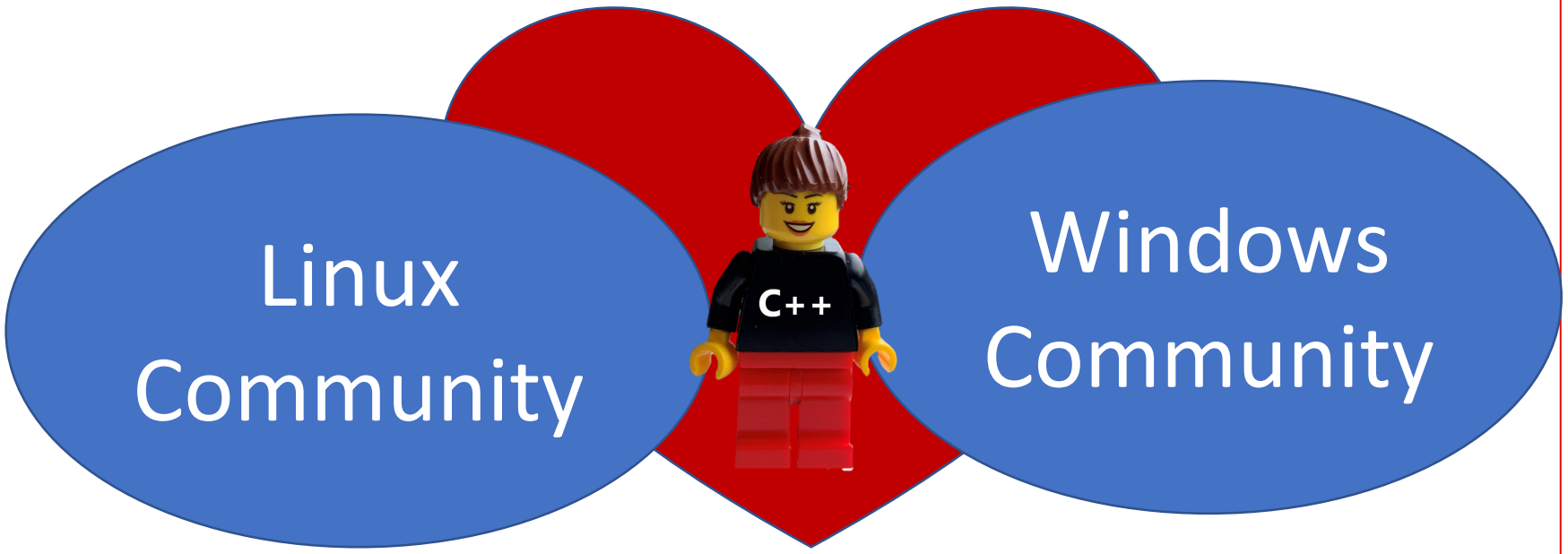
Advanced Developers Conference C++
Development for Professionals!

DOCKER BASED C++
DEPENDENCY & BUILD MANAGEMENT

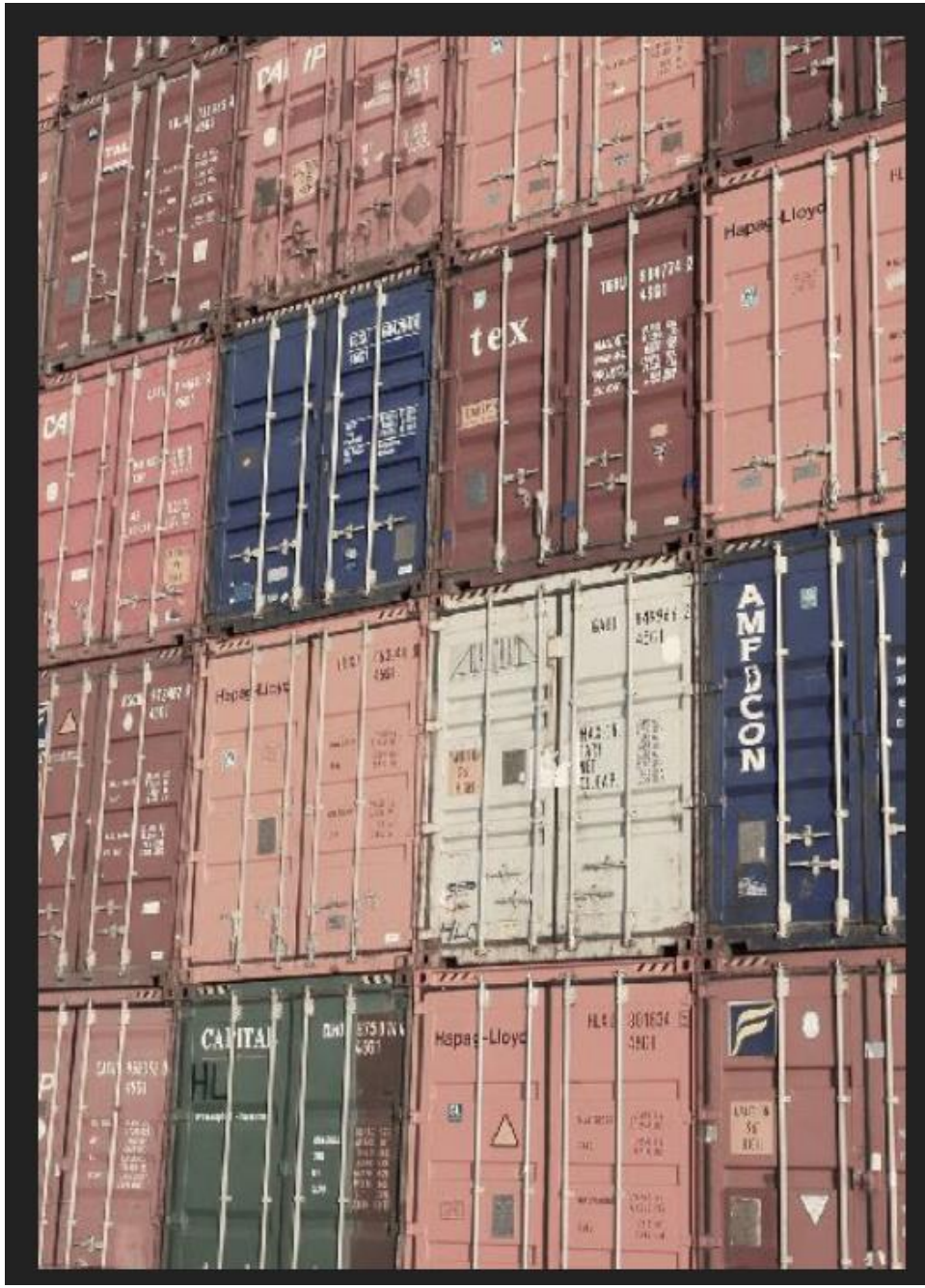


[Johannes Cosmin Dumitru]
[Lead Architect – Technology & Innovation - Swisscom]

ppedv

Los geht's...

- vcpkg: a tool to acquire C++ open source libraries



Solution: Intermodal Shipping Container Ecosystem

Multiplicity of Goods





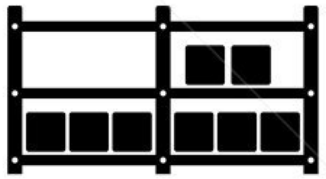


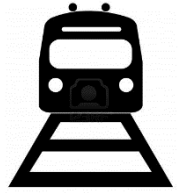
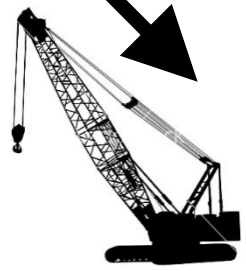
Do I worry about how goods interact (e.g. coffee beans next to spices)

A standard container that is loaded with virtually any goods, and stays sealed until it reaches final delivery.

…in between, can be loaded and unloaded, stacked, transported efficiently over long distances, and transferred from one mode of transport to another

Multiplicity of methods for transporting/storing

Can I transport quickly and smoothly (e.g. from boat to train to truck)

The Intermodal Shipping Container Ecosystem

- 90% of all cargo now shipped in a standard container
- Order of magnitude reduction in cost and time to load and unload ships
- Massive reduction in losses due to theft or damage
- Huge reduction in freight cost as percent of final goods (from >25% to <3%)
- massive globalization
- 5000 ships deliver 200M containers per year

Let's create an **ecosystem** for **distributed** applications

Multiplicity of Stacks

Static website

User DB

Web frontend

Queue

Analytics DB

Do services and apps interact appropriately?

An engine that enables any payload to be encapsulated as a lightweight, portable, self-sufficient container…

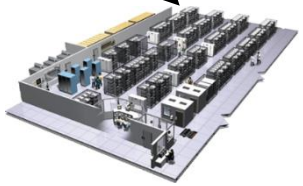
…that can be manipulated using standard operations and run consistently on virtually any hardware platform

Multiplicity of hardware environments

Development VM

QA server

Customer Data Center



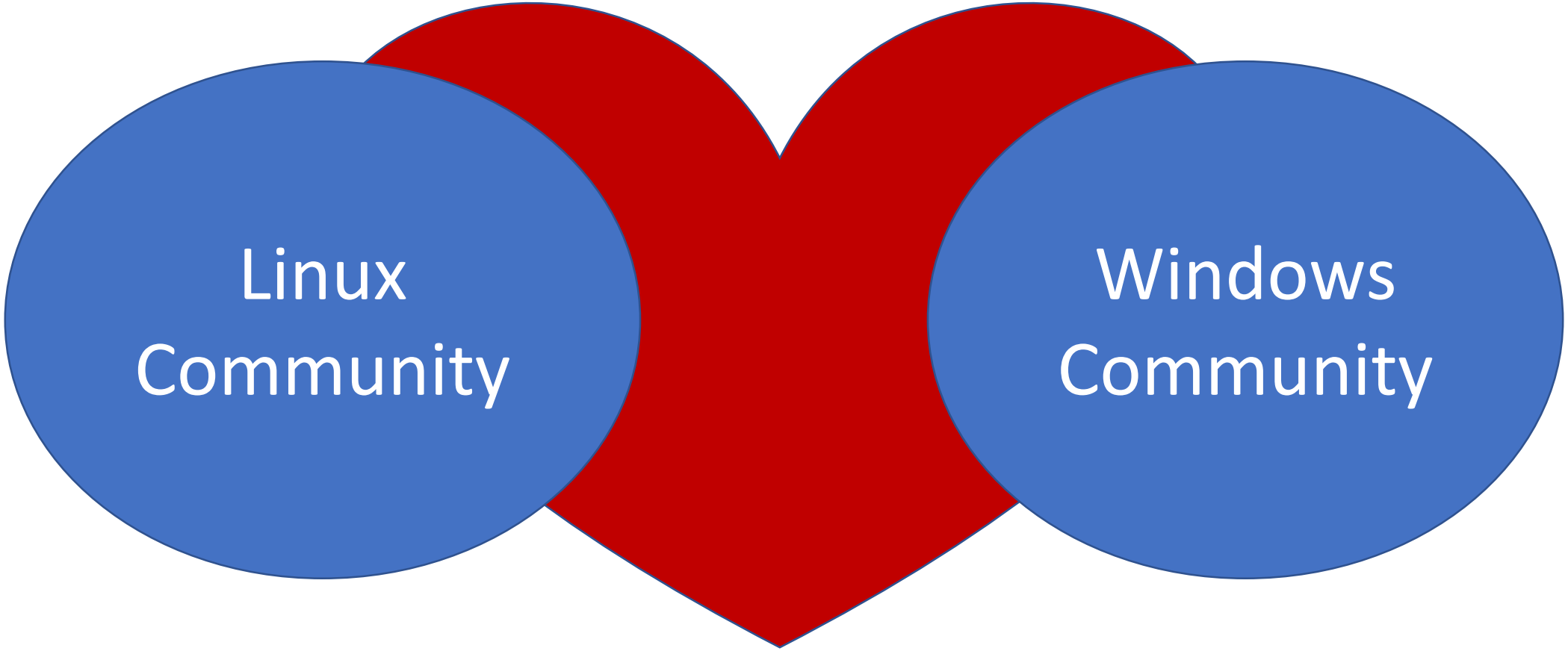
Public Cloud

Production Cluster

Contributor's laptop

Can I migrate smoothly and quickly

Bringing Communities Together



Advanced Developers Conference C++
Development for Professionals!

Titel/Überschrift/Headline

Untertitel/Subheadline

Inhalt

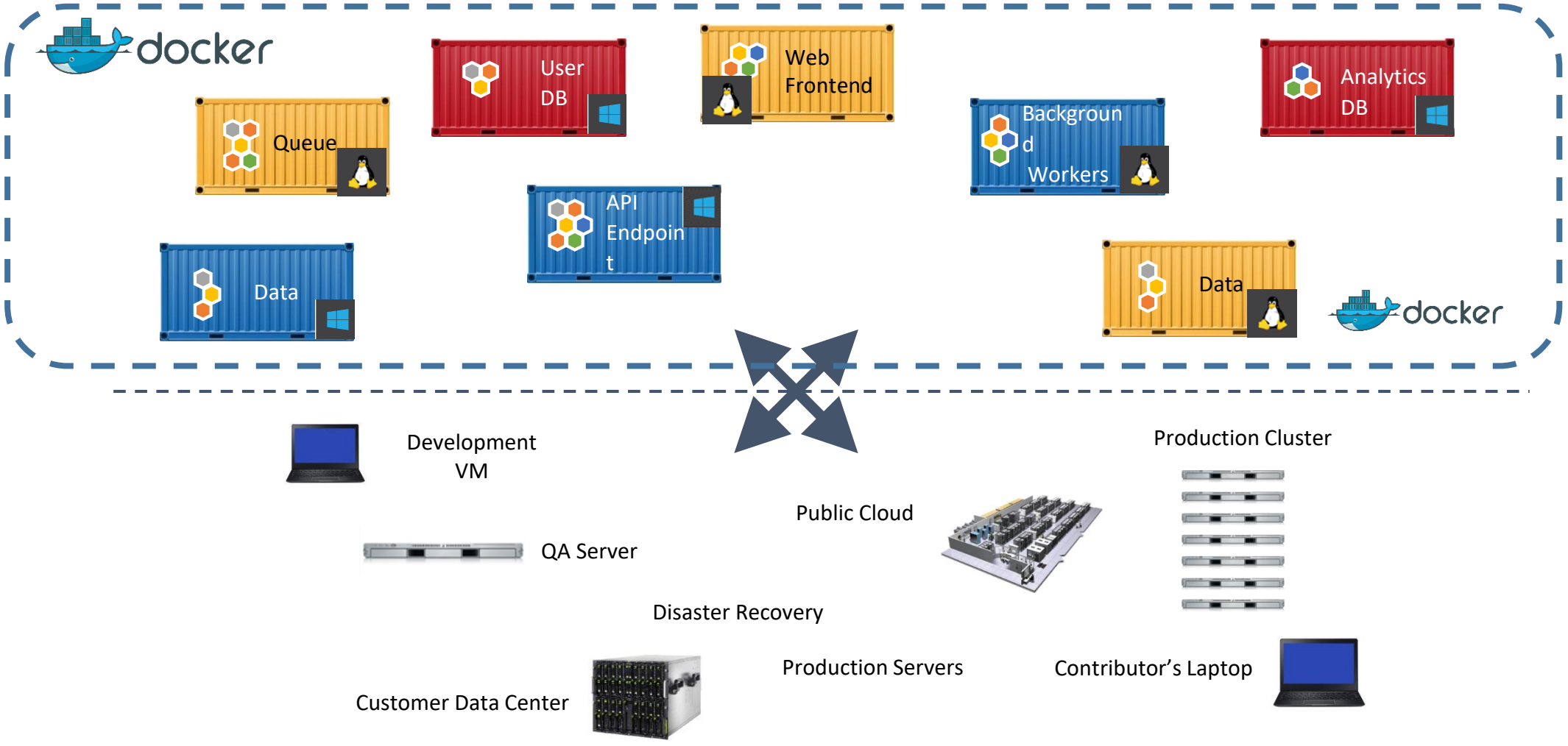
Images and Containers

- Dockerfile
- Hello World
- Multi-Stage Build
- Build a Toolchain
- Contributing to an Open Source Project
- CppDock

Überschrift/Headline

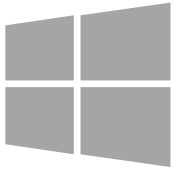
Hier kann Bild, Text, Grafik oder Diagramm innerhalb des Feldes angezeigt werden.

Distributed Applications With Both Linux and Windows Components



Visual Studio Code: C/C++ Extension





- Lightweight, keyboard focused
- Git integration
- Code Editing
  - IntelliSense, Code Browsing, Switch header/source, Code formatting (clang-format)
- Debugging
  - Core-dump debugging, launch, attach, breakpoints (incl. conditional and function), stepping, threads, call stack, watch, GDB and MI commands
- Easily run, build, test, and run external tasks

https://code.visualstudio.com/docs/languages/cpp

Vcpkg: An open source tool

80% of C++ projects use 3+ 3rd party libs

A majority of them use open source libraries

Simplifying rebuilding libs on Windows

A simple cmd line: Usage: **vcpkg install boost**

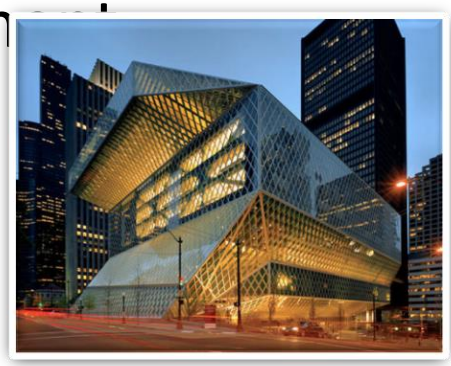
Installs the .h, .lib and binaries in a “lib folder” ready to use and to deploy

Open source tool based on a port tree approach (Vcpkg)

Port file tree is on GitHub, you can contribute to it and/or fork it

Conformance Testing with ~60 OSS Libraries from GitHub

- Testing with GitHub master branches and compiler development trunk
  - MSVC default mode – 58 projects
  - MSVC /std:c++17 mode – 58 projects
  - MSVC /permissive- mode – 55 projects



No.	Source
1	CoreCLR
2	Chakra
3	ClangLLVM
4	OpenSSL
5	Chrome
6	OpenCV
7	RxCpp
8	Boost
9	UnrealEngine
10	Electron
11	QTCreator
12	QT
13	Cocos2dx
14	OSQuery
15	FLAC
16	WinRT
17	Z3
18	PDFium
19	X265
20	RocksDB
21	VCPKG
22	PostgreSQL
23	CryEngine
24	APPLE_LZFSE
25	Blender
26	Dolphin
27	Facebook_ZSTD
28	Glslang
29	Google_Brotli
30	Google_LiquidFun
31	Google_MathFu
32	Google_Protobuf
33	Google_RE2
34	Google_Snappy
35	Google_VP9
36	Google_SwiftShader
37	Irrlicht
38	LAME
39	ITK
40	VTK
41	Sprout
42	LibGIT2
43	LibJPEG
44	LibJPEG_Turbo
45	LUA
46	LUAJIT
47	LZ4
48	Serious_Engine
49	Python3
50	PHP7
51	MySQL
52	Mesos
53	SDL
54	Azure_iot_sdk_c
55	Dlib
56	Bond
57	KTL
58	Outcome

An Inspiration: Cargo Transport Pre-1960

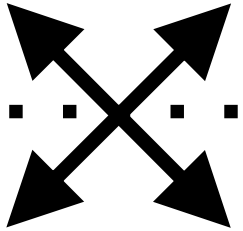
Multiplicity of Goods





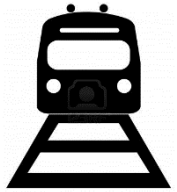


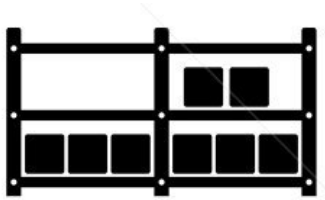
Do I worry about how goods interact (e.g. coffee beans next to spices)



Multipilicity of methods for transporting/storing






Can I transport quickly and smoothly (e.g. from boat to train to truck)

The Problem in 2014: Distributed Applications

Multiplicity of Stacks

Static website

nginx 1.5 + modsecurity + openssl + bootstrap 2

User DB

postgresql + pgv8 + v8

Queue

Redis + redis-sentinel

Analytics DB

hadoop + hive + thrift + OpenJDK

Background workers

Python 3.0 + celery + pyredis + libcurl + ffmpeg + libopencv + nodejs + phantomjs

Web frontend

Ruby + Rails + sass + Unicorn

API endpoint

Python 2.7 + Flask + pyredis + celery + psycopg + postgresql-client

Do services and apps interact appropriately?

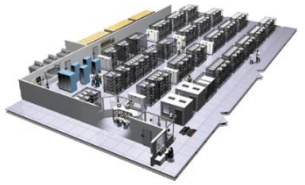
Multiplicity of hardware environments

Development VM

QA server

Customer Data Center

Public Cloud



Disaster recovery

Production Cluster

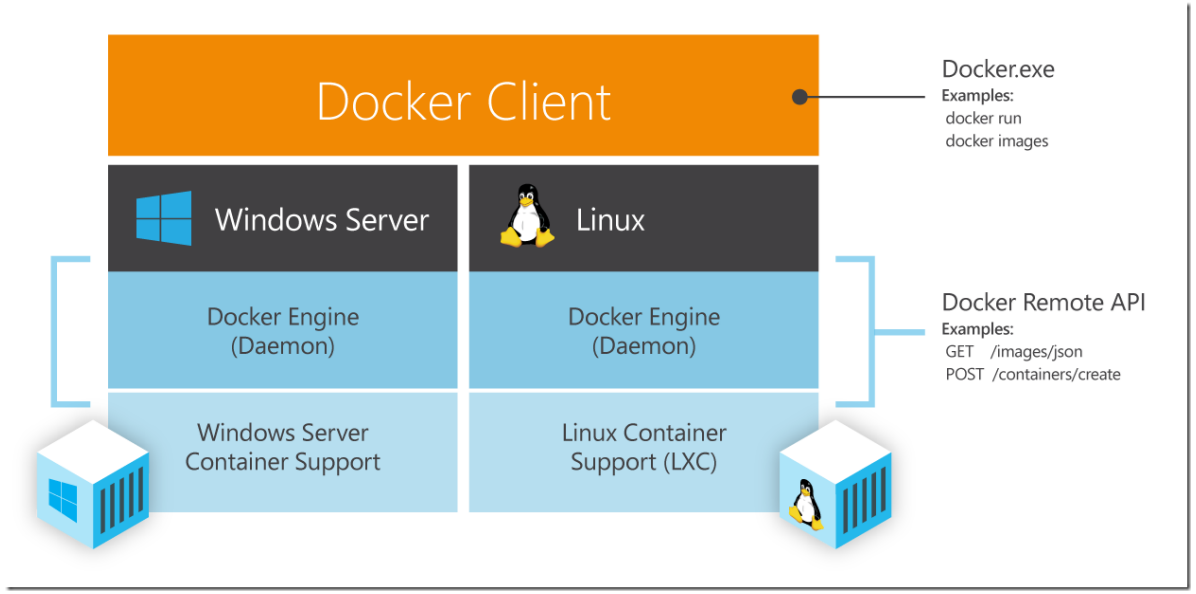
Production Servers

Contributor's laptop

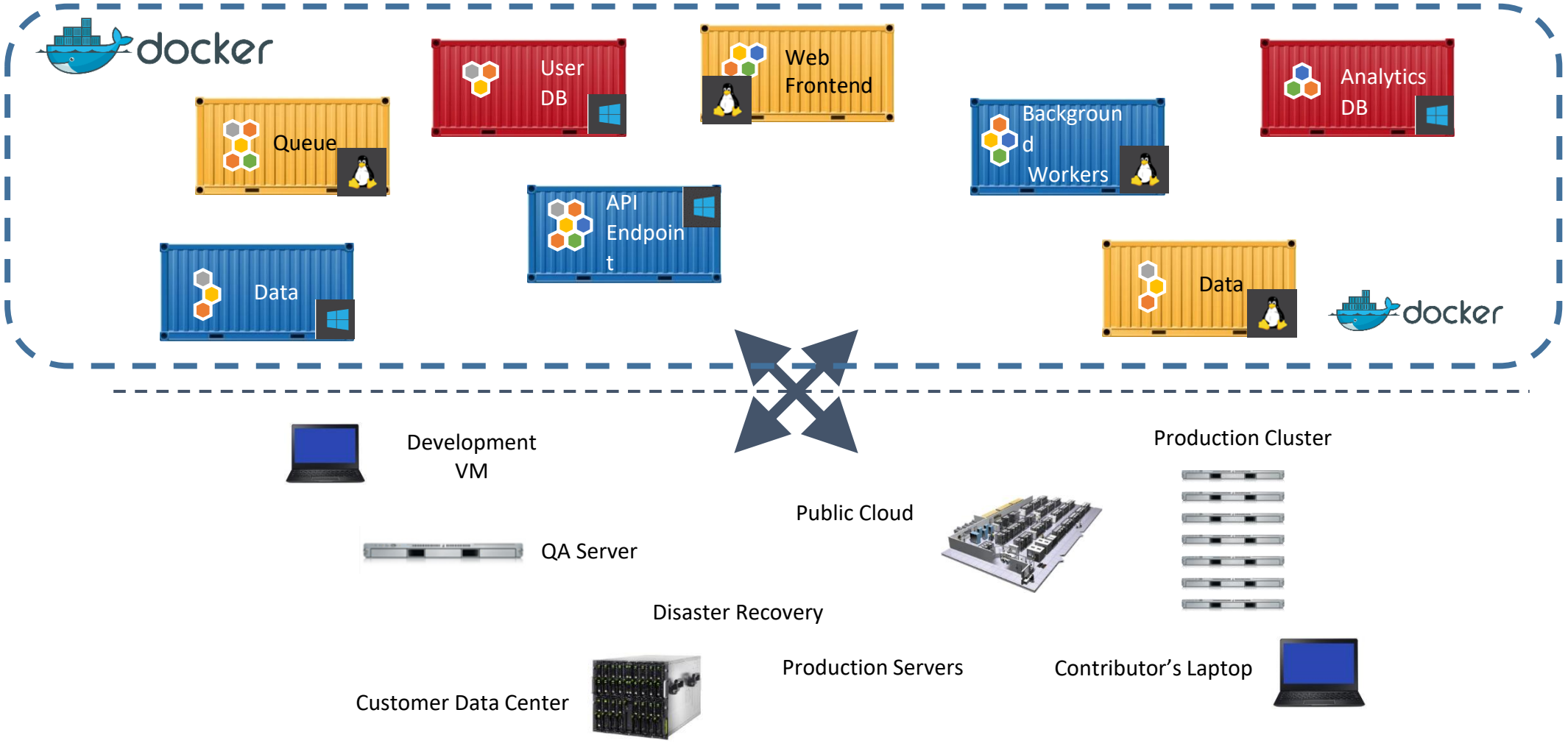
Can I migrate smoothly and quickly?

Recent News: Docker for Windows

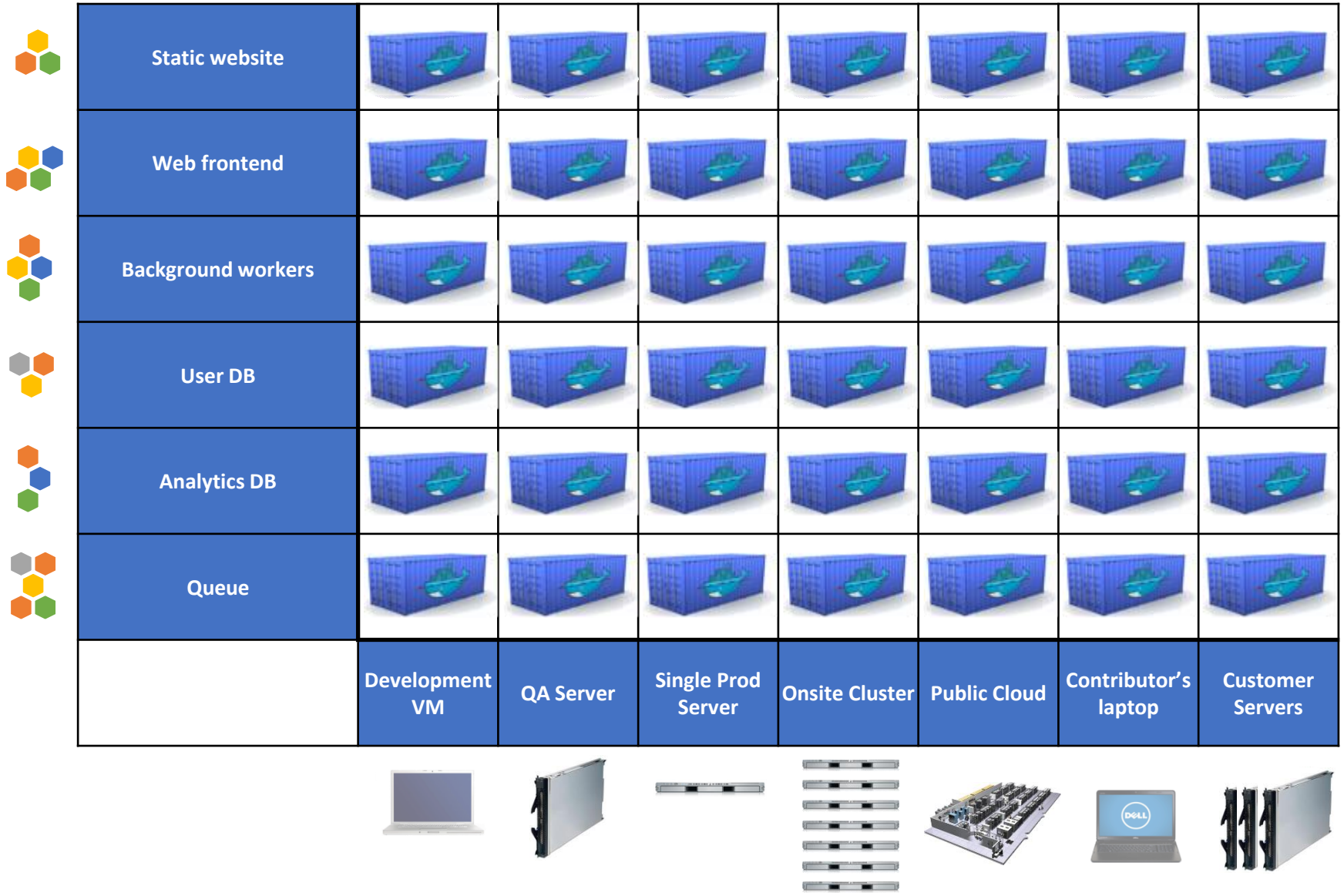
- Bring Docker and Containers to Windows
- Contribute to open source Docker Engine to support Windows
- Local box support on Hyper-V



Distributed Applications With Both Linux and Windows Components

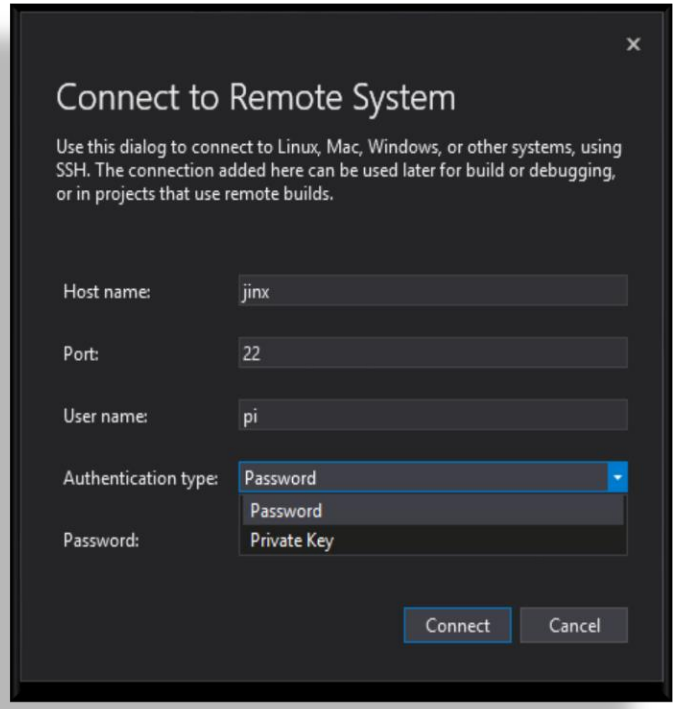


And eliminate the matrix from Hell



Linux

- Use Visual Studio with any Linux distro or Windows Subsystem for Linux (WSL)
  - Remote system needs SSH, GDB, and GCC for compile
  - Connect using user/password or private key
  - Project templates enable control of GCC/GDB on remote target
  - IntelliSense supports GCC with standard Linux libraries out of the box
  - Debug from your projects or attach to remote process
    - Use either gdb or gdbserver on the remote
    - Python pretty printer type visualizers supported in gdb mode
  - Support for CMake > 3.8 added in 15.4
- Resources
  - Documentation: https://aka.ms/vslinux
  - Issues, discussion: https://github.com/microsoft/vslinux



Überschrift/Headline

- Bullet/Dummy text: Donec quam felis, ultricies nec, pellentesque eu, pretium quis, sem. Nulla consequat massa quis enim.
- Bullet/Dummy text: Donec quam felis, ultricies nec, pellentesque eu, pretium quis, sem. Nulla consequat massa quis enim.
- Bullet/Dummy text: Cras dapibus. Vivamus elementum semper nisi. Aenean vulputate eleifend tellus.
- Bullet/Dummy text: Donec quam felis, ultricies nec, pellentesque eu, pretium quis, sem. Nulla consequat massa quis enim.
- Bullet/Dummy text: Donec quam felis, ultricies nec, pellentesque eu, pretium quis, sem. Nulla consequat massa quis enim.
- Bullet/Dummy text: Donec quam felis, ultricies nec, pellentesque eu, pretium quis, sem. Nulla consequat massa quis enim.

Beispiel für Codeanzeige

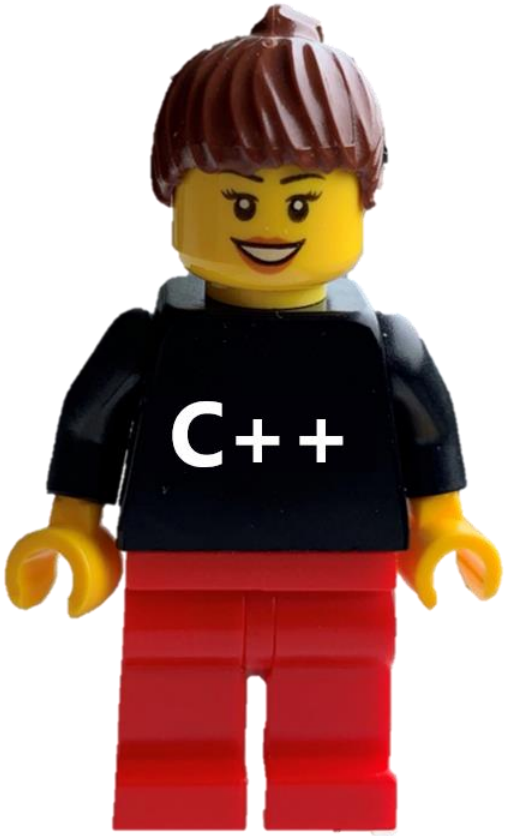
Codesnippet

```
function changeStatus(status)
{
var statusDropDown = NWF$("#"+statusId);
statusDropDown.val(status);
}

NWF.FormFiller.Functions.ProcessOnChange(statusDropDown);
```

Überschrift/Headline

Hier kann die Textbeschreibung zu Bild, Grafik oder Diagramm erscheinen.



Advanced Developers Conference C++
Development for Professionals!

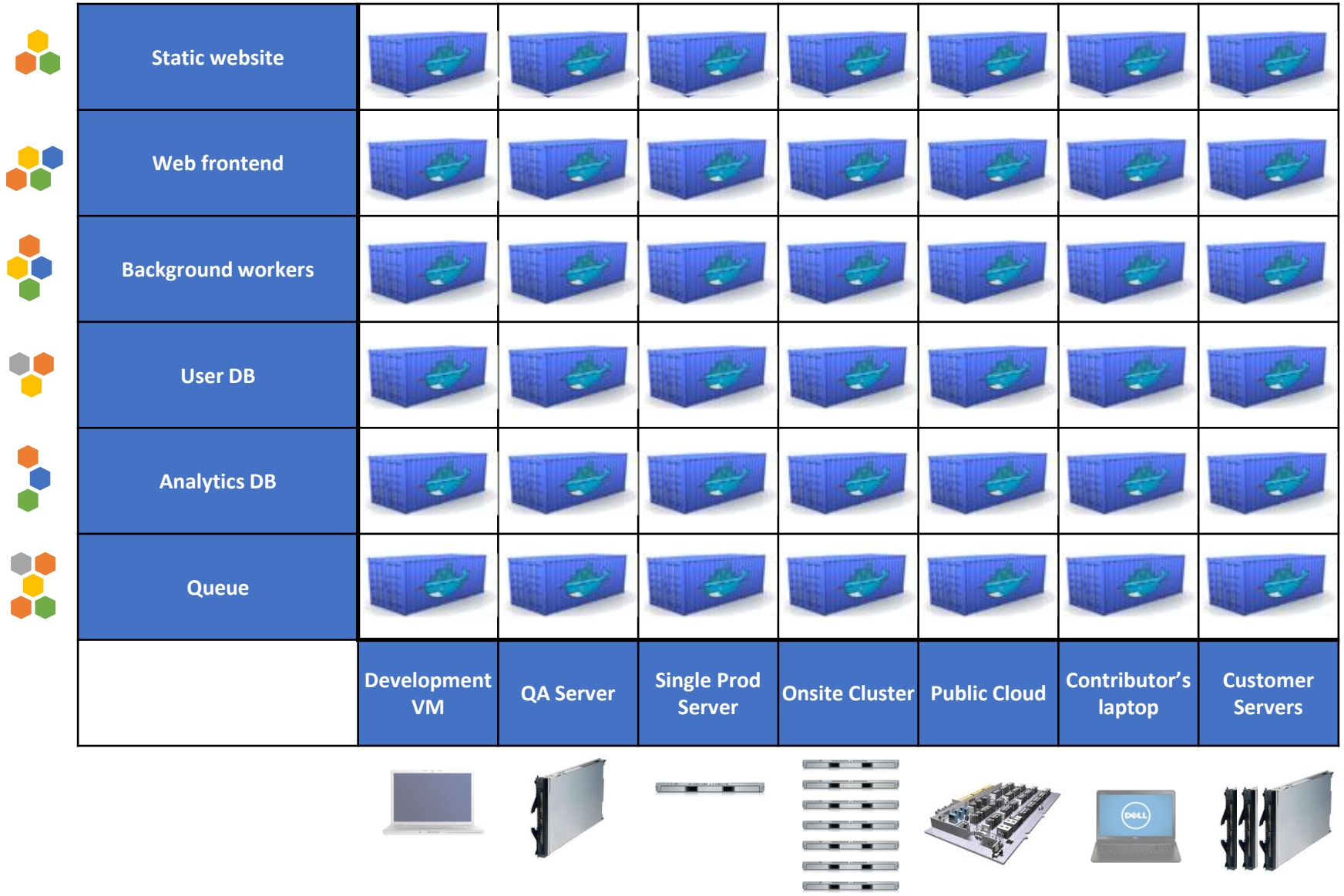
Live Demo

Keyfacts:

Bullet/Dummy tect

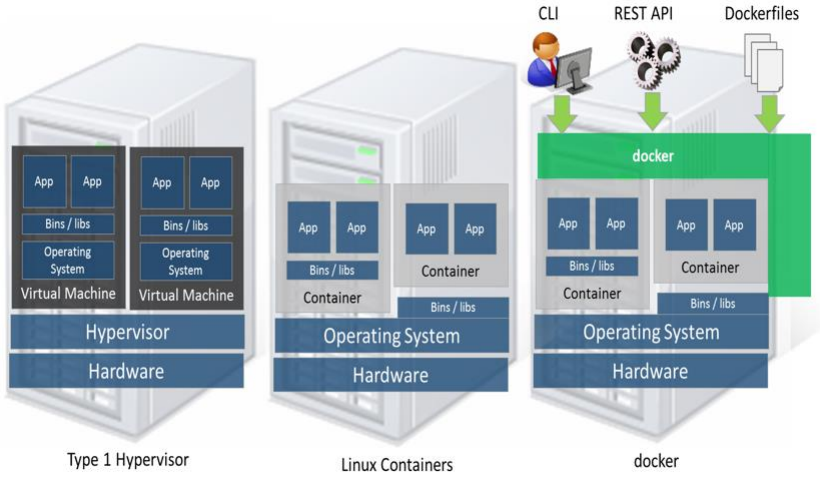
Donex quam felis dolor

And eliminate the matrix from Hell

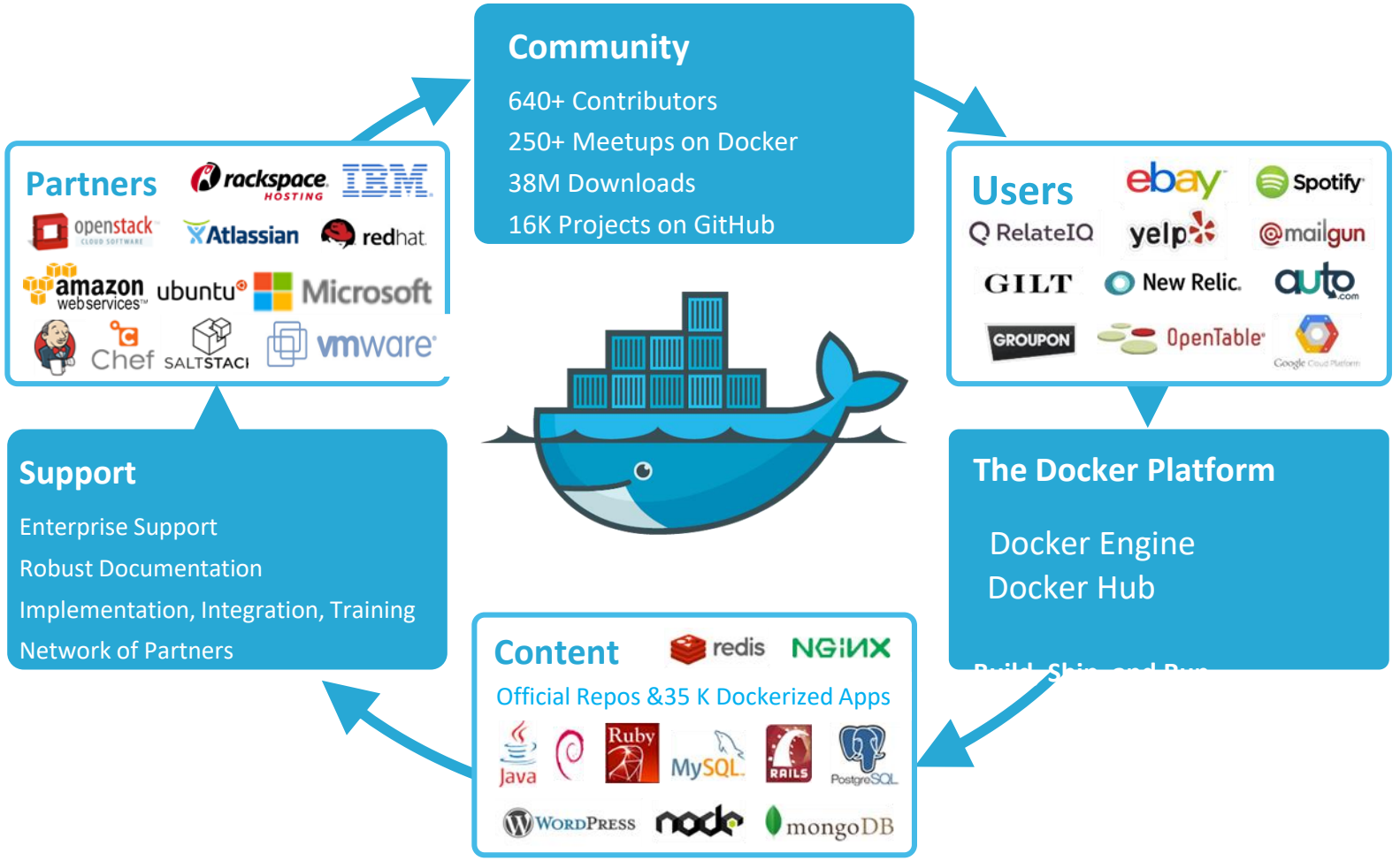


Importance of an Ecosystem

- Container technology has been around for a while (LXC, Solaris Zones, BSD Jails)
- Analogy: Shipping containers are not just steel boxes
- With Docker, low level containers get the following:
  - Re-usable components
  - Ability to run on any Linux server today: physical, virtual, VM, cloud, OpenStack, +++
  - Ability to move between any of the above in a matter of seconds-no modification or delay
  - Ability to share containerized components
  - Self contained environment—no dependency hell
  - Tools for how containers work together: linking, nesting, discovery, orchestration
- “Containerization” is really “Dockerization”



Snapshot: The Docker Ecosystem



Agenda

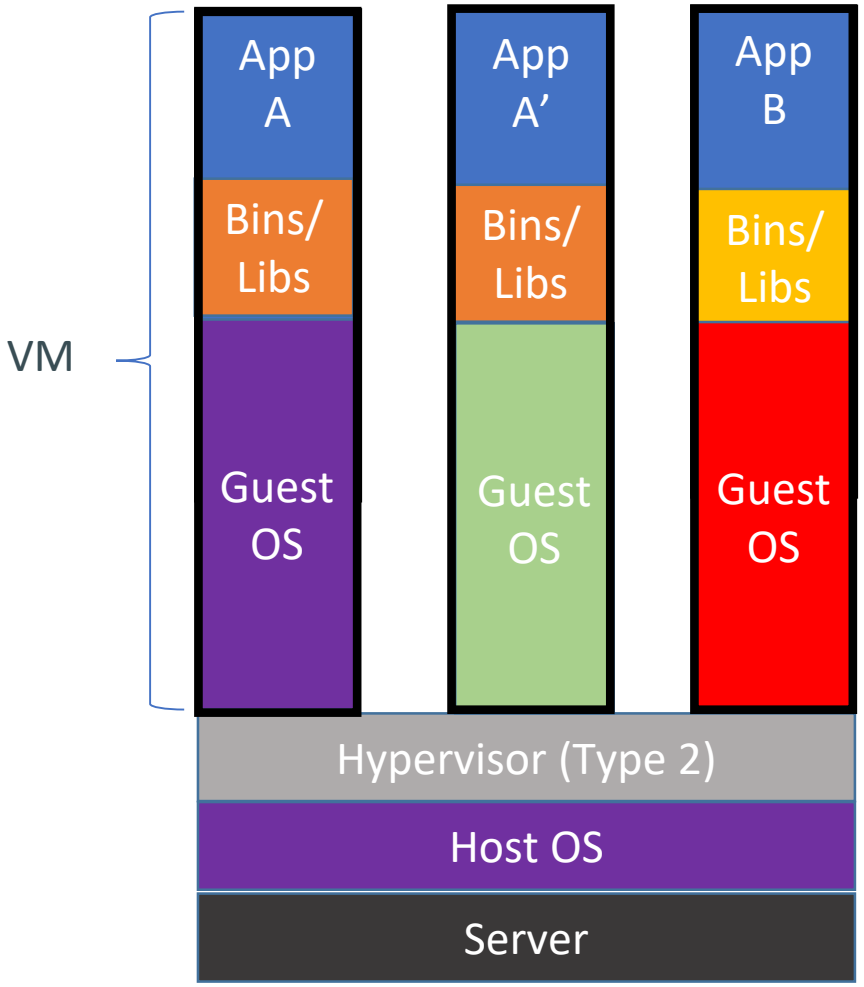
- Introduction
- The growing technology challenge
- An analogy: the shipping industry
- **Docker Engine Overview**
- Docker Hub Overview
- Microsoft and Docker
- Azure and Docker

Docker Engine

- Open Source Project written in Go
- Released March, 2013
- Provides the Docker Container - Repeatable Runtimes, Sandboxing, Network, and Storage
- Linux and (soon) Windows CLI tools for Developers
- Local and Remote REST API for further integration
- Low level API for Runtime, Storage, and Network extension

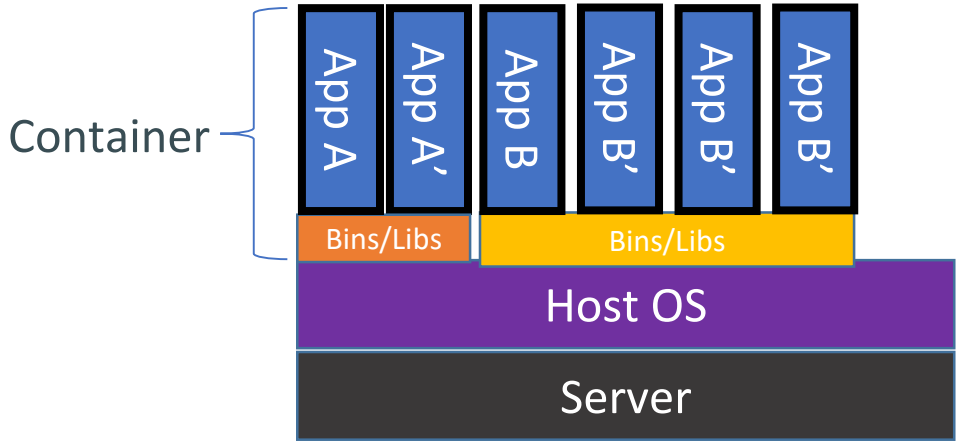
Docker Engine: Demo

Comparison: Containers vs. VMs

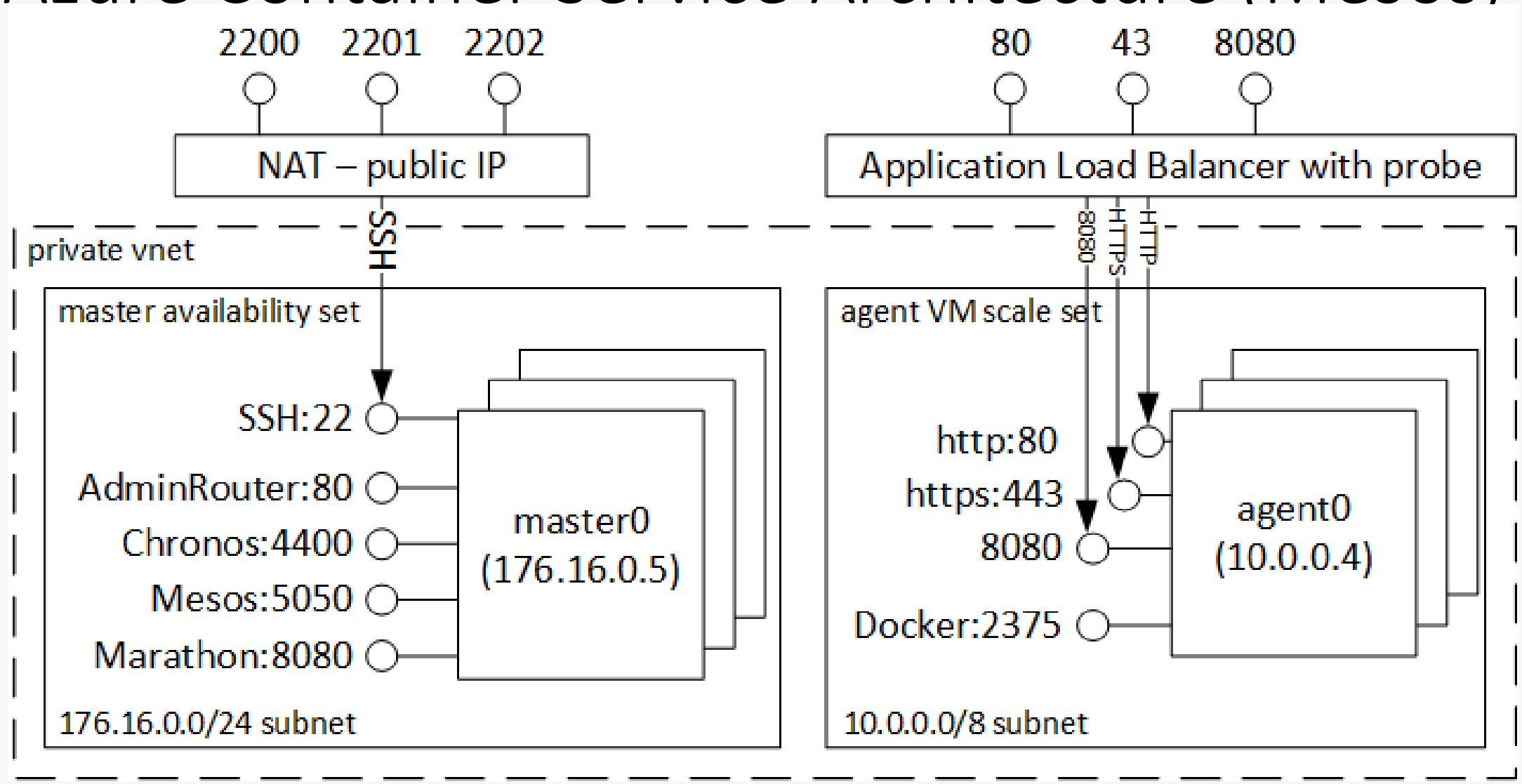


Containers are isolated,
but share OS kernel and, where appropriate, bins/libraries

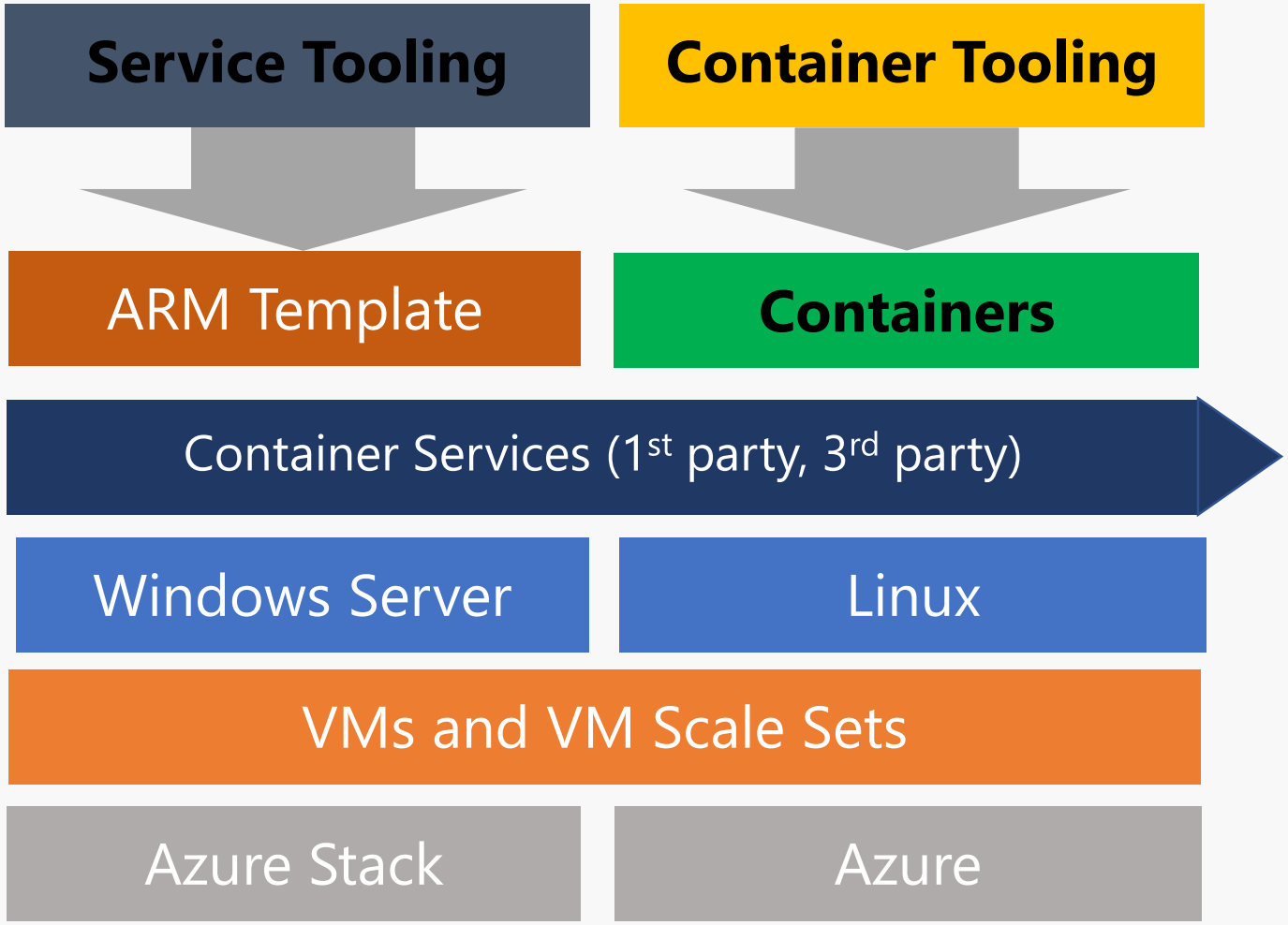
…result is significantly faster deployment, much less overhead, easier migration, faster restart



Azure Container Service Architecture (Mesos)

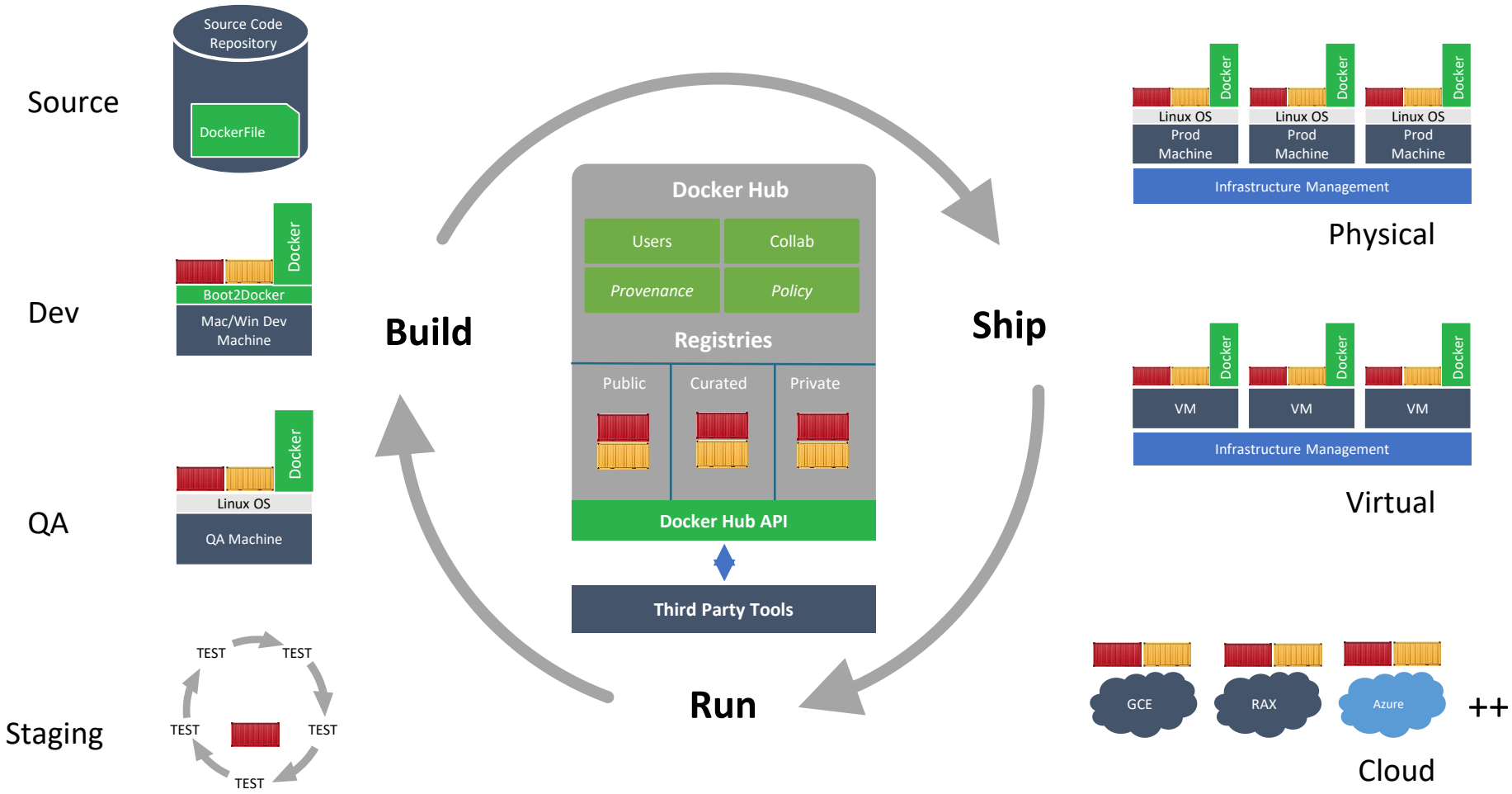


Layered for flexibility and agility



Layer	Supported Technologies
Configuration as Code	ARM, Dockerfile, Docker Compose, Marathon.json
Host cluster management	VM Scale Sets
Container orchestration	Docker Swarm, Chronos, Marathon, Apache Mesos
Monitoring	OMS, Statsd
Networking	IP per container
Storage	Persistent storage
???	

Docker Hub: Build, Ship, Run Applications



Any App

+ 45K apps
+ 16K projects

API

Engine

open source software at the heart of the Docker platform

Hub

cloud-based platform services for distributed applications

API

Any infrastructure

- Physical
- Virtual cloud

Agenda

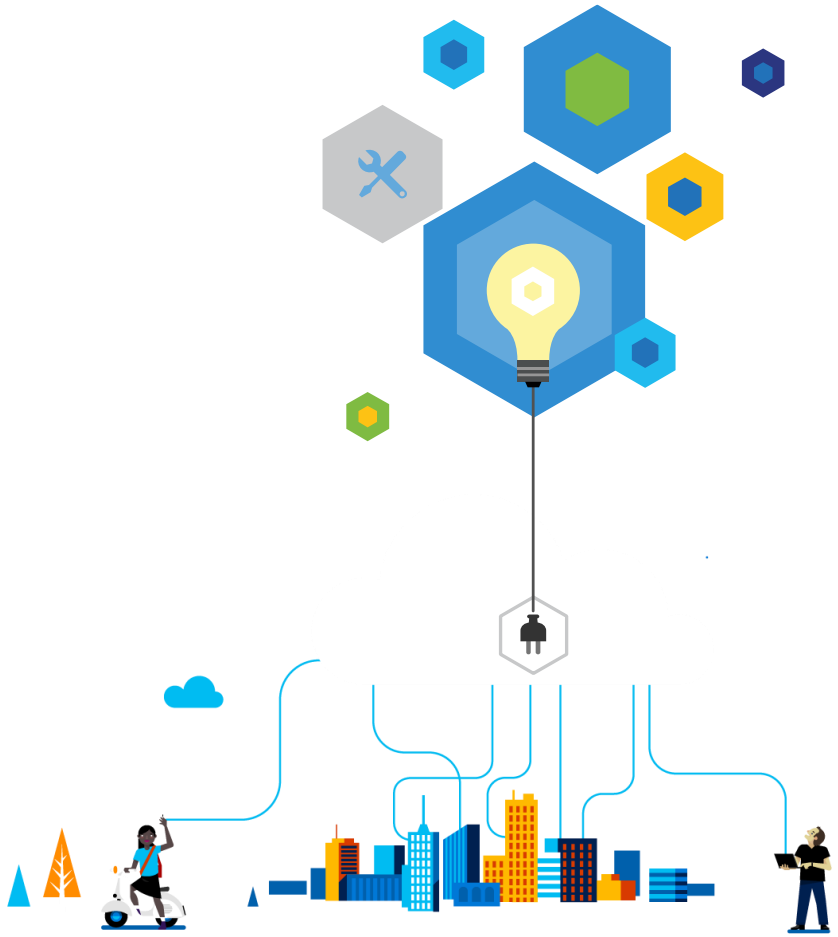
- Introduction
- The growing technology challenge
- An analogy: the shipping industry
- Docker Engine Overview
- **Docker Hub Overview**
- Microsoft and Docker
- Azure and Docker

How to get Started - Some References

- Bitcoin.org
- Bitcoin: A Peer-to-Peer Electronic Cash System, Satoshi Nakamoto, November 2008
- Mastering Bitcoin: Unlocking Digital Cryptocurrencies, by Andreas M. Antonopoulos, O'Reilly Media, December 14
- Ethereum White Paper

Blockchain Platform:

- AWS Hyperledger template
- Azure Hyperledger Fabric
- IBM – Hyperldger Fabric



Advanced Developers Conference C++
Development for Professionals!

Fragen?

Vielen Dank!

Ich freue mich auf Feedback!
[Sprecher]