

Evaluation of Software Defined Radio on Heterogeneous Systems

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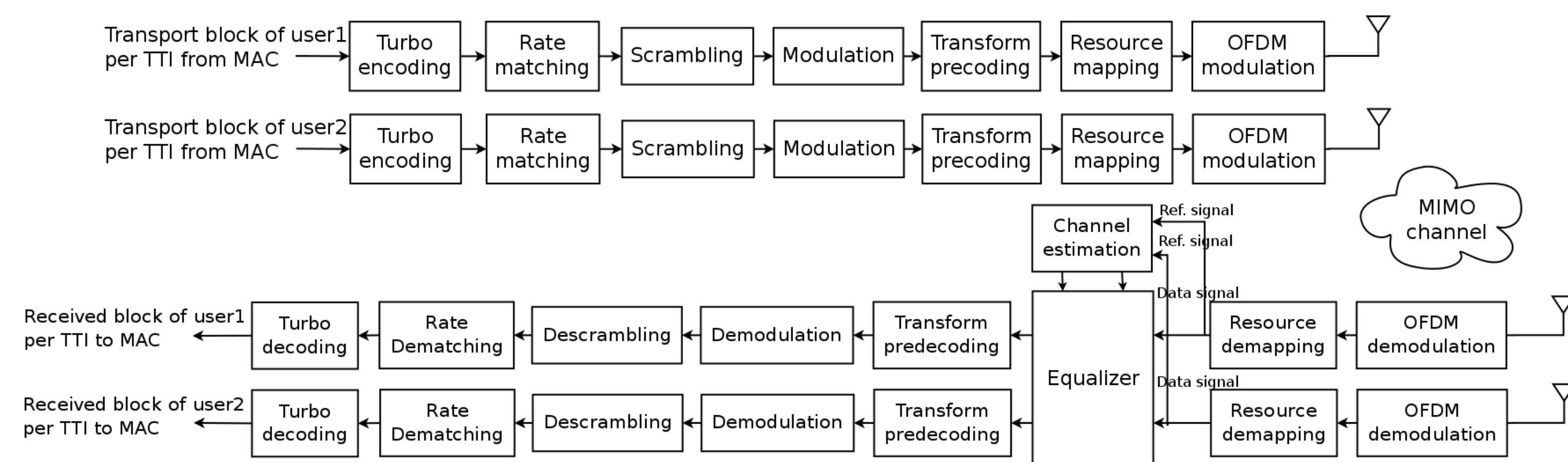
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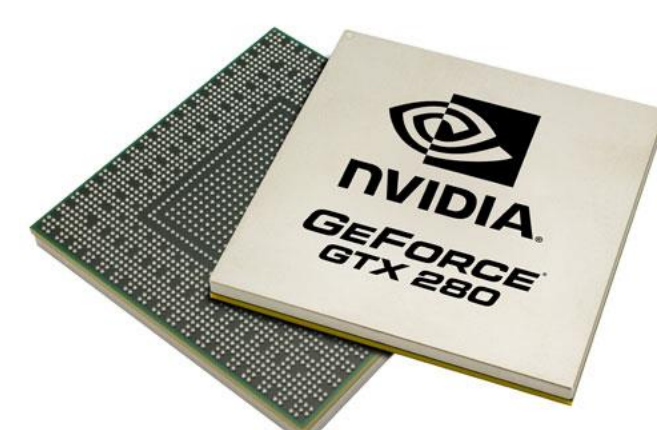
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Workload and Performance Optimization



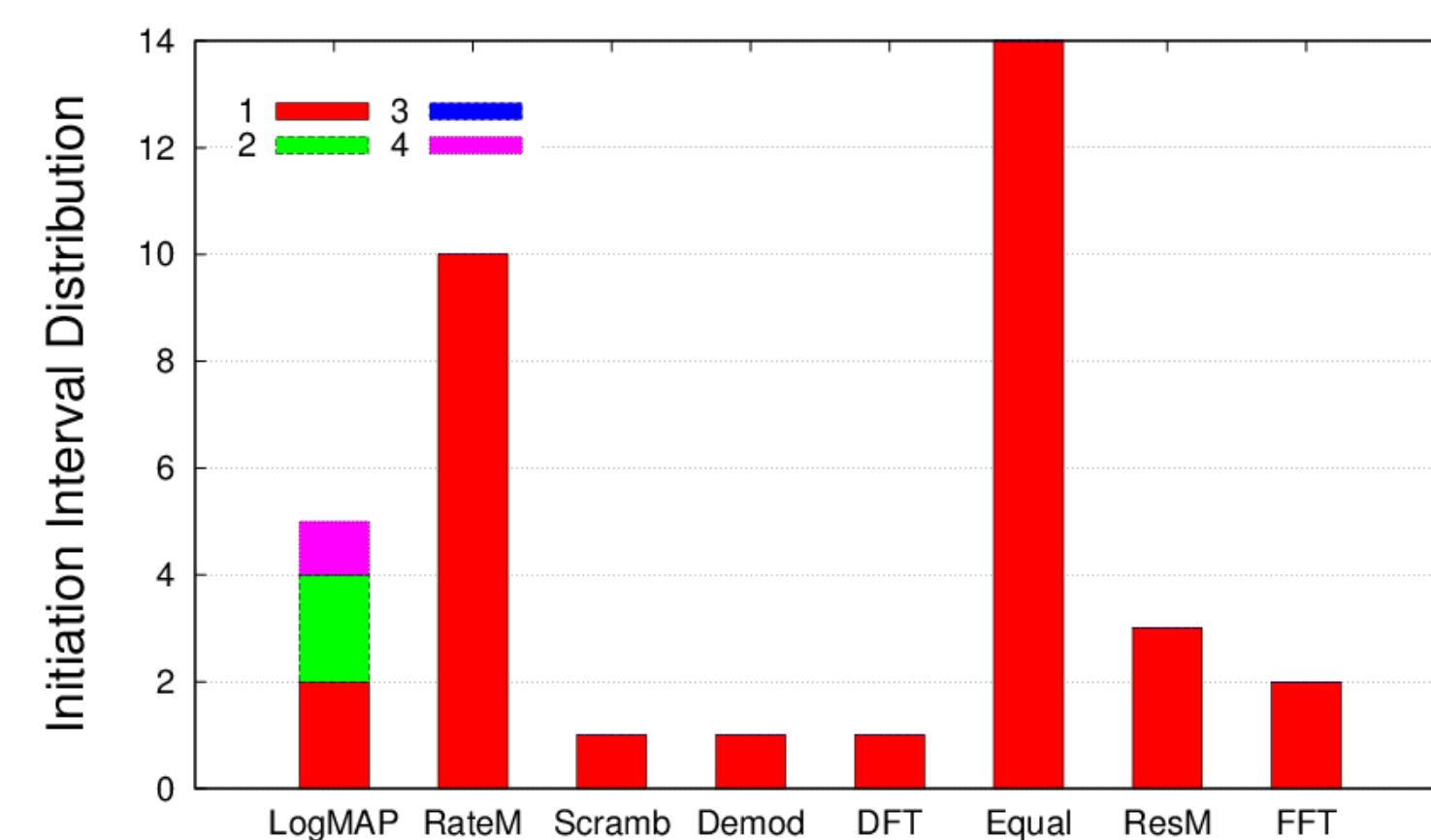
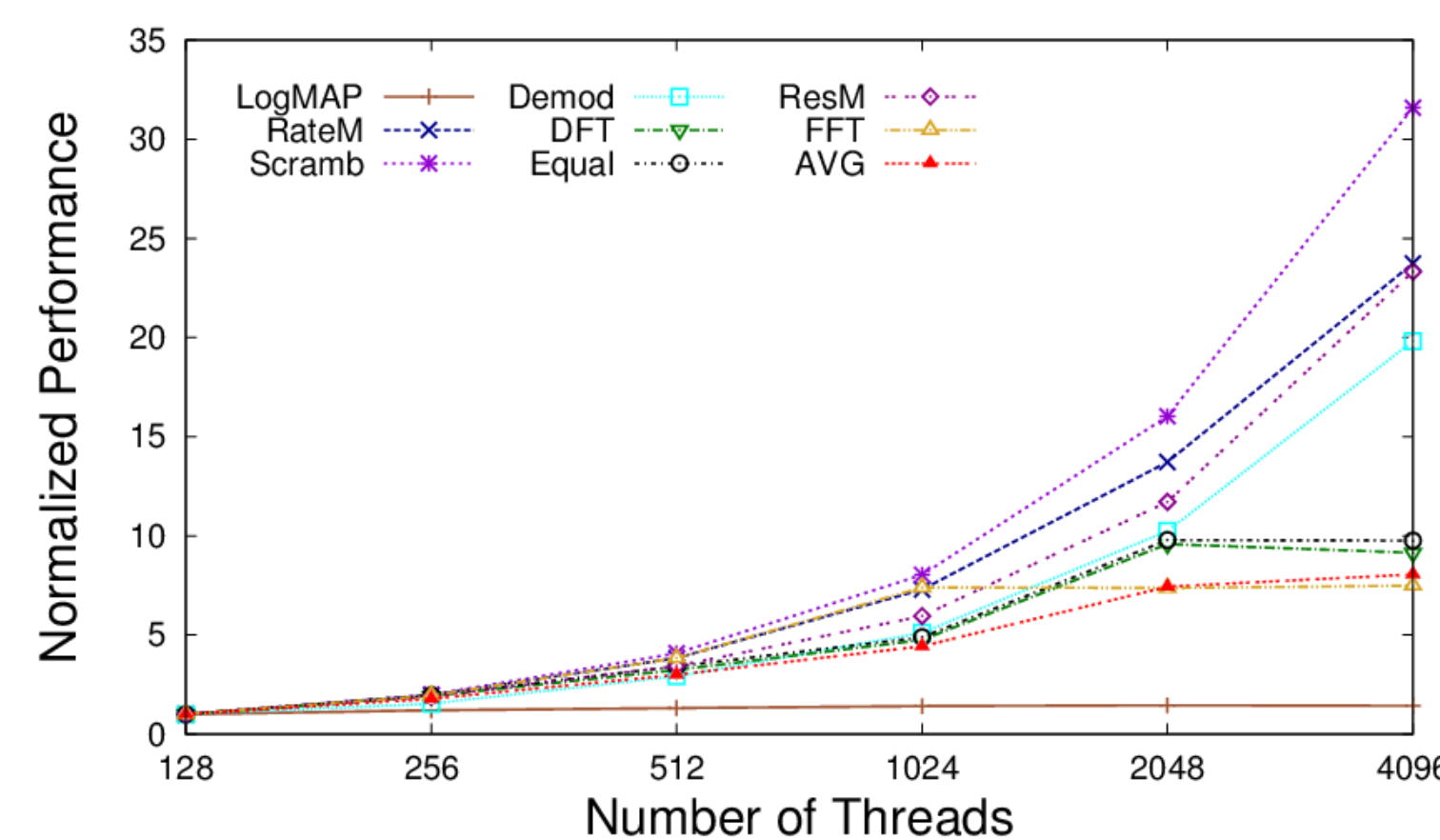
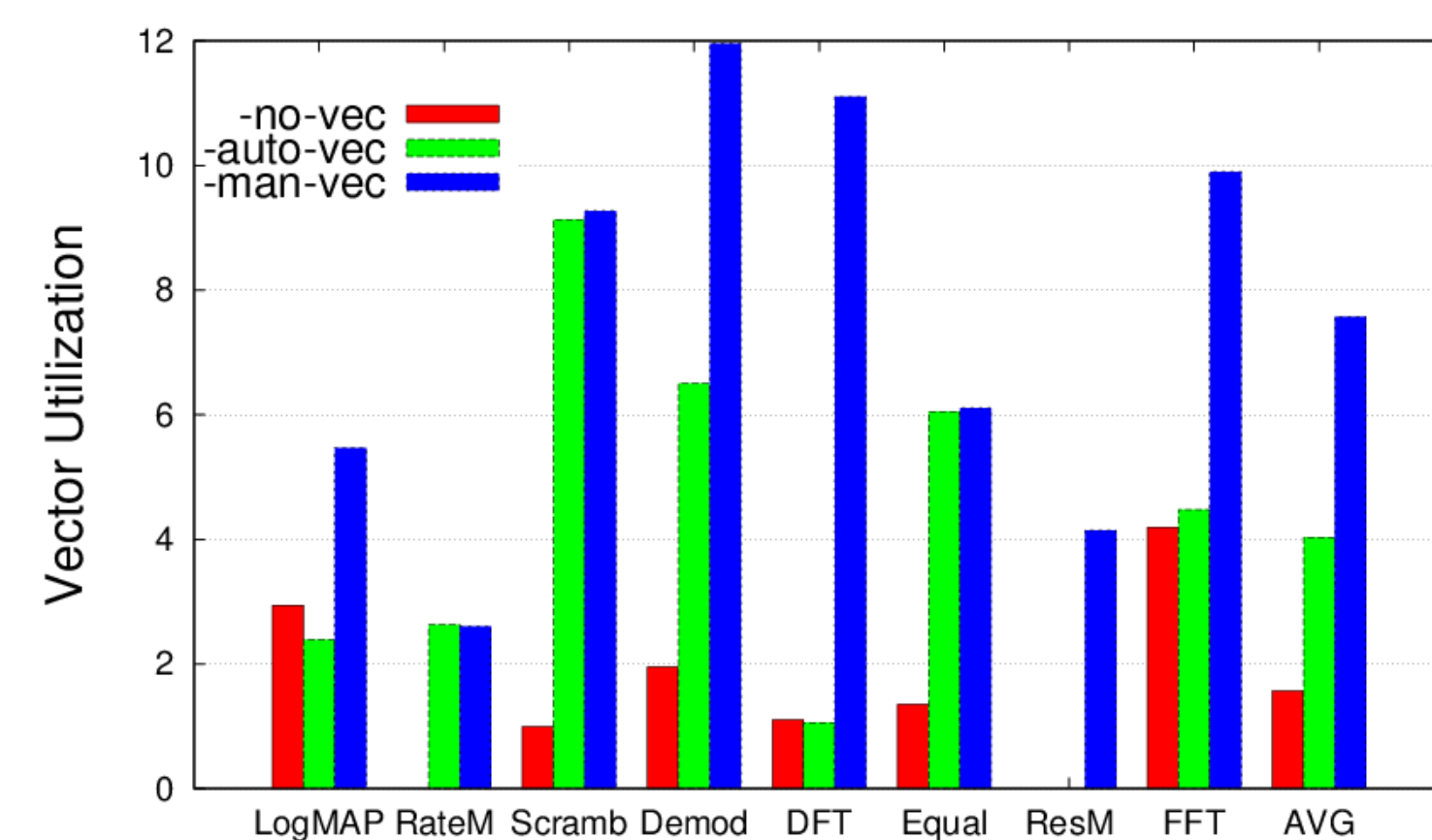
- LTE PHY processing
- Platforms: MIC, GPU, FPGA
- Interfaces: OpenMP, OpenCL, Vivado HLS



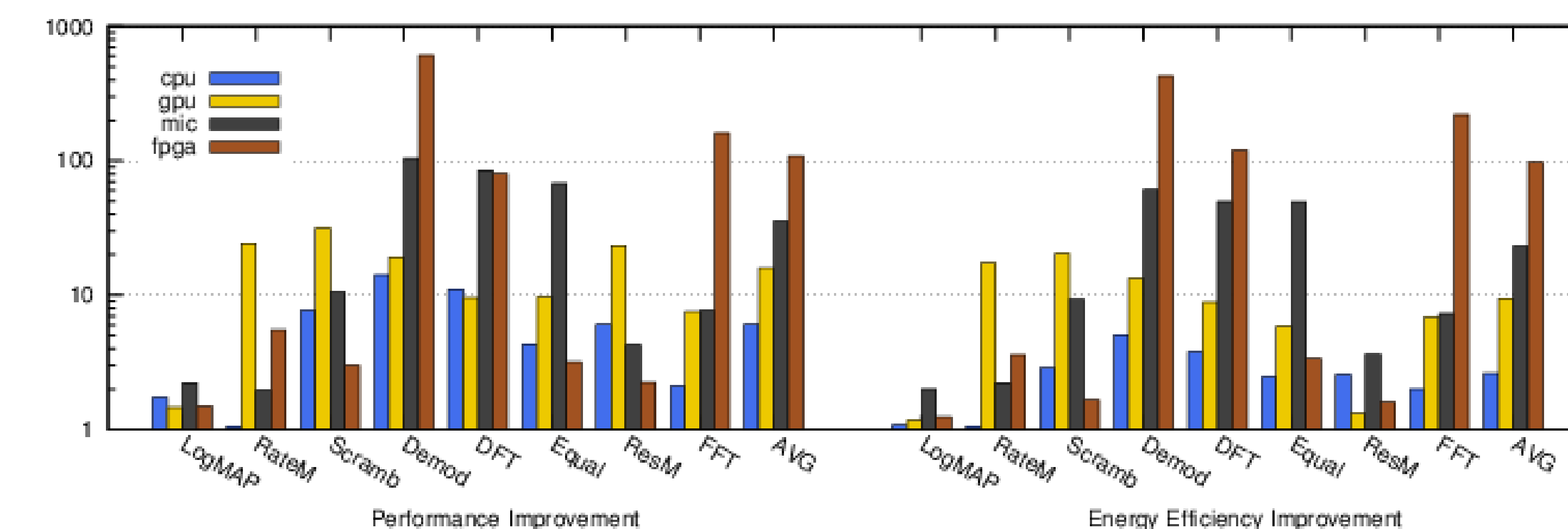
```
#pragma omp parallel for
#pragma simd
_mm512_fm_add_epi32
```

```
task_id=get_global_id(0)
u0=a[task_id];
u1=a[task_id+n>>1];
DFT2(u0, u1, tmp);
```

```
#pragma HLS PIPELINE
#pragma HLS UNROLL factor=2
```

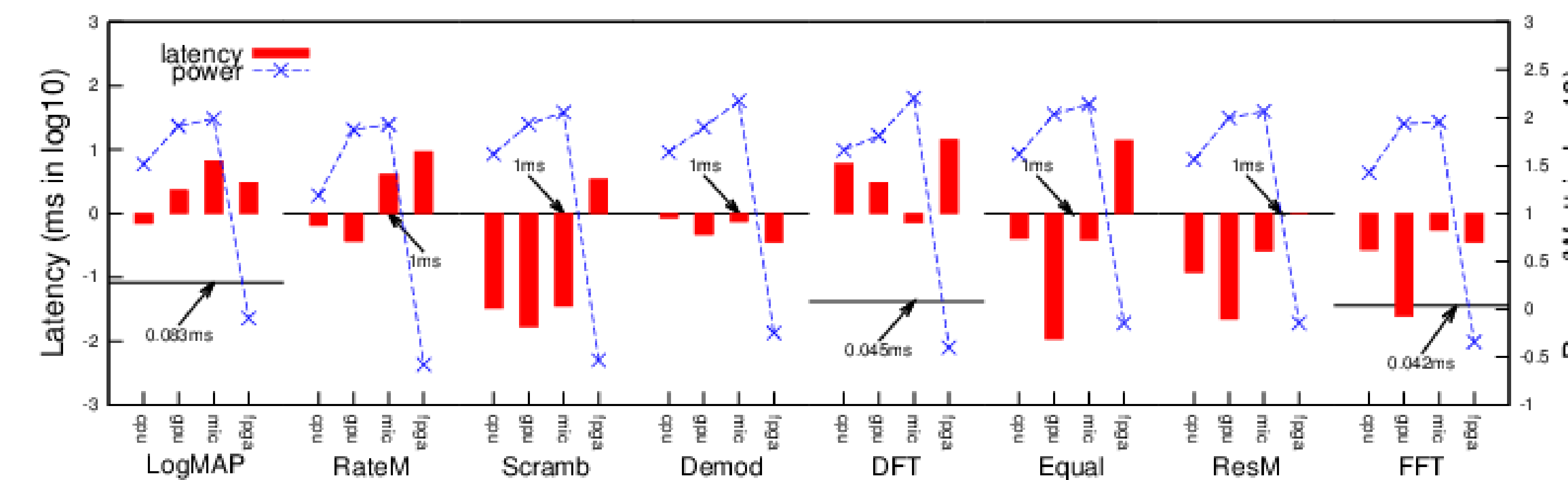


Experimental Results and Design Essentials



We've got improvement on GPU, MIC and FPGA:

- Performance: 15X, 35X, and 108X
- Energy efficiency: 7X, 22X, and 96X



- Wireless kernels exhibit heterogeneity
- Multithreading, vectorization and fine-grained pipeline are advantageous for wireless protocols
- Not a single architecture could meet throughput requirements
- Application-specific hardware is necessary for some modules