About Privacy in Internet of Things

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Abstract—Internet of things devices are everywhere, since the birth of the idea of ubiquous computing that human every day life is envisioned containg millions of devices that control every aspect of our lives. Today we have smart cars, smart houses, smart cities, wearables among other things that use various types of devices and various types of networks to communicate, these devices are designed with usability in mind as a way for us to live a more confortable life. One thing that is not though about much is how these devices treat our privacy rights. Our information is used, traded and sold without the user having much say in the matter besides refusing to use these devices or not having access to certain features. I propose a system that gives the user the crucial information about the devices that are nearby and how to protect the data that that the user doesn't want to share with the systems, this system is capable of detecting what type of devices are nearby, what kind of data is collected by these devices and what can be done to protect unwanted data from being collected.

Index Terms—privacidade, iot, computação ubíqua, sniffer

I. INTRODUÇÃO

Iot as a term began being used in the 90's, a connection can be drawn with Mark Weber's article on ubiquous computing and the rise of devices of various sizes, but mostly the size of a small phone, that make the idea of Weber a reality. These devices are used in various applications starting at home with thermostats, fridges, microwaves, getting embedded in cars in the education system, in our clothes, our phones, watches and even into space.

Privacy and security might at first appear almost the same thing, but privacy is about the user's data and security is about protecting that data.

II. TRABALHOS RELACIONADOS

A. Privacy Assistants

There exists a number of privacy assistants in the market. Privacy assistants have the objective of giving the user flexibility in choosing the prefered privacy options in available applications, most are used in smartphones, very few are made for devices in the internet of things. The university of Carniege Mellon developed one privacy assistant focused on internet of things called "IoT Assistant" [1]. This assistant was created because the designers felt that this part of the market was being ignored and decided to create it. The creation of this system started with a user test case to determine the public's knowledge on this matter, it was tested with a group of 17 people choosed randomly.

III. METADOLOGIA

The proposed methology is composed of two phases, the first phase consists of making a study on the region's general concern with their privacy when using iot devices, their knowledge of privacy rights, what they do to protect their privacy rigths. One one side the objective of this study consist in demistefying the privacy paradox in the region and gather information about their idea to solve this problem with respect to iot devices. The second phase consists in doing an application that can detect iot devices nearby the user with at least a 10 meters radius. The application should do the following when detecting a device: 1. it should show some information about the device; 2. it should categorize the device; 3. it should provide the user with privacy options, if the device allows the user to decline data harvesting. This application at first sight might appear to be a mere privacy assistant but it's not, beacause iot assistants merely choose what privacy options the user first sets and mantains it for every other application that the user might use. The proposed app doesn't have the objective to conform to the user's prefered privacy choices, it merely informs the user about nearby iot devices and can provide the user with privacy options. But the main objective is creating awareness in individuals about the various devices that are around and make the user questions their choices.

A. User Awareness

There has been some work done to determine the users awareness of their actions online in regard to privacy. An interactive theatre expericence [1] was proposed in order to expose privacy malpractices in companies, specially in the capitalistic world where profit is prioritize above all else, in this experiment the public is able to interact with the actors and influence the story of the play, there are various endings depending on the public's choices throughout the play, some endings the company would bury the corruption that was going on, in another ending a team of hackers is able to expose the company's practices to the world. After the play the team responsible for the experiment would talk with public members about what they experienced and discussed what was it about and the memebers pratices with their data on their daily lifes. After some months the team would talk again with the members that were present in the play and talk about any changes they have done in the meantime, most said they did not change thei behaviour, one member said that it took more care of The information that made available online because

it had a bad experience before where some private data was exposed that should have not been exposed. All in all the experiment did not prove to be a success in changing people's behaviour.

B. Units

- Use either SI (MKS) or CGS as primary units. (SI units are encouraged.) English units may be used as secondary units (in parentheses). An exception would be the use of English units as identifiers in trade, such as "3.5-inch disk drive".
- Avoid combining SI and CGS units, such as current in amperes and magnetic field in oersteds. This often leads to confusion because equations do not balance dimensionally. If you must use mixed units, clearly state the units for each quantity that you use in an equation.
- Do not mix complete spellings and abbreviations of units: "Wb/m^2" or "webers per square meter", not "webers/m^2". Spell out units when they appear in text: ". . . a few henries", not ". . . a few H".
- Use a zero before decimal points: "0.25", not ".25". Use "cm^3", not "cc".)

C. Equations

Number equations consecutively. To make your equations more compact, you may use the solidus (/), the exp function, or appropriate exponents. Italicize Roman symbols for quantities and variables, but not Greek symbols. Use a long dash rather than a hyphen for a minus sign. Punctuate equations with commas or periods when they are part of a sentence, as in:

$$a + b = \gamma \tag{1}$$

Be sure that the symbols in your equation have been defined before or immediately following the equation. Use "(1)", not "Eq. (1)" or "equation (1)", except at the beginning of a sentence: "Equation (1) is . . ."

D. LaTeX-Specific Advice

Please use "soft" (e.g., \eqref{Eq}) cross references instead of "hard" references (e.g., (1)). That will make it possible to combine sections, add equations, or change the order of figures or citations without having to go through the file line by line.

Please don't use the {eqnarray} equation environment. Use {align} or {IEEEeqnarray} instead. The {eqnarray} environment leaves unsightly spaces around relation symbols.

Please note that the {subequations} environment in LaTeX will increment the main equation counter even when there are no equation numbers displayed. If you forget that, you might write an article in which the equation numbers skip from (17) to (20), causing the copy editors to wonder if you've discovered a new method of counting.

BibTeX does not work by magic. It doesn't get the bibliographic data from thin air but from .bib files. If you use BibTeX to produce a bibliography you must send the .bib files.

LaTeX can't read your mind. If you assign the same label to a subsubsection and a table, you might find that Table I has been cross referenced as Table IV-B3.

LaTeX does not have precognitive abilities. If you put a \label command before the command that updates the counter it's supposed to be using, the label will pick up the last counter to be cross referenced instead. In particular, a \label command should not go before the caption of a figure or a table.

Do not use \nonumber inside the {array} environment. It will not stop equation numbers inside {array} (there won't be any anyway) and it might stop a wanted equation number in the surrounding equation.

E. Some Common Mistakes

- The word "data" is plural, not singular.
- The subscript for the permeability of vacuum μ_0, and other common scientific constants, is zero with subscript formatting, not a lowercase letter "o".
- In American English, commas, semicolons, periods, question and exclamation marks are located within quotation marks only when a complete thought or name is cited, such as a title or full quotation. When quotation marks are used, instead of a bold or italic typeface, to highlight a word or phrase, punctuation should appear outside of the quotation marks. A parenthetical phrase or statement at the end of a sentence is punctuated outside of the closing parenthesis (like this). (A parenthetical sentence is punctuated within the parentheses.)
- A graph within a graph is an "inset", not an "insert". The word alternatively is preferred to the word "alternately" (unless you really mean something that alternates).
- Do not use the word "essentially" to mean "approximately" or "effectively".
- In your paper title, if the words "that uses" can accurately replace the word "using", capitalize the "u"; if not, keep using lower-cased.
- Be aware of the different meanings of the homophones "affect" and "effect", "complement" and "compliment", "discreet" and "discrete", "principal" and "principle".
- Do not confuse "imply" and "infer".
- The prefix "non" is not a word; it should be joined to the word it modifies, usually without a hyphen.
- There is no period after the "et" in the Latin abbreviation "et al.".
- The abbreviation "i.e." means "that is", and the abbreviation "e.g." means "for example".

An excellent style manual for science writers is.

F. Authors and Affiliations

The class file is designed for, but not limited to, six authors. A minimum of one author is required for all conference articles. Author names should be listed starting from left to right and then moving down to the next line. This is the author sequence that will be used in future citations and by indexing services. Names should not be listed in columns nor

group by affiliation. Please keep your affiliations as succinct as possible (for example, do not differentiate among departments of the same organization).

G. Identify the Headings

Headings, or heads, are organizational devices that guide the reader through your paper. There are two types: component heads and text heads.

Component heads identify the different components of your paper and are not topically subordinate to each other. Examples include Acknowledgments and References and, for these, the correct style to use is "Heading 5". Use "figure caption" for your Figure captions, and "table head" for your table title. Run-in heads, such as "Abstract", will require you to apply a style (in this case, italic) in addition to the style provided by the drop down menu to differentiate the head from the text.

Text heads organize the topics on a relational, hierarchical basis. For example, the paper title is the primary text head because all subsequent material relates and elaborates on this one topic. If there are two or more sub-topics, the next level head (uppercase Roman numerals) should be used and, conversely, if there are not at least two sub-topics, then no subheads should be introduced.

H. Figures and Tables

a) Positioning Figures and Tables: Place figures and tables at the top and bottom of columns. Avoid placing them in the middle of columns. Large figures and tables may span across both columns. Figure captions should be below the figures; table heads should appear above the tables. Insert figures and tables after they are cited in the text. Use the abbreviation "Fig. 1", even at the beginning of a sentence.

TABLE I
TABLE TYPE STYLES

Table Head	Table Column Head		
	Table column subhead	Subhead	Subhead
copy	More table copy[a]		

[a]Sample of a Table footnote.

Fig. 1. Example of a figure caption.

Figure Labels: Use 8 point Times New Roman for Figure labels. Use words rather than symbols or abbreviations when writing Figure axis labels to avoid confusing the reader. As an example, write the quantity "Magnetization", or "Magnetization, M", not just "M". If including units in the label, present them within parentheses. Do not label axes only with units. In the example, write "Magnetization (A/m)" or "Magnetization {A[m(1)]}", not just "A/m". Do not label axes with a ratio of quantities and units. For example, write "Temperature (K)", not "Temperature/K".

REFERENCES

Please number citations consecutively within brackets. The sentence punctuation follows the bracket. Refer simply to the reference number, as in —do not use "Ref. " or "reference " except at the beginning of a sentence: "Reference was the first ..."

Number footnotes separately in superscripts. Place the actual footnote at the bottom of the column in which it was cited. Do not put footnotes in the abstract or reference list. Use letters for table footnotes.

Unless there are six authors or more give all authors' names; do not use "et al.". Papers that have not been published, even if they have been submitted for publication, should be cited as "unpublished". Papers that have been accepted for publication should be cited as "in press". Capitalize only the first word in a paper title, except for proper nouns and element symbols.

For papers published in translation journals, please give the English citation first, followed by the original foreign-language citation. [1]

REFERENCES

[1] J. Colnago, Y. Feng, T. Palanivel, S. Pearman, M. Ung, A. Acquisti, L. F. Cranor, and N. Sadeh, "Informing the design of a personalized privacy assistant for the internet of things," in *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*, ser. CHI '20. New York, NY, USA: Association for Computing Machinery, 2020, p. 1–13. [Online]. Available: https://doi.org/10.1145/3313831.3376389