

ENV-005g — Emulate Communication Failures

[Go to ENV-005 — Emulate Distributed Systems](#)

Statement

The [DIDO-TE](#) SHALL emulate communication failures in accordance with the applicable [Test Definition](#).

Derived From

- [ENV-005 — Emulate Distributed Systems](#)
- [ENV-005a — Emulate Distributed Topology](#)
- [ENV-005c — Emulate Communication Behaviour](#)
- [\[DTE5\] DIDO-TE Requirements Register](#), source requirement identifier and obligation to be assigned
- [\[DTE6\] Structured Information Processing Reference Architecture \(SIP-RA\)](#)
- [\[DTE7\] Federated Data Interpretation Systems Reference Architecture \(FDIS-RA\)](#)

Rationale

Communication failures alter or prevent interactions among otherwise operating participating [Nodes](#).

Relevant failures include connection refusal, connection termination, message loss, message corruption, duplication, reordering, delay, jitter, bandwidth restriction, acknowledgement loss, routing failure, discovery failure, asymmetric reachability, and intermittent connectivity.

Controlled emulation permits assessment of retry, timeout, buffering, deduplication, ordering, error handling, degradation, failover, and recovery behaviour.

A communication failure may affect an individual message, communication path, interface, protocol, or endpoint. ENV-005h separately governs a network partition that divides Nodes into mutually isolated or asymmetrically connected groups.

The applicable Test Definition identifies each affected communication path, failure type, direction, trigger, duration, extent, rate, and required restoration condition.

Applies To

- [Test Environment](#)
- [Test Definition](#)
- [Test Execution](#)

- [Test Object](#)
- [Node](#)
- [Test Resource](#)
- [Configuration](#)
- [Constraint](#)
- [Evidence](#)

Verification

Verification confirms that:

- The applicable Test Definition identifies each communication failure subject to emulation.
- Each specified communication failure has a unique identity.
- The Test Definition identifies each affected communication path, source, destination, direction, interface, and protocol.
- The Test Definition specifies the failure type, trigger, initiation point, duration, extent, rate, and termination condition.
- The Test Definition specifies whether the failure affects all communications or a defined subset of messages, message types, endpoints, or paths.
- The Test Definition specifies the required restoration condition following the communication failure.
- The DIDO-TE establishes the required pre-failure communication state.
- The DIDO-TE initiates each communication failure at the specified event, state, or time.
- The DIDO-TE applies each failure only to the specified communication scope.
- The DIDO-TE maintains each communication failure for its specified duration or until its specified termination condition occurs.
- The DIDO-TE observes affected and unaffected communications during the failure.
- The DIDO-TE restores communication to the specified state when the failure terminates.
- The DIDO-TE distinguishes an injected communication failure from an unintended Test Environment failure.
- The DIDO-TE detects a failure that does not begin, persist, affect communications, terminate, or recover as specified.
- The DIDO-TE records the failure identity, affected paths, failure type, trigger, initiation time, duration, affected communications, observed responses, termination, and restoration as [Evidence](#).
- The DIDO-TE maintains [Traceability](#) among each communication failure, affected paths and Nodes, Test Definition, Test Execution, Evidence, and [Test Results](#).
- A missing, incorrect, uncontrolled, unobserved, unsupported, or untraceable mandatory communication failure constitutes nonconformance with this requirement.

Verification includes:

- Inspection of the communication failures specified by the Test Definition
- Inspection of affected paths, endpoints, directions, protocols, failure types, triggers, durations, rates, and restoration conditions
- Observation of communication before, during, and after each failure
- Emulation of message loss, delay, duplication, reordering, or corruption when specified
- Emulation of connection refusal, termination, discovery failure, routing failure, or intermittent connectivity when specified
- Testing that unaffected communication paths remain within their specified conditions

- Testing restoration of communication following failure termination
- Confirmation that the DIDO-TE detects an incorrectly initiated, scoped, sustained, terminated, or restored failure
- Inspection of communication-failure Evidence and Traceability records
- Confirmation that each mandatory communication-failure deviation produces a nonconformance result

Referenced By

- [ENV-005h — Emulate Network Partitions](#)
- [ENV-005j — Emulate Recovery Behaviour](#)
- [ENV-005k — Observe Distributed Interactions](#)
- [ENV-005l — Record Distributed-System Emulation](#)
- [ENV-005m — Validate Emulation Fidelity](#)

Related Architecture Sections

- Add links to the architecture sections governing communication paths, fault injection, communication quality, failure handling, recovery, Evidence, and Traceability.

Delivery Phase

Assign the applicable delivery phase.

Requirement Status

Draft

Statement Reference

Use the following syntax to reference this requirement's Statement section from another DokuWiki page:

```
{{section>dido:03-dido-te:99-annexes:annex-c-requirements:02-test-environment-requirements:env-005-emulate-distributed-systems:env-005g-emulate-communication-failures#Statement&noheader&nofooter&noeditbtn}}
```

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