Topic:

Load balancing

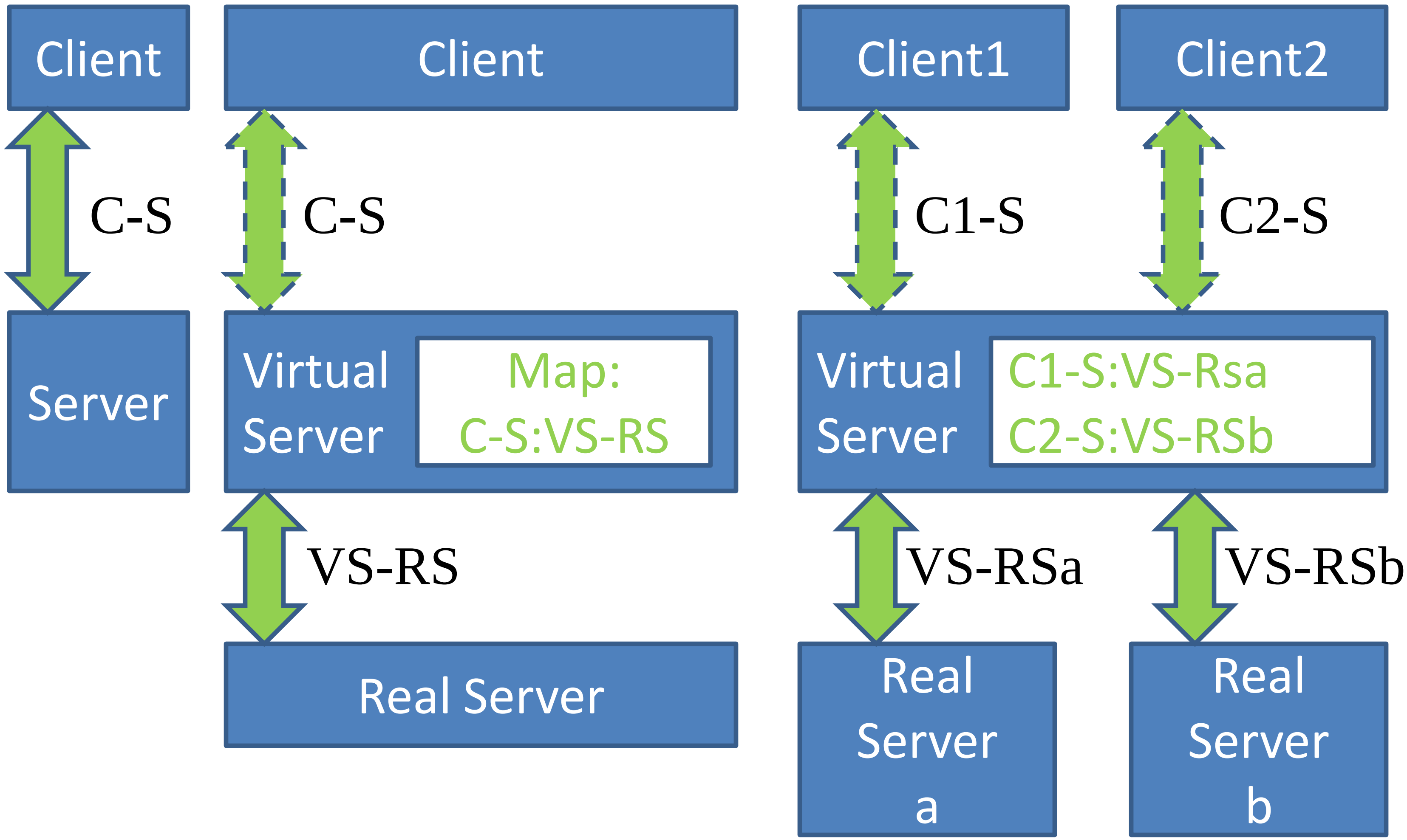
Load balancing

- Servers have resource limitations
- Objectives:
  - Scalability
    - Servers have resource limitations, a single server has maximal load points
    - OS level (multiprocessor, clusters): expensive
    - Add or remove additional servers transparently
  - Availability
    - Replace defective components: only subset of users impacted
    - But not High-Availability (HA): other measures required
- Secondary
  - Transparency
    - “Virtual server”

Load Balancing solutions

- Effective load balancing:
  - Measure availability
    - Health monitoring
    - System availability: ping
    - Service availability: service ping
  - Measure "load"
    - Load = resource usage: CPU, disk, ...
- Transparency
  - Server side state
    - Managed on a server instance:
      - requires persistence
      - Each packet /message of connection to same server
      - Problem with higher level sessions (higher than LB mechanism)
    - State distribution
      - Central state store (new problem point)
      - Cost of state migration

General principle



Load balancing systems

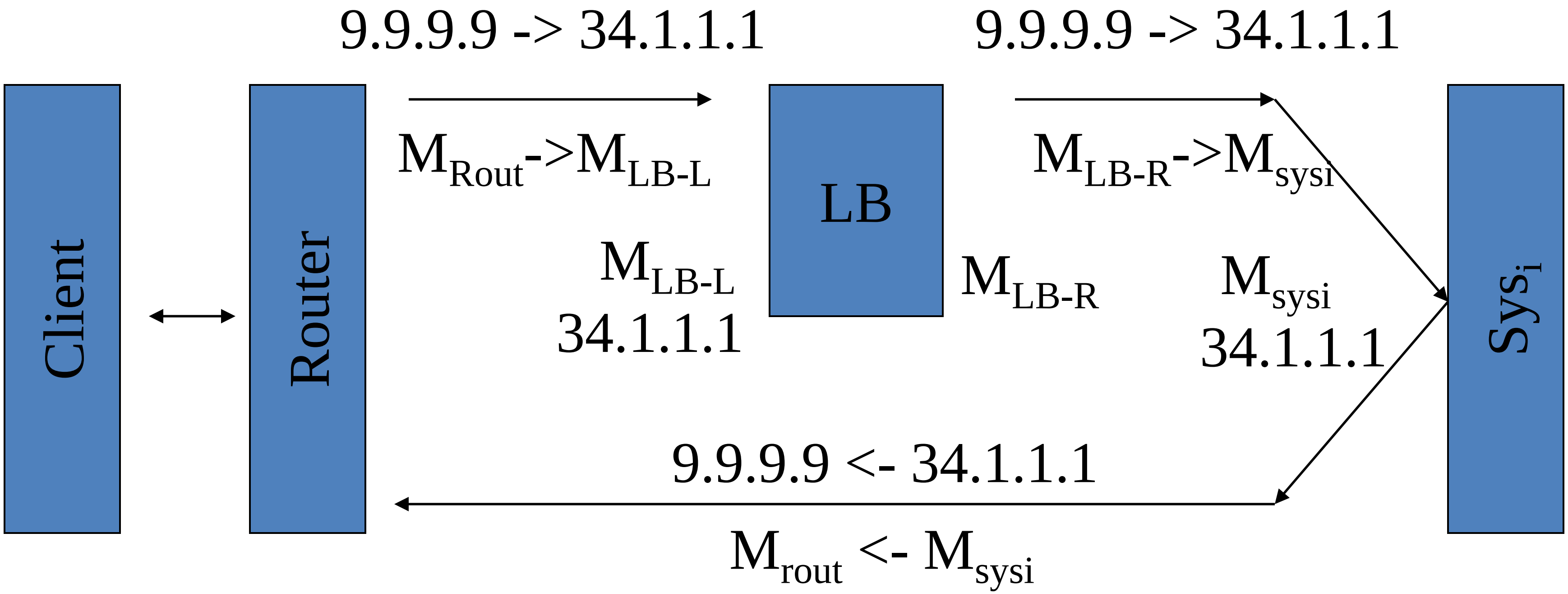
- Four main hooks for network load balancing:
  - ARP
    - Different MACs for single IP
  - NAT
    - Different mappings for same IP
  - DNS round robin
    - Different IPs for same DNS name
  - Proxy
    - Different back-ends for same proxy request

- Many vendors of solution: Alteon, F5, Cisco, Resonate, Radware, ...

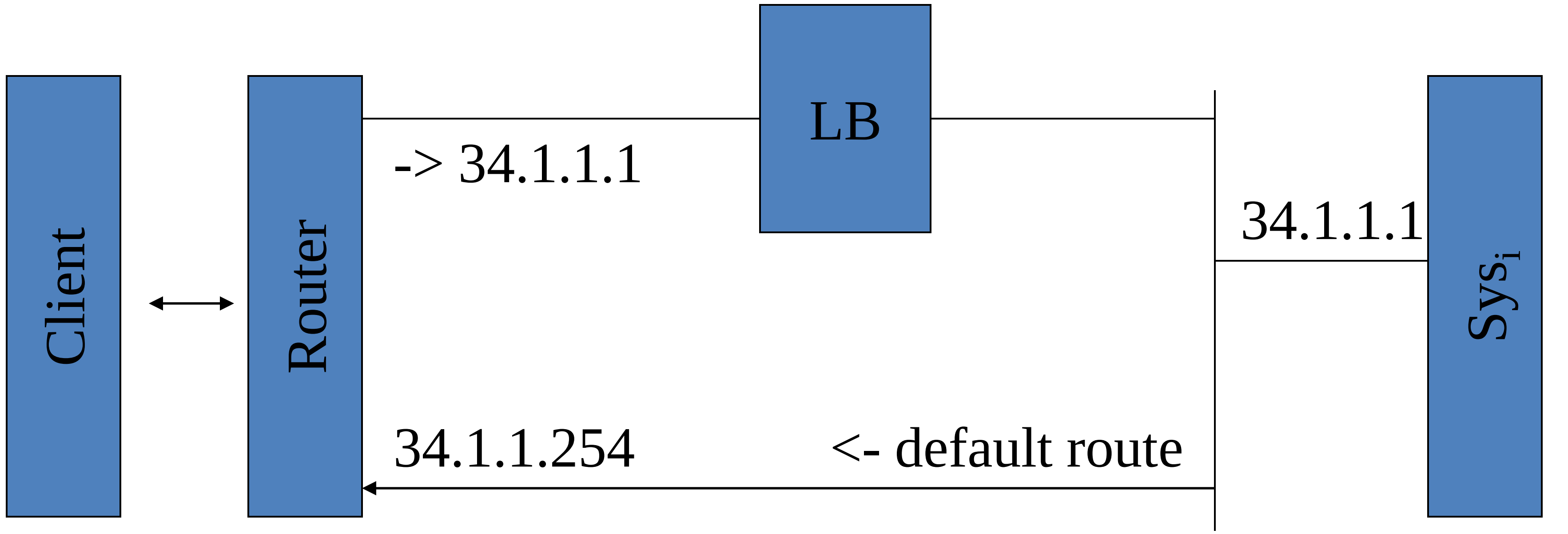
ARP

- IP address: map one IP to multiple MAC addresses
- Keep track of sessions: which MAC for which TCP session
- Note: optimization
  - Short requests, long replies: only request via load balancer, replies: direct
- Examples: Cisco local director, F5 BIG IP

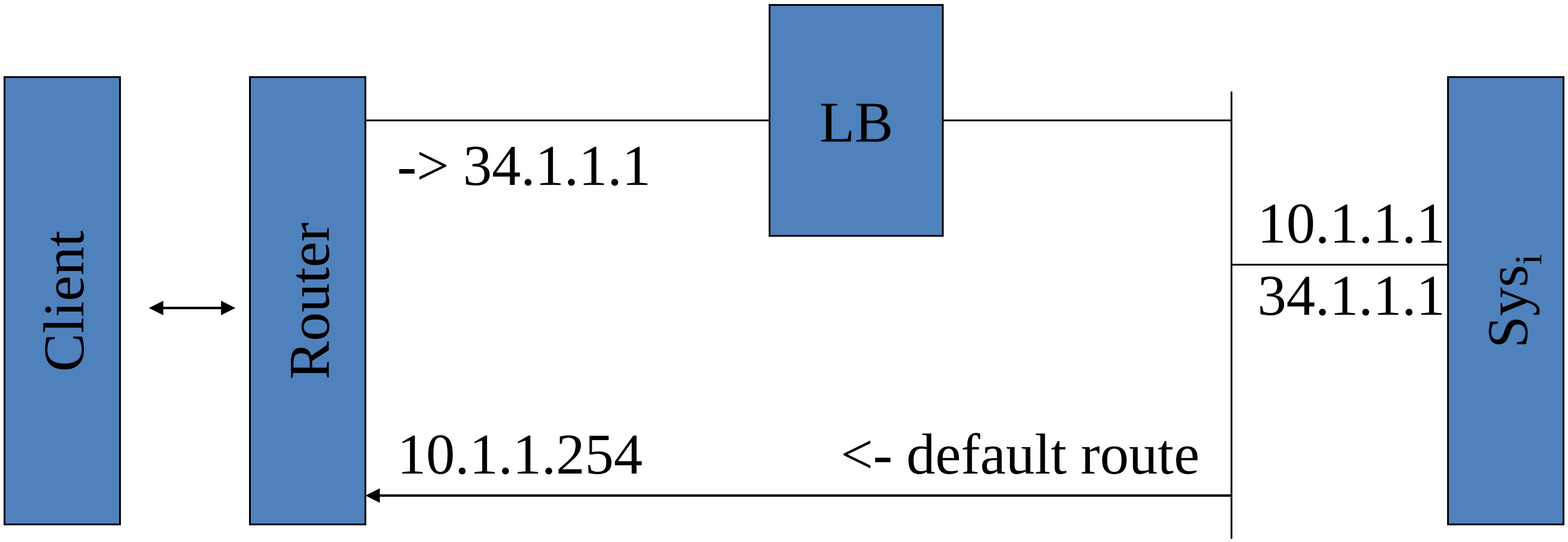
ARP: roundtrip



ARP: routing



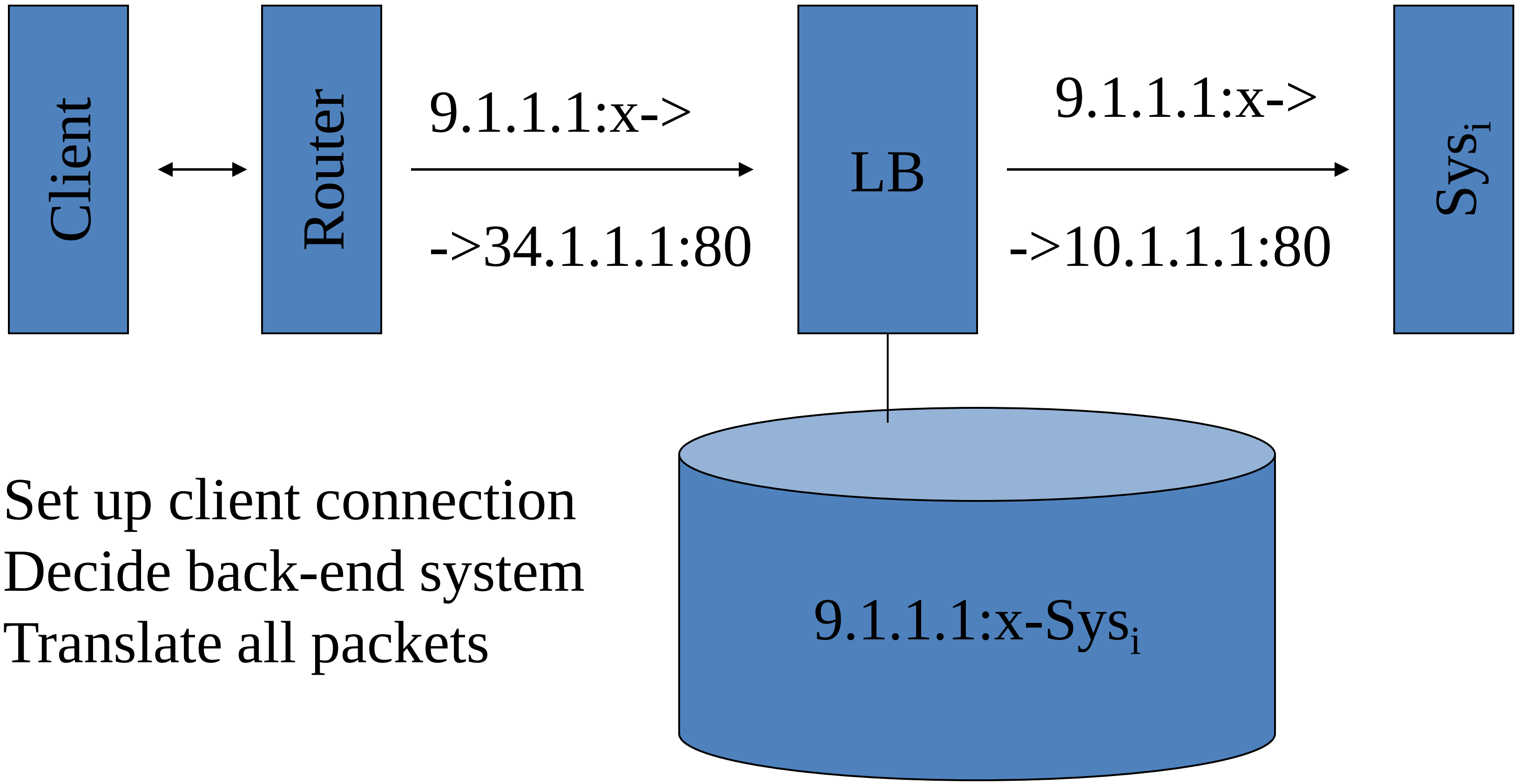
ARP: multiple IPs



NAT based load balancing

- Virtual IP incoming
- Translate to multiple internal IP addresses
- Keep session state
- FW-1, BIG IP

NAT: roundtrip



- Set up client connection
- Decide back-end system
- Translate all packets

DNS round robin

- Do not allow caching of DNS – IP mapping
- Hand out IPs in round-robin mode
- Statistical loadbalancing
- Cisco Distributed Director, 3DNS

Proxy

- Connections forwarded to different IPs
- HTTP reverse proxies
  - Host: a = server a/ Host: b = server b
  - Map:
    - /images: http://a/images
    - /doc: http://b/doc