BULGARIAN NATIONAL INTEROPERABILITY FRAMEWORK FOR INFORMATION SYSTEMS OF EXECUTIVE AUTHORITIES

(Draft – version 1.2)

Adopted by Decision № ..... of ..... by .....

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Introduction

Legal framework

The Bulgarian National Interoperability Framework (BNIF) for Information Systems of Executive Authorities is a medium-term strategic document for implementation of the goals and objectives of E-Governance Development Strategy 2014 - 2020 in the Republic of Bulgaria within the context of interoperability. The present framework is drawn up in compliance with the European Interoperability Framework, version 2, adopted as Annex 2 to the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of Regions 'Towards interoperability for European public services of 16.12.2010. As stated in Recommendation 1 therein: “Public administrations should align their national interoperability frameworks with the European interoperability framework in order to take into account the European dimension of public services”.

EU’s programme ISA (Interoperability Solutions for European Public Administrations) was adopted by a Decision No 922/2009/EC of the European Parliament and of the Council of 16 September 2009 on interoperability solutions for European public administrations. It aims to provide users of electronic public services with modern ways of communication with the administration in their country of origin as well as in other countries of the European Union and to enable the exchange of tools, services and technology solutions that various public administrations have adopted over time and promote their implementation in a European perspective. One of the programme’s key areas of impact is an overview and support of interoperability (policies, strategies, specifications, methodologies, guidelines and other documents, publications and approaches).

The ISA programme creates a framework that allows Member States to work together to create efficient and effective electronic cross-border public services for the benefit of citizens and businesses. It offers European public administrations a comprehensive approach to the establishment of electronic services that can easily cooperate across borders (interoperable electronic public services). Promotion of interoperability of electronic public services forms the first pillar of the ISA programme.

The programme also supports actions that deal with sharing and reuse of best practices, methodologies, services and tools that reduce the costs of establishing interoperable services. These actions belong to the second pillar of ISA programme.

Without a comprehensive approach to interoperability there is a risk that Member States may end up developing mutually incompatible solutions. This leads to new barriers to the delivery of public services within the internal market, while increasing costs and administrative burdens. The ISA programme addresses this risk by supporting the European Interoperability Framework (EIF).

Purpose of the Interoperability Framework

The aim of the interoperability framework is to facilitate public sector operation and to increase public sector efficiency in Bulgaria by improving the quality of services provided to Bulgarian and EU citizens. The specific objectives of the framework are the following:

- To contribute to the development of a service-centred community, where all citizens and enterprises can communicate with the state without having to acquaint themselves with its hierarchical structure and division of roles;
- To contribute to greater transparency of information related to political decisions on public information systems;
- To support the joint delivery of services in the public sector;
- To create conditions for free competition in the development of information and communications technology (ICT) at the administration;
- To reduce and optimize public sector IT expenses;
- To promote and support the delivery of public services in Bulgaria by fostering cross-border, cross-sector and cross-organisation interoperability;
- To guide Bulgarian public administrations in their work to provide public services to businesses and citizens;

Target group

BNIF's target group includes all administrative bodies, persons performing public functions, as well as organizations providing public services.

This document is a guide for private sector managers and project managers involved in the delivery of administrative services in the public sector. This non-technical document addresses all those involved in defining, designing and implementing Bulgarian public services.

The Ministry of Transport, Information Technology and Communications, being the institution in charge of development of e-government in Bulgaria, is responsible for creating the interoperability framework, for the coordination and monitoring of its compliance with internationally accepted documents and standards in the European Union, and in particular with the European Interoperability Strategy and the European Interoperability Framework, as well as its continuous updating and adaptation to the changes in information technology and infrastructure in administration.

The Ministry of Transport, Information Technology and Communications reviews the national framework with regard to the need to update it at least once in five years. Once updates are made, the document shall be coordinated with public sector institutions and proposed for discussion to all interested parties, including NGO representatives and professional organizations. The official version of the document shall be approved and published on the website of the Ministry of Transport, Information Technology and Communications and in the portal of the Interoperability Public Administration.

Definitions

Interoperability

The BNIF addresses interoperability in the very specific context of providing public services in Bulgaria.

Although Bulgarian public services delivery almost always involves data exchange between ICT systems, interoperability is a wider concept and encompasses the ability of organisations and administration units to work together towards mutually beneficial and commonly agreed goals.

Therefore, the following definition is used in the BNIF:

Interoperability, within the context of Bulgarian public service delivery, is the ability of disparate and diverse public sector organisations to interact towards mutually beneficial and agreed common goals, involving the sharing of information and knowledge between the organisations, through the business processes they support, by means of the exchange of data between their respective ICT systems.

Interoperability is multilateral by nature and is best understood as a shared value of a community.

Interoperability framework

An interoperability framework is an agreed approach to interoperability for organisations that wish to work together towards joint delivery of public services. Within its scope of applicability it specifies a set of common elements such as vocabulary, concepts, principles, policies, guidelines, recommendations, standards, specifications and practices.

Interoperability framework is a guideline in drafting laws with regard to IT in the public sector, designing IT solutions and organization of IT public procurement.

Recommendations of BNIF

The BNIF provides recommendations that address specific interoperability requirements. Implementing those recommendations will create an environment conducive to public administrations in providing e-services. This will help cultivate a community of people involved in public services who are familiar with interoperability, organisations ready to collaborate, and common frameworks, tools and services facilitating the delivery of administrative services.

The most important recommendations, conclusions and requirements are set in separate fields numbered consecutively.

Underlying Principles of Interoperability

The interoperability framework is an information policy document of the Republic of Bulgaria based on the European Interoperability Framework and its 12 principles:

1. Subsidiarity and proportionality
2. User-centricity
3. Inclusion and accessibility
4. Security and privacy
5. Multilingualism
6. Administrative simplification
7. Transparency

8. Preservation of information
9. Openness
10. Reusability
11. Technological neutrality and adaptability
12. Effectiveness and efficiency

The most important key principle is the Subsidiarity and proportionality one, setting the frame for EU action in the area of European public services. Principles 2-8 reflect generic user needs and expectations. Principles 9-12 provide a foundation for cooperation among public administrations.

Although these underlying principles have been taken from the European framework, what follows is not a repetition of the European viewpoint, but represents the peculiarities and specifications of application of the principles in Bulgarian context.

Subsidiarity and Proportionality

Subsidiarity principle has its origins in the European Union Treaty. In the present document, subsidiarity principle means that all political decisions related to information in Bulgaria must be made at a low level, closer to users of administrative services. Interoperability related decisions must be made on a state level only if they are more efficient than the ones made at a regional or local level.

Application of subsidiarity principles in Bulgaria means that centralized solutions are used as little as possible. Such solutions are worth mainly regarding joint infrastructure services (e.g. public key infrastructure) and the systems providing comprehensive administrative services to citizens and businesses (e.g. e-government portal egov.bg which is a single entry point to the services of central and local administrations). Departments must not force central government solutions in their area of governance, where an institution may lose control over business processes related to administrative services; neither must central government prescribe technical solutions to local governments. At the same time, however, subsidiarity principle does not restrict public sector institutions' cooperation in working out joint standard solutions.

The principle of subsidiarity and proportionality generally defines the exercise of powers of public administration regarding decisions on interoperability:

- Subsidiarity – in areas which do not fall within the exclusive competence of central administration, it must act only if and insofar as the objectives of the proposed action cannot be sufficiently achieved by local authorities;

  On the one hand, subsidiarity principle applies to reach common goals of the public administration to achieve interoperability. On the other hand, each administrative unit retains its sovereign right to determine its own way and appropriate means of achieving interoperability in the delivery of public services in view of its special features.

- Proportionality – the content and form of decisions made at public administration must not exceed what is necessary to achieve the objectives of interoperability.

This means that administrative actions taken must be in accordance with the objectives of interoperability, without depriving citizens and businesses more than is necessary to achieve those objectives.

The criteria for achieving greater interoperability play a key role in making decisions for ICT deployment aimed at providing better and more efficient public services:

- Accessibility - an opportunity to communicate with the administration through new and alternative access channels (e.g. online, via kiosk terminals, mobile devices) and in new and alternative ways (e.g. through intermediaries, "one-stop-shop", call centres);
- Flexibility - an opportunity to communicate at users' convenience;
- Efficiency - more efficient administration, contributing to better services and better use of available resources;
- Involvement - the opportunity a service to be provided to as many representatives of the target group as possible;
- Popularity - greater interoperability leads to greater use of a service;
- Provision - increased volume of services provided on the basis of clear communication between IT systems without human intervention required in the course of provision of public services.

Information systems must facilitate the operation of administrative units and performance of their functions; that is why merging of the information systems of different organizations mechanically must be avoided, if possible. Instead, creation of independent information systems, linked through services, must be preferred.

User-centricity

Public sector services must be adapted in accordance with the needs of citizens and businesses. Generally speaking, citizens and businesses will expect:

- To access user-friendly services in a secure and flexible manner, allowing personalisation and privacy;
- Citizens and enterprises to provide any given piece of information only once to administrations in order to avoid repeated provision of data;
- Apart from service providers' channels, electronic administrative services to be made available also through information portal egov.bg; services that necessitate cooperation of several institutions to be provided to citizens and businesses as comprehensive services.
- Multichannel delivery, allowing access to services anyhow, anywhere, anytime, within reasonable limits, taking into account security, economic efficiency and the size of the target group.

The central role of consumers involves the fundamental principles of eGovernment:

- "Once only" principle;
- "One-stop-shop" and a single point of contact;
- Personalised and user-centric services;
- Digital by default;
- Openness by default.

Inclusion and Accessibility

The use of ICT must create equal opportunities for all citizens and businesses through open and inclusive services that are publicly accessible without discrimination. Inclusion means taking full advantage of the opportunities to overcome social and economic disadvantages and exclusion. Accessibility ensures that people with special needs and the elderly can access public services of the same levels as all other citizens. In order to increase inclusion and improve accessibility of services, new service delivery channels must be combined with the traditional ones. Moreover, these opportunities must be guaranteed to authorised third parties acting on behalf of citizens who are unable, either permanently or temporarily, to make direct use of public services.

Recommendation 1. Public administrations must ensure that public services are accessible to all citizens, including persons with disabilities and the elderly, according to e-accessibility specifications recognised at a national or international level.

Security and Privacy

Citizens and businesses must be assured that they interact with public administrations in an environment of trust and in full compliance with the relevant regulations on privacy and data protection. Personal data processing in the private sector must be transparent. Safe processing of personal data and reliable storage of e-documents must be guaranteed. Any logs with inquiries into registers containing personal data must be preserved. All inquiries made into such registers must be substantiated.

Citizens must have the right to be informed about the data that public sector administrations have collected about them. Personal data must be collected only for the purposes and in the extent specified in the relevant regulations. Citizens must be guaranteed a right and opportunity to correct inaccurate and misleading data.

Recommendation 2. Public administrations must consider the specific needs of each Bulgarian public service, within the context of common security and privacy policy.

Multilingualism

Multilingualism needs to be carefully considered when designing Bulgarian public services and applied mainly when the need for application thereof has been evaluated

and has been identified to bring a real benefit (i.e. it is not necessary in developing internal services or services with no cross-border interaction and exchange).

A balance needs to be found between the expectations of citizens and businesses to be serviced in their national language and public administrations' ability to offer services in other languages (e.g. English).

Multilingualism of information systems is not only an issue of user interface; it also concerns services, metadata of services, documentation, code comments, data structures and data representation. Reuse of services or components thereof in another language must be easy. Public sector must take care of translation in Bulgarian language of the IT environment. The producer of the respective software product must be in charge of translation of commercial software.

The multilingual aspect to interoperability again becomes apparent when Bulgarian public services require exchanges between ICT systems across linguistic boundaries, as the meaning of the information exchanged must be preserved. Whenever possible, information must be transferred in a language-independent format, agreed among all parties involved.

Recommendation 3. Public administrations must use information systems and technical architectures that cater for multilingualism when establishing a Bulgarian public service after evaluating the necessity and benefits thereof.

Administrative Simplification

Public sector administrations gathers, in their line of duty, a considerable amount of information, which sometimes comes down to the fact that law requires it, not the direct objectives of a particular department. Such processes raise the cost of the operation of public sector administration and cause administrative hindrances to citizens and businesses, which can be expressed as a cost incurred by citizens and business. To achieve administrative simplification, use of different databases to collect the same data must be avoided and, if permissible, public administration units from different sectors must cooperate in the development of Bulgarian public services.

Transparency

Citizens and businesses must be able to understand administrative processes. They must have the right to track administrative procedures and to have an insight into the rationale behind decisions that affect them. When being provided with a public service, they must be able to overview its status, progress and the deadlines related thereto.

Citizens and businesses must be able to give feedback about the quality of the public services provided, to contribute to their improvement and/or to implementation of new services.

Preservation of Information

Public sector must guarantee readability, reliability and integrity of electronic documents created in the course of its activities. Records and information in electronic

form held by administrations for the purpose of documenting procedures and decisions must be preserved so that they can be accessed as long as needed, taking into account security and privacy.

In order to guarantee long-term preservation of electronic records and other kinds of information, appropriate formats must be selected to ensure long-term accessibility, including preservation of associated electronic signatures and other electronic certifications.

Recommendation 4. Public administrations must formulate together a long-term preservation policy for electronic documents relating to electronic public services in Bulgaria.

Openness

In the context of the Bulgarian Interoperability Framework, openness is the willingness of persons, organisations or other members of a community of interest to share knowledge and stimulate debate in order to solve existing problems. Openness means that Bulgarian public administration takes into consideration the alternatives of open specifications, standards and software. Public sector must not absolutise the principle of openness. In situations where open specifications have not achieved the required maturity or where closed solutions are more efficient, public administration may use closed solutions. Decisions must be made proceeding from the idiosyncrasies of each particular case.

Applying the principle of openness suggests public administrations to generate results that can be reused and shared, when developing custom-made software systems.

Recommendation 5. Public administrations must follow the principle of openness when establishing public services, including development of information system architectures and supply of software, while taking into account their priorities and constraints.

Reusability

Reuse means that public administrations confronted with a specific problem seek to benefit from the work of others by looking at what is available, assessing its usefulness or relevance to the problem at hand, and deciding to use solutions that have proven their value elsewhere.

This implies that public administrations must be willing to share with others their solutions, concepts, frameworks, specifications, tools and components. Public sector institutions must be able to reuse other institutions' experience in creation of information systems.

Reuse and sharing naturally lead to cooperation, using collaborative platforms towards mutually beneficial and agreed common goals.

Therefore, reuse is of key importance to the development of public services in Bulgaria.

Recommendation 6. Public administrations are encouraged to reuse and share solutions and to cooperate on the development of joint solutions upon provision of Bulgarian public services.

Technological Neutrality and Adaptability

When developing public services, public administrations must focus on system functionality and defer decisions on technology as long as possible in order to avoid imposing specific technologies or products on their partners and to be able to adapt to the rapidly evolving technological environment. IT solutions must be made transparently, rationally with a view to saving state resources and taking into account the existing technological base. Public administrations must render access to public services independent of any specific technology or product.

Recommendation 7. Public administrations must not impose any specific technological solution on citizens, businesses and other administrations when developing electronic administrative services in Bulgaria.

Effectiveness and Efficiency

When developing public services, public sector administrations must guarantee that decisions taken are the most productive and efficient ones in order to achieve the best solutions for the taxpayers' money. In choosing the best solution, profitability of investments, costs on changing the infrastructure and organization as well as retraining costs, total cost, increase of flexibility, decrease of administrative hindrances, decrease of risks, transparency, simplification, work environment improvement and other aspects must be taken into consideration.

The Conceptual Model for Public Services

Introduction

This chapter proposes a conceptual model for public services development (electronic administrative services), ways to organise the creation and operation of these services. The model brings together the common aspects and best practices observed in providing public services. As a blueprint for future implementations of public services, the model helps develop a common understanding across public administration sectors about the main elements of public services and how they come together. The model emphasises a building-block approach to setting up Bulgarian public services, allowing for the interconnection and reusability of service components when establishing new services.

Overview of the Conceptual Model

The model promotes the reuse of information, concepts, patterns, solutions, and specifications in public sector organisations, considering that public services in Bulgaria:

- are based on information from various sources located in different public departments at different levels of administration, both horizontally and vertically, and
- combine various basic public services constructed independently by public administrations in different organisations.

Therefore, the model highlights the need for modular, loosely coupled service components (service oriented architecture (SOA represents this model), interconnected through infrastructure and mutual efforts in the public sector in order to develop and deliver electronic public service in Bulgaria.

Service Oriented Architecture

A service-oriented architecture (SOA) is an architectural pattern in computer software design in which application components provide services to other components via a communications protocol, typically over a network. The principles of service-orientation are independent of any vendor, product or technology.

Services are non-associated, loosely coupled units of functionality that are self-contained, each service implementing at least one action. Within an SOA, services use defined protocols that describe how services pass and parse messages using description metadata, which describes in detail not only the characteristics of these services, but also the data that drives them. SOA depends on data and services that are described by metadata that must meet the following two criteria:

- The metadata must be provided in a form that software systems can use to configure dynamically by discovery and incorporation of defined services, and also to maintain coherence and integrity.
- The metadata must be provided in a form that system designers can understand and manage with a reasonable expenditure of cost and effort.

The purpose of SOA is to allow users to combine together large chunks of functionality to form special applications built almost entirely from existing software services. SOA as an architecture relies on service-orientation as its fundamental design principle. If a service presents a simple interface that abstracts away its underlying complexity, then users can access independent services without knowledge of the service's platform implementation.

SOA architecture is viewed as a couple of horizontal layers:

- Consumer Interface – graphic user interface for end users or applications accessing other applications or service interfaces;
- Business Process – choreographed services representing business use-cases in terms of applications;

- Services – services are consolidated together for the entire process of operation;
- Service Components – the components used to build the services, such as functional and technical libraries, technological interfaces etc.;
- Operational Systems – this layer contains the data models, enterprise data repository, technological platforms etc.

Web services can implement a service-oriented architecture. They make functional building-blocks accessible over standard Internet protocols independent of platforms and programming languages. These services can represent either new applications or just wrappers around existing legacy systems to make them network-enabled. Each building functionality block can play one or both of two roles:

- *Service provider*: The service provider creates a web service and at the same time publishes its interface and access information to the service registry.
- *Service consumer*: The service consumer or web service client locates entries in the service registry using various find operations and then binds to the service provider in order to invoke one of its web services.

Therefore, the conceptual model explicitly calls for Bulgarian-wide adoption of a service orientation to designing and developing administrative information systems (AIS), comprising consistent, and in some cases jointly developed, service components. Its particular service orientation offers a way of creating and using business processes, packaged as services, throughout their lifecycle.

Recommendation 8. Public administrations must develop a component-based service model, allowing the establishment of Bulgarian public services by reusing, as much as possible, existing service components.

Public administrations introduces a common scheme on how to interconnect service components. There are well-known and widely used technical solutions, e.g. web services, to do this, however implementing them at a national level will require joint and coordinated efforts by public administrations, including investment in common infrastructure.

Recommendation 9. Public administrations must use a common scheme to interconnect loosely coupled service components and possibly a common infrastructure when providing Bulgarian public services.

This model can be conditionally subdivided it into three layers: basic public services, secure data exchange and aggregate public services, which are detailed in the following sections.

Basic public services

The lowest layer of the model deals with the most basic service components from which Bulgarian public services can be built. It groups three types of components,

namely interoperability facilitators, services based on base registries, and external services, together called basic public services.

From service provider perspective in Bulgaria a basic public service is seen as such carried out within a geographically or functionally separate organization as a single process initiated by a service request at the end of which the service is provided or refused.

Therefore, some basic public services have been developed primarily for direct use by the public administration that provides them, but are made available for reuse elsewhere with a view to providing aggregate public services. Others are generic and/or infrastructural by nature, while the remainder represent external services, i.e. services provided by third parties.

Base registries

Base registries are carriers of chronologically systematised information on events, effects, facts, processes, which are reflected in primary documents and register this information for the first time.

The most important components are base registries that provide reliable sources of basic information on items such as persons, companies, vehicles, licences, buildings, locations and roads. Such registries are under the legal control of public administrations and are maintained by them, but the information must be made available for wider reuse with the appropriate security and privacy measures.

The common feature of all implementations of basic registries is the fact that they are authentic in shape, separately or in combination, and are the cornerstone of all public services. Their content is not static, as they reflect information changes and lifecycle.

Recommendation 10. Public administrations that are base data administrators must make their base registries available to others while developing public services, implementing access and control mechanisms to ensure security and privacy in accordance with the relevant legislation.

One of the obstacles to adopting the conceptual model for Bulgarian public services could be legacy systems. These systems and their underlying data repositories may have specific characteristics limiting the possibilities for reuse (e.g. lack of published interfaces) and may require extensive re-engineering in order to make their information available. Access to authentic data sources could be facilitated if the interfaces thereto are published and harmonised, at both semantic and technical level.

Recommendation 11. When developing electronic administrative services, public administrations must develop interfaces to base registries and align them at semantic and technical level.

Interoperability facilitators

Interoperability facilitators provide services such as translation between protocols, formats and languages or act as information brokers.

External services

These include services provided by external parties such as — at business level — payment services provided by financial institutions or — at infrastructure level — connectivity services provided by telecommunications providers.

Secure data exchange

This layer is central to the conceptual model since all access to basic public services passes through it.

From a business point of view, administrations and other entities exchange official information that may involve access to base registries. This must be carried out in a secure, harmonised, managed and controlled manner allowing information exchange between administrations, businesses and citizens that is:

- signed and certified — both sender and receiver have been identified and authenticated through agreed mechanisms;
- encrypted —confidentiality of the exchanged data is ensured;
- logged – the electronic records are logged and archived to ensure a legal audit trail.

Secure data exchange must allow secure exchange of certified messages, records, electronic forms and other kinds of information between the different systems. In addition to transporting data, this layer must also handle specific security requirements such as electronic signatures, certification, encryption and time stamping.

Security is potentially one of the main barriers to interoperability if it is not applied in a harmonised and agreed way among organisations.

The conceptual model highlights this and calls on all public electronic service providers to:

- consider the security issues head-on;
- cooperate on a common framework to meet their respective security needs via compatible mechanisms and commonly agreed specifications;
- reach a common understanding on essential characteristics such as protective marking levels, authorisation and authentication levels.

Therefore, public administrations must agree on a common security framework when establishing Bulgarian public services (see Recommendation No 2).

One of the key prerequisites for implementing the functionality expected in secure data exchange involves leveraging national identification and authentication infrastructures in the organisations to reach working cross-organisations and cross sectors schemes. These schemes must establish which ICT architectures and data are

needed in a national context to make existing organisation electronic identity infrastructures interoperable.

The provision of secure (i.e. signed, certified, encrypted and logged) data exchange also requires several management functions, including:

- service management, to oversee all communications on identification, authentication, authorisation, data transport, etc., including access authorisations, revocation, and audit;
- service registration, to provide (subject to proper authorisation) access to available services through prior localisation and verification that the service is trustworthy;
- service logging, in order to ensure that all data exchanges are logged for future evidence, and archivedq where necessary.

Aggregate public services

Aggregate public services are performed as a process in which the data supported by administrations is accessed in a secure and controlled way. They can be provided by several administrations at any level, including national and even cross-border level (see the List of Unified Names of Administrative Services).

A typical aggregate service must be provided and must appear to its users as a single service. Inside the public administration transactions may be implemented as internal administrative services across borders, sectors and administrative levels.

Aggregation is accomplished via mechanisms tailored to specific business requirements. In the most general case, some business logic is required to implement the requirements, and the implementation mechanism could take several forms, such as orchestration or workflow engines, all included in portal-like access infrastructures.

Nowadays, users expect to access public services not solely through government portals or websites but also via intermediaries with whom they are in contact on a regular basis.

Therefore, public services must be developed in such a way that they can easily be integrated in intermediaries' websites through mechanisms of various devices, without government losing responsibility for the service itself and with clear indications enabling users to tell the difference between private and public services.

If aggregate public services are provided by intermediaries, public administrations must establish:

- an authorisation process to determine which basic public services may be disclosed to which intermediary, and
- a process of certifying intermediaries to establish trust between users and service providers.

Applications of the conceptual model

What makes the conceptual model powerful is its flexibility allowing different aggregate services to be created by combining basic public services from multiple providers. The model unlocks the potential for further aggregating and combining the different services which have already been developed.

Possible applications of the model include: cross-border, cross-sectoral and cross-administrative application. This, however, raises a number of issues, such as:

Trust: cross-border application of the model involves allowing external access to national base registries, which requires a high degree of security and trust.

- Dependence of Bulgarian public services on level of service at a lower level: the aggregated services depend on basic public services provided by different administrations.
- Common specifications for basic public services: the fact that the basic public services on which the aggregated services are based are developed by different public administrations highlights the need for common interface specifications, at both technical and semantic level.
- Privacy and data protection: even when personal information is exchanged across borders, national data protection legislations apply. The secure data exchange layer implements and enforces the security requirements for the aggregate service. As data originating from different Member States may be subject to different data protection requirements, a set of common requirements for data protection must be agreed in order to implement the aggregate services.

Recommendation 12. When jointly developing Bulgarian public services, public administrationsmust use a common taxonomy of basic public services and agree on minimum service requirements for secure data exchange.

Interoperability levels

Introduction

Similarly to the European Union Interoperability Framework, the Bulgarian Framework divides interoperability into the following levels: legal, organizational, semantic and technical. The same approach could be used with regard to development of public services throughout the country and by any public sector institution and its information system. The political level With a major significance in this scheme, where the general context of a public organization, its relationships with the surrounding environment, overall vision, priorities and goals are described at a political level. Moreover, the political context incorporates all four levels in a generalized form.

Interoperability levels can be defined as follows:

- Legal interoperability: in this level, an overview is provided on the legal system regulating the organization’s activity, legal view on services, data, information systems and security.

- Organizational interoperability: this is the ability of organizations to provide services to one another and their customers with the help of information systems. Documentation of the organizational dimension contains descriptions of operational processes, guidelines and rules defining the processes, service level agreements and descriptions of the change management procedures.
- Semantic interoperability: the ability of organizations to understand the meaning of exchange information (data) in the same way. In the corresponding documentation, the semantic assets and the rules of semantic enrichment of data are described.
- Technical interoperability: interoperability of technical and software infrastructure. The documentation of this dimension provides general architecture, summary of guidelines and standards as well as specifications of user interfaces, data submission and exchange.

In developing new Bulgarian public services each of these levels must be taken into account.

Political context

Political context of the BNIF

The Bulgarian National Interoperability Framework for Information Systems of Executive Authorities reflects both national and European key initiatives, such as:

- EU Programme - ISA (Interoperability Solutions for European Public Administrations) (http://ec.europa.eu/isa/)
- European Interoperability Framework (EIF) - version 2 (http://ec.europa.eu/isa/documents/isa_annex_ii_eif_en.pdf)
- E-Governance Development Strategy (2014-2020) (https://www.mtitc.government.bg/upload/docs/2014-03/1_StrategiaRazvitieEU_RBulgaria_2014_2020.pdf)
- Roadmap to Implementing the E-Governance Development Strategy (2014–2020) (https://www.mtitc.government.bg/upload/docs/2014-06/Patna_Karta_30042014.pdf)
- Basic Model of Aggregate Administrative Services (http://www.ipa.government.bg/sites/default/files/administrativno_obsluzhvane_0.pdf)
- Electronic Government Act (http://www.egov.bg/ereg-public/misc/norm/docs.rg)
- Ordinance on the general requirements for interoperability and information security (http://www.egov.bg/ereg-public/misc/norm/docs.rg)

- Ordinance on electronic administrative services (https://www.mtitc.government.bg/upload/docs/NaredbaElektronniAdmUslugi_.pdf)
- Ordinance on the registers of information objects and electronic services (https://www.mtitc.government.bg/upload/docs/NaredbaRegistriInformacionniObekti_.pdf)
- Ordinance on the internal flow of electronic documents and paper documents in the administrations (https://www.mtitc.government.bg/upload/docs/NaredbaVutreshenOborotElDoc.pdf)
- Ordinance on the requirements to the single environment for electronic documents exchange (https://www.mtitc.government.bg/upload/docs/NaredbaESOED.pdf)
- Electronic Document and Electronic Signature Act (https://www.mtitc.government.bg/upload/docs/ZakonElektronniaDokumentPodpis.pdf)
- Protection of Personal Data Act (https://www.cpdp.bg/?p=element&aid=373)
- Regulation (EU) No 910/2014 of the European Parliament and of the Council of 23 July 2014 on electronic identification and trust services for electronic transactions in the internal market and repealing Directive 1999/93/EC (http://eur-lex.europa.eu/legal-content/BG/TXT/?uri=CELEX:32014R0910)
- Digital Agenda for Europe – A Europe 2020 Initiative (http://ec.europa.eu/digital-agenda/)
- Open Government Approach - A Europe 2020 Initiative (http://ec.europa.eu/digital-agenda/en/open-government)

The European interoperability framework is the foundation of the Bulgarian interoperability framework.

The BNIF imposes requirements on state information systems and serves as a meta-framework for the documents related to interoperability architecture of the public sector information systems.

Political context of public sector information systems

Each information system has its context. Creation of new public services and information systems supporting them, or their rearrangement, in general, comes from activities on political level. Political will is usually expressed in legal acts, coalition programmes, development plans and other similar documents. In those cases where there is no clear political decision and legal basis for creating an information system/service, it has to be created beforehand.

Where the functions of an institution are changed in the course of research and development of its information system, a clear idea of its relationships and operational

processes with other institutions is required. Without a clear conception information systems must not be changed.

Information systems and public services must be created following a procedure and based on a genuine need; they must be confirmed by political decisions. In order to create services and information systems, a legal basis is also required. The documentation relating to architecture of interoperability of information systems must describe how the institution, its processes, systems and services are connected with the environment.

Legal interoperability

Legal interoperability is a characteristic of the legislation itself which stands to guarantee expedience as regards the relevance in law of the data. Legal interoperability is ensured by harmonising the legal acts regulating the business processes related to provision of public services.

Each document on interoperability architecture of an information system must contain a part handling legal interoperability.

The present document handles legal interoperability from a national point of view. A list of basic legal acts regulating digital information is provided hereinabove (item 4.2.1.). When preparing acts related to e-services delivery, public sector institutions must consider and respect the abovementioned legal acts. Each institution is responsible for the drafting and amendment of regulations governing its administrative activities.

Recommendation 13. Public administrations must carefully consider all relevant legislation relating to data exchange, including data protection legislation, when jointly developing a Bulgarian public services.

Organisational interoperability

This aspect of interoperability handles cooperation of public administrations aimed at achieving their mutually agreed goals. In practice, organisational interoperability implies integrating business processes and related data exchange.

In the context of public services delivery in the state information system this means that the documentation of interoperability architecture of the information systems relating to organizational interoperability must cover the following aspects:

- A list of business processes with their short descriptions, mutual interoperability and interoperability with external business processes;
- Costing of resources in the development of individual components of services and distribution of cost in the development of aggregate services between different administrations involved;
- Principles of management of services' life cycle;
- Description of the principles of change management of an information system.

Business process alignment

In order different administrative units to be able to work together efficiently and effectively to provide Bulgarian public services, they may need to align their existing business processes or even to define and establish new ones.

The implementation of business processes management initiatives typically passes through several major stages:

- Modelling and documentation of processes in order to enhance their understanding and initially identify optimization opportunities;
- Redesigning business processes implemented on paper into electronic ones that eliminate paper forms, records and other documents and inefficiencies associated with them;
- Full process automation by integrating them into information systems;
- Adding intelligent automatic verification of data in electronic form;
- Introduction of automated control procedures in order to ensure process continuity and operation in case of technical problems or human error;
- Providing real-time visibility of processes;
- Process efficiency analysis in order to facilitate subsequent improvement.

Business process alignment implies documenting those processes in an agreed way, so that all public administrations contributing to the delivery of public services can understand the overall business process and their role in it. Specific characteristics and scope of activities of different public administration units suggest different levels of readiness for alignment of business processes over time. Therefore, when business processes management stages are completed, individual administrative units must first ascertain readiness to coordinate their business processes with a view to the possibility of providing aggregate public services.

Recommendation 14. Public administrations must document their business processes and agree on how these processes will interact in the delivery of Bulgarian public services.

Organisational relationships

A service-oriented conceptual model for public services means that the relationships between service providers and service users must be clearly structured. This involves finding instruments to formalise mutual assistance, joint action and interconnected business processes in connection with aggregate service provision. Examples of such instruments are Service Level Agreements (SLAs), signed between participating public administrations and/or Memoranda of Understanding on joint actions and cooperation. For cross-sector action, they must preferably be multilateral agreements.

Recommendation 15. Public administrations must clarify their organisational relationships as part of the establishment of Bulgarian public services.

Change management

Since the provision of Bulgarian public services is a result of collective work of institutions that produce or consume parts of the service, change management processes are critical to ensure accuracy, reliability and continuity of services delivered to other public administrations, businesses and citizens.

Recommendation 16. Public administrations working together to provide Bulgarian public services must agree on change management processes to ensure continuous service delivery.

Semantic interoperability

Semantic interoperability is the ability of different organizations to understand the meaning of information similarly. What makes semantic interoperability complicated is the fact that the ways in which software systems are used, their aims and contexts are different, and that is why data submission, encryption and nuances of meaning vary so much.

The assets of semantic interoperability are reusable metadata (XML schemes, data models, etc.) and comparative data (classifiers, taxonomies, etc.). Semantic interoperability framework suggests a collection of such assets, which facilitates interconnection of systems semantically.

Metadata level is the initial level for achieving semantic interoperability. Setting up repositories of XML schemes is a prerequisite for achieving interoperability on syntax level. The following types of semantic interoperability assets exist: metadata, dictionaries, thesauruses, classifiers, taxonomies, conversion tables, ontologies and service registers.

In the context of the present framework, semantic interoperability encompasses the following aspects:

- The meaning of data elements and the relationship between them. It includes developing vocabulary to describe data exchanges, and to ensure that data elements are understood in the same way by communicating parties.
- Syntactic interoperability - describing the exact format of the information to be exchanged in terms of grammar, format and schemes.

Achieving semantic interoperability at a national level requires at least the following:

- agreed processes and methodologies for developing semantic interoperability assets;
- agreement by cross-sector communities on the use of semantic interoperability assets at a national level.

Due to the complexity of the task and the large number of interested parties, it will take a concerted effort to harmonise processes and methodologies.

Recommendation 17. Public administrations must support the establishment of cross-sector communities that aim to facilitate semantic interoperability and should encourage these communities to share results on Bulgarian and international platforms.

Technical interoperability

Technical interoperability covers the technical aspects of connecting information systems. It includes aspects such as interface specifications, interconnection services, data integration services, data presentation and exchange, etc.

While public administrations have specific characteristics at political, legal, organisational and, partly, semantic level, interoperability at a technical level is not specific to public administrations. Therefore, technical interoperability must be ensured, whenever possible, via use of formalised specifications, either standards pursuant to Bulgarian legislation or specifications issued by ICT industry fora and consortia.

Recommendation 18. Public administrations must agree to use formalised specifications in order to ensure technical interoperability when developing Bulgarian public services.

Interoperability Agreements

Introduction

This chapter proposes an approach to facilitate cooperation among public administrations in providing Bulgarian public services. As stated throughout this document, Bulgarian public services delivery requires cooperation among different public administrations at the different interoperability levels described in the previous chapter. For each level, the organisations involved can rely on the general regulations on e-governance – the Electronic Government Act and the secondary legislation for its implementation, but can also formalise cooperation arrangements in interoperability agreements. Agreements must be drafted with sufficient detail to achieve their aim — delivery of Bulgarian public services — while granting a maximum internal autonomy to each organisation.

At organisation level, interoperability agreements can, for example, take the form of Service Level Agreements (SLAs) that specify the obligations of each party participating in the provision of cross-sector and aggregate services.

At semantic level, interoperability agreements can take the form of reference taxonomies, schemes, code lists, data dictionaries, sector-based libraries and so forth.

At technical level, interoperability agreements include interface specifications, communication protocols, messaging specifications, data formats, security or dynamic registration specifications as well as service development specifications.

While interoperability agreements at legal and organisational level will usually be very specific to the respective Bulgarian public service concerned, interoperability

agreements at technical level and, to a lesser extent, at semantic level can often be mapped onto existing formalised specifications.

Recommendation 19. When developing Bulgarian public services, public administrations must consider the Electronic Government Act and the secondary legislation on its implementation and, where necessary, should define interoperability agreements.

Decisions on what formalised specifications and technologies to use to ensure interoperability for Bulgarian public services must be based on transparency, fairness and non-discrimination. One way to do this is to agree on a common assessment methodology and selection process.

Assessing and selecting formalised specifications

When public administrations select the formalised specifications or technologies to ensure interoperability, they must assess relevant formalised specifications. This assessment must be tailored to the specific interoperability needs of the public administrations in question, but based on objective criteria, primarily related to functional interoperability needs. When several formalised specifications meet functional interoperability needs, additional criteria on quality of implementation, market support, potential for reusability and openness can be used.

Recommendation 20. Public administrations must use a structured, transparent and objective approach to assessing and selecting formalised specifications.

Specifications, openness and reuse

The level of openness of a formalised specification is an important element in determining the possibility of sharing and reusing software components implementing that specification. This also applies when such components are used for establishment of new Bulgarian public services.

If the openness principle is applied in full:

- All interested parties have the same possibility of contributing to the development of formalised specifications and public review is part of the decision-making process;
- The specification is made publicly available for everybody;
- Intellectual property rights related to the specification are licensed on fair, reasonable and non-discriminatory terms or on a royalty-free basis in a way that allows implementation in both proprietary and open source software.

Due to their positive effect on interoperability, use of such open specifications, characterised by the features mentioned above, as well as the sharing and reuse of software implementing such open specifications, is encouraged in the course of Bulgarian public service delivery.

However, public administrations may decide to use less open specifications, if open specifications do not exist or do not meet functional interoperability needs.

In all cases, specifications must be sufficiently well thought out and developed, as well as adequately supported by the market, except if used in the context of creating innovative solutions.

Recommendation 21. When developing Bulgarian public services, public administrations must prefer open specifications, taking due account of the coverage of functional needs, maturity and market support.

Open standards

The main tool to ensure interoperability in the development of Bulgarian public services is the implementation of internationally accepted open standards. Principles and structure of public sector standards are contained in the Register of standards. This document provides the basic and most adequate solutions regarding the use of standards for Web services and information security of web services in the context of implementation of the conceptual model for service-oriented architecture.

Web services' architecture is based on the interaction between its three main components: service provider, register of services and service consumer (applicant). Modern standards to achieve common communication model for business applications in Web environment are HTTP, XML, SOAP (Simple Object Access Protocol), WSDL (Web Services Description Language) and UDDI (Universal Description, Discovery and Integration). SOAP is an XML-based protocol for data exchange in distributed systems, using as a transport protocol mainly HTTP. WSDL can be seen as an XML-based grammar for Web services specification (what are they providing, where are they located, how are they accessed what methods do they use). The presentation of this meta-information about the type of service is made in the records maintained by the UDDI standard (Universal Description Discovery and Integration). UDDI is developing standardized specifications for detection and description of web services.

Due to the Increasing use of web services the need to protect these applications also increases. Web services can be dynamically open and generated by sending XML communications over standard transport protocol such as HTTP. Obviously, HTTP and hence Web services are vulnerable to many possible security attacks. As regards to web services, there are several standards relating to protection of applications at a communication level:

- XML Encryption: this is a specification defined by the W3C consortium addressing the requirement for data confidentiality by using encryption techniques. Encrypted data are enveloped in XML tags defined in the specification.
- XML Signature: this is a technology defined by the W3C and IETF (The Internet Engineering Task Force), providing data authentication and integrity at a communication level.
- WS-Security: WS-Security is a standard defined by OASIS (the Organization for the Advancement of Structured Information Standards) providing a

mechanism for data authentication, integrity and confidentiality within one SOAP communication. WS-Security is used as a XML Signature and XML Encryption specifications and determines how to incorporate digital signatures and encrypted data in a .

- SAML (Security Assertion Mark-up Language): this is a standard defined by OASIS which provides mechanisms for sharing of information related to authentication and authorization of partner applications.

Recommendation 22. Bulgarian public sector administrations must implement a defined minimum set of open standards relating to Web services and their information security. When developing public services and the associated information systems, they must consider the standards listed in the Register of standards with varying degrees of obligation.

Contribution to the standardisation process

In some cases, public administrations may find that no suitable formalised specification is available for a specific need in a certain area. If new specifications have to be developed, public administrations may either develop the specifications themselves and put forward the result for standardisation, or request a new formalised specification to be developed by standards developing organisations. The resulting formalised specifications must comply with the characteristics set out in Section 5.2.1. and be published in the Register of standards.

Even where existing formalised specifications are available, they evolve over time and experience shows that revisions often take a long time to be completed. Active government participation in the standardisation process mitigates concerns about delays, improves alignment of the formalised specifications with public sector needs and can help governments keep pace with technology innovation.

Recommendation 23. Public administrations must lead or actively participate in standardisation work relevant to their needs.

Interoperability governance

Due to their cross-organisational characteristics, Bulgarian public services operate in a complex and changing environment. Ensuring interoperability between legal instruments, organisation of business processes, information exchanges, services and components that support the delivery of Bulgarian public services is a continuous task, as interoperability is disrupted by changes to the environment, i.e. to legislation amendments, the needs of businesses or citizens, the organisation of public administrations, business processes or technologies.

Recommendation 24. Public administrations must ensure that interoperability is stable over time when developing and delivering Bulgarian public services.

Even if interoperability is maintained for a given Bulgarian public service, its delivery often relies on components that are common to many Bulgarian public services. These components, which are the results of interoperability agreements reached outside the scope of the public service, must also be made available to the public.

Moreover, as the common components and interoperability agreements are the results of work carried out by public administrations at different levels (local, regional, national and international), coordination and monitoring this work requires a holistic approach.

This can be achieved by establishing a technology portal where public institutions will publish information on the performance of public services - service components, reference models, interfaces, etc.

Recommendation 25. Public administrations must establish a common approach to governance of their interoperability activities across administrative levels.

Glossary

Business Process	A business process is a sequence of linked activities that creates value by turning inputs into a more valuable output. This can be performed by human participants or ICT systems, or both.
Interface	An interface is a conceptual or physical boundary where two or more independent legal systems, organisations, processes, communicators, IT systems, or any variation/combination thereof interact.
Information and Communication Technology (ICT)	Technology, e.g. electronic computers, computer software and communications technology, used to convert, store, protect, process, transmit and retrieve information.
Metadata	Metadata are structured data which contains information about other data and thereby describes data. For example, the attributes of electronic data are detailed by author, rights of access, date of the last processing, format and keywords. This makes the retrieval, administration and management of electronic resources substantially easier.
Interoperability	The ability of disparate and diverse public sector organisations to interact towards mutually beneficial and agreed common goals, involving the sharing of information and knowledge between the organisations, through the business processes they support, by means of the exchange of data between their respective ICT systems. Interoperability describes the ability and the instruments for direct communication and cooperation between different systems and organizational units based upon common standards, technologies and concepts. Furthermore, interoperability needs a shared understanding of information and an adjustment of data structure. This means, for example, on a technical level that devices with different hardware can communicate in a network based on a common protocol. Also, look at § 1, item 13 of the Electronic Government Act.
Orchestration	Orchestration involves executing a set of processes, described in a standard language, which is configurable and capable of executing all the requisite service calls and routing the inputs and outputs of processes according to rules described in that language.

Software components, service components	Unified approach to establishing information systems for the provision of public services from architecture to implementation thereof, in which the information system is designed as a set of components forming data and functionalities in groups that can also be reused as "building blocks" to create other public services or information systems.
Service Level Agreements (SLA)	A formalised agreement between two cooperating persons/organisations, typically, a service provider and a user. The agreement is expressed in the form of a written contract.
Interoperability Agreements	Interoperability agreements are written, concrete and binding documents which set out the precise obligations of two parties cooperating in the development of public services across an interface to achieve interoperability.
Standard	A standard is a technical specification approved by a recognised standardisation body for repeated or continuous application, the compliance with which may have different binding levels and which is one of the following: - international standard: a standard adopted by an international standardisation organisation and made available to the public, - national standard: a standard adopted by a Bulgarian standardisation body and made available to the public, Also look at § 1, item 1 of the National Standardization Act.
Taxonomy	A taxonomy represents a classification of the standardised terminology for all terms used within a knowledge domain. In a taxonomy, all elements are grouped and categorised in a strict hierarchical way, and are usually represented by a tree structure. In a taxonomy, individual elements are required to reside in the same semantic scope, so all elements are semantically related with one another to one degree or another.
Formalised Specifications	Formalised specifications are either standards pursuant to EU Directive 98/34, or specifications established by ICT industry fora or consortia.