

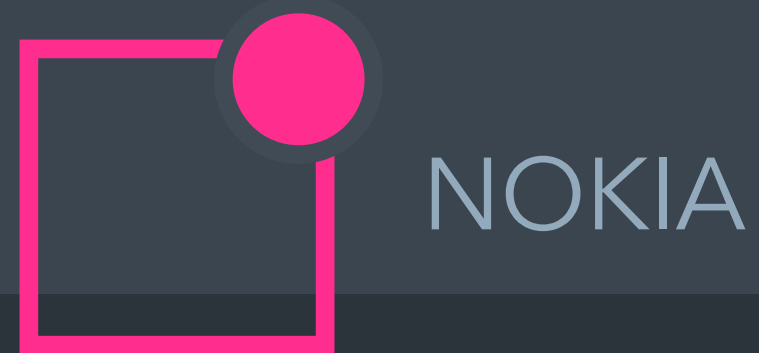


容器技术在大规模通讯产品中的应用

NOKIA

杨光
诺基亚小站研发



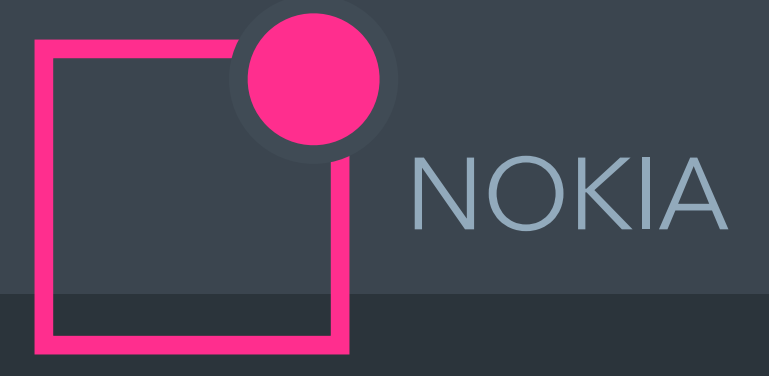


杨光
DAN YANG

诺基亚小站研发总监。历任无线安全产品架构设计师，亚太技术支持负责人，全球无线产品引入负责人，模式创新负责人等。

兴趣：
大规模并行计算、深度学习、数据分析科学

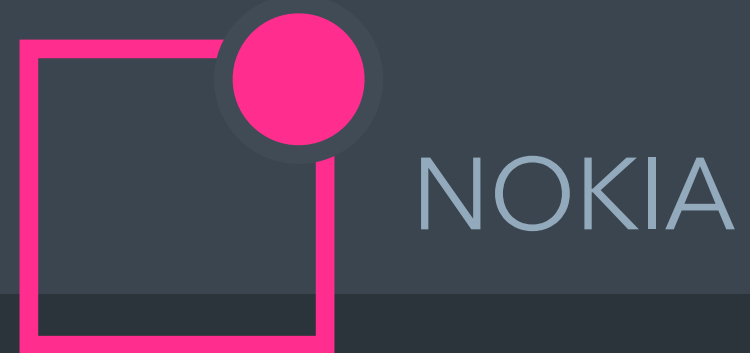




容器技术在无线通讯产品中的应用

诺基亚的DevOps实践





WHY NOKIA WANTS TO DO DEVOPS



The fastest time to market

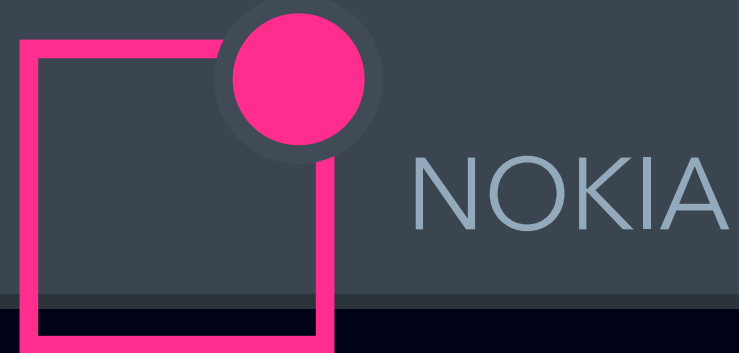
- Capability to deliver features super fast improves operator business which eases to justify Nokia SW value

Shorter cycles reduce risks

- Ability to react to market / internal conditions quickly
- Implementing the right features via shortened feedback cycle

Improved efficiency

- Increased automation
- Improved quality via constant testing and early fault correction
- Minimized number of supported code branches

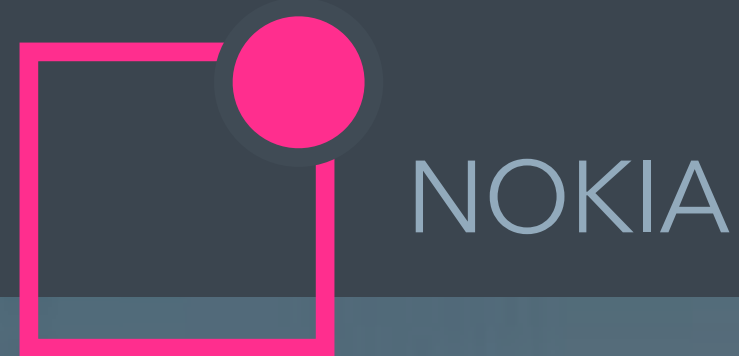


无线通讯系统CI/CD的难点

- 硬件种类繁多
- 系统非常复杂
- 高可靠性要求 99.9999%可用性
- 实时性系统要求 (例如4G TDLTE 10MS一帧)
- 现网部署量巨大 (例如南京城区有15000+个基站)

无线通讯系统里面鲜有真正意义上成功的CI/CD案例

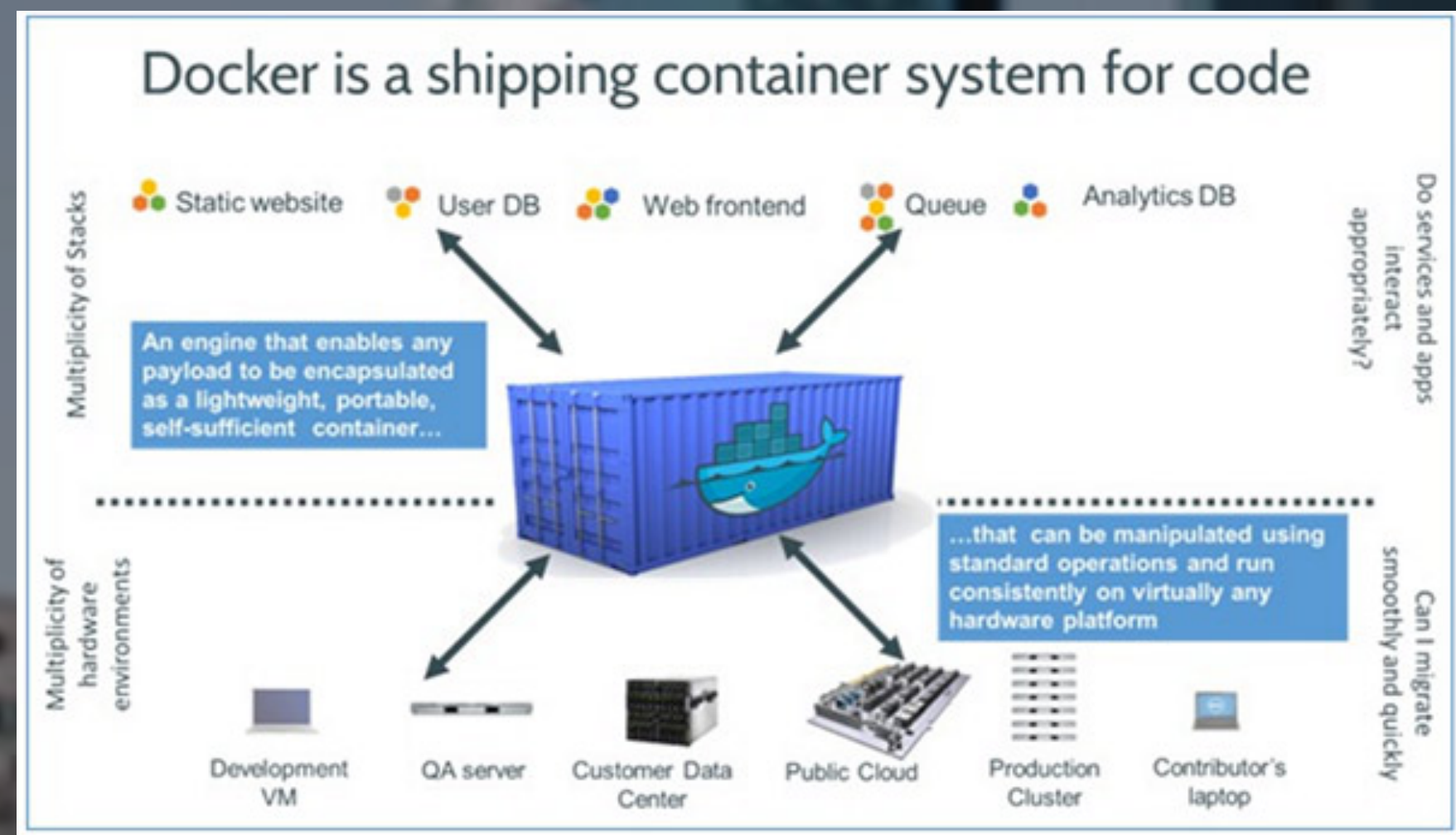
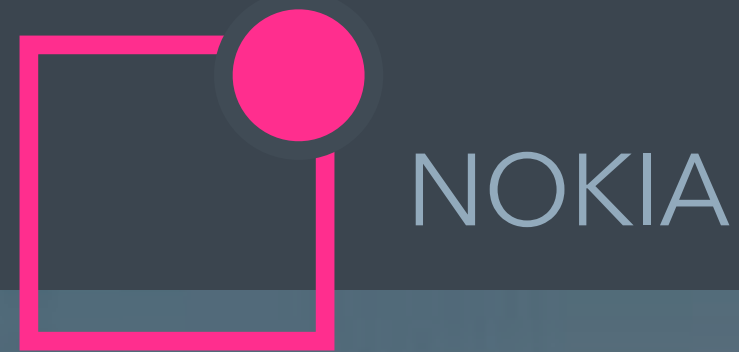




无线通讯系统的演进

- 网络标准趋向于融合和统一
- 网络拓扑结构变得越来越简单，网元进一步减少
- 硬件通用化和硬件一体化的趋势
- 网络虚拟化，软件定义网络以及容器技术等成熟





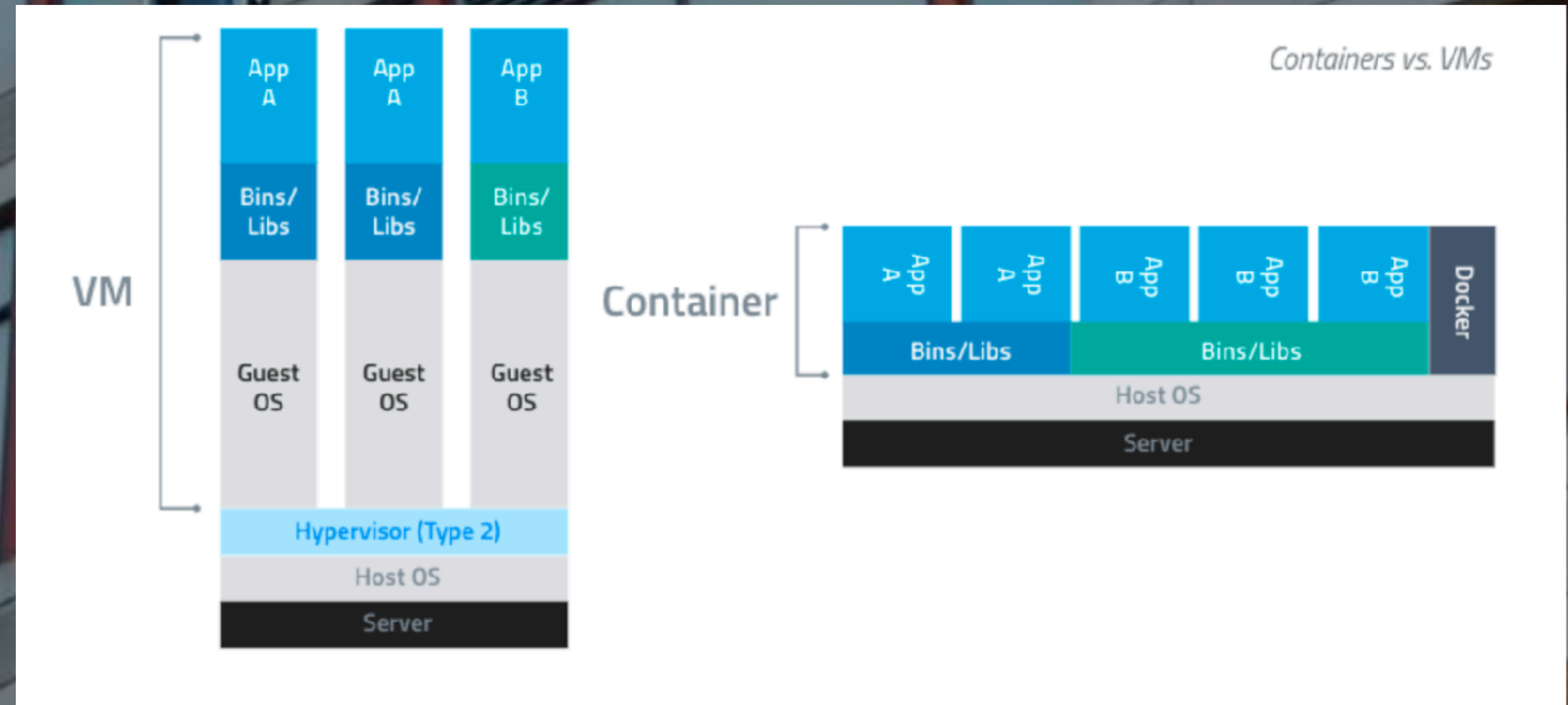
Docker is an open-source engine that automates the deployment of application into containers.

Docker enables true independence between applications and infrastructure and developers and IT ops to unlock their potential and creates a model for better collaboration and innovation.





WHY CONTAINER



- Duplicated Guest OS overhead (computing and storage)
- Lower density, up to tens of VMs
- Slow startup, normally minutes
- Better resource isolation

- Share kernel with Host OS
- Higher density, up to thousands of containers
- Fast startup, seconds even to milliseconds
- Resource isolation benefits most of users

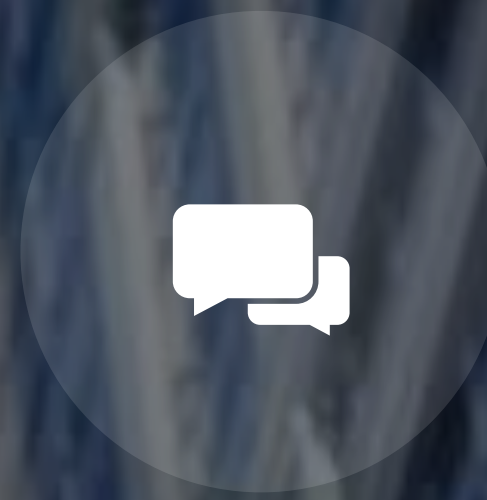




NOKIA部署容器技术的路线



在CI/CD中开始部署容器技术

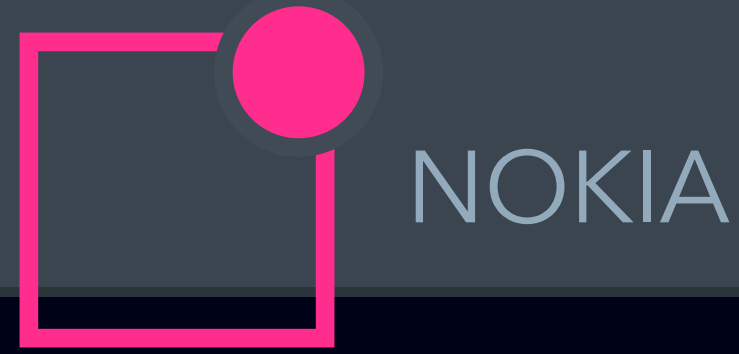


在试商用中部署容器实现CD
(CONTINUE DEPLOYMENT)



通讯产品中部署容器技术





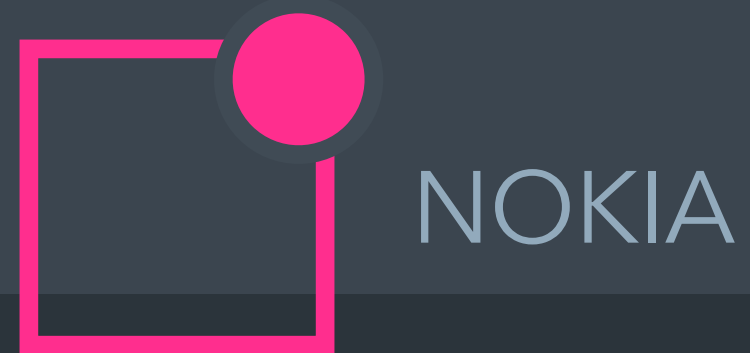
无线通讯产品CI/CD需要解决的问题



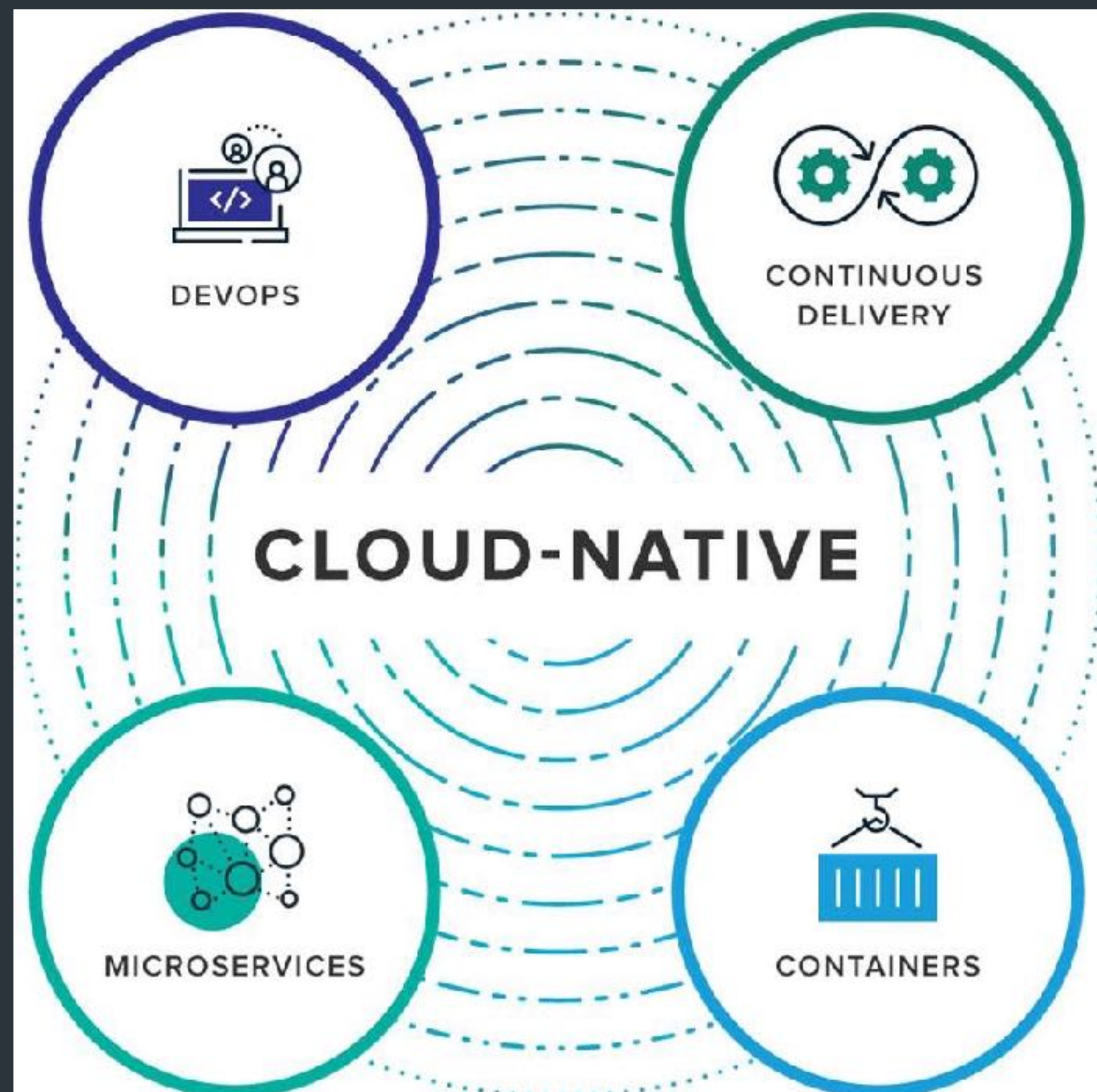
- 无线通讯测试平台的标准化（既包括硬件部分也包括软件部分）
- 基于云服务架构（可发现、可管理）的无线通讯测试管理平台
- 硬件虚拟化、模拟器以及Mock Service
- 交换、VLAN等的支持
- 自动系统升级、自动配置以及小区激活
- 测试集合在分布式硬件测试平台的并行处理以及特殊配置（硬件）的适配性
- 自动测试环境随手可得（测试工程师能在5-10分钟内完成整个自动化测试平台的配置
- 运行时间（部分测试和全部测试）

无线通讯系统里面鲜有真正意义上成功的CI/CD案例

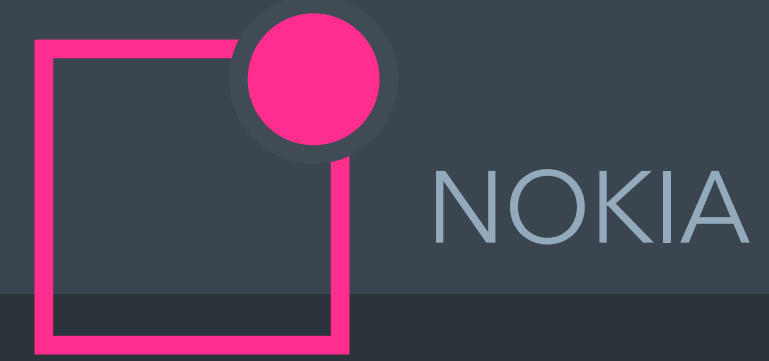




基于CLOUD-NATIVE的CI/CD平台

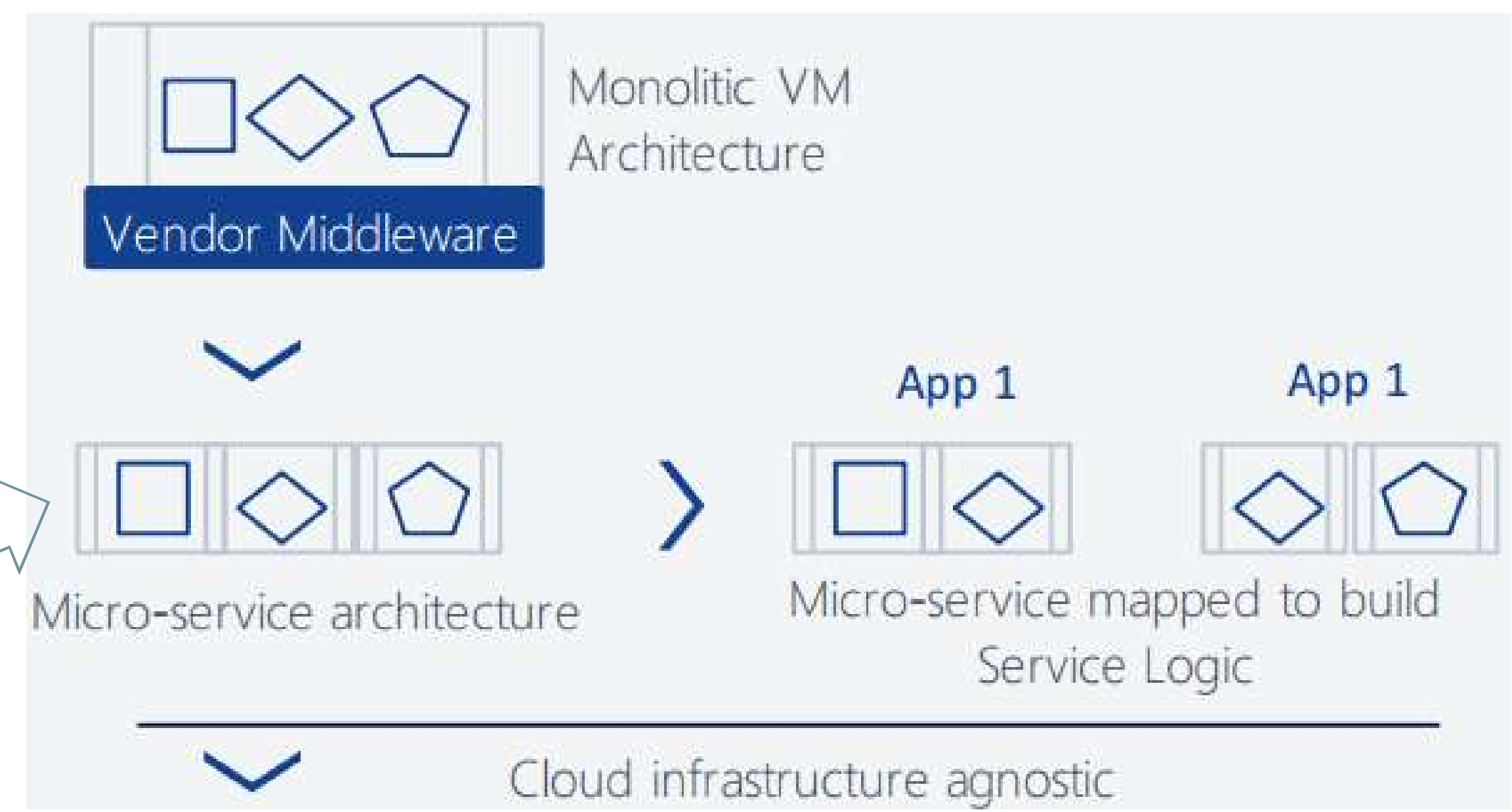


Cloud-Native vs. Traditional	
Predictable	Unpredictable
OS abstraction	OS dependent
Right-sized capacity	Over-sized capacity
Collaborative	Siloed
Continuous delivery	Waterfall development
Independent	Dependent
Automated scalability	Manual scaling
Rapid recovery	Slow recovery

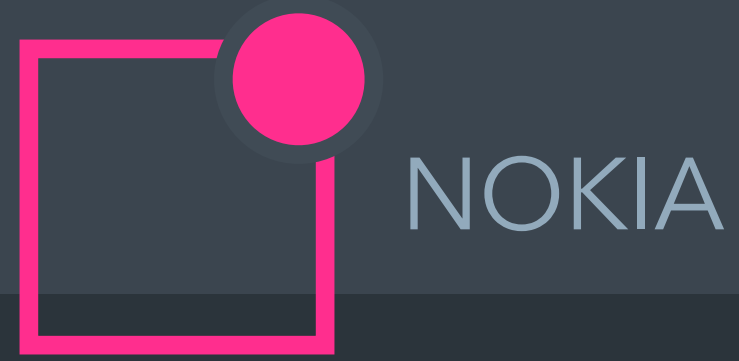


NOKIA CLOUD-NATIVE STRATEGY

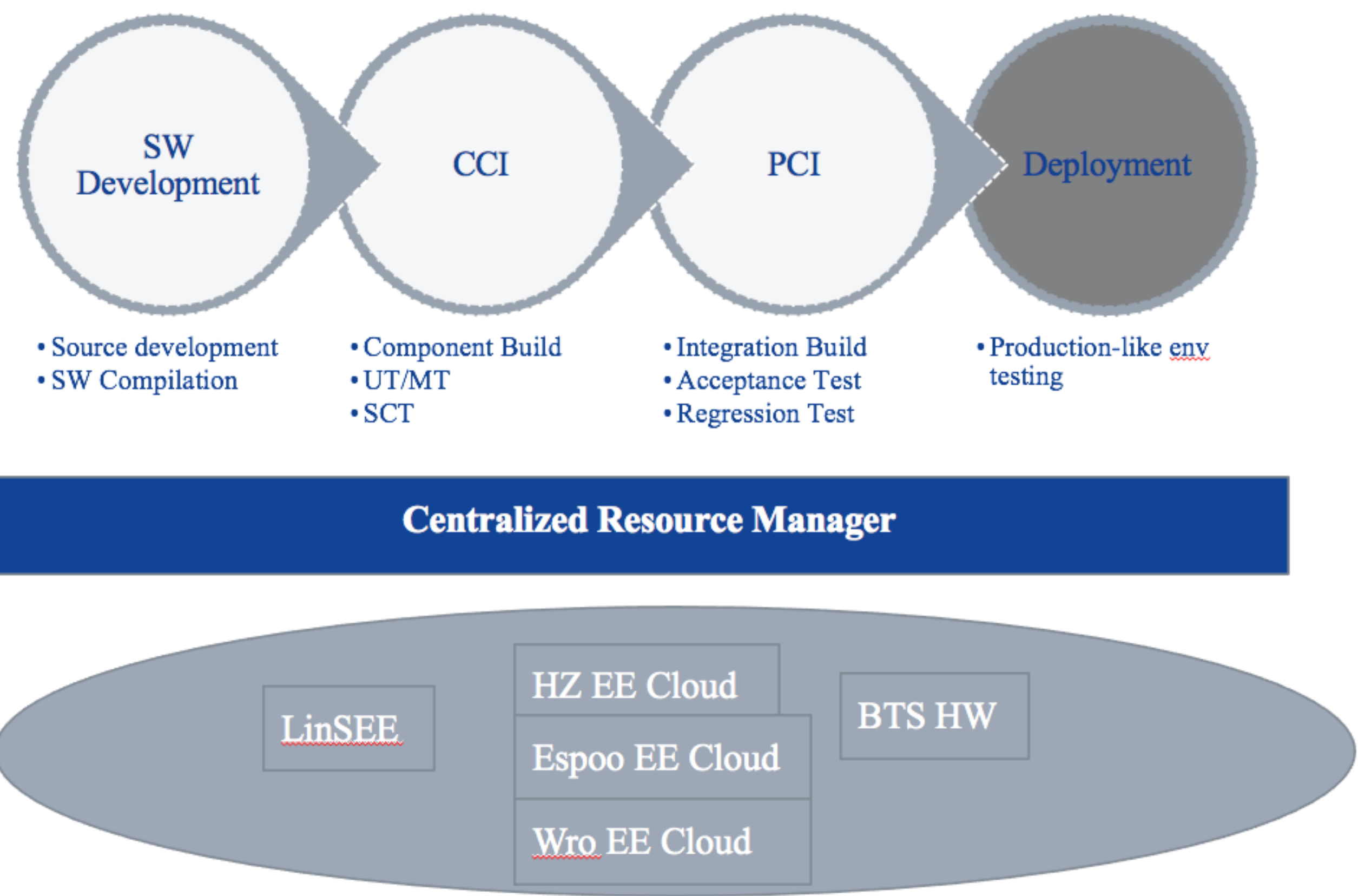
- Shared Data Layer
- Stateless VNF machines
- Programmable Open Ecosystem
- **Micro-service architecture**
- Distributed cloud deployment
- Network slicing

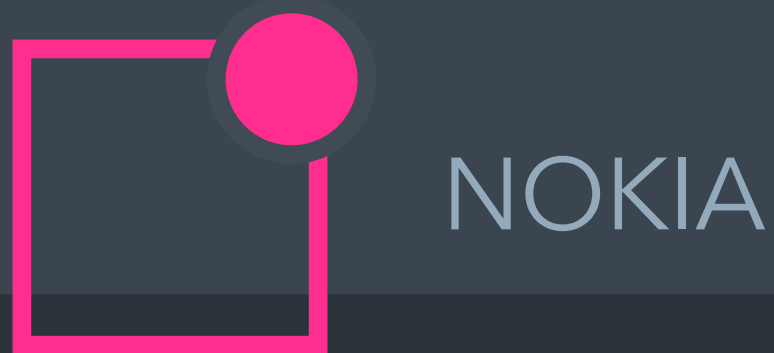


Decomposed functional components as micro-services for independent upgradability, scalability, manageability



CENTRALIZED RESOURCE MANAGER





实时资源调度和监控

kubernetes Search + CREATE

Cluster 载荷(Workloads)

名字空间(Namespace) 工作节点(Nodes) 持久性存储卷(Persistent Volume) Roles Storage Classes

名字空间(Namespace) 包括所有名字空间(All namespaces)

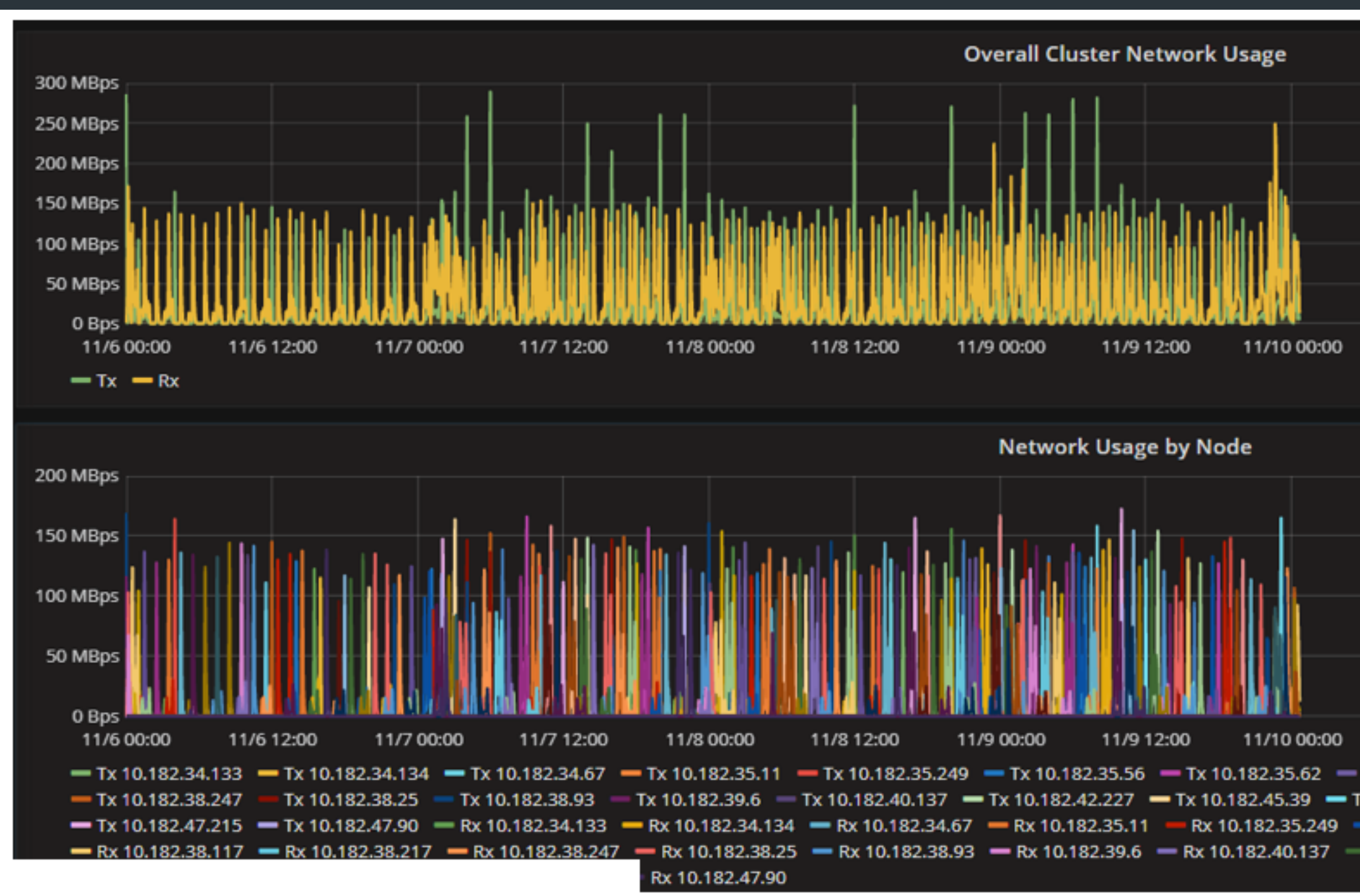
Workloads Daemon Sets Deployments Jobs Pods

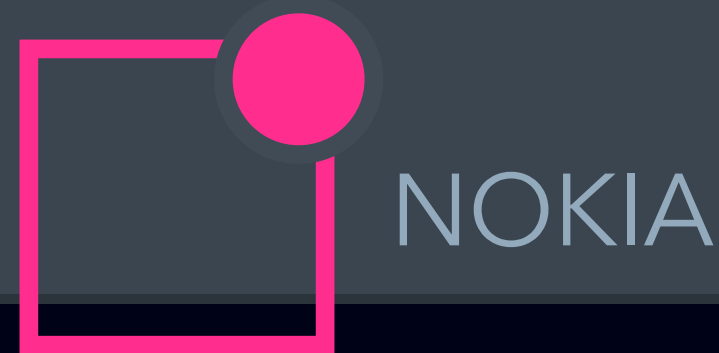
CPU使用

内存使用

Name	Namespace	Labels	Pods	Age	Images
✓ kube-dns	kube-system	addonm... k8s-app... kube...	1 / 1	15 分钟	centralized... centralized... centralized...

Name	Namespace	Status	Restarts	Age	CPU (cores)	Memory (bytes)
✓ kube-dns-3299363520-8lrwf	kube-system	Running	0	15 分钟	0	77.996 Mi
✓ kubernetes-dashboard-420232951-sh...	kube-system	Running	0	15 分钟	0.003	53.648 Mi
✓ heapster-2482353642-tjfvj	kube-system	Running	0	15 分钟	0	40.430 Mi
✓ monitoring-grafana-3277441326-rwp...	kube-system	Running	0	15 分钟	0	33.582 Mi
✓ monitoring-influxdb-402483266-x0rcl	kube-system	Running	0	15 分钟	0	18.699 Mi



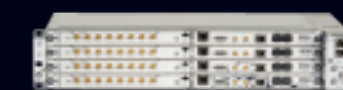


CRT自动化测试平台

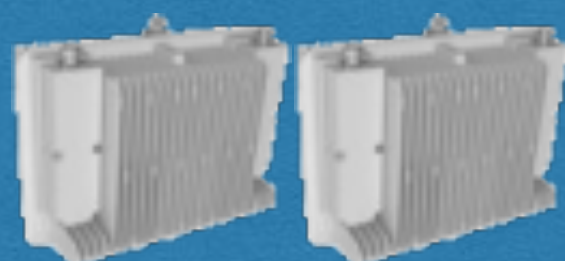
CRT分布式云平台 (波兰, 美国和中国)



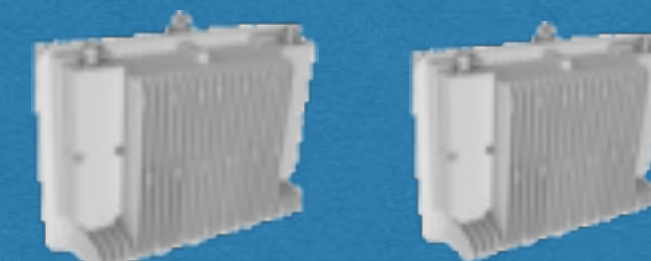
- 统一部署的UTE (Universal Test Env) 容器, 包括所需要的所有软件、模拟器以及工具
- 每一个硬件测试平台由一个UTE容器实例来代表
- 容器镜像的自动分配、自管理以及统一管理 (SWARM)
- UTE容器的版本管理以及升级
- Jenkins Trigger 以及Pipeline
- 网络拓扑结构的自动解析和分配
- 测试Case自动发现、分配和并行运行
- Git服务
- 自发现以及自动分配的商业手机矩阵、高通手机矩阵以及手机群集模拟器
- 结果呈现, Log自动分析 (Elastic Search平台)
- 进展自动推送 (Slack)

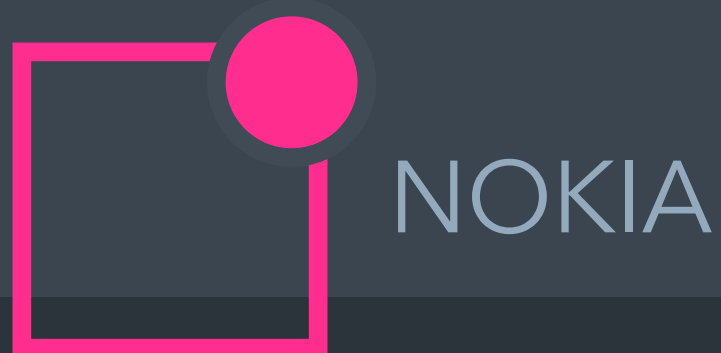


手机测试平台

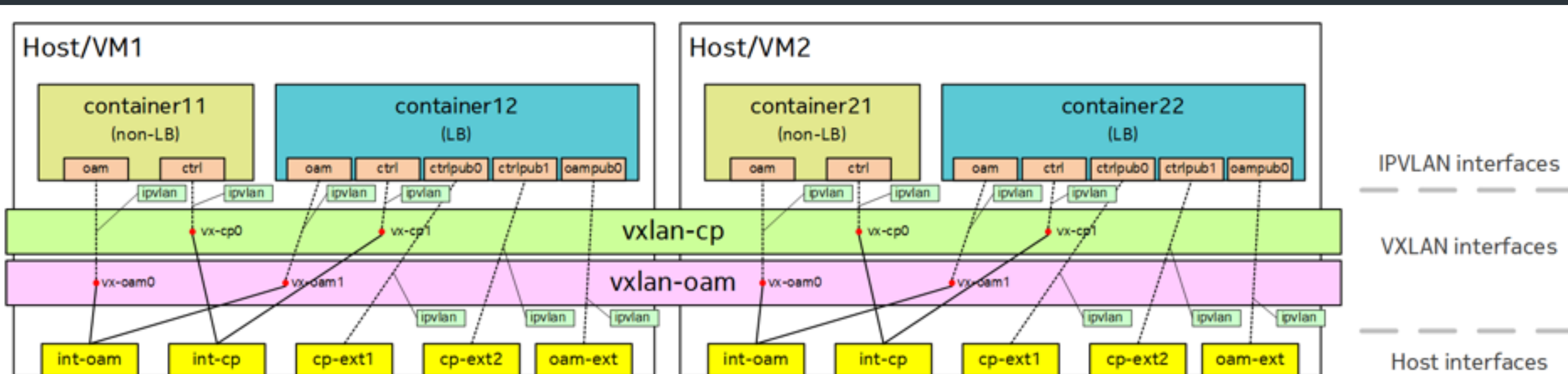


分布在全球的小站测试平台池





CRT测试容器网络拓扑



Two type of containers from networking point of view

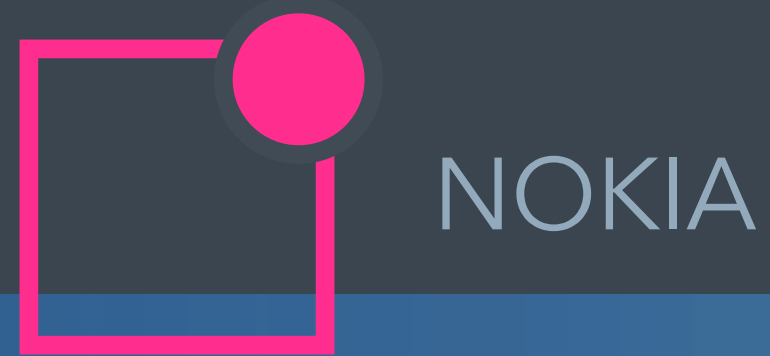
- With external connectivity (IP Dispatcher on LB)

- Without external connectivity (all else on non-LB)

External connectivity only from IP Dispatcher

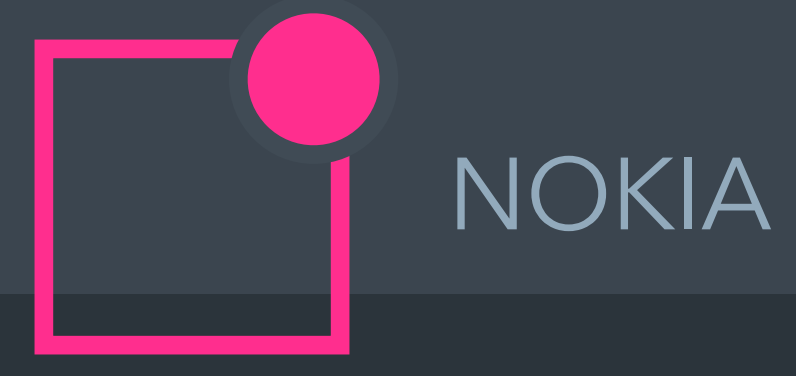
- IP Dispatcher is used for external connectivity, internal traffic does not (generally) pass through an IPD

All networks between containers are overlay networks

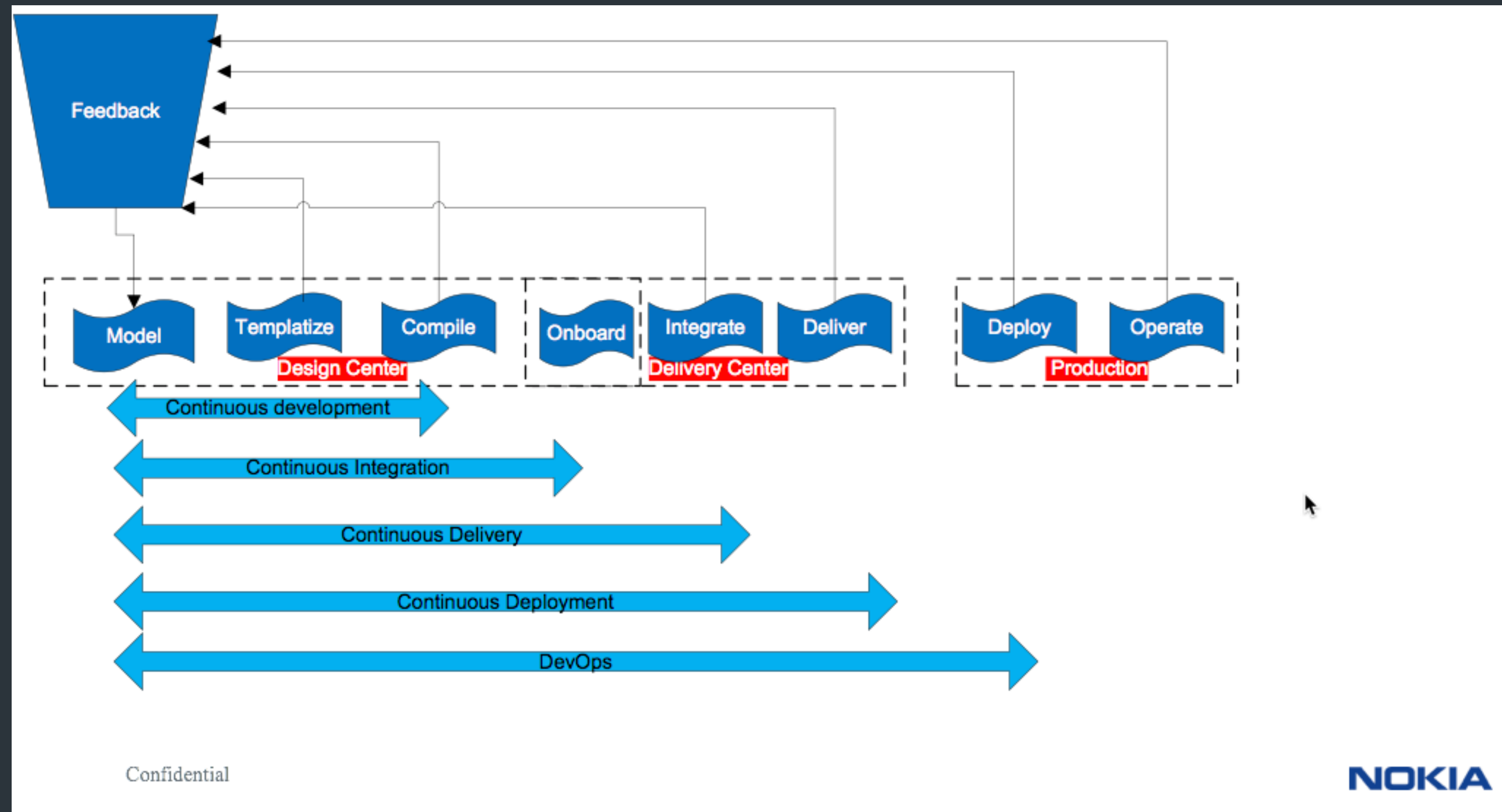


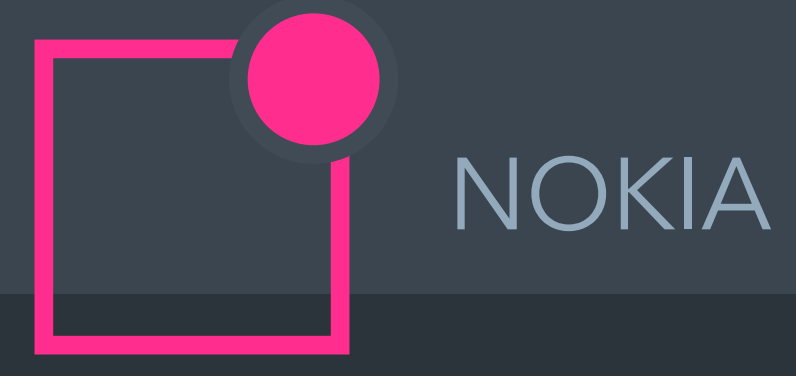
在试商用网络中部署容器实现CD (Continue Deployment)





DEVOPS





CONTINUE DEPLOYMENT 中国移动



CRT分布式云平台（波兰，美国和中国）

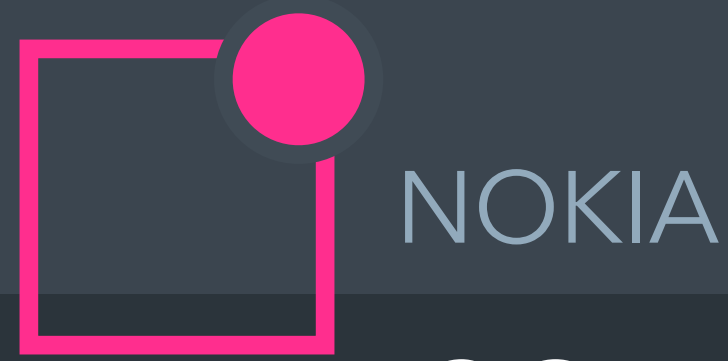


远程测试平台



中国移动试商用网络

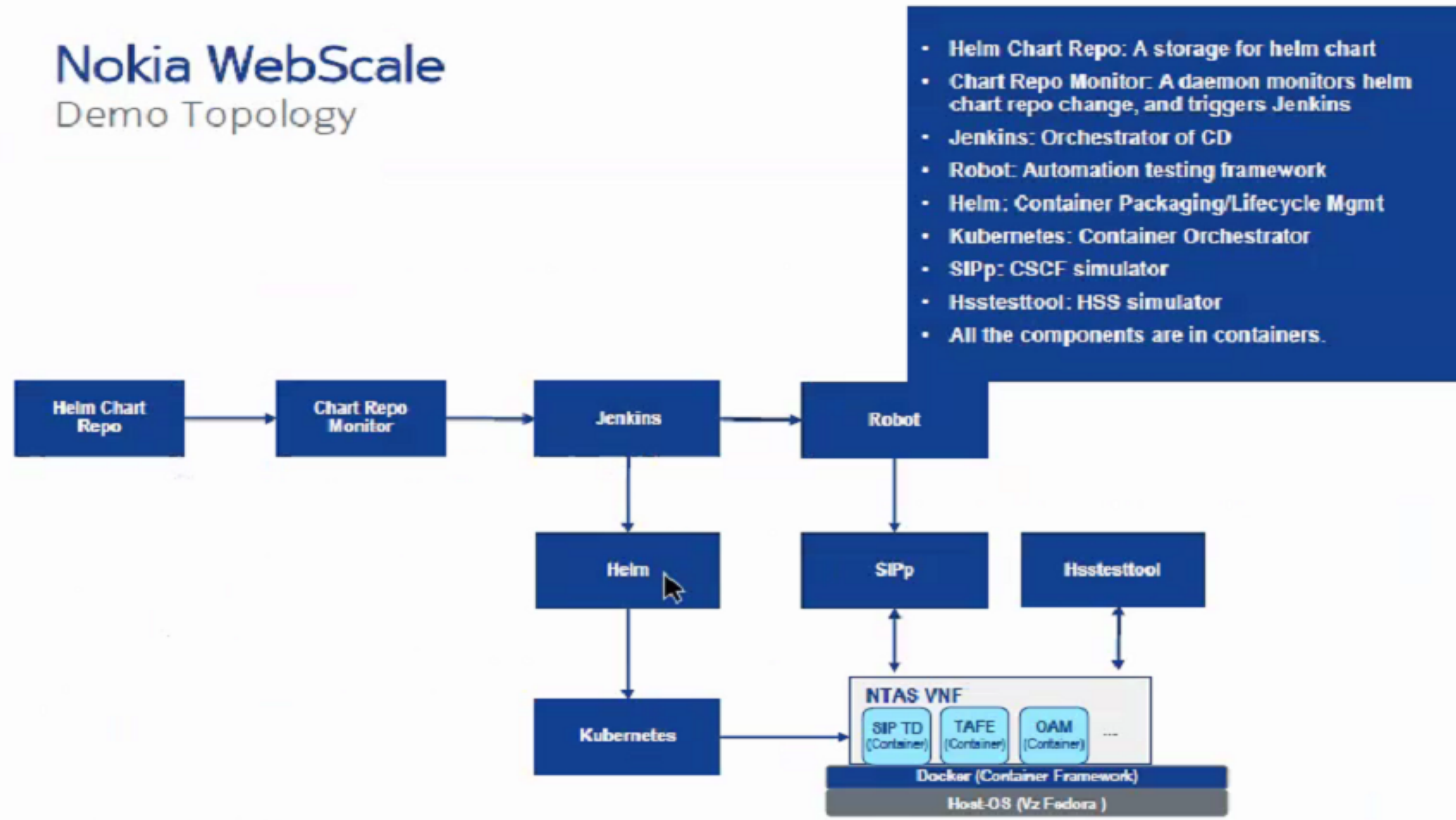




NOKIA

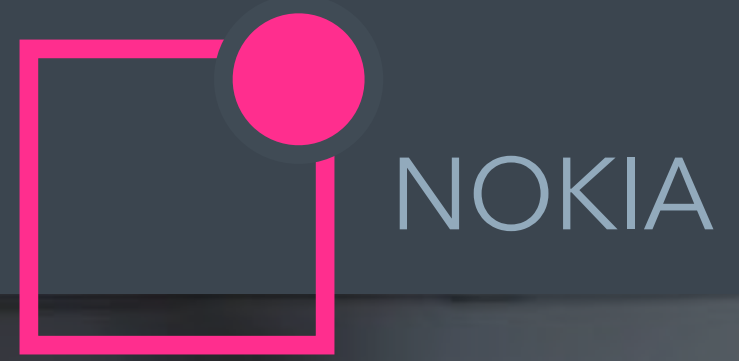
CONTINUE DEPLOYMENT WITH VERIZON

Nokia WebScale Demo Topology

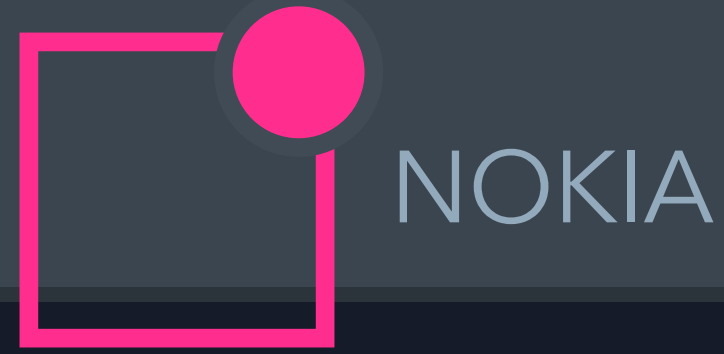


- Helm Chart Repo: A storage for helm chart
- Chart Repo Monitor: A daemon monitors helm chart repo change, and triggers Jenkins
- Jenkins: Orchestrator of CD
- Robot: Automation testing framework
- Helm: Container Packaging/Lifecycle Mgmt
- Kubernetes: Container Orchestrator
- SIPp: CSCF simulator
- Hsstesttool: HSS simulator
- All the components are in containers.

Note – all Components deployed in containers



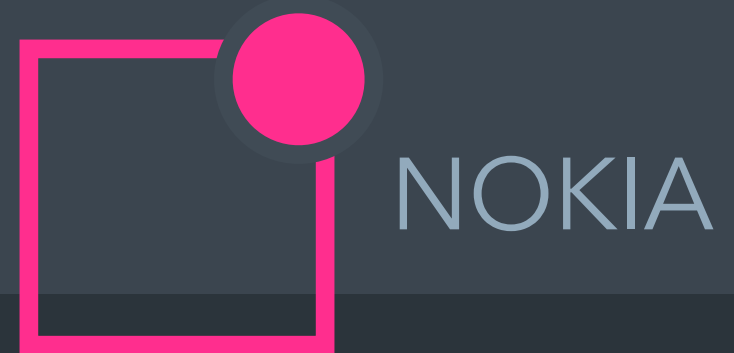
诺基亚的DevOps实践



诺基亚DEVOPS实践的特点




- 诺基亚在确定公司层面的DevOps战略的同时，并没有从组织层面强制推进DevOps的实施
- 鼓励小团队在DevOps上的创新和实践
- 通过各地的Coach（教练）在全球范围内分享最佳实践
- 固化最佳实现的成果，并加以推广
- 关注人，而不是只关注技术、流程本身
- 拥抱DevOps开源工具的同时，也赞助开源产品（例如Robot Framework）





诺基亚DEVOPS的培训

THROUGH OUR DEVOPS PORTFOLIO

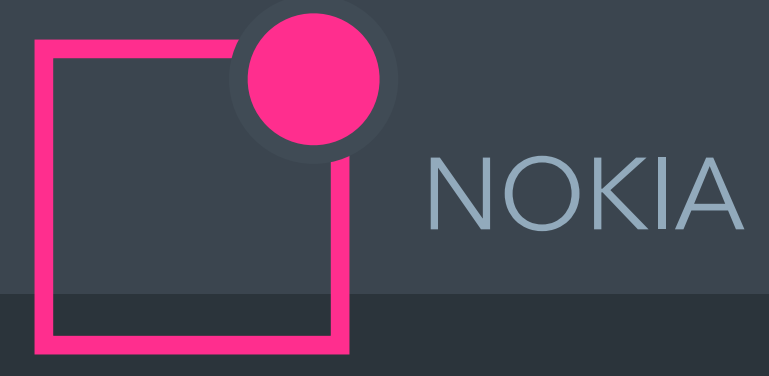
DEVOPS PORTFOLIO		
 EDUCATION COACHING, WORKSHOPS & TRAINING	 ACCELERATION APPLICATION LIFECYCLE AUTOMATION	 TRANSFORMATION DEVOPS, AGILE & CLOUD STRATEGY
AGILE & DEVOPS COACHING INSTRUCTOR LED TRAINING	DEVOPS ENGINEERING PROCESS AUTOMATION	DEVOPS, CLOUD & AGILE STRATEGY ORGANISATIONAL AGILITY



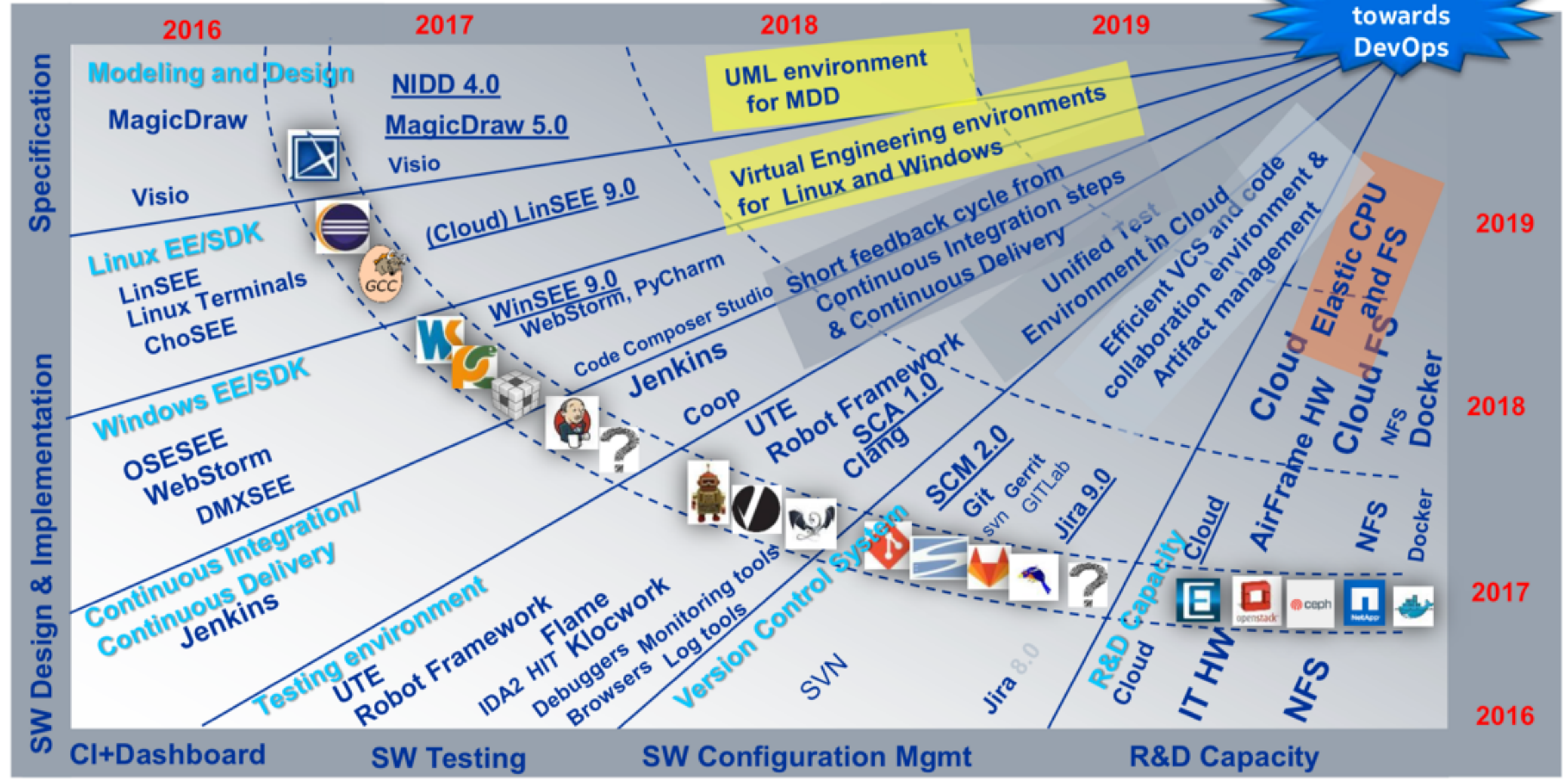
www.devopsguys.com

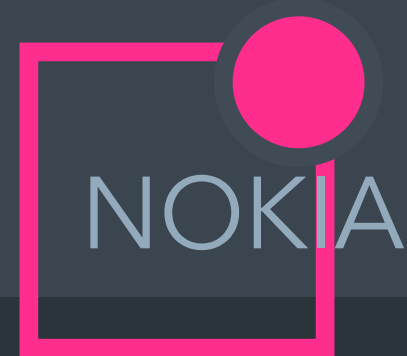
Phone: 0600 368 7378 | e-mail: team@devopsguys.com

Excel 2013



MN SW Engineering Tools long term view for 2018





诺基亚南京研发中心



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发机构



涵盖硬件、软件
和测试等领域



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站产品全球最大研
发中心

NOKIA