



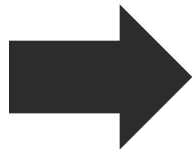
ETC2-PACKAGE

TEXTURE COMPRESSION CODECS MANDATORY IN
OPENGL ES 3.0 AND OPENGL 4.3

JACOB STROM, ERICSSON RESEARCH

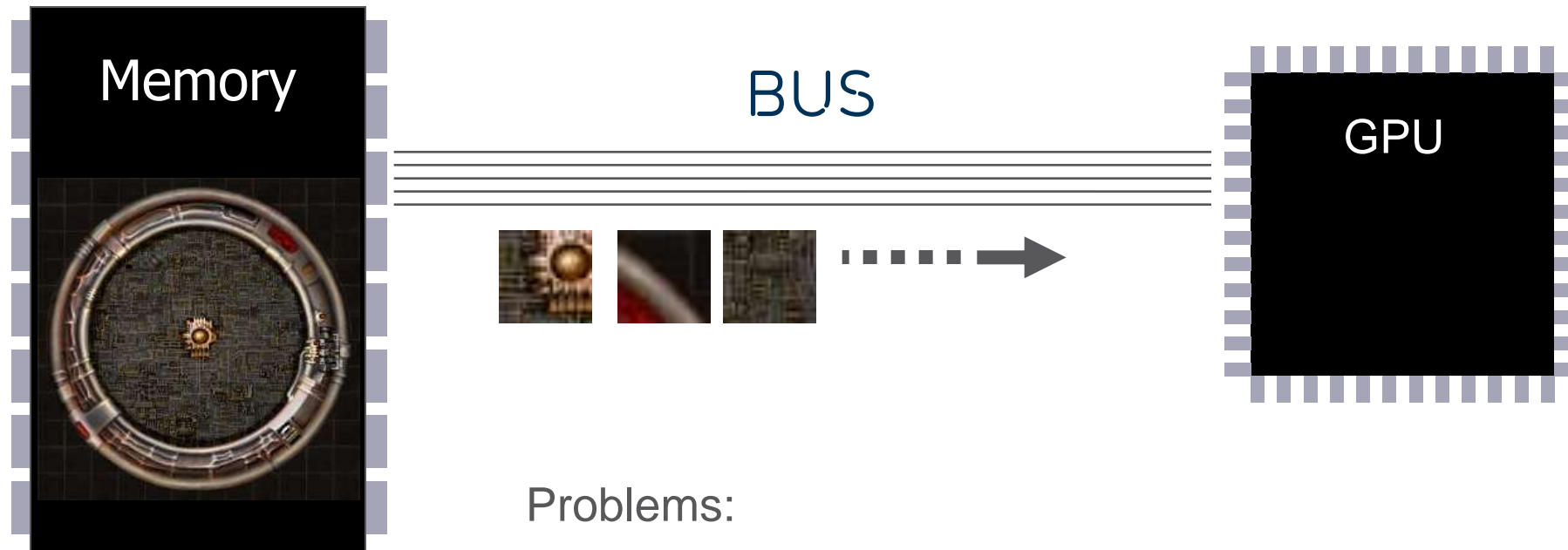
QUICK SUMMARY

- › New codecs that provide
 - Higher Quality
 - Alpha (1bit and full alpha)
 - R- and RG-textures
- › Mandatory in OpenGL ES 3.0 / OpenGL 4.3
 - Finally mandatory texture compression in OpenGL/OpenGL ES!



same bit rate!

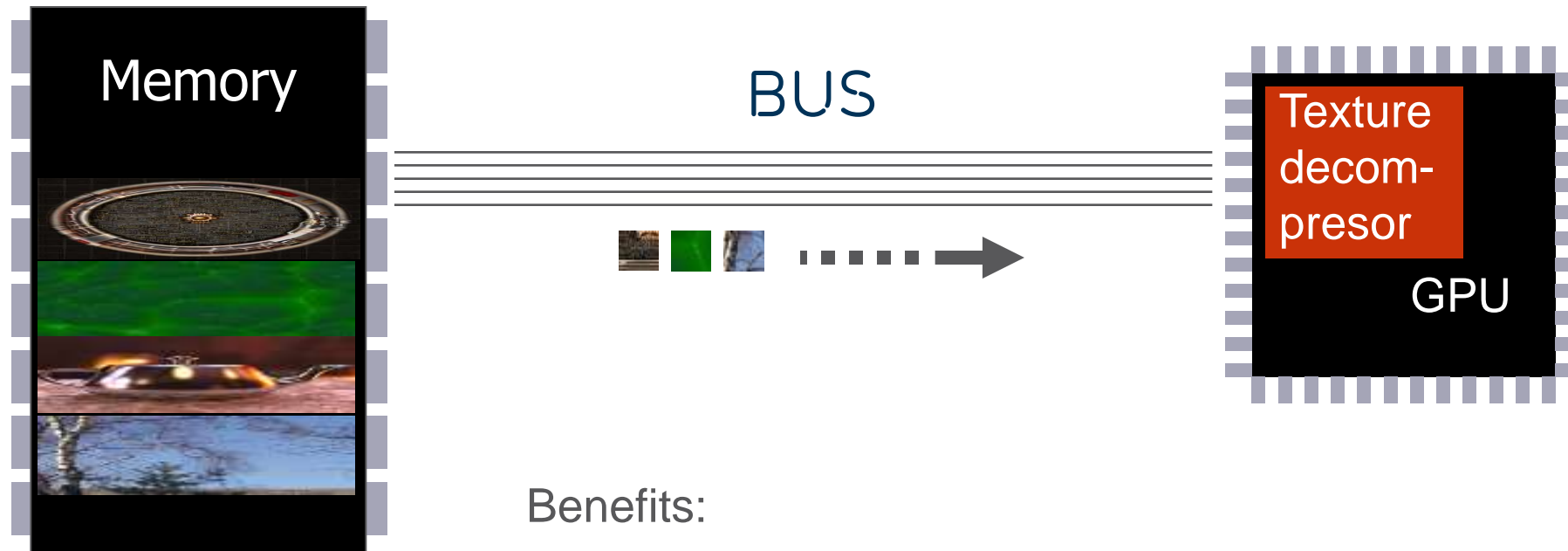
WHY TEXTURE COMPRESSION?



Problems:

- Memory can get full
- Bus can get congested (performance bottleneck)

WHY TEXTURE COMPRESSION?



Benefits:

- More textures fit in memory
- Less traffic on bus = higher performance
- Less traffic on bus = lower power consumption
- Cheaper to transmit textures over networks

HISTORY

- › ETC1 was standardized in OpenGL ES
- › ETC1 is supported in Android with v2.2 (Froyo) and above, which means over 370 million devices.
- › However, it was never mandatory in OpenGL ES 2.0, so developers would have to check if it was there.
- › Also, it lacked support for alpha and RG-textures.

ETC2 – NEW VERSION

- › ETC2 is an updated version of ETC1
- › Same bitrate as ETC1 – but enhanced quality
 - Now about 1.0 dB better than ETC1
 - About 0.8 dB better than S3TC/DXTC.
 - About 1.6 dB better than PVR-TC

QUALITY COMPARISON



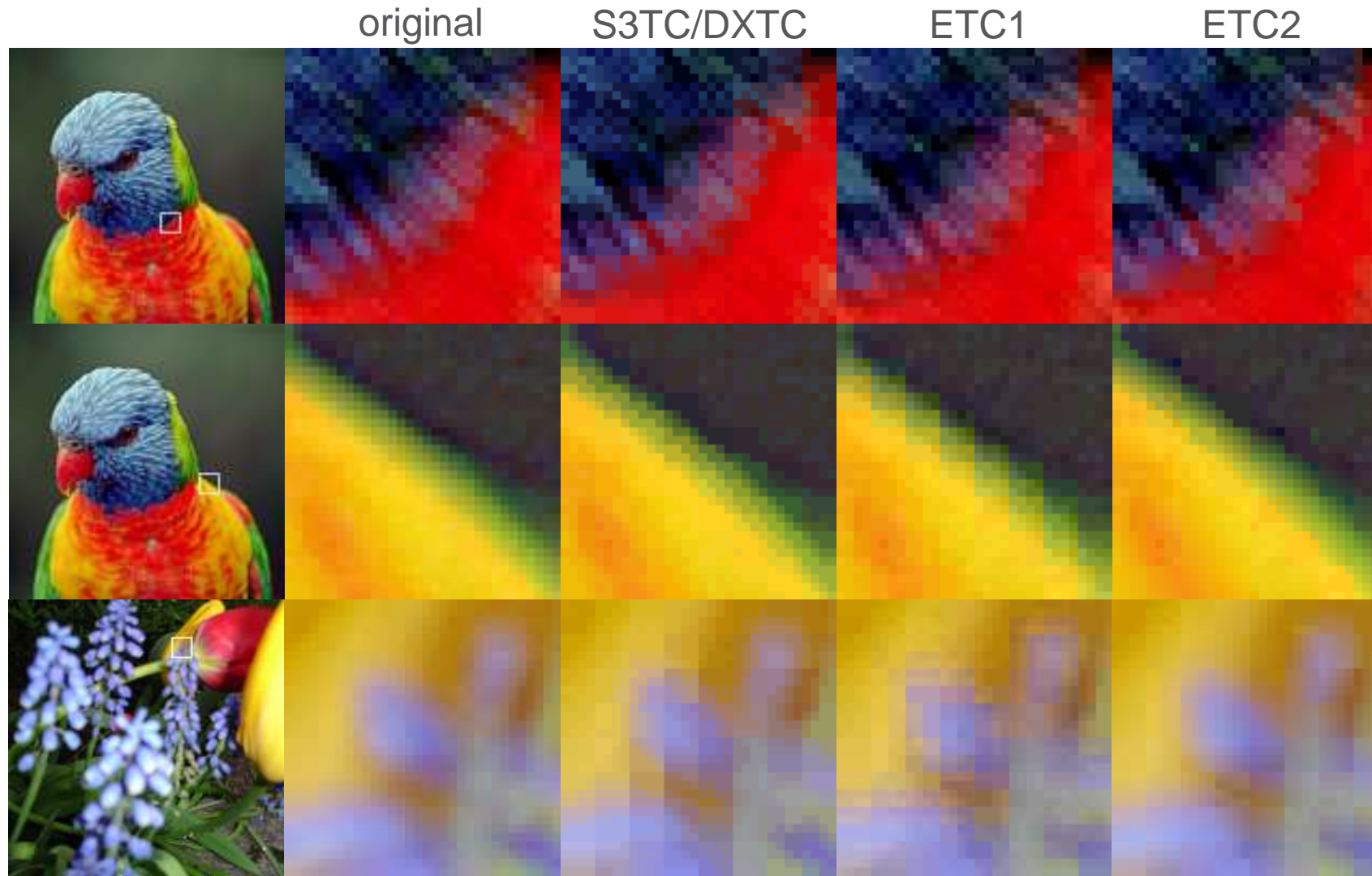
original

S3TC/DXTC

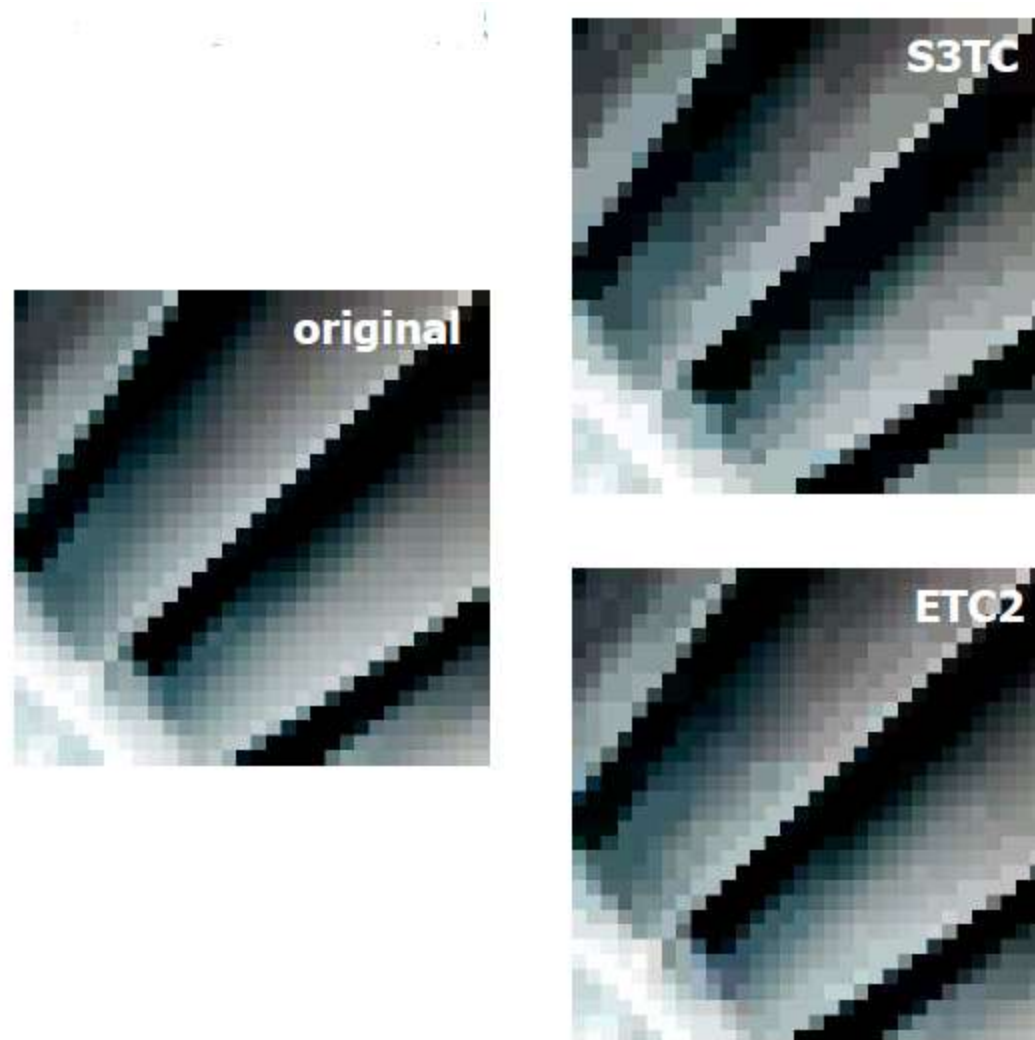
ETC 1

ETC2

QUALITY COMPARISON



LIGHT MAPS



BACKWARDS COMPATIBLE

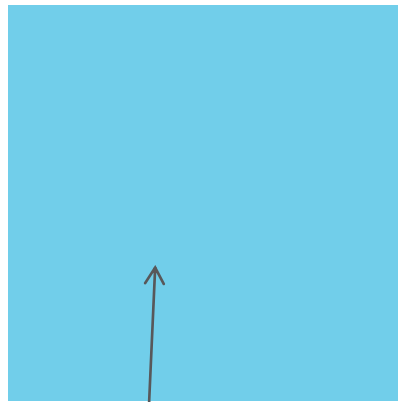
- › ETC2 is backward compatible with ETC1: If you have an old ETC1 texture, you can load it as an ETC2 texture and the hardware will decode it correctly.
- › This means, that if you are developing content, if you create an ETC1 texture, it will be able to run on:
 - All OpenGL ES 3.0 devices
 - All OpenGL 4.3 devices
 - All of the 370 million Android handsets that can handle ETC1
- › Also means ETC2 can never be worse than ETC1 even for a single block of data

BACKWARDS COMPATIBLE (CONT.)

- › ETC1 and ETC2 textures share a lot of blocks
- › It is possible to store an ETC1 textures (for legacy devices) and ETC2 textures (for OpenGL ES 3.0 devices) in a single file.



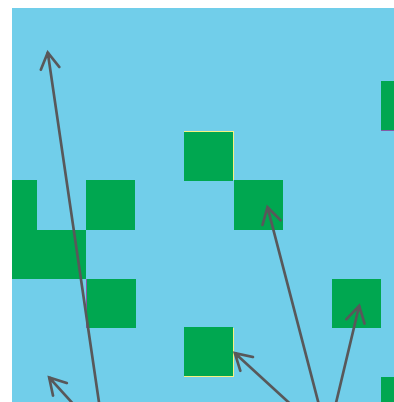
ETC1



only ETC1
blocks



ETC2



ETC1
blocks

ETC2
blocks



store both ETC1
and ETC2 in same
file

FLAVORS OF ETC2

- › ETC1 could only handle RGB textures
- › ETC2 comes in several flavours:

	RGB	sRGB
RGB only (4 bpp)	RGB8_ETC2	SRGB8_ETC2
RGBA (8 bpp)	RGBA8_ETC2_EAC	SRGB8_ALPHA8_ETC2_EAC
RGB punchthrough A (4 bpp)	RGB8_PUNCHTHROUGH_ALPHA1_ETC2	SRGB8_PUNCHTHROUGH_ALPHA1_ETC2

EAC

- › ETC1 could only handle RGB textures
- › Two-channel (RG) textures needed for normal maps.
- › EAC gives high-quality one-channel (R) and two-channel (RG) channel textures
- › Signed version can preserve 0 exactly

	unsigned	signed
one channel data (R, 4 bpp)	R11_EAC	SIGNED_R11_EAC
two channel data (RG, 8 bpp)	RG11_EAC	SIGNED_RG11_EAC

COMPRESSOR

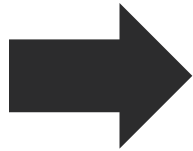
- › Downloadable from <http://devtools.ericsson.com/etc>
- › Compresses all new formats plus ETC1
- › Two modes; fast and slow
 - "slow" mode faster than previous compressor and does exhaustive compression, i.e., optimal quality
 - "fast" mode provides good compression
- › Even quicker compression is possible; we have implemented compression with speed equivalent of 1280x720 in 28 fps on a quad core 1.4 GHz ARM

NETWORK TRANSFER

- › ETC2 is 4 bpp, but sending a JPEG with equal quality is cheaper
- › However, using different packing methods (ZIP, LZA) it is possible with more efficient transmission
- › Recent research shows that special-purpose packing methods can compress ETC-files to sizes smaller than JPEG for equal quality, at around 2.2 bpp.

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 - Higher Quality
 - Alpha (1bit and full alpha)
 - R- and RG-textures
- › Mandatory in OpenGL ES 3.0 / OpenGL 4.3
 - Finally mandatory texture compression in OpenGL/OpenGL ES!
- › Compressor available online <http://devtools.ericsson.com/etc>



same bit rate!



ERICSSON

DIFFERENCES ETC2/EAC VS ASTC

- › ETC2/EAC codecs are mandatory, ASTC is optional
 - Developers can rely on ETC2/EAC to be there
- › ETC2 is backwards compatible with ETC1
 - An ETC1 texture can be used in new devices and millions of old
 - An ETC1 and ETC2 texture can be stored in the same file with less than 2x the size
- › ETC2/EAC is likely smaller in silicon area size than ASTC
- › ETC2 has punchthrough alpha

- › ASTC support more bit rates
 - ETC2 can only support 4 bits per pixel
- › ASTC slightly higher quality
 - around half a dB