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Airport Landside Security Screening Modelling

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[dstl]

ASC

ANALYSIS SUPPORT CONSTRUCT

BAE SYSTEMS

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MOTIVATION

Airport security remains a high priority and attack targets include concourses and other public spaces, in line with the general threat to crowded spaces

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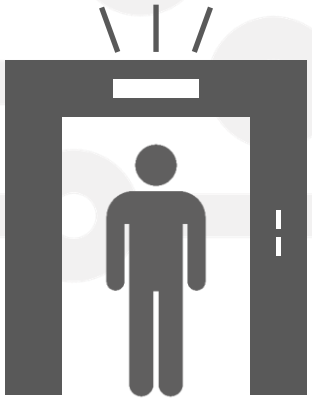
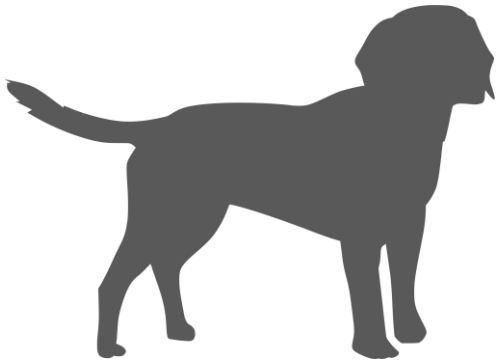
Requirement

- Develop understanding and evaluate potential security screening systems in landside area of airport terminal
- Screening systems include

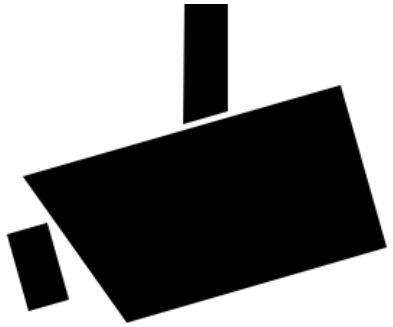


Fixed location sensors

Handheld sensors



Moving sensors



Stand-off sensors

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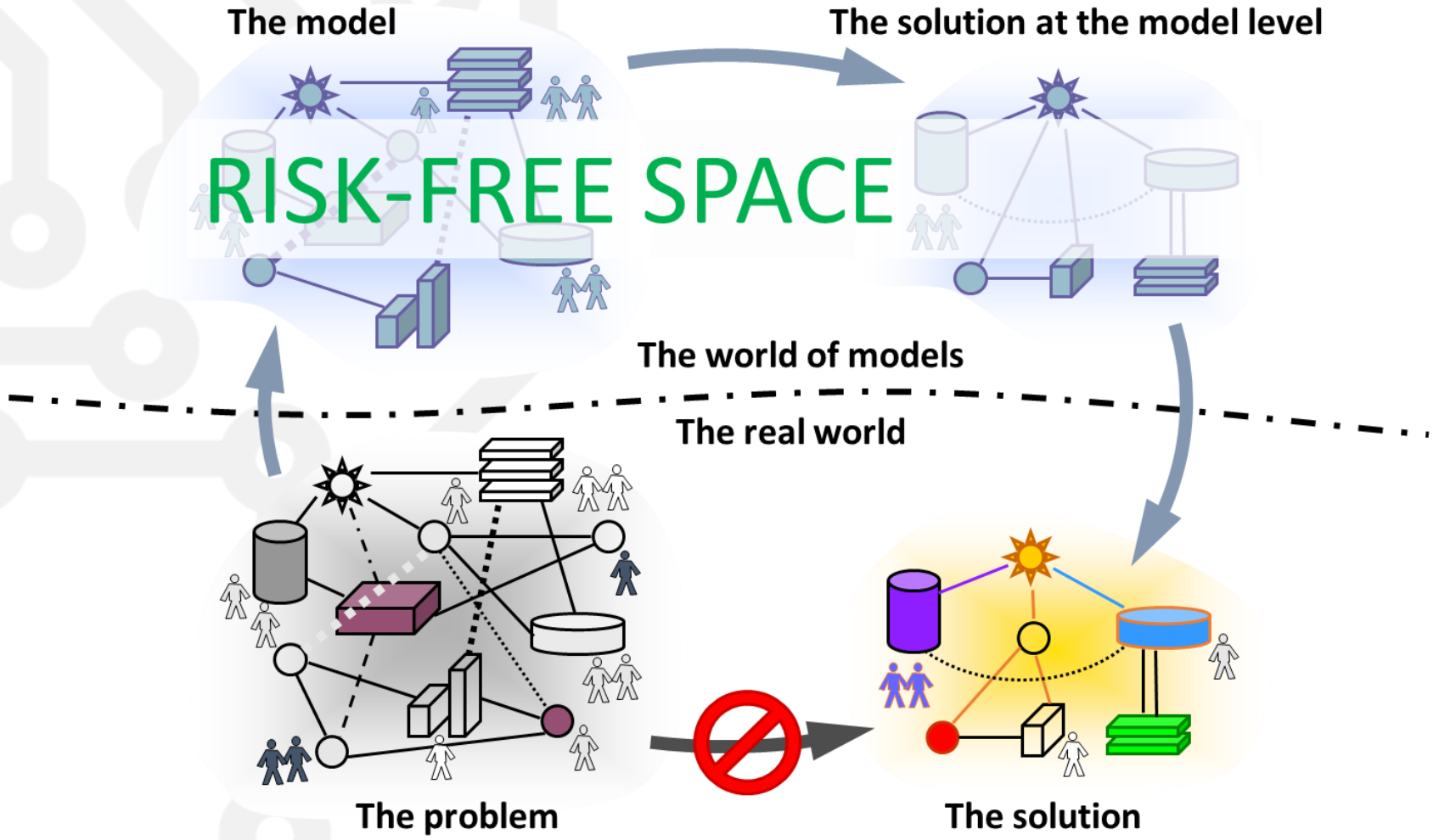
Aims of This Work

- Demonstrate that modelling can support the requirements



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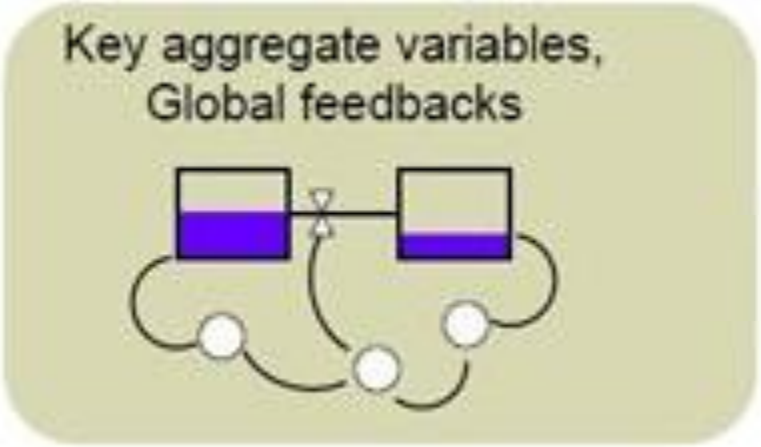
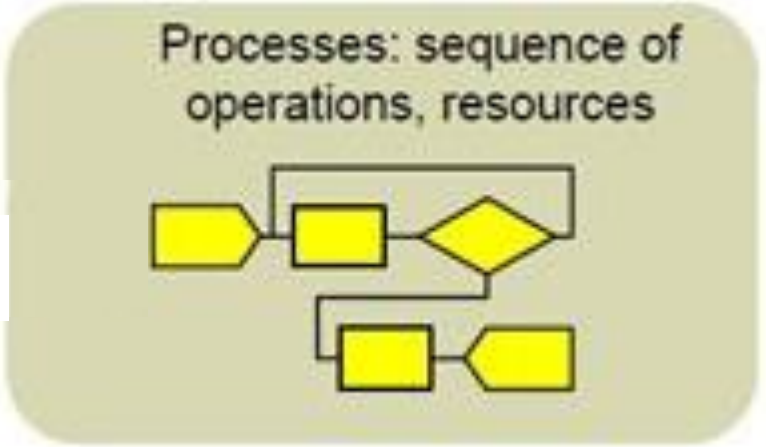
Aims of This Work

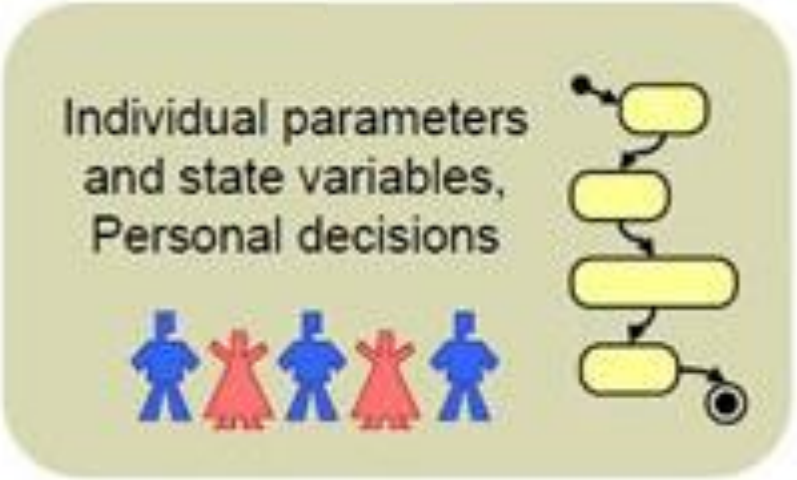
- Demonstrate that modelling can support the requirements
- Demonstrate that modern modelling methods overcome limitations of traditional methods, as they handle interacting entities, e.g. people, sensors, and the complexity these interactions produce



System Dynamics



Discrete Event Simulation



Agent Based Modelling

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Landside Screening Model

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Scenario

Example terminal

Heathrow Terminal 5 Departures

Arrival modes

Private car | Taxi | Bus | Train | Tube

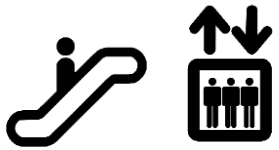
Typical day

~26,800 travellers pass through Departures

Traveller arrival modelled to match

Outgoing flights

Arrival modes



Routes into terminal

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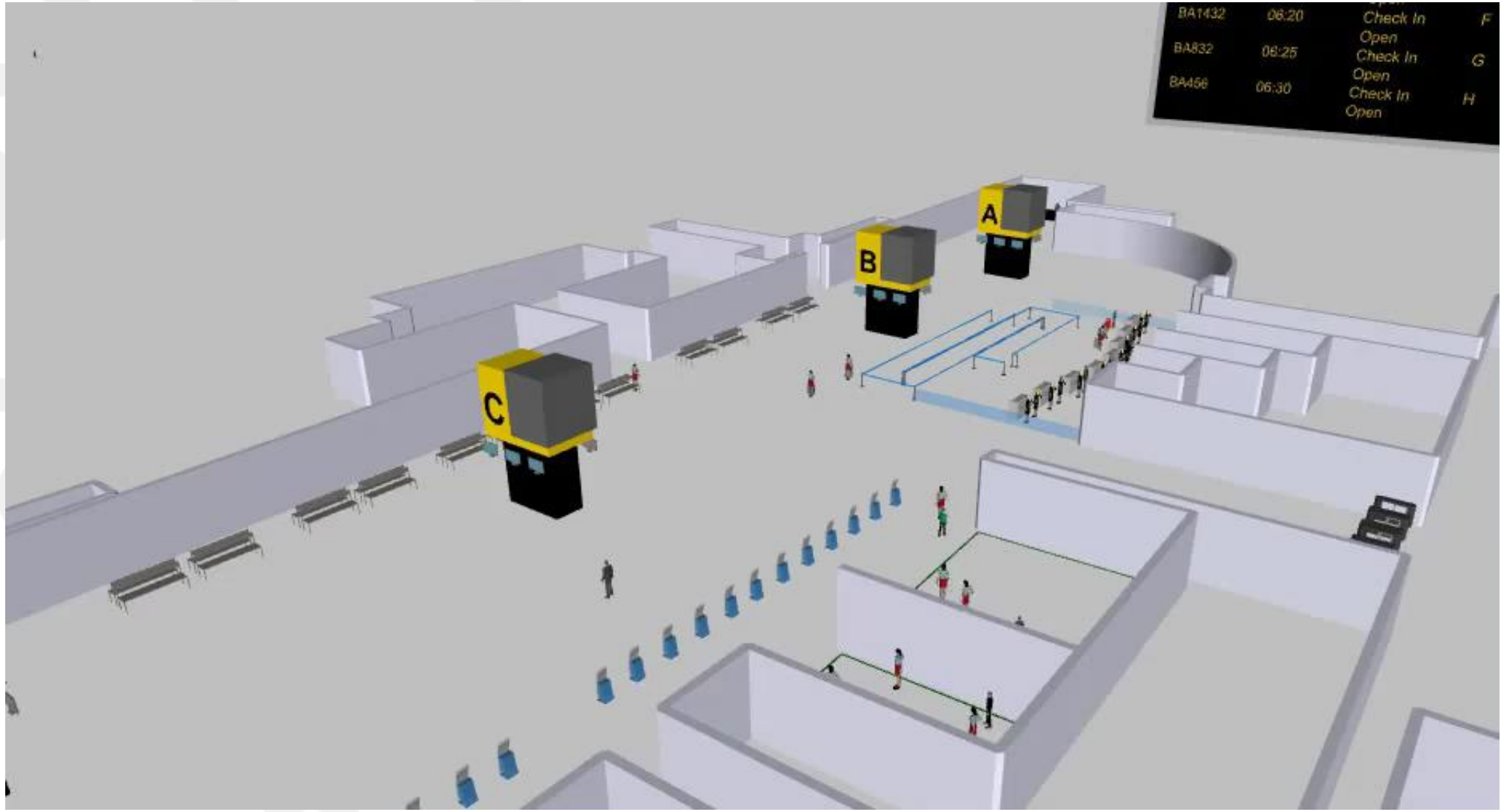
Model: Base



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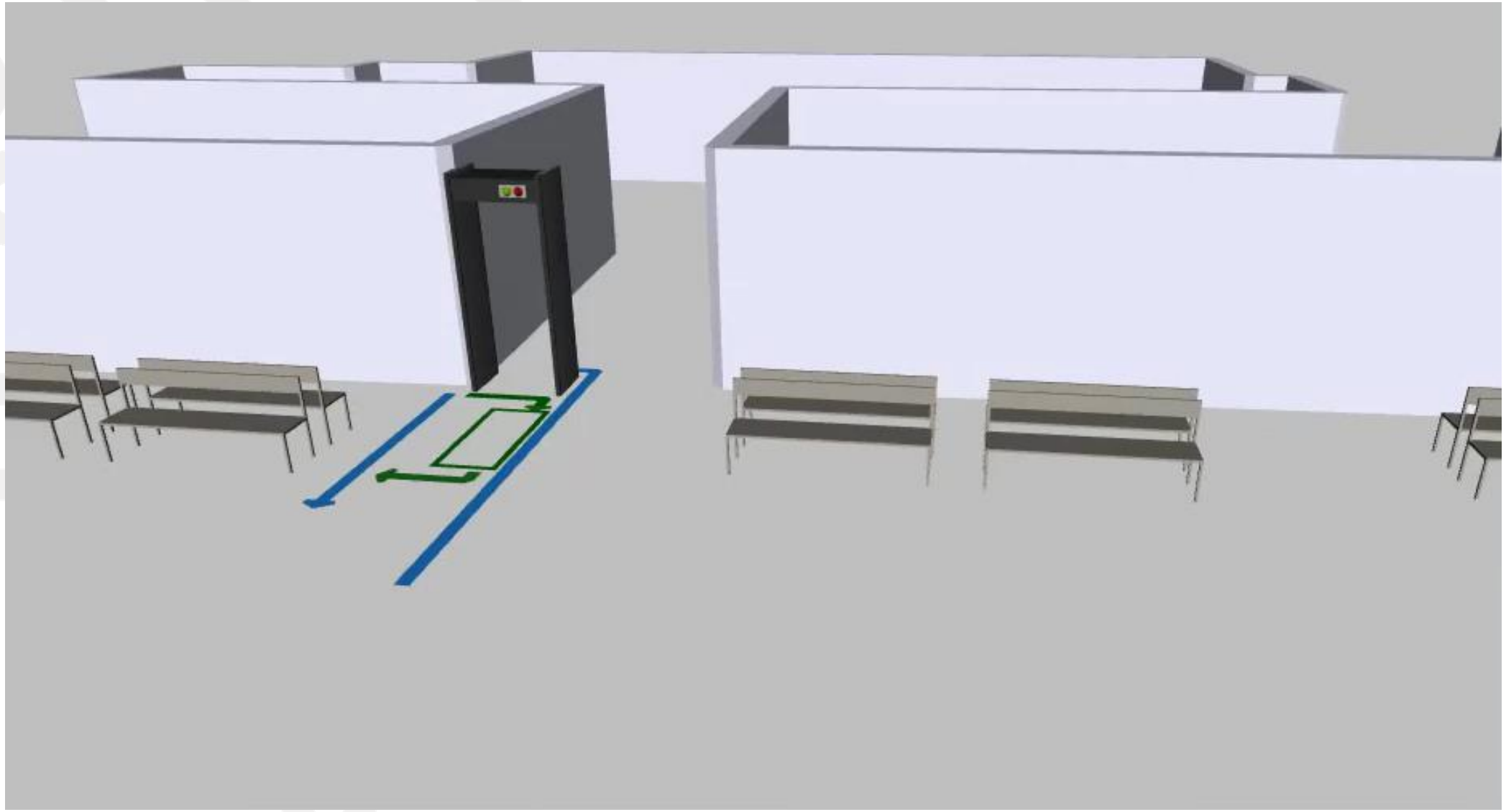
Model: Portal



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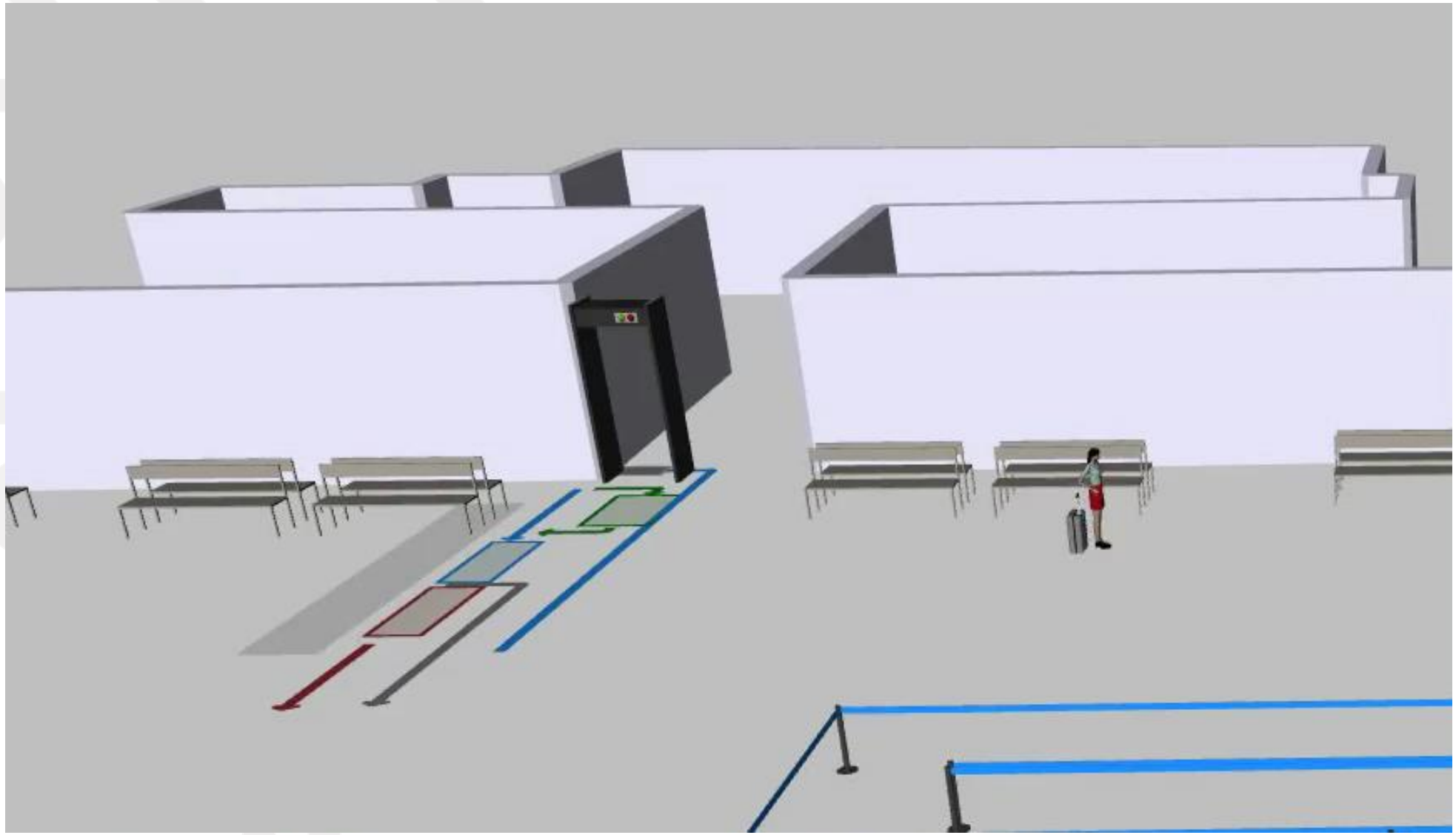
Model: Portal + ETD



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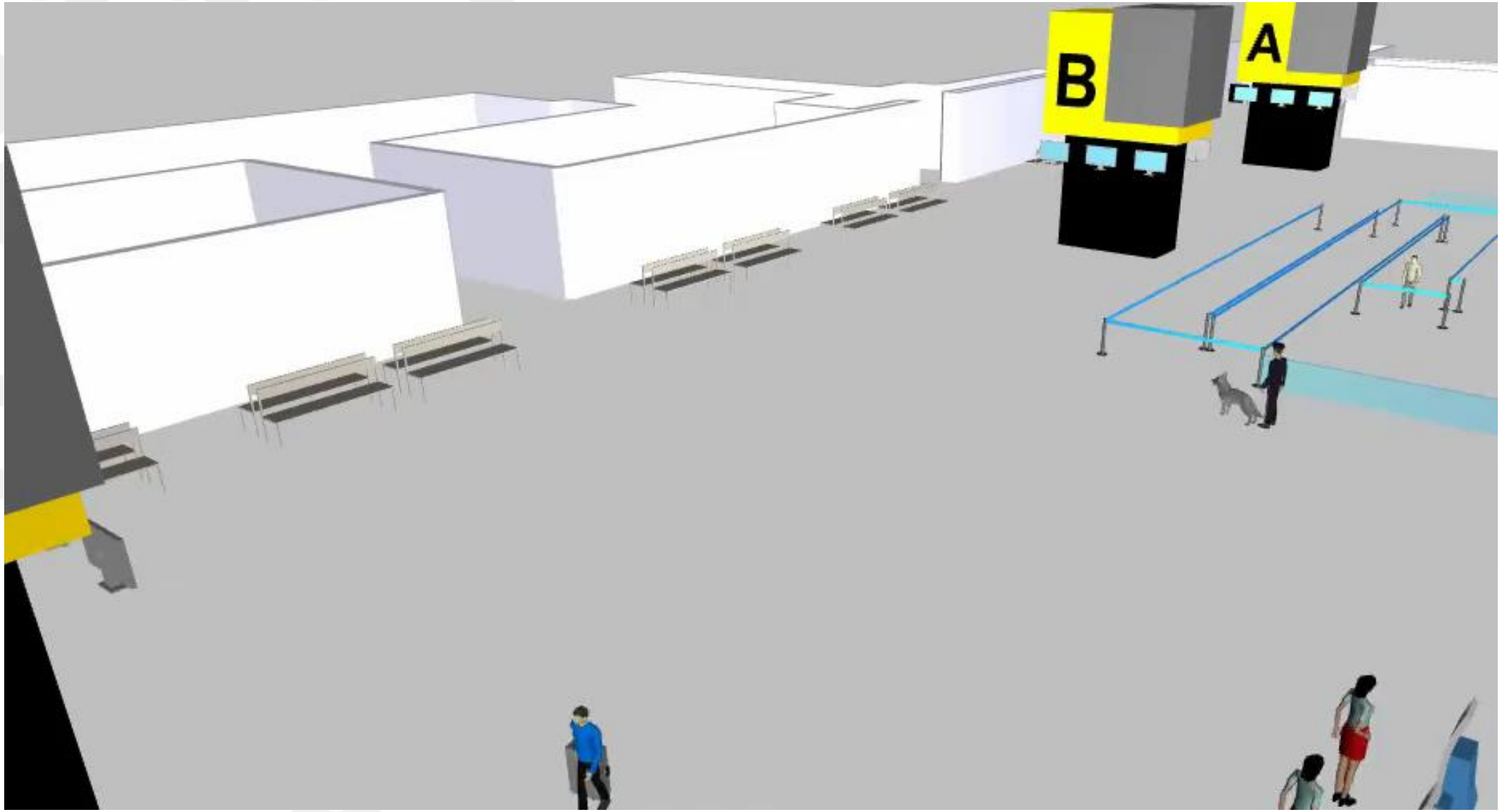
Model: Roaming Dog



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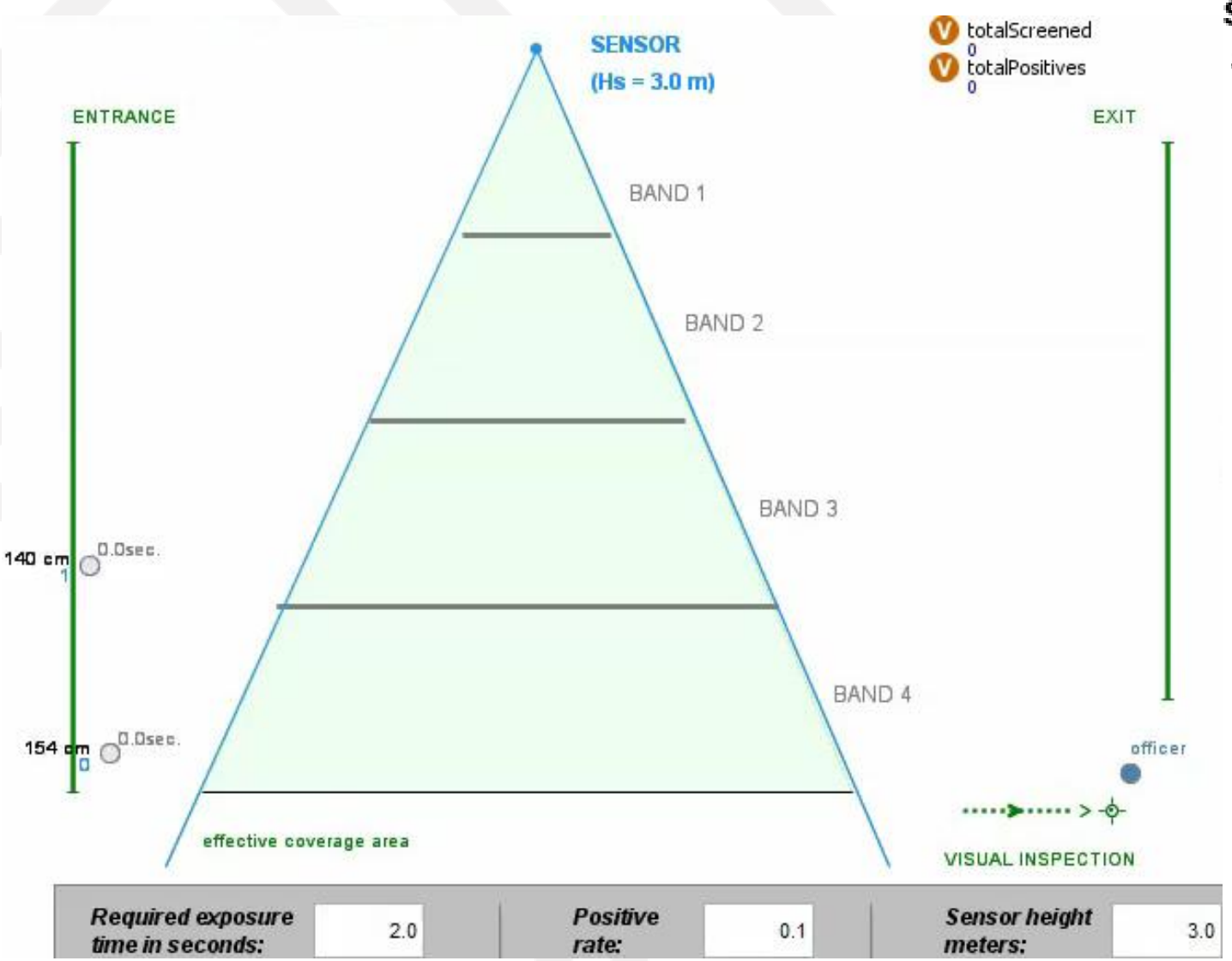
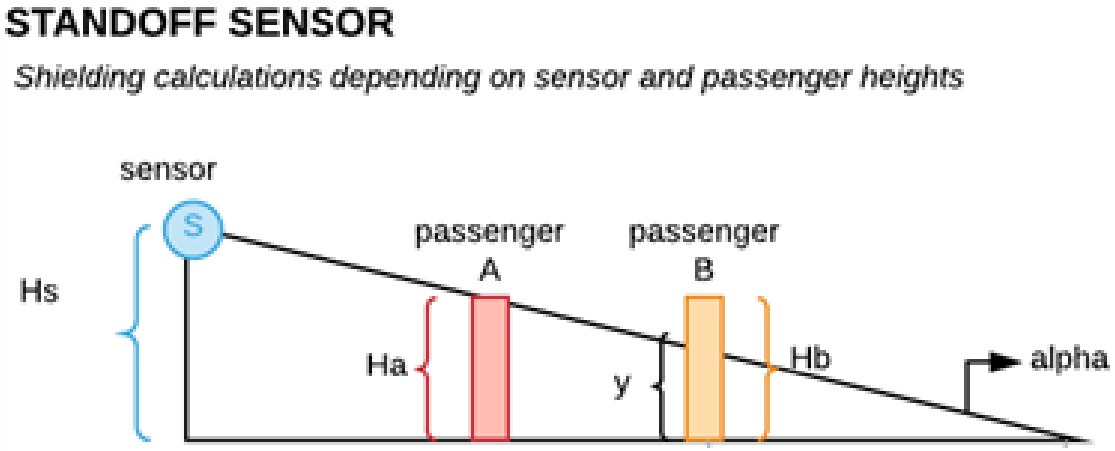
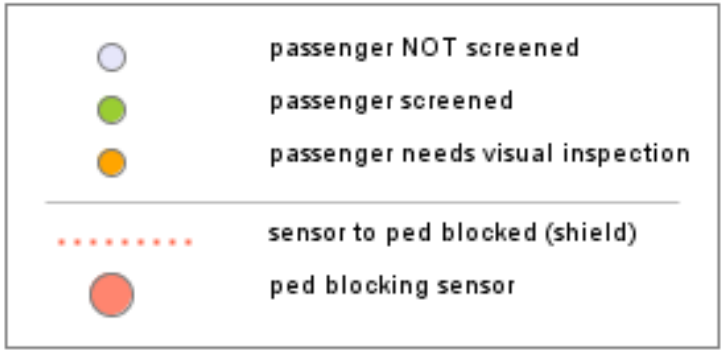
Model: Stand-off Sensor







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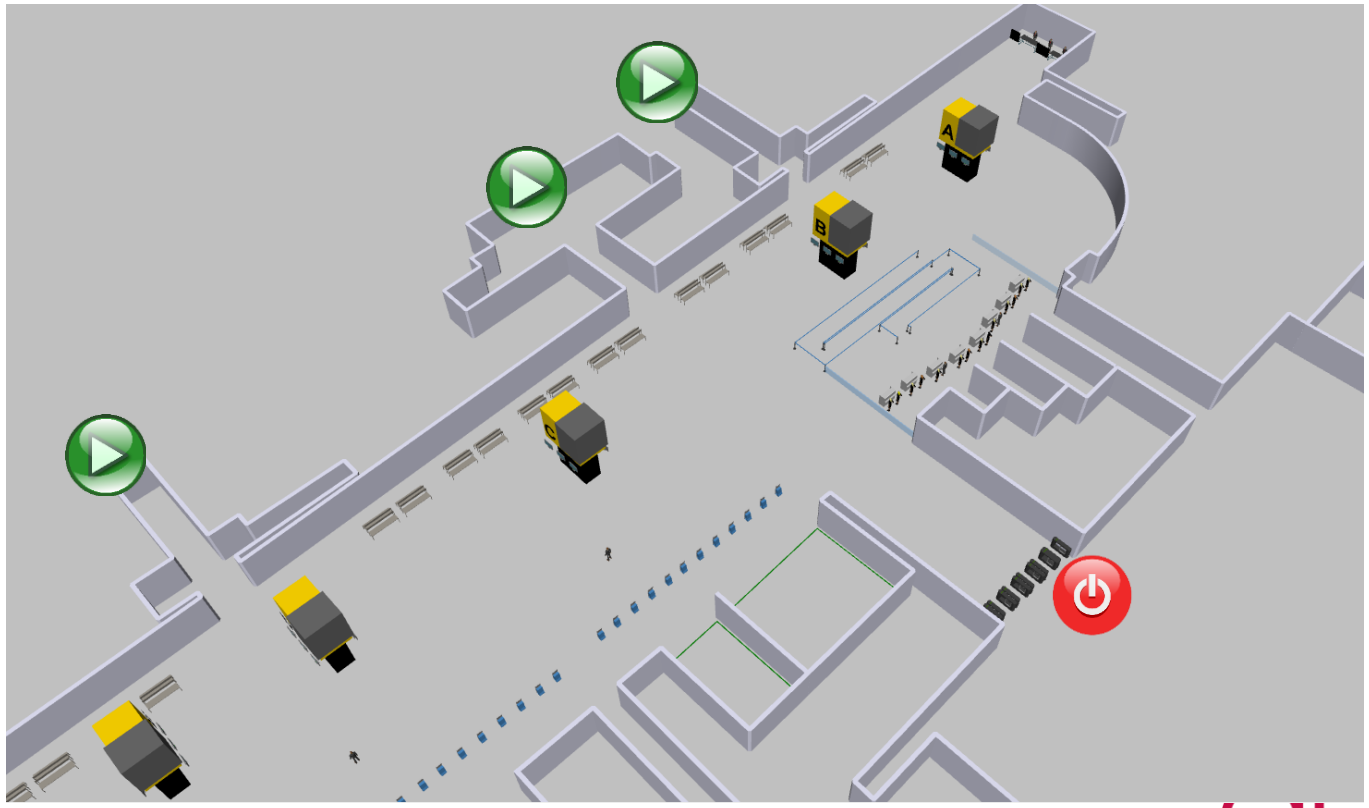
Metrics

- Screening effectiveness
  - % passengers screened
- Inconvenience
  - Median increase in time taken (point of entry through to security)
  - Queue lengths forming at security points



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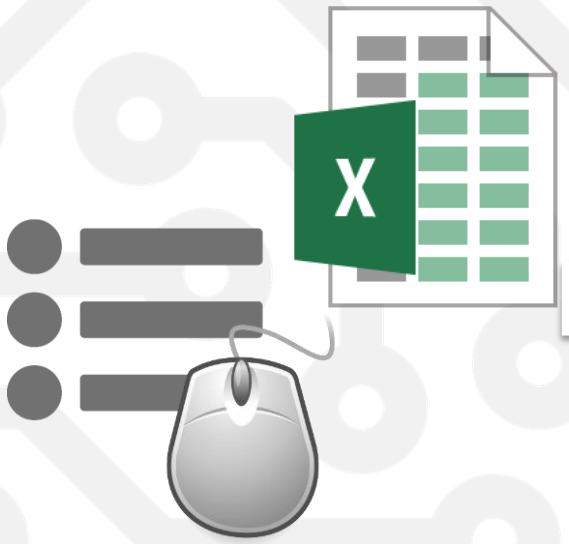
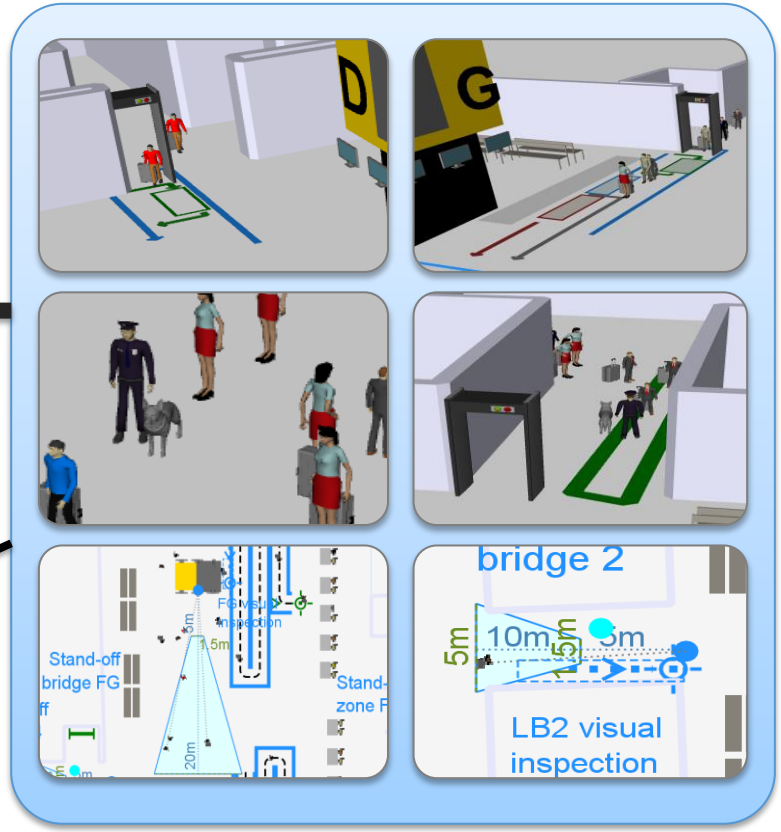
Model Components



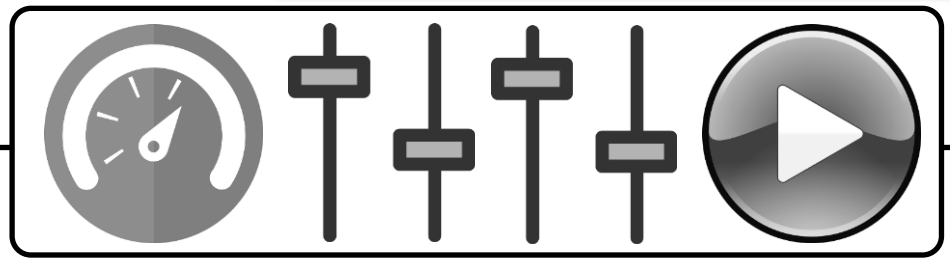
Scenario

Base Model

Security Screening Modules



Metrics



Experiment Controls

Results

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Model: Combined

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Some Results of Proof-of-Concept Study

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Experiments

- Screening scenarios
  1. No screening
  2. Portal
  3. Portal & ETD
  4. Portal & dog on bridge
  5. Standoff on bridge
  6. Dog in concourse
  7. Standoff in concourse
- Investigated
  - Passenger numbers
  - Numbers targeted for screening
  - Characteristics of screening measures
- Metrics captured included screening coverage and passenger inconvenience results – we present the latter
- 8 repeats carried out for each experiment case
- **Model to be validated – preliminary results to show capability**

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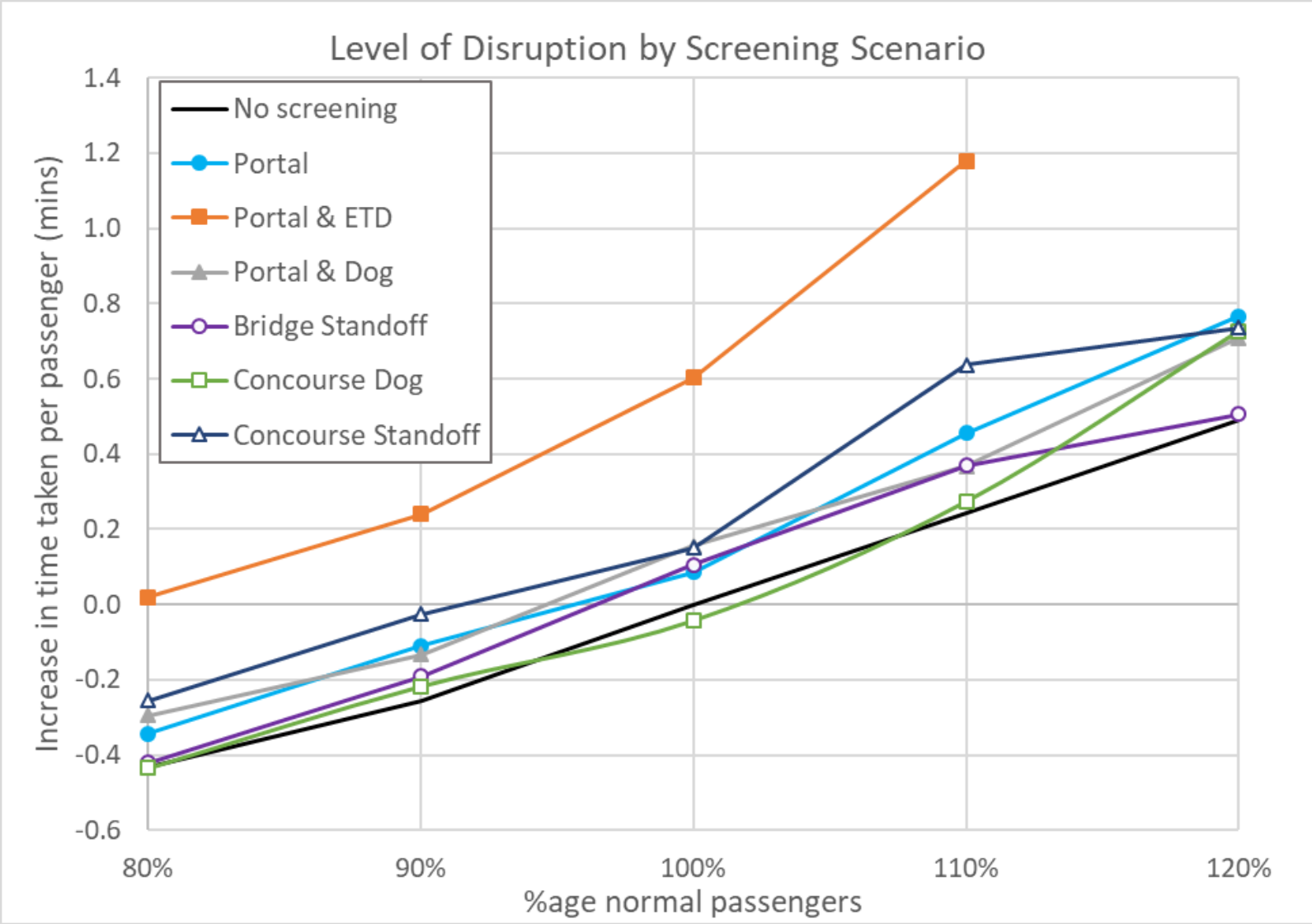
Effect Of Passenger Load



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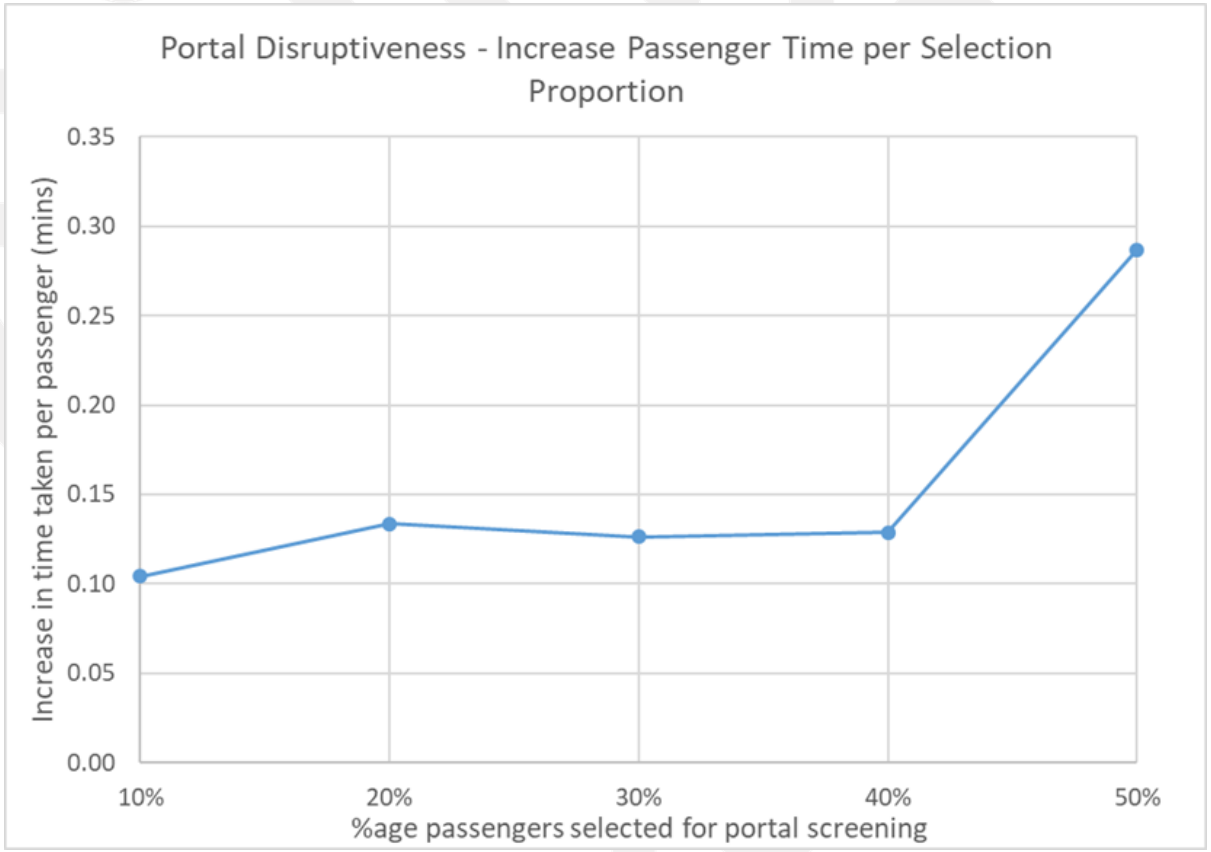
Portal Placed on Link Bridge

Effect of proportion passengers selected for screening



		Average queue length	Maximum queue length
Proportion selected	10%	0.15	3
	20%	0.41	29
	30%	2	169
	40%	9.58	1,192
	50%	3.04	198

High variability in 40% & 50% cases – requires more runs to get stable results

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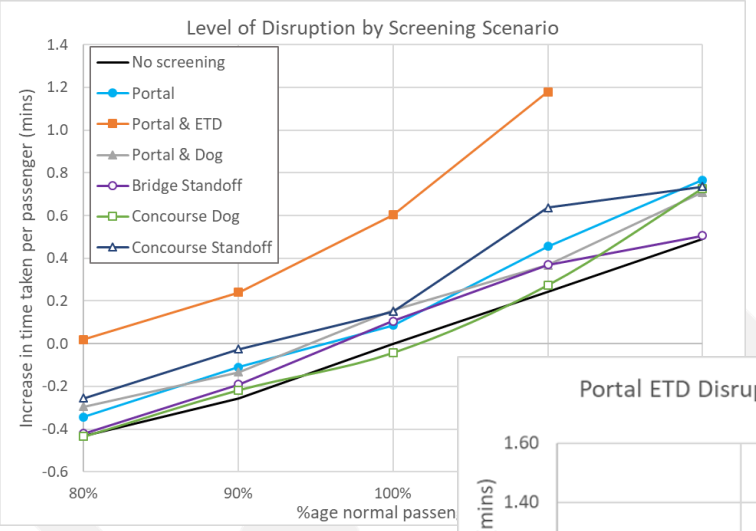
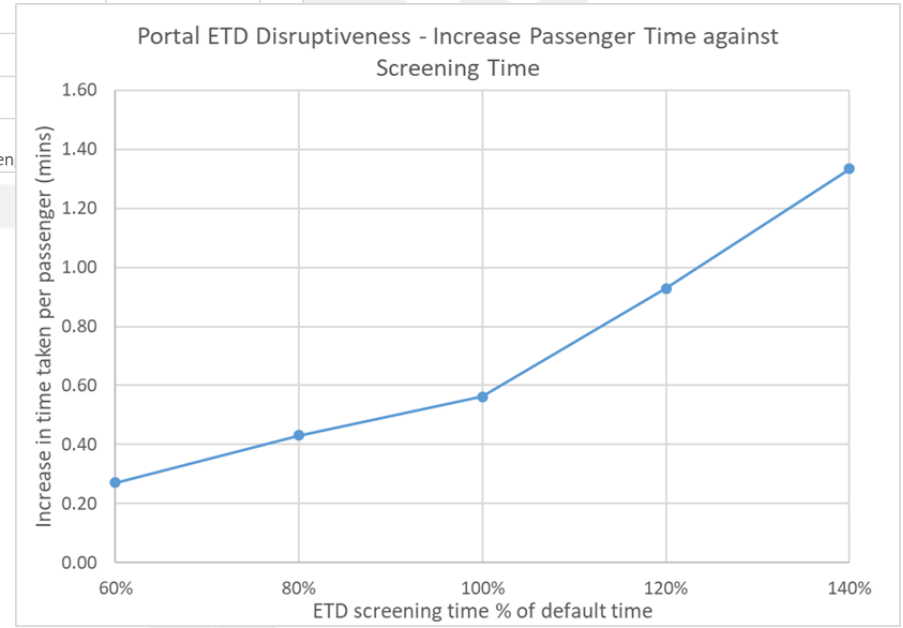
Portal With Etd On Link Bridge

Impact of ETD screening time





		Average queue length	Maximum queue length
ETD screening time (relative to default)	60%	1.17	154
	80%	1.23	56
	100%	14.24	681
	120%	85.39	1,281
	140%	126.1	1,589

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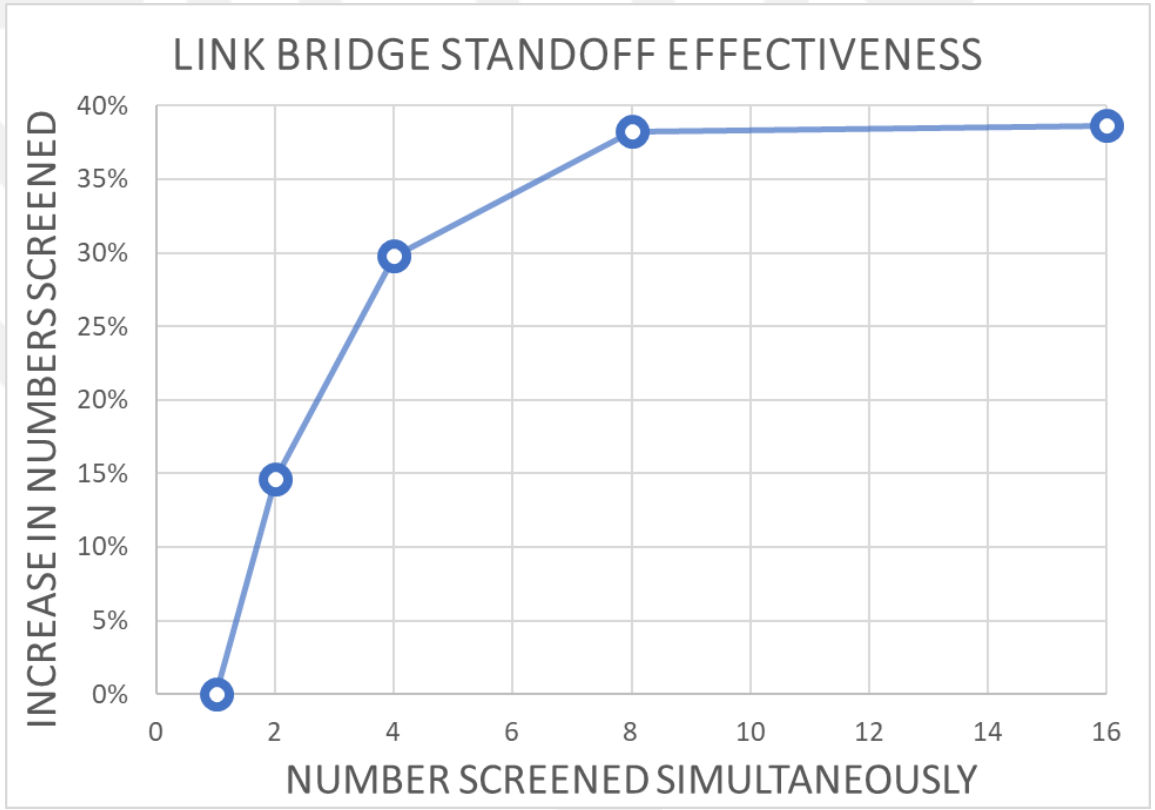
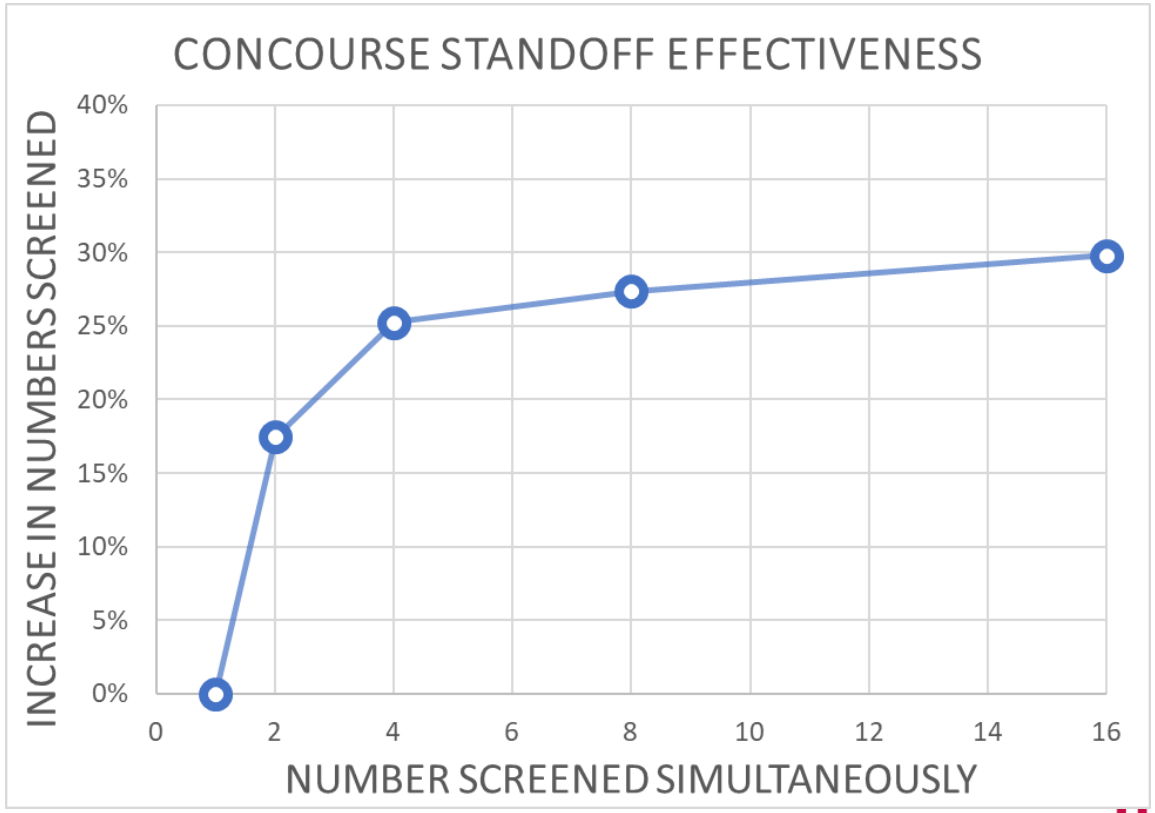
Stand-off Sensor

Benefit of simultaneous screening for stand-off sensors – shown relative to one-by-one screening





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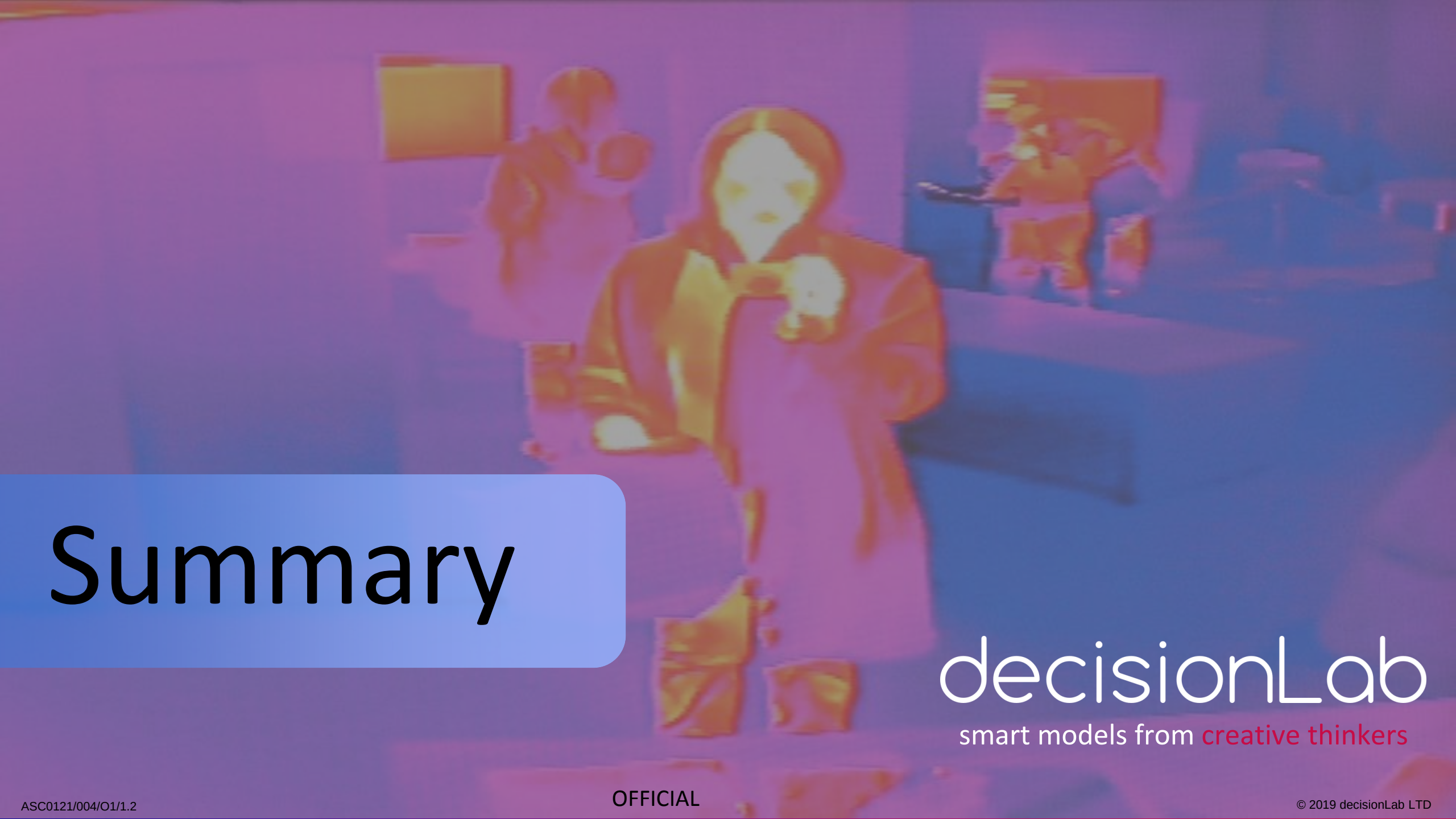

Summary

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Summary

- Developed a proof-of-principle model
  - Focused on LHR Terminal 5
- Carried out example study to demonstrate capability and usefulness
  - Although assumptions and model need to be reviewed, has provided some key findings of potential interest

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