Building Production-Ready Containers

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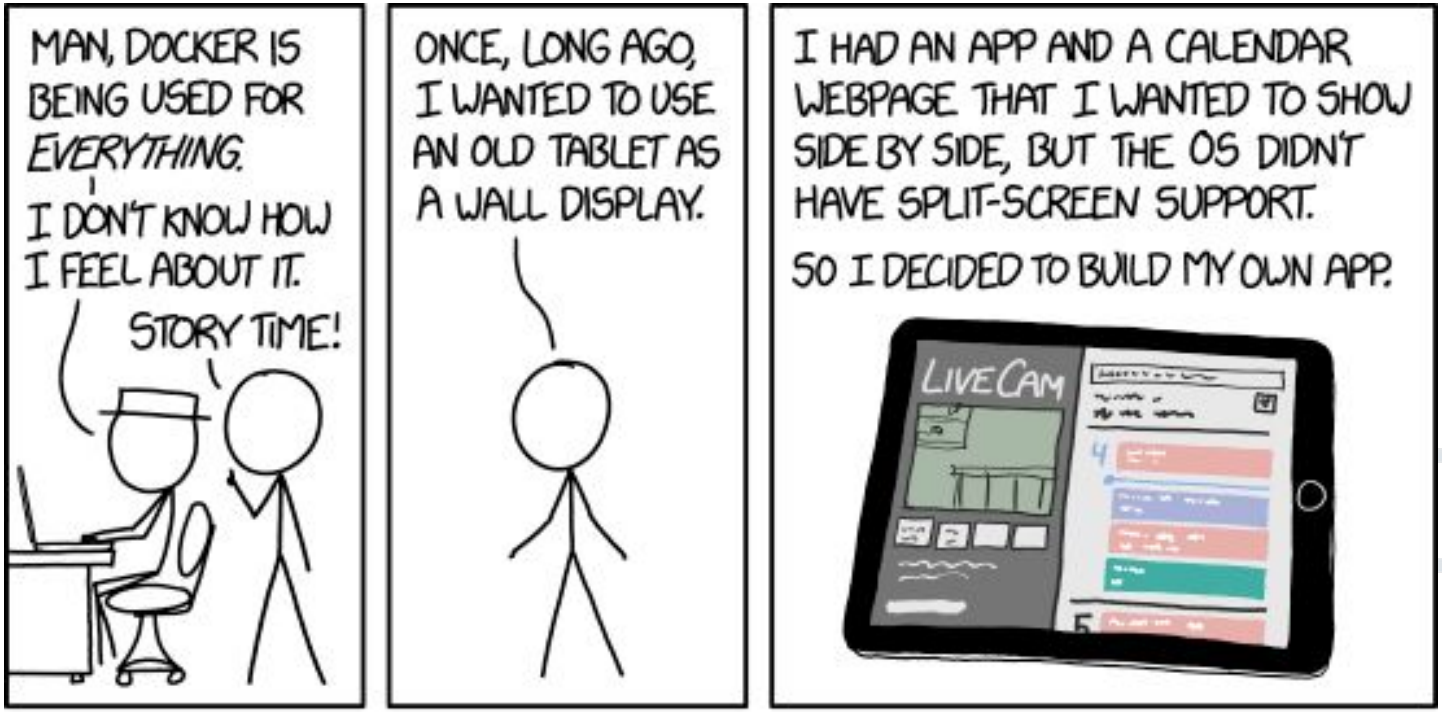
Containers Make Things Easy, Right?



Containers Make Things Easy, Right?

AGENDA

- Capabilities, Problems, and Trade offs
- Fundamental Shift in Mindset
- Implications & Common Obstacles
  - (And how to overcome them!)
- The Tenets of Building
- Putting It All Together

CAPABILITIES, CHALLENGES, AND TRADE OFFS

PROBLEM

“Most uses of Docker are like a junk drawer: neat on the outside, a total mess on the inside. People stuff their python 2 app in there and forget what their dependencies are, or where they got them from. Good luck upgrading that 2-3 years from now.”

- gerbilly on Hacker News

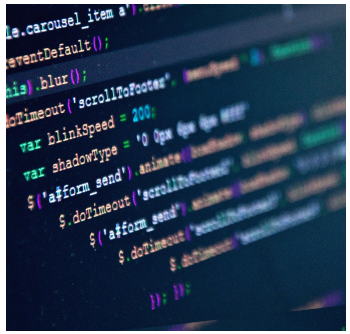
MINDSET

“Using containers is as much of a business advantage as a technical one. When building and using containers, layering is crucial. You need to look at your application and think about each of the pieces and how they work together—similar to the way you can break up a program into a series of classes and functions.”

- Ryan Hallisey

BLOCKERS

1. Code: mysqld
2. Configuration: /etc/my.cnf
3. Data: /var/lib/mysql
4. Other stuff :-)

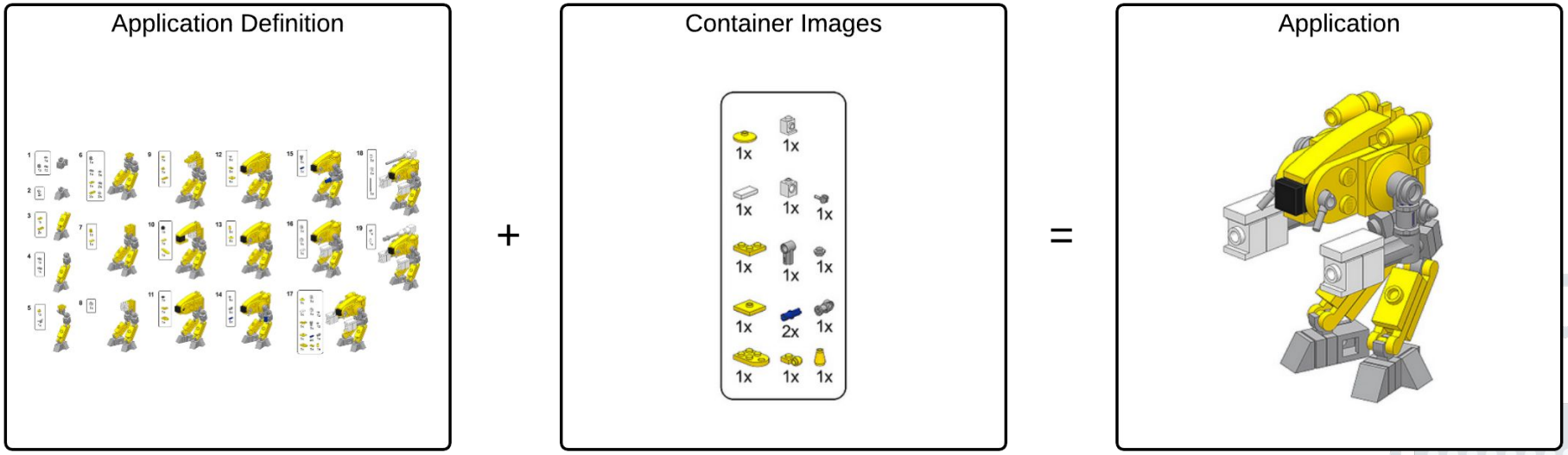


OTHER STUFF :-)

	EASY	MODERATE	DIFFICULT
Code	Completely Isolated (single process)	Somewhat Isolated (multiple processes)	Self Modifying (e.g. Actor Model)
Configuration	One File	Several Files	Anywhere in Filesystem
Data	Saved in Single Place	Saved in Several Places	Anywhere in Filesystem
Secrets	Static Files	Network	Dynamic Generation of Certificates
Network	HTTP, HTTPS	TCP, UDP	IPSEC, Highly Isolated
Installation	Packages, Source	Installer and Understood Configuration	Installers (install.sh)
Licensing	Open Source	Proprietary	Restrictive & Proprietary
Recoverability	Easy to Restart	Fails Sometimes	Fails Often

APPLICATION DELIVERY

Container images, assembly instructions, and resource requirements



PRODUCTION-READY CONTAINERS

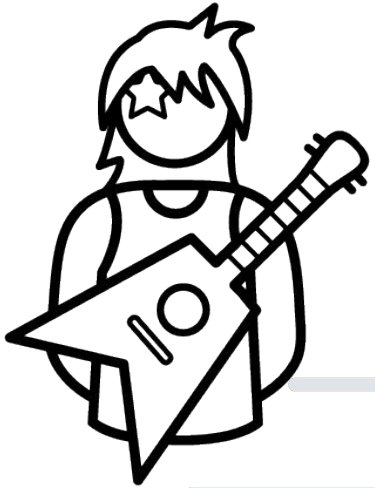
More than just container images to deliver real applications

- Image Build Instructions
  - Source Control
- Container Images
  - Registries
- Orchestration Definitions
  - Source Control
- Operators
  - Operators Lifecycle Manager

```
apiVersion: v1
kind: ReplicationController
metadata:
  name: mysql
  labels:
    name: mysql
spec:
  replicas: 1
  template:
    metadata:
      labels:
        name: mysql
    spec:
      containers:
      - name: mysql
        image: openshift3/mysql-55-rhel7
        env:
          - name: MYSQL_ROOT_PASSWORD
            value: pizza
          - name: MYSQL_USER
            value: pizza
          - name: MYSQL_PASSWORD
            value: pizza
```

SOFTWARE NIRVANA

How will you use your extra free time?



The Tenets of Building

THE 5 COMMANDMENTS

Foundational to all of these rules is source control for everything - treat all of the artifacts as buildable from code

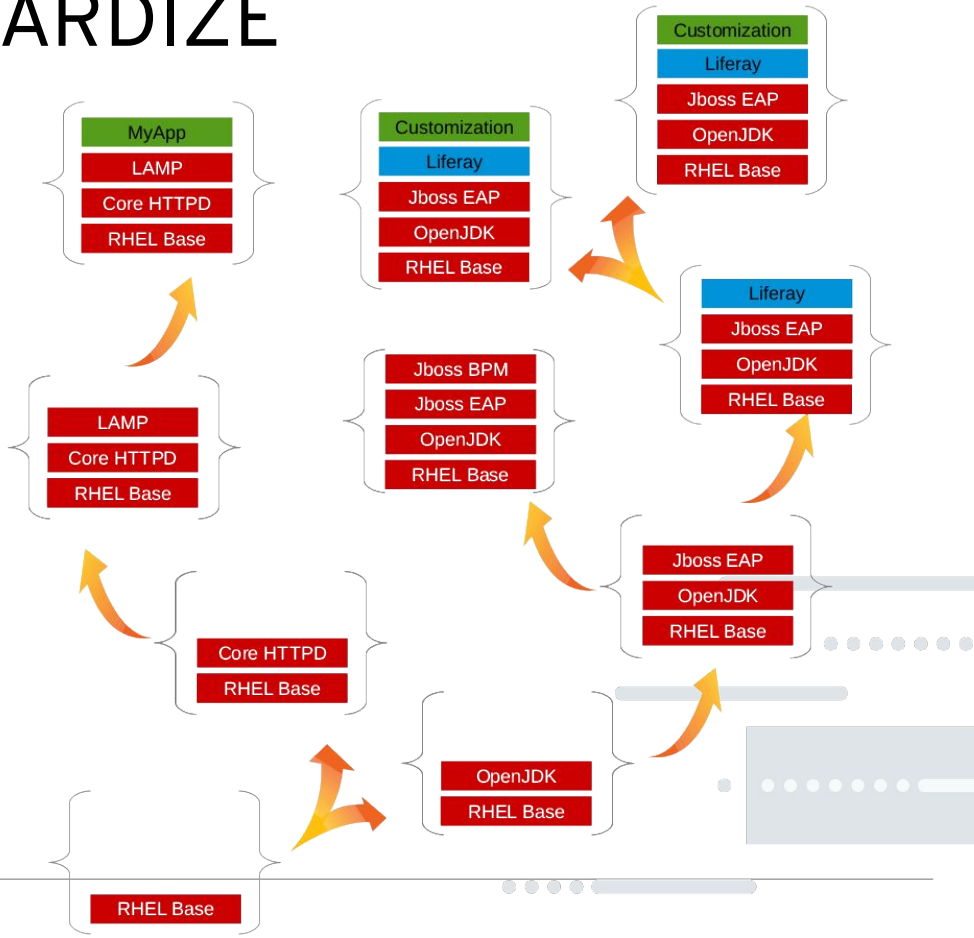
- Standardize
- Minimize
- Delegate
- Process
- Iterate

STANDARDIZE

Goal: Publish a standard set of images with common lineage

- Base image(s)
  - Application Frameworks
  - Application Servers
  - Databases
  - Etc

- **Benefits:**
  - Easier scale
  - Maximize reuse of common layers
  - Minimize pulls
  - Limit environment anomalies



MINIMIZE

Goal: Limit the content in the image to what serves the workload

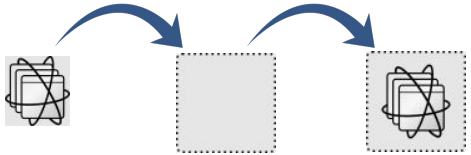
- buildah can populate images with tools from the host.

Benefit:

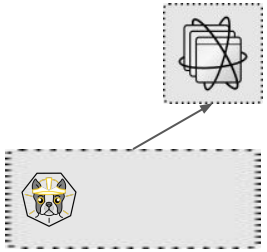
- Smaller attack / patching surface
- More efficient push/pulls

Warning: taking this to the extreme will negate layer sharing and not have the intended effect

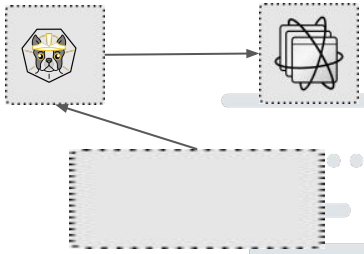
buildah



Build OCI/docker Images



Leverage the host tools

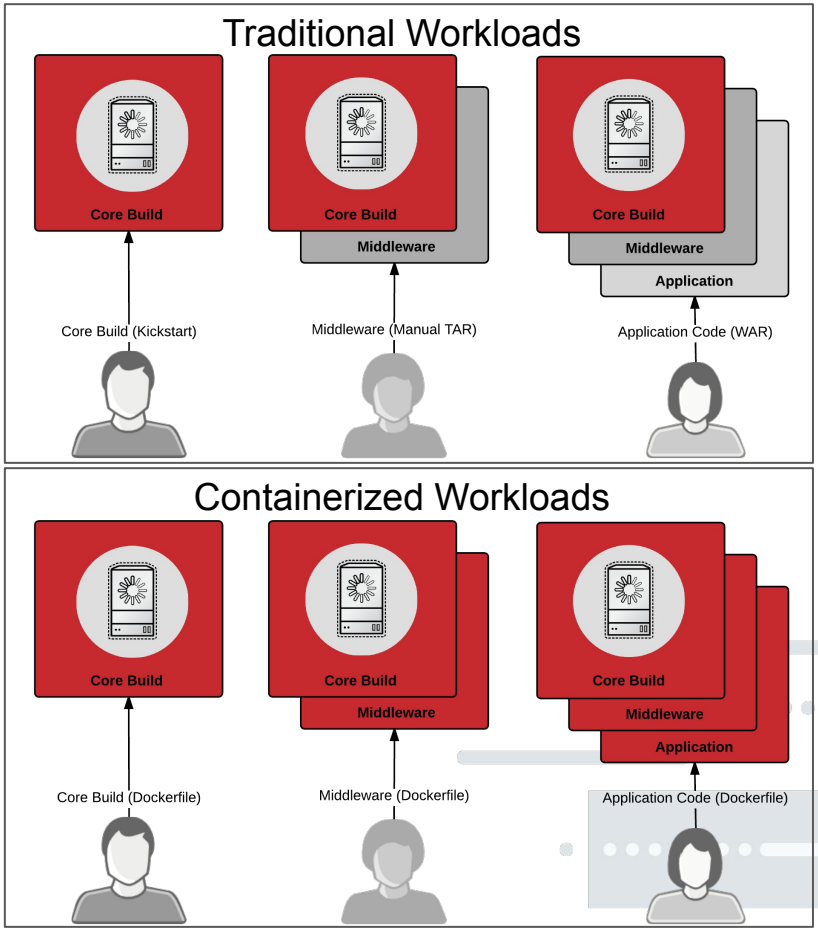


Leverage a buildah container

DELEGATE

Goal: Ownership needs to lie with expertise

Benefit: Leverage your teams on the part of the stack they know best

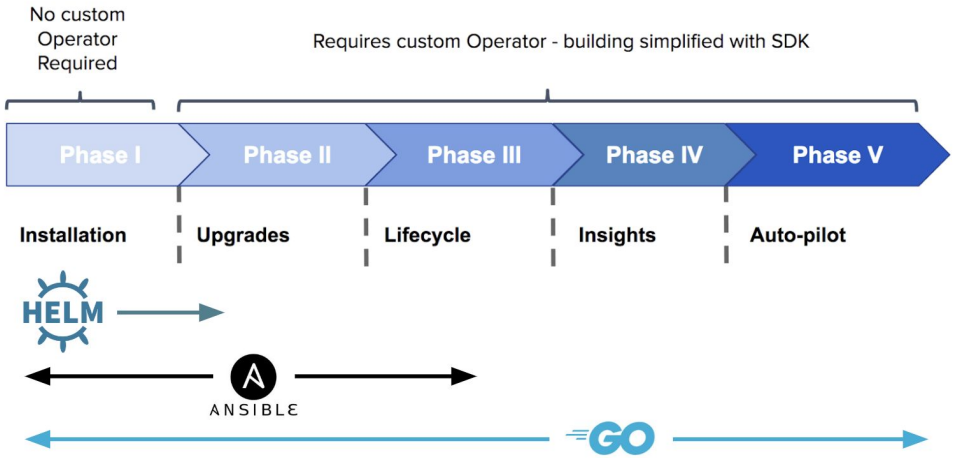


FOCUS ON PROCESS AND AUTOMATION

Goal: Automate rebuilds of all objects

- Testing (CI, performance, etc)
- Security
- Operators

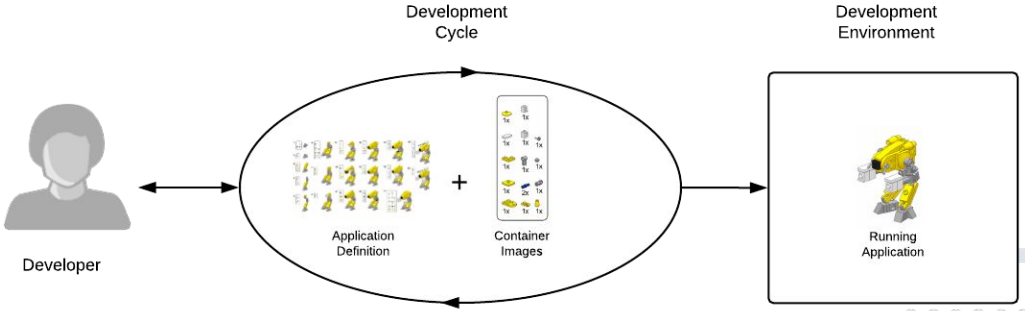
Benefits: Fast redeployment as you make changes to the environment



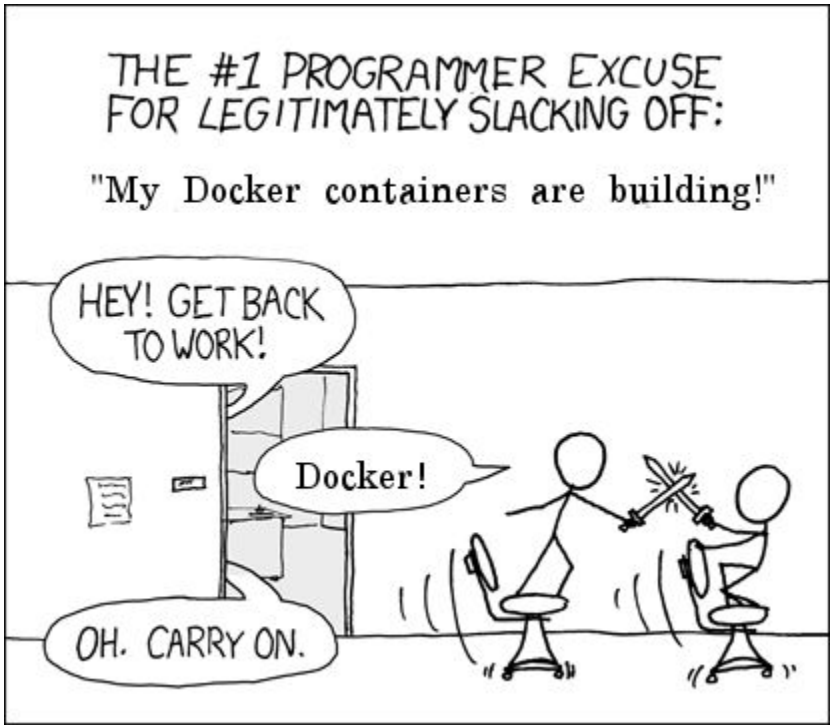
ITERATE

Goal: DON'T REPEAT THE MISTAKES OF THE PAST!!!!!

Benefit: Capture it in code. Knowledge is temporal.



3 IN A ROW!


THE #1 PROGRAMMER EXCUSE FOR LEGITIMATELY SLACKING OFF:
"My Docker containers are building!"
HEY! GET BACK TO WORK!
Docker!
OH. CARRY ON.

PUTTING IT ALL TOGETHER

DON’T GET STUCK IN A SINGLE NODE MINDSET

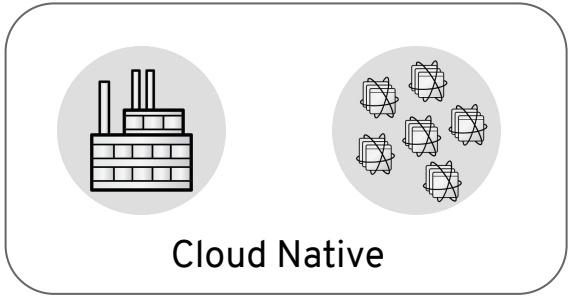
This mindset:

- Only thinks about container images
- Treats containerized applications like traditional applications
- Doesn’t fully leverage the power of containers
- Doesn’t think about automation at day two

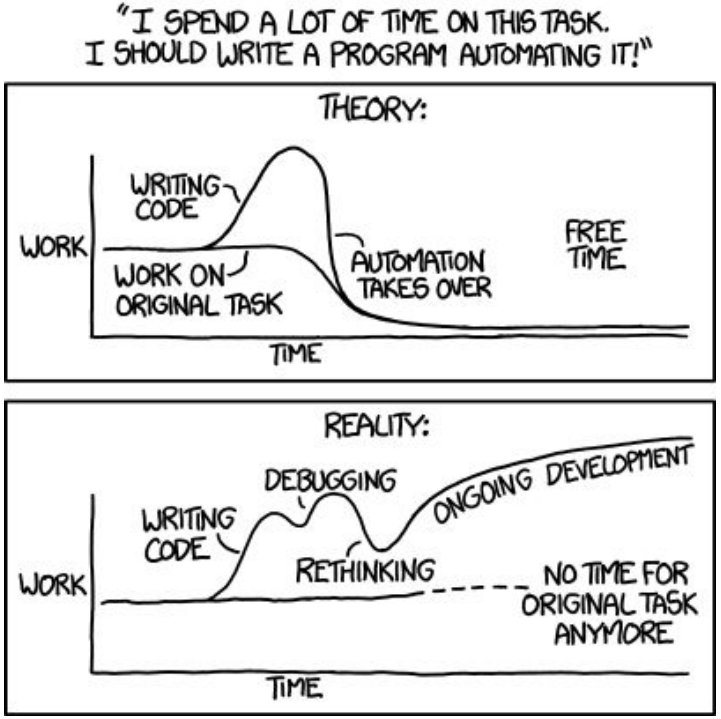
THINK ABOUT DAY-2 OPERATIONS

This mindset:

- Think about how everything can be automated
- Offload updates, backups, restarts, failures all mundane tasks
- Interact through an API, not by SSH'ing into nodes
- Drive the entire platform by defining state, not just the applications



ANOTHER HILARIOUS XKCD



RED HAT SUMMIT

THANK YOU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WHAT CHALLENGES DO CONTAINERS REALLY SOLVE IN PRODUCTION?

True

- Better separation of concerns between developers, operations, database administrators, middleware specialists, etc
- Compatibility and portability still need to be planned for.
- Developers and operations need a mix of new and existing skills
- Better definitions of applications & sub-components
- Truly distributed systems environment

False

- Everybody can do whatever they want. Developers will just do everything themselves. We no longer need specialists.
- Complete portability - build once, run anywhere. I...mean...anywhere
- Containers are easy. Developers just use them, don't worry...
- You must completely break your application up
- Forget everything you know, this is magic