An Economic Approach to Security

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Conundrum: Everyone agrees that information insecurity is a serious problem. Some of the most decorated researchers in Computer Science have been making progress on cryptography and security for 30 years. Yet, widespread security problems persist, and technology that purports to solve them is not widely deployed.

Thesis (Anderson 2001): Information insecurity is primarily an economic problem, not a technological problem. Non-adoption of good security technology is the result of *perverse incentives*.

- Tragedies of the commons
- Liability dumping
- Principal-agent problems

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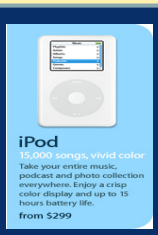

Examples of commercially successful products in which security is based on risk management and economics

Comparison to state of the art

Current ("secure-systems") approach

- Formulate and solve a well motivated "security" problem.
- Implement your solution.
- Try to convince people to adopt your solution.

New ("economics") approach

- Formally model a market in which "security" is *one* of the agents' goals.
- Compare the costs and benefits of different approaches to security (including tolerating insecurity).
- Implement the most cost-effective solution.

Flexibility as an Instrument in Digital Rights Management (WEIS 2005)

Digital-content distributors have some control over the *prices* they charge for their products and over the *flexibility* with which purchased copies can be used (*e.g.*, the extent to which they can be copied, shared, or modified). More flexible products may fetch higher prices, but flexibility may also dampen sales, because some users will obtain copies through sharing instead of buying. We study these tradeoffs between flexibility and security in various models, taking into account that some digital environments are highly *permeable* (*e.g.*, have higher rates of social contact or network bandwidth or both), and some are not. Our results include:

- If users are homogenous, there is a critical permeability level up to which all users buy the product, and the optimal price and flexibility levels decrease as permeability increases. When permeability rises above the critical value, the number of users who buy decreases, and the optimal price and flexibility stay constant.
- A platform vendor who also sells digital content (that he licenses from copyright owners) will find it optimal to allow very flexible use by platform owners and to set a low price for content; most of the vendor's profit is from platform sales. Copyright owners' revenue is low, because prices are low and because sharing of content is common.

The tension between platform vendor and copyright owner predicted by our model is observed in the real world: The February 28, 2005 *Financial Times* quotes a music executive who says, "Our music is not something to be given away to sell iPods."

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