FINANCIAL AND TECHNICAL ISSUES OF RAMNICU VALCEA - VALCELE RAIL CONNECTION

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Abstract: The paper resume the discussions related to the rather old and unfinished project of a short rail connection between Ramnicu Valcea and Vilcele, along the one of a few rail links which crosses the Carpathian Mountains. Using the opportunity of FLAVIA project activities, and the developed software, called FLAVIA tool, one compares the container transport by rail (on two routes: on the TEN-T corridor IV, Romanian part, and alternatively, on the route using the discussed rail link) and by road, between Curtici station and Constanta Port, in order to assess the main advantages of the work completion. Finally, it draws several conclusive remarks in order to provide an incentive for decision makers.

Key words: container transport; rail corridor; energy consumption; technologic time; short-term scenario; FLAVIA tool.

1. THE FLAVIA PROJECT OBJECTIVES, STRUCTURE, OUTPUTS

The international project "*Freight and Logistics Advancement in Central/ South-East Europe - Validation of trade and transport processes, Implementation of improvement actions, Application of co-coordinated structures*", in short FLAVIA, has as the main objective the consolidation of a fright transport corridor between Central Europe region and South East Europe region, and also the extension of the trade and transport connections to the TRACECA and Black Sea region's countries, through the modal shift from the road to rail and inland waterway transport.

The FLAVIA partnership includes transport operators, association, authorities,

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research institutes and universities from seven countries located in the central part of Europe, and Romania, located in the South-East. In the Figure 1 [7] , the flags with F character indicate those seven countries (those two arrows suggest other two corridors on the North-South and South-North direction, funded also by the European Regional Development Fund).

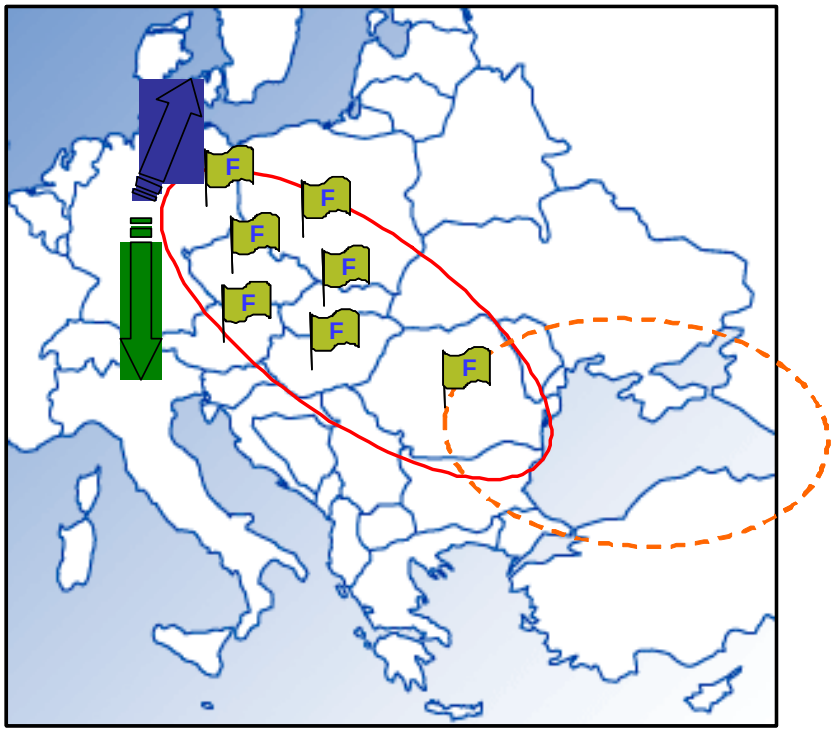

Fig. 1. The FLAVIA partnership and the project study area (Source: [7])

The Lead Partner is Technical University of Applied Sciences Wildau-Research Group Transport Logistics, and the other partners are, as follows: Pro Rail Alliance (Allianz pro Schiene) (DE), GVZ Development Corporation Southwest Saxony (DE), Ministry of Economy of the Federal State Brandenburg (DE), University of Pardubice (CZ), EXPRESS-INTERFRACHT Co. (CZ), Interport Servis Ltd. (SK), Upper Austrian University of Applied Sciences, Research &Development Ltd.-LOGISTIKUM (AT), Institute of Logistics and Warehousing (ILIM) (PL), University POLITEHNICA of Bucharest -Transportation Research and Consulting Centre (UPB-CCPCT), Technical University of Košice, Faculty of Manufacturing Technologies (SK) Regional Advisory and Information Centre Presov (SK), Hungarian Logistics Association (HU), BILK Kombiterminál Zrt. (HU). FLAVIA was entering into force in Mach 2010 and its duration is 36 months.

FLAVIA is focusing on cooperative structures like pro-rail alliances, the

transfer of best practice as well as "greener" logistics. The most important technical Work Packages and their main objectives are, as follows: Identification of trade and transport barriers measures and overcome; Concept development and transfer of best practice; Green transport and preparation of investment; Extension of the trade and transport corridor Central-Southeast.

Using the opportunity of FLAVIA project activities, the Romanian partner, UPB-CCPCT, has investigated the advantages provided by the rather old, intensive discussed and unfinished rail link, Rm. Valcea - Valcele. The aim was to provide an incentive to the transport decision makers, at very high level, to reconsider this project for the medium term development plan of the railway network in Romania.

In the next section there is a short overview related to the already accomplished works on the rail link, its advantages, and the necessary works and costs for finishing purpose. The third section is dedicated to the assessment of the presented advantages of the rail transport along the new connection, in case of short-term but also for long-term scenarios, when the TEN-T corridor IV on Romanian territory is finished. The main comparisons are drawn between those two rail routes and the road shortest route, considering the same transport relation: Curtici to Constanta Port. In the fourth last section the main conclusive advantages for the rail transport operators are briefly resumed.

2. RAIL CONNECTION BETWEEN RAMNICU VALCEA AND VILCELE STATIONS

2.1. Brief history and an overview

The rail connection between Ramnicu Valcea and Valcele has a long history, and just before 1990, it was almost finished. After 1990, many times this connection was considered but, in fact was not ever entirely deployed. Now, again it is pointed out that the finishing of its more then a half-accomplished works (only for those 39 km) would be beneficial for a better connectivity of the entire rail network.

The necessity of this line was officially first mentioned in Chamber of Deputy in 16th June 1862, this idea also being registered in national plans from 1919, 1920, 1920 and 1927. Even though the Second World War German troupes had in mind the built of this rail connection to shorten the way to the West Europe. Initially abandoned, this idea got life after 20 years and in 1949, terrain studies had begun, but after another 30 years, in 1979, the works begun, the optimal solution being a rail line with the high curve radius and the less slopes.

Even though there were some works still to be done in order to consolidate the sides' terrain, but in summer of 1989, the communist authorities officially opened the line, and for one year (1993-1994) there were 4 pairs of trains per day using this line.

Between 1990 and 1996 the works were progressing with a slow rate in time because of lack of founding and decided attitude of the authorities. In 1996, the Ministry of Transport resolved to stop the finishing woks and operation, but without

undoubtedly and comprehensively explanations.

The railroad from Valcele to Ramnicu Valcea had a length of 39 km, normal track gauge of 1435 mm; it was designed for diesel traction, with light signals and electro-mechanical interlocking system. The re-opening of this Valcele – Ramnicu Valcea rail line will facilitate the using of a shortest rail route from Western part of Romania to the Black Sea and to the South-East regions, and contribute to a real traffic flow efficiency; the route from Sibiu to Bucharest, using the RmValcea-Valcele shortcut for example, will be 78 km shorter then the TEN-T corridor through Brasov (Table 1).

Table 1. **Characteristic resistance of the main crossing-rail lines of the South Carpathian Mountains, linking Bucharest and Curtici** (Source: [4])

No of route	Route	Characteristic resistance [N/KN]		Altitude [meters above the see level]	Length of route [km]
		going direction	return direction		
1	Bucuresti–Caracal-Craiova-Orsova-Timisoara-Curtici	24	32	500	607
2	Bucuresti-Caracal-Craiova-Tg.Jiu- Simeria -Curtici	18	22	720	604
3	Bucuresti-Caracal-Piatra Olt-Ramnicu Valcea-Podul Olt-Vintu-Simeria-Curtici	10	10	390	659
4	Bucuresti-Ploiesti-Brasov-Podu Olt- Vintu-Simeria-Curtici (TEN-T corridor IV)	22	28	1100	639
5	Bucuresti -Ploiesti- Brasov-Sighisoara-Blaj-Vintu-Simeria-Curtici	22	28	1100	626
6	Bucuresti-Pitesti **(Valcele)-Rm.Valcea** - Podu Olt- Vintu-Simeria-Curtici	11	11	450	561

The expert's opinion is unanimous that the main advantages of this shortcut line are the following:

- first one comes from its smaller characteristic resistance in comparison with all other Carpathian rail crossing lines (see Table 1), especial with Sibiu-Brasov-Ploiesti to Bucharest sections, of the TEN-T corridor IV, and
- the second one is related to the operational TEN-T corridor decongesting actions, especially considering the heavy trains with more than 2000 gross tones (because of the high characteristic resistance on the Brasov - Bucharest sector there is need for a pushing second locomotive for heavy trains in both directions).

For an easier comparison of alternative routes linking Curtici cross-boarding

point and Bucharest, the sketch extracting all possibilities for this corridor is depicted in Figure 2. Every rail segment is noted with a set of numbers; each number indicates a specific route.

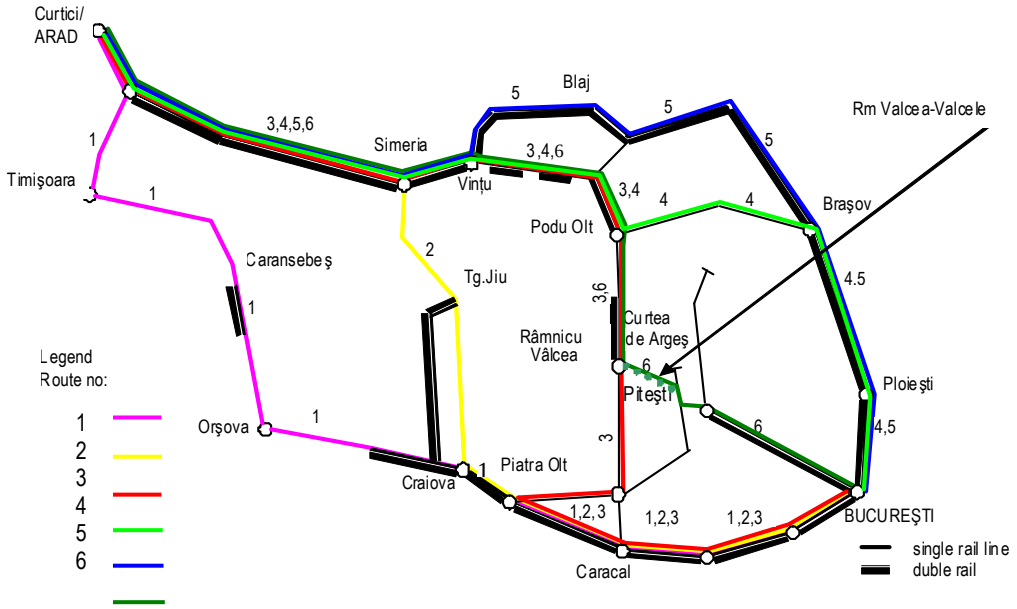

Fig. 2. Sketch of all six alternative routes linking Curtici to Bucharest (Source: [4])

These advantages are well-known by the operators and the needed works had been introduced into the Romanian Comprehensive network [2] and planned for financing, but for now there are no actual actions. At the present, Valcele and Ramnicu Valcea rail connection is interrupted, the switches for this line had been removed and also the line track and the crossbeams were disassembled from the track and putted into conservation stage.

2.2. Necessary works and costs evaluation

The railway connection between Valcele and Ramnicu Valcea has the minimum curve radius is 700 and has a characteristic resistance of 11 N/kN. This railway was designed to connect the two main rail connections Bucharest-Pitesti-Piatra Olt with Bucharest-Sibiu-Arad-Curtici, as we already have mentioned above.

Until the end of 2003 the state of the working where as following:

- Double track bridges and viaducts 2406 meters;
- Single track bridges and viaducts 1214 meters;
- Almost 2 million cubic meters of embankments;
- Single track tunnels 4200 meters;
- 165 culverts;

- Total length of approximately 55 km of track superstructure.

UPB-CCPCT performed a study in order to estimate the current state of the RmValcea-Valcele line, in 2003 [4]. According to this study, the actual status of the already finished works was, as follows:

- Viaducts - 70%
- Tunnels - 100% (finished and in-adequate shape)
- Culverts 97%
- Embankment 100% (finished and in-adequate shape)
- Embankment consolidation 23%
- Superstructure 97%

For the finishing building works it is mainly needed the extra 1093 meters of double track buildings, viaduct for a total of 446 meters and approximately 20.000 cubic meters for embankment consolidation. The finishing works were evaluated at about mio EUR 432 and in 2011; the project was included into the list of project planned for 2012-2016. In the Romanian Network Statement this project has *2014 as the date of completion* [1].

The new line will have single track sectors, and this is the reason of not so much operation capacity. We studied different operational schemes and the results were about 32-40 pairs of trains per day.

Rail link Rm Valcea - Valcele has important parts already accomplished and the works to make it operational will reveal its efficiency in term of time and energy saving, because it is part of the lightest and shortest (in the same time) alternative to the North branch of the Romanian TENT-T corridor IV. Its envisaged finishing time is earlier than corridor IV completion. It is considered as a mid-term useful alternative to corridor IV, in order to have an acceptable performance for the rail/intermodal services.

Concluding, the main roles of this new line are: to provide a acceptable solution for trains between Curtici and Constanta, before the TEN-T corridor IV is complete (before 2020), as long as its works are planed to be finished in 2014; to undertake the heavy trains from the TEN-T corridor IV, after its completion (after 2020), as well as the urgent trains; to improve the rail network reliability, considering the rather few Tran-Carpathian rail connections on the Romanian territory [6].

3. MAIN ADVANTAGES OF THE OPERATION ON THE NEW RAIL CONNECTION

3.1. Time and energy savings

The TEN-T corridor IV has a heavy profile when it is passing-through the Brasov surrounding. In Figure 3, it is a sketch of its longitudinal profile of Ploiesti to Brasov rail line. From the rail operational point of view, it is need to add a second pushing locomotive in Brasov, and respectively in Campina, which are the base of the heavy slop. Moreover, in order to have the tax access savings (meaning to reduce the

number of trains for infrastructure tax access reducing), transport operators include the middle locomotive for even heavier trains. Hence, there is a need for **technologic times** in order to attach and detach of pushing locomotive for each single train passing through the TEN-T corridor; specific checking operation for brakes functioning implies at least 15 minutes for locomotive attaching; similarly, for the pushing locomotive detaching (always in Predeal, as profile peak) need for another at least 15 minute (Figure 3). The delay for about 30 minutes are needed for every heavy train (whit more than 750 gross tonnes coming from Curtici to Bucharest, and with more than 900 gross tonnes for opposite direction). Hence, for the heavy trains following the alternative route through Rm Valcea - Valcea, there are at least 30 minutes saved. The time commercial opportunity loss should be considered also for a comprehensive assessment of the proposed route [5]. Moreover, in future research, the assessment of the damages on railway infrastructure at the slops' base portions because of such heavy breaking efforts and the energetic consumption, may provide the amount of the real advantages for heavy trains using the lightest connection through Rm. Valcea-Valcele link.

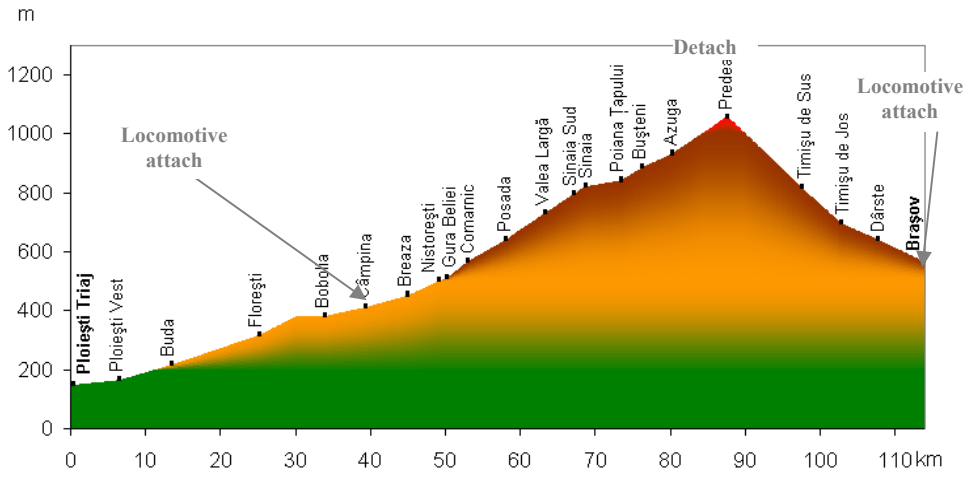

Fig. 3. Longitudinal profile of the TEN-T corridor IV and the technological operations for the pushing locomotive attaching and detaching (Source: [9])

3.2. Comparison scenarios and advantages assessment by FLAVIA tool

Based on the existing interim IT-tool [3] a web-based tool for intermodal route planning, infrastructure information and for evaluating changes of intermodal freight nodes and networks was developed [7]. It is possible to calculate various routings of alternative intermodal logistics chains in terms of minimised time, distance, costs and energy consumption. The IT-tool offers the possibility to include fixed relations in the routing process (already existing intermodal transport service offers operated by a transport operator). Result of the routing is a map and a list showing the used sections

per transport mode and values of the routing are given (duration, distance, energy consumption, costs).

The analyses scenarios were on long terms and short term too, as follows:

A. Long-term scenarios

Two long-term scenarios is build-up using the FLAVIA tool, both for 2020 horizon, when all works will be completed, as follows:

- LT1- North branch of TEN-T corridor IV, connecting the cross-boarding point Curtici to Constanta;
- LT2- alternative route connecting Curtici to Constanta, via Rm Valcea-Valcele new line.
- The both scenarios are studied in two cases, each:
- for transit only, meaning that there are no stops to take/leave any group of wagons; this situation describe the maritime of exports from CE, beyond the Black Sea area,
- for mixed scope, one for transit and exports/imports from/to Romania with CE countries (e.g. Germany), for continental trade and another one for exports/imports with outside European countries, using the Constanta Port, international trade; for this mixed situations, three stops in Arad, Brasov and Bucharest for the first route are set, and another three stops in Arad, Simeria (or Pitesti), Bucharest are set. Pitesti is related to the Dacia Automotive Plant.

B. Short-term scenarios

Two scenarios are build-up, considering the same routes, but described for 2012 situation, as follows:

- ST1- route of the North branch of TEN-T corridor IV having with only three operational sectors, and all others with actual running speed, some of them under the works restrictions.
- ST2- existing alternative route connecting Curtici cross-boarder to Constanta Port, passing through Timisoara, Craiova, Bucharest (other alternative route might be chosen, as well).

Similar, the both short-term scenarios are studied in two cases, each, for transit only, on one hand, and for mixed scope, on the other hand, as we described above.

On short term scenarios, additional option was set: a fixed rail connections between Constanta and Bucharest in both directions, denoted by FS. All scenarios are synthetically described in Table 2, below.

For all described scenarios FLAVIA tool is used and the main results are collected in Annexes of 5.2.7. Action Report [8].

Table 2. **Brief description of long- and short- term scenarios** (Source: authors)

Scenario	Code	Trade scope	Route	Description (no of stops, maxim. speed)
LT1	LT1-T-corridor	direct transit to Black Sea for maritime exports/imports	the North branch of TEN-T corridor IV: Curtici, Simeria, Brasov, Bucharest, Constanta	- no stops; - max. 100 km/h
	LT1-M-corridor	mixed trade, transit + Romanian expts./impts. with CE and maritime		- three stops: Arad, Brasov, Bucharest; - max.100 km/h
LT2	LT2-T-A	direct transit to Black Sea for maritime exports/imports	alternative route using new line: Curtici, Simeria, RmValcea-Valcele-Pitesti, Bucharest, Constanta	- no stops; - max. 100 km/h
	LT2-M-A	mixed trade, transit + Romanian expts./impts. with CE and maritime		- three stops: Arad, Simeria (or Pitesti), Bucharest; - max.100 km/h
ST1 (2012 current situation)	ST1-T-corridor	direct transit to Black Sea for maritime exports/imports	the North branch of TEN-T corridor IV: Curtici, Simeria, Brasov, Bucharest, Constanta	- no stops; - max. 100 km/h only on Fetesti-Constanta sector.
	ST1-M-corridor	mixed trade, transit + Romanian expts./impts. with CE and maritime		- three stops: Arad, Brasov, Bucharest; - max.100 km/h only on Fetesti-Constanta sector
	ST1-M-corridor-FS	mixed trade, transit + Romanian expts./impts. with CE and maritime+ fixed rail service		- three stops: Arad, Brasov, Bucharest; - max.100 km/h only on Fetesti-Constanta sector; - fixed rail service Bucharest-Constanta.
ST2 (2012 current situation)	ST2-T-A	direct transit to Black Sea for maritime exports/imports	alternative existing route: Curtici, Timisoara, Craiova, Bucharest, Constanta	- no stops; - max. 100 km/h only on Fetesti-Constanta sector.
	ST2-M-A	mixed trade, transit + Romanian expts./impts. with CE and maritime		-three stops: Arad, Brasov, Bucharest; - max.100 km/h only on Fetesti-Constanta sector
	ST2-M-A-FS	mixed trade, transit + Romanian expts./impts. with CE and maritime		- three stops: Arad, Brasov, Bucharest; - max.100 km/h only on Fetesti-Constanta sector; - fixed rail service Bucharest-Constanta.

4. Conclusions on assessment of advantages for shippers using logistic service on corridor

The main advantages of the rail intermodal transport on Romanian territory on short term (actual situation) are assessed by comparison of the every scenario versus road transport between the same pair origin/destination points (Curtici and Constanta) on Romanian territory, in terms of the total duration, energy consumption, and total cost per TEU. The road route is the shortest route. The results of the assessments are concentrated in Table 3, below.

Table 3. **Advantages of the rail intermodal train by comparison with road transport for similar pair origin/destination on Romanian territory** (Source: authors)

Compared Scenario	Code	Trade scope	time saving per TEU	energy saving per TEU	cost saving per TEU
ST1 (2012 current situation) versus Shortest Road Route	ST1-T-corridor	direct transit to Black Sea for maritime exports/imports	00:06	5003 (46%)	243 (27%)
	ST1-M-corridor	mixed trade, transit + Romanian expts./impts. with CE and maritime	-02:39	3675 (34%)	56 (6%)
	ST1-M-corridor-FS	mixed trade, transit + Romanian expts./impts. with CE and maritime+ fixed rail service	-02:39	4428(41%)	135(15%)
ST2 (2012 current situation) versus Shortest Road Route	ST2-T-A	direct transit to Black Sea for maritime exports/imports	02:04	5289 (49%)	292 (32%)
	ST2-M-A	mixed trade, transit + Romanian expts./impts. with CE and maritime	-00:56	5051 (47%)	204 (22%)
	ST2-M-A-FS	mixed trade, transit + Romanian expts./impts. with CE and maritime	-00:56	5804 (54%)	286 (31%)

The most important saving for energy and cost is consequent from the alternative route via Timisoara - Craiova - Bucharest, with fixed service from Bucharest to Constanta, considering also mixed traffic (domestic and international and three stops for logistic operations).

However, all three stops introduce delays of about one hour each. The delay (comparing with Shorter Road Route) is smaller than the delay in case of corridor route with fixed service, too. The explanation comes from the actual situation on corridor and the speed restriction for the infrastructure works on several sectors. The important saving is for energy consumption because the alternative route via Timisoara- Craiova is a shorter rail route. In any case, there another alternative rail routes to be compared

with route on rail corridor IV.

As a conclusion, the rail services on actual situation of rail are still better than the road route, considering the energy consumption and cost.

In case that the only time of entire routes is important for users, then the transit service (without any logistic operation in station), similar to a shuttle service is an option. The total time for corridor route (via Brasov) in case of direct transit from Curtici (Arad) cross-border to Constanta is almost 22 hours, and about 20 hours for alternative route via Timisoara - Craiova.

In case of intermodal train, with three stops the total time via corridor (Brasov) is about 24 hours and one half, and for alternative route (via Timisoara-Craiova) is about 23 hours. The shortest road route takes 22 hours, which is similar with a direct transit route.

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