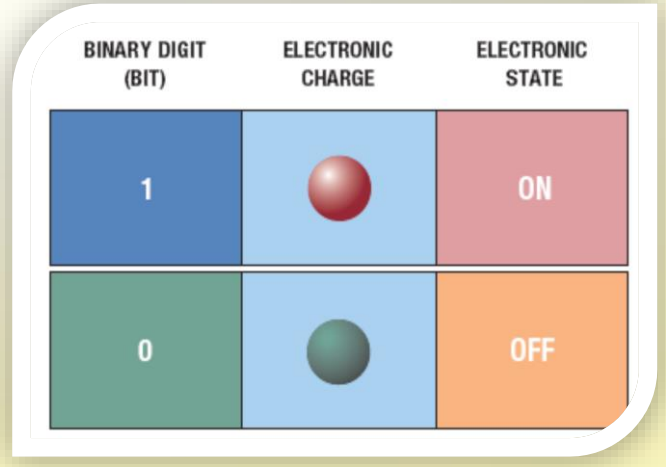
2강. Hardware

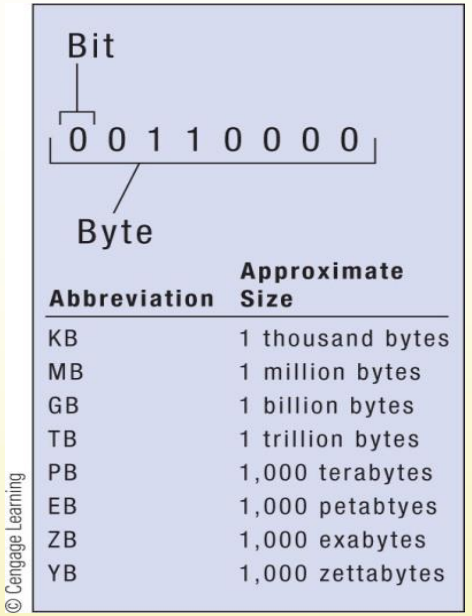
Data Representation

- Digital Binary Computer System
  - 모든 data와 instruction은 binary digital data로 convert되어야 함.
  - Off/On electrical Sate로 convert
  - 모든 data는 off(0) 와 on(1)로 표현
  - Bit
    - Binary Digit의 약자로 data표현의 최소 단위
  - Byte
    - 8개의 bits로 구성되며 data를 저장하는 실제 기본 단위
    - 2^8=256 개의 문자 표현 가능



Data Representation

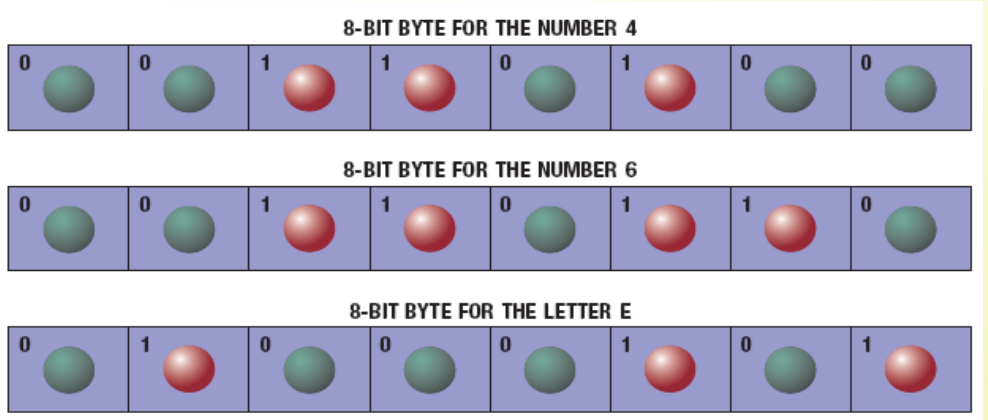
- 저장 장치의 기본단위
  - 1000(≒ 2^{10})배씩 증가
  - Kilobyte(KB) : 2^{10}
  - Megabyte (MB) : 2^{20}
  - Gigabyte(GB) :2^{30}
  - Terabyte(TB) : 2^{40}
  - Petabyte(PB) : 2^{50}



Abbreviation	Approximate Size
KB	1 thousand bytes
MB	1 million bytes
GB	1 billion bytes
TB	1 trillion bytes
PB	1,000 terabytes
EB	1,000 petabtyes
ZB	1,000 exabytes
YB	1,000 zettabytes

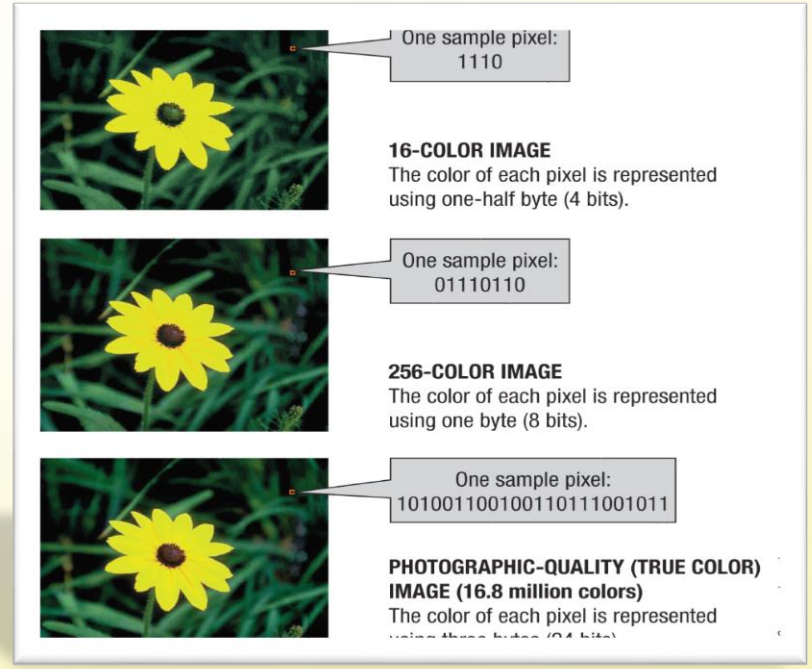
Data Representation

- Binary Numbering System
  - 모든 수치 data는 1또는 0의 binary number로 표현
- Character Coding Schemes
  - ASCII
    - 한 Byte로 한 개의 character를 표현
  - Unicode
    - 2~4개 Byte로 한 개의 character를 표현
    - 2^{16} ~ 2^{32}개의 character를 표현
    - 모든 세계 언어의 표현 가능
    - ASCII code를 대체



Data Representation

- Graphic Data
  - Photos 또는 drawings
  - Image는 small dots(pixel)로 구성
  - 각 pixel은 2~3B로 표현
    - More Bits = more colors
- Audio Data와 Video Data
  - Computer로 입력 시 Binary data로 convert
  - 대량의 data로 압축하여 저장하게 됨

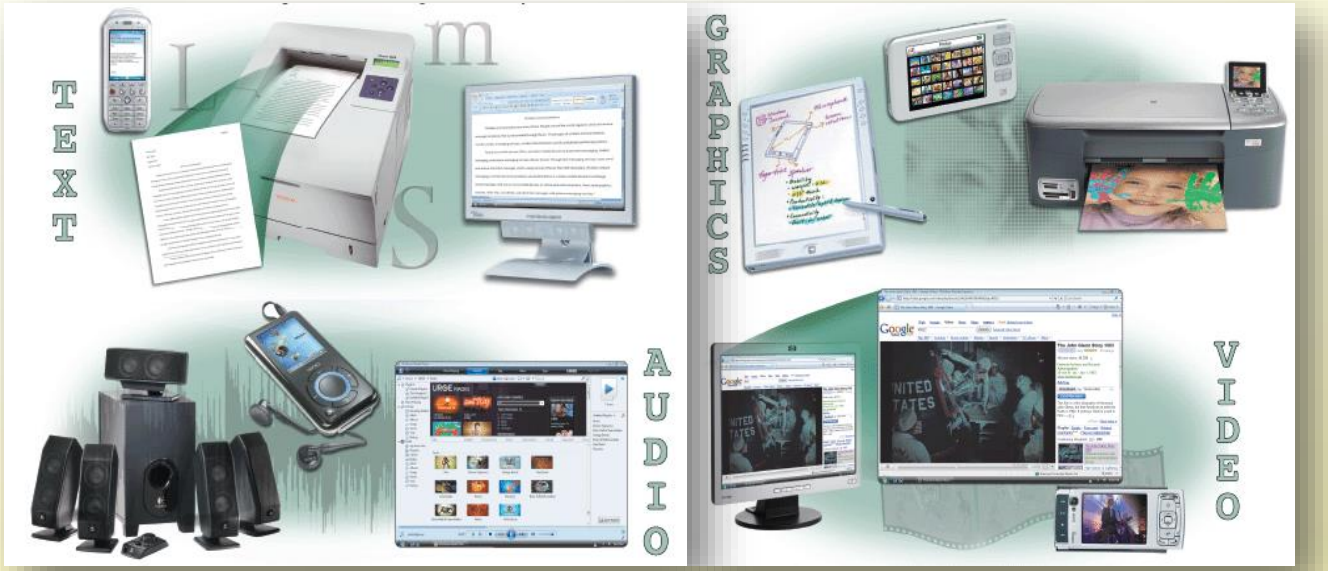


Input

- Computer 에 의해 처리될 data와 instruction입력
  - Input device를 통해 computer memory에 입력 됨
- Input device
  - Data와 instruction을 입력해주는 hardware components
  - Keyboard
  - Mouse
  - Trackball
  - Touchpad
  - :

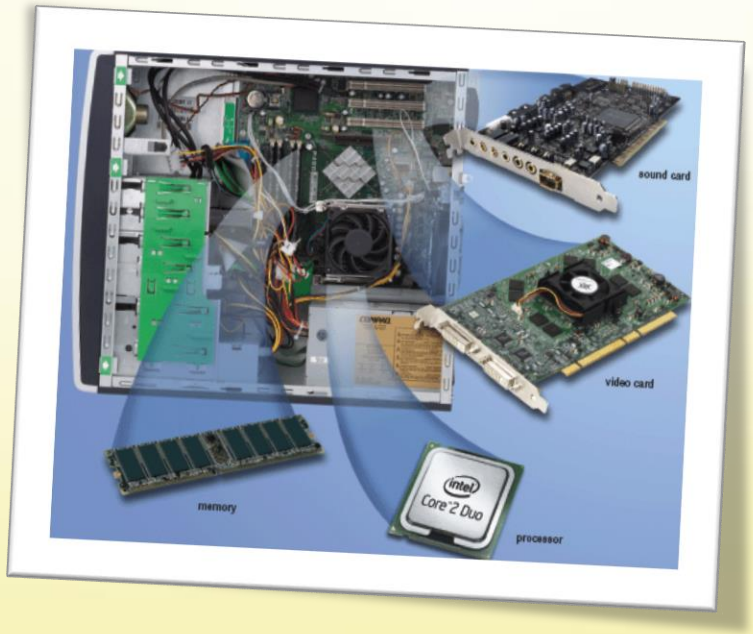
Output

- 입력된 data를 처리하여 산출된 유용한 information
- Output Device
  - Information를 display해 주는 hardware component
  - Monitor
  - Printer
  - Speaker
  - Data Projector



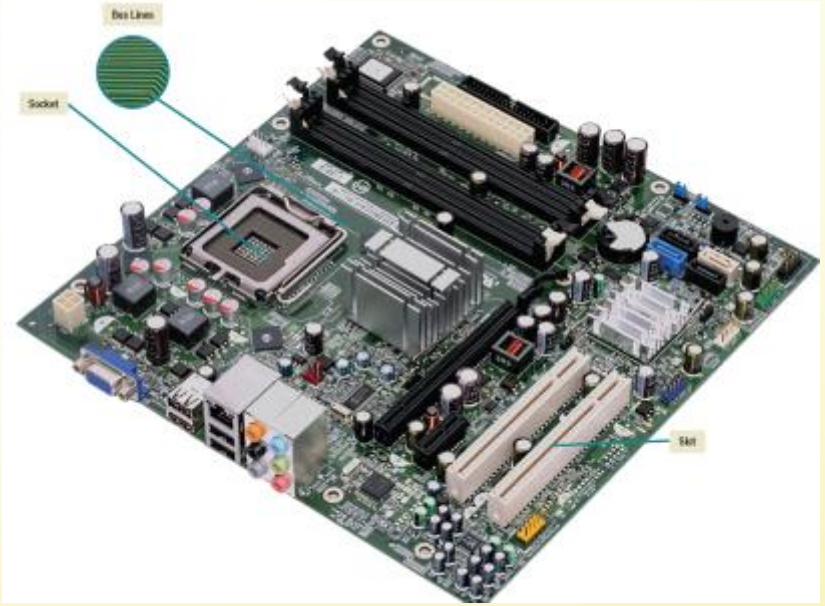
System Unit

- Data를 처리하는 electronic components를 포함하고 있는 case
  - Processor
  - Memory
  - Adapter Card
    - Sound Card
    - Video Card
  - Power Supply
  - :

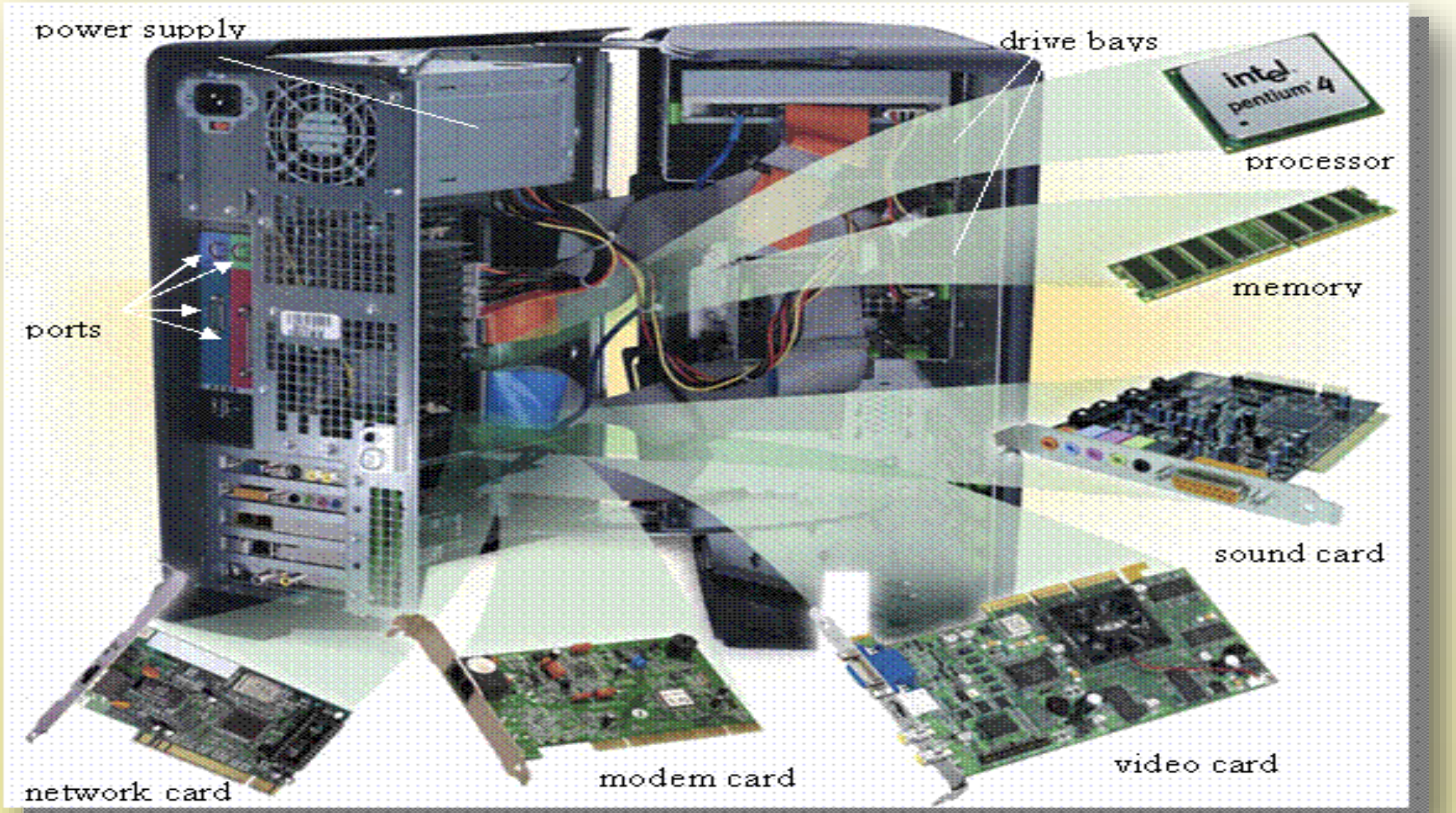


System Unit

- Motherboard
  - System unit내의 주요 Circuit Board
  - Processor Chips
  - Memory Slots
  - Expansion Slots
  - Bus Line
- Drive Bays
- Power supply

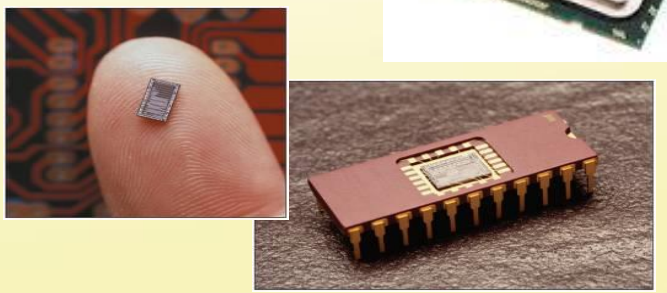


System Unit

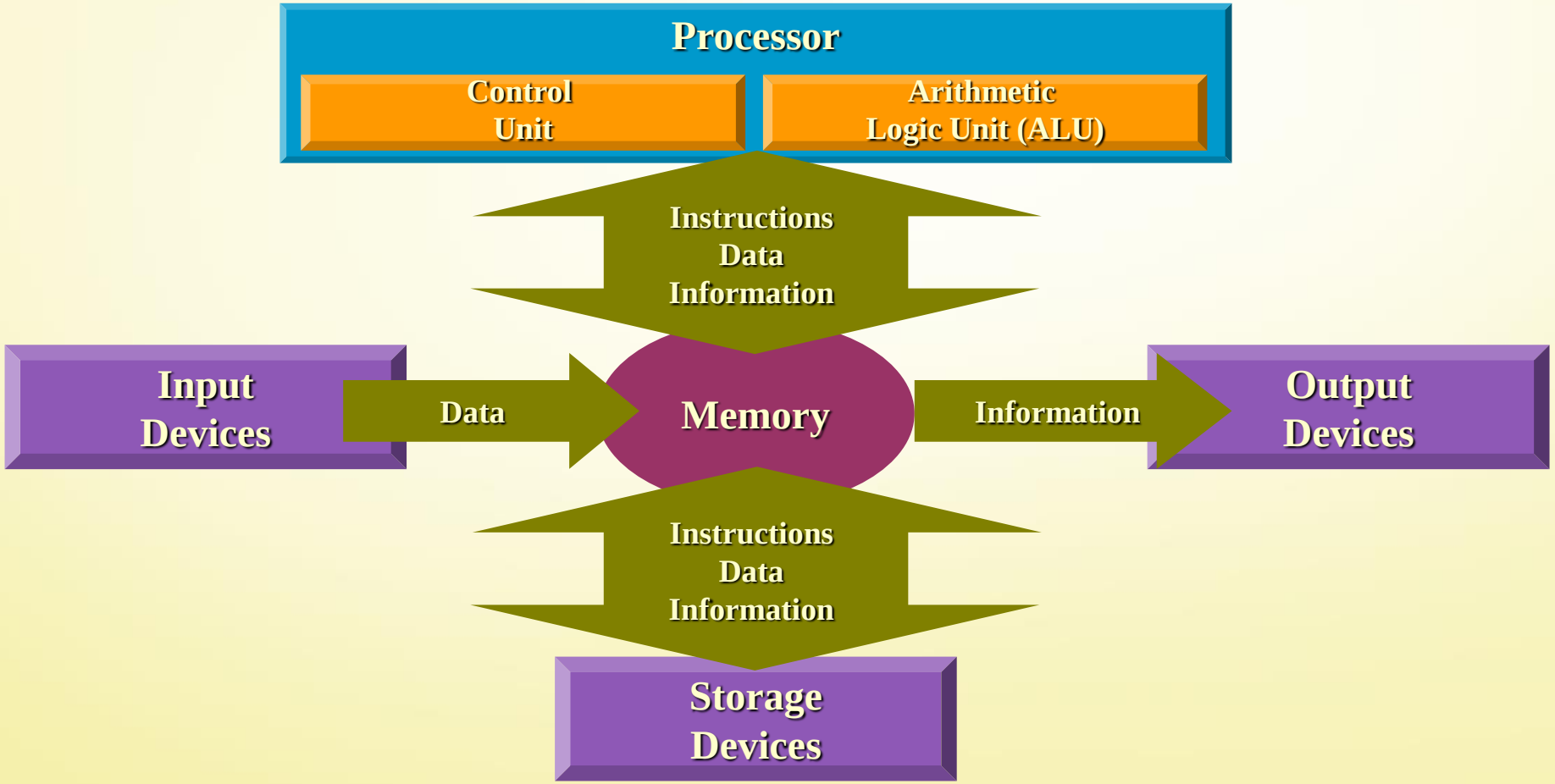

power supply
drive bays
intel pentium 4
processor
memory
ports
sound card
network card
modem card
video card

System Unit

- CPU
  - Computer를 작동하는 기본 instruction들을 수행하고 처리하는 Processor
  - 두 요소
    - Control Unit(CU)
      - Computer의 모든 동작을 지시, 제어하는 unit
    - Arithmetic Logic Unit(AlU)
      - 산술, 논리연산을 실제 수행하는 unit



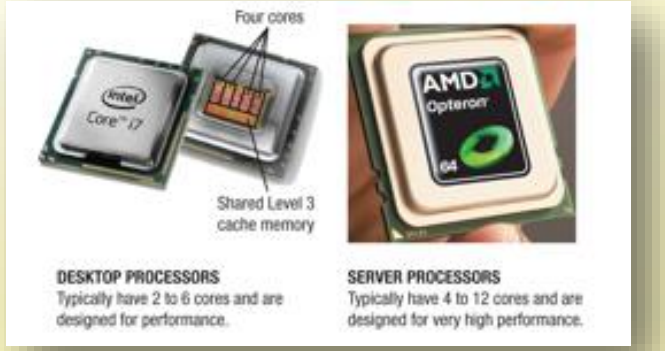
System Unit


Processor
Control Unit
Arithmetic Logic Unit (ALU)
Instructions
Data
Information
Input Devices
Data
Memory
Information
Output Devices
Instructions
Data
Information
Storage Devices

System Unit

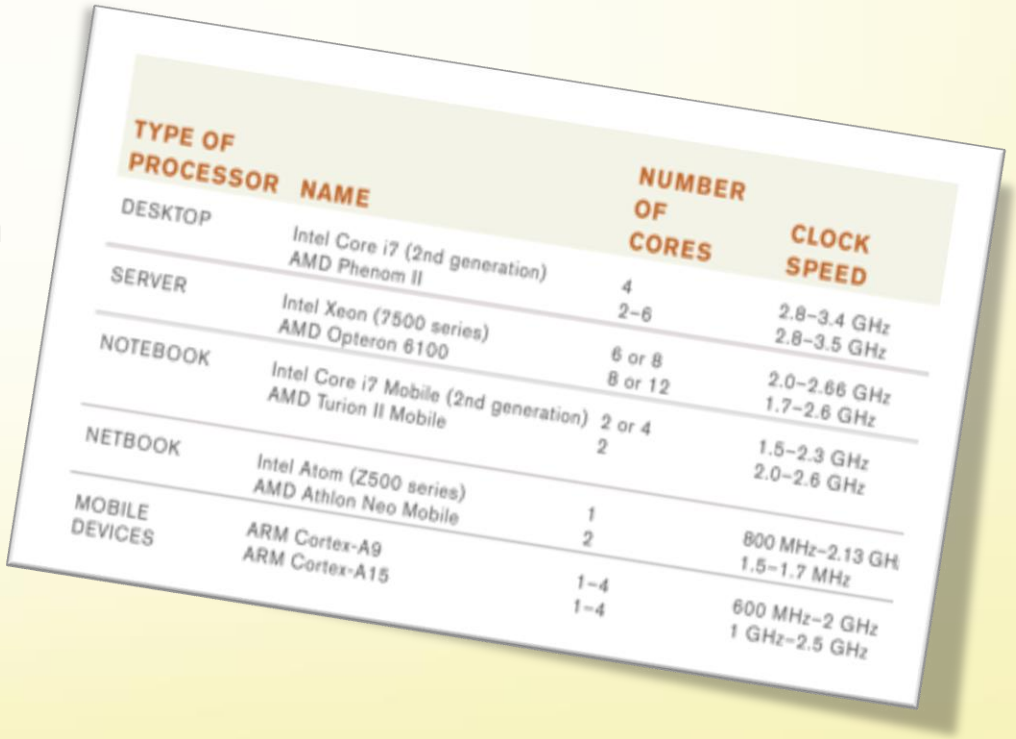
- CPU의 성능 결정 요소
  - Word Size
    - Processor가 한번에 처리할 수 있는 data 양
    - 64-bit processor가 보편적
  - Multi-core Chip
    - 한 번에 여러 작업의 동시 수행 가능
    - Dual-core CPU
      - 두 개의 separate processor를 포함하는 single CPU chip
    - Quad-core CPU
      - 네 개의 개의 separate processor를 포함하는 single CPU chip

Processor	Manufacturer	Description
Core 2 Quad	Intel	64-bit, quad-core
Core 2 Extreme	Intel	64-bit, quad-core
Xeon	Intel	64-bit, dual- and quad-core
Athlon 64 X2	AMD	64-bit, dual-core
AMD Phenom X4	AMD	64-bit, multicore
Nano	Via	64-bit, low power
Cell	Sony/Toshiba/IBM	64-bit, eight-core



System Unit

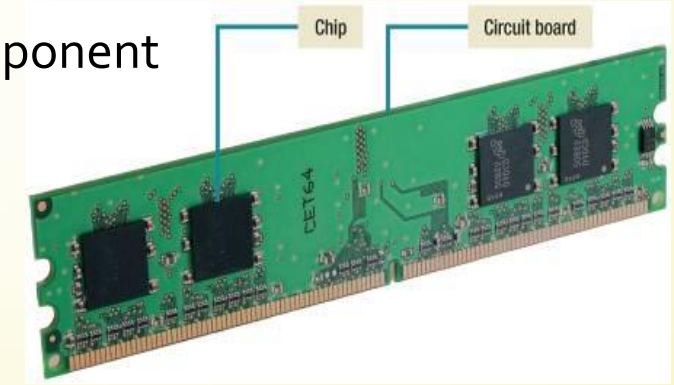
- CPU의 성능 결정 요소
  - Clock Speed
    - Processor의 processing speed로 instruction 수행 속도를 결정
    - Higher CPU clock speed = More instruction processed/sec
    - 측정 단위 : gigahertz(GHz)
    - 최신 microcomputer의 clock speed
      - 2~4 GHz



TYPE OF PROCESSOR	NAME	NUMBER OF CORES	CLOCK SPEED
DESKTOP	Intel Core i7 (2nd generation) AMD Phenom II	4 2–6	2.8–3.4 GHz 2.8–3.5 GHz
SERVER	Intel Xeon (7500 series) AMD Opteron 6100	6 or 8 8 or 12	2.0–2.66 GHz 1.7–2.6 GHz
NOTEBOOK	Intel Core i7 Mobile (2nd generation) AMD Turion II Mobile	2 or 4 2	1.5–2.3 GHz 2.0–2.6 GHz
NETBOOK	Intel Atom (Z500 series) AMD Athlon Neo Mobile	1 2	800 MHz–2.13 GH 1.5–1.7 MHz
MOBILE DEVICES	ARM Cortex-A9 ARM Cortex-A15	1–4 1–4	600 MHz–2 GHz 1 GHz–2.5 GHz

System Unit

- Memory
  - instruction, data, information을 저장하는 electronic component
    - Computer를 제어, 관리해 주는 system software
    - Application software
    - Application software에 의해 처리되는 data
    - 처리된 information
  - 측정 단위 : byte
    - 최신 micro computer : 4~8 GB Memory



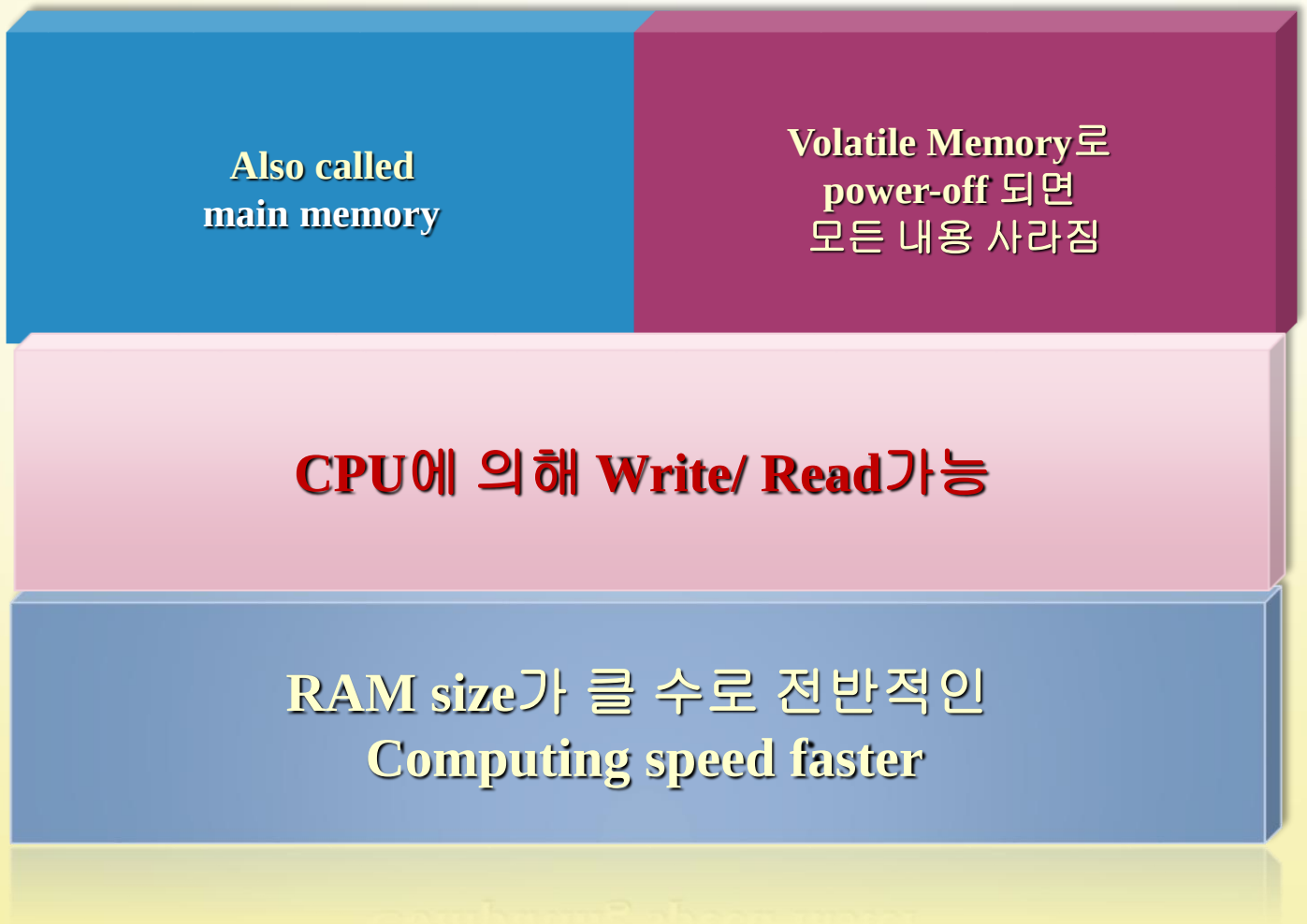
Term	Abbreviation	Approximate Size
Kilobyte	KB or K	1 thousand bytes
Megabyte	MB	1 million bytes
Gigabyte	GB	1 billion bytes
Terabyte	TB	1 trillion bytes

System Unit

- Memory
  - Random Access Memory (RAM)
  - Temporary 또는 Volatile Memory
    - CPU에 의해 처리될 data, instruction을 임시 저장
    - CPU에 의해 처리된 중간 결과와 최종 결과를 임시 저장
  - CPU는 data, instruction을 randomly 또는 directly access가능
    - Memory는 byte단위로 유일의 주소를 갖고 있음

System Unit

- Memory

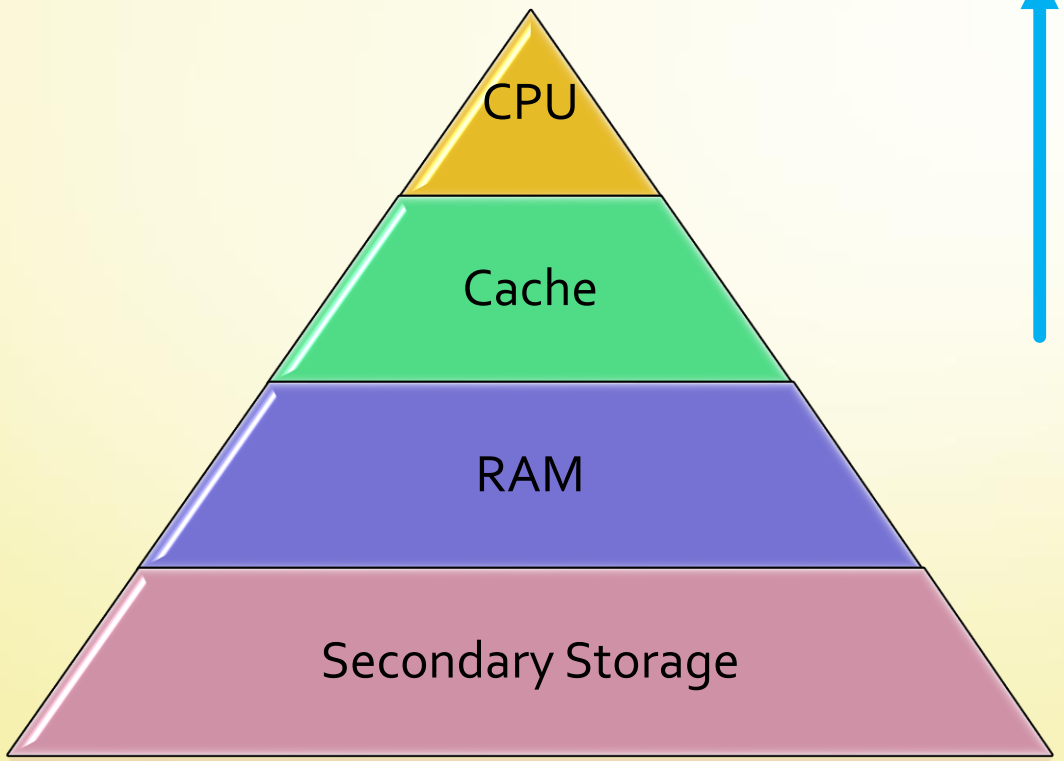


System Unit

- Cache Memory
  - CPU 와 가까이 또는 CPU안에 위치한 RAM보다 아주 빠른 memory
  - 자주 사용되는 data와 instruction을 저장하여 computer process성능을 향상
  - 세가지 types
    - Level1 Cache (L1 Cache) : built into processor
    - L2 Cache : built into processor : Slower, Larger
    - L3 Cache : RAM과 CPU사이에 위치 :slowest, Largest
  - More Cache Memory => Faster processing

System Unit

- RAM 과 Cache Memory

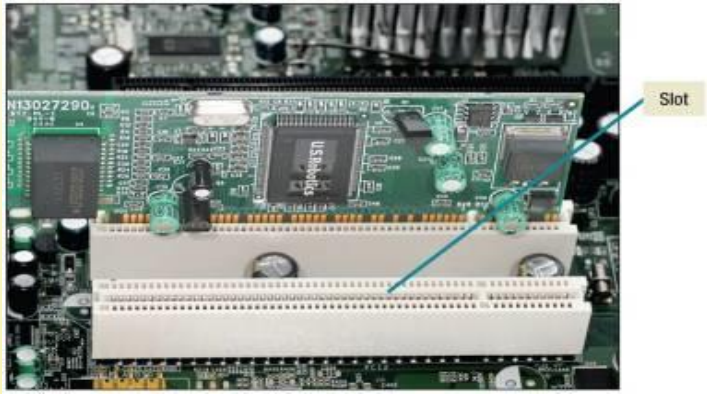


Smaller
Faster
More expensive

Larger
Slower
Less expensive

System Unit

- Expansion Slots
  - Adapter card(expansion card)를 add하기 위한 slot제공
  - Adapter card
    - Computer System과 주변기기와의 연결을 제공해 주는 circuit board
    - Graphics Cards
    - Sound Cards
    - Network Interface Card(NIC)
    - TV Tuner Cards

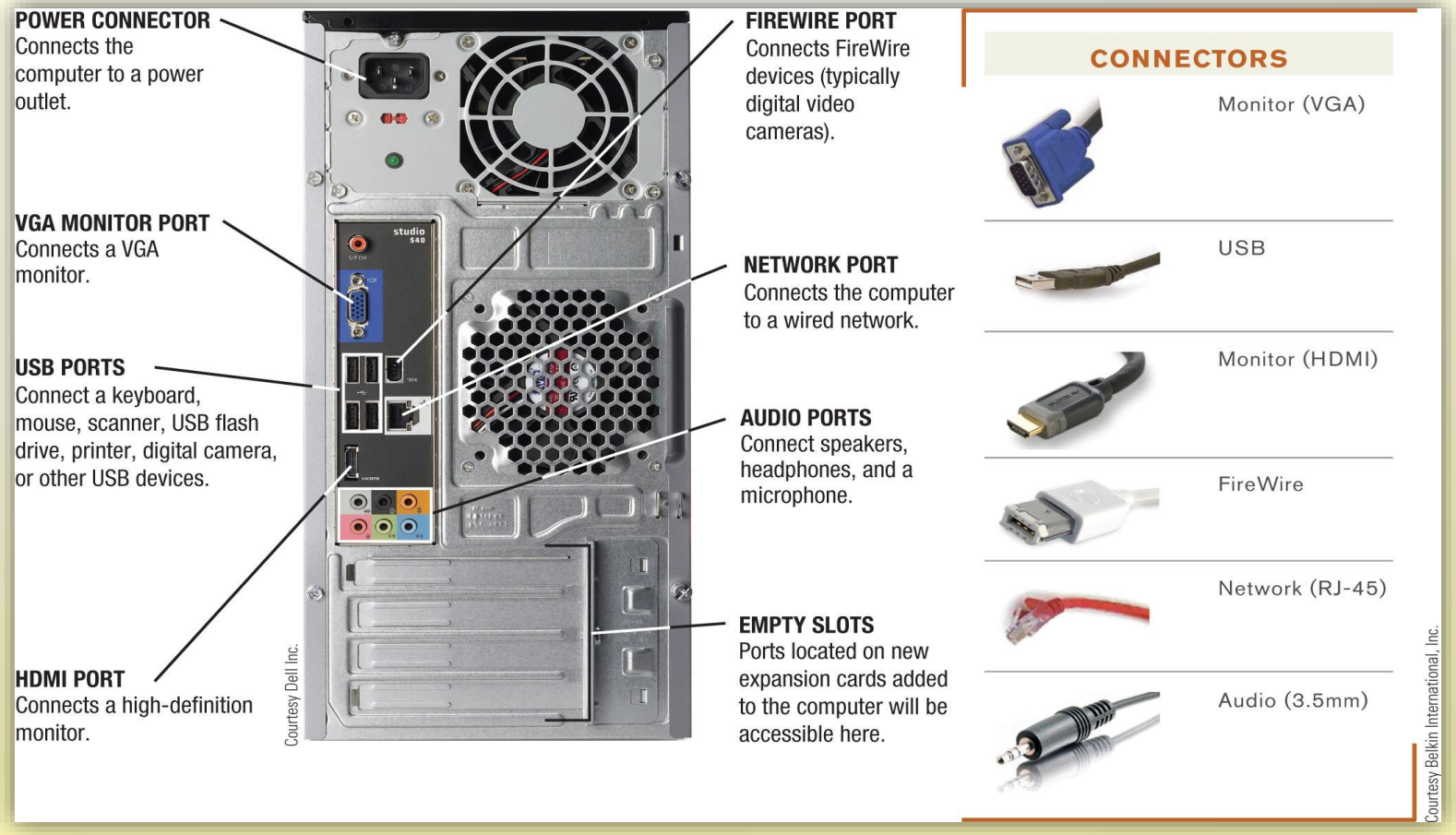


System Unit

- Bus
  - Computer System의 구성요소간의 data송수신을 위한 electronic path
  - 두 종류
    - Expansion Bus
      - CPU와 주변기기(입출력 기기)와의 연결 통로
      - PCIe, Universal Serial Bus(USB), Firewire bus, ..
    - Memory Bus
      - CPU와 Ram을 연결해 주는 통로

System Unit

- Standard Ports



Secondary Storage

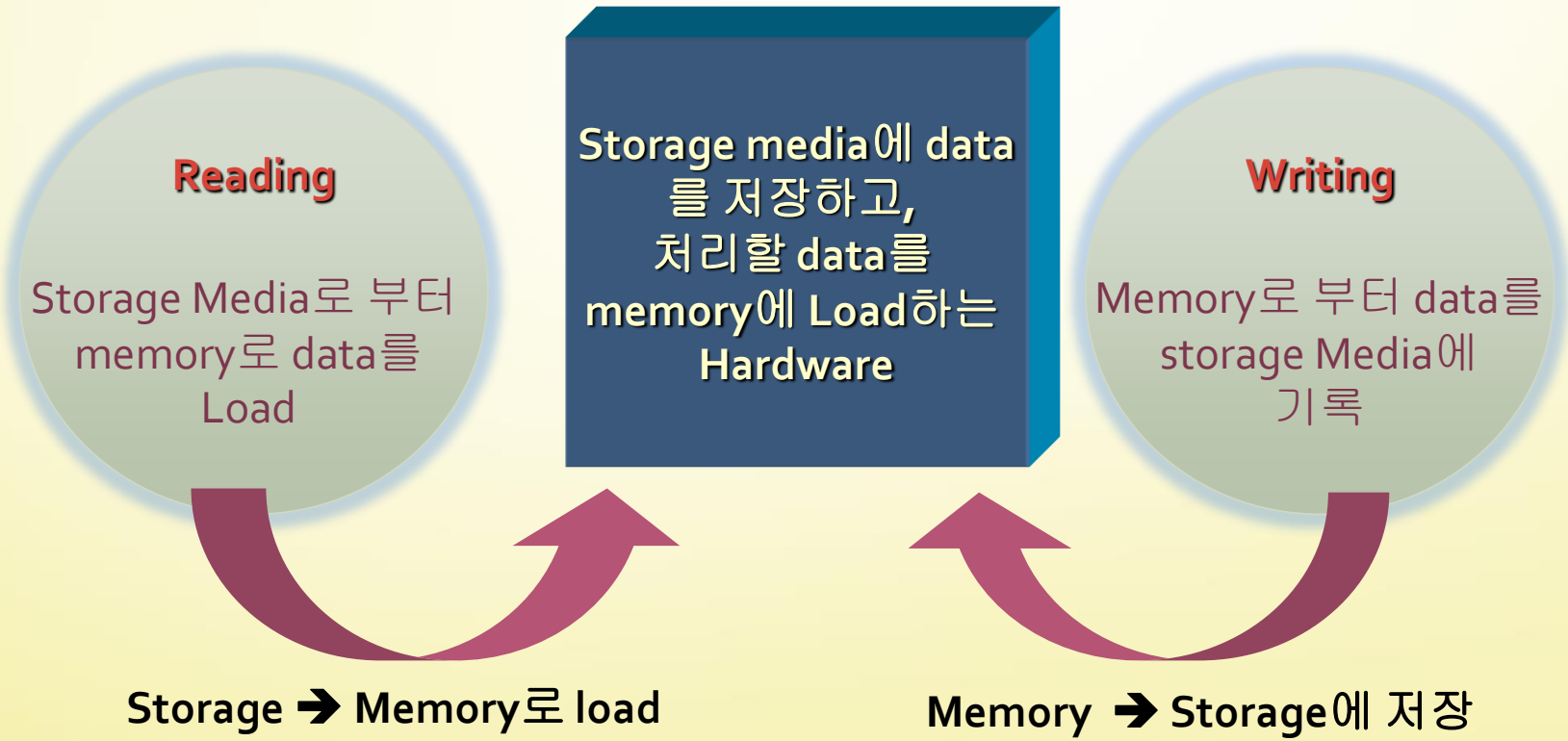
- RAM
  - Volatile Memory
  - Temporary Memory
- Secondary Storage
  - Nonvolatile Storage
    - 전원이 off인 경우에도 data가 지워지지 않음
  - Permanent Storage
    - 영구 저장 가능

Secondary Storage

- Storage Media와 storage Devices
  - Storage Media
    - 실제 Data가 저장되는 hardware
    - DVD disc, flash memory card, Hard Disk, ..
  - Storage Device
    - Data를 매체에서 read /write하는 hardware
    - DVD drive, Hard Disk drive, Flash memory card reader, ..
    - 일반적으로 Storage device 는 alphabet letter에 의해 지정 됨
      - C drive, D drive, E, F, G drive, ..

Secondary Storage

- Storage Device

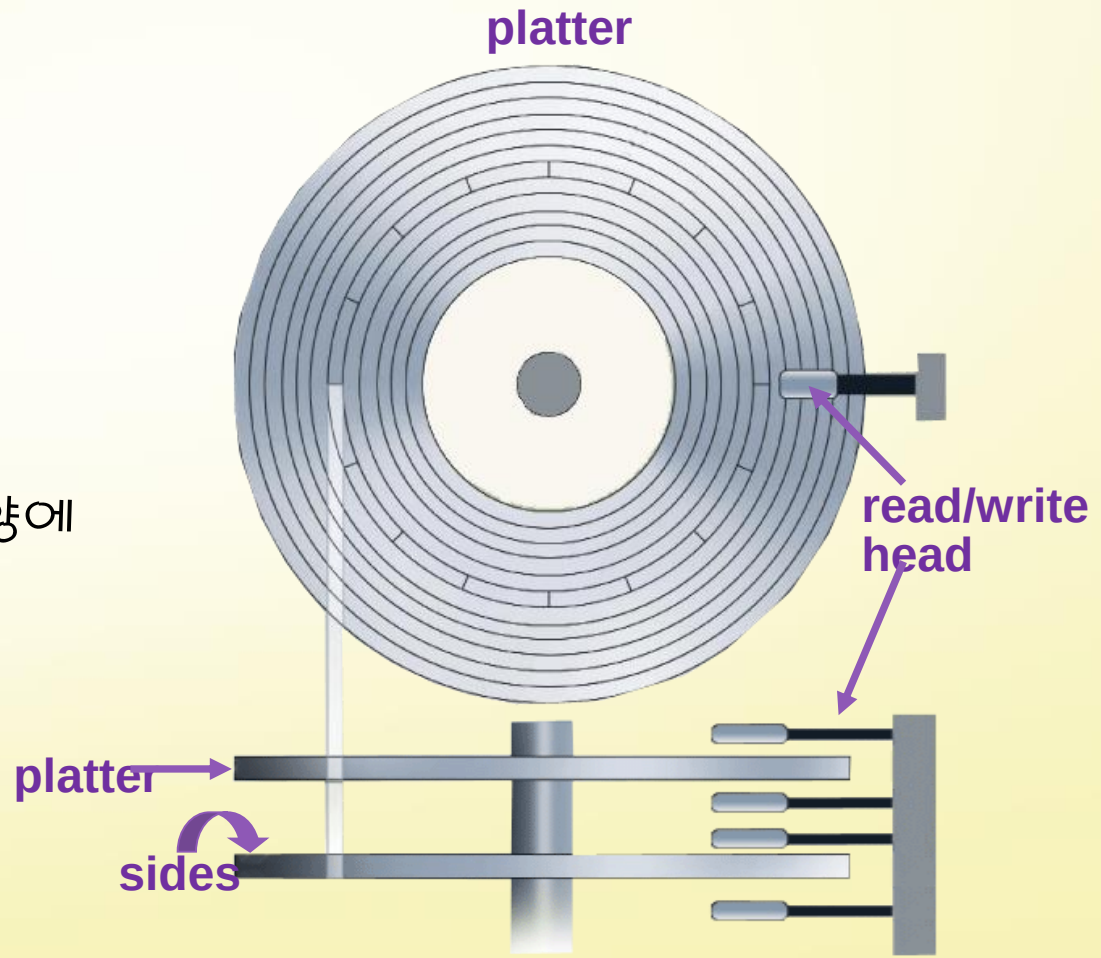


Secondary Storage

- Storage Technology에 따른 분류
  - Magnetic (Hard Disks)
  - Optic (Optic Discs)
  - Electrons (Flash Memory Media)

Secondary Storage

- Magnetic Disk Storage
  - Conventional Hard Drives
  - System Unit에 위치한 대용량 저장 매체
    - 주로 C: Drive로 지칭
  - Disk표면의 magnetic particles의 자화 방향에 따라 0 또는 1을 기록
  - Read/write head에 의해 read/write



Secondary Storage

- Magnetic Disk Storage
  - 외부 환경에 민감한 최대 밀폐된 저장 매체
  - Programs과 Data File의 영구 저장 매체
    - Operating System을 포함한 system software
    - Powerful Application Programs
    - Data Files

Notebook computer내의
2.5 inch Hard Drive

Desktop computer내의
3.5 inch Hard Drive

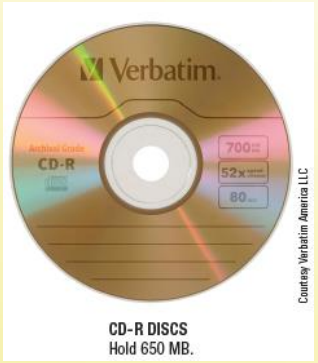
Secondary Storage

- Optic Discs Storage
  - Laser beam에 의해 disc 표면을 burn
    - Lands : 1
    - Pits : 0
  - Three Types
    - Compact Disc(CD)
    - Digital Versatile Disc(DVD)
    - Blu-Ray(Hi-Def) Disc

Secondary Storage

- Optic Discs Storage
  - 각 type은 three categories로 다시 분류
    - Read- Only Disc
    - Recordable Disc – Write once
    - Rewritable Disc – Write on multiple times

Format	Typical Capacity	Description
CD	650 MB to 1 GB	Once the standard optical disc
DVD	4.7 GB to 17 GB	Current standard
Blu-ray	25 GB to 50 GB	Hi-def format, large capacity



CD-R DISCS
Hold 650 MB.

DVD+R DL DISCS
Hold 8.5 GB.

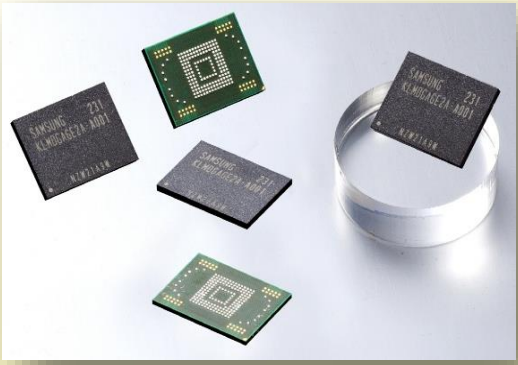
BD-R DL DISCS
Hold 50 GB.

Secondary Storage

- Solid-State Storage
  - Data를 electronically read/ write
    - Moving part가 없음
  - 장점
    - Less Power Usage
    - Faster Data Access
    - Higher Reliability
  - Solid –state drives (SSDs)
    - 내장 Hard Drive를 대체하는Solid-state Storage
    - 주로 notebook computer와 mobile device에 적용

Secondary Storage

- Solid-State Storage
  - Flash memory cards
    - Computer, camera mobile phone등에서 널리 사용
  - Embedded Flash Memory
    - 내장된 flash memory
    - Digital camera, mobile phones, GPS devices, ..
  - USB Drives
    - Capacity : 1 GB to 256 GB



Secondary Storage

- Cloud Storage
  - Internet을 통해 사용 가능한 online storage
  - Cloud Storage제공 web sites
    - Google Drive, MS Onedrive, Facebook, Apple iCloud, Naver N Drive, Daum cloud, ..
  - Web-based Applications제공
  - 장점
    - 어디서나internet을 통해 Access가능
      - Easy upload / download
    - 쉽게 공유 가능 – group member간의 real-time editing가능

Secondary Storage

- Cloud Storage
  - 무료 제공 용량(2015.1)

Cloud Website	무료 제공 Capacity
Google Drive	15GB
MS Onedrive	15GB
Daum Cloud	50GB
Naver N Drive	30GB