

5.5 Deploy the Environment

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Crucible deploys an identified and controlled environment from selected **Baselines**, constructed Images, configuration, dependencies, and deployment parameters.

Deployment realizes the intended environment on a selected **Deployment Target**. Crucible preserves the relationship between the intended deployment, the inputs used, the operations performed, and the resulting deployed state.

Deployment does not independently establish that the environment is compliant, operationally approved, or authorized for use. Separate assessment, validation, and authorization activities make those determinations.

Select the Deployment Target

The deployment activity identifies the Deployment Target on which Crucible will realize the environment.

The selected Deployment Target identifies the infrastructure, platform, provider, location, Security Domain, or other execution context needed to perform the deployment.

Deployment-target selection can account for:

- The required environment type
- The selected Infrastructure Baseline
- The supported Machine Images or Container Images
- Available compute, storage, and network resources
- Provider-specific capabilities
- Security Domain restrictions
- Connectivity conditions
- Required deployment parameters
- Applicable organizational controls

The selected Deployment Target must support the resources and operations required by the applicable deployment description.

Prepare the Deployment Inputs

Crucible prepares the controlled inputs required to perform the deployment.

The inputs can include:

- The selected **Infrastructure Baseline**
- Constructed Machine Images
- Constructed Container Images

- Application artifacts
- Configuration definitions
- Network definitions
- Storage definitions
- Security configuration
- Preserved Dependencies
- Credentials or credential references
- Deployment parameters
- Provider-specific parameters
- Applicable policy and compliance content

Each input retains its identity and revision so Crucible can relate the resulting deployed environment to the content used to create it.

Resolve Provider-Specific Parameters

Crucible separates provider-independent deployment intent from provider-specific realization details.

Provider-independent content describes the required resources, relationships, configuration, and lifecycle operations without unnecessarily binding the deployment to one provider.

Provider-specific parameters can identify:

- Resource types
- Instance or service classes
- Image identifiers
- Regions or locations
- Network identifiers
- Storage classes
- Provider credentials
- Provider-specific configuration values
- Provider implementation settings

Crucible supplies the resolved parameters to the applicable Provider Implementation without changing the provider-independent deployment intent.

Perform Deployment Operations

Crucible performs the operations required to realize the environment on the selected Deployment Target.

Deployment operations can include:

1. Prepare the Deployment Target
2. Verify required inputs and dependencies
3. Create or configure infrastructure resources
4. Create network and storage resources

5. Instantiate Machine Images or Container Images
6. Apply configuration
7. Deploy application workloads
8. Apply security controls
9. Execute required post-deployment activities
10. Record the result of each operation

The applicable Infrastructure Baseline and deployment description determine which operations apply and the order in which Crucible performs them.

Deployment Orchestration

Deployment orchestration coordinates the activities needed to produce the intended environment.

The orchestration process preserves the relationships among:

- The selected Deployment Target
- The Infrastructure Baseline
- The deployed resources
- The selected Images
- The deployment parameters
- The Provider Implementation
- The individual Deployment Operations
- The resulting environment state

Crucible records the status and result of each operation so an operator can determine whether the deployment completed, partially completed, or failed.

Deployment Across Providers

Crucible can apply a consistent deployment lifecycle across supported provider environments while allowing each Provider Implementation to perform the operations required by its target platform.

The supported provider environments can differ in:

- Resource models
- Interface protocols
- Authentication mechanisms
- Network services
- Storage services
- Image formats
- Configuration parameters
- Operational constraints

Crucible preserves common deployment intent and lifecycle records across those differences.

Support for multiple providers does not require every provider to offer identical resources or behavior. The selected Deployment Target and Provider Implementation determine which capabilities are

available.

Concurrent and Distributed Deployment

A deployment can involve more than one Deployment Target when the applicable deployment description requires a distributed environment.

Crucible can coordinate deployment activities across targets while preserving the identity, status, and result of each target-specific operation.

A distributed deployment can include:

- Resources deployed in more than one location
- Resources deployed through more than one provider
- Resources assigned to different Security Domains
- Central and edge resources
- Connected and disconnected deployment stages

Each Deployment Target remains independently identifiable even when the targets form one operational environment.

Deployment Failure and Rollback

When a Deployment Operation fails, Crucible records:

- The failed operation
- The affected Deployment Target
- The inputs used by the operation
- The observed failure
- Operations completed before the failure
- Resources created or modified
- The resulting environment state
- Any recovery or rollback activity

When the applicable deployment description provides a [Deployment Rollback](#), Crucible performs the defined rollback operations and records their results.

Rollback returns the environment to a defined recoverable state. Rollback does not imply that every provider can restore every resource to its exact previous state.

Deployment Result

The deployment result records:

- The deployment identifier

- The selected Deployment Target
- The Infrastructure Baseline and revision
- The deployed Images and revisions
- The deployment parameters
- The Provider Implementation and revision
- The Deployment Operations performed
- The status of each operation
- The resources created, changed, or removed
- The final deployment status
- Any failure or rollback information
- The associated [Provenance](#)
- The associated [Traceability](#)
- The generated [Evidence](#)

The deployment result becomes an input to [5.6 Validate the Result](#) and subsequent compliance, approval, maintenance, replacement, recovery, or retirement activities.

Requirements Addressed

Requirement	Statement
FR-DEP-001 — Deploy Infrastructure Resources	Crucible SHALL deploy Infrastructure Resources .
FR-DEP-002 — Deploy Virtual Machines	Crucible SHALL deploy Virtual Machines .
FR-DEP-003 — Deploy Kubernetes Clusters	Crucible SHALL deploy Kubernetes Clusters .
FR-DEP-004 — Deploy Containerized Workloads	Crucible SHALL deploy Containerized Workloads .
FR-DEP-005 — Deploy Platform Services	Crucible SHALL deploy Platform Services .
FR-MC-001 — Cloud Provider Abstraction	Crucible SHALL provide Cloud Provider Abstraction.
FR-MC-002 — Provider-Specific Extensions	Crucible SHALL provide provider-specific extensions through Provider Plugins .
FR-MC-003 — Deployment Portability Across Cloud Providers	Crucible SHALL provide deployment portability across Cloud Providers .
FR-MC-004 — Hybrid-Cloud Deployments	Crucible SHALL perform Hybrid-Cloud Deployments .
FR-MC-005 — Edge Deployments	Crucible SHALL perform Edge Deployments.

The linked leaf requirement pages remain the canonical sources.

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