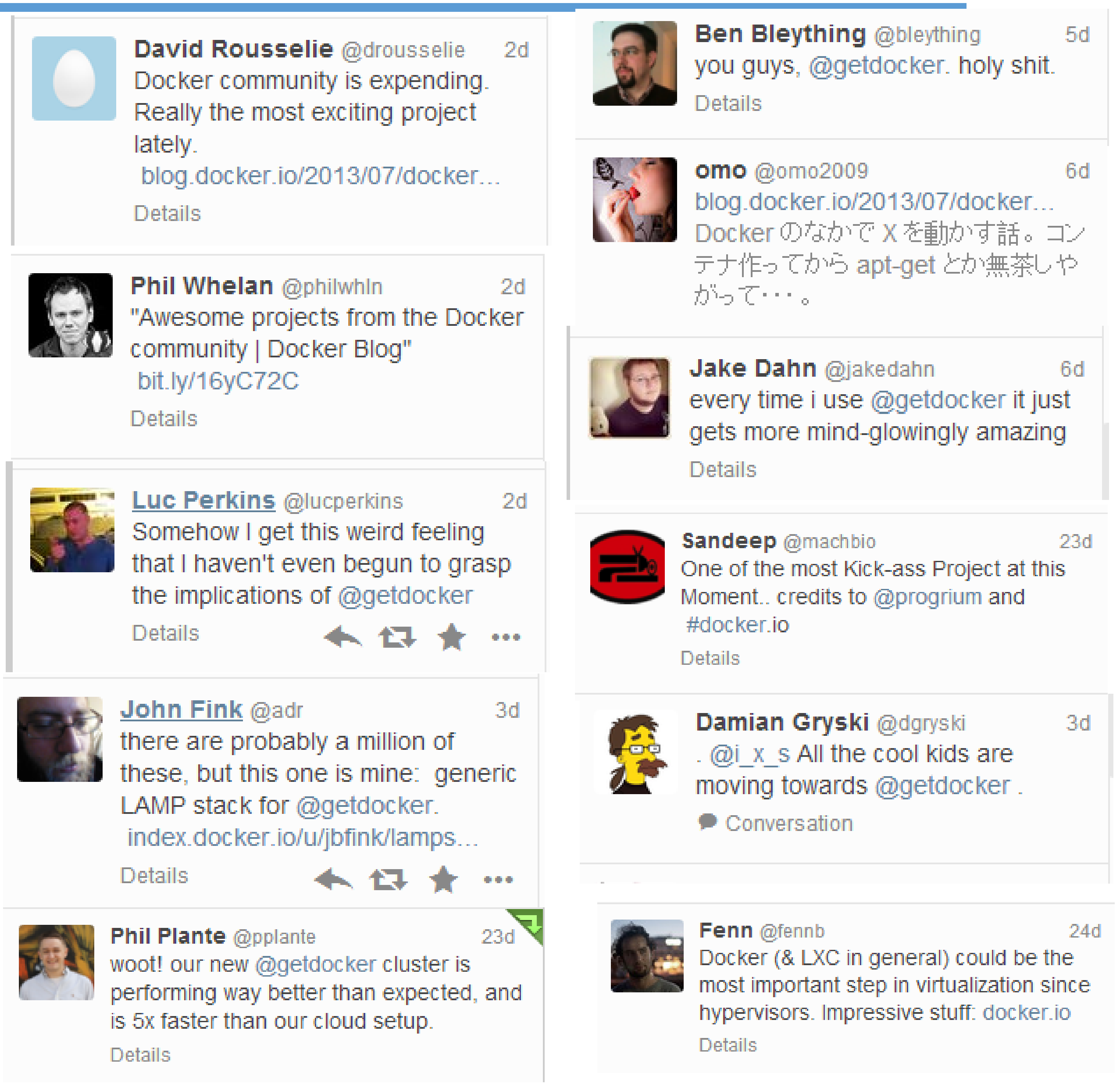
docker

Docker, Containers, and the Future of Application Delivery

In the four months since Docker launched

- >50,000 pulls
- >4,000 github stars
- >100 significant contributors
- >150 projects built on top of docker
  - UIs, mini-PaaS, Remote Desktop….
- 1000’s of Dockerized applications
  - Memcached, Redis, Node.js…
- Integration in Jenkins, Travis, Chef, Puppet, Vagrant and OpenStack
- Meetups arranged around the world…with organizations like Ebay, Uber, Mozilla, Cloudflare, and Rackspace presenting on their use of Docker



David Rousselie @drousselie 2d
Docker community is expending. Really the most exciting project lately.
blog.docker.io/2013/07/docker…
Details

Phil Whelan @philwhln 2d
"Awesome projects from the Docker community | Docker Blog"
bit.ly/16yC72C
Details

Luc Perkins @lucperkins 2d
Somehow I get this weird feeling that I haven't even begun to grasp the implications of @getdocker
Details

John Fink @adr 3d
there are probably a million of these, but this one is mine: generic LAMP stack for @getdocker.
index.docker.io/u/jbfink/lamps…
Details

Phil Plante @pplante 23d
woot! our new @getdocker cluster is performing way better than expected, and is 5x faster than our cloud setup.
Details

Ben Bleything @bleything 5d
you guys, @getdocker. holy shit.
Details

omo @omo2009 6d
blog.docker.io/2013/07/docker…
Docker のなかで X を動かす話。コンテナ作ってから apt-get とか無茶しやがって・・・。

Jake Dahn @jakedahn 6d
every time i use @getdocker it just gets more mind-glowingly amazing
Details

Sandeep @machbio 23d
One of the most Kick-ass Project at this Moment.. credits to @progrium and #docker.io
Details

Damian Gryski @dgryski 3d
. @i_x_s All the cool kids are moving towards @getdocker .
Conversation

Fenn @fennb 24d
Docker (& LXC in general) could be the most important step in virtualization since hypervisors. Impressive stuff: docker.io
Details

Why all the excitement?

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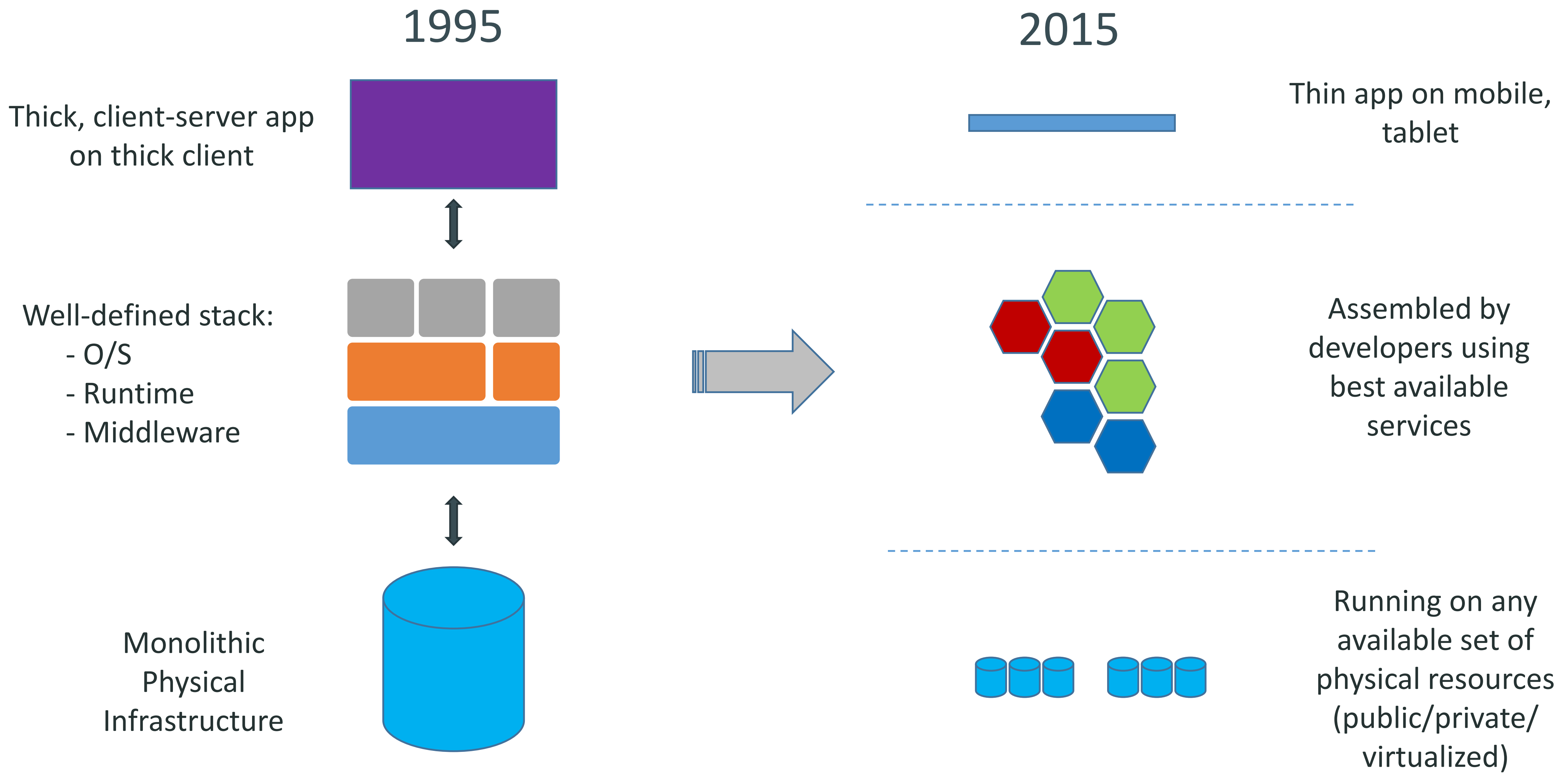
Market View: Evolution of IT


1995
2015
Thick, client-server app on thick client
Well-defined stack:
- O/S
- Runtime
- Middleware
Monolithic Physical Infrastructure
Thin app on mobile, tablet
Assembled by developers using best available services
Running on any available set of physical resources (public/private/ virtualized)

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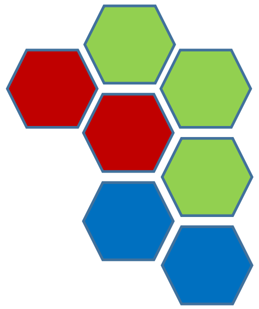
Challenges

2015

Thin app on mobile, tablet

Assembled by developers using best available services



How to ensure services interact consistently, avoid dependency hell

How to avoid n X n different configs

Running on any available set of physical resources (public/private/ virtualized)

How to migrate & scale quickly, ensure compatibility

The Challenge

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

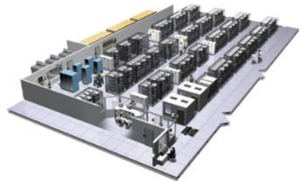
Customer Data Center

Public Cloud

Disaster recovery

Production Servers

Production Cluster



Contributor’s laptop

Can I migrate smoothly and quickly?

Results in N X N compatibility nightmare

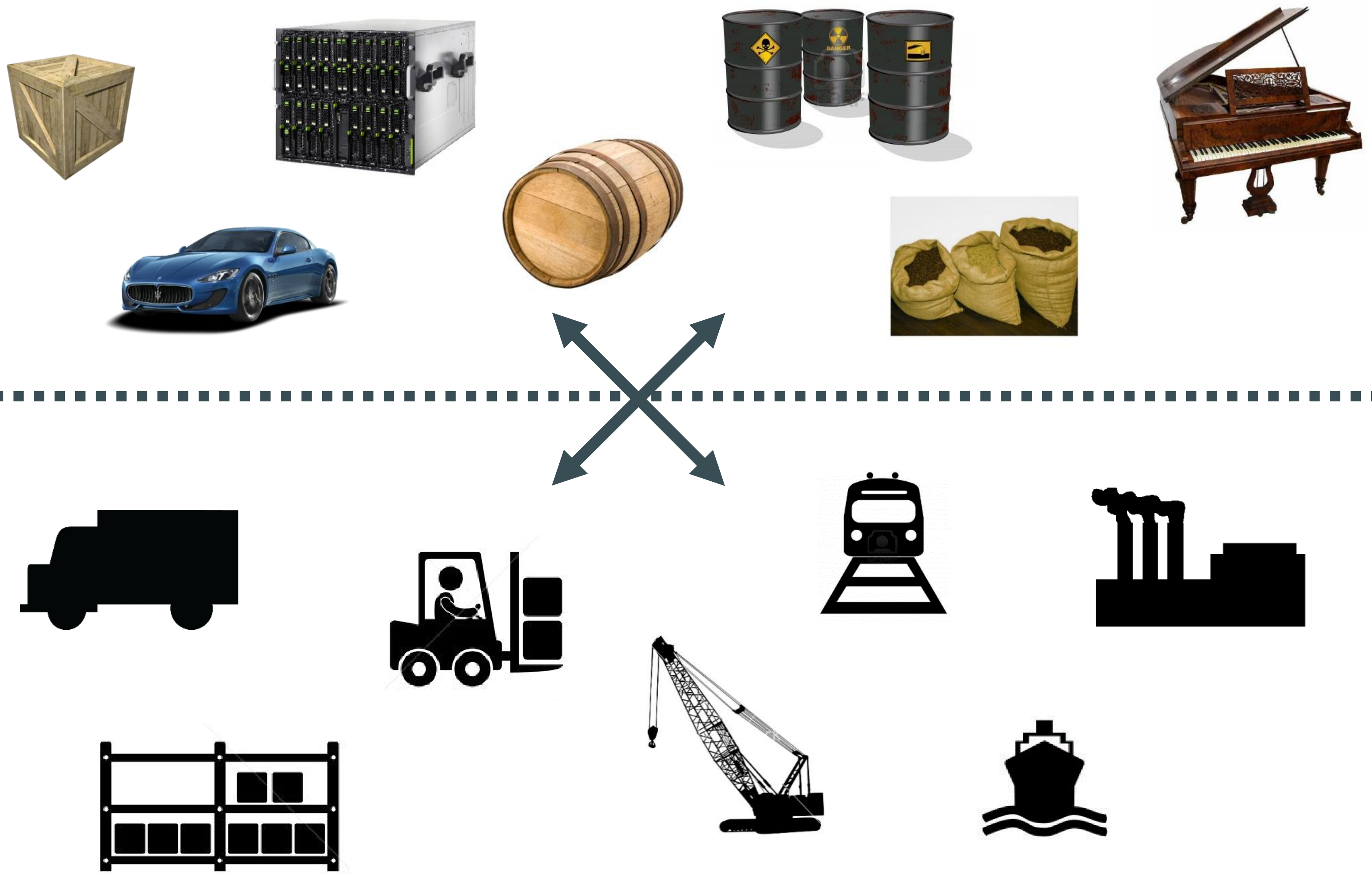
	Development VM	QA Server	Single Prod Server	Onsite Cluster	Public Cloud	Contributor’s laptop	Customer Servers
Static website	?	?	?	?	?	?	?
Web frontend	?	?	?	?	?	?	?
Background workers	?	?	?	?	?	?	?
User DB	?	?	?	?	?	?	?
Analytics DB	?	?	?	?	?	?	?
Queue	?	?	?	?	?	?	?

A useful analogy…

Cargo Transport Pre-1960

Multiplicity of Goods

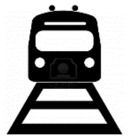
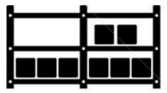
Do I worry about how goods interact (e.g. coffee beans next to spices)



Multipilicity of methods for transporting/storing

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

Also an NxN Matrix

	?	?	?	?	?	?	?
	?	?	?	?	?	?	?
	?	?	?	?	?	?	?
	?	?	?	?	?	?	?
	?	?	?	?	?	?	?
	?	?	?	?	?	?	?
							

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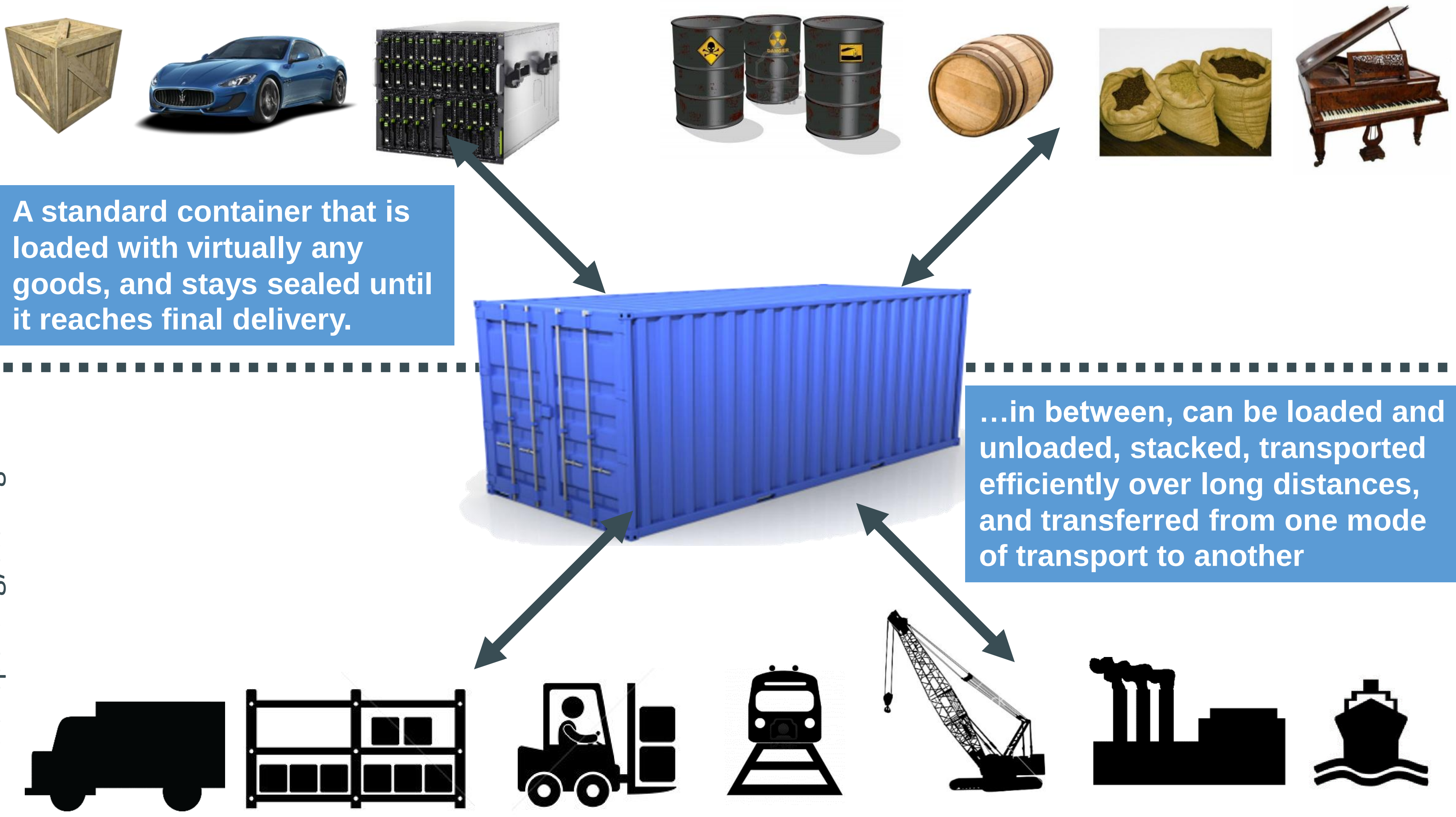
Solution: Intermodal Shipping Container

Multiplicity of Goods

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

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

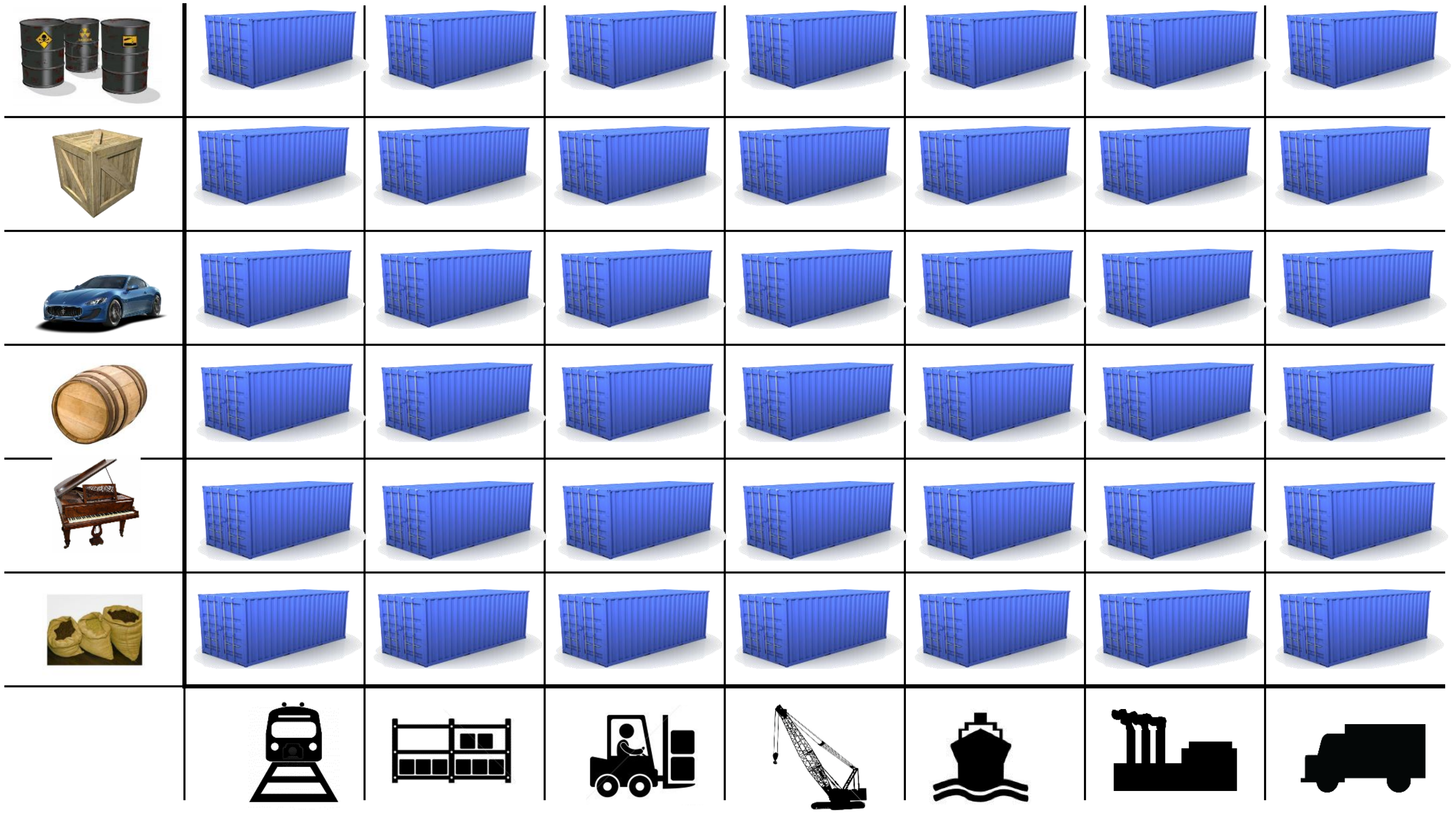


Multiplicity of methods for transporting/storing

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

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

This eliminated the NXN problem…



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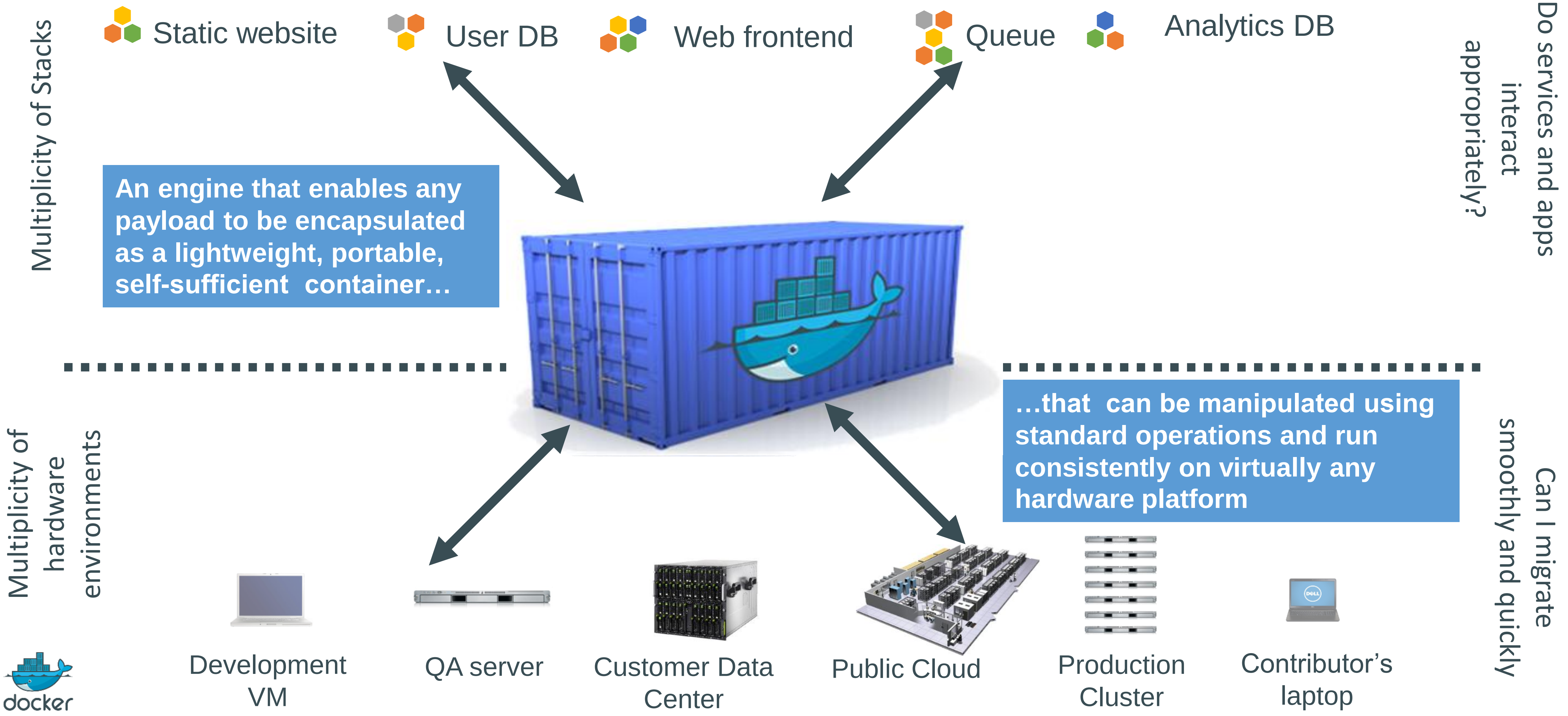
and spawned an Intermodal Shipping Container Ecosystem

- 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 globalizations

- 5000 ships deliver 200M containers per year

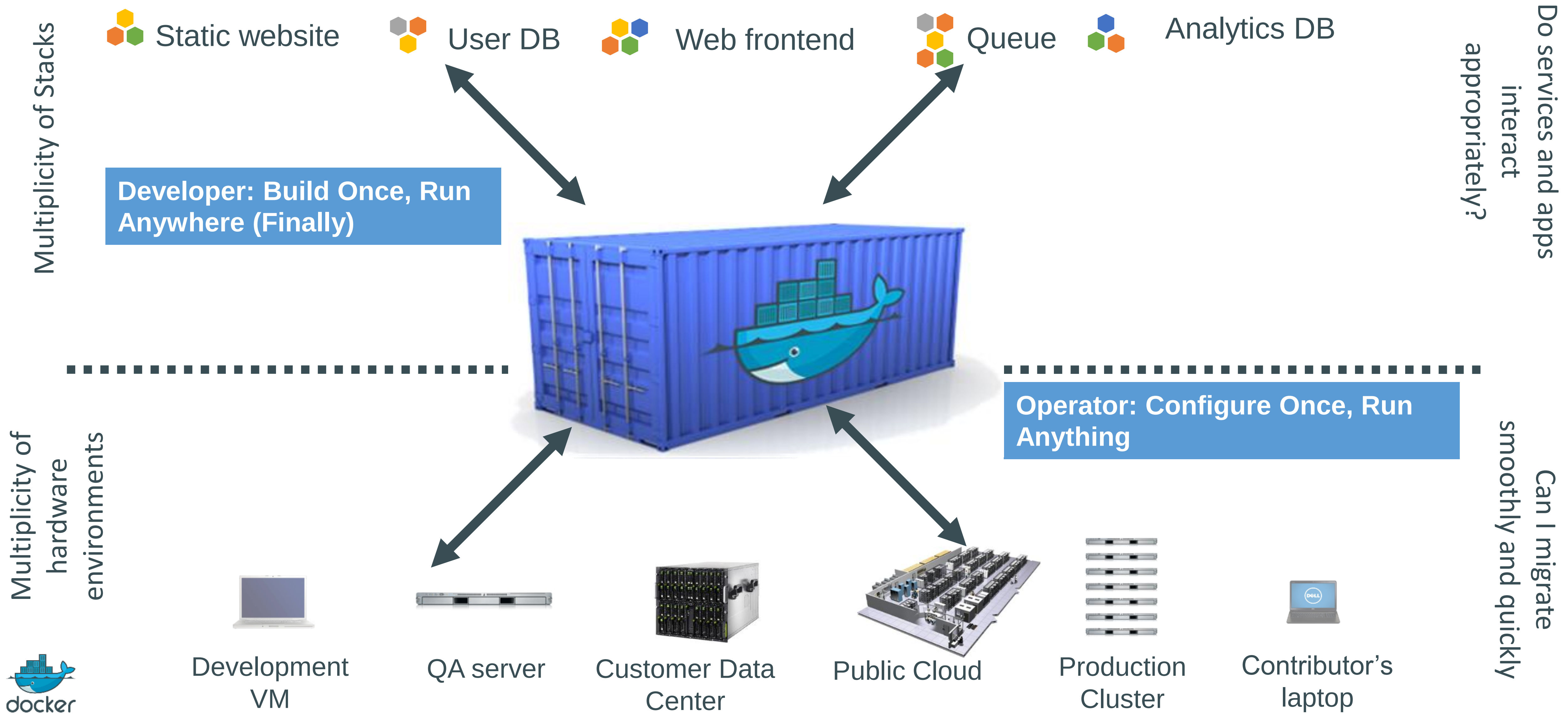
Docker is a shipping container system for code



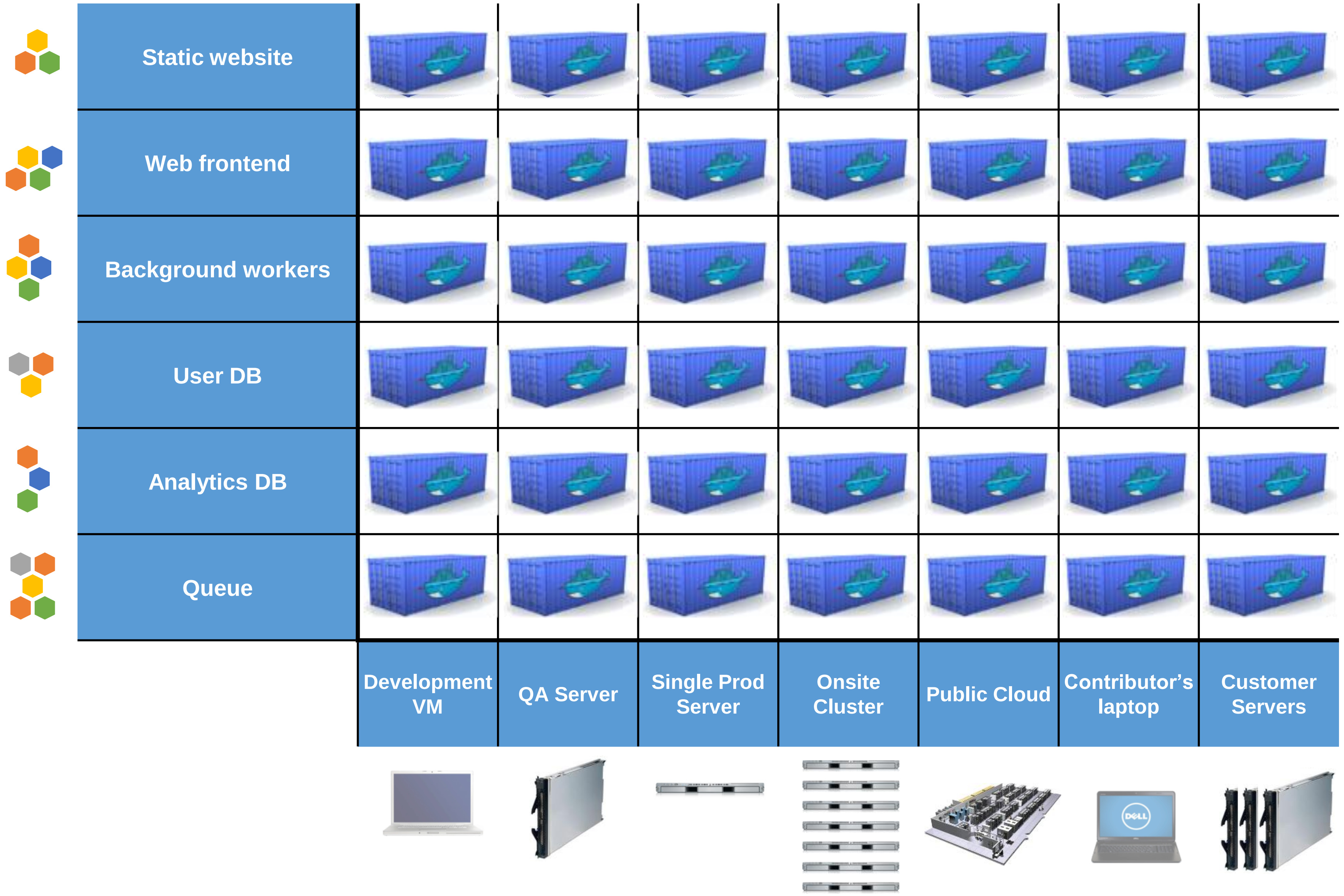
An engine that enables any payload to be encapsulated as a lightweight, portable, self-sufficient container…

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

Or…put more simply


Multiplicity of Stacks
Static website
User DB
Web frontend
Queue
Analytics DB
Do services and apps interact appropriately?
Developer: Build Once, Run Anywhere (Finally)
Operator: Configure Once, Run Anything
Multiplicity of hardware environments
Can I migrate smoothly and quickly
Development VM
QA server
Customer Data Center
Public Cloud
Production Cluster
Contributor's laptop
docker

Docker solves the NXN problem



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Why containers matter

	Physical Containers	**Docker**
Content Agnostic	The same container can hold almost any type of cargo	Can encapsulate any payload and its dependencies
Hardware Agnostic	Standard shape and interface allow same container to move from ship to train to semi-truck to warehouse to crane without being modified or opened	Using operating system primitives (e.g. LXC) can run consistently on virtually any hardware—VMs, bare metal, openstack, public IAAS, etc.—without modification
Content Isolation and Interaction	No worry about anvils crushing bananas. Containers can be stacked and shipped together	Resource, network, and content isolation. Avoids dependency hell
Automation	Standard interfaces make it easy to automate loading, unloading, moving, etc.	Standard operations to run, start, stop, commit, search, etc. Perfect for devops: CI, CD, autoscaling, hybrid clouds
Highly efficient	No opening or modification, quick to move between waypoints	Lightweight, virtually no perf or start-up penalty, quick to move and manipulate
Separation of duties	Shipper worries about inside of box, carrier worries about outside of box	Developer worries about code. Ops worries about infrastructure.

Why Developers Care

- Build once…run anywhere
  - A **clean, safe, hygienic and portable** runtime environment for your app.
  - **No worries about missing dependencies**, packages and other pain points during subsequent deployments.
  - Run each app in its **own isolated container**, so you can run various versions of libraries and other dependencies for each app without worrying
  - **Automate testing, integration, packaging**…anything you can script
  - **Reduce/eliminate** concerns about compatibility on different platforms, either your own or your customers.
  - **Cheap, zero-penalty containers** to deploy services? A VM without the overhead of a VM? Instant replay and reset of image snapshots? That’s the power of Docker

Why Developers Care

“Docker interests me because it allows simple environment isolation and repeatability. I can create a **run-time environment once, package it up, then run it again on any other machine**. Furthermore, everything that runs in that environment is isolated from the underlying host (much like a virtual machine). And best of all, everything is fast and simple.”

-Gregory Szorc, Mozilla Foundation

http://gregoryszorc.com/blog/2013/05/19/using-docker-to-build-firefox/

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Why Devops Cares?

- Configure once…run anything
  - Make the entire lifecycle more efficient, consistent, and repeatable
  - Increase the **quality of code** produced by developers.
  - **Eliminate inconsistencies** between development, test, production, and customer environments
  - Support segregation of duties
  - Significantly improves the speed and reliability of continuous deployment and continuous integration systems
  - Because the containers are so **lightweight**, address significant performance, costs, deployment, and portability issues normally associated with VMs

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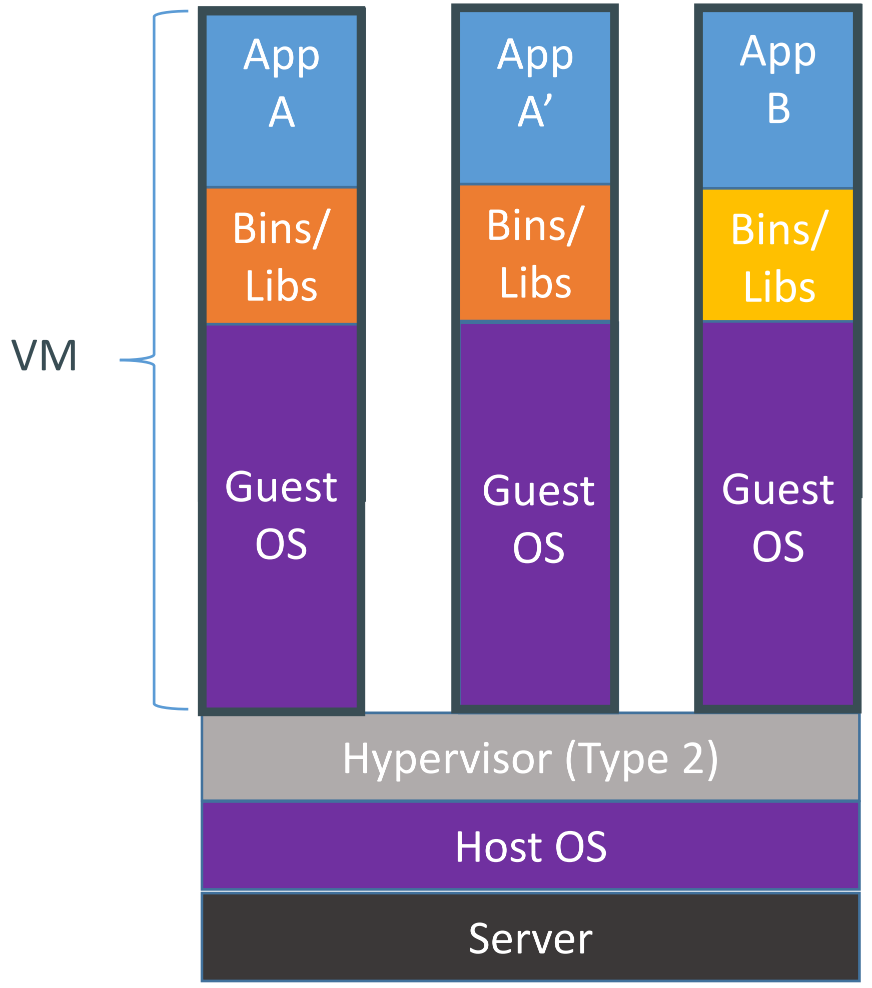
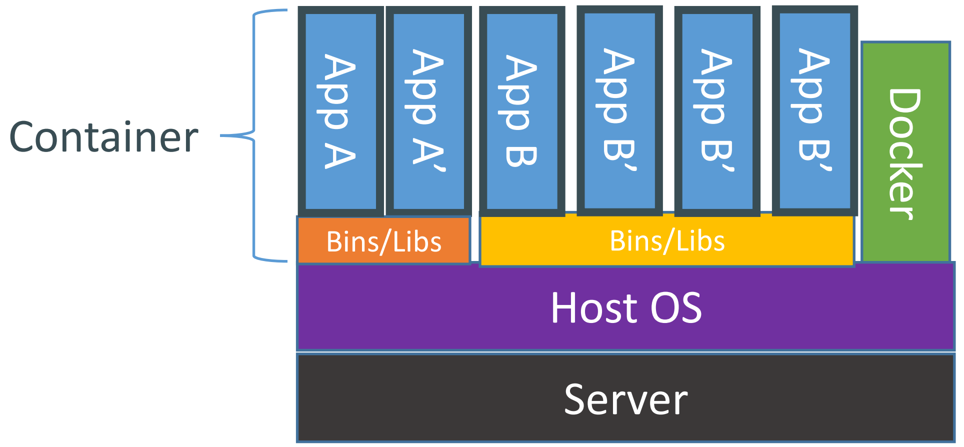
Containers vs. VMs



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



How They Work?

- Refer the PPT 2

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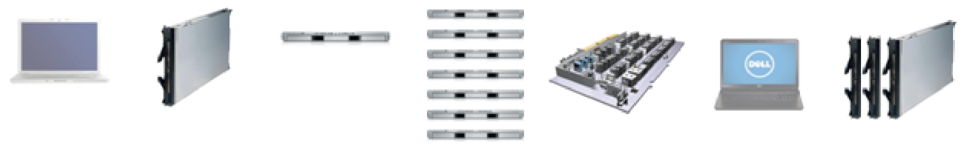
Alternatives/Complementary Approaches

	Development VM	QA Server	Single Prod Server	Onsite Cluster	Public Cloud	Contributor's laptop	Customer Servers
Static website	?	?	?	?	?	?	?
Web frontend	?	?	?	?	?	?	?
Background workers	?	?	?	?	?	?	?
User DB	?	?	?	?	?	?	?
Analytics DB	?	?	?	?	?	?	?
Queue	?	?	?	?	?	?	?

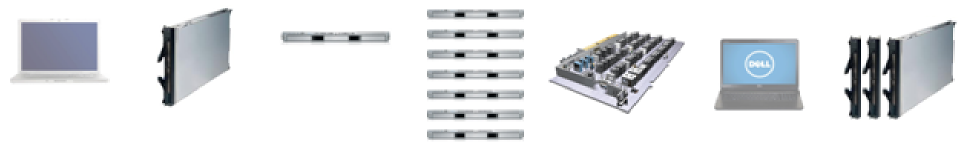


- Policy
  Reduce Rows
- Configuration Management
  Reduce Columns
- Traditional HW Virtualization
- Packaging Automation

Alternative 1: Impose Consistent Dev Environment

Reduce # rows via policy

	Development VM	QA Server	Single Prod Server	Onsite Cluster	Public Cloud	Contributor's laptop	Customer Servers
Static website	?	?	?	?	?	?	?
Web frontend	?	?	?	?	?	?	?
Background workers	?	?	?	?	?	?	?
User DB	?	?	?	?	?	?	?
Analytics DB	?	?	?	?	?	?	?
Queue	?	?	?	?	?	?	?



Description:

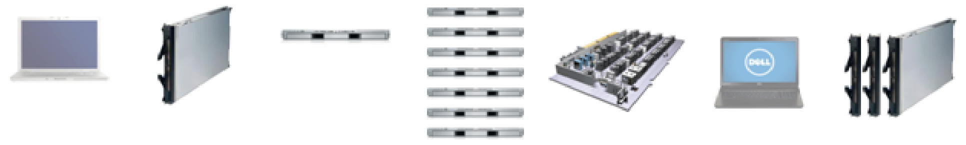
- Try to impose a consistent development environment

Challenges:

- Goes against 20 years of development trends
- Can't predict what will be needed for next app
- Doesn't work outside confines of the enterprise (e.g. at customer sites)

Alternative 2: Configuration Mgt/Automation

	Development VM	QA Server	Single Prod Server	Onsite Cluster	Public Cloud	Contributor's laptop	Customer Servers
Static website	?	?	?	?	?	?	?
Web frontend	?	?	?	?	?	?	?
Background workers	?	?	?	?	?	?	?
User DB	?	?	?	?	?	?	?
Analytics DB	?	?	?	?	?	?	?
Queue	?	?	?	?	?	?	?



Reduce # Columns via Chef/Puppet/etc.

Description:

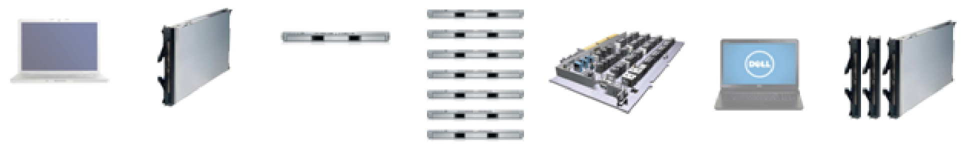
- Automate creation of consistent runtime environment for different machines

Challenges:

- Chef/Puppet etc. are extremely useful for creating more consistent machine configuration
- But…has to be redone for each new application or version
- Brittle
- Doesn’t work easily outside confines of the enterprise (e.g. at customer sites)

Alternative 3: Hardware Virtualization

Static website	?	?	?	?	?	?	?
Web frontend	?	?	?	?	?	?	?
Background workers	?	?	?	?	?	?	?
User DB							
Analytics DB	?	?	?	?	?	?	?
Queue	?	?	?	?	?	?	?
	Development VM	QA Server	Single Prod Server	Onsite Cluster	Public Cloud	Contributor's laptop	Customer Servers



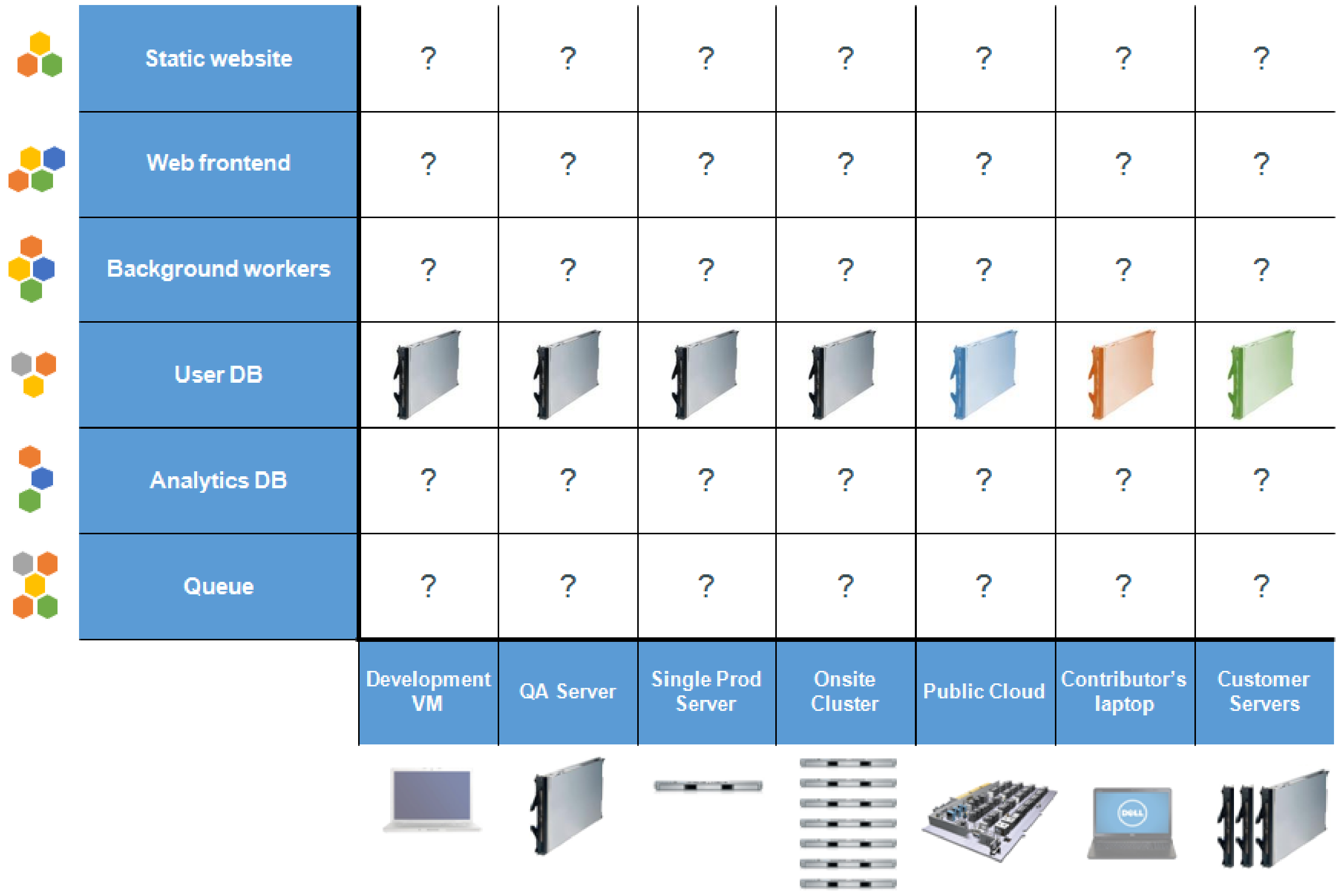
Description:

- Create a virtual server for each app

Challenges:

- HW Virtualization great for many uses cases (e.g. server consolidation)
- But.. heavyweight/expensive/slow
- Need different VM for different hypervisor environments
- Has to be completely redone for each new application or version
- Not good for scale out, hybrid clouds, massive clustering, iterative development

Alternative 4: Package Automation



	Development VM	QA Server	Single Prod Server	Onsite Cluster	Public Cloud	Contributor's laptop	Customer Servers
Static website	?	?	?	?	?	?	?
Web frontend	?	?	?	?	?	?	?
Background workers	?	?	?	?	?	?	?
User DB							
Analytics DB	?	?	?	?	?	?	?
Queue	?	?	?	?	?	?	?

Description:

- Automate creation of different VMs for different

Challenges:

- A great solution for certain distribution challenges, but…
- VMs are still heavyweight/expensive
- Has to be completely redone for each new application or version
- Better idea: combine containers plus automation

Use Cases—From Our Community

Use Case	Examples	Link
Build your own PaaS	Dokku - Docker powered mini-Heroku. The smallest PaaS implementation you've ever seen	http://bit.ly/191Tgsx
Web Based Environment for Instruction	JiffyLab – web based environment for the instruction, or lightweight use of, Python and UNIX shell	http://bit.ly/12oaj2K
Easy Application Deployment	Deploy Java Apps With Docker = Awesome	http://bit.ly/11BCvvu
	Running Drupal on Docker	http://bit.ly/15MJS6B
	Installing Redis on Docker	http://bit.ly/16EWOKh
Create Secure Sandboxes	Docker makes creating secure sandboxes easier than ever	http://bit.ly/13mZGJH
Create your own SaaS	Memcached as a Service	http://bit.ly/11nL8vh
Automated Application Deployment	Push-button Deployment with Docker	http://bit.ly/1bTKZTo
Continuous Integration and Deployment	Next Generation Continuous Integration & Deployment with dotCloud's Docker and Strider	http://bit.ly/ZwTfoy
Lightweight Desktop Virtualization	Docker Desktop: Your Desktop Over SSH Running Inside Of A Docker Container	http://bit.ly/14RYL6x

Want to learn more?

- www.docker.io
- www.scmGalaxy.com
- www.DevOpsSchool.com

www.docker.io