Software as a Service and the growth of ITS

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Abstract

This paper will introduce Software as a Service (SaaS) as a key means for transportation agencies of reducing costs while offering greater ITS services. The paper will describe several properties of SaaS offerings that are currently available in ITS. Then it will detail three case studies of current SaaS companies active in ITS and describe how each demonstrates the properties. The paper will conclude that public and private transportation bodies should employ SaaS offerings, and should work to remove any internal rules that unnecessarily restrict the consideration and deployment of SaaS-based products.

Keywords

Software as a Service, Cloud computing, Traffic data, Pay-as-you-drive, vehicle fleet telematics

Introduction

In the current fiscal environment of shrinking transportation budgets due to decreasing fuel tax revenues, Software as a Service (SaaS) is a potential key to help spur the growth of ITS. SaaS allows optimal use of infrastructure through optimal processing of traffic and transportation data, and does so economically—with a clear business case for all parties involved. Employing SaaS allows transportation agencies to simultaneously reduce their costs and improve service, and do so affordably. Because SaaS is typically a subscription-based service, agencies can begin using them with little or no up-front capital payment. As a result, SaaS services are appearing in many areas of ITS.

This paper will introduce the concept of SaaS based ITS products and examine three case studies of current ITS SaaS companies:

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<th>ITS Area</th>
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<td>Vehicle Counting and Traffic Data</td>
<td>Metrotech Inc</td>
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<td>Vehicle Fleet Services</td>
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Based on the case studies, this paper will discuss the properties of SaaS that demonstrate why each of these products can succeed in an SaaS delivery format, and conclude that SaaS is a valuable delivery model and will play an important role in ITS in the next decade.

Software as a Service

SaaS is a business model in which software and data are hosted by a central server system provided by the SaaS provider [Wikipedia]. SaaS is often conflated with cloud computing,
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but is a distinct concept. Cloud computing refers to an information technology architecture in which a central offsite group of servers provide services and manage data. SaaS refers to the more specific situation where a company that has developed a specific piece of software offers that software to customers on a cloud computing platform (instead of allowing the customers to download it), and charges customers on a subscription basis.

SaaS is now well established in several fields of software, most notably Customer Relationship Management (CRM). The first very successful SaaS-based firm was salesforce.com, which remains the best-known SaaS CRM product. In addition to CRM, accounting and other back-office business functions are offered as SaaS.

In the field of ITS, SaaS has been discussed for many years. However SaaS ITS products and services have become available only relatively recently. Compared with traditional software offerings, SaaS offers functionality benefits. Some functionality is only available on SaaS, and so using SaaS can bring greater functionality as well as cost savings. Thus SaaS offers major advantages, and should be pursued and encouraged by transportation agencies. The following three case studies illustrate major ITS SaaS offerings:

**Case Study #1: EROAD**

EROAD is a provider of commercial vehicle tolling and fleet service software in New Zealand and operate their services using a SaaS model. EROAD offered the first onboard unit (OBU) that supports automatic payment of New Zealand’s commercial vehicle weight-distance based road fees [Michie]. EROAD’s hardware, web application and transaction gateway overcomes all the typical shortcomings associated with paper-based road tolling regimes. EROAD bundles their OBU with tolling services and commercial vehicle fleet software, on a monthly lease basis to end customers at no cost to the roadway agency.

As a SaaS product, EROAD runs servers that provide road fee and commercial vehicle fleet services from a central location. To implement their SaaS solution, EROAD provides a hardware product, their OBU. The OBU collects data from vehicles and sends it back to the EROAD servers. The OBU also guarantees compliance with the road fee payments in all vehicles in which it is installed.

EROAD employs a direct to client service model that benefits both customers and the government agency operating the weight distance tax. EROAD sells their services to private commercial vehicle operators, who pay for the convenience of automatically paying for the weight distance tax as well as a host of other fleet services. The government benefits through reduced administration, enforcement, and other costs related to the weight distance tax. Both the government agency responsible for the weight distance tax and the private clients get better service and reduce their operating costs from this model.

EROAD’s unique selling point is the security of their OBU and web application: the EROAD device cannot be tampered with or removed from a vehicle without it entering into an unauthorized state which cannot be reversed without undertaking a formal audit, nor can operators able to report false travel or fail to report travel [Michie]. EROAD’s OBUs have vehicle movement inputs from three separate, independent sources: a GPS chip, the vehicle’s electronics, and an accelerometer. If any one of these three sources is disabled, the other sources continue to provide information, and if inputs indicate that they are intentionally disabled, EROAD is notified and the customer is then required to complete the investigation.
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process. EROAD also uses heavy electronic security (encryption and authentication), and to date has never experienced a material security breach.

**Case Study #2: Metrotech Inc.**

Metrotech Inc is a provider of cloud-based traffic analytics software that does not require data from special cameras, but instead uses data feeds of standard roadway-mounted CCTV cameras used for traffic surveillance and incident response. By employing advanced video processing algorithms, Metrotech’s traffic analytics software delivers more accurate results from lower quality hardware and data than many other video traffic analytics companies deliver from very advanced video hardware [Kotscher].

Metrotech offers a typical SaaS software product: it runs servers that execute their traffic analytics for all their customers from a central location. Their servers execute real-time analysis of traffic at intersections, which can be used to display signal phase and timing and traffic conditions, or can be fed into adaptive signal algorithms to optimize traffic flow through the equipped intersections.

Some agencies are deterred from implementing real-time traffic analytics due to the large up-front capital cost of the cameras. Metrotech removes this deterrence by charging a relatively low up-front fee and annual subscription [Kotscher]. This allows agencies to employ adaptive signal timing who would before never have considered it. Metrotech’s service also relieves the need to deploy and maintain a larger IT infrastructure. Metrotech’s service benefits drivers as well as the agencies: better timing means better traffic flow that benefits everyone.

Metrotech’s central processing of all data from its customers allows it to achieve a virtuous cycle of improvement: the more data it gets, the more it can improve its own algorithms.

Electronic security is not as critical for Metrotech as for other SaaS firms, since CCTV feeds contain no personal info, yet Metrotech still employs secure connections.

**Case Study: Xirgo**

Xirgo is a leading ITS SaaS Company supplying the rapidly emerging pay-as-you-drive (PAYD) insurance market. PAYD insurance means that insurance companies provide a device to drivers to install in their cars, and if the drivers demonstrate safe driving habits or have lower than average mileage, allows them to lower their premiums. In some cases, PAYD insurance companies may choose to charge for mileage driven instead of charging an annual premium (despite the name pay-as-you-drive, many companies providing a PAYD product simply scale premiums based on driving patterns) [Wikipedia].

PAYD insurance is now gaining wide deployment in Europe. This is especially true in countries such as the U.K. where gender discriminatory pricing has been made illegal by EU regulation (because young men are statistically a higher driving risk, they are charged higher insurance premiums, but EU regulation now forbids this practice). In the U.S., the most widely known PAYD service is the Progressive Snapshot™. Xirgo supports Progressive and other PAYD insurance products through its service [Wikipedia].

Xirgo employs hardware called “OBDII port dongles,” which read data from a car’s OBDII port. Xirgo programs the dongles to monitor and collect certain data from the vehicle. Xirgo
also provides cloud-based data processing services to support the dongles: Xirgo collects the
data from the dongles in use by drivers, maintains accounts for each driver, and provides
simple, clean end-data to the insurance company. Xirgo sells the dongles and the services to
insurance companies.

Xirgo’s services meant that Progressive did not have to develop technical knowledge of a
car’s OBDII interface, or programming or managing the dongle hardware, well outside of its
business expertise. With Xirgo’s services, Progressive and other insurance companies are
able to roll out PAYD services without extensive development. These services differentiate
companies offering them from other companies allowing them to retain current customers
and grow new ones.

Xirgo’s services also allow insurance companies to better monitor their own products. They
offer near real-time updates on driver behavior to insurance companies. The companies can
bill in mileage blocks; or continue to just change premiums. End users also benefit because
they can earn lower premiums through safe driving.

Xirgo employs very tight security measures in order that both customers and the insurance
industry can trust the product and resulting premium outcomes

Properties of SaaS

Based on the offerings of these three companies, the author has identified following common
characteristics of SaaS in ITS:

1. SaaS products in ITS involve specialized, heavy computation data processing. EROAD
performs extensive data processing to compute mileage traveled accurately, and to detect
security issues. Metrotech performs intensive and recurrent data processing to determine
traffic data and provide information on traffic flow conditions. Xirgo executes intense data
processing on vehicular data received from their OBUs. Each of these data processing
activities requires a deep, specialized understanding of the data being processed, and each
requires IT facilities that handle large-scale data processing.

2. ITS SaaS products employ data collection hardware—either hardware originally used
for other purposes, or dedicated hardware. ITS SaaS is a data processing based activity, and the
data must have a source. Metrotech employs data from cameras originally used for surveillance, while both EROAD and Xirgo provide their own
hardware or OBUs.

3. ITS SaaS products provide near real-time results. Each of these companies updates
user accounts in increments of seconds or minutes—not days. These SaaS products
can replace retrospective analytics, for example, Metrotech’s computations can
replace the non-real-time analysis of data that is used to adjust signal timing.

4. ITS SaaS products foremost value proposition is to agencies and/or companies—Metrotech’s and Xirgo’s main business case is with agencies and
insurances companies respectively. EROAD required approval from the of transport
agency to provide their services to end-users. All these cases demonstrate that the
SaaS firm’s initial sales and marketing efforts were directed to agencies and/or
companies in contrasts to the world of smartphone transportation apps, which are marketed directly at the end-user.

5. **ITS SaaS improves the service agencies or companies offer to end customers.** While the products are all marketed towards agencies and companies, the improvements offered by SaaS directly benefit end-users. All drivers benefit from better signal timing provided by Metrotech’s data. EROAD customers are relieved of significant paperwork associated with paying the commercial vehicle weight distance charges. PAYD insurance customers using Xirgo’s products are benefited by the opportunity to earn lower premiums.

6. **ITS SaaS products reduce cost of completing an existing task for agencies or companies.** In addition to providing better service, ITS SaaS reduce costs for agencies or companies that adopt them. Metrotech’s offerings reduce the costs of optimizing signal timing. EROAD’s products reduce the costs of administering a paper-based system. Xirgo’s products allow insurance companies to monitor customers to more accurately gauge risk, reducing costs of supporting risky drivers in the long run.

7. **ITS SaaS companies take extensive measures to guarantee data security.** All three the companies profiled here take extensive security measures. As their services are cloud-based, electronic security is a necessary feature of SaaS.

8. **ITS SaaS products and services reduce the complexities of software and hardware updates.** Agencies or companies running SaaS products do not need to maintain hardware for them or to update their software, both tasks requiring complex IT administration issues.

**Conclusion**

ITS SaaS products and services provide a range of benefits both to agencies or companies who adopt them and to end-users who benefit from their services. They thus constitute a true win-win scenario in-line with the global trend towards cost effective eCommerce delivery models.

Electronic security threats are significant, but all SaaS companies active in the ITS field are aware of these threats, and take action to mitigate these risks.

In the coming decade, there will be many more SaaS firms in all branches of ITS supporting all modes of transportation, including highway, aviation, transit, and freight. Successful ITS SaaS offerings will support economical use of infrastructure through optimal processing of traffic and transportation data, and offer clear benefits both to the agencies/companies who adopt them and to the end users of the transportation system.

Not every application in ITS will transition to SaaS. The SaaS business case suits only applications requiring intense data analysis. Safety critical applications may be slower to adopt SaaS, due to higher security threats. Services that require absolutely real-time computation for safety, such as Incident Detection Systems for bridges and tunnels, may never adopt SaaS, due to time lags inherent in Internet transmission of large quantities of data.
Transportation agencies on all levels of government, and private companies, should investigate ITS SaaS products and services, and work to overcome any barriers to their use and deployment. Barriers may include overly restrictive security policies that flatly forbid use of SaaS products and services in some cases. Such policies stem from the incorrect belief that offsite transmission of data is inherently insecure. Similarly, new and existing ITS companies should investigate the possibility of offering SaaS products and services to leverage the benefits that this field has to offer.

References