## CS241 - L24 - Lawrence Angrave - Simple TCP Client Example + HTTP

What is the OSI (**Open Systems Interconnection**) Model?

			OSI Model						
	Layer	Data unit	Function <sup>[3]</sup>	Examples					
	7. Application		High-level APIs, including resource sharing, remote file access, directory services and virtual terminals	HTTP, FTP, SMTP					
Host	6. Presentation	Data	Translation of data between a networking service and an application; including character encoding, data compression and encryption/decryption	ASCII, EBCDIC, JPEG					
layers	5. Session		Managing communication sessions, i.e. continuous exchange of information in the form of multiple back-and-forth transmissions between two nodes	RPC, PAP					
	4. Transport	Segments	Reliable transmission of data segments between points on a network, including segmentation, acknowledgement and multiplexing	TCP, UDP					
	3. Network	Packet/Datagram	Structuring and managing a multi-node network, including addressing, routing and traffic control	IPv4, IPv6, IPsec, AppleTalk					
Media layers	2. Data link	Bit/Frame	Reliable transmission of data frames between two nodes connected by a physical layer	PPP, IEEE 802.2, L2TP					
	1. Physical	Bit	Transmission and reception of raw bit streams over a physical medium	DSL, USB					

Image Attribution: http://en.wikipedia.org/wiki/OSI\_model

What is "U.D.P." and what are its main characteristics?

What is T.C.P. and what are its main characteristics?

Which one uses handshaking?

Which one requires more system resources?

Which one can be used with **read** and **write** system calls?

Which one encrypts the data payload?

If your application preferred to handle missing packets over late packets, which one would you use?

What is HTTP? Does it run over TCP or UDP?

Is HTTP version 1.0 and version 1.1 a text or binary protocol?

How do you make a TCP connection to a server

What is the purpose of getaddrinfo?

```
struct addrinfo {
struct addrinfo?
                                                                        ai_flags;
                                                        int
                                                                        ai_family;
Why memset?
                                                       int
int
                                                                       ai_socktype;
                                                                       ai protocol;
                                                       socklen_t ai_addrlen;
AF_INET;?
                                                        struct sockaddr *ai_addr;
                                                                       *ai_canonname;
SOCK_STREAM; ?
                                                        struct addrinfo *ai_next;
                                                        };
connect?
      struct addrinfo hints, *result;
      memset(&hints, 0, sizeof(struct addrinfo) );
      hints.ai_family = AF_INET;
      hints.ai_socktype = SOCK_STREAM;
      s = getaddrinfo("www.illinois.edu", "80", &hints, &result);
      if (s!=0) {
          fprintf(stderr, "getaddrinfo: %s\n", gai_strerror(s));
      exit(1);
      }
      int sock_fd = socket(hints.ai_family, hints.ai_socktype, 0);
      connect(sock_fd, result->ai_addr, result->ai_addrlen);
```

## IPv4 Header Format

Offsets	Octet				0					1											2	2				3									
Octet	Bit	0	1 3	2 3	3 4	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
0	0	١	/ersi	on			IH	L		DSCP ECN									Total Length													,			
4	32		Identification Flags Fragment Offset																																
8	64		Time To Live Protocol Header Checksum																																
12	96																S	ourc	e IP A	Addre	ess														
16	128																Des	tina	ion I	P Add	dress														
20	160																0	otior	ıs (if	IHL >	- 5)														

# TCP header:

Offsets	Octet							:	1									2			3													
Octet	Bit	0	1	2	3	4	5	6	7	8	9	10	11	12	13	3 14	1	5	16	17	18	19	20	21	22	23	24	4 25	26	2	27 28	29	30	31
0	0		Source port															Destination port																
4	32		Sequence number																															
8	64		Acknowledgment number (if ACK set)																															
12	96	Dā	ata d	offs	set		ser 9 0	ved <b>0</b>	N S	C W R	E C E	U R G	A C K	P S H	R S T	Y	1	[ ]							W	indo	ow :	Size						
16	128							(	Chec	ksur	m									Urgent pointer (if URG set)														
20	160								Opti	ons	(if d	ata	offse	et >	5.	Pado	ded	at	the	end	d wit	:h "(	o" by	tes	if ne	ces	sar	y.)						
•••																																		

 $Image\ attribution-wikipedia.com$ 

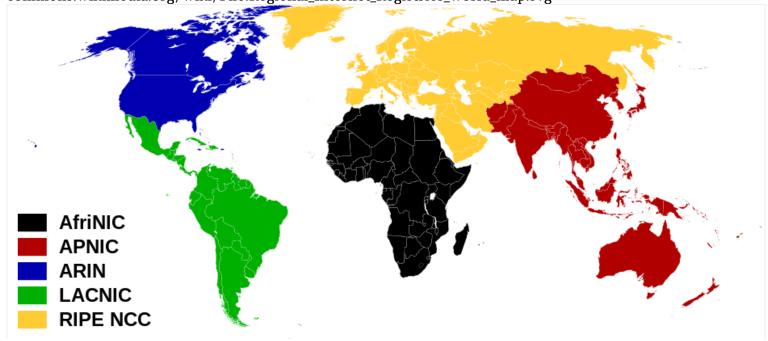
# MAP OF THE INTERNET THE IPV4 SPACE, 2006

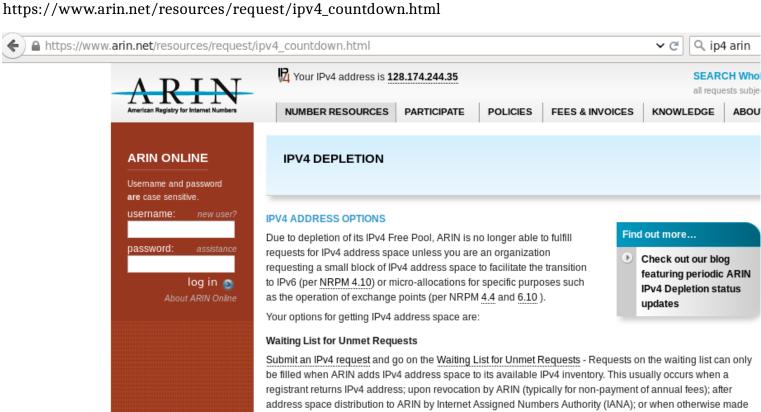


THIS CHART SHOWS THE IP ADDRESS SPACE ON A PLANE USING A FRACTAL MAPPING WHICH PRESERVES GROWING -- ANY CONSECUTIVE STRING OF IPS WILL TRANSLATE TO A SINGLE COMPACT, CONTIGUOUS REGION ON THE MAP. EACH OF THE 256 NUMBERED BLOCKS REPRESENTS ONE /8 SUBNET (CONTAINING ALL IPS THAT START WITH THAT NUMBER). THE UPPER LEFT SECTION SHOWS THE BLOCKS SOLD DIRECTLY TO CORPORATIONS AND GOVERNMENTS IN THE 1990'S BEFORE THE RIRS TOOK OVER ALLOCATION.

Exhaustion of IPv4 for each of the 5 regional authorities.

ARIN exhausted 24 September 2015 commons.wikimedia.org/wiki/File:Regional\_Internet\_Registries\_world\_map.svg





## available to be re-issued. Transfers to Specified Recipients

Seek IPv4 address space via a Transfer to Specified Recipients (NRPM 8.3 or NRPM 8.4)

- > If you have identified an organization that is interested in transferring an IPv4 address block to you, you can enter directly into the Transfer Process via ARIN Online.
- > If you are looking for an organization with IPv4 addresses to transfer, you can get pre-approved for a transfer while you locate available resources. Pre-approvals are valid for 24-months.

### Specified Transfer Listing Service

You can register for ARIN's Specified Transfer Listing Service to help find an organization that ARIN has validated as having IPv4 resources eligible for transfer.

To ensure the growth of your network well into the future, you might also consider requesting IPv6 address space directly from ARIN.