

## Αρχικοποίηση του Docker Swarm στο PC:

```
C:\Users\nikos>docker swarm init
Swarm initialized: current node (nfs9ezqi331y4eolgoilk8r6k) is now a manager.

To add a worker to this swarm, run the following command:

    docker swarm join --token SWMTKN-1-2slxy6segf4moouwxklxv2oaec51unc1b0ft66ha5qm8o817g-06tnityw3vjdprqbsudlea7nn 192.168.65.3:2377

To add a manager to this swarm, run 'docker swarm join-token manager' and follow the instructions.
```

## Deploy του project στο stack:

```
C:\Users\nikos\OneDrive\Έγγραφα\examifyV2\database>docker stack deploy -c docker-compose.yaml examify
Since --detach=false was not specified, tasks will be created in the background.
In a future release, --detach=false will become the default.
Creating network examify_app-network
Creating service examify_mongodb
Creating service examify_back
Creating service examify_front
```

## A. Αναπαραγωγή αντιγράφων των τριών επιπέδων της εφαρμογής.

```
C:\Users\nikos\OneDrive\Έγγραφα\examifyV2\database>docker ps
```

CONTAINER ID	IMAGE	COMMAND	CREATED	STATUS	PORTS	NAMES
8b41d539e09a	mongo:latest	"docker-entrypoint.s..."	32 seconds ago	Up 29 seconds	27017/tcp	examify_mo
ngodb.1.wnd0n54j1ecrieg213ye3cgu6	mongo:latest	"docker-entrypoint.s..."	32 seconds ago	Up 30 seconds	27017/tcp	examify_mo
44bd37f7daa3	mongo:latest	"docker-entrypoint.s..."	32 seconds ago	Up 29 seconds	27017/tcp	examify_mo
ngodb.3.t5olzxo7tyk6an9psdu5khh33	mongo:latest	"docker-entrypoint.s..."	32 seconds ago	Up 30 seconds	27017/tcp	examify_mo
623e62303e5b	mongo:latest	"docker-entrypoint.s..."	32 seconds ago	Up 30 seconds	27017/tcp	examify_mo
ngodb.2.i6qvoueud2hun42kfdfsy4qdz8	mongo:latest	"docker-entrypoint.s..."	32 seconds ago	Up 30 seconds	27017/tcp	examify_mo
8fc14d18c53e	front:latest	"docker-entrypoint.s..."	33 seconds ago	Up 30 seconds	5173/tcp	examify_fr
ont.1.s5m8h0k25sf8kibdulpv35msv	front:latest	"docker-entrypoint.s..."	33 seconds ago	Up 30 seconds	5173/tcp	examify_fr
d2fe4bf62b85	front:latest	"docker-entrypoint.s..."	33 seconds ago	Up 30 seconds	5173/tcp	examify_fr
ont.2.4s5hm5ercn8k5hqb64bhs10xo	front:latest	"docker-entrypoint.s..."	33 seconds ago	Up 30 seconds	5173/tcp	examify_fr
e2f79c091cd9	front:latest	"docker-entrypoint.s..."	33 seconds ago	Up 30 seconds	5173/tcp	examify_fr
ont.3.jq3n81t31hba9z1bui968c65	nikostsa27/back:latest	"java -jar examify.j..."	35 seconds ago	Up 33 seconds	5456/tcp	examify_ba
7b3ef2535480	nikostsa27/back:latest	"java -jar examify.j..."	35 seconds ago	Up 33 seconds	5456/tcp	examify_ba
ck.2.lwlvbfu0ivrcincypw4sx90d	nikostsa27/back:latest	"java -jar examify.j..."	35 seconds ago	Up 33 seconds	5456/tcp	examify_ba
fa3f781e204c	nikostsa27/back:latest	"java -jar examify.j..."	35 seconds ago	Up 33 seconds	5456/tcp	examify_ba
ck.3.kqqgllu0vaznt53zu1h917jgo	nikostsa27/back:latest	"java -jar examify.j..."	35 seconds ago	Up 34 seconds	5456/tcp	examify_ba
f97ec697ec2a	nikostsa27/back:latest	"java -jar examify.j..."	35 seconds ago	Up 34 seconds	5456/tcp	examify_ba
ck.1.ydimf04s43qnlftt7y1wwx70s	nikostsa27/back:latest	"java -jar examify.j..."	35 seconds ago	Up 34 seconds	5456/tcp	examify_ba

```
C:\Users\nikos\OneDrive\Έγγραφα\examifyV2\database>docker service ls
```

ID	NAME	MODE	REPLICAS	IMAGE	PORTS
i4dsaeahghgmq	examify_back	replicated	3/3	nikostsa27/back:latest	*:5456->5456/tcp
ruw920bovy1	examify_front	replicated	3/3	front:latest	*:5173->5173/tcp
kow8aiefs5q0	examify_mongodb	replicated	3/3	mongo:latest	*:27017->27017/tcp

## B. Διαπίστωση της εξισορρόπησης φορτίου. Εκτέλεση πολλαπλών αιτημάτων για να διαπιστωθεί η κατανομή και ο ταυτοχρονισμός. (χρησιμοποίηση Apache Benchmark)

```
C:\Users\nikos\OneDrive\Έγγραφα\examifyV2\database>ab -n 100 -c 10 http://localhost:5173/
This is ApacheBench, Version 2.3 <$Revision: 1913912 $>
Copyright 1996 Adam Twiss, Zeus Technology Ltd, http://www.zeustech.net/
Licensed to The Apache Software Foundation, http://www.apache.org/

Benchmarking localhost (be patient).....done


Server Software:
Server Hostname: localhost
Server Port: 5173

Document Path: /
Document Length: 674 bytes
```

```

Concurrency Level:      10
Time taken for tests:    0.659 seconds
Complete requests:      100
Failed requests:         0
Total transferred:      87400 bytes
HTML transferred:       67400 bytes
Requests per second:    151.75 [#/sec] (mean)
Time per request:       65.899 [ms] (mean)
Time per request:       6.590 [ms] (mean, across all concurrent requests)
Transfer rate:          129.52 [Kbytes/sec] received

Connection Times (ms)
              min      mean[+/-sd] median   max
Connect:        0        0   0.5      0      2
Processing:      4        59  82.6     12     290
Waiting:         4        57  80.6     12     282
Total:           4        59  82.5     13     291

Percentage of the requests served within a certain time (ms)
 50%    13
 66%    48
 75%    93
 80%   104
 90%   224
 95%   278
 98%   290
 99%   291
100%   291 (longest request)

```

Γ. Διαπίστωση της ακεραιότητας της βάσης δεδομένων μετά από την εκτέλεση πολλαπλών αιτημάτων σε πολλαπλά αντίγραφα της βάσης.

```

C:\Users\nikos\OneDrive\Έγγραφα\examifyV2\database>docker exec -it examify_mongodb.3.yu6nmf95rz4qmvqtgvtyhs88t mongosh
Current Mongosh Log ID: 67879d6c77066506f94969
Connecting to:      mongodb://127.0.0.1:27017/?directConnection=true&serverSelectionTimeoutMS=2000&appName=mongosh+2.3.4
Using MongoDB:      8.0.4
Using Mongosh:      2.3.4

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

To help improve our products, anonymous usage data is collected and sent to MongoDB periodically (https://www.mongodb.com/legal/privacy-policy).
You can opt-out by running the disableTelemetry() command.

-----
The server generated these startup warnings when booting
2025-01-15T11:29:53.998+00:00: Using the XFS filesystem is strongly recommended with the WiredTiger storage engine. See http://dochub.mongodb.org/core/prodnotes-filesystem
2025-01-15T11:29:58.701+00:00: Access control is not enabled for the database. Read and write access to data and configuration is unrestricted
2025-01-15T11:29:58.708+00:00: For customers running the current memory allocator, we suggest changing the contents of the following sysfsFile
2025-01-15T11:29:58.708+00:00: We suggest setting the contents of sysfsFile to 0.
2025-01-15T11:29:58.708+00:00: Your system has glibc support for rseq built in, which is not yet supported by tcmalloc-google and has critical performance implications. Please set the environment variable GLIBC_TUNABLES=glibc.pthread.rseq=0
2025-01-15T11:29:58.708+00:00: vm.max_map_count is too low
2025-01-15T11:29:58.709+00:00: We suggest setting swappiness to 0 or 1, as swapping can cause performance problems.
-----

```

```
]
examify> db.course.find().pretty()
[
  {
    _id: ObjectId('67795645b4461a367969bb45'),
    code: 'CS101',
    title: 'Introduction to Computer Science',
    professors: [ 'johndoe' ],
    students: [ 'ics22089' ],
    _class: 'gr.nikts27.examify.entity.Course'
  }
]
examify> db.stats()
{
  db: 'examify',
  collections: Long('2'),
  views: Long('0'),
  objects: Long('3'),
  avgObjSize: 281.6666666666667,
  dataSize: 845,
  storageSize: 40960,
  indexes: Long('2'),
  indexSize: 40960,
  totalSize: 81920,
  scaleFactor: Long('1'),
  fsUsedSize: 81522081792,
  fsTotalSize: 1081101176832,
  ok: 1
}
examify>
```

```

test> use examify
switched to db examify
examify> show collections
course
users
examify> db.users.count()
DeprecationWarning: Collection.count() is deprecated. Use countDocuments or estimatedDocumentCount.
2
examify> db.exams.count()
0
examify> db.courses.count()
0
examify> db.users.find().pretty()
[
  {
    _id: ObjectId('67794f51cffbb83086590d3b'),
    fullName: 'Nikolaos Tsaridis',
    email: 'ics22089@uom.edu.gr',
    username: 'ics22089',
    password: '$2a$10$w76oqftA1hbbVx0K0CgP0036TGkPIMxkACEqoikSy41dqHe04rkJO',
    role: 'STUDENT',
    courses: [ 'CS101' ],
    refreshToken: 'eyJhbGciOiJIUzUxMiJ9...',
    createdAt: ISODate('2025-01-04T15:10:09.027Z'),
    _class: 'gr.nikts27.examify.entity.User'
  },
  {
    _id: ObjectId('67794f51cffbb83086590d3c'),
    fullName: 'John Doe',

```

Δ. Ενημέρωση κάποιου επιπέδου της εφαρμογής (π.χ. μικρή αλλαγή στη λογική ή στην παρουσίαση) για να διαπιστώσουμε ότι η ενημέρωση γίνεται εν λειτουργία (CI/CD).

(μικρή αλλαγή στον κώδικα)

```

App.jsx
    path="/home"
    element={({auth.user.role === "STUDENT")
      ? <Navigate to="/student"/> : <Navigate to="/professor"/>}
    />
    <Route path="/professor" element={<ProfessorHome/>} />
    <Route path="/student" element={<StudentHome/>} />
    <Route path="/calendar" element={<CalendarPage user={auth.user}/>} />
    <Route path="/build-exam" element={<BuildExamPage profName={auth.user.name}/>} />
    <Route path="/see-submissions" element={<SeeSubmissionsPage/>} />
    <Route path="/grade-exam" element={<GradeExamPage/>} />
    <Route path="/start-exam" element={<AnswerQuestionsPage/>} />
  </Routes>
  <div className="footer">
    <p>Version 1.1 - Updated Live</p>
  </div>
</div>
) : <Auth/>}
</>

```

## Κάνουμε build το νέο image με διαφορετικό tag

```
PS C:\Users\nikos\OneDrive\Έγγραφα\examifyV2\exams_frontend\examify_react> docker build -t front:v1.1 .
[+] Building 7.1s (11/11) FINISHED                                docker:desktop-linux
=> [internal] load build definition from Dockerfile                0.1s
=> => transferring dockerfile: 277B                                0.0s
=> [internal] load metadata for docker.io/library/node:latest     6.1s
=> [auth] library/node:pull token for registry-1.docker.io        0.0s
=> [internal] load .dockerignore                                  0.0s
=> => transferring context: 52B                                     0.0s
=> [1/5] FROM docker.io/library/node:latest@sha256:79daa9914f64d084477d704b32ab6143190d21c43b4f4ae5410bac7a491e07ae  0.1s
=> => resolve docker.io/library/node:latest@sha256:79daa9914f64d084477d704b32ab6143190d21c43b4f4ae5410bac7a491e07ae  0.1s
=> [internal] load build context                                   0.1s
=> => transferring context: 6.65kB                                   0.1s
=> CACHED [2/5] WORKDIR /app                                       0.0s
=> CACHED [3/5] COPY package*.json ./                              0.0s
=> CACHED [4/5] RUN npm install                                    0.0s
=> [5/5] COPY . .                                                  0.2s
=> exporting to image                                              1.2s
=> => exporting layers                                              0.4s
=> => exporting manifest sha256:85cc899cad8cf94e9200239fe19beadcbaf7a2025cb6f1d5c51f2c599df2ca8  0.0s
=> => exporting config sha256:f55c0a326cbc41845bf082f9ea0f9c2382b3f486f001171dc77cc232fac81268  0.0s
```

## Ενημέρωση του docker-compose

```
front:
  image: front:v1.1
  deploy:
    replicas: 3
    update_config:
      parallelism: 1      # Ένα-ένα container
      delay: 10s          # 10 δευτερόλεπτα μεταξύ updates
      order: start-first  # Ξεκινά το νέο πριν σταματήσει το παλιό
    restart_policy:
      condition: on-failure
```

## Εφαρμογή της ενημέρωσης

```
C:\Users\nikos\OneDrive\Έγγραφα\examifyV2\database>docker stack deploy -c docker-compose.yaml examify
Since --detach=false was not specified, tasks will be created in the background.
In a future release, --detach=false will become the default.
Updating service examify_mongodb (id: 625241ilv44h4sb6ri5maggmj4)
Updating service examify_back (id: vx00anxsslk6ae42x4epion3b)
Updating service examify_front (id: u5j5236uuffbduyr49p5m4hb4)
image front:v1.1 could not be accessed on a registry to record
its digest. Each node will access front:v1.1 independently,
possibly leading to different nodes running different
versions of the image.
```

```
C:\Users\nikos\OneDrive\Έγγραφα\examifyV2\database>docker service ps examify_front --format "{{.Name}} {{.CurrentState}}"
"
examify_front.1 Running 12 seconds ago
examify_front.1 Shutdown 7 seconds ago
examify_front.2 Running 25 seconds ago
examify_front.2 Shutdown 20 seconds ago
examify_front.3 Starting 1 second ago
examify_front.3 Running 22 minutes ago
```

## Ε. Επιστροφή στην κατάσταση του ενός αντιγράφου ανά επίπεδο και κλείσιμο

```
C:\Users\nikos\OneDrive\Έγγραφα\examifyV2\database>docker service scale examify_front=1 examify_back=1 examify_mongodb=1
examify_front scaled to 1
examify_back scaled to 1
examify_mongodb scaled to 1
overall progress: 1 out of 1 tasks
1/1: running [=====>]
verify: Service examify_front converged
overall progress: 1 out of 1 tasks
1/1: running [=====>]
verify: Service examify_back converged
overall progress: 1 out of 1 tasks
1/1: running [=====>]
verify: Service examify_mongodb converged

C:\Users\nikos\OneDrive\Έγγραφα\examifyV2\database>docker service ls
ID                NAME                MODE                REPLICAS            IMAGE                PORTS
vxo0anxsslk6      examify_back         replicated           1/1                 nikostsa27/back:latest *:5456->5456/tcp
u5j5236uuffb      examify_front        replicated           1/1                 front:v1.1           *:5173->5173/tcp
625241i1v44h      examify_mongodb       replicated           1/1                 mongo:latest          *:27017->27017/tcp
```

```
C:\Users\nikos\OneDrive\Έγγραφα\examifyV2\database>docker service ls
ID                NAME                MODE                REPLICAS            IMAGE                PORTS
vxo0anxsslk6      examify_back         replicated           1/1                 nikostsa27/back:latest *:5456->5456/tcp
u5j5236uuffb      examify_front        replicated           1/1                 front:v1.1           *:5173->5173/tcp
625241i1v44h      examify_mongodb       replicated           1/1                 mongo:latest          *:27017->27017/tcp

C:\Users\nikos\OneDrive\Έγγραφα\examifyV2\database>docker stack rm examify
Removing service examify_back
Removing service examify_front
Removing service examify_mongodb
Removing network examify_app-network

C:\Users\nikos\OneDrive\Έγγραφα\examifyV2\database>docker service ls
ID                NAME                MODE                REPLICAS            IMAGE                PORTS

C:\Users\nikos\OneDrive\Έγγραφα\examifyV2\database>docker swarm leave --force
Node left the swarm.
```

## Κλείσιμο της εφαρμογής

```
C:\Users\nikos\OneDrive\Έγγραφα\examifyV2\database>docker service ls
ID                NAME                MODE                REPLICAS            IMAGE                PORTS
vxo0anxsslk6      examify_back         replicated           1/1                 nikostsa27/back:latest *:5456->5456/tcp
u5j5236uuffb      examify_front        replicated           1/1                 front:v1.1           *:5173->5173/tcp
625241i1v44h      examify_mongodb       replicated           1/1                 mongo:latest          *:27017->27017/tcp

C:\Users\nikos\OneDrive\Έγγραφα\examifyV2\database>docker stack rm examify
Removing service examify_back
Removing service examify_front
Removing service examify_mongodb
Removing network examify_app-network

C:\Users\nikos\OneDrive\Έγγραφα\examifyV2\database>docker service ls
ID                NAME                MODE                REPLICAS            IMAGE                PORTS

C:\Users\nikos\OneDrive\Έγγραφα\examifyV2\database>docker swarm leave --force
Node left the swarm.
```