The digitally coherent public sector

White Paper on a common public-sector digital architecture

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A common public-sector digital architecture

Citizens and businesses shall experience that treatment and service that involves different parts of the public sector is delivered more coherently than it is today. The government, together with the municipalities and the regions has agreed on a Digital Strategy for 2016-2020, which sets ambitious goals for continued digitisation of the Danish public sector. Goals which are to support coherence in the public-sector service delivery to citizens and businesses.

Therefore, as part of the Digital Strategy 2016-2020, local, regional and central governments have agreed to establish a common public-sector architecture to facilitate secure and efficient data sharing and processes across public organisations.

The vision for the common public-sector digital architecture is:

> **The digitally coherent public sector**
> The common architecture for digitisation must ensure secure cross-organisational processes and efficient sharing of data across the public sector and between the public and private sectors.
>
> The goal is that citizens and businesses experience services that are efficient, coherent, transparent and targeted at the individuals' needs, and also provide good conditions for innovation, growth and development in society.

The vision translates into eight architecture principles:

1. Architecture is managed at the proper level in accordance with the common framework
2. Architecture promotes coherence, innovation and efficiency
3. Architecture and regulation support each other
4. Security, privacy and confidence is ensured
5. Processes are optimized cross-organisationally
6. Good data are shared and reused
7. IT solutions collaborate effectively
8. Data and services are supplied reliably

The principles are concretised through architecture rules, which are to be used by projects in order to design digital solutions which create coherence across the public sector for citizens and businesses. The architecture rules are operationalised by common methods and language for the architectural work, as well as by common reference architecture and building blocks, standards and requirements for common solutions.

The common architecture will first be used in connection with the 33 initiatives in the Digital Strategy 2016-2020.

The Government, Local Government Denmark and Danish Regions have agreed to discuss whether to use the common public-sector digital architecture more widely in the public sector at a later point in time.

Digital coherence

The Danish public sector is becoming increasingly digital; data, IT systems, robots and apps help citizens, businesses and public-sector employees perform tasks. Digitisation and use of new technologies are two of the most important instruments to improve public services and make them run more smoothly to the benefit of citizens and businesses.

Today, IT systems have been established in almost every field in the public sector. The central government relies on more than 4000 different IT systems, and local and regional governments rely on a corresponding number. Moreover, the public sector has worked together to establish a digital infrastructure that includes systems such as NemID (an eID solution), Digital Post (a digital mailbox for messages and communications from public authorities) and Borger.dk.

In collaboration with the local and regional governments, the Government has set ambitious goals for continued digitisation of the Danish public sector in the Digital Strategy 2016-2020. A key challenge will be to use digitisation to create stronger coherence in public-sector services. Citizens and businesses should experience more coherence when they are treated or receive services across several public organisations. The same data should not have to be collected repeatedly, as this is a costly and cumbersome process. The public organisations should be able to draw on each other's knowledge and to work together to the benefit of citizens and businesses.

To achieve this goal, we are faced with an enormous challenge due to the way in which IT systems in the public sector have been designed and developed over the years. The many thousands of public-sector IT systems do not speak a common language, and there is no common public-sector plan for how IT systems can exchange data and participate in coherent processes securely, efficiently and effectively. Agreements have been made on how to share data for each single system, resulting in 'spaghetti integrations', which were expensive to develop and that are now proving even more expensive and challenging to maintain.

Therefore, as part of the Digital Strategy 2016-2020, the local, regional and central governments have agreed: to establish a common architecture to facilitate safe and efficient data sharing and processes across public organisations.

The purpose of the common architecture is to support digital coherence in the public sector at several levels between central, regional and local governments. Across different sectors, for example healthcare, social services, education and the labour market; between the public sector and the private sector; and across borders, not least with regard to the EU and the digital European single market.

This common digital architecture includes a common framework for the architecture of the projects, including governance with fora, mandates and processes for the common architecture work, common architecture rules, as well as a framework for documentation of architecture in projects and quality assurance through review.

The common digital architecture also includes a framework architecture that comprises a number of reference architectures. These reference architectures define reusable architecture building blocks that projects should take into consideration.

Thus, the common architecture defines the overall framework for development of the digitally coherent public sector. We are in for a long haul which over the coming years will require significant effort with regard to collaboration and coordination in the public sector. However, Danish citizens and businesses stand to benefit immensely from this effort.

Looking forward

The focus of this White Paper is the sharing of data and cross-organisational processes, and thus also the challenges related to secure, transparent and safe handling of data.

Sensors, drones, robots, self-driving cars, artificial intelligence, smart machines, language recognition and the Internet of Things (IoT) - the high-paced evolution of technological development is set to continue, and many new types of digital solutions will become an integral part of the daily life of the public sector in the future.

The common architecture that is defined in this White Paper does not, and cannot, take all of these developments into consideration. However, the common architecture will provide public organisations with a stronger and more robust starting point for introducing new technologies.

The present White Paper will be updated at a later point in time with a view to gathering experience and including new focus areas.

You can follow the development of the common architecture at http://arkitektur.digst.dk (in Danish)

Vision and principles for a common architecture

The first white paper on IT architecture was published by the Ministry of Science, Innovation and Higher Education in 2003. The message then was that the public sector should take on greater responsibility for the IT architecture, that a common public-sector framework for architecture focussing on interoperability be established, and that the public sector establish stronger competences within the areas of business and IT architecture.

In the time that has passed since the first white paper was published in 2003, digital technologies and how they are applied in society as a whole have undergone tremendous development. A digital revolution has taken place in the public sector, so to speak. At the same time, the public sector has matured with regard to its use and collaboration regarding digitisation.

For citizens and businesses, digitisation has truly set its mark on everyday life, and the expectations with regard to public-sector proactive use of data and cross-organisational processes in the public sector, is ever-increasing.

The digitally coherent public sector

The Digital Strategy 2016-2020, agreed on by the local, regional and central governments, sets three ambitious goals for the development of a more digital public sector in years to come.

- Digital solutions must be easy-to-use, quick and ensure high quality
- Public sector digitisation must provide good conditions for growth
- Security and trust must be in focus at all times

In order to be able to realise these goals, it is important to create greater coherence between processes and increase reuse of data. This can be done by more common management of the architecture on which digital solutions are based.

Consequently, the Digital Strategy is supported by a vision for a common public-sector digital architecture that will promote digital coherence in the public sector:

> **Architecture vision: The digitally coherent public sector**
> The common architecture for digitisation must ensure secure cross-organisational processes and efficient sharing of data across the public sector and between the public and private sectors.
>
> The goal is that citizens and businesses experience services that are efficient, coherent, transparent and targeted at the individuals' needs, and also provide good conditions for innovation, growth and development in society.

This vision is ambitious and points far into the future - and there are sure to be many bumps on the way to achieving the goal. Having said that, Denmark has a good starting point for realising this vision to achieve a digitally coherent public sector that will benefit citizens and businesses. Denmark is one of the most digital nations in the world, and the Danish public sector is often mentioned in discussions about creating value through digitisation. Denmark has world class public-sector data that includes, for example, high-quality, coherent basic data. And the Danish public sector has worked closely together for many years on the digital transformation of their services.

The individual citizen also has great confidence in the public sector. In an ever-more digital, automated and data-reliant public sector, it is vital to maintain and increase this confidence. Therefore, the common architecture helps organisations improve their data management, and provides citizens and businesses with an overview of what data the public organisations hold.

Architecture principles for digital coherence

When several actors with different projects need to work together to facilitate coherent digitisation of the public sector, a set of common architecture principles is required to manage the process.

These principles should ensure that the vision is materialised and that architecture decisions are based on conscious choices. However, the principles are not set in stone and should be assessed in connection with each specific task.

Principle 1: Architecture is managed at the proper level in accordance with the common framework

The architecture for a given solution may determine how a task is performed, and therefore it is important that decisions concerning the architecture are made as close to the citizen or business as possible. However, this should always be balanced with the fact that some decisions regarding architecture are best dealt with at a higher, common level, to ensure coherence and reuse across organisations and domains. A common framework for documentation and review of architecture is used to advance this coherence.

Principle 2: Architecture promotes coherence, innovation and efficiency

The architecture is used to promote and balance considerations regarding coherence, efficiency and innovation in the interplay between citizens, businesses and the public sector - both in the long and short terms. This is why digitisation projects should develop their architecture on the basis of the common public-sector architecture framework and reference architecture and use open standards that are non-binding with regard to suppliers and proprietorial technologies.

Principle 3: Architecture and regulation support each other

Project architecture deliverables help ensure compliance with relevant legislation and other regulation. In turn, the architecture should help ensure that new

legislation and other regulation is ready for digitisation. This can be achieved by identifying complex rules in legislation or by establishing common concepts and by helping ensure a shared understanding of these concepts across legislation.

Principle 4: Security, privacy and trust is ensured
Citizens and businesses must be confident that information used in a digital solution will be processed safely and in accordance with current legislation. This is achieved by incorporating, information security and protection of privacy by design in the solution.

Principle 5: Processes are optimized cross- organisationally
Digital solutions are designed with citizens and businesses in the centre so that they experience coherent service delivery processes across the public sector. Cross-organisational processes are optimised on the basis of common goals for coherent, efficient and value-adding workflows.

Principle 6: Good data is shared and reused
Data is a resource that, through sharing and reuse, is used to add value for citizens and businesses and to establish coherence in the public sector. Concepts and data are described uniformly, so they can be reused and sufficient quality of the data.

Principle 7: IT solutions collaborate effectively
Digital solutions are designed in such a way that they can contribute to a well-functioning interplay with the digital systems of other organisations. To ensure that this interplay is both efficient and secure, common integration patterns, security standards and protocols for the exchange of data are used.

Principle 8: Data and services are supplied reliably
In the digitally coherent public sector, authorities, citizens and businesses need to be able to rely on data and IT services being available when they need them. Using data and services made available by other parties should be secure and efficient. For this reason, the underlying infrastructure must meet the service level agreements.

Managing data and a good data basis

The vision and principles focus specifically on sharing data and good management of data as key tools for creating digital coherence in the public sector. Private-sector enterprises that work with targeted digitisation efforts share this strong focus on data.

Because data is so important for how a task is performed, public organisations need to be able to manage data in a completely new way. Not only regarding data security but also regarding data as an asset that determines how the public sector can develop good services and increase their efficiency. Considerable sums and man-hours are invested in developing and maintaining this asset.

The quality of a public organisation's or a sector's data basis is increasingly decisive for how well and appropriately a task can be performed, both by the public organisations internally and in cross-organisational processes. Similarly, an incomplete data basis leads to poor service, errors and additional costs. For many public organisations, establishing a good and coherent data basis is a step in the right direction to becoming more data-mature.

From plan to reality

The vision and the eight principles are a corner stone in the overall plan for the next years' development of the digitally coherent public sector. An analogy can be made to the way that a city plan serves as an overall plan for the development of a city and must take into consideration how to meet the needs of citizens and businesses.

The overall architecture plan results in a series of guidelines, reference architectures, technical standards and IT components. Remaining within the city plan analogy, these can be seen as district plans that specify the different parts of the overall plan. The most important elements are expected to be ready in the course of 2017 and 2018.

The initiatives in the Digital Strategy 2016-2020 must be based on the common architecture, which will be implemented gradually towards 2020.

Areas of the public sector that fall beyond the scope of the Digital Strategy 2016-2020 are not obligated to use the common architecture in this White Paper, however, it may be relevant and appropriate for them to do so anyway. If they do choose to use the common architecture, they should also introduce it gradually when revising existing systems or when developing new systems.

Management of the common architecture

The common architecture must be managed in a collaboration involving all actors in the public sector. Management in this context is about having a common vision and principles but also operational management and the actual coordination of numerous practical issues are equally important. Digital coherence requires a combination of both the big and small pieces of the puzzle.

As part of the common public-sector digital architecture, a common public-sector management system will be established comprising the following elements:

- **Governance** Fora, mandates and processes for common architecture work
- **Rules:** Architecture rules to be used in digitisation projects
- **Documentation:** Common framework for documenting the architecture
- **Review:** Requirements regarding review of the architecture for quality assurance purposes
- **Common public-sector framework architecture:** Reference architecture and reusable building blocks, etc.

Governance for the common architecture

Determining the architecture is a management responsibility, and therefore it must be clear who (individual or forum) has the mandate to determine, approve or reject an architecture.

Under the Digital Strategy 2016-2020, the steering committee for data and architecture is responsible for the common digital architecture. The steering committee for data and architecture will take on this responsibility, referring to the portfolio steering committee for the Digital Strategy 2016-2020, who in turn will refer to the parties responsible for the Digital Strategy 2016-2020: the Danish Government, Local Government Denmark and Danish Regions.

The steering committee for data and architecture has the following tasks under the Digital Strategy:

- Determining and delivering a common architecture for the initiatives in the Digital Strategy 2016-2020, more specifically this White Paper and the affiliated reference architectures, specifications, standards, etc.
- Ensuring use of the common digital architecture across the entire Digital Strategy taking into consideration the business case of each initiative, including reviewing the architecture in the initiatives in the Digital Strategy.

The common public-sector digital architecture *must* be used in the initiatives in the Digital Strategy 2016-2020 and *can* be used by public organisations and other digitisation projects in general.

In cases where public organisations that are not covered by the Digital Strategy 2016-2020 use the common public-sector digital architecture, the steering committee for data and architecture is therefore not the competent management forum; instead, another forum designated by the authority in question should take on this role.

Assisted by the secretariat in the Agency for Digitisation, the steering committee for data and architecture is responsible for maintaining the common architecture. This includes securing the required framework and agreements for maintenance of the individual elements. Moreover, the secretariat is responsible for tasks concerning communication, overview of the common public-sector architecture framework, competence development, sharing of knowledge and exchanging experiences with the common architecture, and advising the initiatives in the Digital Strategy 2016-2020.

Common documentation framework

Central to the common public-sector digital architecture is the requirement for documentation of the architecture of the projects. Needless to say, it is much easier to collaborate and to "make the pieces fit together", when the architecture has been described using the same methodology.

The documentation framework establishes pragmatic requirements with regard to documenting the projects to ensure that documentation provides value for the community and for the individual project. This implies a focus on a simple documentation framework, providing the necessary project architecture oversight without increasing expenses necessary for writing, documentation with regards to i.e. tenders, and that requirements regarding future maintenance can be limited to the most urgent needs.

The common documentation framework supports, among other things, quality assurance through review and reuse of architecture products. Using the common documentation framework facilitates the use of a common language between business and IT architects in the public sector, and it facilitates targeted competence development for public-sector enterprise and solution architects.

The common documentation is developed based on public-sector experience with valuable documentation and added best practice from international and well-tested methods and architecture frameworks. The documentation framework is designed to take into account that there is a large number of considerations in architecture in order to create secure and efficient cross-organisational digitisation and data

Review of architecture

A central element in the common management framework is a model and process for architecture reviews.

Architecture reviews of projects under initiatives in the Digital Strategy must:

- ensure that the projects focus specifically on increased digital coherence in the public sector
- ensure that projects use and benefit from common public-sector building blocks, e.g. standards or common infrastructure
- identify any needs for using or adapting existing workflows, data and IT systems at the individual organisation
- identify any needs from projects to establish new or adapt existing common public-sector building blocks
- help projects deal with barriers, increase collaboration and support the reuse of workflows, data and IT systems across organisations.

Under the Digital Strategy 2016-2020, cross-institutional review groups conduct reviews, and the steering committee for data and architecture is authorised to approve architecture reports from initiatives under the Digital Strategy 2016-2020.

The specific reviews and approval of these reviews should be based on pragmatic considerations. There may be reasonable time-related, financial and functional reasons for deviating from the guidelines, principles and standards, and such reasons should be taken into account.

A common public-sector framework architecture

Based on the principles and architecture rules in this White Paper, a common public-sector framework architecture for secure sharing of data and cross-cutting processes will be established.

The common public-sector framework architecture will serve as an overview of, and guideline for, the sub-elements on which development of solutions are to be based, e.g. reference architectures and building blocks.

The common public-sector framework architecture will build on similar previous work, including the previous common public-sector collaboration on architecture and standards (OIO), the architecture of the Basic Data Programme, the common architecture for the health sector, the common framework architecture for local governments, and the European Interoperability Reference Architecture (EIRA).

Common architecture rules

The architecture rules describe the principles in more detail and serve as practical and operational rules to be used in digitisation projects.

Use of the rules should be pragmatic and based on common sense. Deviations from the rules should be documented as part of architecture reviews.

Principle 1: Architecture is managed at the proper level in accordance with the common frameworks (management) AR 1.1: Manage the architecture at the proper levels and manage coherently AR 1.2: Optimise the architecture according to both project and common objectives AR 1.3: Use the common documentation framework to describe the architecture AR 1.4: Make sure the project architecture is reviewed AR 1.5: Ensure sufficient skills for architecture work
Principle 2: Architecture promotes coherence, innovation and efficiency (strategy) AR 2.1: Use and expand the common public-sector architecture AR 2.2: Use open and international standards AR 2.3: Avoid dependencies on suppliers and proprietorial technologies AR 2.4: Build ready-for-change and with the user as the starting point AR 2.5: Make data and solutions available to the private sector
Principle 3: Architecture and regulation support each other (legal) AR 3.1: Take legal obligations into account with regards to sharing and reusing data and IT systems AR 3.2: Contribute to digitisation-ready legislation
Principle 4: Security, privacy and trust is ensured (security) AR 4.1: Meet requirements for information security and protection of privacy AR 4.2: Use common architecture for information security
Principle 5: Processes are optimized cross-orginisationally (tasks) AR 5.1: Design coherent user journeys AR 5.2: Optimise cross-organisational processes according to common goals
Principle 6: Good data is shared and reused (information) AR 6.1: Share and reuse data AR 6.2: Use common rules to document data AR 6.3: Give data the quality requested AR 6.4: Display information on data sources, definitions and data models
Principle 7: IT solutions collaborate effectively (application) AR 7.1: Design and display interfaces according to common integration patterns and technical standards
Principle 8: Data and services are supplied reliably (infrastructure) AR 8.1: Supply data and services in accordance with agreed service goals

Principle 1: Architecture is managed at the proper level in accordance with the common frameworks

Developing architecture is a management task with implications for costs and returns. Therefore, it is vital that digital projects embrace this management task.

AR 1.1: Manage the architecture at the proper levels and manage coherently

Architecture is established as locally and as close to the task as possible, i.e. at the individual organisations or domains. Where there are common objectives and needs, the architecture is designed to connect these. This involves collaboration and agreements across domains and decision levels.

This means that:

- Responsibility for project-architecture deliverables should be anchored in the project steering committee and project management.
- Projects identify early on, the elements in the project that place demands on interoperability and cross-organisational architecture. For example, cross-cutting processes, data sharing or common components.
- The parts of the architecture forming the basis for cross-organisational cooperation, is agreed on with the relevant parties. For example, this could be a common logic data model to which the domains and actors involved can map their own physical data models without having to change their internal data models.
- Management of cross-organisational architecture respects the use of domain-specific languages, data models and standards where necessary.
- The common architecture is specialised and profiled where necessary and where this yields additional value. However, it should be ensured that this does not conflict with the overall need for cross-organisational interoperability.

AR 1.2: Optimise the architecture according to both project goals and common objectives

The project-architecture deliverables are not only optimised with regard to the project's own objectives; the strategic goals of coherence and efficiency centred on citizens and businesses are also considered. Projects should therefore contribute to the development of an ever-more digitally coherent public sector that shares data and has an increasingly coherent IT landscape.

This means that:

- If there is any conflict between project needs and the requirements of the common architecture, the project should document this with arguments explaining why the project has not met cross-organisational considerations and the common architecture.

- If there is a financing problem following a situation where one actor makes

the investment and another actor benefits, the issue should be escalated for processing at a higher level.

AR 1.3: Use the common documentation framework to describe the architecture

Projects deliver according to the common public-sector documentation framework that identifies requirements for architecture descriptions to be included in project management and used for reviews of the architecture. This makes it easier to manage, analyse, review, approve and use documentation across actors.

This means that:

- Projects deliver architecture documentation in accordance with the common public-sector documentation framework for quality assurance, dialogue with stakeholders, architecture and project review, and public hearings.
- Projects should display and share architecture documentation so that others can access it and reuse relevant parts.

AR 1.4: Make sure the project architecture is reviewed

The architecture is quality-assured according to the common public-sector framework for architecture review that describes processes, roles, responsibilities and formats for review, reporting and decisions.

This means that:

- It is clarified early on whether and when a project is to be subject to an architecture review. In order to avoid set-backs, the review should be as early as the idea and analysis phase. There may also be a review in later phases as required.
- Projects deliver agreed documentation as the basis for the review. The point of departure in this context will be the common documentation framework.
- The project steering committee addresses the review report and its recommendations.

AR 1.5: Ensure sufficient skills for architecture work

The ability to work with architecture is considered as part of the maturity of an organisation in line with the ability to manage projects, supplier relations and operations.

Therefore, digitisation projects are staffed with resources with sufficient skills and knowledge to ensure that the architecture products have the necessary quality.

This means that:

- Projects plan which products require specialist architecture skills, when

they are to be produced, and who is to produce them.
- Project owners ensure that they have access to the required resources, with the required architecture skills available at the right time in the course of the project.

Principle 2: Architecture promotes coherence, innovation and efficiency

The architecture design of a solution can have implications for task performance far into the future. Therefore, long-term coherence should be incorporated from the start.

AR 2.1: Use and expand the common public-sector architecture

Digitisation projects utilise the common public-sector framework architecture and associated reference architecture, building blocks and specifications in order to promote coherence, innovation and efficiency.

This means that:

- In designing their business and IT architecture, projects departs in the common public-sector framework architecture, including the relevant reference architectures and building blocks as well as the common public-sector technical standards and infrastructure components such as NemID/MitID and NemLog-in.
- Projects responsible for development and realisation of parts of the common public-sector framework architecture, e.g. a reference architecture, a standard or a technical component, help ensure that there is a plan and responsibility for future management, operation and maintenance.

AR 2.2: Use open and international standards

As far as possible, public digital solutions build on international specifications and standards that correspond to the specific needs and which are open, widespread internationally and have secure maintenance.

By building on international standards and specifications, Denmark reap the benefits from international work already completed; work that often requires extensive resources. If international standards and specifications are open and mature, it will be more likely that there are several suppliers and products and thereby more competition, innovation and lower prices. Using international standards, including in particular common European standards, increases the opportunities for international interoperability.

This means that:

- Open, international standards and specifications is used where possible. This requires a specific assessment.

- Where necessary, Danish profiles are developed based on international standards and specifications. Where relevant, standards are translated into Danish.

AR 2.3: Avoid dependencies on suppliers and proprietorial technologies

As far as possible, public organisations should avoid technical solutions that bind them to specific suppliers and to proprietary technologies and products. This supports market competition and following solutions that are innovative, cheap and flexible, utilising standard solutions and modules from several suppliers based on open interfaces.

This means that:

- In connection with new acquisitions and further development of IT solutions, projects use open, widespread standards that are independent of specific suppliers, technologies or products.
- Where relevant, sustainable, open source components is used.
- Contractual and technical frameworks ensure the possibility to later change to another supplier. This includes documenting data and ensuring that it can be extracted from the IT solution.

AR 2.4: Build ready-for-change and with the user as the starting point

Public-sector digitisation should add value and create space for innovation and efficiency improvements. Therefore, solution development is organised to create optimal opportunities for new solutions for specific needs and to adapt and replace solutions when business and user needs change or when new technological possibilities present itself.

This means that:

- Users are involved from the start and during all development and testing of new solutions.
- Solutions are developed iteratively where relevant and possible, in accordance with agile methods so that it is possible to continuously learn, prioritise and adjust as the needs arise.
- New solutions should be divided when possible into smaller modules with interfaces based on open standards so that the individual module can easily be replaced.

AR 2.5: Make data and solutions available to the private sector

Public-sector data and IT services are assets which create value for society and beyond the public sector. Therefore, this data should be made available for private actors where relevant and possible.

This means that:

- Projects consider early on whether there are opportunities to make data, IT services and components available to the private sector.
- If it is decided to share data, IT services or components, a plan to manage any financial, organisational, legal or technical barriers is addressed.

Principle 3: Architecture and regulation support each other

Architecture help ensure compliance with relevant legislation and other regulation, and that legislation is challenged and made ready for digital solutions.

AR 3.1: Take legal obligations into account with regards to sharing and reusing data and IT systems

Work on architecture ensures compliance with regulations, identifies issues regarding legally binding agreements for cross-organisational processes, data sharing and reuse of IT systems, and suggests solutions to these issues.

Digital solutions must comply with the law, digitalisation also brings new opportunities to regulators. Therefore, architecture supports new and better regulation and legislation possibilities.

This means that:

- Projects ensure that they account for current Danish legislation, including the Public Administration Act, the Archives Act and relevant EU regulation.
- As part of architecture work, projects identify issues with regard to data sharing and reuse of data and IT services. Projects propose solutions to ensure that the business and IT architectures comply with legal obligations and, where relevant, they propose amendments to such obligations.

AR 3.2: Contribute to digitisation-ready legislation

Where relevant, the architecture in digitisation projects contribute to setting a better foundation for legislation ready for digitisation, for example by securing clear processes, rules and information in the common tasks and in the IT solution applied.

This means that:

- When inappropriate barriers to digital solutions are identified in legislation or in regulations for case processing etc., projects help challenge the legislation and regulations with proposed solutions.
- Projects note whether there are inappropriate statutory requirements for use of specific technologies which inhibit technical advancements in the area and innovation opportunities.

Principle 4: Security, privacy and trust is ensured

Trust is crucial for digital solutions. Citizens and businesses must trust that information will be processed safely and in accordance with relevant legislation.

AR 4.1: Meet requirements for information security and protection of privacy

Digital solutions for cross-organisational processes and data sharing are established on the basis of a comprehensive and meticulously prepared security model. Information security is an integrated element from tendering to go-live.

This means that:

- Projects conduct a risk assessment early on as well as an assessment of the consequences for privacy and information security in accordance with the relevant legislative and common public-sector requirements.
- If cloud computing is part of the project, the particular requirements for this aspect is considered.
- The digital solution is designed so that protection of privacy and security are ensured, including storing and exchange of sensitive data only when absolutely necessary.

AR 4.2: Use common architecture for information security

In order to establish coherent user journeys, cross-organisational work processes and data sharing across domains, security must be managed coherently, including management of user rights, security processes, security models, and that infrastructure components are coherent and interoperable.

This means that:

- Projects take their point of departure in the common public-sector reference architecture for user management that sets the framework for how public organisations are to work on digital user administration and access control.

Projects ensure that security models to manage security across domains are agreed and applied for cross-organisational processes.

Principle 5: Processes are optimized cross-orginisationally

Digital solutions are designed based in citizens and businesses so that they experience coherent service processes across organisations.

AR 5.1: Design coherent user journeys

Digital services are designed based in the user and with knowledge about the entire process so that the user experiences a good, simple and coherent service, even across public organisations.

This means that:

- Projects ensure that development of digital solutions is based on identification and understanding of the relevant user journeys and user tasks.
- Projects analyse both user journeys and user experiences in order to optimise digital services to be intuitive, efficient and coherent.

AR 5.2: Optimise cross-organisational processes according to common goals

Cross-orginasitional processes are optimised on the basis of common goals for coherent, efficient and value-adding workflows.

This means that:

- Projects optimise the cross-organisational processes on the basis of common goals for each process and they should document these goals in accordance with agreed methods, including relevant actions, activities and decision rules in the processes. Documentation is displayed and shared so that it can be reused where processes are generic and can be implemented in several organisations.
- Projects ensure that the public organisations affected set common quality goals and milestones that manage how agreed cross-cutting processes are being optimised. For example, with regard to quality, resource consumption, waiting time, lead time and specific requirements for activities. Agreements clarify who is responsible for what in the cross-orginisational processes.

Principle 6: Good data is shared and reused

Data is a resource that, through sharing and reuse, is used to add value for citizens and businesses and to establish coherence in the public sector.

AR 6.1: Share and reuse data

If suitable data is generated or collected by one public organisation, it should be reused by other public organisations, if legally and practically possible. Citizens and businesses should not be burdened unnecessarily with having to submit the same information to the public sector several times.

This means that:

- When considering decisions on sharing and reuse, projects assess potentials and limitations in the analysis of the project. This assessment could be based on whether there is personal or confidential data, whether data could be master data or transaction/temporary data, whether there are small or large amounts of data, whether data is simple or complex, etc.
- Projects that are to use new data investigate whether similar data has already been collected by other public organisations or businesses. If others have collected more or less the same data, projects consider whether common data collection and quality assurance can be established.

- Projects ensure that relevant organisations make relevant data available for relevant parties.
- If necessary, a clear agreement on responsibility for collection, documentation, display, update and use of data.

AR 6.2: Use common rules to document data

Data and definitions are described according to common rules in order to promote reuse. It is important to ensure that data is understood correctly and fits together when it is used across different processes and IT systems at public organisations.

This means that:

- Projects use the common public-sector rules for definition and data modelling to describe the semantic modelling of data. The rules support alignment between the definitions in legislation and the data displayed via the interfaces in IT systems.
- Projects describe their data and definitions as fully as possible so that they can be understood and reused in other contexts.

AR 6.3: Give data the quality requested

The quality of data collected or generated in an IT solution should facilitate cross-organisational application and reuse in other IT solutions.

Public resources can be saved by applying and reusing data across public organisations and private businesses, but the benefits of reusing data cannot be realised until the data is of appropriate quality.

This means that:

- Projects document data quality according to a common language and concept of data quality.
- Projects investigate whether there is a positive business case for improving data quality through collaboration and possibly joint financing with other public organisations or private actors.
- Projects consider the extent to which citizens and businesses can be involved in data collection and quality assurance.

AR 6.4: Display information on data sources, definitions and data models

Descriptions of data sources, definitions and data models are displayed. From this, public organisations and private individuals gain insight into what data the public organisations have and following the potential for reuse.

This means that:

- Descriptions of data sources, definitions and data models should is displayed

in accordance with common standards, e.g. on public organisation websites or in a common catalogue.

Principle 7: IT solutions collaborate effectively

Digital solutions are built so that they can be part of a well-functioning interplay with digital systems at other organisations and contribute to coherence across public and private organisations.

AR 7.1: Design and display interfaces according to common integration patterns and technical standards

Projects ensure that data and services can be displayed with open interfaces and also that relevant self-service solutions, administrative systems and general infrastructure services can be integrated with each other so that the coherent service and cross-cutting process is supported digitally.

If individual projects develop solutions to issues that have already be resolved, development and maintenance costs will increase, longer development times will occur and hence create greater risks of error.

Therefore, integration of IT solutions uses common integration patterns and data is exchanged in accordance with agreed protocols.

This means that:

- Projects describe explicitly the specific interface requirements demanded by public organisations or businesses.
- Projects ensure that the most appropriate integration patterns are identified and agreed on the basis of the clarified requirements for information content and service goals.
- Integrations are designed using common, agreed integration patterns.
- Interfaces and services comply with agreed technical formats and protocols that support secure and efficient data transport.
- Projects ensure that information on interfaces is displayed according to common standards so that they are accessible for all relevant parties, e.g. in a common catalogue.

Principle 8: Data and services are supplied reliably

Using data and services made available by other parties should be secure and efficient. Therefore, the underlying infrastructure should meet the agreed service goals.

AR 8.1: Supply data and services in accordance with agreed service goals

As cross-organisational processes, data sharing and common components become more widespread in the public sector. From this follows that individual

IT solutions become increasingly dependent on IT services outside the control of the individual organisation.

It should be possible for public organisations and other data users such as businesses, to be confident that important data and IT services are accessible within agreed timeframes and agreed quality and service criteria.

This means that:

- Projects clarify how best to ensure efficient and secure delivery. This may be through an in-house distribution solution or, for example, via one of the large distribution platforms such as the national service platform for the health area , the common municipal service platform , and the common public-sector data distributor .
- Projects ensure that agreements are made and published with regard to accessibility, response times, operational conditions and relevant quality criteria for data and IT services displayed for reuse.
- Projects assess whether the robustness and availability of building blocks incorporated in several IT solutions or in common infrastructure can be achieved through higher service goals or via more installations.
- Projects ensure that relevant tests are conducted, including security tests, load tests and scalability tests.

Steering committee for data and architecture