Question 1....

Describe the heart of the chapter in two words

Question 2...

What is a bit?
A few points about bits

1. A "bit" is a unit of information (or data... see below) - it doesn't "grow" or "shrink", but the number of bits collected or available can grow or shrink.

2. "Information" is not the same thing as "Data"
   ○ Software can translate data into something we understand
   ○ Could have a lot of data, but little information!
   ○ Information Theory really studies this (Claude Shannon)

Cell Towers and Cell Phones

Cell phone locations can be determined without GPS!

Ubiquitous information access
- A new idea?

Article at right is by Vannevar Bush in 1945.
Moore’s Law and Exponential Growth

Variants of Moore’s Law (from 1965)

- Density of transistors on chip doubles every 2 years
- Computing speed doubles every 1.5 years
- Hard drive storage doubles every two years

The power of doubling:

First a fact: A ream of paper (500 sheets) is 2 inches thick

Folding a stack of paper over doubles the thickness in “number of sheets stacked”

If you could fold a piece of paper over 50 times, how thick would it be?

\[ 2^{50} \times 0.002 \text{ inches} \]

\[ 1125899906842624 \text{ sheets thick} \]

\[ \frac{1125899906842624}{250} \text{ sheets per inch} \times \frac{1}{12} \text{ inches per foot} \times \frac{1}{5280} \text{ feet per mile} \]

... gives: 71 million miles (distance to sun is about 93 million miles)

Some Examples of Computer Speed

Back in 1986 I started running the same program (selection sort on 20,000 integers) on every new computer I got access to. Excerpts:

Original IBM PC (1982 machine): 30,601 seconds (8.5 hours)

Sun 3/80 (1987 - my main grad school machine): 289.6 seconds

PC with Intel 486/66: 56.7 seconds

“Connection Machine” (CM5 - a $1.4 million computer in 1991): 3.8 sec

Intel Core2 Duo E7400 (measured in 2009): 0.124 seconds

More From Your Reading Reflections

Confusing points:

- Moore’s Law: Speed no longer increasing? Yes it is, but not per processor.
- “Data warehouse” - not a single collection point, but many private ones
- Laws - what is current for cyberbullying and privacy?
  - Cyberbullying: Varies state-by-state; most states now address this
  - Privacy: Very little legal protections. Good resource is EPIC (Electronic Privacy Information Center): [http://epic.org](http://epic.org)

Connections and other points

- Several people mentioned NSA/government monitoring stories
  - What about Bradley Manning and Wikileaks
- Cyber war - “Syrian Electronic Army” in the news lately - how much disruption could they cause?
- Targeted ads - what do you think?
- Storage/Processing limits: Are we reaching the end of growth?
**Koans of Bits**

1. It's All Just Bits
2. Perfection is Normal
3. There Is Want in the Midst of Plenty
4. Processing is Power
5. More of the Same Can Be a Whole New Thing
6. Nothing Goes Away
7. Bits Move Faster Than Thought

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**Final Thoughts?**

Technologies - good or bad?

- Tor (anonymous communication)
- BitCoin (anonymous financial transactions)
- Trusted Computing Technology (security vs personal control)