Privacy enhancement in health monitoring systems

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Outline

Introduction

Figure 1: Patient condition in rural health centers

Figure 2: Using telemedicine to improve health care in rural areas

Introduction

Figure 3: Health monitoring systems based on VPN

- Internet of Things (IoT) promise to provide readily accessible health information that can help people address personal and community health concerns.

Introduction

- Remote health monitoring is a technology to enable monitoring of patients outside conventional clinicat settings, which may increase access to care and decrease healthcare delivery costs.
- A lot of sensitive information are shared through internet.

Outline

Objectives

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- Medical care is greatly improved by remote patient monitoring systems and many health monitoring systems are used between patients and doctors.
- Several confidential and sensitive information is exchanged between them.
- Many proprietary security systems are used for sensitive patient data exchange. These systems are sometimes very expensive.

Objectives

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- The aim of the present work is to propose firstly health monitoring architecture based on free and open source VPN solutions which can enhance privacy in health monitoring systems.
- On the other hand, this work combines with VPN an intrusion prevention system to enhance security.

Outline

Method

- Thus host to site VPN with IPSec ensure secure communications over internet networks through the use of cryptographic security services.
- VPN have been configured with openswan, as the IP addresses of VPN clients will change dynamically and according to internet service providers, we have configured a same key on both server and client with ipsec ranbits 256 to validate the authentication process.

Method

Method

Figure 4 presents the network architecture of health monitoring systems.

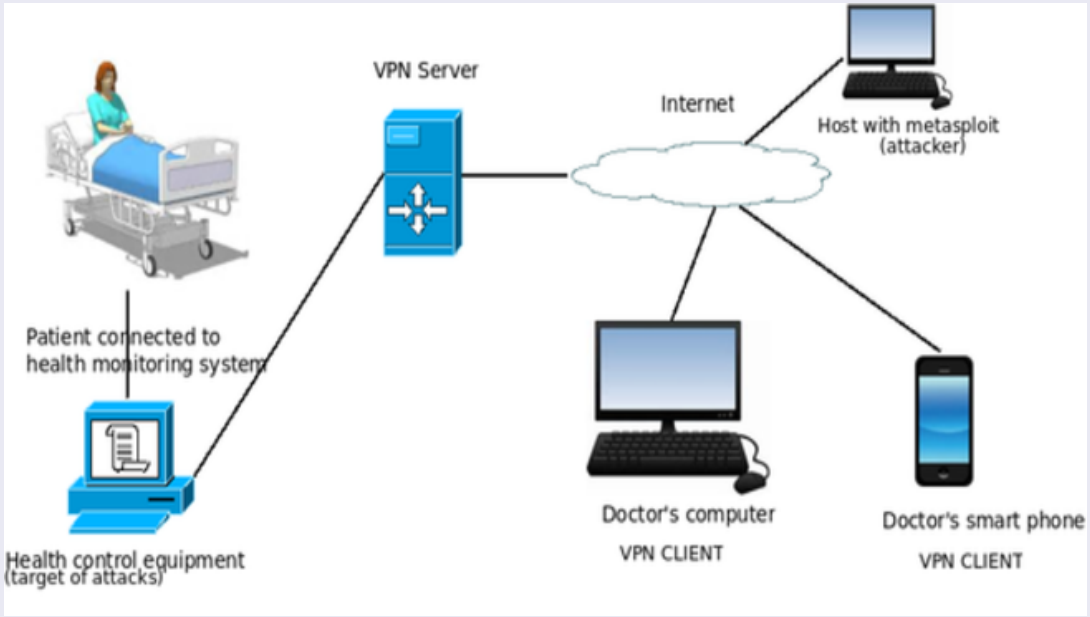

Figure 4: Health monitoring systems with host to site VPN

Method

Method

- We then generated attacks with Metasploit on the non secured health monitoring system network to check its vulnerability.
- Finally we installed and configured a firewall and an intrusion prevention system (SNORT-INLINE) on the VPN server .
- We have later generated the same attacks on the secure network to compare these vulnerabilities.

Method

Method

Figure 5 shows the proposed secure VPN architecture.

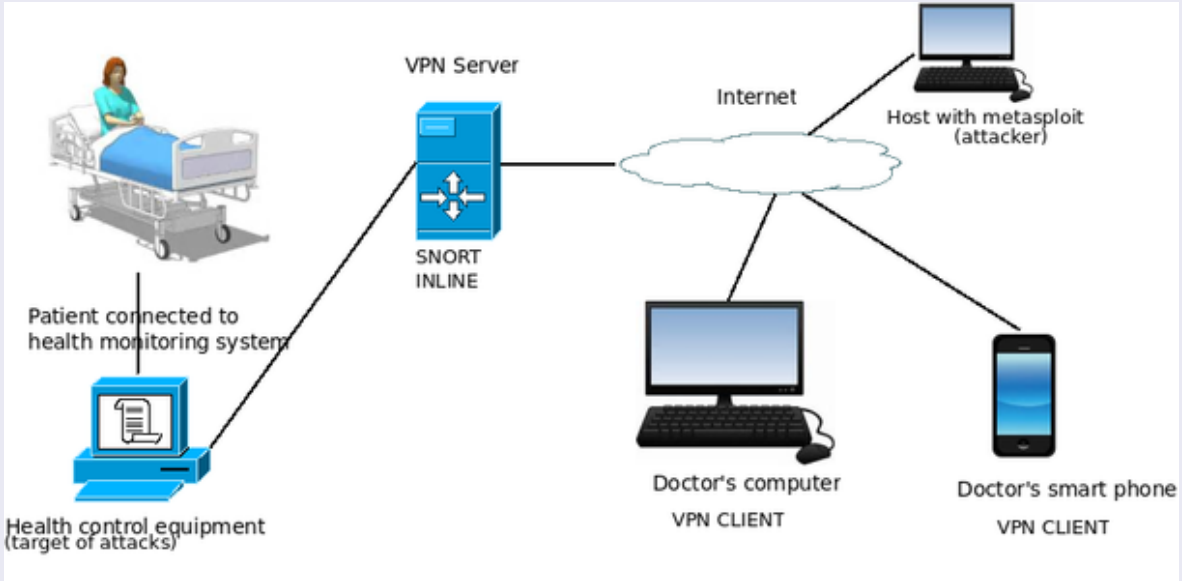

Figure 5: Health monitoring systems with host to site VPN and SNORT INLINE

Outline

Attacks generation test in health monitoring architecture based on simple VPN

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We first performed a test of Transmission Control Protocol (TCP) ports scan on a target station.

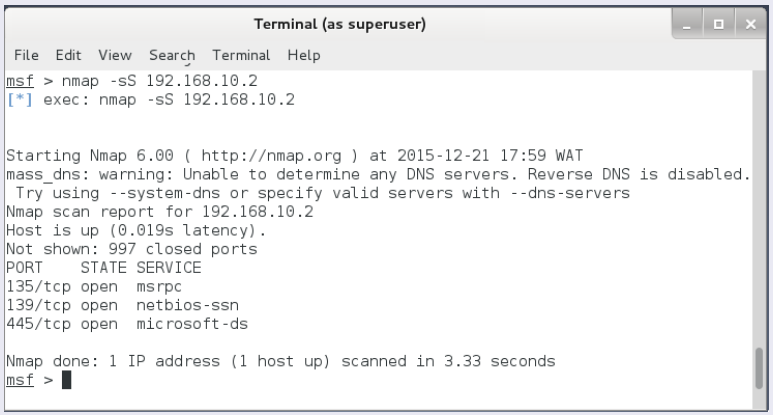

Figure 6: Attacks generation test in health monitoring architecture based on simple VPN

MS08 067 attack generation

MS08 067 attack generation

- This attack allows remote code execution if an affected system receives a specially crafted RPC request. MS08 067 attack is running on windows XP and windows server 2003.
- In the underdeveloped countries and precisely in africa most computers continue to use windows XP system. Therefore we find it necessary to pay particular attention to this type of attack.
- To generate this attack, we loaded it into the Metasploit attack generator. After loading the attack, we sent the payload reverse tcp. The figure 7 shows the result of this attack.

MS08 067 attack generation

MS08 067 attack generation

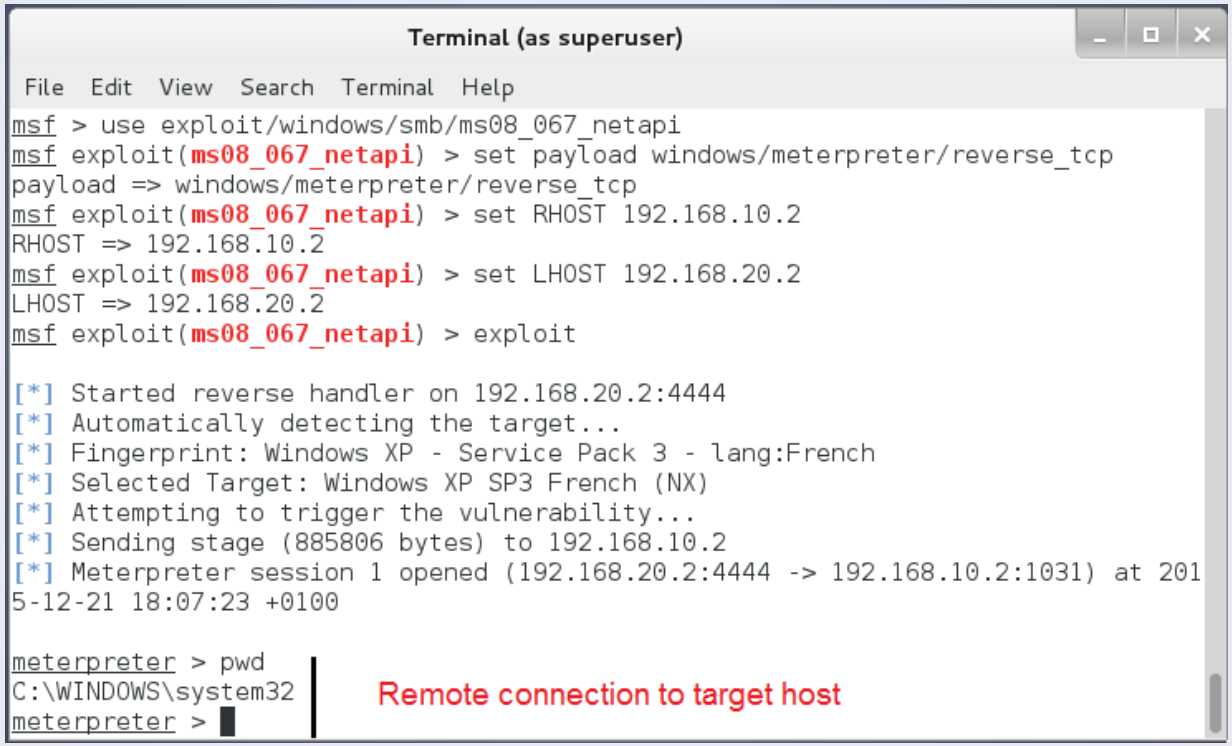

Figure 7: MS08 067 attack using SMB protocol

Attacks generation test in health monitoring architecture based on secure VPN

Attacks generation test in health monitoring architecture based on secure VPN

- To secure the VPN, we have installed a snort inline intrusion prevention system on the VPN server.
- We have regenerated the MS08 067 attack. Figures 8 and 9 show that the prevention system blocked the attack and has saved alerts in snort inline log file .

Attacks generation test in health monitoring architecture based on secure VPN

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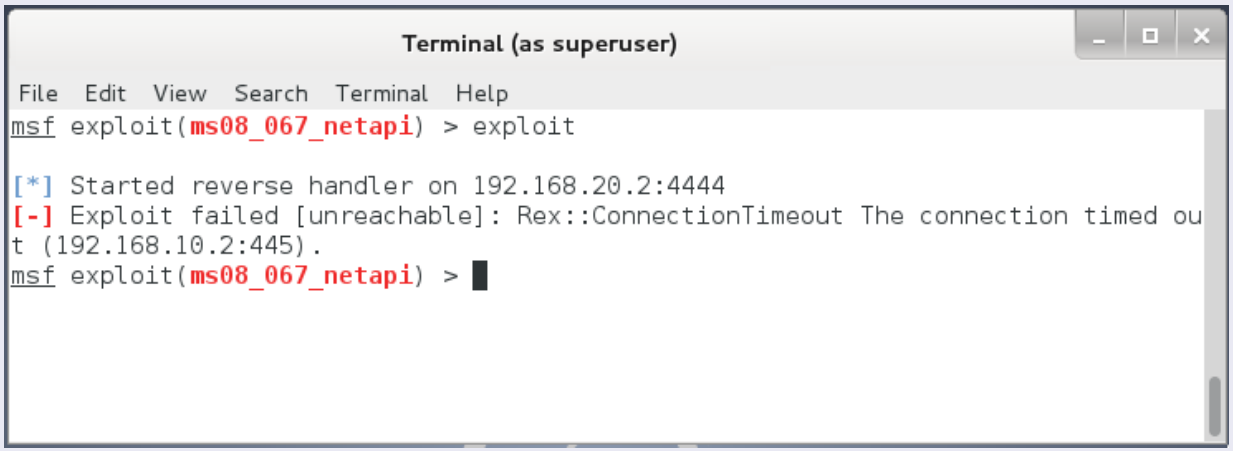

Figure 8: MS08 067 attack failure

Attacks generation test in health monitoring architecture based on secure VPN

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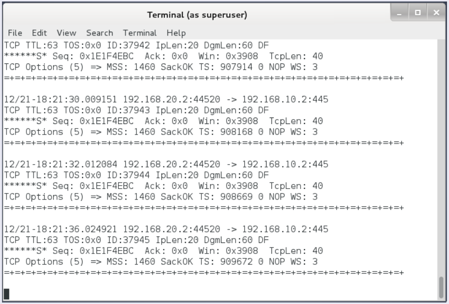

Figure 9: Contents of snort inline log file

Outline

Attacks generation test in health monitoring architecture based on secure VPN

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- This work proposes a new network architecture to strengthen safety, privacy and confidentiality of exchanged data and prevent different intrusion in a health monitoring system based on virtual private networks.
- This architecture composed of intrusion prevention and firewall systems allowed us to detect the various intrusions to health monitoring systems.

THANK YOU FOR YOUR ATTENTION