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Process of Capacity Allocation on Public Sidings

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Abstract

The gradual liberalization of the Czech rail market did not leave unaffected sidings and railway infrastructure managers operating railway transport as their main business activity at the same time. This paper presents the main changes in capacity allocation on public sidings in accordance with the amendment to the Act on Rail Systems. It outlines the specific procedures in capacity allocation on public sidings, the specific modes of request processing and the economic side of capacity allocation. The purpose of capacity allocation is to allow for an efficient use of services offered to all authorized entities. The requests are generally submitted through PROK SW. Furthermore, this paper touches on the initial experience of the Faculty of Transport Engineering of the University of Pardubice, as a capacity allocator on public sidings and rails owned by České dráhy, a.s., with statistical evaluation.

Keywords: liberalization, public siding, service facility, allocator.

1. Definition of allocator, public sidings and service facilities

Public sidings are defined by the Act on Rail Systems as rails (lines) on which transport can be operated by more than one railway undertaking and the main purpose of which is the connection of a service facility to national and regional rail systems by Directive no. 319/2016 (2016). Public sidings are in most cases sidings (rails) on the premises of former depots of České dráhy, a.s. rolling stock allowing for access to one or more service facilities. Rails on premises used in mining, processing and energy industries are not considered as public sidings.

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Furthermore, the provisions of §32 of the Act on Rail Systems, as amended, set out that railway capacity is allocated on national and regional rail systems and on public sidings. The allocator allocating the capacity is the railway infrastructure manager. In the national rail system, capacity is allocated by the Railway Infrastructure Administration (SŽDC, s.o.). To ensure a sufficiently non-discriminatory access to railway infrastructure in accordance with the European directives by Document 32012L0034 (2019) and (3), the provisions of §32 of the Act stipulate that where the railway infrastructure manager operates railway transport as their main business activity at the same time, the manager is to find a person to perform the activities defined under §32 by Document 32016L2370 (2019) on their behalf. The activities listed there include the adoption of rules for the calculation of the price for the use of railway and the price of capacity allocation, and activities related to the actual capacity allocation. Another section containing the term "allocator" is §33 stating that the "allocator should provide a rail network statement…". As such, it is not entirely clear how to meet the provisions of the two sections mentioned above. §32 defines functions to be outsourced by the railway infrastructure manager, whereas §33 contains other obligations of the allocator. A possible solution is for the rail to have two allocators. One of them would be carrying out the specific functions as defined in §32, and the other one (the railway infrastructure manager) would carry out other functions provided for in §33. The period in which these rules first became applicable was the current timetable 2018/2019, for which the respective rail network statement had been issued the year before (Ricci et al., 2017).

Capacity allocation thus became applicable on the first day of the period of validity of rail network statement 2019. In 2018, there were interim rules in place under the management of the Faculty of Transport Engineering of the University of Pardubice; these rules were a connecting bridge between the periods before and after the introduction of capacity allocation. Game-changing was certainly the rail network statement 2018/2019 issued by the University of Pardubice and the Czech Railways by Declaration (2017) and containing the main principles of railway capacity allocation. Most important here is the information on submitting an application, and also Annex No. 4 containing the calculation of the price for the processing of requests for railway capacity allocation and of the price for the use of railway. The implementation of this amendment made the situation more complex for railway undertakings as the payment for the request for railway capacity allocation is made to the allocator (the Faculty of Transport Engineering), the payment for the use of railway is provided to the railway infrastructure manager, and the payment for the service provided at the service facility is made to an independent branch of the railway infrastructure manager in accordance with §23f. Yet another confusing aspect for railway undertakings is the fact that the request for capacity allocation according to the rail network statement by Declaration (2017) is only binding for public sidings. As for non-public sidings, it is only necessary to provide for a non-discriminatory access, and not for capacity allocation. As a result, many railway infrastructure managers operate sidings which are not public, not having to secure an allocator and provide a rail network statement. They are nevertheless still obliged to offer their services at the service facility on a non-discriminatory basis. The major Czech railway infrastructure manager, i.e. the Railway Infrastructure Administration (SŽDC), operates six public sidings listed under section 3.2 of the Rail Network Statement for SŽDC Public Sidings 2019 by Railway Infrastructure Administration (Lizbetin et al. 2018).

An amendment to the Act on Rail Systems is currently before the Czech Chamber of Deputies with the ambition to modify the obligations of allocators among other things. According to this amendment, the most important new functions of allocators would include collecting railway infrastructure fees to reflect the requirements of applicable legislation by Document 32012L0034 (2019). At the same time, there is a big discussion over the actual definition of public sidings and of the access to service facilities on these sidings as defined by the Act on Rail Systems by Directive no. 319/2016 (2016) and the superior Commission Regulation (EU) 2017/2177 by Document 32017R2177 (2017).

2. Definition of allocator, public sidings and service facilities

Section 1 defined the functions of an allocator as assumed by the Faculty of Transport Engineering of the University of Pardubice on behalf of the Czech Railways under the contract. In addition to processing and issuing a part of the rail network statement, these functions mainly include the actual process of capacity allocation and accounting for payments for this allocation. The initial ideas on the method of capacity allocation were significantly different from the current way of capacity allocation on public sidings. The original considerations on the technical implementation of capacity allocation on public sidings envisaged the creation of an interactive pdf form to be sent

to the allocator via e-mail. This idea was based on the presumption that the vast majority of journeys would be regular and accounted for in a timetable. For such journeys, one form would have been enough.

However, after consultation with employees of the railway infrastructure manager responsible for organizing the traffic on sidings, it turned out the reality was very different. Many railway undertakings access service facilities irregularly (ad hoc), and it would be consequently necessary to fill in and process a large number of forms. Another disadvantage of a pdf form would be the fact that the subsequent processing of data would be difficult and cumbersome. That's why this option was no longer considered, giving way to a more efficient solution: an application in which the individual railway undertakings fill in their capacity allocation requests. Originally, two options were considered for the technical implementation of the application – either a desktop application, or a web one. A desktop application installed on the users' computers would have a significant disadvantage lying in the fact that it had been planned from the very beginning to continuously add new functions to the application and it would be very difficult to provide for updates on all user computers. The distribution and installation of the application could be complicated as well due to the fact that some railway undertakings might have security policies in place on their user computers. As a result, the installation of the application could be significantly more complex and longer and its operation slower. That's why a web application turned out to be the most convenient option. In this solution, the application can be accessed through a web browser not only on a personal computer, but on a mobile phone or tablet as well. A new version of the application is released centrally on the web server, allowing all users to always work with the up-to-date version of the application. The disadvantage of a web application is the need to be connected to the Internet. The web application was subsequently implemented under the name "capacity allocation information system" (hereinafter also referred to as "IS PROK"). (Ľupták et al. 2018)

The development of the application didn't stop with its going live. Work is currently ongoing on functions which would allow the employees of the railway infrastructure manager to view statistical data on individual journeys.

3. Access to IS PROK

The provision of access is not determined by considerations on the user's relevance as anyone can request access to the application according to the non-discriminatory principle. This stage of access to the application can be seen as passive. Figure 1 shows a flowchart of the process of providing active access to IS PROK. This process starts with an applicant sending a request to the e-mail address "pridelce@upce.cz" asking for the provision of access to this application. To this end, a system of accounts of railway undertakings with allocated user accounts was developed. Going through the steps of the flowchart, a user gains active access to IS PROK.

Every applicant is responsible for the actions performed by users created upon his or her request. Every applicant can have any number of user accounts which can be either individual (e.g. for Jaroslav Cimrman – CimrmanJ) or shared (e.g. for the group of Pardubice railway foremen – strojPce). At the same time, different roles can be allocated to individual users. The role defines the rights of the specific user (to file requests to be taken into account when creating the annual working timetable, to file ad hoc requests, to view requests, to view requests of all users of the given applicant, etc.). This system is essential for large companies (Railway Infrastructure Administration (SŽDC, s.o.), Czech Railways Cargo (ČD Cargo, a.s.), Czech Railways (ČD, a.s.)) with multilevel organizational structure. (Ľupták et al. 2019)

The next step involves checking whether the applicant has a valid licence. Where this is not the case, the licence can be substituted by a proxy granted by another licence holder who allows the applicant to file a request using their licence. Such proxy can be limited in time and an applicant can also have proxies from several licence holders. That's why by Directive no. 319/2016 (2016) and by Declaration (2017) emphasize the distinction between the terms "railway undertaking" and "applicant" (Dižo et al., 2018).

A document in very close connection to the licence is the contract for the operation of railway transport (hereinafter also referred to as "CORT"). This document lists rail parts and sidings which can be entered and used by the railway undertaking. A licence holder can only access those sidings and rails in IS PROK which are covered by the respective CORT. Considering the constant significant changes, it is very important to keep this list up-to-date; it is often updated several times a month. However, this list based on the CORT is only activated upon signing the invoicing contract (Abramovic et al., 2017).

Failing to go through any step of the flowchart indeed leads to the termination of the process. Nevertheless when restarting the process, it is possible to start with the step previously terminated by a negative answer.

A special role in this system has the railway infrastructure manager, i.e. the Czech Railways. Their employees responsible for the organisation of traffic on sidings can access the part of IS PROK meant for the railway infrastructure manager. Here they can for instance view all approved capacity allocation requests for specific sidings for different days so that they can better organize and plan for all operations and activities performed on the siding.

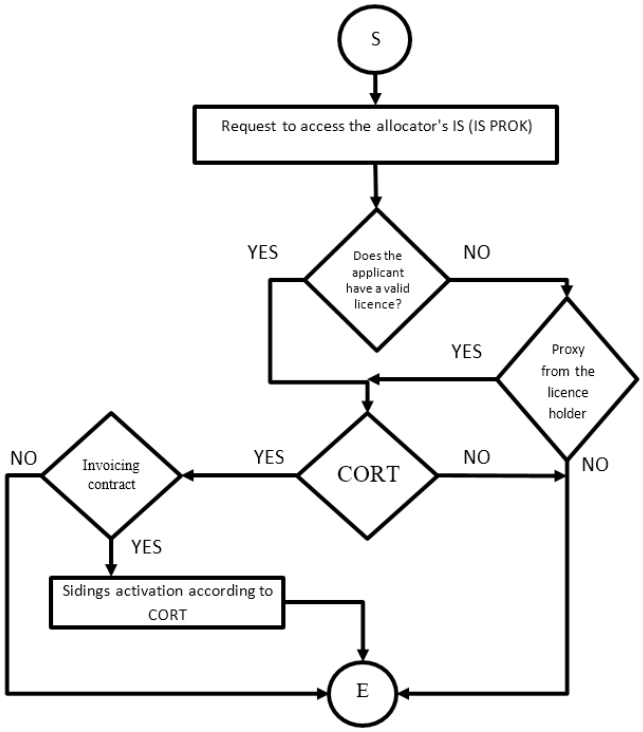

Fig. 1. Flowchart of the process of providing active access to IS PROK.

With the creation of public sidings, all applicants have now the chance to use the service facilities offered based on clearly defined and non-discriminatory conditions. The purpose of capacity allocation is to allow for effective use of the services offered to all authorized entities. The requests can only be filed through IS PROK. In accordance with the valid rail network statement by Declaration (2017), the following requests can be submitted (Stopka et al., 2017):

- regular request (the most cost-effective option) – submitted in due time or after the due date (late request),
- irregular request (ad hoc request) – submitted no later than 5 calendar days before the requested date of railway capacity allocation,
- urgent – submitted later than 5 calendar days, but no later than 24 hours before the requested date of railway use,
- super-urgent – submitted in case of an unpredictable event, which the applicant couldn't have foreseen even within the submission period for an urgent request.

It is likely that with the continuous development of IS PROK, the number of request types will be reduced.

4. Numbers of requirements filed through IS PROK

It can be seen from the Faculty of Transport Engineering database that between January and June 2019, requests were filed for a total of 314,774 operations on 60 sidings. This is equivalent to almost 30 operations per siding per

day. There are naturally large differences in the total numbers of operations. The busiest and least busy sidings and parts of the national rail system are provided for in Table 1.

Table 1. Number of operations on sidings and parts of the national rail system.

Siding (part of the national rail system)	Number of operations	Siding (part of the national rail system)	Number of operations
Praha Jih	24,609	Nýřany	406
Brno Horní Heršpice	13,211	Hodonín	397
Rakovník	12,213	Telč	354
Liberec	12,059	Stará Paka	247
Opava východ	8,415	Osoblaha	120

Considering the number of requests and days these requests were submitted for, the allocator registered a total of 309,017 requirements in the reference period. A breakdown of these requirements by request type is provided in Table 2. It is clear that most requirements are those to be taken into account when creating the train traffic diagram (hereinafter also referred to as "TTD"). However, it is obvious that this is the final number for the current annual timetable, whereas the number of requests of other types will further increase.

Table 2. Number of required operations by request type.

Type of request	Number of requirements	Percentage
Total	309,017	100.0%
TTD requests	302,281	97.8%
Ad hoc (ah)	5,208	1.7%
Urgent ah	817	0.3%
Super ah	622	0.2%

As for the shares of different railway undertakings, there were 19 railway undertakings submitting requests to the Faculty of Transport Engineering in the reference period. The most prominent railway undertaking is again the Czech Railways, having submitted more than 97% of all requests. Other important applicants include the Railway Infrastructure Administration (SŽDC), Czech Railways Cargo (ČD Cargo), GW Train Regio and Die Länderbahn, having filed a combined total of 2.3% of requests (see Table 3). The remaining 14 railway undertakings account for less than 1% of requests.

Table 3 Number of processed requests filed by important railway undertakings.

Railway undertakings	January	February	March	April	May	June
ČD Cargo, a.s.	581	606	715	653	692	619
České dráhy, a.s.	0	0	72	8	66	37
Die Länderbahn GmbH DLB,	59	57	74	75	73	64
GW Train Regio a.s.	70	72	86	104	111	30
SŽDC, s. o.	251	254	283	267	258	241
Others	22	27	31	33	34	22

The total number of sidings and parts of the national rail system is 60. On 13 sidings out of these, requests were only filed by the Czech Railways. On the contrary, the busiest sidings in terms of the number of railway undertakings include Brno Maloměřice and Olomouc with requests from 7 different railway undertakings. Filing an ad hoc capacity request, the applicant is to state the scope of services requested to be used at the service facility. Between January and June 2019, there was a total of 13,294 requests including 12,043 requests for services provided at service facilities. The most frequently requested services included diesel (53%), water (20%) and maintenance (21%). Another criterion examined was the week day for which the request was submitted. The distribution of requests is shown in Table 4.

Table 4 Number of requests by week days.

Week day	Total	TTD requests	Ad hoc	Urgent AH	Super AH
Monday	45,436	44,636	568	102	118
Tuesday	46,453	45,426	824	97	94
Wednesday	46,651	45,775	626	138	100
Thursday	47,559	46,593	724	132	98
Friday	48,923	47,861	717	211	122
Saturday	37,924	36,821	1003	56	32
Sunday	36,070	35,169	746	81	58

It can be seen that the number of requests filed for different working days is generally the same, ranging between 45,436 and 48,923. This corresponds to 14.7% to 15.8%. As for weekend days, the number of requests is lower by approximately 10,000, i.e. the requests for a weekend day account for about 11.9%.

The vast majority of requests is again the regular requests (indicated by the polyline and the left y-axis in Fig. 2). The number of ad hoc requests is the greatest for Saturday (meaning the day for which the request is filed, not on which day), with urgent requests being most frequently filed for Friday (indicated by the columns and the right y-axis in Fig. 2). Super-urgent ad hoc requests are mostly filed for working days. (Černá et al. 2018)

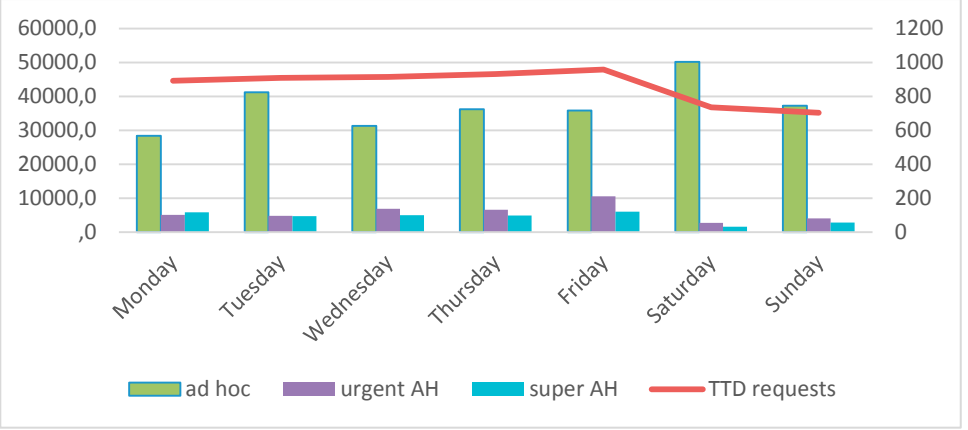

Fig. 2 Number of requests by week days.

5. Economic aspects of allocation

As has already been mentioned, the allocator can set the price for their activities covering the allocator's direct costs of railway capacity allocation by Price bulletin (2017). Together with the price set by the railway infrastructure manager for the use of railway through a train ride, or for sidings through a train ride or shunting a vehicle, and with the price set by the railway infrastructure manager for the railway access to service facilities, the price set by the allocator is included in the price for the use of railway infrastructure (Lizbetin and Bartuska 2018).

In accordance with §33 of the Act on Rail Systems, as amended, the price of railway capacity allocation and the rules of its calculation must be included in the rail network statement provided by the allocator based on the above mentioned Act. All parameters of the system of establishing the price of railway capacity allocation and the price for the use of railway through a train ride or vehicle shunting must be in accordance with the principles of material price regulation as set out in the applicable price assessment of the Ministry of Finance of the Czech Republic.

5.1. Basic prices and rules of calculation

In the rail network statement, the total price for the use of railway or service facility (C) includes the following four elements by Zitricky et al. (2017): the price of request processing (C1), the price for the use of the national rail system (C2), the price for a single use of a public siding for vehicle shunting in accordance with Annex No. 3 (C3), and the price for the use of a service facility (C4).

The price of request processing (C1) includes all actions and costs involved in the request processing, i.e. the costs incurred to the allocator.

The price of request processing is established depending on the following factors by Siroky et al. (2014):

- length of the time interval between filing a request for railway capacity allocation and the requested date of railway use,
- relationship between the request for railway capacity allocation and the date of creation of the annual timetable or its planned changes,
- number of trains or shunted vehicles in the request.

5.2. The possibility for the railway undertaking the reduce the unit costs of request processing

The rules mentioned in section 5.1 show that the earlier a request is filed and the more requirements it includes, the more cost effective it is in terms of unit costs. Such price structure should motivate railway undertakings to earlier and better planned requests for capacity allocation. For regular passenger transport it is relatively easy to plan many performances well ahead. These requirements are then included in one request and applied for the whole duration of the annual timetable and for the whole siding by Gasparik et al. (2017). On the contrary, it is very difficult for freight railway undertakings to plan the time and place of refilling. Even though the Faculty of Transport Engineering did record some regular requests to be taken into account when creating the annual working timetable even in freight transport, most request are filed in the ad hoc mode. There is room for optimization even here though. Close monitoring reveals some regularities even in freight transport (diesel refuelling on Tuesdays and Thursdays, etc.). Through thoughtful planning, it is possible to reduce the costs incurred to the applicant by reducing the number of urgent ad hoc requests and increasing the number of ad hoc requests. This would not only allow for a more balanced distribution of capacity and use of service facilities, but also for cost savings for the railway undertakings. Figure 3 shows the shares of different types of ad hoc requests between October 2018 and June 2019. Out of the total number of 6,647 requests, there were 5,208 ad hoc requests, 817 urgent requests and 622 super-urgent requests. As mentioned above, there is room for saving even in ad hoc requests.

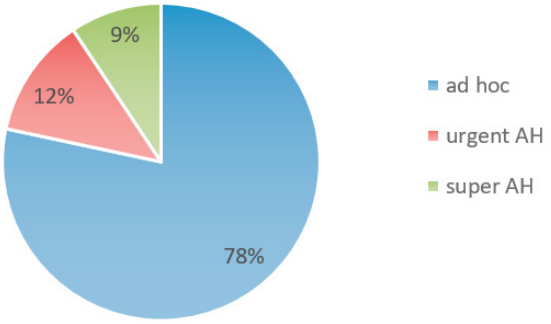

Fig. 3 Distribution of different types of ad hoc requests.

A model example of the possible saving could be the situation of an applicant on three public sidings – Česká Třebová, Hradec Králové and Pardubice. Table 5 shows the number of requests submitted by the applicant between October 2018 and March 2019 including the distribution of different request types and the percentage of different types of requests for every public siding.

Table 5 Numbers and shares of requests by type.

Siding	**Ad hoc**		**Urgent ad hoc**		**Super-urgent ad hoc**		**Total**	
	Number	%	Number	%	Number	%	Number	%
Česká Třebová	14	58	4	17	6	25	24	100
Hradec Králové	10	19	39	72	5	9	54	100
Pardubice	13	31	27	64	2	5	42	100

As can be seen from Table 6, there are significant differences between the shares of the individual request types. Taking into account the total costs and unit costs of one request, Table 7 shows the differences between the individual sidings.

Table 6 Price [CZK] per request by type.

Siding	Ad hoc	Urgent ad hoc	Super-urgent ad hoc	Total	Price of 1 request
Česká Třebová	5,250	2,000	3,000	10,250	427
Hradec Králové	3,750	19,500	2,500	25,750	476
Pardubice	4,875	13,500	1,000	19,375	461

If the applicant managed to eliminate urgent ad hoc requests and transform those to ad hoc requests within the five-day limit, the saving would be as provided for in Table 7 below.

Table 7 Price [CZK] of requests after transformation and the corresponding saving.

Siding	Total price of requests in CZK	Saving in CZK
Česká Třebová	9,750	500
Hradec Králové	20,875	4,875
Pardubice	16,000	3,375

However, the model example is only hypothetical as it is not possible in the constantly changing traffic situation to always stick to the five-day time limit for submitting an ad hoc request, with urgent and super-urgent ad hoc requests helping the railway undertakings better react to such changing situation.

6. Conclusion

The function of an allocator was only introduced to the Czech rail market recently and railway undertakings only had a relatively short time to acquaint themselves with the new, liberalized rules of access to service facilities through public sidings. One of the allocators is also the Faculty of Transport Engineering of the University of Pardubice, allocating capacity on public sidings and rails owned by the Czech Railways. During the approximately 18 months of the system's operation, the Faculty has developed a functional system which is being continuously enhanced and adapted to the needs of applicants. At this point, the authors would like to thank the Railway Infrastructure Administration (SŽDC, s.o.) for technical consultancy during the preparation of the rail network statement, and to railway undertakings, namely to Czech Railways Cargo (ČD Cargo, a.s.), Railway Infrastructure Administration (SŽDC, s.o.) and Czech Railways (ČD), for feedback during the development of IS PROK.

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