FastForward Storage and I/O
7.3 – End-to-End Epoch Recovery
DAOS Server Failure Recovery

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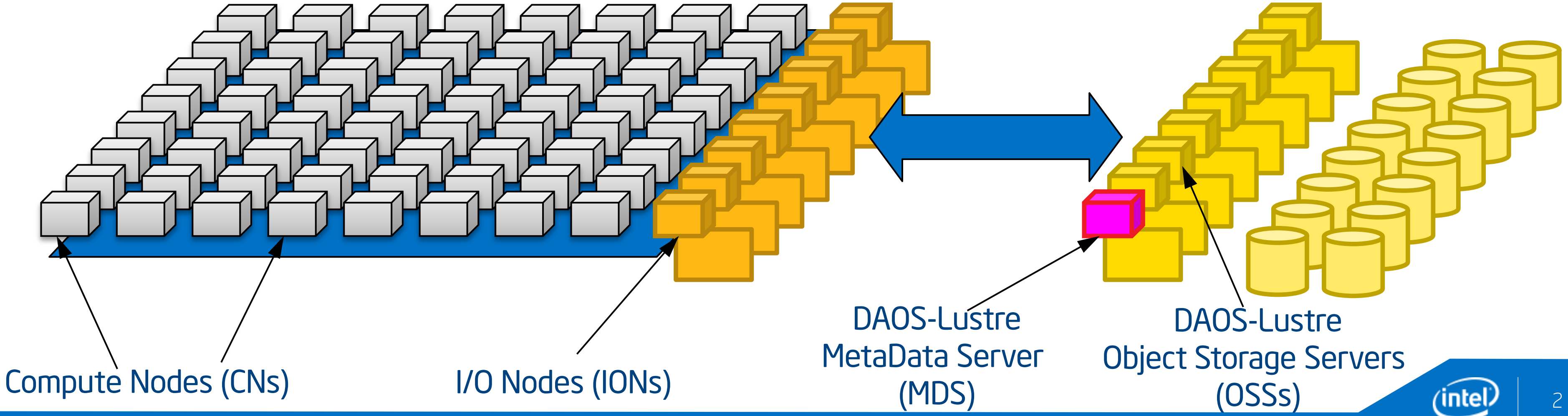
Demonstration Goals

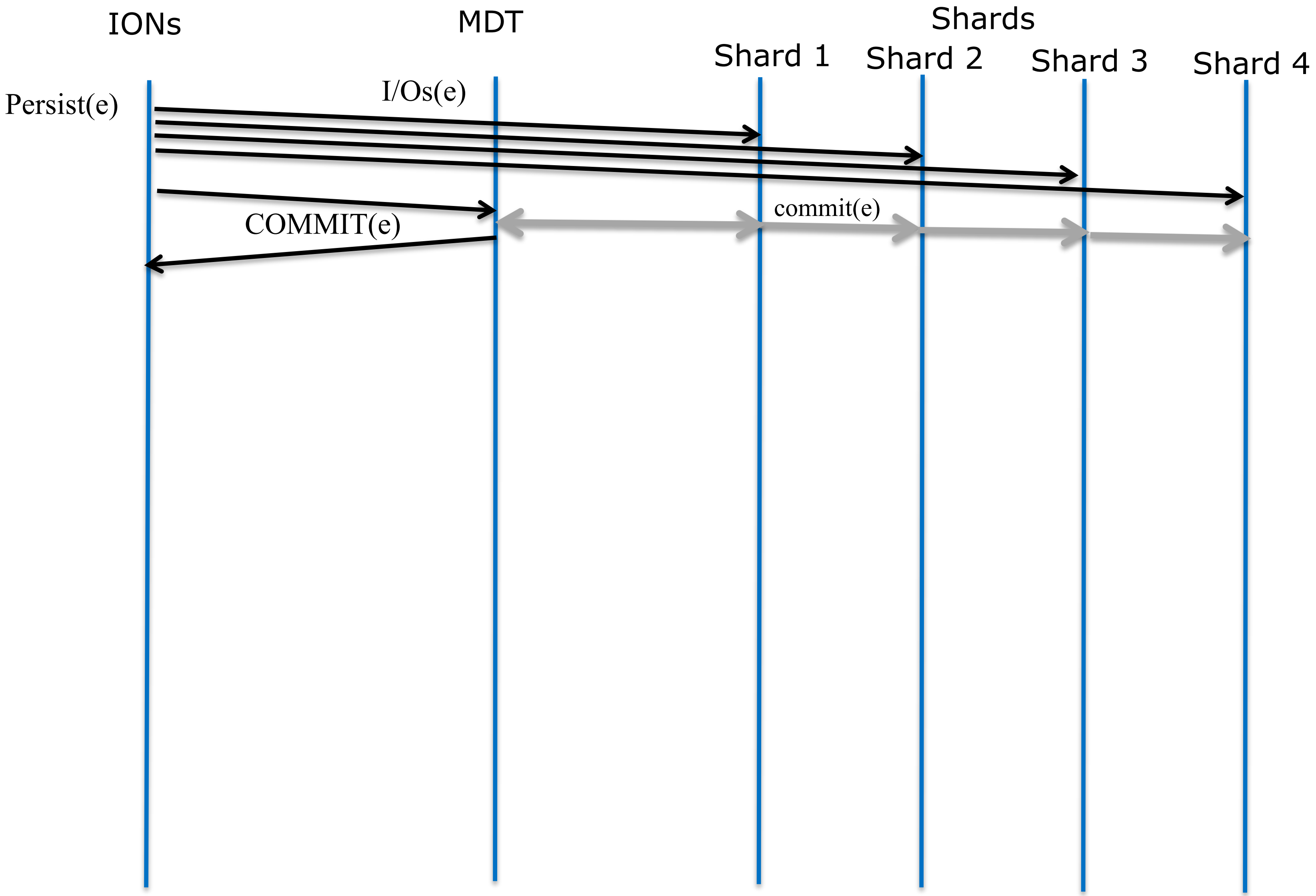
- Demonstrate a fully integrated stack
- Demonstrate resilience of the stack to failures
    - CN & ION failure recovery already demonstrated
    - Simulate transient failure of the DAOS MDS
    - Simulate transient failure of a DAOS OSS
    - Simulate transient failure of multiple DAOS OSSs
    - Simulate permanent failure of a DAOS OSS


Compute Nodes (CNs)
I/O Nodes (IONs)
DAOS-Lustre MetaData Server (MDS)
DAOS-Lustre Object Storage Servers (OSSs)

Test Environment

- VPIC runs on 4 CNs: lola-[20,25-27]
- 4 IONs: lola-[12-15] using flash & Lustre cross-mounts to share data stored in burst buffers
- 4 OSSs: lola-[16-19] using flash as well
- 1 MDS: lola-2 stored on a JBOD disk
- Zero copy disabled in VOSD
  - Major problems found in ZFS patch implementing block migration from intent log to DAOS object
  - New less intrusive approach is being implemented
- Failures are simulated by rebooting nodes via IPMI
- "Screen" session with a shell on each node

ION failure: what happened at DAOS level …



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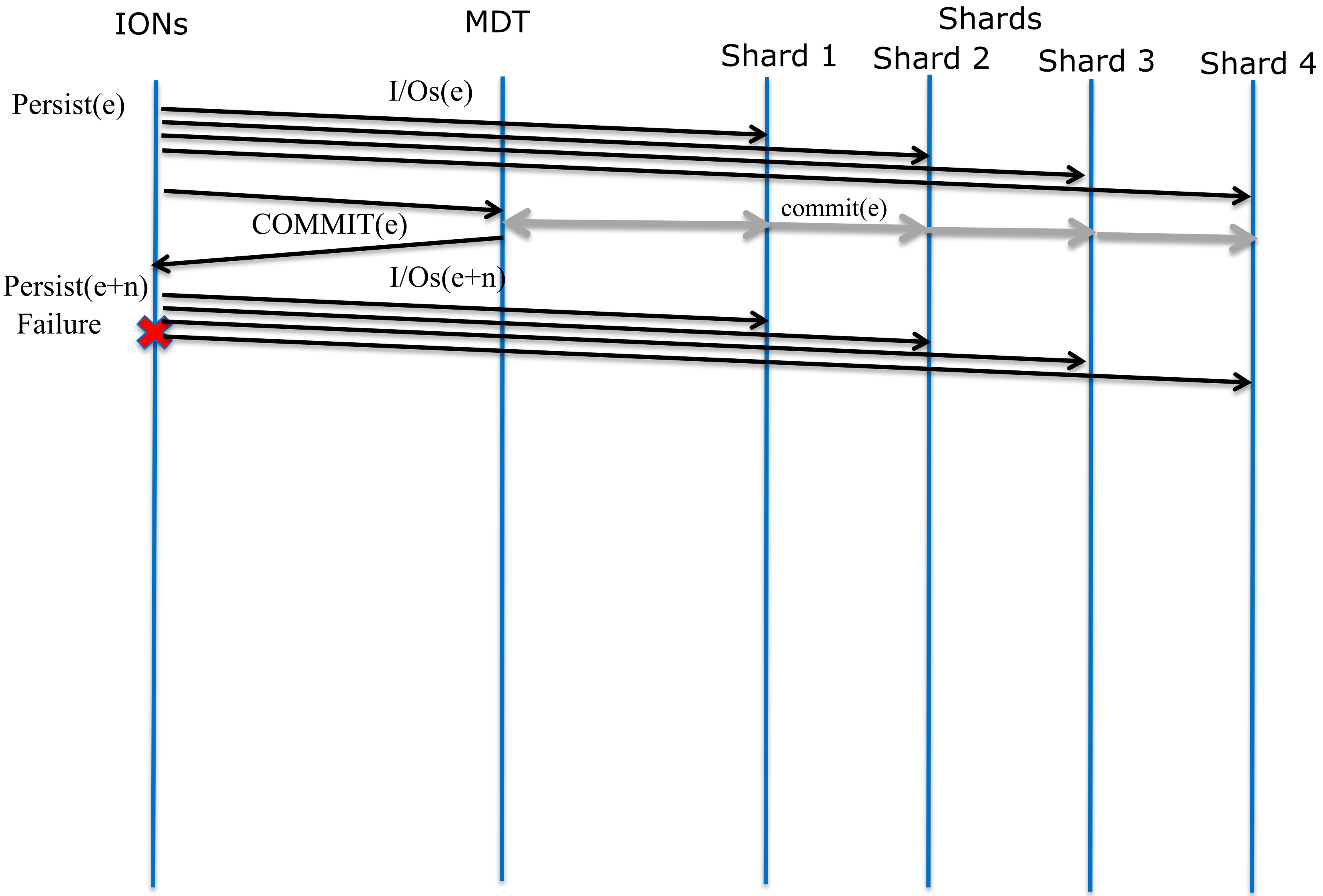

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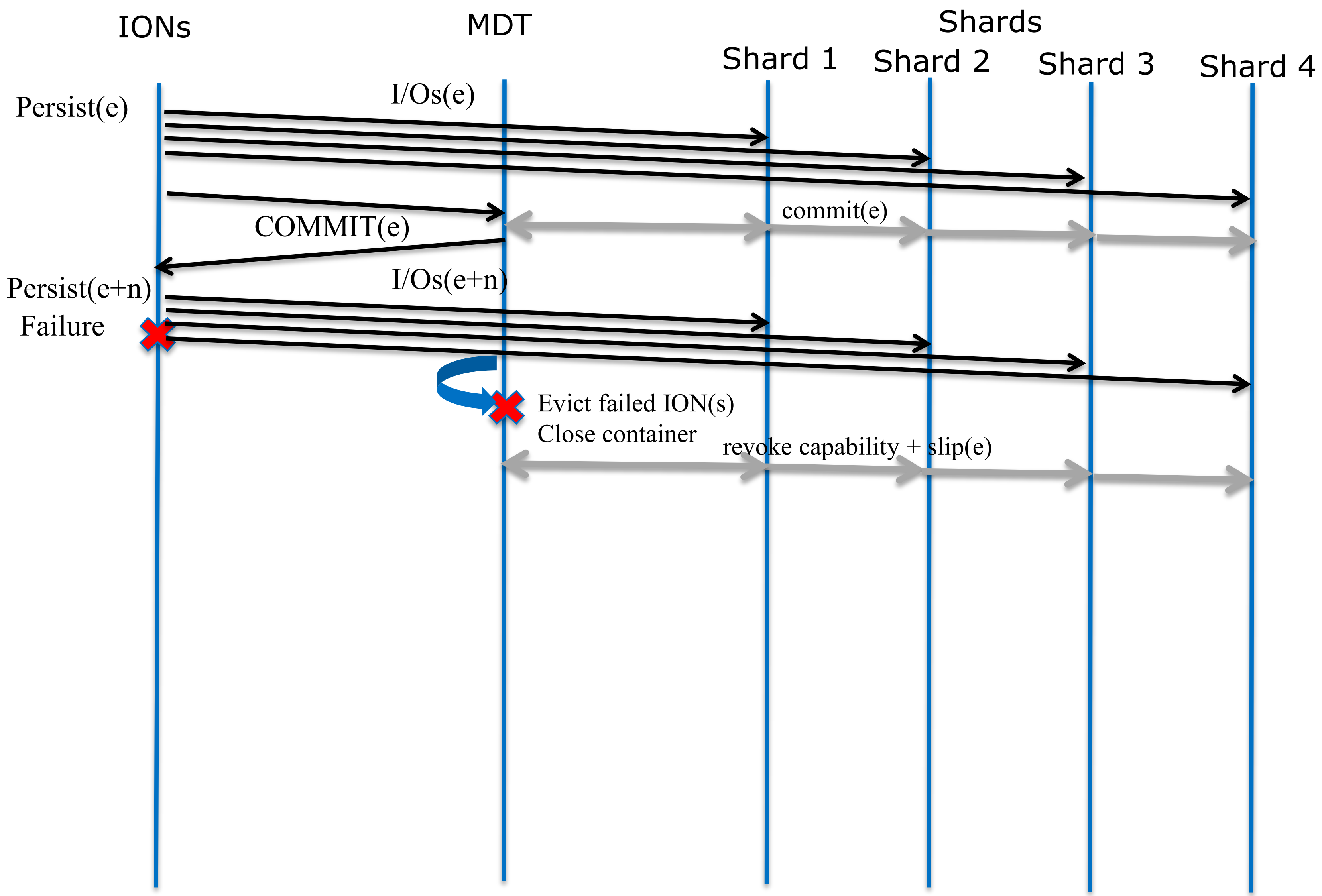

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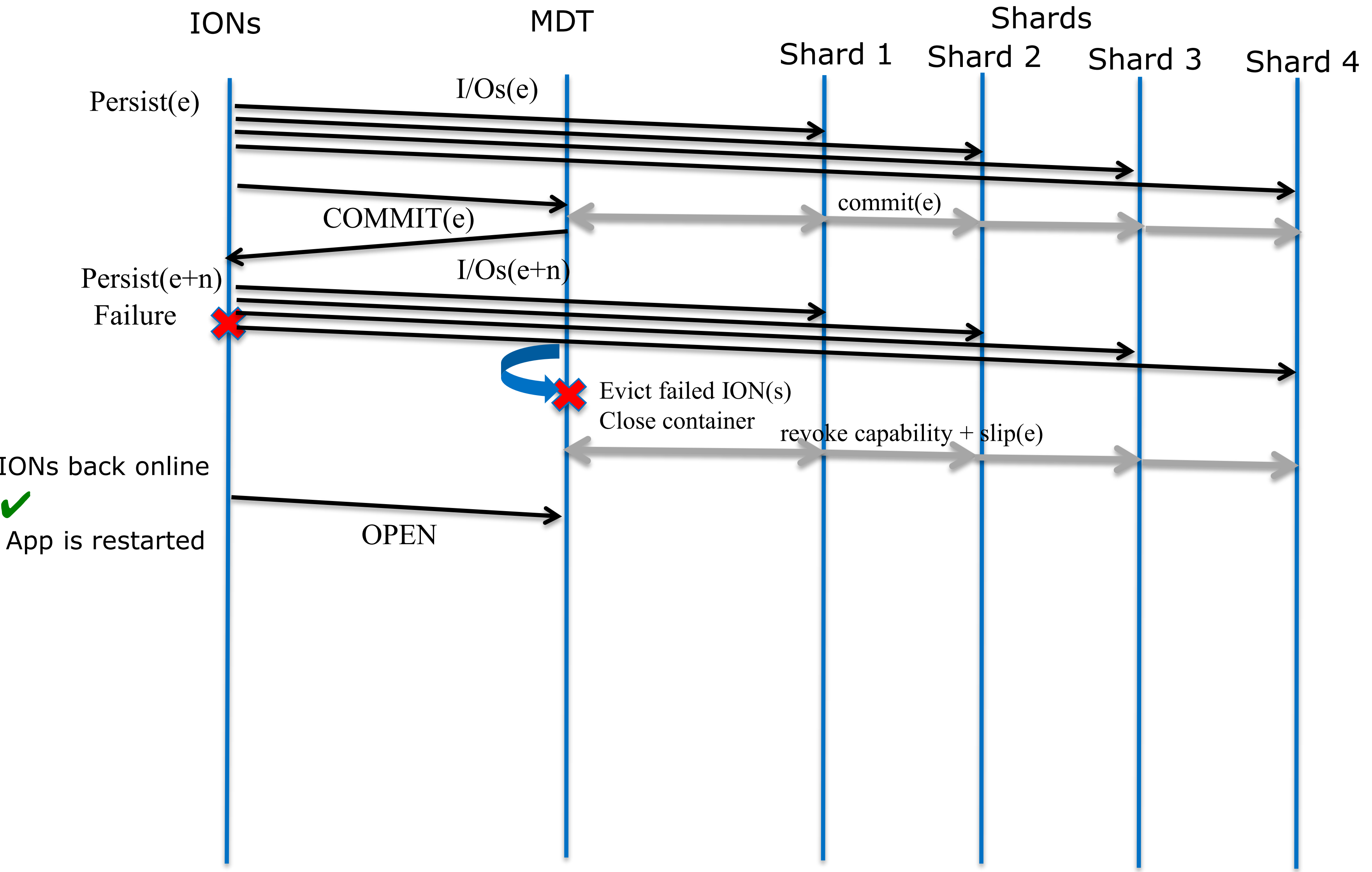

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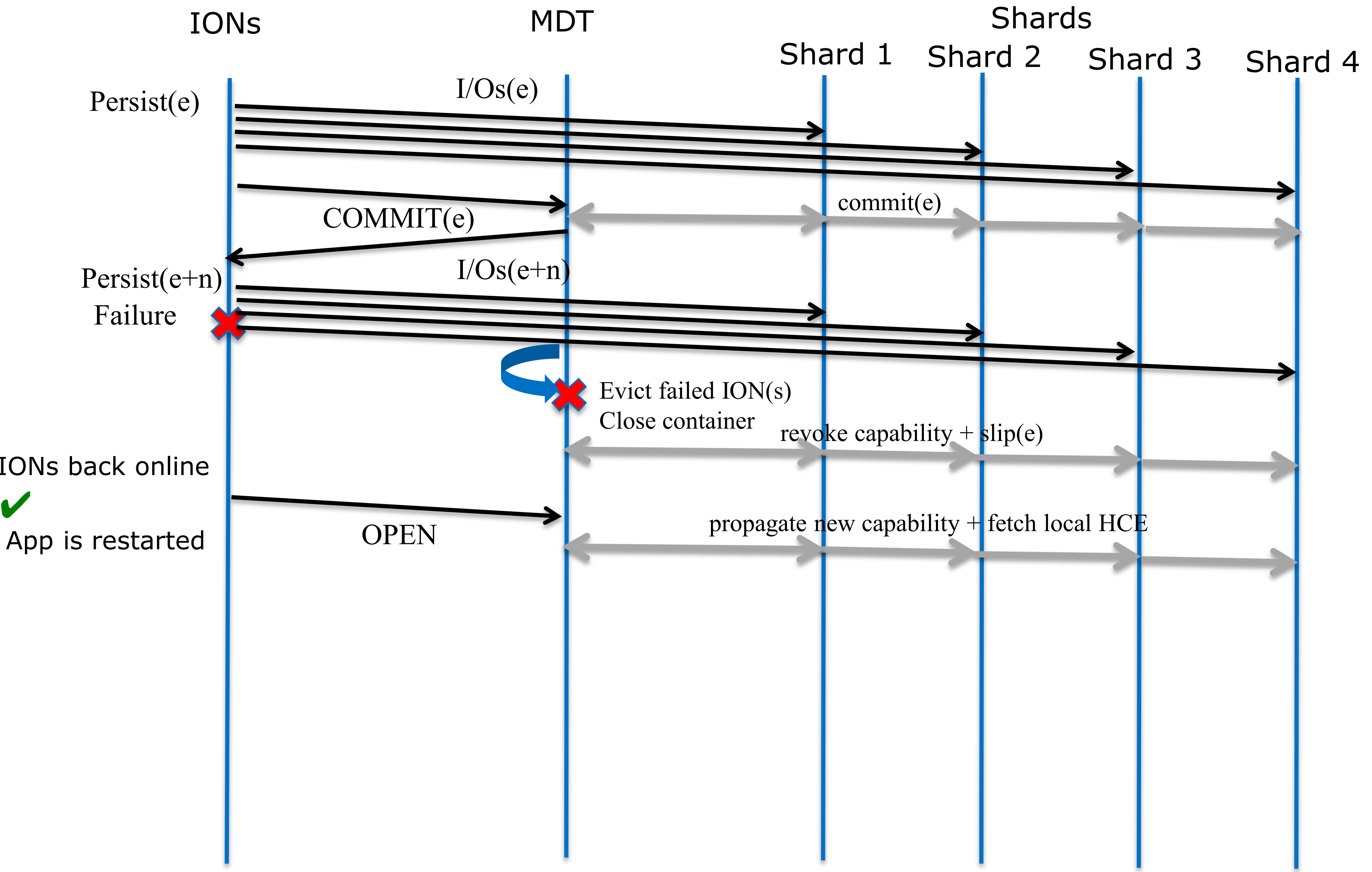

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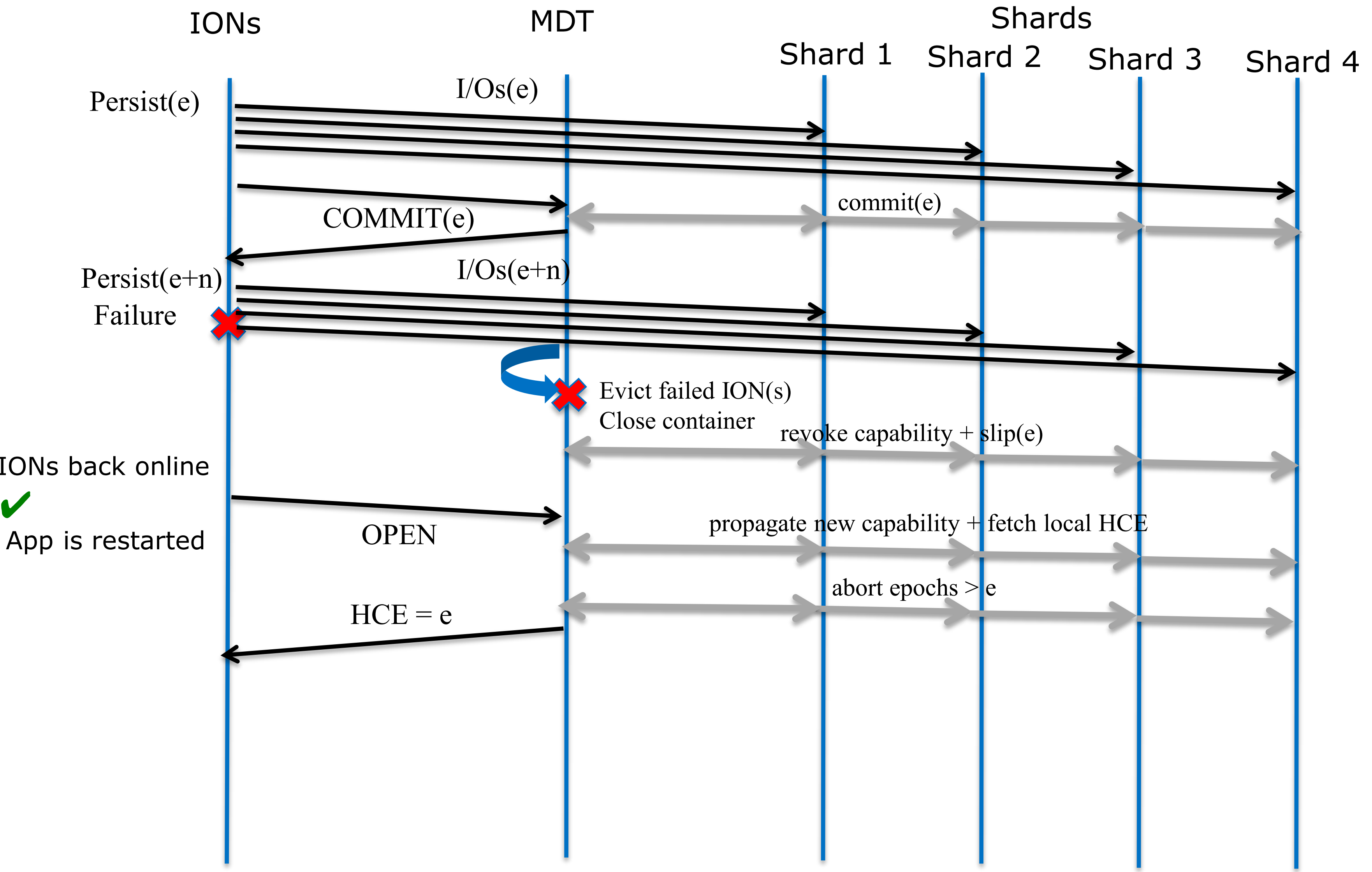

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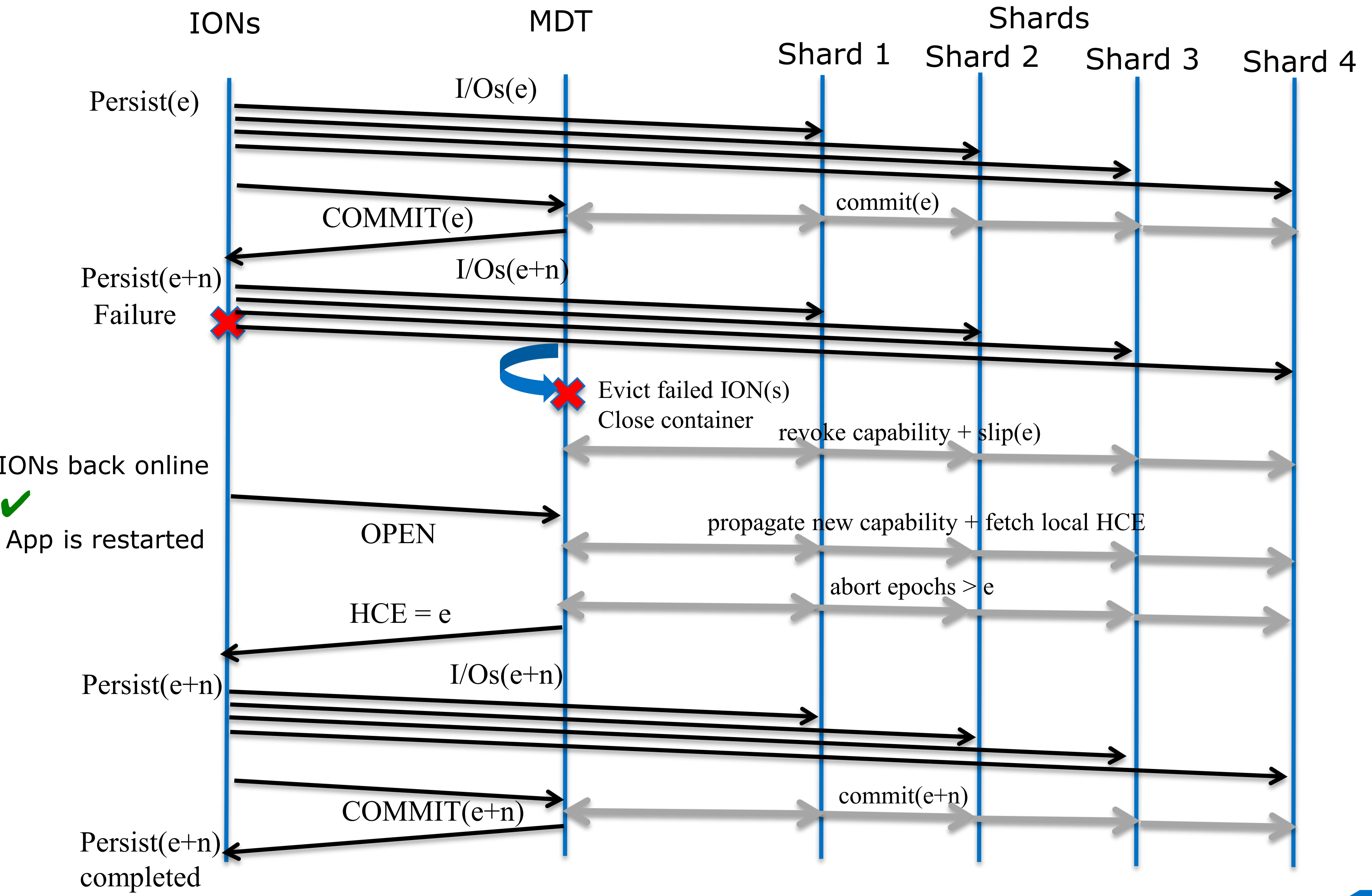
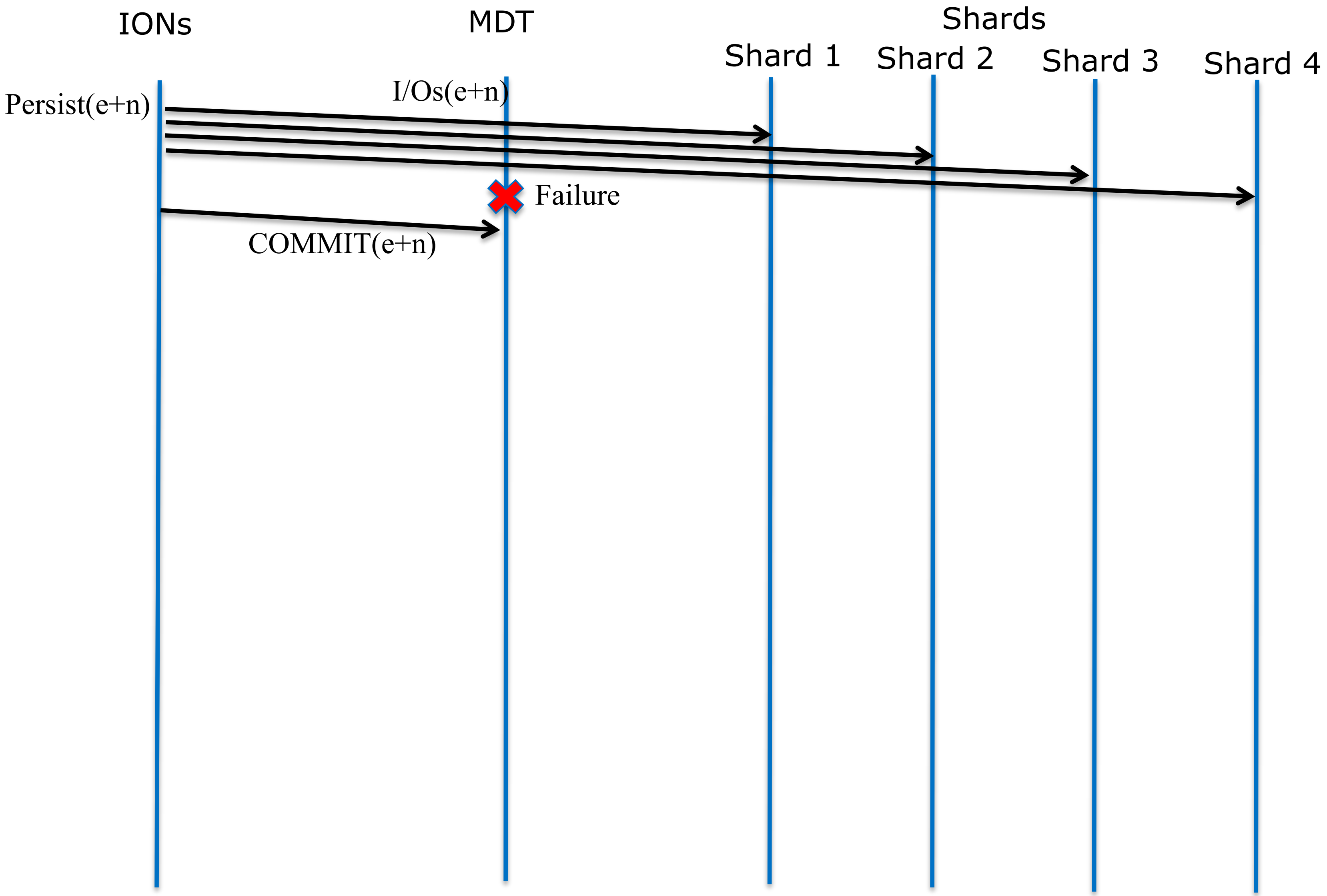


Transient MDS Failure

- Let’s start the demo
  - Run VPIC Application on CNs & IONs
  - Power cycle the MDS (lola-2)
  - Remount the MDT once the MDS is back online
  - Wait for VPIC to complete
  - Clear all burst buffers
  - Run VPIC again in verify mode to check consistency of DAOS data
- Expected result
  - Application continues running until it needs to communicate with the MDT (epoch_query/commit/slip)
  - Application waits for MDT to be up
  - Application resumes and completes successfully
  - Second VPIC run completes successfully with no corruption found

MDS failure: what is going on?



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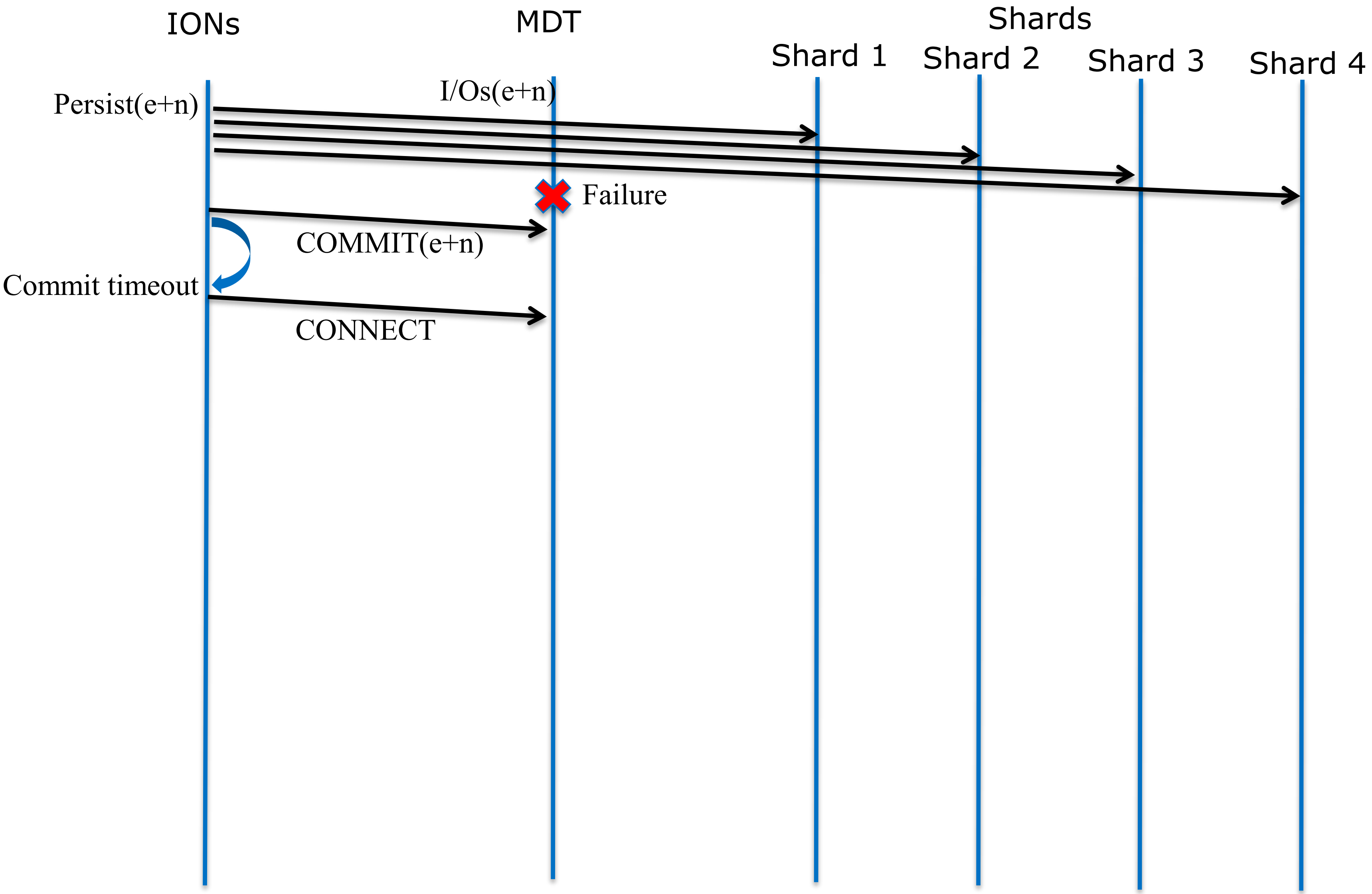

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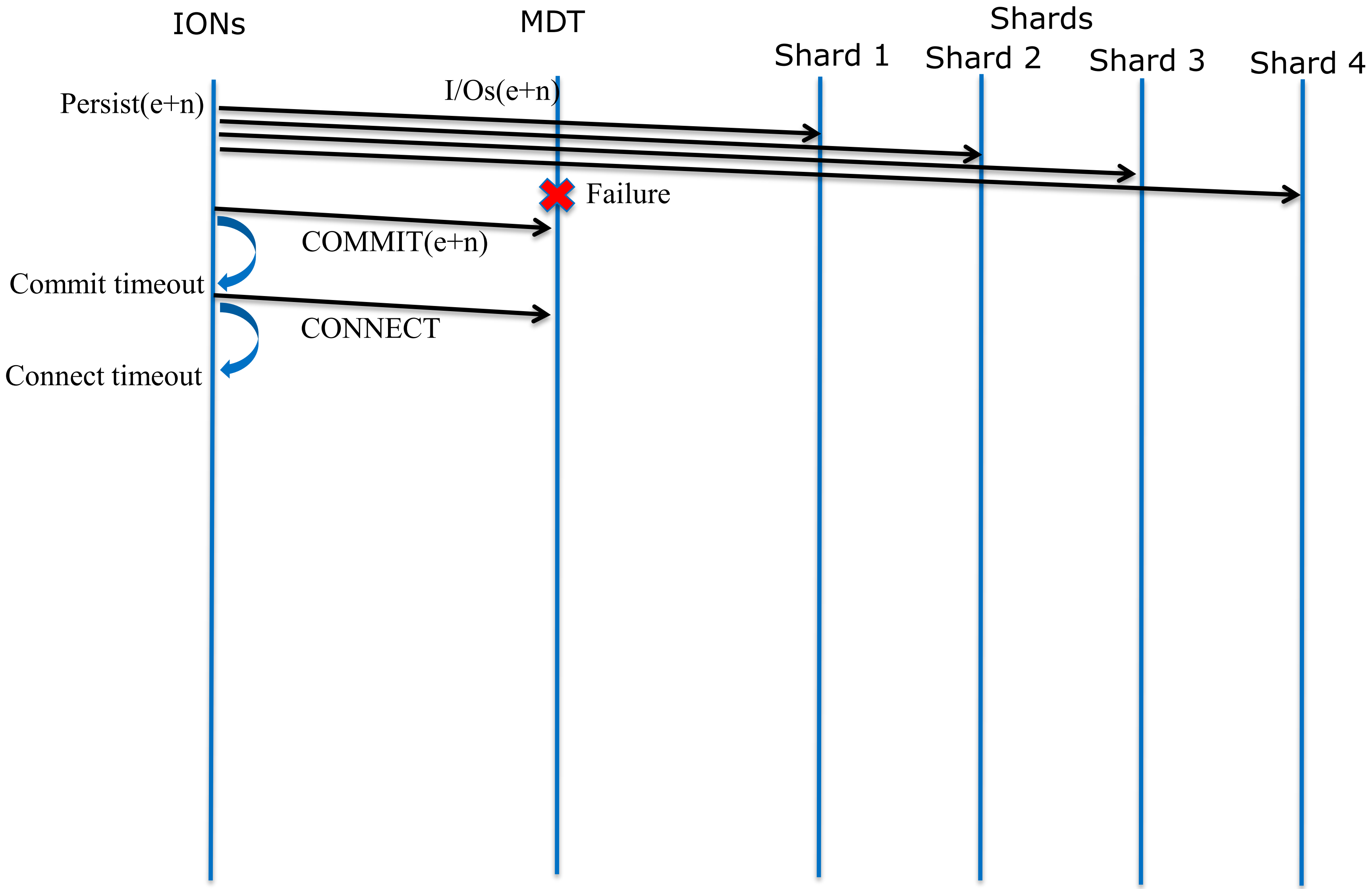

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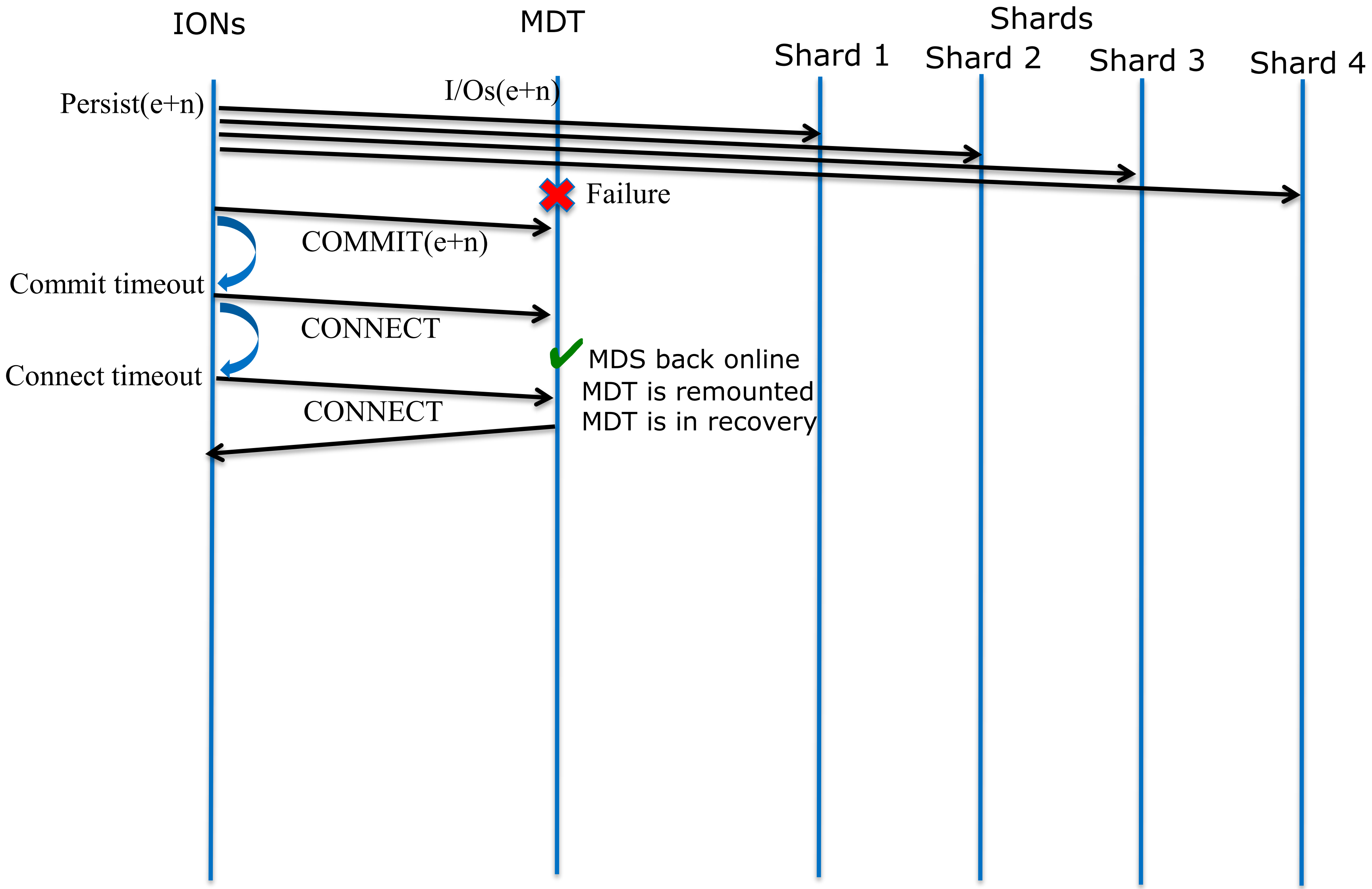

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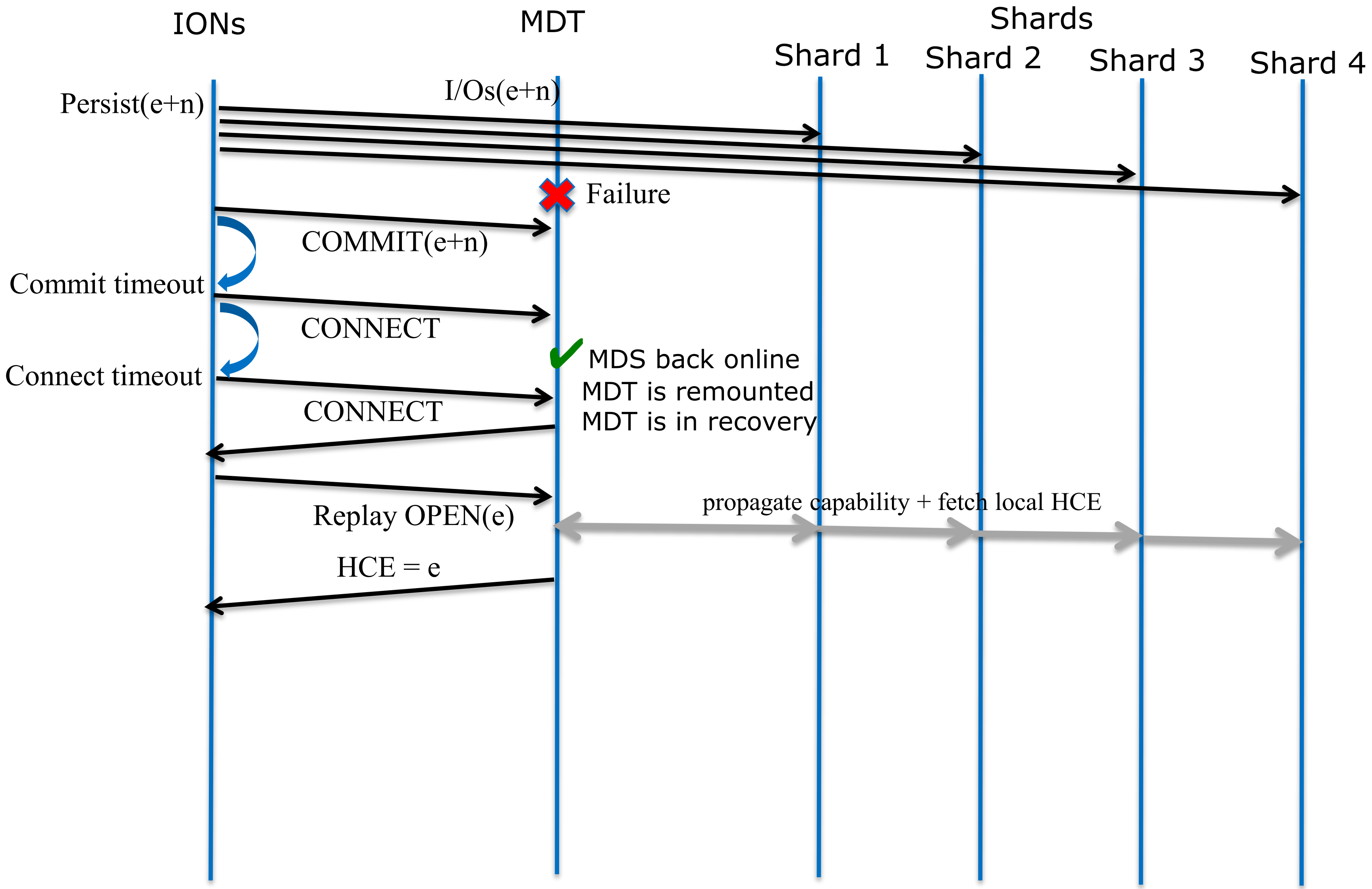

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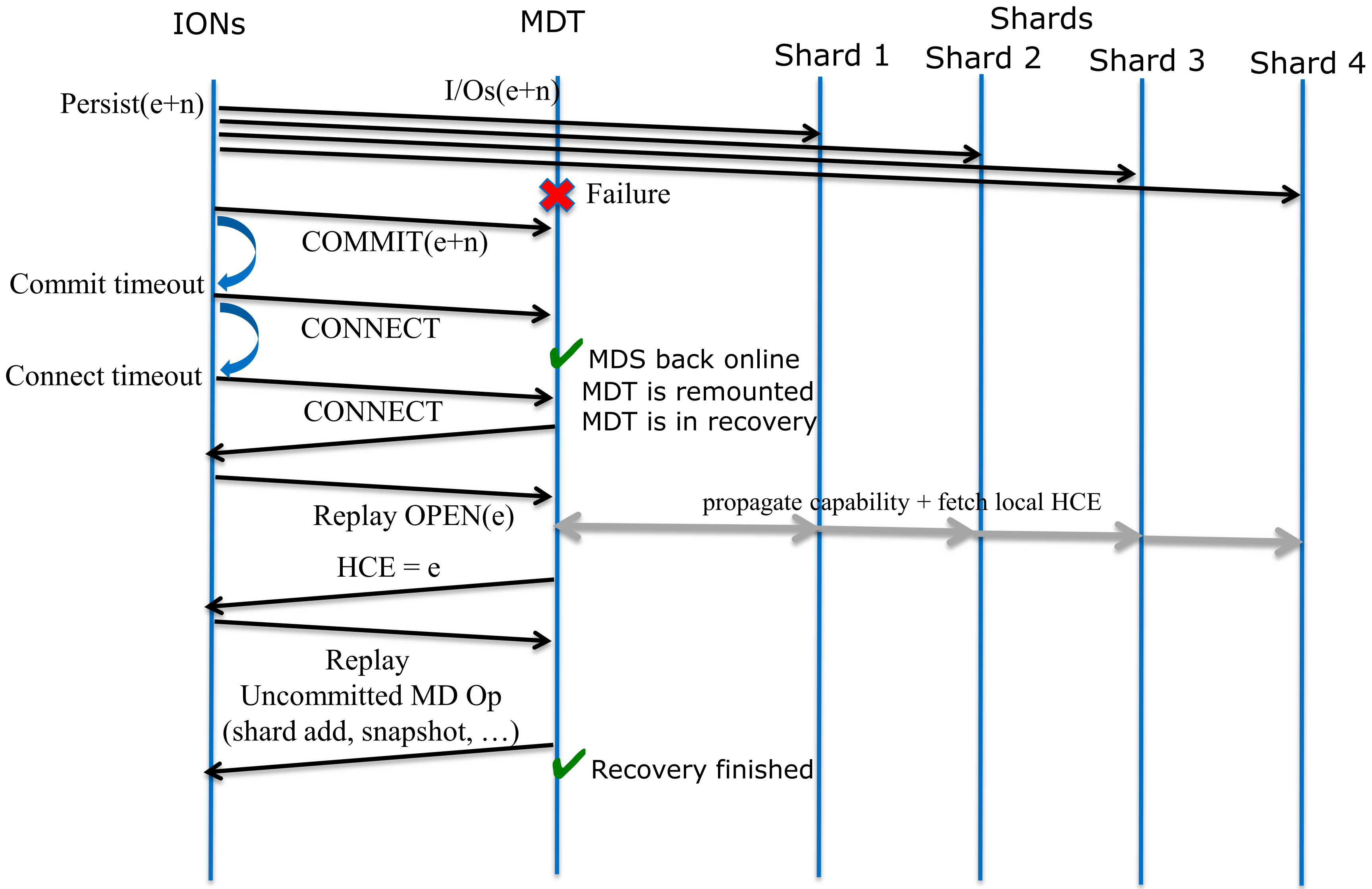

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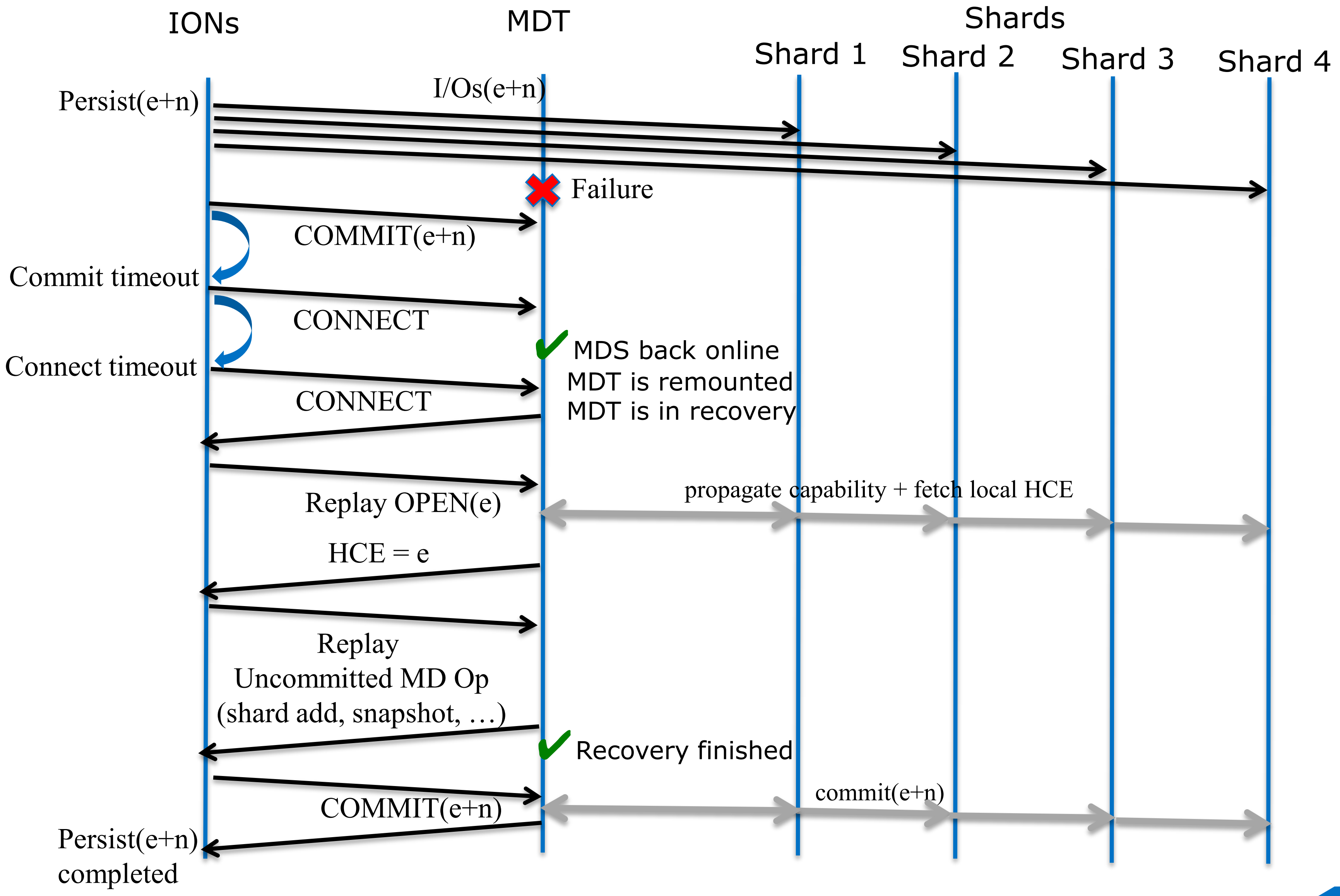


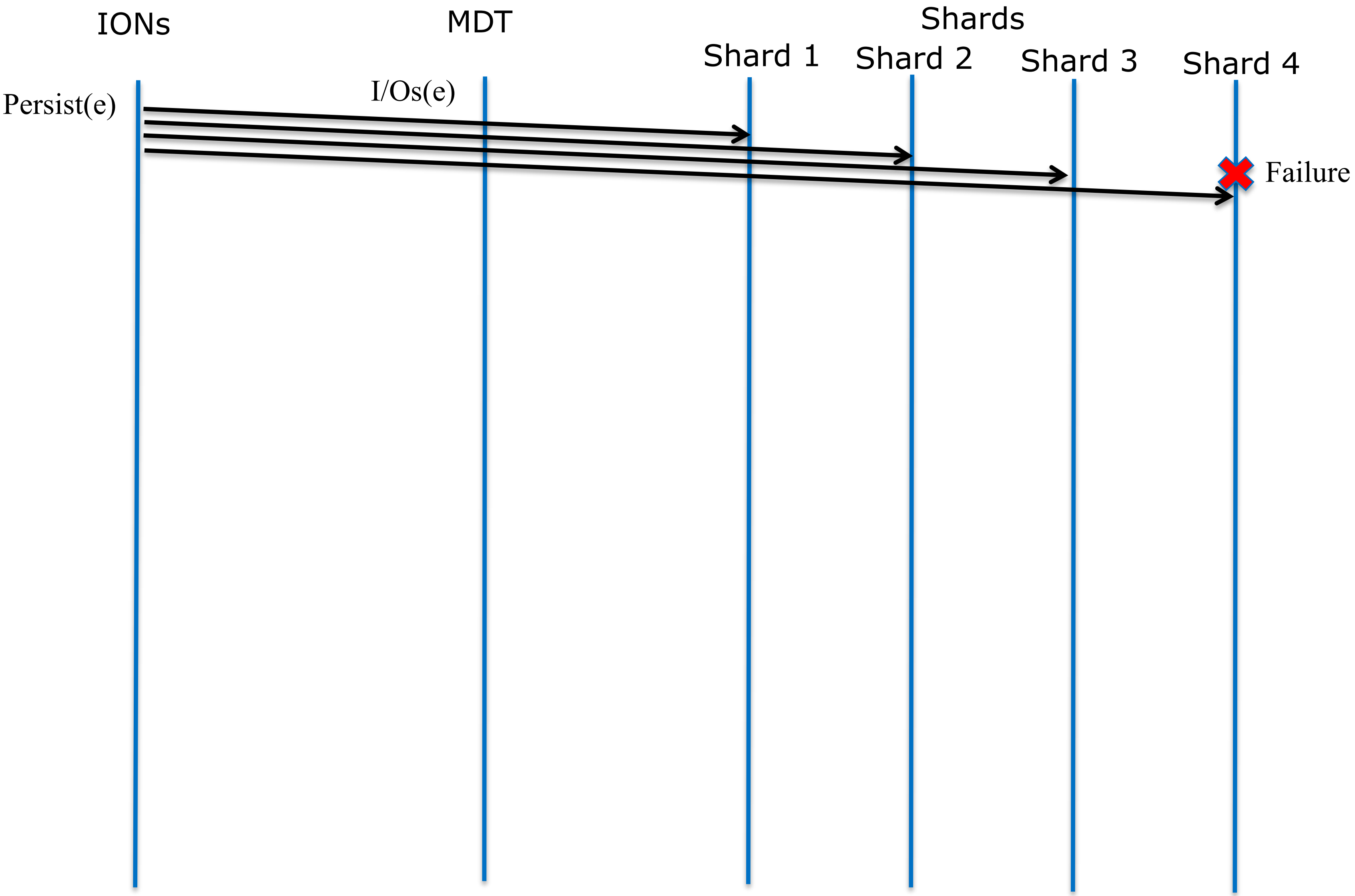
Transient OSS Failure (1/2)

- Let's start the demo
  - Run VPIC Application on CNs & IONs
  - Power cycle an OSS (lola-16)
  - Remount the OSTs once the OSS is back online
  - Wait for VPIC to complete
  - Clear all burst buffers
  - Run VPIC again in verify mode to check consistency of DAOS data

Transient OSS Failure (2/2)

- Expected result
  - Application continues running until it needs to communicate with an OST which is down
    - Might happen through a server collective issued by the MDT
  - Application waits for the OST to be back online
  - Persist() call might fail if OST has lost I/Os on disk
    - HDF retries persist in this case
  - Application resumes and completes successfully
  - Second VPIC run completes successfully with no corruption found

OSS failure: what is going on?



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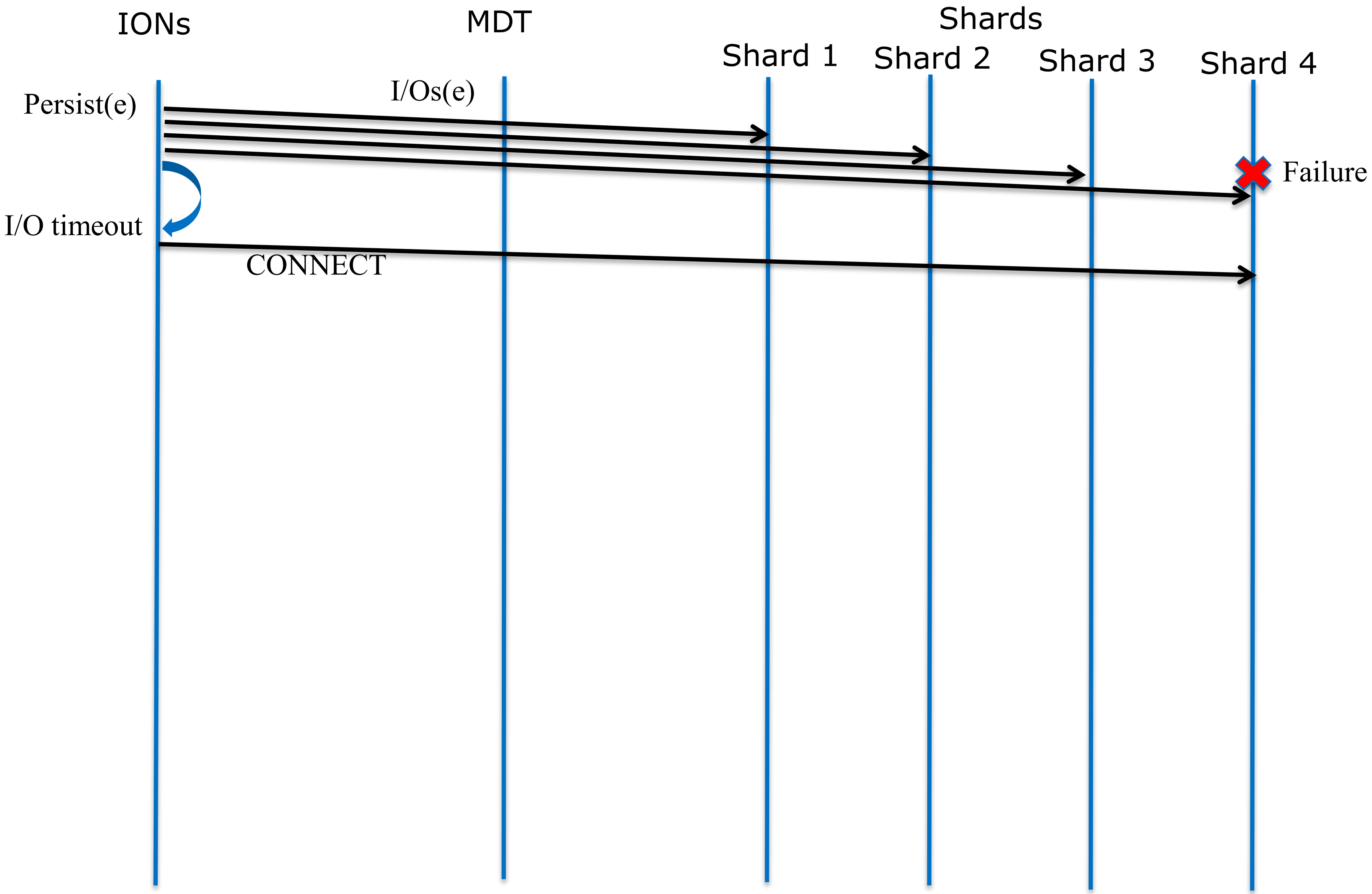

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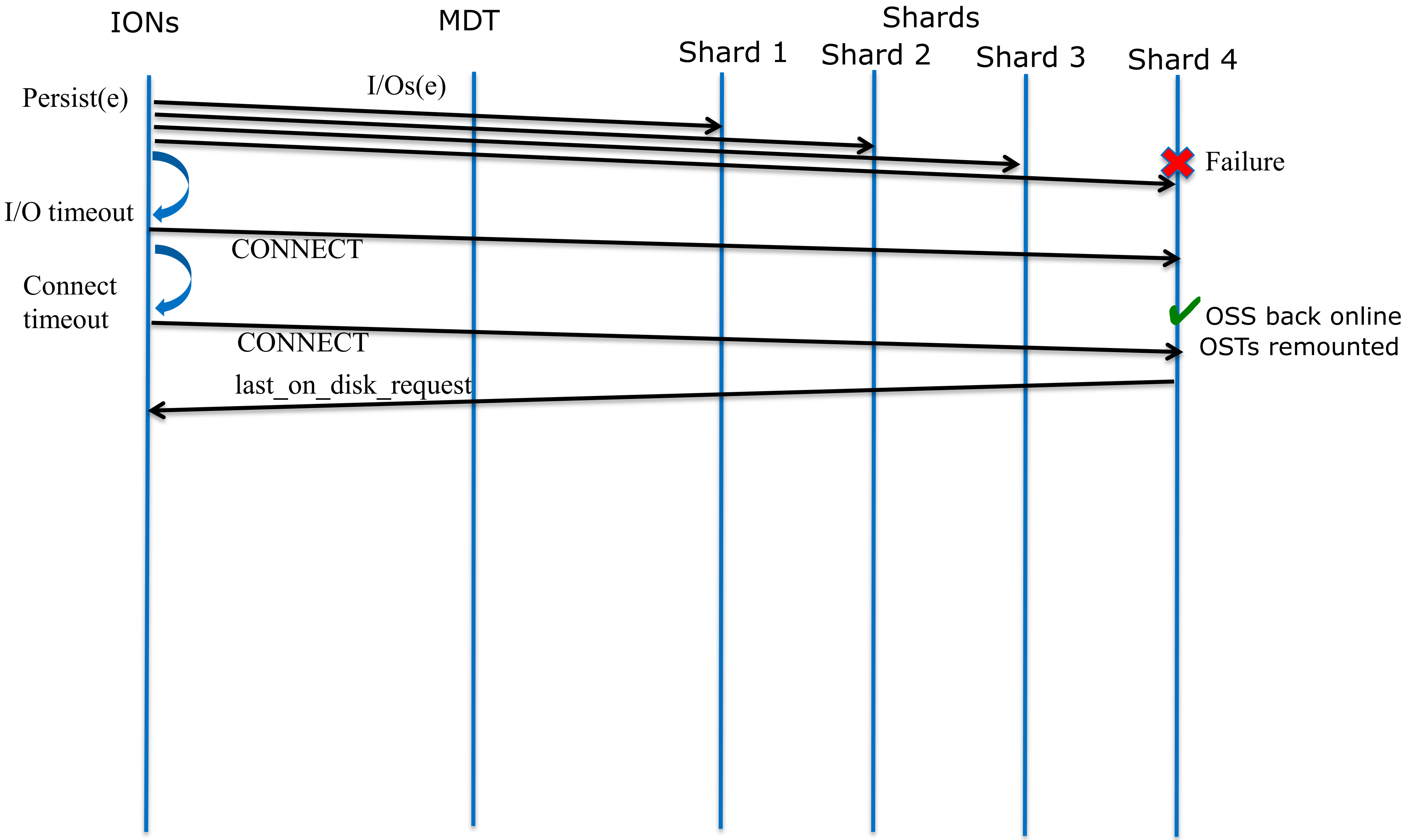

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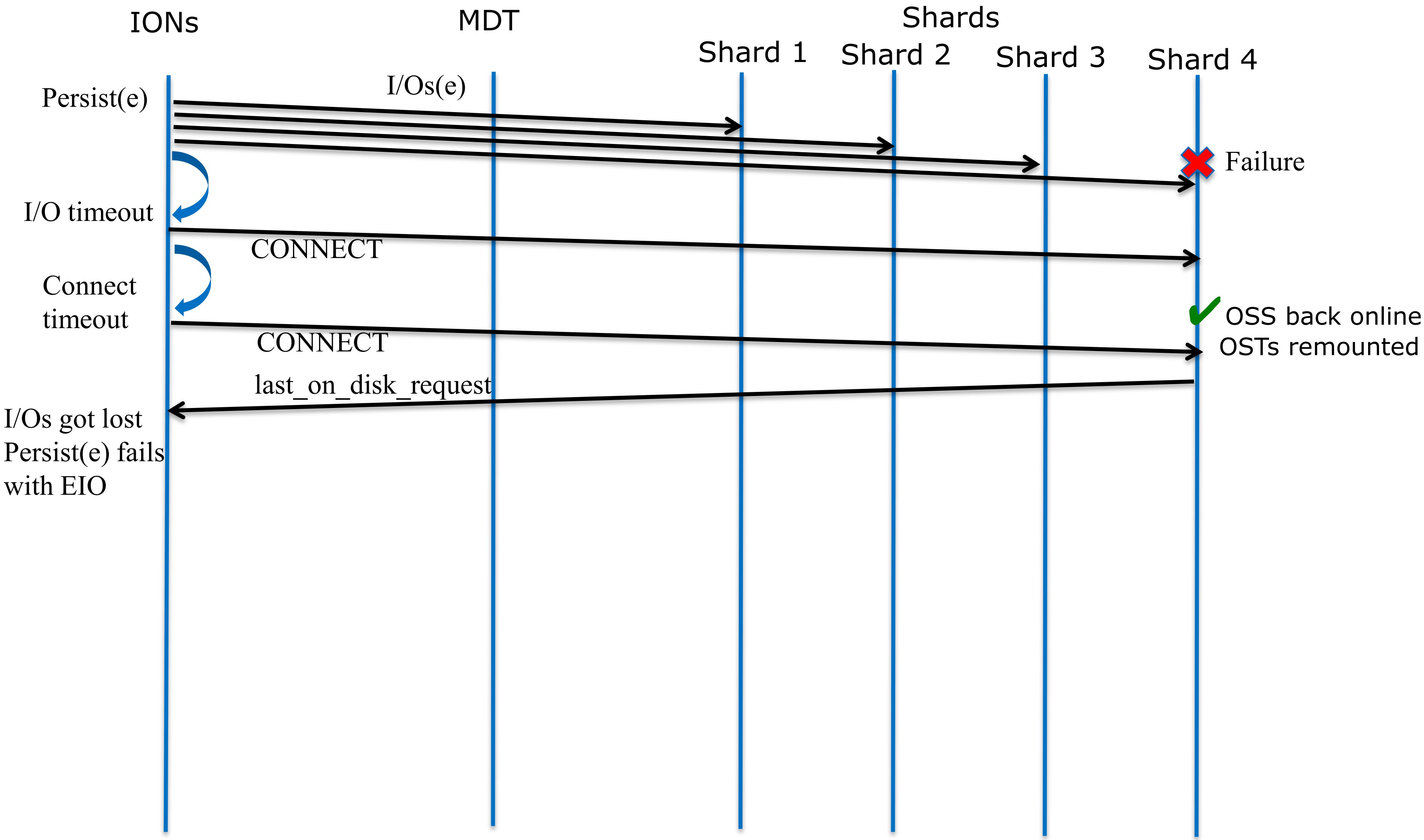

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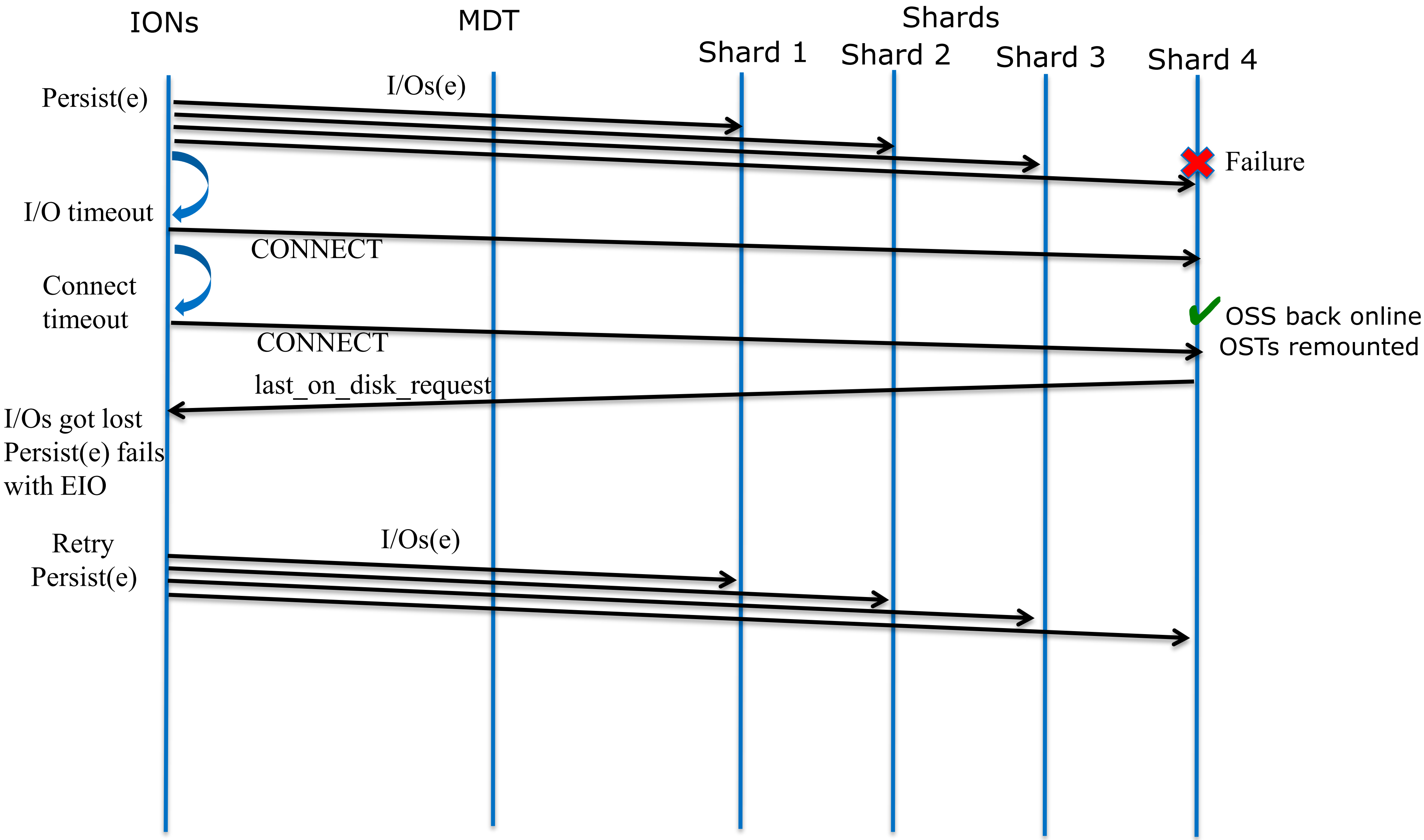

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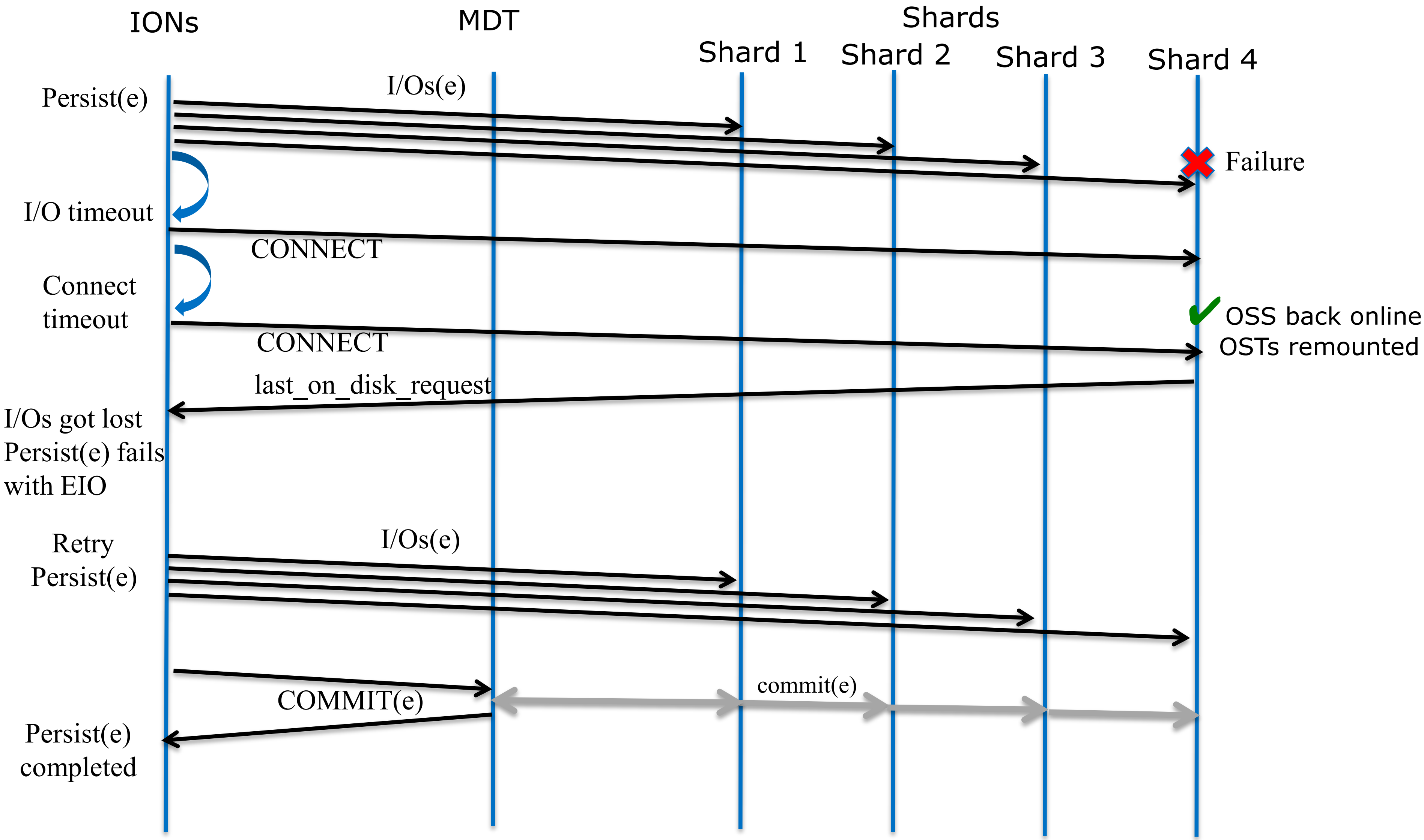

Failure of Multiple OSSs

- Run same demo, but power cycle all OSSs this time
- Same mechanisms involved and same result expected

Permanent OST Failure

- Let’s run the demo
  - Run VPIC Application on CNs & IONs
  - Mark an OST as permanently deactivated with conf_param
  - Any attempt to communicate with the deactivated OST fails with ESHUTDOWN (108)
- Expected result
  - VPIC should fail since some shards are not accessible any more
  - DAOS-HA required to handle such permanent failures

Demonstration Materials

- Source code still available on git.whamcloud.com
  - repository ff/daos_lustre, tag v1.2_DAOS
  - http://git.whamcloud.com/?p=ff/daos_lustre.git
- Built as usual Lustre tree:
  - autogen.sh
  - configure –with-linux=… –with-spl=… –with-zfs=…
  - make & make install (or make rpms)
- This slide deck & scripts are uploaded to the wiki
  - https://wiki.hpdd.intel.com/display/FF/Project+Quarter+7
  - “7.3 DAOS Demo Slides” & “7.3 DAOS Scripts”