



SPIES

Secret Protection Incentive-based Escrow System

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File Sharing = Piracy

- P2P's killer app: free stuff
 - Music, movies, software, books
- The Problem:
 - **How do we prevent digital content from appearing on P2P file sharing networks?**
- [Byers, Cranor, Cronin, Kormann, McDaniel (*ACM DRM'03*): 77% of movies on the Internet from before release date.

The Ebert Example

- Roger Ebert is given a review copy of a new movie on DVD.
 - He has no incentive not to share the copy.
- Current Approaches
 - Enforcement:
 - RIAA: lots of money and lawyers required
 - Watermarking: limited soln; arms race
 - Prevention:
 - DRM: proprietary solns, screen captures, etc

Our Approach

- We propose the use of incentives:
 - Escrowed money provides an economic incentive to not share the data.
 - Personal copies are okay; losing a copy is not
 - Agnostic to media protected

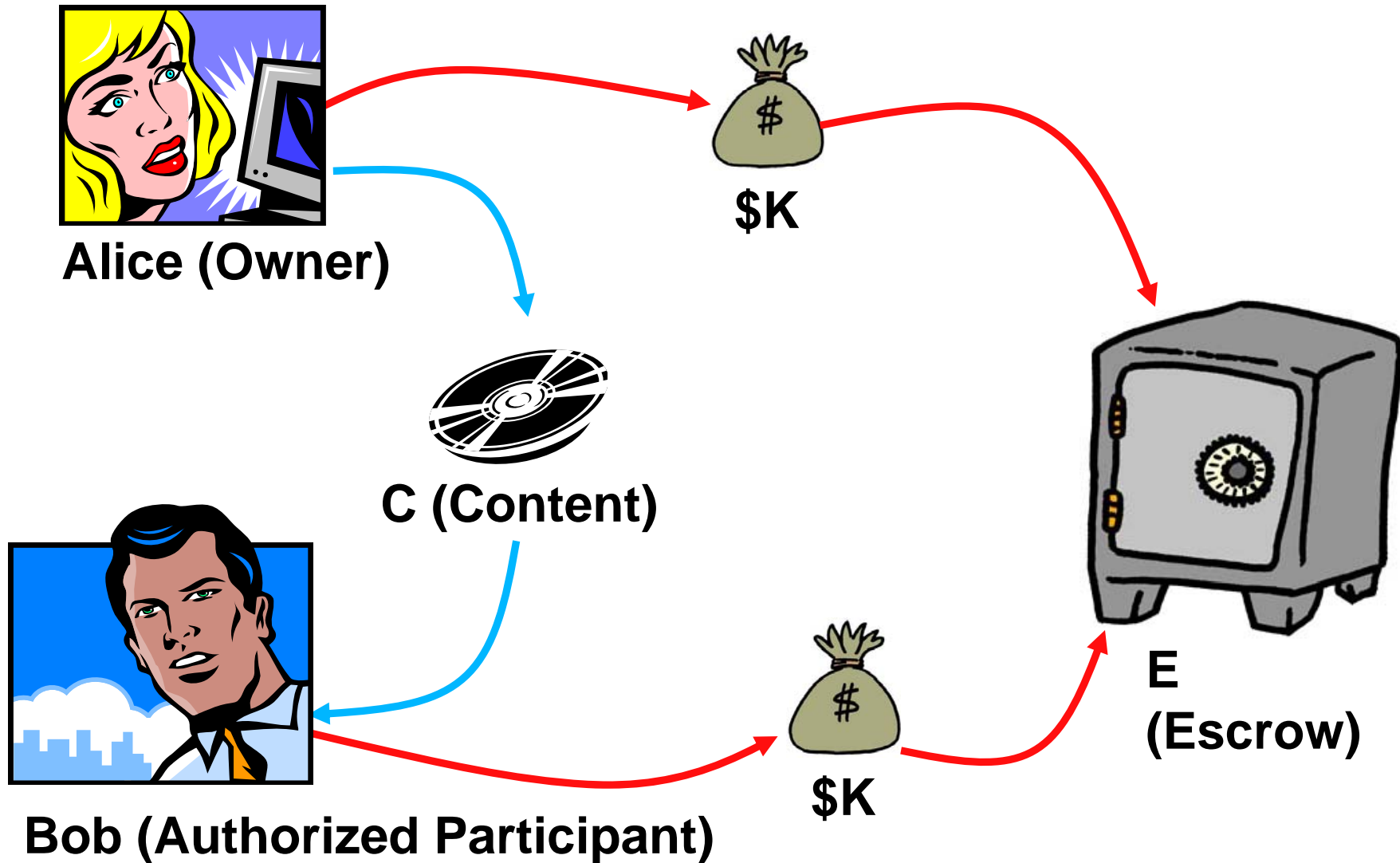
What SPIES is For

- Protection of content that should remain secret:
 - Sharing between small number of peers
 - Limited duration of protection
- Another layer of defense supplementing watermarking or DRM.

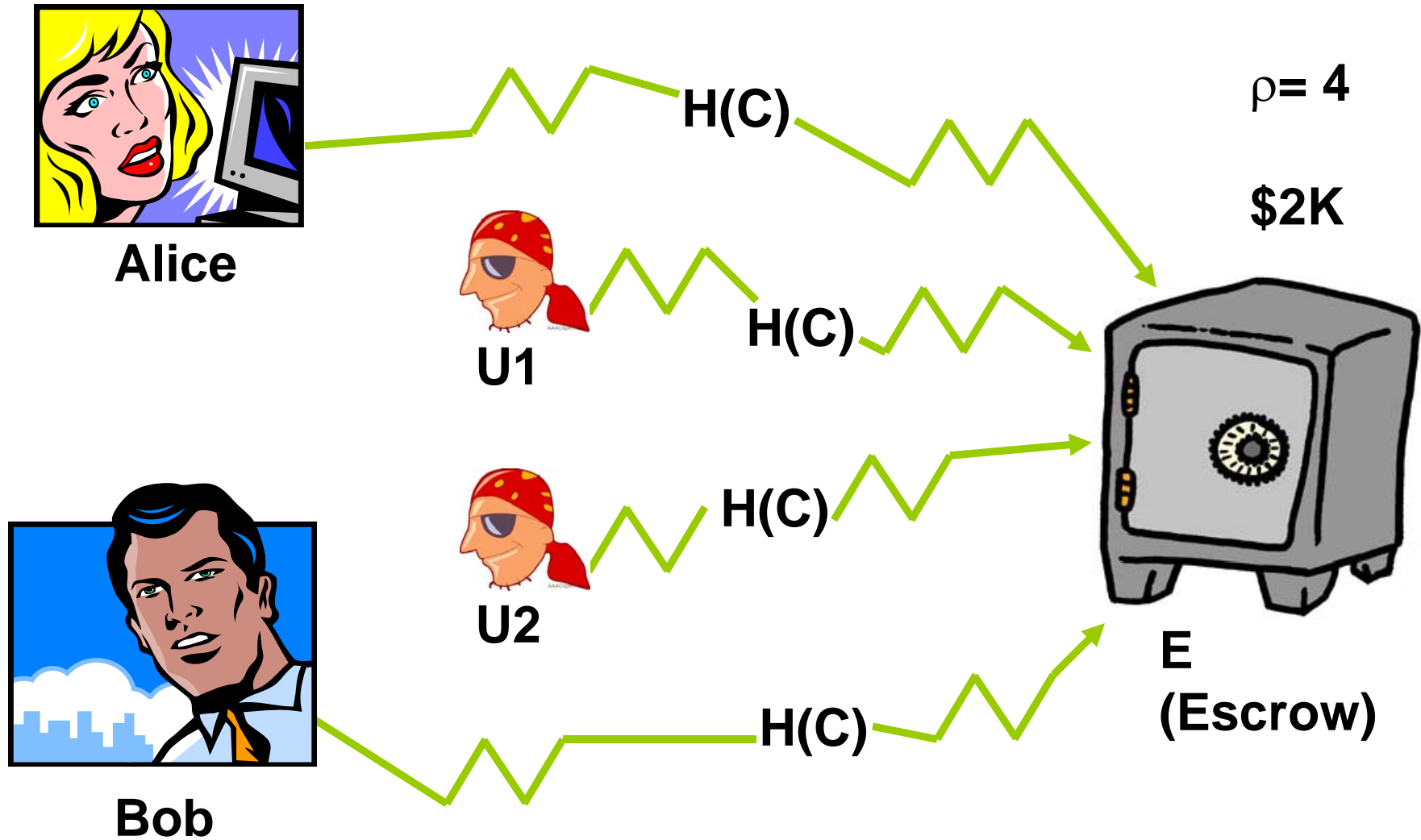
The SPIES Protocol

- 1. Exchange
 - 2. Registration
 - 3. Payment
- } Protection period

1. Exchange



2. Registration



3. Payment

\$UMass
Alumni
Fund\$



Alice



$\$2K \cdot pf(\rho)$



U1



$\$2K/pf(\rho)$



U2



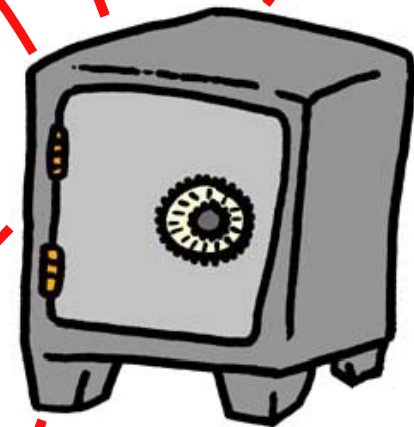
$\$2K/pf(\rho)$



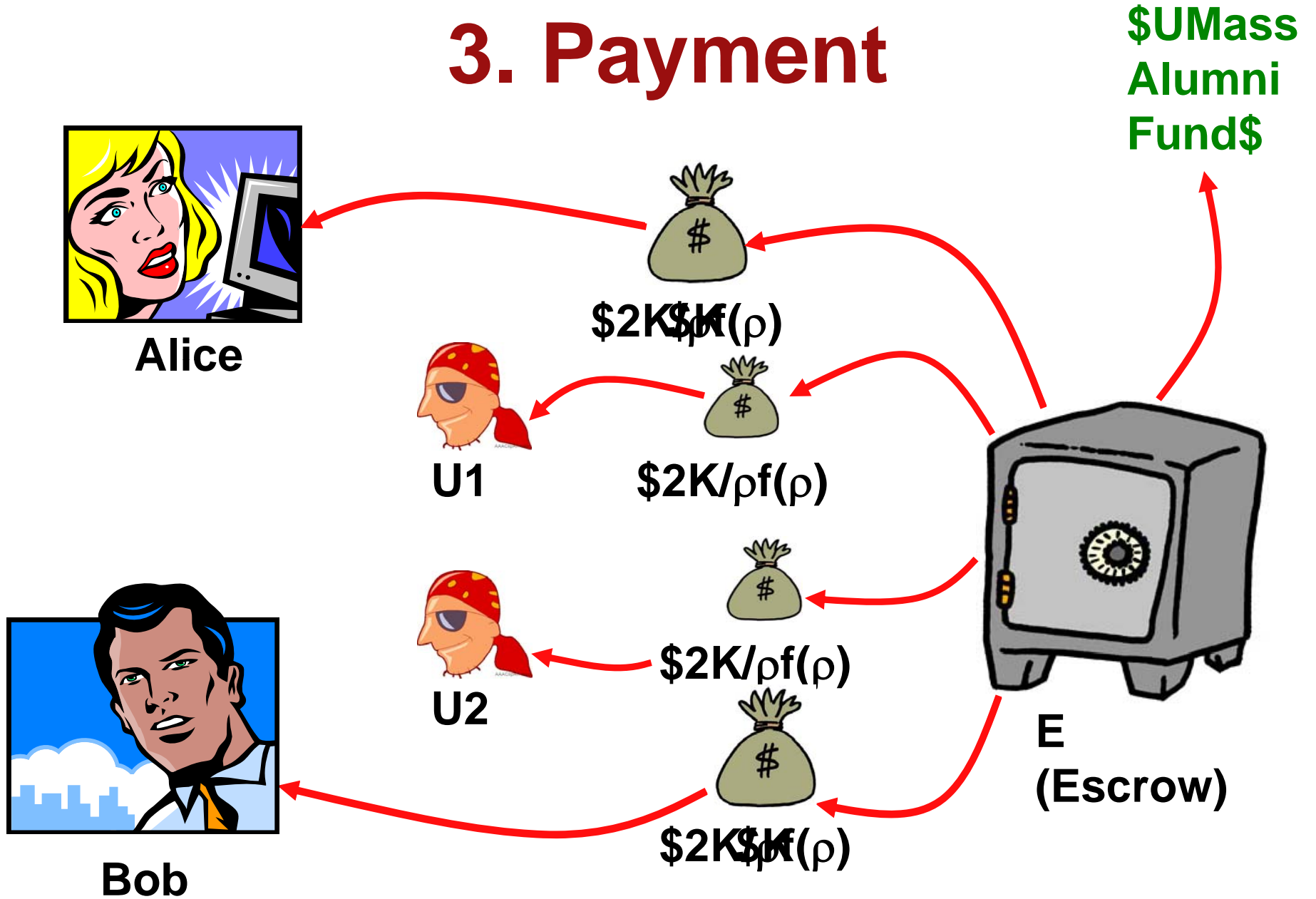
$\$2K \cdot pf(\rho)$



Bob



E
(Escrow)



Incentives and Rational Actions

- Alice and Bob
 - Sharing leads to getting less money
 - More sharing is worse
- Pirates
 - Get a copy and register, if possible
 - Don't share it

Details

- Payout function
- Proof of content
- Setting amount in escrow
- Charities

Payment Function

- Problem:
 - Suppose Alice registers R times
- Solution:
 - Payout per registration drops s.t.
 $R \times (\text{new payout}) < 1 \times (\text{old payout})$
 - Payout:
$$\frac{\$2K}{pf(\rho)}$$
 - If $f(\rho)$ is exponential, more registrations is worse!

Proof of Content

- Problem:
 - Bob sells a modified copy of C on the side
- Solution:
 - Hash: commit to having the content during the protection period
 - Full content comparison
- Amount of Escrow

Charity Selection

- Problem:
 - Alice is a UMass Alumnus
- Partial Solution:
 - A set of charities
 - Choose one at random

Conclusions

- SPIES provides incentives to stop sharing
- Encourages protection of data

