

C.3.3 Twin Node Requirements

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This section identifies the requirements governing [Twin Nodes](#) used to represent, observe, simulate, reproduce, compare, select, or interact with corresponding [Nodes](#) within distributed verification and testing.

Twin Node requirements address the controlled relationship among a logical twin identity, one or more Twin Node realizations, and the corresponding real-world, virtual, simulated, or otherwise represented Node.

The requirements address twin identity, association, [Configuration](#), realization selection, state acquisition, synchronization, simulation, comparison, controlled interaction, validation, and [Traceability](#).

A logical twin identity may be associated with more than one Twin Node realization. A Test Execution may therefore select the applicable realization without changing the logical identity represented within the test.

A Twin Node may receive information from multiple eligible sources. Configuration, communication policies, and applicable Quality of Service controls govern source eligibility and communication behavior without assigning semantic authority to a source solely because the source participates in the communication mechanism.

The requirements in this section derive from the applicable source documents identified in Annex B.

The DIDO-TE BAA identifies Digital Twins as a means of representing systems or systems of systems and explicitly requires functionality to manage and select between virtual and real-world twin nodes during testing.

The U.S. Patent Application describes virtual and physical Twin Nodes addressed using an identifier shared by one or more other Twin Nodes. It also describes adding or modifying a Twin Node, comparing resulting test results against a baseline, and validating the Twin Node or emulated distributed system when the results correspond.

The DIDO Reference Architecture provides the broader Digital Twin, DDS publish-subscribe, and DDS Quality of Service concepts used to normalize and decompose these source concepts into individually verifiable architectural obligations.

A Twin Node requirement may be represented by an individual leaf requirement or by a non-leaf requirement group containing subordinate independently verifiable obligations.

Requirements

Requirement ID	Requirement Title	Primary Source Basis
TWIN-001	Establish Twin Identity	[DTE1] , Twin Node claims; [DTE2] , F17; [DTE9] , Appendix A, <i>Digital Twin</i>
TWIN-002	Associate Twin Realizations	[DTE1] , Twin Node claims; [DTE2] , F17

Requirement ID	Requirement Title	Primary Source Basis
TWIN-003	Configure a Twin Relationship	[DTE2], Digital Twin and F17 material; [DTE9], Digital Twin and DDS Quality of Service concepts
TWIN-004	Select a Twin Realization	[DTE2], F17; [DTE1], virtual and physical Twin Node concepts
TWIN-005	Acquire Twin State	[DTE9], Digital Twin and DDS publish-subscribe concepts
TWIN-006	Synchronize Twin State	[DTE9], Digital Twin and DDS Quality of Service concepts
TWIN-007	Simulate Twin Behavior	[DTE2], Digital Twin research area; [DTE9], Appendix A, <i>Digital Twin</i>
TWIN-008	Compare Twin Results	[DTE1], baseline and additional-result comparison; [DTE2], baseline and comparison testing
TWIN-009	Validate a Twin or Test Environment	[DTE1], Twin Node validation claims
TWIN-010	Control Twin Interaction	[DTE9], Digital Twin interaction concepts
TWIN-011	Maintain Twin Traceability	[DTE1]; [DTE2]; DIDO-TE Traceability requirements

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Notes for Editors

Twin Node requirements use the TWIN requirement prefix.

The explicit links under Contents remain while the Twin Node requirement pages are being created and reviewed. After all planned requirement pages exist, the explicit links may be removed because the indexmenu automatically discovers them.

Apply the requirement identification, decomposition, source and derivation, normative-language, quality, status, and page-structure rules defined by Annex C.

Preserve stable requirement identifiers when moving or reorganizing Twin Node requirement pages.

Do not allocate Twin Node requirements directly to a particular DDS implementation, product, or realization within the requirement Statement. Maintain realization relationships through Traceability.

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