

Distributed Network Topology

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Discussion

A Distributed Network Topology arranges multiple networked [Nodes](#) so that the Nodes collectively provide the communication and coordination required by a [Distributed System](#).

The topology distributes network participation across multiple Nodes rather than requiring all communication or coordination to pass through one central Node.

Characteristics of a Distributed Network Topology include:

- Multiple interconnected Nodes
- Direct or indirect communication among participating Nodes
- Distribution of communication, processing, data, or coordination responsibilities
- Continued communication among remaining Nodes following the loss of a participating Node, when permitted by the governing architecture
- Absence of a single Node through which every network interaction must pass

Participating Nodes do not need to perform identical functions or possess equal authority.

The governing architecture assigns roles and responsibilities such as:

- Producing data
- Consuming data
- Routing messages
- Processing requests
- Storing data
- Replicating data
- Validating transactions
- Coordinating state
- Providing discovery
- Enforcing policy

A Distributed Network Topology differs from a [Centralized Network Topology](#), in which participating Nodes depend on a central Node for primary communication, coordination, processing, or access to authoritative data.

A Distributed Network Topology also differs from a [Distributed System](#):

- A Distributed Network Topology describes the arrangement and interconnection of Nodes
- A Distributed System describes the coordinated system behavior performed across those Nodes

Definition

*network topology in which multiple interconnected **Nodes** collectively provide communication and coordination without requiring every interaction to pass through a single central Node*

Source

- DIDO Reference Architecture, Network Topology Taxonomy
- DIDO Reference Architecture, Distributed Network Topology
- Dido Solutions, Inc. and Jackrabbit Consulting, Inc.

Note

A Distributed Network Topology does not require every Node to:

- Hold the same data
- Perform the same processing
- Communicate directly with every other Node
- Possess equal authority
- Provide the same services
- Remain continuously available

The governing architecture determines:

- Node roles
- Communication paths
- Routing behavior
- Data distribution
- State coordination
- Redundancy
- Failure handling
- Discovery mechanisms
- Security controls
- Authority relationships

A Distributed Network Topology can contain gateways, coordinators, directory services, or other specialized Nodes without becoming a Centralized Network Topology, provided those Nodes do not form a required central path for every network interaction.

The term does not prescribe peer-to-peer protocols, blockchain, distributed ledgers, consensus algorithms, message brokers, cloud computing, or a particular transport protocol.

Example

A deployment-management network contains multiple Nodes that exchange deployment requests,

status information, and results.

Execution Nodes perform deployment operations, storage Nodes preserve records, and validation Nodes assess results. The Nodes perform different roles while participating in one Distributed Network Topology.

Loss of one execution Node does not prevent the remaining Nodes from communicating or performing the operations permitted by the governing architecture.

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