



A First Look at Usage of Free Software in Brazilian States

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Abstract—This article presents the first results of a quantitative and qualitative exploratory research in progress on the use of free software by Brazilian states. The data were collected along the first semester of 2023. The motivation for the research was the lack of centralized and explicit data on the use of free software on the states. Initially, the free software scenario in the states is presented from the recovering of some state laws about free software. The data were collected by surveys sent to Brazilian states ombudsman under the Brazilian access to information law. All 26 Brazilian states and the federal district were questioned about the use of free software, about their policies regarding software acquisition, and the development of original free software. This research contributes to knowledge about the use and production of free software by Brazilian government.

Keywords—Brazil; free software; public software; states; survey.

I. INTRODUCTION

In Brazil, in the first decade of the 20th century, some states approved laws that gave preference to the use of free software in their administrations. More precisely, the states of Rio Grande do Sul, (2002), Paraná (2003) and Santa Catarina (2004), located in the southern region of Brazil.

According to Birkinbine [1], “this early period of adoption in states and municipalities, as well as the convincing economic rationale for implementing free software, led the federal government to pass a series of directives, objectives, and action items requiring or encouraging the adoption of free software in federal agencies in 2004”.

Brazil has 26 states and a federal district. In 2023, 22 states had state-owned information technology companies and 2 states had secretariats specializing in information technology. The three oldest companies in this group are Celepar, from Paraná (1964), Proderj, from Rio de Janeiro (1968), and Prodesp, from São Paulo (1969). Half of these state-owned information technology companies were created in the 1970s. This decade was significant for the history of computing in Brazil because it was the decade when the first Brazilian computer, the Patinho Feio (1972), was built, and when the first Brazilian computer manufacturing company, Cobra (1974), was created. According to Borges [2], the “model chosen to develop the information technology

industry in Brazil was, therefore, a combination of state funding and the participation of private companies”.

During the 2000s, Brazil's federal government strongly promoted the use of free software. While there are some surveys on the use and production of free software by the federal government, we did not find consolidated data on the use of free software by state governments.

This article aims to fill a gap on the use and production of free software by Brazilian states and thus enable further research.

II. METHODOLOGY

We wanted to collect the following information:

- Which free software are used by Brazilian states;
- Which free software were produced by Brazilian states;
- What are the software acquisition policies of the Brazilian states.

To obtain data on usage, production and software acquisition policies of the Brazilian states, we used the Brazilian access to information law (12527/2011). This law determines that it is the duty of the Brazilian State to “guarantee the right of access to information, which will be provided, through objective and agile procedures, in a transparent, clear manner and in easy-to-understand language” (our translation). Thus, the participation of states in this survey was not voluntary. They were required to respond by law.

Each state has its structure for complying with the access to information law. So we had to make requests on different information systems. The requests had the following questions:

- What are the free software used by the agencies of the State of [NAME] and what are they used for?
- Does the State of [NAME] have a policy of buying proprietary software even if there is free software with the same functionality?
- Has the State of [NAME] developed any free software through its agencies?

The data from the responses received were transferred to spreadsheets to create software-state and policy-state matrices. From these matrices, we present the results in the following section. It is important to say that sometimes it was necessary to make new requests because the state did not respond satisfactorily to the questions or refused to respond. Finally, it must be remembered that this is a partial result, as some states have not yet responded.

III. RESULTS

Eighteen states answered some of the questions until this paper is concluded. Three states didn't provide a list of used free software: Ceará (CE), Minas Gerais (MG) and São Paulo (SP).

TABLE I
STATES PARTICIPATION

Question	How many answered
About which free software are used	15
About free software acquisition policies	18
About development of free software	18

A. Free software usage

We identified 158 software used by the 15 states that responded to the request about which free softwares they use. Table 2 shows how many free software each state declared to use. It is important to clarify that we are talking about occurrences of the same product, not the quantity of copies. No state reported how many instances of each software are used.

TABLE 2
FREE SOFTWARE USAGE BY STATE

State	Quantity
AL	89
AM	2
BA	1
DF	1
GO	23
MA	15
MS	42
PE	7
PR	6
RJ	4
RN	3
RO	21
RR	12
SC	1
SE	5

It is possible to notice that Alagoas (AL) is the bigger user, with 89 software, while Bahia (BA) and Distrito Federal (DF) use only one free software each one.

Table 3 shows the user states that use four or more free software. The two most used software are Nginx, a HTTP server, and PostgreSQL, a database management system. These two software are used by 6 states each one. The users of Nginx are AL, DF, GO, MA, MS and RO. The users of PostgreSQL are AL, MA, MS, PE, PR and SE. You can discover the name of any Brazilian state from its code in ISO 3166-2:BR [3].

116 software are used by only one state. The most of these are used by AL.

Among the mentioned software, we find a software from the Brazilian Public Software Portal, the SEI. SEI is the Portuguese acronym for Electronic Information System. Brazilian Public Software is a specific type of free software that meets the modernization needs of public administration [4].

TABLE 3
MOST USED FREE SOFTWARE

Software	User states
Nginx	6
PostgreSQL	6
Apache	5
Grafana	4
Kubernetes	4
MySQL	4
Nextcloud	4
SEI	4
SonarQube	4
Zabbix	4
Zimbra	4

B. Free software production

Only one state, Alagoas (AL), reported having developed free software. However, we found that this state had not actually developed any free software. Two states (BA and CE) responded that they did not know whether they had developed free software. At first, of the 18 states that provided an answer to the question, none produced free software.

C. Free software acquisition policies

From responses from 18 states, we identified four categories of acquisition policies for software in general, including free software therefore:

1. **Evaluation of technical criteria:** Most states – 12 – responded that they acquire software for its technical characteristics, regardless of whether it is free or not. What matters is meeting the requirements;



2. **Preference for free software:** 3 states (AM, RO and SC) responded that they prefer free software when purchasing software;
3. **Warranty, technical support and right to upgrades:** While the first category revealed a lack of understanding of the question on the part of the states, since they asked about software with the same functionality, two states (GO and RR) were quite clear about what rules out free software from being acquired: the lack of support and guarantee.
4. **Microsoft Platform:** One state, Maranhão, declared that it gives preference to the acquisition of software from the Microsoft platform.

IV. DISCUSSION

The questions submitted to the states were not closed questions, with alternatives to be chosen, but were questions related to facts, they were objective questions. We observed, however, that there were still problems of objectivity in some responses.

For example, the state of Alagoas initially responded that it had produced free software. When asked about the software produced, Alagoas indicated a list of software developed with link for systems in production (<https://www.itec.al.gov.br/component/produtos/?categoria=sistemas>). When consulting this list, we were unable to find information about licensing or the source code repository. We made a new request asking about the source code and Alagoas replied this time that “the software developed using open code is for internal use by State bodies and the source code may be made available to other bodies through a Term of Technical Cooperation” (our translation). That is, the state of Alagoas did not develop free software. Alagoas developed software that could be shared with other government agencies, which was not free for anyone to study, modify and redistribute.

The government of the state of Amapá did not respond within the specified period and when we tried to access the system to request the information, it was offline, showing an error message that exposed details of the system's implementation.

The state of Bahia cited Comprasnet as free software, but Comprasnet is not free software. It is software created by the Federal Data Processing Service for the Ministry of Planning [5], has public access as a service, but does not have open source code.

The state of Ceará responded that it acquires software based on technical criteria, but informed that there was a decree (29255/2008) in force between 2008 and 2021 that established “the preferential use of free software as a standard corporate tool for the execution and management of the state technology policy information and communication of the State Executive Branch” (our translation).

The federal district mentioned some software as “examples”, implying that it did not provide the complete list

of software. The state of Goiás also did not provide a complete list, as it ended its list of software with “etc”.

The state of Maranhão reported that two administrative systems were free software: SIGA and SIGEF. SIGA is the Integrated System of Administrative Management and SIGEF is the Integrated System of Planning and Fiscal Management of the State of Maranhão. Both have no source code available, so they are not free software.

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The state of Maranhão responded that all the information systems it develops are open source. However, it did not inform the source code repository of these systems or their licenses. We infer that the answerer understands that using open source software to create other software automatically makes it open source software, which shows a lack of understanding of the concept. The author of the answer also adds that corporate software from the state of Maranhão is “subject to source code assignment, for use or improvement thereof” (our translation). That is, the source code has to be requested, it is not open for consultation, and there is no certainty that it will be made available if requested.

The state of Mato Grosso had not responded to the request for information at the time of writing. We had claiming and are waiting for an answer.

The state of Pará did not respond to the request for information within the stipulated period. We called the higher court and it also did not respond within the deadline, nor until the closing of this article.

The state of Paraíba initially requested that the request be forwarded directly to its information technology company, CODATA. This, in turn, said that the information should be requested from the secretary of state (which had indicated CODATA as responsible for the response). When questioned a second time, the secretary of state said that the request should be made directly to its information technology management, which did not respond as of the completion of this article.

To the question about the development of free software, the state of Pernambuco replied that “the software developed

by the government uses technologies with an open source license" (our translation), without however naming the software, nor indicating the source code repository.

The government of Piauí replaced its access to information system days after the request was made. He joined the federal government's access to information system. Thus, it was necessary to make a new request, which was not answered until the conclusion of this article.

The information technology enterprise of state of Parana (Celepar) mentioned some of their used software. Although it stated that it did not develop any free software, Celepar declared that it participates in free software communities.

The state of Santa Catarina mentioned only two software, LibreOffice and WPS Office, but the latter is not free software.

The states of Amapá, Espírito Santo, Mato Grosso, Rio Grande do Sul and Tocantins had not responded as of the completion of this article.

All states ignored that the first question also questioned the purpose of the software for the state.

V. CONCLUSION

We observed that some public managers responsible for granting access to public information lack understanding of the concept of open source and free software. This lack of understanding leads to misconceptions such as assuming that using free software to build other software automatically makes it free software.

Even for the states that responded, we only have a partial view of the use of free software, as some of them did not list all software, using terms such as "etc" (GO) and "examples" (DF). In other words, there are more free software in use by Brazilian states than those found in this research.

Some responses stating that there is no complete knowledge about the free software used shows a weakness in software inventory management by some states. The fact that the State simply does not know exactly which software is running on its computational park reveals a lack of control over the management of information technology. This lack of control over what is installed can also characterize weakness in information security management - but this is a hypothesis.

We observed that only two states understood the question about free software acquisition policies. The objective was to know, given that there are two software with exactly the same functionalities, one being free and the other not, what would be the tiebreaker? According to Goiás (GO) and Roraima (RO), the existence of support and warranty is what determines the preference for free software.

Finally, we observed that among the software most used by Brazilian states, basic software predominates, such as web servers, database management systems and monitoring systems. The exceptions are Nextcloud and SEI, which are information systems, with interfaces designed not for information technology technicians, but for any other operators.

Brazilian states use free software, that's a fact. The data obtained so far show, however, that none of them produced free software, which characterizes them as users. Only the state of Paraná mentioned participation in free software communities, but did not provide any contribution data, which suggests that this participation is limited to discussion, not involving coding.

VI. NEXT STEPS

We will track requests for responses and charges for responses not delivered by the deadline or partially delivered. When we get the responses from the remaining states and the responses from the partially responding states, we will review the results and post them.

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