Introducing the Microsoft Azure Stack Development Kit on Lenovo Servers

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Introduces the Lenovo offering for Microsoft Azure Stack

Describes implementation using Azure Stack Development Kit (ASDK)

Includes a sample configuration for implementing a single-node Proof-of-Concept (PoC)

Provides guidelines and recommendations for use when implementing an Azure Stack PoC

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Abstract

Microsoft Azure Stack brings the Azure Public Cloud experience into the customer's data center. Azure Stack is a multi-node hyper-converged hybrid cloud solution which was released in September 2017 as an integrated appliance from Lenovo®. In addition, the Azure Stack Development Kit (ASDK) is available for customers to run PoC on a single node.

This paper is a guide for IT consultants that want a head start on Microsoft Azure Stack experience. It provides a sample Bill of Materials (BOM) based on ThinkSystem SR650 and System x3650 M5 and for Azure Stack single node ASDK implementation. The paper also provides guidance and important things to note during the implementation process.

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Introduction

Microsoft Azure Stack is a new hybrid cloud platform product that enables organizations to deliver and consume Azure services from their own data center. Lenovo ThinkAgile™ for Microsoft Azure Stack is an integrated, turnkey, hybrid cloud solution optimized with resilient, high performing, and secure software-defined infrastructure. It's a great platform to

- ► Consume and deliver Azure cloud services from the security of your own data center
- ► Enable rapid development and iteration of apps with on premise deployment tools to help transform your organization
- ► Unify app development across the hybrid cloud environment
- ► Easily move apps and data across private and public clouds

Microsoft Azure Stack software provides a subset of Azure cloud services, and is deployed on the SR650 and x3650 M5 nodes in a hyper-converged, clustered configuration engineered for high stability, resiliency, and performance. Azure Stack enables consistent cloud services across the private cloud within organizations, hosted public clouds provided by service providers, and the Azure public cloud provided by Microsoft.

The Lenovo Azure Stack solution is based on Windows Server 2016 technologies, and developed after more than a year of co-engineering effort between Lenovo and Microsoft solutions architects and engineers. It is an integrated solution with Lenovo provided hardware components and Microsoft providing software components to allow developers to build cloud born applications that can run in their data centers and in Azure public cloud seamlessly.

The Lenovo Azure Stack solution allows customers to develop once and deploy in multiple scenarios. With Azure Stack, IT staff can maximize agility and efficiency by transforming on-premises data center resources into Azure-consistent IaaS and PaaS services.

Azure Stack Development Kit

Lenovo ThinkAgile for Microsoft Azure Stack integrated solution is now available from Lenovo. For customers that want to get Azure Stack experience before making the investment on a multi-node solution, there is a PoC version of software available today to try, called the Azure Stack Development Kit.

Microsoft has good information on the ASDK at:

https://docs.microsoft.com/en-us/azure/azure-stack/azure-stack-poc

The content on this web page walks you through the prerequisites for deploying ASDK, provides you the ASDK software to download and provides PowerShell scripts to automate the deployment.

Once the deployment is complete, the website also lists instructions on how to make use of Azure Stack software to provide services for tenants and consume and manage resources.

Hardware requirements

The Azure Stack Development Kit software is for single-node development and test environments, and is not intended for production use.

Minimum and recommended hardware requirements for this single-node ASDK are defined on the Microsoft website listed above and are summarized in Table 1.

Table 1   Hardware requirements

Component	Minimum	Recommended
Disk drives: Operating System	1 OS disk with minimum of 200 GB available for system partition (SSD or HDD)	1 OS disk with minimum of 200 GB available for system partition (SSD or HDD)
Disk drives: General Azure Stack ASDK Data	4 disks. Each disk provides a minimum of 140 GB of capacity (SSD or HDD). All available disks will be used.	4 disks. Each disk provides a minimum of 250 GB of capacity (SSD or HDD). All available disks will be used.
Compute: CPU	Dual-Socket: 12 Physical Cores (total)	Dual-Socket: 16 Physical Cores (total)
Compute: Memory	96 GB RAM	128 GB RAM
Compute: BIOS	Hyper-V Enabled (with SLAT support)	Hyper-V Enabled (with SLAT support)
Network: NIC	Windows Server 2012 R2 Certification required for NIC; no specialized features required	Windows Server 2012 R2 Certification required for NIC; no specialized features required
HW logo certification	Certified for Windows Server 2012 R2	Certified for Windows Server 2012 R2

Recommended configuration

Lenovo recommends using a ThinkSystem SR650 or System x3650 M5 server with the specifications as listed below to deploy ASDK. Lenovo ThinkAgile for Microsoft Azure Stack solution will be built with at least four nodes so it would be good to use same servers for single-node ASDK.

The ASDK servers are not upgradeable to multi-node Azure Stack offering.

The reason being that the Azure Stack solution will be delivered as an Integrated multi-node solution in a rack from Lenovo with anywhere from four to twelve servers, a management server and three switches.

If you would like to order the configurations listed below (SR650 - Table 2 or x3650 M5 - Table 3 on page 5), please work with your Lenovo representative.

Table 2   Lenovo Bill of Materials (BOM) for Azure Stack single node ASDK - ThinkSystem SR650

Product	Description	Quantity
7X06CTO1	Server1 : ThinkSystem SR650 - 3yr Warranty	1
AUVW	ThinkSystem SR650 3.5" Chassis with 8 or 12 bays	1
AWEE	Intel Xeon Silver 4110 8C 85W 2.1GHz Processor	2
AUNB	ThinkSystem 16GB TruDDR4 2666 MHz (1Rx4 1.2V) RDIMM	8
AUR6	ThinkSystem SR650/SR550/SR590 3.5" SATA/SAS 8-Bay Backplane	1

Product	Description	Quantity
AUNL	ThinkSystem 430-8i SAS/SATA 12Gb HBA	1
AUMV	ThinkSystem M.2 with Mirroring Enablement Kit	1
AURC	ThinkSystem SR550/SR590/SR650 (x16/x8)/(x16/x16) PCIe FH Riser 2 Kit	1
AUKG	ThinkSystem 1Gb 2-port RJ45 LOM	1
AUAJ	Mellanox ConnectX-4 Lx 2x25GbE SFP28 Adapter	1
AUPW	ThinkSystem XClarity Controller Standard to Enterprise Upgrade	1
AXCA	ThinkSystem Toolless Slide Rail	1
AURD	ThinkSystem 2U left EIA Latch Standard	1
AVWC	ThinkSystem 550W(230V/115V) Platinum Hot-Swap Power Supply	2
6311	2.8m, 10A/100-250V, C13 to C14 Jumper Cord	2
B0Z4	ThinkSystem 3.5" Intel S4500 480GB Entry SATA 6Gb Hot Swap SSD	6
AUUV	ThinkSystem M.2 CV3 128GB SATA 6Gbps Non-Hot Swap SSD	2
3798	3m Green Cat5e Cable	2
AURP	Lenovo ThinkSystem 2U 2FH Riser BKT	1
AUS1	Lenovo ThinkSystem 2U OP Panel Cage for 8x3.5"Config	1
AUQB	Lenovo ThinkSystem Mainstream MB - 2U	1
AURH	ThinkSystem SR550/SR650/SR590 Right EIA Latch Standard	1

Table 3   Lenovo Bill of Materials (BOM) for Azure Stack single node ASDK - System x3650 M5

Product	Description	Quantity
8871-AC1	AS_1node_ASDK: Lenovo System x3650 M5	1
ATDY	2.5" Flexible Base (up to 24x 2.5") w/o Power Supply	1
ATEL	Intel Xeon Processor E5-2620 v4 8C 2.1GHz 20MB Cache 2133MHz 85W	1
ATFB	Additional Intel Xeon Processor E5-2620 v4 8C 2.1GHz 20MB 2133MHz 85W	1
ATC8	8GB TruDDR4™ Memory (1Rx4, 1.2V) PC4-19200 CL17 2400MHz LP RDIMM	16
A5G6	x3650 M5 8x 2.5" HS HDD Assembly Kit (Single RAID)	1
A3YY	N2215 SAS/SATA HBA	1
AT89	300GB 10K 12Gbps SAS 2.5" G3HS HDD	5
3797	1.5m Green Cat5e Cable	1
802	1.5m Blue Cat5e Cable	1
A5EU	System x® 750W High Efficiency Platinum AC Power Supply	1

Product	Description	Quantity
6311	2.8m, 10A/100-250V, C13 to IEC 320-C14 Rack Power Cable	1
AUK7	Windows Server 2016 Configuration (TPM 2.0 and Secure Boot)	1

Notes about the Bill of Materials:

► There is flexibility with the processor if there are at least 16 cores available.

► The above memory configuration will give you 16x8=128 GB memory as recommended above.

► The OS can be loaded on a single 300GB disk.

► The x3650 M5 servers supports two RAID adapters M1215 and M5120 and a non-RAID adapter or a simple HBA, the N2215. N2215 is recommended to connect to the data disks. If the disks are connected to a RAID adapter information about device location and power control is not available to the operating system.

► 4x 300GB disks will be used for Azure Stack ASDK data.

► This configuration is the listing the basic configuration. If would like higher performance, recommendation is to use higher SKU processors, more memory and SSDs.

► If you plan to test more than 1 or 2 VMs, then more memory and disk space is required.

Getting started

To get started with the ASDK, Lenovo recommends installing Windows Server 2012 R2 or Windows Server 2016 standard edition on the server.

Once the OS installed, you can use the Deployment Checker for Azure Stack Technical Preview 2 provided by Microsoft to confirm that your hardware meets all the requirements. The Deployment Checker is available from:

https://gallery.technet.microsoft.com/Deployment-Checker-for-50e0f51b

The ASDK server needs to have a connection to the internet and should be able to connect to public Azure. A Microsoft Azure Active Directory (AAD) account needs to be created.

Under your Microsoft Azure account, create a new Active Directory listing and under this Active Directory, create a global administration account with a valid password. This account has the following form <UserName>@<YourActiveDirectoryName>.onmicrosoft.com and will be used later during deployment.

Additional instructions for creating the AAD account are listed on the Microsoft Azure website:

https://azure.microsoft.com/en-us/free/

Notes:

► Other Microsoft accounts such as Hotmail or Outlook accounts will not work to deploy Azure Stack Development Kit.

► There should be only one connection to the Internet from the server. If there are more than one connection, deployment will fail. On the Lenovo x3650 M5 servers, make sure to disable all but one network connections under **Control Panel** → **Network and Internet** → **Network Connections**.

Installing Azure Stack ASDK

At this point, you are ready to download the deployment package and run the deployment PowerShell script according to instructions from this web page:

https://docs.microsoft.com/en-us/azure/azure-stack/azure-stack-run-powershell-script

Physically or through a remote session, sign into your ASDK Host as Administrator. Open a browser with the link above to follow along with the instructions. There are three steps to follow for installing the ASDK.

Step 1. Download the deployment package

1. Go to the above link and enter your information as requested to get the download link. You will then be able to download the file AzureStackDownloader.exe.

2. Create a download directory C:\ASDKDownload\ for the download of the Azure Stack Development Kit.

3. Now start AzureStackDownloader.exe. Select to download the optional Windows Server 2016 Evaluation ISO and choose the download directory you created above and click on the Download link to begin downloading the ASDK. Depending on your internet speed, this could take some time.

4. When the download is completed, select the **Run** button to begin the self-extractor process. Choose the defaults as you click **Next** to go through the dialogs to start the extractor.

5. When the extract process completes, click **Done** then click **Quit**. The CloudBuilder.vhdx is now in the subfolder C:\ASDKDownload\Azure Stack Development Kit\

6. Copy CloudBuilder.vhdx to C:\

Step 2. Prepare the Cloudbuilder.vhdx

1. Open an elevated PowerShell console as Administrator and run a script to download askd-installer.ps1

2. Copy the PowerShell commands in Figure 1 on page 7 and paste them into the PowerShell console:

```
$Uri = 'https://raw.githubusercontent.com/Azure/AzureStack-Tools/master/Deployment/asdk-installer.ps1'
$LocalPath = 'c:\AzureStack_Installer'
New-Item $LocalPath -Type directory
Invoke-WebRequest $uri -OutFile ($LocalPath + '\' + 'asdk-installer.ps1')
CD C:\AzureStack_Installer
.\asdk-installer.ps1
```

Figure 1   PowerShell commands

3. The asdk-installer.ps1 will open a window that is the ASDK Installer user interface

4. Click the **Prepare Environment** button.

5. Click **Browse** and select C:\CloudBuilder.vhdx

6. If you are installing additional drivers check the box for that and select the folder with your drivers

7. Click the **Next** button to advance to Optional Settings and enter the details

8. DHCP is default, but if you must use a Static IP then tick that box and enter you static IP information then click **Next**

9. The installer will now prepare the environment.

10. When the process is complete, click **Next** then click **Reboot now**.

11. After server reboot, you will be logging in to the CloudBuilder.vhdx Windows Server 2016 Datacenter, in which you will install Azure Stack.

12. Install any needed drivers for NIC and SAS HBA, and run UpdateXpress to install the remaining drivers.

Rerunning the installer

At any point during the install, or even after a successful deployment, if you want to start the installation again, follow these steps:

1. Connect to the server using a remote KVM session (where you can see the Windows boot menu) or be physically at the host

2. Reboot the server.

3. When you see the Windows Boot menu, select your original Windows Server install instead of the default Azure Stack.

4. Once in your original Windows Server installation, unmount any extra drives and delete C:\CloudBuilder.vhdx.

5. Copy in a new C:\CloudBuilder.vhdx file from C:\ASDKDownload\Azure Stack Development Kit\

6. Follow the above steps beginning with Step 2 on page 7 to execute PowerShell script asdk-installer.ps1.

Step 3. Deploy the development kit

1. The ASDK Host has now rebooted and you must sign in with the credentials you entered in the ASDK Installer UI in the previous step.

2. Right-click on the network connection icon in the bottom right of the task bar and click **Open Network and Sharing Center**.

3. On the left side of the Network and Sharing Center window click **Change adapter settings**.

4. On every network device except for the one that has Internet access, right click each icon and select **Disable**. You should have only 1 active network device. All others should be Disabled, even if no cable is connected.

5. Close the two networking windows.

6. Open File Explorer and in the left side select **This PC**. You will see that in addition to the drives you originally created for this server, there are 2 new drives. A new C:\ that is the CloudBuilder.vhdx and another drive for EFI boot drive used by it. Your existing drives will be changed to lower drive letters D:, E:, F:, etc. Do not make any changes to CloudBuilder.vhdx or any file on your original boot drive.

7. Close File Explorer.

8. Open a PowerShell console as an Administrator (right click).

9. Change to the folder on your original drive that has asdk-installer.ps1 and run it. The drive was changed to D: or E:, so it might be D:\AzureStack_Installer\

    ```
    CD D:\AzureStack_Installer
    .\asdk-installer.ps1
    ```

10. From the Installer UI click the **Install** button.

11. For Type select **Azure Cloud** to connect to public Azure. Don't choose ADFS option, as it requires different configuration steps.

   When you select Azure Cloud, in the next box you must put your Azure Active Directory domain where you have Administrator permissions. It will be of the form `myasdkdomain.onmicrosoft.com`. You can find this by logging into `https://portal.azure.com` and hovering your mouse over the upper-right avatar picture and look for domain.

12. Enter the server login password for the local Administrator and click **Next**.

13. Select the network interface that is connected and click **Next**.

14. Enter the network IP information and click **Next**.

15. If you see the message, `An update cannot be downloaded`, follow the instructions on the page.

16. The UI will configure the settings. Click **Next**.

17. Click the **Deploy** button.

18. If you selected Azure Cloud in step 11, you will be asked for credentials in the first few minutes.

   > **Tip:** Credentials must be an Azure AD Global Admin level account, with user name in AAD format such as `username@domainname.onmicrosoft.com`. Create one if needed. Use of a standard Microsoft account attached to Azure such as `user@hotmail.com` will fail.

19. The deploy will begin. The script will take several hours to run. The sever will reboot once during this process.

20. After the reboot, if you would like to monitor the deployment progress, log in to the server as azurestack\AzureStackAdmin.

21. Once you see a message in PowerShell window saying `COMPLETE: Action 'Deployment'`, it means the deployment completed successfully.

   If you run into errors during deployment, you can either start the deployment again with `.\asdk-instller.ps1 -rerun`

   If that fails also, redeploy from scratch as described in "Rerunning the installer" on page 8

Step 4. Reset password expiration

To make sure that the password for the development kit host doesn't expire too soon, follow these steps after you deploy:

1. On the development kit host, open Group Policy Management and navigate to **Group Policy Management** → **Forest: azurestack.local** → **Domains** → **azurestack.local**.

2. Right click on **Default Domain Policy** and click **Edit**.

3. In the Group Policy Management Editor, navigate to **Computer Configuration** → **Policies** → **Windows Settings** → **Security Settings** → **Account Policies** → **Password Policy**.

4. In the right pane, double-click **Maximum password age**.

5. In the dialog box, change the Password will expire in value to **180**, then click **OK**.

Step 5. Install Azure PowerShell

1. Run these PowerShell commands to install Azure PowerShell:

```
Install-Module -Name AzureRm.BootStrapper
Use-AzureRmProfile -Profile 2017-03-09-profile -Force
Install-Module -Name AzureStack -RequiredVersion 1.2.10
```

Figure 2   PowerShell commands

2. You will be prompted to answer `A` for Yes to All for each command.

Step 6. Register Azure Stack

In this step, you enter your registration information.

1. Before registering Azure Stack, you must register the Azure Resource Provider by following the steps provided at:

   https://docs.microsoft.com/en-us/azure/azure-stack/azure-stack-register

2. Download the Azure Registration Script from here:

   https://go.microsoft.com/fwlink/?linkid=842959

3. Save the Azure Registration Script to C:\temp

4. Log in to your account at https://portal.azure.com.

5. In the bottom-left corner of the browser select **More Services** → **Subscriptions**.

6. Click the subscription you want to use. The Essentials window may already be open, but if not open it to show your subscription information.

7. In a PowerShell window, enter the following two commands, where where *path* is the full path to the Registerwithazure.psm1 file, and xxxx-xxxx is your subscription number:

```
Import-module path\Registerwithazure.psm1

Add-AzsRegistration -CloudAdminCredential "azurestack\azurestackadmin"
-AzureDirectoryTenantName "yourdomain.onmicrosoft.com" -AzureSubscriptionId
"xxxxxx-xxxx-xxxx-xxxx-xxxxxxx" -PrivilegedEndpoint AzS-ERCS01 -BillingModel
Development
```

Figure 3   PowerShell command to register Azure Stack

8. You will be prompted for your Azure credentials as well as prompted to press Enter twice as the script runs.

Next steps

Once the deployment is complete, you can connect to Azure Stack by clicking the portal icon on desktop or opening a browser and navigating to this URL:

https://adminportal.local.azurestack.external/

When you are connected, you can validate that the Registration was successful by clicking **More Services** → **Marketplace Management** → **Add from Azure**. If you see a list of items available from Azure (such as WordPress), your activation was successful.

Now you can performance tasks like creating and deploying a virtual machine, creating and managing storage accounts, creating plans and offers for tenants, offer services to tenants, plan and manage storage and networking resources, etc.

For details about these tasks, see the following web page:

https://docs.microsoft.com/en-us/azure/azure-stack/azure-stack-first-scenarios

Resources

The following web pages are relevant to the topic presented in this paper:

► Microsoft Azure Stack single node ASDK:

https://docs.microsoft.com/en-us/azure/azure-stack/azure-stack-poc

► Lenovo System x3650 M5 product guide:

https://lenovopress.com/lp0068-lenovo-system-x3650-m5-machine-type-8871

► Lenovo Azure Stack solution:

https://lenovopress.com/lp0603-lenovo-thinkagile-sx-for-microsoft-azure-stack

Change history

April 16, 2018:

► Minor corrections to steps in Step 3. Deploy the development kit

November 8, 2017:

► Corrections to the installation and registration steps
► Added ThinkSystem SR650 bill of materials

October 29, 2017:

► Updated the Microsoft ASDK URL

October 24, 2017:

► Updated the paper to reflect that Microsoft Azure Stack is now generally available
► Added comprehensive instructions on how to install Azure Stack ASDK, "Installing Azure Stack ASDK" on page 7

Authors

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