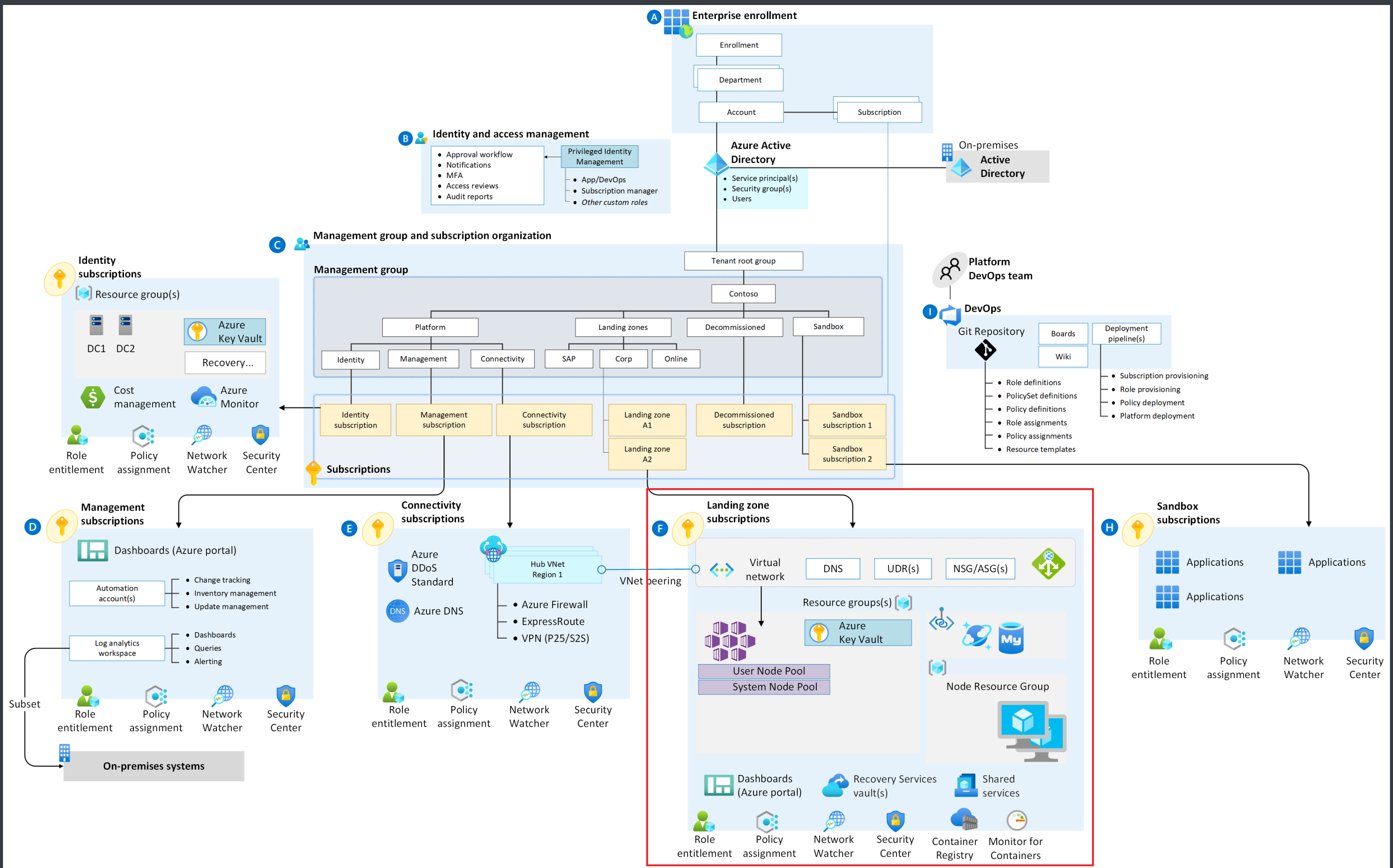
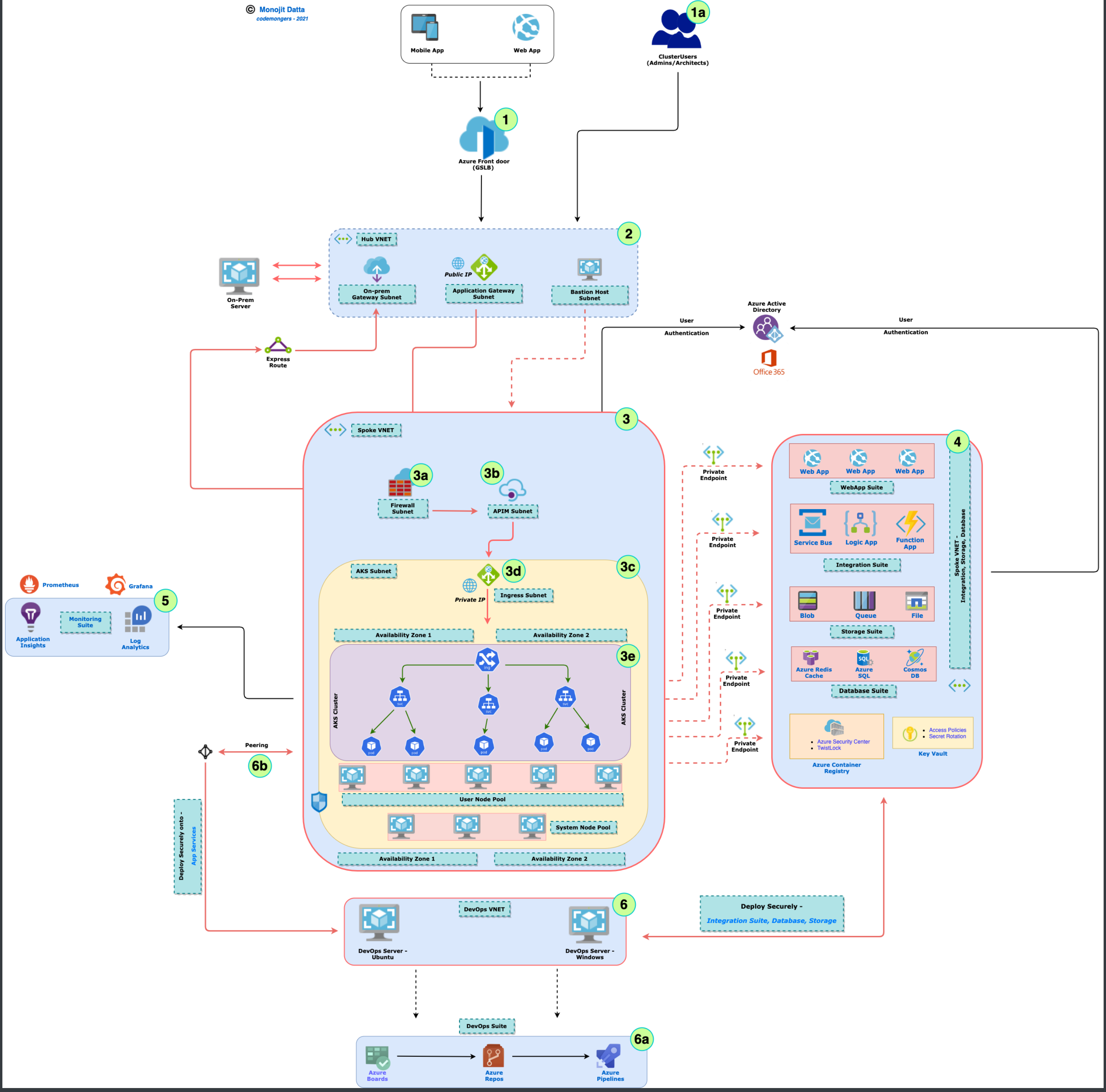
ESLZ for AKS



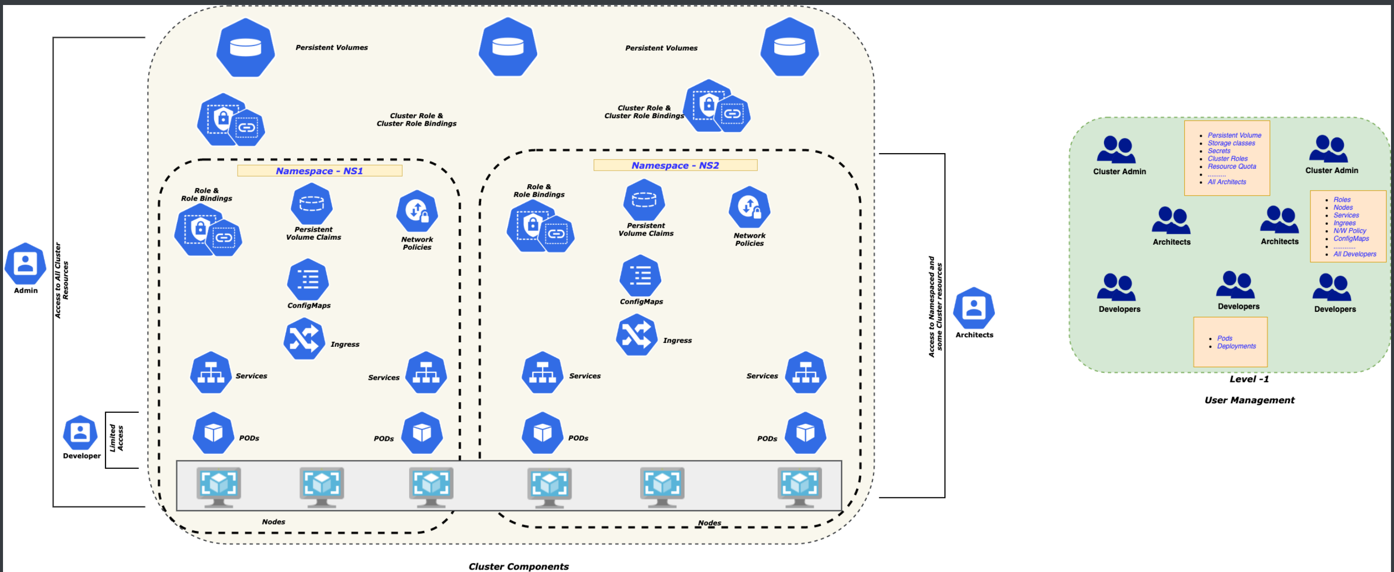
High Level Ref Arch.



Enterprise enrollment

- Primary Azure AD tenant as RBAC or a diifferent Tenant
- Heightened compliance requirements
- Cost vs Benefits

Identity and access management

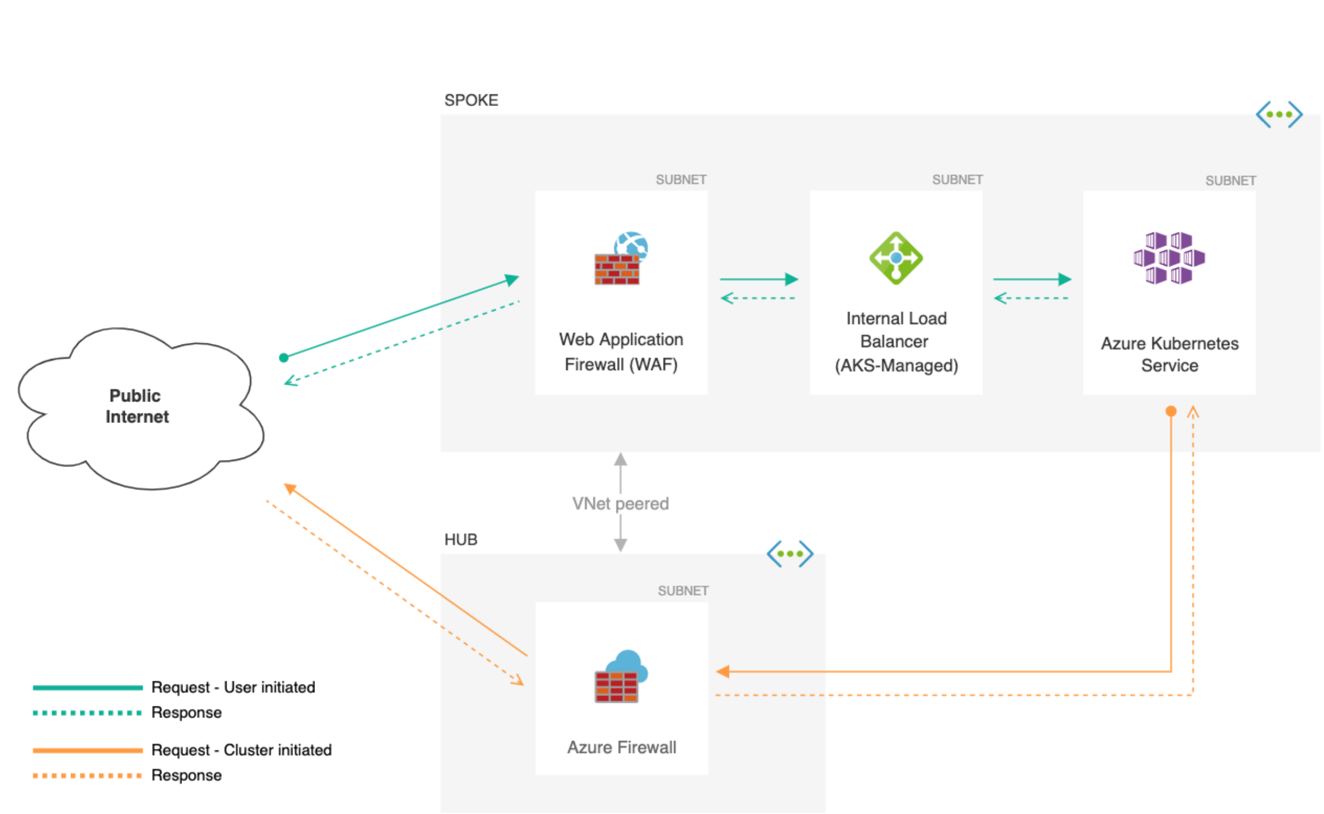


- Managed Identity or Service Principal
- How to Authenticate cluster access - *Client certificate-based* or *Azure Active Directory*
- RBAC
  - Method for isolation - *namespace, network policy, compute (node pool), or cluster*
  - Decide whether application teams can read other workloads in their cluster or in other clusters
  - How many Groups and What Groups - *Cluster Admin, Architects, Developers, Stakeholders* - at the minimum
    - What permissions are needed for each of the above Groups
    - What permissions are needed for the application teams to deploy into the cluster
  - Kubernetes RBAC integrated with Azure AD to limit privileges and minimize granting administrator privileges
  - Use AKS-managed *Azure AD integration* to use Azure AD for authentication and operator and developer access
  - Use Kubernetes *roles* and *role bindings* to Azure AD groups
  - Ex: Helm chart for *manager* RBAC

```
manager:
  roleName: smoke-manager-roles
```

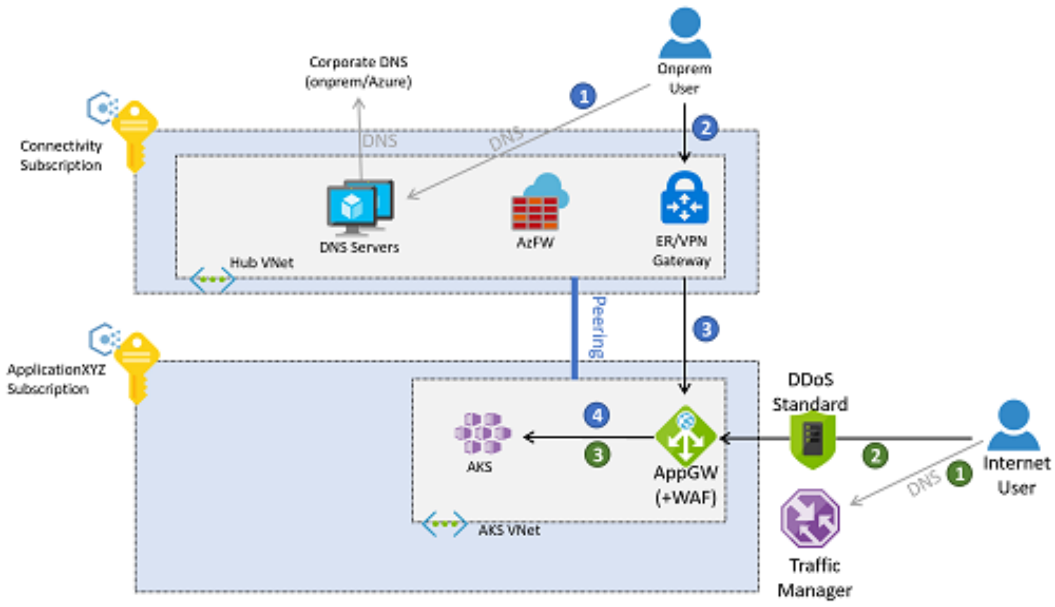
```
    roleNamespace: smoke
    rules:
    - apiGroups: ["*"]
      resources: ["*"]
      verbs: ["*"]
    - apiGroups: ["metrics.k8s.io"]
      resources: ["nodes", "pods"]
      verbs: ["get", "list"]
    bindingName: smoke-manager-rb
    bindingNamespace: smoke
    subjects:
    - name: <azure_ad_group_id>
      kind: Group
```

Network topology and connectivity

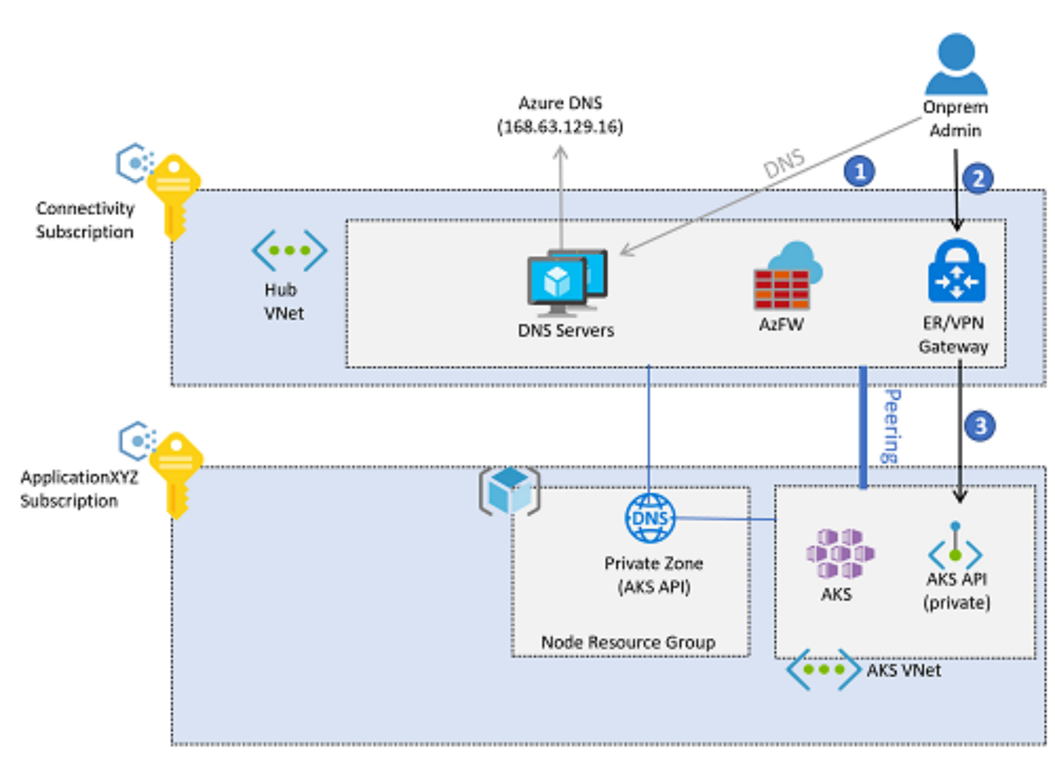


- Azure CNI vs Kubenet
- Size of the virtual network subnet for AKS - Scaling vs IP address limits
- External Access

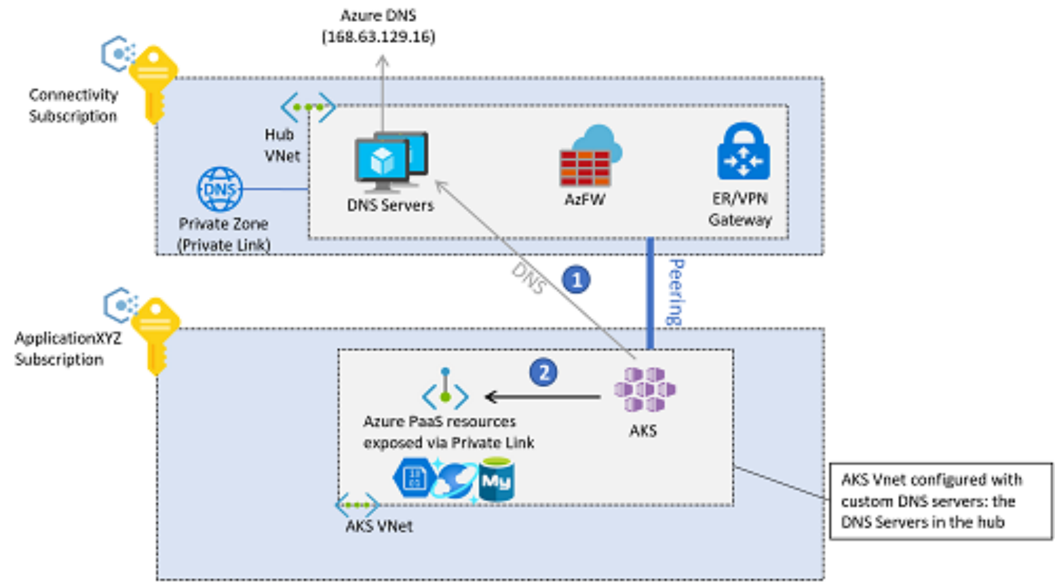
  - Azure Frontdoor with WAF
  - Application Gateway
  - API Management - *Authentication, Policies, Monitoring, Routing*
    - Outside the Cluster
      - Points to AKS Ingress
      - Private VNET (*Premium*)
      - Custom Domain
      - Authenticate early
    - Inside the Cluster
      - Self Hosted Gateway
      - Less Costly
      - One single Ingress and one APIM can manage routing of services across all namespaces
      - Authenticate late - inside the cluster
- InBound access to the cluster
  - Ingress Controller - Off-cluster Or In-Cluster
  - Service Mesh - Observablity, Traffic Splitting, Connected Clusters
  - Private IP of Ingress (ILB)
  - SSL flow
    - SSL Offload - Application Gateway or AKS Ingress
    - Backend-Protocol: Https
    - SSL PassThru - *Layer 4*
  - Appropriate Certificates
  - Private DNS Zone - multi-tenancy



- Azure Policy Add-On
    - Choose from Set Policies and integrates with as much as of them
- OutBound from AKS
    - Load Balanced Cluster or UDR cluster (*no pulic Load balancer by default*)
    - restricted egress internet access
    - Azure Firewall or a network virtual appliance cluster by configuring UDRs in the AKS subnet
    - K8s Network Policies can be used to improve security and filter network traffic between pods in an AKS cluster
- Private Clusters



- AKS Pod to Backend services


Azure DNS
(168.63.129.16)
Connectivity Subscription
Hub VNet
DNS
Private Zone (Private Link)
DNS Servers
AzFW
ER/VPN Gateway
DNS
1
Peering
ApplicationXYZ Subscription
2
Azure PaaS resources exposed via Private Link
AKS
AKS VNet
AKS Vnet configured with custom DNS servers: the DNS Servers in the hub

Resource organization

- Single Tenant, Multi Tenant
- Management groups
  - Flat structure
  - Segmented structure
  - Hierarchical structure
- container registry topology
  - Per workload
  - Per cluster with multiple workloads in the registry
  - Per all clusters in the landing zone with multiple workloads and clusters in the same registry
  - Per all clusters across multiple landing zones with multiple workloads and clusters in the same registry
- container registry policies
  - Set a policy at the subscription level requiring all hosts in the landing zone to use the defined registry.
  - Set a more granular policy at the resource group level.
  - Set a broader policy at the management group level.

Governance disciplines

Build security

- DevSecOps with container images
- Shift Letf - remediate most issues before they start moving down the pipeline

Registry security

- Drift control from build
- Prevention of push/pull of contaminated images
- Image signing

Cluster security

- Authentication and authorization
- Network security
- Vulnerability and compliance management
- Isolation
- Taints/Tolerations
- Live Accurate info about the cluster

Node security

- Runtime protection
- Vulnerability and compliance management
- Azure Policy

Application security

- Secrets storage - Az KeyVault; integate with a DevOps solution (*Az DevOps*)
- Image Security
- Application Code security

Operations baseline

- AKS limits. Use multiple AKS instances to scale beyond those limits
- Logically within a cluster and physically in separate clusters.
- Control resource consumption by workloads.
- Virtual machines sizes and the impact of using one or the other.
    - Larger VMs vs Smaller VMs
    - Multiple Node pools based on workloads
- Monitor and Log AKS
- Updates and Upgrades that you should do
- horizontal pod autoscaler and cluster autoscaler
- Consider securing traffic between pods using - network policies and the Azure policies plug-in
- Control plane logs components

Deployment Options

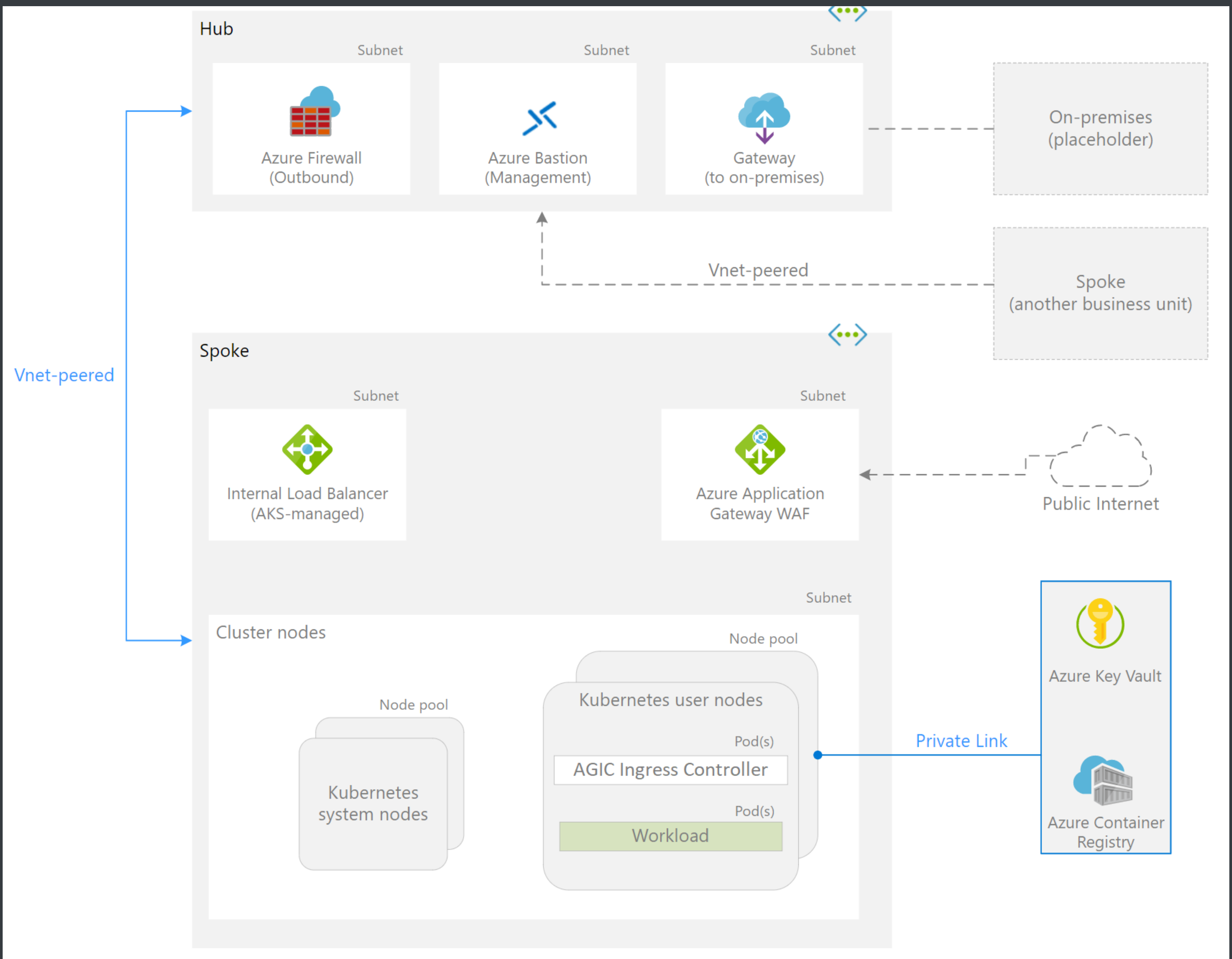
- https://docs.microsoft.com/en-us/azure/cloud-adoption-framework/scenarios/aks/eslz-platform-automation-and-devops

BCDR

- https://docs.microsoft.com/en-us/azure/cloud-adoption-framework/scenarios/aks/eslz-business-continuity-and-disaster-recovery

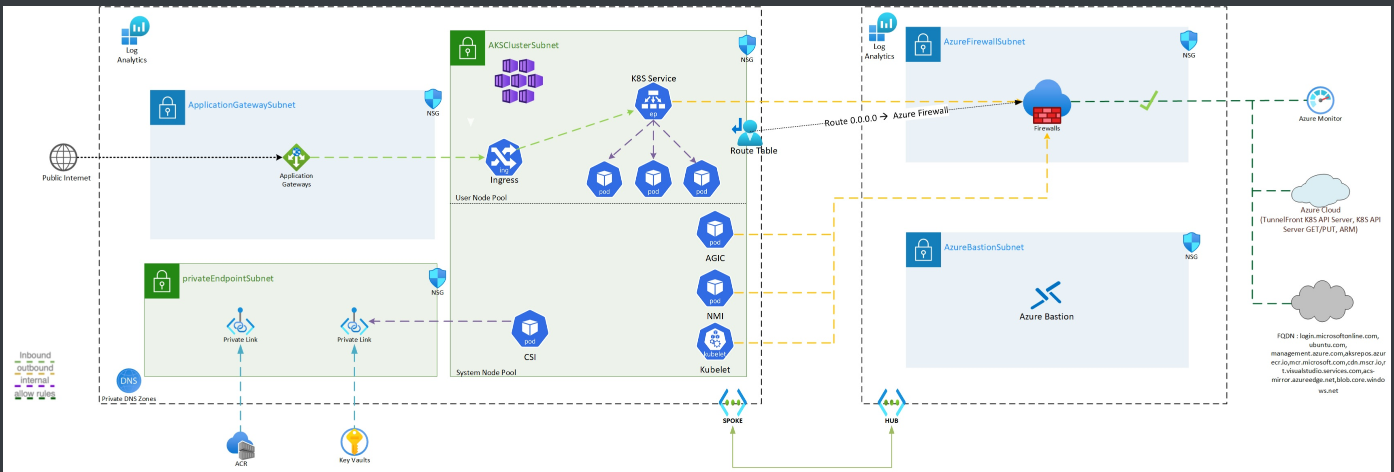
Construction Sets for AKS

AKS Secure Baseline – Public Cluster



https://github.com/monojit18/Enterprise-Scale-for-AKS/tree/main/Scenarios/Secure-Baseline

AKS Secure Baseline with Private Cluster



https://github.com/monojit18/Enterprise-Scale-for-AKS/tree/main/Scenarios/AKS-Secure-Baseline-PrivateCluster