

Cross-platform Cloud-enabled Apps: Xamarin & Azure

Nasser AlNasser

Senior Technical Evangelist - Microsoft

email: naalnas@microsoft.com

twitter: @nasser



Agenda

Mobile development challenges

Native Android, iOS and Windows applications

Create mobile experiences

Connected to the cloud

Faster development cycles



Mobile represents
the single largest
technology
innovation of all time



Smartphone adoption is happening

10X

Faster than
the PC boom
of the 80s

2X

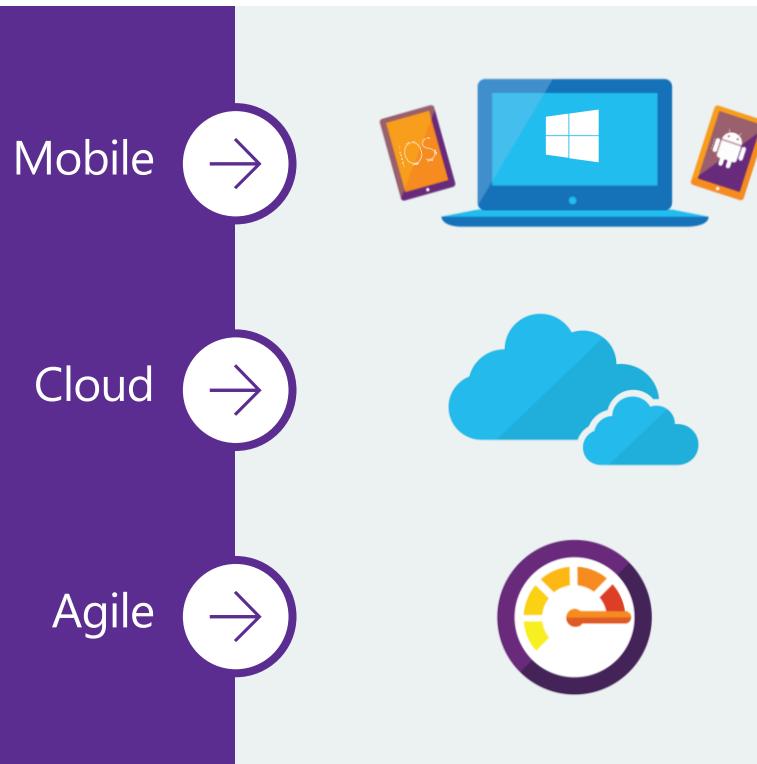
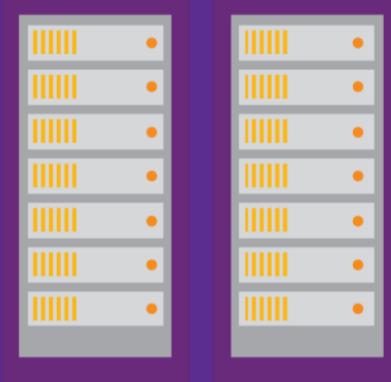
Faster than the
Internet boom
of the 90s

3X

Faster than the
recent social
networking
explosion

Mobile apps are part of a broader modernization

Core-business
Applications



Extend to any device

Take advantage
of cloud scale
and economics

Business agility

How Microsoft can help



Create mobile experiences...

New applications or new end points to existing applications for **Android, iOS, and Windows**

Xamarin
Visual Studio



...connected to the business...

Enterprise-ready platform that integrates modern mobile experiences with **existing business assets**

Microsoft Azure



...with mobile-era agility

Achieve speed with **faster development cycles** and continuous measure and learn

Visual Studio Team Services
HockeyApp

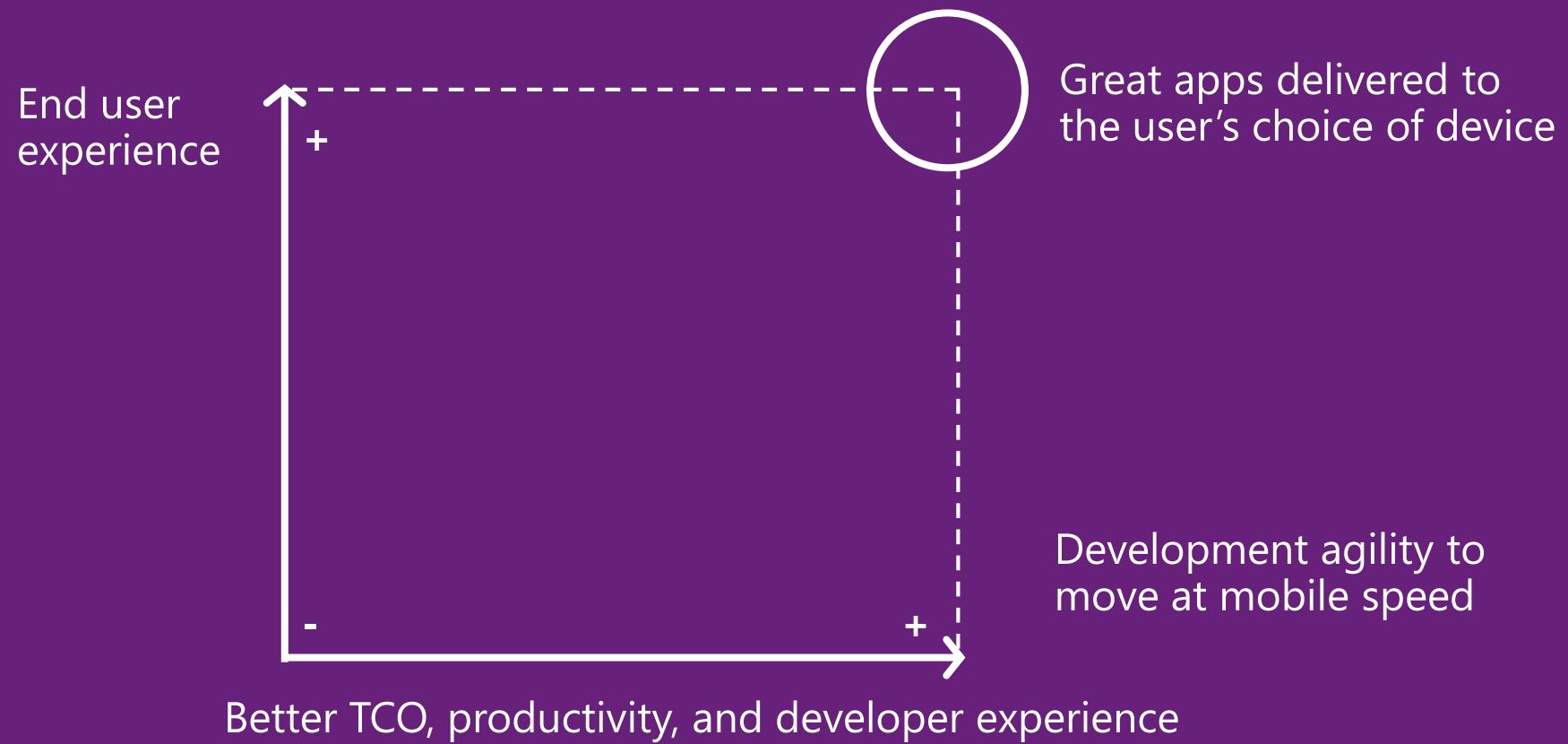
Enterprises are
going mobile on
multiple platforms

According to **Gartner**,
by 2016, 70% of the
mobile workforce will
have a smartphone,
and **90% of enterprises**
will have **two or more**
platforms to support



Cross-platform mobile
strategy choices

Sweet spot for the successful mobile enterprise



Silo'ed approach

Building native apps
multiple times means

Client development is completely
different for each device type

Only the Services (server-side) can be
reused, with certain differences when
consuming them

TCO grows exponentially

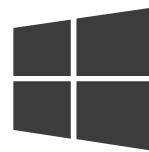
iOS



Objective-C, Swift
XCode



Java
Eclipse



C#, JS, C++
Visual Studio

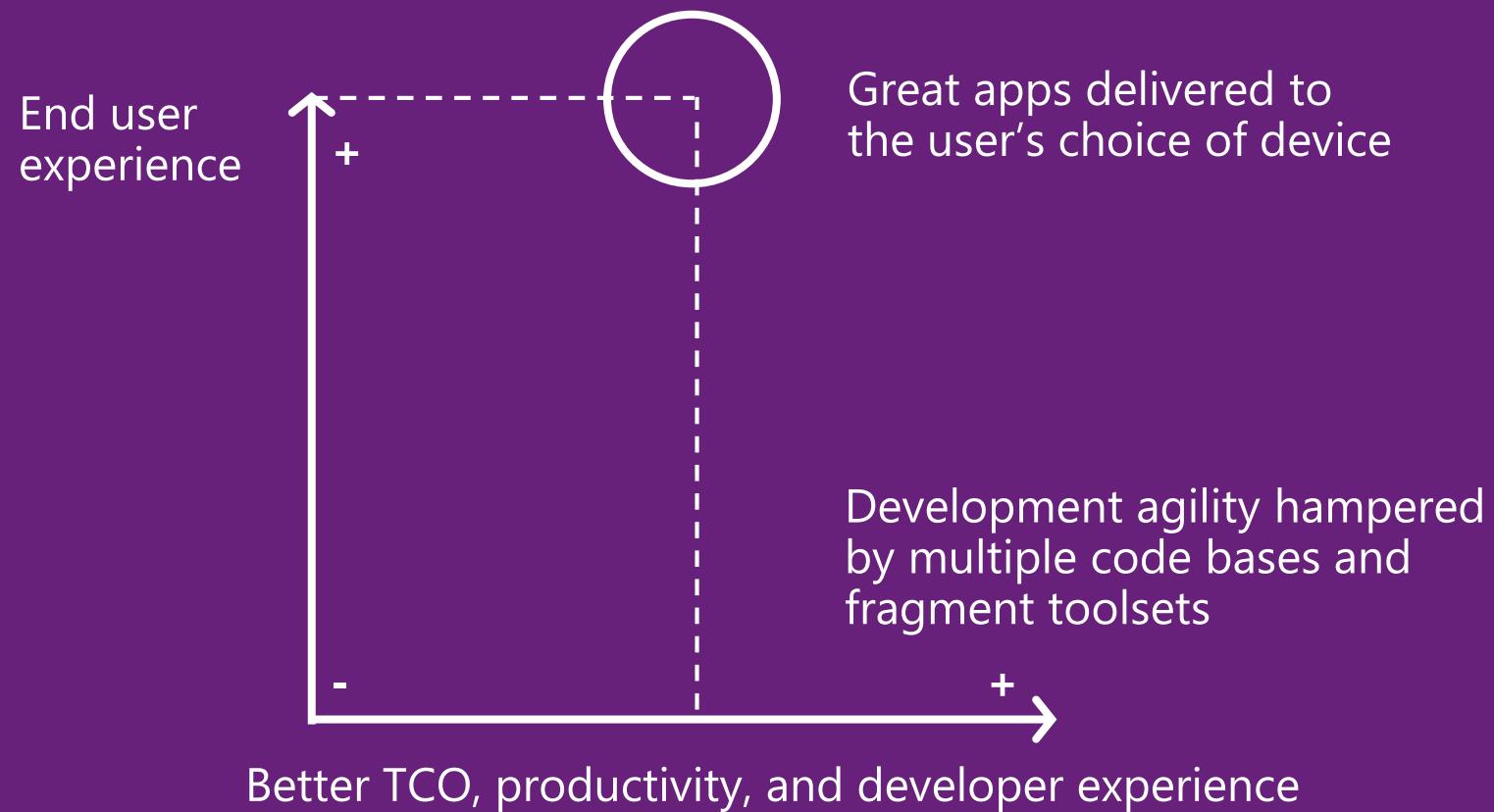
The *Silo'ed* approach

Multiple teams and multiple code bases are expensive and slow

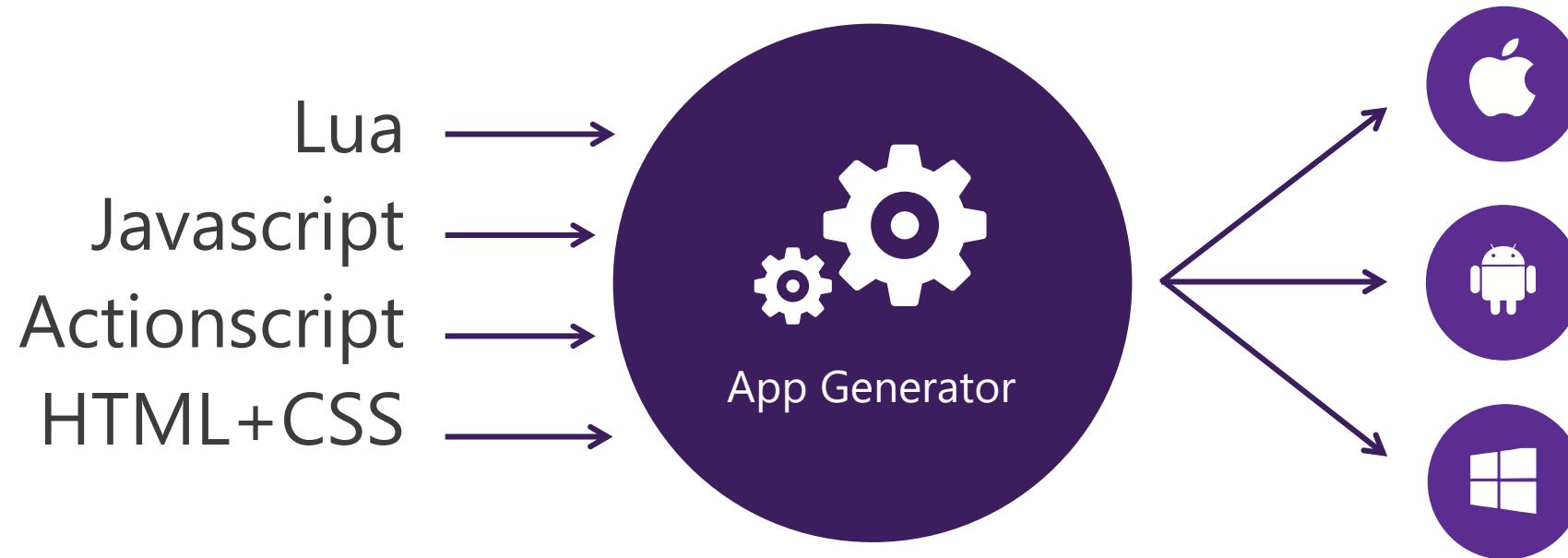


The *Silo'ed* approach

Multiple teams and multiple code bases are expensive and slow



Hybrid Approach



Hybrid approach

Hybrid apps. Presentation written in HTML/CSS and behavior written in JavaScript/TypeScript

Highest code reuse ratio at UI expense

Performance depends on the container

Apache Cordova/Ionic

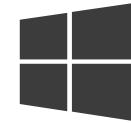
CSS • HTML • TypeScript • JavaScript • Ionic • ...



Write-once-run-anywhere box



iOS



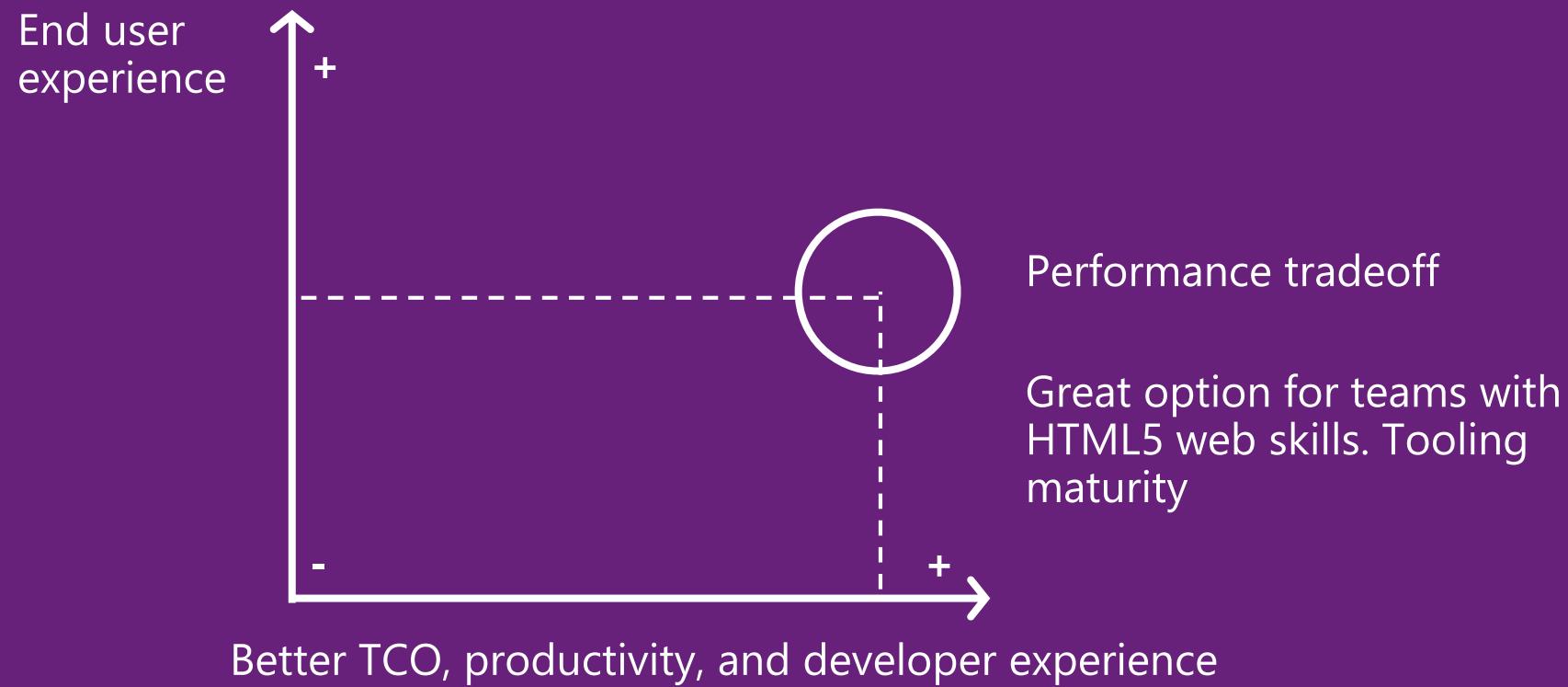
The *write-once-run-anywhere* approach

HTML Hybrid scenarios like Apache Cordova

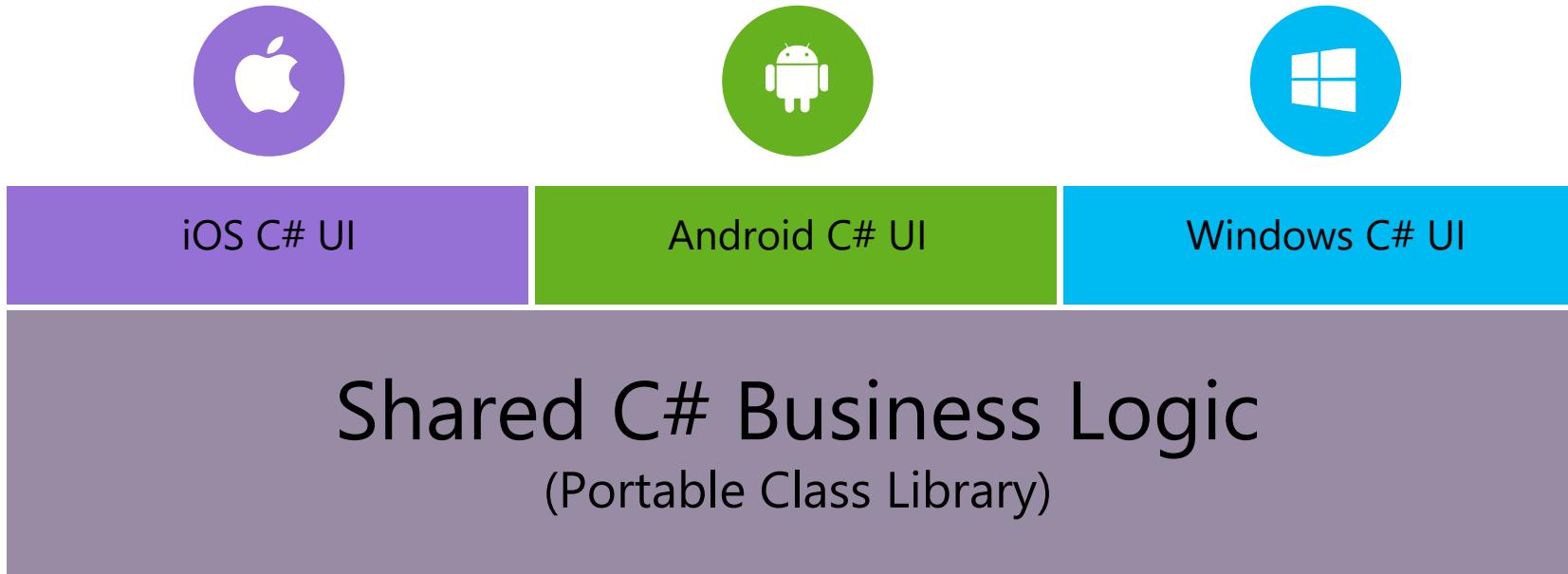


The *write-once-run-anywhere* approach

HTML Hybrid scenarios like Apache Cordova



Xamarin Approach



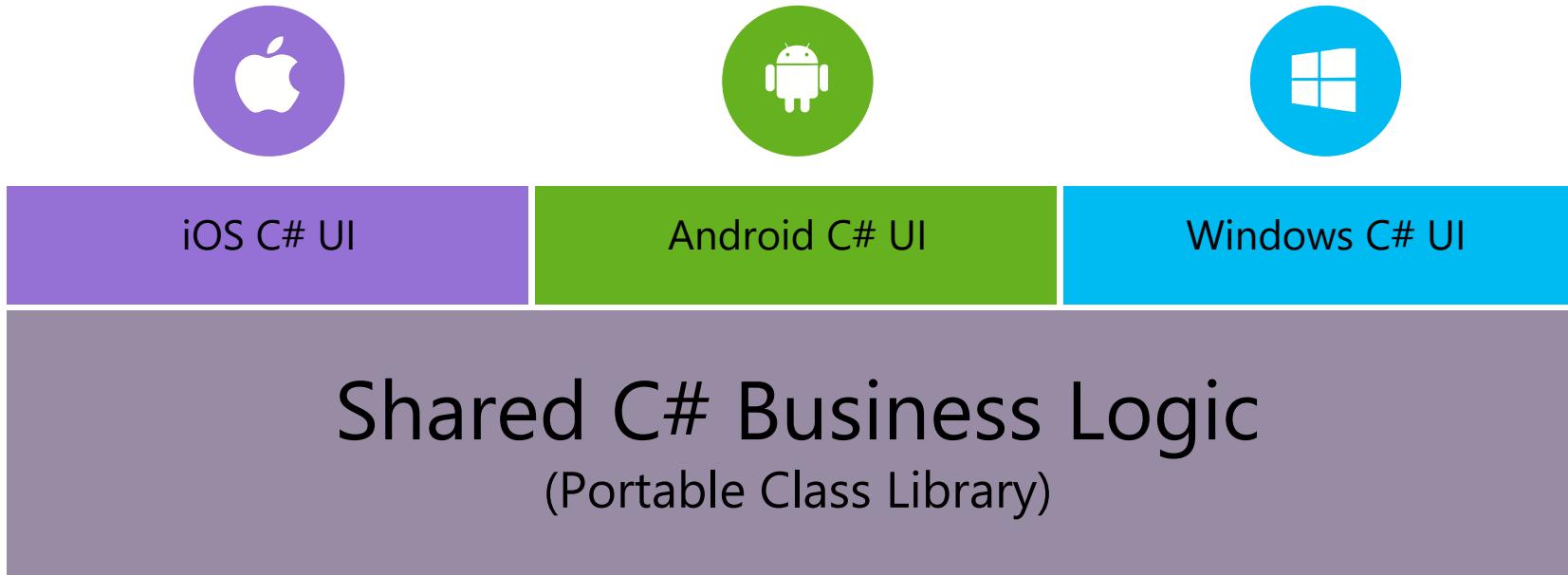
Shared C# codebase • 100% native API access • High performance



Shared C# Business Logic (Portable Class Library)

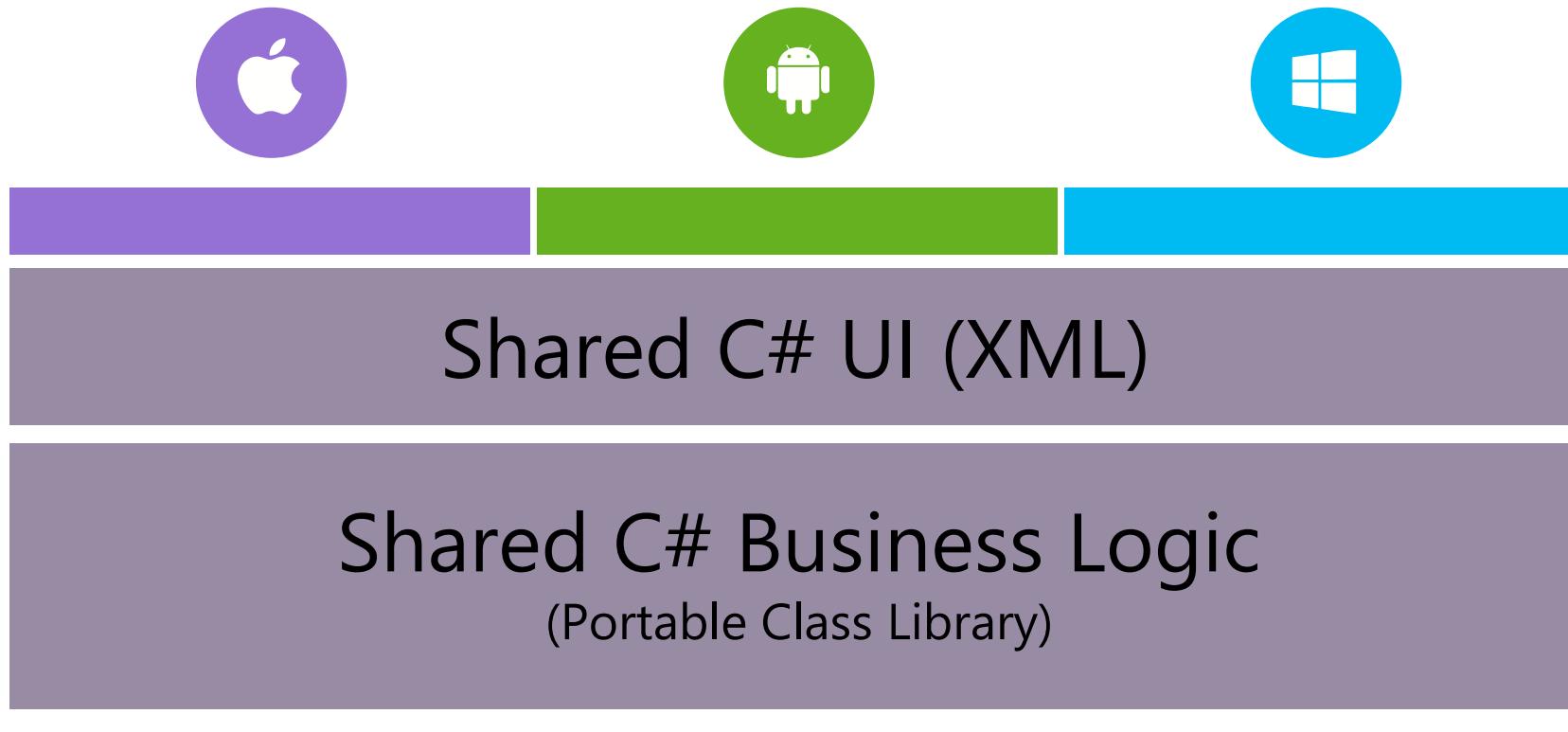
Shared C# codebase • 100% native API access • High performance

Xamarin Approach



Shared C# codebase • 100% native API access • High performance

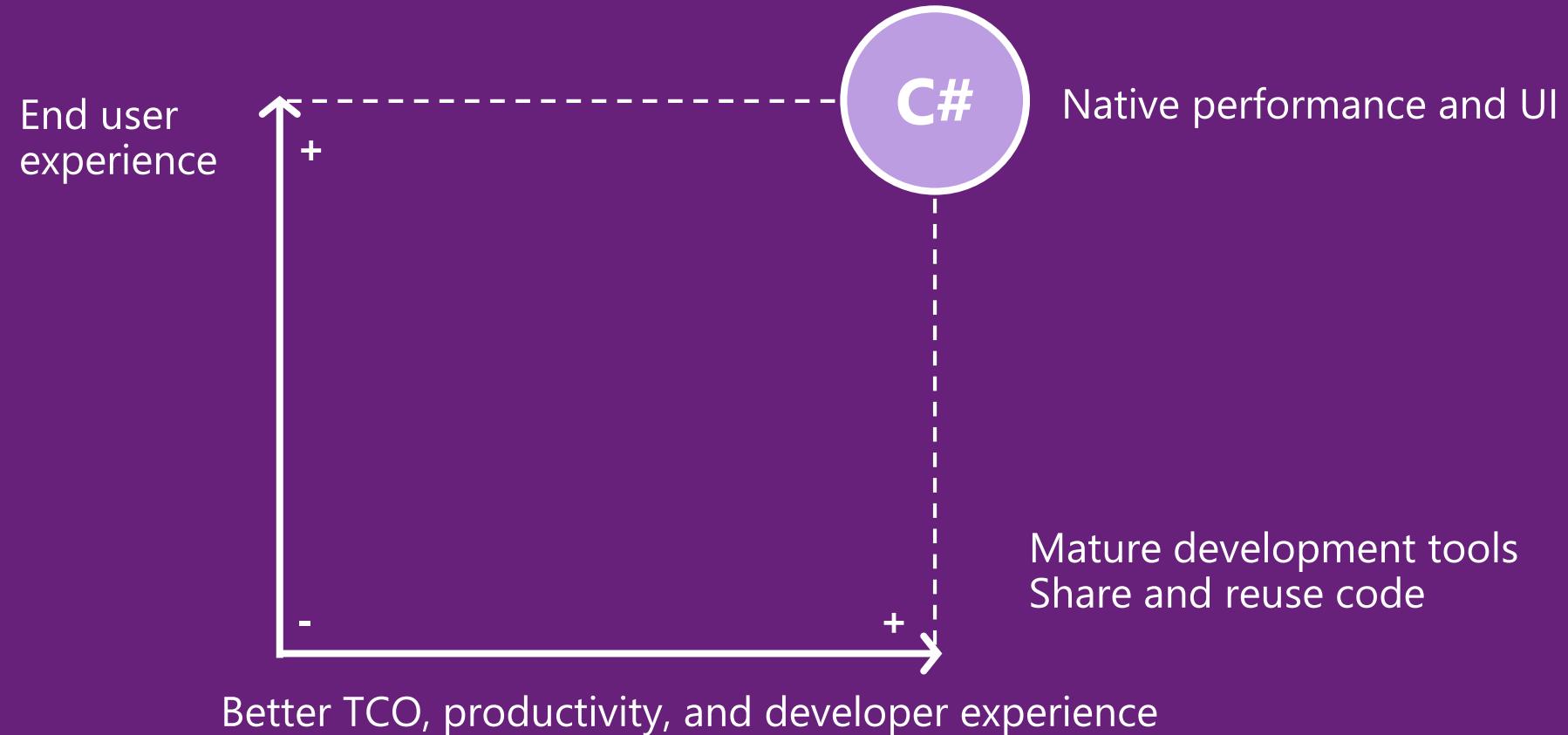
Xamarin Approach (Forms)



Shared C# codebase • 100% native API access • High performance

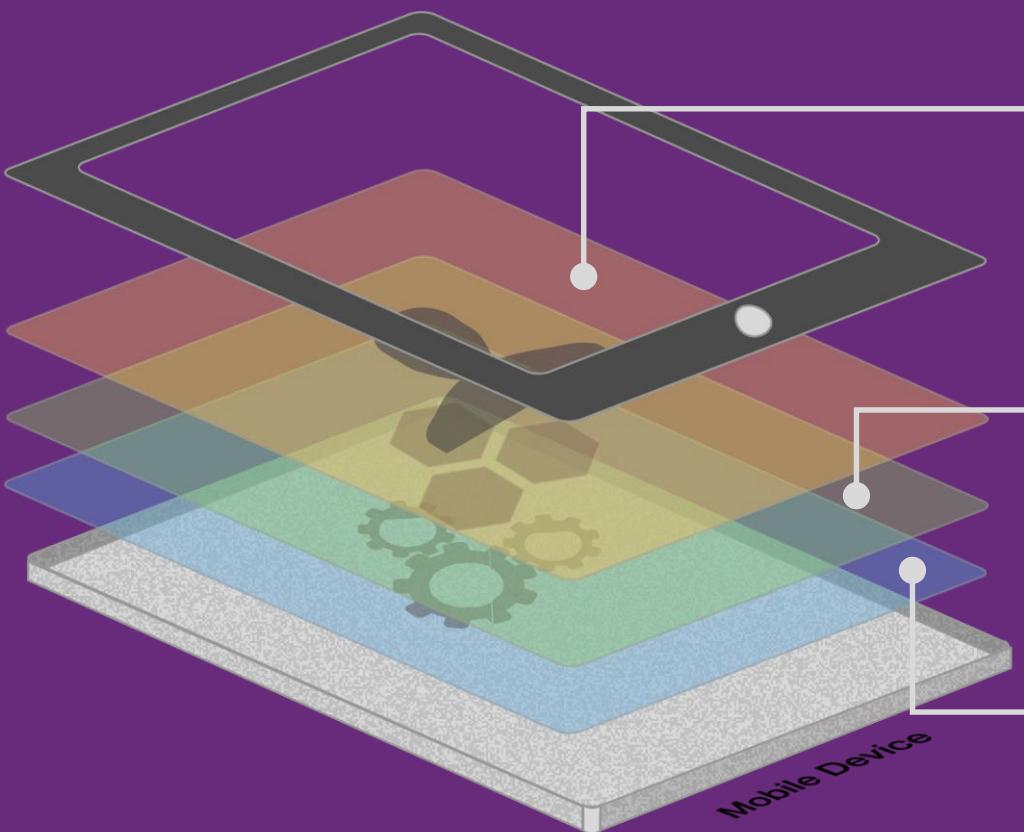
Visual Studio and Xamarin unique approach

The best of all worlds



Xamarin is native in all 3 ways

The best of all worlds



Native user interface

Apps are built with standard, native user interface controls for easy and familiar interactions

High-fidelity API access

Apps have access to the full spectrum of functionality exposed by the underlying platform and device

Native performance

Apps leverage platform-specific hardware acceleration, and are compiled as native binaries, not interpreted at runtime



Always
up-to-date

Same-day support:

iOS 5

iOS 6

iOS 7

iOS 7.1

iOS 8

iOS 9

iOS10

Full support for:

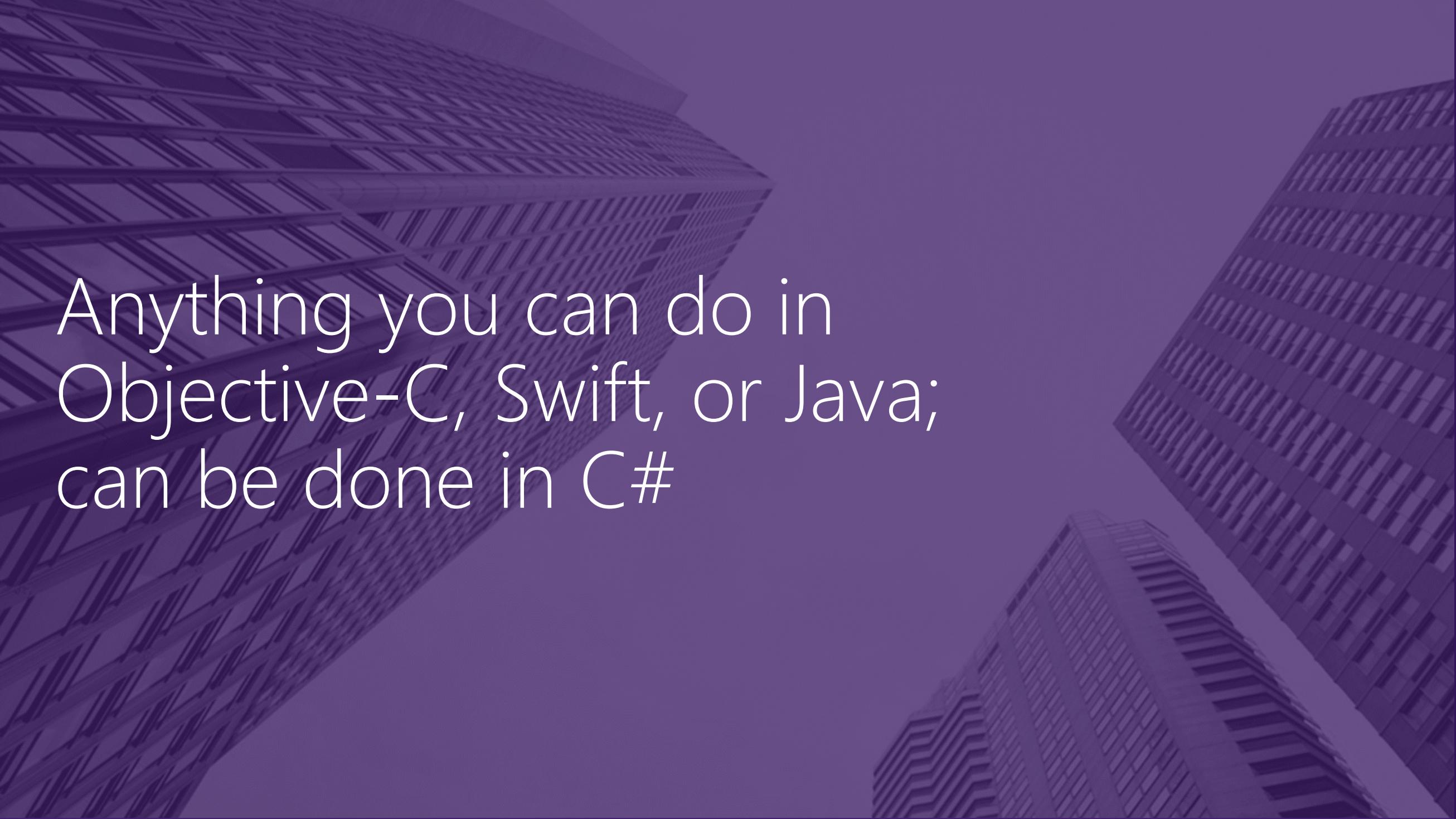
Apple Watch

Google Glass

Android Wear

Amazon Fire TV

And much more



Anything you can do in
Objective-C, Swift, or Java;
can be done in C#

Demo

Sample Xamarin application

The Xamarin SDK

OSS Xamarin SDK

<http://open.xamarin.com>

Full OSS runtime
with MIT license

Part of the
.NET
Foundation

Mono
contributed
to the .NET
Foundation

No better time to be a .NET developer

No better time to be a .NET developer

.NET
Framework

Comprehensive
solution

Modern device
experiences



Universal Windows Platform
Xamarin

Modern cloud
experiences



.NET Core
ASP.NET Core

Innovative • Cross-platform • Open

.NET ecosystem

6M
.NET developers



Top 10
Language=C#



>100K
ASP.NET Core developers

Pre-release builds

6x
Faster than Node.js



1.8B
.NET Framework installs

.NET Users

145 repositories
>23K forks
>4K contributors
>68% community



The Visual Studio family

Most
complete
developer IDE



Code
optimized
editor



Visual Studio Code

Developer
services
for teams



Visual Studio Team Services

Best-in-class tools for **every** developer

The Visual Studio family

12.7M

VS 2015
downloads

 Visual Studio

1.7M

unique
installations

 Visual Studio Code

4M

registered
developers

 Visual Studio Team Services

Best-in-class tools for **every** developer

Xamarin and Visual Studio integration

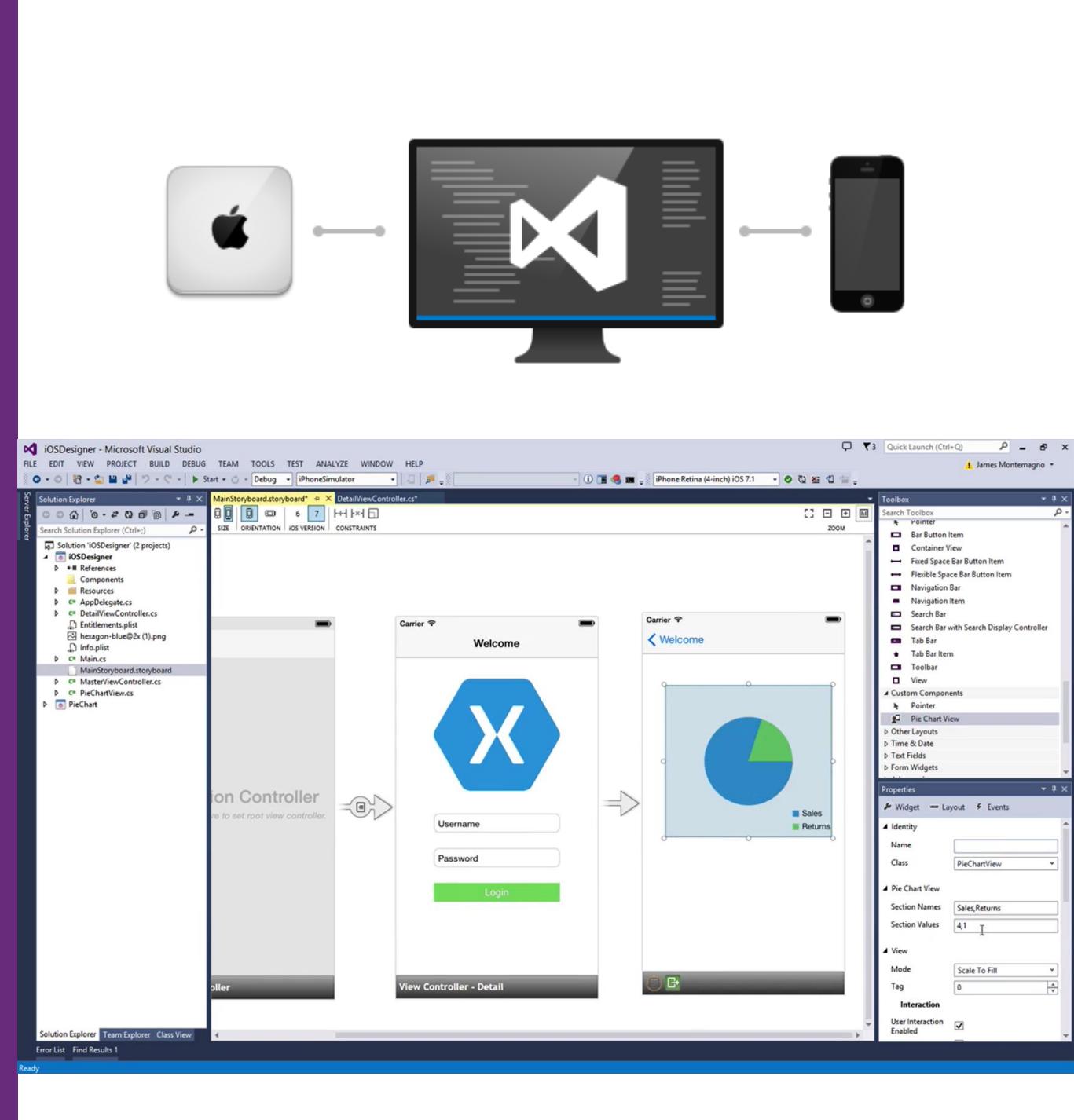
A single solution for
Android, iOS, and
Windows development

Leverage the entire
Microsoft ecosystem

Visual Studio Team Services (VSTS)

ReSharper

Your favorite code coverage
and profiling tools



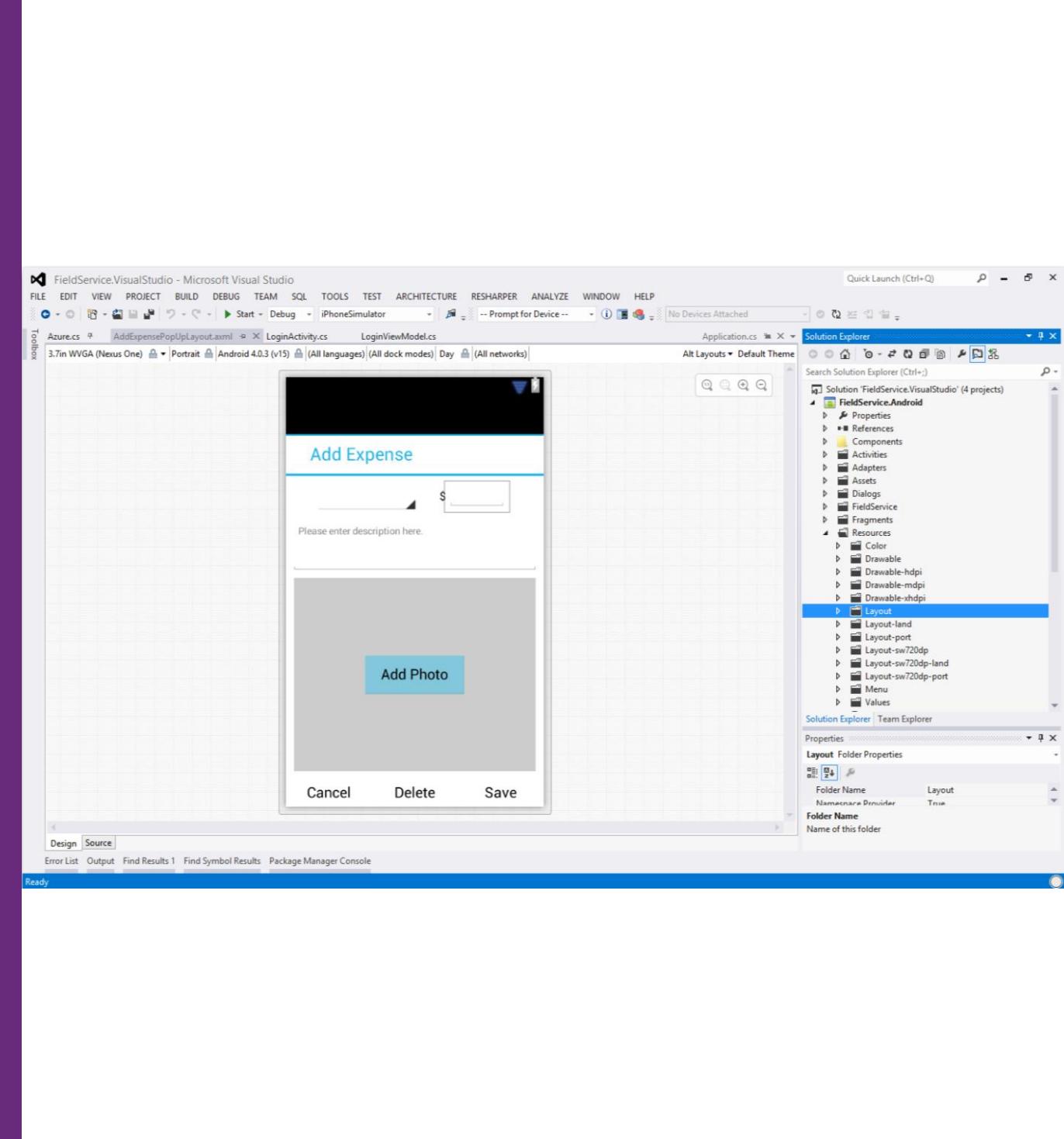
Native UI designers

Create UI with drag and drop simplicity

Target multiple screen sizes, resolutions, and OS versions

Layouts saved in native resource formats

World's best Android and iOS designers available in Visual Studio



Visual Studio Enterprise

Embedded assemblies

Gain insights on the application performance and behavior

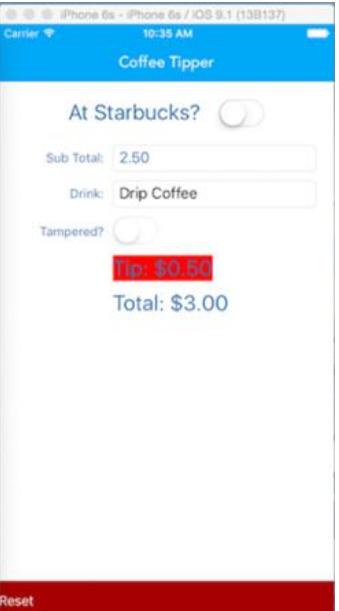
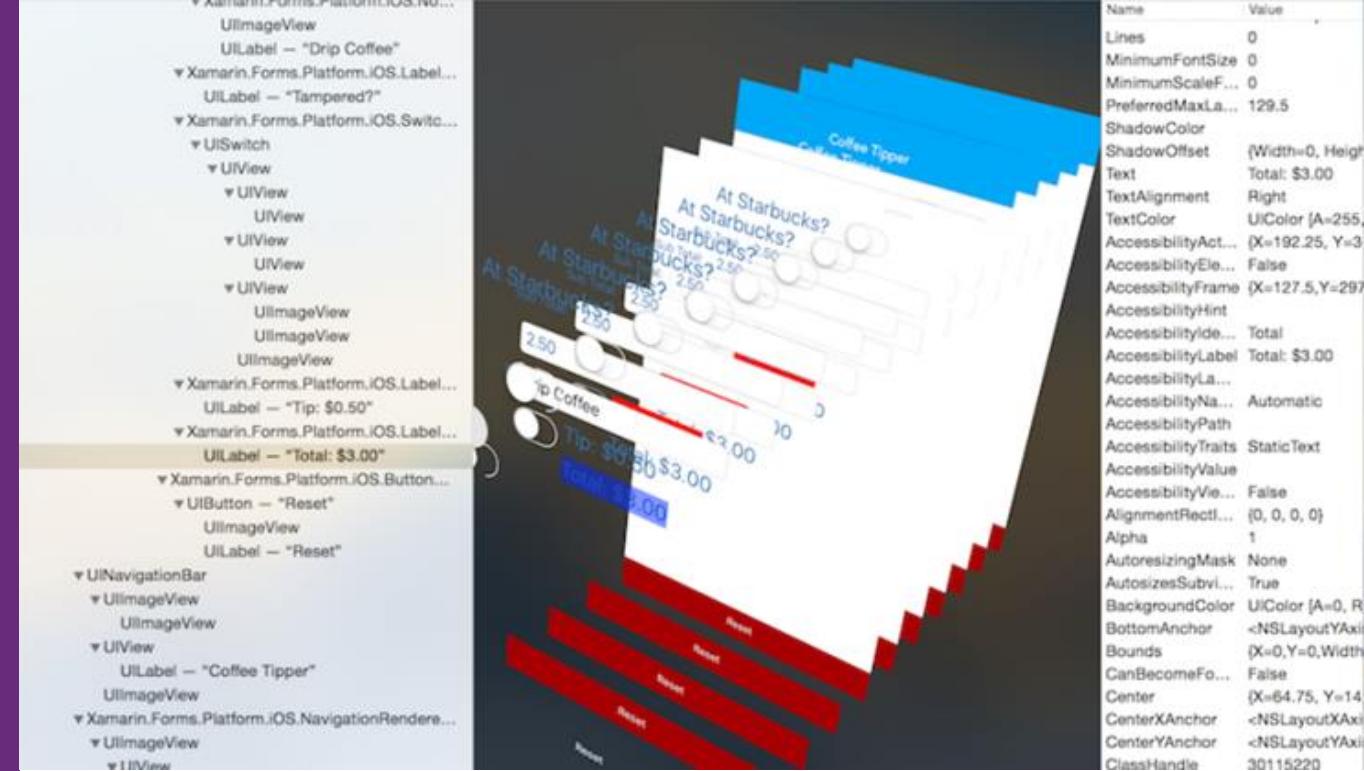
Xamarin Inspector Preview

Xamarin Profiler Preview

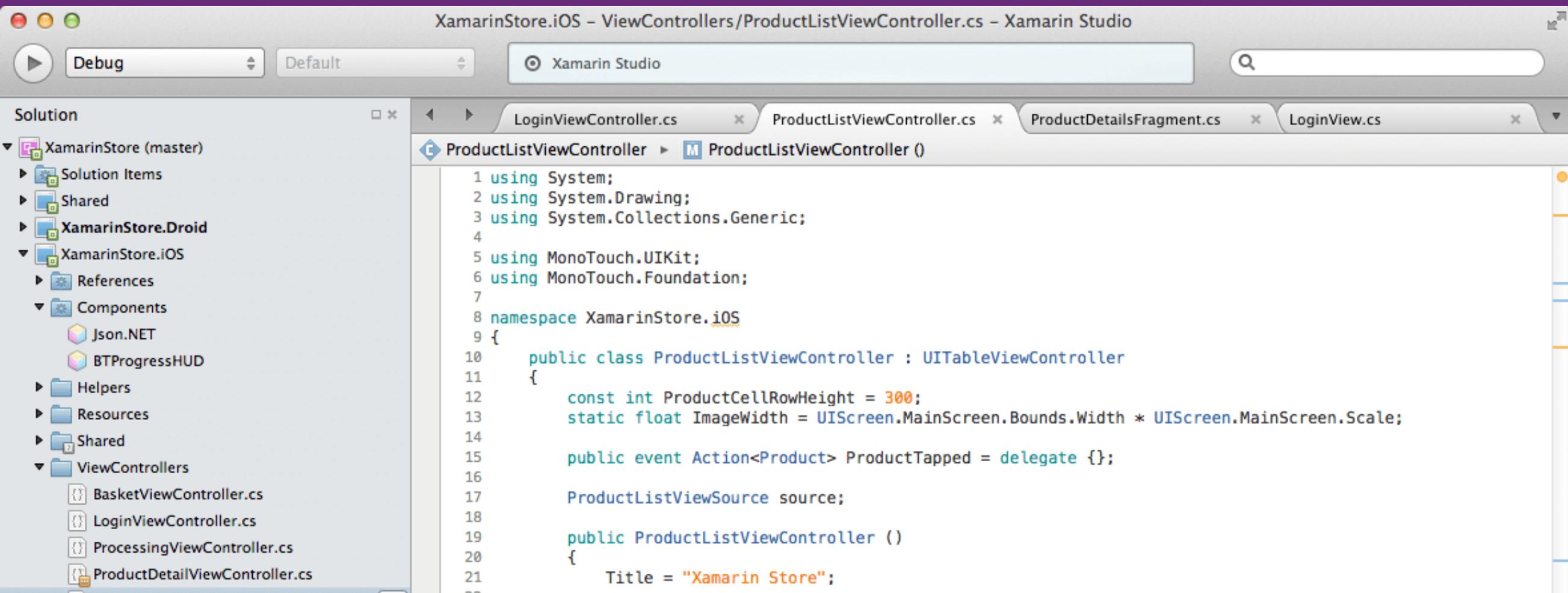
Deliver higher quality by testing on real devices

Xamarin Test Cloud Discount

Ent. Features on Visual Studio and
Xamarin Studio



Xamarin Studio – OS X

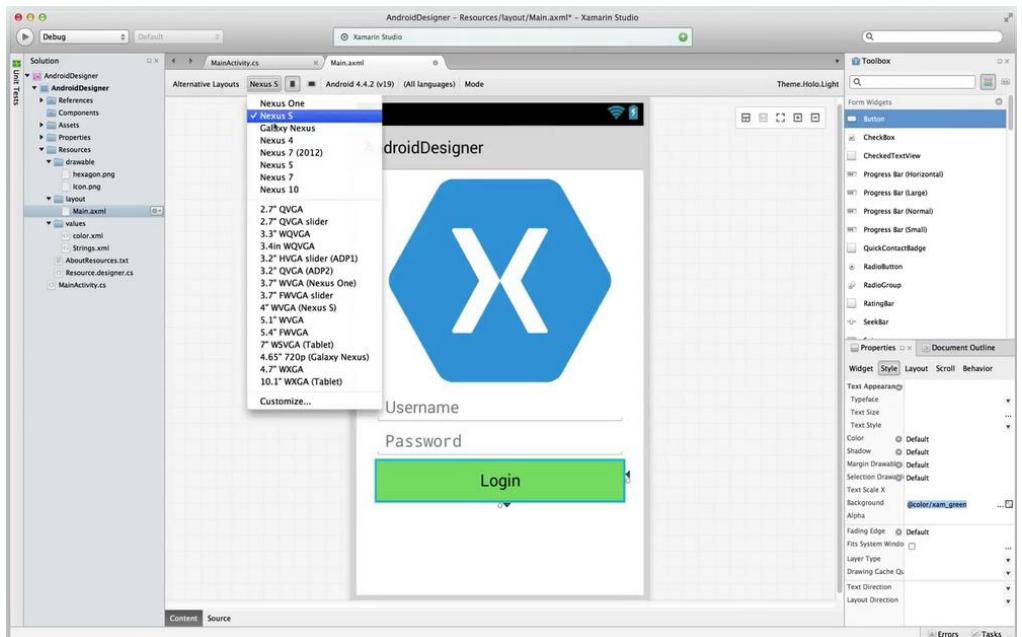
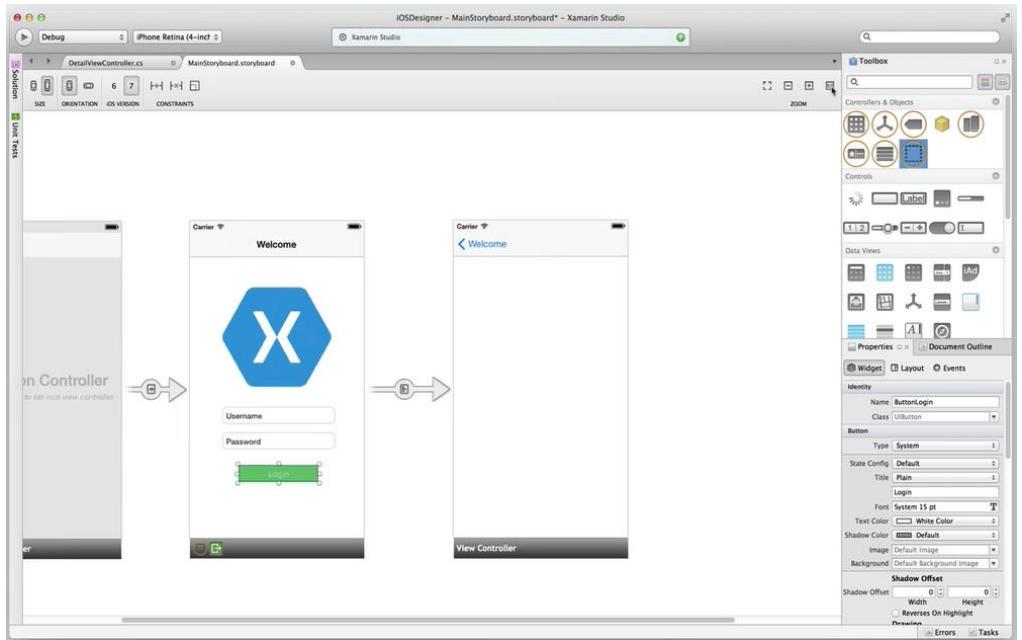


Xamarin Studio

Android and iOS
native designers

Code completion,
refactoring, debugging,
integrated version control,
F# support and more

Publishing





Need a break?

How Microsoft can help



Create mobile experiences...

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Visual Studio



...connected to the business...

Enterprise-ready platform that integrates modern mobile experiences with **existing business assets**

Microsoft Azure



...with mobile-era agility

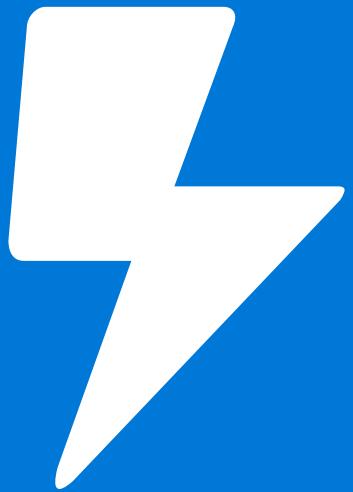
Achieve speed with **faster development cycles** and continuous measure and learn

Visual Studio Team Services
HockeyApp

Why the Cloud?

- Rapidly setup environments to drive business priorities
- Scale to meet peak demands
- Increase efficiency and reduced cost.

Speed



Scale



Economics

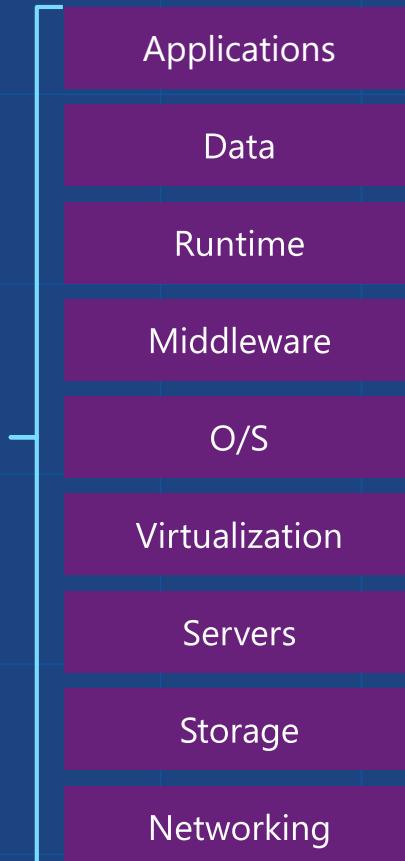


On Prem - IaaS – PaaS - SaaS

Hosting models

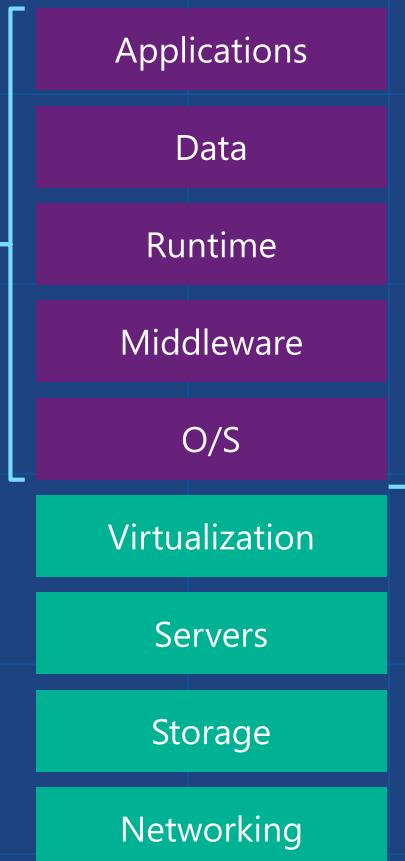
On Premises
(Private Datacenter)

You scale, make resilient and manage



Infrastructure
(as a Service)

You scale, make resilient & manage



Platform
(as a Service)

You manage



Business model

Software
(as a Service)

Scale, resilience and management by vendor



Pizza as a Service



■ You Manage

■ Vendor Manages

Source: "Pizza as a service"

What is Microsoft Azure?

- An open and flexible cloud platform
- Rapidly build, deploy and manage secure applications to scale
- Leverage current skills and the world's most popular languages, tools, and frameworks
- Deploy applications on our secure and reliable global datacenter network or your own on-premise datacenter



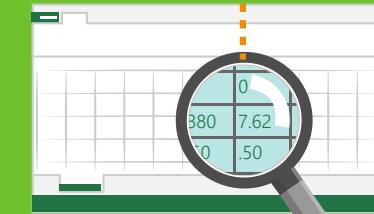
Cloud Platform

Transform the
datacenter



Empower enterprise
mobility

Unlock insight
on any data

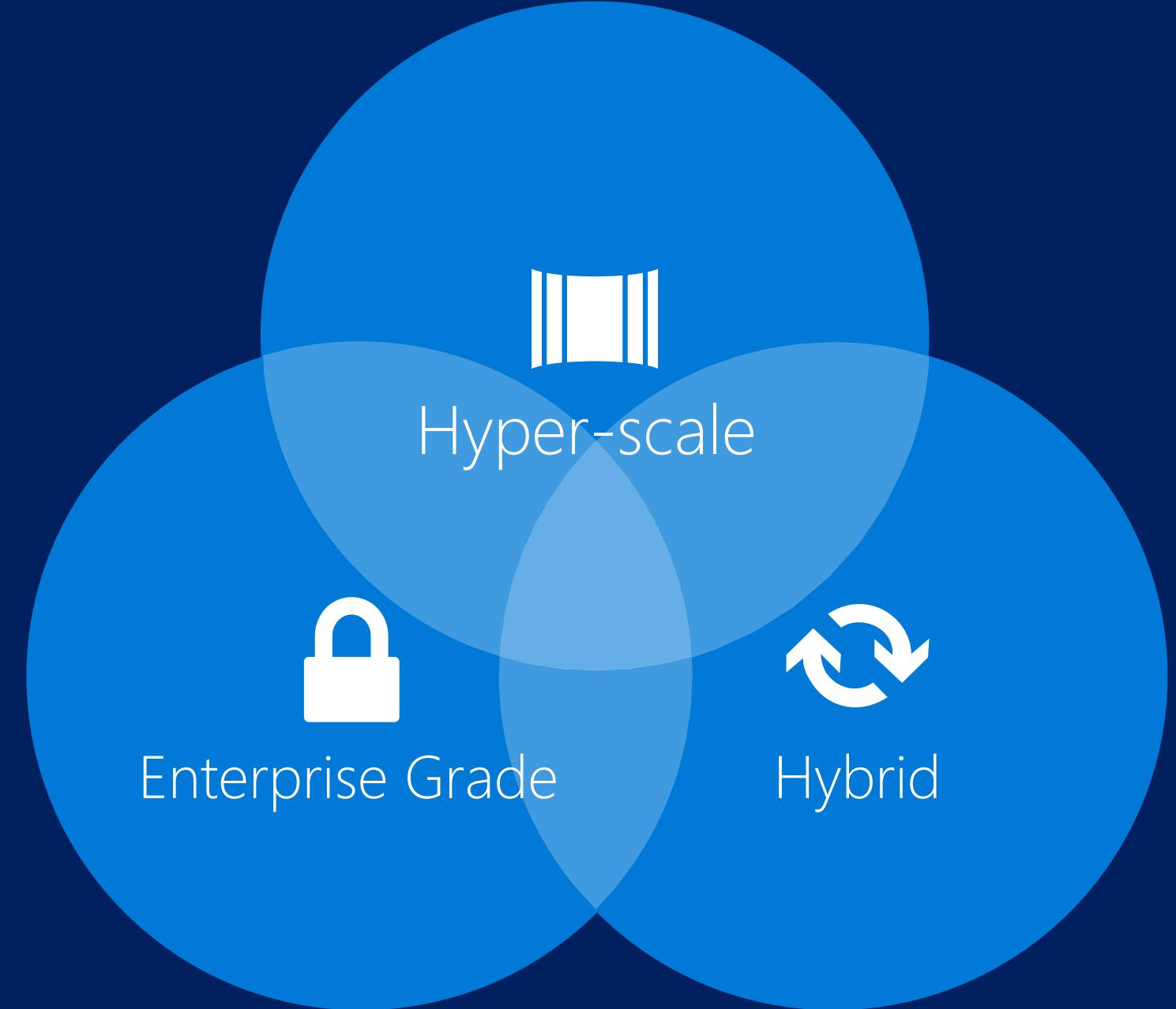


Create the internet
of your things



Enable application
innovation

How we differentiate

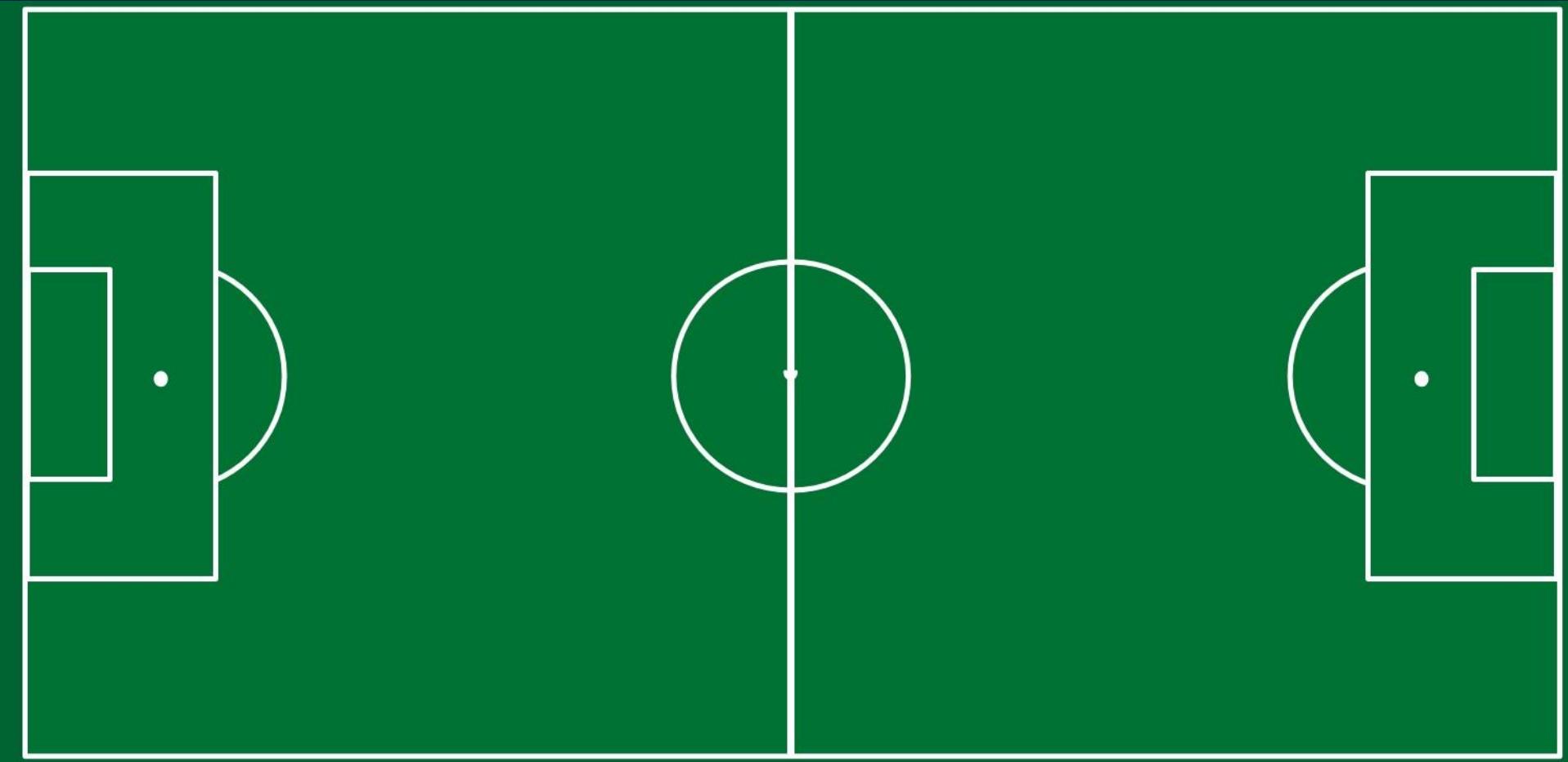




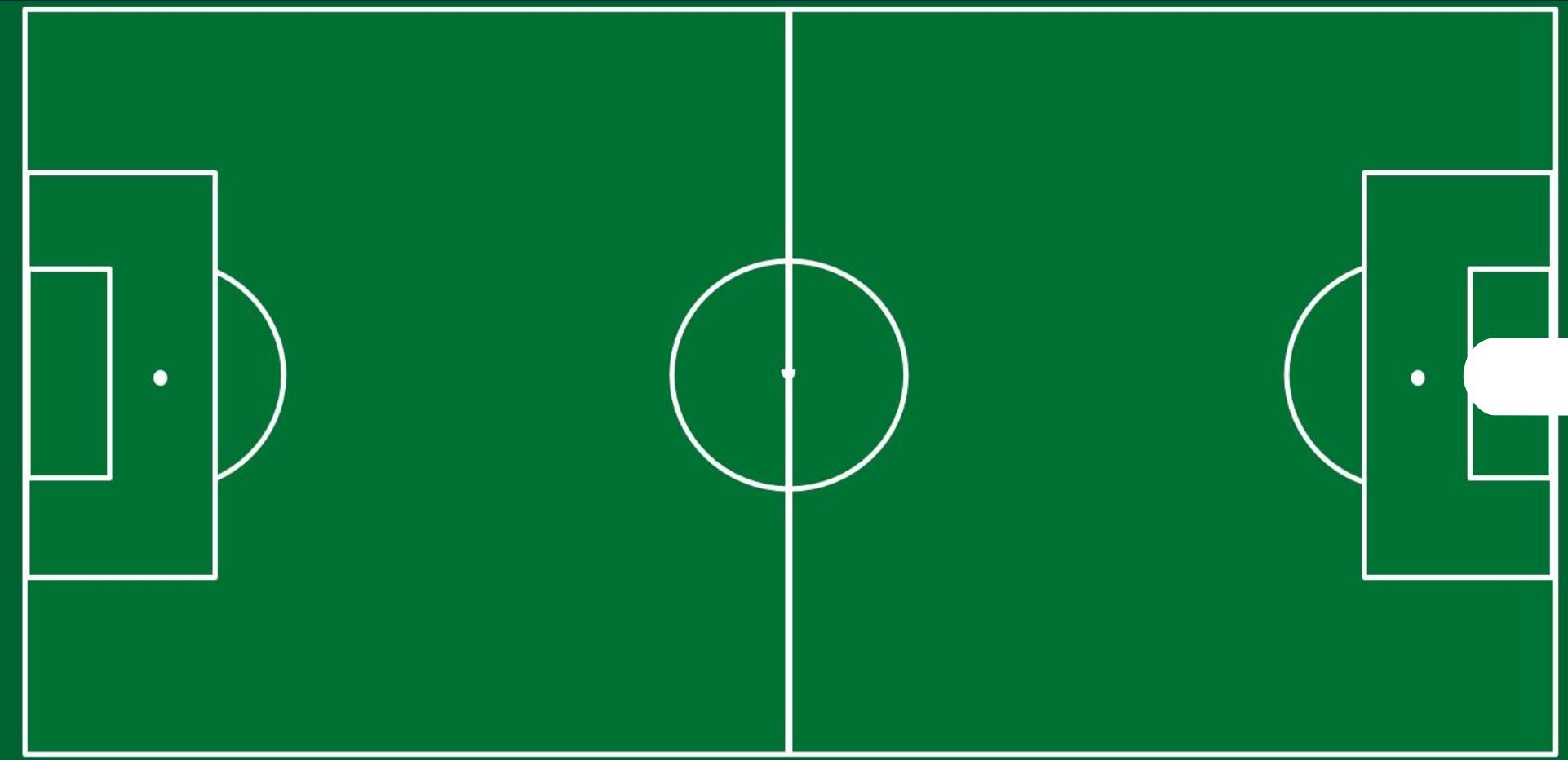
Azure
footprint



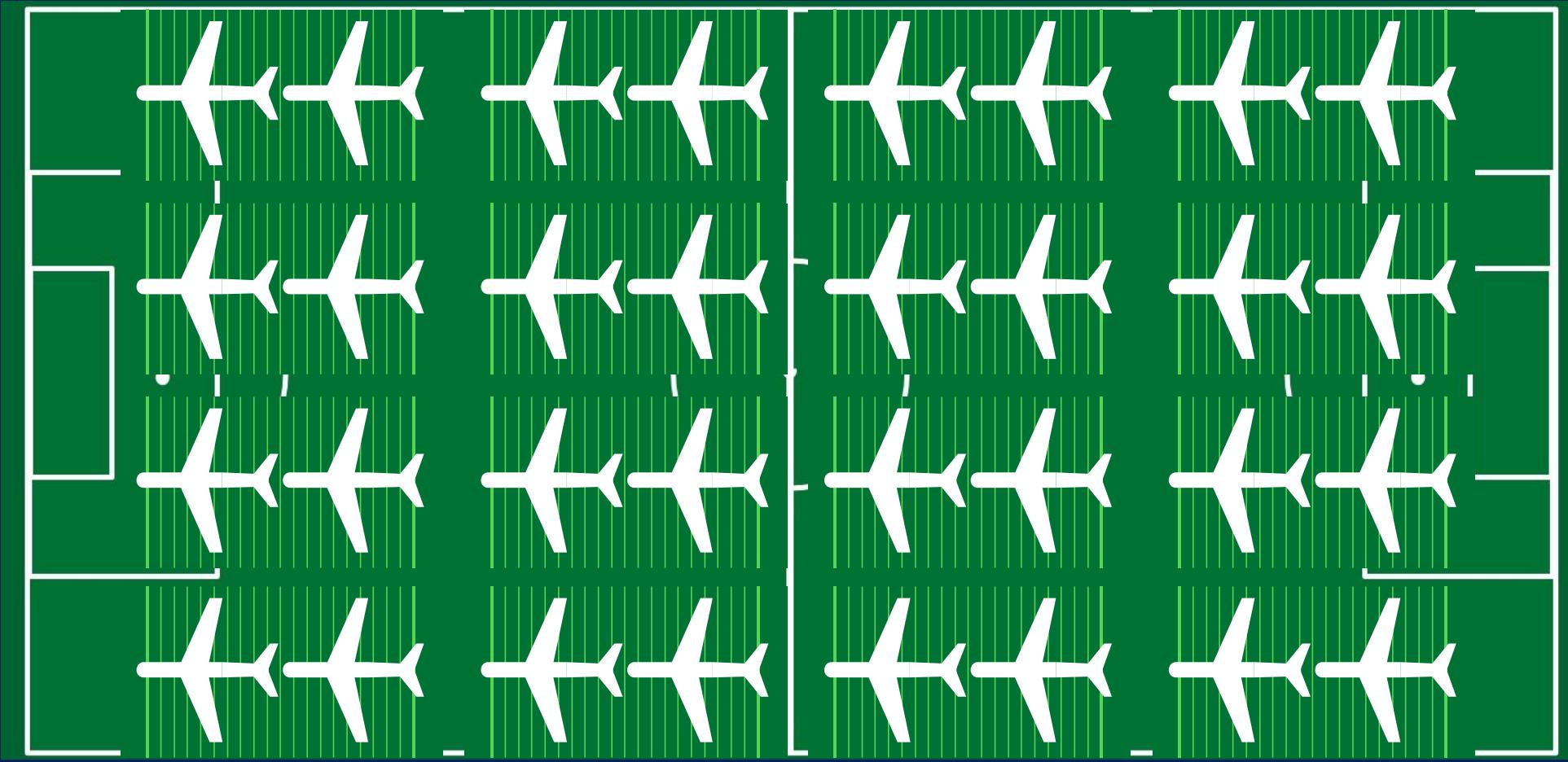
Azure
footprint



Datacenter buildings are about one football field in size



...large enough to hold two
jumbo jets



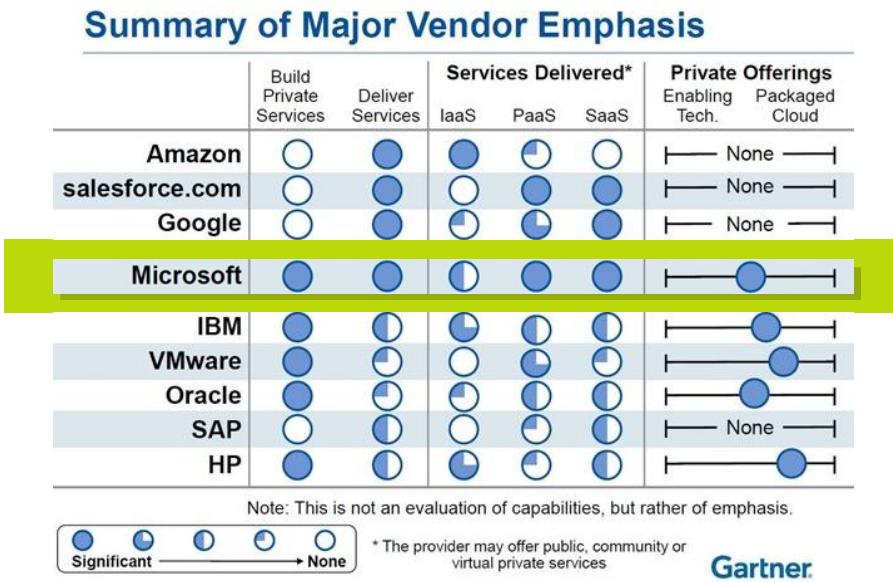
That's up to 600,000 servers in
And there are 16 buildings per region...
each Azure region

Leader in Gartner magic quadrants

- ✓ Cloud Infrastructure as a Service
- ✓ Enterprise Application Platform as a Service
- ✓ Public Cloud Storage Services
- ✓ x86 Server Virtualization

→ Microsoft only leader in all four magic quadrants

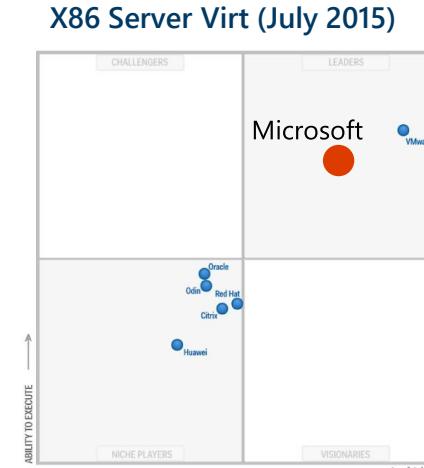
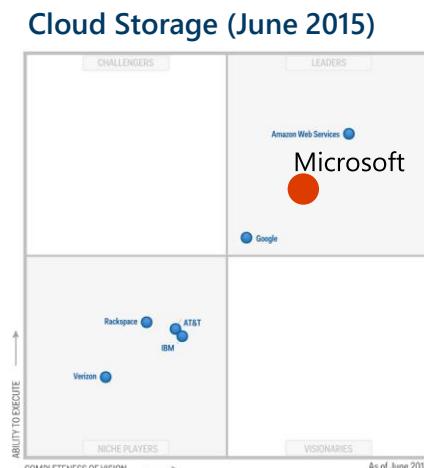
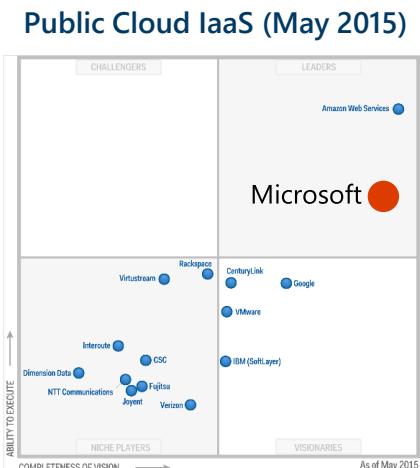
Industry validation



"Microsoft's comprehensive hybrid story, which spans applications and platforms as well as infrastructure, is highly attractive to many companies, drawing them towards the cloud in general."

**LYDIA LEONG,
GARTNER**

Microsoft Leads Everywhere...



Azure momentum

~100,000

New Azure customer subscriptions/month

20 Million

SQL database hours used every day

>50 Trillion

Storage objects in Azure

777 Trillion

Storage transactions per day

500 Million

Azure Active Directory Users

60 Billion

Hits to Websites run on Azure Web App Service

85%

Of Fortune 500 Companies use Microsoft Azure

>40%

Revenue from Start-ups and ISVs

1.5 Trillion

Messages per month processed by Azure IoT



Azure

500+

New releases in
the last 12 months

Azure Clients



SKANSKA



H E A R S T



SECURITY & MANAGEMENT



Portal



Active Directory



Multi-Factor Authentication



Automation



Key Vault



Store / Marketplace



VM Image Gallery & VM Depot

PLATFORM SERVICES

Compute



Cloud Services



Service Fabric



Batch



Remote App

App Platform



Web Apps



API Apps



Mobile Apps



Logic Apps



API Management



Notification Hubs

Developer Services



Visual Studio



Azure SDK



Team Project



Application Insights

Integration



Storage Queues



Biztalk Services



Hybrid Connections



Service Bus

Media & CDN



Media Services



Content Delivery Network (CDN)

Analytics & IoT



HDInsight



Machine Learning



Data Factory



Event Hubs



Stream Analytics



Mobile Engagement

Data



SQL Database



SQL Data Warehouse



Redis Cache



Search



DocumentDB



Tables

HYBRID OPERATIONS



Azure AD Connect Health



AD Privileged Identity Mngt



Backup



Operational Insights



Import/Export



Site Recovery



StorSimple

INFRASTRUCTURE SERVICES

Compute



Windows



Linux



Containers

Storage



BLOB Storage



Azure Files



Premium Storage

Networking



Virtual Network



Load Balancer



DNS



Express Route



Traffic Manager



VPN Gateway



Application Gateway

Azure App Service

One integrated offering



Web Apps



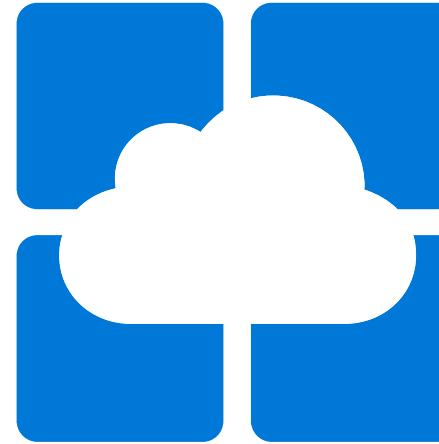
Mobile Apps



Logic Apps



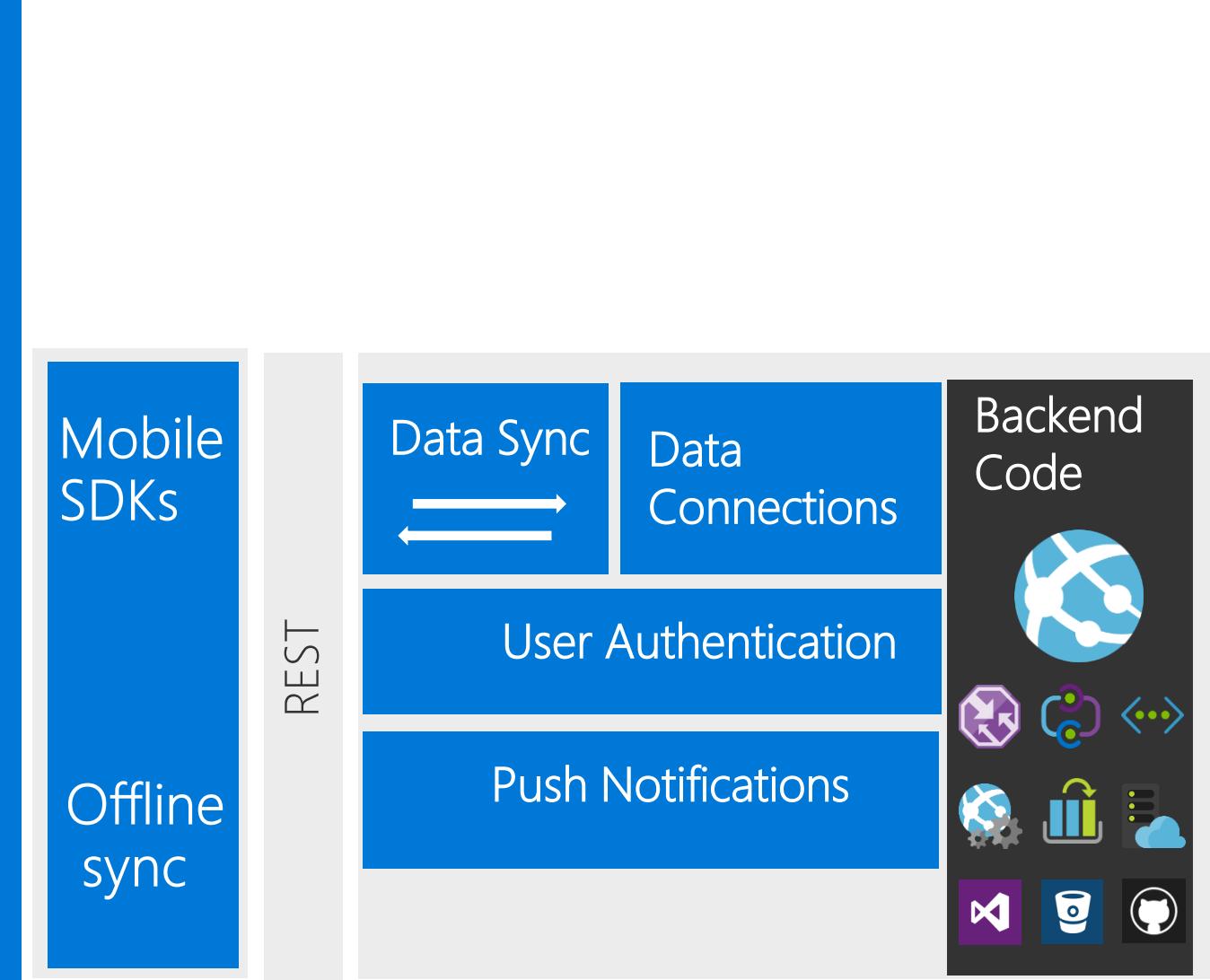
API Apps



Azure Mobile Apps

Engage employees, partners
and customers on any device at
any time

Enterprise Grade Apps
Fully Managed Platform
High Productivity Development



Mobile SDKs

Gateway to backend capabilities
Data / Notifications / Auth

Native SDKs

Cross-Platform SDKs

.NET and node back-ends
available

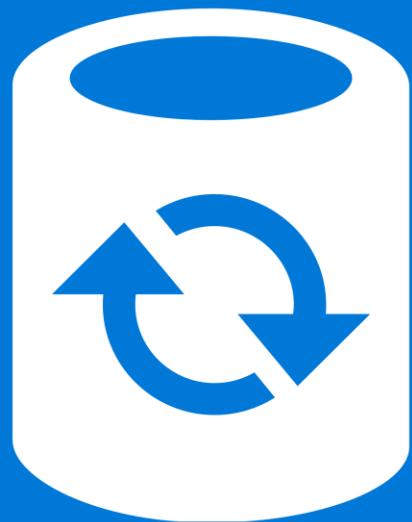
Native SDKs

Android
iOS
Windows

Cross-plat SDKs

Cordova/PhoneGap
Xamarin
Sencha
Titanium
HTML 5/JS

Why offline sync?



Make apps **resilient** against intermittent network connectivity

Allow end-users to create and modify data even when there is **no network access**

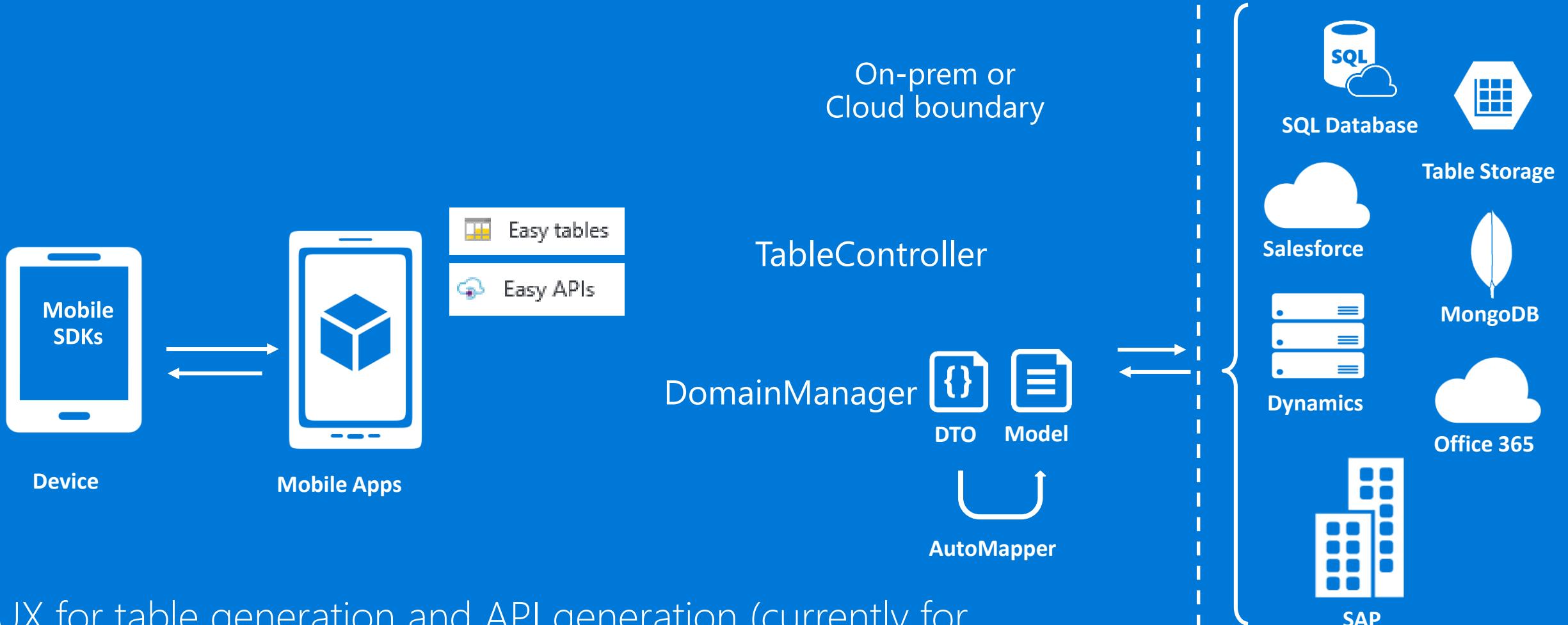
Sync data **across multiple devices**

Improve app responsiveness by **caching** server data locally on the device

Detect and **handle conflicts** when the same record is modified by more than one client



Connects to any data source



UX for table generation and API generation (currently for Node.js and Azure SQL databases, working on adding more providers and .NET backends)

Authentication

Same as API and Web Apps

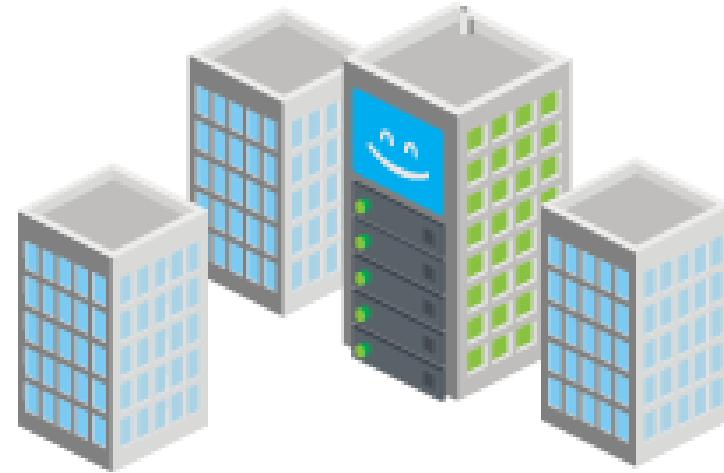
Access levels

- Anonymous (or roll your own)
- Authenticated

Authenticated

- Azure AD (User account or service principal)
- Microsoft account
- Social: Facebook, Google, Twitter

CORS



Cross-Platform Push Notifications

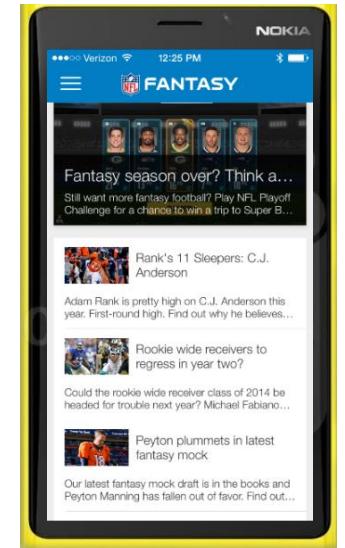
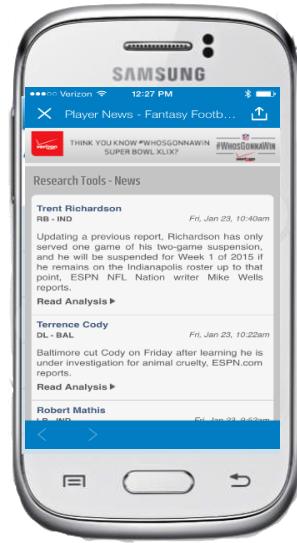
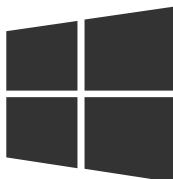
Localized for the language,
country, and time zone
of the user

Segmented and
personalized

High scale



iOS



..wait, there is more...

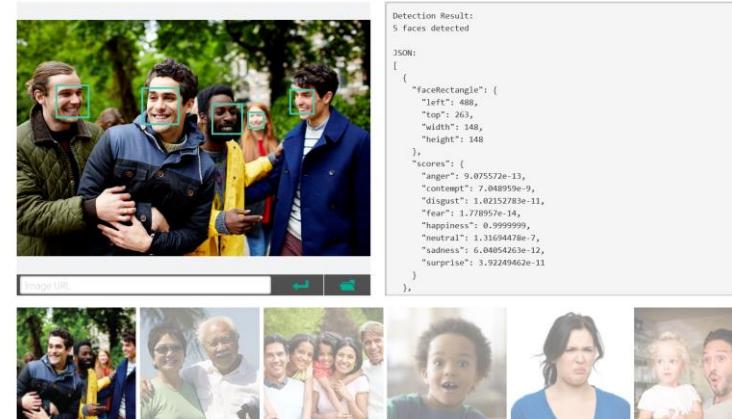
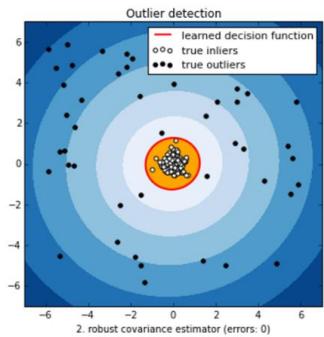
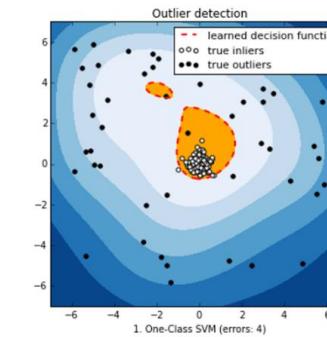
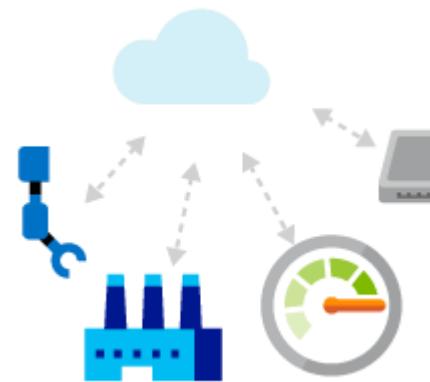
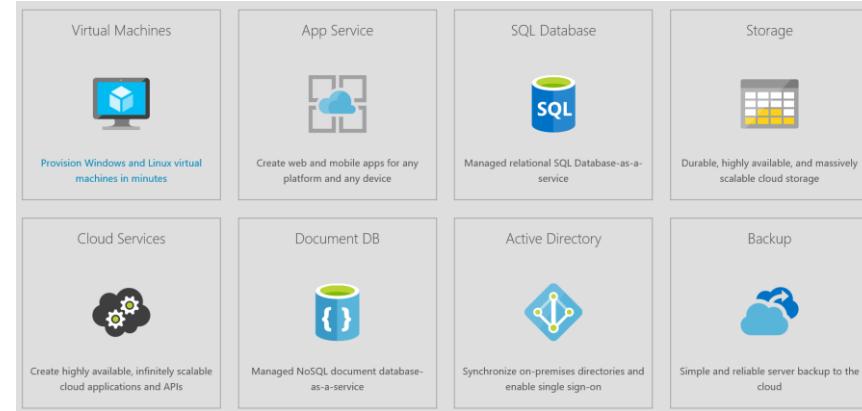
Build back ends with a higher level of control

with Azure App Service, Virtual Machines,
Service Fabric, Container Services...

Connect and Manage IoT assets with Azure IoT Hub

Create 'smart' apps

with Cognitive Services and Machine Learning





Demo

How Microsoft can help



Create mobile experiences...

New applications or new end points to existing applications for **Android, iOS, and Windows**

Xamarin
Visual Studio



...connected to the business...

Enterprise-ready platform that integrates modern mobile experiences with **existing business assets**

Microsoft Azure

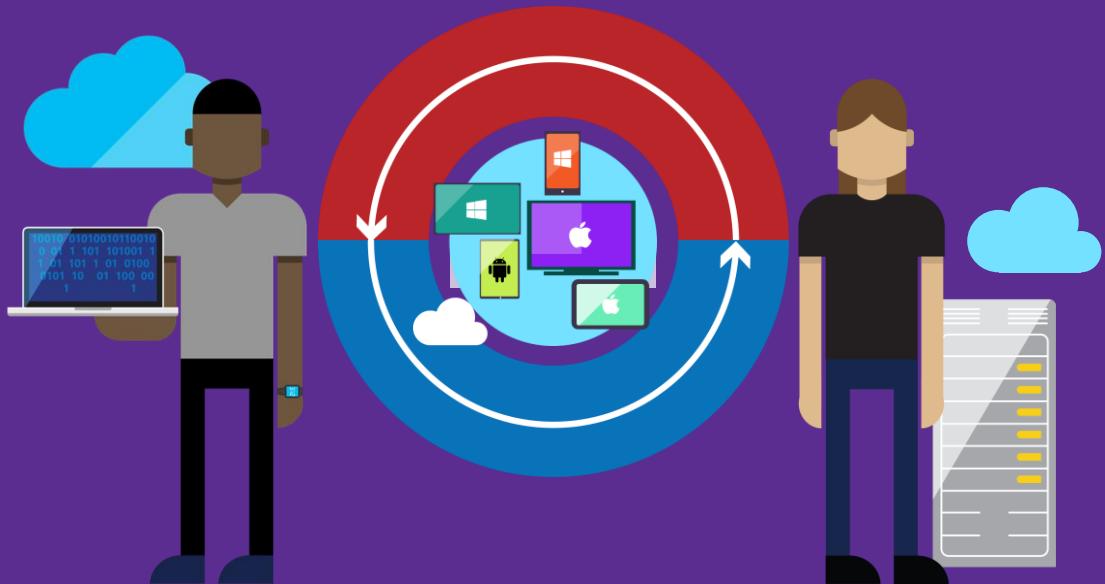


...with mobile-era agility

Achieve speed with **faster development cycles** and continuous measure and learn

Visual Studio Team Services
HockeyApp

Continuous Integration & Delivery (CI, CD)



Developer

Operations



Automate and orchestrate your build, test, and release processes



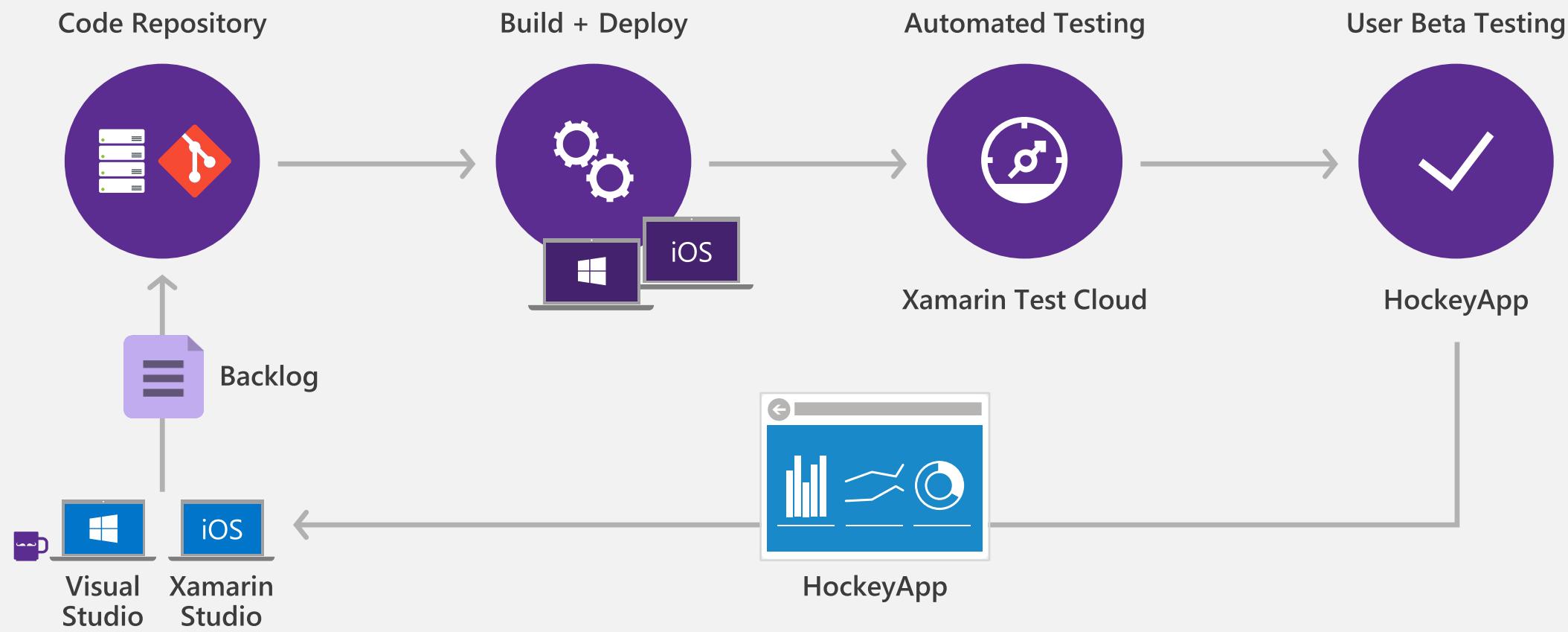
Smooth deployment and beta testing of mobile apps



Close the loop between development and operations

Visual Studio Team Services and TFS
HockeyApp
Xamarin Test Cloud

Integration and delivery



Agile planning

Tools for the entire team

Monitor all your team's work – including operational issues – using built-in Kanban boards. Track work in progress to ensure you've got a streamlined channel from idea to delivery

Design Needed 4/4 In Development

Doing Done

Keyboard shortcuts for key actions ... Noah Munger 5	Responsive design for home page Christina Kelly 5
Email confirmation after submit Brett Cambell 3	

Failures on load of shopping cart page on stale browser
Christina Kelly

Date format support for different locales.
Noah Munger 5

Order	Title	State	Effort	Tags
1	Add, Edit, Remove from shopping cart	Approved	5	Mobile
2	Communication of shopping cart updates	Committed	5	Mobile Web
3	Responsive design for shopping cart	Committed	3	Customer Visible Web
4	Edit existing users	Committed	5	Web
5	Filtering is broken when an item is selected	Approved	2	
6	Add new users	Approved	13	Web
7	Direct link to an item in the catalog	Committed	8	Mobile
8	Welcome mails that include a "Getting..."	New	3	Mobile

Tasks Needing Attention

To Do In Progress

Week	In Progress
1	12
2	10
3	11
4	10
5	8

Backlog Distribution

Committed Approved New Done

Category	Count
Committed	12
Approved	5
New	11
Done	29

Dashboards and charts

Dashboards

Build dashboards that provide visibility to your team and stakeholders. Stop worrying where to find things and instead use Visual Studio Team Services or Team Foundation Server to get everyone on the same page

Fabrikam Fiber ← May 03, 2013 ⏪ → Live Active Bugs

Results Editor Charts

+ New chart ⏪

Bug #462 Avatar does not load in home pa... Pokrovskaya @Jamal Hartnett is this the bug you were #462? Jamal Hartnett yes, that's the one - can you take a look at ... Pokrovskaya Sure, I'll do that now. Jamal Hartnett Thanks.

Changeset 185023 Sprint 47 Update Johnnie McLeod AL.Gated 1302.144 X failed Build Summary

Post a message

Active Bugs by Priority - Chart

VSOnline 10

Iteration	Count
Sprint 69	2
Sprint 68	3
Sprint 67	5
Sprint 66	4
Sprint 65	1
Sprint 64	3
Sprint 63	2
(other)	8

Active Bugs by Iteration - Chart

Active Bugs Stacked Bar by Release

Active Bugs Pivot Table by Itertion

Active Bugs Trend by Priority

Active Bugs Trend by Area

Visual Studio Online / Food Jan 2014

HOME CODE WORK BUILD TEST* Com... Explorer Commits Branches Pull Requests

Pull Request 1

Raisa Pokrovskaya comment

eggs chocolate bacon cheese green peppers

RP how about different colors?

JII agree

butter

Raisa Pokrovskaya thinks the looks good an hour ago

RP Add another vegetable. After make all these adjustments, changes are good to merge.

JII Yeah, I was thinking we need

6/20/2014 6/24/2014 6/28/2014 7/2/2014 7/6/2014 7/10/2014 7/14/2014

60 55 50 45 40 35 30 25 20 15 10 5 0

Mobile tasks

Build and deployment

Simplify the creation of powerful build deployment pipelines with the deployment tasks

Dozens of tasks exist for build and deployment options across a wide variety of Microsoft, non-Microsoft, and OSS technologies

Build steps are easily extensible and an ecosystem of third-party steps are available from the Visual Studio Team Services store

The screenshot shows the Visual Studio Team Services interface for building a Xamarin iOS solution named 'PartsUnlimited-aspnet45/PartsUnlimited.sln'. The 'BUILD' tab is selected in the top navigation bar. In the center, there's a list of build steps:

- Android Build
- Android Signing
- Xamarin License
- Xamarin Test Cloud
- Xamarin.Android
- Xamarin.iOS (selected)
- Xcode Build
- Xcode Package iOS

On the right side, there are configuration settings for the selected 'Xamarin.iOS' step:

- Solution:** PartsUnlimited-aspnet45/PartsUnlimited.sln
- Configuration:** Release
- Override path to mdtool:** (empty field)
- Build for iOS Simulator:** (checkbox)
- Control Options:**
 - Enabled: checked
 - Continue on error: unchecked
 - Always run: unchecked

A 'More Information' link is also visible.

Quality is hard

iOS



7 OS versions

20 Devices

20 Languages

35 Locales

6 Screen sizes

10 OS versions

24K Distinct devices

39 Languages

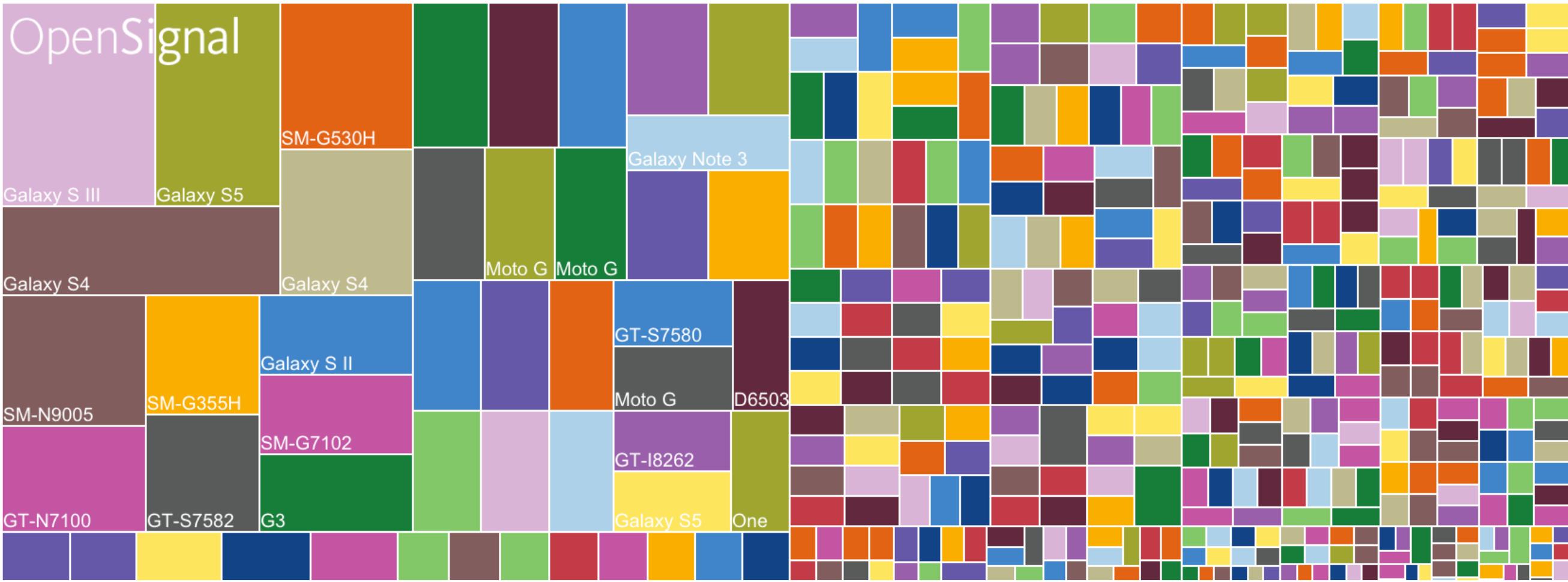
57 Locales

27 Screen sizes

15 Manufacturers

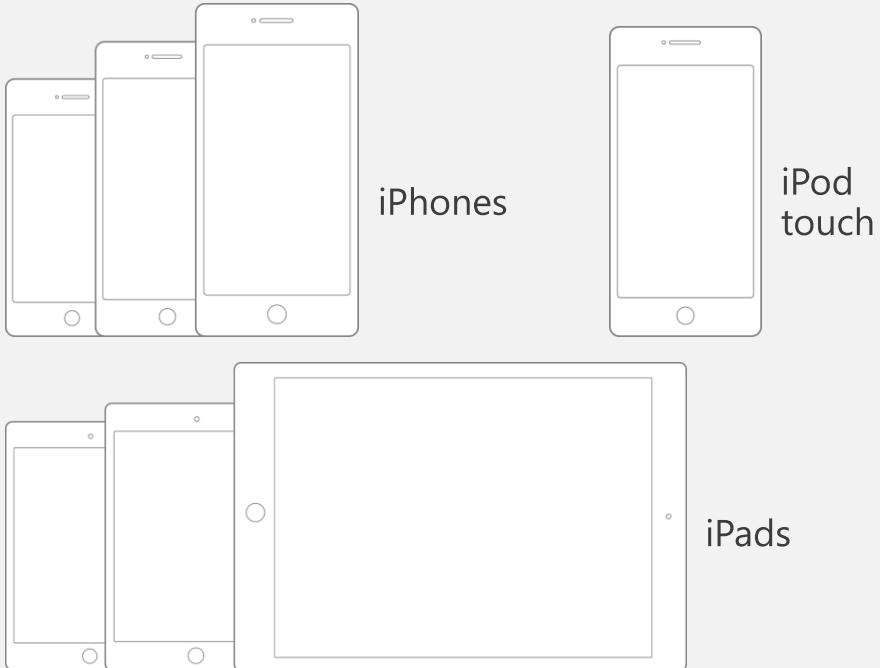
6 Screen configurations

Android diversification

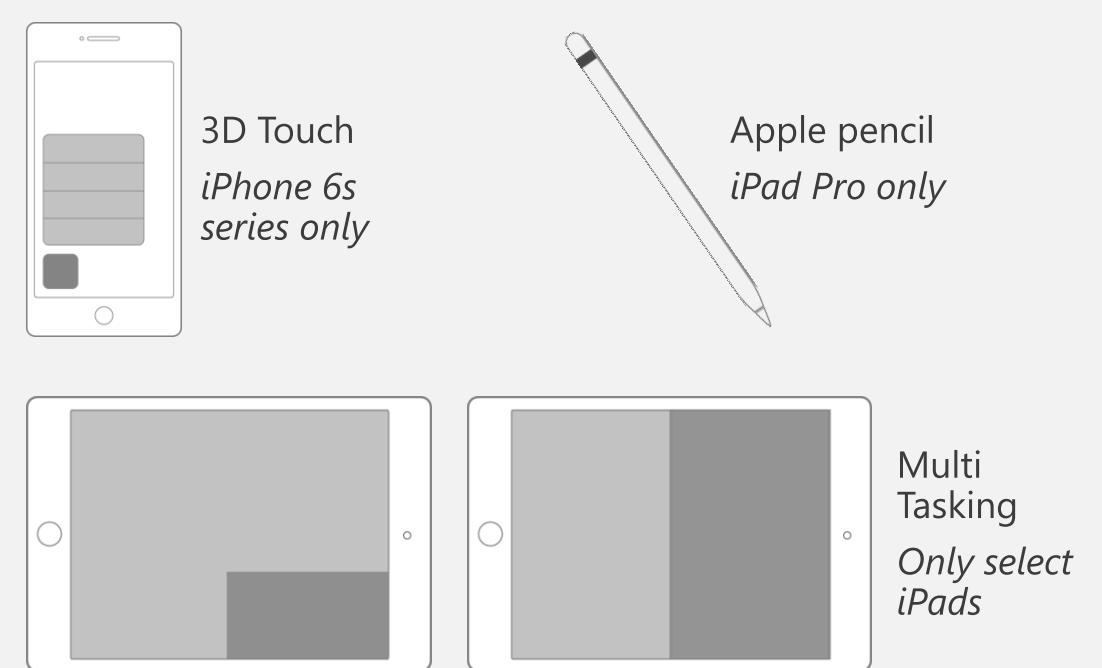


iOS diversification

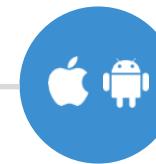
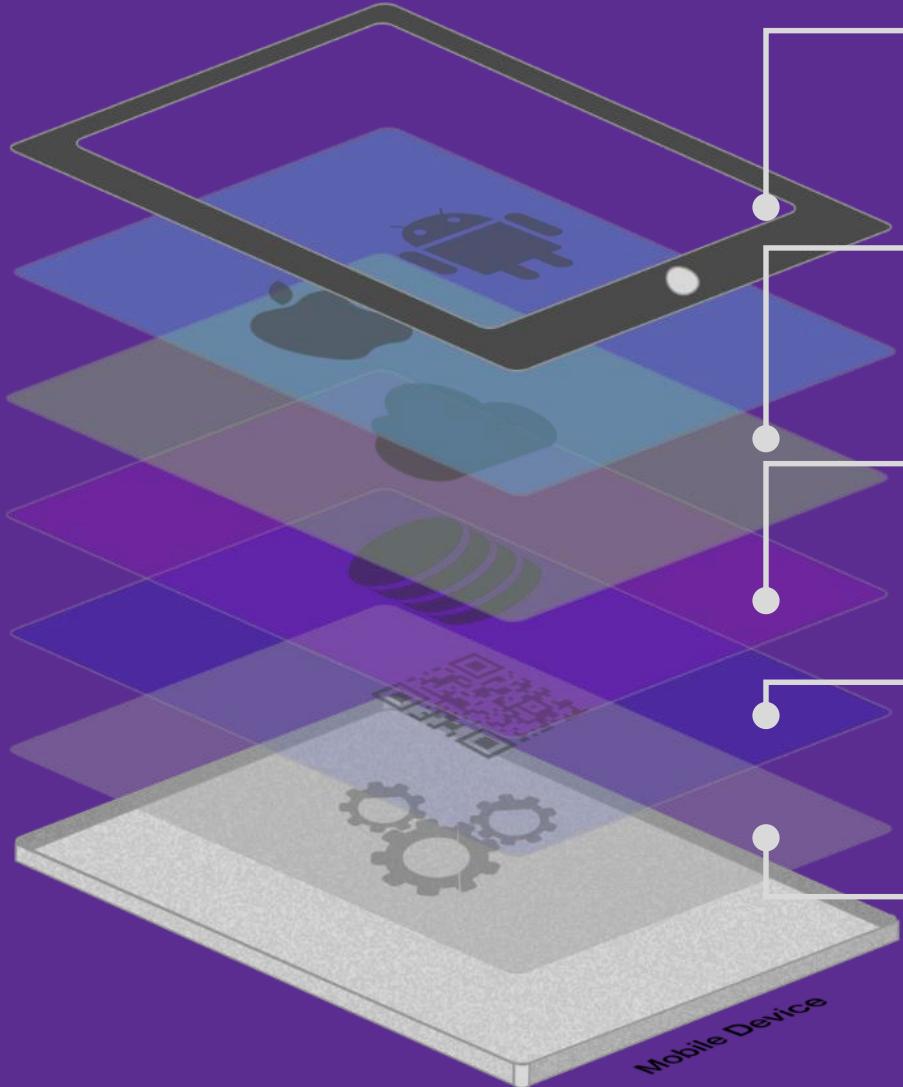
Form factors



iOS 9 features



Application complexity



Thousands of iOS and Android APIs



Public web APIs



Backend integrations



Third-party libraries



Memory, CPU, and network constraints

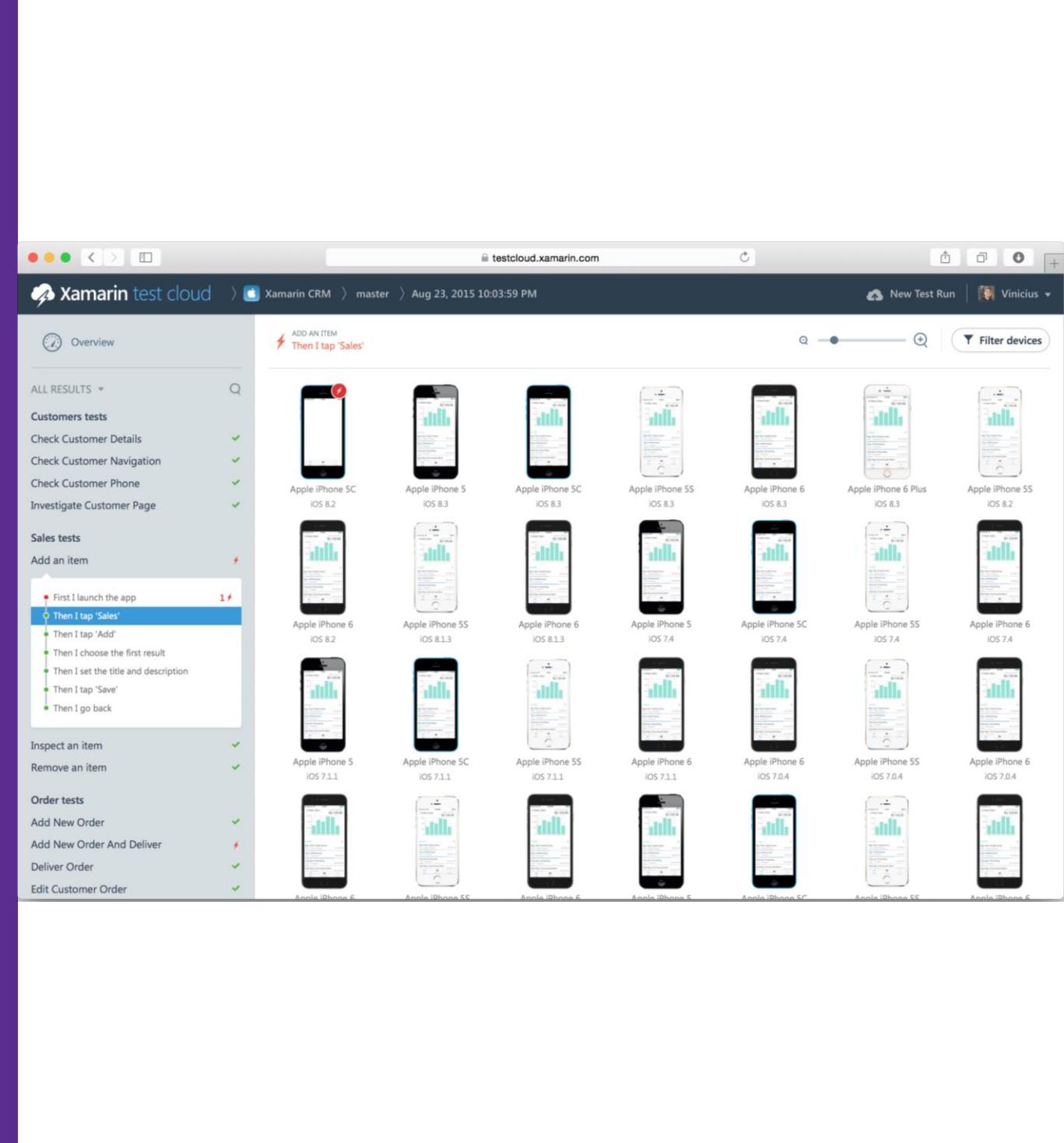
Xamarin Test Cloud

2,000+ real devices

Automate your app testing and run them on over 2,000 different real devices. Test everything users do, as well as any performance problems with step-by-step memory and performance tracking

Script C# or Ruby

Xamarin Test
Recorder for Visual Studio
Preview



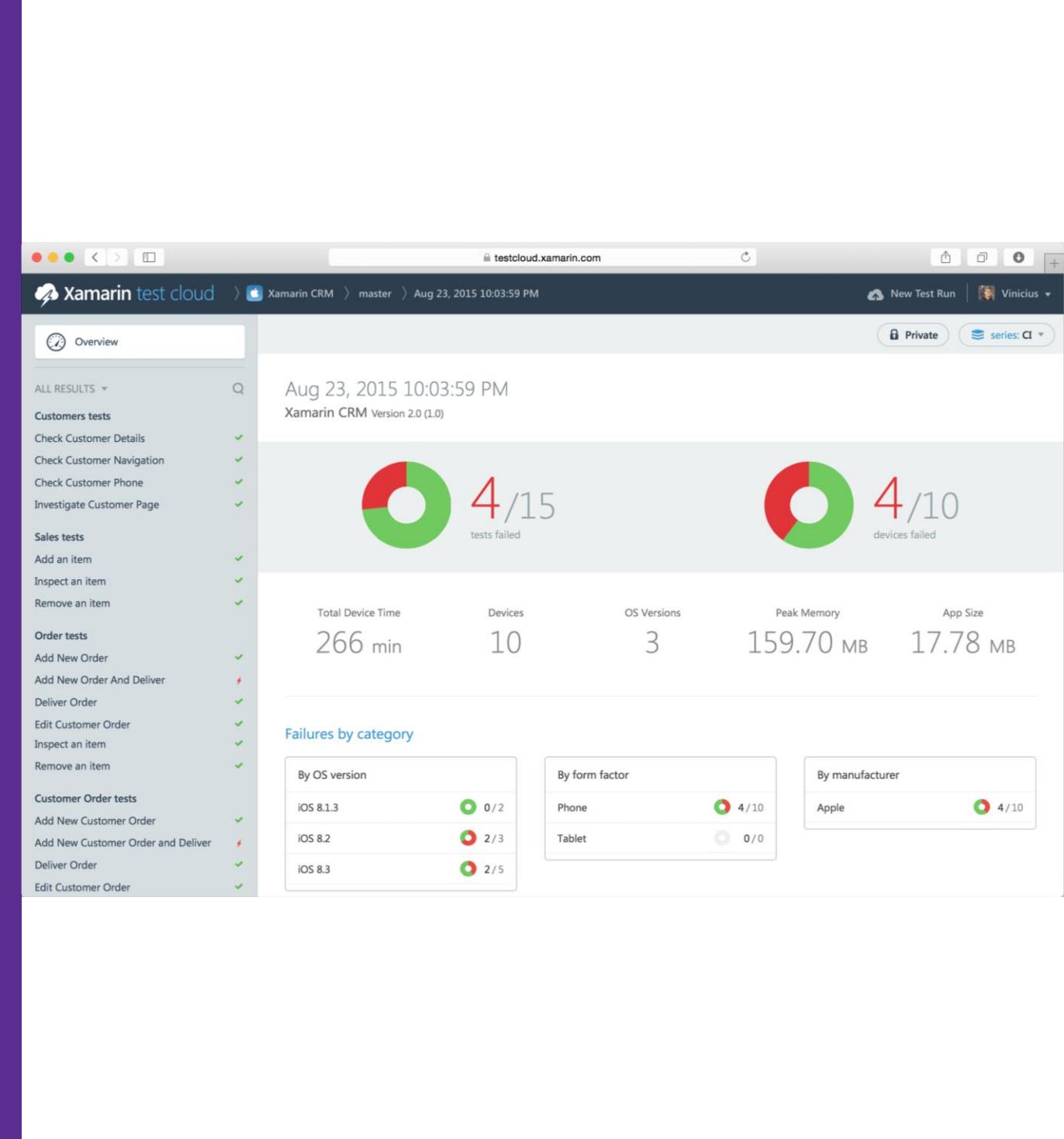
Detailed reports

Track results

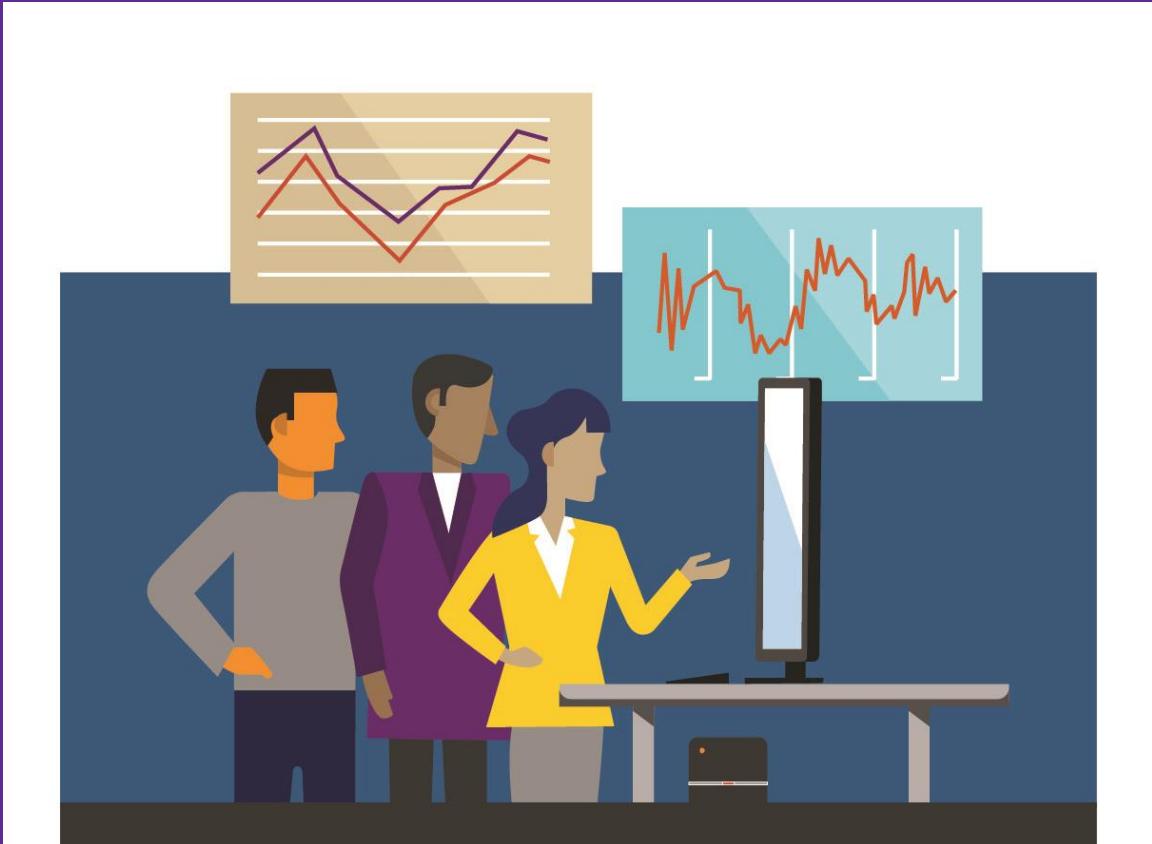
The rich, detailed reports available through Xamarin Test Cloud gives users the ability to analyze reports that include results, screenshots, and performance metrics

Trend analysis

Compare results to previous runs to find regression bugs or performance bottlenecks. Have insight into the quality of your application



Continuous monitoring & learning



Get insights about availability and crashes of apps and services



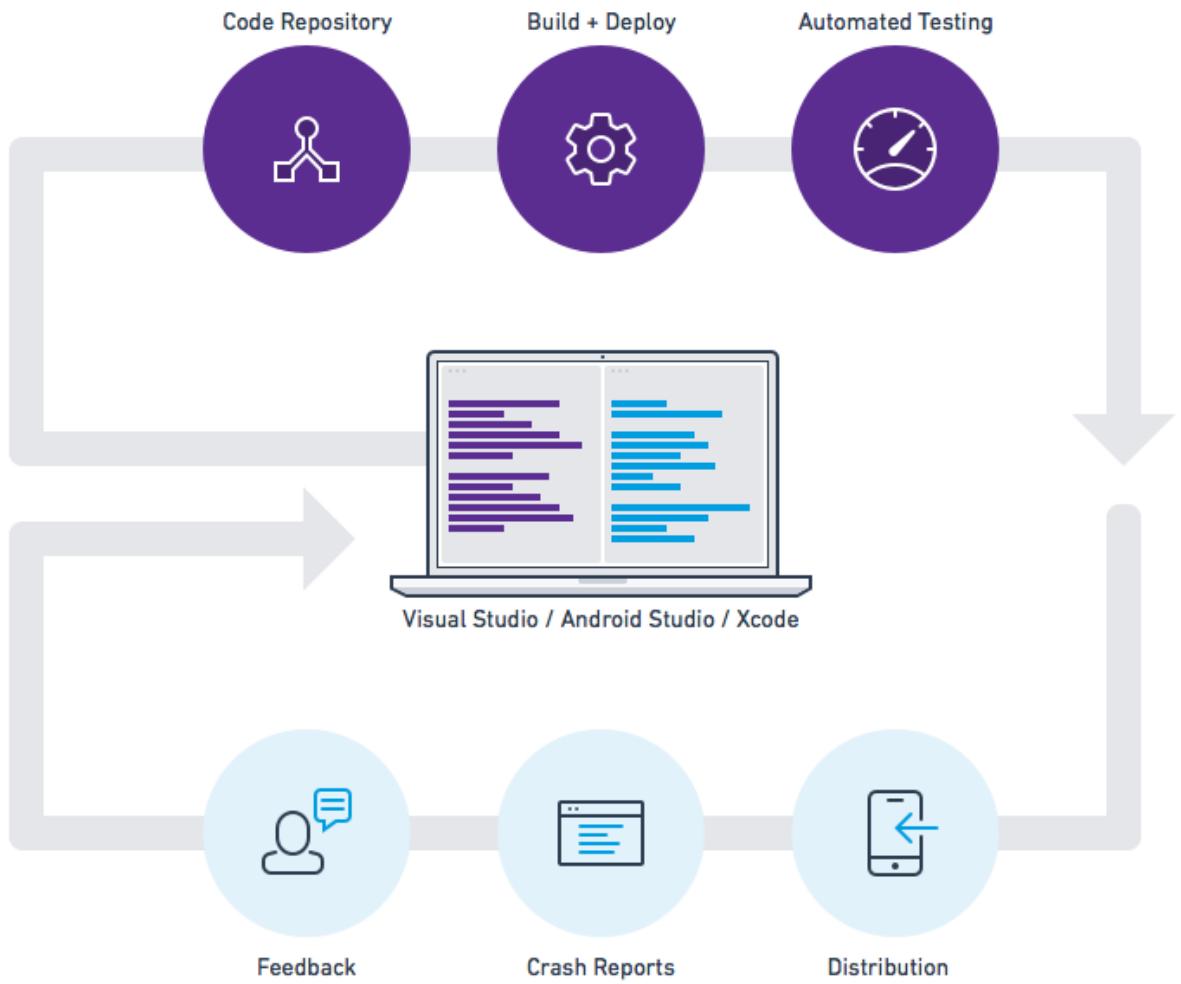
Analyze results in beta testing and platforms/devices coverage



Learn from production usage and connect to direct marketing actions

HockeyApp
Azure Mobile Engagement

Visual Studio Team Services and HockeyApp



Distribution

In-house App Store for testers

Upload beta versions of your application to the HockeyApp store to allow testers to install and test these versions on actual devices

Deployment made easy

HockeyApp's desktop app automatically tracks all necessary information about your latest build in order to make uploading beta versions very easy

The screenshot shows the HockeyApp distribution interface. At the top, there are three dropdown menus: 'Release type' set to 'Beta', 'App name' set to 'Paperbag', and 'Upload file types' set to '.ipa & .dSYM.zip'. To the right of the file type dropdown is the file size '(5.1 MB)'. Below these are four checkboxes: 'Download Allowed' (checked), 'Restrict Downloads' (unchecked), 'Notify Testers' (unchecked), and 'Set version as Mandatory' (unchecked). On the right side of the screen, there are two radio buttons: 'Textile' (unchecked) and 'Markdown' (checked). A large text area labeled 'Release Notes:' is below these buttons. At the bottom left, there is a dropdown menu 'When finished:' with the option 'Open Download Page' selected. On the far right, there is a blue 'Upload' button.

Crash reports

No additional code

By integrating HockeyApp's open source SDK for Android, iOS, Mac, and Windows your apps can send crash reports directly to HockeyApp, no additional code needed

Powerful crash analysis

HockeyApp processes and symbolicates all crash reports. This gives meaningful stack traces with friendly class names, methods, and accurate line numbers

The screenshot shows a search interface for crash reports. At the top, there is a search bar containing the text "cclass:ImageQueueController" and a "Search" button. Below the search bar, there are two tabs: "Crashes" (which is selected) and "Crash Groups". Under the "Location & Reason" section, there are four entries, each showing a stack trace line starting with "- [ImageQueueController saveImageToFileSystem:] line 1165" followed by an "NSInvalidArgumentException" error message.

Location & Reason
- [ImageQueueController saveImageToFileSystem:] line 1165 NSInvalidArgumentException, reason: -[_NSPlaceholderDictionary initWithObjects:forKeys:count:]: attempt to insert nil object at index 0
- [ImageQueueController saveImageToFileSystem:] line 1165 NSInvalidArgumentException, reason: -[_NSPlaceholderDictionary initWithObjects:forKeys:count:]: attempt to insert nil object at index 0
- [ImageQueueController saveImageToFileSystem:] line 1165 NSInvalidArgumentException, reason: -[_NSPlaceholderDictionary initWithObjects:forKeys:count:]: attempt to insert nil object at index 0
- [ImageQueueController saveImageToFileSystem:] line 1165 NSInvalidArgumentException, reason: -[NSCFDictionary initWithObjects:forKeys:count:]: attempt to insert nil object at index 0

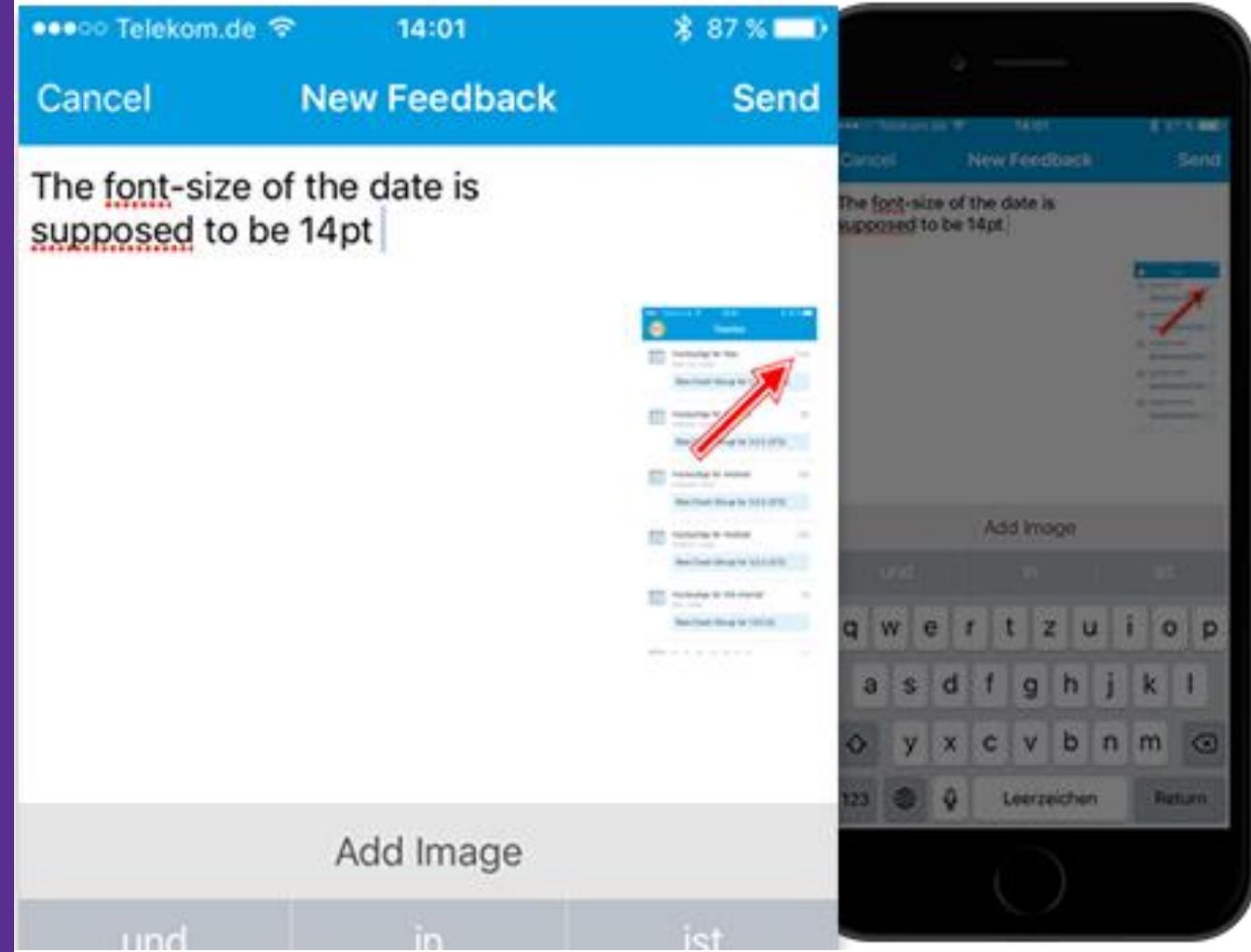
Feedback

A conversation with your users

All feedback is handled as discussions. You can manage these discussions in the web interface or through email. Search discussions, mark them as completed or create work items based on them. Give your users a voice outside of the app store

All development phases

You can use the feedback feature for all builds of your app or just beta versions. Either way, HockeyApp makes it easy for users to tell you what's what. Let them post ideas right from within your app



Beta test coverage

Real usage matters

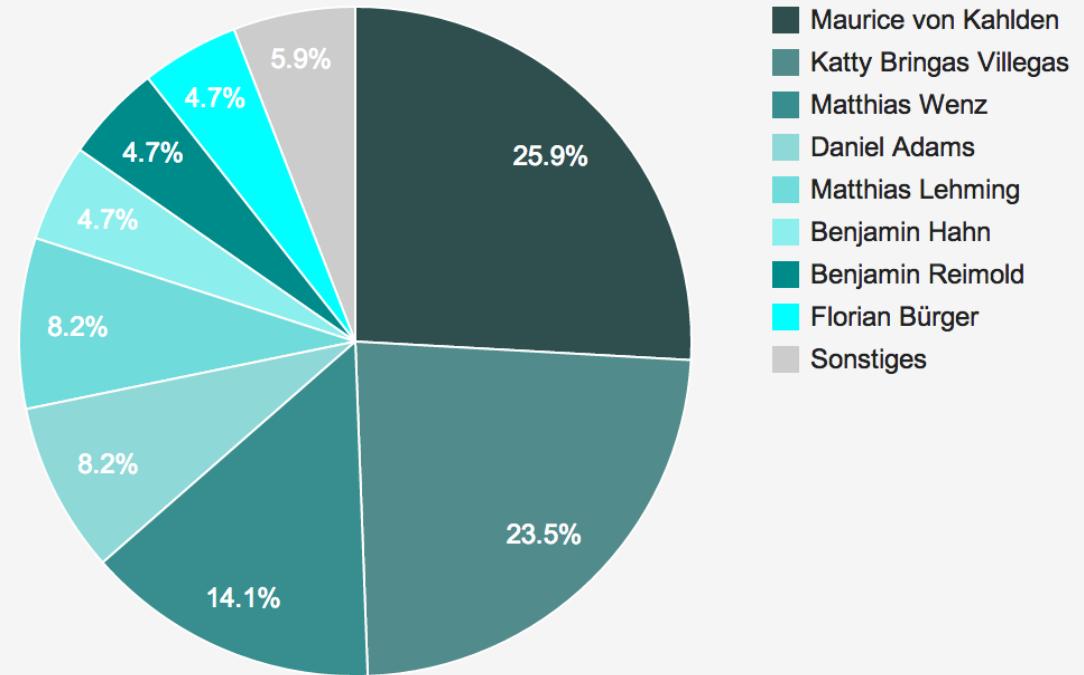
Advanced metrics to see which devices were used, how long the app was used for, and which language was tested.

No additional setup

Detailed charts

HockeyApp features both raw data from analytics as well as live, interactive charts for the most important metrics

Users



How Microsoft can help



Create mobile experiences...

New applications or new end points to existing applications for **Android, iOS, and Windows**

Xamarin
Visual Studio



...connected to the business...

Enterprise-ready platform that integrates modern mobile experiences with **existing business assets**

Microsoft Azure



...with mobile-era agility

Achieve speed with **faster development cycles** and continuous measure and learn

Visual Studio Team Services
HockeyApp

Visual Studio... now with Xamarin

Visual Studio Community

Tools for non-Enterprise scenarios

Key scenarios

Hobbyists, students, OSS, small teams
Create applications for Android, iOS, and Windows
Runs on Windows
Share code across devices
Debugging code

Key IDE features

Build (incl. remote Mac agent)
Native designers
Debugger
Xamarin.Forms

New Dev Essentials benefits

Access to recorded Xamarin University classes

Xamarin Studio Community

Tools for non-Enterprise scenarios

Key scenarios

Hobbyists, students, OSS, small teams
Create applications for Android and iOS
Runs on OS X
Share code across devices
Debugging code

Key IDE features

Build (incl. remote Mac agent)
Native designers
Debugger
Xamarin.Forms

New Dev Essentials benefits

Access to recorded Xamarin University classes

Visual Studio Professional

Tools for individual developer and small team productivity

Key scenarios

Unrestricted, professional mobile development, code sharing, and debugging

Key IDE features

No usage restrictions for Visual Studio
No usage restrictions for Xamarin Studio

New subscription benefit

Access to advanced content on Xamarin University

Visual Studio Enterprise

Enterprise grade tools for projects of any size and complexity

Key scenarios

Productivity for enterprise applications
Enterprise security
Enterprise quality

Key IDE features

Embedded Assemblies
Xamarin Inspector Preview
Xamarin Profiler Preview
Xamarin Test Recorder Preview
Above enterprise features in Xamarin Studio
VSE features used for Xamarin

New subscription benefit

25% Test Cloud discount



Xamarin University

What you'll learn

- iOS and Android fundamentals
- Mobile app lifecycle
- Native UI and controls
- Cross-platform architecture
- Mobile best practices
- Secure backend integration

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Xamarin Evolve 2016 Sessions

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Q&A



naalnas@microsoft.com
@nasser



