

## **Strategy for OIO Architecture for e-Government 2006-10**

### **Ministry of Science, Technology and Innovation, Denmark**

OIO E-government Architecture is a cross-organizational enterprise architecture focusing on the public sector administration, service, procurement and other public sector activities.

#### **Introduction**

OIO Architecture is a new term that covers the joint public work within e-government architecture and standardization. First and foremost, OIO Architecture is a common framework, i.e. a common paradigm that contains overall principals, methods, tools, and control frameworks. Nevertheless, OIO Architecture is also — and to an ever increasing extent — the embodiment of a concrete architecture including selection of standards, reference model design, establishment of common infrastructure elements, etc.

The work within OIO Architecture is rooted in the joint public Coordinating Information Committee (KIU), as well as the OIO Enterprise Architecture Committee and the OIO Data Architecture Committee. Furthermore, a range of processes and procedures related to this work are being established, examples of these being involvement, case work, consultations, and decisions. All results that are achieved in accordance with these processes and procedures constitute at part of OIO Architecture. OIO Architecture is communicated via the OIO.dk portal.

The Coordinating Information Committee issued the 2003 White Paper on Enterprise Architecture, which pointed out the necessity of a common overall approach to transition projects. The white paper defined IT architecture as a fundamental description of one or more IT systems, including the principles for design and development of the systems, as well as for the connections between them. Nevertheless, e-government architecture is about much more than IT systems. Specialist literature defines this as Enterprise Architecture (EA). This is a specific approach to architecture that focuses on the correlation between business/administration and technical resources, considering the elements as whole entities, e.g. when looking at an enterprise or across organizations.

Through the method-driven architecture work the joint public sector can benefit from transition projects and from investing in information technology. Enterprise and IT architects will collaborate closely to join the processes and the IT support, both within and across organizations.

This document constitutes an element in the follow-up to the White Paper, and contains a description of the overall, multi-year strategy for the work involved. The purpose of this document is to clarify the ambition for the OIO Architecture to the public sector decision-makers. The document also describes the overall work plan for the centrally coordinated architecture and standardization work under the Ministry of Science, Technology and Innovation.

The strategy has its foundation in the following overall goals:

- The OIO Architecture must be the foundation for management decisions and the link between visions and solutions.
- common public collaboration and cross-cutting exchange of data.
- architectural plans of agencies and development of IT.

The OIO Architecture must be operational. Strategy for OIO Architecture describes where the public sector architecture needs to go, and sets a frame for the next five years of architecture and standardization work in the public sector. The strategy concerns both central joint-public sector initiatives that define framework for the architectural work, as well as the actual architecture work with digitalization projects in sectors, in common public projects, and in the individual agency.

### **The Need for an OIO Architecture Strategy**

#### **The Challenge**

Denmark is facing a large number of challenges in the years from 2006 to 2010. A range of societal factors are driving new initiatives, for example:

- With the ongoing and frequent changes in the framework conditions, agility in the shape of transformation readiness and adaptability is a core requirement for both private and public organizations, and the technologies they use.
- The accelerating technological development gives new possibilities, new investment needs, and increases demand for new competencies
- The sharpened international competition, including the strong pressure from low income countries, means that we must compete on non-wage parameters.
- The increasing number of senior citizens, and the decreasing number of taxpayers to finance the transfer incomes — combined with limitations in both resources and tax raises — call for higher efficiency in the public sector.
- To meet the demand for openness both in the administration and the IT solutions, digital solutions must meet a series of technical and architectural requirements, including a number of standards and legal provisions.

#### **Initiatives**

The multitude of challenges is met by a wide range of political initiatives that are critical for the future development and operation of the public sector. In addition, several projects directly influence how citizens and businesses use information technology for solving a number of tasks. Here are some examples:

- The Government's modernization program, which comprises a large number of projects
- The E-government Strategy, including e-day and a number of digitalization projects
- Sector strategies such as the strategy for the health sector
- The Danish Municipal Reform, by which authorities will be combined and tasks will be transferred
- The Globalization Initiative, which focuses on a wide range of strategic efforts.
- A large number of local development and innovation projects within the individual authorities, such as consolidation of the IT portfolio at enterprise level.

#### **Direction Markers**

OIO Architecture also has the direct task of supporting the e-government vision and direction markers that are described in the "E-government Strategy 2004-2006".

Throughout recent years, Project E-government together with initiatives such as the Government's modernization program and the Municipal Reform have introduced a shift in the paradigm for public service, communication, and administration. Meanwhile, a shift in the paradigm for the use of IT has occurred, not only in the public sector, but in society at large.

### **The e-government vision**

*Digitalization will contribute to the creation of an efficient and coherent public sector with a high quality of service in which citizens and businesses are at the centre of attention.*

### **Overall direction markers**

- Direction marker 1: The public sector must provide coherent services with the citizens and businesses as the center of attention.
- Direction marker 2: E-government must create an increased quality of service and liberate resources.
- Direction marker 3: The public sector must work and communicate digitally.
- Direction marker 4: E-government must be founded on a coherent and flexible IT infrastructure.
- Direction marker 5: Public sector management must spur the development and provide for the realization of the vision within their organizations.

The transition follows general tendencies, which are also found internationally. A rough sketch of the development shows a transition from what could be called the **silos paradigm** (stand-alone solutions), by which the individual player optimizes the one business process by means of dedicated IT solutions, to what could be called the **coherence paradigm**.

*Working towards the coherence paradigm must lead to the actual creation of coherent digital services, through which, for example, citizens and businesses will have one portal to access to all public services. Neither should they have to submit the same data over and over again, faster case-handling and immediate decision should be available, and a much higher degree of transparency should be prevalent.*

In practice, the realization of the coherence paradigm is supported by the architectural paradigm called the Service Oriented Architecture (SOA).

### **The Common Architectural Challenge**

The aim of the OIO E-government Architecture is to establish and maintain the frameworks and foundations that we need to realize the vision for E-government on the basis of the defined direction markers, and formulated strategies.

The overall recommendations of the White Paper on Enterprise Architecture\* were:

- The public sector — individual authorities and joint projects — should be more actively responsible for its own enterprise architecture.
- A common enterprise architecture framework should be established for the planning of public IT systems, especially with a view to ensuring interoperability.
- A considerable effort should be put into distributing knowledge about and developing competencies within enterprise architecture, and the joint-public sector initiatives.

The White Paper furthermore recommends that the common enterprise architecture framework, which is held to be a precondition for a successful implementation of the visions, should contain the following elements:

- Joint coordination, including the establishment of an Enterprise Architecture Committee that refers to the Coordinating Information Committee.
- Common methodology in the shape of process, terms, and specification standards for enterprise architecture.
- Common choices and principles within standards, infrastructure, etc., including a reference profile and the service oriented enterprise architecture.
- Common tools, for example in the shape of common databases and contract model libraries, process specifications, data definitions, software, and components, together with specifications of infrastructure solutions.

(\*In this context the term enterprise architecture refers to the wider scope of a cross-organizational enterprise architecture).

The specific initiatives relating to the White Paper recommendations are presented graphically in section 9 below, core joint-public sector initiatives in the adaptation phase. Example: The Government's Globalization initiative, the Government's modernization program, the Municipal Reform, and Strategy for E-government

#### **Specific architectural challenges for all public authorities**

The public authorities, companies and institutions are all faced with great challenges. Be it at the European Union level, the national common public level across central, regional and local government, or within the individual authority, and be it a Ministry, a hospital, a local administration or a cross-local government power supplier.

There are different tasks involved at different levels, internationally, nationally and locally, yet at the same time these tasks are connected.

- **Internationally / EU**  
In the years to come, the EU must provide the architectural foundation for trans-European services, which may be both citizen oriented and function as internal administration services. In other words, a consensus must be established on common principles and standards across all EU countries. The authorities of the member states must then conform to these if they wish to join the trans-European services.
- **National / cross-public sector**  
At cross-public sector level, Denmark must realize a number of national initiatives such as the Municipal Reform and the Strategy for E-government. This will, for instance, require the establishment of a multitude of common principles, standards and common solutions, and also that the relevant authorities, businesses, and citizens join in with their local solutions. Examples of this are the business portal VIRK, Nemkonto, OIOXML, electronic invoicing, and FESD. Connected to this architectural work is also the determination of rules, legislation, framework tenders, etc.
- **Locally / the individual authority**  
The individual authority or business must ensure that it can conform to the common principles and standards. In addition, they must establish a number of own principles and standards, such as a taxonomy for their own tasks, or enter into a sector collaboration to establish a common language. Or they must implement a common user control model,

consolidate the technical platform, and establish coherent documentation of their own system portfolio.

E-government requires the existence of both requirements and standards that apply within a specific sector, as well as requirements and standards that apply across multiple sectors (multi sector), and requirements and standards that apply to all sectors (general). In other words, the work involved must be coherent both vertically and horizontally.

- **Vertical collaboration between sectors**

The sector specific requirements and standards will ensure that the services, processes, and data can function across players/systems within the sector in question without any translation problems from one player/system to the other. One example could be pharmaceutical data, which is primarily related to the health sector as regards the prescription and use of pharmaceuticals.

- **Horizontal collaboration across sectors**

Multi-sector and general requirements and standards will ensure that services, processes, and data exchanges can function across sectors without translation defaulters from one sector to the other — otherwise, in worst case, the problem has simply been lifted to a higher level. In this case, the example of pharmaceutical data would mean that there may be a need for exchanging data that can also be used in other sectors, such as address details (reference data), prices (trade), account numbers (finance), etc.

The implementation of these tasks will take place in the years to follow. With their high level of complexity and their numerous correlations and interdependencies, these challenges may be compared to those of the industrialization or the development of the welfare society or similar groundbreaking societal changes. In this case, however, focus is only on the tasks, processes, language, and data of the public sector together with its use of technology.

### **Goals, strategies, and critical success factors**

As mentioned in the introduction, the overall purpose is for the OIO Architecture to be the foundation for

- management decisions and coherence between visions and solutions
- common public collaboration and cross-cutting exchange of data
- architectural plans of authorities and development of IT.

This section will describe the targets, strategies, and critical success factors within each of the three main purposes of the OIO Architecture. A critical success factor for OIO Architecture describes a *state* or *ability*, which, if it is present, will increase the probability that the strategies will succeed, and the goals will be achieved.

### **The foundation for management decisions and coherence between visions and solutions**

#### **Goals**

- *OIO Architecture must support the transformation and development of the public administration.*

#### **Strategies**

- OIO Architecture must assist the realization of the political visions and goals for which consensus has been achieved — in accordance with the subsidiary principle — in the

EU, in Parliament (Folketinget), and in the Government, or across central, regional and local government.

- Because OIO Architecture must conform with and support the strategic goals of the organizations, an explicit coordination must take place in the form of e.g. dialog, consultations, and reviews.
- The decision-making and communication procedures for working in committees and sector committees must be unified in order to establish a homogenous, efficient, and collaborative organizational framework for the OIO Architecture.
- Communication concerning architecture, including communication lines and orientations, must be streamlined and anchored in all public authorities, and among their suppliers.
- It must be monitored whether the key players and the public sector in general comply with and benefit from a joint OIO Architecture, for example through statistics, surveys, and dialog.
- Based on the common architectural methodology, requirements, and recommendations, the development projects of architectural relevance must be subject to review and approval.
- Projects that challenge the OIO Architecture must be identified, and any benefits, disadvantages, opportunities, and barriers must be uncovered, in order for the relevant decision-makers to make qualified decisions.
- Through specific tools OIO Architecture will enhance the transparency from decision to implementation.

#### **Critical success factors**

- The OIO Architecture is widely backed by the stakeholders.
- The relevant sections of the architecture, such as the principles, are formulated and communicated in a language that the top management of all authorities understands.
- The application area of the present and the desired OIO Architecture is well defined.
- A metric exists that "measures" the progress.
- A well-defined set of rules and processes exists that can verify whether projects comply with the OIO Architecture.

#### **Foundation for the common public collaboration and cross-cutting exchange of data**

##### **Goals**

- *OIO Architecture must support coherence across administrative borders.*

##### **Strategies**

- Common, cross-functional OIO Architecture projects must be initiated in order to link the existing with the desired architecture.
- The OIO Architecture work must focus on supporting interoperability. Hence, focus must be on common standards for processes, data, and technology, as well as common infrastructure elements.

- The choice of architecture must be as close to the general and international standards, and must be supported by the industry.
- The relevant architecture choices must be submitted to international forums for quality assurance, and a possible international adoption of the Danish choices and procedures.
- OIO Architecture choices should be developed in dialogue with the industry, which should be able to contribute, both to the OIO Architecture, and by developing and adjust products for the OIO Architecture. In the long term, this will ensure the development of a larger number of products that conform to the OIO Architecture.
- Results, decisions, standards, and documentation must be available via the OIO portal.

#### **Critical success factors**

- The OIO Architecture will be developed as a cross-public sector "project" in which everybody will contribute to a common pool of documented architecture.
- The authorities and players responsible within the individual sectors take responsibility over the development and establishment of consensus about the use of the relevant standards that are specific for a given sector, i.e. by establishing sector committees.
- The authorities and players within given sector areas take the responsibility for coordinating their work with comparable players within other sectors, thus ensuring the coherence of architecture and standards across sectors where this is relevant.
- OIO Architecture is easily accessible for all who wish to use it, among other places, and especially, through the OIO portal and OIO architecture tools.

#### **The foundation for authorities' architectural plans and IT development.**

##### **Goals**

- *OIO Architecture must consist of a common core architecture, which is identified, documented, consistent, updated, communicated, and used.*

##### **Strategies**

- The OIO Architecture must be designed to be operational and actually usable.
- OIO Architecture must guide and document strategy and technology choices.
- OIO Architecture must be mapped to competency requirements, and thus contribute to the competency management within all public authorities.
- Technologies and the systems and the project portfolio of the public sector must be monitored in order to ensure that sensible decisions are made when acquiring and replacing technologies and systems.
- OIO Architecture must support the technological aspects of the architecture, including systems components, platforms, performance, and security.
- Standards, policies, and guidelines from the OIO Architecture must be part of the standard contracts with external suppliers.

### **Critical success factors**

- OIO Architecture is developed according to known and common principles under a common methodology.
- All stakeholders are able to access and understand the documentation and guidelines that are required to use the OIO Architecture.
- Stakeholders can easily provide documentation for the OIO Architecture.
- Stakeholders can easily submit change proposals for the OIO Architecture.
- The OIO Architecture is documented and maintained in formal EA tools / libraries.

### **Roadmap**

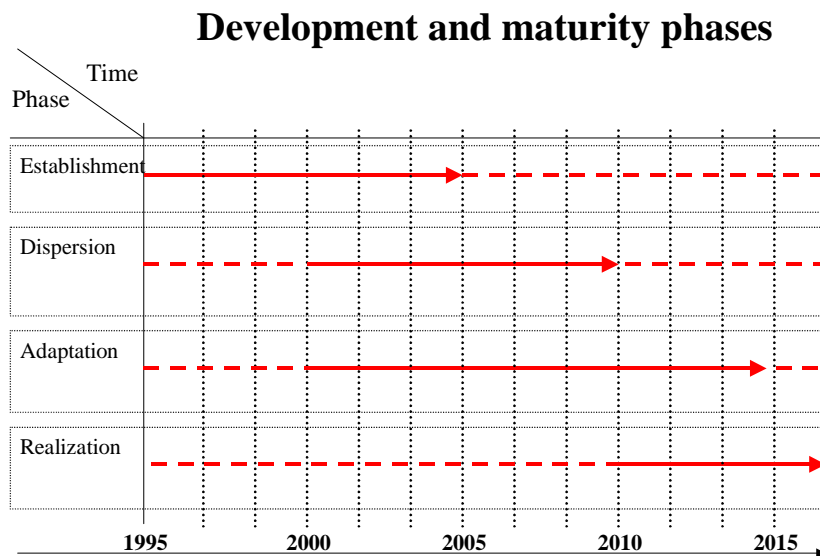
#### **The transformation process**

The visions for a coherent and flexible architecture must be fulfilled in a continuous process over many years to come. *The road to e-government* with a coherent architecture may, in very broad terms, be seen as four more or less overlapping phases of development and maturity pertaining to the application of new internet-related technologies (years in parentheses are periods in which activities and effects related to the properties of the phase are expected to be particularly significant):

- **Establishment phase (1995-2005)**  
The need for coherent public information and services enters the agenda, the internet and related technologies are used as a supplement to the existing IT, stimulation of the widespread use of broadband, supporting software for development and building of knowledge, businesses and institutions enter the internet, establishment of the terms and language of the information society regarding IT.
- **Dispersion phase (2000-2010)**  
IT enters all services, processes, and decisions, IT affects all parts of society through various platforms. Architecture for e-government enters the political agenda as part of large modernization and transition initiatives, which focus on accessibility and inclusion (IT for All). A significant build-up of new IT-related competencies occurs in the public sector authorities and businesses, including various architectural competencies.
- **Adaptation phase (2000-2015)**  
The work of reorganizing the organization and the technologies according to known methods and measurable goals is widespread, integration of services across authorities, consolidation of e-services on fewer portals. Major changes are implemented in the public sector, and, simultaneously, the private sector adapts to the new conditions of the information society.
- **Realization phase 2010-2020**  
The processes of the information society are exploited continuously within the frameworks and guidelines that have been established in the previous phases. The architecture and the applied standards are continuously developed and maintained.

Nevertheless, it is important to note that the realization phase should be viewed as a phase in which dispersion and maturity have reached a certain level. Most initiatives are effective and, hence, continuously provide achievement of goals. Accordingly, it is **not** the entire architecture and all standards that must be in place and implemented everywhere, before realization and effect have been achieved. The realization phase embodies the presumption that a large-scale collective transformation has taken place in core areas.

The four phases are presented graphically in the below figure:

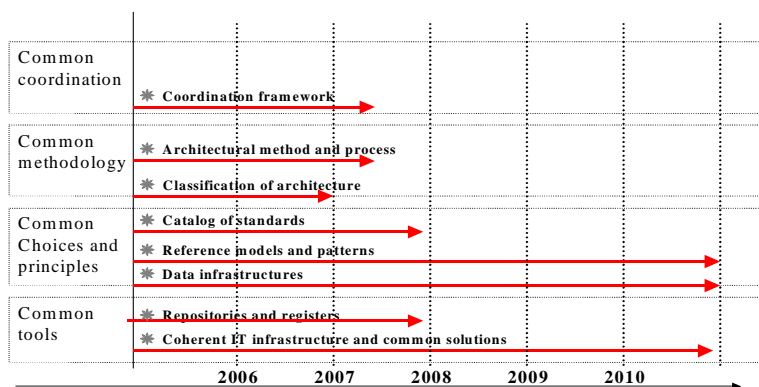


This strategy for OIO Architecture for e-government relates to the time period 2006-2010. In this time span, the architecture work will to a larger extent become organized, concretized, put into practice, and — as a result — begin to show results.

#### Development and dispersion of OIO Architecture

The figure below illustrates a roadmap of the core initiatives of the OIO Architecture work. The overview is divided into four areas which are covered by the White Paper recommendations for the establishment of a common architectural framework. The figure below illustrates a roadmap of the core initiatives of the OIO Architecture work. The overview is divided into four areas that are covered by the White Paper recommendations for the establishment of a common architectural framework.

#### Roadmap for the development and dispersion of OIO Architecture 2006-2010



### **Overview of central OIO Architecture initiatives**

The below overview lists a number of core initiatives that should be realized in the period 2006-2010 as part of the joint public architecture work. The initiatives are distributed according to their support of the recommendations of the White Paper on Enterprise Architecture.

#### **Main recommendation 1: Take active responsibility for own architecture**

1. IT strategies (in progress)
2. Surveys / statistics (in progress)

#### **Main recommendation 2: Common IT architecture framework**

##### **White Paper recommendation 1: Joint coordination**

###### Organization and process

3. Overall coordination (in progress)
4. Coordination of EA/IT architecture competencies (in progress)
5. Coordination of data architecture competencies (in progress)
6. Coordination of sector architectures (in progress)

###### Governance and incentives

7. Incentive catalogue (in progress)
8. Standard contracts and requirement specifications (in progress)
9. Rule development within legislation etc. (ad hoc)
10. Project review (ad hoc)
11. Socio-economic aspects (in progress)
12. Cost-benefit analyses (ad hoc)
13. Economic issues related to open source and open standards (in progress)

##### White Paper recommendation 2: Common methodology

###### Common methodology

14. Architectural method (in progress)
15. Data architectural method (in progress)
16. Architectural framework (classification/terminology) (in progress)

##### White Paper recommendation 3: Common choices and principles

###### Standards

17. Common catalog of standards (in progress)
18. Decision and review support (in progress)

###### Reference models and patterns

19. Reference models for ESDH systems (FESD) (in progress)
20. Reference model for public portals (in progress)
21. Reference model for citizen oriented services (in progress)

- 22. Reference model for Service Oriented Architecture - the SOA initiative (in progress)
- 23. Reference model for web services (in progress)
- 24. Reference model for user control (in progress)

Coherent data infrastructure

- 25. Data architecture: Cross-public sector definitions of concepts and data (in progress)
- 26. e-Business framework (in progress)

Coherent IT infrastructure and common solutions

- 27. Common user administration services (in progress)
- 28. Common workflow broker (not initiated)
- 29. Common format brokers (in progress)

White Paper recommendation 4: Common tools

Common tools

- 30. Architecture library (Architecture documents) (in progress)
- 31. Component library (Software) (in progress)
- 32. Infrastructure base/XML repository (XML schema) (in progress)
- 33. Infrastructure base/UDDI (Web services) (in progress)
- 34. Database access (public databases/data registers) (in progress)

Main recommendation 3: Spread knowledge and develop competencies

Communication

- 35. OIO.dk (in progress)
- 36. OIO newsletter (in progress)

Dialogue forums

- 37. OIO Forum for architecture (in progress)
- 38. OIO Forum for data architecture (in progress)
- 39. Network of researchers (in progress)

Knowledge centers

- 40. Software (in progress)
- 41. Accessibility (in progress)
- 42. User-friendliness (in progress)

Competency development

- 43. University courses (in progress)
- 44. e-Learning (not initiated)
- 45. Certification (not initiated)

(Note: For further information please contact the author Michael Bang Kjeldgaard, mbk@itst.dk)

## **Annex A: Definition of OIO Architecture**

OIO E-government Architecture is a cross-organizational enterprise architecture focusing on the public sector administration, service, procurement and other public sector activities.

OIO Architecture is a new term that covers the joint public work within e-government architecture and standardization.

In order for us to collaborate across administrative and professional borders between authorities, suppliers, sectors, etc., we need a common understanding of what is meant by OIO Architecture.

First and foremost, OIO Architecture is a common framework — i.e. a common paradigm that contains overall principles, methods, guidelines, tools, and control frameworks — which is documented.

Nevertheless, OIO Architecture is also — and to an ever-increasing extent — the embodiment of a concrete architecture including selection of standards, reference model design, establishment of common infrastructure elements, etc. When documentation takes place at this level, OIO Architecture is a description of the central and common elements that constitute e-government and e-business.

OIO Architecture has a wider scope than traditional IT or systems architectures. In many ways, OIO Architecture corresponds to Enterprise Architecture (EA), which is an approach that typically focuses on the perspective of a collective enterprise, and takes its offset in business development and IT support of the business. OIO Architecture can also in many ways be compared to, what in the US is referred to as Federal Enterprise Architecture (FEA), which emphasizes an approach that goes across the different departments and agencies at the Federal level. In this context, what is particular about OIO Architecture is certainly that it is cross-public sector and comprises central, regional, and local government.

OIO Architecture can be defined by five mutually complementary definitions of e-government architecture, which introduce significant aspects of the purpose of OIO Architecture, delimitation, framework, dynamics, basic properties, and rationality.

**Business & administration:**

*”the process and documentation driven by the needs of the business and the administration, and whose purpose it is to ensure that the organization's use of IT optimally supports the needs within the business and the administration”.*

**Purpose and prerequisites:**

*”a description of process, data, and technology standards, guidelines, and components, including services, applications, and infrastructure elements, that are necessary prerequisites for realizing visions and specific objectives related to e-government and the development of the public business”.*

**Anchoring and cooperation:**

*”the common principles and guidelines for central, regional, and local government that are agreed in a common process in order to use IT coherently and efficiently, and hence offer the citizens and the business community better services, and facilitate administration.”*

Communication and change:

"the communicated description and documentation of the present and the desired future relationship between the business and the supporting technology."

Reasonability and functionality:

*"a description of the most appropriate organization of one or more IT systems, including the principles for the design, development, and mutual relationship of these systems."*