CHAPTER 24

LEGAL AND ETHICAL ASPECTS

LEARNING OBJECTIVES

After studying this chapter, you should be able to:

- ♦ Discuss the different types of computer crime.
- ♦ Understand the types of intellectual property.
- ♦ Present an overview of key issues in the area of privacy.
- ♦ Compare and contrast various approaches to codifying computer ethics.

The legal and ethical aspects of computer security encompass a broad range of topics, and a full discussion is well beyond the scope of this book. In this chapter, we touch on a few important topics in this area.

24.1 CYBERCRIME AND COMPUTER CRIME

The bulk of this book examines technical approaches to the detection, prevention, and recovery from computer and network attacks. One other tool is the deterrent factor of law enforcement. Many types of computer attacks can be considered crimes and, as such, carry criminal sanctions. This section begins with a classification of types of computer crime and then looks at some of the unique law-enforcement challenges of dealing with computer crime.

Types of Computer Crime

Computer crime, or *cybercrime*, is a term used broadly to describe criminal activity in which computers or computer networks are a tool, a target, or a

place of criminal activity.[1] These categories are not exclusive, and many activities can be characterized as falling in one or more categories. The term *cybercrime* has a connotation of the use of networks specifically, whereas *computer crime* may or may not involve networks.

The U.S. Department of Justice [DOJ00] categorizes computer crime based on the role that the computer plays in the criminal activity, as follows:

- **Computers as targets:** This form of crime targets a computer system, to acquire information stored on that computer system, to control the target system without authorization or payment (theft of service), or to alter the integrity of data or interfere with the availability of the computer or server. Using the terminology of Chapter 1, this form of crime involves an attack on data integrity, system integrity, data confidentiality, privacy, or availability.
- **Computers as storage devices:** Computers can be used to further unlawful activity by using a computer or a computer device as a passive storage medium. For example, the computer can be used to store stolen password lists, credit card or calling card numbers, proprietary corporate information, pornographic image files, or "warez" (pirated commercial software).
- **Computers as communications tools:** Many of the crimes falling within this category are simply traditional crimes that are committed online. Examples include the illegal sale of prescription drugs, controlled substances, alcohol, and guns; fraud; gambling; and child pornography.

[1] This definition is from the New York Law School Course on Cybercrime, Cyberterrorism, and Digital Law Enforcement (information-retrieval.info/cybercrime/index.html).

A more specific list of crimes, shown in Table 24.1, is defined in the international Convention on Cybercrime.[2] This is a useful list because it represents an international consensus on what constitutes computer crime, or cybercrime, and what crimes are considered important.

Table 24.1 Cybercrimes Cited in the Convention on Cybercrime

Article 2 Illegal access
The access to the whole or any part of a computer system without right.

Article 3 Illegal interception
The interception without right, made by technical means, of non-public transmissions of computer data to, from or within a computer system, including electromagnetic emissions from a computer system carrying such computer data.

Article 4 Data interference
The damaging, deletion, deterioration, alteration or suppression of computer data without right.

Article 5 System interference
The serious hindering without right of the functioning of a computer system by inputting, transmitting, damaging, deleting, deteriorating, altering or suppressing computer data.

Article 6 Misuse of devices
a The production, sale, procurement for use, import, distribution or otherwise making available of:
i A device, including a computer program, designed or adapted primarily for the purpose of committing any of the offences established in accordance with the above Articles 2 through 5;
ii A computer password, access code, or similar data by which the whole or any part of a computer system is capable of being accessed, with intent that it be used for the purpose of committing any of the offences established in the above Articles 2 through 5; and
b The possession of an item referred to in paragraphs a.i or ii above, with intent that it be used for the purpose of committing any of the offences established in the above Articles 2 through 5. A Party may require by law that a number of such items be possessed before criminal liability attaches.

[2] The 2001 Convention on Cybercrime is the first international treaty seeking to address Internet crimes by harmonizing national laws, improving investigative techniques, and increasing cooperation among nations. It was developed by the Council of Europe and has been ratified by 43 nations, including the United States. The Convention includes a list of crimes that each signatory state must transpose into its own law.

Article 7 Computer-related forgery

The input, alteration, deletion, or suppression of computer data, resulting in inauthentic data with the intent that it be considered or acted upon for legal purposes as if it were authentic, regardless whether or not the data is directly readable and intelligible.

Article 8 Computer-related fraud

The causing of a loss of property to another person by:

a Any input, alteration, deletion or suppression of computer data;

b Any interference with the functioning of a computer system, with fraudulent or dishonest intent of procuring, without right, an economic benefit for oneself or for another person.Article 9 Offenses related to child pornography

a Producing child pornography for the purpose of its distribution through a computer system;

b Offering or making available child pornography through a computer system;

c Distributing or transmitting child pornography through a computer system;

d Procuring child pornography through a computer system for oneself or for another person;

e Possessing child pornography in a computer system or on a computer-data storage medium.

Article 10 Infringements of copyright and related rights

Article 11 Attempt and aiding or abetting

Aiding or abetting the commission of any of the offences established in accordance with the above Articles 2 through 10 of the present Convention with intent that such offence be committed. An attempt to commit any of the offences established in accordance with Articles 3 through 5, 7, 8, and 9.1.a and c. of this Convention.

Yet another categorization is used in the CERT 2007 E-crime Survey, the results of which are shown in Table 24.2. The figures in the second column indicate the percentage of respondents who report at least one incident in the corresponding row category. Entries in the remaining three columns indicate the percentage of respondents who reported a given source for an attack.[3]

[3] Note that the sum of the figures in the last three columns for a given row may exceed 100%, because a respondent my report multiple incidents in multiple source categories (e.g., a respondent experiences both insider and outsider denial-of-service attacks).

Table 24.2 CERT 2006 E-Crime Watch Survey Results

	Committed (net %)	Insider (%)	Outsider (%)	Source Unknown (%)
Theft of intellectual property	30	63	45	5
Theft of other (proprietary) info including customer records, financial records, etc.	36	56	49	9
Denial of service attacks	36	0	84	20
Virus, worms or other malicious code	72	23	80	16
Fraud (credit card fraud, etc.)	29	47	69	18
Identity theft of customer	19	46	79	4
Illegal generation of spam e-mail	40	10	78	20
Phishing (someone posing as your company online in an attempt to gain personal data from your subscribers or employees)	31	0	77	26
Unauthorized access to/use of information, systems or networks	60	47	60	13
Sabotage: deliberate disruption, deletion, or destruction of information, systems, or networks	33	49	41	15
Extortion	33	49	41	15
Web site defacement	14	22	78	6
Zombie machines on organization's network/bots/use of network by BotNets	20	16	72	28
Intentional exposure of private or sensitive information	11	71	36	7
Spyware (not including adware)	51	17	73	17
Other	11	50	43	21

Law Enforcement Challenges

The deterrent effect of law enforcement on computer and network attacks correlates with the success rate of criminal arrest and prosecution. The nature of cybercrime is such that consistent success is extraordinarily difficult. To see this, consider what [KSHE06] refers to as the vicious cycle of cybercrime, involving law enforcement agencies, cybercriminals, and cybercrime victims.

For **law enforcement agencies**, cybercrime presents some unique difficulties. Proper investigation requires a fairly sophisticated grasp of the technology. Although some agencies, particularly larger agencies, are catching up in this area, many jurisdictions lack investigators knowledgeable and experienced in dealing with this kind of crime. Lack of resources represents another handicap. Some cybercrime investigations require considerable computer processing power, communications capacity, and storage capacity, which may be beyond the budget of individual jurisdictions. The global nature of cybercrime is an additional obstacle: Many crimes will involve perpetrators who are remote from the target system, in another jurisdiction or even another country. A lack of collaboration and cooperation with remote law enforcement agencies can greatly hinder an investigation. Initiatives such as international Convention on Cybercrime are a promising sign. The Convention at least introduces a common terminology for crimes and a framework for harmonizing laws globally.

The relative lack of success in bringing **cybercriminals** to justice has led to an increase in their numbers, boldness, and the global scale of their operations. It is difficult to profile cybercriminals in the way that is often done with other types of repeat offenders. The cybercriminal tends to be young and very computer-savvy, but the range of behavioral characteristics is wide. Further, there exist no cybercriminal databases that can point investigators to likely suspects.

The success of cybercriminals, and the relative lack of success of law enforcement, influence the behavior of **cybercrime victims**. As with law enforcement, many organizations that may be the target of attack have not invested sufficiently in technical, physical, and human-factor resources to prevent attacks. Reporting rates tend to be low because of a lack of confidence in law enforcement, a concern about corporate reputation, and a concern about civil liability. The low reporting rates and the reluctance to work with law enforcement on the part of victims feeds into the handicaps under which law enforcement works, completing the vicious cycle.

Working With Law Enforcement

Executive management and security administrators need to look upon law enforcement as another resource and tool, alongside technical, physical, and human-factor resources. The successful use of law enforcement depends much more on people skills than technical skills. Management needs to understand the criminal investigation process, the inputs that investigators need, and the ways in which the victim can contribute positively to the investigation.

24.2 INTELLECTUAL PROPERTY

The U.S. legal system, and legal systems generally, distinguish three primary types of property:

- **Real property:** Land and things permanently attached to the land, such as trees, buildings, and stationary mobile homes.
- **Personal property:** Personal effects, moveable property and goods, such as cars, bank accounts, wages, securities, a small business,

furniture, insurance policies, jewelry, patents, pets, and season baseball tickets.

- **Intellectual property:** Any intangible asset that consists of human knowledge and ideas. Examples include software, data, novels, sound recordings, the design of a new type of mousetrap, or a cure for a disease.

This section focuses on the computer security aspects of intellectual property.

Types of Intellectual Property

There are three main types of intellectual property for which legal protection is available: copyrights, trademarks, and patents. The legal protection is against **infringement**, which is the invasion of the rights secured by copyrights, trademarks, and patents. The right to seek civil recourse against anyone infringing his or her property is granted to the IP owner. Depending upon the type of IP, infringement may vary (Figure 24.1).

COPYRIGHTS

Copyright law protects the tangible or fixed expression of an idea, not the idea itself. A creator can claim copyright, and file for the copyright at a national government copyright office, if the following conditions are fulfilled:[4]

- The proposed work is original.
- The creator has put this original idea into a concrete form, such as hard copy (paper), software, or multimedia form.

[4] Copyright is automatically assigned to newly created works in countries that subscribe to the Berne convention, which encompasses the vast majority of nations. Some countries, such as the United States, provide additional legal protection if the work is registered.

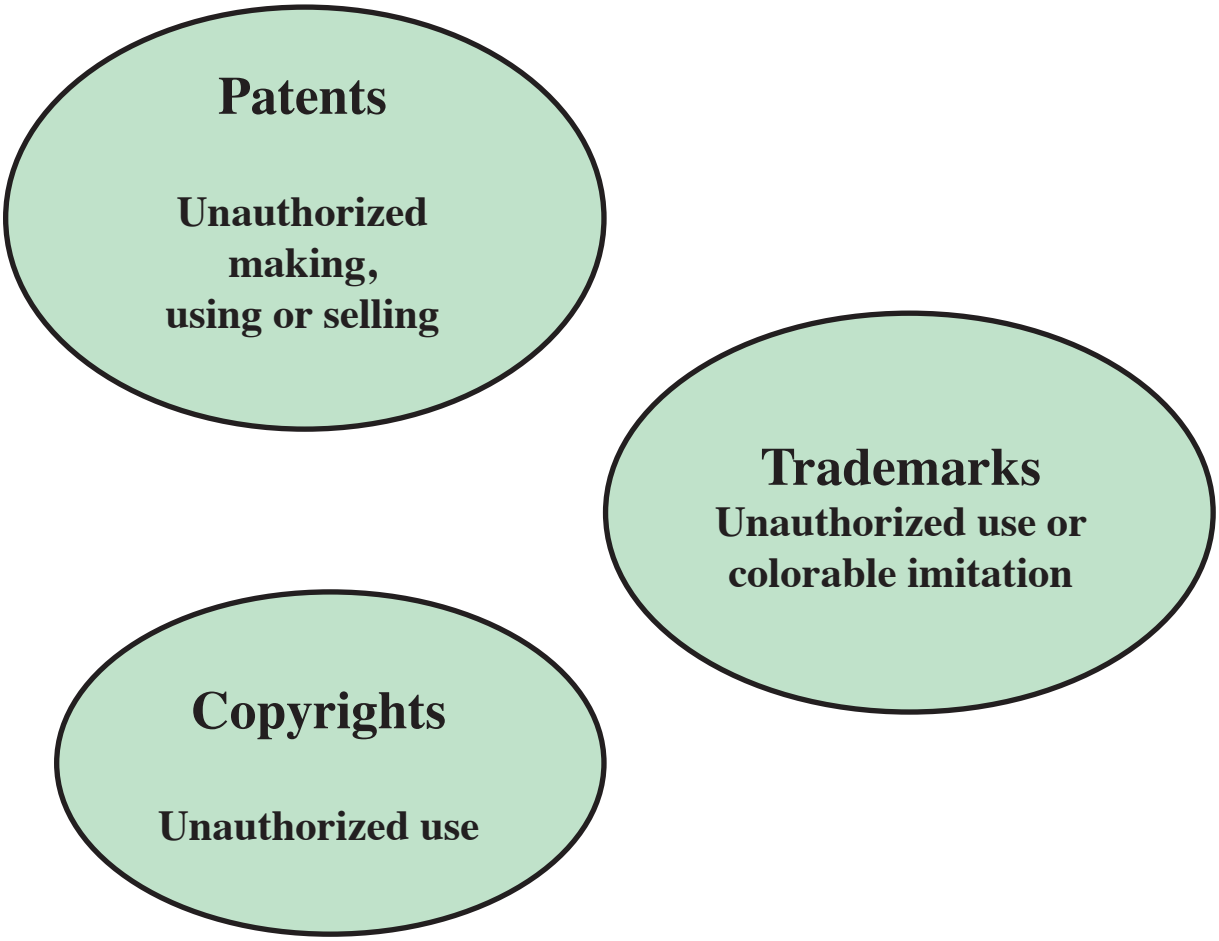

Figure 24.1 Intellectual Property Infringement

Examples of items that may be copyrighted include the following [BRAU01]:

- **Literary works:** Novels, nonfiction prose, poetry, newspaper articles and newspapers, magazine articles and magazines, catalogs, brochures, ads (text), and compilations such as business directories

- **Musical works:** Songs, advertising jingles, and instrumentals
- **Dramatic works:** Plays, operas, and skits
- **Pantomimes and choreographic works:** Ballets, modern dance, jazz dance, and mime works
- **Pictorial, graphic, and sculptural works:** Photographs, posters, maps, paintings, drawings, graphic art, display ads, cartoon strips and cartoon characters, stuffed animals, statues, paintings, and works of fine art
- **Motion pictures and other audiovisual works:** Movies, documentaries, travelogues, training films and videos, television shows, television ads, and interactive multimedia works
- **Sound recordings:** Recordings of music, sound, or words
- **Architectural works:** Building designs, whether in the form of architectural plans, drawings, or the constructed building itself
- **Software-related works:** Computer software, software documentation and manuals, training manuals, other manual

The copyright owner has the following exclusive rights, protected against infringement:

- **Reproduction right:** Lets the owner make copies of a work
- **Modification right:** Also known as the derivative-works right, concerns modifying a work to create a new or derivative work
- **Distribution right:** Lets the owner publicly sell, rent, lease, or lend copies of the work.
- **Public-performance right:** Applies mainly to live performances
- **Public-display right:** Lets the owner publicly show a copy of the work directly or by means of a film, slide, or television image

PATENTS

A patent for an invention is the grant of a property right to the inventor. The right conferred by the patent grant is, in the language of the U.S. statute and of the grant itself, "the right to exclude others from making, using, offering for sale, or selling" the invention in the United States or "importing" the invention into the United States. Similar wording appears in the statutes of other nations. There are three types of patents:

- **Utility patents:** May be granted to anyone who invents or discovers any new and useful process, machine, article of manufacture, or composition of matter, or any new and useful improvement thereof;
- **Design patents:** May be granted to anyone who invents a new, original, and ornamental design for an article of manufacture; and
- **Plant patents:** May be granted to anyone who invents or discovers and asexually reproduces any distinct and new variety of plant.

An example of a patent from the computer security realm is the RSA public-key cryptosystem. From the time it was granted in 1983 until the patent expired in 2000, the patent holder, RSA Security, was entitled to receive a fee for each implementation of RSA.

TRADEMARKS

A trademark is a word, name, symbol, or device that is used in trade with goods to indicate the source of the goods and to distinguish them from the goods of others. A servicemark is the same as a trademark except that it identifies and distinguishes the source of a service rather than a product. The terms *trademark* and *mark* are commonly used to refer to both trademarks and servicemarks. Trademark rights may be used to prevent others from using a confusingly similar mark, but not to prevent others from

making the same goods or from selling the same goods or services under a clearly different mark.

Intellectual Property Relevant to Network and Computer Security

A number of forms of intellectual property are relevant in the context of network and computer security. Here we mention some of the most prominent:

- **Software:** This includes programs produced by vendors of commercial software (e.g., operating systems, utility programs, applications) as well as shareware, proprietary software created by an organization for internal use, and software produced by individuals. For all such software, copyright protection is available if desired. In some cases, a patent protection may also be appropriate.
- **Databases:** A database may consist of data that is collected and organized in such a fashion that it has potential commercial value. An example is an economic forecasting database. Such databases may be protected by copyright.
- **Digital content:** This category includes audio files, video files, multimedia, courseware, Web site content, and any other original digital work that can be presented in some fashion using computers or other digital devices.
- **Algorithms:** An example of a patentable algorithm, previously cited, is the RSA public-key cryptosystem.

Digital Millennium Copyright Act

The U.S. Digital Millennium Copyright Act (DMCA) has had a profound effect on the protection of digital content rights in both the United States and

worldwide. The DMCA, signed into law in 1998, is designed to implement World Intellectual Property Organization (WIPO) treaties, signed in 1996. In essence, DMCA strengthens the protection of copyrighted materials in digital format.

The DMCA encourages copyright owners to use technological measures to protect copyrighted works. These measures fall into two categories: measures that prevent access to the work and measures that prevent copying of the work. Further, the law prohibits attempts to bypass such measures. Specifically, the law states that "no person shall circumvent a technological measure that effectively controls access to a work protected under this title." Among other effects of this clause, it prohibits almost all unauthorized decryption of content. The law further prohibits the manufacture, release, or sale of products, services, and devices that can crack encryption designed to thwart either access to or copying of material unauthorized by the copyright holder. Both criminal and civil penalties apply to attempts to circumvent technological measures and to assist in such circumvention.

Certain actions are exempted from the provisions of the DMCA and other copyright laws, including the following:

- **Fair use:** This concept is not tightly defined. It is intended to permit others to perform, show, quote, copy, and otherwise distribute portions of the work for certain purposes. These purposes include review, comment, and discussion of copyrighted works.
- **Reverse engineering:** Reverse engineering of a software product is allowed if the user has the right to use a copy of the program and if the purpose of the reverse engineering is not to duplicate the functionality of the program but rather to achieve interoperability.

- **Encryption research:** "Good faith" encryption research is allowed. In essence, this exemption allows decryption attempts to advance the development of encryption technology.
- **Security testing:** This is the access of a computer or network for the good faith testing, investigating, or correcting a security flaw or vulnerability, with the authorization of the owner or operator.
- **Personal privacy:** It is generally permitted to bypass technological measures if that is the only reasonable way to prevent the access to result in the revealing or recording of personally identifying information.

Despite the exemptions built into the Act, there is considerable concern, especially in the research and academic communities, that the act inhibits legitimate security and encryption research. These parties feel that DMCA stifles innovation and academic freedom and is a threat to open source software development [ACM04].

Digital Rights Management

Digital Rights Management (DRM) refers to systems and procedures that ensure that holders of digital rights are clearly identified and receive the stipulated payment for their works. The systems and procedures may also impose further restrictions on the use of digital objects, such as inhibiting printing or prohibiting further distribution.

There is no single DRM standard or architecture. DRM encompasses a variety of approaches to intellectual property management and enforcement by providing secure and trusted automated services to control the distribution and use of content. In general, the objective is to provide mechanisms for the complete content management life cycle (creation, subsequent contribution by others, access, distribution, use), including the management of rights information associated with the content.

DRM systems should meet the following objectives:

1. Provide persistent content protection against unauthorized access to the digital content, limiting access to only those with the proper authorization.
2. Support a variety of digital content types (e.g., music files, video streams, digital books, images).
3. Support content use on a variety of platforms, (e.g., PCs, PDAs, iPods, mobile phones).
4. Support content distribution on a variety of media, including CD-ROMs, DVDs, and flash memory.

Figure 24.2, based on [LIU03], illustrates a typical DRM model in terms of the principal users of DRM systems:

- **Content provider:** Holds the digital rights of the content and wants to protect these rights. Examples are a music record label and a movie studio.
- **Distributor:** Provides distribution channels, such as an online shop or a Web retailer. For example, an online distributor receives the digital content from the content provider and creates a Web catalog presenting the content and rights metadata for the content promotion.
- **Consumer:** Uses the system to access the digital content by retrieving downloadable or streaming content through the distribution channel and then paying for the digital license. The player/viewer application used by the consumer takes charge of initiating license request to the clearinghouse and enforcing the content usage rights.

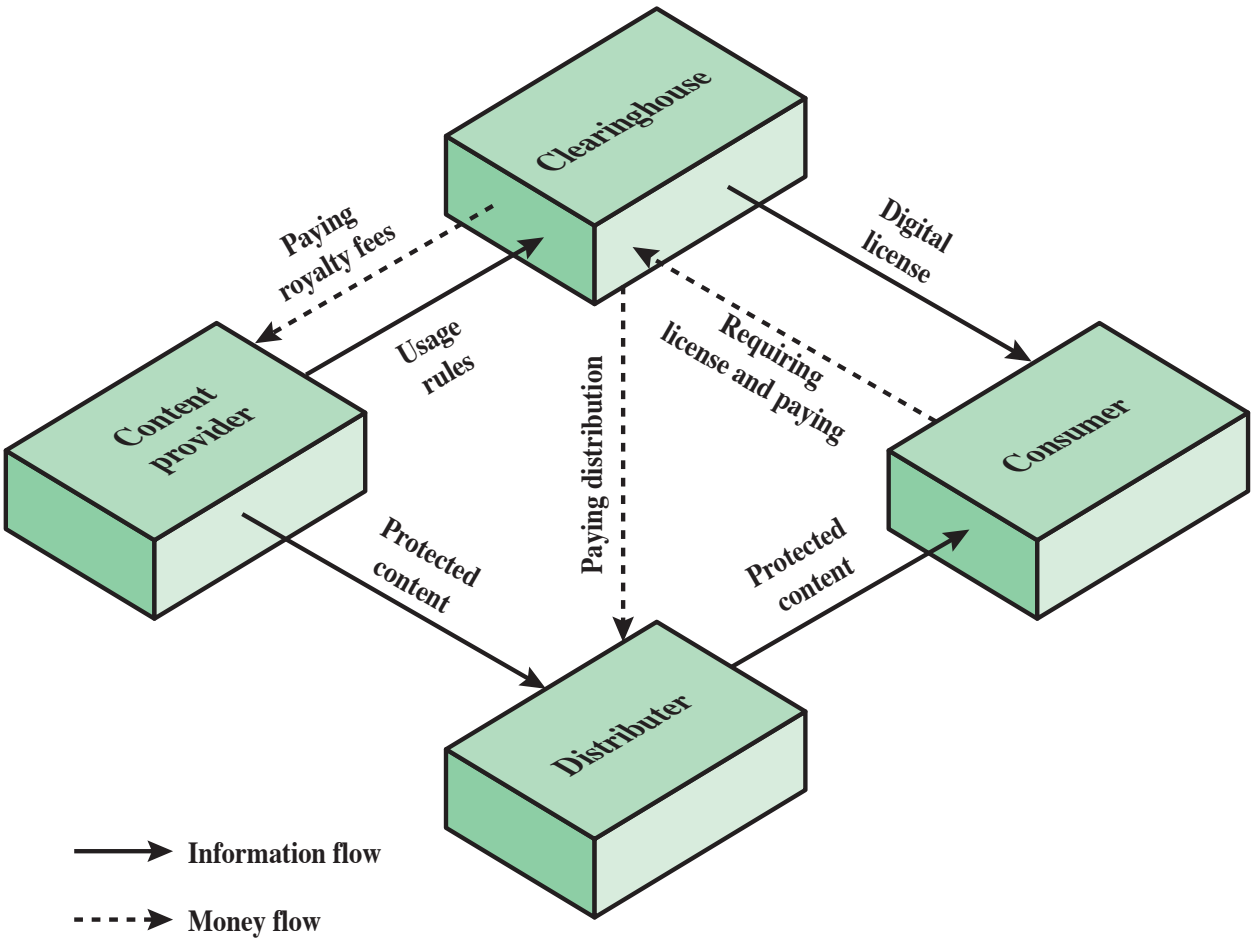

Figure 24.2 DRM Components

- **Clearinghouse:** Handles the financial transaction for issuing the digital license to the consumer and pays royalty fees to the content provider and distribution fees to the distributor accordingly. The clearinghouse is also responsible for logging license consumptions for every consumer.

In this model, the distributor need not enforce the access rights. Instead, the content provider protects the content in such a way (typically encryption) that the consumer must purchase a digital license and access capability from the clearinghouse. The clearinghouse consults usage rules provided by the content provider to determine what access is permitted and

the fee for a particular type of access. Having collected the fee, the clearinghouse credits the content provider and distributor appropriately.

Figure 24.3 shows a generic system architecture to support DRM functionality. The system is access by parties in three roles. **Rights holders** are the content providers, who either created the content or have acquired rights to the content. **Service providers** include distributors and clearinghouses. **Consumers** are those who purchase the right to access to content for specific uses. There is system interface to the services provided by the DRM system:

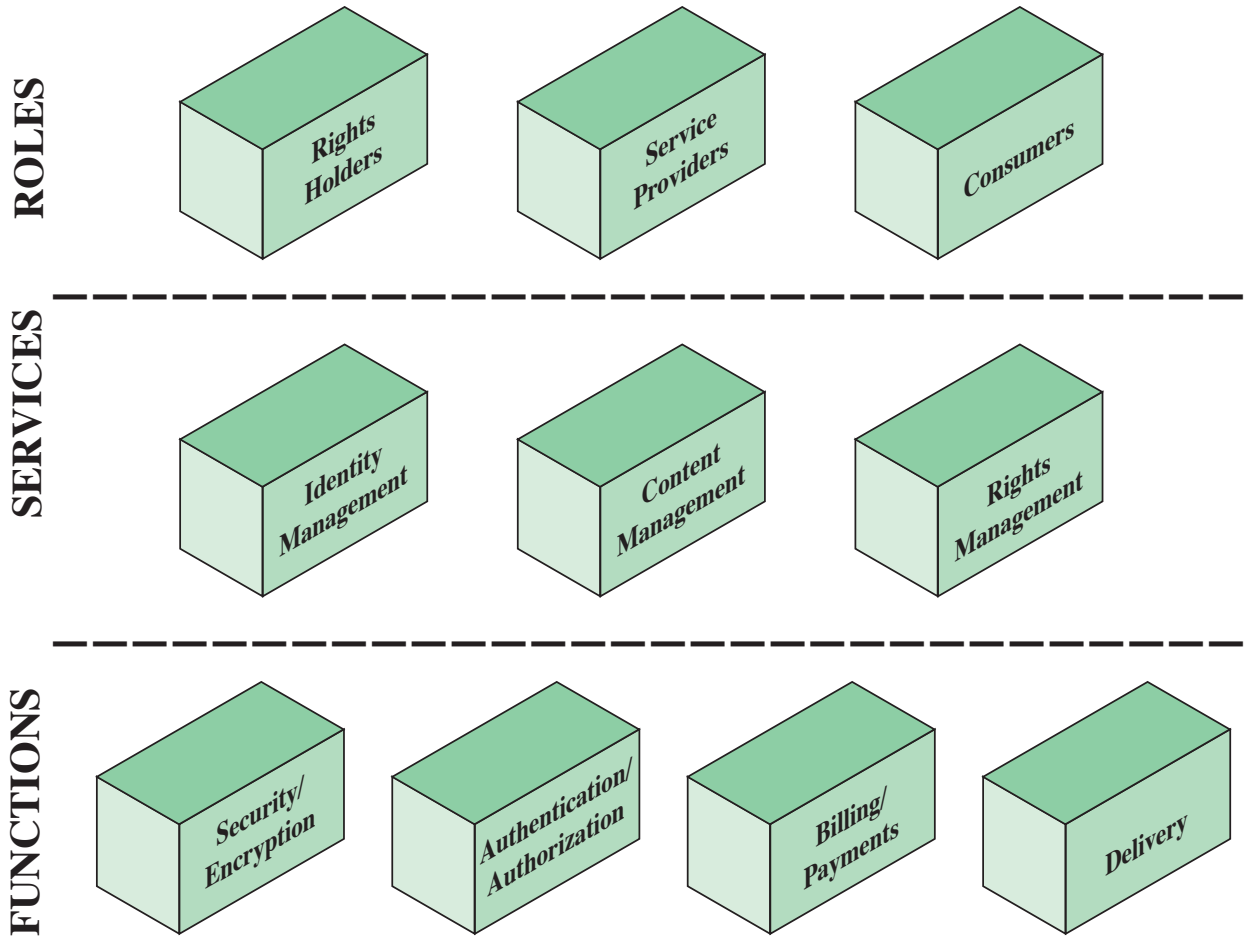

Figure 24.3 DRM System Architecture

- **Identity management:** Mechanisms to uniquely identify entities, such as parties and content
- **Content management:** Processes and functions needed to manage the content lifestyle
- **Rights management:** Processes and functions needed to manage rights, rights holders, and associated requirements

Below these management modules are a set of common functions. The **security/encryption** module provides functions to encrypt content and to sign license agreements. The identity management service makes use of the **authentication** and **authorization** functions to identify all parties in the relationship. Using these functions, the identity management service includes the following:

- Allocation of unique party identifiers
- User profile and preferences
- User's device management
- Public-key management

Billing/payments functions deal with the collection of usage fees from consumers and the distribution of payments to rights holders and distributors. **Delivery** functions deal with the delivery of content to consumers.

24.3 PRIVACY

An issue with considerable overlap with computer security is that of privacy. On the one hand, the scale and interconnectedness of personal information collected and stored in information systems has increased dramatically,

motivated by law enforcement, national security, and economic incentives. The last mentioned has been perhaps the main driving force. In a global information economy, it is likely that the most economically valuable electronic asset is aggregations of information on individuals [HAYE09]. On the other hand, individuals have become increasingly aware of the extent to which government agencies, businesses, and even Internet users have access to their personal information and private details about their lives and activities.

Concerns about the extent to which personal privacy has been and may be compromised have led to a variety of legal and technical approaches to reinforcing privacy rights.

Privacy Law and Regulation

A number of international organizations and national governments have introduced laws and regulations intended to protect individual privacy. We look at two such initiatives in this subsection.

European Union Data Protection Directive

In 1998, the EU adopted the Directive on Data Protection to both (1) ensure that member states protected fundamental privacy rights when processing personal information, and (2) prevent member states from restricting the free flow of personal information within the EU. The Directive is not itself a law, but requires member states to enact laws encompassing its terms. The Directive is organized around the following principles of personal information use:

- **Notice:** Organizations must notify individuals what personal information they are collecting, the uses of that information, and what choices the individual may have.

- **Consent:** Individuals must be able to choose whether and how their personal information is used by, or disclosed to, third parties. They have the right not to have any sensitive information collected or used without express permission, including race, religion, health, union membership, beliefs, and sex life.
- **Consistency:** Organizations may use personal information only in accordance with the terms of the notice given the data subject and any choices with respect to its use exercised by the subject.
- **Access:** Individuals must have the right and ability to access their information and correct, modify, or delete any portion of it.
- **Security:** Organizations must provide adequate security, using technical and other means, to protect the integrity and confidentiality of personal information.
- **Onward transfer:** Third parties receiving personal information must provide the same level of privacy protection as the organization from whom the information is obtained.
- **Enforcement:** The Directive grants a private right of action to data subjects when organizations do not follow the law. In addition, each EU member has a regulatory enforcement agency concerned with privacy rights enforcement.

UNITED STATES PRIVACY INITIATIVES

The first comprehensive privacy legislation adopted in the United States was the Privacy Act of 1974, which dealt with personal information collected and used by federal agencies. The Act is intended to

1. Permit individuals to determine what records pertaining to them are collected, maintained, used, or disseminated.

2. Permit individuals to forbid records obtained for one purpose to be used for another purpose without consent.
3. Permit individuals to obtain access to records pertaining to them and to correct and amend such records as appropriate.
4. Ensure that agencies collect, maintain, and use personal information in a manner that ensures that the information is current, adequate, relevant, and not excessive for its intended use.
5. Create a private right of action for individuals whose personal information is not used in accordance with the Act.

As with all privacy laws and regulations, there are exceptions and conditions attached to this Act, such as criminal investigations, national security concerns, and conflicts between competing individual rights of privacy.

While the 1974 Privacy Act covers government records, a number of other U.S. laws have been enacted that cover other areas, including the following:

- **Banking and financial records:** Personal banking information is protected in certain ways by a number of laws, including the recent Financial Services Modernization Act.
- **Credit reports:** The Fair Credit Reporting Act confers certain rights on individuals and obligations on credit reporting agencies.
- **Medical and health insurance records:** A variety of laws have been in place for decades dealing with medical records privacy. The Health Insurance Portability and Accountability Act (HIPPA) created significant new rights for patients to protect and access their own health information.

- **Children's privacy:** The Children's Online Privacy Protection Act places restrictions on online organizations in the collection of data from children under the age of 13.
- **Electronic communications:** The Electronic Communications Privacy Act generally prohibits unauthorized and intentional interception of wire an electronic communications during the transmission phase and unauthorized accessing of electronically stored wire and electronic communications.

Organizational Response

Organizations need to deploy both management controls and technical measures to comply with laws and regulations concerning privacy as well as to implement corporate policies concerning employee privacy. ISO 27002 (*Code of Practice for Information Security Management*) states the requirement as follows:

ISO 27002: Data protection and privacy of personal information

An organizational data protection and privacy policy should be developed and implemented. This policy should be communicated to all persons involved in the processing of personal information. Compliance with this policy and all relevant data protection legislation and regulations requires appropriate management structure and control. Often this is best achieved by the appointment of a responsible person, such as a data protection officer, who should provide guidance to managers, users, and service providers on their individual responsibilities and the specific procedures that should be followed. Responsibility for handling personal information and ensuring awareness of the data protection principles should be dealt with in accordance with relevant legislation and regulations. Appropriate technical and organizational measures to protect personal information should be implemented.

An excellent, detailed list of considerations for organizational implementation of privacy controls is provided in *The Standard of Good Practice for Information Security*, from the Information Security Forum [ISF12]. This material is reproduced in Appendix 24A.

Computer Usage Privacy

The Common Criteria specification [CCPS09] includes a definition of a set of functional requirements in a Privacy Class, which should be implemented in a trusted system. The purpose of the privacy functions is to provide a user protection against discovery and misuse of identity by other users. This specification is a useful guide to how to design privacy support functions as part of a computer system. Figure 24.4 shows a breakdown of privacy into four major areas, each of which has one or more specific functions:

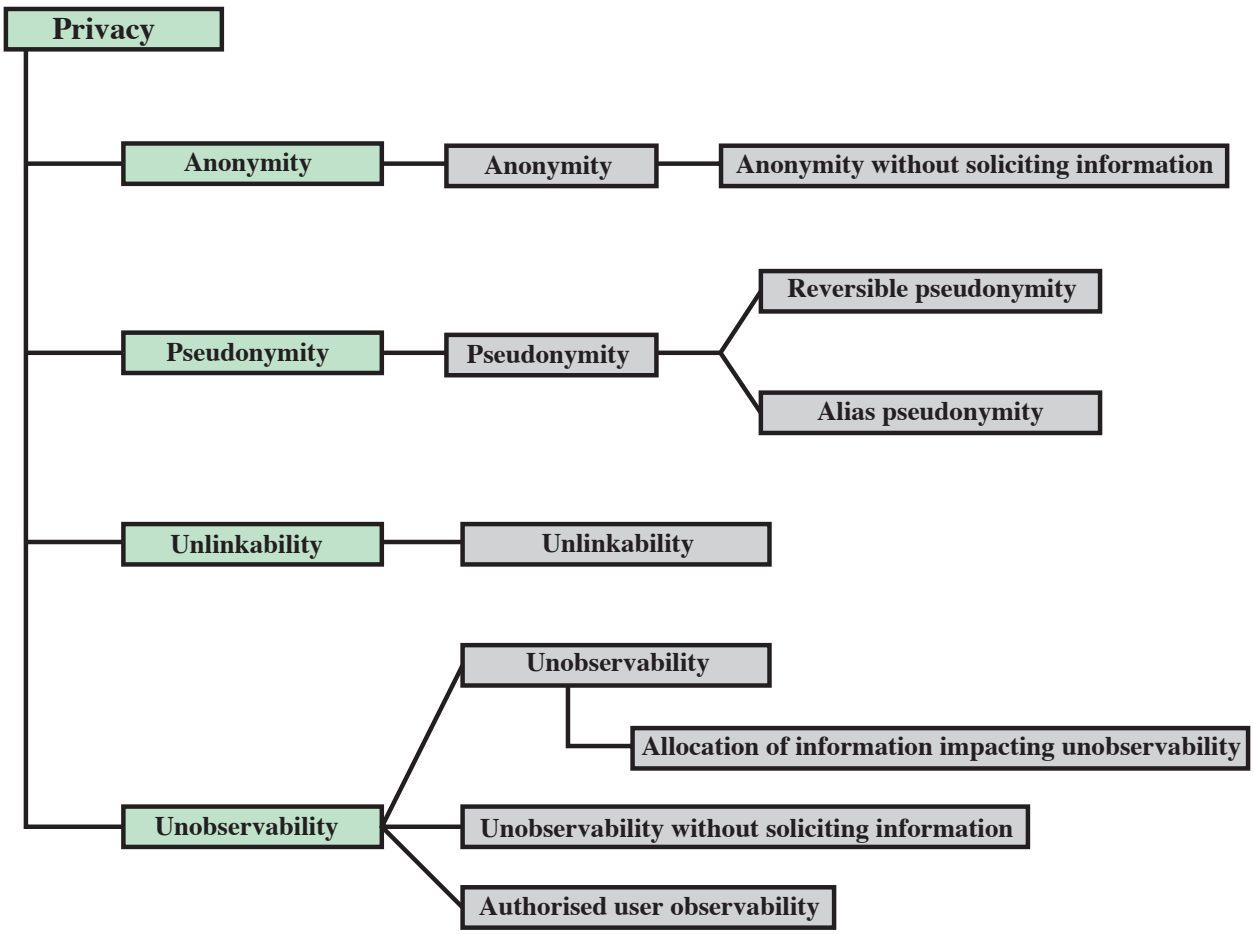

Figure 24.4 Common Criteria Privacy Class Decomposition

- **Anonymity:** Ensures that a user may use a resource or service without disclosing the user's identity. Specifically, this means that other users or subjects are unable to determine the identity of a user bound to a subject (e.g., process or user group) or operation. It further means that the system will not solicit the real name of a user. Anonymity need not conflict with authorization and access control functions, which are bound to computer-based user IDs, not to personal user information.
- **Pseudonymity:** Ensures that a user may use a resource or service without disclosing its user identity, but can still be accountable for that use. The system shall provide an alias to prevent other users from

determining a user's identity, but the system shall be able to determine the user's identity from an assigned alias.

- **Unlinkability:** Ensures that a user may make multiple uses of resources or services without others being able to link these uses together.
- **Unobservability:** Ensures that a user may use a resource or service without others, especially third parties, being able to observe that the resource or service is being used. *Unobservability* requires that users and/or subjects cannot determine whether an operation is being performed. *Allocation of information impacting unobservability* requires that the security function provide specific mechanisms to avoid the concentration of privacy related information within the system. *Unobservability without soliciting information* requires that the security function does not try to obtain privacy-related information that might be used to compromise unobservability. *Authorized user observability* requires the security function to provide one or more authorized users with a capability to observe the usage of resources and/or services.

Note that the Common Criteria specification is primarily concerned with the privacy of an individual with respect to that individual's use of computer resources, rather than the privacy of personal information concerning that individual.

Privacy and Data Surveillance

The demands of homeland security and counterterrorism have imposed new threats to personal privacy. Law enforcement and intelligence agencies have become increasingly aggressive in using data surveillance techniques to fulfill their mission. In addition, private organization are exploiting a number of trends to increase their ability to build detailed profiles of individuals,

including the spread of the Internet, the increase in electronic payment methods, near-universal use of cellular phone communications, ubiquitous computation, sensor webs, and so on.

Both policy and technical approaches are needed to protect privacy when both government and nongovernment organizations seek to learn as much as possible about individuals. In terms of technical approaches, the requirements for privacy protection for information systems can be addressed in the context of database security. That is, the approaches that are appropriate for privacy protection involve technical means that have been developed for database security.

A specific proposal for a database security approach to privacy protection is outlined in [POPP06]. The privacy appliance is a tamper-resistant, cryptographically protected device that is interposed between a database and the access interface, analogous to a firewall or intrusion prevention device. The device implements privacy protection functions, including verifying the user's access permissions and credentials and creating an audit log. Some of the specific functions of the appliance are as follows:

- **Data transformation:** This function encodes or encrypts portions of the data so as to preserver privacy but still allow data analysis functions needed for effective use. An example of such data analysis functions is the detection of terrorist activity patterns.
- **Anonymization:** This function removes specific identifying information from query results, such as last name and telephone number, but creates some sort of anonymized unique identifier so that analysts can detect connections between queries.
- **Selective revelation:** This is a method for minimizing exposure of individual information while enabling continuous analysis of potentially

interconnected data. The function initially reveals information to the analyst only in sanitized form, that is, in terms of statistics and categories that do not reveal (directly or indirectly) anyone's private information. If the analyst sees reason for concern, he or she can follow up by seeking permission to get more precise information. This permission would be granted if the initial information provides sufficient cause to allow the revelation of more information, under appropriate legal and policy guidelines.

- **Immutable audit:** A tamper-resistant method that identifies where data go and who has seen the data. The audit function automatically and permanently records all data accesses, with strong protection against deletion, modification, and unauthorized use.
- **Associative memory:** This is a software module that can recognize patterns and make connections between pieces of data that the human user may have missed or didn't know existed. With this method, it can discover relationships quickly between data points found in massive amounts of data.

The owner of a database installs a privacy appliance tailored to the database content and structure and to its intended use by outside organizations. An independently operated privacy appliance can interact with multiple databases from multiple organizations to collect and interconnect data for their ultimate use by law enforcement, an intelligence user, or other appropriate user.

24.4 ETHICAL ISSUES

Because of the ubiquity and importance of information systems in organization of all types, there are many potential misuses and abuses of

information and electronic communication that create privacy and security problems. In addition to questions of legality, misuse and abuse raise concerns of ethics. Ethics refers to a system of moral principles that relates to the benefits and harms of particular actions, and to the rightness and wrongness of motives and ends of those actions. In this section, we look at ethical issues as they relate to computer and information system security.

Ethics and the IS Professions

To a certain extent, a characterization of what constitutes ethical behavior for those who work with or have access to information systems is not unique to this context. The basic ethical principles developed by civilizations apply. However, there are some unique considerations surrounding computers and information systems. First, computer technology makes possible a scale of activities not possible before. This includes a larger scale of recordkeeping, particularly on individuals, with the ability to develop finer-grained personal information collection and more precise data mining and data matching. The expanded scale of communications and the expanded scale of interconnection brought about by the Internet magnify the power of an individual to do harm. Second, computer technology has involved the creation of new types of entities for which no agreed ethical rules have previously been formed, such as databases, Web browsers, chat rooms, cookies, and so on.

Further, it has always been the case that those with special knowledge or special skills have additional ethical obligations beyond those common to all humanity. We can illustrate this in terms of an ethical hierarchy (Figure 24.5), based on one discussed in [GOTT99]. At the top of the hierarchy are the ethical values professionals share with all human beings, such as integrity, fairness, and justice. Being a professional with special training imposes additional ethical obligations with respect to those affected by his or

her work. General principles applicable to all professionals arise at this level. Finally, each profession has associated with it specific ethical values and obligations related to the specific knowledge of those in the profession and the powers that they have to affect others. Most professions embody all of these levels in a professional code of conduct, a subject discussed subsequently.

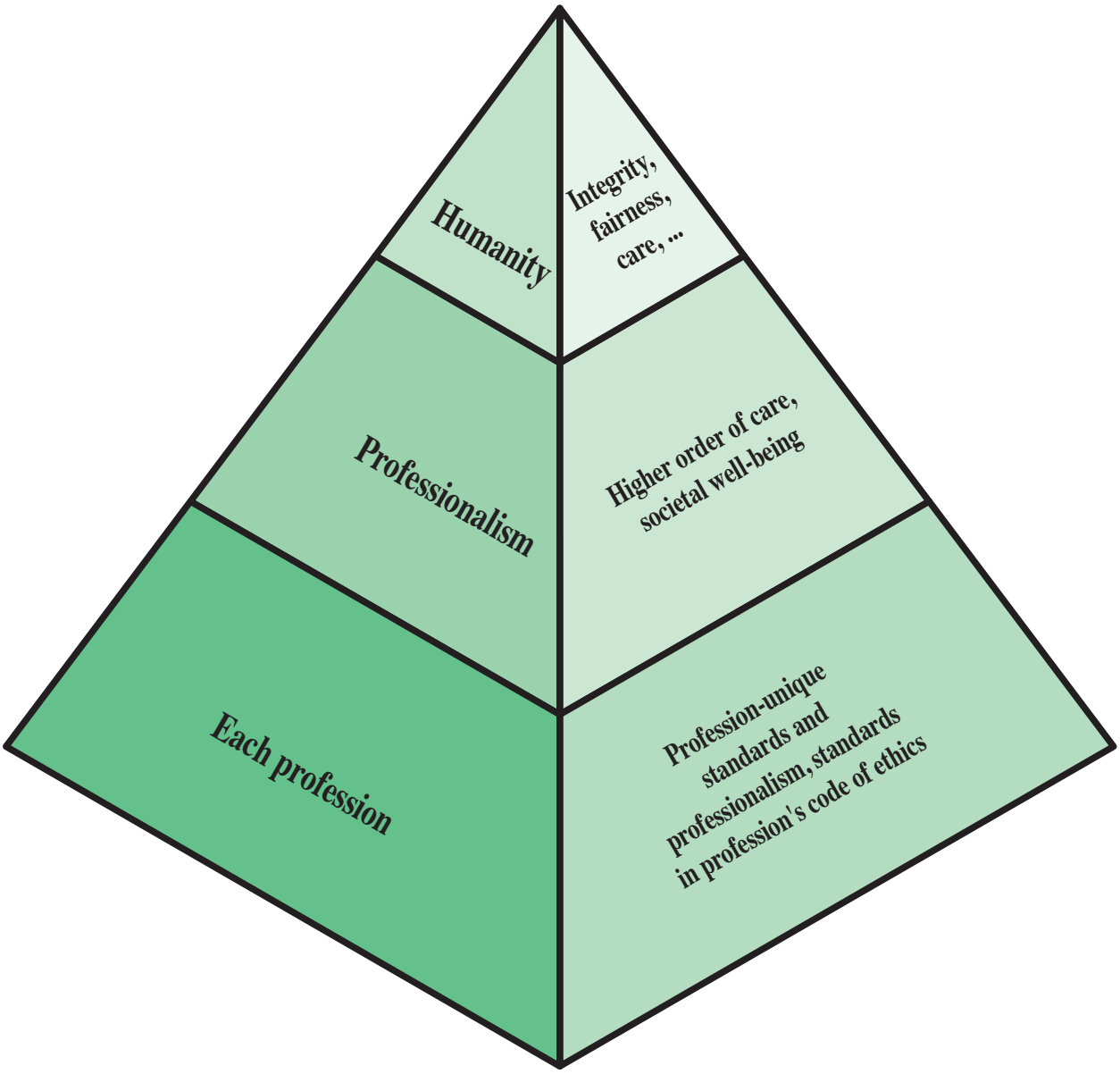

Figure 24.5 The Ethical Hierarchy

Ethical Issues Related to Computers and Information Systems

Let us turn now more specifically to the ethical issues that arise from computer technology. Computers have become the primary repository of both personal information and negotiable assets, such as bank records, securities records, and other financial information. Other types of databases, both statistical and otherwise, are assets with considerable value. These assets can only be viewed, created, and altered by technical and automated means. Those who can understand and exploit the technology, plus those who have obtained access permission, have power related to those assets.

A classic paper on computers and ethics [PARK88] points out that ethical issues arise as the result of the roles of computers, such as the following:

- **Repositories and processors of information:** Unauthorized use of otherwise unused computer services or of information stored in computers raises questions of appropriateness or fairness.
- **Producers of new forms and types of assets:** For example, computer programs are entirely new types of assets, possibly not subject to the same concepts of ownership as other assets.
- **Instruments of acts:** To what degree must computer services and users of computers, data, and programs be responsible for the integrity and appropriateness of computer output?
- **Symbols of intimidation and deception:** The images of computers as thinking machines, absolute truth producers, infallible, subject to blame, and as anthropomorphic replacements of humans who err should be carefully considered.

We are concerned with balancing professional responsibilities with ethical or moral responsibilities. We cite two areas here of the types of ethical questions that face a computing or IS professional. The first is that IS professionals may find themselves in situations where their ethical duty as professionals comes into conflict with loyalty to their employer. Such a conflict may give rise for an employee to consider "blowing the whistle," or exposing a situation that can harm the public or a company's customers. For example, a software developer may know that a product is scheduled to ship with inadequate testing to meet the employer's deadlines. The decision of whether to blow the whistle is one of the most difficult that an IS professional can face. Organizations have a duty to provide alternative, less extreme opportunities for the employee, such as an in-house ombudsperson coupled with a commitment not to penalize employees for exposing problems in-house. Additionally, professional societies should provide a mechanism whereby society members can get advice on how to proceed.

Another example of an ethical question concerns a potential conflict of interest. For example, if a consultant has a financial interest in a certain vendor, this should be revealed to any client if that vendor's products or services might be recommended by the consultant.

Codes of Conduct

Unlike scientific and engineering fields, ethics cannot be reduced to precise laws or sets of facts. Although an employer or a client of a professional can expect that the professional has an internal moral compass, many areas of conduct may present ethical ambiguities. To provide guidance to professionals and to articulate what employers and customers have a right to expect, a number of professional societies have adopted ethical codes of conduct.

A professional code of conduct can serve the following functions [GOTT99]:

1. A code can serve two inspirational functions: as a positive stimulus for ethical conduct on the part of the professional, and to instill confidence in the customer or user of an IS product or service. However, a code that stops at just providing inspirational language is likely to be vague and open to an abundance of interpretations.
2. A code can be educational. It informs professionals about what should be their commitment to undertake a certain level of quality of work and their responsibility for the well being of users of their product and the public, to the extent the product may affect nonusers. The code also serves to educate managers on their responsibility to encourage and support employee ethical behavior and on their own ethical responsibilities.
3. A code provides a measure of support for a professional whose decision to act ethically in a situation may create conflict with an employer or customer.
4. A code can be a means of deterrence and discipline. A professional society can use a code as a justification for revoking membership or even a professional license. An employee can use a code as a basis for a disciplinary action.
5. A code can enhance the profession's public image, if it is seen to be widely honored.

We illustrate the concept of a professional code of ethics for computer professionals with three specific examples. The ACM (Association for Computing Machinery) Code of Ethics and Professional Conduct (Figure 24.6) applies to computer scientists. The IEEE (Institute of Electrical and Electronic

Engineers) Code of Ethics (Figure 24.7) applies to computer engineers as well as other types of electrical and electronic engineers. The AITP (Association of Information Technology Professionals, formerly the Data Processing Management Association) Standard of Conduct (Figure 24.8) applies to managers of computer systems and projects.

A number of common themes emerge from these codes, including (1) dignity and worth of other people; (2) personal integrity and honesty; (3) responsibility for work; (4) confidentiality of information; (5) public safety, health, and welfare; (6) participation in professional societies to improve standards of the profession; and (7) the notion that public knowledge and access to technology is equivalent to social power.

1. GENERAL MORAL IMPERATIVES.

1.1 Contribute to society and human well-being.

This principle concerning the quality of life of all people affirms an obligation to protect fundamental human rights and to respect the diversity of all cultures. An essential aim of computing professionals is to minimize negative consequences of computing systems, including threats to health and safety. When designing or implementing systems, computing professionals must attempt to ensure that the products of their efforts will be used in socially responsible ways, will meet social needs, and will avoid harmful effects to health and welfare.

In addition to a safe social environment, human well-being includes a safe natural environment. Therefore, computing professionals who design and develop systems must be alert to, and make others aware of, any potential damage to the local or global environment.

1.2 Avoid harm to others.

"Harm" means injury or negative consequences, such as undesirable loss of information, loss of property, property damage, or unwanted environmental impacts. This principle prohibits use of computing technology in ways that result in harm to any of the following: users, the general public, employees, employers. Harmful actions include intentional destruction or modification of files and programs leading to serious loss of resources or unnecessary expenditure of human resources such as the time and effort required to purge systems of "computer viruses."

Well-intended actions, including those that accomplish assigned duties, may lead to harm unexpectedly. In such an event the responsible person or persons are obligated to undo or mitigate the negative consequences as much as possible. One way to avoid unintentional harm is to carefully consider potential impacts on all those affected by decisions made during design and implementation.

To minimize the possibility of indirectly harming others, computing professionals must minimize malfunctions by following generally accepted standards for system design and testing. Furthermore, it is often necessary to assess the social consequences of systems to project the likelihood of any serious harm to others. If system features are misrepresented to users, coworkers, or supervisors, the individual computing professional is responsible for any resulting injury.

In the work environment the computing professional has the additional obligation to report any signs of system dangers that might result in serious personal or social damage. If one's superiors do not act to curtail or mitigate such dangers, it may be necessary to "blow the whistle" to help correct the problem or reduce the risk. However, capricious or misguided reporting of violations can, itself, be harmful. Before reporting violations, all relevant aspects of the incident must be thoroughly assessed. In particular, the assessment of risk and responsibility must be credible. It is suggested that advice be sought from other computing professionals. See principle 2.5 regarding thorough evaluations.

1.3 Be honest and trustworthy.

Honesty is an essential component of trust. Without trust an organization cannot function effectively. The honest computing professional will not make deliberately false or deceptive claims about a system or system design, but will instead provide full disclosure of all pertinent system limitations and problems.

A computer professional has a duty to be honest about his or her own qualifications, and about any circumstances that might lead to conflicts of interest.

Membership in volunteer organizations such as ACM may at times place individuals in situations where their statements or actions could be interpreted as carrying the "weight" of a larger group of professionals. An ACM member will exercise care to not misrepresent ACM or positions and policies of ACM or any ACM units.

1.4 Be fair and take action not to discriminate.

The values of equality, tolerance, respect for others, and the principles of equal justice govern this imperative. Discrimination on the basis of race, sex, religion, age, disability, national origin, or other such factors is an explicit violation of ACM policy and will not be tolerated.

Inequities between different groups of people may result from the use or misuse of information and technology. In a fair society,all individuals would have equal opportunity to participate in, or benefit from, the use of computer resources regardless of race, sex, religion, age, disability, national origin or other such similar factors. However, these ideals do not justify unauthorized use of computer resources nor do they provide an adequate basis for violation of any other ethical imperatives of this code.

1.5 Honor property rights including copyrights and patent.
Violation of copyrights, patents, trade secrets and the terms of license agreements is prohibited by law in most circumstances. Even when software is not so protected, such violations are contrary to professional behavior. Copies of software should be made only with proper authorization. Unauthorized duplication of materials must not be condoned.

1.6 Give proper credit for intellectual property.
Computing professionals are obligated to protect the integrity of intellectual property. Specifically, one must not take credit for other's ideas or work, even in cases where the work has not been explicitly protected by copyright, patent, etc.

1.7 Respect the privacy of others.
Computing and communication technology enables the collection and exchange of personal information on a scale unprecedented in the history of civilization. Thus there is increased potential for violating the privacy of individuals and groups. It is the responsibility of professionals to maintain the privacy and integrity of data describing individuals. This includes taking precautions to ensure the accuracy of data, as well as protecting it from unauthorized access or accidental disclosure to inappropriate individuals. Furthermore, procedures must be established to allow individuals to review their records and correct inaccuracies.

This imperative implies that only the necessary amount of personal information be collected in a system, that retention and disposal periods for that information be clearly defined and enforced, and that personal information gathered for a specific purpose not be used for other purposes without consent of the individual(s). These principles apply to electronic communications, including electronic mail, and prohibit procedures that capture or monitor electronic user data, including messages,without the permission of users or bona fide authorization related to system operation and maintenance. User data observed during the normal duties of system operation and maintenance must be treated with strictest confidentiality, except in cases where it is evidence for the violation of law, organizational regulations, or this Code. In these cases, the nature or contents of that information must be disclosed only to proper authorities.

1.8 Honor confidentiality.
The principle of honesty extends to issues of confidentiality of information whenever one has made an explicit promise to honor confidentiality or, implicitly, when private information not directly related to the performance of one's duties becomes available. The ethical concern is to respect all obligations of confidentiality to employers, clients, and users unless discharged from such obligations by requirements of the law or other principles of this Code.

2. MORE SPECIFIC PROFESSIONAL RESPONSIBILITIES.

2.1 Strive to achieve the highest quality, effectiveness and dignity in both the process and products of professional work.
Excellence is perhaps the most important obligation of a professional. The computing professional must strive to achieve quality and to be cognizant of the serious negative consequences that may result from poor quality in a system.

2.2 Acquire and maintain professional competence.
Excellence depends on individuals who take responsibility for acquiring and maintaining professional competence. A professional must participate in setting standards for appropriate levels of competence, and strive to achieve those standards. Upgrading technical knowledge and competence can be achieved in several ways:doing independent study; attending seminars, conferences, or courses; and being involved in professional organizations.

2.3 Know and respect existing laws pertaining to professional work.
ACM members must obey existing local, state,province, national, and international laws unless there is a compelling ethical basis not to do so. Policies and procedures of the organizations in which one participates must also be obeyed. But compliance must be balanced with the recognition that sometimes existing laws and rules may be immoral or inappropriate and, therefore, must be challenged. Violation of a law or regulation may be ethical when that law or rule has inadequate moral basis or when it conflicts with another law judged to be more important. If one decides to violate a law or rule because it is viewed as unethical, or for any other reason, one must fully accept responsibility for one's actions and for the consequences.

2.4 Accept and provide appropriate professional review.
Quality professional work, especially in the computing profession, depends on professional reviewing and critiquing. Whenever appropriate, individual members should seek and utilize peer review as well as provide critical review of the work of others.

2.5 Give comprehensive and thorough evaluations of computer systems and their impacts, including analysis of possible risks.
Computer professionals must strive to be perceptive, thorough, and objective when evaluating, recommending, and presenting system descriptions and alternatives. Computer professionals are in a position of special trust, and therefore have a special responsibility to provide objective, credible evaluations to employers, clients, users, and the public. When providing evaluations the professional must also identify any relevant conflicts of interest, as stated in imperative 1.3.

As noted in the discussion of principle 1.2 on avoiding harm, any signs of danger from systems must be reported to those who have opportunity and/or responsibility to resolve them. See the guidelines for imperative 1.2 for more details concerning harm,including the reporting of professional violations.

2.6 Honor contracts, agreements, and assigned responsibilities.
Honoring one's commitments is a matter of integrity and honesty. For the computer professional this includes ensuring that system elements perform as intended. Also, when one contracts for work with another party, one has an obligation to keep that party properly informed about progress toward completing that work.

A computing professional has a responsibility to request a change in any assignment that he or she feels cannot be completed as defined. Only after serious consideration and with full disclosure of risks and concerns to the employer or client, should one accept the assignment. The major underlying principle here is the obligation to accept personal accountability for professional work. On some occasions other ethical principles may take greater priority.

A judgment that a specific assignment should not be performed may not be accepted. Having clearly identified one's concerns and reasons for that judgment, but failing to procure a change in that assignment, one may yet be obligated, by contract or by law, to proceed as directed. The computing professional's ethical judgment should be the final guide in deciding whether or not to proceed. Regardless of the decision, one must accept the responsibility for the consequences.

However, performing assignments "against one's own judgment" does not relieve the professional of responsibility for any negative consequences.

2.7 Improve public understanding of computing and its consequences.

Computing professionals have a responsibility to share technical knowledge with the public by encouraging understanding of computing, including the impacts of computer systems and their limitations. This imperative implies an obligation to counter any false views related to computing.

2.8 Access computing and communication resources only when authorized to do so.

Theft or destruction of tangible and electronic property is prohibited by imperative 1.2 - "Avoid harm to others." Trespassing and unauthorized use of a computer or communication system is addressed by this imperative. Trespassing includes accessing communication networks and computer systems, or accounts and/or files associated with those systems, without explicit authorization to do so. Individuals and organizations have the right to restrict access to their systems so long as they do not violate the discrimination principle (see 1.4). No one should enter or use another's computer system, software, or data files without permission. One must always have appropriate approval before using system resources, including communication ports, file space, other system peripherals, and computer time.

3. ORGANIZATIONAL LEADERSHIP IMPERATIVES.

BACKGROUND NOTE:This section draws extensively from the draft IFIP Code of Ethics,especially its sections on organizational ethics and international concerns. The ethical obligations of organizations tend to be neglected in most codes of professional conduct, perhaps because these codes are written from the perspective of the individual member. This dilemma is addressed by stating these imperatives from the perspective of the organizational leader. In this context"leader" is viewed as any organizational member who has leadership or educational responsibilities. These imperatives generally may apply to organizations as well as their leaders. In this context"organizations" are corporations, government agencies,and other "employers," as well as volunteer professional organizations.

3.1 Articulate social responsibilities of members of an organizational unit and encourage full acceptance of those responsibilities.
Because organizations of all kinds have impacts on the public, they must accept responsibilities to society. Organizational procedures and attitudes oriented toward quality and the welfare of society will reduce harm to members of the public, thereby serving public interest and fulfilling social responsibility. Therefore,organizational leaders must encourage full participation in meeting social responsibilities as well as quality performance.

3.2 Manage personnel and resources to design and build information systems that enhance the quality of working life.
Organizational leaders are responsible for ensuring that computer systems enhance, not degrade, the quality of working life. When implementing a computer system, organizations must consider the personal and professional development, physical safety, and human dignity of all workers. Appropriate human-computer ergonomic standards should be considered in system design and in the workplace.

3.3 Acknowledge and support proper and authorized uses of an organization's computing and communication resources.
Because computer systems can become tools to harm as well as to benefit an organization, the leadership has the responsibility to clearly define appropriate and inappropriate uses of organizational computing resources. While the number and scope of such rules should be minimal, they should be fully enforced when established.

3.4 Ensure that users and those who will be affected by a system have their needs clearly articulated during the assessment and design of requirements; later the system must be validated to meet requirements.
Current system users, potential users and other persons whose lives may be affected by a system must have their needs assessed and incorporated in the statement of requirements. System validation should ensure compliance with those requirements.

3.5 Articulate and support policies that protect the dignity of users and others affected by a computing system.
Designing or implementing systems that deliberately or inadvertently demean individuals or groups is ethically unacceptable. Computer professionals who are in decision making positions should verify that systems are designed and implemented to protect personal privacy and enhance personal dignity.

3.6 Create opportunities for members of the organization to learn the principles and limitations of computer systems.
This complements the imperative on public understanding (2.7). Educational opportunities are essential to facilitate optimal participation of all organizational members. Opportunities must be available to all members to help them improve their knowledge and skills in computing, including courses that familiarize them with the consequences and limitations of particular types of systems.In particular, professionals must be made aware of the dangers of building systems around oversimplified models, the improbability of anticipating and designing for every possible operating condition, and other issues related to the complexity of this profession.

4. COMPLIANCE WITH THE CODE.

4.1 Uphold and promote the principles of this Code.
The future of the computing profession depends on both technical and ethical excellence. Not only is it important for ACM computing professionals to adhere to the principles expressed in this Code, each member should encourage and support adherence by other members.

4.2 Treat violations of this code as inconsistent with membership in the ACM.

Adherence of professionals to a code of ethics is largely a voluntary matter. However, if a member does not follow this code by engaging in gross misconduct, membership in ACM may be terminated.

Figure 24.6 ACM Code of Ethics and Professional Conduct

We, the members of the IEEE, in recognition of the importance of our technologies in affecting the quality of life throughout the world, and in accepting a personal obligation to our profession, its members and the communities we serve, do hereby commit ourselves to the highest ethical and professional conduct and agree:

1. to accept responsibility in making decisions consistent with the safety, health and welfare of the public, and to disclose promptly factors that might endanger the public or the environment;
2. to avoid real or perceived conflicts of interest whenever possible, and to disclose them to affected parties when they do exist;
3. to be honest and realistic in stating claims or estimates based on available data;
4. to reject bribery in all its forms;
5. to improve the understanding of technology, its appropriate application, and potential consequences;
6. to maintain and improve our technical competence and to undertake technological tasks for others only if qualified by training or experience, or after full disclosure of pertinent limitations;
7. to seek, accept, and offer honest criticism of technical work, to acknowledge and correct errors, and to credit properly the contributions of others;
8. to treat fairly all persons regardless of such factors as race, religion, gender, disability, age, or national origin;
9. to avoid injuring others, their property, reputation, or employment by false or malicious action;
10. to assist colleagues and co-workers in their professional development and to support them in following this code of ethics

Figure 24.7 IEEE Code of Ethics
(Copyright ©2006, Institute of Electrical and Electronics Engineers)

In recognition of my obligation to management I shall:

- Keep my personal knowledge up-to-date and insure that proper expertise is available when needed.
- Share my knowledge with others and present factual and objective information to management to the best of my ability.
- Accept full responsibility for work that I perform.
- Not misuse the authority entrusted to me.
- Not misrepresent or withhold information concerning the capabilities of equipment, software or systems.
- Not take advantage of the lack of knowledge or inexperience on the part of others.

In recognition of my obligation to my fellow members and the profession I shall:

- Be honest in all my professional relationships.
- Take appropriate action in regard to any illegal or unethical practices that come to my attention. However, I will bring charges against any person only when I have reasonable basis for believing in the truth of the allegations and without any regard to personal interest.
- Endeavor to share my special knowledge.
- Cooperate with others in achieving understanding and in identifying problems.
- Not use or take credit for the work of others without specific acknowledgement and authorization.
- Not take advantage of the lack of knowledge or inexperience on the part of others for personal gain.

In recognition of my obligation to society I shall:

- Protect the privacy and confidentiality of all information entrusted to me.
- Use my skill and knowledge to inform the public in all areas of my expertise.
- To the best of my ability, insure that the products of my work are used in a socially responsible way.
- Support, respect, and abide by the appropriate local, state, provincial, and federal laws.
- Never misrepresent or withhold information that is germane to a problem or situation of public concern nor will I allow any such known information to remain unchallenged.
- Not use knowledge of a confidential or personal nature in any unauthorized manner or to achieve personal gain.

In recognition of my obligation to my employer I shall:

- Make every effort to ensure that I have the most current knowledge and that the proper expertise is available when needed.
- Avoid conflict of interest and insure that my employer is aware of any potential conflicts.
- Present a fair, honest, and objective viewpoint.
- Protect the proper interests of my employer at all times.
- Protect the privacy and confidentiality of all information entrusted to me.
- Not misrepresent or withhold information that is germane to the situation.
- Not attempt to use the resources of my employer for personal gain or for any purpose without proper approval.
- Not exploit the weakness of a computer system for personal gain or personal satisfaction.

Figure 24.8 AITP Standard of Conduct
(Copyright ©2006, Association of Information Technology Professionals)

All three codes place their emphasis on the responsibility of professionals to other people, which, after all, is the central meaning of

ethics. This emphasis on people rather than machines or software is to the good. However, the codes make little specific mention of the subject technology, namely computers and information systems. That is, the approach is quite generic and could apply to most professions and does not fully reflect the unique ethical problems related to the development and use of computer and IS technology. For example, these codes do not specifically deal with the issues raised by [PARK88] listed in the preceding subsection.

The Rules

A different approach from the ones so far discussed is a collaborative effort to develop a short list of guidelines on the ethics of developing computer systems. The guidelines, which continue to evolve, are the product of the Ad Hoc Committee on Responsible Computing. Anyone can join this committee and suggest changes to the guidelines. The committee has publish a document, regularly updated, entitled *Moral Responsibility for Computing Artifacts*, and is generally referred to as *The Rules*. The current version of *The Rules* is version 27, reflecting the thought and effort that has gone into this project.

The term *computing artifact* refers to any artifact that includes an executing computer program. This includes software applications running on a general-purpose computer, programs burned into hardware and embedded in mechanical devices, robots, phones, web bots, toys, programs distributed across more than one machine, and many other configurations. *The Rules* apply to, among other types, software that is commercial, free, open source, recreational, an academic exercise or a research tool.

As of this writing, the rules are as follows:

1. The people who design, develop, or deploy a computing artifact are morally responsible for that artifact, and for the foreseeable effects of

that artifact. This responsibility is shared with other people who design, develop, deploy, or knowingly use the artifact as part of a sociotechnical system.

2. The shared responsibility of computing artifacts is not a zero-sum game. The responsibility of an individual is not reduced simply because more people become involved in designing, developing, deploying or using the artifact. Instead, a person's responsibility includes being answerable for the behaviors of the artifact and for the artifact's effects after deployment, to the degree to which these effects are reasonably foreseeable by that person.
3. People who knowingly use a particular computing artifact are morally responsible for that use.
4. People who knowingly design, develop, deploy, or use a computing artifact can do so responsibly only when they make a reasonable effort to take into account the sociotechnical systems in which the artifact is embedded.
5. People who design, develop, deploy, promote, or evaluate a computing artifact should not explicitly or implicitly deceive users about the artifact or its foreseeable effects, or about the sociotechnical systems in which the artifact is embedded.

Compared to the codes of ethics discussed earlier, *The Rules* are few in number and quite general in nature. They are intended to apply to a broad spectrum of people involved in computer system design and development. *The Rules* have gathered broad support as useful guidelines by academics, practitioners, computer scientists, and philosophers from a number of countries [MILL11]. It seems likely that *The Rules* will influence future versions of codes of ethics by computer-related professional organizations.

24.5 RECOMMENDED READING

The following are useful articles on computer crime and cybercrime: [KSHE06], [CYMR06], and [TAVA00]. [BRAU01] provides a good introduction to copyrights, patents, and trademarks. [GIBB00] provides a concise description of the Digital Millennium Copyright Act. A useful introduction to Digital Rights Management is [LIU03]. [CAMP03] discusses legal aspects of DRM and describes some commercially available systems.

[ISAT02] is an illuminating discussion of the relationship between security and privacy with suggestions on technical security measures to protect privacy. [GOTT99] provides a detailed discussion of the software engineering code of ethics and what it means to individuals in the profession. [CHAP06] is a thoughtful discussion of basic ethical issues related to the creation and use of information systems. [HARR90] is a detailed discussion of training employees on how to integrate ethics into decision making and behavior related to the use of information systems and computers. [ANDE93] is a very useful analysis of the practical implications of the ACM Code of Ethics, with a number of illustrative case studies.

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24.6 KEY TERMS, REVIEW QUESTIONS, AND PROBLEMS

Key Terms

code of conduct computer crime copyright cybercrime	Digital Millennium Copyright Act (DMCA) digital rights management ethics infringement	intellectual property patent privacy trademark

Review Questions

24.1 Describe a classification of computer crime based on the role that the computer plays in the criminal activity.

24.2 Define three types of property.

24.3 Define three types of intellectual property.

24.4 What are the basic conditions that must be fulfilled to claim a copyright?

24.5 What rights does a copyright confer?

24.6 Briefly describe the Digital Millennium Copyright Act.

24.7 What is digital rights management?

24.8 Describe the principal categories of users of digital rights management systems.

24.9 What are the key principles embodied in the EU Directive on Data Protection?

24.10 How do the concerns relating to privacy in the Common Criteria differ from the concerns usually expressed in official documents, standards, and organizational policies?

24.11 What functions can a professional code of conduct serve to fulfill?

Problems

24.1 For each of the cybercrimes cited in Table 24.1, indicate whether it falls into the category of computer as target, computer as storage device, or computer as communications tool. In the first case, indicate whether the crime is primarily an attack on data integrity, system integrity, data confidentiality, privacy, or availability.

24.2 Repeat Problem 24.1 for Table 24.2.

24.3 Review the results of a recent Computer Crime Survey such as the CSI/FBI or AusCERT surveys. What changes do they note in the types of crime reported? What differences are there between their results and those shown in Table 24.2?

24.4 An early controversial use of the DCMA was its use in a case in the United States brought by the Motion Picture Association of America (MPAA) in 2000 to attempt to suppress distribution of the DeCSS program and derivatives. These could be used circumvent the copy protection on commercial DVDs. Search for a brief description of this case and it's outcome. Determine whether the MPAA was successful in suppressing details of the DeCSS descrambling algorithm.

24.5 Consider a popular DRM system like Apple's FairPlay, used to protect audio tracks purchased from the iTunes music store. If a person purchases a track from the iTunes store by an artist managed by a

record company such as EMI, identify which company or person fulfils each of the DRM component roles discussed in Section 24.2.

24.6 Table 24.3 lists the privacy guidelines issued by the Organization for Economic Cooperation and Development (OECD). Compare these guidelines to the categories the EU adopted in the Directive on Data Protection.

24.7 Many countries now require organizations that collect personal information to publish a privacy policy detailing how they will handle and use such information. Obtain a copy of the privacy policy for an organization to which you have provided your personal details. Compare this policy with the lists of principles given in Section 24.3. Does this policy address all of these principles?

24.8 A management briefing lists the following as the top five actions that to improve privacy. Compare these recommendations to the Information Privacy Standard of Good Practice in Appendix H.4. Comment on the differences.

1. Show visible and consistent management support.
2. Establish privacy responsibilities. Privacy requirements need to be incorporated into any position that handles personally identifiable information (PII).
3. Incorporate privacy and security into the systems and application life cycle. This includes a formal privacy impact assessment.
4. Provide continuous and effective awareness and training.
5. Encrypt moveable PII. This includes transmission as well as mobile devices.

Table 24.3 OECD Guidelines on the Protection of Privacy and Transborder Flows of Information

Collection limitation

There should be limits to the collection of personal data and any such data should be obtained by lawful and fair means and, where appropriate, with the knowledge or consent of the data subject.

Data quality

Personal data should be relevant to the purposes for which they are to be used, and, to the extent necessary for those purposes, should be accurate, complete and kept up-to-date.

Purpose specification

The purposes for which personal data are collected should be specified not later than at the time of data collection and the subsequent use limited to the fulfillment of those purposes or such others as are not incompatible with those purposes and as are specified on each occasion of change of purpose.

Use limitation

Personal data should not be disclosed, made available or otherwise used for purposes other than those specified in accordance with the preceding principle, except with the consent of the data subject or by the authority of law.

Security safeguards

Personal data should be protected by reasonable security safeguards against such risks as loss or unauthorized access, destruction, use, modification or disclosure of data.

Openness

There should be a general policy of openness about developments, practices and policies with respect to personal data. Means should be readily available of establishing the existence and nature of personal data, and the main purposes of their use, as well as the identity and usual residence of the data controller.

Individual participation

An individual should have the right:
(a) to obtain from a data controller, or otherwise, confirmation of whether or not the data controller has data relating to him.
(b) to have communicated to him, data relating to him within a reasonable time; at a charge, if any, that is not excessive; in a reasonable manner; and in a form that is readily intelligible to him;
c) to be given reasons if a request made under subparagraphs(a) and (b) is denied, and to be able to challenge such denial; and
d) to challenge data relating to him and, if the challenge is successful to have the data erased, rectified, completed or amended.

Accountability

A data controller should be accountable for complying with measures which give effect to the principles stated above.

24.9 Assume you are a midlevel systems administrator for one section of a larger organization. You try to encourage your users to have good password policies and you regularly run password-cracking tools to check that those in use are not guessable. You have become aware of a burst of hacker password-cracking activity recently. In a burst of enthusiasm you transfer the password files from a number of other sections of the organization and attempt to crack them. To your horror, you find that in one section for which you used to work (but now have rather strained relationships with), something like 40% of the passwords are guessable (including that of the Vice-President of the section, whose password is "pre$ident"!). You quietly sound out a few former colleagues and drop hints in the hope things might improve. A couple of weeks later you again transfer the password file over to analyze in the hope things have improved. They haven't. Unfortunately, this time one of your colleagues notices what you are doing. Being a rather "by the book" person, he notifies senior management, and that evening you find yourself being arrested on a charge of hacking and thrown out of a job. Did you do anything wrong? Briefly indicate what arguments you might use to defend your actions, Make reference to the Professional Codes of Conduct shown in Figures 24.6 through 24.8.

24.10 Section 24.4 stated that the three ethical codes illustrated in this chapter (ACM, IEEE, AITP) share the common themes of dignity and worth of people; personal integrity; responsibility for work; confidentiality of information; public safety, health, and welfare; participation in professional societies; and knowledge about technology related to social power. Construct a table that shows for each theme and for each code, the relevant clause or clauses in the code that address the theme.

24.11 This book's Premium Content site includes a copy of the ACM Code of Professional Conduct from 1982. Compare this Code with the 1997 ACM Code of Ethics and Professional Conduct (Figure 24.6).

- **a.** Are there any elements in the 1982 Code not found in the 1997 Code? Propose a rationale for excluding these.
- **b.** Are there any elements in the 1997 Code not found in the 1982 Code? Propose a rationale for adding these.

24.12 This book's Premium Content site includes a copy of the IEEE Code Ethics from 1979. Compare this Code with the 2006 IEEE Code of Ethics (Figure 24.7).

- **a.** Are there any elements in the 1979 Code not found in the 2006 Code? Propose a rationale for excluding these.

b. Are there any elements in the 2006 Code not found in the 1979 Code? Propose a rationale for adding these.

24.13 This book's Premium Content site includes a copy of the 1999 Software Engineering Code of Ethics and Professional Practice (Version 5.2) as recommended by an ACM/IEEE-CS Joint Task Force. Compare this Code each of the three codes reproduced in this chapter (Figures 24.6 through 24.8). Comment in each case on the differences.

24A INFORMATION PRIVACY STANDARD OF GOOD PRACTICE

This specification is from *The Standard of Good Practice for Information Security* [ISF12].

Principle: Responsibility for managing information privacy should be established and security controls for handling personally identifiable information applied.

Objective: To prevent information about individuals being used in an inappropriate manner, and ensure compliance with legal and regulatory requirements for information privacy.

1. A high-level committee (or equivalent) should be established to be responsible for managing information privacy issues, and an individual appointed to co-ordinate information privacy activity (e.g., a Chief Privacy Officer).

2. The high-level working group should be aware of:
a) privacy-related legislation and regulation with which the organization needs to comply
b) the location(s) of personally identifiable information held about individuals (e.g., application and database servers, computer devices, consumer devices and portable storage devices)
c) how and when personally identifiable information (i.e., information that can be used to identify an individual) is used

3. An information privacy programme should be established which includes:
a) identifying individuals or a group of individuals within the organization who are responsible for implementing the programme
b) establishing an awareness programme to make staff and external parties (e.g., sutomers, clients, and suppliers) aware of the importance of information privacy (or integrating into existing awareness campaigns)
c) performing privacy assessment against critical business applications across the organization to identify privacy-related risks.
d) undertaking privacy audits to determine the level of compliance with relevant legislation and internal policies.

4. There should be a documented information privacy policy that covers the:
a) acceptable use of personally identifiable information
b) rights of individuals about whom personally identifiable information is held
c) legal and regulatory requirements for privacy
d) need for privacy assessments, awareness and compliance programmes
e) technical controls (including privacy enhancing technologies)

5. The information privacy policy should require that where personally identifiable information is stored or processed, there should be a process to ensure that it is:
a) classified and labeled (e.g., as personally identifiable information)
b) adequate, relevant and not excessive for the purposes for which it is collected
c) accurate (i.e., recorded correctly and kept up-to-date)
d) kept confidential (i.e., protected against unauthorized disclosure)
e) processed fairly and legally, and used only for specified, explicit and legitimate purposes
f) held in a format that permits identification of individuals for no longer than is necessary
g) only provided to external parties that can demonstrate compliance with legal and regulatory requirements for handling personally identifiable information

6. Individuals about whom personally identifiable information is held (e.g. the 'data subject' according to the EU Directive on Data Protection) should:
a) have their approval sought before this information is collected, stored, processed or disclosed to third parties
b) be informed of how this information will be used, allowed to check its accuracy and able to have their records corrected or removed.
c) have the ability to opt out of the collection and disclosure of this information (e.g., to external parties)
d) have a method available to them to hold the organization accountable for following information privacy principles (i.e., those common to the majority of privacy-related legislation)

7. Personally identifiable information should be
a) handled in accordance with relevant legislation, such as the EU Directive on Data Protection or the US Health Insurance Portability and Accounting Act (HIPAA)
b) protected throughout its lifecycle (i.e., through creation, processing, storage, transmission, and destruction).

8. Technical controls (often referred to as privacy enhancing technologies) should be used to help protect privacy-related information, including:
a) encryption to prevent unauthorized disclosure
b) data masking (also known as data obfuscation, data de-identification, data depersonalization, data scrubbing, and data scrambling), which involves concealing parts of information (e.g., names, addresses, social security numbers and credit card numbers) when being stored or transmitted
c) tokenization, which substitutes valid information (e.g., database fields, records) with random information and provides authorized access to this information via the use of tokens

d) protecting privacy-related metadata (e.g., document attributes or descriptive information that may contain personal information such as the name of the person who last updated a file).

9. A method of dealing with data privacy breaches should be established, which includes:

a) identifying when a data privacy breach occurs (typically by monitoring event logs or using intrusion detection and information leakage protection tools)

b) responding to a data privacy breach (typically as part of an organization's information security incident management process).