Scale Android applications economically in the cloud with Anbox Cloud

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Executive Summary

How can companies get the performance and control associated with running virtualised Android[1] instances in the cloud without massive investments in manual management or prohibitively high cloud bills? In this whitepaper, we'll explore how mobile cloud computing platforms like Anbox Cloud provide better security, privacy and performance, and how Anbox Cloud in particular uses automation tools and tightly-packed instances to keep overall costs down. We'll focus on four use cases: cloud applications, particularly as it relates to gaming, virtual devices, mobile application testing and enterprise mobile application management.

Introduction

Application developers naturally want to provide their users with the best, most modern experience possible. Depending on the application type, this could include super-fast data processing capabilities or sharp three dimensional graphics. No application developer wants to create experiences that cater to the lowest common denominator in terms of device hardware capabilities.

The reality, though, is that most users do not have high-end devices and don't replace every time a new version is available. This puts application creators in a bind: they can't build demanding or innovative applications while still ensuring they are accessible to all end-users.

Mobile cloud computing platforms like Anbox Cloud give application developers the ability to solve this riddle and deliver high-performing, interactive applications to users regardless of what type of device those users have.

Better user experience isn't the only advantage of mobile cloud computing platforms — it's also a way to protect users' privacy, ensure data security and affordably test applications.

Developers need a way to reduce their applications' dependence on end-user hardware in a way that will scale easily and affordably. Mobile cloud computing platforms make it possible to decouple mobile applications and end-user hardware. Anbox Cloud makes this approach affordable and accessible while keeping per-user costs minimal.

[1]Android is a trademark of Google LLC. Anbox Cloud uses assets available through the Android Open Source Project.

Hardware: the limiting factor

Since mobile devices first entered the computing scene, the default way to run an application on them was to have users download the application onto their device. For iOS devices, the hardware and operating system was and is controlled by the same company. The number of device variations are finite. But Android took an entirely different model, offering an open-source operating system that works on any mobile device.

What is Anbox Cloud?

Anbox Cloud is a highly scalable, hardware-agnostic mobile cloud computing platform to virtualise mobile workloads. Anbox Cloud offloads compute, storage and energy-intensive applications from devices to any cloud, providing a consistent user experience regardless of device hardware.

Even if Android can run on a wide variety of hardware, running applications locally means they are subject to hardware constraints. Some applications won't work well on hardware with low processing power or memory. Many application features like 3D images don't work on the majority of devices because the hardware won't support it. This reliance on end-users' hardware limits the types of applications available on mobile devices while simultaneously creating security and privacy concerns when sensitive data is stored locally, especially a concern for workplace applications.

In addition, companies are forced to build different versions of applications: an iOS version, a desktop version, an Android version. Testing application performance and experience on thousands of devices is onerous, creating a massive bottleneck — not to mention huge expense — for companies that develop applications.

In action: cloud gaming

Performance is critical for cloud gaming; but a consistent user experience is almost as important, especially when players on different devices are interacting with each other. Mobile gamers are very sensitive to performance issues, and will often leave gaming platforms if the performance isn't satisfactory. For gaming companies, however, it's challenging to provide the high frame rates and seamless performance users expect when many of them use outdated, low-end devices. At the same time, gaming companies are under constant pressure to update and innovate their games.

Anbox Cloud makes it possible for gaming companies to provide users with a low latency, high frame rate experience, no matter where they are in the world or what type of device they use.

In addition, the Anbox Cloud management system uses an algorithm to automatically optimise video quality based on fluctuating network conditions. Frame streaming technology insulates users from video transmission errors like frame skipping.

At the same time, gaming companies need to keep costs-per-user down to remain economically viable. Anbox Cloud makes it possible for gaming companies to increase profit margins while still delivering a better, more consistent user experience. By automating all of the infrastructure management, with Anbox Cloud, gaming companies are also able to devote more resources to creating innovative games.

Anbox Cloud makes it easy to start a cloud gaming company, easy to scale and easy to become profitable.

The advantages of a mobile cloud computing platform

Mobile cloud computing platforms provide an alternative. They run in the cloud rather than locally on the device, and are accessed by end users through their apps. The user interacts with the application in exactly the same way as if it were running locally, but does not depend on the device hardware for compute or storage resources. It runs in the cloud, processes data in the cloud and stores data in the cloud. This frees applications from the hardware constraints of mobile devices, opening up opportunities to provide an exceptional user experience that is consistent across all types of devices.

Moving from running applications on-device to a mobile cloud computing platform that virtualises the application away from the device is a powerful way to manage some of these challenges for application developers. Chief among them is that mobile cloud computing platforms are completely hardware agnostic. Users access the mobile application from their device, but the application runs in the cloud. Any device that has access to the internet or data streaming can access the application. It could be an iPhone, Raspberry Pi, tablet or desktop computer. As a result, you can run extremely powerful applications on outdated or low-powered devices and ensure that all end users have the same experience regardless of their hardware. You can also run resource and energy-intensive applications that would otherwise not be able to run on any mobile device because of hardware constraints, opening up the possibilities for new types of applications.

In action: virtual devices

Using Anbox Cloud, it's possible to have a single piece of hardware operate as if it were two or more phone lines.

A virtual device is a phone line that can be accessed in the cloud. A user logs in to the application from his or her mobile device, tablet or even desktop computer. The virtual phone operates like an Android phone. It is able to place and receive calls and texts from its own number and has full access to the device camera and other sensors. The user experience is the same as using the device's native phone — if accessed from a mobile device — or like using a mobile phone from a tablet or desktop.

One particularly compelling way to use virtual devices is to allow employees to have one device for both their personal and their work phone, but access the work line through a cloud-based Android instance. This strategy reduces costs for companies and prevents employees from having to carry two devices.

Whether you need to have multiple phone lines accessible from the same device, you need to ensure data privacy for employees or you need highly performant graphical processing without purchasing very top-of-the-line hardware, virtual devices can help.

Performance no longer depends on the computing power each individual device has. Application developers are able to control quality, latency and other performance indicators for all users, so that the person with the cheapest, oldest device has the same experience as someone with a brand-new, high-end device. This is especially critical for any interactive application — from gaming applications to workplace collaboration applications.

Security is also under central control when using a mobile cloud computing platform. When applications run on-device, effectively ensuring security for sensitive data is challenging. In a bring your own device scenario, the company can't control where employees take their mobile devices after work hours and don't have complete control over who can access the device. In addition, the risk of a device being stolen is high. Buying thousands of devices for employees, however, can be cost-prohibitive. Using a mobile cloud computing platform gives companies granular security safeguards, including making log-ins possible only on particular sites. In addition, data is stored in the cloud, by the company, rather than on devices.

Privacy is a hot-button issue and a major concern for both end-users and regulators. Many applications running on-device collect location data, and employees might be hesitant to have an official application downloaded on his or her personal device. With a mobile cloud platform, end users don't need to worry about the application collecting data or accessing other parts of his or her personal device.

Comprehensive testing is near impossible for Android applications. There are too many permutations of hardware, computing power and operating system versions that end users could potentially use. This all but ensures that some users will experience bugs, and that fixing those bugs will be challenging because they might only appear on a small number of devices.

In action: enterprise mobile application management

With Anbox Cloud, it's possible for organisations with strict security and privacy standards to adopt bring-your-own-device policies. Enterprises don't need to worry about employees taking data home with them or getting a security virus on their personal devices.

With Anbox Cloud, employees log on to applications through their browsers, and all of the data is hosted centrally and managed by the enterprise. Since no data is actually stored on the employee's device, the enterprise doesn't have to worry about who has physical access to that device or whether or not there might be software vulnerabilities the employee is unaware of. Enterprises can even use the Anbox Cloud setting to only allow sign-ons when a device is at a specific geographic location.

Employees, meanwhile, don't need to worry about the privacy implications of installing an employer application on their private devices.

For many enterprises, the alternative to using a mobile cloud computing platform is to purchase a dedicated device for each employee, often at considerable expense. With Anbox Cloud, companies get all of the advantages of a strict separation between personal and work devices, at a much lower per-employee cost.

Even in settings where purchasing devices is unavoidable, companies can purchase the device with the lowest processing power, even if the applications it needs to run have high GPU requirements. This is particularly helpful in AR/VR applications, where powerful headsets are expensive as well as heavy and cumbersome. Using Anbox Cloud, companies can choose the most ergonomic headset and offload the heavy processing to the cloud — getting the performance of a top-of-line device without the physical weight or the expense.

Choosing Anbox Cloud

Before Anbox Cloud, the only alternative to running Android locally on-device was to set up a virtual machine-based cloud instance of Android. These solutions involve so much manual configuration and management that any savings on testing are quickly dwarfed by investments in manual work. In addition, the cloud costs are prohibitive, especially for companies with millions of global users.

Anbox Cloud leverages Canonical's automation and virtualisation tools to deliver a scalable Android in the cloud platform that simplifies management and densely packs containers. Here's how a combination of easy orchestration, automatic scaling and a streamlined architecture make it possible for companies of all sizes to get better control of their Android applications.
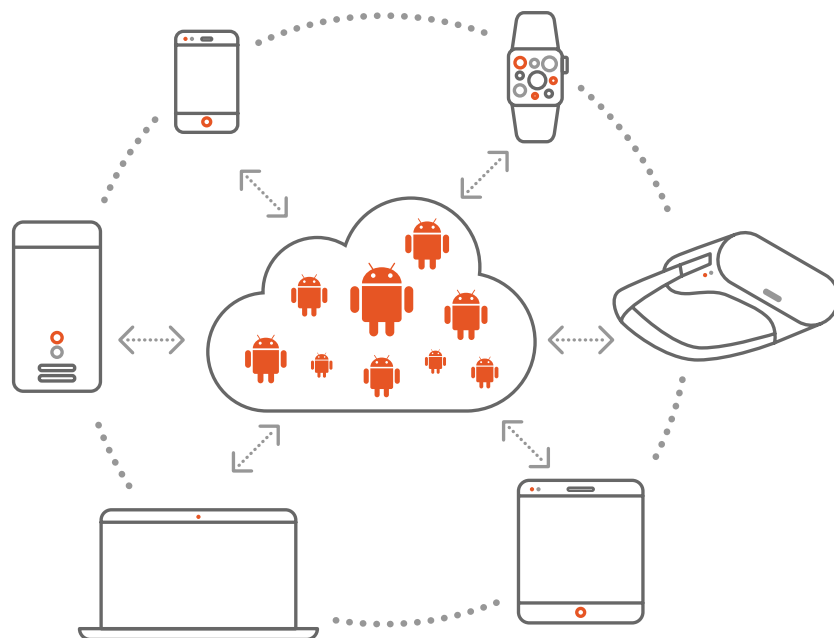
In action: application testing at scale

Testing applications, especially for companies working at scale and doing quick iterations, has to be automated. Anbox Cloud gives companies a way to fully simulate thousands of Android devices, in a way that integrates with continuous integration and continuous delivery tools. Using Anbox Cloud gives application developers access to a larger number of test scenarios, so they can run tests that are more comprehensive and cover a higher percentage of use cases. This makes it less likely that corner cases will be missed by tests and cause problems for end users.

Especially when developing applications at high speed and at high scale, costs can escalate quickly. The need to test so many different scenarios can make testing expensive — but Anbox Cloud helps reign in cloud costs associated with the testing environment using both automated infrastructure management and high container density on each cloud instance.

Economics

Cloud costs can be prohibitive for companies considering moving from on-device applications to a mobile cloud computing platform. Anbox Cloud uses the LXD container manager to allow application developers to use system containers instead of virtual machines to package applications. System containers offer the full virtualisation capabilities of virtual machines combined with a low overhead and the manageability of containers. This allows companies to sidestep the hard limits on the number of virtual machines per cloud instance. Using LXD, Anbox Cloud can put more than double as many containers on each cloud instance as would be possible in a virtual machine-based approach. This denser architecture instantly cuts the number of instances companies need to provision.

Resource provisioning is not the only economic challenge when it comes to running a VM-based mobile cloud computing platform. If all of the virtual machines need to be managed manually, running the platform requires a massive investment in engineering human resources of the scale that would only make sense for the largest of companies. Manual management also simply isn't a best practice: the risk of an oversight from human error is too great. With Anbox Cloud, installation, configuration, upgrades, scaling, health checks and benchmarking can all be managed with automation tools like Juju, freeing engineers to work on higher-value projects and dramatically reducing the operational overhead.

Scalability

Automated scaling is essential to both controlling cloud costs without compromising performance. Game streaming applications, for instance, have dramatic variation in usages based on time of day or day of the week. Autoscaling means that companies don't have to provision for peak usage even if the peak is only one or two hours per day.

Anbox Cloud is also designed to easily scale to millions of global users. This level of scalability is only possible with automation — the manual effort required to spin up or decommission instances make manually scaling for millions of users impossible.

Anbox Cloud can't entirely eliminate the cloud costs required to run virtual Android applications in the cloud, but by using containers and automation tools the per-user cost is less than half of equivalent mobile cloud computing platforms.

The technology behind Anbox Cloud

Anbox Cloud is able to provide high container density, automated orchestration and simplified infrastructure provisioning thanks to the underlying technology it's built on. Here's a look at the technology Anbox Cloud is built on.

Juju automates the configuration, scaling and operational tasks needed to deploy and manage microservices at scale, reducing the operational overhead of running a mobile cloud computing platform.

Metal-as-a-Service (MAAS) simplifies remote infrastructure provisioning to deploy or scale Anbox Cloud. This makes it easier to deploy Anbox Cloud in any data centre.

LXD is a Linux container hypervisor that combines the speed, density and scalability of containers with the security of isolated virtual machines. LXD is the engine that makes Anbox Cloud highly scalable, economical and easy to manage. In practice, LXD is installed in an Ubuntu cloud instance and used to spin up unprivileged, secure, isolated containers that also run Ubuntu. Anbox Cloud runs inside the containers, and uses a client application to interface with devices.

Anbox Cloud also comes with Canonical's Ubuntu Advantage for Infrastructure support plan, providing 24/7 access to support teams. In addition, Anbox Cloud is automatically updated with the latest versions and security patches by connecting with an image server hosted by Canonical.

Conclusion

Moving from on-device Android applications to a mobile cloud computing platform gives companies more control over user experience, security and privacy—but for companies on global scale, a VM-based platform is too expensive to provision and requires excessive, tedious manual scaling and operations.

Anbox Cloud is completely hardware agnostic. It supports both x86 and ARM architectures, making it able to run on any device type or server hardware. End users connect to Anbox Cloud through their browser, offloading any data processing, storage or compute tasks to the cloud.

Anbox Cloud gives companies all the benefits of a mobile cloud computing platform, without the cloud costs or investment in engineering resources. The ability to centrally manage user experience for millions of global users makes cloud-based Android applications feasible even for companies without a huge engineering organisation or limitless IT budgets.

Resources

- Webinar: An introduction to Anbox Cloud
- Whitepaper: Cloud gaming for Android
- Blog: Canonical introduces Anbox Cloud - scalable Android in the cloud
- Blog: Implementing an Android based cloud gaming service with Anbox Cloud
- Blog: Anbox Cloud disrupts mobile user experience

Alternatively, learn more about Anbox Cloud
or contact us to request a demo.

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