C.3.3 Twin Node Requirements

Go to C.3 Functional Requirements

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 Twin Identity, one or more Twin Realizations, and the corresponding real-world, virtual, simulated, or otherwise represented Node.

The requirements address Twin Identity, association of Twin Realizations, Twin Relationship Configuration, realization selection, access to Twin Realization state, synchronization, simulation, comparison, controlled interaction, and Traceability.

A Twin Identity may be associated with more than one Twin Realization. A Test Execution may therefore select a Twin Realization without changing the Twin Identity represented within the test.

A Twin Relationship may obtain information from multiple eligible Data Sources. Configuration, communication parameters, Source Selection, and Quality of Service characteristics govern the use and exchange of that information without assigning semantic authority to a Data Source solely because the source participates in a communication mechanism.

The requirements in this section derive from the 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 a 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.

Validation requirements derived from the Twin Node source material are governed under C.3.10 Validation Requirements rather than duplicated within this section.

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, *Digital Twin*

Requirement ID	Requirement Title	Primary Source Basis
TWIN-002	Associate Twin Realizations	[DTE1], Twin Node claims; [DTE2], F17
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	Access Twin Realization State	[DTE1], Twin Node state and test-result concepts; [DTE2], Digital Twin monitoring concepts; [DTE9], Digital Twin and distributed data concepts
TWIN-006	Synchronize Twin Realization State	[DTE2], Digital Twin monitoring and integration concepts; [DTE9], Digital Twin and DDS Quality of Service concepts
TWIN-007	Simulate Twin Behavior	[DTE2], Digital Twin research area; [DTE9], Appendix A, *Digital Twin*
TWIN-008	Compare Twin Results	[DTE1], baseline and additional-result comparison; [DTE2], baseline and comparison testing
TWIN-009	Control Twin Interaction	[DTE1], Twin Node modification concepts; [DTE2], Digital Twin interaction concepts; [DTE9], Digital Twin and governance concepts
TWIN-010	Maintain Twin Traceability	[DTE1]; [DTE2]; DIDO-TE Traceability requirements

Contents

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, you may remove the explicit links 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 after the Twin Node requirement set is baselined or

referenced by other architecture, ConOps, verification, or traceability artifacts.

Validation obligations derived from Twin Node source material belong under C.3.10 Validation Requirements rather than being duplicated as Twin Node requirements.

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