Load Balancing

Load Balancing

- Most performance problems are related to competition for shared resources (processor, memory, disk, network capacity, etc.)
- Load balancing allows applications to proceed concurrently without all competing for the same resources
- Simple example: distribute application load between server and browser
  - e.g. JavaScript to validate user form input in browser to avoid repeated validation round-trips to server

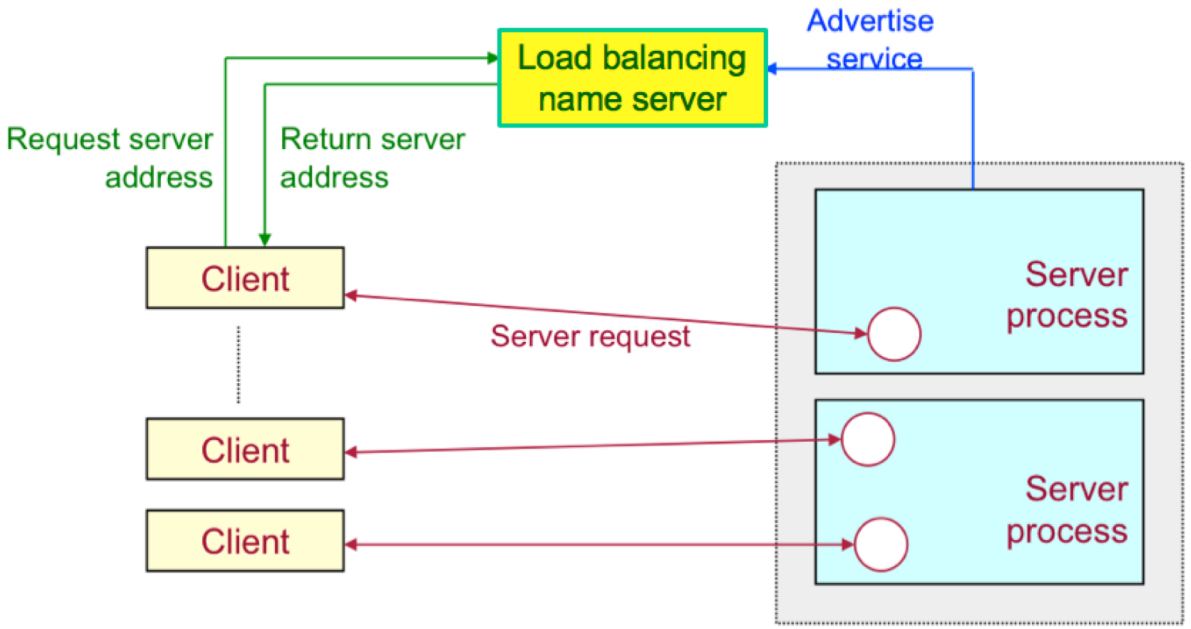
Server load balancing architecture

- Imagine a distributed environment containing:
  - Several clients
  - Multiple replicated servers that can serve client requests
- How are client requests balanced across the servers?

  => This is the essential task of load balancing

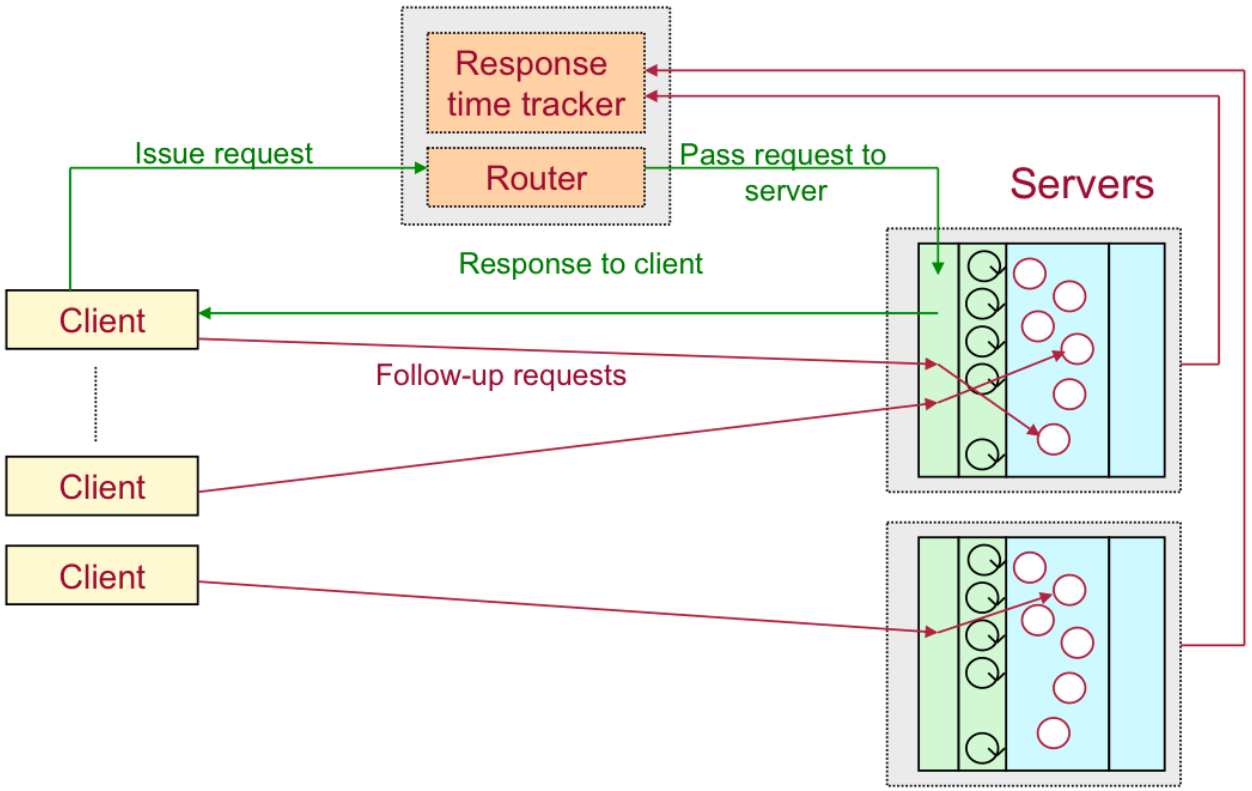
Server load balancing architecture – example 1

- Client calls on name server to find the location of a suitable server
- Name server can spread client objects across multiple servers
  - Often ‘round robin’
- Client is bound to server until it decides to request new address from name server



Server load balancing architecture – example 2

- Client calls load balancing router when issuing request
- Router passes request to chosen server
- Follow up dialogue directly from client to same server

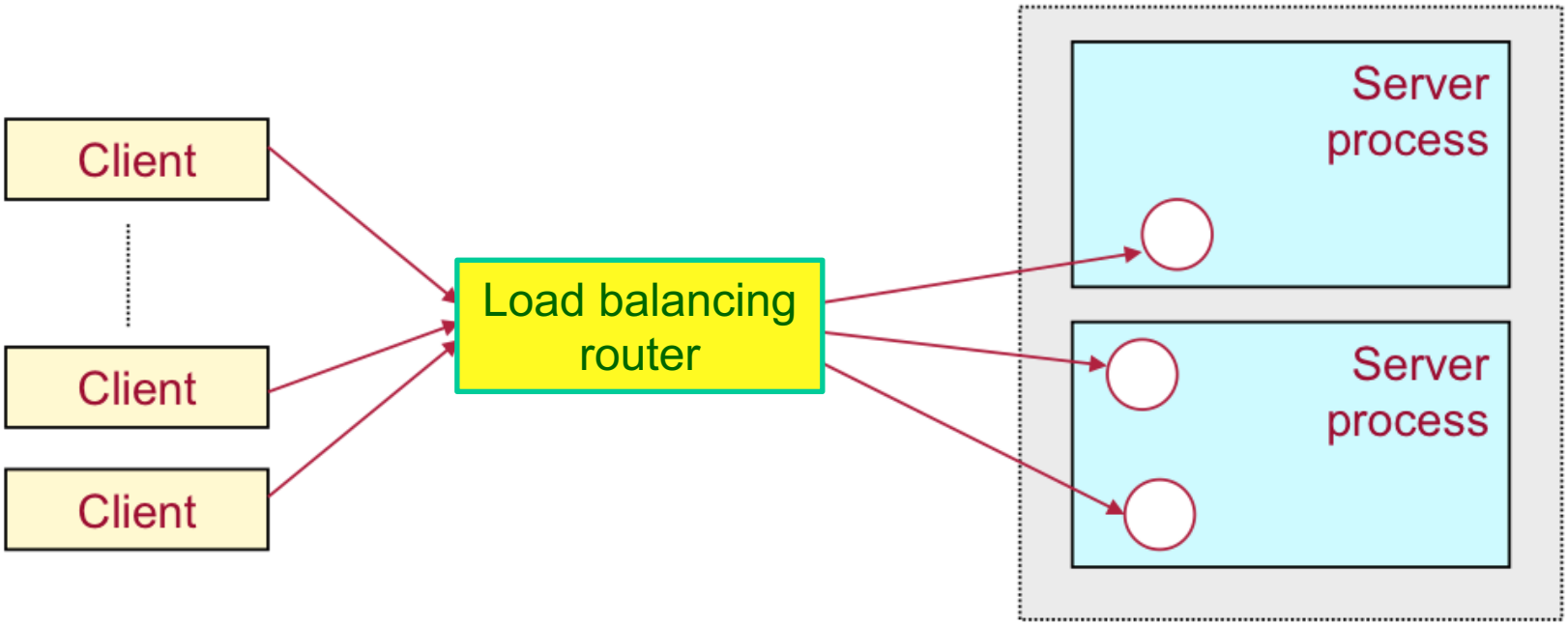


Server load balancing architecture – example 2

- Scales well …
  - Router only involved when request is issued
  - Follow-up dialogue directly from client to same server
    - Good for handling state
  - Initial server allocation based on response time
    - Client allocated to least-loaded server
- But …
  - No support for dynamic re-balancing as server load changes

Server load balancing architecture – example 3

- Some systems involve the router in every browser request
  - Request goes to router who then passes it on to a server process
  - Router can be a bottleneck here
    - Need to consider router scalability and fault tolerance as well!



Scheduling algorithms – **server** selection

- Several approaches, including:
  - Round robin
    - Apply each successive request to each server in turn
  - Highest response time
    - Based on monitoring server performance
  - Lowest load
    - Based on monitoring server resource utilisation
  - Match request size to server performance
  - Match request priority to server performance/availability
  - Combination of the above

Scheduling algorithms – **request** selection

- Several approaches, including:
  - First come first served
  - Priority queueing
    - Maintain a number of request queues with different priorities
    - e.g. a service like Tickemaster might like to complete work-in-progress bookings before admitting new ones
  - Shortest job first
    - Prioritise request with lower resource requirements
    - Risks request *starvation* – long jobs never processed
  - Shortest remaining time
    - Prioritise request where overall session/transaction is closest to completion

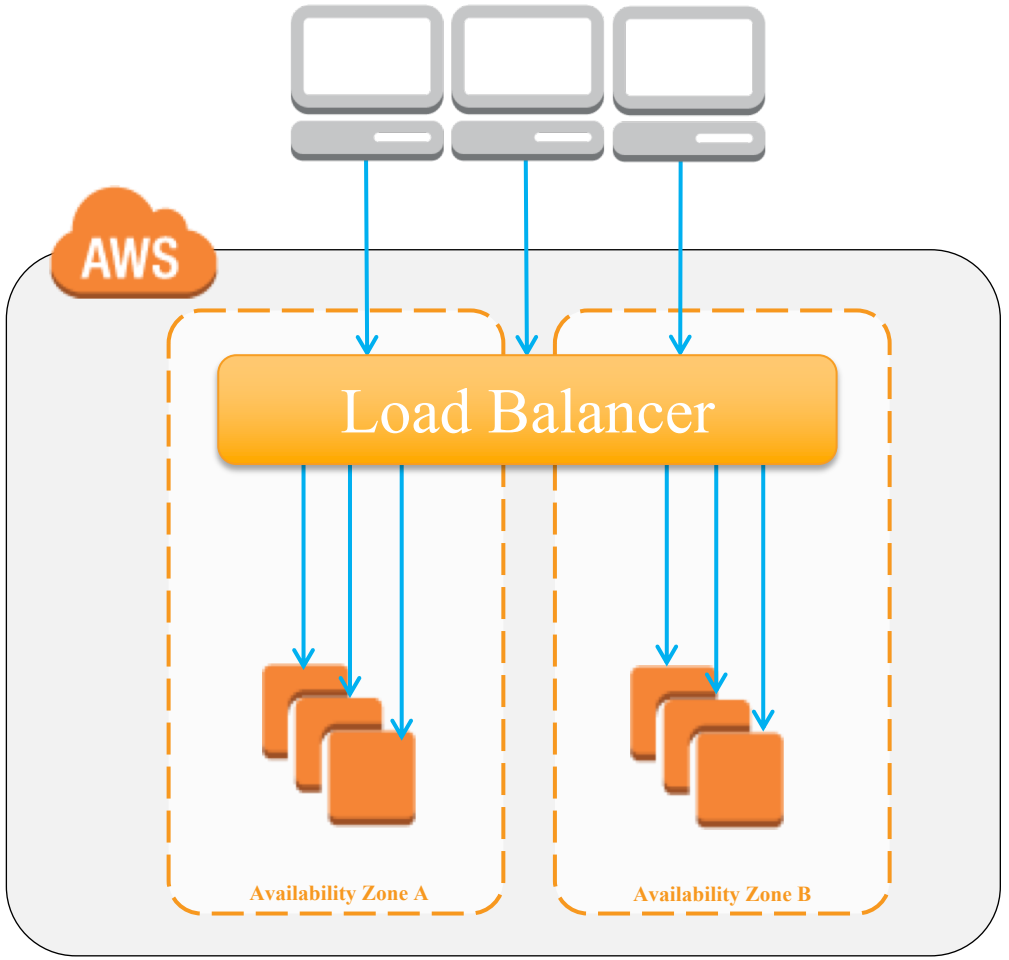
AWS Elastic Load Balancing

Elastic Load Balancing

- Distributes traffic across multiple EC2 instances, in multiple Availability Zones (AZs)
- Supports health checks to detect unhealthy Amazon EC2 instances
  - Traffic no longer routed to instances that are not responding adequately
- Routes and load balances HTTP, HTTPS and TCP traffic to EC2 instances
- Region-specific but not dependent on specific AZ
  - A "highly available" AWS-managed service

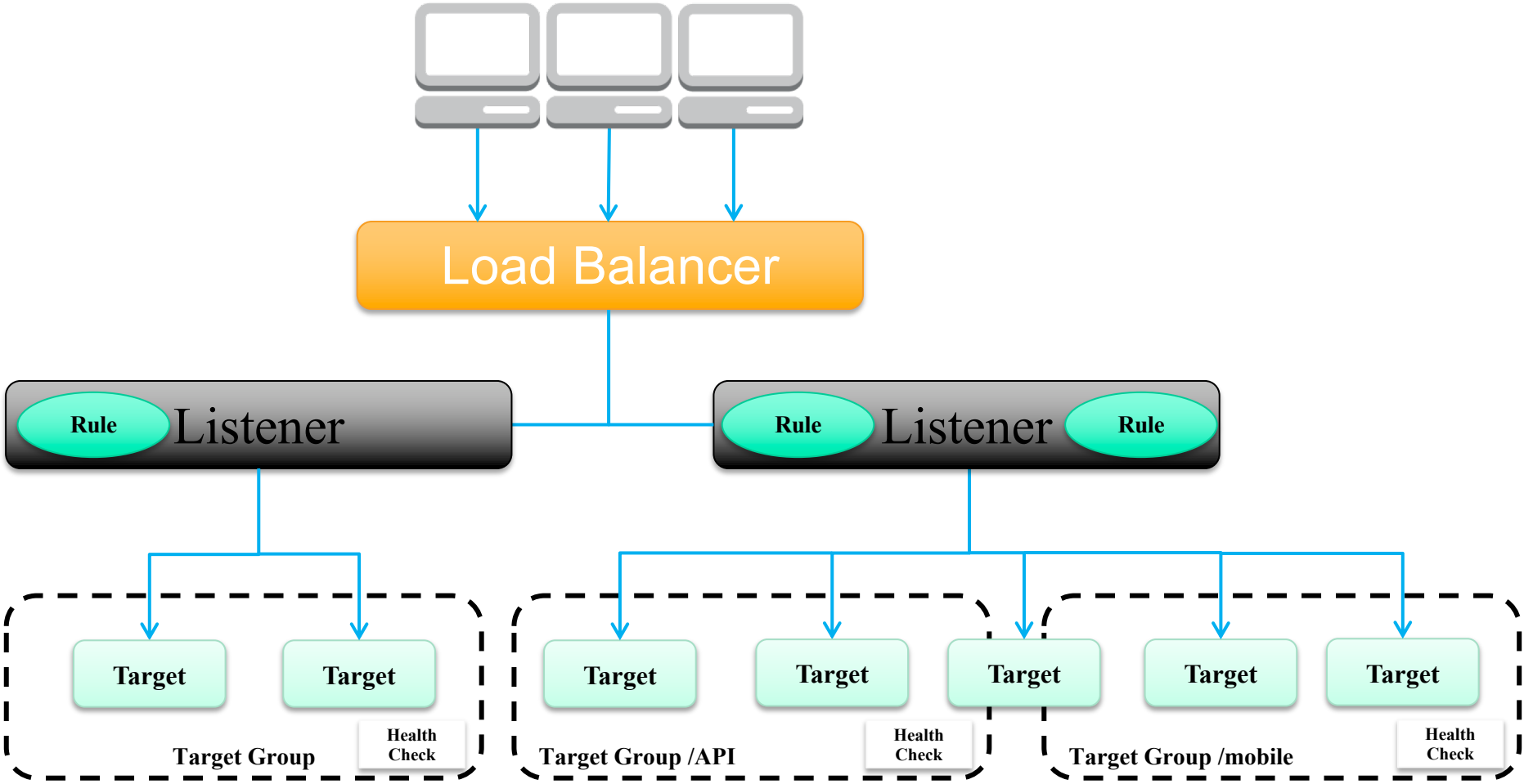
AWS Classic Load Balancer

Register instances with your load balancer



AWS Application Load Balancer

Register instances as targets in a **target group**, and route traffic to a target group.



Next: Create an Application Load Balancer