



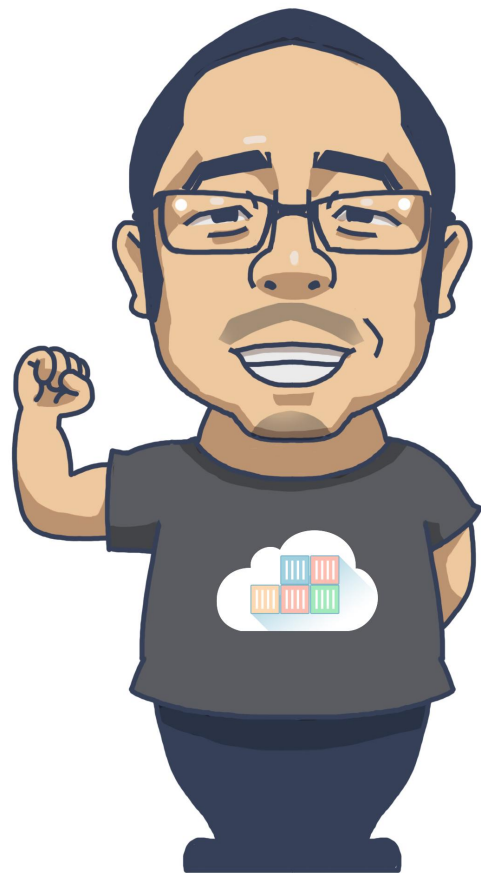
# Git Refactoring - Paving the Way for Anonymous, Decentralized Open Source in the Web 3.0

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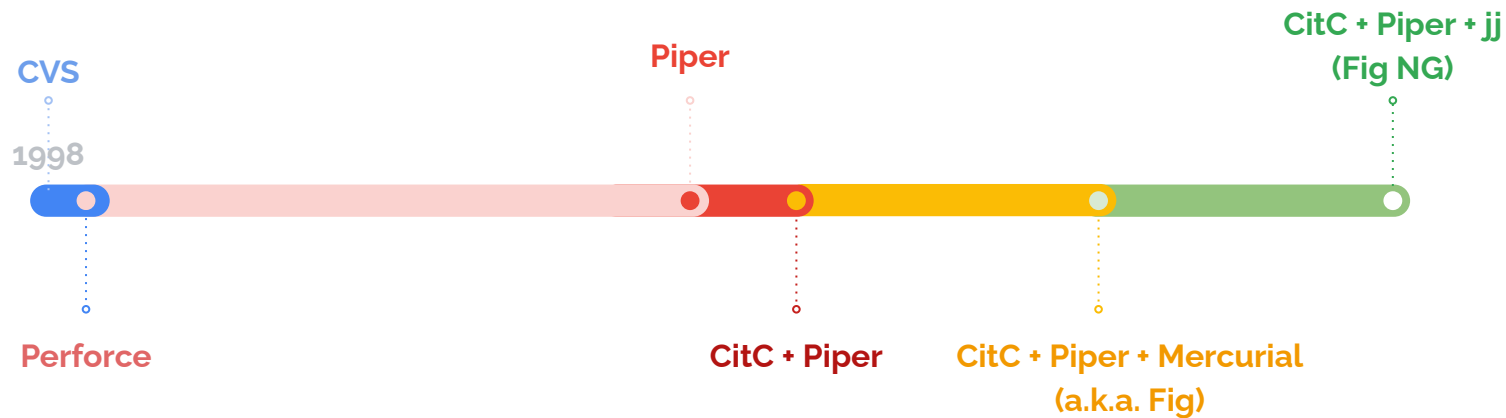


# Eli Ma

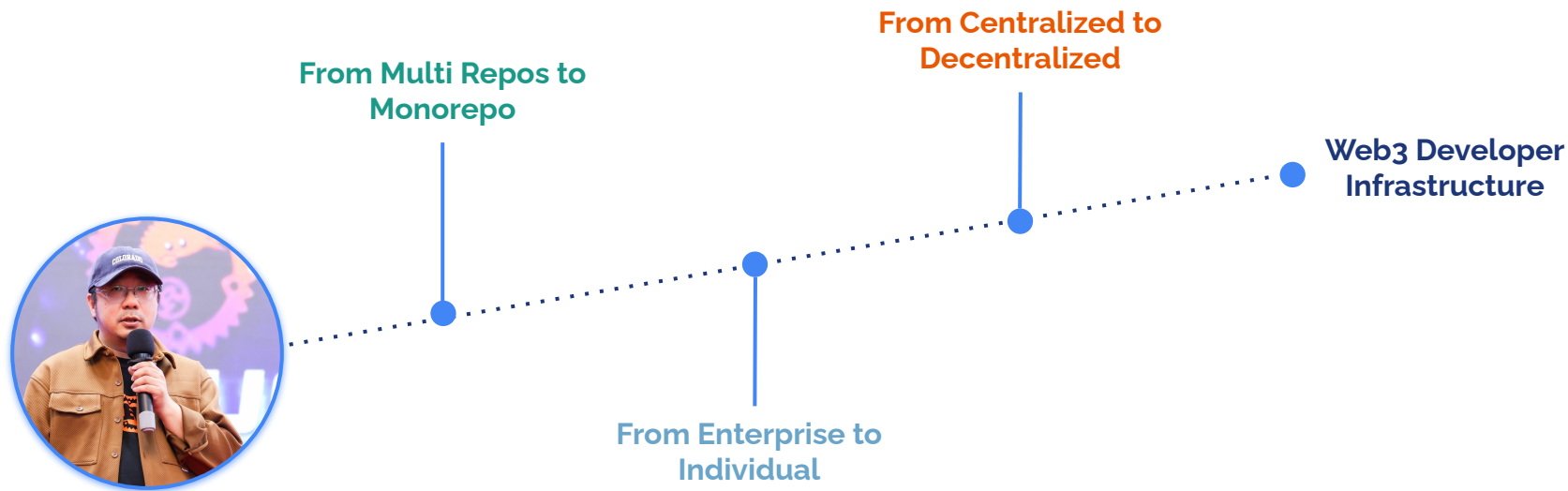
Individual Member of Governing  
Board of Web3 Infrastructure  
Foundation



# Background: VCS at Google



# Background: Mega Story





# Git - Addressable Content Filesystem/Database

```
$ find .git/objects -type f
.git/objects/01/55eb4229851634a0f03eb265b69f5a2d56f341 # tree 2
.git/objects/1a/410efbd13591db07496601ebc7a059dd55cfe9 # commit 3
.git/objects/1f/7a7a472abf3dd9643fd615f6da379c4acb3e3a # test.txt v2
.git/objects/3c/4e9cd789d88d8d89c1073707c3585e41b0e614 # tree 3
.git/objects/83/baae61804e65cc73a7201a7252750c76066a30 # test.txt v1
.git/objects/ca/c0cab538b970a37eae769cbbde608743bc96d # commit 2
.git/objects/d6/70460b4b4aece5915caf5c68d12f560a9fe3e4 # 'test content'
.git/objects/d8/329fc1cc938780ffdd9f94e0d364e0ea74f579 # tree 1
.git/objects/fa/49b077972391ad58037050f2a75f74e3671e92 # new.txt
.git/objects/fd/f4fc3344e67ab068f836878b6c4951e3b15f3d # commit 1
```

```
yetianxing@Bens-MacBook-Pro objects % git cat-file -p e154b80cfcef1fa25cdaeb0196fef123abeea48f
040000 tree 7d3573f05b754d00d2cb539a7f84303c65c4d31c A
040000 tree 44b97edfd0982f61dc94e30dbba2c233d0ccd67d B
yetianxing@Bens-MacBook-Pro objects % git cat-file -p 7d3573f05b754d00d2cb539a7f84303c65c4d31c
100644 blob 8cc952479f70f75aea782f3df828c51e0cb5645b 1.txt
100644 blob 8cc952479f70f75aea782f3df828c51e0cb5645b 2.txt
yetianxing@Bens-MacBook-Pro objects % git cat-file -p 44b97edfd0982f61dc94e30dbba2c233d0ccd67d
100644 blob 8cc952479f70f75aea782f3df828c51e0cb5645b 1.txt
```

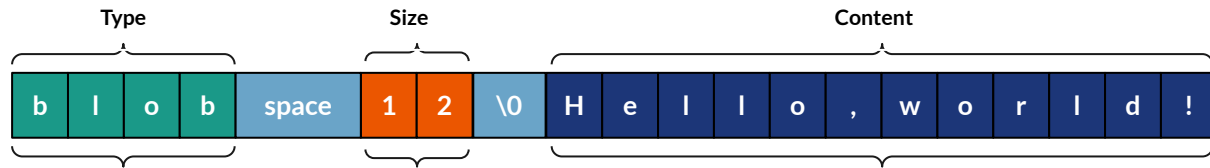
# Git Internal Objects

Blob

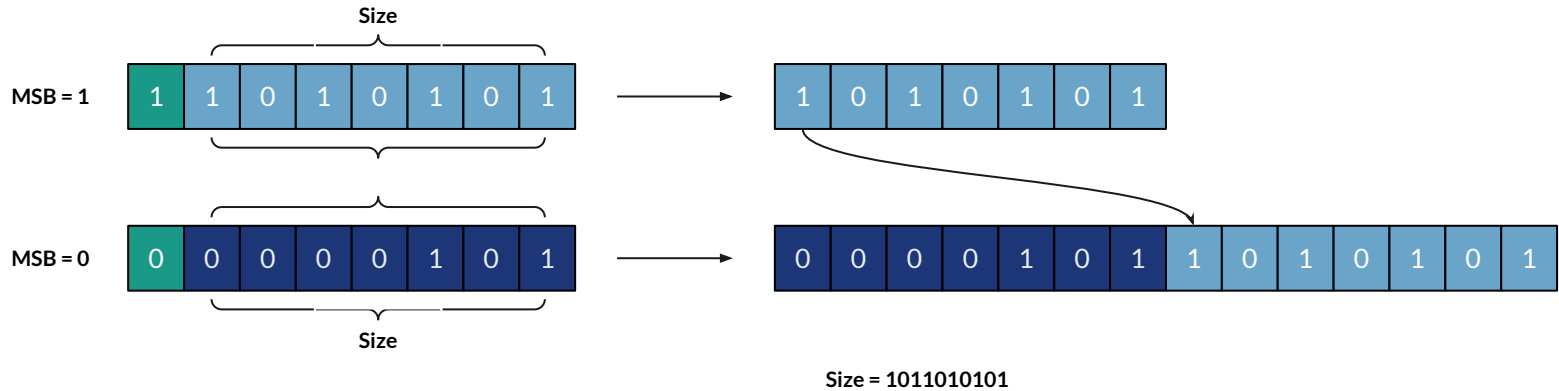
Tree

Commit

Tag

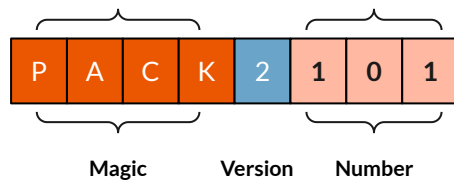


# Variable-Length Decoding

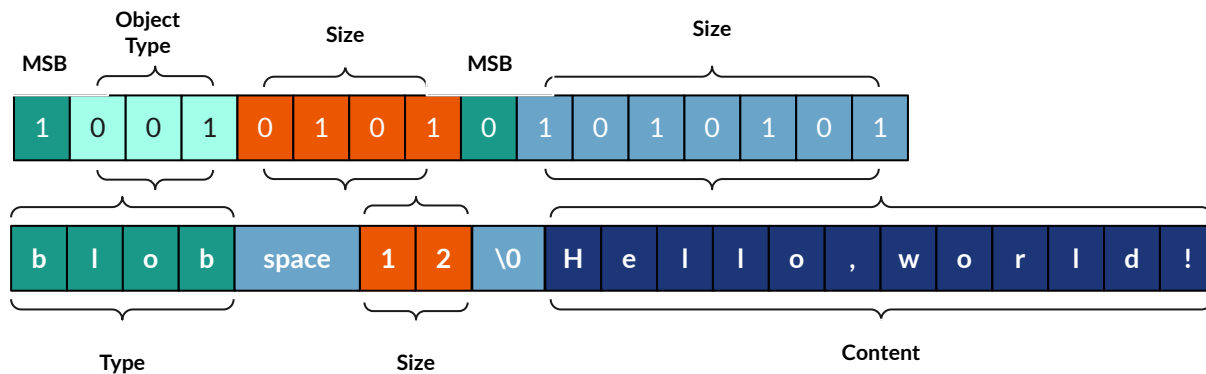


# Git Pack File

HEADER



Object

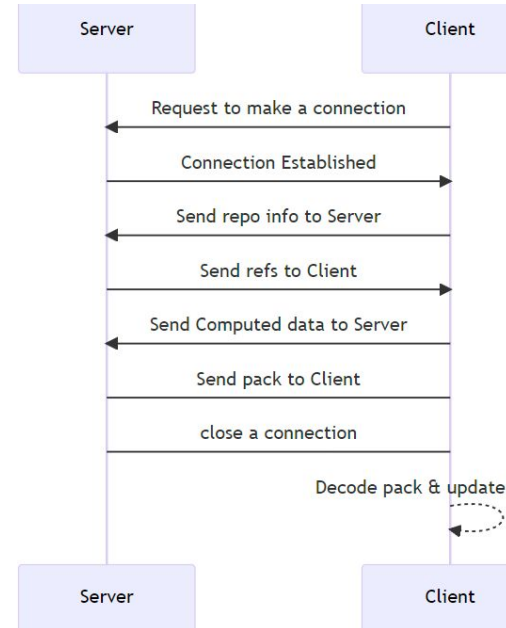




# Git SSH Protocol

```
sequenceDiagram
    participant Server
    participant Client
```

```
Client -->> Server: Request to make a connection
Server -->> Client: Connection Established
Client -->> Server: Send repo info to Server
Server -->> Client: Send refs to Client
Client -->> Server: Send Computed data to Server
Server ->> Client: Send pack to Client
Client ->> Server: close a connection
Client ->> Client: Decode pack & update the local
```





# Git URI - p2p://<peerID>/<repo>.git

[<protocol>://]<username>[:<password>]@<hostname>[:<port>]/<path>[.git]

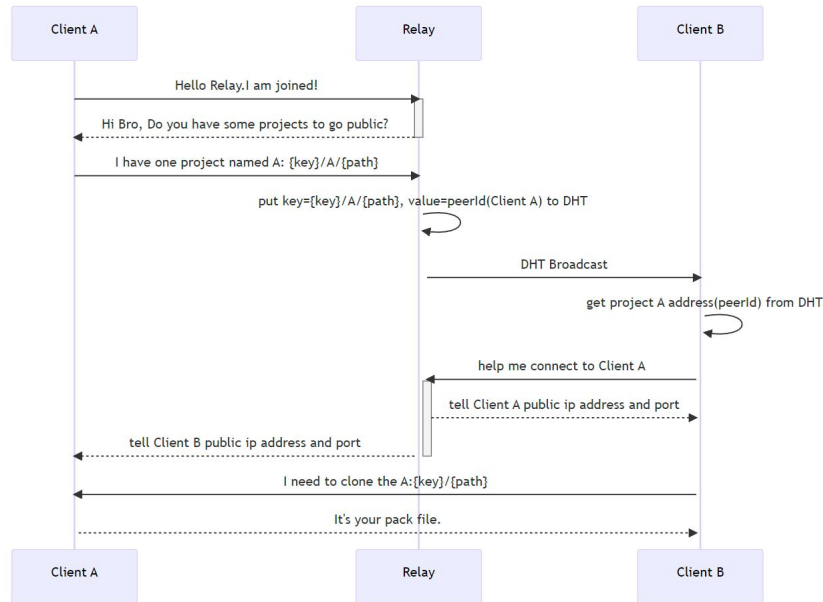
1. The <protocol> could be an optional prefix like p2p:// or mega:// to indicate the p2p protocol.
2. The <username> represents the node key accessing the repository so that we could replace it with for the p2p identity.
3. The <password> is unnecessary for public repositories.
4. The <hostname> typically represents the server, but in p2p, it maps to the node key hosting the repo. We could reuse <key> here or use a different term like <hostkey> to avoid confusion.
5. The <port> may not be relevant for p2p networking?
6. For <path>, mega uses monorepos so there are no <namespaces> or <repo> names, only paths. We could design a virtual path scheme to map paths to exposed public paths privately.



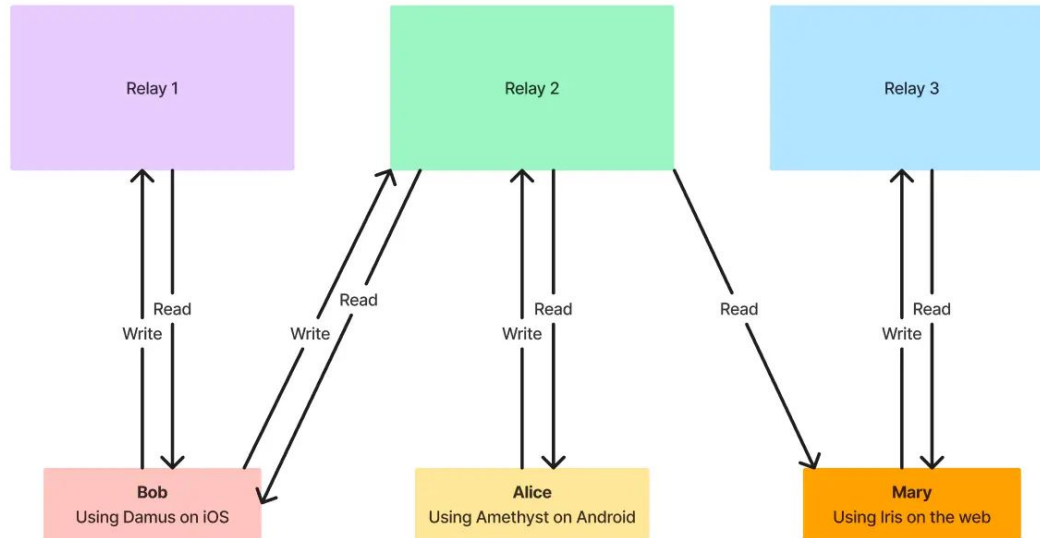
# DHT Data Format

```
[
  {
    "upstream": "12D3KooWFgpUQa9WnTztcvs5LLMJmwsMoGZcrTHdt9LKYwerxK",
    "peerId": "node_a_peerId ",
    "hash": "12D3KooWFgpUQa9WnTztcvs5LLMJmwsMoGZcrTHdt9LKYKpM4MiK",
    "timestamp": 1690191636
  },
  {
    "upstream": "12D3KooWFgpU4564WnTztcvs5LLMJmwsMoGZcrTHdt9LKYKpM4MiK",
    "peerId": "12D3KooWFgpUQa9WnTztcvs5LLMJmwsMoGZcrTHdt9LKYKpM4MiK ",
    "hash": "ddddddd",
    "timestamp": 1690128000
  }
]
```

# P2P Process through DHT



# Distributed Open Source Collaboration through Nostr





## NIP 111 - Repo Broadcast

```
{
  "kind": 50001,
  "content": "p2p://79c2cae114ea28a981e7559b4fe7854a473521a8d22a66bbab9fa248eb820ff6/mega.git",
  "tags": [
    ["a", "commit"],
    ["k", "79c2cae114ea28a981e7559b4fe7854a473521a8d22a66bbab9fa248eb820ff6"],
    ["r", "mega.git"],
    ["c", "56686d65a0078016f998e86506aafead34773b0e"]
  ],
  "pubkey": "79c2cae114ea28a981e7559b4fe7854a473521a8d22a66bbab9fa248eb820ff6",
  "created_at": 1682790000
}
```



## NIP 111 - Merge Request

```
{
  "kind": 50001,
  "content": "p2p://b3e392b11f5d4f28321cedd09303a748acfd0487aea5a7450b3481c60b6e4f87/mega.git",
  "tags": [
    ["a", "request"],
    ["k", "79c2cae114ea28a981e7559b4fe7854a473521a8d22a66bbab9fa248eb820ff6"],
    ["r", "mega.git"],
    ["c", "931a8681b66ffc5914b4c9bc8a06f12d4176de96"]
  ],
  "pubkey": "b3e392b11f5d4f28321cedd09303a748acfd0487aea5a7450b3481c60b6e4f87",
  "created_at": 1682790000
}
```



# Anonymous, Decentralized Open Source

End & Thanks

<https://github.com/web3infra-foundation/mega>

