

6 Public Cloud Vendor Comparison

If a government decides to go with a public cloud setup then the next step is to determine which vendor to select. Vendors usually have multiple offerings, and it can be challenging to compare vendors. Comparisons are typically further complicated by different vendors using different terminology and units. It is recommended that, even if deciding to pursue a private cloud, governments still assess public cloud vendors to determine a baseline of offerings and service level agreements that they may wish to provide. In order to assist with any future comparisons governments may undertake, a vendor comparison can be found in this section for reference.

Azure and Amazon were chosen due to their breadth of services and geographic offerings. This report is not recommending one vendor over another, but only providing an example of a vendor assessment to provide guidance to governments on developing vendor requirements for their own vendor assessments.

Price is a key factor, especially as it can differ per region. Unlike private clouds, public clouds are not fully customizable. Pricing can vary depending upon the components and services provided by the public cloud service provider and also how the government utilizes those computing resources. A rough baseline for public cloud pricing can be found in the tables in this section.

At this time, there is no data center in Africa for Azure or Amazon, so it is recommended that African countries consider either using a data center on the European continent or a local cloud provider. If a local provider is selected, it is recommended the provider be assessed based on the general concepts and specific recommendations outlined in this report. Please be aware that actual pricing can vary based on utilization and contracting (i.e. predicted infrastructure usage, upfront payment, transaction volume, sizing, etc.).

The tables in this section are a representative list of various options and pricing for Amazon and Azure at a specific point in time, it is not comprehensive and further investigation should be done before selecting a provider. January 29, 2016

Key Differences – Azure and Amazon

Type	Amazon	Azure	Advantage
Availability	Amazon supports high availability across data centers	Azure supports high availability within a data center	Amazon
	Services such as load balancing, virtual network, and auto-scaling spans the region	Services such as load balancing, virtual network, and auto-scaling spans the region	

Cloud Readiness Toolkit Country Report

Type	Amazon	Azure	Advantage
Load Balancing	Supports load balancing based on IP address (layer 4) and application performance (layer 7) and provides metric-driven load balancing	Supports load balancing based on IP address (layer 4) and application performance (layer 7) and provides sophisticated load balancing policies	Tie
Virtual	Virtual Private Cloud (VPC) which supports Flow Logs which logs relevant traffic for storage and analysis	VNet to VNet (virtual network)	Amazon
Network	Direct Connect provides faster port speed than Azure however Amazon charges extra for a redundant port	Express Route has redundant ports by default	Azure
Auto Scaling	Has auto scaling provisions, terminates instances based on configured policies, and replaces unhealthy instances automatically	Automatically replaces unhealthy instance (service healing). Auto-scaling also supports both time and load-based scale up and scale down.	Tie
Compute	EC2 is billed by the hour	Virtual Machine is billed by the minute, but is slightly more expensive on average	Tie
Storage	Allows requestor to choose the input/output operation per second (IOPS)	Has more predefined IOPS level	Amazon
Security	Provides both server-side and client-side encryption options	Provides both server-side and client-side encryption options	Tie

Map of Major Data Centers – Azure and Amazon



Regional	Amazon	Azure
Asia & Pacific	Tokyo, Japan Beijing, China Singapore, Singapore Sydney, Australia India (Coming soon) Ningxia, China (Coming Soon) South Korea (Coming Soon)	Hong Kong, Hong Kong Singapore, Singapore Saitama, Japan Osaka, Japan Sydney, Australia Melbourne, Australia Pune, India Chennai, India Mumbai, India
Africa	None	None
Europe	Ireland Frankfurt, Germany	Dublin, Ireland Amsterdam, Netherland
North America	Northern Virginia, United States Oregon, United States Northern California, United States Ohio, United States (Coming Soon) Canada (Coming Soon)	Iowa, United States Virginia, United States Illinois, United States Texas, United States California, United States
South America	São Paulo, Brazil	São Paulo, Brazil

General Comparison

Category	Description	Amazon	Azure
Container Support	Container is an image that contains the complete file system in order to run software. It includes code, runtime, system tools, system libraries and all other components you can install on a server. This will allow environment and component consistency.	✓ EC2 Container Service	✓ Azure Container Service
Analytics (Big Data)	This feature will enable the processing and analysis of large amounts of data to reveal patterns, trends, associations, and other information readable by human.	✓ Elastic Map Reduce (EMR)	✓ - HDInsight (Hadoop) - Azure Data Lake
Compute Service	This service provides the computing power. It comes with different operating system and other services such as storage and network.	✓ - Elastic Compute Cloud (EC2) - Amazon Elastic Beanstalk	✓ - Virtual Machine - Cloud Service - Azure Websites and Apps
Desktop Service	This service provides virtual desktop service where you have your desktop computer in the cloud and access it via the internet.	✓ Amazon Workspace	✓ Azure RemoteApp
Hybrid Cloud Storage	This allows on premise applications to access storage which is located in the cloud system. It makes data growth management, data management, and backup (disaster recovery) easier.	✓ AWS Storage Gateway	✓ StorSimple
Load Balancing	A load balancer distributes network or application traffic across a number of servers. Load balancers are used to increase capacity (concurrent users) and reliability of applications.	✓ Elastic Load Balancing	✓ Azure Resource Manager (ARM)
Managed Deployment	This service automates code deployments, enabling you to deploy reliably and rapidly. The service allows you to launch and track the status of application deployments.	❓ AWS CodeDeploy	❓ Visual Studio Team Services

Operating System Comparison

Type	Amazon	Azure
Linux	CentOS 6.0+ / 7.0 Debian 8.0+ Red Hat Enterprise Linux 6.0+ / 7.0+ SUSE Linux Enterprise 11+ / 12+ Ubuntu 12.04 / 14.04 FreeBSD 9.0+ / 10.0+	CentOS 6.3+ / 7.0+ CoreOS 494.4.0+ Debian 7.9+ / 8.2+ Oracle Linux 6.4+ / 7.0+ Red Hat Enterprise Linux 6.7+ / 7.1+ SUSE Linux Enterprise 11 SP3+ / 12+ Open SUSE 13.1+ Ubuntu 12.04 / 14.04 / 15.04 / 15.10
Windows	Windows 2003 R2 Windows 2008 R2 Windows 2008 Windows 2012 Windows 2012 R2	Windows 2008 R2 Windows 2012 R2
Virtual Desktop	Windows 7 with MS Office, Trend Micro and utility bundles	Not Supported

Network Comparison

Type	Amazon	Azure	Remark
Virtual Network	Amazon Virtual Private Cloud (VPC)	Virtual Network	This service enables you to establish a private network (closed and security enhanced). This network is logically (rather than physically) isolated from other networks.
Direct Connection	AWS Direct Connection	Express Route	This service enables you to directly connect to the cloud directly from your premises (office or data center) over vLAN which means you can control bandwidth throughput, and keep a more reliable connection than internet-based connections.
DNS	Amazon Route 53	Azure DNS	Domain Name Server (DNS) is used to translate domain names to IP address (like yellow pages). This feature enables users to quickly access applications and infrastructure in the cloud.

Database Comparison

Type	Amazon	Azure	Remark
Relational Database	Amazon Relational Database Service (RDS)	Azure SQL Database	Both Amazon and Azure provide Database as a Service (DaaS) options. Amazon provides more database options as part of their DaaS.
NoSQL Database	DynamoDB MongoDB	DocumentDB MongoDB	NoSQL databases do not use tabular relationships to organize data and are mostly used to store large amounts of unstructured data.
Data Warehousing	Amazon Redshift	Azure SQL Data Warehouse	Data warehousing is used to run data analysis and produce reports. It stores current and historical data.

Operating System Pricing Comparison – Azure and Amazon

Data Center Location	Amazon – Linux	Azure - Linux	Amazon - Windows	Azure - Windows
Japan	\$0.08	\$0.11	\$0.10	\$0.158
Australia	\$0.08	\$0.116	\$0.10	\$0.186
Singapore	\$0.08	\$0.116	\$0.10	\$0.174
EU Region #1 – Ireland	\$0.056	\$0.094	\$0.076	\$0.15
EU Region #2 - Varies	\$0.06	\$0.102	\$0.08	\$0.162
Brazil	\$0.108	\$0.116	\$0.128	\$0.178
US West	\$0.052	\$0.094	\$0.072	\$0.154
US East	\$0.052	\$0.088	\$0.072	\$0.148

- Amazon EU Region #2 - Frankfurt
- Amazon - 2 vCPU / 4GB RAM
- Azure EU Region #2 – Netherland
- Azure - 2 cores / 3.5GB RAM

Storage Pricing Comparison – Azure and Amazon

Data Center Location	Amazon - Storage (500TB)	Azure - Storage (500TB)
Japan	\$0.0313 per GB	\$0.0228 per GB
Australia	\$0.0313 per GB	\$0.0251 per GB
Singapore	\$0.0285 per GB	\$0.0228 per GB
EU Region #1 - Ireland	\$0.0285 per GB	\$0.0228 per GB
EU Region #2 - Varies	\$0.0308 per GB	\$0.0228 per GB
Brazil	\$0.0387 per GB	\$0.0309 per GB
US West	\$0.0285 per GB	\$0.0228 per GB
US East	\$0.0285 per GB	\$0.0228 per GB

This table compares S3 storage on Amazon and Locally Redundant Storage (LRS) on Azure

- Azure EU Region #2 – Netherland
- Amazon EU Region #2 – Frankfurt

Network (traffic) Pricing Comparison – Azure and Amazon

Traffic	Amazon – DNS Query	Azure – DNS Query
First One Billion Queries / month	\$0.700 per million queries	\$0.540 per million queries
Over One Billion Queries / month	\$0.350 per million queries	\$0.375 per million queries

Traffic	Amazon – Health Check	Azure – Health Check
Internal	\$0.50 per health check / month	\$0.36 per health check / month
External	\$0.75 per health check / month	\$0.54 per health check / month

Health check is a process by which network traffic is sent to check if an instance or node is active. This is required in order to setup load balancing and high availability.

Data Center Location	Amazon – Gateway	Azure - Gateway
Japan	\$0.062 per hour	\$0.036 per hour
Australia	\$0.059 per hour	\$0.036 per hour
Singapore	\$0.059 per hour	\$0.036 per hour
EU Region #1 - Ireland	\$0.048 per hour	\$0.036 per hour
EU Region #2 - Varies	\$0.052 per hour	\$0.036 per hour
Brazil	N/A	\$0.036 per hour
US West	\$0.045 per hour	\$0.036 per hour
US East	\$0.045 per hour	\$0.036 per hour

A gateway is a network point that acts as an entrance to another network. It enables the end users to access the system over the internet or enable a hybrid cloud system. This table compares a NAT Gateway in a VPC on Amazon and basic VPN or ExpressRoute Gateway on Azure.