Sviluppo di un'architettura efficiente ed estensibile per fornire servizi di rete evoluti per l'internet di prossima generazione

Borsista

Francesco Giacinti

Tutor

Prof. Gianluca Reali

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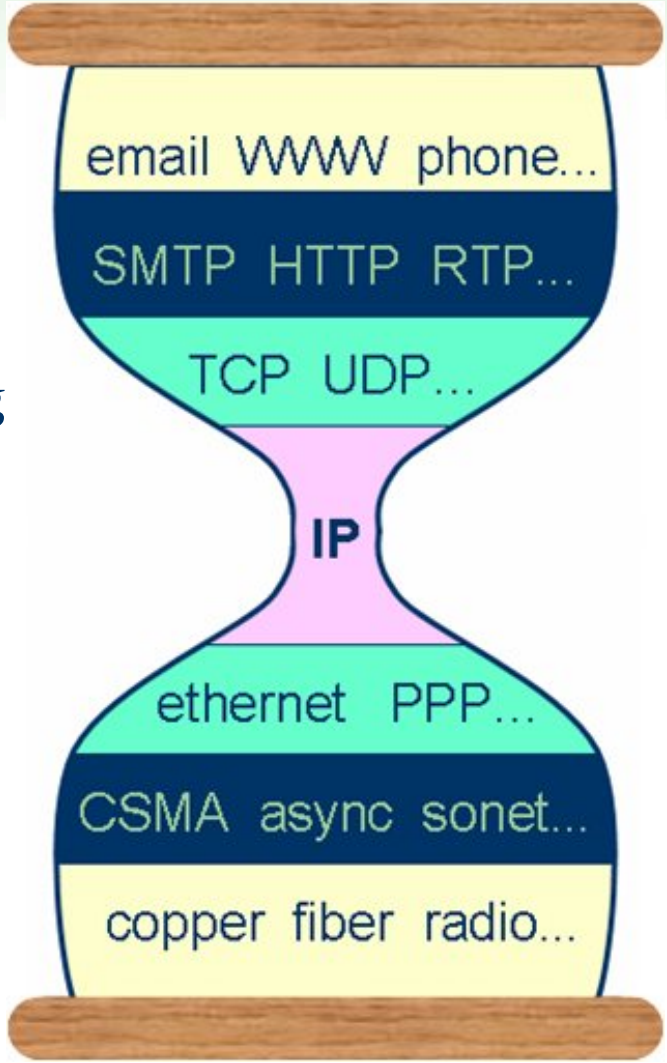
Summary

- Internet Ossification
- NetServ
- NSIS-based Signaling
- Activity Phases
- Use Cases: CDN and KeepAlive
- Specific Research Objectives

Internet Ossification 1/2

- As networks grow they become resistant to change
  - large investment in physical infrastructure
  - many stake-holders with often competing interests
  - even modest changes (e.g. IPv6) are difficult to deploy
- Ossification is a serious concern
- End-to-end is no more enough
- Virtualization can change all this



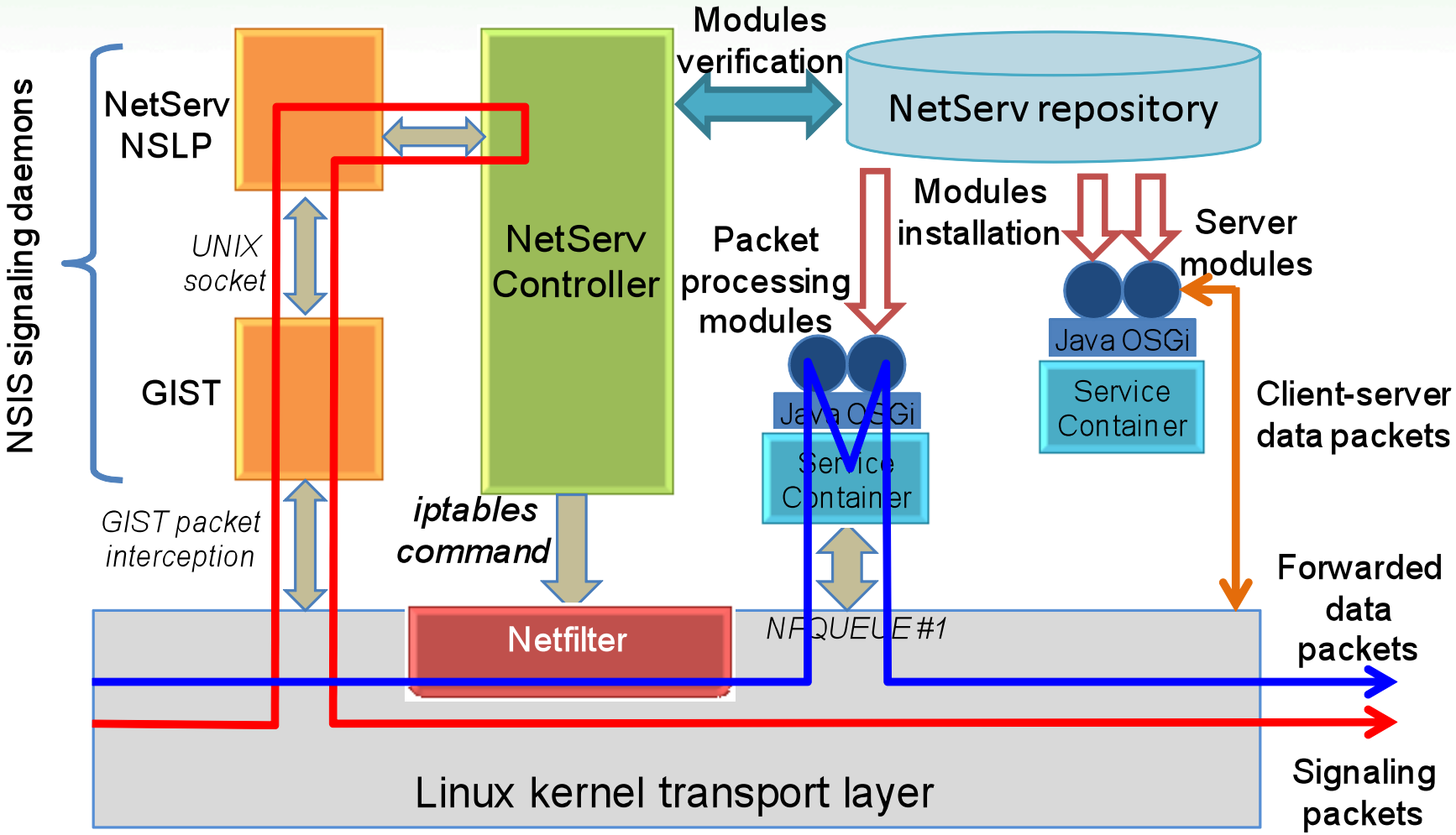
Internet Ossification 2/2

- Virtualization allows many *virtual networks* to co-exist within a shared substrate
  - Technology now makes it feasible to virtualize routers
  - Virtualized switch fabrics can permit sharing with traffic isolation
- In-network virtualization can provide the needed flexibility for the Future Internet

What is NetServ?

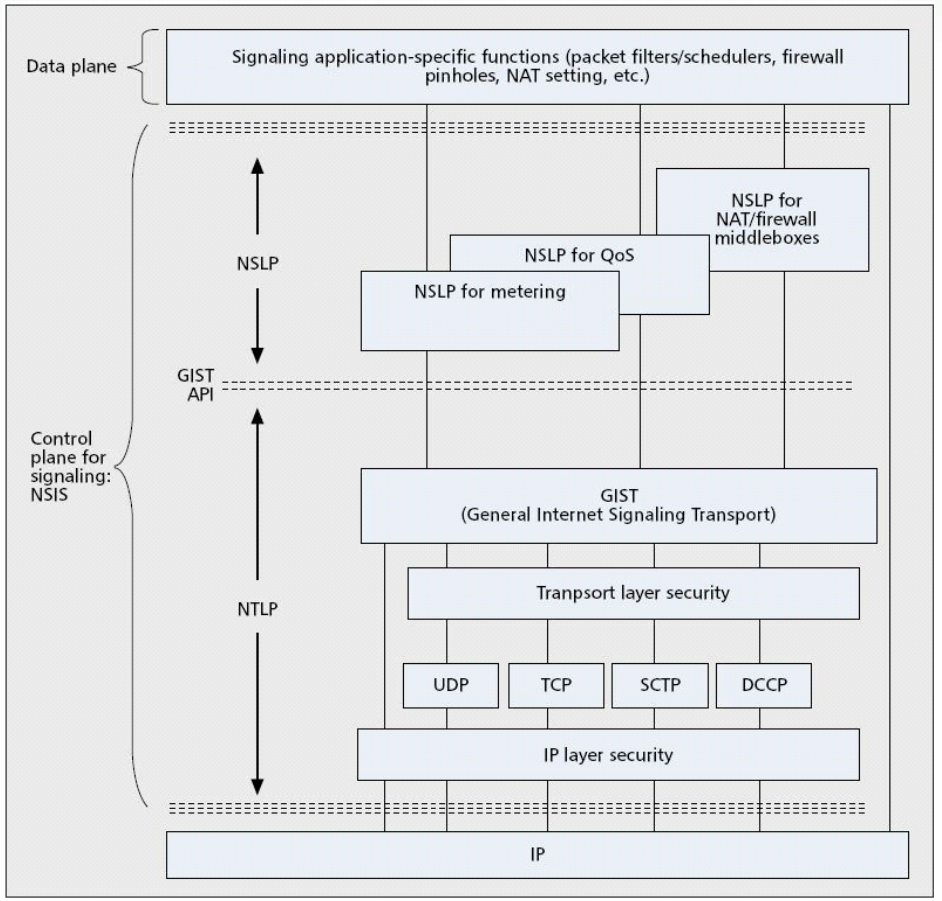
- NSF FIND project led by Columbia University (NY) with Deutsche Telecom – DOCOMO – Bell Labs and **UniPG**!!
- In-network service container
- Java-programmable, signal-driven router
- Resources isolation and virtualization
- NSIS signaling support
- Hot service deployment and removal
  - Service installed only when needed
- Only assumes that a node provides packet transport
  - Future Internet highly evolvable, and decouples services from a specific technology
  - NetServ everywhere from routers to end systems (users and servers)

NetServ Node Architecture



NetServ Signaling 1/2

- NSIS signaling
  - suite of protocols envisioned to support various signaling application
  - IETF RFC 4080
- Two layers:
  - NTLP: NSIS Transport Layer Protocol
    - GIST (Generic Internet Signaling Transport)
  - NSLP: NSIS Signaling Layer Protocol
    - NetServ-specific NSLP
      - On-path based signaling
      - Three messages
        - » SETUP + ACK
        - » PROBE REQUEST/RESPONSE
        - » REMOVE + ACK



NetServ Signaling 2/2

- NetServ protocol provides
  - Installation and removal of service modules on path
  - NetServ network probing features, such as:
    - State of on-path nodes (Topology Discovery)
    - State of services (Service Discovery)
    - Logs and errors collection for service/node management system or debug
- Currently based on NSIS-ka implementation

Activity Phases

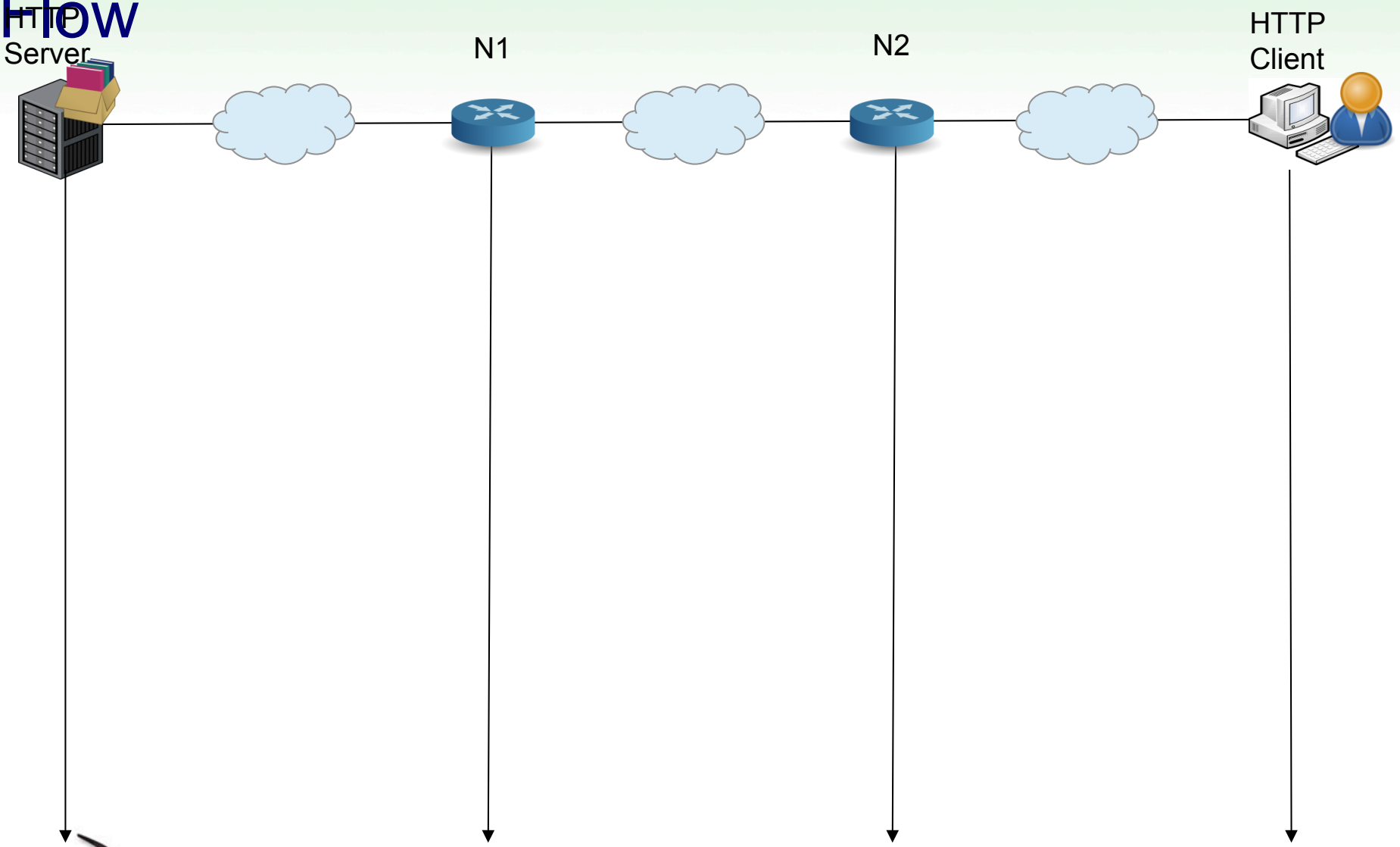
1. **Identification of a number of use cases for network services.**
2. **Requirements analysis for network services selected as meaningful use cases.**
3. Review of the NetServ service architecture with respect to the requirements identified during the previous phase.
4. Implementation of a fully functional prototype implementation with example services.
5. Performance evaluation of implemented services over proposed architecture in both fixed and mobile terminals.

Use Cases

- Content Delivery Network (CDN) service
  - Use case for addressable service
  - Processing, distributing and caching of specific content

- Keep Alive service
  - Use case for packet processing service
  - To check the system capabilities to develop applications for packet processing directly on the router

Data Delivery Signaling Flow



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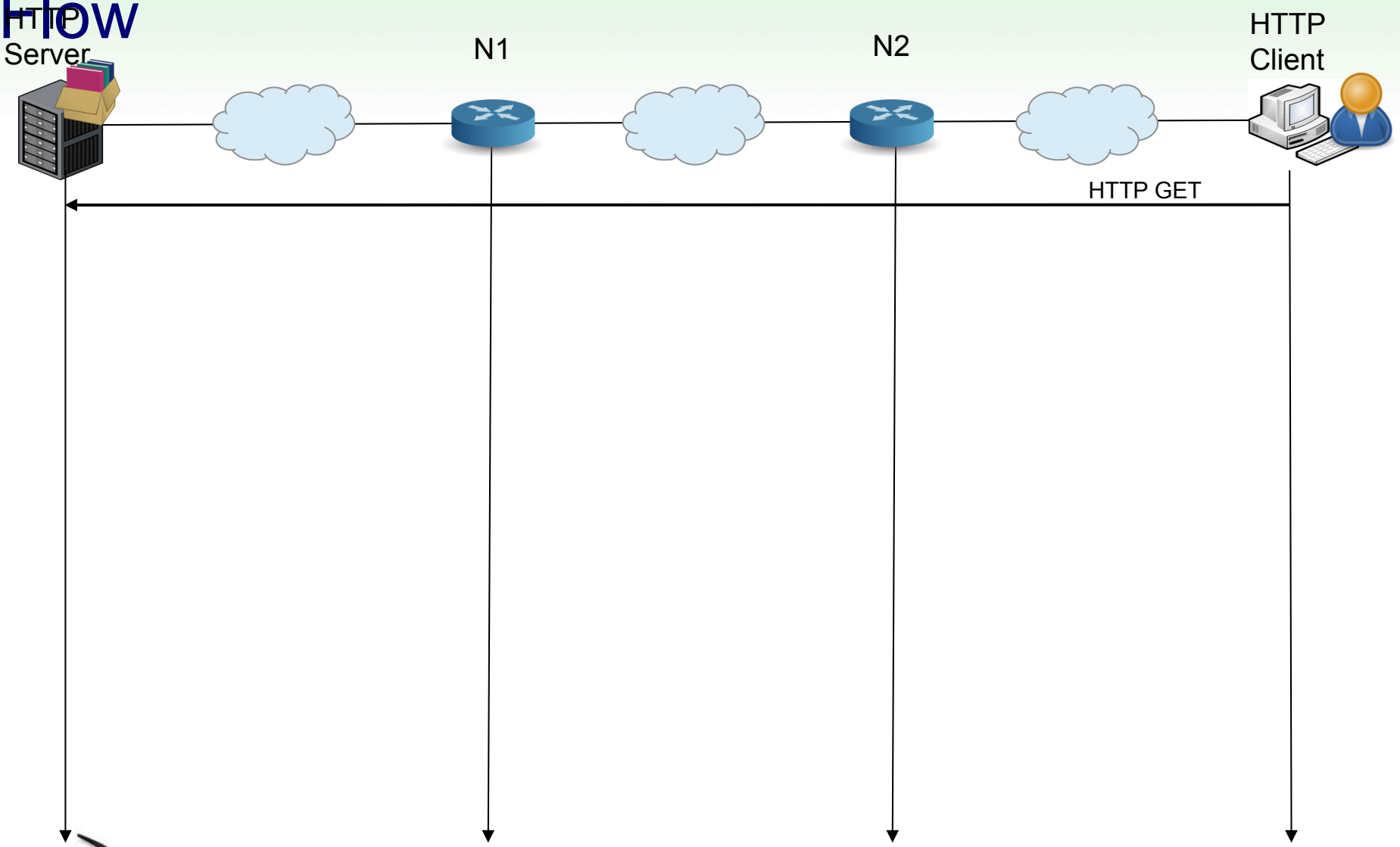

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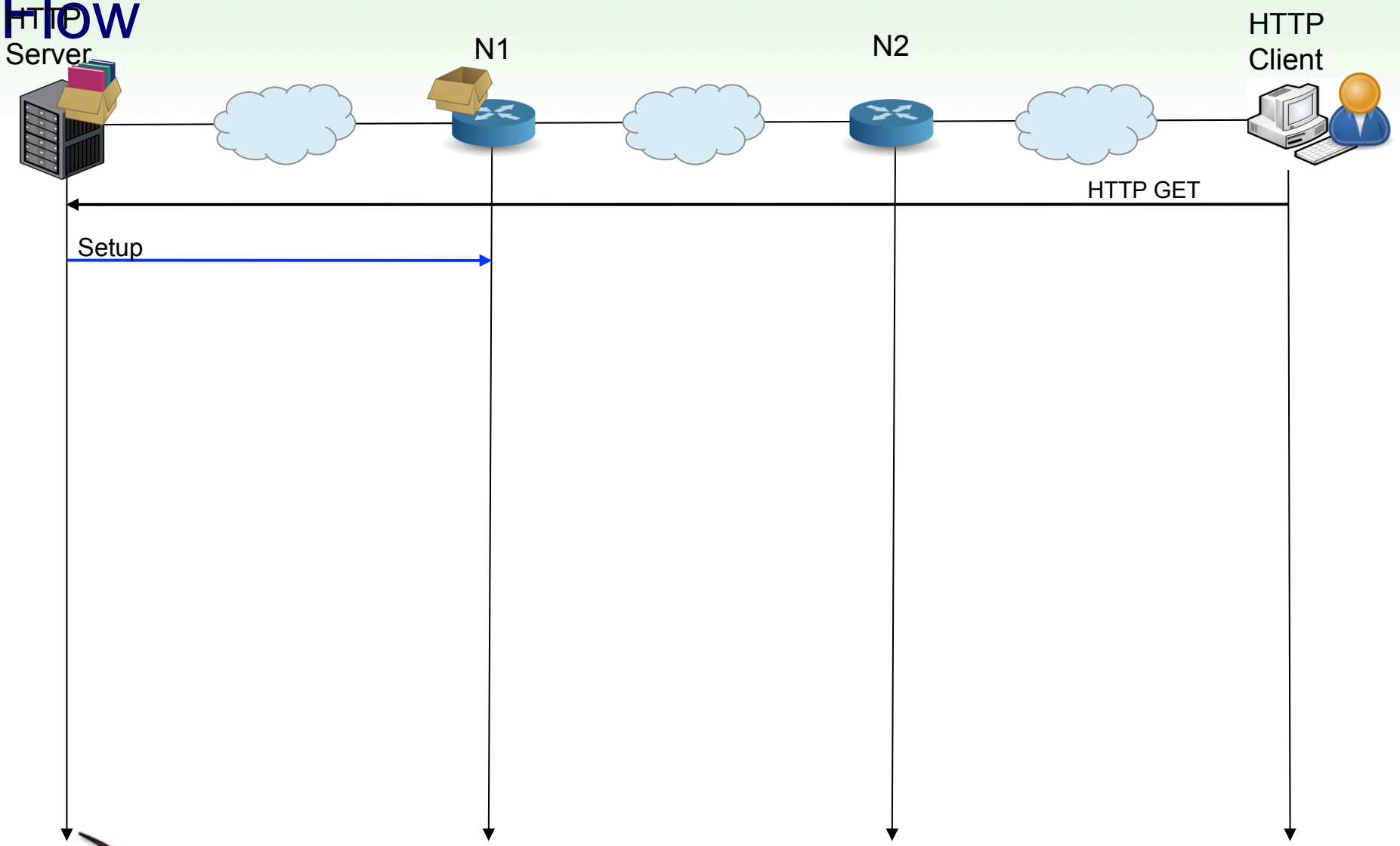

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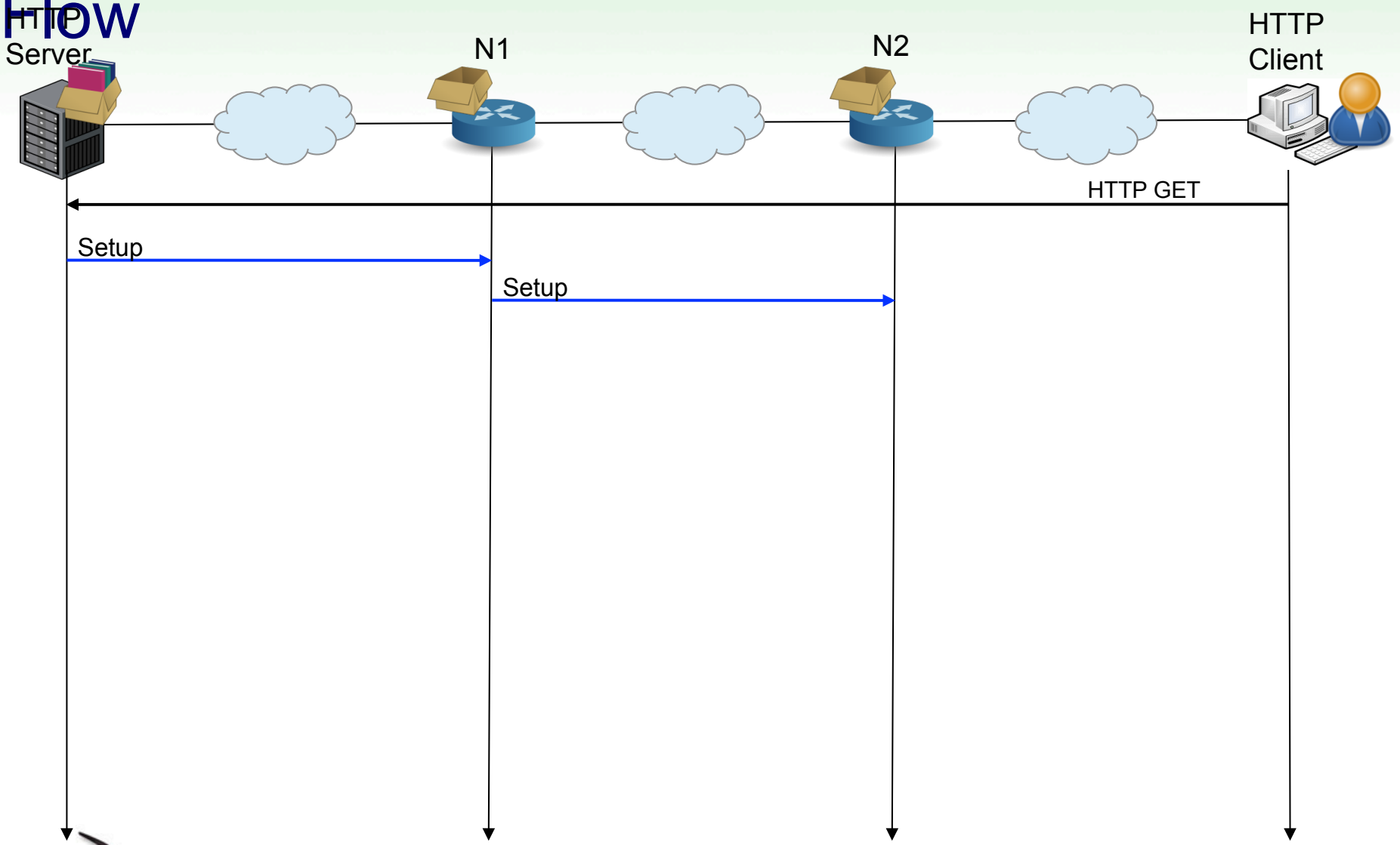

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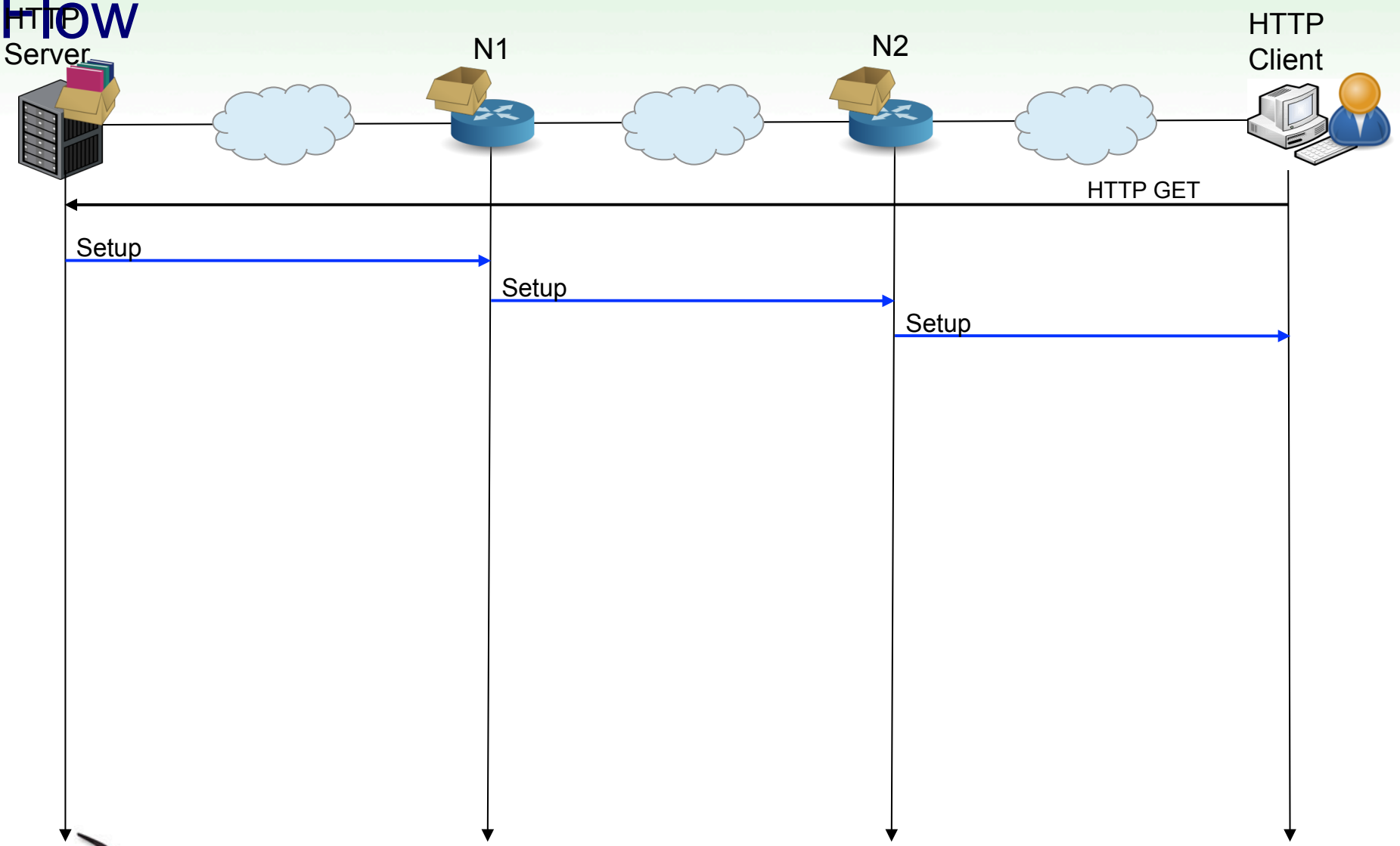

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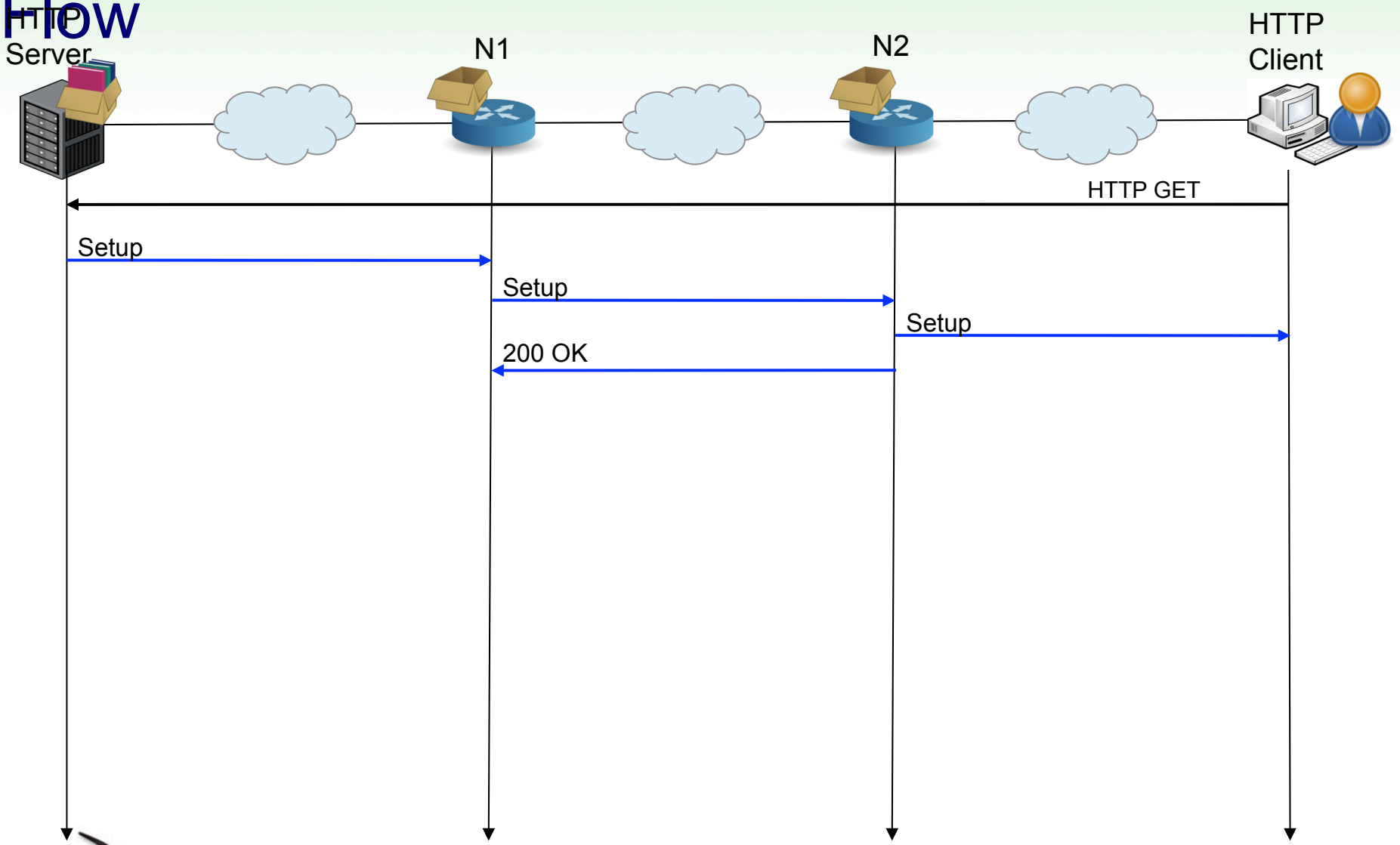

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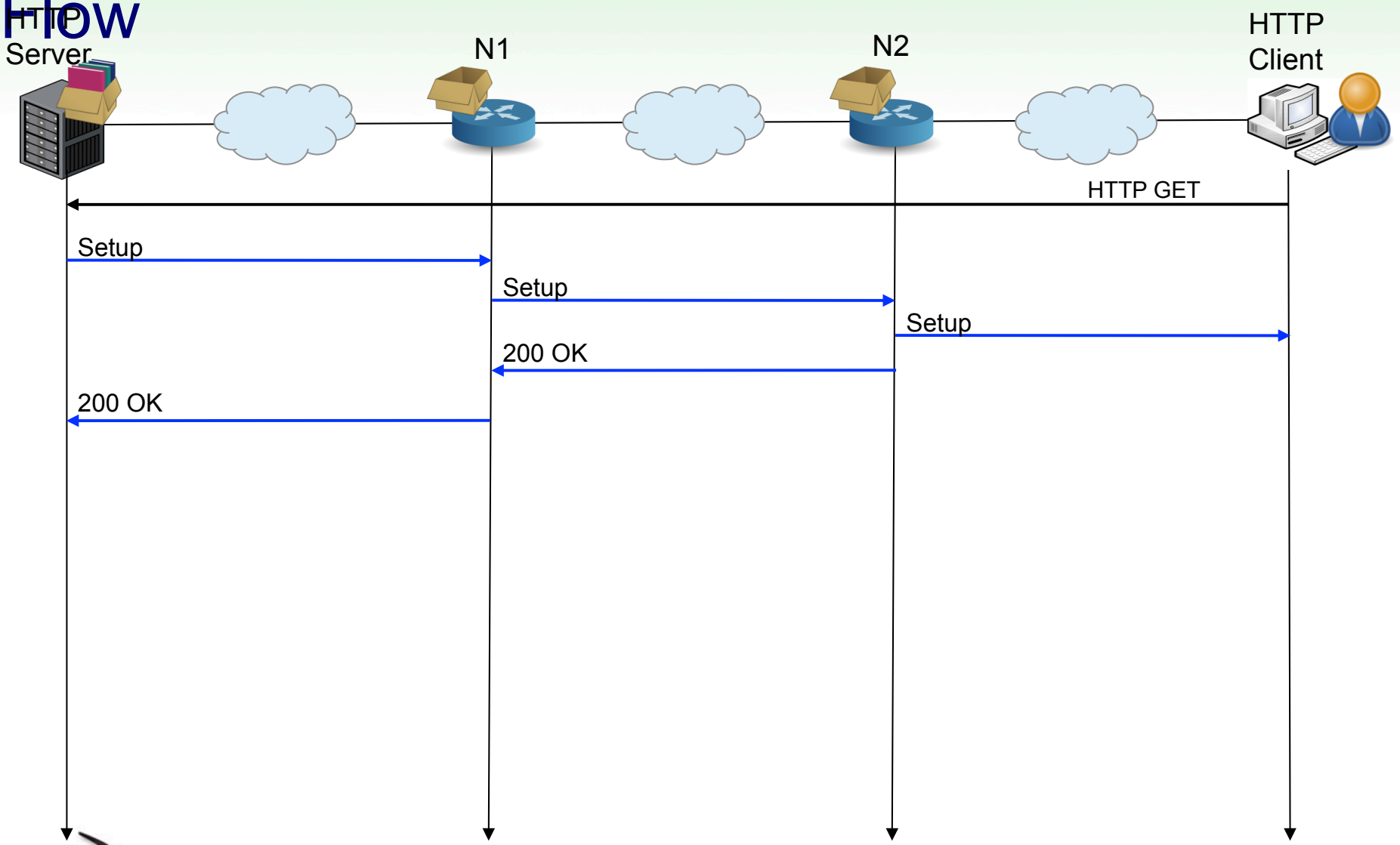

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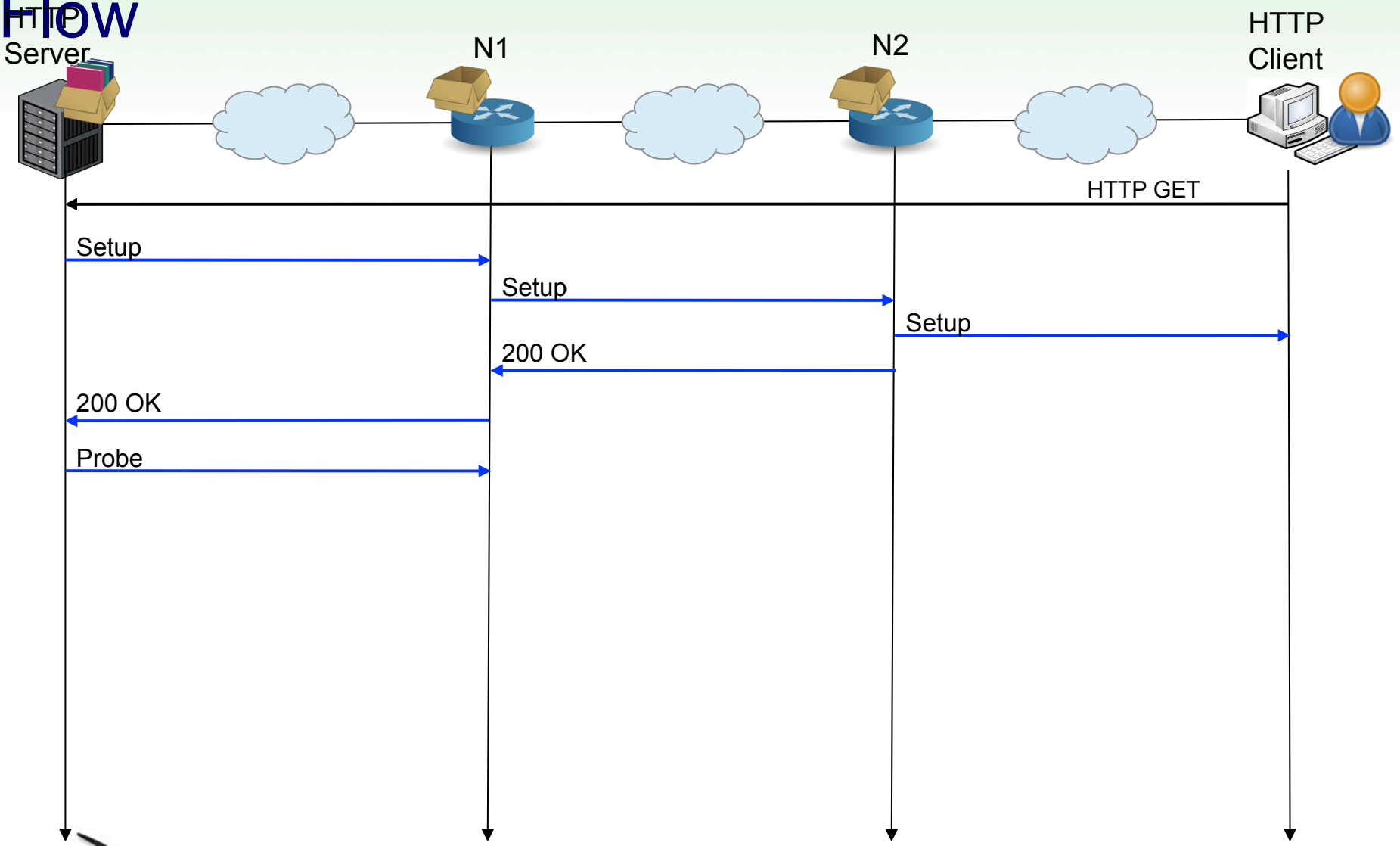

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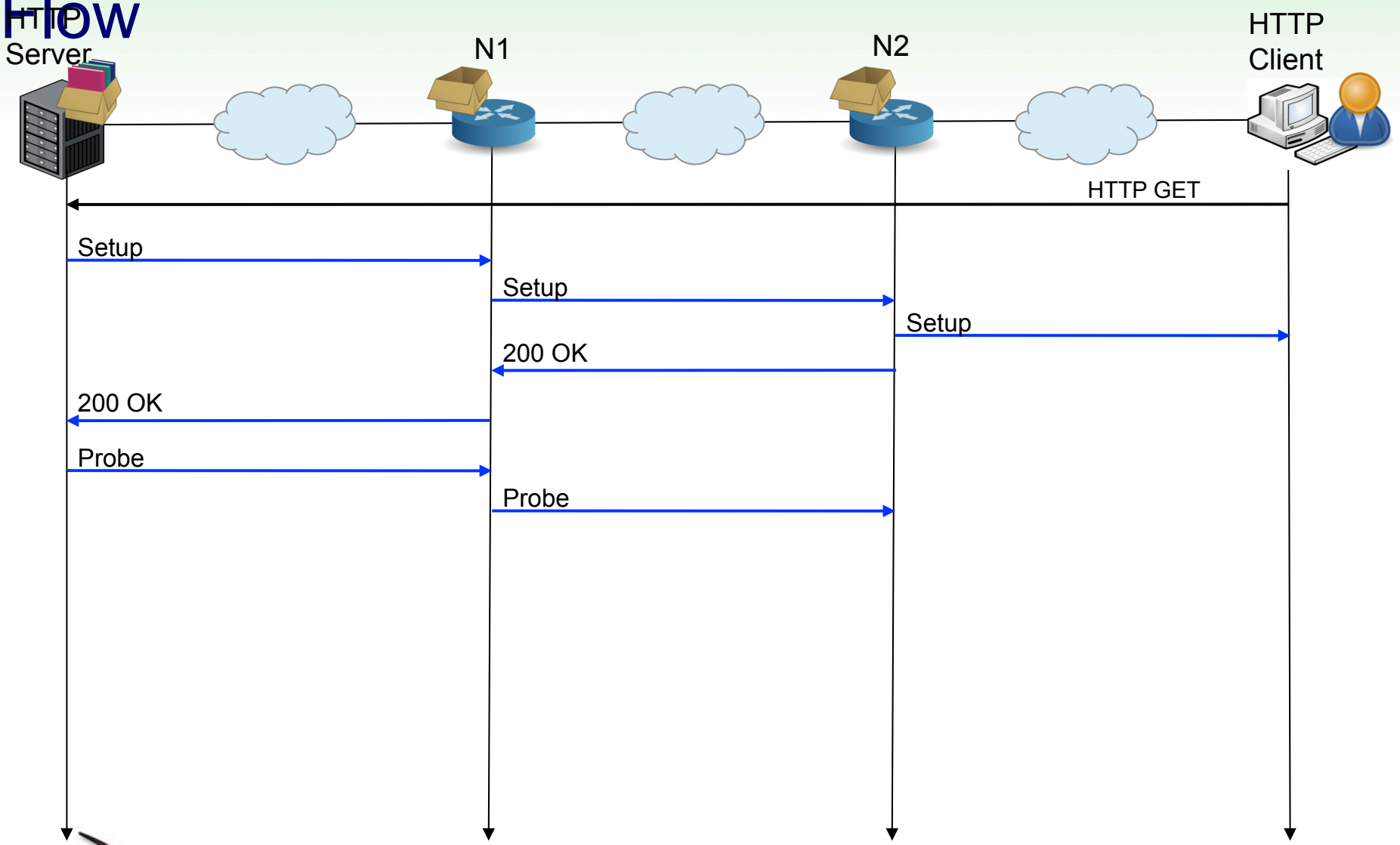

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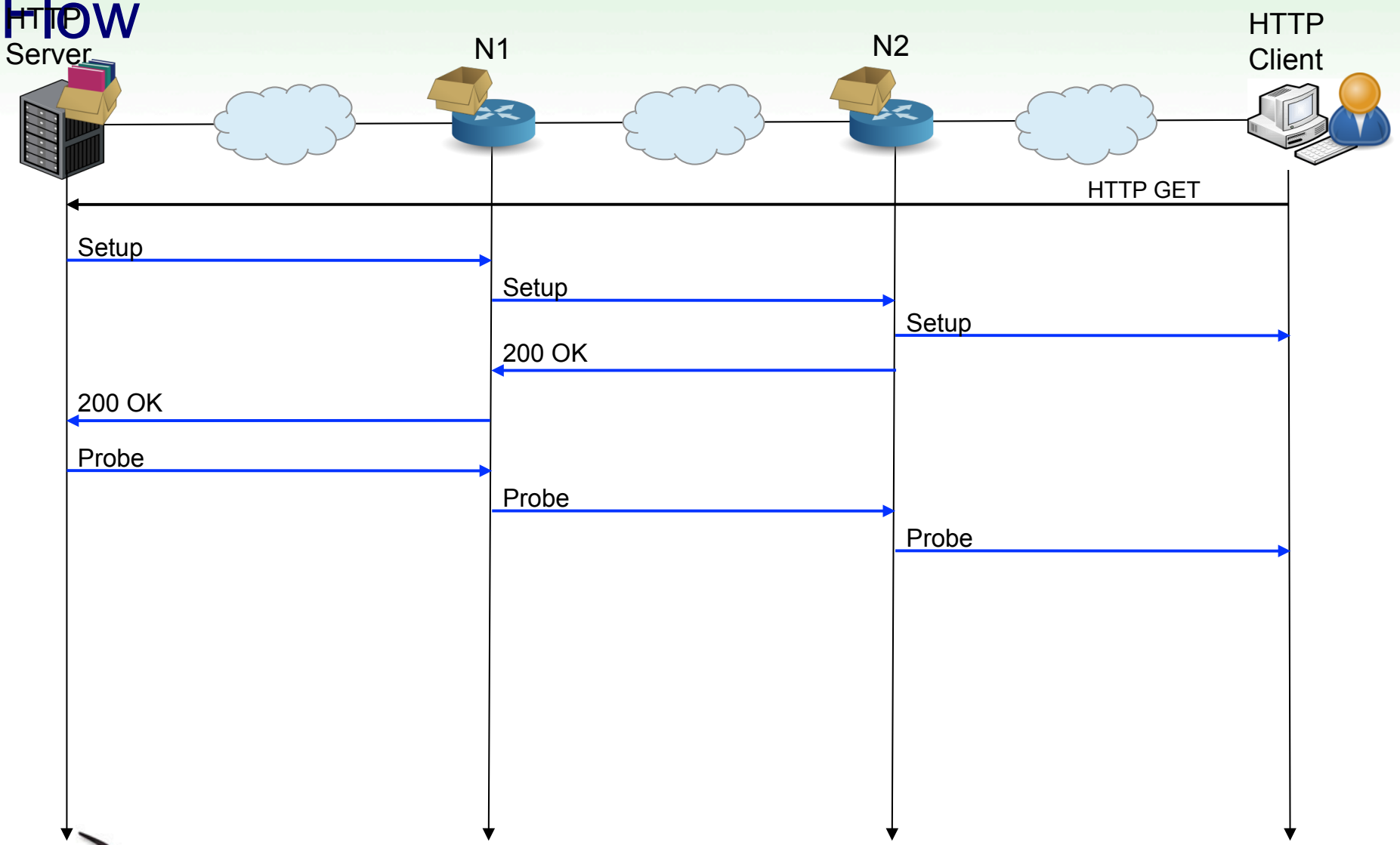

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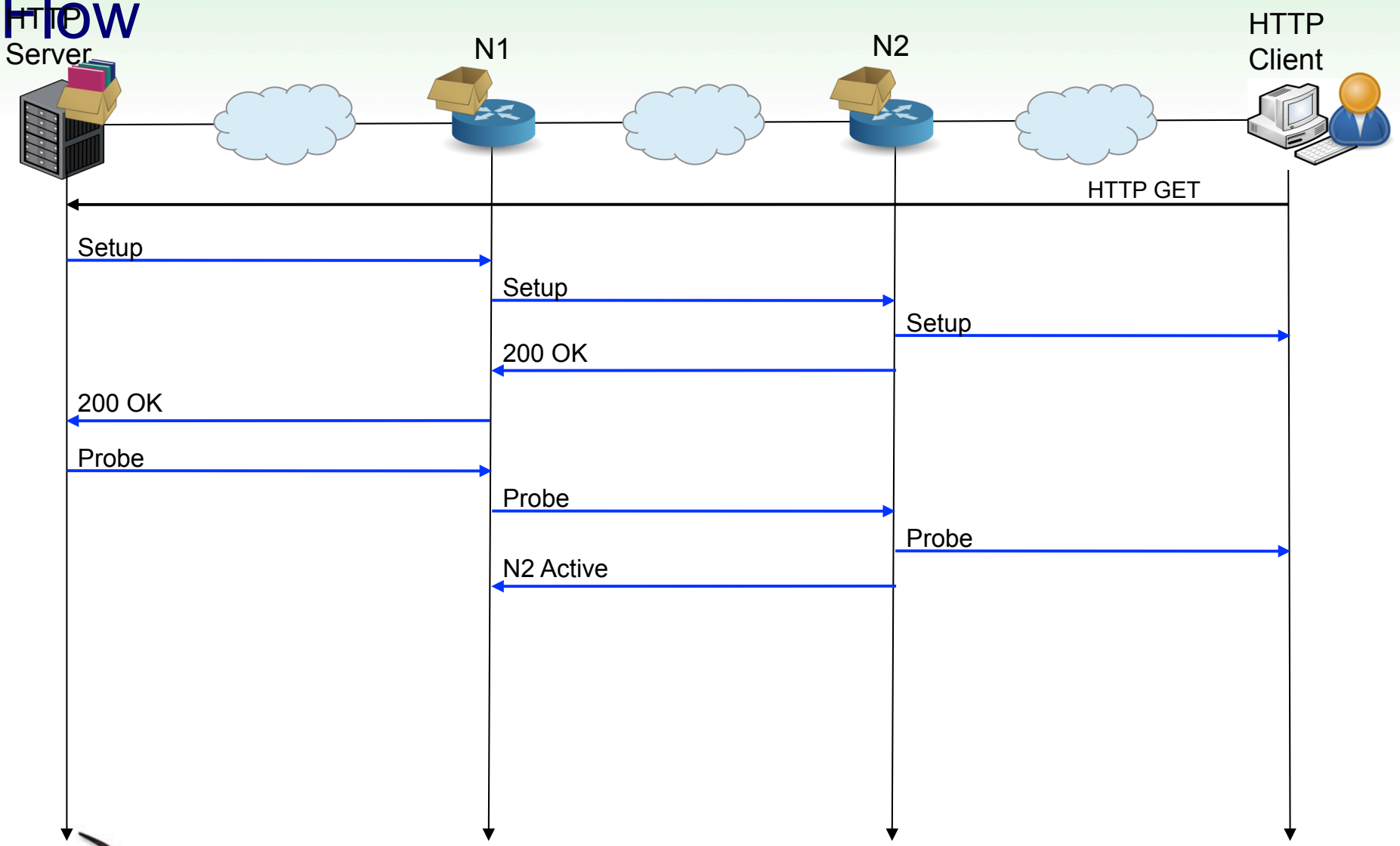

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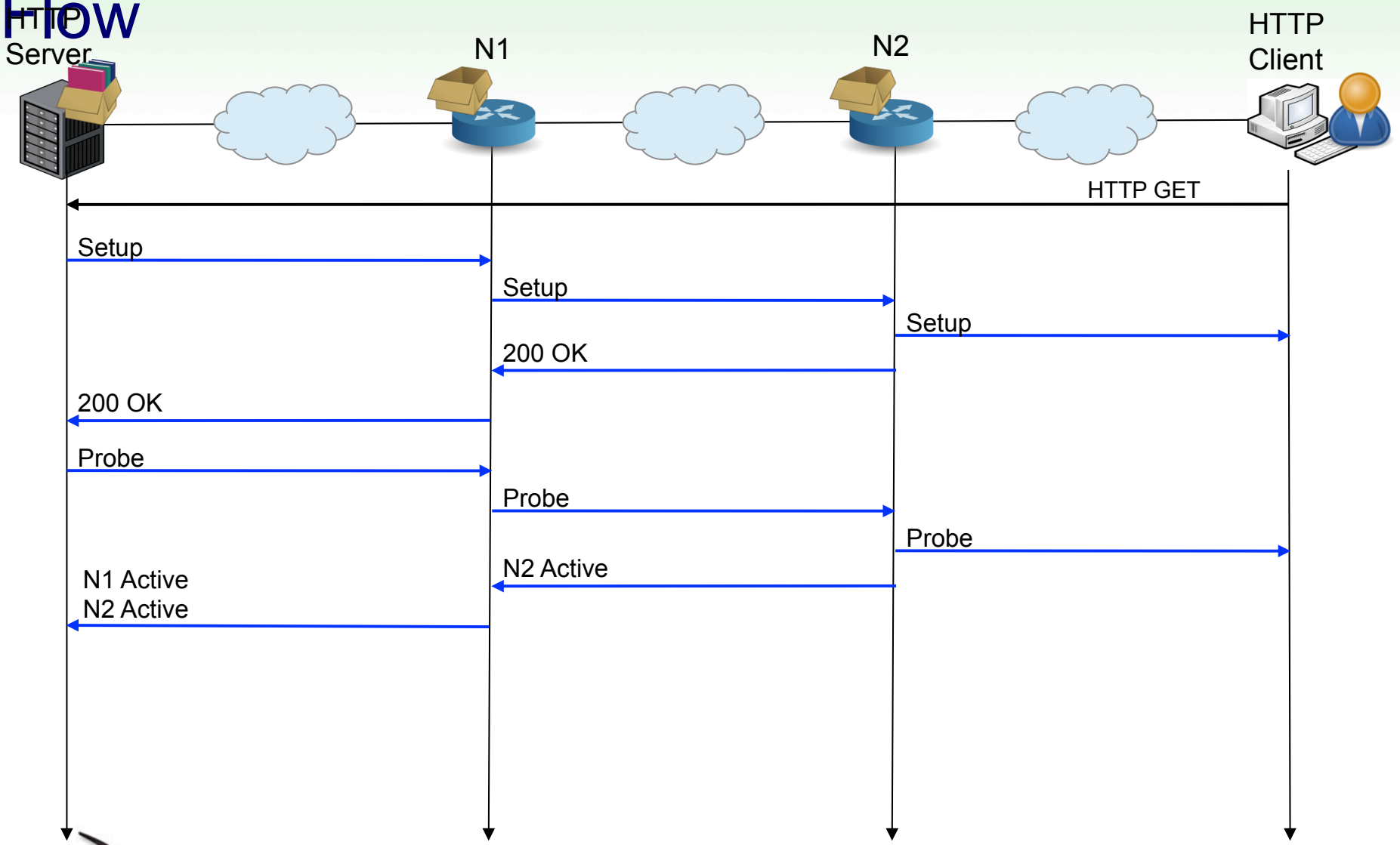

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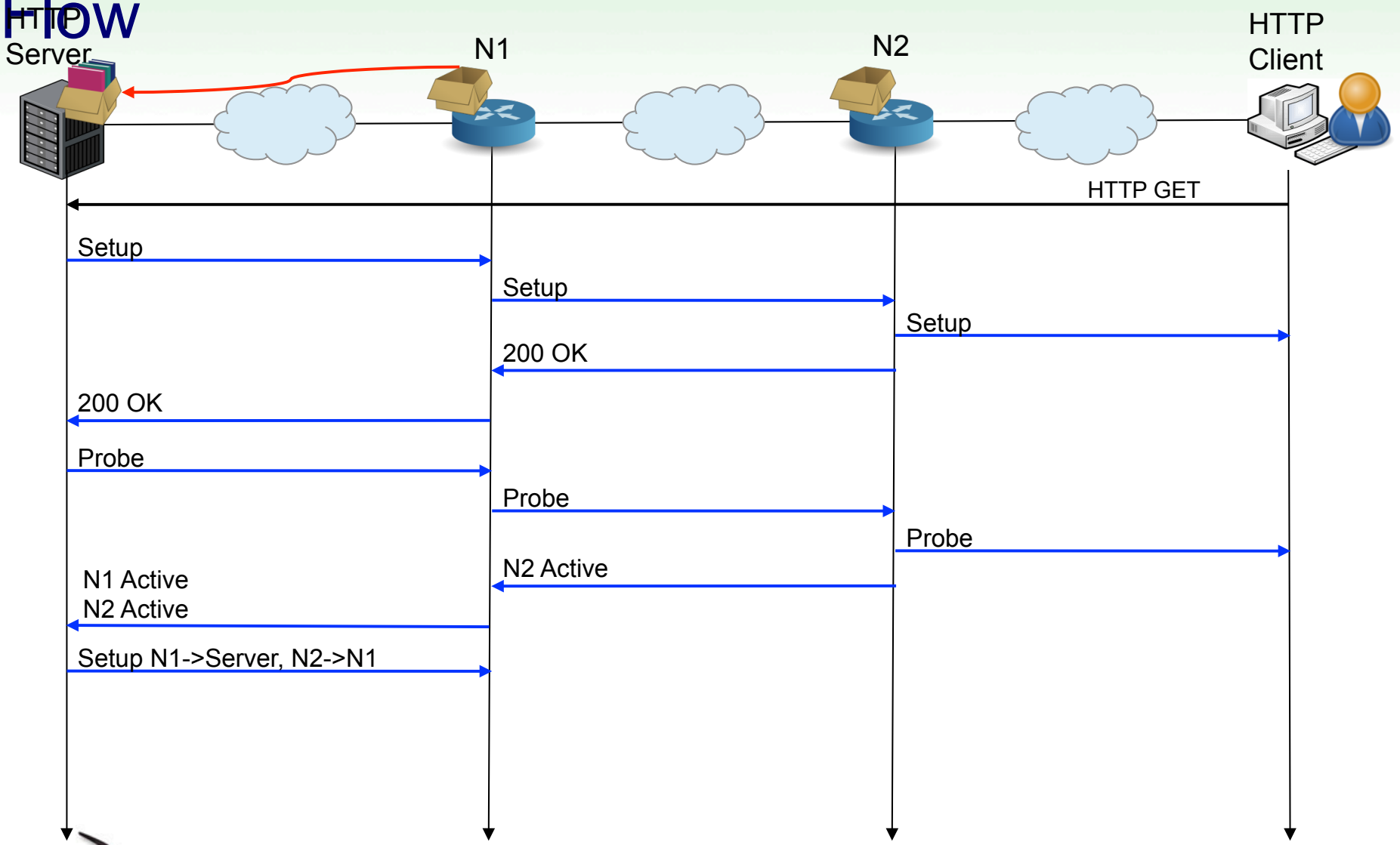

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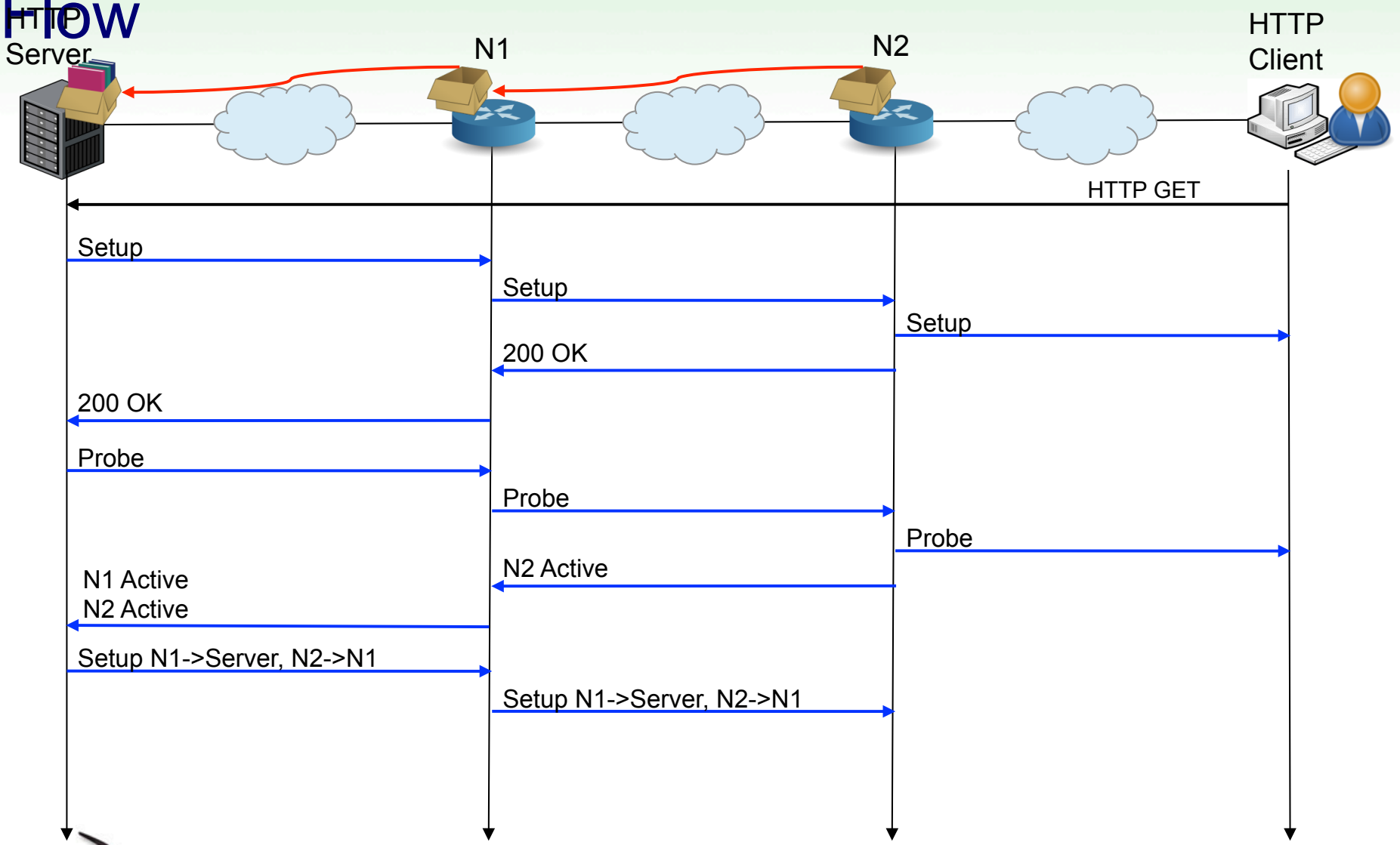

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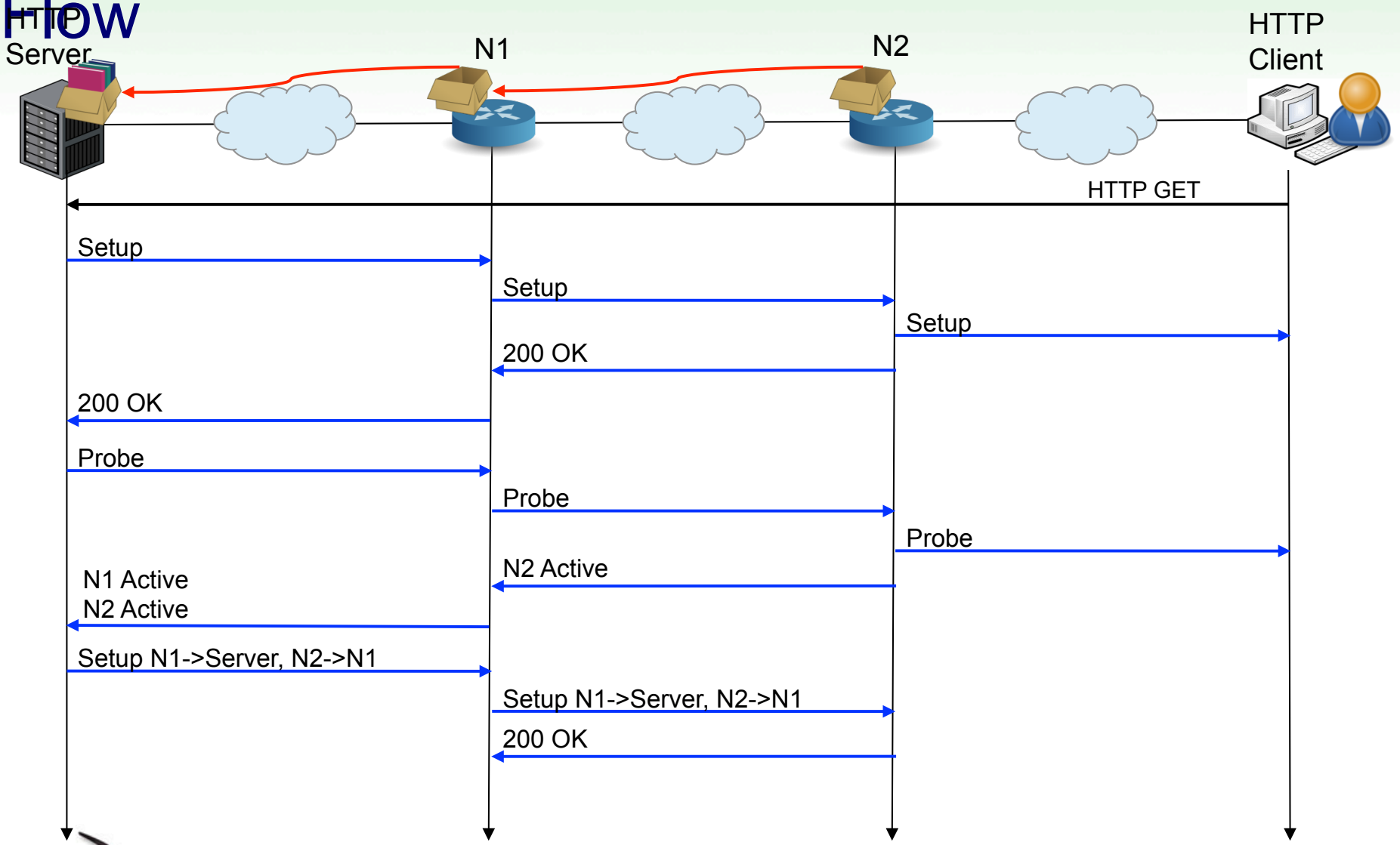

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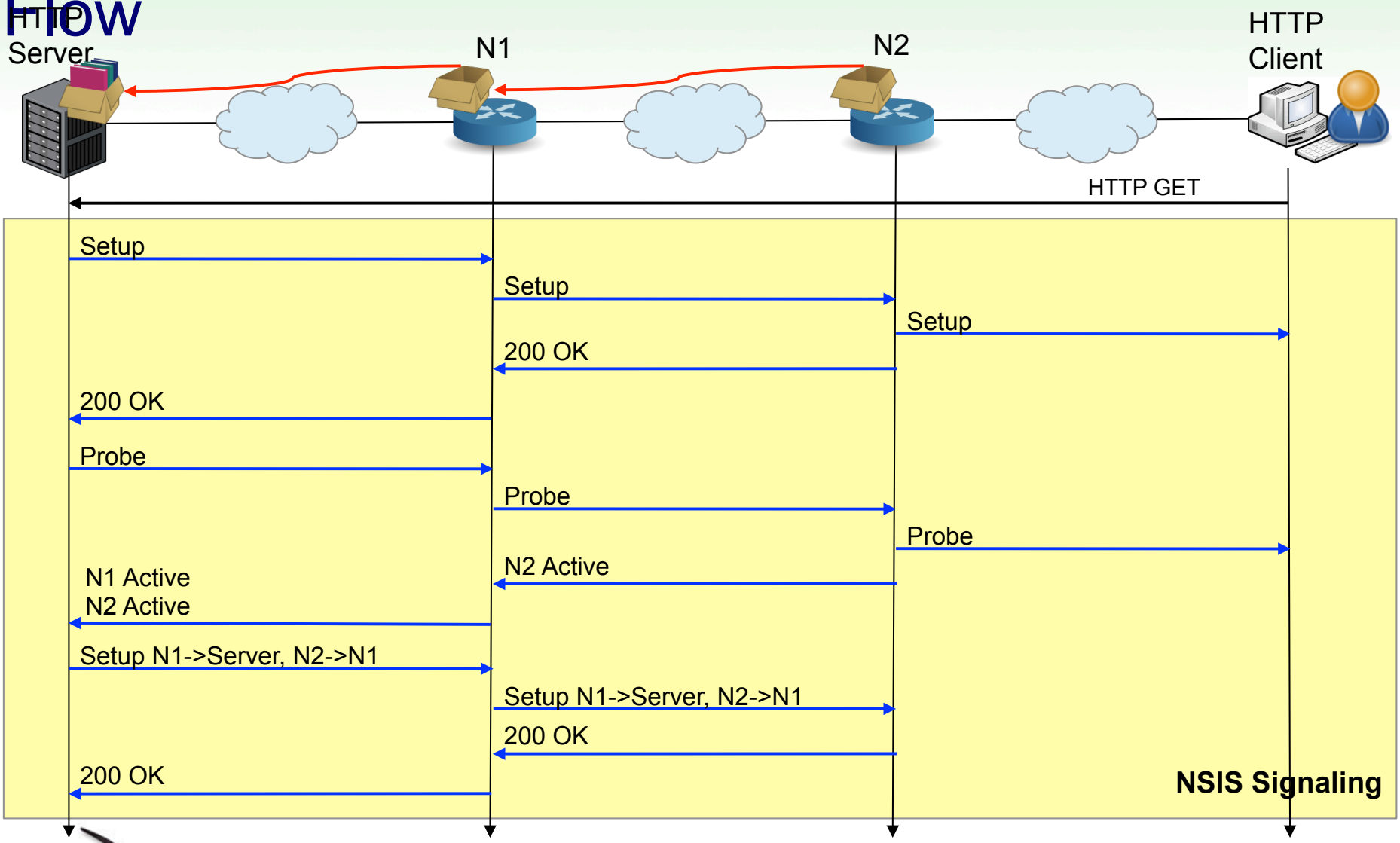

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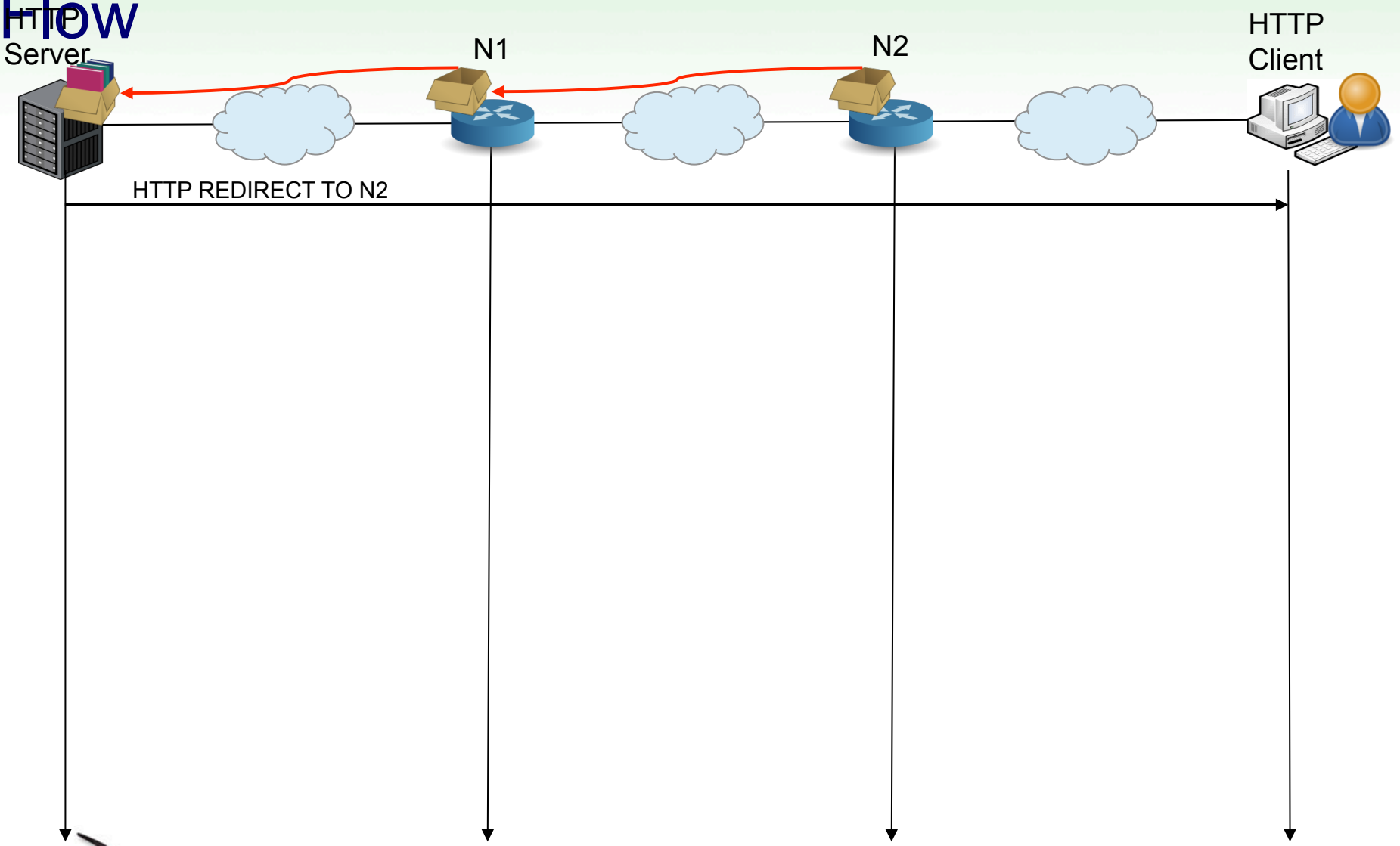

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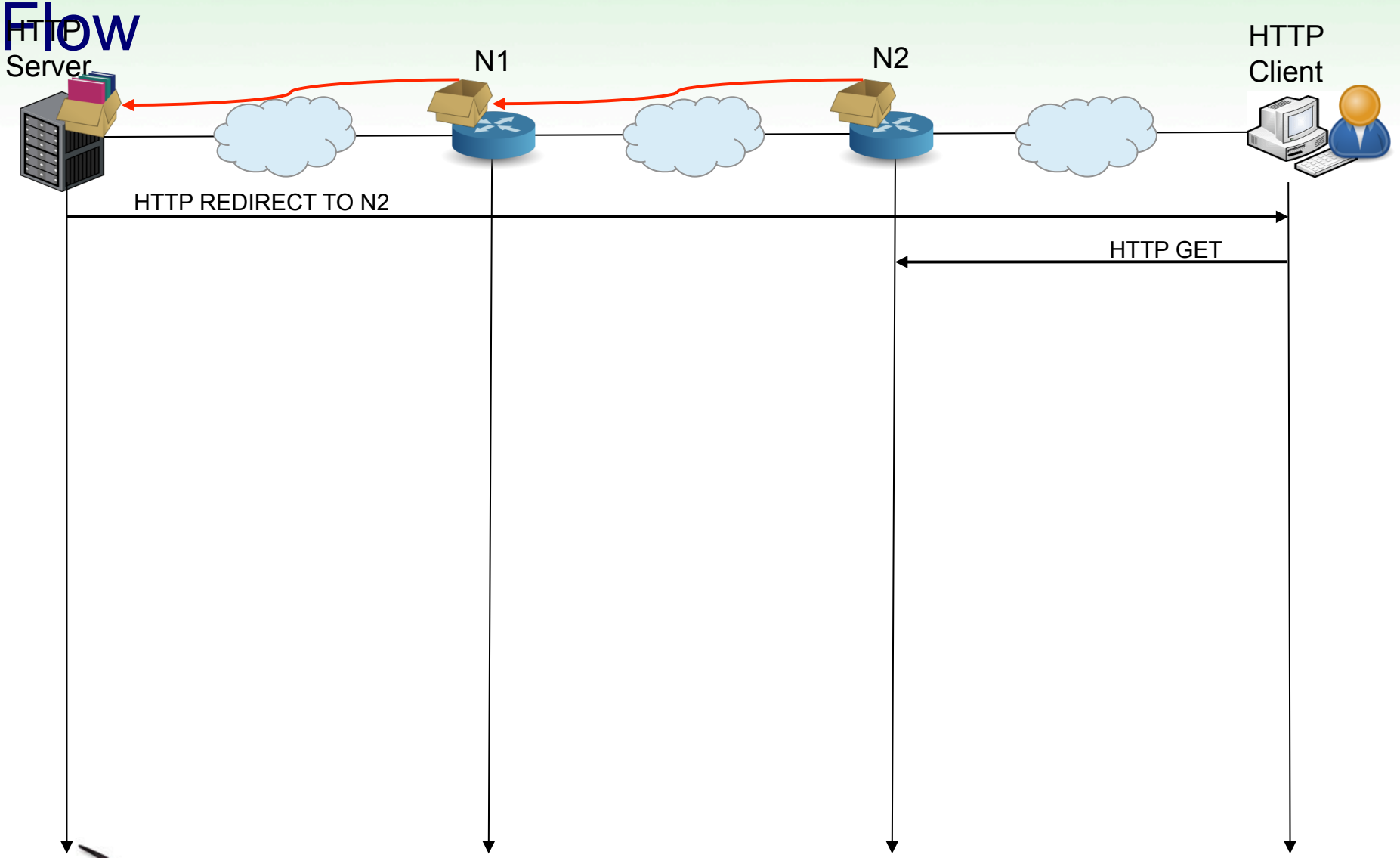

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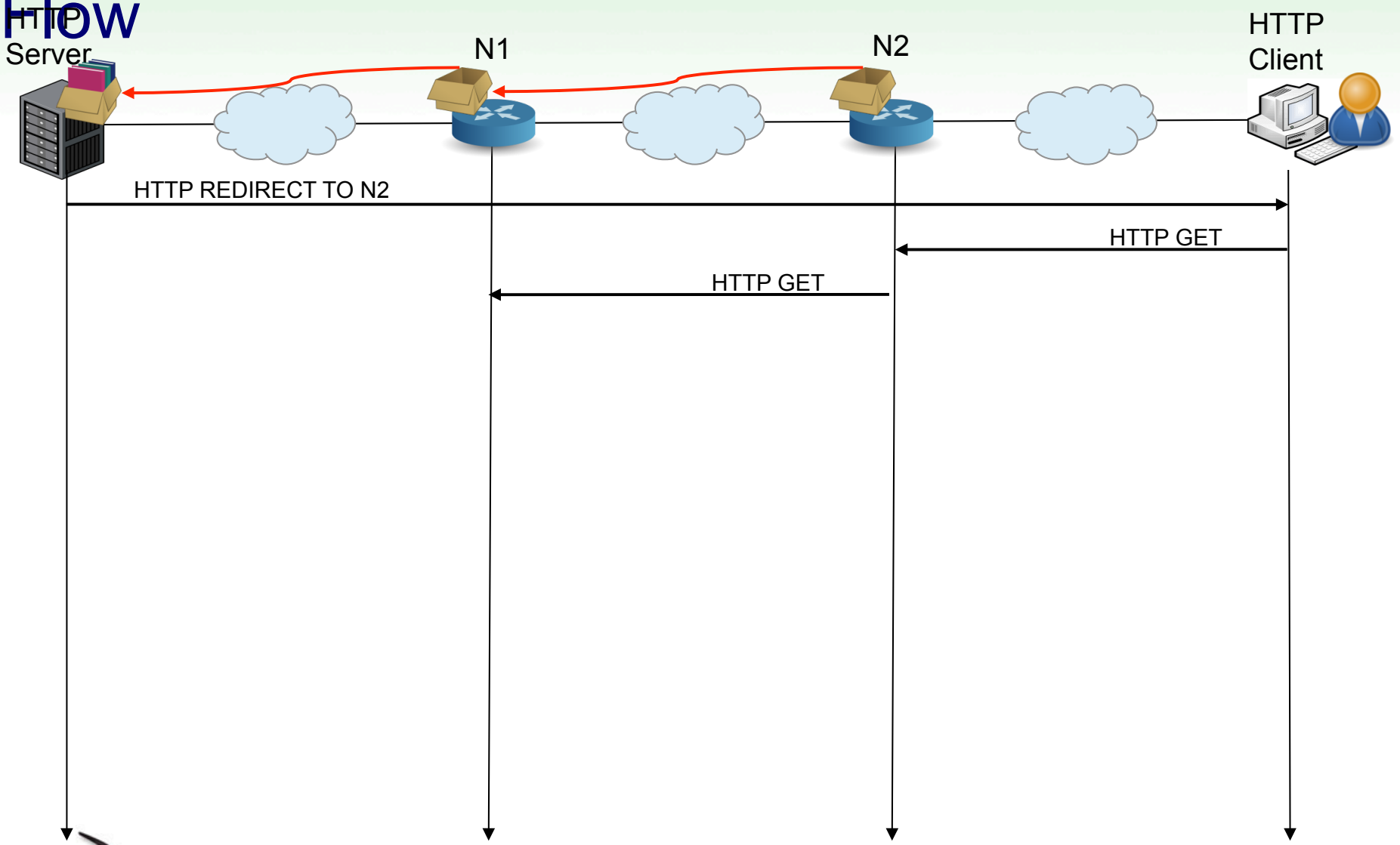

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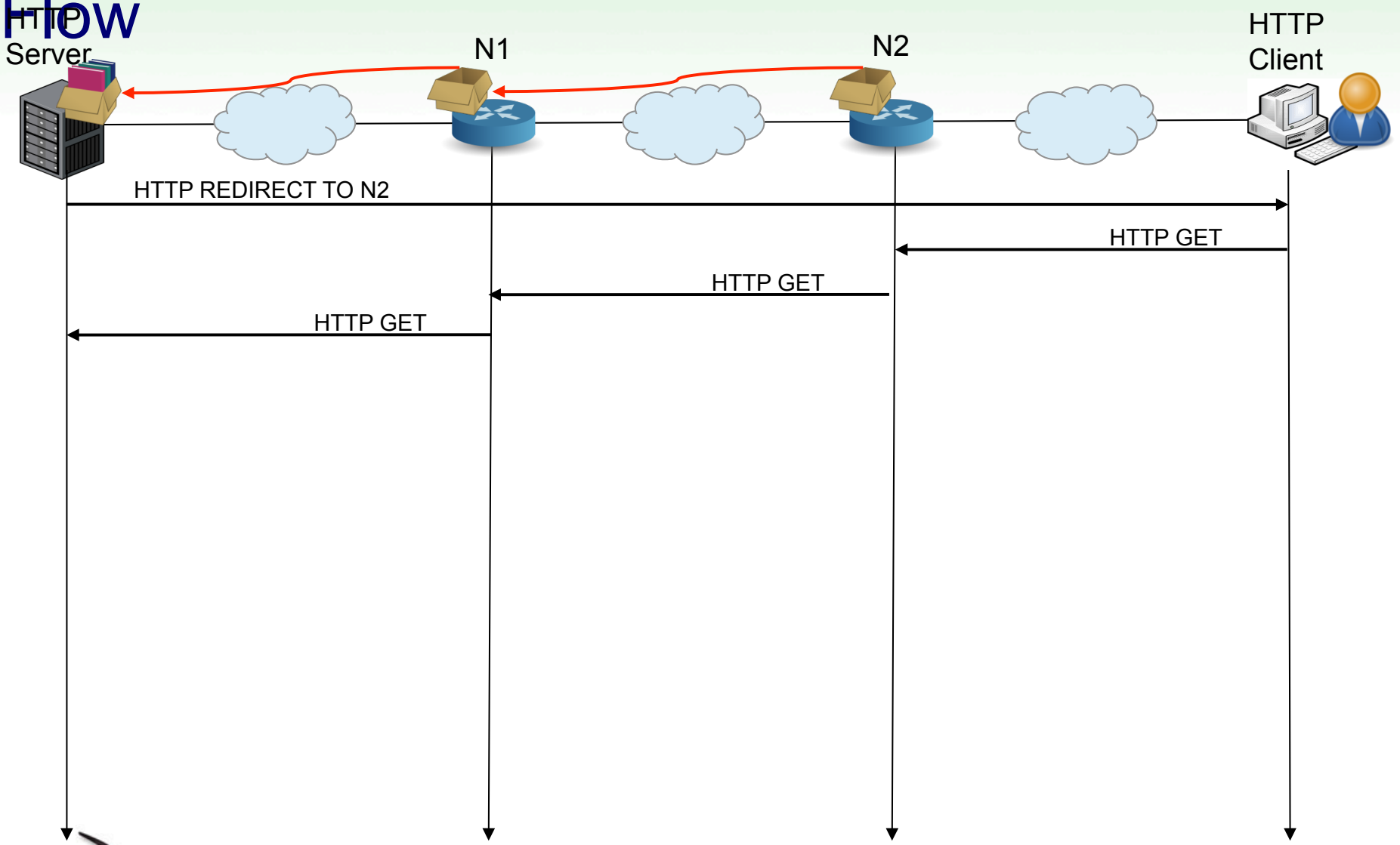

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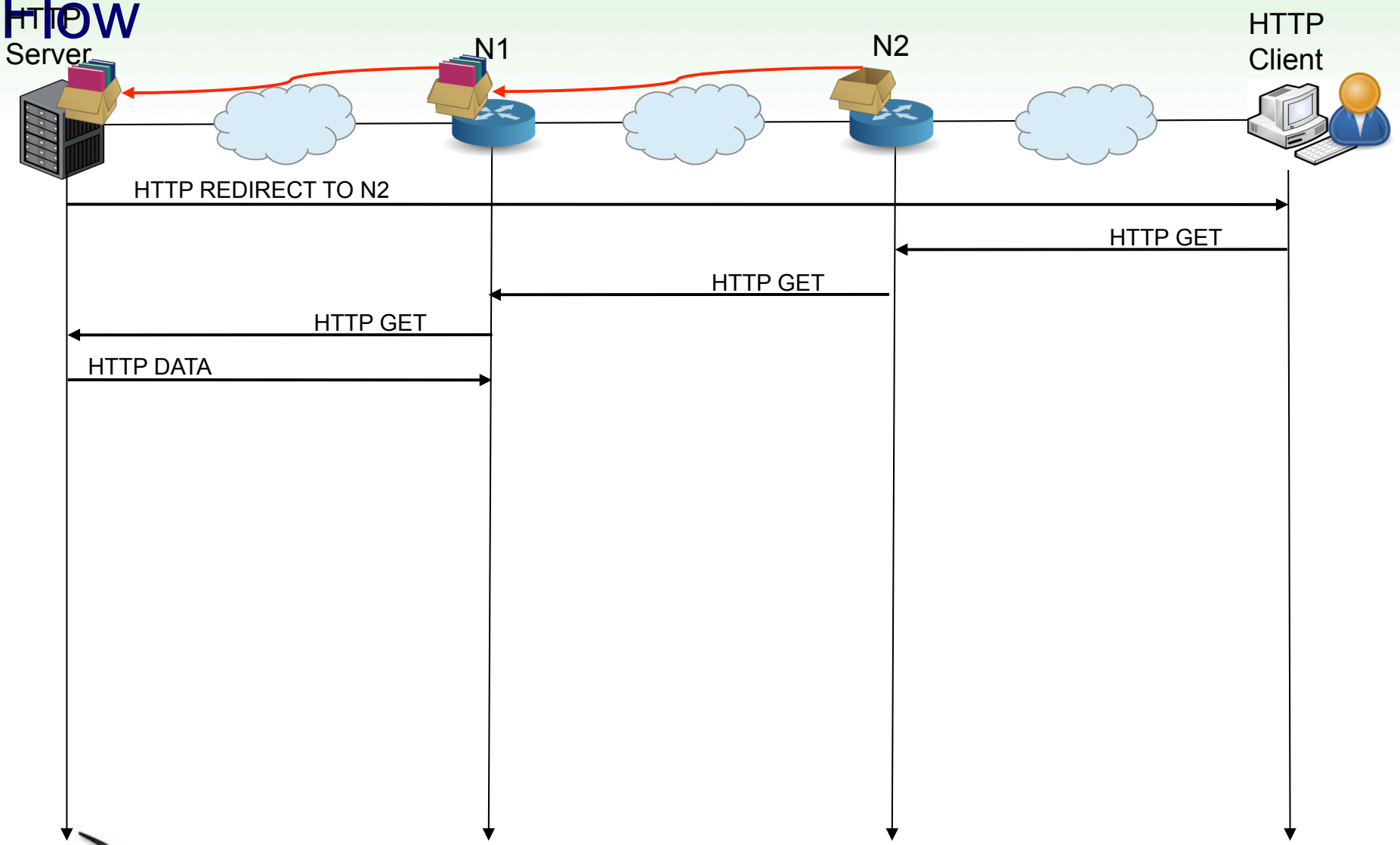

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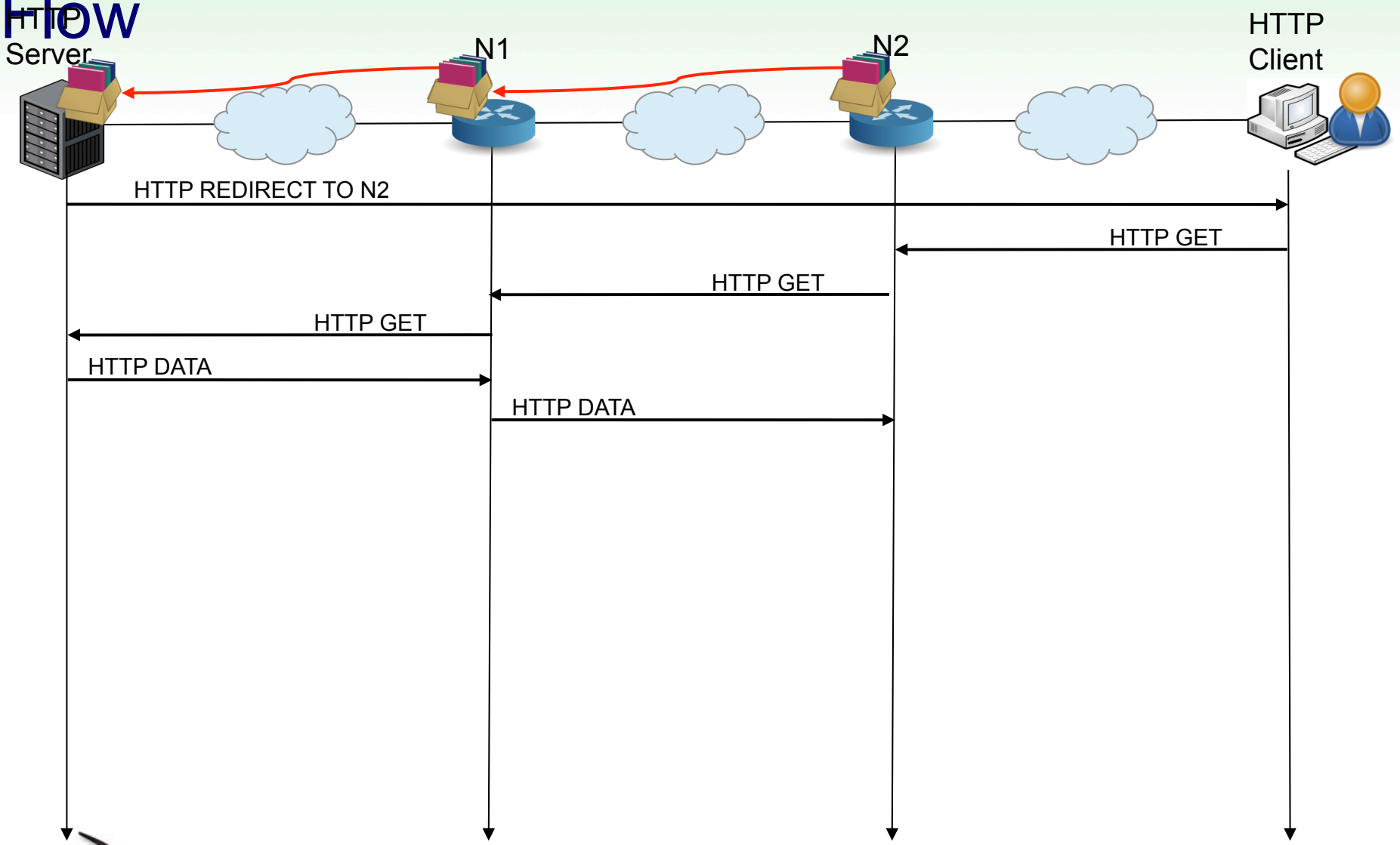

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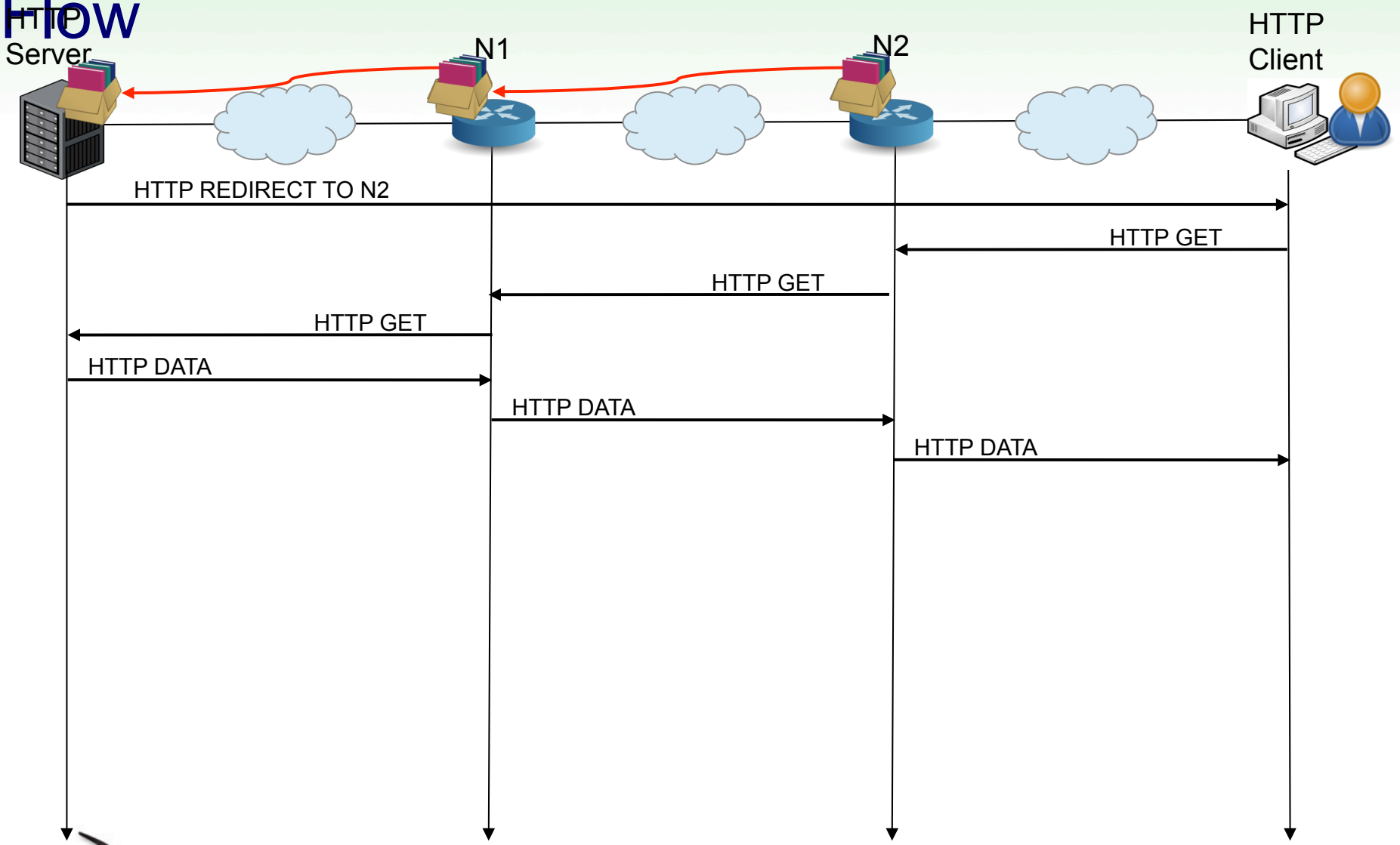

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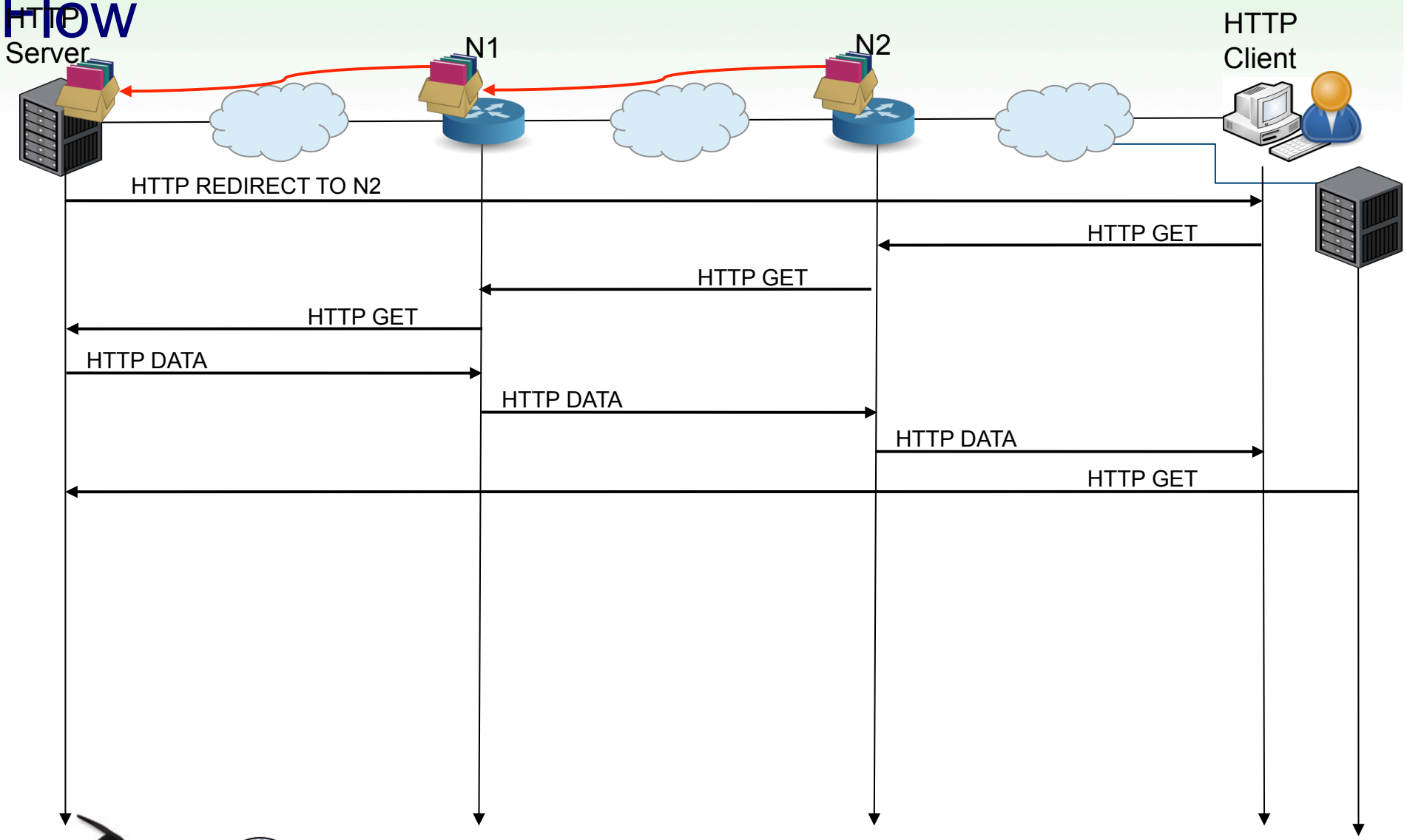

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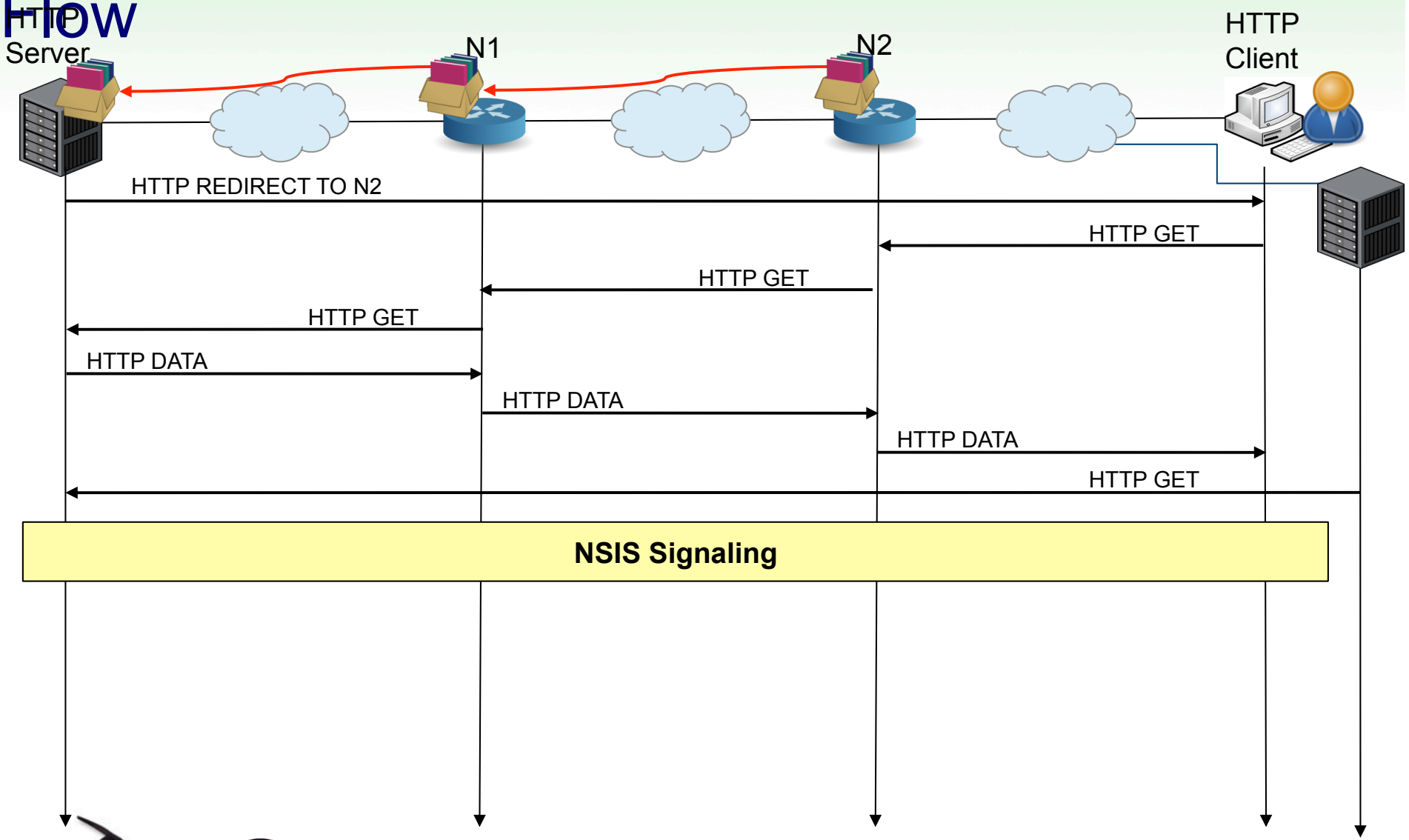

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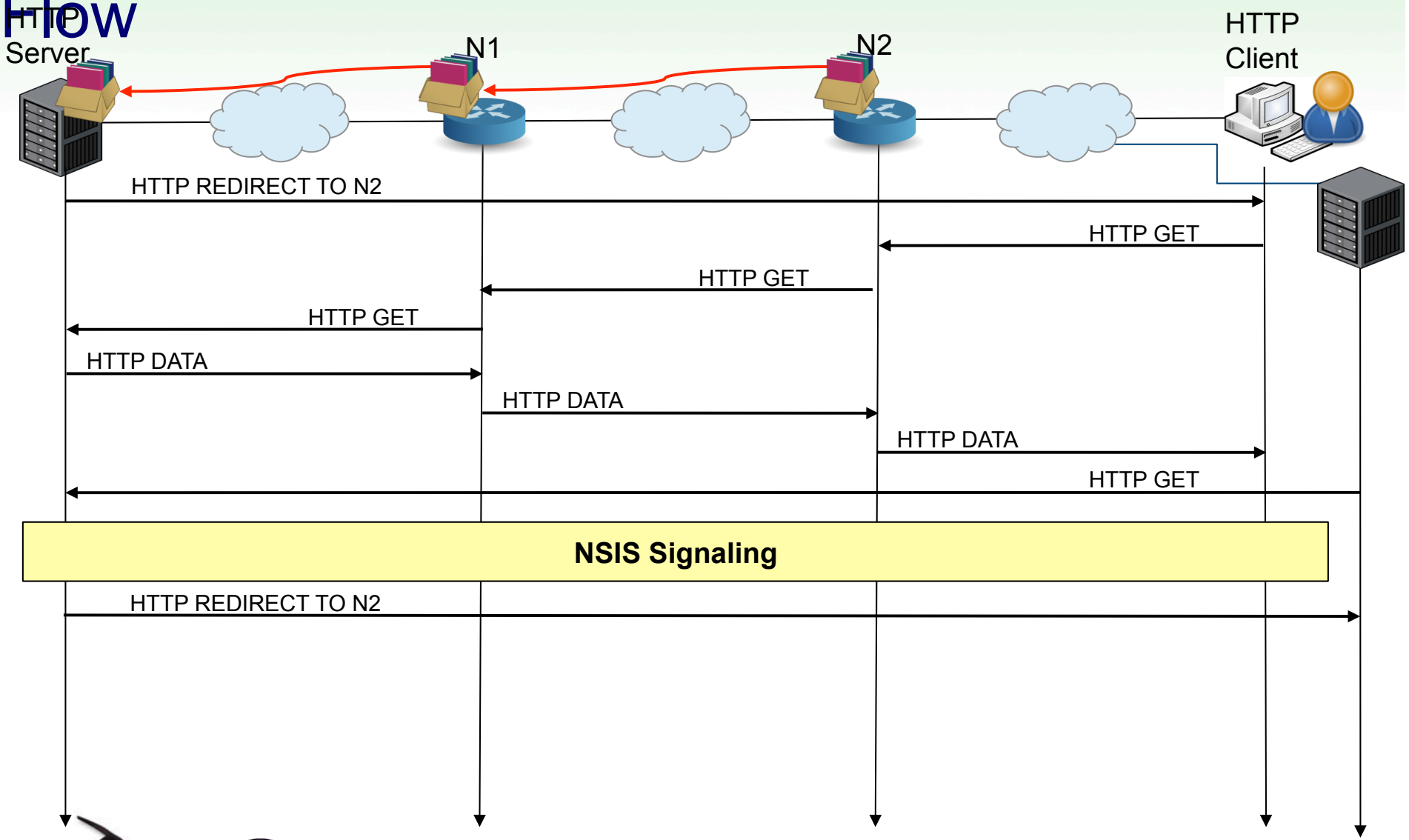

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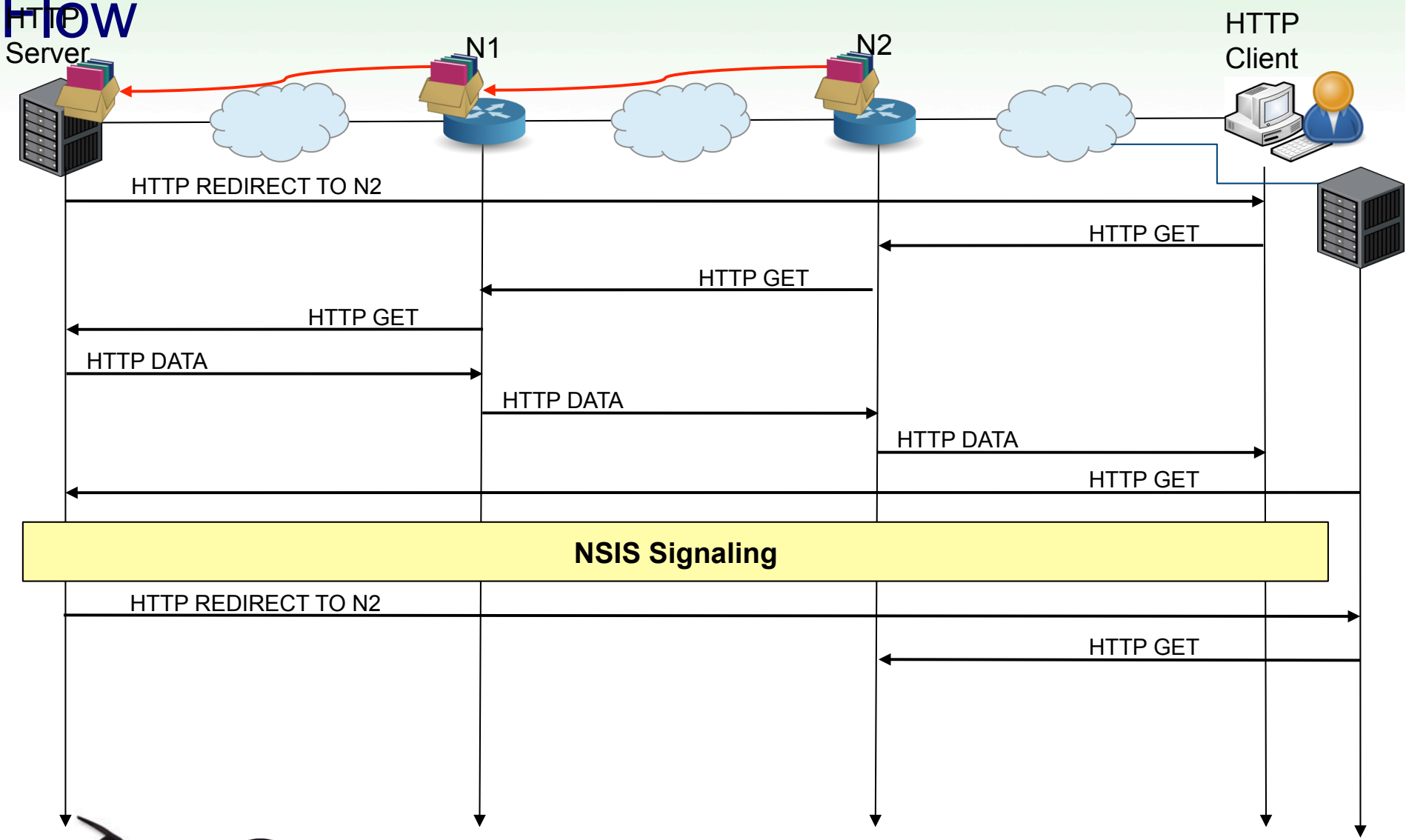

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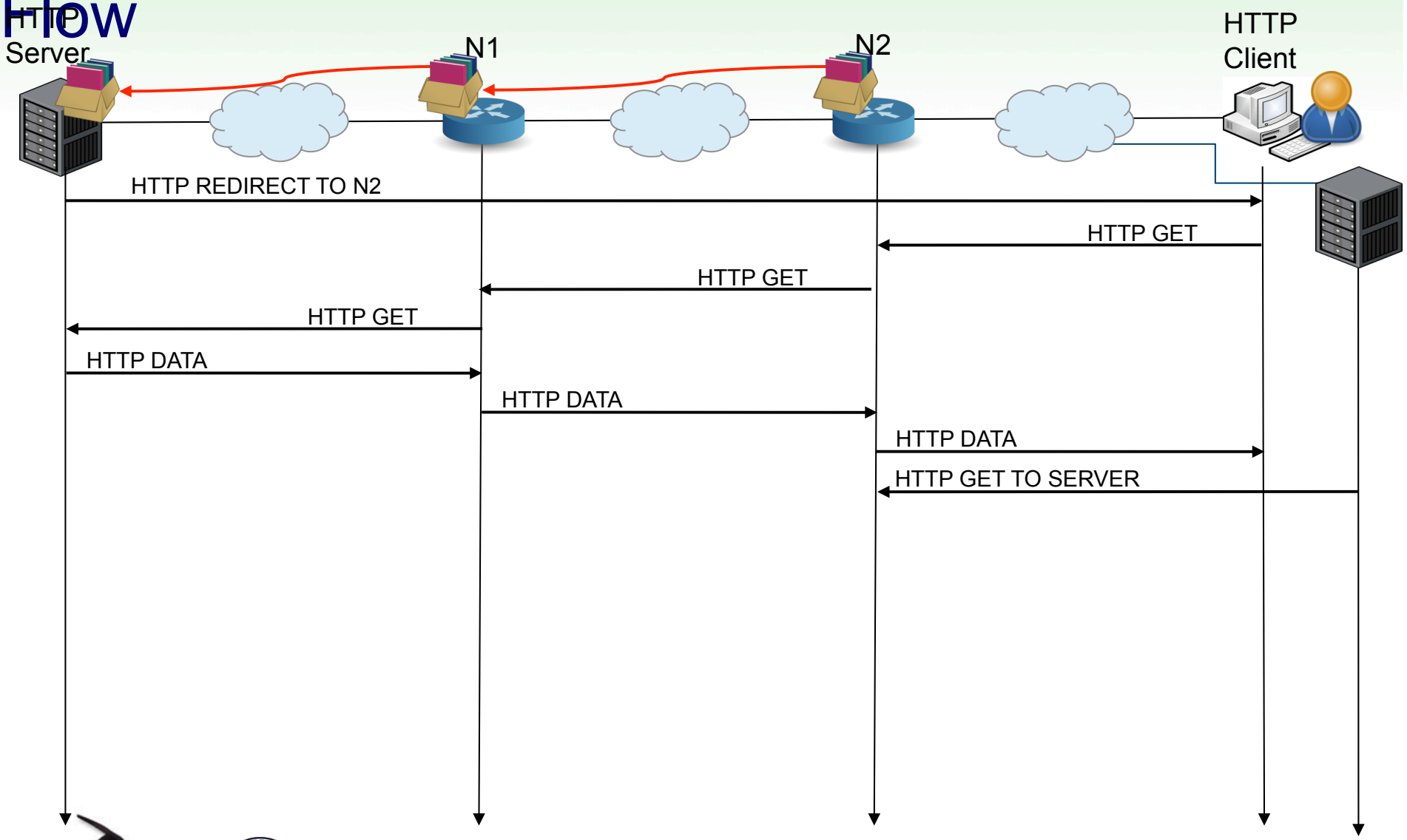

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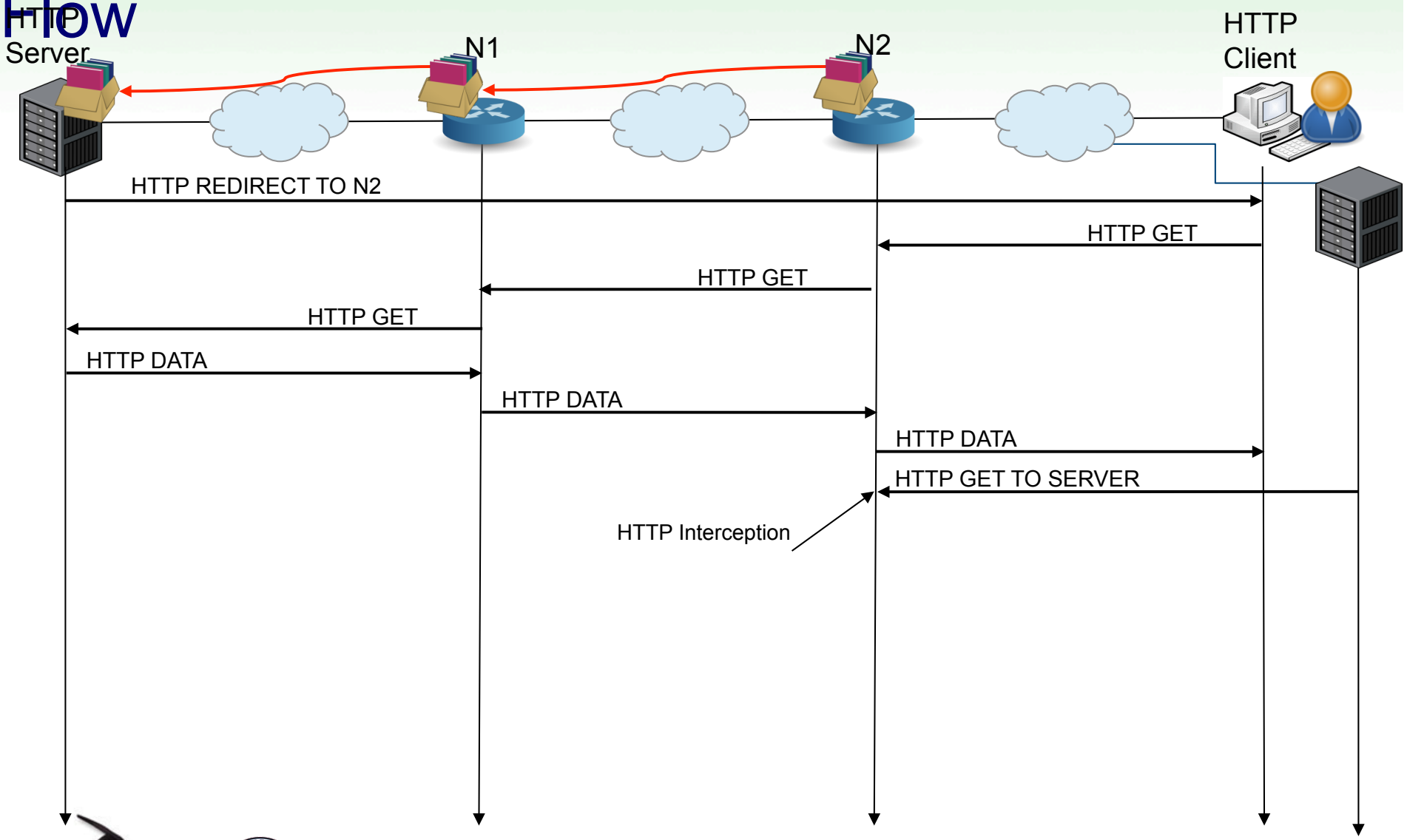

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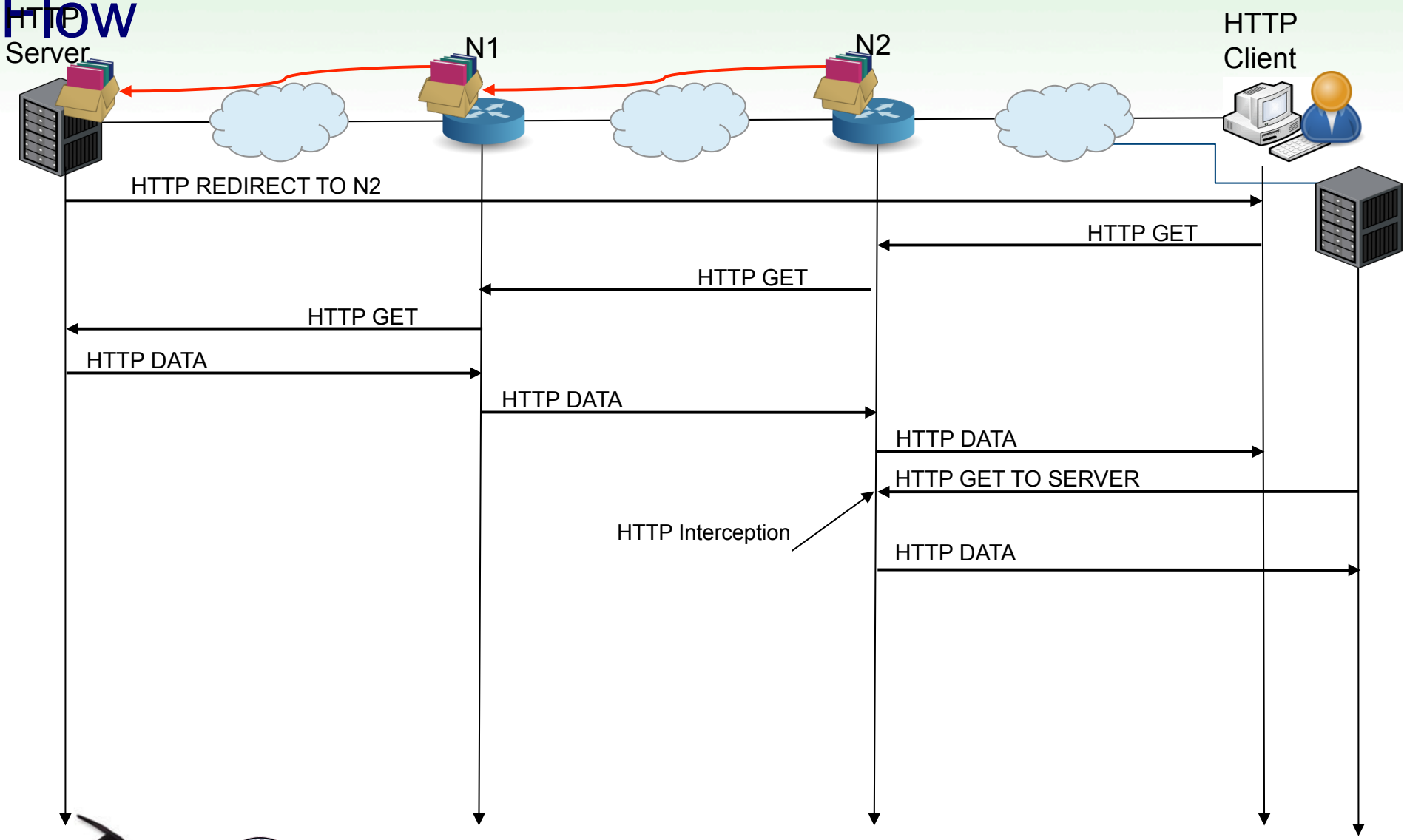
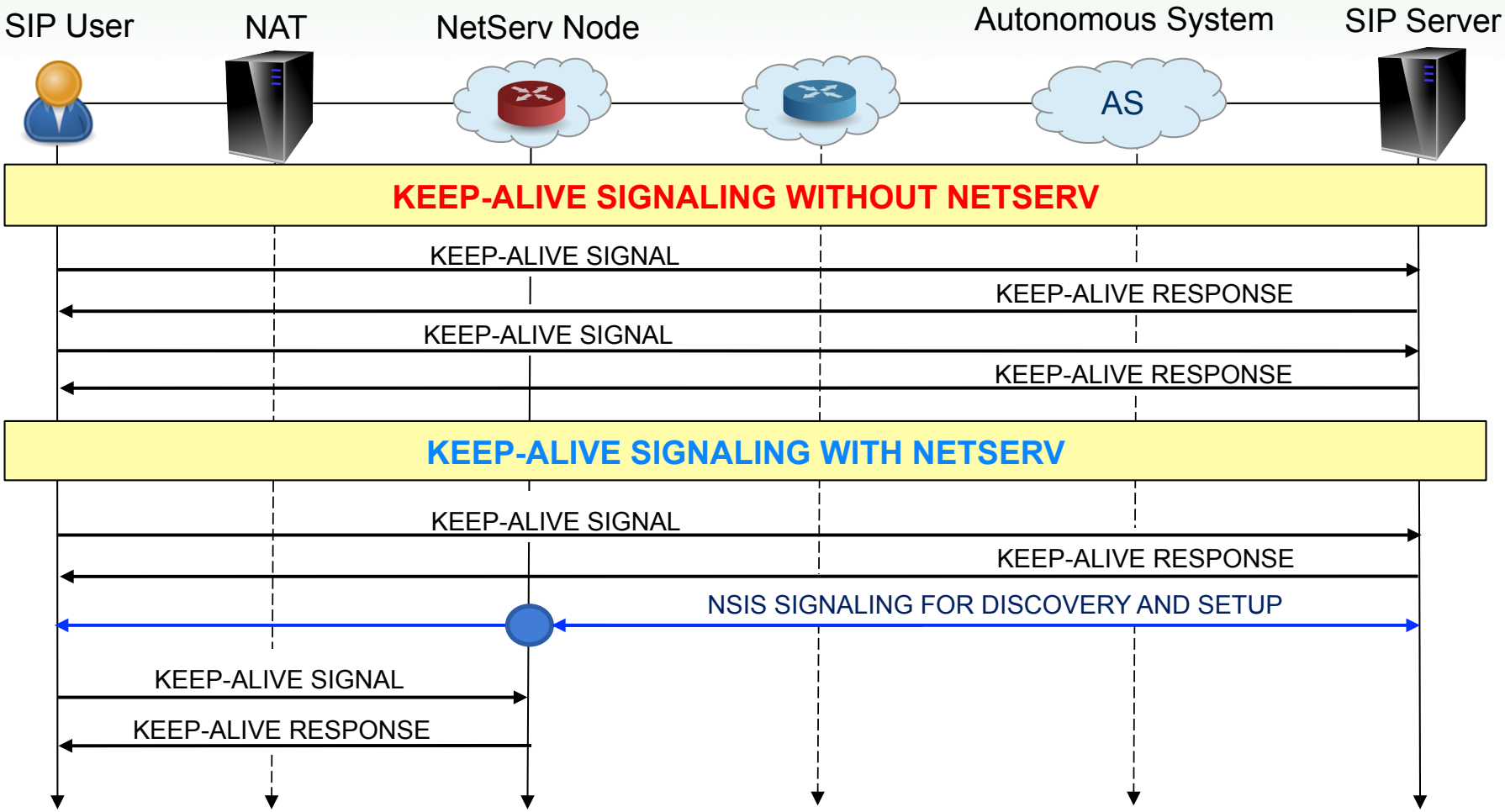


Keep Alive Signaling Flow



Specific Research Objectives

- Integration of off-path extension for NSIS signaling to create more advanced services (dynamic content management & caching).
- Realization of an equivalent router: server/pc with NetServ + switch OpenFlow.
- Porting to Juniper routers through Junos SDK.
- (Time permitting) Porting of the NetServ on android based mobile devices (implementing the hosting the NetServ environment as an Android App) in order to enlarge the applicability of the proposed service architecture and using it as a common base for different and cloud sourcing services.

Thank you!