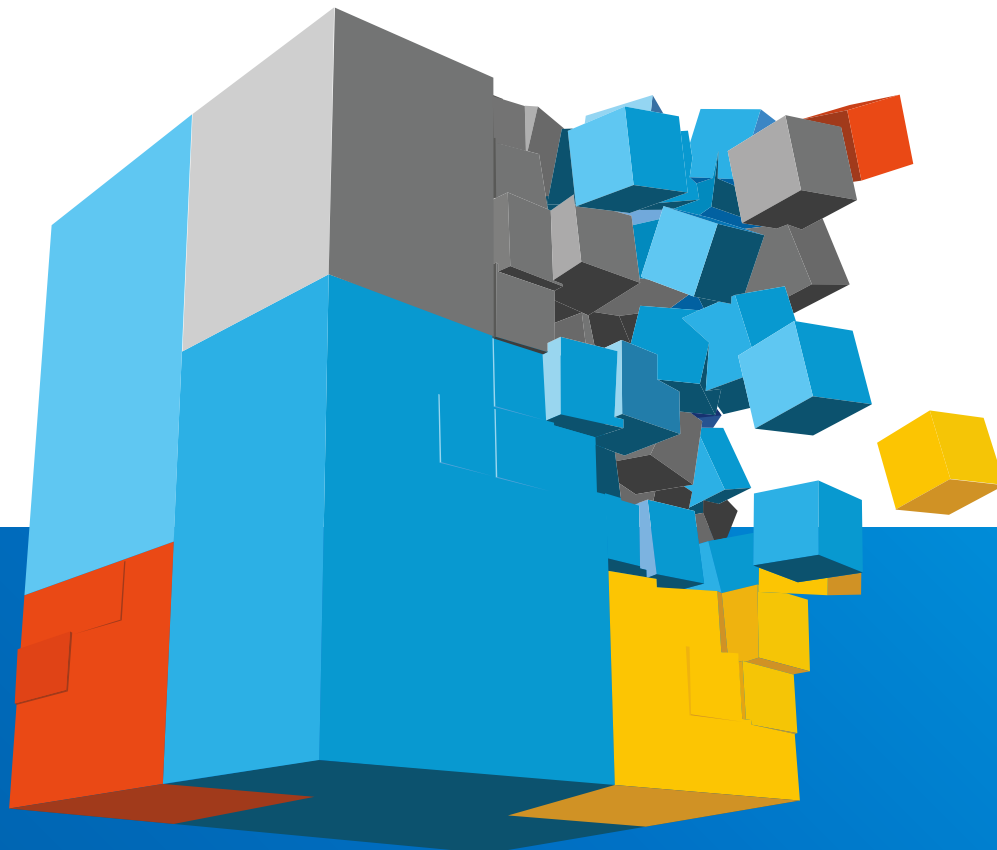
Do you want to run your SDI on vendor-specific solutions or open source? Understand what you will gain and trade off with both those approaches before choosing your solutions.

✓ Consider your deployment options.

Do you want to build your SDI from a portfolio of discrete solutions from different vendors so you can customize to your needs, or opt for speed of deployment via converged and hyperconverged solutions?

✓ Get educated.

- Read white papers, research studies, and analyst reports.
- Find out what other companies learned on their SDI journey—build on best practices and avoid common pitfalls.
- Look for reference architectures of proven SDI solutions from [Intel Builders](#) members.



Take the first steps with Intel based platforms for software-defined infrastructure.

Learn more about building your own enterprise cloud at intel.com/cloud.

Find solution briefs, proof-of-concept publications, reference architectures, and vendor connections at [Intel Builders](#).

Share with Colleagues    

¹ "State of the CIO 2015" (survey). CIO (January 5, 2015).

cio.com/article/2862760/cio-role/2015-state-of-the-cio.html#slide9

² *Open Cloud Management and Orchestration 2015: Adoption and Experiences*. Enterprise Management Associates (June 2015). researchandmarkets.com/research/7pkh48/open_cloud

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