

ENV-005 — Emulate Distributed Systems

[Go to Test Environment Requirements](#)

Statement

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

Derived From

- [\[DTE5\] 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

A distributed system comprises independently executing components whose behaviour depends on communication, coordination, timing, topology, resource availability, failure conditions, and changes in system membership.

Testing a distributed system requires the Test Environment to reproduce the conditions under which its participating [Nodes](#) interact. A Test Execution limited to nominal communication and infrastructure conditions provides insufficient support for assessing behaviour under delay, message loss, network partition, resource contention, node failure, recovery, or topology change.

Distributed-system emulation establishes controlled representations of participating Nodes, communication paths, infrastructure resources, external services, failure conditions, and recovery behaviour. The applicable Test Definition specifies the required emulation scope, configuration, operating conditions, permitted variation, and acceptance criteria.

The child requirements decompose this requirement into individually verifiable obligations governing distributed topology, participating Nodes, communication behaviour, time, resources, failures, recovery, observation, evidence, and emulation fidelity.

Applies To

- [Test Environment](#)
- [Test Definition](#)
- [Test Execution](#)
- [Test Object](#)
- [Node](#)
- [Test Resource](#)

- [Configuration](#)
- [Constraint](#)
- [Evidence](#)

Contents

Verification

Verification confirms that:

- The applicable Test Definition identifies the distributed system subject to emulation.
- The Test Definition identifies the participating Nodes, communication paths, infrastructure resources, external services, and system boundaries.
- The Test Definition specifies the required topology, communication behaviour, time conditions, resource conditions, failure conditions, recovery behaviour, and permitted variation.
- Each applicable child requirement has a conforming verification result.
- The DIDO-TE establishes the specified distributed-system conditions before Test Execution.
- The DIDO-TE maintains or changes those conditions according to the Test Definition during Test Execution.
- The DIDO-TE observes interactions among participating Nodes and supporting Test Resources.
- The DIDO-TE records the applied emulation configuration, actual conditions, interactions, changes, failures, and recovery events as [Evidence](#).
- The DIDO-TE validates the fidelity of the emulated conditions against the criteria specified by the Test Definition.
- The DIDO-TE maintains [Traceability](#) among the Test Definition, emulated conditions, participating Nodes, Test Execution, Evidence, and [Test Results](#).
- An unidentified, incorrectly configured, uncontrolled, unobserved, unsupported, or untraceable distributed-system condition constitutes nonconformance with this requirement.

Verification includes:

- Inspection of the distributed-system model and Test Definition
- Inspection of participating Nodes, communication paths, resources, services, and system boundaries
- Comparison of specified and established distributed-system conditions
- Observation of nominal distributed interactions
- Observation of specified timing, resource, failure, partition, membership-change, and recovery conditions
- Inspection of distributed-system observations and Evidence
- Inspection of emulation-fidelity validation results
- Inspection of Traceability records
- Confirmation that each applicable child requirement has a conforming verification result
- Confirmation that a missing or incorrectly emulated mandatory condition produces a nonconformance result

Referenced By

- [ENV-005a — Emulate Distributed Topology](#)
- [ENV-005b — Emulate Participating Nodes](#)
- [ENV-005c — Emulate Communication Behaviour](#)
- [ENV-005d — Emulate Time and Clock Conditions](#)
- [ENV-005e — Emulate Resource Conditions](#)
- [ENV-005f — Emulate Node Failures](#)
- [ENV-005g — Emulate Communication Failures](#)
- [ENV-005h — Emulate Network Partitions](#)
- [ENV-005i — Emulate Membership and Topology Changes](#)
- [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 distributed-system topology, Node interaction, communication, timing, resource conditions, fault injection, recovery, observation, Evidence, and Traceability.

Delivery Phase

Assign the applicable delivery phase.

Requirement Status

Draft

Statement Reference

Use the following syntax to reference this requirement

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