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User-driven ICT technical feasibility for GNSS services

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The broadened usage of Global Navigation Satellite System (GNSS) applications in agriculture, marine, aviation and local-based services (LBS), made it a crucial technology for our daily lives. GNSS market domain is rapidly growing by evolutionary technologies particularly in Information and Communication Technology (ICT) as the European GNSS Agency (GSA) annual revenues indicate that GNSS added-values (services) will hit 195 billion in 2025. Therefore, a feasibility study should be provisioned for projects in the section as a management-oriented activity to provide go or no-go decisions and to verify how to fulfill the users' requirements. Five essential areas of project feasibility are: Technical, Economical, Legal, Operational and Scheduling. The need for ICT technical feasibility for GNSS arises from the increased ICT infrastructural choices appropriate in respect to the GNSS applications. If an appropriate technology is not selected, the system will incur additional costs, and will not ensure higher profit and keep performing for a protective period appeal. As there is no precise definition regarding technical feasibility study (TFS), one can define it as the technical resources necessary for the development, purchase, installation and operation of a system [1]. The given definition leads us to a hierarchical approach for the ICT technical feasibility.

As a result, a novel approach has been developed to address ICT TFS for GNSS services in the frame of TREASURE project (www.treasure-gnss.eu). The approach surveys user needs and requirements through a technical questionnaire and focuses on the targets of users for positioning and navigation applications in space, aviation, maritime and land at local, regional and global level. Once the user and technical requirements are collected and validated, the appropriate ICT infrastructure is proposed and its performance evaluated. Therefore, an interoperable and compatible ICT solution is proposed which is adequately aligned to the user needs in TFS. The ICT architecture promotes: 1) scalability through the hardware flexibilities by using cloud Infrastructure as a Service (IaaS) instead of on-premises physical ICT infrastructure, as well as 2) increased integrity and greater agility by implementation of microservices as small autonomous services that work together for realization of a larger application. The solution includes essential GNSS corrections in real-time and post-processing distribution and this is conceived by taking care of the economic outlook and security issues.

To sum up, the technical feasibility study offers an original contribution by proposing a new ICT cloud infrastructure for GNSS-based services, in particular concerning the provision of positioning algorithms and error mitigations. The novelty of the developed solution lies in a customized ICT architecture, obtained through unique and privileged access to user communities, reachable thanks to the H2020 project TREASURE, allowing the development of a solution entirely driven by user needs. The economic outlook of GNSS downstream markets evolution highlights the actual fit of the technology proposed in the real context, offering useful insights to service providers to gain a sustainable competitive advantage. The simultaneous adoption of the technical and commercial perspective is meant to offer interesting findings to both the scientific community and GNSS industry, creating synergies previously unexplored. As an avenue for further research, it would be interesting to deploy a performance assessment of the algorithms and capabilities of the proposed ICT infrastructure. Such an exercise would allow for a more specific benchmark with the state-of-the-art performance, highlighting the actual novelty and advantages of the proposed solution.

References

[1] H. J. Rosenblatt, Systems analysis and design. Cengage Learning, 2013.