DICOM Implementation Experience at ITC

Advanced Technology Consortium

for Clinical Trials Quality Assurance

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Some Problems Encountered

- Inconsistent precision used in different IODs within the same file set
- "Grid Frame Offset Vector" not used consistently by different vendors
- 32 bit dose packing

Inconsistent Precision Used

- Causes Z values for CT and SS to not be equal
- ITC forces the SS Z value to equal the Z value of the nearest CT

Frame Offset Vector

- Per DICOM standard the values in "Grid Frame Offset Vector" in RT Dose IOD should be "z coordinates (in mm)"
- Most vendors interpret that as absolute position in patient space
- One vendor interpreted the vector as relative positions in patient space with the absolute position determined by "Image Position (Patient)"

Hypothetical 24 Bit Pixel Cell

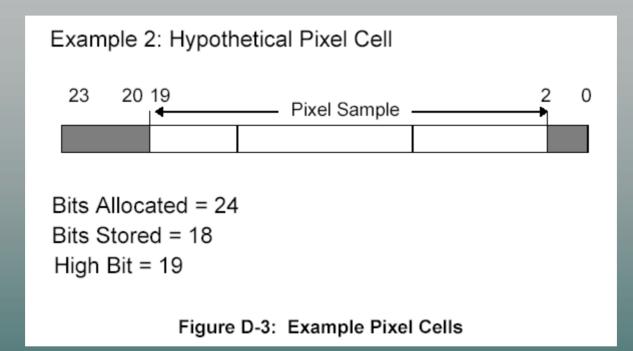


Figure From PS 3.5 - 2003

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24 Bit Pixel Cell Data Packing

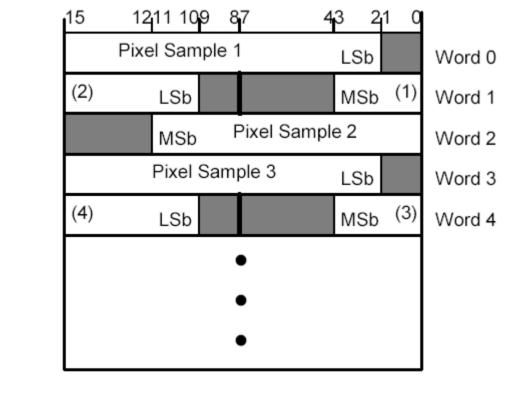


Figure D-4: Example Pixel Cells Packed into 16-bit Words (VR = OW)

Figure From PS 3.5 - 2003

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24 Bit OW Layout in Memory

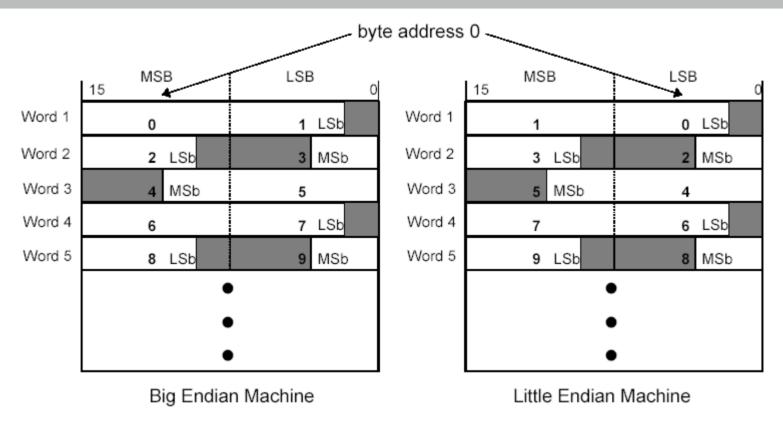


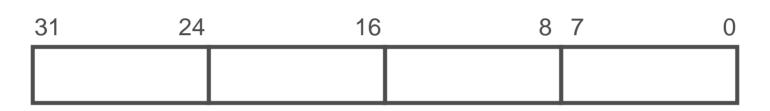
Figure D-5: Example Pixel Cells Byte Ordered in Memory (VR = OW)

Figure From PS 3.5 - 2003

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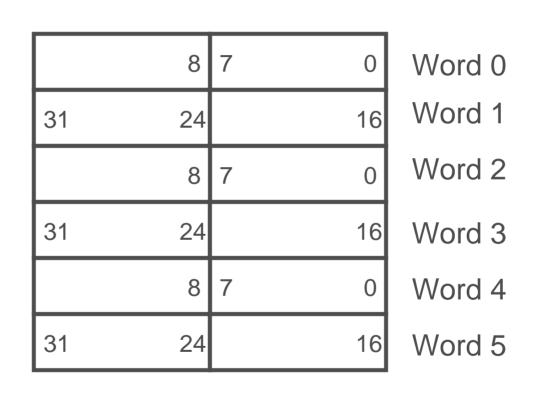
32 Bit Pixel Cell



Bits Allocated = 32 Bits Stored = 32 High Bit = 31

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32 Bit Pixel Cell Data Packing



VR = OW

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32 Bit OW Layout in Memory

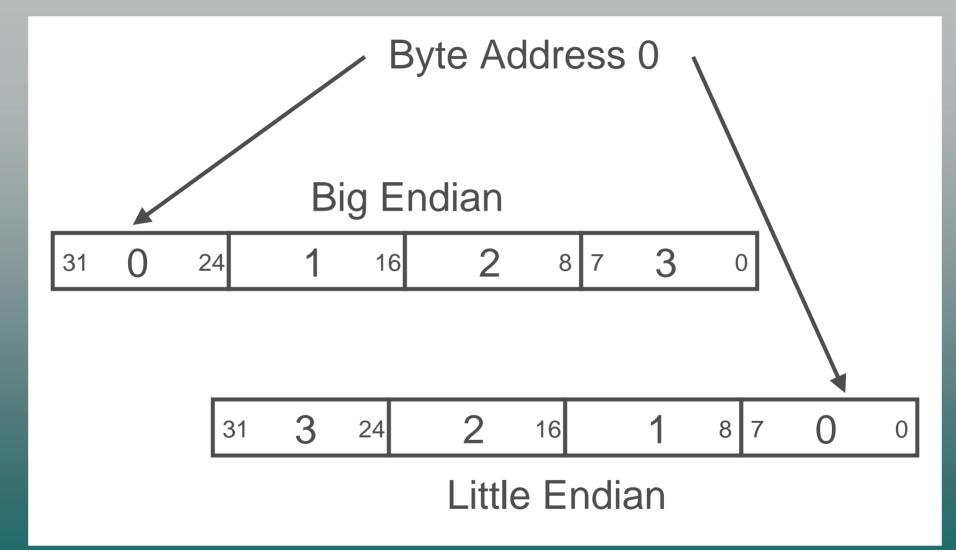
Byte Address 0												
	0	8	7	1	0	Word 0		1	8	7	0	0
31	2	24		3	16	Word 1	31	3	24		2	16
	4	8	7	5	0	Word 2		5	8	7	4	0
31	6	24		7	16	Word 3	31	7	24		6	16
	8	8	7	9	0	Word 4		9	8	7	8	0
31	10	24		11	16	Word 5	31	11	24		10	16
	Big Endian						Little Endian					

VR = OW

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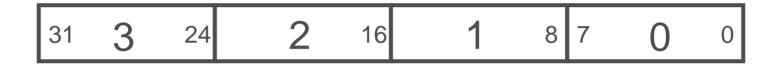
32 Bit Values in Memory



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Little Endian Storage vs OW Data Packing



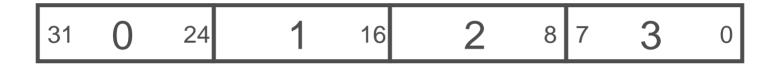
	1	8	7	0	0
31	3	24		2	16

No Problem

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Big Endian Storage vs OW Data Packing



	0	8	7	1	0
31	2	24		3	16

Problem

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Conclusion for 32 Bit Dose?

 On Big Endian Machines one must swap 16 bit words within 32 bit long words before writing DICOM or after reading DICOM