CLAIMS

What is claimed is:

1. A method for testing nodes in a distributed system comprising:
   configuring a plurality of virtual nodes to emulate a distributed system that is used to process and manage distributed immutable data objects (DIDOs);
   initiating a test of the emulated distributed system, the test including performing one or more transactions on a first DIDO to obtain a modified first DIDO;
   verifying the emulated distributed system by comparing the modified first DIDO with a second DIDO that has been generated from the first DIDO by a validated system;
   generating baseline results for the test by executing the test when each virtual node in the emulated distributed system comprises a validated node;
   comparing the baseline results with additional results obtained by executing the test after adding or modifying at least one virtual node in the emulated distributed system; and
   validating an added or modified virtual node or the emulated distributed system when the baseline results match the additional results.

2. The method of claim 1, wherein at least one of the one or more transactions is executed by a node under test in the emulated distributed system.

3. The method of claim 2, further comprising: validating the node under test when content of the modified first DIDO corresponds to content of the second DIDO.

4. The method of claim 1, wherein the first DIDO is a copy of a reference DIDO and wherein the second DIDO is obtained by causing the validated system to perform the one or more transactions on an identical copy of the first DIDO.

5. The method of claim 4, wherein the reference DIDO includes a first distributed ledger configured to securely maintain one or more transaction records and wherein the second DIDO includes a second distributed ledger and the modified first DIDO includes a third distributed ledger, each distributed ledger being maintained independently.

6. The method of claim 5, wherein content of the modified first DIDO corresponds to content of the second DIDO when decrypted information in the second distributed ledger matches corresponding decrypted information in the third distributed ledger.

7. The method of claim 4, wherein the validated system is a real-world system, and wherein the reference DIDO, the second DIDO and the one or more transactions are copied from the real-world system at corresponding recorded points-in-time.

8. The method of claim 1, further comprising:
configuring a starting point for a test timeline for executing a test plan using the emulated distributed system, wherein the one or more transactions are defined by the test plan.

9. The method of claim 8, wherein the test timeline is executed at a rate consistent with real time in a first mode of operation and at a rate different from real time in a second mode of operation.

10. The method of claim 8, further comprising:
restarting the test with an unmodified version of the first DIDO after resetting the test timeline to the starting point.

11. The method of claim 8, further comprising:
configuring the test plan to cause at least one virtual node to modify a distributed ledger of the first DIDO, wherein modifying the distributed ledger includes using time sensitive cryptography to encrypt information maintained by the distributed ledger in accordance with the test timeline.

12. The method of claim 1, further comprising:
configuring a plurality of physical nodes to implement different virtual nodes in the plurality of virtual nodes, wherein the plurality of physical nodes includes physical nodes that are situated in geographically remote locations with respect to one another.

13. The method of claim 1, wherein at least one node of the plurality of virtual nodes comprises a container.

14. The method of claim 1, further comprising:

including a virtual twin node in the emulated distributed system, wherein the virtual twin node is addressed using an identifier shared by one or more other twin nodes in the emulated distributed system;

comparing the baseline results with additional results obtained by executing the test after adding or modifying the virtual twin node; and

validating at least one added or modified virtual twin node or the emulated distributed system when the baseline results match the additional results.

15. The method of claim 1, further comprising:

including a physical twin node in the emulated distributed system, wherein the physical twin node is addressed using an identifier shared by one or more other twin nodes in the emulated distributed system;

comparing the baseline results with additional results obtained by executing the test after adding or modifying the physical twin node; and

validating the added or modified physical twin node or the emulated distributed system when the baseline results match the additional results.

16. A test platform for a distributed system comprising:

a plurality of processing systems each configured to operate one or more of a plurality of virtual nodes;

a network coupled to the plurality of processing systems and configured to communicatively couple the plurality of virtual nodes such that the plurality of virtual nodes is configured to emulate a distributed system that is used to process and manage distributed immutable data objects (DIDOs); and

a test management processor configured to:

initiate a test of the emulated distributed system, the test including performing one or more transactions on a first DIDO to obtain a modified first DIDO;

verify the emulated distributed system by comparing the modified first DIDO with a second DIDO that has been generated from the first DIDO by a validated system;

generate baseline results for the test by executing the test when each virtual node in the emulated distributed system comprises a validated node;

include a twin node in the emulated distributed system, wherein the twin node is addressed using an identifier shared by one or more other twin nodes in the emulated distributed system;

compare the baseline results with additional results obtained by executing the test after adding or modifying the twin node; and

validate at least one added or modified twin node or the emulated distributed system when the baseline results match the additional results.

17. The test platform of claim 16, wherein at least one of the one or more transactions is executed by a virtual node under test in the emulated distributed system, and wherein the test management processor is further configured to:

validate the virtual node under test when content of the modified first DIDO corresponds to content of the second DIDO.

18. The test platform of claim 16, wherein the first DIDO is a copy of a reference DIDO, wherein the second DIDO is obtained by causing the validated system to perform the one or more transactions on an identical copy of the first DIDO, wherein the validated system is a real-world system, and wherein the reference DIDO, the second DIDO and the one or more transactions are copied from the real-world system at corresponding recorded points-in-time.