FR-IMG-004 — Image Signing

Go to Crucible Image Management Requirements

Statement

Crucible SHALL associate a digital signature with an identified Image.

Source Statement

> Crucible SHALL perform Image Signing by generating a Digital Signature for an identified Image and associating the Digital Signature with that Image.

Source

Crucible System Requirements Specification, Version 1.1 Draft, Functional Requirements, FR-IMG-004.

Assessment

The source statement expresses the approved intent but does not provide a fully testable formulation.

The following Specification, Discipline, and Authoring findings apply:

- **The system** does not use the defined system name
- **shall** does not follow the established uppercase normative convention
- **Support** is a weak verb that does not identify the required behavior
- **Image signing** does not identify the Image to which the signature applies
- The source statement does not identify the observable result of the signing operation
- The source statement does not require verification of the resulting signature
- The source statement does not prescribe a signing algorithm, signature format, key-management system, repository, or implementation technology

The normalized Statement:

- Replaces **The system** with Crucible
- Replaces **support** with the direct behavior **associate**
- Identifies an Image as the subject of the signing operation
- Identifies a digital signature associated with the Image as the required result
- Retains one primary required behavior
- Preserves implementation independence

The normalized Statement does not add requirements for signature verification, Image approval, promotion, publication, deployment, or key governance. Separate requirements define those obligations.

Rationale

A digital signature associated with an identified Image allows an actor or process to evaluate whether the signature corresponds to that Image and an applicable signing identity.

Image signing contributes to:

- Image authenticity evaluation
- Image integrity evaluation
- Identification of the signing identity
- Controlled Image distribution
- Controlled Image promotion
- Provenance
- Auditability
- Traceability

The signing operation may apply to:

- A Machine Image
- A Container Image
- Identifying Image metadata
- An Image content digest
- A representation containing the Image and associated metadata

The applicable architecture and lower-level requirements determine the exact signed representation and signing mechanism.

Applies To

This requirement applies to:

- Crucible
- Images
- Machine Images
- Container Images
- Image identifiers
- Image content digests
- Digital signatures
- Signing identities
- Signing operations
- Image repositories
- Image build workflows
- Image promotion workflows
- CI/CD Pipelines

Verification

1. Verification SHALL confirm that Crucible performs a signing operation for an identified Image
2. Verification SHALL confirm that the signing operation associates a digital signature with the identified Image
3. Verification SHALL confirm that the associated digital signature identifies or references the Image to which it applies

Verification may include:

- Machine Image signing tests
- Container Image signing tests
- Signature-record inspection
- Image-metadata inspection
- Image-digest comparison
- Signing-log inspection
- Automated CI/CD Pipeline testing

The verification record SHALL identify:

1. The signed Image
2. The Image identifier
3. The signed representation
4. The signing operation
5. The associated digital signature
6. The signing result
7. The observed output
8. The generated Evidence

Outgoing Traceability

This requirement realizes:

- MO-001
- MO-005
- MO-006

This requirement relates to:

- FR-IMG-001 — Build Virtual Machine Images
- FR-IMG-002 — Build Container Images
- FR-IMG-003 — Immutable Infrastructure Workflows
- FR-IMG-005 — Image Verification
- FR-IMG-006 — Image Promotion Workflows
- 6. Machine Images and Image Layers
- 9. Compliance and Security
- 10. Reproducibility, Provenance, and Traceability

Referenced By

The wiki Backlinks function provides the current list of pages that reference `FR-IMG-004`.

Incoming Traceability should be derived dynamically from backlinks rather than maintained as a duplicate manual list.

Backlinks identify incoming references but do not define the semantics of each relationship. Referencing pages should identify whether the relationship represents realization, refinement, verification, dependency, or another defined traceability relationship.

ConOps Relationship

The Crucible Concept of Operations describes a Phase 1 workflow that builds controlled Image Artifacts through an automated CI/CD Pipeline.

FR-IMG-004 establishes the required signing behavior for an identified Image produced or processed by that workflow.

Requirements governing Image building, signature verification, promotion, compliance assessment, publication, transfer, and deployment define separate behavior.

Delivery Phase

Phase 1

Implementation Status

Not Assessed

Implementation status requires verification that Crucible associates a digital signature with an identified Image.

Requirement Status

Draft

The source System Requirements Specification identifies Version 1.1 as a draft.

Notes for Editors

This requirement page should retain the stable requirement identifier `FR-IMG-004`.

Changes to the Statement SHALL preserve the approved intent of the source requirement.

The Source Statement should preserve the original wording from the controlling System Requirements Specification.

The Statement should remain limited to associating a digital signature with an identified Image.

Requirements for signature verification, Image approval, promotion, publication, transfer, and deployment should remain in their applicable requirement pages.

Verification criteria should test only the behavior stated in the normalized Statement and should not introduce additional normative obligations.

Incoming Traceability should use the wiki Backlinks function rather than a manually maintained list.

To reference this requirement Statement from another wiki page, insert:

```
{{section>dido:02-crusible:99-annexes:annex-c-requirements:03-functional-requirements:03-02-image-management:fr-img-004#Statement&noheader&nofooter&noeditbtn}}
```

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