Windows OS Processes and Threads

GUILAN UNIVERSITY PRESENTATION

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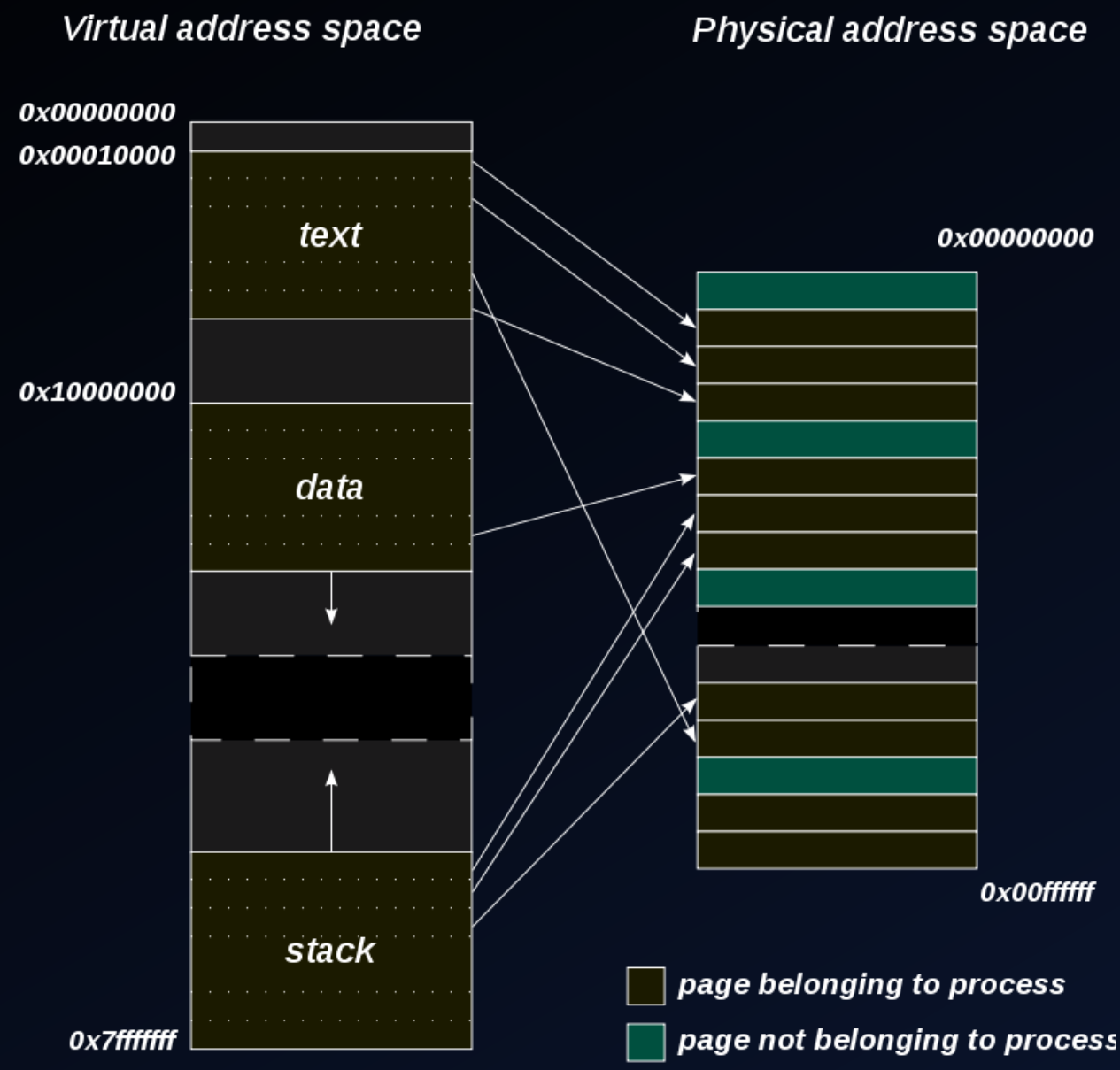
Presentation Content

- Theoretical Presentation
  - Process and Threads in Windows
  - Job object
  - Thread Pool
  - Windows vs Linux thread states
- Practical Presentation
  - Windows Task Manager
  - Linux htop and nmon
  - Process Explorer and process list overview
  - Performance Monitor (perfmon.msc)

Processes

- Virtual address space
- Executable code
- Open handles to sys objects
- Security context
- Unique Process Identifier (PID)
- Priority class
- Minimum and Maximum working set sizes
- At least one Thread of execution


Virtual address space
Physical address space
0x00000000
0x00010000
text
0x10000000
data
stack
0x7fffffff
0x00000000
0x00ffffff
page belonging to process
page not belonging to process

Thread

- Thread is an Entity within a process that can be scheduled for execution.
- System can simultaneously execute as many threads as there are processors on the computer

Thread

Shares:

- Virtual address space
- System resources

Maintains:

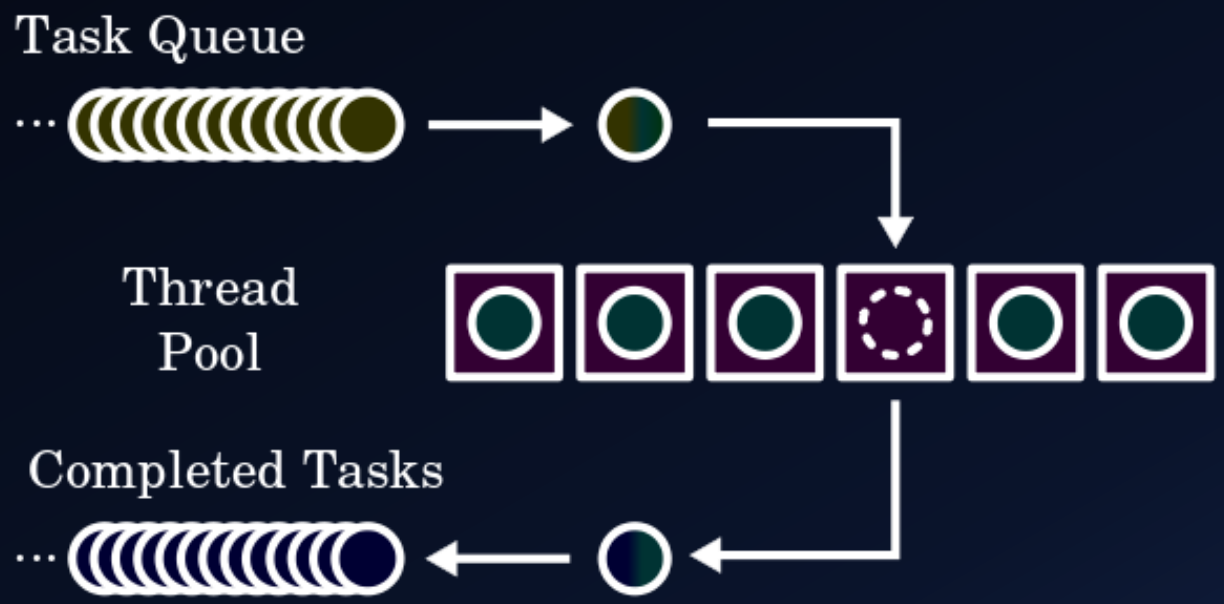
- Exception Handlers
- Scheduling priority
- Local storage
- Unique Thread Identifier (TID)
- Structure set for saving context

Job Object

- Allows group of processes to be managed as a unit
- Are:
  - Namable
  - Securable
  - Sharable
- Controls attributes of processes associated
- Operations on them affects processes

Thread Pool

- Reduces application threads
- Provides management for worker thread



Windows vs Linux Thread States

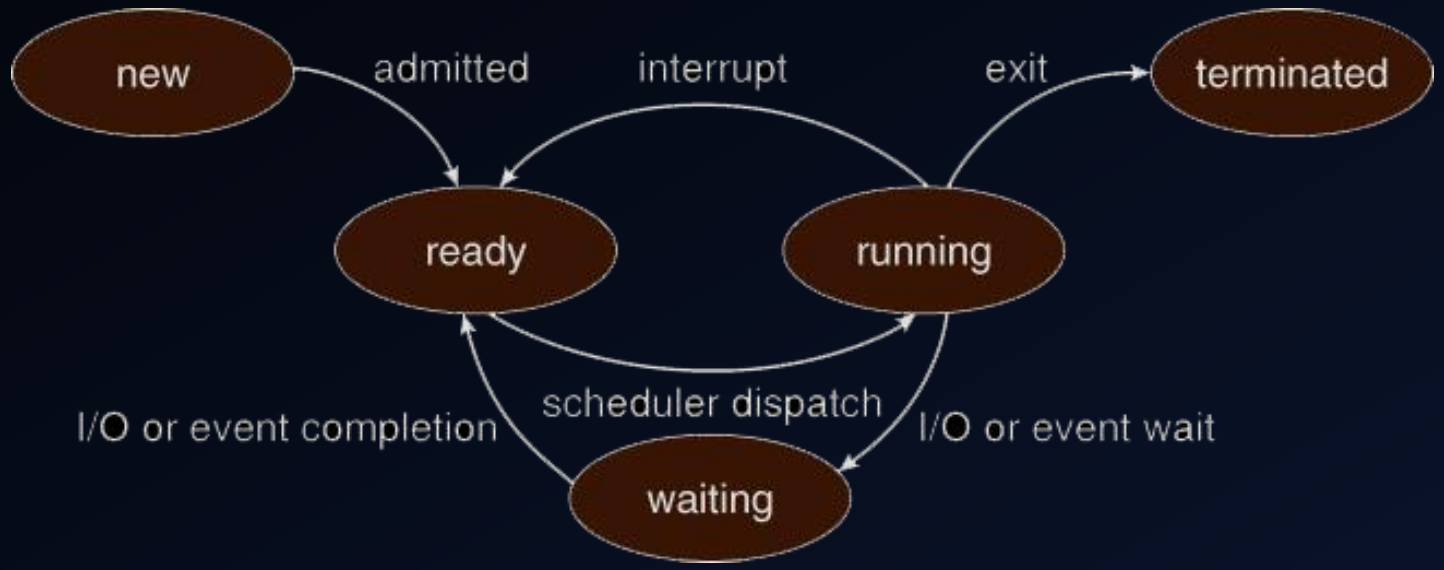
Windows Thread States	
Code	State
0	Initialized
1	Ready
2	Running
3	Standby
4	Terminated
5	Waiting
6	Transaction
7	Unknown

Linux Thread States	
Code	State
	ready
	blocked
	running
	terminated

Windows vs Linux Thread States

- Initialize
  - Thread initialized but not started yet
- Ready
  - Thread is waiting to use a processor because no processor is free. The thread is prepared to run on the next available processor.
- Running
  - Thread currently using a processor
- Standby
  - Thread is about to use a processer. Only one thread can be at this state at a time
- Terminated
  - Thread has finished executing and has exited
- Wait
  - Thread is waiting for an event: sync, IO, Time limit
- Transition
  - waiting for a resource, other than the processor

Linux Thread States



Windows Thread States