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Android UI Performance

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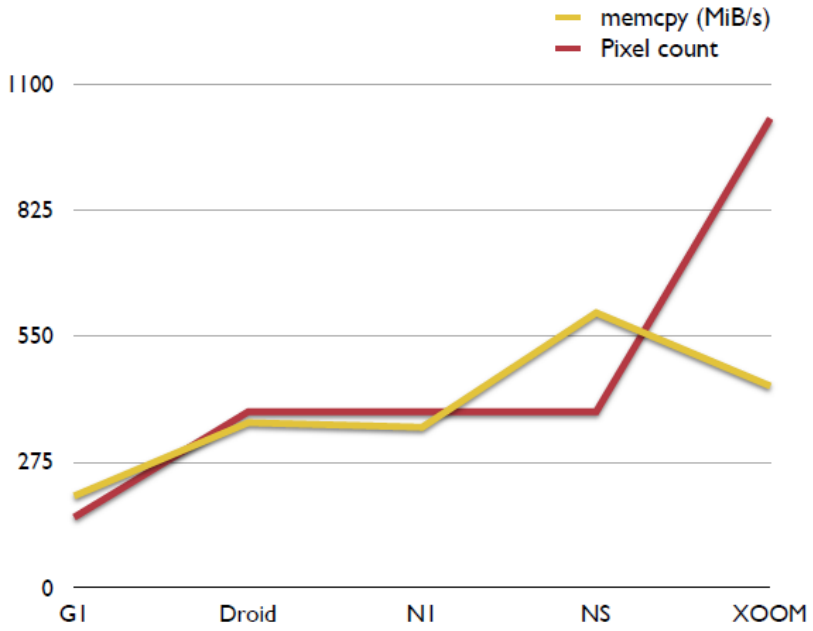
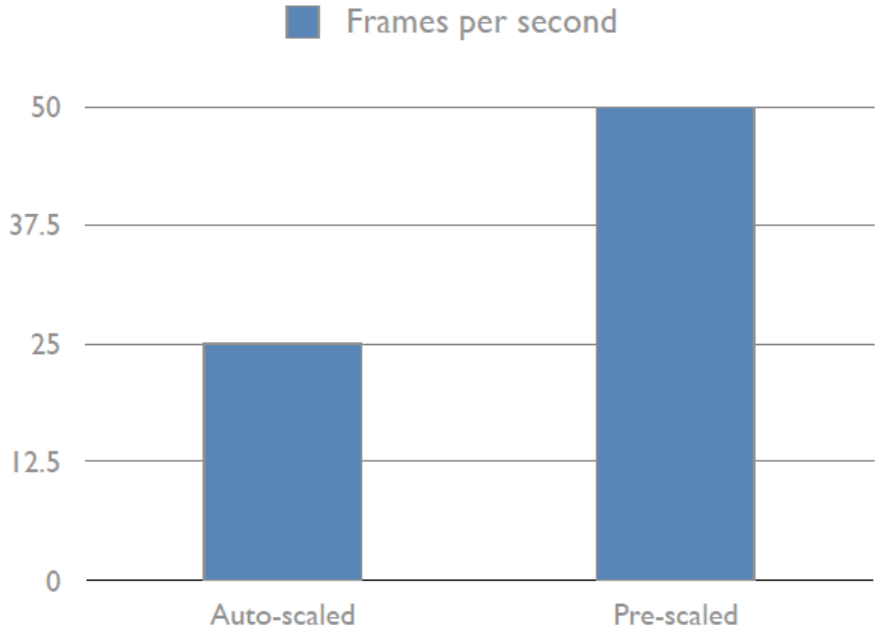
Why this topic


memcpy (MiB/s)
Pixel count
1100
825
550
275
0
G1
Droid
N1
NS
XOOM

Bitmap and Window Related

How expensive?



Pre-scaling is easy

```
// Rescales originalImage to the size of view using
// bitmap filtering for better results
originalImage = Bitmap.createScaledBitmap(
                originalImage, // bitmap to resize
                view.getWidth(), // new width
                view.getHeight(), // new height
                true); // bilinear filtering
```

In Gingerbread...

- All windows are 32 bits
  - Transparent: RGBA_8888
  - Opaque: RGBX_8888
- OpenGL surfaces are 16 bits
- All bitmaps loaded in 32 bits (ARGB_8888)
- For quality reasons
  - No more banding, no more dithering

Performance

	16 bits	16 bits dithered	32 bits
ARGB_8888	6.0 ms	7.5 ms	2.0 ms
ARGB_4444	4.0 ms	5.0 ms	3.5 ms
RGB_565	0.5 ms	0.5 ms	6.0 ms

Performance measured with HVGA 2.2 emulator

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Window backgrounds

- Sometimes unnecessary
  - Top-level opaque view
  - layout_width=fill_parent
  - layout_height=fill_parent
- Expensive to draw
- Dumb rendering engine

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Removing the background

```
<!-- res/values/styles.xml -->
<resources>
        <style name="Theme.NoBackground" parent="android:Theme">
                <item name="android:windowBackground">@null</item>
        </style>
</resources>
```


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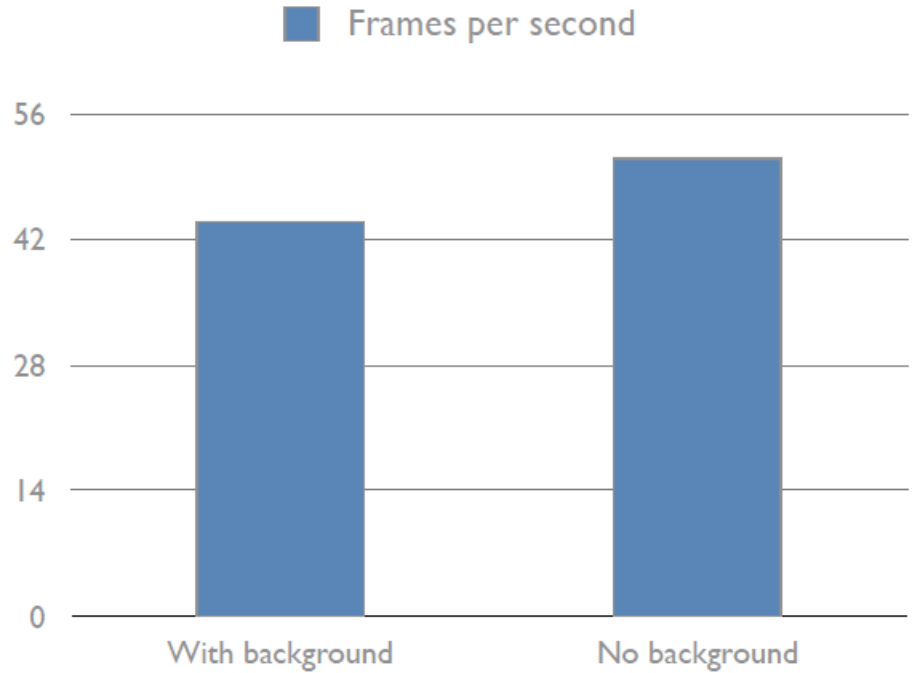
What do I get?


Frames per second
56
42
28
14
0
With background
No background

Redraw efficiently

- invalidate()
  - So easy
  - So expensive
- Dirty regions
  - invalidate(Rect)
  - invalidate(left, top, right, bottom)
  - Rect.union()----Launcher

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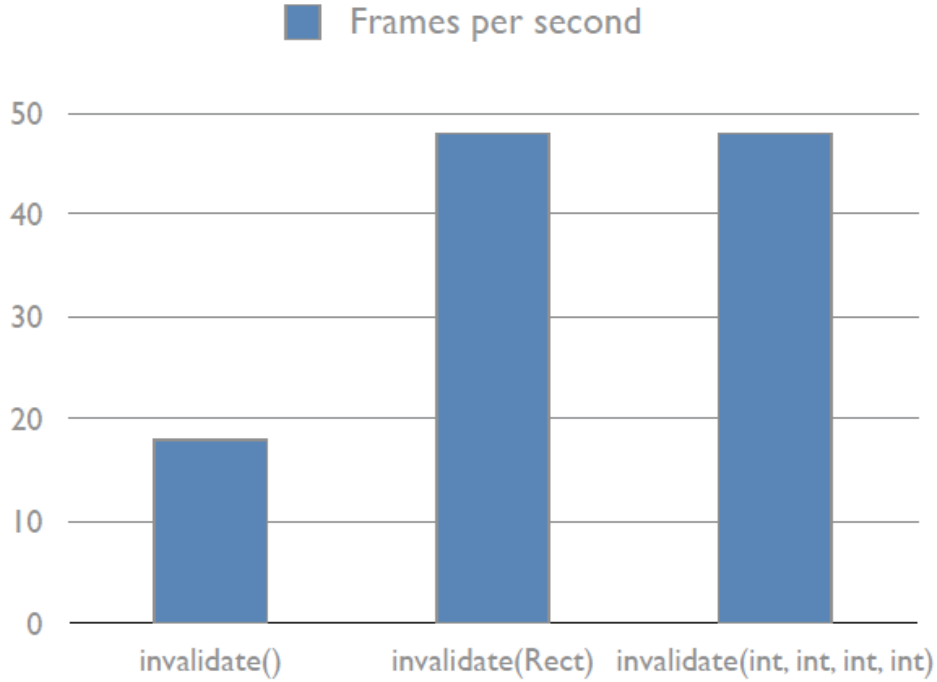
Just do it


Frames per second
50
40
30
20
10
0
invalidate()
invalidate(Rect)
invalidate(int, int, int, int)

GridLayout

Example Dialog

Garbage Zero

Hardware Acceleration & Layers

```
android:targetSdkVersion="14"
```

```
1 <uses-sdk android:targetSdkVersion="14">
2 <application>
3 <activity ... />
4 <activity android:hardwareAccelerated="false" />
5 </application>
```

View.setLayerType(int type, Paint p)

- view.setLayerType(View.LAYER_TYPE_NONE, null)
- view.setLayerType(View.LAYER_TYPE_SOFTWARE, null)------setWillNotDraw()
- view.setLayerType(View.LAYER_TYPE_HARDWARE, null)

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	Drawing a ListView		
	Hardware layer	DisplayList	Software
Time in ms	0.009	2.1	10.3

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```
view.setLayerType(View.LAYER_TYPE_HARDWARE, null);
view.animate().rotationY(180);
animator.addListener(new AnimatorListenerAdapter() {
        @Override
        public void onAnimationEnd(Animator animation) {
                view.setLayerType(View.LAYER_TYPE_NONE, null);
            }
        });
animator.start();
```

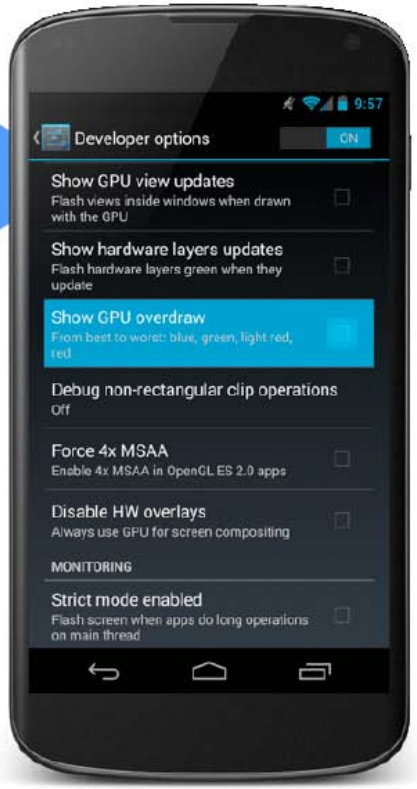
Profiling

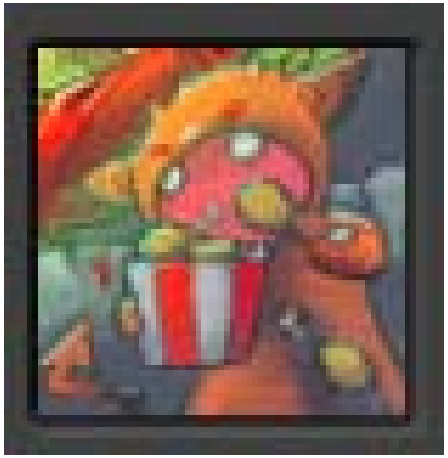
- Systrace
- TraceView------method calling
- HierarchyViewer
- ……

OverDraw

Overdraw

Blue	1x
Green	2x
Red	3x
Deep Red	4x





Tips & tricks

- Avoid layouts
- Layers
- Less ViewTreeObserver
- canvas.saveLayer(x, y, width, height,Canvas.CLIP_TO_LAYER_SAVE_FLAG);
- Don’t use too many views
- Be careful of setAlpha()
- Reuse rendering objects
- Don’t modify Bitmaps often
- Don’t modify Paths often
- Avoid overdraw
- Profile(tools)

Thanks!

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