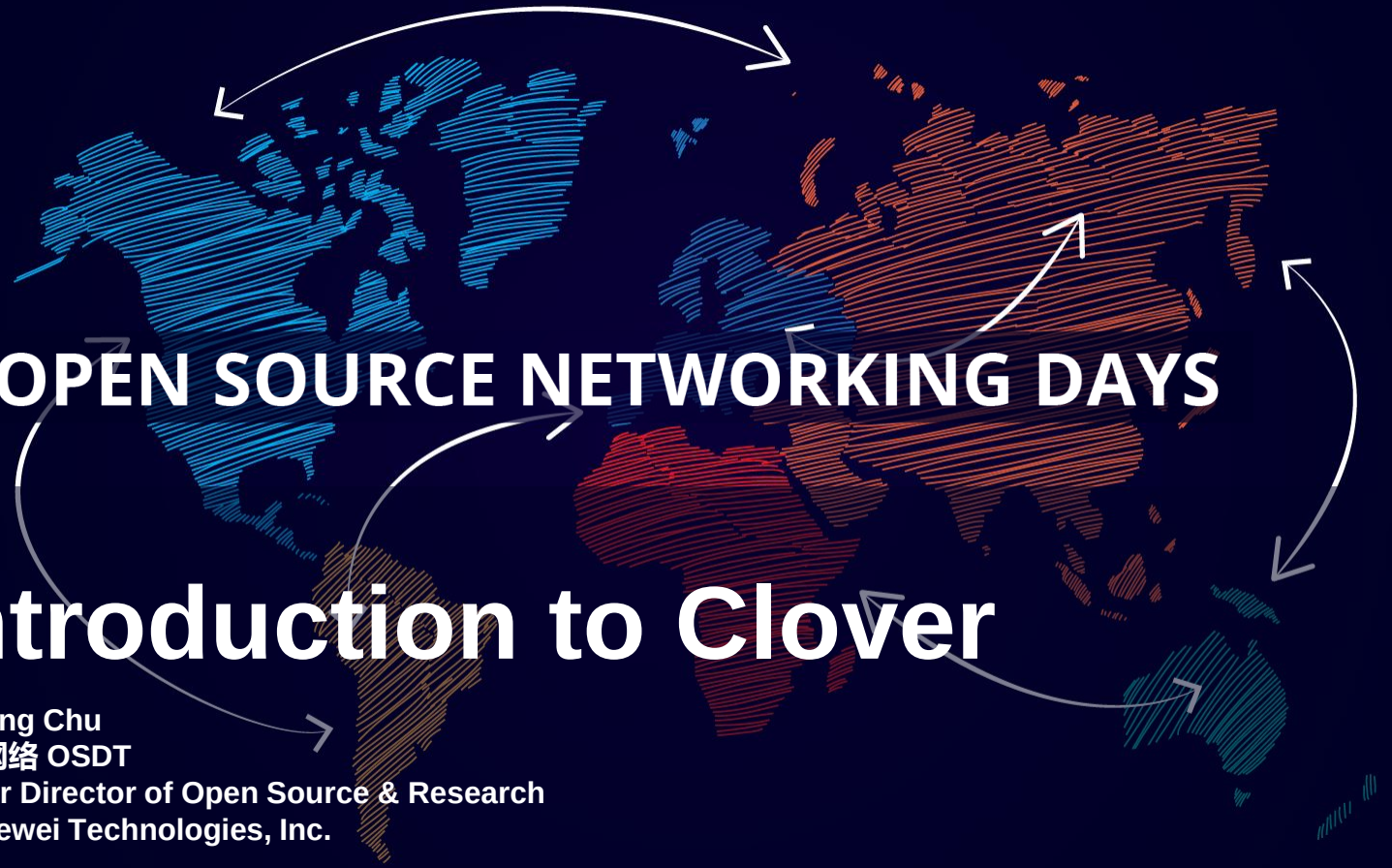

OPEN SOURCE NETWORKING DAYS

Introduction to Clover

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目录: OSN Days - October 12, 2018 上海

1. 为什么未来网络要原生态云化？
2. 原生态云化对网络意味着什么？
3. Clover开源项目介绍
   - 网格
   - 可视性
   - 网络可视性
   - 持续部署自动化
   - 多元环境
4. Clover开源项目路标
5. Q&A

Motivation 为什么未来网络要原生态云化？

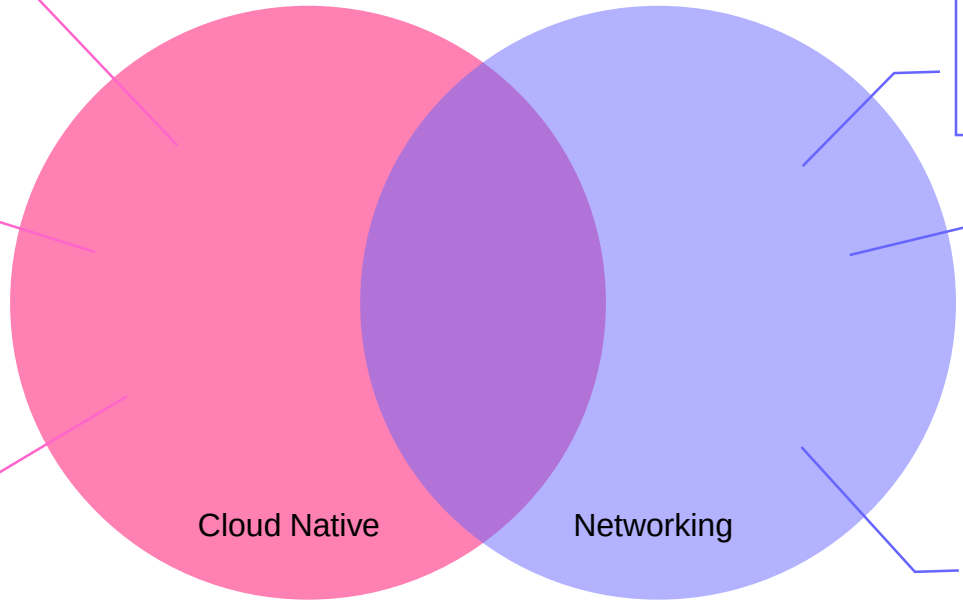
- 下一代网络技术需要 To Support Future Network Services, e.g. 5G top use cases
  - 50 billion IoT devices by 2020
  - Exceptional user experience with AR/VR
  - Ultra low latency services (extending cloud to the edge), autonomous vehicles
- 网络服务管理自动化需要 To Realize Zero Touch Operations
  - ONAP, ETSI ZSM
  - 德电：“DT: Brutal Automation is the Only Way to Succeed”
- 网络应用智能化需要 To Empower Application Innovation
  - Monetization with close user engagements
  - Data analytics and ML driven automation and optimization

What Does Cloud Native Mean for Networking? 原生态云化对网络意味着什么？

Cloud Native：软件包容器化

Cloud Native：软件架构微服务化

Cloud Native：软件动态管理业务流程自动化



开发新一代网络技术需要在现有云基础上解决新的挑战，比如IoT，边缘云，AR/VR，无人驾驶

未来网络需要快频率大规模低成本的运营自动化

网络最终支持的应用是全面云化智能化的，网络需要对未来应用提供原生态云的构件和服务

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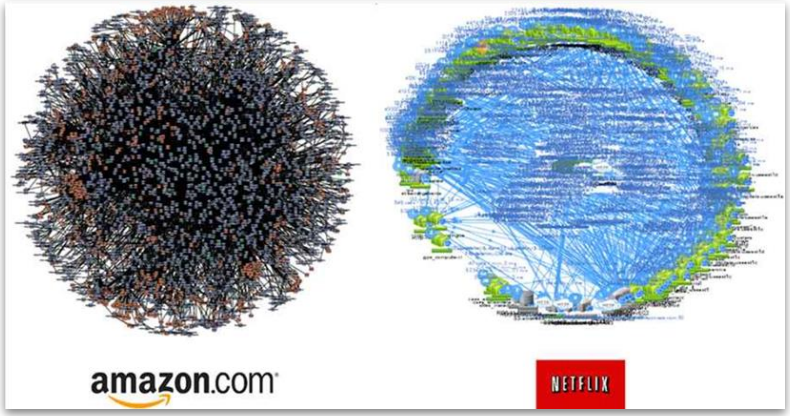
What is Clover? Clover开源项目简介

- Clover is a framework stack to develop network services as cloud native micro-service applications that can be developed, deployed and operated with high degree of automation.
- Network service: any network function in software, including applications, management, control or data planes
- Clover currently uses Kubernetes and Docker containers as the baseline
- Clover main function areas:
  - Use **service mesh** to segment micro-services, control traffic and unify security
  - Consolidate **visibility, tracing, monitoring** to enhance **debuggability** and **operability**
  - Automate **validation** of network service characteristics
  - Use **continuous deployment** (CD) to realize operational automation
  - Target **diverse deployment environments**

Service Mesh: 利用网格来应对规模化和复杂性

- Growth of microservices often leads to “Container Sprawl”.
- Dependencies between microservices are tangled and error-prone.
- Debugging and validation are difficult for one microservice by a given developer.
- Security policies are difficult to enforce and verify.
- Solution: A dedicated service layer: Service Mesh.



ONAP
OPEN NETWORK AUTOMATION PLATFORM

~150 containerized services

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Brief Intro to Istio – Istio网格简介

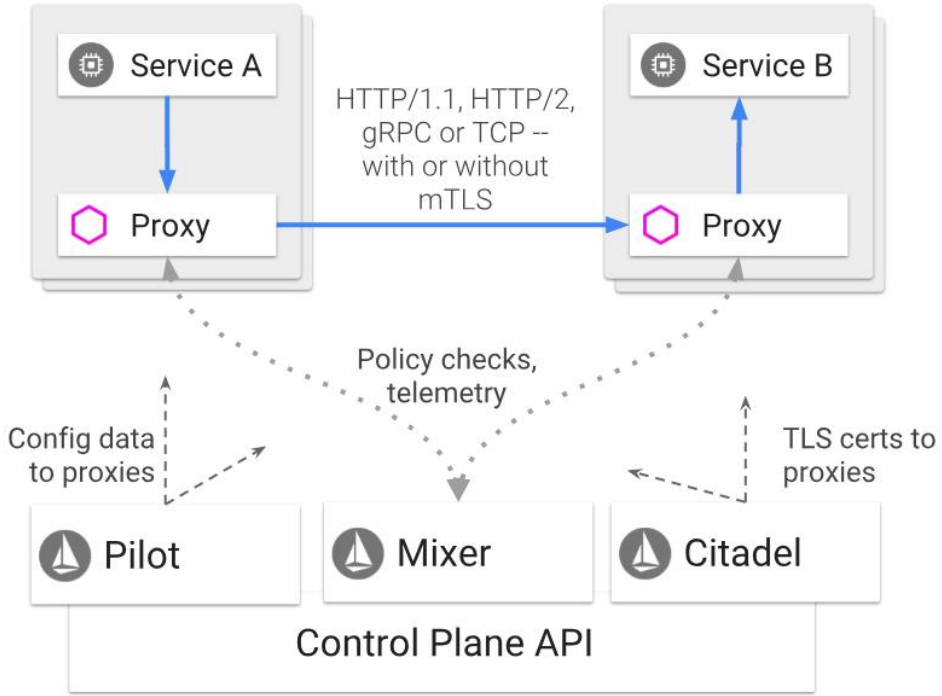
An Istio service mesh is composed of a set of proxies (Envoy) deployed in each pod as ‘sidecars’.

These proxies mediate and control all inter-microservice traffic.

Pilot maps abstract service discovery, intelligent routing and resiliency functions to the proxies.

Mixer enforces policies and collects telemetry data – and evaluates them as ‘attributes’.

Citadel allows security policies based on service identify rather than network controls.



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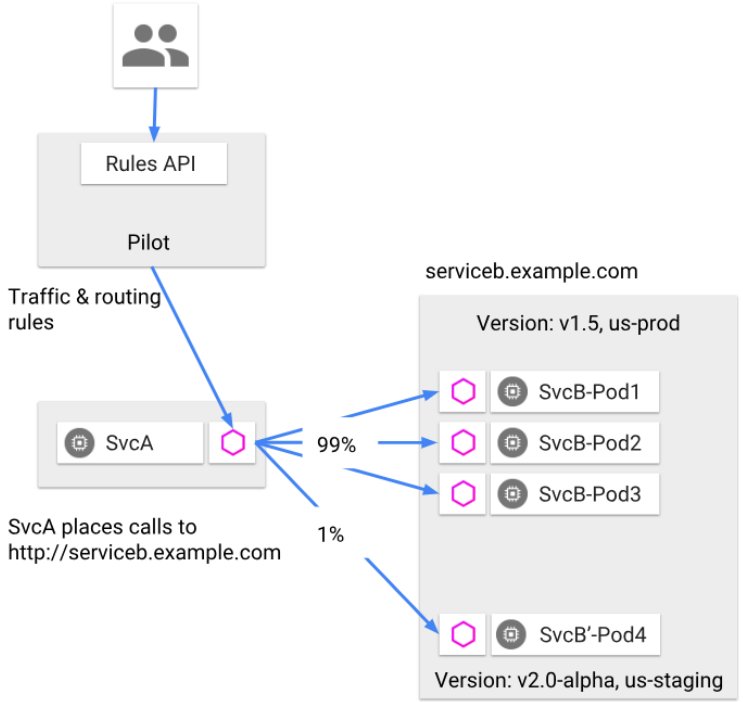
Istio Traffic Policies 服务流量管理

Examples of common traffic policies

- Traffic routing
- Traffic mirroring
- Circuit breaking
- Rate limiting
- Fault injection
- Timeouts
- Retries

Policy rules are defined in Pilot, and can be used to automate many operational and resiliency tasks.



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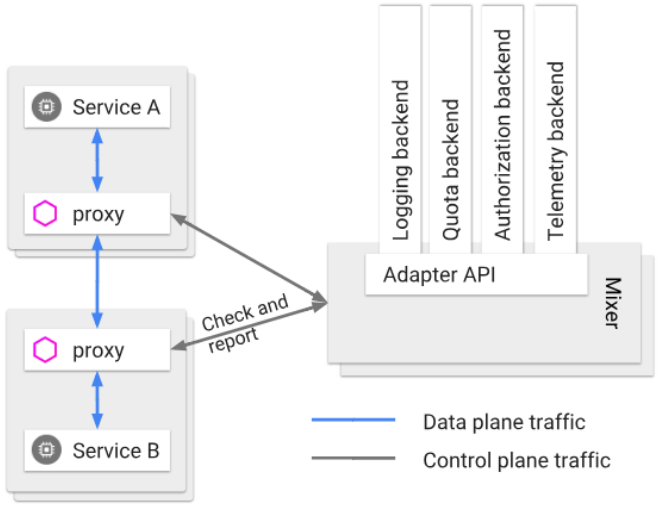
Istio Control Policies 控制策略管理

Control policies are implemented by Mixer through a plugin design.

The policy language centers around ‘attributes’. Mixer is also seen as an attribute processing engine.




```yaml
apiVersion: config.istio.io/v1alpha2
kind: rule
metadata:
  name: promhttp
  namespace: istio-system
spec:
  match: destination.service == "service1.ns.svc.cluster.local" && request.headers["x-user"] == "user1"
  actions:
  - handler: handler.prometheus
    instances:
    - requestduration.metric.istio-system
```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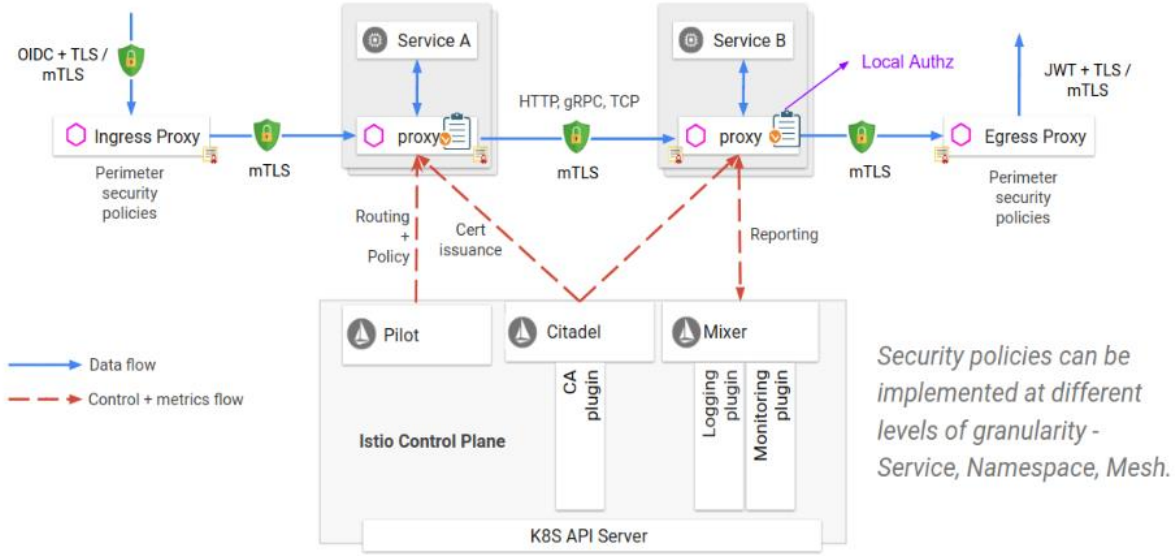
Istio Security 安全策略



Citadel负责密钥管理，Proxies管加密通讯，Pilot管理相关策略，Mixer负责审计和许可等。

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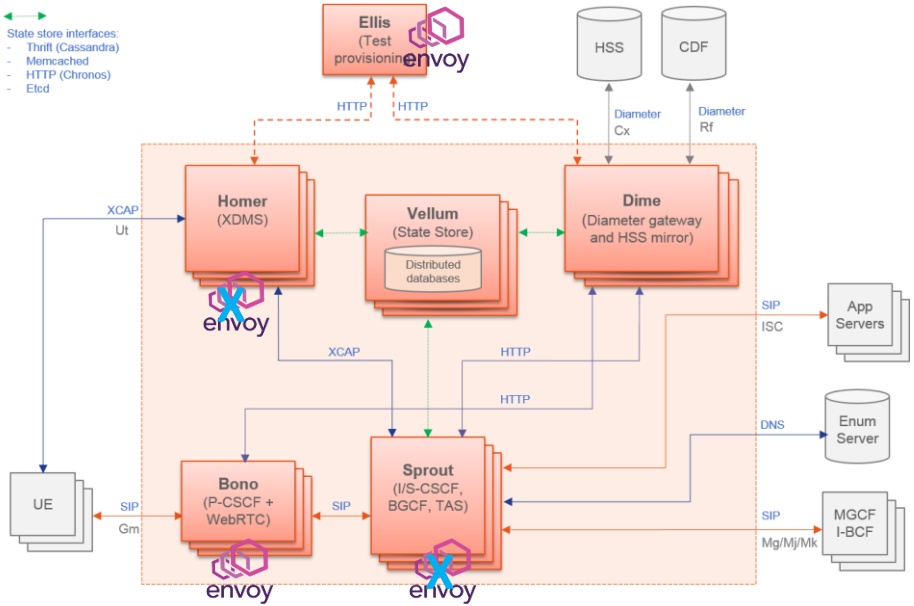
幼稚尝试：Put Clearwater on Service Mesh



Clearwater是一个简单网络模块的开源样版实现。其中一些模块可以直接采用Service Mesh，但大部分微服务模块有问题（e.g. Traffic blackhole）。结论：需要网络功能模块微服务化的framework stack。

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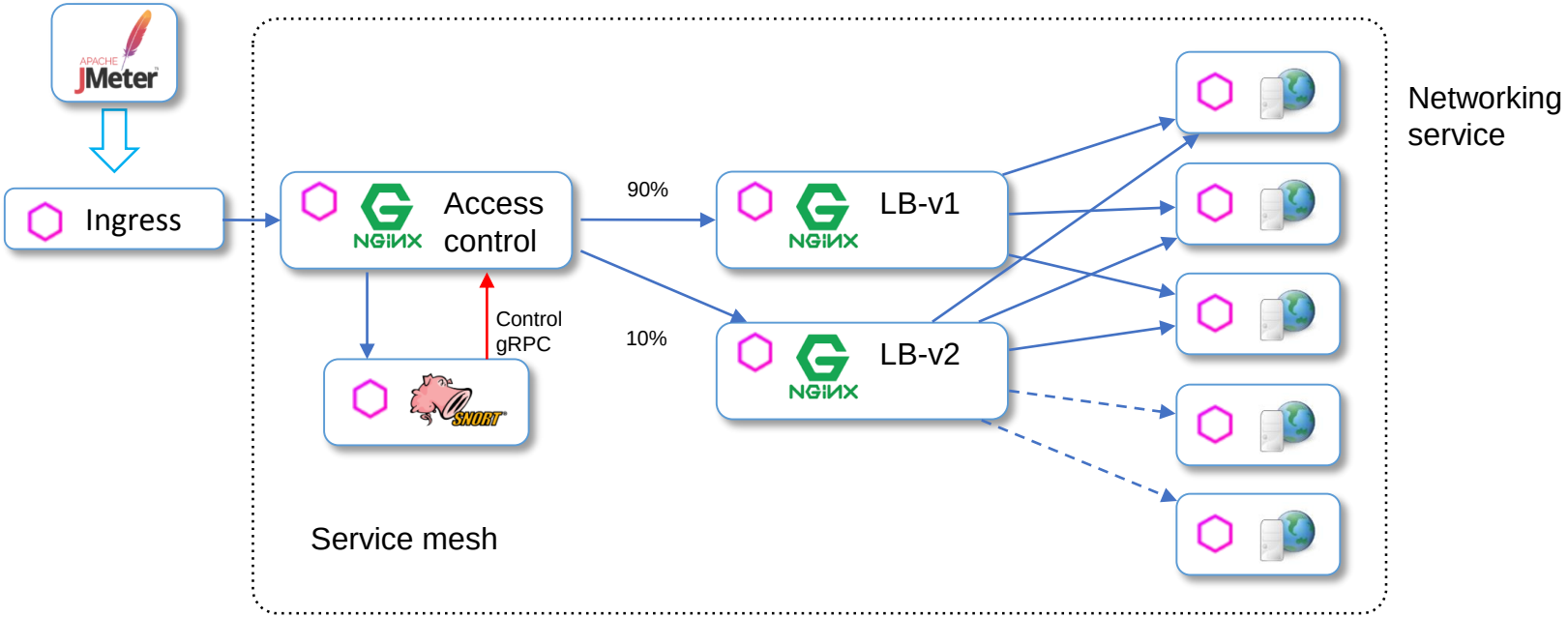
Clover Sample Networking Service 原生态网络服务模板



Clover原生态网络服务模版（Fraser release -1st）

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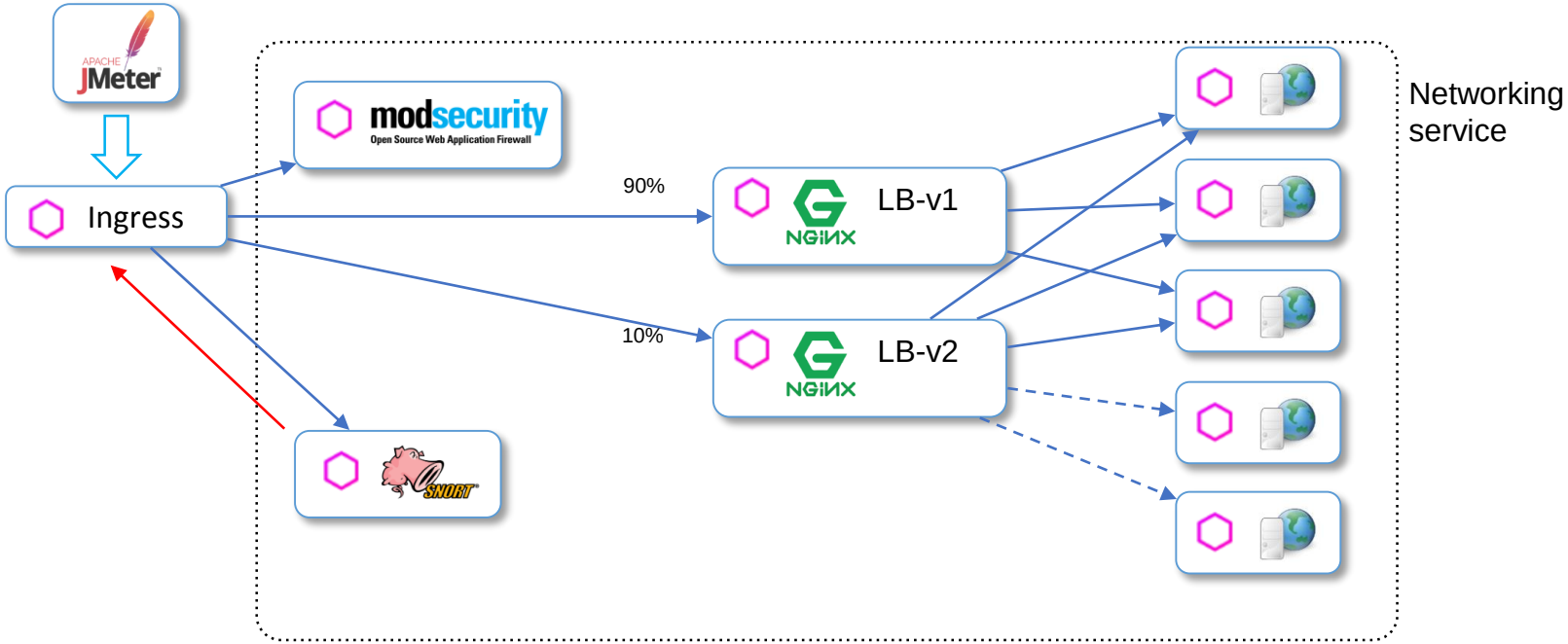
Clover Sample Networking Service 原生态网络服务模板



Clover原生态网络服务模版（Gambia release – 2nd）

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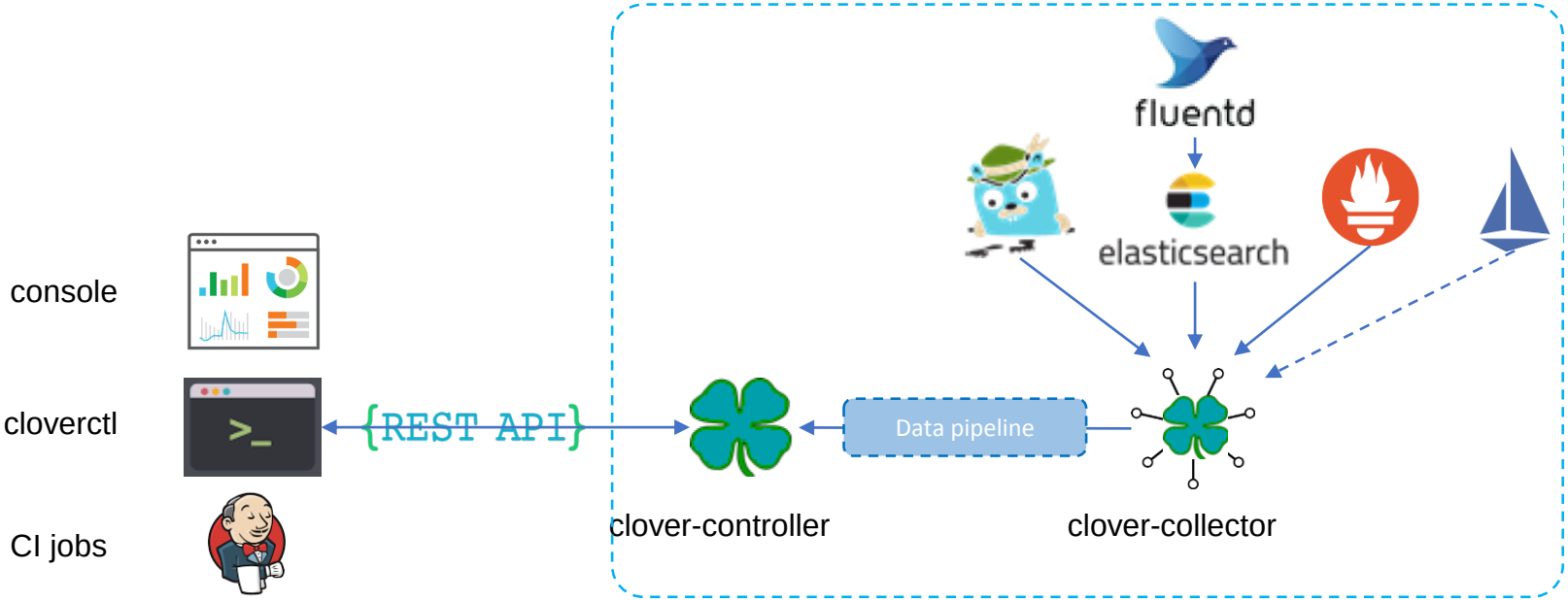
Clover Visibility 数据化的可视性



帮助收集，分析，处理数据，自动化运作等

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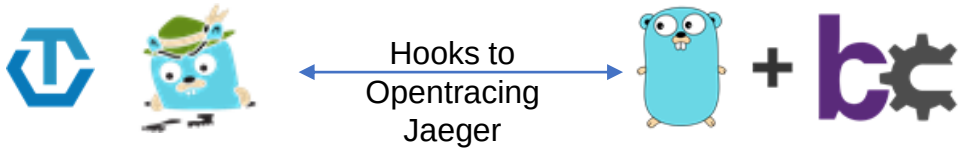
Clovisor: Network tracing via Clover + Iovisor 网络可视性

Istio has some shortcomings for Networking:

- Heavy weight
  - 13 containers today
  - Sidecar per pod
- Only has visibility for L4-7, not L3.
- Limited protocol support, tunneling, encapsulations

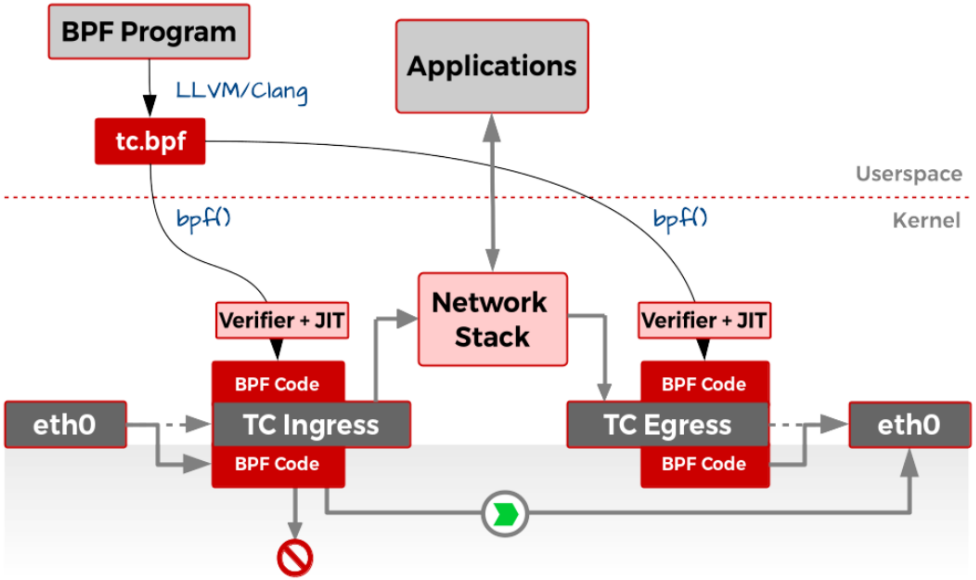
Clover enhances network tracing leveraging eBPF and IOvisor

Clovisor



A Brief Intro to eBPF – 简介

- Extended Berkeley Packet Filter
- Kernel “virtual machine”
- Programmed in user space. Clover uses golang
- Modern design with better performance and lighter system resource consumption.
- Used for Tracing, Security, Dynamic networking (containers), and many more.



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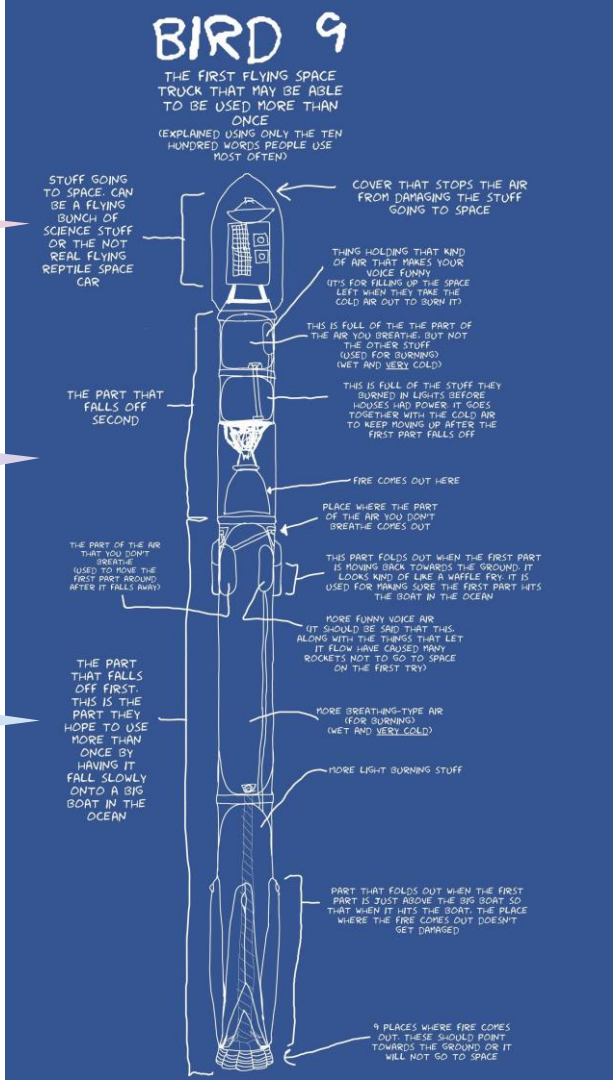
An Analogy: Continuous Deployment

Automating a complex interconnected network bears some similarity to colonizing Mars, you begin first with a **delivery vehicle** that you can *Launch, Land, Repeat reliably and cheaply.*

Payload: containerized software package.

Fuel: the non-reusable cost of each deployment.

Vehicle: the Continuous Deployment system.

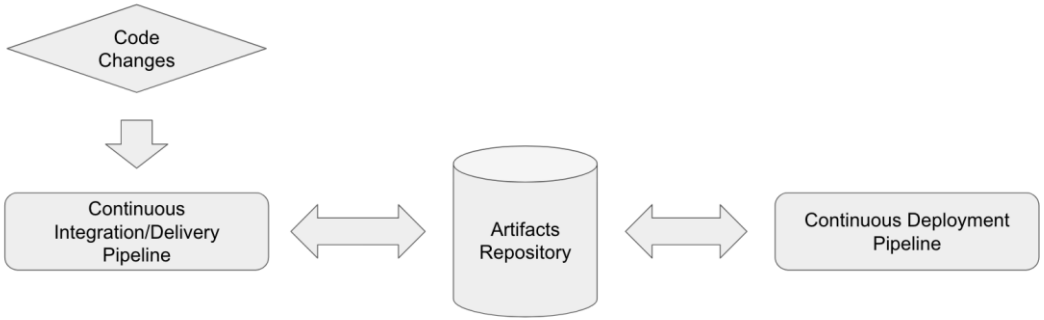


"The Falcon 9 explained using the 1000 words people use most regularly"
Image credit: https://imgur.com/nCqs3EO

Continuous Deployment 持续部署和自动化

- CI focuses primarily on automating the development process
- It manages code, test cases, bugs etc.
- At the end of CI pipeline, you get a package ready for deployment (Delivery)

- CD focuses primarily on automating the operation process of maintaining services
- It manages services, resources, upgrades, data etc.
- CI and CD are closely related



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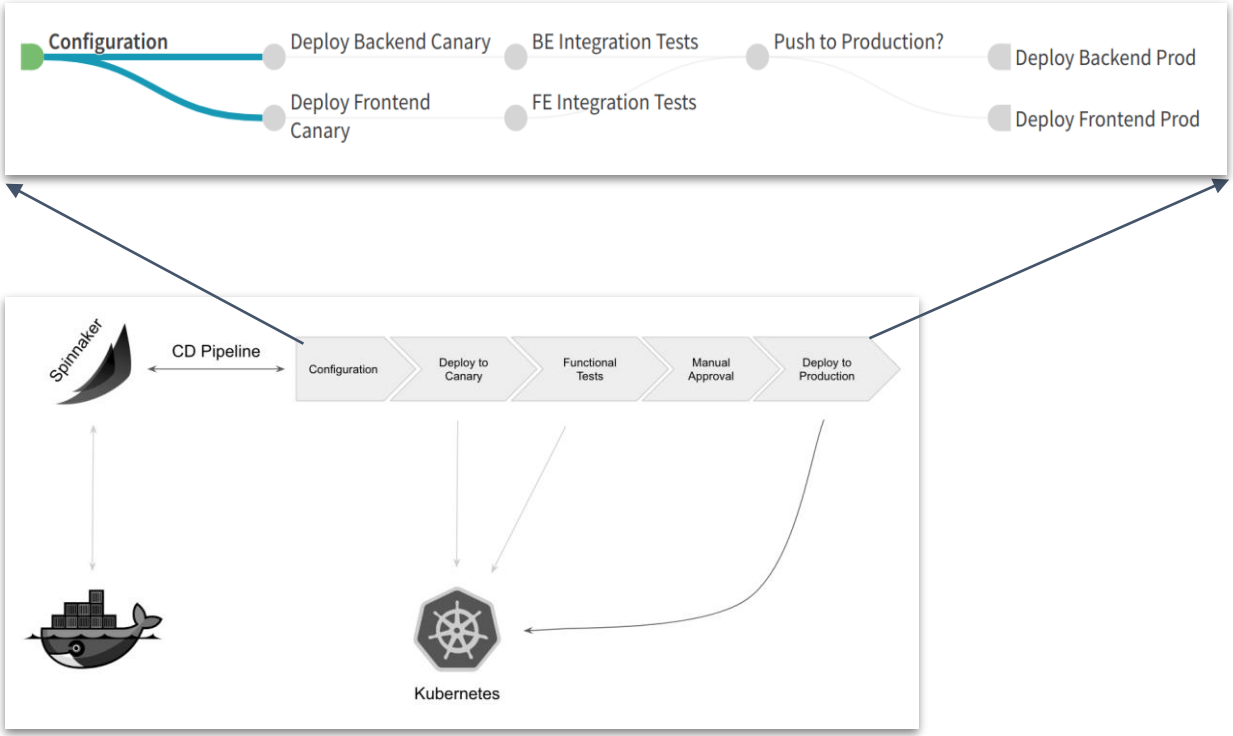
Continuous Deployment 持续部署和自动化

- Spinnaker is a dedicated CD tool
- A/B
- Canary
- Blue/Green
- Integrate together to achieve *Zero Touch* automation



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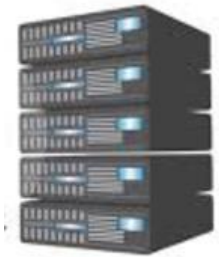
Diverse Target Computing Environment 多元部署环境

AKRAINO EDGE STACK

Tiny (Personal, uCPE, SD-WAN, IoT)



Small (Edge / Access)

Medium (Aggregation /Regional)

Huge, Public Clouds (Global data center)

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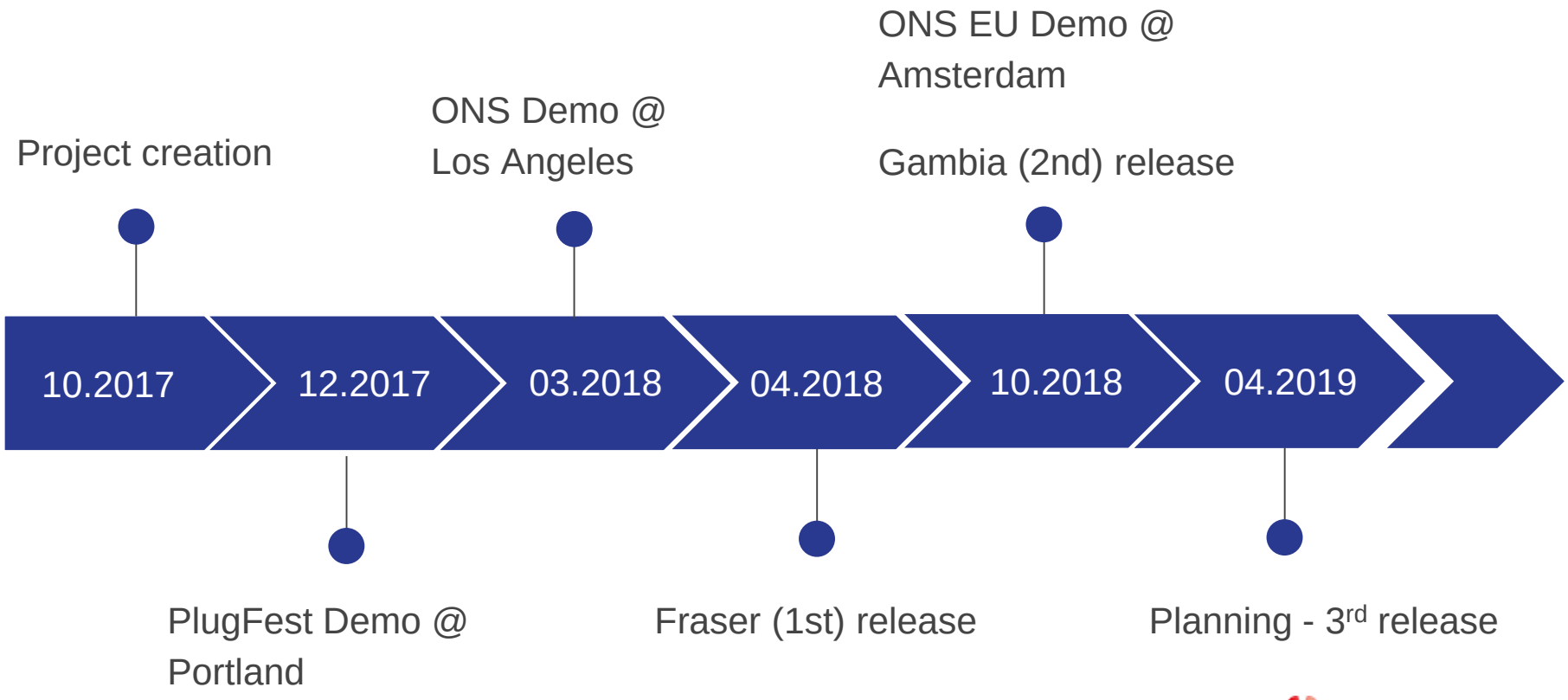
Clover Milestones 项目路标



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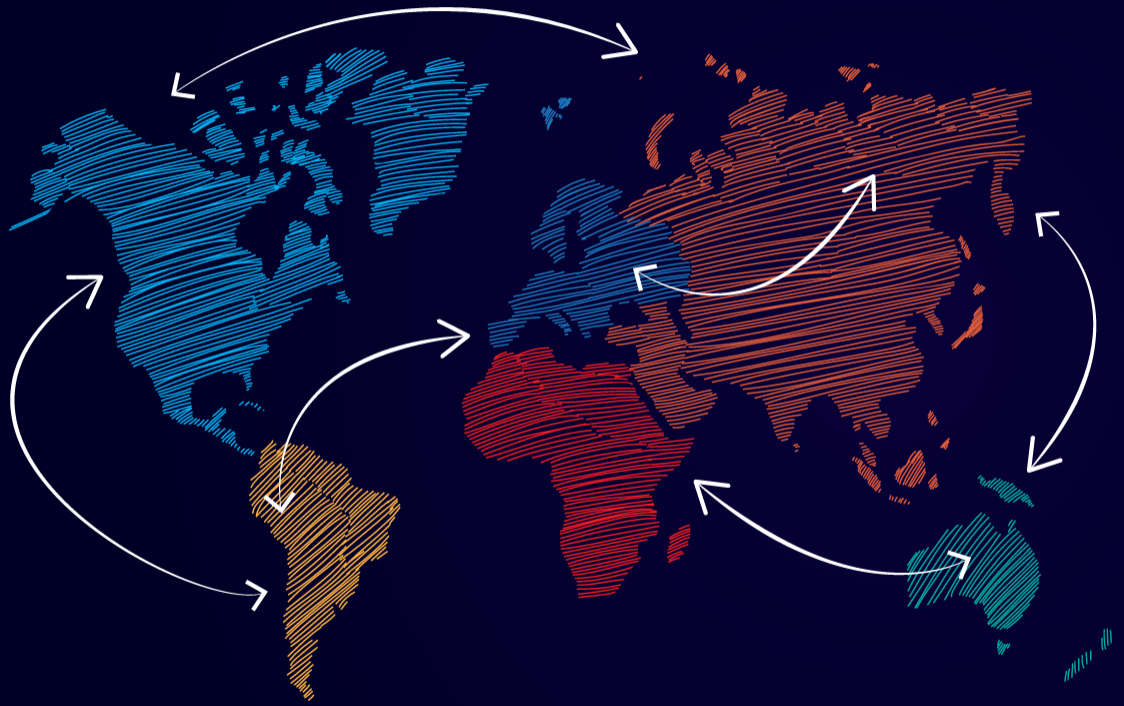

Q&A