Beyond DevOps: How Netflix Bridges the Gap

Josh Evans - Director of Operations Engineering

November 16, 2015
Fall 2013

Technical Debt

- Java 6
- Perforce
- Single Master Jenkins
- Ant
- CentOS
- Asgard/Mimir
How do we drive broad-based change?
The Paved Road

- Java 7
- Stash
- Jenkins Shards
- Gradle
- Ubuntu
That’s great but...

Some said
• You’re overloading us
• Too many projects
• Poor targeting

Others said
• What took you so long?
• We’ve moved on
• Now we need to migrate

We’re paying a high tax
Organizational Debt

- Expectations gap
  - Division of labor
  - Timing of solutions
  - Leadership

- Affects
  - Reputation
  - Relationships
  - Lost opportunities
How do we bridge the gap?
“Remember that TIME is money...”
Time is a form of currency
Our time today...

- Product Engineering
- Operations Engineering
- Challenges & Strategies
Our time today...

- Product Engineering
- Operations Engineering
- Challenges & Strategies
Product Innovation

winning moments of truth
Friends' Favorites

Archer
2009  TV-MA  36 episodes
🌟🌟🌟🌟 ![HD]

Sophisticated spy Archer may have the coolest gadgets, but he still has issues when it comes to dealing with his boss -- who also is his mother.

H. Jon Benjamin, Judy Greer, Amber Nash

My List

My List

FUTURAMA
STAR TREK
Breaking Bad
Dexter
ALWAYS SOLID PHILADELPHIA

TV Shows, TV Action & Adventure
We're not bad people, but we did a bad thing.
The Rayburns seem to have the perfect life in their lovely Florida town. But nobody's perfect -- especially the Rayburns.
Continuous Innovation

- Every facet of the product
- 1400 AB tests in the last year & accelerating
But wait, there’s more...
You build it, you run it

**Build It**
- design
- code
- build
- bake
- test
- deploy

**Run It**
- configure
- monitor
- triage
- fix

...at scale, globally
- 1000s of starts per second
- 100,000s of requests per second
- 100,000,000 hours of content / day
- 3 AWS Regions, 3 AZs per region
Relentless product innovation

Building & running micro-services at scale, globally
Our time today...

- Product Engineering
- Operations Engineering
- Challenges & Strategies
The Gap

DevOps is a software development method that emphasizes the roles of both software developers and other information-technology (IT) professionals with an emphasis on IT Operations.

- Wikipedia
Why? How?
Operational Excellence

Quality

Velocity
Operational Excellence is the continuous improvement of the management, design, and function of operational environments to achieve greater quality, velocity, and competitive advantage.
Operations Engineering is the application of software engineering practices to achieve and sustain operational excellence.

- Engineering Tools
- Insight & Real-time Analytics
- Performance & Reliability
Operations Engineering

• Service provider
• Operational excellence driver
• Cross-cutting solutions
• Undifferentiated heavy lifting
Our time today...

- Product Engineering
- Operations Engineering
- Challenges & Strategies
Remember that feedback?

• You’re overloading us
• What took you so long?

• We made assumptions
  – Requirements – what & when
  – Time for non-product work
How do we...

• Move from assumptions to knowledge
• Affect change without imposing a tax?
• Achieve and sustain operational excellence?
Time is a form of currency
5 strategies for success in time-based economies

software & organizational engineering
1. Reach out
Talk to your engineering customers

- What are your biggest operational pain points?
- How can we help?
- How well are we meeting your needs today?
- What would you like to see from us in the future?

Listen

Shower, rinse, repeat
Grease the Squeaky Wheels

- low tolerance for tax
- more vocal than most
What they wanted

• High impact solutions
• Clarity on deliverables
• Lower operational tax
• Leadership, innovation, and partnership
Our commitments

- Deliver on solutions
- Better road map definition & communication
- A more aggressive stance on automation
- Deeper investment into leadership, innovation, planning
2. Make an impact

- Apply what you’ve learned
- Deliver what matters
• global cloud console
• end to end delivery
• automation platform
• velocity with confidence
<table>
<thead>
<tr>
<th>Region</th>
<th>Stack</th>
<th>PROD</th>
<th>Load Balancer</th>
<th>Security Groups</th>
<th>Properties</th>
<th>Tasks</th>
<th>Config</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU-WEST-1</td>
<td>prod</td>
<td>api-prod</td>
<td>1184 / 1</td>
<td>99%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>US-EAST-1</td>
<td>ci</td>
<td>V175</td>
<td>Build: #4220</td>
<td>prod</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>US-WEST-2</td>
<td>perf</td>
<td>V135</td>
<td>Build: #4220</td>
<td>perf</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Instance Information**

- **Launched**: 2015-11-14 08:06:06 PST
- **In**: prod us-west-2b
- **Type**: c3.8xlarge
- **Server Group**: api-prod-v335
- **VPC**: None (Ec2 Classic)

**Status**

- **Discovery**: Up
- **Health Check**: Status

**DNS**

**Security Groups**

- **Logs**

**Netflix Configuration**
This dashboard tracks Spinnaker adoption for Prod Deployments based on the source app in Chronos events (asg - create).

Count By: App
3. Make it easy to do the right thing
Supply & Demand

- Engineering time is scarce
- We must do more heavy lifting
Provide on-ramps

- Spinnaker manual step
- Automated migrations – Mimir
Automate proven practices
• Alerting and Monitoring
• Apache & Tomcat Hardening
• Automated Canary Analysis
• Autoscaling
• Chaos Participation
• Consistent Naming
• ELB Configuration
• Healthcheck Configured
• Red-Black Pipeline
• Squeeze Testing
• Timeout & Fallback Tuning
• Workload Reliability
Production Ready?

- Alerting and Monitoring
- Apache & Tomcat Hardening
- **Automated Canary Analysis**
- Autoscaling
- Chaos Participation
- Consistent Naming
- ELB Configuration
- Healthcheck Configured
- Red-Black Pipeline
- Squeeze Testing
- Timeout & Fallback Tuning
- Workload Reliability
Canaries

Customers → Load Balancer → Old Version (v1.0) → Metrics

Load Balancer → New Version (v1.1)
Canaries

Customers → Load Balancer

Old Version (v1.0)
0 Servers

New Version (v1.1)
100% → 100 Servers

Metrics
Automated Canary Analysis

Define
- Metrics
- A threshold

Every n minutes
- Classify metrics
- Compute score
- Make a decision
Static & Functional Testing

Static
Unit Tests
Integration Tests
Canary Analysis
Performance
Conformity
Chaos

Make it easy to do the right thing
4. Reduce the cost of change
Continuous, Broad-based Change

- Ongoing migrations
- Library propagation
- 100s of micro-services
- Complex dependencies
Change Engineering

- Locate
- Communicate
- Facilitate
Who owns this artifact, repository, service?

- Automated forensics
  - Who last touched x?
  - What team?
  - Who was their manager?
Whitepages

- Workday wrapper
- App & REST API
- Organization hierarchy
- Metadata
- Change log
• REST-based service
• Sources
  – Whitepages
  – Stash
  – Edda
  – Jenkins
  – Spinnaker
  – Etc...
"employees": [
    {
      "id": "241",
      "firstName": "Josh",
      "lastName": "Evans",
      "username": "jevans",
      "email": "jevans@netflix.com",
      "jobTitle": "Director of Operations Engineering",
      "isManager": true,
      "isCurrent": true,
      "title": "Josh Evans (jevans) - Operations Engineering",
      "_links": {
        "self": {
          "href": "/api/employees/241"
        },
        "manager": {
          "href": "/api/employees/117890"
        },
        "team": {
          "href": "/api/teams/f9134a81"
        },
        "projects": {
          "href": "/api/teams/f9134a81/projects"
        }
      }
    }
]
Today – Targeted Coordination

• Security vulnerabilities
  – Who owns this service?

• Platform updates
  – Who is using this version of this library?
Future – Change Campaigns

Automated, efficient technical project management

- Communication
- Guidance
- Tracking

Low tax for TPMs & engineers
5. Develop Partnerships

Beyond supply & demand
Spinnaker 1.0 – 1H 2015

- Nearing completion
- Aggressive schedule
- Unexpected delays
- Commitment to June delivery
Edge Engineering

• Built their own continuous delivery solution
• Not positioned for engineering-wide support
• Believes common solutions
Partnership in Action

- Strong relationship
- Open discussions about concerns
- Decision - leaned forward

- +2 engineers on Spinnaker
- Successful 1.0 launch
Moving Forward Together

• Containers?
• Achieving alignment
• Collaborative exploration
  – Edge, Platform, Operations
  – A new paved road?
Payoffs

- Paved Road adopted
  - Adding new ones
- Production Ready ongoing
- Migrations easier
- Reputation improving

- Improved
  - Service uptime
  - Rate of change
Putting it to the test in 2016

- Streaming production & test - EC2 Classic to VPC
- Highly cross-functional
- Complex dependencies
- Zero downtime

Stay tuned...
Five Strategies

1. Reach out
2. Make an impact
3. Make it easy to do the right thing
4. Reduce the cost of change
5. Develop partnerships
Open Sourced!

https://netflix.github.io/
Questions?

Josh Evans  
jevans@netflix.com  
@ops_engineering