With the continuous extension of security measures within the passenger security checkpoint, throughput and passenger experience are becoming increasingly important to airports. The implementation of additional security measures will always have influence on other (sub-)processes of passenger screening. To determine this influence, insight in performance of the entire security checkpoint is key. With this insight, airports can take improving measures when the desired passenger throughput is not met, and monitor the effectiveness of these measures instantly. Also, differences in performance of security lanes can be compared easily. This can be useful when testing new security equipment or concepts of operations.

To get a complete insight in security checkpoint performance is quite a challenge, though. Nowadays, lots of screening devices (e.g. x-ray machine, security scanner, walk-through metal detector) can provide relevant data in terms of passenger and/or baggage throughput. Even queuing time can be measured accurately. However, there is still a missing link between queuing and the actual security process. When the passenger throughput is measured at the security scanner or walk-through metal detector (WTMD), the time passengers use to divest their belongings on the x-ray conveyor (divest time) determines the maximum achievable passenger throughput (when the maximum passenger check capacity is not met). For this reason, divest time, together with passenger throughput, provide key information on the checkpoint’s performance.

**Measuring Divest Time**

To provide insight into (near real-time) checkpoint performance, data needs to be available throughout the day, at regular intervals. This also applies to divest time. Because a long divest time of only a few passengers can cause a significant disturbance of the passenger flow through the checkpoint, it is desired to measure divest time of all passengers.

The measurement of divest times comes with several challenges. First of all, a system that can measure divest times needs to be able to operate in a crowded area, with often limited ceiling height. Systems that
are currently used at airports to measure waiting times and/or process times use technologies that can track a signal (i.e. Bluetooth® or Wi-Fi) of a mobile device. These technologies are not able to measure all passengers. Also, cameras installed at ceilings (facing down) can be used to track persons. These technologies can cover a limited area when deployed at the divest area of a security checkpoint due to limited ceiling height.

Next, a system that can measure divest times needs to be able to handle multiple divest procedures. With sequential divesting, passengers can fill trays and place baggage on the x-ray conveyor while walking in line towards the x-ray. In this situation, the start and end position of the divesting area are variable and could be different for each passenger. When parallel divesting is used (situation where passenger have an allocated space for divesting their belongings), the passenger flow will be disrupted at the divest area because passengers can overtake each other.

Finally, and probably the toughest challenge; a measurement system needs to be able to adapt to the passenger’s behavior. All passengers move through the divest area in different ways. Passengers can walk back to the divest area for secondary divesting or can use multiple divest positions (with parallel divesting). Also, passengers can ignore the prescribed divest procedure. All these challenges summarize the requirements for the development of a new system for divest time measurements. When a system is able to provide reliable information on passenger divest times, lots of new insights can be provided on checkpoint performance.

Using Divest Time for Checkpoint Performance Monitoring
For a complete overview of the performance of a checkpoint, performance data on each sub-process needs to be available. With information on passenger divest times, the chain on passenger flow throughout the entire screening process can be closed. When facing a limited passenger throughput at the security scanner or WTMD, it is essential to find the underlying root cause(s) before implementing improving measures. When the root cause of limited passenger throughput cannot be found in PAX check capacity or obstruction at recheck (both evincible with a combination of x-ray and security scanner/WTMD data), the root cause will be found in the supply of passengers at the security scanner/WTMD. A limited supply of passengers at the security scanner/WTMD can be caused by two factors:

1. **Divest Time**
2. **Occupancy Divest Position(s)**

1. **Divest Time**
   When the divest positions are supplied properly (i.e. high occupancy rate), the divest time per passenger determines the maximum achievable passenger throughput at the security scanner/WTMD (when maximum passenger check capacity is not met). Example: When the average divest time per passenger equals 30 seconds, and a parallel divest setup is used with three divest locations, the maximum achievable throughput equals 3 locations * (1/0.5 minutes) = 6 passengers per minute.

2. **Occupancy Divest Position(s)**
   When the divest positions are not supplied properly, the low occupancy causes a limited passenger throughput at the security scanner/WTMD. This low occupancy can be the result of an inefficient allocation of security lane and/or divest position. Also, a low demand of passengers can cause a low occupancy at the divest area.

As described above, multiple factors can influence important indicators for checkpoint performance, like passenger throughput. Passenger throughput itself will have influence on other (sub)-processes, like reclaim and recheck. When a system for measuring divest times can be deployed at the
reclaim area, reclaim time per passenger can also provide essential information on passenger flow at the security checkpoint.

Conclusion
For checkpoint performance monitoring, information on each sub-process is required to provide a complete overview on passenger flow and throughput. Also, this information needs to be available when a root cause analysis will be performed. With the measurement of passenger divest (and reclaim) times, key information on passenger flow at the security filter becomes available. This information also provides detailed insight in potential causes of limited passenger throughput. Finally, information on divest time is the missing link between passenger queuing and the actual security process.

Passenger Terminal Expo 2017
We, Point FWD, a highly specialized AVSEC consultancy firm based at Amsterdam Airport Schiphol, are developing the measurement solution together with our technology partners. This system will be able to measure dwell time in configurable zones (divest and/or reclaim areas), measure occupancy rate during an adjustable time interval and report information near real time.
Please visit us at the Passenger Terminal EXPO 2017 (14-16 March 2017, RAI Amsterdam, Netherlands, Stand 8080) to see how we can help to provide insight in your security checkpoint operations and improve checkpoint performance.