

Table 8.2 Example Page Sizes

| Computer | Page Size |
|------------------------|-----------------------|
| Atlas | 512 48-bit words |
| Honeywell-Multics | 1024 36-bit word |
| IBM 370/XA and 370/ESA | 4 Kbytes |
| VAX family | 512 bytes |
| IBM AS/400 | 512 bytes |
| DEC Alpha | 8 Kbytes |
| MIPS | 4 kbytes to 16 Mbytes |
| UltraSPARC | 8 Kbytes to 4 Mbytes |
| Pentium | 4 Kbytes or 4 Mbytes |
| PowerPc | 4 Kbytes |

Table 8.3 Operating System Policies for Virtual Memory

| | |
|---|--|
| Fetch Policy Demand Prepaging | Resident Set Management Resident set size Fixed Variable Replacement Scope Global Local |
| Placement Policy | |
| Replacement Policy Basic Algorithms Optimal Least recently used (LRU) First-in-first-out (FIFO) Clock Page buffering | Cleaning Policy Demand Precleaning |
| | Load Control Degree of multiprogramming |

Table 8.4 Resident Set Management

| | Local Replacement | Global Replacement |
|----------------------------|--|---|
| Fixed Allocation | <ul style="list-style-type: none">•Number of frames allocated to process is fixed.•Page to be replaced is chosen from among the frames allocated to that process. | <ul style="list-style-type: none">•Not possible. |
| Variable Allocation | <ul style="list-style-type: none">•The number of frames allocated to a process may be changed from time to time, to maintain the working set of the process.•Page to be replaced is chosen from among the frames allocated to that process. | <ul style="list-style-type: none">•Page to be replaced is chosen from all available frames in main memory; this causes the size of the resident set of processes to vary. |

Table 8.5 UNIX SVR4 Memory Management Parameters (page 1 of 2)

Page Table Entry

Page frame number

Refers to frame in real memory.

Age

Indicates how long the page has been in memory without being referenced. The length and contents of this field are processor dependent.

Copy on write

Set when more than one process shares a page. If one of the processes writes into the page, a separate copy of the page must first be made for all other processes that share the page. This feature allows the copy operation to be deferred until necessary and avoided in cases where it turns out not to be necessary.

Modify

Indicates page has been modified.

Reference

Indicates page has been referenced. This bit is set to zero when the page is first loaded and may be periodically reset by the page replacement algorithm.

Valid

Indicates page is in main memory.

Protect

Indicates whether write operation is allowed.

Disk Block Descriptor

Swap device number

Logical device number of the secondary device that holds the corresponding page. This allows more than one device to be used for swapping.

Device block number

Block location of page on swap device.

Type of storage

Storage may be swap unit or executable file. In the latter case, there is an indication as to whether the virtual memory to be allocated should be cleared first.

Table 8.5 UNIX SVR4 Memory Management Parameters (page 2 of 2)

Page Frame Data Table Entry

Page State

Indicates whether this frame is available or has an associated page. In the latter case, the status of the page is specified: on swap device, in executable file, or DMA in progress.

Reference count

Number of processes that reference the page.

Logical device

Logical device that contains a copy of the page.

Block number

Block location of the page copy on the logical device.

Pfdata pointer

Pointer to other pfdata table entries on a list of free pages and on a hash queue of pages.

Swap-use Table Entry

Reference count

Number of page table entries that point to a page on the swap device.

Page/storage unit number

Page identifier on storage unit.

Table 8.6 Average Search Length for one of N items in a Table of Length M

| Technique | Search Length |
|-------------------------------|----------------------------|
| Direct | 1 |
| Sequential | $\frac{M + 1}{2}$ |
| Binary | $\log_2 M$ |
| Linear hashing | $\frac{2 - N/M}{2 - 2N/M}$ |
| Hash (overflow with chaining) | $1 + \frac{N - 1}{2M}$ |