Process Control Block

Each system process is represented by a Process Control Block (PCB), which is a data structure that contains all requisite information for the Processor Manager to track process movement throughout creation, execution, and termination in the system. Similarly, each thread is represented by a Thread Control Block (TCB)—the corresponding data structure for thread management.

- **Process Identification (PID)**: unique identifier
- **Process Status**: current job status (i.e., HOLD, READY, RUNNING, WAITING, FINISHED) and resources required for said status
- **Process State**: Information related to job state
  - *Process status word*: present instruction counter and register contents when not running
  - *Register contents*: process data during interrupt
  - *Main memory*: logical and physical memory address
  - *Resources*: data relating to allocated resources (e.g., disk sector, peripheral devices)
  - *Process priority*: used for priority scheduling systems
- **Accounting**: billing information and performance metrics
  - CPU time used during execution
  - Total time on system
  - Main storage occupancy
  - Secondary storage usage
  - Systems programs used (e.g., compilers, editors)
  - Amount and type of IO operations
  - Time waiting for IO completion
  - Data bandwidth

Thread Control Block

Typical contents of TCB

1. **Thread identification**: unique identifier
2. **Thread state**: current state of thread (READY, RUNNING, WAITING, DELAYED, BLOCKED)
3. **CPU information**: data the operating system needs to track progress of thread execution, current instruction, and data being used
4. **Thread priority**: used to indicate weight of thread relative to other threads, and used to determine which thread should be selected from the READY queue
5. **Process pointer**: indicates the process that created the thread
6. **Sub-thread pointers**: indicates other sub-threads created by this thread

nb. It is the PCBs and TCBs that are linked together in their respective queues by the job and process schedulers. Note that while control blocks are grouped in HOLD, READY, RUNNING, and FINISHED queues, when in a WAITING state, they are grouped by their reason for waiting; for example, processes waiting due to a page fault will be queued together while processes waiting for a disk IO request will be linked together in another waiting queue.