Cloud Service Architecture Optimization Methodology for Telemedicine and e-Health Interoperability

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Abstract

Mobile healthcare appliances' bulk interconnection is beneficial both on individual and on population level resulting in enhanced healthcare prognosis models. The flawless mobile healthcare information-exchange on a larger scale calls for improved healthcare data interchange standards and also for suitable architectural design. The difficulties of healthcare interoperability standards are already discussed thoroughly in previous articles. Therefore, this article focuses on the mathematical methodology for e-Health service architecture optimization. In general, this research program aims to establish the scientific basis for the global cloud-based e-Health bio-sensory devices interconnection. In particular, this paper focuses on the underlying cloud service architecture's optimization. The contextual basis of this service architecture optimization methodology relies upon the Open System Interconnection model. During this procedure the service architecture solution candidates are described in diagrams with numbered subcomponents. These diagrams representing the architectural solution including the referenced subcomponents are mapped into directed graphs and later into adjacency matrices. The corresponding availability matrices derive from the adjacency matrices after the associated matrix operations, such as matrix multiplication, signum and sum functions. Finally, the comparison of these availability matrices results in the identification of the optimal architecture design. This technique offers the appropriate mathematical methodology for the e-Health service architecture optimization. Statistical optimization methodologies already existed for service architecture optimization. However, this presented optimization procedure delivers a comprehensive solution that is applicable also on a system-level, guiding to establish the prerequisites for the systematical interconnection of e-Health smart devices.

Keywords: Cloud architecture optimization, matrix-operation, directed graph

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