



University of Technology, Sydney
Faculty of Engineering and Information Technology

CARMA:
COMPLETE
AUTONOMOUS
RESPONSIBLE
MANAGEMENT
AGENT
(SYSTEM)

Submitted by:
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CERTIFICATE OF AUTHORSHIP/ORIGINALITY

I certify that the work in this thesis has not previously been submitted for a degree nor has it been submitted as part of requirements for a degree except as fully acknowledged within the text.

I also certify that the thesis has been written by me. Any help that I have received in my research work and the preparation of the thesis itself has been acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

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Abstract

The continuing expansion of telecommunication service domains, from Quality of Service guaranteed connectivity to ubiquitous cloud environments, has introduced an ever increasing level of complexity in the field of service management. This complexity arises not only from the sheer variability in service requirements but also through the required but ill-defined interaction of multiple organisations and providers. As a result of this complexity and variability, the provisioning and performance of current services is adversely affected, often with little or no accountability to the users of the service.

This exposes a need for total coverage in the management of such complex services, a system which provides for service *responsibility*. Service responsibility is defined as the provisioning of service resilience and the judgement of service risk across all the service components. To be effective in responsible management for current complex services, any framework must be able to interact with multiple providers and management systems. The CARMA framework proposed by this thesis, aims to fulfil these requirements through a multi-agent system, that is based in a global market, and can negotiate and be responsible for multiple complex services.

The research presented in this thesis draws upon previous research in the fields of Network Management and Cloud service management, and utilises agent technology to build a system that is capable of providing resilient and risk aware management of services comprised of multiple providers. To this end the research aims to present the architecture, agent functionality and interactions of the CARMA system, as well as the structure of the marketplace, contract specification and risk management.

As the scope and concepts of the proposed system are relatively unexplored, a model and simulation were developed to verify the concepts, explore the issues, assess the assumptions and validate the system. The results of the simulation determined that the introduction of CARMA has the potential to reduce the risk in contracting new services, increase the reliability of contracted services, and increase the utility of providers participating in the market.