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# Can / Am EMTP News

## Voice of the Canadian/American EMTP User Group

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### Salford Compiler and DOS Extender

How much longer might DBOS last, following the attack on DOS by Microsoft (see the January, 1995, issue)? Walter Dykas at ORNL (the Oak Ridge National Laboratory in Tennessee, USA) provided the following insight in E-mail dated November 27<sup>th</sup>: *"From the Salford newsletter 'Source File', November 1995, the last paragraph of an article titled, 'DBOS : Origin And Future': 'Obviously, we shall continue (sic) support DBOS*

*for as long as you and your customers need it, but we do encourage you all to think Win32 for your future products.' .... and a bit of interesting trivia : DBOS was meant to be a temporary name. 'DOS Extender' hadn't been coined yet. DBOS stands for 'David Bailey's Operating System.' I feel much better now that I know that!!"* Yes, your Editor does too, although he does have one question: who the hell is David Bailey?!

INTINF of STARTUP can be given values larger than the column width of 8 would suggest; and the free-format alternative (see the January, 1995, issue) is not required, either! New special values are :

User value : 107 108 109 209  
Converted to : 1.E7 1.E8 1.E9 2.E9

In theory this could continue beyond 209, were it not for the Salford/Intel limit of 32-bit integers (half of those famous 4 gigabytes of 32-bit address space). November 24<sup>th</sup> was the date of this extension. It also was the date that Robert Meredith of NYPA (the New York Power Authority in White Plains) warned of the forthcoming need in public E-mail of the Fargo list server.

A 120-MHz Gateway 2000 produced DC-1 simulation in 9.835 seconds (11.484 total time). This was measured in the nearby (now Lloyd Tower) office of Yu Wang of Pacific Power. Both ATP and TPPLOT graphics were verified at 768 by 1024-pixel resolution, although lack of a graphic cursor was a disadvantage compared with standard VGA. Although TPPLOT graphics seemed perfect, ATP graphics appeared weak in the bottom third of the screen. This was similar to what was seen using those Gateway computers in Gainesville last year (see the April, 1994, issue). Screen scrolling speed has set a new record: just over a second for all 1174 lines of the HELP window of TPPLOT. WARM worked fine in ATPON.

Finally, 4 Mbytes of RAM were devoted to the disk cache of SMARTDrive as a conservative start. Later, Mr. Wang might experiment with more. Why not, when he has 64 Mbytes (amazing)! Incidentally, one minor improvement that resulted from this experimentation on November 28<sup>th</sup> was the addition of an error message to the screen when an input data file is rejected. It was confusing otherwise, for the use of DISK along with LU6VRT = 32768, because the rejection message was invisible in the RAM buffer. Well, no longer.

FILE is a possible new response to the opening prompt that begins execution. If used, it is to be followed by the name of a disk file that contains all input parameters on a single line. This was requested by Hans Kristian Hoidalen shortly after his presentation at Prof. Ned Mohan's course last summer (see July, 1995, issue). It seems that some computers or versions of DOS were not properly communicating arguments of a batch file such as RUNTP.BAT to the program. So, instead of passing the arguments, the name of a disk file that contains them can be passed. ATP then will connect this file and read the ATP arguments. To illustrate, the modified execution command of RUNTP could be as follows for any program created after November 20<sup>th</sup>:

RUN77 TPBIG /PARAMS FILE HANS.DAT  
where HANS.DAT would be created by ATPDRAW  
to contain the one line "disk dc6. \* -r"

Would .LIB format allow Salford EMTP to be distributed using anonymous FTP (aFTP), which has no security? This was the thinking of Laurent Dubé as summarized in E-mail dated November 25<sup>th</sup>. "Because the *atp.lib* file is not executable without the main program header *atp.exe*, it is possible to post *atp.lib* along with *tpplot.lib* at the ftp archive sites." The idea would be to put most of the volume into the .LIB files that can not be used by themselves. The main programs, which would call the .LIB files, would not be available without security. But they would be easy to append to normal E-mail because they are so small. But how does ensure that a new .LIB file is not used with an old or counterfeit main program? Could one build in a password so that the two would be a matched pair? How secure would this be? Who knows how to handle the details?

Parametric studies are performed using the CARD subcommand of the APPEND command of SPY as has been illustrated by @5 for simulation and @6 for supporting programs. The SEC register stores the card number that is to be modified. Prior to improvement on November 12<sup>th</sup>, this number had to be loaded manually by the user. Now, it can be determined automatically by the program based on a character string that the user supplies. In the two illustrations, the new service has been requested by new dummy NONE commands that require an extra minus sign on the PRI register. This is the flag for new logic that is to determine the data card number experimentally by searching for the 1st occurrence

of the text of the preceding (order is critical!) MES= tag. This text to be located can be a part of an in-line comment, so uniqueness can easily be created artificially if it does not exist naturally using a short string of the non-comment part. Text of comment cards, too, could be used --- provided comment cards have not all been destroyed by switch NOCOMM = 1 within STARTUP. Previously, text of the MES= tag was terminated by the first blank. To allow imbedded blanks, quotation marks now can be used to delimit the character string. The recommended technique is to do this once, outside the loop that would vary parameters.

PTI PSS/E has ridden PCs and Salford DBOS to success in recent years, it is noted. The November, 1995, issue of *PSS/E Newsletter* explains that 1994 "saw our user community grow to over 300." An attached 7-page list of users dated Nov. 28, 1995, has 324 entries. The final 30 of these --- licensed for hourly use and added since October of 1993 --- all use PCs. The 24 entries for perpetual use that were added during 1995 all are for PCs except for one IBM RS/6000, one DEC Alpha VMS, and one that uses VAX as well as PCs. Anyone who attended the 1990 LEC meeting in Leuven, Belgium, may recall your Editor's public argument in favor of DBOS and PCs. PTI use was mentioned, although the trend to DBOS was strongly disputed by a PSS/E user from Denmark. Your Editor feels vindicated by the 1995 statistics. Salford DBOS seems to have revolutionized PTI PSS/E use as much as it revolutionized ATP use. Final observation: Who might be number one on the list? Minnesota Power in Duluth, of course, as featured in your Editor's famous 25-page *EMTP Memorandum* dated 17 December 1976. PTI shows March of 1976 as the installation date for Tom Varilek's Prime 400 with its hard disk having two 6-Mbyte platters the size of respectable pizzas (slides 5 and 6). In retrospect, amazing!

KOMPARE = 4 of STARTUP provides yet a higher level of comparability of DC\*.LIS files for those who verify program operation by methodical comparison (e.g., using Mike Albert's shareware LIST on the GIVE2 disk). If developers do their job, the "no older than" date in the heading will change regularly. That is for level 3 or below. But for level 4, the real date will be converted to "July, 1993" to ease comparisons. Why July of 1993? This happened to be the date when your Editor was reminded of the need to update by Prof. Corwin Alexander. This was during the summer of 1995! The 1993 date is buried in OVER51NY where the NY honors NYPA (home of the 1993 Schultz revolution).

HVDC.ZIP on the DBOS disk has been updated so as to be compatible with the Schultz revolution of late 1993. Specifically, the \$OPEN involving unit 22 no longer is C-like. Also, some 91% of the address space can be saved by use of NEW LIST SIZES. Need for the change to \$OPEN was first called to the attention of

your Editor by Taku Noda, doctoral student at Doshisha University in Kyoto, Japan. As part of the ongoing development of his Noda frequency dependence, he had wanted to simulate a full-size data case. So, on November 20<sup>th</sup>, your Editor referred him to Daniel Goldsworthy's materials (see story in the July, 1992, newsletter). One change to the program, too, was required. LUNT10 is defined in STARTUP to be an I/O unit number. But Salford EMTP is more sophisticated than to use this unquestioningly. Another parameter LIMCRD bounds the number of input data cards. If the actual number is substantially smaller, the difference represents wasted virtual address space. Why virtual and not disk space? This was yet another consequence of that famous Schultz Revolution (see the October, 1993, newsletter): input data cards were stored in RAM rather than on disk. To recover the wasted space, your Editor decided to transfer card images to another I/O unit (72). So, LUNT10 might be different for small DAN2 than for big DAN1 (preservation in local N26 was added to TABLES ).

Virus protection in ROM can conflict with DBOS installation. Thus began a paragraph in the preceding issue. Confirmation from the factory was obtained via Walter Dykas in an envelope postmarked September 19<sup>th</sup>. Salford's newsletter dated September treats the issue at the top of page 7 in an answer that responds to the question *"My machine freezes when DBOS starts."* According to the experts, *"Some modern motherboards have a built in virus scanner which sometimes works by trapping the INT 78h instruction. This is the interrupt used by DBOS and associated programs. It is necessary to disable the ROM virus scanner in order to run DBOS ."*

Possible graphic incompatibility of new hardware with Salford DBOS Rev. 2.71 was explained by Prof. Bruce Mork of Michigan Tech in Houghton. In public E-mail of the Fargo list server dated October 30<sup>th</sup>, he wrote the following about Dr. Sayeed Ghani's Trident MVGA T9440: *"This card is one of the 'advanced' cards that cannot be controlled via the conventional DOS BIOS video interrupts. Typically, these cards are only capable of going up to standard 16-color VGA mode using BIOS video interrupts. Note that IBM standardized these video mode numbers for CGA, EGA, and VGA, for all text and graphics modes. The VESA 'standard' follows this same approach for higher resolution text and graphics modes. The Tseng labs ET4000 video chip is an example of this. Other video cards based on the 8514A and the S3 do not follow this approach, and (as of DBOS 2.71 anyway) DBOS cannot be configured to control them using the BIOS video interrupt methods. The card must offer VESA compatibility before their high-res video modes can be set with video interrupts. Often, the video card will come with a device driver (such at VESA.COM) that can be added to your config.sys file, enabling the 600x800 and higher video modes .... You need to obtain the VESA device driver and the table of video modes, with the hexadecimal video mode numbers. This is not always*

*possible, however. I recently purchased a pentium PC with a high-end video card (based on S3) from a very popular mail order supplier. Their 'tech support' people were only able to tell me what icons to click on in windows, and had never heard of VESA or BIOS video interrupts. Further, the price they negotiated for their video cards was cheap because they promised the card supplier that they would never need any tech support, and that none of the end users of the cards would ever hassle the card manufacturer. At the moment, I am still running the card in VGA mode, although I have heard there is a generic VESA device driver 'somewhere out on the net' that will make an S3 able to recognize the VESA bios video interrupts."*

PSCTYP is a new name for A6 text at the bottom of STARTUP beginning December 8<sup>th</sup>. The PSC is associated with NYPA PostScript --- to allow the user to override the .PS choice from Robert Meredith. But the user group will distribute STARTUP with a blank field, meaning that there will be no change from the past.

ATPHPGL.001 etc. are the names of HP-GL files that are produced if NOHPGL in STARTUP is not unity. Lack of compatibility with Microsoft (MS) Word 6.0 as used at BPA under MS Windows 3.1 remains a concern of Jules Esztergalyos. This followed public discussion of possible PCPLOT interfaces with Word 6.0 in response to E-mail of the Fargo list server dated December 2<sup>nd</sup>. In this, Lawrence Borle of Curtin University of Technology in Australia asked *"Can anyone help me with a method of importing output plots from ATP to Windows Word6? I use PCPLOT, but in the past have had to use real scissors and glue to get my plots into a paper."* Various alternatives were proposed, and one was HP-GL output of PCPLOT. The response from address [ro'leary@sande.com](mailto:ro'leary@sande.com) on December 2<sup>nd</sup> stated: *"Per Ed Lennox of S&C Electric: Choose the option to plot to HPGL output from Pcpplot, then direct that output to a file rather than a printer. MS Word is able to interpret the HPGL output. I have done this with Word 2.0, but haven't tried yet with Word 6.0."* Question: could ATP HP-GL somehow be modified easily so as to be equally compatible? If so, how? December 5<sup>th</sup>, following discussion with Mr. Esztergalyos, Dr. Tsu-huei Liu demonstrated the problem by sending existing disk file ATPHPGL.001 into WordPerfect 5.1 without difficulty. This was after observing a broken plot within Word 6.0 running under MS Windows 3.1 on her 486.

## Improvements to Salford TPPLT

20 or more graphic modes are possible for modern output cards, and these seem to overflow storage that has been used to determine the highest resolution that DBOS will support. This discovery began with consideration of public E-mail of the Fargo list server dated October 30<sup>th</sup>.

Dr. Sayeed Ghani at the University of Northumbria in England had complained about graphic incompatibility. The end result was expansion of storage from 20 to 40 modes maximum on November 9<sup>th</sup>. New output seen in DUMTPP.LIS for BPA's 1991 AT&T 486/33 shows:

```
Begin MEMORY. # of graphic modes N7 = 5
Max supported screen Y-pixels LIMYYY = 600
      XRES   YRES   COLOURS   MODE   BANKED
Video mode 1. 640     350      16      16      0
Video mode 2. 640     480      16      18      0
Video mode 3. 320     200     256      19      0
Video mode 4. 800     600      16      88      0
Video mode 5. 640     400     256      94      1
```

After being informed of this development, Bob Jackman of Salford provided some historical perspective in E-mail dated November 13<sup>th</sup>: *"The lack of a parameter for the array size on get\_graphics\_modes@ is my stupidity. I have wished a thousand times since that I had done it differently. The situation is even worse than you think because, if the array is too small, then the routine will trample on memory that it doesn't own. The -1 terminator means that it hasn't done this."* Mr. Jackman mentioned possible use of USE\_VESA\_INTERFACE@ of newer DBOS. More about this next time?

The REAL\*8 .PL4 of CUSTOM PLOT FILE can not yet be plotted using Salford TPPLOT. Thus began a paragraph in the July newsletter. Of course, it was only unformatted .PL4 files that posed a problem, and these come in two flavors. For the more popular and efficient, which is C-like, the restriction was removed August 24<sup>th</sup>. New binary switch JREAL8 normally has value zero, which means single precision. But if the user toggles this manually to unity using integer index 271, then double precision will be assumed. Just as with batch-mode ATP plotting, as quickly as REAL\*8 numbers are read from a .PL4 file, they are converted to REAL\*4. As a result, there is no gain in precision of TPPLOT use. But at least now someone possessing such a file has a way to see what the content is using TPPLOT !

MATH is a command for mathematical processing of the signals as they are loaded from the .PL4 file. Programming began Christmas day, and operation to convert voltages and currents into powers and energies was demonstrated to Dr. Liu using @MATH two days later. The next issue should summarize details.

## News from Outside USA and Canada

A printed copy of the October newsletter was mailed by BPA each of its 9 primary EMTP contacts on October 23<sup>rd</sup>. This was 10 days after OCT95.ZIP was attached to E-mail to Prof. Bruce Mork of Michigan Tech and Mathias Noe in Hannover, Germany (for placement on the European mirror).

Electricity Transmission Authority (formerly Pacific Power, and before that Electricity Commission of New South Wales) in Sydney, Australia, was mentioned in the preceding issue. Well, the mailing address for the

Australian user group has changed again. In E-mail dated November 2<sup>nd</sup>, Stephen Boroczky gave a new address: *"System Planning; TransGrid; PO Box A1000; Sydney South NSW 2000; Australia. We cannot guarantee any more that our mail will be forwarded from our old address."* Maybe reinvention is even more out of control in Australia than it is in the USA (joke; at least BPA has kept its same old mailing address)?

IPST'95, the 1995 International Conference on Power Systems Transients, was mentioned in the preceding issue. Well, a summary and a list of authors and titles of all papers was broadcast by Prof. Mork's Fargo list server on October 31<sup>st</sup>. About philosophy, *"IPST was created with the goal of promoting the study of power systems transients by offering a platform of scientific and technical excellence for its presentation. As an open conference, it is intended to be a forum for the scientific community involved in all topics related to the study of transient phenomena in electric energy systems. This includes, but is not limited to, computer simulations, transient analyser studies and field measurements."* A copy of the 563-page, soft-bound Conference Proceedings is available *"at the price of 13,500 PTE (Portuguese Escudos), plus shipping by priority mail (1,450 PTE inside Portugal, 5,150 PTE elsewhere)."* Payment is to be made to *"Instituto da Energia - INTERG"* at mailing address:

Instituto da Energia - INTERG; Av. Rovisco Pais; 1096 Lisboa Codex; PORTUGAL .

One dollar was worth about 147 PTE on November 24<sup>th</sup> according to BPA's Robert Hasibar. At this rate, that price of 13,500 PTE is about \$92 American.

## More about Electronic Mail ( E-mail )

China recently allowed E-mail. This important development was noted in the 17 November 1995 issue of *Science* magazine. Quoting from page 1141: *"In April 1994, when China got its first direct Internet link, there were about 1000 users in China"* according to Hao Xin of IHEP. *"I think there are more than 10,000 users now."* Now the question is, who in China first will send E-mail to the user group? This is a general invitation.

IEEE SPA was mentioned last time. BPA's Robert Hasibar supplied the meaning of the acronym : Standards Process Automation.

Return receipts first were used on December 19<sup>th</sup>. This followed the suggestion of another BPA Volunteer, Barbara J. Hanson. Under MS Mail, clicking on the **Options** button at the top of a note being keyed offers this choice in its menu. So, it was used on notes to Doshisha University in Japan (Prof. Naoto Nagaoka) and the University of Minnesota (Rajendra Naik, one of Prof. Ned Mohan's graduate students). Receipts were received the following day for both of these messages. The receipt

from Japan contains the following key information : by duaic.doshisha.ac.jp .... Thu, 21 Dec 95 06:50:18 +0900.

Dr. Kurt Fehrle in West Chester (a suburb of Philadelphia), Pennsylvania, USA, is one of the final ATP collaborators to establish E-mail contact with the user group. This was explained in the April, 1995, issue. Well, on October 19<sup>th</sup>, the long-awaited message finally was received from <[kfehrle@locke.ccil.org](mailto:kfehrle@locke.ccil.org)> Dr. Fehrle explained: *"After some more searching, I have finally found the Chester County Inter Link (CCIL), a free public telecomputing network for Chester County. .... For the time being, I use a terminal provided by CCIL at the West Chester Senior Center, near my home. Other terminals are provided at the Public Library and at the YMCA. In the near future, I will install a modem at my home computer to access CCIL from home."*

Robert Meredith, half of the *dynamic duo* at NYPA (the New York Power Authority in White Plains), now is experimenting with another personal E-mail service. On October 14<sup>th</sup>, he used address **meredith@gbn.net** to send the following explanation: *"It is a PPP account with a local (unlimited free) access line. I pay \$15/month ... plus sales tax. I'm entitled to 60 hours of use per month .... The gbn.net (General Business Networks) account in New Jersey (201 area code) is affiliated with a parent organization (mhv.net, mid-Hudson Valley) in New York (914 area code). I've found that I can also dial the mhv.net access number from work in White Plains and gain access. So from work - though not a free call - it is still a same area code access call. This is a way around the delays our NYPA gateway has been imposing on us (30 hour outbound delay a few days ago). I'm still trying things out -- Web browser, PMFTP, PMMail, etc -- all in OS/2 -- to see how they need to be configured to work. I'm composing this in PMMail off line and will dial up to have it automatically sent when I'm done."*

Robert Meredith's **gbn.net** address did not last long, however. On December 1<sup>st</sup>, he wrote: *"I can't believe my address is changing again! I logged on yesterday to gbn.net and was greeted with the news that they are changing their name to csnet.net. So my new e-mail address is **meredith@csnet.net** It seems that mail addressed to the old name continues to come in, but I don't know how long that will last. The new name supposedly better positions them for their new target user group: 'Community Schools Network'. They have always had bargain basement rates for schools 9am-5pm (About \$100/year for slip/ppp). Now it seems they want to have a name that reflects that. They claim only 2-4% of classrooms have internet access, so this is a growth field -- besides getting access to a large potential audience of family users via the children in the classes."*

*"100-mph winds rip Oregon"* was the headline in *The Oregonian* the day after the big storm, which hit Portland during the afternoon of December 12<sup>th</sup>. The best E-mail

related story comes from Alan Batie, owner and operator of Agora, who had warned ahead of time that, if the storm should materialize, it was likely his power would go out. Then, the day after, he warned that Agora would be shut down at 20:00 for the night so he could get some sleep (to avoid the necessity for waking up every 3 hours to keep Agora operating). Two days after the onset of the storm, Mr. Batie provided the following summary of continuing problems: *"The Great Storm materialized and agora is running limited services on generator power until power is restored. Agora will go down at 4:15pm for refueling if power has not been restored yet ...."* It had not. There was further explanation the following day: *"The power company says they're working on neighborhoods now, but that it will be Monday before everyone is back online."* On the larger scale, transmission towers were blown down in northern California, severing the dc intertie and one of the three 500-kV ac interties.

That CompuServe flat rate of \$10/month for 5 hours of connection time (see preceding issue) applies to more than just the USA. Contacted by telephone the weekend after his fall meeting, EEUG Chairman Mustafa Kizilcay explained that this is the rate he, too, now pays (in equivalent German marks, of course).

A cable modem is a recent high-speed alternative to telephone lines for those who have cable television and a cooperating supplier. A good summary can be found on page 326 of the December issue of *Computer Shopper*. The attraction is much higher speed --- as high as 30 MB/sec (the demands of television far exceed those of the telephone); the problem is lack of standards: *"Truly standardized cable modems aren't expected until the turn of the century."* An Ethernet adaptor is required to connect the cable modem to computer. Will the cable modem challenge ISDN as the next big step forward for Internet surfers? The race seems to be on, with ISDN having a big lead (cable modems are new).

Addresses of ATP user groups of the world were added to the ATP Web (WWW) page of Michigan Tech in Houghton. In list server mail dated November 8<sup>th</sup>, Prof. Bruce Mork issued a call for corrections: *"Just go to the home page at <http://www.ee.mtu.edu/atp> The menu item was always there, but now it is activated. If there are any corrections to these addresses, please let me know. We would like to add the phone/fax numbers, and e-mail addresses as well."* It was decided that each entry should decide for itself what electronic addresses it wanted listed. For example, the Can/Am user group has requested no listing of FAX or voice telephone numbers. This should force an initial contact by E-mail (preferable).

Marco Polo Pereira of Furnas in Rio de Janeiro, Brazil, heads the Latin American user group. E-mail first was received from him on December 12<sup>th</sup>. Although this came from a longer address, **mpolo@furnas.gov.br** is said to be a usable address.

*"Internet security advances, but skepticism remains"* is the title of the lead story of the *Trends & Technology* section of the December issue of *Computer Shopper*. In the middle of column 2, one reads: *"Microsoft and Visa also announced the jointly developed Secure Transaction Technology (STT) and Private Communication Technology (PCT) protocols. The former is designed for credit-card transactions, while the latter supports E-mail .... The specs are available free to developers via Microsoft's home page ( <http://www.microsoft.com> )."*

Erienet is the provider of David Szymanski's preferred access to the Internet. So began a paragraph last time. Well, two weeks before Thanksgiving (around November 9<sup>th</sup>), Mr. Szymanski warned Dr. Liu and your Editor by telephone not to send E-mail the following week. Why? He would be attending Comdex in Los Vegas, Nevada, so his mail would be deleted. Yes, Dr. Liu and your Editor both heard that any mail more than 3 days old is purged by Moose. Amazing! Does anyone else have such a problem? Such a policy seems almost unthinkable.

**postmaster@admin.ee.ufl.edu** on the campus of the University of Florida in Gainesville (USA) returned to Agora on October 14<sup>th</sup> E-mail that had been addressed to Yin Yuxin. Since Dr. Yin now is working for Global Engineering in Roswell (suburban Atlanta), Georgia (see preceding issue), the termination of his account was expected. The surprise lay in the fact that the mail was sent to Florida not from Agora, but rather from the Fargo list server! Is this a first (for mail to bounce back to the author rather than the mailing machine)? Prof. Bruce Mork pursued your Editor's mention of the phenomenon, and reported as follows two days later: *"I notified the listserve manager at NDSU about this. He looked at the header, and notified the e-mail folks in Florida that they have their delivery error handling set up wrong. .... their mailer should be sending the 'bounce' back to the atp-emtp list server, but isn't."* Addendum dated November 11<sup>th</sup>: FH Osnabrueck, too, returned such a message to Agora rather than Fargo.

Marty Hoag wrote from **nu021172@vm1.nodak.edu** to inform those in Osnabrueck of their problem. His form letter began: *"Your system apparently sent a mail error message to the From: or Reply-To: address. Error messages should be sent to either the SMTP MAIL FROM 'envelope' return address or if necessary to the RFC822 'Sender:' field if present. Excerpts of related RFCs are included below. Of course the error message should include a copy of the original RFC822 headers at a minimum and include information such as specific user addresses which may be obsolete or have some other problem (i.e., the affected SMTP/RFC821 RCTP TO address)."* This was in mail dated November 13<sup>th</sup>.

India first was heard from by E-mail on the subject of ATP when a message arrived at BPA on November 10<sup>th</sup>. From Dr. N. Prabhakaran, Professor and Head of the

Electrical Engineering Department of Calicut Regional Engineering College in Kerala, the message began: *"Received your E-mail dated 11/09/95."* Well, user group records show a message to Kerala on September 5<sup>th</sup> (yes, some 65 days ago). It is not obvious that even heads of departments have their own private mail boxes : the address that was used was **crec@reccal.ernet.in** Inside MS Mail, your Editor --- hereafter referred to as the Vasco da Gama of E-mail --- used the **Reply** button on November 11<sup>th</sup> to confirm the historic communication.

Hong Kong can be sent large E-mail such as Salford EMTP (the GIVE1.ZIP and GIVE2.ZIP attachments) without difficulty. This was confirmed by Prof. Laurie Snyder of Hong Kong University in E-mail that was dated November 19<sup>th</sup>. After the restriction that was discovered during attempted transmission to Sydney, Australia (see the April, 1995, issue), this was reassuring.

The Houghton FTP server for ATP materials would seem to be gaining IEEE PES respect. Interested readers may consult Fig. 5 on page 38 of the October issue of *Computer Applications in Power*. About this, Prof. Bruce Mork observed: *"Our ATP ftp site is listed as a resource in the power engineering WWW sites."*

The Reply command within Unix Elm is dangerous for those who receive mail from list servers. This subject was mentioned before (see the April, 1995, issue). More specifics are being supplied now because the confusion seems common. E.g., both Prof. Bruce Mork and your Editor have been burned again this way during recent months. Studying the matter more closely, the Elm *table of contents* (one line per message) for a mailbox seems inconsistent. Sometimes server mail is properly labeled, and other times it is not. For example, dated October 23<sup>rd</sup>, the server mail from Hong Tang was correctly shown as coming from the Fargo list server (Agora Elm displayed "EDU!owner-atp-emtp" as the source). But the message from Sue Childs on October 19<sup>th</sup> gave no such clue on the outside (Agora Elm displayed "Sue Childs" as the source). Very tricky. But why the difference? There is some similarity to the confusion of that E-mail post office on the campus of the University of Florida, which on October 14<sup>th</sup> returned mail to the author (your Editor) rather than the mailer (Fargo).

Elm even hides the header, sometimes! I.e., not only is the source unknown on the outside, it also can be unknown on the inside! Mail from Prof. Yoshihiro Murai of Gifu University in Japan provides an example as shown to Laurent Dubé November 17<sup>th</sup>. As your Editor entered the message, the screen was blanked, some address-type information was painted at the top of the screen, and then this rapidly was overpainted by the message content. This all happens in a fraction of a second --- too rapidly to be read. Some encoding is involved, it seems. Instead of the usual information line at the bottom of the screen that advises about use of "i" to return to the index, just

"stdin" appears on the bottom line. One can **not** use "i" to abort the listing. Instead, your Editor repeatedly presses the space bar until the message has entirely scrolled past. This is a serious disadvantage of Elm.

Public E-mail of the Fargo list server has come to be viewed as more of a problem for program developers than a solution. The trouble is believed to be fundamental, too. On October 1<sup>st</sup>, your Editor wrote the following to Glenn Wrate, doctoral student of Prof. Bruce Mork who controls the service: *"There were some very good reasons our founding fathers (Madison, Jefferson, etc.) chose a republic for this country rather than a democracy. What works in small groups breaks down as population of the demos approaches infinity. With some 310 subscribers ...., it is no wonder the Fargo list server has had its problems with content. What newspaper would print every letter it might receive from readers? Who would hold a meeting of 300 persons and allow anyone in the audience to speak on any subject at any time and at any length? At some point, common sense must prevail.* Have readers considered an alternative, read-only service that would disenfranchise the Fargo rabble?

Etiquette for use of the Fargo list server finally was broadcast by Prof. Bruce Mork. This was on the 17<sup>th</sup> of October, as detailed in a separate story.

Advertising via the Fargo list server finally was disapproved in polite but firm terms by Prof. Bruce Mork. Recall mention of the problem one year ago (search for either *junk* or *Alameda* in the January, 1995, issue). Well, October 27<sup>th</sup>, there was a contribution about *"measuring electric currents : Rogowski coils for all applications."* The author was said to be D. A. Ward of Rocoil Ltd. in Harrogate, U.K., who uses E-mail address **rocoil@sesame.demon.co.uk** No, there were neither prices nor even any overt solicitation, but it would appear that Rocoil is trying to exploit Rogowski coil technology commercially. No mention of ATP was found in the pitch. After informed criticism of the technology, Prof. Mork concluded as follows on October 28<sup>th</sup>: *"Finally, I would caution Mr. Ward that this list server is a forum for technical discussions related to transient modeling and ATP usage. We discourage advertisements or other promotions. If you would like to discuss EMTP models for linear couplers, that may be of interest to some of the subscribers. Maybe you can use ATP to develop transient models for your linear couplers, to demonstrate their performance?"*

*"Daffodillies and leeks : join our watersports club"* was the beginning of the *From:* line of list server mail dated November 23<sup>rd</sup>. This allows clarification of the original mention of daffodillies and leeks in the July, 1995, newsletter. The author is Helen Maniatt, a Research Associate at Staffordshire University in the UK.

MS Windows 95 might clobber Navigator by Netscape

according to a story on page A3 of the December 4<sup>th</sup> issue of the *Wall Street Journal*. The title is: *"Microsoft probe spurs subpoenas tied to Internet; Antitrust effort appears focused on Windows 95, disabled rival software."* So how did this work? *"...Netscape publicly complained about the final version of Windows 95 after it was released last August. The Netscape Navigator works without problems under Windows 95 -- until a user chooses the Microsoft path to the Internet, Netscape asserted. Then the Microsoft product 'overwrites' the rival provider's specifications for linking to the Internet."*

## European EMTP User Group

EEUG, the *"European EMTP-ATP User Group e.V."* held its second annual meeting November 13<sup>th</sup> through the 15<sup>th</sup> at the Congress-Center in Hannover, Germany.

Copies of the conference materials were offered by Prof. Kizilcay in public E-mail of the Fargo list server dated December 22<sup>nd</sup>. These will be *"delivered in a 4-ring binder. .... The same prices apply for both Proceedings and MODELS Course Notes and include postage and packing."* Prices were displayed in two tables. These range from a minimum of 50 DEM (for delivery by surface mail to a member in Europe) to a maximum of 120 DEM (for delivery by air to a nonmember outside of Europe). Prices do not include any VAT (value added tax). *"A DOS 3.5-inch floppy disk recorded with sample MODELS data cases"* is included with the MODELS course notes.

Neural networks have recently been of interest to some ATP users. Two of the 17 papers at the Hannover meeting mentioned neural networks in their titles. The first of these, by Janko Kosmac and Peter Zunko of the University of Ljubljana in Slovenia, has title *"A neural network vacuum circuit breaker model for simulation of transient overvoltages."* The Abstract follows: *"This paper presents a novel approach for simulating transient overvoltages due to the opening of a vacuum circuit breaker. The breaker is modeled using a neural network representation, and was implemented in EMTP using MODELS. The neural network is trained on field measurements before being used in the simulation. A representative simulation results under different operating conditions are presented. The paper also describes how the neural network technique can be used in EMTP. This new approach should enable engineers to model various vacuum circuit breakers without requiring a detailed knowledge of plasma physics."* Although this says EMTP, ATP is critical, obvious: the EMTP of DCG and EPRI does not have MODELS by author Laurent Dubé. The second paper is entitled *"ATP as a source of signals for neural network training and testing,"* by Miroslaw Lukowicz and Waldemar Rebizant of the Technical University of Wroclaw, Poland. Here the connection to

ATP seems weaker: "... *training and testing was performed in simulative way outside of ATP package by means of MATLAB program.*"

Better ZnO surge arrester modeling was well explained by authors A. Somogyi, G. Ban, and L. Prikler of T.U. Budapest in Hungary. Their paper is entitled "*Modelling the electrical and thermal behaviour of metal oxide arrester using MODELS.*" A good summary can be found in the Conclusions section: "*The thermal and the electric behaviour of arresters can be described by means of the complete validated model. The model is able to calculate the voltage, the current and the temperature of the arrester. It is clearly shown by the comparison of simulated data that the voltage dependency of the nonlinearity exponent is not negligible. The authors found good agreement between the simulated and measured current.*" So, the next question should be obvious: are manufacturers ready to share data for such more sophisticated models with the general public?

That secret TCSC modeling of G.E. (an early mention can be found in the January, 1993, newsletter) appears to be increasingly irrelevant to the average ATP user outside of G.E. Who wants to simulate without knowledge of either the physical or the mathematical modeling that is being used? Why management at BPA ever agreed to this secrecy seems increasingly myopic, as time passes. Well, one paper at the meeting illustrates well the open alternatives: "*A thyristor controlled series capacitor model for the EMTP-ATP program*" by A. R. M. Tenorio, N. Jenkins, and M. H. J. Bollen of the University of Manchester in England. The ATP interface to G.E. TCSC is likely to survive into spring only if someone at BPA specifically requests its continuation. Your Editor's inclination is to convert all associated code to comments.

Laurent Dubé's MODELS course occupied the third day of the Hannover meeting. Attendance is understood to have included 22 paying students plus Prof. Kizilcay.

E-mail at FH Osnabrueck has proven to be unreliable, based on the experience of Prof. Mustafa Kizilcay. As documented in a note dated October 28<sup>th</sup>, your Editor has had 2 pieces of mail returned as undeliverable. During a visit November 3<sup>rd</sup>, Laurent Dubé confirmed the problem based on his own correspondence. Even the Fargo list server had at least one mailing to Osnabrueck rejected (and incorrectly returned to the author rather than the mailer, as mentioned elsewhere).

## BPA and Others Defund EPRI

DCG Chairman Doug Mader has revealed publicly a number of problems that have plagued DCG / EPRI EMTP development in recent years. Thus began one

paragraph in the July, 1995, issue. Chairman Mader referred to "*recent difficulties at EPRI with membership defections and loss of funding.*" More now is known.

BPA is withdrawing most of its support from EPRI. This promising consequence of BPA's attempt to reinvent itself was the lead story in a 7-page internal newsletter named *Research Ramblings*, which describes itself as "*a publication of the Corporate RD&D Staff, in cooperation with researchers throughout BPA.*" Quoting from Vol. 1, No. 1., which is dated September, 1995: "*BPA's EPRI membership in FY 1996 is changing .... full membership dues decrease from \$8.9M to \$2.24M. As a result of EPRI's progressive flexibility program, which allows a choice in 'pieces' of EPRI that we subscribe to, BPA's FY 1996 membership dues decrease to \$1.66M.*" Here FY indicates fiscal (as opposed to calendar) year, and M indicates millions of dollars per year. What about this *progressive flexibility* nonsense? This seems to be the name EPRI has applied to recent strategy that attempts to stem the tide of complete withdrawals by offering membership in small pieces. The new acronym used for a piece of the former unified EPRI program is BU for *Business Unit*. "*BPA can only access EPRI information and services from those BUs we have paid for. You will be denied access to any information from BUs that we did not join.*" Well, better 20% than 100%. So, who said nothing good came from the mindless reinvention (we were bound to find some benefit eventually) ? !

LADWP is the acronym used for the Department of Water and Power within the City of Los Angeles in California. In E-mail dated November 29<sup>th</sup>, Glenn Wrate of Michigan Tech in Houghton explained that "*LADWP has left EPRI.*" Pacific Gas & Electric of San Francisco is another large west coast utility that is rumored to have left, although the separation may not be total and your Editor only has two verbal reports from others in BPA.

What is the big picture? Who has a realistic estimate of total 1996 revenue for EPRI, and how might this compare with totals for preceding years? Clearly, this is a very important story for persons having EMTP interest.

## CIGRE hvdc data via Dykas

A large CIGRE hvdc (high voltage direct current) test case now is available to any licensed ATP user thanks to the effort of Walter Dykas at ORNL (the Oak Ridge National Laboratory in Tennessee, USA). In public E-mail of his Fargo list server dated October 25<sup>th</sup>, Prof. Bruce Mork announced that "*it is now on the ftp server, in the file atp/dcase/cigbench.zip. Both DOS ZIP and unix TZ archives are included within this file.*" In a *Reply* later that same day, Mr. Dykas provided context by referring to a recent publication by the IEEE PES Working Group on Dynamic Performance and Modeling

of dc Systems and Power Electronics for Transmission Systems. This has number 95 WM 272-5 PWRD, and is entitled *"Report on test systems for ac/dc interaction studies."* The authors are S. Lefebvre, A. M. Gole, J. Reeve, L. Pilotto, N. Martins, and S. Bhattacharya. *"The CIGRE Benchmark is model T-4 in the IEEE paper,"* according to Mr. Dykas.

Utility OLDTACS within archive HVDC.ZIP on the DBOS disk of Salford EMTP distribution was described in the July, 1992, issue. This updates antiquated (pre-*"M39."*, which dates to July of 1984) TACS data to modern standards. For those who forgot or never knew, Ma Ren-ming from Wuhan, China, made a number of important advances involving TACS during his final year working at BPA. Data was changed in that, within the category of TACS data, original ordering restrictions and blank separator cards were removed. Of course, this was only possible because new type codes were assigned --- such as 33 for output variables. Now back to Walter Dykas and the CIGRE materials. As received from Mr. Lefebvre, a user of DCG/EPRI EMTP, the data was old. So, OLDTACS was applied by Mr. Dykas as the first of his modifications.

## News about Laurent Dubé's MODELS

19 students attended the week-long course on MODELS that was taught by Laurent Dubé at IST in Lisbon, Portugal, during the week of October 9<sup>th</sup> through the 13<sup>th</sup>. All students were from Portugal, and Laurent Dubé was authorized by the user group to sign Can/Am ATP license applications in its behalf.

As different tasks are completed, they should be summarized in this publication. This was written in the April issue about Laurent Dubé's most recent contract with BPA to improve MODELS. So, the summary of progress reports as they were issued by MODELS author Dubé in public E-mail of the Fargo list server continues.

*"Iterated USE of a model"* was the headline of the MODELS Technical Note that was broadcast from the Fargo list server on August 30<sup>th</sup>. This began: *"The ITERATE option has been added to the USE statement, indicated as: 'USE modelname AS usename ITERATE' This option indicates that the model can be used more than once at each time step, for example when called from inside an iteration loop. When this option is specified, MODELS saves the initial state of the model when called at a new time step, and re-starts from that saved initial state at each re-use of the model at the same time step. The following data case provides a simple illustration."*

*"Type-94 iterated component"* was the headline of an 11-Kbyte MODELS Technical Note that was broadcast from the Fargo list server on August 31<sup>st</sup>. This began:

*"In ATP, the type-94 nonlinear component is a user-defined multi-branch circuit component. The operation of the component is described in the MODELS section of the data case, and can be written in the MODELS language or in other programming languages. The solution of the component is simultaneous with the solution of the rest of the circuit, without any time delay. The connection with the rest of the circuit is a true electrical connection defined in terms of currents and voltages, not a TACS-like control connection designed for doing signal monitoring and control involving a time step delay. Similarly, the interface with the circuit is defined in terms of the voltages and currents of the user's data case, not in programming terms of ATP common blocks and subroutines. Because MODELS provides a standard interface for a direct connection between ATP and other programs, a type-94 component can be modeled by a user-supplied external program connected by the user to ATP via MODELS. Two types of type-94 components are available: 1) type-94 Thevenin component; 2) type-94 iterated component. The type-94 Thevenin component has been available for a few years already. It can be connected to the circuit as one or more coupled branches.... The single-branch version of the type-94 iterated component has just been installed in ATP. Its model is executed one or more times at each time step, called by the iteration routine of ATP."*

*"Type-94 iterated multi-branch"* was the headline of the MODELS Technical Note that was broadcast from the Fargo list server on September 25<sup>th</sup>. This began: *"The multi-branch version of the new type-94 iterated component has now been installed in ATP. .... Two examples follow, illustrating the use of the multi-branch type-94 iterated component solved using MODELS. Eight similar examples now illustrate the use of the Thevenin and the iterated type-94 component."*

*"POSTPROCESS PLOT FILE"* was the headline of the MODELS Technical Note that was broadcast from the Fargo list server on September 27<sup>th</sup>. This makes unnecessary the intermediate use of TACS as had been suggested by your Editor in the preceding issue. Outside of MODELS, the interface is identical to that used by your Editor for the Type-25 TACS source (see story in the July, 1995, newsletter). Inside MODELS, Mr. Dubé explained: *"Declare any number of signals from the PL4 file as inputs to MODELS: 'INPUT gen {PL4(1)}, curr {PL4(2)}' where: \*) gen and curr are arbitrary input names of the MODELS section; \*) PL4 is the new input type connecting the input to the PL4 file; \*) 1, 2, etc indicate the corresponding curve number in the PL4 file. The data case shown below is the new 3rd subcase of benchmark DC46.DAT"*

TESTMODL.ZIP is the archive of MODELS test cases from author Laurent Dubé. A revised copy was placed in **/pub/atp/models/tutor** as announced by Prof. Bruce mork in public E-mail dated October 31<sup>th</sup>. The

following description from Mr. Dubé was included: *"The additions include new and/or modified illustrations of:*

- \* *COMBINE ITERATE* for solving simultaneous nonlinear equations
- \* *USE ITERATE* for repeated calls to a model at any time step
- \* *MODELS STAND ALONE* for use of *MODELS* without a circuit description
- \* *type-94 Thevenin MODELS circuit components*
- \* *type-94 iterated MODELS circuit components*
- \* *functions using array arguments and argument lists*
- \* *functions returning array values*
- \* *definition and use of models written in other languages*
- \* *definition and use of functions written in other languages*
- \* *Z-transform transfer functions*"

*"Type-94 syntax"* was the headline of the *MODELS Technical Note* that was broadcast from the Fargo list server on November 1<sup>st</sup>. This began as follows: *"A small modification has been made to the syntax of the type-94 nonlinear MODELS component in ATP."* The original, single SSREF has been replaced by new SSV and SSI (for voltage and current, respectively).

*"Z-transform transfer function"* was the headline of a second *MODELS Technical Note* that was broadcast from the Fargo list server on November 1<sup>st</sup>. This began: *"It is now possible to use a z-transform transfer function to express the value of a variable in MODELS. The syntax is identical to the Laplace transfer function, with the operator 's' replaced by the operator 'z-'. "*

*"Modeling a circuit inside a type-94"* was the headline of a *MODELS Technical Note* that was broadcast from the Fargo list server on November 22<sup>nd</sup>. This began: *"A useful application of a type-94 component is to represent a component by circuit elements where the values of the elements need to vary during the simulation. This note describes how to represent in a model a R/L circuit using a type-94 iterated component."*

## NYPA PostScript for Salford EMTP

Robert Meredith and Robert Schultz of NYPA (the New York Power Authority in White Plains) may have abandoned the Salford compiler in favor of Watcom, but developers in Portland have not. As a result, progress in White Plains, which is shared in the form of Watcom ATP FORTRAN, sometimes has to be modified for use with Salford EMTP. This present story summarizes the latest such massaging, which is associated with all-new PostScript code that was received at BPA by E-mail from Mr. Meredith on the 6<sup>th</sup> and the 9<sup>th</sup> of October.

PostScript resolution has been disconnected from screen resolution. This was not important at NYPA

because high-resolution monitors (1024 x 1280 pixels) were in use there. Having the same PostScript resolution was plenty good for engineering use. But what about the average Salford EMTP user, including your Editor, who still employs standard VGA with only 480 x 640 pixels of resolution? The solution was to give PostScript its own pixels. This has been done in a new 4<sup>th</sup> line of the GRAPHICS disk file. The new 3<sup>rd</sup> line is from NYPA (where it originally had been added to STARTUP):

C	NPGRID	WHTBAK	.	.	.
	4	0.3			
C	JXMAX	JYMAX	JXINCH	JYINCH	.
	1280	1024	105	105	

What is to prevent full resolution of 300 or the even-newer 600 dots/inch? Nothing other than practicality, it would seem! At BPA, all NYPA pixels were doubled, giving 2560 x 2048. Then output comparable to that famous QUARTER PLOT display of DC-35 was compared by eye. The careful observer is just barely able to detect negligible differences in parts of the curves (e.g., nearly-horizontal segments). Further increases in resolution probably would not be detectable, and certainly should be of no engineering consequence.

PSPLOT is the name of NYPA's PostScript printer spooling program. This first became available to Salford EMTP users on November 8<sup>th</sup> when NYPAPOST.ZIP was added to the DBOS disk. Inside will be found the 18.8-Kbyte .EXE file that requires DBOS. Developers in Portland did nothing other than compile and link the FORTRAN that was appended to an E-mail message from Mr. Meredith. On November 7<sup>th</sup>, he wrote: *"I believe you may now need the psplot7 program, which is attached in what I think is correct Salford syntax. I have not tried to compile it (neither Schultz nor I want to reboot to Salford to confirm it), but the process of converting to Salford syntax is not too complicated, has been documented in the code, and I think I got it right. The code is yours to use, but should not be redistributed in other-than-executable form, lest unauthorized revisions break the 1:1 linkage with the ATP Postscript format."*

Of course, Salford EMTP creates the PostScript output directly. So who needs PSPLOT, and why? Mr. Meredith wrote: *"Basically it gives Postscript printer users the ability to print only selected plots and the choice of one, two or four plots per page. It also provides the opportunity to change the default color Postscript traces --- which may appear too-lightly shaded on a B/W Postscript image --- back to black, or to substitute a non-default header file for more dramatic changing of fonts, line widths, grids and other plot characteristics. Robert Schultz demonstrated in Portland at the July 23rd user group meeting how 4 plots/page are possible."*

Yes, the special feature QUARTER PLOT exists for Salford EMTP, but this is for screen plotting (possibly redirected to disk as bitmaps for Epson or LJ2 printers); it affects neither the PostScript nor the HP-GL output. But PSPLOT can produce the same effect as part of

postprocessing, which is much more flexible (the user can have his cake and eat it, too). Executing the program without any argument reveals the following summary:

```
Usage: postplot [-ooutputfile] [-iinputfile]
                  [-hheaderfile] [-pplots/page]
                  [-all] [-eot] (-color) n1 n2 n3-n4
                  n5 n6-end, e.g., 2 5 6-8 12-end
Defaults: inputfile = postplot.ps
          outputfile = postcom.ps
          headerfile = ATP default
          eot = .false. (no PS Printer Reset)
          color = .false. (no color PS Output)
          plots/page = 1 (opt= 2, 4, 4c ...)
```

So, from that final line, the qualifier `-p4` will produce 4 plots/page in row order. Use `-p4c` for column order.

DCNEW-15 is the new standard test case that has been devoted to NYPA PostScript verification. The most important output is not the `.LIS` file, but rather the 158-Kbyte `DCN15.PS` file of 14 PostScript plots. Since the NYPA example used 1024 x 1280-pixel resolution, so does BPA. Distribution by the user group also will involve this resolution, for uniformity.

## Szymanski uses Windows 95 for ATP

A 133-MHz Pentium-based PC was ordered from computer reseller David Szymanski on December 4<sup>th</sup>. Included were all the MS tools required to support ATP under Microsoft (MS) Windows 95 according to the latest ideas from Wattsburg, Pennsylvania, which is the home of Szymanski Consulting Inc. Compilers for FORTRAN, C, and BASIC languages are included. For the record, roots of the December purchase can be traced to August when David Szymanski had offered to test current ATP source code using the new MS PowerStation compiler to which he could obtain free access as an MS beta tester. That was before the new product was available to the general public, and when news of its performance was prohibited by the MS licensing agreement. Since that beginning, Szymanski attended the Comdex computer show in Las Vegas, Nevada, during mid-November, and this provided an opportunity to talk personally with MS compiler experts. He determined that the time was right for the next step: consideration of the new MS software by developers in Portland. The new MS PS FORTRAN compiler now is available to the general public, so no longer must its performance be kept secret.

PTI (Power Technologies, Inc. of Schenectady, New York) is another party having serious MS PS interest. The November, 1995, issue of *PSS/E Newsletter* explains the following on page 3 under the title PC Note: *"The new version is based on a Microsoft Fortran compiler. This compiler should be more readily available and in general less expensive than the Salford compiler. .... The new version requires less disk space and also allows PSS/E to be a true console application (batch will be possible). It will allow pre-emptive multi-tasking. It should also run quicker but we do not have enough information yet to verify this."* Well, PSS/E developers were ahead of ATP developers in switching to Salford in

1989, so it is not surprising to learn now that they also are ahead in providing the MS alternative. Far from being upset at not being first, your Editor is reassured by this latest PTI news, which was seen on December 19<sup>th</sup>.

OLE is the Microsoft acronym that stands for Object Linking and Embedding. This is the MS way to connect together at execution time procedures that are in separate programs. Well, David Szymanski is believed to be the first to advocate to developers in Portland the exploitation of OLE for ATP. Although he provided an explanation of OLE in general terms much earlier, it was during a November 7<sup>th</sup> telephone conversation that Mr. Szymanski made the concrete observation about possible use for interfacing MATLAB with ATP. Recall first mention of the desire in the July, 1994, newsletter. Well, Szymanski's idea was passed to Gayle Collins in England by E-mail the following day. Readers should understand that there is no restriction of OLE to FORTRAN or C languages, either. Szymanski explained that the much cheaper MS Visual Basic also could be used. Who knows where this might lead? User-supplied source code certainly should be easier for the average user to write and debug in Basic than in C. Of course, *the devil is in the details* (experimentation and innovation will be needed).

OLE Automation is the subject of Paul Bonner's column on pages 588 and 590 of the January issue of *Computer Shopper*. Any reader who wants an idea of what Szymanski is talking about with MS Visual Basic is advised to read this. The story begins with the basics: *"One application, the automation client, drives another, the automation server, by making calls through an OLE interface ...."* The article concludes as follows: *"The walls between applications are tumbling down, and OLE automation is the catalyst that is making it happen."* For ATP, maybe --- with Szymanski's help!

The Panasonic PowerDrive PD/CD-ROM is a new feature. It acts as both a quad-speed CD-ROM reader and also an optical disk writer. Details next time.

## IBM OS / 2 Warp Used by NYPA

IBM's OS / 2 is being used for the support of ATP by Robert Meredith and Robert Schultz of NYPA (the New York Power Authority in White Plains). This is a continuation of the same story in the preceding issue.

*"Just Add OS/2 Warp"* is a free package of software utilities from IBM to help users deinstall Windows 95 and then load OS/2 Warp, or to install OS/2 Warp alongside Windows 95. This according to a news release from IBM that was received in E-mail from Robert Meredith on November 6<sup>th</sup>. The IBM news release was dated October 31<sup>st</sup> (Halloween), and it followed the title *"IBM offers treat for those who feel tricked by Windows 95."* So much

for the humor and hype. The concept of free software to ensure compatibility before one purchases appears sound: *"Just Add OS/2 Warp's Upgrade Advisor automatically checks the user's PC to determine if it is ready to upgrade to OS/2 Warp. The Advisor shows whether the PC has enough memory, processor power and hard disk space, so that the user can move on to the upgrade with confidence. The Advisor allows users to see whether their devices are supported by OS/2 Warp and where to obtain device drivers if they are not. It also will suggest hardware upgrades that can make the PC ready for OS/2 Warp."* But how would this have helped Fred Pagano (recall his OS/2 horror story in the preceding issue), if he was not a Windows 95 user?

120-MHz Pentium times for DC-1 were supplied by Mr. Meredith in E-mail dated December 23<sup>rd</sup>. For his home computer, execution under OS/2 is surprisingly fast: 8.87 sec for the time-step loop (10.91 sec total). Note that those Gateway times in the lead story are substantially longer. Why? Meredith built his home computer himself, using quality parts. He uses a *"120 MHz Tyan Titan III motherboard with 512k pipeline burst cache and 32 MB of 32-bit 60 nS RAM .... OS/2 Connect is now configured with 4 MB of disk cache. Using the new HPFS383.IFS file system driver (free upgrade, of course) finally brings OS/2 to disk cache sizes comparable to that used in WNT and times at least as good."*

## Trapezoidal Rule Oscillations

This is a continuation of the story having the same title in the preceding issue.

Those Manitoba hvdc simulators were mentioned last time in the paragraph about IPST'95 in Lisbon. Recall that Peter Kuffel, Kelvin Kent, and Garth Irwin from Winnipeg, Manitoba, Canada, contributed pages 499-504 of the bound conference Proceedings. The title is very descriptive: *"The implementation and effectiveness of linear interpolation within digital simulation."* If one can believe this paper (and your Editor does believe part of it), interpolation can be very effective in suppressing artificial numerical oscillations of hvdc-type problems (many thyristors imbedded in inductive circuits). After considerable thought about the idea, your Editor decided that he likes the general concept from a theoretical point of view. It has two important advantages: 1) the time-step DELTAT can remain fixed; and 2) the trapezoidal rule of integration remains unchanged. That is the good news. The bad news is that a major overhaul of EMTP programming is believed to be required in order to apply the procedure in all of its generality (including distributed lines, TACS, MODELS, and rotating machinery). This is **not** the impression conveyed by the Manitoba authors, however. In the paragraph immediately above Fig. 3, they write: *"... and requires no extra programming once*

*a basic interpolation algorithm has been implemented."* Below the figure, the authors write that the procedure *"can thus be implemented in existing programs without major compatibility problems."* Yeah, right (*"Hello, sucker!"* as Bruce Williams would say). To rephrase the conclusion, after the massive reprogramming has been performed, little extra work would be required (joke)!

That mindless voting on the Fargo list server (see the same story last time) was particularly stupid because most advocates of change seemed not to notice or understand the ramifications of the way the proposal had been modified since it first was introduced by Roger Argenal many months ago. Recall that the discussion began with CDA, which should be relatively simple to program, and which would require little extra storage. Interpolation is not at all the same. It would be much more complicated to implement in EMTP, and would require large amounts of new storage. Who among those clamoring for change recognized this complication? Naturally Robert Meredith understood **this**, too. Not quoted last time was his evaluation of the work required. From server mail dated September 26<sup>th</sup>: *"Those individuals who think that a change in the calculation technique used by ATP is their highest priority should consider taking a one or two year sabbatical and donating their time or their employer's time .... to reprogramming ATP .... Or perhaps they would care to underwrite a similar effort by a more experienced programmer."* That's right: progress, but at what cost?

Interpolation for voltage zeros might be just as important as interpolation for current zeros. Yet, no mention of this related problem is noted in the Manitoba paper. Any reader who does not understand is reminded of duality: the closing of a capacitive circuit and the opening of an inductive circuit have identical dynamics. This is because equation  $i = C * dv/dt$  for capacitance C is the same as  $v = L * dt/di$  for inductance L. Anyone who has studied capacitor switching using ATP should be familiar with the phenomenon of trapezoidal rule oscillation of the capacitor current, which is analogous to inductor voltage. Note that interpolation for voltage zeros would double the number of adjustments for each diode in the steady state: in addition to the obvious opening, there also would be one closing per cycle.

Nonlinearities further complicate interpolation, of course. Linear interpolation probably is acceptable for linear networks, but what about nonlinear ones? For slow, smooth modeling of magnetic saturation, trouble might not be expected. But what about for ZnO surge arresters? On the step that a steep-fronted surge might hit such a highly-nonlinear device, linear interpolation could be highly inaccurate. Discontinuous devices such as relays probably are even more difficult. Yet, nothing about such potential challenges is read in the Manitoba paper. That EMTDC interpolation might work well for typical hvdc simulation, but other, not-so-compliant

networks can be imagined, and could be constructed.

CDA is believed to be comparable to the idea that was proposed in Leuven during the mid '80s. Most likely this was 1987. For sure, it was a fall LEC meeting that was attended by now-Professor Maria Teresa Correia de Barros. Your Editor clearly recalls that she was one advocate, citing her own doctoral research that used a different integration method. Dr. Olov Einarsson of ASEA Research was another. Your Editor's response was simple: If all could agree on what change should be made, it would be made. Well, Dr. Einarsson came back the following year and explained that he had changed his mind! He no longer supported the idea of tampering with the trapezoidal rule because he had come to appreciate the potential dangers of masking trouble. Remember Robert Meredith's advice last time (*"I have come to regard the oscillations as a useful indicator that my model needs more work ..."*) ? ! This seems to express the sentiment of Dr. Einarsson's concern.

Laurent Dubé began experimentation after the Lisbon conference, using his own ideas for a CDA-like scheme. Your Editor received this in E-mail dated September 17<sup>th</sup>. Comment lines of the code include this summary: *"The choice of method to calculate di/dt is dictated by wanting the voltage oscillation to inject zero-sum energy in the solution. Using the mid-point derivative deltaI/deltat doesn't do it. Instead, we adjust the mid-point di/dt to the end point, using d2i/dt2 assumed constant over the interval (same as trapezoidal rule assuming that the slope of the voltage is constant over the interval). This method produces an oscillation damped in 3 steps."* Again, the idea was to find something cheaper than interpolation (the Manitoba solution). For that hanging inductor (see last time), Mr. Dubé's modification is interesting. Assuming a circuit breaker opened the loop, the 3 or 4 steps of damped oscillation are a reminder that some real-world dynamics (the arc) are missing. Unfortunately, just as his enthusiasm was rising, your Editor discovered (i.e., was rudely reminded by ATP simulation) that diodes are more demanding. Any forward voltage will result in erroneous reclosure, and continued flopping of the open/close cycle. Power electronics users would not be happy with the Dubé procedure, it was concluded. There is not yet consensus for **this** solution, either --- any more than there was for either CDA or the discussion in Leuven.

Switch opening at peak rather than zero current may be necessary as recognized years ago by Prof. Ned Mohan of the University of Minnesota. His Exercise 10 within his *"Computer exercises for power electronics education"* provides a simple illustration of the trickery required for such cases. Note that interpolation for current zeros is irrelevant in such cases because one can not find what does not exist! Those who see Manitoba-type logic as a panacea are advised to think long and hard about Mohan's Exercise 10. If the diode is not driven in lock step along with the transistor (the switch to ground, which opens at

peak current), disastrous oscillations will result. Last fall, this phenomenon was pointed out to your Editor by Prof. Yoshihiro Murai of Gifu University in Japan.

A new, dependent, non-statistical switch was proposed by your Editor as a result of his detailed consideration of Exercise 10. The idea is simple: why should TACS or MODELS logic be required just to operate a second switch (the slave) at the same time instant as the first (the master)? Upon reading of this idea, Laurent Dubé wrote the following on October 23<sup>rd</sup>: *"I think that so far, switches have been the poor child of EMTP. Not much attention has been put into them. Master / slave dependency is a good and easy place to start. It's a good idea to identify common logic that would have to be done by outside controls, and build in the most frequently-used."* Agreed. Note that none of this has anything to do with either interpolation or modification of the trapezoidal rule. Rather, it concerns the creation of simpler tools for allowing the user to live with the existing trapezoidal rule. The user still must know how to model (vintage Meredith advice).

At BPA, Robert M. Hasibar has used EMTP longer than anyone else; and for a decade or so (prior to the crazy reorganization of 1994), he supervised all such usage within System Engineering. Not a subscriber of the Fargo list server, he first saw that famous Meredith advice after he was given a printed copy of the October newsletter around the end of that month. Apparently he was impressed enough to send your Editor an E-mail message of applause dated November 2<sup>nd</sup>. The following are excerpts of his observations: *"I have been preaching for years what Bob Meredith so eloquently stated: the engineer must **not** ignore physics! The EMTP user must always understand just what he/she is modelling! When we were members of the DCG, I objected to this CDA junk based on this very thing. As Mr. Meredith states, these oscillations are a useful indicator that the model lacks something, namely, **physics**! A switch must have all parts modelled and they include the stray capacitance and other damping elements (switch opening is most critical here) actually present. I realize the arc is also important here, but that's another story, and not applicable to the present consideration. So, even though no one asked me, I vote to leave well enough alone. We sometimes try to do **too** much for the user .... I see any change here as being particularly dangerous to accurate understanding. .... I just have a really strong feeling about this."*

Eventually a copy of Hasibar's letter was sent to Meredith, who produced an even more quotable reaction to the clamor for change. According to E-mail dated December 12<sup>th</sup>, *"We don't need ATP for dummies"* is *"the oft heard (around NYPA) Bob Schultz comment. ... His opinion is that one who is unable to solve a simple switching TRV problem is not qualified to be an engineer."* For those unfamiliar with the reference, IDL Books sells

a popular series of manuals with titles such as "*DOS for dummies*," "*Internet for dummies*," etc.

Oscillation as a single, unqualified term is not of much use. The same name has been loosely applied to what almost certainly are many, different dynamics. This recalls another observation about those list server voters: they seemed never to address, or even acknowledge, the different types of oscillations. It is not obvious that there is a single, best cure for all types. The Dubé proposal might be accepted by some who open circuit breakers, but it was quickly found to be inadequate for circuits involving diodes. It is believed the Manitoba researchers adopted their interpolation because it might have been the only workable solution they could imagine for large numbers of thyristors. Such simulation was their business, and they seem to have been willing to pay the price for their now-famous cure. Well, hvdc is far from the average ATP simulation, and neither BPA nor NYPA has ever had great difficulties. As a result, neither is presently enthused about paying the price, which is believed to be high (assuming the work were to be done properly, and in all generality).

Smaller time steps will **not** solve the problem of the hanging inductor, it should be emphasized. This was proven on page 6A-15 of the ATP Rule Book. Magnitude of the oscillation is independent of the time step when opening occurs exactly at a current zero. So why the commonly-held belief that smaller time steps will solve trapezoidal rule problems? Your Editor is baffled. An example was seen in mail from Fargo dated September 28<sup>th</sup> when Timothy Rae, a student in Natal, South Africa wrote: "*I am presently involved in the simulation of an HVDC line which has on the odd occasion been plagued by the numerical oscillations. The quick solution to this problem has been to shorten the simulation time step.*" From the description given, it is unclear that the same problem of trapezoidal rule oscillation is involved. If time-step size is too large, all sorts of bad things might happen. For example, commutation failure was mentioned by those Manitoba authors. But this is a different problem than trapezoidal rule oscillation! This is a problem with discretization and interpolation. No doubt about it, assumptions associated with these concepts break down as time-step size increases excessively. But this is true whether or not there are discontinuities of switching. Excessive time-step size is a separate phenomenon that may have nothing to do with trapezoidal rule oscillation as illustrated on page 6A-15.

ATP is being developed for industrial rather than university use. This is another point that must be made. Timothy Rae also wrote the following: "*as a student I would prefer a more user friendly ATP which does not have such oscillations. This will tend towards making it an easier package for under-grads and post-grads to learn and use as a simulation tool. Such an oscillation feature would make ATP a more user friendly package.*" Yeah,

well, I suppose students might enjoy free lunches, too (joke)! One problem with Prof. Mork's Fargo list server is that it seems to have created an artificial sense of participation --- even empowerment --- on the part of some. As a general rule, the most opinionated and vocal voters (e.g., "the program is broken; I vote to fix it!") seemed to be less experienced, less comprehending, and less mature. One last time: ATP is not being developed to make life easier for students, and there is little sympathy for those who ignore snubber circuits that exist physically. As one experienced user wrote privately on September 24<sup>th</sup>, there is reason to worry about the quality of education received by students of any professor who might choose to avoid the real-world necessity of snubber circuits (joke)!

Logic to interpolate for switch current and voltage zeros, and a special half-step to suppress oscillations, have been added to ATP for test purposes as explained in a separate story. This work began on September 24<sup>th</sup> as first was revealed outside of BPA in E-mail to Japan dated October 15<sup>th</sup>. The procedure remains severely limited and experimental, however, and is not yet (and may never be) available for use by the general public.

*"This is the challenge: describe a configuration -- as small and simple as possible, please -- for which ATP is unsuitable."* Thus began the paragraph about Dr. Kurt Fehrle's contribution to the analysis three months ago. Is it any surprise that not a single such attempted description has been seen on the Fargo list server? Those who were so quick to demand publicly the assistance of others did not bother to contribute a single response to the challenge, as far as your Editor knows. Particularly following the added insight of preceding paragraphs and the separate story about interpolation, it is difficult to take that famous public clamor seriously. Gabor Furst mentioned the small size of the initial noise. Now we are down to zero percent of the two percent, and that **is** nothing!

Roger Argenal was heard from again, however. Is any reader surprised? Uncharacteristically restrained following Prof. Bruce Mork's warning of October 17<sup>th</sup> (see story about E-mail), Mr. Argenal's contribution dated October 20<sup>th</sup> began as follows: *"I have decided to not reply to Scott Meyer's comments in his Newsletter at this time. .... Maybe the day when someone sets up a Scott. Meyer.differences.with.everybody forum or newsletter where everyone can air their not so nice views of this individual I will."* Yes, Mr. Argenal does seem to have plenty of not-so-nice views about many things, including modeling. In the middle can be found several half-baked arguments. For example, *"I think we all agree with the following statements: 1. What we are trying to do with EMTP, in all of our simulations, is to find the solution of a differential equation via a numerical method."* No, we do **not** all agree. The most common complaint about trapezoidal rule oscillations does not concern any particular differential equation. Certainly the equation of

an inductor,  $v = L * di/dt$ , poses no difficulty. Rather, the trouble concerns switching -- points where there are no derivatives. What are the differential equations that represent an ideal switch? This is another challenge, and your Editor did not need to wait for Dr. Kurt Fehrle to propose it, either! The problem is not with differential equations of components, but rather with ideal switching. But this is not the fault of the trapezoidal rule. An alternative viewpoint is to consider the problem as one of interpolation, which breaks down at discontinuities, of course. The discontinuities, in turn, are the natural consequence of discretization and the conditional algebraic (not differential!) equations of an ideal switch. Finally, the algebraic equations of an ideal switch are the fault of overly-idealistic modeling (vintage Meredith advice).

Roger Argenal ended his contribution on October 20<sup>th</sup> with an idea that MODELS might be used. "*.... can one create such an effect using MODELS? If someone thinks that it can be done, please advise me. I am looking forward to any suggestions.*" Well, there was encouragement --- not from author Dubé, of course, but rather from another voice among that vocal 2%. carl-hein ("*i write in small letters because i do not want to attract any attention*") mostert wrote the following on October 21<sup>st</sup>: "*i am of opinion that you might be able to use the type 94 'black box elements' to replace a models controlled switch.*" Later that same day, Mr. Argenal responded to Mr. Mostert as follows: "*I will start 'digging' for material in the next few weeks. I have no experience with models but I sure look forward to learning it now that it might provide a way of reducing the numerical oscillations. I will keep in touch by private means. If we make serious progress, I think we should keep the server informed.*" Your Editor does, too; but **only if!** January 4<sup>th</sup>, the watch for progress in Calgary and Stellenbosch continues. It should be particularly interesting to consider how Mr. Argenal's Type-94 idea might be applied to the more than 24 valves and thyristors that are closely connected together on each pole at each end of BPA's dc line to California (see HVDC.ZIP on the Salford DBOS disk). Yes, this is another challenge for Mr. Argenal, assuming he has not lost interest.

Prof. Cheng-Tsung Liu of National Sun Yat-Sen University in Kaohsiung, Taiwan, made an unexpected announcement on the subject in public E-mail of the Fargo list server dated October 22<sup>nd</sup>. His contribution from address [liu@ee.nsysu.edu.tw](mailto:liu@ee.nsysu.edu.tw) included the following: "*we have a paper submitted to the coming PES '96 winter meeting regarding the technique to eliminate all the numerical oscillation problems commonly generated in the switching circuit simulation. .... We can avoid all of such problems by properly using the type 94 model and the Dm algorithm we developed combined together (Dm is showing in the Oct. '94 issue of IEEE Trans. of PWRD). Please just be patient, hopefully you can get all the solutions in PES'96 winter meeting if our paper is accepted.*" Only one public response was seen. This was

from Roger Argenal, who wrote two sentences: "*I look forward to reading your very important paper. Thank you for drawing my attention to it, I am sure I will enjoy the reading.*" Needless to say, your Editor is not at all convinced, and does not have a clue what this is about. For the record, he remains **extremely** skeptical.

Arcs within or outside of circuit breakers or fuses are worthy of some explanation. It is possible Prof. Liu might be considering this special, simple case. Also, one of the less-illuminating comments of that spontaneous voting last September might have concerned arcs. Carl-Hein Mostert of the University of Stellenbosch in South Africa wrote the following paragraph in public E-mail of the Fargo list server dated September 19<sup>th</sup>: "*My study leader has just been in Europe and was actually told by Van Dommelen that the ATP 'cannot simulate switching correctly.' What is happening to the European ATP community which if I'm not mistaken was under Van Dommelen?*" Your Editor has not yet addressed the first sentence, although he immediately responded to the second: "*Don't you read newsletters? ....*" About switching, it should be emphasized that the average user who complains about switch modeling typically does **not** want to "*simulate switching correctly.*" This is an important point, and it brings us back to the advice of Robert Meredith. Stray elements in and around the switch sometimes must be modeled, if one wants a good approximation to transients in the vicinity. For an arc in air, or in a controlled medium (circuit breakers, fuses, etc.), the dynamics of that arc, too, might be represented. But this is not new. Ten years ago, Prof. Mustafa Kizilcay, then a doctoral student at the University of Hannover in Germany, contributed illustrations to the ATP user community as documented on comment cards of DC-43. These data use TACS to represent dynamics of the arc, although MODELS seems to be Prof. Kizilcay's more recent choice (e.g., see his paper in the May/June, 1994, issue of ETEP). If one really wants to "*simulate switching correctly,*" this is an illustration of what might be required. For transistor switching, there is the possible model that was contributed by Prof. Naoto Nagaoka of Doshisha University in Kyoto, Japan (see the second subcase of DC-30). To summarize, it makes no sense to represent a physical switching device by an ideal switch, and then to complain that ATP might not "*simulate switching correctly.*" Of those two alternatives given by Robert Meredith in the preceding newsletter, do not forget the second ("*... or learn to model*").

Massimo Ceraolo of the University of Pisa in Italy began his public E-mail on October 17<sup>th</sup> as follows: "*As I understand from the Oct. issue of CanAm News, the question if modify the algorithm of ATP in order of reducing or eliminating numerical oscillations is over. After all, the suggestion to disregard Mr. Argenal's proposal was well supported by several people, among which shines Mr. Meredith.*" This illustrates an entirely new type of miscomprehension. Recall that the long story

last time ended as follows: "Substantially more could be written on the subject of numerical oscillation .... Look for a continuation in the January issue." Possibly Mr. Ceraolo did not read this final sentence, or does not understand what *continuation* means? In any case, what does the possible rejection of any one particularly bad idea (e.g., from Roger Argenal) have to do with whether or not ATP might change? Unfortunately, misinformation and/or disinformation that is spread by the Fargo list server has slowed real understanding. Each issue of the newsletter has been limited to 20 pages, and any page that must be used to refute misinformation about ATP is a page that is lost to technical details. If the Fargo rabble could demonstrate some self-restraint, they might learn more (about the control of ATP oscillations) quicker.

A lot more could be written, about an idea that has evolved in response to constructive private feedback from Prof. Yoshihiro Murai of Gifu University in Japan. It was Prof. Murai who first stated the need for *on-line bridge thyristor selection* --- a term that meant nothing to either your Editor or Prof. Ned Mohan. Eventually the need was understood, however --- and perhaps satisfied, at least in part. *Dynamic current redirection* is the name of a new technique that has been developed to assist those who want to switch at peak rather than at zero current. An example is transistor turn-off, which today can be modeled using a GIFU switch. Details next time.

## Macintosh ATP by Stu Cook

Stu Cook of JUST Services in suburban Montréal, Québec, Canada, has been compiling new Macintosh ATP FORTRAN using the Language Systems compiler on his Apple Quadra (a Motorola 68040-based Mac). This is a continuation of the story in the April and October, 1995, issues.

That PowerPC expansion card (see the April, 1995, story) still does not support ATP properly, but it **does** support an old version of BPA's load flow program. This good news was learned during a December 28<sup>th</sup> telephone conversation. The board runs at 50 MHz, which is twice the speed of the Quadra motherboard. A cooperating dealer allowed Mr. Cook to test compilation using a new 120-MHz Power Mac. Compilation speed using this new hardware was about 5.5 times that of the expansion card.

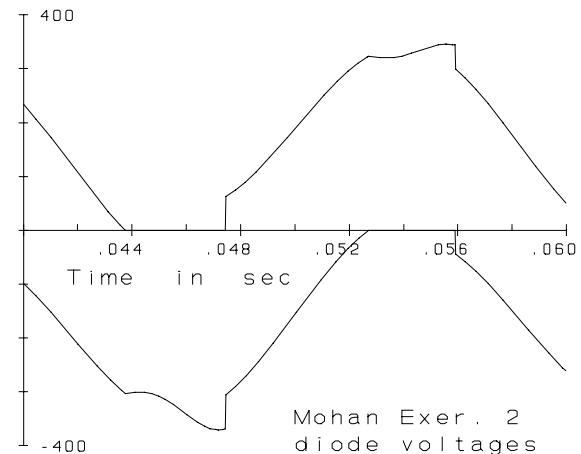
## Testing Interpolation and Half-step

Interpolation to estimate zeros of switch voltages and currents, followed by a special half-step to suppress possible artificial oscillation of the trapezoidal rule, is available for experimentation using Salford EMTP for Intel-based PCs as this story is being written at the end of October.

Limitations of the new code are severe, so should be carefully understood at the outset. Changes have been made for lumped, series-RLC elements only; they ignore rotating machinery and control system modeling (TACS and/or MODELS) entirely. As a result, thyristors can **not** be represented. But diodes can, and this is enough to begin the consideration of Prof. Ned Mohan's *"Computer exercises for power electronics education."*

Interpolation is linear, and this is clear enough. A real (exact) half-step then is estimated by averaging a full step. Note this differs from the procedure described by those Manitoba authors. Not appreciating the significance, your Editor decided not to resynchronize with the original time discretization. Instead, he chose to use a perfect half-step, which seemed more likely to kill immediately those unwanted, artificial numerical oscillations.

Truly amazing improvement can be reported for Mohan's single-phase Exercises 1 and 2. Since the second of these is simpler (it has 2 diodes rather than 4), it will be used for illustration. After removing the damping resistor  $R_p$  across the source inductance, and also both snubbers, waveforms become perfectly smooth between vertical discontinuities at switching instants:



*Chatter* was the name applied to artificial numerical oscillation of the trapezoidal rule. Those Manitoba authors defined this term as *"time step to time step numerical oscillation."* Well, curiously, the interpolation and half-step that were so effective for single phase do not eliminate all chatter in all 3-phase circuits. In fact, the first 3-phase circuit that was observed, Prof. Mohan's Exercise 4, continued to exhibit spikes in spite of the remedy. After considerable study, it was concluded that your Editor's logic was not at fault. All remaining chatter is real! To see this, any reader having Mohan's data is advised to study the following switching:

Diode VC to POSC closing after .00840 sec

Diode VB to POSSB opening after .00845 sec

Diode VC to POSC opening after .00850 sec

This is **with** snubbers! The voltage zero of phase C precedes the current zero of phase B for the upper group of diodes. So, the diode of phase C closes. But once

phase B has opened (the following step), the diode of phase C sees a reverse voltage, so it flops back open again. This is the spike --- one for each diode, and it repeats each cycle.

Loss of simulation time is one cost of interpolation and the new half-step. For Prof. Mohan's Exercise 4, a total of 400 steps would nominally be required to simulate to 20 msec using a 50  $\mu$ sec time step size. Well, the new logic that interpolated at each voltage and current zero required 428 steps. While this 7% increase is not big, it would seem to be only the tip of an iceberg. This is for a single bridge of 6 diodes. What happens for industrial-strength usage such as BPA's hvdc intertie to California? As can be seen within HVDC.ZIP on the Salford DBOS disk, Dan Goldsworthy represents all 16 bridges that actually exist. Although time loss for this real-world problem can not yet be measured, it seems obvious that it would be a whole lot bigger than 7%. As the number of valves approaches infinity, the limit is switching on each time step. The conclusion is clear: time loss would be substantial for large data cases. Therefore, your Editor must question point 3 of the Conclusions section of that Manitoba paper ("the use of interpolation .... had a negligible effect on execution time ...."). The only way your Editor can believe the effect to be negligible would be if those Manitoba authors might be wasting a dominant amount of time elsewhere. The loss of simulation time due to interpolation is both inevitable and undeniable. It provides a lower bound on what probably is an even larger loss of simulation speed.

Table dumping, restoring, and interpolation represent additional effort. This was ignored in the preceding paragraph, which considered only the number of steps. Well, each new step should be more costly than each old step, on average; and each new step with interpolation would be more costly still. As a result, simulation speed would be retarded even more than the number of steps by itself would suggest.

Larger time steps was one of the advantages claimed by those Manitoba authors. Your Editor questions this from at least two viewpoints. Quoting from E-mail to Laurent Dubé dated October 31<sup>st</sup>: "If one wanted harmonics, note that spikes dictate a cutoff frequency based on DELTAT. Is this much different than without interpolation? It seems to me that eliminating some but not all chatter would not much change the limits of Fourier analysis, and hence the accuracy of harmonic decomposition. The idea of a larger DELTAT also is compromised, since as DELTAT increases, the cutoff frequency decreases."

"That any of this has much to do with engineering is unclear. Those Manitoba authors show that they can simulate using DELTAT = 100  $\mu$ sec without commutation failure. But why would anyone want to try? The transient analysis itself becomes erroneous. Forgetting about hvdc,

*those who simulate ac transients for a living at BPA (Goldsworthy and Co.) do not use step size as large as 100  $\mu$ sec, generally. .... If DELTAT could be varied, then there might be a big payoff since one might be able to allow settling into the steady state using a larger time step. But interpolation and the Manitoba half step offers no such improvement, note. If accurate simulation of transients on lines requires smaller steps, anyway, where is the big benefit from interpolation? For all the emphasis on that CIGRE benchmark, I see no claim by those Manitoba authors that any engineering consequence resulted from their procedure."* Addendum of November 3<sup>rd</sup>: When this writing was shown to Mr. Goldsworthy, he confirmed smaller time steps for ac simulation at BPA. In fact, he said that 20  $\mu$ sec now is typical!

*"Finally, there are nonlinearities. What good is linear interpolation if the phenomena are nonlinear, and perhaps discontinuous --- even logical as opposed to numeric?"* Later that same day, Laurent Dubé's response to this final point was highly educational: "Your remarks about the discontinuous signals or values makes a strong point against interpolation. This is what is at the root of the whole problem, trapezoidal rule included. The trapezoidal rule uses linear interpolation and therefore does not represent discontinuities well. I remember Guido Bortoni and I having a long passionate discussion about including or not including in MODELS a whole set of logic to deal with and consider differently both signals that are discontinuous and signals that are continuous. We were referring to it as step algebra. Basically it amounts to solving twice at each solution time when a step occurs, equivalent to solving at  $t^-$  and at  $t^+$ . My main counter argument was that, because we are doing discrete-time simulation, **every** new value of a signal is a step! The only way around it is to make a distinction between two types of variables, defining a special type as 'step variables,' and apply the step logic only to those variables and the variables whose values depend on them, and apply interpolation (the regular kind of interpolation done by the trapezoidal rule) to everything else (if there remains anything else!)."

To conclude, interpolation remains interesting. But it also remains costly and specialized. Rigorous treatment for the most general of cases would not be either cheap or easy. As a result, no one your Editor knows is making plans to rush ahead with such changes --- regardless of what those salesmen of EMTDC might be claiming as they attempt to peddle their product around the world.

## Miscellaneous News about Cables

Shunt conductance  $G$  of a cable might depend on frequency. This radical modification of past practice was suggested in public E-mail of the Fargo list server dated November 6<sup>th</sup>. Bruno Ceresoli of ENEL S.p.A. Electric

Research Center near Milano, Italy, wrote the following from [ceresoli@cre.enel.it](mailto:ceresoli@cre.enel.it) : "The study considers high frequency (lightning) phenomena .... The question ... is the modeling of the dependence of the cable conductance with the frequency. This dependence, negligible at low frequencies, seems to be of importance in high frequency ranges (e.g. 1-1000 kHz). An analytical expression that has been suggested as a first approximation is a 2nd-order polynomial:  $G(f) = K * (A * f + B * f^2)$  [S/km] with typical values  $K = 1.2E-6$ ,  $A = 35$ ,  $B = 0.3$  and  $f$ =frequency in kHz. .... The problem is how to model, in the ATP program, this dependence, i.e. a branch whose impedance is a real (not complex) function dependent with the frequency."

Taku Noda, doctoral student at Doshisha University in Kyoto, Japan, answered this inquiry the following day. "For test purposes, you can use the Kizilcay F-dependent element ... you can discretize a cable which you are going to analyze, and put shunt admittances representing your frequency dependence of the cable. I think this must be the fastest way and have enough accuracy. .... I also have a question to your equation. Is it a theoretical equation, or experimental? If it is completely theoretical and based on physical laws, I am very interested in it. ... If it were implemented in CABLE PARAMETERS, you could model it by using J. Marti or Noda setups ...."

CABLE PARAMETERS comes from Prof. Akihiro Ametani of Doshisha University in Kyoto, Japan, as explained in the July, 1994, issue. Well, eigenvalues from CP are **not** always ordered with non-increasing imaginary part as required by Taku Noda's filter (see separate story). This important discovery was made by BPA's Dr. Tsu-huei Liu on December 4<sup>th</sup> when she first produced reasonable agreement between the .CCC files that had been created by both LINE CONSTANTS and CABLE PARAMETERS for the case of BPA's single-circuit (i.e., 3-phase), 500-kV overhead geometry. The solution was to add sorting to CP immediately after the eigenvalue computation in Prof. Ametani's EIGEN .

## Bruce Mork's E-mail Etiquette

Etiquette for use of the Fargo list server (for public E-mail concerning ATP) finally was broadcast by Prof. Bruce Mork. This was on the 17<sup>th</sup> of October, following more public arguing about trapezoidal rule oscillations (see separate story). The rest of this story is from Prof. Mork.

"There have been a couple rounds of volatile 'exchanges' on the list server over the past year. It is time that we remind ourselves what this list server is all about, and preserve this valuable free resource. I hate to send out such a long (almost 60 lines) message, but I suggest that everyone take the time to read this:

*The ATP-EMTP list server is meant to be a self-moderated forum. The purpose for creating it was:*

- 1) Release news from ATP developers;
- 2) Suggest directions for ATP development, report bugs, etc.

3) Provide a forum to share thoughts and ideas on ATP and MODELS usage;

4) Allow ATP users to help each other with specific modeling challenges. The reasons it is a list server and not a newsgroup are:

5) People must identify themselves when they subscribe. With only known professionals having a common interest in using ATP, the 'signal to noise ratio' can be kept much higher than internet newsgroups whose 'contributors' do not have to subscribe, and seem to spend most of their time exchanging cutesy diatribes and rhetoric.

5) The intent is to limit discussions to licensed ATP users, so we can discuss and share information without violating the terms of our license agreement.

6) Subscribers can add and remove themselves from the list, so it is self-maintaining. However, the list 'owner' (me) can step in and remove any subscriber who behaves in a non-professional or unethical manner. So far I have been very lenient, as I understand that everyone can slip up once or twice, and therefore deserves a second chance.

Rules of acceptable behavior have never been specified, and I hesitate to do so. Basically, if common sense and professional etiquette are used, there should be no problem. We want to exchange quality information without the clutter of jokes, insults, self-aggrandizement, etc., that typify the newsgroups.

*To maintain a high quality, common sense would say:*

1) Begin all messages with a short and to-the-point overview. None of us wants to spend any more time reading our e-mail than we have to. Those who aren't interested in the topic can quickly delete it and move on.

2) If you want to write a long discussion on some topic, send it to me and we can put it on the ftp server.

3) Avoid sending out huge data cases to all subscribers. First send a short message asking for help. Send the related data case only to those who offer help. Report the solution later to the ATP community (there are over 300 of us on the listserver). If the case is well-documented, it can then be placed on the ftp server.

4) It is fine to voice opinions, but avoid insulting others in the process (i.e. agree to disagree. We don't have to stoop to the level of lawmakers and throw around thinly-veiled insults of the nature '... my esteemed colleague, who is an idiot if he believes that, but I better not anger him too much because I might need a favor from him later...'). Be professional in your actions, not just your words.

5) Don't 'cry wolf' too often. Getting into the habit of asking other subscribers for help before looking in the Rule Book, asking often for help but never helping others in return, etc., should be avoided. What goes around,

comes around (you'll get back what you put into it).

*I don't want to spend all my time moderating discussions and controlling the subscriber list. That defeats the whole purpose of this listserver. Royalty-free availability of ATP, the efforts of all those who work together to develop ATP (often on a volunteer basis), and the existence of this list server and ftp site (and a WWW site soon to be announced) are resources that none of us wants to lose."*

## Florida Short Course March 11 - 14

Prof. Dennis Carroll of the University of Florida in Gainesville plans to offer his annual ATP short course again this year. The date will be March 11<sup>th</sup> through the 14<sup>th</sup>, and content will follow the reduced format explained in the April, 1995, newsletter. For details, send E-mail to Prof. Carroll at address **dcarr@admin.ee.ufl.edu**

Faculty this year are expected to be the same as last year (see the July, 1995, newsletter). In addition to Dr. Kurt Fehrle and Prof. Carroll, Dr. Yin Yuexin is expected to return from his present home near Atlanta, Georgia.

## Taku Noda Frequency Dependence

LSIZ30 is the limit of a new COMMON block of VARDIM that is used to store integer information for each Noda circuit. The name comes from the fact that LSIZ30 is read from the final field of the third data card of VARDIM --- List number 30. The user simply keys the number of Noda circuits he wants. Internally, there is an addition of one followed by multiplication by three. But this detail, which began November 24<sup>th</sup>, need not concern the user. The default value is 2, and the limiting size in LISTSIZE.BPA is 60.

That minor problem with phasor initialization **was** solved by Taku Noda. The first of 5 subcases of DCN-14 illustrates this for one phase of 500-kV overhead line (a simplified version of DC-37).

LINE CONSTANTS and CABLE PARAMETERS finally have been reconciled by BPA's Dr. Tsu-huei Liu for both single- and double-circuit 500-kV overhead lines. This is for NODA SETUP use (Dr. Liu would compare the .CCC files), and it included the continuously-transposed single circuit as a special case. No, Prof. Dommel's SUBROUTINE TUBE (see preceding issue) is not being used. Instead, Dr. Liu replaced Prof. Dommel's 30-year-old code by Prof. Akihiro Ametani's newer code. This is an important change to the internal workings of LINE CONSTANTS : no longer does it offer independent computation of the skin effect.

Those three guinea pigs outside of BPA have not yet been supplied with the new frequency dependence. Taku Noda decided that he wants to rework his fitter to minimize user intelligence. Your Editor is tempted to make an analogy to HAUER SETUP of 15 years ago: it worked, but only BPA's Dr. John Hauer was easily able to use it effectively for all problems of interest. Too much user intelligence was required. Your Editor has concluded that this might be the present state of Mr. Noda's fitter, so distribution has been delayed to allow Mr. Noda time to rework his fitter.

## Hysteresis Modeling by Type-96

Hysteresis modeling using the Type-96 pseudo-nonlinear element was criticized by both Prof. Bruce Mork of Michigan Tech in Houghton and Robert Meredith of NYPA (the New York Power Authority in White Plains). This was in public E-mail of the Fargo list server dated the 29<sup>th</sup> and the 30<sup>th</sup> of October, respectively. The discussion began with an inquiry by three students from Uruguay.

Prof. Mork: *"We found that the Type-96 element was not able to correctly model/predict ferroresonance over a wide range of core voltages. If operation does not wander too far from rated voltage, the Type-96 works ok. We found that for a single-phase transformer, the Type-98 or Type-93 nonlinear inductance, paralleled with a linear core loss resistance whose value was determined for rated voltage (performance does not seem very sensitive to core loss resistance value), performed much better. More recent work with single phase transformers has borne this out. We are especially concerned with the accuracy of CT models that use the Type-96 element, as core voltage covers an extremely broad range depending on the short circuit current and type of burden attached. For 3-phase transformers, where multiple Type-98 (or Type-93) elements are required to represent the core limbs, model performance becomes much more sensitive to core loss resistance representation. The conclusion is that, at the moment, until some better core representations are developed/verified/ implemented, you should get fairly good results with a Type-98 inductance for the core magnetization. ATP is a very good simulation package to use for this type of simulation. MODELS gives you nearly unlimited possibilities should your modeling work require special user-defined modeling elements."*

Mr. Meredith then wrote as follows about Type-96 logic: *"It is little more than a convenient way to make a steady-state plot look ok; it has little/no transient predictive value. I looked into its behavior several years ago and concluded that the path traced in minor-loop (reduced voltage) operation was severely in error, due to the parallel path tracing approach used. Consequently any residual flux/mmf determined by the model can also*

be assumed to be incorrect. .... The hysteresis phenomenon is a result of the residual mmf buildup and its forced reversal over cyclic operation. The residual mmf can be represented by TACS controlled current injected and removed at the terminals of a type 98 element. .... the principles that I have followed are that the iron must be allocated into several groups of like performing crystals or domains. Each group of crystals can have its 'permanent' (residual) magnetic mmf changed at different flux density levels. Once changed, their orientations (residual mmf components) cannot be reversed except by application of a negative flux density similar in magnitude to that which previously orientated it. The sum of the residual mmfs of all the groups represents the net mmf of the iron core. A demagnetized sample is one with either none of the groups having a residual mmf or simply a balanced number of groups having opposing mmfs, as results from the application of decreasing cycles of applied external mmf. .... I might add that representing hysteresis in any kind of detail has caused me to use several hundred TACS variables, which tends to make a simulation run ten times as long as otherwise. .... This probably a long way to advise you to never use the type 96 element, unless you are really desperate for any kind of a wrong answer rather than no answer at all."

In defense of the much-maligned Type-96 element, one should mention that it allows residual flux. Yes, current sources controlled by TACS might produce the same effect (Mr. Meredith's idea), but such usage is rather low level and complicated for the average user. As for the prediction of terminal flux in transformers at the ends of transmission lines that are disconnected, this was the great deception during 1979. Forgetting about the Mork and Meredith criticism, terminal flux simply was too sensitive to Type-96 and other network parameters that were not known precisely. For 17 years, your Editor has made the analogy to a roulette wheel. The familiar classical equations involving inertia and friction might be applied to predict the final position, but uncertainty is too great for this to have any practical use. Modeling of the weather is another such example. Conclusion: beware of the use of models that are oversimplified.

## Miscellaneous Intel PC Information

Pentium Pro seems to be the name Intel has chosen for its next generation of x86 processor, which had been code named P6 (i.e., 80686). The skeptical, surprised reader can only conclude that this latest generation does not represent as much of an improvement as preceding generations did. Has improvement finally slowed?

A \$400 PC to run Salford EMTP and TPPILOT? Yes, in the form of a slow 386 SX. Thus began a short paragraph in the preceding issue. Three months later, the

slow can be omitted if one is willing to pay another hundred dollars. Page 291 of the November issue of *Computer Shopper* is filled with various bargains from that same Dollar Computer Corporation. One of the boxes reads as follows: "Compaq desktop with VGA color monitor. 486 DX / 25 MHz; 4 MB ram; 120 MB HDD; 1.44; 101 keyboard; VGA card. \$499."

WordPerfect was acquired by Novell as mentioned in the July, 1994, newsletter. Well, some 16 months later, it seems apparent that the purchase was a disaster for both companies. "Novell will quit Word Perfect business" is the subject of an Associated Press story that was being circulated via BPA E-mail on October 31<sup>st</sup>. Essentially the same story was found on page B14 of *The Oregonian* that same day. There is some similarity to what happened to DR-DOS, as explained in the October, 1994, issue: "Novell said it would quit developing personal productivity software and try to sell the business applications division, which includes the hallmark Word Perfect that was once the biggest-selling word processing software. .... The decision sent Novell's stock rising. Novell said it has decided to focus on networking software, its core business. .... Novell acquired Word Perfect for \$855 million in June 1994. .... With those purchases, Novell positioned itself to compete directly with Microsoft in applications software. .... And Novell changed its senior leadership. Founder Ray Noorda retired as chief executive several weeks after making the Word Perfect and Borland deals but before they were officially completed. New chief executive Bob Frankenberg expressed his commitment to the acquired businesses, publicly speaking out on new products. But in recent months, he has acknowledged troubles the company has had making new versions of Word Perfect and Quattro Pro to work with Microsoft's Windows 95 operating system." Yes, he who controls the operating system (Bill G.) has an obvious advantage.

PostScript printers are cheap enough these days. \$300 is the Tredex price seen on page 761 of the January issue of *Computer Shopper*. The description reads as follows: "Panasonic 2 MB Postscript Laser (Not InkJet). Quality LED Printer. 300 dpi; 4 pages per minutes; Adobe Postscript." To conclude, that dynamic duo of NYPA (Meredith and Schultz) might have provided an expensive solution years ago, but prices have dropped in the interim. It is hard to recognize any PostScript penalty in that Tredex price. There still remains incompatibility with cheap publishing software such as WP 5.1, however.

## Miscellaneous Small Items

Free printed copies of the 20-page October newsletter were mailed by First Class (air) to 9 Canadian and 73 American addresses on November 9<sup>th</sup>. Included was an advertising sheet for the Japanese IEE Power & Energy '96 Conference at Osaka University on August 7-9.