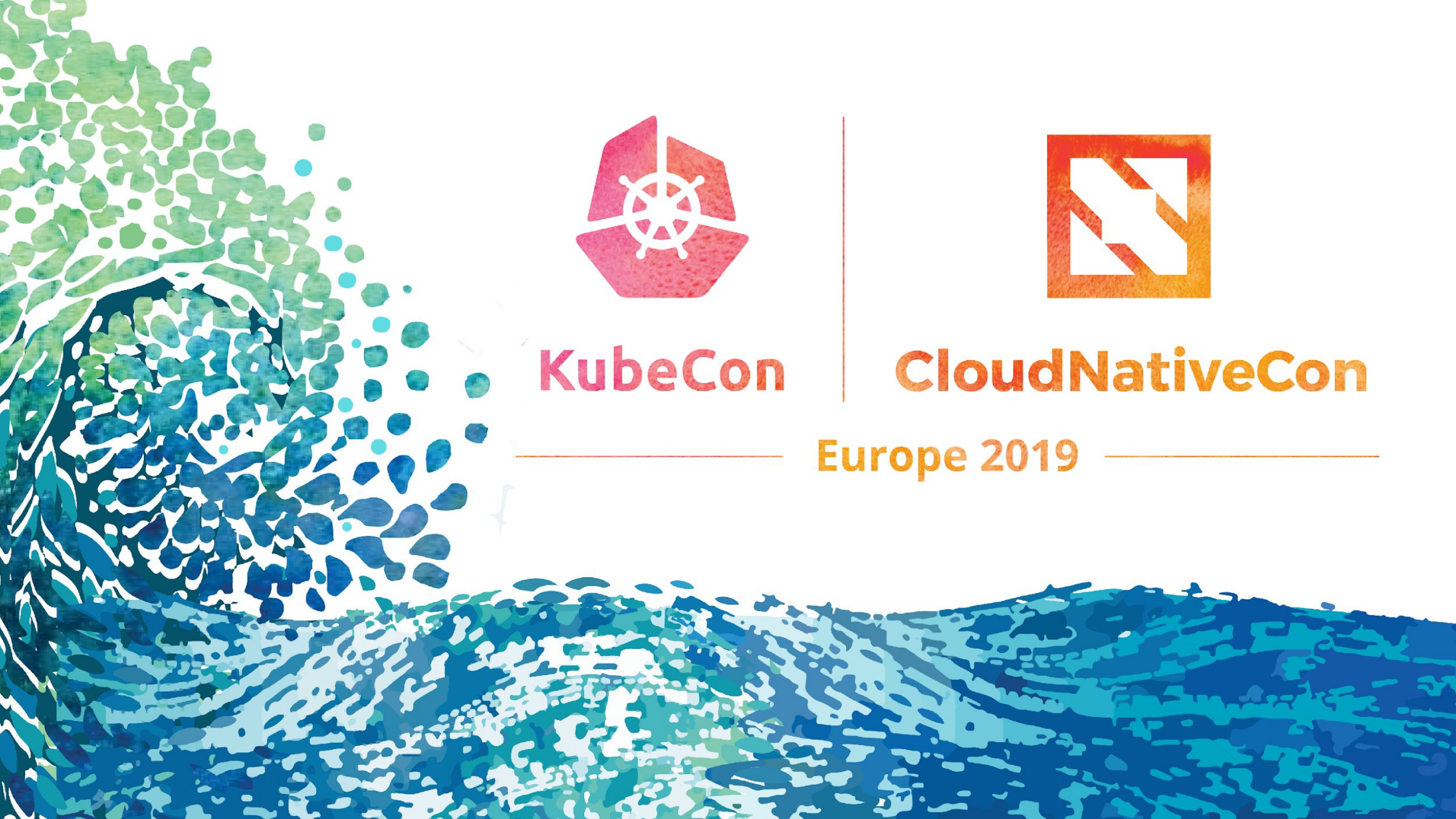
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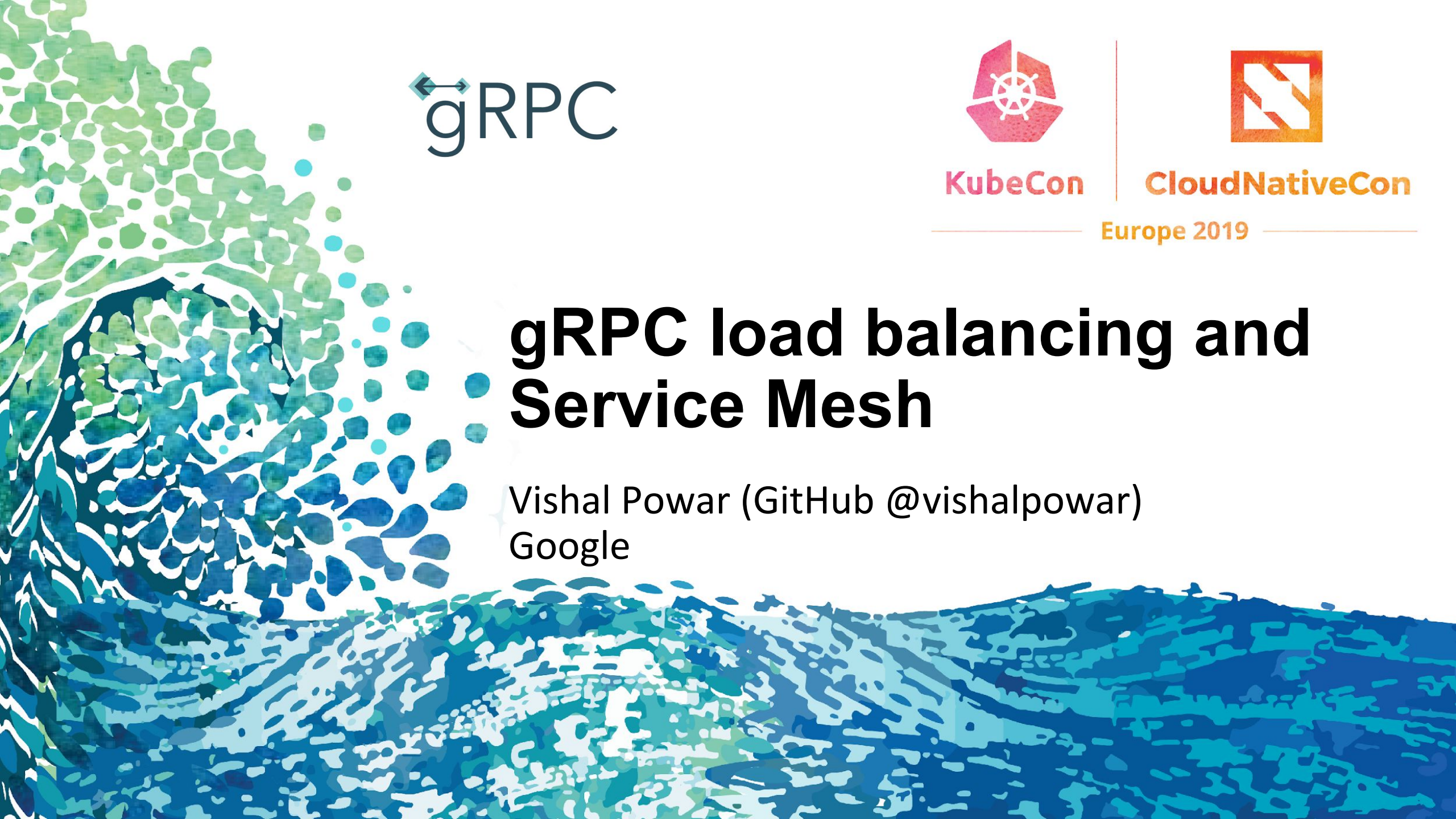

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gRPC load balancing and Service Mesh

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Google

Agenda

- Load balancing in gRPC
- Centralized balancing
- Load balancing at scale
- Service mesh
- Demo

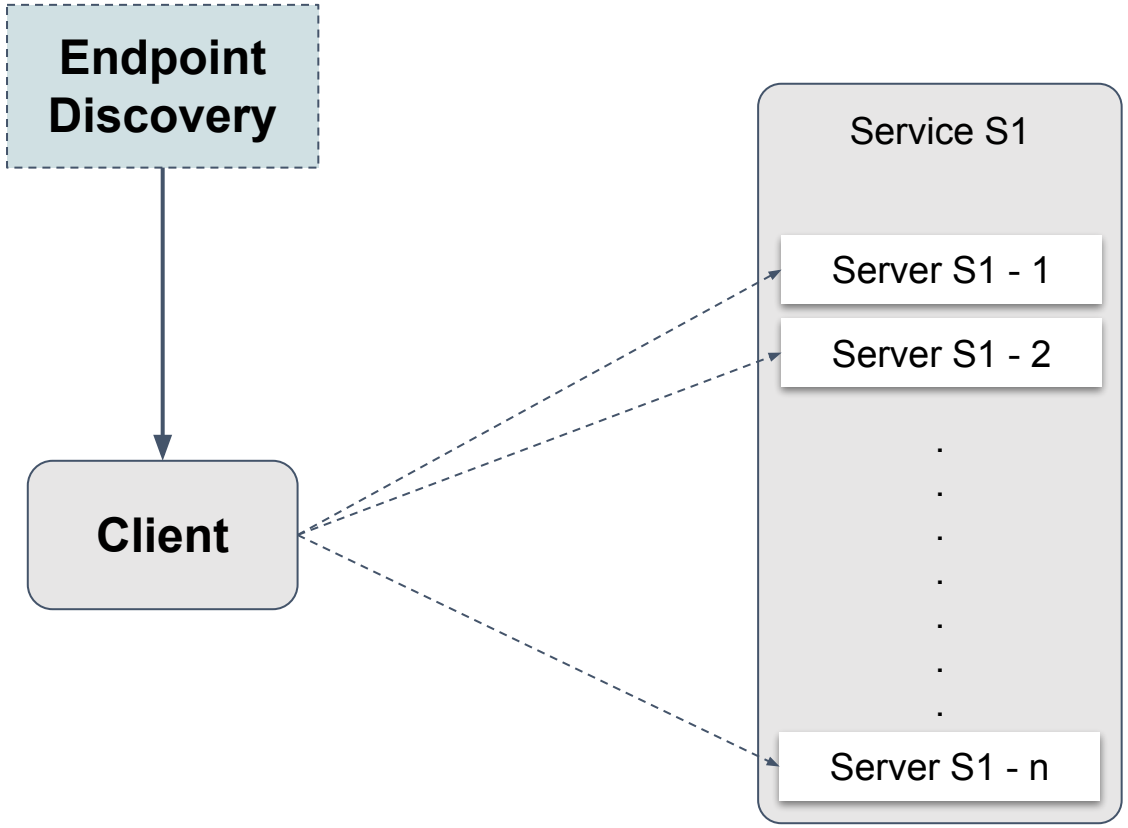
Why load balancing?

- Load balancing is a mechanism to
  - Improve throughput of a service.
  - Improve service availability and reliability.

- Load balancing should help client pick service endpoints
  - Based on client requirements (latency, #connections).
  - Based on endpoint requirements (isolation, #connections).

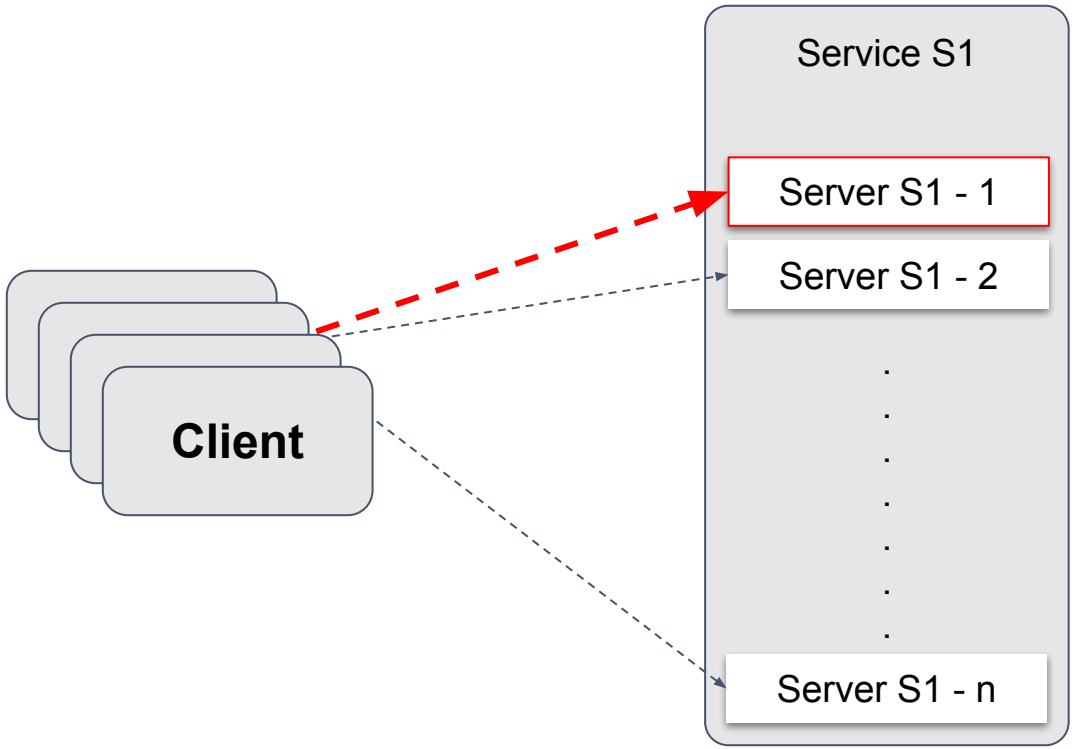
Client-side load balancing (gRPC)

- Client decides which endpoints to connect and send request
  - e.g
    - Round Robin
    - Pick-First
- Client can also connect to subset of endpoints.

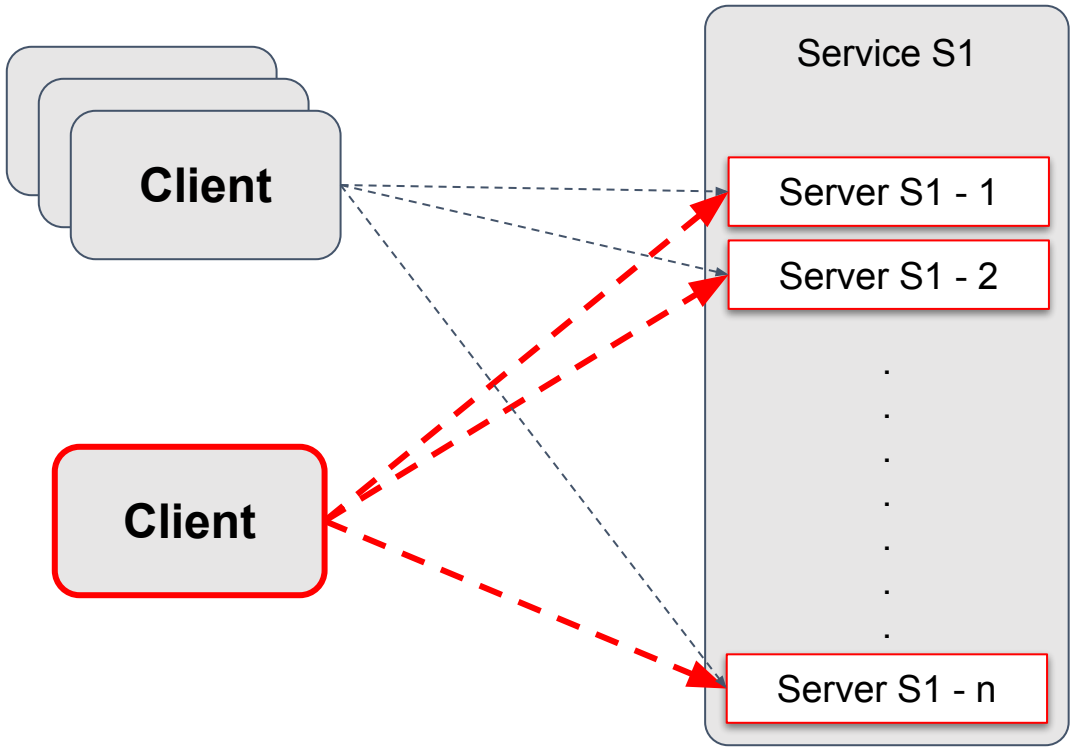


Client-side load balancing (gRPC)

- Pick first - Server Overload

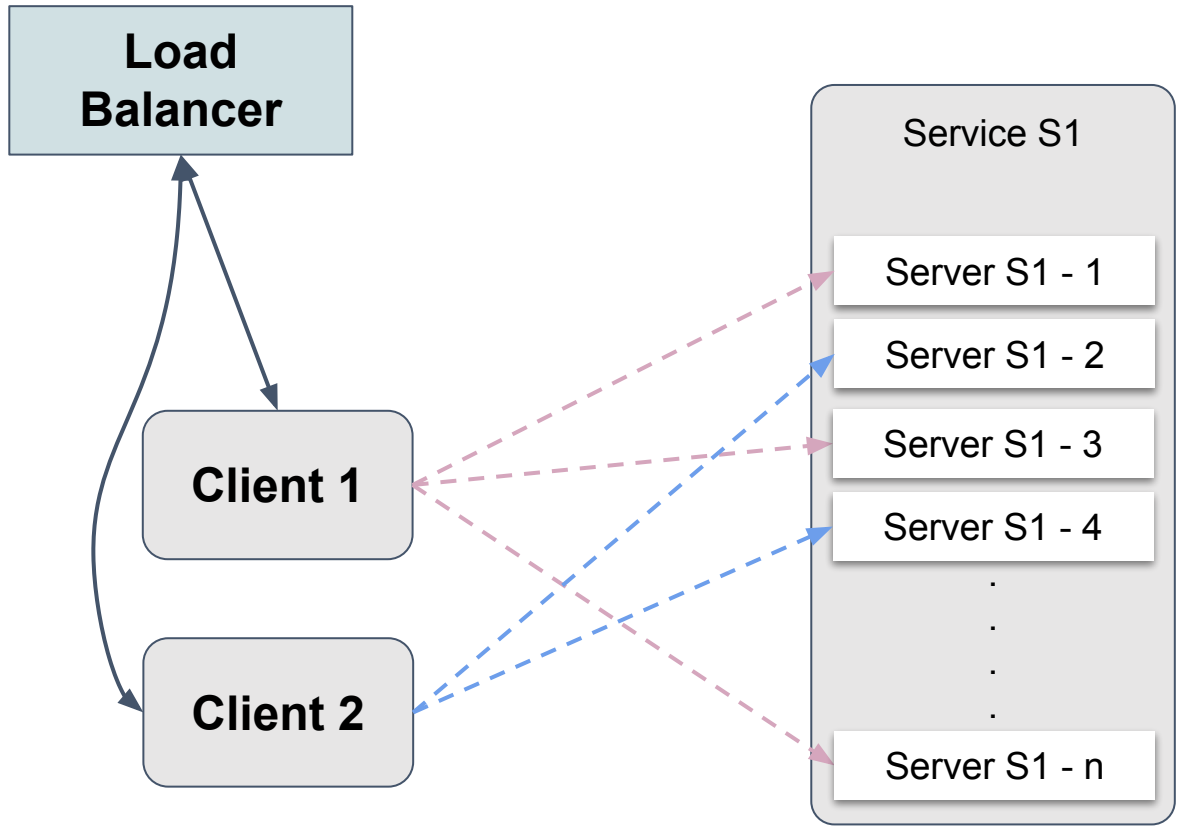


- Round robin - No isolation



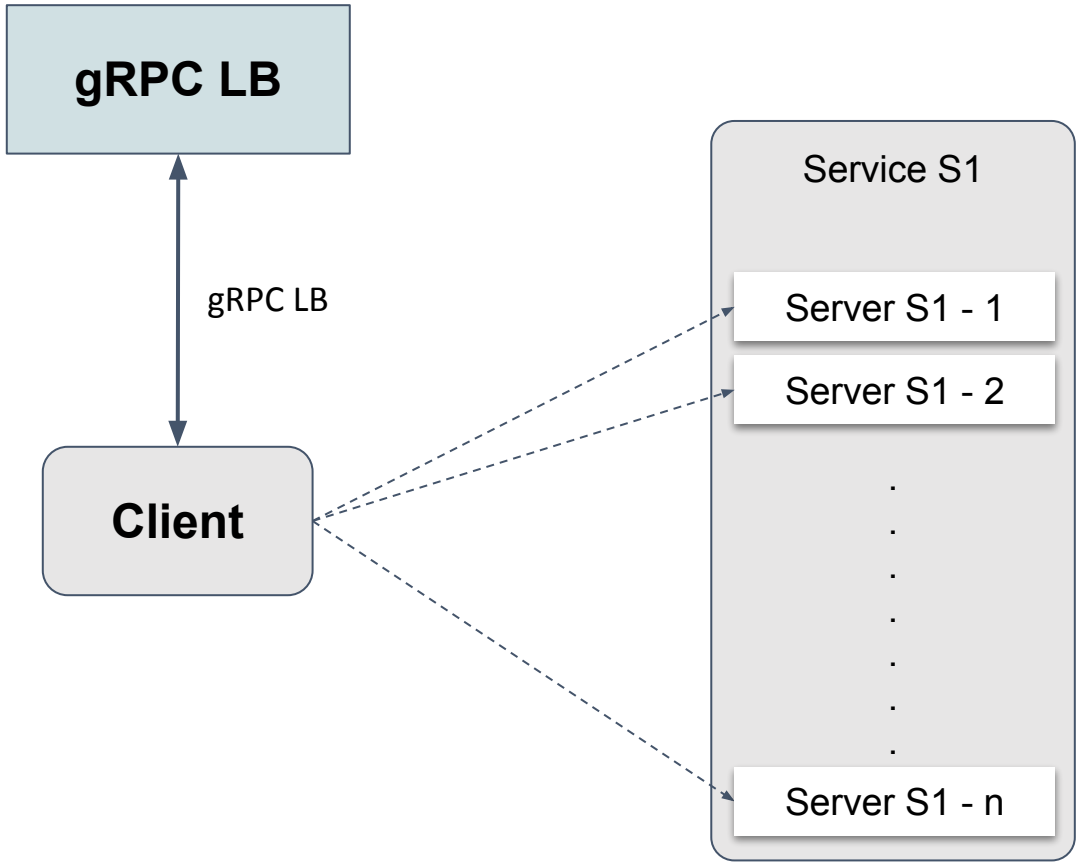
Centralized load balancing

- Load balancer takes global decision to protect endpoints from client local decision.



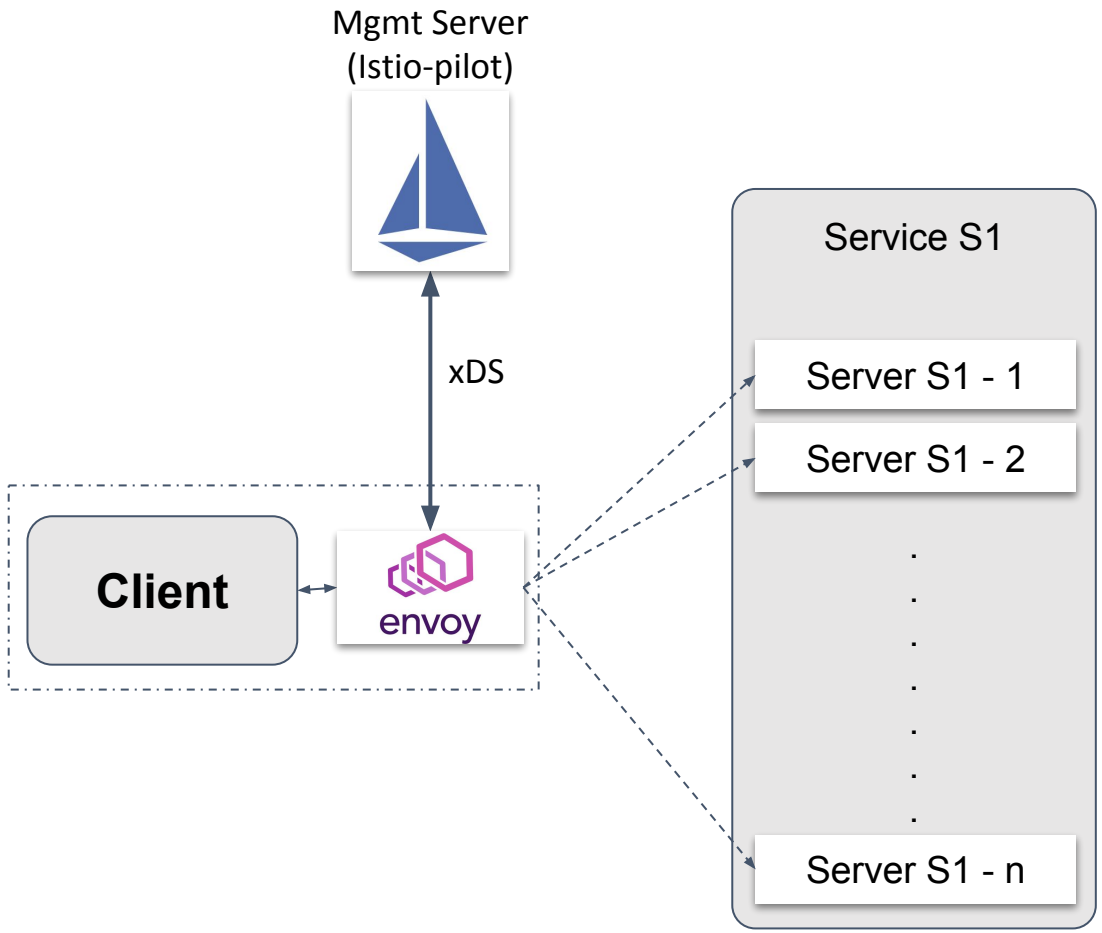
gRPC LB

- Look-aside load balancing with gRPC LB protocol.
- Balancer provides list of endpoints to use.
  - The list encodes weight information that clients use for making request.



Proxy load balancing (envoy)

- Middle proxy or sidecar deployment.
- xDS server provides endpoints and load balancing configuration for envoy.

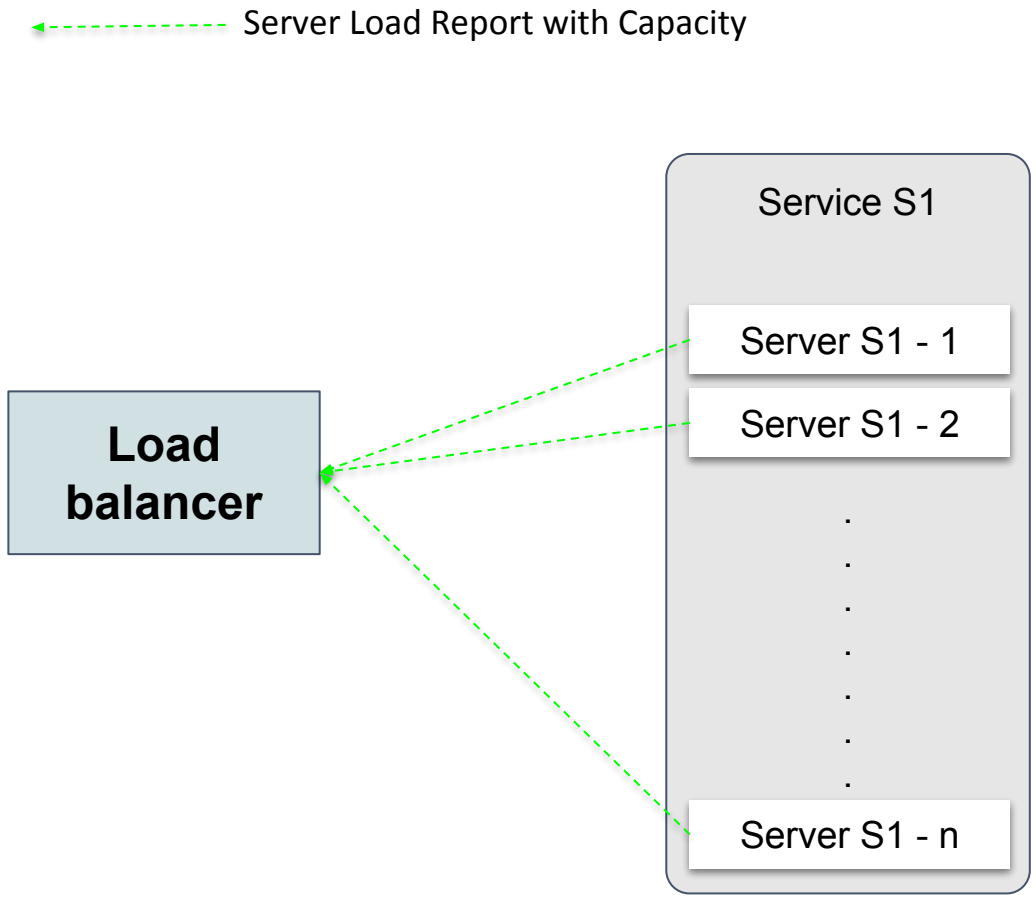


Deployment considerations

- Deployments are heterogenous with endpoints differing in
  - e.g. capacity, location
- Individual endpoints health and capacity can change.
  - e.g. service upgrade, hardware failure.
- For better balancing, central load balancer needs to know about all of this.

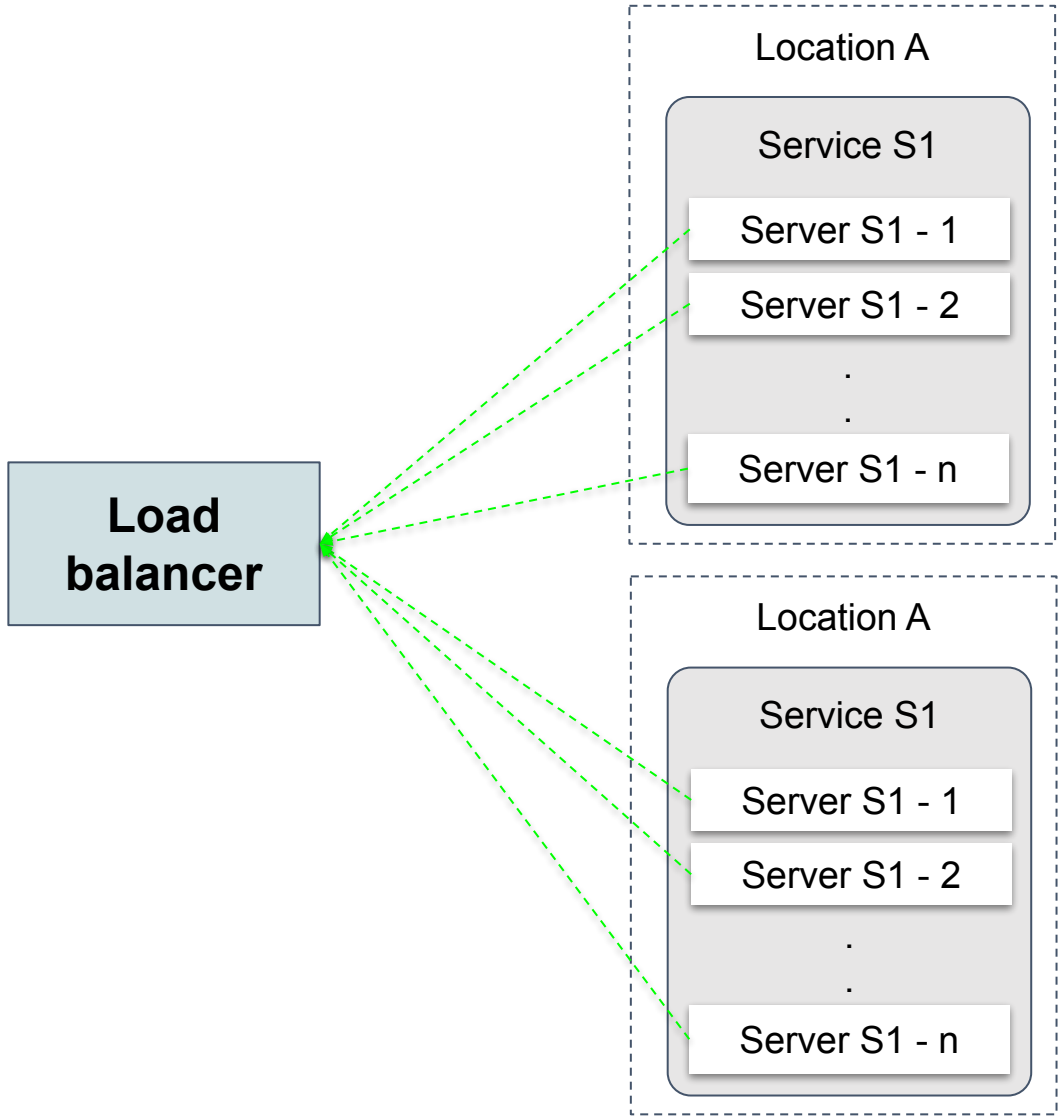
Informed balancing - Capacity

- Health can be determined by connecting to the endpoint.
- Capacity is service specific, and can be configured or reported by endpoints.
  - e.g compute, memory.



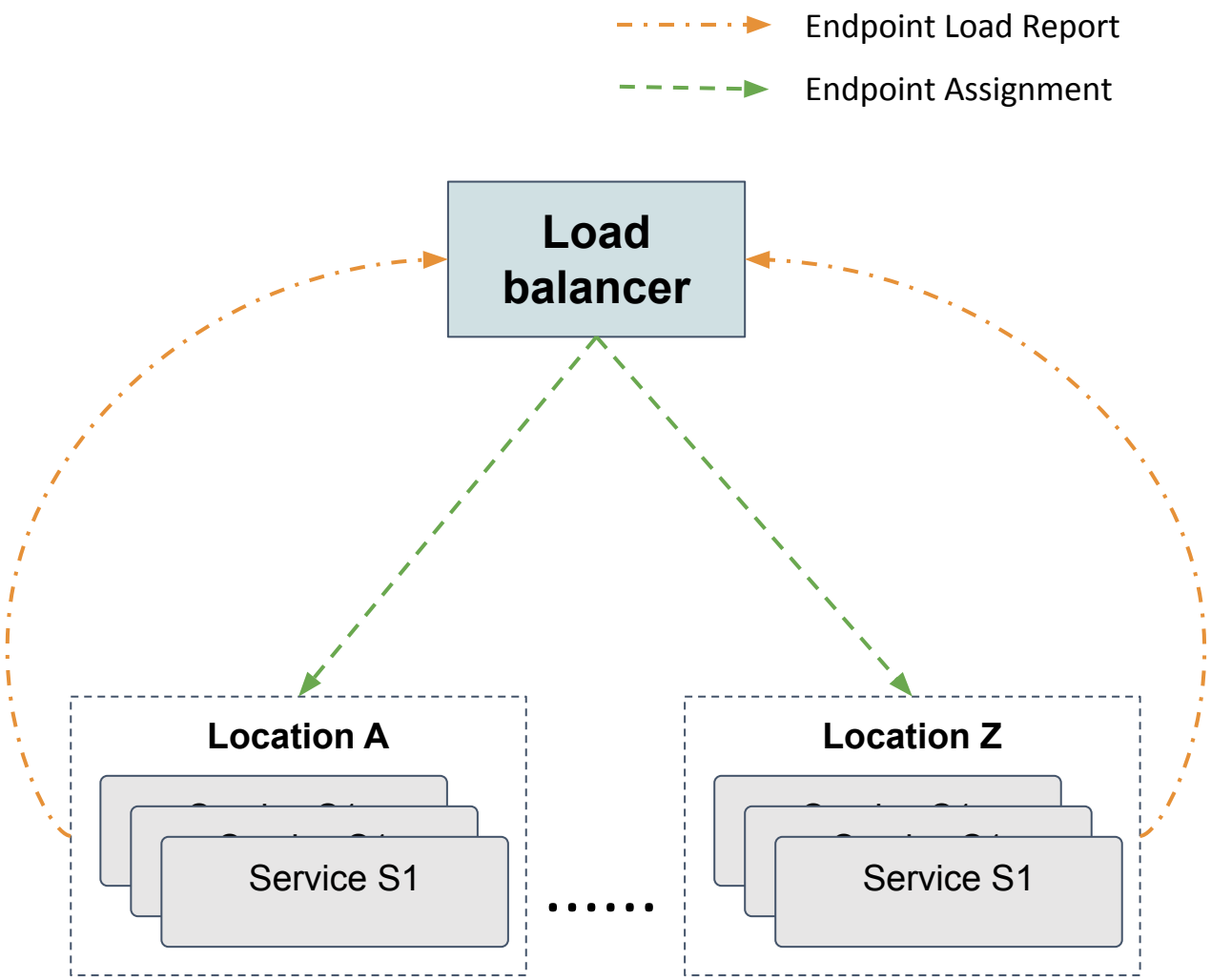
Informed balancing - Locality

- Routing requests closer to the client has advantages.
- Both endpoints and clients locality needs to be known by the load balancer.
- Locality capacity can be used for balancing decisions.



Load balancing at scale

- Collecting information and making global decisions for each client is expensive.
- Change propagation to clients is slower (~ seconds).

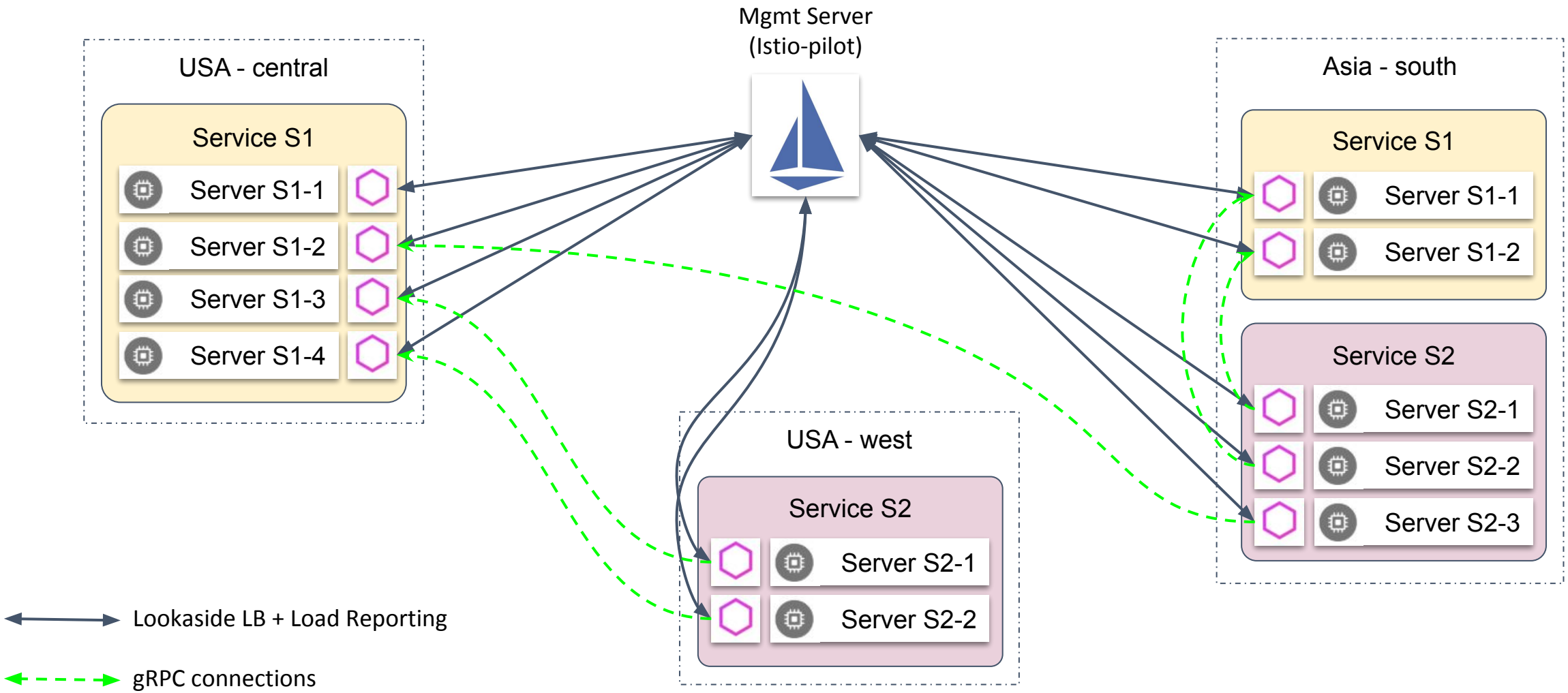


Load balancing at scale

- Take global decisions based on locality capacity and proximity.
  - consider client load on each locality.
  - provide enough information for clients to react quickly.

- Have clients take local decisions based on most recent information.

Service mesh and load balancing

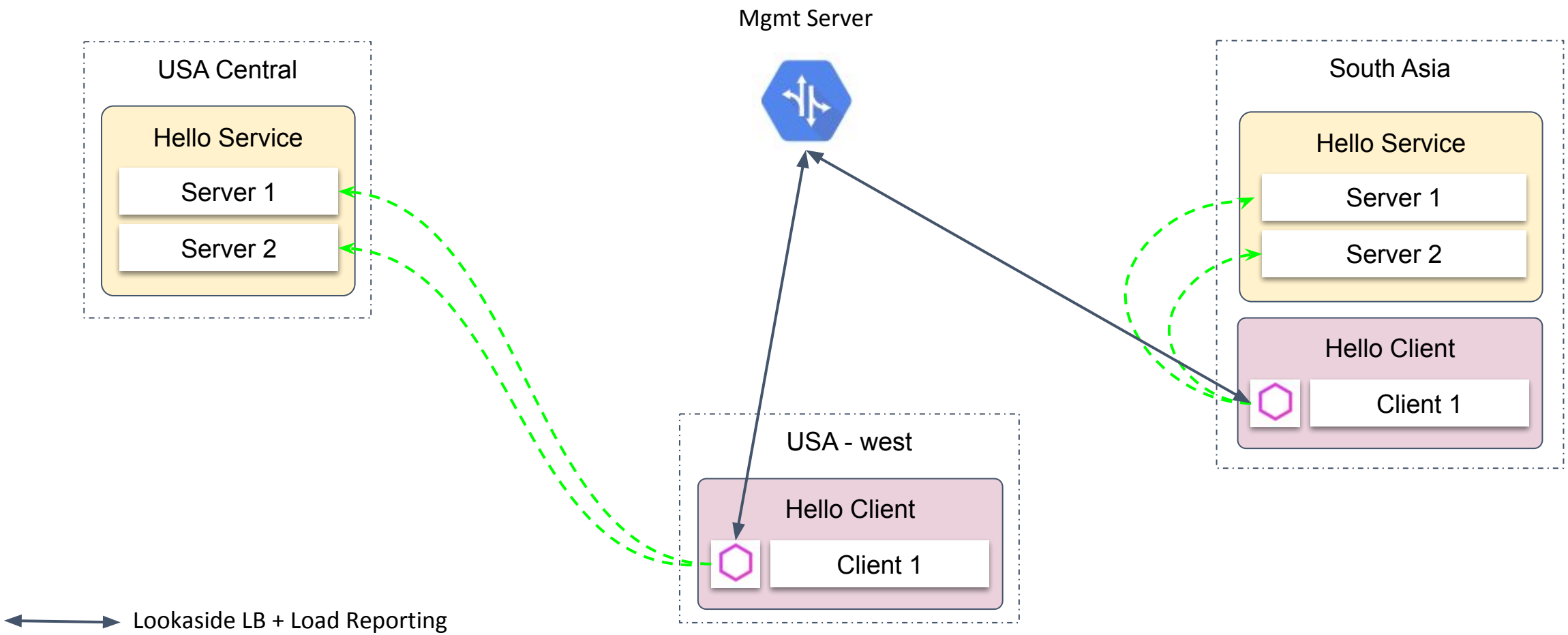


gRPC in service mesh

- xDS provides construct to achieve Load balancing flexibility.

- Information and controls are available for clients side balancing.
  - Weights at Locality and Endpoints
  - Proximity information at locality.

Demo


Mgmt Server
USA Central
Hello Service
Server 1
Server 2
South Asia
Hello Service
Server 1
Server 2
Hello Client
Client 1
USA - west
Hello Client
Client 1
Lookaside LB + Load Reporting
gRPC connections

Thank You

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