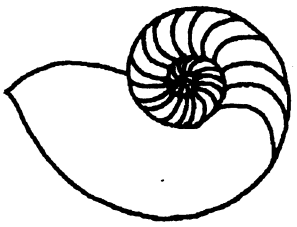

Technical UNIX® User Group

June 1990 $2.50
Volume 2, Number 8

newsletter of the Technical UNIX® User Group

This month ...

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Financial Statement
Barbecue Details

Late Breaking News...
June Barbecue to be held at
Kirk Marat's House
See ANNOUNCEMENT for details

Thoughts From The Editor

By Susan Zuk

Summer has finally arrived! I have been really looking forward to this season. Now's the time for watching the guys on the beaches, water-skiing at the cottage, and sitting back with a cold glass of iced tea. O.K., you can have your beer!

Now is also the time for our annual barbecue. Come on over to Kirk's house for a grand ole evening. It was great fun last year so let's now go for round 2. Gilbert's column tells you what to bring and what will be supplied. If you can bring a barbecue please let us know. Also please RSVP by Friday, June 9th so we can plan the food. Give us a call and we'll see you on the 12th.

As you know, we did not have a formal newsletter last month. The city members did receive a meeting notice. I was unexpectedly out of town for a month so the newsletter could not be compiled. Gilles and Gilbert sent out the notice of the meeting. Thank you guys for helping me out.

This month we have an update of our financial situation. It looks quite good. Maybe we'll be able to do something really special at one of our meetings next year.

For those of you who have your fishing gear ready for the season or have already caught your first master angler, we have located a special Fortune File for you.

Our featured article is on the topic of TCP/IP and OSI. Take a look and see what some experts are saying about the future of these protocols.

Well, that's all for now. See you at the barbecue. The directions on how to get to Kirk's place are on the last page of the newsletter. Have a great summer!!!

Group Information

The Technical Unix User Group meets at 7:30 pm the second Tuesday of every month, except July and August. The newsletter is mailed to all paid up members 1 week prior to the meeting. Membership dues are $20 annually and are due at the October meeting. Membership dues are accepted by mail and dues for new members will be pro-rated accordingly.

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ANNOUNCEMENT...

Meeting Location:

The June meeting will be a friendly get together and barbecue hosted by Kirk Marat at 22 Hobson Place, Winnipeg, on June 12th. See map for directions on how to get there. Please RSVP with Susan or Gilbert by Friday, June 8th.

The President's Corner

By Gilbert Detillieux

In past issues, and at past meetings, we've looked at networking on Unix systems using TCP/IP and its associated set of utilities. This networking software has certainly increased the functionality of Unix, and made it a far more useful and complete system. Once you get used to using the network services, it is hard to go back to stand-alone mode.The ease with which you can move your data (or yourself)from machine to machine is very appealing.

However, there is a price to pay for all this flexibility and open access to networked machines, as was demonstrated quite clearly when the Internet Worm made its way across the continent, jumping from machine to machine. This incident, which happened well over a year ago, is still very much in the news. The June issue of Unix/World features two articles on the subject, and front page coverage. Other Unix related and general computer related publications are also still talking about it.

The Worm story is still relevant for at least a couple of reasons. First, the sentencing of its creator, Robert T.Morris, happened just recently. Second, recent studies of systems on the Internet have shown that many of the securi tyholes that were exploited by the Worm are still around today on an alarming number of systems. The story is also of particular interest to me, since our university is about to be connected to the Internet this summer. We have many Unix systems to support, most of which have no system source code; we must therefore rely on all these vendors to provide us with updates that correct these weaknesses.

Security has always been an inherent problem at universities, because of the combination of: free access to facilities all over the campus, young inquisitive minds with lots of idle time, lots of turnover in student population and administrative personnel, and lax policies and procedures for dealing with those issues. The problem in the past has not been that serious because it was mostly limited to the local campus, and there were usually simple and effective ways of dealing with individual cases that arose, once the perpetrators were found.

Once on the Internet, however, the problem becomes much more difficult to deal with. With the ever increasing number of machines on campus (many without a designated system administrator), and the possibility of sophisticated outside attacks, it is quite conceivable that we could be hit without even knowing it. Furthermore, outside attacks would be much more difficult and expensive to deal with, and maybe too impractical to fight. Even with the bugs and unintentional security holes corrected, the network is still likely to be rather insecure. Sensitive data (such as passwords) are often transmitted as clear text, and can be examined by anyone with the right software.

Although total security is virtually impossible with the present Unix networking software, things can be made secure enough to prevent many of the more common attacks. Articles that appear on the electronic boards and in many publications certainly can help, and are a good place to start. The time to start thinking about security is now, even if your systems are not currently networked; they will quite likely be in the future, and you will have enough other things to worry about at that time.

On another note, our June meeting is coming up soon (June12, to be precise). In keeping with the tradition started last year, this will be a barbecue to launch the summer, and to give us all a chance to chat informally before the two month summer break. One of our members, Kirk Marat, is once again hosting the barbecue. Details such as the location can be found elsewhere in this newsletter. Friends, spouses and children are of course all welcome! The starting time will be 6:30 PM. Bring your own meat for the barbecue, and bring lawn chairs if you have them. We will provide the salad, potato salad, desert, and soft drinks. Hope to see you there!

A very happy and relaxing summer to you all. We will be back with the next newsletter before the September meeting.

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The UNIX Transportation System

By Rick Cook
Reprinted with permission from the March/April issue of CommUNIXations, published by Uniforum

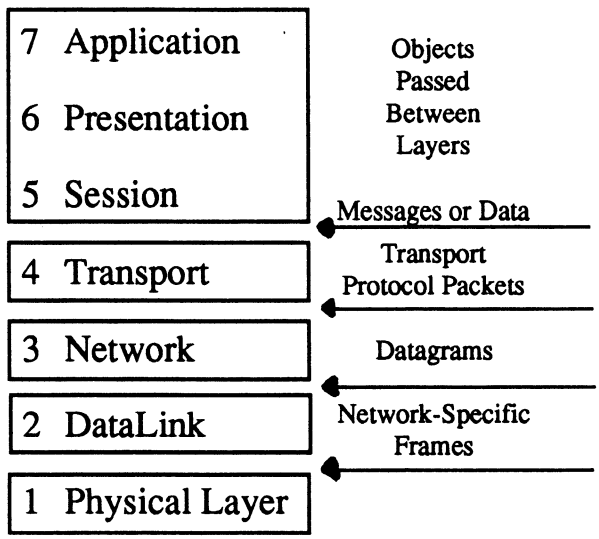
Over the years, TCP/IP and UNIX have enjoyed a symbiotic relationship. It could grow even stronger in this decade.

One of the major factors in the increased popularity of UNIX is its connectibility to a wide range of computers running on a wide variety of networks. At the heart of that connectivity is TCP/IP (Transmission Control Protocol/Internet Protocol), a standard method for communicating over networks of networks.

TCP/IP is not a software program but a group of protocols. Taken together, these protocols define how tasks and information are sent over a network and how software communicates over the network. Implementing the protocols is up to the companies, computer and network vendors and third parties who supply versions of TCP/IP to users.

Over the last 10 years, TCP/IP has become one of the most important communications protocols in the computer world. Everything from the Internet, one of the largest networks in the world, to local-area networks in offices uses TCP/IP. As UNIX expands in the 1990s, the role of TCP/IP will continue to grow. Not even the arrival of the OSI (Open Systems Interconnect) standard is likely to supplant it completely.

TCP/IP and the OSI 7-Layer Model



TCP/IP occupies layers 3 and 4 of the OSI Communications Reference Model, but it also relates to levels 5, 6, and 7. TCP/IP, then, is concerned with sending messages and data over the network, as well as transport protocol packets. Its basic unit of data is the datagram. Lower levels are concerned with media and network structure and communicating network-specific frames of information.

UNIVERSAL APPEAL

TCP/IP is popular both technically and from a marketing standpoint. Technically, it is a robust, proven and fairly efficient method of moving data over a network. It is sold by a number of vendors on a wide variety of computers.

TCP/IP is nearly universal in the UNIX world. Although it is most intimately associated with the Berkeley versions of UNIX, almost everyone who offers UNIX or a UNIX computer has a version of TCP/IP. AT&T's recently released System V Release 4, for example, includes a version of TCP/IP that works under Streams, a communications architecture for building communication protocols out of small pieces that communicate by sending messages. Third-party vendors also offer versions of TCP/IP; some are available for nominal license fees.

"If someone has UNIX and wants to put in a local-area network, they almost always choose TCP/IP," says Robert Davis, director of product marketing for Novell's San Jose, CA, development center. "TCP/IP is far and away the most often used protocol in any network that has to do with UNIX, largely because it is included with UNIX products," he explains.

"The popularity of TCP/IP is rooted in the UNIX environment," says Nai-Ting Hsu, director of the networking business unit at Silicon Graphics in Mountain View, CA. "Everyone can get a TCP/IP implementation that will be interoperable with other versions.

"When people look at UNIX boxes as a cost-effective way to service their computing needs, they need

a way to integrate them," Hsu adds. "TCP/IP provides a standard way to do that."

Although UNIX users think of TCP/IP as a UNIX protocol, it is not limited to UNIX machines. In fact, it is probably the most common non-proprietary protocol in the computer world today. (SNA is more widely used but it is owned and controlled by IBM and tied to IBM hardware.) Even if machines on a network don't run UNIX, the chances are excellent that a version of TCP/IP is available for all of them.

There are two main reasons for this universality. One is the popularity of UNIX. Although many vendors don't run UNIX as the primary operating system on their machines, most offer a way to connect to UNIX systems. The easy way to provide communications with UNIX is with TCP/IP. And, because TCP/IP is a non-proprietary standard, anyone can offer it with any machine.

ROOTS AND RESULTS

TCP/IP grew out of research in connecting computer networks that the Defense Advanced Research Projects Agency (DARPA), a group within the U.S. Department of Defense (DoD), began in the late 1960s. DARPA had projects at universities and research facilities across the United States and needed a way for those sites to exchange information. Since the sites used many different kinds of computers and many of them already had computer networks, the new system had to be architecture-independent and able to communicate over other networks.

TCP/IP evolved gradually to meet the needs of ARPANET, as the network was called. By 1982, the protocols had gone through several revisions and in 1983, DoD standardized them for internetwork communication.

During the same period, UNIX was evolving as well. Since most of the nodes on ARPANET were labs or universities, there was an early natural affinity between UNIX and TCP/IP. As a result, TCP/IP became the effective standard for communications over packet-switching systems.

Such heavy use led directly to another of TCP/IP's major advantages. TCP/IP has evolved through several iterations and has been modified in light of the lessons learned. "TCP/IP has a lot of reliability and data integrity features built into it," says Davis.

"TCP/IP withstood the test of years of service on DARPA Internet," says Ezra Goldman, vice president of software technologies at Interactive Systems, Corp., of Naperville, IL. "As a result, it's a very serviceable set of utilities and underlying protocols, and most of the bugs have been shaken out. People who are looking for real-world solutions today don't have many other options."

TCVP/IP is most common in the engineering and science markets, in large part because that is where UNIX is strongest. However, like UNIX itself, TCP/IP is migrating into the business world. "TCP/IP is the only point of commonality of UNIX, MVS and MS-DOS platforms, says Goldman. "It's the lingua franca that everyone speaks."

PROTOCOLS AND PACKETS

TCP/IP is an entire group of protocols. The Internet Protocol (IP) is responsible for delivering chunks of information from one system to another across the network. In addition to getting information to the proper node on the system, it provides additional services, such as reassembling packets that had to be divided to get through the network.

The Transmission Control Protocol (TCP) provides what amounts to a virtual circuit over the network. In other words, it takes the information from the host, breaks it into chunks, which the IP protocol passes over the network, and reassembles the chunks into a coherent data stream. It provides reliable communications between the hosts.

TCP/IP is roughly cognate with layers 3 and 4 (Network and Transport) of the International Organization for Standards' (ISO) Open Systems Interconnect (OSI) standard. Unlike OSI, however, which provides a model for an entire transaction, TCP/IP does include two protocols (ARP and RARP) that translate between IP addresses and Ethernet addresses.

TCP/IP is not concerned with the media used to transmit information, or with the structure of the network. Those are defined by lower-level protocols. Nor is TCP/IP concerned with the nature of the information transmitted or how it will be used. That is the business of the protocols in the layers above TCP/IP.

TCP/IP can run over many different media, such as fiber optics and twisted-pair wiring, and different kinds of networks, such as Ethernet. It can carry anything from binary code to pictures. Voice doesn't work well over TCP/IP, although some companies do offer voice-capable packet-switching systems.

The basic unit of data in TCP/IP is the packet, or dat-

agram. This is a chunk of information with an attached header containing the nformation needed to move the data accurately to its destination. (More precisely, there are two headers on each datagram, one for TCP and one for IP.) Each datagram header includes the source and destination addresses and a number showing its place in the sequence of datagrams making up the message. There is also a checksum to determine if the data was garbled in transmission and a number of other pieces of information.

In a packet-switching network, there can be more than one route from source to destination. Datagrams are transmitted from node to node over the network until they reach their destination. However, the datagrams may not follow the same path or arrive at the same time. Packet-switching networks are virtual networks built of insubstantial links rather than hard-wired circuits. Depending on the load on the node-to-node links and other conditions, succeeding datagrams may travel completely different paths to their destination.

Using virtual circuits makes a packet-switching network very robust. There can be many routes between two destinations and as long as even one of them is still working, the information will get through. Likewise, the nodes can be instructed to shift datagrams to other routes if a link becomes overloaded by traffic.

At the destination, the host uses the sequence numbers to arrange the packets in order. Packets that were lost or garbled in transmission are requested again, the headers are stripped and the information is reassembled for use by the host.

NETWORKS OF NETWORKS

The strength of TCP/IP is that it is specifically designed to work over networks of networks. To a large extent, it manages to ignore the nature of the network it is running over. It can work not only on a single network but on a heterogeneous collection of networks.

Special features help TCP/IP run over networks of networks while making the minimum number of assumptions about the nature of those networks. For example, TCP/IP contains facilities to divide datagrams into smaller datagrams if the packets exceed the size that a particular network can handle. The system will also automatically reconstruct the split packets if necessary.

The Fortune File

Submitted by Susan Zuk

This one is for all you naturalists!

What is the difference between a fisherman and a hunter?

A hunter lies and waits,
and the fisherman waits and lies!

Although TCP/IP was originally designed to work on wide-area networks, its popularity and flexibility have led to its application on local-area networks as well. Various companies offer TCP/IP systems that run on Ethernet and other popular LAN hardware.

COPING WITH LIMITS

Good as it is, TCP/IP has limits. Much of the work with TCP/IP implementations today is aimed at stretching those limits.

At the low end, the most important problem with TCP/IP is size. Because it does so much, TCP/IP requires a considerable amount of memory to run. This is a particular problem on LANs using MS-DOS personal computers because of the 640K limit on directly addressable memory on those machines.

To solve this dilemma, companies such as TRW offer TCP/IP cards that include their own processors and memory. The cards offload the TCP/IP functions from the main computer and take much less space on the system. TRW claims its card takes only 28K of RAM to run on a PC.

The high-end problem is speed. A TCP/IP datagram contains substantial information that is redundant or unnecessary on a LAN. It requires significant amount of processing to calculate addresses and assemble and strip packets, most of which is wasted on a LAN. "It has a lot of overhead and it chews up a lot of CPU cycles to move things around," says Nai-Ting Hsu of Silicon Graphics.

This is a particular problem on high-bandwidth applications such as graphics or calculation. Since

many users in scientific and technical applications want to create nets of workstations, graphics processors and high-speed computers, the speed of the network can be a critical consideration.

One way to increase speed is to make the protocol more efficient. Several companies are taking steps in that direction. "Among the things you can do is put in an option for negotiating transfer sizes, recognizing congested networks and taking steps on both the sending and receiving ends to avoid saturating a network that is already bogged down," Goldman advises.

For example, Goldman points out that, unlike simple communications protocols such as Xmodem, TCP/IP does not require an acknowledgement for each datagram. Instead the system can establish a "window" that determines how many datagram packets will be sent before an acknowledgment is needed.

"I think there is going to be a strong demand for more efficient and faster TCP/IP implementations," Goldman says. "Because TCP/IP is essentially an open standard, many people will build value-added versions of the protocol. As long as the interfaces stay the same, you can swap out the underlying layers and replace them with faster underlying layers."

Silicon Graphics has taken steps toward optimizing network hardware for TCP/IP. Since the company's main business is scientific, engineering and graphics workstattions, its customers are interested in high-throughput networks. "We have to provide high-performance networking products to our customers who have lots of data to move around.," Hsu says. "We did studies to determine where the overhead is and spent time to optimize data movement."

Because of mismatches between the data packet format and the way the buffer handles the data, and because of the need to manipulate the packet with the UNIX kernel, the protocol normally demands copying data back and forth, according to Hsu. Silicon Graphics has worked out ways to eliminate much copying, which has speeded up the protocol.

These problems aren't likely to damage TCP/IP's position or growth, however. "It almost doesn't matter what the technical details are," says Goldman. "TCP/IP is good enough to do most of the jobs that people ask it to do."

THE END OF TCP/IP?

Eventually, TCP/IP will probably be replaced by the OSI suite of protocols -- whenever that becomes final. Unlike TCP/IP, which evolved as an answer to a specific problem, OSI is an attempt to define the entire process of computer-to-computer communication from screen to screen. Its seven layers of protocols will cover everything, not just transmission over the network. Most analysts say that once it is finished and takes hold in the market, OSI will displace TCP/IP because it is more modern and offers more services.

Analysts expect that to happen around the middle of the decade. But not everyone is convinced, especially not the vendors of TCP/IP systems. Joe Aro, manager of marketing at TRW's information networks division in Torrence, CA, points out that there is already a large and growing base of TCP/IP systems. It won't be easy for companies to discard those networks to move to others based on the OSI protocols. As a result, he says, the systems will exist in the marketplace for some time.

"Look at OS/2," he says. "That may be an option for people, but with the magnitude of MS-DOS machines being used, MS-DOS isn't going to disappear. The change will be an incremental move because there are so many systems out there. Rather than a migration there is going to be a merging.

Others believe that TCP/IP has technical advantages over OSI. "OSI is too big and too slow," says Hsu.

In fact, some aspects of TCP/IP may end up in OSI. Recently a working group of the Internet Engineering Task Force demonstrated that TCP/IP's Simple Network Management Protocol (SNMP) could be used to monitor network devices running on OSI technology. A number of TCP/IP backers are suggesting that SNMP makes more sense for network management than OSI's Common Information Management Protocol (CIMP) because it is smaller and more efficient.

Whether this happens or not, it appears that TCP/IP will be with us for a while to come. Goldman agrees. "I think both TCP/IP and OSI will co-exist. They have two different approaches to solving problems. There is always room for multiple standards. Look at Coke and Pepsi.

Rick Cook is a free-lance writer based in Phoenix. His work has appeared in a variety of publications, including *Aviation Week, Byte, Computer Decisions, Computer Graphics World, High Technology, Managing Quarterly.* He is also the author of several science fiction books.

Technical UNIX User Group Financial Statements

Gilles Detillieux, Treasurer

Here are the financial statements for the first half of our fiscal year. As you can see from these statements, we are in great financial shape, and will be able to have one heck of a party at the end of the year. We are now 41 members strong.

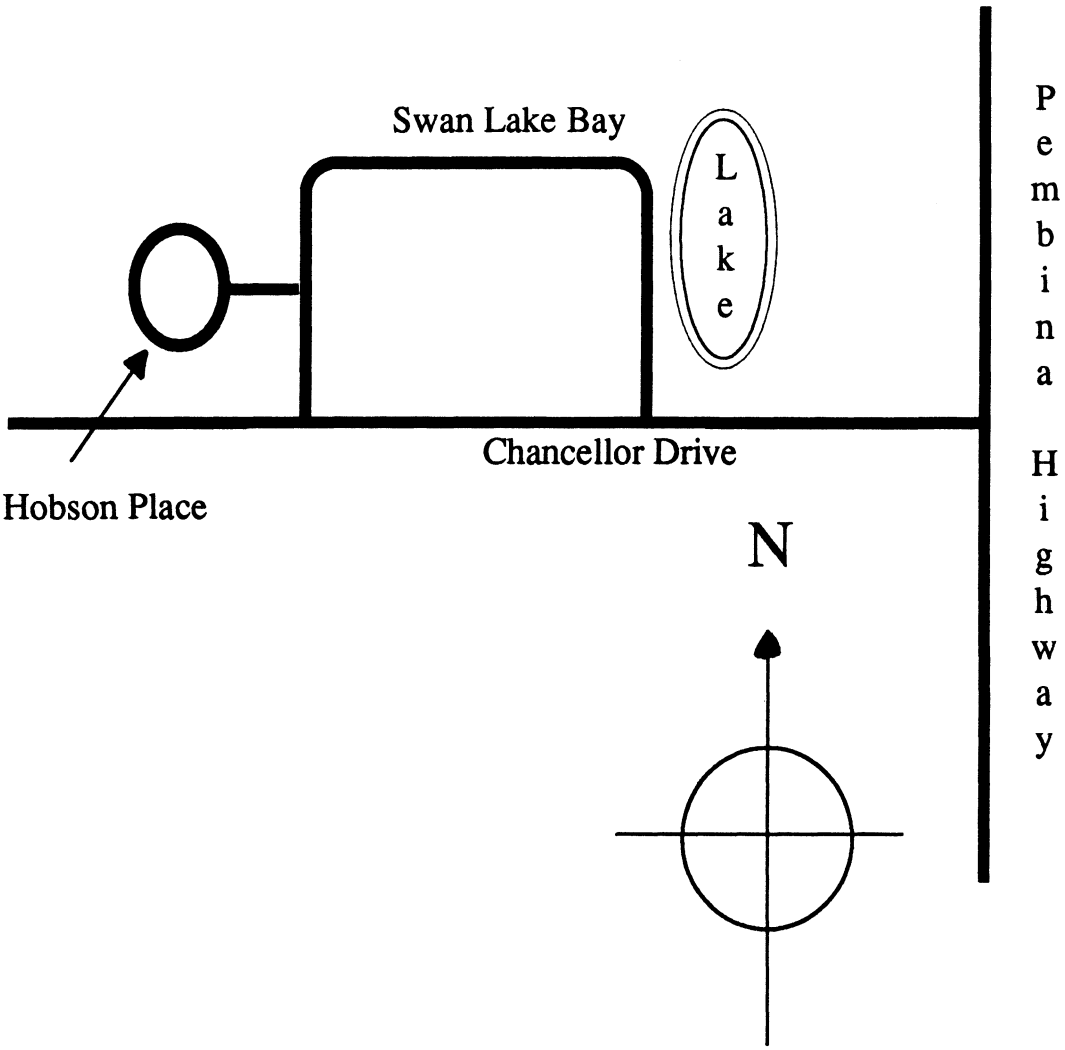
Balance Sheet
Mar. '90

Assets:		
bank account		$ 749.84
cash (to be deposited)		24.00
		$ 773.84
Liabilities:		
due to Unisys		130.14
due to member(s)		4.12
		134.26
Equity:		
net income to date		557.96
retained earnings		81.62
		639.58
Total Liabilities + Equity		$ 773.84

Income & Expense
Oct.'89-Mar.'90

Income:		
membership dues		$ 744.00
back issues payments		12.50
		$ 756.50
Expenses:		
Christmas party		20.73
bank charges		6.25
legal		0.00
stationery:		
envelopes	37.30	
mailing labels	0.00	
paper	20.19	
		57.49
postage		114.07
Total Expenses		$ 198.54
Net Income:		
		$ 557.96

TUUG Barbecue Details



* Bring your own meat
* Bring your own beverage (alcoholic)
*Bring your own lawn chair

* 22 Hobson Place
* Tuesday, June 12, 6:30 pm
* RSVP by Friday, June 8th
  Susan 788-7312 or Gilbert 261-9146