SAP on the IBM Cloud certified infrastructure

A guide for IBM Business Partners to plan, provision and run SAP workloads on the IBM Cloud

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Executive summary

The global digital economy is characterized by three main trends: an exponential increase in collected data, an accelerating adoption of cloud as the favored delivery vehicle for services and the shortening of the adoption curve on new technologies.

Enterprises are moving critical business workloads to the cloud and are looking for trusted partners to help them migrate quickly, securely and with reduced business risks. IBM has been helping enterprises worldwide successfully migrate to the IBM Cloud for many years.

This guide is primarily for IBM Business Partners who plan, move, upgrade, transform and manage SAP workloads on the IBM Cloud. As an SAP global partner for more than 40 years, with SAP-certified cloud infrastructure experience, IBM has been a leader in the migration of SAP workloads to the cloud. And IBM Business Partners have been driving the adoption of SAP and the migration of SAP workloads to the IBM Cloud. IBM Business Partners who work with IBM have a great opportunity to build on the leading technologies of the IBM Cloud and the unique expertise of IBM to help clients in their transition to digital enterprises.

The IBM Cloud is globally available, with data centers strategically located in business hubs to shorten data paths and improve applications response. Clients' data on the IBM Cloud move on separate paths for better security. SAP-certified bare metal from IBM can deliver higher performance and high availability for clients' SAP workloads. While scalability, security and availability are important, the reality is that data is only as good as the business insights that can be gained from it. That's where the IBM Cloud stands out as the artificial intelligence (AI)-ready cloud with all the machine learning and data analytics driven by IBM Watson®.

IBM and its IBM Business Partners are ready to help enterprises migrate their SAP workloads to the IBM Cloud, armed with over 40 years of experience, virtually unmatched technical know-how, deep industry expertise, global presence and a cloud that's scalable, security rich and AI ready.

Introduction

Clients are looking for more than an SAP-certified platform. In today's world, digital transformation is critical to staying competitive, and IBM paves the way in three simple steps:

– **Move to the cloud:** The IBM Cloud simplifies the journey by providing an SAP-certified infrastructure for easier and faster deployments when there's a need to extend or move workloads into the IBM Cloud. These capabilities support rapid capacity expansion, migrating SAP workloads to the cloud or supplementing an existing private cloud architecture.
– **Accelerate SAP HANA adoption:** Clients can upgrade their SAP HANA environments by using a vast array IBM Cloud services while helping to optimize their infrastructure investment budget.

– **Fuel digital transformation:** Finally, after clients realize the benefits of SAP HANA, they can focus on unlocking the value of their data with AI and data analytics using IBM Cloud services, such as IBM Watson.

Whether you're working with a small or a large enterprise, IBM Cloud for SAP workloads can be configured for client self-management, IBM-management or IBM Business Partner-managed modes—making these options flexible and well suited for virtually any environment.

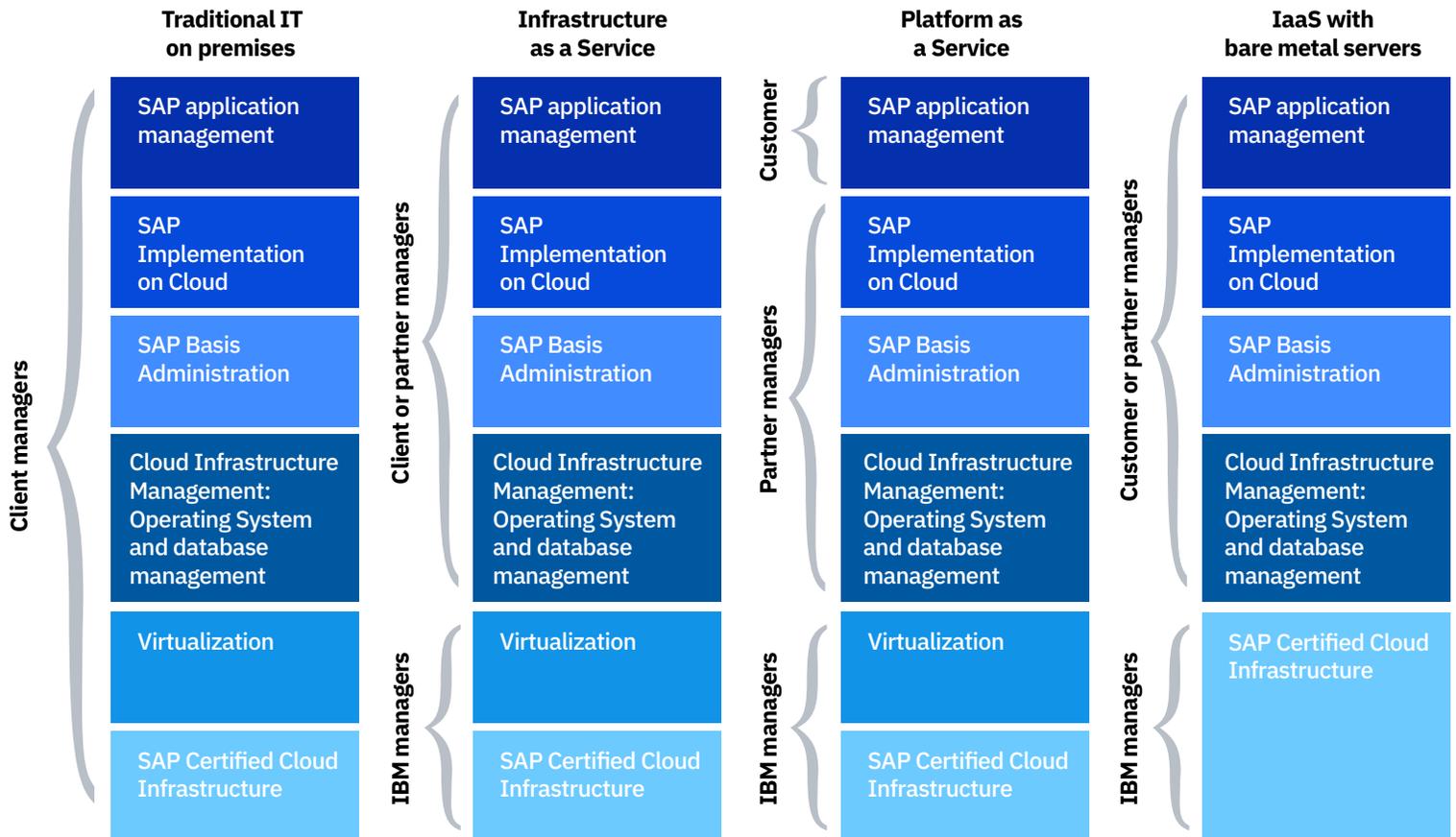| Traditional IT on premises	Infrastructure as a Service	Platform as a Service	IaaS with bare metal servers
Client managers: SAP application management, SAP Implementation on Cloud, SAP Basis Administration, Cloud Infrastructure Management: Operating System and database management, Virtualization, SAP Certified Cloud Infrastructure	**Client or partner managers:** SAP application management, SAP Implementation on Cloud, SAP Basis Administration, Cloud Infrastructure Management: Operating System and database management. **IBM managers:** Virtualization, SAP Certified Cloud Infrastructure	**Customer:** SAP application management. **Partner managers:** SAP Implementation on Cloud, SAP Basis Administration, Cloud Infrastructure Management: Operating System and database management, Virtualization. **IBM managers:** SAP Certified Cloud Infrastructure	**Customer or partner managers:** SAP application management, SAP Implementation on Cloud, SAP Basis Administration, Cloud Infrastructure Management: Operating System and database management. **IBM managers:** SAP Certified Cloud Infrastructure

Figure 1. Deployment models for SAP solutions on the IBM Cloud

The IBM Cloud global data center presence

The IBM Cloud infrastructure offers flexible, security-rich and AI-ready environments for clients migrating to the cloud. IBM data centers are strategically located in main business centers worldwide, which shortens the data path of traffic and makes applications more responsive. Clients can use IBM AI tools for machine learning and data analytics to gain valuable business insight and make real-time educated business decisions.

With the IBM Cloud, clients can deploy their SAP workloads and gain cloud agility for higher satisfaction and reduced costs. IBM's global presence and virtually unmatched technical and business expertise offers clients a trusted service provider for a reduced-risk journey to the cloud and more successful SAP workload deployments.

The IBM Cloud infrastructure covers six continents, 19 countries and 60-plus cloud locations.
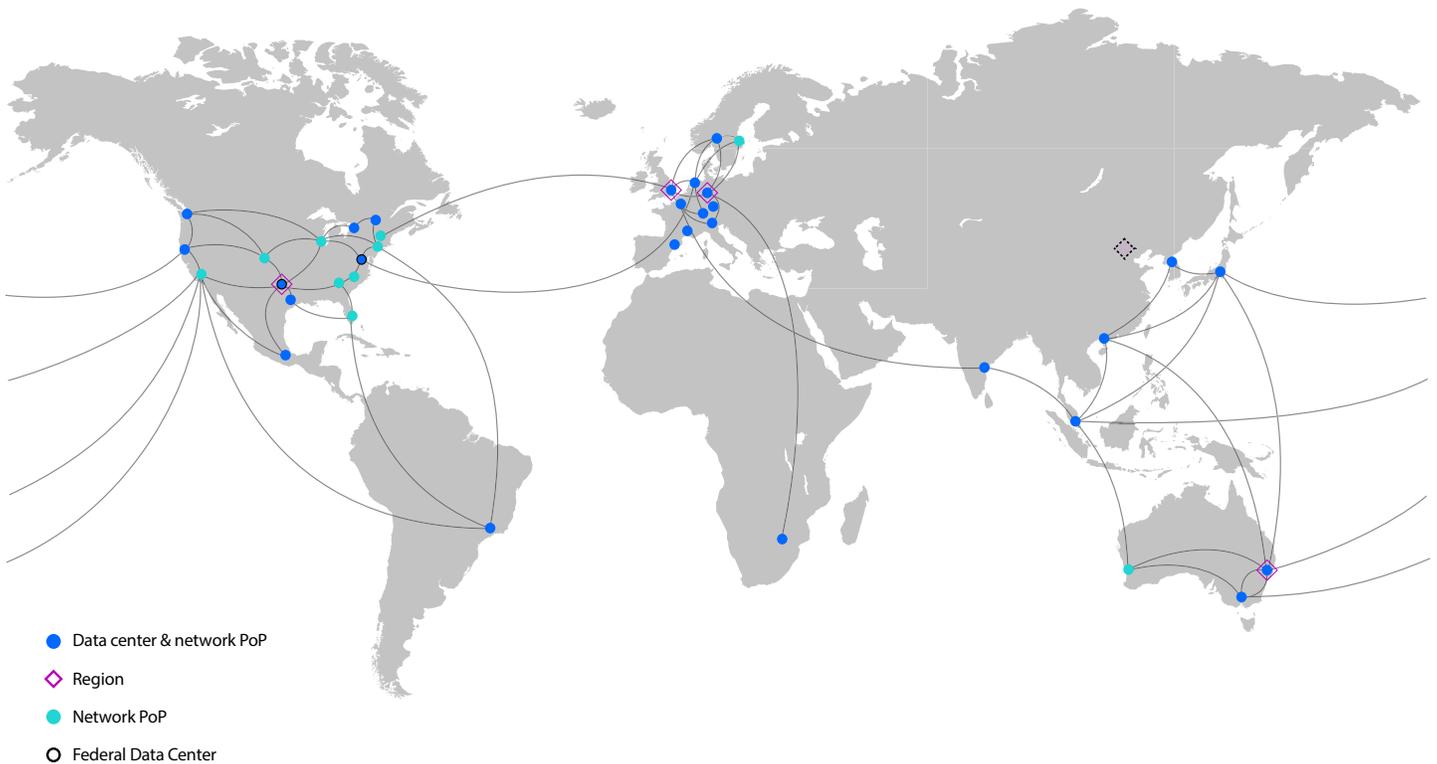

● Data center & network PoP

◇ Region

● Network PoP

○ Federal Data Center

Figure 2. Worldwide IBM data centers and points of presence

The IBM Cloud architecture

The IBM Cloud architecture can provide superior technical capabilities, such as a software-defined environment critical to cloud infrastructure, programmable interfaces, versatile hardware and network configurations. The IBM Cloud architecture is designed to deliver a higher level of flexibility by mixing virtual and dedicated servers to fit a variety of workloads, automation of interfaces and hybrid deployment options. The IBM Cloud SAP-certified infrastructure offering for SAP HANA and SAP NetWeaver can provide you with a best-fit selection. This selection includes bare metal and virtualization-based servers on top of which the SAP software stack is run.

The following graph shows a reference architecture (RA) for an SAP landscape in the IBM Cloud comprised of:

– SAP HANA databases
– SAP NetWeaver Application Servers
– Other relational database management systems (RDBMS)
– SAP Web Dispatcher
– Vyatta network components

The example reference architecture is configured with high availability and disaster recovery capabilities. Note that in Figure 4, the database servers can be any database system supported by SAP NetWeaver—for example SAP HANA.
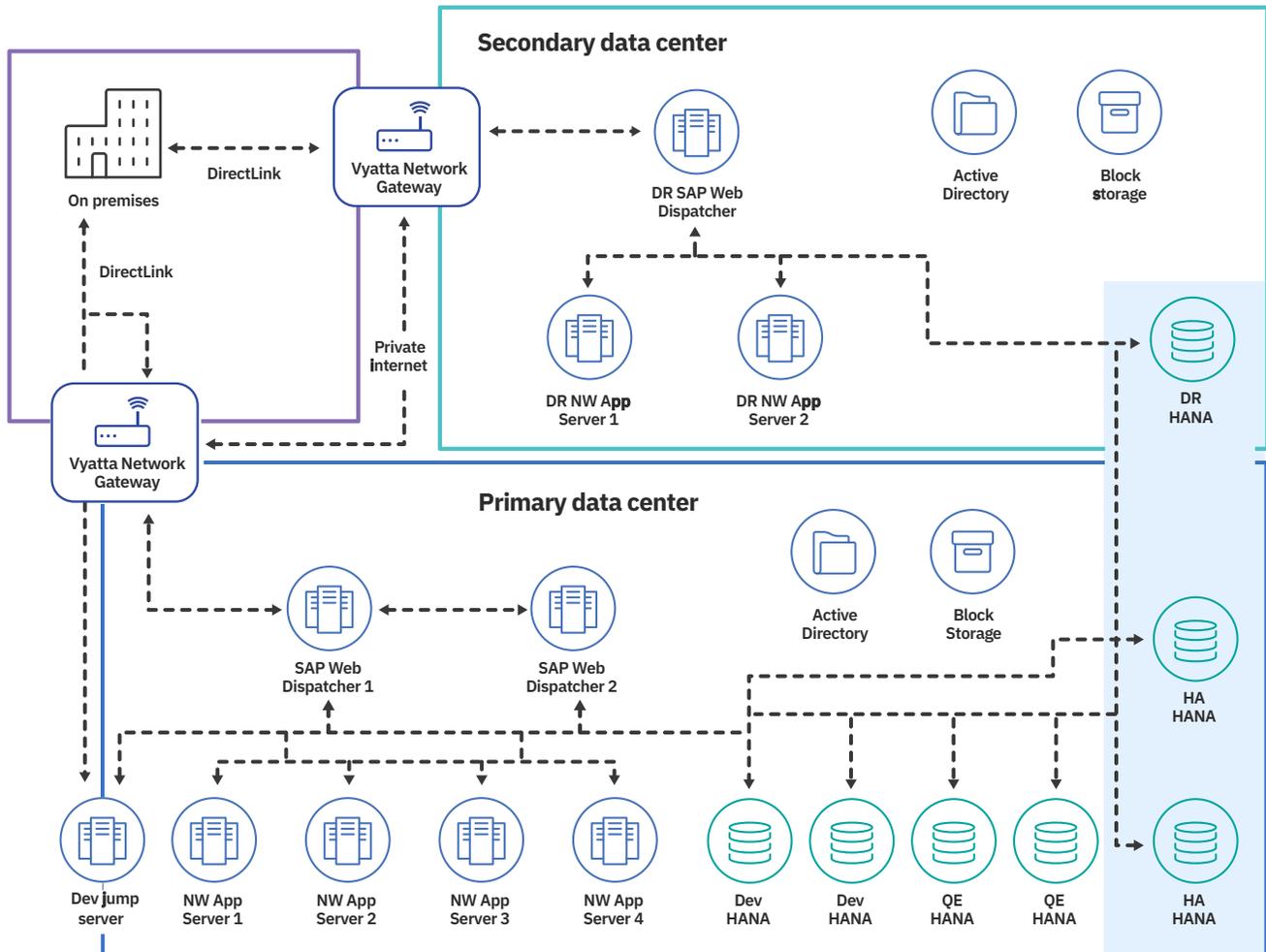

Figure 3. Sample SAP in the IBM Cloud reference architecture with primary and secondary data centers in the IBM Cloud. (DR = Disaster recovery, NW = NetWeaver, HA = High-availability)

Opportunities for IBM Business Partners

The services listed below are examples of managed services that can be provided by IBM Business Partners.

The scope may vary based on the agreement between the end client and the IBM Business Partner:

– Cloud infrastructure management
– Operating system (OS) management: Install OS patches and security upgrades; upgrade OS to maintain compatibility with SAP; set up user administration; configure, monitor and troubleshoot OS problems; perform OS image backup and restore
– Database management, including install, administer, manage, monitor, backup and restore functions for HANA and non-HANA databases
– SAP Basis administration includes transport management, system monitoring, backup and recovery, hot and support pack upgrades, kernel upgrades, system refreshes and copies, user and role administration, and disaster recovery services
– SAP implementation services include one or more of the following:
   • Migration of existing SAP applications from on premise to cloud
   • New implementation of SAP ERP Central Component (SAP ECC) on traditional databases
   • Greenfield implementation. A brand new implementation of S/4HANA with complete re-engineering and process simplification
   • Brownfield implementation. A system conversion or migration to S/4 HANA without disturbing existing business processes, enabling re-evaluation of customization and existing process flows
– SAP application management services

Post-implementation application management services include service request, incident, problem and change management to the system; application monitoring and event management, and continuous IT operations and business improvements.

Plan your SAP environment

Every successful implementation starts with a good plan. This section includes a sample architecture, guidance on how to size your environment, an estimator tool and a vision of what's possible with SAP on the IBM Cloud.

Cloud benefits estimator tool for SAP

Tool description:

– **A no-cost** web-based tool that provides potential **savings of moving SAP workloads to the IBM Cloud** based on client's current IT environment
– Developed by **Alinean Inc,** business value tools specialists
– **Get results and report in minutes** thanks to default cost data based on country and industry
– Provides savings by area and a **10-25-page report**
– Can be used as **input to build a full business case** with the help of IBM sales specialists
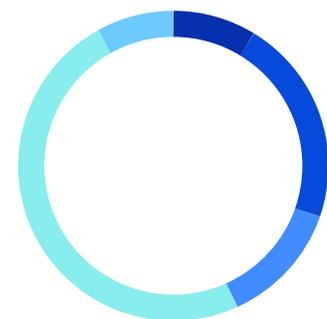
Your estimated annual savings

Below is your annual savings summary. Click on any benefit below to view or edit details. Go to the next page to download you customer report for even more information.

Accelerate time to value	Increase customer reach and retention	Reduce infrastructure total cost of ownership (TCO)
USD 222,758	USD 562,625	USD 324,712
Click to view, edit details	Click to view, edit details	Click to view, edit details
Optimize IT labor	Avoid risk of data breach, IP theft, and fraud	Reduce system downtime
USD 1,183,638	USD 56,400	USD 204,488

USD 2,554,621
Estimated annual benefits

Benefits by category

- ■ Value accelerations
- ■ Infrastructure
- ■ Risk avoidance
- ■ Customer reach IT
- ■ labor
- ■ System downtime

Figure 4. Estimated annual savings and benefits of moving SAP workloads to the IBM Cloud. (The use of "$" in this graphic refers to US dollars and must be converted to local currencies as needed.)

Sizing your SAP environment

You need to correctly size your server before you purchase it, because right sizing is key to the success of your project. Improperly sized memory or storage requirements can lead to an upgrade and migration to a larger server, as well as possibly wasted resources and higher costs.

Main memory is one of the most important resources to consider when sizing an SAP HANA-certified appliance. The public SAP HANA Master Guide provides a starting point for sizing-related topics. The Sizing SAP HANA information within the guide provides guidance on how to size your SAP HANA system. It points to the different installation and migration scenarios for both greenfield installations and existing systems. There's a link to the SAP HANA version of the SAP Quick Sizer tool.Note that a SAP S-user ID is required to access the tool). The page also lists the SAP notes related to sizing your SAP HANA server.

Configuring your solution

The following lists are the components (and quick links) that you'll need as you design your SAP landscape on the IBM Cloud:

– SAP Landscapes on IBM Cloud Video Demos and Product Tour

– SAP NetWeaver on IBM Cloud

– SAP HANA on IBM Cloud

– SAP NetWeaver on IBM Cloud Quick Reference Guide for Microsoft Windows

– SAP NetWeaver on IBM Cloud Quick Reference Guide for Red Hat Enterprise Linux

Provisioning components

IBM SAP-certified servers for SAP HANA and SAP NetWeaver
IBM offers a variety of SAP-certified servers for SAP HANA and SAP NetWeaver through the IBM Cloud for SAP Applications offering. The servers are bare metal servers with your choice of OS, including Red Hat Linux, SUSE Linux, Microsoft Windows server or deployed with the VMware Elastic Sky X (ESX) hypervisor. For details on the SAP NetWeaver-certified servers, see SAP Note 2414097. Be aware that on the hypervisor, you deploy one of the operating systems listed in SAP Note 2414097 as a guest OS.

External storage of different types and accessible through different protocols — such as a Network File System, Common Internet File System or Internet Small Computer System Interface (iSCSI) — can be used for backup and other purposes.

All SAP software solutions that are based on either SAP HANA or SAP NetWeaver include the entire SAP Business Suite, and SAP S/4HANA can be deployed in the IBM Cloud environment.

For other software components outside of these, contact SAP support. Follow the SAP sizing process to determine the right server size for your project and choose from the servers listed for either the SAP HANA or SAP NetWeaver offering.

You can choose several SAP-certified configuration bare metal servers. The following are examples; your environment may be different. You have the flexibility to mix and match as required.

SAP HANA servers come with a preselected storage layout that fulfills SAP's storage key performance indicators (KPIs) for SAP HANA. It's not recommended that you change these layouts, and you should consult your IBM Business Partner about how to use shared storage for HANA. Note that if you decide to resize the storage, then you must use a tailored data center integration (TDI) approach on the servers and the storage attached to them.

For more information on the SAP HANA-certified servers, see the Certified and Supported SAP HANA Hardware Directory.

Central processing unit (CPU)	Speed	Sockets	Core	RAM	Server name	Size
Intel Xeon E3-1270v6	3.80 gigahertz (GHz)	1	4	32 gigabytes (GB) 64 GB	BI.S3.NW32 BI.S3.NW64	Small Small
Intel Xeon 6140 - Gold	2.30 GHz	2	36	192 GB 384 GB 768 GB	BI.S3.NW192 BI.S3.NW384 BI.S3.NW768	Medium Medium Large
Intel Xeon E5-2690v4	2.60 GHz	2	28	512 GB	BI.S2.NW512	Large

Table 1: SAP NetWeaver t-shirt size configurations

Central processing unit (CPU)	Speed	Sockets	Core	RAM	Server name	Size
Intel Xeon E3-1270v3	3.80 GHz	1	4	32 GB	BI.S1.NW32	Small
Intel Xeon E5-2690v3	2.30 GHz	2	24	128 GB 256 GB	BI.S1.NW128 BI.S1.NW256	Medium Large

Table 2: Intel Xeon 1-2 socket servers

Central processing unit (CPU)	Speed	Sockets	Core	RAM	RAID	Server name
Intel Xeon 6140 – Gold	2.30 GHz	2	36	192 GB 384 GB 768 GB	1 10 10	BI.S3.H2192 BI.S3.H2384 BI.S3.H2768
Intel Xeon E5-2690v3	2.20 GHz	4	96	1 terabyte (TB)	5	**BI.S2.4100***
				1 terabyte (TB)	1	BI.S2.4101
				2 TB	5	**BI.S2.4200***
				2 TB	10	BI.S2.4201
				4 TB	5	**BI.S2.4400***
				4 TB	10	BI.S2.4401
		8	192	4 TB	5	BI.S2.8400
				4 TB	10	BI.S2.8401
				8 TB	5	BI.S2.8800
				8 TB	10	BI.S2.8801

*Table 3: SAP HANA t-shirt size configurations. *Server names shown in bold text are certified for VMware.*

Central processing unit (CPU)	Speed	Sockets	Core	RAM	RAID	Server name
Intel Xeon E7-4890v2	2.80 GHz	4	60	512 GB	10	BI.S1.H512
				1 TB	10	BI.S1.H1000
				2 TB	10	BI.S1.H2000

Network

Any device in the IBM Cloud environment can be ordered with a choice of internal and optional external local area network (LAN) access. The external address is a routable public IP address and should be handled with care. The internal address is determined by the ordered virtual LAN (VLAN) and chosen from a subrange of 10.0.0.0/8 for the VLAN. By ordering multiple VLANs, different environments or traffic types can be segregated based on your network design and security requirements.

While a public interface with a configured firewall can cover some scenarios—for example, a short-term, rapid prototyping proof of concept with non-critical data—a firewall device should be considered for most cases. The example reference architecture maps a production scenario, so public network interfaces are out of scope.

The IBM Cloud Direct Link

For mission-critical workloads like SAP, one of the most important components in your landscape is how you connect to the IBM Cloud. Choosing the correct connection method is critical to ensuring uptime, reliability, and stability for your landscape, and as a result, IBM Cloud provides three different options to have a stable connection from your

on-premises network to your IBM Cloud network. Each Direct Link solution has specific features and benefits, and they can be evaluated individually here:

IBM Cloud Direct Link Exchange

IBM Cloud Direct Link Connect

IBM Cloud Direct Link Dedicated

To make your evaluation simpler, please use the graphic below to help you select the right connection method from your premises to IBM's premises.

Because uptime for your SAP environment is of primary concern, IBM highly suggests that all customers establish two Direct Link connections to the IBM Cloud points of presence (POPs) or data centers, with one going to the primary site and the other going to the secondary site. IBM also suggests that you choose a different backhaul provider for each connection. This highly-available architecture helps ensure that even if there's disruption at the backhaul level, your connection to the IBM Cloud remains stable, available, and is an essential component of the successful deployment of your SAP landscape.

For additional information on your IBM Cloud Direct Link options, please see the IBM support documentation here.

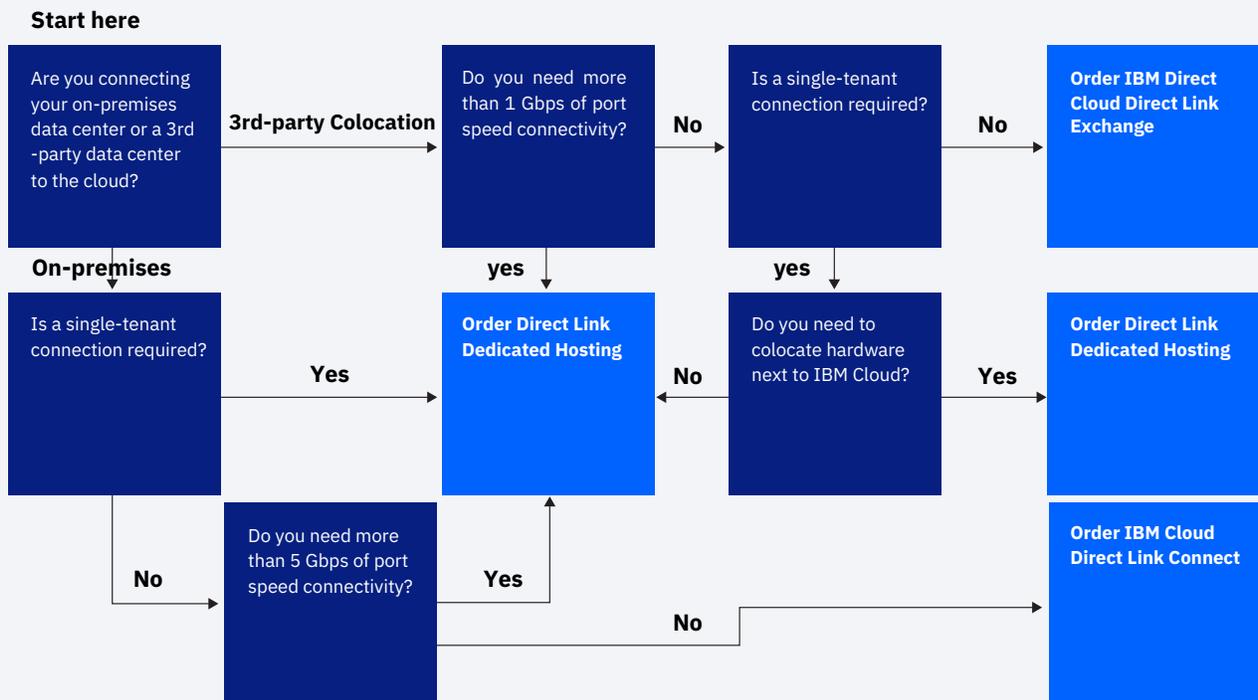**Decision tree:** Which Direct Link deployment option should I choose?

Figure 5. This graphic shows the IBM Cloud Direct Link deployment options.

Vyatta Network Gateway

Vyatta provides a software-based virtual router, virtual firewall/Network Address Translation (NAT), and virtual private network (VPN) capabilities for IPv4 and IPv6. If users are to connect remotely into your IBM Cloud systems, these devices can serve as endpoints for a site-to-site VPN or the so-called "road-warrior VPN" access point. Different kinds of VPN technologies—Internet Protocol security (IPSec), or secure socket layer (SSL) VPN tunnels, such as OpenVPN, can be used. Depending on the SAP technology you're using, these VPN connections can be used to interconnect SAP systems — even with non-SAP systems — for traditional graphical user interface (GUI) technology, as well as browser-based SAPUI5 technology. Connecting an SAP Web Dispatcher behind a Vyatta Gateway allows for further features to be used, such as load balancing or single sign-on scenarios. Get more information on the SAP Web Dispatcher here.

The Vyatta device can be deployed in a high-availability cluster configuration with a bandwidth up to 10 Gbps. For more information, see Vyatta Gateways and Virtual Router Appliance Video Demo's and Product Tour.

Jump box server

A jump box server lets you give specific users low-level access to your IBM Cloud environment through command line access-based tools or other special purpose tools, such as SAP HANA Studio. Database administration tools, as well as the users who are granted access to the tools, are managed centrally on the jump box server. Users can log in to your IBM Cloud environment from their desktops through Remote Desktop Protocol (RDP), which is routed through the VPN gateway.

Running and managing SAP on the IBM Cloud

IBM Cloud Infrastructure as a Service (IaaS) can provide you with full control of procuring, managing and decommissioning your infrastructure. When you select IaaS, IBM provides virtualized servers, storage and networking resources. IaaS gives you flexibility and helps keep you in control of the rest of the stack, including platform and applications. See Table 4. You can get a full list of IBM support responsibilities and options here.

Client	IBM Cloud
Architecture design	3.80 gigahertz (GHz)
Order and configure IBM Cloud IaaS through the portal	Service-level agreement for cloud entitlements: https://www.ibm.com/cloud/support
Deployment, configuration and management of servers, storage, connectivity, virtualization and open systems, applications, security, backup and restore, high availability, disaster recovery and monitoring	Around-the-clock access to the IBM Cloud technical support team with thickets, phone and chat included with purchased IBM Cloud services

Table 4. Example of client and IBM responsibilities when running the SAP environment in the IBM Cloud

Accelerate SAP HANA adoption

SAP is transforming its entire application portfolio through S/4HANA. Virtually all new development that's related to digital transformation, the Internet of Things (IoT) and big data is occurring in S/4HANA. Mainstream support for SAP R/3 is currently slated to end in 2025. Between now and then, over 35,000 SAP clients may need to make migration and upgrade decisions in response to the SAP S/4HANA roadmap. Many of these clients will likely move to the cloud along with their migration and upgrade to S/4HANA.

The IBM Cloud helps clients in their journey to S/4HANA by:

– Reducing upgrade time to S/4HANA by 15 - 25 percent versus on premises, which is based on IBM internal data (individual client results will vary) and is due to the IBM Cloud infrastructure, which can provide just-in-time hardware

Fuel digital transformation

The IBM Cloud can deliver the capabilities that can enable more efficient and orderly digital transformation of your enterprise. Migrating to the cloud requires the right tools and applications that can make sense of your data and provide you with real-time analysis for meaningful and actionable insight. IBM is helping to lead the industry with AI solutions that make sense of your clients' data and give you access to IBM Watson application programming interfaces (APIs) so you can deliver better solutions to your clients.

The native access to IBM Watson APIs is a main driver for clients' decisions to select the IBM Cloud for their SAP workloads. The IBM Cloud offers more than 30 cognitive APIs to build your own business extension. In addition, IBM can provide:

Added value with AI:

– IBM Watson cognitive services are a key capability that helps you extend the value of SAP data in the IBM Cloud for your enterprise clients.
– IBM Watson services can enhance your clients' data and their users' interactions with that data.
– Virtually all IBM Watson services are accessible through well-described APIs.

Clients are using AI, machine learning (ML) and deep learning (DL) to develop powerful new analytics to make better sense of their data. To achieve their potential and deliver higher value, AI initiatives must deliver accurate results in a timely fashion. That imperative maps back to the need for high data quality or the use of well-designed AI systems for preparing and managing your data. According to Accudata.com, the cost of "bad" data to US businesses every year is around USD 3.1 trillion dollars.[1] IBM Watson solutions can deliver the tools you need for better data quality and better insight into your SAP workloads.

IBM integration capabilities and tools, such as the IBM Application Integration Suite and the IBM App Connect offering, supports easier management and access to IBM Watson APIs. These tools allow IBM Business Partner developers or system integrators to configure robust integrations without coding. The tools include prebuilt templates for connecting to SAP systems and flowing data to the Watson™ services through APIs. IBM Application Integration Suite also makes it easier to enable hybrid cloud scenarios with connectivity to cloud apps or on-premises systems. IBM Watson cognitive services and IBM integration tools are available in the IBM Cloud, providing virtually seamless integration of data with essentially any scenario that your enterprise clients' businesses demand.
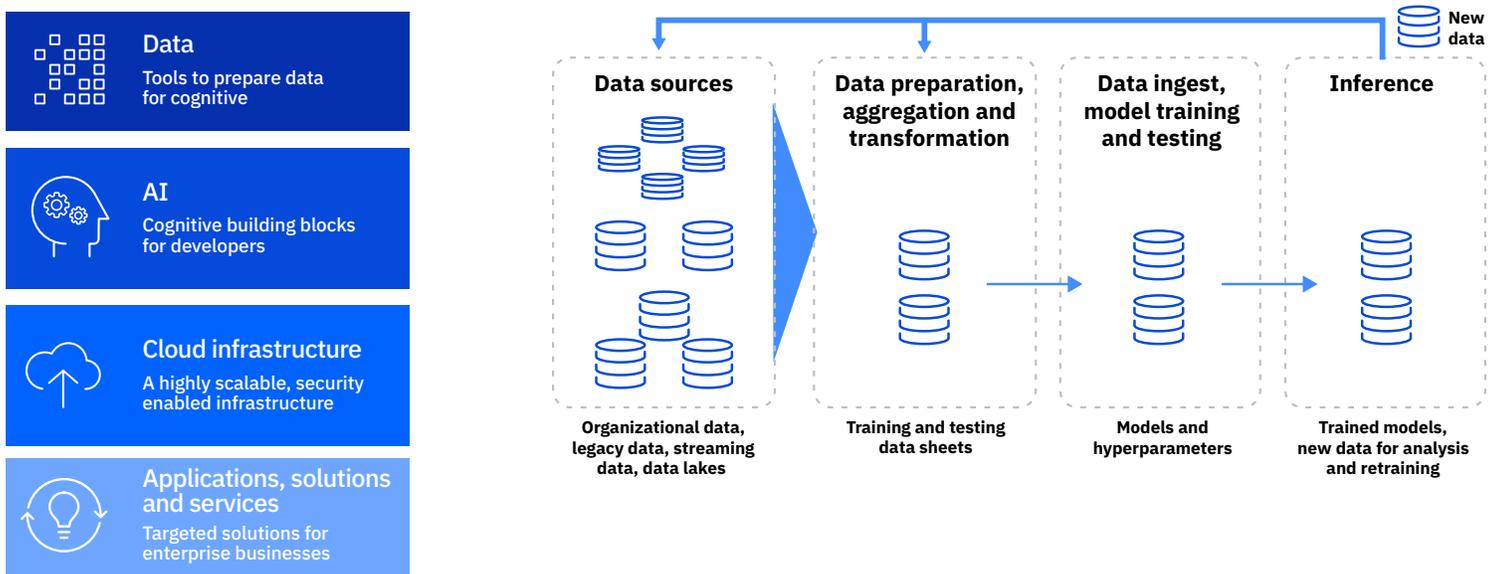

Data
Tools to prepare data for cognitive

AI
Cognitive building blocks for developers

Cloud infrastructure
A highly scalable, security enabled infrastructure

Applications, solutions and services
Targeted solutions for enterprise businesses

Data sources
Organizational data, legacy data, streaming data, data lakes

Data preparation, aggregation and transformation
Training and testing data sheets

Data ingest, model training and testing
Models and hyperparameters

Inference
Trained models, new data for analysis and retraining

New data

Figure 6. The IBM Cloud offers a robust suite of AI-ready cloud architecture.

Additional tools

IBM architectures provide practices for building apps on the cloud. The reference architectures define the basic pattern, while implementations provide specific technology, practices and tool choices to build and deploy that pattern. Customize your architecture. Download the diagram template, which includes solutions and samples of different cloud architectures and a roadmap to build, extend and deploy an application.

The Benefits Estimator Tool — a web-based tool that's available at no charge — helps you assess your enterprise clients' potential savings by moving their SAP workloads to the IBM Cloud. The tool can be used as a door opener, based on an at-no-cost assessment to the IBM Business Partner or client.

IBM Cloud for SAP Benefits Estimator tool

Infrastructure architectures

Private cloud

Virtualization

[1] Thompson Reuters and Accudata.com, October 2018

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