Hacking for Dummies

(Access to other peoples systems made simple – & some extra database lore).

Introduction

The author is not responsible for any abuse of this information. It is intended for educational use only. You may be quite shocked at how vulnerable you are! As an afterthought I added a section on database access due to a number of requests.

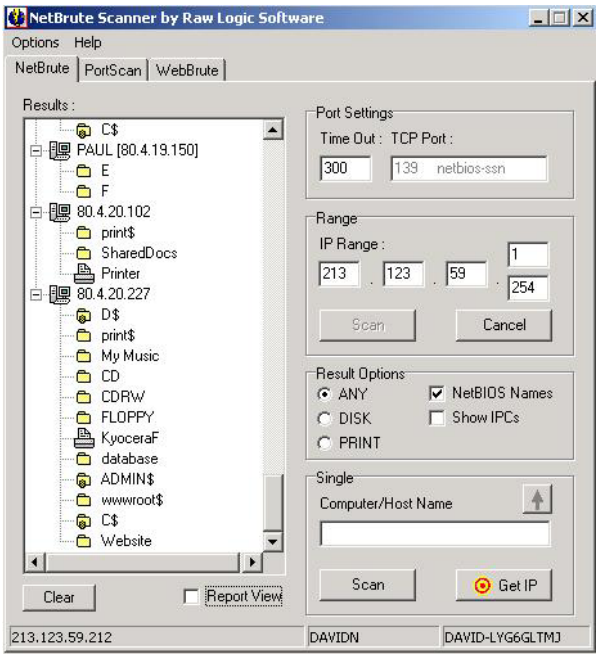
The majority of successful attacks on computer systems via the Internet can be traced to exploitation of security flaws in software and operating systems. These few software vulnerabilities account for the majority of successful attacks, simply because attackers are opportunistic – taking the easiest and most convenient route. They exploit the best-known flaws with the most effective and widely available attack tools. Most software, including operating systems and applications, comes with installation scripts or installation programs. The goal of these installation programs is to get the systems installed as quickly as possible, with the most useful functions enabled, with the least amount of work being performed by the administrator. To accomplish this goal, the scripts typically install more components than most users need. The vendor philosophy is that it is better to enable functions that are not needed, than to make the user install additional functions when they are needed. This approach, although convenient for the user, creates many of the most dangerous security vulnerabilities because users do not actively maintain and patch software components they don't use. Furthermore, many users fail to realize what is actually installed, leaving dangerous samples on a system simply because users do not know they are there. Those unpatched services provide paths for attackers to take over computers.

For operating systems, default installations nearly always include extraneous services and corresponding open ports. Attackers break into systems via these ports. In most cases the fewer ports you have open, the fewer avenues an attacker can use to compromise your network. For applications, default installations usually include unneeded sample programs or scripts. One of the most serious vulnerabilities with web servers is sample scripts; attackers use these scripts to compromise the system or gain information about it. In most cases, the system administrator whose system is compromised did not realize that the sample scripts were installed. Sample scripts are a problem because they usually do not go through the same quality control process as other software. In fact they are shockingly poorly written in many cases. Error checking is often forgotten and the sample scripts offer a fertile ground for buffer overflow attacks.

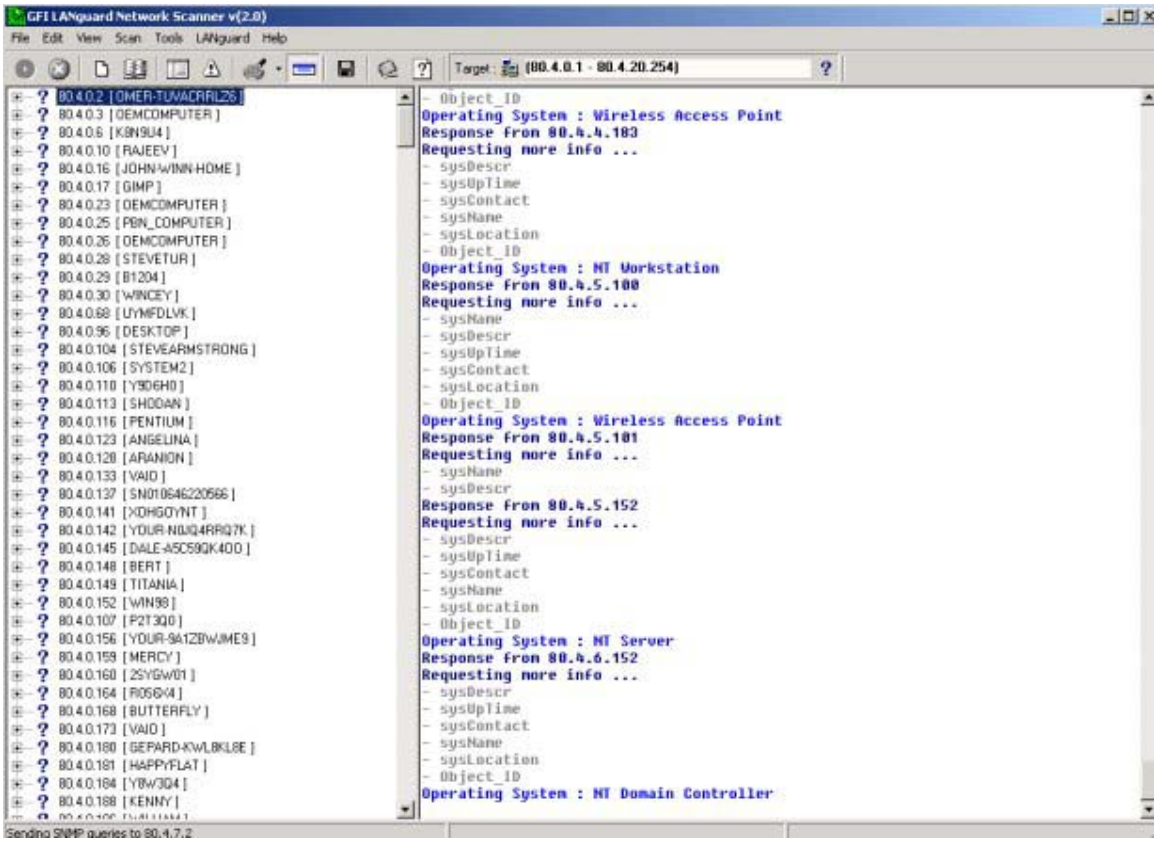
The simplest means to gain access to a system is by simple file and printer sharing. This is used to allow others on say, a home local area network share files, printers, and internet connections. If the computer having file and printer sharing enabled, this in fact allows these resources to be shared, and on offer, to the entire internet! This is largely due to the fact that Netbios was originally intended for use on local area networks (LAN's), where trusted sharing of resources made sense for many reasons. It was never intended to 'go global'.

First, search using a Netbios scanner, for a system with sharing enabled. A program such as Netbrute, by Raw Logic Software, is ideal. These programs can help the would-be hacker, as well as the network administrator. Run the scan over a subnet at a time, for example an IP address range from 80.1.1.1 to 80.1.1.254. Choose a system which has, preferably, it's whole hard disk

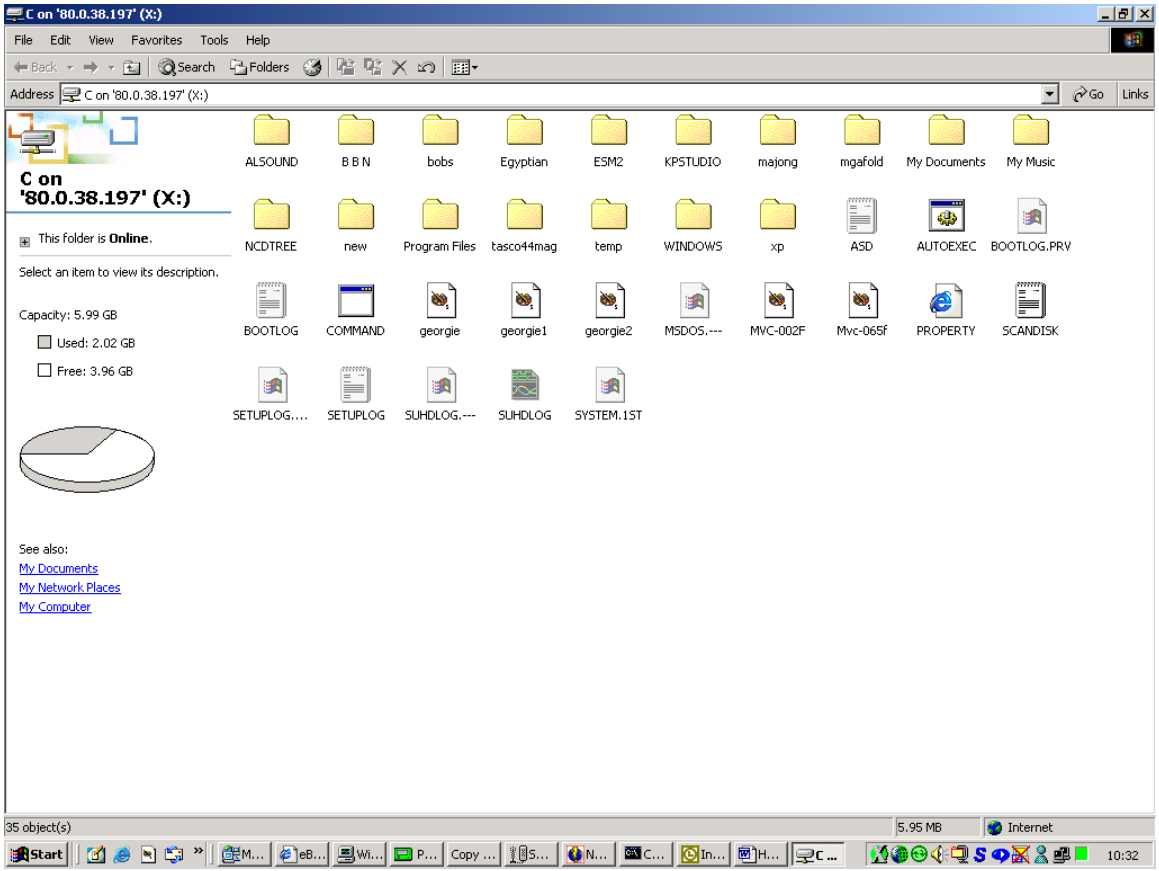
shared (You'd be amazed at some peoples stupidity!!!), this shows up as a result such as \\80.5.7.2\C or similar. Simply copy & paste this link into the address bar of Windows Explorer, and hit enter! This is a screenshot of Netbrute in operation:



For more comprehensive information, use a utility such as Languard Network Scanner. This returns a wealth of information such as domain names, login names, and more. Here is a shot of this in use:



Need I say more? If you find a system where the root directory of C: is shared, then on Windows 9.X systems, you'll be able to access the whole of the hard drive. On Windows NT/2000 systems, you will have only access as according to NTFS file access permissions. Here is a screenshot of Windows Explorer pointed at the root directory:



You can even map it to a network drive (use tools > map network drive), it's as easy as that!

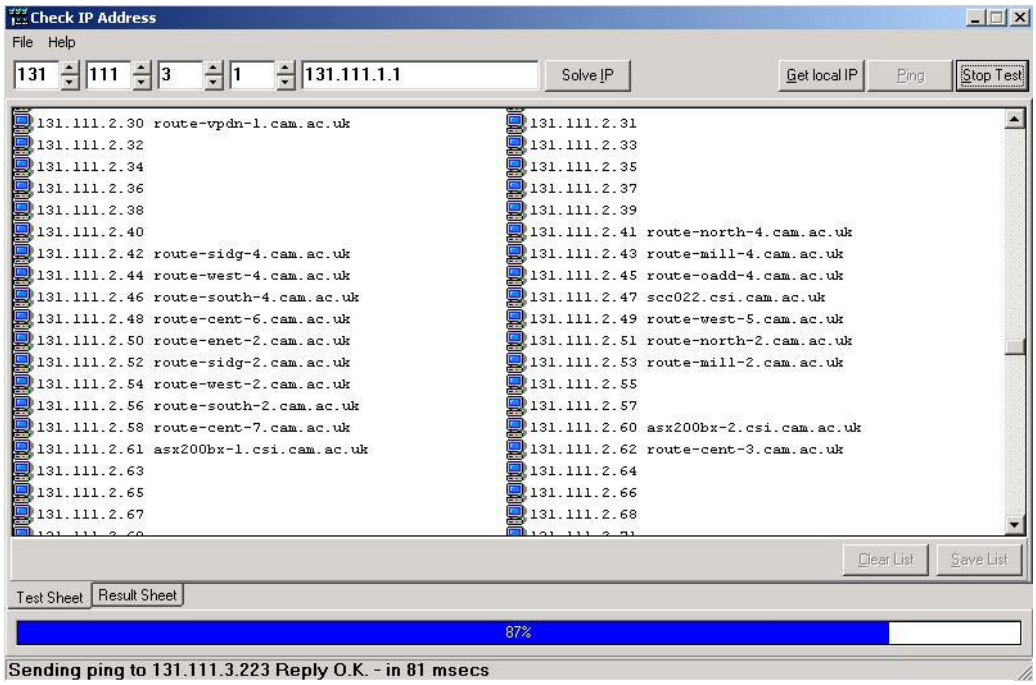
For best results, I recommend choosing systems with 'better than modem' connections. If you don't know where to start, try your own IP address. To get this, do the following:

- For Windows 9.X, go to start > Run and type 'Winipcfg' to get your IP address.
- For Windows NT/2000, got to start > programs > accessories > commend prompt, and type 'ipconfig'.

This will return your IP address. If you are using a dialup connection, you will need to connect first. For 'always on' cable connection, omit this step. Then run your scan over the subnet; e.g. if your IP address is 164.99.34.212 then try a scan from 164.99.34.1 to 164.99.34.254. This should be enough to get you started. Have fun…

IP Scanning

This simple scan simply pings a range of IP addresses to find which machines are alive. Note that more sophisticated scanners will use other protocols (such as an SNMP sweep) to do the same thing. This is a very simple technique which requires little explanation. It is however, useful for the domain name to be returned also.



Port Scanning

This section introduces many of the techniques used to determine what ports (or similar protocol abstraction) of a host are listening for connections. These ports represent potential communication channels. Mapping their existence facilitates the exchange of information with the host, and thus it is quite useful for anyone wishing to explore their networked environment, including hackers. Despite what you have heard from the media, the Internet is NOT exclusively reliant on TCP port 80, used by hypertext transfer protocol (HTTP). Anyone who relies exclusively on the WWW for information gathering is likely to gain the same level of proficiency as your average casual surfer. This section is also meant to serve as an introduction to the art of port scanning, in which a host system can be persuaded to yield up it's secrets. To accomplish this, you need to obtain a port scanner. There are many available both for free or for a small fee. It should have all these features:

- dynamic delay time calculations: Some scanners require that you supply a delay time between sending packets. Well how should I know what to use? You can always ping them, but that is a pain, and plus the response time of many hosts changes dramatically when they are being flooded with requests. For root users, the primary technique for finding an initial delay is to time the internal "ping" function. For non-root users, it times an attempted connect() to

a closed port on the target. It can also pick a reasonable default value. Again, people who want to specify a delay themselves can do so with -w (wait), but you shouldn't have to.

- Retransmission: Some scanners just send out all the query packets, and collect the responses. But this can lead to false positives or negatives in the case where packets are dropped. This is especially important for "negative" style scans like UDP and FIN, where what you are looking for is a port that does NOT respond.
- Parallel port scanning: Some scanners simply scan ports linearly, one at a time, until they do all 65535. This actually works for TCP on a very fast local network, but the speed of this is not

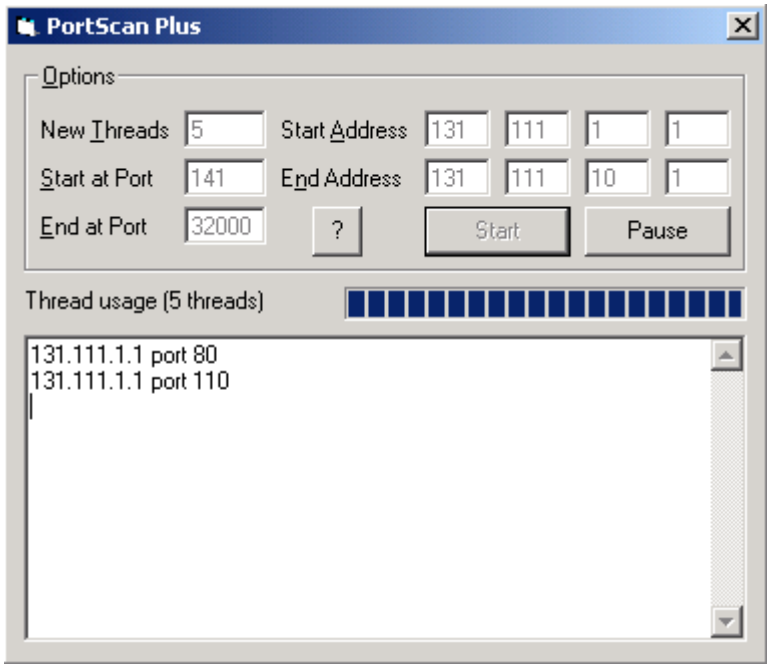
at all acceptable on a wide area network like the Internet. It is best to use non-blocking i/o and parallel scanning in all TCP and UDP modes. Flexible port specification: You don't always want to scan all 65535 ports! Also, the scanners which only allow you to scan ports 1 - N often fall short of my need. The scanner should allow you to specify an arbitrary number of ports and ranges for scanning. For example, '21-25,80-113' is often useful if you are only probing the most frequently running services.

- Flexible target specification: You may often want to scan more then one host, and you certainly don't want to list every single host on a large network! It is useful to scan, say a subnet at once, e.g. 131.111.11.0 – 131.111.11.254.
- Detection of down hosts: Some scanners allow you to scan large networks, but they waste a huge amount of time scanning 65535 ports of a dead host! Annoying! You are advised to choose a scanner which allows timeout intervals to be adjusted.
- Detection of your IP address: For some reason, a lot of scanners ask you to type in your IP address as one of the parameters. You don't want to have to 'ifconfig' and figure out your current IP address every time you connect. Of course, this is better then the scanners I've seen which require recompilation every time you change your address! If you are using a cable 'always on' connection, you may find that the IP address remains constant, as in my own case.

There are actually 65536 ports in all; however by convention services with which we are most familiar tend to use the lower numbers. Here are a few:

FTP	21
Telnet	23
SMTP	25
HTTP	80
POP3	110

Although the services can be configured to use other ports, this is very unusual. Ports above 1024 tend to be used by the operating system. Essentially a port scanner sends packets of data on each port in tern, and listens for replies to determine what services are running. A detailed list is available at the end of the document. This is an example of a simple port scanner in use:



Network Topology Views

This may be useful on occasion. It provides a graphical view of the resources on your network. For example, it may show which systems are behind a firewall, and which routers are on-line.

A 'network viewer'.

Packet Sniffing

A packet sniffer or protocol analyser is a wire-tap device that plugs into computer networks and eavesdrops on the network traffic. Like a telephone wiretap allows one to listen in on other people's conversations, a "sniffing" program lets someone listen in on computer conversations. However, computer conversations consist of apparently random binary data. Therefore, network wiretap programs also come with a feature known as "protocol analysis", which allow them to "decode" the computer traffic and make sense of it. Sniffing also has one advantage over telephone wiretaps: many networks use "shared media". This means that you don't need to break into a wiring closet to install your wiretap, you can do it from almost any network connection to eavesdrop on your neighbours. This is called a "promiscuous mode" sniffer. However, this "shared" technology is moving quickly toward "switched" technology where this will no longer be possible, which means you will have to actually tap into the wire.

There is no single point on the Internet where it is possible to 'see' all of the traffic. The connectivity of the Internet looks similar a fisherman's net. Traffic flows through a mesh, and no single point will see it all! The Internet was built to withstand a nuclear attack—and to survive any "single point of failure". This likewise prevents any single point of packet sniffing. Consider this situation: you have two machines in your own office talking to each other, and both are on the Internet. They take a direct route of communication, and the traffic never goes across the outside public portion of the Internet. Any communication anywhere in the net follows a similar "least-cost-path" principle.

Ethernet was built around a "shared" principle: all machines on a local network share the same wire. This implies that all machines are able to "see" all the traffic on the same wire. Therefore,

Ethernet hardware is built with a “filter” that ignores all traffic that doesn’t belong to it. It does this by ignoring all frames whose MAC address doesn’t match their own. A wiretap program effectively turns off this filter, putting the Ethernet hardware into “promiscuous mode”. Thus, Mark can see all the traffic between Alice and Bob, as long as they are on the same Ethernet wire.

Since many machines may share a single Ethernet wire, each must have an individual identifier. This doesn’t happen with dial-up modems, because it is assumed that any data you send to the modem is destined for the other side of the phone line. But when you send data out onto an Ethernet wire, you have to be clear which machine you intend to send the data to. Sure, in many cases today there are only two machines talking to each other, but you have to remember that Ethernet was designed for thousands of machines to share the same wire. This is accomplished by putting a unique 12-digit hex number in every piece of Ethernet hardware. To really understand why this is so important, you might want to review the information in section 5.4 below. Ethernet was designed to carry other traffic than just TCP/IP, and TCP/IP was designed to run over other wires (such as dial-up lines, which use no Ethernet). For example, many home users install “NetBEUI” for File and Print Sharing because it is unrelated to TCP/IP, and therefore hackers from across the Internet can’t get at their hard-drives.

Raw transmission and reception on Ethernet is governed by the Ethernet equipment. You just can’t send data raw over the wire, you must first do something to it that Ethernet understands. In much the same way, you can’t stick a letter in a mailbox, you must first wrap it in an envelope with an address and stamp.

Following a is a brief explanation how this works:

Alice has IP address: 10.0.0.23
Bob has IP address: 192.168.100.54
In order to talk to Bob, Alice needs to create an IP packet of the form 10.0.0.23-->192.168.100.54 . As the packet traverses the Internet, it will be passed from router-to-router. Therefore, Alice must first hand off the packet to the first router. Each router along the way will examine the destination IP address (192.168.100.54) and decide the correct path it should take.

All Alice knows about is the local connection to the first router, and Bob’s eventual IP address. Alice knows nothing about the structure of the Internet and the route that packet will take. Alice must talk to the router in order to send the packet. She uses the Ethernet to do so. An Ethernet frame looks like the following:
What this means is that the TCP/IP stack in Alice’s machine might create a packet that is 100 bytes long (let’s say 20 bytes for the IP info, 20 bytes for the TCP info, and 60 bytes of data). The TCP/IP stack then sends it to the Ethernet module, which puts 14 bytes on the front for the destination MAC address, source MAC address, and the ethertype 0x0800 to indicate that the other end’s TCP/IP stack should process the frame. It also attaches 4-bytes on the end with a checksum/CRC (a validator to check whether the frame gets corrupted as it goes across the wire). The adapter then sends the bits out onto the wire. All hardware adapters on the wire see the frame, including the ROUTER’s adapter, the packet sniffer, and any other machines. Proper adapters, however, have a hardware chip that compares the frame’s “destination MAC” with its own MAC address. If they don’t match, then it discards the frame. This is done at the hardware level, so the machine the adapter is attached to is completely unaware of this process.

When the ROUTER Ethernet adapter sees this frame, it reads it off the wire and removes the leading 14-bytes and the trailing 4-bytes. It looks at the 0x0800 ethertype and decides to send it to the TCP/IP stack for processing (which will presumably forward it to the next router in the chain toward the destination). In the above scenario, only the ROUTER machine is supposed to see the Ethernet frame, and all other machines are supposed to ignore it. The wiretap, however, breaks the rules and copies the frame off the network, too.

To see your own Ethernet address, do the following;

Win9x: Run the program “winipcfg.exe”. It will tell you.

WinNT/2000: Run the program “ipconfig /all” from the command-line. It will show the MAC address for your adapters. This is an example result:

Windows NT IP Configuration
Host Name . . . . . : sample.robertgraham.com
DNS Servers . . . . . : 192.0.2.254
Node Type . . . . . : Hybrid
NetBIOS Scope ID. . . . . :

IP Routing Enabled. . . . . : Yes
WINS Proxy Enabled. . . . . : No
NetBIOS Resolution Uses DNS : No
Ethernet adapter SC12001:

Description . . . . . : DEC DC21140 PCI Fast Ethernet Adapter

Physical Address. . . . . : 00-40-05-A5-4F-9D
DHCP Enabled. . . . . : No
IP Address. . . . . : 192.0.2.160
Subnet Mask . . . . . : 255.255.255.0
Default Gateway . . . . . : 192.0.2.1
Primary WINS Server . . . . : 192.0.2.253
Linux
Run the program “ifconfig”. Here is a sample result:

eth0 Link encap:Ethernet HWaddr 08:00:17:0A:36:3E
inet addr:192.0.2.161 Bcast:192.0.2.255 Mask:255.255.255.0
UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
RX packets:1137249 errors:0 dropped:0 overruns:0
TX packets:994976 errors:0 dropped:0 overruns:0

Interrupt:5 Base address:0x300
Solaris: Use the “arp” or “netstat -p” command, it will often list the local interface among the ARP entries.

This is a sample packet before decoding:

```
000  00 00 BA 5E BA 11 00 A0 C9 B0 5E BD 08 00 45 00  ...^......^...E.
010  05 DC 1D E4 40 00 7F 06 C2 6D 0A 00 00 02 0A 00  ....@....m......
020  01 C9 00 50 07 75 05 D0 00 C0 04 AE 7D F5 50 10  ...P.u......}.P.
030  70 79 8F 27 00 00 48 54 54 50 2F 31 2E 31 20 32  py.'..HTTP/1.1.2
040  30 30 20 4F 4B 0D 0A 56 69 61 3A 20 31 2E 30 20  00.OK..Via:.1.0.
050  53 54 52 49 44 45 52 0D 0A 50 72 6F 78 79 2D 43  STRIDER..Proxy-C
060  6F 6E 6E 65 63 74 69 6F 6E 3A 20 4B 65 65 70 2D  onnection:.Keep-
070  41 6C 69 76 65 0D 0A 43 6F 6E 74 65 6E 74 2D 4C  Alive..Content-L
080  65 6E 67 74 68 3A 20 32 39 36 37 34 0D 0A 43 6F  ength:.29674..Co
090  6E 74 65 6E 74 2D 54 79 70 65 3A 20 74 65 78 74  ntent-Type:.text
0A0  2F 68 74 6D 6C 0D 0A 53 65 72 76 65 72 3A 20 4D  /html..Server:.M
0B0  69 63 72 6F 73 6F 66 74 2D 49 49 53 2F 34 2E 30  icrosoft-IIS/4.0
0C0  0D 0A 44 61 74 65 3A 20 53 75 6E 2C 20 32 35 20  ..Date:.Sun,.25.
0D0  4A 75 6C 20 31 39 39 39 20 32 31 3A 34 35 3A 35  Jul.1999.21:45:5
0E0  31 20 47 4D 54 0D 0A 41 63 63 65 70 74 2D 52 61  1.GMT..Accept-Ra
0F0  6E 67 65 73 3A 20 62 79 74 65 73 0D 0A 4C 61 73  nges:.bytes..Las
100  74 2D 4D 6F 64 69 66 69 65 64 3A 20 4D 6F 6E 2C  t-Modified:.Mon,
110  20 31 39 20 4A 75 6C 20 31 39 39 39 20 30 37 3A  .19.Jul.1999.07:
120  33 39 3A 32 36 20 47 4D 54 0D 0A 45 54 61 67 3A  39:26.GMT..ETag:
130  20 22 30 38 62 37 38 64 33 62 39 64 31 62 65 31  ."08b78d3b9d1be1
140  3A 61 34 61 22 0D 0A 0D 0A 3C 74 69 74 6C 65 3E  :a4a"....<title>
150  53 6E 69 66 66 69 6E 67 20 28 6E 65 74 77 6F 72  Sniffing.(networ
160  6B 20 77 69 72 65 74 61 70 2C 20 73 6E 69 66 66  k.wiretap,.sniff
170  65 72 29 20 46 41 51 3C 2F 74 69 74 6C 65 3E 0D  er).FAQ</title>.
180  0A 0D 0A 3C 68 31 3E 53 6E 69 66 66 69 6E 67 20  ...<h1>Sniffing.
190  28 6E 65 74 77 6F 72 6B 20 77 69 72 65 74 61 70  (network.wiretap
1A0  2C 20 73 6E 69 66 66 65 72 29 20 46 41 51 3C 2F  ,.sniffer).FAQ</
1B0  68 31 3E 0D 0A 0D 0A 54 68 69 73 20 64 6F 63 75  h1>....This.docu
1C0  6D 65 6E 74 20 61 6E 73 77 65 72 73 20 71 75 65  ment.answers.que
1D0  73 74 69 6F 6E 73 20 61 62 6F 75 74 20 74 61 70  stions.about.tap
1E0  70 69 6E 67 20 69 6E 74 6F 20 0D 0A 63 6F 6D 70  ping.into...comp
1F0  75 74 65 72 20 6E 65 74 77 6F 72 6B 73 20 61 6E  uter.networks.an
```

This is the standard “hex dump” representation of a network packet, before being decoded. A hex dump has three columns: the offset of each line, the hexadecimal data, and the ASCII equivalent. This packet contains a 14-byte Ethernet header, a 20-byte IP header, a 20-byte TCP header, an HTTP header ending in two line-feeds (0D 0A 0D 0A) and then the data. The reason both hex and ASCII are shown is that sometimes ones is easier to read than the other. For example, at the top of the packet, the ASCII looks useless, but the hex is readable, from which you can tell, for example, that my MAC address is 00-00-BA-5E-BA-11. Each packet contains a 14-byte Ethernet header, a 20-byte IP header, a 20-byte TCP header, an HTTP header ending in two line-feeds (0D 0A 0D 0A) and then the data.

I need to explain the word ‘hexadecimal’. The word “decimal” has the root “dec”, meaning “10”. This means that there are 10 digits in this numbering system:

0 1 2 3 4 5 6 7 8 9

The word “hexadecimal” has the roots “hex” meaning 6 and “dec” meaning 10; add them together and you get 16. This means there are sixteen digits in this numbering system: 0 1 2 3 4 5 6 7 8 9 A B C D E F

The is useful because all data is stored by a computer as “bits” (binary-digits, meaning two digits: 0 1), but all bits are grouped into 8-bit units known as “bytes” or “octets”, which in theory have 256 digits. Bits are two small to view data, because all we would see is a stream like 00101010101000010101010110101101101011110110, which is unreadable. Similarly, using 256 digits would be impossible: who can memorize that many different digits? Hexadecimal breaks a “byte” down into a 4-bit “nibble”, which has 16-combinations (256 = 16*16). This allows us to represent each bytes as two hexadecimal digits. Hexadecimal allows technical people to visualize

the underlying binary data. This is an explanation of the hexadecimal numbering system:

0000 = 0 0001 = 1 0010 = 2 0011 = 3
0100 = 4 0101 = 5 0110 = 6 0111 = 7
1000 = 8 1001 = 9 1010 = A 1011 = B
1100 = C 1101 = D 1110 = E 1111 = F

In other words, when you encounter the hexadecimal digit "B", you should immediately visualize the bit pattern "1011" in your head. It is much like memorizing multiplication tables as a kid, memorizing this table will serve much the same purpose. Hexadecimal is often preceded by a special character(s). For example, when you see the number "12", is this "twelve" (decimal) or "eighteen" (hexadecimal)? If it is hex, it is often written as either "0x12", "x12", or "$12". The former is the preferred version, since that is how many programming languages represent it. Naturally, this isn't needed for hex dumps because the fact we are showing hex is pretty much assumed. Computers represent everything as numbers. This means the text your are reading right now is represented as numbers within the computer. ASCII is one such representation. In ASCII, the letter 'A' is represented by the number 65, or in hex, 0x41. The letter 'B" is represented by the number 66/0x42. And the process continues for all characters, numbers, punctuation, and so forth. If you look at the normal (English) keyboard you will count 32 punctuation characters, 10 decimal digits, 26 letters, and 26 more letters when you take into account UPPER/lower case. This comes to 94 different characters. In binary, you need 7-bits to represent that number of combinations. This maps nicely onto the standard 8-bit bytes used in computers, with room left over. In hex dumps, note that the ASCII columns contains lots of periods. A byte has 256 combinations, but we can only view 94 of them. Any character that is not one of these 94 visible characters is shown as a period.

Anyhow, if you want to try packet sniffing, I hope I have now provided the information you need to get started. You can download a packet sniffer free from the web as either shareware or freeware. Give it a go! By now, you must be feeling that there is a good chance that your boss may well have been snooping on your use of the corporate LAN and/or the internet all along! Is there no such thing as privacy at work nowadays? If you have a score to settle, the next section is for you…

Statistical Databases

This may seem rather a departure from the 'domestic' hacking scene. But on reflection of some queries I have recently received relating to corporate databases, particularly relating to salary and employment details, I decided to give this topic a mention.

Have you ever wanted to somehow, obtain from your employer's database, details relating to the personnel department? In this dreadful world of job insecurity and appraisal schemes, the author has just cause to explain a possible means to learn employer's secrets.

A statistical database is, in it's simplicity, a store of information relating to the infrastructure of entire organisations. This includes personal and employee details. These systems are implemented by means of Microsoft Access, MYSQL and other similar software, but what they all have in common is that one fact must be stored in one place. This is vital to ensure that queries return unique results. Please note that, in order to use this information successfully, a working knowledge of SQL (Structured Query Language) and relational algebra, is assumed. Some operand details are provided; however please note that this is not a SQL reference manual! This is a huge topic. I am simply suggesting possible means by which they may be manipulated in order to yield up details to which the database administrator has forbidden you access. The methods of trying to bypass access restrictions either may or may not work on all systems; the author merely

states that they have been successfully tried with success on *some* experimental databases.

Hacking a Statistical Database

'Views' are used by a database administrator in order to hide certain data from those who do not need access to it according to their job description. For example, take this simple database for a small company having 10 employees:

Fname	Lname	Sex	dependents	occupation	Salary	Tax	audit
John	Harris	M 3		Programmer 25k		5k 3	
Lisa	White F	2		Receptionist 15k		3k 0	
Alison	Baker	F 0		Programmer	25k	5k	1
Emma	Foster	F 2		Secretary	13k	2.5k 1	
Steve	Smith	M 2		Manager	30k	6k 0	
Ann	Reid	F 1		Clerk	25k	5.5k 0	
Micheal	Roberts	M	0	Secretary	12k	2k	0
Tom	Reynolds M	3		Porter	11k	2k 0	
Pauline	Blackman F		4	Programmer	18k	3.5k 1	
Sandra	Moore	F	1	Programmer	21k	4k	1

Suppose you wanted to find out John Harris's salary. However, you do not have access to the salary and tax columns, as your administrator has excluded you from this view, as company policy states that only the personel department need access to this data. The key is not accessible to users. However, anyone with a limited knowledge of relational algebra can still get the information they seek…

We must arm ourselves with what we do know about John. We know that he is male and is a programmer. Without any protection other than the view set by the database administrator, these queries will flush out his salary:

SELECT COUNT (*) FROM Stats

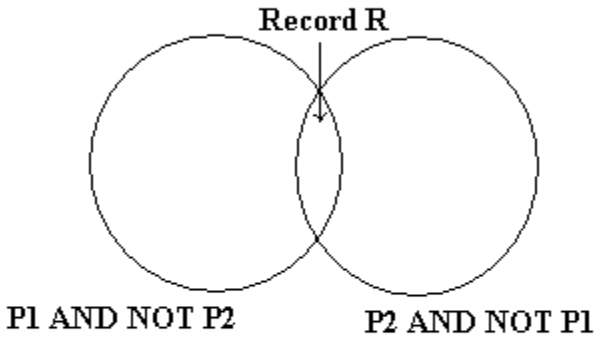
WHERE sex = 'M' AND Occupation = 'Programmer'
Response 1
We have a single male programmer!
SELECT Sum(salary) Sum(tax) FROM Stats
WHERE Sex = 'M' AND occupation = 'Programmer'

Response 25k, 5k
We have found John's salary out. This single tuple attack is unlikely to work as, for security the administrator may have ruled that a query must say, more than one tuple. Therefore a single subject cannot be weeded out as before. However the multi-tuple manipulation can counter this as follows.

SELECT COUNT (*) FROM Stats
Response 10
SELECT COUNT (*) FROM Stats
WHERE NOT (sex = 'M' AND occupation = 'Programmer'
Response 9 (10 –1 = 9)
SELECT Sum(salary) Sum(tax) FROM Stats
Response 195k, 38.5k
SELECT Sum(salary) Sum(tax) FROM Stats
WHERE NOT Sex = 'M' AND occupation = 'Programmer'
Response 170k, 33.5k
So 195 – 170 = 25, 38.5 – 33.5 =5
Answer = 25k, 5k
We have still got Johns salary! As the response in each case contained more than one tuple, it passed as an admissible query!

The individual tracker approach

This method utilises predicates about John to construct queries.
SELECT COUNT (*) FROM Stats
WHERE sex = 'M'
Response 4
So there exist 4 males on the database.
SELECT COUNT (*) FROM Stats
WHERE sex = 'M' AND NOT (occupation = 'programmer')
Response 3
So there is only 1 male programmer.
SELECT Sum(salary) Sum(tax) FROM Stats
WHERE Sex = 'M'
Response 78k, 15k
SELECT Sum(salary) Sum(tax) FROM Stats
WHERE Sex = 'M' AND NOT (occupation = 'programmer')
Response 53k, 10k
So 78-53=25 and 15-10=5
Result 25k,5k
So as before, we have John's salary. If we have a predicate about a specific record, i.e. John is male AND a programmer, we can formulate queries to obtain the results we wish to obtain. This can be summed up as P1 AND P2. The predicate P1 AND NOT P2 can be used as a tracker for that individual record.



(Simple set Theory)

Hardware Tricks

For the hacker with some knowledge of computer hardware and general electronics, and who is prepared to mess about with circuit diagrams, a soldering iron and perhaps a voltmeter, logic probe or oscilloscope, still further possibilities open up. One of the most useful bits of kit consists of a small cheap radio receiver (MW/AM band), a microphone and a tape recorder. Radios in the vicinity of computers, modems and telephone lines can readily pick up the chirp chirp of digital communications without the need of carrying out a physical phone 'tap'.Alternatively, an inductive loop with a small low-gain amplifier in the vicinity of a telephone or line will give you a recording you can analyse later at your leisure.

By identifying the pairs of tones being used, you can separate the caller and the host. By feeding the recorded tones onto an oscilloscope display you can freeze bits, 'characters' and 'words'; you can strip off the start and stop bits and, with the aid of an ASCII-to-binary table, examine what is happening. With experience it is entirely possible to identify a wide range of protocols simply from the 'look' of an oscilloscope. A cruder technique is simply to record and playback sign-on sequences; the limitation is that, even if you manage to log on, you may not know what to do afterwards. Listening on phone lines is of course a technique also used by some sophisticated robbers. In 1982 the Lloyds Bank Holborn branch was raided; the alarm did not ring because the thieves had previously recorded the 'all-clear' signal from the phone line and then, duringthe break-in, replayed the recording up the line to the alarm monitoring apparatus. Sometimes the hacker must devise ad hoc bits of hardware trickery in order to achieve his ends. Access has been obtained to a well-known financial prices service largely by stringing together a series of simple hardware skills. The service is available mostly on leased lines, as the normal vagaries of dial-up would be too unreliable for the City folk who are the principal customers.

However, each terminal also has an associated dial-up facility, in case the leased line should go down; and in addition, the same terminals can have access to Prestel. Thus the hacker thought that it should be possible to access the service with ordinary viewdata equipment instead of the special units supplied along with the annual subscription. Obtaining the phone number was relatively easy: it was simply a matter of selecting manual dial-up from the appropriate menu, and listening to the pulses as they went through the regular phone.

The next step was to obtain a password. The owners of the terminal to which the hacker had access did not know their ID; they had no need to know it because it was programmed into the terminal and sent automatically. The hacker could have put micro 'back-to-front' across the line and sent a ENQ to see if an ID would be sent back. Instead he tried something less obvious.

The terminal was known to be programmable, provided one knew how and had the right type of keyboard. Engineers belonging to the service had been seen doing just that. How could the hacker acquire 'engineer' status? He produced the following hypothesis: the keyboard used by the service's customers was a simple affair, lacking many of the obvious keys used by normal terminals; the terminal itself was manufactured by the same company that produced a range of editing terminals for viewdata operators and publishers. Perhaps if one obtained a manual for the editing terminal, important clues might appear. A suitable photocopy was obtained and, lo and behold, there were instructions for altering terminal IDs, setting auto-diallers and so on.

Linux & Unix for beginners

Unix has become the primo operating system of the Internet. In fact, Unix is the most widely used operating system in the world among computers with more power than PCs. True, Windows NT is coming up fast as a common Internet operating system. But today Unix in all its flavours still is the operating system to know in order to be a truly elite hacker. So far we have assumed that you have been hacking using a shell account that you get through your Internet Service Provider (ISP). A shell account allows you to give Unix commands on one of your ISP's computers. But you don't need to depend on your ISP for a machine that lets you play with Unix. You can run Unix on your own computer and with a SLIP or PPP connection be directly connected to the Internet.
Note: Serial Line Internet Protocol (SLIP) and Point-to-Point Protocol (PPP) connections give you a temporary Internet Protocol (IP) address that allows you to be hooked directly to the Internet. You have to use either SLIP or PPP connections to get to use a Web browser that gives you pictures instead on text only. So if you can see pictures on the Web, you already have one of these available to you. The advantage of using one of these direct connections for your hacking activities is that you will not leave behind a shell log file for your ISP's sysadmin to study. Even if you are not breaking the law, a shell log file that shows you doing lots of hacking can be enough for some sysadmins to summarily close your account.
What is the best kind of computer to run Unix on? Unless you are a wealthy hacker who thinks nothing of buying a Sun SPARC workstation, you'll probably do best with some sort of PC. There are almost countless variants of Unix that run on PCs, and a few for Macs. Most of them are free for download, or inexpensively available on CD-ROMs. The three most common variations of Unix that run on PCs are Sun's Solaris, FreeBSD and Linux. Solaris costs around $700. Enough said. FreeBSD is very good indeed.
Linux, however, has the advantage of being available in many variants (so you can have fun mixing and matching programs from different Linux offerings). Most importantly, Linux is supported by many manuals, news groups, mail lists and Web sites. out.
Historical note: Linux was created in 1991 by a group led by Linus Torvalds of the University of Helsinki. Linux is copyrighted under the GNU General Public License. Under this agreement, Linux may be redistributed to anyone along with the source code. Anyone

can sell any variant of Linux and modify it and repackage it. But even if someone modifies the source code he or she may not claim copyright for anything created from Linux. Anyone who sells a modified version of Linux must provide source code to the buyers and allow them to reuse it in their commercial products without charging licensing fees. This arrangement is known as a "copyleft." Under this arrangement the original creators of Linux receive no licensing or shareware fees. Linus Torvalds and the many others who have contributed to Linux have done so from the joy of programming and a sense of community with all of us who will hopefully use Linux in the spirit of good guy hacking. Viva Linux! Viva Torvalds! Linux consists of the operating system itself (called the "kernel") plus a set of associated programs.

The kernel, like all types of Unix, is a multitasking, multi-user operating system. Although it uses a different file structure, and hence is not directly compatible with DOS and Windows, it is so flexible that many DOS and Windows programs can be run while in Linux. So a power user will probably want to boot up in Linux and then be able to run DOS and Windows programs from Linux. Associated programs that come with most Linux distributions may include:

* a shell program (Bourne Again Shell -- BASH -- is most common);
* compilers for programming languages such as Fortran-77 (my favorite!), C, C++, Pascal, LISP, Modula-2, Ada, Basic (the best language for a beginner), and Smalltalk.;
* X (sometimes called X-windows), a graphical user interface
* utility programs such as the email reader Pine (my favorite) and Elm

Top ten reasons to install Linux on your PC:

1.When Linux is outlawed, only outlaws will own Linux.

2. When installing Linux, it is so much fun to run fdisk without backing up first.

3.The flames you get from asking questions on Linux newsgroups are of a higher quality than the flames you get for posting to alt.sex.bestiality.

4.No matter what flavor of Linux you install, you'll find out tomorrow there was a far more 3l1te ersion you should have gotten instead.

5.People who use Free BSD or Solaris will not make fun of you. They will offer their sympathy instead.

6.At the next Def Con you'll be able to say stuph like "so then I su-ed to his account and grepped all his files for 'kissyface'." Oops, grepping other people's files is a no-no, forget I ever suggested it.

7.Port surf in privacy.

8.One word: exploits.

9.Installing Linux on your office PC is like being a postal worker and bringing an Uzi to work.

10.But - - if you install Linux on your office computer, you boss won't have a clue what that means.

What types of Linux work best? It depends on what you really want. Redhat Linux is famed for being the easiest to install. The Walnut Creek Linux 3.0 CD-ROM set is also really easy to install -- for Linux, that is! My approach has been to get lots of Linux versions and mix and match the best from each distribution. I like the Walnut Creek version best because with my brand X hardware, its autodetection feature was a life-saver.

INSTALLING LINUX is not for the faint of heart! Several tips for surviving installation are:

1) Although you in theory can run Linux on a 286 with 4 MB RAM and two floppy drives, it is *much* easier with a 486 or above with 8 MB RAM, a CD-ROM, and at least 200 MB free hard disk space.

2) Know as much as possible about what type of mother board, modem, hard disk, CD-

ROM, and video card you have. If you have any documentation for these, have them on hand to reference during installation.
3) It works better to use hardware that is name-brand and somewhat out-of-date on your computer. Because Linux is freeware, it doesn't offer device drivers for all the latest hardware. And if your hardware is like mine -- lots of Brand X and El Cheapo stuph, you can take a long time experimenting with what drivers will work.
4) Before beginning installation, back up your hard disk(s)! In theory you can install Linux without harming your DOS/Windows files. But we are all human, especially if following the advice of point 7).
5) Get more than one Linux distribution. The first time I successfully installed Linux, I finally hit on something that worked by using the boot disk from one distribution with the CD-ROM for another. In any case, each Linux distribution had different utility programs, operating system emulators, compilers and more. Add them all to your system and you will be set up to become beyond elite.
6) Buy a book or two or three on Linux. I didn't like any of them! But they are better than nothing. Most books on Linux come with one or two CD-ROMs that can be used to install Linux. But I found that what was in the books did not exactly coincide with what was on the CD-ROMs.
7) I recommend drinking while installing. It may not make debugging go any faster, but at least you won't care how hard it is.
Now I can almost guarantee that even following all these 6 pieces of advice, you will still have problems installing Linux. Oh, do I have 7 advisories up there? Forget number 7. But be of good cheer. Since everyone else also suffers mightily when installing and using Linux, the Internet has an incredible wealth of resources for the Linux -challenged.
If you are allergic to getting flamed, you can start out with Linux support Web sites. The best I have found is http://sunsite.unc.edu:/pub/Linux/. It includes the Linux Frequently Asked Questions list (FAQ), available from sunsite.unc.edu:/pub/Linux/docs/FAQ.

In the directory /pub/Linux/docs on sunsite.unc.edu you'll find a number of other documents about Linux, including the Linux INFO-SHEET and META-FAQ,
The Linux HOWTO archive is on the sunsite.unc.edu Web site at: /pub/Linux/docs/HOWTO. The directory /pub/Linux/docs/LDP contains the current set of LDP manuals. You can get ``Linux Installation and Getting Started'' from sunsite.unc.edu in /pub/Linux/docs/LDP/install-guide. The README file there describes how you can order a printed copy of the book of the same name (about 180 pages).
Now if you don't mind getting flamed, you may want to post questions to the amazing number of Usenet news groups that cover Linux. These include:

comp.os.linux.advocacy Benefits of Linux compared
comp.os.linux.development.system Linux kernels, device drivers
comp.os.linux.x Linux X Window System servers
comp.os.linux.development.apps Writing Linux applications
comp.os.linux.hardware Hardware compatibility
comp.os.linux.setup Linux installation
comp.os.linux.networking Networking and communications
comp.os.linux.answers FAQs, How-To's, READMEs, etc.
linux.redhat.misc
alt.os.linux Use comp.os.linux.* instead
alt.uu.comp.os.linux.questions Usenet University helps you
comp.os.linux.announce Announcements important to Linux

comp.os.linux.misc Linux-specific topics Want your Linux free? Tobin Fricke has pointed out that "free copies of Linux CD-ROMs are available the Linux Support & CD Givaway web site at http://emile.math.ucsb.edu:8000/giveaway.html. This is a project where people donate Linux CD's that they don't need any more. The project was seeded by Linux Systems Labs, who donated 800 Linux CDs initially! Please remember to donate your Linux CD's when you are done with them. If you live near a computer swap meet, Fry's, Microcenter, or other such place, look for Linux CD's there. They are usually under $20, which is an excellent investment. I personally like the Linux Developer's Resource by Infomagic, which is now up to a seven CD set, I believe, which includes all major Linux distributions (Slackware, Redhat, Debian, Linux for DEC Alpha to name a few)plus mirrors of tsx11.mit.edu and sunsite.unc.edu/pub/linux plus much more. You should also visit the WONDERFUL linux page at http://sunsite.unc.edu/linux, which has tons of information, as well as the http://www.linux.org/. You might also want to check out http://www.redhat.com/ and http://www.caldera.com/ for more information on commercial versions of linux (which are still freely available under GNU)."

What about Linux security? Yes, Linux, like every operating system, is imperfect. Eminently hackable, if you really want to know. So if you want to find out how to secure your Linux system, or if you should come across one of the many ISPs that use Linux and want to go exploring (oops, forget I wrote that), here's where you can go for info: ftp://info.cert.org/pub/cert_advisories/CA-94:01.network.monitoring.attacks ftp://info.cert.org/pub/tech_tips/root_compromise http://bach.cis.temple.edu/linux/linux-security/ http://www.geek-girl.com/bugtraq/ There is also help for Linux users on Internet Relay Chat (IRC). Ben (cyberkid@usa.net) hosts a channel called #LinuxHelp on the Undernet IRC server.

Brief SQL Reference

To get all columns of a table without typing all column names, use: SELECT * FROM TableName; To get the total number of tuples (rows): SELECT Count(*); FROM EMPLOYEE To get the total number of female employees in reception: SELECT Count (*) FROM EMPLOYEE WHERE sex = ‘m’ AND Department = ‘reception’;

Relational Operators

There are six Relational Operators in SQL, and after introducing them, we’ll see how they’re used: = Equal <> or != Not Equal < Less Than > Greater Than <= Less Than or Equal To >= Greater Than or Equal To

For example, if you wanted to see the EMPLOYEE ID NO’s of those making at least, or over $50,000, use the following:

SELECT EMPLOYEEIDNO FROM EMPLOYEESTATISTICSTABLE WHERE SALARY >= 50000;

Notice that the >= (greater than or equal to) sign is used, as we wanted to see those who made greater than $50,000, or equal to $50,000, listed together.

The *WHERE* description, SALARY >= 50000, is known as a *condition* (an operation which evaluates to True or False). The same can be done for text columns:

SELECT EMPLOYEEIDNO FROM EMPLOYEE STATISTICSTABLE WHERE POSITION = 'Manager';

This displays the ID Numbers of all Managers.

More Complex Conditions: Compound Conditions / Logical Operators

The *AND* operator joins two or more conditions, and displays a row only if that row's data satisfies **ALL** conditions listed (i.e. all conditions hold true). For example, to display all staff making over $40,000, use:

SELECT EMPLOYEIDNO

FROM EMPLOYEESTATISTICSTABLE
WHERE SALARY > 40000 AND POSITION = 'Staff';

The *OR* operator joins two or more conditions, but returns a row if **ANY** of the conditions listed hold true. To see all those who make less than $40,000 or have less than $10,000 in benefits, listed together, use the following query:

SELECT EMPLOYEEIDNO FROM EMPLOYEESTATISTICSTABLE WHERE SALARY < 40000 OR BENEFITS < 10000

AND & OR can be combined, for example:

SELECT EMPLOYEEIDNO

FROM EMPLOYEESTATISTICSTABLE
WHERE POSITION = 'Manager' AND SALARY > 60000 OR BENEFITS > 12000;

First, SQL finds the rows where the salary is greater than $60,000 and the position column is equal to Manager, then taking this new list of rows, SQL then sees if any of these rows satisfies the previous AND condition or the condition that the Benefits column is greater than $12,000. Subsequently, SQL only displays this second new list of rows, keeping in mind that anyone with Benefits over $12,000 will be included as the OR operator includes a row if either resulting condition is True. Also note that the AND operation is done first. This is a law of Boolean algerbra. This is analogous to

the principle of mathematics which state that 'multiplication and division take precedence over addition and subtraction'.
To perform OR's before AND's, like if you wanted to see a list of employees making a large salary (>$50,000) or have a large benefit package (>$10,000), and that happen to be a manager, use parentheses:

SELECT EMPLOYEEIDNO

FROM EMPLOYEESTATISTICSTABLE
WHERE POSITION = 'Manager' AND (SALARY > 50000 OR BENEFIT > 10000);

IN & BETWEEN

An easier method of using compound conditions uses *IN* or *BETWEEN.* For example, if you wanted to list all managers and staff:

SELECT EMPLOYEEIDNO FROM EMPLOYEESTATISTICSTABLE WHERE POSITION IN ('Manager', 'Staff'); or to list those making greater than or equal to $30,000, but less than or equal to $50,000, use:

SELECT EMPLOYEEIDNO FROM EMPLOYEESTATISTICSTABLE WHERE SALARY BETWEEN 30000 AND 50000;

To list everyone not in this range, try:

SELECT EMPLOYEEIDNO FROM EMPLOYEESTATISTICSTABLE WHERE SALARY NOT BETWEEN 30000 AND 50000; Similarly, NOT IN lists all rows excluded from the *IN* list. Additionally, NOT's can be thrown in with AND's & OR's, except that NOT is a unary operator (evaluates one condition, reversing its value, whereas, AND's & OR's evaluate two conditions), and that all NOT's are performed before any AND's or OR's.

SQL Order of Logical Operations (each operates from left to right) 1. NOT 2. AND 3. OR

Using *LIKE*

If you wanted to see all people whose last names started with "L"; try: SELECT EMPLOYEEIDNO FROM EMPLOYEESTATISTICSTABLE WHERE LASTNAME LIKE 'L%'; The percent sign (%) is used to represent any possible character (number, letter, or

punctuation) or set of characters that might appear after the "L". To find those people with LastName's ending in "L", use '%L', or if you wanted the "L" in the middle of the word, try '%L%'. The '%' can be used for any characters in the same position relative to the given characters. NOT LIKE displays rows not fitting the given description. Other possiblities of using LIKE, or any of these discussed conditionals, are available, though it depends on what DBMS you are using; as usual, consult a manual for the available features on your system, or just to make sure that what you are trying to do is available and allowed. This disclaimer holds for the features of SQL that will be discussed below. This section is just to give you an idea of the possibilities of queries that can be written in SQL.

Joins

In this section, we will only discuss *inner* joins, and *equijoins*, as in general, they are the most useful. For more information, refer to an SQL manual.

Good database design suggests that each table lists data only about a single *entity*, and detailed information can be obtained in a relational database, by using additional tables, and by using a *join*.

First, take a look at these example tables:

AntiqueOwners

OwnerID OwnerLastName OwnerFirstName 01 Jones Bill 02 Smith Bob 15 Lawson Patricia 21 Akins Jane 50 Fowler Sam

Orders

OwnerID ItemDesired 02 Table 02 Desk 21 Chair 15 Mirror

Antiques

SellerID BuyerID Item 01 50 Bed 02 15 Table 15 02 Chair 21 50 Mirror 50 01 Desk 01 21 Cabinet 02 21 Coffee Table 15 50 Chair 01 15 Jewelry Box 02 21 Pottery 21 02 Bookcase 50 01 Plant Stand

Keys

First, let's discuss the concept of *keys*. A *primary key* is a column or set of columns that uniquely identifies the rest of the data in any given row. For example, in the AntiqueOwners table, the OwnerID column uniquely identifies that row. This means two things: no two rows can have the same OwnerID, and, even if two owners have the same first and last names, the OwnerID column ensures that the two owners will not be confused with each other, because the unique OwnerID column will be used throughout the database to track the owners, rather than the names.

A *foreign key* is a column in a table where that column is a primary key of another table, which means that any data in a foreign key column must have corresponding data in the other table where that column is the primary key. In DBMS-speak, this correspondence is known as *referential integrity*. For example, in the Antiques table, both the BuyerID and SellerID are foreign keys to the primary key of the AntiqueOwners table (OwnerID; for purposes of argument, one has to be an Antique Owner before one can buy or sell any items), as, in both tables, the ID rows are used to identify the owners or buyers and sellers, and that the OwnerID is the primary key of the AntiqueOwners table. In other words, all of this "ID" data is used to refer to the owners, buyers, or sellers of antiques, themselves, without having to use the actual names.

Performing a Join

The purpose of these *keys* is so that data can be related across tables, without having to repeat data in every table— this is the power of relational databases. For example, you can find the names of those who bought a chair without having to list the full name of the buyer in the Antiques table...you can get the name by relating those who bought a chair with the names in the AntiqueOwners table through the use of the OwnerID, which *relates* the data in the two tables. To find the names of those who bought a chair, use the following query:

SELECT OWNERLASTNAME, OWNERFIRSTNAME

FROM ANTIQUEOWNERS, ANTIQUES

WHERE BUYERID = OWNERID AND ITEM = 'Chair';

Note the following about this query...notice that both tables involved in the relation are listed in the FROM clause of the statement. In the WHERE clause, first notice that the ITEM = 'Chair' part restricts the listing to those who have bought (and in this example, thereby owns) a chair. Secondly, notice how the ID columns are related from one table to the next by use of the BUYERID = OWNERID clause. Only where ID's match across tables and the item purchased is a chair (because of the AND), will the names from the AntiqueOwners table be listed. Because the joining condition used an equal sign, this join is called an *equijoin*. The result of this query is two names: Smith, Bob & Fowler, Sam.

Dot notation refers to prefixing the table names to column names, to avoid ambiguity, as follows:

SELECT ANTIQUEOWNERS.OWNERLASTNAME, ANTIQUEOWNERS.OWNERFIRSTNAME

FROM ANTIQUEOWNERS, ANTIQUES
WHERE ANTIQUES.BUYERID = ANTIQUEOWNERS.OWNERID AND ANTIQUES.ITEM = 'Chair';

As the column names are different in each table, however, this wasn't necessary.

***DISTINCT* and Eliminating Duplicates**

Let's say that you want to list the ID and names of **only** those people who have sold an antique. Obviously, you want a list where each seller is only listed once—you don't want to know how many antiques a person sold, just the fact that this person sold one (for counts, see the Aggregate Function section below). This means that you will need to tell SQL to eliminate duplicate sales rows, and just list each person only once. To do this, use the *DISTINCT* keyword.

First, we will need an equijoin to the AntiqueOwners table to get the detail data of the person's LastName and FirstName. However, keep in mind that since the SellerID column in the Antiques table is a foreign key to the AntiqueOwners table, a seller will only be listed if there is a row in the AntiqueOwners table listing the ID and names. We also want to eliminate multiple occurences of the SellerID in our listing, so we use *DISTINCT* **on the column where the repeats may occur.**

To throw in one more twist, we will also want the list alphabetized by LastName, then by FirstName (on a LastName tie). Thus, we will use the *ORDER BY* clause:

SELECT DISTINCT SELLERID, OWNERLASTNAME, OWNERFIRSTNAME FROM ANTIQUES, ANTIQUEOWNERS WHERE SELLERID = OWNERID ORDER BY OWNERLASTNAME, OWNERFIRSTNAME;

In this example, since everyone has sold an item, we will get a listing of all of the owners, in alphabetical order by last name. For future reference (and in case anyone asks), this type of join is considered to be in the category of *inner joins.* Please note that by no means is this a complete reference!!! It is, however, a guide to the queries you will need to know in order to (hopefully) extract the data you seek. Have fun…

The 'Ping of Death'

Essentially, it is possible to crash, reboot or otherwise kill a large number of systems by sending a ping of a certain size from a remote machine. This is a serious problem, mainly because this can be reproduced very easily, and from a remote machine. The attacker needs to know nothing about the machine other than its IP address. Be afraid.

It's very easy to exploit - basically, some systems don't like being pinged with a packet greater than 65536 bytes (as opposed to the default 64 bytes).

An IP datagram of 65536 bytes is illegal, but possible to create owing to the way the packet is fragmented (broken into chunks for transmission). When the fragments are reassembled at the other end into a complete packet, it overflows the buffer on some systems, causing a reboot, panic

or hang, but sometimes even having no effect at all.

Most implementations of ping won't allow an invalid datagram like this to be sent. Among the exceptions are Windows '95 and NT, although they are certainly not the only ones...

IP packets as per RFC-791 can be up to 65,535 (2^16-1) octets long, which includes the header length (typically 20 octets if no IP options are specified. An ICMP ECHO request "lives" inside the IP packet, consisting of eight octets of ICMP header information (RFC-792) followed by the number of data octets in the "ping" request. Hence the maximum allowable size of the data area is 65535 - 20 - 8 = 65507 octets.

Note that it is possible to send an illegal echo packet with more than 65507 octets of data due to the way the fragmentation is performed. The fragmentation relies on an offset value in each fragment to determine where the individual fragment goes upon reassembly. Thus on the last fragment, it is possible to combine a valid offset with a suitable fragment size such that (offset + size) > 65535. Since typical

machines don't process the packet until they have all fragments and have tried to reassemble it, there is the possibility for overflow of 16 bit internal variables, which can lead to system crashes, reboots, kernel dumps and the like. The problem can be exploited by anything that sends an IP datagram - probably the most fundamental building block of the net. Not only ICMP echo, but TCP, UDP and (apparently) even new style IPX can be used to hit machines where it hurts. This bug is extremely easy to exploit. Users are already trying it out "just to see if it works"!

Port Numbers and Services

This data is from Internet Assigned Numbers Authority (IANA). IANA maintains the Assigned Numbers RFC. The entries in this file are in the same format as found in a standard Berkeley UNIX /etc/services file. There are also links between the protocol and services names, and their respective RFCs (their standard documentation). This file has two sections:

Well known Port Numbers: port numbers that IANA assigns Registered Port Numbers: port numbers that IANA does not assign. This provides a list of which ports are used my which services. There really is more to the net than HTTP alone!

WELL KNOWN PORT NUMBERS

The Well Known Ports are controlled and assigned by the IANA and on most systems can only be used by system (or root) processes or by programs executed by privileged users. Ports are used in the TCP [RFC793] to name the ends of logical connections which carry long term conversations. For the purpose of providing services to unknown callers, a service contact port is defined. This list specifies the port used by the server process as its contact port. The contact port is sometimes called the "well-known port".

To the extent possible, these same port assignments are used with the UDP [RFC768].

The assigned ports use a small portion of the possible port numbers. For many years the assigned ports were in the range 0-255. Recently, the range for assigned ports managed by the IANA has been expanded to the range 0-1023.

[Go back to top of file]

Port Assignments:

```
Keyword       Decimal    Description                 References
-------       -------    -----------                 ----------
              0/tcp    Reserved
              0/udp    Reserved
#                     Jon Postel <postel@isi.edu>
tcpmux          1/tcp    TCP Port Service Multiplexer
tcpmux          1/udp    TCP Port Service Multiplexer
#                     Mark Lottor <MKL@nisc.sri.com>
compressnet     2/tcp    Management Utility
compressnet     2/udp    Management Utility
compressnet     3/tcp    Compression Process
compressnet     3/udp    Compression Process
#                     Bernie Volz <VOLZ@PROCESS.COM>
#               4/tcp    Unassigned
#               4/udp    Unassigned
rje             5/tcp    Remote Job Entry
rje             5/udp    Remote Job Entry
#                     Jon Postel <postel@isi.edu>
#               6/tcp    Unassigned
#               6/udp    Unassigned

echo
echo            7/tcp    Echo
echo            7/udp    Echo
#                     Jon Postel <postel@isi.edu>
#               8/tcp    Unassigned
#               8/udp    Unassigned

discard
discard         9/tcp    Discard
discard         9/udp    Discard
#                     Jon Postel <postel@isi.edu>
#              10/tcp    Unassigned
#              10/udp    Unassigned
systat          11/tcp    Active Users
systat          11/udp    Active Users
#                     Jon Postel <postel@isi.edu>
#              12/tcp    Unassigned
#              12/udp    Unassigned

daytime
daytime         13/tcp    Daytime
daytime         13/udp    Daytime
#                     Jon Postel <postel@isi.edu>
#              14/tcp    Unassigned
#              14/udp    Unassigned
#              15/tcp    Unassigned [was netstat]
#              15/udp    Unassigned
#              16/tcp    Unassigned
```

```
#               16/udp    Unassigned
qotd            17/tcp    Quote of the Day
qotd            17/udp    Quote of the Day
#                       Jon Postel <postel@isi.edu>
msp             18/tcp    Message Send Protocol
msp             18/udp    Message Send Protocol
#                       Rina Nethaniel <---none--->

chargen
chargen         19/tcp    Character Generator
chargen         19/udp    Character Generator

ftp (data and control)
ftp-data        20/tcp    File Transfer [Default Data]
ftp-data        20/udp    File Transfer [Default Data]
ftp             21/tcp    File Transfer [Control]
ftp             21/udp    File Transfer [Control]
#                       Jon Postel <postel@isi.edu>
ssh             22/tcp    SSH Remote Login Protocol
ssh             22/udp    SSH Remote Login Protocol
#                       Tatu Ylonen <ylo@cs.hut.fi>
telnet          23/tcp    Telnet
telnet          23/udp    Telnet
#                       Jon Postel <postel@isi.edu>
                24/tcp    any private mail system
                24/udp    any private mail system
#                       Rick Adams <rick@UUNET.UU.NET>
smtp            25/tcp    Simple Mail Transfer
smtp            25/udp    Simple Mail Transfer
#                       Jon Postel <postel@isi.edu>
#               26/tcp    Unassigned
#               26/udp    Unassigned
nsw-fe          27/tcp    NSW User System FE
nsw-fe          27/udp    NSW User System FE
#                       Robert Thomas <BThomas@F.BBN.COM>
#               28/tcp    Unassigned
#               28/udp    Unassigned
msg-icp         29/tcp    MSG ICP
msg-icp         29/udp    MSG ICP
#                       Robert Thomas <BThomas@F.BBN.COM>
#               30/tcp    Unassigned
#               30/udp    Unassigned
msg-auth        31/tcp    MSG Authentication
msg-auth        31/udp    MSG Authentication
#                       Robert Thomas <BThomas@F.BBN.COM>
#               32/tcp    Unassigned
#               32/udp    Unassigned
dsp             33/tcp    Display Support Protocol
dsp             33/udp    Display Support Protocol
#                       Ed Cain <cain@edn-unix.dca.mil>
#               34/tcp    Unassigned
```

```
#               34/udp    Unassigned
                35/tcp    any private printer server
                35/udp    any private printer server
#                       Jon Postel <postel@isi.edu>
#               36/tcp    Unassigned
#               36/udp    Unassigned
time            37/tcp    Time
time            37/udp    Time
#                       Jon Postel <postel@isi.edu>
rap             38/tcp    Route Access Protocol
rap             38/udp    Route Access Protocol
#                       Robert Ullmann <ariel@world.std.com>
rlp             39/tcp    Resource Location Protocol
rlp             39/udp    Resource Location Protocol
#                       Mike Accetta <MIKE.ACCETTA@CMU-CS-A.EDU>
#               40/tcp    Unassigned
#               40/udp    Unassigned
graphics        41/tcp    Graphics
graphics        41/udp    Graphics
nameserver      42/tcp    Host Name Server
nameserver      42/udp    Host Name Server
nicname         43/tcp    Who Is
nicname         43/udp    Who Is
mpm-flags       44/tcp    MPM FLAGS Protocol
mpm-flags       44/udp    MPM FLAGS Protocol
mpm             45/tcp    Message Processing Module [recv]
mpm             45/udp    Message Processing Module [recv]
mpm-snd         46/tcp    MPM [default send]
mpm-snd         46/udp    MPM [default send]
#                       Jon Postel <postel@isi.edu>
ni-ftp          47/tcp    NI FTP
ni-ftp          47/udp    NI FTP
#                       Steve Kille <S.Kille@isode.com>
auditd          48/tcp    Digital Audit Daemon
auditd          48/udp    Digital Audit Daemon
#                       Larry Scott <scott@zk3.dec.com>
bbn-login       49/tcp    Login Host Protocol (TACACS)
bbn-login       49/udp    Login Host Protocol (TACACS)
#                       Pieter Ditmars <pditmars@BBN.COM>
re-mail-ck      50/tcp    Remote Mail Checking Protocol
re-mail-ck      50/udp    Remote Mail Checking Protocol
#                       Steve Dorner <s-dorner@UIUC.EDU>
la-maint        51/tcp    IMP Logical Address Maintenance
la-maint        51/udp    IMP Logical Address Maintenance
#                       Andy Malis <malis_a@timeplex.com>
xns-time        52/tcp    XNS Time Protocol
xns-time        52/udp    XNS Time Protocol
#                       Susie Armstrong <Armstrong.wbst128@XEROX>
domain          53/tcp    Domain Name Server
domain          53/udp    Domain Name Server
```

```
#                   Paul Mockapetris <PVM@ISI.EDU>
xns-ch          54/tcp    XNS Clearinghouse
xns-ch          54/udp    XNS Clearinghouse
#                   Susie Armstrong <Armstrong.wbst128@XEROX>
isi-gl          55/tcp    ISI Graphics Language
isi-gl          55/udp    ISI Graphics Language
xns-auth        56/tcp    XNS Authentication
xns-auth        56/udp    XNS Authentication
#                   Susie Armstrong <Armstrong.wbst128@XEROX>
                57/tcp    any private terminal access
                57/udp    any private terminal access
#                   Jon Postel <postel@isi.edu>
xns-mail        58/tcp    XNS Mail
xns-mail        58/udp    XNS Mail
#                   Susie Armstrong <Armstrong.wbst128@XEROX>
                59/tcp    any private file service
                59/udp    any private file service
#                   Jon Postel <postel@isi.edu>
                60/tcp    Unassigned
                60/udp    Unassigned
ni-mail         61/tcp    NI MAIL
ni-mail         61/udp    NI MAIL
#                   Steve Kille <S.Kille@isode.com>
acas            62/tcp    ACA Services
acas            62/udp    ACA Services
#                   E. Wald <ewald@via.enet.dec.com>
whois++         63/tcp    whois++
whois++         63/udp    whois++
#                   Rickard Schoultz <schoultz@sunet.se>
covia           64/tcp    Communications Integrator (CI)
covia           64/udp    Communications Integrator (CI)
#                   "Tundra" Tim Daneliuk
#                   <tundraix!tundra@clout.chi.il.us>
tacacs-ds       65/tcp    TACACS-Database Service
tacacs-ds       65/udp    TACACS-Database Service
#                   Kathy Huber <khuber@bbn.com>
sql*net         66/tcp    Oracle SQL*NET
sql*net         66/udp    Oracle SQL*NET
#                   Jack Haverty <jhaverty@ORACLE.COM>
bootps          67/tcp    Bootstrap Protocol Server
bootps          67/udp    Bootstrap Protocol Server
bootpc          68/tcp    Bootstrap Protocol Client
bootpc          68/udp    Bootstrap Protocol Client
#                   Bill Croft <Croft@SUMEX-AIM.STANFORD.EDU>
tftp            69/tcp    Trivial File Transfer
tftp            69/udp    Trivial File Transfer
#                   David Clark <ddc@LCS.MIT.EDU>
gopher          70/tcp    Gopher
gopher          70/udp    Gopher
#                   Mark McCahill <mpm@boombox.micro.umn.edu>
netrjs-1        71/tcp    Remote Job Service
```

```
netrjs-1        71/udp    Remote Job Service
netrjs-2        72/tcp    Remote Job Service
netrjs-2        72/udp    Remote Job Service
netrjs-3        73/tcp    Remote Job Service
netrjs-3        73/udp    Remote Job Service
netrjs-4        74/tcp    Remote Job Service
netrjs-4        74/udp    Remote Job Service
#                       Bob Braden <Braden@ISI.EDU>
              75/tcp    any private dial out service
              75/udp    any private dial out service
#                       Jon Postel <postel@isi.edu>
deos            76/tcp    Distributed External Object Store
deos            76/udp    Distributed External Object Store
#                       Robert Ullmann <ariel@world.std.com>
              77/tcp    any private RJE service
              77/udp    any private RJE service
#                       Jon Postel <postel@isi.edu>
vettcp          78/tcp    vettcp
vettcp          78/udp    vettcp
#                       Christopher Leong <leong@kolmod.mlo.dec.com>
finger          79/tcp    Finger
finger          79/udp    Finger
#                       David Zimmerman <dpz@RUTGERS.EDU>
http            80/tcp    World Wide Web HTTP
http            80/udp    World Wide Web HTTP
www-http        80/tcp    World Wide Web HTTP
www-http        80/udp    World Wide Web HTTP
#                       Tim Berners-Lee <timbl@W3.org>
hosts2-ns       81/tcp    HOSTS2 Name Server
hosts2-ns       81/udp    HOSTS2 Name Server
#                       Earl Killian <EAK@MORDOR.S1.GOV>
xfer            82/tcp    XFER Utility
xfer            82/udp    XFER Utility
#                       Thomas M. Smith <tmsmith@esc.syr.ge.com>
mit-ml-dev      83/tcp    MIT ML Device
mit-ml-dev      83/udp    MIT ML Device
#                       David Reed <--none--->
ctf             84/tcp    Common Trace Facility
ctf             84/udp    Common Trace Facility
#                       Hugh Thomas <thomas@oils.enet.dec.com>
mit-ml-dev      85/tcp    MIT ML Device
mit-ml-dev      85/udp    MIT ML Device
#                       David Reed <--none--->
mfcobol         86/tcp    Micro Focus Cobol
mfcobol         86/udp    Micro Focus Cobol
#                       Simon Edwards <--none--->
              87/tcp    any private terminal link
              87/udp    any private terminal link
#                       Jon Postel <postel@isi.edu>
kerberos        88/tcp    Kerberos
kerberos        88/udp    Kerberos
```

```
#                   B. Clifford Neuman <bcn@isi.edu>
su-mit-tg       89/tcp    SU/MIT Telnet Gateway
su-mit-tg       89/udp    SU/MIT Telnet Gateway
#                   Mark Crispin <MRC@PANDA.COM>
dnsix           90/tcp    DNSIX Securit Attribute Token Map
dnsix           90/udp    DNSIX Securit Attribute Token Map
#                   Charles Watt <watt@sware.com>
mit-dov         91/tcp    MIT Dover Spooler
mit-dov         91/udp    MIT Dover Spooler
#                   Eliot Moss <EBM@XX.LCS.MIT.EDU>
npp             92/tcp    Network Printing Protocol
npp             92/udp    Network Printing Protocol
#                   Louis Mamakos <louie@sayshell.umd.edu>
dcp             93/tcp    Device Control Protocol
dcp             93/udp    Device Control Protocol
#                   Daniel Tappan <Tappan@BBN.COM>
objcall         94/tcp    Tivoli Object Dispatcher
objcall         94/udp    Tivoli Object Dispatcher
#                   Tom Bereiter <--none--->
supdup          95/tcp    SUPDUP
supdup          95/udp    SUPDUP
#                   Mark Crispin <MRC@PANDA.COM>
dixie           96/tcp    DIXIE Protocol Specification
dixie           96/udp    DIXIE Protocol Specification
#               Tim Howes <Tim.Howes@terminator.cc.umich.edu>
swift-rvf       97/tcp    Swift Remote Virtural File Protocol
swift-rvf       97/udp    Swift Remote Virtural File Protocol
#                   Maurice R. Turcotte
#               <mailrus!uflorida!rm1!dnmrt%rmatl@uunet.UU.NET>

tacnews         98/tcp    TAC News
tacnews         98/udp    TAC News
#                   Jon Postel <postel@isi.edu>
metagram        99/tcp    Metagram Relay
metagram        99/udp    Metagram Relay
#                   Geoff Goodfellow <Geoff@FERNWOOD.MPK.CA.U>
newacct        100/tcp    [unauthorized use]
hostname        101/tcp    NIC Host Name Server
hostname        101/udp    NIC Host Name Server
#                   Jon Postel <postel@isi.edu>
iso-tsap        102/tcp    ISO-TSAP Class 0
iso-tsap        102/udp    ISO-TSAP Class 0
#                   Marshall Rose <mrose@dbc.mtview.ca.us>
gppitnp         103/tcp    Genesis Point-to-Point Trans Net
gppitnp         103/udp    Genesis Point-to-Point Trans Net
acr-nema        104/tcp    ACR-NEMA Digital Imag. & Comm.
300
acr-nema        104/udp    ACR-NEMA Digital Imag. & Comm.
300
#                   Patrick McNamee <--none--->
```

```
csnet-ns        105/tcp    Mailbox Name Nameserver
csnet-ns        105/udp    Mailbox Name Nameserver
#                       Marvin Solomon <solomon@CS.WISC.EDU>
3com-tsmux      106/tcp    3COM-TSMUX
3com-tsmux      106/udp    3COM-TSMUX
#                       Jeremy Siegel <jzs@NSD.3Com.COM>
rtelnet         107/tcp    Remote Telnet Service
rtelnet         107/udp    Remote Telnet Service
#                       Jon Postel <postel@isi.edu>
snagas          108/tcp    SNA Gateway Access Server
snagas          108/udp    SNA Gateway Access Server
#                       Kevin Murphy <murphy@sevens.lkg.dec.com>
pop2            109/tcp    Post Office Protocol - Version 2
pop2            109/udp    Post Office Protocol - Version 2
#                       Joyce K. Reynolds <jkrey@isi.edu>
pop3            110/tcp    Post Office Protocol - Version 3
pop3            110/udp    Post Office Protocol - Version 3
#                       Marshall Rose <mrose@dbc.mtview.ca.us>
sunrpc          111/tcp    SUN Remote Procedure Call
sunrpc          111/udp    SUN Remote Procedure Call
#                       Chuck McManis <cmcmanis@sun.com>
mcidas          112/tcp    McIDAS Data Transmission Protocol
mcidas          112/udp    McIDAS Data Transmission Protocol
#                       Glenn Davis <davis@unidata.ucar.edu>
auth            113/tcp    Authentication Service
auth            113/udp    Authentication Service
#                       Mike St. Johns <stjohns@arpa.mil>
audionews       114/tcp    Audio News Multicast
audionews       114/udp    Audio News Multicast
#                       Martin Forssen <maf@dtek.chalmers.se>
sftp            115/tcp    Simple File Transfer Protocol
sftp            115/udp    Simple File Transfer Protocol
#                       Mark Lottor <MKL@nisc.sri.com>
ansanotify      116/tcp    ANSA REX Notify
ansanotify      116/udp    ANSA REX Notify
#                       Nicola J. Howarth <njh@ansa.co.uk>
uucp-path       117/tcp    UUCP Path Service
uucp-path       117/udp    UUCP Path Service
sqlserv         118/tcp    SQL Services
sqlserv         118/udp    SQL Services
#                       Larry Barnes <barnes@broke.enet.dec.com>
nntp            119/tcp    Network News Transfer Protocol
nntp            119/udp    Network News Transfer Protocol
#                       Phil Lapsley <phil@UCBARPA.BERKELEY.EDU>
cfdptkt         120/tcp    CFDPTKT
cfdptkt         120/udp    CFDPTKT
#                       John Ioannidis <ji@close.cs.columbia.ed>
erpc            121/tcp    Encore Expedited Remote Pro.Call
erpc            121/udp    Encore Expedited Remote Pro.Call
#                       Jack O'Neil <---none--->
smakynet        122/tcp    SMAKYNET
```

```
smakynet        122/udp    SMAKYNET
#                   Mike O'Dowd <odowd@ltisun8.epfl.ch>
ntp           123/tcp    Network Time Protocol
ntp           123/udp    Network Time Protocol
#                   Dave Mills <Mills@HUEY.UDEL.EDU>
ansatrader      124/tcp    ANSA REX Trader
ansatrader      124/udp    ANSA REX Trader
#                   Nicola J. Howarth <njh@ansa.co.uk>
locus-map       125/tcp    Locus PC-Interface Net Map Ser
locus-map       125/udp    Locus PC-Interface Net Map Ser
#                   Eric Peterson <lcc.eric@SEAS.UCLA.EDU>
unitary         126/tcp    Unisys Unitary Login
unitary         126/udp    Unisys Unitary Login
#                   <feil@kronos.nisd.cam.unisys.com>
locus-con       127/tcp    Locus PC-Interface Conn Server
locus-con       127/udp    Locus PC-Interface Conn Server
#                   Eric Peterson <lcc.eric@SEAS.UCLA.EDU>
gss-xlicen      128/tcp    GSS X License Verification
gss-xlicen      128/udp    GSS X License Verification
#                   John Light <johnl@gssc.gss.com>
pwdgen          129/tcp    Password Generator Protocol
pwdgen          129/udp    Password Generator Protocol
#             Frank J. Wacho <WANCHO@WSMR-SIMTEL20.ARMY.MIL>
cisco-fna       130/tcp    cisco FNATIVE
cisco-fna       130/udp    cisco FNATIVE
cisco-tna       131/tcp    cisco TNATIVE
cisco-tna       131/udp    cisco TNATIVE
cisco-sys       132/tcp    cisco SYSMAINT
cisco-sys       132/udp    cisco SYSMAINT
statsrv         133/tcp    Statistics Service
statsrv         133/udp    Statistics Service
#                   Dave Mills <Mills@HUEY.UDEL.EDU>
ingres-net      134/tcp    INGRES-NET Service
ingres-net      134/udp    INGRES-NET Service
#                   Mike Berrow <---none--->
loc-srv         135/tcp    Location Service
loc-srv         135/udp    Location Service
#                   Joe Pato <apollo!pato@EDDIE.MIT.EDU>
profile         136/tcp    PROFILE Naming System
profile         136/udp    PROFILE Naming System
#                   Larry Peterson <llp@ARIZONA.EDU>
netbios-ns      137/tcp    NETBIOS Name Service
netbios-ns      137/udp    NETBIOS Name Service
netbios-dgm     138/tcp    NETBIOS Datagram Service
netbios-dgm     138/udp    NETBIOS Datagram Service
netbios-ssn     139/tcp    NETBIOS Session Service
netbios-ssn     139/udp    NETBIOS Session Service
#                   Jon Postel <postel@isi.edu>
emfis-data      140/tcp    EMFIS Data Service
emfis-data      140/udp    EMFIS Data Service
emfis-cntl      141/tcp    EMFIS Control Service
```

```
emfis-cntl      141/udp    EMFIS Control Service
#                   Gerd Beling <GBELING@ISI.EDU>
bl-idm          142/tcp    Britton-Lee IDM
bl-idm          142/udp    Britton-Lee IDM
#                   Susie Snitzer <---none--->
imap2           143/tcp    Interim Mail Access Protocol v2
imap2           143/udp    Interim Mail Access Protocol v2
#                   Mark Crispin <MRC@PANDA.COM>
news            144/tcp    NewS
news            144/udp    NewS
#                   James Gosling <JAG@SUN.COM>
uaac            145/tcp    UAAC Protocol
uaac            145/udp    UAAC Protocol
#               David A. Gomberg <gomberg@GATEWAY.MITRE.ORG>
iso-tp0         146/tcp    ISO-IP0
iso-tp0         146/udp    ISO-IP0
iso-ip          147/tcp    ISO-IP
iso-ip          147/udp    ISO-IP
#                   Marshall Rose <mrose@dbc.mtview.ca.us>
cronus          148/tcp    CRONUS-SUPPORT
cronus          148/udp    CRONUS-SUPPORT
#                   Jeffrey Buffun <jbuffum@APOLLO.COM>
aed-512         149/tcp    AED 512 Emulation Service

aed-512         149/udp    AED 512 Emulation Service

#               Albert G. Broscius <broscius@DSL.CIS.UPENN.EDU>
sql-net         150/tcp    SQL-NET
sql-net         150/udp    SQL-NET
#                   Martin Picard <<---none--->
hems            151/tcp    HEMS
hems            151/udp    HEMS
#                   Christopher Tengi <tengi@Princeton.EDU>
bftp            152/tcp    Background File Transfer Program
bftp            152/udp    Background File Transfer Program
#                   Annette DeSchon <DESCHON@ISI.EDU>
sgmp            153/tcp    SGMP
sgmp            153/udp    SGMP
#                   Marty Schoffstahl <schoff@NISC.NYSER.NET>
netsc-prod      154/tcp    NETSC
netsc-prod      154/udp    NETSC
netsc-dev       155/tcp    NETSC
netsc-dev       155/udp    NETSC
#                   Sergio Heker <heker@JVNCC.CSC.ORG>
sqlsrv          156/tcp    SQL Service
sqlsrv          156/udp    SQL Service
#                   Craig Rogers <Rogers@ISI.EDU>
knet-cmp        157/tcp    KNET/VM Command/Message Protocol
knet-cmp        157/udp    KNET/VM Command/Message Protocol
#                   Gary S. Malkin <GMALKIN@XYLOGICS.COM>
pcmail-srv      158/tcp    PCMail Server
```

```
pcmail-srv      158/udp    PCMail Server
#                  Mark L. Lambert <markl@PTT.LCS.MIT.EDU>
nss-routing     159/tcp    NSS-Routing
nss-routing     159/udp    NSS-Routing
#                  Yakov Rekhter <Yakov@IBM.COM>
sgmp-traps      160/tcp    SGMP-TRAPS
sgmp-traps      160/udp    SGMP-TRAPS
#                  Marty Schoffstahl <schoff@NISC.NYSER.NET>
snmp           161/tcp    SNMP
snmp           161/udp    SNMP
snmptrap        162/tcp    SNMPTRAP
snmptrap        162/udp    SNMPTRAP
#                  Marshall Rose <mrose@dbc.mtview.ca.us>
cmip-man        163/tcp    CMIP/TCP Manager
cmip-man        163/udp    CMIP/TCP Manager
cmip-agent      164/tcp    CMIP/TCP Agent
smip-agent      164/udp    CMIP/TCP Agent
#                  Amatzia Ben-Artzi <---none--->
xns-courier     165/tcp    Xerox
xns-courier     165/udp    Xerox
#                  Susie Armstrong <Armstrong.wbst128@XEROX.COM>
s-net          166/tcp    Sirius Systems
s-net          166/udp    Sirius Systems
#                  Brian Lloyd <---none--->
namp           167/tcp    NAMP
namp           167/udp    NAMP
#                  Marty Schoffstahl <schoff@NISC.NYSER.NET>
rsvd           168/tcp    RSVD
rsvd           168/udp    RSVD
#                  Neil Todd <mcvax!ist.co.uk!neil@UUNET.UU.NET>
send           169/tcp    SEND
send           169/udp    SEND
#              William D. Wisner <wisner@HAYES.FAI.ALASKA.EDU>
print-srv       170/tcp    Network PostScript
print-srv       170/udp    Network PostScript
#                  Brian Reid <reid@DECWRL.DEC.COM>
multiplex       171/tcp    Network Innovations Multiplex
multiplex       171/udp    Network Innovations Multiplex
cl/1           172/tcp    Network Innovations CL/1
cl/1           172/udp    Network Innovations CL/1
#                  Kevin DeVault <<---none--->
xyplex-mux      173/tcp    Xyplex
xyplex-mux      173/udp    Xyplex
#                  Bob Stewart <STEWART@XYPLEX.COM>
mailq          174/tcp    MAILQ

mailq          174/udp    MAILQ

#                  Rayan Zachariassen <rayan@AI.TORONTO.EDU>
vmnet          175/tcp    VMNET
```

```
vmnet          175/udp    VMNET
#                   Christopher Tengi <tengi@Princeton.EDU>
genrad-mux     176/tcp    GENRAD-MUX
genrad-mux     176/udp    GENRAD-MUX
#                   Ron Thornton <thornton@qm7501.genrad.com>
xdmcp          177/tcp    X Display Manager Control Protocol

xdmcp          177/udp    X Display Manager Control Protocol

#                   Robert W. Scheifler <RWS@XX.LCS.MIT.EDU>
nextstep       178/tcp    NextStep Window Server
NextStep       178/udp    NextStep Window Server
#                   Leo Hourvitz <leo@NEXT.COM>
bgp            179/tcp    Border Gateway Protocol

bgp            179/udp    Border Gateway Protocol

#                   Kirk Lougheed <LOUGHEED@MATHOM.CISCO.COM>
ris            180/tcp    Intergraph

ris            180/udp    Intergraph

#                   Dave Buehmann <ingr!daveb@UUNET.UU.NET>
unify          181/tcp    Unify
unify          181/udp    Unify
#                   Vinod Singh <--none--->
audit          182/tcp    Unisys Audit SITP

audit          182/udp    Unisys Audit SITP

#                   Gil Greenbaum <gcole@nisd.cam.unisys.com>
ocbinder       183/tcp    OCBinder
ocbinder       183/udp    OCBinder
ocserver       184/tcp    OCServer
ocserver       184/udp    OCServer
#                   Jerrilynn Okamura <--none--->
remote-kis     185/tcp    Remote-KIS
remote-kis     185/udp    Remote-KIS
kis            186/tcp    KIS Protocol
kis            186/udp    KIS Protocol
#                   Ralph Droms <rdroms@NRI.RESTON.VA.US>
aci            187/tcp    Application Communication Interface
aci            187/udp    Application Communication Interface
#                   Rick Carlos <rick.ticipa.csc.ti.com>
mumps          188/tcp    Plus Five's MUMPS
mumps          188/udp    Plus Five's MUMPS
#                   Hokey Stenn <hokey@PLUS5.COM>
qft            189/tcp    Queued File Transport
qft            189/udp    Queued File Transport
#                   Wayne Schroeder <schroeder@SDS.SDSC.EDU>
gacp           190/tcp    Gateway Access Control Protocol
```

```
cacp            190/udp    Gateway Access Control Protocol
#                       C. Philip Wood <cpw@LANL.GOV>
prospero        191/tcp    Prospero Directory Service
prospero        191/udp    Prospero Directory Service
#                       B. Clifford Neuman <bcn@isi.edu>
osu-nms         192/tcp    OSU Network Monitoring System

osu-nms         192/udp    OSU Network Monitoring System

#               Doug Karl <KARL-D@OSU-20.IRCC.OHIO-STATE.EDU>
srmp            193/tcp    Spider Remote Monitoring Protocol
srmp            193/udp    Spider Remote Monitoring Protocol
#                       Ted J. Socolofsky <Teds@SPIDER.CO.UK>
irc             194/tcp    Internet Relay Chat Protocol

irc             194/udp    Internet Relay Chat Protocol

#                       Jarkko Oikarinen <jto@TOLSUN.OULU.FI>
dn6-nlm-aud     195/tcp    DNSIX Network Level Module Audit

dn6-nlm-aud     195/udp    DNSIX Network Level Module Audit

dn6-smm-red     196/tcp    DNSIX Session Mgt Module Audit Redir
dn6-smm-red     196/udp    DNSIX Session Mgt Module Audit Redir
#                       Lawrence Lebahn <DIA3@PAXRV-NES.NAVY.MIL>
dls             197/tcp    Directory Location Service
dls             197/udp    Directory Location Service
dls-mon         198/tcp    Directory Location Service Monitor
dls-mon         198/udp    Directory Location Service Monitor
#                       Scott Bellew <smb@cs.purdue.edu>
smux            199/tcp    SMUX
smux            199/udp    SMUX
#                       Marshall Rose <mrose@dbc.mtview.ca.us>
src             200/tcp    IBM System Resource Controller
src             200/udp    IBM System Resource Controller
#                       Gerald McBrearty <---none--->
at-rtmp         201/tcp    AppleTalk Routing Maintenance

at-rtmp         201/udp    AppleTalk Routing Maintenance

at-nbp          202/tcp    AppleTalk Name Binding

at-nbp          202/udp    AppleTalk Name Binding

at-3            203/tcp    AppleTalk Unused

at-3            203/udp    AppleTalk Unused

at-echo         204/tcp    AppleTalk Echo

at-echo         204/udp    AppleTalk Echo
```

```
at-5            205/tcp    AppleTalk Unused

at-5            205/udp    AppleTalk Unused

at-zis          206/tcp    AppleTalk Zone Information

at-zis          206/udp    AppleTalk Zone Information

at-7            207/tcp    AppleTalk Unused

at-7            207/udp    AppleTalk Unused

at-8            208/tcp    AppleTalk Unused

at-8            208/udp    AppleTalk Unused

#                       Rob Chandhok <chandhok@gnome.cs.cmu.edu>
tam             209/tcp    Trivial Authenticated Mail Protocol
tam             209/udp    Trivial Authenticated Mail Protocol
#               Dan Bernstein <djb@silverton.berkeley.edu>
z39.50          210/tcp    ANSI Z39.50
z39.50          210/udp    ANSI Z39.50
#                       Mark Needleman
#                      <mhnur%uccmvsa.bitnet@cornell.cit.cornell.edu>

914c/g          211/tcp    Texas Instruments 914C/G Terminal
914c/g          211/udp    Texas Instruments 914C/G Terminal
#                       Bill Harrell <---none--->
anet            212/tcp    ATEXSSTR
anet            212/udp    ATEXSSTR
#                       Jim Taylor <taylor@heart.epps.kodak.com>
ipx             213/tcp    IPX

ipx             213/udp    IPX

#                       Don Provan <donp@xlnvax.novell.com>
vmpwscs         214/tcp    VM PWSCS
vmpwscs         214/udp    VM PWSCS
#                       Dan Shia <dset!shia@uunet.UU.NET>
softpc          215/tcp    Insignia Solutions
softpc          215/udp    Insignia Solutions
#                       Martyn Thomas <---none--->
atls            216/tcp    Access Technology License Server

atls            216/udp    Access Technology License Server

#                       Larry DeLuca <henrik@EDDIE.MIT.EDU>
dbase           217/tcp    dBASE Unix
dbase           217/udp    dBASE Unix
#                       Don Gibson
```

```
#          <sequent!aero!twinsun!ashtate.A-T.COM!dong@uunet.UU.NET>

mpp          218/tcp    Netix Message Posting Protocol
mpp          218/udp    Netix Message Posting Protocol
#                  Shannon Yeh <yeh@netix.com>
uarps        219/tcp    Unisys ARPs
uarps        219/udp    Unisys ARPs
#                  Ashok Marwaha <---none--->
imap3        220/tcp    Interactive Mail Access Protocol v3
imap3        220/udp    Interactive Mail Access Protocol v3
#                  James Rice <RICE@SUMEX-AIM.STANFORD.EDU>
fln-spx      221/tcp    Berkeley rlogind with SPX auth
fln-spx      221/udp    Berkeley rlogind with SPX auth
rsh-spx      222/tcp    Berkeley rshd with SPX auth
rsh-spx      222/udp    Berkeley rshd with SPX auth
cdc          223/tcp    Certificate Distribution Center
cdc          223/udp    Certificate Distribution Center
#          Kannan Alagappan <kannan@sejour.enet.dec.com>
#          224-241    Reserved
#                  Jon Postel <postel@isi.edu>
#          242/tcp    Unassigned
#          242/udp    Unassigned
sur-meas     243/tcp    Survey Measurement
sur-meas     243/udp    Survey Measurement
#                  Dave Clark <ddc@LCS.MIT.EDU>
#          244/tcp    Unassigned
#          244/udp    Unassigned
link         245/tcp    LINK
link         245/udp    LINK
dsp3270      246/tcp    Display Systems Protocol
dsp3270      246/udp    Display Systems Protocol
#                  Weldon J. Showalter <Gamma@MINTAKA.DCA.MIL>
#          247-255    Reserved
#                  Jon Postel <postel@isi.edu>
#          256-343    Unassigned
pdap         344/tcp    Prospero Data Access Protocol
pdap         344/udp    Prospero Data Access Protocol
#                  B. Clifford Neuman <bcn@isi.edu>
pawserv      345/tcp    Perf Analysis Workbench
pawserv      345/udp    Perf Analysis Workbench
zserv        346/tcp    Zebra server
zserv        346/udp    Zebra server
fatserv      347/tcp    Fatmen Server
fatserv      347/udp    Fatmen Server
csi-sgwp     348/tcp    Cabletron Management Protocol
csi-sgwp     348/udp    Cabletron Management Protocol
#          349-370    Unassigned
clearcase    371/tcp    Clearcase
clearcase    371/udp    Clearcase
#                  Dave LeBlang <leglang@atria.com>
ulistserv    372/tcp    Unix Listserv
```

```
ulistserv       372/udp    Unix Listserv
#                       Anastasios Kotsikonas <tasos@cs.bu.edu>
legent-1        373/tcp    Legent Corporation
legent-1        373/udp    Legent Corporation
legent-2        374/tcp    Legent Corporation
legent-2        374/udp    Legent Corporation
#                       Keith Boyce <---none--->
hassle          375/tcp    Hassle
hassle          375/udp    Hassle
#                       Reinhard Doelz <doelz@comp.bioz.unibas.ch>
nip             376/tcp    Amiga Envoy Network Inquiry Proto

nip             376/udp    Amiga Envoy Network Inquiry Proto
#                       Heinz Wrobel <heinz@iam.com>
#                       Dale L. Larson <dale@iam.com>
tnETOS          377/tcp    NEC Corporation
tnETOS          377/udp    NEC Corporation
dsETOS          378/tcp    NEC Corporation
dsETOS          378/udp    NEC Corporation
#                       Tomoo Fujita <tf@arc.bs1.fc.nec.co.jp>
is99c           379/tcp    TIA/EIA/IS-99 modem client
is99c           379/udp    TIA/EIA/IS-99 modem client
is99s           380/tcp    TIA/EIA/IS-99 modem server
is99s           380/udp    TIA/EIA/IS-99 modem server
#                       Frank Quick <fquick@qualcomm.com>
hp-collector    381/tcp    hp performance data collector
hp-collector    381/udp    hp performance data collector
hp-managed-node 382/tcp    hp performance data managed node
hp-managed-node 382/udp    hp performance data managed node
hp-alarm-mgr    383/tcp    hp performance data alarm manager
hp-alarm-mgr    383/udp    hp performance data alarm manager
#                       Frank Blakely <frankb@hpptc16.rose.hp.com>
arns            384/tcp    A Remote Network Server System
arns            384/udp    A Remote Network Server System
#                       David Hornsby <djh@munnari.OZ.AU>
ibm-app         385/tcp    IBM Application
ibm-app         385/tcp    IBM Application
#                       Lisa Tomita <---none--->
asa             386/tcp    ASA Message Router Object Def.
asa             386/udp    ASA Message Router Object Def.
#                       Steve Laitinen <laitinen@brutus.aa.ab.com>
aurp            387/tcp    Appletalk Update-Based Routing Pro.
aurp            387/udp    Appletalk Update-Based Routing Pro.
#                       Chris Ranch <cranch@novell.com>
unidata-ldm     388/tcp    Unidata LDM Version 4
unidata-ldm     388/udp    Unidata LDM Version 4
#                       Glenn Davis <davis@unidata.ucar.edu>
ldap            389/tcp    Lightweight Directory Access Protocol
ldap            389/udp    Lightweight Directory Access Protocol
#                       Tim Howes <Tim.Howes@terminator.cc.umich.edu>
uis             390/tcp    UIS
```

```
uis             390/udp    UIS
#                          Ed Barron <---none--->
synotics-relay  391/tcp    SynOptics SNMP Relay Port
synotics-relay  391/udp    SynOptics SNMP Relay Port
synotics-broker 392/tcp    SynOptics Port Broker Port
synotics-broker 392/udp    SynOptics Port Broker Port
#                          Illan Raab <iraab@synoptics.com>
dis             393/tcp    Data Interpretation System
dis             393/udp    Data Interpretation System
#                          Paul Stevens <pstevens@chinacat.Metaphor.COM>
embl-ndt        394/tcp    EMBL Nucleic Data Transfer
embl-ndt        394/udp    EMBL Nucleic Data Transfer
#                          Peter Gad <peter@bmc.uu.se>
netcp           395/tcp    NETscout Control Protocol
netcp           395/udp    NETscout Control Protocol
#                          Anil Singhal <---none--->
netware-ip      396/tcp    Novell Netware over IP
netware-ip      396/udp    Novell Netware over IP
mptn            397/tcp    Multi Protocol Trans. Net.
mptn            397/udp    Multi Protocol Trans. Net.
#                          Soumitra Sarkar <sarkar@vnet.ibm.com>
kryptolan       398/tcp    Kryptolan
kryptolan       398/udp    Kryptolan
#                          Peter de Laval <pdl@sectra.se>
iso-tsap-c2     399/tcp    ISO-TSAP Class 2
iso-tsap-c2     399/udp    ISO-TSAP Class 2
#                Yanivk Pouffary <pouffary@yaec.enet.dec.com>
work-sol        400/tcp    Workstation Solutions
work-sol        400/udp    Workstation Solutions
#                          Jim Ward <jimw@worksta.com>
ups             401/tcp    Uninterruptible Power Supply
ups             401/udp    Uninterruptible Power Supply
#                          Guenther Seybold <gs@hrz.th-darmstadt.de>
genie           402/tcp    Genie Protocol
genie           402/udp    Genie Protocol
#                          Mark Hankin <---none--->
decap           403/tcp    decap
decap           403/udp    decap
nced            404/tcp    nced
nced            404/udp    nced
ncld            405/tcp    ncld
ncld            405/udp    ncld
#                          Richard Jones <---none--->
imsp            406/tcp    Interactive Mail Support Protocol
imsp            406/udp    Interactive Mail Support Protocol
#                          John Myers <jgm+@cmu.edu>
timbuktu        407/tcp    Timbuktu
timbuktu        407/udp    Timbuktu
#                          Marc Epard <marc@waygate.farallon.com>
prm-sm          408/tcp    Prospero Resource Manager Sys. Man.
prm-sm          408/udp    Prospero Resource Manager Sys. Man.
```

```
prm-nm          409/tcp    Prospero Resource Manager Node Man.
prm-nm          409/udp    Prospero Resource Manager Node Man.
#                          B. Clifford Neuman <bcn@isi.edu>
decladebug      410/tcp    DECLadebug Remote Debug Protocol
decladebug      410/udp    DECLadebug Remote Debug Protocol
#                          Anthony Berent <berent@rdgeng.enet.dec.com>
rmt             411/tcp    Remote MT Protocol
rmt             411/udp    Remote MT Protocol
#                          Peter Eriksson <pen@lysator.liu.se>
synoptics-trap  412/tcp    Trap Convention Port
synoptics-trap  412/udp    Trap Convention Port
#                          Illan Raab <iraab@synoptics.com>
smsp            413/tcp    SMSP
smsp            413/udp    SMSP
infoseek        414/tcp    InfoSeek
infoseek        414/udp    InfoSeek
#                          Steve Kirsch <stk@frame.com>
bnet            415/tcp    BNet
bnet            415/udp    BNet
#                          Jim Mertz <JMertz+RV09@rvdc.unisys.com>
silverplatter   416/tcp    Silverplatter
silverplatter   416/udp    Silverplatter
#                          Peter Ciuffetti <petec@silverplatter.com>
onmux           417/tcp    Onmux
onmux           417/udp    Onmux
#                          Stephen Hanna <hanna@world.std.com>
hyper-g         418/tcp    Hyper-G
hyper-g         418/udp    Hyper-G
#                          Frank Kappe <fkappe@iicm.tu-graz.ac.at>
ariel1          419/tcp    Ariel
ariel1          419/udp    Ariel
#                          Jonathan Lavigne <BL.JPL@RLG.Stanford.EDU>
smpte           420/tcp    SMPTE
smpte           420/udp    SMPTE
#                          Si Becker <71362.22@CompuServe.COM>
ariel2          421/tcp    Ariel
ariel2          421/udp    Ariel
ariel3          422/tcp    Ariel
ariel3          422/udp    Ariel
#                          Jonathan Lavigne  <BL.JPL@RLG.Stanford.EDU>
opc-job-start   423/tcp    IBM Operations Planning and Control
Start
opc-job-start   423/udp    IBM Operations Planning and Control
Start
opc-job-track   424/tcp    IBM Operations Planning and Control
Track
opc-job-track   424/udp    IBM Operations Planning and Control
Track
#                          Conny Larsson  <cocke@VNET.IBM.COM>
icad-el         425/tcp    ICAD
icad-el         425/udp    ICAD
```

```
#           Larry Stone <lcs@icad.com>
smartsdp       426/tcp    smartsdp
smartsdp       426/udp    smartsdp
#                   Alexander Dupuy <dupuy@smarts.com>
svrloc         427/tcp    Server Location
svrloc         427/udp    Server Location
#                   <veizades@ftp.com>
ocs_cmu        428/tcp    OCS_CMU
ocs_cmu        428/udp    OCS_CMU
ocs_amu        429/tcp    OCS_AMU
ocs_amu        429/udp    OCS_AMU
#                   Florence Wyman <wyman@peabody.plk.af.mil>
utmpsd         430/tcp    UTMPSD
utmpsd         430/udp    UTMPSD
utmpcd         431/tcp    UTMPCD
utmpcd         431/udp    UTMPCD
iasd           432/tcp    IASD
iasd           432/udp    IASD
#                   Nir Baroz <nbaroz@encore.com>
nnsp           433/tcp    NNSP
nnsp           433/udp    NNSP
#                   Rob Robertson <rob@gangrene.berkeley.edu>
mobileip-agent  434/tcp    MobileIP-Agent
mobileip-agent  434/udp    MobileIP-Agent
mobilip-mn     435/tcp    MobilIP-MN
mobilip-mn     435/udp    MobilIP-MN
#                   Kannan Alagappan <kannan@sejour.lkg.dec.com>
dna-cml        436/tcp    DNA-CML
dna-cml        436/udp    DNA-CML
#                   Dan Flowers <flowers@smaug.lkg.dec.com>
comscm         437/tcp    comscm
comscm         437/udp    comscm
#                   Jim Teague <teague@zso.dec.com>
dsfgw          438/tcp    dsfgw
dsfgw          438/udp    dsfgw
#                   Andy McKeen <mckeen@osf.org>
dasp           439/tcp    dasp      Thomas Obermair
dasp           439/udp    dasp      tommy@inlab.m.eunet.de
#                   Thomas Obermair <tommy@inlab.m.eunet.de>
sgcp           440/tcp    sgcp
sgcp           440/udp    sgcp
#                   Marshall Rose <mrose@dbc.mtview.ca.us>
decvms-sysmgt   441/tcp    decvms-sysmgt
decvms-sysmgt   441/udp    decvms-sysmgt
#                   Lee Barton <barton@star.enet.dec.com>
cvc_hostd      442/tcp    cvc_hostd
cvc_hostd      442/udp    cvc_hostd
#                   Bill Davidson <billd@equalizer.cray.com>
https          443/tcp    https  MCom
https          443/udp    https  MCom
#                   Kipp E.B. Hickman <kipp@mcom.com>
```

```
snpp            444/tcp    Simple Network Paging Protocol
snpp            444/udp    Simple Network Paging Protocol
#                          [RFC1568]
microsoft-ds    445/tcp    Microsoft-DS
microsoft-ds    445/udp    Microsoft-DS
#                          Arnold Miller <arnoldm@microsoft.com>
ddm-rdb         446/tcp    DDM-RDB
ddm-rdb         446/udp    DDM-RDB
ddm-dfm         447/tcp    DDM-RFM
ddm-dfm         447/udp    DDM-RFM
ddm-byte        448/tcp    DDM-BYTE
ddm-byte        448/udp    DDM-BYTE
#                          Jan David Fisher <jdfisher@VNET.IBM.COM>
as-servermap    449/tcp    AS Server Mapper
as-servermap    449/udp    AS Server Mapper
#                          Barbara Foss <BGFOSS@rchvmv.vnet.ibm.com>
tserver         450/tcp    TServer
tserver         450/udp    TServer
#                          Harvey S. Schultz <hss@mtgzfs3.mt.att.com>
sfs-smp-net     451/tcp    Cray Network Semaphore server
sfs-smp-net     451/udp    Cray Network Semaphore server
sfs-config 452/tcp    Cray SFS config server
sfs-config 452/udp    Cray SFS config server
#                          Walter Poxon <wdp@ironwood.cray.com>
creativeserver  453/tcp    CreativeServer
creativeserver  453/udp    CreativeServer
contentserver   454/tcp    ContentServer
contentserver   454/udp    ContentServer
creativepartnr  455/tcp    CreativePartnr
creativepartnr  455/udp    CreativePartnr
#                          Jesus Ortiz <jesus_ortiz@emotion.com>
macon-tcp       456/tcp    macon-tcp
macon-udp       456/udp    macon-udp
#                          Yoshinobu Inoue
#                          <shin@hodaka.mfd.cs.fujitsu.co.jp>
scohelp         457/tcp    scohelp
scohelp         457/udp    scohelp
#                          Faith Zack <faithz@sco.com>
appleqtc        458/tcp    apple quick time
appleqtc        458/udp    apple quick time
#          Murali Ranganathan <murali_ranganathan@quickmail.apple.com>
ampr-rcmd       459/tcp    ampr-rcmd
ampr-rcmd       459/udp    ampr-rcmd
#                          Rob Janssen <rob@sys3.pe1chl.ampr.org>
skronk          460/tcp    skronk
skronk          460/udp    skronk
#                          Henry Strickland <strick@yak.net>
datasurfsrv     461/tcp    DataSurfSrv
datasurfsrv     461/udp    DataSurfSrv
datasurfsrvsec  462/tcp    DataSurfSrvSec
datasurfsrvsec  462/udp    DataSurfSrvSec
```

```
#                       Larry Barnes <Larryb@larryb.MV.COM>

alpes           463/tcp    alpes
alpes           463/udp    alpes
#                       Alain Durand <Alain.Durand@imag.fr>
kpasswd         464/tcp    kpasswd
kpasswd         464/udp    kpasswd
#                       Theodore Ts'o <tytso@MIT.EDU>
ssmtp           465/tcp    ssmtp
ssmtp           465/udp    ssmtp
#                       John Hemming <JohnHemming@Mkn.co.uk>
digital-vrc     466/tcp    digital-vrc
digital-vrc     466/udp    digital-vrc
#                       Dave Forster <forster@marvin.enet.dec.com>
mylex-mapd      467/tcp    mylex-mapd
mylex-mapd      467/udp    mylex-mapd
#                       Gary Lewis <GaryL@hq.mylex.com>
photuris        468/tcp    proturis
photuris        468/udp    proturis
#                       Bill Simpson <Bill.Simpson@um.cc.umich.edu>
rcp             469/tcp    Radio Control Protocol
rcp             469/udp    Radio Control Protocol
#                       Jim Jennings +1-708-538-7241
scx-proxy       470/tcp    scx-proxy
scx-proxy       470/udp    scx-proxy
#                       Walter Poxon <wdp@ironwood-fddi.cray.com>

mondex          471/tcp    Mondex
mondex          471/udp    Mondex
#                       Bill Reding <redingb@nwdt.natwest.co.uk>
ljk-login       472/tcp    ljk-login
ljk-login       472/udp    ljk-login
#                       LJK Software, Cambridge, Massachusetts
#                       <support@ljk.com>
hybrid-pop      473/tcp    hybrid-pop
hybrid-pop      473/udp    hybrid-pop
#                       Rami Rubin <rami@hybrid.com>
tn-tl-w1        474/tcp    tn-tl-w1
tn-tl-w2        474/udp    tn-tl-w2
#                       Ed Kress <eskress@thinknet.com>
tcpnethaspsrv   475/tcp    tcpnethaspsrv
tcpnethaspsrv   475/tcp    tcpnethaspsrv
#                       Charlie Hava <charlie@aladdin.co.il>
#               476-511    Unassigned
exec            512/tcp    remote process execution;
#                       authentication performed using
#                       passwords and UNIX loppgin names
biff            512/udp    used by mail system to notify users
#                       of new mail received; currently
#                       receives messages only from
#                       processes on the same machine
```

```
login          513/tcp    remote login a la telnet;
#                         automatic authentication performed
#                         based on priviledged port numbers
#                         and distributed data bases which
#                         identify "authentication domains"
who            513/udp    maintains data bases showing who's
#                         logged in to machines on a local
#                         net and the load average of the
#                         machine
cmd            514/tcp    like exec, but automatic
#                         authentication is performed as for
#                         login server
syslog         514/udp
printer        515/tcp    spooler
printer        515/udp    spooler
#              516/tcp    Unassigned
#              516/udp    Unassigned
talk           517/tcp    like tenex link, but across
#                         machine - unfortunately, doesn't
#                         use link protocol (this is actually
#                         just a rendezvous port from which a
#                         tcp connection is established)
talk           517/udp    like tenex link, but across
#                         machine - unfortunately, doesn't
#                         use link protocol (this is actually
#                         just a rendezvous port from which a
                          tcp connection is established)
ntalk          518/tcp
ntalk          518/udp
utime          519/tcp    unixtime
utime          519/udp    unixtime
efs            520/tcp    extended file name server
router         520/udp    local routing process (on site);
#                         uses variant of Xerox NS routing
#                         information protocol
#              521-524    Unassigned
timed          525/tcp    timeserver
timed          525/udp    timeserver
tempo          526/tcp    newdate
tempo          526/udp    newdate
#              527-529    Unassigned
courier        530/tcp    rpc
courier        530/udp    rpc
conference     531/tcp    chat
conference     531/udp    chat
netnews        532/tcp    readnews
netnews        532/udp    readnews
netwall        533/tcp    for emergency broadcasts
netwall        533/udp    for emergency broadcasts
#              534-538    Unassigned
apertus-ldp    539/tcp    Apertus Technologies Load Determination
```

apertus-ldp 539/udp Apertus Technologies Load Determination
uucp 540/tcp uucpd
uucp 540/udp uucpd
uucp-rlogin 541/tcp uucp-rlogin
uucp-rlogin 541/udp uucp-rlogin
Stuart Lynne <sl@wimsey.com>
542/tcp Unassigned
542/udp Unassigned
klogin 543/tcp
klogin 543/udp
kshell 544/tcp krcmd
kshell 544/udp krcmd
appleqtcsrvr 545/tcp appleqtcsrvr
appleqtcsrvr 545/udp appleqtcsrvr
Murali Ranganathan <Murali_Ranganathan@quickmail.apple.com>
dhcp-client 546/tcp DHCP Client
dhcp-client 546/udp DHCP Client
dhcp-server 547/tcp DHCP Server
dhcp-server 547/udp DHCP Server
Jim Bound <bound@zk3.dec.com>
548/tcp Unassigned
548/udp Unassigned
549/tcp Unassigned
549/udp Unassigned
new-rwho 550/tcp new-who
new-rwho 550/udp new-who
cybercash 551/tcp cybercash
cybercash 551/udp cybercash
Donald E. Eastlake 3rd <dee@cybercash.com>
deviceshare 552/tcp deviceshare
deviceshare 552/udp deviceshare
Brian Schenkenberger <brians@advsyscon.com>
pirp 553/tcp pirp
pirp 553/udp pirp
D. J. Bernstein <djb@silverton.berkeley.edu>
554/tcp Unassigned
554/udp Unassigned
dsf 555/tcp
dsf 555/udp
remotefs 556/tcp rfs server
remotefs 556/udp rfs server
openvms-sysipc 557/tcp openvms-sysipc
openvms-sysipc 557/udp openvms-sysipc
Alan Potter <potter@movies.enet.dec.com>
sdnskmp 558/tcp SDNSKMP
sdnskmp 558/udp SDNSKMP
teedtap 559/tcp TEEDTAP
teedtap 559/udp TEEDTAP
Mort Hoffman <hoffman@mail.ndhm.gtegsc.com>
rmonitor 560/tcp rmonitord
rmonitor 560/udp rmonitord

```
monitor         561/tcp
monitor         561/udp
chshell         562/tcp    chcmd
chshell         562/udp    chcmd
snews           563/tcp    snews
snews           563/udp    snews
#                       Kipp E.B. Hickman <kipp@netscape.com>
9pfs            564/tcp    plan 9 file service
9pfs            564/udp    plan 9 file service
whoami          565/tcp    whoami
whoami          565/udp    whoami
streettalk      566/tcp    streettalk
streettalk      566/udp    streettalk
banyan-rpc      567/tcp    banyan-rpc
banyan-rpc      567/udp    banyan-rpc
#                       Tom Lemaire <toml@banyan.com>
ms-shuttle      568/tcp    microsoft shuttle
ms-shuttle      568/udp    microsoft shuttle
#                       Rudolph Balaz <rudolphb@microsoft.com>
ms-rome         569/tcp    microsoft rome
ms-rome         569/udp    microsoft rome
#                       Rudolph Balaz <rudolphb@microsoft.com>
meter           570/tcp    demon
meter           570/udp    demon
meter           571/tcp    udemon
meter           571/udp    udemon
sonar           572/tcp    sonar
sonar           572/udp    sonar
#                       Keith Moore <moore@cs.utk.edu>
banyan-vip      573/tcp    banyan-vip
banyan-vip      573/udp    banyan-vip
#                       Denis Leclerc <DLeclerc@banyan.com>
#               574-599    Unassigned
ipcserver       600/tcp    Sun IPC server
ipcserver       600/udp    Sun IPC server
nqs         607/tcp    nqs
nqs         607/udp    nqs
urm             606/tcp    Cray Unified Resource Manager
urm             606/udp    Cray Unified Resource Manager
#                       Bill Schiefelbein <schief@aspen.cray.com>
sift-uft        608/tcp    Sender-Initiated/Unsolicited File Transfer

sift-uft        608/udp    Sender-Initiated/Unsolicited File Transfer
#                       Rick Troth <troth@rice.edu>
npmp-trap       609/tcp    npmp-trap
npmp-trap       609/udp    npmp-trap
npmp-local      610/tcp    npmp-local
npmp-local      610/udp    npmp-local
npmp-gui        611/tcp    npmp-gui
npmp-gui        611/udp    npmp-gui
#                       John Barnes <jbarnes@crl.com>
```

```
ginad          634/tcp    ginad
ginad          634/udp    ginad
#                         Mark Crother <mark@eis.calstate.edu>
mdqs           666/tcp
mdqs           666/udp
doom           666/tcp    doom Id Software
doom           666/udp    doom Id Software
#                         <ddt@idcube.idsoftware.com>
elcsd         704/tcp    errlog copy/server daemon
elcsd         704/udp    errlog copy/server daemon
entrustmanager  709/tcp    EntrustManager
entrustmanager  709/udp    EntrustManager
#                         Peter Whittaker <pww@bnr.ca>
netviewdm1      729/tcp    IBM NetView DM/6000 Server/Client
netviewdm1      729/udp    IBM NetView DM/6000 Server/Client
netviewdm2      730/tcp    IBM NetView DM/6000 send/tcp
netviewdm2      730/udp    IBM NetView DM/6000 send/tcp
netviewdm3      731/tcp    IBM NetView DM/6000 receive/tcp
netviewdm3      731/udp    IBM NetView DM/6000 receive/tcp
#                         Philippe Binet  (phbinet@vnet.IBM.COM)
netgw          741/tcp    netGW
netgw          741/udp    netGW
netrcs         742/tcp    Network based Rev. Cont. Sys.
netrcs         742/udp    Network based Rev. Cont. Sys.
#                         Gordon C. Galligher <gorpong@ping.chi.il.us>
flexlm         744/tcp    Flexible License Manager
flexlm         744/udp    Flexible License Manager
#                         Matt Christiano
#                         <globes@matt@oliveb.atc.olivetti.com>

fujitsu-dev     747/tcp    Fujitsu Device Control
fujitsu-dev     747/udp    Fujitsu Device Control
ris-cm         748/tcp    Russell Info Sci Calendar Manager
ris-cm         748/udp    Russell Info Sci Calendar Manager
kerberos-adm    749/tcp    kerberos administration
kerberos-adm    749/udp    kerberos administration
rfile          750/tcp
loadav          750/udp
pump          751/tcp
pump          751/udp
qrh         752/tcp
qrh         752/udp
rrh           753/tcp
rrh         753/udp
tell         754/tcp     send
tell         754/udp     send
nlogin         758/tcp
nlogin         758/udp
con         759/tcp
con         759/udp
ns         760/tcp
```

```
ns         760/udp
rxe        761/tcp
rxe        761/udp
quotad         762/tcp
quotad         762/udp
cycleserv      763/tcp
cycleserv      763/udp
omserv         764/tcp
omserv         764/udp
webster        765/tcp
webster        765/udp
phonebook      767/tcp    phone
phonebook      767/udp    phone
vid        769/tcp
vid        769/udp
cadlock        770/tcp
cadlock        770/udp
rtip         771/tcp
rtip         771/udp
cycleserv2     772/tcp
cycleserv2     772/udp
submit         773/tcp
notify         773/udp
rpasswd        774/tcp
acmaint_dbd    774/udp
entomb         775/tcp
acmaint_transd 775/udp
wpages  776/tcp
wpages         776/udp
wpgs  780/tcp
wpgs  780/udp
concert        786/tcp      Concert
concert        786/udp      Concert
#                       Josyula R. Rao <jrrao@watson.ibm.com>
mdbs_daemon 800/tcp
mdbs_daemon 800/udp
device  801/tcp
device  801/udp
accessbuilder   888/tcp       AccessBuilder
accessbuilder   888/udp       AccessBuilder
#                    Steve Sweeney <Steven_Sweeney@3mail.3com.com>
vsinet         996/tcp    vsinet
vsinet         996/udp    vsinet
#                    Rob Juergens <robj@vsi.com>
maitrd  997/tcp
maitrd  997/udp
busboy  998/tcp
puparp  998/udp
garcon  999/tcp
applix  999/udp       Applix ac
puprouter 999/tcp
```

puprouter 999/udp
cadlock 1000/tcp
ock 1000/udp
1023/tcp Reserved
1024/udp Reserved
IANA <iana@isi.edu>

REGISTERED PORT NUMBERS

The Registered Ports are not controlled by the IANA and on most systems can be used by ordinary user processes or programs executed by ordinary users. Ports are used in the TCP [RFC793] to name the ends of logical connections which carry long term conversations. For the purpose of providing services to unknown callers, a service contact port is defined. This list specifies the port used by the server process as its contact port. While the IANA can not control uses of these ports it does register or list uses of these ports as a convienence to the community. To the extent possible, these same port assignments are used with the UDP [RFC768].

The Registered Ports are in the range 1024-65535.
[Go back to top of file]
Port Assignments:

Keyword Decimal Description References
--- --- --- ---
1024/tcp Reserved
1024/udp Reserved
IANA <iana@isi.edu>
blackjack 1025/tcp network blackjack
blackjack 1025/udp network blackjack
iad1 1030/tcp BBN IAD
iad1 1030/udp BBN IAD
iad2 1031/tcp BBN IAD
iad2 1031/udp BBN IAD
iad3 1032/tcp BBN IAD
iad3 1032/udp BBN IAD
Andy Malis <malis_a@timeplex.com>
nim 1058/tcp nim
nim 1058/udp nim
nimreg 1059/tcp nimreg
nimreg 1059/udp nimreg
Robert Gordon <rbg@austin.ibm.com>
instl_boots 1067/tcp Installation Bootstrap Proto. Serv.

instl_boots 1067/udp Installation Bootstrap Proto. Serv.

instl_bootc 1068/tcp Installation Bootstrap Proto. Cli.

instl_bootc 1068/udp Installation Bootstrap Proto. Cli.

```
#                       David Arko <<darko@hpfcrn.fc.hp.com>
socks          1080/tcp   Socks
socks          1080/udp   Socks
#                       Ying-Da Lee <ylee@syl.dl.nec.com
ansoft-lm-1     1083/tcp   Anasoft License Manager
ansoft-lm-1     1083/udp   Anasoft License Manager
ansoft-lm-2     1084/tcp   Anasoft License Manager
ansoft-lm-2     1084/udp   Anasoft License Manager
nfsd-status 1110/tcp   Cluster status info
nfsd-keepalive 1110/udp   Client status info
#                       Edgar Circenis <ec@hpfclj.fc.hp.com>
nfa            1155/tcp   Network File Access

nfa            1155/udp   Network File Access

#                       James Powell <james@mailhost.unidata.com>
lupa           1212/tcp   lupa
lupa           1212/udp   lupa
#                       Barney Wolff <barney@databus.com>
nerv  1222/tcp   SNI R&D network
nerv  1222/udp   SNI R&D network
#                       Martin Freiss <freiss.pad@sni.de>
hermes  1248/tcp
hermes  1248/udp
alta-ana-lm     1346/tcp   Alta Analytics License Manager
alta-ana-lm     1346/udp   Alta Analytics License Manager
bbn-mmc  1347/tcp   multi media conferencing
bbn-mmc  1347/udp   multi media conferencing
bbn-mmx  1348/tcp   multi media conferencing
bbn-mmx  1348/udp   multi media conferencing
sbook          1349/tcp   Registration Network Protocol

sbook          1349/udp   Registration Network Protocol

editbench       1350/tcp   Registration Network Protocol

editbench       1350/udp   Registration Network Protocol

#               Simson L. Garfinkel <simsong@next.cambridge.ma.us>
equationbuilder 1351/tcp   Digital Tool Works (MIT)

equationbuilder 1351/udp   Digital Tool Works (MIT)

#                       Terrence J. Talbot <lexcube!tjt@bu.edu>
lotusnote       1352/tcp   Lotus Note

lotusnote       1352/udp   Lotus Note

#               Greg Pflaum <iris.com!Greg_Pflaum@uunet.uu.net>
relief          1353/tcp   Relief Consulting
```

```
relief          1353/udp   Relief Consulting

#                   John Feiler <relief!jjfeiler@uu2.psi.com>
rightbrain      1354/tcp   RightBrain Software
rightbrain      1354/udp   RightBrain Software
#                   Glenn Reid <glann@rightbrain.com>
intuitive edge  1355/tcp   Intuitive Edge
intuitive edge  1355/udp   Intuitive Edge
#                   Montgomery Zukowski
#                   <monty@nextnorth.acs.ohio-state.edu>

cuillamartin    1356/tcp   CuillaMartin Company
cuillamartin    1356/udp   CuillaMartin Company
pegboard        1357/tcp   Electronic PegBoard
pegboard        1357/udp   Electronic PegBoard
#                   Chris Cuilla
#                   <balr!vpnet!cuilla!chris@clout.chi.il.us>

connlcli        1358/tcp   CONNLCLI

connlcli        1358/udp   CONNLCLI

ftsrv           1359/tcp   FTSRV

ftsrv           1359/udp   FTSRV

#                   Ines Homem de Melo <sidinf@brfapesp.bitnet>
mimer           1360/tcp   MIMER

mimer           1360/udp   MIMER

#                   Per Schroeder  <Per.Schroder@mimer.se>
linx            1361/tcp   LinX
linx            1361/udp   LinX
#                   Steffen Schilke <---none--->
timeflies       1362/tcp   TimeFlies

timeflies       1362/udp   TimeFlies

#                   Doug Kent <mouthers@slugg@nwnexus.wa.com>
ndm-requester   1363/tcp   Network DataMover Requester
ndm-requester   1363/udp   Network DataMover Requester
ndm-server      1364/tcp   Network DataMover Server
ndm-server      1364/udp   Network DataMover Server
#                   Toshio Watanabe
#                   <watanabe@godzilla.rsc.spdd.ricoh.co.j>

adapt-sna       1365/tcp   Network Software Associates
adapt-sna       1365/udp   Network Software Associates
#                   Jeffery Chiao <714-768-401>
netware-csp     1366/tcp   Novell NetWare Comm Service Platform
```

```
netware-csp     1366/udp   Novell NetWare Comm Service Platform
#                   Laurie Lindsey <llindsey@novell.com>
dcs           1367/tcp   DCS
dcs           1367/udp   DCS
#                   Stefan Siebert <ssiebert@dcs.de>
screencast      1368/tcp   ScreenCast

screencast      1368/udp   ScreenCast

#                   Bill Tschumy <other!bill@uunet.UU.NET>
gv-us         1369/tcp   GlobalView to Unix Shell

gv-us         1369/udp   GlobalView to Unix Shell

us-gv         1370/tcp   Unix Shell to GlobalView

us-gv         1370/udp   Unix Shell to GlobalView

#             Makoto Mita <mita@ssdev.ksp.fujixerox.co.jp>
fc-cli         1371/tcp   Fujitsu Config Protocol

fc-cli         1371/udp   Fujitsu Config Protocol

fc-ser         1372/tcp   Fujitsu Config Protocol

fc-ser         1372/udp   Fujitsu Config Protocol

#             Ryuichi Horie <horie@spad.sysrap.cs.fujitsu.co.jp>
chromagrafx     1373/tcp   Chromagrafx

chromagrafx     1373/udp   Chromagrafx

#                   Mike Barthelemy <msb@chromagrafx.com>
molly          1374/tcp   EPI Software Systems
molly          1374/udp   EPI Software Systems
#                   Jim Vlcek <vlcek@epimbe.com>
bytex          1375/tcp   Bytex
bytex          1375/udp   Bytex
#             Mary Ann Burt <bytex!ws054!maryann@uunet.UU.NET>
ibm-pps        1376/tcp   IBM Person to Person Software
ibm-pps        1376/udp   IBM Person to Person Software
#                   Simon Phipps <sphipps@vnet.ibm.com>
cichlid        1377/tcp   Cichlid License Manager
cichlid        1377/udp   Cichlid License Manager
#                   Andy Burgess <aab@cichlid.com>
elan           1378/tcp   Elan License Manager
elan           1378/udp   Elan License Manager
#                   Ken Greer <kg@elan.com>
dbreporter      1379/tcp   Integrity Solutions

dbreporter      1379/udp   Integrity Solutions
```

```
#                       Tim Dawson <tdawson%mspboss@uunet.UU.NET>
telesis-licman  1380/tcp   Telesis Network License Manager

telesis-licman  1380/udp   Telesis Network License Manager

#                       Karl Schendel, Jr. <wiz@telesis.com>
apple-licman    1381/tcp   Apple Network License Manager
apple-licman    1381/udp   Apple Network License Manager
#                       Earl Wallace <earlw@apple.com>
udt_os          1382/tcp
udt_os          1382/udp
gwha            1383/tcp   GW Hannaway Network License Manager
gwha            1383/udp   GW Hannaway Network License Manager
#                       J. Gabriel Foster <fop@gwha.com>
os-licman       1384/tcp   Objective Solutions License Manager

os-licman       1384/udp   Objective Solutions License Manager

#               Donald Cornwell <don.cornwell@objective.com>
atex_elmd       1385/tcp   Atex Publishing License Manager
atex_elmd       1385/udp   Atex Publishing License Manager
#                       Brett Sorenson <bcs@atex.com>
checksum        1386/tcp   CheckSum License Manager

checksum        1386/udp   CheckSum License Manager

#                       Andreas Glocker <glocker@sirius.com>
cadsi-lm        1387/tcp   Computer Aided Design Software Inc
LM
cadsi-lm        1387/udp   Computer Aided Design Software Inc
LM
#                       Sulistio Muljadi
objective-dbc   1388/tcp   Objective Solutions DataBase Cache
objective-dbc   1388/udp   Objective Solutions DataBase Cache
#                       Donald Cornwell
iclpv-dm        1389/tcp   Document Manager

iclpv-dm        1389/udp   Document Manager

iclpv-sc        1390/tcp   Storage Controller

iclpv-sc        1390/udp   Storage Controller

iclpv-sas       1391/tcp   Storage Access Server

iclpv-sas       1391/udp   Storage Access Server

iclpv-pm        1392/tcp   Print Manager

iclpv-pm        1392/udp   Print Manager
```

iclpv-nls 1393/tcp Network Log Server

iclpv-nls 1393/udp Network Log Server

iclpv-nlc 1394/tcp Network Log Client

iclpv-nlc 1394/udp Network Log Client

iclpv-wsm 1395/tcp PC Workstation Manager software

iclpv-wsm 1395/udp PC Workstation Manager software

A.P. Hobson <A.P.Hobson@bra0112.wins.icl.co.uk>
dvl-activemail 1396/tcp DVL Active Mail

dvl-activemail 1396/udp DVL Active Mail

audio-activmail 1397/tcp Audio Active Mail

audio-activmail 1397/udp Audio Active Mail

video-activmail 1398/tcp Video Active Mail

video-activmail 1398/udp Video Active Mail

Ehud Shapiro <udi@wisdon.weizmann.ac.il>
cadkey-licman 1399/tcp Cadkey License Manager
cadkey-licman 1399/udp Cadkey License Manager
cadkey-tablet 1400/tcp Cadkey Tablet Daemon
cadkey-tablet 1400/udp Cadkey Tablet Daemon
Joe McCollough <joe@cadkey.com>
goldleaf-licman 1401/tcp Goldleaf License Manager
goldleaf-licman 1401/udp Goldleaf License Manager
John Fox <---none--->
prm-sm-np 1402/tcp Prospero Resource Manager
prm-sm-np 1402/udp Prospero Resource Manager
prm-nm-np 1403/tcp Prospero Resource Manager
prm-nm-np 1403/udp Prospero Resource Manager
B. Clifford Neuman <bcn@isi.edu>
igi-lm 1404/tcp Infinite Graphics License Manager
igi-lm 1404/udp Infinite Graphics License Manager
ibm-res 1405/tcp IBM Remote Execution Starter
ibm-res 1405/udp IBM Remote Execution Starter
netlabs-lm 1406/tcp NetLabs License Manager
netlabs-lm 1406/udp NetLabs License Manager
dbsa-lm 1407/tcp DBSA License Manager
dbsa-lm 1407/udp DBSA License Manager
Scott Shattuck <ss@dbsa.com>
sophia-lm 1408/tcp Sophia License Manager

```
sophia-lm       1408/udp   Sophia License Manager

#                   Eric Brown <sst!emerald!eric@uunet.UU.net>
here-lm         1409/tcp   Here License Manager
here-lm         1409/udp   Here License Manager
#                   David Ison  <here@dialup.oar.net>
hiq           1410/tcp   HiQ License Manager
hiq           1410/udp   HiQ License Manager
#                   Rick Pugh <rick@bilmillennium.com>
af            1411/tcp   AudioFile
af            1411/udp   AudioFile
#                   Jim Gettys <jg@crl.dec.com>
innosys         1412/tcp   InnoSys
innosys         1412/udp   InnoSys
innosys-acl     1413/tcp   Innosys-ACL
innosys-acl     1413/udp   Innosys-ACL
#                   Eric Welch <--none--->
ibm-mqseries    1414/tcp   IBM MQSeries

ibm-mqseries    1414/udp   IBM MQSeries

#                   Roger Meli <rmmeli%winvmd@vnet.ibm.com>
dbstar          1415/tcp   DBStar
dbstar          1415/udp   DBStar
#                   Jeffrey Millman <jcm@dbstar.com>
novell-lu6.2    1416/tcp   Novell LU6.2
novell-lu6.2    1416/udp   Novell LU6.2
#                   Peter Liu <--none--->
timbuktu-srv1   1417/tcp   Timbuktu Service 1 Port

timbuktu-srv1   1417/tcp   Timbuktu Service 1 Port

timbuktu-srv2   1418/tcp   Timbuktu Service 2 Port

timbuktu-srv2   1418/udp   Timbuktu Service 2 Port

timbuktu-srv3   1419/tcp   Timbuktu Service 3 Port

timbuktu-srv3   1419/udp   Timbuktu Service 3 Port

timbuktu-srv4   1420/tcp   Timbuktu Service 4 Port

timbuktu-srv4   1420/udp   Timbuktu Service 4 Port

#                   Marc Epard <marc@waygate.farallon.com>
gandalf-lm      1421/tcp   Gandalf License Manager
gandalf-lm      1421/udp   Gandalf License Manager
#                   gilmer@gandalf.ca
autodesk-lm     1422/tcp   Autodesk License Manager
autodesk-lm     1422/udp   Autodesk License Manager
#                   David Ko <dko@autodesk.com>
```

```
essbase         1423/tcp   Essbase Arbor Software
essbase         1423/udp   Essbase Arbor Software
hybrid          1424/tcp   Hybrid Encryption Protocol
hybrid          1424/udp   Hybrid Encryption Protocol
#                   Howard Hart <hch@hybrid.com>
zion-lm         1425/tcp   Zion Software License Manager
zion-lm         1425/udp   Zion Software License Manager
#                   David Ferrero <david@zion.com>
sas-1           1426/tcp   Satellite-data Acquisition System 1
sas-1           1426/udp   Satellite-data Acquisition System 1
#                   Bill Taylor <sais@ssec.wisc.edu>
mloadd          1427/tcp   mloadd monitoring tool
mloadd          1427/udp   mloadd monitoring tool
#                   Bob Braden <braden@isi.edu>
informatik-lm   1428/tcp   Informatik License Manager
informatik-lm   1428/udp   Informatik License Manager
#                   Harald Schlangmann
#                   <schlangm@informatik.uni-muenchen.de>

nms             1429/tcp   Hypercom NMS
nms             1429/udp   Hypercom NMS
tpdu            1430/tcp   Hypercom TPDU
tpdu            1430/udp   Hypercom TPDU
#                   Noor Chowdhury <noor@hypercom.com>
rgtp            1431/tcp   Reverse Gossip Transport
rgtp            1431/udp   Reverse Gossip Transport
#                   Ian Jackson  <iwj@cam-orl.co.uk>
blueberry-lm    1432/tcp   Blueberry Software License Manager

blueberry-lm    1432/udp   Blueberry Software License Manager

#                   Steve Beigel <ublueb!steve@uunet.uu.net>
ms-sql-s        1433/tcp   Microsoft-SQL-Server
ms-sql-s        1433/udp   Microsoft-SQL-Server
ms-sql-m        1434/tcp   Microsoft-SQL-Monitor
ms-sql-m        1434/udp   Microsoft-SQL-Monitor

#                   Peter Hussey <peterhus@microsoft.com>
ibm-cics        1435/tcp   IBM CISC
ibm-cics        1435/udp   IBM CISC
#                   Geoff Meacock <gbibmswl@ibmmail.COM>
sas-2           1436/tcp   Satellite-data Acquisition System 2
sas-2           1436/udp   Satellite-data Acquisition System 2
#                   Bill Taylor <sais@ssec.wisc.edu>
tabula          1437/tcp   Tabula
tabula          1437/udp   Tabula
#                   Marcelo Einhorn
#                   <KGUNE%HUJIVM1.bitnet@taunivm.tau.ac.il>

eicon-server    1438/tcp   Eicon Security Agent/Server
```

eicon-server 1438/udp Eicon Security Agent/Server

eicon-x25 1439/tcp Eicon X25/SNA Gateway

eicon-x25 1439/udp Eicon X25/SNA Gateway

eicon-slp 1440/tcp Eicon Service Location Protocol

eicon-slp 1440/udp Eicon Service Location Protocol

Pat Calhoun <CALHOUN@admin.eicon.qc.ca>
cadis-1 1441/tcp Cadis License Management
cadis-1 1441/udp Cadis License Management
cadis-2 1442/tcp Cadis License Management
cadis-2 1442/udp Cadis License Management
Todd Wichers <twichers@csn.org>
ies-lm 1443/tcp Integrated Engineering Software

ies-lm 1443/udp Integrated Engineering Software

David Tong <David_Tong@integrated.mb.ca>
marcam-lm 1444/tcp Marcam License Management
marcam-lm 1444/udp Marcam License Management
Therese Hunt <hunt@marcam.com>
proxima-lm 1445/tcp Proxima License Manager
proxima-lm 1445/udp Proxima License Manager
ora-lm 1446/tcp Optical Research Associates License Manager
ora-lm 1446/udp Optical Research Associates License Manager
apri-lm 1447/tcp Applied Parallel Research LM
apri-lm 1447/udp Applied Parallel Research LM
Jim Dillon <jed@apri.com>
oc-lm 1448/tcp OpenConnect License Manager
oc-lm 1448/udp OpenConnect License Manager
Sue Barnhill <snb@oc.com>
peport 1449/tcp PEport

peport 1449/udp PEport

Qentin Neill <quentin@ColumbiaSC.NCR.COM>
dwf 1450/tcp Tandem Distributed Workbench Facility

dwf 1450/udp Tandem Distributed Workbench Facility

Mike Bert <BERG_MIKE@tandem.com>
infoman 1451/tcp IBM Information Management
infoman 1451/udp IBM Information Management
Karen Burns <---none--->
gtegsc-lm 1452/tcp GTE Government Systems License Man

```
gtegsc-lm       1452/udp   GTE Government Systems License Man

#             Mike Gregory <Gregory_Mike@msmail.iipo.gtegsc.com>
genie-lm        1453/tcp   Genie License Manager

genie-lm        1453/udp   Genie License Manager

#                   Paul Applegate <p.applegate2@genie.geis.com>
interhdl_elmd   1454/tcp   interHDL License Manager
interhdl_elmd   1454/tcp   interHDL License Manager
#                   Eli Sternheim eli@interhdl.com
esl-lm          1455/tcp   ESL License Manager
esl-lm          1455/udp   ESL License Manager
#                   Abel Chou <abel@willy.esl.com>
dca             1456/tcp   DCA
dca             1456/udp   DCA
#                   Jeff Garbers <jgarbers@netcom.com>
valisys-lm      1457/tcp    Valisys License Manager
valisys-lm      1457/udp    Valisys License Manager
#             Leslie Lincoln <leslie_lincoln@valisys.com>
nrcabq-lm       1458/tcp    Nichols Research Corp.
nrcabq-lm       1458/udp    Nichols Research Corp.
#                   Howard Cole <hcole@tumbleweed.nrcabq.com>
proshare1       1459/tcp    Proshare Notebook Application
proshare1       1459/udp    Proshare Notebook Application
proshare2       1460/tcp    Proshare Notebook Application
proshare2       1460/udp    Proshare Notebook Application
#                   Robin Kar <Robin_Kar@ccm.hf.intel.com>
ibm_wrless_lan  1461/tcp    IBM Wireless LAN
ibm_wrless_lan  1461/udp    IBM Wireless LAN
#                   <flanne@vnet.IBM.COM>
world-lm        1462/tcp    World License Manager
world-lm        1462/udp    World License Manager
#                   Michael S Amirault <ambi@world.std.com>
nucleus         1463/tcp    Nucleus
nucleus         1463/udp    Nucleus
#                   Venky Nagar <venky@fafner.Stanford.EDU>
msl_lmd         1464/tcp    MSL License Manager
msl_lmd         1464/udp    MSL License Manager
#                   Matt Timmermans
pipes           1465/tcp    Pipes Platform
pipes           1465/udp    Pipes Platform  mfarlin@peerlogic.com
#                   Mark Farlin <mfarlin@peerlogic.com>
oceansoft-lm    1466/tcp    Ocean Software License Manager
oceansoft-lm    1466/udp    Ocean Software License Manager
#                   Randy Leonard <randy@oceansoft.com>
csdmbase        1467/tcp    CSDMBASE
csdmbase        1467/udp    CSDMBASE
csdm            1468/tcp    CSDM
csdm            1468/udp    CSDM
#             Robert Stabl <stabl@informatik.uni-muenchen.de>
```

```
aal-lm          1469/tcp    Active Analysis Limited License Manager
aal-lm          1469/udp    Active Analysis Limited License Manager
#                       David Snocken  +44 (71)437-7009
uaiact          1470/tcp    Universal Analytics
uaiact          1470/udp    Universal Analytics
#                       Mark R. Ludwig <Mark-Ludwig@uai.com>
csdmbase        1471/tcp    csdmbase
csdmbase        1471/udp    csdmbase
csdm            1472/tcp    csdm
csdm            1472/udp    csdm
#               Robert Stabl <stabl@informatik.uni-muenchen.de>
openmath        1473/tcp    OpenMath
openmath        1473/udp    OpenMath
#                       Garth Mayville <mayville@maplesoft.on.ca>
telefinder      1474/tcp    Telefinder
telefinder      1474/udp    Telefinder
#                       Jim White <Jim_White@spiderisland.com>
taligent-lm     1475/tcp    Taligent License Manager
taligent-lm     1475/udp    Taligent License Manager
#               Mark Sapsford <Mark_Sapsford@@taligent.com>
clvm-cfg        1476/tcp    clvm-cfg
clvm-cfg        1476/udp    clvm-cfg
#                       Eric Soderberg <seric@cup.hp.com>
ms-sna-server   1477/tcp    ms-sna-server
ms-sna-server   1477/udp    ms-sna-server
ms-sna-base     1478/tcp    ms-sna-base
ms-sna-base     1478/udp    ms-sna-base
#                       Gordon Mangione <gordm@microsoft.com>
dberegister     1479/tcp    dberegister
dberegister     1479/udp    dberegister
#                       Brian Griswold <brian@dancingbear.com>
pacerforum      1480/tcp    PacerForum
pacerforum      1480/udp    PacerForum
#                       Peter Caswell <pfc@pacvax.pacersoft.com>
airs            1481/tcp    AIRS
airs            1481/udp    AIRS
#                       Bruce Wilson, 905-771-6161
miteksys-lm     1482/tcp    Miteksys License Manager
miteksys-lm     1482/udp    Miteksys License Manager
#                       Shane McRoberts <mcroberts@miteksys.com>
afs             1483/tcp    AFS License Manager
afs             1483/udp    AFS License Manager
#                       Michael R. Pizolato <michael@afs.com>
confluent       1484/tcp    Confluent License Manager
confluent       1484/udp    Confluent License Manager
#                       James Greenfiel <jim@pa.confluent.com>
lansource       1485/tcp    LANSource
lansource       1485/udp    LANSource
#                       Doug Scott <lansourc@hookup.net>
nms_topo_serv   1486/tcp    nms_topo_serv
nms_topo_serv   1486/udp    nms_topo_serv
```

```
#                       Sylvia Siu <Sylvia_Siu@Novell.CO>
localinfosrvr   1487/tcp    LocalInfoSrvr
localinfosrvr   1487/udp    LocalInfoSrvr
#             Brian Matthews <brian_matthews@ibist.ibis.com>
docstor         1488/tcp    DocStor
docstor         1488/udp    DocStor
#                       Brian Spears <bspears@salix.com>
dmdocbroker     1489/tcp    dmdocbroker
dmdocbroker     1489/udp    dmdocbroker
#                       Razmik Abnous <abnous@documentum.com>
insitu-conf     1490/tcp    insitu-conf
insitu-conf     1490/udp    insitu-conf
#                       Paul Blacknell <paul@insitu.com>
anynetgateway   1491/tcp    anynetgateway
anynetgateway   1491/udp    anynetgateway
#                       Dan Poirier <poirier@VNET.IBM.COM>
stone-design-1  1492/tcp    stone-design-1
stone-design-1  1492/udp    stone-design-1
#                       Andrew Stone <andrew@stone.com>
netmap_lm       1493/tcp    netmap_lm
netmap_lm       1493/udp    netmap_lm
#                       Phillip Magson <philm@extro.ucc.su.OZ.AU>
ica             1494/tcp    ica
ica             1494/udp    ica
#                       John Richardson, Citrix Systems
cvc             1495/tcp    cvc
cvc             1495/udp    cvc
#                       Bill Davidson <billd@equalizer.cray.com>
liberty-lm      1496/tcp    liberty-lm
liberty-lm      1496/udp    liberty-lm
#                       Jim Rogers <trane!jimbo@pacbell.com>
rfx-lm          1497/tcp    rfx-lm
rfx-lm          1497/udp    rfx-lm
#                       Bill Bishop <bil@rfx.rfx.com>
watcom-sql      1498/tcp    Watcom-SQL
watcom-sql      1498/udp    Watcom-SQL
#                       Rog Skubowius <rwskubow@ccnga.uwaterloo.ca>
fhc             1499/tcp    Federico Heinz Consultora
fhc             1499/udp    Federico Heinz Consultora
#                       Federico Heinz <federico@heinz.com>
vlsi-lm         1500/tcp    VLSI License Manager
vlsi-lm         1500/udp    VLSI License Manager
#                       Shue-Lin Kuo <shuelin@mdk.sanjose.vlsi.com>
sas-3           1501/tcp    Satellite-data Acquisition System
3
sas-3           1501/udp    Satellite-data Acquisition System
3
#                       Bill Taylor <sais@ssec.wisc.edu>
shivadiscovery  1502/tcp    Shiva
shivadiscovery  1502/udp    Shiva
#                       Jonathan Wenocur <jhw@Shiva.COM>
```

imtc-mcs 1503/tcp Databeam
imtc-mcs 1503/udp Databeam
Jim Johnstone <jjohnstone@databeam.com>
evb-elm 1504/tcp EVB Software Engineering License Manager
evb-elm 1504/udp EVB Software Engineering License Manager
B.G. Mahesh < mahesh@sett.com>
funkproxy 1505/tcp Funk Software, Inc.
funkproxy 1505/udp Funk Software, Inc.
Robert D. Vincent <bert@willowpond.com>
utcd 1506/tcp Universal Time daemon (utcd)
utcd 1506/udp Universal Time daemon (utcd)
Walter Poxon <wdp@ironwood.cray.com>
symplex 1507/tcp symplex
symplex 1507/udp symplex
Mike Turley <turley@symplex.com>
diagmond 1508/tcp diagmond
diagmond 1508/udp diagmond
Pete Moscatelli <moscat@hprdstl0.rose.hp.com>
robcad-lm 1509/tcp Robcad, Ltd. License Manager
robcad-lm 1509/udp Robcad, Ltd. License Manager
Hindin Joseph <hindin%robcad@uunet.uu.net>
mvx-lm 1510/tcp Midland Valley Exploration Ltd. Lic.
Man.

mvx-lm 1510/udp Midland Valley Exploration Ltd. Lic.

Man.

Charles X. Chen <charles@mvel.demon.co.uk>
3l-l1 1511/tcp 3l-l1
3l-l1 1511/udp 3l-l1
Ian A. Young <iay@threel.co.uk>
wins 1512/tcp Microsoft’s Windows Internet Name
Service
wins 1512/udp Microsoft’s Windows Internet Name
Service
Pradeep Bahl <pradeepb@microsoft.com>
fujitsu-dtc 1513/tcp Fujitsu Systems Business of America,
Inc
fujitsu-dtc 1513/udp Fujitsu Systems Business of America,
Inc
fujitsu-dtcns 1514/tcp Fujitsu Systems Business of America,
Inc
fujitsu-dtcns 1514/udp Fujitsu Systems Business of America,
Inc
Charles A. Higgins
<75730.2257@compuserve.com>
ifor-protocol 1515/tcp ifor-protocol
ifor-protocol 1515/udp ifor-protocol
Dr. R.P. Alston <robin@gradient.com>
vpad 1516/tcp Virtual Places Audio data
vpad 1516/udp Virtual Places Audio data

```
vpac            1517/tcp    Virtual Places Audio control
vpac            1517/udp    Virtual Places Audio control
vpvd            1518/tcp    Virtual Places Video data
vpvd            1518/udp    Virtual Places Video data
vpvc            1519/tcp    Virtual Places Video control
vpvc            1519/udp    Virtual Places Video control
#                       Ehud Shapiro <udi@ubique.co.il>
atm-zip-office  1520/tcp    atm zip office
atm-zip-office  1520/udp    atm zip office
#                       Wilson Kwan <wilsonk%toronto@zip.atm.com>
ncube-lm        1521/tcp    nCube License Manager
ncube-lm        1521/udp    nCube License Manager
#                       Maxine Yuen <maxine@hq.ncube.com>
rna-lm          1522/tcp    Ricardo North America License Manager
rna-lm          1522/udp    Ricardo North America License Manager
#                       MFlemming@aol.com
cichild-lm      1523/tcp    cichild
cichild-lm      1523/udp    cichild
#                       Andy Burgess <aab@cichlid.com>
ingreslock 1524/tcp    ingres
ingreslock 1524/udp    ingres
orasrv          1525/tcp    oracle
orasrv          1525/udp    oracle
prospero-np     1525/tcp    Prospero Directory Service non-priv
prospero-np     1525/udp    Prospero Directory Service non-priv
pdap-np         1526/tcp    Prospero Data Access Prot non-priv

pdap-np         1526/udp    Prospero Data Access Prot non-priv

#                       B. Clifford Neuman <bcn@isi.edu>
tlisrv          1527/tcp    oracle
tlisrv          1527/udp    oracle
mciautoreg      1528/tcp    micautoreg
mciautoreg      1528/udp    micautoreg
#                       John Klensin <klensin@MAIL1.RESTON.MCI.NET>
coauthor        1529/tcp    oracle
coauthor        1529/udp    oracle
rap-service     1530/tcp    rap-service
rap-service     1530/udp    rap-service
rap-listen      1531/tcp    rap-listen
rap-listen      1531/udp    rap-listen
#                       Phil Servita <meister@ftp.com>
miroconnect     1532/tcp    miroconnect
miroconnect     1532/udp    miroconnect
#                       Michael Fischer +49 531 21 13 0
virtual-places  1533/tcp    Virtual Places Software
virtual-places  1533/udp    Virtual Places Software
#                       Ehud Shapiro <udi@ubique.co.il>

micromuse-lm    1534/tcp    micromuse-lm
micromuse-lm    1534/udp    micromuse-lm
```

```
#                       Adam Kerrison <adam@micromuse.co.uk>
ampr-info       1535/tcp    ampr-info
ampr-info       1535/udp    ampr-info
ampr-inter      1536/tcp    ampr-inter
ampr-inter      1536/udp    ampr-inter
#                       Rob Janssen <rob@sys3.pe1chl.ampr.org>
sdsc-lm         1537/tcp    isi-lm
sdsc-lm         1537/udp    isi-lm
#                       Len Wanger <lrw@sdsc.edu>
3ds-lm          1538/tcp    3ds-lm
3ds-lm          1538/udp    3ds-lm
#                       Keith Trummel <ktrummel@autodesk.com>
intellistor-lm  1539/tcp    Intellistor License Manager
intellistor-lm  1539/udp    Intellistor License Manager
#                       Ron Vaughn <rv@intellistor.com>
rds             1540/tcp    rds
rds             1540/udp    rds
rds2            1541/tcp    rds2
rds2            1541/udp    rds2
#                       Sudhakar Rajamannar <mobius1@cerfnet.com>
gridgen-elmd    1542/tcp    gridgen-elmd
gridgen-elmd    1542/udp    gridgen-elmd
#                       John R. Chawner +1 817 354-1004
simba-cs        1543/tcp    simba-cs
simba-cs        1543/udp    simba-cs
#                       Betsy Alexander +1 604-681-4549
aspeclmd        1544/tcp    aspeclmd
aspeclmd        1544/udp    aspeclmd
#                       V. Balaji <balaji@aspec.com>
vistium-share   1545/tcp    vistium-share
vistium-share   1545/udp    vistium-share
#           Allison Carleton <acarleto@naper1.napervilleil.ncr.com>
abbaccuray      1546/tcp    abbaccuray
abbaccuray      1546/udp    abbaccuray
#                       John Wendt 614-261-2000
laplink         1547/tcp    laplink
laplink         1547/udp    laplink
#                   Michael Crawford <MichaelC@dev.travsoft.com>
axon-lm         1548/tcp    Axon License Manager
axon-lm         1548/udp    Axon License Manager
#   Mark Pearce <<Mark_A.._Pearce/AXON_Networks_Inc..@notes.axon.com>
shivahose       1549/tcp    Shiva Hose
shivasound      1549/udp    Shiva Sound
#                       Kin Chan <kchan@shiva.com>
3m-image-lm     1550/tcp    Image Storage license manager 3M Company
3m-image-lm     1550/udp    Image Storage license manager 3M Company
#                       J. C. Canessa <jccanessa@mmm.com>
hecmtl-db       1551/tcp    HECMTL-DB
hecmtl-db       1551/udp    HECMTL-DB
#                       Maxime Belanger <R173@hec.ca>
pciarray        1552/tcp    pciarray
```

pciarray 1552/udp pciarray
Ron Folk <rfolkes@avl.com>
sna-cs 1553/tcp sna-cs
sna-cs 1553/udp sna-cs
Tony Sowter <ts@datcon.co.uk>
caci-lm 1554/tcp CACI Products Company License Manager
caci-lm 1554/udp CACI Products Company License Manager
Erik Blume <erikb@caciasl.com>
livelan 1555/tcp livelan
livelan 1555/udp livelan
khedayat@roadrunner.pictel.com <Kaynam
Hedayat>
ashwin 1556/tcp AshWin CI Tecnologies
ashwin 1556/udp AshWin CI Tecnologies
Dave Neal <daven@ashwin.com>
arbortext-lm 1557/tcp ArborText License Manager
arbortext-lm 1557/udp ArborText License Manager
David J. Wilson <djw@arbortext.com>
xingmpeg 1558/tcp xingmpeg
xingmpeg 1558/udp xingmpeg
Howard Gordon <hgordon@system.xingtech.com>
web2host 1559/tcp web2host
web2host 1559/udp web2host
Stephen Johnson <sjohnson@mindspring.com>
asci-val 1560/tcp asci-val
asci-val 1560/udp asci-val
Brian Schenkenberger <brians@advsyscon.com>
facilityview 1561/tcp facilityview
facilityview 1561/udp facilityview
Ed Green <egreen@pmeasuring.com>
pconnectmgr 1562/tcp pconnectmgr
pconnectmgr 1562/udp pconnectmgr
Bob Kaiser <BKaiser@palindrome.com>
cadabra-lm 1563/tcp Cadabra License Manager
cadabra-lm 1563/udp Cadabra License Manager
Arthur Castonguay <arthurc@doe.carleton.ca>
pay-per-view 1564/tcp Pay-Per-View
pay-per-view 1564/udp Pay-Per-View
Brian Tung <brian@isi.edu>
winddlb 1565/tcp WinDD
winddlb 1565/udp WinDD
Kelly Sims <kellys@garnet.wv.tek.com>
corelvideo 1566/tcp CORELVIDEO
corelvideo 1566/udp CORELVIDEO
Ming Poon <mingp@corel.ca>
jlicelmd 1567/tcp jlicelmd
jlicelmd 1567/udp jlicelmd
Christian Schormann <100410.3063@compuserve.com>
tsspmap 1568/tcp tsspmap
tsspmap 1568/udp tsspmap
Paul W. Nelson <nelson@thursby.com>

```
ets             1569/tcp    ets
ets             1569/udp    ets
#                       Carstein Seeberg <case@boole.no>

orbixd          1570/tcp    orbixd
orbixd          1570/udp    orbixd
#                       Bridget Walsh <bwalsh@iona.ie>
rdb-dbs-disp    1571/tcp    Oracle Remote Data Base
rdb-dbs-disp    1571/udp    Oracle Remote Data Base
#                       <mackin@us.oracle.com>
chip-lm         1572/tcp    Chipcom License Manager
chip-lm         1572/udp    Chipcom License Manager
#                       Jerry Natowitz <Jerry Natowitz>
itscomm-ns      1573/tcp    itscomm-ns
itscomm-ns      1573/udp    itscomm-ns
#                       Rich Thompson <richt@watson.ibm.com>

mvel-lm         1574/tcp    mvel-lm
mvel-lm         1574/udp    mvel-lm
#                       David Bisset <dbisset@mvel.demon.co.uk>
oraclenames     1575/tcp    oraclenames
oraclenames     1575/udp    oraclenames
#                       P.V.Shivkumar <PSHIVKUM@us.oracle.com>
moldflow-lm     1576/tcp    moldflow-lm
moldflow-lm     1576/udp    moldflow-lm
#                       Paul Browne <browne@moldflow.com.au>
hypercube-lm    1577/tcp    hypercube-lm
hypercube-lm    1577/udp    hypercube-lm
#                       Michael Moller <moller@hyper.hyper.com>
jacobus-lm      1578/tcp    Jacobus License Manager
jacobus-lm      1578/udp    Jacobus License Manager
#                       Tony Cleveland <tony.cleveland@jacobus.com>
ioc-sea-lm      1579/tcp    ioc-sea-lm
ioc-sea-lm      1579/tcp    ioc-sea-lm
#                       Paul Nelson <paul@ioc-sea.com>
tn-tl-r1        1580/tcp    tn-tl-r1
tn-tl-r2        1580/udp    tn-tl-r2
#                       Ed Kress <eskress@thinknet.com>
vmf-msg-port    1581/tcp    vmf-msg-port
vmf-msg-port    1581/udp    vmf-msg-port
#                       Eric Whitehill <eawhiteh@itt.com>
tams-lm         1582/tcp    Toshiba America Medical Systems

tams-lm         1582/udp    Toshiba America Medical Systems

#                       Philip Scott<pks@smtp.orasis.com>
simbaexpress    1583/tcp    simbaexpress
simbaexpress    1583/udp    simbaexpress
#                       Betsy Alexander +1 604-681-4549
#           1584-1599   Unassigned
issd  1600/tcp
```

issd 1600/udp
1601-1641 Unassigned
isis-am 1642/tcp isis-am
isis-am 1642/udp isis-am
isis-ambc 1643/tcp isis-ambc
isis-ambc 1643/udp isis-ambc
Ken Chapman <kchapman@isis.com>
1644-1649 Unassigned
nkd 1650/tcp
nkd 1650/udp
shiva_confsrvr 1651/tcp shiva_confsrvr
shiva_confsrvr 1651/udp shiva_confsrvr
Mike Horowitz <mah@Shiva.COM>
xnmp 1652/tcp xnmp
xnmp 1652/udp xnmp
Ali Saleh <scomm@cerf.net>
1653-1660 Unassigned
netview-aix-1 1661/tcp netview-aix-1
netview-aix-1 1661/udp netview-aix-1
netview-aix-2 1662/tcp netview-aix-2
netview-aix-2 1662/udp netview-aix-2
netview-aix-3 1663/tcp netview-aix-3
netview-aix-3 1663/udp netview-aix-3
netview-aix-4 1664/tcp netview-aix-4
netview-aix-4 1664/udp netview-aix-4
netview-aix-5 1665/tcp netview-aix-5
netview-aix-5 1665/udp netview-aix-5
netview-aix-6 1666/tcp netview-aix-6
netview-aix-6 1666/udp netview-aix-6
netview-aix-7 1667/tcp netview-aix-7
netview-aix-7 1667/udp netview-aix-7
netview-aix-8 1668/tcp netview-aix-8
netview-aix-8 1668/udp netview-aix-8
netview-aix-9 1669/tcp netview-aix-9
netview-aix-9 1669/udp netview-aix-9
netview-aix-10 1670/tcp netview-aix-10
netview-aix-10 1670/udp netview-aix-10
netview-aix-11 1671/tcp netview-aix-11
netview-aix-11 1671/udp netview-aix-11
netview-aix-12 1672/tcp netview-aix-12
netview-aix-12 1672/udp netview-aix-12
Martha Crisson <CRISSON@ralvm12.vnet.ibm.com>
1673-1987 Unassigned
licensedaemon 1986/tcp cisco license management
licensedaemon 1986/udp cisco license management
tr-rsrb-p1 1987/tcp cisco RSRB Priority 1 port
tr-rsrb-p1 1987/udp cisco RSRB Priority 1 port
tr-rsrb-p2 1988/tcp cisco RSRB Priority 2 port
tr-rsrb-p2 1988/udp cisco RSRB Priority 2 port
tr-rsrb-p3 1989/tcp cisco RSRB Priority 3 port
tr-rsrb-p3 1989/udp cisco RSRB Priority 3 port

#PROBLEMS!==========

mshnet 1989/tcp MHSnet system
mshnet 1989/udp MHSnet system
Bob Kummerfeld <bob@sarad.cs.su.oz.au>
#PROBLEMS!==========

stun-p1 1990/tcp cisco STUN Priority 1 port
stun-p1 1990/udp cisco STUN Priority 1 port
stun-p2 1991/tcp cisco STUN Priority 2 port
stun-p2 1991/udp cisco STUN Priority 2 port
stun-p3 1992/tcp cisco STUN Priority 3 port
stun-p3 1992/udp cisco STUN Priority 3 port
#PROBLEMS!==========

ipsendmsg 1992/tcp IPsendmsg
ipsendmsg 1992/udp IPsendmsg
Bob Kummerfeld <bob@sarad.cs.su.oz.au>
#PROBLEMS!==========

snmp-tcp-port 1993/tcp cisco SNMP TCP port
snmp-tcp-port 1993/udp cisco SNMP TCP port
stun-port 1994/tcp cisco serial tunnel port
stun-port 1994/udp cisco serial tunnel port
perf-port 1995/tcp cisco perf port
perf-port 1995/udp cisco perf port
tr-rsrb-port 1996/tcp cisco Remote SRB port
tr-rsrb-port 1996/udp cisco Remote SRB port
gdp-port 1997/tcp cisco Gateway Discovery Protocol
gdp-port 1997/udp cisco Gateway Discovery Protocol
x25-svc-port 1998/tcp cisco X.25 service (XOT)
x25-svc-port 1998/udp cisco X.25 service (XOT)
tcp-id-port 1999/tcp cisco identification port
tcp-id-port 1999/udp cisco identification port
callbook 2000/tcp
callbook 2000/udp
dc 2001/tcp
wizard 2001/udp curry
globe 2002/tcp
globe 2002/udp
mailbox 2004/tcp
emce 2004/udp CCWS mm conf
berknet 2005/tcp
oracle 2005/udp
invokator 2006/tcp
raid-cc 2006/udp raid
dectalk 2007/tcp
raid-am 2007/udp
conf 2008/tcp
terminaldb 2008/udp
news 2009n/tcp
whosockami 2009/udp
search 2010/tcp

pipe_server 2010/udp
raid-cc 2011/tcp raid
servserv 2011/udp
ttyinfo 2012/tcp
raid-ac 2012/udp
raid-am 2013/tcp
raid-cd 2013/udp
troff 2014/tcp
raid-sf 2014/udp
cypress 2015/tcp
raid-cs 2015/udp
bootserver 2016/tcp
bootserver 2016/udp
cypress-stat 2017/tcp
bootclient 2017/udp
terminaldb 2018/tcp
rellpack 2018/udp
whosockami 2019/tcp
about 2019/udp
xinupageserver 2020/tcp
xinupageserver 2020/udp
servexec 2021/tcp
xinuexpansion1 2021/udp
down 2022/tcp
xinuexpansion2 2022/udp
xinuexpansion3 2023/tcp
xinuexpansion3 2023/udp
xinuexpansion4 2024/tcp
xinuexpansion4 2024/udp
ellpack 2025/tcp
xribs 2025/udp
scrabble 2026/tcp
scrabble 2026/udp
shadowserver 2027/tcp
shadowserver 2027/udp
submitserver 2028/tcp
submitserver 2028/udp
device2 2030/tcp
device2 2030/udp
blackboard 2032/tcp
blackboard 2032/udp
glogger 2033/tcp
glogger 2033/udp
scoremgr 2034/tcp
scoremgr 2034/udp
imsldoc 2035/tcp
imsldoc 2035/udp
objectmanager 2038/tcp
objectmanager 2038/udp
lam 2040/tcp
lam 2040/udp

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interbase 2041/tcp
interbase 2041/udp
isis  2042/tcp   isis
isis  2042/udp   isis
isis-bcast 2043/tcp   isis-bcast
isis-bcast 2043/udp   isis-bcast
#                    Ken Chapman <kchapman@isis.com
ivs-video      2232/udp   IVS Video default
rimsl  2044/tcp
rimsl  2044/udp
cdfunc  2045/tcp
cdfunc  2045/udp
sdfunc  2046/tcp
sdfunc  2046/udp
dls  2047/tcp
dls  2047/udp
dls-monitor 2048/tcp
dls-monitor 2048/udp
shilp  2049/tcp
shilp  2049/udp
dlsrpn         2065/tcp   Data Link Switch Read Port Number
dlsrpn         2065/udp   Data Link Switch Read Port Number
dlswpn         2067/tcp   Data Link Switch Write Port Number
dlswpn         2067/udp   Data Link Switch Write Port Number
ats           2201/tcp   Advanced Training System Program
ats           2201/udp   Advanced Training System Program
#
ivs-video      2232/tcp   IVS Video default
ivs-video      2232/udp   IVS Video default
#      Thierry Turletti <Thierry.Turletti@sophia.inria.fr>
ivsd          2241/tcp   IVS Daemon
ivsd          2241/udp   IVS Daemon
#      Thierry Turletti <Thierry.Turletti@sophia.inria.fr>
pehelp         2307/tcp   pehelp
pehelp         2307/udp   pehelp
#                    Jens Kilian <jensk@hpbeo82.bbn.hp.com>
#
rtsserv        2500/tcp   Resource Tracking system server
rtsserv        2500/udp   Resource Tracking system server
rtsclient      2501/tcp   Resource Tracking system client
rtsclient      2501/udp   Resource Tracking system client
#                    Aubrey Turner
#            <S95525ta%etsuacad.bitnet@ETSUADMN.ETSU.EDU>
hp-3000-telnet  2564/tcp   HP 3000 NS/VT block mode telnet
www-dev        2784/tcp   world wide web - development
www-dev        2784/udp   world wide web - development
NSWS  3049/tcp
NSWS  3049/udp
vmodem         3141/tcp   VMODEM
vmodem         3141/udp   VMODEM
#                    Ray Gwinn <p00321@psilink.com>
```

```
ccmail          3264/tcp   cc:mail/lotus
ccmail          3264/udp   cc:mail/lotus
dec-notes       3333/tcp   DEC Notes
dec-notes       3333/udp   DEC Notes
#                       Kim Moraros <moraros@via.enet.dec.com>
mapper-nodemgr    3984/tcp     MAPPER network node manager
mapper-nodemgr    3984/udp     MAPPER network node manager
mapper-mapethd    3985/tcp     MAPPER TCP/IP server
mapper-mapethd    3985/udp     MAPPER TCP/IP server
mapper-ws_ethd    3986/tcp     MAPPER workstation server
mapper-ws_ethd    3986/udp     MAPPER workstation server
#               John C. Horton <jch@unirsvl.rsvl.unisys.com>
bmap            3421/tcp   Bull Apprise portmapper
bmap            3421/udp   Bull Apprise portmapper
#                       Jeremy Gilbert <J.Gilbert@ma30.bull.com>
#
prsvp           3455/tcp   RSVP Port
prsvp           3455/udp   RSVP Port
#               Bob Braden <Braden@isi.edu>
vat             3456/tcp   VAT default data
vat             3456/udp   VAT default data
#               Van Jacobson <van@ee.lbl.gov>
vat-control     3457/tcp   VAT default control
vat-control     3457/udp   VAT default control
#               Van Jacobson <van@ee.lbl.gov>
#
udt_os          3900/tcp   Unidata UDT OS
udt_os          3900/udp   Unidata UDT OS
#                       James Powell <james@mailhost.unidata.com>
netcheque       4008/tcp   NetCheque accounting
netcheque       4008/udp   NetCheque accounting
#                       B. Clifford Neuman <bcn@isi.edu>
nuts_dem        4132/tcp   NUTS Daemon
nuts_dem        4132/udp   NUTS Daemon
nuts_bootp      4133/tcp   NUTS Bootp Server
nuts_bootp      4133/udp   NUTS Bootp Server
#                       Martin Freiss <freiss.pad@sni.>
rwhois          4321/tcp   Remote Who Is
rwhois          4321/udp   Remote Who Is
#                       Mark Kosters  <markk@internic.net>
unicall         4343/tcp   UNICALL
unicall         4343/udp   UNICALL
#                       James Powell <james@enghp.unidata.comp>
krb524          4444/tcp   KRB524
krb524          4444/udp   KRB524
#                       B. Clifford Neuman <bcn@isi.edu>
# PROBLEM krb524 assigned the port,
# PROBLEM nv used it without an assignment
nv-video        4444/tcp   NV Video default
nv-video        4444/udp   NV Video default
#               Ron Frederick <frederick@parc.xerox.com>
```

```
#
sae-urn         4500/tcp   sae-urn
sae-urn         4500/udp   sae-urn
urn-x-cdchoice  4501/tcp   urn-x-cdchoice
urn-x-cdchoice  4501/udp   urn-x-cdchoice
#                       Paul Hoffman <phoffman@proper.com>
rfa             4672/tcp   remote file access server
rfa             4672/udp   remote file access server
commplex-main 5000/tcp
commplex-main 5000/udp
commplex-link 5001/tcp
commplex-link 5001/udp
rfe             5002/tcp   radio free ethernet
rfe             5002/udp   radio free ethernet
claris-fmpro    5003/tcp   Claris FileMaker Pro
claris-fmpro    5003/udp   Claris FileMaker Pro
#                       Jon Thatcher <jon_thatcher@qm.claris.com>
telelpathstart  5010/tcp   TelepathStart
telelpathstart  5010/udp   TelepathStart
telelpathattack 5011/tcp   TelepathAttack
telelpathattack 5011/udp   TelepathAttack
#               Helmuth Breitenfellner <hbreitenf@vnet.imb.com>
mmcc            5050/tcp   multimedia conference control tool
mmcc            5050/udp   multimedia conference control tool
#               Steve Casner <Casner@isi.edu>
rmonitor_secure 5145/tcp
rmonitor_secure 5145/udp
aol             5190/tcp   America-Online
aol             5190/udp   America-Online
#                       Marty Lyons <marty@aol.com>
aol-1           5191/tcp   AmericaOnline1
aol-1           5191/udp   AmericaOnline1
aol-2           5192/tcp   AmericaOnline2
aol-2           5192/udp   AmericaOnline2
aol-3           5193/tcp   AmericaOnline3
aol-3           5193/udp   AmericaOnline3
#                       Bruce Mackey <BAMackey@aol.com>
padl2sim 5236/tcp
padl2sim 5236/udp
hacl-hb  5300/tcp # HA cluster heartbeat
hacl-hb  5300/udp # HA cluster heartbeat
hacl-gs  5301/tcp # HA cluster general services
hacl-gs  5301/udp # HA cluster general services
hacl-cfg 5302/tcp # HA cluster configuration
hacl-cfg 5302/udp # HA cluster configuration
hacl-probe 5303/tcp # HA cluster probing
hacl-probe 5303/udp # HA cluster probing
hacl-local      5304/tcp
hacl-local      5304/udp
hacl-test       5305/tcp
hacl-test       5305/udp
```

```
#                       Eric Soderberg <seric@hposl102.cup.hp>
proshareaudio   5713/tcp   proshare conf audio
proshareaudio   5713/udp   proshare conf audio
prosharevideo   5714/tcp   proshare conf video
prosharevideo   5714/udp   proshare conf video
prosharedata    5715/tcp   proshare conf data
prosharedata    5715/udp   proshare conf data
prosharerequest 5716/tcp   proshare conf request
prosharerequest 5716/udp   proshare conf request
prosharenotify  5717/tcp   proshare conf notify
prosharenotify  5717/udp   proshare conf notify
#                       <gunner@ibeam.intel.com>
x11          6000-6063/tcp   X Window System
x11          6000-6063/udp   X Window System
#            Stephen Gildea <gildea@expo.lcs.mit.edu>
softcm         6110/tcp   HP SoftBench CM
softcm         6110/udp   HP SoftBench CM
spc          6111/tcp   HP SoftBench Sub-Process Control
spc          6111/udp   HP SoftBench Sub-Process Control
#                       Scott A. Kramer <sk@tleilaxu.sde.hp.com>
dtspcd         6112/tcp   dtspcd
dtspcd         6112/udp   dtspcd
#                       Doug Royer <Doug.Royer@eng.sun.com>
meta-corp      6141/tcp   Meta Corporation License Manager
meta-corp      6141/udp   Meta Corporation License Manager
#                       Osamu Masuda <--none--->
aspentec-lm     6142/tcp   Aspen Technology License Manager
aspentec-lm     6142/udp   Aspen Technology License Manager
#                       Kevin Massey <massey@aspentec.com>
watershed-lm    6143/tcp   Watershed License Manager
watershed-lm    6143/udp   Watershed License Manager
#                       David Ferrero <david@zion.com>
statsci1-lm    6144/tcp   StatSci License Manager - 1
statsci1-lm    6144/udp   StatSci License Manager - 1
statsci2-lm    6145/tcp   StatSci License Manager - 2
statsci2-lm    6145/udp   StatSci License Manager - 2
#                       Scott Blachowicz <scott@statsci.com>
lonewolf-lm     6146/tcp   Lone Wolf Systems License Manager
lonewolf-lm     6146/udp   Lone Wolf Systems License Manager
#                       Dan Klein <dvk@lonewolf.com>
montage-lm      6147/tcp   Montage License Manager
montage-lm      6147/udp   Montage License Manager
#                       Michael Ubell <michael@montage.com>
ricardo-lm     6148/tcp   Ricardo North America License Manager
ricardo-lm     6148/udp   Ricardo North America License Manager
#                       M Flemming <mflemming@aol.com>
xdsxdm  6558/tcp
xdsxdm  6558/udp
acmsoda        6969/tcp   acmsoda
acmsoda        6969/udp   acmsoda
#                       Daniel Simms <dsimms@acm.uiuc.edu>
```

```
afs3-fileserver 7000/tcp   file server itself
afs3-fileserver 7000/udp   file server itself
afs3-callback 7001/tcp   callbacks to cache managers
afs3-callback 7001/udp   callbacks to cache managers
afs3-prserver 7002/tcp   users & groups database
afs3-prserver 7002/udp   users & groups database
afs3-vlserver 7003/tcp   volume location database
afs3-vlserver 7003/udp   volume location database
afs3-kaserver 7004/tcp   AFS/Kerberos authentication service
afs3-kaserver 7004/udp   AFS/Kerberos authentication service
afs3-volser 7005/tcp   volume managment server
afs3-volser 7005/udp   volume managment server
afs3-errors 7006/tcp   error interpretation service
afs3-errors 7006/udp   error interpretation service
afs3-bos 7007/tcp   basic overseer process
afs3-bos 7007/udp   basic overseer process
afs3-update 7008/tcp   server-to-server updater
afs3-update 7008/udp   server-to-server updater
afs3-rmtsys 7009/tcp   remote cache manager service
afs3-rmtsys 7009/udp   remote cache manager service
ups-onlinet     7010/tcp   onlinet uninterruptable power supplies
ups-onlinet     7010/udp   onlinet uninterruptable power supplies
#           Brian Hammill <hamill@dolphin.exide.com>
font-service    7100/tcp   X Font Service
font-service    7100/udp   X Font Service
#      Stephen Gildea <gildea@expo.lcs.mit.edu>
fodms           7200/tcp   FODMS FLIP
fodms           7200/udp   FODMS FLIP
#          David Anthony <anthony@power.amasd.anatcp.rockwell.com>
dlip            7201/tcp   DLIP
dlip            7201/udp   DLIP
#          Albert Manfredi <manfredi@engr05.comsys.rockwell.com>
npmp            8450/tcp    npmp
npmp            8450/udp    npmp
#                    Ian Chard <ian@tanagra.demon.co.uk>
man  9535/tcp
man  9535/udp
sd              9876/tcp   Session Director
sd              9876/udp   Session Director
#              Van Jacobson <van@ee.lbl.gov>
distinct        9999/tcp   distinct
distinct        9999/udp   distinct
#                    Anoop Tewari <anoop@next.distinct.com>
isode-dua 17007/tcp
isode-dua 17007/udp
biimenu         18000/tcp Beckman Instruments, Inc.
biimenu         18000/udp Beckman Instruments, Inc.
                R. L. Meyering <RLMEYERING@BIIVAX.DP.BECKMAN.COM>
icl-twobase1    25000/tcp icl-twobase1
icl-twobase1    25000/udp icl-twobase1
icl-twobase2    25001/tcp icl-twobase2
```

icl-twobase2 25001/udp icl-twobase2
icl-twobase3 25002/tcp icl-twobase3
icl-twobase3 25002/udp icl-twobase3
icl-twobase4 25003/tcp icl-twobase4
icl-twobase4 25003/udp icl-twobase4
icl-twobase5 25004/tcp icl-twobase5
icl-twobase5 25004/udp icl-twobase5
icl-twobase6 25005/tcp icl-twobase6
icl-twobase6 25005/udp icl-twobase6
icl-twobase7 25006/tcp icl-twobase7
icl-twobase7 25006/udp icl-twobase7
icl-twobase8 25007/tcp icl-twobase8
icl-twobase8 25007/udp icl-twobase8
icl-twobase9 25008/tcp icl-twobase9
icl-twobase9 25008/udp icl-twobase9
icl-twobase10 25009/tcp icl-twobase10
icl-twobase10 25009/udp icl-twobase10
J. A. (Tony) Sever <J.A.Sever@bra0119.wins.icl.co.uk>
dbbrowse 47557/tcp Databeam Corporation
dbbrowse 47557/udp Databeam Corporation
Cindy Martin <cmartin@databeam.com>

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USC/Information Sciences Institute, August 1980.

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