

MARK WILLEMS discusses the role planning and scheduling can play in helping rail operators cope with changing market realities

Plan for change

Proper planning and scheduling of rail operations is no easy task. And it is far from a static field. As a result of major shifts in the passenger and freight rail environment over the past few decades, many train operating companies (TOCs), freight operating companies (FOCs) and network operators are finding that the planning and scheduling methods that worked a few years ago are no longer adequately serving their needs.

The way rail companies have traditionally handled planning varies by company type and region. Most state-owned rail companies, which are still the largest company in many countries, have been using legacy planning systems that were developed in-house. Smaller companies, many of which are in the UK and other places where TOCs tend to be regionally focused, have traditionally handled planning manually using spreadsheet-like systems and other generic programs.

Virtually across the board, legacy systems and manual methods are slowly being replaced by new systems that introduce greater automation and increased flexibility. Companies that have not upgraded yet, or are

not yet looking into it, will almost certainly have to do so soon. To understand which capabilities are most needed (and which are less critical), and how new planning methods can change the rail business, it is worth considering the change factors.

Change begets change

Throughout Europe, ongoing privatisation and EU deregulation of public transport are leading to a separation of passenger and freight operations. The need for a new approach to planning and scheduling is most clear for freight operating companies, because the legacy systems in use at the large European operators were geared primarily to scheduling passenger train operations, which follow regular weekly schedules. This does not work well for rail freight service operators, who must contend with fluctuating demand both in the long term, affected by the economic climate, and in the short term, due to daily variations in the demand for transport.

Increased rail competition means that quality of service and cost effectiveness must play a more important role. Competition is already a major factor in the UK, and other

European markets will soon follow. Greater competition means that more rail operators are sharing the same network and, because a change in the schedule of one operator may necessitate changes on the part of other operators, TOCs and FOCs now require highly agile planning and operations. Also, passenger rail operators must comply with service level agreements (SLAs) set by national governments.

Another issue driving both freight and passenger rail operators to rethink their planning procedures is an increasingly demanding workforce. Traditionally rail company employees have been very faithful to the company. However, in recent years, younger workers have not been attracted to work in rail transportation. Attracting new employees and catering to an older workforce that tends to include a higher percentage of part-time workers, requires more flexible and personalised planning.

Train and freight operating companies are not alone in facing fast-changing planning challenges. The increased number of rail operators sharing a single network creates substantial complexity for network

management companies. Their ability to communicate plans and, in particular, real-time changes, is crucial.

Plan to address the new realities

As previously outlined, in today's environment and looking ahead, rail operators' service levels must be consistently high; ensuring employee satisfaction is becoming more complex; and flexible operations and optimised resource utilisation are all essential. The main variables in scheduling, i.e. crew, rolling stock and tracks, are each subject to many types of constraints. Drivers' route knowledge, shift preferences and training certifications together determine where and when they can work. Union rules and government regulations can vary greatly between different regions and countries, and because even a small railway operator may employ workers from different regions or use multiple countries' networks, the varying labour and safety rules must all be taken into account. Locomotives use different technologies; tracks can be electrified or not and their safety requirements and maintenance schedules must all be considered. Finally, repositioning the rolling stock most efficiently, enabling the crew to return to their home depot in time, and creating a robust schedule that limits the effect of delays and other disruptions together create an algorithmically complex puzzle.

The legacy planning systems and manual methods that have been in use for years are severely limited in their ability to address these types of challenges because constructing plans is typically laborious. In the case of an error or change, the planner has to return to the plan and manually correct it – a time-consuming process that does not allow for investigation of many alternatives or searching for improvements to the plan. Additionally, crew planning and rolling stock planning have traditionally been handled separately. A change in one area means the planners for the other have to make adjustments. But without an automated real-time information flow, the process is slow, resulting in late decisions and hence expensive solutions. Additionally, processes can easily result in corrupt data due to errors in manually copying and transferring data from one system to another.

Planning technologies that have become available in recent years enable rail operators to overcome many of the most pressing challenges. There are now advanced planning and scheduling (APS) systems that can take

into account the vast variety of constraints and variables, and that enable planners to investigate different scenarios and immediately see the effect of any particular change. Combining all rolling stock and crew planning into a single, integrated plan can greatly facilitate decision-making across the board, and enable a balanced plan, which is essential to cost-effective operations. With the ability to investigate scenarios in real-time and propagate changes across all operations, rail operators can significantly reduce their empty repositioning rate, and potentially enjoy huge savings.

Enabling the creation of high-quality plans that ensure validity of all constraints can allow changes to the process that further increase operational flexibility. For example, until recently, DB Schenker Rail in Benelux, had to comply with a union requirement that plans must be published in full detail 13 weeks in advance in order to allow the great number of rules to be verified. This limits the flexibility to make changes as any changes also need to be communicated. After DB Schenker Rail began using an advanced planning and scheduling solution from the author's company, it was able to create much higher quality plans, increasing the trust that all the rules were being properly followed. The train operator negotiated a new agreement with the union that required them to communicate only the start and end times of each shift, enabling them to create plans only two weeks in advance, instead of 13, and to provide crew members with details only 15 minutes in advance.

Focus on planning... and on the planner

Even though crew and rolling stock planning are intimately connected with other management fields, such as HR, salary computation, order processing and ERP, planning itself is complex enough that it requires a dedicated system. Instead of burdening the planning system with additional functionality, or adding planning capabilities into an existing management system, it is better to use a planning solution that is fully integrated with the other systems.

In evaluating the new technologies and solutions available, rail operators need to look for a system that can take into account all the rules and factors affecting their operations. They need to be able to check whether a plan is valid, to investigate scenarios and get immediate confirmation of the effect of a

proposed change, according to detailed rules, with nothing left out. This requires a certain amount of automation, but full automation should not be the goal in and of itself. Just as the promise of the 'paperless office' was an inspiration, but we all still need paper, so talk of 'totally automated planning' needs to be tempered by the reality that planners need to be able to investigate, decide, control and change plans. Certain decisions, such as to violate certain rules, cannot be automated and require human input. Automation makes it all easier, faster and more effective.

One way of getting the planning capabilities needed for today's rail operations is to build a custom system. This can result in a perfect-fit solution, but the development time and cost can be prohibitive and maintenance and upgrades will continue to burden company resources for years to come. Another option is to use a commercial system based on a standard architecture with a purpose-built layer around it. This enables a perfect fit with the rail company's particular planning requirements, while still enabling relatively short and cost effective development. It also ensures that updates will be available, and affordable, well into the future.

In summary

Rail companies can expect to gain several benefits from introducing advanced planning. These include: a more efficient process due to increased trust with their workforce and unions; cost savings achieved through less empty repositioning; and higher productivity due to better resource utilisation. ■



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