

# *Resource-aware Distributed Split Radix FFT on Wireless Sensor Networks*



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**High Performance Embedded Computing (HPEC)**

**Workshop**

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**(A) Approved for public release; distribution is unlimited.**

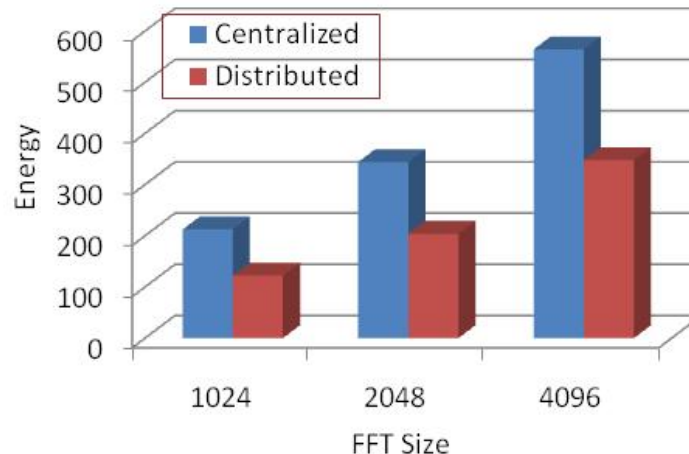
# Resource Aware Distributed SR-FFT on WSN

## Scope

- ✓ Distributed Numerical Computation and Signal Processing on Energy and Resource-constrained Embedded Platforms
- ✓ Wireless Sensor Networks: Typical example of an severely resource constrained platform

## Contributions

- ✓ Develop a distribution mechanism for the Split Radix FFT on WSN
- ✓ Achieve a balanced tradeoff between parallelism and communication cost
- ✓ Develop a resource-aware task allocation
- ✓ Achieve **4x increase** in speed vs. centralized (single node)
- ✓ Achieve **2.4x energy** savings per node vs. centralized (single node)



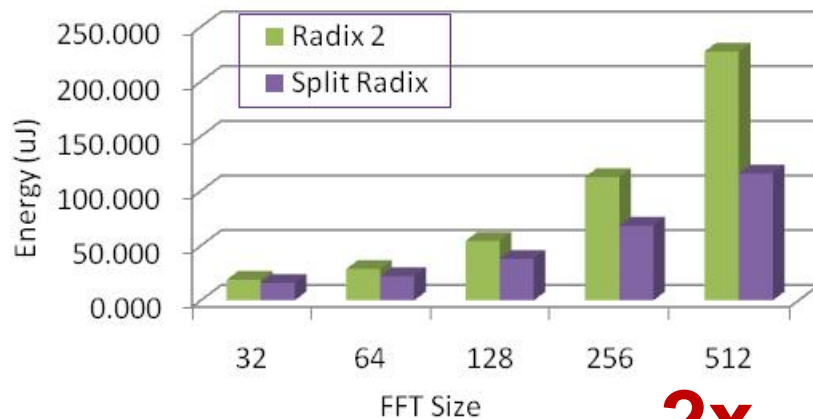
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## Split Radix

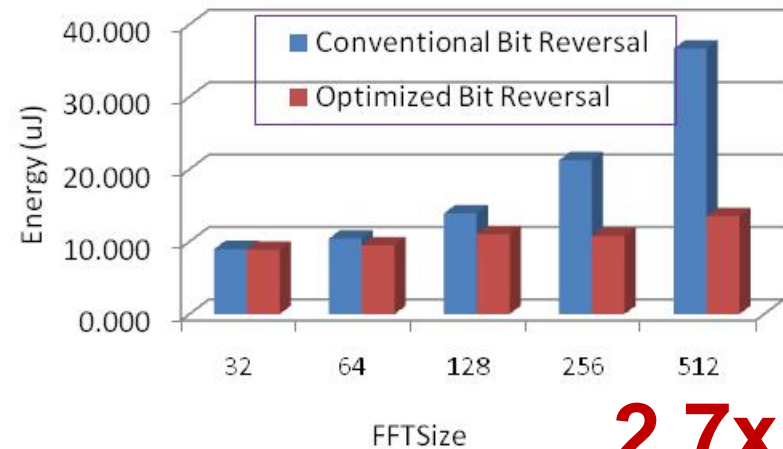
- ✓ Fewer number of arithmetic operations
  - ✓ Faster
- But
- ✓ Less regular structure

## Bit Reversal

- ✓ When needed: bit reversal of the first  $N/8$  even-indexed inputs
- ✓ Otherwise: Implicit bit reversal

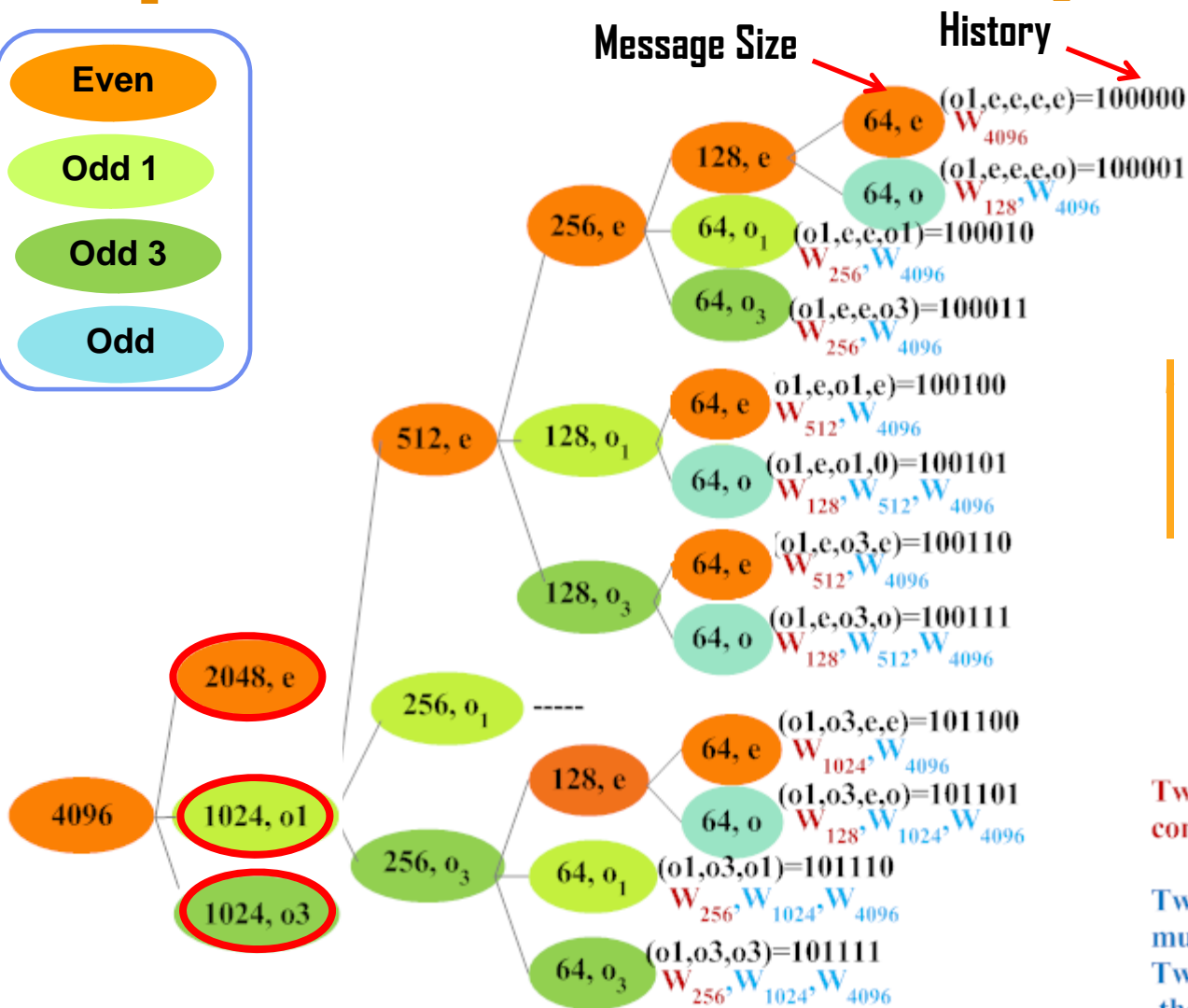


2x



2.7x

# Resource Aware Distributed SR-FFT on WSN



History

- ✓ Transmission Schedule
- ✓ Destination Address
- ✓ Twiddle factors to compute

Twiddle factors in red are computed by the nodes

Twiddle factors in blue are multiplied by the result. These Twiddles are computed by the even-type nodes