Google Cloud Next '21 Day 2

Company Participants

- Abby Carey, Developer Advocate
- Aja Hammerly, Developer Advocate
- Anupriya Srivastava, Cloud Developer Advocate
- Aparna Sinha, Director of Product Management
- Brian Lozada, Chief Information Security Officer
- Dev Ittycheria, Chief Executive Officer
- Iman Ghanizada, Security Solutions Manager, Google Cloud
- Jahidul Khandaker, Senior Vice President and Chief Information Officer
- Joel Conkling, Product Manager, Earth Engine
- Marco Genovese, Customer Engineer, Google Cloud
- Murray Kucherawy, Production Engineering Manager
- Phil Venables, Chief Information Security Officer, Google Cloud
- Priyanka Vergadia, Developer Advocate
- Rae Wang, Director, Product Management, Google Cloud
- Rasesh Patel, Chief Product and Platform Officer
- Richard Seroter, Director, Outbound Product Management, Google Cloud
- Sachin Gupta, Vice President and General Manager, Infrastructure, Google Cloud
- Sri Subramanian, Group Product Manager, Security, Google Cloud
- Steph Hay, Cloud Security UX Director, Google Cloud
- Sunil Potti, Vice President and General Manager, Google Cloud Security
- Suraj Rao, Global Head, Advanced Analytics Office
- Tanisha Rai, Product Manager, Google Cloud
- Unidentified Speaker
- Urs Holzle, SVP, Technical Infrastructure
- Vidya Nagarajan Raman, Group Product Manager, Google Cloud
- Vidya Nagarajan-Raman, Group Product Manager, Google Cloud

Presentation

Aparna Sinha

Hi, I'm Aparna Sinha. Welcome to Day 2 of Google Cloud Next. I'll be co-hosting today alongside Urs Holzle and we've got a really great lineup of new technology and demos from Google Cloud. But before we get started, I want to thank you all for taking time out of your busy week to be here with us. Yesterday was an incredible first day at Next.

Thomas and Sundar made some amazing announcements. This week, we're releasing over 100 new products, services and programs for you. We're kicking off Day 2 now with this keynote, A Cloud Built For Developers. After this, we'll jump right into a live developer Q&A, where you can ask us anything. And then tomorrow is Community Day and that will be totally dedicated to you for learning, discussions, networking and all kinds of fun. All right. Let's get things started by welcoming Urs. Hi, Urs.

Urs Holzle {BIO 15314490 <GO>}

Hi, Aparna. Hi, everyone. I hope you're as excited as I am to get started today. And since this is a developer keynote, we'll kick it off with our first demo right away from Google Research and our DeepMind colleagues, who've been working on some amazing voice technology.

(Audio-Video Presentation)

Now before you get too impressed by my language skills, I did not actually speak these words. What you just heard is a custom text to speech model that has trained on my voice and that can generate synthetic speech in different languages. And our teams have already started using this technology to improve our voice experience for all users.

Aparna Sinha

That's right. Google's Project Euphonia is already using custom voice to help people with a typical speech to communicate and be better understood. Technology like this creates a more inclusive world. To find out more about this, check out the Project Euphonia website. Custom voice is available today for select cloud customers. We're very mindful of the potential misuses of this technology and we're taking great care to prevent them by reviewing each use case uniquely.

Urs Holzle {BIO 15314490 <GO>}

Now, look around you. Every day you see innovation that's brought to you by developers, like yourself with persistence and skill. And Google has a long tradition of supporting developers in open source and elsewhere. For years you've been using technologies, like Kubernetes, Firebase, TensorFlow, Go, Angular, gRPC many others. And when we built Google Cloud, we built it for developers and we were inspired by all the things you've created with it. And our job is quite simply to make it easier for you to do what you love. So we focus on making you as productive as possible with the least amount of effort. And so in everything we design, we take all the feedback that you're sharing with us and build a cloud platform that just works, whether that's by natively embedding key security or sustainability features into the platform itself or by featuring partner solutions right within our own console, we're really focused on one goal, giving you the best developer experience of any cloud provider.

Aparna Sinha

Google Cloud has had tremendous traction with digital native customers since our very early days. How have you seen customer and partner adoption evolve since then?

Urs Holzle {BIO 15314490 <GO>}

Well, many of our biggest customers are cloud natives, but we've seen tremendous adoption by a broad segment of enterprise customers in traditional industries as well, like entertainment or financial services.

For example, Major League Baseball, which is North America's oldest and most attendanced professional sports league is using Google Cloud to modernize fan engagement and to increase operational efficiency. And Equifax, which was founded in 1899 and is one of the world's largest consumer credit reporting agencies is transforming itself from a credit bureau to a next generation data analytics and technology company built on Google Cloud.

Aparna Sinha

We've seen a huge shift. Essentially every company is becoming a tech company to increase their competitiveness and establish leadership in their industries. Developer talent and cloud services are at the heart of this shift. Whether you call that digital transformation or something else, companies of all sizes are finding that Google Cloud is optimized to help make your data, your applications and your talent more useful and relevant to your business.

Urs Holzle {BIO 15314490 <GO>}

Exactly. And as Thomas mentioned yesterday, everyone needs to be thinking through how they will fundamentally shift into a technology company to serve their customers in the most meaningful ways, 10 years from now. And you as developers are key to making this happen. So organizations ask themselves, do we have the most cutting-edge technology to become a leader in our industry? And you the developers are well equipped to answer this. And we are super focused on making you and your company successful, and there's two areas we focus on to support your growth.

First, of course, making it easier for developers to get their job done; second, investing in the developer community so that everyone can learn and grow from each other. So let's talk about how Google Cloud is making it easier for developers to get their job done. From our transformational infrastructure stack to our deep innovations in data, security, ML, every feature we release starts with simplifying the developer experience, take our open cloud experience for example. We recently expanded our compute stack to include Tau VMs that deliver 42% better price performance over any other comparable solution in the market with no recompile.

And thanks to our zero trust approach to security, Google Cloud was ranked a leader in IaaS Platform Native Security by Forrester well ahead of the competition.

And of course, we're focusing also on managed services that make it easy for you to deploy scale and manage Kubernetes clusters on the edge or in the cloud. And Google cloud has the most complete and most secure container experience for developers.

In fact, the 2021 Gartner Solution Scorecard for Google Kubernetes Engine gave GKE an overall score of 92, again, well ahead of the competition. And of course with GKE and Anthos, you can run these containers anywhere on premise or the clouds, on the edge, anywhere.

So it's fair to say that in a year since Google invented Kubernetes, containers have really completely revolutionized IT operations. Now recently, European filmmakers from Honeypot.io created a documentary on the history of Kubernetes and it will be out in January 2022. And you are the very first audience to have a look at the trailer right now so let's roll out.

(Audio-Video Presentation)

Aparna Sinha

This is such a great community.

Urs Holzle {BIO 15314490 <GO>}

Yeah, absolutely. I recognize a lot of the faces and I can't wait to see the film. Now let's get back to how we're making it easier for developer for you to build really the leading technology companies of tomorrow. Now Kubernetes deployments can involve a fair bit of manual configuration, clusters, nodes, load balancers, YAMLs, et cetera. But not on Google Cloud because we offer you the most automated and secure Kubernetes experience available. With GKE Autopilot, Google provisions and manages the clusters entire underlying infrastructure, including control playing, node pools, working nodes and they -- that lets you focus on the higher level services and applications that you're building.

Nobody else offers anything like this because beyond managing node upgrades, GKE Autopilot also automatically configures security features, like Shielded GKE Nodes, secure boot and workloads identity. And it also implements security best practices by blocking the less safe features like external IPs or legacy authorization. So you don't get a toy Kubernetes cluster with GKE Autopilot. You get a sophisticated cluster that uses the best practices brought to you by the team that brought to you Kubernetes itself.

So you're always up to date. And you get the same results as the experts without having to be an expert yourself.

Aparna Sinha

The pandemic put developers in the driver's seat. And you all drove GKE usage to all-time highs. At the same time, we saw explosive growth in the use of Google Cloud Serverless offerings, especially Cloud Run, and Cloud Functions. It's mainly enterprise developers who have driven this growth.

Cloud Run excels at developer experience. It's earned the highest customer satisfaction rating among developers as measured by user research international. Cloud Run combines the best of both worlds, bringing you serverless and containers. There's no cluster to setup or configure. So developers are able to scale seamlessly and securely. Under the hood, Cloud Run scales container instances in isolated sandboxes. Any access outside a sandbox is mediated by network controls or identity in access management or both. And it isn't just for new apps, Cloud Run supports traditional workloads like Java Spring Boot and ASP.NET.

We also recently introduced committed use discounts to lower the cost at scale, and we've introduced always on CPU, which enables asynchronous and background processes to be used on Cloud Run. So you have all the benefits of serverless without the restrictions. The theme here is easier, more secure development, especially with remote work.

Urs Holzle {BIO 15314490 <GO>}

You're absolutely right. We've been focusing on remote development for some time now, but the pandemic has certainly accelerated the shift. Now, what would be more essential to remote development than to be able to use the full power of GCP right from your laptop with zero local setup.

Cloud Shell Editor is a context of where remote development environment that lets you develop and manage applications securely from any browser. It supports languages like Go, Java, Node, Python, C Sharp and it comes with an integrated Debugger, Source Control, API Explorer and if you want to test locally on your laptop, it also comes with local emulators for Kubernetes and serverless APIs.

Aparna Sinha

Thank Urs. Next let me introduce you to Abby Carey. She is going to show us how Google Cloud makes it easy for you to securely build modern applications, again right from your laptop. Hi, Abby.

Abby Carey

Hi, Aparna. We developers have had a hard time writing, extending, deploying and operating applications, but it doesn't have to be difficult. Let's start with Cloud Shell Editor. It comes with current versions of your favorite dev tools, like Docker, minikube, Skaffold, and more, there is nothing to download or install locally. Tutorials

are built into Cloud Shell Editor, which makes it easy to come up to speed on complex topics, like GKE.

Aparna Sinha

So no more switching between tabs, docs your terminal and your code. This integrated experience is highly differentiated from other clouds. You can even author your own tutorials. And that allows your organization to share best practices and onboard new hires faster.

Abby Carey

Another popular feature is Kubernetes YAML authoring assistance. Let's say I want to add YAML for a service to this project. I can press control space and then find the Kubernetes service snippet. Now I can tab through and fill everything in. I also get auto completes. And if I happen to make a formatting mistake, I am notified that there's an issue in real time.

Aparna Sinha

Now, many of you prefer to work locally in an IDE, this same YAML authoring assistance, it's also available for VSCode and IntelliJ via the Cloud Code plug-in. Cloud Code has built-in support for both Cloud Run and Kubernetes.

Abby Carey

In fact, if you're using Cloud Run or Functions, you don't need to know Docker. You can build and deploy your app with just one command because Cloud Code -- because Code Build is integrated under the hood. This is an application with no Dockerfile. With the new G-Cloud Run deploy command, all I have to do is provide a name for my service and then let it know where my source code lives, which is this current directory. And we're deploying.

Aparna Sinha

So nice. And thanks to this ease-of-use, 98% of users deploy an application to Cloud Run on their first try in less than five minutes.

Abby Carey

I just showed Source Code deploys the Cloud Run, but there are more ways Google Cloud has made deployment easier and more secure. First, I can scan my build container images to check for vulnerabilities. I've already run an on-demand scan on one of my images using G-Cloud Artifacts Docker images scan. Now, I can copy the ID of my scan and then view my images vulnerabilities with the list of vulnerabilities command. Now once that's finished, a severity level is assigned to each vulnerability to help you prioritize.

Aparna Sinha

That's super important. It's really helpful in addressing security concerns earlier in the software development lifecycle. But now, what if your build pipeline is compromised?

Abby Carey

For that, I can enable binary authorization on my deployed Cloud Run services. This way, only trusted container images are deployed to production.

Aparna Sinha

Binary authorization is truly unique in the industry. It enables you to put proactive security measures in place to reduce software supply chain attack risk by blocking deployments that violate policy. And speaking of deploying, we're making it seamless for you to do CI/CD securely. You can take advantage of serverless build environments within your own private network with Cloud Build private pools.

Abby Carey

And for advanced CD, we have Google Cloud deploy, which allows you to create custom, delivery pipelines for your specific use case and needs.

Aparna Sinha

That is so cool. So a real application connects to many supporting cloud services. So Abby, can you show us an example of how we make these integrations easier?

Abby Carey

Sure. When creating a cloud function. It's easy to integrate with Secret Manager. First, create a secret that stores your API key, which I've already done. Now, I can either mount it as a volume or expose it as an environment variable, I'll mount it as a volume and then I'll name my mount path.

This will always point to the latest version of my secret. And now, I can securely reference this API key from my source code. This abstraction enables portability and a better local development experience. Cloud Run also integrates with seeker manager to make it easier to do the right thing and not put sensitive data in source.

Aparna Sinha

Love that so much. Okay. So now you've written your app, you've deployed your app, and you've connected your app to other Google Cloud Resources. What's next?

Abby Carey

Operating your app in production. With Cloud Ops, you get one integrated view for your alerts, events, metrics and logs. No more jumping around multiple tools, as you try to understand what went wrong.

Aparna Sinha

That was so awesome, Abby. Thank you for sharing this with us.

Abby Carey

Thanks, Aparna.

Aparna Sinha

In each of these instances, we've done the integration work for you because the more work we put into this, the less work you have to do, and this principle applies to security as well. We've put a lot of energy into building security natively into everything we do, so that you can innovate with assurance. Both GKE and Cloud Run benefit from the security fixes, we implement before vulnerabilities are exposed. Just think about the famous vulnerability and covered in how Kubernetes was handling proxy requests. We found it, we coordinated and communicated the disclosure. We fixed it for the entire Kubernetes community and we patched all our products before any customers were impacted. More recently, cyber threats have shifted the focus towards the software supply chain.

Urs Holzle {BIO 15314490 <GO>}

That's right. Malicious actors are trying to compromise the software supply chain from bad code submission to by-passing this CI/CD pipeline all together. And to help solve this problems, we've proposed an industry standard called SLSA.

It's a security framework that provides common criteria for increasing levels of software security through automation and through cryptographic signing at each stage of the software supply chain. And that makes it possible, but not necessarily easy and so making it easy for developers to ensure security is super important. And that's why we're focusing on building the security right into the developer tool chain, anticipating and preventing issues ahead of time not when you're most at risk. So, for example, Cloud Build our service that lets you build, test and deploy across multiple environments such as VMs, Serverless, Kubernetes or Firebase, now offers SLSA Level 1 compliance by default. Because Cloud Build gives you verifiable build provenance.

So this provenance, lets you trace a binary to the source code that it was built from to prevent tampering and to prove that the code that you think you're running actually is the code you are running. Cloud Build is the first and only CI/CD service to offer this capability, but we go beyond that.

As you've seen build integrity, automatically generates digital signatures, which can then be validated before deployment by binary authorization. That's another Google Cloud first. And so without you needing to do anything, we prevent anyone in your organization from deploying code that has not been built by your legitimate build system.

Now ensuring security post-deployment is equally critical. On GCP you can enable continuous scanning and you can use our Service Mesh to embrace a zero trust security model, and automatically and declaratively secure your services and the communication. So you can manage authentication, authorization, and encryption between services with little or no changes to the applications themselves. Let me say that again. With little to no changes to the applications themselves. So that means that these security improvements help secure not just new code, but also existing binaries, so you can use them for any application that you're migrating to the cloud.

Both Anthos Service Mesh and now Cloud Build Hybrid are available across Google Cloud and your on-premise environment, and they worked with VPC Service Controls and VPC Peering to automate the developers security for your enterprise. No other cloud provider protects your software supply chain to this level because we started working on software supply chain security long before it was in headlines. And so by choosing GCP, you benefit from this leading edge focus on security.

Aparna Sinha

Whether we're building foundational open-source technologies, like Kubernetes or Istio or turning them into fully managed services, like GKE and Anthos Service Mesh, our goal is always to reduce complexity for our users. By helping create these industry standards, we can provide safer and simpler services for you, the developer. And that's exactly our approach to securing the software supply chain. We've co-founded the open-source security foundation with other technology leaders to create security standards for open-source software, and we're starting to bring products to market like open-source insights, which provides you a complete transitive dependency graph for many open source packages.

Now, let's turn back to Urs to hear why Google Cloud is best positioned to support you in becoming a technology leader in your industry using data as a core asset.

Urs Holzle {BIO 15314490 <GO>}

Thanks. Yeah. So far, we've been talking about developing and managing code. But data is at the heart of many enterprises. So we also have the leading data cloud products in the industry, designed for optimal performance and reliability for applications of all sizes, while scaling to immense capacity.

Now, let's start with databases. When it comes to databases every cloud gives you choices. They offer SQL databases, which are great, but unfortunately, don't scale. And of course, no SQL databases, which do scale, but unfortunately are not SQL.

Only Google Cloud gives you a third choice with Spanner, because Spanner is SQL. And in fact, it just got a postgres interface, but it scales horizontally and you can literally handle a billion requests per second. Nobody else has a scalable SQL system. So it's no wonder we're seeing huge adoption. Now on that data warehouse side, we have of course the leading cloud data warehouse with BigQuery, hundreds of customers are using BigQuery at petabyte scale today. Petabyte each and you can run of course, BigQuery Omni on AWS or Azure.

On top of that, open source systems for data like processing, like flank, spark and beam run natively on Google Cloud in a simpler and more cost-effective way than in other environments. In fact, you can realize a 57% lower TCO compared to on-premise data leaks for data science projects. Now, on top of that savings, our Data Cloud also includes the world's first and only auto scaling and serverless spark service. And finally, Google has deep partnerships with leading data-driven companies, including Databricks, Confluent, MongoDB, Redis Labs and many others. And so together, we help customers access an open platform that powers analytics at scale yet is easy to use.

Aparna Sinha

Our partner community is central to the health of our Cloud business and we're especially excited about the innovation coming from our data cloud partnerships. Together, we've optimized our infrastructure for performance and efficiency to give our partners that extra edge, when they run on Google Cloud.

One of our leading data partners is MongoDB. And we have their CEO, Dev Ittycheria with us today. Welcome Dave.

Dev Ittycheria {BIO 1966070 <GO>}

Hi, everyone. Happy to be here.

Aparna Sinha

Dave, one of the trends we're seeing in our enterprise customer base is that they are now competing for leadership positions in their industry by becoming technology companies. How would you say, Google Cloud and MongoDB working together can help these customers achieve that transition?

Dev Ittycheria {BIO 1966070 <GO>}

Well, Aparna, the companies who are in the leadership positions in their industries are those who have built their competitive advantage using software and data to transform their business. And the key word here is build. You can't buy a competitive advantage. You have to build it. This means you need to enable your developers to innovate as quickly as possible whether it's building new software to seize new opportunities or to respond to new threats. MongoDB and Google Cloud deeply understand this. Developers choose MongoDB on Google Cloud, because we give

them the tools they need to be as productive as possible, including having our services available in the Google Cloud console for easy discovery and deployment.

Today MongoDB Atlas runs in 24 Google regions across the world with deep technical integrations with Google's analytic and AI tools. This enables our customers to innovate quickly and emerge as leaders in their industries. As a result, we're seeing explosive growth of customers embracing the true value of our partnership.

Aparna Sinha

That's incredible. So when you think about the development teams at these new customers, what's the biggest challenge that you're helping them solve?

Dev Ittycheria {BIO 1966070 <GO>}

Yeah, when you talk to development teams, you find that they spend the most amount of their time trying to work with data as serving relevant data at the right time to the right audience is critical to building any application. Unfortunately, relational databases are not designed for the way developers think or code. Nor they are designed for scale, fault tolerance or resilience. Consequently development teams find it hard to move fast using relational databases.

MongoDB is designed to address this problem, we make it very easy for developers to work with data and we're able to address the most demanding requirements of performance, scale and fault tolerance. The partnership with MongoDB and Google Cloud enables developers around the world to easy build modern software applications to address their needs of today and tomorrow.

Aparna Sinha

That's terrific. Thank you so much for being here with us today.

Dev Ittycheria {BIO 1966070 <GO>}

Thank you for having me.

Urs Holzle {BIO 15314490 <GO>}

And yes, thanks Dave for joining us. Now there's lots of ways developers can improve their productivity. Automate tasks that are repetitive, master the command line, use the best tools that make your life easier or reuse other people's code, just to name a few. And another great way to accelerate your productivity is with building blocks or templates or fully managed services in areas like machine learning.

Because on Google Cloud, you don't have to be an expert to build smart applications, with new services like Vertex AI, you can build, deploy and scale more effective AI models quickly. So that lets you deliver the insights to your organization

that will help them create more personalized customer experiences, run more efficient processes, and take that leadership position in your industry.

Aparna Sinha

So with that, let's go to our next live demo. Joining me today is Anu Srivastava. She's going to show us how these breakthroughs in AI are advancing cloud adoption and redefining the world of document processing. Hi, Anu.

Anupriya Srivastava

Hey, Aparna. We all know how to work with data when it's in a structured format, like in a database, some JSON, CSV files are just variables in my code, right. But what about unstructured data? Many of the world's business processes start to include or end with a document, but these documents can be difficult to process. Think about all the ways, you could enhance your application if you could just unlock that data. This is where Google Cloud Document AI comes in.

DocAI is a platform that has solutions and tooling for automating your workflows backed by machine learning. We've bundled together some of Google's flagship AI technology such as Computer Vision, OCR, Natural Language Understanding and even Google's Expertise and building knowledge graphs, all to provide you with a simple yet powerful way to build applications that better understand unstructured data. Let's go see a demo of DocAI in action.

So here we have a receipt. I was buying some office supplies since we are unfortunately not back in the office yet. What I'm going to do is I'm going to actually upload this into the DocAI platform. So in our Cloud console, we have the DocAI platform where we have built-in preview mechanisms so you can test out your documents. So this is going to an end point, which has a specialized model we have specifically trained on a variety of expenses. Google maintains and improves the models for you.

Aparna Sinha

Wait a minute. I hope this is not with my data.

Anupriya Srivastava

Absolutely not. We never use your data to train our models. Your data is only used to serve your request. So let's take a look at the data extracted.

Aparna Sinha

I've seen this before. Next you're going to tell me that you're going to automate my expenses.

Anupriya Srivastava

I knew you would say that this is the canonical demo use case, right? But have you ever seen it like this? Take a look at this field that I'm highlighting, the supplier address. This address isn't present anywhere in the document.

Aparna Sinha

Wow, where did that come from?

Anupriya Srivastava

This is only possible with Google's Document AI. The secret sauce here is that the knowledge graph is able to not only give you back the original text from document, but it's going to enrich your response, akin to what you'd see in a search, but as part of your API response.

Aparna Sinha

Wow, that's really great.

Anupriya Srivastava

And it's not just this, we have several specialized models for many more document types of much higher complexity. Let's take a look at this payslip. So I ran this earlier and we're looking at the preview output again.

You can see that we have some keys, we have some fields, you can see enrichment on the employer name and the address. Once your data is in a schematized format, meaning that we know for every document of certain doc type there are common important pieces of information. So what we did is we predefined a set of keys. So what we do is with your extracted data, we merge your data to these predefined keys. So it's much easier to work with an raw OCR. So once it's in a schematized format, it's easier to pass on to a downstream service or maybe you're using something for analytics like, BigQuery or Looker.

Aparna Sinha

That makes sense. But what about ensuring accuracy? And also do you have multi-language support?

Anupriya Srivastava

We know that with important documents such as these, you can't afford any missteps when it comes to accuracy. So that's why DocAI provides a human-in-the-loop configuration to trigger on confidence scores so either for specific keys or on the entire document itself. And as for translation, we support over 100 languages such as

Spanish, Japanese, Arabic, no other solution on the market supports such a wide array of languages.

Aparna Sinha

Human-in-the-loop translation and knowledge graph capabilities that can be applied to a wide variety of documents. This seems super useful. Of course, the next big question is, can it be applied to big bulky complex documents like business contracts?

Anupriya Srivastava

Let's take a look. So here, I read a contract earlier this morning. You can see that there are typical things you'd find in any contract. There are some document names, the parties involved, some dates and like with every easy-to-read contract being sarcastic here, there is an expiration term. So this expiration date actually isn't present anywhere in the document and it's actually not easy to figure out. It's not in an easily parsable format. Shocker, Google's contract processor is able to figure out this date value by understanding signals found across the entire document.

Aparna Sinha

Wow. Well, Anu before you go. Can you tell our awesome developers, how they can get started with DocAI?

Anupriya Srivastava

Absolutely. So I know we covered a lot at just breakneck speeds. So check out the breakout sessions on DocAI to dive deeper. You can also check out the documentation for Codelabs and Quickstarts. We have client libraries in all of your favorite languages such as Python, Node.js, my personal favorite is Java. But it's an API, so you can really use this with whatever platform or framework you're already using. We are thrilled and look forward to see how you use Google DocAI to power your applications.

Aparna Sinha

That was amazing. Can I have a high five? Yeah, thank you, Anu. I loved every part of it.

Anupriya Srivastava

Thank you for having me.

Urs Holzle {BIO 15314490 <GO>}

Another area that Google has invested in deeply and that's becoming more important to more companies is sustainability. Many cloud providers have a vision

for as in sustainable future. And many aim to have to match their electricity consumption with a 100% renewable energy by 2025 or 2030.

We accomplished a 100% renewable energy in 2017. So we're the only hyperscale cloud to do this today. And all that with data centers that are twice as efficient as the average data center.

Aparna Sinha

This past week, Sundar talked about Google's goal to enable over a billion users to live and work more sustainably by next year. To reach goals like this, and those outlined in climate pledges made by more organizations every day. We rely on developers like you to do something about it, but we also know that it's difficult.

Urs Holzle {BIO 15314490 <GO>}

That's right. One of the biggest challenges that companies face is that they lack the tools to account for environmental costs and to help developers address this for their organizations we built sustainability tools directly into Google Cloud. With Google Cloud carbon footprint, you have access to the energy-related emissions data that you need for external carbon disclosures in just one click. Now you won't need this calculator, if you just want to report the net carbon footprint of your workload on GCP, because on GCP, it's always zero.

We also have our region-picker where you can choose the data center region with the lowest gross carbon cost right now. Of course, again your net impact is zero, no matter what region you pick. But this tool lets you help go one step further to become carbon free, not just carbon neutral. Now that's actually a tool that I can't wait to deprecate in 2030 or so, because Google Cloud has committed to be 100% carbon free by 2030, every hour of every day. Now, we also realize there's still a lot to learn when it comes to building sustainably and to help, we just released a master class called Sustainable IT Decoded with some of the world's top experts. So check it out for guidance on how we can all build more sustainably.

Now we all were proud to run the cleanest cloud in the industry, we're even more inspired by the work that our customers are doing with Google Cloud to solve climate change challenges that are unique to their business. And today, we bring you a preview of Google Earth Engine and its integration with Google Cloud.

With over 700 datasets and 50 petabytes of data today, Earth Engine gives scientists and developers access to the world's largest catalogue of satellite imagery and to tools for driving sustainable impact.

Aparna Sinha

So let's look at this in a bit more detail. With an example of how Google Earth Engine and Google Cloud enable customers to assess risks arising from climate

change. But instead of me telling you about it. We've invited Joel Conkling to show you.

Joel Conkling {BIO 17246128 <GO>}

Thanks, Aparna. The world is constantly changing and that creates opportunities and risks. Helping uncover critical insights about the changing world, that's why we are integrating Earth Engine into Google Cloud. Now integration is now in private preview. Today, I'll demo a workflow that combines Vertex AI, Earth Engine, BigQuery and Google Maps platform to show how Google Cloud makes it incredibly easy for you to innovate and deliver insights and do it quickly. So here's a scenario.

You work at an insurance company and you need to analyze your company's exposure to flood risk. You think new buildings may be a strong contributor to that risk. You want to test your hypothesis. To do that, we first needed to understand where the built environment is expanding. In other words, we just need to categorize the surface of the entire planet. That could be hard, but Vertex AI offers the tooling to develop a best-in-class ML model, and Earth Engine provides constantly updated data.

Let's fast forward a bit. We finished training our model and now Earth Engine is sending satellite imagery to be categorized. So your understanding of the world can update in near real-time. Here's the Earth Engine script showing the results of that model. This area in red is where the model estimates the locations of buildings, that's your current built environment. To find the change over time, we need a few more lines of code. These lines of code give us a built environment to 2016 and here, we calculate the difference between 2016 and today. When there's a change, it shows up in purple on the map. This is where there are new buildings. So next, we're going to export, sample and export the data, so we can do additional analysis in BigQuery.

Over into BigQuery console, this script clusters those data points here and then outputs polygons that show the areas with the biggest changes in the built environment. So at this point, you have a few options. You could combine this data with flood locations, you identify around the world. Also with Earth Engine, maybe you want to enhance your model with weather data and physical terrain data that's available on Earth engine, too. You could also include data on your company's insurance portfolio to gain additional insight into critical risks.

We'll wrap up this demo by visualizing our results in a new feature available in Google Maps platform. The open source data viz library deck.gl with a BigQuery connector provided by CARTO. So we now have a clear picture of where the built environment is changing and where to focus next for our work on flood risks.

In summary, no wrangling data, no need to manage infrastructure just actionable insights incredibly quickly. We can't wait to see what you'll do with Earth Engines new integration with Google Cloud. And with that, I'll pass it back to Aparna.

Aparna Sinha

Thank you, Joel. It's incredible to see how our customers can use our sustainable technologies to address climate change now. I'm really inspired by all the things we've talked about today and thinking about how you're going to lead your companies into the future, that's super exciting. No pressure, but it's really up to you. We've invested millions in the developer community over the last five years and we'll continue to invest in the coming years. And Urs as proof of that I understand you have some additional news to share today.

Urs Holzle {BIO 15314490 <GO>}

Absolutely. I'm really excited to announce today, our new developer community program called Google Cloud Innovators. I want to welcome and introduce our first group of leaders who are driving meaningful impact in the industry and their community. So take a look.

(Audio-Video Presentation)

Aparna Sinha

This is so exciting.

Urs Holzle {BIO 15314490 <GO>}

Yeah. Through this program, we'll give developers access to early technology previews and Google engineers. We'll recognize the expertise of our community influencers by promoting their contributions, and we will work closely with them to solve the toughest problems. So we're excited to come together with this group of innovators. Join us at cloud.google.com/innovators.

Aparna Sinha

So cool. I've been waiting for this all this time. Community is extremely important for companies to create that much-needed human connection with developers. And we hope that this gives you a window into the motivation that you all give Google to build cloud products and services that developers love.

Urs Holzle {BIO 15314490 <GO>}

And we look forward to partnering with you to become the greatest tech companies in your industries.

Aparna Sinha

Remember to join us next at the live developer Q&A session and also tomorrow at Community Day. Enjoy the rest of the show.

Urs Holzle {BIO 15314490 <GO>}

Thanks, everyone.

Questions And Answers

A - Aparna Sinha

(Question And Answer)

A - Aja Hammerly

Hi, everyone. Thanks for joining us today for the developer live Q&A. I'm Aja. And a reminder, that this Q&A is live. If you want to join the conversation reach out on Twitter with the #GoogleCloudNext. We've reached out asking for your questions on social media and you all have been responding. We will be answering your questions during the next 20 minutes. And first of all, let's welcome Priyanka, who's here to answer your questions with me today. Hi Priyanka.

A - Priyanka Vergadia

Thanks, Aja. That keynote was absolutely amazing. Yes. So let's get into the goodness that Urs and Aparna shared a highlight for me was really that upcoming documentary on Kubernetes, so cool. I also enjoyed the Google Cloud innovator community announcement, securing software supply chain and building sustainably. What caught your eye?

A - Aja Hammerly

A lot of the stuff you just mentioned. Definitely our innovations and sustainability, the ability to see your carbon footprint of your cloud workloads is really, really cool. When I heard about it in yesterday's keynote, I immediately went and looked at all my personal projects to see the carbon costs of what I had been doing. And I love having that kind of data to use in decision-making like it help me make the right decisions. But I'm mostly really, excited about the cloud innovators program. I've really missed interacting with our Google Cloud Dev Community.

I wanted to hear and see all the amazing things the community has been up to. And the innovators program should let us do that and we're working on some super special Innovators Only events in 2022 that I can't wait to tell the community about.

A - Priyanka Vergadia

Wow. Yeah. That all sounds really amazing. I'm also excited about that secure supply chain announcement SLSA. And how the combination of cloud build and binary authorization actually helps kick start your journey to secure your software artifacts by fully automating that build process.

A - Aja Hammerly

Yeah. That's just so interesting. That's so cool. So let's get -- to our first question. We've got the questions coming in, just for the folks at home, the backstage crew is looking for your tweets as well. So keep them coming in during the thing we will be bringing them in live.

So our first question is from Asher. And it is, who would be good candidates for the participation in the private preview of Earth Engine.

A - Priyanka Vergadia

Yeah. So anybody who is like doing work on sustainable things, right? So with the sustainability lens, if you're thinking about financial services, the customer packaged goods and their impact on the environment and how all of that can be combined together. So, yeah, anything that you're doing with the sustainability lens, obviously, it's in private preview. So you have to qualify and stuff, but if you have that angle of sustainability, you're probably a right fit for it.

A - Aja Hammerly

Awesome. Thank you for that. Second question, came in from Priyanka's Twitter. I saw this one this morning as I was coming in to do this Q&A. And this one is any examples -- do we have any examples of end-to-end spark based pipelines for ML. They'd love to see them. Specifically they're interested in learning how Serverless Spark can be leveraged in big data and ML Ops framework on Google Cloud.

A - Priyanka Vergadia

Yeah, so thank you for this question. I think it came from Pranav. I saw my Twitter this morning. So really what it's all about is the Serverless Spark ML framework is about you not having to create your back-end infrastructure to run Spark. So that's all taken care of for you, so you can just run your workloads, which is in this case like you're trying to run a machine learning Spark job. You can just get started by not worrying about the infrastructure, so that's one part.

The other piece of it is the Vertex workbench, which is the Jupyter notebook, but hosted, but it also gives you the opportunity to connect with Dataproc or the Spark ML jobs that you might have built and run all of that. So as a Data Scientist, I can just use my workbench. And that becomes my home to kind of get the data, massage it, connect with Dataproc Spark ML jobs, and then get all those predictions right in that one spot.

A - Aja Hammerly

Awesome. Thanks, Priyanka. That was a really comprehensive answer. So now we have a question from Christopher. And it's what are the benefits of the innovators program? You mind, if I take this one?

A - Priyanka Vergadia

Yeah, please.

A - Aja Hammerly

So the big benefit of the innovators program is going to be access to innovators only events. Like we're going to be doing some AMAs we're planning right now, road map meetings potentially. And there's also an innovators virtual background that you can download and then use in your Google Meet meetings.

Wow, another question came in from Twitter. Awesome. So let me read this one. My POV. Massive focus on the security -- massive focus on security focus in the developer cloud. Isn't this a topic that matters more for the managers of developers than for developers? And I'll take this one too if it's cool with you.

A - Priyanka Vergadia

Yeah.

A - Aja Hammerly

So I'm a manager. And yeah, that's a really good question. Security is vital to all aspects of software development and security needs to be everyone's job. Yeah, managers need to care a lot about it, but we need to make the tools, so that developers can do the right thing automatically. And that everyone is participating in making our cloud more secure. And we talked about some of those things. We talked about our tooling that can help you to make sure that you put your secrets in secure locations as opposed to putting them in code.

We talked about the SLSA. We talked about lots of other parts and all of this is part of a secure software supply chain, but security does need to be everyone's job. Managers can help by teaching their developers and enforcing it, but everyone needs to take the steps to make things more secure. So yes, good point, but everyone is involved.

Okay. This is a great one from Priyanka's LinkedIn. Is it possible to connect to the public IP of a cloud SQL instance from a private cloud run service, we have been asked this one before when visiting customers?

A - Priyanka Vergadia

Yeah.

A - Aja Hammerly

Also, is this a -- is this cross project setup? Cloud Run service and Cloud SQL instance are on separate GCP projects. So can you do a cross project setup with your database in your running room service somewhere else, Priyanka?

A - Priyanka Vergadia

You actually can. So you have, so in this scenario, you have a Cloud SQL instance in one project and you have your -- you have your compute or whatever is calling that

cloud SQL instance in another project and you could totally make them work by using what is called as private server -- private service access. What it does is it connects the two together even with a private IP? So you don't even have to expose a public IP for your Cloud SQL instance, which as again comes back to the security point, you were making earlier.

Everybody has to think about security. So you're not exposing with public IP. You're just using the private IP of your Cloud SQL instance and connecting it to the virtual machine or wherever you're running your compute to call your search from. So it's possible, private service access is the service you're looking forward to kind of connect the two together. It's a VPC offering.

A - Aja Hammerly

Awesome. Thank you so much, Priyanka. Cool. A question from Andy. This is one of my favorites. So there's a lot of ways to run an application on Google Cloud. It's a huge platform. How do I know what should I choose? Where do I run my stuff? Should I run it on GKE, Compute Engine, Cloud Run? So many good choices.

A - Priyanka Vergadia

Yeah. This is a question we get a lot, right? And it's -- it really just depends on your situation. And the situations can be a lot, the type of team, the size of team and the number of number of developers you have and the languages that you might be using. So there are lots of different scenarios in which you can decide. So I'll give an example of a few. So for example, Compute Engine. Like, if you're migrating and you just want to get from on-premise infrastructure into cloud and you just want the speed, you just want to get there. I would choose Compute Engine to just migrate as is and then modernize later if needed. Sometimes you don't need to modernize, because if you have licensing requirements and stuff like that. So that's Compute Engine. If you want to work with containers, need a little bit more abstraction -- less abstraction. You can work with containers with GKE and that gives you a lot more control over the number of nodes you have and the processing that you're using.

But if you might be just wanting to run containers, but don't want to manage the underlying infrastructure by nodes and stuff like that and the regions, just use Cloud Run, because it's serverless, but it allows you to use your container images and just deploy them.

Cloud Functions is kind of like everywhere. So you're trying to do -- we handle one function or a piece or a feature of code that you just deploy in a function -- as a function as a code sort of service, but it kind of applies everywhere. So I wouldn't say, so cloud function is not like or it's more of and, like it works with any of those, just more of an extension and enhancement of your services with serverless. So I hope that helped clarify a little bit of that, but there's a lot that goes in that decision.

A - Aja Hammerly

Yeah, I know and I really liked how you called out the cloud functions is not an or, it's and, Cloud Functions is just fantastic it is tying pieces together. It is one of the things

I love about it. And I'm just going to point out for folks that we have sessions on all of these in the breakouts. So if you want to go learn more about these, go look in our breakouts and you can find out more about the different offerings that Google Cloud has.

So now we have a question from Esther. What languages do Cloud Run and Cloud Function support? Let's see if I can do this from memory, I've been practicing. So GCF. These are the standard languages you see on Google Cloud. We've got Node.js, Python, Go, Java, .net, Ruby and PHP. I got them all. Awesome.

Cloud Run supports any language or any library, or any binaries that you can put in the container. But if you want to use the source code deploys feature that Abby showed earlier. That is supported on Node, Python, Go, Java and .net. And specific versions of those languages are supported. So please do go to the website and make sure the version that you need is the one that we support.

A - Priyanka Vergadia

Great memory by the way.

A - Aja Hammerly

Oh, yeah. I'm really good at naming all those languages. So from Salina. Oh, yes, great question. When should I use GKE Autopilot versus Cloud Run?

A - Priyanka Vergadia

I'll let you take that one.

A - Aja Hammerly

You are going to let me take this one?

A - Priyanka Vergadia

Yeah.

A - Aja Hammerly

Okay. So this pretty much boils down to, do you want Kubernetes or not. If you want Kubernetes, if you want the enhanced flexibility that Kubernetes has, or you want to have all those knobs and dials that you can turn to really fine-tune everything for your networking needs or your particular load profile, use GKE Autopilot. If you want to -- if you have a container and you want to run it on GCP and that's your goal, Cloud Run is great, Cloud Run is fantastic at that. And as we pointed out, you don't even need a container if you use Cloud Run source deploys for those languages I just mentioned.

More questions. Oh, this one is for you Priyanka. This is from Caleb. What file formats are supported with the DocAI stuff that you talked about?

A - Priyanka Vergadia

Oh, yeah. So you can do images and PDFs. It's really about the unstructured image data. So PDFs and images.

A - Aja Hammerly

So okay. Let's see what else we got. Oh, this one is from Mark and another one for you Priyanka. It's another security question. So can you tell us more about binary authorization? We covered it very briefly in the keynote, but it's something I've been hearing a lot about and I'd love to know a little more about it.

A - Priyanka Vergadia

Yes. So again, it kind of boils down to the whole like security narrative that, that you mentioned that everybody is kind of responsible for the security of the entire platform. So in this case, but with binary authors really deploy time security. So you are deploying and making sure that your images or container images if you're using GKE or Cloud Run works with binary odd.

So when you're -- at your deployment stage, you have -- you can provide signature authorizations on your images. So if -- and the verification on the authorities for those. So if they are authorized only binary art will apply the authorizations and once the image is authorized only then you can deploy it.

A - Aja Hammerly

Awesome. So I just got the signal that we're running out of time. So this is going to unfortunately be the last question. And this question comes from Wesley. Can I use the build integrity features with my on-prem software?

A - Priyanka Vergadia

Huh. Okay. Yeah. So you kind of can. So with Cloud Build it's really any container image which is built on Cloud Build. You can use both on -- you can use it in both on-prem or on Google Cloud. You just have to use the binary attestation Cloud Build. And it's on the GitHub page, so you can check that out. But if you're building it within Cloud Build, you can deploy it on-prem or in Google Cloud.

A - Aja Hammerly

Thanks Priyanka. Well, that was a lot of fun. It was great to hear all the questions from the audience. You all had some great ones. And I want to say, just a huge thank you to Priyanka for joining us and answering so many of those questions. Be sure to join us back over on g.co/couldnext as the open infrastructure spotlight will be kicking off shortly and they have some amazing things that they're going to show off. Thanks for joining us, everyone.

A - Aparna Sinha

Hi, everyone. I hope you enjoy the Dev Keynote. I'm Jeff Reed, VP of Product for Application Modernization Platform at Google Cloud. Thank you so much for being with us here today. In most of my conversations with customers, I found they are accelerating their technology adoption through the use of cloud-based services to build and deliver new capabilities, like curbside pickup in retail, remote diagnostics in manufacturing, and completely new experiences to better support their end customers.

Today, I'm going to share some exciting announcements that will further empower you to digitally transform your organization. We recognize that each company has unique cloud needs. So we at Google Cloud are focused on three areas to support you in whatever stage you are in your cloud evolution.

First, we set out to make your migration or modernization path easy. With Google Cloud, you can easily evolve your existing applications or build new cloud-native apps. Second, our open platform extends Google Cloud services and engineering practices to hybrid and multi-cloud environments for consistent service delivery. And third, our PlanetScale distributed infrastructure is transformative and delivers the highest level of performance and availability in a secure and sustainable way.

One of our primary goals is to make it easy for you to deploy and scale and manage Kubernetes anywhere. In the years since Google invented Kubernetes, containers have completely revolutionized IT operations. Given our history, it is not surprising that Google Kubernetes Engine, GKE, is the leading solution in the market, and even Gartner agrees. In the recent Gartner Solution Scorecard, GKE scored 92 out of 100, making it the absolute strongest strategic option among public cloud Kubernetes services.

Until now, Kubernetes involved a fair amount of manual configuration. You have to manage your own clusters, nodes, GMO files, it's a lot. With our introduction at GKE Autopilot, a new mode of operation in GKE, we're making it much easier for you to use Kubernetes. Google provisions and manages the entire clusters underlying infrastructure, including the control plane, node pools, worker nodes, letting you and your developers focus on your software, while GKE Autopilot manages all aspects of the infrastructure.

In the midst of the pandemic, we saw a large number of our customers adopting serverless technologies. And that's no surprise, since serverless technology enables companies to rapidly develop and deploy any application in a fully automated environment. With services like Cloud Functions, Eventarc and Workflows, you can easily set up event-driven serverless workflows that connect into Google Cloud, third-party SaaS services or your own applications. Serverless is also about running complex workloads at scale, while still preserving a delightful developer experience. In fact, serverless with Cloud Run is about delivering a true developer platform with the flexibility to run any language, any library, any binary.

You can bring traditional workloads such as Java Spring Boot, ASP.NET and more to serverless compute now. Whether it's GKE Autopilot, Cloud Run or Cloud Functions, our goal is to make it easy for you to build and scale apps how you want and where you want.

Our second focus area is delivering open infrastructure cloud. It relies on open source-based technology, like Kubernetes, Istio and Knative, delivering the portability you expect. It also offers you the choice and flexibility to build the manager apps across multiple clouds. To realize these benefits, Anthos operates as a cloud-backed control plane that provides consistent development and management at scale across both edge, on-premise, and multi-cloud environments. It then enables you to build and manage global fleets and establish operational consistency at scale.

Let's hear from my colleague, Rae Wang, who interviewed Jahid Khandaker and Suraj Rao, the CIO and Global Head of Advanced Analytics at Western Digital on their multi-cloud journey.

A - Rae Wang {BIO 20628940 <GO>}

Welcome and thank you for sharing your insights with our audience. We have been working together since 2019 on Western Digital's cloud transformation. What initially prompted you to focus on modernizing applications and standardizing software delivery across the organization?

A - Jahidul Khandaker

Thank you, Rae. We are happy to be here. As a result of various merger and acquisitions, WDC became an integration of three corporations: HGST, WDC and SanDisk. To support very diverse infrastructure and IT environments across the three entities, switching to a cloud strategy became an imperative for driving to a standardization.

A - Suraj Rao

Now, Jahid mentioned about the cloud strategy. In 2018, we saw tremendous growth in IoT applications from our global factories that required low-latency and high-speed on-premise solutions. However, now we were faced with this daunting task of keeping our on-premise and the cloud solutions synched up. This led to exploring solutions that provide a uniform management plane across our hybrid environment. After trying multiple solutions for over two years, we chose Anthos. Anthos gives us vendor-agnostic solution that works across GCP and on-premise environments, while keeping the doors open for a multi-cloud future.

A - Rae Wang {BIO 20628940 <GO>}

That is great to hear, go Anthos. So, what does hybrid and multi-cloud strategy mean to Western Digital?

A - Suraj Rao

Sure, Rae. Western Digital is making a pivotal strategy shift to Anthos for our big data platform. We are migrating more than 25 business-critical applications seamlessly to this hybrid environment with Anthos. This move has several advantages: a richer user experience, greater security and enhanced flexibility to manage factory applications. Some of these critical applications include image analysis on millions of images a week for factory disposition, machine learning workloads for real-time factory decisions and many, many others.

A - Rae Wang {BIO 20628940 <GO>}

Thank you. That's a great strategy and some amazing use cases. Now looking forward, what are your upcoming digital transformation goals in the next three to five years for Western Digital?

A - Jahidul Khandaker

Rae, the future at Western Digital is very exciting. We want to deliver excellence everywhere. Ultimately, we see cloud technology as an enabler of our key business priorities, reduce time to deliver services, rationalize our application footprints and meet customer demand for IoT and edge applications.

A - Rae Wang {BIO 20628940 <GO>}

Thank you, Jahid and Suraj. I look forward to amazing work from this great partnership.

A - Aparna Sinha

Thanks, Jahid, Suraj and Rae. Since we announced Anthos back in 2019, we are thrilled with the reception it has received in the market. In fact, as of Q2 2021, Anthos compute under management grew more than 500% year-over-year. And today, we're extending Anthos for even more workloads in more environments and in more locations. We're announcing Anthos for VM to support development teams that want to standardize in Kubernetes, but have existing workloads running on virtual machines that could not be easily containerized. Once you shift or attach VMs directly to the Anthos environment, you can leverage declarative configuration and policy management with Anthos Config Management, and end-to-end application visibility and security with Anthos Service Mesh.

We're also introducing, one of my favorites, Anthos Multi-Cloud API, which enables you to provision and manage GKE clusters running on AWS and Azure infrastructure through a centralized Google backed control plane. Generally available today, the Anthos Multi-Cloud API ensures your team has a consistent experience to create, manage and update GKE clusters, regardless of which major public cloud you're using.

Thank you for joining us on the path to revolutionizing cloud computing. Now, I'm going to hand it over to Sachin Gupta, VP, GM for Infrastructure and longtime friend to talk about how we're extending these innovations to dedicated environments. Great to see you, friend.

A - Sachin Gupta {BIO 20660275 <GO>}

Thanks, Jeff. Great to be here in person. And it's great to see you all. Our goal in Google Cloud is to meet you where you are in your digital transformation. We understand some of your workloads cannot move to the public cloud entirely due to various factors, such as high amounts of local data processing, low latency requirements or strict data security and privacy requirements. But as you heard yesterday from Thomas, we're working to help you solve some of these constraints.

With the announcement of Google Distributed Cloud, we are extending our infrastructure to the edge and to your own data centers. This announcement allows you to further digitize your business applications by ensuring they have the speed, intelligence and processing power in managed heterogeneous environments. And we're approaching this from a differentiated standpoint relative to other cloud providers.

First, we bring Google's AI and analytics solutions closer to where the data is being generated and consumed to harness real-time insights. Second, Google Distributed Cloud is enabled by Anthos. It helps you to build and run applications on GKE clusters and virtual machines anywhere with the cloud-backed control plane for consistent management at scale. And third, our PlanetScale infrastructure delivers the highest level of performance and availability on the most secure and sustainable platform.

Google Distributed Cloud is a fully managed integrated hardware and software solution. Meaning, you don't have to worry about the underlying infrastructure, and can focus on your applications and business initiatives. We aim to simplify operations, leveraging Google's expertise and track record in areas like scale deployment, fleet management and site reliability engineering. This allows you to focus on your business priorities and leave the complexities to us.

Google Distributed Cloud is designed for running sensitive workloads that meet sovereignty requirements and offers private 5G LTE solutions for enterprise customers. There are four deployment scenarios depending on the customers' need: the Google network edge, the operator edge, the customer edge and customer data centers.

The first use case I'll talk through is that Google's network edge, which is designed for single and multi-tenant use cases, leveraging over 140 Google network edge locations worldwide.

Next is the operator edge. This is owned by communication service providers for both single and multi-tenant cloud use cases. As I mentioned before, you'll benefit from 5G LTE services provided by our operator partners. It can accommodate emerging services and applications with stringent latency and reliability requirements. For example, online games and game streaming depend on low latency to preserve the end-user experience.

Then we have the enterprise customer edge. These are customer-owned edge locations, such as retail stores, factory floors or branch offices, which require localized compute and processing directly in these edge locations.

Next, the customer data centers are customer-owned facilities or colo facilities and are set up for single and multi-tenant hybrid scenarios. It's also ideal for lifecycle management of virtual network functions for communication service providers that reside on-premises, such as cloud native build-out of private 5G networks.

Google Distributed Cloud also includes a hosted mode to run sensitive workloads. Hosted mode helps you meet sovereignty needs by addressing data residency with strict security and privacy requirements, all while providing you with a way to modernize on-premise deployments. Customers can manage this directly or host through a designated and trusted partner. The good news is that hosted mode does not require connectivity to Google Cloud at any time to manage infrastructure, and uses a local control plane for operations. Upgrades and patches are offered by Google and verified by the trusted partner.

To learn more about how customers are leveraging Google Distributed Cloud, I'd like to welcome Rasesh Patel, Chief Product and Platform Officer, AT&T. Rasesh, welcome to Next.

A - Rasesh Patel {BIO 16303010 <GO>}

Thanks, Sachin. It's so good to be here with you today.

A - Sachin Gupta {BIO 20660275 <GO>}

Rasesh, why don't we dig right in and have you tell us about how you are looking to leverage Google's Distributed Cloud for your edge and computing needs?

A - Rasesh Patel {BIO 16303010 <GO>}

You bet. I'd start with saying AT&T and Google have similar goals when it comes to edge compute. We both want our business customers to build and run modern applications close to their end users. By moving compute workloads closer to the user, we can reduce latency to levels that will allow for a whole new range of mobile experiences that weren't possible before. Sometimes this compute will be on the network edge. Sometimes it will be at the customer premise. But regardless of where the compute workloads occur, this is not something AT&T is going to do alone.

A - Sachin Gupta {BIO 20660275 <GO>}

That is tremendous. It is really fascinating how communications has been able to influence business revolution. And it looks like you are poised to do it all over again. So what kind of new business outcomes do you think we can bring together with 5G and edge?

A - Rasesh Patel {BIO 16303010 <GO>}

You're absolutely right, Sachin. Our goal is to create net new business services and customer experiences. Let me give you some industry examples.

In retail, services including streamlining automated inventory management, predicting and managing cues, even enabling cashier list checkout options will come to life. In healthcare, we see secure multi-gig connectivity for all devices within a hospital. The advent of remote patient diagnostics and care and rapid data transfer between field-based emergency medical services, like an ambulance, and hospitals. And in the entertainment industry, we're enhancing in-venue experiences for concerts and sporting events, with solutions ranging from immersive AR and VR experiences, smart parking, ticketless entry, to contactless food and souvenir payment.

A - Sachin Gupta {BIO 20660275 <GO>}

Last question. What are your goals for AT&T and Google partnership in the next three to five years?

A - Rasesh Patel {BIO 16303010 <GO>}

Well, our work together brings market-transformative capabilities to businesses across many industries. 5G and fiber-based edge connectivity and compute with Google's powerful ecosystem that includes maps, voice recognition, AI, Android and many other capabilities, enables the development of these next-gen experiences in an accelerated time-to-market.

And we're looking forward to a lot of expansion. We're bringing our network-based solution with Google Cloud to over 15 major markets in the next several years. We have plans to roll out the services in major metro markets including Chicago, Atlanta, Dallas, Miami, San Francisco and many more. So stay tuned.

A - Sachin Gupta {BIO 20660275 <GO>}

Thank you for joining us, Rasesh. And we look forward to continued success and delivering joint value to our mutual customers. Thank you again, Rasesh.

A - Rasesh Patel {BIO 16303010 <GO>}

Thanks for having me.

A - Sachin Gupta {BIO 20660275 <GO>}

Everything you just heard about Google Distributed Cloud is made possible by Google's PlanetScale infrastructure. To ensure you are successful, our infrastructure delivers several key differentiated benefits, including a global network construct, performant and customizable compute services and reliable and secure storage.

First, at the core of this infrastructure is the world's largest and lowest latency network with 27 regions, 82 zones and 146 points of presence, located in more than 200 countries, all interconnected with 16 subsea cables. It enables companies like Major League Baseball, Wayfair and 1-800-Flowers to quickly migrate existing

enterprise workloads to Google Cloud. And we're continuing to invest in our global network and global reach. This year alone, we have already added four new cloud regions: Warsaw, Delhi, Melbourne, and Toronto.

Moreover, with simpler networking solutions, such as Network Connectivity Center, you can easily connect SD-WANs, VPNs and Interconnects with a centralized management model and monitor the network with Network Intelligence Center. And with Private Service Connect, you can connect at the service layer without configuring the underlying network.

Second is our performant and customizable compute platform. Compute engine allows your applications to achieve higher reliability, security and scale, without any of the operational toil. We've recently announced a new VM family, Tau VMs, which is optimized for scale-out digital-native workloads. Tau VMs offer 42% higher price performance than alternatives from any other leading cloud provider.

As of today, I'm also excited to announce the preview release of new Spot VMs.With Spot VMs, you can use excess compute capacity at deeply discounted rates. And our new Spot VMs offer better savings and more predictable pricing than alternatives from any other leading cloud.

Third, our business continuity and storage options. Our strategy is about tailoring your storage needs to your workload so we can meet your price and performance needs. To advance our storage as the best option for global enterprises, we had recently introduced three important new services.

The first is backup for GKE, which is an easy cloud-native way for customers to protect their configuration and data running in their stateful containers. The second is Filestore Enterprise, our cloud-native managed NFS storage solution that offers 99.99% availability SLA and is ideal for running enterprise applications such as SAP and GCP. And the third is additional robust business continuity features for cloud storage, that extends the unique single namespace model we have with dual region buckets. You now get more choice in where your data is stored with custom dual region buckets. And the option of a new market-leading 15-minute RPO SLA.

We're passionate about helping customers continually evolve their approach to modernization and bring more of their applications and data to the cloud. Google Cloud is PlanetScale, available wherever you need it, while also providing cutting-edge innovations in performance and security. Our goal is to make your journey to cloud easy by offering transformative capabilities to help you innovate faster and save money through an open approach that enables flexibility and choice.

Next, I'm going to turn it over to the demo team to bring the magic of Google Cloud to life. So stick around. And after the demo, we'll be taking your questions in a live Q&A. See you then.

A - Richard Seroter

Hey. Welcome, everyone. I'm Richard.

A - Vidya Nagarajan-Raman

Hi. I'm Vidya.

A - Richard Seroter

We're really glad you joined us here today. We're going to have a lot of fun talking tech. And I wish you could be here with us personally, but we're live at least. That means we can kind of say anything. Like I could say, Google should bring back Google Reader, and I'm still working here. So that's awesome. If you have other hot takes, you want to share some feedback, put it in the chat. We can see that stuff live right now. So keep your comment.

A - Vidya Nagarajan Raman {BIO 21475323 <GO>}

If you can't see the live interactivity, please click on the blue Join Live Interactive Experience button on the Next website, and we'll see you on the other side. For those of you just joining us from the spotlight session, you heard about some of our new product announcements including Anthos for VMs, Anthos Multi-Cloud API, and the Google Distributed Cloud.

A - Richard Seroter

Yes. Awesome. In next 15 minutes, we're actually going to show you all of these in action, which is great. So here's what we're going to do together. First, we're going to migrate something, and demonstrate how to get some new value from an old system by moving VM-based applications to a newer containerized platform. And we'll start by showing you how to run a legacy happening serverless platform. So buckle up, Vidya.

A - Vidya Nagarajan Raman {BIO 21475323 <GO>}

Next, we'll create. We'll build a new experience for customers through our AI-powered software. And then we'll deploy with some brand new deployment tools, unique to Google Cloud.

A - Richard Seroter

Love it. Finally, we're going to be expanding our deployment targets. We're not just shipping the cloud anymore, but extending that awesome path to production to other public clouds and even closer to your customers at the edge. All right, let's switch some things up. Shall we?

I now work at Symbol Shops, probably because I'm a Google Reader crack. So let's pretend that I am the Director of IT at this company, Symbol Shops. And like many of you, our global business has been shifted because of increasing demands online. And at the same time, we have some problems. So old software was never meant for all the customer load we're putting on it now. It's holding us back. We're trying to offer mobile experiences, real-time stuff. We have to do it as quick as we can. And

look, I can't rewrite everything. So how do we reduce some cost and add some capabilities to that existing software, a little easier without much -- too much effort?

So I want to start with a smart migration approach. I want a repeatable efficient way to move old systems to newer stuff, maybe even a serverless one. But Symbol Shops needs help from our trusted partners at Google Cloud. Help, Vidya, you're my only hope.

A - Vidya Nagarajan Raman {BIO 21475323 <GO>}

I got you, Richard. So our fit assessment tool, which you can see here is initiated from the Google Cloud console. It helps us understand what can be automatically migrated and which workloads are going to be most successful in their new home. It's unique to Google Cloud, and saves you time.

By pointing our migrate service at a set of over 2,000 virtual machines in our on-prem vSphere environment, we just generated a fit assessment for the workloads running in each of those VMs.And remember, these VMs could be running on-prem in Google Cloud, in AWS or in Azure.

So now, let's take a look at the results of the assessment. See here, we have a graphical view of our most likely candidates for migration. This tool is particularly good at detecting compatibility for older Java applications like Java EE application servers. Now that we've assessed, let's migrate.

Using our migrate service, I'm taking a Java app running on WebSphere in an on-prem VM and generating a container image that can run on any of our container services, all via automation. And you can see here that the classic Java app is now served up by our only pay-for-what-you-use, serverless container product, Cloud Run.

A - Richard Seroter

Wow, I love that. So this is great. We'll make sure we know what we just did there. I mean, I don't have to manage all of these partially utilized virtual machines anymore, because you containerized it. And I've offloaded some of the operating system management, I don't have to patch OSs anymore. That's awesome. And you've actually given me access to brand new functionality and saved me money by running in a modern platform like Cloud Run. So you just took a classic Java app and ran that on the serverless platform. It's pretty wild stuff. If you like that, tell us in the chat that you have a need for putting some of your older systems in these newer platforms.

All right. So next step. Let's create some new value and get that to Google Cloud. So Symbol Shops has some problems we want to solve. We have a app that tracks some of the store performance, but it runs in VMs and it needs some serious modernization to support all of those sort of new customer experiences and can keep us competitive. So this means upgrading functionality and even changing how we could deliver it to production. So curbside pickup super hot right now. How do I

add functionality then to count how many customers did curbside pickup each day? That seems really important. Vidya, I don't know. Can you help me with this one?

A - Vidya Nagarajan Raman {BIO 21475323 <GO>}

Yes, of course. I can. So Richard, what is does current app consist of?

A - Richard Seroter

Well, thank you for asking. Our current app has a MongoDB database with multiple services that track orders and pickups. We actually want to add new services in data to capture and analyze that curbside pickup info. And to make that happen, we could look at historical footage from the past day and count the pickups and do some analysis later.

A - Vidya Nagarajan Raman {BIO 21475323 <GO>}

This looks like a great opportunity to do two things. First, we're going to add Google Cloud AI to process video footage and capture metrics. Second, we'll containerize these workloads and put them on a continuous delivery pipeline so that it's easy to keep making changes.

A - Richard Seroter

I like that. So if you do this, then we'd actually know how many customers are doing curbside pickup, maybe even how long they were waiting. And I think you're going to fix them on my path to prod and keep it -- make it easy to kind of package and keep changing the software over and over again. I love that.

A - Vidya Nagarajan Raman {BIO 21475323 <GO>}

Yes. Absolutely. Check it out. So Google Cloud Vision API can detect vehicles in this footage to determine how well curbside pickups have been going at each location. So now, let's write some code and deploy the updated app to Google Cloud. This is exciting and I'm hoping all our audience is excited too. I'm using Visual Studio Code here, but I could easily use IntelliJ or any JetBrains IDE. And using the no-cost cloud code plug-in, I can easily browse Google Cloud services, add them to my app, and then code and test this container-based app.

A - Richard Seroter

You are the fastest coder I've ever seen. That was remarkable. That was pretty simple too. I like that. So now that everything is working locally, how would they then deploy this to the cloud?

A - Vidya Nagarajan Raman {BIO 21475323 <GO>}

Let me show you. First, we need to package up this app into a container. You probably want your developers spending time writing code, not Dockerfiles. And we can help with that. I'll show you how we like to package containers. And while I'm doing that, audience, tell us how do you package your containers. So here is our

poll, and we have four options in our poll. So I'm hoping you would actually pick it up.

A - Richard Seroter

Awesome.

A - Vidya Nagarajan Raman {BIO 21475323 <GO>}

So Cloud Build is a serverless build tool that many customers use for continuous integration. The (inaudible) now support industry standard cloud buildpacks to package up our app into a container image automatically and push it to Artifact Registry. Artifact Registry stores your container images in regional repositories. And here, you see that we automatically scan for vulnerabilities.

A - Richard Seroter

That's the -- what else do we use Artifact Registry for? This is -- I haven't seen as much about that. Can you tell me a little bit about that?

A - Vidya Nagarajan Raman {BIO 21475323 <GO>}

Yes. So while we use Artifact Registry for storing Docker container images, Richard, we can also use it for storing all your language-specific artifacts in one place. For instance, we just went GA with Java, Node.js and Python packages using the maven NPM and PyPI repository formats, respectively.

A - Richard Seroter

That's pretty cool. So while we're waiting for the poll results, looking at some of the chat, I saw some questions about how do we do day 2 management of migrated workloads. I think the migrate tooling gives you a container image that now I could download to my desktop, I can run in different places. I have different ways to run that.

Some other questions about -- again, thinking about how do we migrate to GKE and Cloud Run. I think these tools are pretty cool that they can actually take an app and run it in either one, which is pretty great. And I think we're seeing the poll results come in.

A - Vidya Nagarajan Raman {BIO 21475323 <GO>}

Yes. It looks like the results are in. And it's amazing that a lot of folks are already automating today. And they're automating the adorkable commands in CI pipeline. That's excellent.

So now that we have a container in the registry, I think it's time to deploy it. So to deploy your app, let's use the new Google Cloud Deploy Service, a continuous delivery service for deploying containerized workloads. While the service is containerized and could run in GKE or Cloud Run, the app is fairly coupled to our

MongoDb infrastructure running in Kubernetes, and is part of our multi-cloud strategy.

So let's target one of our GKE Autopilot clusters. GKE Autopilot is the fully managed Kubernetes service, where Google Cloud provisions, scales, upgrades and troubleshoots the cluster for me. Here we see a deployment pipeline that helps us manage release candidates and environments. Cloud Deploy helps us manage promotion and roll-out across these environments. And once the app is deployed to GKE Autopilot, you can start using it from each retail store that you have. You kick this all off with a push to get and also you manually approve final promotion to production. In fact, I'm going to have someone drop the URL in the chat window now so that you can see it for yourself, it all works just like magic.

A - Richard Seroter

That's cool. It must be true. You put the link there, that's great. So it's awesome. So from development to packaging deployment, I mean I think personally this is the best set of integrated tools for services and building containers that I've seen. So I think that's awesome. So we're also seeing some other folks in the chat talking about some of these components as well and what they're seeing for migrating the apps and hopefully clicking links and trying to break the app we just deployed.

All right. So now that we've just taken that existing app, we added AI functionality, we dramatically changed the knowledge that each of our stores has about the customer experience. That's pretty cool.

A - Vidya Nagarajan Raman {BIO 21475323 <GO>}

Indeed. Isn't it, Richard? What else do you want to throw my way?

A - Richard Seroter

I think we got some time. So we've acquired a few other retail chains who use different clouds. I mean, nobody's perfect, right? So at the same time, this app needs to run in more places so the each of those stores can analyze curbside pickup behavior, regardless of what cloud they're using. So I guess, Vidya, my question for you is, how do I run this app everywhere?

A - Vidya Nagarajan Raman {BIO 21475323 <GO>}

Yes. That's a great question, Richard. And we do have a solution for consistency across any environment. Check out how we do it through Anthos. With the new multi-cloud API, we can provision these clusters right from the Google Cloud CLI or console in other clouds, including AWS and Azure, where you already have some applications installed.

See here, that I'm using a single G-cloud command to create a GKE cluster on Azure. Here we have deployed GKE clusters to Google Cloud and Microsoft Azure. I'm managing it all from Google Cloud and I'm even able to centrally deploy and view workloads to any of these GKE clusters.

A - Richard Seroter

That's wild. Thanks, Vidya. So you're actually putting GKE, I think it's the best Kubernetes in the public cloud, anywhere I wanted. I mean that's really powerful stuff, I love that new Azure support. And again, each store manager, whatever cloud they're using, can actually see a report at the end of the day to know how they performed on curbside pickup. That was the goal.

All right. But now you're making me think that we could probably even do more, right? We could expand some of our thinking here and maybe respond to the customer demands in real time. Could we actually evolve from that after the fact analysis of parking lot footage to maybe improve the experience in the real time? By that, I'm thinking of, could I run this AI model against live camera footage instead of recorded stuff, and maybe be able to do something with it as it happens?

But of course, as always new challenges emerge, if we think of something like this. So off the top of my head, we'd have to somehow customize this AI model, right? Because now I have to identify the number of cars in motion, how many are waiting, is the curbside lot picking up. And I probably want to operationalize that model and move it closer to the store because I'm processing data in real time, so latency matters. And then I want to integrate all that insight I'm getting with the existing in-store systems for the managers to use so they can move their employees around. So that's a lot of stuff. I don't know. Can you help me with that?

A - Vidya Nagarajan Raman {BIO 21475323 <GO>}

We can. So I'm calling in my colleague, Gabrielle[ph]. He has been working with one of your on-prem locations, Richard, in Austin. And he can explain how we improve your software for edge scenarios. Hi, Gabrielle.

A - Unidentified Speaker

Hi, Vidya. And hello, everyone. Glad to join you, Richard. By the way, congrats on new role in Symbol. What you're asking for, can we solve the newly announced Google Distributed Cloud in the edge. As such you mentioned, it brings the best of Google Cloud to the edge. It consists of a fully managed CPU, GPU optimized platform with a common set of Google and third-party applications. You build once and deploy anywhere. As an example here at some of your stores. So let's get going.

We're going to add real-time intelligence with AI models, and process the data locally to reduce video latency. Let's get these running on the edge in each store. So we start out by first using Google Vertex AI. So we train the engines and the Vision AI objects recognition and classification models in the central cloud.

Here, we are monitoring the progress and accuracy of the model. And as you can see, the trained models cannot be packaged into container images, right? Those container images can be ready to be deployed anywhere including at the edge. In this case we will be targeting five different Symbol stores. From the Google console, we can choose the Kubernetes clusters running at specific edge locations across all

the Symbol stores. Once we pick those clusters, we can deploy the Vision AI mode that we created to each edge in the store, and manage those edge clusters just like any other GKE clusters.

The Symbol operations team has the same familiar experience. Only now, Symbol can also leverage the GPU-optimized Google Distributed Cloud to achieve better performance and lower latency.

And as if we manage service, distributed cloud comes with the same integrated Google Cloud operation and management capabilities that you're used to. Here, Symbol can monitor the health and state of their store deployments, manage capacity scale, all of these using a familiar Google console and backed by Google SRE practices.

So as you can see in the video here, our real-time analysis of curbside plant service level from the live footage led to real-time insights for Symbol Shops to build a better customer experience at each store. Specifically, this new model at the edge is recognizing cars in motion, telling you when the curbside pickup rows are filling up, all execute in real time. So what do you think, Richard? Back to you.

A - Richard Seroter

This is great. You're amazing, Gabrielle. And that's -- I can't believe you built all that all by yourself. So this actually gives all our store managers really new insight into the real-time customer experience, letting those stores allocate staff and people based on real-time customer demand. That's awesome.

So for the audience out there, I'm actually interested, what sort of apps do you think about running at the edge? Is that a real use case you're considering? What sort of things might run there?

All right. So I do love what you built for me. I don't want to be greedy, but I want a little more. This app isn't an island, right? You're doing some cool AI containerized based stuff, but there's a lot of things already at that store location, right? Our notification services, other back office. It's all in VMs.So now that we have to integrate our new AI customer service app, these VM-based systems, am I signing up for completely different management experiences across containers and virtual machines or can you do something for me?

A - Unidentified Speaker

Absolutely not. We're going to provide you the same experience with the new Anthos for VMs.We can actually help you bring those virtual machines into the Anthos platform and manage them the same way we manage containers. So see here, that I've moved a set of virtual machines on the Anthos management, which now gives me a straightforward way to move and modernize existing apps at the edge.

A - Richard Seroter

Well, it's awesome. There's nothing you can't do, Gabrielle. That's great. So what's powerful here is that all the Google power fleet management in Google Cloud, other clouds, at the edge is all based on Anthos with one open control plane for wherever those workloads run. This simplifies our operations a lot or that open foundation makes hiring developers and operators a heck of a lot easier.

All right. So last challenge for you. Symbol has this growing European presence, but some of those regional stores operate with some restrictions on data sovereignty. I don't want to sacrifice all the amazing development and management capabilities that you and Vidya have showed me today. So is this a lost cause or do you have something for me?

A - Unidentified Speaker

Yes. We have something for you. And as we announced yesterday, with the new Google Distributed Cloud hosted, we can use a single hardware and software stack from Google Cloud. But now with local compute and in local control plane, it runs not only our container and VM workloads but also the data and application services we care about. You could run this, as an example, in the regional hoster fully air-gapped, and have local stores connect directly to that, one open modern platform from wherever you want to operate.

A - Richard Seroter

I'm sold. You've done it. So it's pretty cool. So same Anthos control plane tech, but also local services in this fully air-gapped setting. That's great stuff. Thanks, Gabrielle. Appreciate you joining us here. And Vidya, did you like that?

A - Vidya Nagarajan Raman {BIO 21475323 <GO>}

I did actually. And Gabrielle, that was amazing. And I'm sure our audience think so as well. Over the last 15 minutes, we have shown you how Google Cloud offers a world-class experience for building new software or modernizing what you have. Our solutions for container-based apps are second to none. And we're now making it possible to extend those terrific services to wherever you need us to be.

A - Richard Seroter

All right. Thank you all for joining us, Vidya, Gabrielle as well. This was terrific stuff. And thank you out there for the chat and the engagement. It was awesome to see that. So now, stay tuned for the live Q&A coming up next. We're going to talk about everything from the spotlight, all the way through to this demo, get your questions in there, and we'll be answering it live. Thanks so much. Bye-bye.

A - Vidya Nagarajan Raman {BIO 21475323 <GO>}

Bye.

A - Richard Seroter

All right. Hi. It's me again. In case you didn't tune in for that live demo that just wrapped up, I'm Richard.

A - Sachin Gupta {BIO 20660275 <GO>}

And I'm Sachin. Richard, it was nice to see you in your new role. Symbol Shops' demo captain.

A - Richard Seroter

Yes. Thanks for hiring me back. I'm glad to be back. So our friends from the live demo are going to be sticking around to answer any of the questions you may have. So you may see their faces throughout this show as well. So let's just jump right in, with a little poll. What gets you fired up about tech, using serverless platforms, running GKE anywhere? How about continuously building software or even just having breakfast or dinner? Put your results in there. I'd love to see what you have to say.

So while we wait for that, a reminder. This Q&A is completely live, you can engage with us directly. Ask your questions. Say hi in the chat. Yell at us, certainly Sachin, not me. I'm doing my best. If you can't though, go back to the Next event website, click on that blue Joint Interactive Experience button and we'll wait for you over here.

All right. Now time for some poll results. Let's see what we have. Anything coming in so far. What do we think fires people up? What fires you up, Sachin?

A - Sachin Gupta {BIO 20660275 <GO>}

Look, besides breakfast or dinner, it's all about Google Distributed Cloud. And the ability to have that consistent management, run anywhere, meeting our customers where they're at, fully managed solutions is just absolutely incredible. And what Gabrielle has showed up there with Vidya, that was just fantastic.

A - Richard Seroter

Yes. That's a big deal. Well, looking at the results so far, you all are just animals, eating breakfast or dinner. So good job.

A - Sachin Gupta {BIO 20660275 <GO>}

I was right.

A - Richard Seroter

Yes. Do whatever, live your life. That's great. So let's get started with our first question. This one comes from Jessica[ph]. So when would I use Anthos on bare metal infrastructure versus that Google Distributed Cloud at edge? How do I make a decision between the two?

A - Sachin Gupta {BIO 20660275 <GO>}

Yes. That's a great question. Thanks for that question. So, first of all, let me just go back to that Symbol Shops retail example. If you're a customer, you have your own hardware, it's customized for that environment perhaps, and you're just looking for a stack on top to run. Anthos bare metal is a great option. But if you're a customer where you just want to consume the whole stack, hardware, software-as-a-service, and you want to leave all that complexity to us, then the Google Distributed Cloud product is a great solution for that. And so we want to be very flexible about it. You get to choose based on what your needs are.

A - Richard Seroter

So it's nice to have software-based option or the software and hardware --

A - Sachin Gupta {BIO 20660275 <GO>}

Exactly. Because different customer -- same customer, we have two use cases as well.

A - Richard Seroter

But the same control plane.

A - Sachin Gupta {BIO 20660275 <GO>}

But the same control plane, same experience. Deploy right ones, build ones, deploy anywhere.

A - Richard Seroter

Yes, that's a big deal. So this one is going to be for you, Sachin, as well. We're just going to pummel you with questions to start with. So this one comes from Mike. So -- or no, Val's asking this question. Let's switch questions up. This one's going to go to Vidya. I'll give you a breather.

A - Sachin Gupta {BIO 20660275 <GO>}

Okay. Sounds good.

A - Richard Seroter

You worry out on that one. So Vidya, this one's for you. Are there other managed services that people might want to adopt as they become more cloud-native? What do they start picking up as they start making this move to cloud?

A - Vidya Nagarajan Raman {BIO 21475323 <GO>}

Yes. Absolutely, Richard. So as you deploy more microservices, you can easily leverage our fully managed serverless orchestration products, like Workflows or Eventarc, so that you can connect as well as coordinate Google Cloud services, such as Cloud Functions, Cloud Run, HTTP-based API services including third-party services, so that you can tie them all up into serverless workflows. And this really helps you address those type of use cases, which require business-critical, mission-

critical workflows, so that you can actually have inbuilt error handling, retries, observability built in so that everything actually executes reliably and flawlessly.

A - Richard Seroter

Love it. Thank you very much, Vidya. Good. Next one, this one is for you, Sachin, buckle up here. So Robert from Liberty Mutual is asking us about kind of the OS support for Anthos. So when I think about -- we know Anthos supports Windows and Linux, which is great. So he's curious about what flavors of Linux will support AIX? So where are we at on some of the operating systems?

A - Sachin Gupta {BIO 20660275 <GO>}

This -- the Anthos support we have is consistent with Anthos that you have from a software-only point of view. So with Google Distributed Cloud, we just carry it forward. And what we're doing is we're certifying that solution on top of hardware that we've prescribed. And I think there was a question that I was seeing in chat which is about, hey, what kind of hardware we certified. So we've gone in, we have hardware from Dell, from HPE. We've got GPUs from Nvidia. And so it's a different hardware for different scenarios. And then on top of that, whatever Anthos provides, we can bring to bear.

A - Richard Seroter

Yes. And for Anthos on bare metal just out of interest, so you can run RHEL, CentOS, Ubuntu. So we support all of those as well. So we try to give you a good set of choices there. Awesome. We're throwing more stuff at Sachin. Let's do it.

A - Sachin Gupta {BIO 20660275 <GO>}

Okay.

A - Richard Seroter

So are you seeing any customer preference so far for GKE Autopilot versus GKE Standard? GKE Standard is amazing. It's got all the knobs and dials, Autopilot is just turnkey, ready to go. Are you seeing any change in preferences?

A - Sachin Gupta {BIO 20660275 <GO>}

First of all, we've seen massive adoption of GKE Autopilot. So it's really opened the door, I think, for many, many customers, who wanted to get the benefit of Kubernetes and containers, but wanted it to be sort of automatically set up for them. But you still have customers, who don't just want that Kubernetes API, they actually want -- they have an existing cluster or they have an environment that's fine tuned for their needs, very, very large scale deployments where GKE works great. And so I think with the combination of GKE and GKE Autopilot, we can now cater to any of those needs.

A - Richard Seroter

Yes. I think -- so we looked at the data, we've actually seen a lot of Autopilot customers are just new Google Cloud customers as well, as a great first foray into Kubernetes.

A - Sachin Gupta {BIO 20660275 <GO>}

Exactly. They can get going so quickly. I mean again, the demos that were showed just now were fantastic, right?

A - Richard Seroter

Yes, even I can use it. Yes, it's great stuff.

A - Sachin Gupta {BIO 20660275 <GO>}

Exactly.

A - Richard Seroter

More stuff for you, Sachin. This was coming from Jude[ph]. So how do I choose which container-oriented compute service to use? Now we don't necessarily have the 17 ways that other clouds offer, we have maybe few or more focused services, but there's still choices, not just one way to run container. So how should someone make some decisions there?

A - Sachin Gupta {BIO 20660275 <GO>}

Yes. So I think -- look, we do try to keep it simple, but there are some choices. If you have something that's compute-heavy, where it's a lot of self-managed software that you have, self-managed services that you're creating, it could be that you have your own databases, it could be a middleware messaging. That's where we think GKE is best.

But if you're a consumer of a lot of the managed services and you've got some adjacent code that complements those services, then Cloud Run is fantastic. And so, again, not the 17 choices like you mentioned, but there are a few choices based on how you're using that containerized environment.

A - Richard Seroter

Yes, that's a crisp way of thinking about it. Good stuff. All right. Spencer is asking us, Anthos for VMs is interesting, we announced that and it seems wild. We've been just talking containers all this time. Now we're talking VMs.So when the world is the use case for that, why would I think about having Anthos manage virtual machines?

A - Sachin Gupta {BIO 20660275 <GO>}

Great question once again. And look, again, we've been ruber[ph] clear about this. We want to meet customers where they're at. And while customers are looking to modernize and want to be on GKE -- on Kubernetes containerized, they do have some software components, some applications that require a VM environment.

And so the ability to have that one consistent management plane and have the sort of lowered cost of running VMs or containers on top of Kubernetes, that's a very powerful combination. So Anthos for VMs is just to make sure that while they're looking to modernize, whatever pieces of software that they have, that requires that VM environment, they can bring it along consistently as they do the transition.

A - Richard Seroter

Yes. It seems powerful against flat and maybe the operational toolchain, just treat the VMs containers the same way that are really going to simplify hiring, just management, those sorts of things.

A - Sachin Gupta {BIO 20660275 <GO>}

Exactly. And if the VMs go away at some point, great. If they're going to be there running next to the containers, that's great. But that consistency of management reduces the operational cost.

A - Richard Seroter

Yes. That's great call. This one's going to go to Vidya. So Alex is asking us about Cloud Run. And look, this is something that we talk a lot about. We love Cloud Run. Cloud Run is terrific. So what's new and interesting there? Like what's been happening in the Cloud Run world?

A - Vidya Nagarajan Raman {BIO 21475323 <GO>}

Yes. Thanks, Richard. So here are some new features that might be interesting. Number one, to further secure your Cloud Run environment, which has been GA with binary authorization so that you can deploy your trusted container images. Number two, you can now run even more workloads, for instance, workloads that may need background processing. And we offered additional always-on CPU allocation controls, which comes with new pricing. There are no request fees. Memory and CPU is priced about 25% lower. The third feature that might be interesting to call out is that while Cloud Run free tier continues to exist, we also now recently introduced committed use discounts, so that you can actually get up to 17% discount for over a year with one-year commitment.

A - Richard Seroter

That's great. Awesome. Thanks, Vidya. Yes, I think some of that committed use stuff is terrific, same with the security features. I mean Cloud Run is one of the best security-oriented just container runtimes out there in addition with GKE.

Also another question. This one's coming in for you again, Sachin, I'm glad you're ready. Vladimir[ph] is asking us, what is the benefit of doing Anthos Edge versus Anthos on VMware? I know those are even different, I guess, to start with if we think about the question, could you do on VMware at the edge? How do you think about then our Distributed Cloud Edge? I guess kind of help demystify this.

A - Sachin Gupta {BIO 20660275 <GO>}

If I think about the question, it feels a little bit similar to the previous question, which is, what are you actually trying to do. If you're actually trying to modernize, then the Anthos environment, where we provide that simple management plane built on Kubernetes, where you can run containerized applications, but you can also run VMs now. That's a -- you're on a path to modernization and that's what you're looking for. You're looking for operational cost reduction, simplification, but you want to be into the sort of new world in the containerized world. That's where that wins. And so -- but there are going to be other options on-prem that you can run.

And then similar to perhaps other solutions that may be out there, where it's not just a software layer, you can package the hardware and the software completely together. That's where Google Distributed Cloud that's built on Anthos comes together. So a real question, are you looking to modernize? Is it just a pure legacy environment that that's how it's going to remain? If you're looking to modernize and you need the flexibility of having VMs as well, Anthos and Anthos for VMs is perfect.

A - Richard Seroter

Yes. And if you have a VMware footprint at the edge already, then obviously we can run right on top of that. And everything is amazing. So again, I like the flexibility that -- we'll work with what we have.

A - Sachin Gupta {BIO 20660275 <GO>}

And look, if you want to run that VMware footprint inside Google Cloud in our regions, for that you have Google Cloud VMware engine, and we support that. And so we're very flexible based on what customers are trying to achieve.

A - Richard Seroter

Yes. Awesome. Another one for you, Sachin. This one, I think, is interesting. So I thought Anthos was already multi-cloud. Whether we're talking about the multi-cloud API when we're already doing that or what's new with a multi-cloud API?

A - Sachin Gupta {BIO 20660275 <GO>}

Yes. Anthos, look has been multi-cloud for over a year now, right? And so the multi-cloud API is really about instead of having to bring up your clusters, your GKE clusters and the control plane as well in every single cloud, you can now just run that control plane in Google Cloud, and then manage those clusters that may be sitting in AWS or Azure or somewhere else in a very, very simple way through that same control plane. And so it's further simplifying how you deploy those clusters and how you manage them and bringing you the power of GKE and Anthos together.

A - Richard Seroter

Yes. No, I love that demo of just showing a single G-cloud command. Because for someone today, you could deploy Anthos on AWS, but you'd first stand up that management cluster, and it's been up user clusters. It wasn't hard, but can I just simplify that, can we take more responsibility. And it looks like we have. So I think it's really just a simplification story. Awesome.

This one is for me somehow. So awesome. So how do I choose between GKE Autopilot and Cloud Run?

Look, Autopilot is amazing. It feels like serverless Kubernetes, right? And that's why it's kind of magic on how that behaves. And it's still all Kubernetes in their covers. There's no goofy extra extension stuff, this is just GKE. Cloud Run is also kind of a serverless environment.

So when you look at the difference between the two, really it's about -- to some extent, do I want Kubernetes, if I'm deploying marketplace offerings, I'm deploying a database, I'm deploying stateful workloads, Autopilot is going to be amazing there, right? So that one is pretty powerful. And at the same time, if I'm in Cloud Run, and as you mentioned earlier, I've got a lot of managed services, I'm using Spanner, I'm using Pub/Sub, I'm doing AI/ML and I'm putting some code in the gaps to connect the dots to add some API endpoints, Cloud Run is amazing.

So I don't know, I think when I look at this and we look at customers, it's often case where if I want Kubernetes, GKE is clearly a great choice. If I'm building compute intense systems, as you mentioned earlier, GKE is amazing and Autopilot is awesome. And when I'm just trying to run some containers and I'm building things that kind of connect dots between other managed services, Cloud Run is best in class.

A - Sachin Gupta {BIO 20660275 <GO>}

Yes. It just depends on your starting point, I guess, right?

A - Richard Seroter

Yes. But again, not too many choices, but just enough. Awesome. There is another one for Sachin. This one's coming from the Ford Motor company folks. Is Anthos open source? Is there any support available? Is this just DIY, live your life, are we actually behind the product helping people, there's commercial offering? Help clear that up.

A - Sachin Gupta {BIO 20660275 <GO>}

Yes. So first of all, in terms of open source, it's built on Kubernetes. And so built on open source components, for sure. It enables our first-party software on top but also third-party open source software that can run in that containerized or VM environment.

As far as support, it's been -- we now have more and more partners, more and more customers trained on Anthos. Anthos is the foundation of Google Distributed Cloud as well. And so we continue to invest heavily to ensure that the training, the enablement, the skills, the capabilities get built up in our customers, in our partners to continue and support those deployments. I don't know, if you want to add to that on some of the answers.

A - Richard Seroter

No, it's a great answer. I mean we see so many people take all this amazing open source and build platforms, which can be powerful. And Anthos is actually 30-something-odd open source projects, that come into one curated, integrated, tested, packaged commercial product, as you say. And the multi-cloud support is the best effort. We test this and certify it on Azure, on Amazon, on-prem, on bare metal. So I think that's pretty powerful stuff that I know some people can still get a little bit, like what in the world is Anthos? And I think it's important for us to remind people that, Anthos is really a way to build and manage distributed fleets of infrastructure. And so what a powerful way to do that in a supported fashion from the folks who created it.

A - Sachin Gupta {BIO 20660275 <GO>}

Hybrid multi-cloud with hardware, software together. I mean, yes.

A - Richard Seroter

How do I manage a bunch of GKE clusters all over the place? That's a really powerful, hopeful, simple way to understand this sort of the thing.

Yes. Have you continued to see that uptick as well in Anthos? I know we're starting to see some of the growth there. Are you happy with where things are going?

A - Sachin Gupta {BIO 20660275 <GO>}

Yes. Absolutely. Yes, we continue to see great customer traction. And now with more as-a-service solutions with Anthos, Anthos for VMs, Anthos for bare metal, continue to meet customers where they're at.

A - Richard Seroter

Putting it in distributed cloud, is a powerful story for customers, because again I can make one investment in my skills, and now I can take advantage of this in a lot of places.

A - Sachin Gupta {BIO 20660275 <GO>}

Yes.

A - Richard Seroter

Awesome. So next we want to go to Vidya with this, giving for Sachin a breather. And so Fabian[ph] is asking, what the -- with everything -- containers are all over the place. Should I just opt for Cloud Run instead of App Engine? What's the future of App Engine in this context? I like these edgy questions. Vidya, what do you got for me?

A - Vidya Nagarajan Raman {BIO 21475323 <GO>}

Yes. So App Engine is obviously a very successful product for us at Google and serverless. However, we see containers as very, very strong positioned for the future of development as you could see with all the demos that we had and with what technologies such as Cloud Run as well as GKE Autopilot that has come into play, it has got the benefits of portability and better integrations with the rest of GCP as well as the cloud. So that's the way we look at it.

A - Richard Seroter

It seems like a good answer. I mean, Google Cloud's got a lot of these stable services, a lot of customers on App Engine, but it's nice to have alternates as people are looking for other integrations, things like that. Cloud Run is -- continue to be a big investment. That's awesome.

Sachin, this one's for you. Security questions. I mean, I was personally impressed with a lot of -- and enjoyed a lot of the keynotes from yesterday as we looked at all the investments we're making in security here. Like if you're trying to make a choice on security, I think Google Cloud is your best choice, and not just because I work here. But how secure are some of these clusters out of the box? We're thinking about -- and I'm assuming this refers to Anthos. When we stick either an Anthos cluster or GKE cluster off-prem, or even just a GKE cluster sitting in Google Cloud, how do you think about the security story, and how secure is this by default?

A - Sachin Gupta {BIO 20660275 <GO>}

By default, what we're trying to do is turn on all the best practices that we recommend so that the communication channel that you described is secure. If customers want to manage that with their own keys, they can. But we want to make sure that all the best practices, so that if it's the days in transit, the days in rest, that by default we can keep that on for customers. I mean, you should add some more Anthos-specific maybe security capabilities that we turn on.

A - Richard Seroter

Yes. As you say, there's a lot of important things around OS hardening, how we distribute bits, they're coming from us, you can trust that as well, that we're putting them through the paces. But then with Autopilot, arguably, one of the best parts of Autopilot as we just enable all the security stuff by default, right? Because I don't know what I'm doing as an end user myself when I send up stuff. So if you're turning on the right sort of encryption at rest settings, you're turning on the right role-based access, you're turning based on continual updates for patching. I think that's pretty awesome. So in a lot of these cases, we're defaulting to secure.

A - Sachin Gupta {BIO 20660275 <GO>}

I think one of the other questions we get is, how do you handle this then in the air gap environment, right? So now, like how does the customer get software updates? How do they make those secure? And so what we do is we take that software, we publish it to a repository. The customer is able to download it outside their air gap, check it for any vulnerabilities, test it out on their own, and then move it into the air gap, and then the platform will automatically deploy it. And so these some additional

checks that they're able to add, when they have those very strict sovereignty data privacy needs, that need to be able to check any piece of software that's coming down.

A - Richard Seroter

Powerful stuff. All right, last question for you. I could ask you questions all day, but I'm being told I have to ask you a last question.

A - Sachin Gupta {BIO 20660275 <GO>}

Okay.

A - Richard Seroter

So John wants to know as well. So I'm assuming this refers to Distributed Cloud. Whose Hardware is this? And who does it run on? And do you manage the hardware platform as well? Let's at least refer the Distributed Cloud. Are we managing the hardware? Is it coming from Google? Are we making the kits or is it coming from partners? Lay that out for us real quick.

A - Sachin Gupta {BIO 20660275 <GO>}

Yes. So we are -- it's prescriptive hardware that we provide and we manage. And so in terms of how it's supported, again, that's done through us. We can do this through partners as well. And so what happens is in a -- for example, in an air gap in the hosted mode, you may need to have a trusted partner, customer may want a trusted partner who's actually doing the operations in terms of, hey, I'm adding a rack or adding more hardware components. But the software that we provide manages that hardware infrastructure that's deployed on-prem. And the beauty of it is the control plane there is completely disconnected from Google Cloud as well. So you have both those options. The edge mode where it's connected, we can do it centrally across many sites or hosted where that control plane is local, but we still manage the hardware.

A - Richard Seroter

Super powerful stuff. Love that. So thank you, Sachin. Thanks to all of our guests who we threw questions to on the demo set. So it's been awesome hearing from you all, getting all that feedback. Make sure to hop over to the Cloud Next site, and stay tuned for Phil and Sunil talking about security. Thank you.

A - Sunil Potti {BIO 19013276 <GO>}

Hi, there. Thanks for all that participation in our Q&A. And I hope you're enjoying the show. So, welcome to the security spotlight. My name is Sunil Potti, and I'm the VP and GM for Google Cloud Security.

Over the last few months, we've seen some of the most damaging cyber attacks in history against public utilities, private sector companies, government agencies, causing many organizations to realize they're at a pivotal moment in their security

journey. Of course, this is not news to most of you in our industry, but let me put a few things in context with a sobering statistic.

Did you know that the cost of cyber crime is now estimated between $2 trillion and $10 trillion a year? For the past two decades, Google has made security the cornerstone of our strategy. This has resulted in Google enabling more users to be safe than anyone else in the world, blocking malware, phishing attempts, spam, cyber attacks globally, and not just for a few thousands of websites, but for billions of users and millions of websites globally.

So that being said, we also realized that this journey will require enduring commitment over the coming years. And that's why Google is committed to invest $10 billion over the next five years to help strengthen cybersecurity for enterprises, consumers and governments. We want you to be able to use our Google Cloud Security magic to protect your enterprise. We make that possible in two ways. First, we provide the industry's most trusted cloud for accelerating your digital transformation efforts. And secondly, we bring trust to you with security products that meet you where you are and bring our Google Security magic to your on-prem, private and multi-cloud environments. And it's just not about having best-in-class security capabilities, it's also about how they're actually delivered in a consumerized fashion.

But at Google Cloud, we take a different approach. We are driven by a vision of invisible security, where security technologies are engineered in so you get opinionated, full-stack coverage of security controls, security operations as the silo disappears, so niche security talent gets democratized. And last but quite significantly, shared responsibility in a world of public cloud evolves to shared fate, where we, as your provider, have true skin in the game and mutual security outcomes. So a great example of what I mean by invisible security is the all-new built-in data protection, automatic DLP for BigQuery. It's a game-changing capability that discovers and classifies sensitive data for all of our BQ projects across your entire org without you needing to do a single thing.

And we take a full step back and internalize what invisible security could mean for you. As an enterprise, a service provider, a partner, whoever it is, there are three areas where Google's insight and experience can make a make a meaningful difference. One, protecting your employees and assets. Two, protecting your IP. Three, protecting your users and your brand. Let me spend a bit of time on each of these.

First, one of the most overused buzzwords in cyber security today is zero trust. Why not? The core of a zero trust approach is the idea that implicit trust in any single component of a complex interconnected system can create serious security risks. What does that mean, is that trust needs to be established via multiple mechanisms and be verified continuously. So here at Google, we've applied a zero trust approach to most aspects of our operations. We've implemented zero trust access with our BeyondCorp framework, shared our used case with the entire world and delivered

BeyondCorp Enterprise, a world-class solution that includes integrated threat and data protection.

We've had great reception to BeyondCorp Enterprise since the launch earlier this year. And today, we're delivering capabilities that expand the surface area for zero trust access to cover all of your apps, both modern as well as legacy. So as a point of note, right after this session, the team will be doing a live end-to-end demo of BeyondCorp Enterprise to show how you can make access easier and more secure, the Google way. So don't miss it.

Next, protecting your assets is easier if it's intentionally done upstream, shifting security left. And so, zero trust goes beyond access to protecting your workloads as well and your IP. And how Google operates our production environment is in this way: the way software is conceived, produced, managed and interacts with other software. We call our approach BeyondProd and we've already productized many capabilities for you.

So, looking at BeyondCorp and BeyondProd, you realize that zero trust is much more than tools. Zero trust is how we envision designing, deploying and operating safe environments, so our daily lives as an enterprise or consumer can go from a world of being on the edge to being safe and safer with Google. But you can lose sight of the fact that while zero trust approach has helped address the preventative side of your program, robust detection and response capabilities are needed to complete the equation. And this is why we invest in Chronicle and we continue to amplify it as our foundational security operation solution. And we are excited to announce stronger integration between Chronicle and Security Command Center, SCC on GCP, with centralization of alerts, the addition of Cloud Asset Inventory Management and user context to enrich investigations.

Next, let's talk a little bit about protecting your intellectual property. So for organizations pursuing digital transformation, code is your IP, which is the heart of your business. The foundation of securing your code is a secure software supply chain, from the time developers start writing code through your CI/CD pipeline, all the way to deploying and operating in production. So at Google Cloud, we believe two things are foundationally necessary for doing this in an enduring fashion: one, industry-wide frameworks and standards are a must, but they also need to be complemented by full-stack managed services that implement these standards and make adoption easy. So, for the first, Google co-founded OpenSSF across the industry forum for open source and supply chains software security and with projects such as SLSA, an end-to-end framework for ensuring the integrity of software artifacts.

And second, we have the AllStar, GitHub App, right in time for the fall season for continuous enforcement of best practices for GitHub projects. And then last but not least, Open Source Scorecards, which provide risk score for open source projects. And these are just a few ways Google is contributing to industry-wide standards. And on Google Cloud, with our invisible security approach, we provide these tools in a

fully managed environment from code to build, deploy, run and operate, that implement these standards by default.

And let's not forget, you also get a consistent way to define and enforce policy for a zero trust software supply chain that establishes provenance and prevents modification or tampering. And we're building this zero trust software supply chain with new additions across the board, you can learn more about all of these launches in our breakout sessions.

So to add some more context to this with new voices in our conversation on these topics, I'd like to bring on Murray from Facebook and Steph who leads our Cloud Security User Experience team. Steph and Murray, over to you.

A - Steph Hay {BIO 17699674 <GO>}

Thanks, Sunil. And welcome, Murray. Can you tell us about your role at Facebook and what that work entails?

A - Murray Kucherawy

Sure. I'm a manager supporting the Cloud Foundation team within Facebook. Cloud Foundation is chartered to help teams with a need to use public clouds for their workloads so that they can do so both quickly and safely.

A - Steph Hay {BIO 17699674 <GO>}

Can you talk about how Facebook is leveraging zero trust, secure supply chains or other modern cybersecurity solutions?

A - Murray Kucherawy

Facebook focuses a lot of engineering effort on secure supply chains. This extends to our use of the cloud as well. So, our workloads that will run externally have all of the same requirements as the internal ones in terms of security, vulnerability management, security logging, monitoring, tight access control to resources, access auditing, data deletion requirements, penetration testing, mandatory reviews of anything with privacy implications and so on.

One approach we're taking is that our teams can't use any UIs or directly control the services they build in the cloud. They have to go through our tool suite to do it. Some of our suite uses open source -- common open source tools, which means there are vast online help resources available to enable our teams to design and build their services. Then we provide our own extensions so that these tools integrated with our existing internal development workflows, logging systems, dashboards, et cetera. It also allows us to impose our own guardrails and best practices. Its infrastructure is code in its truest sense.

Naturally, we already have an internal CI/CD system, that's used to update our internal services on a regular basis after appropriate code reviews and automated testing.

A - Steph Hay {BIO 17699674 <GO>}

So I'd love to wrap up by hearing about your experiences. What your team uses to keep Facebook fortified and continually strengthen its security posture? And two, partnering.

A - Murray Kucherawy

One of the capabilities that our tool chain allows is to inspect what the deployment is going to do before it happens, which gives us an opportunity to impose best practices or error checking and stop problems from going live. Some of these rules shield us from accidental security exposures, some look for weak deployment practices such as a lack of redundancy and still others look for avoidably expensive practices. These rules applied here are based on both our own experiences and policies and those recommended by our expert partner team supporting us. This allows us to be agile and respond to incidents when they come to our attention.

A - Sunil Potti {BIO 19013276 <GO>}

Thanks, Murray and Steph. Interesting to see how these ideas are implemented and I'm excited to see where we'll continue to go together.

Okay. So let's move beyond our infrastructure for a moment and think about the big picture. The software that runs your business delivers value to your customers and your users. The security you are building is designed to protect the users and build trust between them and you. Security incidents erode that trust and eventually damage your brand. So now Google keeps more users safe online than anyone else on the world. So let's see how we are advancing our efforts and delivering all these capabilities to enterprises wherever you are, eradicating phishing as well as completely stopping fraud, period.

And in this area, safe browsing is the gold standard. Our program to protect users from dangerous sites or files is unprecedented in its reach and capability. Its capabilities are invisibly baked into browsers on 4 billion plus devices. Last year alone, we advanced the state-of-the-art with enhanced safe browsing, an optional but more advanced level of safe -- security for safe browsing the web. And by sharing real-time browsing data in a privacy-preserving way, we were able to deliver a 35% additional reduction in phishing attacks and malware that reach users.

These kinds of numbers and this kind of efficacy has not been possible without leaning in on our heritage and our core competencies in providing security as a built-in capability to consumers as well as enterprises wherever they are. And since its introduction in April 2020, in addition to safe browsing, millions of users have taken advantage of this extra protection in a very rapid fashion. So our ultimate goal is to eliminate phishing as a threat, period. Bringing safe browsing capabilities into your environment through Gmail, BeyondCorp Enterprise and many other products.

So in addition to targeting users directly, attackers view websites as the first and often easiest place to commit fraud. And over 5 million sites today use reCAPTCHA,

our fraud and bot management solution that stops attacks like credential stuffing and account takeovers. With reCAPTCHA Enterprise, you can do this frictionlessly without user challenges to maintain an optimal user experience, which is just another example of invisible security. And over and above this, we continue to bring together the best of Google's capabilities to enhance fraud prevention. So a new integration between Cloud Armor and reCAPTCHA Enterprise that detects and stops bot activity at the edge is now in preview.

So let's hear more from Brian Lozada, the CISO at HBO Max, on how they're actually using reCAPTCHA Enterprise to protect their users and therefore their brand.

A - Brian Lozada

Thank you, Sunil. We chose reCAPTCHA Enterprise because we wanted to offer our customers security against malicious actors, while continuing to provide a frictionless customer experience. With reCAPTCHA Enterprise, we enable our customers through our login and registration process without requiring them to engage in any kind of a challenge. It's a win for everyone. Our development and product organizations can continue to focus on creating customer centric experiences and our customers can easily use our services. The use of reCAPTCHA has helped us in our mission to secure the customer experience allowing our customers to feel comfortable while enjoying our platform. Thank you.

A - Sunil Potti {BIO 19013276 <GO>}

Thank you, Brian. So we want to provide as much assistance as possible in your digital transformation or your security transformation. As Thomas mentioned in his keynote, we are excited to launch our new Google Cybersecurity Action Team to help. And to talk more about this, I love to kind of bring on Phil Venables, our Cloud CISO who is leading this effort to tell you more. Phil?

A - Phil Venables {BIO 20055418 <GO>}

Thanks, Sunil. So the Google Cybersecurity Action Team marshals experts from across Google to form what we believe will be the world's premier security advisory team as a singular mission supporting the security and digital transformation of government, critical infrastructure, enterprises, small businesses, consumers and society overall. To deliver on this mission, there are many ways the GCAT can help you today with strategic advisory services for your security strategy, including transformational workshops and content like our CISO guide to cloud security transformation, and our framework for increasing operational resilience for financial services organizations, with trust and compliance services driven by specialists who continually obtain the most important global compliance certifications for our products and map them to industry control frameworks for you.

We have full-spectrum customer security and solutions engineering that delivers proven blueprints and architectures for deploying our products and services securely in accordance with your regulatory regimes, as well as comprehensive solutions for areas like autonomic security operations, cyber resilience, zero trust architectures and many more we've got under development. And finally, with threat intelligence and incident response services, including threat briefings, preparedness

drills and rapid response engagements so you can stay on top of the evolving threat and security landscape.

Another way we're working to help strengthen and transform security is by working with industry and the public sector. Google Cloud joined as an initial partner for the U.S. Department of Homeland Security's Joint Cyber Defense Collaborative, and this initiative will strengthen our collective security posture by preempting and reducing the impact of cyber threats through increasingly strong partnerships between the public and private sectors. And as Sunil mentioned at the White House Cybersecurity Summit in August, we announced that Google will invest $10 billion over the next five years to further strengthen cybersecurity.

The areas addressed included expanding zero trust programs, securing the software supply chain, enhancing open-source security as well as training 100,000 Americans in skills including data privacy and security through our Google Career Certificate program, and this builds on the $100 million we've already committed to improving open-source security focused on efforts like Linux kernel development and work like metrics tracking and the Coordinated Vulnerability Disclosure through the Open Source Security Foundation. So with that, Sunil, back to you to wrap up.

A - Sunil Potti {BIO 19013276 <GO>}

Thanks, Phil. Great stuff. As you could see, our commitment to improving security for customers and the whole ecosystem is substantial, and more importantly, it's enduring, in products, in resources and monetary terms. We're making a meaningful difference with our long-range vision and commitment of invisible security, delivering continuously around zero trust, safely securing your software supply chain, and delivering user protection services to protect your users and your brand.

So to close, I mentioned a few new products and I didn't have time to cover all the other amazing innovations that are coming out of our teams. And we're making many more such announcements here at Next. So, please see our security experts, fellow customers and partners in our track sessions to go deep on the topics and product that matter most to you. So don't forget, the live demo of BeyondCorp Enterprise is coming up next right here, followed by a live Q&A, where we will be answering your top questions. Thanks again. Stay secure. And have a great rest of Next.

A - Marco Genovese

Hi, everyone. I'm Marco.

A - Tanisha Rai

And I'm Tanisha.

A - Marco Genovese

In the security spotlight, we heard about the importance of a zero trust approach to security.

A - Tanisha Rai

And in our demo today, we will show you how to implement zero trust access to be more secure and more productive. And a quick shout-out to our audience, this is truly live. Dive into the chat, we want to hear from you. Tell us what you do and where you're joining from. We can see you. Check it out, Marco.

A - Marco Genovese

Sure enough. We can see everybody down here, and we're so excited to interact and talk to you all today. If you're still hanging out in the Next event website, click on the blue button that says 'Join the Interactive Experience' to activate these features. Okay, so let's get into it. We're going to cover three things: one, how your entire workforce can securely access legacy and modern applications without exposing your network to attacks; and two, how you can get better protection against threats and data loss right from within your browser; and three, how you can gain visibility into unsafe activity even if users are on a corporate network or device. And we're going to do all of this with BeyondCorp Enterprise.

BeyondCorp Enterprise, or BCE, as we call it, is Google Cloud's zero trust access solution. With BCE, you can use Chrome to access apps and resources. In the background, Google's network protects and proxies traffic enforcing access policies. These policies use factors such as identity, device info, location and third-party signals to authorize access to apps and data that you need to do your job.

A - Tanisha Rai

That's awesome, Marco. So let's get to the good stuff. Think about it. How easy is it for your developers to work remotely and securely right now? We know it's a tough task. We know that making life easy for developers while also protecting your code is critical. That's why our new BeyondCorp Enterprise feature, client connector is so important. It enables zero trust access to legacy thick client applications.

A - Marco Genovese

Yes. I think a lot of people run into that today. So let's take a look at how developers would use it. We set up this laptop for the Cymbal Group.

A - Tanisha Rai

By the way, they're a fictional company. Cymbal has been around since the 1970s and they haven't modernized all their applications. Sound familiar? One of their main developer applications is still hosted in a private data center.

A - Marco Genovese

Now, I see this quite a bit. Until recently, Cymbal developers didn't have a way to access this application remotely without a VPN. The security team had constant concerns that remote users could expose the network or even worse, their source code to attacks or hackers. But now, using BeyondCorp Enterprise's client connector, they can access client-server apps without a VPN. Let me show you how Cymbal

developers would connect via SSH to their Git repository. And before I show you, let me just say, don't blink or you might miss it. It's that simple.

So let's go ahead and swing on over to our developer machine. From here, I can simply open up Google Chrome. Once Google Chrome has actually loaded, you can see I have authenticated to mykit application repository already. Up in the right-hand corner, I simply click on my endpoint verification extension, and from here I click on start connection. My endpoint has been postured in the background and a secured connection has been made to GitLab. From there, I can simply then, once it's turned green of course, minimize my browser. And then on the left hand side, I'm going to go ahead and open up my terminal application, this is my thick client application.

I'm going to then go ahead and run a Git clone and that's actually going to pull down the code from Git to my local machine. And there is my application pulled down locally onto my endpoint. I know that probably seemed pretty straightforward. But what you might not have noticed was: first, there were no clients, it's all in the browser you probably already had opened; second, in the background, continuously validating the identity and the device and a bunch of other factors is our identity were a proxy; and third, our TCP proxy seamlessly and securely forwards all the traffic. The fact that developers around the world can do this remotely, simply and securely without all the hassle of VPN is pretty awesome.

A - Tanisha Rai

And with BeyondCorp Enterprise, workers are only allowed access to applications they're permitted to use. So, we prevent unwanted lateral movement across the network. So audience, we want to know, would you use this method for remote access in your organization?

A - Marco Genovese

Awesome. Now, let's see how your workforce can securely access modern web applications, even from non-corporate devices. Let's look at how Cymbal does it for their extended workforce, their call center contractors.

A - Tanisha Rai

Meet Rhonda. She's one of thousands of remote contractors who help with Cymbal's 24/7 support during the holiday shopping season. So, security community, can you share in our chat in the past year have you onboarded new temporary workers? Did you send them a laptop or make them install software so they could be more secure?

A - Marco Genovese

Looks like that would be a yes. Contractors also tend to be more vulnerable to attacks. Last year, 44% of organizations experienced a breach and 74% of those breaches were the result of giving too much privileged access to third parties. So for Cymbal, keeping those users off the corporate network decreases the risk of being exposed to attacks like Ransomware. And here's where using BeyondCorp Enterprise comes through again for Cymbal. Contractors and other employees were

able to BYOD, onboard quickly and use the device that they feel comfortable with, while BCE layers of protection keep them secure.

A - Tanisha Rai

That way, Rhonda can have secure access from her own device with clear separation between work and personal activity. Let me show you exactly what she sees as she begins her day. She first navigates to her Google Chrome browser. Then she navigates to her Cymbal call center application, will enter in our credentials. We will then do two-factor authentication with our time security key.

Now that we passed two-factor authentication, we are in our Cymbal call center application. You saw Rhonda log in to chrome with her Cymbal credentials. This is what we call a BeyondCorp protected profile. It extends threat and data protection as soon as she logs in. As you can see, our agentless approach means no additional software. She gets right to work on her own device rather than picking up a laptop from IT and waiting hours while everything gets configured, therefore saving time and money.

A - Marco Genovese

Awesome, Tanisha. And the thing about zero trust access is that we don't automatically trust Rhonda, just because she has login credentials. Authorization is continuous, not just when she first logs in. BeyondCorp Enterprise enforces Cymbal's contractor access policies, based on her identity and contextual information about her device and location, as well as the fact that she's authenticated with her Titan key. So, security community, we want to know, what do you all use for multi-factor authentication, SMS code, security keys, maybe an authentication app or maybe something else completely? Hopefully, it's not nothing.

A - Tanisha Rai

For me, it's my security key, every day, especially since I don't always have my phone on me.

A - Marco Genovese

Yes, same here. They're so easy to use and they provide the strongest protection against phishing. Regardless of what you use, some form of multi-factor authentication is critical for basic security hygiene and we highly recommend it, especially for remote access. So let's take a look. I don't know if anybody has anything. Looks like, most people use, let's say, security keys, B, awesome. That's what we love to hear. So, let's get back to Rhonda who just authenticated to the app and explore how we can integrate threat and data protection right from within her browser.

A - Tanisha Rai

Great. Let's see her get to work and show our BCE protect Cymbal, their customers and Rhonda with ease. It's been a really busy day. She doesn't have enough time to finish processing a batch of customer refunds before her next call. She wants to save

the customer credit card information to a local file and do the refunds when things slow down. But saving the sensitive information to another location is against Cymbal security policy. Let me show you her experience.

Let's navigate to our credit card file and let's download this where Rhonda can do the refunds at another time. As you can see, she's blocked. You can see a message appear at the bottom that prevents her from doing so.

A - Marco Genovese

Yes, exactly. You can actually see where the credit card PDF has sensitive and dangerous content inside of it. And I'll show you a policy that's been configured for Cymbal that will detect risky behaviors just like these. So let's go ahead and look at our administrative console here in admin.google.com.

Over on the left hand side, you can see the security menu. And if you scroll down underneath security, you can actually see data protection. And we're going to go ahead and authenticate obviously as administrator securely. So let's go and type in our password. And once I've authenticated, I'll be able to go ahead and look at my data protection policies. You'll notice here, which says managed rules. So we're going to go ahead and drill into managed rules and we can actually see now the credit card detection policy that Ron is hitting right here. We've also got detectors for things like social security or even detecting code that's being copied or pasted or shared by the developers. So as the admin, you can decide if you want to automatically block user actions, as Cymbal has done here or if you want to trigger warning to the user instead.

A - Tanisha Rai

And in addition to things like credit card numbers, you can also set specific DLP policies to detect file type as source code. So that way you can protect sensitive information and code by monitoring, controlling or even blocking what people upload or download.

A - Marco Genovese

Exactly. We can use very granular policies for this type of information in order to protect against exfiltration. So, we just showed you some of the types of data protection policies you can set up. You can also customize access policies and the changes take effect in real time. This is a really big deal because you get continuous checking of whether a user is in or out of policy, giving you up to the second security controls. In fact, let's make an update here in real time for Rhonda. So okay, community, we're going to ask you which policy we should change. Is it her location, maybe her operating system policy? Or whether or not she's on a corporate owned device? Please chime in here, we'd really love to understand and hear what you guys deem important.

While we wait for the results to come in, I will say that I see these kinds of things all the time with my customers. They want to be able to dynamically change policies depending on their circumstances. In particular, some customers are really

interested in controlling for location, perhaps limiting access to only certain countries. Additionally, if a company is going through an org change or maybe a merger, being able to change access policies for select groups of users or departments in real time is crucial. And beyond these three choices in the poll, there are many other ways to customize your access policies based on what your organization needs. So, let's go ahead and look back at the polls.

And it looks like corporate owned device. So awesome. I love it. And thanks to everybody contributing. Let's go ahead and do this right now. So we're going to go ahead and jump on over into our GCP Cloud console. And from here, we can see our Identity-Aware Proxy. We can actually see our Cymbal GitLab for a developer application. We can also see our call center application.

And again, these applications could be anywhere and for this demo, they're in GCP. We're going to go ahead and select the call center application and down at the bottom, we can see Rhonda over on the right hand side in her application access policy. Let's go ahead and edit that, and we're going to go ahead and remove the existing access policy that's allowing access from Europe and the U.S., and we're going to go ahead and delete that one. And we're going to add a new rule.

We're simply going to go ahead and select Cloud IAP, IAP web app user. And then from there, we're going to go ahead and select the access policy which everybody chose, and that was required corporate device, right? Okay. Just want to make sure I remember that correctly. Let's go ahead and save that in place. Click save and when we save that policy, it's actually going to be propagated across the world within a very short period of time. All of the proxies across Google's global network are immediately updated. So the next time any user tries to access a protected resource, they're evaluated against that new policy set. We mentioned continuous authorization earlier and this is a key part of that. Authorization is not a one-time occurrence. So even if you begin a new session, that doesn't mean you'll have perpetual access.

A - Tanisha Rai

Exactly. And for companies like Cymbal that employ hourly and temp workers, their ability to dynamically update access conditions is important. For instance, they could set these policies so workers only access applications and resources during their shift hours or working days or only allow access from specific geographies. They also may want to require that devices have the most up-to-date operating systems and security patches. So this is an important condition to manage, especially for all the contractors using their own devices.

A - Marco Genovese

Exactly. So because Rhonda doesn't meet that condition, which I just updated, she will no longer be able to access the call center application. Now, I think we've all faced this and it's one of the most frustrating things about remote access, especially when you're using the VPN. You think you should have access to something, but for some reason, it's just not working.

A - Tanisha Rai

It's so worse. So let's see if our real-time change worked. So when Rhonda tries to open a new task in the call center application, let's take a look at what she sees. Let's navigate back to her home. And she's denied access, as a result of the change Marco just did. But once again, BCE has Rhonda covered. She can report this error using our new feature the BeyondCorp Enterprise policy troubleshooter, which informs end users that they're blocked and tells them how to get help quickly. So, as you can see here, she would follow the prompt to email the admin to get help. Let's go ahead and email our admin. Our admin is now notified of us being blocked. With BeyondCorp Enterprise policy troubleshooter, admins can quickly fix issues that are blocking users keeping them productive.

A - Marco Genovese

Yes. You bet. Let me show you what the Cymbal admin would see on the other side of this request and how they can unblock users like Rhonda. So we're going to go ahead and switch gears. Let's go over to Gmail, another Google application. And it looks like we got a notification for credit card detection, which is good. So we know if Ron is taking some interesting actions within her endpoint, oh, and it looks like we just got an email from Rhonda because she's actually been blocked to an application. There's the link that she sent over, so let's go ahead and click on that, and we'll automatically be logged directly into the Google Cloud platform.

So from here, I can actually see the different policies and bindings that are in place. So let's go ahead and select the call center application. And over on the right hand side here, we can actually see the granted conditions or the denials themselves. So let's go ahead and look at the binding details. So interestingly here, we can see that Rhonda failed to meet any of the listed access levels and sure enough, it's requiring a corporate device which was not granted. So I normally go back and I block her by updating that policy. So her access level is evaluated like any other contractor, but we're going to keep moving just in the interest of time.

A - Tanisha Rai

Sounds good. That was so easy by the way.

A - Marco Genovese

Yes, super easy. Now, let's look how BCE can give us some better visibility into unsafe user activities, whether there are unsuccessful access attempts like we just saw or other anomalous activities across the apps that BCE protects. Let me put the security dashboards in Chrome and give you all a look. So, we're going to jump back over into our Google Admin console here and in the same security menu on the left hand side, we can actually click on dashboards. Wait for those to load out for a second. So something to make note of here is that with Chrome data protection, you're actually going to get a whole slew of different information. We can see Chrome high-risk users, we can see individuals with DLP incidents if we want to scroll down a little bit. We could actually see how many users are forgetting their passwords, if I can figure out how to use a track pad here. So we can see user login attempts, we can see for example messages that are encrypted, but what we're

interested in is whether or not those credit card numbers are making it through. So, let's go ahead and drill a little bit into one of these reports.

So we can see every single file uploaded, file downloaded, web content upload for example. We can actually see every single time that this took place for our social security detection as well as credit card detection. And if we were to actually drill in on credit card detection here and I think it's really cool, so I'm going to show everybody real quick here since we do have like another minute and that is all the sensitive data transfers that are taking place, block detected or otherwise. So even if your organization isn't using all corporate-owned devices, you can still monitor security events and investigate those alerts.

A - Tanisha Rai

That's awesome, Marco. Audience, so what do you think? Let us know in the chat. We definitely know this is something of interest. In the last 15 minutes, you've seen how an entire workforce can access modern and legacy applications securely, how you can improve threat and data protection and how you can get better visibility into risky activity, even on unmanaged devices.

A - Marco Genovese

Yes. Our call right at the end of the day with BeyondCorp Enterprise is to make your experience more productive and more secure and our team looks forward to supporting you on your zero trust journey.

A - Tanisha Rai

Thanks so much for joining us today and participating. We have a live Q&A coming up next to answer all of your Google Cloud security questions, as well as any questions you might have had from the demo. So please stick around.

A - Marco Genovese

Yes, please do. And thank you all for joining. We will see you all soon.

A - Tanisha Rai

Bye.

A - Iman Ghanizada

Awesome. Thanks so much, Tanisha and Marco. That's an incredible demo. It's always fun to see our products in action, and I'm sure between the great spotlight earlier, the demo, our audience has some great questions lined up. So thank you for joining everyone today. My name is Iman.

A - Sri Subramanian

And I am Sri. I'm so thrilled to be here, answering your questions live from our fabulous studio here in Sunnyvale.

A - Iman Ghanizada

Awesome. We're also joined by the team that just took you through that live demo just a few minutes ago. So you may see them pop up to help answer questions throughout the show. Okay. Let's jump right in with a little poll. Tell us what got you most excited today? Is it our trusted cloud? Is it are zero trust philosophy? Is it our $10 billion cybersecurity investment? Or is it the Cybersecurity Action Team? And by the way, I'm waiting for these poll results. So while we wait for these results, just a reminder, this Q&A is live, so you can engage with us directly.

So Steve, Brian, Dinesh, I'm watching all of you right here live on the chat. So, if you can, just go back to the Next event website and click on the blue 'Join the Interactive Experience' button. And as we give you some time to submit your poll, I want to hear the scoop from you, Sri. So, tell us what you're most excited about?

A - Sri Subramanian

I am really excited about the zero trust model. I feel like, we're kind of adopting it and we're seeing a lot of people move toward it. So -- yeah.

A - Iman Ghanizada

Yes. I mean, we've been doing this for so long, right? We're taking an approach that we've pioneered and we're putting it out in the world and are watching a lot of customers sort of adopting this approach now.

A - Sri Subramanian

Yes, absolutely.

A - Iman Ghanizada

Awesome. Looks like --

A - Sri Subramanian

Looks like, it is.

A - Iman Ghanizada

Looks like it is. Yes, that's right. That's right. Looks like a lot of people are really excited about zero trust, that's amazing. Okay, cool. What's the next runner up? We've got our $10 billion cybersecurity investment, but zero trust is definitely leading by a pretty big margin. All right, so let's go ahead and get started. Let's kick off our first question, yes.

A - Sri Subramanian

All right, sounds good.

A - Iman Ghanizada

All right, cool. So I guess while we're waiting for questions from the audience to populate, the question I have for you is, why security dominating the headlines?

A - Sri Subramanian

You have to be under a rock to not like notice all the stuff that's happening around us, all the IPOs with SentinelOne and ForgeRock and Darktrace. And we're seeing Presidents and Prime Ministers commit a large amount, a giant amount of dollars including our New President to security. And so, I think there are two things here. Typically, an industry will see a lot of movement because there is a technology shift that happens and we're seeing that too with the digital transformation, the way that we secure our environment has changed, and so there's a lot of movement that's happening in this industry because of that.

Added to that, security has this other thing where it's also driven by the people who are attacking the -- the attacks that are happening and we're seeing a huge amount of attacks happening today. And as a result, like for example, we've had -- I mean, this is really sad, we've had our first death that happened because of a Ransomware this year. We've had a pipeline company having to pay a ton of money for a Ransomware. We had -- we've had manufacturing companies get disrupted in their manufacturing at a distillery company, basically had a disruption pretty recently. And so, we're seeing a lot of this happen all around us and that's kind of adding more focus into this area, where people are starting to realize that this is an important area that needs a lot of investment, because otherwise businesses are going to suffer because of it and nations are going to suffer because of it. And that's I think part of the reason that we're seeing this doubling of that exponential growth.

A - Iman Ghanizada

You mentioned a couple of great things. Like, I've noticed that the cloud evolution has allowed a lot of businesses to sort of transform the way that they work, the way that they offer services and products to their consumers, and we as human beings are now more dependent on technology now more than ever. And so, I was like to say that like, cybersecurity is going to start to be seen as a service-oriented role, an honorable role in society because we have customers who build healthcare systems on our cloud, industrial systems on our cloud, offer all sorts of services, right? And as we become more and more dependent on technology, we need to ensure that we're also advancing the state of how secure our infrastructure is, so that we can protect our customers and protect the people at the end of the day.

So, looks like we got a question from Jeanette[ph] which is, what makes Google's cloud more secure and trusted than its competitors?

A - Sri Subramanian

So, Google actually started building a lot of these security products for itself, right? So Google is known as a very secure company and so what we've done recently is taken some of the work that we have done to secure our own corporations or our own customers like BeyondCorp that we just saw the demo for or a reCAPTCHA and productized it, and the vision here is that every customer can be just as secure as Google is. Add to that this idea of innovation that's there at Google. So for example,

when we decided to go into the federal space and do a FedRAMP certification, instead of just standing up a couple of data centers near North Virginia and saying like, let's do that, let's -- this is a set of customers, let's give them a cloud that is compliant to their needs, we decided to make all of Google Cloud FedRAMP pie. And so now, a customer in Brazil can leverage those features just as much as a federal customer might.

So I think there is this leaning in to the forefront of security that we're now seeing with the trusted partner cloud, for example, we had a couple of announcements last week, we had an announcement with Thales. And we're sort of saying that you can -- a lot of nations want to be able to own their own infrastructure and their own destiny. And so, we're taking the Google Cloud and kind of making it available to them in a way that they own it and they operate it. And so, that's another thing that we're doing that's kind of pushing the boundaries, and I think this is just this idea of pushing the boundary, that is what makes Google really special.

A - Iman Ghanizada

Yes, I think you mentioned something that's really important that which is like, because we own all of our infrastructure and we've served billions of users all around the world through Gmail, through search and through all this, it's kind of a no-brainer that we also allow enterprises and small businesses to also now revamp the way that they do their operations on our cloud and on our infrastructure. And so, we are able to do global changes like that with the FedRAMP certification, right, where we do manage all of our infrastructure end to end, which is a big, big element of this. It allows us to govern our cloud more securely, more efficiently and also to pioneer really significant changes for our cloud and all of our customers worldwide.

A - Sri Subramanian

100%.

A - Iman Ghanizada

Yes. All right. We got the next question, which is from Izumi[ph]. The question is, which operating systems does BCE support? Does BCE support third-party clouds or on-premise application? And I believe this question would be probably best suited for Marco.

A - Marco Genovese

Yes. I can answer that question. So the beauty of BeyondCorp and I would just say based on obviously the breadth and width of our Chrome browser is that we can support any operating system at this point. So whether it's Chrome OS, obviously, which we love and hold near and dear to our hearts or Windows or Mac OS or Linux or Android or iOS, we support all of them. So your users aren't going to be limited to a particular operating system which is great, especially when you are an organization trying to enable, right, enable your employees and your contractors. On top of that, we support everything from thick client applications, right, to server-based applications, web-based applications, that could be HTP, TCP-based protocols. There is no limit at this point in time. So the kind of imagination is the limit.

A - Iman Ghanizada

Yes. I mean as someone who probably doesn't get as much exposure to BeyondCorp and getting hands on as I used to, I really loved your demo. And so, that was super helpful and I'm -- can't wait to go back and re-watch it. We've got another question from Tara[ph], which is in the spotlight. Sunil spoke a lot about invisible security. So two questions, this is two-pronged. If security is invisible, does that mean that I can't change the settings or decide what security I want? And two, does invisible security mean that security is free?

A - Sri Subramanian

It's a great question. I think I'd like to step back and see what the problem is, right? So the problem we're trying to solve is that there is an alert fatigue that we're trying to deal with, right? There is -- most corporations can't even look at, forget about processing, about 50% of the alerts that they get. So you're starting to see all these alerts coming in, you don't look at it. And there is a lot of work being done to bubble up the more important alerts and put them in front of the sock and so forth. But that still means that there're 50% of the alerts that you don't even look at, right?

So the idea is, are there things that we can do to prevent certain type of action, for example, that might not be kosher action without creating friction in the business? So based on the businesses-owned rules, are there org policies that you can write? Are there deny policies that you can write? What can we build into the platform in a way that you're bringing down the number of alerts and the number of things that you need to watch? And how do you actually guide things to happen? And so, this idea of moving from just always responding to things to maybe preventing things, maybe guiding people in the right direction.

A great example is, there was a customer who once told me that just by sometimes popping up a question like, is this something that you want to do, you'll find that a large number of people will just not do it, right? And so, you can -- there are a lot of different ways that you can prevent certain things from happening and that I think is the core to what invisible security is about. So it is based on things that someone might configure. And it's based on the business logic that, that company wants to have and it's not something that's just invisible in the sense that you lose visibility into your security, it's invisible in that. There are things that you don't need to do and they're not coming at you all the time.

A - Iman Ghanizada

(Multiple Speakers) as much as possible, it's like no security person ever said that their job is completely stress-free and it's usually right. And so, I was like to say like, we as humans, we do security in our everyday lives, right, with the threat model when we leave the house, we put our seatbelts on, we lock the doors. We've been taught over all these years of evolution how to be secure, right? Some of us more than others, right? And then when we get into our digital lives on the cloud, we have to relearn all these things and some of them we have to build into our infrastructure so that they become part of our background processes and some of it comes through user enablement and some of it comes through the amazing products that

we serve. Security is the core of how we advance all of the amazing things that we're doing as humans into this new world where everything is technology-driven and whatnot.

We got a question from Noor[ph], and this one's for Tanisha probably. I would say, Tanisha, what applications does BCE support?

A - Tanisha Rai

Thanks, Iman. BCE supports all applications from IaaS to SaaS to thick client applications as well. And like I mentioned, we support HTTP and HTTPS in addition to TCP protocols, like SSH and RDP.

A - Iman Ghanizada

Awesome. And I see a lot of great chatter from the audience. Ravi, Joey, Tisha, Tommy. Awesome. Thank you for engaging. All right, cool. So we got another question from John Mikhail[ph], sorry if I pronounced your name wrong. It says, can you only use the Chrome browser for BCE? And then, how do you make sure the Chrome browser is in use is the approved one? The Chrome browser that's in use is the approved one, not another Chrome instance that could be amend in the middle.

A - Marco Genovese

Yes. It all makes sense. So this is kind of the beauty of Context-Aware policies, right? We can enforce these policies down to the browser level, versions, for example, what kind of browsers we're able to access. If it's a corporate managed browser or device, you can wrap policies around all of that. So you can be very, very granular.

And I would say the other side of this is we want users to be able to use what browser they want, right, for personal access. I think that's great. We should continue to support that if that's what they want, if that's what the corporation wants. But as far as accessing corporate resources, it's just like anything else, right? You want to be able to manage it and we're not going to actually just trust anything. So having a trust in Chrome browser for accessing corporate applications works great for our customers, and it's just the best method to kind of move forward. So hopefully that answers your question.

A - Iman Ghanizada

Thanks, Marco. Yes. All right. We got a question from Robert. And this says, how is Google's zero trust model different than other competing hyperscalers?

A - Sri Subramanian

So, I think zero trust model is like -- so Google set the zero trust model and I think there's the world that's adopting the zero trust model. The zero trust model, there's only one model. There isn't a Google zero trust model and someone else's zero trust model. And the zero trust model is very similar to -- maybe I think an analogy is the things that happen today, as we got into the studio. We've all been vaccinated and tested multiple times in the last week and still when we came in, we got tested again.

And then, we were masked and had a shield and we were doing that up until we were in front of the camera, and as soon as this is all done, we're going to be masked and sent out, right? So this idea that you have access to something just at the time that you have access and there's context to whether you need access or not and where you're coming from and what you're doing and that should all be added into the decision-making of what you are. I think that's what is zero trust, and it's great that it was pioneered by Google. But today that is a model that's being used everywhere.

I think where the question may be coming from is about the BeyondCorp Enterprise and how is that differentiated? And I think the key thing here is we've seen the track record of Google in terms of keeping our employees and our data safe through BeyondCorp Enterprise, and we're trying to get that out to our customers. And the one thing that I would like to point out is the zero trust model isn't just one tool. It's a mindset, it's a way in which we do things and I'm really excited about GCAT, the announcement that we just made about the Cybersecurity Action Team where we're going to be having like these security experts and CISOs, people like Phil Venables, available to our customers to think through this model and think through end-to-end, how they're going to actually be implementing it. And so that's the exciting thing I think overall. We have the pioneering product. We have the knowledge of zero trust end-to-end. We've actually implemented it and we've proven it.

A - Iman Ghanizada

I love the analogy you put together about COVID and whatnot, because it's like we went from traditional network-centric boundaries to identity-centric boundaries and now it's like, who are you and what's your purpose and what are all the other factors into why you should be performing this action. And I think one of the most amazing things about when I first joined Google was not having to use a VPN.

A - Sri Subramanian

Yes.

A - Iman Ghanizada

Think this worked and I thought that was really nice. So we're going to go to a question from Amitabh[ph] from Ford. So the question is, how do we implement zero trust in our org?

A - Sri Subramanian

This is a great question. And I'm going to actually throw that question to you. You're in the solutions team, so let's talk about this, right? How do we implement zero trust in the org? And I guess it starts with BeyondCorp. But what are all the factors that you think about?

A - Iman Ghanizada

I always like to say that a lot of big workload transformations and security are not just a matter of buying a product and paying for a service. It takes a lot of enablement

and education from the top down and from the bottom up. We have to structurally think about how we're going to transform the way that we work and what implications those have on the way that we work today and what our pros and cons are and where our approach is going to be, what our strategy is going to be to sort of get there. And that strategy is going to be augmented by people, by teams, by development teams, by tools, by partners.

So when we advise customers and we sit down with clients and we talk about solutions, right, and helping transform elements of their business, we don't just talk about how our product can be leveraged in your organization, because we've got product teams that can talk about the product. We talk about how we can actually transform the business, how we can get the whole organization to culturally transform the way that they work, and how we can get on a tangible path to achieving a zero trust architecture in their workforce, and that may be a multi-year strategy, right? And so, there's many, many, many different layers to this.

A - Sri Subramanian

I agree. I think there's this whole thing about you can think of a question only in -- you can think of a product and a particular problem that you're trying to solve, but if you're not thinking about it end-to-end, like security is just as strong as the weakest link, right? And so, if you have a contractor who has direct access, then you have a problem there. So are you thinking about the thing end-to-end?

A - Iman Ghanizada

Awesome. By the way, big shout-out to the GCAT for bringing on that security advisory role. So we got one last question here and Sri, I'm going to give you this last question, which is, what do you mean by shared fate? And how is that different from shared responsibility?

A - Sri Subramanian

It's a great question. So shared responsibility has really unfortunately come to mean giving up responsibilities. I am responsible for something and you're responsible for something else. And so, that is not the partnership approach that Google wants. What we want is to be able to say, well, we're sharing the responsibility and we're sharing the fate from that responsibility. So we're doing two things; one is we're making sure that we're bringing in all the data left to you in terms of configuration that you might have, in terms of like secure landing zone or secure blueprints. And then we also have risk manager to quantify and then be able to address your risk. So all of that is what a shared fate is where we're actually being part of the process with the customer.

A - Iman Ghanizada

Awesome. Thank you all for joining us today and big thanks to Sri, Tanisha and Marco for sharing their insights. That's all we have for you on the live show today. Be sure to check out our great on-demand content. Our live programming kicks off tomorrow at 9 a.m. Pacific with our community spotlight. Thanks for joining us.

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