

## Boosting Government Performance with Open Source Software? – A Roadmap for Germany

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### ABSTRACT

Governments face a considerable pressure from all directions: budget restrictions, citizens' expectations, demographical trends, local competition from surrounding areas – to name just a few. EGovernment is regarded as an imminent tool to tackle many of these challenges. Obviously, IT itself is object of increasing complexity, constant change and financial implications. This paper outlines how the federal German government follows a strategic roadmap for eGovernment by shaping the objectives and goals for IT expansion. We discuss the role of open source software and how new approaches for software development can turn the ambitious aims into reality.

**PALABRAS CLAVE:** eGovernment, Open Source Software, OpenSAGA, Software Standards

### INTRODUCTION

In terms of rational behavior, public institutions have to decide on priorities, deal with scarce resources, evaluate the impact of decisions etc. With the caring state evolving year by year, the challenges for state services have been growing without cease. Governments are under a considerable pressure to keep up with the requirements posed by all societal stakeholders (citizens, business, interest groups etc.) – while public budgets have almost over-stretched their potentials.

It is evident, that IT technology has been a pivotal driver concerning productivity, service quality, communication speed, effortless access to information etc. And IT itself is exposed to exponential change and increasing complexity. The basic question is: How can governments further develop into “High-Performance Organizations” (de Waal, 2007) and cope with contradictory requirements and demands. Obviously, case-by-case decisions, muddling-through concepts or business-as-usual are not acceptable options.

Still in the 90<sup>th</sup>, when the internet began to unfold its potentials, the German federal government opted for a comprehensive IT agenda, i.e. for a systematic, coordinated

approach to stimulate and implement innovative, internet-based eGovernment solutions. Labeled BundOnline 2005, the overall objective was to propagate process and task oriented services with citizens and companies in the centre (Zypries, 2002).

Since BundOnline 2005, the efforts for penetrating public administrations with IT have required significant investments. Attracted especially by a zero-fee license concept, IT decision maker have been carefully monitoring the development of open source software as an alternative for proprietary solutions. Furthermore, the federal system in Germany requests a very specific attention towards interoperability. In vertical perspective, the “players” in Germany are local and city governments, regional administrations (“Regierungspräsidenten” and some agglomeration management districts), the 16 states and finally the federal administration. In horizontal perspective, cities, labour administration, and many more specialised institutions cooperate closely to implement legal requirements.

In this review we outline some conceptual cornerstones of German’s federal IT-strategy which is largely based on the propagation of open source software (OSS) and a set of software standards (SAGA). Furthermore, we describe the OSII initiative with the ambitious goal to develop an open source software stack relevant (also) for eGovernment. Finally, we refer to OpenSAGA, an open framework for implementing SAGA compliant eGovernment applications – hence covering the complete path from overall strategy to implementation aspects.

## **IN NEED FOR HIGH-PERFORMANCE GOVERNMENT: BUNDONLINE 2005**

Before 1998, eGovernment in the Federal Administration was just a vague concept: to leverage public institutions’ agility. With the initiative BundOnline2005 the federal government set up an agenda for a comprehensive modernization of administrative services. The basic idea was to make 350 different services in more than 100 administrative units internet-ready till 2005, starting from year 2000. These applications addressed all three targets: Government2Customer, Government2Business, and Government2Government. The financial investment was considerable: 1.65 billion Euros, with 48 % for the decentralization of applications and services and 25 % for the optimization of organizational workflows. The applications targeted internet services for patent applications, a variety of tax and tariffs solutions, export regulations, and a virtual market place for 250 billion Euros/year of government tenders (Zypries, 2002).

Beyond these directly executed projects it was expected that similar activities were motivated on all other governmental layers, even if on a smaller scale. This notion of ignition is of utmost relevance for local administration which has to run 3,000 processes with up to 10,000 services or products - many of them only rarely demanded or characterised by unstable peak demand (Kommune21, 2010).

Today, despite considerable efforts and the success of BundOnline 2005, the German eGovernment is not in a leading European position. Challenged by this, representatives of politics, administration and business met in December 2010 to agree on an agenda to advance Germany into the top five in eGovernment (IT-Planungsrat, 2010) It is consensual that a further boost requires affordable, standardized, and sustainable IT paradigms, architectures and solutions.

## OPEN SOURCE SOFTWARE: CONCEPT AND EXPECTATIONS

Software is Open Source software (OSS) when the source code is freely distributed with the right to modify the code, on the condition that redistribution is not restricted, and is obtainable for only the reasonable cost of reproduction (Open Source, 2011). Hence,

- the user is allowed to analyse how the programme works and to customize the code according to his special needs
- the program can be improved (extensions, additional functionalities)
- the program is allowed to be copied for whatever reasons and executed on an unrestricted number of computers
- copies are allowed to be distributed to any user.

In contrast, vendors of closed, proprietary software typically provide only executable binary code, and they usually place very specific limits on the redistribution of the software.

There are numerous examples for the positive consequences of the legal approach of OSS. Especially the success of the internet and the WWW depends on OSS (TCP/IP, HTML). OSS is strong in operation systems, infrastructure and networks (Unix, Linux, Apache, and PHP). Based on the notion of “wisdom of the crowds”, the open software concept has in many ways changed the software industry and some regard the advent of OSS as the “Era of Enlightenment (Uhl, 2004).

The success of OSS has initiated a serious political discussion in Europe about the overall societal benefit of open source compared to proprietary solutions. Four major criteria were in the centre of the governmental perspective: dependency, cost, security, and transparency (Gosh et al., 2002). Table 1 compares the possible benefits and weaknesses of the OSS paradigm (Office).

Table 1: Benefits and weaknesses of OSS

Expected Benefits	Perceived weaknesses
Strong support for interoperability	Uncertainty as to what exactly constitutes OSS (legally, sustainability, ...)
Supplier independence, i.e. no problem if the original supplier disappear or withdraw support	Fear that support can be fragmented or difficult to obtain, particularly for niche products
Platform independence, i.e. availability of the source code tends to lead to a wider range of platforms	Misunderstanding of the licensing and implications for the intellectual property rights
Avoidance of a proprietary lock-in (high costs of migration from a proprietary solution to any alternative)	Difficulties in identifying appropriate OSS applications
Patches or updates to OSS tend to be produced very rapidly	Documentation often poor
No license costs	Licenses often only a small part of the total cost of ownership (TOC)
More security, i.e. it is believed that OSS is less vulnerable than proprietary software due to the openness, the awareness and the transparency of the community	Lack of real world experience and support for migration from closed proprietary software to OSS

There are some requirements essential for the success of OSS (Schmitz and Castiaux, 2002):

- a sufficient number of institutions with the same or a similar problem
- an excellent support on how to understand the source code (beyond documentation)
- a common pool of easy to understand core modules, i.e. modularised software, not a monolithic code
- clear identification of those code modules that are stable/saturated in contrast to those that still need further improvement
- availability of a community for the discussion of requirements, goals and priorities for future developments.

## **THE GERMAN FEDERAL IT-STRATEGY, SAGA AND OSS**

### **IT Planning Council**

Since April 1, 2010, an IT planning council is responsible for

- coordination of the cooperation between federal and state governments
- decisions on IT interoperability and security standards
- global governance of eGovernment projects (IT-Planungsrat, 2010).

The federal government is represented by the Representative of the Federal Government for IT (“Bauftragte der Bundesregierung”), the states by the state secretaries. Furthermore, three representatives of central association of the local governments and Federal Commissioner for Data Security and Informational Freedom take part consultatively. In addition, the representatives of the Minister Conference and further institutions have to be involved if their issues are touched by the decisions of the IT Planning Council.

Already in 2010, the IT Planning Council outlined the goals for a national eGovernment strategy. He strives for a common strategic orientation by federal, state and local governments in further developing eGovernment. Addressing eight key areas and a number of goals within, the IT council defined the roadmap for the coming years (IT-Planungsrat 2010).

### **Standard Architectures for Government Applications (SAGA)**

In order to promote the Federal Government's eGovernment initiative much beyond the BundOnline 2005 objections and to support federal, state and municipal agencies, the E-Government Manual was prepared under the leadership of the German Federal Office for Information Security. This manual is designed as a reference and central exchange platform for issues related to eGovernment.

In 2003, SAGA - an acronym for Standards and Architectures for eGovernment Applications - became part of the Government manual. SAGA defines a comprehensive standardization initiative for Germany's public administrations, primarily the Federal Government and sets forth guidelines, whilst the eGovernment manual explains the implementation of these guidelines and offers practical advice. SAGA pursues a comprehensive standardization approach for Germany's administrations in order to achieve two main goals (Der Beauftragte, 2008):

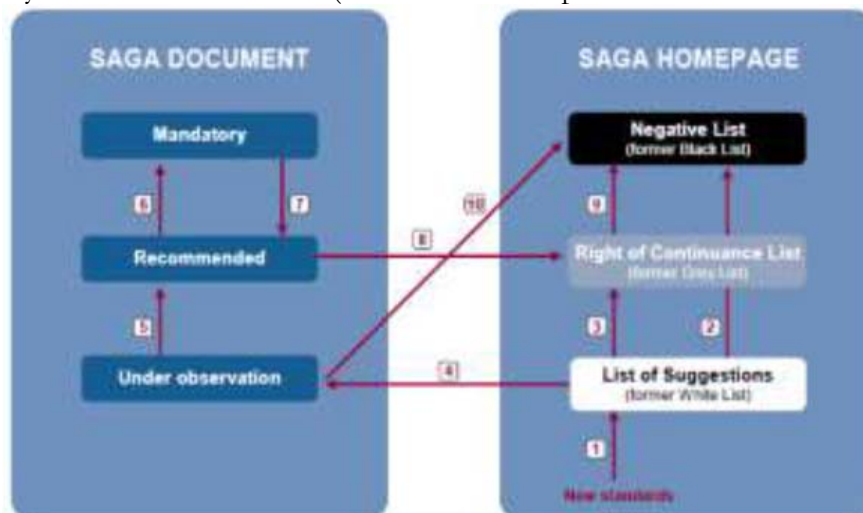
- defining technical standards and architectures for eGovernment applications, covering all levels and institutions relevant for eGovernment, and
- standardizing processes and data in administrations in order to achieve interoperability and compatibility of eGovernment applications (Federal Ministry of the Interior).

In technical terms, SAGA concentrates on five objectives:

- Interoperability, i.e. warranting co-operation between various eGovernment applications in order to effectively exchange information between the Federal Government, citizens, businesses and partners of the Federal Government
- Reusability, i.e. re-use of process and data models, systems, services and components in various eGovernment projects in order to generate synergies
- Openness, i.e. inclusion of open standards in eGovernment applications in order to promote their long-term usability
- Reduction of costs and risks, i. e. considering investment-safe developments on the market and in the field of standardization
- Scalability, i.e. ensuring usability.

The standards undergo a defined process before they are included: Starting with the examination of proposals to the discussion by an expert group to be classified according to “under observation”, “recommended” and “mandatory”. Extended classifications refer to the life cycle of standards and affect a “List of Suggestions”, a “Right of Continuance List”, and “Negative List”.

Fig. 1: Lifecycle of SAGA standards (numbers indicate possible document workflows)



The Federal Ministry of the Interior recommends that SAGA 4.0 be considered in tenders for eGovernment applications for the federal administration. Customers shall include a section on “SAGA conformance” and SAGA-relevant criteria in its contracting documents. It is expected that SAGA 5.0 will become mandatory for public institutions, i.e. whenever possible; the standard software to be bought should be primarily products or product versions which are compatible with SAGA recommendations.

Obviously, SAGA is in strong favor of OSS. Minimum requirements for the openness of standards for acceptance in SAGA are defined as follows:

- The standard was published and the documentation of standard specifications is either free or at most available against a nominal fee.
- The intellectual property (for instance, in the form of patents) of a standard or of parts of a standard must, if possible, be accessible without being contingent upon the payment of a license fee.
- The federal administration and the users of its services must be able to use the standard without restriction.
- The standard must remain published and freely usable in the future (Der Beauftragte, 2008).

## THE NOTION OF AN OPEN SOURCE STACK: LISOG AND THE OSII INITIATIVE

Lisog was founded in March 2005 with the goal to interconnect producer and user in the open source field. With solutions for eminent IT and open source topics Lisog wants to demonstrate that open source is a sustainable business approach. Today, the network has 120 members – among them leading IT companies, SMEs and public administrations. Lisog is gaining public visibility by promoting open source in manifold ways: Seminars, public relations, organisation of fairs etc. Of special relevance is the Open Source Integration Initiative (OSII) launched by Lisog in March, 2010 (Lisog, 2011).

The pivotal concern of the OSII initiative is to develop a stack of open software (Fig. 2) with harmonized interfaces which can be used as a flexible toolbox competitive with proprietary solutions. 19 SMEs and one research organisation collaborate under OSII stacking out the comprehensive spectrum of IT solutions - Groupware, CRM, ERP, DMS, Business Intelligence, Middleware (ESB), Linux, and Backup as well as archive tools (OSII, 2011).

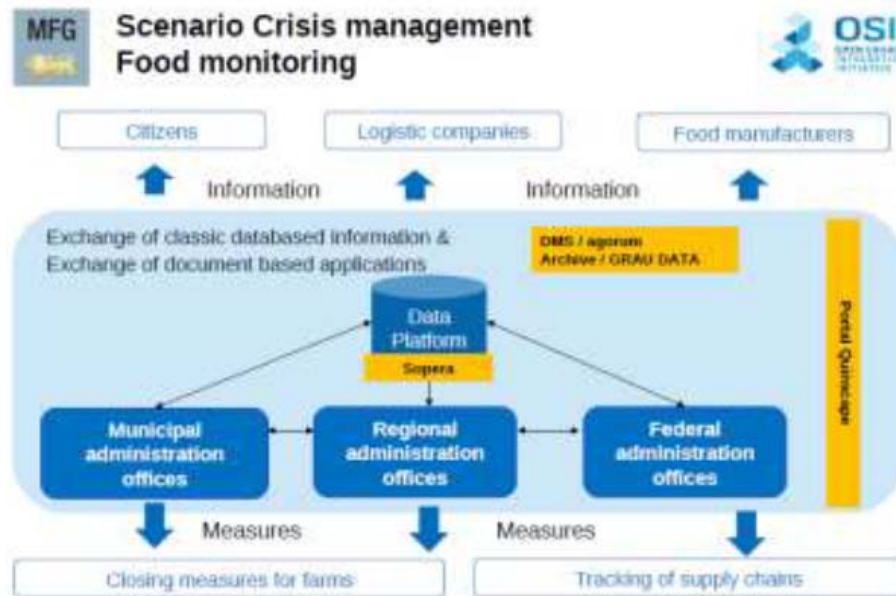
OSII is considered as an open network that shall be extended easily by additional modules and companies. Furthermore, there are sufficient redundancies that allow user to choose between different provider according to quality, service and their prices. In case of the dropout of a partner it shall be possible to switch to an alternative solution provider. To guarantee a technically mature stack the quality of the interface shall be tested extensively so that there is a sufficient level of quality and level of orchestration.

Fig. 2: Lisog stack and related companies



At the end of 2011, a sale and marketing concept and a number of scenarios shall be defined (food crisis and intervention (Fig. 3), activity and task management, document management and collaboration etc.).

Fig. 3: Scenario and partners for crisis management



In an overall perspective, OSII shall enable Open Source companies to become member of an innovative ecosystem, fathoming new business models and addressing new customers.

## OPERATIONAL APPROACH: THE OPENSAGA FRAMEWORK

The mission of the OpenSAGA initiative is to deliver an open source framework for developing SAGA-compliant, Java-based web applications (OpenSAGA, 2011). OpenSAGA, a member of Lisog and the OSII initiative, offers a Java-framework to transform eminent requests of SAGA into real-world web applications. The basic idea is to automatically produce SAGA-compliant applications for eGovernment. Within the OpenSAGA initiative – officially started in Mai 2010 under the GPL V2 license – companies, research institutions and government institutions co-operate to foster real-world applications based on SAGA standards.

The OpenSAGA framework can be characterised by four essential characteristics:

- it describes domain interrelationships ("what?"), while the appropriate technical implementation ("how?") is generated (more or less) automatically
- it makes reasonable assumptions, especially in terms of SAGA compliance; i.e. software developers do not have to take care of SAGA related technologies
- it concentrates on semantic relations, not technical implementation details
- it is almost completely model-driven.

The basis of OpenSAGA applications is a declarative model with focus on technical aspects. This model defines from which parts the application is composed of and how the individual parts interrelate - instead of describing the technical implementation in detail. In other words, the model may be significantly simpler than the resulting application, focusing

on the users' technical issues and defining the application's domain, and the processes within the application.

Fig. 4. Food emergency warning: Screenshot generated with OpenSAGA



Primary targets in the model design are:

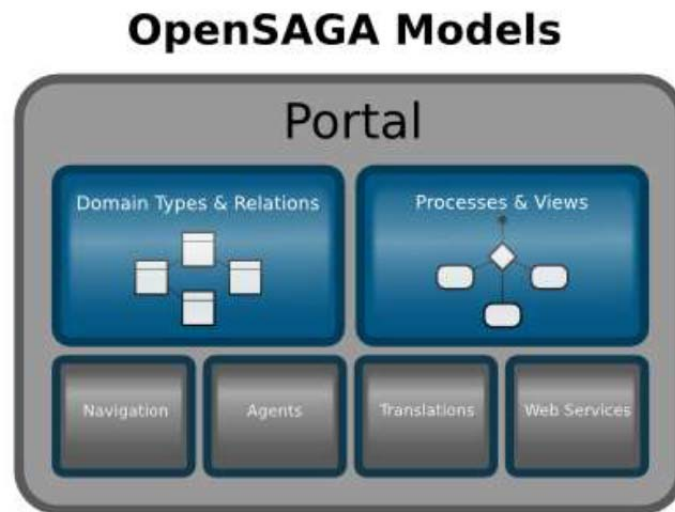
- to make them the central working artifact, i.e. that developers implement exclusively models and strategy interfaces without access to generated codes, so the work performed is purely model-based;
- to find a description format for the integral components of web applications which is as technology-independent as possible;
- to provide the highest possible abstraction level for the description;
- to enable a systemized top-down design for a step-by-step description of complex contexts; and
- to design the models in such a way that a technological evolution is possible without having to rewrite or extensively amend applications.

In architectural terms, OpenSAGA consists of four elements:

- The domain models describe the application's specialist domain. They declare the individual object types and their features, concentrating on the description of what is there, not on where and how it is saved.
- The process model describes the behavior of the application and its reaction to user input. Basically, they correspond to a status diagram with access points, decision status and views which describe the user interface. Transitions connect the conditions of a process and feature action lists which are executed when the transition is activated.
- The view model describes the general structure and content of a view state within a process. It describes the connection between the input and output elements of the views and domain types and the connection between buttons and links, and transitions.
- The generator creates a runtime model from the XML files of the models. A runtime model is a graph of Java object instances and is available throughout the runtime. This runtime model is transformed into implementation artifacts — for example Java classes are generated from domain models, and the processes are translated into Spring webflow and JSF templates.



Fig. 5. Elements of OpenSAGA



OpenSAGA can be regarded as a significant contribution to the SAGA standard ambitiously aiming at becoming a de facto standard for eGovernment solutions. However, if this mission can be achieved is rather questionable.

## CONCLUSION

We have highlighted basic objectives of the German eGovernment strategy. This strategy is focused on interoperable, open source based solutions. The open source community in Germany has accepted this challenge aiming at an open source software stack that shall meet all core eGovernment requirements. By way of example for this stack, we outlined how OpenSAGA addresses the specifications of the SAGA standard promoted by the German federal government.

However, this is only a small cleavage. New ideas like open data, cloud computing and mobile solutions supplement the picture posing a constant need for additional IT concepts. Creative initiatives concerning open data, for instance in Berlin, begin to take shape, and with respect to cloud computing, the German federal government has initiated lead projects (also in the field of eGovernment) whose outcome has to be evaluated carefully in the years to come.

The years to come will prove how fast the German initiatives will boost eGovernment and if the open source approach can play an important part. Till today, the situation is characterized by a certain reluctance to invest in OSS solutions.

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- Brigitte Zypries is State Secretary in the Federal Ministry of the Interior.