

Preface

In the Information and Communications Technology (ICT) sector where metadata standards are proliferating at unprecedented levels and automated information management systems need to collect and process information from, every day, sensors, devices, applications, systems, etc., the interoperability of the information and the knowledge exchange is identified as one of the major challenges. Furthermore, this necessity continues increasing as result of the everyday new demands for smarter services and the large amount of information captured and generated electronically, and also for today's trend about the information being processed and stored in cloud applications.

The introduction of these cited new demands bring as clear consequence the inevitable diversification of information, then as a predictable requirement, efficient data collection and optimal processing mechanism have to be designed and implemented and service providers, operators and infrastructure managers have to operate with many different standards and vocabularies. The use of semantic techniques to face up this requirement sounds as an optimum approach providing advantages in terms of facilitating data and information mapping. However those semantic techniques are becoming very costly, in terms of computing resources and time-response factors, resulting in loss of business opportunities because existing systems are not adaptable enough to those scalability demands.

If this cross-domain and information sharing problem is translated into the communications domain, as a result, it is necessary to deal with the most common scenario where computer network infrastructures collect data with the objective of supporting diverse communication services and applications. In communications systems, the problems about interoperability of data and information exchange are evident, and even more in recent days when the IT sector and its demands about convergence within heterogeneous communication systems, these problems are increased exponentially, emphasizing the need for proper semantic techniques and methodologies to facilitate information exchange processes.

ICT market is evolving towards more interconnected platforms and demanding integrated service solutions; for example, cloud computing emerges as one of the

most promising and at the same time more adaptive computing services, generating the multiplicity of middleware approaches and infrastructure development.

Cloud computing concentrates on tackling not only the complex problems associated with service cost reduction demands but also those related to network performance, efficiency and technological flexibility [Greenberg09]. It is true there is a market boom generated about cloud computing solutions; it rises exponentially when the economic atmosphere drives the world economies to a more service revenue with less investment in technology. However, beyond the service advantages and marketing revenue cloud-based solutions can provide, it is absolutely necessary to have well-identified service challenges, technology requirements and clear customer and service provider necessities to specifically and correctly solve root problems.

As a main common requirement when diverse systems are interacting, the linked data and exchange of information are considered as crucial features. In this diverse and complex set of service and technological requirements, about information exchange and systems integration respectively, the role of management systems and other next generation applications and networking services supporting the mentioned integration is most likely catalogued as a set of alternatives.

A traditional scenario example to understand this complexity can be studied in autonomic systems management [see work from the Autonomic Communications Forum (ACF)]. Acting as a root problem, autonomic networks are not able to handle the broad diversity of information from resources, devices, networks, systems and applications. Particular interest focuses on exchanging information between different stake holders (autonomic components or autonomic layers) when it is necessary; however as described, there is no capability to exchange pieces of such information between the different systems participating in the autonomic solution.

The convergence of software and networking solutions can provide solutions for some of the complex management problems present in current and future Information and Communications Technologies (ICTs) systems. Current ICT research is focused on the integrated management of resources, networks, systems and services. This can be generalized as providing seamless mobility to, for example, personalize services automatically. This type of scenarios requires increased interoperability in service management operations.

Integrated management and cross-layer interactions involve both the transmission capabilities from network devices and the context-aware management services of the middleware environment. Transmission capabilities influence the performance of the network, while middleware impacts the design of interfaces for achieving data and command interoperability.

Integrated management refers to the systematization of operations and control of services in networks and systems. Cross-layer refers to the joint operation of the physical, link, management and service layers, and context-awareness refers to the properties that make a system aware of its user's state, the goals of the user and operator, and the state of the network environment. This awareness helps the systems to adapt their behaviour according to applicable business rules, all the while offering interoperable and scalable personalized services. To do this, different data

models are required in NGN and Internet solutions, due to the inherent heterogeneity of vendor devices and variability in the functionality that each device offers.

Typical solutions have attempted to provide middleware to mediate between a (small) subset of vendor-based solutions, while research has investigated the use of a single information model that can harmonize the information present in each of these different management data models. Industry has not yet embraced the approach, since this research typically does not map vendor-specific functionality to a common information model.

To alleviate this problem in ICT systems, the convergence of software solutions and managing systems controlling the networking infrastructures must provide alternate solutions in short incubation periods and with high scalability demands. Additionally and as result on the increasing demand to implement cloud solutions, it is not difficult to understand why ICT research is focusing on the integrated management of resources, networks, systems and cloud solutions or cloud services and on the way to exchange data standards facilitating this information interoperability and systems integration labor. These challenges in terms of realistic services and applications can be generalized as looking forward for providing seamless mobility services to, for example, personalize services automatically.

This book focuses on Ontology Engineering and its applications in service and network management systems. This book aims to act as a reference book defining application design principles and methodological modeling procedures to create alternative solutions to the scientific and technological challenge of enabling information interoperability in cross-domain applications and systems, examples in managing cloud services and computer network systems are included.

In today's ICT systems, the enormous amount of information and the increasing demands for optimally managing them generates the necessity of rethinking if current information management systems can cope to these demands and what are the best practices to make more efficient the telecommunications services in computer networks, particularly in times where everything is migrating to cloud-based systems. Thus this book is expressly an invitation to explore and understand the basic concepts, the applications and the consequences and results about applying ontology engineering in cloud services, networks and management systems

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