

Inside Microsoft Engineering: DevOps Lessons



Gene Kim
@RealGeneKim



Following

.@edblankenship: "At Microsoft, we're 2 yrs into unifying our engr practices & tools; no more Windows vs Office vs everyone else"

RETWEETS

10

LIKES

8



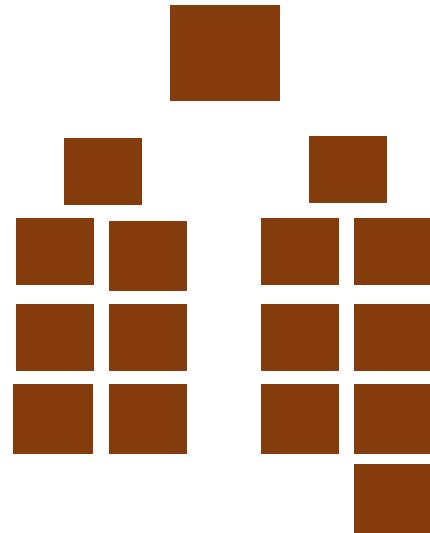
10:27 AM - 4 Mar 2016

Team Responsibilities

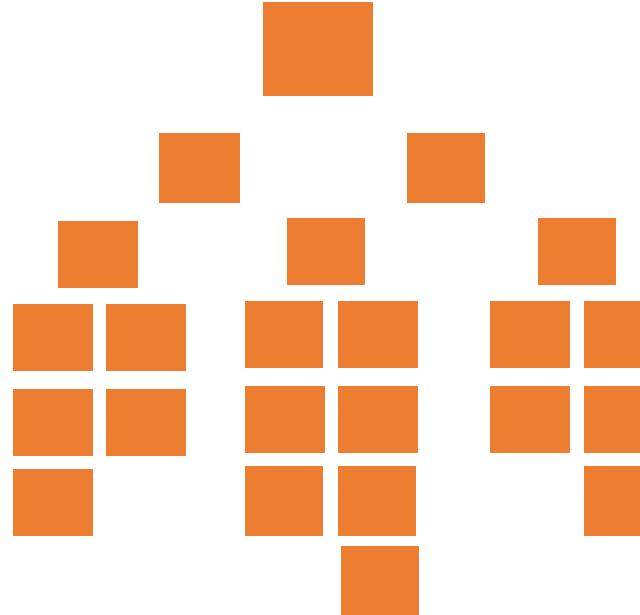
Organization Chart... before



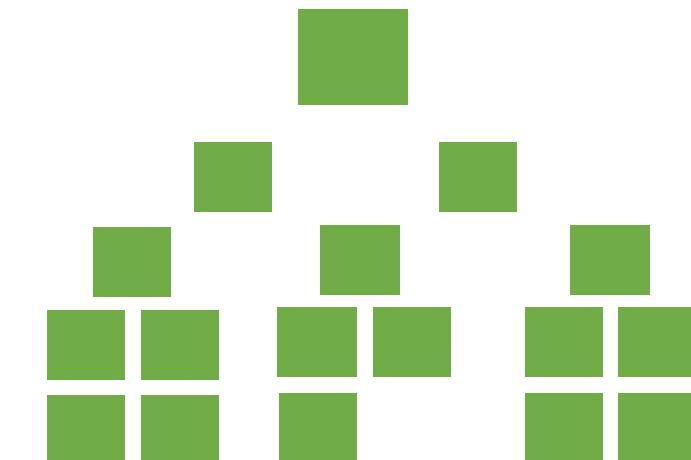
Program Management



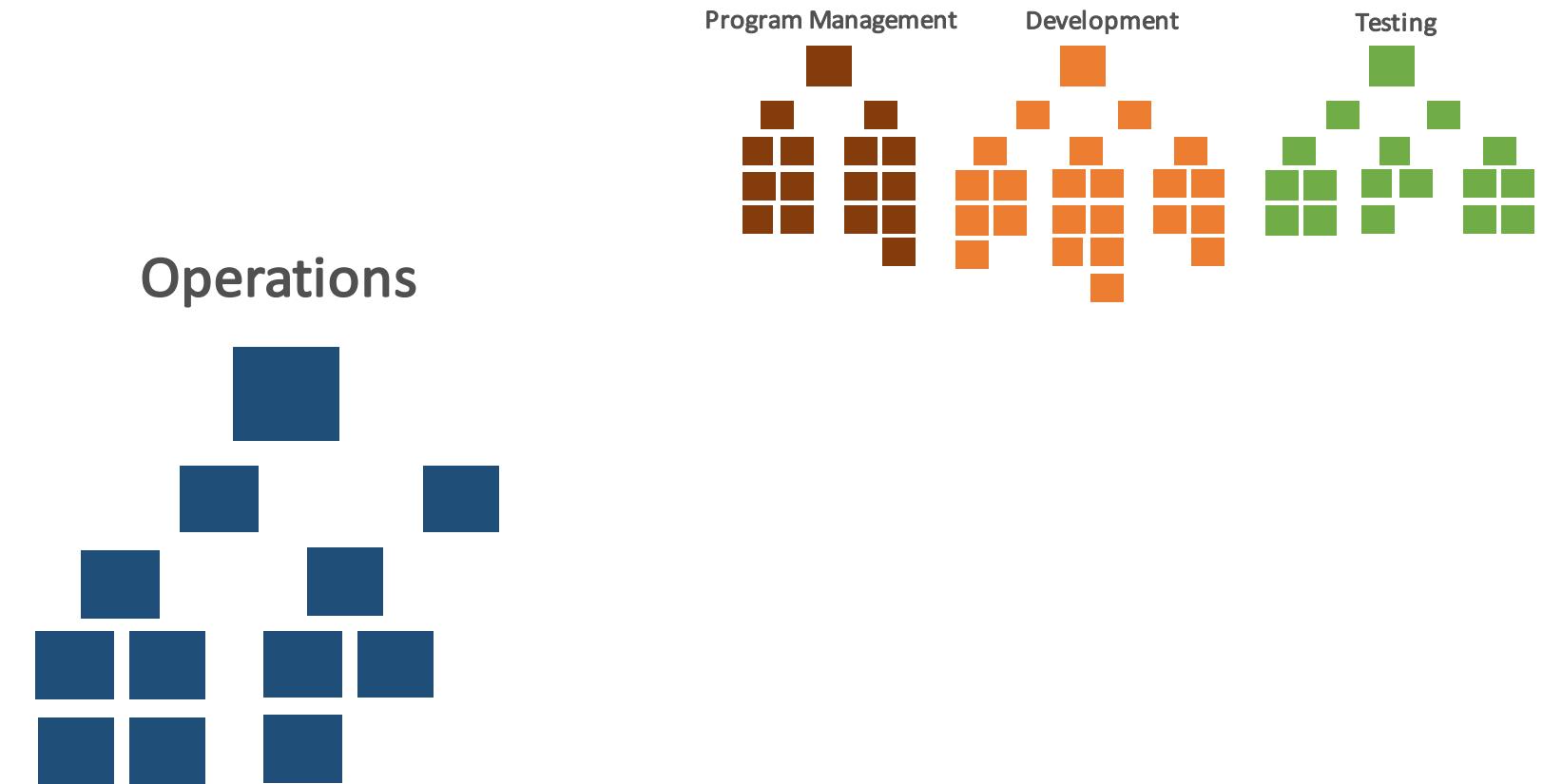
Development

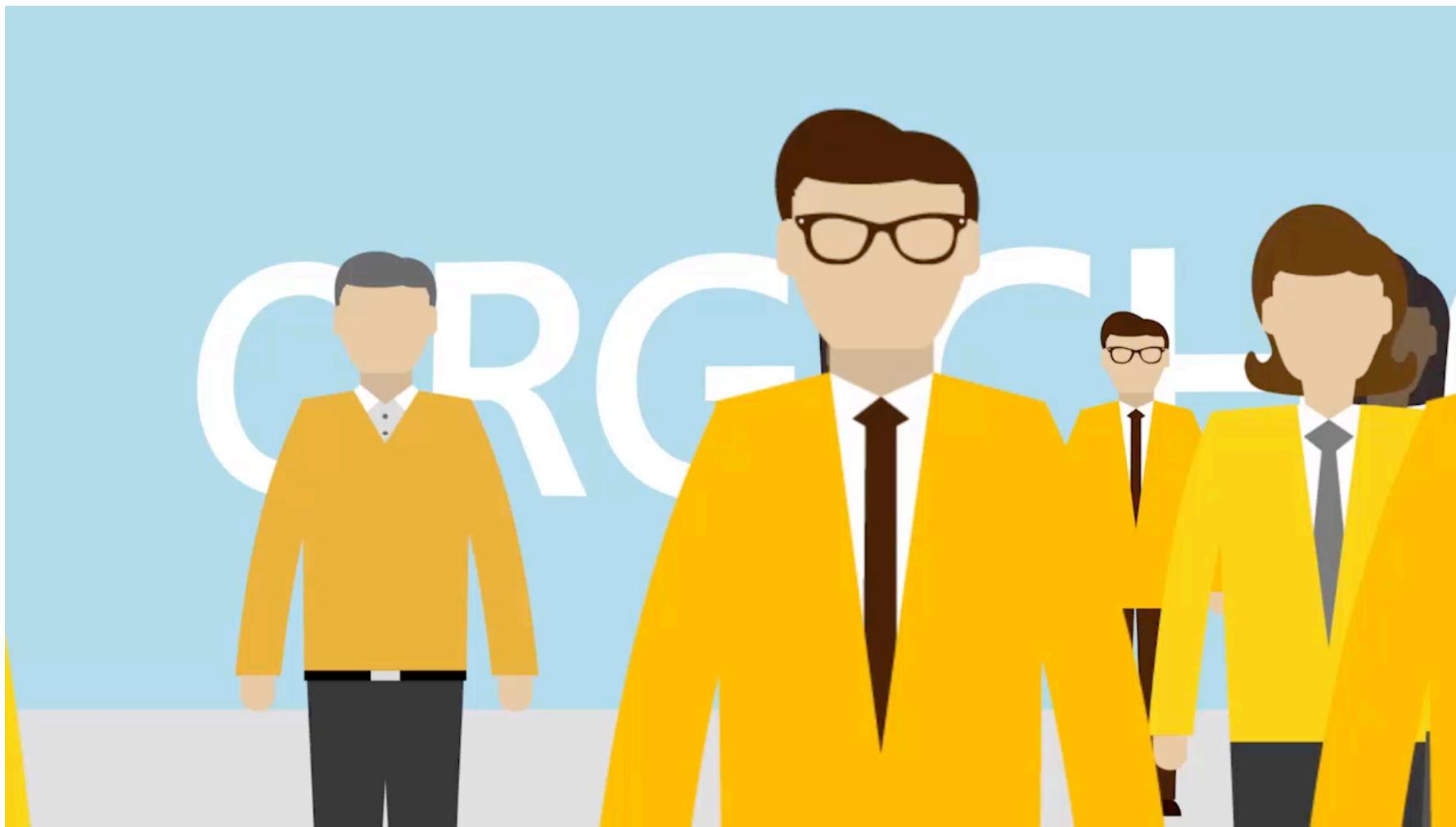


Testing



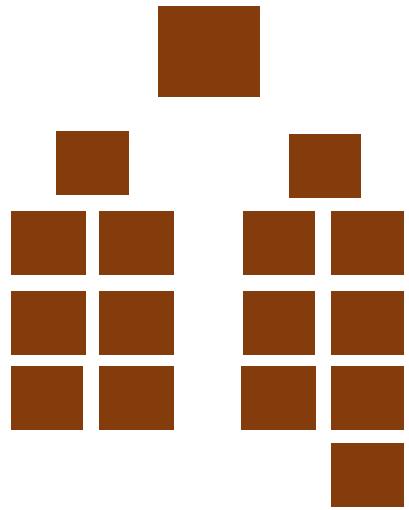
Organization Chart... before



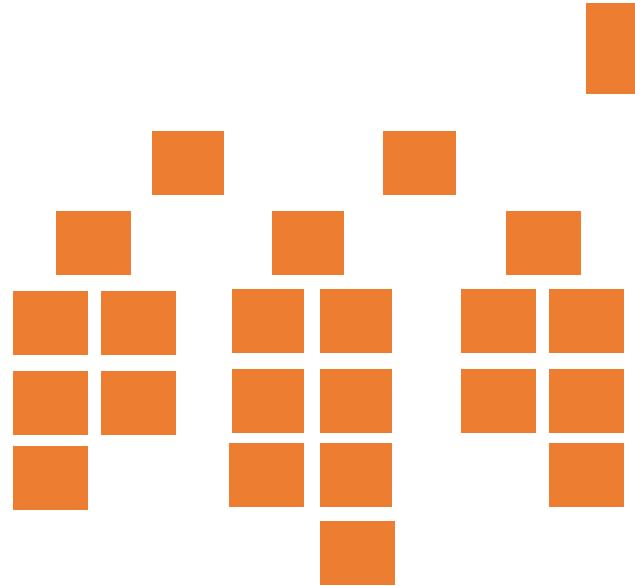


Organization Chart

Program Management



Engineering



Engineering



Operations

Feature Teams

Cross-discipline

10-12 people

Self managing

Autonomous backlog

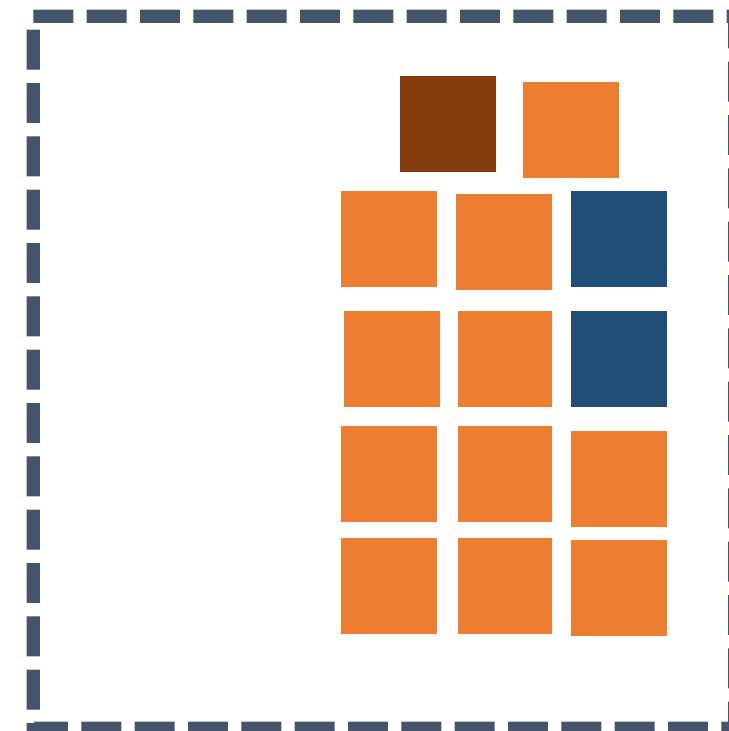
Intact for 12-18 months

4307 people

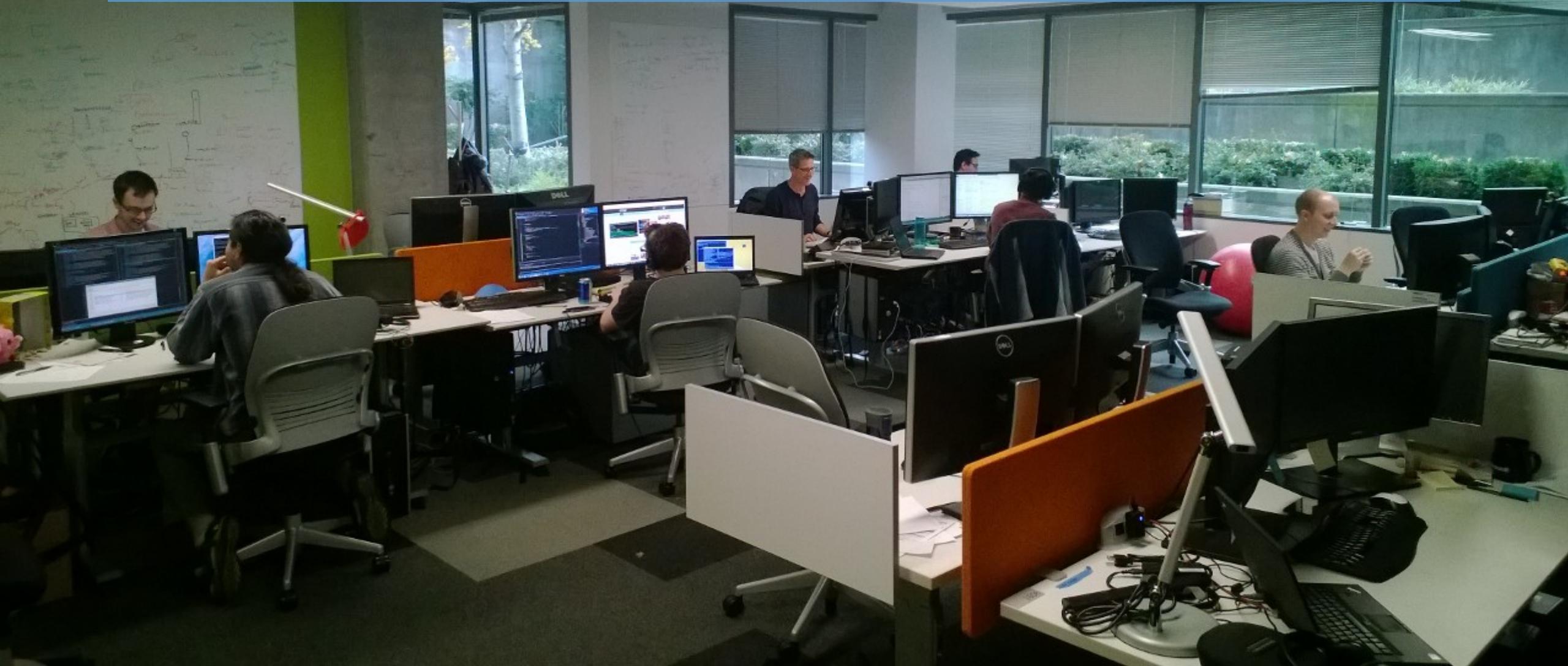
436 in Team Services

35 feature teams

Version control



Team rooms



OPERATIONAL CAPABILITY	PRE-DEVOPS TRADITIONAL OPS	NOW DEVOPS
Capacity Management	Ops	DevOps*
Live Site Management	Ops	DevOps*
Monitoring	Ops	DevOps**
Problem Management	Ops	DevOps*
Change Management	Ops	Dev**
Service Design	Dev & Ops	DevOps
Service Management	Ops	DevOps*

* This capability has been partially automated

** This capability has been majority or fully automated

"We are giving engineers the power — we are giving them control & authority over all of the parts of the software process.

You develop it, you test it, you run it. If something's wrong, you have the power to fix it."

Learnings & Benefits

Shared responsibilities

Shared accountabilities

Increased sense of accomplishment

Feature teams obsessed with understanding our customers

Decoupled services: clear contracts

Fully automated

Flighting Deployments

HOME CODE WORK BUILD TEST PACKA

Explorer

TFS - Prod Update | Edit

Releases Overview

Release ▾

Title

TFS - Prod Update 155

TFS - Prod Update 154

TFS - Prod Update 153

TFS - Prod Update 152

TFS - Prod Update 151

TFS - Prod Update 150

TFS - Prod Update 148

TFS - Prod Update 149

TFS - Prod Update 147

TFS - Prod Update 146

TFS - Prod Update 145

TFS - Prod Update 144

TFS - Prod Update 143

TFS - Prod Update 142

TFS - Prod Update 141

TFS - Prod Update 140

TFS - Prod Update 139

TFS - Prod Update 138

TFS - Prod Update 137

TFS - Prod Update 136

TFS - Prod Update 135

TFS - Prod Update 134

TFS - Prod Update 133

TFS - Prod Update 132

TFS - Prod Update 131

more releases...

Definition: TFS - Prod Update



Releases

Environments

Artifacts

Configuration

Triggers

General

History



Save



Release ▾

State All

Add environments

Ring 0

...

2 / 2 tasks enabled



1



Ring 1

...

2 / 2 tasks enabled



0



Ring 2

...

2 / 2 tasks enabled



0



Ring 3

...

2 / 2 tasks enabled



0



Add tasks

Prepare LightRail

Prepare LightRail



Command Line

Deploy Ring



By Description

g (VSCS) M98 deployment ring 0-2 201604...

g (VSCS) M97 daily hotfix ring 3 20160412.1

g (VSCS) M98 deployment ring 0-2 M98_20...

g (VSCS) M97 daily hotfix ring 2-3 2016040...

g (VSCS) M98 prod update ring 0-1

g (VSCS) M98 hotfix ring 0 20160408.12

g (VSCS) M97 daily hotfix 20160408.1

g (VSCS) M98 ring 0 20160408.1

g (VSCS) M98 hotfix ring 0 20160407.15

g (VSCS) M98 hotfix ring 0

g (VSCS) Daily hotfix M97 20160407.4

g (VSCS) M98 Deployment Ring 0

g (VSCS) M97 daily hotfix 20160406.2 ring ...

g (VSCS) M97 Daily hotfix 20160406.2

g (VSCS) M97 Daily hotfix 20160405.3

g (VSCS) M97 Hotfix 20160404.1

li M97 daily hotfix.

li M97 daily hotfix with Garima's fix.

li M97 daily hotfix.

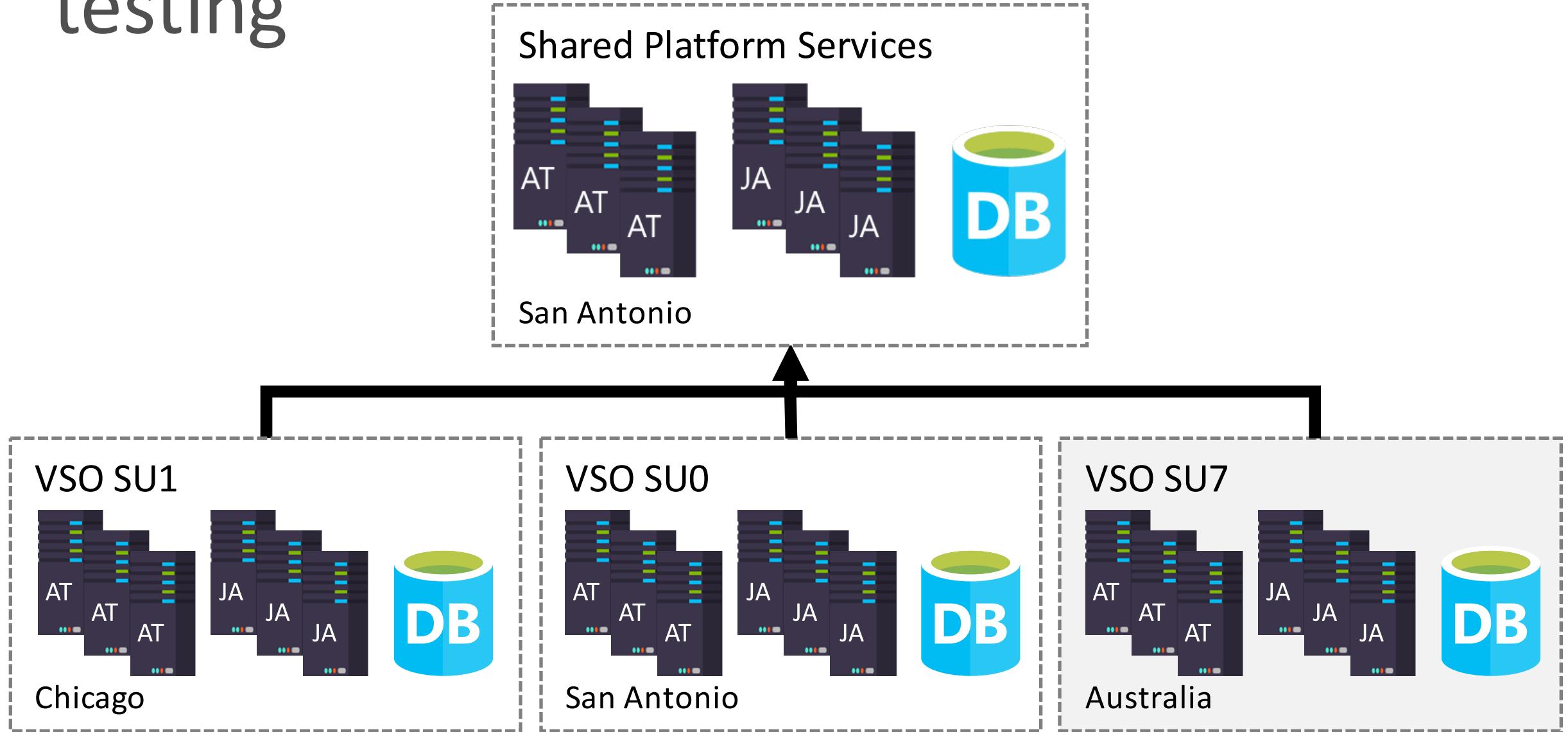
li M97 hotfix to all rings.

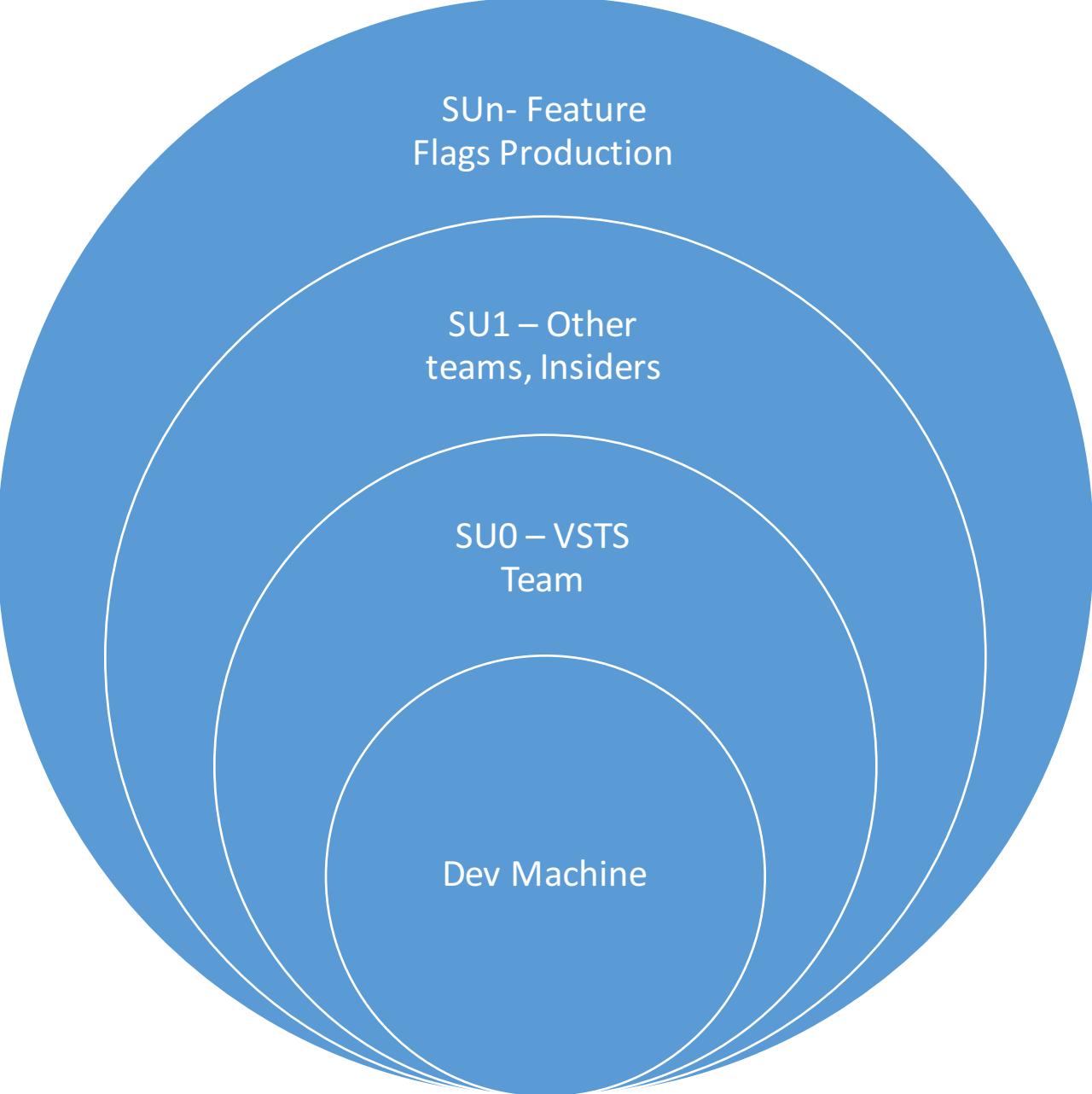
li M97 hotfix to all rings.

li M97 deploy to ring 3 with Hao's h...

li M97 hotfix deploy with Hao's cha...

Multiple scale units enable canary testing





SUn- Feature
Flags Production

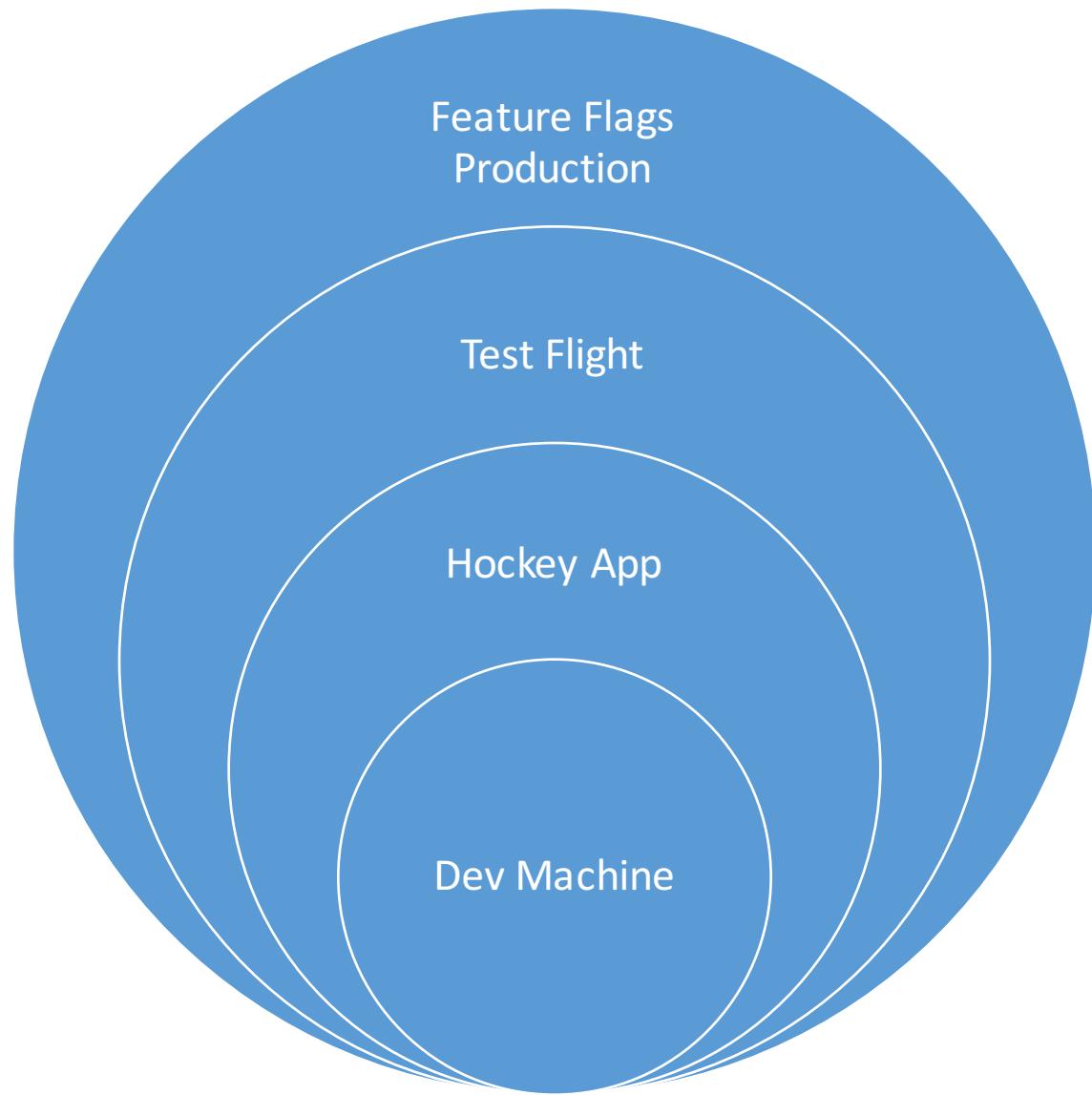
SU1 – Other
teams, Insiders

SU0 – VSTS
Team

Dev Machine

Automated builds to phones

iOS Dogfood with HockeyApp Edit						
	Queued	Completed	Deleted	Filter by tags: Add...		
	Queue build...					
#	🕒 ⓘ	Name	Build Definition	Source Branch	Source Version	Date Completed
1	🕒	iOSDaily_ship_build_20160317.1	iOS Dogfood with HockeyApp	refs/heads/master	Commit 839c20	21 hours ago
2	🕒	iOSDaily_ship_build_20160316.1	iOS Dogfood with HockeyApp	refs/heads/master	Commit 2c163e	Wednesday
3	🕒	iOSDaily_ship_build_20160315.3	iOS Dogfood with HockeyApp	refs/heads/master	Commit aeb26a	Tuesday
4	🕒	iOSDaily_ship_build_20160315.1	iOS Dogfood with HockeyApp	refs/heads/Ship	Commit 8c233a	Tuesday
5	🕒	iOSDaily_ship_build_20160314.1	iOS Dogfood with HockeyApp	refs/heads/Ship	Commit 5d841d	Monday
6	🕒	iOSDaily_ship_build_20160311.1	iOS Dogfood with HockeyApp	refs/heads/Ship	Commit 79f957	3/11/2016
7	🕒	iOSDaily_ship_build_20160310.1	iOS Dogfood with HockeyApp	refs/heads/Ship	Commit 53b267	3/10/2016
8	🕒	iOSDaily_ship_build_20160309.1	iOS Dogfood with HockeyApp	refs/heads/Ship	Commit c763e8	3/9/2016
9	🕒	iOSDaily_ship_build_20160308.1	iOS Dogfood with HockeyApp	refs/heads/Ship	Commit 3a237c	3/8/2016
10	🕒	iOSDaily_ship_build_20160307.1	iOS Dogfood with HockeyApp	refs/heads/Ship	Commit b9d09d	3/7/2016
11	🕒	iOSDaily_ship_build_20160304.1	iOS Dogfood with HockeyApp	refs/heads/master	Commit 5ba902	3/4/2016
12	🕒	iOSDaily_ship_build_20160303.1	iOS Dogfood with HockeyApp	refs/heads/master	Commit 70c331	3/3/2016
13	🕒	iOSDaily_ship_build_20160302.1	iOS Dogfood with HockeyApp	refs/heads/master	Commit fd611b	3/2/2016
14	🕒	iOSDaily_ship_build_20160301.1	iOS Dogfood with HockeyApp	refs/heads/Ship	Commit a2ade2	3/1/2016
15	🕒	iOSDaily_ship_build_20160229.1	iOS Dogfood with HockeyApp	refs/heads/Ship	Commit 8c89e1	2/29/2016



Carrier



12:53 AM



Settings Feature Ramping

Email In Outlook



FindChanges for Backup



In App Purchase



Local Thumbnail



Notifications Upsell



Push Notifications



Send Feedback



Shake to Send Feedback



Shortcut Items



Team Sites Preview



What's New



Learnings & Benefits

Controls exposure

Supports early feedback, experimentation

Test with your own team first

Granular

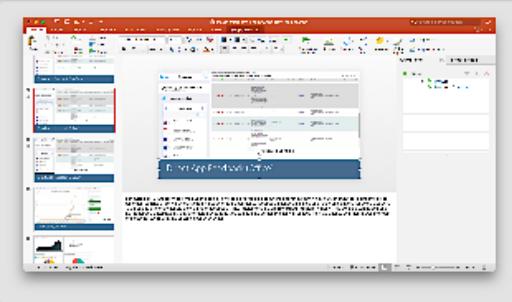
*Learning from
Customers:
Direct Feedback*

Direct Feedback (Office)

Send Feedback

1 We appreciate your feedback. What did you like?

2 Include screenshot



3 Include email address

Add email address

 Send

We'll only send this data when you have an internet connection. We may not be able to respond to you personally, but we do review every comment.

[Privacy Statement >](#)

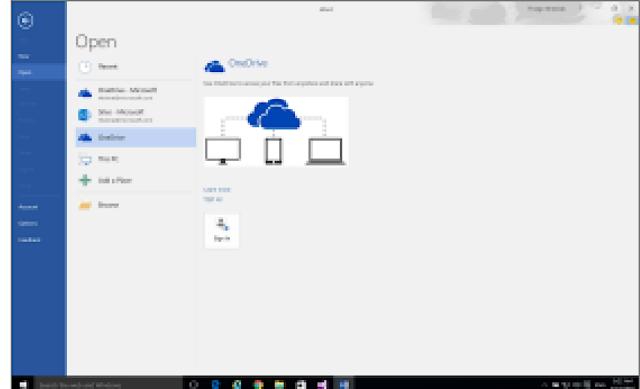
Customer ID: j0S7MyBCQK66wEoK8s1sKoE2QFTCRt6o43k9B3Rd400

Session ID: 87F259C0-0006-4F30-A4DC-E018E9760332

Microsoft Office Feedback

We appreciate your feedback. Is there something we can do better?

Include screenshot



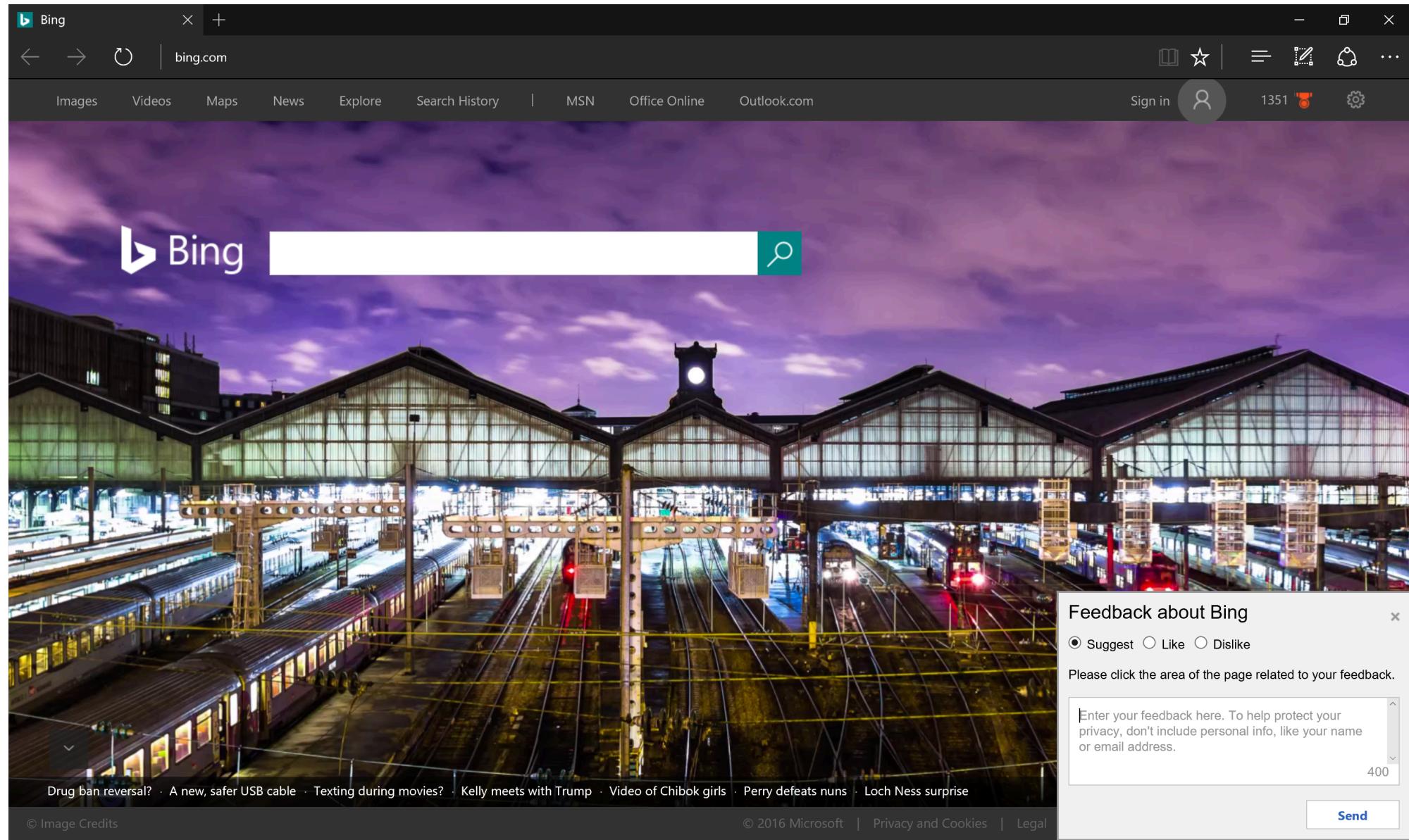
Include email address  Add email address

 Send a Frown

Thank you for taking the time to send us feedback! We may not have the time to respond to each piece of feedback, but we will work hard to make sure it is reviewed. Interested in how we use your feedback?

[Your privacy is important to us](#)

Direct Feedback (Bing)



Direct Feedback (Azure Portal)

Preview UI Microsoft Azure

Report bug Search resources

scott.gu2016@outlook.com MICROSOFT

Dashboard

New

- Resource groups
- All resources
- Recent
- App Services
- Virtual machines (classic)
- Virtual machines
- SQL databases
- Cloud services (classic)
- Subscriptions
- Stream Analytics jobs
- IoT Hub
- Storage accounts
- Data factories
- Event hubs
- Machine learning works...
- Application Insights
- Team Services accounts
- Browse >

mydriving AZURE IOT HUB

4/14/2016 UTC MYDRIVING

MESSAGES 10906 / 400k

DEVICES 9313

3% TOTAL

Active

mydriving-archive STREAMING JOB

Input Events and Output Events past week

15K

10K

5K

0K

Apr 9 Apr 11 Apr 13

Events MYDRIVING-DF

8

6

4

2

0

Apr 7 Apr 8 Apr 9 Apr 10 Apr 11 Apr 12 Apr 13

mydriving-ext SERVICE FABRIC CLUSTER

mydriving-hourlypbistreaming job

mydriving-mydriving MOBILE APP

Running

mydrivinglogs

Total egress

600MB

400MB

200MB

0MB

12 PM 6 PM Apr 14

Average E2E latency

300

200

100

0

12 PM 6 PM Apr 14

MYDRIVINGDB

Resource utilization MYDRIVINGDB

100%

50%

0%

8:30 AM 8:45 AM 9 AM 9:15 AM

World map showing resource locations

Send us feedback

Thank you for taking the time to give us feedback about the Azure portal.

Are you satisfied with your experience?

Smiley face Sad face

Tell us about your experience...

Include a screenshot

Yes, it's OK to email me about my feedback.

Privacy

Submit feedback

Direct Feedback (OneDrive mobile)

The screenshot illustrates the process of submitting direct feedback from the OneDrive mobile app to the Parature Console.

OneDrive Mobile App (Left):

- Carrier: WiFi, Time: 1:07 AM, Battery: Full.
- Top bar: "Contact Us" and "Send".
- Text input field: "I can't find 'Presentation.pptx' that Peter shared with me."
- Checkmark button: "Include screenshot".
- Recent Docs section:
 - OneDrive Mobile Team (1/14/15, 10:32 AM • 616.41 MB)
 - BoletoElectronico (12/24/14, 10:05 AM • 558 KB)
 - CodingStandards (4/25/11, 12:39 AM • 99 KB)
 - Drive Representation (3/1/16, 2:51 PM • 115 KB)
 - To Do List (3/8/14, 11:58 AM • 208 KB)

Parature Console (Right):

Ticket List - Dogfood Feedback-iOS (15)

Ticket #	Add your comment	Date Created	Assigned To	Full Name	Product Version	Major Endpoint	Applica
30099-232231	Doesn't make sense to have an Add Items option. Should be Upload. My eyes and mental model are looking for the words Upload and any button starting with U. Upload is a consistent term used in all apps especially file storage apps. This should be a bug.	02/21/2016 5:10 PM PST	Eric Mao	hangquan adhoc	iOSDaily_ship_build_20160218.5	iOS alpha	
30099-231523	Shake to send feedback is cool	02/20/2016 4:16 PM PST	Eric Mao	hangquan adhoc	iOSDaily_ship_build_20160218.5	iOS alpha	
30099-231522	Your offline file icon does not symbolize offline. If you were to take away the words Offline and had someone guess what that icon meant. No one would get it	02/20/2016 4:16 PM PST	Eric Mao	hangquan adhoc	iOSDaily_ship_build_20160218.5	iOS alpha	
30099-226570	Not sure if this is expected but my photos aren't uploading in the background. I need to launch the client to get them discovered and uploaded.	02/15/2016 3:25 AM PST	Andras Gaal	iOSDaily_ship_build_20160212.1		iOS alpha	

Parature Console

Visual Studio 2015

New and returning users may [sign in](#)

Welcome to the Visual Studio 2015 UserVoice site. This site is for suggestions and ideas for the IDE of Visual Studio (Community, Professional or Enterprise). You can also add suggestions for [Team Services](#) or [Visual Studio Code](#). Or go to [Connect](#) to file a bug.

We also added an [Announcements](#) section where we will be posting special opportunities for you to participate in.

Read about current UserVoice statuses and their definitions in our article "[What Does the Status of My Feedback Mean?](#)" article.

We look forward to hearing from you!

The Visual Studio team

[Terms of Service and Privacy Policy](#)

I suggest you ...

Enter your idea

Hot

Top ideas

New

Category

Status

My feedback

23,269
votes

[Vote](#)

XNA 5

Please continue to work on XNA. It's a great way for indie game developers like myself to make games and give them to the world. XNA gave us the ability to put our games, easily, on the most popular platforms, and to just dump XNA would be therefor heartbreaking... I implore you to keep working on XNA so we C# developers can still make amazing games!

370 comments · Games · Flag idea as inappropriate...

16,224
votes

[Vote](#)

Allow .NET games on Xbox One

Yesterday was announced that Xbox One will allow indie developer to easily publish games on Xbox One.

Lots of indie developers and small game company are using .NET to develop games. Today, we are able to easily target several Windows platforms (Windows Desktop, Windows RT and Windows Phone 8) as well as

Visual Studio 2015

[Post a new idea...](#)

All ideas

My feedback

.NET 604

Accessibility 26

Application Insights 1

Blend for Visual Studio 31

Cloud 61

Debugging and Diagnostics 356

Extensibility 134

Games 32

IDE and Editor 2452

Install 73

Languages - C# 603

Languages - C++ 212

Languages - F# Tools 63

Languages - JavaScript 55

Languages - Other 42

Languages - Visual Basic 244

LightSwitch 202

Mobile App Development 88

Performance 88

Project 204

SQL Server Data Tools 122

Test Tools 185

User Interface 153

Visual Studio Tools for Unity 39

VS Emulator for Android 22

Windows 8 Apps 109

Windows Azure Tools 18

Learnings & Benefits

Increase in quality

Helps develop a community

Direct feedback from customers

Feature teams obsessed with understanding our customers

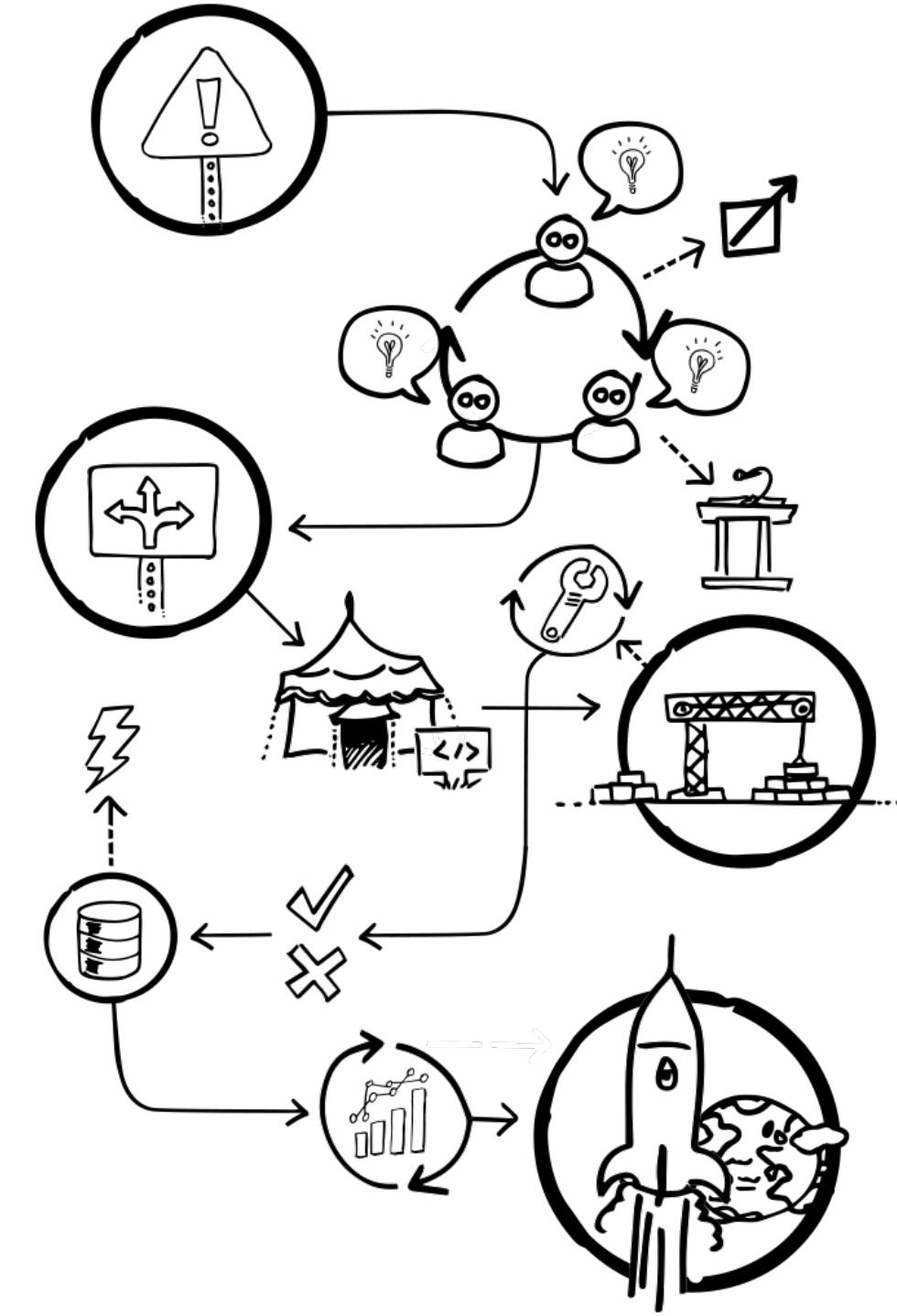
Increased customer satisfaction

Idea Velocity

Growth Hacks

BingCubator

Hack Days





//oneweek



Hackathon

Hackathon 2015 Grand Prize Winner

OneNote for Learning

The free add-on makes it easier for teachers to improve all students' reading and writing, including those with disabilities like dyslexia.



TEAM

HACK VENUE

USA - Redmond, WA Hack Tents

PRIMARY CUSTOMER

Students/Teachers/Schools

PROJECT KEYWORDS

Immersive, Reading, Writing, Dyslexia

Learning Tools for OneNote, Microsoft OneNote, Dyslexia, ADD, IEP

OneNote

Learning Tools for OneNote

Increasing comprehension for every student

Students become independent readers

Teachers get more instructional time

Get Started Now



Learning Tools for OneNote Customer Preview

Making it easier to read and write

The Learning Tools for OneNote help everyone improve their reading and writing skills, including gifted learners, students with learning differences or a combination of any of the broad range of unique student abilities.

"Students spend so much energy decoding that they can't focus on content. This tool will help making learning more efficient."

Joel Reese, teacher Sammamish High School

[Learning Tools For Microsoft OneNote May Be One Of The Most Disruptive Education Technologies Yet](#)
Jordan Shapiro, Forbes Magazine

[Learning Tools for OneNote - Top Dyslexia apps of 2016](#)
Drs. Brock and Fernette Eide, leading Dyslexia authors and researchers

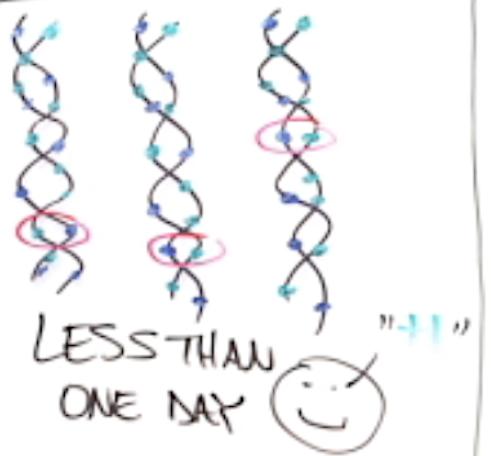
[Download Learning Tools Add-In](#)

[Other download options](#)



FROM IDEA TO USER!

PART 1: PROTOTYPING



PART 2: IMPLEMENTING

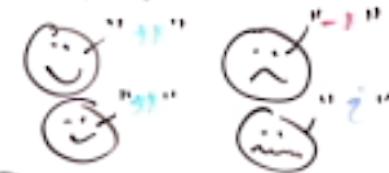
HELLOCS
[CUSTOMER.DELIGHT()];

WORLDCS
[CUSTOMER.DELIGHT()];

VARIABLES BY
FEATURE

PART 3: SUBMISSION

REVIEW



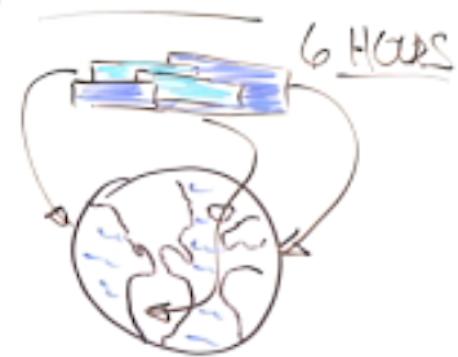
BUILD



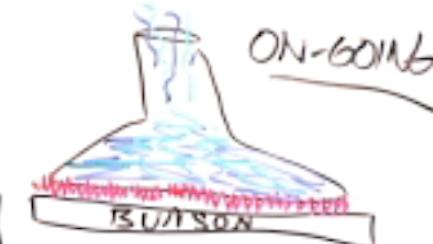
VALIDATE



PART 4: DECK



PART 5: EXPERIMENT



*It's not about getting
code to production,
it's about getting
ideas into production*

- Craig Miller, Bing -

Requirements

Must have a culture that supports creativity

Must have infrastructure that makes code creation fast/easy/empowering

Must have an experimentation capability to try out 1000s of ideas

Must have an analysis capability to validate ideas

Must be ready to fail, a lot

Must be committed to doing it sustainably

Live site first culture in place already, and reinforce it

Have a metrics culture to assess real progress and not just intuition (data > opinion)

Learnings & Benefits

Eliminate HIPPO (Highest Paid Person Override), empowers individuals

Product decisions made from real customer data

Improves continuous delivery, testing at scale, and telemetry of solutions

Incentivizes creativity

*Learning from
Customers:
Experimentation &
Telemetry*



amazon



ALSO TRY: Walmart · Target · Netflix

202,000,000 RESULTS Any time ▾

Ad related to amazon

[Amazon.com® Official Site - Huge Selection and Amazing Prices.](#)[www.Amazon.com · Official Site](#)

Free Shipping on Orders Over \$25

[Amazon Prime](#)[Prime Instant Video](#)[Join Amazon Student](#)[Rent Textbooks](#)[Download eTextbooks](#)[Kindle Store](#)[Amazon.com: Online Shopping for Electronics, Apparel, Computers ...](#)[www.amazon.com · Official site](#)

Customer service 866-216-1072

Online shopping from the earth's biggest selection of books, magazines, music, DVDs, videos, electronics, computers, software, apparel & accessories, shoes, jewelry ...

Books

Shop online for millions of new and used books

Music

Browse best sellers, new releases, deals, vinyl records, MP3s, and ...



amazon



ALSO TRY: Walmart · Target · Netflix

202,000,000 RESULTS Any time ▾

Ad related to amazon

[Amazon.com® Official Site - Huge Selection and Amazing Prices.](#)[www.Amazon.com · Official Site](#)

Free Shipping on Orders Over \$25

[Amazon Prime](#)[Prime Instant Video](#)[Join Amazon Student](#)[Rent Textbooks](#)[Download eTextbooks](#)[Kindle Store](#)[Amazon.com: Online Shopping for Electronics, Apparel, Computers ...](#)[www.amazon.com · Official site](#)

Customer service 866-216-1072

Online shopping from the earth's biggest selection of books, magazines, music, DVDs, videos, electronics, computers, software, apparel & accessories, shoes, jewelry ...

Books

Shop online for millions of new and used books

Music

Browse best sellers, new releases, deals, vinyl records, MP3s, and ...

Figure 1: Font color experiment. Can you tell the difference?



Create a Visual Studio Online Account

Create your first team project

Welcome. Your account, [REDACTED] is created and ready to go. Now create your first team project where you'll host your code and backlog. [Learn more](#)

Project name:

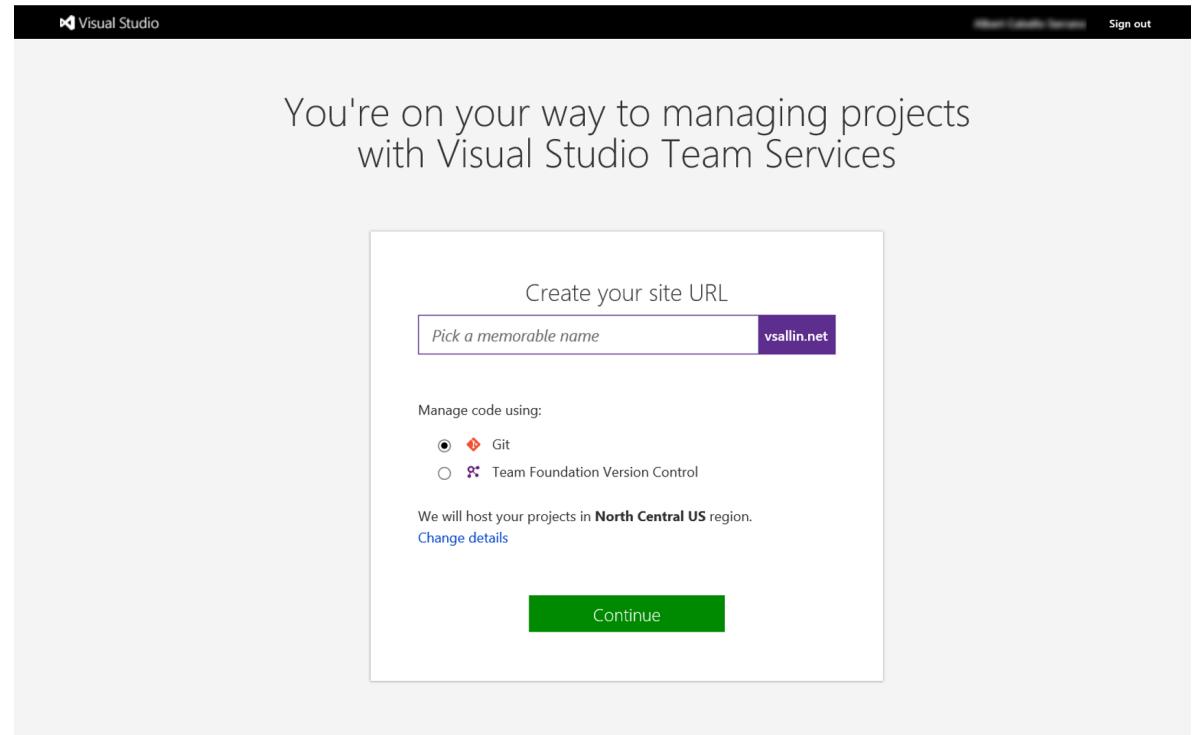
Process template:

Version control: Team Foundation Version Control Git

Need help deciding?

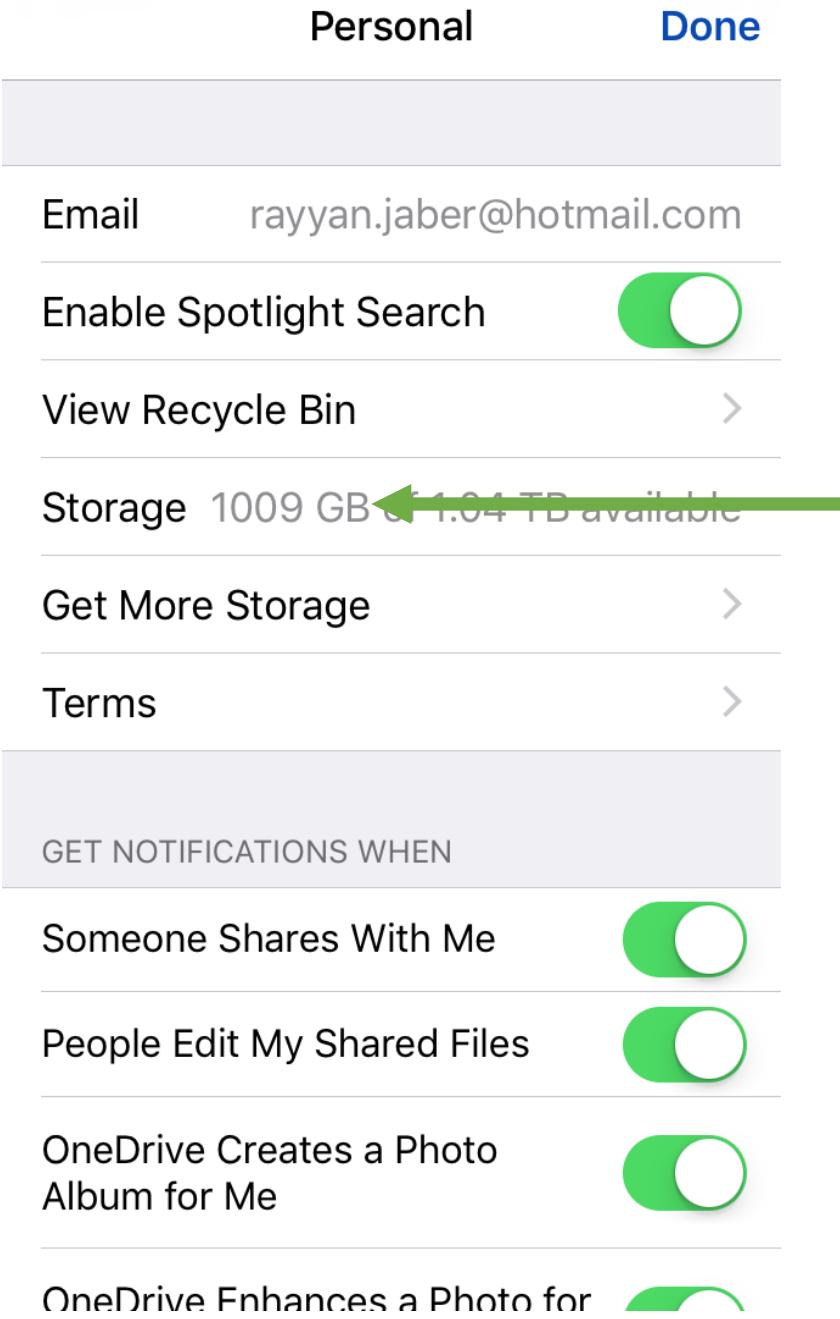
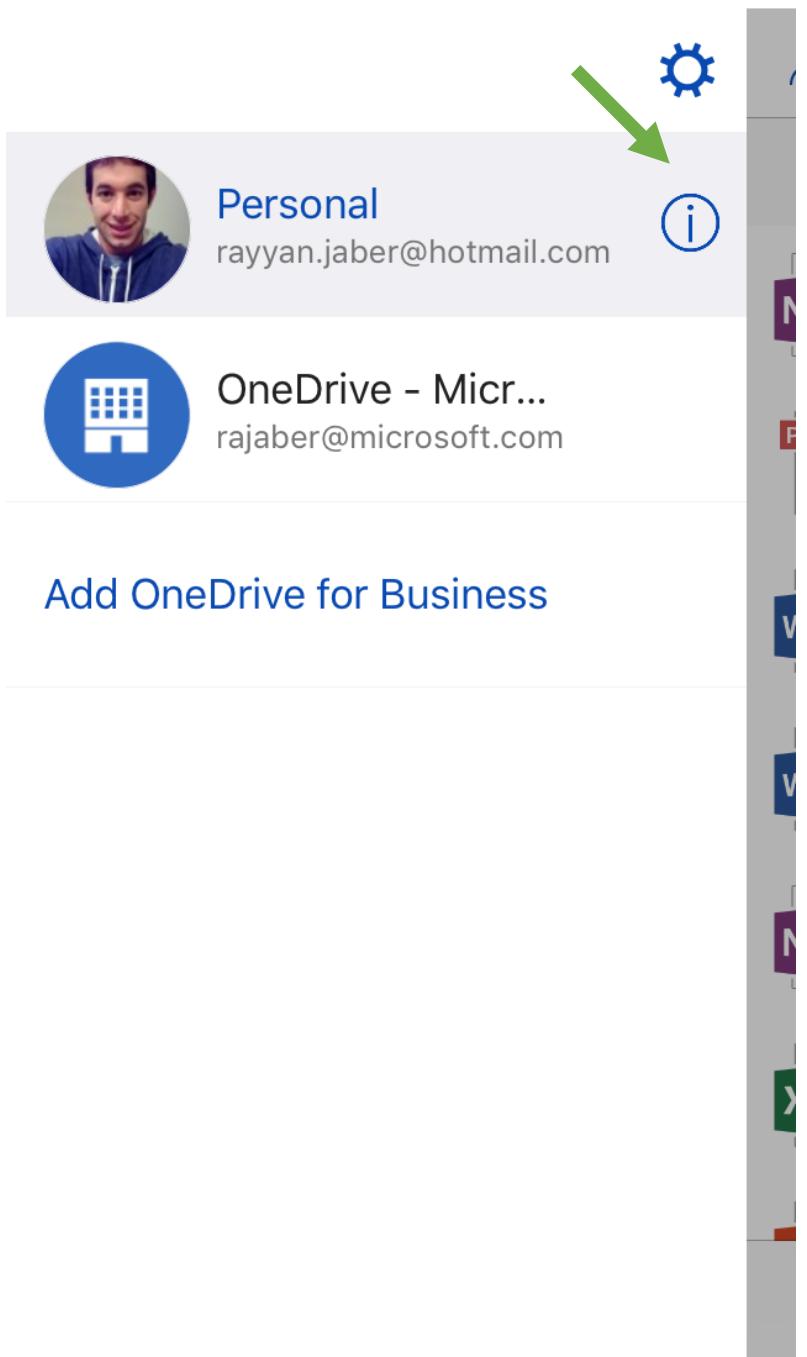
Give your team project a name like 'calculator', or 'team awesome'. Use **Agile** if your team tracks development and test activities separately, or wants to compare estimated and completed hours to actuals. Use **Scrum** if your team practices Scrum or wants to minimize their planning and tracking overhead. Choose **CMMI** when your team follows more formal project methods that require a framework for process improvement and an auditable record of decisions. Git is the most lightweight Version Control to use. Local changes are shared with other developers by pushing and pulling changes through a remote, shared repository. Use **Team Foundation Version Control** if you want a centralized server repository to track and version files. Local changes are always checked in the central server. Still not sure what options to choose? Find out which [process template](#) and [version control](#) you should use.

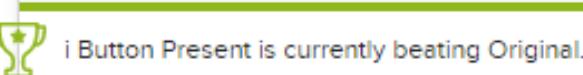
Create project



Existing experience Baseline:
36% conversion to project

50% to 100% customers
conversion to project (+18%)

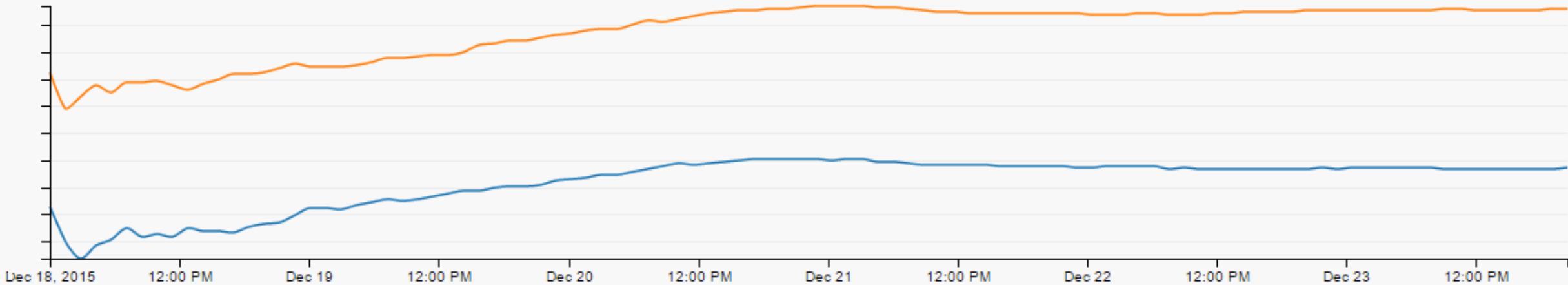




Launch...

Conversion Rate ▾

View Annotations



Dec 18, 2015 12:00 PM Dec 19 12:00 PM Dec 20 12:00 PM Dec 21 12:00 PM Dec 22 12:00 PM Dec 23 12:00 PM

[click and drag on the chart below to zoom in]



Dec 18, 2015 12:00 PM Dec 19 12:00 PM Dec 20 12:00 PM Dec 21 12:00 PM Dec 22 12:00 PM Dec 23 12:00 PM

VARIATION	UNIQUE CONVERSIONS VISITORS	CONVERSION RATE	DIFFERENCE INTERVAL	IMPROVEMENT	STATISTICAL SIGNIFICANCE STATUS
Original			---	---	---
i Button Present				+50.3%	>99% winner

data > opinion

Learnings & Benefits

Know if features are useful and successful

Reduction in technical debt

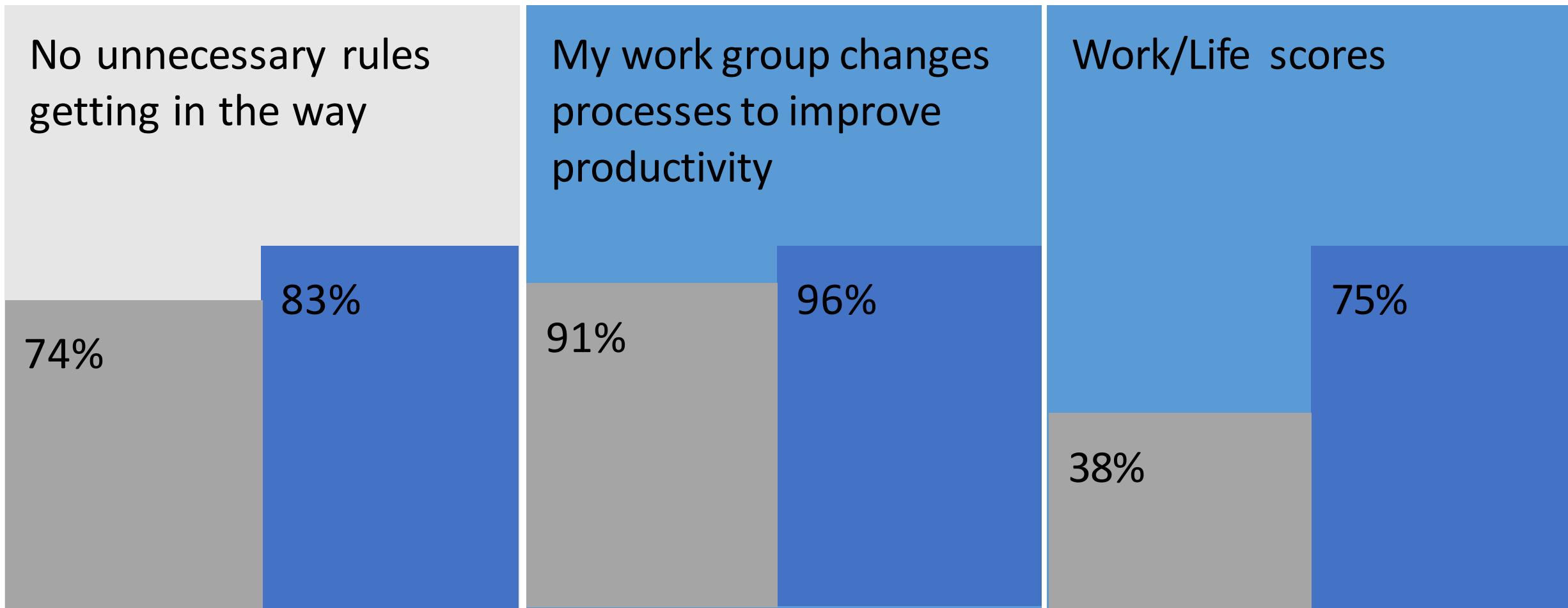
Prioritize features/platforms to no longer support

Faster determination of service or app problem

Capture all unexpected error scenarios

Instrument any major changes to see impact

Developer happiness



Thiago Almeida

@nzthiago

<http://talmeida.net>

Stop by the Microsoft booth!

<http://aka.ms/DevOpsDimension> - DevOps Dimension Show on @CH9

<http://aka.ms/EngineeringStories> - Microsoft engineering stories

<http://aka.ms/VSTSinfo> - Visual Studio Team Services

<http://exp-platform.com> - Bing experiments



GET THESE SLIDES: <http://aka.ms/DoDLondon16>