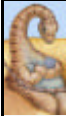


Capitolo 9: Memoria virtuale

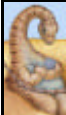


Capitolo 9: Memoria virtuale



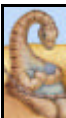
- Introduzione
- Paginazione su richiesta
- Copiatura su scrittura
- Sostituzione delle pagine
- Allocazione di frame
- Paginazione degenerare (*thrashing*)
- File mappati in memoria
- Allocazione di memoria del kernel
- Ulteriori considerazioni
- Esempi di sistemi operativi



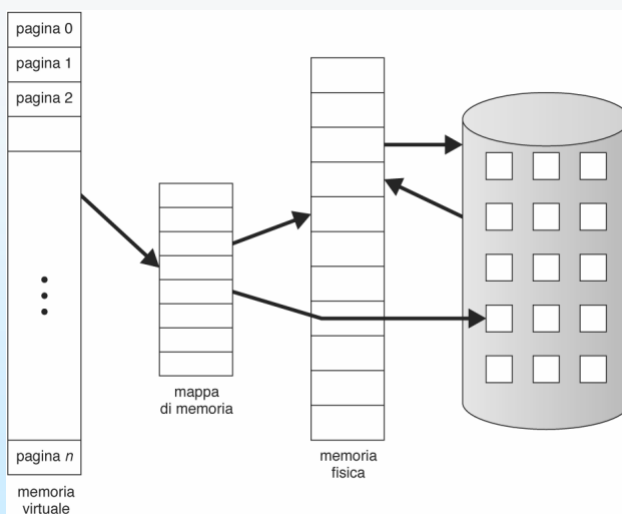


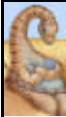
Obiettivi

- Descrizione dei vantaggi derivati dalla memoria virtuale.
- Definizione dei concetti di paginazione su richiesta, algoritmi di sostituzione di pagina e allocazione di frame di pagina.
- Analisi dei principi del modello dell'insieme di lavoro (*working-set*).

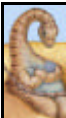
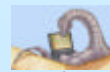
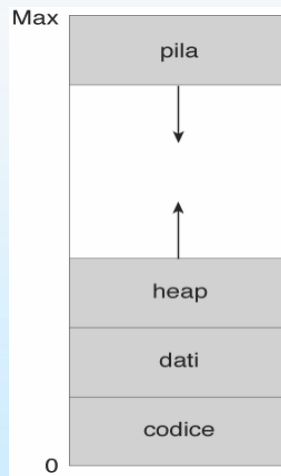


Schema che mostra una memoria virtuale più grande di quella fisica

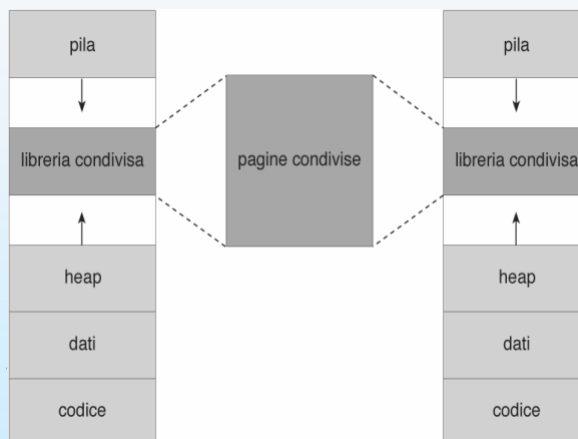


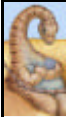


Spazio degli indirizzi virtuali

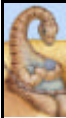
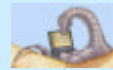
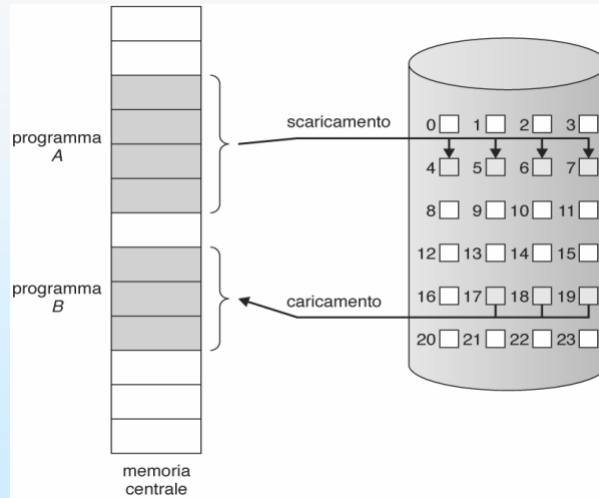


Condivisione delle librerie tramite la memoria virtuale





Trasferimento di una memoria paginata nello spazio contiguo di un disco



Bit valido – non valido

- Bit di validità (v) o non validità (i) in una tabella delle pagine.

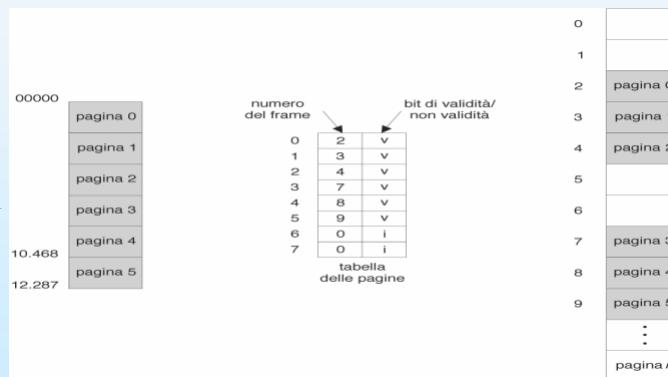
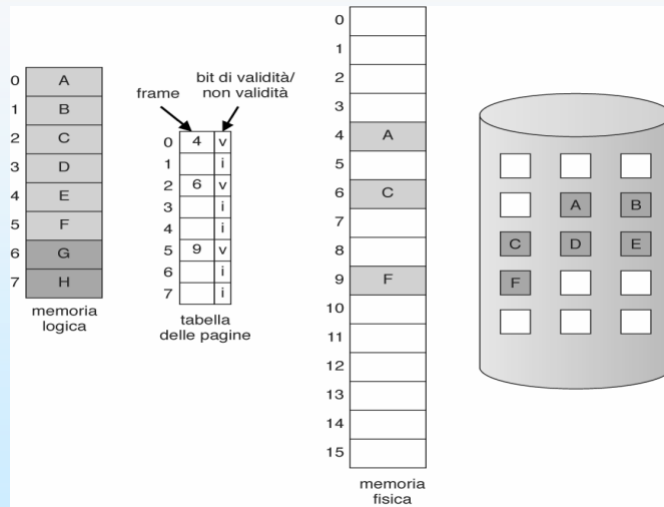
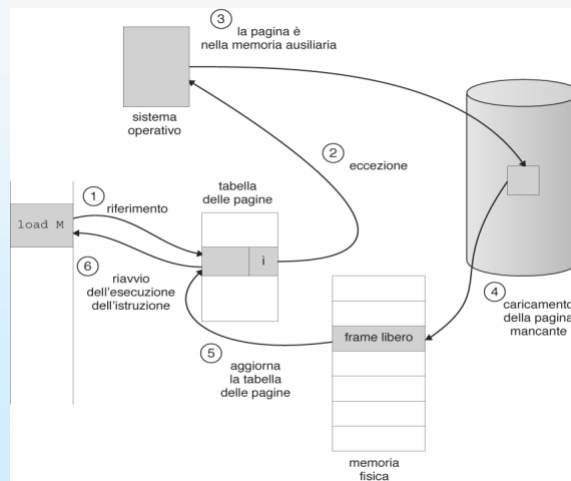
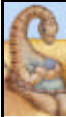


Tabella delle pagine quando alcune pagine non si trovano nella memoria centrale

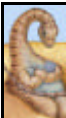
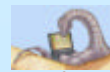
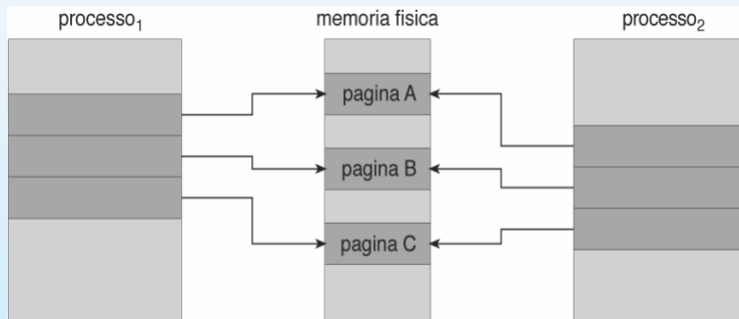


Fasi di gestione di un'eccezione di pagina mancante

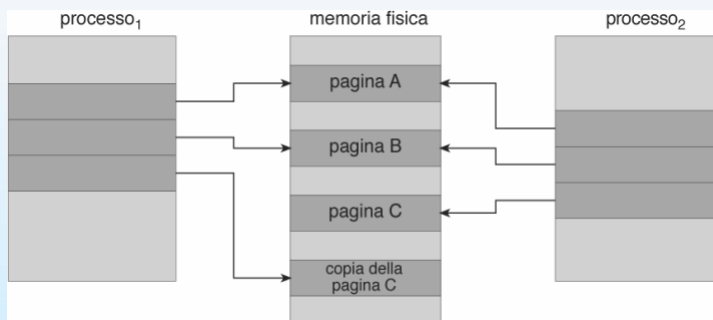




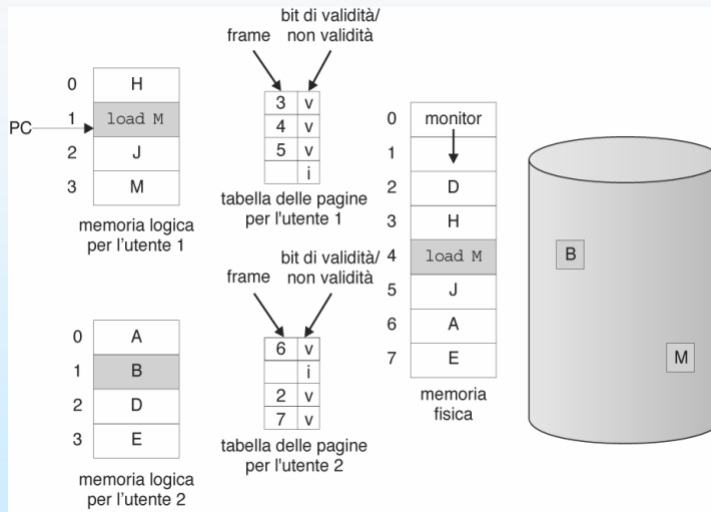
Prima della modifica alla pagina C da parte del processo₁



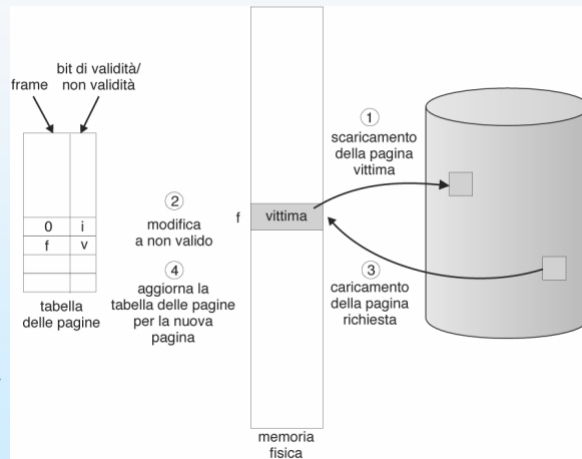
Dopo la modifica alla pagina C da parte del processo₁



Necessità di sostituzione di pagine



Sostituzione di una pagina



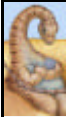
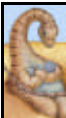
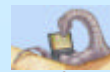
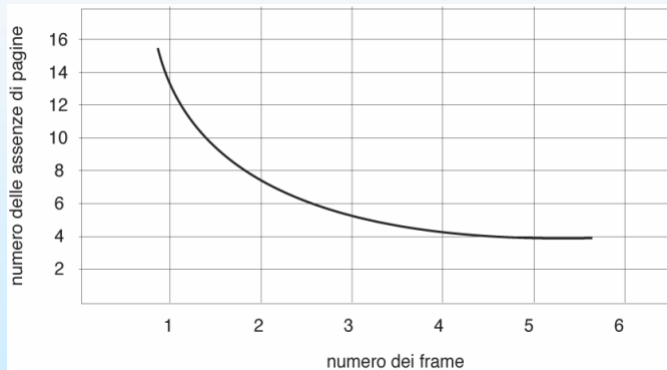
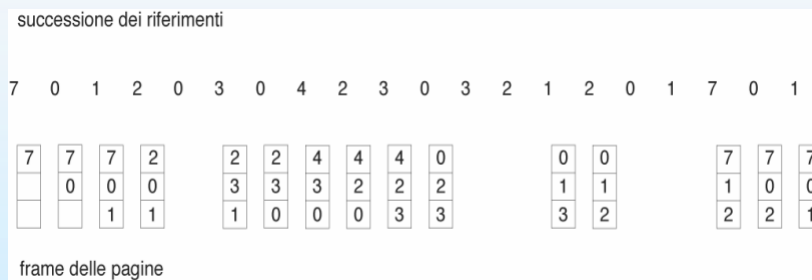
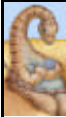


Grafico che illustra il numero di assenze di pagina rispetto al numero dei frame

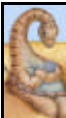
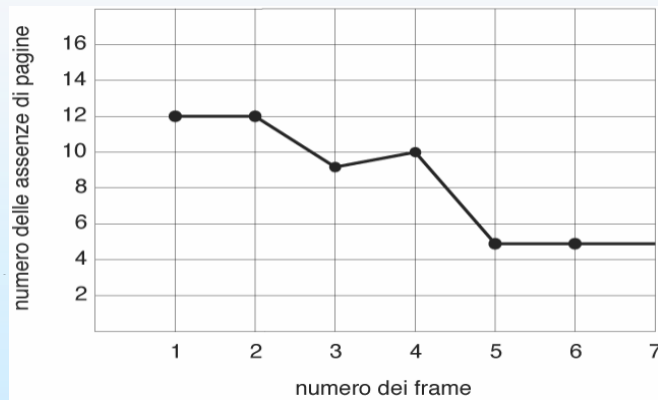


Sostituzione di pagina FIFO





FIFO che illustra l'anomalia di Belady



Algoritmo ottimale di sostituzione delle pagine

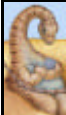
successione dei riferimenti

7 0 1 2 0 3 0 4 2 3 0 3 2 1 2 0 1 7 0 1

7	7	7	2	2	2	2	7
	0	0	0	0	4	0	0
		1	1	3	3	3	1

frame delle pagine





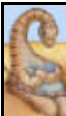
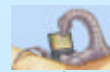
Algoritmo di sostituzione delle pagine (LRU)

successione dei riferimenti

7 0 1 2 0 3 0 4 2 3 0 3 2 1 2 0 1 7 0 1

7	7	7	2	2	4	4	4	0	1	1	1
	0	0	0	0	0	0	3	3	3	0	0
		1	1	3	3	2	2	2	2	2	7

frame delle pagine



Uso di una pila per registrare i più recenti riferimenti alle pagine

successione dei riferimenti

4 7 0 7 1 0 1 2 1 2 7 1 2

2
1
0
7
4

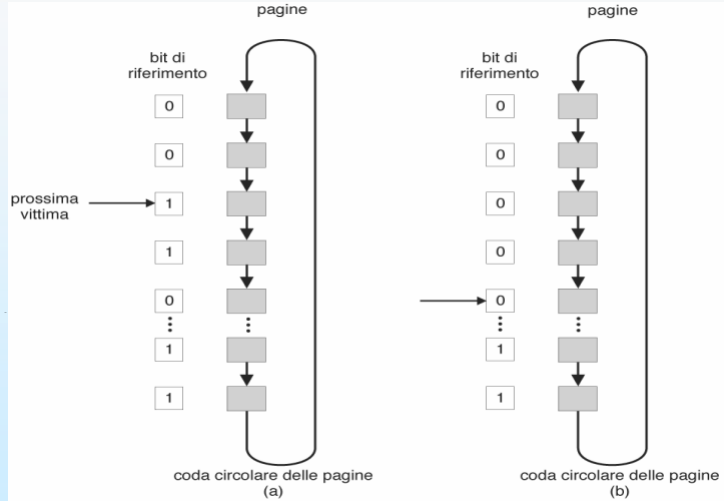
pila
prima di a

7
2
1
0
4

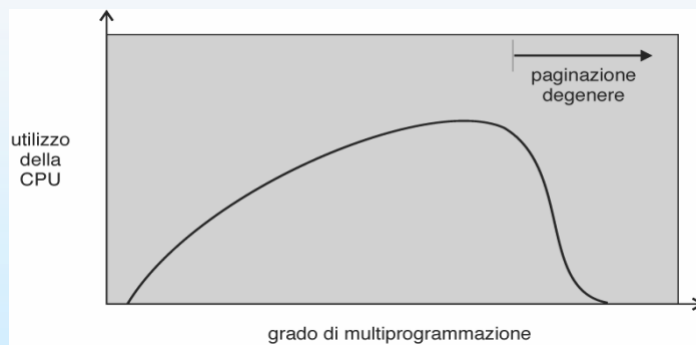
pila
dopo b

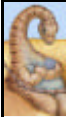


Algoritmo di sostituzione delle pagine con seconda chance (orologio/clock)

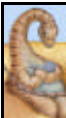
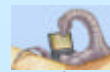
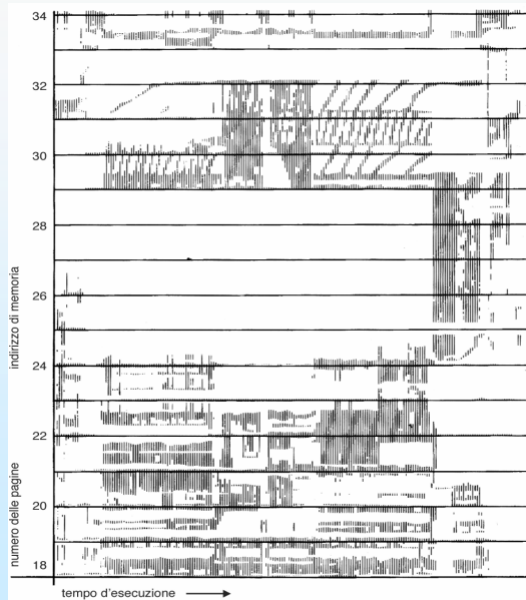


Paginazione degenera (thrashing)

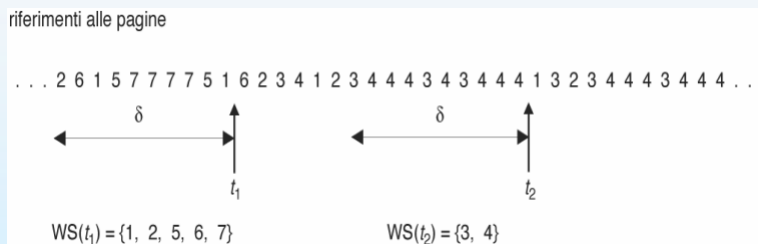




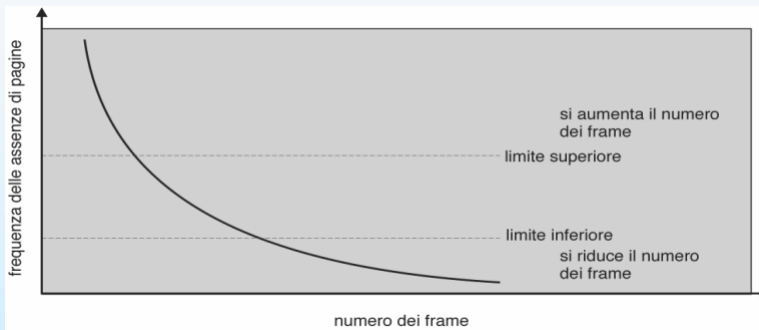
Località dei riferimenti alla memoria



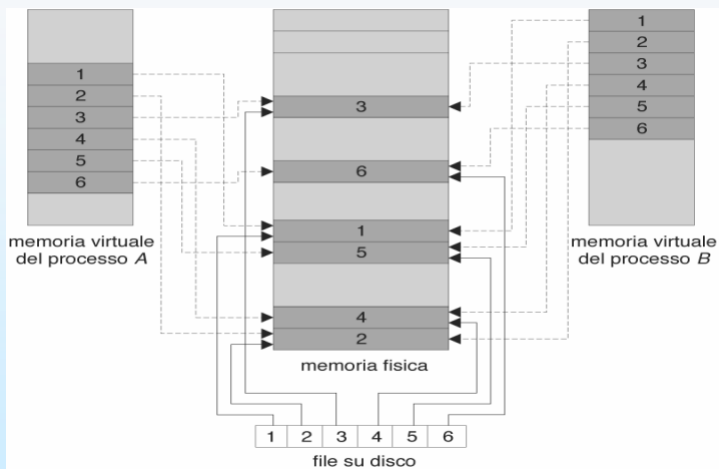
Modello dell'insieme di lavoro

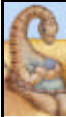


Frequenza delle assenze di pagine

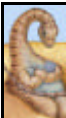
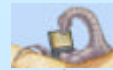
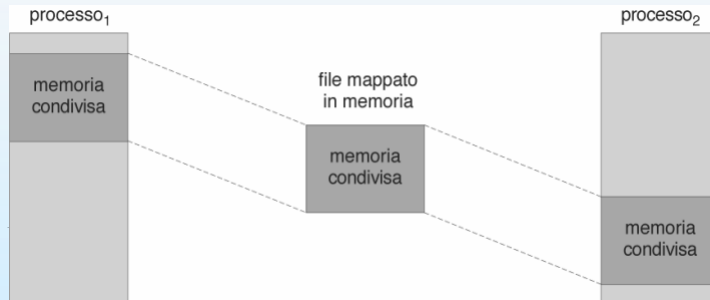


File mappati in memoria

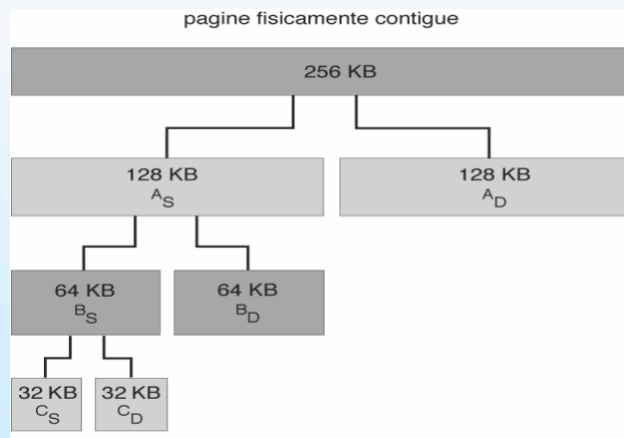


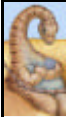


Condivisione della memoria in Windows tramite I/O mappato in memoria

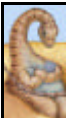
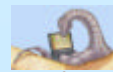
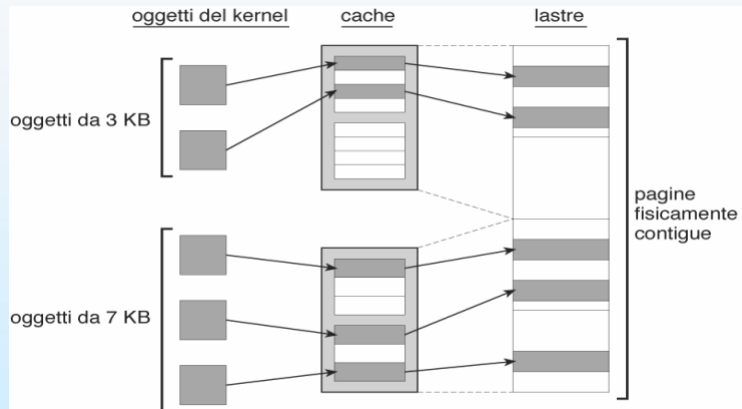


Sistema di allocazione "buddy"

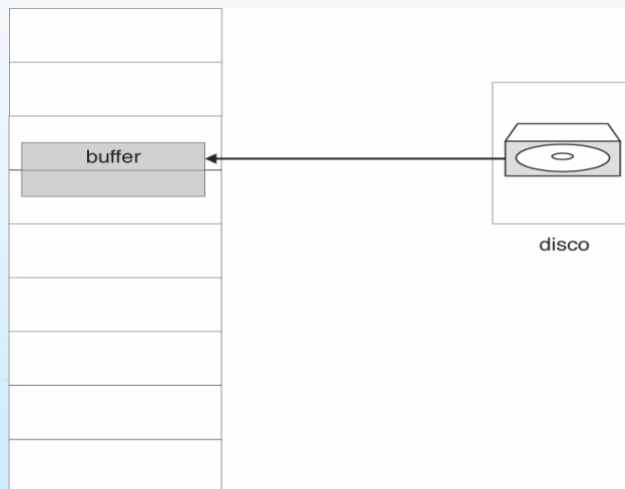


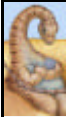


Allocazione a lastre (slab)

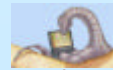
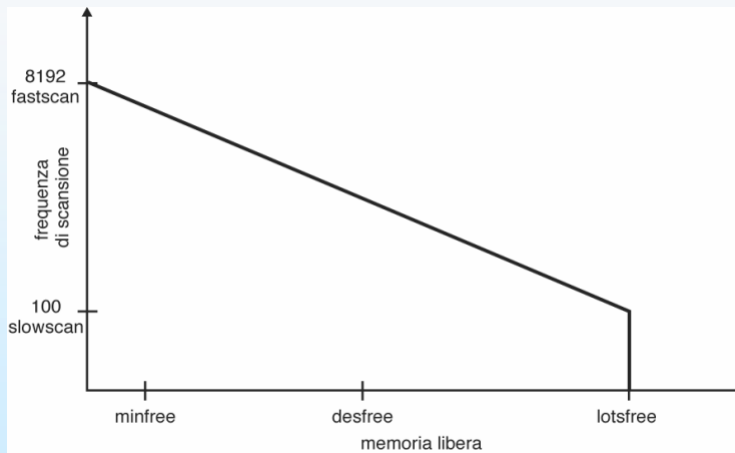


Ragione per cui i frame usati per l'I/O devono essere presenti in memoria





Scansione delle pagine in Solaris



Fine del Capitolo 9

