Apple's Encryption Challenge: Game theory in the real world

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In February of 2016 Apple Inc. was faced with a court order from the FBI to create an

entirely new operating system that would allow the FBI to bypass the security protections on the

iPhone lock screen. This court order was issued after a shooting that occurred in San Bernardino

back in December 2015 (14 people were killed and 22 injured); the attack was later deemed a

terrorist attack. The FBI recovered a working phone (iPhone 5c) that belonged to one of the

gunmen, Syed Rizwan Farook. However, because of the security precautions that Apple

implements on all its devices, the FBI didn't want to risk trying to hack the phone and losing all

the data in the process.

On Apple devices, whenever the device passcode is created, the user automatically

enables Data Protection. This means that unless the one trying to gain access to that device

knows the passcode, they will have to attempt accessing it using brute-force (a method using

multiple password tries). A large iteration count is used to make each attempt slower. To further

discourage brute-forces passcode attacks, there are escalating time delays after the entry of an

invalid passcode at the lock screen. There is also a setting on each device that, when enabled,

will automatically wipe it after 10 consecutive incorrect attempts to enter the passcode. To the

FBI's disadvantage, the phone that was retrieved had this setting enabled.

Apple's decision whether to comply with the court or not could mark a profound change

in the digital age. This issue (privacy vs security) is very controversial and has been brought up

many times but has never been fully addressed. Much is at stake, and battle lines in this

sequential strategic game have been drawn.

The FBI's first move could have been more adroit. They appended their request to unlock

the iPhone with creating a new operating system that would allow them, the FBI, to attempt to

unlock devices on their own. Surely, they should have known that Apple would not have immediately conceded to their demands. Apple responded to the FBI's move by not helping, because their payoff[1] is greater than if they were to help the FBI. However, their move may not be inconsequential. It most likely foretells the outcome for others involved such as other tech companies and consumers. Both players at this point cannot increase their payoff by choosing an action different from their current one. This action profile is the Nash Equilibrium.

In the game space, the FBI ideally wants Apple to unlock the iPhone that was retrieved so they impose a threat (court order) on Apple. If Apple chooses to not comply with this court order and the court order passes, then Apple will be punished by the law. By complying to this court order it is important to remember that right now the common knowledge requires that all players know and understand that the phone cannot be decrypted. If we relax that statement even the slightest bit a lot can unravel. The knowledge of a backdoor existing can be enough to ruin confidence. This is especially true today since phones are becoming our life and our identity. Ruining that confidence would have grave unintended consequences especially on consumers like us.

In response to the FBI's strategy, Apple tries to counteract this by promising their consumers that they will do everything in their power to fight the federal demands to help mine data from the iPhone used by one of the shooters. This will result with the FBI dropping the case and using a 3rd party to decrypt the iPhone which leads to the new Nash Equilibrium.
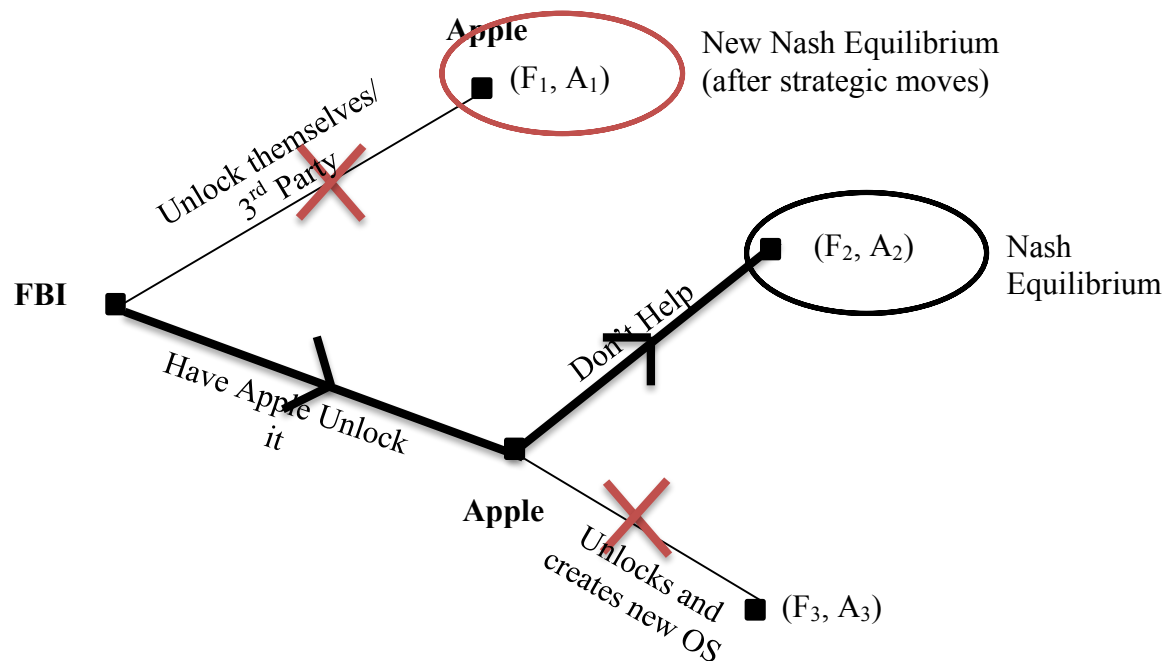
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[1] The payoffs for the FBI and Apple are as follows:
     -when the FBI unlocks the phones themselves/ uses a 3rd party (F_1, A_1)
     -when the FBI chooses to have Apple unlock it and Apple chooses to not comply (F_2, A_2)
     -when the FBI has Apple unlock the phone and Apple complies (F_3, A_3).
Therefore, we assume that the payoffs are $\mathbf{F_3 > F_1 > F_2}$ and $\mathbf{A_1 > A_2 > A_3}$.

It is interesting to treat the court order between the FBI and Apple Inc. as a game, and to think about the best strategies for each, and how the moves of one might affect the choices of the others. Yet, we are not talking about a game. We are talking about consequential choices that could change the future of technology. The encryption war is far from over. If anything, it is more urgent than ever.

Apple

(F_1, A_1) New Nash Equilibrium
(after strategic moves)

Unlock themselves/
3rd Party

FBI

(F_2, A_2) Nash
Equilibrium

Have Apple Unlock
it

Don't Help

Apple

Unlocks and
creates new OS

(F_3, A_3)

Resources:
http://www.apple.com/customer-letter/answers/
https://www.apple.com/business/docs/iOS_Security_Guide.pdf

https://assets.documentcloud.org/documents/2714001/SB-Shooter-Order-Compelling-Apple-Asst-iPhone.pdf
http://www.wired.com/wp-content/uploads/2016/02/SB-shooter-MOTION-seeking-asst-iPhone.pdf