Module 2: HW/SW Partitioning
Lecture 2.1: Objective of HW/SW Partitioning

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Outline

• Objective of HW/SW partitioning
• Why is application-specific HW more efficient?
• Target architectures for HW/SW partitioning
• Key steps in HW accelerator design
Re-cap: The efficiency vs. flexibility tradeoff

- Orders of magnitude in performance and energy efficiency

性能 vs. 灵活性折衷

- 大量级的性能和能量效率

### 系统级芯片设计

<table>
<thead>
<tr>
<th>处理器类型</th>
<th>性能</th>
<th>能效</th>
</tr>
</thead>
<tbody>
<tr>
<td>StrongARM110</td>
<td>0.4 MIPS</td>
<td>0.4 MIPS/mW</td>
</tr>
<tr>
<td>TMS320C54x</td>
<td>3 MIPS</td>
<td>3 MIPS/mW</td>
</tr>
<tr>
<td>ASIP</td>
<td>20-30 MOPS</td>
<td>20-30 MOPS/mW</td>
</tr>
</tbody>
</table>

- 通用目的处理器
- 数字信号处理器
- 应用特定处理器
- 专用单元处理机
- 可编程的领域设备
- 标准单元
- 完全定制
HW/SW Partitioning

• Determining the right mix of “hardware” and “software” to implement a given function
  – Software → Runs on a general-purpose programmable processor
  – Hardware → Some degree of specialization to the function being implemented
HW/SW Partitioning

• Objectives
  – Meet performance target with minimum hardware added
  – Minimize energy/power while meeting performance constraint
  – Maximum performance while keeping certain functions flexible

• What makes this tricky is the inter-dependence between the different components
  – E.g., Does adding application-specific HW increase or decrease power?
  – How does application-specific HW impact overall system performance?