Managing Distributed Cloud Native Applications Made Easy

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MANAGING DISTRIBUTED CLOUD
NATIVE APPLICATIONS MADE EASY
Distributed Applications in the Cloud
Distributed Applications in the Cloud
Distributed Applications in the Cloud

Responsibility to develop, test, configure, deploy, update, remove, migrate, patch, trace, analyze, ...

Application DevOps Team (~ 2 Pizzas)
What are the Challenges?

X Develop...
What are the Challenges?

- Develop...
- Deployment-specific configuration...
What are the Challenges?

- Develop...
- Deployment-specific configuration...
- Package and deliver...
What are the Challenges?

- Develop...
- Deployment-specific configuration...
- Package and deliver...
- Deploy...
What are the Challenges?

- Develop...
- Deployment-specific configuration...
- Package and deliver...
- Deploy...
- Update...
What are the Challenges?

✗ Develop...
✗ Deployment-specific configuration...
✗ Package and deliver...
✗ Deploy...
✗ Update...
✗ ...with no downtime...
What are the Challenges?

- Develop...
- Deployment-specific configuration...
- Package and deliver...
- Deploy...
- Update...
- ...with no downtime...
- Undeploy...
Solutions

✗ Script code world to automate operations ...
× Script code world to automate operations...
  ...up-front investment and maintenance
Solutions

✗ Script code world to automate operations...
   ... up-front investment and maintenance
✗ Declarative app model, interpreted by deploy tools...
Multi-Target Application (MTA)
Multi-Target Application (MTA)

Business capability
Lifecycle Management Unit

Java (Heavy data processing)
"Backend"

Node.js (User request processing)
"Frontend"

DB service instance
"Persistence"

Geo-spatial service
"External resource"

MTA: my-app

Module 1
Resource

Version x.y.z
Three things it is good for

1. Define an app composed of multiple sub-components ... ... tools can establish a unified lifecycle
Three things it is good for

2. Declare resources my app depends on ...
   ... tools can allocate and bind such resources
Three things it is good for

3. Declare configuration variables for different deployments
   ... tools can bind sub-components, automate deployment based
   on default settings, or request missing mandatory values
Develop
Spring Music inspired sample

- web – songs and albums
- news provider
- external news provider
MTA Descriptors

‡ YAML files
MTA DESCRIPTORS

✘ YAML files
✘ MTA Deployment Descriptor (mtad.yaml)
MTA Descriptors

- YAML files
- MTA Deployment Descriptor (mtad.yaml)
- MTA Extension Descriptor (*.mtaext)
MTA Deployment Descriptor

_schema-version: 3
ID: org.cf.samples.spring-music
version: 1.0.0

modules:
  - name: spring-music-web
type: java.tomcat
path: build/libs/spring-music.jar
requires:
  - name: news-provider
properties:
    NEWS_URL: ~{url}
  - name: spring-music-db
  - name: spring-music-news-external
parameters:
  buildpack: java_buildpack
properties:
PENULATE_ALBUM_REPOSITORY: true

resources:
  - name: spring-music-news
    type: javascript.nodejs
    path: spring-music-news/
    provides:
      - name: news-provider
        properties:
          url: ${default-url}/news

parameters:
  buildpack: java_buildpack
properties:
PENULATE_ALBUM_REPOSITORY: true

config:
url:
MTA Deployment Descriptor

MTA header
X spec version
X app ID
X version

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requires:
  - name: news-provider
properties:
    NEWS_URL: ~{url}
  - name: spring-music-db
  - name: spring-music-news-external
parameters:
  buildpack: java_buildpack
properties:
  POPULATE_ALBUM_REPOSITORY: true

resources:
  - name: spring-music-news
type: javascript.nodejs
path: spring-music-news/
provides:
  - name: news-provider
    properties:
      url: ${default-url}/news

parameters:
  buildpack: java_buildpack
properties:
  POPULATE_ALBUM_REPOSITORY: true

- name: spring-music-news-external
type: user-provided-service
parameters:
  config:
    url:
MTA Deployment Descriptor

Modules

- name
- type
- path

```json
_schema-version: 3
ID: org.cf.samples.spring-music
version: 1.0.0

modules:
- name: spring-music-web
type: java.tomcat
path: build/libs/spring-music.jar

requires:
- name: news-provider
  properties:
    NEWS_URL: ~{url}

resources:
- name: spring-music-db
type: managed-service
parameters:
  service: postgresql
  service-plan: v9.4-container

- name: spring-music-news
  type: javascript.nodejs
  path: spring-music-news/
  provides:
  - name: news-provider
    properties:
      url: ${default-url}/news

parameters:
buildpack: java_buildpack

properties:
POPULATE_ALBUM_REPOSITORY: true

- name: spring-music-news-external
type: user-provided-service
parameters:
  config:
    url:
MTA Deployment Descriptor

Modules
X buildpack
X route
X other parameters

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- name: spring-music-web
type: java.tomcat
path: build/libs/spring-music.jar
requires:
  - name: news-provider
properties:
    NEWS_URL: ~{url}
- name: spring-music-db
- name: spring-music-news-external

parameters:
buildpack: java_buildpack
properties:
  POPULATE_ALBUM_REPOSITORY: true

resources:
- name: spring-music-news
  type: javascript.nodejs
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  provides:
    - name: news-provider
      properties:
        url: ${default-url}/news

parameters:
- name: spring-music-db
  type: managed-service
  parameters:
    service: postgresql
    service-plan: v9.4-container

parameters:
- name: spring-music-news-external
  type: user-provided-service
  parameters:
    config:
      url:
MTA Deployment Descriptor

Modules

- properties/env

_modules:
  - name: spring-music-web
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path: build/libs/spring-music.jar
requires:
  - name: news-provider
properties:
    NEWS_URL: ~{url}
- name: spring-music-db
- name: spring-music-news-external
parameters:
  buildpack: java_buildpack
  properties:
    POPULATE_ALBUM_REPOSITORY: true

resources:
  - name: spring-music-news
    type: javascript.nodejs
    path: spring-music-news/
    provides:
      - name: news-provider
        properties:
          url: ${default-url}/news

parameters:
  config:
    url:
MTA Deployment Descriptor

Modules

X  expose config

```yaml
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path: build/libs/spring-music.jar
requires:
  - name: news-provider
properties:
    NEWS_URL: ~{url}
  - name: spring-music-db
  - name: spring-music-news-external
parameters:
  buildpack: java_buildpack
properties:
  POPULATE_ALBUM_REPOSITORY: true

resources:
  - name: spring-music-news
    type: javascript.nodejs
    path: spring-music-news/
    provides:
      - name: news-provider
        properties:
          url: ${default-url}/news
```

- name: spring-music-db
  type: managed-service
  parameters:
    service: postgresql
    service-plan: v9.4-container

- name: spring-music-news-external
  type: user-provided-service
  parameters:
    config:
      url:
MTA Deployment Descriptor

Modules

X placeholders like ${default-url}

resolved automatically

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  - name: news-provider
properties:
    NEWS_URL: ~${url}
  - name: spring-music-db
  - name: spring-music-news-external
parameters:
  buildpack: java_buildpack
properties:
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  - name: spring-music-news
    type: javascript.nodejs
    path: spring-music-news/
    provides:
      - name: news-provider
        properties:
          url: $(default-url)/news

parameters:
  service:
    type: postgresql
    service-plan: v9.4-container

- name: spring-music-news-external
  type: user-provided-service
  parameters:
    config:
      url:
MTA Deployment Descriptor

Modules

- inject config via reference notation like `~{url}`

```json
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path: build/libs/spring-music.jar
requires:
  - name: news-provider
properties:
    NEWS_URL: ~{url}
- name: spring-music-db
  - name: spring-music-news-external
parameters:
  buildpack: java_buildpack
properties:
  POPULATE_ALBUM_REPOSITORY: true

- name: spring-music-news
  type: javascript.nodejs
  path: spring-music-news/
  provides:
    - name: news-provider
      properties:
        url: $(default-url)/news

resources:
- name: spring-music-db
  type: managed-service
  parameters:
    service: postgresql
    service-plan: v9.4-container

- name: spring-music-news-external
  type: user-provided-service
  parameters:
    config:
      url:
```
```yaml
-schema-version: 3
ID: org.cf.samples.spring-music
version: 1.0.0

modules:
  - name: spring-music-web
    type: java.tomcat
    path: build/libs/spring-music.jar
    requires:
      - name: news-provider
        properties:
          NEWS_URL: ~{url}

resources:
  - name: spring-music-db
    type: managed-service
    parameters:
      service: postgresql
      service-plan: v9.4-container
  - name: spring-music-news-external
    type: user-provided-service
    parameters:
      config:
        url:

requires:
  - name: news-provider
    properties:

parameters:
  buildpack: java_buildpack
  properties:
    POPULATE_ALBUM_REPOSITORY: true
```

**MTA Deployment Descriptor**

**Resources**

- name
- type

**X** name

**X** type
MTA Deployment Descriptor

Resources
X service label
X plan
X other parameters

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requires:
  - name: news-provider
properties:
    NEWS_URL: ~{url}
- name: spring-music-db
- name: spring-music-news-external
parameters:
  buildpack: java_buildpack
properties:
  POPULATE_ALBUM_REPOSITORY: true

resources:
  - name: spring-music-news
    type: javascript.nodejs
    path: spring-music-news/
    provides:
      - name: news-provider
        properties:
          url: ${default-url}/news

parameters:
  service: postgresql
  service-plan: v9.4-container
  - name: spring-music-news-external
    type: user-provided-service
    parameters:
      config:
        url:
MTA Deployment Descriptor

Resources

X some parameters unknown on design time

```yaml
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modules:
- name: spring-music-web
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path: build/libs/spring-music.jar
requires:
- name: news-provider
  properties:
    NEWS_URL: ~{url}
- name: spring-music-db
- name: spring-music-news-external
parameters:
  buildpack: java_buildpack
  properties:
    POPULATE_ALBUM_REPOSITORY: true

- name: spring-music-news
  type: javascript.nodejs
  path: spring-music-news/
  provides:
    - name: news-provider
      properties:
        url: ${default-url}/news

resources:
- name: spring-music-db
  type: managed-service
  parameters:
    service: postgresql
    service-plan: v9.4-container

- name: spring-music-news-external
  type: user-provided-service
  parameters:
    config:
      url:
```

url:
MTA Deployment Descriptor

Modules
- X service bindings

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modules:
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type: java.tomcat
path: build/libs/spring-music.jar
requires:
  - name: news-provider
properties:
    NEWS_URL: ~{url}

- name: spring-music-db
parameters:
  buildpack: java_buildpack
properties:
  POPULATE_ALBUM_REPOSITORY: true

resources:
  - name: spring-music-news
    type: javascript.nodejs
    path: spring-music-news/
    provides:
      - name: news-provider
        properties:
          url: ${default-url}/news

parameters:
  service:
    type: postgresql
    service-plan: v9.4-container
    config:
      url:
MTA Extension Descriptor

Deployment context dependent
Add property values and parameters

```
_schema-version: 3
ID: cf.samples.spring-music.prod-config
extends: cf.samples.spring.music

modules:
  - name: spring-music-web
    parameters:
      memory: 1G
      instances: 2
    properties:
      POPULATE_ALBUM_REPOSOTORY: false
  - name: spring-music-news
    parameters:
      memory: 128M

resources:
  - name: spring-music-news-external
    parameters:
      config:
        url: https://news-external.my.domain/news
```
What is an MTA Archive (MTAR)?

- Container, compliant with the JAR specification
- Contains modules...
  ... a manifest and the MTA deployment descriptor
- Used for distribution of the packaged app
Building MTA Archives

1. Create projects
Building MTA Archives

1. Create projects
2. Edit, build, run, debug...

DEVELOPER

1. (1)

DEV & BUILD TOOLS

2. (2)

MODULE

3. (3)

TEXT EDITOR

4. (4)

MTA DEPLOYMENT DESCRIPTOR

MANIFEST.MF

5. (5)

JAR OR MAVEN PLUGIN

PACKAGE

MTA ARCHIVE

MODULE

MTA DEPLOYMENT DESCRIPTOR

MANIFEST.MF
Building MTA Archives

1. Create projects
2. Edit, build, run, debug...
3. Author an MTA deployment descriptor (mtad.yaml)
1. Create projects
2. Edit, build, run, debug...
3. Author an MTA deployment descriptor (mtad.yaml)
4. (Optional) Add a MANIFEST.MF
Building MTA Archives

1. Create projects
2. Edit, build, run, debug...
3. Author an MTA deployment descriptor (mtad.yaml)
4. (Optional) Add a MANIFEST.MF
5. Use JAR tool or Maven plugin to package

Diagram:
- Developer
  - dev & build tools
  - text editor
  - MTA deployment descriptor
  - MANIFEST.MF
  - MTA archive
  - module
  - MTA deployment descriptor
  - MANIFEST.MF
  - JAR or maven plugin
  - package
Deploy Cloud Foundry
CF CLI plugin to deploy MTA with a single operation
"Backend" app to achieve desired application state
Supported Operations

× Deploy (incl. from Git, in future from directory)
× Update (incremental)
× Blue-green deploy
× Cross-MTA configuration
Enterprise Qualities

- Deterministic deployment order and timing
- Recoverability of a multi-step operation
- Logging and auditability
- Version evolution policies
- Deletion of non-relevant artifacts
>1000
Deploys per day

>1500
Distinct MTAs (incl. test ones)

>100
Real apps

@ SAP Cloud Platform
It is Open Source
Open Source Availability

MTA model guide
MTA parsers, validators, persistence and utilities
CF MTA plugin
CF MTA deploy service
Proposal for incubation in CF Foundation
Proposal for incubation in CF Foundation

Planned features:
- Parallel materialization of artifacts
- Application configuration update
- Docker support
- Lifecycle hooks
- Secure configuration management
Key Takeaways

App/Service → MTA Model → Deploy

Cloud Foundry
THANKS!

Any questions?

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nvvalchev@gmail.com
Credits

Special thanks to all the people who made and released these awesome resources for free:

❌ Presentation template by SlidesCarnival
❌ Photographs by Unsplash
SlidesCarnival icons are editable shapes.

This means that you can:
- Resize them without losing quality.
- Change fill color and opacity.

Isn’t that nice? :)

Examples:
Extra graphics