

# ICS 351: Today's plan

- Simple Network Management Protocol
- Performance
- Peer-to-Peer Networking

# Simple Network Management Protocol

- SNMP uses the network to report status information and alerts about remote systems
- SNMP messages are carried over UDP
- values can be loaded on demand (pull model), but when needed and configured appropriately, alerts are sent independently by the systems being managed (push)

# SNMP

## Management Information Base

- SNMP needs a machine-independent way to indicate which item of information is being requested or sent
- logically, the entire universe of information that can be accessed is built into a large tree: the Management Information Base or MIB
- the tree is extensible so individuals and organization can add their own subtrees -- private MIBs
- the tree is universal and known to all

# navigating the MIB

- the path through the tree is sufficient to indicate one specific item (corresponding to a variable in a programming language)
- the path through the tree can be indicated by a sequence of numbers, the number of left siblings of the path being taken
- for example, 0.2.7.5.14.1.7.0 is such an Object Identifier (OID)
- OIDs are useful for enumerating arrays of objects, e.g., network interfaces, routing table entries

# SNMP programs

- a network management station is used by the system administrator to monitor multiple systems
- a management agent must run on every managed device, get the required information, and provide it on request

# SNMP basic operation

- the network management station may send GET requests to get one or more objects from specific agents
- the network management station may also send SET requests to modify one or more objects on specific agents
- agents will send TRAP or INFORM alerts to network management stations that they have been configured to alert
- because it uses UDP, SNMP (like DNS) cannot assume that its operations will be successful.

# examples

- sample MIB:  
[http://uw714doc.sco.com/en/SDK\\_dmi/DMI\\_SNMP](http://uw714doc.sco.com/en/SDK_dmi/DMI_SNMP)
- MIB table retrieval example:  
<http://etutorials.org/Networking/network+management>

# Performance

- performance is measured as both latency and throughput
- latency matters when there are lots of round-trips
- throughput matters when lots of data must be sent
- at each level in the network, it is usually cheaper to provide less performance than more, or more profitable to serve more people with the same bandwidth
- HTTP headers consume multiple hundred bytes, as opposed to about 40-60 bytes for TCP/IP headers
- but nobody is concerned enough to try to compress them
- so people must have lots of bandwidth available!



# Peer-to-peer Networking

- in this class, it has been clear that a PC can perform as a router, and vice-versa
- why not use our PCs as routers?
- for many purposes this is adequate
- if we are not restricted to forwarding to IP addresses, there is less need for hierarchical control
- in fact, we can have content-addressable networks
- perhaps, to increase the incentive, every node that has content and makes it available might get priority for obtaining content
- the decentralization and lack of control are one of the attractions for many of the users

# Peer-to-peer Networking Management

- management of a network requires some authorities that cooperate
- in a peer-to-peer network, both the management and the authority are made as small as possible
- because there is no hierarchical assignment of addresses, each peer can decide what content to provide, i.e. what "address" to use
- this minimizes management
- the network is connected by having one peer exchange addresses about other peers
- then, if the original peer stops collaborating, the other peers can be used to connect to the network
- the expectation is that some useful data exchange will take place, not necessarily that there will be continuous end-to-end connectivity with all parties involved

# Peer-to-peer vs. Client-Server

- a server is a program that provides a service
- typically, a server is found at a given address and port number, and is maintained by an individual or an organization
- clients are often anonymous or at least unidentified
- peer-to-peer often brings the same anonymity of a client to the infrastructure
- for a very different example, routing is a peer-to-peer process, but the routers are identified by IP address if nothing else
- there could also be authenticated peer-to-peer networks, set up for the reliability rather than the anonymity aspect
- the ultimate appeal of peer-to-peer for some networking people is a self-organizing, self-managing scalable network
- peer-to-peer networks seem to be widely accepted