Intellectual Property Office

BL O/597/15

18 December 2015

PATENTS ACT 1977

APPLICANT	Hitachi Ltd.
ISSUE	Whether applications GB1306420.9 and GB1314852.3 Comply with Section 1(2) of the Patents Act 1977
HEARING OFFICER	Stephen Brown

DECISION

Introduction

1 The examiner in both these cases has reported that the claimed inventions do not comply with Section 1(2) of the Act as they are considered to be excluded as computer programmes as such. Hitachi Ltd. have for their part asked for one hearing to cover both applications and I am grateful for their offer.

2 Hitachi Ltd was represented at the hearing on 8th October by Mr Stephen Gill of Mewburn Ellis. He was assisted by Mr Kentaro Asai from Hitachi. For my part I was assisted by Mr Nigel Hanley. Also attending the hearing were the Examiner, Ms Amanda Mason, and an observer, Mr Max Emery.

Application GB 1314852.3

3 This application was filed on 20th August 2013 and claimed priority from an earlier Japanese application. It was published as GB 2507163 and following two rounds of amendment the applicants were offered a hearing on 17th August 2015.

4 The application concerns a system and method for obtaining an estimated future timetable based on a planned timetable and a current timetable. The system then produces an allowable delay timetable for trains arriving at a terminal station and uses this information to produce a delay proposal. To produce the proposal the system uses the estimated future timetables of various trains and considers possible changes to platform numbers and the departure order of trains in order to reduce the number of trains exceeding a maximum delay for an arrival time at a terminal station. The most recent set of claims were filed on 30th April 2015. There are two independent claims, claim 1 & claim 3. They have substantially the same scope and are listed in appendix 1 at the end of this decision.

Application GB 1306420.9

5 This application was originally published as WO 2012/049929 and entered the national phase on 9th April 2013 where it was republished as GB 2497706. Following one round of amendment the applicants were offered a hearing on 15th June 2015

6 This application is about simulating train operations on a section of line based on an operation plan and current track records to produce a corrected prediction time for exiting the section of line. The corrected exiting prediction can then be combined with predictions from other line sections.

7 The most recent set of claims were filed on 9th April 2013. There are two independent claims, claim 1 & claim 6. They have very similar, though not identical, scopes and are listed in appendix 2 at the end of this decision.

The law and its interpretation

8 Section 1(2) of the Patents Act 1977 states (emphasis added):

> *1(2) It is hereby declared that the following (amongst other things) are not inventions for the purpose of the Act, that is to say, anything which consists of –*
>
> *(a) a discovery, scientific theory or mathematical method;*
>
> *(b) a literary, dramatic, musical or artistic work or any other aesthetic creation whatsoever;*
>
> *(c) a scheme, rule, or* method for *performing a mental act, playing a game or doing business, or* ***a program for a computer****;*
>
> *(d) the presentation of information;*
>
> *but the foregoing provisions shall prevent anything from being treated as an invention for the purposes of the Act only to the extent that a patent or application for a patent relates to that thing as such.*

9 As explained in the notice published by the UK Intellectual Property Office on 8th December 2008[1], the accepted starting point for determining whether an invention falls within the exclusions of section 1(2) is the judgment of the Court of Appeal in *Aerotel/Macrossan*[2].

10 The interpretation of section 1(2) has also been considered by the Court of Appeal in *Symbian*[3]. This case arose under the computer program exclusion, but as with its previous decision in *Aerotel/Macrossan*[2], the Court gave general guidance on section 1(2). Although the Court approached the question of excluded matter primarily on the basis of whether there was a technical contribution, it nevertheless

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[1] http://www.ipo.gov.uk/pro-types/pro-patent/p-law/p-pn/p-pn-computer.htm
[2] Aerotel Ltd v Telco Holdings Ltd and Macrossan's Application [2006] EWCA Civ 1371; [2007] RPC 7
[3] Symbian Ltd v Comptroller-General of Patents, [2009] RPC 1

(at paragraph 59) considered its conclusion in the light of the *Aerotel/Macrossan*[2] approach. The Court was quite clear (paragraphs 8-15) that the structured four-step approach to the question in *Aerotel/Macrossan*[2] was never intended to be a new departure in domestic law. That it remained bound by its previous decisions, particularly *Merrill Lynch*[4] which rested on whether the contribution was technical and that any differences in the two approaches should affect neither the principles nor the outcome in any particular case.

11 Subject to the clarification provided by *Symbian*[3], it is therefore appropriate to proceed on the basis of the four-step approach explained at paragraphs 40-48 of *Aerotel/Macrossan*[2] namely:

> *(1) Properly construe the claim.*
>
> *(2) Identify the actual contribution (although at the application stage this might have to be the alleged contribution).*
>
> *(3) Ask whether it falls solely within the excluded matter.*
>
> *(4) If the third step has not covered it, check whether the actual or alleged contribution is actually technical.*

Application of the *Aerotel* test and consideration of the *AT&T* signposts

Properly construe the claims

12 I do not think that this step poses any problems. It is clear from both applications that their inventions involve computer software running on standard hardware. Page 7, lines 20 to 24, of GB 1314852.3 and page 10, lines 15 to 21, of GB 1306420.9 make this clear. However, the fact that the inventions are effected as computer programmes does not of course mean that they are excluded as the thing as such. What matters is whether or not the inventions provide a technical contribution beyond that of 'mere programmes'.

Identify the actual contributions

13 At the hearing Mr Gill was content to agree with the Examiner's assessment of the contribution of each application, as laid out in her earlier examination reports. Specifically:

GB 1314852.3

"a computer program which determines an optimal change to a set of railway timetables for multiple trains whilst they are en-route by considering one or more potential changes to a train departure order and platform, estimating a future timetable for each train resulting from each potential change, determining whether or not each estimated timetable is one according to which the train will arrive at a

[4] Merrill Lynch's Appn. [1989] RPC 561

terminal station within an allowable delay, and then proposing implementation of the change which results in the lowest number of trains exceeding the allowable delay"

GB 1306420.9

"a computer program which revises a set of railway timetables for multiple trains whilst they are en-route by predicting future running of each train separately for two line sections on respective sides of a station and correcting the predicted "downstream" timetable according to a correlation between a time a train will leave the upstream line section and a time a train will enter the downstream line section"

14 I too agree with these formulations of the contributions.

Ask whether the contributions fall solely within excluded matter

15 Mr Gill argued that the contributions did not fall solely within excluded matter drawing my attention to the "signposts" identified by Lewison J in *AT&T/CVON*[5]. These signposts were endorsed by the Court of Appeal in *HTC v Apple*[6] and since then read as follows:

> *i) whether the claimed technical effect has a technical effect on a process which is carried on outside the computer;*
>
> *ii) whether the claimed technical effect operates at the level of the architecture of the computer; that is to say whether the effect is produced irrespective of the data being processed or the applications being run;*
>
> *iii) whether the claimed technical effect results in the computer being made to operate in a new way;*
>
> *iv) whether the program make the computer a better computer in the sense of running more efficiently and effectively as a computer;*
>
> *v) whether the perceived problem is overcome by the claimed invention as opposed to merely being circumvented.*

16 Specifically, Mr Gill argued that both contributions related to the production of better timetables for running railways. These timetables, he argued, were methods of controlling a technical system that was external to the computer and that as a consequence both contributions clearly passed the first AT&T signpost.

17 In support of his view Mr Gill made a number of observations on how you could define the term "timetable" especially in the context of a railway network. Railway networks are, in his view, complex physical systems that operate according to a

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[5] AT&T Knowledge Ventures/Cvon Innovations v Comptroller General of Patents [2009] EWHC 343 (Pat)

[6] HTC v Apple [2013] EWCA Civ 451

number of constraints. These constraints include the physical capabilities of the trains and ensuring that no two trains run on the same piece of track at the same time. These constraints must be built into the timetable which makes it more than just an issue of logistics. A timetable is, to use Mr Gill's own words: “an engineering timing control system”. He thus argued that the act of revising or updating a railway timetable is a complex and inherently technical problem.

18 To reinforce this view Mr. Gill drew a parallel with the control of a robotic plant. He argued that a claim to the control of such a plant would not be considered excluded as it involved the synchronisation and optimisation of multiple technical processes. Given that the generation of an improved railway timetable involved a similar degree of technical considerations, Mr Gill felt that the contributions of the two current applications were likewise patentable.

19 I’m afraid that I do not construe the term 'timetable' in quite the same way as Mr Gill. To my mind the skilled person, and indeed the unskilled person alike, would understand a timetable to be no more than a guide to the expectation of when trains should arrive at, or leave from, a station. I note that this is not just a modern interpretation - it is one that is routed in history going back almost to the start of the railways themselves in the early 1800s. For example, Michael Portillo has made several successful television series based on the well known Bradshaw’s Guides[7] which provided “timetable information for the Victorian traveller”.

20 On a technical level, I have no doubt that the generation of modern timetables has become a far more complex task especially given the improvements in technology from those first railways. I also acknowledge that the contributions of the current inventions concern the updating and optimisation of timetables while trains are en route - something inconceivable in Victorian times. Nonetheless, it is my view that what they ultimately add to human knowledge is no more than the generation of better timetables. The key issue in this case is thus: can these timetables be considered to be “engineering timing control systems”, as Mr Gill suggests, or are they just a guide to the expectation of when trains will arrive at, or depart from, a station?

21 As explained in paragraph 20, above, history is on the side of the latter interpretation. Additionally, I can see little in the current applications that supports the former construction. If, as Mr Gill suggests, these timetables are akin to “an engineering control system” I would expect there to be a fairly detailed disclosure of how the improved timetables are used to control the speed of trains, the power supplied to them, to switch the points on the track, or other similar control techniques, such that the railway is directly controlled *by* the timetable. I can find no such disclosures in either application.

22 I am therefore unconvinced that Mr Gill's "engineering timing control system" construction of the term 'timetable' is the correct one. I thus conclude that what the contributions add to human knowledge is no more than the generation of a better set of expectations of when trains can arrive at, or depart from, stations. As such, I can see no technical effect on a process which is carried on outside the computer and

[7] http://bradshawsguides.com/history.html

conclude that the contributions are no more than programmes for a computer as such.

23 While both applications make it clear that human operators may use these timetables to assist them in improving the operation of a railway I do not consider this a direct enough causal link to form a technical effect outside the computer. To conclude otherwise would be to consider any advice about a technical system displayed by a computer to a human operator to constitute a non-excluded technical effect. In my view this would drive the proverbial 'coach and horses' through the computer program exclusion and so cannot be correct.

24 During the hearing, Mr Gill also directed me to a number of other hearing decisions made by this Office. Whilst I am not bound by these decisions they are of course persuasive.

25 One particular decision he raised was that of *TMG International*[8]. This is of interest since it too concerned the production of a timetable for a rail network. In this instance the hearing officer found that the application was excluded as a mental act and as a computer program. Mr Gill argued that following the decision in *Halliburton*[9] this application, and by extension the current applications, should not be excluded as a mental act as it involved a computer. Here I agree with Mr Gill. The law is settled in this area - I am bound to follow the so-called narrow interpretation of the mental act exclusion.

26 However, I believe that if TMG[8] were heard today it would still be excluded as a computer program as such. In paragraph 20 of his decision the hearing officer, John Rowlatt, states:

> *However, in that other case there is a direct causal link between the claimed method and the driving of the train; specific driving advice is generated and delivered to the driver for action and is performed continuously to adjust for operational disturbances. In the current case there is no such link. A schedule is created, nothing more, by which a set of trains may be moved, but the schedule merely informs how trains should or could be moved. The step introduced into the main claim that a set of trains is moved on the basis of the schedule has no direct relationship with the movement itself.*

27 It is my understanding that Mr Gill would have me consider that the timetables generated by the current applications are intrinsically linked to moving the trains. I do not agree with Mr Gill on this point and I share my colleague's view that there is a fundamental disconnect between a timetable and the movement of trains that may be moved according to that timetable.

28 Mr Gill then drew my attention to the decision in *JDA Software*[10]. This application concerned a method of determining a transportation plan for delivery of goods and retrieval of associated salvage equipment through a transportation network. In particular Mr Gill made the point that there was no argument on the first AT&T[5]

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[8] BL O/208/06
[9] Halliburton Energy Services Inc. v Comptroller General of Patents [2011] EWHC 2058 (Pat).
[10] BL O/386/12

signpost but that argument centred on the fourth signpost. Whilst this is undoubtedly true I do not see how this helps the applicants' position. The case was dismissed as a computer program and the hearing officer specifically found that an improvement in the production of the transportation plan was just that and did not result in an improved or more efficient computer. It was also accepted in this hearing that producing a transportation plan was not in any way a method of controlling a transportation network.

29 Mr Gill also raised *Innovation Science Pty Limited*[11]*.* This application concerns determining whether an object can be at predetermined locations within a predetermined time period in a transportation network. Using a computer in this instance led to a saving in the man hours required to carry out the investigative work and the query response time. Mr Gill's view is that this case is about the process and not about the context of the claimed invention. However, I do not see how this helps the applicants as it shows once again that determining some form of schedule in a transportation system is still excluded.

30 *Logined*[12] is a decision concerning the generation of a drilling plan for an oil or gas field to optimise production according to certain constraints. In this decision, Mr Gill directed me to the end of paragraph 22, where the hearing officer, A. Bartlett, states:

> *I also agree that HHJ Birss QC seems to be saying that if none of the other exclusions applies it is unlikely that a program representing something external to the computer will be excluded as a computer program as such.*

31 However, I note that he then went on to add that:

> *The passage though clearly does not rule out that possibility altogether and what I must do is decide whether it applies here given the particular facts of the present case.*

32 In the end the hearing officer in *Logined*[12] concluded that the application was excluded as a program for a computer as such. At the end of paragraph 27 he states that:

> *I do not consider the computer program at the heart of the present invention to represent something "specific and external to the computer". It represents a method of generating a plan, which in my view is neither sufficiently specific nor external to the computer.*

33 To my mind, this is once again similar to the current two contributions which both use computer programmes to generate plans. The fact that the plans are intended for use in a technical field is not enough to render the contributions non-excluded.

34 Finally, Mr Gill referred me to the decision in Boeing[13]. This concerns the interrogation of a component database to identify rogue aircraft components needing replacement. In particular, Mr Gill referred me to paragraph 31 of the decision where the hearing officer, J. Pullen, states that:

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[11] BL O/315/12
[12] BL O/408/12
[13] BL O/312/15

The contribution, as identified above, does not lie in the analysis of data and the subsequent identification of potentially faulty parts, but in the application of these techniques to aircraft maintenance procedures. The aircraft system is not part of the computer - the maintenance of the aircraft system is a process which is carried out outside the computer and the identification of potentially faulty parts has an effect on that process. This has a number of effects, as listed in paragraph 35 of the application, as filed. Among these are extending the life of the aircraft and improving the safety of the aircraft which are technical effects. As such, the identified contribution is technical and is not a computer program as such.

35 It was Mr Gill's view that if aircraft maintenance is a technical field then so is running a railway. I do not disagree with this point but note that in this decision the hearing officer concluded that the contribution lay in the *application* of data analysis to the field of aircraft maintenance. In contrast, in the current applications I have concluded that the contributions lie in the production of better timetables. Furthermore, as explained above, I am of the view that there is no direct controlling link between said timetables and the actual movement of trains. I thus do not consider the conclusion reached in Boeing[13] to be directly comparable to my decisions in the current cases.

36 For completeness I will now briefly consider the four remaining *AT&T*[5] signposts. In terms of the second signpost the contributions rely entirely on the processing of timetable data - there is nothing happening at the level of computer architecture. Taking the third and fourth signposts together, there is no suggestion that the contributions involve a new computer or that it operates more efficiently or effectively as a computer. As to the fifth signpost, I do not see how, in this instance, it helps decide the matter in either direction. Firstly, because I am unsure precisely what problems the applications are intended to overcome. Neither am I sure that the production of improved timetables overcomes the problems associated with delays in a railway. I am sure, however, that the fifth signpost does not alter my conclusion that both contributions are excluded as no more that programmes for a computer as such.

Check whether the contributions are actually technical in nature

37 I have effectively answered step 4 in my analysis of step 3 above. Having given consideration to the meaning of the term 'timetable' and reviewed the cases Mr Gill has relied upon, I have been unable to identify any relevant technical effects provided by the contributions defined above. The invention does not provide an allowable technical contribution and thus cannot be said to be technical in nature.

Auxiliary claims for GB 1314852.3

38 The applicants submitted a set of auxiliary claims for GB 1314852.3 that they wished me to consider should I refuse the application as currently worded. These claims comprise two new independent claims - these are listed in appendix 3 at the end of this decision. The key difference between the auxiliary claims and the current claims

can be summarised as: implementing the new timetable by instructing trains to move accordingly.

39 I would make two points. Firstly, in paragraph 23, above, I have already accepted that it is implicit in the contribution that the new timetable may be used to instruct trains to move accordingly. Making this feature explicit does not alter my overall assessment of patentability. Secondly, I have addressed this point in my discussion of the decision in TMG[8] in paragraph 27. I remain of the view that there is a fundamental disconnect between a timetable and the movement of trains that may be moved according to that timetable. The latter may well be technical but I have concluded that the former is the output of a program for a computer as such. Accordingly, I find that the auxiliary claims do not alter my view that the contribution of GB 1314852.3 is excluded.

Decision

40 I have found that the contributions made by the inventions in GB1314852.3 and GB1306420.9 both fall solely in subject matter excluded under section 1(2) as programmes for a computer as such. I have considered both specifications carefully and can see nothing which could reasonably be expected to form the basis of valid claims. I therefore refuse both applications under section 18(3).

Appeal

41 Any appeal must be lodged within 28 days.

Dr. Stephen Brown
Deputy Director, acting for the Comptroller

Appendix 1

GB 1314852.3 Claims as amended on 30th April 2015

Claim 1

A re-planning job assistance apparatus, comprising:

a constraint programming execution unit, which is configured to produce, when executed, a solution to a problem described in constraint programming;

a train operation estimation unit, which is configured to obtain an estimation timetable for each of plural trains as a result of estimation of train operation on the basis of a respective planned timetable, a respective current timetable obtained by changing said planned timetable, and a respective result timetable recording a result of operation of the train, the estimation timetable estimating train operation in the future;

an allowable delay consideration unit, which is configured to obtain an allowable delay timetable according to which a given train is scheduled to arrive at a terminal station with an allowable maximum delay, the allowable delay timetable being obtained in the basis of said respective planned timetable and said respective current timetable; and

an allowable delay proposal unit, which is configured to propose re-planning in respect of the number of trains arriving at the terminal station within a predetermined delay time, by applying said train operation estimation unit and said allowable delay consideration unit

wherein said allowable delay proposal unit further comprises:

for said estimation timetables,

a unit, which is configured to change platform number specified for the trains by the timetables for each of the plural stations, from a starting station up to a node station, being a station as which an order of overtaking trains is conducted;

a unit, which is configured to change the departure order of the trains, for each station, from said starting station up to said node station; and further

a unit which is configured to determine if a number is reduced or not of an allowable maximum delay exceeding train(s0, being a train(s) delayed by a time equal to or larger than an allowable maximum delay time “L” for an arrival time at the terminal station.

Claim 3

A re-planning job assistance method, implemented by a processing apparatus, having a CPU, a memory and a terminal, the apparatus being suitable for conducting collection of information of stations and an operation condition of trains, and an instruction of an operation, through a network, the method comprising the following steps of

A dispatcher producing current timetables by manually changing respective planned timetables;

Producing an estimation timetable for each of plural trains by changing the respective planned timetable so that it satisfies a restriction equation, the estimation timetable estimating train operations in the future;

Producing an allowable delay timetable, according to which a given train is scheduled to arrive at a terminal station with an allowable maximum delay, by changing said respective planned timetable so that it satisfies a restriction equation;

Producing an allowable delay proposal by changing platform numbers specified for the trains by the timetables within a station yard and/or departure order of the trains; and

Said dispatcher inputting said proposal through operation of said terminal;

Wherein said step of producing said allowable delay proposal comprises the following steps of:

For the estimation timetables;

Changing the platform numbers specified for the trains by the timetables for each of plural station from a starting station up to a node station, being a station at which an order of overtaking of the trains is conducted;

Changing the departure order of the trains, for each station, from said starting station up to said node station; and

Determining if a number is reduced or not of an allowable maximum delay exceeding train(s), being a train(s) delayed by a time equal to or larger than an allowable maximum delay time “L” for an arrival time at the terminal station.

Appendix 2

GB 1306420.9 Claims as filed on 9th April 2013

Claim 1

An operation control assistance system comprising a database which has a schedule data table which stores an operation plan; a central processing unit having a data update unit which updates said operation plan, a track record schedule update unit which updates track record times of said operation plan, and a prediction calculation unit which performs simulations of train operations based on said operation plan and said track record times; and a station device which obtains train travelling track records from different stations, said operation control assistance system performing train operation predictions over a plurality of line sections;

Wherein said central processing unit includes a correction data generation unit which generates correlation data between line section entering time of trains across a line section boundary station and a predicted time correction unit which corrects results of prediction calculation for said line section boundary station, and wherein said database includes a correction data tale which stores the correlation data generated by said correction data generation unit, and operation predictions regarding a plurality of line sections are complimented with one another.

Claim 6

A control method for an operation control assistance system having a central processing unit including a data update unit which updates an operation plan, a track record schedule update unit which updates track record times of said operation plan, a prediction calculation unit which performs simulations of train operations based on said operation plan and said track record times, a correction data generation unit which generates correlation data between a different line section entering time and a different line section exiting time of trains across a line section boundary station between line sections, and a predicted time correction unit which corrects results of prediction calculations for said line section boundary station; a database having a schedule data table which stores said operation plan and a correction data table which stores the correlation data table generated by said correction data generation unit; and a station device which obtains train travelling track records from different stations;

Wherein, when the existing train is included in those registered records in said correction data tale which are targeted for prediction calculations, the predicted time of said exiting train as the boundary station is corrected by adding to the predicted time of said existing train at said boundary station the value obtained by subtracting a time allowance register in the record of an existing train form a delay time calculated as the difference between the predicted entering time registered in the second of the exiting train in said correction data table on the one hand and the predicted entering time obtained through prediction calculations on the other hand.

Appendix 3

Auxiliary Claims for GB 1314852.3

Claim 1

A re-planning job assistance apparatus, comprising:

a constraint programming execution unit, which is configured to produce, when executed, a solution to a problem described in constraint programming;

a train operation estimation unit, which is configured to obtain an estimation timetable for each of plural trains as a result of estimation of train operation on the basis of a respective planned timetable, a respective current timetable obtained by changing said planned timetable, and a respective result timetable recording a result of operation of the train, the estimation timetable estimating train operation in the future;

an allowable delay consideration unit, which is configured to obtain an allowable delay timetable according to which a given train is scheduled to arrive at a terminal station with an allowable maximum delay, the allowable delay timetable being obtained in the basis of said respective planned timetable and said respective current timetable; and

an allowable delay proposal unit, which is configured to propose re-planning in respect of the number of trains arriving at the terminal station within a predetermined delay time, by applying said train operation estimation unit and said allowable delay consideration unit ***to produce an allowable delay proposal;***

wherein ***said apparatus changes the planned timetable on the basis of the allowable delay proposal, said apparatus further comprises a network interface which executes the planned timetables by instructing operation of the trains on a network, and*** allowable delay proposal unit further comprises:

for said estimation timetables,

a unit, which is configured to change platform number specified for the trains by the timetables for each of the plural stations, from a starting station up to a node station, being a station as which an order of overtaking trains is conducted;

a unit, which is configured to change the departure order of the trains, for each station, from said starting station up to said node station; and further

a unit which is configured to determine if a number is reduced or not of an allowable maximum delay exceeding train(s0, being a train(s)

delayed by a time equal to or larger than an allowable maximum delay time “L” for an arrival time at the terminal station.

Claim 3

A re-planning job assistance method, implemented by a processing apparatus, having a CPU, a memory and a terminal, the apparatus being suitable for conducting collection of information of stations and an operation condition of trains, and an instruction of an operation, through a network, the method comprising the following steps of

A dispatcher producing current timetables by manually changing respective planned timetables;

Producing an estimation timetable for each of plural trains by changing the respective planned timetable so that it satisfies a restriction equation, the estimation timetable estimating train operations in the future;

Producing an allowable delay timetable, according to which a given train is scheduled to arrive at a terminal station with an allowable maximum delay, by changing said respective planned timetable so that it satisfies a restriction equation;

Producing an allowable delay proposal by changing platform numbers specified for the trains by the timetables within a station yard and/or departure order of the trains; ~~***and***~~

Said dispatcher inputting said proposal through operation of said terminal ***to change the planned time tables***; ***and executing the changed planned timetables by instructing operation of the trains on the network;***

Wherein said step of producing said allowable delay proposal comprises the following steps of:

For the estimation timetables;

Changing the platform numbers specified for the trains by the timetables for each of plural station from a starting station up to a node station, being a station at which an order of overtaking of the trains is conducted;

Changing the departure order of the trains, for each station, from said starting station up to said node station; and

Determining if a number is reduced or not of an allowable maximum delay exceeding train(s), being a train(s) delayed by a time equal to or larger than an allowable maximum delay time “L” for an arrival time at the terminal station.