

Conceptual Models for T-Commerce in Brazil

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ABSTRACT

After creating a new standard for Digital TV, Brazil began to develop interactive content for its system. The middleware (Ginga) specification provides a solution for advanced interactivity, which allows the development of high value applications and enables solutions such as television commerce (T-Commerce).

This article proposes models to be adopted by broadcasters and advertisers for T-Commerce applications, as well as some alternative ways of payment. There are also many difficulties in developing this type of application in Brazil. Some of them such as the secure communication norms which have not been standardized yet; integration with payment mechanisms, among others will be exposed and analyzed along this paper.

Besides analyzing these problems, this article shows the experiments in the development of two models of T-Commerce applications that could be used as a reference in the country.

Keywords

T-Commerce. Television Commerce. Interactive DTV applications. Brazilian Digital Television System. Ginga middleware.

1. INTRODUCTION

Digital television commerce, which is often referred to as T-commerce for short, is a particular case of electronic commerce using the digital television and other devices in connection with it as an infrastructure of commerce [1].

In Brazil there are still some barriers in the development of T-Commerce applications. For example, important issues related to secure communication have not been defined yet in the Brazilian Digital TV standards.

The paper presents, in Section 2, some data around digital TV and e-commerce in Brazil. Section 3 introduces the Ginga middleware and some of its characteristics that are relevant to T-Commerce. Section 4 discusses the result of a study on models for T-Commerce. Section 5 presents the experiments around the implementation of two T-Commerce applications using the proposed models. Section 6 has the conclusions and future work.

2. BRAZILIAN SCENARIO

Studies related to Digital TV in Brazil began in 2003 with the creation of the Brazilian Digital Terrestrial Television Forum (SBTVD Forum). During the lengthy discussion process about the interactivity standards, all the technological alternatives have been thoroughly studied, taking into account the characteristics of the Brazilian analog television system.

The first digital transmission was held in December 2007, in the city of São Paulo. At the moment, there are a few interactive applications for digital TV for testing purposes, without interaction from real users, because the receivers are not in accordance with the middleware standards, described in Section 3.

Television is the most common electrical appliance found in Brazilian households, present in 96.8% of them [2], largely surpassing the number of homes with computers. In parallel to this, electronic commerce (e-commerce) continues growing in Brazil, being limited only by the lack of a large computer base. In 2009, e-commerce generated a turnover of about US\$ 6 billion in the country, which is 28% higher than the previous year. In the same year, a total of 17 million people had at least one shopping experience on the Internet [3].

These data demonstrate the enormous potential for the T-Commerce market in the country.

3. THE GINGA MIDDLEWARE

The middleware of the Brazilian DTV standard ISDB-TB is called Ginga [4]. Its specification is defined by the Brazilian Association of Technical Standards (ABNT). ABNT is a founding member of the International Organization for Standardization (ISO) and the body responsible for technical standardization in Brazil.

Ginga is in accordance with the ITU J.200 [5] and divides the middleware into two engines: presentation and execution. The presentation (declarative) engine is called Ginga-NCL [6] and the execution engine (procedural) is called Ginga-J [7]. There is also a bridge that allows interaction between the two environments. Finally, running above the engines, there is a common core that contains the infrastructure used by Ginga-NCL and Ginga-J. The Ginga architecture is illustrated in Figure 1.

Ginga-NCL is a logical engine that processes NCL (Nested Context Language) documents. A key component of Ginga-NCL is the declarative content decoding engine (NCL formatter). Other important modules are the XHTML-based user agent, which includes a stylesheet (CSS) and ECMAScript interpreters, and the Lua engine, which is responsible for interpreting Lua scripts [9].

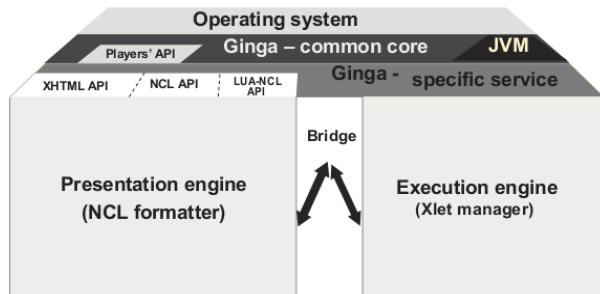


Figure 1. Ginga Architecture [6].

Ginga-J is the logical engine that handles procedural applications (Java Xlets). A key component of the procedural application environment is the procedural content execution engine, composed by a Java Virtual Machine (JVM) [9].

The bridge provides a mapping mechanism that allows two-way applications interaction on both machines, either by manipulating NCL documents in Ginga-J, executing Java code through Xlets in NCL or using the Ginga-J API in Lua scripts [6].

The common core is composed of common content decoders (such as PNG, JPEG, MPEG) and procedures to obtain contents transported in MPEG-2 transport streams and via the interactive channel [6].

Many types of applications are need connectivity back to the head-end via some form of communication route, know as return channel or interactive channel. Interactive channels come in several different flavors, depending on the cost of the receiver and the type of the network the interactive channel is connected to [10]. Ginga specifications also does not mandate the presence of an interactive channel, but in case it exists, it must be TCP/IP.

The security standard draft [11], which specifies the security requirements for Ginga, has not been concluded. The current version addresses issues related to user authentication, certificate infrastructure and permissions. It also defines that the interactive channel should support HTTP (HyperText Transfer Protocol) and HTTPS (HyperText Transfer Protocol Secure) at the application layer.

These issues around security should be completed in order to allow the development of T-Commerce applications with a level of security assurance in real environments.

4. T-COMMERCE MODELS

The literature review involving television and interactive models of T-Commerce is described in Section 4.1. The next subsections describe three characteristics that help to define models of T-Commerce: 1) presentation, 2) form of payment and 3) content associativity.

4.1 Related Work

There are not so many scientific publications related to T-Commerce, so the model proposed is based on books, commercial content and experiments.

Srivastava [12] quotes the use of T-Commerce in categories such as book, video, music, gifts, electronics, apparel and toys. Advertising is treated as something separate and he also does not relate banners to possible purchase interactions.

Gulati [13] defines three types of T-Commerce: push-commerce, enhanced shopping channels and virtual mall. It does not specify any payment models and says that the push-commerce is limited to an interactive commercial (without the possibility of doing a purchase).

Chan-Olmsted [14] considers that definitions of T-Commerce may involve purchase orders via toll-free, but much more than that, classifies T-Commerce as a) transactions conducted by clicking though with the TV remote control or b) offers presented on television and completed with an actual transaction on the PC Web Page.

4.2 Presentation Model

This article defines four conceptual presentation models for T-Commerce in Brazil that can be extended to other countries: Sales Channel, Program Related, Interactive Advertising and Other Initiatives.

Sales Channel: refers to a channel that offers a products catalog, services or an application that sells products from an Internet store. In Brazil, there are specific channels that sell products and currently do the purchasing process by telephone. For example, this model allows the possibility of having a sales channel for buying tickets for events. The sales channel could be presented during the whole day or during a given period of the program schedule.

Program Related: are applications that can appear on television programs such as interviews, football games, soap operas, among others. For example, the promotion and sale of a kind of sandal at a specific time that an actress is wearing in a soap opera or the offer of a specific book during a talk show with its author.

Interactive Advertising: adds interactivity in commercials through a specific application. The limited time of an advertising is something that need to be considered.

Other Initiatives: is related to the use of T-Commerce for other purposes. For example, donation of money for charity, buying content, gambling, among others.

4.3 Form of Payment Model

Three ways are defined as forms of payment model alternatives that can be used during the purchase process in any of presentation categories: Payment by Credit Card, Direct Debit and Other Forms. There are models that are more suitable for some applications than others, as described in Table 1. Moreover, some models can use the interactivity channel.

Payment by Credit Card: refers to the payment model where the viewer enters the credit card number and others information that are is necessary to finish the payment process. The purchase is made at the time and mandates the use of the interactive channel.

Direct Debit: the viewer only enters its user account (registered in a service) and the payment is done. Possibly it will be discounted in the next billing cycle or the payment may be generated independently. It mandates the use of the interactive channel.

Other Forms: payment is completed via any other way than television, such as telephone, email invoice, among others. The process starts on the television, but it allows sales via television receivers that do not have interactive channel. However, in the presence of an interactive channel, it could be used to provide the customer contact information to a telemarketing operator, who would make contact. It can be explored in presentation models of T-Commerce which time for application execution is limited or when an alternative to the use of the interactive channel is necessary.

Table 1. Table of possible presentation models by payment models.

Presentation Model	Payment by Credit Card	Direct Debit	Other Forms
Sales Channel	Yes	Yes	Yes ⁽¹⁾
Program Related	Yes	No ⁽²⁾	Yes
Interactive Advertising	No ⁽³⁾	No	Yes
Other Initiatives	Yes	Yes	Yes

4.4 Content Associativity Model

The Ginga standard [4] presents two types of services related to TV content: contextualized and independent.

A T-Commerce application may be related to the content featured in the video. For example, the product being sold may be available for purchase at a given moment of the video. Or, an actor is wearing a watch in a soap opera and at some time, in a close-up, the application could appear making possible the purchase of the product.

Also, a T-Commerce application may not be contextualized with the content, which will be considered as the independent type. For example, a brewery sponsoring a soccer game. Table 2 summarizes the possibilities of the relationship of content in the presentation models proposed.

Table 2. Table of possible presentation models by content associativity.

Presentation Model	Contextualized	Independent
Sales Channel	Yes	No
Program Related	Yes	No ⁽⁴⁾
Interactive Advertising	Yes	No ⁽⁵⁾
Other Initiatives	Yes	Yes

5. EXPERIMENTAL WORK

Two model of presentation applications were developed: Sales Channel (Section 5.3) and Program Related (Section 5.4).

5.1 Assumptions

Currently there are a few implementations of the Ginga-NCL engine in virtual machines and digital TV receivers and they still do not provide the necessary resources to enable secure communication. The analysis made during this project concluded that the best way to use the security mechanisms in the Ginga-NCL would be via the Ginga-J bridge. This is because the Lua language, in Ginga, does not provide secure connections. Besides the use of HTTPS directly in NCL documents does not allow much flexibility in development.

On the other hand, in Ginga-J, the APIs to implement a secure communication have already been defined. However, there are still no implementations, either emulators or real devices, to be used in the application development.

It was also carried out a preliminary study on payment systems and third party gateways in Brazil. It was not found a widespread integration approach that meets the needs of T-Commerce. The currently available approaches allow, in most of the cases, the integration with e-commerce via browser, which does not apply to Digital TV. The final T-Commerce solution would probably need an integration via computer systems, like Web Services.

5.2 Development Process

The development was then performed on the Ginga-NCL engine through the use of Lua scripts. It was decided not to use the Ginga-J environment because of the few development tools available. The security issues described will be handled via Ginga-J bridge in future work, when the infrastructure evolves.

These application examples used an integration server (gateway) to receive purchase requests. Due to lack of integration with the payment systems at this time, it is necessary that an administrator manually complete the transaction after receiving the request. The future architecture will evolve as described in Figure 2 without manual intervention.

¹ It would be an evolution of the traditional sales channel by telephone, but adding interactivity.

² Usually a user does not have an account in a specific program, so it would be not possible to buy in a program in such way.

³ There is not so much time to process a Payment by Credit Card during a commercial.

⁴ The products being offered will be related with the program, like they do in merchandising.

⁵ Interactive advertising will use interactive applications to improve the experience.

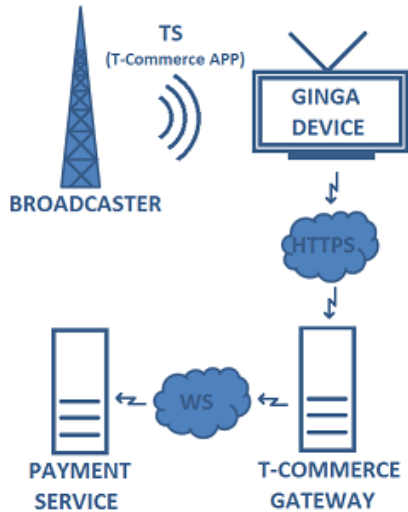


Figure 2. T-Commerce application architecture.

The applications were developed in Eclipse IDE¹. The tests were performed locally on the virtual machine STB Virtual 0.11.2, available in Portal do Software Público², and also on the Proview receiver, with the RCASoft³, a commercial implementation of Ginga middleware.

5.3 Model 1 – Sales Channel

It was developed an example of the Sales Channel category (Section 4.2), inspired in traditional e-commerce stores, such as Amazon⁴.

The store is displayed in almost the whole television screen and requires full attention from the viewer, as shown in Figure 3. It offers the possibility to navigate among the various products of the store. This example have a relationship with the current channel, so it could be described as having an contextualized content associativity (Section 4.4).



Figure 3. List of products.

¹ <http://www.eclipse.org>

² <http://www.softwarepublico.org.br>

³ <http://www.rcasoft.com.br>

⁴ <http://www.amazon.com>

The viewer can also navigate and receive more details of a product (Figure 4) and add it to a shopping cart (Figure 5). This cart can be edited to change quantity or remove the contained products. All this control and interaction is done through the remote control, using color keys in the navigation actions and arrows.



Figure 4. Product details.

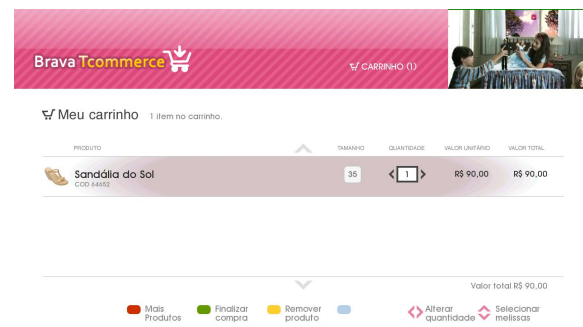


Figure 5. Shopping cart.

After checking out, a form is displayed requesting credit card information (Figure 6), following the Payment by Credit Card model (Section 4.3). After filling out the data, these are sent to a server using the JSON (JavaScript Object Notation) protocol over HTTP (Hypertext Transfer Protocol).

Once it receives the server response, the application shows a message saying if the transaction was completed successfully or not. Finally, if the interactive channel is not available in the receiver, the process of checkout displays a screen that contains a telephone, which can be used to finalize the purchase. This also demonstrates the use of Payment by Other Forms model (Section 4.3), which can be combined in this case.



Figure 6. Checkout.

5.4 Model 2 – Program Related

This model was developed to exemplify the category Program Related (Section 4.2). The features described in Model 1 (products list, product detail, shopping cart and checkout form) have been retained, but simplified in some way.

The application starts hidden, displaying a small non-intrusive alert at the bottom of the screen. These alerts promote certain product at an instant of the video, so it is contextualized (Section 4.4). The NCL language notifies the Lua script in certain periods of time, synchronized with the video, so the script can load the current product that will be displayed. The Figure 7 demonstrates the possibility of buying the blue clothes that the actor is wearing.



Figure 7. Alert displaying a product.

From this small alert, the viewer can navigate through more product details (Figure 8), add it to the shopping cart (Figure 9) and checkout (Figure 10). The payment model of this example is the Payment by Credit Card (Section 4.3). For each of these steps, the application takes a larger space on the screen, overlaying the video channel gradually, according to the interest shown by the viewer.



Figure 8. Product details.



Figure 9. Shopping cart.



Figure 10. Checkout.

6. CONCLUSIONS AND FUTURE WORK

This work pioneered the development of T-Commerce applications in Brazil. It proposed a categorization of conceptual models that can be exploited economically, enabling application development to promote television commerce in the country. Finally, two functional applications using Ginga have also been developed, demonstrating these concepts in practice.

A major difficulty encountered in the Ginga development was the lack of tools and testing environments. Today there are few tools to use and also the testing environments are quite immature, implementing only part of the specifications and having several bugs. It is necessary to develop such tools, as well as the environments evolve in order to improve the development of new interactive applications and take T-Commerce to the next level.

Future work includes adding security mechanisms to the applications developed – as soon as the draft is concluded - and also to use a real payment integration without requiring the use of other ways for payment.

Some qualitative usability tests are being done in order validate some ideas and improve the T-Commerce applications that were developed. More work on this subject would be very relevant to help understand the behavior of Brazilian viewers. There are just few studies in Brazil relating usability and digital TV applications experience.

Another interesting thing would be developing applications for the other proposed models and also develop the two applications described here using Ginga-J, allowing a comparative analysis. Finally, evolve these conceptual models adding other variables and exploring subcategories would be relevant.

The development of interactive applications, in Brazil, should grow from this year, when receivers with complete implementations of Ginga will be launched. Moreover, the investment done by the government, industry and broadcasters on research and development in the area of Digital TV is likely to encourage the use of interactive applications, including T-Commerce.

7. ACKNOWLEDGMENTS

This project was sponsored by a Brazilian fund for research and development called FINEP. Many thanks to all researchers involved at CERTI Foundation and Brava ECM. Finally, we would also like to thank the Graduate Program in Computer Science (PPGCC) at UFSC.

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