Lecture Notes: ARM64 Architecture and Programming

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1 Introduction to ARM64 Architecture

ARM64 (AArch64) is a 64-bit architecture developed by ARM Holdings, widely used in modern mobile devices and servers. ARM64 offers a significant register file structure, with 31 general-purpose registers and special-purpose registers such as the Program Counter (PC) and Stack Pointer (SP). These registers provide flexibility for performing low-level operations efficiently.

1.1 Key Features

- 64-bit general-purpose registers (X0-X30).
- Special-purpose registers for the stack, program control, and more.
- Optimized function calling convention.

2 General Purpose Registers

The general-purpose registers are used to store temporary values, pass parameters to functions, and store return addresses.

2.1 Register Overview

- **X0-X7**: Registers used for parameter passing.
- **X8**: Indirect result register.
- **X9-X15**: Caller-saved scratch registers.
- **X19-X28**: Callee-saved registers.
- **X29 (FP)**: Frame Pointer.
- **X30 (LR)**: Link Register (return address for subroutine calls).