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Build 2021
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SCOTT GUTHRIE: Good morning, everyone, and welcome to Build 2021. Build is all about developers, and we're incredibly excited to talk to you this week about some of the work that we're doing that enables developers to build even better apps and solutions and deliver even more impact to the world.

This past year has been a year really unlike any other, and developers have been absolutely critical to helping businesses, governments and people everywhere respond and adapt to the challenges of the pandemic. And as we work to reimagine our future, developers have never been more important to the world.

Microsoft was founded 46 years ago as a developer tools company. At the time, our first and only product was Microsoft BASIC, and developers and the platforms and tools they use have been core to Microsoft's DNA ever since. And today, we have the richest developer tools in the world with Visual Studio, GitHub and .NET. And with the Microsoft Cloud, we have an incredibly rich platform that developers can use to build apps and solutions that can reach any person on the planet. And we want to empower all of you to build what comes next.

Now, no other company has the breadth and depth of the solutions that we deliver at Microsoft, and the Microsoft Cloud obviously is critical to enabling that. What makes the Microsoft Cloud particularly rich is just the set of rich set of services it delivers, and with Microsoft Azure, we provide the underlying cloud infrastructure and cloud platform that you need.

And then on top of it, we have rich SaaS-based capabilities with Microsoft 365 and with Dynamics 365 that allow you to connect to employees and reinvent business processes, all in a SaaS-based way.

And with our Power Platform, we provide the glue that allows you to stitch all of these solutions together to accelerate digital transformation.

With GitHub and Visual Studio, we have the world's richest developer tools and services, and with our built-in security capabilities, you can go ahead and protect all these solutions and manage them with a common identity control plane that enables you to kind of securely run any workload anywhere. No other cloud vendor offers this fully comprehensive developer experience and overall platform capabilities.

Over 95% of the largest 500 companies in the world today are now building amazing applications using this Microsoft Cloud, and throughout Build this week, many of our customers across every industry are going to share about how they are using the

Microsoft Cloud to help themselves digitally transform and reimagine how they engage with their employees and customers.

A great example of an amazing organization that's driving a really transformational cloud strategy and becoming an even deeper digital technology company is UBS, which is one of the largest financial institutions in the world.

Three years ago, UBS announced a plan to make the firm more agile by leveraging the cloud to build new client experiences and be able to support their clients using leading-edge digital solutions. And today, now more than 50% of their computing power is being hosted in the cloud, and UBS is driving really this transformation of becoming more agile, delivering better and better solutions, using data and AI to really strengthen their business and transform the value that they can provide to their clients. And we're incredibly pleased to be a partner that's been key to enabling that experience.

Now, in this talk, I'm going to go ahead and highlight a couple of the great innovations that we're delivering this week at Build and have some amazing talks that you can go ahead and watch that go deeper about each of them. And I'm going to give you kind of a slice of just some of the great sessions that you can check out as part of this conference.

Let's start by talking about some of the latest innovations we're delivering with our developer tools in cloud. As I mentioned earlier, Microsoft has the most comprehensive tools and platforms for developers to use, as well as the teams they're on to leverage, to code, collaborate and ship solutions from anywhere.

Our tools have integrated collaboration capabilities so that you can work across a team, so that you can have your entire team collaborate securely together. And you can use your favorite languages, opensource frameworks to make sure that you can leverage the full ecosystem that's out there, regardless of your platform or choice. And you can build, test and deploy all of your code to the cloud using the great set of GitHub capabilities and Visual Studio capabilities that we provide.

We just released a new version of Visual Studio 2019 that we call the 16.10 release. This includes a bunch of great productivity enhancements for .NET and C++ developers, enhanced GIT tooling support, as well as improved container and Azure tooling features, including support for new Azure API management, all built into the IDE.

We also announced the new version of Visual Studio that we're calling Visual Studio 2022. This is going to be the first 64-bit native version of Visual Studio, which will bring a lot of great performance and scalability improvements to developers working on a large, complex projects.

.NET 6 marks the completion of our journey to really unify the .NET ecosystem, and .NET 6 Preview 4 is now available, which unifies the .NET platform, while also introducing new innovations like C# 10, .NET MAUI and Blazer, that enable you to build

cross-platform, native mobile and desktop apps for Android, Mac OS, iOS and Windows, all using a single code base.

I definitely want to encourage you to check out some of the great sessions and upgrades to these latest additions because they really provide a tremendous amount of new capabilities and power.

What's great is that Visual Studio and .NET are the perfect complements to this larger developer set of capabilities, and combined, Visual Studio, GitHub and Azure in particular, enable developers to focus on building apps and not have to worry about all of the infrastructure that's required in order to run them.

With Visual Studio, GitHub and Azure, you get a seamless experience that enables you to focus on your code and deploy and get it to the cloud, using your favorite languages and platforms of your choice, so that you can, again, code, collaborate and deploy applications securely across the team anywhere you want.

One of the key capabilities that we introduced last year was a new capability we called GitHub Actions, and GitHub Actions enable developers to easily create secure and compliant code-to-cloud workflows that integrate not just building and testing code, but also things like governance, security, compliance and quality into an overall software development lifecycle.

Now, as you build more and more for the cloud and as you try to become a more and more agile organization, these things are pretty critical to automate and build in directly into the workflow. And GitHub Actions allow you to do just that.

GitHub Actions are incredibly easy to set up. Historically, setting up a CI/CD pipeline was not, I'd say, the most fun experience and it would often be a fairly involved process that required a lot of infrastructure. What we've done with GitHub Actions is made it really trivial to do instead and do it all in a cloud-native way.

Basically, you can go now to any repo inside GitHub and you'll notice at the top there's now an Actions tab on it. When you click it, it gives you a screen like this which has a whole bunch of starter templates that you can apply to go ahead and build and run the code that you're using.

And so, for example, here I've got a .NET repository and so I can click the .NET setup in order to start with a default build environment rather than me having to write one from scratch. And then what I can go ahead and do is edit this YAML file that's created for me with any custom steps or configurations that I want.

And the Actions themselves, they're just text files stored in the YAML format. The benefit about that is it means that they can be checked into my source control, I can version them, and I can easily edit and do diffs against them.

We provide kind of a built-in text experience inside GitHub, but again, because it's in source control, you can use any tool to edit it and collaborate on it across a team.

We also have a built-in marketplace with a bunch of templates and built-in Actions that you can leverage, and in fact, you can build your own Actions and either publish it to the marketplace or share it across other projects or teams.

And things like built-in support for container scanning or policy controls or security checks are all examples of great Actions that you can just leverage from a broad ecosystem, both in the open source world, as well as, again, other teams within your enterprise or organization.

And then once you save this Action, any time you check in code, you can set it, configure it to automatically run. And so, for example, build, test and deploy your solution.

So, for example, if you're inside Visual Studio, we've integrated GitHub Actions directly into the IDE. And any time you do a commit or submit a pull request, the workflow will trigger automatically and run that Action as part of that process.

Now, when the Action is running, it's going to be running in the cloud. And under the covers, GitHub is using Azure, for example, to spin up a VM for you automatically and execute and run that build test. The nice thing is you don't have to worry about that infrastructure at all. It's all just provided for you as part of GitHub. In this case, here you can see we're actually running our build and it's completing all the different steps as part of it. And that kind of, again, allows us to very easily automate the entire workflow.

In addition to running that YAML file and being able to run kind of any custom code as part of the action, we've also now built into GitHub support for CV so you can automate delivery and deployment of the code into the cloud as well, and added great enterprise features like policy checks or even manual approval processes that you can go ahead and configure before you deploy into production. The great thing again is it's automated everywhere.

Now, all of these capabilities I'm showing work in a multi-cloud way. Regardless of whether you are deploying to Azure or any other cloud, you can leverage all these capabilities, including the on-premises environments that are not even cloud-enabled yet.

What we've done also, though, is we've also integrated this workflow into Azure as well. And so, for example, here inside the Azure portal, you can see how we are showing all of the deployments that have actually happened to our Azure Kubernetes cluster here as part of a GitHub Action. And we do the same thing for web apps and other app model types that we support inside Azure.

The beauty here is you can actually see not just on the GitHub side, but you can also see on the Azure side each of these deployments and versions that have gone into production. And if I click on, for example, one of these check-ins, I can even go ahead and jump

directly into the commit to see what code actually changed as part of this deployment, allowing you to kind of link the development process and the operations process together.

And what's great is GitHub Actions are available today. In fact, we give every customer of GitHub, even people that just have a free account, a number of built-in GitHub Action minutes that you can go ahead and use without actually having to pay anything. And so, again, it's the easiest and really the best way to set up CI/CD anywhere and, again, allows you to build incredibly rich, productive workflows to take your code into the cloud.

One of the other great services and capabilities that we're adding into GitHub is something we call GitHub Codespaces. What GitHub Codespaces does is it allows you to stand up a full development environment in the cloud that is associated with a specific repository or project you're working on and gives you kind of an incredibly powerful development environment that can really fully harness the power of cloud infrastructure anywhere in the world.

In the same way that we added an Actions tab into every repo, you'll notice we also now have a code button that we're exposing as well. And if you click that, it shows you a nice little dropdown where you can, for example, clone a local repository of your repo, like you would today inside GitHub, but you'll notice there's also now a button which allows you to open this code with a Codespace. And when you click on that, it will go ahead and provision a development environment for you fully in the cloud. This takes about 15 seconds from scratch.

Behind the covers, it's spinning up a container environment hosted inside Azure, in fact, and cloning the repo and setting up again a full development experience for you.

The benefit here is if you're joining a new project or maybe you're moving to a different machine or maybe in a pandemic, you're sometimes working from home, in addition to, say, in an office environment, this allows you to kind of have the complete development experience setup that you need in literally 15 seconds or less. And once this is provisioned, you're dropped into a full development experience, all hosted inside the browser.

And you'll notice this looks like Visual Studio Code, and, in fact, it is Visual Studio Code, in this case running in the cloud with a full editing and development experience that you can now use anywhere.

Built into this is features like IntelliSense, so I can do for code intelligence regardless of my language, again, built into this experience.

I also have a command shell, so I can actually run Linux commands, in this case because I'm running a Linux based code space. We'll have a Windows version in the future as well. And so you can basically run your commands directly as part of this to do local dev and test.

You can hit F5 and go ahead and launch into a bugger. This allows you to actually set breakpoints, as well as to debug your code, just like if it was on a local machine. For example, right here, I can even go ahead and when my break point is hit, configure it so that I can go ahead and see my variables, set watches, again, just like I would in a local development experience, but again, all in the cloud.

And the nice thing about Codespaces is you only pay by the minute. It's not something you have to have kind of running all the time. You can use it just for a few minutes if you want to quickly debug or check in a fix for something.

And because you can spin up any size resource in the cloud, it's also great if you want a really, really beefy machine with lots of cores and lots of memory, that you can then use from your laptop or even a tablet device anywhere in the world. It gives you a lot more flexibility, a lot more agility, and I definitely encourage you, if you haven't tried it out, sign up for it on GitHub.com and let us know what you think.

Now, I've talked about a bunch of great improvements and enhancements that we're releasing at Build this week, and there's a phenomenal talk by Amanda Silver, Donovan Brown and Julie Strauss, and I definitely encourage you to watch that session to learn more about our latest innovation for developer tools and cloud and go a lot deeper on all the great technology I just walked through.

So, that was a little bit about developer tools in cloud. Let's actually now just switch gears and talk about building cloud-native applications.

Now, one of the things that's great about Azure is the power of all the built-in developer capabilities that we deliver as a service on it, and we literally have literally hundreds now of services on Azure that you can take advantage of as a developer to build great applications.

And some of these, I know a lot of people that are watching, things like web apps and serverless functions, and logic apps, you're very familiar with, and they're used now by literally millions of developers around the world today.

Yesterday, we announced a preview of a great new set of Azure capabilities which are going to now allow you to take these same services that you've used inside Azure, and build applications that can now use them and run anywhere, across whether it's on Azure, across an on-premises environment, including bare metal, as well as VMware deployments, as well as even other clouds like AWS and GCP. In fact, any Kubernetes cluster around the world, again, running in any environment, can now be connected through what we call Azure Arc, and you can now take advantage of these services on top of that cluster as well.

What this means is that you can now innovate faster by using our built-in Azure application services, and again, have this beautiful model where you can focus on your code and not have to worry about the underlying infrastructure that it's running on top of.

And this means you don't have to kind of trade off productivity for portability, you can now run it everywhere.

It also means that you now have a higher-level set of capabilities that you could run on top of Kubernetes, so you get some of the flexibility that Kubernetes provides, as well as the portability that it provides, but an even richer set of capabilities that enable you as a developer to build applications faster. And then this also gives you a great way as a developer to work with teams on the operation side to be able to run and monitor the applications in a multi-cloud approach.

And again, the power of all this is through something we call Azure Arc, which is a key element of our multi-cloud, hybrid strategy. And what Azure Arc provides all up is this notion that you can go ahead and do cloud operations anywhere for your cloud applications.

And I talked on the previous slide about how you can use all of our application services. Azure Arc also allows you to manage infrastructure, and in previous developer conferences, we've also announced and now support the ability to run, for example, our database services as well on top of Arc. And the combination of all of this gives you just tremendous flexibility to, again, build solutions that have ultimate portability and can be used everywhere.

And with Azure Arc, you have a single pane of glass for management and operations and monitoring. You can apply Azure policy and governance controls as part of it.

And Azure Arc works with any CNCF conformant Kubernetes cluster, which again makes it possible to use Azure Application Services, data services and infrastructure services literally anywhere to accelerate your innovation faster.

Gabe Monroy has a great talk here at Build this week called Build Cloud Native Applications that Run Anywhere, which is a great session where you can learn more about all of these announcements and really start taking advantage of it today.

Now, I talked about cloud-native apps and our developer tools. Obviously, one of the key ingredients of all of those apps is the data that they store and the AI that works against it. And with Microsoft Azure and our overall cloud platform, we now provide an incredibly rich set of services and capabilities that enable you to do this. And this week, we're going to talk about some of our great, latest innovations.

One of the services that's been very differentiated for Azure over the last couple of years, and that developers really love, is our Azure Cosmos DB database. Azure Cosmos DB is our fast, ultra-low latency, no-SQL database. It's designed for a single millisecond response time. It supports a wide variety of different developer APIs, including popular ones like Cassandra and MongoDB, and Gremlin Graph and others. And it enables you to build petabyte-scale applications that can even run across multiple simultaneous Azure regions in an active-active-active or more configuration. And we have customers today

that are literally scaling to trillions of transactions per day against a single database to support customers all over the globe.

In particular, we announced the general availability of our Cosmos DB serverless support. With serverless, developers no longer need to kind of provision the database that you're always built for, regardless of how it's used. Instead, with serverless capabilities, you only pay us based on the actual database operations that you perform.

And so, there's no minimum charge or capacity planning required. Instead, you basically just pay for the request against your database service, which provides tremendous flexibility, obviously, in your pricing and also how you can scale your application.

We also this week introduced our new integrated cache support for Cosmos DB, which can boost performance by up to 300% on your workload and reduce your costs by up to 96% for heavy read workloads inside your application.

We also announced some new enterprise-grade security capabilities, much richer role-based access control support, as well as something we call always encrypted, which is particularly important in this ultra-secure world that we now live in.

And we've made some really great free tier enhancements. And that's been something a lot of people have often asked for in the past, which is, hey, I love Cosmos DB, but you know, can you help me get started with it without having to pay a lot of money?

And the great thing with Cosmos DB now is you get a free 25 gigabyte database that can do a thousand requests per second, with no cost ever, and you can use that now to start building applications faster and easier than ever before.

Now, we have customers across pretty much every industry now that are taking advantage of the capabilities that Cosmos DB delivers, and in particular, this sort of need for incredibly responsive, incredibly available applications that can scale up to handle things like Black Friday and the holiday shopping season and other things like Singles Day and other kind of key shopping events around the year, where you sometimes have hundreds of millions of people hit your site in just the span of a few minutes or an hour. And these are just some examples on this slide of some of the retail customers that are running on Azure, leveraging capabilities like Cosmos DB in order to deliver that solution.

One of these is the largest not only retailer in the world, but actually the largest business in the world today, which is Walmart, and they're the Fortune one company in terms of revenue and size in the world.

During this past holiday season, as shoppers often pivoted to doing more and more of their purchases online instead of inside their physical stores, e-commerce became an even more important part of Walmart's overall revenue and overall business model, and they

now generate billions of dollars in annual revenue and their e-commerce business is growing incredibly fast.

As they kind of prepared for that holiday season, being able to scale up and support that load and be able to handle trillions of daily requests, with five nines availability, and have sub-millisecond or single-digit millisecond latency at petabytes scale was absolutely critical.

And Wal-Mart used Cosmos DB for all of their online transactions as part of this past holiday season. They ran their site in an active-active mode across multiple Azure regions and they delivered sub-10 millisecond latency as part of their application. And it was a tremendous success. It's just one example of how you can build these next generation solutions using this amazing cloud technology now for Azure.

Now, for Azure AI, we're also making some great announcements this week that enable developers to build AI applications even faster. Lots of great new improvements with our Azure Applied AI services. These are kind of pre-built AI models that you can leverage, so if you want to do document processing or customer service or extract content from a document, all those capabilities are built in for you as a developer to call as an API.

Great improvements to PyTorch, including PyTorch Enterprise Support, which enables even more capabilities for custom AI models that you want to build.

And with our Azure Arc enabled support, like you saw with our application services earlier, you can now use our Azure ML services everywhere, including in on-premises environments or even on other clouds.

And then lastly, we got some great improvements with our bot support with our Azure Bot Service, that will enable you to build even more interactive and better services that you can deliver to end users.

I definitely recommend Rohan Kumar's great talk, which is called: Deliver New Intelligent Cloud-Native Applications by Harnessing the Power of Data and AI session that we're having this week, where you can learn more about all these great enhancements and more.

Now, a lot of what I've covered so far is from a core platform perspective and in the Azure bucket of the Microsoft Cloud. Now, one of the things that we've also seen this past year has been, obviously, as people have pivoted to work more from home, or in a hybrid way, the need to collaborate in a remote fashion across organizations and across teams.

And one of the key applications that's been essential for kind of connecting all these employees and all these people around the world has been Microsoft Teams. And there's now more than 145 million daily active people that use Microsoft Teams in a pretty essential way to run their businesses.

And part of what makes Teams powerful is not just that you can do video conferencing or text chats, but you can also integrate applications as part of that overall experience and leverage the Microsoft Cloud as really a collaborative application development experience that you can integrate your business processes and your applications within.

And with the Microsoft Power Apps offering that we have, professional developers can also now accelerate delivering workflows and the delivery of business applications to all 145 million of these users.

We see increasingly the need for you to be able to kind of build these types of business applications and asynchronous collaboration scenarios faster, and part of what we're trying to do with the Microsoft Cloud all up is enable professional developers to work with, say, business analysts inside an enterprise, as well as people building simple automation workflows or front-end experiences, and combine all of this into solutions that can be deployed quickly and leveraging all the collaboration capabilities that are built in as part of the Microsoft Cloud. And we now have a really great development workflow that enables that.

These are just some of the great companies that are building these types of solutions of Power Apps, Azure, and I definitely encourage you to try out the capabilities that we now have within your own organization as well.

Just to kind of illustrate how easy it is for you to build these types of solutions, I'd like to kind of walk through one great example, which is Toyota North America.

Toyota wanted to build solutions that enable their thousands of employees around the world to do quality check deliveries in the aftermarket accessory business within the vehicles that they sell. And they wanted to be able to do it using Power Apps and the power of Teams and be able to leverage an Azure-based backend. And this solution is now being used by all Toyota dealerships as part of the vehicle delivery and accessory business. Let's see how they built it.

The great thing is they were able to go into Visual Studio and just say "file new project" and create a Web API using the standard .NET Web API support that their developers were already familiar with. They could create the APIs. They could call Cosmos DB or SQL or other data services. And then when they're ready, they could either right-click and publish that API into Azure or set up a GitHub Action and do it automatically using a CI/CD process.

Now, once they've published that API and they used Azure API Management in order to publish it into a catalog, the beauty is all of the business analysts inside Toyota, as well as other developers, could basically consume it using Power Apps and inside Teams and all in a very secure, easy way.

And so, for example, here inside Power Apps, you'll notice that that Toyota API that we just built in .NET now surfaces on the toolbox, and that developer is now able to go ahead and very easily data bind UI elements inside of Power App, they can go ahead and call those APIs inside the cloud.

You can see here, this is a nice sort of Excel-like macro language. This could even be used by, say, a business analyst that maybe is not a professional developer in order to call that API that was built by a professional developer, in a very easy, seamless way.

And then, once an application is built, they can just go ahead, right-click and publish it into Microsoft Teams, with just a single click, and now it can be deployed to anyone inside a dealership or across the Toyota organization.

This is an example of that application now running inside Microsoft Teams on a Windows desktop. But the beauty is it also works on any device that Teams is on. So, for example, if I'm on my phone, I can just pull up the app drawer to find the app, and then I can go ahead and activate it.

This is a great way I can literally roll out applications across any tablet, phone or desktop device, on any operating system, and now connect end users directly to that API that's running on Azure, again, all through the power of Power Apps.

And this is sort of a great example of how you can start to build really interactive, very fast development workflows that really enable you to deliver amazing value in a digital transformation kind of way to an entire organization using Teams.

This week at Build, we're also announcing a whole bunch of new capabilities for professional developers to also target Teams using procedural code as well. And you can do that through SDKs, and we now have great SDKs built into Visual Studio and some really great tooling support that we're delivering.

We also now have developer API support for the Power Platform, so you can use C# or your other languages in order to code against the Power Platform as well, and a bunch of great capabilities around collaboration and being able to set up meetings and do voice through our Azure communication services and Teams, all built-into your applications that you code.

Jeff Teper has a great talk that you can also watch this week to learn more about all these innovations and how they come together to enable you to use the Microsoft Cloud and our development tools to build amazing applications and solutions.

The last thing I thought I'd talk about is around how you can build applications inside Azure, not just for, say, employees inside your organization or for customers that are end users, but also package them up into business applications or SaaS-based delivered solutions that you can then sell both to end users, as well as to other businesses, and deliver in a SaaS-based way.

Part of what makes the Microsoft Cloud powerful, as I talked about earlier, is the rich set of capabilities that we deliver, not just with Azure, but with things like Office 365 and Dynamics 365 and the Power Platform.

And what's great is, as a developer, you don't always have to start with, say, a blank Kubernetes cluster or blank VM. You can actually start by taking advantage of some of these built-in developer components, like I talked about just a moment ago with Teams and with the Power App platform, when you're building your solutions and your applications.

And this allows you, for example, if you want a full customer service solution, to start with Dynamics 365 and then build custom UI or custom workflows around it and be able to leverage an incredibly rich set of CRM capabilities that we provide, that you can then adapt as part of your SaaS-based solution.

I definitely want to encourage developers, if you haven't already looked at all these components, to start looking at some of these bigger components and some of these bigger building blocks that you can leverage, because just like you can leverage APIs and libraries in the past, this allows you to do even more and deliver even more value to your customers.

And we not only provide kind of horizontal support like CRM, but increasingly, we're also providing richer and richer industry support. And so, this allows us to deliver features that have even kind of more sophisticated capabilities and components tailored for a specific industry. And we now have five industry clouds with built-in vertical industry components that you can leverage as part of your solutions.

Make sure to check out Charles Lamanna's great talk on Build Differentiated SaaS Apps with the Microsoft Cloud, which is a session this week that goes much deeper into how you can leverage all of this, and again, build amazing applications as part of your solutions.

We've covered a lot of territory in this presentation and hopefully, you see just sort of the richness of some of the great new capabilities that we're releasing this week and how you can use them to build amazing solutions. And as I talked about it, there are some great sessions you can watch to go even deeper and learn more.

No other cloud provides the depth and breadth of what Microsoft provides, and between this cloud and our developer tools, you can really build some just phenomenal solutions, and I'm really looking forward to seeing what you build with it.

Coming up next, don't miss Scott Hanselman's developer session and the rest of our day two Microsoft into Focus sessions. I hope you have a great Build and a great rest of the week. Thanks so much.

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