

## Endianness Depends on the ISA

So, again:

**How are bytes stored in memory?**

**Loads and stores use the same approach, so who cares?**

Choice depends on the ISA:

- some are little endian,
- some are big endian, and
- some support both (not at the same time).

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## Communication Requires a Common Approach

**What happens if**

- **a big endian machine**
- **sends a stream of bytes**
- **to a little endian machine?**

**Oops.**

**One** of the two machines **must swap the order** of the bytes.

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## Little Endian Hosts Must Swap Bytes to Use the Internet

When the Internet was developed,

- big endian ISAs dominated computing, so
- the **Internet uses big endian.**
- Protocol data must be in big endian order
- or a machine's packets will be dropped.

**Little endian ISAs** (like x86)

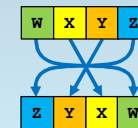
- **must swap the order of bytes**
- to use the Internet protocols!

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## Reverse Order of Bytes to Swap Endianness

It's not so bad...\*

Just swap the order one byte at a time.



\*When Intel, Microsoft, and Compaq cooperated to produce a standard for desktop/server room networking, the protocols were little endian. Go figure.

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