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CloudNativeCon

Europe 2018

Building a Cloud Native Culture in an Enterprise

The New York Times

Deep Kapadia, Director of Delivery and Site Reliability Engineering
Tony Li, Site Reliability Engineer



Agenda

- What is the NYT technology enterprise?
- Transforming and planning for "the cloud"
- Proving the concept (demo)
- Culture and tooling shifts
- There is more work to do



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The NYT engineering enterprise

Abridged history of NYT on the internet:

- 1974 computers arrive in the newsroom
- 1994 @times on AOL
- 1996 officially online at www.nytimes.com
- 2010 first foray into public cloud infrastructure
- 2016 plan to shut down data centers
- 2018 www.nytimes.com is cloud native
 - Running on Kubernetes
- 2018 data-centers shut down
 - 300+ apps migrated to AWS or GCP

Welcome! First-time users [register here](#) or [take a QuickTour](#) of the site.

The screenshot shows the homepage of The New York Times on November 12, 1996. At the top, it says "The New York Times ON THE WEB". To the right, there's a small advertisement for "knicks.net celtics oneonone newyork.boston.com". Below the header, it says "All the News That's Fit to Print" and "Tuesday, November 12, 1996". On the left, there's a "NEW AUTO CLASSIFIEDS" section. In the center, there's a large photo of a crowd. To the right, there are two columns of news headlines: "LATE NEWS UPDATE" with "Two Aircraft Collide In Air Near Delhi, Killing About 350" and "IN CYBERTIMES" with "Europe Betting on Self-Regulation to Control the Internet". At the bottom, there are links for "Help Center" and "Low Graphics".

PLEASE OPEN YOUR WINDOW TO THE WIDTH OF THIS LINE OF TEXT.

Copyright 1996 The New York Times

nytimes.com today

- Homepage
- Section fronts
- Articles
- Interactives
- Graphics
- Videos
- Slideshows
- Search

The screenshot shows the New York Times homepage. At the top, there are links for "ENGLISH" (with "CHINESE" and "ESPAÑOL" options), "SUBSCRIBE NOW", and "LOG IN". Below the header, the title "The New York Times" is displayed, along with the date "Tuesday, May 1, 2018", "Today's Paper", "Video", "73°F", and "Dow -0.72%". A navigation bar below the title includes links for "World", "U.S.", "Politics", "N.Y.", "Business", "Opinion", "Tech", "Science", "Health", "Sports", "Arts", "Books", "Style", "Food", "Travel", "Magazine", "T Magazine", and "ALL".

The main content area features a large image of a dessert, likely a fruit tart or pie, with a scoop of ice cream. To the right of the image, the "Cooking" section is highlighted with the text "Helpful videos, tempting results. Experience NYT Cooking for \$1.25 per week." and a "START TODAY" button.

Below this, a prominent article is titled "Mueller Has List of Questions for Trump" by Matt Apuzzo and Michael S. Schmidt. The article discusses Robert S. Mueller III's investigation into Russian election interference. Other visible articles include "The Democrats' Real Diversity Problem" by David M. Levy, "The Real Villain Behind Our New Gridlock Age" by Paul Krugman, and "Trump Says Disclosure of Questions Is 'Disgraceful'" by Matt Apuzzo and Michael S. Schmidt. The footer contains sections for "READER CENTER", "THE CROSSWORD", and "Letters".



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nytimes.com today

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The New York Times

Sections | HOME | SEARCH | LOGIN | 🔍

평창 2018 | Today's Results | Medal Count | Sam At The Games

Complete coverage of the 2018 Olympic Games in Pyeongchang, South Korea.

 DOUG MILLS/THE NEW YORK TIMES

With Olympics Over, Team Korea Goes Back to Being 2 Countries

Athletes from North and South Korea waved the flags of their own countries as they arrived for the closing ceremony. Only time will tell whether Olympic diplomacy has had a lasting effect.

February 25, 2018 · By MOTOKO RICH

 DOUG MILLS/THE NEW YORK TIMES

John Shuster and the U.S. Curling Team Win First Gold Medal

Shuster's crew won its first-ever gold medal in curling after a huge, 5-point end against Sweden, the top-ranked team in the world.

February 24, 2018 · By SCOTT CACCIOLA

South Korea's 'Garlic Girls' Fall to Sweden in Olympic Curling

The women's curling team from a garlic-growing region had become an international sensation with a strong showing, but could not overcome Sweden.

February 25, 2018 · By KAREN CROUSE

ON OLYMPICS



Ester Ledecka Makes History With Gold Medals in Snowboarding and Skiing

Ledecka, of the Czech Republic, won the gold medal in snowboarding parallel giant slalom and skiing super-G.

February 23, 2018 · By KAREN CROUSE

Medal Count | NOR 14 • 14 • 11 | GER 14 • 10 • 7 | CAN 11 • 8 • 10 | USA 9 • 8 • 6 | NED 8 • 6 • 6

 Meet Walter Winans, the Ultimate Two-Event Olympic Medalist

 Team U.S.A.? More Like Team Minnesota

 U.S. Biathletes Boycott Russia Event

 Russian Bobsledder Fails Doping Test

 Russia, the Olympics' Awkward Guest



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nytimes.com today



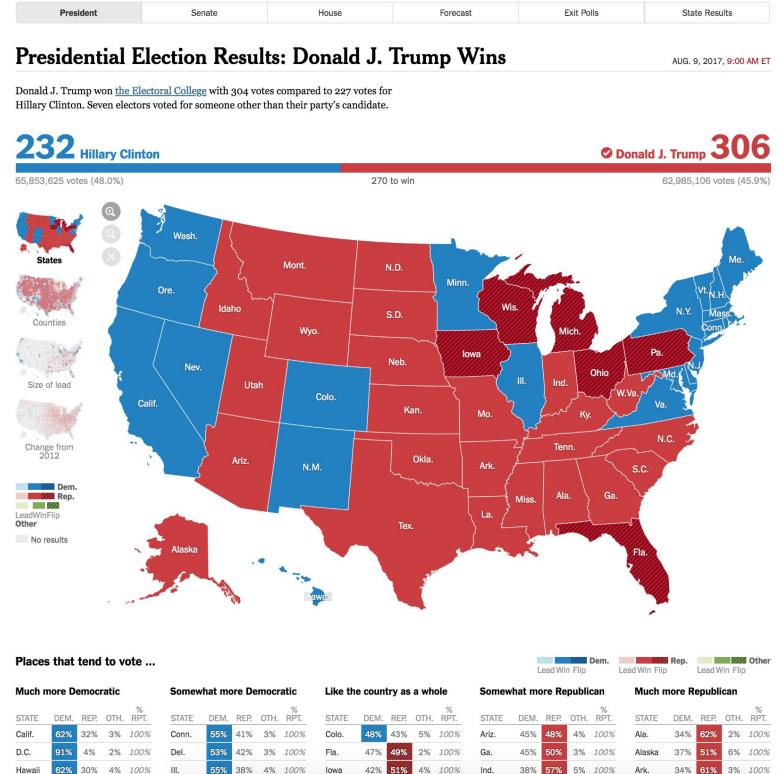
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New Products (Cooking)



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The screenshot shows a cooking website interface. At the top left is the logo 'T|Cooking'. To its right is a search bar with the placeholder 'What would you like to cook?'. Further right are links for 'WHAT TO COOK THIS WEEK' and 'COOKING GUIDES'. On the far right is a 'YOUR RECIPE BOX' section for 'Deep Kapadia' with a gear icon. Below the header is a large image of several cowboy cookies on a baking sheet. A red circular button labeled 'RECIPE OF THE DAY' is overlaid on the image. A white callout box contains the title 'Cowboy Cookies' and a description: 'A classic enhanced with oats, pecans, coconut and cinnamon.' Below the title is the name 'MARIAN BURROS'. At the bottom left of the image area are social sharing icons for 'Save To Recipe Box', Facebook, Pinterest, and Email.

What would you like to cook?

WHAT TO COOK THIS WEEK

COOKING GUIDES

YOUR RECIPE BOX
Deep Kapadia

RECIPE OF THE DAY

Cowboy Cookies

A classic enhanced with oats, pecans, coconut and cinnamon.

MARIAN BURROS

Save To Recipe Box f p ↗

New Products (Games)

The Mini
Tuesday, May 1, 2018
By JOEL FAGUANO

The Crossword
Tuesday, May 1, 2018
Want to play online? [Subscribe Today!](#)

Tips & Tricks
10 Puzzles

READ ABOUT TODAY'S PUZZLE ON WORDPLAY

Featured Article

How to Solve The New York Times Crossword
A Guide by DEB AMLEN
With patience and practice anyone can learn to solve crosswords. [Read More](#)

Logic Puzzles



Tuesday May 1, 2018

The Daily Crossword • By JACOB STULBERG • Edited by WILL SHORTZ



4:50

Rebus Clear Reveal Check



65D Go (for)



ACROSS

- 44 Push away
45 Yen
47 Gait faster than a walk
48 More than none but less than all
50 Morrison who wrote "Beloved"
52 Word stamped on an invoice
56 Good place to fish from
59 Salient
61 Kovalchuk of the N.H.L.
62 African game
64 Obstacle ... or any one of four black squares in this puzzle?
66 Bishop's headdress
68 Polynesian land east of Fiji
69 Greek letter that represents the golden ratio
70 Figure in many sci-fi film
71 Part of a cattle roundup

DOWN

- 37 Bit of wear for Colonel Sanders
38 As well
39 Prone (to)
41 Harlem sights
43 Take another crack at
46 Latin American seafood dish
49 Pitcher Hershiser
51 White House family with the dog Bo
52 Strong wines
53 Going on
54 Vapid
55 Word before City or after Fort on Midwest maps
57 Stanley who wrote "The Magic Kingdom"
58 Hit below the belt
60 Skier's convenience
63 Large coffee holders
65 Go (for)

And everything behind the scenes



- CMS (content management system)
- APIs
- Subscription services
- Consumer revenue
- Advertising platform
- Archives
- Mobile platforms

The NYT engineering enterprise



- The IT team transformed into infrastructure and product teams
- Organic growth sprouted many product and platform teams
- The way people consume information shifted drastically with the advent of mobile platforms, social media, etc
- We had to move **fast**



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The initial foray into the cloud

Started dabbling in AWS in 2010:

- Treated it like our data center; **closely guarded access**
- **Unable to scale** infrastructure processes based on needs
 - Ticket and approval workflow for things that could be automated
 - Automation wasn't considering newer DevOps principles
- Apps were built around these constraints and turned into a lot of **spaghetti architecture**
 - Lack of 12 Factor Apps, secret stores, service discovery, autohealing
- We underwent a **misguided CD effort** with every team determining their deployment pipelines and tools
 - Considerably fragmented our stack with 5+ deployment systems



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Starting a transformation

More concerted effort in 2016:

- Formation of the Delivery Engineering team
 - Mix of developers across the org with devops experience / interest
- **Focus towards developer experience**
- Use modern methods to build and deploy apps
 - Lots of interest in running apps in containers
 - A couple teams dabbled in container orchestration in isolation
 - Mesos/Marathon, Nomad, Kubernetes, Swarm
- Kubernetes hype and **availability of managed K8s** on GKE
- Team rebuilding the web platform was interested in deploying to containers

What is "Delivery Engineering"?

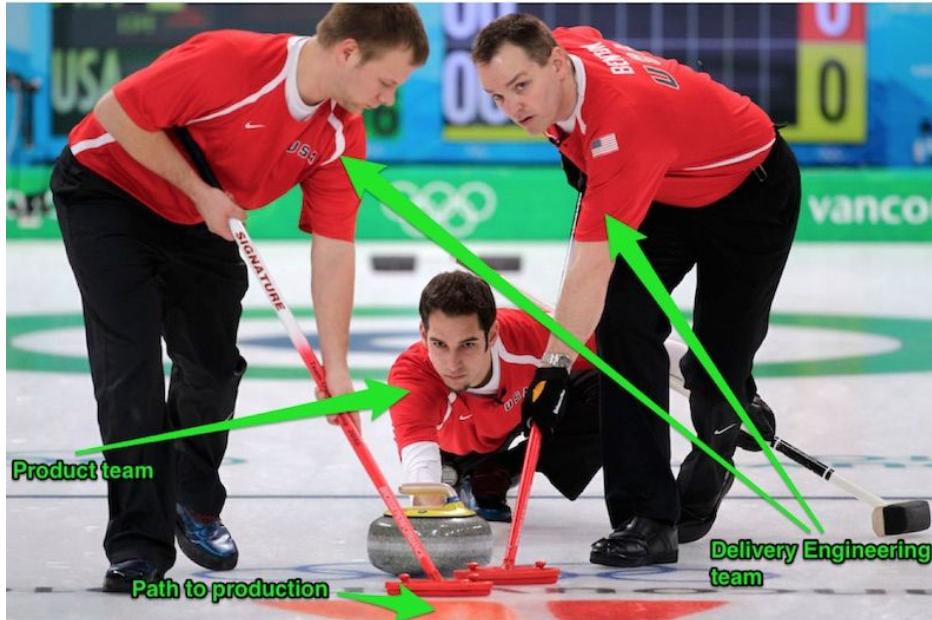


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From Greg Dziedowicz: <http://greqdmd.com/blog/2015/07/19/delivery-engineering-team/>



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Using (more) modern tools

- GitOps
 - GitHub driven workflow
- Drone (drone.io)
 - Pipeline as code
- Terraform
 - Infrastructure as code
- Vault
 - Actually manage secrets the right way, policies as code

Also noticed that many of the tooling we gravitated towards was written in Go (yay for standards)!

Proof of concept



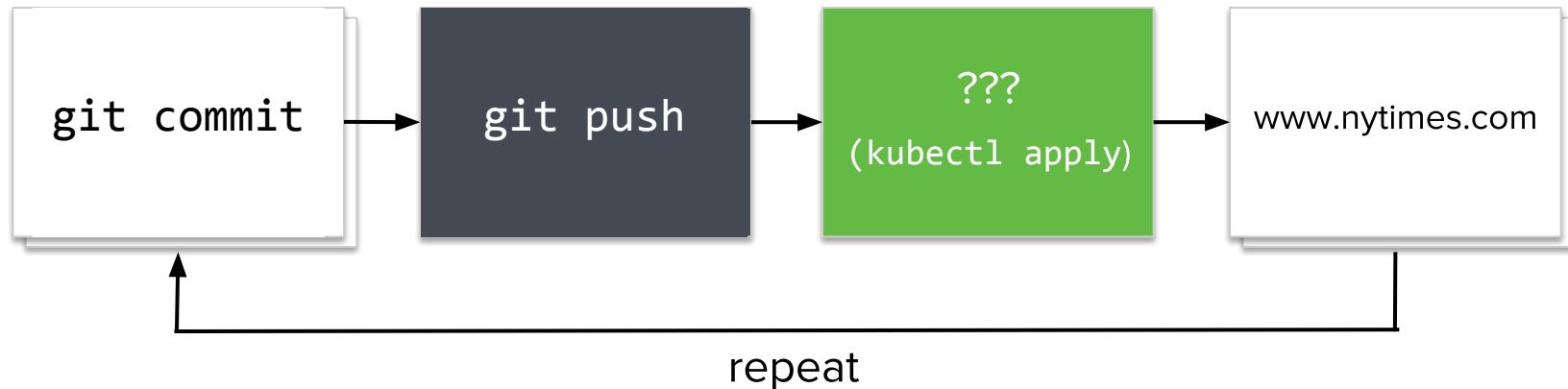
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With a team willing to try something new, we put together a proof of concept around a well known but **powerful idea**:





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Demo time

1. Update code
2. Update credentials
3. git push
4. CI/CD
5. Deployed and live 

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Highly-structured systems

Downloaded from https://academic.oup.com/imrn/article/2020/10/3303/2020033 by guest on 10 August 2020

为什么说“中国古典文学名著”是“四大名著”

Page last updated: 2020-06-01 10:00:00

www.ijerpi.org | 10

- FEDERAL BUREAU OF INVESTIGATION, NEW YORK, NEW YORK
 - HOSTMASTER@WWW7.BIAZI.IT:8080-8081-8082
 - COLLECTIVE
 - 00120001@RUBICOD.COM (00120001)
 - A.P.S. TORRENTS 12345678
 - KODAKNETTEA.XPORT:PORT 10.10.10.100-100
 - DEBLO WORLD SERVICE:PORT 443/80-80
 - MELLIU WORLD:PORT 443 -> TCP PORT 443
 - MELLIU WORLD:PORT 443 -> TCP ALIAS:PORT 10.10.231.231
 - KODAKNETTEA SERVICE:PORT 443/80-80
 - DEBLO WORLD SERVICE:PORT 10.10.231.231
 - KODAKNETTEA:PORT 443 -> TCP PORT 443
 - MELLIU WORLD:PORT 443 -> TCP 23/23438
 - MELLIU WORLD:PORT 443 -> TCP PORT 443/80
 - KODAKNETTEA:PORT 443 -> TCP PORT 443
 - KODAKNETTEA:PORT 443 -> TCP ALIAS:PORT 10.10.231.231
 - DEBLO WORLD:PORT 443 -> TCP ALIAS:PORT 10.10.231.23446
 - KODAKNETTEA SERVICE:PORT 443-80-80
 - KODAKNETTEA:SERVICE:PORT 443 -> TCP 23/23438
 - HOWTO



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Shifting instead of lifting

We realized that a lift and shift was not going to be easy.

Compared to a datacenter, the cloud has:

- Different **networking** designs
- Different **security** models and restrictions
- Different IAM and **access** to resources
- Different **costs**
- Different (expanded) **features** and services
- Different levels of **reliability** and **support** models
- Different **tools** available

Shifting instead of lifting

Factoring in these differences, it is **easier to lean in and shift** into a cloud native mentality, using the migration as an opportunity to move the needle forward.

Embracing this gave us an **opportunity to improve** the developer experience, velocity, and productivity.

Replicating a traditional datacenter model in the cloud was unlikely to work, fit, or scale in this paradigm.

We **made mistakes**, but here are our big learnings.



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Shifting Processes

Shifting processes (1)

Culture shift:

- Instill application / service ownership and destiny

Tooling shift:

- Team-ownership of GCP projects for developer freedom
- PagerDuty for everyone



Google Cloud Platform



Shifting processes (2)

Culture shift:

- Ticket-based to self-service underlied tooling transformation

Tooling shift:

- Write simple scripts developers can run using off the shelf tools (gcloud, kubectl)
- Write documentation, step-by-step guides, and link to tutorials

Shifting processes (3)



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Culture shift:

- Educate developers on best practices

Tooling shift:

- Teach 12FA (the Twelve-Factor App) and have example apps
- Containers: what are they and how to use them



Shifting processes (4)

Culture shift:

- Design, discuss, and work in the open

Tooling shift:

- Write RFCs (Request For Comments):
 - Architecture proposals
 - Use of cloud services
 - Best practices
 - Decision changes





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Shifting processes (5)

Culture shift:

- Kubernetes / GCP training and developer ramp up

Tooling shift:

- In person training sessions for developers
- Share and read case studies, blog posts, tutorials, and videos





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Shifting Development

Shifting development (1)

Culture shift:

- Use it instead of build it

Tooling shift:

- Stop rolling custom instances and leverage the managed service / version in the cloud
- Use off-the-shelf / open source projects that follow standards



Shifting development (2)

Culture shift:

- Iterate faster and gain confidence in a modern CI/CD process

Tooling shift:

- Drone.io and its container-based plugin ecosystem
- Simple yet flexible pipeline as code versioned with projects
- Drop the assumptions and baggage of Jenkins for a new start



GitHub



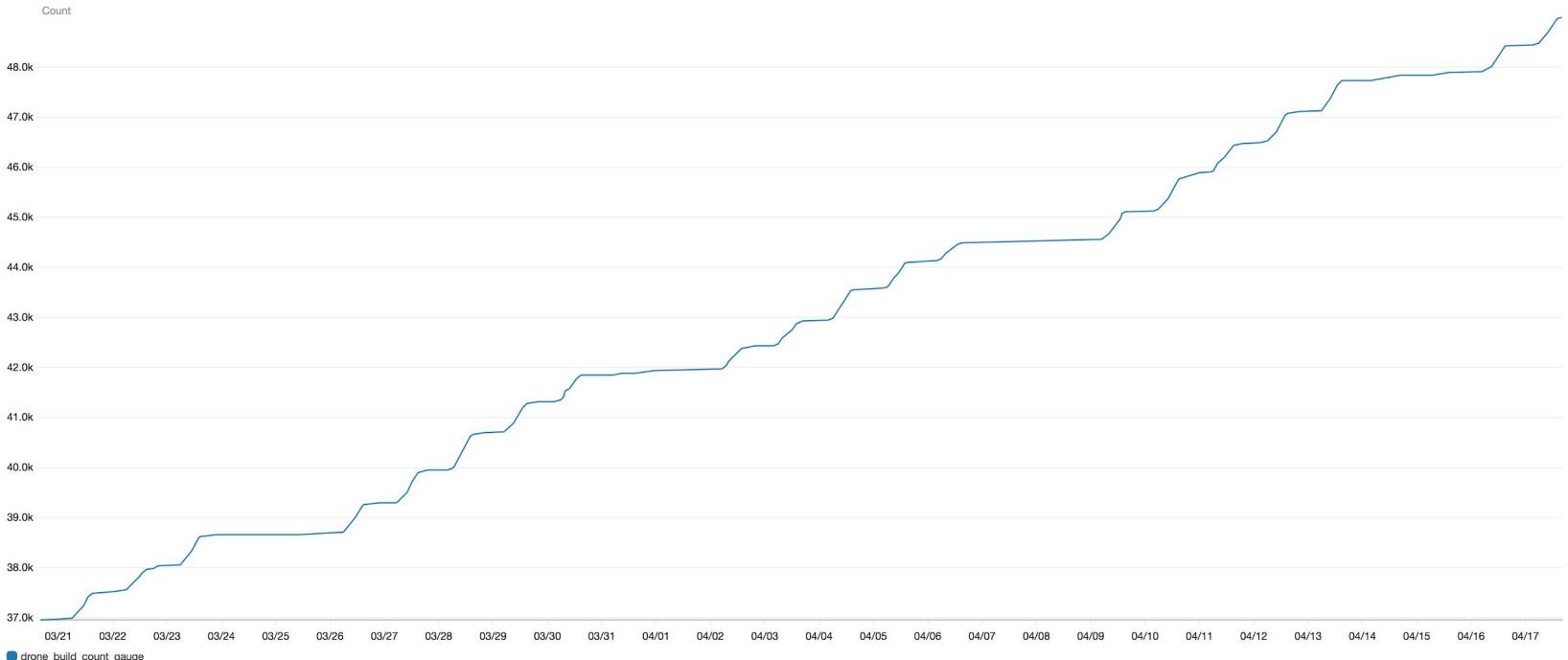
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~12k builds in the last 4 weeks



Shifting development (3)

Culture shift:

- Treat secrets like secrets

Tooling shift:

- Own the Vault platform and evangelize its use
- Tooling makes onboarding easy and consistent across the org



Shifting development (4)

Culture shift:

- Decentralize the CDN and make it self-service to the teams

Tooling shift:

- Break up fragile and centralized Varnish / routing logic
- Automate configuring the Fastly CDN to delegate logic ownership to the teams that control those services



HashiCorp
Terraform

Shifting development (5)



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Culture shift:

- Make costs visible to developers

Tooling shift:

- Codify GCP project budgets
- Visualize and alert expenditures in Slack

```
---  
budget:  
  monthly: 2000  
  alert_levels:  
    - 10  
    - 25  
    - 50  
    - 75  
  alert_overage: 10  
  notify:  
    slack:  
      - my-channel  
      - @my-username
```



GCP Budget Bot APP 11:16 AM
Budget report for [my-project](#)

June 1 2017 to June 10 2017: \$326.43



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Shifting Communication

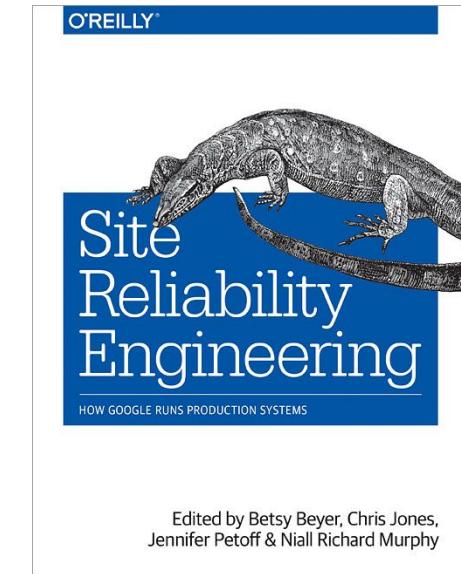
Shifting communication (1)

Culture shift:

- Scale Delivery Engineering support effectively to those who need it the most

Tooling shift:

- DevOps team members became SREs
- Embed SREs on teams that are risky, migrating, or learning
- Office hours, shared scrums, shared goals, support over Slack



Shifting communication (2)



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Culture shift:

- Be ahead of change, instead of trying to consolidate change

Tooling shift:

- Stay ahead of dev teams in best practices and technologies
- Attend conferences, learn from the community, and participate in alphas / betas to predict potential solutions and challenges



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O'REILLY®
Velocity
CONFERENCE

SRE CON
AMERICAS

Google Cloud
Next

 **Altitude**

Shifting communication (3)



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Culture shift:

- Be excited to shut things down
- Consolidate complex systems
- Be explicit and own dependencies

Tooling shift:

- Avoid migrating outdated, snowflake, and complex systems
- Schematize or archive data (many pages as static HTML)
- Broadcast and "soft shut down" (disconnect) services far ahead of deadlines, finding "forgotten" dependencies

Shifting communication (4)

Culture shift:

- Get feedback on processes and tools

Tooling shift:

- Review and iterate on results from monthly / quarterly surveys
- Allow readers / users to contribute to the docs / tools





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Shifts In Progress



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Shifts in progress (1)

Culture shift:

- Bring more SRE concepts to reality

Tooling shift:

- Establish clear SLOs between product and development teams
- Continue education in SRE practices

Shifts in progress (2)

Culture shift:

- Foster a shared view of reliability
- Provide early insight into service health

Tooling shift:

- Instrument metrics in a common way, like Prometheus
- Organization-wide SLO dashboards in Grafana
- Internal status page and catalog of services



Prometheus



Shifts in progress (3)

Culture shift:

- Enhance self-service methods / automation
- Reduce technical and support debt incurred during ramp-up

Tooling shift:

- Iterate and fix non-ideal implementations
- Channel more SRE support to JIRA for coordination to reduce reactionary or non-prioritized work through Slack



App Engine



Amazon EKS



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Shifts in progress (4)

Culture shift:

- Integrate and automate validation
- Ramp up the Test Automation team

Tooling shift:

- Run any and all tests in CI/CD pipelines, such as Blazemeter
- Integrate metrics and monitoring for analysis and rollbacks



Shifts in progress (5)

Culture shift:

- Integrate more cloud native technologies
- Think with the features and faults of the cloud in mind

Tooling shift:

- Use a service mesh and service catalog to do the heavy lifting
- Track and graph services to prevent "forgotten" dependencies



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The CNCF is doing good things

The NYT joined the CNCF to **invest in our own future**:

- Advocate and supporter of standard open tooling
- Gives us confidence when making choices
- Encourages best practices and vendor interoperability
- Sets quantitative targets for training and vendor support
- Rallies this large community to make active contributions

Join us



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Working at the NYT is an opportunity to be **an agent of change**:

- Work and build with standard open tooling
- Help us build trust and confidence into our systems
- Practice best practices
- Contribute back to this community

Jobs: **nyti.ms/technology**

Blog: **open.nytimes.com**

Thanks!



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Big shout outs to:

- The team members of Delivery Engineering who are not here today who did a lot of this work
- The product & developers at NYT, who are open to learning, changing, and actually executed the migrations to the cloud
- The leadership at NYT for dedicating the resources to do this

Jobs: nyti.ms/technology

Blog: open.nytimes.com

Questions?



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