1. 概念

- 1992: 各种变化？？？

- ISPs: Interconnected Internet service providers
- RFC (Request for Comments): 收集一堆网络标准文件
- Internet SOCiety (ISOC): a professional membership organization that comments on policies, practices, and oversees others dealing with network policy issues.
- Internet Engineering Task Force (IETF): responsible for protocol engineering and development.
- communications architecture/protocol suite: a structured set of protocols
- host + network elements/ internetworking devices(–Hub(集线器，可以是wireless的) –Bridge(understand data-link layer protocols) –Switch –Router –Gateway)

-Protocols: define format, order of messages sent and received among network entities, and actions taken on message transmission, receipt; **communication conventions**
- 连接上网的device至少要有一个 stack?

- TCP/IP Protocols:
  - •4(high-level)**Application Layer**: **HTTP**, **telnet**, DNS, SNMP, DHCP
    - – Service: Handles details of application programs.
    - – Functions: Everything is application specific.
    - - package: **application data**
  - •3**Transport Layer**: UDP（发送前不建立连接，速度快）, **TCP**（发送前建立连接，有超时重传）
    - – Service: Controls delivery of data between hosts.
    - – Functions: Connection establishment/termination, error control, flow control.
    - - packet: **TCP segment**
  - •2**Network Layer**: **IP**, ICMP, IGMP
    - – Service: Moves packets inside the network.
    - – Functions: Routing, addressing, switching, congestion control.
    - - packet: **IP datagram**
  - •1(low-level)**Data Link Layer**: **Ethernet(also a layer-2 protocol?)**, Wi-Fi, PPP, ARP, etc
    - – Service: Reliable transfer of frames over a link.
    - – Functions: Synchronization, error control, flow control.
    - - packet: **ethernet frame**

- Internet: refers to the global information system that
  - •is logically linked together by a globally unique address space based on the Internet Protocol (IP) or its subsequent extensions/ follow-ons;
  - •is able to support communications using the Transmission Control Protocol/Internet Protocol (TCP/IP) suite or its subsequent extensions/follow-ons, and/or other IP-compatible protocols; and
  - •provides, uses or makes accessible, either publicly or privately, high level services layered on the communications and related infrastructure described herein.

- Naming and Addressing: Uniquely identify processes in different computers for communications.
  – Domain name： identify a host; home.nyu(second-level).edu(top-level), 由DNS解析成相符合的IP地址
    - **DNS: Domain Name System:** distributed database; name caching(on PC, so no query and reply);
      Resolves a domain name to the corresponding IP address; 可以用**TCP**也可以用**UDP**；不总是解析成**IP**地址（**eg**邮箱）
  – MAC address(layer-2 address:network):Medium Access Control address, hardware address; 和在哪里没关系，是和设备相关的
    - Different link layer protocols use different MAC address
      –Ethernet, 48 bits(6 bytes), globally unique
      –Hexadecimal notation, e.g., 0x8:0:20:87:dd:88
    - **ARP (Address Resolution Protocol):** translate an IP address to the corresponding MAC address
    - MAC protocols： rules to share a medium： collision detection & avoidance
    - Network topology: Point-to-point N(N-1)/2 links to connect N node; –Broadcast
  – IP address (电脑在不同地点IP也会变)
    - IPv4, 32 bits (4 bytes), written in dotted-decimal notation: 128.238.42.112
    - IPv6, 128-bit address
  – Port number

- Ethernet Frame Format:
  •Source Ethernet (MAC) Address •Destination Ethernet Address
  •Frame Type: used to identify the payload •CRC: used for error control