

BAE SYSTEMS

Embedded Real-time Implementation

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Real Time Distributed Systems

- Define the Problem we are trying to address
- Explain our Approach to solving the problem
- Discuss our Framework Implementation
- Show the Roadmap for Algorithmic Demonstrations



Real Time Processing In Distributed System

- The Real Keys are:
 - Data Transforms (Algorithms)
 - Processors
 - Data Source
 - Data Sinks
 - Interconnects
- All affected by TIMING
- The object is to be able to put these items together in a matter that provides a predictable, deterministic processing subsystem

*Running the **RIGHT ALGORITHM** in the **RIGHT PLACE** at the **RIGHT TIME** on the **RIGHT DATA***



Data Movement

- Data in Real-Time Systems is generated by the Sensor in high volume streams
 - How can this data be moved to the algorithms?
 - How do I size the system for the maximum data flow?
- Interconnect Technology Pushes us in one direction!
 - Inside the Box – High-speed parallel interconnects (Myrinet, Raceway, Infiniband)
 - Inside the Rack – High-speed serial interconnects (Infiniband, Firewire, 10Gbit Ethernet)
 - Inside the Room/Platform – Medium-speed serial interconnects (100Mbit Ethernet)
 - Across the building – Medium-speed serial interconnects (100/10Mbit Ethernet, etc.)
 - Across the city – T1/T3 class links
 - Across the globe – Fractional T1

*Data Movement Driven by Capacity and Costs!
What is the cheaper solution?*



Transform (Algorithm) Movement (Placement)

- Advances in the available tools permits moving the transform closer to the sensor
 - Microprocessor technology (speed, power, size, throughput)
 - Memory technology (speed, power, size, volume)
 - FPGAs (speed, power, size, throughput)
 - Networking (transparent interconnects, physical layer independence)
- It is becoming easier to put sufficient processing resources at the sensor location
- It is becoming easier to put useful algorithms in the processors
- It is becoming easier to modify & change these algorithms

Processing Technologies enable placement of processing resource at the sensor.



Creation of New System Management Challenges

- System is no longer static or created in a pre-defined configuration
- Dynamics demand management of:
 - CPU cycles
 - Memory
 - Storage
 - Interconnect Bandwidth
 - Communications Bandwidths

