Falcon Network

A High-Performance, Wide Area Interconnect

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IC3

Motivation

- Every consensus protocol suffers with laggy network
- Nakamoto consensus suffers by:
  - Losing mining revenue
  - Wasting hash power
  - … resulting in centralization pressure!
- In fact, the effect of the block size on the network latency is a highly contentious point!

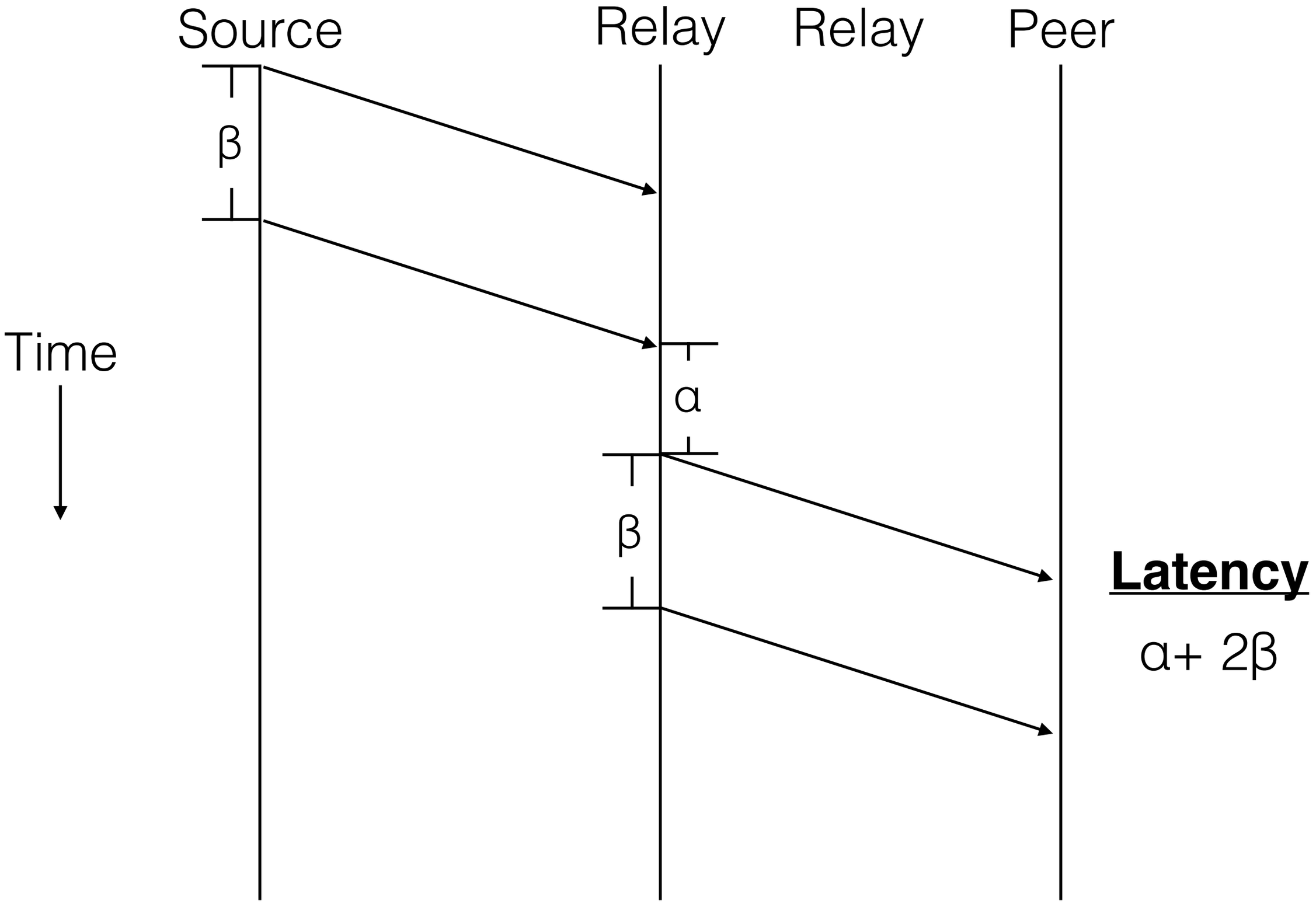
Current Relay Network

- Bitcoin Fast Relay Network (BFRN)
  - Big improvement over P2P layer of Bitcoin through:
    - Minimal validation
    - Hand-optimized topology
    - **Compression**
- Not actively maintained
- Compression software required at end hosts
- Optimizes for bandwidth, not latency

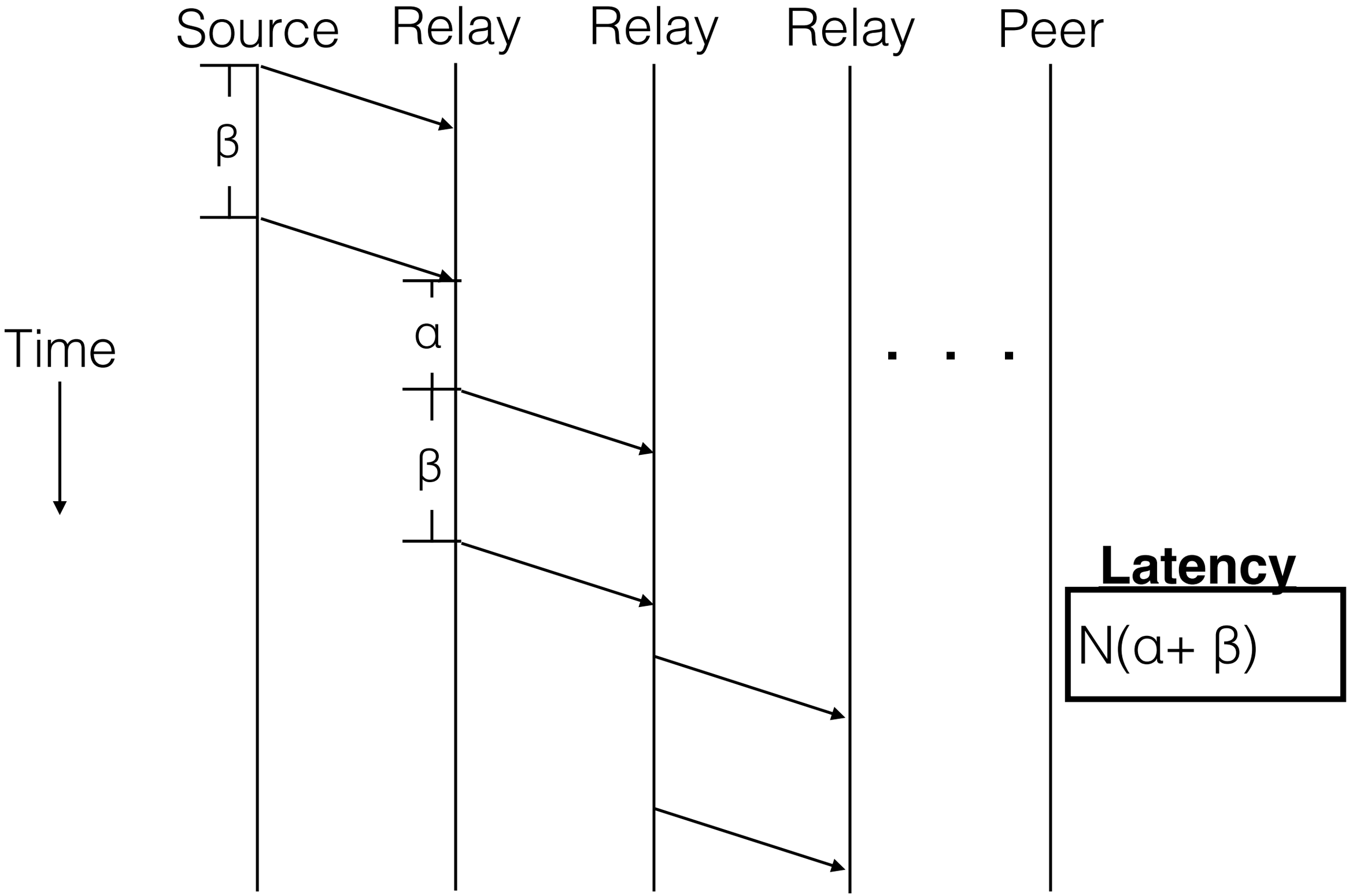
Falcon Network

- Falcon Network achieves gains through
  - Minimal validation
  - Hand-optimized topology
    - ***Cut-through routing***
- No special software required on clients
- Fundamentally faster than other techniques
- Orthogonal to compression (BIP 152)

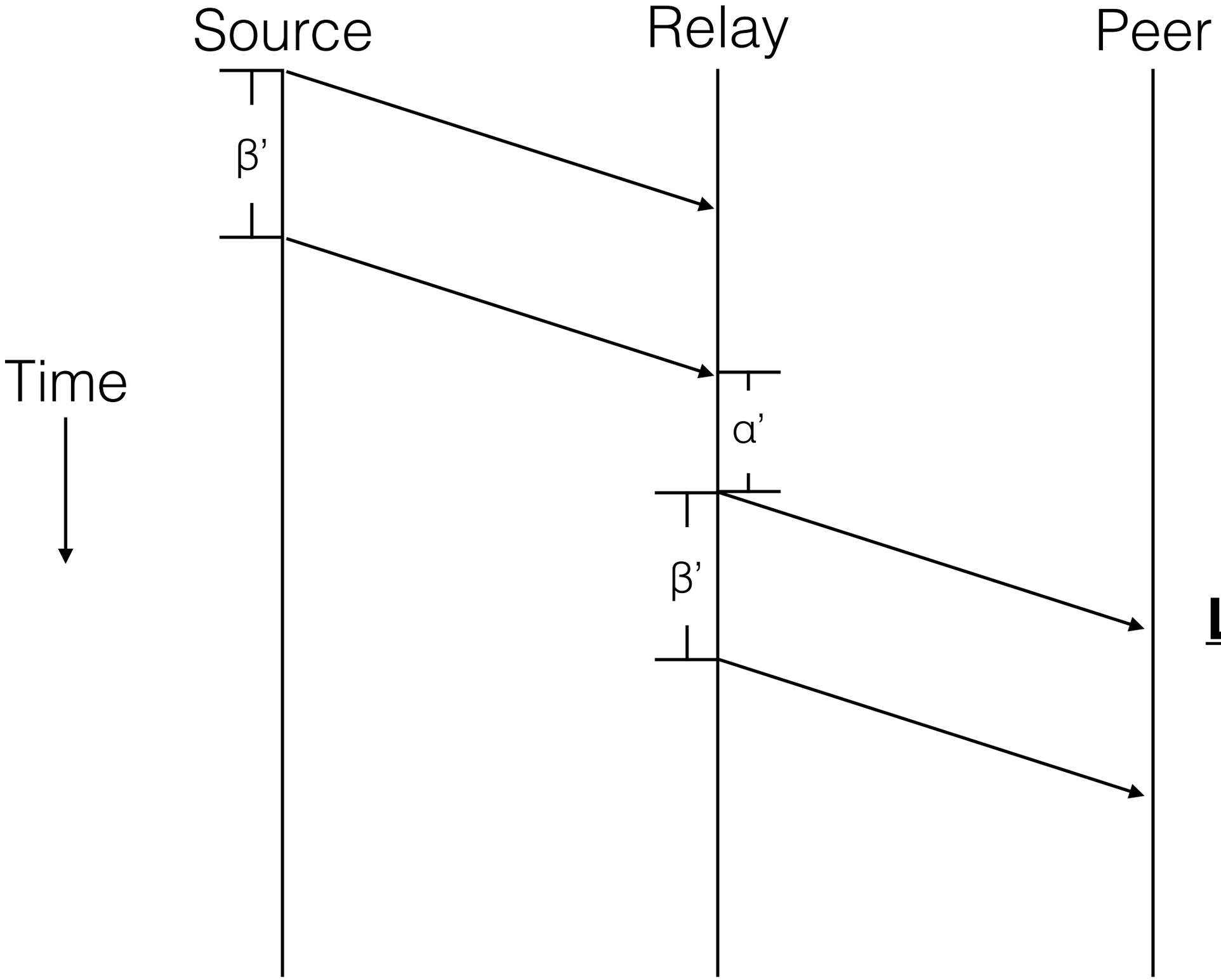
Bitcoin P2P Routing



Bitcoin P2P Routing



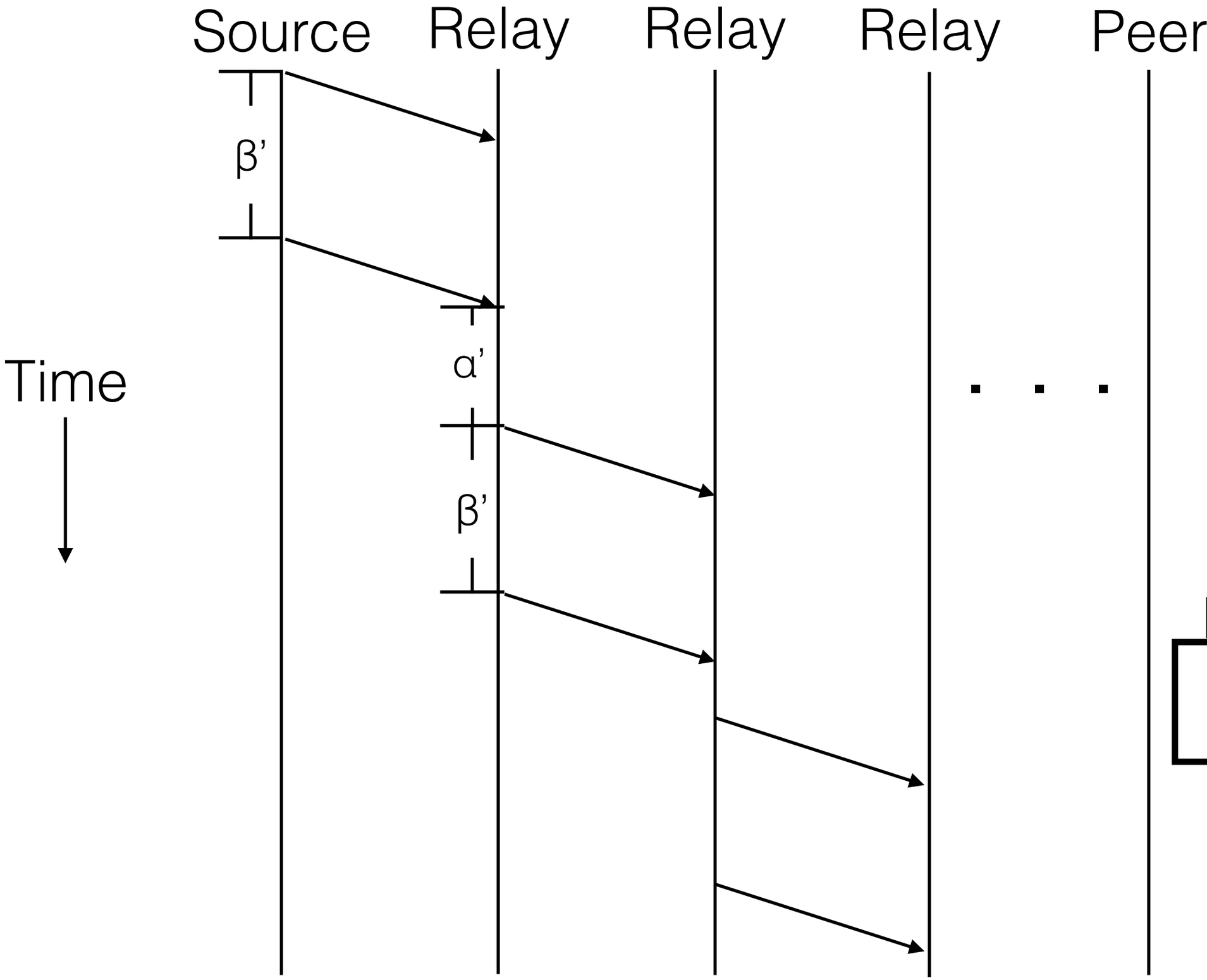
BFRN Routing



Latency

α'+ 2β'

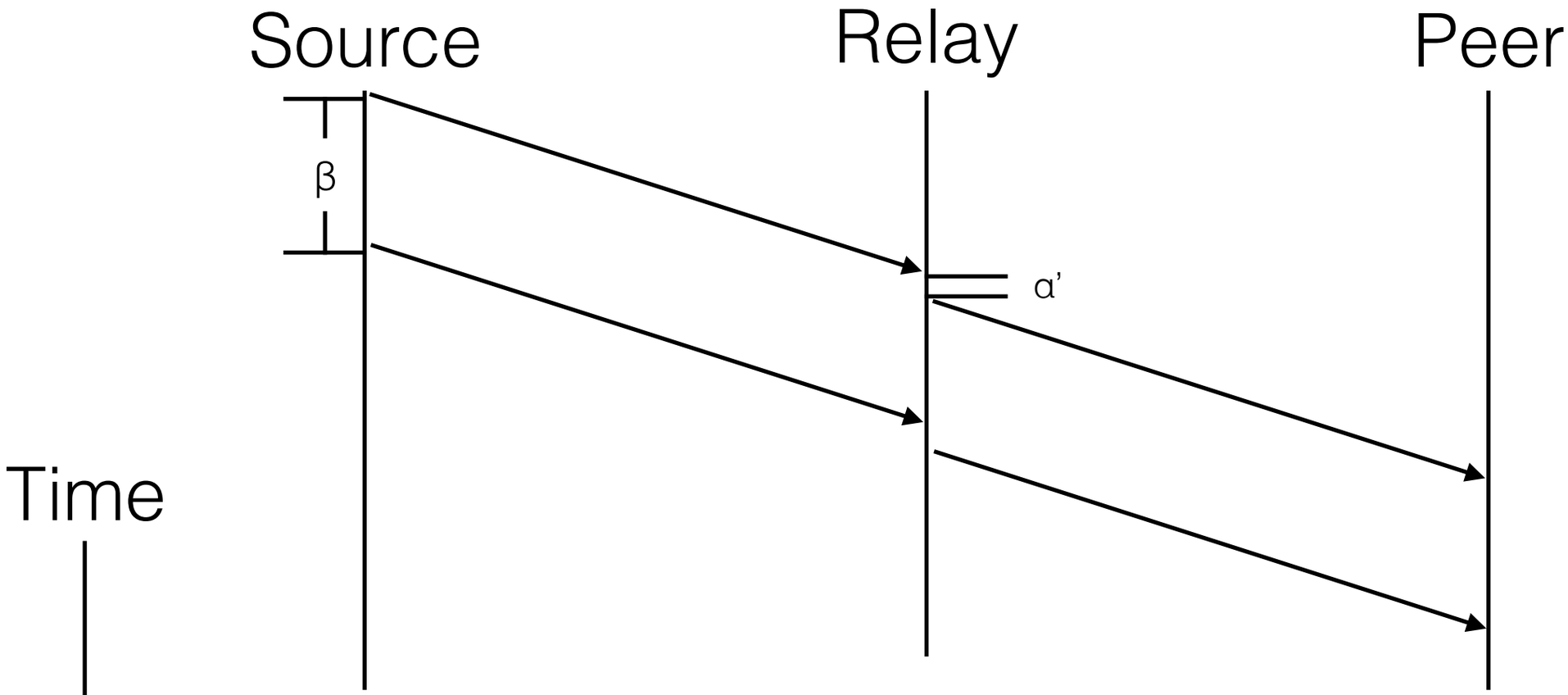
BFRN Routing



Latency

N(α'+ β')

Falcon Network Routing

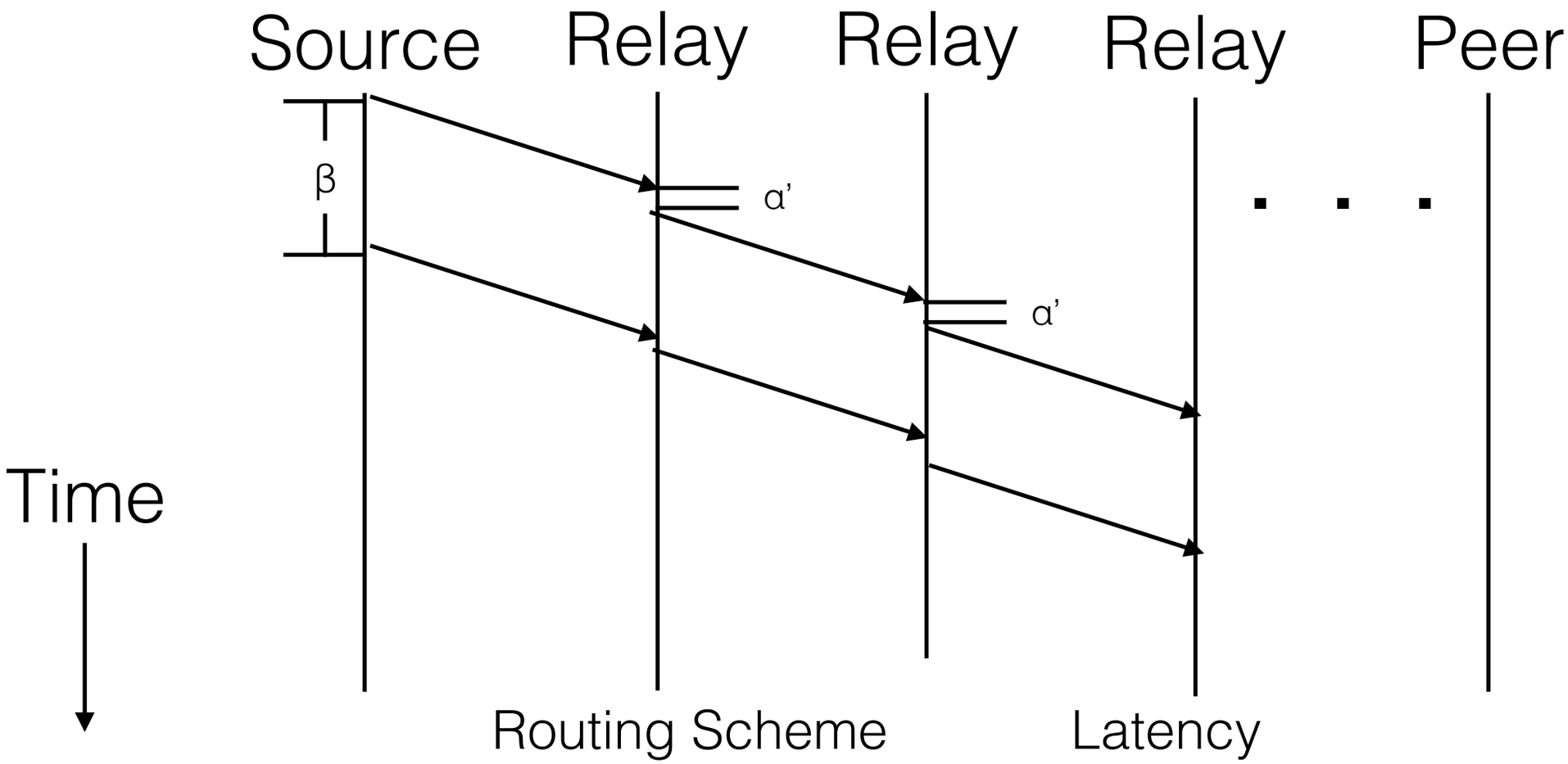


Routing Scheme	Latency
Bitcoin P2P	$N(\alpha + \beta)$
BFRN	$N(\alpha' + \beta')$
Falcon Network	$N\alpha' + \beta$

Latency

$\alpha' + \beta$

Falcon Network Routing

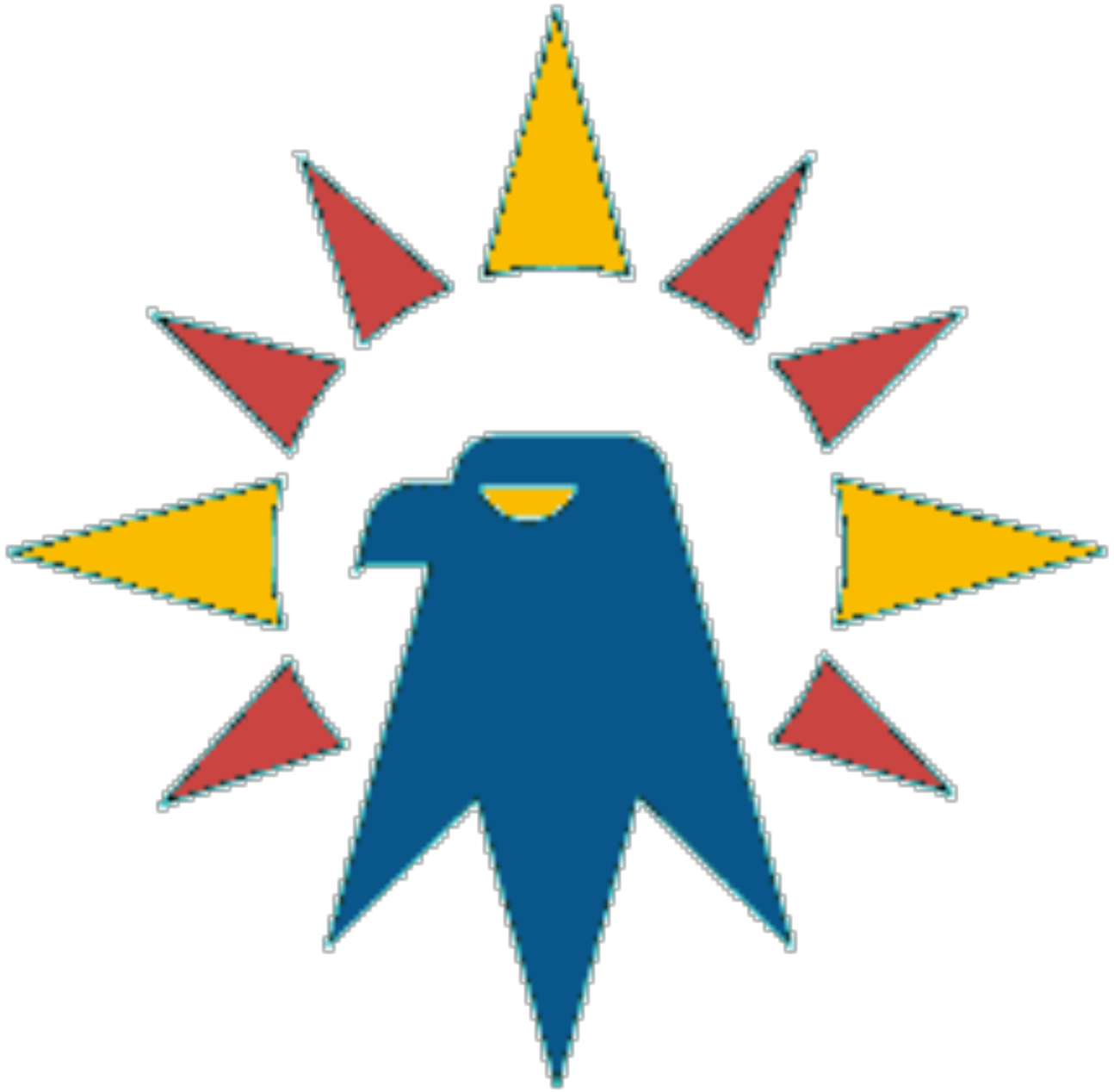


Routing Scheme	Latency
Bitcoin P2P	N(α+ β)
BFRN	N(α'+ β')
Falcon Network	Nα'+ β

Latency

Nα'+ β

Network Operation Center



Takeaways

- Rethinking of the Bitcoin network layer using a principled approach
    - Significantly faster and more scalable than alternatives
- Orthogonal to compression

Looking Forward

- Automatically managing topology

- Measure the network characteristics of cryptocurrencies

- Unique vantage point as a fast relay service

Public Release

- First public announcement!
- Email: soumya@cs.cornell.edu
- Sign-Up Sheet: https://tinyurl.com/FalconNetwork