Virtual Tourism Business Networks in Developing Countries

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Abstract. Since the rising of Computer and Information Technologies, that enterprises and organizations explore them to run their businesses, in order to explore new business opportunities, increase profits and decrease costs. Due several reasons, most of micro, small and medium enterprises located in remote communities, especially those located in developing countries, face a number of obstacles and difficulties due to their business structure and limited access to information and communication infrastructures. This paper presents the conclusive remarks of a master thesis that aims the development of a model for a virtual business network, bringing together tourism industry players located in remote communities, in order to provide them the opportunity to, at a low cost, join to the information society, explore new business opportunities and acquire global visibility. This virtual business network is fostered and relies on a JXTA P2P distributed e-marketplace model that seems to be an effective and alternative way to overtake the presented problem.

Keywords: e-Business, Business Network, e-Inclusion, Tourism.

1 Introduction

The yearning of travel and the desire to meet different people and to make relations with other civilizations has been a constant in man's history. Tourism is seen today as travel for recreation and became one of most dynamic, international and multimillionaire industries [1]. However, it is not a well defined industry due the fragmented nature of its product [2]. It requires services of leisure, lodging, transportations, hospitality, etc., that are provided by a wide range of other industry sectors. As other industries, the tourism has impact on the economy of the areas where it takes place (regions, countries or continents). These are known as touristic destinies, and most of them are totally dependent of tourism influx, for their economy support. This is a particular fact in the third world and developing countries [3]. This dependency isn't only relative to capital transference of the producing areas to the destination areas, through tourist spends [4]. Tourism business opportunities are

affected by factors such as country economy, geographic location, enterprise dimension and technological capacity [3]. Thus, a small tourism producer located in a remote community does not have the same facilities to run his business, as one located at North America or Europe.

This paper presents the work developed in the context of a master thesis [5] as well as further developments and testing realized after its conclusion. The project addresses three tourism sub-sectors, namely crafts, eco-agro-tourism and cultural heritage, which are interdependent and complementary for a number of activities and practices and strongly linked to declining rural areas. The main goal of this project is therefore to eliminate the digital divide barriers, creating equal opportunities and access to a global tourism virtual business network, where each player of target sectors can emerge globally, and everyone benefits being connected to each other. This presented virtual business network is fostered by a free and distributed P2P e-marketplace, aiming to enable local communities, the access to business collaboration services and give to their businesses a global visibility.

Section 2 presents an overview of tourism industry value chain and the Information Technologies tools that support it. In Section 3 is presented the model adopted in order to create the virtual business network, as well the core technology. Section 4 describes the experimental developments, where are described the core services developed as well the main software components that supports the network. At the end are presented the experimental tests and results. Finally at Section 5, some concluding remarks are made.

2 Tourism Industry

As in the distribution of physical products, the touristic distribution is a process composed by stages, through which flowing touristic products, since their production stage to their delivery to the consumer. This track is more or less long depending on the number of involved actors [1]. The tourism industry value chain includes four main actors:

- **Producers** – entities that produce the touristic products (e.g. agro-tourism farm, craftsman, etc.);
- **Wholesale Dealers** – typically known as tour operators, they combine goods and services that directly buy from producers.
- **Retailers** – sell the touristic packages from wholesale dealers to consumers.
- **Consumers** – the tourists.

Although not mentioned, there are other players involved in the tourism distribution chains, namely the regional tourism organizations, official organisms and governmental entities, whose activity is related to the coordination and promotion of the touristic destinies, providing also information to the wholesale dealers and retailers.

2.1. The Tourism Industry Support Network

The dimension of the worldwide tourism industry and the wide set of relations that it involves, suggest the existence of huge amounts of information being processed. The tourism industry is supported today by a large information network, which interconnects all players on its value chain [3]. This network is extremely important in the distribution, marketing and coordination of the activities, and includes: Computer Reservation Systems (CRS's) [6], Global Distribution Systems (GDS's) [7], [8], Internet based applications, and Digital Interactive Television Applications (DITA's).

CRS's are basically databases, that allow tourism producers and operators to manage their catalogs, making them simultaneously available to their business partners (e.g. room reservations and ticket emission by transportation companies).

GDS's are informatics systems that enable the availability checking, making reservations and ticket emission by tourism producers of any type, at a global scale [8]. There are currently four main GDS's available for travel agencies: Amadeus, Galileo, Sabre and Worldspan, all supported by consortiums of aerial transportation companies.

The Internet based applications, allowed to tourism consumers the direct access to touristic information and to make reservations, avoiding intermediaries. Beside this, the structure of interconnections created trough the Web, allowed to organizations the access to information about products and services, at a global scale, and simultaneously, the development of marketing actions, creating thus a bridge between the offer side and the demand/ buyer side, with great flexibility and interactivity, overtaking the electronic intermediaries, like the GDS's.

The Digital Interactive Television has been also adopted as a business channel by tourism operators. The DITA's take advantage of their ability of using the Internet, to sell or advertise touristic products and services, using a common TV set.

The market for e-Tourism has been growing quickly, but dominated by large tourism organizations, offering normalized products and supported by powerful marketing actions, communication and access to systems providing value added services, such as the ability to remotely make reservations in real time [7]. Most of the micro, small and medium enterprises of Alternative Tourism, specialty those located in remote communities, stay out of this restrict circle [1], [5], [9]. In order to eliminate this digital division, these small and medium enterprises need tools that enable them to:

- Have the opportunity to communicate and globally publish the diversity of their touristic resources, through a clear explanatory and consistent way.
- Be present on an information network that enables them to share their touristic offers at a world wide level.
- Promote an integrated and locally grounded economy chain for remote communities based on a strong local identity, leveraging on local natural, human and cultural resources.

The global reach provided by virtual business networking, gives increasing opportunities to expanding a business almost every day [10]. With new contacts, affiliations, referrals and growing customer awareness, a virtual business network lays the path for the success of a business right from the moment the business begins this venture [10].

3 The Tourism Virtual Business Network Model

With the arrival of internet, information technologies and advancements in the field of e-commerce, most of the traditional limitations and barriers are no longer a concern. Small or medium size businesses can compete nowadays in global markets. These small businesses can form groups also known as «business networks» to further improve their capabilities and reach [10]. In a business network, actors are autonomous and linked to each other through relationships, which are flexible and may change accordingly to fast changes in the environment. The stickiness that keeps the relationships is based on technical, economic, legal and especially on personal ties [11]. Organizations are moving, or must move, from today's relatively stable and slow-moving business networks, to an open digital platform where business is conducted across a quickly formed network with everyone, anywhere, anytime despite different business processes and computer systems [12]. Table 1 presents an overview of the characteristics of New Business Network Approaches, may have.

Table 1 – Characteristics of New Business Network Approaches[1]

Characteristics	Description
Products and services	Relative complex, bundled, and fast delivered products and services
Value creation	Demand networks with quick connect and disconnect relationships
Coordination and control	Network orchestration with distributed control and decision making
Information sharing	Information sharing over and with network partners
Infrastructure	Network platform with networked business operating system

3.1 Proposed Virtual Business Network Business Model

To reach the new Business Network Approaches characteristics, the business model for the proposed Tourism Virtual Business Network is based on the Peer-to-Peer distributed e-marketplace Model presented in [9]. E-marketplaces are an optimal solution, as a start point to buyers and sellers of target sectors meet each other, where suppliers try to sell their products and buyers try to satisfy their buying needs [9],[13].

P2P architectures provide far more decentralized infrastructures, while allowing a much wider range of business patterns to take place. By one hand, the interaction over a P2P network resembles the way real-world enterprises perform business with each other. On the other hand, a small set of simple services is enough to support complex business processes over a P2P infrastructure. Beside this, when compared to the traditional e-marketplaces, a P2P e-marketplace overcomes all their disadvantages [9], [13], providing more dynamic and complex relationships [9].

The proposed distributed P2P based e-marketplace model builds on the infrastructure presented by Fig. 1, that suggests a direct mapping of target tourism

[1] Adapted from [12]

sectors players, including producers, travel agencies and even consumers, on a heterogeneous P2P network.

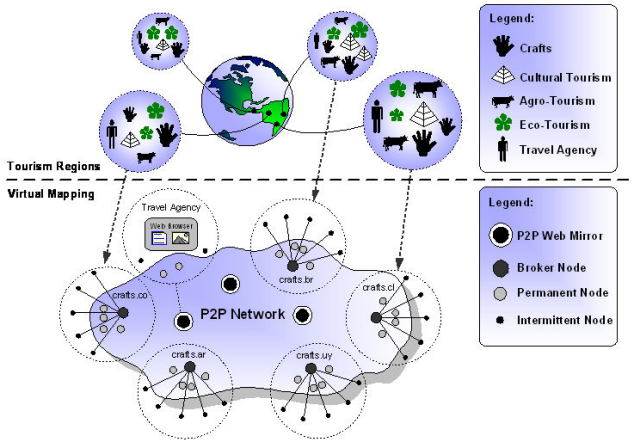

Fig. 1 - The P2P Network Infrastructure [9]

The model comprises four peer types: Web Mirror nodes, Broker nodes, Permanent nodes and Intermittent nodes. Web mirror nodes provide an entry point for all players on the Business Network. They are mainly targeted for consumers and allow them to search tourism offers on the P2P network, using a simple web browser. Broker nodes are collaborative nodes. They are mainly targeted to local tourism official organisms (or Tourism Regions Entities), and their role is to help small producers to keep their offers constantly available on the network. The remaining nodes could both be targeted to producers or travel agencies. They are different from the previous nodes because they may not have a permanent connection to Internet.

The ability to provide free services [5], [9], [13], the network scalability capacity, the speed of grow capacity and the P2P based services as Virtual Presence, Instant Messaging, Share and Collaboration, seems to be the key for a free e-marketplace that leverages a Virtual Business Network that allow to create a network effect, where everyone can benefits to be connected with everyone.

3.2. P2P Related Technology

There are today a wide range of P2P development technologies as Gnutella [14], Freenet [15], Jabber [16] or JXTA [17]. The first three solutions have been created for specific purposes as file sharing and Instant Messaging. JXTA has been created to develop heterogeneous P2P networks for general purposes. It is an open source project that defines a set of XML based protocols that establish an ubiquitous, secure and pervasive virtual network on top of IP and non-IP networks, allowing peers to directly interact and be organized independently of their locations on the network, that can be behind or not a firewall or NAT (Network address translation). The JXTA 2.0 specification [18] builds up on six independent language protocols:

- *Peer Discovery Protocol* (PDP) – Resources search and advertisement;
- *Peer Resolver Protocol* (PRP) – Generic query service;
- *Peer Information Protocol* (PIP) – Net and peer monitoring;
- *Pipe Binding Protocol* (PBP) – Addressable messaging;
- *Rendezvous Protocol* (RVP) – Propagation services;
- *Endpoint Routing Protocol* (ERP) – Message routing service;

All these protocols are available as services and can be used for the development of new richer high level services, as Instant Messaging, File Sharing, etc. JXTA has been also designed to be ubiquitous. Any device including mobile phones, PDAs, personal computers or servers are able to host a JXTA application. The information about peers, pipes and any shared resources as services, contents or files is represented by advertisements – a piece of XML structured information that describes a peer a pipe or any other resource. The communication between two JXTA peers is basically a trade of XML based messages.

The security aspects are tackled by existing and well matured technologies, as transport layer services, digital certificates and certificate authorities. Thus, JXTA provides the ability to integrate heterogeneous information sources in a decentralized, self-organized and secure way [17].

4 Experimental Developments

The developed prototype focuses mainly in the tasks of assembling and publishing tourism offers by tourism producers, as well the respective tourism offer searches by possible buyers. Another emphasized aspect is the possibility of the establishment of real time business interactions between trading parts through instant messaging. This functionality, besides allowing an easier communication between trading and business partners, induces to the development of business relationships and partnerships, through the creation and management of business partner lists, and status monitoring in the business network. The P2P tourism e-marketplace comprises three core software applications: Web mirror, Enterprise Application and Search Application. All these applications build on an infrastructure based on JXTA P2P Services, as shown in Fig. 2.

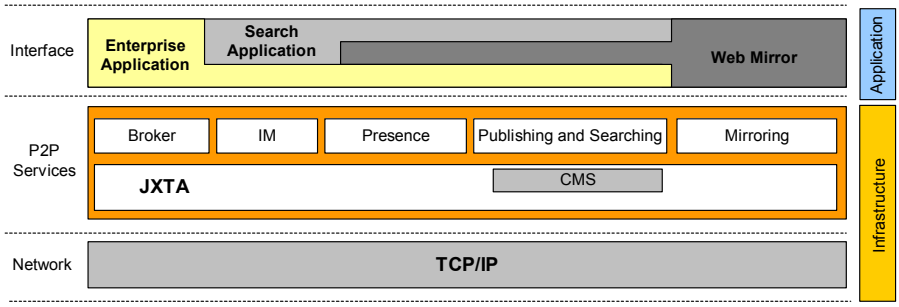

Fig. 2 Global multi-layer architecture of the tourism e-marketplace

4.1 Core P2P Services

The core P2P services provide most of the core functionalities of the e-marketplace, and are known as: Broker Service; Instant Messenger Service; Presence Service; Publishing and Searching Service; and Mirroring Service. Although all these services were vital for the support P2P network, each application implements only the services needed to fulfill its functional requirements.

Broker Service. The broker service provides the required mechanisms so that a peer can act as broker, ensuring that the owners of intermittent nodes can make their tourism offers always available on the network. The permanent availability is made by transferring the tourism offer from the intermittent node of a given Producer to a pre-selected peer running the Broker Service. This service builds on three JXTA services: *Discovery Service*, *Pipe Service* and *Content Management Service*. The first is used to find a Broker Peer; the second is used to open the communication channel between both peers, which is used for message exchanges. Messages define the type of operation to be performed by the broker: transfer, remove, share, unshare (_TRANSFER, _REMOVE, _SHARE, _UNSHARE). At last, the role of the *Content Management Service* is to transfer the offer files from their source to the node running the Broker Service. Once transferred, the broker node publishes the offer and sends back to offers owner the new JXTA Offer Advertisement, which includes the new location address of the offer file. This address is then used to state the real location of the offer file, when the Web Mirror databases are updated with the new record related to the uploaded offer.

Instant Messenger Service. This service allows the establishment of a complex web of business interactions between sellers and costumers or business partners. These interactions range from simple information requests about products our services, to the definition of contractual terms, payment conditions etc. The service architecture builds on two core JXTA services – the *Resolver Service* and the *Pipe Service*, used for chat requests and communication channel binding, respectively. The negotiation for starting a chat session, involves two different messages: the first is used for asking for a IM session (*InitiateIMRequest*) and includes the requester name and his e-mail address; the second message is the answer for the IM request (*InitiateIMResponse*) and includes the name and the e-mail address of the answerer, as well the *Pipe Advertisement* that the requester peer must use to state the communication channel. These information exchanges allow the control of the received IM requests by a user, accepting only those that he desires.

Presence Service. The presence service provides the indispensable mechanisms so that a user manages his presence status on the network, and also monitors the presence status of his business partners. The status information of a participant is represented by a Presence Advertisement, a XML based piece of information, whose structure is illustrated on Fig. 3. The presence information includes the peer identification (PeerID) the name and e-mail address of the user (E-mailAddress and Name) and finally the presence status of the user (PresenceStatus). The presence status can assume six different values: offline, on-line, busy, away, be right back, on

the phone and out to lunch, respectively. The service's architecture builds on the JXTA *Discovery service*, following the model proposed by Wilson [19]. Thus, the presence service relies on the *Discovery Service* [18], [19] capabilities to publish Presence Advertisements, as well as to discovery and get Presence Advertisements of other participants. This model allows that the user presence information can be obtained through his e-mail address.

```
<?xml version="1.0" encoding="UTF-8"?>
<PresenceAdvertisement>
    <PeerID>urn:jxta:uuid9615461646162614A78746150325033F3BC76FF
    13C2414CBC0AB993666DA53021</PeerID>
    <E-mailAddress>empresaa@mail.pt</E-mailAddress>
    <PresenceStatus>1</PresenceStatus>
    <Name>Empresa A</Name>
</PresenceAdvertisement>
```

Fig. 3. A presence advertisement

Publishing and Searching Service. This service provides the necessary mechanisms for publishing and searching tourism offers. The service builds on a user service called *Content Management Service* (CMS), whose purpose is to provide the share, search and transfer of files within a peer group [18], [19]. Relying on the CMS capabilities, this service provides the publishing, searching and transferring tasks of tourism offers on the P2P network.

Mirroring Service. The mirroring service provides the necessary mechanisms so that the summary information about an offer published by given producer can be stored on the Web Mirrors databases [5], [9]. Its architecture builds on two JXTA services: the *Discovery Service* and the *Pipe Service*. The first is used to find the existing Web Mirrors, while the second is used to the establishment of the communication channel between the peer hosting the Enterprise application and the existing Web Mirrors.

4.2 Distributed e-Marketplace Software Components

Enterprise Application. This application is targeted to tourism producers or Official Organisms [1]. Provides producers with the functionalities to create, manage and publish their offers, search offers, manage their presence and monitor the presence of their partners on the network, and manage their contact lists. All of these functionalities are provided by a set of modules:

- *Offer management module* – Allows the management of tourism offers including functions as publish offers (locally or remotely using a broker), unshare offers and remove offers (Fig. 4).
- *Offer creator module* – Provides a tool for tourism offers creation and edition. It supports plug-ins, in way to add some flexibility for different tourism sectors offers support.
- *Offer search module* – Allows the search of tourism offers on the P2P network, using offers' keywords as search key.

- *Instant Message module* – Provides a tool for users initiate IM sessions with their business partners.
- *Presence management module* – Provides a tool for user presence management on the network as well as the presence monitoring of the users available in the contacts list. It also allows the search of users on the network having their email address as search key.

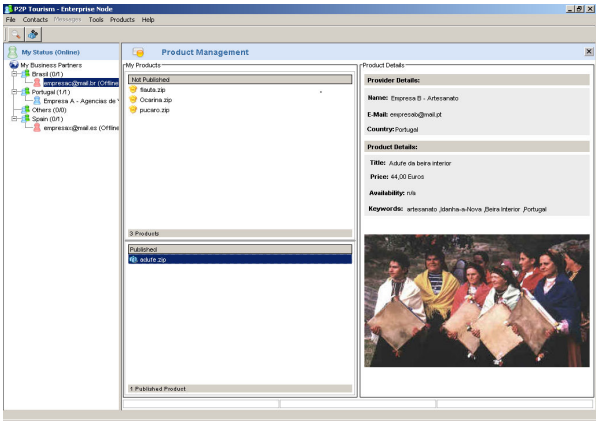

Fig. 4. Enterprise Application interface: Offer management tool

All of these modules are supported by a set of JXTA based services, namely the Presence service, the IM service, the Broker service and the Publishing and Searching service. This application can run Broker Services to help other peers.

Search Application. Once e-marketplace members, intermediaries such as tour operators and travel agencies need functionalities that enable them to search tourism offers, find and lookup business partners in an easy, fast and straight way. The Search application is targeted to these players (Fig. 5). It may run on a permanent or intermittent node. This application is in fact a simplified version of the Enterprise Application, providing the same modules and functionalities, except those for offer management and creation.

Web Mirror. The Web Mirror Application is a web based application that provides centralized points on the network, and works as the entry point for a user to join to the distributed tourism e-marketplace (Fig. 6). The services provided by the Web Mirror Application can be from different types: general users or visitors services, and e-marketplace support services. For visitors, the Web Mirror provides a service for offer searching, either on the local databases or in the P2P network through a web browser. The support services include the member's only services such as: Member account services; Software and updates services; Mirroring service for local databases update. The Web Mirror operation is supported by three JXTA based services namely the Presence Service for presence monitoring; the Publish and Searching Service for P2P searches and offers retrieving; and the Mirroring Service for local databases update.

The core technology is Java based, namely Java Beans and Java Server Pages.

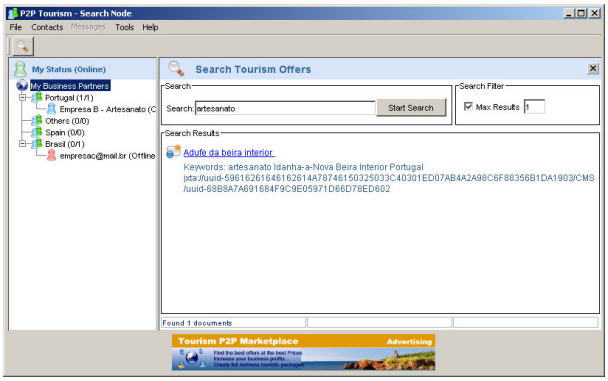

Fig. 5. Search Application interface: Offer search tool

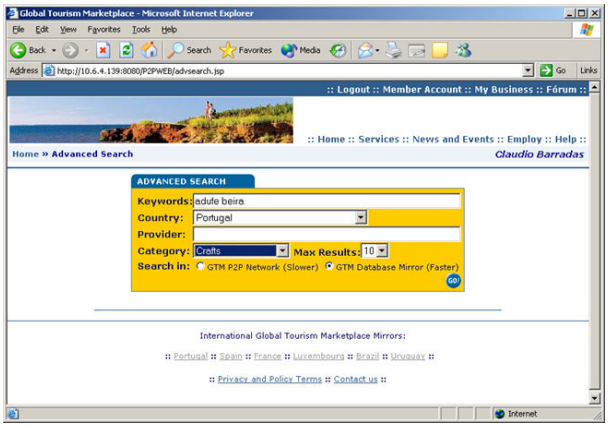

Fig. 6. - Web Mirror interface

Tourism Offers. The tourism offers consists on a combination of a set of documents including media files, as audio, video, pictures and text based contents, all arranged and structured by a XML structure [5], [9]. These media files joined together represent an offer that can travel on the JXTA P2P network [20] and presented in a web browser that supports XML and XLS transformations. By the one hand, this architecture allows conferring some tangibility to the tourism offers, a desirable characteristic for any digital tourism offer [1]. On other hand also provides the flexibility needed for integrating offers from different tourism sectors.

4.3. Security

At the current status of the prototype the security aspects are quite basic, once the main focus was centered on the aspects related to the publication and search of

tourism offers and to the establishment of contacts between business partners. Apart the JXTA platform basic security mechanisms, which requires that any JXTA peer must automatically log in the default JXTA peer group - "NetPeerGroup" [17], the tourism e-marketplace has its own peer group denominated as "*JXTA Tourism Group*". Having its own peer group, the e-marketplace peers are bounded by a logic segmentation of the JXTA network, living on a protected network space with well defined limits. All the communications and resources shares are made on the group scope, which makes them invisibles behind the group boundaries. Although these mechanisms can provide some security, even though minimum, it can be strengthened using digital certificates, encrypting all communications.

4.4. Experiments and Results

The experiments and final tests were done in a semi-closed laboratorial environment, and were focused in the tasks of sharing; searching and transferring tourism offers as well the start of basic trading interactions. Table 1 summarizes the peer types, locations as well the running services, of the peers that constitute the experimental P2P based e-marketplace.

Table 2. Summary of involved Peers in experimental tests.

Application Type	Number of running instances	Location	Running Broker Service
Web Mirror	1	Inside Firewall	N/A
Enterprise App	6	Inside Firewall	Yes
Search App	13	Inside Firewall	N/A
Enterprise App	1	Internet	Yes
Search App	2	Internet	N/A

All the services and functionalities provided by the applications were tested simultaneously, in order to simulate a real situation of the business network operation. The business network worked as expected in all tests executed inside the firewall. The peers located in the internet had some difficulties to communicate with the peers inside the firewall, taking a few seconds to complete the connection. It was also observed a considerable raise in the amount of network traffic, a typical and undesirable feature of the P2P based networks.

5 Conclusion

Typical e-marketplaces supporting technologies require some expertise, powerful hardware resources and infrastructures, which carry on large supporting costs. Consequently, most of these costs are passed to e-marketplaces' members, causing an increase of their participation costs. Promoting a virtual business network supported by a P2P based tourism e-marketplace seems to be the best strategy to achieve the low

costs and create a network effect that will ensure the success in reducing the "digital divide"[9]. The free services provided by the e-marketplace, and the low cost of operation may foster the rapid achievement of critical mass [9], [13], leading to a huge number of buyers and sellers trading and exploring new business opportunities. From a technical perspective, the performance and flexibility provided by the proposed distributed e-marketplace support P2P network ensures the support of the sustained growth of peer nodes in the network.

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