Docker Introduction

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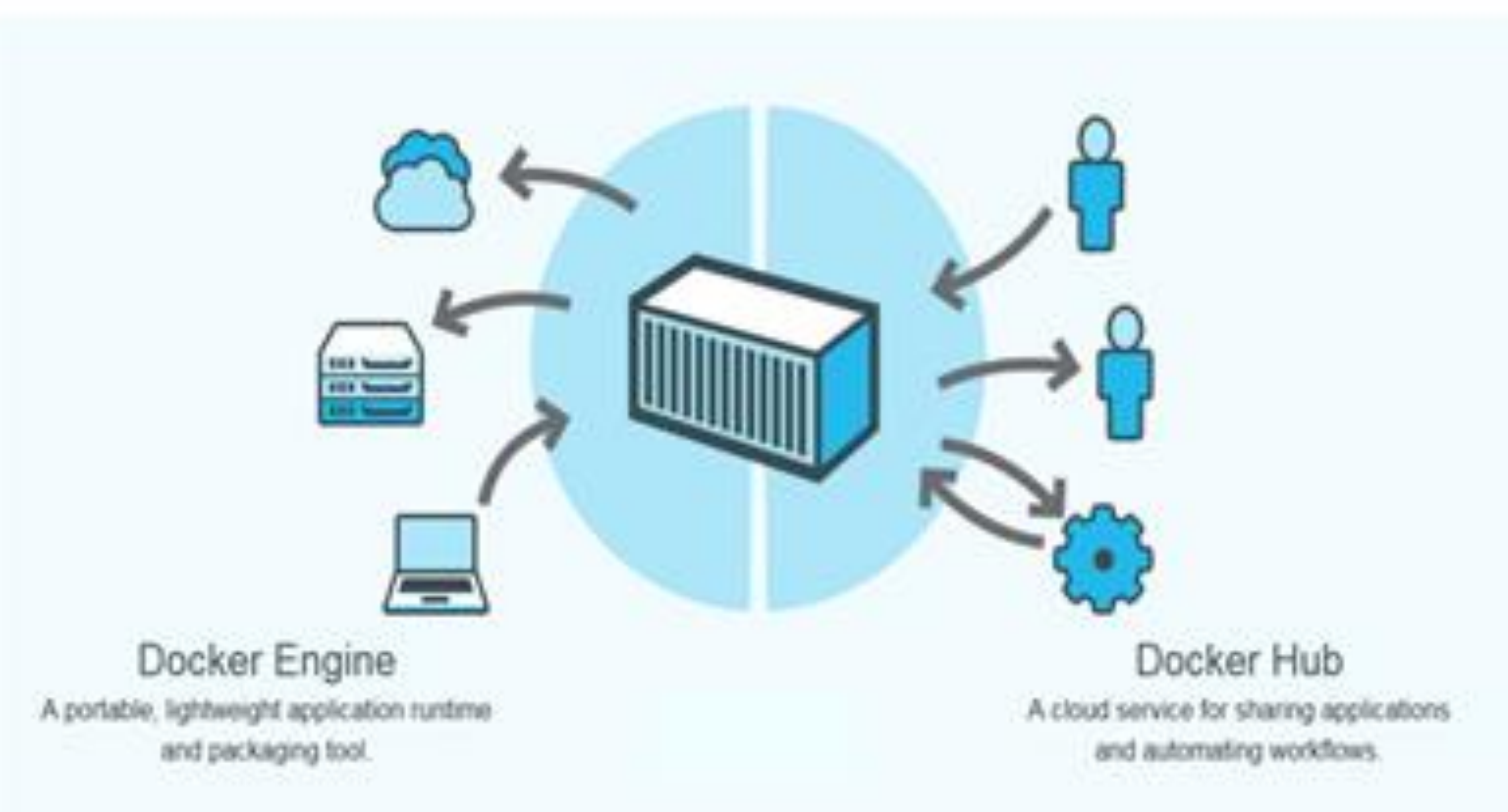
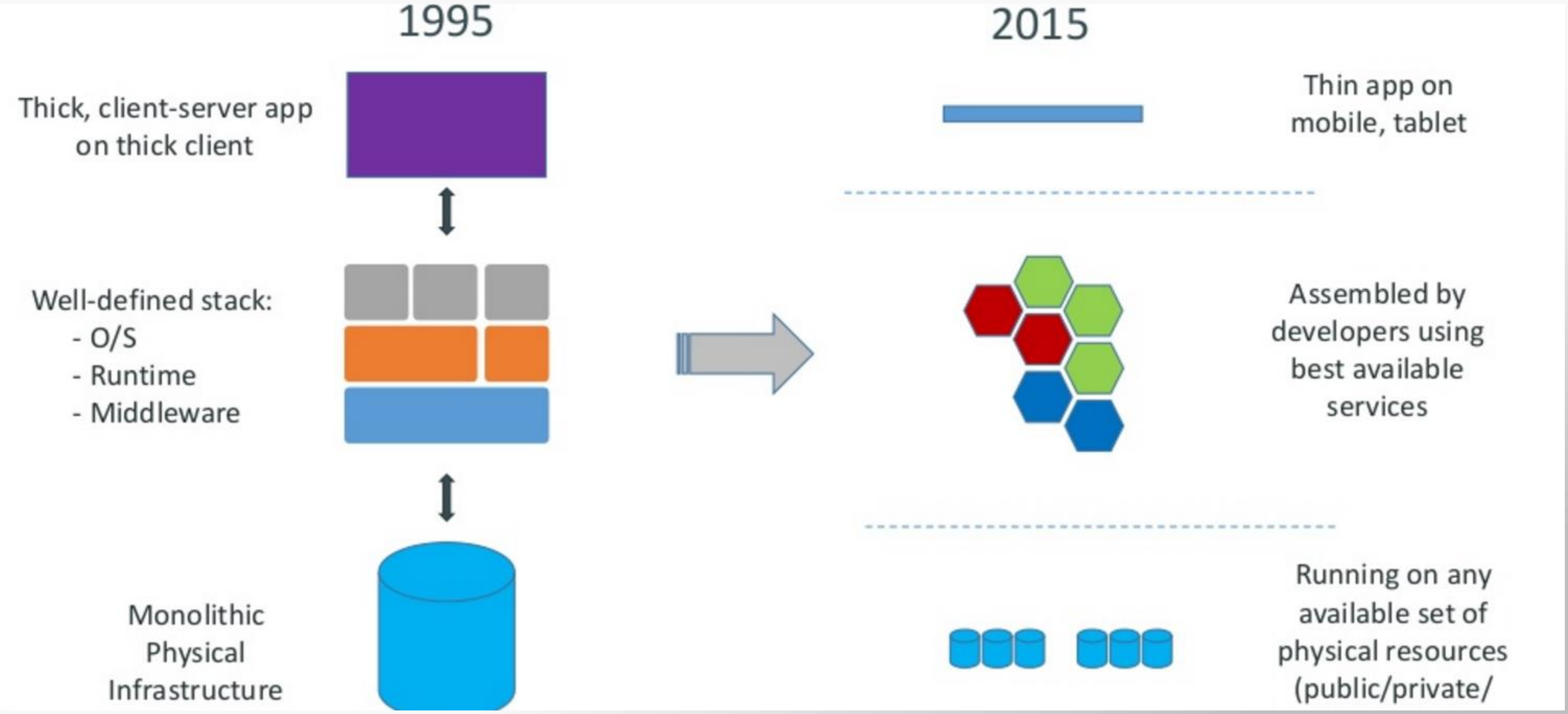
Docker

Open platform for developers and system administrators to build and test cloud applications

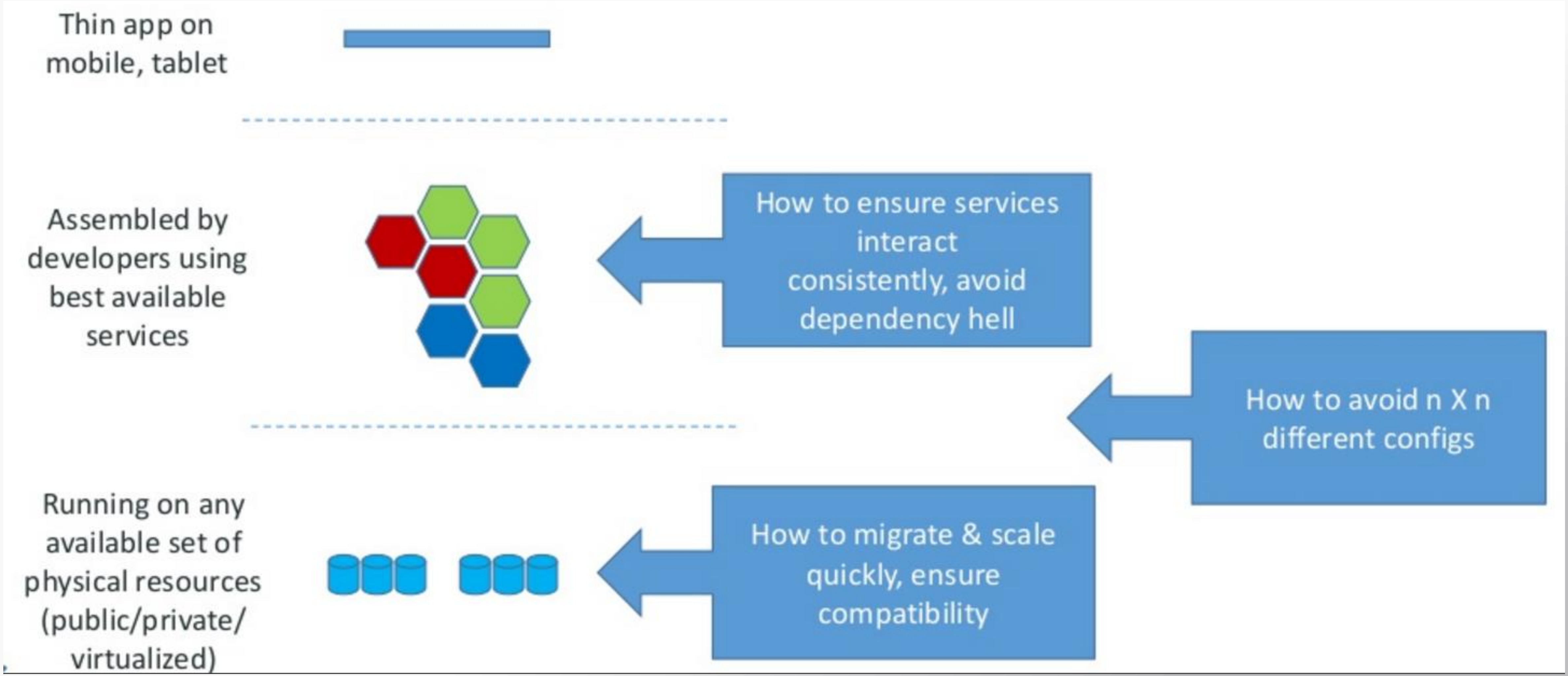

Docker Engine
A portable, lightweight application runtime and packaging tool.
Docker Hub
A cloud service for sharing applications and automating workflows.

Motivation for the Creation of Containers



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/

The challenge



Thin app on mobile, tablet

Assembled by developers using best available services

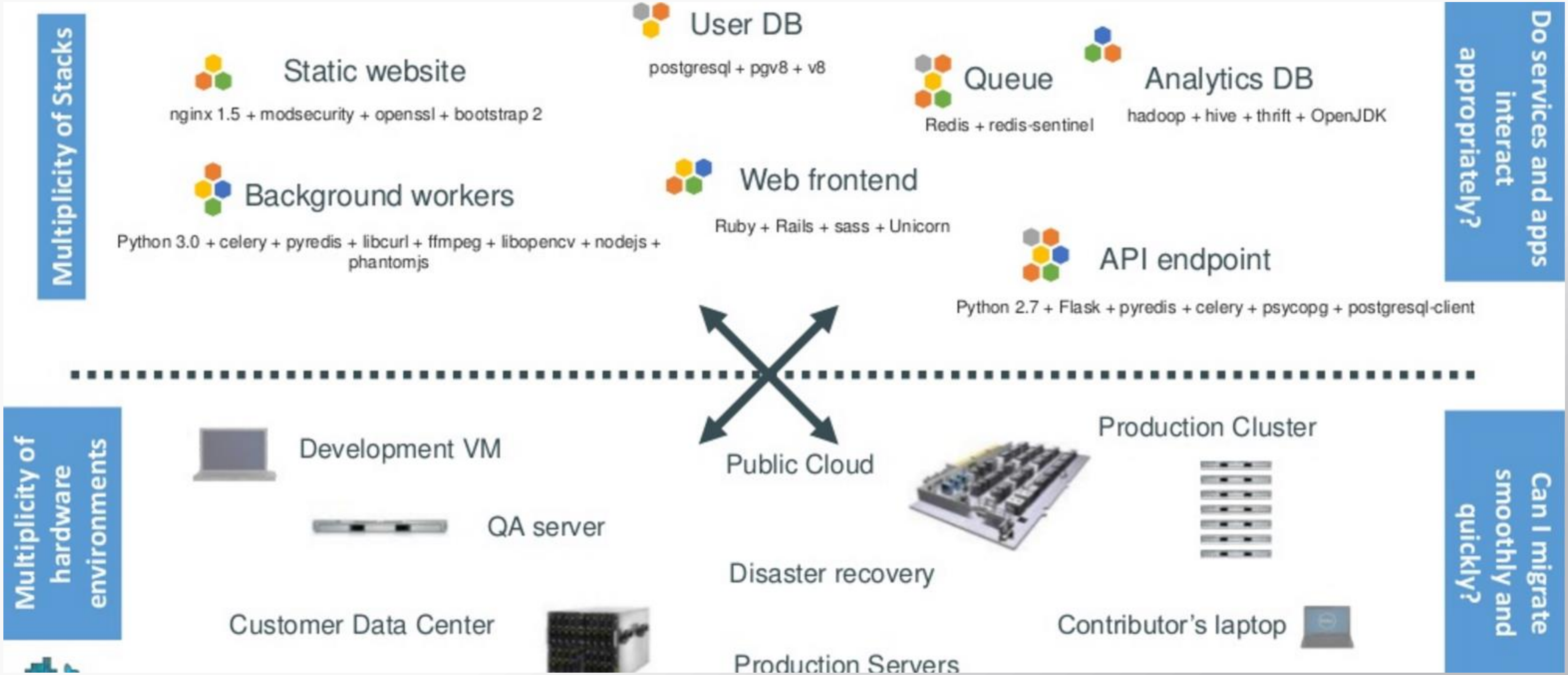
Running on any available set of physical resources (public/private/ virtualized)

How to ensure services interact consistently, avoid dependency hell

How to avoid n X n different configs

How to migrate & scale quickly, ensure compatibility

The challenge continued



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

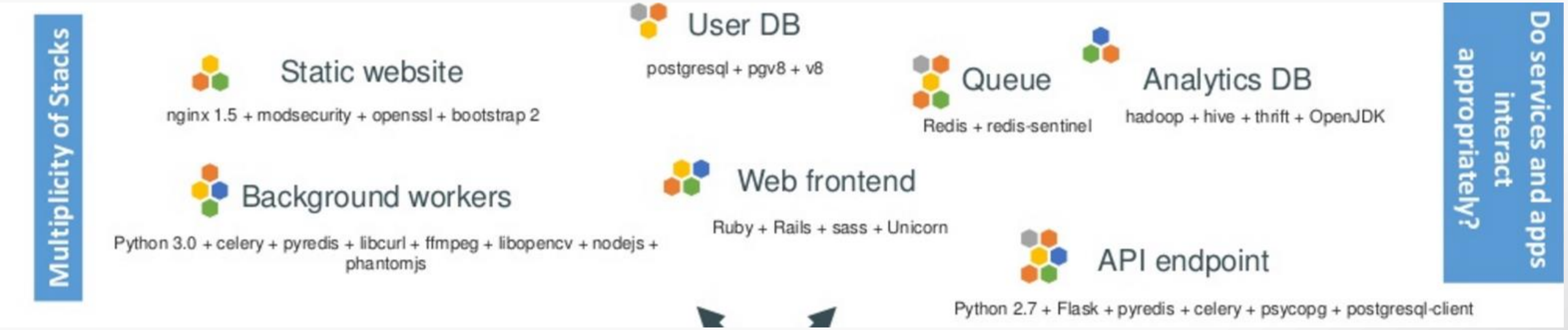
Production Servers

Production Cluster

Contributor's laptop

Can I migrate smoothly and quickly?

What were some of these technologies??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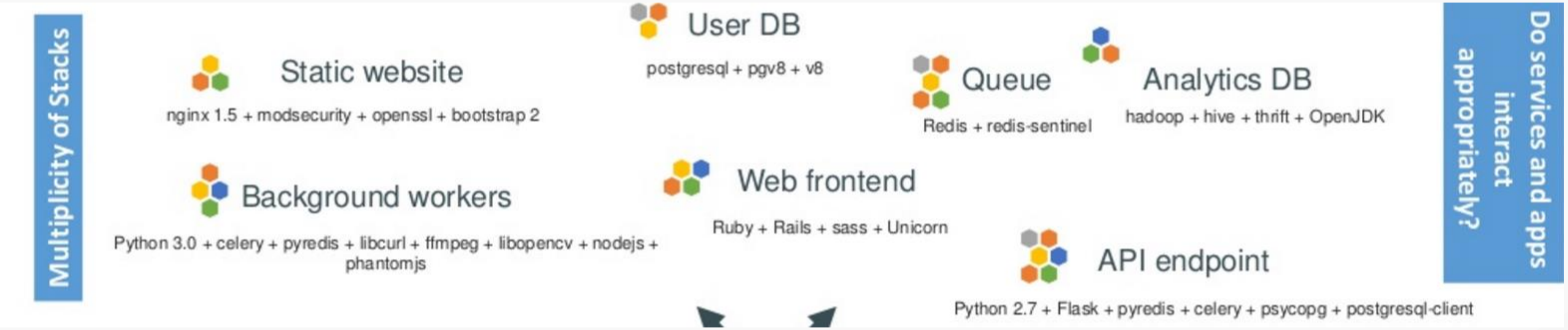
Do services and apps interact appropriately?

Static web: nginx is a fast webserver, generally faster than Apache

Queue: Redis = in-memory **data structure store**, used as a database, **cache** and message broker.

What were some of these technologies??



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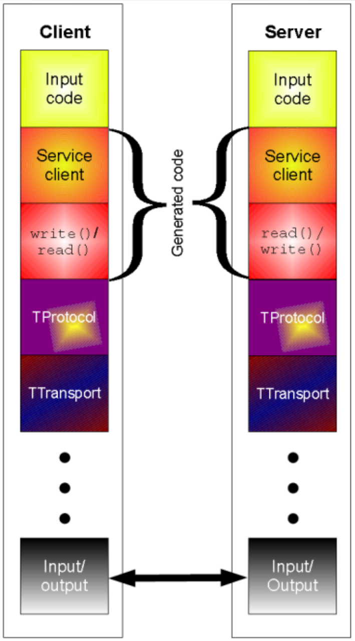
Do services and apps interact appropriately?

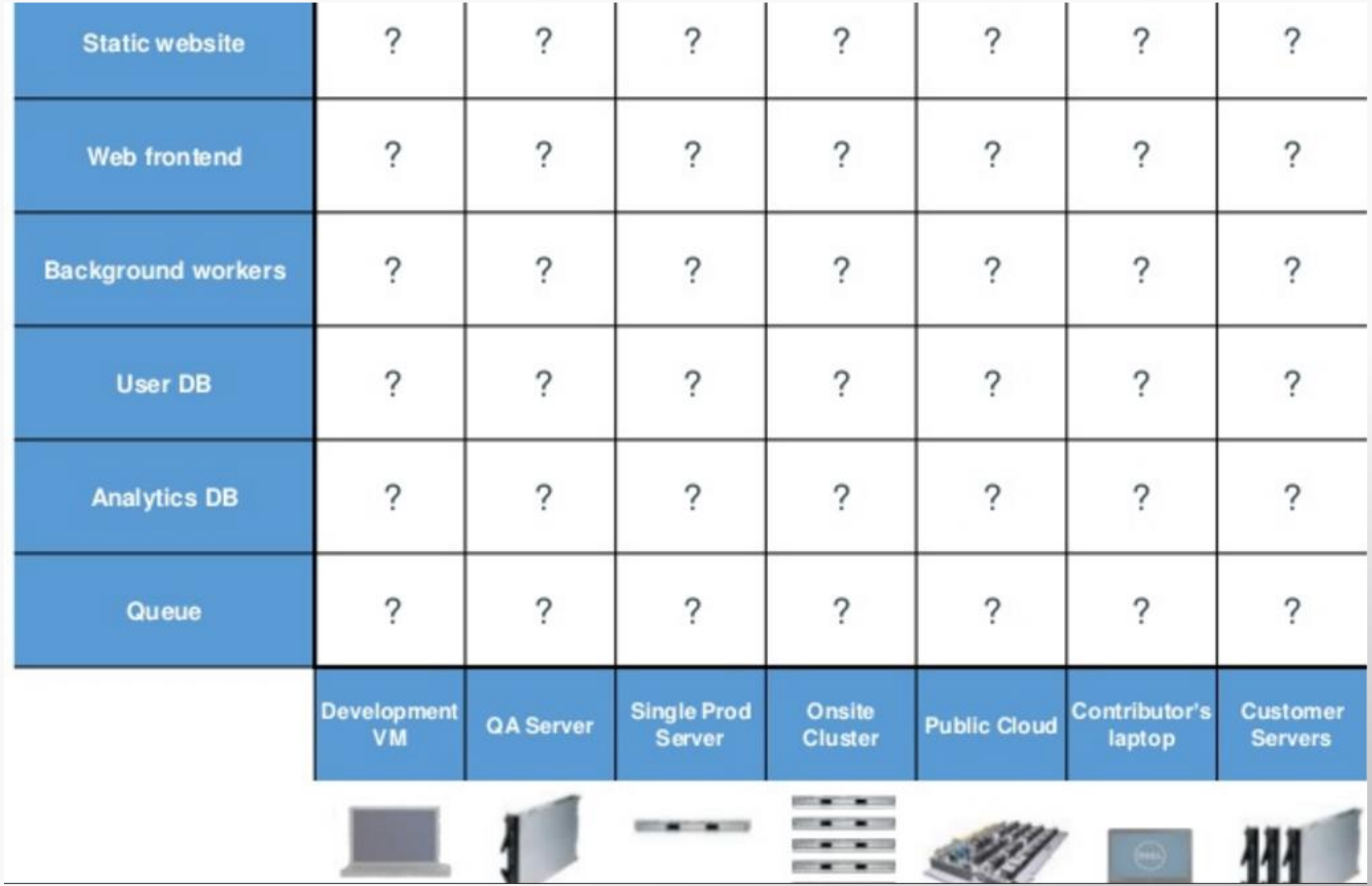
Analytics DB:

- Hadoop = distributed storage and processing of dataset of big data using MapReduce programming model
- Hive = Hadoop based Database, offer SQL-like interfaces with HDFS-based data
  - ---allows these database developers or data analysts to use Hadoop without knowing the Java programming language or MapReduce. Now, instead of challenging MapReduce code, you can design a star schema data warehouse or a normalized database.
- Thrift = used to define and create services for numerous languages.[2]
  - It is used as a remote procedure call (RPC) framework and was developed at Facebook for "scalable cross-language services development".



Looking for all kinds of solutions…

Too many to consider



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

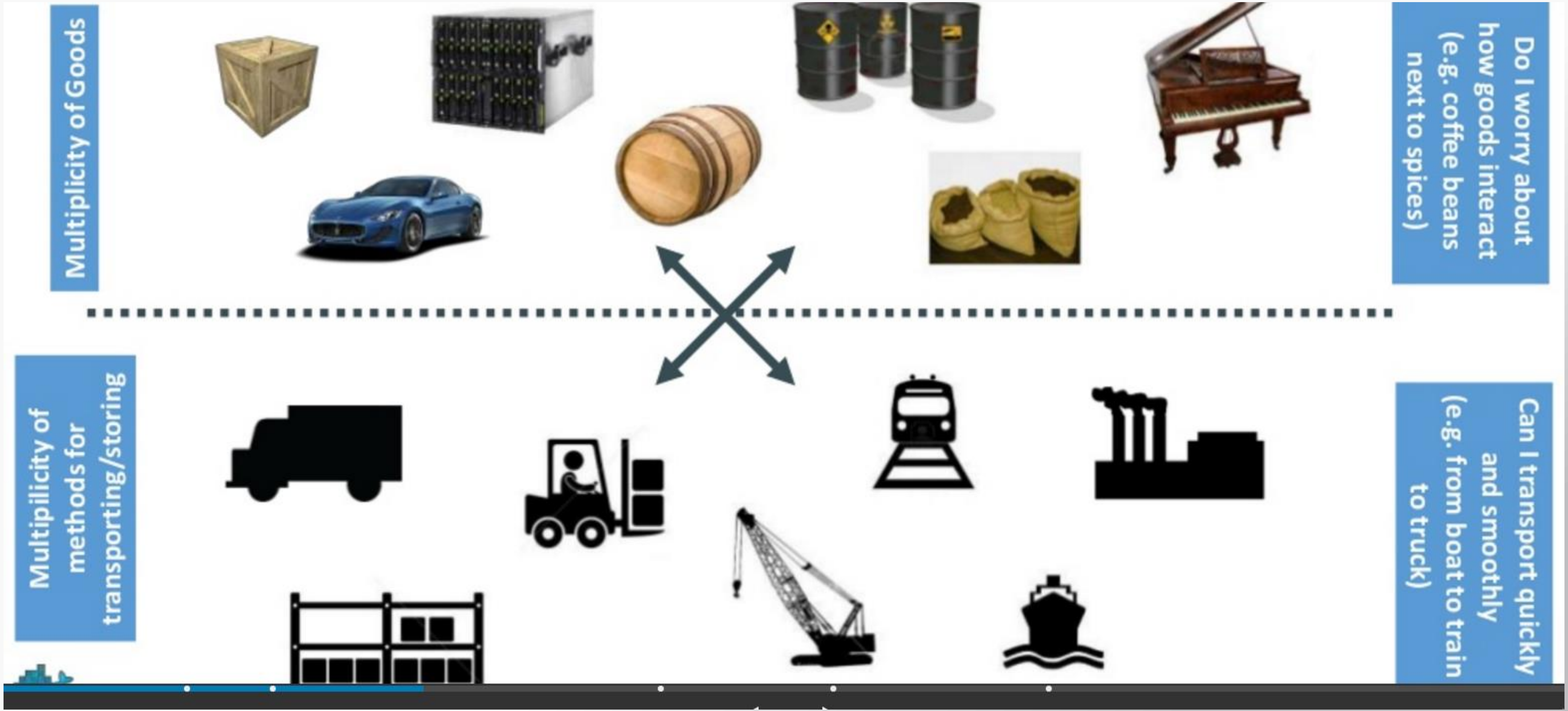
THE ANSWER

Something called a CONTAINER ----which is the business Docker has created.

Huh??? Container

Here is an analogy that Docker use’s to let you understand….

Understanding….an analogy
…cargo transport pre-1960



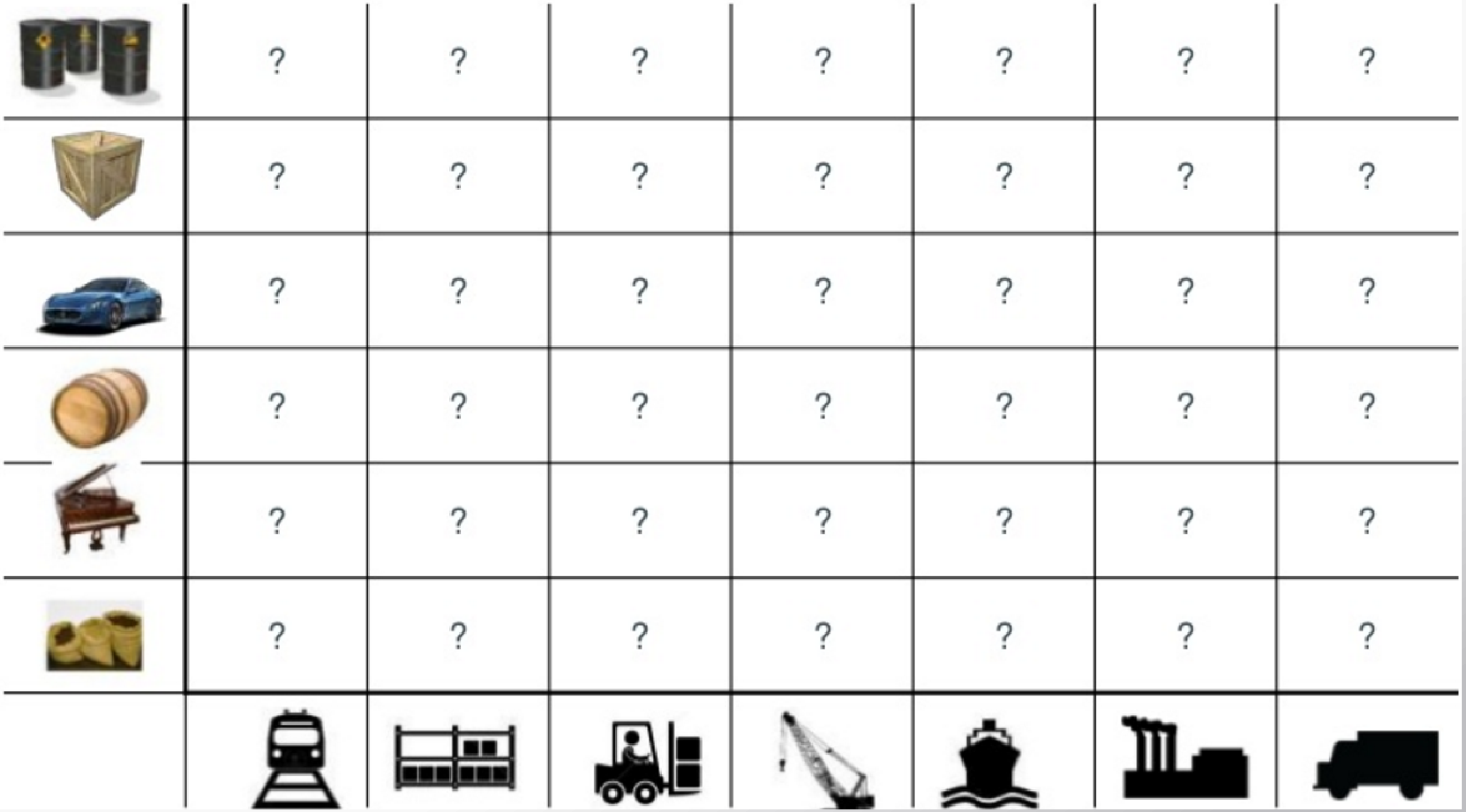
Multiplicity of Goods

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)

What are the possibilities



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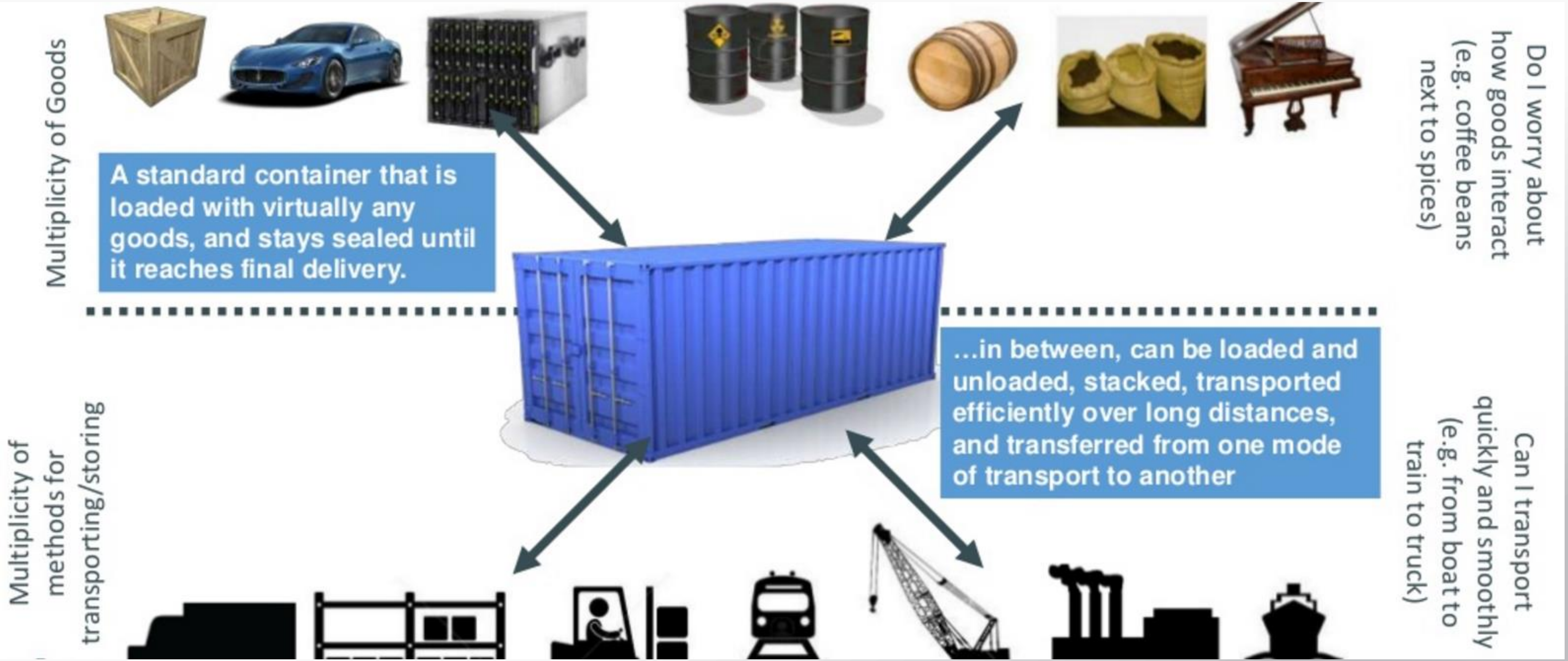
	?	?	?	?	?	?	?
	?	?	?	?	?	?	?
	?	?	?	?	?	?	?

SOLUTION—shipping containers



Multiplicity of Goods

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

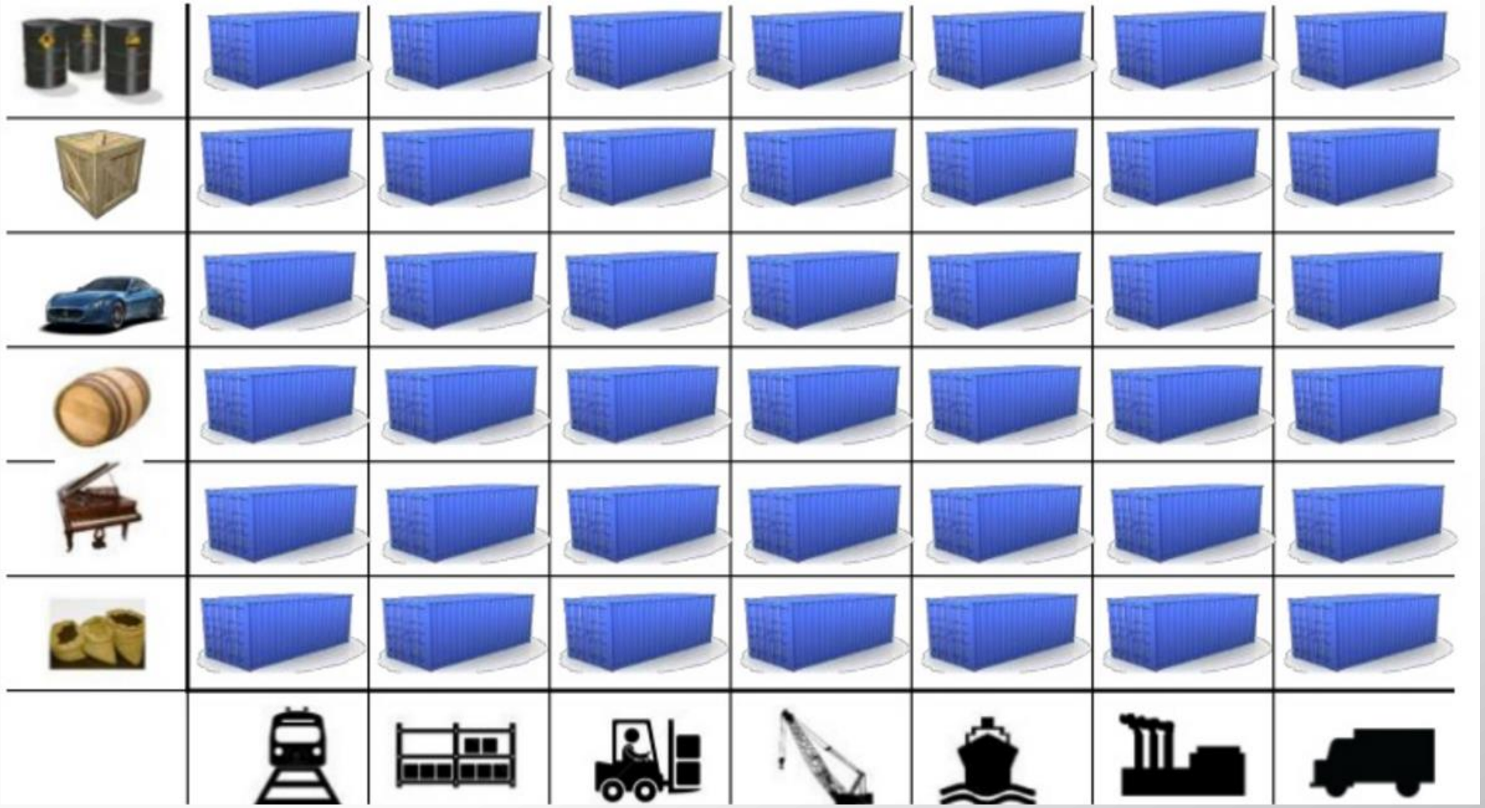
Do I worry about how goods interact (e.g. coffee beans next to spices)

Multiplicity of methods for transporting/storing

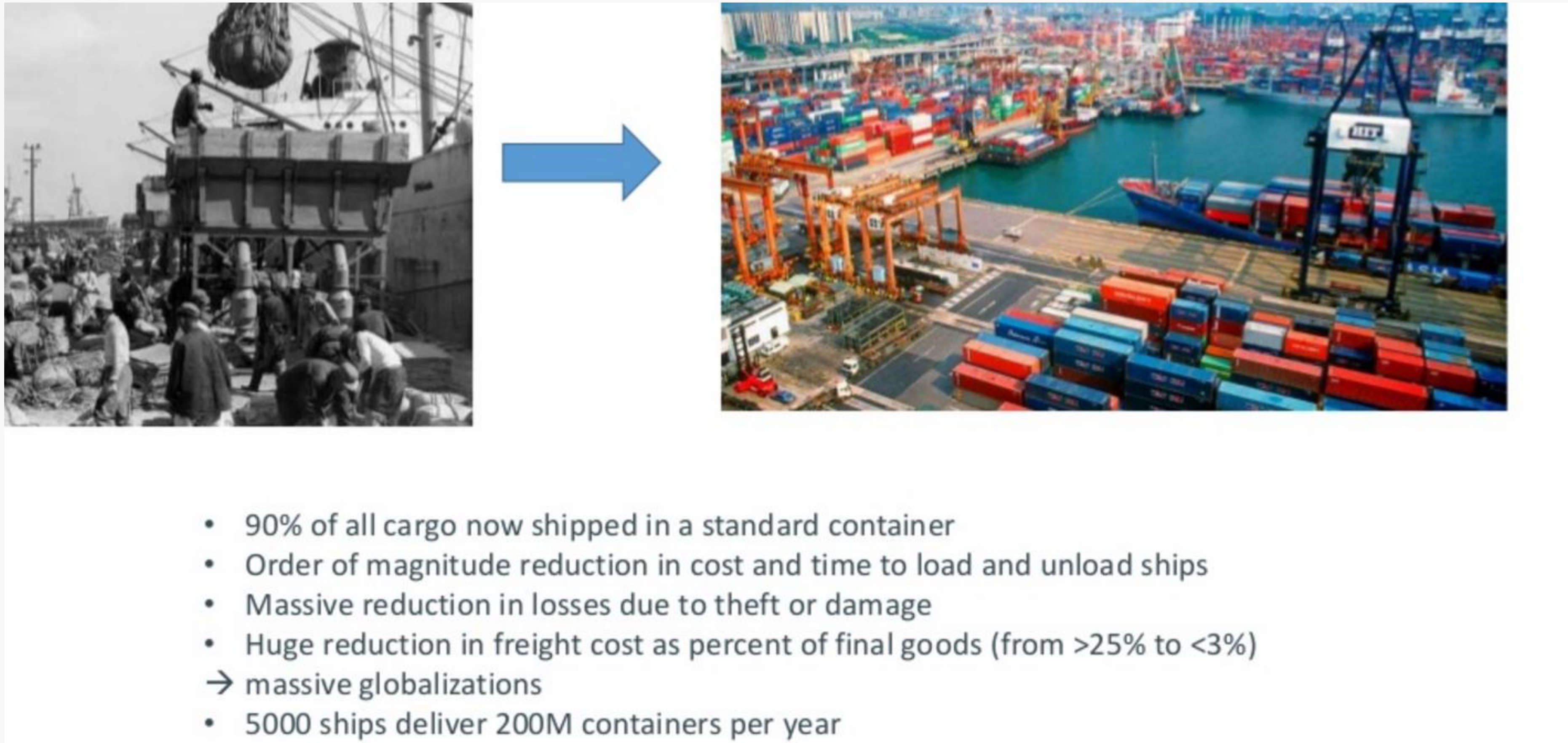
…in between, can be loaded and unloaded, stacked, transported efficiently over long distances, and transferred from one mode of transport to another

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

This solved the problem



Today shipping is done with containers

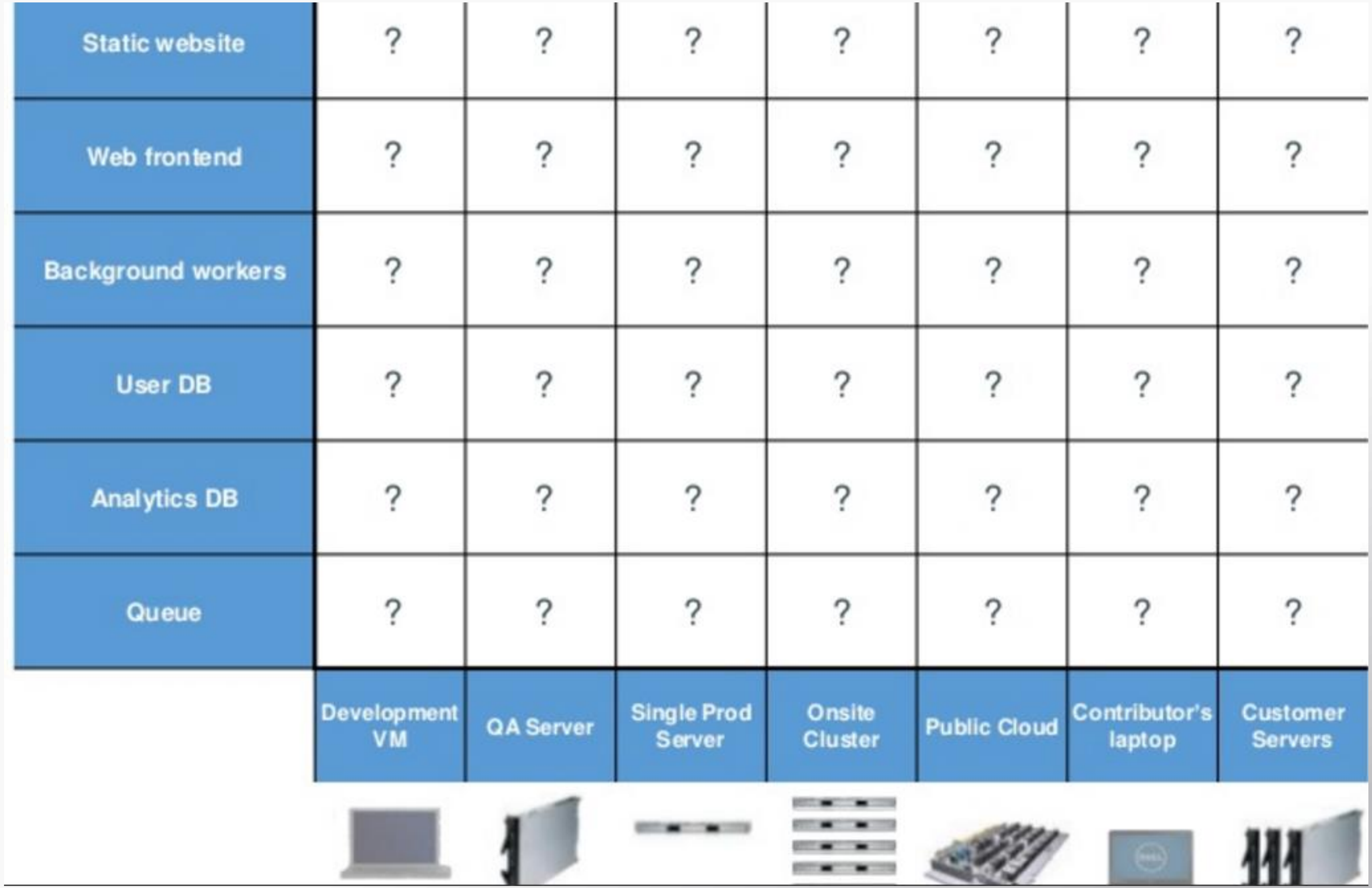


- 90% of all cargo now shipped in a standard container
- Order of magnitude reduction in cost and time to load and unload ships
- Massive reduction in losses due to theft or damage
- Huge reduction in freight cost as percent of final goods (from >25% to <3%)

→ massive globalizations

- 5000 ships deliver 200M containers per year

How does this container idea translate to our problem



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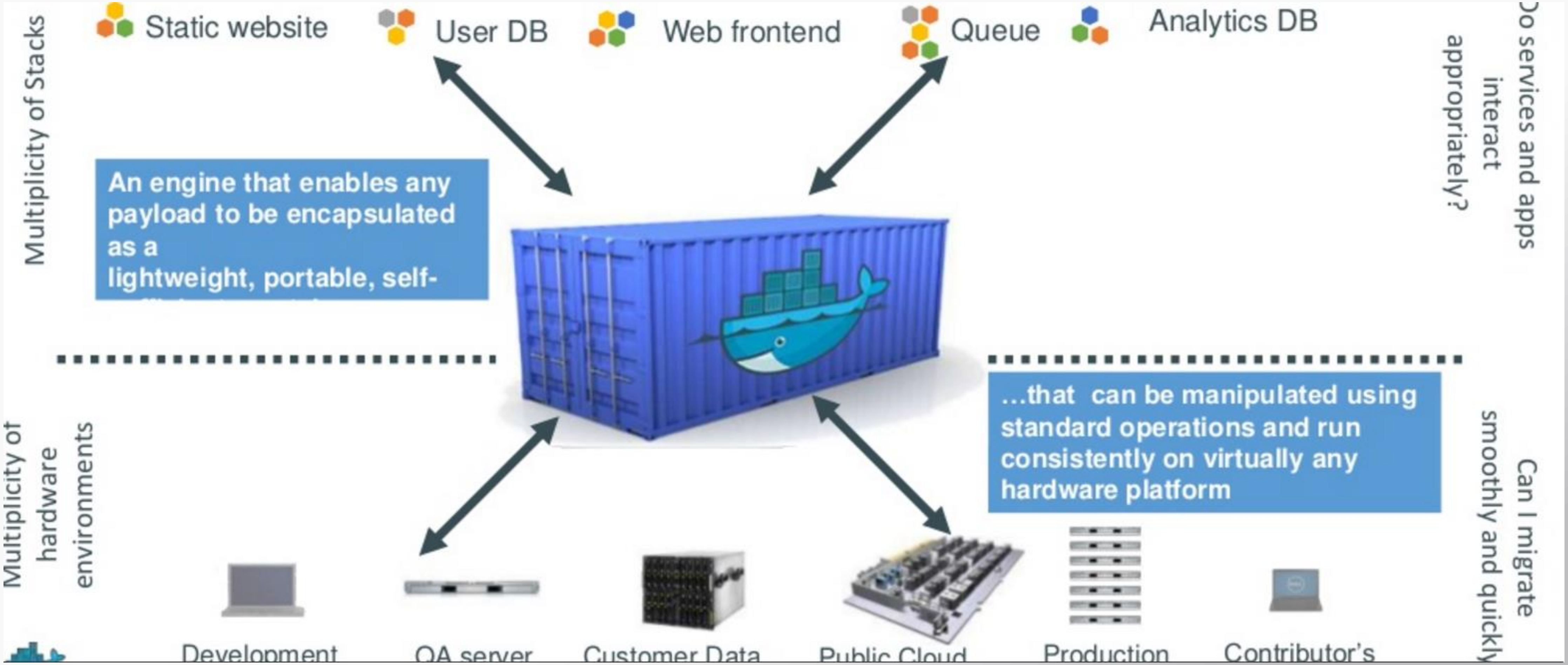
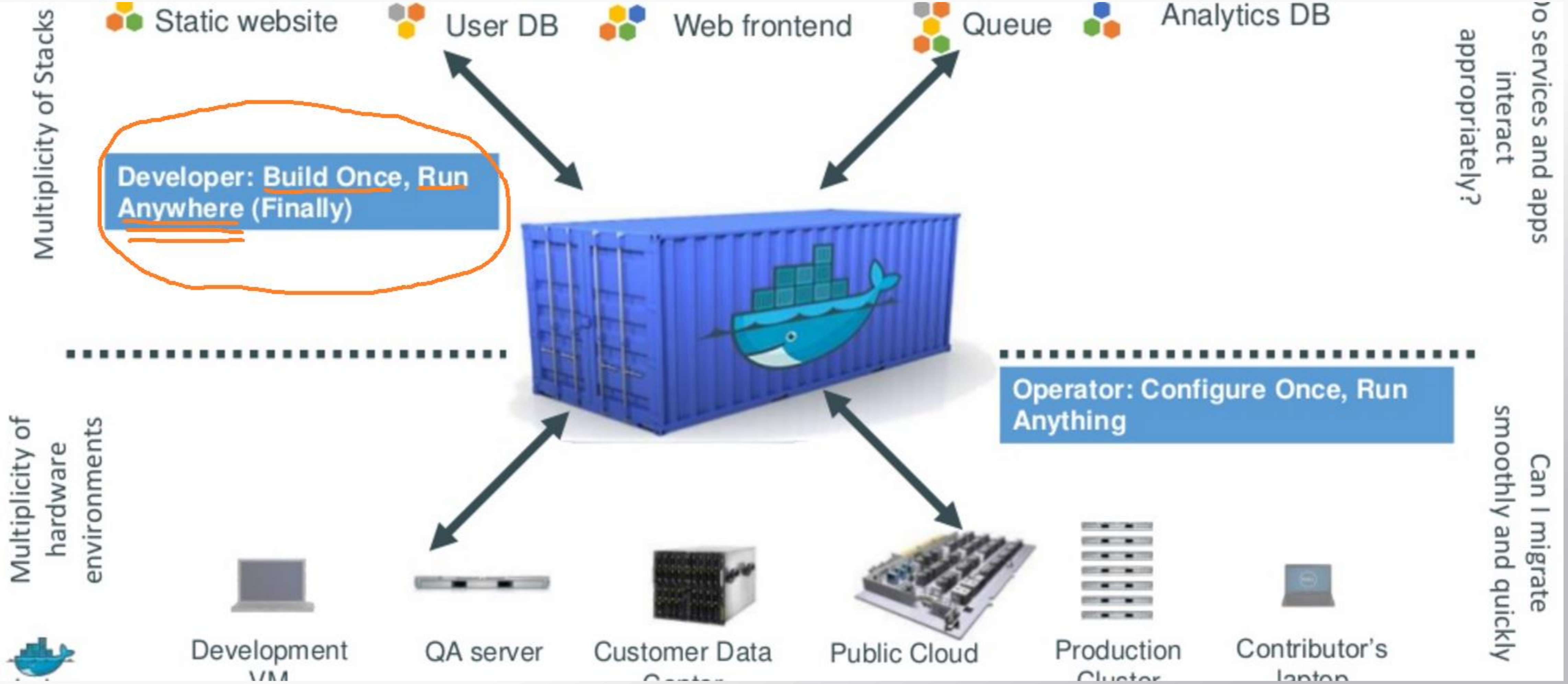
How does this container idea translate to our problem—container for code????



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

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

Do once run anywhere


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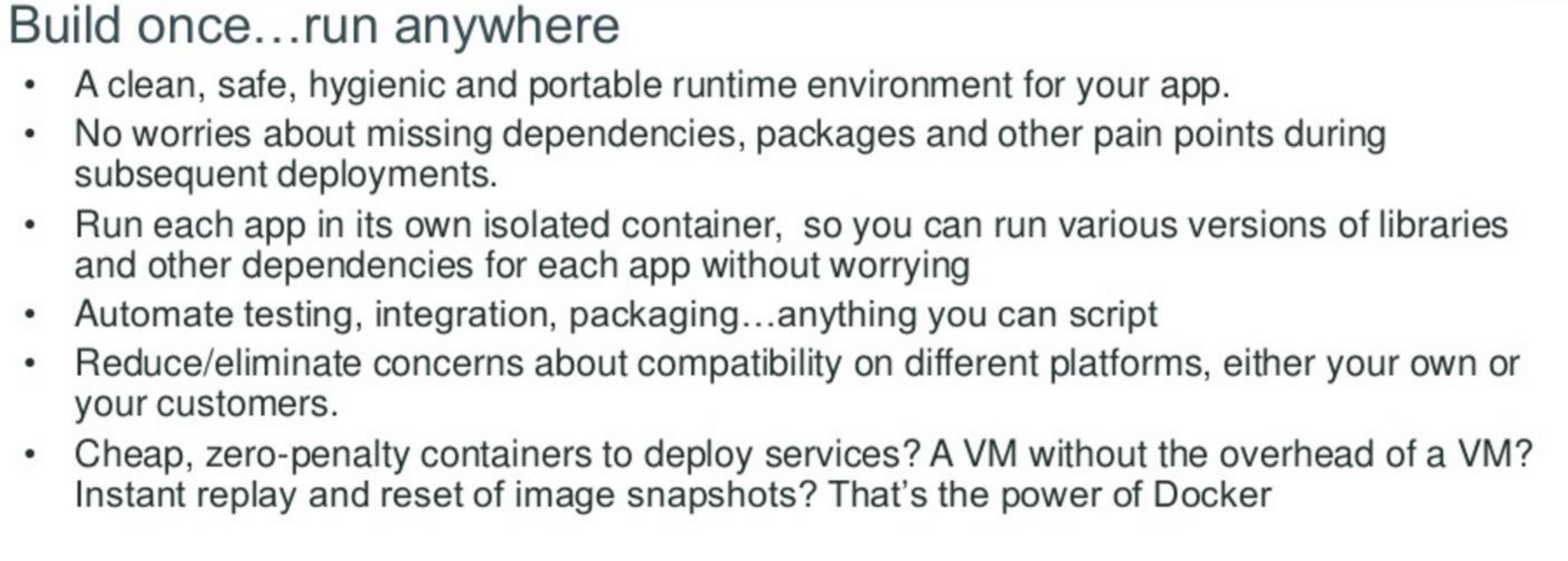
Do services and apps interact appropriately?
Developer: Build Once, Run Anywhere (Finally)
Operator: Configure Once, Run Anything
Multiplicity of hardware environments
Can I migrate smoothly and quickly
Development VM
QA server
Customer Data Center
Public Cloud
Production Cluster
Contributor's laptop

Docker supported in many Cloud platforms

amazon web services™
DigitalOcean
docker
Google
Microsoft

Docker container—developer viewpoint

Build once … run anywhere



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