3.2 Process Scheduling

Process Scheduling in Operating Systems

Process Scheduling is a fundamental function of the operating system that manages the execution of processes by determining which process runs at a given time. This involves managing various queues, selecting processes for execution, and performing context switches between them.

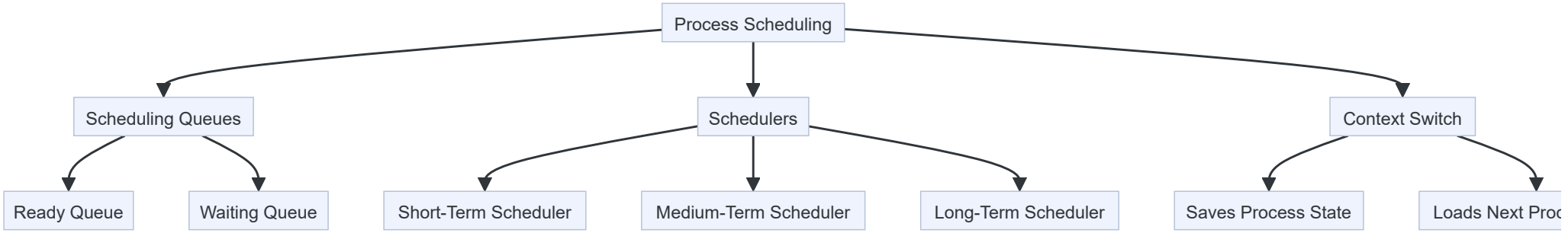
Explanation with Different Perspectives

- **Definition**:
  Process Scheduling involves assigning CPU time to different processes, ensuring efficient execution while maintaining fairness among processes.
- **Simple Usage**:
  Used to decide the order in which processes access the CPU, like managing turns in a game.
- **Scenario**:
  Imagine a classroom where the teacher decides who gets to speak next. The operating system is like the teacher, and the processes are the students, waiting in line to get their turn to speak.
- **Example**:
  When you open multiple applications on your computer, Process Scheduling determines which application gets to use the CPU next, ensuring all applications run smoothly.

Key Components of Process Scheduling

Component	Explanation
Scheduling Queues	Lists of processes waiting for different types of events (ready queue, waiting queue, etc.).
Schedulers	Components that select processes for execution; includes short-term, medium-term, and long-term.
Context Switch	The process of saving the state of a process and loading the state of another; allows multitasking.

Diagram: Process Scheduling Overview



Detailed Explanation of Key Components

1. **Scheduling Queues**:
   - **Ready Queue**: Holds processes that are ready to execute and waiting for CPU time.
   - **Waiting Queue**: Holds processes that are waiting for some I/O operation to complete.

2. **Schedulers**:
   - **Short-Term Scheduler (CPU Scheduler)**: Selects from among the processes in the ready queue and allocates the CPU to one of them. It operates very frequently and is critical for maintaining responsiveness.
   - **Medium-Term Scheduler**: Temporarily removes processes from the main memory (swap out) and places them in secondary storage (swap in) to reduce the degree of multiprogramming.
   - **Long-Term Scheduler (Job Scheduler)**: Determines which processes are to be admitted to the system for processing. Controls the degree of multiprogramming.

3. **Context Switch**:
   - **Definition**: A mechanism that allows the CPU to switch from one process to another, enabling multitasking.
   - **How it Works**: The CPU saves the current process state (registers, program counter, etc.) and loads the saved state of another process.

Summary Table: Process Scheduling Components

Component	Purpose	Function	Example
Scheduling Queues	Manage different process states	Ready Queue, Waiting Queue	Processes waiting for CPU or I/O events
Schedulers	Decide process execution order	Short-Term, Medium-Term, Long-Term	Selecting the next process to execute
Context Switch	Enables multitasking by switching states	Saves and loads process states	Switching between two open applications on your computer

Conclusion

Process Scheduling ensures that all processes get a fair chance to execute, enhancing the system's overall efficiency and responsiveness. By managing various queues, selecting processes for execution, and performing context switches, the operating system maintains smooth multitasking.