DOCKER NETWORKING TIPS

Load Balance Options

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Associated Youtube video:

https://youtu.be/aQmPqrHleJU

About me

- Senior Engineering Manager at Cisco Systems Data Center group
- Author of “Mastering CoreOS” https://www.packtpub.com/networking-and-servers/mastering-coreos/)

- Docker Captain(https://www.docker.com/community/docker-captains)

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What is Service Discovery?

- Allows micro services running as containers to discover each other automatically.
- Components of Service Discovery
  - Health check – Identify healthy service
  - DNS – Maintain service name to IP mapping
- Load balancer uses Service discovery database.
- Standalone Service discovery software examples – Consul, etcd

Service Discovery in Docker

- Service discovery is provided by DNS server available in Docker engine.
- For unmanaged containers, container name resolves to container IP. Alias names can be also be used.
- For services using service IP(endpoint mode=vip), service name resolves to service IP which in turn forwards the request to containers. In this case, ipvs based L4 load balancing is done.
- For services using direct DNS(endpoint mode=dnsrr), service name directly resolves to container IP. In this case, DNS round robin load balancing is done.
- Service Discovery is network scoped. Only containers in same network can discover each other.

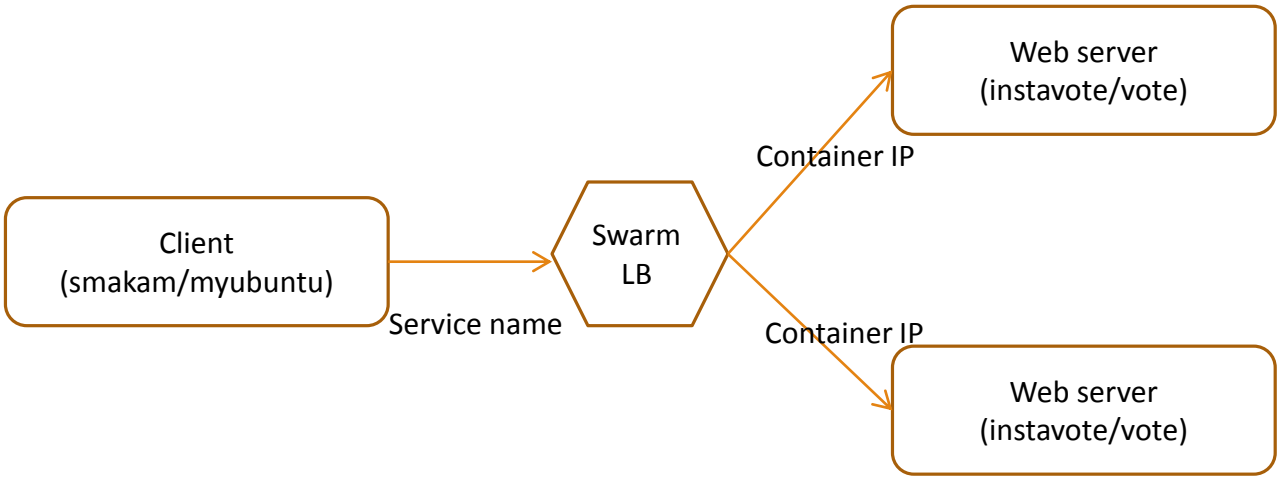
What is Load balancing?

- L4 Load balancer does load balancing based on L3 and L4 fields.
- L7 Load balancer uses URL fields to load balance.
- Load balancer also supports advanced features like SSL/TLS termination, Content based routing, Access control and authorization, Rewrites and redirects, sticky session
- Example Load balancers are nginx, haproxy, traefik, ELB in AWS.

Load balancing in Docker

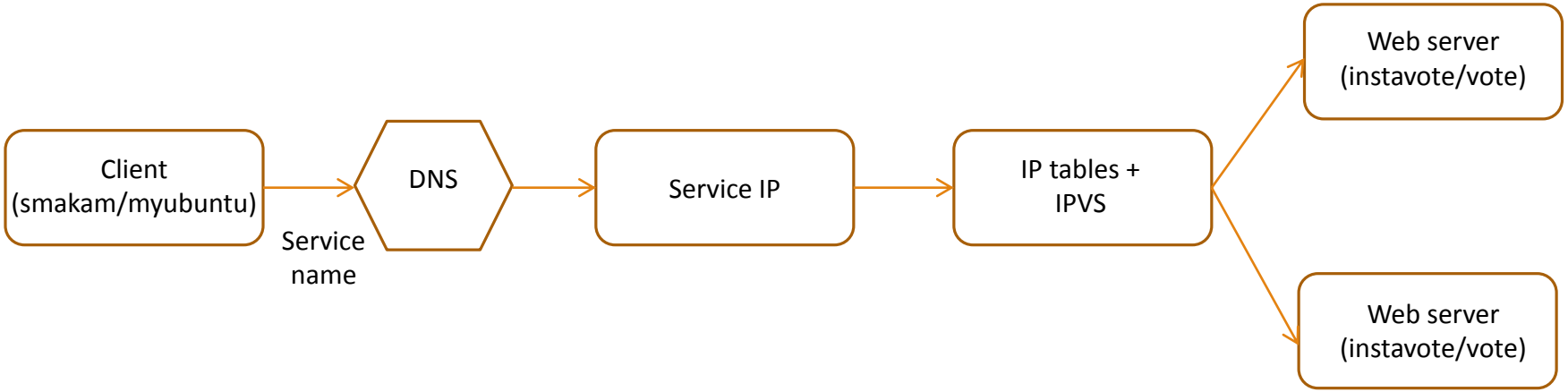
- For unmanaged containers, load balancing is done using simple round robin load balancing. Using aliases, a single alias can load balance to multiple unmanaged containers .
- Docker takes care of load balancing internal services to the containers associated with the services.
- For services using service IP(endpoint mode=vip), ipvs and iptables are used to load balance. This provides L4 based load balancing. Ipvs is Linux kernel load balancing feature.
- For services using direct DNS(endpoint mode=dnsrr), DNS round robin balancing is used.
- For services exposed externally, Docker uses routing mesh to expose the service on all Swarm nodes. Routing mesh uses “ingress” network to connect all nodes.
- For HTTP based load balancing, HRM(HTTP Routing mesh) can be used. This is supported only with Docker EE.
- Docker can also integrate with external load balancers like nginx, haproxy, traefik as well as cloud load balancers like ELB.

Internal Load balancer



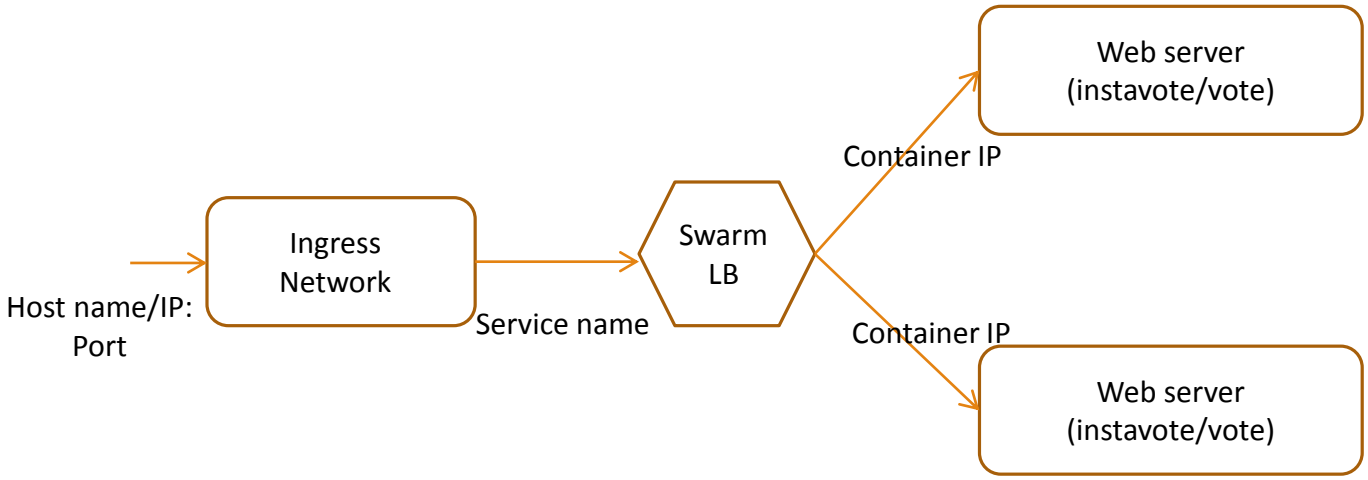
Example: https://github.com/smakam/docker/tree/master/loadbalance/internal

Internal Load balancer - Details



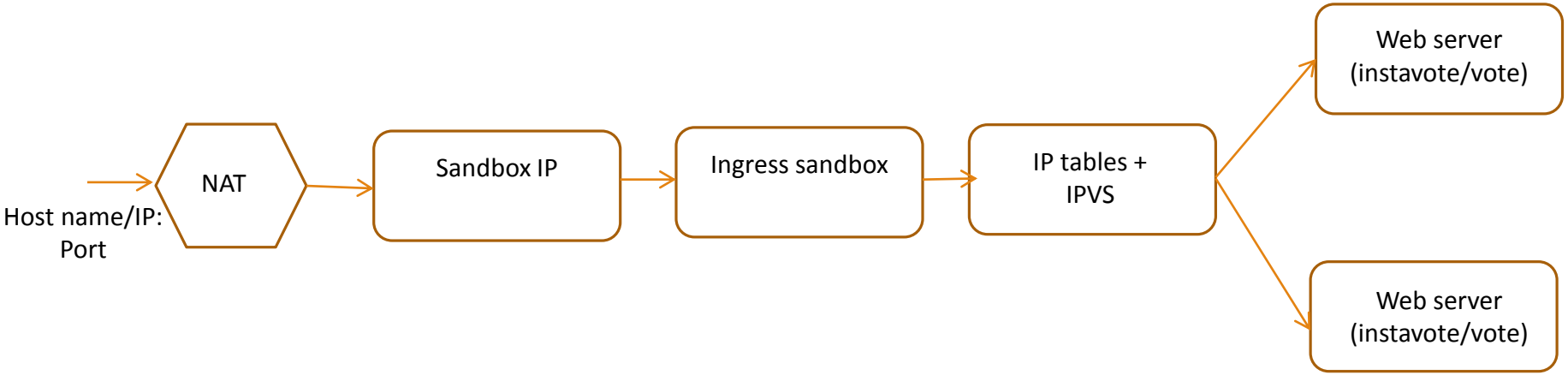
Example: https://github.com/smakam/docker/tree/master/loadbalance/internal

Ingress Load balancer



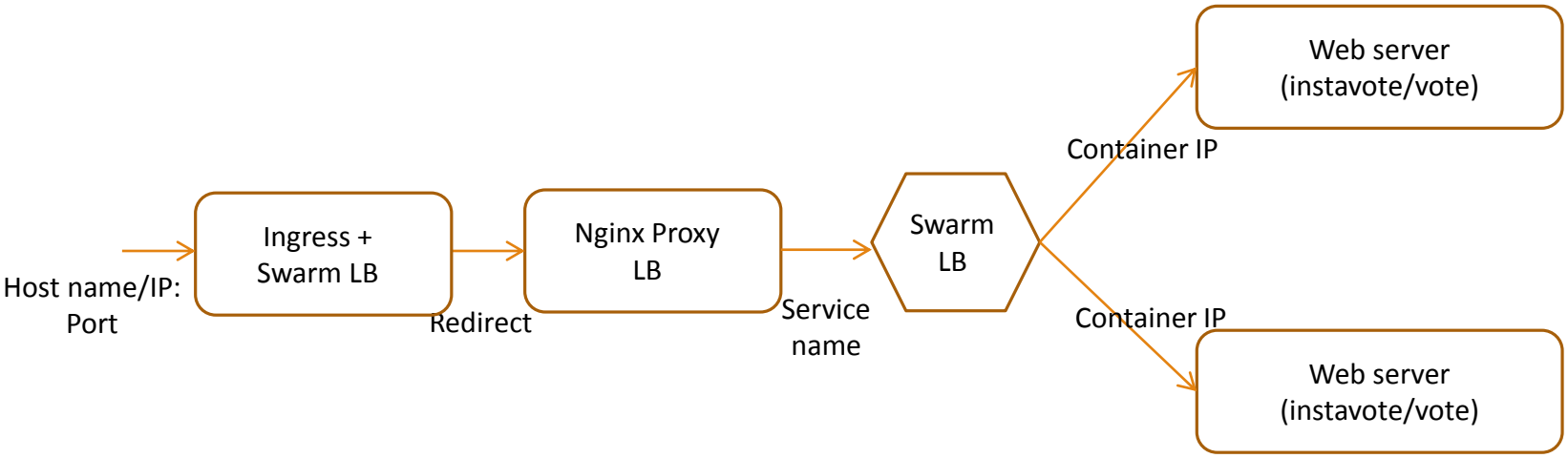
Example: https://github.com/smakam/docker/tree/master/loadbalance/ingress

Ingress Load balancer - Details



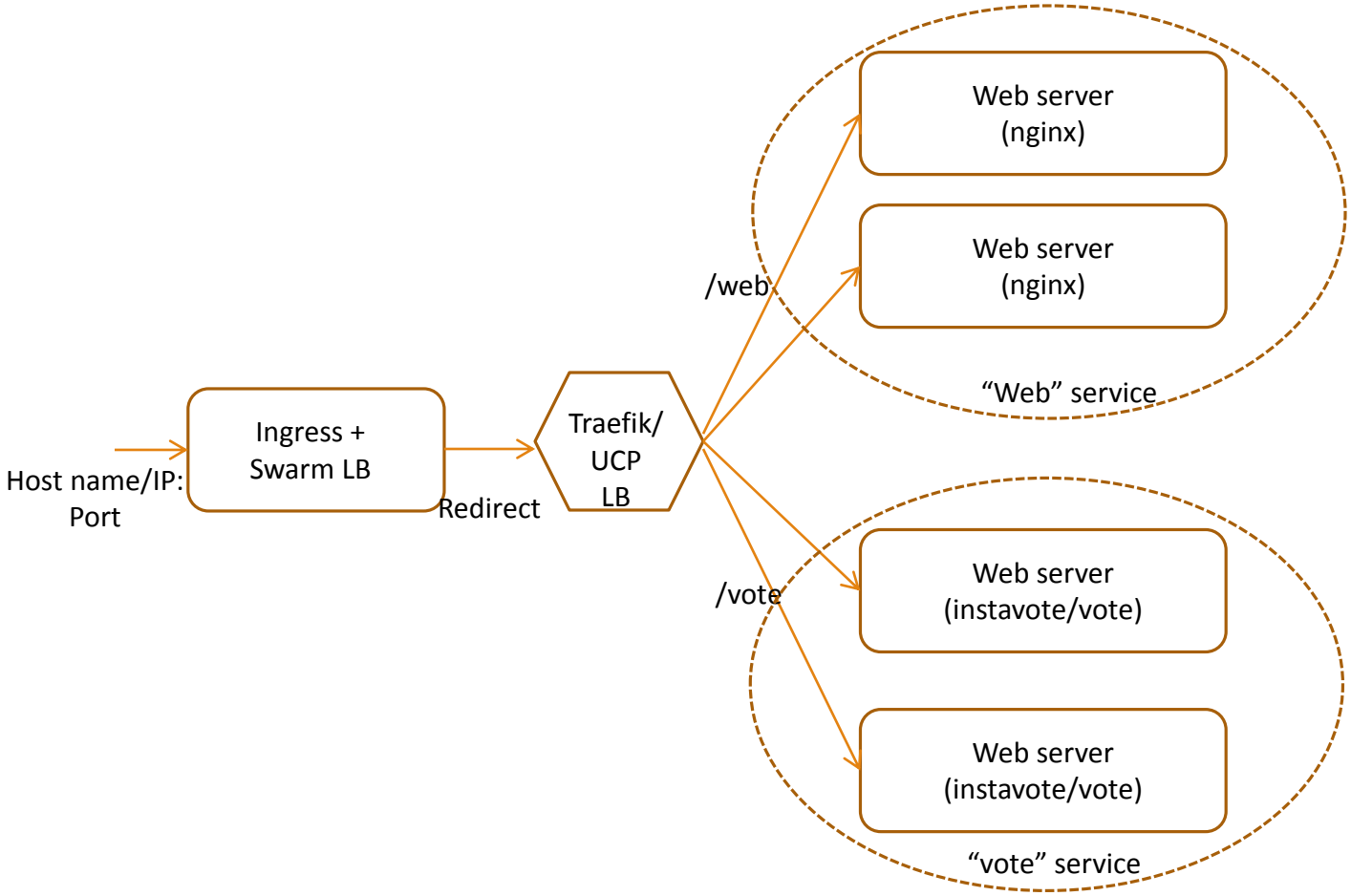
Example: https://github.com/smakam/docker/tree/master/loadbalance/ingress

Proxy Load balancer



Example: https://github.com/smakam/docker/tree/master/loadbalance/proxy

L7 Load balancer



Example: https://github.com/smakam/docker/tree/master/loadbalance/traefik

References

- White paper on Docker networking
- HRM and UCP White paper
- Docker blogs by me
- Docker Networking – common issues and troubleshooting techniques