Munich's Long History with Open Source in Public Administration

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# Introduction

This case study is a retrospective on the policies and use of open source solutions in public administration in the German city of Munich, based on desk research and interviews with employees of the Munich City Hall’s IT Team, [it@M](https://muenchen.digital/it-at-m/).[[1]](#footnote-0) Munich has a 25+ year history of open source in public administration.[[2]](#footnote-1) As early as the 90s, the city used open source solutions for its webapps and the internal phone book.[[3]](#footnote-2)

The urban population of over 2.2 million[[4]](#footnote-3) is serviced by its it@M department. it@M employs about 1,240 developers who provide the administration with IT support and work on digitisation projects. New projects created in it@M are required[[5]](#footnote-4) to be shared publicly through the [it@M GitHub](https://github.com/it-at-m) account although the takeup of this practice has seen mixed results.[[6]](#footnote-5)

Munich is best known in the open source community for LiMux, the city’s own [Ubuntu-based Linux distribution](https://github.com/lhm-limux) used by the public administration employees for many years, starting in 2006. For the past few years, the system has been slowly undergoing a phase-out in favour of proprietary software because of, among other reasons, users’ discontent and lack of continued political backing, as described by the LiMux project’s leader Peter Hoffman.[[7]](#footnote-6) However, the story of open source in Munich’s public administration lives on beyond LiMux. This case study looks at Munich’s past and present open source policies and current plans, which incorporate the lessons from the LiMux project.

# 2004 Linux Migration

## Why was it attempted?

Starting in 2004, Microsoft was due to discontinue its support for its Windows NT 4.0 operating system (OS). A year ahead of the planned change, Munich’s administration was relying on this version of the system to power most of its nearly 15,000 workstations.

Munich’s administrators were facing a tough decision. They could upgrade the NT.4-powered desktops to the latest Windows XP OS – a move that would be associated with high licence and training costs – and potentially replace the older workstations, which were too underpowered to run the new version of Windows. The alternative? A bold switch to an open source-based solution.

The then mayor Christian Ude (SPD) commissioned an IT consulting company to prepare a [special report](https://web.archive.org/web/20060630023127/http://www.muenchen.info/pia/clientstudie_kurz.pdf) that would look into the costs associated with an upgrade of the city’s IT hardware and software. The study estimated the total replacement costs of a proprietary solution, including the necessary migration of hardware upgrades and specialist applications, to amount to €34.2 million. A move to an open source operating system, such as Linux, combined with an open source office suite like OpenOffice (today known as LibreOffice), was estimated to be the cheapest option, adding up to €31.3 million. The estimates were clear – moving to an open source solution was operationally suitable and would help the city save €3.2 million.

The Munich city council held a vote in May 2003, and LiMux was born. After initial delays, a full migration began in 2006. By 2012, 12,600 of the city administration’s desktops were fitted with the system. By December 2013, the city concluded the migration, with over 14,800 desktops running on LiMux. According to reports, the move away from proprietary software saved the city an estimated €11 million.[[8]](#footnote-7)

In November 2017, nearly four years after the conclusion of the migration, the Munich city council adopted a decision overhauling the move. All equipment was to be refitted with Windows 10 counterparts by 2020. The following sections outline the issues that contributed to LiMux’s discontinuation, followed by chapters examining the thriving post-LiMux open source landscape in Munich.

## Challenges and discontinuation

In the first years following the migration, the move was seen as a success. The city installed the LiMux system on more than 2,000 desktops beyond what was initially planned. Moreover, the project developers developed additional solutions for it, such as a form management system [WollMux](https://wollmux.org), which was released as an open source solution and included features such as templates and letterheads. WollMux was recognised as a useful solution outside of Munich as well. According to the Council’s [review](https://web.archive.org/web/20141019093514/http://www.muenchen.de/rathaus/dms/Home/Stadtinfos/Presse-Service/Rathaus-Umschau-2013/Halbjahr2/237_1.pdf) from December 2013, other municipalities, companies and private individuals also made use of WollMux. That same review confirmed that workstations “always remained operational” despite suggestions that adapting to new tools would disrupt the administration’s workflow.

Nearly two decades later, WollMux – renamed LibreOffice Template System in July 2023 – is the only remaining element of the LiMux system that is in wide circulation.[[9]](#footnote-8) The city moved away from using LiMux definitively in 2017, following issues with interoperability and replacement as well as weak political backing.

## Interoperability and replacement issues

In a 2012 [interview](https://www.cio.de/a/triumph-in-muenchen-kehrtwende-in-freiburg,2902414,2), Peter Hofmann, the LiMux project lead, confirmed that the migration had not been complete. Legal restrictions designated the use of closed software in some instances, as in the case of the [Bundesdruckerei's](https://www.bundesdruckerei.de/en/group) (government IT security group) procedures around electronic passports, fingerprint scanners and encryption methods.

Moreover, Hoffmann added that many departments used the office system as a modular system, with Microsoft Excel gaining popularity as a database replacement, which was not possible with the introduction of LiMux as it didn’t allow for programming macros. Moreover, the custom operating system entailed bugs and missing features which, despite being patched up successively, caused problems to its users. The choice to build its own distribution was ambitious and required more experimentation and effort than using standard deployment (e.g., Ubuntu).

LiMux had several constraints compared to proprietary solutions of the time. For instance, city council members could not reach their online email, contacts and calendars from their phones – support for proprietary services like the Outlook groupware was arguably inadequate at the time. Some users also had complaints about interoperability; Microsoft Word and Excel documents received from external organisations had to sometimes be modified and sent back.[[10]](#footnote-9) The city was trying to convince its correspondents to use ODF or PDF extensions whenever possible while also financing the work on WollMux to increase the interoperability, but the issues posed to the users were continuing.

City officials admit that using the open source system was challenging to the employees of the city’s administration. Some, like Stefan Hauf, the council spokesman, commented that the complaints about LiMux were mostly related to compatibility issues in LibreOffice.[[11]](#footnote-10) Karl-Heinz Schneider, the then-head of the internal IT service provider it@M, denied any complaints or disruptions that went beyond “what would normally be expected in an administration of this size.”

## Political discontent

Following the 2014 municipal election, the use of LiMux underwent an evaluation which resulted in a study showing that it@M could not deliver the expected quality and performance of the city council’s IT system due to organisational shortcomings.[[12]](#footnote-11) The IT workstations operated on far too many different and sometimes outdated operating systems, some of which could not handle all the programs. Overall, the majority of the city’s IT equipment had a “residual value of zero euros,” with outdated hardware posing a challenge to the integration of the new operating system. As noted by the [Free Software Foundation Europe](https://fsfe.org/news/2017/news-20170301-01.en.html) (FSFE), the report identified primarily organisational issues – like a lack of clear structures and responsibilities – as the root cause of the troubling LiMux uptake.

In their [study](https://www.scribd.com/document/122167337/Studie-OSS-Strategie-der-Stadt-Munchen-v1-0-Zusammenfassung) (dated January 2013), HP and Windows suggested that upgrading to Windows XP would have cost the city €17 million. The companies claimed that the total cost of switching to LiMux amounted to €60.6 million, even though the city council had estimated it to be €23 million. Hauf challenged the study’s reliability. He claimed that it underestimated the use of web-based apps and inaccurately compared the hardware costs of proprietary and open source software.[[13]](#footnote-12) Moreover, the study assumed an inflated number of baseline users for migration, ignoring the fact that the migration was gradual and that it spread the costs over several years.

## Review strategy

On 9 February 2017, the political parties CSU and SPD filed a [joint motion](https://www.muenchen-transparent.de/antraege/4365777) asking the Council to draw up a concept for “commercially available” products that could be used in administration. In response to the motion, an ad hoc coalition of LiMux/open source supporters formed to back the continued use of LiMux. FSFE, [The Document Foundation](https://www.documentfoundation.org), [KDE](https://kde.org), and the [Open Source Business Alliance](https://osb-alliance.de) produced a [list of questions](https://www.schiessle.org/articles/2017/02/14/rolle-ruckwarts-in-munchen-diese-fragen-sollte-man-sich-stellen/) to the lawmakers about the CSU-SPD motion. These concerned the decision-making processes in the city council as well as questions about transparency, accountability and infrastructure.

During a [plenary vote](https://ru.muenchen.de/pdf/2017/ru-2017-02-15.pdf) on 15 February, the city council voted in favour of developing a strategy to unify the client-side IT architecture. This entailed “immediately creating a concept” for a uniform and city-wide environment based on the new Windows basic client. The decision also called for the administration to prepare a list of the LiMux-based programs that should be eliminated together with an estimate of the investment and acquisition costs.

# Renewed political interest

In August 2019, the federal Ministry of the Interior commissioned a [market analysis](https://www.cio.bund.de/SharedDocs/downloads/Webs/CIO/DE/digitale-loesungen/marktanalyse-reduzierung-abhaengigkeit-software-anbieter.pdf?__blob=publicationFile&v=1) on the possibilities of reducing the dependency on individual software providers. One of the recommendations was to increase the investment in open source software.

Following the 2020 local elections in Bavaria, the majority changed to a coalition between the Greens and the Social Democrats. The ruling parties released their [coalition agreement](https://www.gruene-muenchen.de/wp-content/uploads/2020/04/Druckfassung_Koalitionsvertrag-2020_2026.pdf), in which they promised to rely on open standards and to use free and open source solutions whenever it was “technically and financially feasible” in order to avoid manufacturer dependencies. The agreement also explicitly confirmed that the coalition would adhere to the “[public money, public code](https://publiccode.eu/en/)” principle in its operations and would include this consideration as a criterion for tenders.

While the city continues its transition to Windows, the principle of reliance on open source will apply to new software that will be either acquired or created*.* All new software developed by it@M in-house, which makes up less than 20% of digital products used by the city, should be shared on the [organisation’s GitHub](https://github.com/it-at-m).

It is also important to note that the city has shifted its focus away from desktop applications to web-based solutions. In 2022, it@M became a financial supporter of Vue[[14]](#footnote-13) – a front-end JavaScript library for building user interfaces and single-page applications. Shifting to running web services might help avoid the resistance from users whose work would be disrupted by new, unfamiliar environments. Following LiMux, the city now favours a “soft” incorporation of external open source developers and development methods into the town hall's own methods.

# Open Source in Munich now

In October 2020, the City Council [approved](https://www.muenchen-transparent.de/antraege/6289860) the establishment of the Open Source Hub, a centre within the it@M department that allows employees and committed external parties to work together on open source IT solutions for Munich, with permanently assigned personnel and financial resources.[[15]](#footnote-14) In the reasoning of its decision, the council stated that it wants to change the fact that “open source no longer has the priority which is now demanded by the coalition agreement.” Thus, the OS Hub was created as a space for innovative solutions for small and larger IT projects which are developed in an “unbureaucratic and unconventional manner.”

Since 1 September 2022, Dr Laura Dornheim has been in charge of digital projects at the Munich city council as its Chief Digital Officer. In an interview with the Süddeutsche Zeitung, she stated her commitment to expanding the use of open source in public administration.[[16]](#footnote-15) At the same time, Dr Dornheim underlined her pragmatic approach, saying that she does not want to impose a third overhaul of the city administration’s operating system by reinstating LiMux. Instead, the city should “use as much open source as possible, and where [that] is not possible, we should use good commercial products.”

## Open Source platform and offered solutions

In November 2023, the city launched a dedicated platform [opensource.muenchen.de,](https://opensource.muenchen.de) to showcase its extensive repository of open source solutions. Visitors can choose between three categories – “Use,” “Improve” or “Publish.” Under “Use,” visitors can access 32 open source software applications which are currently in use by the city of Munich and range from administrative tools to user-facing apps. These include applications developed inhouse (labeled “Inhouse”). Furthermore, under “Improve,” the user can access it@M’s code contributions as well as sponsoring offered to [Vuetify](https://opensource.muenchen.de/software/vuetifyjs.html) and [GeoPortal](https://opensource.muenchen.de/software/geoportal.html), which follows the legal funding requirements set out by the city council.[[17]](#footnote-16)



*As of November 2023, it@M offers an overview of its open source activities and solutions on a dedicated website. (Image source:* [*https://opensource.muenchen.de*](https://opensource.muenchen.de)*)*

One of the applications is [DigiWF](https://opensource.muenchen.de/software/digiwf.html), a process automation solution based on [Camunda](https://camunda.com), which provides users with a platform that enables them to create automated workflows themselves via a modular building block concept. The platform ensures that tasks in a business process are processed in the right order and that the necessary information is available digitally in the right place. In addition, DigiWF also provides key figures on workflow executions and thus supports the continuous improvement of processes.

Another solution developed by the city of Munich is [BayernID](https://opensource.muenchen.de/software/bayernid-plugin.html), an eID plugin for single sign-on based on [Keycloak](https://www.keycloak.org), which has been in operation since 2021. It allows citizens, companies and organisations to identify themselves when processing digital administrative services. It is used to uniquely identify oneself online, offering different levels of authentication (weak authentication via a username and a password, a higher level of authentication via [ELSTER](https://www.elster.de/elsterweb/infoseite/elsterauthenticator), and the most secure level via the national eID). In addition, it redirects the user to other state and federal accounts that are available.

With [Epitaph](https://opensource.muenchen.de/software/epitaph.html), it@M provides an indoor navigation tool aiding the visitor guidance system in the Munich registry office (Ruppertstraße 19). With the help of Bluetooth Low Energy (BLE) beacons, Bluetooth signals are emitted and detected by the visitor’s cell phone. Then, the app uses these signals to determine the position, displayed in the app, enabling users to find their way around the building.

Furthermore, the [Inclus](https://opensource.muenchen.de/software/inclus.html) app offers a map of barrier-free, public and semi-public toilets in Munich, based on [OpenStreetMap](https://www.openstreetmap.org/), providing a resource for raising accessibility in the city. When selecting a restroom by clicking on the map, detailed information is displayed, including the floor plan, installed handles, door width, ramp slope, or whether access requires a [Euro-Key](https://www.schwerbehindertenausweis.de/nachteilsausgleiche/mobilitaet-und-reisen/euroschluessel-fuer-behindertentoiletten) (for the semi-public toilets). Guests can also leave feedback on the toilet’s condition to continuously improve and update the map.

During the Covid-19 pandemic, the city also developed its own track-and-trace app, [COVe](https://opensource.muenchen.de/software/cove.html).[[18]](#footnote-17) It was developed inhouse by five developers from the it@M team and released in late April 2020 under the EUPL licence. The app enabled tracking and contacting exposed individuals, alleviating the workload of the city’s health department.

[Zeitmanagementsystem](https://opensource.muenchen.de/software/zeitmanagementsystem.html) allows citizens to book appointments in the city hall for selected services and offers an administration interface to manage the resources for the administrators. The appointment app is an example of successful open source inter-city collaboration – it was initially developed by the [Berlin IT Service Center](https://www.itdz-berlin.de) and the [Fraunhofer Institute for Telecommunications](https://www.hhi.fraunhofer.de/en/index.html) and then taken up by the city of Munich. The city of Munich decided to introduce the "ZMS", an appointment and waiting time management system solution. This solution was developed in cooperation with IT-Dienstleistungszentrum Berlin and BerlinOnline Stadtportal GmbH & Co. KG and is available under an open source licence. It has been introduced gradually since September 2023.

The [DAVe](https://stadt.muenchen.de/infos/dave-datenbank-verkehrszaehlung_open-source.html) app[[19]](#footnote-18) is a specialised procedure to measure road traffic. It enables the employees of the mobility department to document and analyse the development of traffic in Munich on the basis of data from over 2000 road traffic counting stations. Originally developed as proprietary software, it is now released as an [open source application](https://github.com/it-at-m/dave-frontend).

Additionally, Munich financially supports some open source software projects, especially libraries (e.g., Vue). It also runs an [Open Source Sabbatical](https://spd-rathausmuenchen.de/open-source-sabbatical-startet/), which aims to encourage community members to contribute to the Munich pool of open source software. Under the program, the city will fund monthly grants (for a period of 3 or 6 months) for developers to allow them to dedicate more time to developing software for the town hall.

As [reported on OSOR in January](https://joinup.ec.europa.eu/collection/open-source-observatory-osor/news/new-step-towards-open-source-dortmund) 2023, Munich joined forces with Dortmund and Berlin as part of the “Open Source Big 3” project to develop a reproducible open source governance model. It is our understanding that the project is on pause for now (status as of December 2023).[[20]](#footnote-19)

# Lessons learnt

Munich’s pursuit of integrating open source software in its public administration carries many lessons. As shown above, many of these have already started being implemented by the city.

* **Dialogue and cooperation:** Better communication and an agreement on protocols, methods and formats among municipalities are necessary if the migration is to be successfully scaled and replicated elsewhere. In Germany, federated inter-municipal communication remains a limiting factor – exchange channels often rely on a personal connection, making it difficult for municipalities to share their best practices in a more structured manner. However, there are efforts to establish inter-city cooperation, e.g., between Munich, Nuremberg and Augsburg.
* **Empowering technological sovereignty**: The migration of 15,000 workplaces to vendor-neutral open source solutions and open-standard-based file formats was [powered by local IT companies](https://fsfe.org/news/2017/news-20170301-01.en.html), which boosted the city’s technological independence and the local IT industry. This is in line with the current political drive for increasing digital sovereignty in Germany.
* **Scaling ambition**: Munich chose to build its own deployment instead of relying on standard systems. Combined with the size of the municipality and the number of employees in its administration, this could have contributed to Munich’s problems. Shifting focus to web-based open source solutions is more manageable and scalable and has yielded successful results.
* **Appropriate training**: The prevalence of proprietary software for at-home use makes it challenging for public administration workers to use open source in their office, potentially adding the costs of training to the overall migration expenses. Choosing to focus on developing and promoting the use of web-based open source applications alleviates those concerns.

# Conclusion

Many challenges need to be overcome before a greater uptake of open source solutions in public administration is possible, but the example of Munich shows that agility and ingenuity inherent to open source development lead to great results.

Open source is sometimes met with a paradigm clash – unlike the heterogenous and agile developer community, public institutions have fixed priorities and mandates spanning several years, carried out by multiple departments in set organisational structures. Open source development and communities may not adapt well to these environments – by introducing dedicated centres, such as the Open Source Hub at it@M or Open Source Programme Offices (OSPOs) set up in some public organisations, cities can accommodate developers' needs, create a dedicated link with communities and provide room to create, collaborate and test out open source solutions.

In the current search for greater technological sovereignty in the EU, empowering local companies and communities to collaborate in creating open source software will contribute to long-term strategic goals and offer a change of digital reskilling much needed in the EU.[[21]](#footnote-20) Here, Munich leads by example by developing its own solutions, programmes and initiatives (e.g. the OS Sabbatical) as well as setting up a structure allowing for a better, more effective collaboration with other cities and developer communities through its Open Source Hub.

Despite the ups and downs in the history of open source adoption in Munich’s public administration, the future appears promising as the city authorities have recognised the benefits of transparency, cost-efficiency, and collaborative innovation that open source solutions offer. As this case study shows, the open source story of Munich’s public administration extends well beyond LiMux and includes an extensive repository of open source solutions related to administrative procedures, mobility and accessibility. With a renewed commitment to embracing open source principles in public contracts and investing in in-house OS development and drawing on the lessons of the large-scale LiMux project, Munich is well-positioned to navigate new challenges and harness the full potential of open source.

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2. Insight from interviews. [↑](#footnote-ref-1)
3. Insight from interviews. [↑](#footnote-ref-2)
4. City Population, “München, Germany” (7 July 2022), see here: [https://www.citypopulation.de/en/germany/agglo/bayern/A09162000\_\_münchen/](https://www.citypopulation.de/en/germany/agglo/bayern/A09162000__m%C3%BCnchen/). [↑](#footnote-ref-3)
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6. Insight from interviews. [↑](#footnote-ref-5)
7. Computer World, “Moving a city to Linux requires political backing, says Munich project leader” (20 December 2013), see here: <https://www.computerworld.com/article/2487630/moving-a-city-to-linux-requires-political-backing--says-munich-project-leader.html> [↑](#footnote-ref-6)
8. Computer World, “Switching to Linux saves Munich over 11 million” (26 November 2012), see here: <https://www.computerworld.com/article/2716115/switching-to-linux-saves-munich-over--11-million.html> [↑](#footnote-ref-7)
9. LibreOffice Template System or LOTS is actively maintained and used well beyond Munich. As of December 2023, its version 19.0.0 is available under a EUPL-1.1. licence, see here: <https://github.com/LibreOffice/lots>. [↑](#footnote-ref-8)
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14. München Transparent, *Öffentliche Sitzung des IT-Ausschuss vom 28. September 2022 – Beschluss* (28 September 2022), see here: <https://www.muenchen-transparent.de/dokumente/7347900>. [↑](#footnote-ref-13)
15. München Transparent, Open-Source-Hub bei der LHM etablieren (22 October 2020) see here: <https://www.muenchen-transparent.de/dokumente/6289876> [↑](#footnote-ref-14)
16. Süddeutsche Zeitung, “Es gibt leider nicht nur ein oder zwei Baustelle” (26 December 2022) see here: <https://www.sueddeutsche.de/muenchen/muenchen-laura-dornheim-it-referat-digitalisierung-1.5722045?reduced=true>. [↑](#footnote-ref-15)
17. RatsInformationSystem München, “Strategie zur Finanzierung städtisch genutzter Open-Source-Bibliotheken und -Software” (15 November 2023), see here: <https://risi.muenchen.de/risi/sitzungsvorlage/detail/8013996>. [↑](#footnote-ref-16)
18. COVe has been out of use but is still available as a public archive on GitHub, see the frontend here: <https://github.com/it-at-m/cove-frontend> and the backend here: <https://github.com/it-at-m/cove-backend>. [↑](#footnote-ref-17)
19. Datenbank und Auswertung von Verkehrszählungen, in English: Database and Evaluation of Traffic Counts. [↑](#footnote-ref-18)
20. Insight from interviews. [↑](#footnote-ref-19)
21. European Commission, “Report on the state of the Digital Decade 2030” (27 September 2023), see here: <https://digital-strategy.ec.europa.eu/en/library/2023-report-state-digital-decade>. [↑](#footnote-ref-20)