Containers at Netflix - An Evolving Story

Sangeeta Narayanan
Engineering Manager @Netflix
@sangeetan
Going Global

Recent Launches: Italy, Spain, Portugal
Early 2016: Korea, Hong Kong, Taiwan, Singapore
Growing BIGGER
Winning Moments of Truth
An amnesiac spy makes for a lethal agent. It's all good... till he starts digging into the mystery of his past.
Getting BETTER
2015

Device Launches

A/B Tests
New features
Going FASTER
A NETFLIX ORIGINAL FILM
BEASTS OF NO NATION

Directed by Cary Fukunaga

When his village is brutally attacked, a young West African boy is forced to join a unit of child soldiers and transform into a skilled warrior.

Starring Idris Elba, Abraham Attah, Kevin Gomrez

Certified: Director Cary Fukunaga based on his Oscar-winning documentary drama.

Available on Netflix.
Cloud Native Architecture
Automation & Tooling
Culture
New Considerations

Diversity - Users, Tech stacks, Workloads

Dev Ex - Dev iterations, Debugging, Packaging

Rapid Delivery

Resource Sharing
Why Docker?

Dev-centric packaging & reproducibility

Infrastructure abstraction

Faster dev iterations

Resource sharing
Docker @Netflix - Use Cases

Algorithms Engineering

Data Pipeline

Edge Engineering
Docker @Netflix - Use Cases

Algorithms Engineering

Data Pipeline

Edge Engineering
Algorithms Engineering

R&D of algorithmic components for product
Precompute

Online Services

Model Trainer

New data available
Requirements

Infrastructure abstraction

Polyglot support & Local Dev Ex

Dynamic resource allocation & distributed job scheduling
New data available

Model Trainer

+ Distributed scheduler

Precompute

Online Services

Amazon Web Services™ S3 Simple Storage Service
Infrastructure abstraction

Polyglot + Local Dev

Distributed Scheduling
Docker @Netflix - Use Cases

Algorithms Engineering

Data Pipeline

Edge Engineering
Data Pipeline
Publish, Collect, Process, Move Data
Keystone

- Control Plane
- Fronting Kafka
- Samza Router
- Consumer Kafka
- Event Producer

Connected to:
- S3
- EMR
- Stream Consumers
Keystone

- Control Plane
- Fronting Kafka
- Samza Router
  - S3
  - EMR
  - Stream Consumers
- Event Producer
- Consumer Kafka
Requirements

Local Dev Ex

Infrastructure abstraction

Fine-grained resource management
Infrastructure abstraction

Local Dev Ex

Fine grained resource Management
Docker @Netflix - Use Cases

Algorithms Engineering

Data Pipeline

Edge Engineering
Edge Engineering
Entry point to Netflix for all device traffic
Automation & Tools

- Movie Metadata
- Personalization Engine
- Movie Ratings
- Similar Movies
- Recommendation Engine
- User
- A/B Test Engine

API
Automation & Tools

API

Movie Metadata
Personalization Engine
Movie Ratings
Similar Movies
Recommendation Engine
User
A/B Test Engine

Node.js
Html, JS
Requirements

Infrastructure abstraction

Local dev, Polyglot - Java, Groovy, Node.js

Fine-grained resource management
Requirements++

Ops Tooling
Networking, IPC
Security
Insights
Failure Testing
Performance
And more…

Long running Services
vs.
Batch Jobs
Requirements++

Ops Tooling
Networking, IPC
Security
Insights
Failure Testing
Performance
And more…

Long running Services vs. Batch Jobs
<table>
<thead>
<tr>
<th>Name</th>
<th>Version</th>
<th>Stack</th>
<th>Region</th>
<th>Meta</th>
</tr>
</thead>
<tbody>
<tr>
<td>/shakti/primer-ludo-no-remote/setVideoRating</td>
<td>1</td>
<td>test</td>
<td>*</td>
<td>API, java-1.7.0+groovy-2.3.6, com.netflix.api.endpoint.BaseEnd</td>
</tr>
<tr>
<td>/shakti/primer-ludo-no-remote/wigenre</td>
<td>1</td>
<td>test</td>
<td>*</td>
<td>API, java-1.7.0+groovy-2.3.6, com.netflix.api.endpoint.BaseEnd</td>
</tr>
<tr>
<td>/shakti/primer-ludo-no-remote/ratinghistory</td>
<td>1</td>
<td>test</td>
<td>*</td>
<td>API, java-1.7.0+groovy-2.3.6, com.netflix.api.endpoint.BaseEnd</td>
</tr>
<tr>
<td>/shakti/primer-ludo-no-remote/geo</td>
<td>1</td>
<td>test</td>
<td>*</td>
<td>API, java-1.7.0+groovy-2.3.6, com.netflix.api.endpoint.BaseEnd</td>
</tr>
<tr>
<td>/ecapi/account/subscription/plancancel</td>
<td>1</td>
<td>*</td>
<td>*</td>
<td>API, java-1.7.0+groovy-2.3.6, com.netflix.api.endpoint.BaseEnd</td>
</tr>
<tr>
<td>/shakti/primer-ludo-no-remote/densityKids/recentlyWatchedCharacter</td>
<td>1</td>
<td>test</td>
<td>*</td>
<td>API, java-1.7.0+groovy-2.3.6, com.netflix.api.endpoint.BaseEnd</td>
</tr>
<tr>
<td>/shakti/primer-ludo-no-remote/util/error</td>
<td>1</td>
<td>test</td>
<td>*</td>
<td>API, java-1.7.0+groovy-2.3.6, com.netflix.api.endpoint.BaseEnd</td>
</tr>
<tr>
<td>/shakti/primer-ludo-no-remote/pin/info</td>
<td>1</td>
<td>test</td>
<td>*</td>
<td>API, java-1.7.0+groovy-2.3.6, com.netflix.api.endpoint.BaseEnd</td>
</tr>
<tr>
<td>/att/primer/FT modify</td>
<td>1</td>
<td>*</td>
<td>*</td>
<td>API, java-1.7.0+groovy-2.3.6, com.netflix.api.endpoint.BaseEnd</td>
</tr>
<tr>
<td>/primer/shared_module/endpoint</td>
<td>1</td>
<td>test</td>
<td>*</td>
<td>API, java-1.7.0+groovy-2.3.6, com.netflix.api.endpoint.BaseEnd</td>
</tr>
<tr>
<td>/shakti/primer-ludo-no-remote/uberContext</td>
<td>1</td>
<td>test</td>
<td>*</td>
<td>API, java-1.7.0+groovy-2.3.6, com.netflix.api.endpoint.BaseEnd</td>
</tr>
<tr>
<td>/shakti/primer-ludo-no-remote/densityKids/character</td>
<td>1</td>
<td>test</td>
<td>*</td>
<td>API, java-1.7.0+groovy-2.3.6, com.netflix.api.endpoint.BaseEnd</td>
</tr>
<tr>
<td>/shakti/primer-ludo-no-remote/servicecode</td>
<td>1</td>
<td>test</td>
<td>*</td>
<td>API, java-1.7.0+groovy-2.3.6, com.netflix.api.endpoint.BaseEnd</td>
</tr>
</tbody>
</table>
Building out the pieces

Gradle docker plugin to generate Dockerfile

Spinnaker CloudProvider provides abstraction

Bakery support for image generation

Docker registry for internal images

libnetwork plugin for addressable IP
Dev Ex Wins

Faster dev iterations

Run prod image locally; attach debugger

Multiple branch/config variations

Hot reloading of files

‘Roman Riding’ with AMIs
Not There Yet!
‘PaaS-like' Dev Experience

Production scale/Operational readiness

Optimized resource utilization
Dev Ex

Polyglot env, Packaging

Infrastructure Abstraction

Production ready Online Services
Thank You
@sangeetan  NETFLIX
Acknowledgements

The Netflix Algorithms Engineering & Data Pipeline teams

Photo Credits

https://goo.gl/sP5T4X
https://goo.gl/JaNlyf
https://goo.gl/rZXws1
http://goo.gl/V4UFmR
https://goo.gl/R08GPQ
http://tastyk.deviantart.com/art/Evolution-149719618
https://goo.gl/W2UKv0
https://goo.gl/fRcpPN
https://goo.gl/tF199H
https://goo.gl/K1OH9T wildflowers
https://goo.gl/KSaL5s roadmap
https://goo.gl/8JCDQy odometer
https://goo.gl/c4RuSR takeaway box