

Teza de doctorat: Contributii la dezvoltarea arhitecturilor middleware pentru Internetul Obiectelor

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Abstract

Teza de doctorat abordeaza problema dezvoltarii arhitecturilor middleware pentru Internetul Obiectelor, aducand contributii semnificative la proiectarea arhitecturilor substratului intermediar care trebuie sa conecteze o gama cat mai larga de obiecte „inteligente” la retea globala de Internet a Obiectelor si Internet al Serviciilor si anume o metodologie de proiectare integrata, descrierea functionala a unei arhitecturi de referinta propuse si dezvoltarea unei platforme middleware pentru o aplicatie concreta din domeniul agriculturii. Analiza stadiului actual al cunoasterii in domeniul Internetului Obiectelor punand accent pe aspectele legate de proiectarea conceptuala a arhitecturilor middleware a evidenciat faptul ca platformele middleware, fiind dezvoltate pentru aplicatii specifice, fara a se baza pe o arhitectura de referinta, nu sunt interoperabile si creeaza insule izolate de obiecte ce ar trebui conectate la o retea globala de Internet a Obiectelor. De asemenea s-a remarcat faptul ca platformele middleware nu au avut ca scop integrarea serviciilor oferite de obiectele „inteligente” in retea globala de Internet a Serviciilor. S-a facut si o analiza a arhitecturilor propuse pana in prezent, punandu-se accent pe aspectele referitoare la capacitatea de integrare a unei game cat mai variate de obiecte, in vederea proiectarii ulterioare a unei arhitecturi de referinta compatibila cu modelul de referinta adoptat si a unei arhitecturi middleware interoperabile adecvata unei categorii cat mai largi de aplicatii.

Teza de doctorat propune o metodologie de proiectare integrata, bazata pe o abordare sistemica, care sa sprijine dezvoltarea platformelor middleware interoperabile, expunand principalele rezultate ale activitatii de proiectare: cerintele generice identificate pe baza caracteristicilor IoT si a modelului de referinta IoT, stilul arhitectural selectat astfel incat sa permita integrarea IoT-IoS si descrierea functionala a arhitecturii de referinta propriu-zise. Teza de doctorat contribuie cu o arhitectura middleware proiectata pornind de la un scenariu de utilizare a tehnologiilor IoT intr-o aplicatie in domeniul agriculturii, pe baza caruia s-au identificat cerintele specifice pe care trebuie sa le indeplineasca platforma middleware IoT. De asemenea, lucrarea de fata propune o varianta de implementare a arhitecturii middleware utilizand tehnologiile de implementare disponibile la momentul de fata.

The PhD thesis concerns with the development of middleware architectures for the Internet of Things, adding significant contributions to the design process of the intermediary substrate that must connect an enlarged variety of intelligent objects to the global network of Internet of Things and Internet of Services: an integrated design methodology, the functional description of a proposed reference architecture and the development of a middleware platform for a concrete application in the agricultural domain. The analysis of the state of the art in the area of Internet of Things regarding conceptual design of middleware architectures has pointed out that middleware platforms, being developed for specific applications and not based on a reference architecture, are not interoperable and they create isolated islands of object that need to be connected to the global network of Internet of Things. It was also noticed that the middleware platforms didn't have the purpose to integrate the services offered by "intelligent" objects into the global network of Internet of Services. The architectures proposed so far were analyzed from the point of view of the capability to integrate a larger variety of objects, to help the design of a reference architecture compatible with a reference model and an interoperable middleware architecture adequate for an enlarged category of applications.

The PhD thesis proposes an integrated design methodology, based on a systemic approach, that supports the development of interoperable middleware platforms, presenting the main results of the design process: identified generic requirements based on the reference model and IoT characteristics, selected architectural style that allows IoT-IoS integration and the functional description of the proposed reference architecture. The PhD thesis contributes with a middleware architecture designed for a scenario in agriculture that adds some specific requirements needed to be met by the IoT platform. Also, the thesis proposes a possible implementation of the middleware architecture using the technologies available at the moment.