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Towards a Dutch Interoperability Framework

Recommendations to the Forum
Standaardisatie

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Prepared for the Forum Standaardisatie, The Netherlands

The research described in this report was prepared for the Forum Standaardisatie, The Netherlands.

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Executive summary

Electronic government (eGovernment) offers a new channel by means of which citizens, businesses, and government agencies can interact with one another. The provision of eGovernment services (eServices) has the potential to facilitate such interactions, augmenting traditional channels of government by enabling electronic access that is unconstrained by the locations and schedules of the parties involved, thereby improving public sector effectiveness. In order to realize this vision, however, eServices must be “interoperable” with each other: that is, they must be able to work together, sharing compatible and meaningful information to support the tasks that their users need to perform. Such interoperability among eServices should help to reduce the cost of government, increase its cost-effectiveness, improve the coherence, consistency, and responsiveness of government services, and ultimately improve democracy, by facilitating citizen interactions with government while making government itself more transparent, accountable, and credible.

However, there are significant challenges to creating interoperable eServices of this kind, stemming from functional, technical, procedural, cultural, and semantic differences among the government organizations that provide these services. One way of meeting these challenges is to create an interoperability framework (IF) to help eService designers and implementors ensure that their services will work together smoothly. The creation of a Dutch interoperability framework is therefore seen as a key step in promoting eGovernment in The Netherlands, as well as Dutch participation in emerging pan-European Government Services (PEGS) efforts.

This report presents the results of a study intended to help the Forum Standaardisatie make informed decisions about developing an interoperability framework for eServices in The Netherlands, including both services to citizens and businesses and services provided by one government body to another. Although the focus of this study was interoperability among eGovernment systems, eGovernment is merely one of several channels by means of which citizens, businesses, and government agencies interact with one another, and all such channels should be made consistent and coherent in order to ensure transparent and effective interaction. Nevertheless, interoperability among eGovernment systems is expected to be a key factor in facilitating such interaction.

For the purposes of this study, we define interoperability as the ability of distinct systems to communicate and share semantically compatible information, perform compatible transactions, and interact in ways that support compatible business processes to enable their users to perform desired tasks. In the eGovernment context, users may be citizens, businesses, or government employees or agencies that perform tasks involving interaction with the government, and a business process is any activity or sequence of actions that corresponds to such a task. An interoperability framework is a set of principles, policies, criteria, specifications, standards, protocols, and procedures aimed at helping eGovernment developers to design, acquire, and implement systems, data, semantics, business processes, and policies that interact with each other efficiently, effectively,

flexibly, and meaningfully to enable government organizations to provide useful services to citizens, businesses, and each other.

Interoperability involves far more than just information and communications technology (ICT) systems. Interoperability among ICT systems is a means to the end of enabling agencies, organizations, groups of users (citizens or businesses), municipalities, regions, or even nation states to interact with each other more efficiently and effectively. The overall purpose of interoperability is to improve these organizational and societal interactions.

Research questions and approach

The key research questions for the study were as follows.

1. What should comprise a Dutch IF?
2. What factors would promote the adoption and success of a Dutch IF?
3. What should the relationship be between the Nederlandse Overheids Referentie Architectuur (NORA) and a Dutch IF?
4. What additional steps are needed to develop a Dutch IF?

In order to answer these questions, we analysed a sample of existing IFs as well as related enterprise architecture (EA) efforts, in order to identify the range of potential goals and components of an IF. Specific goals and policies for interoperability may be defined differently by different countries or by the European Union (EU). Ideally, it should be possible to derive the contents and character of an IF from an explicit set of such goals and policies. We therefore sought to identify a mapping from the goals of an IF to its composition, and we used this mapping to help develop recommendations specifying which components should comprise a Dutch IF. Adoption and success factors for existing IFs were analysed, along with key features of the Dutch social and governmental context, to produce recommendations for how a Dutch IF should be developed and governed. In order to keep our recommendations technically grounded, we also performed significant analysis of relevant eGovernment technology.

In order to choose a small but representative sample of existing IFs and related EAs for detailed analysis, we briefly examined a more comprehensive set, which we identified by a combination of literature search, web search, and input from the client. Because eGovernment IFs are still a relatively new concept, there are not yet many examples to choose from, and most of those that exist appear to be well known. A few additional IFs have been developed in the commercial world and in specific sectors such as health and education, but the total number of fully articulated IFs is still quite manageable. By means of interacting with the client and applying a few simple selection criteria, we were able to identify a small number of IFs and EAs that appeared to be relevant to the Dutch case. Our selection criteria focused on maturity, generality, and the availability and accessibility of documentation. Based on these criteria, the IFs and EAs that we chose for further analysis were:

- EU–EIF (EU–European Interoperability Framework)
- UK eGIF (eGovernment Interoperability Framework)
- Danish OIO-kataloget (Offentlig Information Online catalogue)
- Estonian EstIF (Estonian IT Interoperability Framework)

- US FEA (Federal Enterprise Architecture)
- NORA (Nederlandse Overheids Referentie Architectuur)

Despite being small, this sample provided a good mix of national, EU, and non-EU (US) efforts involving small, medium, and large countries, while combining elements of IFs and EAs. (Although several commercial and sectoral IFs were considered as well, we ultimately excluded them as being less relevant to eGovernment and providing no significant concepts or mechanisms that were not already present in our sample.)

We attempted to understand both the explicit and implicit goals and policies of each IF and which of its aspects and components were derived from which of its goals and policies. This produced:

- A set of potential goals and scope criteria for an IF
- A set of potential components, architectural features, implementation factors, and other aspects of an IF, including protocols, standards, and semantic considerations
- A set of apparent mappings from the goals and scope criteria of an IF to its components, architecture, and other aspects
- A tentative analysis of how well each IF in our sample group has been implemented and adopted, the extent to which it has achieved its goals, and which technical or implementation factors appear to have been most relevant to its adoption, success, or failure

Based on these results, we derived recommendations for what should constitute a Dutch IF and examined a number of issues surrounding interoperability in the context of eGovernment in The Netherlands, in order to recommend a strategy for developing an IF that would foster interoperability among Dutch eGovernment services and pan-European Government Services (PEGS) involving Dutch participation.

Issues surrounding interoperability

The motivations for fostering interoperability in eGovernment include reducing the cost of government, improving its cost-effectiveness, coherence, consistency, responsiveness, transparency, and accountability, and even improving democracy as a whole. However, interoperability also carries some risks and costs:

- It may compromise privacy
- It may compromise security
- It adds technical complexity to system design

Privacy and security issues can and should be addressed by implementing appropriate combinations of technical, procedural, and legal safeguards. Any residual concerns that cannot be addressed by such safeguards must be weighed against the potential of interoperability to deliver eGovernment benefits to citizens and to enable research that may have social value, for example, in the public health domain.

The added complexity and cost of designing and building interoperable systems is, to some extent, unavoidable. Furthermore, the benefits of interoperability accrue to the operators and users of a system, whereas the added costs are borne by the system's designers and implementors, who may be different parties. This leads to a "sow versus harvest" problem whose solution may require creative reimbursement or cost-sharing.

Interoperability is a “cross-cutting concern” which must be implemented pervasively if it is to be effective. Yet because it is cross-cutting, it is typically considered out of scope by individual projects or programmes, since it involves interaction with other projects or programmes that are outside the boundary of the given effort. It must therefore be motivated and governed by mechanisms that transcend normal project and programme boundaries.

In order to interoperate meaningfully, organizations must have compatible data definitions and interpretations, terminology, business processes, organizational cultures, and policies concerning privacy, access, transparency, accountability, etc. Achieving true interoperability therefore requires the alignment of these semantics across all interacting organizations and their systems. Such alignment requires each organization, sector, and community of interest to define and codify its own semantics and to establish appropriate correspondences with the semantics of any other such entities with which it interacts. This in turn requires cross-organizational, cross-sector, and cross-community interaction and negotiation. Because this process is labour intensive and involves significant intellectual effort, it requires considerable lead time and so should be started as early as possible.

Goals and components of an interoperability framework

The analysis of our sample of IFs and EAs led to the general conclusion that there is as yet insufficient experience with IFs and eGovernment to offer much empirical evidence as to the effectiveness of specific interoperability strategies in achieving specific eGovernment outcomes. It is therefore difficult to draw convincing conclusions about the relative value, impact, or success of many of these efforts, or to produce objective mappings of their goals to their content. Nevertheless, it seems useful to construct tentative mappings of this kind, however speculative, in order to suggest a rational method of determining what should comprise an IF. To do this, we analysed the functions and types of eServices that are implied by various goals and scope criteria, from which we derived the interoperability implications of creating and using such functions and eServices to achieve the desired goals. We then used these implied interoperability requirements to derive appropriate combinations of components and aspects of an IF, thereby mapping the goals and scope of an IF to its content.

Two IFs which have different goals may contain numerous elements in common, but their emphasis, focus, and overall flavour may be quite different. With this in mind, the following mappings list the most significant aspects of an IF for each of a number of distinct potential goals. A particular IF is likely to combine several of these goals, leading to a combination of aspects and components. Furthermore, because different combinations of goals may lead to different interoperability requirements, the priorities accorded to each of the included aspects and components of an IF must be decided on an individual basis.

- **Goal:** Improve cost-effectiveness and cooperation within government
 - emphasize technical standardization
 - coordinate intra-governmental semantics (ontologies, etc.)
 - coordinate ICT development across government

- **Goal:** Improve interaction with EU and other governments
 - emphasize policies for using open standards
 - emphasize cross-border inter-governmental semantics (ontologies, etc.)
- **Goal:** Improve ability to provide and support PEGS
 - emphasize user-oriented cross-border semantics (ontologies, etc.)
 - emphasize use of open standards and (possibly) open-source software
 - include PEGS-related use cases
 - include easy-to-use business process “orchestration” techniques
- **Goal:** Improve transparency/accountability/credibility of government
 - emphasize user-oriented semantics (ontologies, etc.)
 - standardize eGovernment user interfaces
 - coordinate legal/legislative policies underlying transparency/accountability
- **Goal:** Improve citizen/business interaction with government
 - include citizen- and business-oriented eGovernment use cases
 - emphasize citizen- and business-oriented services
 - emphasize sector-related portals
 - emphasize methods of presenting consistent semantics to users
 - include easy-to-use choreography/orchestration
- **Goal:** Improve private sector and personal interactions
 - encourage use of open standards and (possibly) open-source software
 - include semantics for private sector and personal interactions
 - emphasize personal and enterprise portals
- **Goal:** Improve democracy
 - encourage policy-driven business process redesign
 - emphasize functional architecture
 - establish effective policy-consistent governance

These mappings suggest that distinct combinations of goals determine distinct combinations of components and other aspects of an IF. In addition, the relative frequency of certain elements in the mappings (such as semantics) imply that these are particularly important for a wide range of goals. Despite the tentative nature of these mappings, they provide a useful point of departure for determining which components should comprise a Dutch IF, given a set of interoperability goals, which in turn must be derived from eGovernment policies.

The relationship of NORA to a Dutch interoperability framework

In order to develop appropriate recommendations for a Dutch IF, we next analysed a number of aspects of the Dutch situation, including the NORA project and various governance issues. NORA provides a reference architecture for Dutch governmental IT infrastructure. As such, it contains some principles that are helpful for achieving interoperability, and it is widely known. However, we are not convinced that it would be cost-effective to expand and transform NORA into an IF. To do so, the concern for interoperability would have to be infused pervasively throughout NORA. Moreover, NORA would have to shift its image from being “by and for architects” to appeal to a wider group of stakeholders, and its advice would have to be divided into multiple levels

so as to be more accessible and more relevant to policymakers, decisionmakers, and system implementors, as well as to architects. We therefore recommend that NORA be viewed as an architectural complement to a Dutch IF, though we note that the primary reasons for choosing this approach over the alternative are pragmatic and political rather than technical.

Governance

Analysis of existing IFs suggests that governance is a key factor in their success or failure. This implies that a Dutch IF must be endowed with an appropriate and effective governance mechanism, if it is to succeed. The governance model for an IF should encourage widespread buy-in among stakeholders, by engaging them in the process of designing the IF in the first place and in making policy choices and decisions that affect them. If stakeholders feel that they own the IF itself and have a significant role in making the choices and decisions that fall within its scope, they are much more likely to comply with its recommendations—and more importantly, to produce interoperable eGovernment systems. In this regard, the tradition of relying on consensus as the basis for decision-making in The Netherlands has some important advantages for interoperability. On the other hand, a governance model that seeks widespread buy-in at the cost of timely decision-making may sacrifice opportunities to be innovative and agile. Ideally, IF governance should be both inclusive and agile. It is important to design an IF governance model with this in mind and to support it with mechanisms and tools that can balance these two goals. In order to achieve this, we recommend that a governance model should:

- Position the IF governance body carefully
- Ensure that the governance body has appropriate resources and authority
- Aim for inclusive but lean stakeholder representation
- Ensure that representatives have both expertise and decision-making power
- Keep stakeholder interactions focused and goal-oriented
- Subdivide and delegate governance issues and decisions whenever appropriate
- Leverage stakeholder interactions and governance with innovative ICT support

The governance body should be positioned so as to maximize its ability to exert effective control over eGovernment development, while minimizing its threat to stakeholders and its susceptibility to turf wars. It should be given sufficient resources and authority to enact its decisions, including influence over budgetary allocations, where appropriate. Although the body should be inclusive, it should also be lean; that is, stakeholders should be chosen to avoid unnecessary overlap and redundancy while ensuring coverage. Stakeholder representatives should be vetted to ensure that they possess appropriate subject-matter expertise and are empowered to make decisions on behalf of the groups that they represent, and stakeholder meetings and other interactions should be kept focused on high-priority, actionable issues—perhaps by using some formal or semi-formal system of prioritizing and tracking action-items. Complex issues should be delegated to subgroups of the governance body or to auxiliary committees or working groups, in order to offload the main governance group's agenda and enable it to remain responsive. Finally, stakeholder interactions and governance in general should be leveraged by the innovative use of ICT support to reduce the need for face-to-face meetings, keep governance efforts focused on priority issues, track progress and obstacles,

and record assumptions, rationales, and decisions, in order to facilitate the governance process and enhance its transparency and accountability.

Recommendations

In light of our analysis, we recommend that a Dutch IF provide guidance at three distinct levels of eGovernment activity, which we refer to as the *Governance*, *System*, and *Implementation* levels. The IF should encourage the free flow of information in both directions among these three levels, to ensure that the upper levels are responsive to problems and concerns that arise at the lower levels.

The *Governance* level is populated by policymakers and decisionmakers who decide on the goals of eGovernment in The Netherlands, determine the kinds of eServices that should be provided and how they should interoperate, and provide top-level guidance and coordination for the lower two levels and all other stakeholders.

The *System* level is populated by system architects who determine what systems, components, data, and infrastructure are needed, and how these should be combined to provide the desired eService capabilities.

The *Implementation* level is populated by system implementors who build, compose, or acquire the actual systems, components, data, and infrastructure that are needed to produce the eServices that perform eGovernment functions—and who thereafter operate and manage those eServices. Distinct phases of the life cycle of an eService may be performed by different parties, at different levels of government or even outside the government entirely; therefore the *Implementation* level of the IF does not correspond to any specific group or level of government.

We recommend that the IF provide specific guidance for each of these three levels, as discussed in section 6.1 of this report. We further recommend that a Dutch IF contain the following components, each of which is described in section 6.2.

- Definitions
- Interoperability policies/principles
- Governance policies and model
- Compliance criteria
- Legal/legislative considerations
- Architectural advice
- Infrastructure components
- Data
- Metadata
- Semantics
- Relationships to other efforts
- Adoption or implementation advice and best practices
- Standardization policies
- Technical standards
- Process models
- Measurement and evaluation framework
- Use cases
- Road map

Of these components, semantics deserves special attention, as noted above. Although the IF can provide guidance for aligning semantics across organizational, sector, and community boundaries, the actual job of codifying and aligning those semantics will

require significant effort by the organizations, sectors, and communities themselves. This semantics effort should therefore begin as soon as possible, as reflected in Step 1 below.

The following steps constitute a simple process model that should lead to the development of an actual Dutch IF. Although Step 1 need not be performed first, it should be started as soon as possible, since interoperable eGovernment requires an appropriate semantic foundation, and the development of such a foundation is a challenging task that will require significant time. The last three steps should be performed in sequence: a governance model must be developed before it can be implemented, and an implemented governance model is the key to developing an IF that is likely to be widely accepted, and therefore successful.

Step 1: develop a strategy to ensure semantic interoperability

Step 2: develop a governance model for the IF

Step 3: implement the IF governance model

Step 4: use this governance model to develop the IF

Interoperability is a crucial aspect of eGovernment. By enabling distinct systems and organizations to work together meaningfully and transparently, it provides the foundation on which a cost-effective set of eServices can be built and combined to offer a wide range of functions and capabilities to citizens, businesses, and government organizations. Yet interoperability is not easily achieved, since it must be pervasive in order to be effective. Creating and promoting the use of an IF appears to be a good way to improve interoperability throughout eGovernment. A Dutch IF should provide guidance at three distinct levels of eGovernment activity, which we denote the *Governance*, *System*, and *Implementation* levels. As noted above, for a Dutch IF to be effective, its governance must be both inclusive and agile. An appropriate governance model of this kind should be implemented before designing a Dutch IF, and it should be used to engage stakeholders in the design process, thereby maximizing their buy-in. The specific contents and focus of the IF should be derived from a set of goals that are chosen by means of inclusive policy discussion among key stakeholders. In parallel with the development of the IF, an effort should be undertaken to codify and align semantics across government organizations at all levels, involving all sectors and communities of interest. Taken together, these measures should provide a foundation for interoperability among eServices, thereby promoting cost-effective eGovernment in The Netherlands.