

Multimedia Security: Is Their Hope In Securing Our *Digital Future*?

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Outline

- **Problem Overview**
- **What are the Issues?**
- **Is Their Hope?**



Multimedia Security

- **“Everything” is digital these days - a copy of a digital media element is identical to the original**
- **How can an owner protect their content?**
- **Are images still “fossilized light”? (Can you believe something unless you see it or hear it in real-time?)**
- **What does all of this mean in terms of law?**
- **Does any security system really work or does it just make us feel good!**



Media Elements

- **Audio**
- **Images**
- **Video**
- **Documents (including HTML documents)**
- **Graphics**
- **Graphic or Scene Models**
- **Programs (executable code)**



Attitude Problem

- **People are giving up on content protection - we all need to think differently! ⇒ “Information needs to be free”**
 - **would you take something from my house?**
- **Napster**
- **DivX**
- **what does it mean to own “bits”?**

A massive assault on copyright occurred at universities this past Fall!!! (ABC *Nightline* - February 9, 2001)



Attitude Problem

“Information may want to be free as long as it does not belong to you”

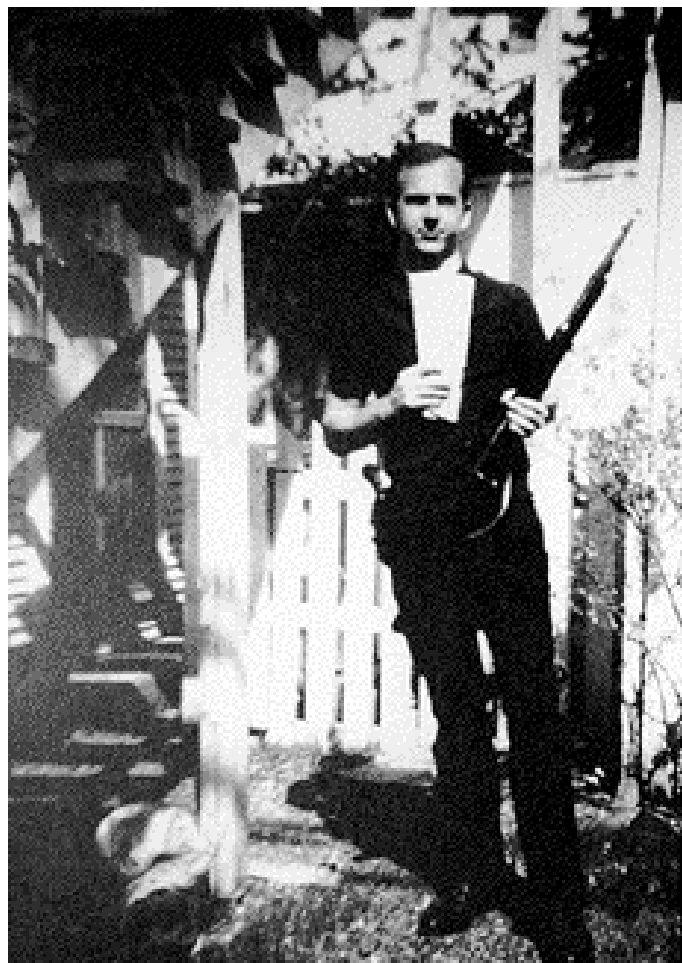
- should your personal information be “free” or just information that has a copyright?**
- “I have the right to take this information because the owner is greedy and makes too much money!”**
- not all users of file sharing programs share**





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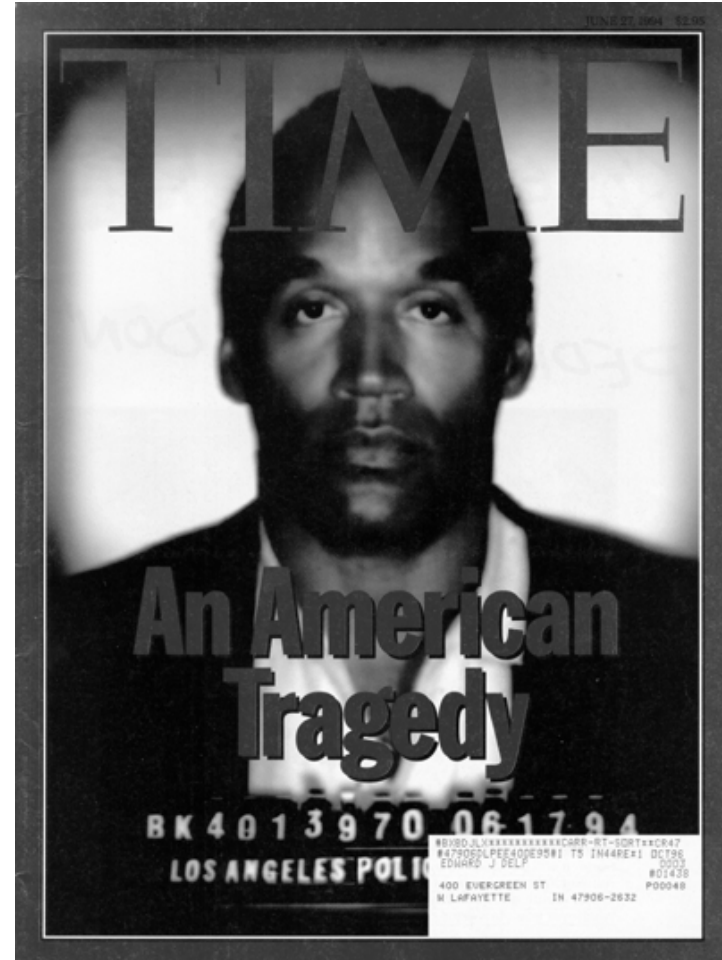
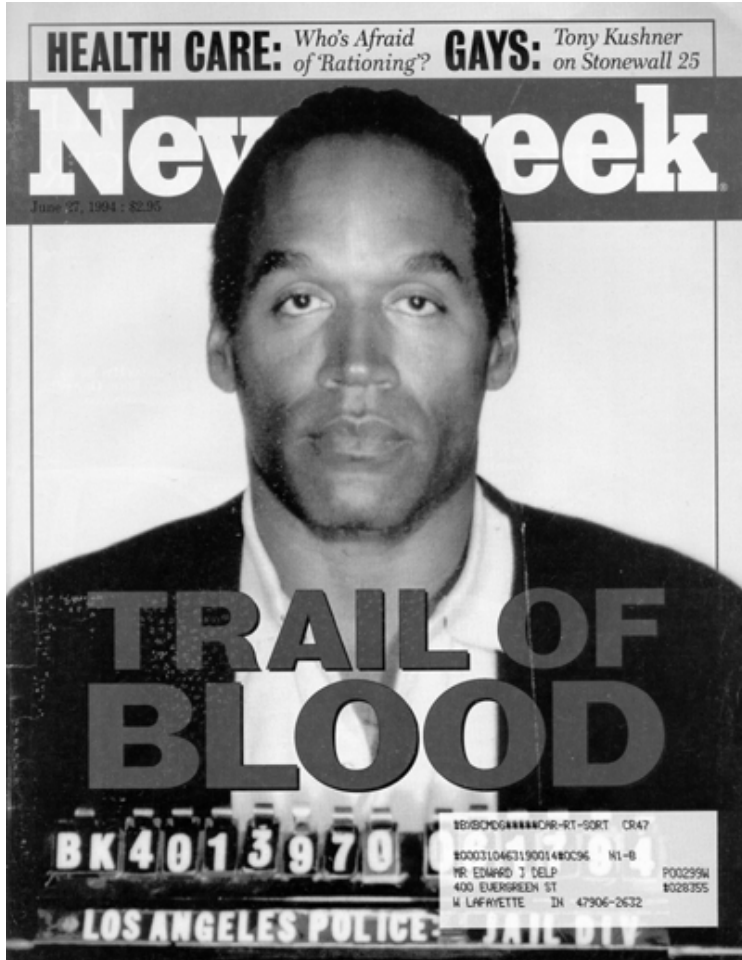


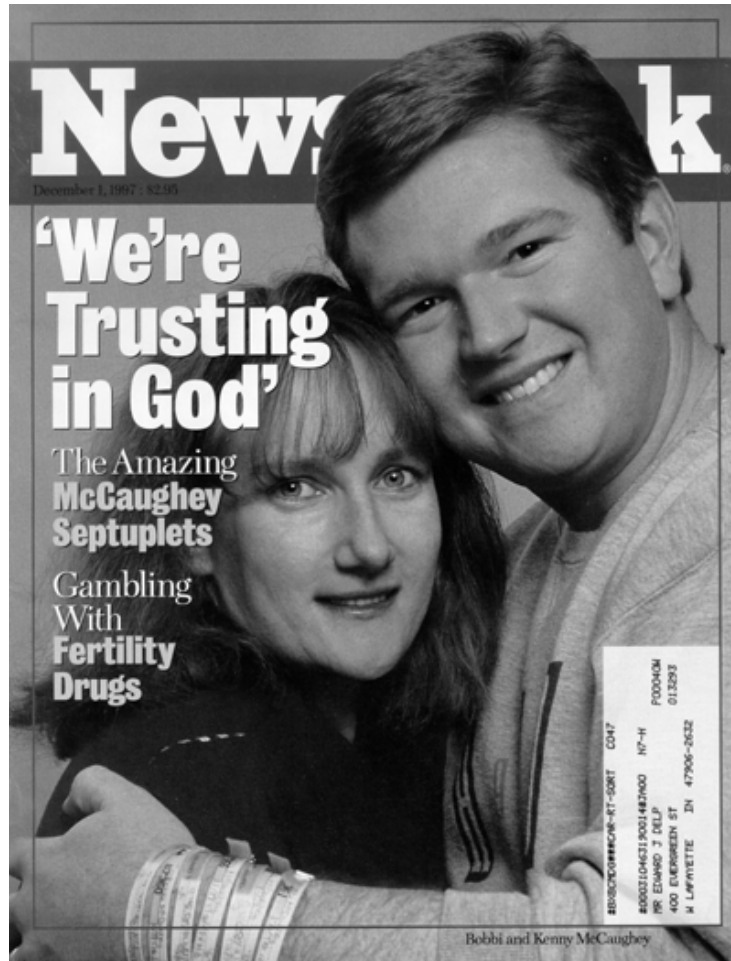


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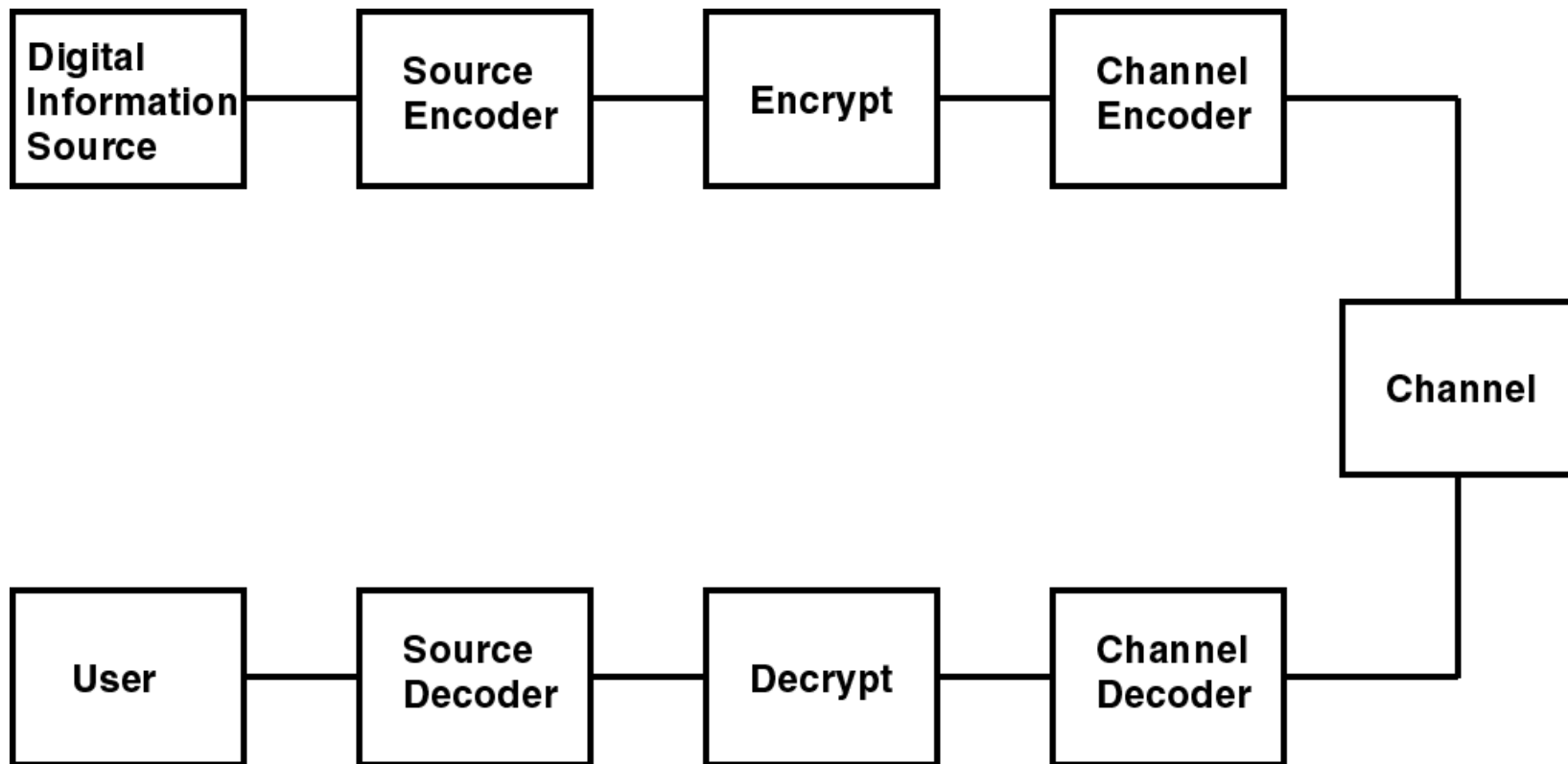




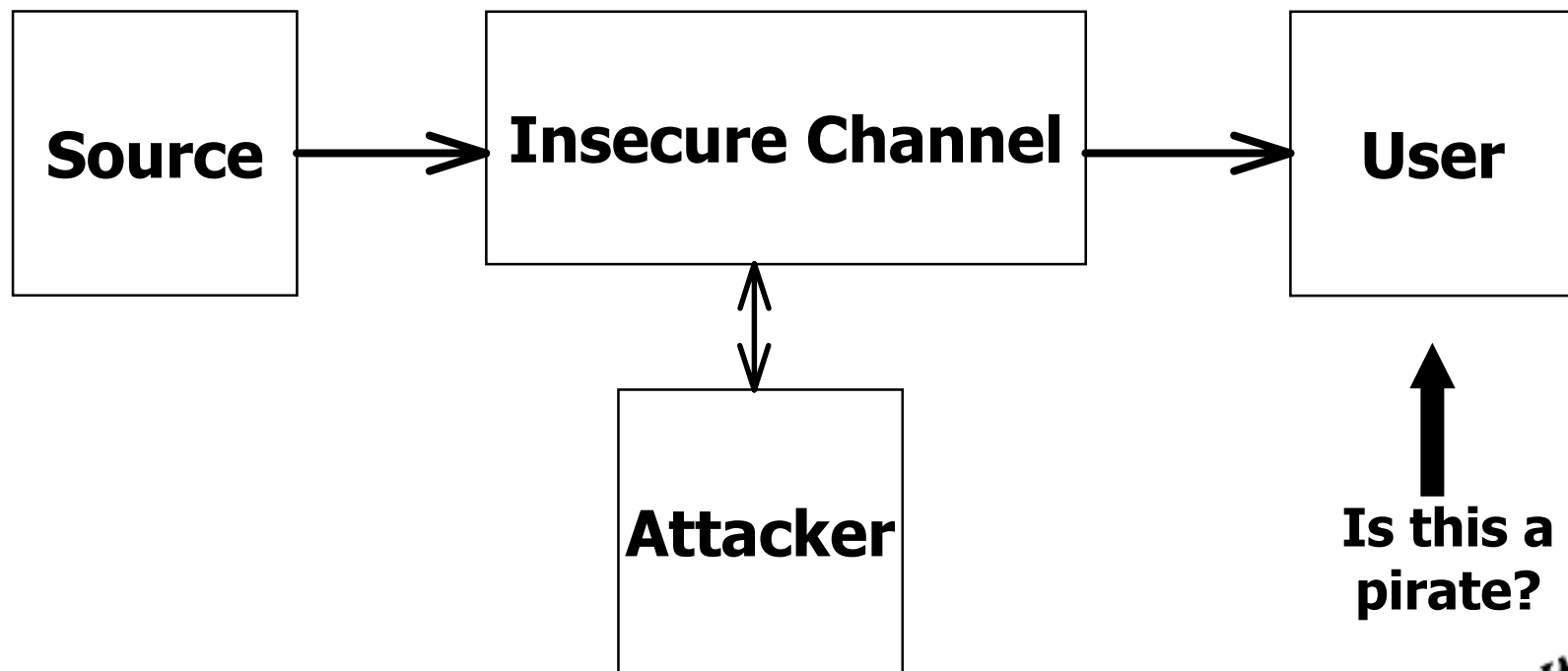




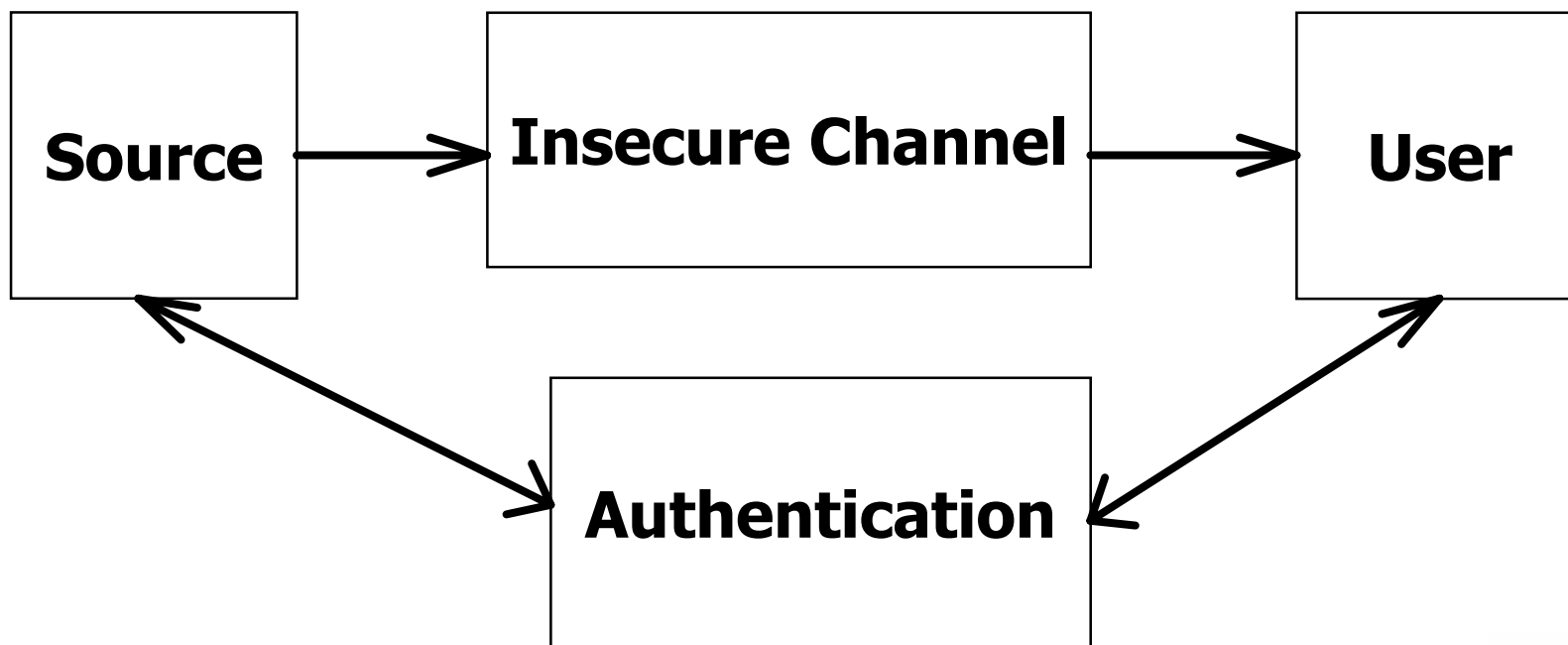
Digital Communication System



Typical Network System: Trusted Users



Network System: User Not Trusted



Multimedia Security Applications

- **Privacy**
- **Authentication**
- **Access Control**
- **Forgery Detection**
- **Copyright Protection**
- **Proof of Purchase (non-deniable)**
- **Proof of Delivery (non-deniable)**
- **Audit Trails**
- **Intruder Detection**



What Do We Want From a Multimedia Security System?

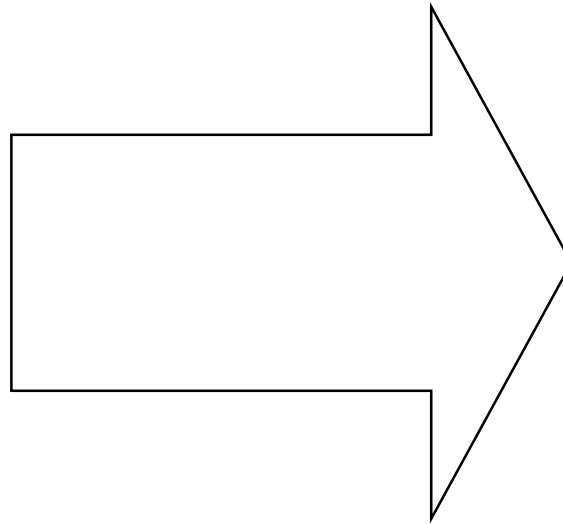
- **Access Control**
 - **Copy Control**
- ⇒
- Playback Control
 - Record Control
 - Generation Control

- **Auditing (fingerprinting)**
 - Who did what and when?



Multimedia Security - Tools Set

- Encryption
- Authentication
- Hashing
- Time-stamping
- Watermarking



SYSTEM

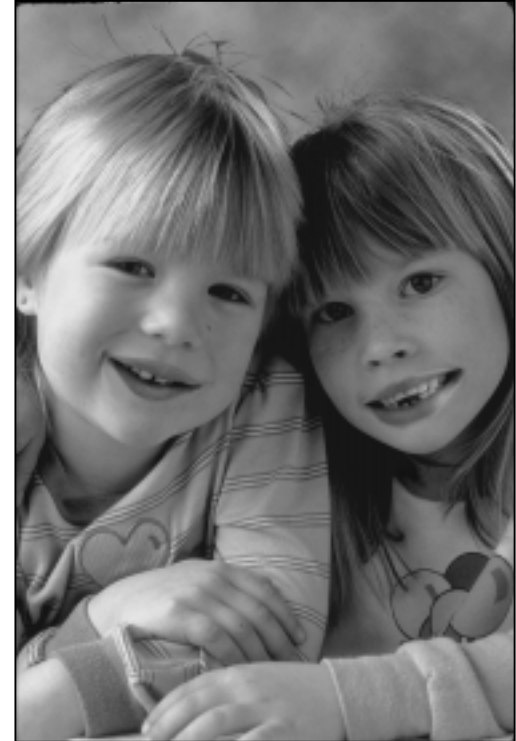


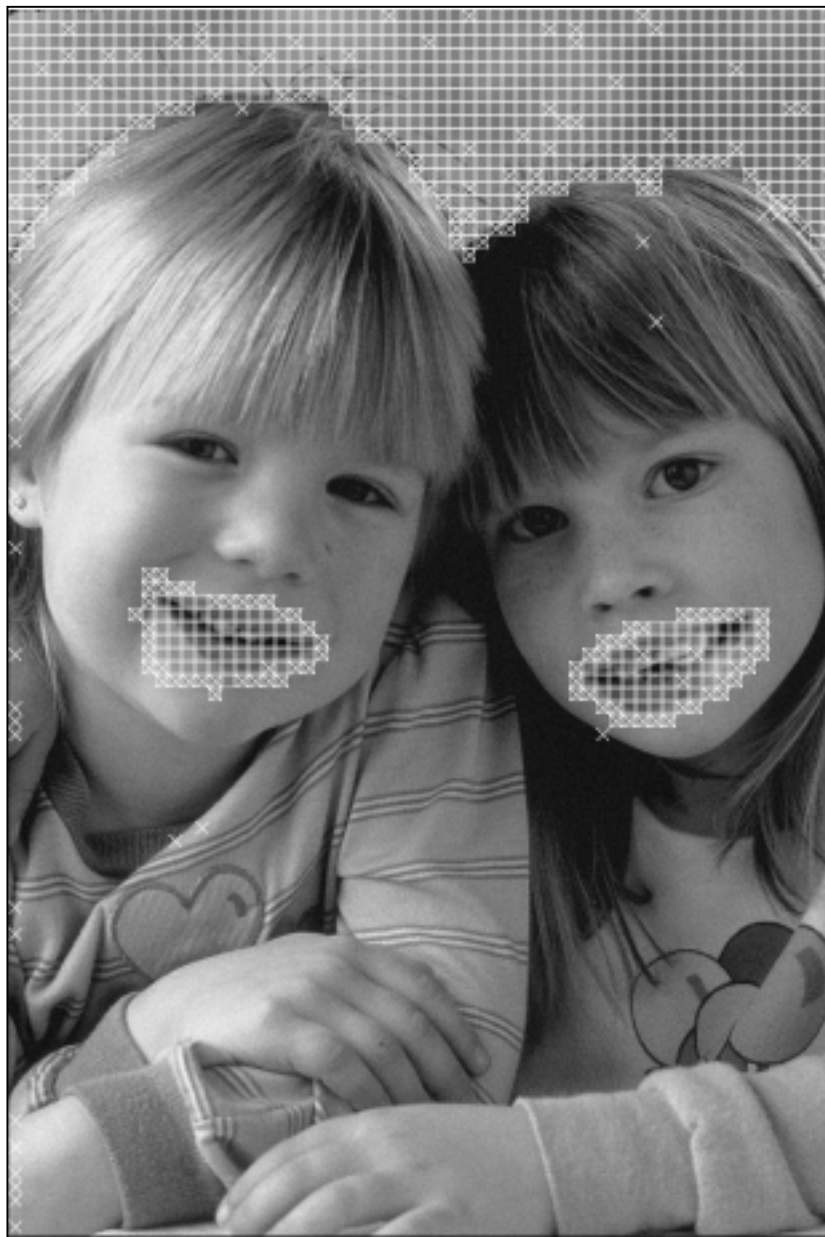
Results - Girls



← Original "Girls"

Altered "Girls" →





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New Applications

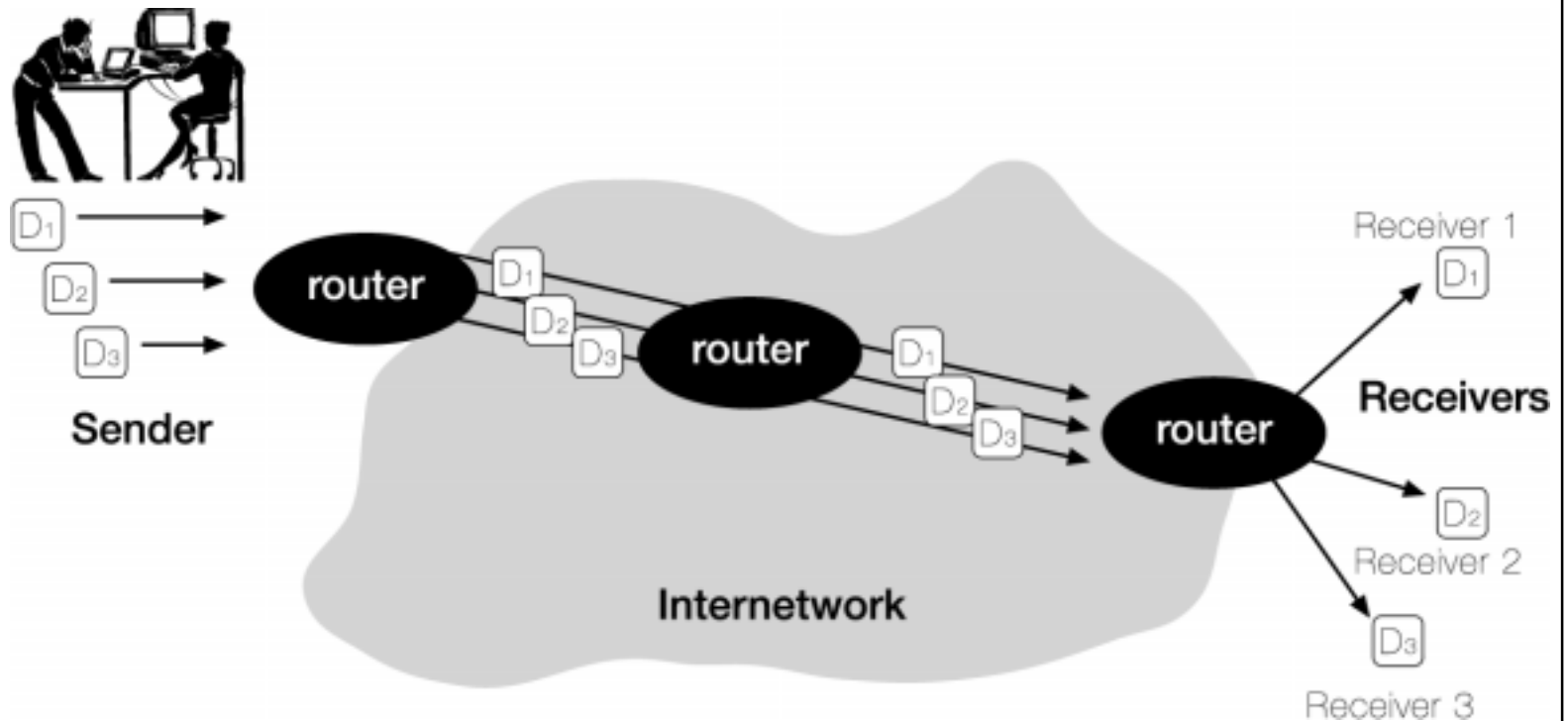
- **Home Networks**
- **Streaming Media**
- **Digital Cinema**
- **Wireless**
- **e-books**



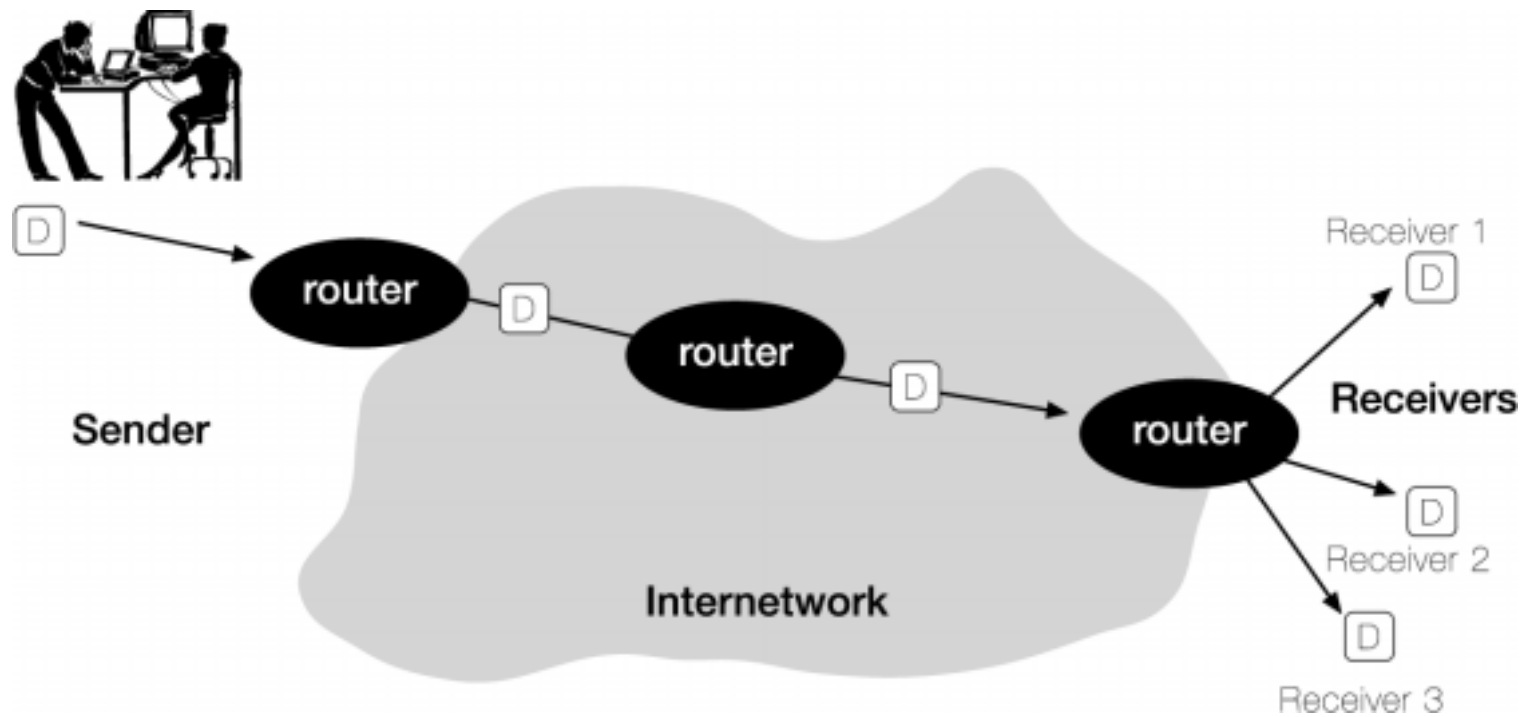
Digital Data in the Home



Streaming: Unicast



Streaming: Multicast



What is Needed?

- **Models of complex end-to-end systems with to respect to security (this is *very* difficult)**
- **Cryptography in a noisy channel - can one still recover something?**
- **Models of watermarking/data hiding - model as a channel coding problem with side information**
- **How can one authenticate in a portable and/or wireless environment?**



What Is Needed?

- **Renewable systems - if the system is “broken” can it be fixed without “product recall”**
- **The security system should exploit the unique properties of the media element with respect to how it is represented and transported (for example multicast)**
- **The security “features” should survive signal processing operations and conversion to analog**
- **Cryptography is not enough and certainly watermarking is not enough - must take a system approach - must understand the application**



Digital Millennium Copyright Act

- **What does it mean to own bits?**
- **Will it be illegal to remove a security feature from a multimedia element?**



Conclusion

- **We need to think differently about our attitudes towards “copyright” - particularly in how we train our students**
- **New “paying models” need to be developed**
- **We need to take a system approach - this is difficult**

