

Android Innovation

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Agenda

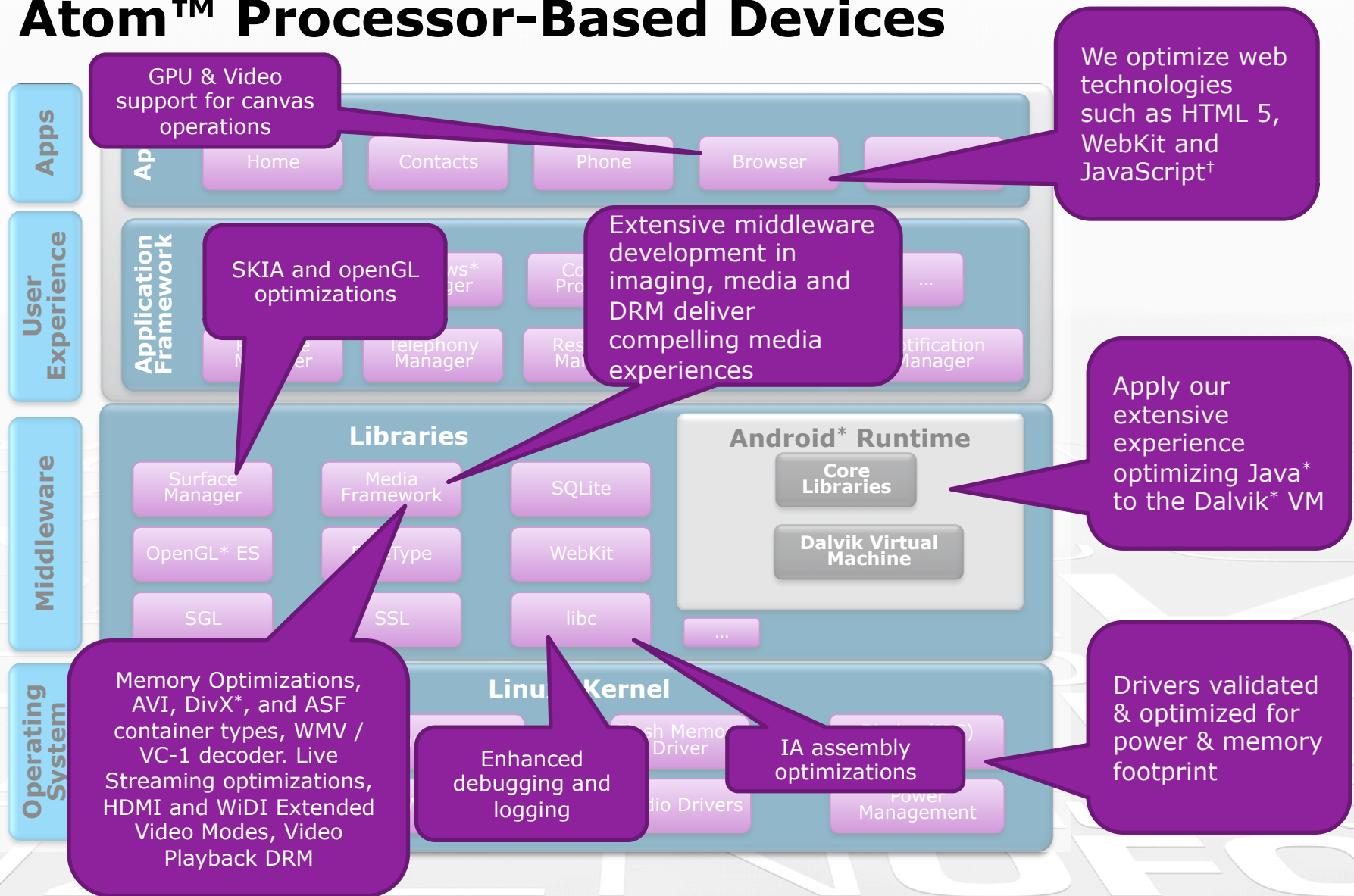
- Android* & Intel® Architecture
- Delivering a Great Developer Experience
- Collaborating with the Android Community to ensure Android runs great on IA

Android* & Intel® Architecture

- Intel is a major contributor to the Android Platform
- Intel Architecture is fully supported in AOSP
 - Optimizations across the entire Android stack
- We're working to extend and enhance the Android Platform
 - Scaling build and runtime for multiple target support
 - Ethernet support
 - Large RAM support via 64-bit kernel
 - x32 for additional performance
 - More to come!



Optimizing Android for Intel® Atom™ Processor-Based Devices



†Based on third party validation and sampling of Android apps using specific computer systems and/or components and reflect the approximate performance of Intel products as measured by those tests. Any difference in system hardware or software design or configuration may affect actual performance and/or results.

Delivering a Great Developer Experience



Intel® Hardware Accelerated Execution Manager & System Images

- Intel® HAXM accelerates Android emulation by 5-10x
- Intel system images easy to install in the Android SDK Manager



Intel® Graphics Performance Analyzers – GPU performance

- Real-time system-level performance analysis with CPU and GPU metrics
- Detailed analysis for OpenGL-ES* applications



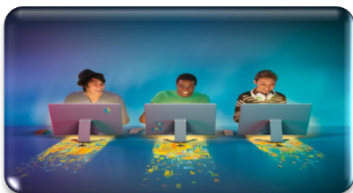
Intel® VTune™ Amplifier – power and performance

- In-depth SoC-wide analysis
- Comprehensive CPU and PMU analysis
- Detailed power analysis
- JIT profiler for Java*



Intel® C++ Compiler – app performance

- Boosts performance of C++ code with a single recompile
- Intel® Atom™ processor optimized common libc/libm functions
- Binary and source compatible with GNU* GCC compilers



Intel® JTAG Debugger - reliability

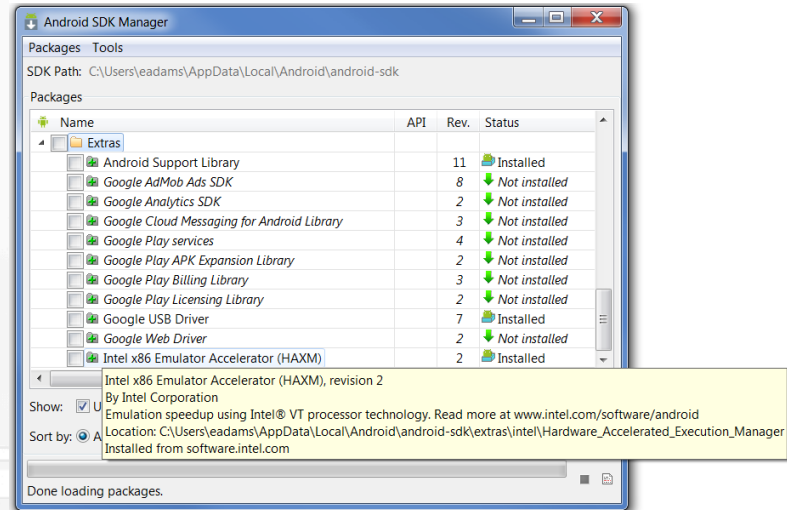
- CPU and SoC system source level debugging of kernel and drivers
- On-Chip instruction trace support
- Flashing and peripheral register support

Intel SOC Design-in, Manufacturing and Debug Tools for OEM and ODM

Tool Description	Functional Description
Mfg. Phone Flashing Tool	Host-based reference software to flash all or part of the phone SW/FW image. Tool can flash 1 to 8 phones to support development and manufacturing.
Firmware Stitching and Flashing Tools	Host-based combination tool used to stitch FW and to flash Medfield firmware components and initial boot loader. Can be used standalone or integrated in customer tool stack via APIs.
Multi-Media Audio MSIC device audio configuration tool	Host-based tool to adjust MSIC device gain & levels, modem output gain & levels, and configure audio offload processing parameters for multimedia playback.
Platform Trace Capture and Analysis Tool	Host-based tool to capture and decode log messages from the platform. Online and offline tracing & logging. Uses either Lauterbach or "Fido" probe via MIPI interface. Crash dump available via standard Android* DDMS.
Modem Flashing Tool	Host-based tool to flash modem firmware. Includes IMC Modem Flash client to enable modem FW update from the AP side. Requires direct USB connection to modem.
Modem RF Calibration Tool	Host-based Reference Tool for RF calibration. Generates RF calibration content to be integrated in the modem FW.
Modem Tuning, incl. Audio Features	Host-based tool to tune the parameters of components in modem, including modem audio. Signing module reference code available for mfg (e.g. IMEI).
Modem Trace Capture and Analysis Tool	Host-based tool to capture and analyze mobile station software operational traces. Focus is on modem operation. Includes pluggable decoder libraries, analysis DLLs and scripts.
WiFi Calibration Tool	Code embedded in Test OS and within the TI driver to generate WiFi design calibration. In mfg, TXBIP Calibrates WiFi on 1st Power-up.
Modem Voice Path Audio tuning tool for the Audience chip	Host-based tool for configuration and tuning of voice processing within the Audience Audio chip. Generates Audience voice tuning content to be integrated in the FW image.

Intel® Hardware Accelerated Execution Manager (Intel® HAXM)

- Accelerates Android emulation by 5-10x by natively executing x86 CPU commands
- Leverages Intel® Virtualization Technology
 - Available on most IA-based PCs since 2005
 - Support for Mac* & Windows*
 - KVM for Linux
- Applicable for both Dalvik and NDK apps
 - Must compile NDK apps for x86
 - Only works with x86 System Image
- Available as an “Extra” in the Android SDK Manager directory
- OpenGL ES 2.0 Support



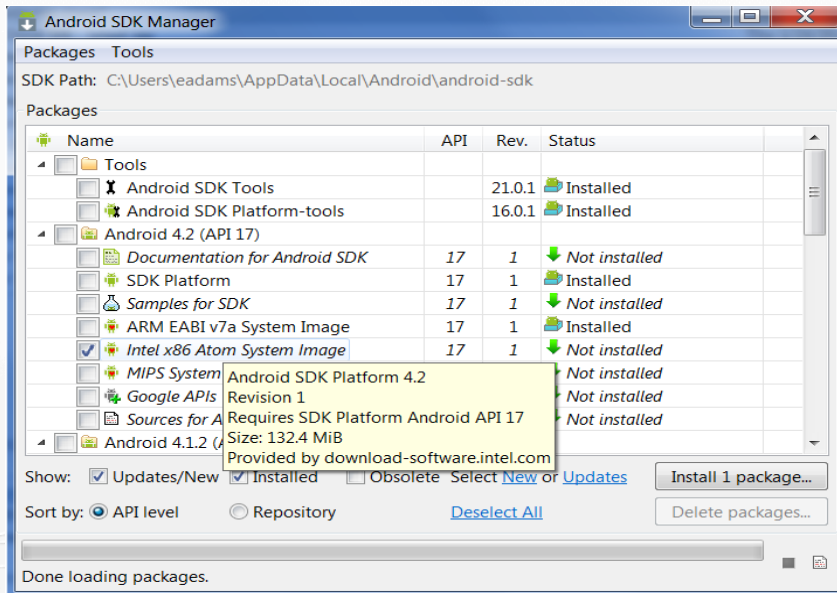
Remember to run the installer
(/sdk/extras/intel on Windows)

“Thanks to contributions to AOSP from Intel, the emulator now supports running x86 system images in virtualization mode on Windows and Mac OS X. This allows the emulator running at near native speed.”
Xavier Ducrohet, Android SDK Tech Lead, Mar 2012

“The x86 emulator runs twice as fast as Android phone, and almost 4 times faster than the ARM emulator.”
Android Developer
AnDevCon
May 2012

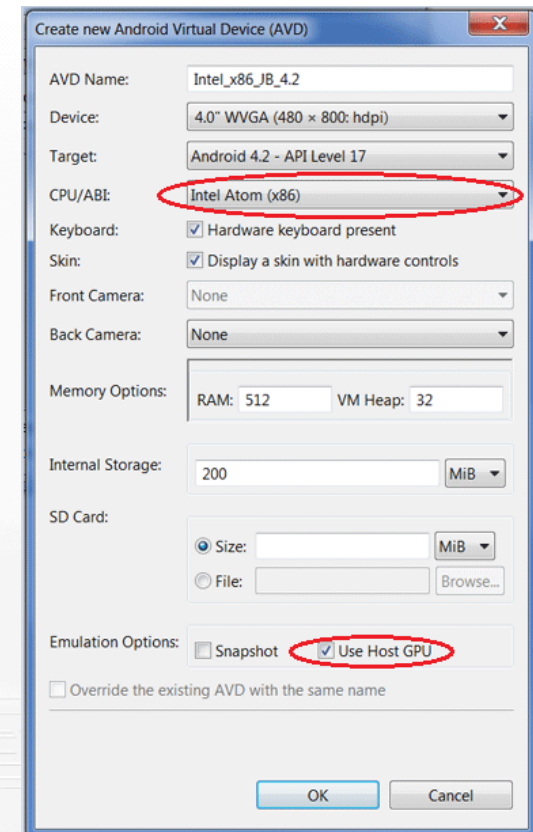
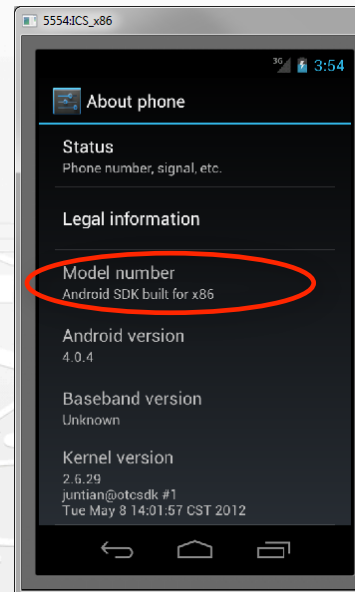
Android x86 Emulator System Images

Easy to install via the Android SDK Manager



1. Download the x86 system image from the SDK Manager.

3. Check settings to verify you're emulating an x86 system.

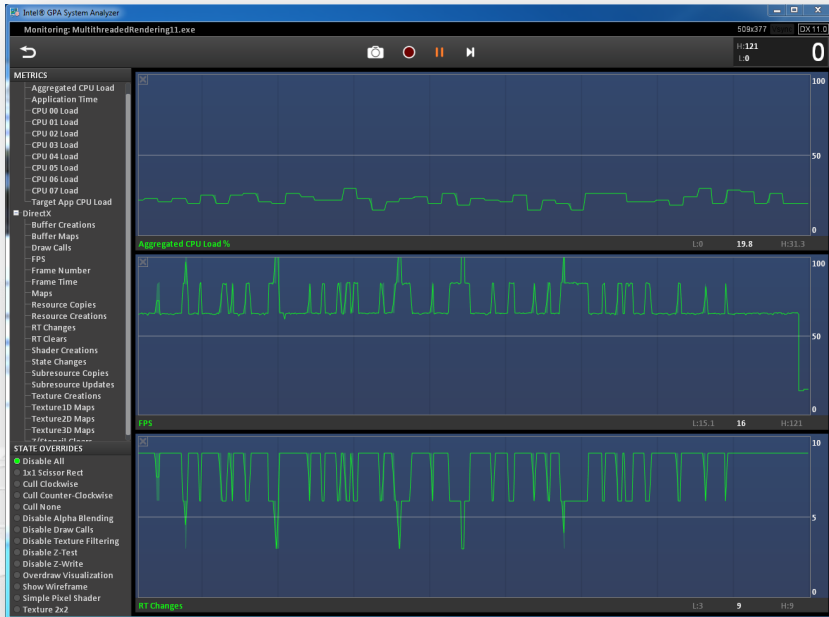


2. Create new AVD choosing x86 (make sure GPU and Keyboard emulation are enabled).

Over 6 million downloads of HAXM & System Images in the past year!

Intel® Graphics Performance Analyzers

System Analyzer support for Android

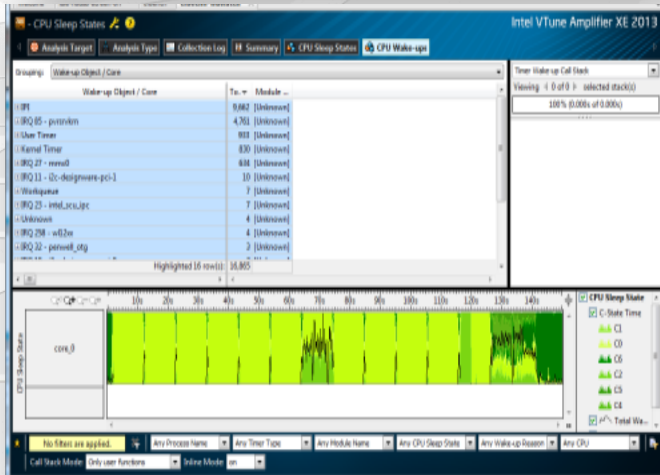
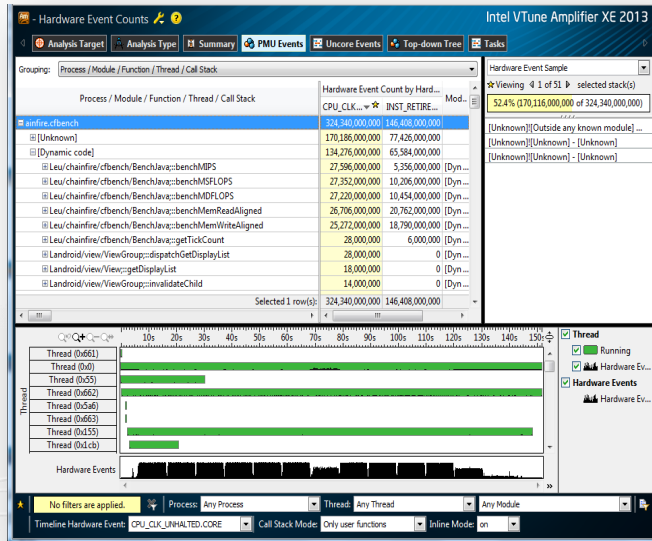


- Real-time system-level performance Analysis with CPU and GPU metrics
- Detailed analysis for OpenGL-ES* applications
- OpenGL-ES* experiments help narrow down problems
- Real-time charts of CPU, Graphics API, processor graphics HW, and power metrics

Find out more at software.intel.com/tools

Intel® VTune™ Amplifier

Power and Performance Profiler



Performance Hardware Collection

- Event-based sampling for tuning platform performance
- Identify code using CPU
- Drill to the source code – Java, Native C++,

Quickly identify Architecture bottlenecks

- Cache Misses, Branch miss-predictions
- CPU metrics
- Fast Hot Spot analysis with call stacks

Power Analysis

- Identify causes of wakeups
- Show CPU frequencies by CPU core

Correlate activity from

- CPU
- SoC Components
- Android Wakelocks

VTune™ Amplifier Example

VTune™ Amplifier

X86 Platform

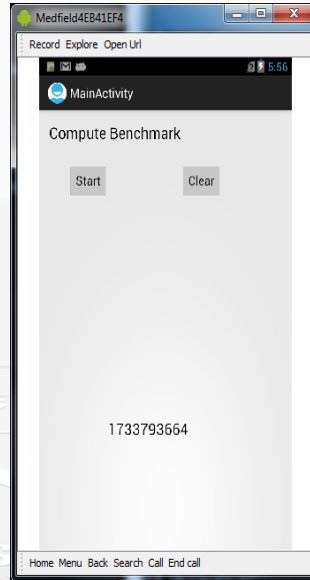
```
public void showValue(View v) {
    int i, j, sum=0;

    for (i=0;i<10000;i++)
        for (j=0;j<10000;j++)
            sum+=i;

    TextView tv =
    (TextView)findViewById(R.id.textView2);
    tv.setText(String.valueOf(sum));
}

public void clearValue(View v) {
    TextView tv =
    (TextView)findViewById(R.id.textView2);
    tv.setText("");
}
```

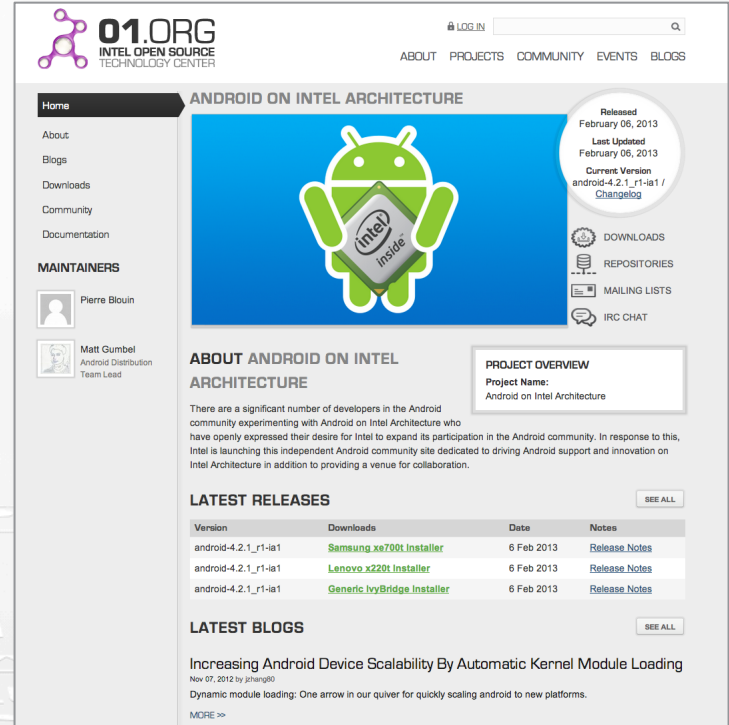
Application
Dalvik VM
Operating System
Firmware
Hardware



Detects and helps fix issues across all layers of the x86 platform

Intel's Community for Android on IA: www.01.org/android-ia

- A launch pad for system developers to collaborate on IA platforms
- Complementary to AOSP
- Provides full source and reference binary images
 - Not intended for direct use in products
- Supports commercially available IA platforms
 - As reference vehicles for platform development



The screenshot shows the website for the Intel Open Source Technology Center's Android on Intel Architecture project. The page features a navigation menu on the left with links for Home, About, Blogs, Downloads, Community, and Documentation. Below the navigation is a 'MAINTAINERS' section listing Pierre Blouin and Matt Gumbel. The main content area includes a large header image of the Android robot with the Intel logo, a 'PROJECT OVERVIEW' section, an 'ABOUT ANDROID ON INTEL ARCHITECTURE' section, and a 'LATEST RELEASES' table. The table lists three releases: android-4.2.1_r1-ia1 (Samsung x6700 Installer), android-4.2.1_r1-ia1 (Lenovo x220t Installer), and android-4.2.1_r1-ia1 (Generic IvyBridge Installer). A 'LATEST BLOGS' section is also visible at the bottom.

Version	Downloads	Date	Notes
android-4.2.1_r1-ia1	Samsung x6700 Installer	6 Feb 2013	Release Notes
android-4.2.1_r1-ia1	Lenovo x220t Installer	6 Feb 2013	Release Notes
android-4.2.1_r1-ia1	Generic IvyBridge Installer	6 Feb 2013	Release Notes

Check out the demo of the latest release running on the Acer* Iconia* W700

Project Highlight: Scaling Android Runtime

- Problem: Traditionally, a binary build target is created for each platform variant
 - Doesn't take advantage of discoverability mechanisms in the platform
- Solution: Create a single binary build target that runs across multiple IA-based platforms
 - Automatic signed kernel module loading
 - Enhanced Camera, Audio, and WiFi HALs that autodetect underlying hardware interfaces
 - Device provisioning via Interactive Installer

Code is hosted at <http://01.org/android-ia>

Sessions and Activities

Monday February 18

4:20 – 5:00pm	Toward a Portable Lunch Target and the Scaling Problem – Mark Gross
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Tuesday February 19

9:00 – 10:00am	Panel: Is Android the New Embedded Linux – Dave Stewart
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11:30 – 12:20pm	Android-IA Scalability Features to Support a Single Build Target – Andrew Boie
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Also join us at the Intel booth!

Thank You!



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Notice revision #20110804

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