DATA STORAGE TECHNOLOGIES & NETWORKS

(CS C446, CS F446 & IS C446)

LECTURE 02 – STORAGE

Role of Data in Computing Systems

- In Functional Computing / Interactive Computing:
  - Computational Data
    - Program or Instructions
    - Computed (temporary) data – within a computation
  - Interaction Data
    - Input and Output – interactions with user
  - Extreme case: purpose of computation is data:
    - E.g. Documents - Word Processing, Records - Data Processing
- Led to the classical (von Neumann) architecture
  - Storage and flow during a computation
    - Registers and primary memory
  - Persistence across multiple computations
    - Secondary memory

Role of Data in Computing Systems [2]

- In Distributed Computing:
  - Apart from External Data and Computational Data,
    - Communication Data (i.e. data exchanged between the computers in the network) is also significant.
  - Extreme case
    - Communication of Data is the purpose (of computing) – email, file transfer, data on the web (text or multimedia streams)
- Led to network architecture(s)
  - Data Stored in individual computers
    - Same as Functional Computing
  - Data communicated through links between computers
    - For Collaboration or for Communication per se.
  - Shared data stored in special purpose computers
    - Database servers, Websites, Email servers.

Role of Data in Computing Systems [3]

- In Reactive Computing:
  - Nature of data
    - Not just input/output or communication data
  - Data rates (arrival / dispatch) could be dependent on external "events"
    - Events may neither be predictable nor "controllable"
    - Contrast with input/output:
      - often predictable and always controllable (another way of saying that the computer is autonomous in FC).
- Led to Embedded Systems Architectures
  - Not in the scope of the course.
    - Will briefly talk about Flash Memory Storage – relevant for Mobile/Embedded Systems.

Storage Requirements

- From a (logical) computing perspective:
  - Transitory data
    - To be stored for the period of computation.
  - Persistent, Isolated data
    - To be stored across computations but useful only by (or through) a single computer
  - Persistent, Shared data
    - To be stored across computations and used by (or through) multiple computers
  - Persistent, Exportable data
    - To be stored beyond computations and possibly used by external (non-computing) systems

Storage Requirements

- Persistent Isolated Data
  - Data is accessible to (or accessible through) a single computer and persistent across computations
    - (Input/Output on the) Storage is controlled by the computer
  - Types of (logical) data accesses:
    - Large streams – either text or binary (e.g. program code, multimedia)
    - Transactional units – records
  - Applications need not be aware of physical details of storage
    - Operating System provides a logical layer – File System
    - Special purpose logical layers are possible – Database System