

# Windows Processes

- Implemented as objects
- An executable process may contain one or more threads
- Both processes and thread objects have built-in synchronization capabilities

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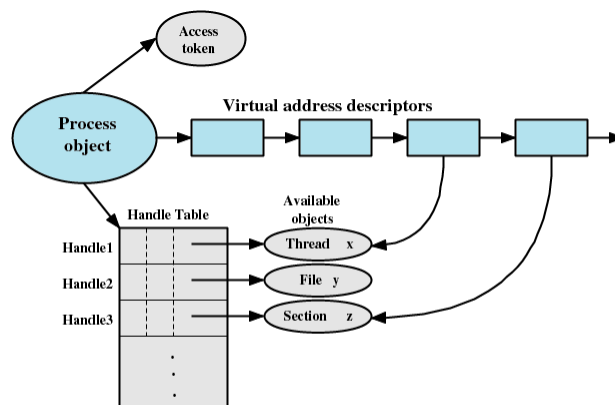
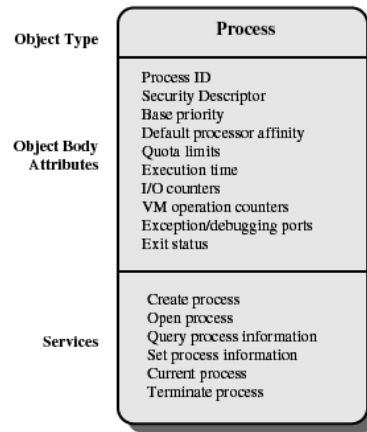


Figure 4.12 A Windows Process and Its Resources

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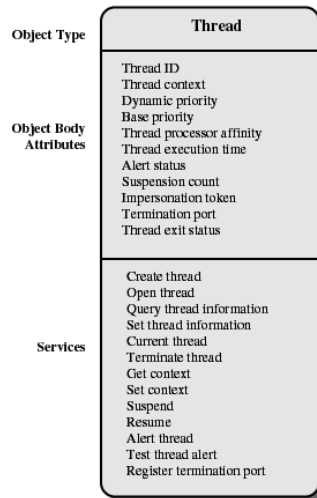
# Windows Process Object



(a) Process object

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# Windows Thread Object



(b) Thread object

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# Windows 2000 Thread States

- Ready
- Standby
- Running
- Waiting
- Transition
- Terminated

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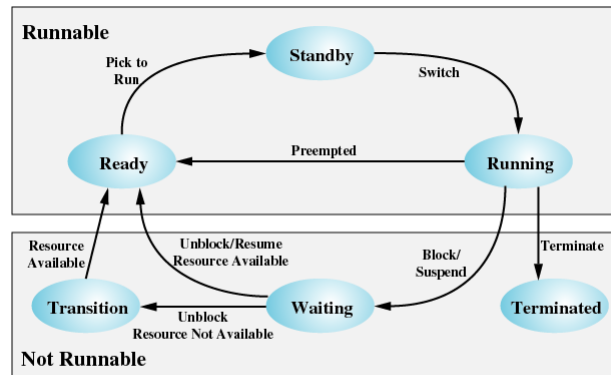


Figure 4.14 Windows Thread States

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# Solaris

- Process includes the user's address space, stack, and process control block
- User-level threads
- Lightweight processes (LWP)
- Kernel threads

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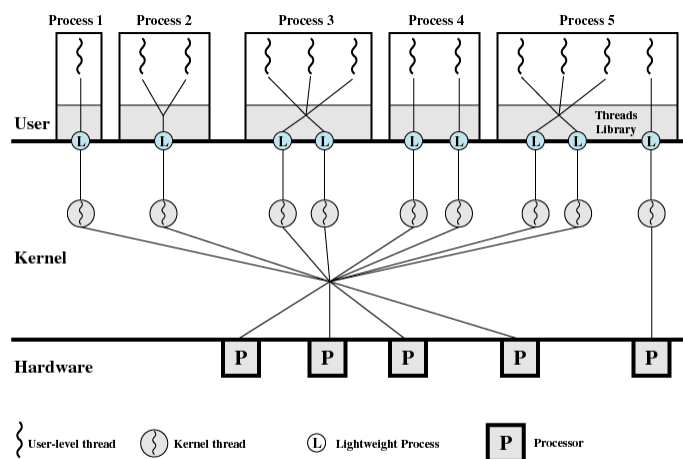
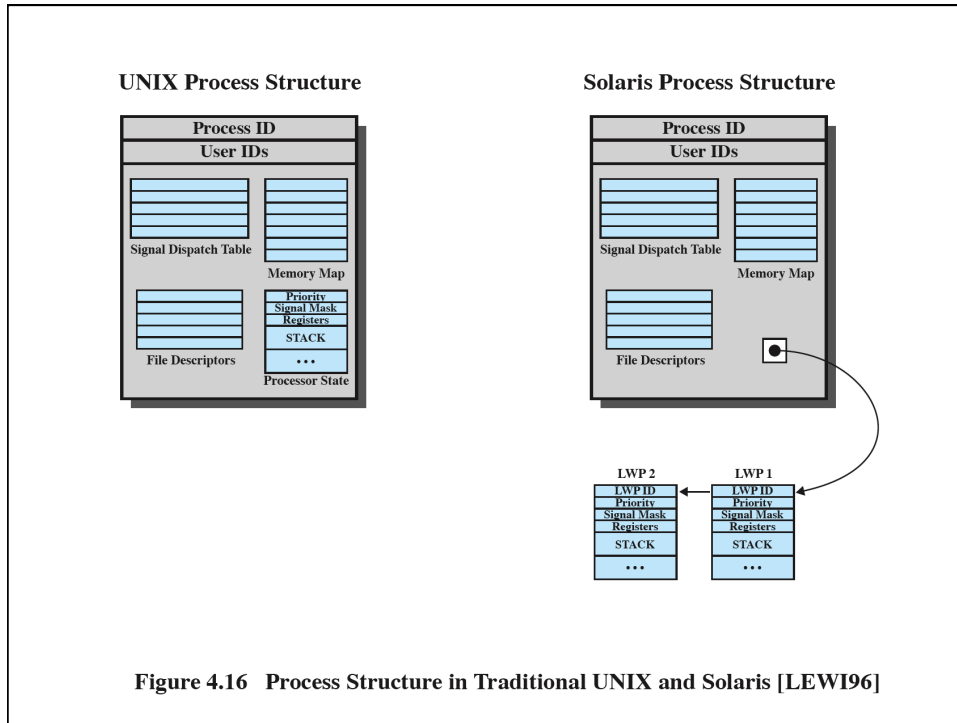


Figure 4.15 Solaris Multithreaded Architecture Example

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## Solaris Lightweight Data Structure

- Identifier
- Priority
- Signal mask
- Saved values of user-level registers
- Kernel stack
- Resource usage and profiling data
- Pointer to the corresponding kernel thread
- Pointer to the process structure

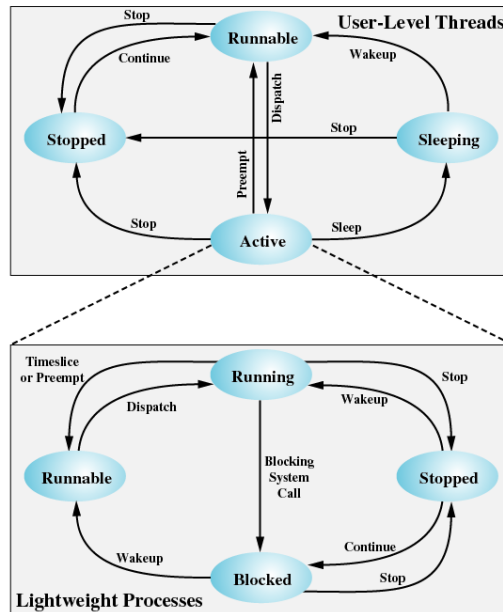


Figure 4.17 Solaris User-Level Thread and LWP States

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## Linux Task Data Structure

- State
- Scheduling information
  - normal or real-time, priorities
- Identifiers
- Interprocess communication
- Links
- Times and timers
- File system
- Address space
- Processor-specific context

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# Linux States of a Process

- Running
- Interruptable
- Uninterruptable
- Stopped
- Zombie

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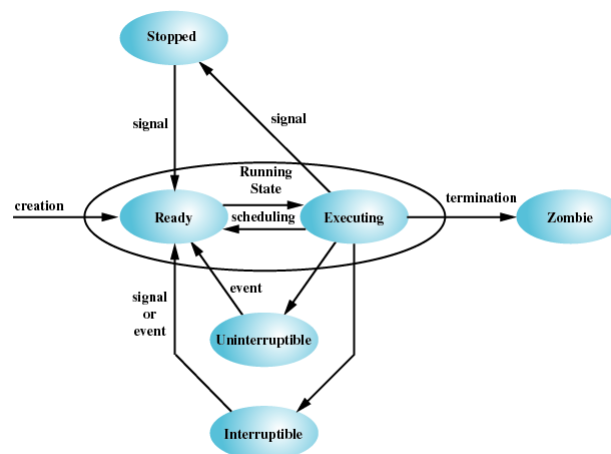


Figure 4.18 Linux Process/Thread Model

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