Security Issues for Telecommuting

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Abstract

Telecommuting affords many in the workforce options about where and when they can work. Many organizations are promoting telecommuting to allow their employees to work from home, while on travel, at a client site, or in a telecommuting center. While the benefits to telecommuting are obvious, new risks to the organization are introduced. This paper will highlight security issues related to telecommuting and propose solutions that may help organizations better manage the telecommuting environment.

The Risk of Telecommuting

Telecommuting is one of the popular buzz words for management in the '90s. It is becoming accepted as the way to do business. However, opening up corporate[1] systems to dial-in and other forms of access presents three significant security risks.

The first risk is that intruders will be able to access corporate systems without having to be on site. Hackers armed with war dialers, electronic eavesdroppers at conference sites, or shoulder surfers watching employees enter IDs and passwords are all very real threats in today's environment. In addition to intruders whose goal may be mischief, hacking is attractive to people trying to steal or misuse corporate information. Electronic access to records is often more anonymous than trying to bribe employees or gain physical access.

A second risk of telecommuting, closely related to the first, is that corporate information can be read, and potentially modified, while it is in transit.

Telecommuting also presents organizations with more pedestrian risks. These include the risk of losing corporate information and resources when they are outside the protective shell of the organization.

What is *telecommuting*? It is the use of telecommunications to create an "office" away from the established (physical) office. The telecommuting office could be in an employee's house, a hotel room or conference center, any site an employee travels to, or a telecommuting center. The telecommuter's office may or may not have the full computer functionality of the established

[1] Corporate is used to mean the belonging of any organization, including public sector agencies, private sector business, academic institutions, or other types of organizations.

office. For example, an employee on travel may read email. On the other side of the spectrum, an employee's house may be equipped with ISDN and the employee may have full computer capability at high speeds.

Security Issues for Protecting Internal Systems

In planning for the security of telecommuting, the first step is to examine what type of access is needed. What systems and data do employees need? What is the sensitivity of these systems and data? Do they need system administrator privileges? Do they need to share files with other employees? Is the data confidential?

From a security perspective, the critical determinations are:

- What would happen if an intruder gained the same access as the employee?
- What would happen if an intruder were able to use the employee's account, but gain more access than authorized for that user?

If the answer to either of these questions is "uh-oh," then security is important.

A. Firewalls/Secure Gateways

A secure gateway, often called a firewall, blocks or filters access between two networks, often between a private network and a larger more public networks such as the Internet or public switched network (i.e., the phone system). For telecommuting, the trick is to decide what to make available to telecommuting employees using public networks, what degree to ensure that only authorized users can get to the internal network, and how to ensure that the secure gateway works properly.

If possible, it can be more secure to put all the resources needed by telecommuting employees outside of a secure gateway. However, this is only possible if employees do not need access to corporate databases. For example, employees may only need to send reports in or access public databases, such as product/sales information or government forms.

However, most telecommuting employees will need more access. For traveling employees, this may be limited to needing email. There are many firewall implementations that use a email proxy to allow access to the files on a protected system without having to directly access that system.

Once again, many telecommuting employees will need more access. They need access to internal resources. The employees may need to use a variety of resources such as LAN applications, mainframe applications, run client software, use TCP/IP services.

A secure gateway, or series of gateways, can be used to divide internal resources based on access need of telecommuters. For example, computers with high-risk organizational data (such as

proprietary business plans) may be separated by router from systems with a lower level of risk. A series of routers can be used to further restrict access to the highest-risk systems.

For some situations, current firewall technology can be used to give virtual access by using proxies. In addition, current firewall can use IP filtering to permit access to only certain types of resources.

However, for many organizations, the primary security function of the secure gateway is to provide robust authentication of users.

Secure gateways may also provide additional auditing and session monitoring. The gateway can perform an intrusion detection function. For example, the secure gateway could monitor a session for keystrokes which may indicate someone trying to exceed access (e.g., ^C, ^Z).

B. Robust Authentication

For most organizations, robust authentication should be required if access is given to internal systems. However, many organization should require robust authentication even for email if it is relied to discuss business decisions (i.e., if the organization would care if someone else read your email).

Robust authentication can increase security in two significant ways: 1) It can require the user to possess a token in addition to a password or PIN and 2) it can provide one-time passwords. Tokens when used with PINs provide significantly more security than passwords. For a hacker or other would-be impersonator to pretend to be someone else, the impersonator must have both a valid token *and* the corresponding PIN. This is much more difficult than obtaining a valid password and user ID combination (especially since most user IDs are common knowledge).

Robust authentication can also create one-time passwords. Electronic monitoring (eavesdropping or sniffing) or observing a user type in a password is not a threat with one-time passwords because each time a user is authenticated to the computer, a different "password" is used. (A hacker could learn the one-time password through electronic monitoring, but it would be of no value.)

Most commercial robust authentication systems use smart tokens. The user provides a PIN which unlocks the token and then uses the token to create a one-time password. However, it is possible to use software-only one-time password schemes. (Tokens which do not provide for one-time passwords, such as ATM cards, are less common for telecommuting because they require hardware at the remote site and, without physical security, are vulnerable to electronic monitoring.)

Telecommuting employees who directly access internal systems should be robustly authenticated and should be routed to specific computer systems. The combination of routing and robust authentication can greatly increase security and reduce the costs associated with robust authentication by limiting it to employees with the greatest access.

The following figure diagrams an example of an agency with multiple access points for telecommuting that segregates telecommuters into three risk-based areas. Access to Host 1 is granted based on simple password-based authentication. Host 1 contains read only applications. There is no confidential data on Host 1. Access to Host 2 is granted based on robust authentication, but is outside the firewall. The rationale for creating Host 2 was to be able to support applications that the firewall cannot protect against (e.g., no proxy is available). Access to internal systems (Host 3, Host 4 and the LAN) requires robust authentication. The firewall uses proxies to mediate between the external network (including both Internet and dial-in connectivity) and the internal network.

Three caveats need to be made:

1. Any additional logins (to Host 3 or Host 4, for example) are in the clear. Anyone eavesdropping on the connection can gain a valid ID and password to Host 3 or Host 4. With proper configuration management (i.e., no modem connections inside the firewall), these systems will not be directly accessible from the outside, and, therefore, the ID and password will not be usable.

2. Too much or too complicated segregation may prevent users from sharing information necessary to perform their jobs.

3. Firewall and router administration requires careful and correct implementation of rules

(system specific policy).

C. Port Protection Devices

A port protection device (PPD) is fitted to a communications port of a host computer and authorizes access to the port itself, prior to and independent of the computer's own access control functions. A PPD can be a separate device in the communications stream,[2] or it may be incorporated into a communications device (e.g., a modem). PPDs typically require a separate authenticator, such as a password, in order to access the communications port.

One of the most common PPDs is the *dial-back modem*. A typical dial-back modem sequence follows: a user calls the dial-back modem and enters a password. The modem hangs up on the user and performs a table lookup for the password provided. If the password is found, the modem places a return call to the user (at a previously specified number) to initiate the session. The return call itself also helps to protect against the use of lost or compromised accounts. This is, however, not always the case. Malicious hackers can use such advance functions as call forwarding to reroute calls.

Security Issues for Data Transfer

In addition to intruders possibly gaining access to internal systems, it is also possible to eavesdrop on an entire session. Eavesdropping is not technically difficult if there is physical access to cable or wire used for communication or logical access to switching equipment.

If a telecommuting employee will be transferring data for which someone would go to the trouble of eavesdropping to get, then encryption may be necessary. Another scenario when eavesdropping is more likely is if an employee is at a large conference or other location where an eavesdropper may set up equipment in hopes of hearing something useful. Some conferences offer equipment to attendees to use to check email, transfer files, etc. This is useful to attendees, since they do not need to provide laptops; however, this could be a target for electronic eavesdropping.

Software- or hardware-based encryption provides strong protection against electronic eavesdropping. However, it is more expensive (in initial and operating costs) than robust authentication. It is most useful if highly confidential[3] data needs to be transmitted or if even moderately confidential data will be transmitted in a high threat area.

It is, however, unlikely that employees will always know when they are in a high threat area. It is incumbent on management to train employees.

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[2] Typically PPDs are found only in serial communications streams.

[3] Highly confidential implies that someone would actively pursue obtaining the data.

Security Issues for Telecommuting from Home

What this paper has discussed so far are issues related to protecting internal corporate systems and data in transit. Many employees telecommute from home, which raises an additional set of issues. Some of these concerns relate to whether employees are using their own computers or using computers supplied to them by the organization.

A. Home Data Storage Integrity and Confidentiality

Other members of the employee's household may wish to use the computer used for telecommuting. Children, spouses, or other household members may inadvertently corrupt files, introduce viruses, or snoop. Organizations can take several approaches:

1. Employee accountability. Some organizations may choose not to have specific rules forbidding household members from using PCs, but hold the employee responsible for the integrity and confidentiality of the data. Obviously, this is not a good choice if the data is highly confidential.

2. Removable hard drives. If corporate data is stored on a removable hard drive (or floppy), then the risk is greatly reduced.

3. Data encryption. Corporate data can be kept encrypted on the hard disk. This will protect its confidentiality and will detect changes to files.

4. Dedicated use. If an organization requires this, it should recognize that it is difficult to enforce.

B. Home System Availability

In addition to the possibility of a home computer breaking or being stolen, it may not be compatible with office configurations. For example, the home computer may use a different operating system. This may complicate set up, software support, troubleshooting, or repair. It is in the best interest of the organization to ensure that policy covers all these situations.

Security Issues for Telecommuting Centers

Telecommuting centers, normally located in outlying suburbs, are another choice for organizations. From a security perspective they may offer hardware for encryption, removable hard drives, and increased availability. However, by concentrating telecommuters, they may make themselves a more attractive target for eavesdropping. At a minimum, organizations should require robust authentication from telecommuting centers.

If communications encryption is supported by the center, organization should be aware that data may not be encrypted while it is inside the center. The encryption may occur at a modem pool.

Conclusion

In conclusion, telecommuting offers many benefits. With adequate attention to security, it is possible to create "an office away from the office."

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http://www.telecommute.org/links.html#tc - includes resource links to new stories, organizations, teleworking studies, and telecommuting centers.

http://www.pacbell.com/Lib/TCGuide/tc-12.html - contains Pacific Bell's 4 page Telecommuting and Resource Access Security Checklist of questions to consider when creating a telecommuting security policy.