Discussion on Internet Interconnection and Regulation

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Abstract

This paper analyzed the status and requirements of Internet interconnection in China, in order to get suggestions on Internet regulation and interconnection policy. We had research on the Internet connectivity status and policy adjustment, and explored network neutrality and the regulation of Internet big data business. We got connectivity regulatory advice, and solutions for net neutrality, big data business, consumer privacy protection. We ought to refer to the experience of developed countries, to optimize the connectivity and hardware conditions, try to carry out net neutrality, and establish the data property. We also have to strengthen the supervision in advance and explore the role of the government, and the citizens in the regulation, in order to improve the environment for industry development, and promote the development of information industry.

Keywords

Interconnection, network neutrality, big data, regulation

1. Introduction

In order to realize Internet interconnection and promote the "5G" strategy, China has promoted the construction of backbone direct link points to reduce the flow around, and explored the incentive and control of various businesses in the Internet regulatory ecosystem. With the impact of the development of the information industry on connectivity, the Internet interconnection structure has undergone new adjustments and changes to a certain extent. The settlement price between networks has gradually decreased, and the quality of communication between networks has been challenged by the decrease of income. The development of information industry promotes the rise of Internet companies, and the relationship between telecom operators and Internet service providers, as well as network content providers, changes with the development of the industry. Optimizing Internet connectivity and improving the basic hardware conditions for Internet development, would help promote data sharing, encourage enterprise cooperation, promote sustainable industrial development and improve service performance. On the other hand, massive users' data gives rise to more new businesses, with the supervision of Internet content and users' rights and interests under the connectivity greatly promoting the maintenance of a sound environment for the development of the Internet. Based on the relevant research, this paper put forward some regulatory suggestions on the interconnection architecture, inter-network settlement, inter-network communication quality, and discussed the network regulatory issues under the new situation of the Internet.
2. The foundation of Internet connectivity

The interconnection of the Internet platform is the interconnection of the products and services of the Internet platform, and the ultimate realization of the interconnection of products and services. In other words, interconnection is a kind of technical means and institutional arrangement, including granting users the right to carry data, requiring the platform to open its Application Programming Interface (API), and requiring the platform to reasonably set the Robots protocol, etc. Intercommunication is a final perception of the user. The connotation of Internet platform connectivity includes subjective and objective levels, gradually expanding from a single dimension to a multi-dimension.

The development of Internet technology is based on the form of next generation network. LTE, communication network, broadband connection and intelligent terminal provide users with the "interconnection" of communication business [1]. With the development of information technology, great changes have taken place in the process of value creation in the information industry. The value chain has evolved into a value network and gradually developed into a value ecosystem. The liberalization policy has opened up the telecommunications industry to competitive services, with resource sharing providing opportunities for new vendors to introduce value-added services on the telecommunications network. The developing interconnectivity of Internet mainly refers to the establishment of the connection between different networks by users of multiple operators in the market. The Internet interconnectivity is mainly divided into the backbone and mobile network. At present, our country's main policy effort lies in the broadband strategy and other backbone related policies. China's Internet backbone connectivity is mainly focused on the interconnection architecture, inter-network settlement and network communication quality. In view of new connectivity problems, performance-based smart regulation is encouraged.

2.1 Internet Connectivity Architecture

2.1.1 The interconnection architecture of connectivity

The backbone network provider at the top level has a network with high speed and large capacity, which could provide global access and interconnectivity. It can sell Internet access services in bulk to the network service provider, then resell the Internet access services to the network service provider, and retail the Internet access services to end users. The basic contents of 5G message communication include requirements on network architecture, routing organization, communication function, communication protocol, security and inter-network settlement. We configure a 5G message communication gateway, and connect the gateways using dedicated lines or VPN. Traditional short message gateways carry text information through signaling. In 5G message communication, signaling and the media layer need to transmit multimedia messages together, and the protocols used include SIP, MSRP, and HTTP. Therefore, an interworking interface needs to be defined to realize message interaction.

2.1.2 Limitations and supervision of Internet interconnection architecture

Online information sources are mainly distributed in the network of leading operators. The lack of information sources of small operators is not conducive to business development and the industry cannot fully compete. Therefore, supervision should be properly released to promote the opening of basic telecom service industry. In terms of the Internet architecture in our country, because of the large population base and complex interested parties, the government has gradually developed relevant laws to restrict monopoly, encourage the development of small operators and ensure the operation and maintenance investment of the main operators.

2.2 The settlement between Internet network

2.2.1 Ensuring connectivity

The settlement methods of Internet connectivity mainly include: non-settlement mode, which is used between networks with the same network capacity, with limited differences in geographical conditions and the same number of users. The network transmitted free of charge, which not based on time and traffic charges, can be applied between regional backbone networks. Multilateral settlement, which is mainly used for the neutral exchange center application of multilateral reciprocal agreements, can adopt different payment structures, whose members with more users generally pay a certain token fee. Bilateral negotiation and settlement, that is, both parties sell business to each other through interconnection points, and balance relevant sales revenue through settlement, which helps to establish stable peer relationship in unbalanced network [2].
2.2.2 Development of inter-network settlement on the Internet

Based on the current technical conditions, the long-term cost of interconnection between networks is estimated, including the cost of short-term change of interconnection provided by the leading operator and the cost of short-term no change. By considering the cost of capital and common cost, the cost of fully competitive market can be estimated, and reasonable compensation can be made to the interconnection service operators who provide relevant costs. The interconnection settlement method recommended for WTO and EU is the general trend of global development [3].

As more and more large-scale backbone networks at home and abroad adopt the free direct peer connection mode, the vertical hierarchy of purchasing transit services from lower-level backbone networks to higher-level backbone networks, becomes blurred. The competition in the global backbone network market is becoming increasingly fierce, with the price of transfer service falling constantly. The price of large-capacity port transfer decreases by a certain amount every year on average. In the Asia-Pacific region, the price of transfer service has fallen to a relatively low level [4].

The original circuit domain gateway offices of IMS Inter network settlement, are deployed in various cities. Inter-network call settlement is divided into local calls and long-distance calls. Long-distance calls are divided into inter-provincial and intra-provincial toll calls. The IMS communication gateway is deployed in the capital city, while the single point of communication is adopted in the province. Therefore, the concept of long-distance service within the province disappears. To comply with the changes in the IMS network interconnection architecture, inter-network settlement rules are simplified, with a unified settlement rate set in the province, and no distinguishment between provincial local calls and provincial long-distance calls. While traditional short messages are charged and settled by item, 5G messages introduce multimedia content. In the interconnection, users should be able to charge inter-network messages by traffic volume, number of messages, and duration. The charging fields of 5G messages include the charging type, calling and called party ID, media type, and message content length. Specific settlement rules and rates can be determined by the carriers through negotiation.

2.2.3 Suggestions on supervision of inter-state network settlement

China’s government deeply supervises market access system, interconnect structure and settlement system. Under this governance, the market service performance level of backbone network is not high, with some problems exist in the Internet and settlement. Therefore, it is necessary to further optimize the governance of backbone network. The inter-network settlement method ought to combine the network scale and network traffic, and determines the calculated income according to the operator network scale. We should study the establishment of a third-party technical supervision platform for inter-network communication quality and its feasibility, technical plans and management measures. Considering the big data and video service brought by network convergence, the mechanism of alleviating network congestion ought to be studied [5].

All in all, there is a rapid decline of settlement price in the Chinese Internet settlement method. The excessive reduction of inter-network settlement price would lead to the penetration of domestic third parties. At present, the main gap of network value between Chinese operators and international operators lies in network scale, user and information source. We should encourage the improvement of network structure, attract excellent information source, rule out the interference of market human factor in the evaluation of network value, and be fair to the value of flow and income, so as to ensure the effective development of information source construction and achieve strategic supervision [6].

2.3 Inter-network communication quality and supervision suggestions

The internetwork interchange bureau was transferred from the circuit domain to the IP network, and the monitoring points were changed from scattered collection in each city to centralized collection in the province. Since the inter-network signaling changes from ISUP to SIP, the signaling monitoring system needs to be modified to realize the SIP protocol analysis and processing functions. The operation quality of IP-based network is challenged by packet loss, delay, jitter, which needs to be improved. In 2003, there was an inter-network settlement and Interconnectivity signaling monitoring system based on No.7 signaling. 5G messages are mainly multimedia data, including voice, image, video and other formats. The inter-network transmission of all types of data should meet specific performance requirements.

The traffic between networks is quite serious, and the network service content has changed from content service to data, multimedia and telephone service, so new evaluation methods of network communication quality and service quality are needed. From the non-technical level, in the face of higher requirements for network bandwidth put
forward by the application of new technologies, the time period of the Internet backbone enterprise tariff should be ideal enough, so as to better match the bandwidth demand and supply to avoid extreme congestion in some time periods [7]. The competent department of telecommunications could establish a monitoring system to monitor indicators such as transmission delay and delivery rate of inter-network messages, so as to ensure that the services meet the corresponding service quality requirements. The supervisory department should follow up and supervise in time.

3. Connectivity regulation strategies under the new situation

The game among the stakeholders in the Internet ecosystem, such as the government, users, Internet service providers and Internet content providers, makes it very important to coordinate the relationship between all parties and maintain the sustainable development of the Internet industry. With the development of connectivity, more attention should be paid to the actual effect and the performance-based control. In terms of Internet regulation, direct supervision mainly focuses on interconnection, while indirect regulation is aimed at negative effects beyond mutual exchange. In recent years, with the study deepening gradually thorough to the control and regulation of the Internet space, the Internet regulation policy of our country involved more in the network information activities, and the supervision of the Internet monopoly intervention.

3.1 Connectivity and encouragement of leaders

In 2020, the inter-network settlement of backbone networks was abolished in China. In 2021, the annual operating revenue of China Mobile reached 848.3 billion yuan, with a year-on-year growth of 10.4%, and the revenue of communication service reached 751.4 billion yuan, with a year-on-year growth of 8.0%, with a growth rate of 4.8 percentage points higher than that in 2020. CHBN achieved comprehensive growth in customer scale and revenue scale, and HBN revenue accounted for 35.7% of communication service revenue, up 4.3 percentage points year-on-year. Operating revenue reached 848.3 billion yuan. It was listed on the Shanghai Stock Exchange on January 5th, 2022.

After the cancellation of inter-network settlement, China Mobile gave full play to the advantages of 2.6GHz/4.9GHz capacity and 700MHz coverage, to carry out multi-frequency coordination and efficient deployment, opened more than 730,000 5G base stations in total, including 200,000 5G base stations with 700MHz, promoting the maturity of the R16 standard industry, and leading 47 R17 standard projects in total, among the leaders in the world. With the continuous investment and improvement of the backbone network, the network quality of China Mobile has been continuously optimized and improved. In addition, the popularity of China Mobile’s user convergence service has driven a larger number of individual broadband users. At the same time, the development of CDN and IDC business has greatly increased the contribution of China Mobile to network content and services.

Internet connectivity has formed a relationship of equality, opposition and mutual need, and the relationships of competition and cooperation between backbone networks. On the international competition level, backbone network industry technology leaders are to play a more important role.

3.2 Regulation of connectivity: Anti-monopoly

Interconnection, and open connectivity of platforms could produce win-win results. There are still some behaviors that are difficult to test from the outside. We need new technologies, new supervisory systems, unconventional systematic monitoring systems, to fulfill smart supervision. The competition in the field of digital economy is evolving into the competition among platforms, eventually become the ecological competition indeed, which highlights the value of data circulation as a new factor of production. And the data level anti-monopoly would become the key point the governance of next stage.

In the merger cases of Huya and Douyu with market shares of more than 40% and 30% respectively in 2021, according to the Anti-Monopoly Law, operators prepared for centralized review and in-depth supervision found that this merger has the effect of restricting and excluding competition: both upstream and downstream markets have strong market control and are capable of implementing two-way vertical blockade, with the entity having the incentive to implement two-way vertical blockade after centralization. On one hand, the game copyright license owned by the online game operation service provider is the key to carry out the game live broadcast. The two kinds of users have a high degree of overlap and could transformed into each other. The results are as follows: If it has or may have the effect of excluding or restricting competition in the live broadcast game market and the online game operation service market in China, while the applicant fails to prove that the positive impact of concentration on competition is
significantly greater than the negative impact, or it is in line with the social and public interests, and the commitment plan submitted by the applicant cannot effectively reduce the negative impact of concentration on competition, the State Administration for Market Regulation will suggest such concentration of business operators to be prohibited.

The supervision of macro projects, are usually irregular behaviors, lacking of appropriate regulatory policies. The intelligent supervision is carried out case by case to avoid the damage caused by violations of the Internet users and normal market industries. It is anticipated that the relevant regulatory laws and regulations will become more and more sound. In 2021, the National Anti-Monopoly Bureau was officially established, which further enriched the anti-monopoly regulatory power, enhanced the regulatory authority, and strengthened the regulatory efforts from the perspective of regulatory functions, regulatory subjects and regulatory strategies. As a government behavior, Internet regulation needs to be constantly improved to meet the complex and frequently changing network information environment and build a regulatory mechanism with strong adaptability. To understand the nature and significance of connectivity issues, we must base on history and recognize the particularity of Internet connectivity issues. An in-depth analysis of the strategies of Internet platforms to create a "safe path" and "characteristic plan" for connectivity in the name of security reveals that the essence of connectivity is still an anti-monopoly issue, while connectivity still needs strong supervision [8].

3.3 Personal information protection of big data connectivity

At present, the Internet service network communication channels are gradually dispersed and fragmented. The emergence of we-media under the interconnectivity, shows that the Internet has developed from a communication channel to an expression channel, and has transformed into a diversified network, with the network social organization shape forming gradually. With the development of Internet technology and the integration and penetration of connectivity in the whole field, the supervision may focus on the protection of personal information and data flow.

Baidu's search engine data, Tencent's user social data including behavior data, consumption data, geographical location data, Internet finance data, social network data, could possibly be left out. Connectivity makes big data run efficiently. In order to ensure accuracy, when accessing the interface of medical big data platform, the data is usually not processed in any way, and the patient's identity information and personal privacy would be recorded, stored and transmitted through the network media. The technology of data watermarking and desensitization is still not mature, with many devices for data security not provided with complete guarantee. The interconnectivity of mobile apps and the potential interest pool behind the network popover advertisement, as a form of visual communication [9], makes it a breeding ground for illegal activities. Its mandatory presentation brings great disgust to the Internet life of netizens and even affects the formation of a good social atmosphere [10]. Network popover advertising induces operation, steals personal information popover logo invisibly, conceals page camouflage, using personal information for online fraud which becomes a social focus. The Shanghai Consumer Protection Commission investigated 600 apps, 58 percent of which contained advertisements, and 69.7 percent of which did not have a "close button".

While promoting Internet connectivity, the scientific development of procedures should focus on the right priorities. While striving for interests, we ought not do anything against public morality. The boundary between disclosure and confidentiality of personal data should be properly handled. The Personal Information Protection Law requires that the scope of use of personal information should be well protected, and the right of right holders to know and decide should be strictly protected. Relevant research shows that domain name can be classified by user identity to ensure privacy protection; The control and supervision of resource-oriented services would help avoid the waste of telecommunication resources and effectively protect the privacy and personal safety of citizens. In the face of the rare development opportunities given by the network era, the government should give full play to its advantages and build a good ecological environment for Internet advertising. With the improvement of data value, the supervision of big data businesses, the determination of property rights, and the privacy protection are gradually put on the agenda of the government [11].

4. Reflections on Internet regulation

In terms of government supervision, the popularity of mobile Internet and the formation of network society enable netizens to form ability of independent thinking and discrimination in the interconnected environment. With the constant impact of Chinese supervision, the scale and intensity of supervision should also be strengthened. Although the execution is efficient, the execution force will inevitably be reduced since more social values and the interests of Internet users are needed. At present, there are still different opinions from different groups on Chinese supervision,
with information sharing and interworking in supervision still insufficient, leading to contradiction between purpose and interests.

In terms of the policy system, due to the dispersed information in the supervision, it is difficult to centralize all the supervision modes without limiting the efficiency, as we need to bring different stakeholders into the scope of investigation, and control the interconnected network information content by regulating the market. Meanwhile, the proportion of traditional institutionalized administrative control is gradually declining, with the combination of market and pluralistic social forces gradually becoming an effective supplement to administration.

In terms of regulatory mechanism, the current network content regulation under connectivity is short of resources, with heavy tasks, difficult increase, insufficient information sharing and communication. The regulatory mechanism needs to better match the network content environment. We could improve its adaptability to regulatory issues and needs by optimizing the labor division and strengthening regulatory techniques and intensity. Regulatory authorities ought to pay more attention to incentives and leave decision-making authority to social forces, which would promote independent evolution of the Internet information ecosystem.

Under the principle of maintaining the healthy and ordered development of information industry, to discuss the problems of strengthening the interconnectivity and supervision, is the foundation of the sustainable development of information industry. The experience of global developed countries is the result of continuous adjustment and adaptation in the information industry development. Chinese regulatory authorities would continue to improve regulations, policy documents and standard documents to provide clear and detailed guidance to enterprises. Simultaneously, the regulatory response would be faster, leading to a better coordination of all parties’ interests, promoting a better network environment [11].

5. Conclusion

With the development of information technology, the interconnection between different enterprises in the information industry has been gradually put on the agenda. However, it should be noted that while encouraging Internet content providers to provide users with better services, we should also start from the core elements such as network interconnection structure, inter-network settlement, and inter-network communication quality to ensure the reasonable interests of service providers and operators in the information industry ecology. We ought to learn from foreign experience, to improve the interconnectivity of information industry, to realize the broadband strategy and keep in line with international standards.

The regulatory policy introduced in 2021 has refined the work content and eliminated the previous ambiguous areas. As the connectivity between different enterprises in the information industry is expanding, more attention should be paid to encouraging Internet content providers to provide users with better services. Homogeneously, inter-network communication quality and anti-monopoly should be taken into consideration to ensure the reasonable rights of Internet service providers and operators, to improve the high-quality interconnection of Chinese information industry, and realize the 5G strategy in the 14th Five-Year Plan.

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References


