CSE 490/590 Spring 2023 Homework 7

1. Discuss the applications in these two categories and explain how they architecturally differ from each other.

Vector processors
GPUs

- Similarities to vector machines:
  - Works well with data-level parallel problems
  - Scatter-gather transfers
  - Mask registers
  - Large register files

- Differences:
  - No scalar processor
  - Uses multithreading to hide memory latency
  - Has many functional units, as opposed to a few deeply pipelined units like a vector processor.

2. Explain Convoy and Chime

Convoy - A set of vector instructions that could potentially execute together
Chime - Unit of time taken to execute a convoy

3. In the figure given below, which architecture is better in terms of performance? Explain the reason for your answer. (Hint: Figures link for Chapter 4)
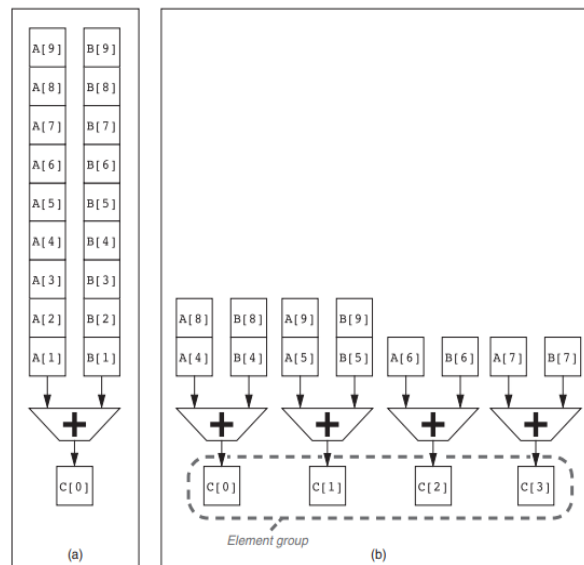
(b) is better because it has four add pipelines which can complete four additions per clock cycle, while (a) can complete only one addition per clock cycle.

CSE 490/590 Spring 2023 Homework 7

4. What are domain-specific architectures? Where are they most commonly used?

Domain Specific Architecture – Architectures used for a specific domain which provides factor of 100 improvements in the number of operations per second

Most commonly used in domains such as Machine Learning (Deep Neural Networks) and Image Processing

Explain briefly the following Domain specific architecture
  (a) Tensor Processing Unit
  (b) Catapult
  (c) Crest

  See Chapter 7, Domain Specific Architectures for these specific architectures.

5. Explain warehouse computers. Why should these computers address achieving low power consumption?

See Chapter 6, Warehouse-scale Computers