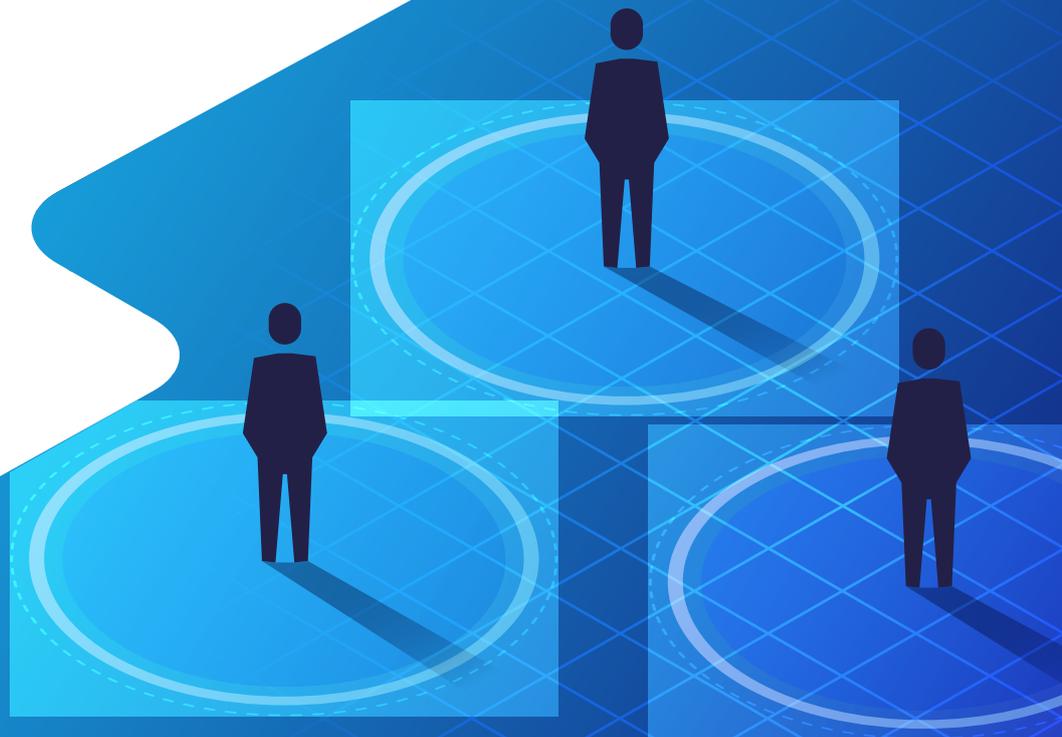


Scenarios Are King:

Scheduling & Planning For The Social Distancing Era



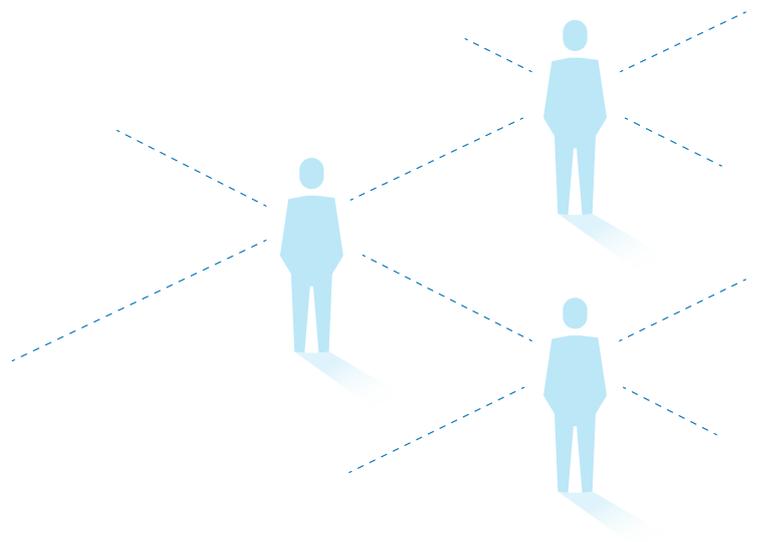
Introduction

In the past several months, public transportation is facing a staggering amount of uncertainty. First, services were cut and ridership dropped. Then restrictions were eased and service changed some more. Funding, ridership and additional factors turned what was once a stable operation into a service that changes all the time. In this new world, agencies and operators must come to terms with a new reality: **the reality of multiple scenarios.**

In the world before Coronavirus, there were several constant truths: ridership was all-important, the metric that proved that the transportation service was worthy of the public's trust. Funding was more or less constant. Another truth was that service and the resulting crew and vehicle schedules seldom changed. The absence of large changes is also due to the fact that planning and scheduling public transportation is notoriously difficult and requires a lot of work, expertise and technology as well as regulatory and/or public approval.

All this has changed. The sudden realization that service has to be reduced during the early lockdown phases has been replaced by the understanding that service is bound to change yet again, forcing the industry to come to terms with a new reality: there are going to be many service scenarios that need planning and scheduling, and this is going to impact how the industry uses technology and understands its operational results.

This ebook will discuss several aspects of the need to change planning and scheduling often and the impact they have on current industry practices.





Making service reductions

What happened

When the Coronavirus hit, we heard a similar message from agencies all over the world. They needed to prepare for driver shortages. We were asked to help model service in case of two scenarios - 10% or 25% driver absenteeism, as a result of quarantines or infection. Early on, this was the initial concern in the industry - protecting bus drivers and dealing with the ramifications of crew shortages. Even before the virus, the issue of driver shortages was a core focus of many scheduling exercises, looking to reduce duties and roster rows. Yet, as lockdown approached and the need to reduce service became evident, the driver shortage concern became secondary.

Indeed, after the industry began disinfections, fare elimination and rear-door boarding, the main concern was how to cut service. Many agencies moved to some form of weekend service. Others cut service span, frequency and coverage, based on either ridership data or estimates as to the demand for their services when lockdown is in effect. At this point, making service changes solely based on driver shortages wasn't the core need.

Scheduling implications:

1. Driver shortages

In general, driver shortages are best dealt with by applying a global constraint that requires the planning and scheduling platform to create an optimal schedule given the number of available drivers. However, when a radical service change is made, it may be better to first decide which services be cut (using weekend service or other cuts) and then deal with the driver absenteeism issue.

2. Cutting span, frequency and coverage

Agencies and operators made service cuts across service span, frequency and coverage. The scheduling lesson here was that changing service metrics was easiest to do in systems where there was a seamless integration of the ability to visualize routes on a map, tie them into timetables that can be changed quickly and then sync with the crew and vehicle scheduling. Without this synchronization the ability to quickly generate scenarios and understand their scheduling implications was lost.

3. Quickly modelling new preferences for driver safety

Disinfection and the need to prevent cross-contamination among drivers soon created changes in break preferences, changeovers and turnarounds. First, one needed to quickly understand the implications of making breaks longer for disinfection. Afterwards, more rules were changed, limiting changeovers so drivers don't cross-infect and minimizing changeovers. Some operators even grouped drivers in different groups to limit possible contamination.

4. Rosters

As mentioned above, many agencies took Saturday or Sunday schedules and formed weekly rosters of them. Using optimized rostering in this case can deliver on many fronts. It fairly allocates work amongst drivers as well as deals with the need to reduce roster counts to protect drivers or deal with absenteeism.

Yet, the absence of optimization technology made this much harder. Although going for a weekend service was the easiest way to reduce service, both from the point of view of communicating with the public as well as scheduling ease, the lack of rostering modules made this difficult. That's why the virus has driven a discussion of whether cafeteria style rostering should be abandoned for roster optimization.

5. Collaboration and remote work

Last but not least, with the necessity of having as many people as possible work from home, the importance of cloud-native systems became evident. The use of an on-premise scheduling platform was difficult, and the ability of several schedulers to collaborate and train remotely on such systems became crucial.



Growing service again

What happened

As lockdown ended, service is beginning to return to normal. Yet, this isn't as simple as it sounds, and may require dealing with even more scenarios, as funding, ridership and, most importantly, crowding requirements change. Specifically, requirements such as crowding prevention are a game-changer with regards to many historical scheduling and planning practices.

Scheduling implications:

1. Controlling crowding

It's no news to say that social distancing will have a profound effect on public transportation. From a scheduling perspective, this raises new challenges that require even more scenarios.

It's easy to miss one important fact with regards to social distancing: it has a huge effect on buses, or, to be more precise, on how many buses are needed to run the service.

Typically, transit agencies estimate overall ridership (patronage) on routes (looking at demand, using surveys etc), the times when this ridership occurs, and the types of ridership (school related trips, seniors, people commuting to work, leisure-related commutes etc). They then make assumptions about the timing of peak use of public transit and off-peak use. But all this data is probably irrelevant post lockdown — schools are mostly closed and unemployment is, unfortunately, high. Additionally, when and how ridership will go back to normal is anyone's guess.

Clearly, social distancing — or rather, the policy decision of whether to enforce social distancing on public transit — is a huge factor. The question is whether it is feasible at all.

In the case of buses, there are two ways of dealing with social distancing. One approach is to have buses stop boarding passengers once the “magic number” has been reached – 15, 20 or 25 passengers. How to do this is up in the air, with regards to enforcement, service, buffer buses and more. The other approach is to increase frequency and hope buses don’t crowd. The problem is that when ridership resumes, we may need double the amount of buses or risk providing a degraded service where people wait for the bus only to see it pass without stopping, with 20 passengers inside.

Scheduling and planning socially distant bus service will be complex. Instead of the classic bus timetables and operational schedules, made from layers upon layers of historical decisions, agencies may need to plan service anew on a weekly basis, to deal with different peak times, fluctuating ridership and social distancing requirements.

2. Scheduling considerations for growing service again

Crowding as well as other changes will require more frequent changes to bus schedules. The following are several considerations and practices, where each works on its own, but which best work in unison:

- **When thinking of crowding, think of corridor planning**

Many corridor planning approaches work well when taking crowding into account. Use a system that will let you visualize multiple routes as well as inbound and outbound routes, all at the same time. You can even add demographic data layers for impact analysis. This makes it easier to use corridor planning to coordinate transfer points where routes intersect, and plan for route consolidation or interlining. In this way you can control crowding based on shared stops between multiple routes.

Corridor planning shows the longest shared corridor for the routes in the route group and marks shared stops. It makes it easy to ensure even headways in a given corridor at given times to facilitate frequent service and avoid bus bunching.

You can use this functionality to increase headways or decrease headways which will support reducing the amount of passengers on the bus and at bus stops to apply the required social distancing.

- **Pay attention to running times**

One of the big changes that comes with lockdown and then easing is that congestion changes radically. As a result, running times that were used for planning and scheduling may no longer become relevant. We recommend integrating AVL data with the planning and scheduling platform to be able to look at short term data and make the corresponding changes. Another approach is to consider a headway based system.

- **Use ridership data to make decisions**

Using detailed ridership data can help identify the new peaks in demand (which may be different compared to pre-Corona times). This can result in the addition of trips to facilitate social distancing. Using a vehicle view within the timetable, even before the scheduling phase, can help tell whether additional vehicles are required and play with the frequency to have the peak vehicle requirement match what is feasible.

- **Use preferences to deal with driver safety**

Use break preferences to add disinfection time to breaks, more time for driver changeovers so drivers don't cross-contaminate. Use driver group definitions to separate different driver groups, prevent them from taking breaks in crowded spaces and more. Most importantly, you can ensure drivers work on both the inbound and outbound for routes, in order to minimize changeovers.

- **Be creative when setting preferences**

As is pretty evident in this ebook, proper responses to the current challenges require checking multiple scenarios. One of the classic applications of this is checking multiple variations on crew scheduling preferences. In a real life scenario, we've seen agencies that needed to provide more trips with less drivers. The answer isn't that this is impossible, but rather that common preferences need to be changed. In this case, the preference for 7-8 hour shifts that controlled overtime needed to be overridden, to provide more trips with less drivers.



Conclusion

While the immense flux the transportation industry is in may seem overwhelming, the new demands of flexibility and scheduling ingenuity are also an opportunity to modernize and revisit many decades old practices. From moving to cloud-native systems to support remote work and collaboration to frequent changes that deliver better work for drivers as well as take ridership and crowding into account, this crisis may have the industry emerge with better operational practices, for the benefit of all.

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About Optibus: Optibus is a cutting-edge software platform that brings much-needed innovation to the essential mobility mode at the heart of our cities: public transportation. Optibus leverages a robust combination of artificial intelligence, advanced optimization algorithms and distributed cloud computing to make public transportation smarter, better and more efficient – and ultimately nourish freedom of movement and sustainable cities. A cloud-native SaaS company founded in 2014, Optibus powers complex transit operations in over 300 cities around the world, planning and scheduling the movement of vehicles and drivers to improve the quality and reliability of transit service and make operations more efficient. Optibus is headquartered in Tel Aviv and has offices in New York, San Francisco, London and Dusseldorf. (www.optibus.com | info@optibus.com)