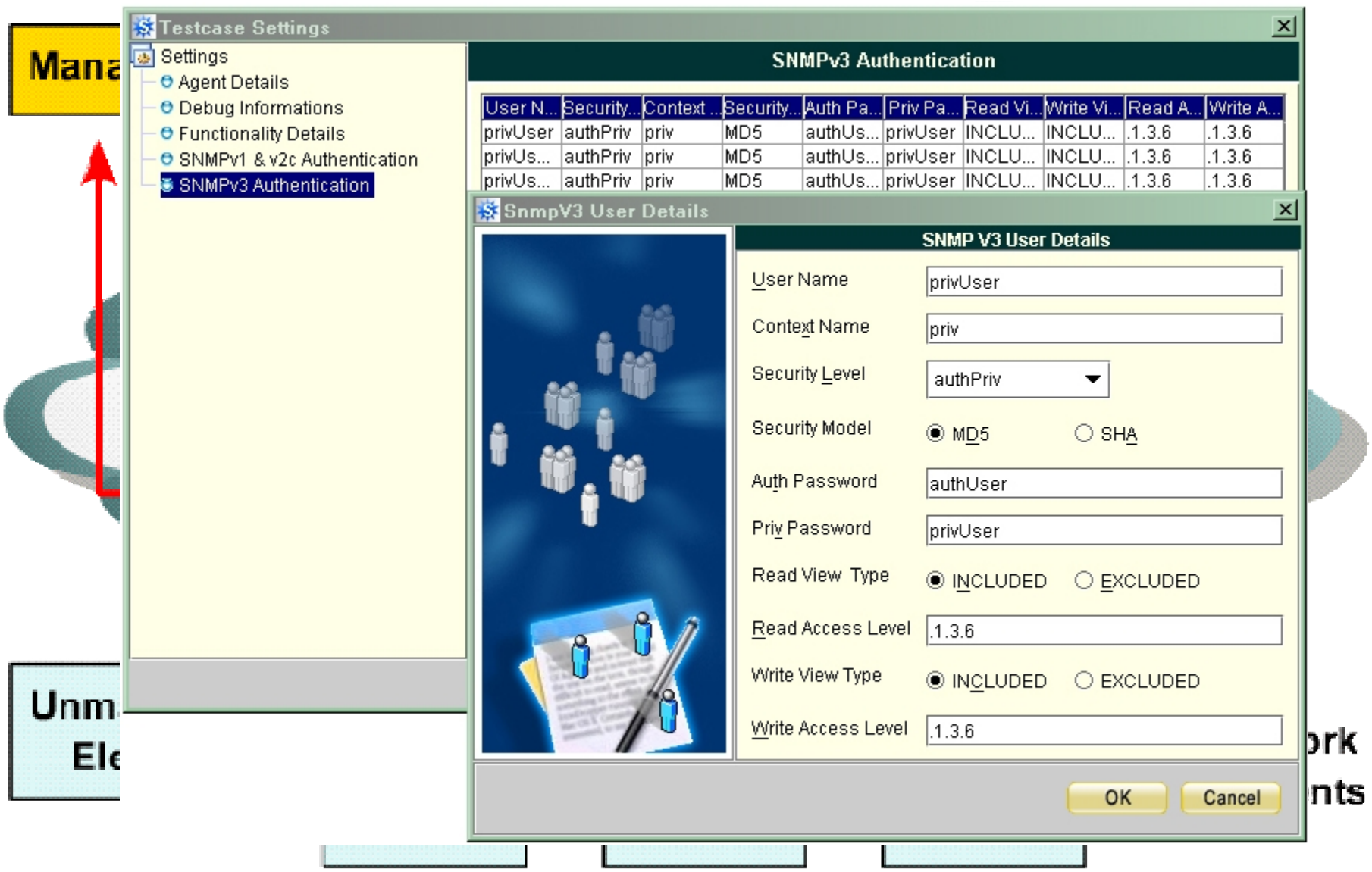
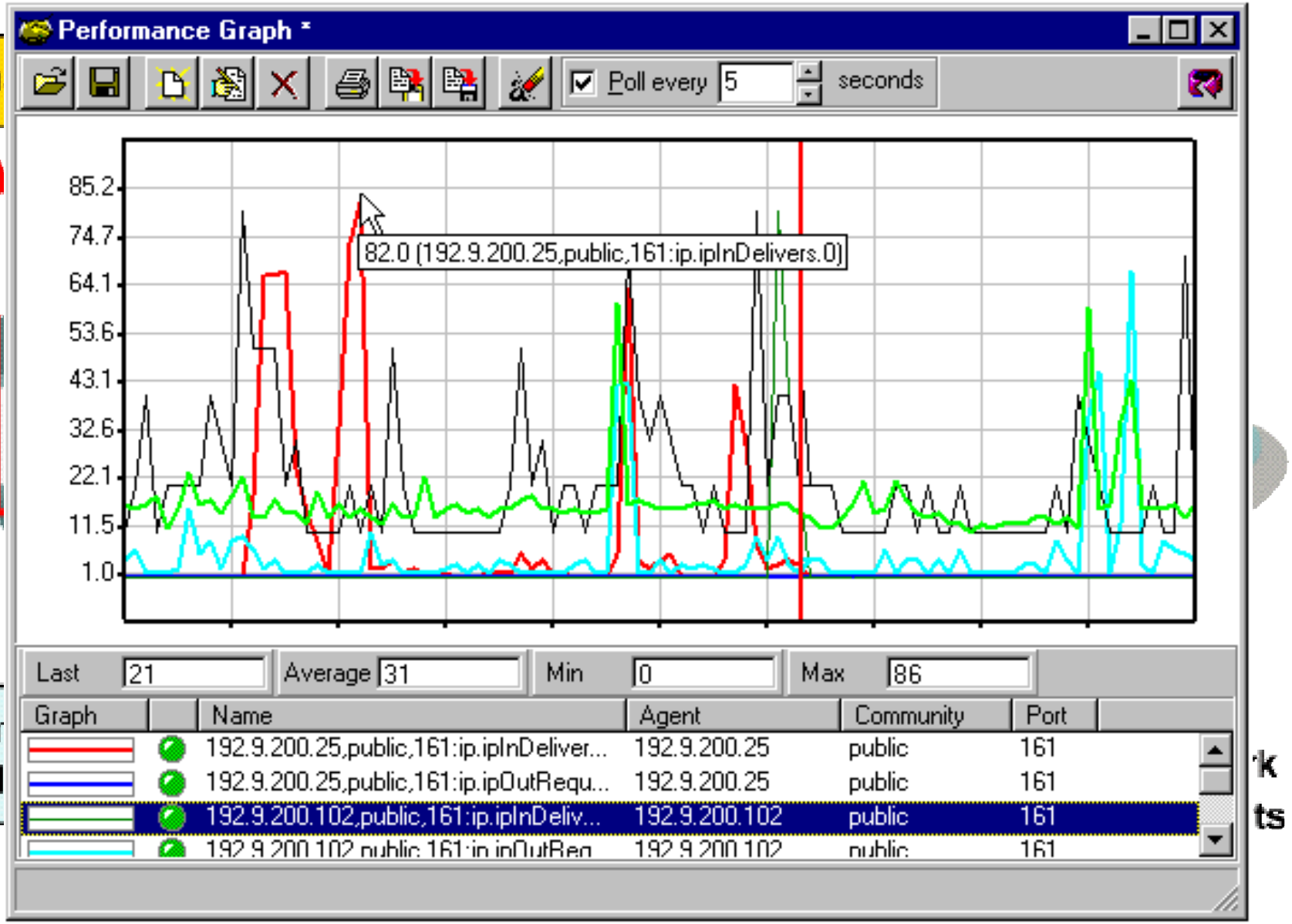
Components of the Organization Model

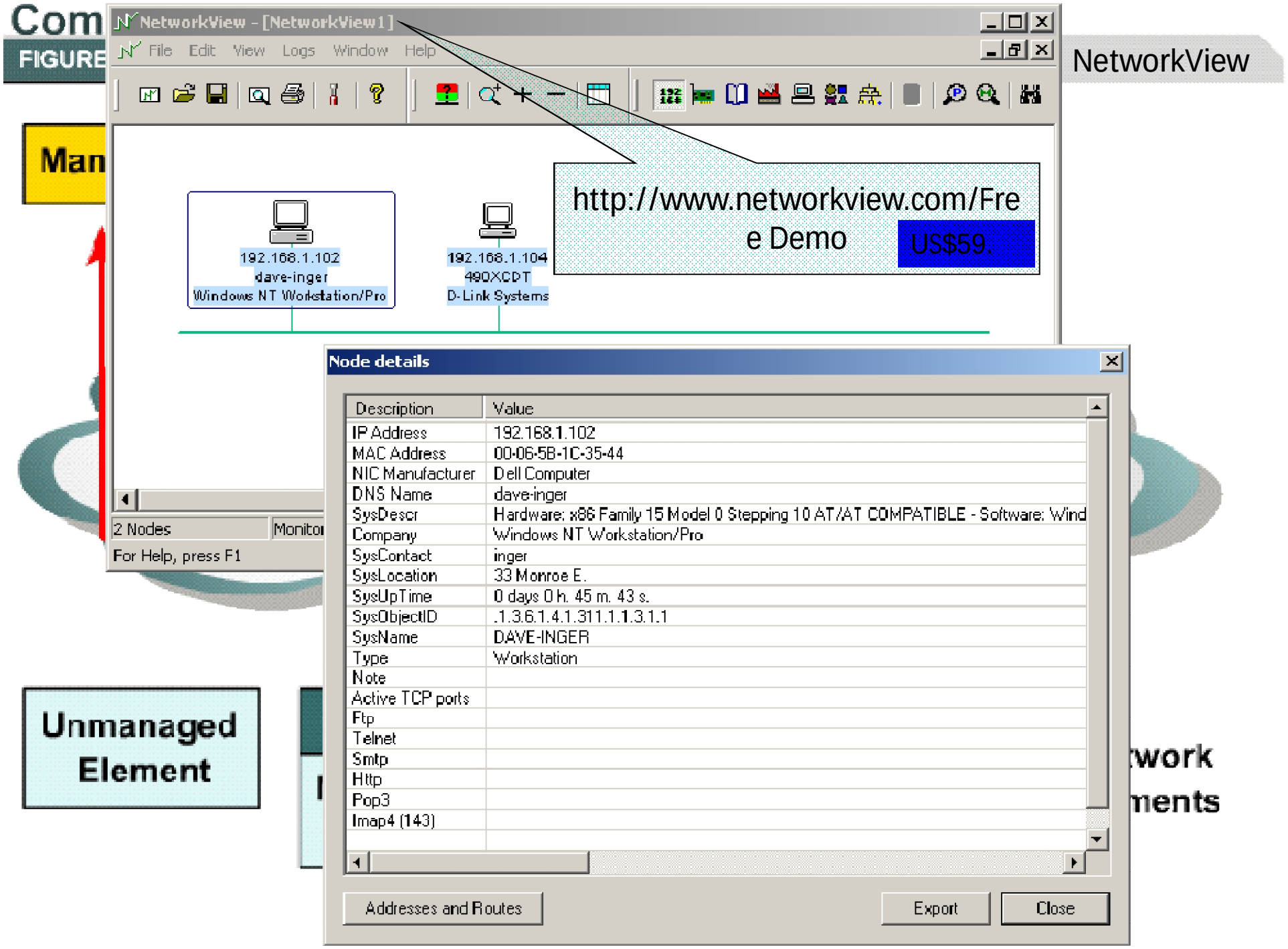
FIGURES



Components of the Organization Model

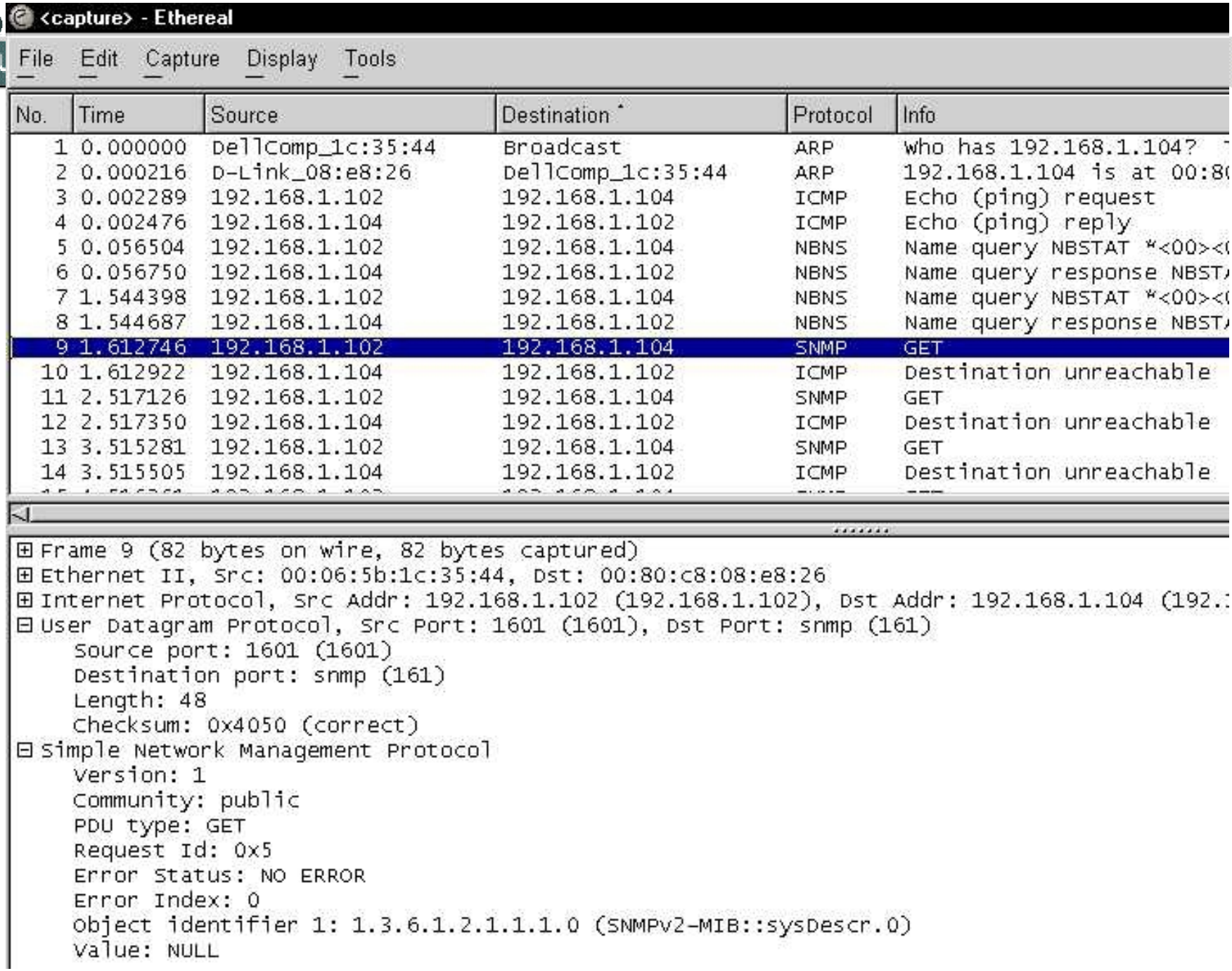
FIGURES



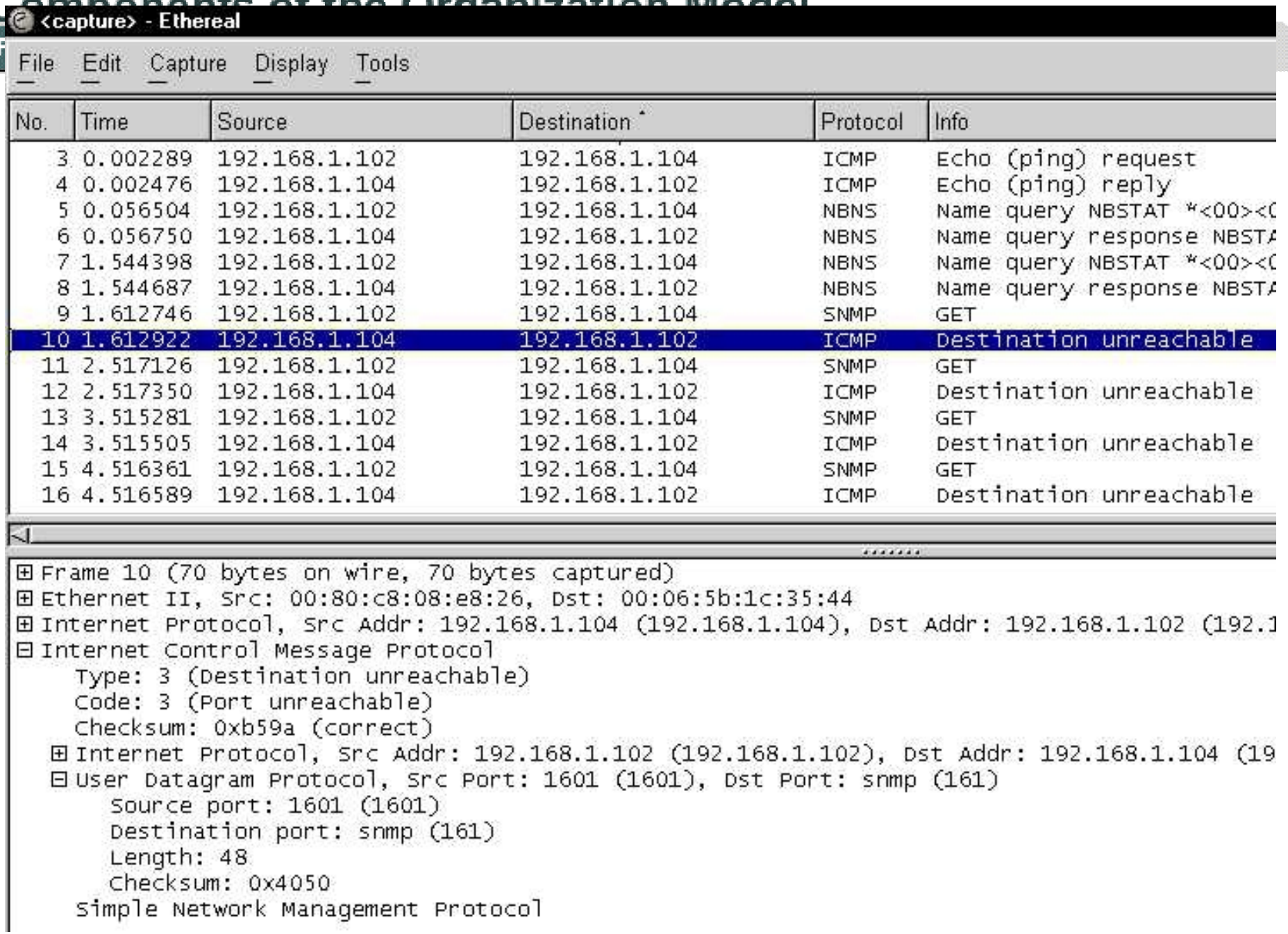

Com
FIGURE
NetworkView
Man
NetworkView - [NetworkView1]
File Edit View Logs Window Help
http://www.networkview.com/Free Demo
US$59.
192.168.1.102
dave-inger
Windows NT Workstation/Pro
192.168.1.104
490XCPT
D-Link Systems
2 Nodes
For Help, press F1
Node details
Description
Value
IP Address
192.168.1.102
MAC Address
00-06-5B-1C-35-44
NIC Manufacturer
Dell Computer
DNS Name
dave-inger
SysDescr
Hardware: x86 Family 15 Model 0 Stepping 10 AT/AT COMPATIBLE - Software: Wind
Company
Windows NT Workstation/Pro
SysContact
inger
SysLocation
33 Monroe E.
SysUpTime
0 days 0 h. 45 m. 43 s.
SysObjectID
.1.3.6.1.4.1.311.1.1.3.1.1
SysName
DAVE-INGER
Type
Workstation
Note
Active TCP ports
Ftp
Telnet
Smtp
Http
Pop3
Imap4 (143)
Addresses and Routes
Export
Close
Unmanaged Element
twork
ments

Co

FIGU

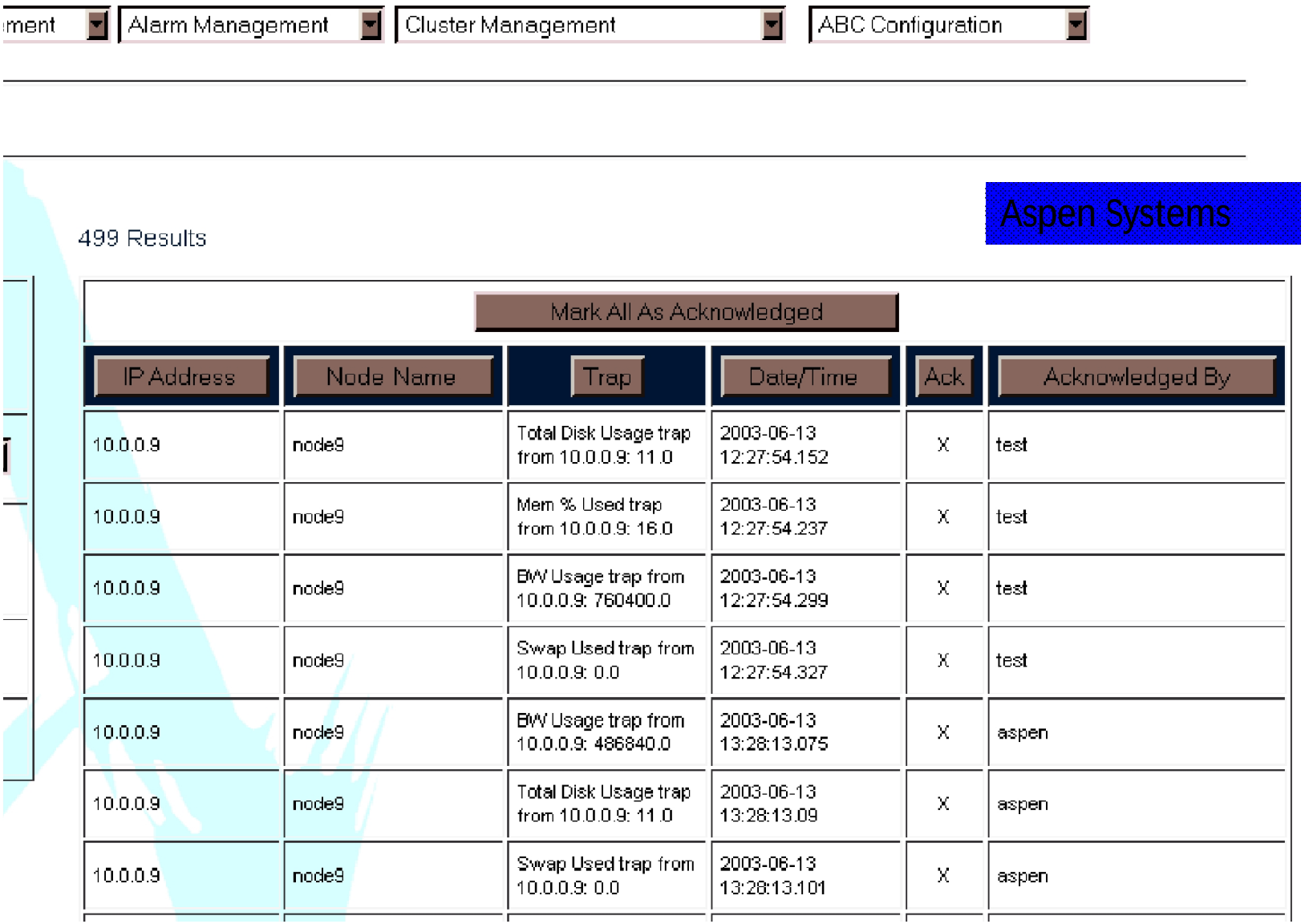

<capture> - Ethereal
File Edit Capture Display Tools
No. Time Source Destination Protocol Info
1 0.000000 DellComp_1c:35:44 Broadcast ARP Who has 192.168.1.104?
2 0.000216 D-Link_08:e8:26 DellComp_1c:35:44 ARP 192.168.1.104 is at 00:8
3 0.002289 192.168.1.102 192.168.1.104 ICMP Echo (ping) request
4 0.002476 192.168.1.104 192.168.1.102 ICMP Echo (ping) reply
5 0.056504 192.168.1.102 192.168.1.104 NBNS Name query NBSTAT *<00><
6 0.056750 192.168.1.104 192.168.1.102 NBNS Name query response NBST
7 1.544398 192.168.1.102 192.168.1.104 NBNS Name query NBSTAT *<00><
8 1.544687 192.168.1.104 192.168.1.102 NBNS Name query response NBST
9 1.612746 192.168.1.102 192.168.1.104 SNMP GET
10 1.612922 192.168.1.104 192.168.1.102 ICMP Destination unreachable
11 2.517126 192.168.1.102 192.168.1.104 SNMP GET
12 2.517350 192.168.1.104 192.168.1.102 ICMP Destination unreachable
13 3.515281 192.168.1.102 192.168.1.104 SNMP GET
14 3.515505 192.168.1.104 192.168.1.102 ICMP Destination unreachable
Frame 9 (82 bytes on wire, 82 bytes captured)
Ethernet II, Src: 00:06:5b:1c:35:44, Dst: 00:80:c8:08:e8:26
Internet Protocol, Src Addr: 192.168.1.102 (192.168.1.102), Dst Addr: 192.168.1.104 (192.
User Datagram Protocol, Src Port: 1601 (1601), Dst Port: snmp (161)
Source port: 1601 (1601)
Destination port: snmp (161)
Length: 48
Checksum: 0x4050 (correct)
Simple Network Management Protocol
Version: 1
Community: public
PDU type: GET
Request Id: 0x5
Error Status: NO ERROR
Error Index: 0
Object identifier 1: 1.3.6.1.2.1.1.1.0 (SNMPv2-MIB::sysDescr.0)
Value: NULL

Components of the Organization Model



Components of the Organization Model

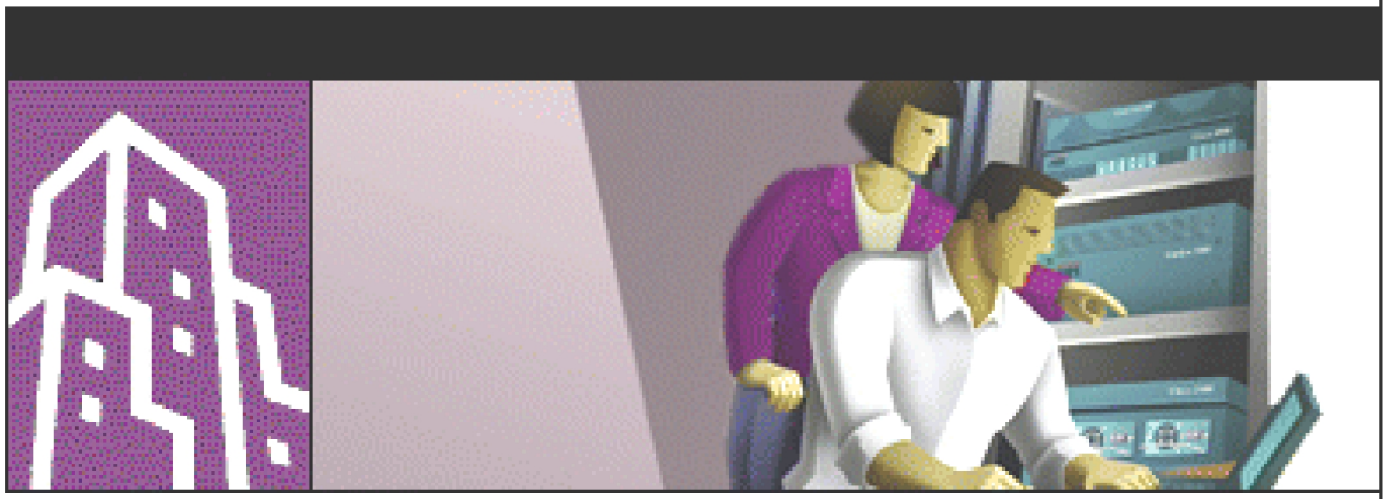
FIGURES



Linux SNMP Network Management Tools

- This page assumes that you already have a working knowledge of the basic tools -- ping, netstat, traceroute, nslookup, dig, tcpdump, /proc/net, ipfwadmin, tcpwrapper, maskd and are looking for graphical, distributed tools.
- SNMP FAQ Frequently asked questions about SNMP.
- Linux CMU SNMP Project -- provides the standard bilingual SNMPv1/v2 agent, incl USEC support, as well as command line tools; includes MIB-2 (RFC 1213) Identification MIB (RFC 1414) Host Resources MIB (RFC 1514) and the TUBS Linux MIB, as well as pointers to the Tcl and Perl snmp libs.
- SUNY Bufallo Network Management Archives -- the most complete archive around, including tools, MIB compilers, documentation. Not Linux specific.
- The Simple Web site maintains info on internet management.
- Simple Times A periodical for Internet network management.

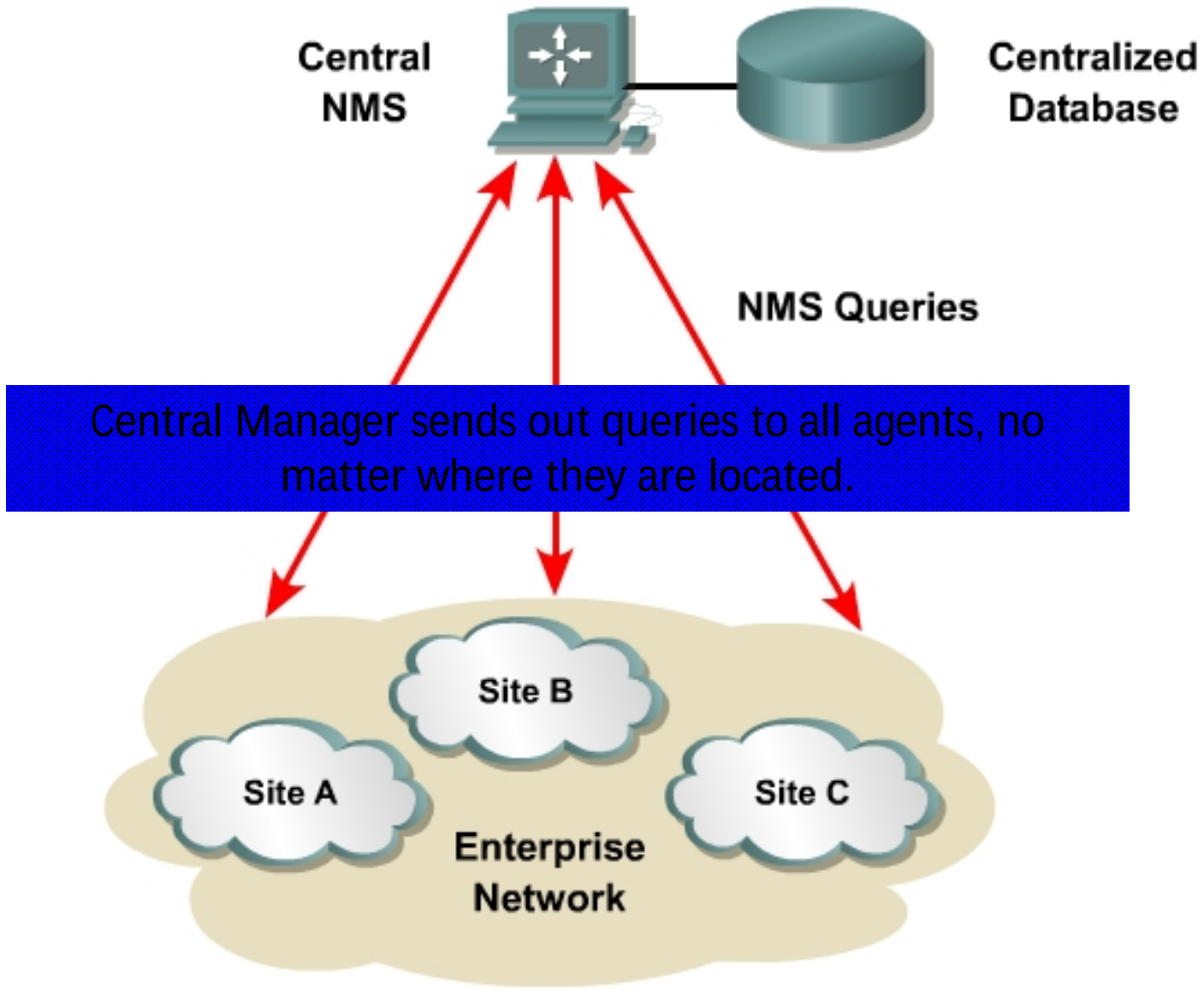
CiscoWorks2000
VPN/Security Management Solution



V 1.0

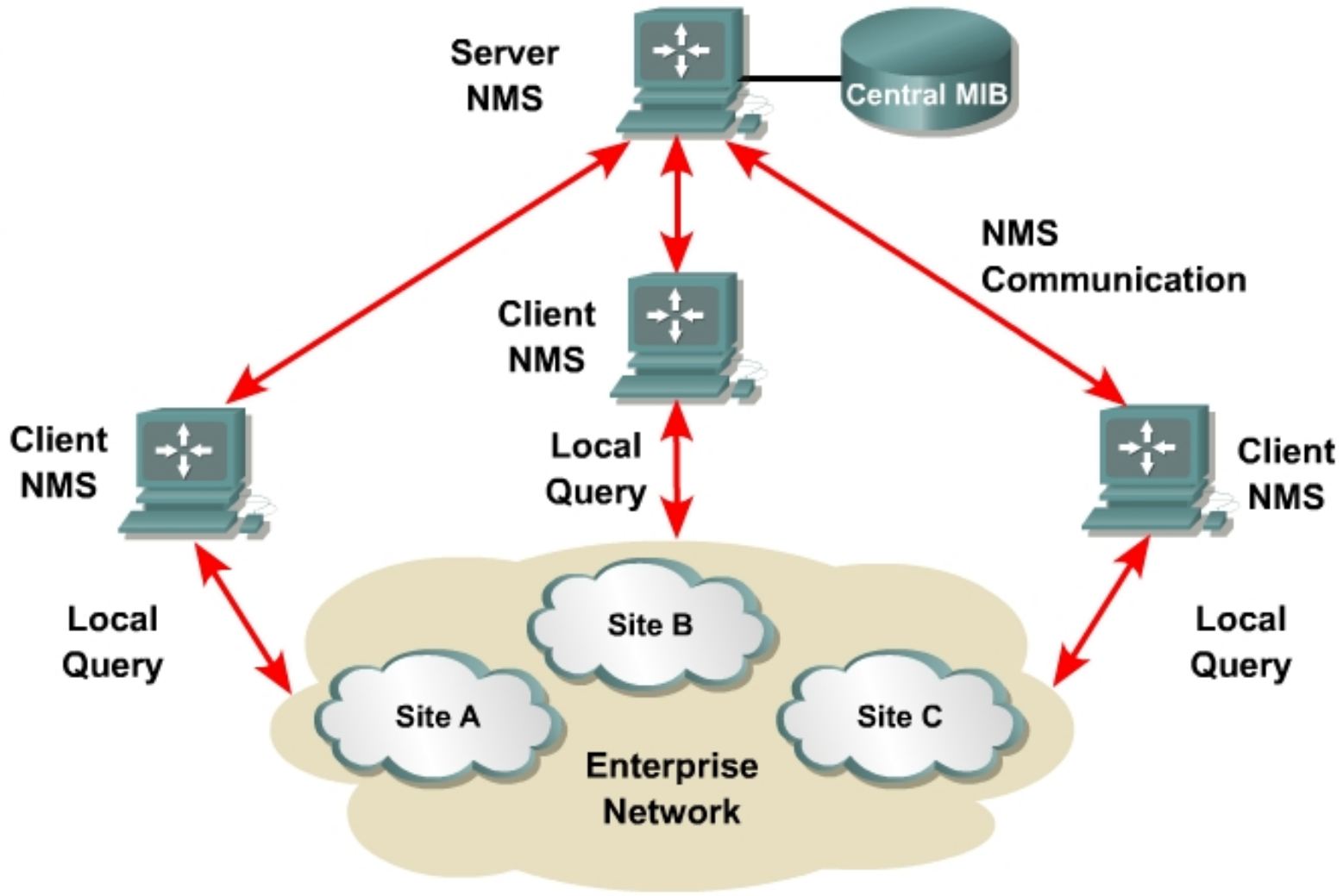
Cisco Systems

Centralized Network Management Architecture



Hierarchical Network Management Architecture

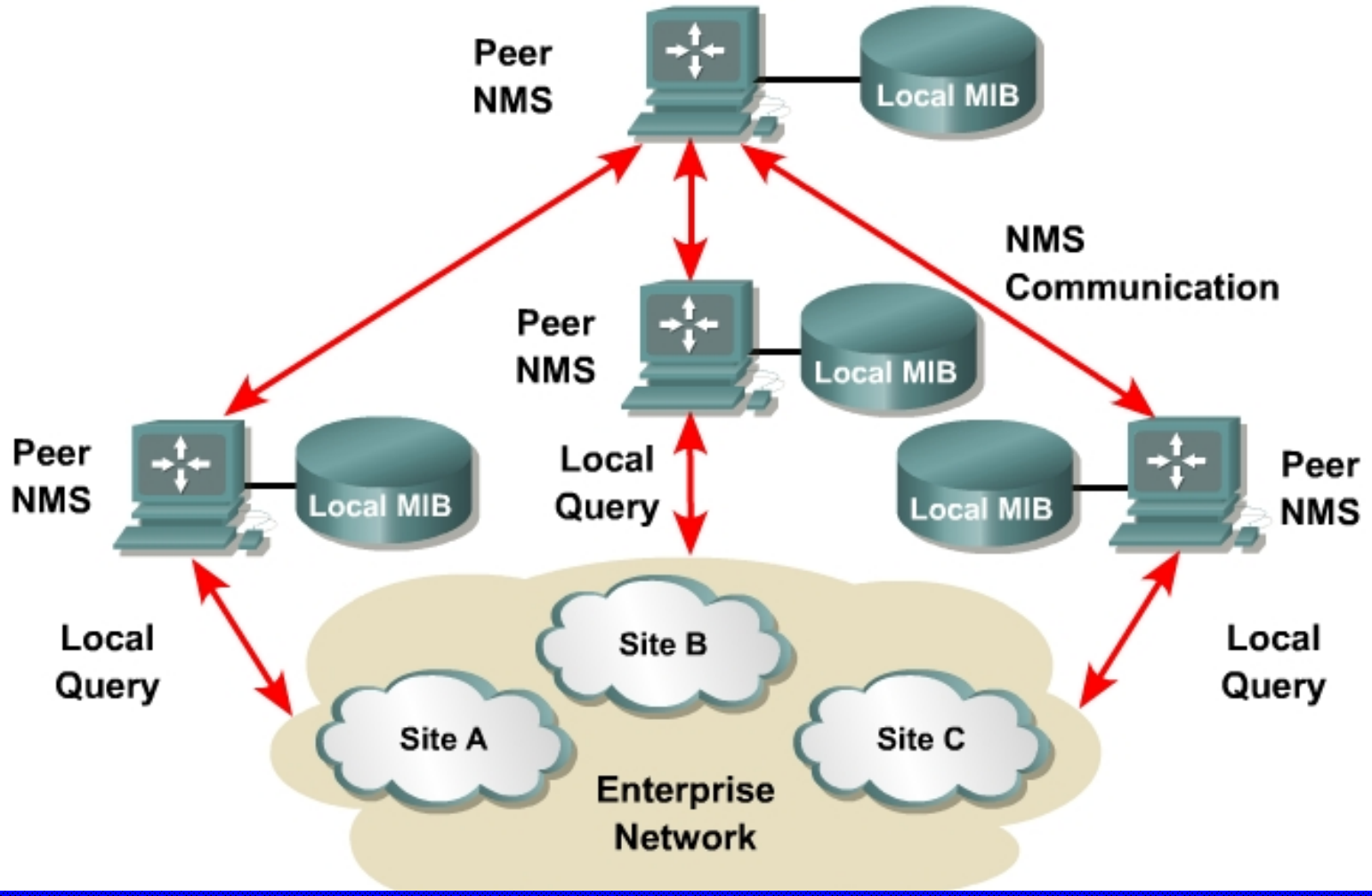
FIGURES
1
2
3
4
5
6



- In a distributed network NMS can act in a client-server architecture.
- The clients send their data to the master server for centralized storage

Distributed Network Management Architecture

FIGURES
1
2
3
4
5
6



- Distributed NMSs have equal responsibility, with their own manager databases.
- Management information is distributed over the peer NMSs.

Management Information Bases

FIGURES

6.2.5 Structure of management information and MIBs

1

2

A MIB is used to store the structured information representing network elements and their attributes.

A MIB defines the variables that reside in a managed node

- Defined according to Structure of Management Information (SMI) rules
- Each managed object is described using an object identifier defined in the SMI

MIB I

- 114 standard objects
- Objects included are considered essential for either fault or configuration management

MIB II

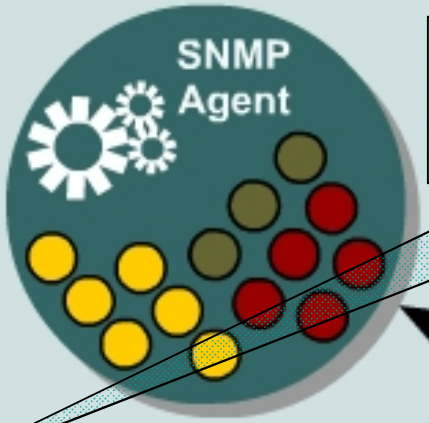
- Extends MIB I
- 185 objects defined

Other standard MIBs

- RMON, host, router

Proprietary vendors MIBs

- Extensions to standard MIBs



All vendors are encouraged to make their MIB definitions known.

1000s of Manageable Objects Defined Following Rules Set Out in the SMI Standards

Management Information Bases

FIGURES

6.2.5 Structure of management information and MIBs

1

2

RFC1213-MIB:ifTable on SolarWinds-Core

File Edit View Help

Export Print Refresh Stop Pivot Help

Index	ifIndex	ifDescr	ifType	ifMtu	ifSpeed	ifPhysAddress	ifAdminStatus	ifOperStatus	ifLastChange
1	1	Ethernet0	ethernet-csmacd(6)	1500	10000000	00E0.F71A.1CA1	up(1)	up(1)	6 seconds
2	2	Ethernet1	ethernet-csmacd(6)	1500	10000000	00E0.F71A.1CA4	up(1)	up(1)	7 seconds
3	3	Ethernet2	ethernet-csmacd(6)	1500	10000000	00E0.F71A.1CA7	up(1)	up(1)	7 seconds
4	4	Ethernet3	ethernet-csmacd(6)	1500	10000000	00E0.F71A.1CAA	up(1)	up(1)	3 days, 21 hours, 2
5	5	Ethernet4	ethernet-csmacd(6)	1500	10000000	00E0.F71A.1CAD	up(1)	down(2)	6 seconds
6	6	Ethernet5	ethernet-csmacd(6)	1500	10000000	00E0.F71A.1CB0	up(1)	up(1)	7 seconds
7	7	Serial0	propPointToPointSerial(22)	1500	1544000		down(2)	down(2)	6 seconds
8	8	Serial1	propPointToPointSerial(22)	1500	1544000		down(2)	down(2)	6 seconds
9	9	Serial2	propPointToPointSerial(22)	1500	1544000		down(2)	down(2)	6 seconds
10	10	Serial3	propPointToPointSerial(22)	1500	1544000		down(2)	down(2)	6 seconds

MIB RFC1213-MIB
Name ifIndex.1

iso.org.dod.internet.mgmt.mib-2.interfaces.ifTable.ifEntry.ifIn

OID 1.3.6.1.2.1.2.2.1.1.1
Type INTEGER
Access read-only
Status unknown
Value Please Wait ...

A unique value for each interface. Its value

The structure itself is defined in the Structure of Management Information (SMI)

1. the data types that can be used to store an object,
2. how those objects are named, and
3. how they are encoded for transmission over a network.

Object Identifiers

FIGURES

6.2.5 Structure of management information and MIBs

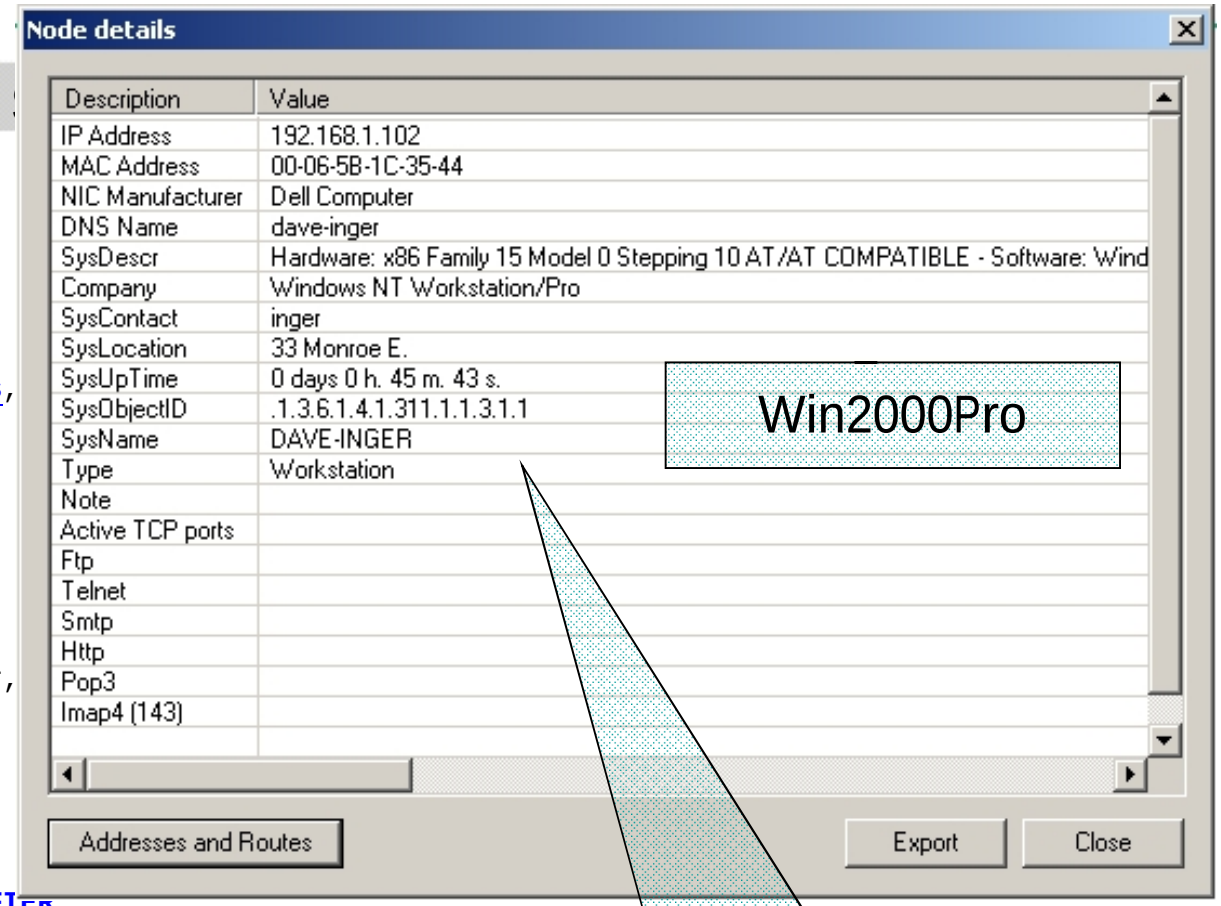
```
-- RFC1213-MIB.html
-- MIB generated by MG-SOFT MIB Explorer Version 1.1 Build 153
-- Wednesday, November 13, 2002 at 12:22:23
-- HTML index:
-- RMON2-MIB, RFC1155-SMI, RFC1213-MIB, RMON-MIB, SNMPv2-TC,
-- TOKEN-RING-RMON-MIB.
--
RFC1213-MIB DEFINITIONS ::= BEGIN
        IMPORTS
                internet, mgmt
                        FROM RFC1155-SMI;
--
-- Type definitions
--      DisplayString ::= OCTET STRING
        PhysAddress ::= OCTET STRING
--
-- Node definitions
--
        -- 1.3.6.1.2.1
        mib-2 OBJECT IDENTIFIER ::= { mgmt 1 }
        -- 1.3.6.1.2.1.1
        system OBJECT IDENTIFIER ::= { mib-2 1 }
        -- 1.3.6.1.2.1.1.1
        sysDescr OBJECT-TYPE
                SYNTAX DisplayString (SIZE (0..255))
                ACCESS read-only
                STATUS mandatory
                DESCRIPTION
                        "A textual description of the entity.  This value
                        should include the full name and version
                        identification of the system's hardware type,
                        software operating-system, and networking
                        software.  It is mandatory that this only contain
                        printable ASCII characters."
        ::= { system 1 }
```

- A unique object identifier, which is a number in dot notation, identifies each managed object
- Each object identifier is described using abstract syntax notation (ASN.1).

Object Identifiers

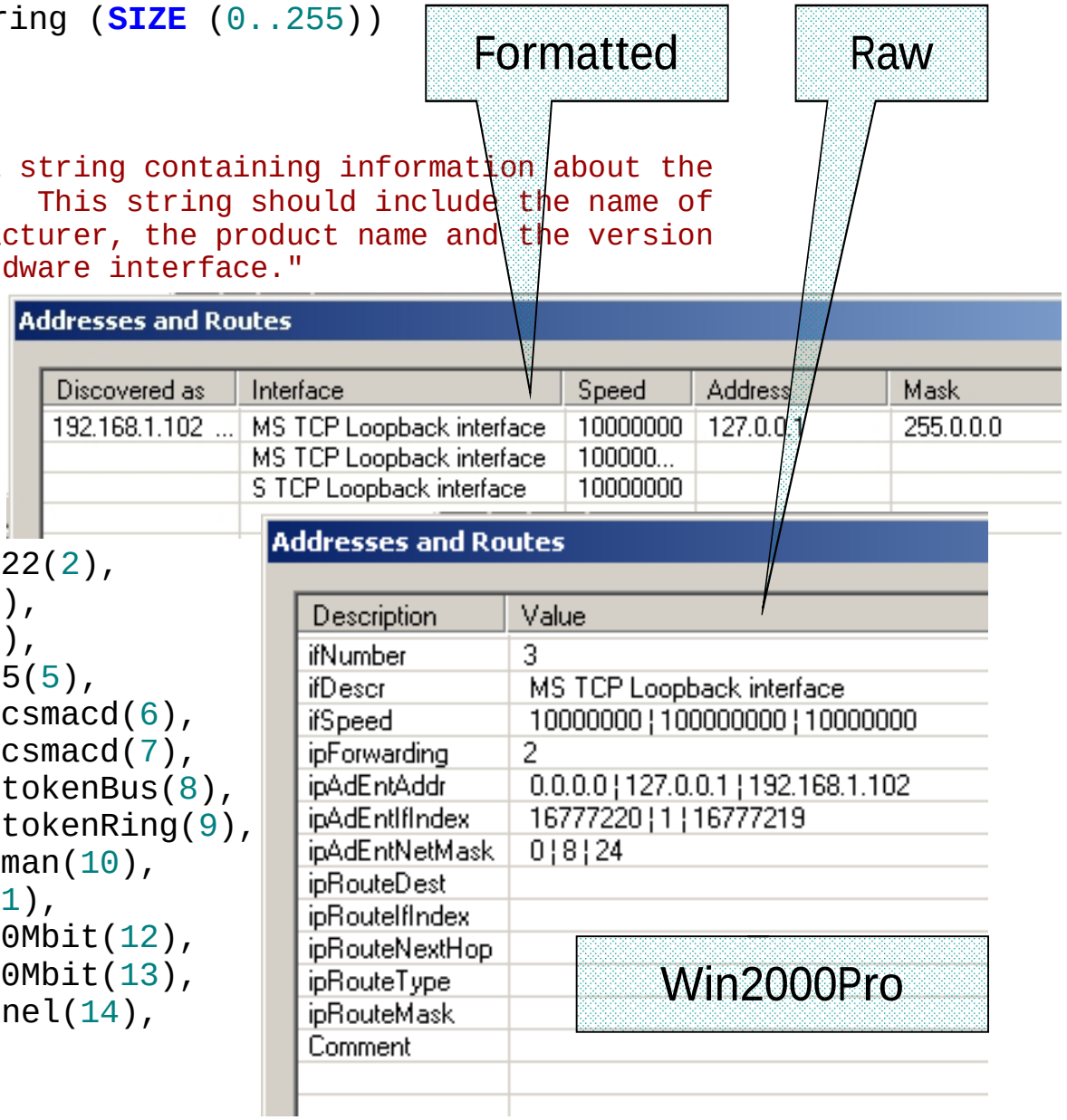
FIGURES 6.2.5

```
IfEntry ::= SEQUENCE
                {
                ifIndex INTEGER,
                ifDescr DisplayString,
                ifType INTEGER,
                ifMtu INTEGER,
                ifSpeed Gauge,
                ifPhysAddress PhysAddress,
                ifAdminStatus INTEGER,
                ifOperStatus INTEGER,
                ifLastChange TimeTicks,
                ifInOctets Counter,
                ifInUcastPkts Counter,
                ifInNUcastPkts Counter,
                ifInDiscards Counter,
                ifInErrors Counter,
                ifInUnknownProtos Counter,
                ifOutOctets Counter,
                ifOutUcastPkts Counter,
                ifOutNUcastPkts Counter,
                ifOutDiscards Counter,
                ifOutErrors Counter,
                ifOutQLen Gauge,
                ifSpecific OBJECT IDENTIFIER
                }
        -- 1.3.6.1.2.1.2.2.1.1
        ifIndex OBJECT-TYPE
                SYNTAX INTEGER
                ACCESS read-only
                STATUS mandatory
                DESCRIPTION
                        "A unique value for each interface.  Its value
                        ranges between 1 and the value of ifNumber.  The
                        value for each interface must remain constant at
                        least from one re-initialization of the entity's
                        network management system to the next re-
                        initialization."
        ::= { ifEntry 1 }
```



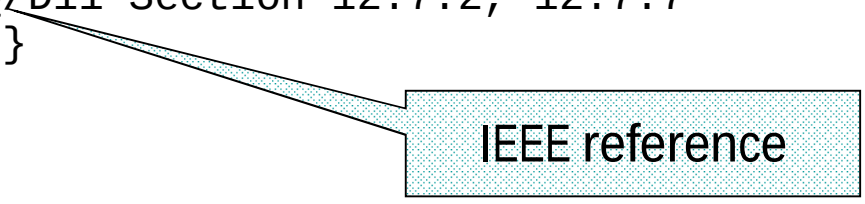
- A unique object identifier, which is a number in dot notation, identifies each managed object
- Each object identifier is described using abstract syntax notation (ASN.1).

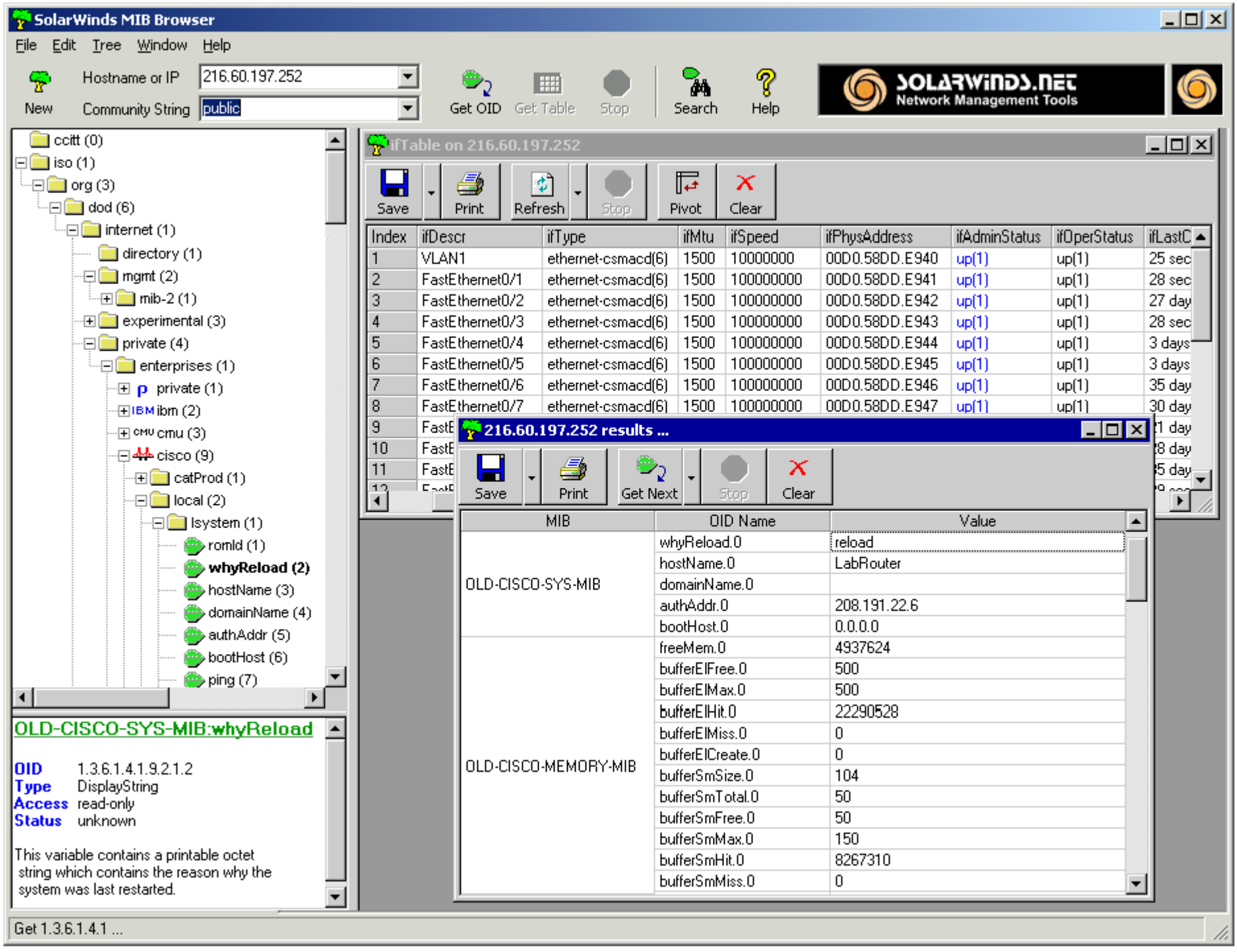
```
ifDescr OBJECT-TYPE
        SYNTAX DisplayString (SIZE (0..255))
        ACCESS read-only
        STATUS mandatory
        DESCRIPTION
                "A textual string containing information about the
                interface.  This string should include the name of
                the manufacturer, the product name and the version
                of the hardware interface."
    ::= { ifEntry 2 }

    -- 1.3.6.1.2.1.2.2.1.3
    ifType OBJECT-TYPE
        SYNTAX INTEGER
        {
            other(1),
            regular1822(2),
            hdh1822(3),
            ddn-x25(4),
            rfc877-x25(5),
            ethernet-csmacd(6),
            iso88023-csmacd(7),
            iso88024-tokenBus(8),
            iso88025-tokenRing(9),
            iso88026-man(10),
            starLan(11),
            proteon-10Mbit(12),
            proteon-80Mbit(13),
            hyperchannel(14),
            fddi(15),
```



```
-- 1.3.6.1.2.1.11.29
        snmpOutTraps OBJECT-TYPE
                SYNTAX Counter
                ACCESS read-only
                STATUS mandatory
                DESCRIPTION
                        "The total number of SNMP Trap PDUs which have
                        been generated by the SNMP protocol entity."
        ::= { snmp 29 }

        -- 1.3.6.1.2.1.11.30
        snmpEnableAuthenTraps OBJECT-TYPE
                SYNTAX INTEGER
                {
                        enabled(1),
                        disabled(2)
                }
                ACCESS read-write
                STATUS mandatory
                DESCRIPTION
                        "Indicates whether the SNMP agent process is
                        permitted to generate authentication-failure
                        traps.  The value of this object overrides any
                        configuration information; as such, it provides a
                        means whereby all authentication-failure traps may
                        be disabled.

                        Note that it is strongly recommended that this
                        object be stored in non-volatile memory so that it
                        remains constant between re-initializations of the
                        network management system."
        ::= { snmp 30 }

END
```

```
dot1qForwardUnregisteredTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF Dot1qForwardUnregisteredEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "A table containing forwarding information for each
        VLAN, specifying the set of ports to which forwarding of
        multicast group-addressed frames for which there is no
        more specific forwarding information applies.  This is
        configured statically by management and determined
        dynamically by GMRP.  An entry appears in this table for
        all VLANs that are currently instantiated."
    REFERENCE
        "IEEE 802.1Q/D11 Section 12.7.2, 12.7.7"
    ::= { dot1qTp 5 }
```




SolarWinds MIB Browser
File Edit Tree Window Help
Hostname or IP 216.60.197.252
New Community String public
Get OID Get Table Stop Search Help
SOLARWINDS.NET Network Management Tools
ccitt (0)
iso (1)
org (3)
dod (6)
internet (1)
directory (1)
mgmt (2)
mib-2 (1)
experimental (3)
private (4)
enterprises (1)
private (1)
ibm (2)
cmu (3)
cisco (9)
catProd (1)
local (2)
lsystem (1)
romId (1)
whyReload (2)
hostName (3)
domainName (4)
authAddr (5)
bootHost (6)
ping (7)
OLD-CISCO-SYS-MIB:whyReload
OID 1.3.6.1.4.1.9.2.1.2
Type DisplayString
Access read-only
Status unknown
This variable contains a printable octet string which contains the reason why the system was last restarted.
ifTable on 216.60.197.252
Save Print Refresh Stop Pivot Clear
Index ifDescr ifType ifMtu ifSpeed ifPhysAddress ifAdminStatus ifOperStatus ifLastC
1 VLAN1 ethernet-csmacd(6) 1500 10000000 00D0.58DD.E940 up(1) up(1) 25 sec
2 FastEthernet0/1 ethernet-csmacd(6) 1500 100000000 00D0.58DD.E941 up(1) up(1) 28 sec
3 FastEthernet0/2 ethernet-csmacd(6) 1500 100000000 00D0.58DD.E942 up(1) up(1) 27 day
4 FastEthernet0/3 ethernet-csmacd(6) 1500 100000000 00D0.58DD.E943 up(1) up(1) 28 sec
5 FastEthernet0/4 ethernet-csmacd(6) 1500 100000000 00D0.58DD.E944 up(1) up(1) 3 days
6 FastEthernet0/5 ethernet-csmacd(6) 1500 100000000 00D0.58DD.E945 up(1) up(1) 3 days
7 FastEthernet0/6 ethernet-csmacd(6) 1500 100000000 00D0.58DD.E946 up(1) up(1) 35 day
8 FastEthernet0/7 ethernet-csmacd(6) 1500 100000000 00D0.58DD.E947 up(1) up(1) 30 day
9
10
11
216.60.197.252 results ...
Save Print Get Next Stop Clear
MIB OID Name Value
OLD-CISCO-SYS-MIB whyReload.0 reload
hostName.0 LabRouter
domainName.0
authAddr.0 208.191.22.6
bootHost.0 0.0.0.0
OLD-CISCO-MEMORY-MIB freeMem.0 4937624
bufferElFree.0 500
bufferElMax.0 500
bufferElHit.0 22290528
bufferElMiss.0 0
bufferElCreate.0 0
bufferSmSize.0 104
bufferSmTotal.0 50
bufferSmFree.0 50
bufferSmMax.0 150
bufferSmHit.0 8267310
bufferSmMiss.0 0
Get 1.3.6.1.4.1 ...