HUAWEI

Huawei Cloud Academy

Huawei Kunpeng Computing ARM Native Application Solution

Grow With Intelligence

Contents

1. Application Scenarios and Development Trend of Cloud Phones

2. Advantages of Deploying Android Cloud Phones on ARM Servers

3. Huawei Kunpeng Computing Cloud Phone Solution

What Is a Cloud Phone

Deploy the Android system in a data center to provide Android cloud phone services.

Typical Application Scenarios



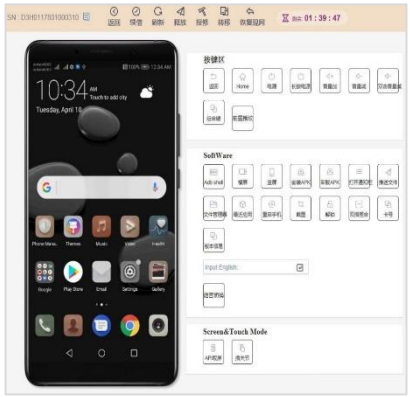
Type	Application Scenario
Hosting	Terminal emulation: Simulate real phones to perform system tests, such as ROM tests, camera algorithm tests, and EMUI tests.
	App testing: Provide a basic Android environment to support function, security, and admission tests of apps.
	Phone hosting: Accommodate hosted applications for cloud phones.
Gaming	Cloud games: Migrate games to the cloud, and use mobile phones only for input and output. Games can be played without download and installation.
	Game idling: Use cloud phones to automate laborious game tasks.
Office	Virtual mobile infrastructure (VMI) mobile office: Support mobile office using cloud phones. Data is stored on the cloud rather than on mobile phones, improving enterprises' data security.

Hosting

[1. Terminal emulation]

➢Terminal manufacturers perform mobile phone system tests.





[2. App testing]

➢A crowdtesting platform provides on-cloud massive mobile phone services and third-party app tests.



➢Perform app admission tests for various app markets

华为应用市场 HUAWEI App Market

百度手机助手 有颜又有货

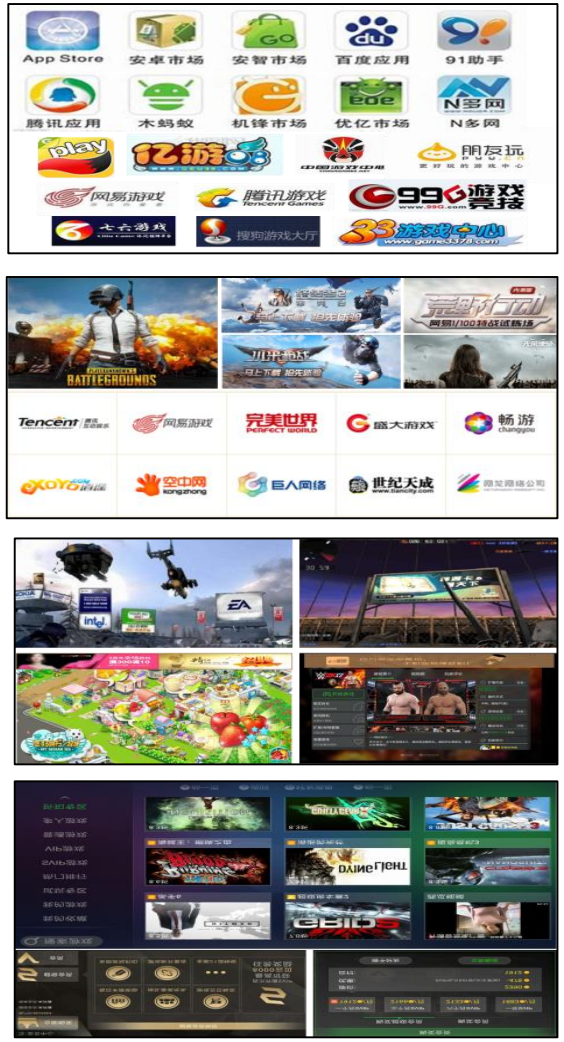
腾讯应用宝 安卓应用商店

[3. Mobile app hosting]

➢Host cloud phones in a data center to support the deployment of various hosted applications.

agoda 知名在线酒店预订公司	途牛旅游网 让旅游更简单	携程 中国酒店预订服务中心	同程旅游 旅游电子商务平台
订房网 在线旅游订房网站	到到网 提供全球化旅游信息	去哪儿 领先的旅游搜索引擎	找酒店网 在线酒店预订平台
阿里旅行·去啊	游多多	旅游网	360旅游

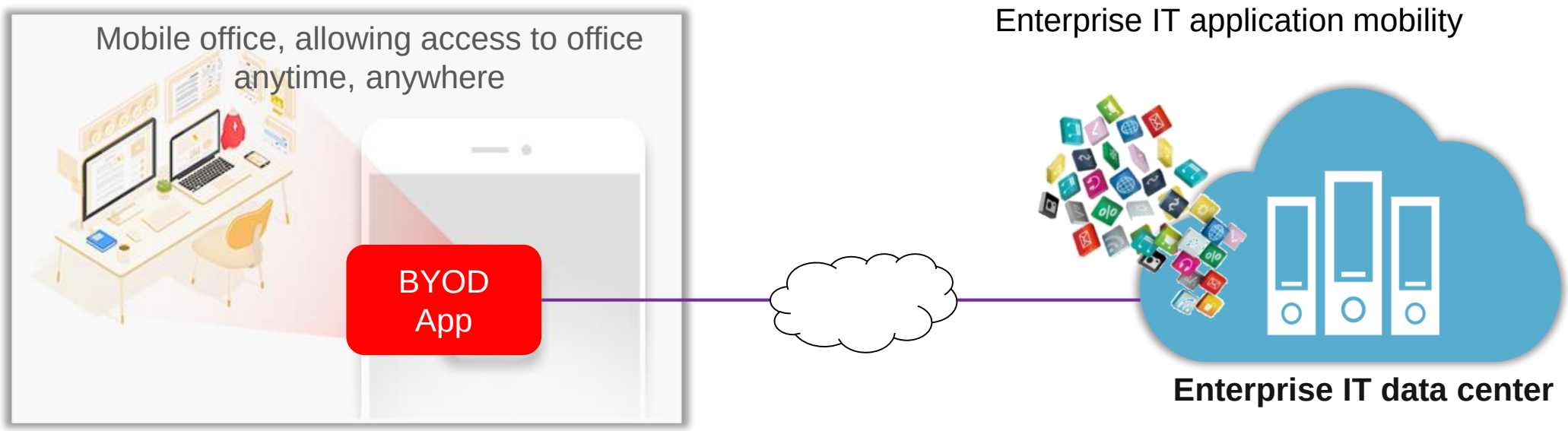
Gaming



Game applications include cloud games (online play, trial play, and game download) and game idling.

Application Scenario		Target Customer	Business Stage	Business Model
1	Online play	Game platforms	Full lifecycle of game rollout	• Grow the platform popularity and increase the number of users. • Monetize games through subscriptions and ads.
2	Trial play and download	• Game developers • Game resellers • App markets	Game promotion	Increase the download rate.
3	Game idling	Game platforms	Full lifecycle of game rollout	Mainly subscriptions.

Office



Bring your own device (BYOD): mainly two ways are available.

➢Mobile Device Management (MDM): Install office apps on mobile phones, and store data and apps on mobile phones.

➢Virtual mobile infrastructure (VMI): Android remote desktop. Install only a remote access client on mobile phones.

Office

Security is the core concern on mobile office. VMI ensures data security without local data storage.

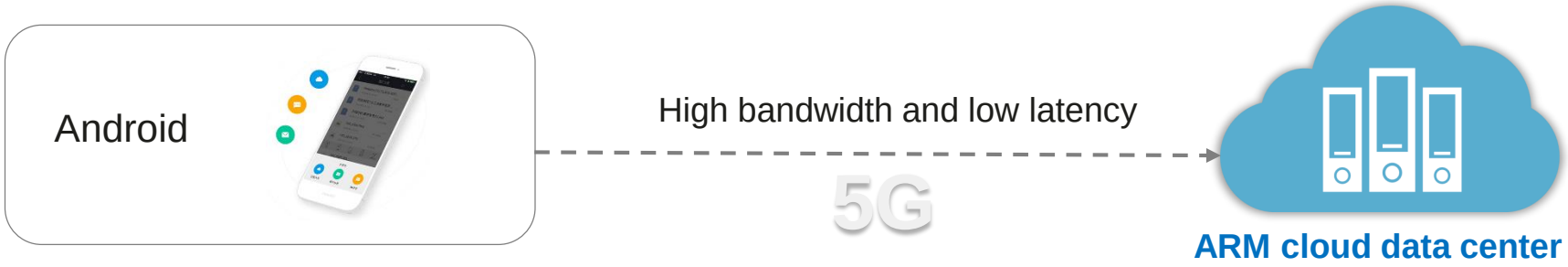
Aspect	Item	MDM	VMI
Security	Data and app security	Data is stored on terminals, which may cause data leakage. Apps need to be released and vulnerabilities may be exploited through reverse analysis.	Data and apps are stored on the cloud, ensuring high security. (★)
	Security vulnerabilities of mobile devices	Affected	No affected
	Data erasure	Not possible if mobile signals are lost.	Easy to implement on the cloud. (★)
User privacy	User privacy	Users may worry about personal privacy leakage because of its excessive control on mobile phones.	No control on users' mobile phones, no user privacy issues incurred. (★)
O&M mgmt	O&M management of mobile apps	A large number of security policies are customized to control mobile terminals and applications.	Cloud VMs are managed in a unified manner. No diversified terminals are involved. (★)
	Antivirus and patching policies	Antivirus software and patches are pushed to and monitored on each user terminal. There are various types of terminals, and the tasks are complicated.	Antivirus software is deployed on the cloud or systems and applications are patched on the cloud. (★)

Major mobile office technologies: MDM, VMI

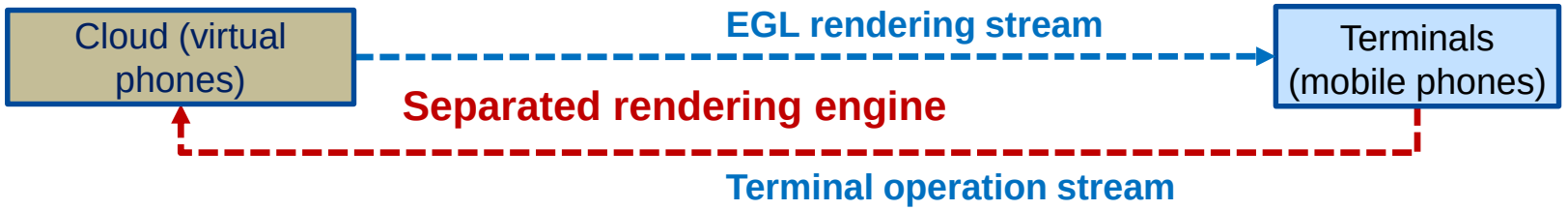
- MDM is relatively mature, but it is inferior in security, user privacy, and O&M management.
- VMI is more suitable for scenarios with high information security requirements.

Cloud Phone Trend

1. High-bandwidth and low-latency 5G networks accelerate the cloudification of mobile apps and bringing opportunities for cloud games and mobile office.



2. Instruction streaming technology will be widely used in cloud phone services.



3. AI apps for cloud phones will continue to emerge.

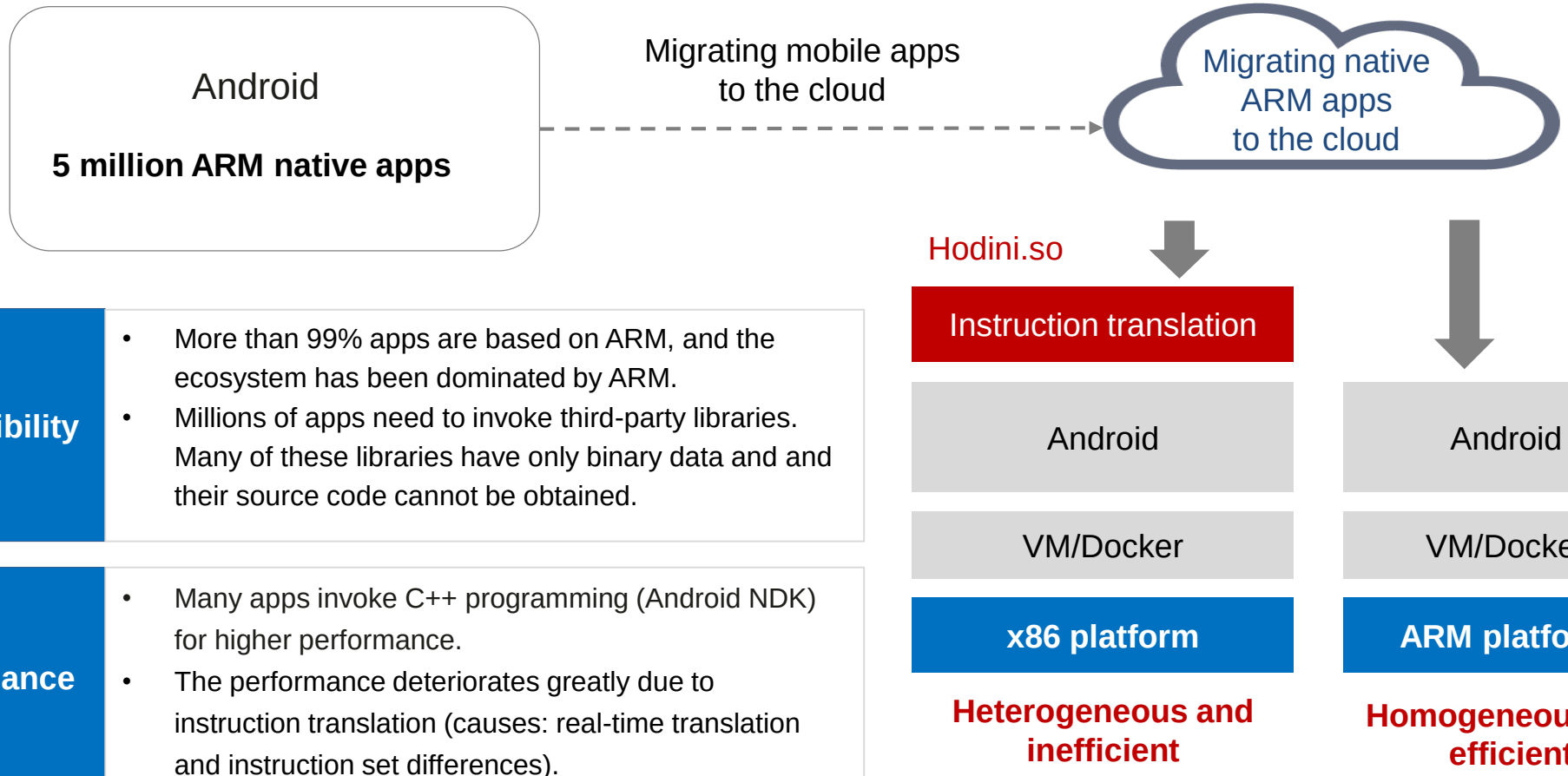
Scene-based intelligence, voice recognition, image recognition, and more

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Cloud Phones: ARM vs. x86

ARM has the natural advantage of homogeneous device-cloud architecture.



Compatibility	• More than 99% apps are based on ARM, and the ecosystem has been dominated by ARM. • Millions of apps need to invoke third-party libraries. Many of these libraries have only binary data and and their source code cannot be obtained.
Performance	• Many apps invoke C++ programming (Android NDK) for higher performance. • The performance deteriorates greatly due to instruction translation (causes: real-time translation and instruction set differences).

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ARM Cloud Phones vs. Mobile Phone APs and Real Phones



TaiShan server-based cloud phones



Mobile phone cluster

Key Item	ARM server	Mobile Phone AP
Reliability and availability	Advantage. Enterprise-level product. User data can be stored using an HA solution to ensure reliability and availability.	• Consumer-level products/components. Consumer-level flash has a short service life. Components such as memory and flash must be replaced independently. Their fault rate generally rises after they have run for one year. • User data is directly stored in the flash chip of the mobile phone. Once the AP is faulty, users cannot access the mobile phone and even use data is lost. Even though with a decoupled computing and storage solution, no existing products or mechanisms support the interconnection between mobile phone APs and data center storage.
Elastic resource allocation	Advantage. A virtualization or container solution enables hardware resources to be allocated based on specific service loads.	• Each mobile phone supports one user. The resources are fixed, causing overprovisioned resources for light-load services while insufficient resources for heavy-load services. • Flash offers a small capacity and can accommodate only several large games. It takes a long time to install, uninstall, and change games, resulting in poor user experience. Therefore, flash is unable to support massive game trial play.
Manageability and maintainability	Advantage. Standard server O&M methods, allowing transfer of O&M experience.	• A new O&M team must be established and a new management solution needs to be designed to implement independent O&M. • Due to a fault rate, engineers have to go to the equipment room frequently and the maintenance workload is heavy.
Admission control	Advantage. The product design complies with the industry's equipment room safety regulations.	• The consumer product does not meet the industry's standard equipment room access requirements and cannot be deployed at scale.

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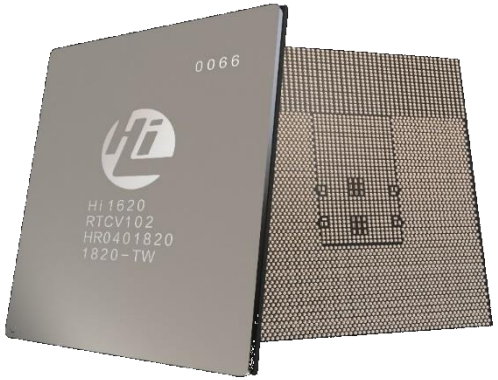
Kunpeng Processors – TaiShan Android Cloud Chips

Kunpeng 916 – Industry's first ARM processor supporting multiple sockets



- Industry's first ARM processor supporting multiple sockets
- 32 cores, 2.4 GHz
- 4-channel DDR4 memory, PCIe 3.0, and SAS/SATA 3.0
- Equally performing as x86 gold 5115

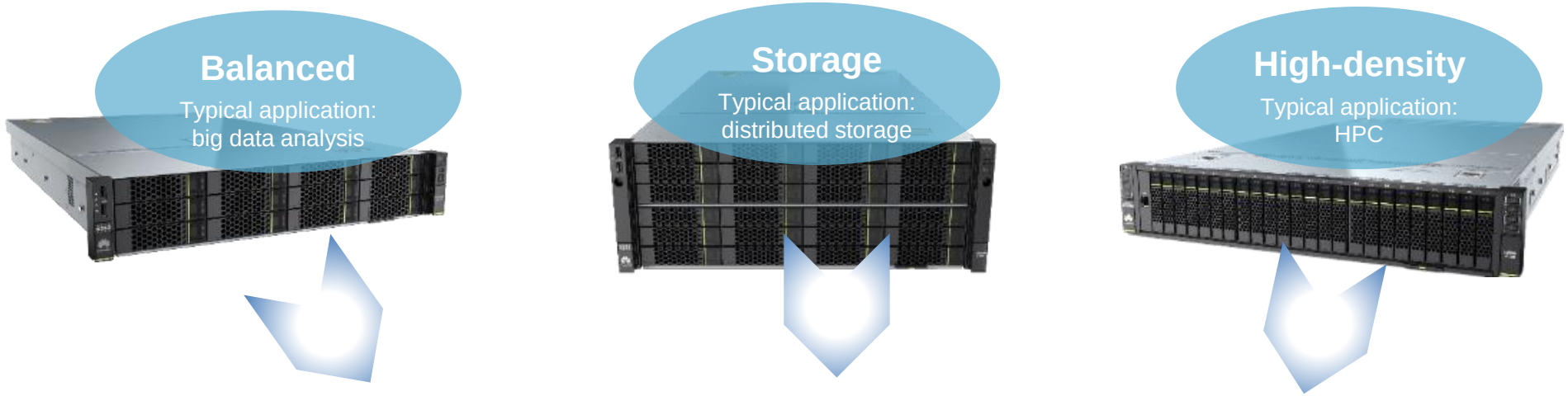
Kunpeng 920 – Industry's first 7 nm ARM processor for data centers



- Industry's first 7 nm ARM processor for data centers
- 32/48/64 cores, 2.6 GHz
- 8-channel DDR4 memory, 33% higher bandwidth
- PCIe 4.0, hardware acceleration for compression/decompression and encryption/decryption
- Equally performing as x86 gold 6148*, 20% less power consumption

* Comparison with the Kunpeng 920 32-core 2.6 GHz processor

TaiShan Server – TaiShan Android Cloud Servers

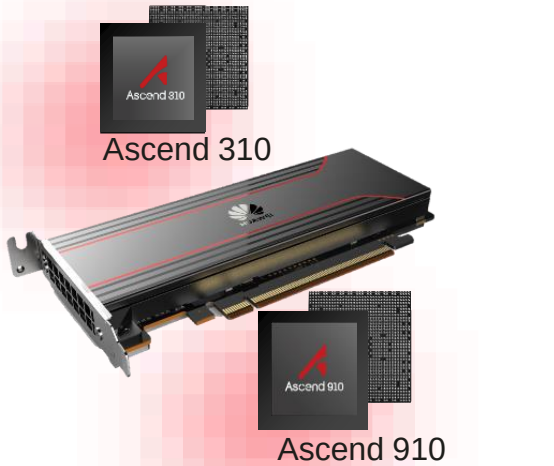


Product	TaiShan 2280/2280 V2	TaiShan 5280/5280 V2	TaiShan X6000/X6000 V2
Form Factor	2U 2-socket rack server	4U 2-socket rack server	2U 4 x 2-socket nodes
Processor	Kunpeng 916/Kunpeng 920 (V2)		
Memory	16 DDR4/32 DDR4 (V2 rack)		
Local storage	Configuration 1: up to 16 x 3.5" hard drives Configuration 2: up to 27 x 2.5" hard drives	Up to 40 x 3.5" hard drives	6 x 2.5" hard drives 3 x 3.5" or 6 x 2.5" hard drives (V2)
LAN on motherboard	2 x GE electrical ports + 2 x 10GE optical ports / 4 x GE + 4 x 10GE or 4 x 25GE (V2) ports		
PCIe extension	Up to five PCIe 3.0 x8 slots Up to eight PCIe 4.0 x8 slots (V2)		Up to two PCIe 3.0 x8 slots Up to two PCIe 4.0 x8 slots (V2)

TaiShan Servers with Da Vinci AI Cards, Ready to Introduce AI Capabilities to Cloud Phones



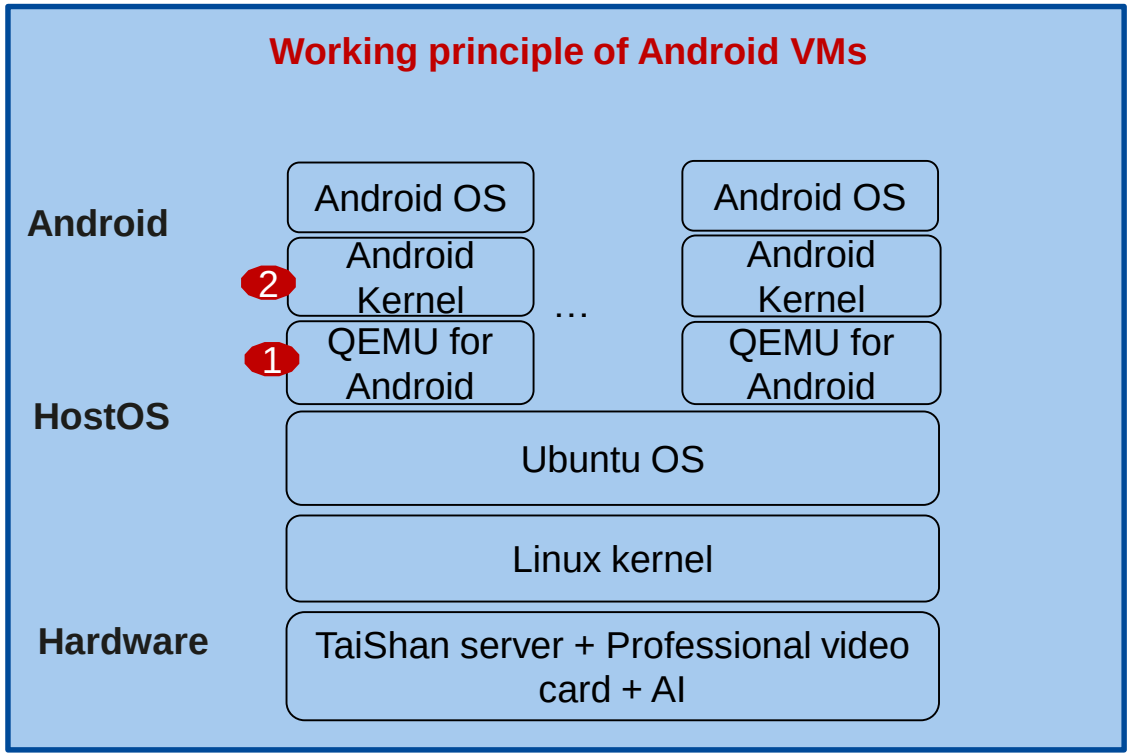
TaiShan 2280/TaiShan 2280 V2 server

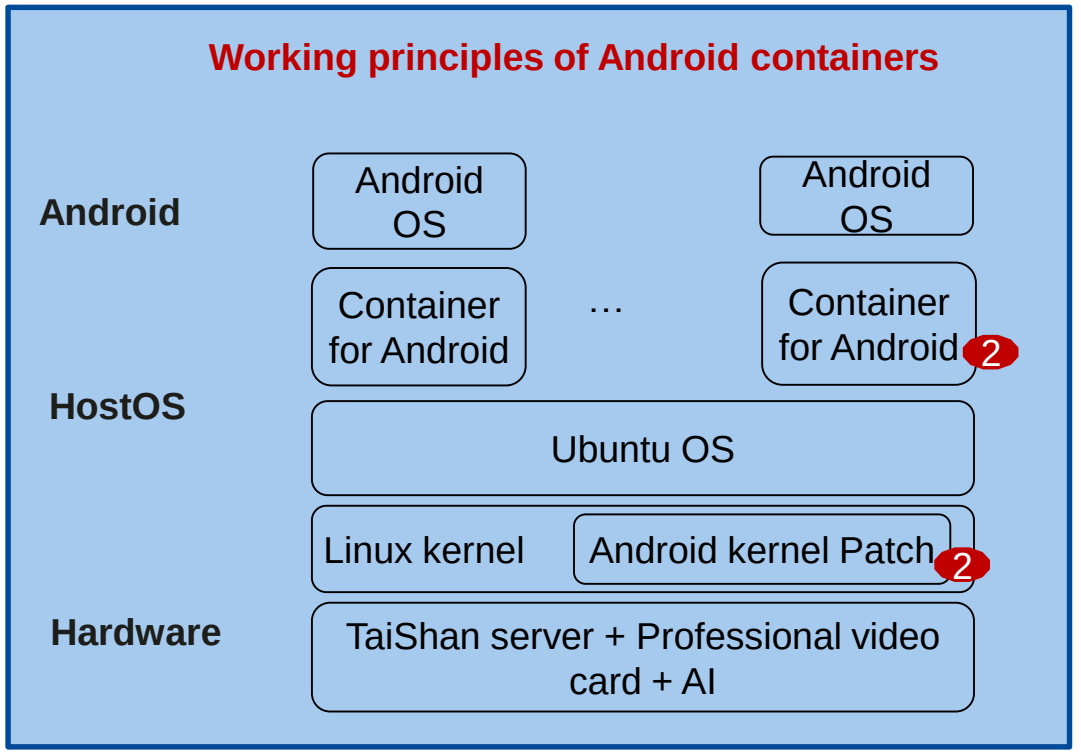


Ascend 310/910 PCIe card

Terminals evolve to have AI capabilities inside. Cloud phones also need AI capabilities. They will extend to application scenarios where real phones do not work.

Building a Basic Android System Based on TaiShan





1. QEMUs for Android: Android VMs and simulators are essentially the implementation of KVMs+QEMUs. The KVMs are built using the standard Linux kernel, but the QEMUs must be designed for Android rather than Linux.
2. Android kernel: In the implementation of VMs and simulators, each Android system has an independent kernel. In the implementation of containers, Android patches must be installed for the Linux kernel, and all Android systems share the kernel.

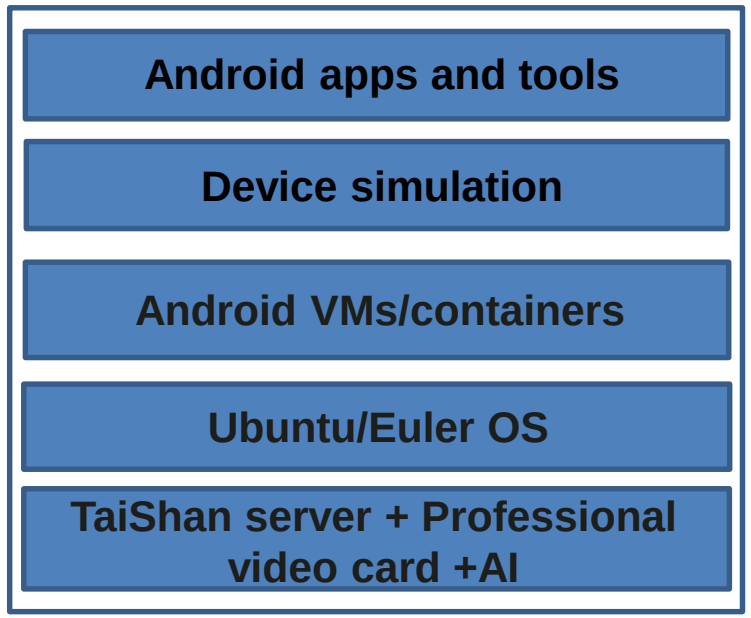
Android simulators have rich open-source community technologies and can be quickly applied. Android containers have relatively new technologies. They are more suitable for high-concurrency services because of their lower overhead.

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Typical TaiShan Solution for Hosting Scenarios

Hosting scenarios include terminal emulation, app testing, and mobile phone hosting. They do not involve end user experience. Instead, they focus on the data center and have low requirements on client user interface (UI) connections. These scenarios need similar TaiShan solutions, with their different preferences.

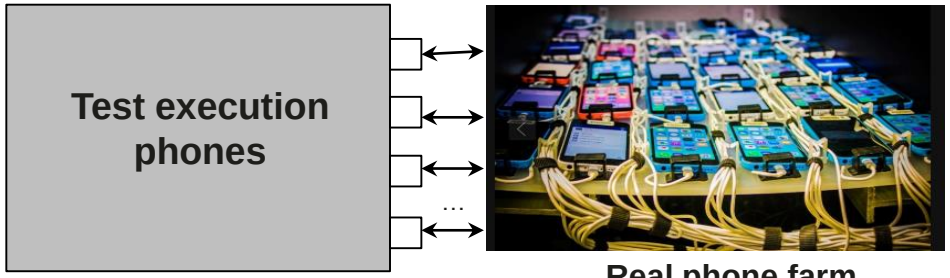
Full stack in a hosting scenario



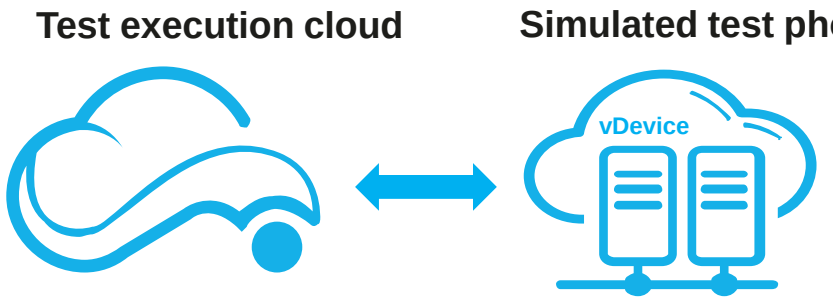
- The Android apps and tools vary with application scenarios.
- Terminal emulation requires comprehensive device simulation, letting virtual phones to have components of real phones, such as batteries, sensors, wireless networks, Wi-Fi, VoLTE, audio, and cameras. Other scenarios need only basic simulation.
- Cost-effective professional video cards support local rendering, and a server supports multiple video cards.

An Example of Hosting

Real phone solution



Analog simulation solution



Start app development and testing without real devices, free of the following problems:

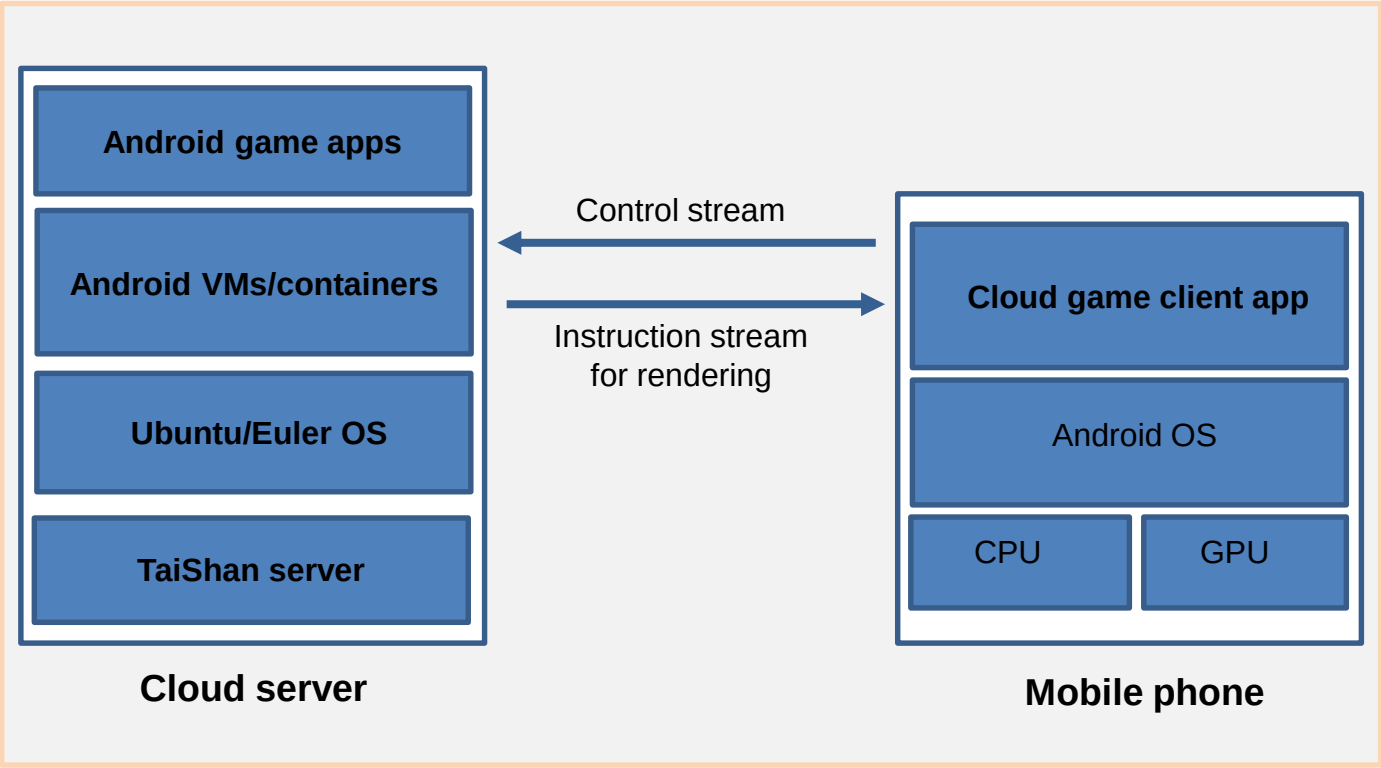
- Real phones, especially those popular ones, for testing are sometimes provided far behind schedule.
- Real phones of different models cannot be reused in testing.
- Some tests are hard to perform on real phones, for example, battery level tests and destructive hardware tests.
- The data center admission requirement for consumer products such as real phones is not that easy to meet.

The simulation solution has effectively supported the development of Huawei's mobile phones, such as Mate 10 and P20. The development and testing platforms were ready 3 month earlier than planned.

Typical TaiShan Solution for Gaming

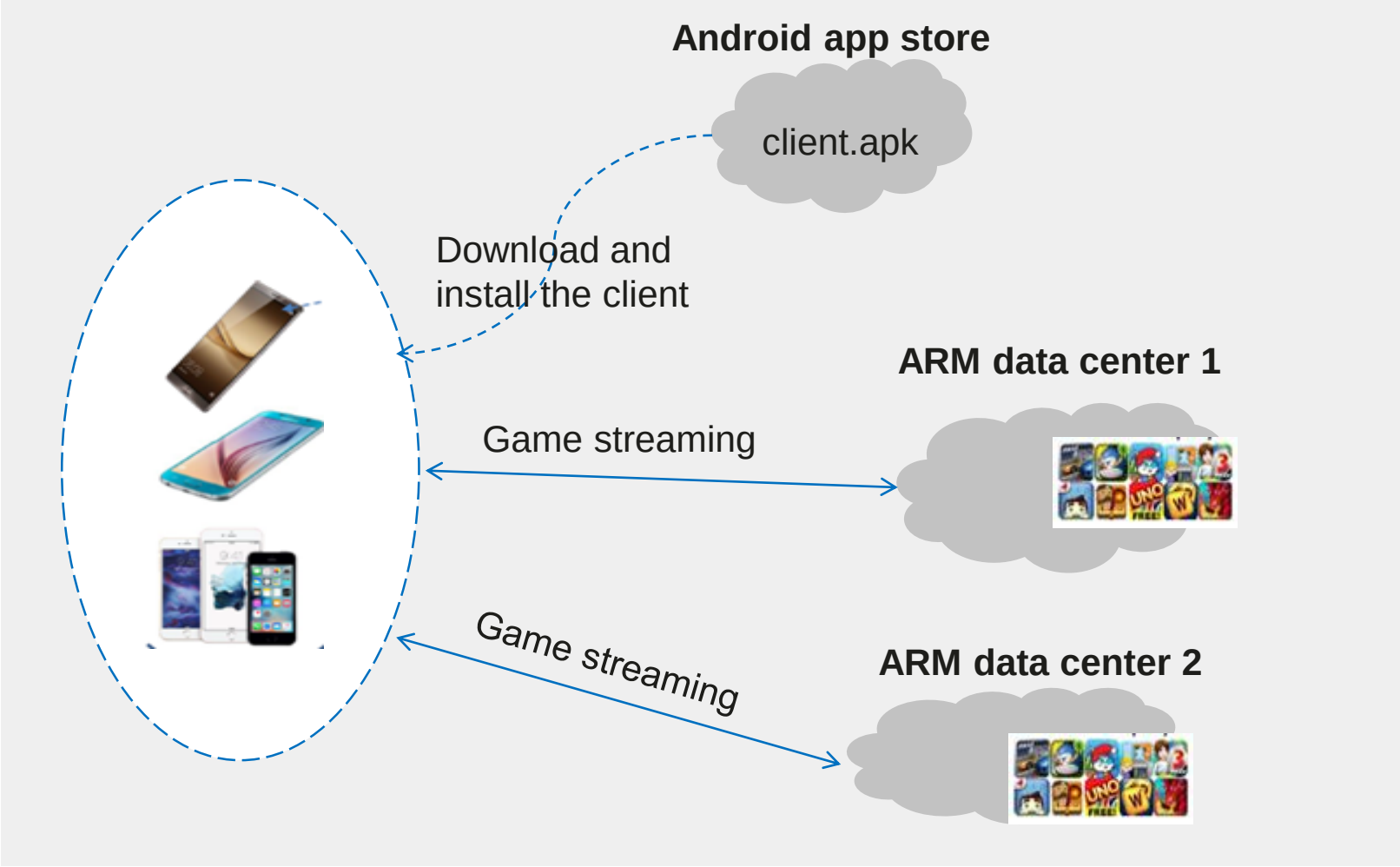
Instruction streaming cloud games are driven by high-density Android containers. No GPUs are required on the cloud. Rendering is performed on terminals. Benefits include optimal image quality and minimized TCO.

Full stack of cloud gaming



- Reconnection via null rendering: On the client and server, maintain the same status for the OpenGL state machine. Once a reconnection request is initiated, synchronize the complete state machine from the server to the client.
- Fast loading using vertex texture cache: Extract the feature values of the vertex texture to identify and filter out repetitively transmitted vertex texture data.
- Reduced network jitter through data mapping: Establish a mapping between the resources allocated by the server and the resources managed by the client to transmit control instruction steams unidirectionally. As a result, the frame rate will not decrease sharply in event of large network latency.
- Dynamic compression of instruction streams: Apply lossless compression to control instruction streams, lossy compression to texture data streams, and residual data transmission to vertex data streams.
- OpenGL ES 3.0: Complete the API adaptation layer of the OpenGL library to support OpenGL ES 3.x apps.

An Example of Cloud Gaming: Helping Customers Innovate Business Models



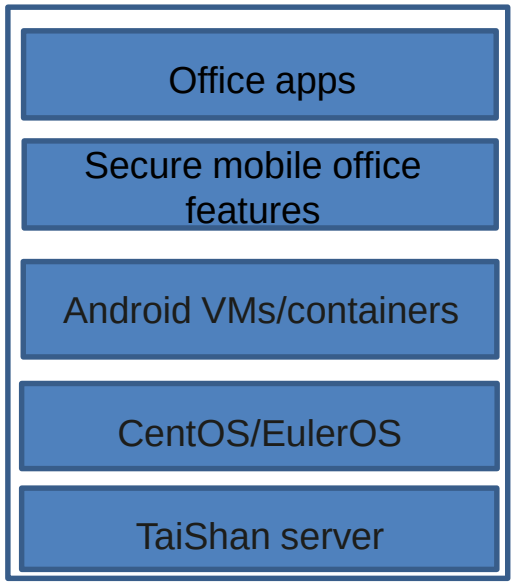
- **App preview**
  - Download-free trial
  - Tap to play
- **Social experience**
  - Game sharing
  - Multi-user collaboration
- **User data value**
  - Ad target push
  - Increased user loyalty due to no purchases or subscriptions needed
- **Streamlined app development**
  - Primary development in Android or iOS
  - Quick rollout and promotion

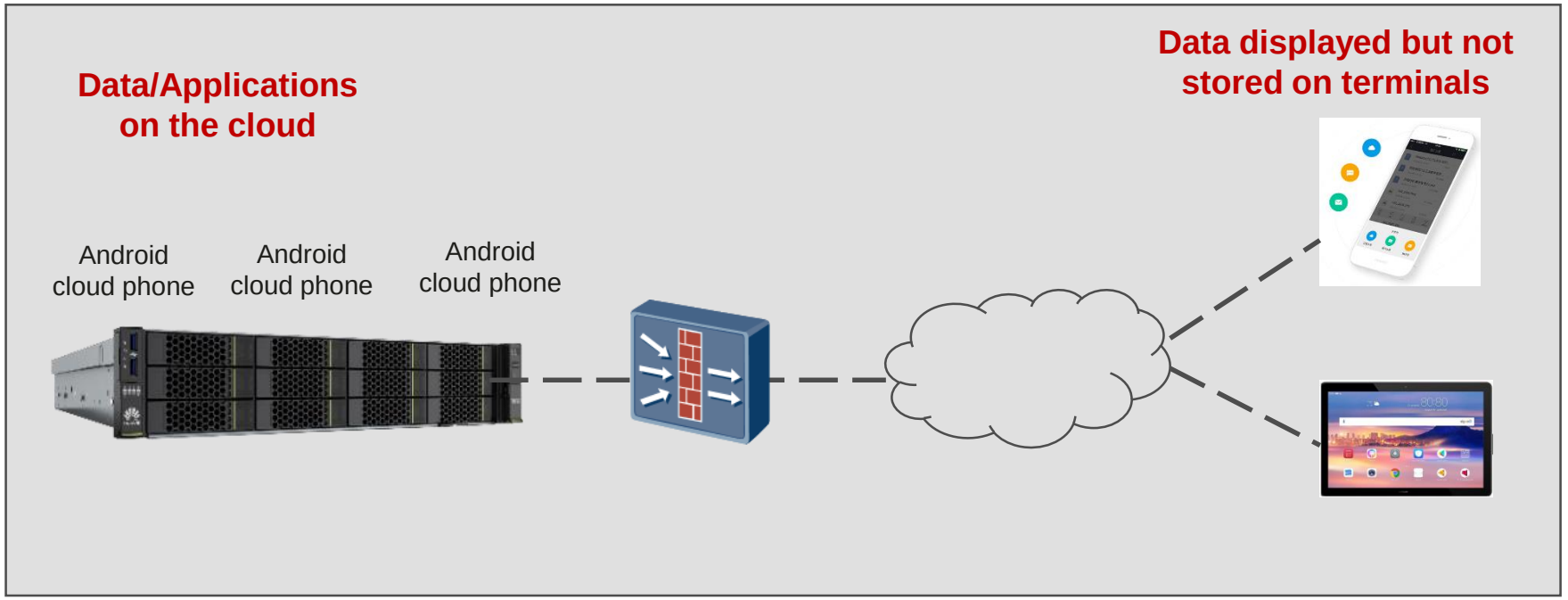
Typical TaiShan Solution for Office

Huawei and our partner jointly develop the VMI mobile office solution based on TaiShan servers. The VMI integrates mainstream office apps and implements secure mobile office via cloud phones.

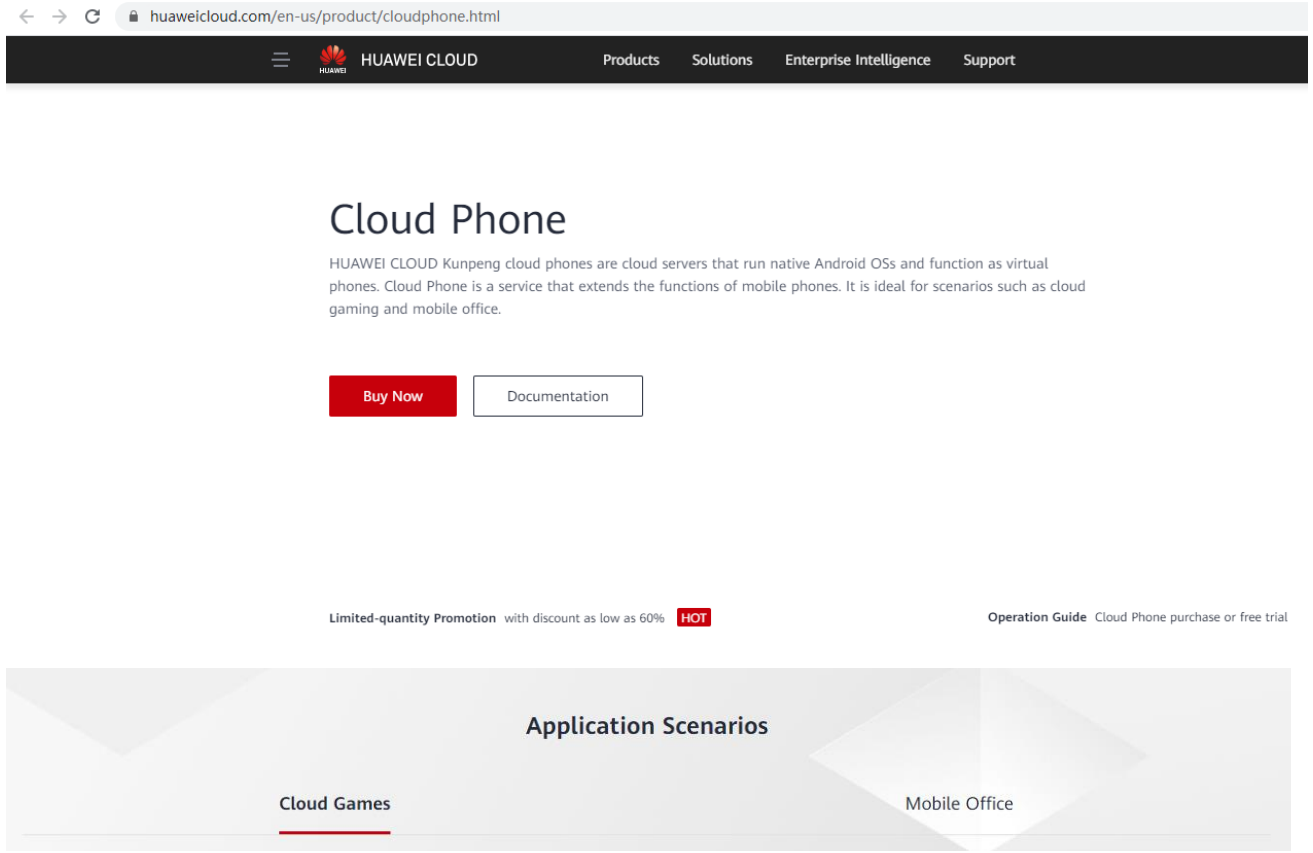
- Secure mobile office features include user management, secure access, access control, channel encryption, remote access protocol, and client security.
- It integrates mainstream office apps, including email, communication, office, traveling, community, attendance check, and administration apps.

Full stack of mobile office





Public Cloud Example: Huawei Cloud Phone Redefines the Development and Use of Mobile Apps



- Industry's first cloud phone solution based on the ARM architecture
- High-performance image rendering provided by professional video cards
- Lossless image delivery enabled by device-cloud separated rendering instruction streams
- Highly emulated mobile phones supported by profound mobile phone R&D experience
- Flexible configuration of cloud phone specifications benefiting from elastic resource deployment and scaling capabilities

HUAWEI CLOUD Cloud Phone + Partner Services Integration

HUAWEI CLOUD provides the Cloud Phone PaaS service. Partners focus on their services development and can quickly integrate their services based on cloud phones.

Partner



Hosting

- Emulation testing
- Batch phone hosting
- App data collection



Gaming

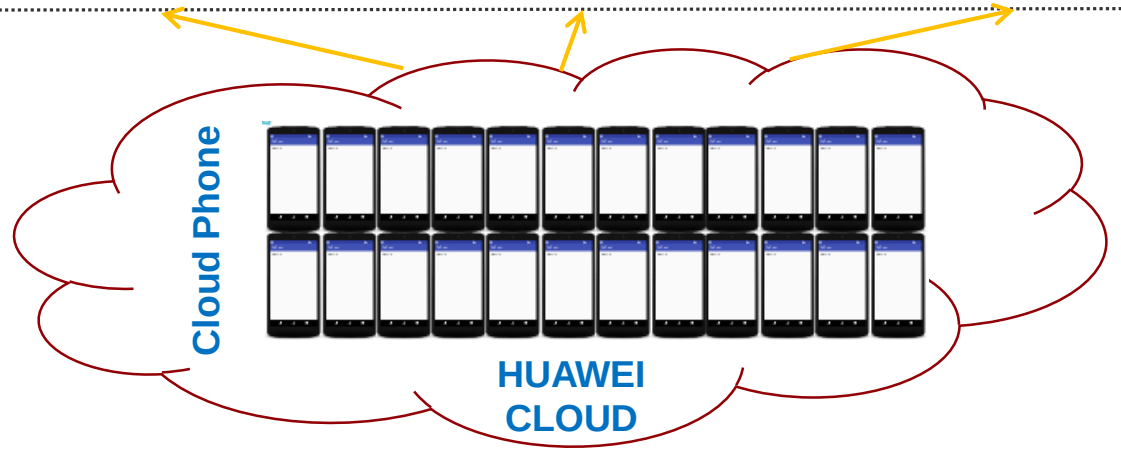
- Game idling
- Trial play and download
- Online play



Office

- BYOD
- Office information security
- Phone function extension

Huawei



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