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VEHICULAR TRAFFIC IN THE ACCESS INTO PORT OF VALPARAÍSO

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EXTENDED ABSTRACT

The main concern of Valparaiso's port authorities was to evaluate the traffic impact in the harbor entrance with the incorporation of a new terminal operator when the second terminal of the harbor becomes available. The current layout has only one entrance, with a bifurcation towards the second terminal. The gates for the current terminal can sometimes overflow, causing a long queue of trucks which block the access to the second terminal. All trucks start their trip into the harbor from an "External Parking Zone" (ZEAL), where trucks make inspections and paperwork. Because of geographic restrictions, the road goes through tunnels and bridges that go directly into the gate entrance. Simulated behavior of the system was included in presentations to new companies interested in doing business in Terminal 2. The best scenario guarantees that the current operations are not going to alter the flow of trucks in the new terminal.

The authorities wanted to know how the flow of trucks was going to change when the second terminal of the harbor became active. The current layout of the harbor has only one entrance in the south area, which trucks must use, trough a bidirectional road, with a bifurcation towards the second terminal. The entrance gates for the current Terminal 1 can sometimes overflow, causing a long queue of trucks which can block the access towards Terminal 2.

The system activities can be summarized as all the trucks start their trip to the harbor from the "External Parking Zone", ZEAL, where the trucks are inspected and also the paperwork is done. Because of geographic restrictions, the road goes through tunnels and bridges that go directly into the gate entrance.

Because of the existence of one terminal, it is operated by just one company, and it is not critical to study the sporadic congestion in the road, because it has to be solved by the company itself that is managing that terminal.

The problem arises when a new terminal operator was interested in applying for the exploitation of the second terminal, but the trucks for this second terminal have to go through the same access and continue to the entrance of Terminal 2. Port authorities must demonstrate that this access is not going to be blocked, so the trucks for Terminal 2 will always have free access .

Alternative scenarios included construction of new access and building demolitions to evaluate layouts of new road systems.

Trucks start coming into the system five days before the arrival of the vessels. Some of them go directly to the harbor, and others should go into ZEAL, do the inspections, paperwork and wait until they are called from the harbor and authorized to leave. This highway is connected with the harbor, it contains three tunnels and only specific areas that allow passing.

When trucks arrive, all of them go through the Canopy, and then go to the gate system. Inside the terminal, the load and unload activities are done, and the trucks leave the terminal zone, going back into the road in direction to ZEAL. Some of the trucks, the Import type, must go into ZEAL again, do customs declarations and inspections, and then leave the system, passing though the exit gates. Other trucks, mainly the Export type, leave the system directly from the terminal.

The approach to study this system was the construction of a simulation model, considering a migration from an older simulation model into Simio environment. The ship arrivals were modeled as entities with arrivals occurring at specific times, according with the arrival calendar. Each vessel will need different types of trucks, depending on their load type, so from each ship entity, new objects are created to represent

different types of loads, hence different types of trucks. These new objects have their own properties and states that characterize the nature of the freight.

The trucks are created dynamically, depending on the demand generated by each incoming vessel. These trucks will also have their own sequence of activities depending if they will attend imports, exports or domestic shipments. All the trucks will travel through public routes, sharing with local traffic usage. Once the trucks complete their loading or unloading activities, they leave the system.

What is evaluated is the Blocking Time of the exit to Terminal 2. The Case Base is the current situation, and the scenarios represent future situations considering both terminals operating with the same activity level. The entrance into Terminal 1 can hold up to four trucks in queue, the fifth truck blocks the exit to Terminal 2. The performance indicator was established by the time that there is a fifth truck in queue.

The experiment design deals with the analysis among scenarios, considering the following parameters:

1. Amount of trucks in the system.
2. Proportion of Vessels in Terminal 1/Vessels in Terminal 2.
3. Speed of Trucks.
4. Amount of Gates in entrance into Terminal 1.
5. Time for attending in entrance into Terminal 1.

The first comparison was to evaluate how the traveling speed of trucks going into the harbor affect the blocking time. For this reason, under the same amount of trucks in the system it was simulated the scenario with controlled velocity. Then, the analysis continued, with unregulated velocity, but increasing the amount of trucks going evenly into Terminal 1 and Terminal 2. When reached the maximum capacity of the system, it was considered an additional gate in the entrance into Terminal 1. Finally, a new scenario was defined considering a faster attention in the entrance into Terminal 1.

The conclusions are :

1. Blocking time of the access to Terminal 2 is dependent on the rate of attendance in the access to Terminal 1, and on the amount of trucks arriving into the port. Scenario 1 considers 5 min in the entrance and Scenario 1-Altered (Scenario 8), considers a reduction of this time of 2 min. The Blocking time reduces significantly. See Figure 5.
2. Using a controlled rate entrance into Terminal 1, there is a capacity of attendance that will not affect the blocking time. Exceeding this level, the blocking time increases exponentially. It is compared Scenarios 1, 3, 4, 5, 6, with 1900 trucks per day and 5 min in the entrance gates. With more than 2700 trucks per day, the blocking time increases significantly. See Figure 6.
3. When the speed of the trucks is controlled to maintain it constant during the trip to the harbor (Scenario 2), there is a lower variability in the arrival of the trucks into Terminal 1, then a shorter queue.
4. It is also found that with an additional gate in the entrance (Scenario 7), the blocking time of the access towards Terminal 2 is reduced, but not significantly.
5. In addition to these scenarios, it was also evaluated the scenarios considering an increment of the trucks going into Terminal 2, but maintaining the amount of trucks going into Terminal 1. The Blocking Time increases proportionally.

Finally, it is strongly recommended the implementation of some automated system in Gates and Canopy for controlling the entrance into Terminal 1.

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