Bitcoin Client - Transaction Fee Attack

23 Aug 2012

Summary:

Malicious changes to the Satoshi client transaction fee setting can cause users to lose their entire wallet balance. This change is trivial to achieve and requires no special knowledge or computational resources.

Scope:

This attack has been tested and confirmed on:

- the Windows bitcoin-qt client

This attack may be applicable to:

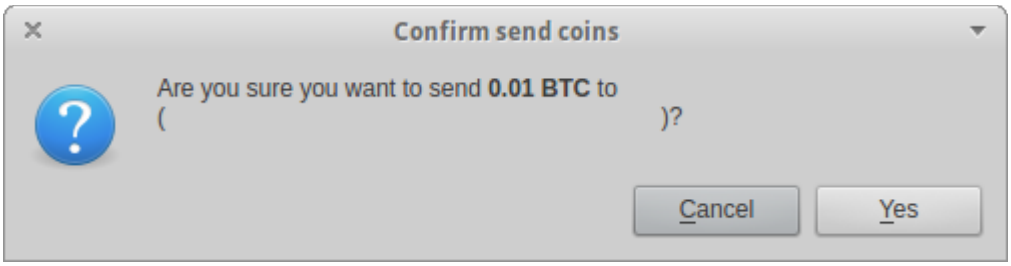
- any of the Satoshi clients, including the daemon clients

This attack does not consider but may also apply to:

- any non-Satoshi client, eg Armory
- thin clients, eg Electrum

Attack Scenario:

- Alice is a regular windows user and somehow manages to obtain a program which contains this particular attack.
- When this program is run, it (unknown to her) alters her bitcoin client settings to have a transaction fee of 50 bitcoin (BTC).
- Alice opens her bitcoin client to send some coins. She has 51 BTC in her wallet.
- Alice sends 0.01 BTC to her friend.
- The alert message asks her to confirm the transaction of 0.01 BTC, which does not show any mention of the malicious transaction fee. (see image below)
- She clicks OK.
- She finds that her balance is now 0.99 BTC and doesn't understand why.
- 50 BTC of her 51 BTC has been sent to to the network as miner fees.



Attack Method:

The value for the amount to pay as a transaction fee is stored in the Window Registry. This value can be trivially changed in a manner which is not detected by antivirus scanners or apparent to the user. This is demonstrated on line 20 of Form.cs

The attack works because the fee amount is never shown to the user from the time they open the client to the time when they complete a transaction. By the time they are aware the settings has changed, the transaction has already happened.

It also works because the value can be changed by anyone to any value.

This attack may or may not apply to other operating systems running the Satoshi client, depending on the write permissions at the location the setting is stored.

This attack may or may not apply to other clients, depending on how the client calculates and displays the transaction fee for each transaction the user makes.

Proposed Solutions:

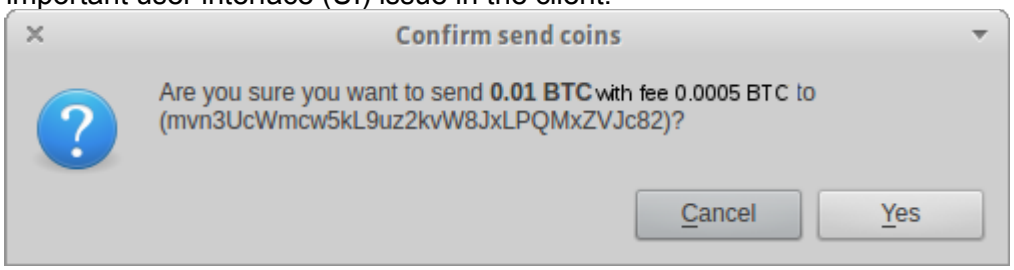
1. Change the client

   The client dialog for confirming a transaction should display the fee every time, even if the fee is 0 BTC. This is demonstrated in the image below. By displaying the fee there is less chance the user will be fooled into making the transaction. They can cancel the transaction and change the fee setting to their desired value.

   [If the attack is designed to constantly change this value, the time between the user setting it and performing their transaction would allow the attacker to change the value back to the malicious value, meaning no transactions can be made with the user's desired transaction fee value.] Debatable, I will test this - it's likely the value is only read from the registry when the client loads, and this 'constantly change the value' attack may not really be an issue.

   Changing the UI does not prevent repeats of the attack and requires close attention to the dialog, which users may not read carefully.

   This is not a good solution to the problem, but is a simple way of addressing an important user interface (UI) issue in the client.



2. Encrypt / lock the settings

   If the settings are stored in a way which cannot be manipulated without some specific knowledge from the user, the setting cannot be maliciously altered. Ideally this would be implemented in a way which allows the settings to be read by anyone, but only the person with knowledge to decrypt / unlock the settings can write to them.

Conclusion:

An attack exists which causes loss of all coins in the user's wallet. It requires no special knowledge or computational resources. This attack can be prevented with two methods - a UI change, and by making it computationally infeasible to read and change the settings.