

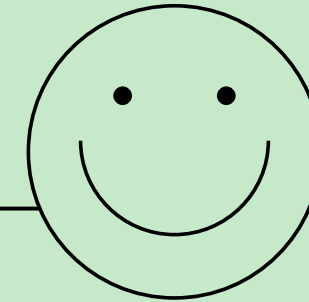
Manenti Edoardo

Simone Nicosanti

Andrea De Filippis

SDCC PROJECT 2K23

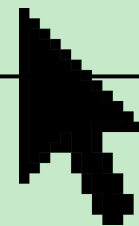
A.A. 2022/2023



STORAGE NEL CLOUD CONTINUUM

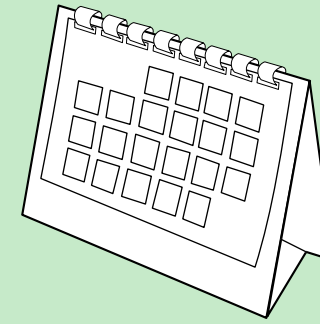


Presentazione del progetto
"SAE storage service"



Let's get started

AGENDA



Introduzione

Architettura

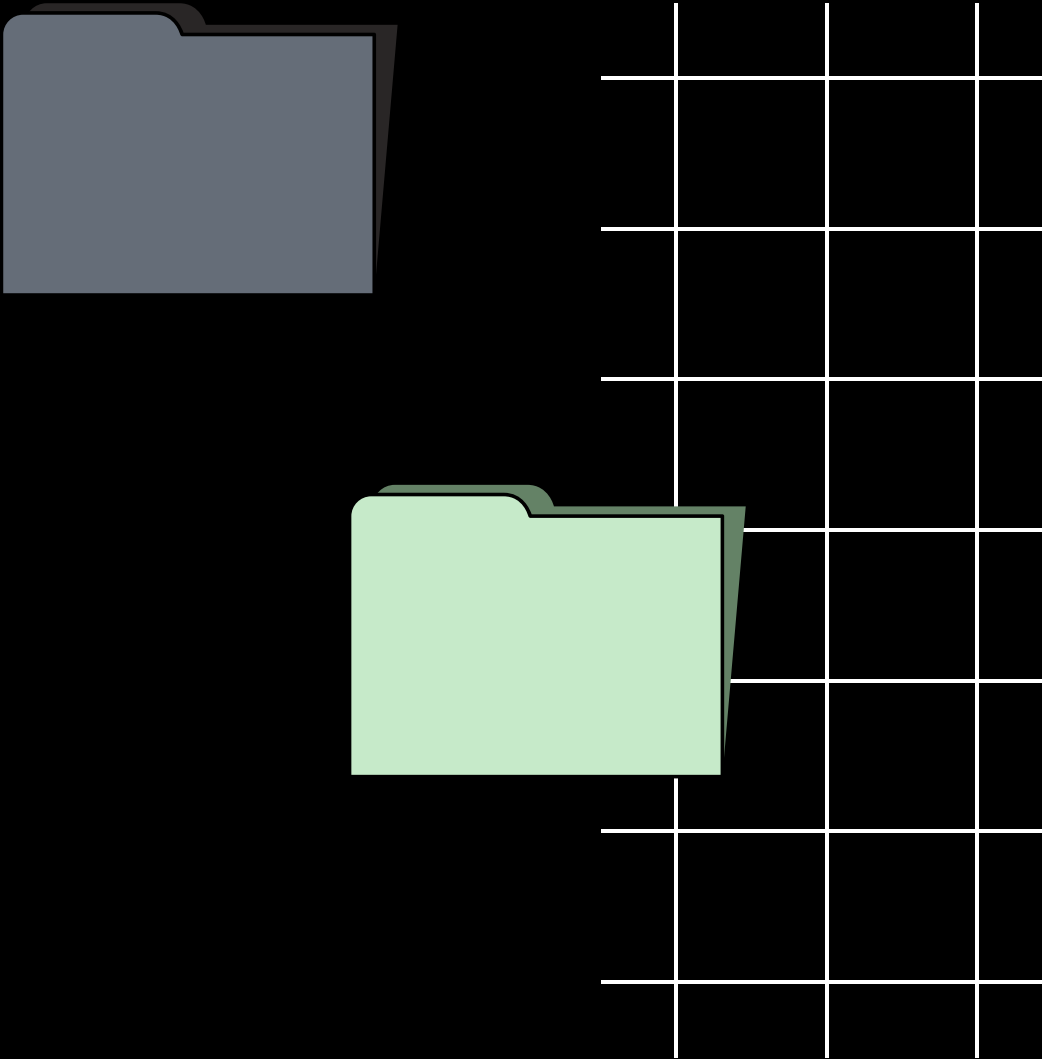
Scelte implementative

Risultati empirici

Sviluppi futuri



INTRODUZIONE

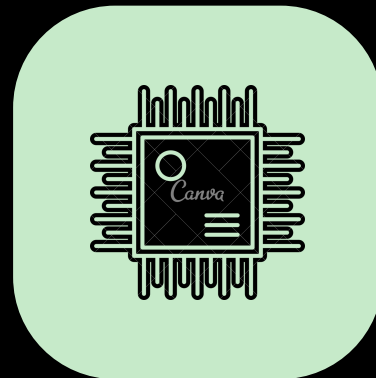


In questa presentazione entreremo nei dettagli di *SAE Storage System* sviluppato come progetto per l'esame di Sistemi Distribuiti.

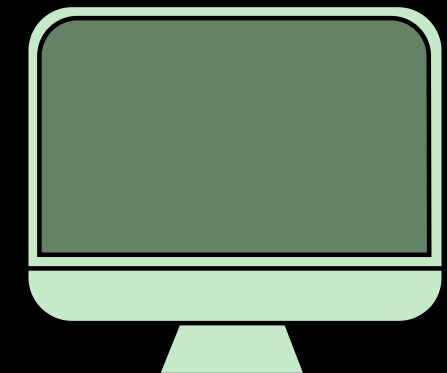
Per prima cosa vediamo i building blocks e l'architettura di base...

BUILDING BLOCKS

9%



EDGE



CLIENT

Nodo con risorse limitate e capacità di caching che comunica con il cloud ed altri dispositivi a formare una rete non strutturata che costituisce un layer intermedio tra i client e il cloud.

Client che, una volta autenticato, può richiedere di inserire o eliminare file nella rete.

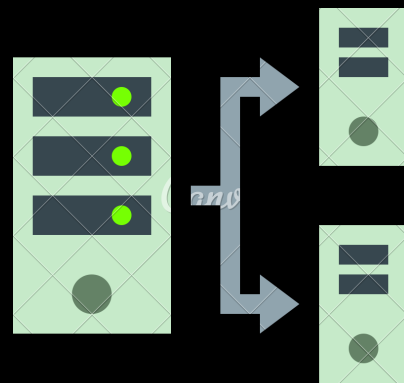


S3 CLOUD

Bucket S3 su amazon web services su cui sono salvati i file dell'intero sistema.

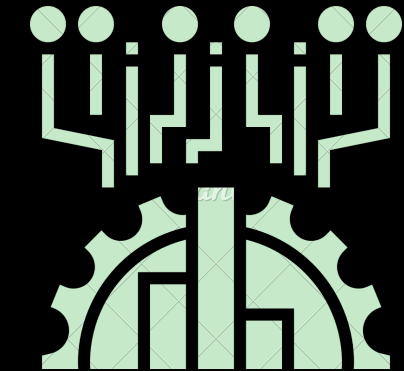
BUILDING BLOCKS

14%



BALANCER

Nodo che autentica i client e ne gestisce le richieste redistribuendole equamente tra i vari edge.



REGISTRY

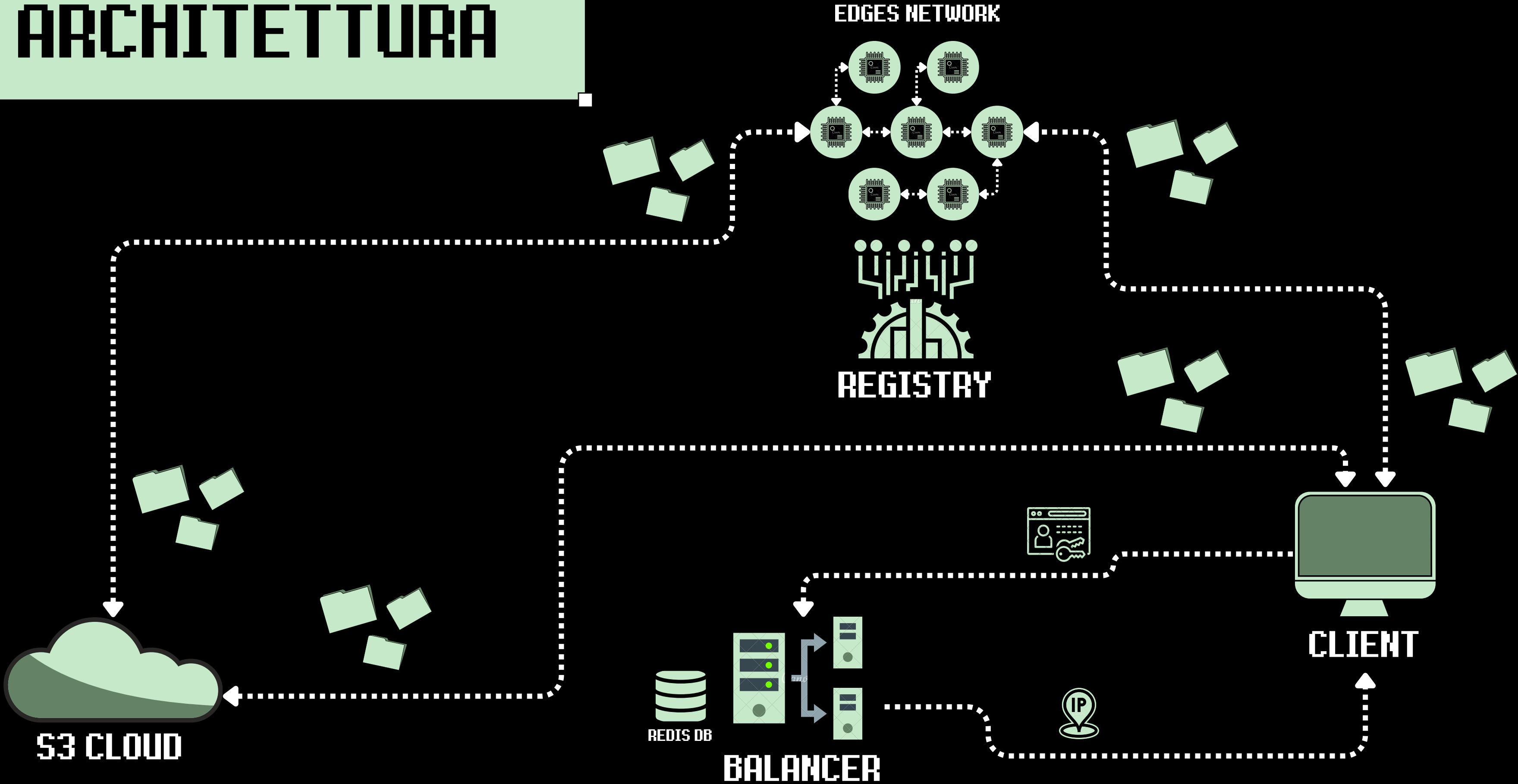
Nodo che gestisce la rete di edge in maniera centralizzata con controlli periodici sulle componenti connesse.



REDIS DB

DB ospitato dal nodo del load balancer che permette di mantenere le utenze autorizzate in persistenza.

ARCHITETTURA

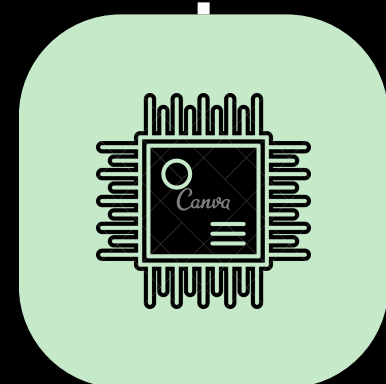


ENTRATA DI UN EDGE

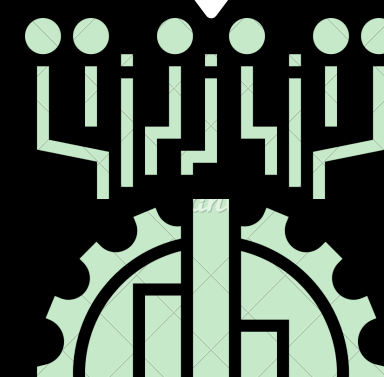
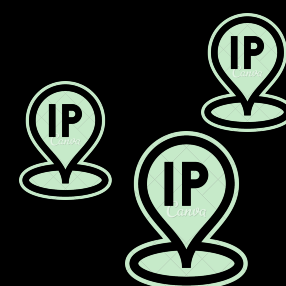
23%

Hello, i want to enter in the network!

Hey there! Here are your neighbours...



NEW EDGE !!!



REGISTRY



ELABORAZIONE

Scelta dei vicini a cui connettersi e aggiornamento degli edge attivi.



ELABORAZIONE

Tentativo di connessione ai vicini restituiti, inizio meccanismo di ping verso di essi e invio di heartbeat periodici verso il registry.

PING

TRA VICINI

27%

Connecting to neighbour...

OK!

Connection request received, connecting...

OK!



A FEW MOMENTS LATER...

Hey neighbour! Are you there?

Yes! Still here...

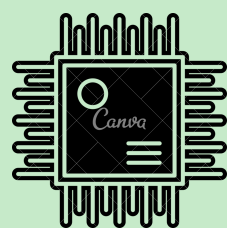
I am already connected to this guy... all good!



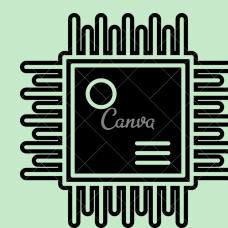
N SECONDS LATER...

Hey neighbour! Are you there?

Yes! Still here...



EDGE

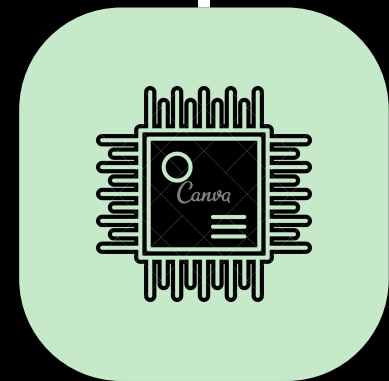


NEIGHBOUR

PING

TRA VICINI

32%



EDGE

Hey neighbour! Are you there?

Yes! Still here but... who are you?

Connection request sent...

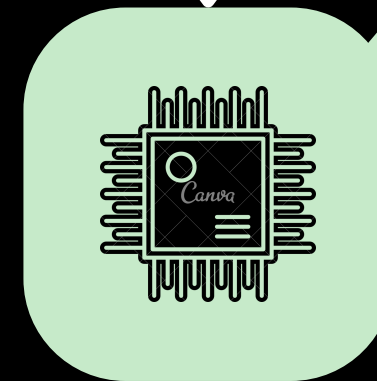
OK!



N SECONDS LATER...

Hey neighbour! Are you there?

Yes! Still here...



NEIGHBOUR

I don't know you...

Let's connect!

PING

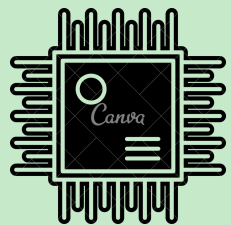
TRA VICINI

36%

Hey neighbour! Are you there?

I'm asking you for the 2nd time... Are you there?

Third time's the charm... Are you there?



EDGE

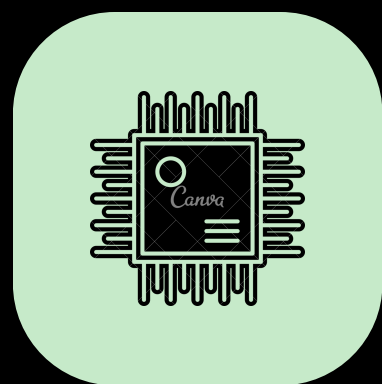


NEIGHBOUR

Neighbour not responding...
assuming he's dead...

HEARTBEAT

VERSO IL
REGISTRY



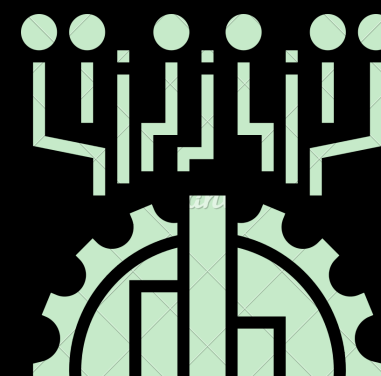
EDGE

I'm alive!



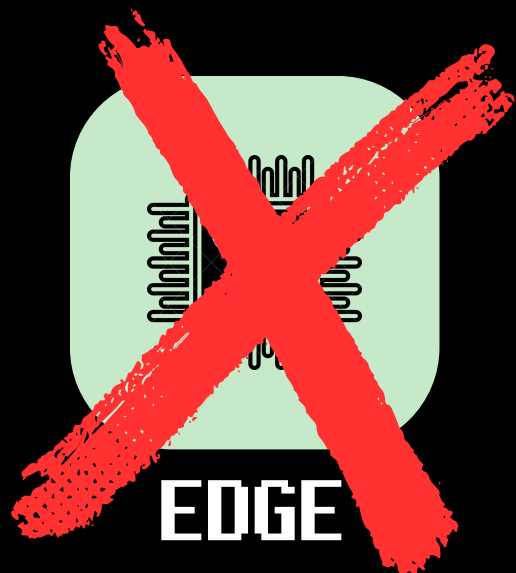
N SECONDS LATER...

I'm alive!



REGISTRY

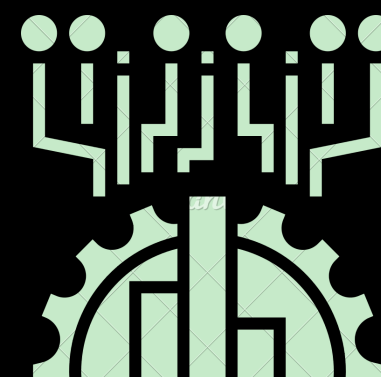
Not hearing from edge for a
while... assuming he's dead...



EDGE



T SECONDS LATER...

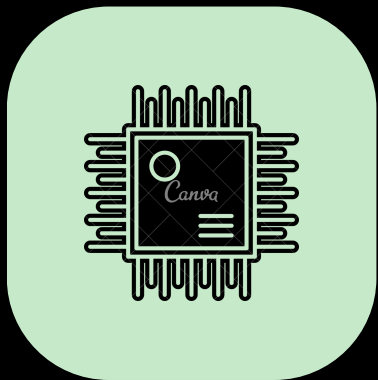


REGISTRY

COSTRUZIONE GRAFO

NEL REGISTRY

45%

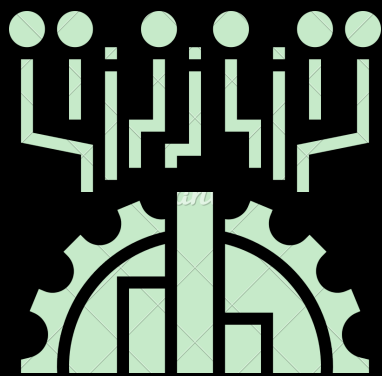


EDGE

Which are your neighbours?



These are my neighbours!



REGISTRY



ELABORAZIONE

Raccolgo le informazioni sui vicini per ciascun edge attivo e ricostruisco il grafo delle connessioni.

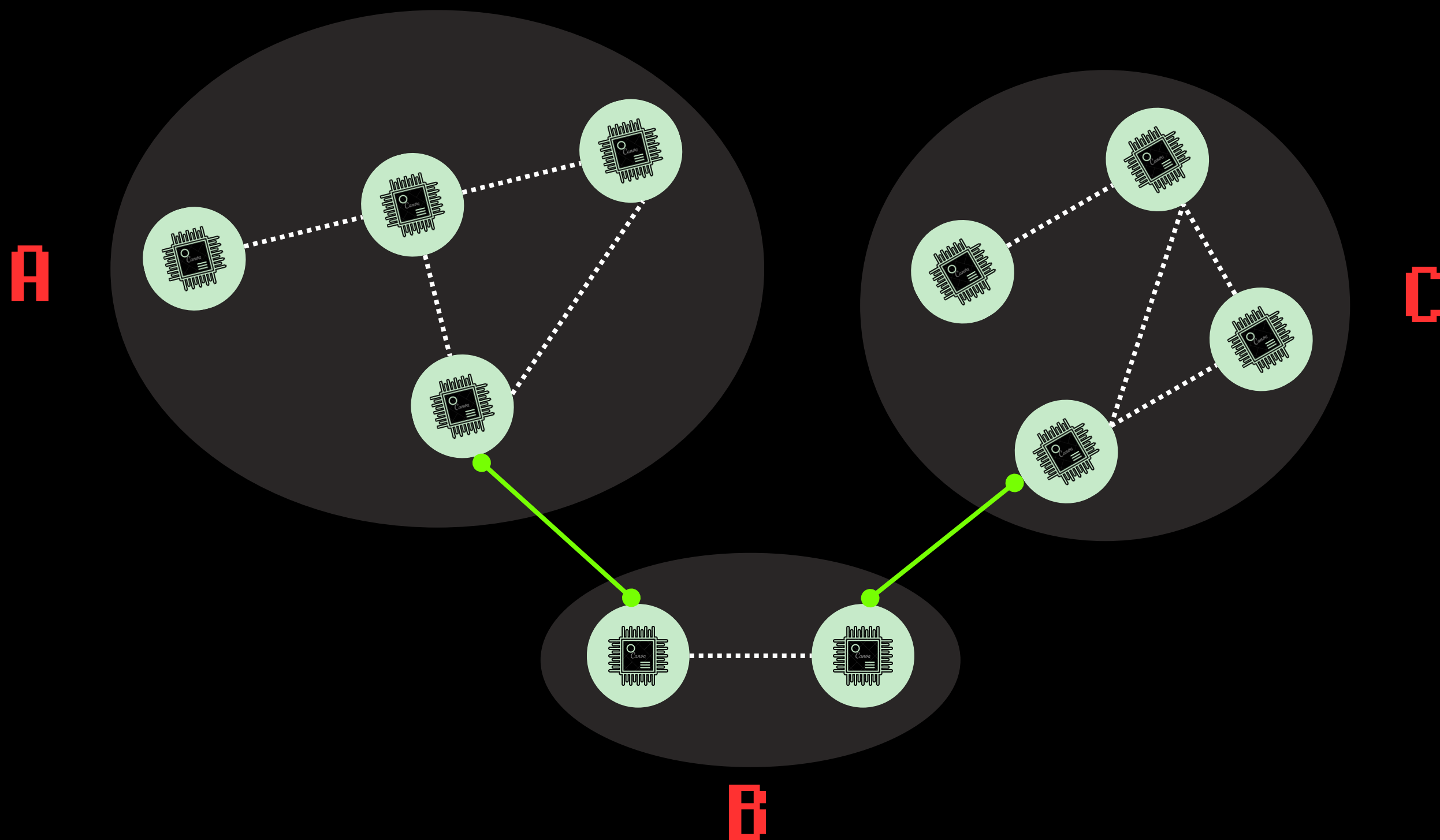
RICERCA COMPONENTI

CONNESSE

NEL REGISTRY

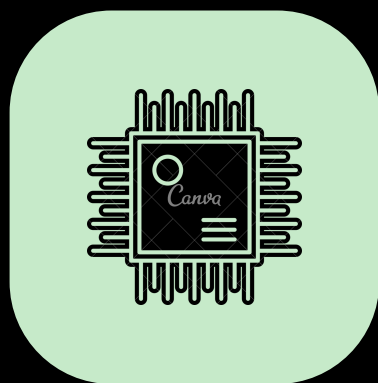
50%

Una volta ricostruito il grafo delle connessioni...



HEARTBEAT

VERSO IL
BALANCER



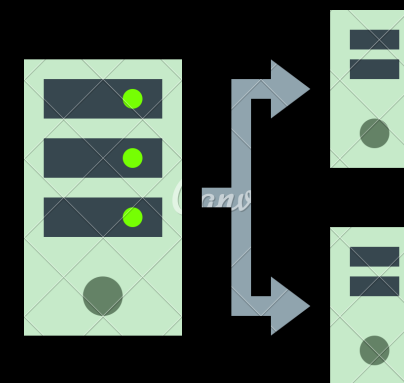
EDGE

I'm alive and i am serving X requests!



N SECONDS LATER...

I'm alive and i am serving Y requests!

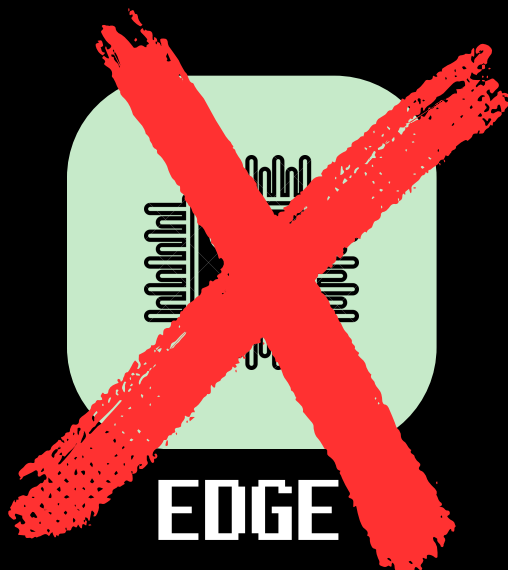


BALANCER



ELABORAZIONE

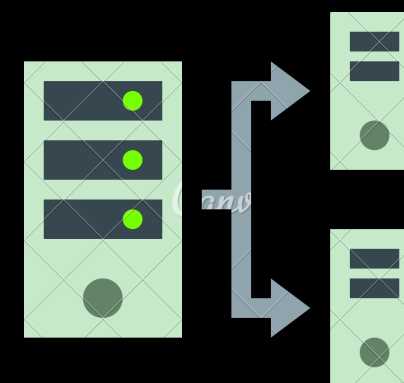
Se conosco l'edge aggiorno
il *CURRENT_LOAD*,
altrimenti lo aggiungo
agli edge attivi e salvo
il valore di carico.



EDGE



T SECONDS LATER...



BALANCER

Not hearing from edge
for a while...
assuming he's dead...

CONNESSIONE AL BALANCER

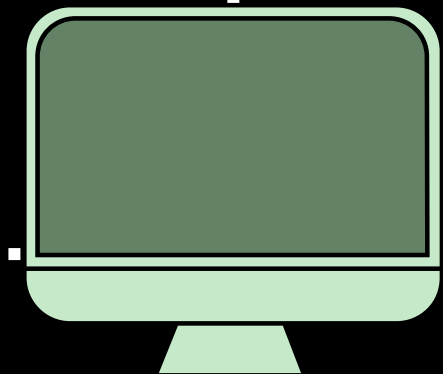
59%

edge.DOWNLOAD/UPLOAD/DELETE "temp_sensorK.json"

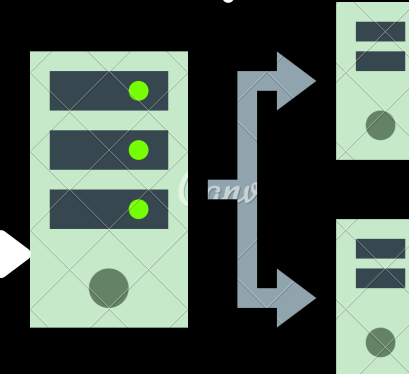
*username: sensorA
password: s3cr3t*



Give me an Edge to contact.



CLIENT



BALANCER



Allow/Deny



REDIS DB



search
for
user

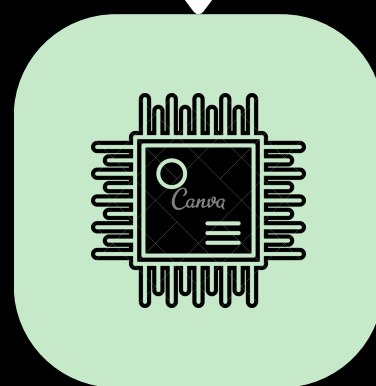
```
IF isLoggedIn(Client) {  
    edge := ChooseEdgeWithMinLoad()  
    edge.CURRENT_LOAD++  
    return edge.IPaddr  
}
```



DOWNLOAD REQUEST

64%

DOWNLOAD
"temp_sensorK.json"



EDGE

RICERCA DEL FILE



1

Ricerca del file nella cache locale

2

Ricerca del file nella rete

3

Ricerca del file su S3

LOOKUP DEL FILE

INVIO DELLE RICHIESTE

```
IF req NOT IN ReqCache {  
    insertInReqCache(req)  
} ELSE {  
    ignoreReq(req)  
}
```

68%

LOOKUP SERVER

POSITIVE EDGE'S
NEIGHBOURS

BLOOM FILTERS

TTL--

TTL--

TTL--

TTL--

EDGE

NEGATIVE EDGE'S
NEIGHBOURS

TTL--

TTL--

TTL--

Not enough
contacted?

LOOKUP DEL FILE

MECCANISMO DI CALLBACK

73%

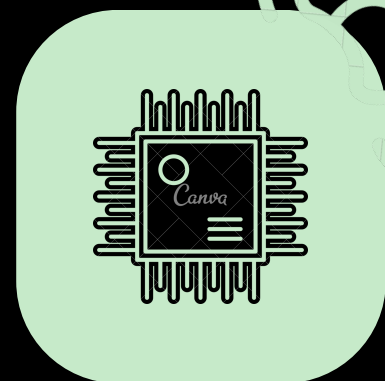
I have it! Here is my ip... 



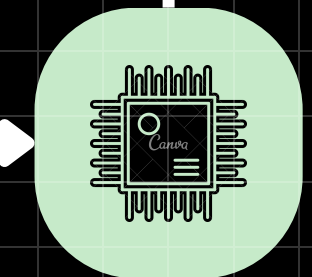
LOOKUP SERVER

 N SECONDS LATER...

Hey you! Give me the file...



EDGE



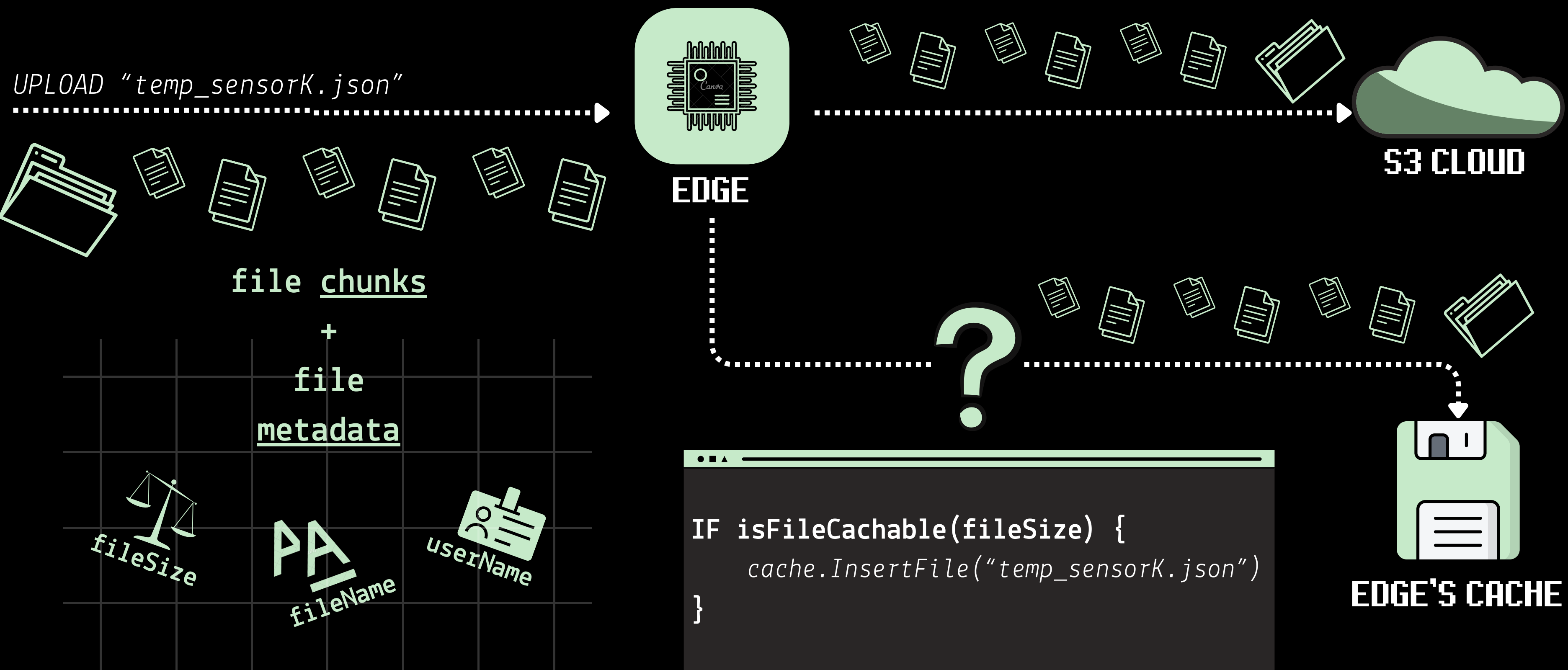
OWNER EDGE



FILE CHUNKS

UPLOAD REQUEST

77%

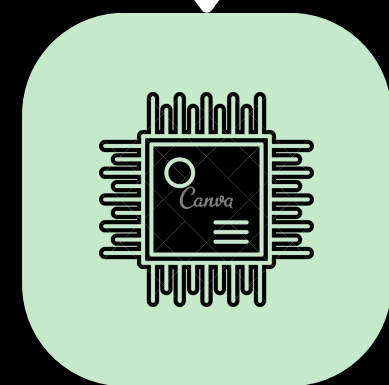


DELETE REQUEST

82%

DELETE

"temp_sensorK.json"



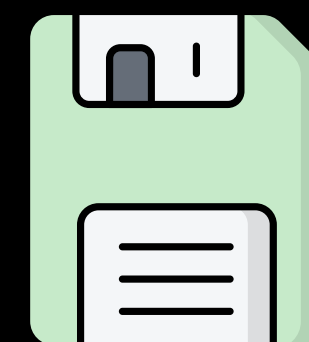
EDGE



S3 CLOUD

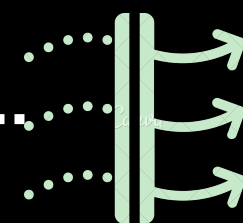


isFileInCache

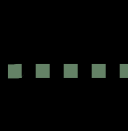
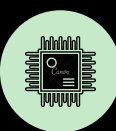
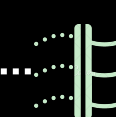
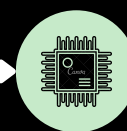
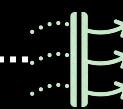
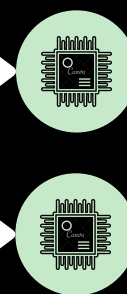


EDGE'S CACHE

BLOOM FILTERS



POSITIVE EDGE'S NEIGHBOURS

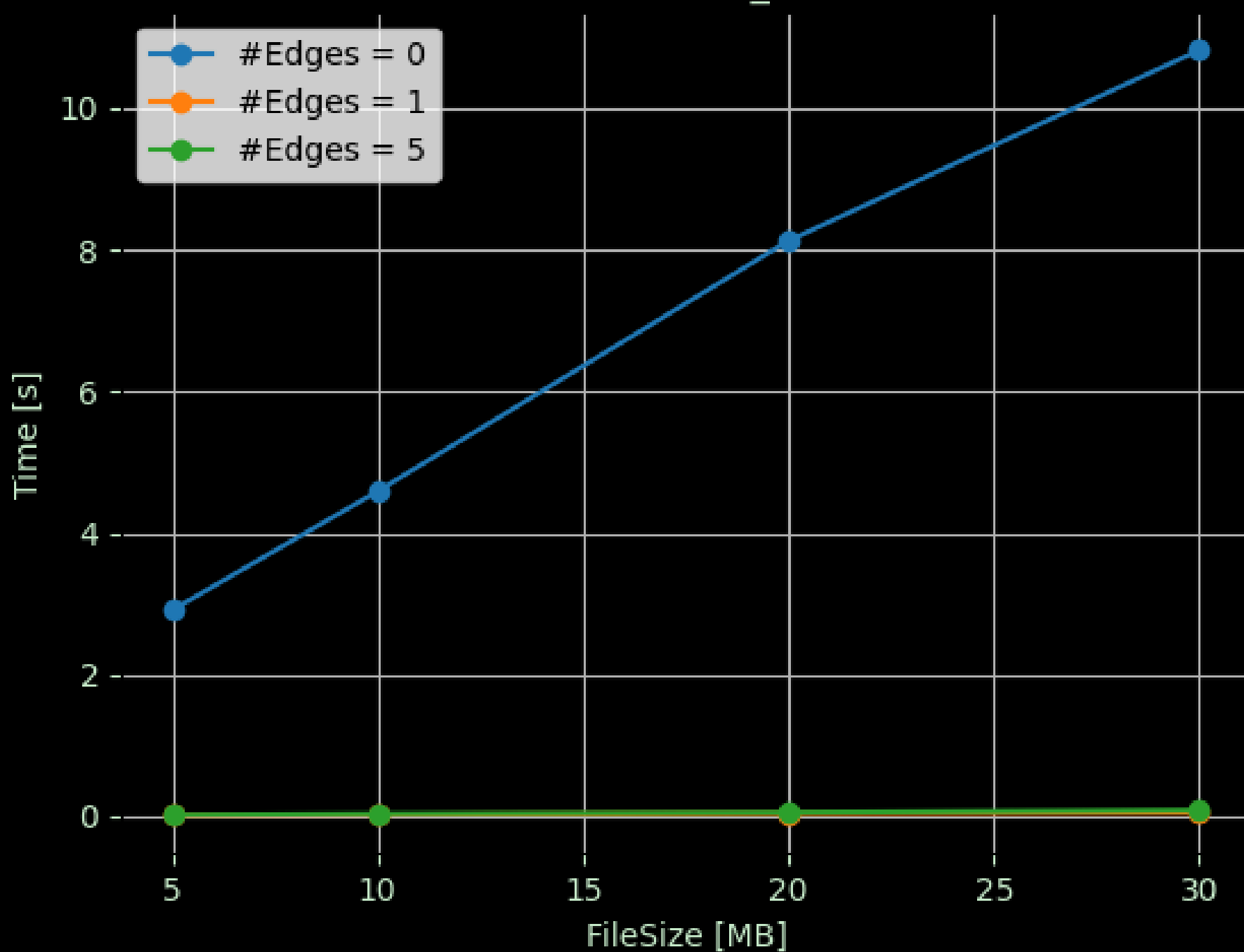


RISULTATI

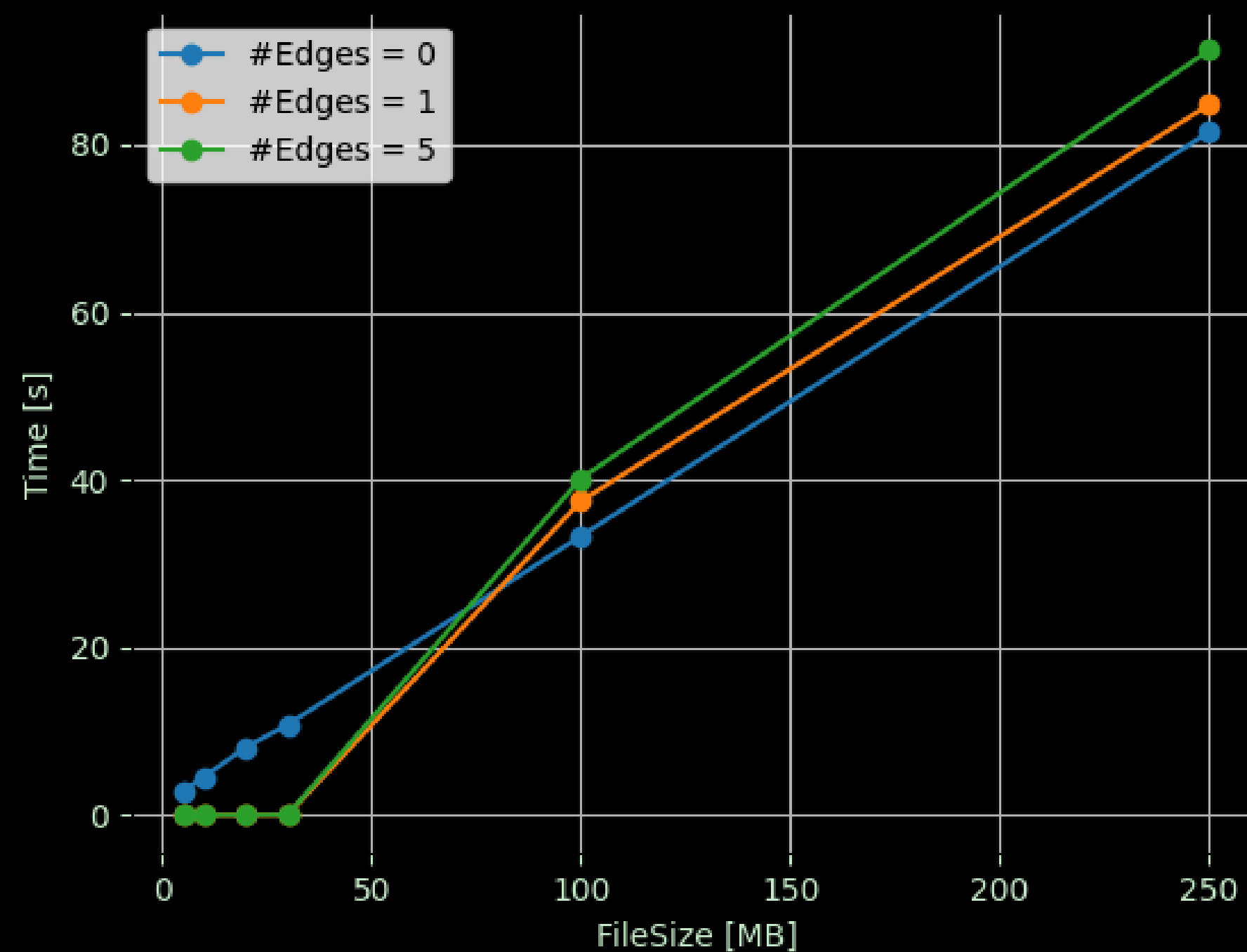
TEST SEQUENZIALI

86%

DOWNLOAD_CUT



DOWNLOAD

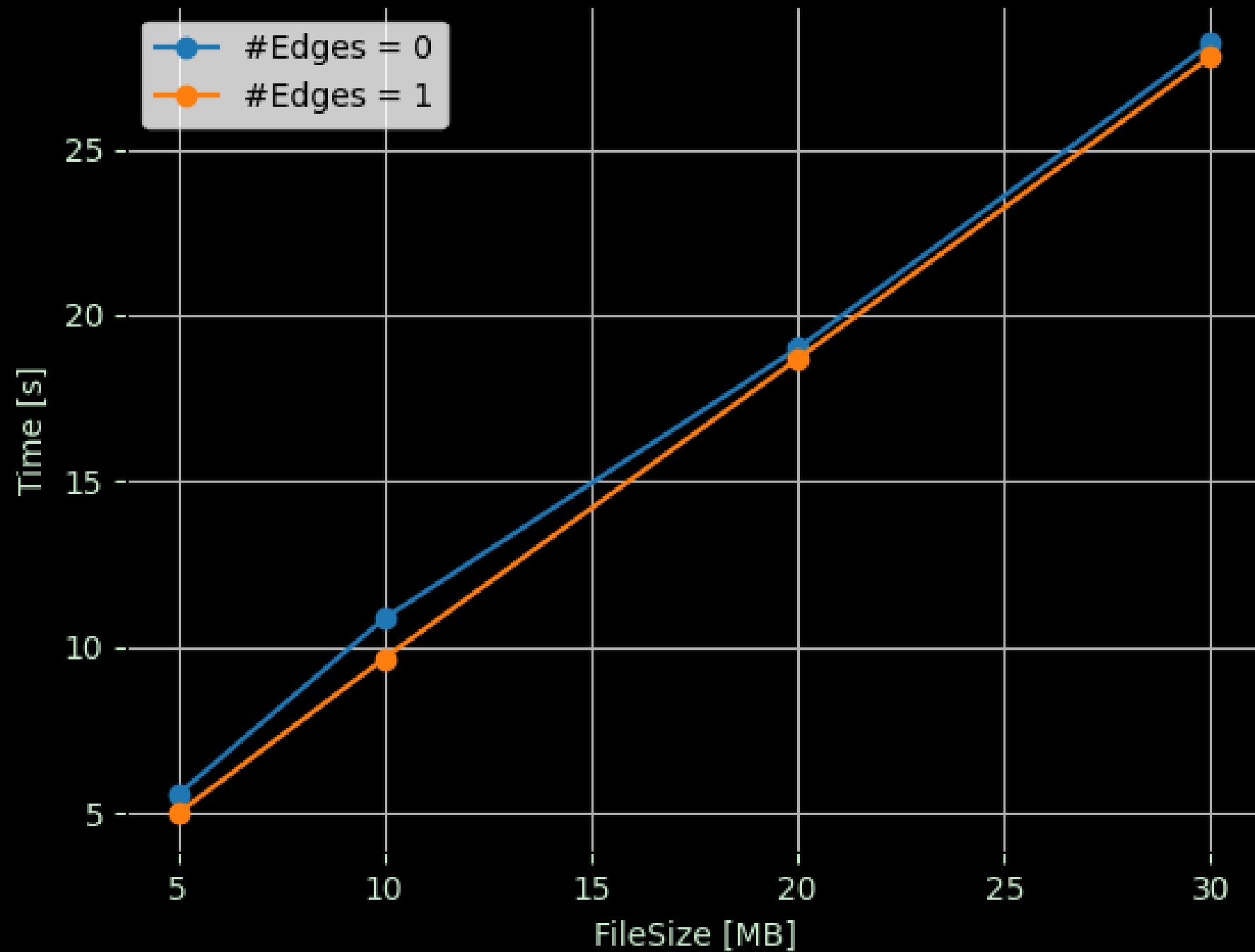


RISULTATI

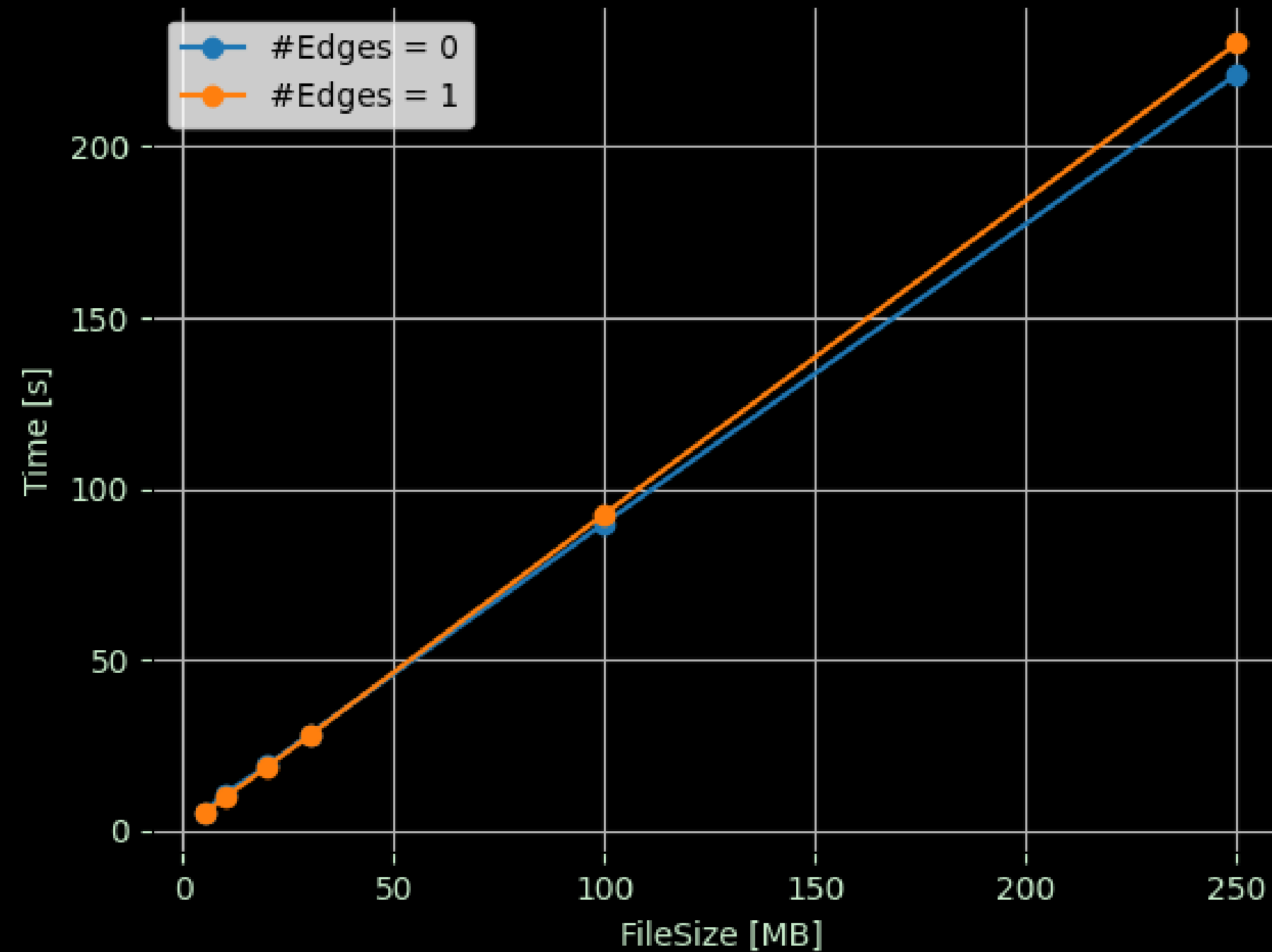
TEST SEQUENZIALI

91%

UPLOAD_CUT



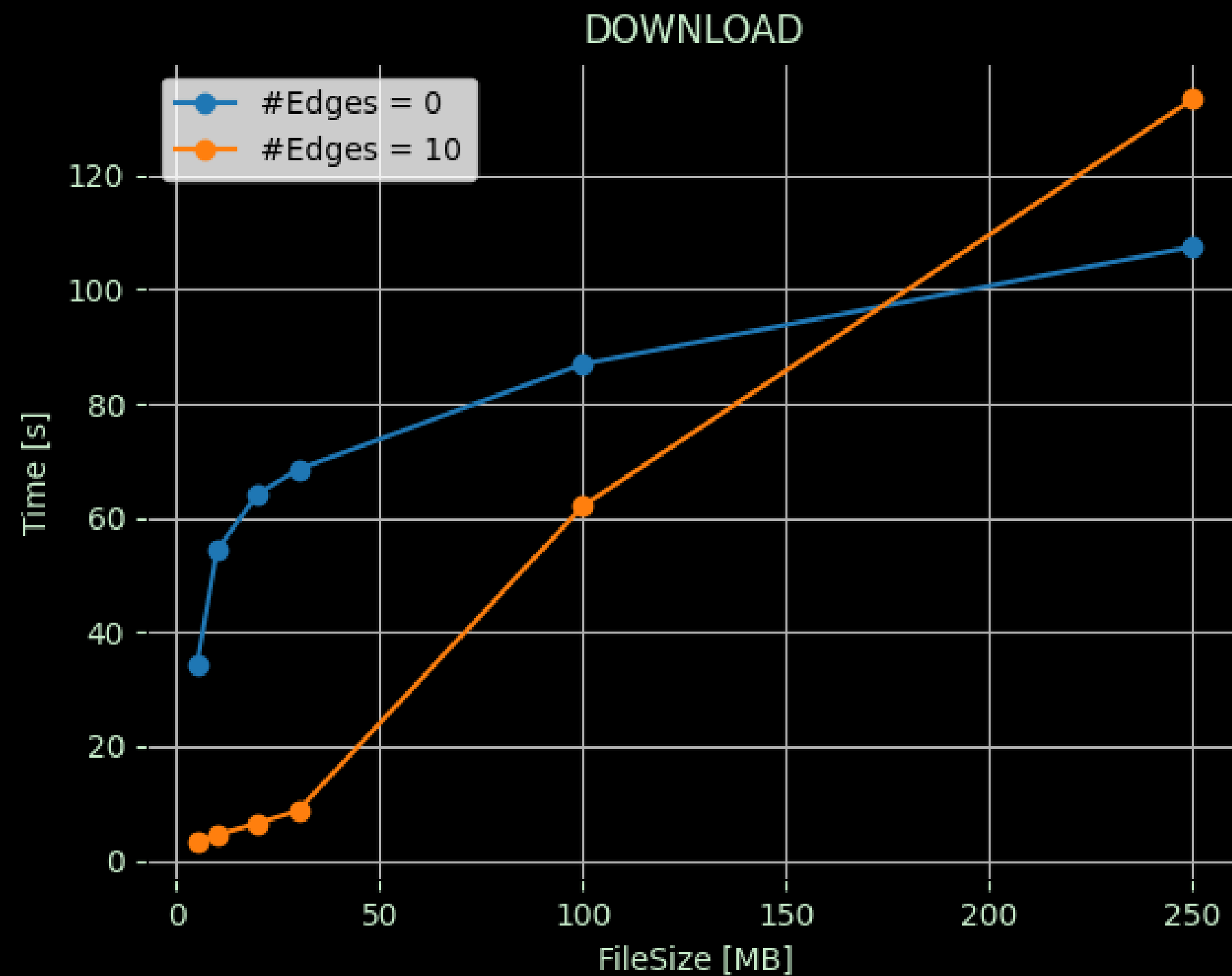
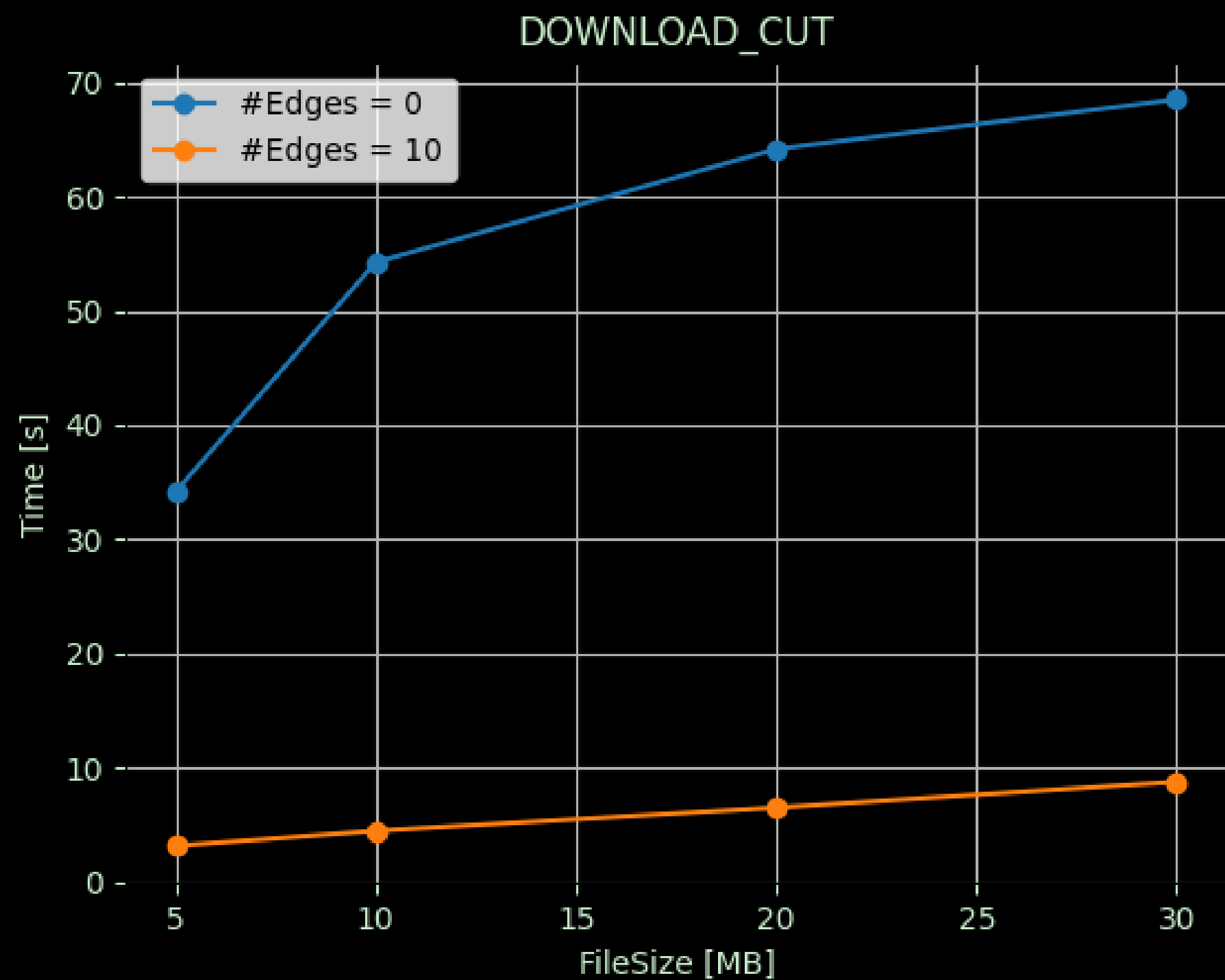
UPLOAD



RISULTATI

TEST DI CARICO

95%



SVILUPPI FUTURI

100%

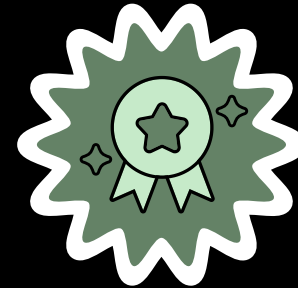
- Supporto per il *versioning* sui file nel sistema.
- Miglioramento del meccanismo di *recovery* sui file scaricati da *Owner Edges* in maniera da supportare la ripresa dello scaricamento dal punto di interruzione.
- Ulteriori test per trovare la configurazione ottimale dell'insieme di parametri configurabili per il sistema *SAE Storage System*.

Manenti Edoardo

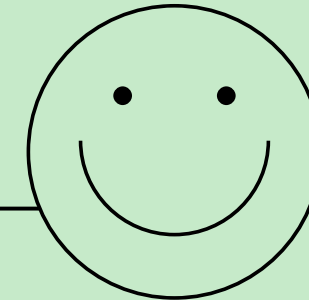
Simone Nicosanti

Andrea De Filippis

GAME COMPLETED



A.A. 2022/2023



GRAZIE DELL'ATTENZIONE



Presentazione del progetto
"SAE storage service"



hope you liked it!