3. Build and release pipelines

└ **3.3 Advanced pipeline design**

└ **3.3.1 Hybrid pipelines, self-hosted agents, VM templates**

---

1. What is a hybrid pipeline and when should it be used?
2. How do you configure a pipeline to run on both Microsoft-hosted and self-hosted agents?
3. What are the core considerations when setting up self-hosted agents in Azure Pipelines?
4. How do you secure and update self-hosted agents?
5. What are the benefits and drawbacks of self-hosted agents vs. Microsoft-hosted agents?
6. How do you use VM templates in pipeline agent pools?
7. What are the main steps to register a new self-hosted agent?
8. How do you configure hybrid jobs across multiple agent types in a single pipeline YAML?
9. What are the key troubleshooting steps if a self-hosted agent fails to run jobs?
10. How do you ensure scalability and availability of self-hosted agents in enterprise scenarios?

---

1. What is a hybrid pipeline and when should it be used?

A hybrid pipeline uses both Microsoft-hosted and self-hosted agents within the same pipeline to leverage cloud scalability and custom environments. Use it when some tasks require custom tooling, dependencies, or access to private resources not available on Microsoft-hosted agents.

---

2. How do you configure a pipeline to run on both Microsoft-hosted and self-hosted agents?

Define separate jobs or stages in your YAML pipeline, specifying `pool: Default` (self-hosted) or `pool: vmImage: 'ubuntu-latest'` (Microsoft-hosted) for each job. Example:

```
jobs:
  - job: Build
    pool:
      vmImage: 'ubuntu-latest'
  - job: CustomTask
    pool:
      name: Default
```

---

3. What are the core considerations when setting up self-hosted agents in Azure Pipelines?

Ensure agents meet system requirements, have required network access, correct permissions, are kept secure, updated, and registered to the right agent pool. Monitor agent health and load for capacity planning.

---

4. How do you secure and update self-hosted agents?

- Run agents as a non-admin user
- Restrict network access
- Install security updates and agent updates promptly
- Protect agent keys
- Use firewalls/endpoint protection
- Regularly audit and rotate agent authentication tokens

5. What are the benefits and drawbacks of self-hosted agents vs. Microsoft-hosted agents?

Self-hosted agents:

- Full control over software/tools, network, and environment
- Can access private resources
- Require maintenance, security, scaling, and cost management

Microsoft-hosted agents:

- Fully managed, always updated, no maintenance
- Scales automatically
- Limited customizations, no persistent state, no access to private on-prem resources

---

6. How do you use VM templates in pipeline agent pools?

Create a preconfigured VM image (template) with required tools and software. Use this template to automatically provision new VMs as agents (e.g., with Azure Scale Set agent pools), ensuring consistent environments and fast scaling.

---

7. What are the main steps to register a new self-hosted agent?

- Download the agent package from Azure DevOps.
- Extract the files.
- Run the config script (e.g., config.cmd or config.sh), provide server URL, authentication token (PAT), and select agent pool/name.
- Start the agent interactively or as a service/daemon.

---

8. How do you configure hybrid jobs across multiple agent types in a single pipeline YAML?

- In YAML, define multiple jobs, each with its own pool property.
- Example:

```
jobs:
  - job: linuxBuild
    pool:
      vmImage: 'ubuntu-latest'
  - job: customJob
    pool:
      name: MySelfHostedPool
```

- This enables one pipeline to use both Microsoft-hosted and self-hosted agents.

---

9. What are the key troubleshooting steps if a self-hosted agent fails to run jobs?

- Confirm agent is online and showing as “Available” in Azure DevOps.
- Check agent logs for errors.
- Verify agent machine connectivity to Azure DevOps (outbound HTTPS 443).
- Ensure authentication tokens are valid and not expired.
- Confirm permissions for agent pool and job steps.
- Validate required software/dependencies are installed.

---

10. How do you ensure scalability and availability of self-hosted agents in enterprise scenarios?

- Use Azure Virtual Machine Scale Set (VMSS) agent pools for auto-scaling.
- Deploy agents across multiple regions or availability zones.
- Monitor agent utilization and automate provisioning/de-provisioning.
- Set up health checks and automated recovery for failed agents.
- Maintain backup agents to handle load spikes.