CM1604
Computer Systems Fundamentals

Master Boot Record

Rathesan Sivagnanalingam

ROBERT GORDON UNIVERSITY ABERDEEN
TEF Gold
INFORMATICS INSTITUTE OF TECHNOLOGY

In this week lecture..

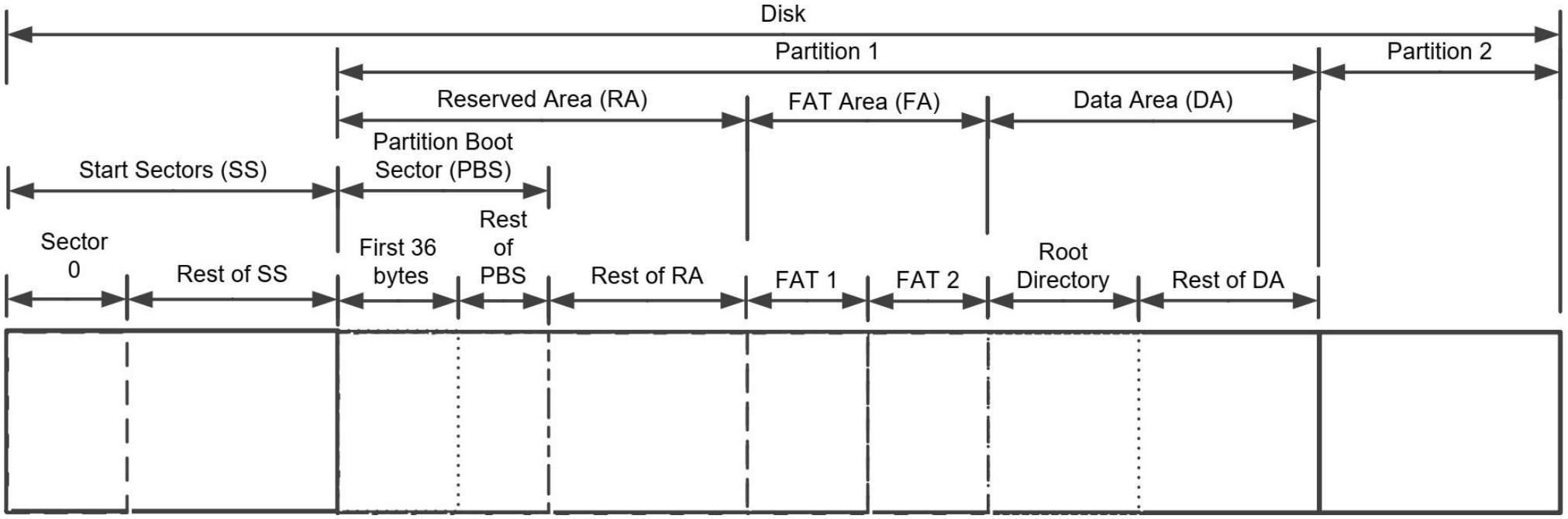
- PC based Partitions
- Schematic view of a Disk
- Disk Sector 0
- Endianness
- Partition Table Entry

PC–based Partitions

- DOS–styled partition & Master Boot Record (MBR) disks. MBR disks are limited to 2 TB sizes.

- GUID Partition Table (GPT) – used in Apple Macs and increasingly in modern PCs. GUID stands for Globally Unique ID. GUID disks can go up to about 9 ZB sizes. 1 ZB is approximately 1021 B. Z stands for Zeta following kilo, Mega, Giga, Tera, Peta, Exa, Zeta, …

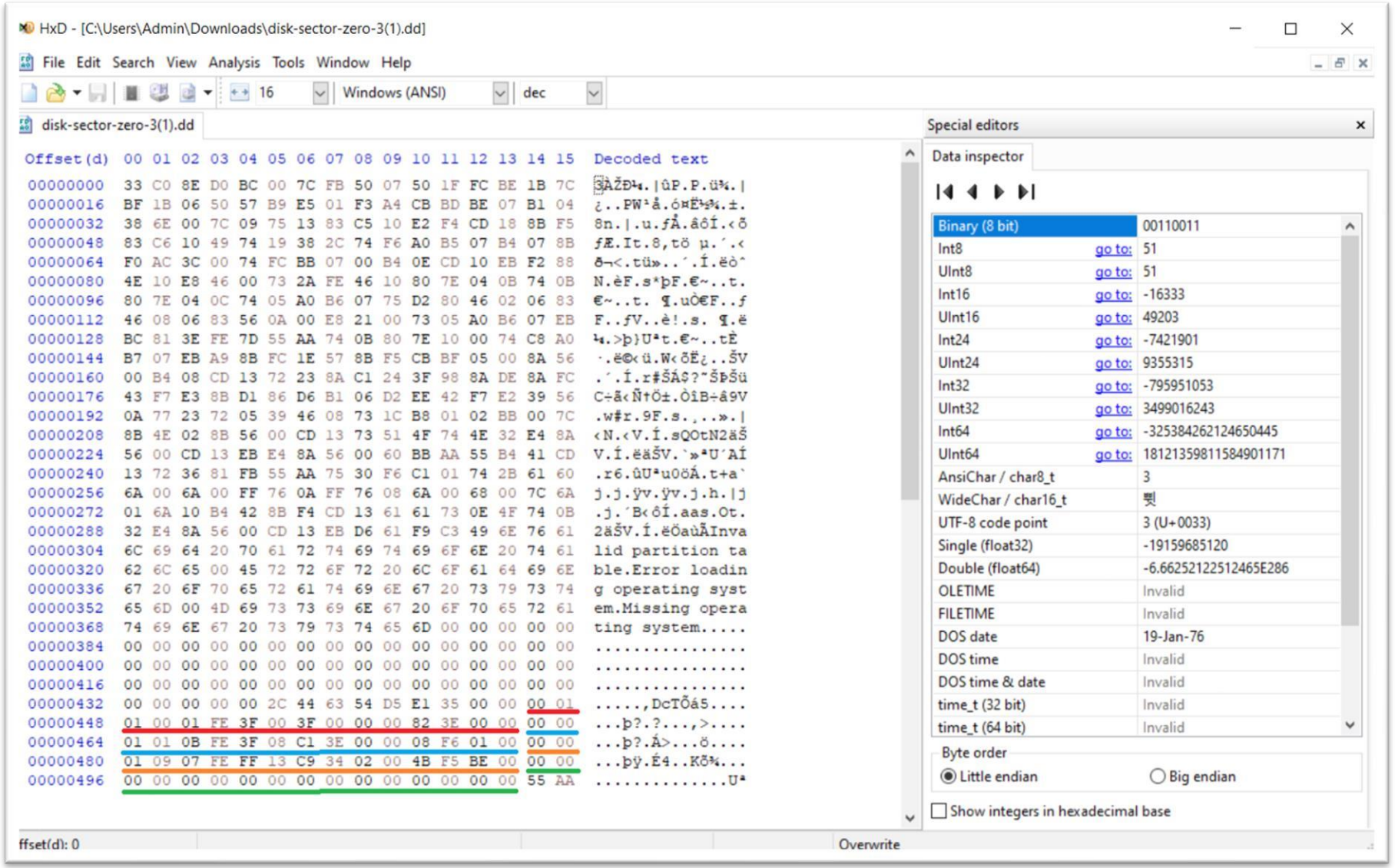
Schematic View of a Disk



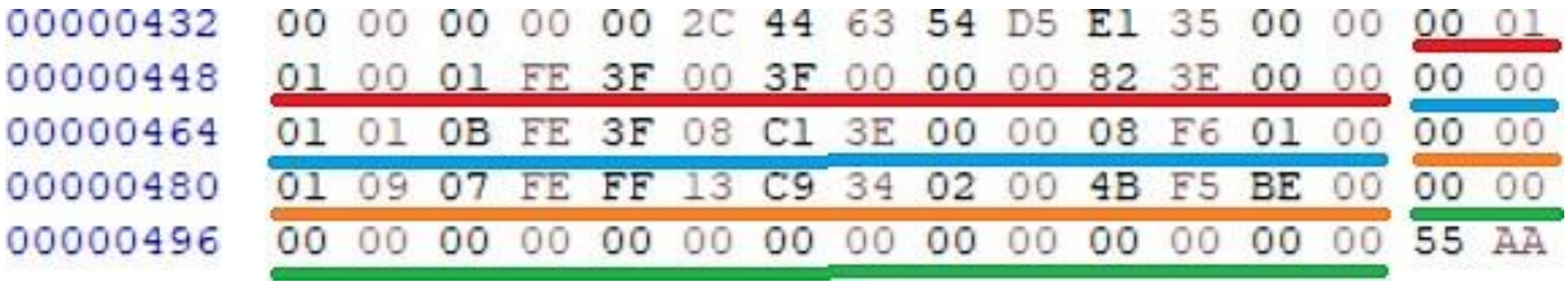
Disk Sector 0

Byte Range	Description	Essential
0–445	Boot Code	No
446–461	Partition Table Entry #1	Yes
462–477	Partition Table Entry #2	Yes
478–493	Partition Table Entry #3	Yes
494–509	Partition Table Entry #4	Yes
510–511	Signature value (0xAA55)	No

Disk Sector 0 Diagrammatic



Disk Sector 0 – Partition Table Entry



Byte Range	Description	Essential
0–445	Boot Code	No
446–461	Partition Table Entry #1	Yes
462–477	Partition Table Entry #2	Yes
478–493	Partition Table Entry #3	Yes
494–509	Partition Table Entry #4	Yes
510–511	Signature value (0xAA55)	No

Partition Table Data

Byte Range	Description
0–0	Bootable Flag
1–3	Starting CHS Address
4–4	Partition Type
5–7	Ending CHS Address
8–11	Starting LBA Address
12–15	Size in Sectors

Disk Sector 0 – Partition Table Entry #1

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
00	01	01	00	01	FE	3F	00	3F	00	00	00	82	3E	00	00

00000432	00	00	00	00	00	2C	44	63	54	D5	E1	35	00	00	00	01
00000448	01	00	01	FE	3F	00	3F	00	00	00	82	3E	00	00	00	00
00000464	01	01	0B	FE	3F	08	C1	3E	00	00	08	F6	01	00	00	00
00000480	01	09	07	FE	FF	13	C9	34	02	00	4B	F5	BE	00	00	00
00000496	00	00	00	00	00	00	00	00	00	00	00	00	00	00	55	AA

Partition Table #1 Data (i)

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
00	01	01	00	01	FE	3F	00	3F	00	00	00	82	3E	00	00

Byte Range	Description	Value
0-0	Bootable Flag	00
1-3	Starting CHS Address	01 01 00
4-4	Partition Type	01
5-7	Ending CHS Address	FE 3F 00
8-11	Starting LBA Address	3F 00 00 00
12-15	Partition Size in Sectors	82 3E 00 00

Endianness

- Little Endian - Little-endian is an order in which the “little end" (least significant value in the sequence) is stored first.
  - Ex: 10 7D 00 stored as 00 7D 10
- Big Endian - Big-endian is an order in which the "big end" (most significant value in the sequence) is stored first
  - Ex: 10 7D 00 stored as 10 7D 00

Partition Table #1 Data (ii)

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
00	01	01	00	01	FE	3F	00	3F	00	00	00	82	3E	00	00

Byte Rang	Description	Little Endian	Big Endian
0-0	Bootable Flag	00	00
1-3	Starting CHS Address	01 01 00	00 01 01
4-4	Partition Type	01	01
5-7	Ending CHS Address	FE 3F 00	00 3F FE
8-11	Starting LBA Address	3F 00 00 00	00 00 00 3F
12-15	Partition Size in Sectors	82 3E 00 00	00 00 3E 82

Partition Table #1 Data (iii)

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
00	01	01	00	01	FE	3F	00	3F	00	00	00	82	3E	00	00

Byte Ra	Description	Little Endian	Big Endian	
0-0	Bootable Flag	00	00	Non Bootable
1-3	Starting CHS Address	01 01 00	00 01 01	
4-4	Partition Type	01	01	FAT12
5-7	Ending CHS Address	FE 3F 00	00 3F FE	
8-11	Starting LBA Address	3F 00 00 00	00 00 00 3F	63 Sectors
12-15	Partition Size in Sectors	82 3E 00 00	00 00 3E 82	16,002 Sectors

Type Values for DOS Partitions

- Table

Questions

- (i) Number of Bootable Partitions?
- (ii) File System installed in the first partition?
- (iii) First partition starting LBA address in little endian format?
- (iv) First partition starting LBA address in big endian format?
- (v) First partition starting LBA address in sectors?
- (vi) Size of the first partition in little endian format?
- (vii) Size of the first partition in sectors?
- (viii) Size of the first partition in KB?