

JCTVC-G430

An experimental comparison of
memory bandwidth between 8-bit
and 10-bit coding

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Purpose

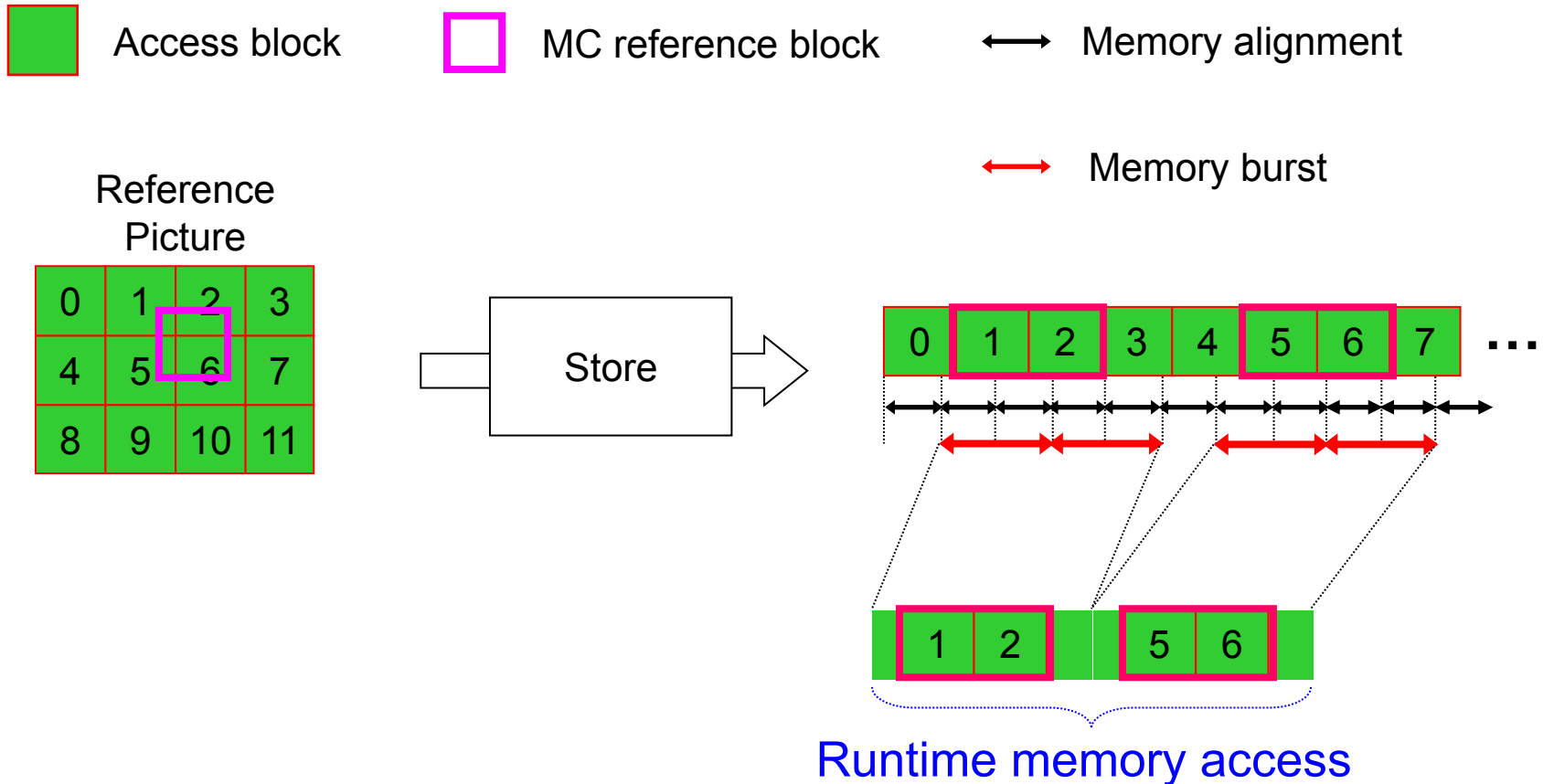
- To discuss quantitative memory bandwidth of 8-bit and 10-bit coding by using the measurement module that has been developed by AHG8 of reference memory compression

Runtime MC Memory Bandwidth

- AHG8 maintains a module for calculating runtime MC memory bandwidth
- The module is configured by access block size and memory alignment/burst sizes
 - Access block size specifies how reference picture is stored in 1-D storage
 - Memory alignment/burst sizes specify how each of access blocks is read from 1-D storage
- The runtime MC memory bandwidth is an approximation of the actual MC memory bandwidth on configured implementation.

Runtime MC Memory Bandwidth (Cont.)

- Runtime memory access is larger than MC reference block due to overhead associated with access block size and memory alignment/burst sizes.



Configurations

| | Access block size for luma | Access block size for chroma | Alignment | Burst length |
|-------------|----------------------------------|------------------------------------|-----------|-----------------|
| Case 1 (2D) | 4x2 | 4x2 | 64-bit | 128-bit |
| Case 2 (1D) | 8x1 | 8x1 | 32-bit | 64-bit |

An experimental result

8-bit vs.10-bit

| | Random Access HE | Low delay B HE | Low delay P HE |
|----------------------|---------------------|-------------------|-------------------|
| MemBand (2D) Ave.[%] | 34% | 34% | 36% |
| MemBand(2D) Max.[%] | 48% | 49% | 45% |
| MemBand(1D) Ave.[%] | 34% | 34% | 36% |
| MemBand(1D) Max.[%] | 48% | 48% | 44% |

8-bit vs. 10-bit

| | Random Access HE | | | Low delay B HE | | | Low delay P HE | | |
|----------------|------------------|--------|--------|----------------|--------|--------|----------------|--------|--------|
| | Y | U | V | Y | U | V | Y | U | V |
| Class A | -3.7% | -19.6% | -20.8% | | | | | | |
| Class B | -2.9% | -9.2% | -8.8% | -3.0% | -10.1% | -11.1% | -2.8% | -9.8% | -11.3% |
| Class C | -1.6% | -3.6% | -4.3% | -1.7% | -4.6% | -5.0% | -1.5% | -4.1% | -4.3% |
| Class D | -1.1% | -3.2% | -3.5% | -1.1% | -5.9% | -5.7% | -0.9% | -4.9% | -4.9% |
| Class E | | | | -6.6% | -17.2% | -13.7% | -5.9% | -17.7% | -14.1% |
| Overall | -2.4% | -8.9% | -9.3% | -2.9% | -9.0% | -8.7% | -2.6% | -8.7% | -8.5% |
| | -2.4% | -8.9% | -9.3% | -2.8% | -9.0% | -8.7% | -2.6% | -8.7% | -8.5% |
| Enc Time | 100% | | | 100% | | | 100% | | |
| Dec Time | 111% | | | 111% | | | 113% | | |

Conclusion

- An experimental comparison of memory bandwidth between 8-bit and 10-bit coding has been shown.
- This result should be considered discussions of memory bandwidth reduction and related activities.
- This is a useful result for discussion of profile and level.

LDP 8-bit vs. LDB 8-bit

| | Y | U | V |
|---------------------|---------------|--------------|--------------|
| Class A | | | |
| Class B | -7.0% | -7.2% | -7.3% |
| Class C | -6.1% | -5.1% | -5.1% |
| Class D | -6.8% | -5.0% | -4.9% |
| Class E | -5.3% | -5.6% | -5.4% |
| Overall | -6.4% | -5.8% | -5.8% |
| Enc Time[%] | 152.6% | | |
| Dec Time[%] | 114.8% | | |
| MemBand(2D) Ave.[%] | 67.7% | | |
| MemBand(2D) Max.[%] | 84.1% | | |
| MemBand(1D) Ave.[%] | 68.3% | | |
| MemBand(1D) Max.[%] | 84.5% | | |

LDP 10-bit vs. LDB 8-bit

| | Y | U | V |
|---------------------|---------------|-------------|-------------|
| Class A | | | |
| Class B | -4.3% | 2.6% | 4.4% |
| Class C | -4.7% | -1.1% | -0.9% |
| Class D | -5.9% | -0.3% | -0.2% |
| Class E | 0.6% | 14.5% | 10.0% |
| Overall | -3.9% | 3.2% | 3.0% |
| Enc Time[%] | 152.8% | | |
| Dec Time[%] | 101.8% | | |
| MemBand(2D) Ave.[%] | 23.6% | | |
| MemBand(2D) Max.[%] | 38.6% | | |
| MemBand(1D) Ave.[%] | 24.0% | | |
| MemBand(1D) Max.[%] | 40.1% | | |