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Topic (i): Architecture

Architecture the ESS.VIP Programme

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I. Introduction

1. The ESS.VIPs Programme has been conceived as the strategic approach for the modernisation of the production systems in the European Statistical System (ESS). It is rooted in the need of the ESS to face the Official Statistics industry wide challenges: an ever-increasing demand for statistics combined with a simultaneous request for reduction in the burden posed by data collection, substantial cuts on the financial and human resources in the ESS accompanied with rising needs for measuring cross-cutting and complex phenomena and meeting at the same time the challenge rising from the disruptive changes of the information industry (see also the HLG Vision).

2. The ESS is a complex system/organisation which regroups all National Statistical Authorities, mainly National Statistical Organisations (NGOs) which operate in European Union (EU) countries, the so called Member States (MSs). Eurostat, the coordinating body of the ESS, is responsible for compiling EU statistics mostly based on national statistics which have been harmonised. The highest strategic instance of the ESS, the ESS Committee, brings together quarterly the head of the NGOs and is chaired by the Chief European Statistician, the Director General of Eurostat.

3. The ESS.VIP Programme implements the Joint Strategy adopted in 2010 by the ESS Committee targeting the transformation of the ESS towards a more "integrated" statistical system, more efficient, more agile and producing highest quality statistics meeting user demand (see European Commission communication COM (2009) 404 on the production method of EU statistics: a vision for the next decade)

4. The Programme architecture consists of a set of modular work packages to be articulated in an appropriate time sequence, combining the

a) realisation of business objectives set up in the ESS Joint Strategy through a set of business projects piloting transformations of the EU statistics statistical production processes;

b) the sustainable transformation of ESS statistical infrastructure towards a "to be " solution through a set of projects targeting the uplift of generic supporting infrastructure enabling the business transformation;

c) the improvement of the enabling framework (legal, organisational, operational) aiming at the proper sourcing and management of the programme and the improvement of the legal and organisational context supporting the transformation of the ESS.

5. The Programme was officially launched in January 2013 with the adoption of three first business projects by the ESS Committee. It will gradually expand including projects covering other components of the programme under its close monitoring and with active participation of EU Member States along the whole programme life cycle. It is planned to extend until December 2017.

6. The following sections of the paper describe the global architecture of the planned programme (section II) and review the architectural principles organising and driving the programme (section III) and finally a series of challenges the Programme has to address to make it a success (section IV).

II. ESS.VIP Programme architecture

A. General architecture of the Programme

7. The Programme builds upon previous Eurostat Vision Infrastructure Projects (VIPs)[1] and ESSnet[2] projects, launched after the adoption of the Communication on "The new production method of European Statistics: a vision for next decade" in 2009 (COM(2009) 404). The term "ESS.VIPs" was introduced to emphasize that the Programme combines those two streams of projects conducted so far, namely the transformation and building common generic and cross domains capabilities for the ESS in partnership with ESS members.

8. The ESS.VIP Programme is built on three pillars. Each pillar contains a number of concrete projects that are managed in a coordinated way targeting outcomes which may not be achievable from running and managing them individually:

9. **Pillar I: Cross-cutting projects**. These projects aim at developing a set of key building blocks of a common architecture and infrastructure for the deployment of new business processes and the related standards ensuring the interoperability of processes and the sharing of information. Currently four projects are envisaged

1. **IMS: (Information Model and Standards)** that focuses on infrastructure interoperability through the promotion and development of standards. In particular, it covers the data and metadata models (like SDMX and DDI) to be put in place to support the full range of statistical processes and information objects.
2. **ESDEN: (European Statistical Data Exchange Network)** that focuses on the communication network architecture and infrastructure as well as on the services needed on top, in particular:
   - the enhancement of the current EDAMIS capabilities,
   - (ESS network), the necessary extension of the capabilities of SDMX-RI (SDMX-Reference Infrastructure),
   - the necessary extension to process and secure confidential data,
   - the development of an infrastructure for remote processing of confidential data and
   - the design of a solution, building on existing pan European communication networks.

[1] VIP: projects owned by Eurostat targeting the development of cross domain infrastructures in Eurostat. In the period 2010-2012, 10 VIP projects have been launched.

[2] ESSnet : European Statistical System collaborative projects funded by Eurostat and bringing together National Statistical Organisations of the EU which results target common statistical issues and should benefit the whole ESS. From 2009 until now 35 ESSnet projets have been launched.

3. **SERV: (Shared Services)** that focuses on the architecture, infrastructure and governance for sharing services among processes and stakeholders. It will target the operationalisation of the "Plug & Play"/SOA architecture developed at UNECE level. It includes the design of the architecture for exposing services, for orchestrating services and managing workflows through a process monitor and manager.
4. **DW: (Data Warehouses)** that focuses on data/metadata infrastructure and solution developments covering, for Eurostat, the reference enterprise data warehouse architecture and solution and for Member States the connectivity of their data warehouses to the ESS data warehouse, building on potential SDMX-RI components.

9. **Pillar II: Business projects**. These projects will pilot, in specific statistical domains and targeted business process segments, the business transformation towards more sharing of information across processes and ESS partners, the use of common services and better sharing of responsibilities and costs. They principally target the reduction of burden and the reuse of information across partners and processes, the improvement of integration of processes and their efficiency reducing waist and increasing automation. Seven projects are envisaged:

1. **ADMIN**: ADMINistrative data (cross statistical domains, GSBPM : Collect and Process);
2. **NAPS-S**: National Accounts Production System – Services (GSBPM : Process, Analyse)
3. **PRIX**: PRIce statistics neXt generation (GSBPM : Collect, Process)
4. **ICT:**: Production and dissemination of ICT statistics based on shared services (GSBPM : Process, Analyse, Disseminate)
5. **ESBRs**: European System of Business Registers (Across Business Statistics domains, GSBPM : Design)
6. **SIMSTAT**: SIngle Market STATistics (GSBPM : Collect)
7. **CDVP**: Common Data Validation Policy (Across Statistical Domain – GSBPM : Process - Review/Validate & Edit)

10. **Pillar III: Administrative projects**. These projects aim at defining the governance of the system, the actors, their responsibilities, the resources committed, the administrative mechanisms, the implementation strategy and the associated communication. A central part in this pillar will be projects aimed at developing the appropriate frameworks and administrative mechanisms allowing for sharing data, services and costs among ESS partners.

B. Rationale

11. The cross cutting projects have been set up to ensure generic development serving the implementation business projects and to limit the number of dependencies. They are organised as to ensure a separation of concerns following enterprise architecture layers and the alignment with the 4 strategic directions for improving ESS architectures underlying the implementation of the Vision, namely:

1. **Communication network** linking MSs and Eurostat ensuring seamless exchange of confidential data and metadata by building on messaging protocols and services enabling linkage of process steps in a distributed computing environment.
2. Capabilities for **sharing information** among Member States partners and Eurostat through the development of data and metadata hubs and common registries & repositories aiming at pooling and redistributing information of common interest.
3. Process **interoperability** among production lines distributed in ESS members through a better sharing of process metadata and the definition of communication protocols.
4. Process **modularity** enabling more flexibility and agility in designing new processes and allowing the sharing and reuse of generic services/components.

12. The architecture of the programme with its main dependencies is summarised in Fig1.

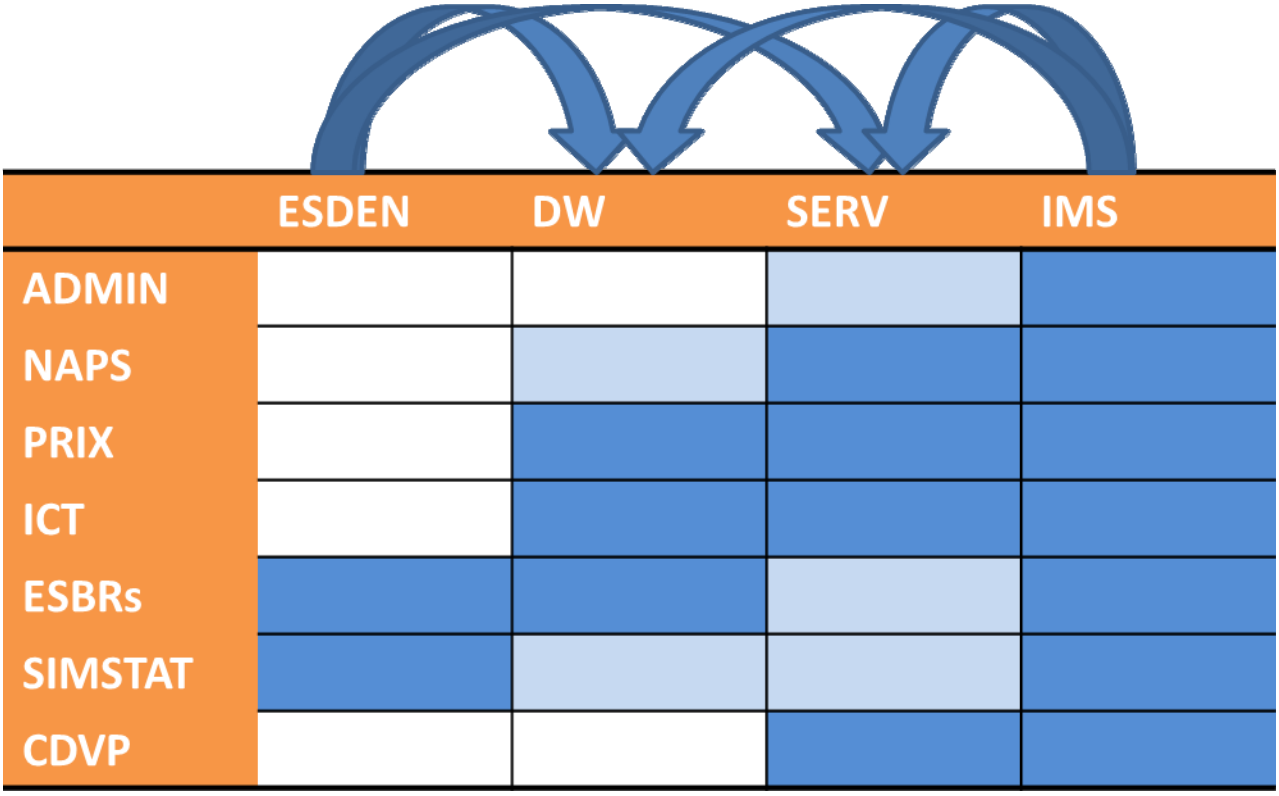

Figure 1: General architecture of the ESS.VIP Programme (first two pillars) and main dependency patterns between business and cross cutting projects and among technical cross cutting projects. Dark blue rectangle stands for strong dependencies, light blue rectangles for secondary dependencies. Arrows indicates major links between the cross cutting layers.

III. ESS.VIP Programme principles

13. The following section provides the set of architectural principles that were at the basis of the design of the Programme as presented to ESS partners. They will have to be complemented in collaboration with Member States to serve as a basis for its monitoring during its entire life cycle including, in particular, the prioritisation and the launching of the new projects.

A. Programme principles

1. **Alignment with ESS Vision**: The Programme aims at developing and transforming sustainably the ESS along the directions identified in the ESS vision.
2. **Business outcome driven**: The Programme targets primarily the realisation of business outcomes and benefits. Technical infrastructure should support this business realisation.
3. **Generic development**: The Programme targets the setting up of generic, sustainable and reusable components covering the 4 layers of the ESS enterprise architecture (business, information, solution and technical).
4. **Programme efficiency**: The Programme development should be cost efficient and should target the reuse of generic components already developed or their migration into the target architecture.
5. **Programme coherence and impact management**: The Programme should aim at a coherent and balanced development across the different layers and its impact (cost of deployment in the ESS and across the different layers) should be constantly monitored.
6. **Derogation** to Programme principles is possible in case a migration plan is designed and included in the project life cycle.

B. Business and information architecture principles

1. Maximum **reuse** of existing process components and segments.
2. **Meta data driven** processes allowing adaptation/parameterisation and extension to other contexts.
3. New business process built as a sequence of **modular process steps / services. .**
4. Information objects structured according to available **information models** and stored in **corporate registries/repositories** in view of reuse.
5. Parsimonious use of confidential data and preservation of **statistical confidentiality.**

C. Solution and technology principles

1. Alignment to **business needs** and **efficiency** principle.
2. **Assembling** and **reuse** of exiting generic components.
3. **Service orientation** and **reusability** of solutions components in different context (MSsMember States or statistical domains).
4. Adherence **to industry and open standards** as available (e.g. Plug & Play)
5. **Separation of concerns** is applied (OSI/Internet layers – abstraction layers ensuring loose coupling).
6. **Security** incorporated in the design of all solutions.

III. ESS.VIP Programme challenges and opportunities

14. The ESS.VIP Programme is a major initiative for Eurostat and the ESS and is a paradigm shift in the organisation of cooperation in the ESS. Although it is based on past experiences like ESSnets, it requires a step by step transformation of the system. Although the approach being innovative many of the components identified need to be built in parallel and constantly adjusted taking into account the different feedback and external constraints. Since the beginning of the initiative, the following issues and opportunities have been identified. They are being addressed in the current iteration of the programme to the maximise chances for success.

15 The main issues are:

1. Business outcome driven orientation puts strain on cross cutting architectural developments. The given infrastructure change requires time: some business projects will not fully benefit from cross cutting developments being available only later. Solutions will have to be built on legacy systems for which an adequate migration strategy should be incorporated in the programme.
2. The Programme builds on Eurostat discretionary funding obtained from normal operational budget and relies onon streamlining of investments. It puts much strain on "production lines" which receivereceive less funding for improvement.improvement. Agile programme governance and commonly agreed prioritisation mechanisms have to be put in place to cope with this tensions and with change of external conditions.
3. The transformation of the IT infrastructure requires specific and high level experienced skills which are not always directly available in public administration. It takes time to recruit new collaborators and to train them. Innovative ways of sourcing projects through pooling of existing resources and redistributing them in a matrix-like approach have to be set up.
4. The transformation requires a cultural change in the organisations involved, in particular in the acceptance of:
   - the primacy of enterprise (ESS) corporate optimum as opposed to local optimal;
   - the loose of control over projects because of the dependencies on other projects run by partners;

- tighter project management standards shifting focus from pure development to actual enterprise transformation and value.

5. The European Statistical System (ESS) has a long tradition in harmonising statistical products and regulating requirements within the different statistical domains. International cooperation has not put much effort on harmonising production methods, processes and systems so far. ESS members have built their own systems and are at different stages of development/transformation. Being part of national government[3], they do not have the full flexibility and means to adapt to new standards. A flexible approach is required by federating the different organisational architectures through the balanced and combined development of interoperability standards (see paper on sponsorship on standardization), infrastructure components to be shared and some common infrastructure and a great flexibility in convergence.
6. The programme has started without a full description and agreement on the "to be state". The comprehensive review of the capabilities of the system to be supported by common developments and the corresponding technical architecture for the cross cutting projects is not yet available rendering difficult, on one side, the articulation between business and cross cutting projects and, on the other side, the agreement on priorities at ESS level. Their parallel development will require additional flexibility in the Programme governance with the possibility to include new high value projects not already detected at the inception.

16 However, given its critical mass and cumulated excellence of about 30 NGOs, the ESS provides many opportunities to ensure the Programme's success. The ESS.VIP Programme can build on and reuse architecture patterns already tested in the most advanced NGOs. It can/should build on Official Statistics Industry standards designed and maintained at UNECE level like GSBPM and GSIM and the forthcoming and highly desirable Plug & Play reference architecture. Finally it can draw on already existing competence in Member States and across the whole EU. Moreover, Eurostat can also lean on architecture and developments made at the level of the European Commission fostering transnational exchange and interoperability in the EU and the migration to Service Oriented Architecture.

[3] Eurostat itself is part of the European Commission and most of its infrastructure depends on decision and provision made at central level by the Directorate General for IT issues.