

GAIA Bus: Cloud Computing Services for Agro-Food Chain

*Georgios Kormentzas, Department of Information and Communication Systems Engineering,
University of the Aegean, Samos, Greece*

ABSTRACT

There is a great need for research and innovation in order to make the food chain to fit and cover the needs and requirements of all stakeholders of the agro-food chain. ICT and especially cloud computing could play an important role at the sustainable agro-food chain. The paper discusses an innovative cloud-based technological bus where the inter-connected entities develop and share cloud services such as farm managing, e-commerce of agrifood products, automation tools for farmers' administrative procedures, e-learning for agriculture topics, information portal, social networking for farmers, traceability services and information tools for precision farming. The Greek version of GAIA bus went online almost one year ago and at the time of writing holds approximately 570.000 subscribers. It is anticipated that in the near future the GAIA bus business penetration is going to concern European and Brazilian agricultural market.

Keywords: Agro-Food Chain, Cloud Computing, Cloud Services, Code Generation, Service Development Platform

1. INTRODUCTION

In the same way that there are many different types of production system across the EU, there are also many different supply chain routes to market [1]. There is a place for more localized production and consumption through localized chains, but the reality is that many supply chains in the EU are cross border and involve large retailers. Changes to production processes on a large scale can have big impacts, and provide market signals to agriculture. A mix of supply chains which all develop ways to improve their sustainability should be welcomed. Therefore

the origin of sourcing is only one amongst various options for the upstream actors of the food chain and should by no way be limited to key food commodities.

The agro-food chain sustainability needs to cover three pillars: social, economic and environmental. A strong emphasis have to be putted on the viability of the agricultural sector in view of assuring food security today and in future with special care on safe, nutritious food of good quality with low environmental impact. The focus must be put on the sustainable development of the food chain, including all players along the food value chain, in view

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of a dynamic process. Therefore, it is better to speak about “sustainable development along the food chain” instead of taking a static approach speaking about “sustainable food”.

There is no direct link between regional, wholesale markets and sustainability of food production and processing, therefore it is an open question the effectiveness of actions in this area in view of stimulating a more sustainable production. But when looking at the whole food chain regional or even local market and direct sales have their place in the sustainability discussion as they contribute to raise awareness at consumer level on where the food comes and the value food has. Regarding improving animal welfare, this aspect should be looked at together with animal health aspects.

Innovation in effective and sustainable food supply chains to develop new products, reduce food wastage and to add value throughout will only happen if imbalances of power are addressed. Therefore it is important to focus on fair and equitable supply chains providing value for everyone, allowing all actors in the chain to innovate in their approach to production and consumption of food, from consumers through farmers, processors and retailers. Transparency in food system is a key issue, and the further development of long term, fair and transparent relationships across the supply chain between retailers, manufacturers and farmers and agri-cooperatives is much needed.

As highlighted in the Strategic Implementation Plan of the EIP on “Agricultural productivity and sustainability” [2] there is a great need for research and innovation in order to make the food chain fit for the future. EU support for solution oriented-research and to increase the uptake of innovative solutions by the food chain members is crucial.

ICT and especially cloud computing [3] could play an important role at the sustainable agro-food chain. It is clear today that the legacy desktop platforms and development environments are being left behind. Even though there are still some prevalent desktop applications that some users install in their personal computers, more and more of the functionality moves to

the cloud services. The architectures behind any cloud services are basically large fleets of machines, running under the supervision of a control software. The control software is capable of managing the collective resources of the fleet, allocating hardware resources from the constituent machines to different “segments” of the cloud – with each segment hosting a specific web application/service.

The GAIA bus constitutes a suite of cloud-based services and systems targeted to virtually all stakeholders in the agro-food chain. Services for farm managing, e-commerce of agrifood products, automation tools for farmers’ administrative procedures, e-learning for agriculture topics, information portal, social networking for farmers, traceability services and information tools for precision farming. The GAIA bus information core is an electronic registry, which keeps complete data records (detailed geospatial reference included) of the involved agro-food chain layers.

The GAIA bus schematically acts as a technological ring (mediation bus) [4] on which connected entities reflect either individual agro-food chain users/actors/players (farmer, agriculturalist, accountant, retailer, consumer, etc), or represent entire public and/or private sectors. The adopted cloud technology enables the bus to provide high quality and safe services in various formats (consumer to consumer, business to consumer, business to business, business to public, etc). In addition, the bus structure allows to add new entities and new services in a modular and efficient way.

After this introductory section, the rest of the paper is organized as follows: Section 2 highlights the business scenarios and the services to be provided by the GAIA bus towards the formulation of a sustainable agro-food chain. Section 3 firstly discusses the architecture of the development platform of the GAIA bus, subsequently presents how an efficient code generator technique is adopted towards the development of the GAIA bus cloud services and lastly gives an overview of the current GAIA bus implementation status and its own business market penetration at the Greek agro-food sec-

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