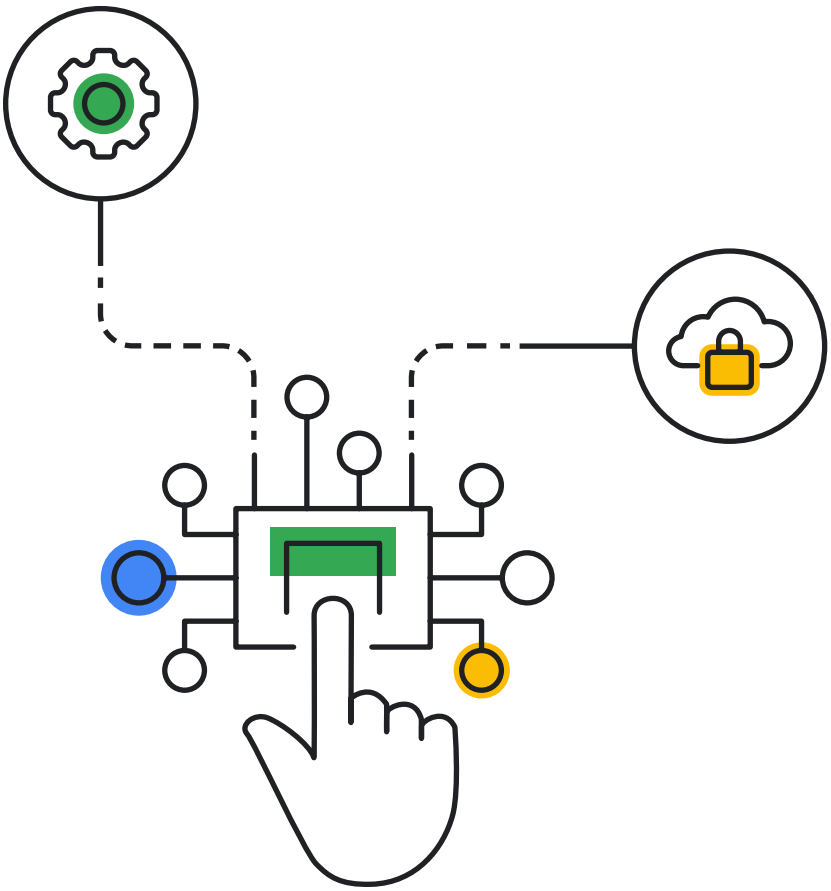
Google Cloud

SAP on Google Cloud

Innovation, reduced risk and simplified deployments on the cleanest cloud in the industry



Google Cloud

Table of contents

Introduction

Applications and innovation in the cloud for SAP customers

Why do SAP customers choose Google Cloud? Whether it's for powerful analytics, ML/AI, secure and scalable infrastructure, or the first-class customer experience, one thing is clear: Google Cloud provides the innovation that SAP customers need to unlock innovation, agility, and efficiency across the organization.

Recent independent studies by Forrester and IDC verify the significant cost savings and efficiency and productivity improvements that result from both moving SAP applications and SAP data to Google Cloud.

Google Cloud for SAP Applications

- **$7.1 million** in legacy system savings[1]
- **$1.3 million** in IT efficiency improvements[1]
- **98% drop** in business losses due to unplanned outages[2]
- **46% decrease** in three-year operations costs[2]

BigQuery for SAP Data

- **52% lower** 3-year cost of operations data warehousing[3]
- **323%** 3-year ROI[3]
- **51% more** efficient data platform teams[3]
- **77% faster** delivery of business reports[3]

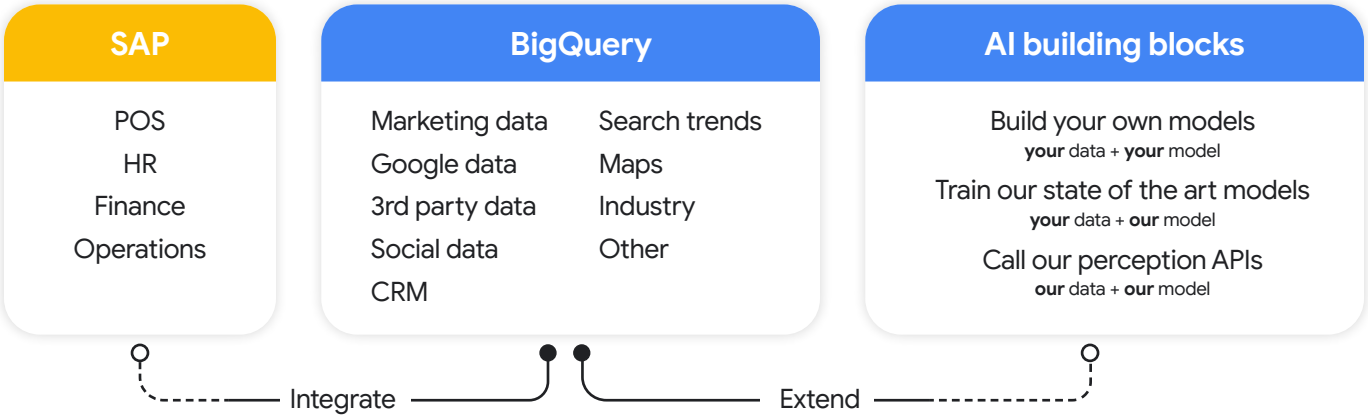
The following pages detail the capabilities Google Cloud delivers to SAP customers. From innovations in analytics and AI/ML, application modernization, and high availability to SAP-certified compute and storage, read on to learn how we're powering the smarter cloud for your enterprise.

1. Forrester, The Total Economic Impact Of SAP On Google Cloud, July 2020
2. IDC, Business Value of Google Cloud for SAP Environments, July 2020
3. IDC, The Value of BigQuery from Google Cloud for SAP Customers, August 2021

Petabyte Scale Cloud Data Warehousing with BigQuery

Uncover deep, data-driven insights with seamlessly consolidated SAP and non-SAP data in BigQuery, a serverless, highly scalable, and cost-effective multi-cloud data warehouse designed for business agility.

- **Integrate SAP data sources with BigQuery** leveraging best-of-breed partner solutions from SAP, Informatica, Qlik, Datavard to Software AG, Dell Boomi, HVR, and more
- **Optimize the use of SAP operational and other data** to better execute business strategies and support line-of-business teams, resulting in average benefits of $6.14M per year
- **Create and execute machine learning models directly** in BigQuery using standard SQL queries with BigQuery ML
- **Extend with AI building blocks to easily infuse AI** into existing solutions or accelerate the build of entirely new ones



Learn more:
BigQuery for SAP customers solution brief and BigQuery solution page
IDC report executive summary and blog

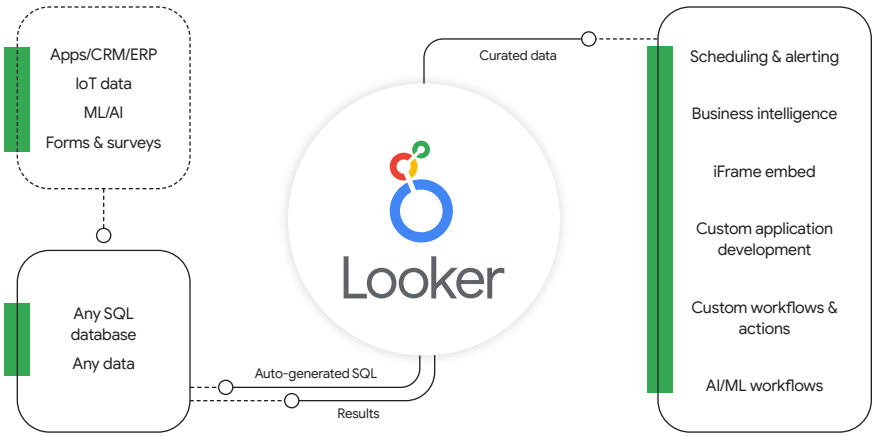
Integrated Analytics with Looker

Big data isn't big if you can only use a fraction of it. Looker's in-database architecture supports multiple data sources and multiple deployment methods to provide flexibility without compromising on transparency, security, or privacy. The governed centralized data model promotes metric consistency and reuse, and the suite of modern APIs lets you supply this trusted data—in real-time and at full scale—to your ecosystem of applications and workflows.

Generate insights that drive results across your business with your SAP data and Looker:

- Train machine learning algorithms on Google Analytics and SAP transactional data to segment customers and recommend products
- Combine Google Trends and Ads data to push timely, relevant, and specific marketing campaigns to the right people
- Infuse procurement workflows with real-time operational insights to improve inventory management of the items sitting in your warehouses

With Looker's modern analytics platform, you get complete customization and control to tailor data for proactive and operational use cases far beyond traditional static visualizations, reports, and dashboards.



Learn more:
Looker and Google Cloud solution page
SAP HANA Looker configuration instructions

Revolutionize how your SAP system runs with Vertex AI

Innovate within your existing workflow, empower teams to implement machine learning (ML) without the need for additional expertise, and streamline development with artificial intelligence (AI). Google Cloud's advanced AI solutions enable everyone in your organization to make an impact. The more data you bring, the more unique insights you'll get—and the more opportunities to redefine how your enterprise is run.

SAP customers are already using Vertex AI to:

- Predict when to ramp up production to meet market demands
- Identify when customers are ready to upgrade for personalized, relevant communications
- Automate warehouse processes embedded into manufacturing or business workflows
- Detect and assess damages early to save time and reduce costs

AI building blocks make it easy for you to add sight, language, conversation, and structured data into your applications.

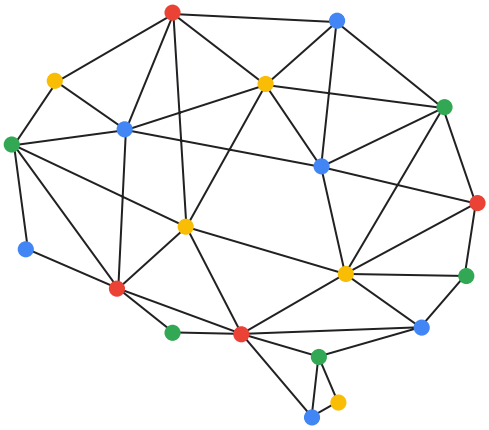
You can use proven, pre-trained APIs, or use AutoML to create high-quality custom models with minimal effort and machine learning expertise.

By 2030, companies that fully absorb AI could double their cash flow.[1]

1. McKinsey & Company, Notes from the AI frontier: Modeling the impact of AI on the world economy, September 2018.

Learn more:
Artificial intelligence solutions page
Google Cloud Machine Learning video
Google Cloud AutoML Vision for SAP customers video

Accelerate cloud innovation with Google Cloud Cortex Framework



Get everything you need to rapidly design, build, and deploy cloud solutions with Google Cloud Cortex Framework, including reference architecture patterns, ready-to-run deployment accelerators, and packaged integration services.

Built on a foundation of proven technologies and solutions from Google Cloud, SAP, and our trusted partner ecosystem, you can deploy advanced cloud-native capabilities at a fraction of the time and cost of relying on in-house talent and specialized expertise.

- Repeatable, scenario-driven reference architectures
- Ready-to-run deployment templates
- Best practices building blocks and blueprints
- Pre-defined, reusable accelerator content
- Packaged integration services from Google Cloud and partners

Accelerate business outcomes

Kickstart insights and business value with easy-to-leverage, scenario-driven, cloud-native reference architectures and content.

Reduce risk, complexity, and cost

Lessen the time, effort, and cost of implementations and achieve desired business outcomes more rapidly with proven deployment templates.

Launchpad for future innovation

Leverage a technology strategy that can scale above and beyond an individual use case, with best-in-class cloud-native tools and capabilities.

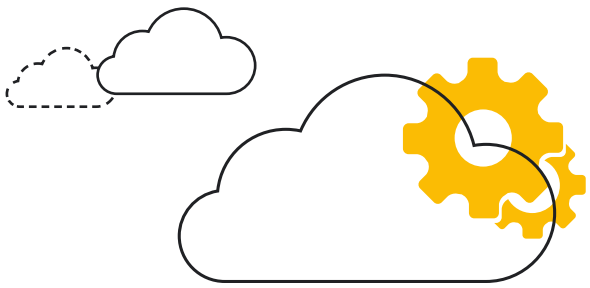
Learn more:
Google Cloud Cortex Framework solutions page
Google Cloud Cortex Framework one sheet
SAPinsider article

Bring cloud-native practices to SAP ecosystems with application modernization

Overcome the challenges of developing and maintaining custom objects by shortening the length of development lifecycles, operating in an environment built for microservices, and reducing dependency on niche knowledge.

Google Cloud is uniquely positioned to bring cloud-native practices to SAP ecosystems by deploying modernized applications as extensions on serverless platforms. Application modernization with Google Cloud also aids digital transformation by introducing DevOps to existing teams, leading to a more agile and user-centric culture.

- Keep the core clean and innovate faster
- Facilitate user feedback
- Avoid impact on business processes
- Keep better track of technical debt
- Adopt cost-effective and flexible runtimes
- Avoid vendor lock-in



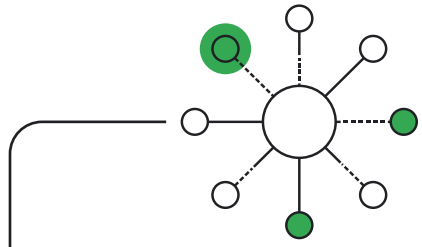
Learn more:
Application modernization solutions page

Automate Google Cloud infrastructure deployments with best-practice templates

Get started with your cloud transition by using Google's deployment guides and templates to help install the underlying compute, network, and storage infrastructure, and in some cases also install SAP specific software such as SAP HANA scale-out systems with host auto-failover.

Go beyond "one-click installs" with:

- Step-by-step deployment guides that are publicly available and customizable
- Complete flexibility to tailor the initial SAP environment installs into cloud and apply your own customization
- Reusable templates that save time and minimize errors in infrastructure setup and configuration
- Automation in minutes with Google Deployment Manager
- Best-practice designs like Linux clustering with pacemaker for high availability (HA)
- Certified disk sizes for guarantee minimum required I/O bandwidth and IOPS



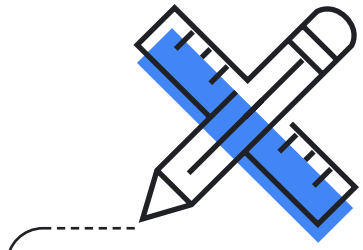
SAP deployment templates managed by Google

- SAP HANA scale up, high-availability cluster on SLES
- SAP NetWeaver on Linux*
- SAP NetWeaver on Windows*
- SAP ASE on Linux*
- SAP MaxDB on Linux*
- SAP MaxDB on Windows*
- IBM DB2 high-availability cluster for SAP

*Template deploys the compute and storage to allow for manual installation of these software/DB tools.

Learn more:
Automating SAP deployments on Google Cloud with Deployment Manager guide

Modernize and create new SAP apps with Apigee full life-cycle API Management



Maximize the value of your SAP systems and data stores by overcoming the challenges of data access, reliability, and governance. Apigee is a full lifecycle API management platform that unlocks SAP data and services to power connected experiences, reduces technical debt and complexity in SAP systems, and minimizes business disruption during SAP system upgrades and migrations.

Apigee provides broad SAP support to enable APIs across platforms

Apigee API Management

- **iPaaS**
  like SAP Cloud Platform, Dell Boomi, etc.
- **Middleware**
  like SAP PO, TIBCO, Software AG, Informatica, etc.
- **SAP NW Gateway**
  either embedded or as a hub in the SAP landscape
- **Standalone SAP systems**
  Built-in SAP interfaces for SAP NetWeaver or SAP HANA systems

- Accelerate access to your SAP data
- Make SAP data available in a secure setup
- Avoid business disruption during SAP migrations
- Access legacy and modern services with ease
- Measure interface usage to your SAP system

Learn more:

Apigee: Your gateway to more manageable APIs for SAP blog
Google Cloud Apigee for SAP Customers solution brief
SAP and Apigee podcast

Elastically scale your architecture with SAP custom VMs

Google Cloud's SAP custom VMs offer a virtualized solution that enables you to manage capacity with machine learning that right-sizes your infrastructure. Lower service costs by paying for today and not tomorrow, flex and move at your own pace, and manage peak processing needs with ease.

SAP Certified for SAP HANA

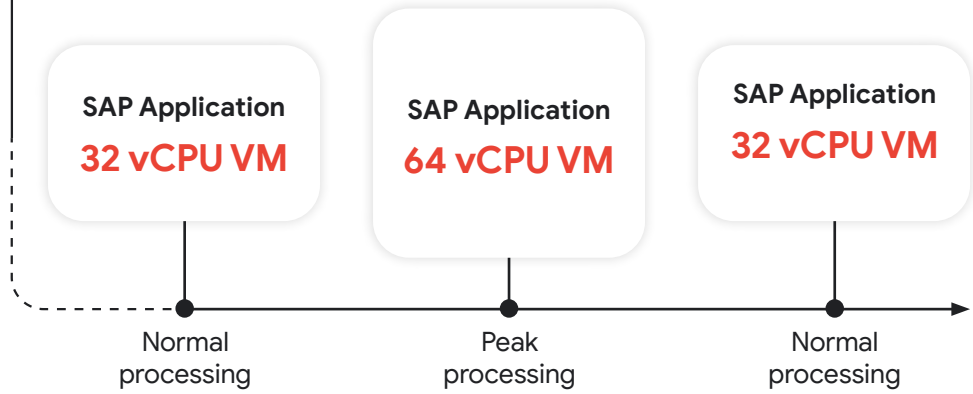
Fast track your implementation with 26+ Google Cloud solutions certified for successful integration with SAP HANA. See SAP note 2456432 for more details

Multiple VM shapes

- 2 to 80vCPU with up to 8GB per vCPU
- Memory to vCPU ratio 0.5 -> 8GB:vCPU
- Custom Machine Types for N2 and N2D, 640GB of memory

Select a minimum CPU platform

Up to 3.4Ghz



Learn more:

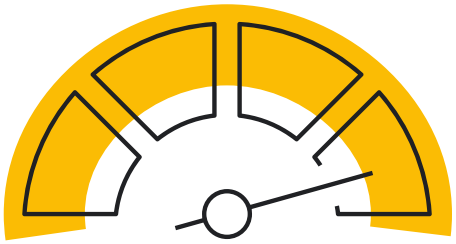
Best practices for SAP app server autoscaling on Google Cloud blog

Google machine types guide

Gain performance improvements with continuous optimized compute

SAP-certified deployments combine the agility and flexibility you need for growth. Leverage performance enhancements with a better TCO using Google Cloud's compute families.

- **Efficient VMs:** 31% cheaper with Dynamic Resource Management
- **General purpose VMs:** The best choice for most workloads, balancing price and performance
- **Compute optimized VMs:** High frequency CPUs for compute intensive workloads
- **Memory optimized VMs:** Large memory machines for SAP and in-memory computing
- **Large instances:** Large instance engineered machines
- **Largest VM ever certified by SAP:** M2-ultramem-416, 12TB 100% virtualized (12TB OLTP/OLAP scale-up and out for SAP S/4HANA), Intel Cascade Lake
- **Bare metal solution:** State of the art dedicated servers based on Intel Cascade Lake, 18 and 24TB offering



Compute families to meet real work needs

Best TCO

Cost-optimized (E2)

- Web serving
- Business-critical applications
- Steady-state LOB apps
- Dev & test environments

Cost savings a priority

Balanced

General purpose (N1 + N2 + N2d)

- **Enterprise apps (SAP)**
- **SAP HANA (<640GB)**
- Medium Dbs and business critical apps
- Web & app serving

Higher performance and performance/$

Workload-optimized

Compute-optimized (C2)

- **Enterprise apps (SAP)**
- EDA
- HPC
- Scientific modeling
- AAA gaming

Highest performance CPUs

Memory-optimized (M1 + M2)

- **SAP HANA (> 1TB)**
- Largest in memory VMs
- Real-time data analytics
- In-memory cache

Most memory on Compute Engine

Learn more:

Certifications for SAP applications on GCP

Certifications for SAP HANA on GCP

Increase network performance and reduce risk with Google Cloud's private network

Improve customer experiences globally with increased network performance and innovation that spans all global regions. Reduce "vendor in the middle" risk with security that is built in, not bolted on.

Google Cloud offers one private network across regions:

- 28 regions, one virtual private cloud (VPC)
- One subnet across availability zones in a region
- Configurable and expandable subnets
- Shared VPC provides centralized network administration, scaling to thousands of service projects while reducing operational overhead and risk with one VPC
- Automatic connection to workloads across any regions
- Access to any region by interconnecting through a single location, through Google's premium network
- Control of firewall rules from one location reduces the risk of error and provides visibility when changes are made

55%

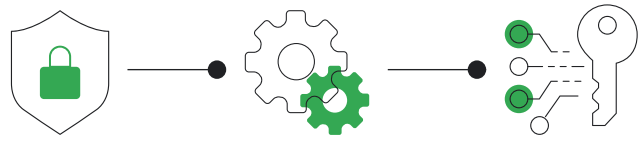
of companies lack an enterprise-wide encryption strategy.[3]

3. Ponemon Institute Global Encryption Trends Study, 2019

100%

of Google Cloud customers have encrypted data.

Fully automated management



More customer control

Encryption by default

Manage keys

Bring your own keys

Learn more:

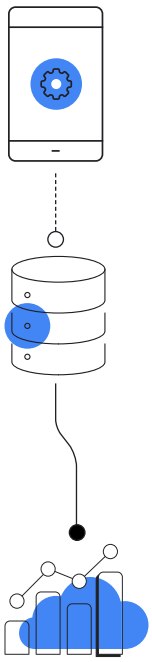
VPC network overview

Your top network performance problems and how to fix them blog

Run your enterprise on a cloud platform designed to deliver high availability and performance

Maximize SAP application uptime, even in the most challenging circumstances, by designing high availability (HA) architectures for your SAP systems in Google Cloud. Realize the potential of a reliable, scalable, and cost-effective SAP environment built on a cloud platform designed to deliver high availability and performance for your mission-critical systems.

Leverage HA at three critical levels:



Infrastructure
Moving an SAP system from on-premises hardware to Google Cloud infrastructure can deliver big improvements in uptime. Google Cloud has two built-in capabilities to achieve this goal: Live Migration and host auto restart. Together, they can significantly reduce downtime caused by hardware failures and maintenance activities.

Database
By supporting and documenting the use of HA architectures for SAP HANA, IBM Db2, MaxDB, SAP ASE service, and Microsoft SQL Server, Google Cloud provides the freedom to decide how to balance the costs and benefits of HA database systems for your SAP environments. We support synchronous replication between primary and secondary database instances across multiple zones within the same region, and other replication methods like log shipping with low latency.

Application server
Get the HA compute and networking capabilities you need to protect against the loss of data through synchronization and maximize reliability and performance from SAP NetWeaver. Deployment Manager automates spinning up additional application servers, eliminating human error, and making it fast and easy to scale your SAP system load during peak times.

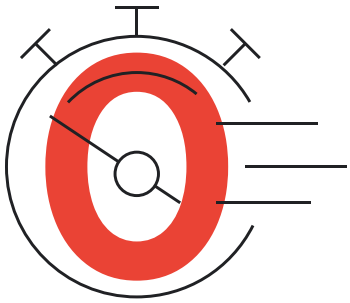
Learn more:
How to run SAP on Google Cloud if high availability is high priority blog

Eliminate planned downtime for SAP environments with Live Migration

Keep your SAP instances running during regular infrastructure maintenance and upgrades, network and power grid maintenance in the data centers, host OS and BIOS upgrades, and more. With Live Migration, your virtual machine instances will remain operational even when a host system event occurs.

Increase uptime and maintain high availability, minimize downtime for planned maintenance and unplanned outages

- Live-migrate running SAP instances to another host in the same zone without reboots
- Run without disruption to keep SAP infrastructure protected and reliable
- Take advantage of new Google infrastructure updates and improvements delivered automatically



99.99%

guaranteed Google Cloud uptime for Instances in Multiple Zones

$1.5M

eliminated system downtime savings per year due to Live Migration[2]

2. The Total Economic Impact Of SAP On Google Cloud, Forrester.

Learn more:

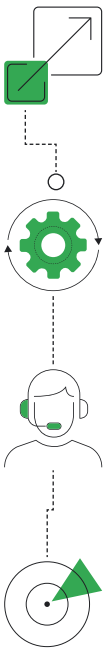
Live migration guide

Run SAP S/4HANA smarter and faster on Google Cloud technical webinar

Maximize SAP HANA uptime with Fast Restart on Google Cloud

Fast Restart enables significantly faster SAP HANA 2.0 SPS4+ restart times by keeping a database intact and in-memory when a process restart or planned maintenance knocks down a SAP HANA instance. But what can you do to minimize downtime in cases where Fast Restart isn't able to close a gap on its own, such as when a host VM must be shut down for planned maintenance or due to unplanned issues?

The best approach to availability is to ensure you have many solutions working in unison with a multi-faceted availability strategy. By running SAP HANA on Google Cloud, customers can rely on interlocking high availability solutions such as:



Live Migration
Move a running SAP HANA instance seamlessly to a new VM prior to beginning scheduled maintenance, without the need for administrator monitoring or intervention.

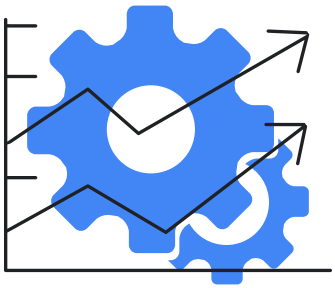
Host Auto Restart
Allow Compute Engine to restart a VM instance automatically on a different host, enabling affected applications to quickly restart, typically through the use of customer-supplied startup scripts.

High-availability database support
Rely on Google Cloud's support for synchronous SAP HANA system replication and SAP HANA host auto-failover.

High availability by design
Google Cloud has stringent availability targets. SAP HANA users leverage a redundant, global infrastructure to deploy applications across multiple zones and regions.

Learn more:
Fast Restart: A powerful new tool to help improve SAP HANA uptime blog

Mitigate memory errors with Memory Poisoning Recovery



SAP customers are protected against memory errors by a ground-breaking first line of defense with Google Cloud's unique Memory Poisoning Recovery (MPR), Live Migration, and Fast Restart capabilities.

Protect against business disruptions due to memory errors. Plan for necessary downtime and reduce maintenance costs and efforts.

- Rapid recovery with SAP HANA Fast Restart
- Decreased business risks with reduced downtime of SAP HANA HA primary and secondary pairs
- Leading infrastructure uptime
- Ground-breaking infrastructure innovations combined with SAP HANA software innovations
- Automatic delivery of new innovations

76% faster

SAP HANA system recovery in the event of a memory failure with Memory Poisoning Recovery, Live Migration, and Fast Restart

Learn more:

SAP HANA: A solution to memory error impacts blog
Live migration guide
Fast Restart: A powerful new tool to help improve SAP HANA uptime blog

Protect your SAP systems with Google Cloud data protection and recovery

Improve how you compete in an unpredictable, complex, and dynamic business environment with cloud-based data protection and recovery for your SAP instances. From persistent disk snapshots to machine images, Google and SAP's cloud solutions work seamlessly together to provide an ecosystem of customizable solutions.

Choose from a range of cloud-based backup solutions that are flexible, scalable, and self-manageable:

Persistent disk snapshots
Fast and cost-effective, persistent disk snapshots allow you to specify the storage location as regional or multi-regional. In an SAP HANA database running on Google Cloud, store backup folders on separate persistent disks to capture and replicate the database server independently.

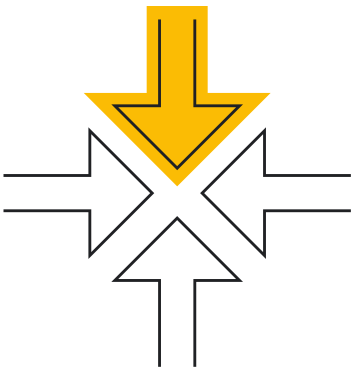
Machine images (Beta)
A Google Compute Engine resource, machine images store all the configuration, metadata, permissions, and data needed from disks to create a VM instance. Machine images are ideal resources for disk backups as well as instance cloning and replication.

Shared file storage
SAP systems can use shared file storage to fulfill any high availability and disaster recovery requirements. Shared file systems can be combined with appropriately chosen Cloud Storage buckets to ensure availability of data backups across zones and regions.

SAP HANA Backint agent for Cloud Storage
For SAP HANA database backup, Google Cloud offers customers a free, SAP-certified, and application-aware Cloud Storage Backint agent for SAP which would eliminate the need for backing up with persistent disks.

Learn more:
9 ways to back up your SAP systems in Google Cloud blog

Simplify SAP system management across clouds with the Google Cloud Connector for SAP Landscape Management



SAP Landscape Management (LaMa) is a centralized SAP management tool designed to simplify, automate, and orchestrate a variety of management and admin tasks across your entire SAP landscape.

The free Google Cloud Connector extends LaMa functionality to SAP systems deployed on Google Cloud, making life easier for customers running Google Cloud as part of a single-cloud, hybrid cloud, or multi-cloud SAP landscape.

- Listing Google Cloud projects, zones, and VM instances within SAP LaMa's landscape overview
- Mass stop/start of Google Compute Engine (GCE) instances, using either the SAP LaMa user interface or the scheduler
- System clone, copy, and DB refresh with Post Copy Automation
- Resizing of machine types
- Relocating SAP application instances to another VM instance
- SAP HANA failover to a replicated SAP HANA HA system via the SAP Host Agent

Landscape-wide visibility and control: Centralized management of your entire SAP landscape deployed on Google Cloud Compute Engine VMs using a single console.

Lower admin TCO: Reduced time, effort and cost to manage and operate your SAP systems through automation, orchestration, and scheduling of SAP Basis administration.

Increased operational agility: Accelerated application lifecycle management operations and fast response to workload fluctuations.

Learn more:

Centralizing SAP system management across clouds using SAP LaMa blog
Google Cloud Connector for SAP LaMa is GA! SAP Community blog
Google Cloud Connector for SAP Landscape Management Planning Guide

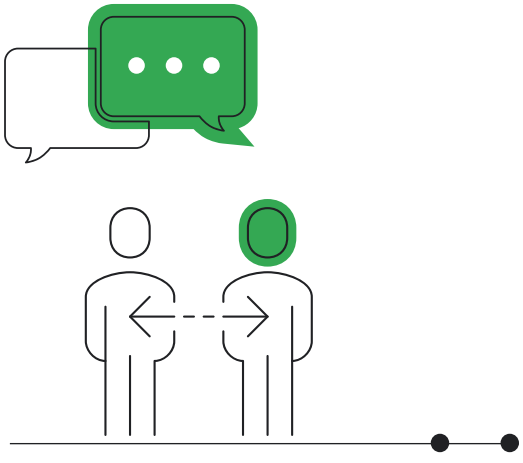
Collaborate with experts to optimize your SAP business applications on Google Cloud

Run your critical business applications on our secure global infrastructure, leverage your growing data volumes to impact business outcomes, and work hand in hand with Google Cloud Professional Service Organization (PSO) SAP experts.

Our deep technical expertise and PSO services help you unlock business value from the cloud across a range of solutions—including infrastructure, application modernization, data management and analytics, machine learning, security, and more.

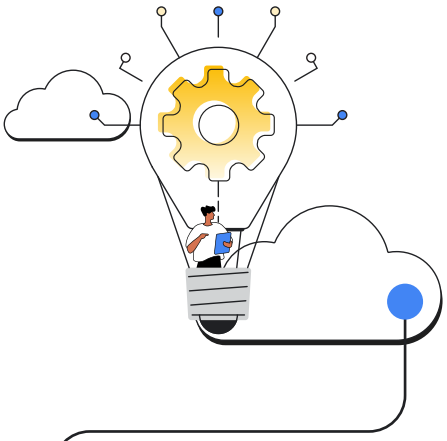
Leverage a proven implementation methodology

- **Assess:** Determine use cases, explore high-level solutions, and test a solution through experiments
- **Plan:** Develop a detailed architecture design and deployment plan—comprehensively scoped to implement the solution—and execute on the detailed design and plan documents
- **Deploy:** Execute on the detailed design, plan documents created during the previous plan phase, and realize the SAP solution in production
- **Optimize:** Look for opportunities to review and enhance existing processes and technologies, and to establish operational best practices



Learn more:
Consulting services homepage
SAP on Google Cloud Technical Resources

Transform your business – as a service – with RISE with SAP on Google Cloud



With RISE with SAP on Google Cloud, get the simplest and safest cloud migration while also maximizing the full value of the cloud.

Low-risk path to the cloud
Reduce the risks even more, speed up time to value, lower migration costs, and defray infrastructure costs with the Google Cloud Acceleration Program.

Zero planned SAP downtime
Experience increased SAP application availability and dramatically reduced planned outages with Google Cloud's unique ability to live-migrate SAP HANA workloads.

Innovation as a practice
Drive new revenue streams, improve processes, build modern applications, and combine Google and SAP data for new insights using Google's advanced analytics, artificial intelligence (AI), and machine learning (ML) capabilities.

Industry's cleanest cloud
Instantly reduce the net operational emissions associated with your workloads to zero by moving SAP applications and workloads to our efficient and smart data centers. Combine SAP data with Google data, analytics, and AI to lower costs and reduce waste.

- **63% faster completion** of queries[1]
- **77% faster delivery** of analytics reports[1]
- **High value Google data** to enrich SAP data
- **2X higher productivity,** development teams[2]
- **Embedded AI and ML** to unleash innovation
- **2X more energy efficient** than typical data center

Learn more:
Accelerate transformation with RISE with SAP on Google Cloud one sheet
Google Cloud and RISE with SAP brief

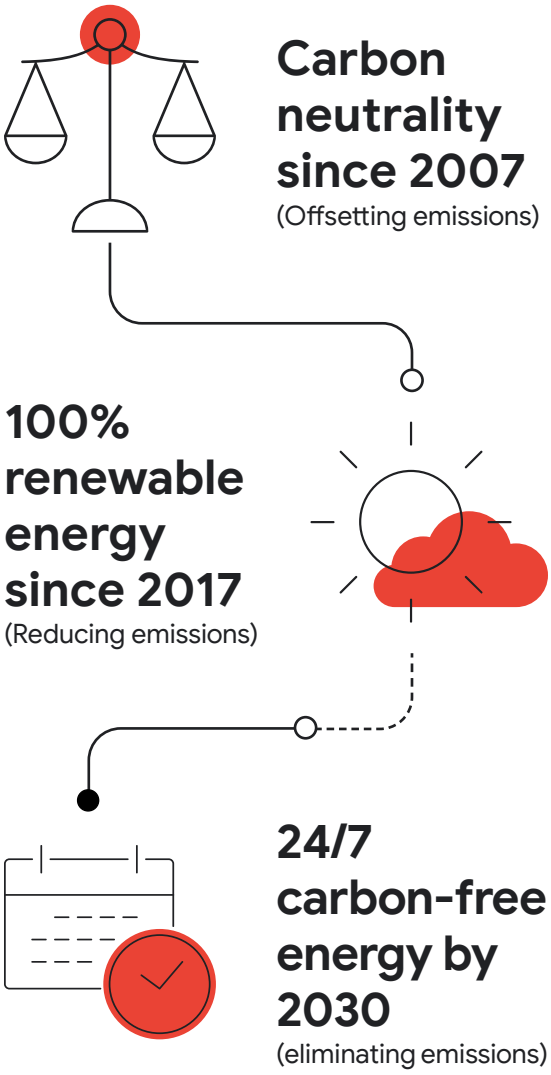
1 IDC, The Value of BigQuery from Google Cloud for SAP Customers, July 2021
2 Business Value of Google Cloud for SAP Environments, July 2020

Innovate sustainably with the cleanest cloud in the industry

Google has been carbon neutral since 2007 and by 2030, our goal is for cloud workloads to use carbon-free electricity every hour of every day in every region. We unify our practices, partnerships, and products around a single mission—to foster sustainability at scale.

- **Setting the pace:** As the world's largest purchaser of renewable energy, we continue to innovate ways to make our operations more sustainable, inspiring others to follow.
- **Pushing change forward:** We partner with nonprofits, research organizations, governments, and businesses to build custom technology and tools to accelerate meaningful change.
- **Making impact personal:** We build products and technology to help people to better understand their impact and actions.

Google Cloud is the only cloud provider that has achieved 100% renewable energy.



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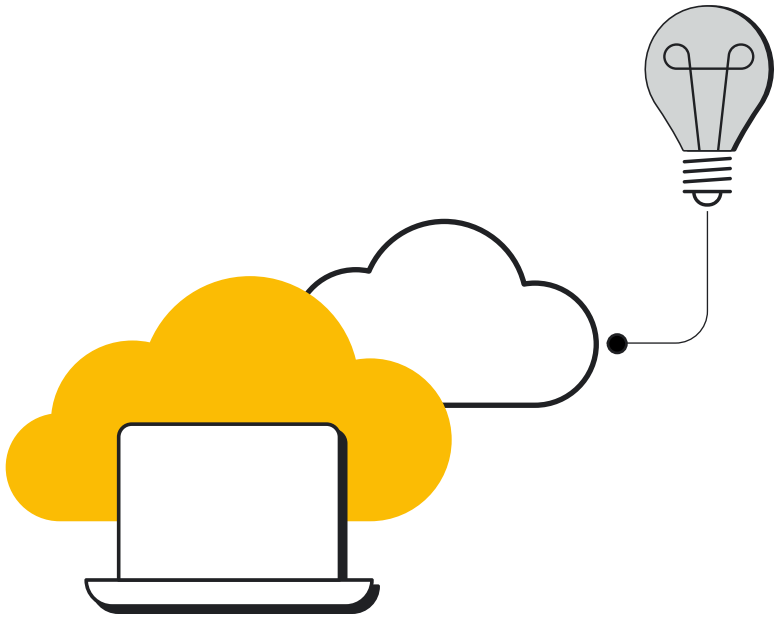

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