

CE443 - Computer Networks

TA Session

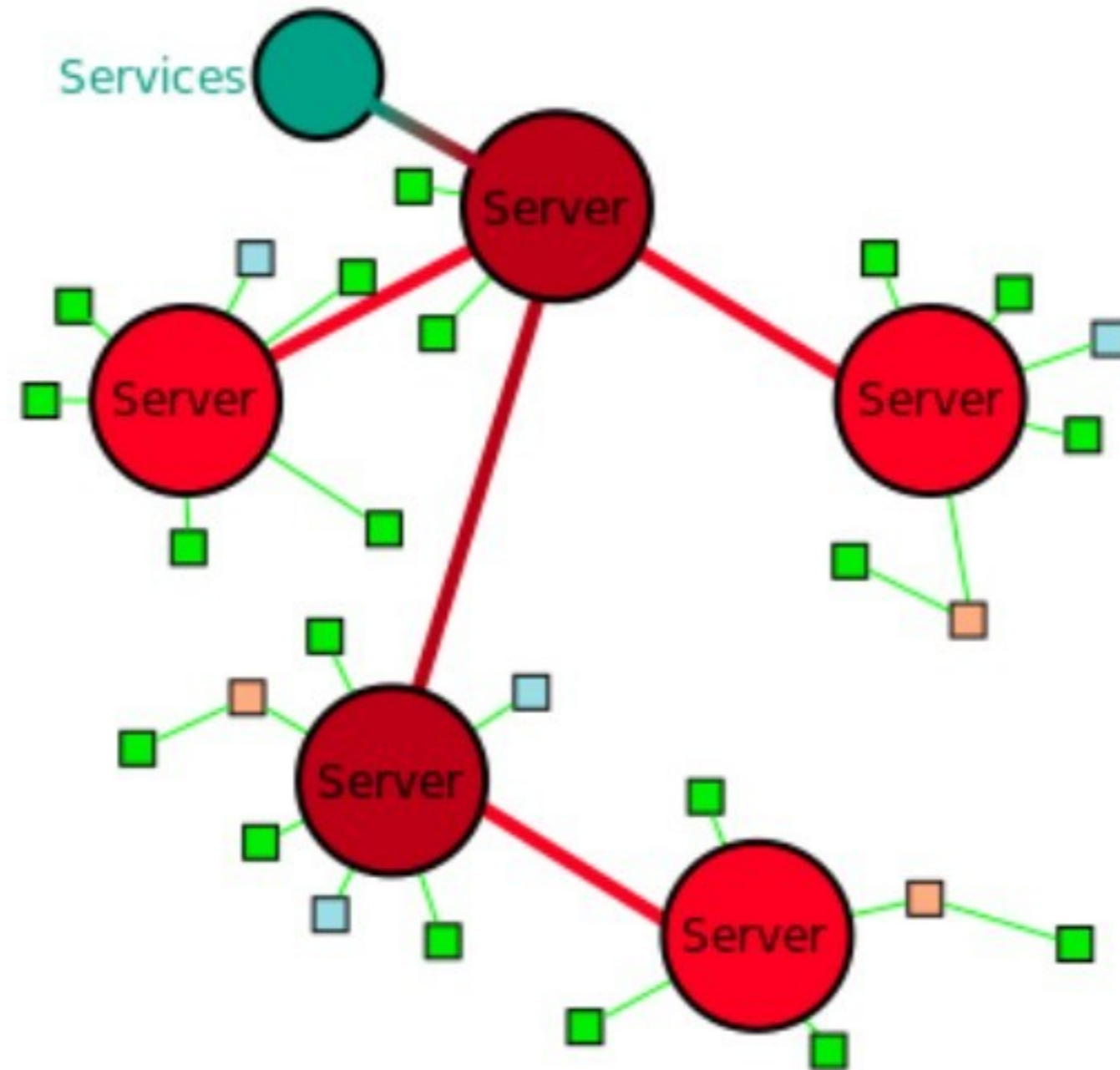
Today Topic

Programming Assignment 0

- Introduction to IRC
- Proposed Protocol
- Assignment Details
- Endianness
- What Should You Send?
- Creating Makefile
- Beginning Socket Programming

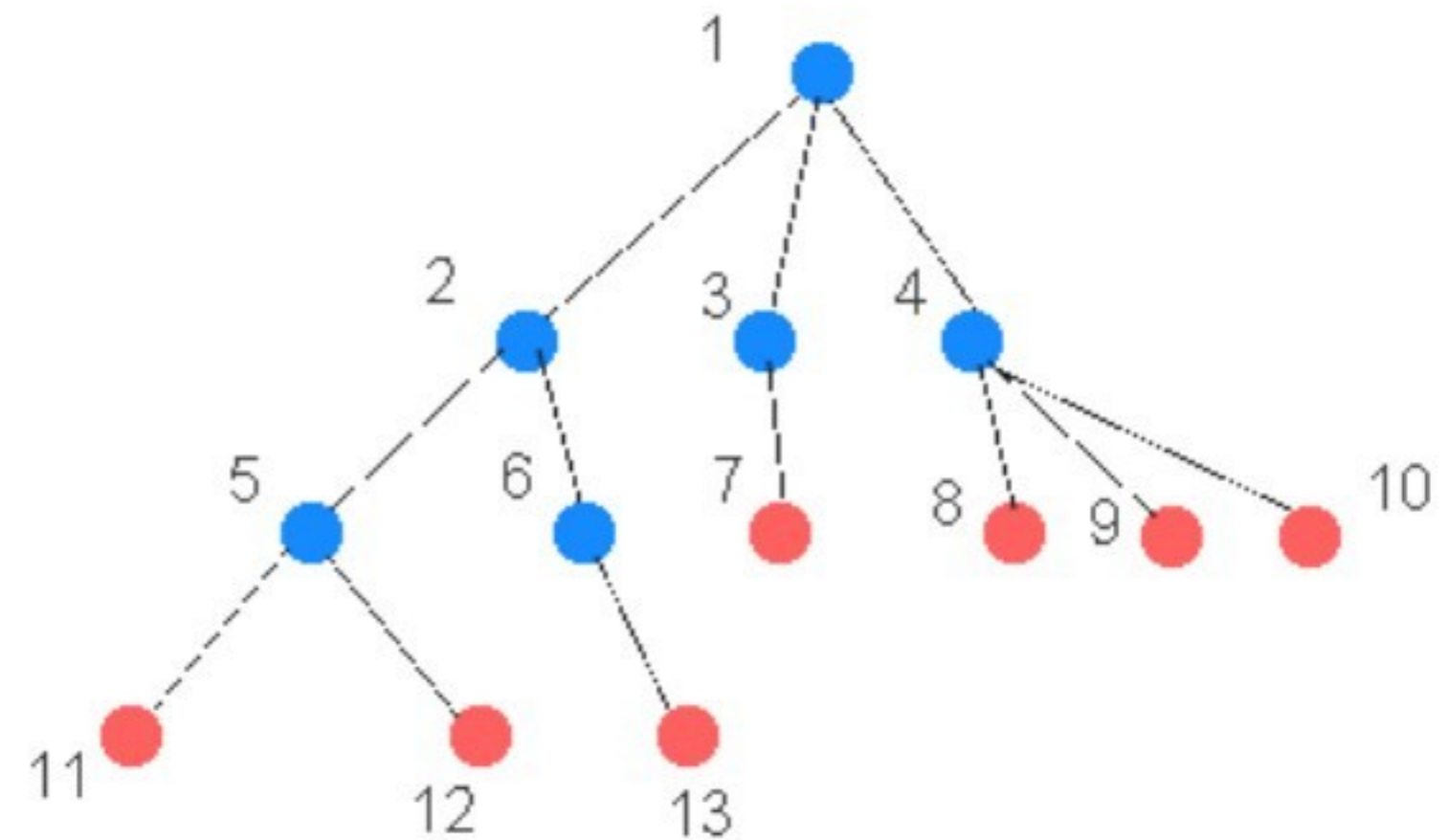
Introduction to IRC

- Internet Relay Chat (IRC) is a protocol that facilitates communication in the form of text.
- The chat process works on a client/server networking model.



Proposed Protocol

- Uses spanning tree structure for communications (loop-free topology).
- Each node can act as either client or server or both.
- Every node (other than the root) must have exactly one parent.
- Each node has an integer ID between 1 and 10000 (assume i).
- Node i listens on port $i+7000$.
- Each node should be informed about the nodes in its subtree.
- Some Scenarios:
 - + When a node joins to the network and chooses a parent ...
 - + When a node leaves the network ...
 - + When a node chooses a new parent ...
 - + When a node sends a message to other ...
 - Destination node is in the subtree of source node ...
 - Destination node is not in the subtree of source node ...
 - Destination node is a leaf ...
 - Destination node is a middle node and has a subtree ...



Assignment Details

- Program starts with an argument that indicates its ID.

```
./sdp.out ID
```

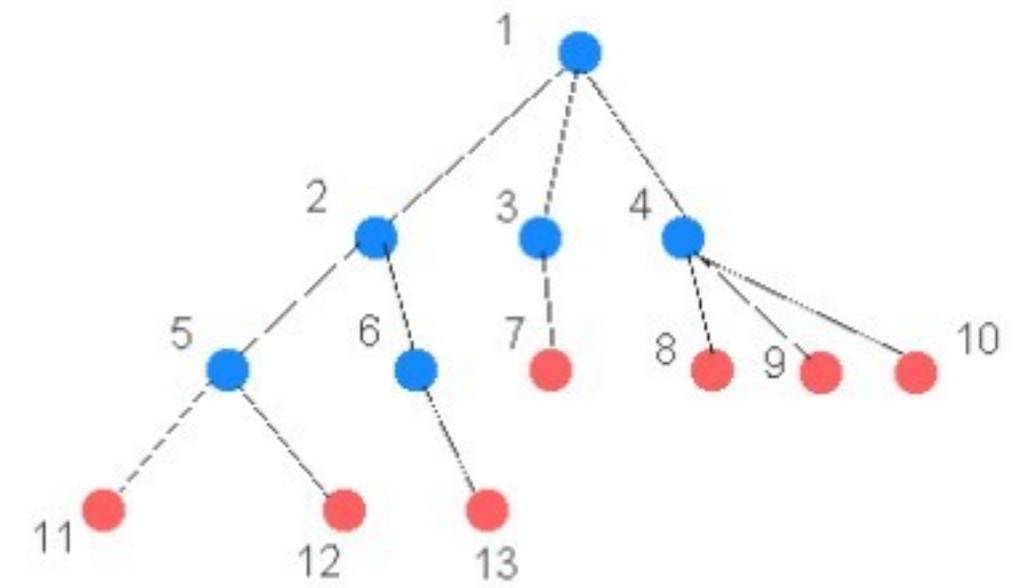
- Immediately starts listening on port "ID + 7000"
- Should support 4 commands:

setparent <Name> <ID>

- + Set specified server as your parent.
- + <Name> is the name of server.
- + <ID> is the ID of server that should listen on "ID + 7000".
- + Find IP of <Name> via getaddrinfo.
- + Connect to the first possible IP (IPv4 or IPv6).
- + Avoid creating loop (Simply ignore command).

exit

- + Leave the network.



sendmessage <d> <msg>

- + Send a message to other node.
- + <d> is the ID of destination node.
- + <msg> is the text message that should be sent.
 - <msg> does not contain space.

print

- + Print the information of parent and children.
 - print command on node 2:

```
Parent: 1
```

```
C(5): 5, 11, 12
```

```
C(6): 6, 13
```

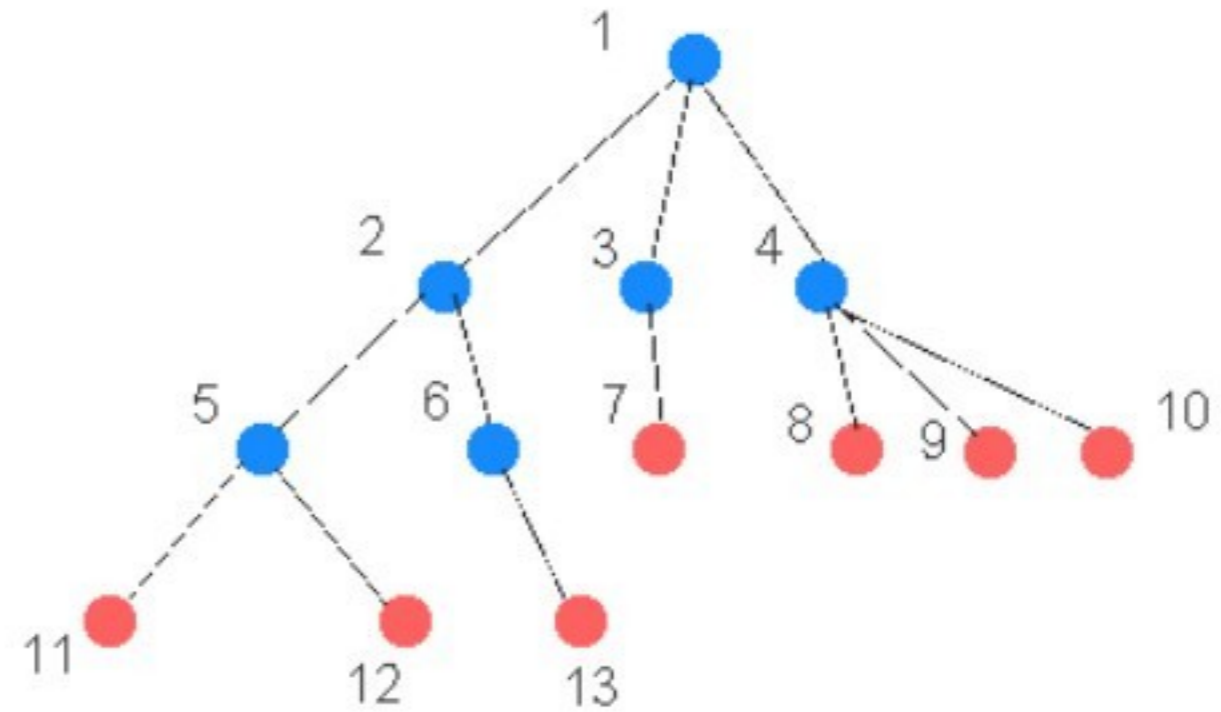
Assignment Details (Cont.)

- Protocol Violation
 - + Sometimes a node violates proposed protocol by sending invalid packets.
 - + In these cases, the program should treat the other client sending the packet as a protocol violator.
 - Close its socket,
 - Update the tree.

Assignment Details (Cont.)

- Packets Between Nodes:

- + How nodes communicate with each other.
- + Transport protocol is TCP.
- + First byte indicates the type of packet.



- First byte == 10: When a node leaves the network, should send its information to the respective parent. Parent repeats this work, until reach to the root node. Similar behavior in Protocol Violation.
- First byte == 11: When a node chooses a new parent, should send its information to the respective parent. Parent repeats this work, until reach to the root node.
- First byte == 20: When a node creates a message (or receives a message from its child), and the destination is NOT in the subtree, the node should send the message to its parent.
- First byte == 21: When a node creates a message (or receives a message from its child), and the destination IS in the subtree, the node should send the message to its child that contains destination in its subtree.
- First byte == 30: When the destination node of a message, gets the message, send that message to all its children. Any child repeats this work, until reach to the leaf.

Endianness

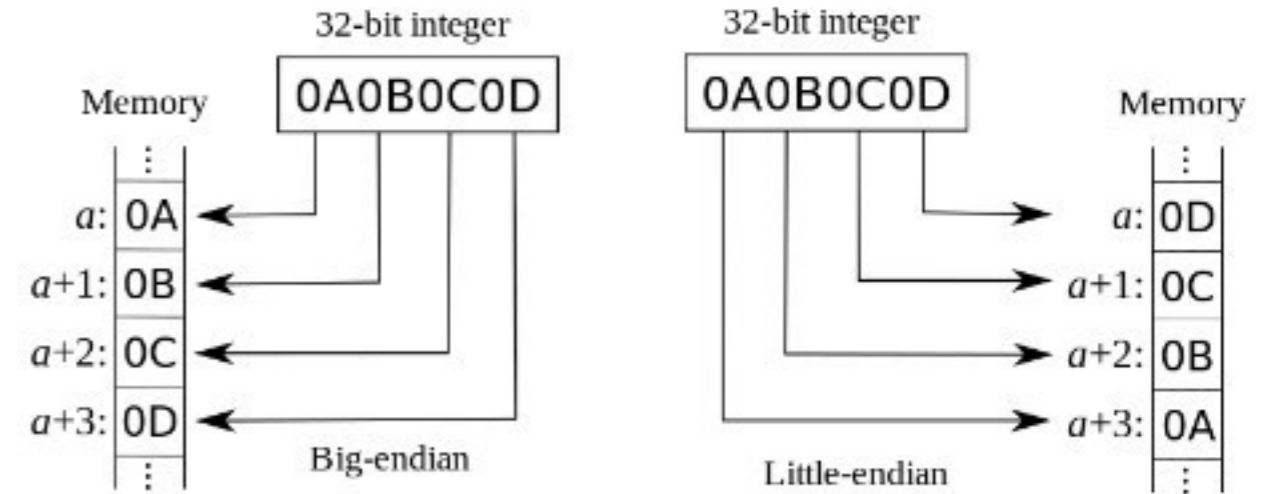
- Endianness is the ordering of bytes of a word of data in computer memory storage.

+ IBM z/Architecture mainframes are big-endian processors and store the most-significant byte of a word at the smallest memory address and the least significant byte at the large.

+ Intel x86 processor represents a common little-endian architecture and stores the least-significant byte at the smallest address.

+ RFC1700 has defined the network order for protocols in the Internet protocol suite to be big-endian.

- So use {int8_t, int16_t, int32_t, uint8_t, uint16_t, uint32_t} instead of {int, unsigned int} for network communications.
- Use {htons(), htonl(), ntohs(), ntohl()} for conversion.



What Should You Send?

- *.c, *.cpp and *.h files
- Just one "Makefile" that generates sdp.out file by issuing "make" command.
- All of these files in a compressed .zip file.

Creating Makefile

- What Is?
 - + Makefile(s) are text files written in a certain prescribed syntax.
 - + Together with Make Utility, it helps build a software from its source files, a way to organize code, and its compilation and linking.

Beginning Socket Programming

- The Paradigm (You will learn today!)
- Let's touch the keyboard ...

