

CST *Bulletin* 3

Mededelingen van Computersystemen en Telematica voor de computergebruikers aan het CWI.
Verschijnt onregelmatig. _____ Aflevering 3 dd. 29 april 1988.

INHOUD:

1. Modems, modems, modems ...
2. \TeX and ditroff
3. New Sun Workstations at the CWI
4. Kinetics FastPath: AppleTalk-Ethernet gateway
5. Macintosh II
6. Ftp
7. Backups
8. Unused equipment
9. Networks
10. Troff and Encapsulated PostScript files

1. Modems, modems, modems ...

Every so often people come and ask me if they can get a modem from the CWI for use at home. Usually the answer is yes, but every so often the answer is: no, we don't have modems (or terminals) in stock; modems have to be ordered and paid from the regular budgets, so money has to be reserved for them.

Up to now some 40 modems have been made available for use at home. With such a large number around one would expect a lot of people working during evening hours (and perhaps even nightly for the real fanatics); however, quite the opposite is true: if at any given time more than 10 people are working from home, it's a record! So one starts wondering what all those modems are used for...

Anyway, in last year's budget money was reserved for another (large) number of modems. Since, however, by that time it was already clear that 1200 bps modems were rapidly becoming obsolete (not to mention 300 bps modems) and promising new, higher speed modems were appearing on the market, it was decided that we should not order new 1200 bps modems right away, but instead get some of those new types for evaluation. That took much more time than we had expected, mostly because we couldn't readily obtain test modems.

Then, while we were testing some modems, another new modem appeared on the mar-

ket: expensive, but with a very high speed. So we decided to include that one in our tests, too. And indeed it turned out to be worthwhile and — because of special arrangements that could be made with the distributor — affordable. That modem was the Telebit Trailblazer (I'll use the abbreviation TB for it). In the following paragraphs I'll explain why the TB modems were chosen and what our further plans are.

First, what are the main differences between the TB and the other modems that make the TB so attractive? To explain that I have to go into some technical detail, comparing the newer modems (except the TB) with the current 1200 bps modems:

- The current 1200 bps modems suffer from line noise: a telephone line that is noisy may cause spurious output characters on your screen, insert kill characters into your input stream (killing a process you may be running) and other nuisances. A *very* noisy line will even make it impossible to do some work. The newer modems we tested have features like error correction and retransmission, which make them work better on noisy lines.
- The newer modems offer higher speeds, some of them up to 4800 bps, by making use of an additional feature: data compression. However, all of them have a basic speed of 2400 bps and the data compression algorithms used are rather simple, so an effective speed of 4800 bps is an exception rather than the rule. For interactive use you won't notice it, but with file transfers to/from a PC you sure will.
- Unfortunately the newer modems use basically the same techniques as the 1200 bps modems; e.g. they make use of two carriers, one for the transmitted data, one for the received data. That makes them susceptible to line noise too. Error correction and retransmission can compensate for that somewhat, but never fully. So what you'll see is a rapid slowdown of the effective speed, up to the point where (on *very* noisy lines), it is virtually impossible to work.
- The newer modems are obviously more expensive than the 1200 bps modems; the more features and the higher the speed, the more expensive they are. There are even true 9600 bps dialup modems on the market now, but those are hellishly expensive (about Dfl. 8000.— !)

Now: what makes the Trailblazer modems so special? Well, here's an overview:

- They don't use 2, but 512 (!) different carriers, each of them only 7 Hz (!) wide. Each of the carriers carries few bits; how many is determined 'on the fly' based upon the condition of the telephone line. What makes this interesting is that a noisy line is usually characterized by 'dips' in the frequency spectrum. The consequence is that on noisy lines the TB, by simply switching off a few of its carriers, can easily compensate for such lines, with only a very small drop in effective speed!
- The basic line speed is 18000 bps. However, since the modems on both sides use the same carriers — as opposed to other modems — there has to be a mechanism to prevent interference. This is done by having them work in 'half duplex with line turnaround' mode, i.e. only one modem is sending at a time, the other receiving, and after a given period the roles are reversed. That turnaround is done very frequently, but even so it's of course not possible to get 18000 bps

effective speed. In practice the maximum effective speed is around 14000 bps, which is still more than the very expensive 9600 bps dialup modems.

- A special protocol is run between the modems, that transfers the data in packets and that provides error correction and retransmission.
- They provide data compression, not using simple algorithms, but using full Lempel-Ziv data compression (like it is used by the 'compress' program under Berkeley Unix).

Needless to say that this all requires quite some CPU power. Therefore the TB modems are equipped with nothing less than a 68000 processor plus a bunch of RAM. This has a funny implication: since the modems are also available as plug-in cards for PC's, when you plug such a card into a PC, you may well have more processing power on the modem card than on the processor card itself!

A drawback of the operating mode and packet protocol used by the modem is that the effective speed is quite dependent on the application: e.g. trying to run another packet protocol across these modems, especially a protocol that uses small packet sizes, will result in a low effective speed, because the external protocol cannot be 'synchronized' with the internal line protocol; in that case one may even have to go back to 'V.22 compatibility mode', in which the modem is compatible with V.22 (1200 bps) and V.22bis (2400 bps) standard modems; in V.22bis mode it even provides a more or less standardized error correction and retransmission protocol (MNP) that quite a number of V.22bis modems now have (but not the ones used by SARA). To overcome this problem, even more use is made of the available CPU power: the modem has 3 special protocols in their firmware: Xmodem/Ymodem, Kermit and UUCP. These internal protocols are highly synchronized with the internal line protocol; it is with these protocols (together with data compression) that effective speeds of 14000 bps can be attained. That means it's an ideal modem for people doing frequent file transfers to/from PC's at home.

Another drawback is that interactive mode is somewhat 'viscous': because every character you type in has to go through the process of packetizing, echo, and line turnaround, the echo is delayed. It 'feels' like working with a PAD over a packet data network. But you get used to it very quickly. In the latest firmware revision level this problem has been almost eliminated, but we don't have that level yet in the TB's we've now received; we expect to get it rather soon though. The latest firmware has another interesting feature: it makes it possible to effectively run SLIP (Serial Line IP) over a Trailblazer link. That is very interesting for PC's: by running SLIP, your PC at home effectively becomes a (temporary) host on the CWI-LAN and you can do all things like telnet, ftp etc.

Well, from the above it should be clear why we have chosen the Trailblazer modems, even though they are expensive (but still less than half the price of a 9600 bps dialup modem). Another reason is that we could get them for a price considerably lower than the normal list price: because the modems have the UUCP protocol built in, they are ideally suited for all EUnet sites that now use 1200 or 2400 bps modems. Together with the NLUUG we have managed to get a special deal (about 25% discount) for every Dutch EUnet site from the Dutch supplier.

Still, some people won't mind low speeds and prefer more modems over fast modems. It's here that we come across another problem we've been facing for a very long time already: all dial-in lines now go via SARA. Apart from the fact that there have been lots of problems with those lines, SARA considers them as 'internal lines' and thus they feel free to take them down when the SARA systems are down, without even notifying any of us! That makes it impossible to work from home then; specifically that's the case on Monday evening. Apart from that, SARA did not want to make Trailblazer modems available on their dial-in lines.

It's the combination of these factors that made us decide that we would go for our own dial-in lines on a special group number for the CWI, fully equipped with Trailblazer modems. In first instance that number will have 16 lines with TB's on them and will be meant only for those that have a TB at home. Later the number can be expanded and will be opened also for those who have some other modem at home. Thus the dial-in will gradually be moved from SARA to our own resources; that will even save us some money...

We have now received the TB modems we ordered from last year's budget. Based on the results of the inquiry we made to get an idea of the sort of use and of the frequency of use, we'll hand out TB modems, combined with a redistribution of the modems currently in use. So some people will get a TB modem in exchange for the modem they have now, which will then be given to others.

Now, to come back to the point of 'trailblazers are nice, but we want more modems, even if they are low speed ones'. Well, it's true that there **are** real cheap modems (up to 2400 bps) on the market. But they lack all the features that make the newer modems so nice: specifically they lack error correction and re-transmission, and it remains to be seen how they will perform on long distance calls, a weak point of most cheap modems. However, if even with the large number of modems that will be available now, there still would be a need for cheap, low speed modems, we would buy them, but only on special request; users of those modems will be restricted to using the SARA modem pool, since we won't have enough dial-in lines available ourselves. The disadvantages of that are known now.

One last point: the CWI has always been and will be the first to try and use innovative equipment. The Trailblazer modems are real innovative, state-of-the-art modems. That too was a reason to choose those modems.

And before I end this story, may I once more remind you that **all** modems and terminals/PC's used at home **must** be registered with the Financial Department. Failure to do so means you are **personally** responsible if anything happens to the equipment you have at home; if it's registered, it falls under the insurance of the CWI. Also, if you don't need your home modem/terminal/PC anymore, you **must** hand it in to CST again; you are **not** allowed to give it to anyone else yourself; if you do, it implies you're again **personally** responsible for the equipment.

Piet Beertema (piet@cw.nl)

2. TeX and (di)troff

The text processing work-group of the OCV has decided that both TeX and (di)troff will be supported at the CWI. This means that, after a short start-up period, TeX will be available for use, and support will be available to users from STO. Also, it is expected that sometime later this year the typing-room will have typists who know TeX. CST expects to have TeX installed and supported on all of our machines by the end of the summer. The time between now and then will be a transition period; during this time there will be trial installations on some machines, which people will be welcome to use. At the same time, CST and STO will be working to build up expertise in maintaining and supporting the TeX system.

As you probably already know, TeX is a formatting system similar (in function) to troff or ditroff. TeX does high-quality formatting, particularly of mathematical equations. It is becoming a de-facto standard in the academic world: a TeX document written in one place can be printed in any other place, so it is likely that in the future, more and more documents will be made in TeX format.

One major difference between ditroff and TeX is that TeX uses its own fonts, not the normal fonts on the printer. Because of this, TeX documents cannot be printed on all printers, but only on those printers which have (or can read) the TeX fonts. At the CWI, this means that TeX output will be available on all the laser printers, but, initially at least, *not* on the Harris Phototypesetter. The laser printers print TeX documents by reading descriptions of the TeX font characters with each document. This is slower than printing ditroff documents, particularly for short documents. In the future, CST hopes to make TeX output to the AGFA laser printer much faster by making the TeX fonts permanently loaded on the printer; for now, however, expect that TeX output on all the laser printers will be slow.

In its plain form, TeX can be very hard to understand and to use, just like ditroff (in fact, it is even more complex than ditroff). But, just as ditroff becomes much easier to use when you add a macro package such as 'ms' or 'mm', the same is true of TeX. There are two widely used macro packages for TeX: L^ATeX and AMS-TeX. CWI will support a standard macro package for TeX; it will probably be L^ATeX or something very similar to L^ATeX. Hopefully, most users will never have to learn much about plain TeX. (Plain TeX will be provided, however, for those who have special needs, such as printing documents from outside the CWI. But 'non-standard' TeX will have less user support.)

To give an idea of what a TeX document looks like, what follows is an example of almost the same text in both ditroff and TeX. First is ditroff, using dieqn and the 'ms' macro package. Then is TeX, using the L^ATeX macro package.

Denise Draper (denise@cwil.nl)


```
.EQ
delim $$
.EN
.LP
Paragraphs begin with macros like ".PP" or ".LP".
.LP
Text can be \fIitalic\fp or \fBbold\fp.
.LP
Inline mathematical formulas are easy to produce,
such as $ x-3y ^{-7} $ or
$ p_{prime}(n) = \lim_{m \rightarrow \infty} \sum_{\nu=0}^{\infty} (1 - \cos^{2m}(\nu! \pi / n)) $.
.LP
Mathematical formulas may also be displayed:
.EQ
left ( { x_{prime} + y^2 } over { ( x + y )^2 } right )
= sqrt { z_{prime} }
.EN
A displayed formula is one line long;
multiline formulas require special formatting
instructions.
.LP
An example of a more complicated, multiline, formula:
.EQ
left ( \int_{-\infty}^{\infty} e^{-x^2} dx right )^2
mark ~ = ~ \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} e^{- (x^2 + y^2)} dx dy
.EN
.EQ
lineup ~ = ~ \int_0^{2\pi} \int_0^{\infty} e^{-r^2} r dr d\theta
.EN
.EQ
lineup ~ = ~ \int_0^{2\pi}
left ( left "" - {e^{-r^2}} over 2
right |_{sub {r=0}}^{sup {r=\infty}}
right ) d\theta
.EN
.EQ
lineup ~ = ~ \pi .
.EN
```

the ditroff sample input

Paragraphs begin with macros like ".PP" or ".LP".

Text can be *italic* or **bold**.

Inline mathematical formulas are easy to produce, such as $x - 3y = 7$ or

$$p'(n) = \lim_{m \rightarrow \infty} \sum_{r=0}^{\infty} (1 - \cos^{2m}(r!^n \pi / n)).$$

Mathematical formulas may also be displayed:

$$\left(\frac{x' + y^2}{(x + y)^2} \right) = \sqrt{z''}$$

A displayed formula is one line long; multiline formulas require special formatting instructions.

An example of a more complicated, multiline, formula:

$$\begin{aligned} \left[\int_{-\infty}^{\infty} e^{-x^2} dx \right]^2 &= \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} e^{-(x^2+y^2)} dx dy \\ &= \int_0^{2\pi} \int_0^{\infty} e^{-r^2} r dr d\theta \\ &= \int_0^{2\pi} \left[-\frac{e^{-r^2}}{2} \right]_{r=0}^{r=\infty} d\theta \\ &= \pi. \end{aligned}$$

the *ditroff* sample output

```

\documentstyle{article}      % Specifies the document style.
\begin{document}            % End of preamble and beginning of text.
\parindent 0pt              % Make paragraphs flush left.

```

One or more blank lines denote the end of a paragraph.

Text can be {\em italic} or {\bf bold}.

Inline mathematical formulas are easy to produce,
 such as \$ x-3y = 7 \$ or

$$p'(n) = \lim_{m \rightarrow \infty} \sum_{\nu=0}^{\infty} (1 - \cos^{(2m)}(\nu!^n \pi / n))$.$$

Mathematical formulas may also be displayed:

```

\begin{displaymath}
\left( \frac{x' + y^2}{(x + y)^2} \right) \sqrt{z''}
\end{displaymath}

```

A displayed formula is one line long;
 multiline formulas require special formatting instructions.

An example of a more complicated, multiline, formula:

```

\begin{eqnarray*}
\left( \int_{-\infty}^{\infty} e^{-x^2} dx \right)^2 \\
&= \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} e^{-(x^2 + y^2)} dx dy \\
&= \int_0^{2\pi} \int_0^{\infty} e^{-r^2} r dr d\theta \\
&= \int_0^{2\pi} \left( -\frac{e^{-r^2}}{2} \right)_{r=0}^{r=\infty} d\theta \\
&= \int_0^{2\pi} \frac{1}{2} d\theta \\
&= \pi.
\end{eqnarray*}
\end{document}          % End of document.

```

the \LaTeX sample input

One or more blank lines denote the end of a paragraph.

Text can be *italic* or **bold**.

Inline mathematical formulas are easy to produce, such as $x - 3y = 7$ or $p'(n) = \lim_{m \rightarrow \infty} \sum_{\nu=0}^{\infty} (1 - \cos^{2m}(\nu!^n \pi/n))$.

Mathematical formulas may also be displayed:

$$\left(\frac{x' + y^2}{(x + y)^2} \right) = \sqrt{x''}$$

A displayed formula is one line long; multiline formulas require special formatting instructions.

An example of a more complicated, multiline, formula:

$$\begin{aligned} \left(\int_{-\infty}^{\infty} e^{-x^2} dx \right)^2 &= \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} e^{-(x^2+y^2)} dx dy \\ &= \int_0^{2\pi} \int_0^{\infty} e^{-r^2} r dr d\theta \\ &= \int_0^{2\pi} \left(-\frac{e^{-r^2}}{2} \Big|_{r=0}^{r=\infty} \right) d\theta \\ &= \pi. \end{aligned}$$

the *L^AT_EX* sample output

3. New Sun Workstations at the CWI

As may be known to a number of people, the number of Sun workstations at the CWI has rapidly increased in the recent past, and will continue to grow in the future. In line with the long term goals of the CWI, we are working toward a model of having a Sun-class workstation on the desk of every researcher who wants one. With this in mind, we hope to offload users from the VAXen and *piring*, and reserve these machines for special purpose computing needs. Of course the rate at which these changes will occur depends on the funding we receive for equipment.

Many users who have newly acquired accounts on these workstations expect the same services and conveniences which are available on the VAXen and *piring*. Unfortunately, we are not yet able to provide an ideal computing environment on the Suns for the reasons outlined below. Due to this, the Sun users have been allowed to keep their accounts on the VAXen and *piring* so that they can continue to do useful work. The Suns are therefore available on an experimental (pre-release) basis, but without full support.

The majority of the Suns at the CWI are *diskless clients*. This means they have their own CPU, but their files live on another machine (called a *fileserver*) and are made available over the network. Therefore all the programs running on a workstation (including the UNIX system itself) live on a fileserver. All of the files you access are actually stored on a disk on one of the fileservers, which may or may not be the one where the system files you access are stored. What might be called the beauty of the system is the fact that all of this is invisible to the user. When you login on one of the diskless workstations, it appears that all of the programs you use and files you access are stored on your own UNIX system. The disadvantage of this setup is that it generates a substantial increase in ethernet traffic.

We are currently too short on fileservers and disk space to fully support all the clients we have. Sufficient fileservers and disks have been ordered but experience tells us it will be some time before they arrive. This means that there may be some delay before many programs can be made available on the workstations. We expect a reasonably stable Sun environment by the middle of this summer.

We currently have the following kinds of Sun workstations in house: 3/50 with monochrome display terminal (19"), 3/75 with monochrome display terminal (19"), 3/160 with a color display terminal (19"), 3/160 standalone (with disk storage) with a color display terminal (19"), 3/60 with monochrome display terminal (19"), 3/60 with color display terminal (19"), 3/60 with a color display terminal (16"), 3/160 fileserver, and a 3/180 fileserver. The current Sun client models (3/60 and 3/160) are available in both the 16" and 19" models and in monochrome and color. The 3/60 is available only as a diskless client while the 3/160 can be a client, or a standalone (or fileserver) with it's own disk

storage. In the near future, we will acquire another fileserver, extra disks for the others, as well as a Sun 4 for experimentation, which will perhaps eventually act as a fileserver. In the longer term we will buy the faster 3/260's and 3/280's and/or Sun 4's as fileservers.

From the user's point of view, the biggest difference between working on a Sun and working on a terminal connected to a large time sharing machine running the UNIX 4.x BSD operating system is the window system available on the workstations. This allows multiple activities to be managed simultaneously, each of them in a different window. We have made copies of the Sun manual for the window system (*Windows and Window Based Tools: Beginner's Guide*) which can be picked up in my office (M351).

It should also be stated that until the new network is installed we will not be able fulfill requests to install the workstations in private offices. They will instead have to stay in places with easy network access to the computer room, such as the terminal rooms on the 2nd and 3rd floor. During this short-term situation, note that Suns that had been ordered specifically for individual projects will be shared by all Sun users. If you are using a Sun with special features (either a color monitor or special language support), please limit your use to those periods when no one else needs those facilities. Accounts will be granted to people who want to try one of the workstations before deciding whether or not they should order one, but this sort of 'exploration' should be confined to periods of general inactivity.

We are currently collecting suggestions and requests from users regarding the programs need and/or desire on the Suns. These suggestions can be sent to me either via electronic or interoffice mail. Those requests that can be fulfilled in the short term will be, and those that can not be will be taken into account in long term planning. All requests will be acknowledged by electronic mail.

Carol Orange (orange@cw.nl)

4. Kinetics FastPath: AppleTalk-Ethernet gateway

Sinds kort beschikt het CWI over een tweetal Kinetics Fastpath gateways. Deze kleine doosjes met een M68000 cpu aan boord, maken een verbinding mogelijk tussen verschillende AppleTalk netwerken, via het Ethernet. Hierdoor is het bijvoorbeeld mogelijk om bij een Macintosh op het ene AppleTalk netwerk, een LaserWriter op het andere netwerk te selecteren en daar documenten op af te drukken.

Ook nu al mogelijk is het gebruik van Telnet op een Mac. Dit programma zoekt via de FastPath gateway over het Ethernet contact met een opgegeven host (*piring, boring, ober, etc.*), om aldaar een terminal sessie te starten. Voordelen hiervan zijn een in principe snellere verbinding (tot maximaal 9,6K bps), alsme-

de een snellere mogelijkheid om files van de Mac van en naar de host te transporteren (gemiddeld 10 keer sneller dan m.b.v. VersaTerm).

In de nabije toekomst moet het ook mogelijk worden, dankzij de FastPath gateways, om:

- vanuit UNIX een LaserWriter op AppleTalk als printer te selecteren
- vanaf een Mac op een LaserPrinter aan UNIX te printen
- direct vanaf een Mac bestanden op UNIX te kunnen aanmaken en te kunnen lezen, als ware het een *hard disc* voor de Mac.
- de UNIX-machine te gebruiken als server voor het verzorgen van automatische backups van de eigen *hard disc* van de Mac

Mocht dit allemaal lukken, dan wordt er verder nog aan gedacht om electronic mail direct op de Macintosh af te leveren c.q. op te halen.

Tot nu toe zijn nog maar twee stukjes AppleTalk op deze manier toegerust, maar met de plannen om het gehele CWI van een nieuwe netwerk infrastructuur te voorzien, zijn er ook de plannen om in principe alle in het gebouw aanwezige stukken AppleTalk op bovenstaande manier te koppelen.

Frank Kuiper (frankk@cw.nl)

5. Macintosh II

Binnenkort hoopt het CWI de beschikking te krijgen over een tweetal Macintosh II machines, met A/UX, de UNIX versie van Apple, Inc.

Deze UNIX implementatie is een System V release 2 versie, met BSD uitbreidingen; met name TCP/IP en sockets. Ook zijn er speciale uitbreidingen gemaakt, die het in principe mogelijk maken dat vanuit A/UX een aantal van de specifieke Macintosh mogelijkheden beschikbaar komen. Hierdoor kan onder andere de interface naar UNIX toe een 'Macintosh' aanzien krijgen.

De MacII is een machine met een M68020 processor, maximaal 8 Mb geheugen en een ingebouwde 80 Mb harde schijf. Verder is het mogelijk om de MacII op het Ethernet aan te sluiten, alsook om meerdere harde schijven (maximaal 7) en ook meerdere, of andere beeldschermen, inclusief kleuren schermen aan te sluiten.

De MacII blijft altijd bruikbaar als 'echte' Macintosh, maar de omschakeling moet bij het aanzetten van de machine geregeld worden. Het is (nog) niet mogelijk om tussentijds even om te schakelen. Wel is het bij bepaalde Macintosh programma's mogelijk om deze onder A/UX te draaien.

Frank Kuiper (frankk@cw.nl)

6. Ftp

Om de vele gebruikers van Macintoshes binnen dit instituut enigzins te helpen, heb ik op *sering*, verdeelt over een aantal directories, vele Macintosh programma's, tools, HyperCard Stacks en nog veel meer bewaard.

Met behulp van *anonymous ftp* is het mogelijk om deze rijkdom naar de eigen UNIX-machine te kopiëren en aldaar te gebruiken. Het overhalen van de op deze manier verkregen files naar de Macintosh moet op de bekende manier gebeuren: VersaTerm, Kermit of Telnet/ftp.

Alle applicaties, documenten, etc, zijn in een zogenaamd 'Hqx' formaat aanwezig. Er dient eerst xbin (op UNIX) of BinHex (op de Mac) losgelaten te worden op deze files, voordat ze bruikbaar zijn op de Mac. Bij alle files is een Readme gevoegd, die (vaak summier) iets verteld over de mogelijkheden van de bijbehorende Hqx file. Deze Readme's zijn tekst files en dus, eenmaal overgehaald, makkelijk te lezen. Soms is er een aparte documentatie file aanwezig, in de naam van de file staat dan '.Doc.'. Dit zijn de bij de file behorende handleidingen en andere documentatie.

Hoe werkt *anonymous ftp*? Nou, gelukkig heel simpel. Het geeft niet vanaf welke machine een *ftp* sessie wordt opgestart, want op alle machines werkt het volgende: (dit is een voorbeeld sessie)

```
$ ftp sering
Connected to sering.
220 sering FTP server (Version 4.120 Tue Sep 1 11:46:14 MET DST 1987)
ready.
Name (sering:frankk): anonymous
331 Guest login ok, send ident as password.
Password:
230 Guest login ok, access restrictions apply.
ftp> ls
200 PORT command successful.
150 Opening data connection for /bin/ls (192.16.184.4,1320) (0 bytes).
bin
mac
macII
226 Transfer complete.
17 bytes received in 0.2 seconds (0.084 Kbytes/s)
ftp> close
221 Goodbye.
ftp> quit
$
```

Bij 'Name' moet 'anonymous' ingevuld worden, bij het password typt u uw login-naam in.

Door 'get filename' in te toetsen, krijgt u een kopie van de genoemde file in de directory waar u *ftp* hebt aangeropen. Ik wil er hier op wijzen dat het niet nodig is om van alles in de *ftp* directories een kopie te maken in uw eigen directory. De files blijven aanwezig, of zijn, indien het om oudere versies gaat, altijd via mij weer te verkrijgen. Deze hele opzet is juist bedoeld om te voorkomen dat een ieder zijn/haar eigen verzameling aanlegt en om steeds de nieuwste versie van een programma c.q. documentatie bij de hand te hebben.

Een 'cd mac' brengt u naar de Macintosh directory. Alle door mij verzamelde Macintosh spullen zijn hier te vinden, verdeeld over en geïndend in een aantal sub-directories.

De file README_FIRST geeft wat meer informatie over hoe *ftp* te gebruiken. In de file 'List' word een log bijgehouden van de files en de directories waar ze te vinden zijn, op volgorde van datum van binnenkomst.

Voor uitgebreide informatie over *ftp*, doe: 'man ftp', of type 'help' als commando in *ftp*.

Frank Kuiper (frankk@cwi.nl)

7. Backups

Several weeks ago, as part of the process of installing new Sun workstations, we had an unfortunate loss of disk data because of a configuration problem with some Sun-delivered software. At about the same time we lost a major file system on *piring*. While it is unclear if this was the work of a small (but resourceful) group of international terrorists, or simply 'one of those things that happen,' these two occurrences do provide a useful background for the restatement of the CST backup policy for all of the general computing facilities at CWI.

In short, the backup policy is:

Nightly, weekly, and monthly backups are made of all system software on each of the shared processors at CWI. This includes the root file systems on the VAXen, *piring*, and the Sun file servers. In addition, files in the public portions of the /usr file systems are also saved nightly, weekly, and monthly. **NON-PUBLIC FILES, INCLUDING PROJECT FILES AND PERSONAL FILES, ARE NOT PART OF THE BACKUP SCHEDULE.** While every attempt is made to backup all files on all machines, there is no guarantee that any files from any of the user file systems will be saved.

The custom at CWI has been that individual project groups routinely provide for their own backups, using tapes available from CST. In addition, individual users may also obtain tapes to archive their files, depending on the availability of tapes. Users with special problems should contact CST for backup advice.

The problem of providing for adequate backups is a substantial one. We are currently investigating ways of providing practical high-speed backups for our increasingly decentralized environment. Candidates under consideration include the acquisition of more high-speed tape transports and the introduction of WORM-technology compact disc backup storage. While we are working on a general solution to this problem, users are reminded that they should appoint someone within their project group to care for locally-important files.

Dick Bulterman (dcab@cw.nl)

8. Unused equipment

During the past 18 months, the number of personal computers placed throughout the main building at CWI has grown from one or two to nearly 80. (Another 20 or so have been lent to researchers for work at home.) As a result of this growth, there are several people who have both 'standard' terminals and PC's (mostly Macintoshes) in their possession.

Users are reminded that if they have an unused terminal in their office (or at home) they should return that terminal to CST as soon as possible. This will allow us to redistribute the terminal to someone else who needs one, or to replace inoperative terminals with operative ones. If the unused terminal is in the CWI building, we will provide a pick-up service. If the terminal (or modem or any other piece of CWI equipment that is no longer in use) is at home, please make arrangements to return it to CST as soon as possible.

Please send mail to Frank Rahmani (fmr@cw.nl) or leave a note in his office (M353) with a description of the excess material and its location.

Dick Bulterman (dcab@cw.nl)

9. More About Networking

'Networking' is, in many ways, the hot topic of the 1980's. In social circles, the term is used to describe the interaction of people, usually with manipulative or even sinister overtones (such as in 'the Old Boys Network' or by the usage of the term to describe the activities of business school graduates). In more technical circles, such as at CWI, we use the term to describe the interconnection of discrete processors, allowing users on one machine to communicate (easily) with users or processes on another machine. Networking activity at CWI is divided into two basic categories: software to support computer-to-computer communication (and thus, user-to-user interaction), and hardware to support the

physical interconnections of various machines. In this article we address some of the aspects of the hardware interconnection of the processors resident at CWI.

Computer networks can be viewed at various levels of abstraction. For example, CWI is the central node for much of the international and intercontinental traffic that flows between UNIX machines in Europe. This networking usually involves telephone-based connections that operate at speeds ranging from 1200 to 64,000 bits per second. Closer to home, CWI is an active node in the WCW-LAN, which links the various research facilities (and SARA) here in Watergraafsmeer. Still more locally, CWI has an institute-wide Ethernet operating at a rated speed of 10,000,000 bits per second that is used to connect our various UNIX machines together. We also have several AppleTalk networks to facilitate the transfer of documents among Macintoshes and laser printers, and a small PCnet to support administrative processing. Finally, we have a star-topology network that allows terminal lines (the familiar RS232C/V24 9600 bits per second connections) to go to our Micom PortSelector, and then to one of our various UNIX machines. See for details CST Bulletin 2.

It has been clear for some time that the current (physical) network infrastructure is inadequate to support the growing trend toward the large-scale decentralized use of workstations at the institute. An initial problem is that our current Ethernet is longer than proscribed in the Ethernet standard; this makes the network inherently unreliable. Furthermore, as the number of diskless workstations grows, the amount of passive network traffic generated by users will increase dramatically. Also, as users become more aware of the possibilities of doing network-based computing, the amount of active network traffic should also increase, especially if we attach special-purpose architectures that can be used for remote job execution (such as one or more parallel processors). Finally, the demand for physical connections in individual offices means that it is time to devise a single, coordinated approach to providing hook-ups throughout the building.

Jaap Akkerhuis addressed these problems last November in an article entitled '*Ontwerp van een integraal netwerk voor het CWI*'. Since that time, a substantial sum of money has been reserved for the implementation of a new network infrastructure. It is hoped that the actual implementation will be completed before the end of the calendar year (with an initial implementation completed by the end of the summer for some parts of the building). A detailed strategy report is being prepared to describe an implementation plan for the new network; I expect this to be finished by the first week in May. The central points of our networking strategy will be detailed here, as a preview for all computing users at CWI.

- In order to facilitate common communication, there will be one backbone Ethernet that will service the entire building. This network will consist of two Ethernet cables, with one available as a backup for a primary cable and as a special-purpose cable for non-standard applications.

- The building will be segmented into a number of physical subnetworks. Each subnetwork will consist of a pair of Ethernet cables and a pair of AppleTalk cables. The dual cable arrangement can be used in a primary/backup fashion, but experience has shown that the cable itself is rarely the weak-link in a network configuration; since it is economically impractical to outfit each machine on a physical subnet with multiple network interfaces, it is expected that the dual cable configuration will be used for the further partitioning of a given physical subnet, to allow for growth and the development of non-standard packet formats, as appropriate.
- While the appearance of a single building-wide Ethernet will be maintained, the various other building networks (PCnet and AppleTalk) will be segmented according to the physical subnetwork structure. Communication among AppleTalk segments will be accomplished by network/protocol translation boxes. (See the article by Frank Kuiper in this issue on one such box.)
- It is our intention to outfit each office and all public rooms within the building (and temporary extensions) with one or more network connection points. Each such point will have Ethernet and AppleTalk connectors, and most will have additional space to provide for special-purpose needs (such as the addition of video cables). The existing RS232/V24 network will not be disturbed. Note that the presence of a connection point in an office does not obligate the office occupants to accept a workstation or PC, just as it does not obligate CST to place a workstation or PC in that office on a moment's notice. Note also that some public rooms, such as terminal rooms, will have multiple connection points.
- In virtually all cases, Ethernet connections will be made using thin-wire Ethernet cable (known affectionately as 'cheapernet'). Such cables are thinner, more flexible, and less expensive than thick-wire Ethernet cables, although they are also more restricted in how they can be configured. Most new workstations have built-in thin-wire connectors. Conversion kits are available for other workstations.

It is expected that our present model of providing centralized computing services, with some work done on local workstations, will shift to a computing configuration where most of the work of individual researchers will be done on local workstations talking to a local server machine. Central computing facilities will then consist of common resources (printing servers, database servers, compute servers). One can expect that, as the numbers of file servers increase, a standard model may be that each department (or even individual project groups within departments) may have their own file servers. In addition, individual departments will probably acquire more and more specialized equipment to service local projects. A goal of the new network structure is to provide for future growth in a manner that allows researchers to access their data with a minimum of (network) interference from other users.

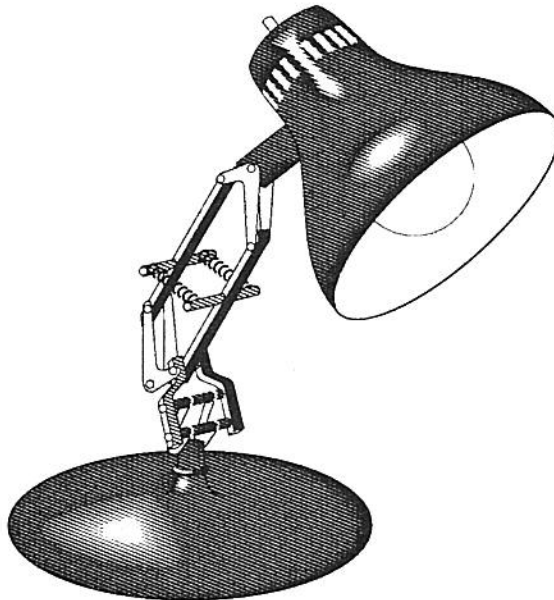
Dick Bulterman (dcab@cwil.nl)

10. Troff and Encapsulated PostScript files

In the last CST-bulletin I pointed out the problems of printing PostScript files via our UNIX-machines. I also explained some details about how to inbed existing PostScript files into each other. There is now a new preprocessor to (di)troff called *psfig*. It works in the same style as *eqn*: calls to get the PostScript files can be placed between the macros *.F+* and *.F-*. So, given that you have the file *luxo-junior.ps* at hand,

```
.F+
figure luxo-junior.ps
.F-
```

will produce:



The macros for centering the picture are called *tmac.psfig* and are in */usr/local/lib/ditroff/tmac*. *Psfig* is installed on all the VAXen, the Suns and *piring*. A manual page is available and a paper describing the details of *psfig* is to be found in the terminal room.

Although the typesetter isn't a PostScript printer, it is possible to have *psfig* at least reserve enough space and an identification string, so you can later hand paste the picture in the output. (The main problem of producing the PostScript files is left as an exercise for the reader).

Psfig was written by Ned Batchelder and Trevor Darrell while at the University of Pennsylvania and *luxo-junior* appears courtesy of Pixar.

Jaap Akkerhuis (jaap@andrew.cmu.edu)

