The Advantages of the Use of Cloud Computing in Intelligent Transport Systems

Jolanta Joszczuk–Januszewska

Gdynia Maritime University, al. Jana Pawla II 3
81345 Gdynia, Poland
jolajj@am.gdynia.pl

Abstract. One of Information and Communication Technologies (ICT) benefits for the society are Intelligent Transport Systems (ITS), which make transport more efficient, faster, easier and reliable. Nowadays one of the most important aims of ITS is that these systems must become faster commonly used. Internet services are one of such solutions, cloud computing services, in particular. Generally the cloud computing is Internet-based computing, whereby shared resources, software, and information are provided to computers and other devices on demand, like the electricity grid. The advantages, particularly concerning the technological and economic aspects, of the use of cloud computing services in ITS are described in this paper.

Keywords: cloud computing, intelligent transport systems, information and communication technologies.

1 Introduction

Multiple initiatives have been initiated world-wide to define the key enabling the main aim that the use of Information and Communication Technologies (ICT) will have to play to maximize the social and economic potential of ICT, the Internet, in particular – today a useful medium of economic and societal activity [1], [2].

Intelligent Transport Systems (ITS) are one of ICT-enabled benefits for society, which make the transport more efficient, faster, easier and reliable. Nowadays one of the most important aims of ITS is that these systems must become faster commonly used [3].

Internet services are one of such solutions, cloud computing services, in particular. Generally the cloud computing is Internet-based computing, whereby shared resources, software, and information are provided to computers and other devices on demand, like the electricity grid [4].

The advantages, particularly concerning the technological and economic aspects, of the use of cloud computing services in ITS are described in this paper.

2 Cloud Computing

It is true that the cloud computing is a revolution that will define information technology (IT) in the second decade of the 21st Century. This new form of computing
is perfectly poised to provide solutions to a host of business problems within organizations large and small [5].

2.1 Definition of Cloud Computing

The cloud computing is a model for enabling convenient, on-demand network access to a shared pool of computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction [6].

In its definition of cloud computing, The National Institute of Standards and Technology (NIST) describes the cloud computing as having five essential characteristics, three service models, and four deployment models. This definition attempts to encompass all of the various cloud approaches [5], [7], and [8].

Essential Characteristics. The following list identifies the essential characteristics:

- **on-demand self-service.** A consumer can unilaterally provision computing capabilities such as server time and network storage, as needed automatically, without requiring human interaction with each service’s provider.
- **broad network access.** Capabilities are available over the network and accessed through standard mechanisms that promote use by heterogeneous thin or thick client platforms (e.g., mobile phones, laptops, and PDAs).
- **resource pooling.** The provider’s computing resources are pooled to serve multiple consumers using a multitenant model, with different physical and virtual resources dynamically assigned and reassigned according to consumer demand. There is a sense of location independence in that the customer generally has no control or knowledge over the exact location of the provided resources, but may be able to specify location at a higher level of abstraction (e.g., country, state, or data center). Examples of resources include storage, processing, memory, network bandwidth, and virtual machines.
- **rapid elasticity.** Capabilities can be rapidly and elastically provisioned, in some cases automatically, to quickly scale out and then rapidly released to quickly scale in. To the consumer, the capabilities available for provisioning often appear to be unlimited and can be purchased in any quantity at any time.
- **measured service.** Cloud systems automatically control and optimize the resource use by leveraging a metering capability at some level of abstraction appropriate to the type of service (e.g., storage, processing, bandwidth, and active user accounts). The resource usage can be monitored, controlled, and reported providing transparency for both the provider and consumer of the utilized service.

Service Models. The following list identifies the service models:

- **Cloud Infrastructure-as-a-Service (IaaS).** This is really the most basic cloud service model, aligning the on-demand resources of the cloud with tactical IT needs. In this way, IaaS is similar to managed services offerings of the Internet era (i.e., hosting services, storage service providers (SSPs), etc.). The primary difference is that cloud resources are virtual rather than physical and can be consumed on an as-needed basis. In other words, enterprise consumers pay for