

Wireless internet security and how to solve collective action problem (or *The social innovation way to solve collective action problem*)

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Abstract — In this paper, we tried to draw a fair assessment on things which will take place soon with the coming era of IoT, 5G technology, global eavesdropping and all that. Nonetheless, we are aware that this article sounds quite gloomy. We are not techno-utopians (read Evgeny Morozov's WSJ article on digital dictatorship¹), but we are not techno-pessimists either. Perhaps you can consider us as: "*techno-realists*."² This paper was written in the same spirit of Jonathan L. Zittrain's book *The Future of Internet and how to stop it*.³

Keywords — *wireless technology, network security, mobile internet security, global eavesdropping, digital dictatorship.*

I. INTRODUCTION

One of the great economists of 20th century, John Maynard Keynes, once remarked: "*Everybody wants to go to heaven, but not too soon.*" Surely, it depends much on how you define heaven. If you define heaven as fast internet access anywhere, possibility of tracking everything, and plenty choices of movie channels, then you can expect your dream will be fulfilled soon. Especially considering recent news of 5G technology already in place for several cities in China, and *Digit Act Bill* passed by US Senate since 2016, and smartphones getting cheaper and cheaper each month.(1) So you can get access on everything faster than ever. Some futurists even declare the coming of "abundance" era, accelerated by rapid advancement of technology. But now the hard questions: is that really a heaven for the entire global population? Or, are we running faster to nowhere? Let us consider some real examples on how bad things can happen along the way.

II. A FEW EXAMPLES

1. The leak report by Edward Snowden revealed ongoing advanced eavesdropping by NSA on the entire population of US citizens. Although the details are rather complicated, including perhaps a very peculiar software called PRISM, soon it became clear that such a report is not just fake. Another report reveals argument by intelligence community that such an eavesdropping is necessary in order to anticipate terrorism attack. But Snowden criticized effectiveness of massive surveillance on US ordinary people for tracking potential threat; instead he argued that such a massive surveillance only distracts intelligence community from doing real work on tracking potential harmful terrorists. His prediction became confirmed at the time of attack in Boston, and also in other areas – when no surveillance method could anticipate.

2. After Snowden story was forgotten, there is a recent report on the stolen passwords of all Yahoo email users, during 2013-2014. The number is quite staggering, not just 100 million, not 200 million, but the whole 3 billion users. Of

¹<https://www.wsj.com/articles/SB10001424052748703983004575073911147404540>

² <http://www.technorealism.org/>

³ This is our presentation to ICRIECE/IEEE, held in India, presented online on last august 4th, 2018. Our paper can be summarized as follows: that the coming era of global eavesdroppers will make human being as losers in their own game, replaced with plethora of drones and surveillance technologies. In order to save humanity, we should take a slower pace and begin considering collective actions (cf. Olson) and then doing meaningful work for society.

course, nobody from Yahoo officers would admit whether they were just sloppy with their system, or they allowed a sort of backdoor access on PRISM eavesdropping. Other email service providers remain muted on this topic too.(2)

3. There is also a growing number of research papers discussing potential global eavesdropping on various wireless communication systems, including each and every piece of handheld devices.(3)

4. And with *Digit Act Bill*, we can expect there will be plethora of new kind of surveillance cameras with built-in RF technology.

5. On top of that, Internet of Things will enable remote controlling of devices, such as wireless sensors etc. Of course, official ads that you watch on television and newspapers only tell you the best out of these things, such as monitoring your kids at home while you are working and so on. But as the Murphy Law tells us, "*all things which can possibly go wrong, will go wrong.*"(5) A number of dystopian movies like "Eagle Eye" depicts how bad things can go when you are being monitored 24 hours a day, and there is no such thing as privacy anymore. And sort of those things are already put in place or underway.

III. WHAT IS GLOBAL EAVESDROPPER?

According to Alejandro Proano et al.: (6)

Wireless sensor networks (WSNs) have shown great potential in revolutionizing many applications including military surveillance, patient monitoring, agriculture and industrial monitoring, smart buildings, cities, and smart infrastructures. Several of these applications involve the communication of sensitive information that must be protected from unauthorized parties. As an example, consider a military surveillance WSN, deployed to detect physical intrusions in a restricted area. Such a WSN operates as an event-driven network, whereby detection of a physical event (e.g., enemy intrusion) triggers the transmission of a report to a sink.

Although the WSN communications could be secured via standard cryptographic methods, the communication patterns alone leak contextual information, which refers to event-related parameters that are inferred without accessing the report contents. Event parameters of interest include: (a) the event location, (b) the occurrence time of the event, (c) the sink location, and (d) the path from the source to the sink. Leakage of contextual information poses a serious threat to the WSN mission and operation. In the military surveillance scenario, the adversary can link the events detected by the WSN to compromised assets. Moreover, he could correlate the sink location with the location of a command center, a team leader, or the gateway. Destroying the area around the sink could have far more detrimental impact than targeting any other area. Similar operational concerns arise in personal applications such as smart homes and body area networks. The WSN communication patterns could be linked to one's activities, whereabouts, medical conditions, and other private information.

In the above contexts, contextual information can be exposed by *eavesdropping* on over-the-air transmissions and obtaining transmission attributes, such as inter-packet times, packet source and destination IDs, and number and sizes of transmitted packets. (6)

IV. THE BIG PICTURE

In other words, with the coming of IoT, it would mean that we are in the dawn of global eavesdropping. So, what can we do to save our daily life as human being in this planet?

This situation looks really gloomy from each angle, but that will surely happen if we allow corporate-giants take control over each minute of our life – just like in Aldous Huxley's *The brave new world*.⁴

It reminds us to an old story:

"There was a guy who one night got into a nightmare, where he live in a country controlled by a terrible dictatorial governor in a province. Many people suffer under that governor. So, he asked himself: "What should

⁴ <http://www.idph.com.br/conteudos/ebooks/BraveNewWorld.pdf>

I do now? Should I become a rebel, fighting for freedom? Or should I become a liberator, to avoid suffering of those people? Or should I work out my own way up to become a new governor, to replace that cruel bastard? Finally, he came up with a simpler solution: he woke up from his dream. That way he became conscious."

Perhaps the lesson of the above story is quite similar with a wonderful Italian movie: *Life is beautiful*.⁵ The movie tells a story of an Italian Jewish bookseller called Guido, who just married with Dora. And they got a boy (Giosue). Their happiness was abruptly halted, however, when Guido and Giosue were separated from Dora and taken to a concentration camp. Determined to shelter his son from the horrors of his surroundings, Guido convinced Giosue that their time in the camp is merely a game. He told that in the end his boy will get a prize: a tank. At the end of the movie, Guido did not survive, but his wife and Giosue did. Then a US soldier put him up to a tank, just like what his father promised.

The lesson is that no matter how hard the situation will be, actually we determine our own state of mind.⁶ We can choose to be happy, or to be defeated in spirit. We can choose to be human or to be absorbed in the entire system of global eavesdropping. Therefore, let us now consider what our options are.

Here are a few options which you can consider:

1. There are extreme ways of living advocated by technophobia people (Luddism), like cutting off your internet wires, throwing your laptop out of the window, and go to a remote mountain or find the edge of the rainbow. We certainly do not advocate that.

2. Going to an exoplanet, a few million light years away from here, is not an option either. Perhaps we should give a decade or more to visionary people like Elon Musk or Jeff Bezos to figure out how we can go there, if it is possible at all.

3. So, for the rest of us, what we can do is to use internet technologies wisely. Update regularly your antivirus software, and change your passwords each 2 months or sooner. And don't use too much free wi-fi in public places, because many people can track you. But if it is okay for you to be monitored by someone else. It is up to you.

4. If you belong to millennial generation, chance is you have become more adept with all these tips. But perhaps you want to do more for society. Our advice is, quoting a word of wisdom for environment activists in 90s: "*Think globally, act locally*." That would mean you should better find a number of friends near you who think likewise, and try to do something good for your community, be it helping orphanage or something like that. We have heard that a number of CEOs only work 3-4 days a week, and they spend the rest of the week to do what they can do for their community.

5. If your small group gets larger and becomes a national movement, then things get interesting. Do not do lobbying to Senate like those big oil companies in order to advance their interests. Instead, you can try to solve Mancur Olson's problem: "*how your group can do collective action at large scale, while the benefits are not so tangible for everyone*" (4). Our hypothesis is: Olson's collective action problem only applies to unconnected society. In a heavily connected society like ours now, we can figure out how to solve this Olson's dilemma, and doing some meaningful collective actions in the internet.⁷ For example: there are some initiatives of online crowdfunding, crowdsourcing, and online cooperatives.⁸ So, actually you can start to do something good to your community even with a small amount of fund, provided you plan properly and do it collectively.

Two commonly asked questions:

a. What is collective action problem?

Mancur Olson's problem can be formulated in shortest way as follows: "*how a group can do collective action at large scale, while the benefits are not so tangible for everyone*."

b. Who is Mancur Olson?

⁵ https://en.wikipedia.org/wiki/Life_Is_Beautiful

⁶ This kind of perseverance and hope instead of horrendous Holocaust can be attributed to an actual survivor: V. Frankl, in his Logotherapy.

⁷ An outline of reasoning to support this hypothesis can be found in Appendix, albeit it is not so sophisticated.

⁸ For example: www.startsomegood.com

Mancur Olson Lloyd, Jr. – (January 22, 1932 – February 19, 1998) was an American economist and social scientist who taught economics at the University of Maryland, College Park. His most influential contributions were in institutional economics, and in the role which private property, taxation, public goods, collective action, and contract rights play in economic development.⁹

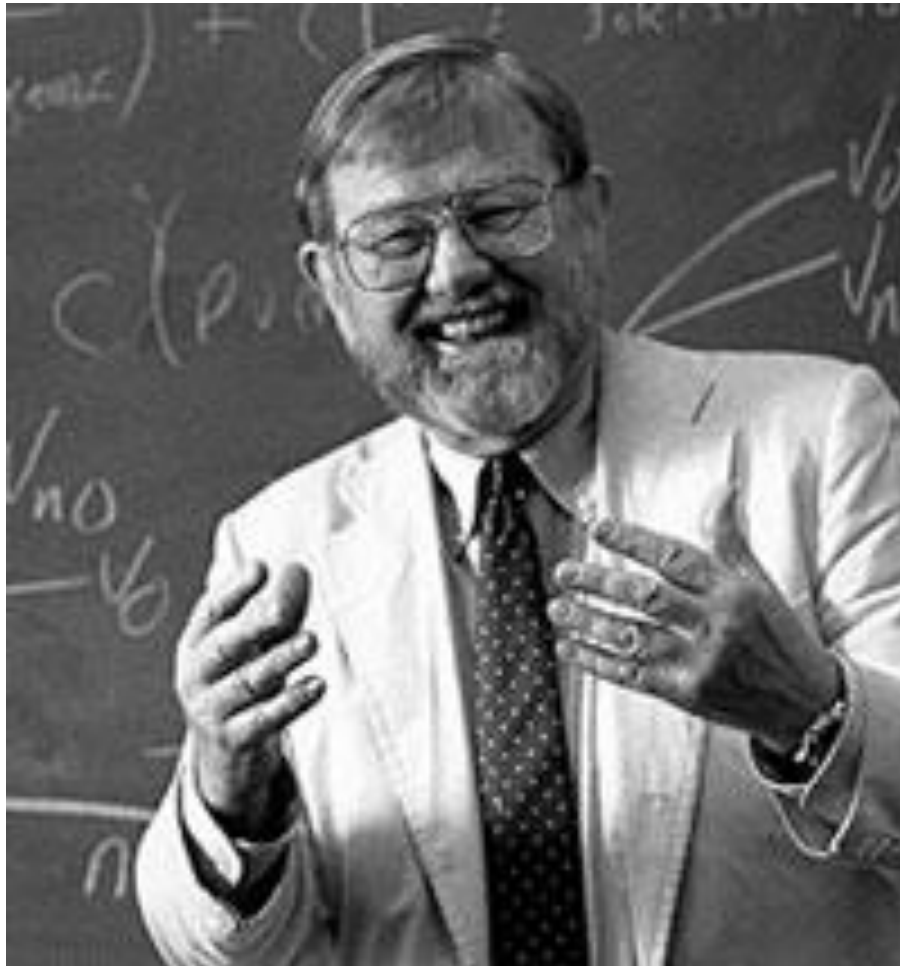


Figure 1. **Mancur Olson Lloyd, Jr.** – (January 22, 1932 – February 19, 1998)

6. A few hints for IT folks

If you are IT folks, perhaps you can try to do some advanced tips as follows:

To mitigate global eavesdropping, Proano et al. proposed traffic normalization methods that regulate the sensor traffic patterns of a subset of sensors that form MCDSs. They developed two algorithms for partitioning the WSN to MCDSs and SS-MCDSs and evaluated their performance via simulations. Compared to prior methods capable of protecting against a global eavesdropper, they showed that limiting the dummy traffic transmissions to MCDS nodes, reduces the communication overhead due to traffic normalization.(6)

V. THE UTILITARIAN QUESTION: PSYCHOPATHIC TRAITS INSIDE OUR MINDS

By suggesting an option to do collective action, it does not mean we are not aware that each of us has selfish motive. In fact, some of us on top of the ladder of society have inclination to be a psychopath. Let us quote an interesting article by Lindsay Dodgson: (9)

⁹ https://en.wikipedia.org/wiki/Mancur_Olson

In the Diagnostic and Statistical Manual of Mental Disorders, or DSM-5, antisocial or psychopathic personality types are defined as having an inflated, grandiose sense of themselves, and a habit of taking advantage of other people. However, it's still a hard disorder to define, as most of us have some psychopathic traits. In fact, some psychologists believe everyone falls on the psychopathy spectrum somewhere.

On their own, some traits are beneficial to us, such as keeping a cool head, and having charisma. This is why many psychopaths become CEOs, because they can look at the cold, hard facts and make decisions without becoming emotionally involved.

Still, a number of researchers have attempted to find a way of diagnosing psychopathic behavior. One well-known test for psychopaths is the "*The Hare Psychopathy Checklist*," which analyses how you see yourself and other people.

The team from Columbia Business School and Cornell Universities gave participants a set of moral dilemmas, and also asked them to complete three personality tests: one for assessing psychopathic traits, one assessing Machiavellian traits, and one assessing whether they believed life was meaningful.

This was one of the questions they were asked:

"A runaway trolley is about to run over and kill five people and you are standing on a footbridge next to a large stranger; your body is too light to stop the train, but if you push the stranger onto the tracks, killing him, you will save the five people. Would you push the man?"

The team found that those who answered the dilemmas with an "ethic of utilitarianism" — the view which says the morally right action is whichever one produces the best consequence overall — possessed more psychopathic and Machiavellian personality traits. In the above question, if you'd choose to push the man, you have more in common with the people who had psychopathic or Machiavellian traits.

This makes sense when you think about how Machiavelli generally believed "*the ends justifies the means*," and that killing innocent people could be normal and effective in politics, as long as the outcome was for the greater good.⁽⁹⁾

This article seems convince us that we need to become aware on our own tendency of being a psychopath. Moreover, it takes honesty to admit that we are prone to be selfish person...then we can work out to be a better person. But there is a deeper question: if controlling our own motive can be very difficult, then where is our society heading? What are our choices?

VI. WHERE WE ARE HEADING FROM HERE

Now, some of you may ask: by suggesting solution to Olson's collective action problem to save our humanity, where is the article heading? Are we advocating collective society as in old day Marxism hammer? Or are we advocating how to escape from the curse of capitalism's *social darwinism*?¹⁰

Yes, normally you read numerous political-economics jargons, e.g. leftist, right wing, centrist left or centrist right and so on.

But it is not our intention to submit another ideological parlance. In fact, these authors are scientist and mathematician, so we are not so inclined to any parlance.

In our opinion, our tendency to cooperate or compete is partly influenced by the culture that we inherit from our ancestors. One of us (VC) once lived for a while in Russia, and he found that many people there are rather cold and distant (of course not all of them, some are friendly). He learned that such a trait is quite common in many countries in Europe. They tend to be individual and keep a distant to each other. In physics term, they are like *fermions*.¹¹

¹⁰ See for example Richard Hofstadter: Social Darwinism in American thought. url: <http://culturism.us/booksummaries/SocialDarwinismHofst.pdf>

¹¹ While our proposed simplifying analogy of human behaviour, i.e. individualism and collectivism sound not so common. Indeed such cultural psychology research has been reported since Harry C. Triandis et al. See for example: (a) The Self and Social Behavior in Differing Cultural Contexts, *Psychological Review*, vol. 96 no. 3; (b) Harry C. Triandis and Eunhook M. Suh, CULTURAL INFLUENCES ON PERSONALITY, *Annu. Rev. Psychol.* 2002. 53:133–60; (c) J. Allik & A. Realo, Individualism-collectivism and social capital, *JOURNAL OF CROSS-*

There is a developmental psychology hypothesis that suggests that perhaps such a trait correlates to the fact that many children in Europe lack nurtures and human touch from their parents, which make them rather cold and individual. Of course, whether this is true correlation, it should be verified.

On the contrary, most people in Asia are gregariously groupie (except perhaps in some big metropolitans). They tend to spend much time with family and friends, just like many Italians. They attend religious rituals regularly, and so on. In physics term, they are *bosons*. Of course, this sweeping generalization may be oversimplifying.¹²

Therefore, it seems quite natural to us, why Adam Smith wrote a philosophy book suggesting that individual achievement is a key to national welfare (because he was a British which emphasized individualism).¹³ It took more than hundred years until mathematicians like John F. Nash, Jr. figured it out that individual pursuit towards their own goals will not lead them to achieve a common goal as society.¹⁴

That is why, we choose to work out Mancur Olson's theorem, because he is able to condense the complicated game theoretical reasoning (whether one should cooperate or not) into a matter of collective actions.

So, which is better: *to be like fermions or bosons*? Our opinion is: just like in particle physics, both fermions and bosons are required. In the same way, fermion behavior and boson behavior are both needed to advance the quality of life. Fermion people tend to strive toward human progress, while boson people are those who make us alive. Just like an old song: Ebony and Ivory...they make harmony in society.

We hope this paper help us to see that collective actions are what made us a human society.¹⁵ And it seems related to *social innovations* and also *social capital* too, in other words a society with social capital and collective actions will ensure its sustainable future.¹⁶ But this is beyond the scope of this article, let us leave such a discussion to economists. But this article surely does not offer a bold answer to where we are heading as global community. Do we arrive at the end of history or this is just a beginning to a new era? Let time will tell.

VII. CONCLUDING REMARKS

In this paper, we tried to draw a fair assessment on things which will take place soon with IoT, 5G and all that. Nonetheless, we are aware that this article sounds quite gloomy. We are not techno-utopians (read Evgeny Morozov's WSJ article on digital dictatorship¹⁷), but we are not techno-pessimists either. Perhaps you can consider us as: "*techno-realists*."¹⁸ This paper was written in the same spirit of Jonathan L. Zittrain book's *The Future of Internet and how to stop it*.

Allow us to conclude this paper with a short message: "*With the coming era of global eavesdroppers, it is not the end of history (Fukuyama). But it will be the end of humanity as we know it, unless we do something collectively to prevent it to happen.*" Thank you.

CULTURAL PSYCHOLOGY, Vol. 35 No. 1, January 2004, 29-49. This last mentioned paper includes a quote from Emile Durkheim: "The question that has been the starting point for our study has been that of the connection between the individual personality and social solidarity. How does it come about that the individual, whilst becoming more autonomous, depends ever more closely upon society? How can he become at the same time more of an individual and yet more linked to society?"

¹² After writing up this article, we found that Sergey Rashkovskiy also wrote a quite similar theme, albeit with a statistical mechanics in mind. The title of his recent paper is: "'Bosons' and 'fermions' in social and economic systems." Here is abstract from his paper: "We analyze social and economic systems with a hierarchical structure and show that for such systems, it is possible to construct thermostatics, based on the intermediate Gentile statistics. We show that in social and economic hierarchical systems there are elements that obey the Fermi-Dirac statistics and can be called fermions, as well as elements that are approximately subject to Bose-Einstein statistics and can be called bosons. We derive the first and second laws of thermodynamics for the considered economic system and show that such concepts as temperature, pressure and financial potential (which is an analogue of the chemical potential in thermodynamics) that characterize the state of the economic system as a whole, can be introduced for economic systems." Url: <https://arxiv.org/ftp/arxiv/papers/1805/1805.05327.pdf>

¹³ If only Adam Smith was born in Bangkok or Manila, probably he wrote his book in a different way.

¹⁴ Imagine 10 players of a football team go simultaneously to make a goal to their opposite team, will they succeed? Of course no, they should arrange according to their coach's instruction: 1-4-4-2, or other type of arrangement.

¹⁵ In our country, there is a specific word for some people who work together to achieve a common goal: "*gotong royong*." (This term was known for ancient time in Indonesian villages, but as part of Philosophical Grundslog, it was introduced to BPUPKI, 1st june 1945, by Ir. Soekarno, a nationalist leader at the time.)

¹⁶ Emily Ouma & Awudu Abdulai. Contributions of Social Capital Theory in Predicting Collective Action Behavior among Livestock Keeping Communities in Kenya. url:

https://ageconsearch.umn.edu/bitstream/49994/2/Manuscript%20No.%20423_Social%20capital%20theory%20and%20collective%20action.pdf

¹⁷<https://www.wsj.com/articles/SB10001424052748703983004575073911147404540>

¹⁸ <http://www.technorealism.org/>

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Appendix: Superconductive Olson theorem

Mancur Olson's problem: "how a large group can do collective action, while the benefits are not so tangible for everyone."

How to solve it...

Superconductive Olson theorem:

"Olson's collective action problem only applies to unconnected society, but not in a digitally connected society."

Outline of reasoning:

Olson's problem in principle states that in a large group, it becomes difficult to do a meaningful collective action,

¹⁹ See for instance: https://www.ted.com/talks/adam_grant_are_you_a_giver_or_a_taker

especially if the benefits for participants are small. That is because individuals mostly seek only their own self-interests.

Let us analyze what actually happens when a group of people is trying to do a collective action. Let us say a group of 10 volunteers want to build mini waste treatment plant for their town. Then they need to gather to discuss the design, the required cost, operational cost etc. It becomes easier to accomplish the plan provided they live in the same city, so their transportation costs are minimal. In that case, the voluntary group members do not expect much in return, except to do something good for the town.

But let us consider a larger group of volunteers in a national scale, this time they want to gather twice a month in a capital city. So, each member of the group needs to spend cost to go to the capital city. Of course they would expect certain benefits in return in order to pay off the costs they have to spend, otherwise the voluntary plan will not become realized.

In both above cases, Olson's analysis is correct. But Olson wrote his Princeton dissertation around 60s. At the time there was no internet connection except perhaps for military purposes.

In our opinion, his theory of collective action is mostly correct, except that he neglects the role of pervasive digital network (internet).

Nowadays, a large group of people can work collectively for a cause with almost zero cost. Therefore, actually there is no barrier anymore to gather a large group to do certain collective actions for the community. For example, gathering polls or doing a petition, e.g, www.petition.com.

Concluding remarks

Our own experience over the past few years also convince us that Olson's collective action problem does not apply in the internet era. It is more like superconductivity phase of material, where electrons can move without resistance. We tend to name our extension of Olson's theorem as "*Superconductive Olson theorem*." Only time will tell what is its role in the future of Internet.