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Distributed SUIT Architecture Model

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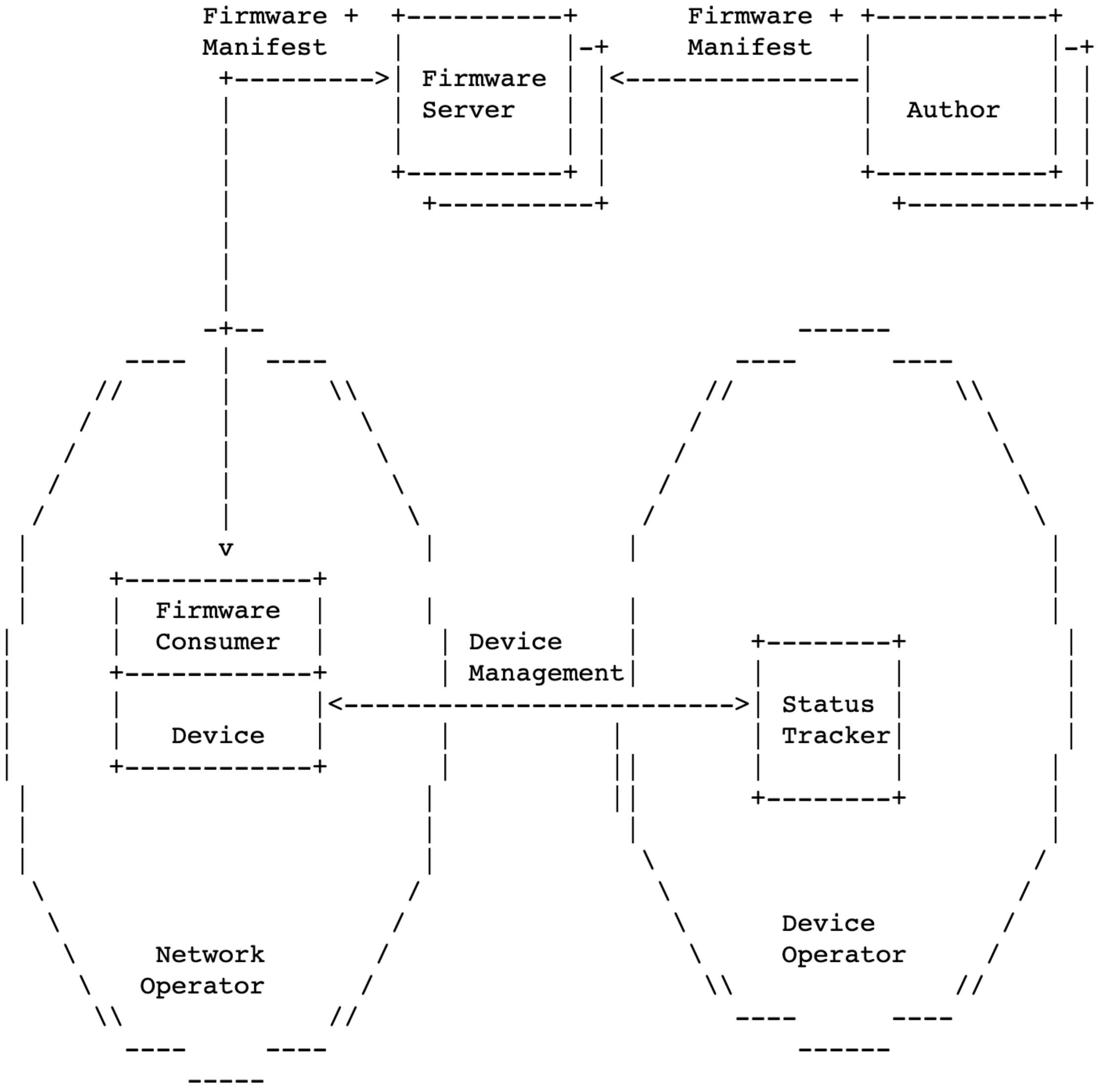
Traditional SUIT Architecture

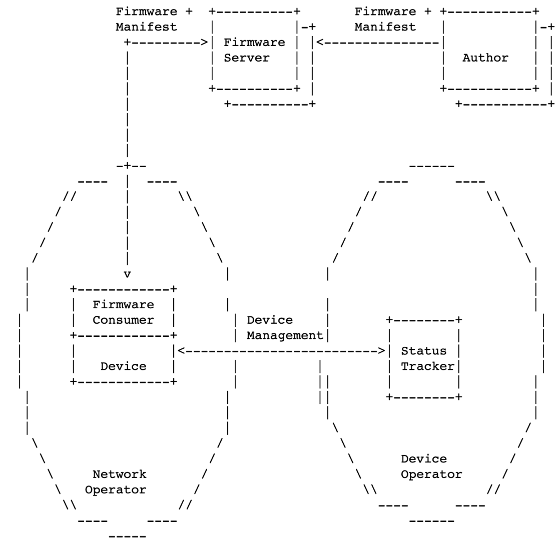
- Adopting Client-Server model
  - Manifests and firmware images are downloaded from ‘firmware servers’



Traditional SUIT Architecture

- Problems

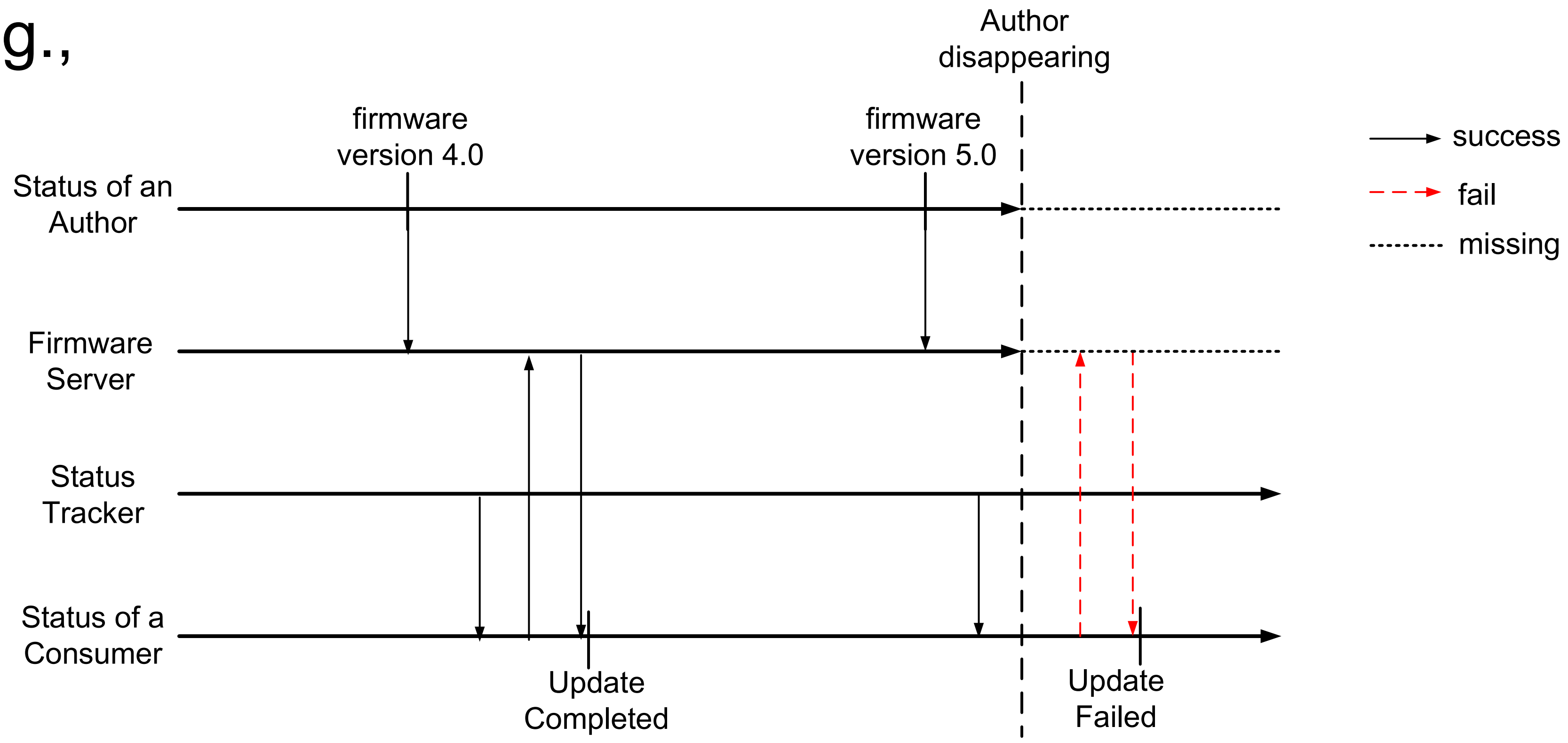
1. Client-server architecture
   - can cause overhead on servers and update failures may occur
   - servers can be targeted by an attacker for use in an attack



2. Author-disappearing
   - If authors disappear, firmware consumers who have not yet updated to the latest version cannot catch up

Traditional SUIT Architecture

- Author-disappearing issue
  - Maintenance of servers is dependent on the author's management
  - Data is not available without servers
    - e.g.,

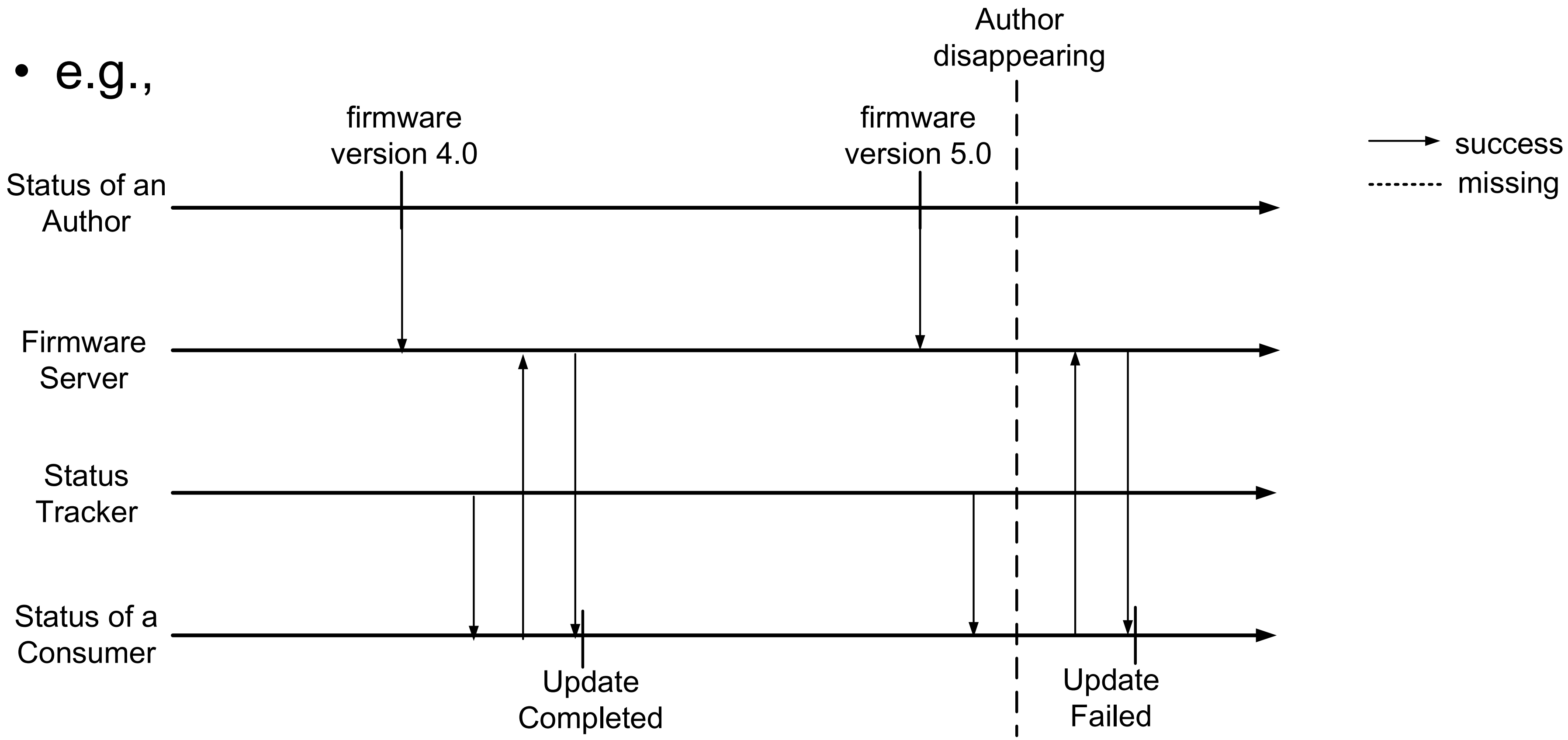


Proposal

- Current SUIT architecture has shortcomings
  - adopting traditional client and server model
  - cannot deal with an ‘author-disappearing issue’
- Blockchain can solve the shortcomings
  - By providing distributed storage (database) for manifests and firmware image files
  - By providing irreversibility for manifests and firmware image files

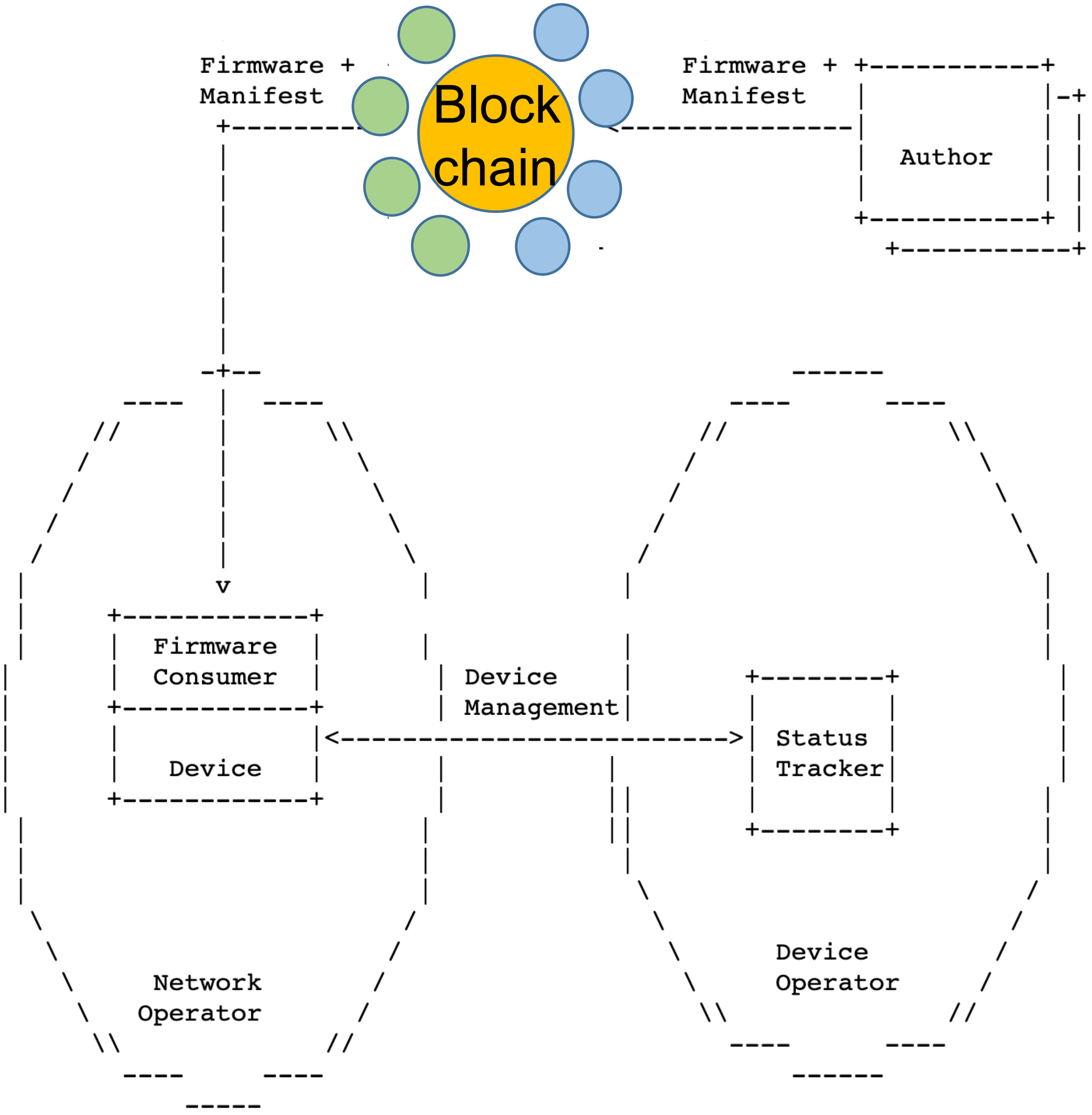
Proposal

- Solving an Author-disappearing issue
  - Even an author's disappeared, data is keep stored on blockchain because it's irreversible
    - e.g.,



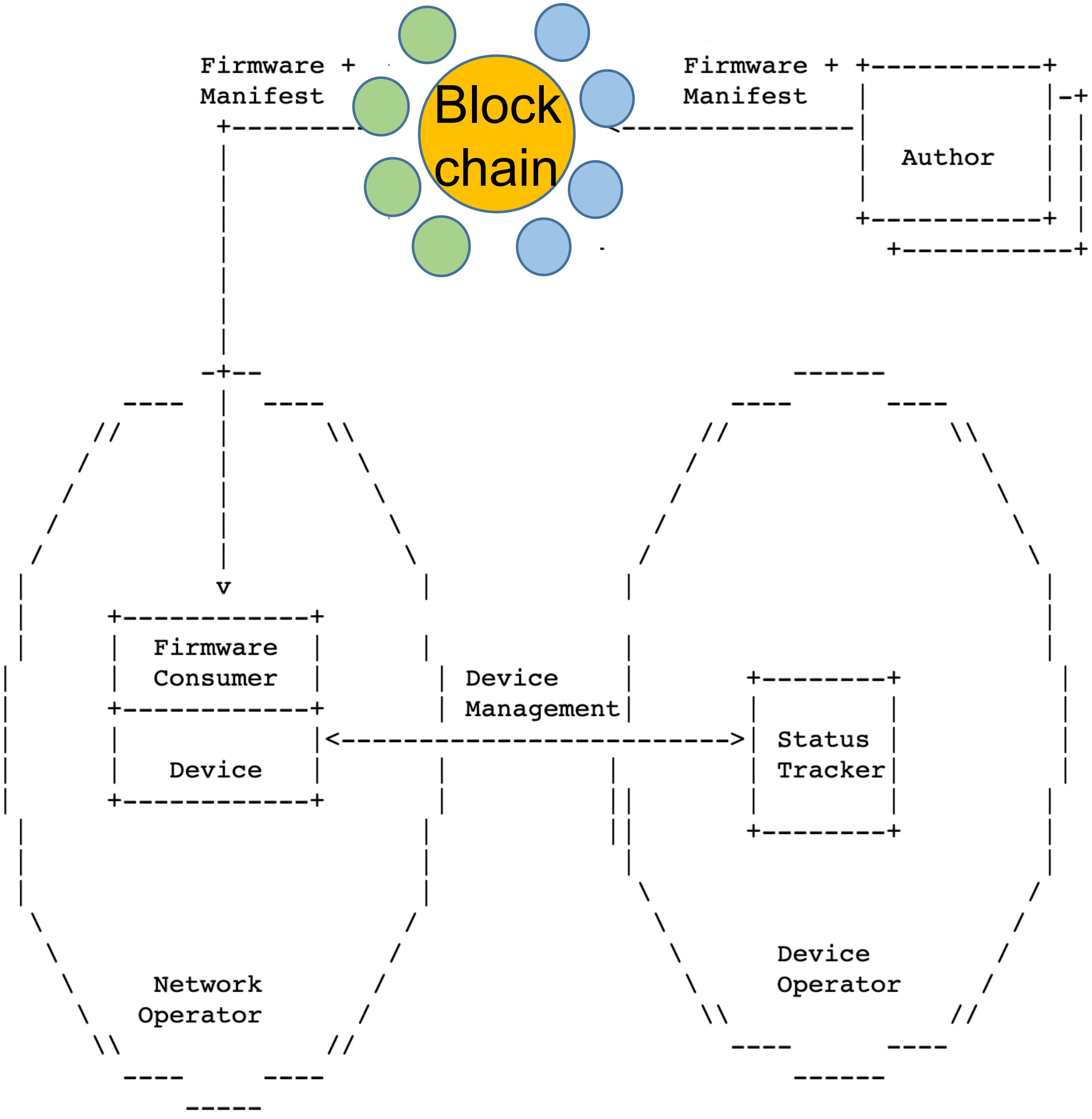
Proposal

- Proposed architecture
  - Firmware Server → Blockchain
    - Distributed storage
    - Data is irreversible
      - provides
        - high availability
        - high reliability



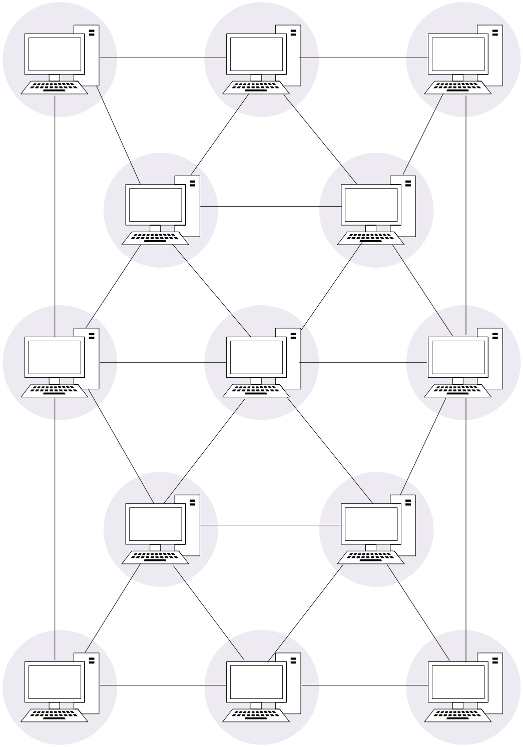
Proposal

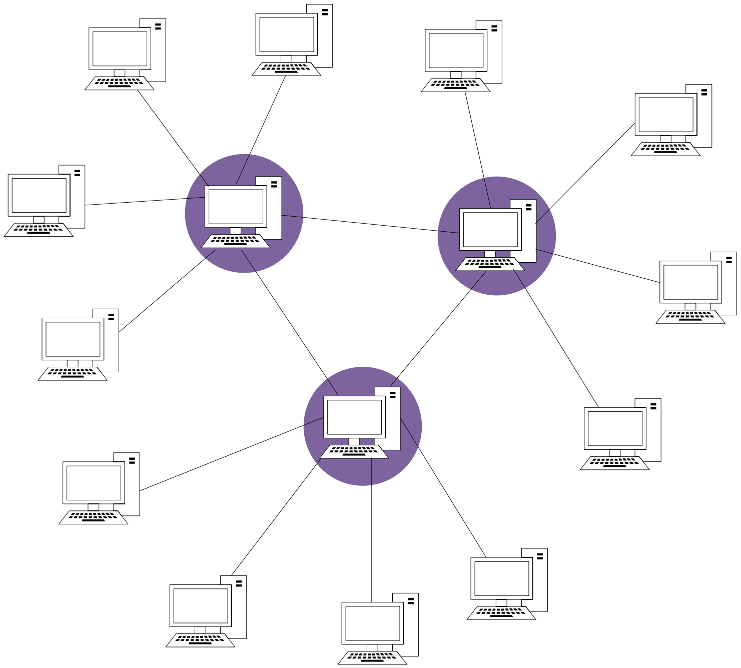
- Proposed architecture
  - To resolve bottle-neck problem
    - 🔵 = registration node
      - Process node registration based on IP
    - 🟢 = retrieval node
      - Retrieve the ip, URL for downloading a firmware image



Proposal

- Private or Consortium platform by cases
  - For Large Companies producing IoT devices
    - Private Blockchain platform
  - SMEs with higher possibility of author-disappearing issues
    - Consortium Blockchain platform





Thank You!

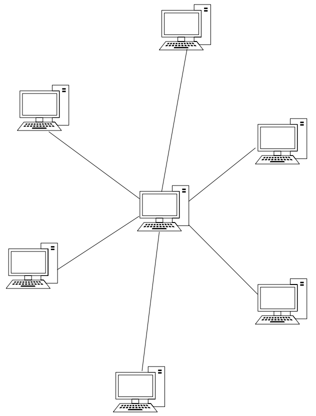
- Next Step
  - Submit a information model draft and improve with comments and discussions
  - Join hackathon with implementation

- Contact Info
  - Speaker: Seoyun Choi
    - seoyun@pel.smuc.ac.kr

Backup #1

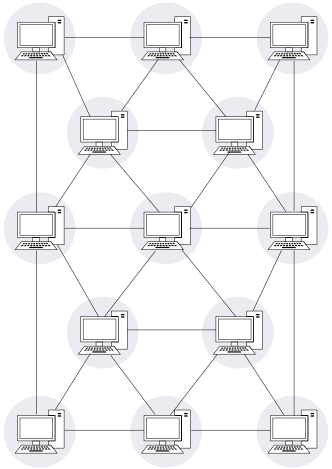
- Types of Blockchain Architectures
  - Public vs Consortium vs Private

<Public Blockchain>



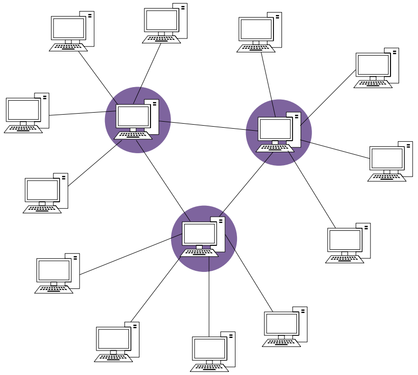
- permissionless
- every node can read & write data
- opened system to anyone
- risky…

<Consortium Blockchain>



- permissioned
- selected nodes can read & write data
- sharing system for an union of small companies

<Private Blockchain>

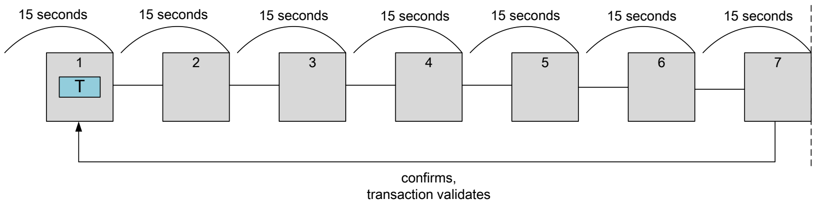


- permissioned
- selected nodes can read & write data
- private system for a large company

Backup #2

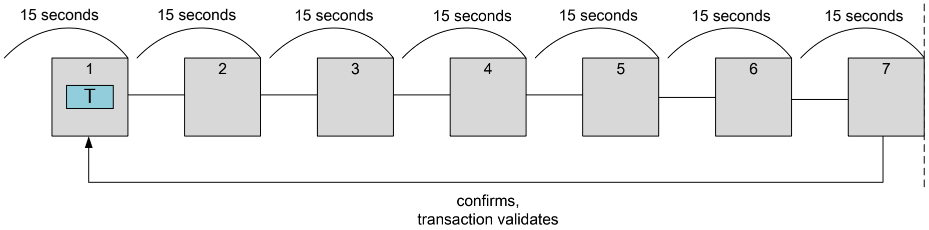
- TPS(Transaction per Second) and Confirmation
  - Bitcoin vs Ethereum vs Hyperledger Fabric

<Bitcoin>



- Block interval: 10 minutes (600 seconds)
- Average number of transactions on a block: 4200
- TPS = $\frac{4200}{600} = 7$ (tps)
- Confirmation Time = 60 minutes

<Ethereum>



- Block interval: 12~15 seconds
- Average number of transactions on a block: 150~450
- TPS = $\frac{150 \sim 450}{15} = 10 \sim 30$ (tps)
- Confirmation Time = about 2 minutes (120 seconds)

<Hyperledger Fabric >

- Block interval: N/A
- Average number of transactions on a block: depends on customization
- TPS = close to 3500 tps (depends on customization)
- Confirmation Time = N/A