

Network Management (SNMP)

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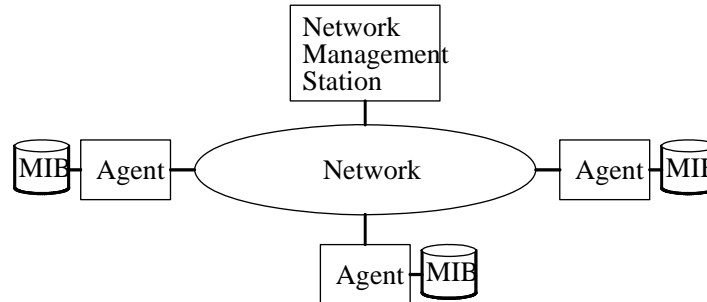
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- q Network Management
- q SNMP
- q Management information base (MIB)
- q ASN.1 Notation
- q SNMPv2
- q SNMPv3

Network Management

- q Management = Initialization, Monitoring, Control
- q Manager, Agents, and Management Information Base (MIB)



SNMP

- q Based on Simple Gateway Management Protocol (SGMP) – RFC 1028 – Nov 1987
- q SNMP = **S**imply **N**ot **M**y **P**roblem [Marshall Rose]
Simple Network Management Protocol
- q RFC 1058, April 1988
- q Only Five commands

<u>Command</u>	<u>Meaning</u>
get-request	Fetch a value
get-next-request	Fetch the next value (in a tree)
get-response	Reply to a fetch operation
set-request	Store a value
trap	An event

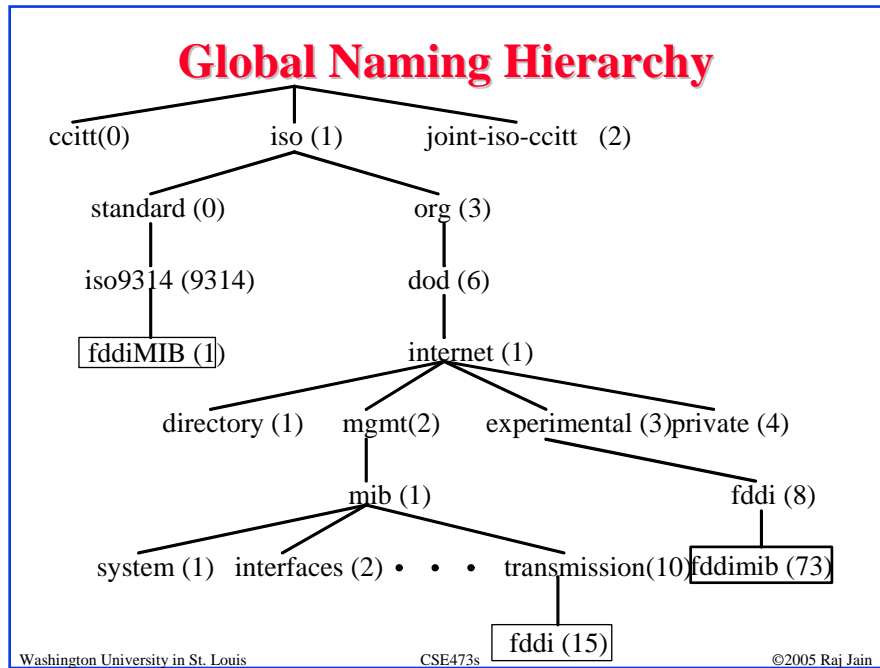
Management Information Base

- q MIBs follow a fixed naming and structuring convention
⇒ Structure of Management Information (**SMI**)
- q These conventions were adopted from Common management Information Protocol (**CMIP**) designed by ISO
- q All names are globally unique
- q All nodes of the name tree are assigned numeric values by standards authorities
iso.org.dod.internet.mgmt.mib.ip.ipInReceives
1.3.6.1.2.1.4.3
- q Tables rows are referenced by appending the index

MIB (Cont)

- q All names are specified using a subset of Abstract Syntax Notation (ASN.1)
- q ASN.1 specifies notation (that humans can read) and encoding (representation and ranges)
- q Only INTEGER, OCTET STRING, OBJECT IDENTIFIER, NULL types
- q Only SEQUENCE, SEQUENCE OF, CHOICE constructors

Global Naming Hierarchy



19-7

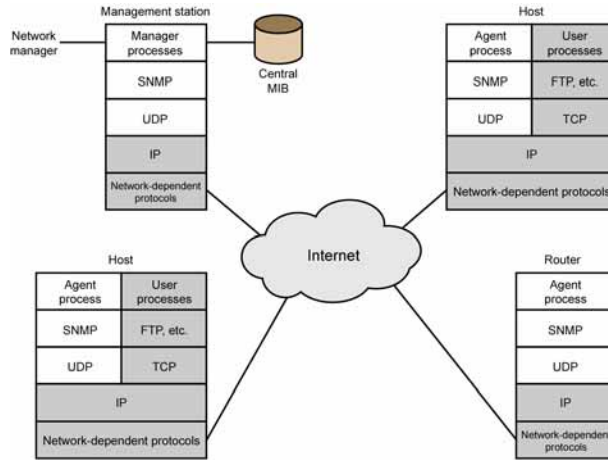
Variable	Category	Meaning
sysUpTime	system	Time since last reboot
ifNumber	interfaces	# of Interfaces
ifMTU	interfaces	MTU
ipDefaultTTL	ip	Default TTL
ipInReceives	ip	# of datagrams received
ipForwDatagrams	ip	# of datagrams forwarded
icmpInEchos	icmp	# of Echo requests received
tcpRtoMin	tcp	Min retrans time
tcpMaxConn	tcp	Max connections allowed

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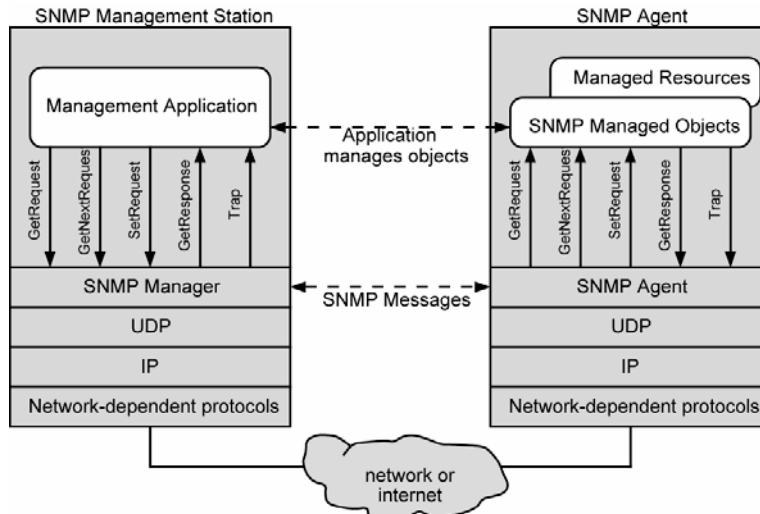
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SNMPv1 Configuration

- q Manager sends request to UDP port 161.
- Agents send traps to UDP port 162



Role of SNMP v1



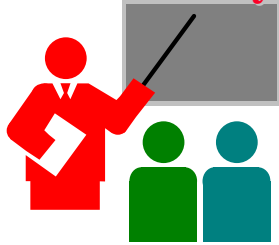
SNMPv2

- q Improved security: authentication and integrity using Data Encryption Standard (DES)
- q *inform request* ⇒ Multiple manager coordination
Locking mechanisms prevent multiple managers from writing at the same time
- q *get bulk* ⇒ Better table handling
- q Confirmation option for Traps
⇒ Agents can ensure that trap was received correctly.
- q New Error codes: noSuchName, badValue, readOnly
- q Reference: RFC 1441, April 1993 and more

SNMPv3

- q Security update of SNMPv2
- q Authentication: Message authentication code with a shared secret key
- q Privacy: Encryption using a shared secret key
- q Access Control: Each manager can have a different set of read/write permission for various component of MIB
- q Ref: RFC 2570, April 1999 and more

Summary



- q Management = Initialization, Monitoring, and Control
- q SNMP = Only 5 commands
- q Standard MIBs defined for each object
- q Uses ASN.1 encoding
- q SNMPv2 fixed issues with bulk requests and simple security
- q SNMPv3 added security

Reading Assignment

- q Read section 22.3 of Stallings' 7th edition
- q Try to answer review questions 22.6 through 22.9 and problem 22.5. There is no need to submit the answers.