OSTEP Chapter 37

ECE 3600, Fall 2022

Table of Contents

1. Hard Disk Drive Geometry
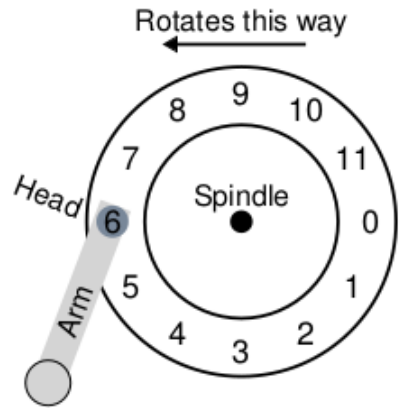
Tracks and Sectors

Figure 37.2: **A Single Track Plus A Head**

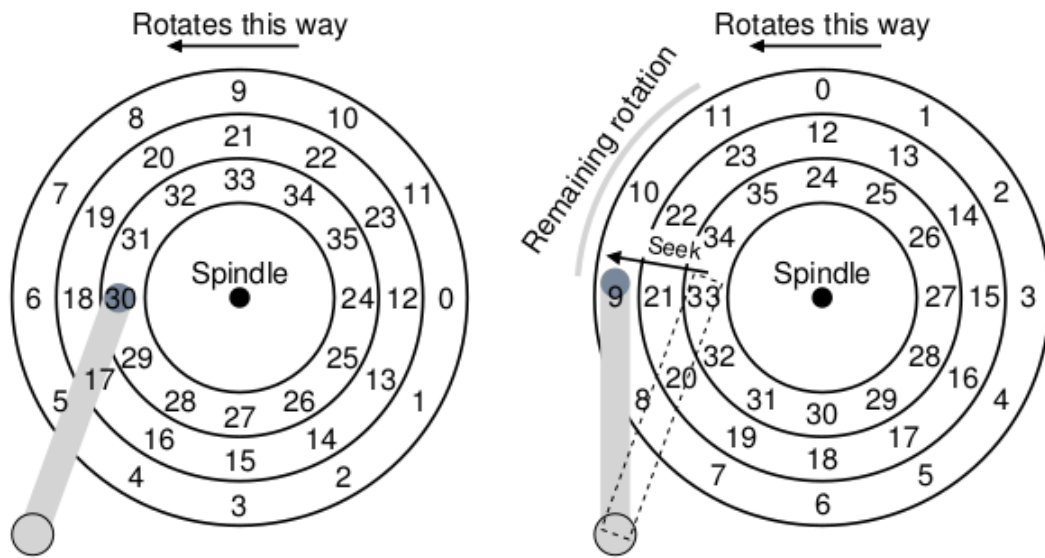**Seek, Rotation, Transfer** - request for sector 11:

Figure 37.3: **Three Tracks Plus A Head (Right: With Seek)**

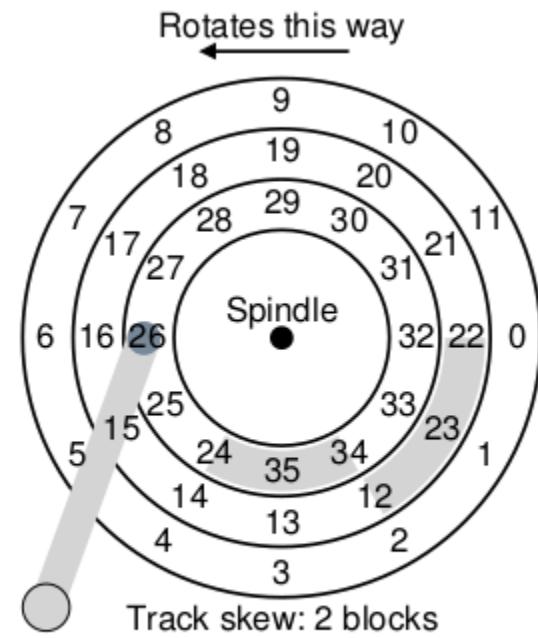## 2. Skew for Faster Sequential Access

Figure 37.4: **Three Tracks: Track Skew Of 2**

3. Example Specifications

	Cheetah 15K.5	Barracuda
Capacity	300 GB	1 TB
RPM	15,000	7,200
Average Seek	4 ms	9 ms
Max Transfer	125 MB/s	105 MB/s
Platters	4	4
Cache	16 MB	16/32 MB
Connects via	SCSI	SATA

Figure 37.5: **Disk Drive Specs: SCSI Versus SATA**

Cheetah Average Timings for 4 KB read:

T_{seek} = 4 msec

$T_{rotation}$ = (max rotation)/2 = (1/15000 min/Rot * 60 sec/min * 1000 msec/sec)/2 = 2 msec

$T_{transfer}$ = 1/125 sec/MB * 1/1024 MB/KB * 4 KB * 1000000 usec/sec = 31.25 usec

4. Disk Scheduling

shortest seek time first (SSTF):
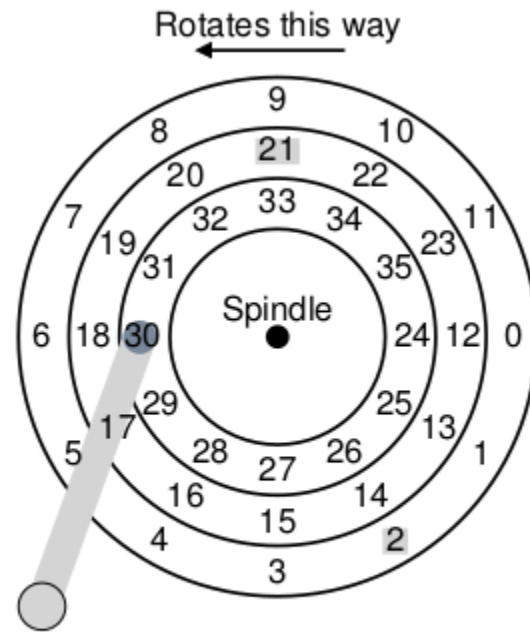
Requests for sectors 8 and 16:
  get 16 first, then 8
  but 8 first, then 16, may be faster

Requests for sectors 2 and 21:
  get 21 first, then 2

Rotates this way

Rotates this way

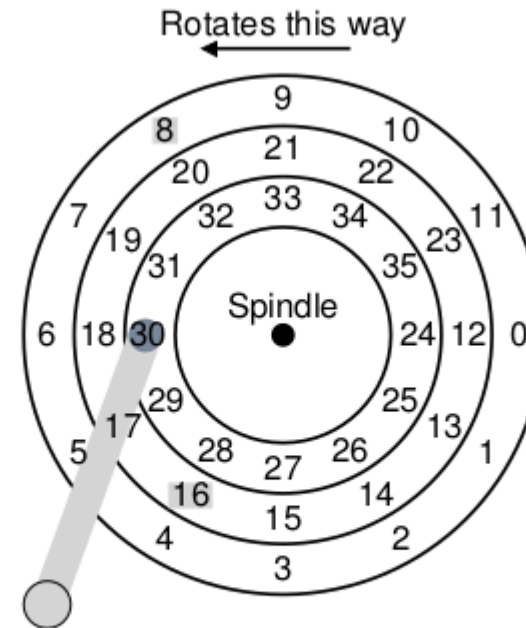Figure 37.7: **SSTF: Scheduling Requests 21 And 2**   Figure 37.8: **SSTF: Sometimes Not Good Enough**

Consider seek + rotate times --> **shortest access time first (SATF)**

5. Exercises

If disk.py fails with error "ImportError: No module named Tkinter": **sudo apt install -y python-tk**
or just comment out the line: `from Tkinter import *` and don't use the graphics -G option

Exercises from the book using disk.py:

Defaults: Seek time = 40 per track, Rotate time = 30 per sector

```
$ python ./disk.py -a 7,30,8 -c -p FIFO

REQUESTS [7, 30, 8]

Block:   7  Seek:  0  Rotate: 15  Transfer: 30  Total:  45
Block:  30  Seek: 80  Rotate:220  Transfer: 30  Total: 330
Block:   8  Seek: 80  Rotate:310  Transfer: 30  Total: 420

TOTALS       Seek:160  Rotate:545  Transfer: 90  Total: 795
```
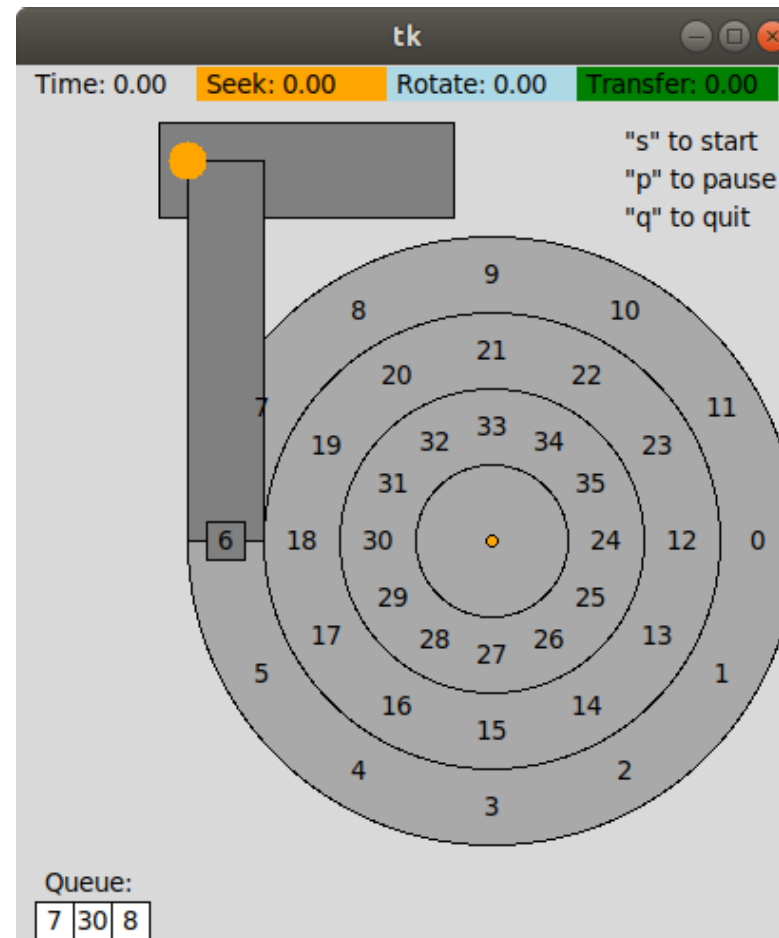
```
$ python ./disk.py -a 7,30,8 -c -p SATF

REQUESTS [7, 30, 8]

Block:   7  Seek:  0  Rotate: 15  Transfer: 30  Total:  45
Block:   8  Seek:  0  Rotate:  0  Transfer: 30  Total:  30
Block:  30  Seek: 80  Rotate:190  Transfer: 30  Total: 300

TOTALS       Seek: 80  Rotate:205  Transfer: 90  Total: 375
```

6. Homework Example

Seek time = 20 per track, Rotate time = 30 per sector

Scheduler Policy: **SATF**

For the following requests determine the block order and seek/rotate times:

REQUESTS [10, 11, 10, 14, 9, 12]

Block	Seek	Rotate

Submit

ans