You will need a laptop with an SSH client.

Please sit on the left 😊

Application Automation & Containerization With Habitat

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Why do we run infrastructure?
We Run Infrastructure
To Run Applications
That the Business Requires
I want to ship your idea.
Monolith → Microservices → Serverless
# What Developers Need

## Application Runtimes

- node
- red squiggle
- blue cat
- red coffee
- python
- OpenShift
- CLOUD FOUNDARY
- Amazon Web Services
- Google Cloud Platform
- Microsoft Azure
- openstack
- docker
- rkt
- DC/OS
- kubernetes
- MESOS

## Application Services

- redis
- MongoDB
- Kafka
- hadoop
- MySQL
- PostgreSQL
- RabbitMQ
- MariaDB
- Storm
- Apache Spark
- elastic
What Developers Need Want

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What the hell have you built.

- Did you just pick things at random?
- Why is Redis talking to MongoDB?
- Why do you even _use_ MongoDB?

Goddamnit  Nevermind
The core of the problem: application management

Current approaches start upside-down: with the OS and not the app.

Sprawl of management tools is the biggest challenge facing modern IT teams.

Heterogeneity is the #1 stumbling block to velocity.
Lifecycle of any software

Build  Deploy  Run
Runtime Concerns

• Application supervision
• Service discovery
• Application configuration
• Topology
• Updates
• Orchestration
Habitat is used to build, deploy, and manage applications…
...in any environment from traditional datacenters to containerized microservices
National Parks

• National Parks Application
  Java Application running in Tomcat
  MongoDB
Modern Applications
Modern Applications

Source Code Repo ➔ Artifact
Modern Applications

Source Code Repo → Artifact → Artifact Repo
Modern Applications

Source Code Repo → Artifact → Artifact Repo

Artifact Repo → Bare Metal → Container → Cloud Instance → VM
Modern Applications

Source Code Repo → Artifact → Artifact Repo →

- Bare Metal
- Container
- Cloud Instance
- VM
Access the Learning Environment

Find your workstation’s IP address
Login to your workstation

Login to your workstation in a second window

User: chef
Password: devopsdays
Port: 443
Log in to your remote workstation

$ ssh chef@12.34.56.78 -p 443
Using PuTTY on Windows

Your IP Address

Port 443
National Parks

• National Parks Application
  Java Application running in Tomcat
  MongoDB

Start the Supervisor first
Supervisor runs services

Installs automatically

Keeps things running
Start the Supervisor

$ sudo hab sup run

∵ Missing package for core/hab-sup/0.31.0
» Installing core/hab-sup/0.31.0
↓ Downloading core/hab-sup/0.31.0/20170907234526
   2.17 MB / 2.17 MB - [================================] 100.00 % 37.71 MB/s
☛ Verifying core/hab-sup/0.31.0/20170907234526
...
✓ Installed core/hab-launcher/4571/20170727193541
★ Install of core/hab-launcher/4571/20170727193541 complete with 2 new packages installed.
hab-sup(MR): Supervisor Member-ID 8246a0e5b93c41418adf55a237b38b93
hab-sup(MR): Starting gossip-listener on 0.0.0.0:9638
hab-sup(MR): Starting http-gateway on 0.0.0.0:9631
Start Java Application

$ sudo hab sup load learn/national-parks

hab-sup(PK): learn/national-parks not found in local package cache, installing from https://willem.habitat.sh/v1/depot
» Installing learn/national-parks from channel 'stable'
↓ Downloading learn/national-parks/0.1.5/20170407081316
  5.75 MB / 5.75 MB | [================================] 100.00 % 65.96 MB/s
熨  Verifying learn/national-parks/0.1.5/20170407081316
...
✓ Installed learn/national-parks/0.1.5/20170407081316
★ Install of learn/national-parks/0.1.5/20170407081316 complete with 16 new packages installed.
hab-sup(MN): The learn/national-parks service was successfully loaded
Meanwhile, in the supervisor output

```
hab-sup(MR): Starting learn/national-parks
hab-sup(MR): Unable to start learn/national-parks, hab-sup(SS)[src/manager/service/spec.rs:208:23]: Missing required bind(s), database
```
Pitfall!

Missing required bind(s), database
Unload Java Application

$ sudo hab sup unload learn/national-parks
Load MongoDB Service

The Supervisor is designed to supervise one or more services concurrently
Load MongoDB into the Supervisor

```bash
$ sudo hab sup load learn/mongodb
```

hab-sup(MN): The learn/mongodb service was successfully loaded
Meanwhile, in the supervisor output

```
hab-sup(MR): Starting learn/mongodb
mongod.db.default(SR): Hooks recompiled
default(CF): Updated mongod.conf
f9886a510442a32e91d38a79b0baad2a4bb589ba36fed74e2ea3493d517d8bd5
default(CF): Updated mongos.conf
8c3e4cd2f3cdd7cd922ce3b529f93672f3af8274e5f6d462a5f8824c25bbbe18
mongod.default(SR): Configuration recompiled
mongod.default(SR): Initializing
mongod.default(SV): Starting service as user=hab, group=hab
mongod.default(O): note: noprealloc may hurt performance in many applications
```
This raises a question

• Where are these packages coming from?
Modern Applications

Source Code Repo → Artifact → Artifact Repo

- Bare Metal
- Container
- Cloud Instance
- VM
Central location
Publicly hosted
Lightweight views

Stored in a depot
https://app.habitat.sh/#/pkgs/learn
$ sudo hab sup load learn/national-parks --bind database:mongodb.default

hab-sup(MR): Starting learn/national-parks
national-parks.default(SR): Hooks recompiled
national-parks.default(SR): Initializing
national-parks.default hook[init](HK): Seeding Mongo Collection
...
national-parks.default hook[init](HK): 2017-09-06T16:46:46.494+0000 Failed: error connecting to db server: no reachable servers
national-parks.default hook[init](HK): 2017-09-06T16:46:46.494+0000 imported 0 documents
national-parks.default(HK): Initialization failed! 'init' exited with code 1
Pitfall!

Cannot connect to the database

Probably a configuration issue with the database
What are the tunables?

```
$ sudo hab sup config learn/mongod

[mongod.net]
bind_ip = "127.0.0.1"
ipv6 = false
...

[mongod.security]
authorization = "disabled"
cluster_auth_mode = "keyFile"
javascript_enabled = true
key_file = ""
...
```
Create a configuration file

$ sudo hab sup config learn/mongodb > mongodb.toml
Edit the `mongodb.toml`

```
[mongod.net]
- bind_ip = "127.0.0.1"
+ bind_ip = "0.0.0.0"
  ipv6 = false
...

[mongod.security]
authorization = "disabled"
- cluster_auth_mode = "keyFile"
+ cluster_auth_mode = ""
  javascript_enabled = true
...
Edit the `mongodb.toml`

```toml
[mongod.net]
bind_ip = "127.0.0.1"
bind_ip = "0.0.0.0"
ipv6 = false
...

[mongod.security]
authorization = "disabled"
cluster_auth_mode = "keyFile"
cluster_auth_mode = ""
javascript_enabled = true
...
```

If you don’t like manually editing files...

```
$ cp new-mongodb-config.toml mongodb.toml
```
Never do this at home!

- We are about to disable some MongoDB security
Supervisor runs services

Manages configuration
Installs automatically
Keeps things running
Change the configuration for MongoDB

```
$ sudo hab config apply --peer 127.0.0.1 mongodb.default \
 1 mongodb.toml
```
Applying Configuration

```
sudo hab config apply --peer 127.0.0.1 mongodb.default 1 mongodb.toml
```

- **peer** - hostname or IP address of a running supervisor
- **mongodb.default** - the service group
- **1** - the incarnation of this configuration
- **mongodb.toml** - the file with the new configuration
Change the configuration for MongoDB

```
$ sudo hab config apply --peer 127.0.0.1 mongodb.default \\
  1 mongodb.toml
```

- Missing package for core/hab-butterfly/0.31.0
- » Installing core/hab-butterfly/0.31.0
- ↓ Downloading core/hab-butterfly/0.31.0/20170907235928
  
  1.18 MB / 1.18 MB \ [=====================================] 100.00 % 84.75 MB/s
- ☛ Verifying core/hab-butterfly/0.31.0/20170907235928
- ...
- ★ Install of core/hab-butterfly/0.31.0/20170907235928 complete with 1 new packages installed.
- » Applying configuration for mongodb.default incarnation 1
- Ω Creating service configuration
- ✓ Verified this configuration is valid TOML
- ↑ Applying to peer 127.0.0.1:9638
- ★ Applied configuration
Meanwhile, in the supervisor output

$ mongod.default(CF): Updated mongod.conf
12a29a9de79166f30aa87640bc4ba4a88b6dc4d4641cf0d6ed00e179229d576f
mongod.default(SR): Configuration recompiled
Meanwhile, in the supervisor output

```bash
$ national-parks.default(SR): Initializing
national-parks.default hook[init]:(HK): Seeding Mongo Collection
national-parks.default hook[init]:(HK): $MONGOIMPORT_OPTS=--host=172.31.26.105
   --port=27017
national-parks.default hook[init]:(HK): 2017-09-06T19:27:08.177+0000
   connected to: 172.31.26.105:27017
national-parks.default hook[init]:(HK): 2017-09-06T19:27:08.177+0000
   dropping: demo.nationalparks
national-parks.default hook[init]:(HK): 2017-09-06T19:27:08.199+0000
   imported 359 documents
national-parks.default(SV): Starting service as user=root, group=root
national-parks.default(O): Starting Apache Tomcat
```
Meanwhile, in the supervisor output

```
org.apache.catalina.startup.HostConfig.deployDirectory Deployment of web
application directory /hab/pkgs/core/tomcat8/8.5.9/20170215223900/tc/webapps/
ROOT has finished in 8 ms
org.apache.coyote.AbstractProtocol.start Starting ProtocolHandler [http-
nio-8080]
org.apache.catalina.startup.Catalina.start Server startup in 14458 ms
```
No network 😞 Use curl

$ curl -L http://localhost:8080/national-parks

<!DOCTYPE html>
<html lang="en">
<head>
   <title>Map of National Parks</title>
   <link rel="stylesheet" href="https://unpkg.com/leaflet@1.0.3/dist/leaflet.css"/>
   ...
</script>
</body>
</html>
Supervisors provide a REST API

External Actors
- Health and Status
- Supervisor Debugging
Supervisors self-organize

Service Discovery

Service Groups
REST API

- http://YOUR_IP:9631/services
- http://YOUR_IP:9631/services/mongodb/default/config
- http://YOUR_IP:9631/services/national-parks/default/config
REST API

- [http://YOUR_IP:9631/services/mongodb/default/config](http://YOUR_IP:9631/services/mongodb/default/config)

```json
{
  "mongodb": {
    "net": {
      "bind_ip": "0.0.0.0",
      "http": {
        "enabled": false,
        "jsonp_enabled": false,
        "rest_interface_enabled": false,
        "port": 27017,
        "ssl": false,
        "allow_connections_without_certificates": false,
        "allow_invalid": false,
        "ca_file": "",
        "cluster_file": "",
        "cluster_password": "",
        "mode": "disabled",
        "pem_key_file": "",
        "pem_key_password": "",
        "enabled": true,
        "file_permissions": "0700",
        "wire_object_check": false,
        "slow_op_threshold": 100,
        "process_management": false,
        "fork": false,
        "pid_file_path": ""
      }
    },
    "replication": {
      "enable_majority_read_concern": false,
      "new_oplog_size": false,
      "ary_prefix_fetch": "all"
    },
    "security": {
      "authorization": "disabled",
      "cluster_auth_mode": "",
      "javascript": {
        "enabled": false,
        "host_name": "",
        "sasl_authd_socket_path": ""
      }
    },
    "archive_movedChunks": false,
    "cluster_role": "",
    "snmp": {
      "enabled": false,
      "master": false,
      "subagent": false
    },
    "storage": {
      "directory_per_db": false,
      "engine": "wiredTiger",
      "index_build": ""  
    }
  }
}```
REST API

- [http://YOUR_IP:9631/services/mongodb/default/config](http://YOUR_IP:9631/services/mongodb/default/config)

With JSONView Chrome Plugin
Runtime Concerns

• Application supervision
• Service discovery
• Application configuration
• Topology
• Updates
• Orchestration
Habitat Open Source Community

We are a passionate group of people, dedicated to bringing automation to places previously unconsidered. Let’s connect at upcoming meetups, training and conferences!

Join Habitat Slack  Contribute to Habitat

Upcoming Events

InSpec
Canberra Infracoders - August!

Meetups
Sydney Cloud Native Meetup

Conferences
Mandi talks about Habitat at SRECon EMEA
Unload the services

$ sudo hab sup unload learn/national-parks

hab-sup(SV): national-parks.default - Shutdown method: Graceful Termination
hab-sup(SV): national-parks.default - process 2457 died with exit code 143
hab-sup(SV): national-parks.default - Service exited
Unload the services

$ sudo hab sup unload learn/mongodb

hab-sup(SV): mongodb.default - Shutdown method: Graceful Termination
hab-sup(SV): mongodb.default - process 2572 died with exit code 0
hab-sup(SV): mongodb.default - Service exited
Load mytutorial

$ sudo hab sup load learn/mytutorialapp

hab-sup(PK): learn/mytutorialapp not found in local package cache, installing from https://willem.habitat.sh/v1/depot
» Installing learn/mytutorialapp from channel 'stable'
↓ Downloading learn/mytutorialapp/0.2.0/20170908131139
    122.55 KB / 122.55 KB \ [============================] 100.00 % 43.81 MB/s
☛ Verifying learn/mytutorialapp/0.2.0/20170908131139
...
✓ Installed learn/mytutorialapp/0.2.0/20170908131139
★ Install of learn/mytutorialapp/0.2.0/20170908131139 complete with 7 new packages installed.
hab-sup(MN): The learn/mytutorialapp service was successfully loaded
Create a configuration file

$ sudo hab sup config learn/mytutorialapp > tutorial.toml
Edit the tutorial.md

- listening_port = 8080
+ listening_port = 80
- message = "Hello, World!"
+ message = "Hello, Raleigh!"
Applying Configuration

```
sudo hab config apply --peer 127.0.0.1 mytutorialapp.default 1 tutorial.toml
```

- **peer** - hostname or IP address of a running supervisor
- **mytutorial.default** - the service group
- **1** - the incarnation of this configuration
- **tutorial.toml** - the file with the new configuration
Hello, Raleigh!
What’s Next?

- Use a provided Habitat development environment, or install Habitat locally
- Join the Habitat Slack Team - [http://slack.habitat.sh/](http://slack.habitat.sh/)
- Work through the tutorial at [https://www.habitat.sh/tutorials/](https://www.habitat.sh/tutorials/)
- Explore Habitat packages on the depot - [https://app.habitat.sh/](https://app.habitat.sh/)
- Explore the Habitat projects - [https://github.com/habitat-sh](https://github.com/habitat-sh)
- Read Habitat Blog posts - [https://www.habitat.sh/blog/](https://www.habitat.sh/blog/)