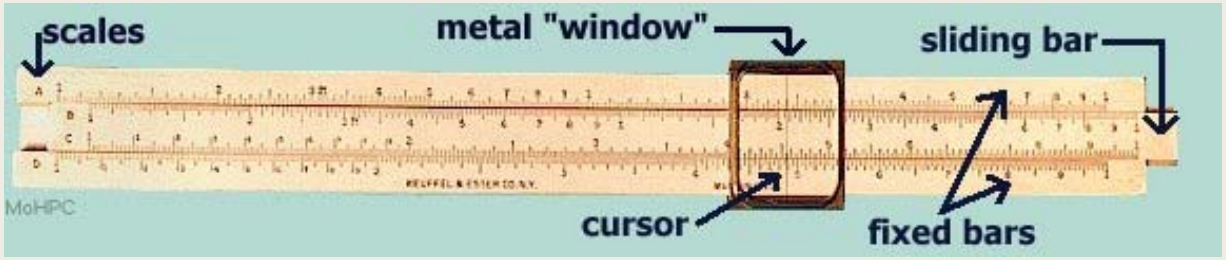
HISTORY OF CALCULATION

Evolution of Computation

Mechanical Era

- Slide Rule is the first mechanical device for numeric calculation
- Slide Rule can do Multiplication, Division, Power, Root and Trigonometry
- Slide Rule works in 2 Steps
  - *Set initial configuration (calibration) between two bars*
  - *Read the value on fixed bar that matches the desire value on sliding bar*



Mechanical Era (2)

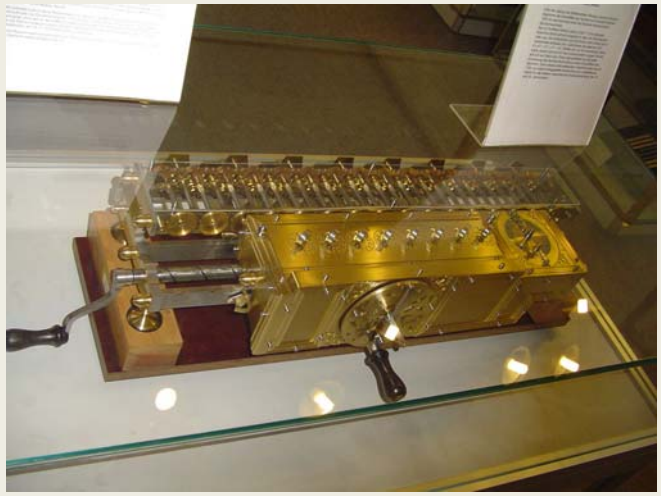
- What is good about this Slide Rule?
- It has visited the moon
- Astronauts in Apollo 11 brought Slide Rule during the trip to the moon in 1969

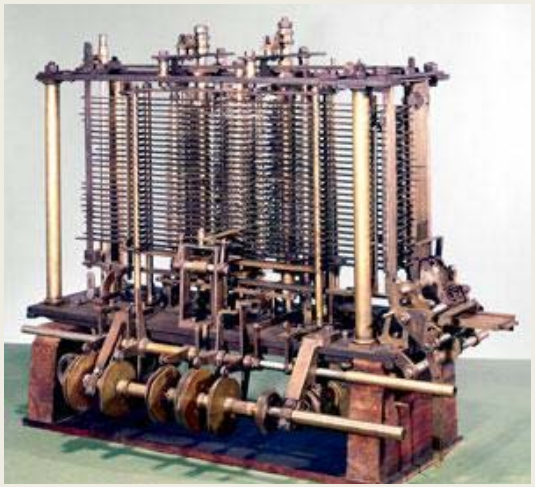
Limitation of Mechanical Devices

- Although they are fast (such as Abacus), they lack some basic things of computer
- No memory
- Not customizable
- Require human (remember that we are lazy!!!)

Pre-World War 2 Era

- Transition from small mechanical device to a (very) large machine that consisted of several moving parts
- They are very fast and powerful but require a physical space





Jacquard’s Loom (1801)

- Developed by Joseph-Marie Jacquard
- Create a complex knitting very fast using a set of punches cards
- Weavers hate this machine for obvious reason

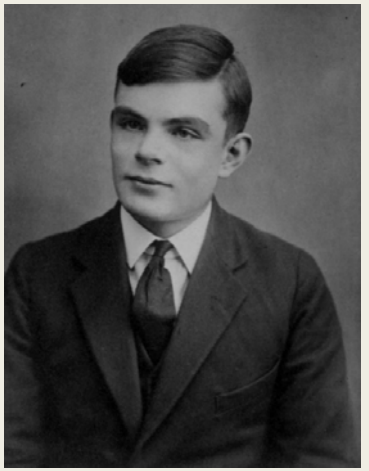
Hollerith’s Census Machine (1890)

- USA wants to record all population data of its people (called US Census)
- At that time, there are about 62 million people
- Inspired by Jacquard’s Loom, Herman Hollerith built a machine that processed census data
- The machine processed 1890 data within 3 months and result was published in 1892
- He found a company which later becomes IBM

World War 2 Era

- Introduce new complicated problems
- How should troop be deployed?
- How can the secret code be cracked?
- Everything must be automated
- Military was willing to spend a large sum of money on creating automated machine

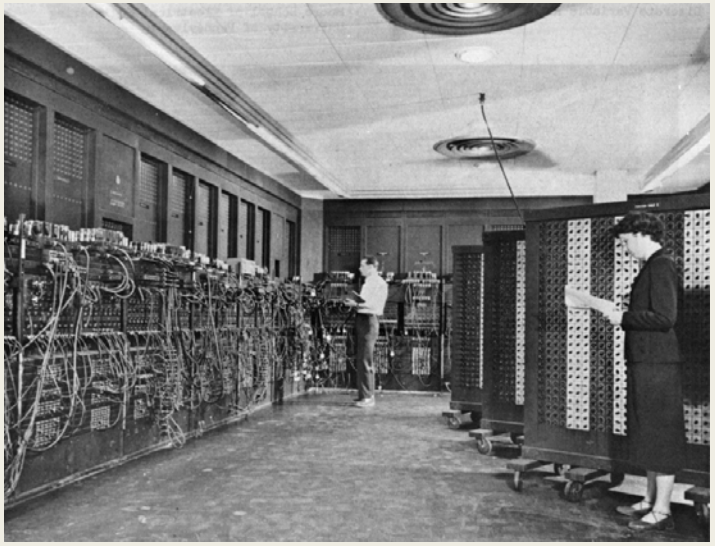
Alan Turing



- Formularize the notions of computation and computability
- Work for UK in developing a machine that can crack German Enigma code during World War 2, helping the Allies to defeat Nazis
- Some said that his work had shortened the war by 4 years
- After World War 2, he developed a test for machine intelligence now called Turing Test
- The Turing Award is the highest award in computing (2016 award winner is the inventor of World Wide Web and the first web browser)

Very First Computer

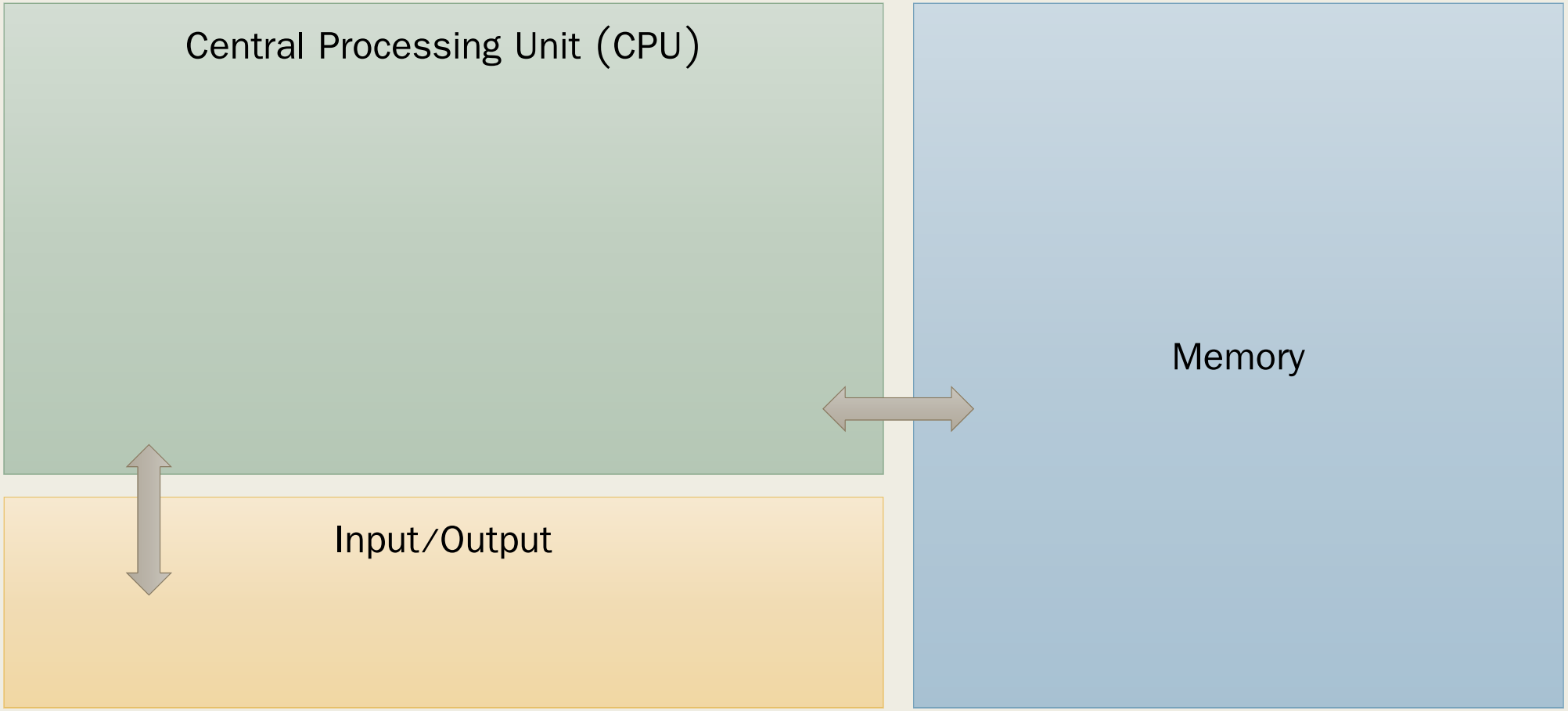
- Harvard Mark I
  - *Electromechanical machine*
- ENIAC
  - *Fully electronic machine*
- They were programmed externally
  - *Programs determined by wiring*



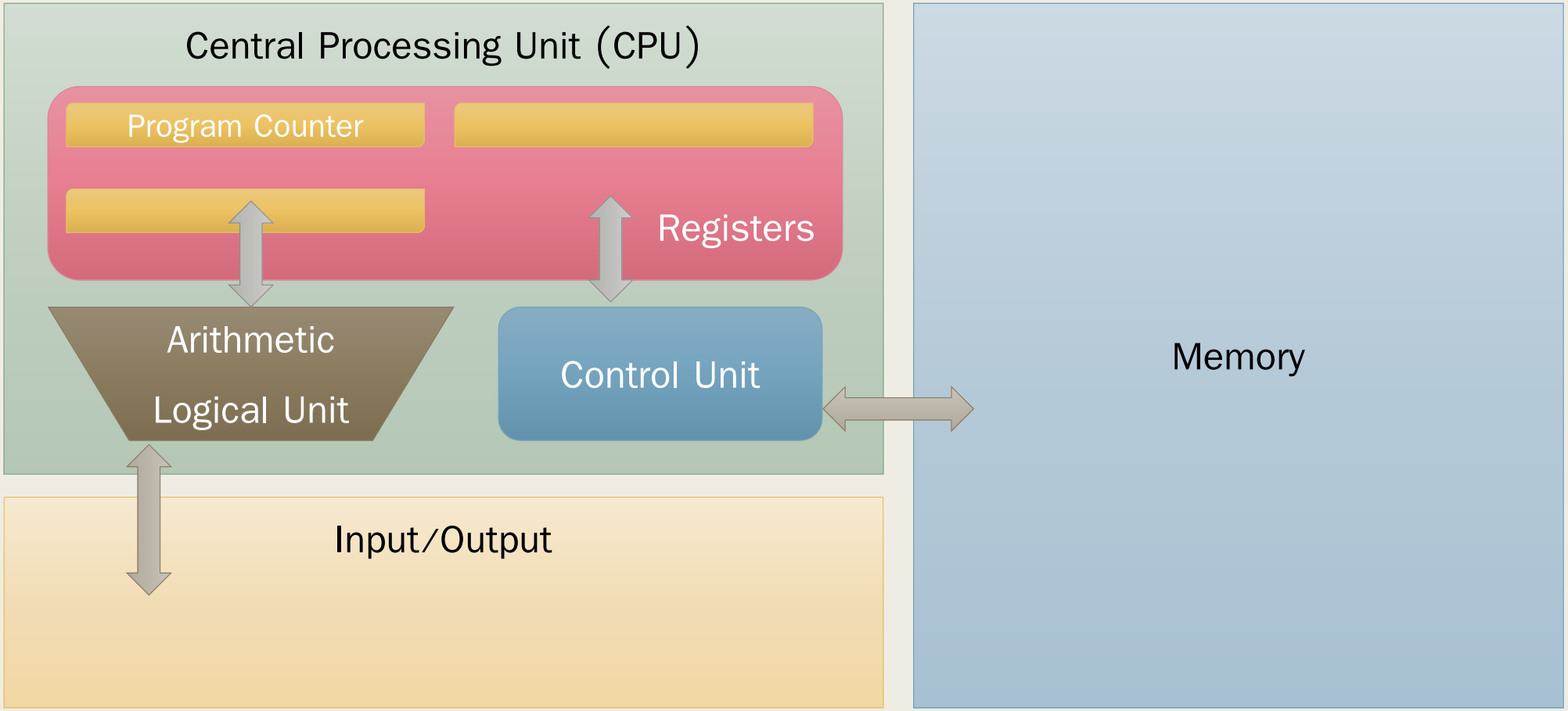
Von Neumann Architecture

- Programs are considered data so they are stored along with data
- Mauchy and Eckert were the first ones to come up with stored-program but John von Neumann publishes the concept and gained recognition
- Machine are partitioned into 3 parts
  - *Control Processing Unit*
  - *Memory*
  - *Input/Output*

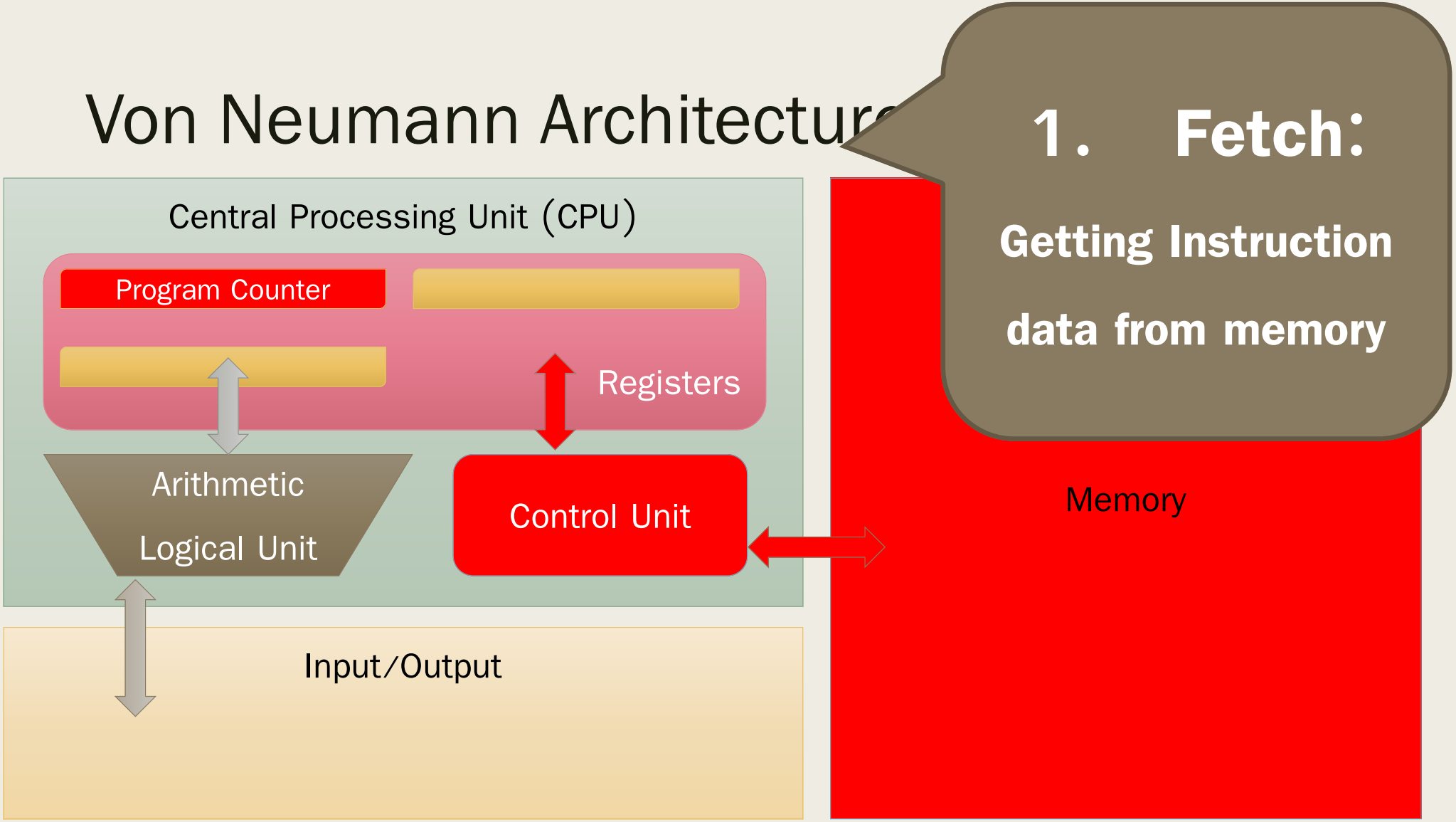
Von Neumann Architecture (2)



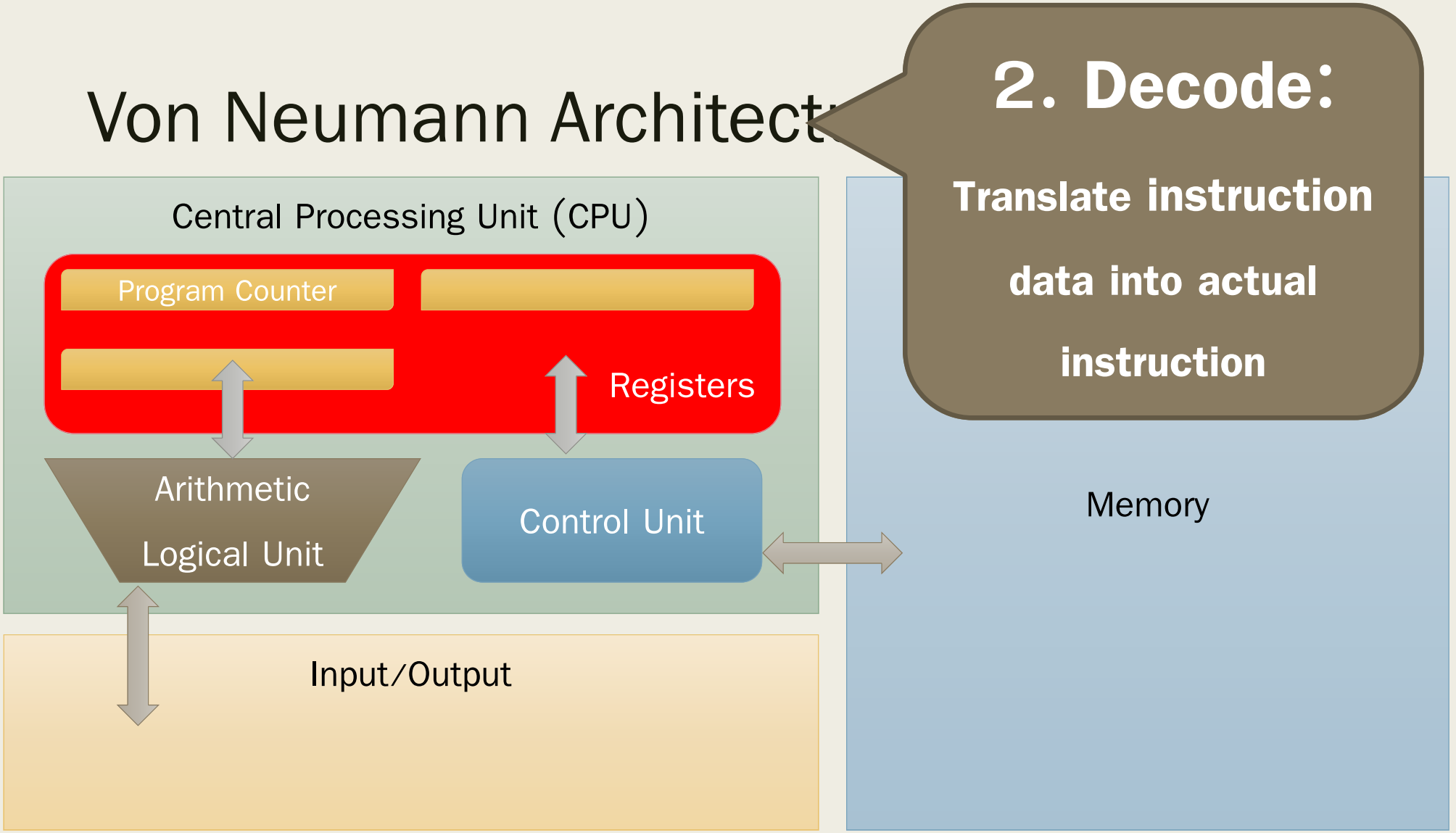
Von Neumann Architecture (3)



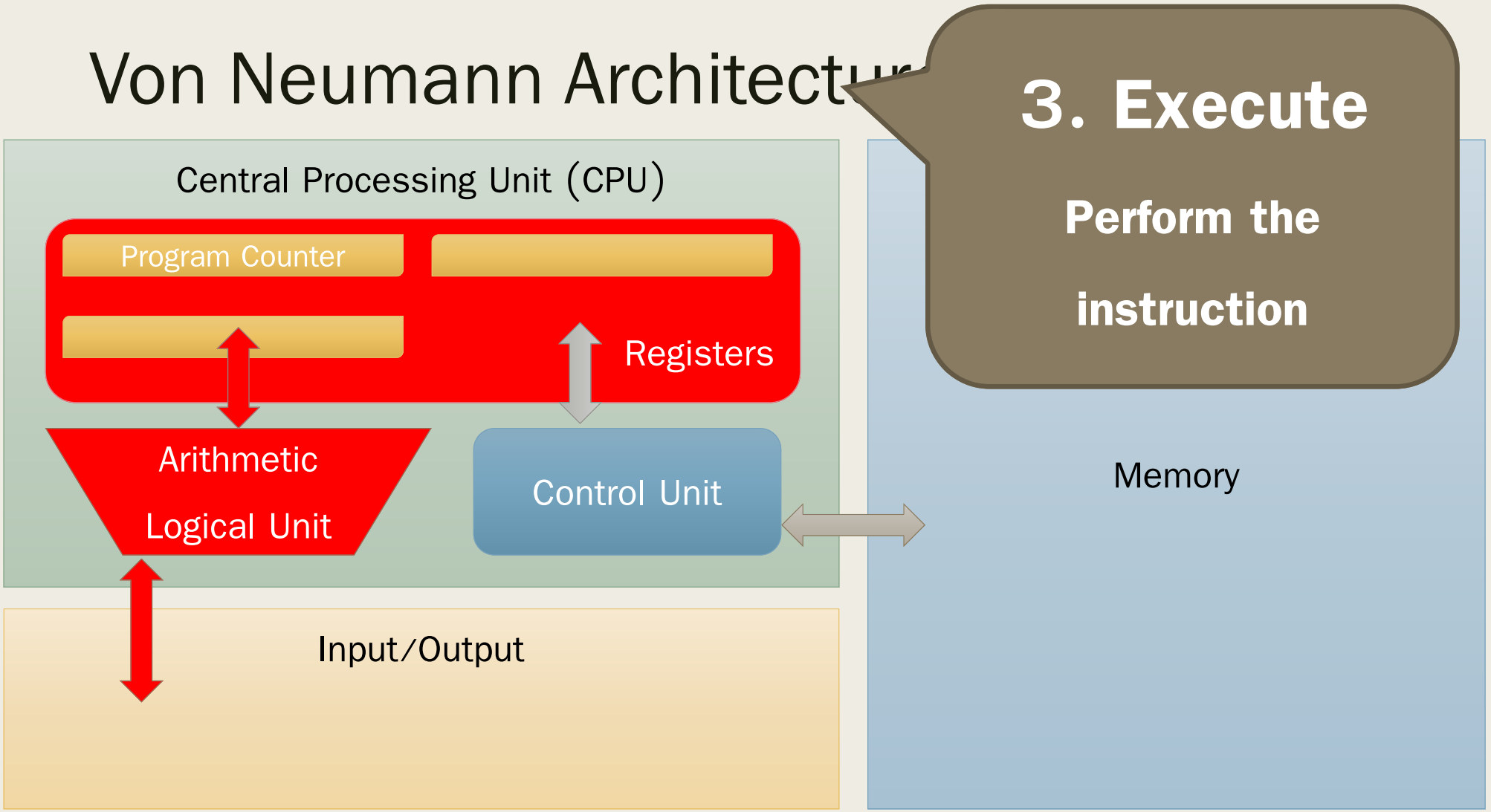
Von Neumann Architecture



Von Neumann Architect



Von Neumann Architectur

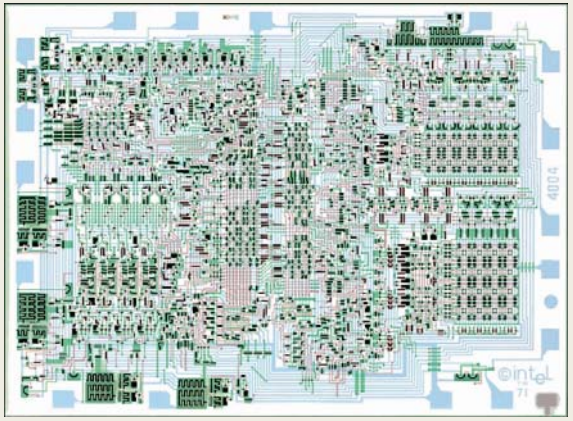


Transistors Era (1947)

- Replace Vacuum Tubes with Transistors
- More reliable, Smaller size
- Lead to Integrated Circuit (Today's CPU)

Microprocessor Era (1971)

- Intel created the first microprocessor which is a CPU on a small chip (CPU used to live in a standalone box)
- Personal computer revolution happened shortly after



1971

2016

Modern Era (Present)

- All-in-one machine that can do almost everything
- Everyone household own at least one computer
- Mobile phone becomes a larger market than computer (Advertisement needs to be optimized on mobile device, e.g., vertical screen)

Future (of Computing) Era

- Devices do not need to be powerful
- Most computation will be performed on “the Cloud”
- Google launches Google Cloud Platform
- Microsoft launches Microsoft Azure