Study of TCP/IP protocols for secured online transactions in C2B E-Commerce

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ABSTRACT

E-commerce is one of the Indian economy's fastest expanding sectors. Despite a rapid growth rate, the Indian e-commerce business has lagged behind that of many established and growing nations, owing to a relatively low internet user base. According to a 2015 survey done by global management consulting company AT Kearney, there were just 39 million internet shoppers in India, a miniscule percentage of the country's 1.2 billion population. However, rising technical proliferation, along with internet and mobile penetration, creates a favourable environment for the growth of e-commerce in India. The country is on the verge of a digital revolution. When combined with the sector's fierce rivalry, the survival of e-commerce enterprises in a highly dynamic environment becomes a difficult undertaking. To ensure client loyalty, businesses must continually adapt and develop while offering an information-rich and frictionless experience. This research seeks to investigate the evolution of e-commerce in India and highlights numerous problems as well as the variables responsible for e-future commerce's growth and development.

Keywords: *TCP/IP, Network Protocol, C2B, E-Commerce, Online transactions.*

Introduction

E-commerce, often known as electronic commerce, refers to the purchasing and selling of goods, products, or services through the internet. E-commerce can also be referred to as electronic commerce or online commerce. These services are available online over the internet network. E-commerce also includes the exchange of money, funds, and data. Commercial to Business (B2B), Business to Customer (B2C), Customer to Customer (C2C), and Customer to Business (C2B) are the four types of business interactions (C2B). E-commerce is commonly defined as any business transaction that takes place via the internet. Amazon, Flipkart, Shopify, Myntra, Ebay, Quikr, and Olx are examples of E-commerce websites. Global retail e-commerce might exceed $30 trillion by 2023.

Types of E-Commerce:

Mode of Business	Relationship	Examples
B2B	Business → Business	Business software (e.g. HR, ERP, Content Marketing software) and business supplies (office supplies, office furniture).
B2C	Business → Consumer	Fashion and apparel, furniture, appliances, and groceries.
B2A	Business → Administration	Services that deal with financial, legal, and employment matters.
C2B	Consumer → Business	Services like consulting, creative freelancing (e.g. photograph, graphic design).
C2C	Consumer → Consumer	Physical items or services sold to other consumers on online marketplaces like eBay, Amazon, Gumtree, or Facebook Market.
A2C	Administration → Consumers	Electronic tax filing, payment for health services, consulting services, training or teaching services.

C2B E-Commerce Model

In this paradigm, a consumer visits a website that displays numerous business organisations offering a specific service. The customer estimates how much he or she wants to pay on a specific service. For example, websites may be used to compare the interest rates on personal loans and vehicle loans offered by various institutions, a corporate entity that approaches the client and offers its services after fulfilling the consumer's requirements within the stipulated budget.
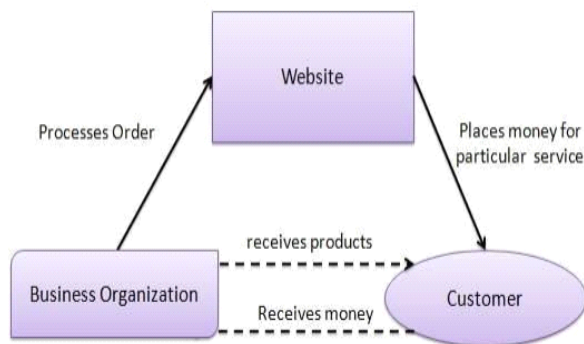

Figure-1 : *C2B E-Commerce Model*

Literature Review:

Gupta (2014) gives a complete description of e-commerce while distinguishing it from e-business in her article "E-Commerce: Role of e-commerce in today's company." The article lists the many ecommerce models, such as B2B, B2C, B2G, and C2C, and analyses them narrative. In "Challenges and Future Scope of Ecommerce in India," Shani (2010) elaborates on the many uses of e-commerce while also identifying the extent to which they are operational in the nation. In "E-commerce and its influence on operations management," Gunasekaran, Marri, McGaughey, and Nebhwani (2002) provide a general overview of electronic commerce inside organisational systems, defining it with relation to e-trading

and commenting on how it has invaded every sphere of business. Earlier internet apps performed a revolutionary impact, according to the report. In "A Study on Current Status of E-Commerce in India: A Comparative Analysis of Flipkart and Amazon," Padmanabh, B (2013) trace the timing and growth of B2C e-commerce beginning in the mid-1990s with the introduction of marriage and employment websites. However, growth was gradual due to restricted internet connection, ineffective online payment methods, and a lack of awareness. The extension of online services to travel and hotel bookings in the mid-2000s provided a significant boost to the Indian B2C e-commerce business, which continues to be a key contributor even now.

In "Growth of E-Commerce in India," Chanana, N. and Goele, S.(2012) notice that, while online travel and hotel reservations continue to dominate the lion's share of the e-commerce sector, their position has dropped over the years due to the recent augmentation and subsequent increase of e-tailing services. The volume of investment in this area has increased dramatically. With the western e-commerce marketplaces saturated, investors perceive huge promise in the Indian industry, and as a result, several start-ups have obtained money from venture capitalists and private equity groups.

To capitalise on India's "underdeveloped internet economy," Japanese investment firm and technology behemoth Softbank invested $627 million in online commerce site Snapdeal and $210 million in Ola taxis. (Mac, 2014). Similarly, New York-based Tiger

Global Management has invested in MakeMyTrip, Flipkart, Myntra, and Quickr. The availability of money has created a favourable ecology and development prospects for both large and small businesses. It has enabled local entrepreneurs to compete against global behemoths and has facilitated the infiltration of e-commerce into every aspect of human life, to the point that the line between e-commerce and traditional business is becoming increasingly blurred. Aggarwal (2014).

Raghunath and Panga (2013) give a detailed examination of many subtleties of e-commerce in "Problems and Prospects of E-Commerce," emphasising that in the present time, every commercial action, such as advertising, ordering, payment, and so on, may be conducted in the digital ecosystem. The article also includes a number of comments on the significance of e-commerce, which are responsible for its growth as a new convention. It has enabled the creation and exploitation of new business prospects while also enhancing customer participation in the development of new goods and services.

The availability of internet connectivity and other online technologies ushers in a new era. Awais and Samin (2012) conducted a SWOT analysis of e-commerce, which highlights ubiquity, low operating costs, improved customer interaction, and time saving as unique strengths of e-commerce, but also emphasises the need for firms to adapt to changing environments and innovate constantly in order to provide better offerings to customers.

With an increase in the number of players in the B2C segment, competition for the first position is expected to intensify, making it critical for firms to improve service quality and invest in logistics in order to benefit from an increase in household disposable income, an increase in internet subscriptions, and the infiltration of mobile commerce (Chanana, N. and Goele, S., 2012).

With an increasing number of websites offering comparable goods and services, increased importance is being assigned to Internet Marketing, which will play a unique role in audience acquisition for e-commerce websites by presenting adverts on search engine result pages and other portals. Internet marketing will not only promote ecommerce, but it will also emerge as a critical support tool for brick and mortar companies. (2013) (Gangeshwer).

Aside from Internet Marketing, Deshmukh, Deshmukh, and Thampi (2013) note another significant development: m-commerce, which they define as a subset of e-commerce. "Transformation from Ecommerce to M-commerce in Indian Context" examines the existing and potential state of e-commerce and m-commerce in the Indian market, with the latter being projected as the future.

The rising fulfilment costs (which include all costs incurred from the time an order is placed until it is delivered to the customer), a lack of last mile connectivity in many sub-urban and rural areas, and rising reverse logistics all impede the growth of e-commerce firms by resulting in significant losses. (Mahar, 2012).

IP was created to meet the communication demands of the United States Department of Defence. In the late 1960s, the Advanced Research Projects Agency (ARPA), now known as DARPA, began defining standard protocols in collaboration with several partner institutions and the business research community, and began building the first multi-vendor networks. ARPANET was the first packet switching network, with four nodes utilising Network Control Protocol, and it was tested in 1969. Following the successful test, the newly born network was transformed into an operating network known as ARPA Internet. TCP/IP protocols were created in 1974 by Vinton G. Cerf and Robert E. Kahn. The Institute of Information Sciences at the University of Southern California developed a reference paper outlining the philosophy of the Internet Protocol in January 1980. It was created to be utilised in an environment of interconnected computer communication networks oriented on packet switching systems.

ARPANET became congested in 1985, and the National Science Foundation created NSFNET to sustain the prior network, which was eventually shut down in 1989. The NSFNET was built on a number of regional networks and peer networks, including the NASA Science Network. By 1986, there existed a network architecture that linked universities and research institutions, as well as supercomputer facilities. The speed of transmissions had to be raised over time, and by 1991, the backbone had been moved to a private corporation that began charging for connections, while companies like IBM created ANSNET in parallel, which was not intended to profit these companies. Computer communication became increasingly crucial in the past, particularly for the military. It becomes clear that a strong communication standard is required to replace the many local network protocols that were previously employed.

The TCP concept was initially outlined in where numerous challenges to be overcome were stated. TCP was deemed to be a dependable end-to-end connection-oriented protocol. It was designed to run on top of the IP protocol.

Online Transactions

An online transaction is a payment mechanism in which funds or money is sent online via electronic fund transfer. The online transaction procedure (OLTP) is safe and secure. Registration, placing an order and payment are the three phases of an online transaction. Let's take a closer look at the various steps of an online transaction. Online transaction processing (OLTP) refers to information systems that facilitate and manage transaction-oriented applications, which are typically used for data entry and retrieval. As a result, online transactions are carried out with the assistance of the internet. It cannot happen without a reliable internet connection. Online transactions occur when a purchasing and selling procedure takes place via the internet. When a consumer buys a product or service online, he or she pays for it via an online transaction.

When we buy something online and pay for it online, we are engaging in an online transaction. Online transactions are completely

safe and secure. This occurs through validation of the OTP supplied to your phone, which is highly secure. In internet transactions, there is no need for any papers. There are three phases to an online transaction: first, registration, second, order placement, and third, online payment. All three processes are combined to accomplish this online transaction. Online transactions are used to buy or sell items on a website such as Flipkart, Amazon, or eBay, among others. There are three stages of online transactions.
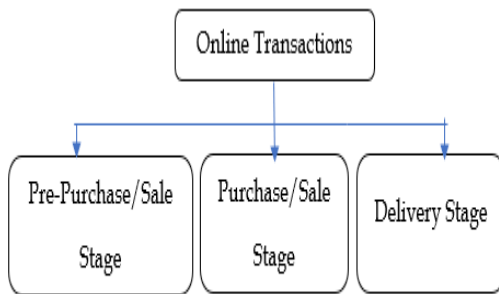

Figure 2: Types of Online Transactions

Types of Online Transactions:

Pre-purchase/Sale Stage: In this stage, the firm advertises the product, telling the consumer about certain crucial details through the advertisement so that the customer is aware of the product. These commercials are designed in such a manner that the client who is drawn to them is eager to purchase the goods.

Purchase/Sale Stage: At this step, the consumer is drawn to buy products, he loves the goods, he buys the goods, and he pays for the items online.

Delivery Stage: At this point, the consumer purchases the finished items and arranges for their delivery.

Network Protocol:

A network protocol is a collection of rules that governs how data is delivered between devices on the same network. Essentially, it enables linked devices to interact with one another despite of variations in internal operations, structure, or design. A network protocol is a set of rules, standards, and data formats that govern how devices communicate data over networks. In other words, network protocols may be compared as languages that two devices must understand in order to communicate information seamlessly, independent of architecture or design differences.

Network Protocols are a collection of rules that control the sharing of information in a simple, dependable, and secure manner. Before we get into the most popular protocols for sending and receiving data across a network, it's important to understand how a network is logically ordered or built. The Open Systems Interface (OSI) paradigm defined by ISO is the most widely used mechanism for establishing open communication between two systems.

The OSI model : How network protocols work

To comprehend the subtleties of network protocols, one must first understand the Open Systems Interconnection (OSI) concept. The majority of network protocols used today are architecturally based on the OSI model, which is considered the basic architectural paradigm for internet working communications.

The OSI model divides communication between two network devices into seven

levels. Each of these seven tiers is assigned a task or combination of duties. Each layer is self-contained, and the duties given to it can be completed individually.

TCP/IP Protocol:

TCP is an abbreviation for Transmission Control Protocol, a communications standard that allows application programmes and computer devices to exchange messages across a network. Its purpose is to transfer packets across the internet and guarantee that data and messages are delivered successfully through networks. TCP is one of the fundamental protocols that establish the laws of the internet and is included in the Internet Engineering Task Force's standards (IETF). It is one of the most widely used protocols in digital network communications that assures data delivery from beginning to finish.

TCP arranges data for transmission between a server and a client. It ensures the integrity of data transmitted via a network. TCP creates a connection between a source and its destination before transmitting data, which it assures remains active until communication occurs. It then divides enormous volumes of data into smaller packets while maintaining data integrity during the process. As a result, all high-level protocols that need data transmission employ the TCP Protocol. Peer-to-peer sharing protocols such as File Transfer Protocol (FTP), Secure Shell (SSH), and Telnet are examples. It is also used to send and receive email through the Internet Message Access Protocol (IMAP), the Post Office Protocol (POP), and the Simple Mail Transfer Protocol (SMTP), as well as for web access

through the Hypertext Transfer Protocol (HTTP).

The User Datagram Protocol (UDP) is an alternative to TCP that is used to build low-latency connections between applications and reduce transmission time. TCP is a costly network tool because it contains missing or malformed packets and safeguards data transmission with controls such as acknowledgments, connection initialization, and flow control. UDP lacks faulty connection and packet sequencing, as well as signalling a destination before delivering data, making it less dependable but less costly. As a result, it is a strong choice for time-sensitive circumstances such as DNS search, Voice over Internet Protocol (VoIP), and streaming video.

TCP/IP Protocol Advantages:
— It is an industry-standard paradigm that may be used to solve actual networking issues.
— It is interoperable, allowing cross-platform communication between diverse networks.
— It is a set of open protocols. Because it is not held by any one institute, it can be utilised by any individual or group.
— It is a client-server design that is scalable. This enables networks to be introduced without interfering with existing services.
— It gives each machine on the network an IP address, allowing each device to be identified via the network. It assigns a domain name to each site. Its services include name and address resolving.

TCP/IP Protocol Disadvantages:

— It is not generic in any way. As a result, it is incapable of representing any protocol stack other than the TCP/IP suite. It cannot, for example, define a Bluetooth connection.

— It does not distinguish between the ideas of services, interfaces, and protocols. As a result, it is unsuitable for describing new technologies in new networks.

— It makes no distinction between the data connection and the physical layers, which serve quite different purposes. The data connection layer should be concerned with frame transmission. The physical layer, on the other hand, should define the physical parameters of transmission. A good model would separate the two levels.

— It was intended and deployed originally for wide area networks. It is not designed for small networks such as LANs and PANs (personal area networks) (personal area network).

— TCP and IP were among the protocols in its suite that were carefully planned and properly implemented. Some of the other protocols were created on the fly and so proved inadequate in the long term. However, due to the model's popularity, these protocols are still in use 30-40 years after their inception.

Usage of TCP/IP protocol for secure E-Commerce transactions

Secure Electronic Transaction (SET) is a system that protects the security and integrity of credit card-based electronic transactions.

SET is not a payment mechanism, but rather a security protocol that is applied to such payments. It employs several encryption and hashing techniques to safeguard credit card payments made over the internet. The SET protocol was developed with the help of major corporations such as Visa, Mastercard, Microsoft, which offered Secure Transaction Technology (STT), and Netscape, which provided Secure Socket Layer technology (SSL).

The SET protocol prevents retailers from disclosing credit card information, keeping hackers and fraudsters at bay. The SET protocol contains Certification Authorities for using common Digital Certificates such as the X.509 Certificate. Before delving deeper into SET, consider the following general scenario of electronic transactions: client, payment gateway, client financial institution, merchant, and merchant financial institution.

The TCP/IP protocol suite, which is extensively used today, was created with the assistance of the Department of Defence. Regardless of the soundness of any implementation, there are a number of major security weaknesses inherent in the protocols. Based on these weaknesses, we outline a range of attacks, including sequence number spoofing, routing assaults, source address spoofing, and authentication attacks. We then examine defences against these attacks and wrap up with a discussion of broad-spectrum defences like encryption.

Conclusion

TCP/IP is a communications standard that allows application programmes and computer

devices to exchange messages across a network. Its purpose is to transfer packets across the internet and guarantee that data and messages are delivered successfully through networks. TCP is one of the fundamental protocols that establish the laws of the internet and is included in the Internet Engineering Task Force's standards (IETF). E-Commerce with the backend support of TCP/IP can be a good combination to create a sustainable business model. A sustainable business approach would be to promote e-commerce and m-commerce as supplements to traditional business rather than alternatives. Synergies between offline and internet enterprises will boost efficiency and lead to a more stable existence. The future also foresees an increase in specialty enterprises, as well as mergers and acquisitions to allow corporations to develop inorganically. Firms must commit to providing services and use internet marketing in order to develop and keep a wider audience. Opportunities in rural markets are emerging as a result of mobile penetration, but they cannot be realised unless they are accompanied by network proliferation, improved mobile app infrastructure, content production in local languages, and last mile connection. Furthermore, in the aftermath of demonetisation, the percentage of digital payments is projected to expand, which would need enterprises developing more secure payment infrastructure.

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