Chapter 135
Secure Knowledge Discovery in Databases

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INTRODUCTION AND BACKGROUND

Knowledge management (KM) systems are quite diverse, but all provide increased access to organizational knowledge, which helps the enterprise to be more connected, agile, and effective. The dilemma faced when using a KM system is to balance the goal of being knowledge-enabled while being knowledge-secure (Cohen, 2003; Lee & Rosenbaum, 2003).

A recent survey of IT security professions found that over 50% of respondents indicated an increase in the security budgets of their organizations since September 11, 2001, and projected that 2004 IT security budgets would be larger than ever (Briney & Prince, 2003).

The need for increased security is driven by both monetary concerns and legal/regulatory requirements. The goal of any security architecture, and specifically for KM systems, is to reduce the potential loss caused by intrusion, system misuse, privilege abuse, tampering, and so forth. Protection must be provided against external threats and from internal abuse and must include components that address the requirements for preserving the confidentiality of data where appropriate.

A 2002 Jupiter Research Consumer Survey estimates that as much as $24.5 billion in online sales will be lost by 2006 due to consumers' lack of confidence in the privacy of online transactions (*E-Compliance Advisor,* 2002). While lack of trust is an opportunity cost, security breaches can causes real losses. One study found firms with publicly announced security breaches lose an average of

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2% of market capitalization within two days of attack, for an average of $1.65 billion dollars per breach (Cavusoglu, Mishra, & Raghunathan, 2002). On the regulatory side, legislation like the Health Insurance Portability & Accountability Act (HIPAA) and the Gramm-Leach-Bliley Act (GLBA) have forced companies in health care and financial services fields to improve their security measures (Briney & Prince, 2003; Ingrian Networks, 2004). Table 1 summarizes some common security threats.

While most of the major news stories about security breaches involve hackers who steal or access confidential information, infect systems with viruses, and cause trouble with worms or spam, an equally important threat comes from inside organizations. A report from Ingrian Networks (2004) indicated that 50% of security breaches are perpetrated by internal staff (see Lee & Rosenbaum, 2004). Internal threats represent a bigger risk than those from outsiders due to the difficulty in quantifying and counteracting the attacks. But while the risk of insider intrusions looms large, many IT security professionals still seem to be externally focused (Briney & Prince, 2003).

With the increased focus on security, both internally and externally, a method that seems to be gaining popularity is a layered security approach (e.g., Kolluru & Meredith, 2001; Clark, Croson, & Schiano, 2001). The layered approach proposes using multiple, overlapping forms of security measures. A representative list of such security measures is summarized in Table 2. The layered security approach is a good way to prevent breaches, because if one measure fails, it is possible that other measures employed can stop the attack.

Table 1. Security threats

Information Source	Ingrian, 2004	Briney, 2000	Boren, 2003
General	Poor security policies, human error, dishonesty, abuse of privileges, introduction of unauthorized software	Viruses, malicious code, executables, electronic theft, disclosure of proprietary data, use of resources for illegal / illicit activities	Storage threats: theft of servers, desktops, hard drives, tape backups, information, malicious software installed on server
Identification / Authorization	Internal / external attackers posing as valid users / customers		
Reliability of Service	Natural disasters, equipment failures, denial of service	Denial of service, buffer overflows	
Privacy	Eavesdropping, unauthorized monitoring of sensitive data		
Integrity / Accuracy	Modification or damaging of information		
Access Control	Password cracking, backdoors, security holes	Protocol weakness, insecure passwords, attacks on bugs in servers	Authentication credentials stolen / not properly managed, users given access to unnecessary information