Variable-Barrad Sampled Working Set (VSWS): evals working set of proc @ sampling instructs based on clipsed virt time. Divers by min & mar of sampling instructs, it began final abords on come by a studieg instructs based on clipsed with time. Divers by min & mar of sampling instructs based on the process of the sample of t "Virtual Mem; starge alloc where where secondary mem can be addressed as if part of main mem. Addres a program may use to refree medicinguished it address men sy uses to identify this yearing electron part of the translated about the control of the part of t Terms:

*Virtual Mem: storage alloc scheme where secondary mem can be addressed as if part of main mem. Addies a program may use to ref mem distin INTERES — UNITROCESSOR SCHEDULING essor Scheduling: Aims to assign procs to be exec by processor in a way that meets sys obj. e.g. response time, throughput, & pr i into 3 functions: Long-term scheduling, Medium-term scheduling, Short-term scheduling down too 3 intercents. Long-erm was recommended.

Types of Scheduling.

Long-term adds to pool of proce to be exec. determines programs admitted to sys for processing.

Long-term adds to pool of proce to be exec. determines programs admitted to sys for processing.

Counted degree of multiprogramming, more proce cereard, smaller % of time each proc can be exec & may limit to provide satisfactory service to care processing to the processing of the processing o term determines which neady pones will be eace next by processor. Known an dispatcher. Exec mont frequently. Makes fine-grained decision of which execut knowless when event occurs that may lead to blocking of our proc or may provide opportunity to present curr running proc in favor of another, it interrupts, O atterrupts, OS calls. Signals (e.g., semaphores) in the solution process time to optimize certain aspects of sys behavior — set of criteria to eval sched policy. Classified into a) performance related: Characteristics of Paging & Segmentation
Simple Paging unitative, easily measured (e.g. response time & throughput) or b) non-performance related; qualitative, hard to measure (e.g. predictability)

User-oriented criteria: relates to behavior of sys as perceived by user or proc (e.g. response time in interactive sys). Important on virtually all systems.: Virt Mem Paging Virt Mem Segmentation Main mem partitioned into frames
o pgs by compiler / Progs broken into pgs by compiler /
mem mgmt sys refined criteria. remove where the completion are Related:

It is a completion includes actual exe time + time waiting for resources (includes prodifferent actual of time by proc submission & completion. Includes actual exe time + time waiting for resources (includes promem mgmt sys Internal frag in frames Turnaround time: inte measure for outen job.

Response time: time from request submission til proc begins to be received.

Non-performance related: Introducing sched points you should painly to must a of parts competen per unt or turn. Assessare of now must work a seen process that it is quite painly pa Not all pgs need be in main mem frames for proc to run. Pgs may be read in as needed Reading pg into main mem may require writing pg out to disk Iternative Scheduling Policies Round Robin SPN SRT FCFS incomes in the future. Avoise theraking.

Sage needed for Yu Meha hadware must supp paging & segmentation. OS must include software for managing movement of pgs and/or segs but so men A main men

Paging term vir men musually susceized w/ systems that employ paging. Each pnc has own pg table, where each entry contains frame # of correspond main norm.

Memory Management Formats max[w] Non-preemptive Non-preemptiv Mode amival) Not emphasized High High High Provides good response time for Provides good response time for short procs Can be high May be high, esp if Response Time Provides good response time Provides good response time Effect on Processes PhilOther necessaria Basicano Determinas which ready mos elected until for east. May be based unjum, resource requirements, excess characteristics of pass. If based on exce characteristics have inported quantiles use we'll use good in good soft, awaing e-e' mine good in my cost of many for the passion of the passio (a) Paging only Number Page Number Offset s much better for long procs > short ones. Tends to favor processor-bound procs over I/O bound procs

5 10 15 20 Inverted Page Table: pg # portion of vira addy is mapped into hash value >> points to inverted pg table. Fixed proportion of real mem required for tables regardless of # of procs or viri pgs supped. Struct inverted be it indexes pg # entries by frame # instead of viri pg #. Each entry includes pg #, process identifie (pid that owas his page), control bis (includes flage # port bocking info), and chain pointer (index val of next entry ment accesses fisch ge labe casy, fest data).

Ausdricht Magging: If Ba oby cannius nome ge labe carrier, o'can't index into TLB based on pg 8; each TLB entry must ine pg # & complete pg labe carry.

Processor equipped wit hardware to simultaneously interrugate TLB entries to determine if there's a mark on page 3; each in malignorgament environ, perior of a page label on set be vir men instant of aims man environment of the page label on set be vir men instant of aims men. Psychordarcentials of some secondary environ environment of the page label on set be vir vir men instant of aims men. Psychordarcentials of some secondary environment environment of the page label on set be vir vir men instant of aims an environment of the page label on set be in the page label on set be in the page label on set be in the page label on set to the page label on set be in the page label on set to the page label on set label to play main men size & program set to be a page label on set label to play main men size & program set to be a page label on the page label Sementation: The start years used by apper gritting larger (most devises on PC, where appelenceme increasingly complex)

**Commentation: Allows reportment to see men as having multiple darky species/generics

**Adds: simplifies handling of growing data stracts, allows programs to be altered & recompiled independently, lends itself to sharing data among processes, lends need to proceed in the start of procedure. itself to protection

(in Contraction and the part of the contraction and the part of corresponding org in main mem & seg length. A bit needed to determine if seg already in main

(in Contraction and the part of the contraction of the part of the OS Software design of mean maps protons of OS depends on whether or not to use vir men techniques, see of applies permittation-both, algoe employed for viction inspects of mean maps by some performance image fairable, belocked: First Parties (medical period per Shortest Remaining equal efficiency.

selection of pg in main mem to be replaced when new pg brought in: removed pg least likely to be reffed near future. More Ratio Next (HRRN) greater hardware & software overhead. .ing: when frame locked, the curr stored pg in that frame may not be replaced. OS kernel & key ctrl structs held in locked frames. I/O buffers & time-INSERT PICTURE HERE Performance Comparison: ant sched discipline that chooses next item to be served independent of service time obeys relationship: Tr/Ts = 1/1-p where Tr= turnaround time or residence time (waiting + exec), T_s = average service time (running state), p = processor util.

CHAPTER 7 — MEMORY MANAGEMENT
Framer (Excel-length block of main mem. Available chunks of mem
Page; fixed-length block in secondary mem (ex: disk). Can be temp copied into frame of main mem. Chanks of a process
Segment: variable-length block in secondary mem. May temporarily be copied into available region of main mem tegme

Segment, seamles enging to the actionally time, any empoward pre-topics and retained region to main metant regions man and the conjudit non main membrane (and the conjudit non main membrane). Mean Migrat studies reage Released in Protection, Statuting, Lugical Org., Physical Org. Physical Org. Physical Org. Released in Protection (Statuting Vinderson and Conjudit non-more man membrane). The membrane of the protection of th

of matrim. Both mean and generate to real near instantons for reasoning wrating. Exclusion or program main ment unipredictable, when reisy generated by proc circus.

Sharring: adv to allow each proc access to same copy of program instead of own copy. Mem mgmt, must allow controlled access to shared areas of mem w/o

impromising prots. Mechs supporting relocation supp sharing capabilities.

ogical Org: mem org as linear; modules written & compiled independently & can have diff degrees of prots, sharing on mod lvl corre

Flood Partitioning: main mem divided into 8 of static parts 80 vp generation time, equal-sized parts where any prov. whose size <= part size available part. OS can wapp out proc. 1 all parts are full it no proc is in ready/maning acte.

All simple to implement filed OS overhead.

Danks: inefficient use of mem due to internal face (wasted space since may program occupies entire part regardless of size); max 8 of active 1 Danks: parts vegetion: 1 all sizes of sizes (max 8 of active 1 Danks); parts vegetion of vegetion of the sizes of sizes; max 8 of active 1 Danks: 8 parts vegetion of vegetion of the sizes of active 1 Danks: 8 parts vegetion of vegetion of the sizes of active 1 Danks: 8 parts vegetion of vegetion of the sizes of active 1 Danks: 8 parts vegetion of vegetion of the sizes of active 1 Danks: 1 Danks:

time).

1 minus and Apper
Particle Chomos block choose in size
Placed the points to scan men from the pinning & chooses 1* available clock large enough
Manfall the phinis to scan men from the placement & chooses next available large enough block
Manfall the phinis scan men from large placement & chooses next available large enough block
Manfall the phinis scan men from large placement & chooses next available to raile research
Bandly Syr, comprised of fixed & dynamic particioning schemes. Space available for also research
Bandly Syr, comprised of fixed & dynamic particioning schemes. Space revuilable for also research
Bandly Syr, comprised of fixed & dynamic particioning schemes. Space revuilable for also research
Bandly Syr, comprised of fixed & dynamic particioning schemes. Space revuilable for also revue for the scheme for the property of the scheme for the sch

Paging: parts mem into relatively small equal fixed-size chunks (frames). Proc divided into small fixed-size chunks of same size (nares). Pr

Page Table - maintained by OS for each proc. contains frame location for each pg in process, proc must know how to access for curr proc., used by pracess produce, pgls and process, proc. must be substituted as the process that may very in length (to there is a max length). Addressing consists of 2 parts: seg # & offsee Adv to interest frags propored ment still. An endough of the process that may very in length (to the process that may very in the process that may very in the process process process process that may very in an dynamic pass.

Adv to interest frags propored ment still. A reduced overhead

Dauly versual fragmentation.

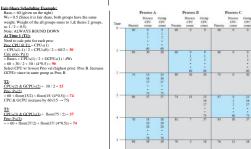
Security lower: Up two hos not declared portions to be sharable, then no other proc should have access to contents of that men portion. If proc declares the

Security lassue: If proc. has not declared portion to be durable, then no other proc should have access to contents of that men portion. If proc declares that portion may be shared power declared process. One security ment uses used pith one proches may be shared power declared to ment input that can occur when proc attempts to store data beyond limits of fixed-and process. The shared process of the process

Address
Logical: ref to mem location independent of curr assignment of data to mem









Classes of Multiprocessors: Loosely Coupled/Distributed Multiprocessor or cluster: consists of collection of relatively autr

here time to next ref is the longest. Produces 3pg faults after fram alloit of filled
(LRU): replaces page that hasn't been referenced for longest time. By locality, should be page least likely to be refed in near future. A lot

Out (FIFO): Treats page gram malloced to proc as circular buffer. Pgs removed round-robin style (simple replacement policy). Page in mem

Took Policy: requires association of additional bit w/ each frame (use bit). When page first loaded in mem/reffed, use bit set to 1. Frame set considered to be ular buffer. frame w/ use bit = 1 passed over.

In the control of the

MAX Many (OS must decide how many pages to being into main mem. Souther amount of morn allos to onch proc. the more proc. on morbit in men or page tounded morning page faith. Beyond centain tare, further allossions of pages with active gare farther and page faith. Beyond the centain tare, further allossions of pages with active gare farther and page faith. Beyond the centain tare, further allowed the centain tare for the cen

rary.

Fixed Alloc, Local Scope: Need to know amount of all for a process before. If too small, high page fault rate. If too large, too few programs in main mem: *Fixed Allow, Lord Scope: Need to know amount of all for a process before. If too small, high page funit runs. If no large, too few programs in main mene increased time specin in swapping it processes of the client.

*Variable: Allocation Cobod's Scope: casies to implement. On a minimals list of the farmes. Five farme added to resident set of process when page funit occur. If no finese available, On sun choose pet our in men. One way to consider potential problems in to use page buffering.

*Variable: Allocation Lord Scope: when new prec's hooled no main men, alloc certain of Org farmes as readent set. When page fail occurs, select pag to replace from mediate or for you suffering failed receivance selection and the process of the page fail occurs, select pag to replace from mediate or for you suffering failed receivance allocation provided to price & increased certain or improve certain performance based on assessment of

likely future demands of active processes.

Page Fault Progress use bit to be associated w/ each page in mem. Bit set to 1 when page accessed. When page fault occurs, OS notes virtual time since last page fault for that process. Does not perform well during transient periods, when there 's a new shift to a new locality.

Virtualis-laterned Sampled Working Set (VSW)'s culture working of one of sampling intensects based on elapset of virtue. Driven by min & max duration of

Formation by Sequelized Processory, there's muster, gas purpose processor ording & provide services to specialized processors

**Tighther Coupled Multiprocessory counts processors that their common main men it under integrated ord of an OS

**Stechnisation formation of their counts processors that their common main men it under integrated ord for an OS

**Stechnisation formation of their integration ordinary in the structure of their integration of their integration

users will be less.

Comes & Very Comes-Grained Parallelium: Synch among procs, but @ very gross ivl. Good for concurr procs on multiprogrammed uniprocessor; multiprocessor can supp withelis to change to user software

multiprocessor can supp withelis to change to user software

for the Grained Parallelium: single appe can be effectively implements as collection of threads with single proc; programmer must explicitly specify poster

parallelium of an app & does need to be a high degree of coordination & interaction among threads of an app. Be of various threads of an app interact is

possible in of an up & then need to be a high degree of continuous & interaction among breath of an up the of various threath of an up the continuous concenting on the ratio and part for earlier up performance.

The Craim of Practification represents more complete use of parallelism this found in track. In a specialized & tragged we many diff approaches

The Craim of Practification represents more complete use of parallelism this found in track. In a specialized & tragged we many diff approaches

and intelligences are suggested to present a parallel process. In a milled process, the hallow goes included to a milled process.

August of Process O'Processors:

August of Processors:

Approaches:
*Master/Slave: Key kernel funcs always run on specific processor. Master schedules -> slave send service re

rocess crtls all mem & I/O resources.

process of tail at men & IO resource.

Dauler matter on become performance bortleneck, & master falls brings down whole sys.

"Ber Architecture: herned one sees on any processor. Each processor does self-sheefil proce pool, Complicates OS since it must ensure processor and better the processor. The processor does not be the processor. The processor does not processor. An indigent to the processor of some priority scheme used, multiple queues he prior. Sys view as multi-server queuesing architecture.

There de Scheddings under decess separated from a set of proceedings, An appear can be set of threads that coop & executors in same aduly space. On

pro. No year as anum-ever openous gardeneurs.

The Turned Scheding, under duce separated not more of proc definition. As app can be not of familia that coop & concern reason and year. On Turned Scheding, under duce separated not more of proc definition. As app can be not of the most that coop & concern control and processor and applications of the processor and pr

Feedback

y improve util Bodo OS & pap involved in sched decounts. Us responsation, y possible of the contract of the co

(see text)

quantum)

Can be high

May favor I/O bound procs

Possible cs of proc. If based

Self Back Time Tasks has desirable for nor mandatory) associated deadline. Still makes sense to sched & complete task even if deadline has passed.

Perfedit & Completed Tasks

Perfedit is requirement may be stated as "one per period for "extendy! Timin spent"

Perfedit is requirement may be stated as "one per period for "extendy! Timin spent"

Read Time System Complete (Complete Tasks) and the state of th

eration: refers to ability to fail but preserve data // capability as possible. Important aspect: stability. Stable if system meets deadlines of most

*Plad Soft Operation: refers to ability to fail but preserve data /7 capability as possible. Important aspect: stability. Stable if system meets deadlines of most critical high pito task, even if other deadlines not met.

Real-Time Scheduling approached depend on a) if sys performs sched analysis & if static/dynamic b) if result of analysis produces sched plan according to which tasks are disposted at run time.

can be used.

**Prenamie nlanging-based: fescibility determined at putting rather than offline prior to start of eyec. I result of analysis is a schedulan used to decide when it

dispatch this task.

*Dynamic best effort: no feasibility analysis performed. Sys tries to meet all deadlines & aborts any started proc whose deadline is missed.

Deadline Scheduling: real-time OS designed w/obj of starting real-time tasks asap & emphasize rapid interrupt handling & task dispatching. Real-generally not concerned w/speed but with completing/starting tasks @ most valuable times. Prios provide a cruel tool & don't capture reqs of compelicion/inition of most valuable time. Uses: Ready Time: time task become ready for execution

Ready Time: time tax, become ready tor execution Starting deadline: time task must begin 'Completion deadline: time task must be completed 'Processing Time: time required to execute the task to complete Resource Requirements: resources required by task while exe 'Priority: measures relative importance of the task.

#



Plaints Interesting can occur in any prior-based preceptive scheduling scheme. Relovant in the context of real time scheduling. Occurs when citize sys force a higher price in the vast five a first prior text. Unbounded, duration of prior inversion depends on time required to handle a shared resource impredictable actions of other unrelated tasks.

Differences:

*Data Rate: there may be differences of magnitude b/w data transfer rate:

"An Application were used to the contractive to manipulate the was antience tases."

An Application was to which a device is part has an influence as those who was the contractive of the IO module that controls the device CCC completely of the IO module that controls the device of the IO module that controls the IO module that controls

proceeding
"Interrupts Driven: processor issues I.O command on behalf of a proc. If nonblocking processor continues to execute instructions form
command. If Nocking next instruction processor eace is from OS, which will put our proc in blocked state & nebule another proc
"Plavest Memory Acress (IMA); DMA module controls exchange of data bo main men & I.O module

No interrupts

No interrupts

Very Command of the Command

by a re-employed > 1/O module given direct ctrl of men via DMA > 1/O module enhanced to become a separate pr d for I/O > I/O module has local mem & is a computer in its own right.

Initions 10 ft O. Sect Assessment on the Conference of the Confere

rescription, doubthet to bandle all desires is uniform names, replies to the vary processive PO devices A the vary the CS manages FO devices. A generalized literarchical Design Expension on the CS doubt to expensed our configuration for the CS doubt to reparation of the CS doubt to expense doubt the discrepancies of the CS doubt and are got the CS lime as series of layers. Each layer performs a raised subset of the fine required of the CS. Layers should be defined set, takings in a layer done required thanges in the configuration of the CS. Layers should be defined set, takings in a layer done required thanges in the layer done to the CS. Layers should be defined set, takings in a layer done required thanges in the layer done to the layers. In the layer done the layers are layers of the CS. Layers should be defined as the layers of the layers of the CS. Layers should be defined as the layers of the layers of the CS. Layers should be defined as the layers of the layers of the CS. Layers should be defined as the layers of the layers of the CS. Layers should be defined as the layers

into in Blocks that are usually of fitted size, transfers made one block if a size, possible to or if due by block if, disk is USB keys are examples. Stream outnots of device transfers of data is down as by severe no block stream, terminal, prience, comm pork, a most other devices that area's recording varanties made to the sys buffer. Reading should uniterated large, those in expectation that block will be needed eventually should not made in the system, person now belock into use sepace is immediately requests another block. Generally provides a speechap compared to the lack of sys buffering. Blanks: complicates OS logic, waspping logic is also affected Stream C-betted Single Buffer: The Control Single Buffer:

to service, buffeng can increase OS difficacy & prop performance block performance parameters; seard disk I Operation desith depend on computer syx. OS, nature of I O channel & disk cell hardware Positioning Read/Write hards: when disk driver operating, disk routing #0 const speed. To read-write head must be positioned #0 desired rack & beginn desired sector of hards. Tack selection into born owing the head in morbio-bed soly syckenization, by desired gas bed on fixed bord syx, One amount syx, the time is takes to position the head #0 track is seek time. Time takes for beginning of sector to reach head is rotational delay. Access time – seek time services at As. As. ine time it t ional delay

rentational delay.

PIOP, processes in seq outler. Fair to all procs. Approxs andom sched performance if many procs competing for disk.

Principy (Wilk); cert of scheduling is conside disk angue est oftonium. Goal is not to optimize disk util but to meet other, short both jobs, & interactive price while per jobs. Proceedy long time. A poor policy for database system halper price. Proceedy long time. A poor policy for database system halper price. Proceedy long time. A poor policy for database system share from Pine (SETF); select disk. 10 request resenting least disk arm not choose mis seek time.

SCAN (referrant angles) arm more is all derends only, the after standers of all constanding requests in that task direction, the direction is revened. Frow whose requests are for tracks nearest to both inner. & contemnost tracks

CCAN (referrant angles) marries that so both inner. & contemnost tracks

NStepSCAN: seg disk request queue into subqueues of length N. subqueue processed I at a time using SCAN. While queue in being processed FCAN: use 2 submesses. When same begins, all requeues are in I queue with the other energy. During same, all new requests put into other queue. Service of new BCAN: the processes of the process

runcipui usuari va cost.
ALID 2: makes use of parallel access technique. Data striping used, hamming code used. Effective choice in an environ where many disk errors occur
RAID 3: requires only single redundant disk, no matter how large disk array. Employs parallel access w/ data distrib in small strips. Can achieve very high c

transfer rate.

RIM of makes use of independent access technique. Bits hyd play rays in school access corresponding union near that a data of the play of the play

Category

required Data availability Large I/O data transfer capacity Level Description Small I/O request rate

Very high Up to twice that of a single disk for read; similar to single disk f Higher than RAID 2, 3, 4, or 5; lower 2N Redundant via Hamming N+mMuch higher than single disk; N+1RAID 2. 4. or 5 Similar to RAID 0 Much higher than nilar to RAID 0 for id; significantly lower in single disk for writ N+1Similar to RAID 0 for read; lower than single disk for write N+1l; generally lower single disk for writ RAID 2, 3, or 4 Similar to RAID 0 Similar to RAID 0 for N+2 Highest of all listed read; significantly lowe than RAID 5 for write N = number of data disks; m proportional to log N

As a future of or unit outside. An improportionate to tog a Pa Molt cache buffer in min more fund stocors, or the mere used to apply to mem that is smaller & faster than main mem & is interposed by main men; processor. Robutes on ay mem access time by exploiting locality. Contains oney of some of sections on fail. When IO request made for particular sectors, their class it is made to the processor of the procesor of the processor of the processor of the processor of the proc

journels recorded most extend tooks at an opport data, what notes retentioning into cache, in placed on top.

Lear Proputing Visit of VIV) block that "expectioned fiverer first a private, Chomer associated or each block is a large recorded of the private of the OS to a user. Desirable properties of files: Long-term existent of the contract of years. File system is one of the most important parts of the OS to a user. Desirable properties of files: Long-term existent stored on data or other recording visitings of a desirable of the private of the OS to a user. Desirable properties of files: Long-term existent stored on data or other recording visitings & data of this import when a user logs off. Sharmbel between processes: files here names & can have associated a permitted of more complete stores for reflective files when the private in the files that the private files are the private in the complete stores to reflect file reflectionships: [He System; provide a means to store data organized as files as well as a collection of funcs that can be performed on files. Mantain a set of attributes amounted with the IC lypid experience cruented to queen because the visit of the private files to the complete of the can be performed on files. Mantain a set of attributes amounted with the IC lypid experience cruented to queen because the visit of the private performed on files. Mantain a set of attributes amounted with the IC lypid experience cruented to queen because the visit of the private cruented to the complete and the complete of the

successed with the file. Typical operations: crusted de, open close, readwise

Filed basic field of the contains dight value. The Tech viriable length

Filed basic files of the district of the contains dight value. The Tech viriable length

File collection of situation filed, that can be treated as unit by one app program.

Filed viriable length

File collection of institute for the data. Elien relationships explicit. Designed for use by \$df tappe. 1 - none file types.

File Mand Yav (20) is used an image most of new 1's pursament file institute in a valid cipotings reformance of provide IO supp for variety of usuage device

File Mand Yav (20) is used an image most of new 1's pursament file and valid cipotings reformance of provide IO supp for variety of usuage device

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e File Sys (Mys 10 L14); primary interface W errorson consease company 37 and 48.

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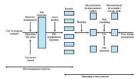
File Sys (Mys 10 L14); primary interface w errorson consease company 38.

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File Sys (Mys 10 L14); primary i



File Org & Access: - File org is the logical structuring of records as determined by the way they're accessed. - In choosing file org, important criteria: short access time, ease of update, economy of storage, simple maintenance, reliability. - Prio of criteria depends on the app using the file.

ustive search
non form of file struct. Fixed format used for records. Key field uniquely identities record. Used in batch apps. Only org that is easily

inveniory curveys.

**Direct/Hashed File: access directly any block of a known address. Makes use of hashing on key val. Often used where very rapid access required, fixed-length

*Account pilot:

anging user would help the allowed to read user directory that includes the file.

*Antendagic user can determine file exists & its owner & can then pertition the owner for additional access rights.

*Antendagic user can read file for any purpose, including copying & execution.

**Execution; user can load & execute a purpose in the cantest copy its execution.

**Agentaging user can read file for any purpose, including copying & execution.

**Agentaging user can med de det, and to the file's chain to the control of the contr

*Specific users: individ user desi

User Groups: set of users not individ defined

"User Groups: set of users not included defined
"All: all user with beautiful accesses, public files
Record Belecking Blocks are most of 10 or secondary strange. Given block sizes, dure are 1 blocking methods:
Record Belecking Blocks are most of 10 or secondary strange. Given block sizes dure and in a block (internal day)
"set and the set of the secondary strange for construction and using all or forceds are most in a block (internal day)
"with the single histogramed Blocking, variable-length records used of, pacing into the book with our mounted space."
"with the single histogram of Blocking, variable-length records used, spacing not employed
"Bly Machaelien on sounder) strange, file consists of collection of blocks. Office guart pays in responsible for allocating blocks to files. The approach taken
for file alloe may influence approach taken for the space pump. Space is allocated to a file as 1 - portions (contiguous set of allocated blocks). File Allocation
Tables/AFAT data status used to keep tract of promiss suppord to a life
Translacenia to a Dismantic Allocation provides policy requires that may ask of a file be declared (if the time of file certain request. For many appir s' a diff to
Translacenia to a Dismantic Allocation provides policy requires the mark ask of a file be declared (if the time of file certain request. For many appir s' and this
file in portions a noted file and note to be waterfile to wear deep programmers and to correstiment size. Symantic allocation discorts on the contracts.

estimate reliably the man potential size of flic teach to be wateful be users & app programmers tend to overestimate size. Dynamic allocation allocs spelling in potentian analyses perform size there's a those of the velocities of more NPO of a single flow to vereal syndiffication, beam to be considered.

"Sociapity of spec increases performance, op for Retrieve, X-strop, & graphy for transactions maning in a transaction-oriented OS.

"Availage and of unall potions increases size for adults needed to manage the able; tinfo
"having flared size portions inspected size of space.
"Availage and the size of the results of space.
"Availage and the size of the results of space."

"Suring variable usine or small fleed-size portions mins waste of usused storage due to overmocane.

Alternatives:

Variable, Large Contiguous Pertions provides better performance, variable size avoids waste, file alloc tables are small

Flocks, cand fried portions provide greater fleedbilly, they may requise large indisconceptes some for their alloc, contiguity has been abundanced as primary

Flocks, transfer for the control of the cont

from POW of individual segential fills.

Chainsel Abberlant's Machaemia vom andrivinal block basis. Each block contain a pointer to nex block in chair. The file albet tube needs just a single

13. Contained Research and Abberlant in commander and the contained file.

Fire Space Management: just an allored space must be managed, so must the unaffored space. To perform file allow, it's necessary so know which blocks are waithen. Deal for the meeted in addition to fie allow table.

waitable. Doth Albor Table needed in addition to file alloc table

Illar Tables: This motion can see sector containing one left or each block on disk. Each entry of 0 corresponds to a free block & each! 1 corresponds to a block in
use. Adv: works well wit applied alloc method, and it is a small as possible.

Calinated Fire Purifician free portions. In pre-banded together by using a pointer & length value in each free portion. Negligible space overhead be then: a so
need for a dat alloc table. Simile of all file alloc methods. Dasher leads to fing every time you alloc a block, the block needs to be read first to recover the
pointers to the new first three block before using in an that block.

The proposition of the new first three block before using in an that block.

The proposition of the new first the lower allock table and the laber. For efficiency, the index should be on the basis of variable-size postions

under allac. The approach provides efficient stap to first of the file alloc methods.

Fine Black Lise

The Shi black is an imaging a # supportainly, list of #*s of all fine blacks is minimized in a recovered portion of the disk.

Thoughouting on the size of the disk, either 2 for 22 times the size of the

convergending bit table from the sourced and the size of the convergending bit table from the size of the disk, either a for the collection of the size of the convergending bit table from the size of the disk, either a for the collection of the size of the convergending bit table from the size of the convergence of the size of the s

Access Martic basic elements are an suppose, causy suppose or accessing the suppose of the secreted by an object as consended to suppose of the secreted between the secrete of the secreted between t

Capability Linc Decomp by mos splek capability skets, which specifies authorized objects & operations for a user

**Lang Ref Mergine Historilary; contains arbitrary data in 0 or more data blocks

**Directory; contains in 16 file annex; a pointer associated insole

*Pointerlay; contains in 16 file annex; a pointer associated insole

**Symbolic Begree an interproces count facility

**Lanks: an and He man for existing file

**Symbolic Block data file containing name of the file a's linked to

Bander All types of UNIX are administered by 50 yearson of insole (index nodes) which are cert structs that contain the key info needed by OS for a particular file. Neveral file names may be associated w: a single inself; active insole is noncounted w: exactly one file, and each file is counted by a capability of the containing man of the file all the containing man of the file and the containing man of the containing man of

Level		Number of Bl	ocks	1	iumber of Bytes	
Direct			12		48K	
Single Indirect		1024	512	4M	2M	
Double Indirect	1024 x 1024	512 × 512 =	256K		IG 4 G - 4M - 4	18 K
Triple Indirect		512 × 256K =	128M		512G	

UNIX directories & inodes: directories are structed in a hierarchical tree. Each directory can contain files and/or other directories. A directory that's inside

Volume Structure, a culture live service on a single logical diskdisk partition & is laid out w/ following elements:

*Boot block: contains code required to boot OS

*Super block: contains earthe & indo about file sys

*Insofe table collection of insofes for each file

*Data blocks: storage space available for data file & subdirectories

**Page BIOCKS: storage space available for data files & subdifferences

**Access Control Lists in UNIX:

**Free BSD allows admin to assign a list of UNIX user IDs & groups to a file.

*Prec BSD anorsis animation assign into on CNA user also a groups to a nice.

*Any number of users & groups can be associated what file, each wid 3 prot bits (read, write, execute).

*A file may be protected solely by the traditional UNIX file access mech.

*Prec BSD files include an additional pots by that indicated whether file has an extended ACL.

PRACTICE QUIZ W/ SOLUTIONS (This is from old quiz/exam on BB)

PROCEED AN ADVISEA WAS DESCRIPTIONS (A LIBIN EXTENDED AND ADVISEANCE OF ADMINISTRATION OF ADMINISTRATI

It is a condition where the system forces a higher priority task to wait for a lower priority task.

What is the difference between SCAN and CSCAN (disk scheduling algos)? SCAN satisfies all outstanding requests until it reaches last track in that direction

then reverse direction. CSCAN restricts sounting one direction only.

Describe main goal of long-term, medium-term sched, & short-term scheduling.

Long-term program becomes a process. Med-Erms process uses viru mem. Montsterm: selects process to exe.

What is the major disadvantage of static memory partitions and dynamic memory partitions?

State: Instruct Progression. Demand: External progressions
A physical or should earlies agrees are an actal sociotion in min memory: T
The best fit placement algorithm (dynamic partitioning), choose the block that is closest in size to the request: T
Timeling is a sure in which the system goods must off to their supering process piece under that acceptance of the control of the Figure 12.2 Elements of File Management

ial: adds an index to file to supp random access. Adds an overflow file. Greatly reduces time required to access a single record. Multiple lyls

**Flacted Sequential: adds in index to life to supprandom access. Adds an overflow (ife. Greatly reduces time required to access a single record. Multiple Pole of indexing and the soul provide guerar access of efficiency.

In the contract of the contract

The Continuation of the Co

enforce access restriction on discreteles.

The Semantical Difference was a section of the second of

6. Selects the resident set agant console that is 1/07 featable.

3 Fixed Alber (2 cold Replacement
b) Vistable Alber (1 cold Replacement
d) Vistable Alber (1 cold Replacement
d) Vistable Alber (1 cold Replacement
d) Vistable Alber (2 cold Replacement
d) Replace (3) Replacement (4) Vistable Memory d) Frame (3) None of the above
8. What is the main objective of a read dime system?
a) Meeting all dendines (b) Minimaring quiting fine (2) Maxing CPU utilization (d) None

a) Meeting all deadlines. b) Minimizing waiting time: () Maxing CVI). Solve the sheekeding algorithm that [Deerengive and the sheeked at 19PO b) ECTS () SNT (d) BRXN (and the shows a period of the shows a period of the sheeked at 19PO b) ECTS () SNT (d) BRXN (and the shows a period of the shows a period of the sheeked at 19PO b) ECTS () Entire most (4) None of the sheeked at 19PO b) ECTS () Extra () SNT (

12. Execute the page replacement algos FIFO, LRU, and Clock for a sys with 3 frames & the following string of page references: 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0,

Englanting FEO greend promine is literally the name? Two first, is, or it's first our shear appeared to be replaced. Yet can shink of it like his:
Tack all gapes in mem in a queue whose it always length of frame (1900x) pay the older page in front who a new page needs to be replaced. The
making genes when 2 is added in 72, it is 2 is payed and replaced. The two queue is 0.1,2. When 3 is added, 0 is popped, or he new making queue
is 1.2, or East whenever a new page gats added.

	(
Г	7	7	7	2	2	2	2	4	4	4	0	0	0		
		0	0	0	0	0	0	0	0	3	3	3	3		
			1	1	1	3	3	3	2	2	2	2	2		
				F		F		F	F	F	F				

Explanation: Premise is also the name. The key here is looking at the actual page sequence. When 2 needs to be added, the page in the table the least recently used, or "furthest away" in the page sequence, is 7 so it gets replaced. When 3 need to be added, the page that is "furthest" is 1, so realized of the own it are traduced since it was used recently look at the furthestedides FIRST instance of a nose (look report) used to the furthest of the first page of the second to the second to

CLO	CK (a gray	y frame	represer	nts the p	ointer)						- 1	
71	71	71	21	21	21	21	41	41	41	4 ⁰	31	31
	O ¹	01	0° 01		00	O1	00	21	21	2º	20	21
		11	1º	10	31	31	30	30	31	01	01	01
			F		F		F	F		F	F	

LEVEL	NUMBER OF BLOCKS	NUMBER OF BYTES
Direct	12 (given)	# Blocks direct Access * Block Size 12 blocks * 4 KB/block = 48 KB * 1024 = 49,152 Bytes
Single Indirect	= Block size / bit file sys (in bytes) Bits -> Bytes: # bits / 8 32 bits / 8 = 4 bytes (bit file sys) 1k-Bytes = 1024 bytes size, so 4 k-bytes = 4 * 1024 = 4096 bytes (block size) 4096 byte block size(4 bytes = 1024 blocks	^^ same formula 1024 blocks * 4 KB-block = 4096 Kbytes = 4 Mbytes = 4,194,304 bytes
Double Indirect	= (# blocks single indirect) ² (1024 blocks) ² = 1,048,576 Blocks	1,048,576 Blocks * 4Kbytes/block = 4,194,304 Kbytes = 4 GBytes = 4,294,967,296 bits = MAX FILE SIZE (Max = 2 ⁷² b = 4,294,967,296 bits)
This is Extra, but	= (# blocks single indirect) ³	THIS EXCEEDS MAX FILE SIZE!
Triple Indirect	(1024 blocks)3	

nent for the chmod command to set perms of a file on a UNIX sys to RW-R-X-X

		le:																														
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	SERV TIME		2	6	-		5	2																								
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				shorte	est remain	ing tim	e. MUST	CHECK	EVERY SE	COND	C					- 4	2	2	1													
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