Computer Networking – Software Defined Networking

* For the report, is it just a paper about how SDN works and things we did, or did you want us to actually contribute as in argue about another paper, verify, disprove, or conduct a survey.
* Listing order for group report must be designed in terms of who contributed the most work
* Project 🡪 Paper 🡪 Presentation
  + In terms of the requirements, is it just like assignment one where we simulate some devices connecting and sending packets and show how it load balancing and scheduling
    - Algorithms for scheduling and load balancing
      * Compare? Use multiple?
      * How to show it?
        + Print statements or Diagram of how it functions
        + Compare to router?
        + How many servers?
        + How much traffic?
    - Paper
      * IEEE format showing work done.
      * Different format?
      * Look for benchmarks
* Network Management/
  + Autonomous systems: many interacting hardware/software components
* Components of network management
  + Managing server and Managed devices, Data, Network management protocol, Command Line Interface, SNMP/MIB, NETCONF/YANG
  + Two ways to convey MIB info, commands:
    - Request/response mode and trap mode
* SNMP protocol: message types
* NETCONF
  + Goal: actively manage/configure devices network-wide
  + Operates between managing server and managed network devices
  + Remote Procedure Call (RPC) paradigm
* OpenDaylight (ODL), ONOS,

Link Layer and LANs: our goals

* Host and router: nodes
* Context
  + Datagrams are transferred by different links
* Services
  + Encapsulate datagram into frame, adding header ,trailer
  + MAC (Media Access Control)
  + Flow control
  + Error detection
  + Error correction
  + Half-duplex and full duplex
* Where is it implemented?
  + Each host
    - In network interface card or a chip
      * Ethernet, Wifi Card, or chip
    - Attaches into host’s system buses
    - Combination of hardware, software, …
* Error Detection and Correction
  + Not 100% reliable
  + Increasing EDC field, you can get better detection and correction
* Parity Checking
  + Single bit parity
  + Two-dimensional bit parity
* Internet checksum
* Cyclic Redundancy Check (CRC)
  + More powerful error detection coding
  + D; data bits
  + G (generator): bit pattern of r+1 bits (given)
* Multiple access links and protocols
  + Point-to-Point Protocol
* Ideal multiple access protocols – Three divided approaches
  + Channel partitioning, Random Access, Taking Turns
  + Random Access examples: ALOHA, CSMA, …
  + Slotted ALOHA – synchronization, same size, slotted
  + Pure ALOHA – no synchronization
  + CSMA (carrier sense multiple access) – listens before transmitting
    - If idle: transmit entire frame
    - If busy: defer transmission
    - Analogy: no interruption
  + CSMA/CD: CSMA with collision detection
    - Detected within short time
    - Colliding transmission aborted, reducing channel wastage
    - Collision detection easy in wired, difficult with wireless (hidden terminal problem)
    - Analogy: polite conversation
  + CSMA collision
  + Ethernet CSMA/CD algorithm
  + CSMA/CD efficiency
  + “Taking Turns” MAC protocols
    - Share efficiently and fairly at high loads
    - Inefficient at low load: delay in channel access, 1/N bandwidth allocated even if only 1 active node
    - Polling
      * Controller node “invites” other nodes (clients) to transmit in turn
      * Typically used with “dumb” devices
      * Concerns: polling overhead, latency, single point of controller
    - Token passing:
      * Control token passed from one node to next sequentially
      * Token message
      * Concerns: token overhead, latency, single point of failure

Computer Networks Notes November 14, 2023 – Wireless and Mobile Networks

* Wifi refers to linking through a wireless link
* Mobile refers to device that can switch over networks
* Infrastructure Mode
  + Based station connects mobile into wired network
  + Handoff: mobile changes base station
* Wireless Network Taxonomy
  + Single hop
    - Infrastructure: Host connects to base which connects to larger internet
    - No infrastructure: no base station, no longer connection to larger internet
  + Multiple hops
    - Infrastructure: Host May relay through several wireless nodes to connect to larger internet: mesh net
    - No infrastructure: no base station, no connection
* Wireless link characteristics
  + Hidden terminal problem
  + Multiple wireless senders, receive create
* Code Division Multiple Access (CDMA)
  + Unique “code” assigned to each user
    - All users share same frequency, but has their own “chipping” sequence to encode data
    - Allows multiple users to “coexist” and transmit simultaneously with minimal interference