

# CNCF Overview

Dan Kohn, Executive Director, [@dankohn1](https://twitter.com/dankohn1)

This presentation is available at:  
<https://github.com/cncf/presentations>

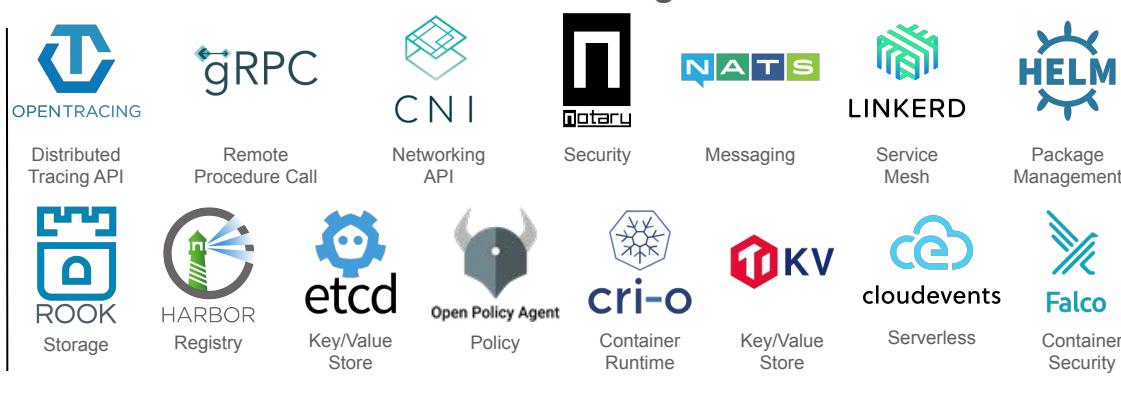
# Cloud Native Computing Foundation

- Nonprofit, part of the Linux Foundation; founded Dec. 2015

## Graduated



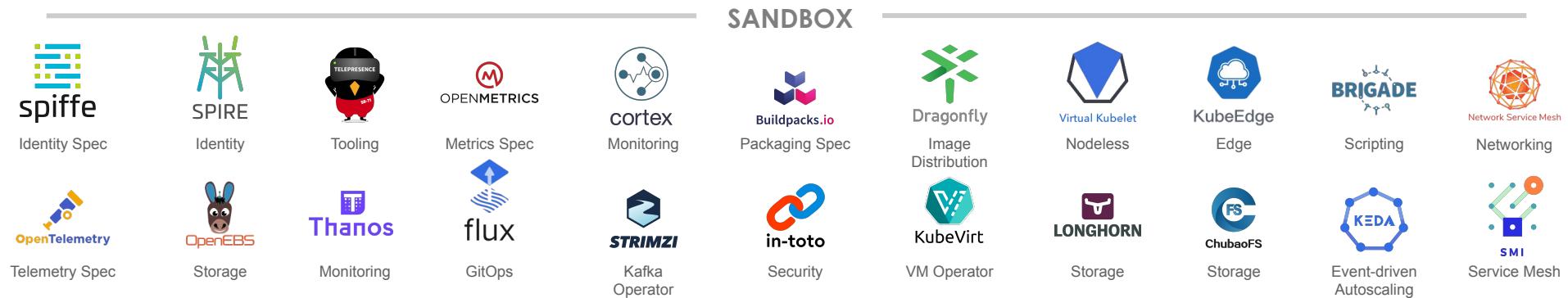
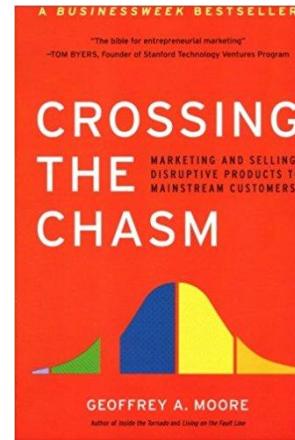
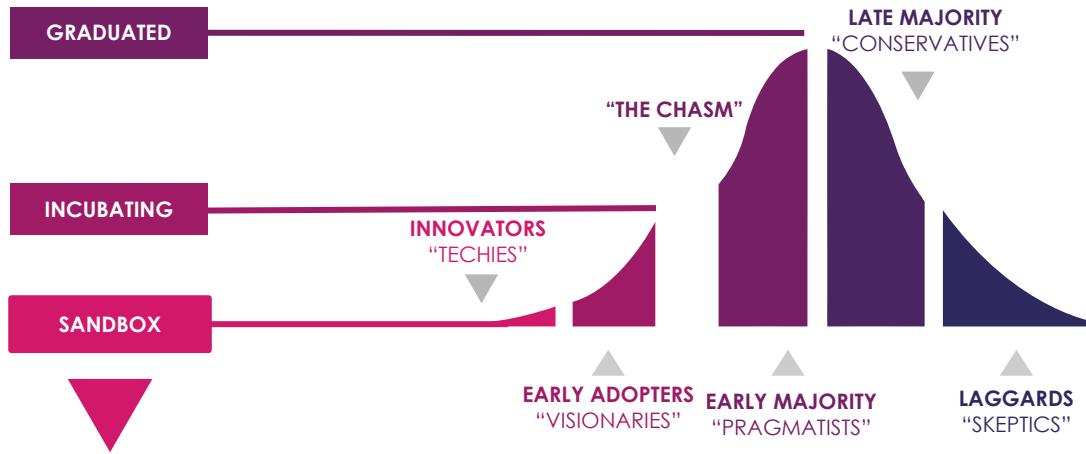
## Incubating



- Platinum members:



# CNCF Project Maturities



# Today the Linux Foundation is much more than Linux



## Security

We are helping global privacy and security through a program to encrypt the entire internet.



## Networking

We are creating ecosystems around networking to improve agility in the evolving software-defined datacenter.



## Cloud

We are creating a portability layer for the cloud, driving de facto standards and developing the orchestration layer for all clouds.



## Automotive

We are creating the platform for infotainment in the auto industry that can be expanded into instrument clusters and telematics systems.



## Blockchain

We are creating a permanent, secure distributed ledger that makes it easier to create cost-efficient, decentralized business networks.



## Web

Node.js and other projects are the application development framework for next generation web, mobile, serverless, and IoT applications.



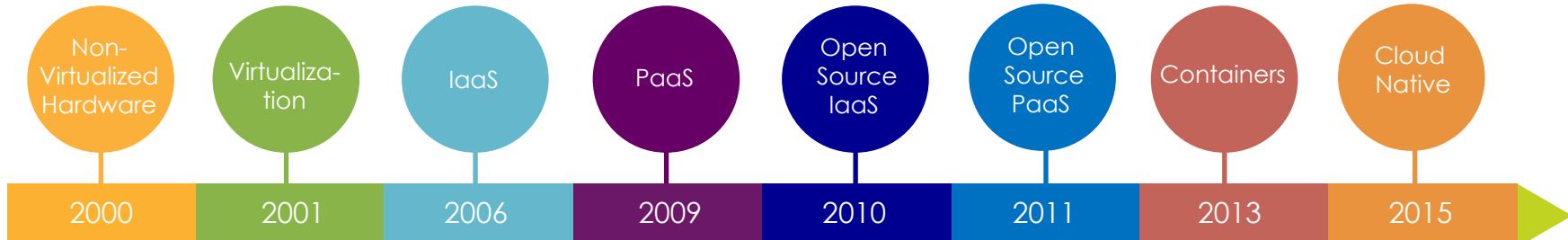
We are regularly adding projects; for the most up-to-date listing of all projects visit [tlfprojects.org](https://tlfprojects.org)



# From Virtualization to Cloud Native



- Cloud native computing uses an open source software stack to:
  - segment applications into *microservices*,
  - package each part into its own container
  - and dynamically orchestrate those containers to optimize resource utilization



# Why You Should Host Your Project at CNCF

- A neutral home increases contributions
- Endorsement by CNCF's Technical Oversight Committee
- Engagement with End User and Service Provider Communities
- Full-time press and analyst relations teams
- Tens of thousands of dollars per year in documentation, security audits, case studies, and other support services
- Maintain your committers and define your own governance, as long as its neutral
- Full-time staff eager to assist
- World-class events team, track at KubeCon + CloudNativeCon around the world, and custom events for your project
- Worldwide meetup groups
- Cloud resources for CI and scale testing



# Cloud Native Trail Map

Trail Map: [l.cncf.io](https://l.cncf.io)

## CLOUD NATIVE TRAIL MAP

The Cloud Native Landscape ([l.cncf.io](https://l.cncf.io)) has a large number of options. This Cloud Native Trail Map is a recommended process for learning about cloud native technologies. At each step, you can choose a vendor-supported offering or do it yourself, and everything after step #3 is optional based on your circumstances.

### HELP ALONG THE WAY

#### A. Training and Certification

Consider training offerings from CNCF and then take the exam to become a Certified Kubernetes Administrator or a Certified Kubernetes Application Developer [cncf.io/training](https://cncf.io/training)

#### B. Consulting Help

If you want assistance with Kubernetes and the surrounding ecosystem, consider leveraging a Kubernetes Certified Service Provider [cncf.io/kscsp](https://cncf.io/kscsp)

#### C. Join CNCF's End User Community

For companies that don't offer cloud native services externally [cncf.io/enduser](https://cncf.io/enduser)

### WHAT IS CLOUD NATIVE?

Cloud native technologies empower organizations to build and run scalable applications in modern, dynamic environments such as public, private, and hybrid clouds. Containers, service meshes, microservices, immutable infrastructure, and declarative APIs exemplify this approach.

These techniques enable loosely coupled systems that are resilient, manageable, and observable. Combined with robust automation, they allow engineers to make high-impact changes frequently and predictably with minimal toil.

The Cloud Native Computing Foundation seeks to drive adoption of this paradigm by fostering and sustaining an ecosystem of open source, vendor-neutral projects. We democratize state-of-the-art patterns to make these innovations accessible for everyone.

[l.cncf.io](https://l.cncf.io)  
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## 1. CONTAINERIZATION

- Commonly done with Docker containers
- Any size application and dependencies (even PDP-11 code running on an emulator) can be containerized
- Over time, you should aspire towards splitting suitable applications and writing future functionality as microservices



## 3. ORCHESTRATION & APPLICATION DEFINITION

- Kubernetes is the market-leading orchestration solution
- You should select a Certified Kubernetes Distribution, Hosted Platform, or Installer: [cncf.io/cck](https://cncf.io/cck)
- Helm Charts help you define, install, and upgrade even the most complex Kubernetes application



## 5. SERVICE PROXY, DISCOVERY, & MESH

- CoreDNS is a fast and flexible tool that is useful for service discovery
- Envoy and Linkerd each enable service mesh architectures
- They offer health checking, routing, and load balancing



## 7. DISTRIBUTED DATABASE & STORAGE

When you need more resilience, scalability than you can get from a single database, Vitess is a good option for running MySQL at scale through sharding. Rock is a storage orchestrator that integrates a diverse set of storage solutions into Kubernetes. Since it runs on top of Kubernetes, it provides a reliable way to store data across a cluster of machines. TiKV is a high performance distributed transactional key-value store written in Rust.



## 9. CONTAINER REGISTRY & RUNTIME

Harbor is a registry that stores, signs, and scans content. You can use alternative container runtimes. The most common, both of which are OCI-compliant, are containerd and cri-O.



## 2. CI/CD

- Setup Continuous Integration/Continuous Delivery (CI/CD) so that changes to your source code automatically result in a new container being built, tested, and deployed to staging and eventually, perhaps, to production
- Set up automated rollouts, rollbacks and testing

## 4. OBSERVABILITY & ANALYSIS

- Pick solutions for monitoring, logging and tracing
- Consider CNCF projects Prometheus for monitoring, Fluentd for logging and Jaeger for Tracing
- For tracing, look for an OpenTracing-compatible implementation like Jaeger



## 6. NETWORKING & POLICY

To enable more flexible networking, use a CNCF-compliant network project like Calico, Flannel, or Weave Net. Open Policy Agent (OPA) is a general-purpose policy engine with rules ranging from authorization and admission control to data filtering.



## 8. STREAMING & MESSAGING

When you need higher performance than JSON+REST, consider using gRPC or NATS. gRPC is a universal RPC framework. NATS is a multi-modal messaging system that includes request/reply, pub/sub and load balanced queues. CloudEvents is a specification for describing event data in common ways.



## 10. SOFTWARE DISTRIBUTION

If you need to do secure software distribution, evaluate Notary, an implementation of The Update Framework.



Overwhelmed? Please see the CNCF Trail Map. That and the interactive landscape are at [l.cncf.io](https://l.cncf.io)

The diagram is organized into several main sections:

- App Definition and Development:** Database, Streaming & Messaging, Application Definition & Image Build, Continuous Integration & Delivery.
- Orchestration & Management:** Scheduling & Orchestration, Coordination & Service Discovery, Remote Procedure Call, Service Proxy, API Gateway, Service Mesh.
- Runtime:** Cloud Native Storage, Container Runtime, Cloud Native Network.
- Provisioning:** Automation & Configuration, Container Registry, Security & Compliance, Key Management.
- Special:** Kubernetes Certified Service Provider, Kubernetes Training Partner.
- Platform:** Certified Kubernetes - Distribution, Certified Kubernetes - Hosted, Certified Kubernetes - Installer, PaaS/Container Service.
- Observability and Analysis:** Monitoring, Logging, Tracing, Chaos Engineering, Serverless, Members.

Each section contains a grid of logos representing different projects or components within that category. The logos are color-coded and some are greyed out to indicate they are not open source.

**Cloud Native Landscape:** This landscape is intended as a map through the previously uncharted terrain of cloud native technologies. There are many routes to deploying a cloud native application, with CNCF Projects representing a particularly well-traveled path.

**l.cncf.io**

# CNCF Cloud Native Interactive Landscape

[Reset Filters](#)

Grouping

No Grouping

Sort By

Stars (high to low)

Category

Any

CNCF Relation

Any

License

Any

Organization

Any

Headquarters Location

Any

**Example filters:**[Cards by age](#)[Open source landscape](#)[Member cards](#)**Cards by stars**[Cards from China](#)[Certified K8s/KCSP/KTP](#)[Cards by MCap/Funding](#)[Download as CSV](#)

The Cloud Native Trail Map ([png](#), [pdf](#)) is CNCF's recommended path through the cloud native landscape. The cloud native landscape ([png](#), [pdf](#)), serverless landscape ([png](#), [pdf](#)), and member landscape ([png](#), [pdf](#)) are dynamically generated below. Please open a pull request to correct any issues. Greyed logos are not open source. Last Updated: 2019-07-12 2:17:13Z

You are viewing 1,158 cards with a total of 1,725,127 stars, market cap of \$10.38T and funding of \$57.68B.

Try it now at  
<https://l.cncf.io>

[Tweet](#) 694

Landscape

Card Mode

Serverless

Members

No Grouping (1158)



Kubernetes

Cloud Native Computing Foundation (CNCF)  
★ 55,292

Elastic

Elastic ★ 42,628  
MCap: \$7.09B

Netdata

Netdata ★ 39,579



Ansible

Red Hat ★ 38,340  
MCap: \$33.43B

Redis

Redis Labs ★ 37,543  
Funding: \$146.6M

serverless

Serverless ★ 30,993  
Serverless Funding: \$13M

Grafana

Grafana Labs ★ 29,826  
Funding: \$1.23M

No Code

No Code ★ 29,736



Dubbo

Apache Software Foundation ★ 27,880



etcd

Cloud Native Computing Foundation (CNCF) ★ 26,033



Prometheus

Cloud Native Computing Foundation (CNCF) ★ 25,134



Traefik

Containous ★ 23,355  
Funding: \$1.06M

Apache Spark ★ 22,617

Apache Software Foundation



Kong ★ 22,580

Kong Funding: \$69.1M



RethinkDB ★ 22,388

Linux Foundation



gRPC ★ 22,130

Cloud Native Computing Foundation (CNCF)



GitLab ★ 21,901

GitLab Funding: \$168.2M



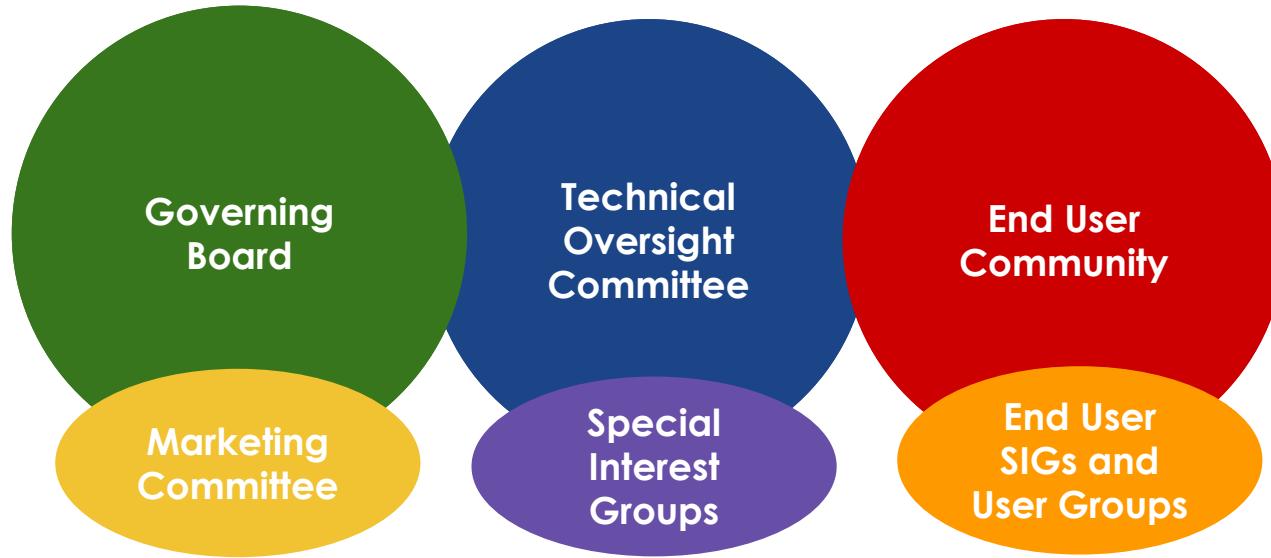
Sentry

Sentry ★ 21,457  
Funding: \$26.5M

# 140+ Companies in the End User Community



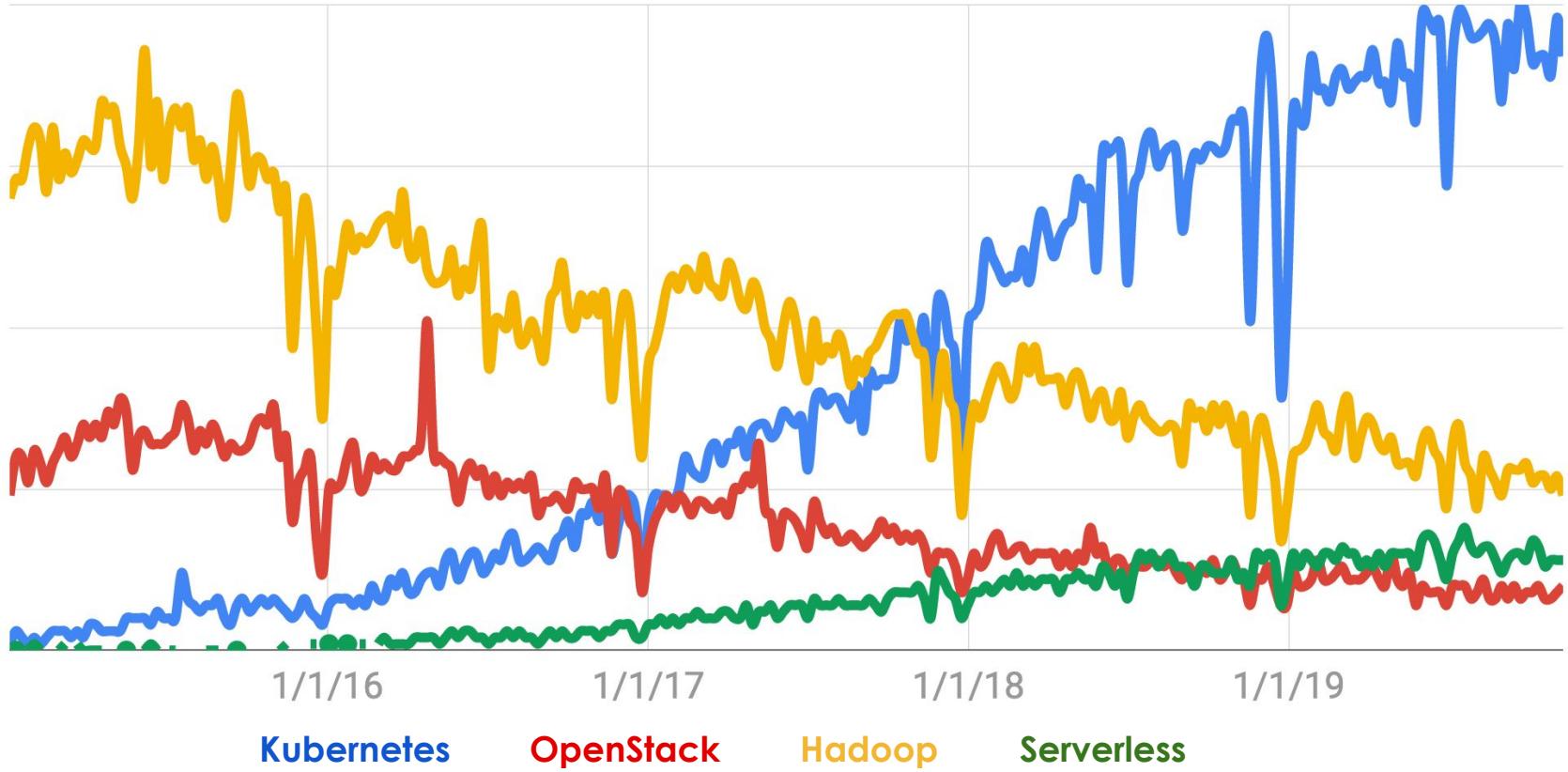
# CNCF Structure



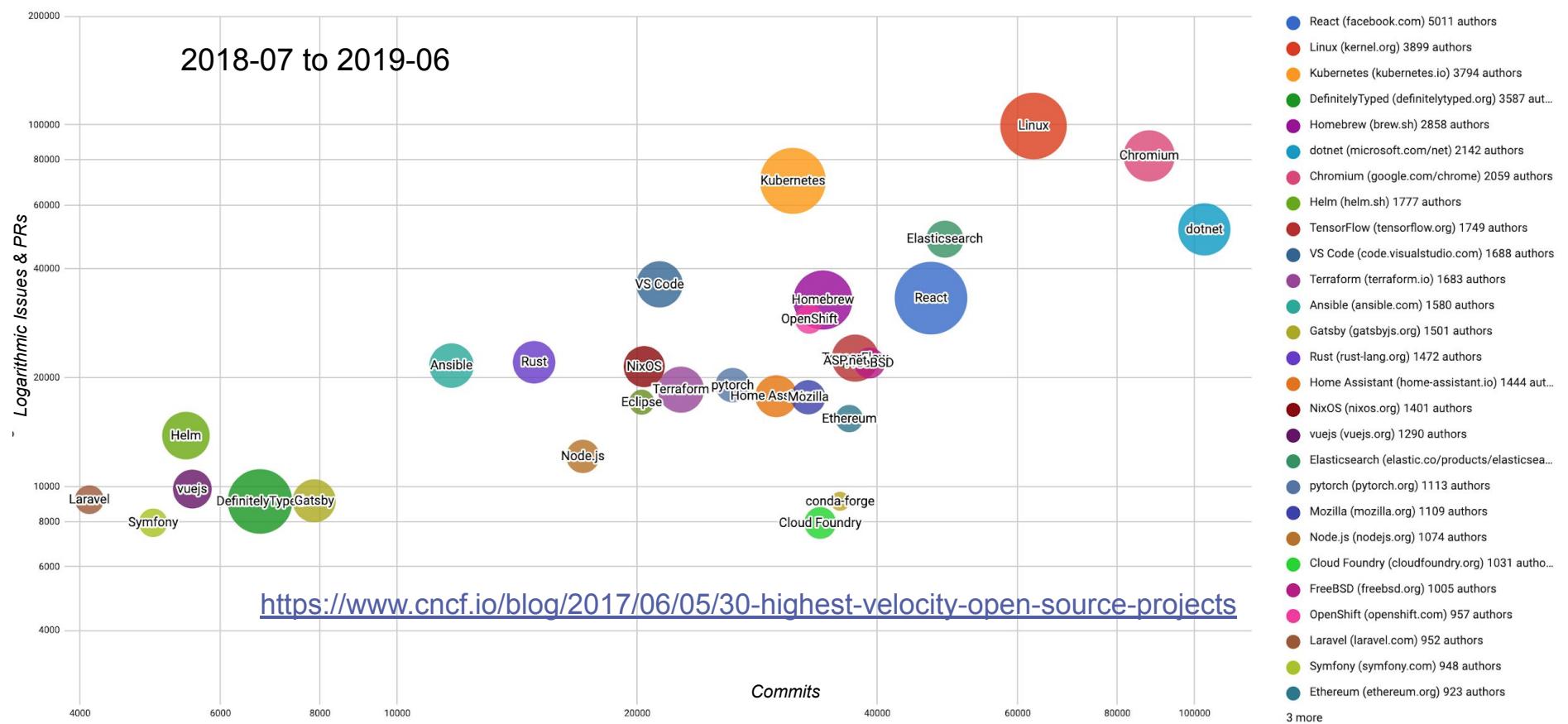
- Mainly vendors
  - Fund the organization
  - Marketing and strategic direction
- 11 top technical architects
  - Admit new projects
  - Acts as a resource to projects
- Real end users of these technologies
  - Communicate back requirements
  - and good and bad experiences



# Kubernetes in Search Trends



# 30 Highest Velocity Open Source Projects



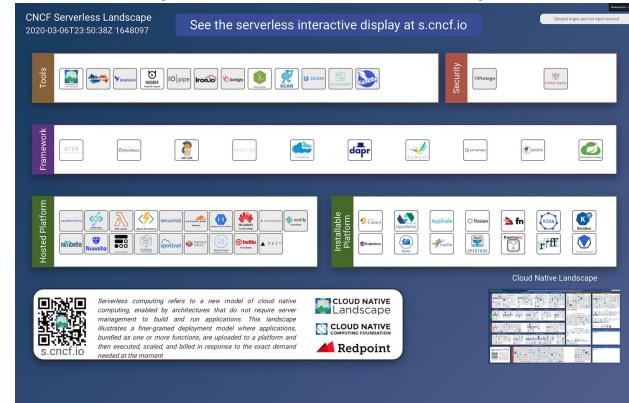
# Serverless in CNCF

## Decomposing Serverless

- Serverless [Working Group](#) published an influential [whitepaper](#)
- Attributes that developers love about closed serverless platforms (which already run on containers):
  - Infinite scalability
  - Microbilling
  - Easy app updates
  - Event-driven architectures
  - Zero server ops
- Several projects are decomposing these into features to be available on top of Kubernetes

## Serverless Landscape & CloudEvents

- The Serverless Landscape [s.cncf.io](https://s.cncf.io) tracks all projects and products in the space



- [CloudEvents](#), a new CNCF project, is a common model for event data to ease cross-provider event delivery



# CNCF Cloud Native Definition v1.0

Cloud native technologies empower organizations to build and run scalable applications in modern, dynamic environments such as public, private, and hybrid clouds. Containers, service meshes, microservices, immutable infrastructure, and declarative APIs exemplify this approach.

These techniques enable loosely coupled systems that are resilient, manageable, and observable. Combined with robust automation, they allow engineers to make high-impact changes frequently and predictably with minimal toil.

The Cloud Native Computing Foundation seeks to drive adoption of this paradigm by fostering and sustaining an ecosystem of open source, vendor-neutral projects. We democratize state-of-the-art patterns to make these innovations accessible for everyone.



# Why Organizations Are Adopting Cloud Native

1. Better resource efficiency lets you to run the same number of services on less servers
2. Improved resiliency and availability: despite failures of individual applications, machines, and even data centers
3. Cloud native allows multi-cloud (switching between public clouds or running on multiple ones) and hybrid cloud (moving workloads between your data center and the public cloud)
4. Cloud native infrastructure enables higher development velocity – improving your services faster – with lower risk



# 500+ Members and Growing

## Platinum Members

Alibaba Cloud



DELL Technologies



ORACLE



vmware

## Gold Members



CLOUDERA



inspur 浪潮



Kingsoft Cloud



ZTE

## Academic/Nonprofit Members

CableLabs



Canada Health Infoway  
Inforoute Santé du Canada



CLOUD FOUNDRY



GOLDEN GATE  
UNIVERSITY



KETI Korea Electronics  
Technology Institute



TTA 한국정보통신기술협회

M ADVANCED  
RESEARCH COMPUTING  
SERVICES  
UNIVERSITY

WIKIMEDIA  
FOUNDATION

# 500+ Members and Growing (Silver 1)



# 500+ Members and Growing (Silver 2)



# 500+ Members and Growing (Silver 3)



# Certified Kubernetes Conformance

- CNCF runs a software conformance program for Kubernetes
  - Implementations run conformance tests and upload results
  - Mark and more flexible use of Kubernetes trademark for conformant implementations
  - [cncf.io/ck](https://cncf.io/ck)



# 92 Certified Kubernetes Partners



# Training and Certification

## Training

- Over 112,000 people have registered for the free Introduction to Kubernetes [course](#) on edX
- Over 17,000 people have registered for the \$299 Kubernetes Fundamentals [course](#)



## Certification

- Over 20,000 people have registered for the Certified Kubernetes Administrator (CKA) online [test](#)
- Over 9,500 people have registered for the Certified Kubernetes Application Developer (CKAD) online [test](#)



# Kubernetes Certified Service Provider

A pre-qualified tier of vetted service providers who have deep experience helping enterprises successfully adopt Kubernetes through support, consulting, professional services and/or training.

## Benefits

- Placement at the top of <https://kubernetes.io/partners/>
- Monthly private meetings with cloud native project leaders, TOC members, and representatives from the Governing Board
- Access to leads from the kubernetes.io for end users looking for support

## Requirements

- Three or more certified engineers
- Business model to support enterprise end users
- Be a CNCF member

<https://www.cncf.io/certification/kcsp/>

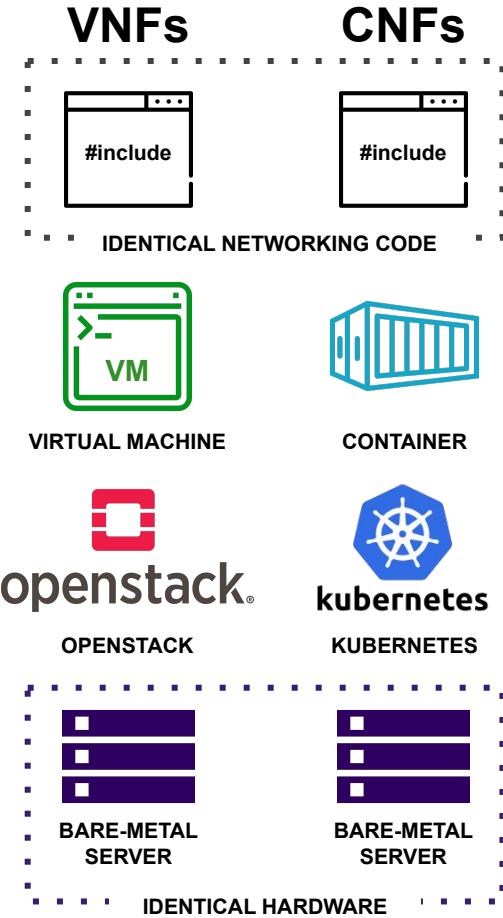


# 138 Kubernetes Certified Service Providers



# CNF Testbed

- Open source [initiative](#) from CNCF
- Compare performance of:
  - Virtual Network Functions (VNFs) on OpenStack, and
  - Cloud native Network Functions (CNFs) on Kubernetes
- Identical networking code packaged as:
  - containers, or
  - virtual machines (VMs)
- Running on top of identical on-demand hardware from the bare metal hosting company [Packet](#)
- See [presentation](#) for more information



# KubeCon + CloudNativeCon



[kubecon.io](https://kubecon.io)

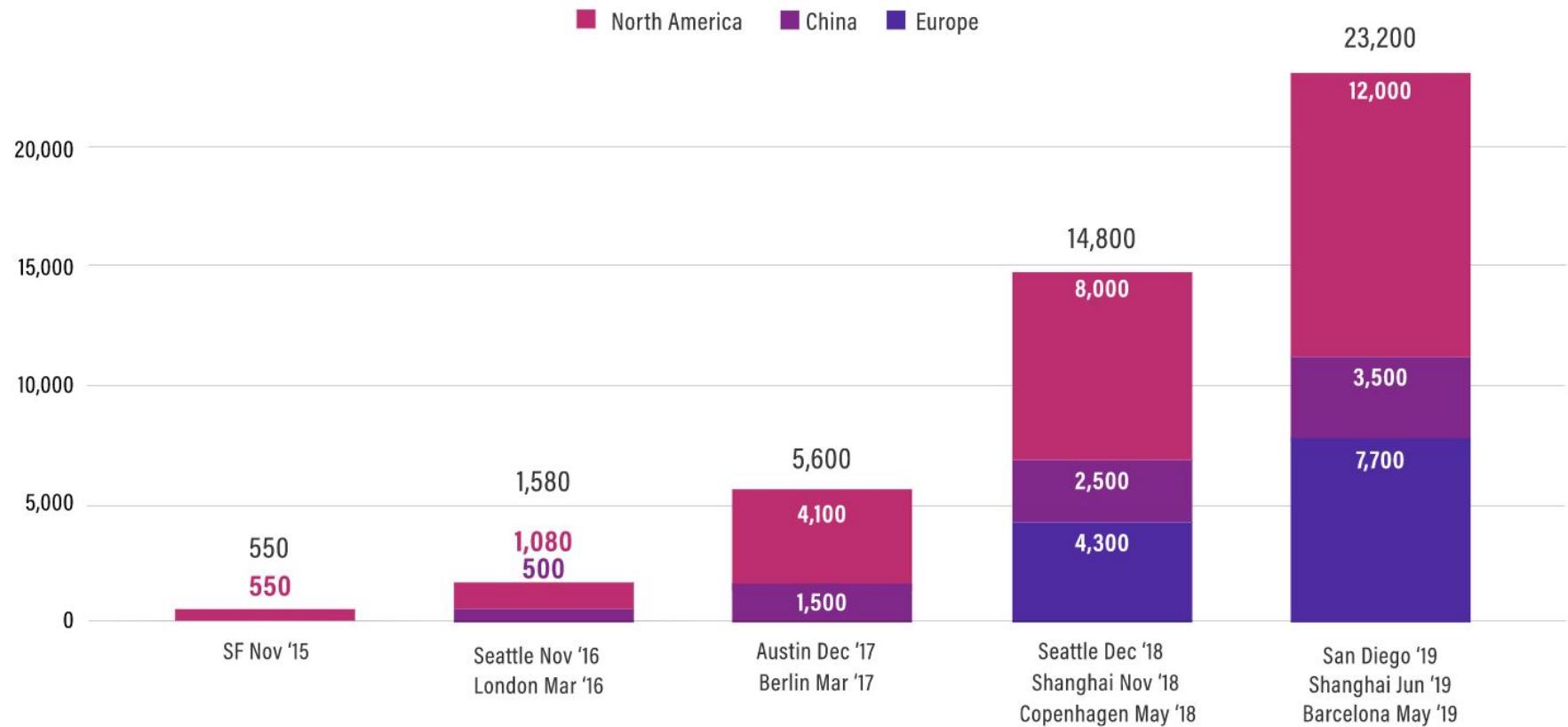


# 1 Additional 2020 Kubernetes Forum: Tokyo

- September 17 just after Open Source Summit.
- Sponsorship details for Tokyo are available. Check out the Sponsorship Prospectus
- More details on CFP and the event coming soon.



# KubeCon + CloudNativeCon Attendance



# Joining the CNCF

# Your Membership Benefits

Organizations join CNCF because they want to take an active role in supporting the growth and evolution of the cloud native ecosystem.

## CNCF Membership Provides:

1



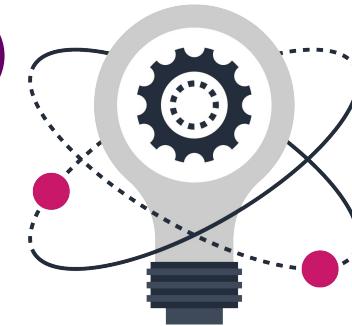
Marketing Amplification  
and Brand Awareness

2



Community Engagement

3



Thought Leadership



# Marketing Amplification and Brand Awareness

Broaden your reach and awareness in the community with CNCF marketing programs.

As a member you can participate in:



## CNCF Marketing Committee

Participate in the marketing committee to engage with your peers in the cloud native space.



## Kubernetes Blogs + KubeWeekly

While both of these are community-driven efforts, CNCF members receive guidance and advice on content to best share your Kubernetes story or tutorial with the community.



## CNCF Webinars

Cost-effectively showcase your organization's thought leadership by educating new and existing community members about best practices, trends, and new technologies.



## KubeCon + CloudNativeCon

CNCF organizes the largest conferences for Kubernetes and other cloud native technologies, with over 4,000 attendees at each of our last two events.



## CNCF Blog

Showcase your thought-leadership and industry commentary, as well as share technical walkthroughs for CNCF projects here.



# Community Engagement

CNCF is a constellation of open source projects. Members of CNCF leverage many programs to engage with our project's ecosystems and share their stories. As a member you can participate in:



## End User Case Studies

End User stories help elevate the technical conversations to business objectives and challenges. This program features real-world use cases and the impact these cloud-native projects are having on end users' businesses.



## Ambassador Program

Become a cloud native advocate and be recognized for your expertise in the cloud native space. You will be empowered to educate local communities around the world to learn about CNCF projects and technologies.



## Kubernetes.io Partner Placement

The kubernetes.io partner page includes separate lists for Certified Kubernetes, KCSP, and KTP partners. One CNCF member reports that 18% of their incoming leads start from kubernetes.io or cncf.io.



## Speaking Opportunities

CNCF organizes a number of small events around the world and is invited to speak at many others. We often ask members to support and represent CNCF at such events.



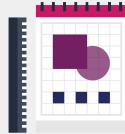
## Linux Foundation Membership

The Linux Foundation (LF) is the organization of choice for building sustainable open source ecosystems. When you join CNCF, you also join the LF. This allows your organization to engage with the larger open source community, including representatives from more than 1,000 of the top technology companies around the world.



# Thought Leadership

**Members of the CNCF can network and help shape the cloud-native market.**  
**As a member you can participate in:**



Elections to serve on the Governing Board to oversee the vision of CNCF and work with the TOC  
The world's largest names in public cloud and enterprise software are part of the CNCF GB.



## Certified Kubernetes

The Certified Kubernetes program ensures that your version of Kubernetes supports the required APIs.



## Kubernetes Certified Service Provider (KCSP)

The KCSP program highlights a pre-qualified and vetted tier of service providers who have deep experience helping enterprises successfully adopt Kubernetes.



## Kubernetes Training Partner (KTP)

The KTP program features training providers with deep experience in cloud native technology training.



## Training and Certification

CNCF, in partnership with Linux Foundation, manages training and exams for our projects. In particular, we run training and certification for Kubernetes with [Certified Kubernetes Administrator \(CKA\)](#) and [Certified Kubernetes Application Developer \(CKAD\)](#).



## TOC Contributor

CNCF's Technical Oversight Committee (TOC) provides technical leadership to the cloud native community.



## Interactive Landscape Placement

CNCF's interactive landscape is a comprehensive survey of all cloud native products and projects.



# CNCF and LF Combined Annual Dues

<b>Platinum Member</b>	<b>\$370,000*</b>
<b>Gold Member</b>	<b>\$120,000</b>
<b>Silver or End User Member</b>	<b>5,000 employees +: \$50,000 3,000 - 4,999: \$45,000 1,000 - 2,999: \$35,000 500 - 999: \$25,000 100 - 499: \$15,000 50 - 99: \$10,000 Less than 50 employees: \$7,000</b>
<b>Academic or Nonprofit</b>	<b>\$500 Nonprofit or \$1,000 Academic</b>

\*Three year minimum commitment



# Silver Membership



**Silver level membership is for those organizations that want to demonstrate their support for CNCF and help grow the CNCF ecosystem. We encourage organizations just getting started in contributing to our communities to begin their partnership with CNCF at the Silver level.**

## Silver members are eligible to:

- ▶ Participate in all Marketing, Community, Thought Leadership opportunities above.
- ▶ Participate in elections to appoint one (1) representative to the CNCF [Governing Board](#) per every ten (10) Silver members, up to three (3) maximum Silver representatives.
- ▶ Receive discounts on KubeCon + CloudNativeCon sponsorship.
- ▶ Demonstrate your organization's support for the Foundation by displaying your logo on the CNCF website and in marketing materials.
- ▶ Access to Linux Foundation's invitation-only Linux Foundation Member Summit.
- ▶ Feature your organization in the quarterly CNCF Silver New Member announcement.



# Gold Membership



**Gold level membership is for those organizations that want to put their organization in full view in support of CNCF and our mission. Organizations that join at the Gold level are deeply committed to using open source technology, helping CNCF grow, voicing the opinions of their customers, and giving back to the community.**

## Gold members are eligible to:

- ▶ Enjoy all benefits included at the Silver level, plus;
- ▶ Participate in elections to appoint one (1) representative to the CNCF Governing Board per every five (5) Gold members, up to three (3) maximum Gold representatives.
- ▶ Receive greater insight into CNCF strategy and project roadmaps through increased engagement with the CNCF Executive Director, Chief Operating Officer, and staff.
- ▶ Increased access to Linux Foundation's invitation-only Linux Foundation Member Summit.
- ▶ Create an individualized press release upon membership announcement with the CNCF PR team.



# Platinum Membership



Platinum level membership is the highest tier of membership and for those organizations who contribute heavily to open source projects housed at the foundation. Platinum level organizations have internal resources dedicated to the advancement and adoption of the projects within our foundation who work in concert with CNCF + LF team members. These companies want to take the most active role in enabling cloud native computing to be ubiquitous.

## Platinum members are eligible to:

- ▶ Enjoy all the benefits of Gold and Silver levels, plus;
- ▶ Appoint one (1) representative to the CNCF [Governing Board](#).
- ▶ Appoint one (1) representative as a voting member in any subcommittees or activities of the Governing Board.
- ▶ Enjoy most prominent placement in displays of membership including on the website and in marketing materials.
- ▶ Increased access to Linux Foundation's invitation-only Linux Foundation Member Summit.
- ▶ Create an individualized press release upon membership announcement with the CNCF PR team.
- ▶ Receive ongoing, individual engagement and guidance from CNCF Executive Director, Chief Operating Officer, and staff.



# Academic and Non-Profit



- The Academic and Non-Profit level of participation is limited to academic and non-profit institutions respectively.

## Academic/Non-Profit members are eligible to:

- ▶ Participate in all Marketing, Community, and Thought Leadership opportunities above.
- ▶ Receive discounts on KubeCon + CloudNativeCon sponsorship.
- ▶ Identify your organization as a member and display your logo on the CNCF website and in marketing materials.
- ▶ Feature your organization in the quarterly CNCF Silver New Member announcement.



# End User Community



CNCF offers multiple opportunities for End Users to contribute and have their voices heard. Companies that use cloud native technologies internally, but do not sell any cloud native services externally, are eligible to join the [End User Community](#). This is an opportunity to collaborate with your peers on best practices, work directly with project maintainers, and provide feedback to CNCF.

## Benefits of joining the CNCF End User Community include:

- ▶ A private monthly conference call, mailing list, and Slack channel. Each month, we organize an opportunity for End User members to hear from leaders in the cloud native community, including project maintainers, Governing Board and Technical Oversight Committee members, prospective project leaders, and each other.
- ▶ Voting to select one representative from the End User Community to serve on the Technical Oversight Committee ([TOC](#)).
- ▶ Opportunities to promote your engagement with the CNCF community including your logo on the website and mentions in press releases and analyst briefings. (This is optional; we support End User Community members that wish to keep their engagement private).
- ▶ 5 tickets to attend the premiere event in the cloud native community, KubeCon + CloudNativeCon, in Europe, China, or North America (2 tickets for companies with less than 300 employees).



# Ways to Join the End User Community

End Users have two ways to participate in the End User Community and CNCF.

## End User Membership (at the Silver, Gold, or Platinum levels)



Same benefits and dues as matching membership level, but also includes the opportunity to participate in the End User Community.



This includes CNCF member benefits like engagement with the Marketing Committee, ability to run for a Governing Board seat and discounts on sponsorships for KubeCon + CloudNativeCon events.

## End User Supporter



Participate in the End User Community, though without the benefits of membership in CNCF. (Supporters do not become members of CNCF or the LF). Can participate in:

- i. End User case study program
- ii. Ambassador Program
- iii. End User Community Call and CNCF End User Slack Channel + mailing list
- iv. Participate and receive tickets to KubeCon + CloudNativeCon



\$4,500 a year for 300+ employees (includes 5 tickets good for KubeCon +CloudNativeCon EU, China or NA)



\$1,800 a year for 299- employees (includes 2 tickets good for KubeCon +CloudNativeCon EU, China or NA)



# Joining CNCF is easy!

Join now: <https://cncf.io/join>

*or*

General Inquiries: [info@cncf.io](mailto:info@cncf.io)

PR: [pr@cncf.io](mailto:pr@cncf.io)

Event Sponsorships: [sponsor@cncf.io](mailto:sponsor@cncf.io)

Membership: [memberships@cncf.io](mailto:memberships@cncf.io)



# Appendix



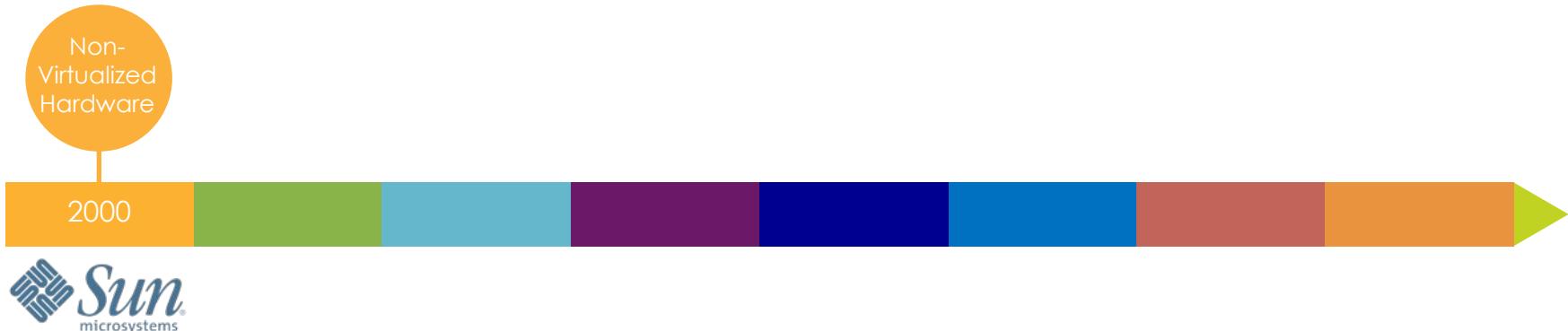
CLOUD NATIVE  
COMPUTING FOUNDATION

# A Brief History of the Cloud

# Non-Virtualized Servers: Sun (2000)



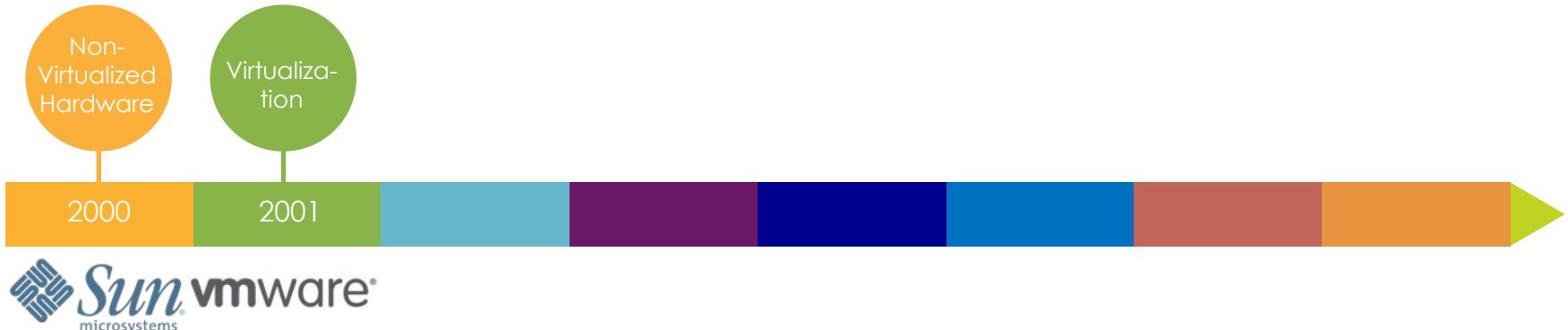
- Launching a new application? Buy a new server; or a rack of them!
- Building block of your application is physical servers



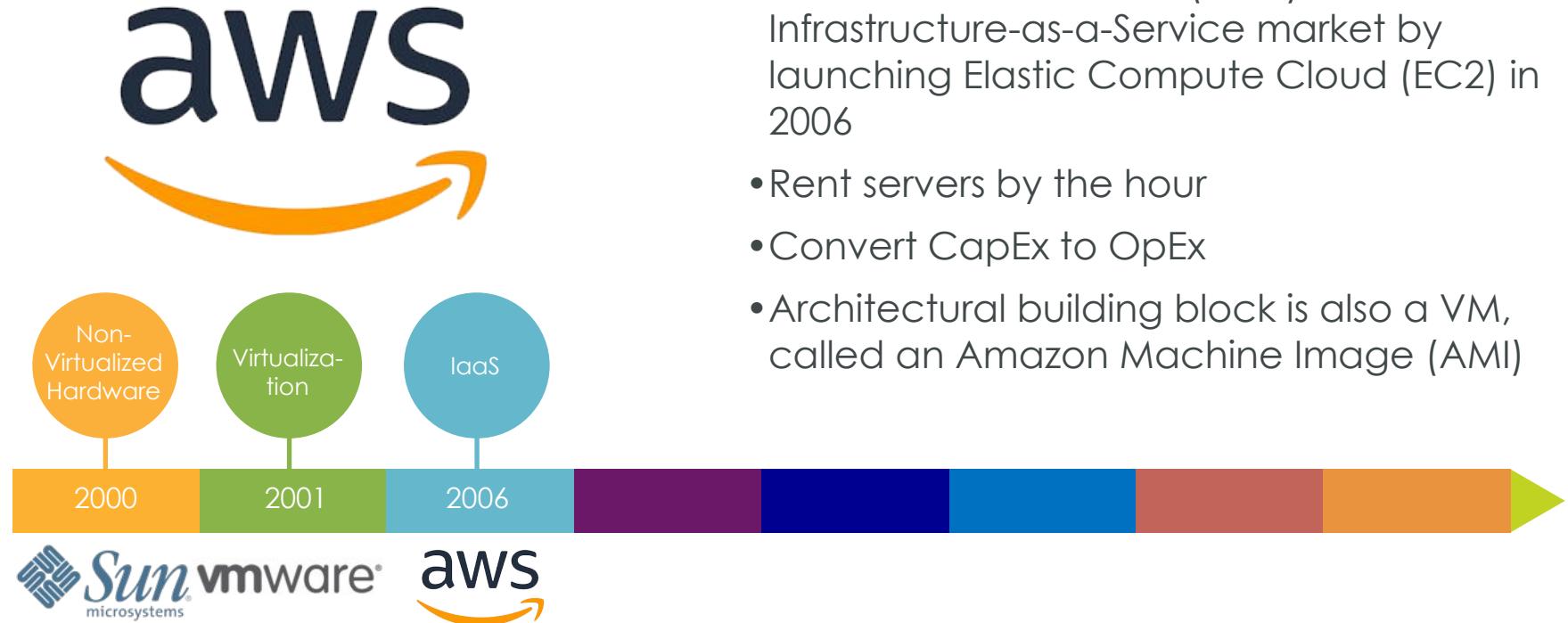
# Virtualization: VMWare (2001)

vmware®

- Releases for server market in 2001
- Popularizes virtual machines (VMs)
- Run many VMs on one physical machine, meaning you can buy fewer servers!
- Architectural building block becomes a VM



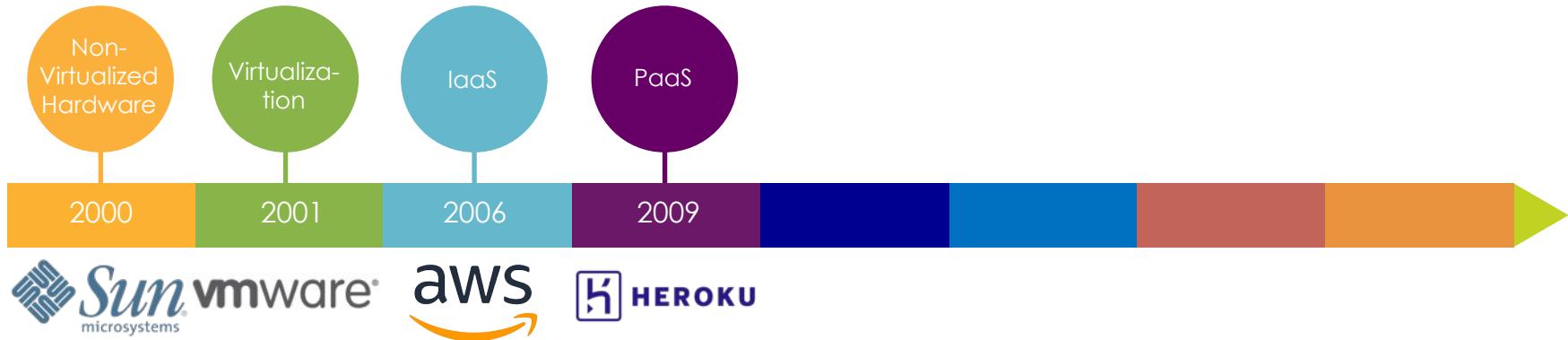
# IaaS: AWS (2006)



# PaaS: Heroku (2009)



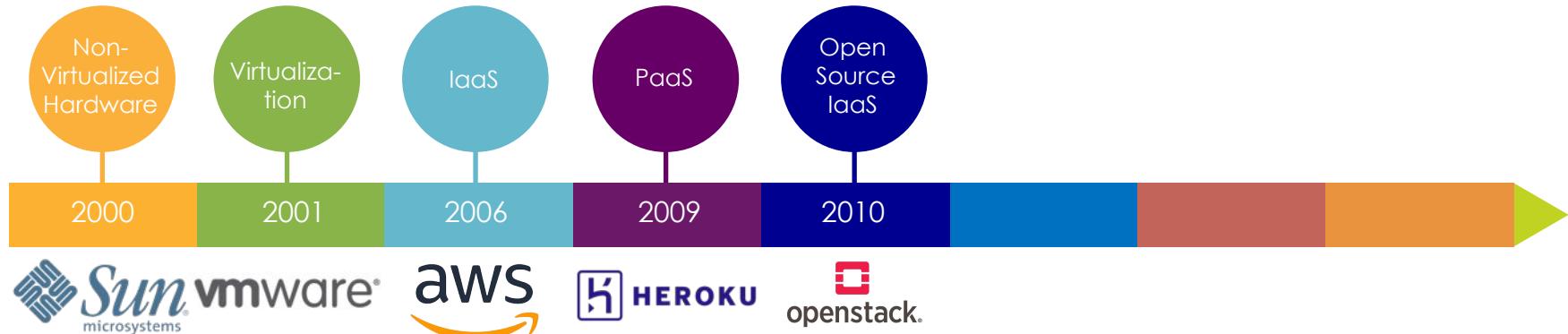
- Heroku popularizes Platform-as-a-Service (PaaS) with their launch in 2009
- Building block is a buildpack, which enables containerized 12-factor applications
  - The process for building the container is opaque, but:
  - Deploying new version of an app is just: git push heroku



# Open Source IaaS: OpenStack (2010)



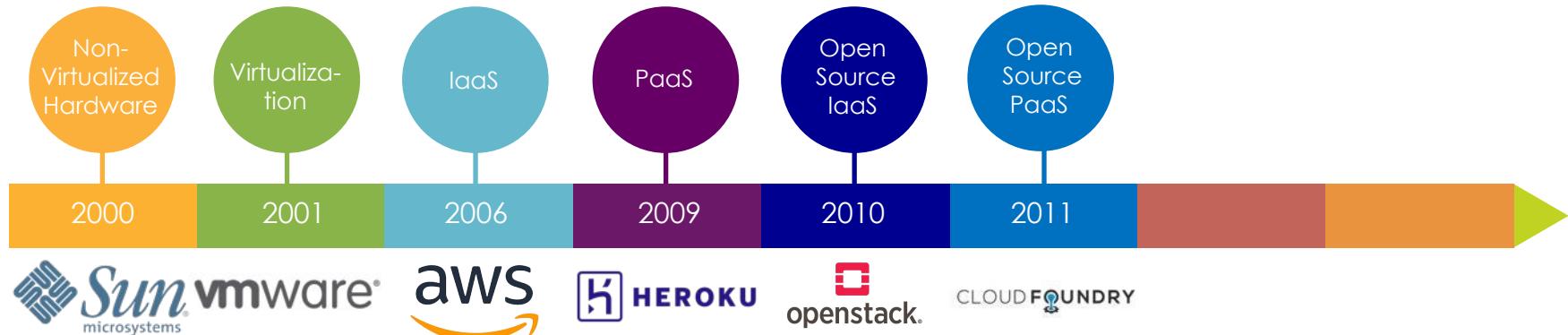
- OpenStack brings together an extraordinarily diverse group of vendors to create an open source Infrastructure-as-a-Service (IaaS)
- Competes with AWS and VMWare
- Building block remains a VM



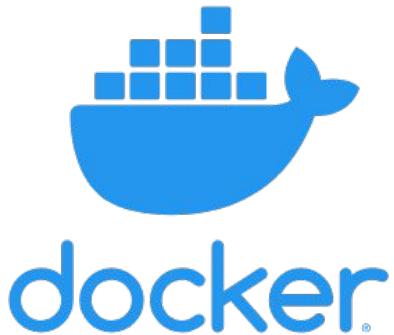
# Open Source PaaS: Cloud Foundry (2011)



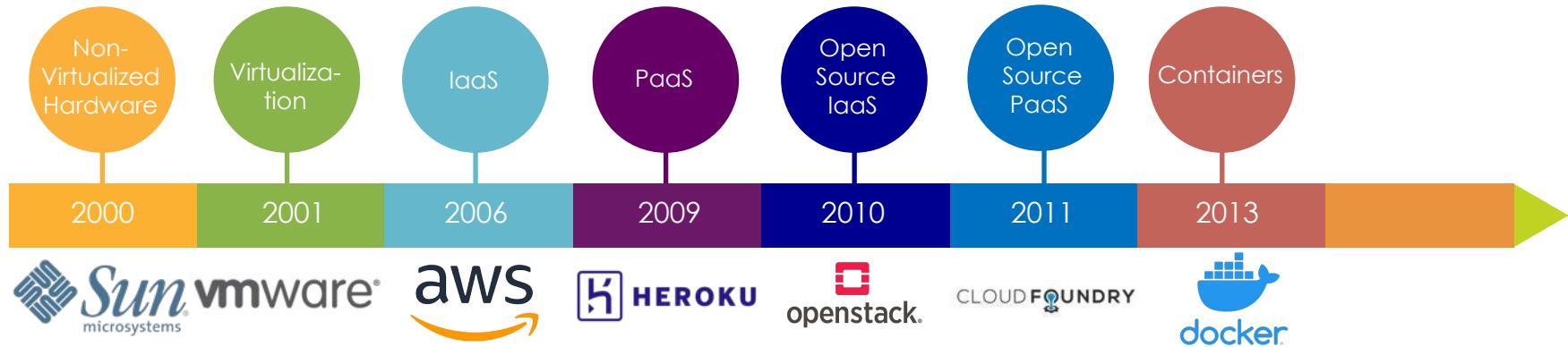
- Pivotal builds an open source alternative to Heroku's PaaS and launches the Cloud Foundry Foundation in late 2014
- Building block is Garden containers, which can hold Heroku buildpacks, Docker containers and even non-Linux OSes



# Containers: Docker (2013)



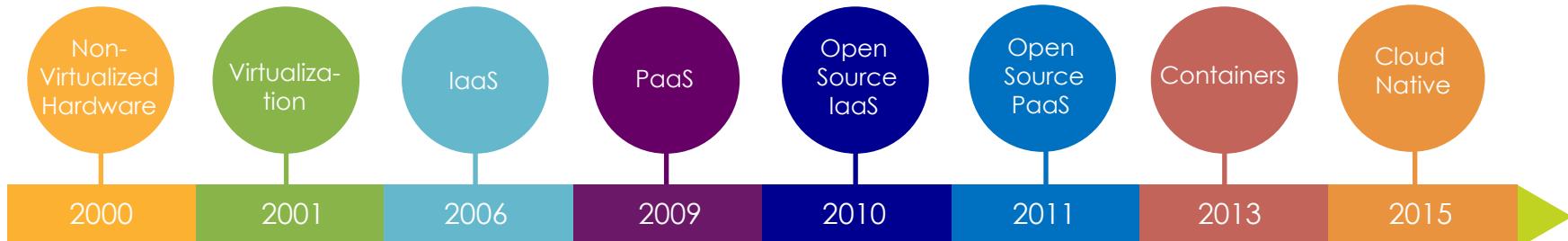
- Docker combines LXC, Union File System and cgroups to create a containerization standard adopted by millions of developers around the world
- Fastest uptake of a developer technology ever
- Enables isolation, reuse and immutability



# Cloud Native: CNCF (2015)



- Cloud native computing uses an open source software stack to:
  - segment applications into *microservices*,
  - package each part into its own *container*
  - and dynamically *orchestrate* those containers to optimize resource utilization



# What Have We Learned?

- Core Building Block:
  - Servers → Virtual Machines → Buildpacks → Containers
- Isolation Units
  - From heavier to lighter weight, in spin-up time and size
- Immutability
  - From pets to cattle
- Provider
  - From closed source, single vendor to open source, cross-vendor



# What About PaaS?

- OpenShift, Huawei CCE, and Flynn are examples of PaaS's built on top of cloud native platforms
- Many new applications start out as 12-factor apps deployable on a PaaS
  - In time they sometimes outgrow PaaS
  - And some apps never fit a PaaS model
- PaaS on top of Kubernetes supports both



# Cloud Native Value Propositions

# Avoid Vendor Lock-in



Open source software stack enables deployment on any public, private cloud or hybrid cloud



# Enable Unlimited Scalability

A wide-angle photograph of a busy port terminal. The foreground is dominated by a red gantry crane with a white lattice boom, positioned over a stack of shipping containers. The background is filled with thousands of shipping containers stacked in various heights, creating a complex geometric pattern of colors including red, blue, green, and white. The containers are branded with names like "K LINE", "COSCO", "ZIM", and "HAMBURG SUD". The sky is clear and blue.

Scales from several nodes on your laptop to tens  
of thousands of self-healing multi-tenant nodes

# Increase Agility and Maintainability



By splitting applications into microservices  
with explicitly described dependencies

# Achieve Resiliency



To failures of individual containers, machines, and even data centers and to varying levels of demand

# Improve Efficiency and Resource Utilization

A photograph of a woman conductor with blonde hair, wearing a white sleeveless top, leading an orchestra. She is holding a baton and gesturing with her right hand. The orchestra members are visible in the foreground and background, playing various instruments like violins and cellos. The audience is seated in the dark auditorium seating behind them.

Via a central orchestrating process that dynamically manages and schedules microservices

# Please follow up with Dan Kohn

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This presentation is available at:  
<https://github.com/cnCF/presentations>