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NuBus: Apple's Implementation

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TOPIC ---

This article discusses the features of NuBus™ and how Apple's
implementation differs from the original design.

DISCUSSION ---

The major advantage of NuBus is its simplicity in system configuration and
protocol. A simple handshake protocol between master and slave enables
modules or boards with different speeds to communicate. There are no
interrupt lines. Each module can interrupt a processor by writing into an
address space area monitored by that processor. NuBus also relies on only
one main bus, in contrast to more complicated competition, such as VME and
Multibus II.

NuBus is independent in terms of system architecture and CPU. Because each
board has its own ROM, there is no need for jumper and switch settings. It
has synchronous bandwidth of 10 MHz and is easily adaptable to
asynchronicity. (Its transactions may be a variable number of clock
periods long.) It requires fewer signal lines than all other advanced
buses.

The major change Apple made to the NuBus was a signal change with the NMRQ
(non-master request). It is a dumb interrupt that allows a slave to
interrupt without being the bus master. Apple's NuBus implementation adds
interrupt lines to the 68020 from each of the slots.

NuBus data-transfer signals are all three-state and include control,
address/data, and parity. Apple also does not implement the parity checks.

Another major change has to do with the form factor: Apple uses smaller

cards.

Although NuBus is designed for 32-bit addressing modes, the Macintosh II logic board is typically set in a 24-bit mode. The current Operating Systems Utilities portion of the firmware will translate to accept previous 24-bit addresses.

The NuBus can handle 16 slots to provide expansion capabilities for Ethernet, terminal, serial and parallel devices, video output, and other processors and coprocessors. Apple's design implements only six.

Here are some articles on NuBus:

- "Battle of the Buses for 32-bit Systems," Systems & Software, 9/84
- "Bus Structure Eases Multiprocessor Integration," Computer Design, 6/84
- "Synchronous 32-Bit Backplane Buses Open Up Distributed System Design," EDN 6/84

For basic information such as pinout and signal descriptions, glossary of terms, addressing, and capabilities, search on "NuBus".

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