

# ORGANISASI DAN ARSITEKTUR KOMPUTER

Pertemuan 2 :  
Sejarah Perkembangan Komputer

# Generasi-0 : Komputer Mekanis

## (1642 – 1945)

- ◎ **Blaise Pascal (1623 – 1662):**
  - Mesin kalkulator pertama (1642), mampu melakukan operasi + dan –
- ◎ **Baron Gottfried Wilhelm von Leibniz (1646-1716)**
  - Membuat mesin yang mampu melakukan operasi perkalian dan pembagian ( 30 tahun kemudian setelah Pascal)

## ◎ Charles Babbage (1792 – 1871)

### 1. Difference Engine:

- penambahan/pengurangan, diferensial berhingga pada polinomial
- hasil tercetak pada lembaran logam (gravier)

### 2. Analytical Engine:

- memiliki 4 komponen: store (1000 50-word), mill (ALU), input (punched card) dan output.
- Dapat menjalankan program dari input punched-card.
- Programmer: Ada Augusta Lovelace
- Belum dapat bekerja secara sempurna karena keterbatasan piranti mekanis.

# Generasi-1 : Tabung Hampa (1945 – 1955)

## ◎ COLOSSUS :

- komputer digital elektronik yang pertama.
- dibuat oleh British intelligence selama WW-II, untuk memecahkan pesan-pesan rahasia yang disadap dari fihak Jerman
- dirahasiakan sampai sekitar pertengahan-70-an

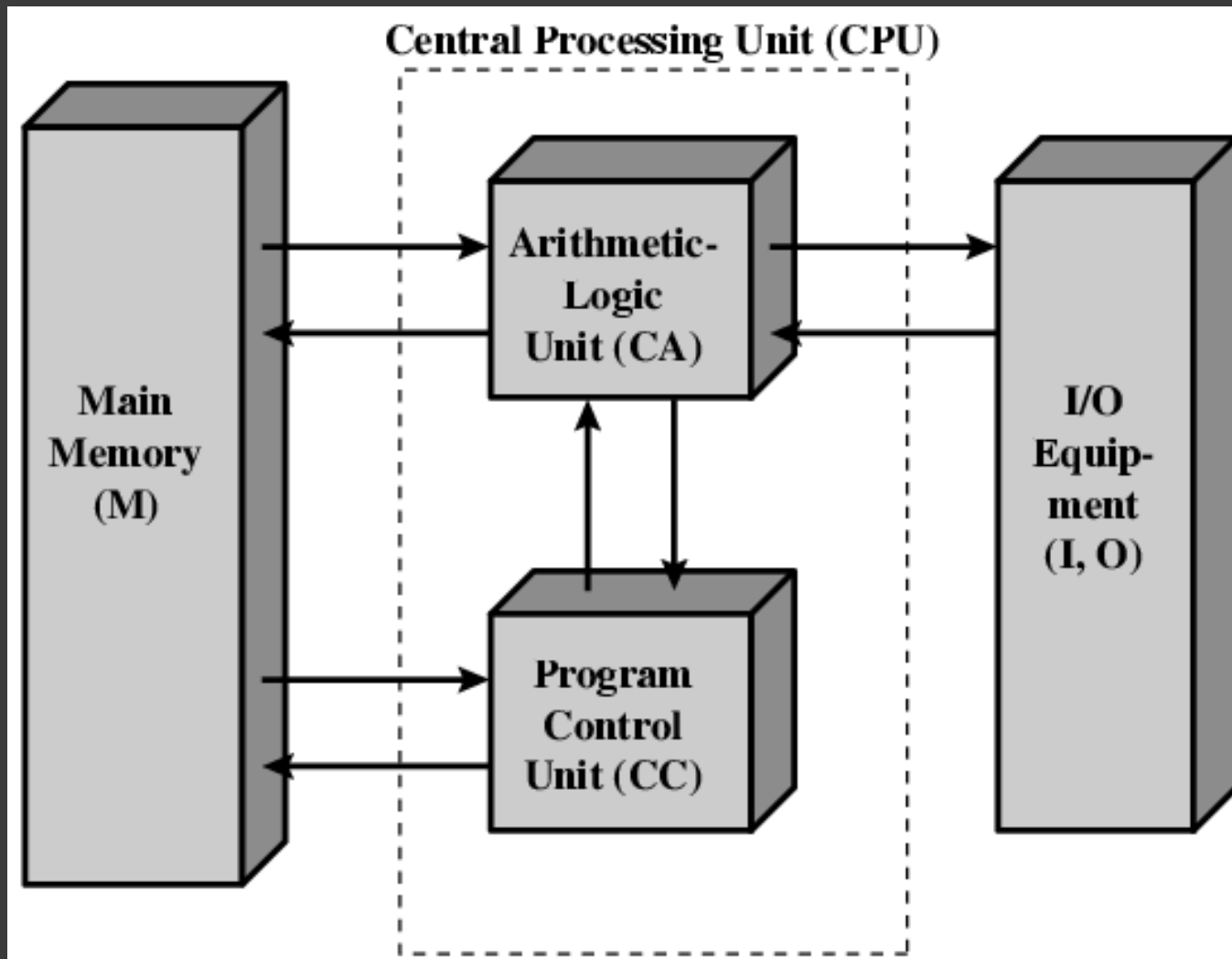
## ◎ ENIAC (1943 – 1946)

- ditujukan untuk kalkulasi tabel-tabel jarak tembak artillery
- berisi 18000 tabung, 1500 relay, berat 30 ton, listrik 140 KW.
- diprogram langsung melalui saklar dan kabel-kabel sambungan.

## ◎ **John Von Neumann**

- semula anggota team pengembangan ENIAC
- pertama kali yang menggunakan aritmatika biner
- Konsep: Strored Program Computer
- arsitektur komputer yang memiliki 5 bagian: memory, ALU, program control, input dan output.
- semua komputer modern menganut arsitektur dari von Neumann.

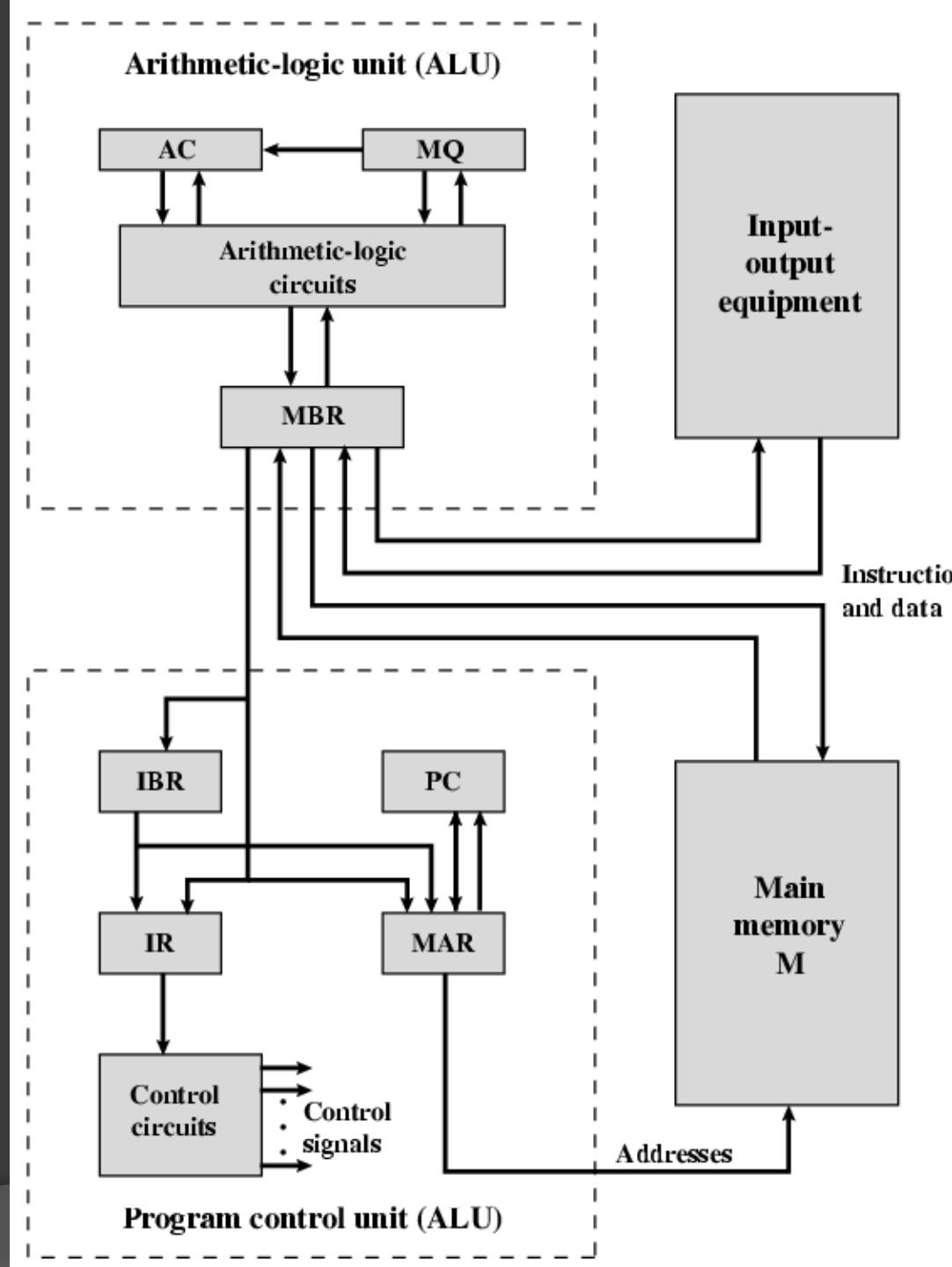
# Arsitektur Stored Program Computer



## ◎ IAS

- Implementasi konsep von- Neumann
- Dibuat di Princeton Institute for Advanced Studies (Selesai dibuat 1952)
- Memori: 1000 x 40 bit words
  - Binary number
  - 2 x 20 bit instructions
- Set registers (dalam CPU):
  - Memory Buffer Register (MBR)
  - Memory Address Register (MAR)
  - Instruction Register (IR)
  - Instruction Buffer Register (IBR)
  - Program Counter (PC)
  - Accumulator (AC)
  - Multiplier Quotient (MQ)

# Structure Detail - IAS





# Generasi-2 : Transistor (1955 – 1965)

- ⊙ **Transistor** ditemukan pada th 1948 di Bell Labs, oleh John Barden, Walter Brattain dan William Shockley.
- ⊙ **TX-0** (Transistorized eXperimental computer 0), komputer transistor yang pertama, dibuat di Lincoln Lab MIT.
- ⊙ **DEC PDP-1**, komputer mini pertama dengan harga murah
- ⊙ **DEC PDP-8**, menggunakan single-bus (Omnibus)
- ⊙ **CDC 6600** (1964), komputer parallel pertama, memiliki unit komputasi dan unit kendali terpisah.
- ⊙ **Burroughs B5000**, menggunakan pemrograman bahasa tingkat tinggi (Algol-60)
- ⊙ **NCR & RCA** membuat komputer dengan ukuran kecil
- ⊙ **IBM 7000**

# Generasi-3 : IC (1965 – 1980)

## ⊙ IBM System/360

- Menggantikan seri 7000 ( tidak kompatible )
- Memiliki beberapa seri dengan bahasa mesin yang sama (“family” of computers)
- Dirancang untuk keperluan scientist maupun komersial
- Komputer pertama yang memiliki kemampuan multiprogramming

## ⊙ DEC PDP-11

- Banyak digunakan di universitas.

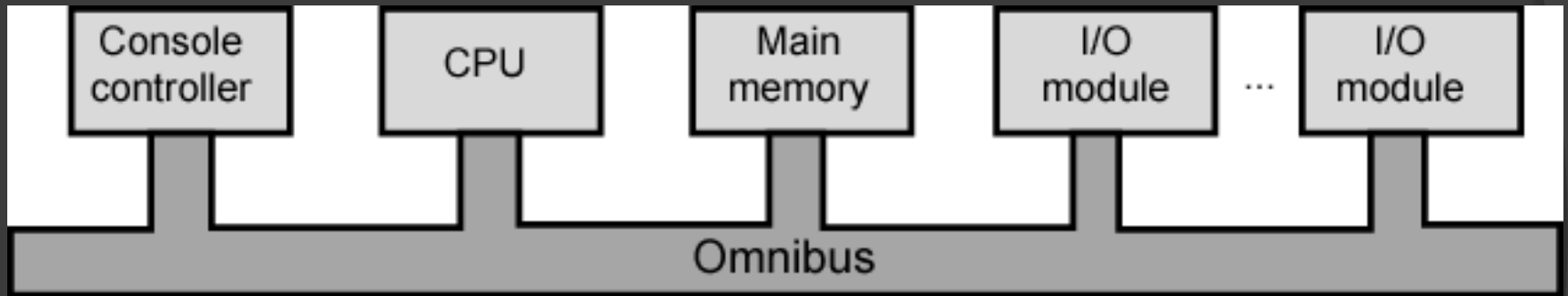
# Generasi-4 : VLSI (1980 – )

- ⦿ Komputer Personal
- ⦿ Komputer yang memiliki kemampuan tinggi dengan harga yang murah

# Moore's Law

- ⦿ Increased density of components on chip
- ⦿ Gordon Moore – co-founder of Intel
- ⦿ Number of transistors on a chip will double every year
- ⦿ Since 1970's development has slowed a little
  - Number of transistors doubles every 18 months
- ⦿ Cost of a chip has remained almost unchanged
- ⦿ Higher packing density means shorter electrical paths, giving higher performance
- ⦿ Smaller size gives increased flexibility
- ⦿ Reduced power and cooling requirements
- ⦿ Fewer interconnections increases reliability

# DEC - PDP-8 Bus Structure



# Computer Families

- ⦿ Each of the following architectures define a family of processors.
- ⦿ Pentium II – Intel
- ⦿ UltraSPARC II – Sun Microsystems
- ⦿ picoJava II – Sun Microsystems

# Pentium II Family

This family has evolved from a calculator chip. It started out as a 4-bit CPU on a chip for a Japanese calculator manufacturer.

Here's a summarized history:

4004, 8008, 8086, 8088, 80286, 80386, 80486,  
Pentium, Pentium Pro, Pentium II

# UltraSPARC II Family

This family grew out of one person's love of running UNIX who had a distaste for doing so on timeshared computers.

A graduate student at Stanford built the first SUN (Stanford University Network) workstation. It was originally powered by a Motorola 68020 processor, and came with built-in Ethernet connection.

SUN-1

SUN-2

SUN-3



Then switched to a RISC architecture to design their own processor SPARC(Scalable Processor ARChitecture).

UltraSPARC I – a 64 bit architecture

# Pentium Evolution (1)

- ◎ 8080
  - first general purpose microprocessor
  - 8 bit data path
  - Used in first personal computer – Altair
- ◎ 8086
  - much more powerful
  - 16 bit
  - instruction cache, prefetch few instructions
  - 8088 (8 bit external bus) used in first IBM PC
- ◎ 80286
  - 16 Mbyte memory addressable
  - up from 1Mb
- ◎ 80386
  - 32 bit
  - Support for multitasking

# Pentium Evolution (2)

- ◎ 80486
  - sophisticated powerful cache and instruction pipelining
  - built in maths co-processor
- ◎ Pentium
  - Superscalar
  - Multiple instructions executed in parallel
- ◎ Pentium Pro
  - Increased superscalar organization
  - Aggressive register renaming
  - branch prediction
  - data flow analysis
  - speculative execution

# Pentium Evolution (3)

- ◎ Pentium II
  - MMX technology
  - graphics, video & audio processing
- ◎ Pentium III
  - Additional floating point instructions for 3D graphics
- ◎ Pentium 4
  - Note Arabic rather than Roman numerals
  - Further floating point and multimedia enhancements
- ◎ Itanium
  - 64 bit
  - see chapter 15
- ◎ Itanium 2
  - Hardware enhancements to increase speed
- ◎ See Intel web pages for detailed information on processors

# PowerPC Family (1)

- ◎ 601:
  - Quickly to market. 32-bit machine
- ◎ 603:
  - Low-end desktop and portable
  - 32-bit
  - Comparable performance with 601
  - Lower cost and more efficient implementation
- ◎ 604:
  - Desktop and low-end servers
  - 32-bit machine
  - Much more advanced superscalar design
  - Greater performance
- ◎ 620:
  - High-end servers
  - 64-bit architecture

# PowerPC Family (2)

## ⊙ 740/750:

- Also known as G3
- Two levels of cache on chip

## ⊙ G4:

- Increases parallelism and internal speed

## ⊙ G5:

- Improvements in parallelism and internal speed
- 64-bit organization