

Міністерство освіти і науки України
Національний технічний університет України
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Фізико-технічний інститут

Проектування високонавантажених систем

Лабораторна робота 4
«Налаштування реплікації та перевірка відмовостійкості
MongoDB»

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1) Налаштувати реплікацію в конфігурації: Primary with Two Secondary Members

lab4

C:\Users\User\Desktop\pvs_gif\lab4

View Configurations

mongo3 mongo:6.0 27019:27017					concern majority reads are currently not possible.", "nextWakeupMillis":13200}} 2024-12-30 19:34:34 mongo2 {"t":{"date":"2024-12-30T17:34:34.125+00:00"},"s": "I", "c":"-", "id":4939300, "ctx":"monitoring-keys-for-HMAC","msg":"Fai l to refresh key cache","attr":{"error":"ReadConcernMajorityNotAvailableYet: Read concern majority reads are currently not possible.", "nextWakeupMillis":13400}} 2024-12-30 19:34:47 mongo2 {"t":{"date":"2024-12-30T17:34:47.537+00:00"},"s": "I", "c":"-", "id":4939300, "ctx":"monitoring-keys-for-HMAC","msg":"Fai l to refresh key cache","attr":{"error":"ReadConcernMajorityNotAvailableYet: Read concern majority reads are currently not possible.", "nextWakeupMillis":13600}} 2024-12-30 19:34:55 mongo2 {"t":{"date":"2024-12-30T17:34:55.128+00:00"},"s": "I", "c":"WTCHKPT", "id":22430, "ctx":"Checkpoint", "msg":"WiredTiger messag e","attr":{"message":{"ts_sec":1735580095,"ts_usec":128006,"thread":"1:0x7f407756 d640","session_name":"WT_SESSION.checkpoint","category":"WT_VERB_CHECKPOINT_PROGR ESS","category_id":6,"verbose_level":"DEBUG","verbose_level_id":1,"msg":"saving c heckpoint snapshot min: 69, snapshot max: 69 snapshot count: 0, oldest timestamp: (0, 0) , meta checkpoint timestamp: (0, 0) base write gen: 1"}}} 2024-12-30 19:35:02 mongo2 {"t":{"date":"2024-12-30T17:35:02.498+00:00"},"s": "I", "c":"-", "id":4939300, "ctx":"monitoring-keys-for-HMAC","msg":"Fai l to refresh key cache","attr":{"error":"ReadConcernMajorityNotAvailableYet: Read concern majority reads are currently not possible.", "nextWakeupMillis":13800}} 2024-12-30 19:35:16 mongo2 {"t":{"date":"2024-12-30T17:35:16.311+00:00"},"s": "I", "c":"-", "id":4939300, "ctx":"monitoring-keys-for-HMAC","msg":"Fai l to refresh key cache","attr":{"error":"ReadConcernMajorityNotAvailableYet: Read concern majority reads are currently not possible.", "nextWakeupMillis":14000}} 2024-12-30 19:35:30 mongo2 {"t":{"date":"2024-12-30T17:35:30.324+00:00"},"s": "I", "c":"-", "id":4939300, "ctx":"monitoring-keys-for-HMAC","msg":"Fai l to refresh key cache","attr":{"error":"ReadConcernMajorityNotAvailableYet: Read concern majority reads are currently not possible.", "nextWakeupMillis":14200}} ↓
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```
test> rs.initiate({_id: "rs0", members: [{_id: 0, host: "mongo1:27017"}, {_id: 1, host: "mongo2:27017"}, {_id: 2, host: "mongo3:27017"}]});  
{ ok: 1 }  
rs0 [direct: other] test> rs.status()
```

Primary нода mongo1

```













rs0 [direct: other] test> rs.status()
{
  set: 'rs0',
  date: ISODate('2024-12-30T17:40:43.016Z'),
  myState: 1,
  term: Long('1'),
  syncSourceHost: '',
  syncSourceId: -1,
  heartbeatIntervalMillis: Long('2000'),
  majorityVoteCount: 2,
  writeMajorityCount: 2,
  votingMembersCount: 3,
  writableVotingMembersCount: 3,
  optimes: {
    lastCommittedOpTime: { ts: Timestamp({ t: 1735580434, i: 1 }), t: Long('1') },
    lastCommittedWallTime: ISODate('2024-12-30T17:40:34.923Z'),
    readConcernMajorityOpTime: { ts: Timestamp({ t: 1735580434, i: 1 }), t: Long('1') },
    appliedOpTime: { ts: Timestamp({ t: 1735580434, i: 1 }), t: Long('1') },
    durableOpTime: { ts: Timestamp({ t: 1735580434, i: 1 }), t: Long('1') },
    lastAppliedWallTime: ISODate('2024-12-30T17:40:34.923Z'),
    lastDurableWallTime: ISODate('2024-12-30T17:40:34.923Z')
  },
  lastStableRecoveryTimestamp: Timestamp({ t: 1735580404, i: 1 }),
  electionCandidateMetrics: {
    lastElectionReason: 'electionTimeout',
    lastElectionDate: ISODate('2024-12-30T17:39:24.603Z'),
    electionTerm: Long('1'),
    lastCommittedOpTimeAtElection: { ts: Timestamp({ t: 1735580354, i: 1 }), t: Long('-1') },
    lastSeenOpTimeAtElection: { ts: Timestamp({ t: 1735580354, i: 1 }), t: Long('-1') },
    numVotesNeeded: 2,
    priorityAtElection: 1,
    electionTimeoutMillis: Long('10000'),
    numCatchUpOps: Long('0'),
    newTermStartDate: ISODate('2024-12-30T17:39:24.663Z'),
    wMajorityWriteAvailabilityDate: ISODate('2024-12-30T17:39:25.951Z')
  },
  members: [
    {
      _id: 0,
      name: 'mongo1:27017',
      health: 1,
      state: 1,
      stateStr: 'PRIMARY',
      uptime: 829,
      optime: { ts: Timestamp({ t: 1735580434, i: 1 }), t: Long('1') },
      optimeDate: ISODate('2024-12-30T17:40:34.000Z'),
      lastAppliedWallTime: ISODate('2024-12-30T17:40:34.923Z'),
      lastDurableWallTime: ISODate('2024-12-30T17:40:34.923Z'),
      syncSourceHost: '',
      syncSourceId: -1,
      infoMessage: 'Could not find member to sync from',
      electionTime: Timestamp({ t: 1735580364, i: 1 }),
      electionDate: ISODate('2024-12-30T17:39:24.000Z'),
      configVersion: 1,
      configTerm: 1,
      self: true,
      lastHeartbeatMessage: ''
    },
    {
      _id: 1,
      name: 'mongo2:27017',
      health: 1,
      state: 2,
      stateStr: 'SECONDARY',
      uptime: 88,
      optime: { ts: Timestamp({ t: 1735580434, i: 1 }), t: Long('1') },
      optimeDurable: { ts: Timestamp({ t: 1735580434, i: 1 }), t: Long('1') },
      optimeDate: ISODate('2024-12-30T17:40:34.000Z'),
      optimeDurableDate: ISODate('2024-12-30T17:40:34.000Z'),
      lastAppliedWallTime: ISODate('2024-12-30T17:40:34.923Z'),
      lastDurableWallTime: ISODate('2024-12-30T17:40:34.923Z'),
      lastHeartbeat: ISODate('2024-12-30T17:40:41.193Z'),
      lastHeartbeatRecv: ISODate('2024-12-30T17:40:41.222Z'),
      pingMs: Long('0'),
      lastHeartbeatMessage: '',
      syncSourceHost: 'mongo1:27017',
      syncSourceId: 0,
      infoMessage: '',
      configVersion: 1,
      configTerm: 1
    },
    {
      _id: 2,
      name: 'mongo3:27017',
      health: 1,
      state: 2,

```

2) Спробувати зробити запис з однією відключеною ногою та write concern рівнім 3 та нескінченним таймаутом. Спробувати під час таймаута включити відключену ноду

lab4
C:\Users\User\Desktop\pvs_git\lab4

View Configurations

 mongo3 mongo:6.0 27019:27017	  	r error", "attr": {"error": {"code": 279, "codeName": "ClientDisconnect", "errmsg": "operation was interrupted because a client disconnected"}, "stats": {"stage": "COLLSCAN", "nReturned": 250, "works": 2430, "advanced": 250, "needTime": 0, "needYield": 0, "saveState": 2180, "restoreState": 2179, "isEOF": 0, "direction": "forward", "minRecord": 7454260860010102785, "docsExamined": 250}, "cmd": {"getMore": 2328811083624040845, "collection": "oplog.rs", "batchSize": 13981010, "maxTimeMS": 5000, "term": 1, "lastKnownCommittedOpTime": {"ts": {"\$timestamp": {"t": 1735580354, "i": 1}}, "t": -1}}}
 mongo1 mongo:6.0 27017:27017	  	2024-12-30 20:17:55 mongo1 {"t": {"\$date": "2024-12-30T18:17:55.762+00:00"}, "s": "I", "c": "NETWORK", "id": 22944, "ctx": "conn18", "msg": "Connection ended", "attr": {"remote": "172.19.0.2:56542", "uid": "4bca98bc-45bd-4b8a-be71-506f66d484d3", "connectionId": 18, "connectionCount": 12}}
 mongo2 mongo:6.0 27018:27017	  	2024-12-30 20:17:57 mongo2 {"t": {"\$date": "2024-12-30T18:17:57.879+00:00"}, "s": "W", "c": "NETWORK", "id": 4615610, "ctx": "ReplicaSetMonitor-TaskExecutor", "msg": "Failed to check socket connectivity", "attr": {"error": {"code": 6, "codeName": "HostUnreachable", "errmsg": "Connection closed by peer"}}} 2024-12-30 20:17:57 mongo2 {"t": {"\$date": "2024-12-30T18:17:57.879+00:00"}, "s": "I", "c": "CONNPPOOL", "id": 22561, "ctx": "ReplicaSetMonitor-TaskExecutor", "msg": "Dropping unhealthy pooled connection", "attr": {"hostAndPort": "mongo3:27017"}} 2024-12-30 20:17:57 mongo2 {"t": {"\$date": "2024-12-30T18:17:57.879+00:00"}, "s": "W", "c": "NETWORK", "id": 4615610, "ctx": "ReplicaSetMonitor-TaskExecutor", "msg": "Failed to check socket connectivity", "attr": {"error": {"code": 6, "codeName": "HostUnreachable", "errmsg": "Connection closed by peer"}}} 2024-12-30 20:17:57 mongo2 {"t": {"\$date": "2024-12-30T18:17:57.879+00:00"}, "s": "I", "c": "CONNPPOOL", "id": 22561, "ctx": "ReplicaSetMonitor-TaskExecutor", "msg": "Dropping unhealthy pooled connection", "attr": {"hostAndPort": "mongo3:27017"}} 2024-12-30 20:17:57 mongo2 {"t": {"\$date": "2024-12-30T18:17:57.879+00:00"}, "s": "I", "c": "CONNPPOOL", "id": 22576, "ctx": "ReplicaSetMonitor-TaskExecutor", "msg": "Dropping unhealthy pooled connection", "attr": {"hostAndPort": "mongo3:27017"}}

```
rs0 [direct: primary] test> db.test.insertOne({test: "all nodes work"}, {writeConcern: {w: 3, wtimeout: 0}});
{
  acknowledged: true,
  insertedId: ObjectId('6772e3b61fae32f5fbfe6911')
}
rs0 [direct: primary] test> db.test.insertOne({test: "mongo3 stopped"}, {writeConcern: {w: 3, wtimeout: 0}});
```

```
rs0 [direct: primary] test> db.test.insertOne({test: "mongo3 stopped"}, {writeConcern: {w: 3, wtimeout: 10000}});
Uncaught:
MongoWriteConcernError[WriteConcernFailed]: waiting for replication timed out
Additional information: {
  wtimeout: true,
  writeConcern: { w: 3, wtimeout: 10000, provenance: 'clientSupplied' }
}
Result: {
  n: 1,
  electionId: ObjectId('7fffffff0000000000000001'),
  optime: { ts: Timestamp({ t: 1735582848, i: 1 }), t: Long('1') },
  writeConcernError: {
    code: 64,
    codeName: 'WriteConcernFailed',
    errmsg: 'waiting for replication timed out',
    errInfo: {
      wtimeout: true,
      writeConcern: { w: 3, wtimeout: 10000, provenance: 'clientSupplied' }
    }
  },
  ok: 1,
  '$clusterTime': {
    clusterTime: Timestamp({ t: 1735582848, i: 1 }),
    signature: {
      hash: Binary.createFromBase64('AAAAAAAAAAAAAAAAAAAAAAAAAAAA=', 0),
      keyId: Long('0')
    }
  },
  operationTime: Timestamp({ t: 1735582848, i: 1 })
}
```

3) Аналогічно попередньому пункту, але задати скінченний таймаут та дочекатись його закінчення. Перевірити чи данні записались і чи доступні на читання з рівнем readConcern: “majority”

```
rs0 [direct: primary] test> db.test.insertOne({test: "mongo3 stopped, but started in timeout"}, {writeConcern: {w: 3, wtimeout: 100000}});
{
  acknowledged: true,
  insertedId: ObjectId('67730ee03831521f9ffe6911')
}
rs0 [direct: primary] test> db.test.find()
[
  { _id: ObjectId('6772e3b61fae32f5fbfe6911'), test: 'all nodes work' },
  { _id: ObjectId('6772e3df1fae32f5fbfe6912'), test: 'mongo3 stopped' },
  { _id: ObjectId('6772e4801fae32f5fbfe6913'), test: 'mongo3 stopped' },
  {
    _id: ObjectId('6772eb5c3b96cd969efe6911'),
    test: 'another primary'
  },
  {
    _id: ObjectId('67730ee03831521f9ffe6911'),
    test: 'mongo3 stopped, but started in timeout'
  }
]
```

4) Продемонстрував перевибори primary node відключивши поточний primary, і що після відновлення роботи старої primary на неї реплікуються нові дані, які з'явилися під час її простою

```
members: [
  {
    _id: 0,
    name: 'mongo1:27017',
    health: 0,
    state: 0,
    stateStr: '(not reachable/healthy)',
    uptime: 0,
    optime: { ts: Timestamp({ t: 0, i: 0 }), t: Long('-1') },
    optimeDuration: { ts: Timestamp({ t: 0, i: 0 }), t: Long('-1') },
    optimeDate: ISODate('1970-01-01T00:00:00.000Z'),
    optimeDurationDate: ISODate('1970-01-01T00:00:00.000Z'),
    lastAppliedWallTime: ISODate('2024-12-30T18:39:54.397Z'),
    lastDurableWallTime: ISODate('2024-12-30T18:39:44.396Z'),
    lastHeartbeat: ISODate('2024-12-30T18:42:00.591Z'),
    lastHeartbeatRecv: ISODate('2024-12-30T18:39:53.398Z'),
    pingMs: Long('0'),
    lastHeartbeatMessage: 'Error connecting to mongo1:27017 :: caused by :: Could not find address for mongo1:27017:
    socketException: Host not found (authoritative)',
    syncSourceHost: '',
    syncSourceId: -1,
    infoMessage: '',
    configVersion: 1,
    configTerm: 2
  },
  {
    _id: 1,
    name: 'mongo2:27017',
    health: 1,
    state: 1,
    stateStr: 'PRIMARY',
    uptime: 4515,
    optime: { ts: Timestamp({ t: 1735584125, i: 1 }), t: Long('2') },
    optimeDate: ISODate('2024-12-30T18:42:05.000Z'),
    lastAppliedWallTime: ISODate('2024-12-30T18:42:05.836Z'),
    lastDurableWallTime: ISODate('2024-12-30T18:42:05.836Z'),
    syncSourceHost: '',
    syncSourceId: -1,
    infoMessage: '',
    electionTime: Timestamp({ t: 1735583984, i: 1 }),
    electionDate: ISODate('2024-12-30T18:39:44.000Z'),
    configVersion: 1,
    configTerm: 2,
    self: true,
    lastHeartbeatMessage: ''
  },
  {
    _id: 2,
    name: 'mongo3:27017',
    health: 1,
    state: 2,
    stateStr: 'SECONDARY',
    uptime: 435,
    optime: { ts: Timestamp({ t: 1735584125, i: 1 }), t: Long('2') },
    optimeDuration: { ts: Timestamp({ t: 1735584125, i: 1 }), t: Long('2') },
    optimeDate: ISODate('2024-12-30T18:42:05.000Z'),
    optimeDurationDate: ISODate('2024-12-30T18:42:05.000Z'),
    lastAppliedWallTime: ISODate('2024-12-30T18:42:05.836Z'),
    lastDurableWallTime: ISODate('2024-12-30T18:42:05.836Z'),
    lastHeartbeat: ISODate('2024-12-30T18:42:08.783Z'),
    lastHeartbeatRecv: ISODate('2024-12-30T18:42:08.798Z'),
    pingMs: Long('0'),
    lastHeartbeatMessage: '',
    syncSourceHost: 'mongo2:27017',
    syncSourceId: 1,
    infoMessage: '',
    configVersion: 1,
    configTerm: 2
  }
],
```

```
rs0 [direct: primary] test> db.test.insertOne({test: "another primary"})
{
  acknowledged: true,
  insertedId: ObjectId('6772eb5c3b96cd969efe6911')
}
```

```
rs0 [direct: primary] test> db.test.find()
[
  { _id: ObjectId('6772e3b61fae32f5fbfe6911'), test: 'all nodes work' },
  { _id: ObjectId('6772e3df1fae32f5fbfe6912'), test: 'mongo3 stopped' },
  { _id: ObjectId('6772e4801fae32f5fbfe6913'), test: 'mongo3 stopped' },
  {
    _id: ObjectId('6772eb5c3b96cd969efe6911'),
    test: 'another primary'
  }
]
```

```
rs0 [direct: primary] test> db.test.find()
[
  { _id: ObjectId('6772e3b61fae32f5fbfe6911'), test: 'all nodes work' },
  { _id: ObjectId('6772e3df1fae32f5fbfe6912'), test: 'mongo3 stopped' },
  { _id: ObjectId('6772e4801fae32f5fbfe6913'), test: 'mongo3 stopped' },
  {
    _id: ObjectId('6772eb5c3b96cd969efe6911'),
    test: 'another primary'
  }
]
```

```
rs0 [direct: primary] test>
```

C:\Users\User>docker exec -it mongo1 mongosh

Current Mongosh Log ID: 6772ebdb6f080cf68afe6910

Connecting to: <mongodb://127.0.0.1:27017/?directConnection=true&serverSelectionTimeoutMS=30000>

Using MongoDB: 6.0.19

Using Mongosh: 2.3.2

For mongosh info see: <https://www.mongodb.com/docs/mongodb-shell/>

```
-----
The server generated these startup warnings when booting
2024-12-30T18:51:47.290+00:00: Using the XFS filesystem is strongly recommended with the
XFS filesystem. See https://dochub.mongodb.org/core/prodnotes-filesystem
2024-12-30T18:51:47.540+00:00: Access control is not enabled for the database. Replication
and authorization is unrestricted
2024-12-30T18:51:47.540+00:00: /sys/kernel/mm/transparent_hugepage/enabled is 'always'
2024-12-30T18:51:47.540+00:00: vm.max_map_count is too low
-----
```

```
rs0 [direct: secondary] test> db.test.find()
[
  { _id: ObjectId('6772e3b61fae32f5fbfe6911'), test: 'all nodes work' },
  { _id: ObjectId('6772e3df1fae32f5fbfe6912'), test: 'mongo3 stopped' },
  { _id: ObjectId('6772e4801fae32f5fbfe6913'), test: 'mongo3 stopped' },
  {
    _id: ObjectId('6772eb5c3b96cd969efe6911'),
    test: 'another primary'
  }
]
```

Аналіз продуктивності та перевірка цілісності

```
user@DESKTOP-060E7M5:/mnt/c/Users/User/Desktop/pvs_git/lab4$ python3 lab42.py
writeConcern = 1
Time: 21s
Likes: 100000
Likes reset to 0.

writeConcern = majority
Time: 176s
Likes: 100000
```