SCSI signal modeling study group (SSM)   99-287r1
October 28, 1999
Huntington Beach, CA
Subject: Approved minutes for the SSM study group on September 29, 1999

This was the next meeting to address the general subject of modeling for
parallel SCSI. Dean Wallace of QLogic led the meeting. Bill Ham of
Compaq took these minutes. There was a good attendance from a broad
spectrum of the industry. Molex (Martin Ogbuokiri) hosted the meeting.

Last approved minutes: 99-270r2.

1. Introduction

Dean Wallace opened the meeting and conducted the introductions and
reviewed the meeting purpose.

2. Attendance

The following folks were present:

Dean Wallace, Qlogic, d_wallace@qlc.com
Martin Ogbuokiri, Molex, mogbuokiri@molex.com
Larry Barnes, LSI Logic, larry.barnes@lsil.com
Jonathan Fasig, Western Digital, jonthan.L.Fasig@wdc.com
Tariq Abou-Jeyab, Adaptec, tajeyab@corp.adaptec.com
Paul Aloisi, Unitrode, aloisi@unitrode.com
Bill Ham, Compaq, bill_ham@ix.netcom.com
Andrew Bishop, Quantum, andrew.bishop@quantum.com
Nicholaos Limberopoulos, C&M, Nlimbeeropoulos@cm-corp.com
Matt Schumacher, Compaq, Matt.Schumacher@compaq.com
Jeff Walden, jwalden@flash.net
Dave Chapman, Amphenol, dave.chapman@aipc.fabrik.com
Jie Fan, Madison cable, jfan@tycoelectonics.com
Bob Gannon, JPM, rgannon@jpmco.com
Jim Broomall, WLGore, jbroomall@wlgore.com
Herb Van Duesen Gore and Associates, hvandeus@wlgore.com
Greg Vaupotic, Amphenol, gerg.vaupotic@snet.net
Gus Panella, Molex, apanella@molex.com
Galen Fromm, Molex, gfromm@molex.com

3. Agenda development

The agenda shown was that used.

4. Approval of previous minutes

The minutes of the August meeting were approved (ham moved / Andrew
Bishop seconded) with slight modifications and Ham will post them with
the corrections.

5. SSM Project proposal - Ham

The project proposal was changed by the SCSI working group to a
technical report. The revised proposal cast in a Technical report
format was created and posted to the T10 web site. The present content
was reviewed for those who had not seen the proposal. The document is
on the web site 99-243r1.pdf.

6. Presentations

6.1 Block diagram simulation process of TDR (Ogbuokiri)

Martin showed the complexities of using TDR in complex structures.
Multiple reflections produce ambiguity in the results.

Several recommendations resulted:

• Use TDR to determine where physically the discontinuities exist.

- Focus simulation efforts on the areas where discontinuities are revealed

- Do not use TDR on complex structures such as backplanes for precision measurements

This produced a "medium of exchange" discussion:

The medium of exchange is the form used to transmit models between interested parties.

The following diagram was developed to clarify some of the terminology used in the simulation environments.

TERMINOLOGY ARCHITECTURE
FOR SIMULATION ENVIRONMENTS

Collection of parametric data that describes the entity being modeled

simulation

Input stimulus

Model
(Spice deck)

Output result
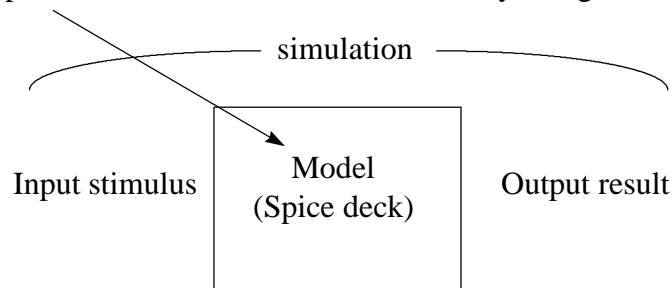
The simulation is run on a simulator (tool)

Therefore the medium of exchange is whatever is used to describe the model in the above figure. Different input stimuli may be used but if a simulation is to be duplicated the input stimuli must be the same. The model itself can have different forms but with the same input stimuli the output result should be the same regardless of the form of the model or the simulator used.

The models can have the following forms:

- Physical structure (size, materials, shapes etc

- Circuit level description (RLGC)

- S parameter matrix

For the TDR and all other SCSI simulations the maximum frequency of interest was agreed to be 600 MHz.

The TDR discussion morphed into a discussion on how to specify the uniform media simulations.

Spice models will be used for the uniform media. Many types of simulation tools may be used with these spice models. Maxwell coefficients will not be used. Both multi line and single line frequency dependent models are required. Single line models shall not be mixed with multi line models.

Parameters to be considered as outputs for the cable media simulations:

- impedance (f)
- attenuation (f)
- NEXT at 1 ns rise time
- propagation time (f?)

Andrew Bishop and Dean Wallace to help Jie to develop a cable media model.

6.2 Document framework (Barnes)

Larry Barnes reviewed the present state of the document. This document has not been posted yet but will be soon. A few changes in the headings and order were recommended.

6.3 Model database strategy (Wallace)

Dean proposed a specific strategy for the web based database.

The main points of the proposal are:

- List of companies with existing models
- What type of models are they? (Connector, media, transceiver, etc)
- Path to the model (how to get it, is an NDA required?)
- What type of model is it? (SPICE, IBIS, HDL etc)
- Revision history and description on the supplier's site, (verification methods if available)

The working group accepted this strategy. Dean will get with John L to initiate this site within the next few days.

6.4 IBIS summit (Wallace)

Dean reported that an IBIS summit meeting is scheduled for October 14, 1999 8:30 to 5 in Marlboro Holiday Inn (508 481-3000). Some of the agenda items are relating to the issues of interest to the SSM group.

The main missing item on the IBIS agenda was the multilevel properties. Larry Barnes to propose a multilevel output capability for IBIS to allow for ISI compensation

6.5 RGL transmission line matrix for VHDCI, SCA-2, HD68 (Ogbuokiri)

Martin reported that he now has RLC models for the VHDCI and SCA-2 connectors. These models will be made available thru the web site when it becomes available. Martin agreed to continue to find or develop an RLC model for the HD68 connector.

6.6 Modeling cable assembly components (Broomall, WL Gore)

Some of this presentation is captured below. The remainder will be uploaded to the t10 web site.

Connectors usually modeled by LC networks

Translates easily to SPICE simulators
May be laborious to extract
Number of segments depends on edge rates

Unmated connectors can be modeled but is it not the usual practice.

Cable media models vary by simulation tools
Realistic simulation requires frequency dependent characteristics
May be difficult to get into SPICE simulators.

Transition regions are similar to connector models

Extraction techniques

        Field solvers
                uses geometry and material properties
                2d,3d
        TDR data extraction (Z-profile)
                Easier for single lines (unbalanced)
                Multiple lines more difficult but needed for
                differential signal paths
                Crosstalk simulations
                See e.g. TDA systems (tdasystems.com)

Need RLGC models as function of frequency
Field solvers are often made to performance spec, not geometry
Time and /or freq domain data yields per unit length parameters.
Good grasp of MTL (multi conductor transmission line) theory needed for differential or multi conductor cables

TDR/TDT

characterizes impedance, time delay,, perhaps easiest path to L
and C

Vector network analyzer
          Characterizes attenuation, and other parameters, perhaps easiest
path toe R and G.

An example was shown of an actual RLGC model.

A map of simulators for cable media was shown:

HSPICE

W-elememt has a problem for example, for non standard cables (non
standard cables are those that do not follow the assumed frequency
dependence in the SPICE elements).

PSPICE

HP' MDS

Pole/zero representations

EyeSym (Gore proprietary)

IBIS - (not for cable media)

The coverage of the cable transition region was significantly discussed.
The methodology should be essentially the same as that used for
connectors except that a transmission line approach may be needed for
the transition region due to its significantly longer physical extent.
A low loss (ie LC model) should be used. A subgroup of JPM, Gore,
Amphenol, Molex, and C&M were at the meeting who are directly involved
in the design and manufacture of cable assemblies. Bob Gannon of C&M
agreed to be the leader of the transition region part of the overall
effort. Bob will be replacing Dave Chapman who was erroneously
identified at the last meeting.

The remaining part of Jim's presentation will be sent to Dean for
posting on the T10 web site.

6.7 IEEE documents (Barnes)

Larry B. provided the following info as a source for information:

The microwave Theory and Techniques Society has published a digital
archive of all its publications including transactions, letters, and
proceedings for Vol 1 #1 (circa 1953) though 1988. The set is available
to general IEEE members for $200 and MTTS members for $100.

7. Output of group

The effort will produce three types of output: (1) reports to the SCSI
plenary through minutes, reports, and other means, (2) a new technical

report document containing the technical details, and (3) a web based repository/directory for specific models.

8. SFF backplane

Bill H noted this activity is still an approved SFF project and planned to be executed but has not yet started due to other priorities.

9. Matrix development for SSM

The following summarizes the present position for the SSM matrix. This matrix is a concise description of the methodology to be used for the respective areas of the point to point SCSI bus segment. Several of the areas were significantly modified at this meeting. Note that the multidrop areas have not yet been identified.

9.1 Transceiver chips: owner, Dean Wallace

Interface is at packaging pins
Model types: Spice, IBIS, HDL, table spice – details TBD
Data patterns: TBD
ISI compensation: required but not presently believed compatible with IBIS capability – this means that IBIS will have to be enhanced and that only SPICE models will be effective until the new IBIS techniques are available.
Single line required - cross talk from non SCSI sources not considered in the model, SCSI line cross talk is not significant within the transceiver. Therefore multiline models are not required for transceivers.

9.2 Bus segment termination: owner, Paul Aloisi

Interface is at package pins
Model types: Spice, IBIS details TBD
Terminator type: multimode
Single line only

9.3 Transceiver board: owners, Tariq Abou-Jeyab and Matt Schumacher

Interface is at transceiver board connectors, transceiver chip pins, terminator chip pins
Model types: Spice
PCB construction: edge, broadside, dielectric type / thickness, vias, pads, discontinuities
Single line, multiline

9.4 Transceiver board connector: owner, Martin Ogbuokiri

Interface is at transceiver board and the cable assembly transition
region
Model types: Spice
Connector types: VHDCI, SCA-2, HD68
Mounting style: thru hole, SMT,
single line, multiline

9.5 Cable assembly transition region: owner, Bob Gannon

Interfaces are at the connector termination and the uniform media
Model types: Spice same as connector
Construction types: twisted flat, round fanout, laminated round, IDC
flat?
Single line multiline

9.6 Uniform cable media: owner, Jie Fan

Interfaces are at the beginning of the cable assembly transition region
on either end.
Model types: Spice
Cable types: flat, round shielded, round unshielded twisted flat?
Single line, multiline

10. Simulation integration strategy

Further discussion pending progress on the component level simulation
work. This will be addressed at the next meeting.

11. System configurations

Not discussed

12. Data patterns

Not discussed

13. Data rate

Not discussed

14. Definitions:

Not discussed

15. Tools:

This topic refers to identification and properties of specific modeling tools. It was not discussed at this meeting.

16. Next meetings

October 28, 1999 Huntington Beach, CA (Requested 10/28 - change from previous date of Oct 27th)
Dec 01, 1999 Rochester, MN
Future requested meetings:
Feb 02, 2000 San Jose (Adaptec?)
Mar 01, 2000 Manchester,NH (Hitachi)

17. Action Items:

Status as of the September 30, 1999 meeting is shown.

Martin O. to supply a block diagram of the simulation process used to do the simulation for TDR.
Status: done

Martin O. to supply an RGL transmission line matrix (circuit type of specification) for VHDCI, SCA-2,and HD68 connectors.
Status: models now exist but not delivered, HD connectors still needed

Dean to provide a target board model.
Status: carried over

Larry Barnes to create a document framework.
Status: done and ongoing

Larry Barnes to do an overview presentation of the IBIS transceiver model specification.
Status: handouts provided but presentation still needed

Ham to post the draft minutes of the September 01 meeting after review by Dean
Status: done

Ham to post the draft minutes of the September 30 meeting after review by Dean
Status: new

Ham to post the draft minutes of the September 30 meeting after review by Dean

Status: new

Jim Broomall to provide electronic copy of his presentation on component modeling methods.
Status: new

Larry Barnes to propose a multilevel output capability for IBIS to allow for ISI compensation.
Status: new

Andrew Bishop and Dean Wallace to help Jie to develop a cable media model.
Status: new