GitTorrent

The decentralized information manager from hell

Manas Pratim Biswas
Roll - 002011001025   UG - IV
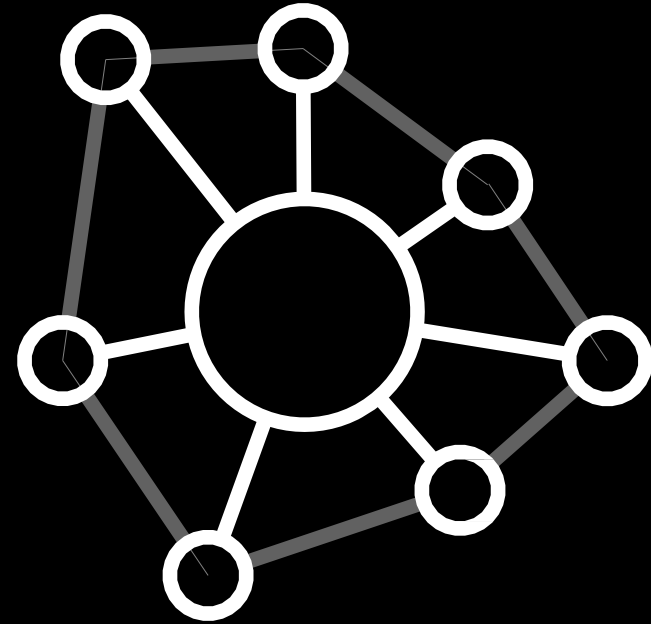Information Technology
Jadavpur University

Introduction

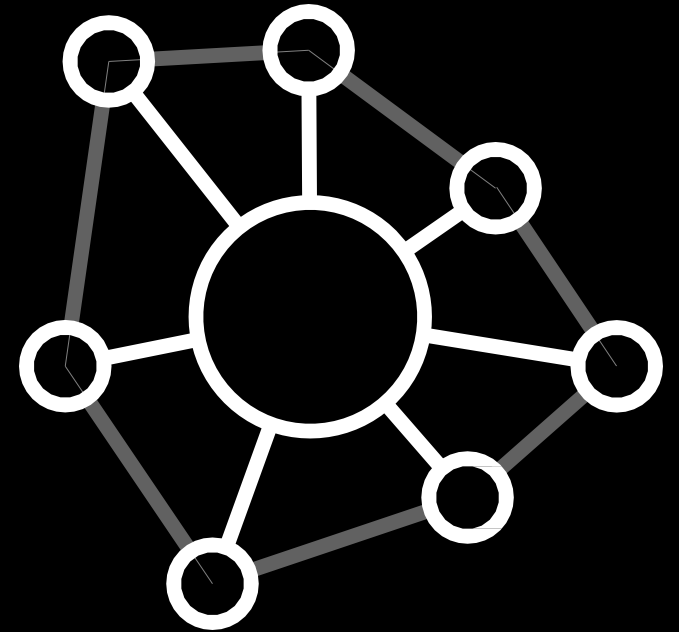# Looking Back

Federated Internet

Federated Internet

File sharing — FTP, HTTP

Chats — IRC, XMPP

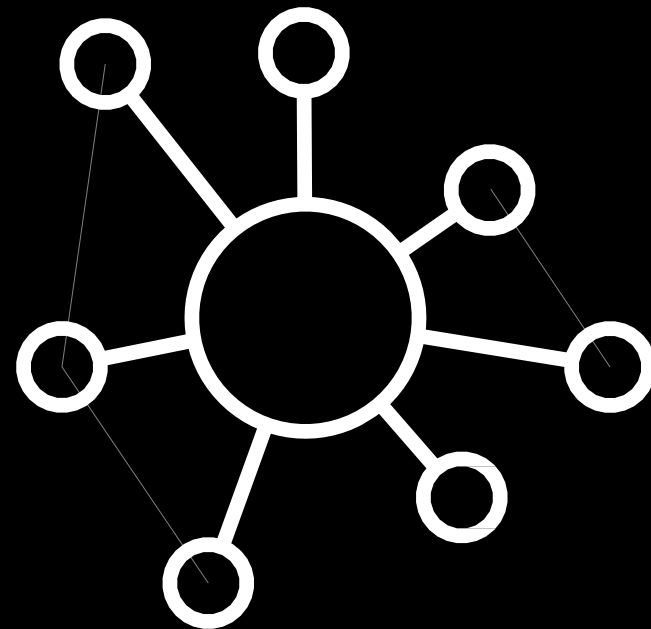*Messaging* — Email, Fidonet

Centralized Internet

File sharing — Dropbox, Google Drive

Chats — Slack, Discord

Messaging — Facebook, WhatsApp

Payments — PayPal
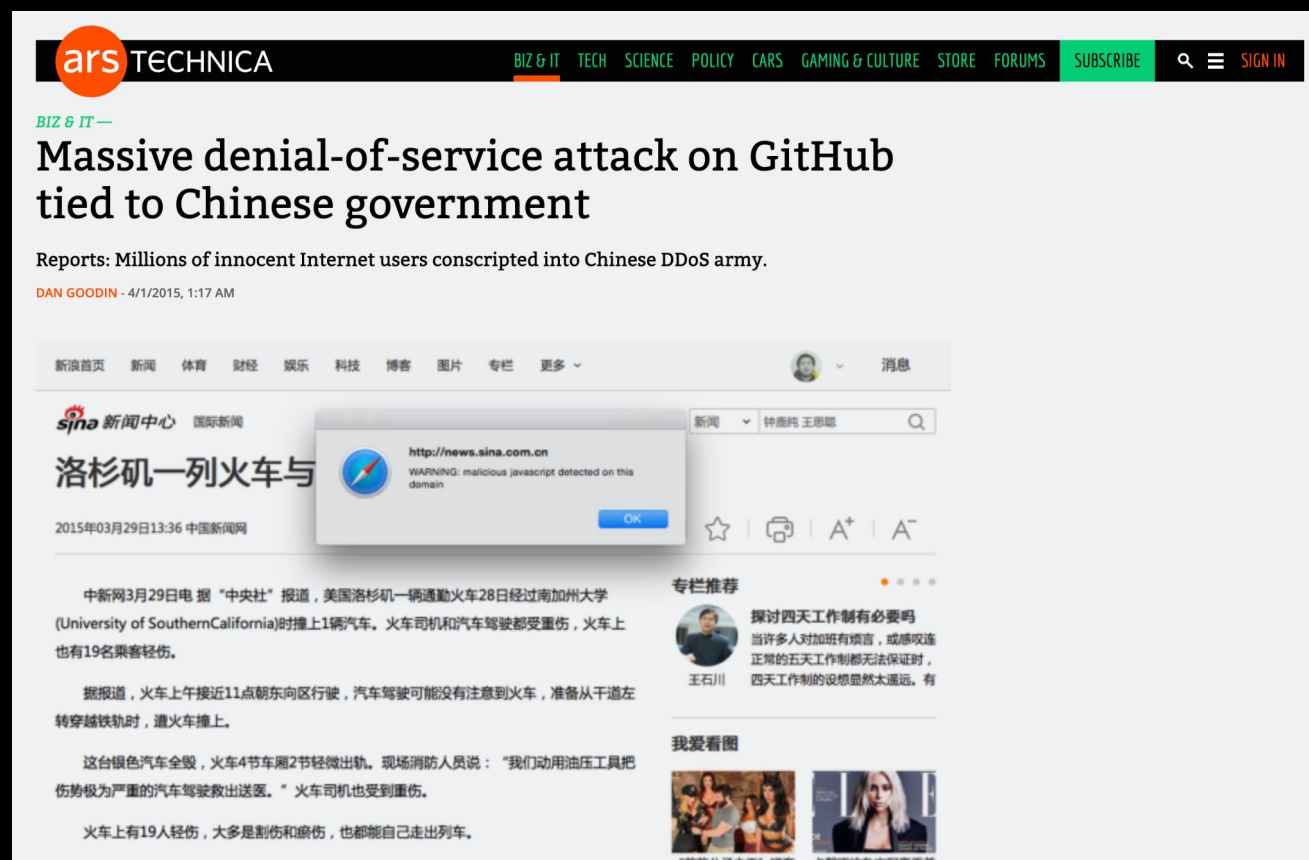
Code — GitHub, GitLab, BitBucket
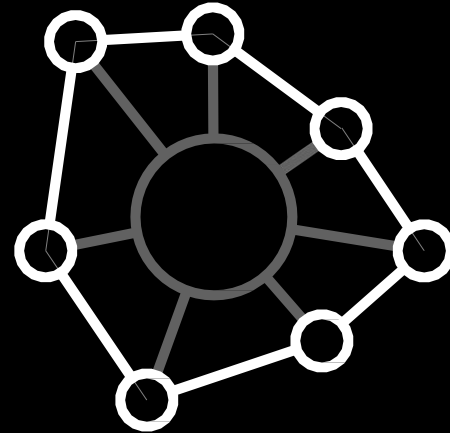
Demerits of Centralization

Data Leaks

Censorship

Resilience and Availability

Government Surveillance

https://arstechnica.com/information-technology/2015/03/massive-denial-of-service-attack-on-github-tied-to-chinese-government/
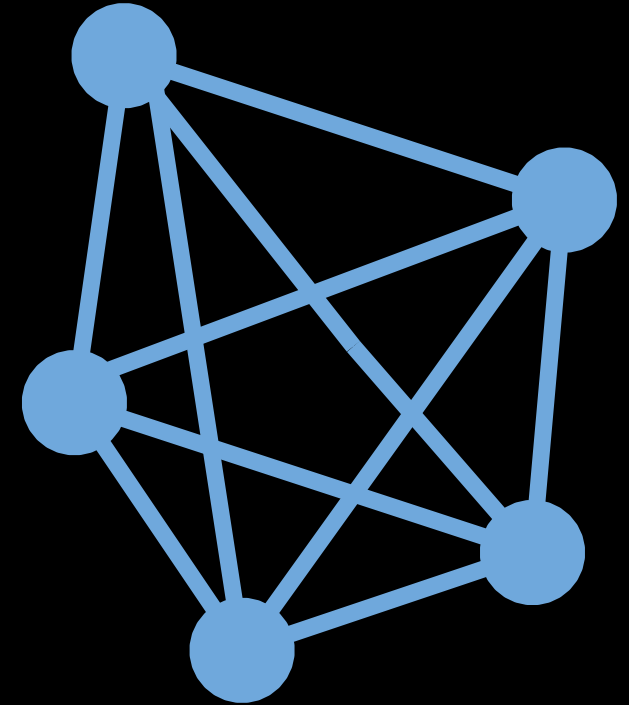
A New Hope

Peer-To-Peer
Distributed Network

Fundamentals

- Peer-To-Peer communication

- Decentralization of Control

- High Resilience and Low Redundancy

- Maintain a Distributed Ledger
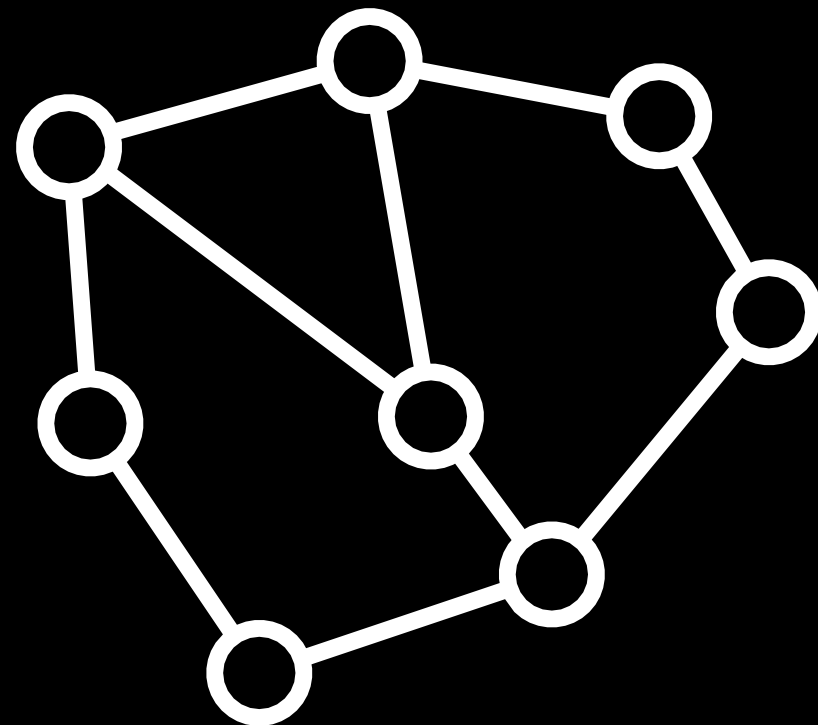
Re-Decentralization

File sharing — BitTorrent, IPFS

Chats — Matrix

Messaging — GNU Ring, Tox

Payments — BitCoin, Ethereum

Code — Distributed Git =>
GitTorrent

Why GitTorrent ?

Practical Reasons

- GitHub's vulnerabilities and potential hacks/ DDoS threats

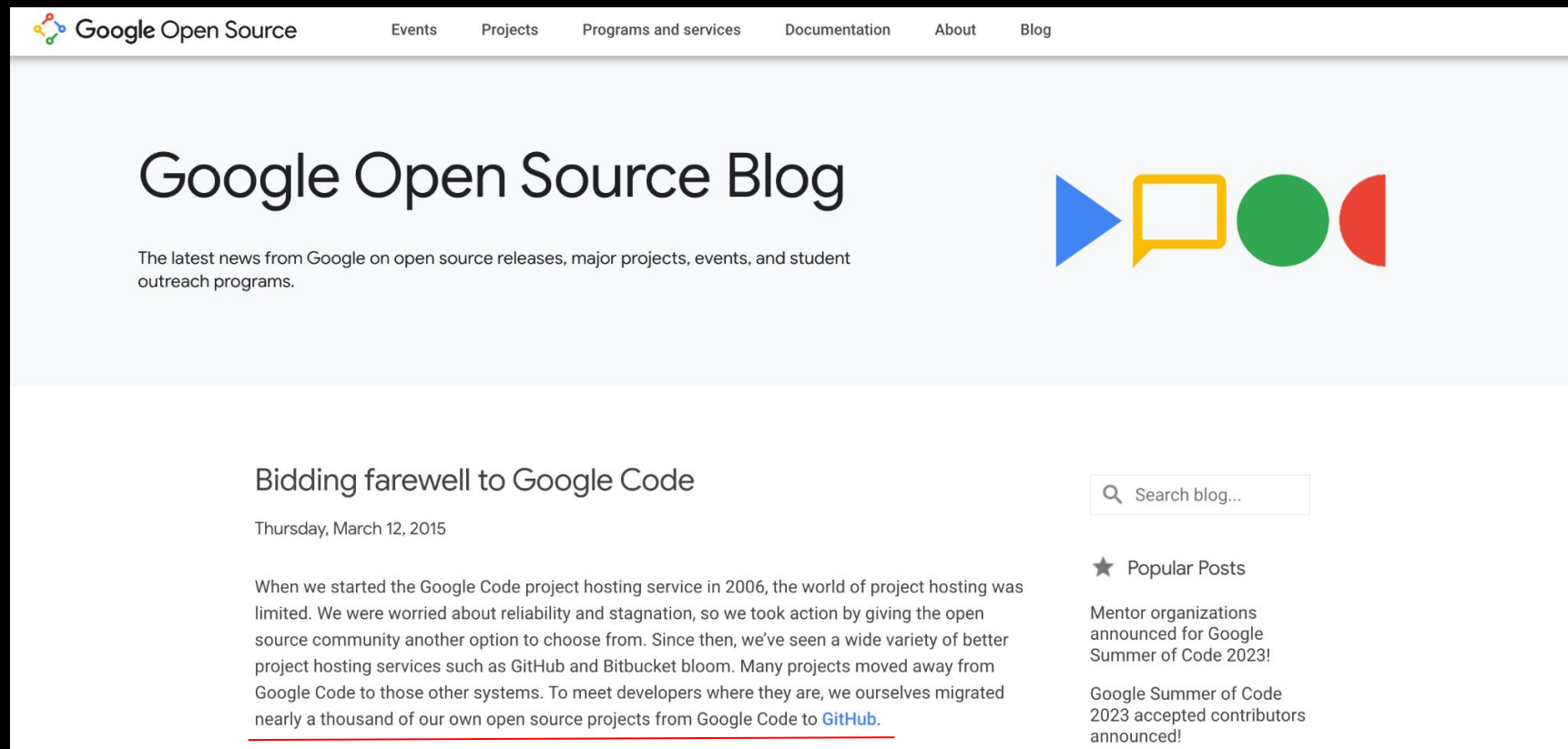- GitHub's centralized control over open-source collaboration

https://mako.cc/writing/hill-free_tools.html

Why GitTorrent ?

Philosophical Reasons

- Free softwares dependency on proprietary tools

- Lack of control and modification options for users

https://mako.cc/writing/hill-free_tools.html

Why GitTorrent ?

Ironical Reason

- Shifting from decentralized protocols (CVS, Subversions) to a centralized server

https://mako.cc/writing/hill-free_tools.html

Why GitTorrent ?

https://opensource.googleblog.com/2015/03/farewell-to-google-code.html

Isn't Git already Decentralized ?

- Comparing Git to FTP, the lack of an index and the inability to turn clients into servers hinder the true decentralization of Git.

- Unlike peer-to-peer protocols like BitTorrent, Git doesn't inherently provide visibility into where repositories are stored or enable direct communication between clients.

Isn't Git already Decentralized ?

- GitTorrent aims to address this limitation by introducing a decentralized approach, allowing users to locate and clone repositories without relying on a central server.

GitTorrenting a repository hosted on BitTorrent

```
1   git clone gittorrent://github.com/cjb/recursers
2   Cloning into 'recursers'...
3
4   Okay, we want to get: 5fbfea8de70ddc686dafdd24b690893f98eb9475
5
6   Adding swarm peer: 192.34.86.36:30000
7
8   Downloading git pack with infohash:
    9d98510a9fee5d3f603e08dcb565f0675bd4b6a2
9
10  Receiving objects: 100% (47/47), 11.47 KiB | 0 bytes/s, done.
11  Resolving deltas: 100% (10/10), done.
12  Checking connectivity... done.
```

GitTorrenting a repository hosted on BitTorrent

run gittorrent client

find the latest revision/commit

git clone

git-remote-gittorrent

GitHub

packfile of git repository

peer-to-peer network
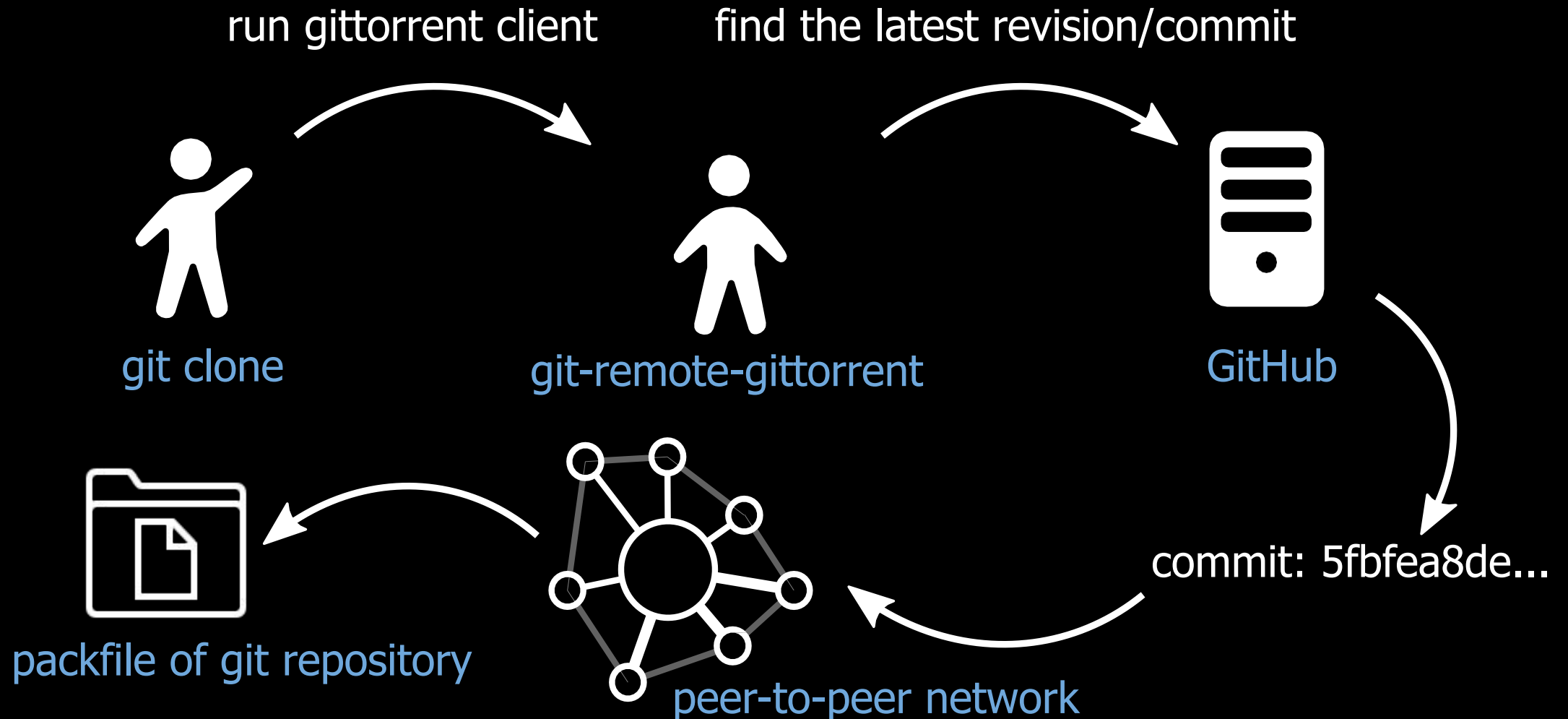
commit: 5fbfea8de...

GitTorrenting a repository hosted on BitTorrent

```
get_nodes('5fbfea8de70ddc686dafdd24b690893f98eb9475') =
    [192.34.86.36:30000, ...]
```
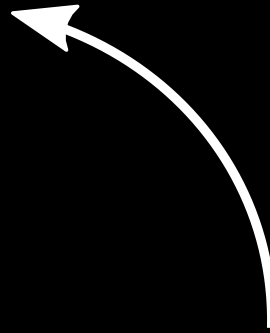
list of all seeders that can seed that particular commit

Kademlia Distributed Hash Table
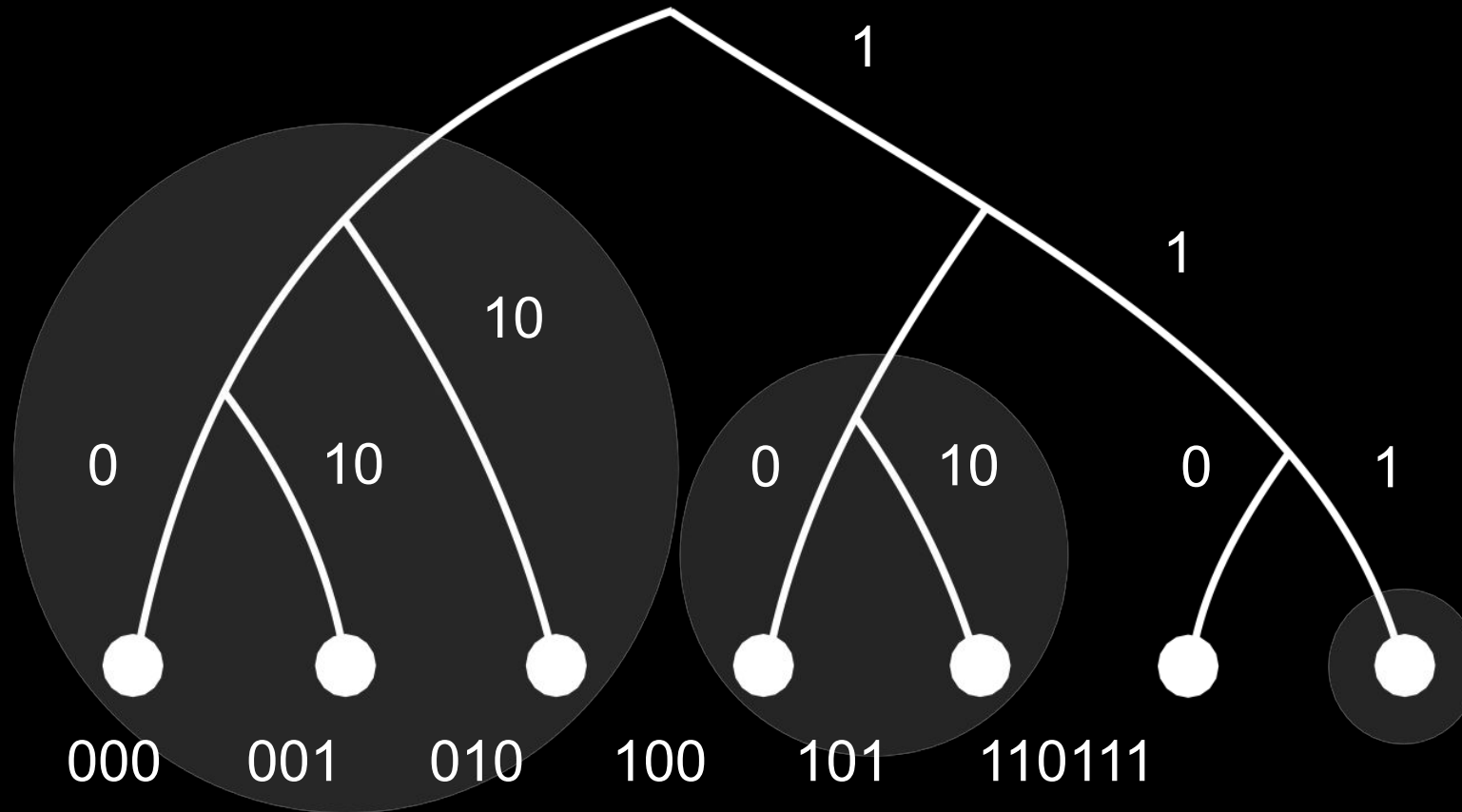
Removing the GitHub Centralised Dependency

```
// Immutable key put
hash(value) = put({
  value: 'some data'
})


// Mutable key put
hash(key) = put({
  value: 'some data',
  key: key,
  seq: n
})


// Get
value = get(hash)
```

GitTorrenting a new revision or commit

new commit as
a signed update
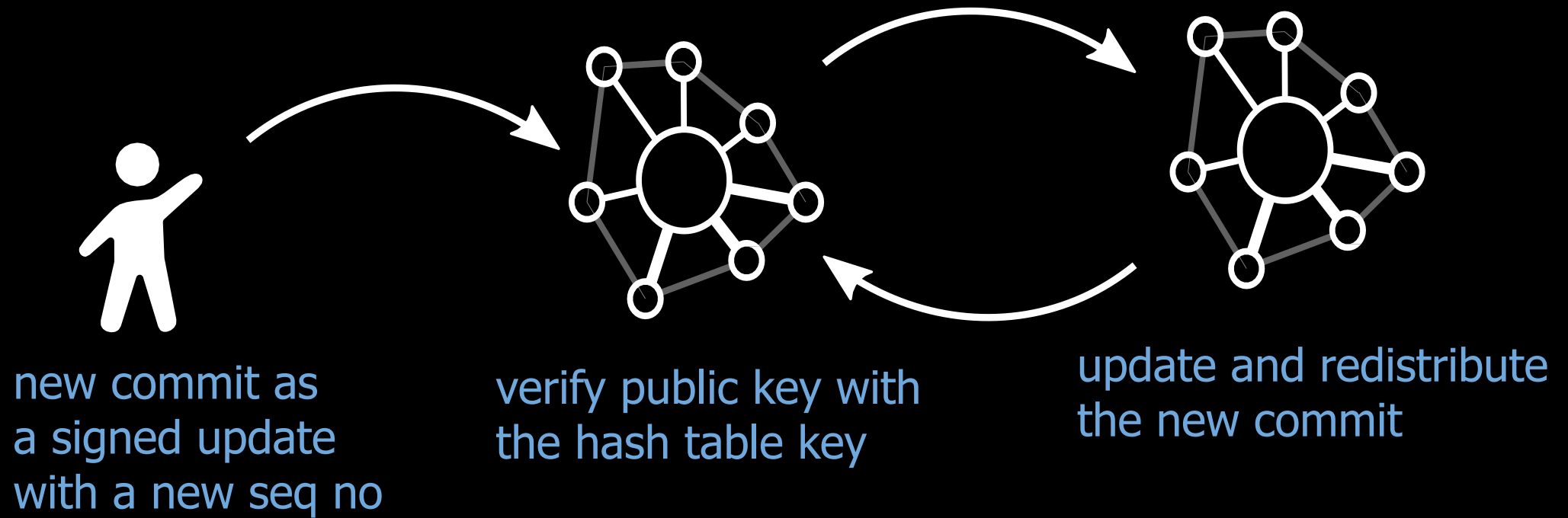with a new seq no

verify public key with
the hash table key

update and redistribute
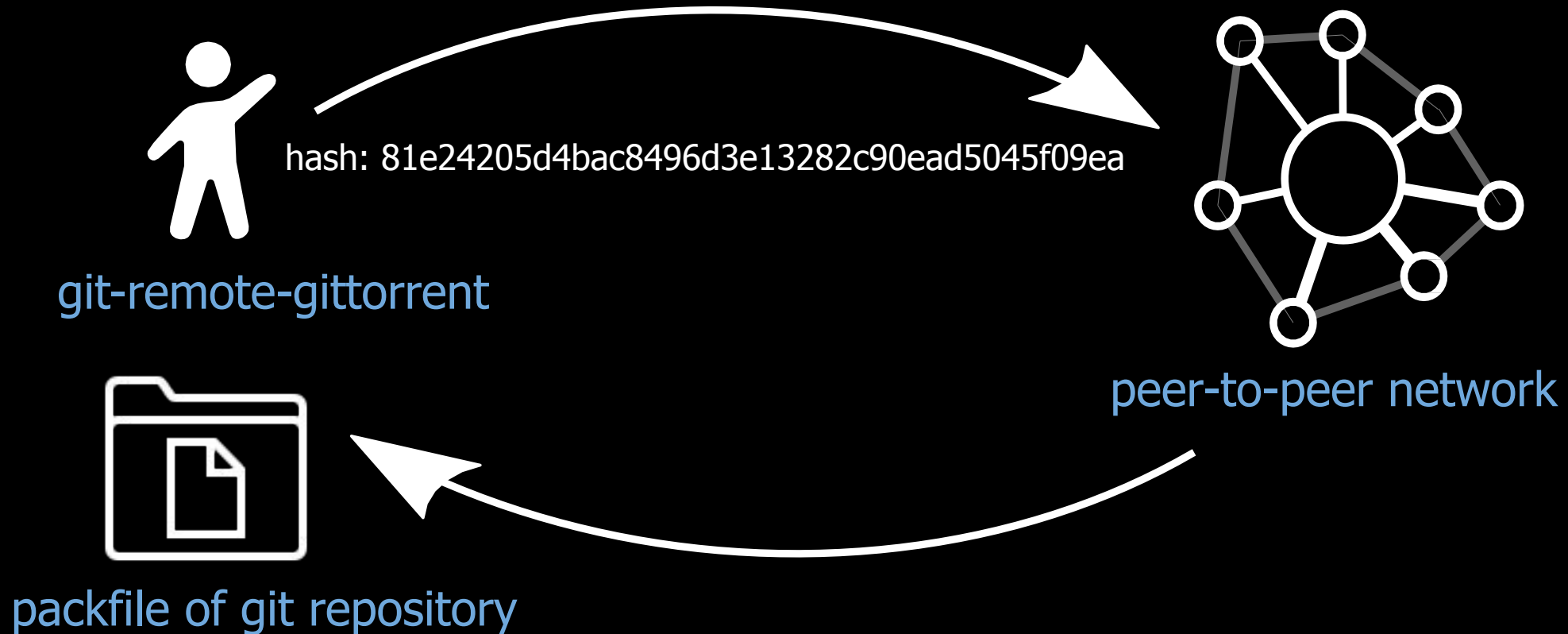the new commit

GitTorrenting a repository hosted on BitTorrent

run gittorrent client with a hex number that is the hash of author's public key which is used as a mutable key on the distributed hash table

hash: 81e24205d4bac8496d3e13282c90ead5045f09ea

git-remote-gittorrent

peer-to-peer network

packfile of git repository

```
git clone gittorrent://81e24205d4bac8496d3e13282c90ead5045f09ea/recursers

Cloning into 'recursers'...

Mutable key 81e24205d4bac8496d3e13282c90ead5045f09ea returned:
name:        Chris Ball
email:       chris@printf.net
repositories:
  recursers:
    master: 5fbfea8de70ddc686dafdd24b690893f98eb9475


Okay, we want to get: 5fbfea8de70ddc686dafdd24b690893f98eb9475


Adding swarm peer: 192.34.86.36:30000


Downloading git pack with infohash: 9d98510a9fee5d3f603e08dcb565f0675bd4b6a2

Receiving objects: 100% (47/47), 11.47 KiB | 0 bytes/s, done.
Resolving deltas: 100% (10/10), done.
Checking connectivity... done.
```

Conclusion

A global BitTorrent swarm
of Git objects

```
git clone https://github.com/cjb/foo
```

```
git clone gittorrent://github.com/cjb/foo
```

```
git clone gittorrent://81e24205d4bac8496d3e13282c90ead5045f09ea/foo
```

GitTorrent Limitations

- Doesn't implement GitHub Comments, Issues, Discussions

- Doesn't implement Pull Request and collaborative workflow

- Seeders should be rewarded for being a part of network

- DHTs support is limited

GitTorrent Future Work

- Distributed revision control systems for bug tracking - *Bugs Everywhere*

- Use IPFS (*InterPlanetary File System*) instead of BitTorrent swarm

https://ipfs.tech/
https://bugseverywhere.org/

Thank you
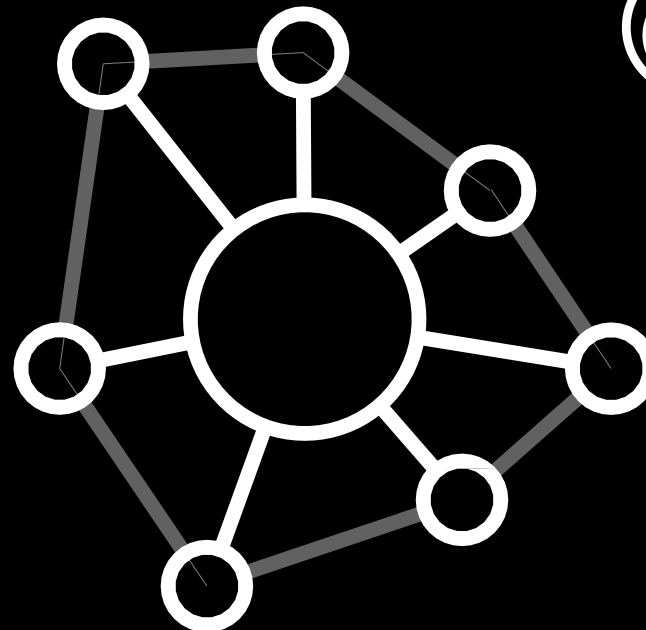
`https://github.com/sanam2405/gittorrent`
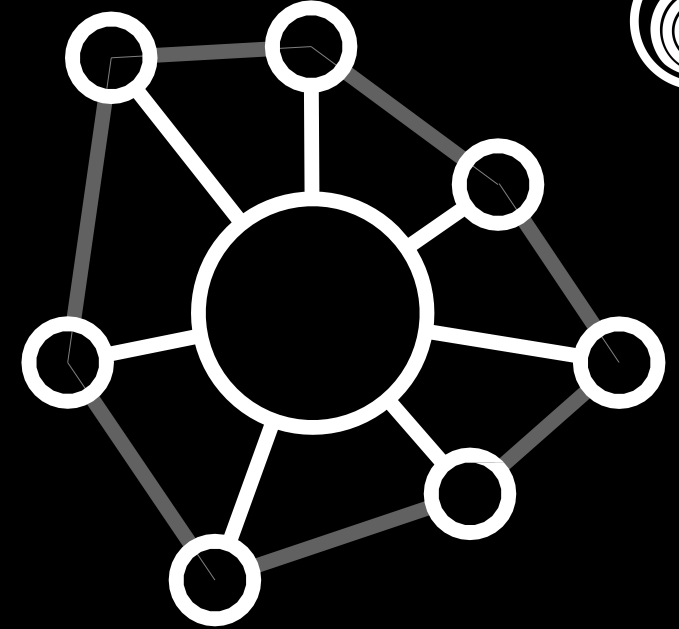
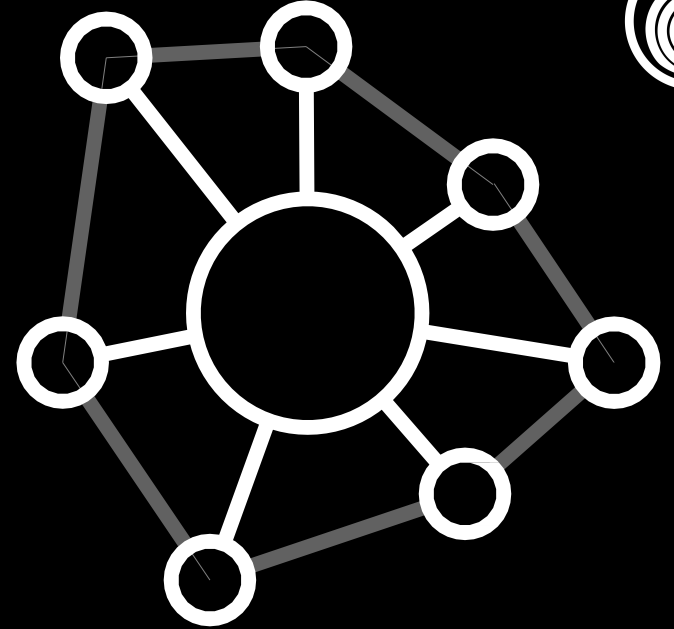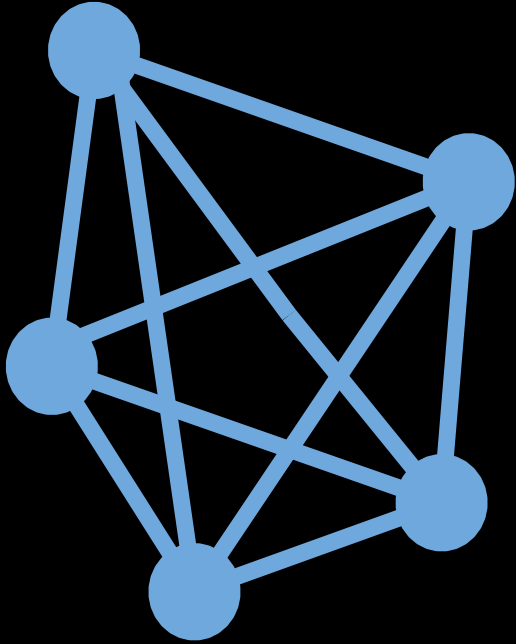Manas Pratim Biswas (@sanam2405)

Roll - 002011001025   UG - IV

Information Technology

Jadavpur University

References

- https://blog.printf.net/articles/2015/05/29/announcing-gittorrent-a-decentralized-github/

- https://github.com/cjb/GitTorrent

- https://lwn.net/Articles/646628/

- https://news.ycombinator.com/item?id=9625840

Questions ?