Claims

1. A computer-implemented method for operating a distributed network (100), the distributed network comprising a plurality of subnets (11), wherein each of the plurality of subnets (11) comprises a plurality of assigned nodes (10), the method comprising

running a set of computational units (15), the computational units (15) being pieces of software which have their own unit state;

assigning each of the computational units (15) to one of the plurality of subnets (11) according to a subnet-assignment, thereby creating an assigned subset of the set of computational units for each of the subnets;

running on each node (10) of the plurality of subnets (11) the assigned subset of the computational units;

replicating, by the subnets (11), the unit state of the computational units (15) of the assigned subsets across the respective subnet (11) by performing an active replication in space;

migrating a computational unit (15) from a first subnet of the plurality of subnets to a second subnet of the plurality of subnets, wherein the migrating comprises

signalling to the first and the second subnet a computational unit (15) of the first subnet as migrant computational unit that shall be migrated;

transferring the migrant computational unit (15) from the first subnet to the second subnet;

agreeing, by the plurality of assigned nodes of the second subnet, to activate the migrant computational unit (15) on the second subnet by performing a consensus protocol;

installing the migrant computational unit (15) on the second subnet; and

activating and running the migrant computational unit (15) on the second subnet.

2. A computer-implemented method according to claim 1, further comprising

preparing, by the first subnet, the migrant computational unit (15) for migration.

3. A computer-implemented method according to claim 1 or claim 2, the method, in particular the step of preparing the migrant computational unit for migration, further comprising

scheduling a migration time;

stopping to accept messages for the migrant computational unit after the migration time; and

stopping to execute the migrant computational unit (15) and/or to modify the unit state of the migrant computational unit after the migration time.

4. A computer-implemented method according to any of the preceding claims, wherein the step of obtaining the migrant computational unit (15) comprises

joining, by the nodes (10) of the second subnet, the first subnet; wherein the joining includes running, by the nodes of the second subnet, the computational units of the first subnet.

5. A computer-implemented method according to any of the preceding claims 1-3, wherein the step of obtaining the migrant computational unit comprises joining, by the nodes of the second subnet the first subnet passively in a listening mode.

6. A computer-implemented method according to any of the preceding claims 4 to 5, wherein the step of transferring the migrant computational unit (15) from the

first subnet to the second subnet comprises performing a node internal transfer of the migrant computational unit (15) between a replica (330) of the first subnet and a replica (320) of the second subnet, wherein the replica of the first subnet and the replica of the second subnet run on the same node.

7. A computer-implemented method according to any of the preceding claims 1 to 3, wherein the step of transferring the migrant computational unit (15) comprises

obtaining, by each node (10) of the second subnet, the migrant computational unit from a node (10) of the first subnet via a messaging protocol, wherein the messaging protocol encompasses in particular a state synchronisation protocol; and wherein the step of transferring the computational unit (15) comprises in particular

splitting, by the nodes (10) of the first subnet, the migrant computational unit (15) into one or more chunks;

transferring the one or more chunks of the migrant computational unit (15) via the messaging protocol from the first subnet to the second subnet.

8. A computer-implemented method according to any of the preceding claims, further comprising

rejecting, by the first subnet, after the migration time, messages for the migrant computational unit, thereby facilitating a re-routing of the respective messages.

9. A computer-implemented method according to any of the preceding claims, wherein the distributed network (100) comprises a central control unit (20), the control unit (20) being configured to perform the steps of

triggering the migration of the migrant computational unit.

10. A computer-implemented method according to any of the preceding claims, wherein the plurality of nodes (10) each comprises a node manager (50), wherein the node manager (50) is configured to perform the steps of:

monitoring a registry (21) of the control unit (20);

instructing the nodes (10) to participate in a subnet (11);

moving the computational unit (15) to a partition of the node which participates in the second subnet; and/or

instructing nodes to stop participation in a subnet.

11. A computer-implemented method for operating a distributed network (100), the distributed network comprising a plurality of subnets (11), wherein each of the plurality of subnets (11) comprises a plurality of assigned nodes (10), the method comprising

running a set of computational units (15), the computational units (15) being pieces of software which have their own unit state;

assigning each of the computational units (15) to one of the plurality of subnets (11) according to a subnet-assignment, thereby creating an assigned subset of the set of computational units for each of the subnets;

running on each node (10) of the plurality of subnets (11) the assigned subset of the computational units (10);

executing, by the nodes (10) of the plurality of subnets (11), computations in a deterministic and replicated manner across the subnets by performing an active replication in space;

migrating a computational unit (15) from a first subnet of the plurality of subnets to a second subnet of the plurality of subnets, wherein the second subnet is not-pre-existing; wherein the migrating comprises

signalling to the first subnet a computational unit (15) of the first subnet as migrant computational unit that shall be migrated;

starting, by the nodes (10) of the first subnet, the second subnet;

internally transferring, by the nodes (10) of the first subnet and the second subnet, the migrant computational unit from the first subnet to the second subnet;

agreeing, by the plurality of assigned nodes (10) of the second subnet, to activate the migrant computational unit on the second subnet by performing a consensus protocol;

installing, by the nodes (10) of the first subnet and the second subnet, the migrant computational unit (15) on the second subnet; and

activating and running, by the nodes (10) of the first subnet and the second subnet, the migrant computational unit (15) on the second subnet.

12. A computer-implemented method according to claim 11, further comprising

adding additional nodes (10) to the second subnet that are not part of the first subnet and/or

removing the nodes (10) of the first subnet from the second subnet.

13. A distributed network (100), the distributed network (100) comprising a plurality of subnets (11), wherein each of the plurality of subnets (11) comprises a plurality of assigned nodes (10), wherein the distributed network (100) is configured to perform the steps of a computer-implemented method according to any of the preceding claims.

14. A node (10) for a distributed network (100) according to claim 13, the node (10) being configured to

participate in a computer-implemented method according to any of the preceding claims 1 to 12.

15. A computer program product for operating a distributed network (100), the distributed network (100) comprising a plurality of subnets (11), the computer program product comprising a computer readable storage medium having program instructions embodied therewith, the program instructions executable by one or more of the plurality of nodes (10) to cause the one or more of the plurality of nodes (10) to perform a computer-implemented method according to any of the preceding claims 1 to 12.