Test Study: Performance and Usability Comparison with SAP HANA deployed in RISE with SAP Private Cloud Edition

Last generated: July 03, 2025

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Performance and usability comparison with SAP HANA deployed in RISE with SAP Private Cloud Edition

Note:

RISE with SAP is an SAP offering that includes a Private Cloud Edition (PCE) as a managed cloud service. For additional information, see RISE with SAP.

This study, conducted in January 2025, examined and compared the performance and user experience of a Network Information Management System with two different architecture configurations, both deployed in Amazon Web Services (AWS):

1. A traditional ArcGIS Enterprise deployment on Windows virtual machines, with an enterprise geodatabase created using SAP HANA and hosted on a Linux virtual machine that was collocated with the other ArcGIS Enterprise components in a single Virtual Private Cloud (VPC).
2. An identical ArcGIS Enterprise deployment, which instead hosts the enterprise geodatabase in a VPC separate from the other ArcGIS Enterprise components.

Note:

This test simulated an SAP HANA geodatabase deployed in RISE with SAP Private Cloud Edition by using a separate VPC from the other ArcGIS Enterprise components to evaluate any potential latency in a similar architecture.

Network latency can have significant impacts on user experience and efficiency performing typical daily GIS operations within a Network Information Management System. In general, when the distance between system components is increased, like separating an enterprise geodatabase in a separate VPC from the other ArcGIS components, network latency increases. No additional network latency was observed with the addition of a second VPC connected with AWS PrivateLink during the conducted tests.

Tested workflows

A set of representative gas utility workflows were tested against each system, which were deployed with the 2024 ArcGIS Network Management Release. System resource utilization, end-user experience, and conducted workflow times were monitored throughout the testing process. The

overall goal of this study is to provide organizations with quantitative and qualitative evidence to support their deployment decisions.

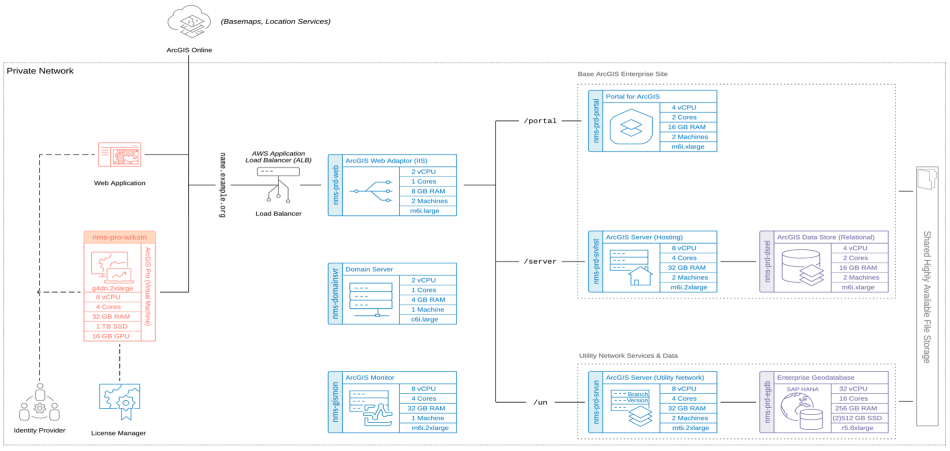
You can read more about these workflows in the related system test study, which evaluated a Network Information Management System configured with SAP HANA.

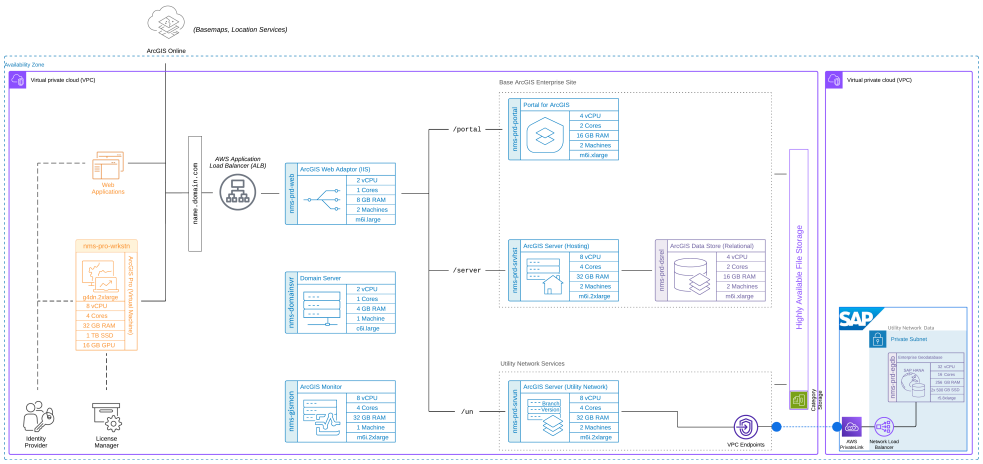
Physical architecture comparison

The following architectures were both designed with:

- A small/medium gas utility in mind
- Support for workflows with a target design load of 15 ArcGIS Pro editors and 200 ArcGIS web users (general user personas)
- Consideration for key design choices
- AWS cloud infrastructure

The SAP HANA Private Cloud Edition (PCE) deployment mirrors the instance types and sizes but includes a separate VPC connected to the ArcGIS Enterprise VPC via AWS PrivateLink where the enterprise geodatabase is configured. EC2 and database instance types are identical between the two deployments, the key difference is the geodatabase hosting approach and network design.





Instance types and configurations

The following system profiles detail the instance types that were chosen and validated for the scope and purpose of this test study. Both systems used the same number and type of AWS EC2 instances. For your own system design, it is highly recommended to follow a complete design process to account for your organization's specific business and technical requirements.

Esri offers system architecture design services should you need help determining all the different factors relating to your organization's physical design, such as networking, storage, system environments, and sizing. Minimum system requirements for each component are listed in the respective software documentation available online.

Desktop (ArcGIS Pro and browser-based workflows)

- 3 machines
- G4dn.2xlarge instance type
- 4 CPU (8 vCPU)
- 32 GB RAM
- 1 TB Disk
- 16 GB GPU

Portal for ArcGIS

- 2 machines

- M6i.xlarge instance type
- 2 CPU (4 vCPU)
- 16 GB RAM
- 128 GB Disk

ArcGIS GIS Server (Network Management services)

- 2 machines
- M6i.2xlarge instance type
- 4 CPU (8 vCPU)
- 32 GB RAM
- 128 GB Disk

ArcGIS GIS Server (hosting server)

- 2 machines
- M6i.2xlarge instance type
- 4 CPU (8 vCPU)
- 32 GB RAM
- 128 GB Disk

ArcGIS Data Store (relational)

- 2 machines
- M6i.xlarge instance type
- 2 CPU (4 vCPU)
- 16 GB RAM
- 256 GB Disk

ArcGIS Web Adaptor

- 2 machines
- M6i.large instance type

- 1 CPU (2 vCPU)
- 8 GB RAM
- 128 GB Disk

ArcGIS Monitor

- 1 machine
- M6i.2xlarge instance type
- 4 CPU (8 vCPU)
- 32 GB RAM
- 128 GB Disk

Shared file storage

- 1 instance
- C6i.xlarge
- 1 CPU (2vCPU)
- 8 GB RAM
- 2 TB Disk

Database host

- 1 machine
- R5.8xlarge instance type
- 16 CPU (32 vCPU)
- 256 GB RAM
- (2) 512 GB Disks

Domain server

- 1 machine
- C6i.large instance type
- 1 CPU (2vCPU)

- 4 GB RAM
- 128 GB Disk

Additional infrastructure considerations

The following are additional areas of consideration when designing a Network Information Management System and an explanation of some infrastructure choices made for this test study.

Application load balancer (ALB)

A load balancer is required in a highly available ArcGIS Enterprise deployment to balance and proxy client traffic to the portal and server components as well as intra-site traffic between the software components. Although the ArcGIS Web Adaptor operates as a load balancer, it is insufficient on its own to serve as a load balancer in a high availability configuration. In this test study, an AWS Application Load Balancer was used.

Shared storage

To successfully implement a highly available ArcGIS Enterprise deployment, several configuration items or folders must be stored in a highly available, shared location. This ensures the data remains accessible even if one server fails, providing uninterrupted service to end-users. Additionally, shared storage simplifies data management in a multi-machine deployment and improves scalability by centralizing data storage and allowing for expansion as needed. In this architecture, a Windows-based file server is used to store these shared components, which is configured with AWS EC2 automatic recovery.

System components not included in the diagram

Not illustrated in the architecture diagram are antivirus software and AWS networking components that were present and active during the test study.

Test methods

Testing was conducted to determine whether any notable performance or user experience impacts were identified when using an enterprise geodatabase deployed with SAP HANA RISE as compared to one deployed on a virtual machine in the same environment as the other ArcGIS system components. To provide meaningful results, all other system hardware configurations and software configurations were kept consistent.

Scripted testing was performed in each environment to simulate the steps an editor would take when performing the defined workflows. Additionally, tests simulated the load of multiple active users interacting with the system by multiplying the simultaneous workflows or steps. During scripted testing, the completion time for each step in each workflow was recorded. User experience impacts were tested by manually completing workflows while the system was under load, to identify any observed degradation of user experience.

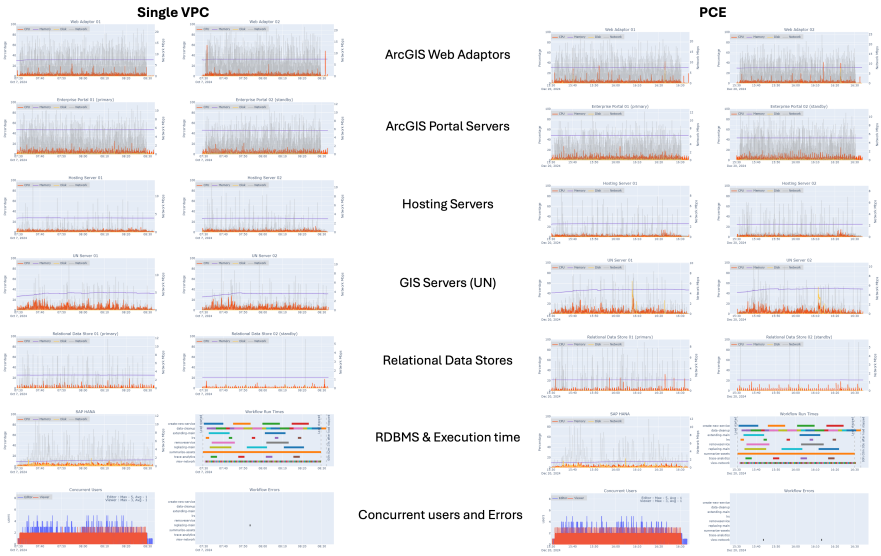
After the tests were successfully completed, the results were assembled and analyzed to compare hardware utilization to the load that was applied to the system. Then, the impact this had on the workflow and step completion times was measured. This method of measuring end-user efficiency aimed to compare the two systems to identify any meaningful differences to the organization's ability to create, access, and maintain their as-built Network Information Management System effectively.

Hardware utilization

The test results show that as implemented, the systems had adequate physical resources to support usage from the design load through usage that was eight times the design load. Refer to the design load definition in physical architecture comparison on this load assumption. Both systems delivered similar performance, with no significant differences in workflow times or user experience.

There was no meaningful change in hardware utilization across the system tiers when using the SAP HANA RISE (NMR 2024 + PCE) test environment as opposed to NMR 2024 in a single VPC environment.

Design load



For both configurations:

- Portal for ArcGIS and the hosting server CPU utilization generally stayed below 15% utilization
- ArcGIS Server CPU utilization generally stayed below 25% utilization
- SAP HANA CPU utilization (as reported) generally stayed below 20% utilization

4x Design load

For both configurations:

- Portal for ArcGIS and the hosting server CPU utilization generally stayed below 25% utilization
- ArcGIS Server CPU utilization generally stayed below 45% utilization
- SAP HANA CPU utilization (as reported) generally stayed below 25% utilization

8x Design load

For both configurations:

- Portal for ArcGIS and the hosting server CPU utilization generally stayed below 35% utilization
- ArcGIS Server CPU utilization generally stayed below 60% utilization
- SAP HANA CPU utilization (as reported) generally stayed below 45% utilization

Measured user experience

In addition to system resource utilization, user experience was also observed. While the system was under load, conducted workflow times were captured for both key workflow steps and the entire workflow completion. The conducted workflow time refers to the average time it took to complete all the steps listed in the workflows. The test results showed that as implemented, both systems provide a similar user experience, with negligible differences in total conducted workflow time and step completion times.

Conclusions and key takeaways

The purpose of this test study was to examine whether performance or user experience would be significantly impacted when using a geodatabase deployed with SAP HANA RISE as compared to one co-located with other ArcGIS system components. The results show that when properly resourced, both systems deliver similar performance, with no significant differences in hardware utilization or conducted workflow times.

Every organization should still perform their own testing to evaluate the right hardware that effectively balances cost and performance for them. As workflows and usage patterns change, routine testing should be completed to identify any necessary changes and optimize infrastructure investments.

Key takeaways

- Tests show equivalent user experience with each system configuration.
- Both systems deliver similar performance, with no significant differences in conducted workflow times.
- No additional network latency was observed with the geodatabase in a separate VPC (connected with AWS PrivateLink) from other ArcGIS Enterprise components.