digest of papers

COMPCON '95

Technologies for the Information Superhighway

March 5 – 9, 1995
San Francisco, California

IEEE Computer Society Press
Los Alamitos, California

Washington • Brussels • Tokyo

IEEE Computer Society Press
10662 Los Vaqueros Circle
P.O. Box 3014
Los Alamitos, CA 90720-1264

The papers in this book comprise the proceedings of the meeting mentioned on the cover and title page. They reflect the authors' opinions and, in the interests of timely dissemination, are published as presented and without change. Their inclusion in this publication does not necessarily constitute endorsement by the editors, the IEEE Computer Society Press, or the Institute of Electrical and Electronics Engineers, Inc.

IEEE Catalog Number 95CH35737
ISBN 0-8186-7029-0 (softbound)
ISBN 0-7803-2657-1 (casebound)
ISBN 0-7803-2658-X (microfiche)
ISSN: 1063-6390

Additional copies may be ordered from:

IEEE Computer Society Press
Customer Service Center
10662 Los Vaqueros Circle
P.O. Box 3014
Los Alamitos, CA 90720-1264
Tel: +1-714-821-8380
Fax: +1-714-821-4641
Email: cs.books@computer.org

IEEE Service Center
445 Hoes Lane
P.O. Box 1331
Piscataway, NJ 08855-1331
Tel: +1-908-981-1393
Fax: +1-908-981-9667

IEEE Computer Society
13, Avenue de l'Aquilon
B-1200 Brussels
BELGIUM
Tel: +32-2-770-2198
Fax: +32-2-770-8505

IEEE Computer Society
Ooshima Building
2-19-1 Minami-Aoyama
Minato-ku, Tokyo 107
JAPAN
Tel: +81-3-3408-3118
Fax: +81-3-3408-3553

Editorial production by Mary E. Kavanaugh
Cover by Joseph Daigle
Printed in the United States of America by KNI, Inc.

The Institute of Electrical and Electronics Engineers, Inc.

Contents

General Chair's Message xi
Program Chair's Message xiii
Steering and Program Committees xiv

TRACK I

World Wide Web Topics
W.W. Wilcke — *HAL Computer Systems*

Using the World Wide Web to Provide Platform Independent Interface to High Performance Computing 3
D.W. Robertson and W.E. Johnston

World Wide Web Network Traffic Patterns 8
J. Sedayao

A Powerful Wide-Area Information Client 13
T.W. Yan and J. Annevelink

Electronic Commerce on the Internet
D. Gifford — *Open Market Inc.* and *Massachusetts Institute of Technology*

Netbill: An Internet Commerce System Optimized for Network Delivered Services 20
M. Sirbu and J.D. Tygar

Payment Switches for Open Networks 26
D.K. Gifford, L.C. Stewart, A.C. Payne, and G.W. Treese

Requirements for Network Payment: The NetCheque™ Perspective 32
B.C. Neuman and G. Medvinsky

Business on Networks
F. Strange — *Lawrence Livermore National Lab and FSTC*

CommerceNet: Spontaneous Electronic Commerce on the Internet 38
J.M. Tenenbaum, C. Medich, A.M. Schiffman, and W.T. Wong

TRACK II

Is it Time to Pay Attention? Information Trials in the Bay Area
W.J. Lennon — *Lawrence Livermore National Lab*

Two Wavelength Division Multiplexing WAN Trials 46
W.J. Lennon and R.L. Thombley

Wavelength Division Multiplexing in Local Area Networks 52
L. Kazovsky

Distance Learning Technologies
T. Wilkins — *Hewlett Packard Laboratories*

Distance Learning Technology on the Desk Top 54
P. Portway

Strategic Planning: Providing Interaction Through Mixed Media in University Distance Learning Programs 55
C. Lane

IEEE 1394: A Ubiquitous Bus

Gary Hoffman and Daniel Moore

Skipstone, Inc., sstone@skipstone.com

Abstract

The IEEE 1394 high-speed serial bus promises to revolutionize the transport of digital data for computers and for professional and consumer electronics products. By providing an inexpensive non-proprietary high-speed method of interconnecting digital devices, IEEE 1394 is a truly universal I/O connection. Its scalable architecture and flexible peer-to-peer topology make 1394 ideal for connecting devices from computers and hard drives, to digital audio and video hardware. Isochronous, just in time delivery, allows low-cost implementations of time-critical multimedia interfaces. This paper examines this IEEE 1394 bus and provides a glimpse into its future potential.

1: Why another interface?

Have you looked behind your computer lately? At first it was simple—a parallel port to connect a printer, a serial port to connect a modem, and cables for a display, a keyboard, and possibly a mouse. SCSI added access to external storage devices, a large cable connector, manually set SCSI ID's, and the dreaded terminator. Multimedia added audio and MIDI connectors. Video added a cable for image capture from a video camera or recorder. Besides requiring a great deal of space for the connectors, the growing number of cables overwhelms many users.

Legacy I/O interfaces monopolize portable electronics surface space though they are typically only used at a home desk. Notebook computer and Personal Digital Assistants are defined by their connector bulkhead.

A new interface is needed by the analog world migrating to a fully digital environment. Audio began the transition with the compact disc and digital audio tape. Yet, when data is transferred between media, the data is first converted to analog by the sender and then again digitized by the receiver. Broadcast and cable television are migrating to digital transport. CCD video cameras are already digital devices.

Digital devices generate a large volumes of data, especially when high-resolution, quality results are desired—consider the following parameters of multimedia devices:

TABLE 1. Multimedia Bandwidth Requirements

Device	Digital Data	Bandwidth[1]
High Quality Video	(30 frames / second) (640 x 480 pels) (24-bit color / pel)	221 Mbps
Reduced Quality Video	(15 frames / second) (320 x 240 pels) (16-bit color / pel)	18 Mbps
High Quality Audio	(44,100 audio samples / sec) (16-bit audio samples) (2 audio channels for stereo)	1.4 Mbps
Reduced Quality Audio	(11,050 audio samples / sec) (8-bit audio samples) (1 audio channel for monaural)	0.1 Mbps

1. megabits per second

To accommodate this magnitude of data, a high-speed transport medium, such as IEEE 1394 is needed.

2: IEEE 1394 high-speed serial bus

IEEE 1394 is a hardware and software standard for transporting data at 100, 200, or 400 megabits per second (Mbps). 100 Mbps chips were available in 4Q94, with 200 Mbps chips expected in late 1995. Market demand may drive availability of 400Mbps chips in late 1996.

The IEEE 1394 serial bus satisfies all of these previously mentioned needs and more. It is:

- a digital interface—there is no need to convert digital data into analog and tolerate a loss of data integrity,
- physically small—the thin serial cable can replace larger and more expensive interfaces,
- easy to use—there is no need for terminators, device IDs, or elaborate setup,
- hot pluggable—users can add or remove 1394 devices with the bus active,
- inexpensive—priced for consumer products,

1063-6390/95 $4.00 © 1995 IEEE

- scalable architecture—may mix 100, 200, and 400 Mbps devices on a bus,
- flexible topology—support of daisy chaining and branching for true peer-to-peer communication,
- fast—even multimedia data can be guaranteed its bandwidth for *just-in-time* delivery, and
- non-proprietary—there is no licensing problem adopting it for your products.

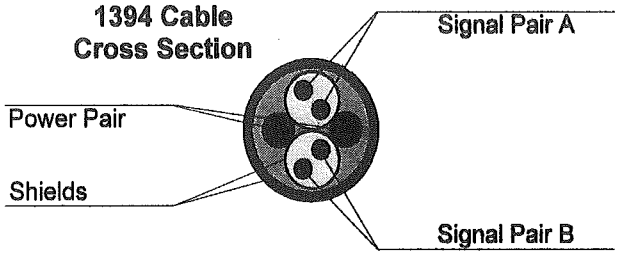
Broad markets for 1394 digital data transport include:

- computers,
- audio, image, and video products for multimedia,
- printer and scanner products for imaging,
- hard disks, especially hard disk Raid arrays, and
- digital video camera, displays, and recorders.

A simple 1394 video conference system is assembled from two 15fps audio/video channels and will consume about one-third of 100Mbps 1394 interface. Ten 15fps audio/video channels may be carried on a 400 Mbps 1394 interface.

3: The 1394 cable

A 1394 cable contains two power conductors, and two twisted pairs for data signalling. Each signal pair is shielded and the entire cable is shielded.

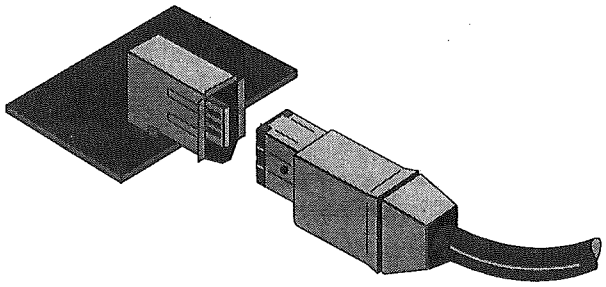


Cable power is specified to be from 8Vdc to 40Vdc at up to 1.5 amps and is used to:

- maintain a device's physical layer continuity when the device is powered down or malfunctioned—very important for a serial topology, and
- provide power for devices connected to the bus.

IEEE 1394 provides data transport and power—a great convenience for the users.

IEEE 1394 cable connectors are constructed with the electrical contacts inside the structure of the connector. Thus preventing any shock to the user or contamination to the contacts by the user's hands.



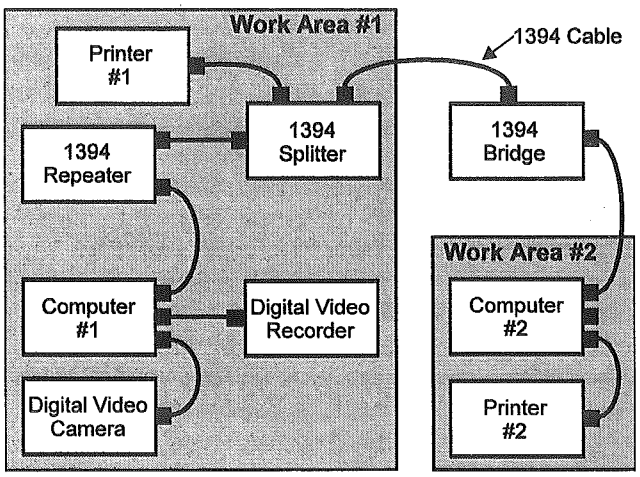
These connectors are derived from the Nintendo GameBoy™ connector. Field tested by children of all ages, this small and flexible connector is very durable. These connectors are easy to use even when the user must blindly insert them into the back of machines. There are no terminators required, or manual IDs to be set.

As 1394 evolves, new cable designs will allow longer distances without repeaters and with more bandwidth.

4: Topology

4.1: IEEE 1394 Cable

IEEE 1394 devices are designed to have multiple connectors, allowing daisy-chain and tree topologies. Consider the following layout of two separate work areas connected with a 1394 bridge.



Work area #1 has a video camera, computer, and video recorder interconnected with IEEE 1394. This computer is also connected to a physically distant printer via a 1394 repeater; the repeater extends the inter-device distance by redriving the 1394 signals. Up to sixteen hops may be made between any two devices on a 1394 bus. A 1394

DOCKET ALARM

Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts

Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research

With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips

Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS
Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS
Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS
Sync your system to PACER to automate legal marketing.