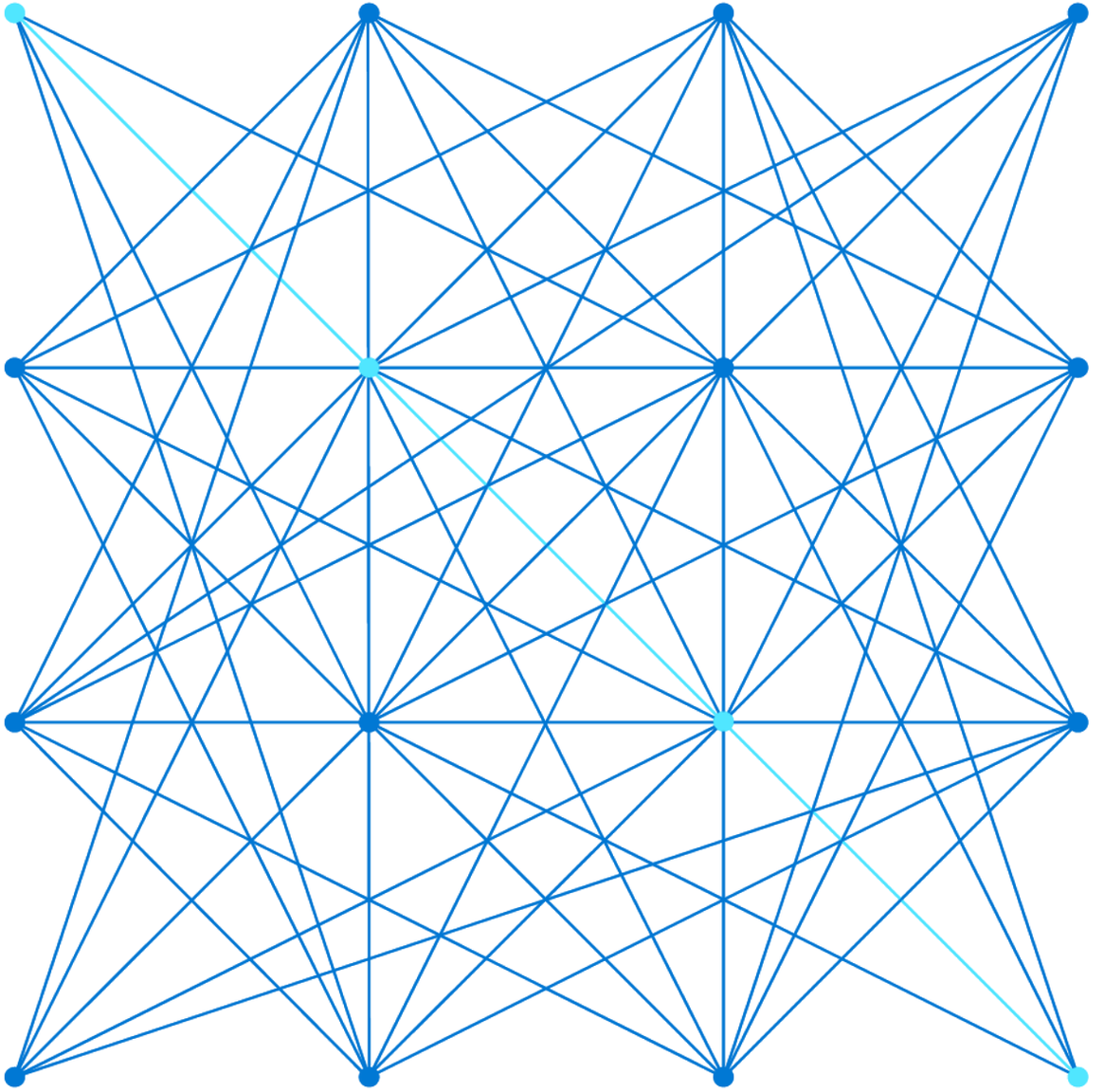
Microsoft Azure

AKS Foundational Training Networking



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Contents

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Course/Lesson Objectives

At the end of this session, you'll be able to:

1. Recognize the AKS general networking architecture.
2. Distinguish between Azure Network components and Kubernetes components.
3. Explain AKS network troubleshooting.

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AKS networking introduction

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High level overview

- Kubernetes API is exposed with a public IP.
- AKS nodes reach the API through a standard load balancer (LB) dedicated outbound IP.
- CNI (Container Network Interface) provides IPs to pods.
- Pods outbound network address translation (NAT) through nodes and then the LB outbound.

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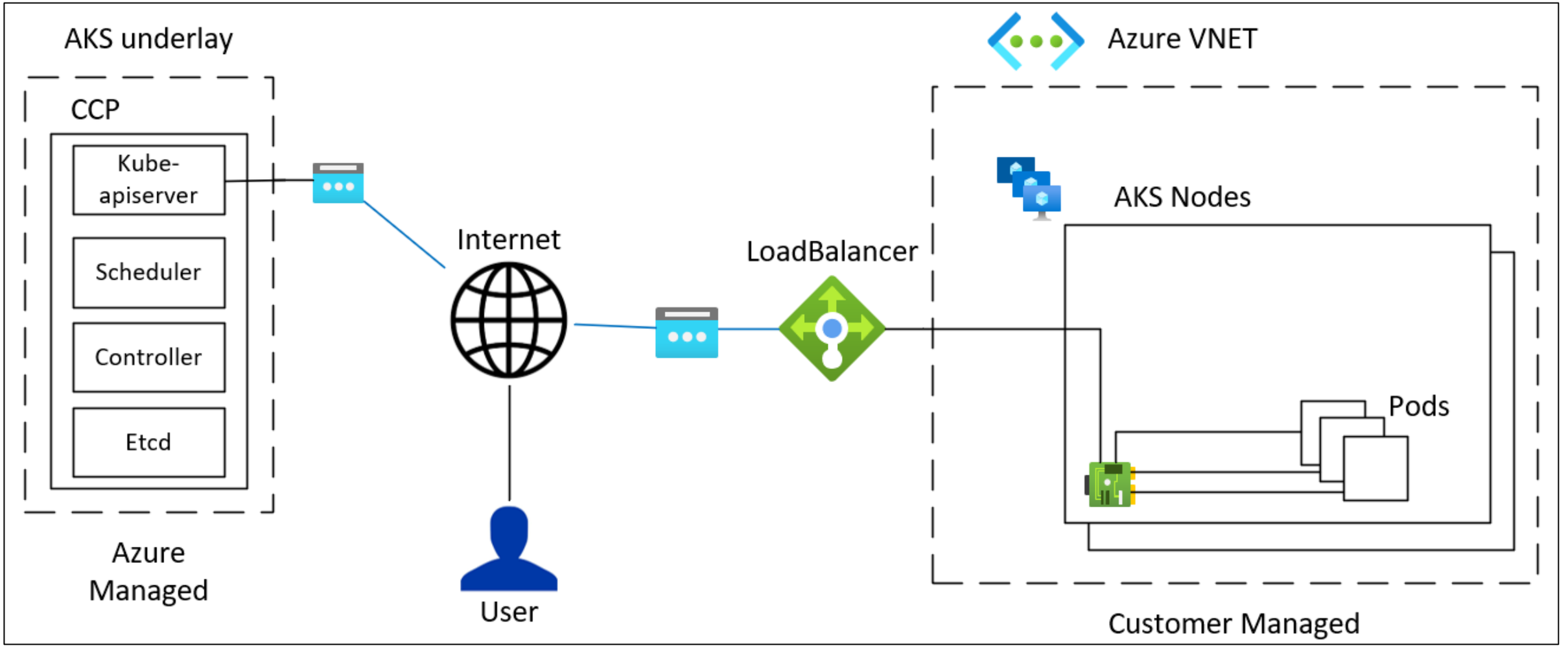
Networking overview



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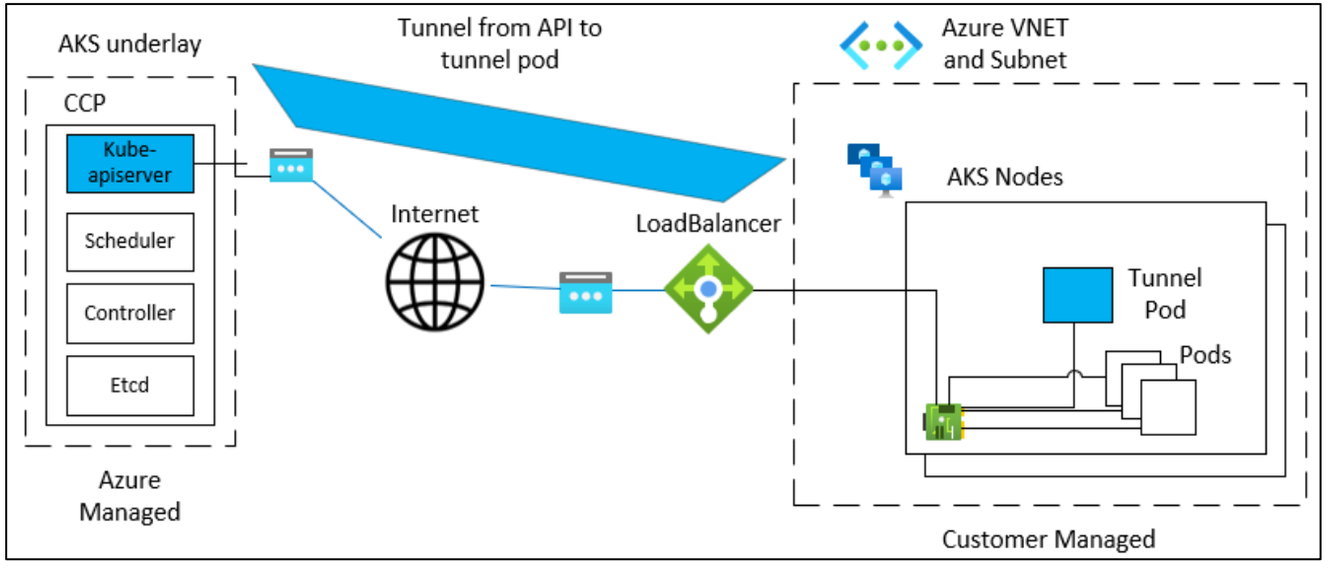
AKS tunnel

- Network path required from API server to the cluster node network for specific operations.
- AKS control plane components are in a separate networks.
- This tunnel consists of a server on the control plane side, and a client on the customer side.



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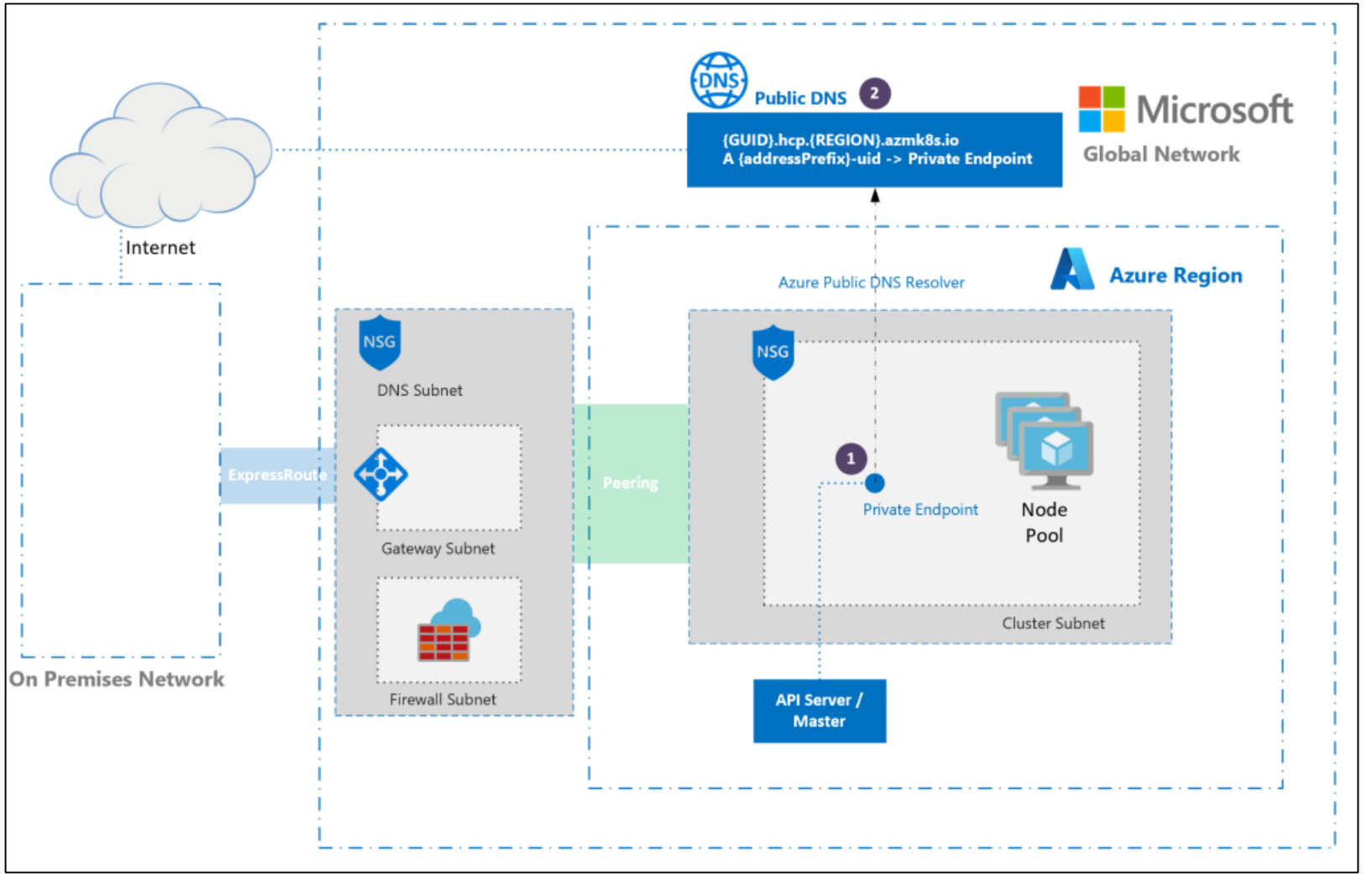
Networking overview for private cluster



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AKS CNI options

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AKS Kubenet

- Default Container Network Interface (CNI).
- Nodes get an IP from an Azure subnet.
- Pods get an IP from a logical address space in the nodes.
- NAT configured for pods to reach Azure virtual network.
- Source IP is translated to the node's primary IP.
- User defined route (UDR) is required on the nodes' subnet.

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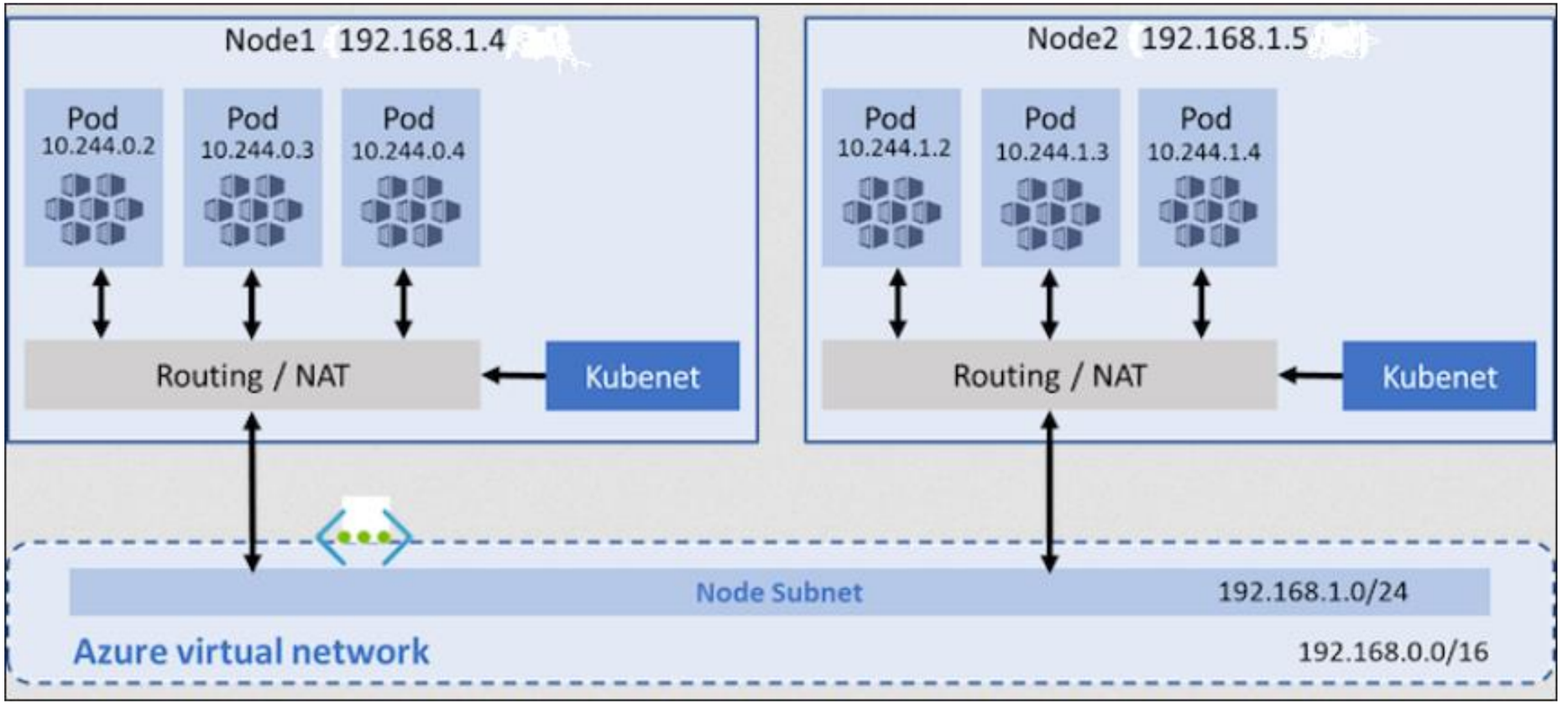
AKS Kubenet



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Azure CNI (Advance CNI)

- Nodes and Pods get an IP from the subnet.
- Each node gets 1 + MaxPod IPs assigned.
- Pods traffic going to a different network get NAT through node IP.
- An UDR is not required.

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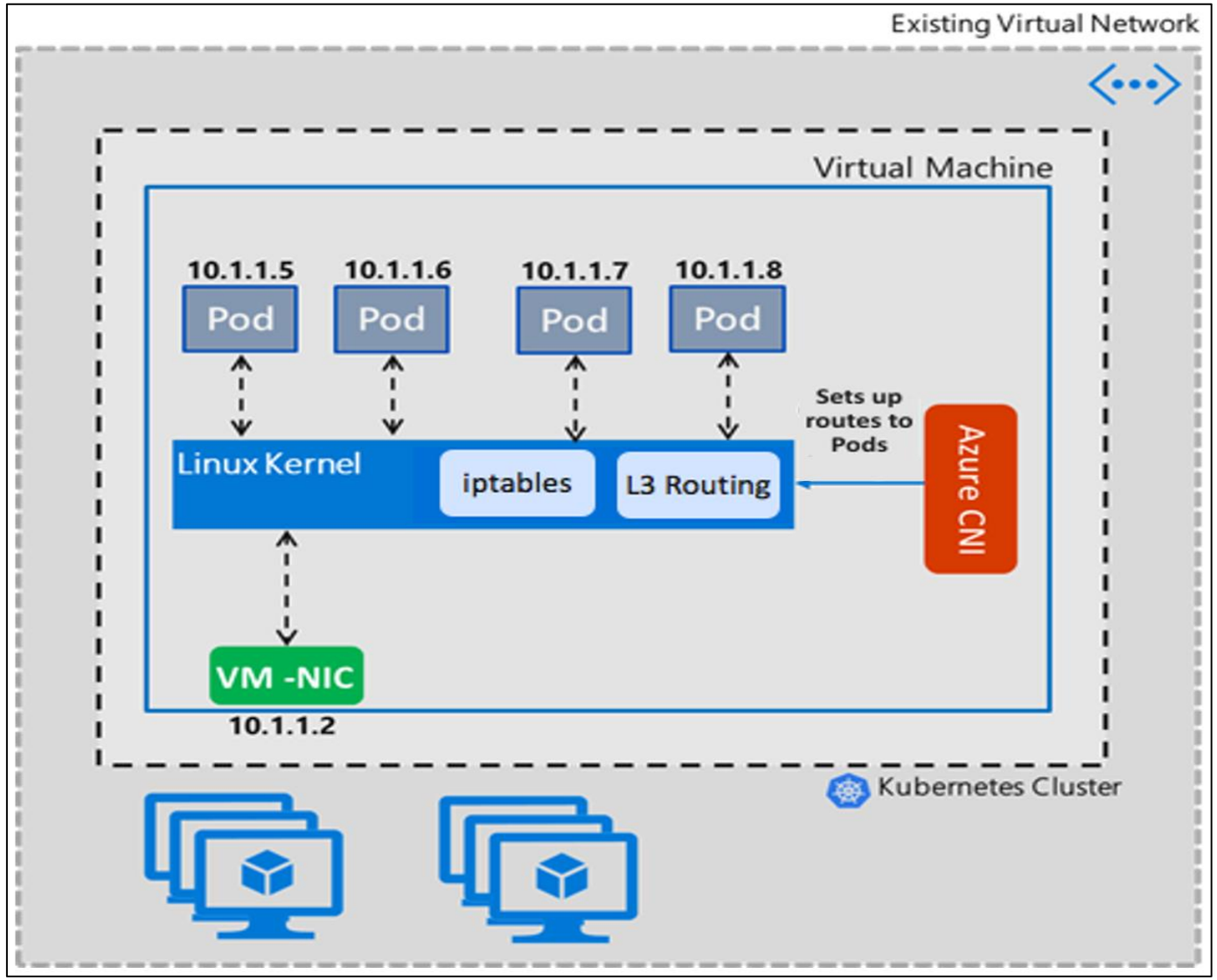
Azure CNI (Advance CNI)



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AKS network components

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Azure network components

- VNET, Subnet, LB, Network Security Group (NSG), UDR, PublicIP, DNS.
- For Kubenet you can specify an existing UDR.
- AKS nodes requires an NSG.
- Default Azure Domain Name System (DNS) is set on the VNET but can be customized.

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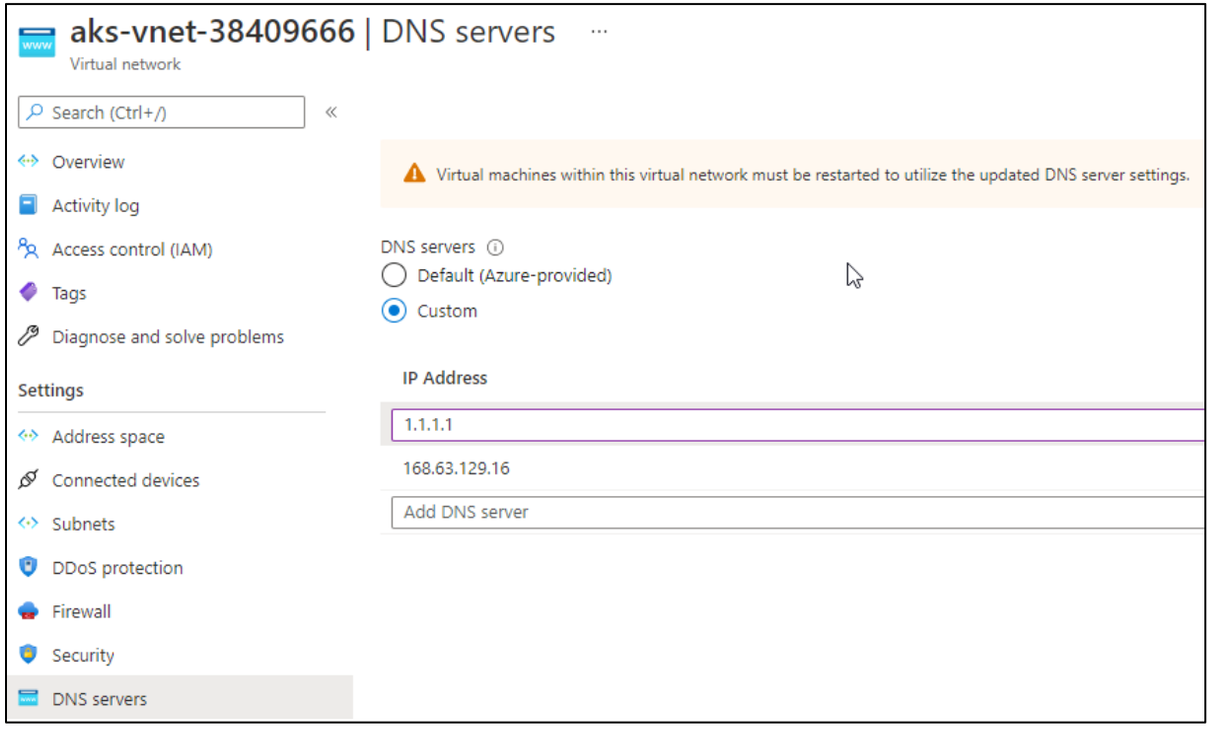
Azure network DNS

- Azure VNET default DNS 168.63.129.16.
- Custom DNS servers can be set on the VNET.
- AKS nodes get DNS configured through Dynamic Host Configuration Protocol (DHCP).



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Kubernetes network components

- --service-cidr sets the K8s service CIDR.
- --dns-service-ip sets the kubedns service IP.
- --pod-cidr sets Kubenet pod CIDR
  - Must be large enough to accommodate the number of nodes that you expect. You can't change this address range once the cluster is deployed.
  - This range is used to assign a /24 address space to each node in the cluster.
- --docker-bridge-address lets nodes communicate with the underlying management platform.

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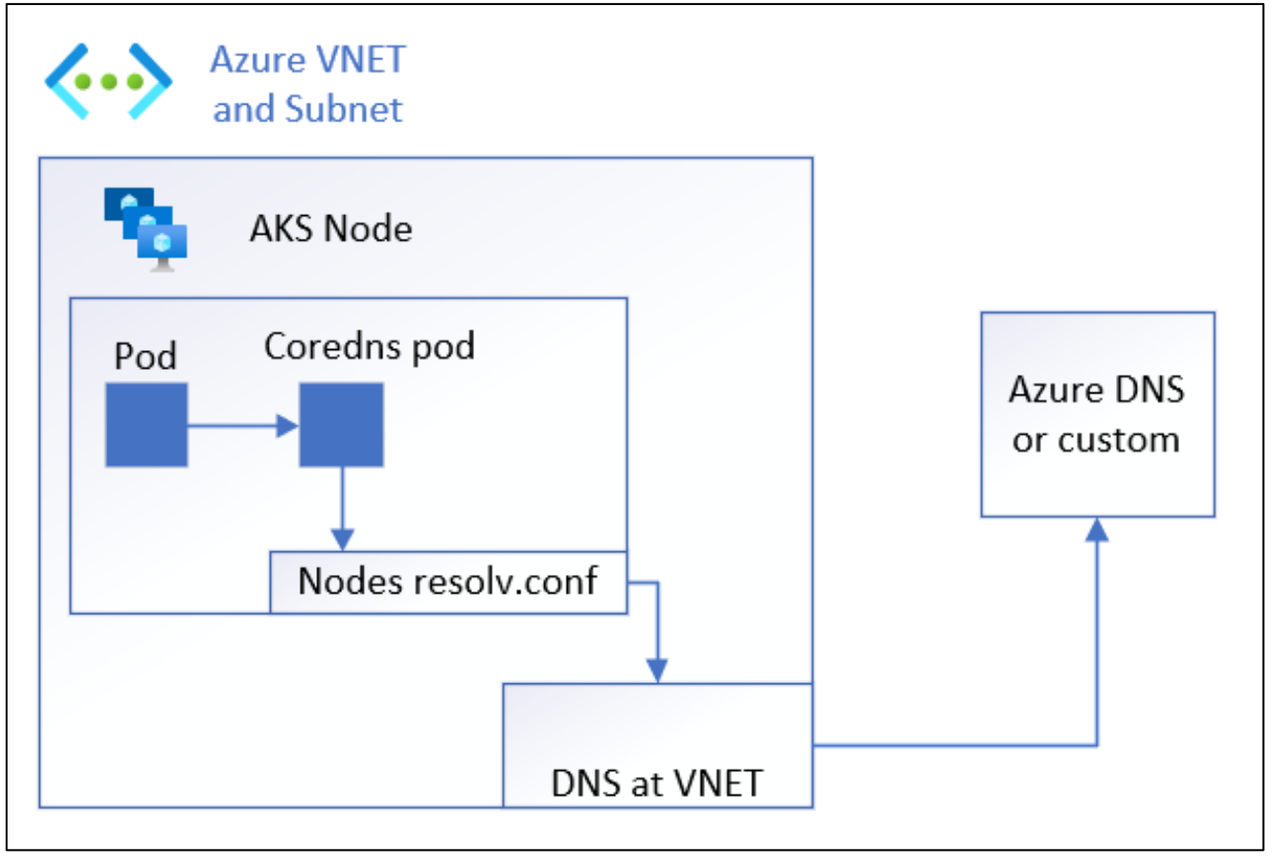
AKS Kubernetes DNS service

- AKS includes Coredns service.
- Coredns uses the node /etc/resolv.conf as a forwarder (the DNS on the VNET will be use as forwarders for external records).
- Coredns deployment is controlled by the CCP addon manager.
- Coredns-custom configmap.



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AKS traffic flow

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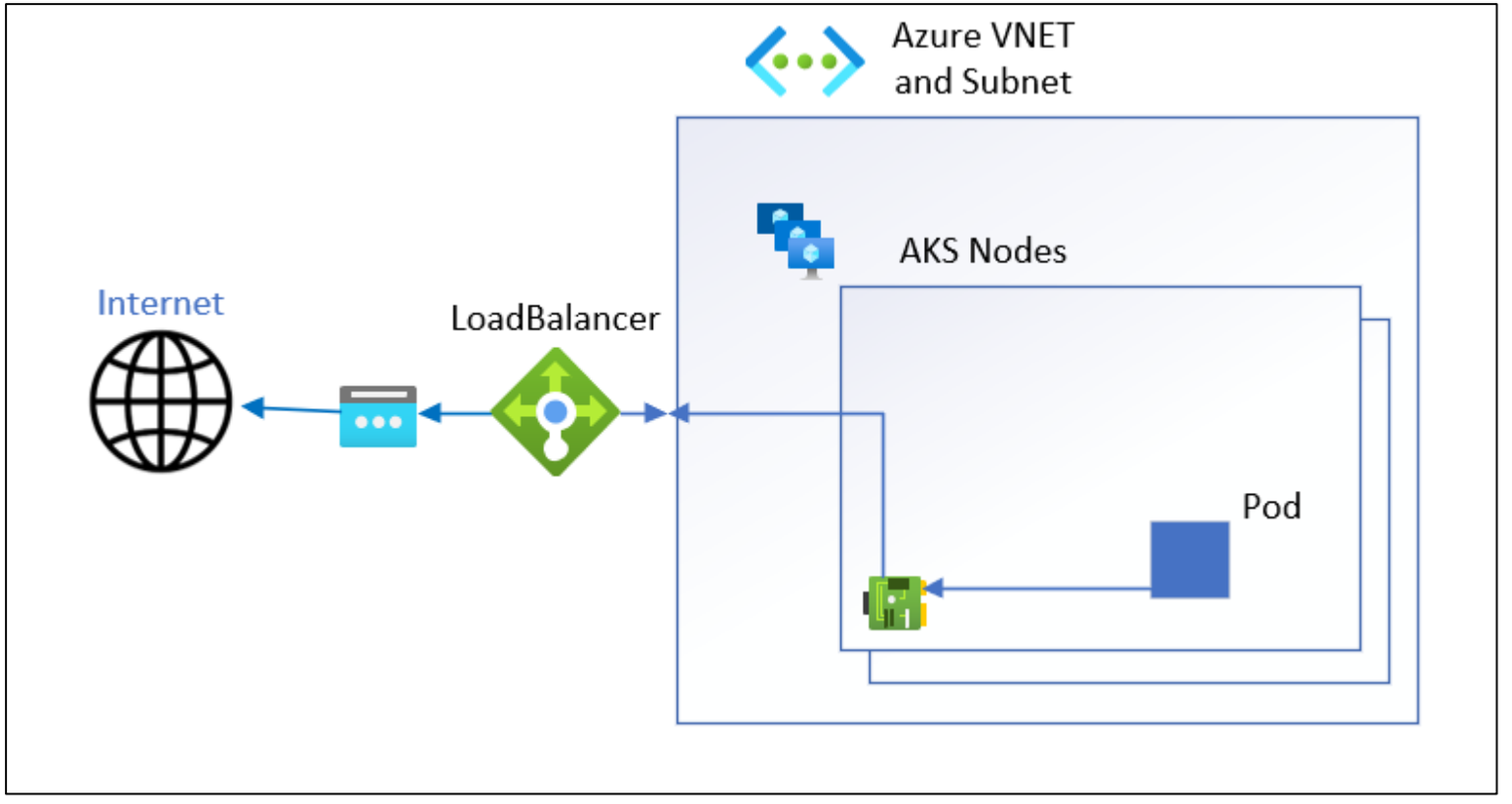
AKS common traffic flows

- Outbound from a pod to the Internet.
- Outbound from a pod to another VNET.
- Inbound from the Internet to a pod.
- Inbound from another VNET to a pod.

Outbound from a pod to the internet



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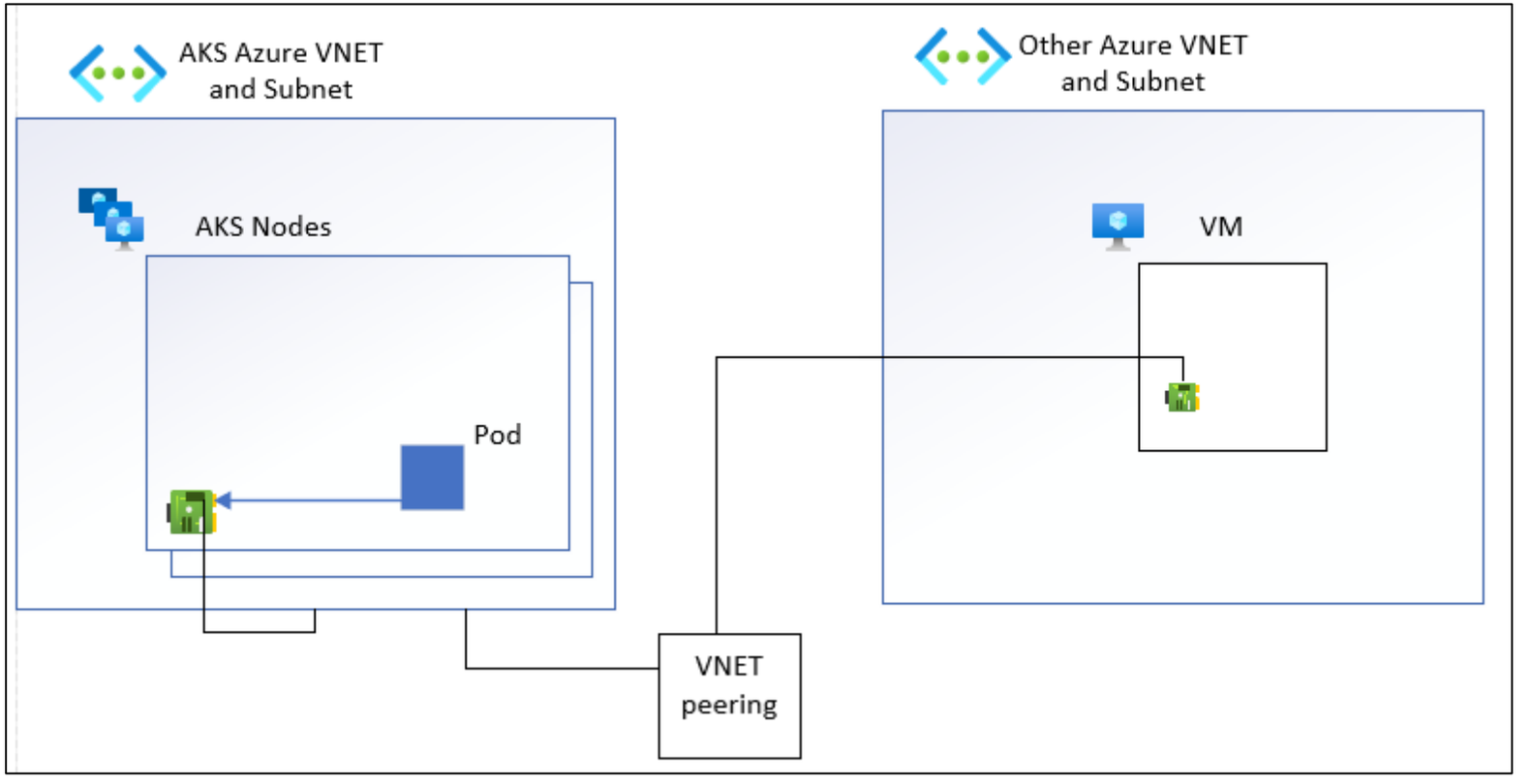
Outbound from a pod to another VNET



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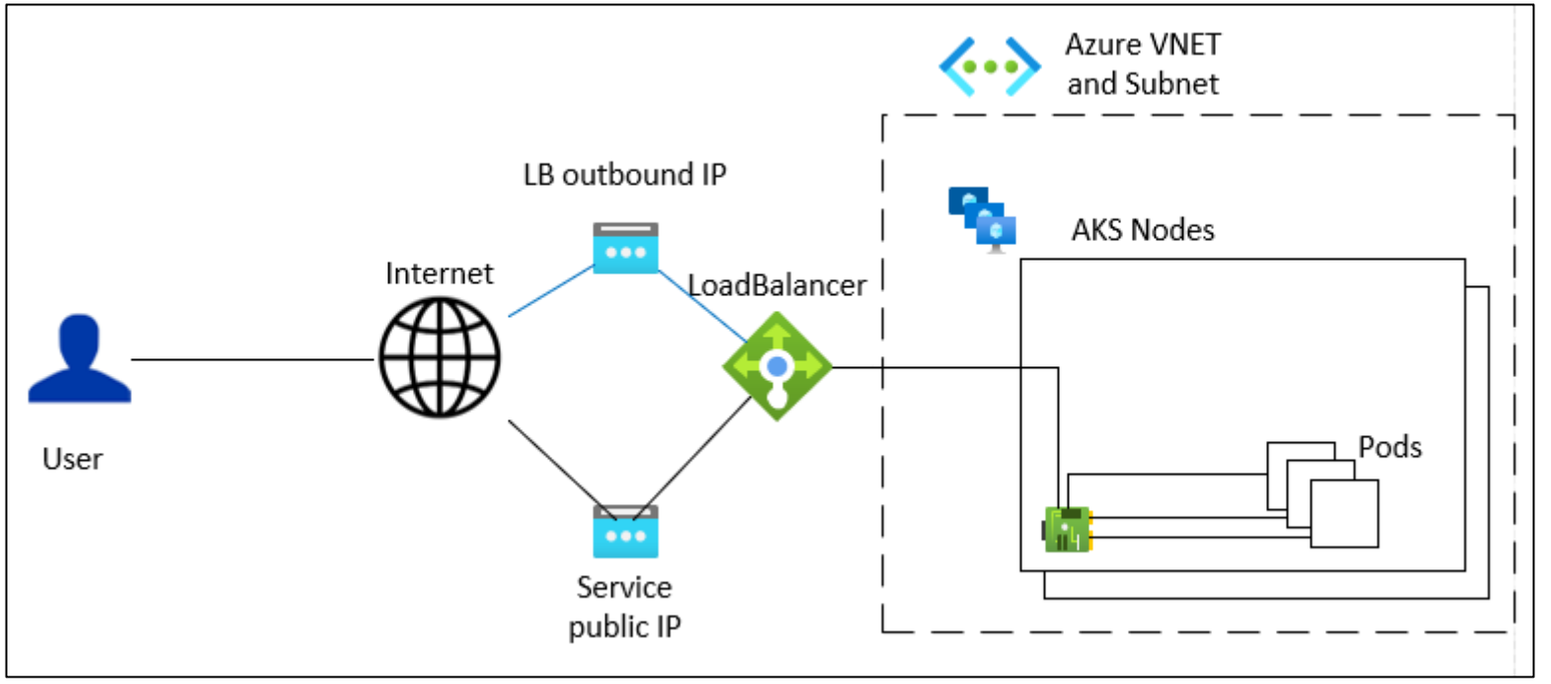
Inbound from the internet to a pod



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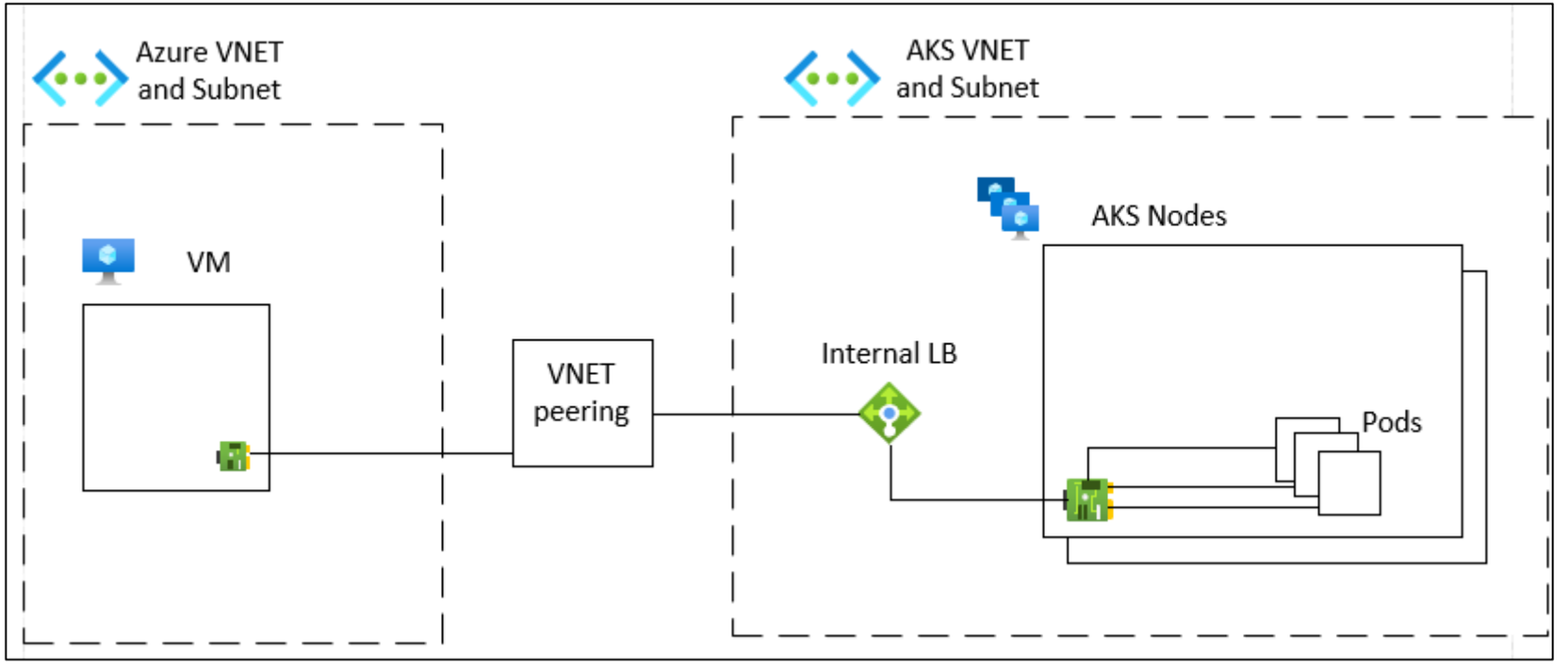
Inbound from another VNET to a pod



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AKS network troubleshooting

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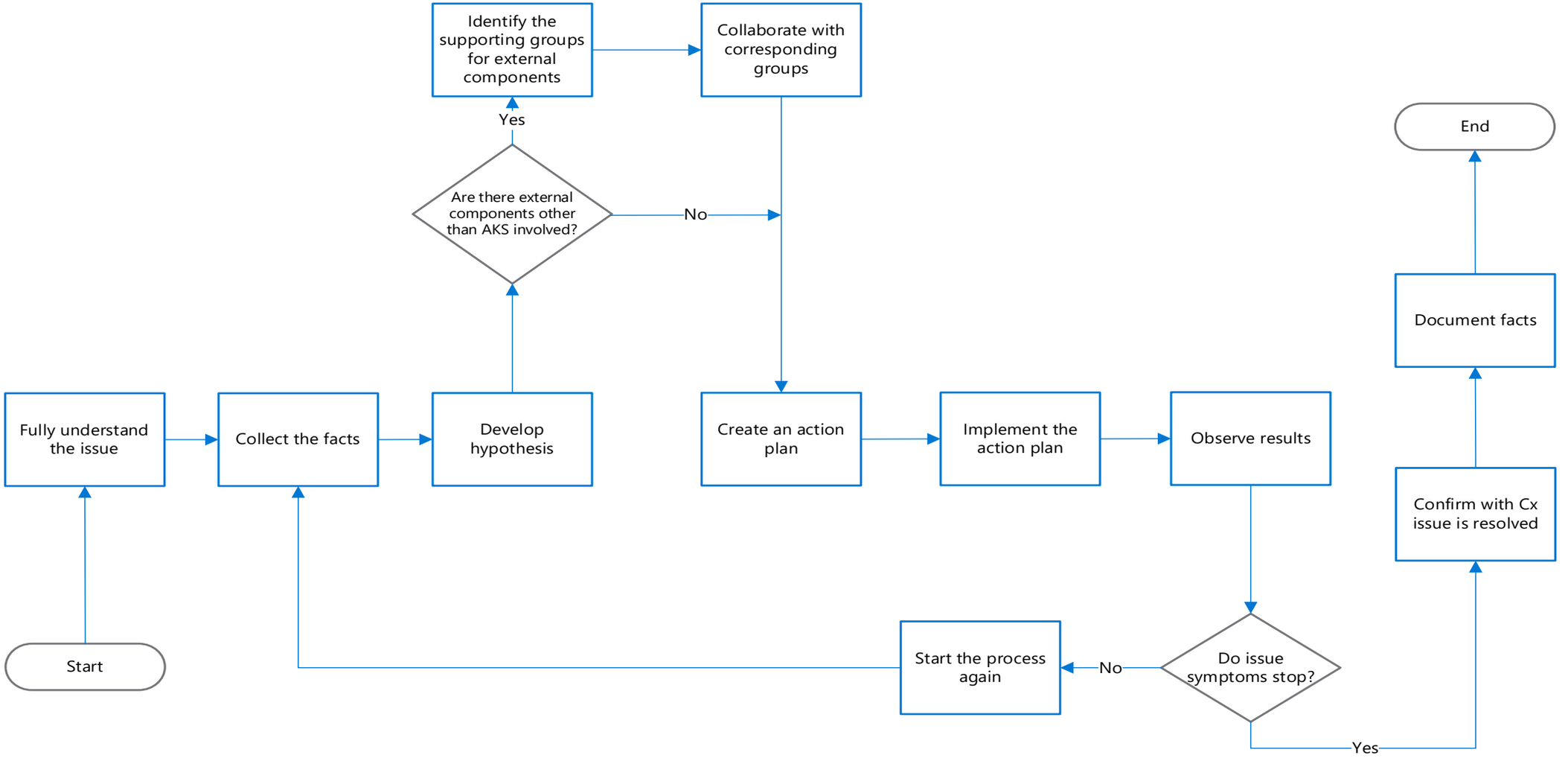
AKS general network troubleshooting



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Demo: Troubleshooting Pod to Pod Connectivity

Scenario

- Walkthrough for AKS network troubleshooting exercise where pods are not able to reach other pods on different nodes.

Tasks

1. Review AKS cluster with pod-to-pod connectivity issues.
2. Use ASC and Applens to collect general cluster information.
3. Diagnose and resolve the issue.

Duration: 13 minutes.

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Course/Lesson summary

During this session, you have gain knowledge about:

1. The AKS general networking architecture.
2. The Azure network components and Kubernetes components.
3. AKS network troubleshooting.

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Resources

- Network concepts for applications in Azure Kubernetes Service (AKS)
- Use kubenet networking with your own IP address ranges in Azure Kubernetes Service (AKS)
- Configure Azure CNI networking in Azure Kubernetes Service (AKS)
- Customize CoreDNS with Azure Kubernetes Service
- Control egress traffic for cluster nodes in Azure Kubernetes Service (AKS)
- Name resolution for resources in Azure virtual networks

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Thank you.