Hyperledger Fabric Single Member Blockchain in Azure Marketplace

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Overview

Over the past year, we have worked diligently to develop an open blockchain ecosystem on Microsoft Azure for blockchain application development. Our goal has been to empower users to build blockchain solutions easily, with the ledger and development tools of your choice.

Initially, we targeted dev/test topologies to deliver development and demo machines for a variety of protocols. We received ample positive feedback from customers to expand support to more complex topologies as they began working on more advanced scenarios. We have now built out support for Hyperledger Fabric Single Member (multi-node) network solution templates in the Azure marketplace.

After reading this article, you will:

- Obtain working knowledge of blockchain, Hyperledger Fabric, and more complicated consortium network architectures
- Learn how to deploy and configure a single-member Hyperledger Fabric consortium network from within the Azure Management Portal

About blockchain

For those that are new to the blockchain community, this is a great opportunity to learn about the technology in an easy and configurable manner on Azure. Blockchain is the underlying technology behind Bitcoin; however, it is much more than just an enabler for a virtual currency. It is a composite of existing database, distributed system, and cryptographic technologies that enables secure multi-party computation with guarantees around immutability, verifiability, auditability, and resiliency to attack. Different protocols employ different mechanisms to provide these attributes. <u>Hyperledger Fabric</u> is one such protocol.

Consortium Architecture on Azure

This template deploys a topology to help test and simulate production for users within a single organization (single member). This deployment comprises of a multi-node network in a single region, soon to be expanded to multiple regions.

The network comprises of three types of nodes:

- 1. **Member Node**: A node running the Fabric membership service that registers and manages members of the network. This node can eventually be clustered for scalability and high availability, however in this lab, a single member node will be used.
- 2. **Orderer Nodes**: A node running the communication service implementing a delivery guarantee, such as total order broadcast or atomic transactions.
- 3. **Peer Nodes**: A node that commits transactions and maintains the state and a copy of the distributed ledger.

Getting Started

To begin, you will need an Azure subscription that can support deploying several virtual machines and standard storage accounts. If you do not have an Azure subscription, you can create a free Azure account.

By default, most subscription types support a small deployment topology without needing to increase quota. The smallest possible deployment for one member will need:

- 5 virtual machines (5 cores)
- 1 VNet
- 1 load balancer
- 1 public IP address

Once you have a subscription, go to the <u>Azure portal</u>. Select '+', select Blockchain, and select 'Hyperledger Fabric Single Member Blockchain'.



Deployment

To start, select the 'Hyperledger Fabric Single Member Blockchain' and click 'Create'. This will open the 'Basics' blade in the wizard.

The Template Deployment will walk you through configuring the multi-node network. The deployment flow is divided into three steps: Basics, Network configuration, and Fabric configuration.

Basics

Under the 'Basics' blade, specify values for standard parameters for any deployment, such as subscription, resource group, and basic virtual machine properties.

A detailed description of each parameter follows:

Parameter Name	Description	Allowed	Default
		Values	Value
Resource prefix	A string used as a base for naming the	6 characters	NA
	deployed resources.	or less	
VM user name	The user name of the administrator for	1-64	azureuser
	each of the virtual machines deployed	characters	
	for this member.		
Authentication type	The method to authenticate to the	Password or	Password
	virtual machine.	SSH public key	
Password (Authentication	The password for the administrator	12 -72	NA
type = Password)	account for each of the virtual machines	characters	
	deployed. The password must contain 3		
	of the following: 1 upper case character,		
	1 lower case character, 1 number, and 1		
	special character.		
	While all VMs initially have the same		
	password, you can change the password		
	after provisioning.		
SSH Key (Authentication	The secure shell key used for remote		NA
type = Public Key)	login.		
Restrict access by IP	Setting to determine type whether client	Yes/No	No
address	endpoint access is restricted or not.		
Allowed IP address or	The IP address or the set of IP addresses		NA
subnet (restrict access by	that is allowed to access the client		
IP address = Yes)	endpoint when access control is		
	enabled.		
Subscription	The subscription to which to deploy.		
Resource Group	The resource group to which to deploy		NA
	the consortium network.		
Location	The Azure region to which to deploy the		
	first member's network footprint.		

A sample deployment is shown below:



Network size and performance

Next, under 'Network size and performance,' specify inputs for the size of the consortium network, such as the number of membership, orderer, and peer nodes. Choose infrastructure options and your Virtual machine size.

A detailed description of each parameter follows:

Parameter Name	Description	Allowed	Default
		Values	Value
Number of Membership	The number of nodes that run the	1	1
Nodes	membership service. For additional		
	details on the membership service, look		
	at Security & Membership Services		
	under the Hyperledger <u>documentation</u> .		
	This value is currently restricted to 1		
	node, but we plan to support scale out		
	through clustering in the next revision.		
Number of Orderer Nodes	The number of nodes that order	1	1
	(organize) transactions into a block>		
	This statement is wordy and confusing.		
	For additional details on the ordering		
	service, visit the Hyperledger		
	documentation.		

	This value is currently restricted to 1 node, but we plan to support scale out in		
	the next version.		
Number of Peer Nodes	Nodes that are owned by consortium members that execute transactions and maintain the state and a copy of the ledger.	3	3-9
	For additional details on the ordering		
	service, visit the Hyperledger		
	documentation		
			Chain al a nal
Storage performance	The type of storage backing each of the	Standard or	Standard
Storage performance	deployed nodes. To learn more about	Standard or Premium	Standard
Storage performance	the type of storage backing each of the deployed nodes. To learn more about storage, visit <u>Introduction to Microsoft</u>	Standard or Premium	Standard
Storage performance	The type of storage backing each of the deployed nodes. To learn more about storage, visit <u>Introduction to Microsoft</u> <u>Azure Storage</u> and <u>Premium Storage</u> .	Standard or Premium	Standard
Storage performance Virtual machine size	The type of storage backing each of the deployed nodes. To learn more about storage, visit <u>Introduction to Microsoft</u> <u>Azure Storage</u> and <u>Premium Storage</u> . The virtual machine size used for all	Standard or Premium Standard A,	Standard Standard
Storage performance Virtual machine size	The type of storage backing each of the deployed nodes. To learn more about storage, visit <u>Introduction to Microsoft</u> <u>Azure Storage</u> and <u>Premium Storage</u> . The virtual machine size used for all nodes in the network	Standard or Premium Standard A, Standard D,	Standard Standard D1_v2
Storage performance Virtual machine size	The type of storage backing each of the deployed nodes. To learn more about storage, visit <u>Introduction to Microsoft</u> <u>Azure Storage</u> and <u>Premium Storage</u> . The virtual machine size used for all nodes in the network	Standard or Premium Standard A, Standard D, Standard D-v2,	Standard Standard D1_v2
Storage performance Virtual machine size	The type of storage backing each of the deployed nodes. To learn more about storage, visit <u>Introduction to Microsoft</u> <u>Azure Storage</u> and <u>Premium Storage</u> . The virtual machine size used for all nodes in the network	Standard or Premium Standard A, Standard D, Standard D-v2, Standard F	Standard Standard D1_v2
Storage performance Virtual machine size	The type of storage backing each of the deployed nodes. To learn more about storage, visit <u>Introduction to Microsoft</u> <u>Azure Storage</u> and <u>Premium Storage</u> . The virtual machine size used for all nodes in the network	Standard or Premium Standard A, Standard D, Standard D-v2, Standard F series,	Standard Standard D1_v2
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A sample deployment is shown below:



Fabric specific settings

Finally, under Fabric specific settings, specify Fabric-related configuration settings.

A detailed de	escription o	f each para	meter follows:
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Parameter Name	Description	Allowed	Default
		Values	Value
Bootstrap User Name	The initial authorized user that will be	9 or fewer	admin
	registered with the member services in	characters	
	the deployed network.		
Bootstrap User Password	The administrator password used to	12 or more	NA
for Fabric CA	secure the Fabric CA account imported	characters	
	into the Membership node.		
	The password must contain the		
	following: 1 upper case character, 1		
	lower case character, and 1 number.		

A sample deployment is shown below:



Deploy

Click through the summary blade to review the inputs specified and to run basic pre-deployment validation.



Review legal and privacy terms and click 'Purchase' to deploy. Depending on the number of VMs being provisioned, deployment time can vary from a few minutes to tens of minutes.

Accessing Nodes

Once the deployment is finished, you should see an Overview screen much like the picture below.

≡	fabric Resource group				* ×
+	Search (Ctrl+/)	+ Add ■ Columns			
	(*) Overview	Essentials			
	Activity log	Subscription name (change) Azure MSFT Internal	Deployments 6 Succeeded		
	Access control (IAM)	Subscription ID 252281c3-8a06-4af8-8f3f-d6af13e4fde3			
3	I Tags	Filter by name All types	✓ All locations	✓ No grouping	~
8	SETTINGS	20 items			
N	Quickstart	NAME V	TYPE 🗸	LOCATION \checkmark	
	Resource costs	1 hlf2racpt-ca0	Virtual machine	North Europe	···· ^
÷	Deployments	hlf2racpt-ca0_OsDisk_1_3ef9ad0c1875410c911912a389af33e1	Disk	North Europe	
	Policies	hlf2racptfabricAvSet	Availability set	North Europe	
	E Properties	hlf2racpt-LB	Load balancer	North Europ e	
	Locks	hlf2racptnsg	Network security group	North Europe	
	Automation script	hlf2racpt-orderer0	Virtual machine	North Europe	
0	MONITORING	htt2racpt-orderer0_OsDisk_1_7fc8812987ca4d03aaaa6ef23c7c6	97b Disk	North Europe	
*	Metrics	Intzracpt-peet0 I	virtual machine	North Europe	
Û	Alert rules	Iniziacurepreto_osofisk_1_000000000020028640889Ct21001ede//44 bif2racot-peerl	Virtual machine	North Europe	
	Diagnostics logs	http://www.upupupupupupupupupupupupupupupupupup	b Disk	North Europe	
	Application insights	hlf2racpt-peer2	Virtual machine	North Europe	
-	🥔 Log analytics (OMS)	hlf2racpt-peer2_OsDisk_1_f8c45d7ab9f9423fa6eef88e8452820	4 Disk	North Europe	
ڻ.	Log search	hlf2racpt-publicip	Public IP address	North Europe	
2	SUPPORT + TROUBLESHOOTING	<+> hlf2racptvnet	Virtual network	North Europe	
-	New support request	nic-ca0	Network interface	North Europe	
>		nic-orderer0	Network interface	North Europe	
		nic-peer0	Network interface	North Europe	
		-			

If the screen does not appear automatically (maybe because you moved around the management portal while the deployment was running), you can always find it in the Resource Groups tab in the left-side navigation bar. Just click on the Resource Group name you entered in step 1 to go to the Overview screen.

This Overview screen shows you a list of all the resources that were deployed by the solution template. You can explore them at will, but from this screen you can also access the *output parameters* generated by the template. These output parameters will give you useful information when connecting to your Hyperledger Fabric network.

To access the output parameters, first click on the Deployments tab in the Resource Group blade. This opens the Deployment History as shown below.

菌 Delete 🛇 Cancel 🚹	Redeploy 💆 Vie	ew template	U Refresh					
○ Search for deployments by n								
DEPLOYMENT NAME	STATUS	^	TIMESTAMP	^	DURATION	^		^
microsoft-azure-blockchain.a	📀 Succeeded		6/19/2017, 1:54:50 PM		11 minutes 49 seconds		Related events	
vmExtensionLinkedTemplate	Succeeded		6/19/2017, 1:54:45 PM		8 minutes 19 seconds		Related events	
ordererVMLinkedTemplate	Succeeded 🗸		6/19/2017, 1:46:14 PM		2 minutes 46 seconds		Related events	
peerVMLinkedTemplate	Succeeded 🗸		6/19/2017, 1:46:13 PM		2 minutes 49 seconds		Related events	
caVMLinkedTemplate	Succeeded		6/19/2017, 1:45:57 PM		2 minutes 33 seconds		Related events	
loadBalancerLinkedTemplate	Succeeded		6/19/2017, 1:43:18 PM		7 seconds		Related events	

From the Deployment History, click on the first deployment in the list to look at the details.

	microsoft-azure-bloc	:kchain.azure-blockchain-servi-2017061913 🗖 🗙
+	🛅 Delete 🚫 Cancel 🐧	🕽 Refresh 🟦 Redeploy 👱 View template
		A
	Summary	
	DEPLOYMENT DATE	6/19/2017, 1:54:50 PM
	STATUS	Succeeded
••	DURATION	11 minutes 49 seconds
8	RESOURCE GROUP	fabric
Q	RELATED	Events
8	TEMPLATE LINK	https://gallery.azure.com/artifact/20161101/microsoft
†		
•	Outputs	
<u>_</u>	API-ENDPOINT	http://hlf2racpt.northeurope.cloudapp.azure.com
	PREFIX	hlf2racpt
•	SSH-TO-FIRST-VM	ssh -p 3000 azureuser@hlf2racpt.northeurope.clouda
2	la se da	
ഭ	Inputs	bif
	NAMEPREFIX	
	AUTHTYPE	password I
	ADMINUSERNAME	azureuser
	ADMINPASSWORD	
~~	ADMINSSHKEY	
4	RESTRICTACCESS	0
>	IPADDRESSORSUBNET	
	NUMMEMBERSHIPS	1
	NUMORDERERS	1 📲 🗸

The details screen will show you a summary of the deployment, followed by three useful output parameters:

- The API-ENDPOINT can be used once you deploy an application on the network.
- The *PREFIX*, also called *deployment prefix*, uniquely identifies your resources and your deployment. It will be used when using the command-line based tools.
- The SSH-TO-FIRST-VM gives you a pre-assembled ssh command with all the right parameters required to connect to the first VM in your network; in the case of Hyperledger Fabric, it will be the Fabric-CA node.

You can remotely connect to the virtual machines for each node via SSH with your provided admin username and password/SSH key. Since the node VMs do not have their own public IP addresses, you will need to go through the load balancer and specify the port number. The SSH command to access the first transaction node is the third template output, 'SSH-TO-FIRST-VM (for the sample deployment: ssh -p 3000 azureuser@hlf2racpt.northeurope.cloudapp.azure.com). To get to additional transaction nodes, increment the port number by one (e.g. the first transaction node is on port 3000, the second is on 3001, the third is on 3002, etc.).

Next Steps

You are now ready to focus on application and chaincode development against your Hyperledger consortium blockchain network. Happy coding!