Azure arm virtual machines, nested loops, winRM and custom extensions

What is Azure Resource Manager, ARM?

Arm is Microsoft Azure's managed automation hosting service. Arm enables an automation designer to define their design intent, expressed as resource specifications using arm's declarative, template automation language.

Arm requires designers to express their design intent:

- a) As the selection, implementation, deployment and provision of computing resource objects, together with
- b) The assembly sequence of those computing resource objects, that is the assembly of compute, storage, and network resource objects.

Arm provides a mapping from compute, network or storage resource specifications to resource objects rendered by arm onto a resource object canvas, located in the automation owner's azure subscription namespace, visible through azure's secured resource management portal.

When is this automation used?

This automation is used when an automation designer intends to implement, install, and provision one or more virtual machine assemblies.

This design extends the automation described in the previous article

https://dzone.com/articles/arm-azure-resource-manager-templates-nested-loops to include the installation of 1 to n virtual machine assemblies, and to provision winRM, initialize data disks, and configure an application log on each virtual machine. A virtual machine is assembled from a collection of resource objects: compute e.g. vm; storage e.g. data managed disks, and; network e.g. network interface card and public ip address.

Design: virtual machine assemblies requirements

The automation's design requirements are:

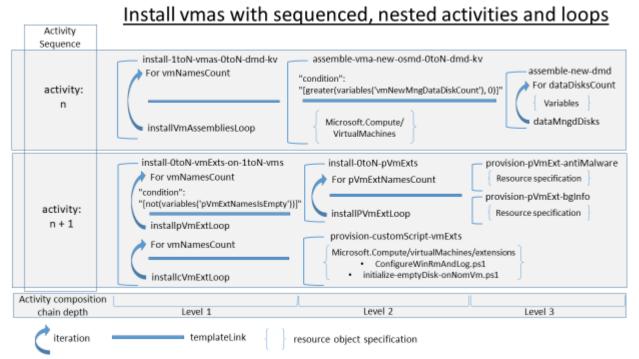
- Install two virtual machine assemblies.
- Attach two managed disks for data to each virtual machine.
- Retrieve virtual machine administrator password from a secure location, i.e. key vault.
- Use existing public ip (pip) address resource objects.
- Use existing network interface card (nic) resource objects.
- Attach nic to existing subnet and vnet.
- Provision each virtual machine with winRM.
- Provision each virtual machine with a windows event viewer application log.
- Initialize each virtual machine's data managed disks.
- Use a secure private storage location to store nested templates and custom script virtual machine extensions, i.e. not a public repo.

Design: activity composition

This design uses sequenced activities and a similar collection of loops and nested activities to that used by the automation described in a previous article. For details of activity composition and the nested control mechanism see that article.

This design uses two sequenced activities -- activity n and n+1, each having an activity composition chain three levels deep -- to install a virtual machine assembly, provision winRM, initialize data managed disks, and add the application log.

[fig1]



Design: activity n, install vm assemblies

Activity n, install-1toN-vmas-0toN-dmd-kv, installs the virtual machine assemblies. The number of virtual machine assemblies installed is determined using the copy loop count vmNamesCount, at level 1 in the activity composition chain.

The level 2 and 3 activities, assemble-vma-new-osmd-0toN-dmd-kv and assemble-new-dmd, are repeated for each virtual machine assembly using the copy statement in level 1.

The level 2 activity has two resource specifications. The first, a link to the level 3 activity, assemble-new-dmd, which is the resource specification for the two managed disks used for virtual machine for data storage.

The second resource specification assembles and installs a virtual machine resource object using the resource objects e.g. the nic, pip, disks, vm, named in the virtual machine resource specification.

The admin password for each virtual machine – this design uses the same password -- is stored in the key vault and retrieved by arm when the virtual machine resource object is rendered. For implementation details see the below, for activity n.

Design: activity n+1, install vm extensions

Activity n + 1, install-0toN-vmExts-on-1toN-vms, provisions proprietary e.g. bgInfo and custom virtual machine extensions e.g. ConfigureWinRmAndLog on each installed virtual machine.

Arm uses the Microsoft.Compute/virtualMachines/extensions resource object, and naming conventions, to provision both proprietary and custom virtual machine extensions.

This design uses separate resources to provision proprietary and custom script extensions. The activity install-0toN-pVmExts provisions the proprietary bgInfo and antiMalware extensions. And the activity provision-customScript-vmExts provisions the custom script ConfigureWinRmAndLog.ps1 extension.

For the installation of proprietary custom scripts see previous article.

Arm enables only one custom script virtual machine extension to be installed on a virtual machine. When virtual machine provisioning requires multiple scripts either the scripts are chained, as is done below to initialize empty disks, or the first custom script extension must be removed from the virtual machine and a new extension resource object installed.

The custom script ConfigureWinRmAndLog.ps1 installs the application log, configures winRM, and then chains to the script, initialize-emptyDisk-onNomVm.ps1, to initialize the data managed disks on the nominated virtual machine.

Design: resource groups and secure private storage

Arm requires designers to group resource objects in resource group objects. Arm's guidance to designers is to group resource objects with similar lifecycles in the same resource group object, see: <u>https://docs.microsoft.com/en-us/azure/azure-resource-manager/manage-resource-groups-portal#what-is-a-resource-group</u>

This design has two resource groups:

- tpt-algoR-ops-rg, to group resource objects with long stable lifecycles, for example the automation's, key vault tpt-algoRigs-kv, and operations storage account tptalgorigsops10strgacc. The blob collection container, prjtplatesandscripts, used as the private store for automation templates and scripts, is located in the operations storage account.
- 2. tpt-algoR-vms-rg, to group components for virtual machine assemblies. The component resource objects for each virtual machine assembly are a network interface card, a public ip address, two data managed disks, a virtual machine os managed disk.

For the structure of the operations storage resource group see the implementation description below.

The resource specifications for nested activity levels 2 and 3 are implemented using azure's external template syntax described here:

https://docs.microsoft.com/en-us/azure/azure-resource-manager/resource-group-linkedtemplates#external-template-and-external-parameters

The templates are located in the private storage account tptalgorigsops10strgacc, blobs collection prjtplatesandscripts. A private storage account is secured by a shared access signature, also known as a sas token.

When arm renders virtual machine assembly resource objects, a sas token is used to access the task templates at the secure private storage location. For details see, implementation activity n, below.

Implementation: activity n, install vm assemblies

Activity n, implemented by task template install-1toN-vmas-0toN-dmd-kv.json, installs each virtual machine assembly.

The admin password for each virtual machine is retrieved by arm, from the key vault resource object tpt-algoRigs-kv, and passed from the level 1 template install-1toN-vmas-0toN-dmd-kv.json as a secure string argument into the level 2 template, assemble-vma-new-osmd-0toN-dmd-kv.json.

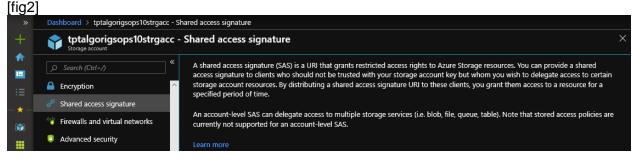
A task template implementing an activity runs 'in' a resource group object, as a consequence a reference to a resource object e.g. a key vault, located in a different resource group e.g. tpt-algoR-ops-rg is qualified by its resource group name.

The key vault is located in the operations resource group, not the virtual machine assemblies' resource group, so the key vault, referenced using the resource object resource id e.g. kvld, includes the key vault's resource group:

"kvId": "[resourceId(variables('kvRgName'), 'Microsoft.KeyVault/vaults', variables('kvName'))]"

The sas token that secures the private storage containing the nested templates and scripts is passed to task template install-1toN-vmas-0toN-dmd-kv.json, as a secure string argument and subsequently passed to the level two template assemble-vma-new-osmd-0toN-dmd-kv.json.

A sas token is retrieved from the azure portal here:



A virtual machine can be provisioned with winRM using either:

- The azure devOps release pipeline available through the azure devOps portal, or
- A custom script virtual machine extension as done here, see activity n+1 implementation, below.

To provision winRM using the azure devOps portal release pipeline, set the arm advanced deployment options. [fig3]

		Advanced deployment options for virtual machines \wedge
	install-nics Disabled: Azure Resource Group Deployment	Enable prerequisites ①
C	install-1toN-vm-assemblies-0toN-dmd-kv	Configure with WinRM agent
	Install-OtoN-vmExts-on-1toN-vms Disabled: Azure Resource Group Deployment	VM details for WinRM
		\$(currentRgName)

Note the "VM details for WinRM" is a release pipeline variable name holding the value of the resource group containing the virtual machines.

Implementation: activity n+1, install vm extensions

For a description about provisioning proprietary custom script virtual extensions e.g. bgInfo, see the earlier article.

To provision winRM using a custom script virtual machine extension specification, this design uses the level 2 template provision-customScript-vmExts.json, initiated from level 1.

Existing installed virtual machines are provisioned by the level 1 activity install-0toN-vmExts-on-1toN-vms implemented by task template install-0toN-vmExts-on-1toN-vms.json.

The level 1 template install-0toN-vmExts-on-1toN-vms.json receives the vmCustomScriptVmExtNames string array argument locating and naming powershell scripts used by the custom script virtual machine extension: [code1]

"vmCustomScriptVmExtNames": [

"https://tptalgorigsops10strgacc.blob.core.windows.net/prjtplatesandscripts/compu te/vmExtensions/vmExtScripts/winRM/ConfigureWinRM.ps1",

"https://tptalgorigsops10strgacc.blob.core.windows.net/prjtplatesandscripts/compu te/vmExtensions/vmExtScripts/winRM/initialize-emptyDisk-onNomVm.ps1"

The vmCustomScriptVmExtNames strings array is passed to the level 2 template provisioncustomScript-vmExts.json which implements the custom script virtual machine extension resource specification, Microsoft.compute/virtualMachines/extensions.

The necessary level 2 extension resource specification properties are:

- 1. The template variable strgAccld value, is a resource Id, qualified by a resource group for the reason described above: [code2]
- "strgAccId": "[resourceId(parameters('opsRgName'),

'Microsoft.Storage/storageAccounts', variables('strgAccName'))]",

2. The template variable hostDNSNameScriptArgument value, [code3]

"hostDNSNameScriptArgument": "[concat (variables('vmName'),

.southeastasia.cloudapp.azure.com')]"

is used as the subject of the self signed certificate that enables winRM access to each virtual machine, as shown here on an installed vm: [fig4]

	· · · · ·	10:234.1110				
· ·	Console1 - [Consol	e Root\Certificates (Local Computer)\Pe	rsonal\Certifica	tes]		- • ×
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4 (Certificates (Local Computer)	😰 tpt-ar-vm50.southeastasia.cloudapp.azure.com	tpt-ar-vm50.southeastasia.cloudapp.azure.com	5/6/2020	Client Authentication, Server Authentication	<none></none>	Certifica A
⊿ 🧰 Personal	Windows Azure CRP Certificate Generator	Windows Azure CRP Certificate Generator	5/6/2020	<all></all>	TenantEncryptionC	
Certificates						More >

- "fileUris": "[variables('vmCustomScriptVmExtNames')]" The file uris is the strings array template variable sourced from template parameter vmCustomScriptVmExtNames as described above.
- 4. "commandToExecute"

The commandToExecute property specifies the powershell script to provision the virtual machine. The path used for powershell -file argument matches the location of the ConfigureWinRmAndLog.ps1 script in the automation's private storage i.e. tptalgorigsops10strgacc/prjtplatesandscripts/compute/vmExtensions/... The script is copied to a similar location on the virtual machine. [code4]

"commandToExecute": "[concat('powershell -ExecutionPolicy Unrestricted file ./compute/vmExtensions/vmExtScripts/winRM/ConfigureWinRM.ps1 _,variables('hostDNSNameScriptArgument'))]",

5. "storageAccountKey":

The virtual machine extension custom scripts are located in private storage .i.e. at tptalgorigsops10strgacc/prjtplatesandscripts. Arm uses a storage account key, not a sas token, to access the custom scripts used by the virtual machine extension object. [code5]

"storageAccountKey": "[listKeys(variables('strgAccId'),

providers('Microsoft.Storage','storageAccounts').apiVersions[0]).keys[0].value]

The azure template function listKeys returns the first storage account key used by the property, storageAccountKey. Note, this implementation assumes the first apiVersion.

All virtual machines in the nominated resource group need to be running when applying a vm extension, even those not targeted for change. The change applies to all virtual machines in the resource group. Otherwise this message appears in the log, 'Cannot modify extensions in the VM when the VM is not running.".

[fig5]
2019-03-23T10:36:00.3829930Z ##[debug]Failed to delete the extension WinRMCustomScriptExtension on the vm tpt-ar-20, with
statusCode: 409,
message: 'Cannot modify extensions in the VM when the VM is not running.',
code: 'OperationNotAllowed',
details: undefined }
2019-03-23T10:36:00.3831545Z ##[debug]Failed to add extension to the vms with the exception: Deletion of extension failed
2019-03-23T10:36:00.3834226Z ##[debug]task result: Failed
2019-03-23T10:36:00.3834938Z ##[error]Deletion of extension failed
2019-03-23T10:36:00.3835799Z ##[debug]Processed: ##vso[task.issue type=error;]Deletion of extension failed
2019-03-23T10:36:00.3837012Z ##[debug]Processed: ##vso[task.complete result=Failed;]Deletion of extension failed
2019-03-23T10:36:00.7981750Z ##[debug]Processed: ##vso[task.logissue type=error;code=OperationNotAllowed;]
2019-03-23T10:36:00.7984161Z ##[debug]Failed to delete the extension WinRMCustomScriptExtension on the vm kdy-ar-50, with
statusCode: 409,
message: 'Cannot modify extensions in the VM when the VM is not running.',
code: 'OperationNotAllowed',
details: undefined }
2019-03-23T10:36:02.2093190Z ##[debug]Processed: ##vso[task.logissue type=error;code=OperationNotAllowed;]
2019-03-23T10:36:02.2094931Z ##[debug]Failed to delete the extension WinRMCustomScriptExtension on the vm kdy-ar-30-vm, wc
statusCode: 409,
message: 'Cannot modify extensions in the VM when the VM is not running.',
code: 'OperationNotAllowed',
details: undefined }
2019-03-23T10:36:07.2987324Z ##[debug][GET] <u>https://management.azure.com/subscriptions/0e9a0ad3-85da-4176-bc3b-08adc9bee7b</u> d
2019-03-23T10:36:07.5781405Z ##[debug]Response status code : 200
2019-03-23T10:36:07.5783055Z ##[debug]Response status : InProgress
2019-03-23T10:36:08.8138490Z ##[debug][PUT]https://management.azure.com/subscriptions/0e9a0ad3-85da-4176-bc3b-08adc9bee7bd
2019-03-23T10:36:12.4402364Z ##[debug]Processed: ##vso[task.logissue type=error;code=OperationNotAllowed;]
2019-03-23T10:36:12.4406351Z Failed to add the extension to the vm: 'tpt-ar-21'. Error: "Cannot modify extensions in the V
2019-03-23T10:36:12.4407283Z ##[debug]Validating the winrm configuration custom script extension status on vm: tpt-ar-21

Implementation: custom script vm extension, pathnames

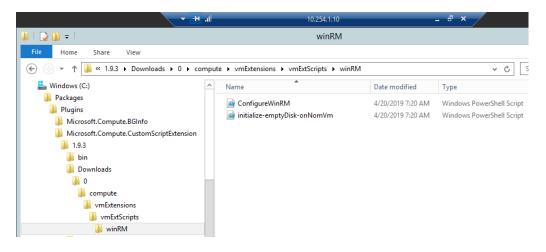
The file path used by a powershell 'dot source' statement in a custom script virtual machine extension to locate the script to chain to e.g.

./compute/vmExtensions/vmExtScripts/winRM/initialize-emptyDisk-onNomVm.ps1 must match the location on the virtual machine to which the custom extension resource copies the fileUris used to provision the virtual machine, as used here in script ConfigureWinRmAndLog.ps1. [code6]

Initialize empty disks

Write-EventLog -LogName \$logNameToInstall -Source \$logNameSrc -EventId 1000 -Message "Verify, next message confirms extension, initialize-emptyDiskonNomVm.ps1, ran."

. ./compute/vmExtensions/vmExtScripts/winRM/initialize-emptyDisk-onNomVm.ps1 Which is copied to here, [fig6]



Note, when a custom script extension is not working some log info is available here: [fig7]

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	〕 Downloads	CommandExecution_20190413095226876	4/13/2019 9:52 AM	Text Document	1 KB				
	🔢 Recent places	CommandExecution_20190414004836402	4/13/2019 9:52 AM	Text Document	1 KB				
		CustomScriptHandler	4/14/2019 12:48 AM	Text Document	10 KB				
		CustomS	criptHandler - Not	epad				_ 🗆 🗙	
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[2984+00000001] [04/14/2019	00:48:33.83] [INFO]	Successfully enabled TLS.							^
		Handler successfully enabled							
		Loading configuration for sequence							
2984-000000011 10/ 11/2019	9 00:48:34.151 INFO	HandlerSettings = ProtectedSetting	gsCertThumbprint	:: 2		2,	ProtectedSettings:		
	00.40.34 OC1 [WADN]	Current sequence number, 0, is not						, PublicSet	
[2504+0000000] [04/14/2019	00.40.34.00] [WARN]	current sequence number, 0, 15 no	r greater than i	ine sequence n	umber of the m	use recently exec	uted configuration	. LATCING	
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🗣 Network	[04/14/2019 00:48:33.37] Execution Complete.								
Network	###### Execution Output:								
	C:\Packages\Plugins\M	icrosoft.Compute.C	ustomScriptExte	nsion\1.9.3>if	not exist R	untimeSettings*.	settings		
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Implementation: storage and pre-installed resource objects

Some resource objects must be installed prior to those resource objects which are either a) assembled from them, or b) consume their services. For example, a virtual machine's admin user password, securely stored as a key vault secret in a key vault resource object, must be

installed before virtual machine resource objects are installed. Similarly, resource group objects must be installed before virtual machine resource objects are installed.

Prior to arm rendering this design's resource specifications on the owner's arm canvas this automation design requires the two necessary resource group objects to be installed, tpt-algoR-ops-rg and tpt-algoR-vms-rg.

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3	tpt-algoR-ops-rg	VSP	Southeast Asia	Succeeded			
8	📄 😭 tpt-algoR-vms-rg	VSP	Southeast Asia	🤣 Succeeded			

• Automation operations resource group name, tpt-algoR-ops-rg.

		name, ipi-aiguitigs-kv. j	iigioj		
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۵	Settings	🔲 📄 tptalgorigsops10strgacc	Storage account Southeast	: Asia southeastasia	/subscriptions •••

 Virtual machine admin password secret name, kvSecretVmAdminPword. [fig11]

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- Storage account name, tptalgorigsops10strgacc.
 - Blob collection container name, prjtplatesandscripts. The following content needs to be stored at the nominated locations rooted in that container:
 - Nested azure task templates:
 - prjtplatesandscripts/compute/virtualMachines/ assemble-vma-new-osmd-0toN-dmd-kv.json assemble-new-dmd.json

prjtplatesandscripts/compute/vmExtensions

install-0toN-pVmExts.json provision-customScript-vmExts.json provision-pVmExt-antiMalware.json provision-pVmExt-bgInfo.json

- Virtual machine extension custom scripts:
- prjtplatesandscripts/compute/vmExtensions/vmExtScripts/winRM ConfigureWinRmAndLog.ps1 initialize-emptyDisk-onNomVm.ps1 [fig12]

Dashboard > Resource groups > tpt-algoR-ops-rg > tptalgorigsops10strgacc - Blobs > prjtplatesandscripts prjtplatesandscripts ♠ ក Upload 👌 Refresh 🔒 Change access level 🏛 Delete 💷 Acquire lease 🐲 Break lease 1.... Authentication method: Access key (Switch to Azure AD User Account) Overview Location: prjtplatesandscripts / compute Access Control (IAM) Show deleted blobs Settinas NAME ACCESS TIER BLOB TYPE LEASE STATE MODIFIED SIZE 💡 Access policy 🖿 (J Properties ۲ Metadata 📄 availabilitySets ۹ investigations virtualMachines **R** vmDisks • vmExtensions ••• Ŷ 📄 vmlmages

- Virtual machine assembly resource group name, tpt-algoR-vms-rg.
 - Public ip address name, <vmname>-pip.
 - Network interface card name, <vmname>-nic. [fig13]

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Implementation: devOps release pipeline and activities

The azure devOps release pipeline action is install-1toN-vmas-0toN-dmd-ext. [fig14]

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	Name	Releases	Created	Stages	Description		^
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The significant activities implementing the action are: [fig15]

<u>~</u>		install-pips Disabled: Azure Resource Group Deployment	Template * () \$(\$ystem.DefaultWorkingDirectory)/_kdyIntra1st/compute/virtualMachines/install-	
		install-nics Disabled: Azure Resource Group Deployment	1toN-vmas-0toN-#md-kv.json Template parameters ()	
		install-1toN-vmas-0toN-dmd-kv		
ي چ	Ĩ	Install-OtoN-vmExts-on-1toN-vms Azure Resource Group Deployment	Override template parameters ① -containerSasToken \$(prjStrgSasToken)	

Notice the (disabled) install-pips and install-nics activities precede, and have installed their resource objects before the virtual machines and their data disks are installed. The activity install-0toN-vmExts-on-1toN-vms installs the custom script vm extensions after the virtual machines are installed.

Verify: installed virtual machine assemblies and provisioning

Verify resource group tpt-algoR-vms-rg, groups virtual machine assembly components. [fig16]

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 ♠ ■ 	,O Search (Ctrl+/)	🕂 Add 🗮 Edit columns 🗓	Delete resource group	Ö Refresh → Move 🚽	Export to CSV	🗓 Delete 🛛 😶 More
:=	🗊 Overview	Essentials		*		
- * -	Activity log	Filter by name	All types	✓ All locations	✓ No grouping ✓	
(*)	Access control (IAM)	12 items 🗌 Show hidden typ	pes 🕦			
	🇬 Tags	NAME TU	TYPE \uparrow_{\downarrow}	LOCATION The	LOCATION ID \uparrow_{\downarrow}	RESOURCE ID 👘
٩	🗲 Events	tpt-ar-vm50	Virtual machine	Southeast Asia	southeastasia	/subscriptions/0 •••
۸	Settings	🗌 😂 tpt-ar-vm50-00-dmd	Disk	Southeast Asia	southeastasia	/subscriptions/0 •••
<u>.</u>	📣 Quickstart	🗌 😂 tpt-ar-vm50-10-dmd	Disk	Southeast Asia	southeastasia	/subscriptions/0 ···
<u>.</u>	📩 Deployments	📃 📊 tpt-ar-vm50-nic	Network interface	Southeast Asia	southeastasia	/subscriptions/0
2	Policies	📃 🚟 tpt-ar-vm50-osmd	Disk	Southeast Asia	southeastasia	/subscriptions/0
*	Properties	tpt-ar-vm50-pip	Public IP address	Southeast Asia	southeastasia	/subscriptions/0 •••
Ŷ	🕒 Locks	tpt-ar-vm51	Virtual machine	Southeast Asia	southeastasia	/subscriptions/0 •••
<u>{</u> 杰}	🖳 Export template	🔲 😂 tpt-ar-vm51-01-dmd	Disk	Southeast Asia	southeastasia	/subscriptions/0 ····
2	Cost Management	🔲 😂 tpt-ar-vm51-11-dmd	Disk	Southeast Asia	southeastasia	/subscriptions/0 ····
•	🍇 Cost analysis	tpt-ar-vm51-nic	Network interface	Southeast Asia	southeastasia	/subscriptions/0 ···
<u>@</u>	🏮 Cost alerts	Stpt-ar-vm51-osmd	Disk	Southeast Asia	southeastasia	/subscriptions/0 ····
٥	(§) Budgets	tpt-ar-vm51-pip	Public IP address	Southeast Asia	southeastasia	/subscriptions/0 ***

Verify vms @ arm portal [fig17]

	Dashboard > Virtual machines							
+	Virtual machines chrisjfaganmsn (Default Directory)							* *
^	👕 🛛 🕂 Add 🕒 Reservations 🗮 Edit columns Ů Refresh 🛛 🔍 Assign tags 🕨 Start 🤍 Restart 💻 Stop 🎟 Delete 注 Services							
	Subscriptions: VSP – Don't see a subscription? Open Directory + Subscription settings							
· - ★	tpt All resource gr	oups 🗸 All ty	/pes	✓ All locations	 ✓ All tags 	~	No grouping	~
	2 items							
	NAME *	ТҮРЕ ↑↓	STATUS	RESOURCE GROUP 1	LOCATION	MAINTENANCE S	SUBSCRIPTION	
3	🔲 🕎 tpt-ar-vm50	Virtual machine	Running	tpt-algoR-vms-rg	Southeast Asia		VSP	
8	🔲 🛄 tpt-ar-vm51	Virtual machine	Running	tpt-algoR-vms-rg	Southeast Asia		VSP	

Verify a vm @ arm portal [fig18]

»	Dashboard > Virtual machines > tpt-ar-	vm50	
+	tpt-ar-vm50		* ×
 ♠ ■ 	, ♀ Search (Ctrl+/) ≪	🗢 Connect 🕨 Start 🤍 Restart 💻 Stop 🛞 Capture 💼 Delete 💍 Refresh	
:=	Overview	Subscription (change) Public IP address VSP 13.76.193.65	^
- * -	Activity log	Subscription ID Private IP address 10.254.1.10	
	Access control (IAM)	Virtual network/subnet VNet1/BackEnd	
	🛷 Tags	DNS name	
B	X Diagnose and solve problems	tpt-ar-vm50.southeastasia.cloudapp.azure.com	

Verify vm extensions through vm activity log @ arm portal [fig19]

»	Dashboard > Resource groups > tpt-alg	oR-vms-rg > tpt-ar-vm50 - Activity log				
+	tpt-ar-vm50 - Activity log					\$7
♠■		≡≣ Edit columns 👌 Refresh 📋 Export to Event Hub		🧈 Logs	Arrian Current filters	🔽 Reset filters
	Overview	 Treate or Update Virtual Machine Extension 	Succeeded	1 wk ago	Sat Apr 20 2019 17:32:14	GMT+ V. К
- 🗙	Activity log	Create or Update Virtual Machine Extension	Started	1 wk ago	Sat Apr 20 2019 17:19:39	GMT+ V. K
	Access control (IAM)	Create or Update Virtual Machine Extension	Started	1 wk ago	Sat Apr 20 2019 17:19:40	GMT+ V. K
	🗬 Tags	Create or Update Virtual Machine Extension	Accepted	1 wk ago	Sat Apr 20 2019 17:19:46	GMT+ V. K
0	X Diagnose and solve problems	Create or Update Virtual Machine Extension	Accepted	1 wk ago	Sat Apr 20 2019 17:19:47	GMT+ V. K
8	Settings	Create or Update Virtual Machine Extension	Succeeded	1 wk ago	Sat Apr 20 2019 17:22:05	GMT+ V. K
?	🙇 Networking	 Create or Update Virtual Machine Extension 	Succeeded	1 wk ago	Sat Apr 20 2019 17:22:07	GMT+ V. K
20	Disks	 Create or Update Virtual Machine Extension 	Succeeded	1 wk ago	Sat Apr 20 2019 17:29:44	GMT+ V. K
*	 Size Security 	Treate or Update Virtual Machine Extension	Succeeded	1 wk ago	Sat Apr 20 2019 17:29:44	GMT+ V. K
Ŷ	Extensions	Create or Update Virtual Machine Extension	Succeeded	1 wk ago	Sat Apr 20 2019 17:32:12	GMT+ V. K
	Continuous delivery (Preview)	Greate or Update Virtual Machine	Succeeded	1 wk ago	Sat Apr 20 2019 17:29:15	GMT+ V. K

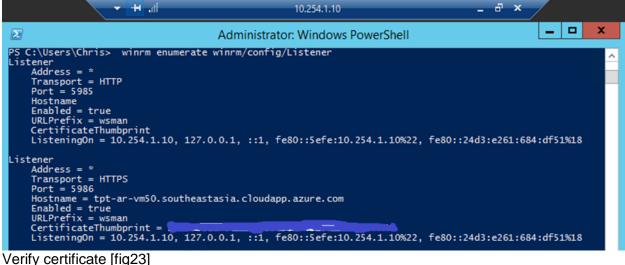
Verify vm extensions @ arm portal [fig20]

	Dashboard > Resource groups > tpt-algoR-vms-rg > tpt-ar-vm50 - Extensions						
	tpt-ar-vm50 - Extensions						
		*	🕂 Add				
:=	💻 Size	^	${\cal P}$ Search to filter items				
- * -	🟮 Security		NAME °.	туре 🖓	VERSION *+	STATUS	
	🖬 Extensions		BGInfo	Microsoft.Compute.BGInfo	2.*	Provisioning succeeded	
	🚳 Continuous delivery (Preview)		WinRMCustomScriptExtension	Microsoft.Compute.CustomScriptExtension	1.*	Provisioning succeeded	
	Availability set						

And [fig21]

»	Dashboard > Virtual machines > tpt-vm1 - Extensions > WinRMCustomScriptExtension > WinRMCustomScriptExtension							
+	WinRMCustomScriptExtension >		WinRMCustomScriptExtension					
<u></u>	👼 Uninstall		1					
. ⊡ :≡	Туре	Microsoft.Compute.CustomScriptExtension	2 { 3 "code": "ComponentStatus/StdOut/succeeded", 4 "level": "Info",					
- * -	Version	1.7	5 "displayStatus": "Provisioning succeeded", 6 "message": "Config\\n MaxEnvelopeSizekb = 8192\\n					
	Status	Provisioning succeeded	7 },					
	Status level	Info	9 "code": "ComponentStatus/StdErr/succeeded", 10 "level": "Info",					
õ	Status message	Finished executing command	11 "displayStatus": "Provisioning succeeded", 12 "message": ""					
Q	Detailed status	View detailed status	13 } 14]					
	Handler status	Ready						
3	Handler status level	Info						

Verify winRM @ installed vm [fig22]



Verify certificate [fig23]

		💌 🛨 📶 10.25	4.1.10 _ = = = ×		
1	Console1 - [Conso	ole Root\Certificates (Local Computer)\P	ersonal\Certificates]	d98b1e73-41cf-4524-b9cb-920)597ffec3
File Action View Favorites W				_ # × 10.254.1.10	
Þ 🔿 🙎 📅 🛍 🙆 😼 📓	1			4/28/2019 5:38 AM	
Console Root Console Root Console Root Control Control Computer) Continues Control Control Control Control Control Control Control Control Control Control		Issued By tpt-ar-watastasia.cloudapp.azure.com Windows Azure CRP Cettificate Generator Windows Azure CRP Cettificate Generator	Expiration Date Intended Purposes 4/20/2020 Client Authentication, Server Author 4/20/2020 <all> 4/20/2020 <all></all></all>	Friendy Name Chone> TenantEncoption TenantEncoption TenantEncoption TenantEncoption Certifica. ▲ TenantEncoption Ten	acenter
→ + .i	10.254.1.10 This PC	- 8		loyment Id: d98b1e73-41cf-4524-b9cb-9205 mai IP: 10.254.1.10	597ffe
(a) < ↑ (b) < (c)		✓ 🖒 Search This F	PC p Boot	t Time: 4/28/2019 5:38 AM 9 Space: C:\ 109.34 GB NTF S	
	▶ Folders (6)			D:\ 6.59 GB NTFS F:\ 127.89 GB NTFS	
☆ Favorites ■ Desktop ↓ Downloads ③ Recent places	Devices and drives (4) Windows (C:)	Temporary Storage (I	2.)	G:\ 127.89 GB NTF S t Name: TP T-AR-VM50	
Desktop		Temporary Storage (I 6.58 GB free of 7.99 G data2 (G:)	B Memo B OS Ve	G:\ 127.89 GB NTF S t Name: TP T-AR-VM50	cente

Verify application event log [fig25]

	lı + •	10.254.1.1	0	- 8 ×	
8		Event Viev	ver		_ □ X
File Action View Help					
🛃 Event Viewer (Local)	algoRigsLog Number of event	s: 15			Actions
 Custom Views Windows Logs Applications and Services Lo algoRigsLog Hardware Events Internet Explorer Key Management Service Microsoft Windows Azure Windows PowerShell Subscriptions 	Information 4/20 Information 4/20 Information 4/20 Information 4/20 Event 1000, algoRigsLogSrc	e and Time //2019 7:21:42 AM //2019 7:21:42 AM //2019 7:21:08 AM onfigureWinRM.ps1 ended.	Source algoRigsLogSrc algoRigsLogSrc algoRigsLogSrc	Event ID Task Categor 1000 (1) 1000 (1) 1000 (1)	ry ∧ algoRigsL ∧ ∧ i Open S Y Create Import Clear Lo Filter C Properti Save All
	' Log Name: algoRigsi Source: algoRigsi	-	4/20/2019 7:21:42 AM		Attach

Resources

All information in this article is intended to provide general information only. It does not purport to be a comprehensive advice.

An automation's resource objects can be installed on a subscription's arm canvas using these azure tools:

- Arm portal
- Command line interface, aka CLI
- Powershell
- DevOps release pipeline the method used above.

The azure devOps task type, deploy resource group, creates a resource group if it doesn't exist.

Further guidance is here:

https://docs.microsoft.com/en-us/azure/azure-resource-manager/resource-group-templatedeploy-portal https://docs.microsoft.com/en-us/azure/azure-resource-manager/resource-manager-quickstartcreate-templates-use-the-portal Example templates for use with the above tools are here: https://github.com/Azure/azure-guickstart-templates

This design's templates and scrips which are intended for elucidation not for production, are available here, under an MIT license:

https://github.com/TecProTools/azure-arm-vmas-NestedLoops