accenture

SAP ON CLOUD AUTOMATION

myNav Cloud Builder

July 2024

myNav Cloud Suite for SAP

Our unique set of tools offer Speed to Market, Increased Quality, Standardization and Cost Efficiency

Cloud Builder

Auto-deploy and landscape life-cycle management

- **Automated Infrastructure and SAP Apps deployment** on Public IaaS platforms based on validated landscape(s), including network, compute, storage & SAP modules
- **Agile development** based on DevOps tools Terraform & Ansible
- Deploy infrastructure and SAP **configuration as a code**
- Automated **validation & documentation** of provisioned infrastructure
- **Industrialization** of best practices for SAP deployments on Public Cloud

✓ **Consistent Landscapes & efficiencies in Infrastructure & SAP Basis provisioning on cloud**

Cloud Migrate

Pre-Migration & Post-Migration Automation

- **Prechecks,** Basis **config extracts**, **validations** & **selective** updates at Source/Target systems
  - SAP Application (Basis)
  - OS
  - Database
- Selective **Cutover** & **Post Migration** steps across multiple layers
- Orchestrated database migrations

✓ **Efficiencies in Basis migration effort**

✓ **Consistent & validated source & target (Cloud) state systems**

Cloud Admin

Supervised SAP Basis automation

- Scripted SAP Basis operations as per best practices
- **Schedule-based starting / stopping** SAP servers for restricted business hours – pay for actual usage
- **Single pane of glass** to manage large SAP estates
- Remote execution in multiple SAP systems simultaneously
- Alleviates SME intervention
- Foundation **for self-healing** with myWizard integration
- User friendly Web based UI

✓ **35+ automation scenarios**

✓ **Kernel upgrade, System Refresh, Client Administration, Transports, HANA patching, Auto Start/Stop, Cluster Administration**

✓ **Self healing scenarios**

Secure Zero Trust Protection OSLogin+

Self-Awareness and Self-Alertness to our Practitioners

- Mitigates accidental errors/risks by including
- **Self-Awareness** to VM users with enhanced login controls
- **Self-Alert** to VM users with enhanced **Visualized Prompt** on critical systems
- Controls to **restrict use of critical commands** at operating system level

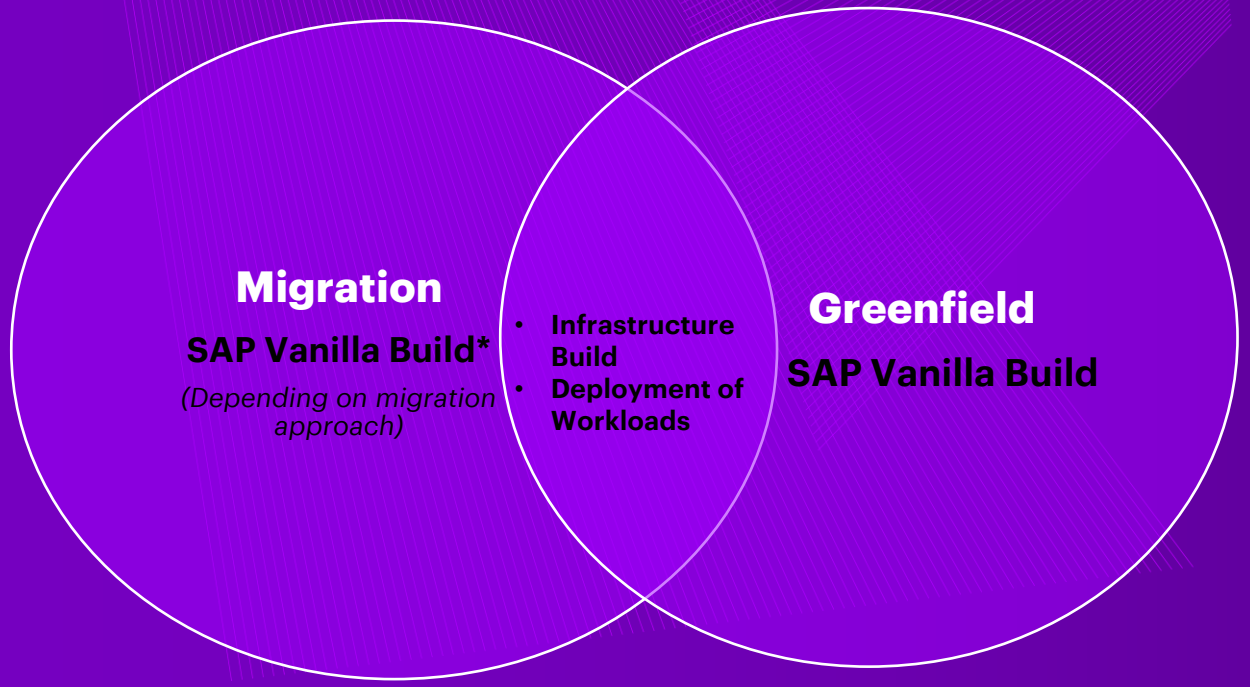
✓ **Improved User awareness for critical missions**

✓ **Prevents unwanted downtimes**

*Refer **myWizard AiOps** for SAP for monitoring solution*

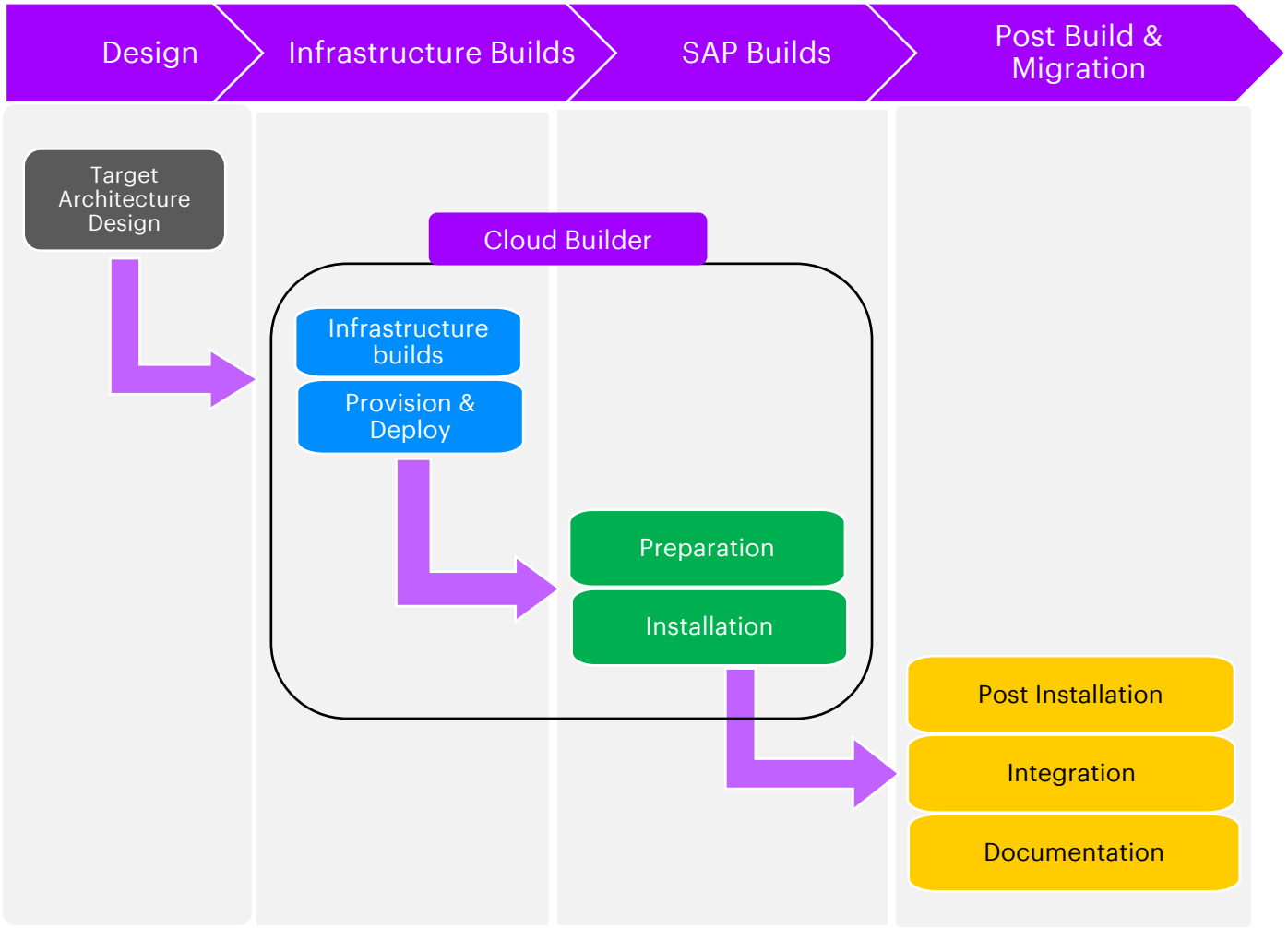
myNav Cloud Builder

Value Proposition



- Automated provisioning of cloud resources
- Automated build of SAP landscape
- Unified Homogeneous System Migrations
- Agile development based on DevOps tools Terraform & Ansible
- Accelerated speed to market for new features & enhancements
- Industrialization of best practices
- Standardized & defect free mass landscape
- Deploy infrastructure and SAP configuration as a code
- Increased auditability and compliance

What areas of SAP and Infrastructure are automated by CB



- **Design:** HLD, LLD, naming conventions
- **Infrastructure Build**: Build & configure foundation elements - VNET, Subnets, NSGs, tools & management servers, UDRs, Firewalls, Storage accounts, Recovery service vault, etc.
- **Provision & Deploy**: Deploy workloads as per BOM*
- **SAP Build on Cloud:**
  - **Preparation for SAP install**
    - Create File Systems
    - Create user and group configuration
    - Download media
    - Execute SWPM for Preparation checks
    - Set critical OS parameters
    - Provide inputs for build
  - **Installation****
    - SAP Vanilla Installation (DB, ASCS/SCS, PAS & AAS)
  - **System specific documentation**
    - OS, DB, Platform & SAP
  - Automated ASCS/SCS HA and HANA DB HA tests in Azure

Automated via Cloud Builder

- Post Build
  - Create Master client and post client creation tasks
  - Maintain system details in router, marketplace
  - SAP Standard Basis post install steps
- Integration
- Testing
- Project Documentation

Planning, Analysis & Design – on paper	Automated builds and provisioning of cloud resources for SAP	Automated	Manual

Depending on migration approaches, Cloud Builder can be used to build a target system on public cloud using source system backup

Type of SAP Deployments supported by CB

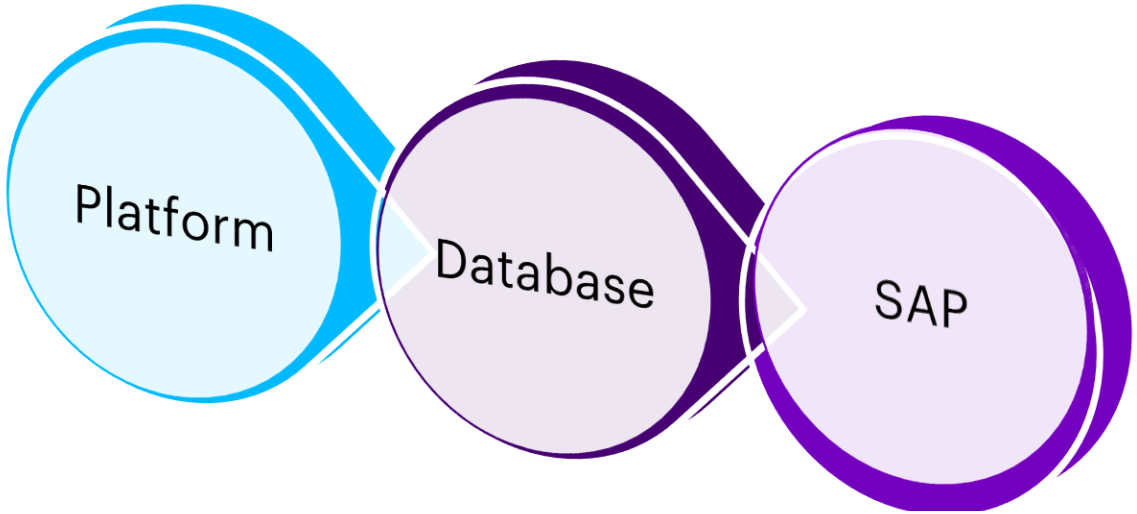
- **SAP Vanilla builds****
  - Installation of ABAP, JAVA and selective standalone systems using SAP Media available from SAP marketplace
  - SAP Kernel, DB versions, JVM versions, Host agent deployed as per customer requirements

- **SAP Greenfield Deployments (with specific SPS levels)**
  - Installation of ABAP and JAVA based systems based on customer specific requirements for SPS levels of SAP components
  - SAP Kernel, DB versions, JVM versions, Host agent deployed as per customer requirements

- **SAP Homogenous Builds/Copy***
  - New capability to build SAP systems in cloud using a DB backup from On-Prem/Source SAP system
  - SAP Kernel, DB versions, JVM versions, Host agent versions deployed as per customer requirements

*for details see subsequent slides.
** Refer PAM for more details

Automated documentation - Checks and Validation



Storage Account Summary

Details Of SC170ASCDWS

Property Name	Azure Value	Terraform Input	Result
Storage Account Name	sc170ascdws	sc170ascdws	PASS
Location	westus2	westus2	PASS
Account Tier	Standard	Standard	PASS
Account Kind	StorageV2	StorageV2	PASS
Min TLS Version	TLS1_2	Not Specified	N.A.
Tags	environment : Test owner : partha.das@accenture.com purpose : MD report	owner : partha.das@accenture.com purpose : MD report environment : Test	N.A.

final_documentation.md

final_documentation.html

- Based on Ansible scripts
- Provides documentation in MD Format – Details of deployed infrastructure and SAP application
- Comparison of scenario's terraform inputs against deployment result for Azure (object and properties)
- Checks and provides comparison against SAP on Cloud best practices
  - Platform Checks
  - Database Checks
  - SAP Checks

Checks	
Platform Checks	AWS, Azure, GCP
Database Checks	HANA
SAP Checks*	ABAP
SAP & HANA DB HA tests	Azure

* Only Basic SAP Checks on newly installed SAP System – ICM hostname, Component list

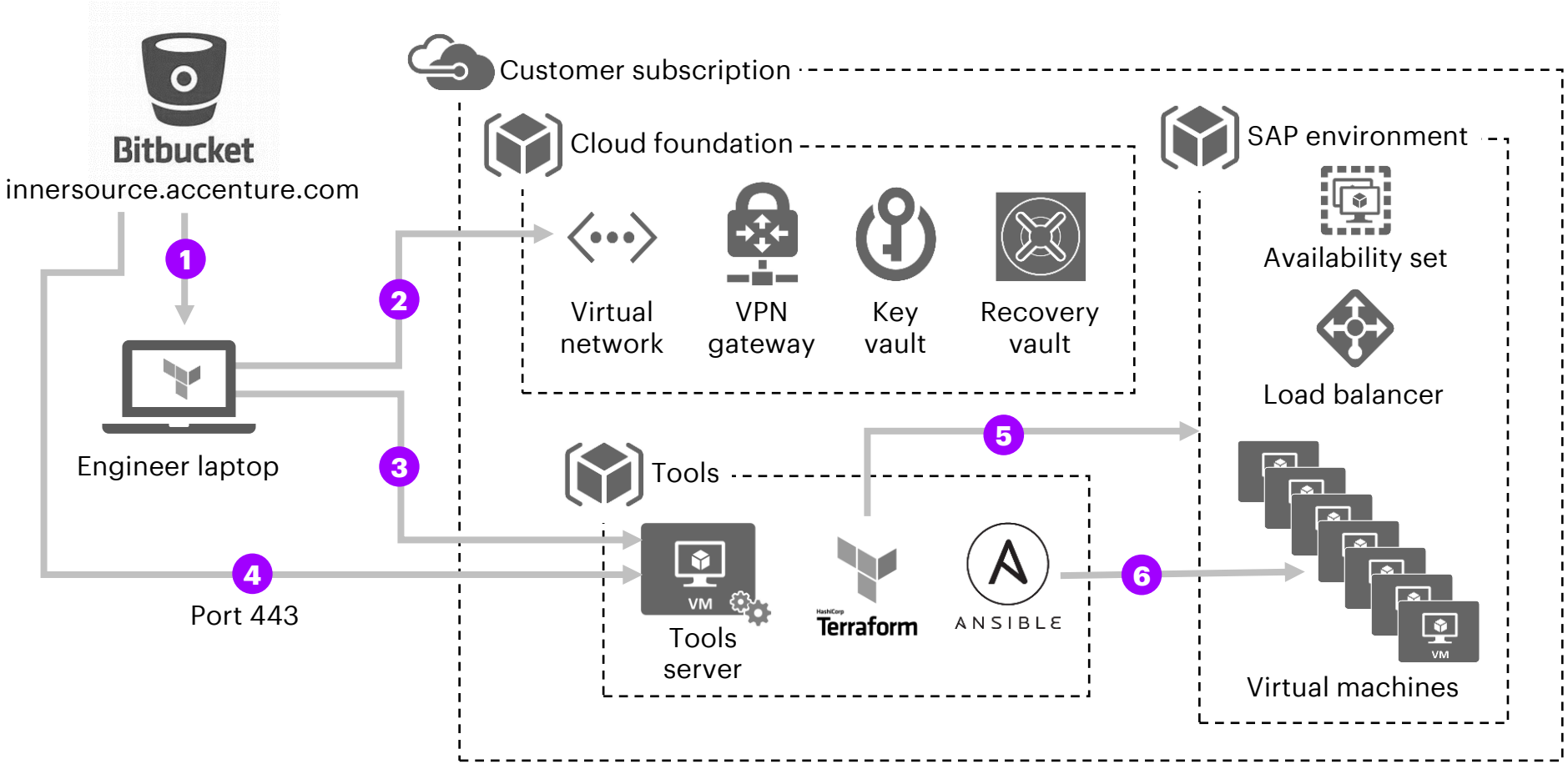
Cloud Builder Essentials

Cloud Builder Essentials Channel

Cloud Builder 2.0

For Azure

Deployment Workflow



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6. Engineer runs Ansible from tools server for configuration & to deploy SAP software

*Note: resource types shown are indicative only

Pre-requisites - Ansible Control Node

- ❑ Service Principal* or system managed identity or named user** with contributor access is required in customer's subscription(s), to deploy infrastructure resources, i.e., VMS, VNETS, Storage etc.
- ❑ Storage account to be created in customer's subscription which will be used to store the Terraform state files or an existing storage account could be used as well.
- ❑ (Recommended) Ansible Tool's server, which is required to deploy SAP via Ansible code to be created in customer's subscription(s) (D4S_V3 or above+ with 100GB disk + 25 GB Swap space on SLES 15.X or RHEL 8.X or CentOS 7+).
- ❑ Recommended to create the Ansible Tools server in dedicated Resource Group, whether it needs to have a separate VNET etc, can be determined based on the exact design & other security related constraints.
- ❑ If target windows VMS are domain joined, the Ansible tools server also need to be part of the same domain.
- ❑ An account with domain join privileges is required, if Cloud-Builder is used for domain join as well.
- ❑ For SAP on Windows domain installation , Service account with necessary privileges (i.e., AD read, or AD create objects and local admin privileges) needed.
- ❑ Once the Ansible Tools server is deployed, connectivity to it is required to be able to execute the tasks and access with SUDO to root on control node .
- ❑ Access required on the Ansible Tools server to clone source code from Accenture **https://innersource.accenture.com**, below mentioned static IP's or hostname, must be white-listed (**34.250.206.173**, **54.216.203.210**), hostname whitelisting is preferred.
- ❑ Ansible Tools server must be able to access Ansible target VMS to perform post build configurations & SAP installation.
- ❑ Depending on network topology, VNET peering might be required.
- ❑ If terraform/packer needs to be executed from the Ansible Tool's server in a restricted network, Hashicorp URLs must be whitelisted (i.e., **https://www.terraform.io/**, **https://registry.terraform.io**/, **https://releases.hashicorp.com**).
- ❑ Ansible URL to be whitelisted **https://pypi.org**
- ❑ To be able to run Ansible on Ansible Tool's server, **yum/zypper update**, **python3**,**PIP**, **GIT**, **Ansible** install must be allowed.
- ❑ **PyWinRM** is required on Ansible Tool's server in the case of any SAP on windows deployment.
- ❑ Some package (i.e., **python3-devel, krb5-devel,krb5-libs - krb5-workstation,gcc,python3,screen**) are required on Ansible Tools server in the case of SAP on windows deployment.
- ❑ For Cloud Migrate – NWRFCDK and pyRFC on tools servers

* If SPN cannot be provided , the tools / Ansible Control Node server can be set as system managed identity with contributor access.
** Named user – project team members

Pre-requisites - Ansible Target VMs (SAP VMs)

- ❑ Cloud-Builder owned Azure Storage Account end-point must be white-listed for copying SAP exports or medias to each Ansible target VM (**https://sapdatastorage.blob.core.windows.net/sap-export-data**).
- ❑ Azcopy utility download is required on each Ansible target VM, to be able to copy SAP exports/medias from Cloud-Builder owned Azure Storage Account , hence, **https://aka.ms/downloadazcopy-v10-windows**, **https://aka.ms/downloadazcopy-v10-linux & https://azcopyvnext.azureedge.net** must be allowed must be allowed.
- ❑ SSH authorized key to be copied to each Ansible Linux target VM from Ansible Tool's server, to be able to connect on secure SSH, which is required for Ansible. Sudo privilege on the target VMs to install SAP.
- ❑ SUDO to root privilege needed on target VMs to carry out package install/update and then the SAP & DB installation.
- ❑ CB tools server should be allowed to execute remote commands on target windows VMs/servers via WinRM protocol (default port of WinRM – 5985 should be allowed) , no GPO should prevent remote command execution on target VMs.
- ❑ For SAP on Windows deployment with ANF – AD Service account with domain admin privilege (SAP note – 3076635)
- ❑ PowerShell DSC modules are required in the case of SAP on windows deployment, hence as per the link some Microsoft network endpoints must be whitelisted, given link to be followed(**https://docs.microsoft.com/en-us/powershell/scripting/gallery/how-to/getting-support/troubleshooting-cmdlets?view=powershell-7.1**) individual urls >> psg-prod-eastus.azureedge.net ; az818661.vo.msecnd.net ; devopsgallerystorage.blob.core.windows.net ; *.powershellgallery.com ; go.microsoft.com ; onegetcdn.azureedge.net

- The following URLs provided for package update is only applicable for Azure marketplace images not for BYOS.
- For SUSE OS SMT and Regional servers must be reachable, links to be followed to be able check for the public IP's as per the Azure region.

✓ https://susepubliccloudinfo.suse.com/v1/microsoft/servers/smt.xml

✓ https://susepubliccloudinfo.suse.com/v1/microsoft/servers/regionserver.xml

- For RHEL OS:

✓ https://docs.microsoft.com/en-us/azure/virtual-machines/workloads/redhat/redhat-rhui

- For Oracle Linux:

✓ https://yum.oracle.com

- For CentOS:

✓ http://vault.centos.org/centos/7.4.1708/extras/x86_64/

✓ https://forums.centos.org/viewtopic.php?t=70717

SAP on Windows – Deployment pre-requisites

- For SAP and MSSQL on Windows domain installation , AD Service account with local admin privileges on the target SAP VM needed, additionally following should in place.
  - Full Control on the OU in which SAP OS users , groups and objects are to be created, or
  - If AD objects already pre-staged or created then READ ALL to the OU in which the SAP OS users , groups and objects exists. If the IDs are created before hand , they must be part of all the necessary AD groups with t he groups and users' part of local machine user and group.

  For more details on users , groups and elevated privileges if domain admin cannot be granted , refer to > **Performing a Domain Installation Without Being a Domain Administrator** in the SAP Installation Guide for SAP on Windows

- For WSFC (windows cluster) creation through CB either service account with domain admin or an account with FULL control and READ all privilege in the OU in which the cluster computer objects are created.

- For WSFC (windows cluster) the service account provided should also have DNS READ & WRITE ACCESS.

- To pre-stage a cluster(if user does not have access to create computer objects) refer to > https://docs.microsoft.com/en-us/windows-server/failover-clustering/prestage-cluster-adds

- As per SAP , the user sapadm is recommended to be created as a LOCAL user. If requirement is to create sapadm as a domain user –
  - Create the new global group SAP_SAP_GlobalAdmin
  - Create the SAP system user sapadm
  - Add the user sapadm to the newly created group SAP_SAP_GlobalAdmin

- Hostname used for SAP Instances should be 13 character or less.

- For SAP on Windows Azure Netapp Files
  - When creating the Active Directory connection, make sure to enter SMB Server (Computer Account) Prefix no longer than 8 characters to avoid the 13 characters hostname limitation for SAP Applications (a suffix is automatically added to the SMB Computer Account name).
  - Create Active Directory connection, as described in Create an Active Directory connection. Make sure to add the user that will run SWPM to install the SAP system, as Administrators privilege user in the Active Directory connection. If you don't add the SAP installation user as Administrators privilege user in the Active Directory connection, SWPM will fail with permission errors, unless you run SWPM as user with elevated Domain Admin rights

  Reference > https://docs.microsoft.com/en-us/azure/virtual-machines/workloads/sap/high-availability-guide-windows-netapp-files-smb
  SAP Note – 3076635

- For SAP on Azure File Share

Refer to https:// https://docs.microsoft.com/en-us/azure/virtual-machines/workloads/sap/high-availability-guide-windows-azure-files-smb for all the details.

- SAP Notes for further reference
  - 2445952 - Correct user account authorization to run SWPM / 70SWPM on Microsoft Windows
  - 2515202 - A required privilege is not held by the client.
  - 3076635 - SAP installation on Azure with Netapp fails with permission denied - NetWeaver

Product Availability Matrix

Azure Platform

Azure Resources	Status
Network & other Foundation Elements*	Available
Compute	Available
Storage	Available
Windows HA with ANF	Available
SAP on AFS (Linux & Windows)	Available

OS/DB & HA patterns^

	Status	HA
HANA / SLES	Available	Available
HANA / RHEL	Available	Available
MS SQL / Windows	Available	Available
Sybase ASE / SLES	Available	Available
Sybase ASE / RHEL	Available	Available
Sybase ASE / Windows	Available	Available
Oracle / OEL	Available	Available
DB2	Available	Available
MaxDB / Win	Available	Not planned

*Note: List of foundation elements is available in Appendix
^Detailed list of SAP Golden Scenarios: Link

SAP

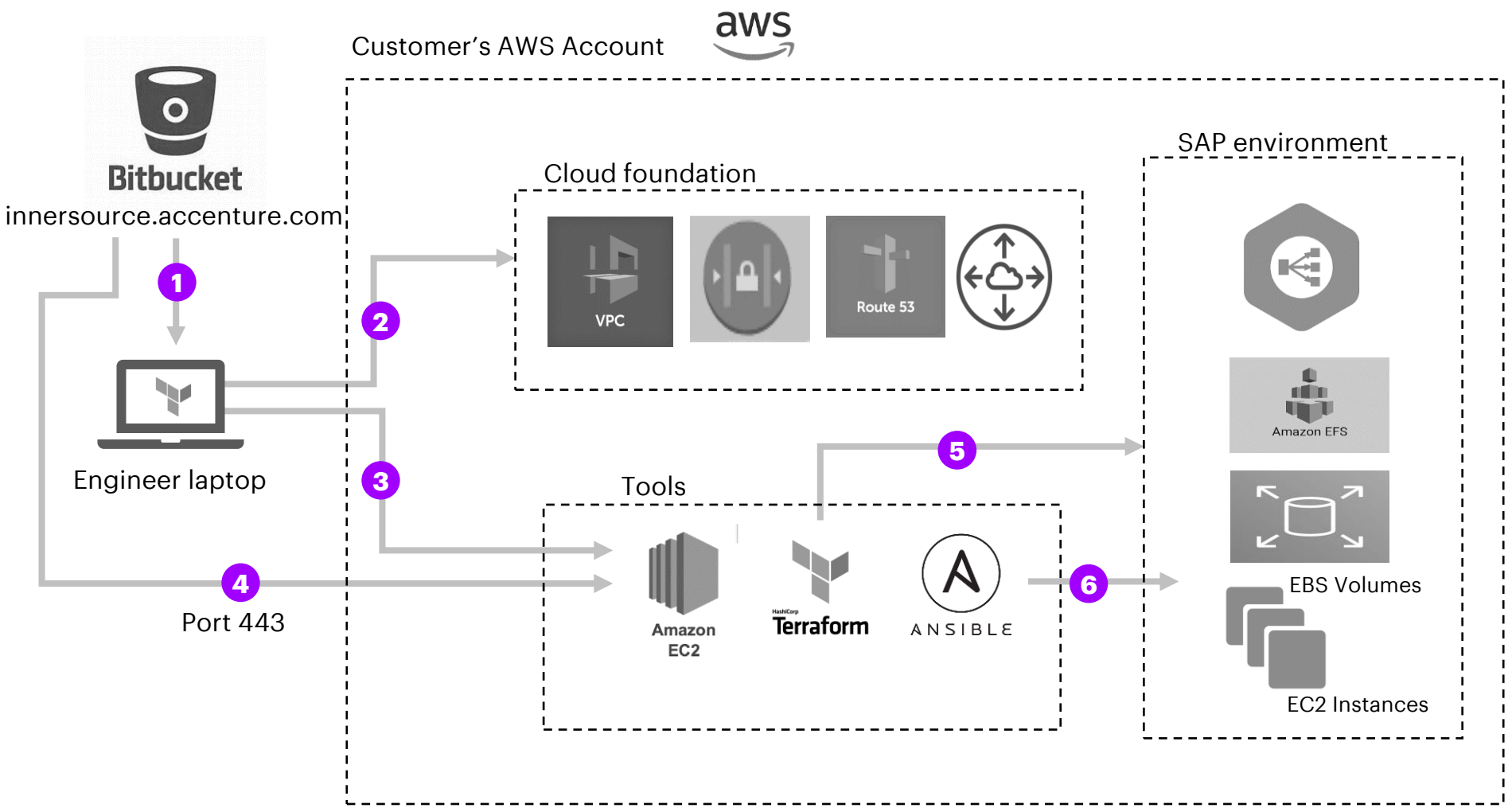
	Status
ABAP & J2EE based stacks	Available
BODS & BOBJ	Available
SAP Router	Available
Web Dispatcher	Available
Cloud Connector	Available
Content Server	Available
SCM Optimizer with Gateway	Available

Custom version requirements

- Cloud Builder has capabilities to accommodate specific SAP product version requirements
- Specifications should be provided by client delivery teams during design discussions

Cloud Builder
For AWS

Deployment Workflow



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6. Engineer runs Ansible from tools server for configuration & to deploy SAP software

*Note: resource types shown are indicative only

Deployment Prerequisites

Cloud Builder Requires the Following

- Access to customer's AWS Account – Programmatic access is recommended to provision any initial infrastructure on AWS. We can also provision these via a VM on which Cloud Builder is hosted
- Access to customer's AWS account – individual user access is also recommended in order to verify / troubleshoot any issues
- S3 bucket to be created in customer's AWS account or existing S3 bucket can be configured to store the terraform state files
- Server to host Cloud Builder to be created to provision infrastructure & implement OS level changes & install SAP in customer's AWS account. While Terraform can be run from engineer's laptop or server hosting Cloud Builder in AWS account, Ansible should be run from the Cloud Builder VM
- **Specifications for this server: OS – SLES or RHEL \t3.large\ 100Gb Disk +25GB Swap Space** (if not SLES or RHEL, UBUNTU can also be used)
- Depending on network topology, we may need VPC peering between the VPC hosting the server for Cloud Builder & VPC intended to host SAP systems
- Permissions required for instance hosting Cloud Builder : EC2 Full Access, S3 Full Access, IAM full access (custom policy for Overlay IP & STONITH will be created), EFS Full Access, KMS (if used), S3 Full Access (required for SAP target instances to download SAP media)
- Access to global/vendor OS repositories if customer repositories are not configured to download and install packages needed for SAP / DB deployments.
- Server hosting Cloud Builder should be able to connect with the target servers where SAP should be installed
- Permissions required for configuring OS & installing SAP should be available with the user connecting to the target servers. User (with sudo root permissions – password less authentication) is required for the tools server to perform configuration & SAP installation on the provisioned instances
- Access is required on the tools server to clone relevant code from Accenture **Innersource. *.innersource.Accenture.com*** url to be whitelisted in customer firewall. Public IPs to Innersource – **34.250.206.173 and 54.216.203.210**
- File transfer between client S3 bucket & Accenture Cloud Builder S3 bucket has to be configured. Cross account S3 bucket sharing has to be enabled
- If Terraform needs to be executed from the Tools server in a restricted network, following URLs must be whitelisted (**https://registry.terraform.io/,https://releases.hashicorp.com, https://*.terraform.io, http://ppa.launchpad.net/ansible/ansible/ubuntu**)
- If customer is providing EC2 instances, ssh communication has to be enabled between the tool server & target EC2 instances
- Ansible URL to be whitelisted **https://pypi.org**

Product Availability Matrix

AWS Platform

AWS Resources	Status
Network & other Foundation Elements*	Available
Compute	Available
Storage	Available

OS/DB & HA patterns^

	Status	HA
HANA / SLES	Available	Available
HANA / RHEL	Available	Available
MS SQL / Windows	Not Available	Not Available
Sybase ASE / SLES	Available	Available
Sybase ASE / RHEL	Available	Available
Oracle / OEL	Available	Available
DB2	Available	Available
MaxDB	Available	Not planned

SAP

	Status
ABAP & J2EE based stacks	Available
BODS & BOBJ	Available
SAP Router	Available
Web Dispatcher	Available
Cloud Connector	Available
Content Server	Available
SCM Optimizer with Gateway	Available

Custom version requirements

Cloud Builder has capabilities to accommodate specific SAP product version requirements

Specifications should be provided by client delivery teams during design discussions

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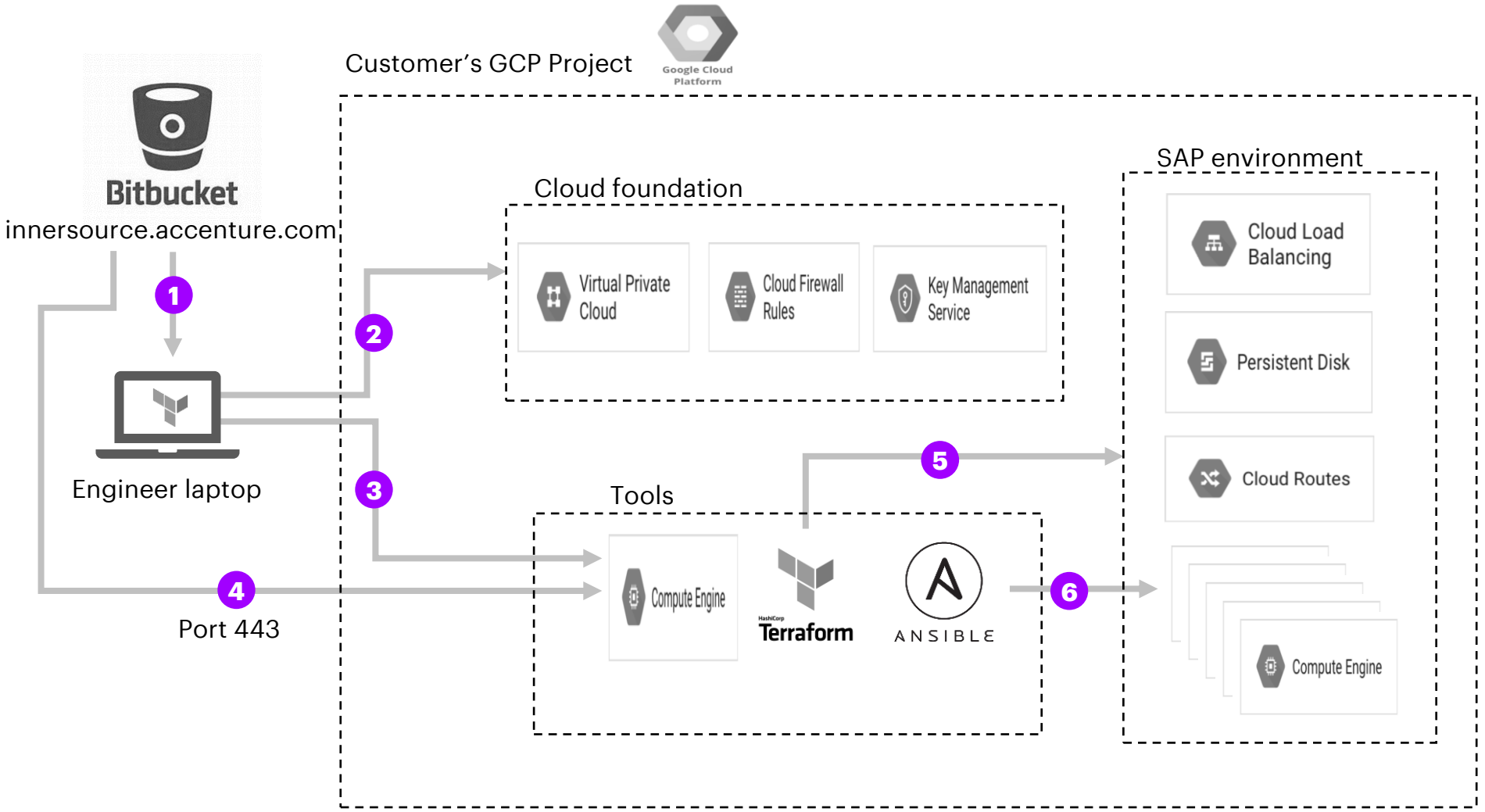
Cloud Builder

For GCP

Deployment Workflow



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Deployment Prerequisites

Cloud Builder Requires the Following

- Access to customer's GCP Account – Service Account Access is recommended to provision any initial infrastructure on GCP. We can also provision these via a VM on which Cloud Builder is hosted.
- Access to customer's GCP account – individual user access is also recommended in order to verify / troubleshoot any issues
- Cloud Storage to be created in customer's GCP account or existing Cloud Storage can be configured to store the terraform state files
- Server to host Cloud Builder to be created to provision infrastructure & implement OS level changes & install SAP in customer's GCP account. While Terraform can be run from engineer's laptop or server hosting Cloud Builder in GCP account, Ansible should be run from the Cloud Builder VM.
- **Specifications for this server: OS – SLES or RHEL \ n1-standard-4 \ 100Gb Disk + 25GB Swap Space** (if not SLES or RHEL , UBUNTU can also be used)
- Depending on network topology, we may need VPC peering between the VPC hosting the server for Cloud Builder & VPC intended to host SAP systems
- Permissions required for instance hosting Cloud Builder : Default or Customized Service Account (Credentials to be shared) . Service Account should have the following Access (Compute Engine Admin , Storage Admin). Storage Admin Access (required for SAP target instances to download SAP media)
- Server hosting Cloud Builder should be able to connect with the target servers where SAP should be installed
- Permissions required for configuring OS & installing SAP should be available with the user connecting to the target servers. User (with sudo root permissions – password less authentication) is required for the tools server to perform configuration & SAP installation on the provisioned instances
- Access is required on the tools server to clone relevant code from Accenture Innersource. *.innersource.Accenture.com* url to be whitelisted in customer firewall. Public IPs to Innersource – 34.250.206.173 and 54.216.203.210
- File transfer between client Cloud Storage & Accenture Cloud Builder Storage has to be configured. Cross project Storage sharing has to be enabled.
- If Terraform needs to be executed from the Tools server in a restricted network, following URLs must be whitelisted (https://registry.terraform.io/,https://releases.hashicorp.com)
- If customer is providing Compute instances, ssh communication has to be enabled between the tools server & target Compute instances

Product Availability Matrix

GCP Platform

GCP Resources	Status
Network & other Foundation Elements*	Available
Compute	Available
Storage	Available

OS/DB & HA patterns^

	Status	HA
HANA / SLES	Available	Available
HANA / RHEL	Available	Available
MS SQL / Windows	Available	NA
Sybase ASE / SLES	Available	Available
Sybase ASE / RHEL	Available	Available
Sybase ASE / Windows	Not Planned	Not Planned
DB2	Planned	Planned
MaxDB	Available	Not Planned

SAP

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Cloud Connector	Available
Content Server	Available

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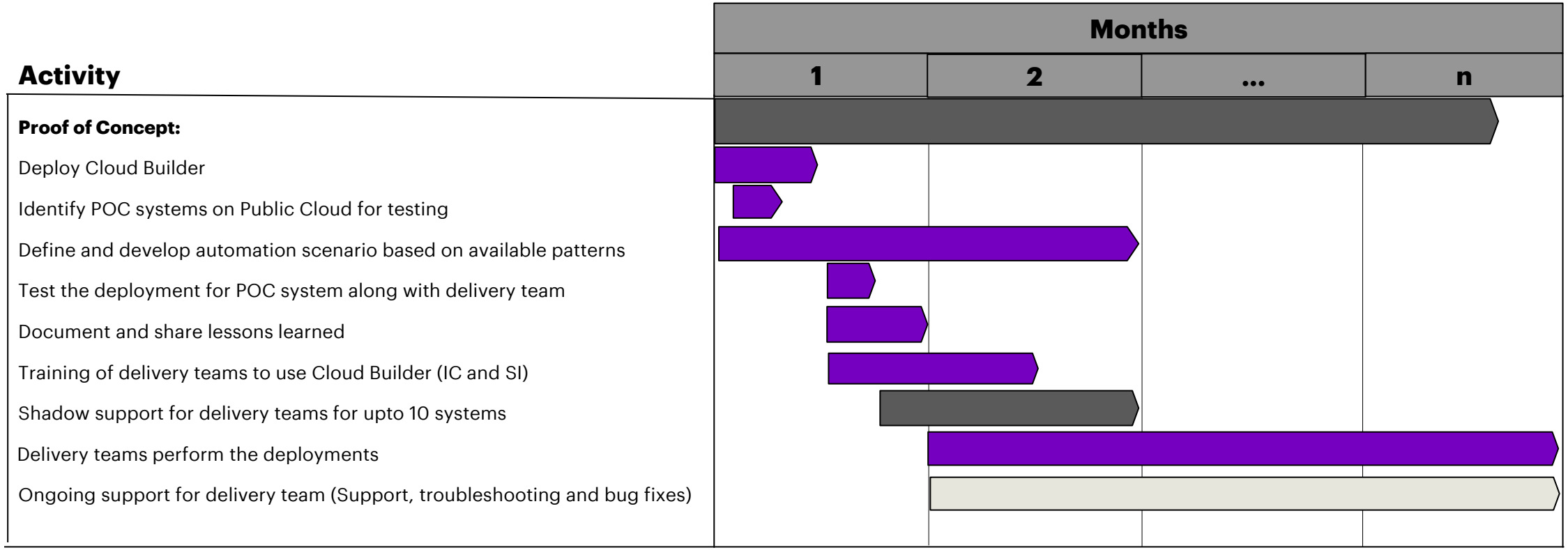
CLOUD BUILDER:
SAP BUILD AUTOMATION TIMELINE



THANK YOU