

Incentivizing Service Network Formation – An Approach to Reward Infrastructural Contribution

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Biographical statements

Tobias Conte studied at the Universität Karlsruhe (TH) and the University of California, Santa Barbara (UCSB). Since 2007 Tobias works as a PhD student and scientific associate at the Research Center for Information Technology (FZI), being work package lead in the large-scale German research project THESEUS/TEXO. His research interests are service networks and mechanism design.

Gerhard Satzger has obtained a diploma in Business Engineering from the University of Karlsruhe and an MBA from Oregon State University/USA. In 1993, he completed a Ph.D. program at the University of Giessen, before he earned his “Habilitation” from the University of Augsburg based on his work on “Capital Intensive Services in Global Markets”. In 1989, Dr. Satzger joined IBM and initially held several consulting and financial management positions. Later, he spent time as assistant professor at the University of Augsburg before returning to IBM Germany as head of controlling in 1998. From 2001 to 2002 he ran the central planning group for IBM Europe/Middle East/Africa, based in Paris. From 2003 onwards, he was CFO of Global Technology Services in Germany - IBM's business unit that includes the IT outsourcing business as well as technical infrastructure projects. Since the beginning of 2008, Dr. Satzger is heading the research group “Service Innovation & Management” in the Karlsruhe Service Research Institute, a joint institution of IBM and the University of Karlsruhe.

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Customers' demand for sophisticated, customized services has considerably been rising in recent years. Open standards and service-oriented architectures have emerged as important building blocks for innovative service value networks tying together the competencies of specialized contributors. Thus, by modularization, complex services should increasingly be able to be composed in a “plug-and-play”-manner. Increasingly, service platforms and marketplaces are created to assemble and manage those networks - with significant business impact, e.g. in the software industry, but also in other domains such as health care.

Obviously, the value of such service networks for customers depends both on the variety of competencies offered as well as on the network's ability to apply them to create a service matching the customers' expectations. While the latter questions have started to be addressed in the literature, the problem of how to attract providers to join a network has not gotten sufficient attention. The well-established dependency of a network's value and the number of people connected to it should not only hold for the demand side, but also the supply side of such networks: Not only the quantity of customers will boost the success of a service network or a platform/marketplace, but also the quantity and complementarity of providers as well as the quality of the services offered by them.

Extending “traditional” mechanism design and its corresponding desiderata, we present an approach that concentrates on explicitly incentivizing the service provider side as a novel way of distributing generated revenues among network participants. Its underlying presumption is not only to compensate those who actually contribute to the complex service offered at a time, but also to pay out to partners who are on standby, i.e. supporting the network's variety, but actually not contributing to the complex service rendered.

We develop and evaluate a mechanism that allocates the complex service instance that is maximizing the system's welfare and that rewards players for their contribution added to the overall network infrastructure. Our methodology is based on Shapley's seminal contribution to cooperative game theory (“Shapley Value”). Further, we show that our mechanism implementation is not only individually rational and budget-balanced, but is also capable of promoting fairness from a game theoretic perspective: Our mechanism satisfies efficiency (the full yield of the cooperation gain is distributed), symmetry (vendors who contribute the same value are paid equally) as well as marginality (increase in the value of a particular cooperation implies, *ceteris paribus*, that none of the players involved in this cooperation is worse off than before).

In summary, we provide a novel budget-balanced and fair mechanism that (i) incentivizes service providers to participate in a service networks and (ii) fosters differentiation by functionality, price, or service quality through fair compensation.