Security Review of Agri-Marine Robotics

INF10101 - INFORMATION SOCIETY AND SECURITY

Matric No. – 40161070

Word Count - 2456 Incl. Tables

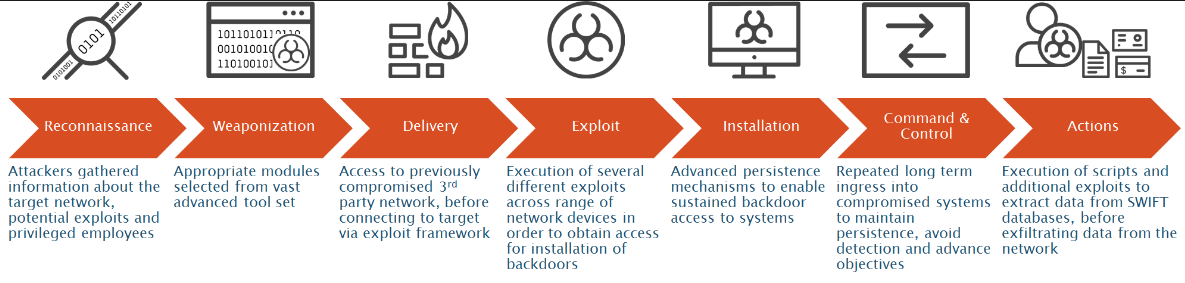
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**1.Threat Context**

**1.1 Introduction**

Agri-Marine Robotics (AMR) is a privately-owned technology and manufacturing firm that specializes in autonomous agricultural and underwater robots. As it is the market leader it must consider security at all levels, therefore an attack and defence model will be created to protect the firm. Both of the models follow a simplified version of the Cyber Kill Chain, this was created to help company’s like AMR think like an threat to itself in order to protect the company.

The Cyber Kill Chain

* + 1. **Scenario**

Aberdeen based robotics manufactures AMR have recently become the market leader in their respected industry. The company is spilt between two sites, the head site in Aberdeen with another site located approximately 20 kilometres away. The head office contains a web server, email server and a file server, because of its relatively small size and it securing two major contracts last year AMR is a top target for attackers and a review of their security must be done.

The company possess many important assets, including Robotic designs and source code. If these assets were taken or destroyed by attackers the business would lose a lot of money and protecting this data must be a priority. This is discussed in Table 1 where AMR’s information assets are assessed.

* 1. **Assets**

Information Assets in Agri-Marine Robotics

|  |  |  |  |
| --- | --- | --- | --- |
| Asset | Vulnerabilities | C, I or A? | Reason |
| Designs/ Patents of Robotics | Staff are the vulnerabilities as they have access to these records. Systems could also be brute forced. | Threat to Confidentiality,  Availability and Integrity | If an attacker gains access to the designs this breaks confidentiality, if they then alter the design this voids integrity, Availability is threated when the designs could be deleted. |
| Customer Records | Same as Designs as staff have access to the records database | Threat to Confidentiality,  Availability and Integrity | If an attacker gains access to the records this breaks confidentiality, if they then alter the records this voids integrity, Availability is threated when the records could be deleted. |
| Email Server | Staff have access to the server and can be targeted for their access. | Threat to Confidentiality,  Availability and Integrity | If an attacker gains access to the emails this breaks confidentiality, if they then alter the emails this voids integrity, Availability is threated when the emails could be deleted. |
| Bank Details | The staff hold the information to the bank details and could be targeted by attacks | Threat to Confidentiality,  Availability and Integrity | If an attacker gains access to the bank details this breaks confidentiality, if they then alter the bank details this voids integrity, Availability is threated when the bank details could be deleted. |

**Table 1- Information Assets for the Scenario**

* 1. **Threat Actors**

The assets that AMR possess are very valuable, and to begin preparation on the protection of the system, external threat actors should be considered. Some of Agri-Marine Robotics external threat actors are discussed below.

|  |  |  |  |
| --- | --- | --- | --- |
| **External Threat Actor** | **Capability** | **Motivation** | **Threat Level** |
| Hacktivist | Capable, While they maybe skilled at hacking they might not have access to the same amount of funds that other attackers may have. | Angered over AMR’s offshore drilling and want to tarnish AMR’s reputation. | High |
| Enemies of the Russian Government | Highly Capable and well-funded by other countries. | To sabotage the Russian government by attacking the company’s that work with Russia | Medium to High |
| Script Kiddies | Fairly Capable due to being able to find scripts online | Wanting to prove themselves by selecting an easier target. | Low |

**Table 2 – Threat Actors**

Hacktivists have the highest threat level as they have the most motivation to attack Agri-Marine Robotics. While the enemies of the Russian government are likely more capable to pull off the attack there are better ways to attack Russia then go through their allies. And as shown in the 2016 Dyn cyber-attack Hacktivist’s such as Anonymous are a real problem.

**2.1 Attack Modelling**

The designs of the agbots are highly valuable to AMR and if a hacktivist group were to be able to delete them the company would lose a large amount of money. The model that will be used to attack will be a simplified form of the Cyber Kill Chain shown in Figure 1.

The first stage is the reconnaissance. During this stage the hacktivist group will be running a vulnerability scanner on the servers and looking for other weaknesses in the system. At this point they will also be looking for any news stories or public data about the company.

The next stage involves looking for a way to breach the system. They could do this they will run a phishing attack on the email server located in the head office to get access to a staff members credentials.

To gain access to the file server the hacktivists will use the staff members credentials they stole in the last stage to enter the server. From here as they have no interest in stealing the designs they will wreak havoc on the server uploading malware and deleting all the designs that are saved to the servers.

The may also upload other malware into the email server to maintain access to the system. This will allow them to access the server again as the organization might be more focused on the breach in the file server and forget to check the email server allowing the attack to happen again if the first attack was not devastating enough.

After deleting the robotics design the hacktivists will not be interested in covering their attack as publicity is good for them. However they will be interested in hiding how they gained access to the server and will delete the email that caused the phishing scam.

**2.2 Defence Modelling**

The defence model is the complete opposite of the attack model that was created above. It is designed to stop the threat that was stated above, in this case the hacktivist group. To stop the Reconnaissance stage AMR may wish to install some anti-malware or anti-virus software into their system or be more vigilant of their server logins to notice the vulnerability scanner. They may also want to be careful what data they realise to the public, so if they are targeted it makes the attack more difficult through lack of information.

To improve their security AMR should educate all their staff on cyber security so there is less chance of staff opening threating emails to deny access to the hacktivists. Also installing firewalls into the servers themselves will also filter a lot of the dangerous emails.

To deny access to the file server AMR have several options. These include; implementing a dynamic access control to allow an admin to closely monitor all logins into the server or removing internet access to the server and only allow a single person to access the server. Another option is implementing a password policy, stating employees must change their password at regular intervals.

To defend against the attackers maintaining access a full system check must be done as soon as a threat is detected. This will allow the administrator to notice any other malware that was upload during the attack. These check should also be done regularly in case the first check missed the threat.

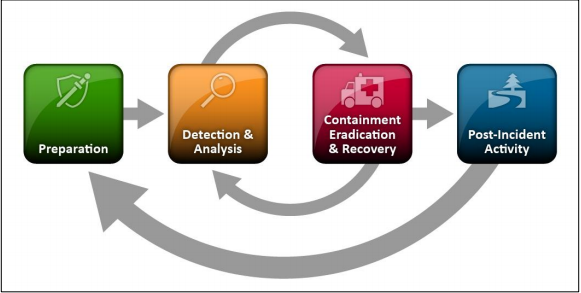
As the hacktivists are not interested in cleaning up after themselves, there is not much the company can do however they should consider not publicising the attack as one of the reasons the attackers performed this was for the publicity.

**2.3 Conclusion**

In conclusion, protecting the robotic designs should be very important to AMR, to perform this task the defence model outlines lines up with the attack model that would be used by an attacker. This would allow the company to deal correctly with each phase.

**3. Incident Handling and Ransomware**

Ransomware is a term used for malware that is used to hold a system *“hostage”* until some kind of payment has been made. The simplest form of this usually locks a user out of their system until the ransom has been paid. A notable example being the “*WannaCry worm*” that was used to attack the NHS in 2017 and demanded Bitcoin in payments to let the user back into the system. The figure below shows the steps that will be used in this ransomware scenario.

 **Figure 2 -Incident Handling Process**

The most important stage in my mind is he preparation phase this is because a company with large amounts of security will not have to deal with the other stages as much as a company that is not prepared. Preparation includes having every workstation secure with anti-virus and anti-malware software, firewalls and Intrusion Prevention Software(IPS). There are also extra steps that companies can take to be prepared. These can include: Having a dedicated war room for communication and co-ordination, Network diagrams and a list of critical assets and current baselines of expected network and system activity. All of these precautions would be adequate preparation.

The detection and analysis phase is the hardest phase to properly manage as an incident could occur in countless ways form countless sources. Making it nearly impossible to be fully prepared however organisations can be prepared to handle the most common form of attacks and their most likely targets. Such as theft or loss of equipment with sensitive data on it, Impersonation which includes spoofing and man in the middle attacks, and attrition attacks which involve DDos attacks, These usually employ an brute force attack to destroy a system. Another issues that arises in this stage is noticing signs of an attack while having anti-virus and anti-malware will help with this the are other ways organizations can be vigilant to notice an attack. These can include web server log ins showing usage of a vulnerability scanner or filenames with unusual characters. These steps will hopefully allow administrators to analyse the ransomware attacks and discover the point of origin.

The first step of this stage is to deciding how to contain the ransomware. This strategy should be determined beforehand and a company should have a different containment strategies for each major type of attack. If only a single part of the network has been affected by the ransomware it can be separated easily to stop the spread, if this is not the case then the entire network will have to be wiped clean. To eradicate the ransomware the easiest way is to pay the fee demanded but this might not be the possible for smaller companies . In that case it may be cheaper to wipe the system assume backups are available.

The most important part of Post-Incident Activity is learning and improving from the attack. This should include a discussion on; Exactly what happened and when? How well did staff react to the incident? And what would be done differently next time if a similar attack occurs. It is also important to collect data on the ransomware that was used, this can be used if the company wishes to prosecute the attackers or can just be used to prepare for an attack of the same type of ransomware in the future.

The reason the process described above is used in a ransomware attack is it covers all the necessary steps needed while not over-complicating the process for non-technical staff. Overall I belive that this process first evidenced by NIST handles the scenario well and is robust enough to hadle other threats not just this scenario.

**4. Evaluation**

During this coursework I have learnt about the many uses of attack defence modelling. At its worst modelling will allow a company to prepare for cyber-attacks by training them to think in a certain way which can be very useful. While modelling might not be a without its flaws it is useful start for companies with limited or no knowledge about cyber-attacks.

My scenario being based around the robotic industries in Aberdeen was very suitable for me, as I am from Aberdeen and knowing many people from this industry I am aware how competitive it is and how desperate companies are to get ahead of each other meaning they must have the most up to date security systems to protect themselves. While the model that was used was simplified and not as robust as a complex model , it does allow for staff with no experience in security to communicate easily with those who do. It also highlights the need for a multi-layer defence which is important as some may think that prevention or detection are the most important and forget to think about the other stages.

The model is not without its issues however with its closer focus to malware other attacks maybe not be prepared for causing a massive issue if a spear-phishing or dos attack occurs. While the model maybe a much cheaper to implement then alternative models, the cost greatly increase the more stages fail and the further the attacker gets causing a snowball effect. An issue also arises when a non-technical staff member is asked to complete any stage as understanding the cyber kill chain is very different from being able to implement it. It is also important to note that while this cyber kill chain is a great starting point in terms of security. It should not be the only form of defence that a company make use of and be used in conjunction with other forms of defence.

In conclusion , the simplified Cyber Kill chain is a great starting point for companies who are not technically gifted, although it might not be perfect and should not be a company’s only form of defence. The positives far outweigh the negatives. It is definitely more beneficial to a company such as Equifax that in my mind would have benefited from using the model. While it might not have prevented the massive data breach it would have certainly minimised the damage that the breach caused.

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