ISEC-615 - Fundamentals of Cybersecurity

Assignment No. 4 - Cybersecurity Design Principles

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**Cyber Breach Overview**

In this article we are going to discuss one of the most prolific hacks in cryptocurrency history,the infamous Mt.Gox hack. This attack was the biggest bitcoin heist in history to date and occurred in a crucial time during crypto currencies infancy stage of development. This security breach would deal a blow to the crypto community that is still discussed today. Because of this breach the phrase “’Not your wallet, not your coins.” Was introduced into the community.

To begin, we will discuss a brief history of Mt.Gox and some incidents leading up to this event. Mt.Gox actually stands for “magic the gathering online exchange” and was initially set up to do just that. Be an online exchange for an online card game. After hearing about the white paper for bitcoin by Satoshi Nakomoto the owners decided to switch from the online card exchange to being one of the first online crypto currency exchanges in the world. Being such a new concept and one for the first to market the online crypto exchange began to grow too quick for its own good. In its prime Mt.Gox was handling about 70% of all the worlds’ bitcoin transactions at the time. The founder Jed McCaleb sold Mt.Gox to Mark Karpelés in March 2011. Jed would eventually move on to create one of the world’s most popular cryptocurrencies Ripple (XRP). The first hack on Mt.Gox should have served as a red flag to what was to come. It first happened in 2011 when a computer was compromised believed to be belonging to a Mt.Gox auditor. This attacker was able compromise user’s private keys and were able to access their online accounts. From there the attacker sold the victims bitcoins for a penny on the dollar. Effectively stealing 2000 BTC’s for about $20, a value that is worth well over $20 Million dollars today in 2019. Besides from this a former business partner coinlab would go on to sue the company for around $75 million dollars on top of that the US government DHS would seize another $5 million for being an unregistered money transmitter. These were arguably red flags for the major hack that was simultaneously taking place covertly and unbeknownst to the exchange until years later. In 2014 Mt.Gox would discover that over the years about 650,000 BTC’s had been stolen from the exchange. Considering BTC is $12,500 today in 2019, that would be an evaluation of over $8 Billion dollars stolen in this heist.

**Security Failures**

So how were these attackers able to steal Hundreds of Thousands of Bitcoins covertly under the radar from Mt. Gox without them noticing? BTC has a maximum supply of 21,000,000 coins ever to be made, so the missing 650,000 means that about %03 of the total supply had been stolen and unaccounted for. It is still disputed on what truly happened to Mt.Gox but the general consensus is that private keys stored in the online wallets were stolen because until Bitcoin 0.4.0 release, the wallets private keys were un-encrypted. Anyone could of copied the wallet.dat files and view the plain text private keys, compromising the security of the wallets and their digital assets. Many people misconceive this attack as a quick process but the attacker was much more dubious then that. This attack was a prolonged attack comparable to a bucket of water with a hole in it. Because of the Mt.Gox stored key share ,the attacker sent smaller portion of bitcoins to outside wallets confusing the website into thinking they were deposits being sent to more secure wallets. Mt.Gox had failed at keeping their private keys secure and auditing there stored key share.It is also said that Mt.Gox did not use the concept of version control and test environments properly. On top of that it is said that changes were only approved from the owner and would take a great deal of time to get approved.

**Cybersecurity Posture**

From the discussion above we can see that Mt.Gox weak security posture ultimately led to its demise. In this component we will review and discuss some more secure concepts that could and should have been implemented.

To begin with the technical aspect Mt.Gox used md5sum for hashing passwords when it was widely agreed upon by that time that this was an insufficient encryption standard. By that time sha-2 should be used for encryption while md5sum should be used for Integrity rather than confidentiality. Meaning you should use md5sum for creating and validating checksums rather than hiding data with encryption. When hackers were able to access the administrative account they faced their next security posture issue of having too many privileges. Remote accounts should have had read only access along with bad management on the security team.

To put it simply Mt.Gox should have had contracted out to a trusted penetration testing team to audit their posture. Hopefully finding their vulnerability to the weak md5sum ,lack of a good cybersecurity management practice, and introduce the concept of secure agile methodologies.

For instance the concept of the keypool having to many key shares, this lead too many available hot wallets for the perpetrator to access. This should have been locked down by removing excess wallets in and amounts in the keypool by sending the digital assets to securely stored and backup encrypted hard wallet. This could have alerted at an earlier time that finances were going out faster than they were coming in. Second hopefully the penetration team could have found vulnerabilities in their postures such as SQL injection or cross-site scripting that could have been nefariously used to take advantage of the weak md5sum hashed passwords. This could have been prevented with the use of a stronger encryption methodology implementation, user training, and auditing of privileges and access. When it came to secure software development practices could have implemented some type of version control such as git. They should have had a dedicated quality assurance team to verify invalid user inputs and regression testing using products such as Selenium or Junit for testing a validation. As for merge request being approved from the top, the concept of committee based review could have been implemented for integration from test environments to production. This could have been implemented with products such as JIRA to build story boards for people to vote on whether things got approved or not eliminating the impossible task of one person reading copious amounts of code for review and approval. The concept of Continuous integration and Continous deployment could of quite frankly cut out a lot of un-necessary data availability and resources. Using tools like Jenkins for CI/CD you could have save resources by having code automatically test itself constantly and deploy the final production if everything passes simultaneously saving money and access to admin accounts because you would no longer have to pay so many workers to do it.

Ultimately Mt.Gox could have been better served by following more secure Agile / Scrum methodologies while also adhering to best security practices such as a more updated password hashing algorithm. Concepts of 2-Factor authentication could have played a positive role in this as well such as a RSA token or google authenticator.

**Business Continuity Plan**

When it comes to business continuity the truth is it’s a little opaque because this attack was estimated to be prolonged over about 3-4 years. Most arguably having enough funds saved in cold wallets and setting a threshold on when serious investigations on the business structure should be assessed. Essentially to set an alert to be notified that way too much money is going out and savings are needing to be accessed. Once they learned there was an issue they should have immediately been vocal and very public about it with their customers. This could have led to many users removing their holdings and employing better security practices such a cold wallet storage and two factor authentication. Holding back information about these issues is a big argument on what ultimately led to their demise. As far as continuing business a good insurance policy definitely could have helped.

**Conclusion**

In conclusion the Mt.Gox hack was a pivotal moment for crypto history being the largest theft of BTC to date. Starting as card game website to becoming the world’s largest crypto exchange sure had its rollercoasters of ups and downs for this company. It taught us that assets stored online on in hot wallets are not truly under your control and should be stored in cold wallets. It taught us the importance secure web development methodologies for continuous integration and deployment of code with automation and peer review. I emphasized the fact that a company should be vocal and loyal to its customer base. It even helped to the development of more secure crypto wallet methodologies by encrypting wallets private keys now being an industry standard. Mt.Gox was an early mover and shaker of the crypto community with such a story of growth from small grass roots to being one of the biggest gainers and crashers of its market. As crypto currency finds its place in the worlds markets and gains value it will be pretty unfathomable that so much Bitcoin was stolen at a time when its value would never be imagined to be so great. This is why that Mt.Gox hack should really be the de-facto standard when it comes conversations about cryptocurrency and web development.

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**Certification of Authorship**



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