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Computer Systems

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Computer systems continue to evolve at an astounding rate. Pentium Processors are approaching the 3 GHz range with bus speeds over 500 MHz. PowerPC Processors are now over 1 GHz. Plug and play devices using USB and IEEE 1394 (Firewire or iLnk) continue to expand in numbers and types. Microsoft XP's operating system is now widely used in new personal computers, but Linux is most common for some other applications (e.g. High Performance Computing). Real-time systems continue to mainly use operating systems such as VxWorks, QNX, Lynx, and others.

The Hewlett-Packard Company/ Compaq Computer Corporation merger, first announced in September 2001 was finally consummated in May 2002 after a bitter 8+ month proxy fight. The combined companies have projected revenues of $87 billion/year making them rival with IBM as the world's largest computer company.

In the embedded processor arena, the Peripheral Computer Interconnect (PCI) bus is now well established, but even with the latest PCI-X specification it is limited in its bandwidth, its connections, and requires a large amount of signals. There are many solutions being worked for higher speed / performance interconnects. There has been continued progress both from established interfaces such as Fibre Channel, IEEE 1394 (Firewire), Raceway and VME and new interfaces. Many of the new interfaces (e.g. InfinBand, RapidIO, 3GIO, StarFabric, GigaBridge, HyperTransport, PICMG 2.16, IEEE 1394b, Switched Ethernet and Serial FPDP) saw first silicon or first applications this year. It is expected that some or most of these will start seeing use in embedded aerospace systems in the coming year.

The very large size (up to 5 million gates) of current RAM-based FPGAs has led to the insertion of these devices into aerospace systems and the ability to design hardware once and then reconfigure it to perform various missions. Reconfigurable Computing was a hot topic this year as this technology began to be used in systems, and system and hardware designers worked through how to build such capability into the infrastructure of the system so that changes can be made easily in an operational scenario.

The DoD kicked off a $267 Million program to accelerate the development of Radiation Hardened integrated circuit technology for satellite programs. The goal is to achieve 0.15 micron radiation hardened technology within three years. The DoD funding will provide two foundries (BAE and Honeywell) with the funding for the capital equipment and the development of the radiation hardened processes. This technology promises an order of magnitude increase in speed and density over today's technology. This will allow for a major increase in on-board data and signal processing which translates into more capable satellite systems.

The MESSENGER spacecraft mission has been designed by Johns Hopkins University to fly by and orbit the planet Mercury, which holds answers to several critical questions regarding the formation and evolution of the terrestrial planets. New data will be gathered on Mercury's exosphere, magnetosphere, surface composition, and interior. The MESSENGER spacecraft uses four RAD6000 processors for command and data handling, power management, guidance and control, science data processing, and safing and fault protection functions.

Wireless Local Area Networks (WLAN) and Personal Area Networks (PANs) continue to evolve. There are numerous standards now, all with advantages and disadvantages, among them (along with there range and data rates) are the: Infrared Data Association (IrDA) (1 meter at 9.6 kbs to 4.0 Mbp), Bluetooth (10-100 meters at 700 kbps - 1 Mbps), IEEE 802.11b (Wi-Fi) (100 meters at 11 Mbps), IEEE 802.11a (50 meters at 24-35 Mbps). Ultra-Wideband (UWB) (Spread Spectrum) (10 meters at 100-500 Mbps). UWB is being evaluated by the IEEE 802 committee group for consideration as a future IEEE standard. The U.S. Navy explored the use of wireless systems onboard several ships including the USS Howard, USS McFaul, USS Monterrey, USS Shadwell, and USS Rushmore.

On the horizon is nanotechnology and quantum computers, both areas are seeing large funding increases from the U.S. government. The funding for these areas will be nearly $700M in 2002. This technology offers the promise of extending Moore's law for many more years.

These and other technological developments could appear in the new *Journal of Aerospace Computing, Information, and Communication*, which was approved by AIAA this year. It will be published online beginning in January 2004.