TIC1001—Introduction to Computing and Programming

National University of Singapore

**Lecture 3: All about Computers**

Moore's Law

Which of the following statement(s) regarding **Moore's Law**is / are **TRUE**?

It is not a law based on scientific facts.

The law is predicted to fail only in 2030.

It was used as a industry benchmark for quite some time.

Moore's Law, in its original term, focused on the density of transistor instead of the speed of processor.

Memory Wall

The **memory wall**refers to:

The gap between the size of the processor component and the memory component.

The difference in the capacity of the registers (in the processor) and the main memory.

The physical distance between the processor and the main memory on a typical motherboard.

The performance gap between processor and main memory.

Power Wall

Which of the following real world example(s) can be explained by the **power wall**?

Many higher end mobile phones have two sets of processor cores: one set with much higher performance compared to the other set.

The increase of CPU clock speed (e.g. Intel i7 typically runs at 3.2GHz) has been much slower in the last few years.

The latest AMD processor (Ryzen) may requires liquid cooling.

Modern graphic cards have enormous fan attached to them.

Multicore Processor

Which of the following statement(s) regarding **multicore processor**is / are **TRUE**?

Without modification, a sequential program can gain about 4x speedup by executing it on a quadcore (4 cores) processor.

A quadcore processor can executes 4 times as many programs at the same time compared to a single core processor.

All PC processor manufacturers have abandoned unicore (single core) processor development for more than 10 years.

Parallel programming allows a program to utilize more than one core during execution.

Stored-Memory Architecture

What is the key idea behind the **stored-memory architecture**(also known as Von-Neumann Architecture)?

Memory locations are directly used as operands in arithmetic operation.

Computation results are stored in memory.

Executable (binary) is stored in the memory.

Both executable and data are stored in the memory.

Load-Store Memory Architecture

Which of the following statement(s) is / are TRUE regarding **load-store memory architecture**?

Operands used in arithmetic are loaded from memory into registers **every**time they are needed.

Load-store memory architecture can help to combat the problem of Memory-wall (large discrepancies between memory and cpu speed).

In a load-store memory architecture, we can have instructions that add two memory operands and store the result in register.

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Instruction Execution Cycle: Reg-To-Reg Instruction

A **register-to-register**instruction will access main memory during which of the following step(s) in its execution cycle? Note that the "Execute" step is further split into 3 smaller steps.

Fetch

Decode

Get Operand(s)

Carry out the operation

Store the execution result