Running Windows 8 on top of Android with KVM

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Agenda

• Motivation
• Prototype
• Demo
• Next Steps
Motivation

- Hardware-based virtualization features have been enabled even on mobile devices
  - EPT, VPID are available on latest Intel® Atom™ processors
  - Unmodified operating systems can be run in virtualization
- Android* is very popular mobile OS
  - Linux-based, therefore KVM module should be available
  - Userland is very different from typical Linux distros
- What does it takes to enable KVM on Android?
  - Exercise: Run Windows 8 on x86 Android
Modes of Windows 8 Guests

1. Legacy PC mode
   - Legacy PC devices (e.g. mouse, keyboard, network, IDE, etc.)
   - Legacy PC BIOS
   - OSPM can be disabled

2. Tablet mode – much more complex
   - Modern tablet devices (e.g. touch panel, sensors, secure boot, etc.)
   - UEFI
   - Advanced OSPM, Connected Standby
Scope of Prototype

- Platforms
- Limbo-android
- Modifications
- Current Status
Android* Platforms

• Core-based Tablet
  • Intel Ivybridge Core i5 3337U with 4G memory and 128G SSD

• Intel® Atom™-based Tablet
  • Intel® Bay Trial Atom™ with 2G memory and 128G eMMC
Qemu/KVM for Android* - Limbo

• What is Limbo?
  • Limbo is an open source project based on Qemu which can manage virtual machines under ARM* Android.
  • https://code.google.com/p/limbo-android/

Port limbo-android to x86/KVM
Overview of Limbo-Android – Qemu/KVM for Android

Android UI

Limbo Activity
- Limbo JNI - VM Management
- SDL Activity
- VNC Activity

Windows 8 VM

Android Framework and Libraries
- ioctl

x86 Linux Kernel
- KVM

SDL for Android
- Glib
- Qemu/KVM as Android NDK Libraries
Qemu/KVM under Android with SDL

• Display
  • Qemu allocates and draws surface via SDL API
  • SDL Android libraries manipulates the surface from SDL Activity via Android EGL API and NativeWindow

• Input
  • SDL Activity forwards user activities from Android WindowManager to SDL Android Libraries
  • SDL Android Libraries forward them to Qemu via SDL event loop

• Sound
  • SDL Activity contains a AudioThread and use AudioTrack from AudioFlinger to playing music forwarded from Qemu
Modifications Required

- **Linux Kernel**
  - No modifications: just enable KVM in the kernel configuration

- **Bionic (C library for Android)**
  - Add missing system calls: pread64()/pwrite64()/lseek64().
  - Add missing POSIX function: sigtimedwait()
    - Required for KVM

- **limbo-android**
  - Resolved x86 build issues
  - Pass KVM-specific arguments to Qemu in Limbo JNI.
    - “-enable-kvm”, virtio configurations
  - Cleanups for 64-bit support (to handle large images)
Current Status

32-bit SMP Windows 8 works well: 2GB (on Core) and <1GB (on Atom)

- Virt IO: Network and storage
- Display: SDL/VNC
- Sound: SDL Activity under Android AudioFlinger
- Input: Keyboard / Mouse / Touch events are passed from Android Activity to Qemu

RDP Support

- Next Page
RDP Support

- RDP and Remote APP
  - Gestures – Scrolling / Scaling / Software Keyboard
  - Software Keyboard Auto Activation
  - Seamless UI
  - Sound Forwarding
  - Share Folder
Demo
Next Steps

2D/3D acceleration:

• Issues: No Vmware VGA / QXL drivers for Windows 8 (WDDM)

Tablet Mode:

• Virtual UEFI

• Sensors
  • USB HID Class Sensors emulation in Qemu

• Camera
  • USB Video Class Camera emulation in Qemu

• UX improvements
  • Touch optimizations

• Virtual Connected Standby
  • “Hardware-reduced ACPI”