

Kadmelia implementation

Mobile and distributed systems, D7024E

Group 12

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1 Frameworks

In this section, we will discuss the various frameworks and technologies that are being utilized in the project. This includes both the backend and frontend technologies, as well as any other tools that are essential for the development process.

Programming language: Go is used as the primary programming language for the backend services, leveraging its concurrency features and performance.

Logging: Logrus is used for structured logging in the application, providing a simple API for logging that allows to pass the container ip address for each log entry to easily identify which node the log entry originated from.

Containerization: Docker in swarm mode is used for container orchestration, enabling the management of multiple containers.

Automation: Bash scripts are employed to automate common tasks such as building and deploying the application, making it easier to manage the deployment and development process.

2 Sprints

2.1 Organizing Sprints

To structure and organize the work efficiently, GitHub Projects is used to create a storyboard for both sprints. The storyboard is available under the Projects tab in the repository, providing an overview of the workflow throughout the course.

2.2 Sprint 0

2.2.1 Done in sprint 0

During sprint 0 we setup the project repository from the Github template given in the course. We also configured a containerization strategy using Docker in swarm mode. We established bash scripts to automate common tasks, such as building and deploying the application. This lets us with a simple script deploy up to n instances, where n is a argument for the deploy script, with ease. Utilizing these scripts, we can easily scale up and down the number of instances in our swarm and Kademlia network in the upcoming sprints.

After setting up the containerization tools, we started on the implementation of finding nodes in the same docker network and establishing communication between them. Our approach involved DNS lookups via the docker DNS service, to get the docker ip addresses of the other containers in the same docker swarm stack. The drawback of this approach is that the containers that start up early won't be able to find the containers that start up later, since they don't exist yet. We didn't solve this problem yet, as we will implement Kademlia protocol for peer discovery to address these issues later in the sprint.

2.2.2 Plan for sprint 0

In sprint 0, we plan to focus on the following tasks:

- **M1** Implement the Kademlia protocol for pinging
- **M1** Implement the Kademlia protocol for network joining
- **M1** Implement the Kademlia protocol for finding nodes
- **M1** Create unit tests for the implemented Kademlia functionalities, via mocking

2.3 Sprint 1

2.3.1 Planned work

As illustrated in Figure 1, the plan is to complete all underlying functionality (M2-M7) during sprint 1. Subsequently, focus will shift to the qualification goals (U1–U5), during sprint 2. This structure was chosen because establishing and verifying the core functionality first ensures a stable foundation, which in turn facilitates the successful implementation of the qualification objectives.

Appendices

Appendix A

▼	P0	\$	Estimate: 0	...				
1	M1 Ping #1		In Progress	▼	M	▼		Sprint 0
2	M5: Containerization #14		Done	▼		▼		Sprint 0
3	M1 Network joining #4		Todo	▼	M	▼		Sprint 0
4	M1 #2		Todo	▼	L	▼		Sprint 0
5	M1: Node lookup #5		Todo	▼	M	▼		Sprint 0
+ Add item								
▼	P1	\$	Estimate: 0	...				
6	M2 #6		Todo	▼		▼		Sprint 1
7	M2: Storing objects #7		Todo	▼	L	▼		Sprint 1
8	M2: finding objects #8		Todo	▼	L	▼		Sprint 1
9	M4: Unit testing #13		Todo	▼	L	▼		Sprint 0
10	M3: Add command structure #22		Todo	▼	S	▼		Sprint 1
+ Add item								

Figure 1: Todos for Sprints at Sprint 0

▼	P2	\$	Estimate: 0	...				
11	M3 #9		Todo	▼		▼		Sprint 1
12	M3: Put command #10		Todo	▼		▼		Sprint 1
13	M3: Get command #11		Todo	▼		▼		Sprint 1
14	M3: Exit command #12		Todo	▼		▼		Sprint 1
15	M7: Concurrency and Thread saftey #18		Todo	▼	XL	▼		Sprint 1
+ Add item								
▼	P3	\$	Estimate: 0	...				
16	U1: Object expiration #15		Todo	▼		▼		Sprint 2
17	U2: Object expiration delay #16		Todo	▼		▼		Sprint 2
18	U3: Forget CLI command #17		Todo	▼		▼		Sprint 2
19	U4: RESTful application interface #19		Todo	▼		▼		Sprint 2
20	U5: Higher unit test coverage #20		Todo	▼		▼		Sprint 2
21	U6: Implement the full/general Kademlia routing tree structure #21		Todo	▼		▼		Sprint 2

Figure 2: Todos for Sprints at Sprint 0, continued