SAP on AWS Architectural Overview

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Rodolfo is a Solutions Engineer for SUSE Linux. He has a Computer Science Engineer degree from the University of Costa Rica and began his career as a networking specialist for Intel, specializing in Linux. He also spent time working for HPE as a Unix System Administrator.

After spending five years in Prague as a SUSE technical support engineer, he transitioned to his current role as a Solutions Engineer. He has been with SUSE for almost a decade now. He lives in Houston, TX and covers the US central and mountain states.
Speaker Bio

Rick Spurgeon – Dallas/Fort Worth, Texas

Rick has been in IT for over 30 years, working for such recognizable names as EDS, FedEx and Red Hat, in addition to several smaller companies. He has 10+ years' experience working with IT resellers, and helped start up an IT reseller firm in the early years of his career. At one point, he worked in Mexico City for 5 years, and is fluent in Spanish.

Rick and his wife enjoy the Fine Arts, both performing and graphical. However, since the recent births of their first grandchildren, there hasn't been much time to spare for the ballet, opera, or museums.

A lifelong resident of the Dallas/Fort Worth area, Rick earned his B.S. at UT Arlington, and his M.S. in Information Systems at UT Dallas.
Why This Is Important

• Growing utilization of public clouds
  • OPEX versus CAPEX
  • Reliability > High Availability
  • Scalability
  • No long-term commitment
  • Global reach

• Many SUSE customers either use, or plan to use, public clouds as their principal, or auxiliary, IT infrastructure
Agenda

• SUSE and AWS Alliance
• SUSE Solutions on AWS
• Minimize Downtime
• SUSE Supported AWS-specific agents
SUSE-AWS Alliance Milestones

- 2010: SUSE Linux Available on AWS
- 2014: SUSE Linux Available on AWS
- 2015: SAP Certified High Availability Solution for SAP HANA Supported and Available on AWS Quick Start
- 2015: Support for New X1 and X1e EC2 Instances (2TB / 4TB)
- 2016: SUSE Manager and SUSE Linux Enterprise Server for SAP Applications Available on AWS
- 2016: Support for New i3 Instance Types
- 2018: Nitro (C5 / M5) Instances for SAP
- Today: SAP HANA Quick Start Featuring SUSE Linux Enterprise Server for SAP Applications High Availability
- Today: Support for New EC2 Bare Metal for HANA
- Today: SUSE Cloud Application Platform on AWS EKS
- Today: SUSE Linux Enterprise Server Available on AWS Gov Cloud
- Today: SUSE Linux Enterprise Server Available on AWS Free Tier
SUSE + AWS

Dedicated to Customer Success Powered by Enterprise Open Source Solutions

9 years of joint engineering between the Amazon EC2 and SUSE Public Cloud Engineering teams

Trusted for mission-critical workloads on AWS with high availability solutions custom-built for the platform

Seamless Linux support from AWS with AWS engineers specifically trained on SUSE solutions such as SUSE Linux Enterprise Server for SAP Applications
SUSE and SAP

SUSE Linux Enterprise, an end-to-end platform for SAP workloads

Over 63 HANA benchmarks on SUSE

SAP HANA developed on SUSE

PAYG and BYOS on AWS

>90% SAP HANA

>70% SAP applications on Linux

SAP HANA Enterprise Cloud on SUSE

SAP’s Linux development platform

18+ Years of SAP and SUSE

100% SAP HANA on Power

100% Business One on SAP HANA

18+ Years of SAP and SUSE
Accelerating the Digital Transformation Journey

SUSE and AWS for SAP Applications

Enhanced Agility, High Availability, Security, and Support

- **High Availability:**
  Solutions co-engineered in Waldorf, Germany for SAP HANA on AWS

- **Rapid Provision:**
  Create new SAP HANA systems through AWS QuickStarts on SUSE Linux in < 1 hr

- **Secure:**
  Innovate while maintaining a secure environment

- **Supported:**
  The first supported OS for SAP HANA on AWS and first on X1 instances

- **Low Cost of Entry:**
  2TB for 40 hours <$700

- **Flexible Pricing:**
  Achieve up to 72% discount on X1 with Reserved Instances
SUSE Solutions on AWS
SUSE Software-defined Infrastructure and Application Delivery Approach

**Application Delivery**
- Container Management: SUSE CaaS Platform
- Platform as a Service: SUSE Cloud Application Platform

**Software-Defined Infrastructure**
- Private Cloud / IaaS: SUSE OpenStack Cloud
- Compute: Virtual Machine & Container
- Storage: SUSE Enterprise Storage
- Networking: SDN and NFV
- Multimodal Operating System: SUSE Linux Enterprise Server

**Physical Infrastructure:** Multi-platform Servers, Switches, Storage

**Infrastructure & Lifecycle Management**
- SUSE Manager

**Public Cloud**
- SUSE Cloud Service Provider Program
SUSE Solutions Optimized for AWS

✓ Public Cloud Module
✓ Public Cloud Procurement Options (BYOS or Pay-as-you-Go)
✓ Preconfigured Value Adds (HA, Network Optimization and more)
Using saptune, you can tune a system for SAP in a very easy, configurable way. In the background, it is using the “tuned” service.

1. First find a tuning profile:
   
   # saptune solution list

   BOBJ Profile for servers hosting SAP BusinessObjects.
   HANA Profile for servers hosting an SAP HANA database.
   MAXDB Profile for servers hosting a MaxDB database.
   NETWEAVER Profile for servers hosting an SAP NetWeaver application.
   S4HANA-APPSERVER Profile for servers hosting an SAP S/4HANA application.
   S4HANA-DBSERVER Profile for servers hosting the SAP HANA database of an SAP S/4HANA installation.
   SAP-ASE Profile for servers hosting an SAP Adaptive Server Enterprise database

2. Then apply the profile, for example:
   
   # saptune solution apply HANA

More info: https://www.suse.com/documentation/sles-for-sap-12/book_s4s/data/cha_s4s_tune.html
Options to Buy: PayG & BYOS
Launching SUSE on AWS

- SUSE Linux Enterprise Server for SAP Applications
- SUSE Linux Enterprise Server
- All BYOS SUSE Products
SAP HANA on the AWS Cloud: Quick Start Reference Deployment

Deployment Guide

Sabareesan Radhakrishnan, Harpreet Singh, and Karthik Krishnan — Solutions Architects, Amazon Web Services

July 2014  (last update: August 2018)


This Quick Start reference deployment guide provides detailed instructions for deploying SAP HANA on the Amazon Web Services (AWS) Cloud by using AWS CloudFormation templates. The Quick Start builds and configures the AWS environment for SAP HANA by provisioning AWS resources such as Amazon Elastic Compute Cloud (Amazon EC2), Amazon Elastic Block Store (Amazon EBS), and Amazon Virtual Private Cloud (Amazon VPC).

This guide is for IT infrastructure architects, system administrators, SAP Basis architects, and SAP Basis administrators who are planning to implement or extend
Minimize Downtime

SUSE Linux Enterprise Server High Availability Extension
High Availability Scenarios for HANA Large Instances
SAP HANA System Replication
Challenge

Murphy’s Law is universal – faults will occur

• Hardware crash, flood, fire, power outage, earthquake

Service outage and loss of data

• You might afford a five second blip, but can you afford a longer outage?

Can you afford low availability?

• How much does downtime cost?
Automated SAP HANA Failover

Rapid recovery of SAP HANA systems by automating failover of large in-memory datasets in case of disaster system failure
Overview of Supported SAP HA Scenarios

- **SAP NetWeaver**
  - Manual/Auto failover
  - Simple stack
  - Enqueue replication
  - Combined stack

- **SAP HANA ScaleUp**
  - Manual/Auto failover
  - Performance optimized
  - Cost optimized
  - Multitenant database containers
  - Storage replication
  - Public Cloud
  - Others

- **SAP HANA ScaleOut**
  - Auto-host failover
  - Manual takeover
  - Performance optimized
  - Storage replication
  - Public cloud
  - Others
SAP HANA System Replication (SAP HSR)

- SAP HSR replicates data between two servers
- SAP HSR does NOT have an automated host failover
- SAP HSR does NOT have a virtual IP failover
- SAP HSR does NOT prevent the other node from remaining active
Automate SAP HANA System Replication

Automates “sr_takeover”

SAP HANA System Replication

SUSE High Availability Solution
Automate SAP HANA System Replication

Service Level Agreement

Improves

SAP HANA System Replication

SUSE High Availability Solution
Automate SAP HANA System Replication Failover
SUSE Supports Four SAP Hana Scenarios

Performance optimized

Node 1

pacemaker
active/active

HANA System Replication

Node 2

SAP HANA (PR1) primary

PR1

SAP HANA (PR1) secondary

Cost optimized

Node 1

pacemaker
active/active

HANA System Replication

Node 2

SAP HANA (PR1) primary

PR1

SAP HANA (QA1) non-prod

MDC – Multi Tenancy

Node 1

pacemaker
active/active

HANA System Replication

Node 2

SAP HANA (PR1) primary

PR1

SAP HANA (PR1) secondary

Scale Out

Cluster 1

pacemaker
active/active

System Replication

Cluster 2

STOP

Not Covered
## HANA SR Scale-Up: Performance Optimized

<table>
<thead>
<tr>
<th><strong>Node 2 Usage:</strong></th>
<th>Dedicated</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Data pre-load on Secondary:</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Take-over decision:</strong></td>
<td>Fully automated by SUSE cluster solution</td>
</tr>
<tr>
<td><strong>Take-over process:</strong></td>
<td>Fully automated by SUSE cluster solution</td>
</tr>
<tr>
<td><strong>Take-over reaction time:</strong></td>
<td>Fast due to pacemaker heartbeat</td>
</tr>
<tr>
<td><strong>Take-over speed:</strong></td>
<td>Fast since data pre-loaded</td>
</tr>
</tbody>
</table>

![Diagram](image-url)
Prerequisites

• Set up two nodes with Performance Optimized configuration
• SUSE’s HANA HA solution supports deployment of SYNC and SYNCMEM across Amazon Availability Zones
• SLES 12 for SAP supports the AWS STONITH method
• res_AWS_STONITH stonith:external/ec2
Prerequisites cont’d

• Time synchronization between the cluster nodes using NTP
  • Images are configured using the Amazon Time Sync Service

• Use one ENI (Elastic Network Interface) with DHCP assigned IP address
  • Enhanced Networking is recommended for production

• Both SAP HANA instances need the same SAP Identifier (SID) and instance number
AWS Requirements
SUSE Supported AWS-Specific Agents

- ec2: STONITH agent
- move-ip agent
- Route 53 agent
- EFS and the file system agent
ec2: The STONITH Agent

- **Location:** /usr/lib64/stonith/plugins/external/ec2
- **Use case:** Kill the other node. Use AWS infrastructure
- **Function:** It fences the other cluster node
  - It starts/stops other cluster nodes
  - It monitors other cluster nodes
ec2: Requirements for Operation

- Technologies being used: AWS CLI
- Agent has to use an AWS profile of the super user
  - It needs appropriate AWS authorization
  - Text output required
- Agent has to reach the EC2 access point
  - Internet access through https required
  - Internet access has to be highly available
- AWS CLI calls have to be successful
ec2: AWS Authorization Needed

- Instance ID only known after instance creation
- Region, account-id and instance ids have to be 100% correct!
- This privilege is powerful
  - The two cluster members can kill each other
  - Everyone with an account on one of the cluster nodes can perform these actions!
- Have such an individual policy for every cluster in your account!

Section 4.1.8.1.
ec2: Common Configuration Mistakes

- Incorrect EC2 name tags
  - Compare cluster parameter with EC2 tags

- Flaw in STONITH policy
  - Test the agent manually
  - Is there a policy attached to the instance?
  - Is there a typo within the parameter?

- Are there network rules preventing access to the EC2 access point?
  - Execute a describe-instance command as root user

- Someone used an EC2 tag with Unicode characters in the account
  - Do manual agent test
  - Fix will ship soon (filtered CLI commands)
ec2: Why it Might induce a False-Positive Take Over

• Someone adds an EC2 tag with Unicode characters ✅ in the region
  • Fix will ship soon through SUSE
• Internet access lost
aws-vpc-move-ip: The Overlay IP Agent

• Location: /usr/lib/ocf/resource.d/suse/aws-vpc-move-ip
• Use case: Used for application server to database traffic
• Function: Changes an AWS routing table entry
  • Send traffic to an IP address to an instance-id
  • Check whether routing table has the correct setting
aws-vpc-move-ip : Requirements for Operation

• Technologies being used: AWS CLI
• Agent has to use an AWS profile of the super user
  • It needs appropriate AWS authorization
  • Text output required
• Agent has to reach the EC2 access point
  • Internet access through https required
  • Internet access has to be highly available
• AWS CLI calls have to be successful
aws-vpc-move-ip: Things to Consider

• Policy is generic for every cluster in your account!
• This privilege is powerful
  • It allows you to modify all routing tables in the account!
• Coming soon: AWS will allow you to limit the ARN to update a specific routing table
• Overlay IP address must be outside of VPC address range to reach both AZs
• To be used for application server to DB traffic
• Not reachable for on-premises users!
In Conclusion

Public cloud usage is growing for a number of reasons

SAP runs well on the public cloud, in general.

There are multiple facilities, strategies, and methods that can be used in AWS to achieve high-availability tailored to satisfy performance and cost constraints
Additional Documentation and Resources

For the latest documentation updates, see http://www.suse.com/documentation

You can also find numerous white papers, a best-practices guide, and other resources at the SUSE Linux Enterprise Server for SAP Applications resource library: https://www.suse.com/documentation/suse-best-practices/
Questions?
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