



駕馭進化的力量

基礎架構8,000倍的演化力量

Dr. Tzung-Hsien (Shawn) Ho

Solution Architect @ VMware

2018年諾貝爾化學獎得主

2018 Nobel Prize in Chemistry



▶▶ **雅諾**

Frances H. Arnold



▶ **史密斯**

George P. Smith



▶ **溫特**

Gregory P. Winter

得獎原因

控制遺傳變因和基因選擇，培育蛋白質解決人類演化的化學問題

提供快速迭代平台，隨機突變酵素

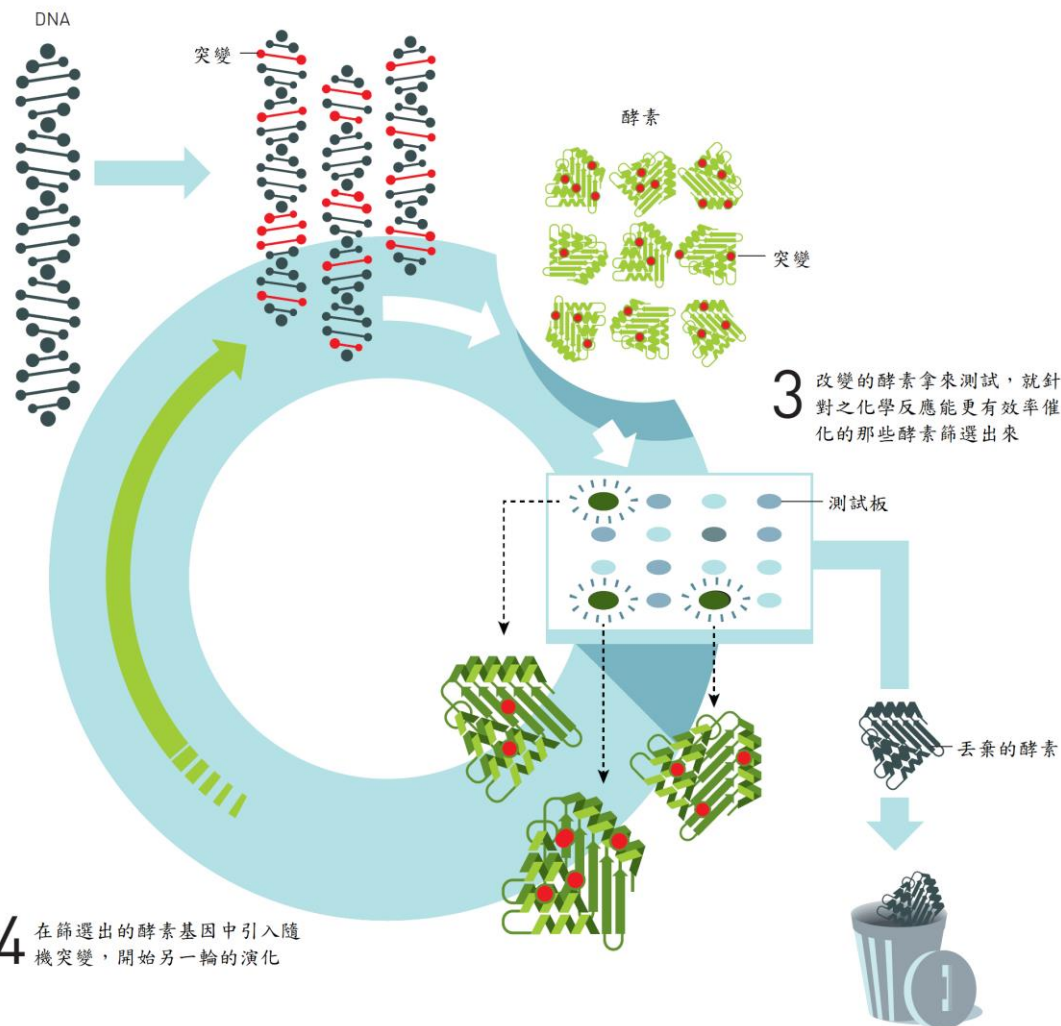
生物基因工程

1 於要改變的酵素基因中引入隨機突變

2 基因插入細菌中，用來作為模板以製造隨機突變的酵素

3 改變的酵素拿來測試，就針對之化學反應能更有效率催化的那些酵素篩選出來

4 在篩選出的酵素基因中引入隨機突變，開始另一輪的演化



『若要掌控新酵素的研發，僅憑藉人的推理能力，將遠遜於讓機率以及定向(人為)選汰來運作的力量』。

這是我們現在所見證的革命性發展之第一個，也是最具決定性的一步

三個構成進化的要素

快速、控制、分析



三個構成進化的要素：快速

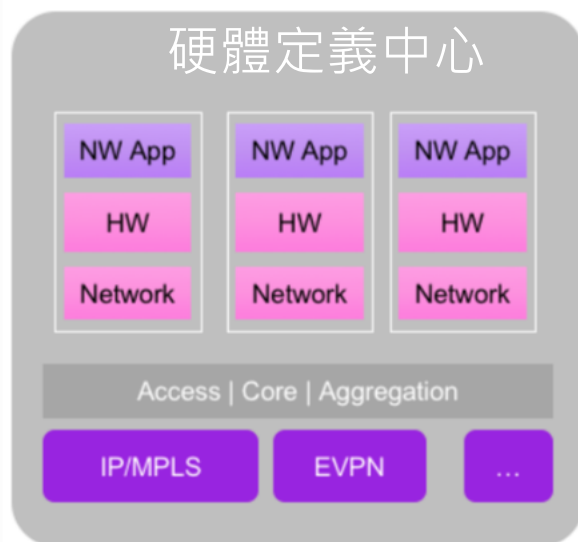


IT的架構：一路走來（開發者視角）

生成單台
機器時間

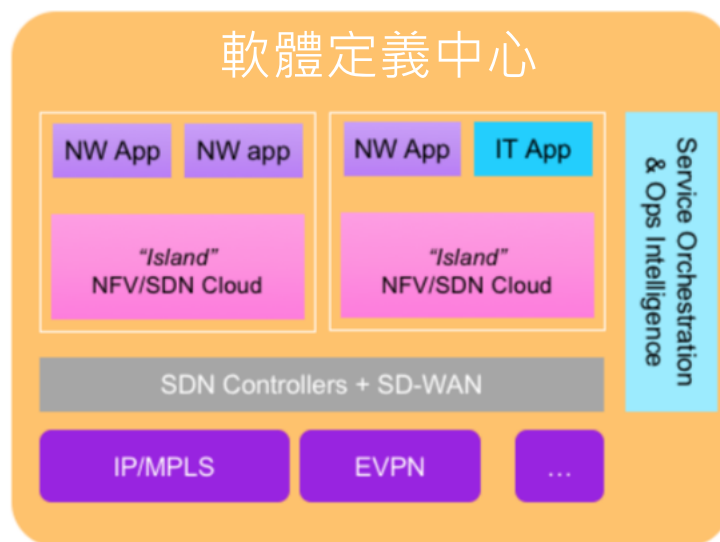
~1天

- 硬體與服務綁定
- 特化硬體
- 採購與維護困難
- 佈建速度緩慢



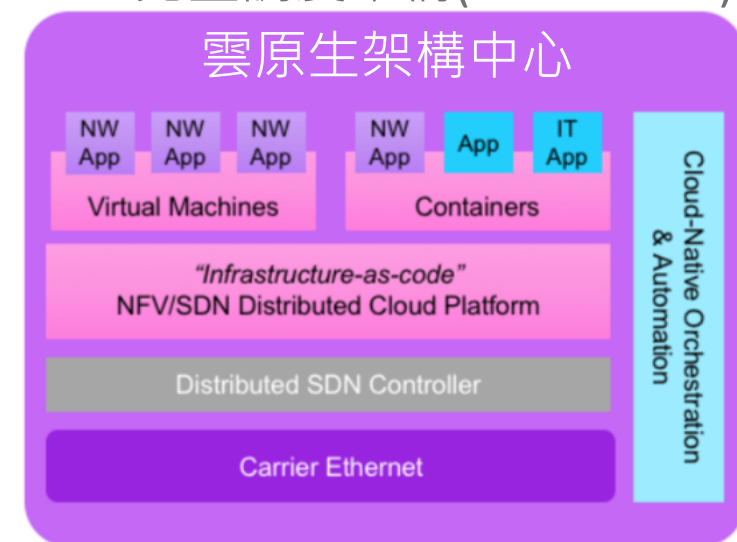
~3分鐘 X 480

- 虛擬機統一調度
 - CPU與記憶體
 - 網路元件隨選
 - 存儲空間生成
- 完整的API支援



~10秒鐘 X 8,640

- 虛擬機 + 容器統一調度
- 跨虛擬機 + 容器的整體網路元件調度
- 容器與虛擬機存儲共享
- 完整調度架構(Kubernetes)

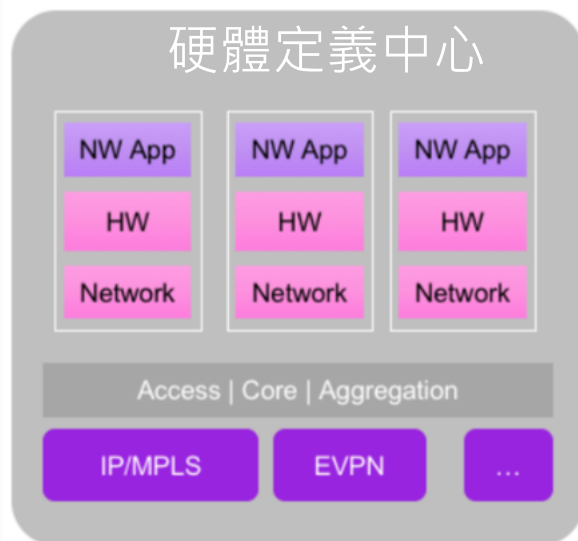


IT的架構：一路走來（開發者視角）

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~1天

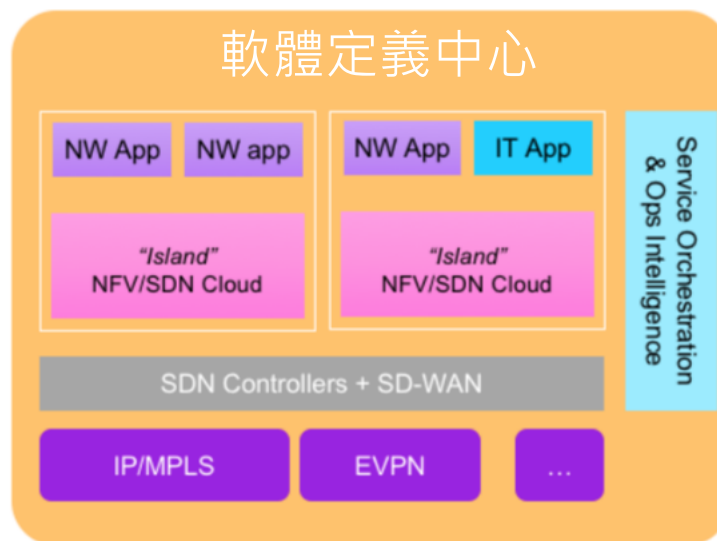
- 硬體與服務綁定
- 特化硬體
- 採購與維護困難
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~10秒鐘 X 8,640

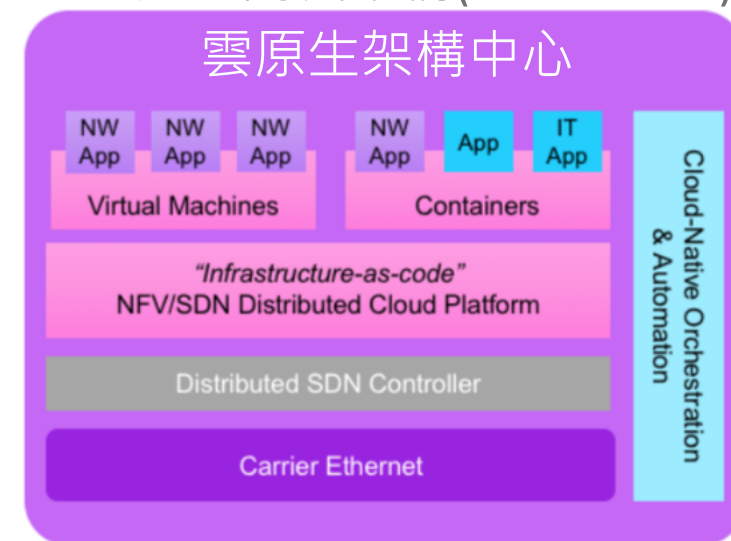
~~~3分鐘 X 480~~

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  - CPU與記憶體
  - 網路元件隨選
  - 存儲空間生成
- 完整的API支援



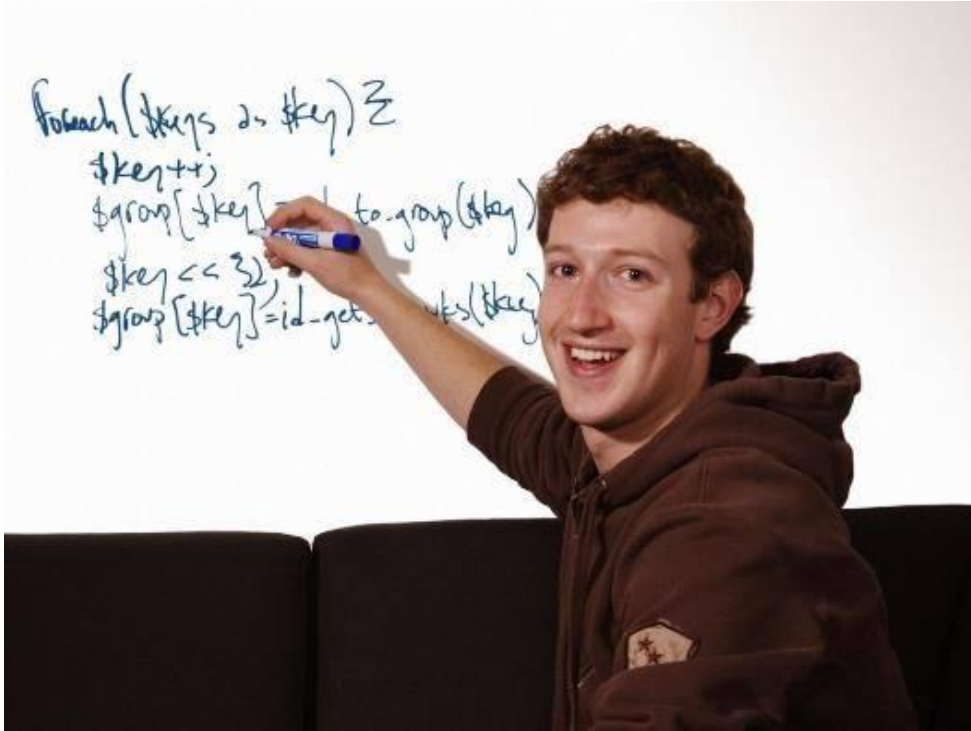
~10秒鐘 X 8,640

- 虛擬機 + 容器統一調度
- 跨虛擬機 + 容器的整體網路元件調度
- 容器與虛擬機存儲共享
- 完整調度架構(Kubernetes)



# Software 的最佳開發策略：Facebook and Google

『快速』的『持續迭代』



“Move fast and break things.” The idea is that if you never break anything, you’re probably not moving fast enough.



## Chromium Blog

News and developments from the open source browser project

Release early, release often. We think that's the best way to develop software that delights people.



# 展示：虛擬機的Instant Clone技術（秒級的開展）

The image displays two side-by-side windows. The left window is the vSphere Client interface, showing a list of virtual machines under the 'Mgmt' folder. The right window is the Windows PowerShell ISE, showing a script named 'InstantClone.psm1' being executed. The script defines variables for source VM, network settings, and a loop to create multiple instant clones.

**vSphere Client Interface:**

- Address bar: <https://vcsa67.lab.taiwan/ui/#?extensionId=...>
- Page title: vSphere Client
- Navigation pane (left):
  - vcasa67.lab.taiwan
    - Taipei
      - Compute
        - Mgmt
          - 172.16.10.83
          - 172.16.10.84
          - CentOS7-1
          - NFS
          - pcf-opsmgr-21
          - ubuntu1604
          - vm-0c709c80-469...
          - vm-78b318cf-8bd2-...
- Summary pane (right):
  - Summary tab selected
  - Virtual Machines section
  - Table of VMs:

| Name ↑               |
|----------------------|
| CentOS7-1            |
| NFS                  |
| pcf-opsmgr-21        |
| ubuntu1604           |
| vm-0c709c80-469...   |
| vm-78b318cf-8bd2-... |

**Windows PowerShell ISE:**

- File Edit View Tools Debug Add-ons Help
- Script: InstantClone.psm1
- Code:

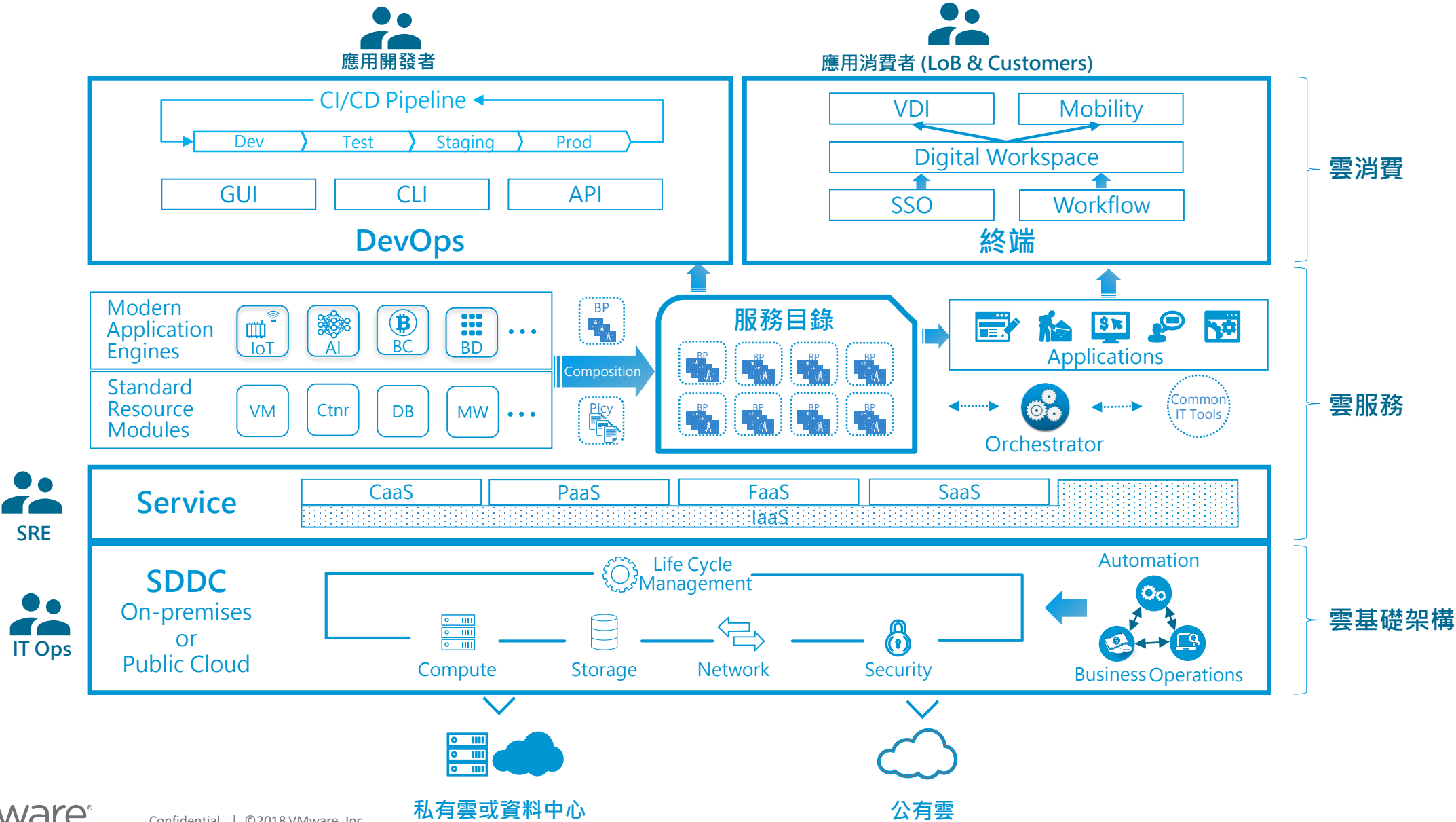
```
1 Import-Module c:\Users\Administrator\InstantClone.psm1
2 $SourceVM = "ubuntu1604"
3
4 $numOfVMs = 1
5 $ipNetwork = "192.168.1"
6 $ipStartingCount=152
7 $netmask = "255.255.255.0"
8 $dns = "172.16.10.64"
9 $gw = "172.16.10.253"
10
11 $StartTime = Get-Date
12 foreach ($i in 1..$numOfVMs) {
13     $newVMName = "IC-$i"
14
15     $guestCustomizationValues = @{
16         "guestinfo.ic.hostname" = "$newVMName"
17         "guestinfo.ic.ipaddress" = "$ipNetwork.$ipStartingCount"
18         "guestinfo.ic.netmask" = "$netmask"
19         "guestinfo.ic.gateway" = "$gw"
20         "guestinfo.ic.dns" = "$dns"
21         "guestinfo.ic.sourcevm" = "$SourceVM"
22     }
23     $ipStartingCount++
24     New-InstantClone -SourceVM $SourceVM -DestinationVM $newVMName -CustomizationFields $guestCustomizationValues
25 }
```
- Terminal output:

```
PS C:\Users\Administrator>
```

# 完整的千倍速開發平台：透過CI/CD還可以更加速

應用平台現代化

資料中心現代化



## Pivotal Container Solution (PKS) :



Pivotal®



## 展示：在PKS中使用JX做CI/CD開展



## 三個構成進化的要素：控制

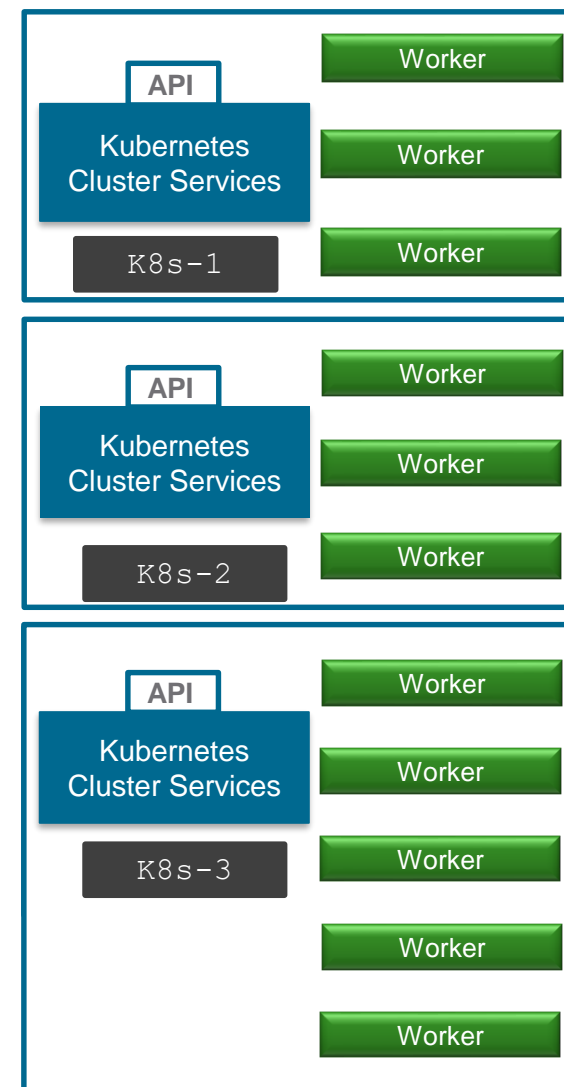
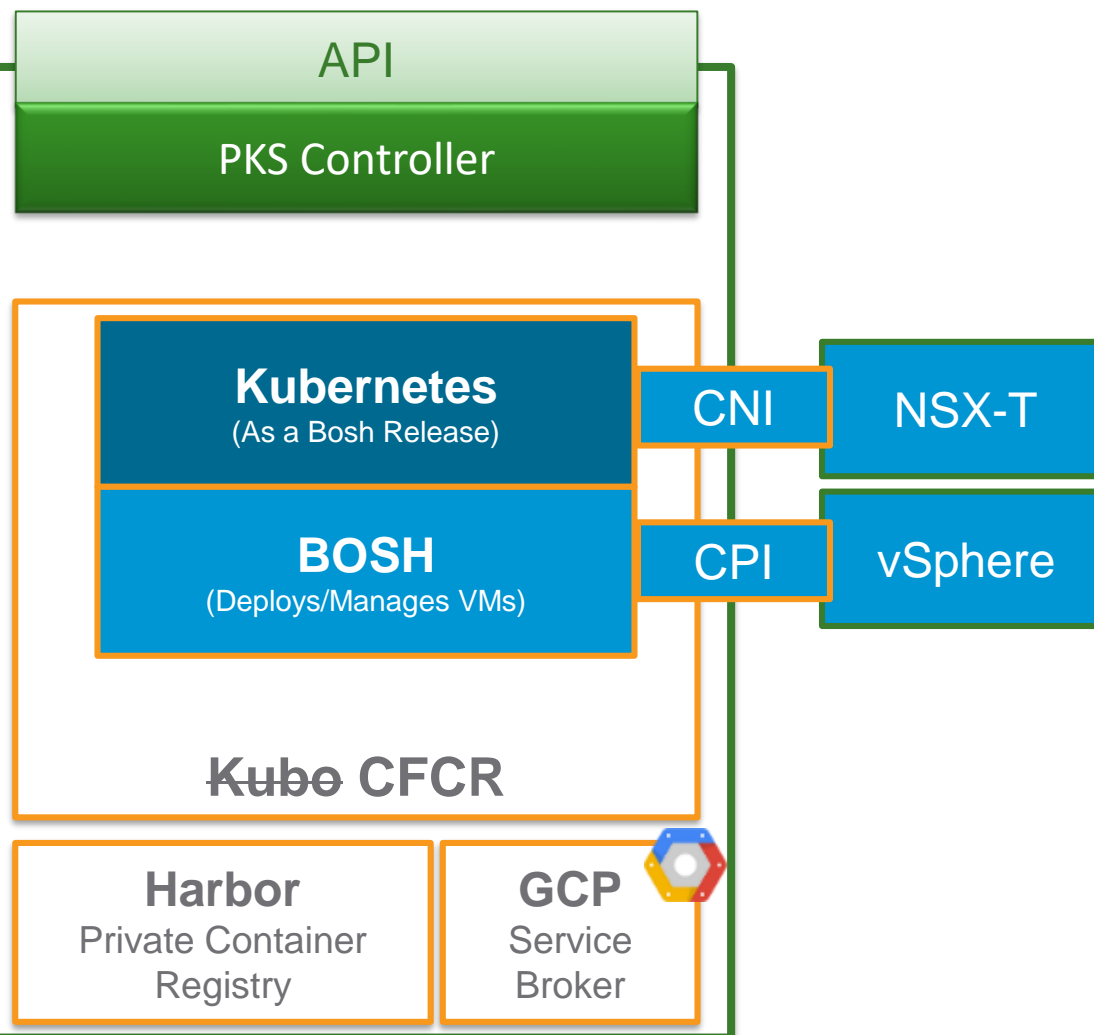


# PKS強大的隔離防護 · 提供多租戶的K8s環境

```
#pks resize K8s-3 n=5
```

## PKS

- Includes
  - PKS Controller, NSX-T
  - CFCR, Harbor, Broker
- Deploys & Configures
  - CFCR
  - vSphere
  - NSX-T Integration
  - Harbor
- Manages Cluster Day 2
  - Scaling
  - Patching
  - Upgrades
  - Failures



# 即使在K8S叢集中：PKS也透過CNI，實踐完整的NAMESPACE隔離

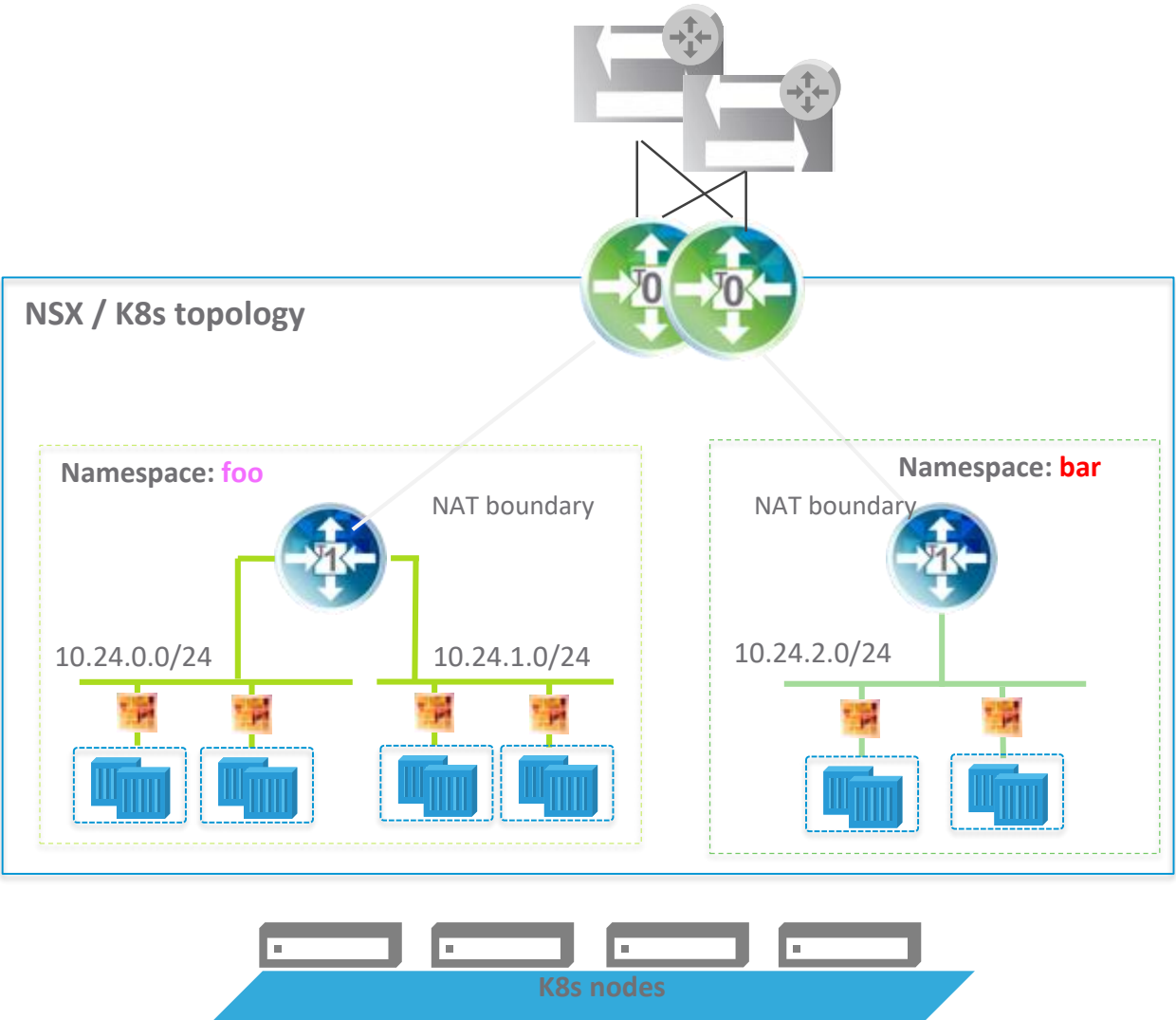
```
1. localadmin@k8s-master: ~ (ssh)

admin@k8s-master:~$ kubectl create namespace foo
namespace "foo" created

admin@k8s-master:~$ kubectl create namespace bar
namespace "bar" created

admin@k8s-master:~$ kubectl run nginx-foo --image=nginx -n foo
deployment "nginx-foo" created

admin@k8s-master:~$ kubectl run nginx-bar --image=nginx -n bar
deployment "nginx-bar" created
```



# PKS產生出的 K8S Pod：也帶著完整的隔離機制

```
name: yelb-ui
spec:
  replicas: 3
  template:
    metadata:
      labels:
        app: yelb-ui
        tier: frontend
        secgroup: web-tier
    spec:
      containers:
      - name: yelb-ui
        image: harbor.lab.taiwan/yelb/yelb-ui:V2
        ports:
        - name: web
          containerPort: 80
          protocol: TCP
        resources:
          requests:
            cpu: 200m
---
apiVersion: extensions/v1beta1
kind: Deployment
metadata:
  name: yelb-appserver
spec:
  replicas: 1
  template:
    metadata:
      labels:
        app: yelb-appserver
        tier: middletier
        secgroup: app-tier
```

## Edit NSGroup - web-tier

General Membership Criteria Members

Maximum Criteria: 5

Logical Port Tag Equals web-tier Scope Equals secgroup +

+ CRITERIA

CLEAR ALL

SAVE

CANCEL

## Edit NSGroup - app-tier

General Membership Criteria Members

Maximum Criteria: 5

Logical Port Tag Equals app-tier Scope Equals secgroup +

+ CRITERIA

CLEAR ALL

SAVE

CANCEL



# PKS產生出的 K8S Pod：也帶著完整的隔離機制

|    |                     |      |           |          |        |        |     |    |                                               |
|----|---------------------|------|-----------|----------|--------|--------|-----|----|-----------------------------------------------|
| 23 | Web-App             | 1079 | web-t...  | app-t... | HTTPS  | Allow  | All | No | packets: 57<br>bytes: 6416<br>sessions: 15    |
| 24 | App-DB              |      | app-ti... | db-tier  | MyS... | Allow  | All | No |                                               |
| 25 | Default Layer3 Rule | 1208 | Any       | Any      | Any    | Reject | All | No | packets: 359<br>bytes: 37663<br>sessions: 130 |

### Traceflow

Source

Destination

Port

pkf-ef99f0ac-e00f-4e7b-bb2d-1052ce0e956-yelb-ui-56b94588c8-mwvrt

Port

pkf-ef99f0ac-e00f-4e7b-bb2d-1052ce0e956-yelb-ui-56b94588c8-gk7p4

IP/MAC

10.120.5/02:50:56:00:70:1c

IP/MAC

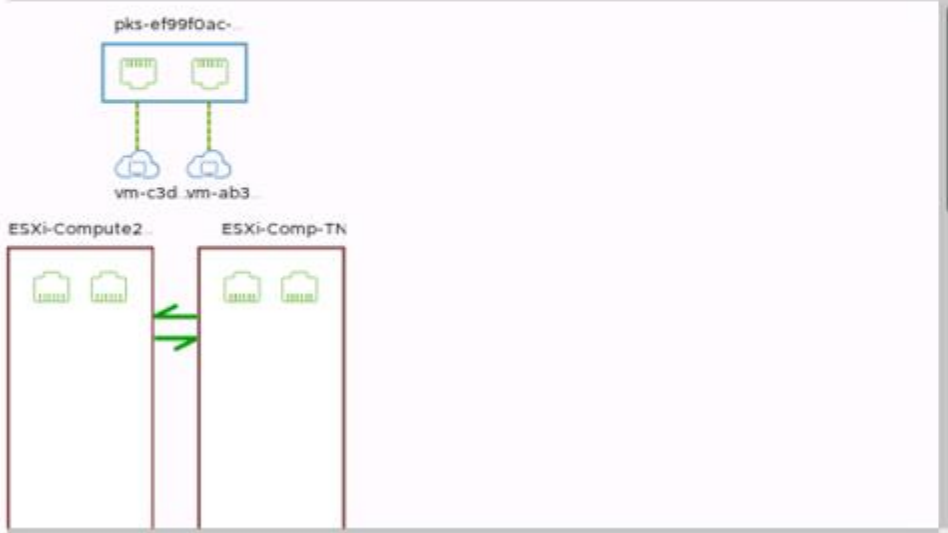
10.120.3/02:50:56:00:70:1a

RE-TRACE

EDIT

NEW TRACE

#### Trace Results



Show: ALL 0 DELIVERED 1 DROPPED

| Physical | Observation Type          | Transport Node | Component                  |
|----------|---------------------------|----------------|----------------------------|
| 0        | Dropped by Firewall: 1208 | ESXi-Compu...  | pkf-ef99f0ac-e00f-4e7b-... |

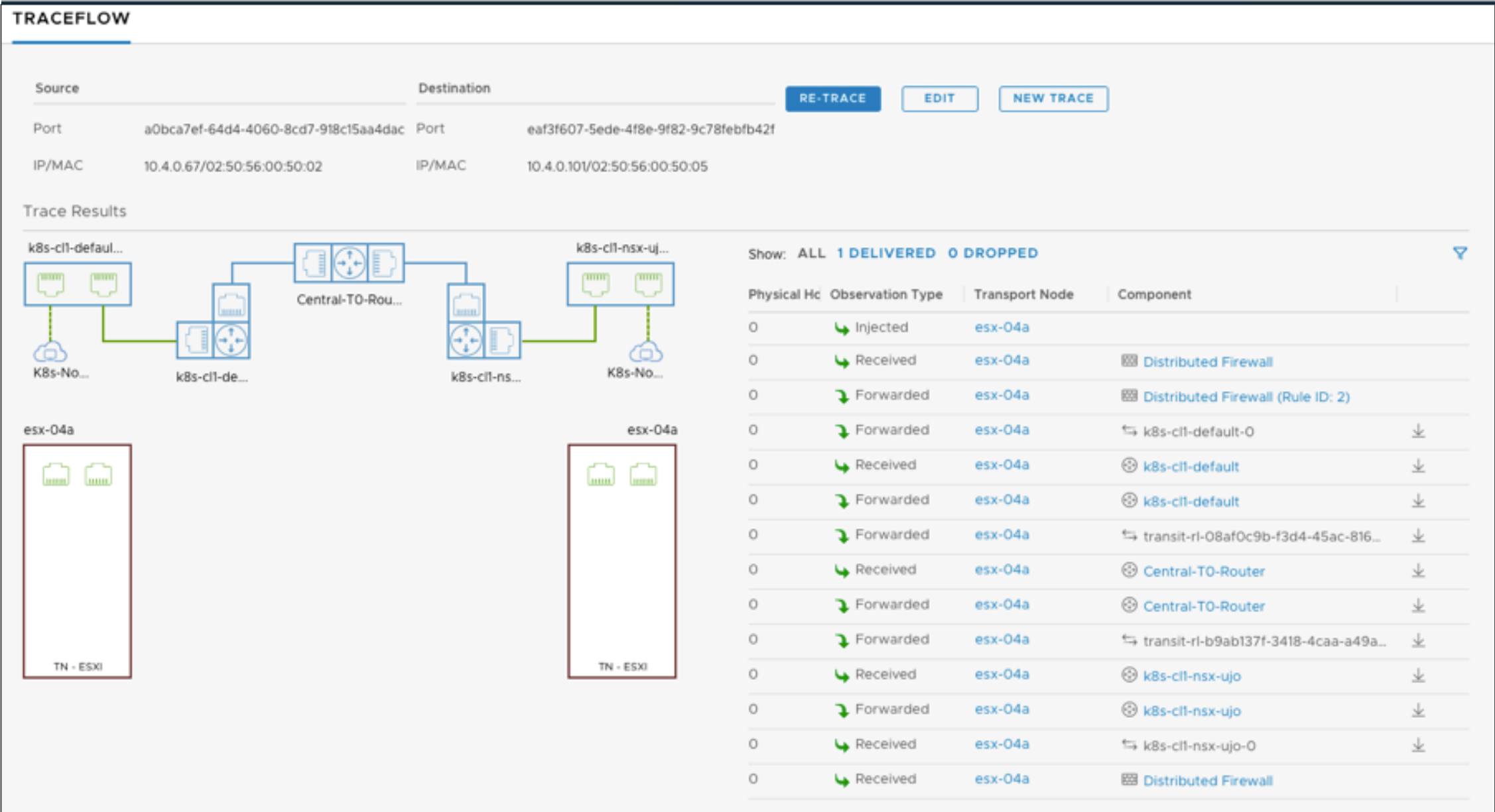
vm

17

## 三個構成進化的要素：分析



# PKS提供網路顯微鏡：『容器到容器 + 容器到虛擬機』的End-to-End 網路流



# PKS提供網路顯微鏡：觀察每個Pod內封包的狀況

vm NSX

<

Dashboard

Tools

Firewall

Encryption

Routing

DDI

Switching

Inventory

Fabric

System

SWITCHES

PORTS

SWITCHING

+

☐ Logical Port ↑

☐ k8s-cl1-nginx-ingress-rc-nq4zm

☐ k8s-cl1-nsx-demo-rc-06cn5

☐ k8s-cl1-nsx-demo-rc-0gdpn

☐ k8s-cl1-nsx-demo-rc-7jls1

☐ k8s-cl1-nsx-demo-rc-m5949

☐ k8s-cl1-redis-server-4043182875-fpdx9

☐ k8s-cl1-yelb-appserver-3315541501-m1nht

☐ k8s-cl1-yelb-appserver-3315541501-m1hwn

☐ k8s-cl1-yelb-appserver-3315541501-s2vmj

☒ k8s-cl1-yelb-ui-127081435-ltvt4

☐ k8s-cl1-yelb-ui-127081435-90xvv

☐ k8s-cl1-yelb-ui-127081435-bns9g

☐ k8s-cl1-yelb-ui-127081435-m13b3

☐ k8s-cl1-yelb-ui-127081435-nt5b0

☐ uplink-zone19-port

☐ web-01/web-01.vmx@75bfa456-1eb2-42fe-...

<

>

1-43 / 43

\*區域連線 (ip proto 47)

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Apply a display filter ... <Ctrl-F>

| No. | Time     | Source            | Destination | Protocol | Length | Info                                        |
|-----|----------|-------------------|-------------|----------|--------|---------------------------------------------|
| 17  | 5.621556 | 10.4.0.2          | 10.4.0.132  | TCP      | 116    | 44144 → 80 [SYN] Seq=0 Win=28200 Len=0 M... |
| 18  | 5.621557 | 10.4.0.132        | 10.4.0.2    | TCP      | 116    | 80 → 44144 [SYN, ACK] Seq=0 Ack=1 Win=27... |
| 19  | 5.621602 | 10.4.0.2          | 10.4.0.132  | TCP      | 108    | 44144 → 80 [ACK] Seq=1 Ack=1 Win=28288 L... |
| 20  | 5.621756 | 10.4.0.2          | 10.4.0.132  | HTTP     | 570    | GET /api/getvotes HTTP/1.1                  |
| 21  | 5.621827 | 10.4.0.132        | 10.4.0.2    | TCP      | 108    | 80 → 44144 [ACK] Seq=1 Ack=463 Win=29056... |
| 22  | 5.622181 | 10.4.0.132        | 10.4.0.137  | TCP      | 116    | 53522 → 4567 [SYN] Seq=0 Win=28200 Len=0... |
| 23  | 5.622337 | 02:50:56:56:44:52 | Broadcast   | ARP      | 102    | Who has 10.4.0.137? Tell 10.4.0.129         |
| 24  | 5.623267 | 02:50:56:56:44:52 | Broadcast   | ARP      | 102    | Who has 10.4.0.135? Tell 10.4.0.129         |
| 25  | 5.940027 | 10.4.0.137        | 10.4.0.132  | TCP      | 116    | 4567 → 53522 [SYN, ACK] Seq=0 Ack=1 Win=... |

▶ Frame 22: 116 bytes on wire (928 bits), 116 bytes captured (928 bits) on interface 0

▶ Ethernet II, Src: Vmware\_96:55:24 (00:50:56:96:55:24), Dst: Vmware\_96:74:ae (00:50:56:96:74:ae)

▶ Internet Protocol Version 4, Src: 172.19.0.7, Dst: 10.66.0.103

▶ Generic Routing Encapsulation (Transparent Ethernet bridging)

▶ Ethernet II, Src: 02:50:56:00:40:07 (02:50:56:00:40:07), Dst: 02:50:56:56:44:52 (02:50:56:56:44:52)

▶ Internet Protocol Version 4, Src: 10.4.0.132, Dst: 10.4.0.137

▶ Transmission Control Protocol, Src Port: 53522, Dst Port: 4567, Seq: 0, Len: 0

0000 00 50 56 96 74 ae 00 50 56 96 55 24 08 00 45 00 .PV.t..P V.U\$.E.

0010 00 66 e5 bc 00 00 3f 2f de e9 ac 13 00 07 0a 42 .f....?/ .....B

0020 00 67 20 00 65 58 03 00 bb 9c 02 50 56 56 44 52 .g .eX.. ...PWDR

0030 02 50 56 00 40 07 08 00 45 00 00 3c 64 f6 40 00 .PV.@... E..<d. @.

0040 40 06 c0 b1 0a 04 00 84 0a 04 00 89 d1 12 11 d7 @.....

0050 86 be f9 ff 00 00 00 00 a0 02 6e 28 ba 99 00 00 ..... ..n(....

0060 02 04 05 82 04 02 08 0a 09 aa 9d 09 00 00 00 00 ..... .....

0070 01 03 03 07 ....

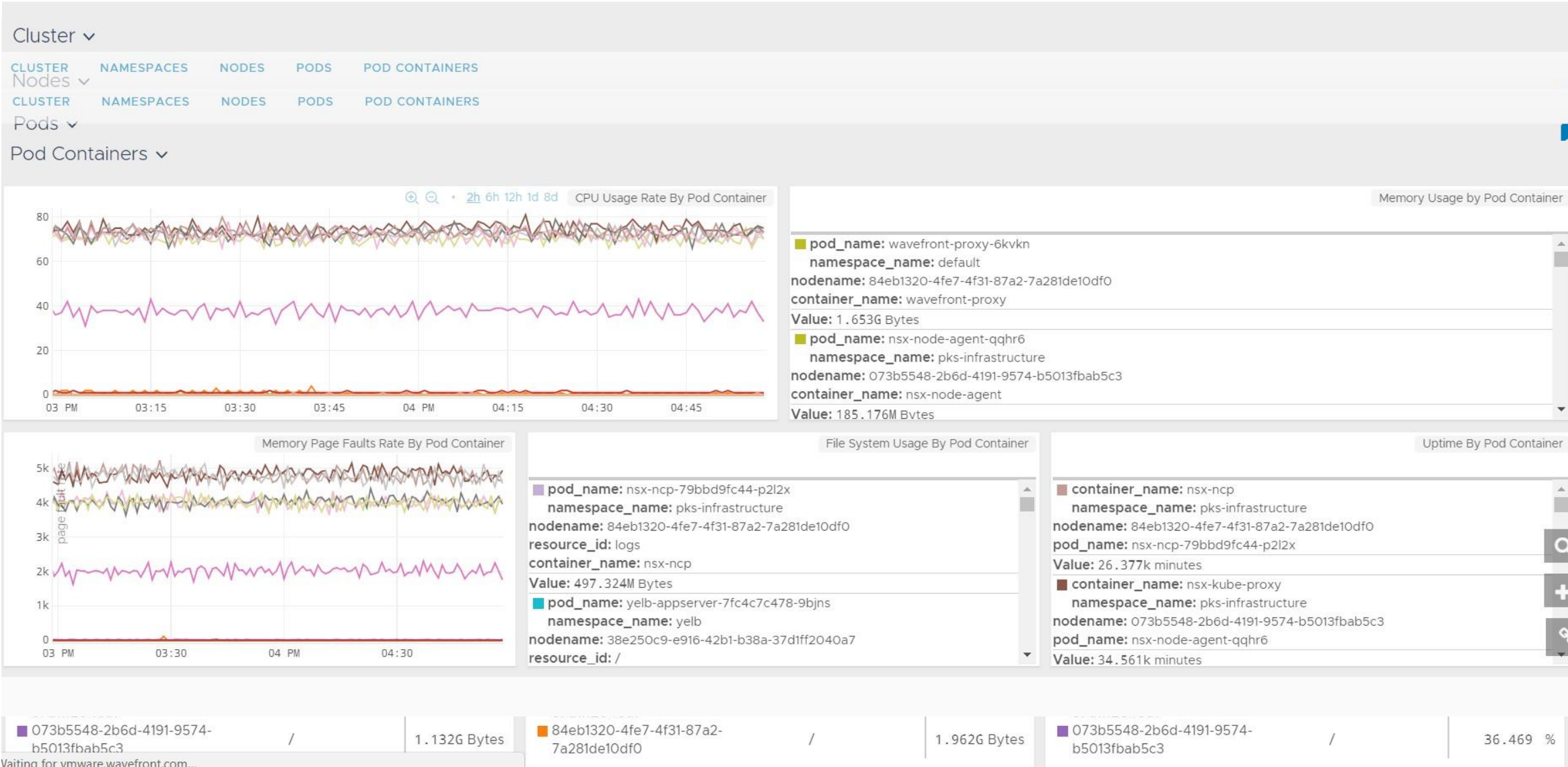
wireshark\_E4DFDF4F-D161-452C-8AD4-7AA51D796419\_20171226094539\_a03872

Packets: 132 · Displayed: 132 (100.0%)

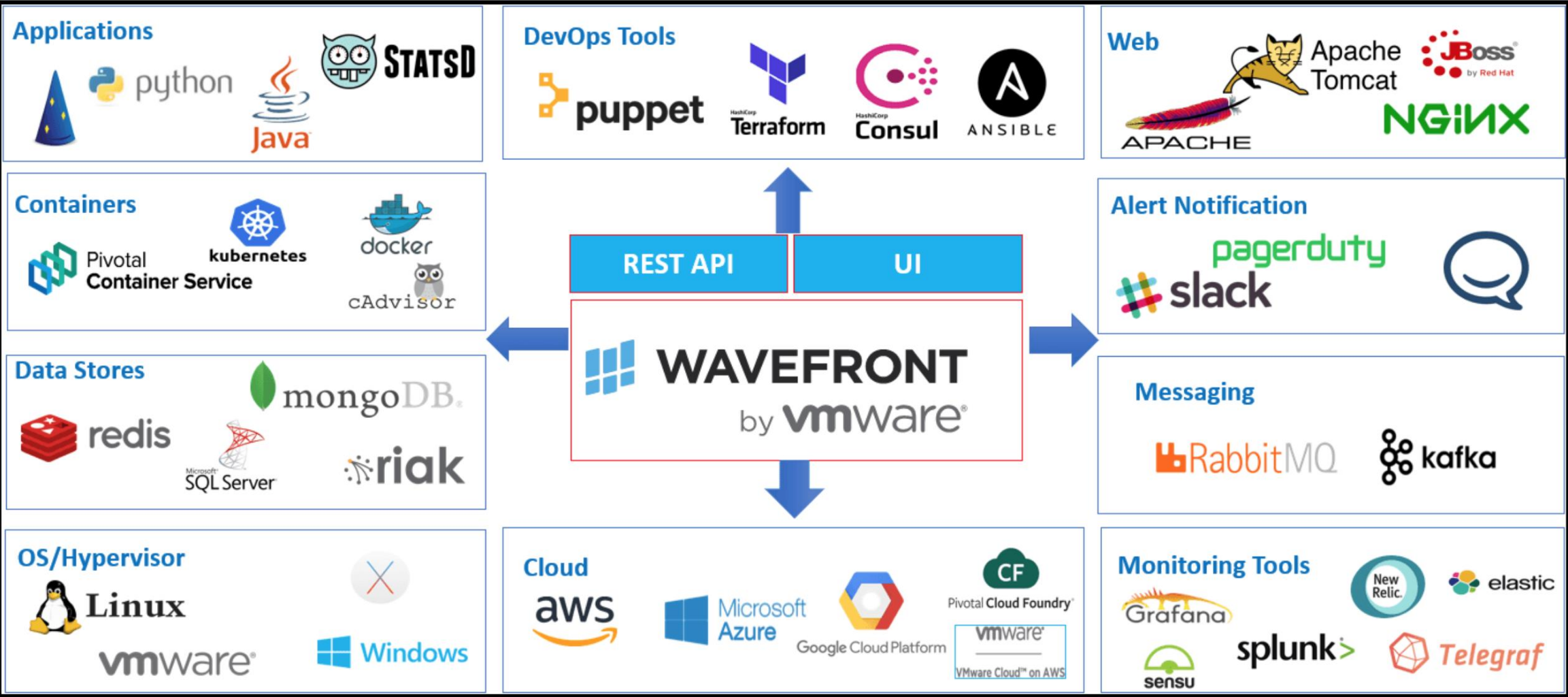
Profile: Default



# WaveFront提供的放大鏡：整個叢集、POD、甚至POD Container的效能



# WaveFront提供的放大鏡：容器內所執行Application的完整效能



LET'S MEET for OUR LAST HERO TODAY : SYNDROME

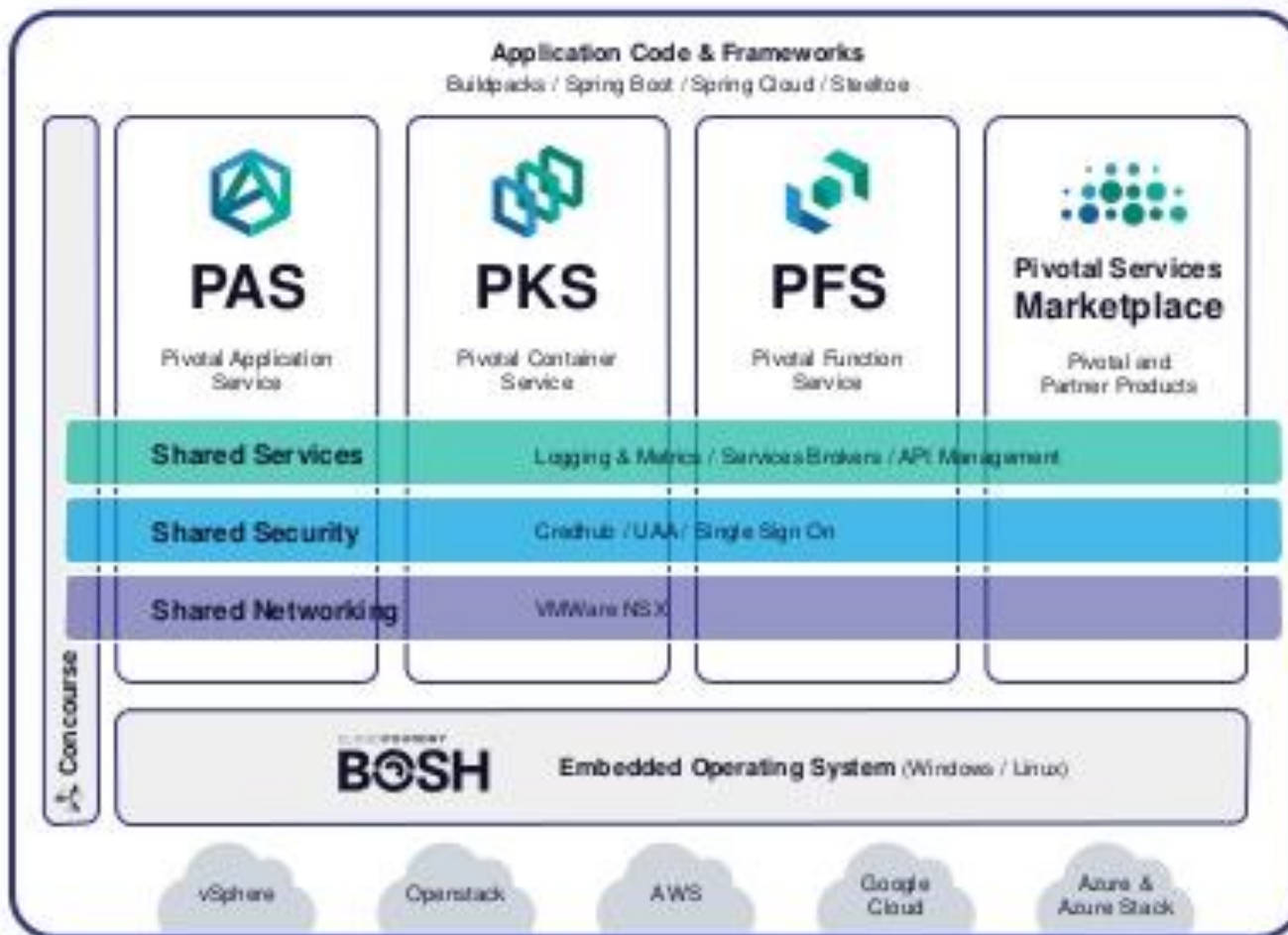




# VMware對企業客戶的承諾：打造GCP-Like的私有雲服務

**Any App  
Every Cloud  
One Platform**

PCF 2.0 — for everything  
that matters





# GKE-ONPREM WILL RESIDE in vSPHERE ON GOOGLE NEXT



So everything you've seen here is



LET'S EVOLVE TOGETHER.....IN > 8,000 TIMES SPEED

