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Open Network for Digital Commerce (ONDC): In Depth Analysis to Revolutionize the E-Commerce Industry in India

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Abstract: Open Network for Digital Commerce (ONDC) is an initiative aiming at promoting open networks for all aspects of exchange of goods and services over digital or electronic networks. ONDC is to be based on open-sourced methodology, using open specifications and open network protocols independent of any specific platform (Press Information Bureau Government of India 06 APR 2022). India is experiencing rapid economic growth and a rising consumer market, with a projected increase in Internet users to 900 million by 2030. This growth has resulted in an increase in digital payments, supported by government initiatives such as the Unified Payment Interface (UPI) and RuPay. As of November 2023, UPI alone processed a record-high of 11.24 billion transactions valued at 12.11 trillion (National Payments Corporation of India's (NPCI)). The expansion of the digital payments ecosystem and the growth in Internet penetration and incomes have led to a significant expansion of the ecommerce sector in India (https://www.ibef.org/industry/ecommerce). However, a small number of major companies currently dominate the market. To address this, India has launched the Open Network for Digital Commerce (ONDC) Initiative to promote a more democratized e-commerce sector and support the growth of India's seller-ecosystem. ONDC intends to create a more extensive network that enables buyers and sellers to communicate and conduct transactions regardless of the platform they use. This would democratize the e-commerce ecosystem in India and promote a more open and inclusive environment for businesses of all sizes to participate in the exchange of goods and services (https://pib.gov.in). This paper emphasis on exploring the potential for ONDC to address the needs and concerns of different stakeholder groups, and to facilitate collaboration and cooperation within the ecosystem and to understand the technology behind the open networks and how ONDC is compared with the UPI technology.

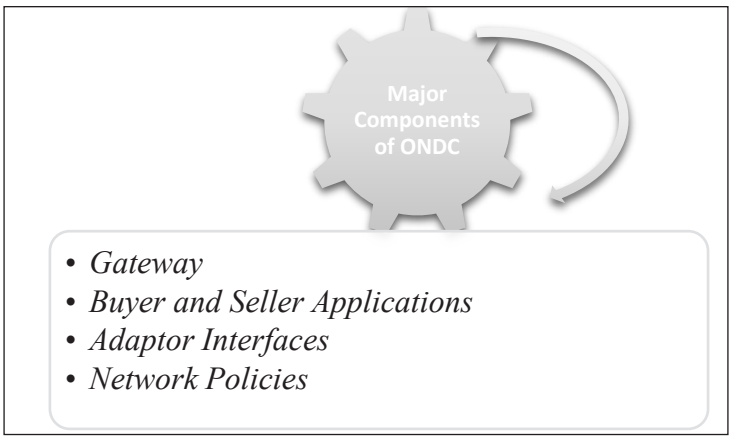
Keywords: E-commerce, Open Network for Digital Commerce (ONDC), UPI technology.

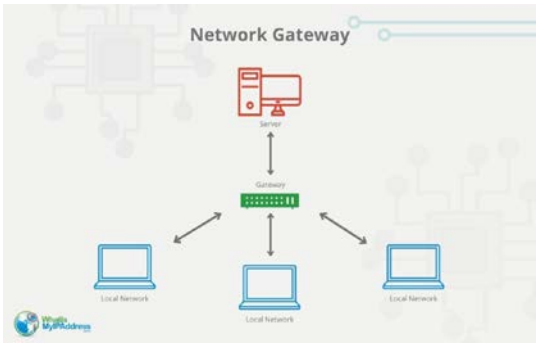
I. Introduction

India's Open Network for Digital Commerce (ONDC) is an initiative aimed at promoting a more inclusive and open e-commerce ecosystem in the country. It is based on an open-source approach, using open standards and network protocols that are not tied to any specific platform. This enables the creation of public digital infrastructures, such as open registries and network gateways, to facilitate the exchange of information and conduct transactions between buyers and sellers. The ONDC protocols are designed to be similar to existing protocols such as the hypertext transfer protocol (HTTP) for information exchange over the internet, the simple mail transfer protocol (SMTP) for email exchange, and the unified payment interface (UPI) for payments (https://www.clearias.com/open-network-for-digital-commerce-ondc/).

Online-to-Offline Direct Commerce, or ONDC, is a revolutionary business model that has been gaining popularity among retailers in recent times. This model aims to bridge the gap between the online and offline retail world by allowing customers to purchase products through an online platform and pick them up from the physical store. This creates a seamless shopping experience for customers and can lead to increased sales for retailers.

Major Components of ONDC (https://ondc.org/): The Open Network for Digital Commerce (ONDC) will include a variety of components to support the growth of India's e-commerce industry.





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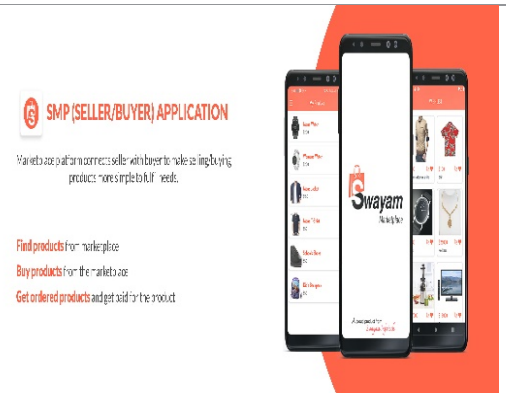

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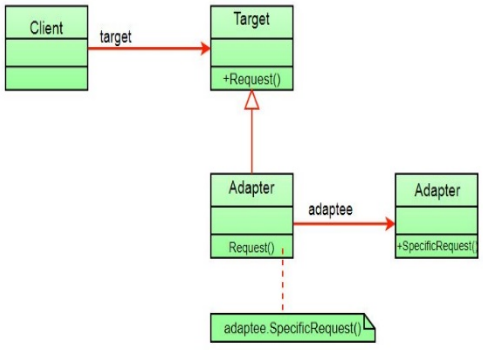
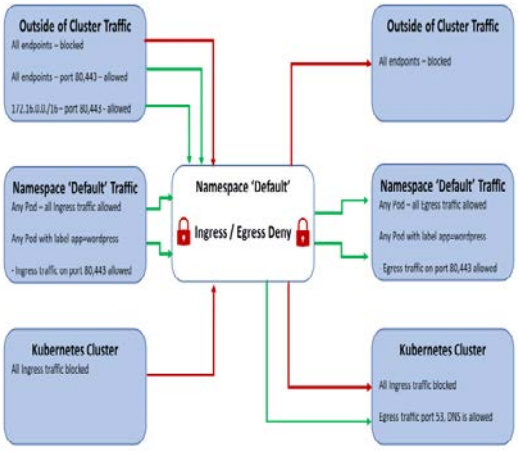


Adaptor Interfaces



Network Policies

II. Literature Review

The concept of open network for digital commerce (ONDC) has been gaining attention in recent years as a way to promote a more inclusive and open e-commerce ecosystem. ONDC is based on an open-source approach, using open standards and network protocols that are not tied to any specific platform. This enables the creation of public digital infrastructures

such as open registries and network gateways to facilitate the exchange of information and conduct transactions between buyers and sellers (https://www.drishtiias.com/). Research has shown that ONDC has the potential to democratize the e-commerce ecosystem and promote the growth of small and medium-sized enterprises (SMEs) by increasing their visibility and accessibility to buyers. A report by Indian Brand Equity Foundation, 2021 found that ONDC can increase the discoverability of SMEs by multicasting search requests to all seller applications based on parameters such as location, availability, and consumer preferences. This can lead to an increase in sales for SMEs and a more diverse range of products and services for buyers. Additionally, ONDC can also increase the competition in the e-commerce sector, leading to better prices, more innovation and better services for the endusers (https://timesofindia.indiatimes.com/blogs/voices/ondc-the-game-changer-for-indian-e-commerce). Furthermore, ONDC can also promote the growth of the e-commerce industry by generating additional gross merchandising value. An article on business standard (2022) found that ONDC has the potential to generate an additional Rs. 3.75 lakh crore for the e-commerce industry in India. This is due to the increased number of buyers and sellers that can be attracted to the platform and the increased trust among buyers and sellers that can be promoted by ONDC's simple and non-restrictive policy framework. ONDC also has the potential to increase the number of transactions, as buyers and sellers are not limited to a specific platform to conduct their transactions. This would lead to more competition and innovation in the market (https://www.business-standard.com/industry/news/ondc-can-support-growth-of-financial-services-ecommerce-deloitte-123083100347_1.html). However, there are also challenges to the implementation of ONDC. A (2022) highlights the need for a clear and consistent legal and regulatory framework to support the development and operation of ONDC. Additionally, there is a need for a strong governance structure to ensure that the network remains transparent, inclusive, and sustainable. Furthermore, there is a need for robust security measures to protect the personal data of buyers and sellers and prevent fraud (https://ondc-static-website-media.s3.ap-south). As the time is passing people are more interested surfing online instead of going out and looking for the product. This means people look for easy way to get things done. If ONDC is going as per it is planned it would be a big revolution in the country just like the UPI system. But if it doesn't work as, it is planned there would a drastic loss to the government of over $22 million (P. R. Venugopal, JETIR, Volume 9, Issue 9, September 2022). The king is the consumer. The seller-friendliness of the platform is irrelevant to them. They only consider convenience and enjoyment. ONDC would be well to keep this in mind. Hence, the ONDC is not against major e-commerce players to pull down its businesses in the market upon competition and posing challenges; however, this network provides an equal opportunity to all the firms in the field of digital commerce (V. Kumar and M. Harshitha, International Journal of Trendy Research in Engineering and Technology, Volume 7, Issue 1, February 2023).

III. Research Objectives

- To understand the technology behind the open networks and how ONDC is compared with the UPI technology.
- To assess the impact of ONDC on the local retailers and how it is benefitting them to expand their business and take it to online platform.
- To analyse the potential roadblocks and challenges faced by these stakeholders in the adoption and use of ONDC, including technical, regulatory, and market barriers.
- To explore the potential for ONDC to address the needs and concerns of different stakeholder groups, and to facilitate collaboration and cooperation within the ecosystem.

IV. Research Methodology

In order to get the data and the insights various interviews will be conducted with the different stakeholders in the ecosystem of ONDC including the retailers, persons from the buyers' apps and the seller apps and also with the policy makers from the Department for Promotion of Industry and Internal Trade (DPPIT) and people from business industry.

A sample of questions has been asked to these people and based on the answers a qualitative and quantitative report will be made.

Going through the various secondary reports including the other research papers, article in magazines of by industry leaders and experts have been collected.

From retailers quantitative and qualitative data have been collected on various aspects and the data have been synthesized to bring out some insights.

V. Limitations of the Study

The first limitation is that this is the new concept which is introduced by the GoI in the year 2022 so not many research papers have been published which can be referred as the source for secondary research.

This ONDC project is still in its pilot phase and the retailers who will be interviewed might not have experience with this new technology and not many customers have purchased from this platform so that might not be reflective of actual potential of this initiative.

A. What Problems Does ONDC Plan to Address?

1. No road map or strategy for some key aspects.	2. Concentration risk gives platforms excessive power.
3. Silent on liability for a bad product.	4. No portability of trust.

5. Local businesses might get squeezed in the long run.	6. Difficult for sellers who want to be on multiple platforms.
7. No clarity on how existing laws will apply.	

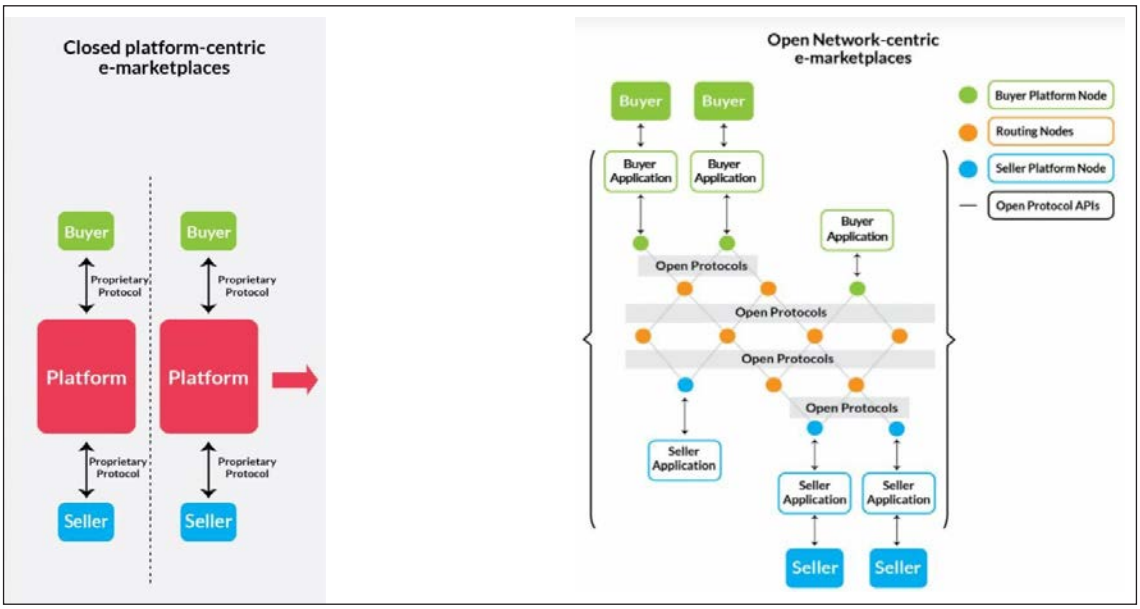
Sources: Sarvesh Mathi Published June 17, 2022.

B. Shift from Platform to Network

Currently, for a buyer and seller to complete a transaction, they must both be on the same platform. However, the ONDC (Open Network for Digital Commerce) will allow for the on boarding of buy-side apps, sell-side apps, logistics providers, payment gateways, and other enablers. This will enable buyers to transact with a wider range of sellers by accessing multiple sell-side apps. The open protocol's APIs will allow these providers to communicate with each other and provide a seamless experience for consumers. Buy-side apps could include traditional e-commerce platforms, as well as other platforms with large user bases, such as internet banking apps, telecom operator apps, common service centres, and UPI payment apps.

In the same way, sell-side apps could include traditional e-commerce apps, as well as seller aggregation platforms like Seller App, e-Samudaay, FPOs, and NABARD. These platforms have multiple MSMEs on boarded, providing an opportunity to monetize a large user base.

To put it simply, the ONDC will enable buyers to access a wider range of sellers by connecting various buy-side apps, sell-side apps, logistics providers, and payment gateways. The open protocol's APIs will facilitate communication between these providers, resulting in a seamless experience for consumers. Buy-side apps will include traditional e-commerce platforms and other platforms with large user bases. Sell-side apps will include traditional e-commerce apps and seller aggregation platforms with multiple MSMEs on boarded, providing opportunities for monetization.



Source: ONDC Strategy Paper.

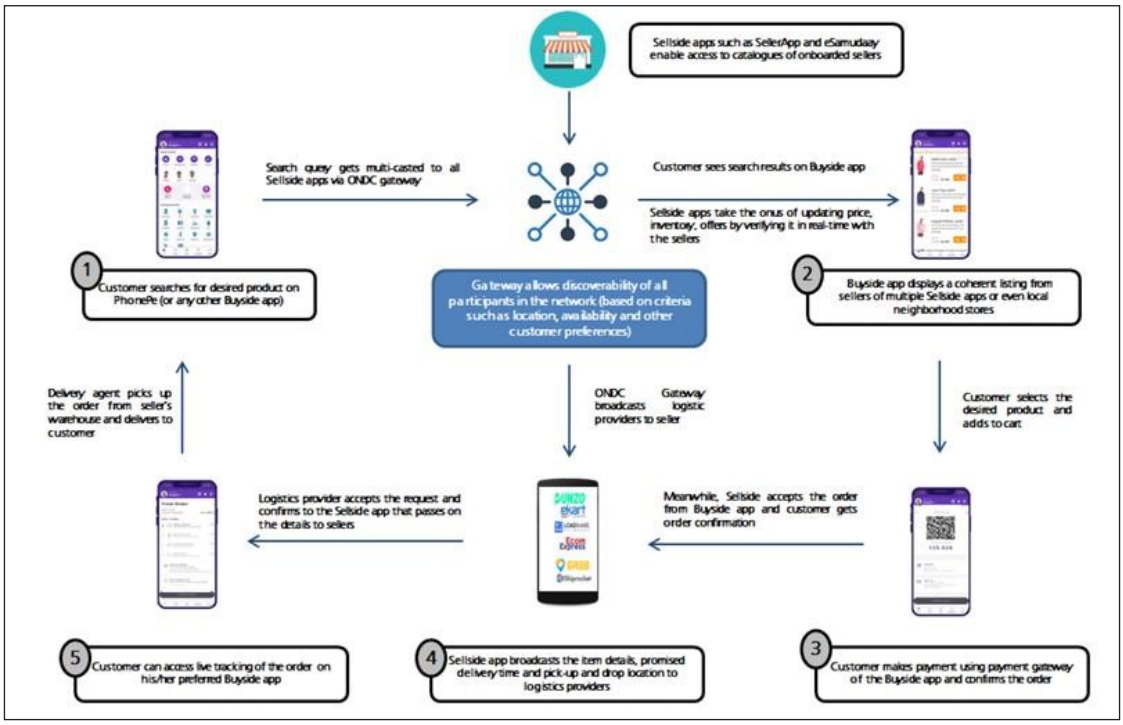
ONDC is a private non-profit organization that is solely focused on facilitating transactions and dispute resolution, rather than being a regulatory or policy-setting authority. Its success depends on enabling multiple parties to leverage interoperability across various platforms. The organization aims to reduce the barriers to entry for SMEs and traditional retailers by allowing them to work with one sell-side app of their choice, while still getting access to buyers on a variety of buy-side apps. Initially, ONDC is focusing on the grocery and restaurant sectors, but it plans to expand to host wholesale, mobility, tourism, and hospitality sectors in the future.

The ONDC network will consist of participants from various domains, such as retail, logistics service providers, restaurants, and hotels, which will join the organization as buyer-side apps, seller-side apps, or gateways. The entity's primary focus is to enable transactions and provide dispute resolution to its participants to ensure successful sustenance of this protocol. By leveraging the interoperability across platforms, the ONDC will reduce the time and money required to work with multiple platforms, making it easier for SMEs and traditional retailers to access a wider range of buyers.

Buyer and Seller-Side Applications: Applications on the buyer and seller sides are those that would enable transactions between buyers and sellers. The seller-side application can be any programme that accepts requests from buyers and, in response, publishes the seller's catalogue of goods and services and fulfils the buyers' orders. The buyer-side application can be your standard phone app as well as voice assistants, chat-bots, etc. Initial reference buyer and seller app releases from ONDC may be open-source.

Gateway: The gateway is an application that enables the discoverability of all sellers in the network by multicasting the search requests that are sent from buyer applications to all seller applications, based on factors like geography, availability, and other client preferences. ONDC will initially provide just one gateway to get things going, but this can later be expanded to multiple gateways.

Beckn-Protocol Based Adaptor Interfaces: Beckn, a non-profit entity that aims to create open specifications for mobility and commerce, has developed open APIs based on an open-source interoperable protocol. These adapter interfaces will allow for the exchange of information among the various participants of the network. The goal is to make e-commerce interoperable, much like how email protocols such as SMTP and IMAP allow an email sent from Gmail to be received by Outlook.



Source: ONDC Strategy Paper.

VI. Technology Behind ONDC

The architecture of the Beckn ecosystem has five layers (from top to bottom):

- Application layer
- Network and Transaction layer
- Infrastructure and Security layer
- Certification layer
- Specification and Support layer

A. Application Layer

The protocol is designed to enable seamless communication and data exchange between different players in the e-commerce value chain, including buyers, sellers, logistics providers, and payment providers. It does this by defining a common language for the exchange of data and services, which is based on a set of standardized APIs (application programming interfaces). Each of these layers has undergone unique independent evolution in terms of complexity and scale. Together, they all work in concert to create the ecosystem of Beckn.

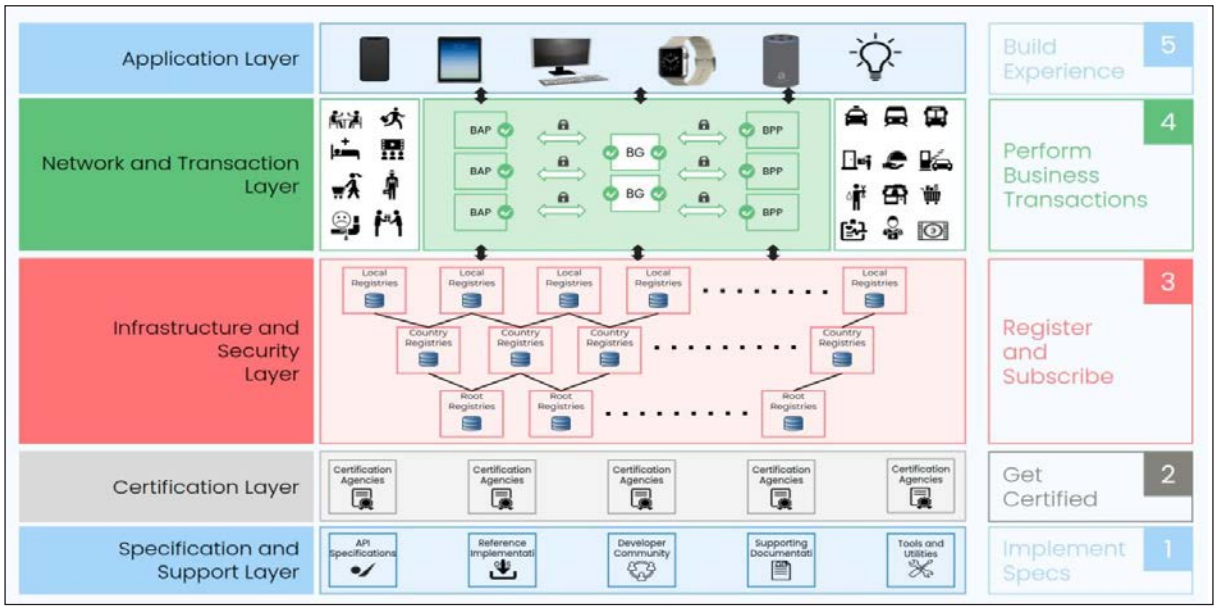
The Registry Infrastructure Layer

The Registry Infrastructure layer comprises a network of open registries that store detailed information about every network participant. The registries are maintained by entities called "Registration Platforms". To get listed on a registry, there is a there is a procedure which is mandatory for every network participant. The registration (in terms of requirements) is specific to each beckn-enabled network. The actors in the Registry Infrastructure layer are the:

Registration Platform(s) (Buyer App or Seller App) - The Registration Platform is a trusted entity that maintains the registry of the participants on the network. Registration Platforms can be formed by the participants of the network or by a public authority; this depends on nature of the network. A network can have more than one such registration platform, all operating by the same rules.

Registrant (Seller) - Any business or non-profit entity that wants its platform to be listed on the Registry. To be listed, the registrant must submit relevant credentials to the Registration Platform. A registrant can apply to be a Beckn Application Platform (BAP), Beckn Provider Platform (BPP), or Beckn Gateway (BG) or any other role allowed in the network.

Subscriber - After the registrant is approved by the Registration Platform, it is listed on the registry with INITIATED status. From this moment on, the entity being registered in no longer a registrant and becomes a subscriber. The subscriber status gives the entity the right to perform transactions on the network.



Source: https://cdnblog.webkul.com/blog/wp-content/uploads/2023/06/beckn-protocol.png

B. Network and Transaction Layer

The Transaction layer of a Beckn-enabled network is the abstraction that encompasses the network actors and the transactions that occur between them. The Transaction layer itself has three distinct parts:

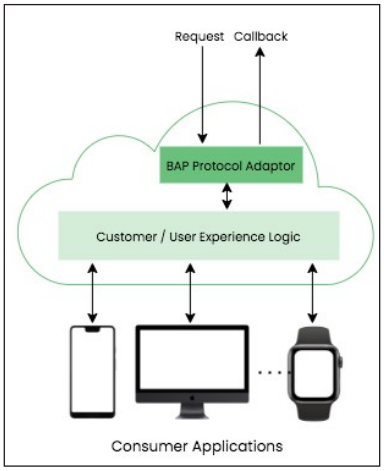
Demand Side (Buyer App) - The consumer-facing platforms called "Beckn Application Platforms" or, for short, "BAPs".

Supply Side (Seller App) - the Seller-facing platforms called "Beckn Provider Platforms" or, "BPPs".

Routing Infrastructure (ONDC Gateway) - The entities between the supply and demand sides, called of "Beckn Gateways" or "BGs", which connect the BAPs and the BPPS.

i) Beckn Application Platform

A Beckn Application Platform (BAP) is a consumer-facing infrastructure which captures consumers' requests via its UI applications, converts them into Beckn-compliant schemas and APIs at the server side, and fires them at the network. BAPs are the initiators of transactions and have the flexibility to communicate with multiple networks and integrate the responses from these networks into a bundled transaction experience.



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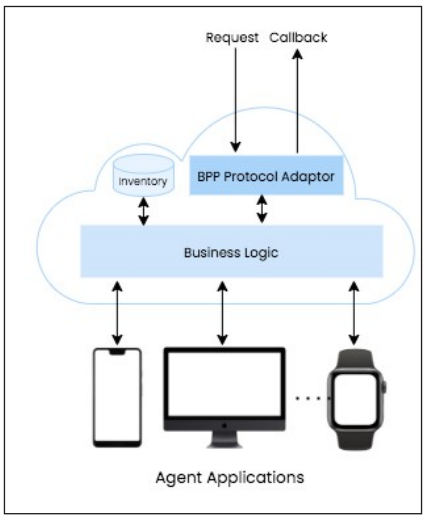
ii) Beckn Provider Platforms

The other side of the network is the supply side which consists of Beckn Provider Platforms (BPPs). These are the platforms that maintain an active inventory, one or more catalogs of products and services, implement the supply logic and enable fulfilment of orders. The BPP can be a single provider with

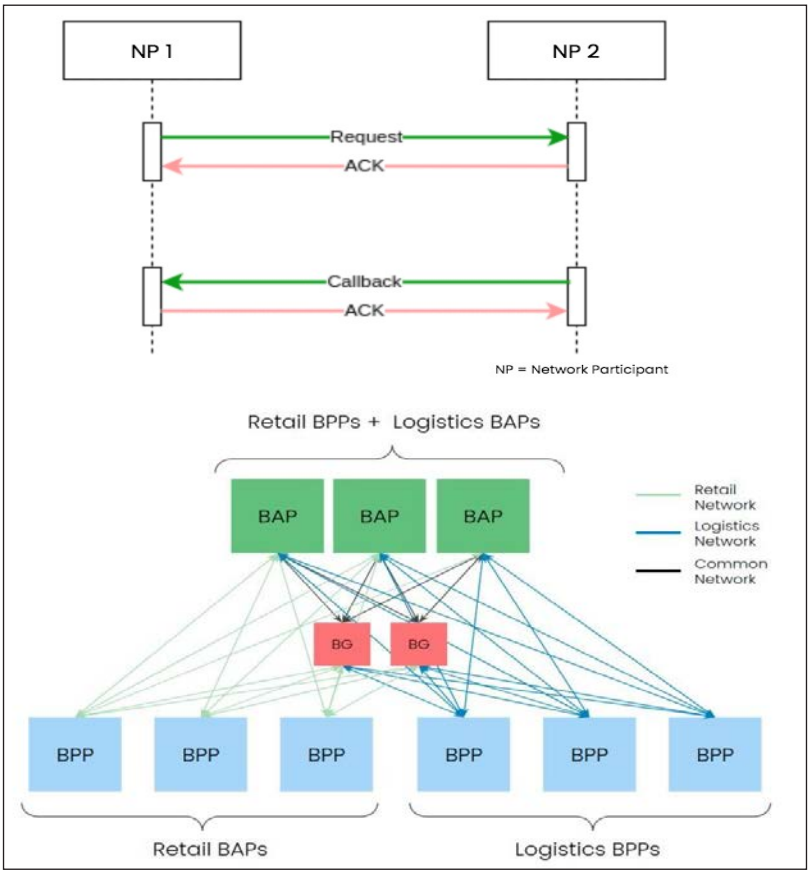
a Beckn API implementation or an aggregator of merchants — this, of course, depends upon the logic of the particular implementation.



C. Infrastructure and Security Layer

Network infrastructure design is very important for setting the blueprint for smoothly running various operations within the hardware and software systems of the company. It is like a laid down map, with proper directions to facilitate a journey; in IT fraternity what we call the systematically distributed layers between hardware and software system of an organization. An ideal *network infrastructure management* model will give you maximum flexibility, scalability and reliability.

Cloud service providers (Sources: https://www.znetlive.com/azure-public-cloud/) and data centre managers have always been looking for that ideal network architecture which can help them in efficiently organizing their operations and rendering better services to their end users. Here, we are going to discuss one of the most followed network models for cloud and DC management (Sources: http://www.racknap.com/cloud-providers) that is *"Hierarchical Network Design".*



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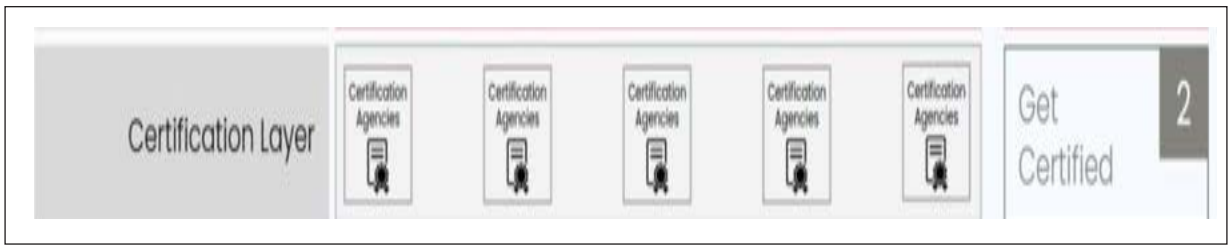
D. Certification Layer

Provide all the resources and support required to implement the network, to test for compliance and to become certified to join the network.



E. Specification and Support Layer

The specification and support layer of ONDC (Open Network for Digital Commerce) provides resources and support for implementing the network, testing for compliance, and joining the network. ONDC is a decentralized network that uses open specifications and network protocols to connect consumers, retailers, and technology platforms. ONDC's architecture is based on the Beckn Protocol, which is designed to create a decentralized network where no one owns the data.

The specification and support layer, along with the certification layer, form the bottom two layers of ONDC (*https://floydee.com/ondc-technical-architecture-behind-a-decentralized-network/).*

VI. Conclusion

The ONDC (Open Network for Digital Commerce) is still in its pilot stage, but companies in the e-commerce ecosystem are already considering how it may impact their strategies. To predict the future of ONDC, three scenarios are outlined, one of which is a blue sky scenario.

A. Utopian Scenario

According to the ideal scenario, ONDC will be the go-to option for all e-commerce transactions in India, with larger players either joining or becoming obsolete. This scenario envisions that the bigger players such as marketplaces and well-funded brands will adopt both the buyer and seller apps, giving ONDC instant growth and traction. Moreover, larger brands and direct to consumer businesses, along with MSMEs and local retailers, are expected to team up to create city or neighbourhood subnets, which will provide further expansion.

However, while this scenario prioritizes scaling, it could undermine one of ONDC's primary objectives: to empower local entrepreneurs and democratize e-commerce. Larger players, with their technological expertise and access to capital, could dominate smaller retailers, further bolstering the position of large incumbents and leading to an e-commerce war with offline FMCG, fashion, and electronics retailers who can directly sell to customers. As a result, MSMEs and local retailers could find themselves falling behind.

In conclusion, the ideal scenario predicts that ONDC will dominate e-commerce, with larger players adopting it and providing rapid growth and traction. However, this could come at the cost of smaller retailers that ONDC was meant to empower, potentially strengthening the position of larger incumbents and leading to an e-commerce war with offline players, while MSMEs and local retailers struggle to keep up.

B. Base Case Scenario

According to the base case scenario, ONDC is expected to continue on boarding various entities on the buyer side, such as banks, telecom operators, and government-sponsored entities, while established and newer brands are expected to join on the seller side.

Additionally, government-sponsored entities and aggregators/enablers are expected to digitize fragmented sellers, and most third-party providers are also expected to participate as enablers.

ONDC is expected to cater to the retail ecosystem that is currently not being served by the current e-commerce landscape in India. By providing a platform for small businesses and individual entrepreneurs to open online stores, ONDC aims to replicate the success of Taobao in China. The goal is for ONDC to complement the current e-commerce ecosystem by enhancing digital penetration among local retailers and in smaller cities.

The incumbents are expected to continue serving an ever-increasing consumer base that is content with the current e-commerce status quo and desires a more predictable and conventional consumer experience. ONDC is predicted to enhance digital penetration in areas that are not currently being served by the incumbents. Essentially, the base case scenario envisions ONDC as a platform that enables small businesses and individual entrepreneurs to thrive online and complements the existing e-commerce ecosystem.

C. Grey Sky Scenario

The "grey sky" scenario is a potential outcome where the ONDC project fails to succeed due to its inability to attract both buyers and vendors. This could occur because customers may not find the platform appealing due to factors such as high prices, limited selection, technical difficulties, lack of knowledge, and lack of incentives for local shops to participate. Additionally, small retailers may not want to follow strict procedures and sacrifice a significant portion of their profit margin.

In this situation, ONDC may pivot towards becoming a B2B facilitator by integrating government-related organisations such as Common Service Centers (CSCs), One District One

Product (ODOP), and agricultural producer organisations, known as FPOs. Although this may not result in direct access to consumers, it can improve the value chain for nearby communities by enabling price discovery and increasing retailer awareness.

In summary, the grey sky scenario predicts that ONDC may struggle to attract users due to a lack of incentives for small retailers and technical difficulties for buyers. The project may shift its focus towards facilitating business-to-business transactions by partnering with government related organisations. This could still provide value to nearby communities by improving the value chain, even if it doesn't result in direct consumer access.

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