

STUDY ON DEVELOPMENT STRATEGY OF SHIPPING CENTERS AND TRANSPORTATION NETWORKS IN THE YELLOW SEA RIM

JIN Feng-jun

(*Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, Beijing 100101, P. R. China*)

ABSTRACT: It is very important to establish cooperative mechanism to guarantee all members to develop their economies in the Yellow Sea Rim. In this paper, the development strategies of shipping centers and transportation network are discussed based on economic globalization tendency. The results argue that a united transportation network should be built in order to promote the economic competition of Northeast Asia in the world. As a key component of the economic cooperation, a hierarchical shipping centers network should be established with Hong Kong, Shanghai, Pusan, Kobe, and Tokyo as cores. The authorities of China, Japan, R. O. Korea and D. P. R. Korea should make more efforts to build a set of cooperation institutions based on raising the transportation efficiency.

KEY WORDS: the Yellow Sea Rim; shipping center; transportation network; Hub-and-Spoke system

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1 INTRODUCTION

The economic globalization has led to the establishment of the global transportation network and the development of coordinated transportation system, which has enhanced the development of transportation hubs with various functions and at various levels. In the new situation of globalization, the status and function of shipping centers need to be evaluated or determined from new viewpoints of development. It may not be in accordance with the needs and trends in the development of macro regions if the strategies are to be finalized from mere local or regional viewpoints. On the other hand, the coordinated transportation network will help promote regional and national development of economic cooperation. Especially with the advancement of transportation technology and the decrease of transportation costs, the degree of interdependency between countries keep increasing while the development of containerized transportation system and Logistics has exerted more functions.

Shipping centers are playing a more critical role in

the development of regional economic cooperation and sometimes directly determine the role of the region or city, where it is located, in the regional economic cooperation. Therefore, many countries and regions attempt to plan and change their ports into global or regional shipping centers when making global strategies, and take great efforts in the construction and administration of infrastructure as well as urban construction.

Northeast Asia is a region with the most rapid and vigorous development of economy, where economic cooperation and trade among countries have developed rapidly in the past 10 years, with rapid increase in commodity exchange and passenger flow as well as the rapid development of transportation industry promoted by the development of trade. The changing functions of ports have made the countries and regions where they are located reconsider the status and strategies of the ports. However, these strategies are made out of local benefits and interests, lacking uniform marketing principles and coordinated planning. In the relatively confined environment, waste in construction of infrastructure and severe competition are quite common (JIN,

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Biography: JIN Feng-jun (1961 –), male, a native of Inner Mongolia, professor, specialized in economic geography, regional planning and transportation.

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2000). Compared with that of Europe, the development of regional shipping system in Northeast Asia is incomplete, and more need to be done in making efficient, cooperative and uniform policies.

The study on the economic region along the Yellow Sea has already had a relatively long history. In the 1980s, Chinese, Korean and Japanese scholars put forward the concept of the Yellow Sea Economic Zone, conducted researches on its forming and development prospects (LI, 1987; JIN, 1991), and probed into the issue of economic cooperation and regional development strategies. In the 1990s, the studies on the Yellow Sea Economic Zone were at the predominant time, involving various aspects of regional socio-economic development and cooperation. It can be seen from the research results that the Yellow Sea Economic Zone refers to three different areas in different senses. In the narrow definition, it refers to just the areas along the Yellow Sea coast, mainly including Jiangsu, Shandong, Hebei, Beijing, Tianjin and Liaoning of China, R. O. Korea, D. P. R. Korea, and North Kyushu of Japan (LEE, 1993; JIN, 2000). This region has the population of 4.7% of the world and creates 3.6% of the world GDP. In the intermediate definition, the Yellow Sea Economic Zone geographically refers generally to Northeast Asia, including North China, Northeast China, Shandong Province and Jiangsu Province of China, D. P. R. Korea, R. O. Korea, Mongolia, Japan, and the Far East area of Russia. This geographical concept has been most extensively accepted. The Yellow Sea Economic Zone in the broad definition refers to a more extensive area, i. e., generally the East Asia region, including China, Japan, the Korean Peninsula, Mongolia, and the Far East area of Russia (LI, 1999; JIN, 2000). This region has the population over 1/4 of the world and the GDP over 1/5 of the world (Table 1). In this paper, the research is mostly focused on the Yellow Sea Economic Zone in the narrow definition while it may also be extended to East Asia or Northeast Asia in relevant contents.

2 PORTS ALONG THE YELLOW SEA ECONOMIC ZONE AND THEIR STRATEGIES

Currently, there are around 30 main ports in Northeast Asia or the Yellow Sea Economic Zone and its surrounding areas, among which the following ports are playing important roles in regional economic cooperation or transportation network: Shanghai, Lianyungang, Rizhao, Qingdao, Yantai, Tianjin, Dalian, Qinhuangdao, Inchon, Pusan, Guangyang, North Kyushu,

Table 1 Basic data of Northeast Asia and vicinity (2000)

Country (region)	Area ($\times 10^3 \text{ km}^2$)	Population ($\times 10^6$)	GDP ($\times 10^9$)	Export ($\times 10^9 \$$)
China	9596.96	1267.430	1159	266.200
Hong Kong, China	1.07	6.665	165	20.187
Taiwan, China	361.79	22.277	314	148.000
Japan	377.80	126.870	4060	150.400
R. O. Korea	99.26	47.280	442	0.560 *
D. P. R. Korea	120.54	222.700	11	0.200 *
Mongolia	1566.50	2.400	1 *	103.100
Russia	17075.40	1455.600	277	
Far East	6200.00	7.630 *		

Source: China Statistical Yearbook 2001, China Statistics Press, 2001

* Data refer to 1999

Fukuoka, Kobe, and Vladivostok.

In addition to good foundation and long history of development, they usually have good landways condition for assembly, distribution and transportation, with main-line railways to connect to economic hinterlands. There are convenient railways in Fukuoka and North Kyushu to connect with their hinterlands while Pusan establishes its close links with its hinterlands via Seoul – Pusan railways and expressways. As the gateway to the sea for the Capital Seoul, Inchon has developed transportation networks in its surrounding areas, which makes close links with its hinterlands possible. As the bridgehead of transportation between Europe and Asia, Vladivostok connects the continental hinterlands with Europe. As a key port in North China, Dalian links to the hinterlands of Northeast China via Harbin – Dalian railway and Shenyang – Dalian expressway. Connecting to North China and Northwest China via various railways and expressways, Tianjin is an important gateway to the sea, with its location in the midst of the economic region of Beijing, Tianjin and Tangshan. Linking to its hinterlands via Qingdao – Jinan railway and expressways, Qingdao has an extensively open hinterland, i. e., Shandong Peninsula, where the economy is quite developed, and has become a main trading partner with R. O. Korea. Connecting with its hinterlands via Lianyungang – Lanzhou railway, Lianyungang is the port nearest to Eurasia Continental Bridge. As the largest port in China, Shanghai links to its hinterlands via the Changjiang (Yangtze) River, railways and expressways. With infrastructure for the development of regional shipping centers, some of the above-mentioned ports may become international shipping centers in that region.

Based on these ports, the sea transportation along the Yellow Sea coast has kept developing rapidly. The contacts among them have been strengthened, especially

those between R. O. Korea and ports along the Yellow Sea of China, which have rapidly developed in the past 10 years, as a result of the rapid development of bilateral trade. For example, besides the regular containerized transportation between Inchon and ports of China, there are six regular roll-in/roll-out transportation routes, namely, Inchon – Dandong, Inchon – Dalian, Inchon – Tianjin, Inchon – Yantai, Inchon – Weihai, and Inchon – Qingdao. The coastal ports of China has maintained close contacts with Fukuoka and Kobe of Japan while Pusan has also had close links to ports in the Kyushu area of Japan.

To enhance the status of local cities or ports, the port authorities or local governments have focused on North-east Asia or international transportation market, with an emphasis on port strategies. Although the strategies are mostly made to get benefits of their own, they still embody the good will of the administration authorities in sustainable development of future transportation market and their own ports. Meanwhile, they also tell the directions of efforts taken by the authorities. The strategies and development directions of major ports in the Yellow Sea Economic Zone are shown in Table 2.

Table 2 Port status and development strategies in the Yellow Sea Rim

Port	Current status	Main strategies and directions
Shanghai	Integrated international transportation hub — Hub Port, Aviation Hub, Major Highway Hub, and Railway Hub; National Information Center and Finance Center; Economic Center, Pioneer in the River Valley; Free Trade Zone, Economic & Technological Development Zone, Hi-tech Industry Development Zone, Processing Zone for Export Products	International Shipping Center; Hub Port of Containerized Transportation; Logistics Center
Lianyungang	One of the Bridge Towers in the Eurasia Continental Bridge; Local Economic Center; Local Port	One of the Bridge Towers in the Eurasia Continental Bridge
Qingdao	Key city opened to the outside world along the sea coast; Key port and transportation hub; Free Trade Zone, Economic & Technological Development Zone, Hi-tech Industry Development Zone, Processing Zone for Export Products; Local Economic Center	Shipping Center in North China
Tianjin	Key city opened to the outside world along the sea coast, Gateway to the sea in North China; Key Port and Transportation Hub; Free Trade Zone, Economic and Technological Development Zone, Hi-tech Industry Development Zone, Processing Zone Export Products; One of the Economic Centers in North China	Shipping Center in North China; Logistics Center
Dalian	Key city opened to the outside world along the sea coast, Gateway to the sea in Northeast China; Key port and transportation hub; Free Trade Zone, Economic and Technological Development Zone, Hi-tech Industry Development Zone, Processing Zone Export Products; One of the Economic Centers in Northern China	Shipping Center in Northern China; Finance Center
Inchon	Gateway to the sea for urban area of Seoul; Second largest port in R. O. Korea; Major Airport	Shipping Center; International Airport; International Logistics Center; International Information Center
Pusan	Hub port of R. O. Korea; Regional International Port; Economic Center; Free Trade Zone	International Shipping Center Containerized Hub Port
Vladivostok	Economic Center in the Far East of Russia; Bridge Tower in the Eurasia Continental Bridge; Key port in the Far East;	Bridge Tower in the Eurasia Continental Bridge; Transportation Corridor
Fukuoka	Gateway to the sea in West Japan; Major Trade Center	Regional Shipping Center
North Kyushu	Gateway to the sea in West Japan; Major Trade Center	Regional Shipping Center

From Table 2, we can see that strategies have been made for most of the ports in the Yellow Sea Economic Zone according to their own status and locations in or-

der to meet the needs in local development. However, more emphases should be put on regional coordination in a wider extent.

3 BASIC TYPES AND CRITERIA OF SHIPPING CENTERS

What necessary conditions a global or regional shipping center has? Can it be a shipping center if it just has good physical facilities? The answer is that besides the basic conditions, local economy and local technological basis on which it depends cannot be neglected in becoming a port into an international or regional shipping center. Moreover, proper matchings in other aspects, e. g., information, finance, administration and other infrastructure, are also critical to the status of a shipping center and its development. Backed up by information network, an international shipping center is not a mere center in the sense of transportation, but one with various comprehensive functions.

According to current development of shipping centers in the world, there are roughly two kinds of international shipping centers: suppositional shipping centers, mainly watercraft registration centers such as Panama, and functional international shipping centers, with shipping as the core. For example, Hong Kong has long been regarded as a key international shipping center in Asia. It is both a real international shipping center and an international shipping registration center.

According to the range of service of ports, shipping centers can be classified into three kinds, i. e., global shipping center, regional shipping center and local shipping center. A global shipping center is the center or hub in the global transportation network, which is on the key point of the global transportation main lines, serves global transportation, and directly connects to most key ports along the sea routes. Such ports include Rotterdam, Singapore, Kaohsiung(Gaoxiong), Hong Kong and Pusan, which are classified as top ports in the port system of the world. A regional shipping center is a transportation center that serves specific countries or regions. It functions as a regional international shipping center. A local shipping center mainly serves the cities or region where it is located, with an emphasis on exchange of domestic products.

According to the functions of transportation, shipping centers can be divided into hub ports and feeder ports. Hub shipping centers boast themselves in their transferring functions while feeder ports mainly focus on the assembly and distribution of goods for hubs.

Generally speaking, an international shipping center should have the following necessary conditions:

(1) Good port facilities and physical conditions. A global shipping center is generally a big port that requires good physical conditions. Therefore, a good lo-

cation is the priority of a possible shipping center. With the tendency of bigger vessels, the physical conditions have become more important. For instance, a main sign of the rapid development of containerized transportation is big transportation vessels, with a full containerized loading capacity of 6000TEU and a water depth of 16m. Currently, there are only a few ports in the world that meet these requirements. It is estimated that those ports located in regions with developed economy and trade and with good natural water-depth conditions will play more and more important parts in the global shipping in the 21st century.

(2) Active trade and developed regional economy. As we all known, the goods flow from trade is the primary motive for the development of shipping centers. Only with regional development of trade can the transportation network and shipping centers be provided with "foods" for their own development. At present, the development of the shipping industry is propelled by the development of global trade.

It is proved by the development of key ports in the world that the development of these ports is closely related with the regional economic development. Many European and American ports have become global shipping centers because of the important status of the region, where they are located, in international trade.

With the gradual enhancement of its status in world trade, East Asia has become a main region while its status as shipping centers of their ports has been strengthened. For example, in 1975, there were only 4 ports in East Asia out of the 20 key containerized transportation ports in the world. For the time being, the number has increased to 10. It is worth mentioning that 5 of the ports are among the Top Ten, which benefits from the increase of regional economy and the enhanced status of trade. Currently, there are the following economic zones in the Yellow Sea area: Tokyo-Osaka economic zone, Seoul-Pusan economic zone, Beijing-Tianjin-Tangshan economic zone, Shenyang-Dalian economic zone, Qingdao-Jinan economic zone, and the Changjiang River Delta economic zone. These regions are both centers of local economic development and origins and absorbers of international trade. The big amount of goods flow has stimulated the development of relevant ports and made them international or regional shipping centers.

With the active trade among countries in East Asia, it is necessary and significant to establish the regional coordinated shipping network. For instance, since the normalization of bilateral relations between China and R. O. Korea in the early 1990s, the development of

economy and trade has rapidly increased. The bilateral trade has achieved a worth of US\$34 500 million in 2000 while there is still vast vista for further development. Shipping is an important way by which the bilateral trade can be realized. Meanwhile, the trade of this region with other continents is also substantial, which has prepared favorable conditions for the development of international shipping networks (Table 3).

Table 3 The trade volume between China and other countries and regions in East Asia ($\times 10^6$ \$)

Country (region)	1990			1995			2000		
	Total	Export	Import	Total	Export	Import	Total	Export	Import
Japan	16599	9011	7588	57467	28463	28005	83164	41654	41510
Hong Kong, China	40908	26650	14258	44575	35984	8591	53947	44518	9429
D. P. R. Korea	482	358	125	550	486	64	488	451	37
R. O. Korea	1943	1259	684	16983	6689	10293	34500	11293	23207
Taiwan, China				17882	3098	14783	30533	5039	25494

Source: China Statistical Yearbook 2001, China Statistics Press, 2001.

these two routes and the ideal locations have made their status of hub ports more outstanding. Hong Kong, Shanghai and Pusan are also on advantageous locations, with obvious potentials in development into hub ports.

(4) Extensive forelands. Extensive route linking with ports in the world networks is very important. Otherwise, they can not be taken as global shipping centers. This shows the importance of contacts and communications. In past analyses, more emphases were put on the handling capacity and amount of trade of ports while the contacts and communications of ports are neglected. It is held in this paper that a global shipping center must maintain extensive and close shipping contacts and communications with ports in the world, including direct and indirect contacts and communications.

(5) Leading the development of world shipping technology. The technology of shipping vessels as well as those of transportation, loading and unloading need to be experimented and developed in or among shipping centers. For example, if the shipping center focuses on the transferring functions, it should be able to accept large modern vessels with advanced equipment, technology and management experience. Currently, containerization is the main development tendency of world shipping, which is also the development objective of many key ports. Therefore, an international shipping center should be the leader in international containerized transportation. Some ports in Northeast Asia, e. g., Shanghai, Pusan, Kaohsiung, Hong Kong and Kobe, have maintained important status in world containerized transportation (Table 4). Besides, efficiency is another

(3) Proper location. Proper locations are very important to the development of global shipping centers. Generally speaking, ports on the international main line routes and close to key trade origins or destinations are most likely to become global shipping centers. In East Asia, the trade is mainly on the two transportation routes i. e., East Asia – Europe route and East Asia – North America route. Singapore and Kaohsiung are on

key index for shipping centers. High efficiency brings about high profits and benefits.

(6) Developed supplementary infrastructure. A shipping center must also be a center in other aspects, e. g., information processing center, economic center, financial center and integrated transportation center, with relevant infrastructure to match them. A shipping center must connect with the information center to exert its advantages of high efficiency.

4 LEVELS OF SHIPPING CENTERS ON THE YELLOW SEA RIM

The ports in Northeast Asia are classified into four levels by some researchers, i. e., hub ports in East Asia like Singapore and Kaohsiung; regional hub ports like Hong Kong and Pusan; developing national hub ports like Shanghai and Kobe; and local ports like Qingdao, Inchon, Dalian and Tianjin (ROBINSON, 1998).

Given the economic circle along the Yellow Sea is taken as an organic system, the functions of ports in the transportation networks are analyzed from various angles. The ports in this region can be classified into the following levels:

Ports of the first level — regarded as global shipping centers or hubs of East Asia, including Shanghai, Pusan and Kobe, which form the main hubs along the west coast of the Pacific Ocean together with Singapore and Hong Kong.

Ports of the second level — regarded as regional shipping centers, including Inchon, Tianjin, Qingdao, Dalian and Kitakyushu.

Table 4 Top 20 container ports in the world ($\times 10^3$ TEU)

1975			1985			2000		
Rank	Port	Volume	Rank	Port	Volume	Rank	Port	Volume
1	New York	1621	1	Rotterdam	2655	1	Hong Kong	17800
2	Rotterdam	1079	2	New York	2405	2	Singapore	17070
3	Kobe	905	3	Hong Kong	2298	3	Pusan	7540
4	Hong Kong	803	4	Kaohsiung	1901	4	Kaohsiung	7426
5	Oakland	522	5	Kobe	1852	5	Rotterdam	6300
6	Seattle	481	6	Singapore	1699	6	Shanghai	5613
7	Saint John	452	7	Long Beach	1444	7	Los Angeles	4879
8	Baltimore	420	8	Antwerp	1350	8	Long Beach	4601
9	Bremen	410	9	Yokohama	1327	9	Hamburg	4250
10	Long Beach	391	10	Hamburg	1159	10	Antwerp	4100
11	Jacksonville	377	11	Jilong	1158	11	Shenzhen	3993
12	Melbourne	365	12	Pusan	1148	12	PTP	3369
13	Tokyo	359	13	Los Angeles	1104	13	Kelang	3206
14	Hamburg	332	14	Tokyo	1004	14	New York	3178
15	Yokohama	328	15	Bremen	986	15	Dubai	3059
16	Los Angeles	327	16	Saint John	882	16	Tokyo	2960
17	Antwerp	297	17	Oakland	856	17	Felixstone	2800
18	Virginia	292	18	Felixstone	850	18	Bremen	2710
19	Sidney	262	19	Seattle	845	19	Gioia Tauro	2653
20	London	260	20	Baltimore	706	20	Yokohama	2400

Source: Container International Yearbook, 1975, 1986, 2001

Ports of the third level — regarded as local shipping centers, including Qinhuangdao, Yantai, Lianyungang, Guangyang and Nanpu.

With the above three levels of ports as the core, the transportation network along the Yellow Sea can be effectively set up. Ports of the first level should try to become global hub ports and serve the global shipping networks. Emphases should be put on the development of the containerized transportation system in order to become global containerized transportation hub ports and transferring ports. Currently, Shanghai and Pusan have established their status of the global Top Ten containerized transportation ports. In the future, they should consolidate their existing status and establish the main-line global containerized transportation route along the west coast of the Pacific Ocean, i. e., Singapore – Hong Kong – Kaohsiung – Shanghai – Pusan – Kobe. In the regional development of these two ports, they both have incomparable advantages over other ports in the same area. Shanghai is located in the Changjiang River Delta economic zone, one of the most developed areas in China, and has convenient linkages with its hinterlands. The local open economy is a necessary precondition to the development of shipping centers. As the biggest containerized port in R. O. Korea, Pusan is located in an area with developed open economy and convenient communications with surrounding areas. Therefore, the perfection of future coordinated transportation network along the Yellow Sea should center on these two ports with other ports as supplementary ports

or feeder ports.

Ports of the second level should focus on transportation and communications within the areas along the Yellow Sea, and establish convenient, express and efficient transportation network and coordinated infrastructure. In addition to the development of containerized transportation and regular transportation, short sea express transportation, including goods express transportation and passenger express transportation, should be developed between these ports by establishing the inter-port express transportation networks. Secondly, the roll-in/roll-out transportation between ports should be developed and a coordinated mechanism in technology, infrastructure, management and policies be established. Thirdly, river-and-sea coordinated transportation and sea-and-continent transportation systems should be set up to develop integrated transportation. In the unified market mechanism, the coordinated transportation across R. O. Korea and Chinese mainland should be developed under the principle of mutual benefits. Fourthly, nearby ferries should be developed. At present, China is actively developing the ferry transportation between Dalian and Yantai. With the operations experience after the completion of this ferry transportation, it is possible to develop the ferry transportation between R. O. Korea and Shandong Peninsula or Dalian. In the global containerized transportation system, these ports can be the feeder ports for Hub ports like Shanghai and Pusan.

Ports of the third level mainly provide services local-

ly, with domestic trade as the direction of their development. In international trade, they function as feeder ports. For these ports, local characteristics and professional functions should be emphasized so that their functions as feeder ports are fully exerted.

5 PROPOSALS

Firstly, a regional shipping system with Shanghai and Pusan as the centers should be established, supplemented by other ports. With the market principles and objectives of serving regional trade development, blocks between countries should be broken to establish effective network systems and enhance efficiency of transportation. Regional networks should be organized in the mode of "Hub-and-Spoke" system.

Secondly, regional transportation networks should be perfected with development of land transportation. With the development of regional economy, it has become more and more important to develop Eurasia Continental Bridge. Currently, the infrastructure of the continental bridge has taken form while the transportation systems have not been established and the status of many ports have not been finalized. Many local governments are trying to change their ports into transferring ports in Eurasia Continental Bridge, e.g., Qinhuangdao, Rizhao and Lianyungang. In the current situation of existing infrastructure and locations, the first step in the development of Eurasia Continental Bridge is to finalize the key ports. It is held in this paper that transferring ports in land transportation must possess relevant necessary conditions. In the areas along the Yellow Sea, it should be the east bridge tower in the land transportation. As far as the ports conditions are concerned, Pusan, Shanghai and Lianyungang should be developed as main transferring ports under preferential policies in order that centralized transportation, proper organization and high transportation efficiency can be achieved, and supplemented by other ports. Services can be provided to Mid-Asia by land transportation of Chinese railways while those to Europe by land transportation of Russia, which can be supplemented by other ports.

Thirdly, efforts should be made in promoting the opening of D. P. R. Korea and the links of transportation networks between Korean Peninsula and Chinese mainland. The confined status of D. P. R. Korea has blocked the links between R. O. Korea and Chinese mainland and restrained the proper development of the regional transportation networks in Northeast Asia. The breakthrough in the way to Korean Peninsula will

lead to further economic cooperation and transportation networks in this region. Therefore, efforts should be taken to get through the land passages by whatever means possible. At present, food, energy and infrastructure are the main obstacles in the development of D. P. R. Korea, which is closely relevant to the stability of society. These hindering factors will soon appear with any minor opening in its policies. Hence, besides economic support, China and R. O. Korea should have a broad foresight in helping D. P. R. Korea develop its infrastructure and get through the land connections. China should realize the significance of these measures in national safety and regional politics and economy.

Fourthly, the marketing process of transportation should be promoted. As a newly established industrial area with a relatively short history and different social and economic systems, a blocked operations mechanism exists, which will undermine the development of regional economic cooperation and restrict its competitiveness as a whole region in the world. Therefore, the unified marketing process of this region should be promoted. Discussions and studies should be made in transportation policies firstly and a legal environment should gradually be formed to meet the requirements of regional economic cooperation and free trade. Besides, the unified and coordinated development of infrastructure should be promoted under the principle of mutual benefits to minimize redundant construction of infrastructure and excessive competitions.

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