



Logging System of Android

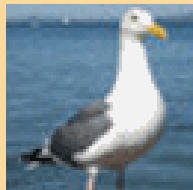
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Who am I?

- 20+ years involved in embedded systems
 - 10 years in real time OS, such as iTRON
 - 10 years in embedded Java Virtual Machine
 - Now GCC, Linux, QEMU, Android, ...
- Blogs
 - <http://d.hatena.ne.jp/embedded/> (Personal)
 - <http://blog.kmckk.com/> (Corporate)
- Twitter
 - @tetsu_koba



Today's topic

- Log from Java program
- Log from native program
- Overview of Android Logging system
- Tips

Log from Java program

- `android.util.Log` class
- `System.out`, `System.err`

android.util.Log

- Static methods
 - Log.e, Log.w, Log.i, Log.d, Log.v
 - e,w,i,d,v mean priority/log level
- writing log with tag, priority
- Tag and priority is used by filtering

```
Static final String LOG_TAG = "Hello";  
...  
Log.i(LOG_TAG, "Hello to log");
```

System.out/System.err

- Default instance is `com.android.internal.os.AndroidPrintStream`
- These connects to `android.util.Log`

Tips: How to identify instance of `System.out`

```
System.out.println("System.out=" +  
System.out.toString());
```

Log from native program

- Use liblog library
- Include <android/log.h>
- __android_log_print
- Writing log with tag, priority

```
#include <android/log.h>
#define LOGI(...) \
__android_log_print(ANDROID_LOG_INFO, LOG_TAG, __VA_ARGS)
...
LOGI("i=%d, name=%s\n", i, name);
```

Stdout/stderr of native program

- These are **NOT** connected to logging system.
- Init process set stdout/stderr to /dev/null for its child processes.
- All Java processes, too.
 - JNI native libs, too.
 - Do not use printf (to stdout) in JNI native libs.

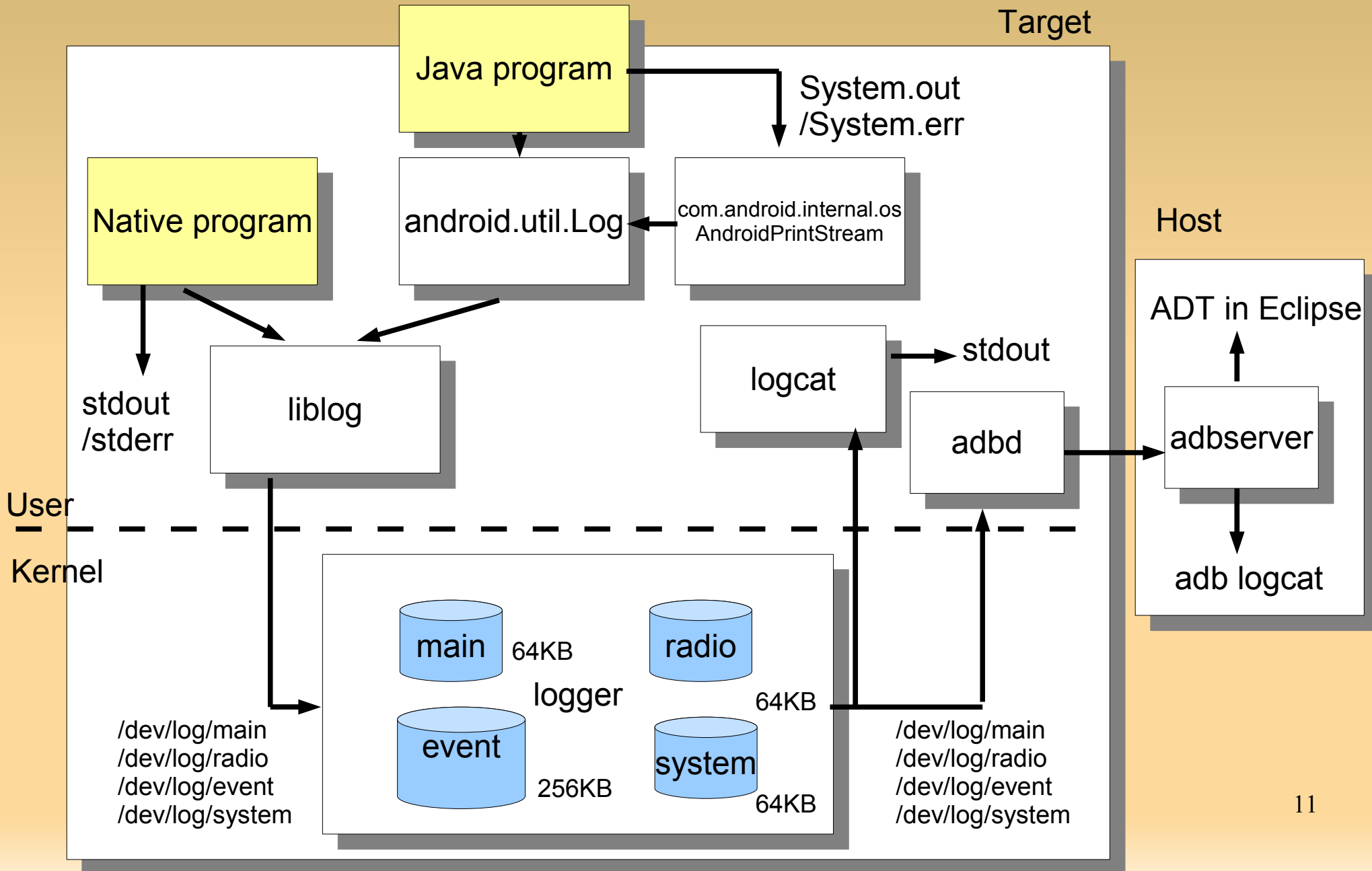
How to read logs

- Logcat command
- Adb logcat
- Logcat pane in ADT, Eclipse
- Filtering by tag and priority

Log device files

- 4 channels, each have ring buffer
 - /dev/log/radio – radio-related messages (64KB)
 - /dev/log/event – system/hardware events (256KB)
 - /dev/log/system – system/framework messages (64KB)
 - /dev/log/main – everything else (64KB)
- File permission of each is 0662
 - owner/group RW, other Write only
 - owner=root, group=log
 - Anyone can write logs, root or log group can read them

Overview of Android Logging System



Where to read in source code

- `android.util.Log`
 - `frameworks/base/core/java/android/util/Log.java`
- `com.android.internal.os.AndroidPrintStream`
 - `frameworks/base/core/java/com/android/internal/os/AndroidPrintStream.java`
- `Liblog`
 - `system/core/liblog/`
- `Logcat command`
 - `system/core/logcat/`
- `Adb command`
 - `system/core/adb/`
- `Kernel log driver`
 - `drivers/staging/android/logger.c`

Tips

- Dumping stack trace
- Character Encoding
- Logwrapper
- Log at init process

Dumping stack trace

- 3 arguments functions in android.util.Log class
 - For example:
 - `Log.e(String tag, String msg, Throwable tr)`
- `Throwable.printStackTrace()` also works
 - Dump to `System.err`
- See also
 - <http://blog.kmckk.com/archives/2902690.html>

You can put 'new Throwable()'

Character Encoding

- Fixed to Utf-8
 - Not Shift-JIS, Not EUC
- Use Utf-8 encoding terminal/window to use logcat
 - adb logcat
 - invoke 'logcat' at serial console
- Logcat pane in ADT in Eclipse seems bug.
 - Can not show Japanese character correctly.

Logwrapper

- Logwrapper redirects stdout/stderr to Android Logging system
- Easy way to add 'usual' command as Android service launched from init.
- See also
 - <http://blog.kmckk.com/archives/2918551.html>

Log at init process

- The first process 'init' does not use Android Logging System.
- Init writes log to (the same node as) '/dev/kmsg'
 - The same way as 'printk' : kernel log

Q & A

Thank you for listening!
Any comments to blogs are welcome.