# Secure Internet Banking on Insecure Hosts

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# Agenda

- Introduction
- Research Question
- Man – in – the – Browser attack
- Solution Proposed: One – time Java Applet
- Attack Scenario
- Conclusion
- Questions

- 19 slides

# Why?


# Cybercriminals earn £48 million in 'Operation High Roller' bank hack

International fraud ring said to use automated techniques to steal €60 million from banks and commercial accounts, according to McAfee and Guardian Analytics report

*By Ellen Messmer | Network World US | Published 17:39, 26 June 12*

## bank hacking program hits three continents

26 June, 2012 09:57


**A new wave of automated hackin online bank accounts might hav stolen $78 million in the past yea customers in Europe, Latin Ame and the United States.**

This is according to researchers who p into the computers of the hacking gang

ESS | POLITICS | TECHNOLOGY | ENTERTAINMENT | STRANGE

## Hacking Attack On 60 Banks

k accounts in a massive cyber raid, after fraudsters raid

7:16am U

# Bank account hacking software gets smarter

Reuters | June 18, 2012 | 0 Comments | Tweet 19 | Like 28

# Introduction: Cat and Mouse Game

- Evolution of attacks
  - Keyloggers
  - Man-in-the-Middle
  - Man-in-the-Browser (MitB)
- Countermeasures
  - Transaction Authentication Codes
  - 2 – factor authentication

# Security vs …

- Usability
- Marketing
- Transaction Cost

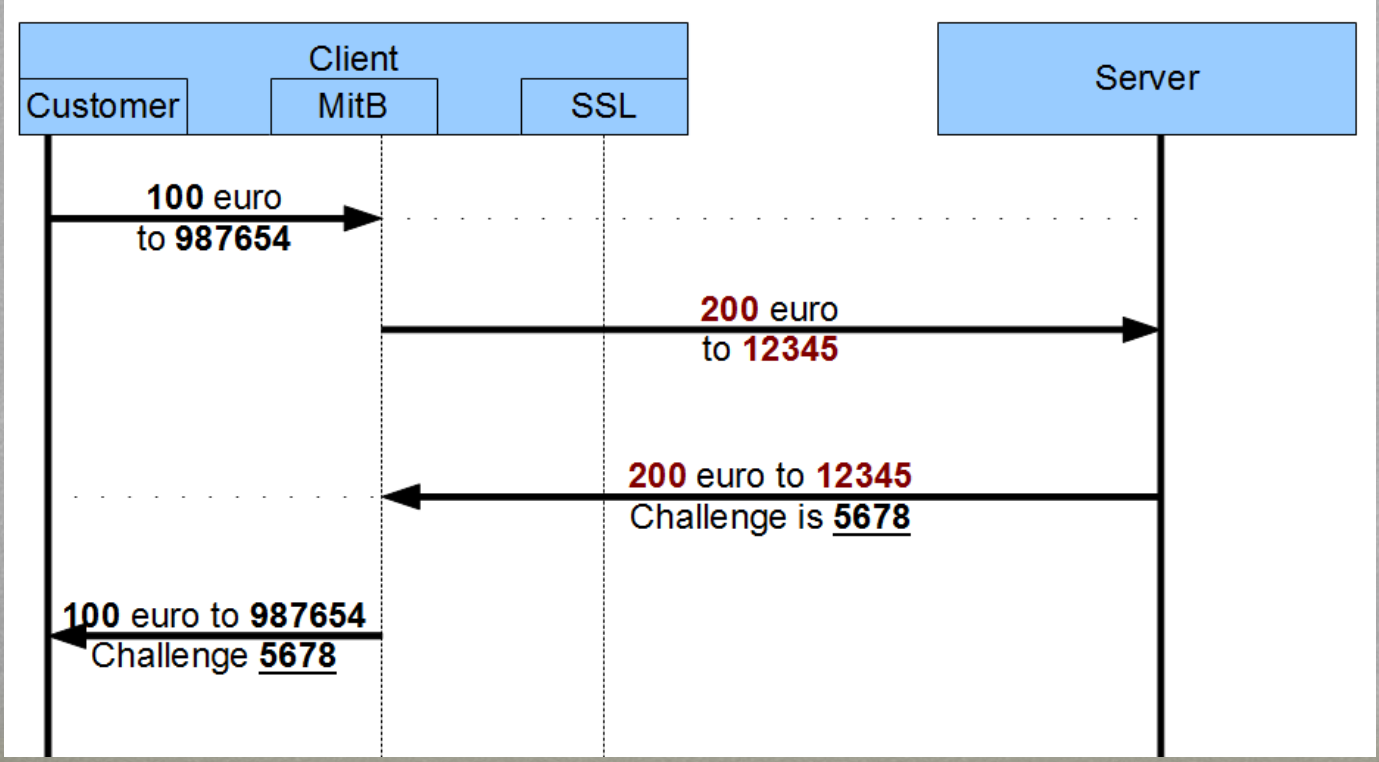
- e.g. e.dentifier2 Connected – Mode
  - Secure device
  - See What You Sign
  - Users may not find it usable
  - Need privileges to install software
  - Need for USB port
  - What about internet cafés?

# Research Question

- Is using one – time Java Applets for Internet Banking transactions a secure and usable solution?
  - What kind of functionality should exist in such an applet?
  - Which are the risks, related to implementing and using the previously mentioned scheme?
  - Which are the strengths and weaknesses of the scheme from a security and usability perspective?

# Man-in-the-Browser attack (1)

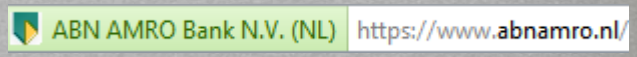
- Malware on customer's computer
- Real – time content manipulation



# Man-in-the-Browser attack

(2)

- Content Manipulation attack
- Automated
- Two stages
  - Manipulate data input
  - Manipulate transaction receipt
- The user will never notice
- Not a Man – in – the – Middle attack




  - Nothing "wrong" with the network; bar is green!
- One Time Passwords, Client Certificates etc. cannot help against the attack

# Man-in-the-browser attack (3)

- Points of attack
  - API hooking
  - Browser Helper Objects (Explorer) - Extensions (Mozilla)
  - Java Script injection
  - Uses regular expressions to find which content needs to be altered
- Example malware
  - Zeus
  - Spy Eye

# One – Time Java Applet

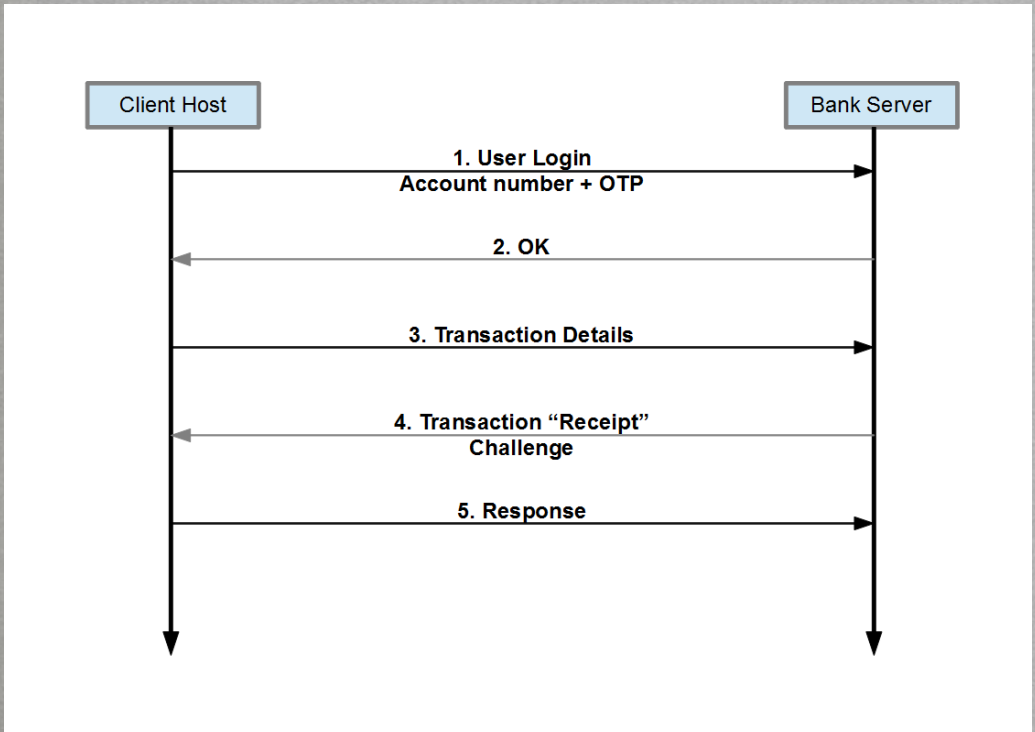
## Pros

- No API hooking
  - Java Virtual Machine
- No need for administrative privileges or USB
- Concepts like randomization against pattern matching
- Encryption within the applet
- Easy to push updates

## Cons

- Changes what customers are used to
- Need for Java Runtime Environment; not always installed
- Transactions probably take longer (compile, sign)
- Not necessarily an answer to Man-in-the-Middle attacks
- Schemes based only on software cannot be 100% secure

# What should the applet do?




- What do we need to protect?
  - Login process?
  - Transaction Details?
  - Challenge?
  - Response?
- In a compromised host all the attacker needs is the one – time codes

# Possible threats: What can Malware do?

- Keyloggers
- Screenshots
- Rootkits
- Manipulate Input
- Manipulate Memory Entries
- Break a CAPTCHA
- Insert root – certificates to OS; code appears to be legitimate
- Break into Java VM
- Break Java security?
- Update botnets!

# What do we want to achieve?

- Make it as hard as possible
  - 100% secure is impossible
- Prevent automation of attack
  - Make input of fraudulent data harder to automate
  - Make receipt manipulation harder to automate

# Secure the applet

- Signed code
- SSL/TLS communication
  - Automatically check server fingerprint
- Secure on a lower level
  - Strings to Characters
  - Code Obfuscation: Harder to analyze code
- Graphical keyboards
- Randomize applet features
- Quick server side updates

# Attack Scenarios (1)

- Attacker builds overlay applet on victim host
  - Attacker tricks the customer into using bogus applet
  - Attacker uses legitimate applet in the background
- All the attacker needs to do is make the user answer the challenge for the attacker's transaction
  - Extract challenge from legitimate applet
  - Pass it to the customer applet
  - Let the customer generate the response
  - Use it as input for his transaction

# Attack Scenarios (2): Countermeasures

- Sign Code and Hope(!) Java Security does not break
- Hope(!) customers pay attention to Certificates
- Randomize code
  - Make it harder to know what messages attacker must send
- Replace Strings with characters
  - Harder to manipulate the transaction receipt
- Graphical keyboards
  - Possibly harder to automate fraudulent input

# Conclusion

- Software only schemes cannot be 100% secure
  - Connected mode is secure enough; use when possible
- One – Time Applet solves the problem, at least for now
  - Easy to update
- Security through obscurity to some extend
- Different levels of security – usability; functionality depends on that
- Usability Survey needed
- Penetration testing needed

# Acknowledgements


- Sander Vos
- Steven Raspe
- Han Sahin

# Questions

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