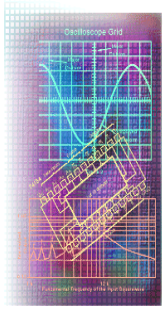
IFSM 310
Software and Hardware Concepts



"Back up my hard drive? How do I put it in reverse?"
- Anonymous

Topics

A+ Demo: Windows 2000 Server

Mobile Computing

Chapter 8: Data and Networks
Communication Technologies

Installing Software

Tech Tales

A customer was complaining that the floppy drive in her system wouldn't work. The tech went to check it, and found she was putting the disks in her systems with the clear plastic wrappers on them...

She didn't want her computer to get a virus...

A+ Demo

Installing Windows 2000 Server

Windows 2000 Server

Blank Hard Drive
Boot Windows 2000 Server CD
Delete any old Partitions
Create new partition / Format / Install
Key: mbk9m-jr62w-793ww-b3qhr-ty4d6
Password: password
Set Date/Time
Drivers?

In Depth

Getting the Most of your Training

by
Don Whitnah, vice president of TestOut Corp.

1: Take advantage of on-the-job training whenever possible

Every job comes with opportunities to learn and practice new skills as part of your job responsibilities. Never pass up a chance to receive additional training, formal or informal. You never know when you'll need a particular computer-related skill.

2: Go back to school for more extended learning

If your schedule allows, begin a part- or full-time degree or certificate program at a technical, community, or online college to build your skills and knowledge. Many schools offer diverse IT programs with both in-classroom, online, and blended learning environments (a combination of in-classroom and online learning).

3: Learn from the experts

Utilize training materials written or recorded by experts in the IT industry. They know more than the bare essentials to just get you by and will help you on your way to becoming an expert in your field, too.

4: Use self-paced, online training for greater flexibility

Unlike instructor-led classroom training and bootcamps, self-paced training allows you to review the instruction until you've mastered it. And when your training is online, you can take it wherever you go. You can continue training until you're ready to certify and you can reference the material again in the future if questions arise.

5: Use training that includes online lab simulations for practical experience

Your training is for more than just passing an exam, right? If you want to learn how to do your job well, make sure whatever training you invest in provides real experience performing tasks with hardware, operating systems, and networking.

6: Test yourself with practice exams to find out where you have knowledge gaps

Using practice exams that comprehensively cover the certification exam material, you will discover your strengths and weaknesses and see where you need to focus your training. High-quality practice exams will also prepare you mentally for the rigor of the actual certification exam.

7: Practice on physical hardware if it's available to you

On a less formal scale, if you have access to computers or components, practice, practice, practice. Many people don't have a computer they can spare, but if you do (or can borrow from someone who does), be sure to use it.

8: Use training that follows IT certification course requirements exactly

This will help prepare for certification exams, especially if the job you're looking for requires them. Make sure you pass your certifying exam the first time by preparing with materials designed according to exam objectives.

9: Use training that tracks every action and scores results accordingly

The only way to gauge your readiness both for a job and for a certification exam is to track your progress. Find a training program that keeps track of your scores as you go. You'll be able to gauge your strengths are and determine where you need additional training and practice.

10: Overall, focus on the fundamentals

Learn processes, how things should be done, and how things work. Good training will help you really understand your job and prepare you to do it well.

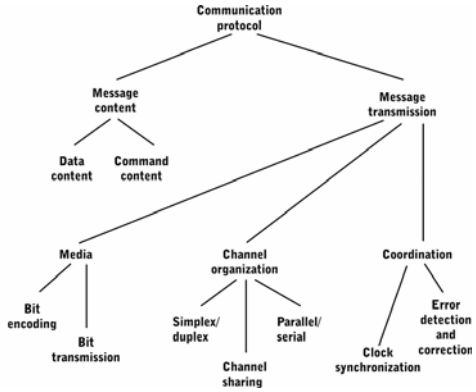
Chapter 8

Data and Networks
Communication Technologies

Communication Protocols

- Set of rules and conventions for communication
  - Message content and format
  - Bit encoding
  - Signal transmission
  - Transmission medium
  - Channel organization
- Include procedures for coordinating flow of data
  - Media access
  - Clock synchronization
  - Error detection and correction

Figure 8-2
Components of a communication protocol



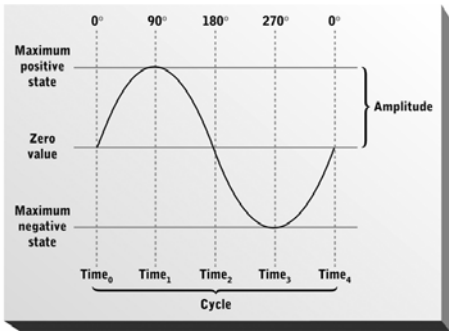
Encoding and Transmitting Bits

- Carrier waves
- Modulation methods
- Data bits can be encoded into analog or digital signals
- Signals
  - Electrical, optical, or radio frequency
  - Capacity and errors

Carrier Waves

- A sine wave with encoded bits (transports bits from one place to another)
- Characteristics of sine waves: amplitude, phase, frequency
- Importance of waves in communications
  - Travel through space, wires, and fibers
  - Can have patterns encoded in them

Figure 8-3
Characteristics of a sine wave



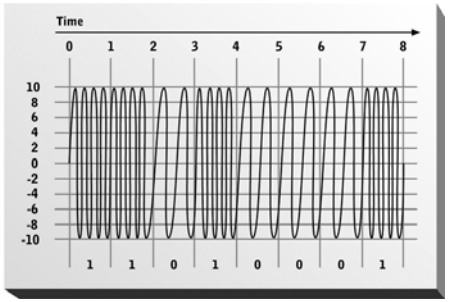
Modulation Methods

- Techniques used to encode bits in sine waves
  - Frequency modulation (FM)
  - Amplitude modulation (AM)
  - Phase shift modulation
  - Multilevel coding

Figure 8-6
The bit string 11010001 encoded in a carrier wave using amplitude modulation

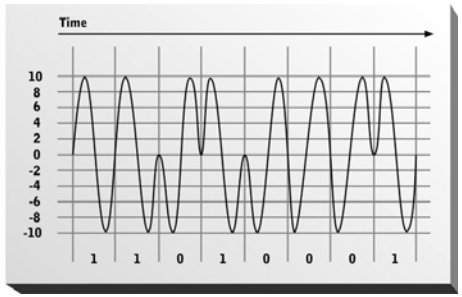
Amplitude modulation (AM) represents bit values as specific wave amplitudes.

Figure 8-7
The bit string 11010001 encoded in a carrier wave using frequency modulation



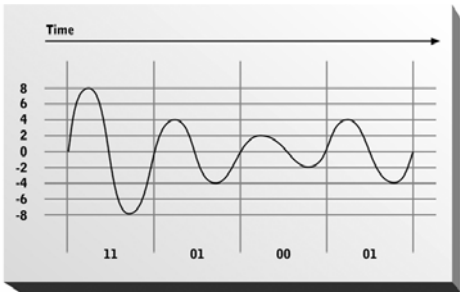
Frequency modulation (FM) represents bit values by varying carrier wave frequency while holding amplitude constant.

Figure 8-8
The bit string 11010001 encoded in a carrier wave using phase shift modulation



Phase shift modulation makes a sudden shift in signal phase which can be detected and interpreted as data.

Figure 8-9
The bit string 11010001 encoded in a carrier wave using 2-bit multilevel amplitude modulation



Multilevel coding embeds multiple bit values within a single wave characteristic.

Analog Signals

- Use full range of carrier wave characteristics to encode continuous data values
- Can represent any data value within a continuum of values

Digital Signals

- Can contain one of a finite number of possible values
- Pulse code modulation (PCM)
  - Binary data transmission via square waves
  - Square waves preferred over short distances

Figure 8-10 ►
The bit string 11010001 encoded in square waves (digital signals)

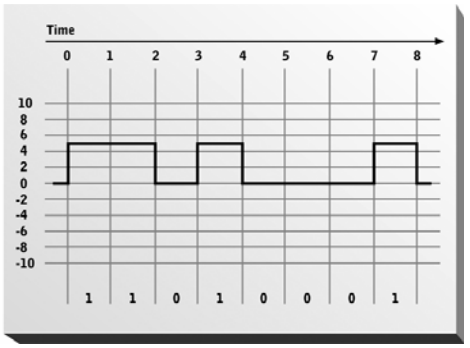
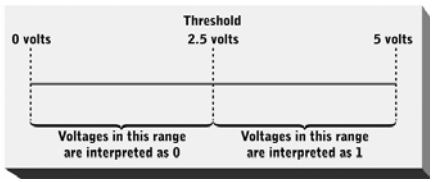


Figure 8-11 ►
A binary signaling method using voltage ranges

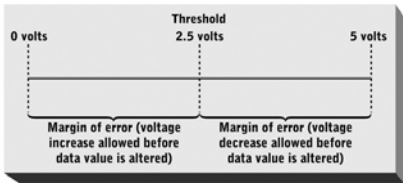


A digital signaling scheme defines a range of wave characteristic values to represent each bit value.

Signal Capacity and Errors

- Analog signals compared with digital signals
  - Carry more information
  - Are more susceptible to transmission error

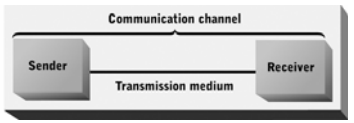
Figure 8-12 ►
Margin of transmission error (voltage drop or surge) before the data value encoded within a binary signal is altered



Transmission Media

- Communication path that transports signals (e.g., copper wire, optical fiber)
- Characteristics
  - Raw data transfer rate (speed and capacity)
  - Bandwidth
  - Susceptibility to noise, distortion, external interference, and attenuation

Figure 8-13 ►
Elements of a communication channel



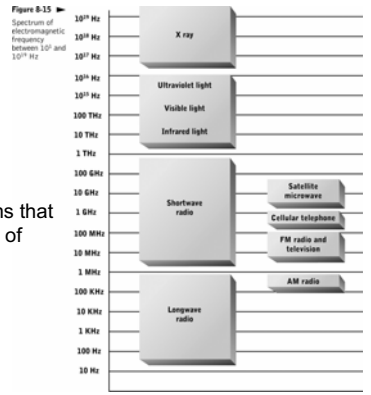
Speed and Capacity

- Interdependent; jointly described as data transfer rate (raw versus effective data transfer rate)
- Factors that account for transmission speed differences among media
  - Length of media
  - Ways in which multiple media segments are interconnected
  - Rate at which bits are encoded in signals and recognized by the receiver

Frequency and Bandwidth

- Carrier wave frequency
  - Fundamental measure of data-carrying capacity (i.e., limits capacity)
- Bandwidth
  - Difference between maximum and minimum frequencies of a signal
  - High-bandwidth channels can carry multiple messages simultaneously

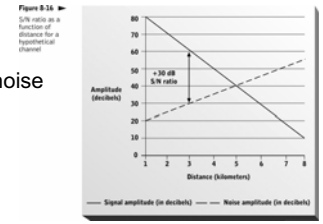
Figure 8-15 ►
Spectrum of electromagnetic frequency between 10^0 and 10^{25} Hz



Range of electromagnetic frequencies; terms that describe subsets of that range

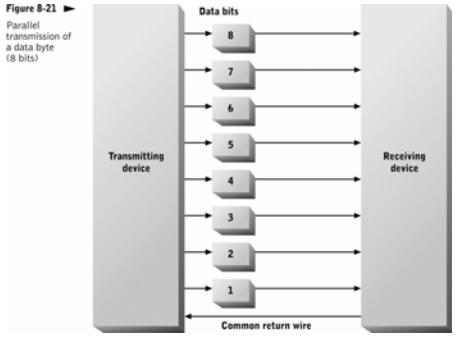
Signal-to-Noise (S/N) Ratio

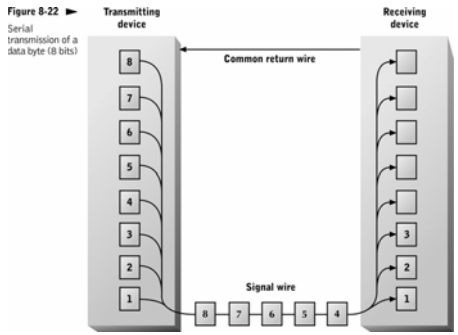
- Measure of the difference between noise power and signal power
- Effective data transfer rate can be much lower than raw data transfer rate due to
  - Electromagnetic interference (EMI)
  - Attenuation
  - Distortion
  - Internal or external noise



Parallel and Serial Transmission

Parallel	*Serial*
• Uses multiple lines to send several bits simultaneously • Unreliable over distances greater than a few meters due to skew and crosstalk • Provides higher channel throughput • Relatively expensive	• Uses a single line to send one bit at a time • Reliable over much longer distances • Cheaper to implement; uses fewer wires or wireless channels



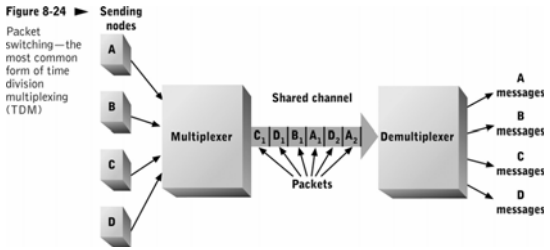


Channel Sharing

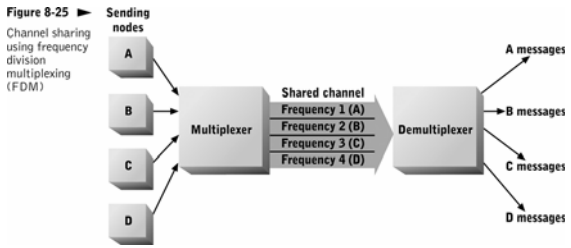
- Uses available capacity by combining traffic of multiple users
- For use when no single user or application needs a continuous supply of data transfer data capacity
- Techniques
  - Circuit switching
  - Packet switching
  - Frequency division multiplexing

Channel Sharing Techniques

Circuit switching	• Allocates an entire channel to a single user for duration of one data transfer operation • Only used where data transfer delay and available data transfer capacity must be within precise and predictable limits (e.g., telephone service)
Packet switching	• Allocates time on the channel by dividing many message streams into smaller units (packets) and intermixing them during transmission
Frequency division multiplexing (FDM)	• Divides a broadband channel into several baseband channels (e.g., cable television)



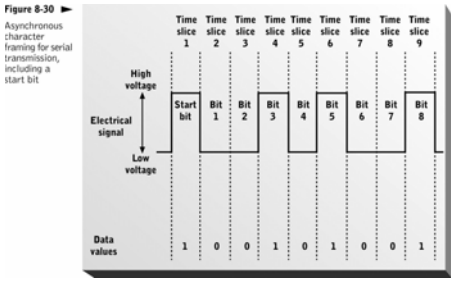
Packet switching: Packets are sent to their destination as channel capacity becomes available.



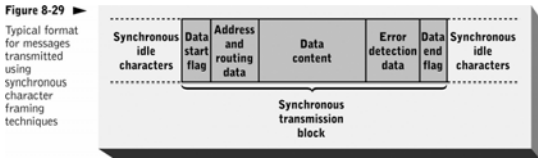
FDM: Signals are transmitted within each subchannel at a fixed frequency or narrow frequency range.

Clock Synchronization

- Ensures that sender/receiver use same time periods and boundaries to encode/decode bit values
- Asynchronous transmission
  - Relies on specific start and stop signals to indicate beginning and end of a message unit
- Synchronous transmission
  - Ensures that sender/receiver clocks are always synchronized by sending continuous data streams



Asynchronous transmission appends one or more start bits to the beginning of each message.



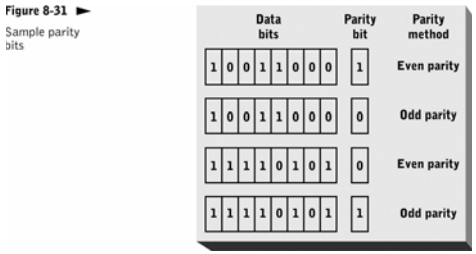
Synchronous transmission: Messages are transmitted in fixed-size byte groups called blocks.

Error Detection and Correction

- Error detection
  - Based on a form of redundant transmission
  - Increasing redundancy increases chances of error detection at the expense of reducing channel throughput
- Common error detection methods
  - Parity checking
  - Block checking
  - Cyclical redundancy checking

Parity Checking

- Also called vertical redundancy checking
- Can be based on even or odd bit counts
- Has a high Type I error rate
- Reliability issues
  - Unreliable in channels subject to error bursts affecting many adjacent bits
  - More reliable in channels with rare errors that are usually confined to widely spaced bits



Block Checking

- Also called longitudinal redundancy checking (LRC)
- Sending device counts number of 1-valued bits at each bit position within a block
- Sender combines parity bits for each position into a block check character (BCC) and appends it to the end of the block
- Receiver counts 1-valued bits in each position and derives its own BCC to compare with that transmitted by sender

	S	p	r	i	n	g	h	i	l	l	BCC
bit 1	1	0	0	1	0	1	0	1	0	0	0
bit 2	1	0	1	0	1	1	0	0	0	0	0
bit 3	0	0	0	0	1	1	0	0	1	1	0
bit 4	0	0	0	1	1	0	1	1	1	1	0
bit 5	1	1	1	0	0	0	0	0	0	0	1
bit 6	0	1	1	1	1	1	1	1	1	1	1
bit 7	1	1	1	1	1	1	1	1	1	1	0
VRC	0	1	0	0	1	1	1	0	0	0	0

An even parity bit is computed for each position of a block of 8 bytes. The set of parity bits forms a BCC that is appended to the block for error detection.

Cyclic Redundancy Checking (CRC)

- Most widely used error detection technique
- Produces a BCC usually more than 8 bits long; can be as large as 128 bits
- Much lower Type I and Type II error rates than parity checking and LRC checking

In Depth

Mobile Computing

Mobile Computing History

Osborne Transportable

Osborne Closeup

Data General One - First Laptop

8088

No hard Disk

1 Meg RAM

Model 100

Atari Portfolio

Features

Convenience

Portability

Operation

The Wearable PC

Weight

Transportable

Laptop

Notebook

Sub notebook

Palmtop

Weight vs. Features

Linear relationship

Remove components (Off-load)

- External Usage
- Cables
- Extra Parts

Solving Component problems

Integration

- Miniaturization
- Built into motherboard

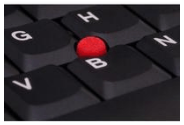
Plug-Ins

- Connections / Cables
- USB

PCMCIA

- Standard Interface

Pointing Devices





- Trackball
- Pointer
- Touch Pad
- Pen

- External
  - Simultaneous Usage
  - Connections

Laptop Pointing Devices

User Action	Integrated Pen	Integrated Trackball	Integrated Fingerstick	Integrated Touchpad	External Mouse
Selecting Item	Best	Worst	Poor	Poor	Good
Left Button Click	Best	Good	Good	Good	Good
Left Button Double Click	Good	Poor	Poor	Poor	Best
Pick Off of List/Menu	Best	Worst	Worst	Worst	Good
Right Mouse Click	Good	Good	Good	Good	Best
Drag and Drop	Best	Poor	Poor	Poor	Good
Freehand drawing	Best	Worst	Worst	Poor	Worst
Annotation	Best	Worst	Worst	Poor	Worst
Notetaking	Best	Worst	Worst	Poor	Worst
Signature	Best	Worst	Worst	Poor	Worst

Portia Isaacson, Pointing Matters!

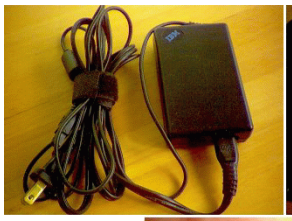
Form Factor

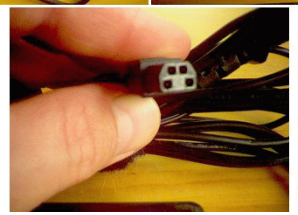
- Standard Notebook
  - 8.5 x 11 x 2 inches or larger
- Sub notebooks
  - 8 x 10 x 1 and less
- Tradeoffs
  - Keyboards
  - Video Screen / Resolution

Power Supply

- AC Power
  - 100-240 volts
  - 50-60 Hz
- Weight of "power brick"
- Connectors
- Cost of spares

Power Bricks



DC Power

Single pin connector, Multiple Pins
Charging: How fast? Computer on/off?

Battery Types

- NiCad (Nickel Cadmium)
  - Memory Problems
- NiMH (Nickel Metal Hydride)
  - More Energy, Shorter Time
- L-ion (Lithium Ion)
  - 80% more power than NiMH
- Zinc-Air - 5x longer, more weight

Ergonomics

- Orientation
- Keyboard
  - Size, Travel, Keys
- Screen
  - Brightness, Contrast, Readability

IBM TP710 Butterfly Keyboard

Video

LCD

Active Matrix - Best

Dual Scan - cheap, hard to read

Size - 8 to 15 inch diagonal

Video Port

Simultaneous Use

Resolution

Desktop or Mobile?

Laptops

More Expensive

Price vs. Power

Easily Stolen

Less Expandable

Hard to upgrade

Security Demo

Stealing Laptops

How Long?

How long does it take to steal a laptop from the class room.

Let's find out.

Take off your watches.

Let's all go into the hallway...

BYOKVM

Bring your own Keyboard, Video, Mouse

Mac Mini

AMD PIC

Cappuccino GX1

- 1.2 GHz Celeron
- 128MB - Up to 256 MB
- 10GB - Up to 40GB
- DVD ROM
- 10/100 NIC
- Sound Card
- Serial / Parallel / Modem
- Video – 82810E controller
- 2 USB
- PS/2 Keyboard, Mouse
- TV Out – Composite, SVideo
- Windows XP Home / Linux etc.

Case Study

The $100 Laptop

The 100 dollar Laptop

CAMBRIDGE, Mass.--A low-cost computer for the masses moved one step closer to reality on Wednesday.

Nicholas Negroponte, the co-founder of the Media Lab at the Massachusetts Institute of Technology, detailed specifications for a $100 windup-powered laptop targeted at children in developing nations.

Design

The proposed design of the machines calls for a 500MHz processor, 1GB of memory and an innovative dual-mode display that can be used in full-color mode, or in a black-and-white sunlight-readable mode. The display makes the laptop both an electronic book and a laptop.

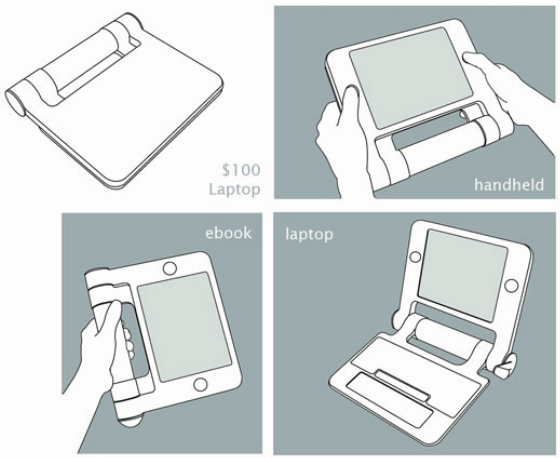
One display design being considered is a flat, flexible printed display developed at MIT. Negroponte said the technology can be used to produce displays that cost roughly 10 cents per square inch. The target is $12 for a 12-inch display with near-zero power consumption.

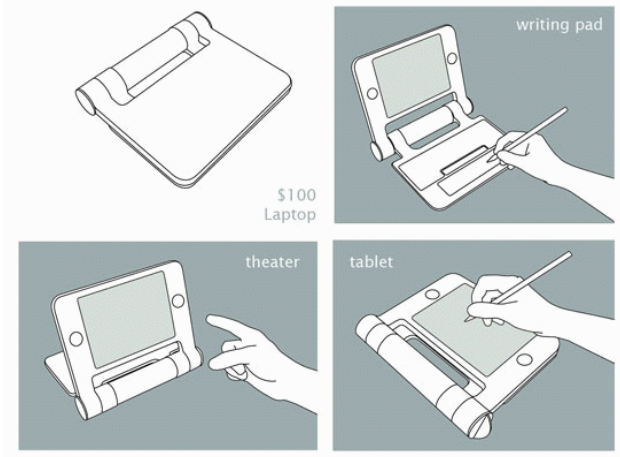
Reaching Out

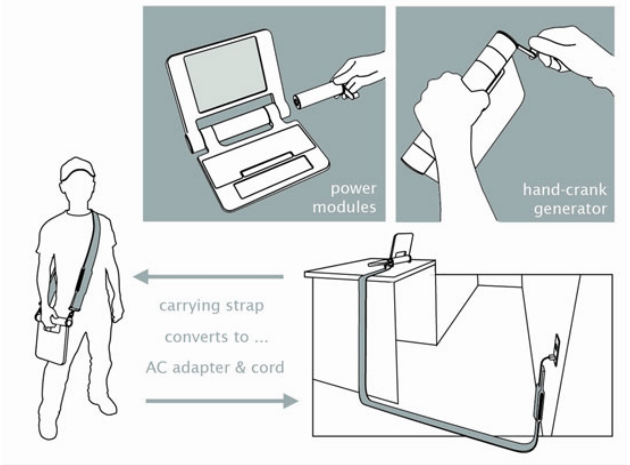
The idea is simple. It's an education project, not a laptop project. If we can make education better--particularly primary and secondary schools--it will be a better world.

While the initial goal of the project is to work with governments, Negroponte said MIT is considering licensing the design or giving it to a third-party company to build commercial versions of the PC. "Those might be available for $200, and $20 or $30 will come back to us to make the kids' laptops. We're still working on that," he said.

Prototype





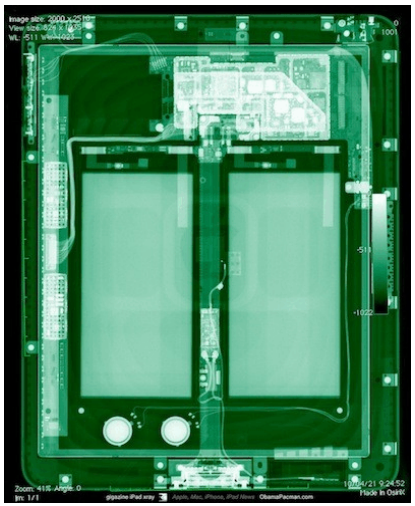


Prototype

Final Product

iPad Porn

Video: iFixIt
iPad Teardown



Common Task

Software Installation

Software Installation

Read the License
- How Many Users / Machines
- "Just Like a Book?"
- Licence Enforcement

Read Directions
- Special Process? Any System Modifications?

Software Installation

Will it work on your machine?
- CPU, Memory, Disk space, H/W
- Will it work on ALL machines?

Back up your system

Back up the Original disks -
- Never Use Again

Software Installation

Check for READ.ME file on Installation Disks

If Upgrade Maintain Old Software
- How Compatible - Data Files, Configuration, etc.

Install first on test system

Software Installation

Install Software
- Most of the Time: Use the Defaults

Configure Software

Check other Applications that might be affected

Software Installation

Prepare Quick Use Information
Inform Users of availability
Monitor New Applications
Provide Conversion tools

Maintain Old Version while needed
- Remove from Menu, but keep
- Eventually, Backup and remove

Homework

Study for Exam

Parting Thought

"Computer Lie #1: You'll never use all that disk space."
- Anonymous

End of Lesson