

Airport of the Future



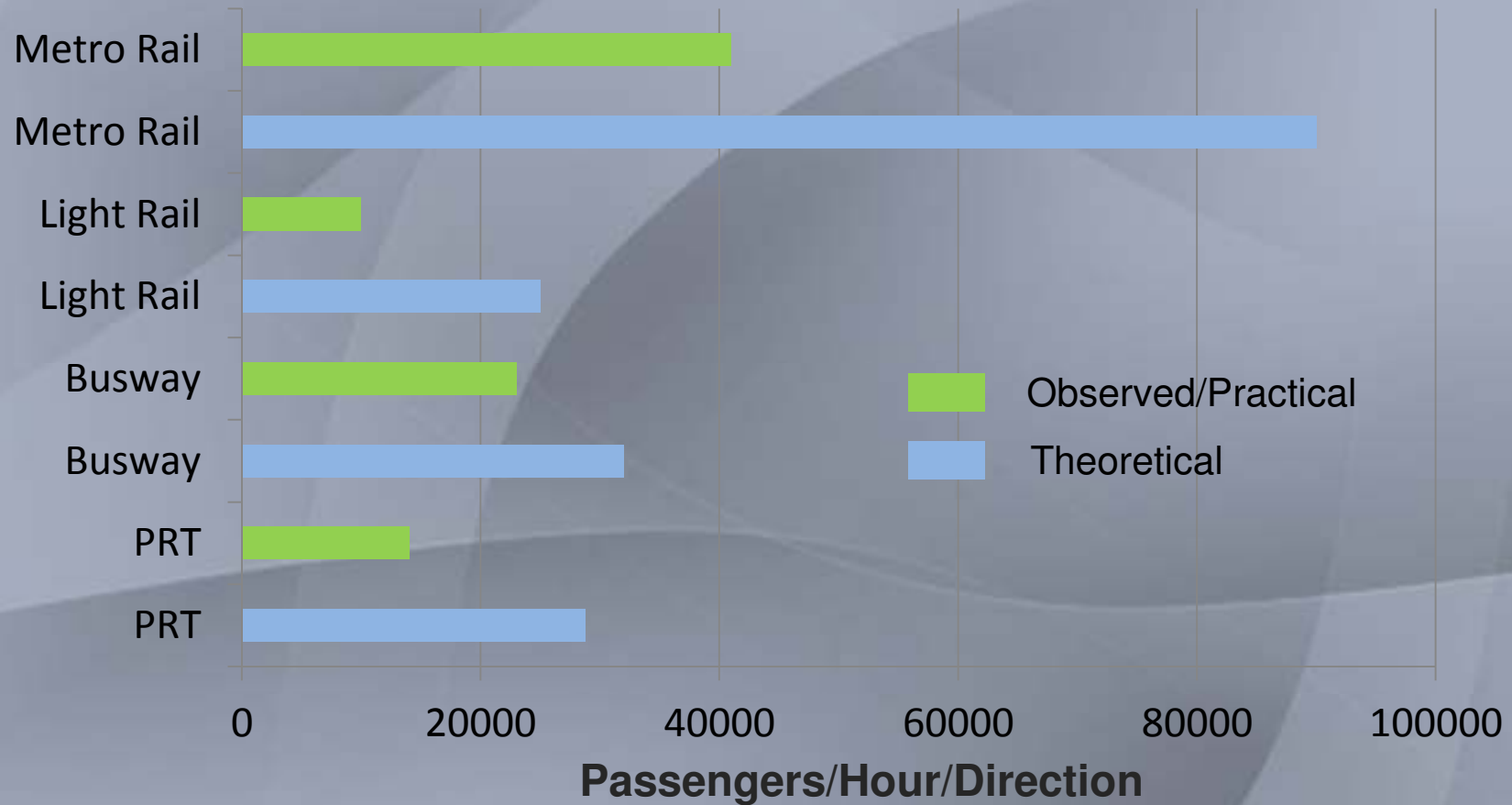
- **Introduction to PRT**
- **Example Systems**
- **Airport Security Options**
- **Automated Airport Terminal**
- **Conclusions**

Personal Rapid Transit (PRT)

- Driverless vehicles on a guideway
- One to six seated passengers plus luggage
- Direct origin to destination service
 - No need to transfer or stop
- Service on demand – not scheduled
- Very short headways (seconds)



Capacity Comparison



Sources: TCRP Transit Capacity Manual
 PANYNJ
 PRTC Estimates

Note: This is guideway/corridor capacity
 PRT's strength is network capacity



Personal Rapid Transit Benefits

- **Can attract drivers from their cars**
 - Has little or no waiting
 - Provides non-stop service
- **Is 100 times safer than cars**
- **Uses much less energy than other systems**
- **Has no on-site emissions**
- **Has low infrastructure needs**
- **Can also carry freight**
- **Is economical to operate**



Example Systems



- **2getthere**
- **Vectus**
- **ULTra**

- Vehicles carry 4 – 20 passengers
- Max. speed = 25mph
- Capacity up to 2,500pphpd
- Automated operations since 1997
- Masdar PRT Project operating since 2010



PRT
consulting

2getthere Masdar PRT Vehicle



2getthere Masdar PRT System



Vectus PRT System

- Subsidiary of POSCO
- Test track in Sweden
- Meets Swedish safety specs
- Suncheon Project (2013)



Vectus PRT System

- Linear induction motors
- Good all-weather capability
- Can accommodate 6



ULTra PRT System

- 1,200 kg gross weight
- 40 kph
- 2KW continuous battery power
- Heathrow project – 99.6% reliability



System Features

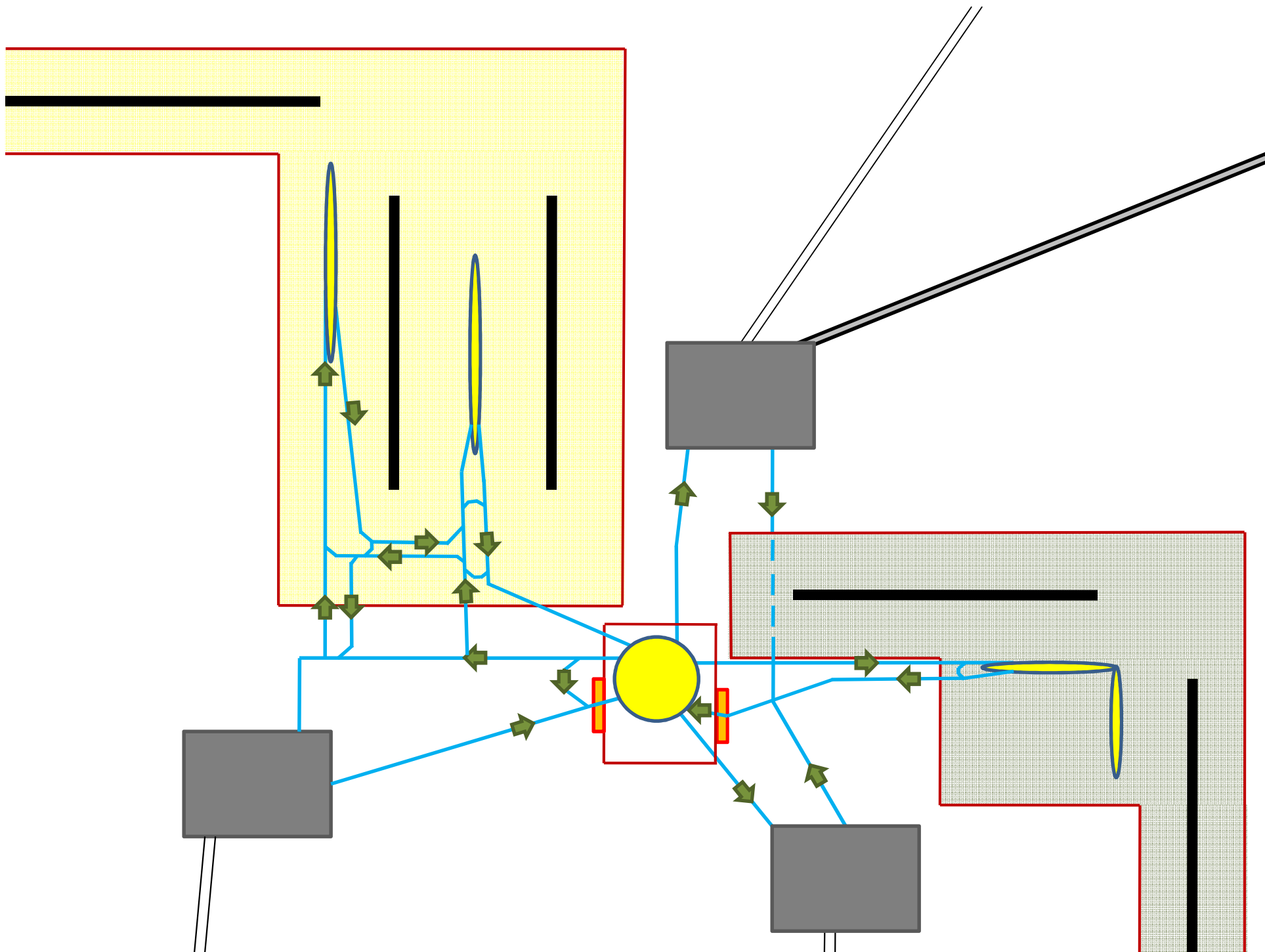
- Footbridge-like elevated guideway
- 4 passengers





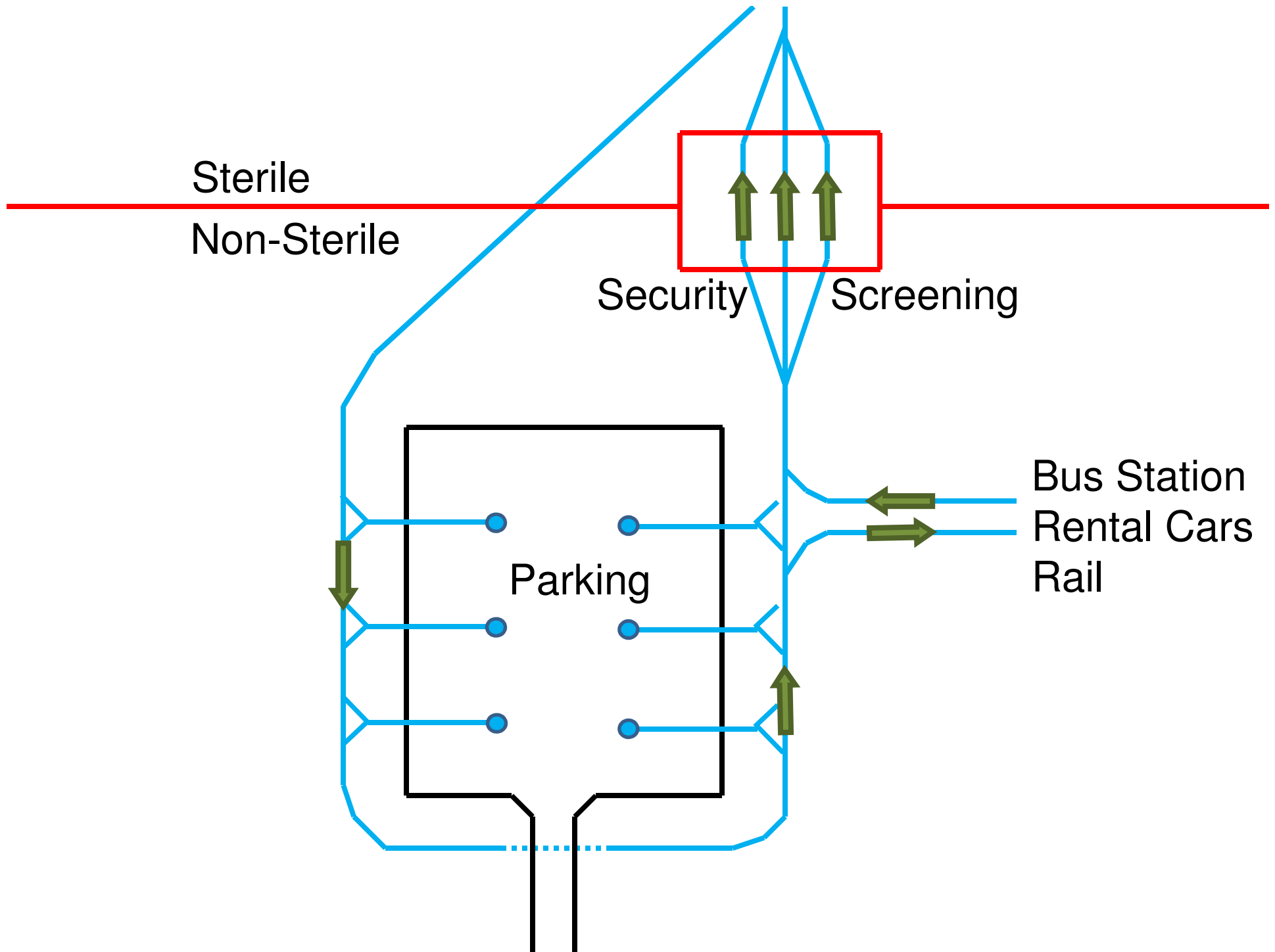
Secure Airport Concept One



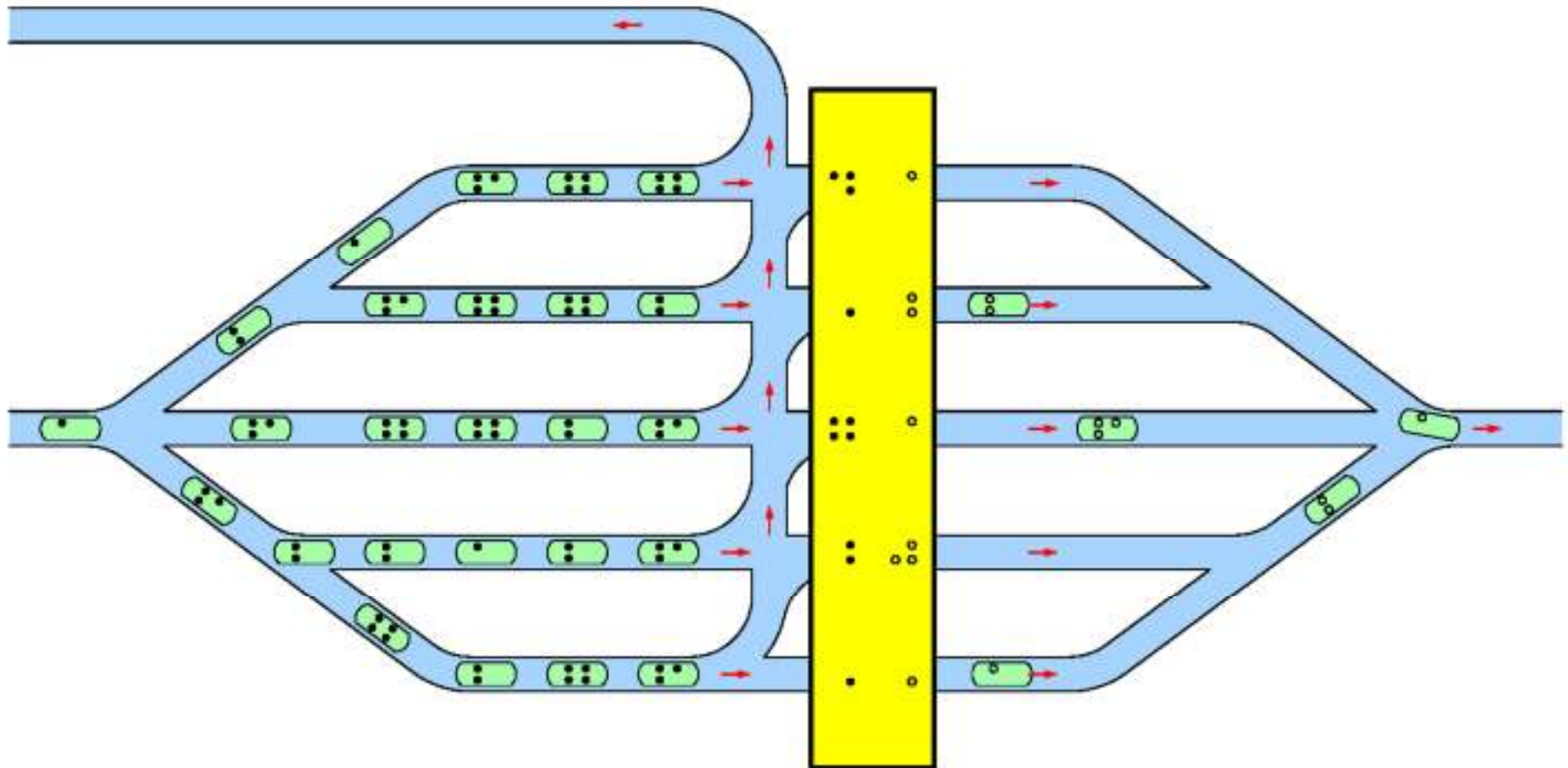


On-Board Check-in





Remote Security Screening Facility



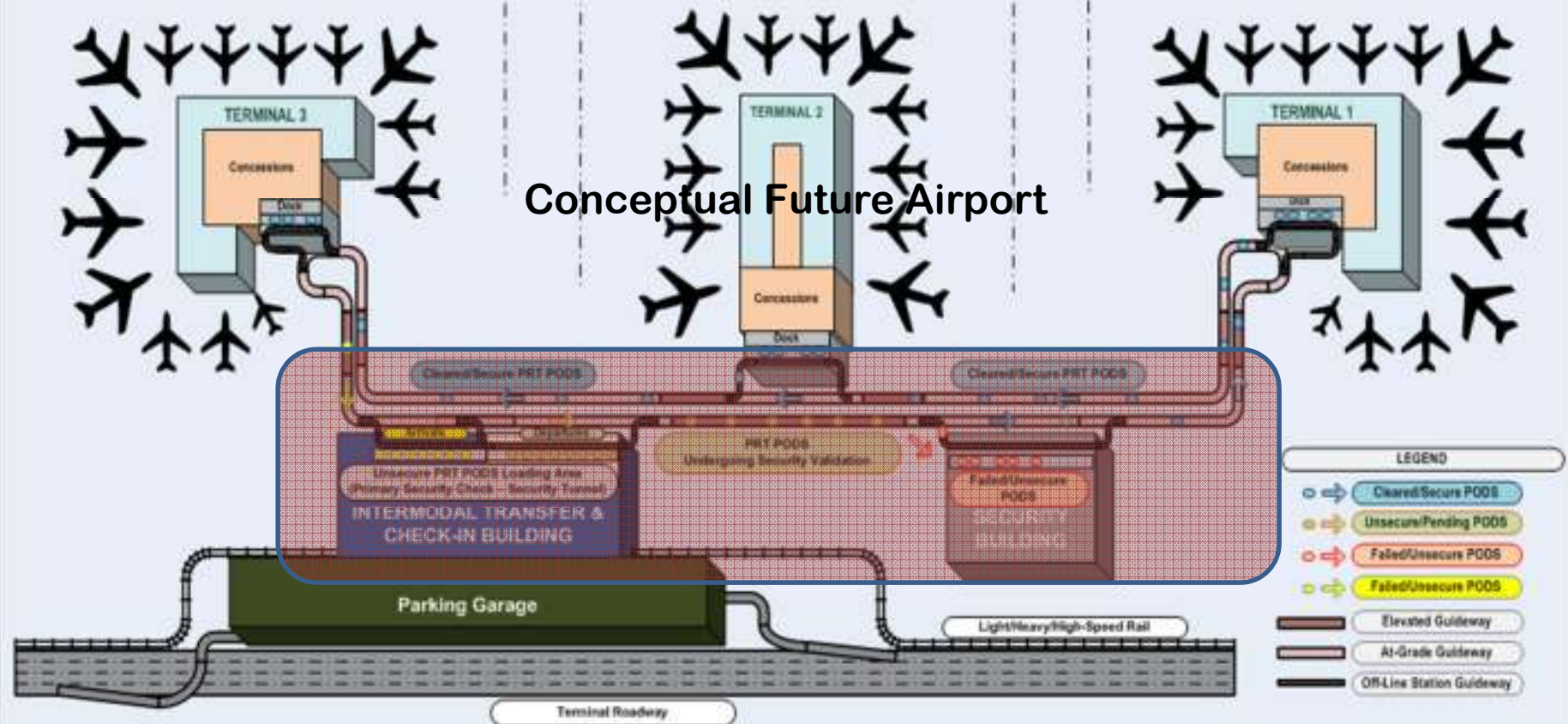


Secure Airport Concept Two

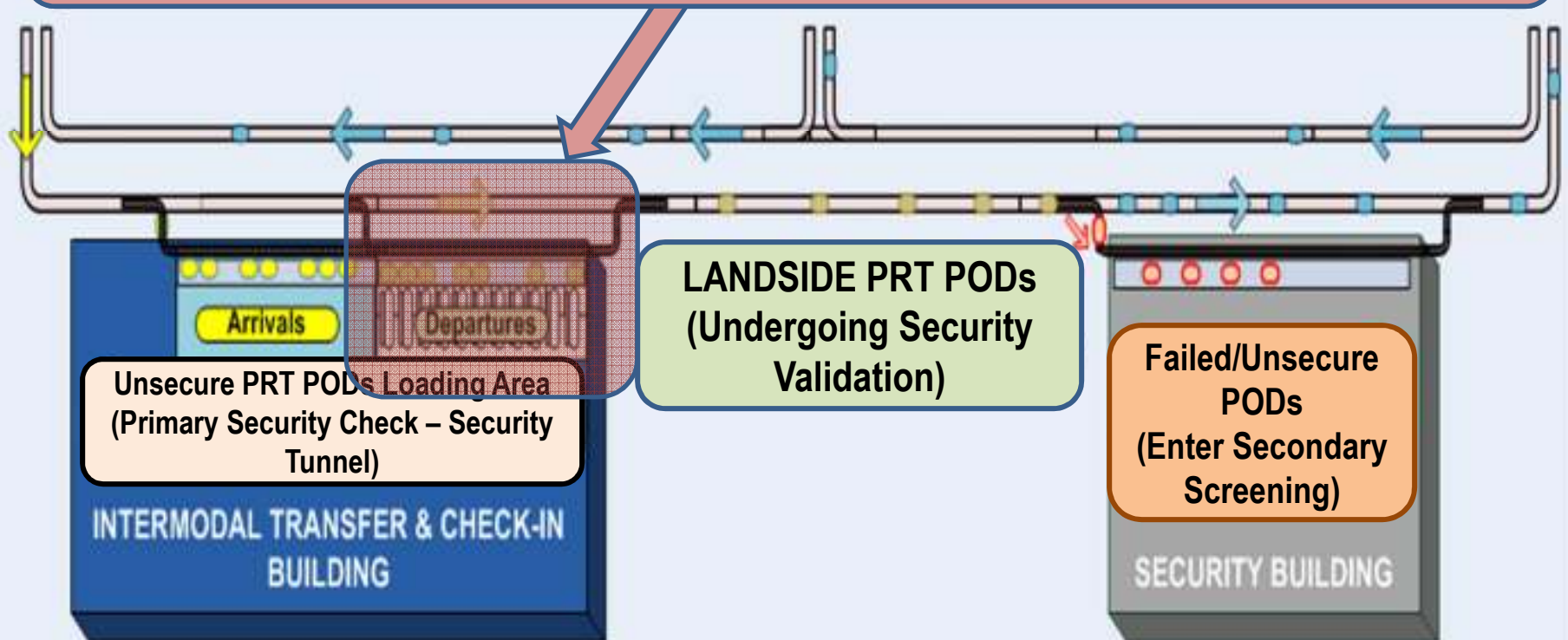


LANDSIDE FACILITIES

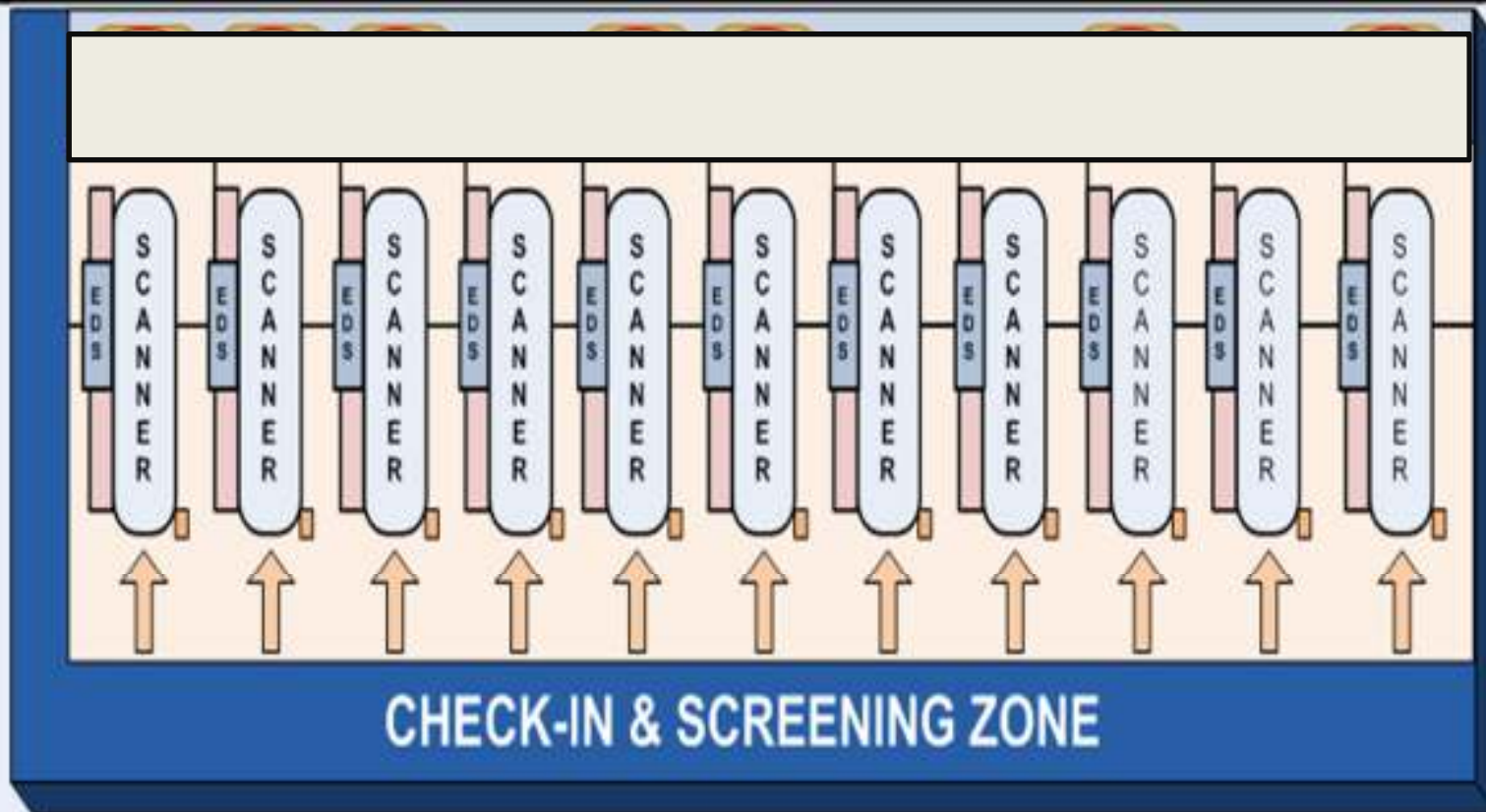
Conceptual Future Airport

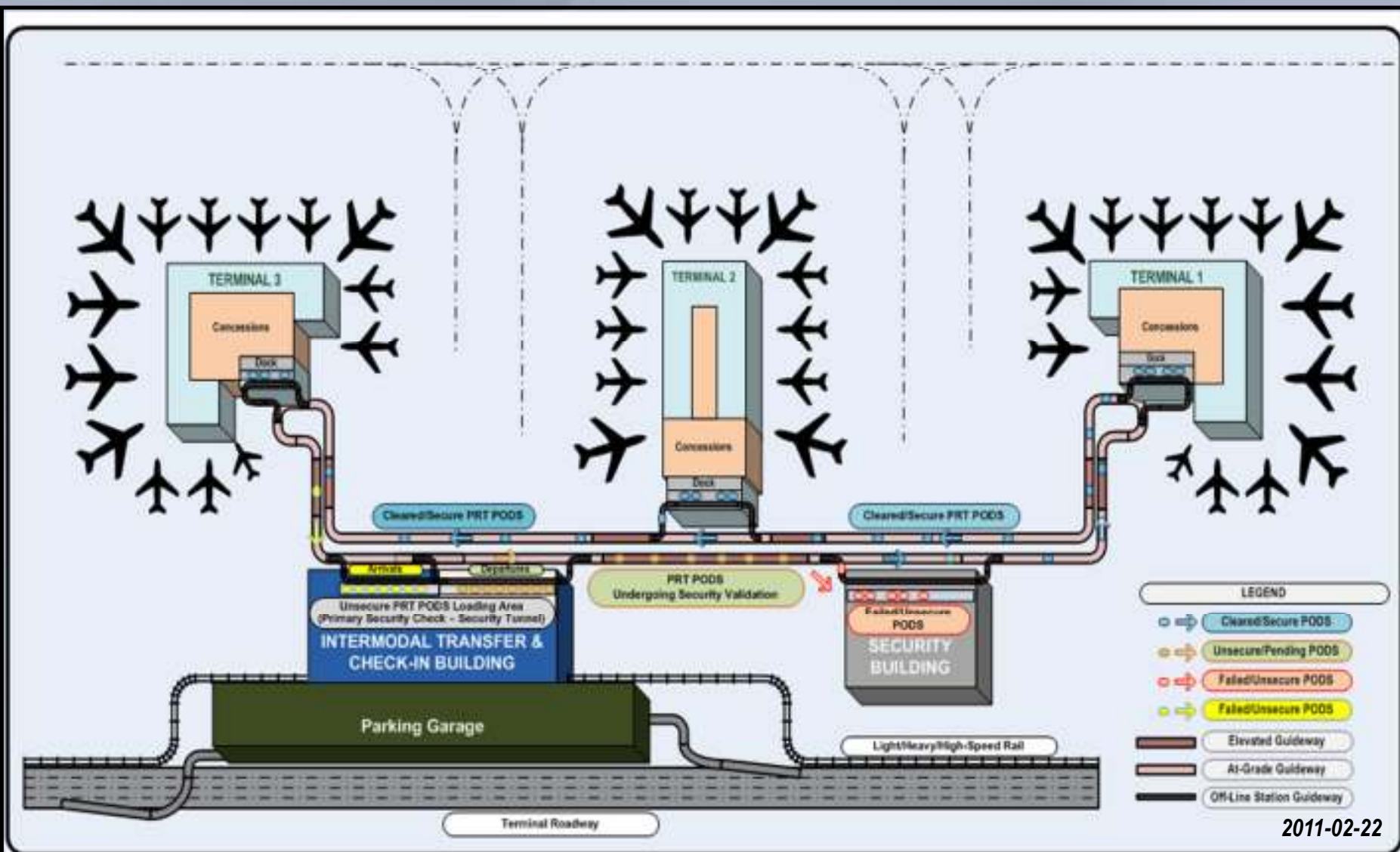


SECURITY SCREENING

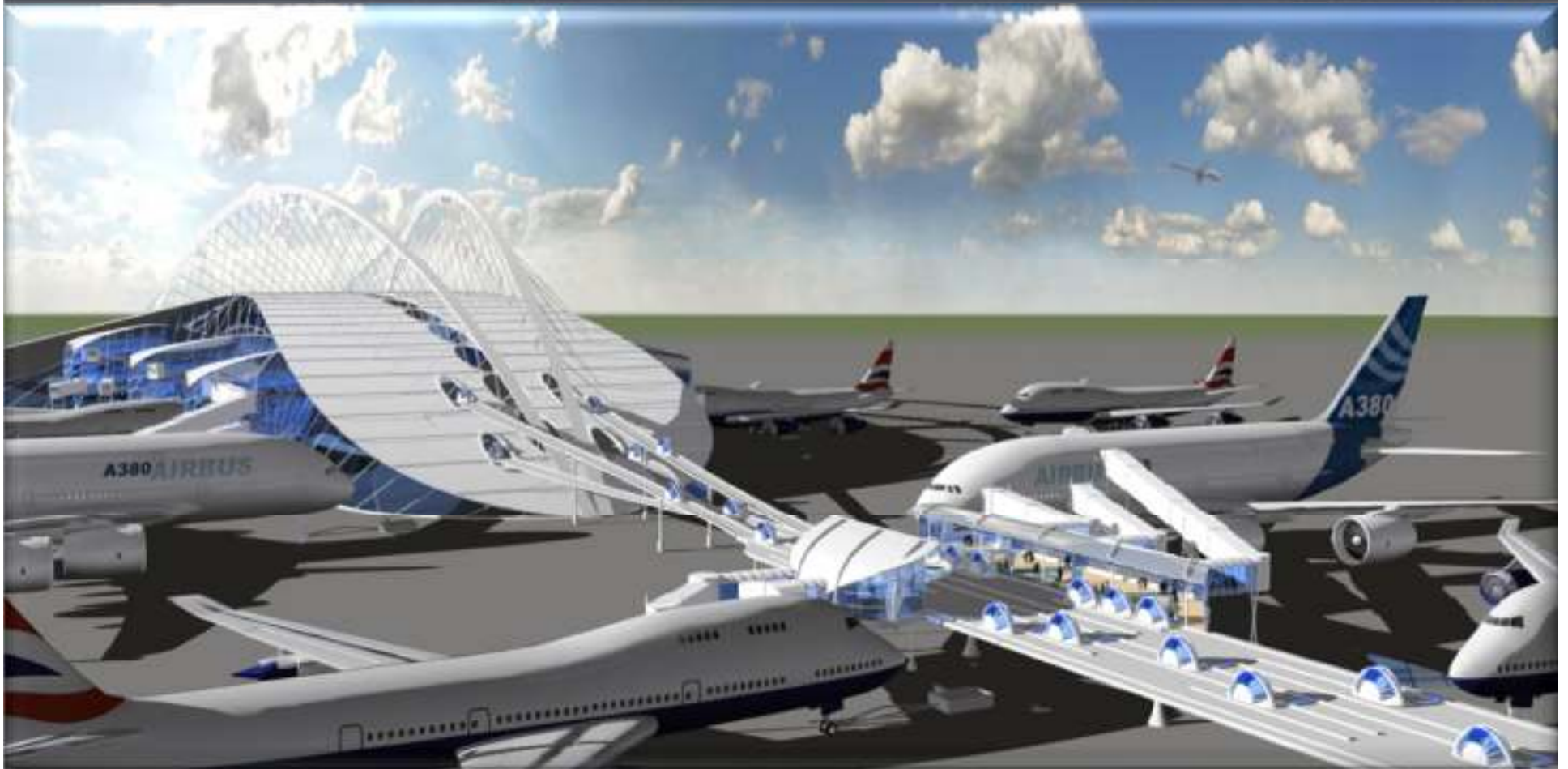


Departures Platform





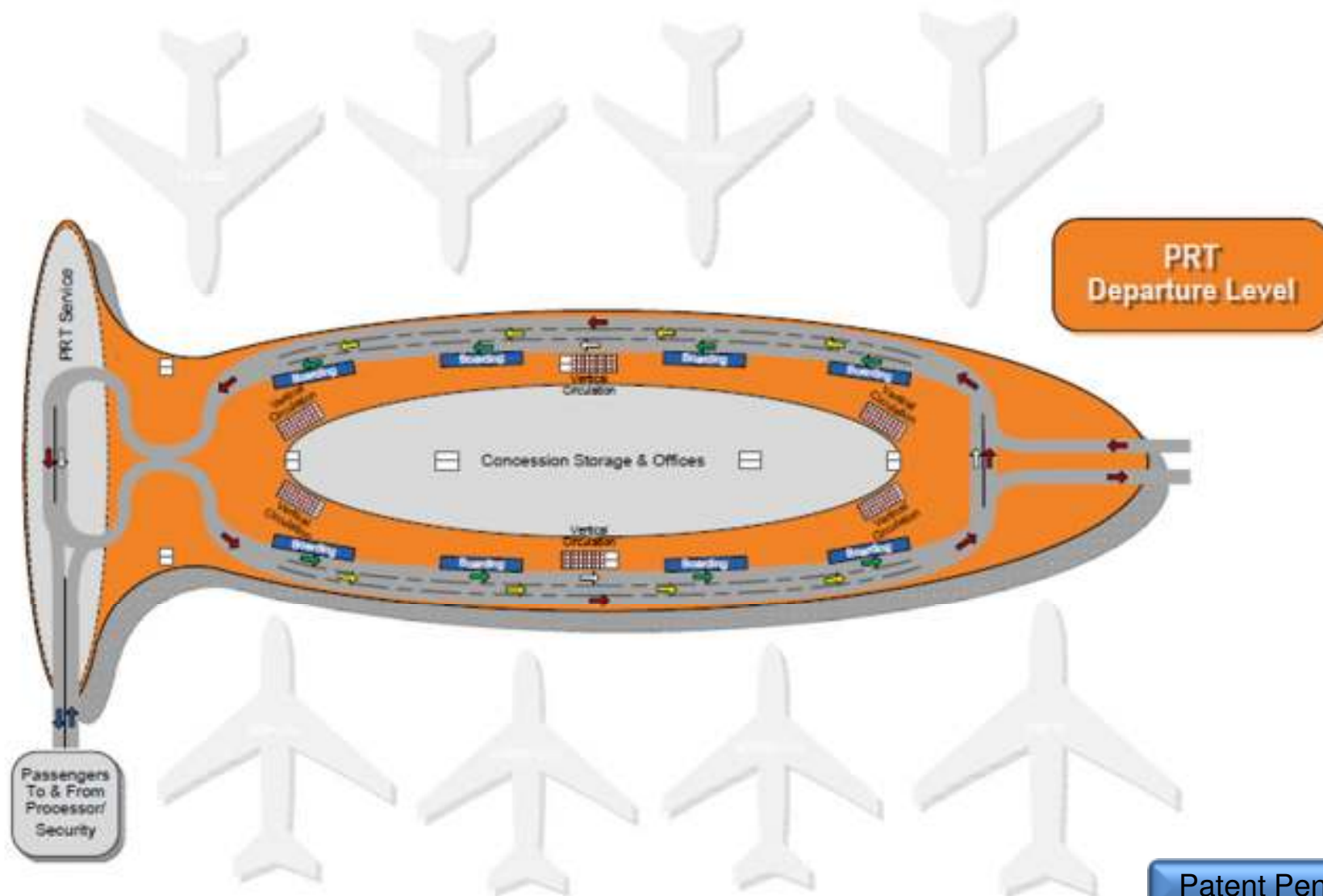
Automated Airport Terminal



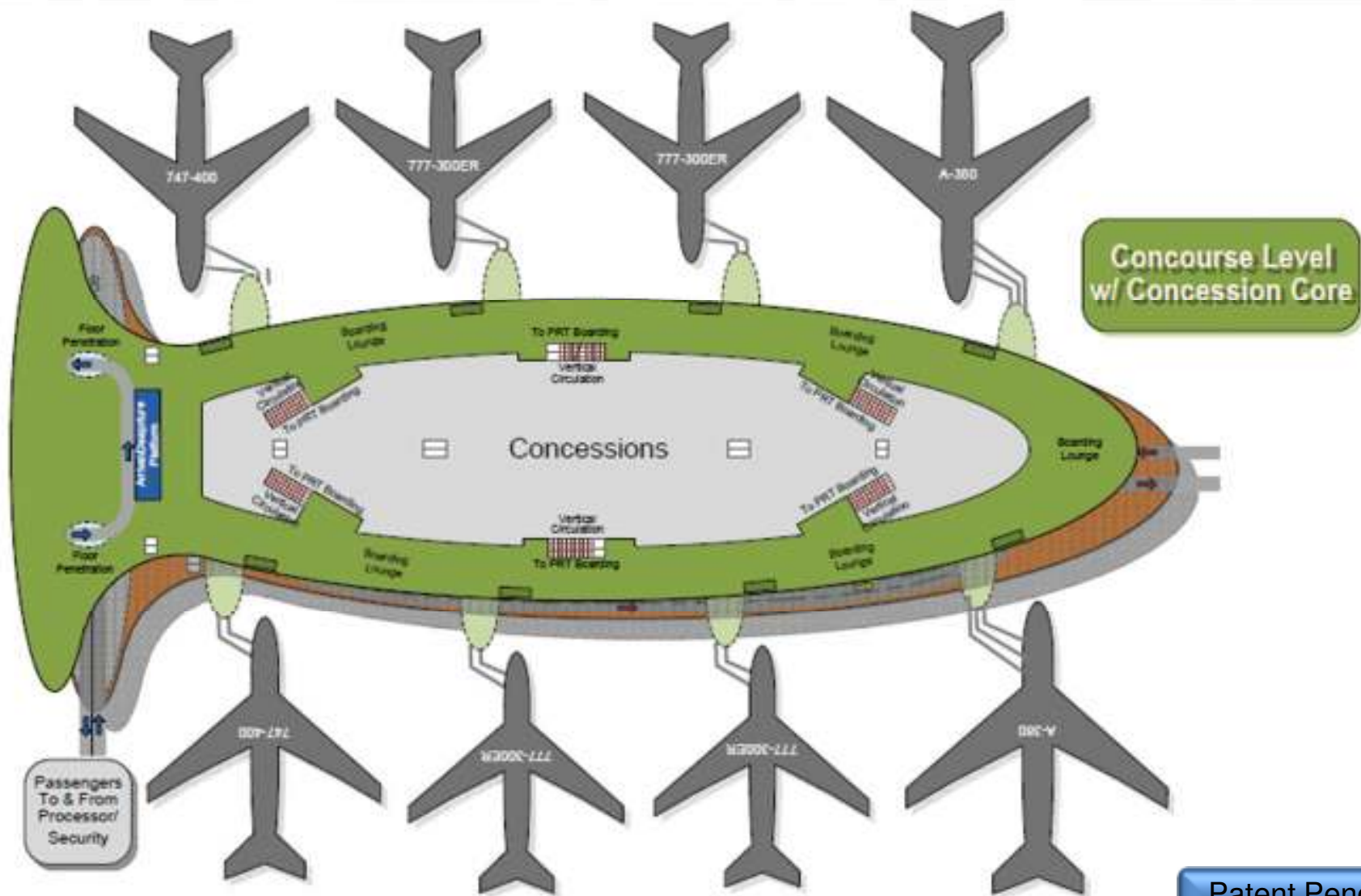
- Three-level concourse with integrated PRT
- PRT guideway with aircraft boarding stations

Patent Pending

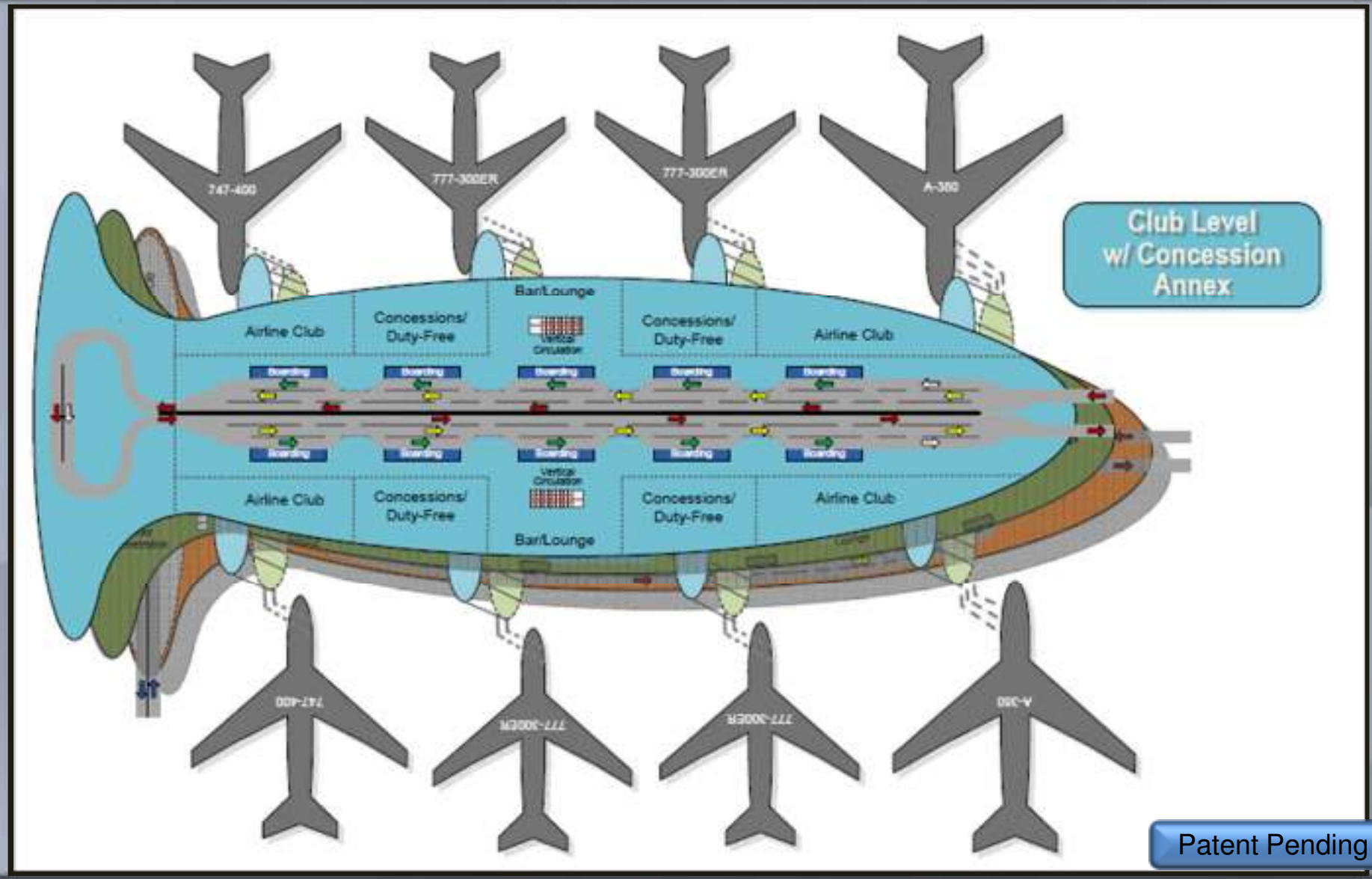
3-Level Integrated Terminal



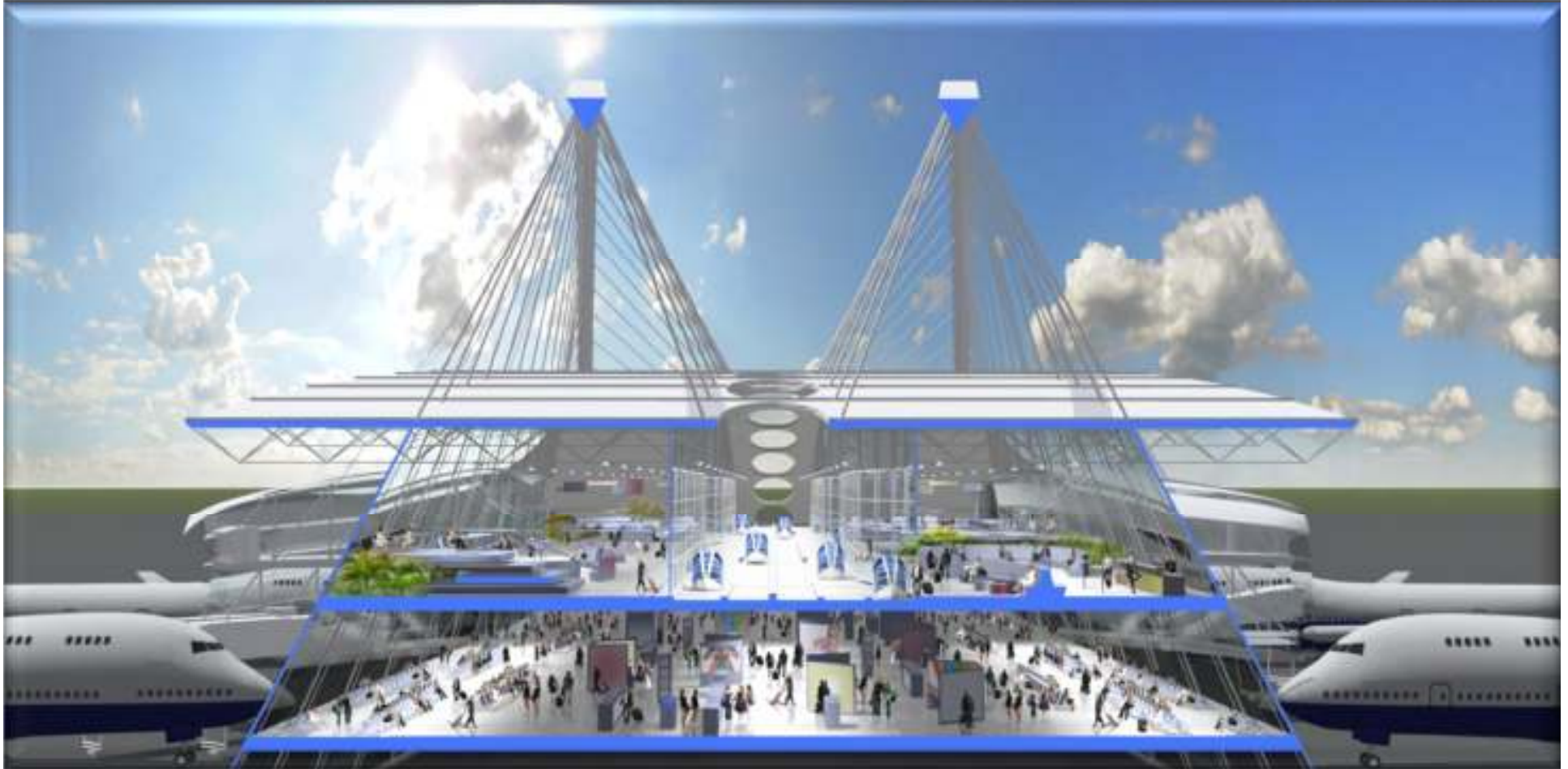
3-Level Integrated Terminal



3-Level Integrated Terminal



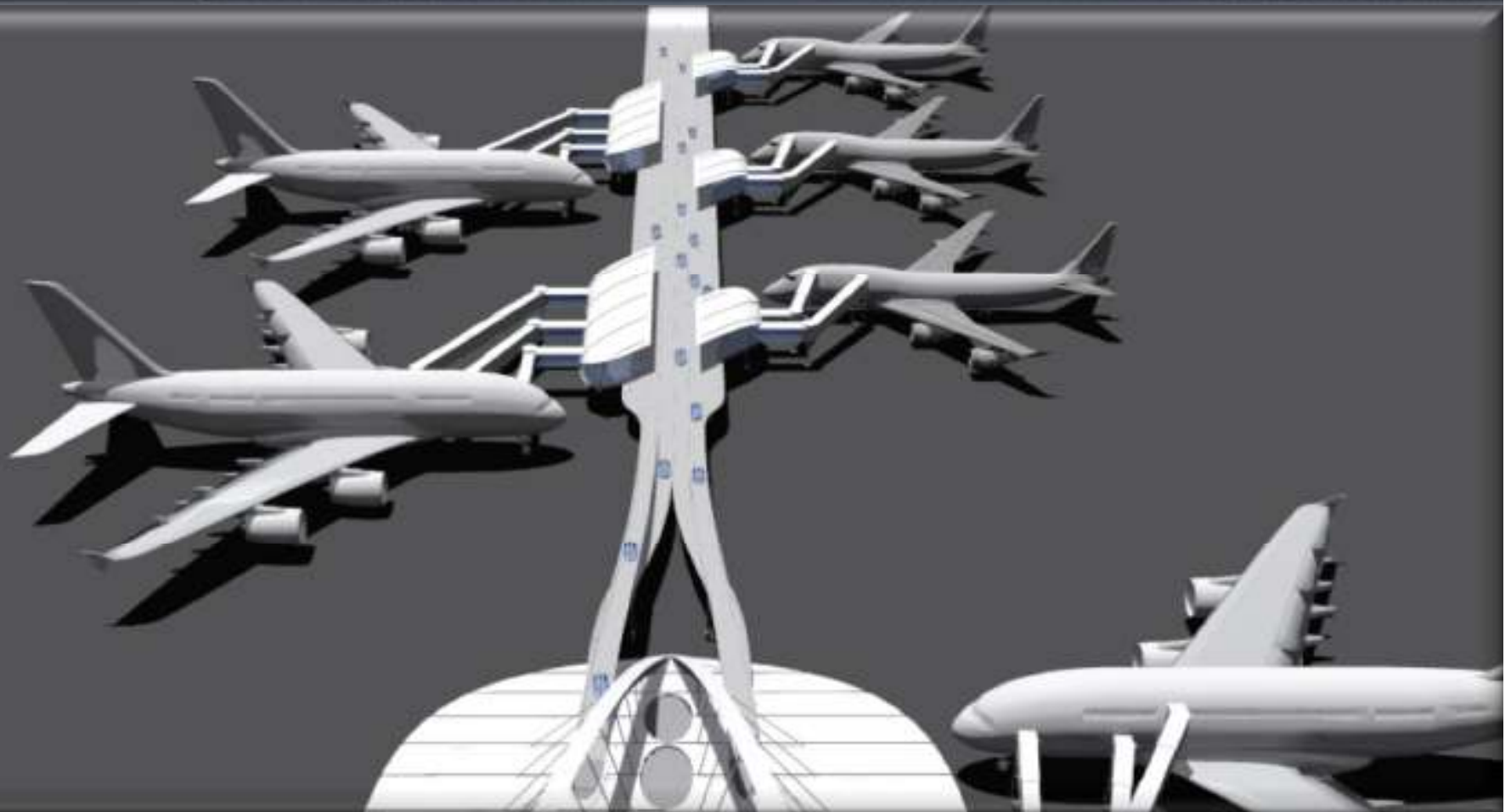
In-Terminal PRT



- 3rd level: Airline clubs and high-end concessions, direct PRT access
- 2nd level: General boarding (contact gates) and concession core
- 1st level: General PRT access (not shown)

Patent Pending

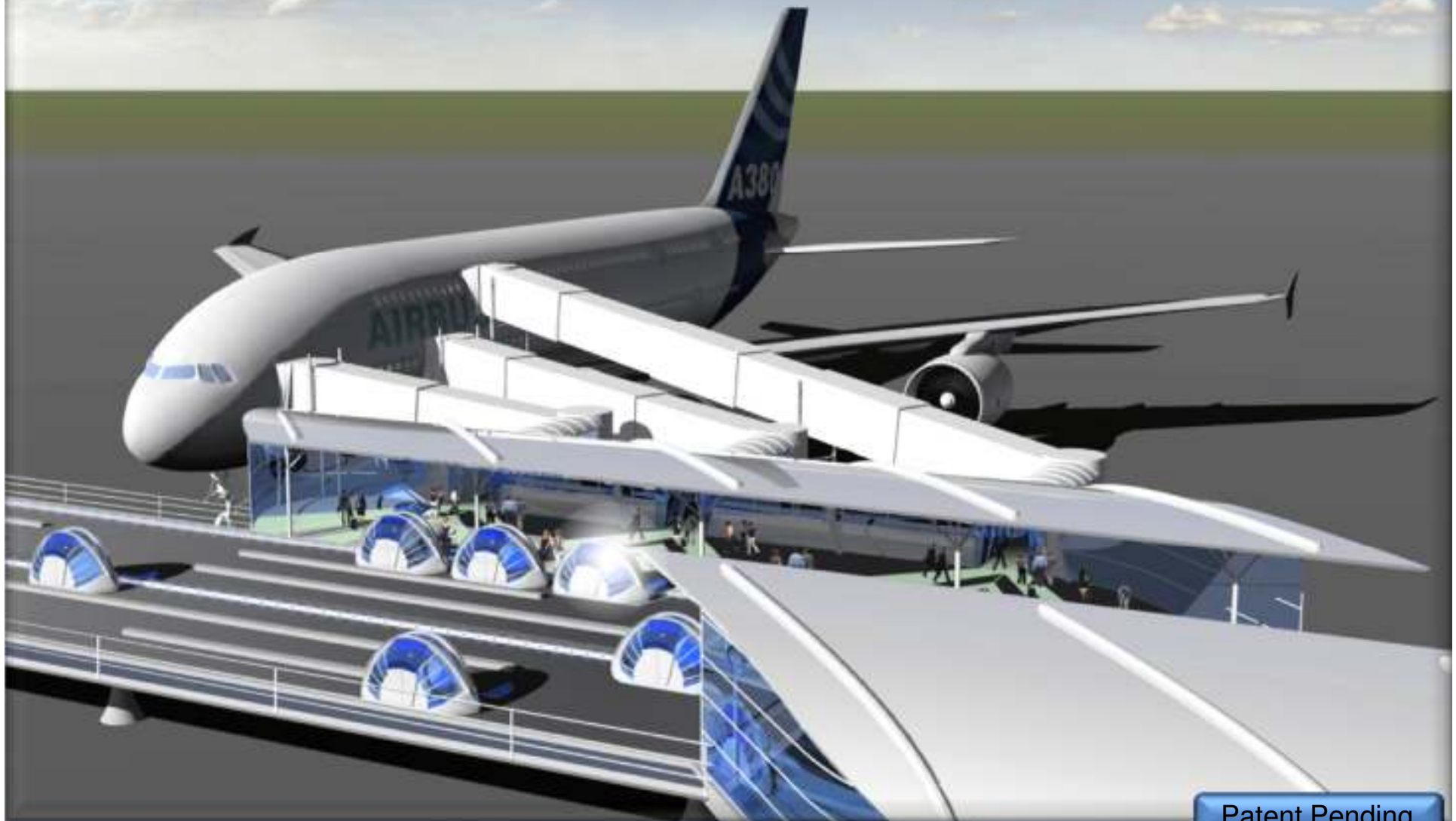
PRT Station at Each Aircraft



- Concourse with integrated PRT
- Bi-directional PRT guideways
- Aircraft boarding stations

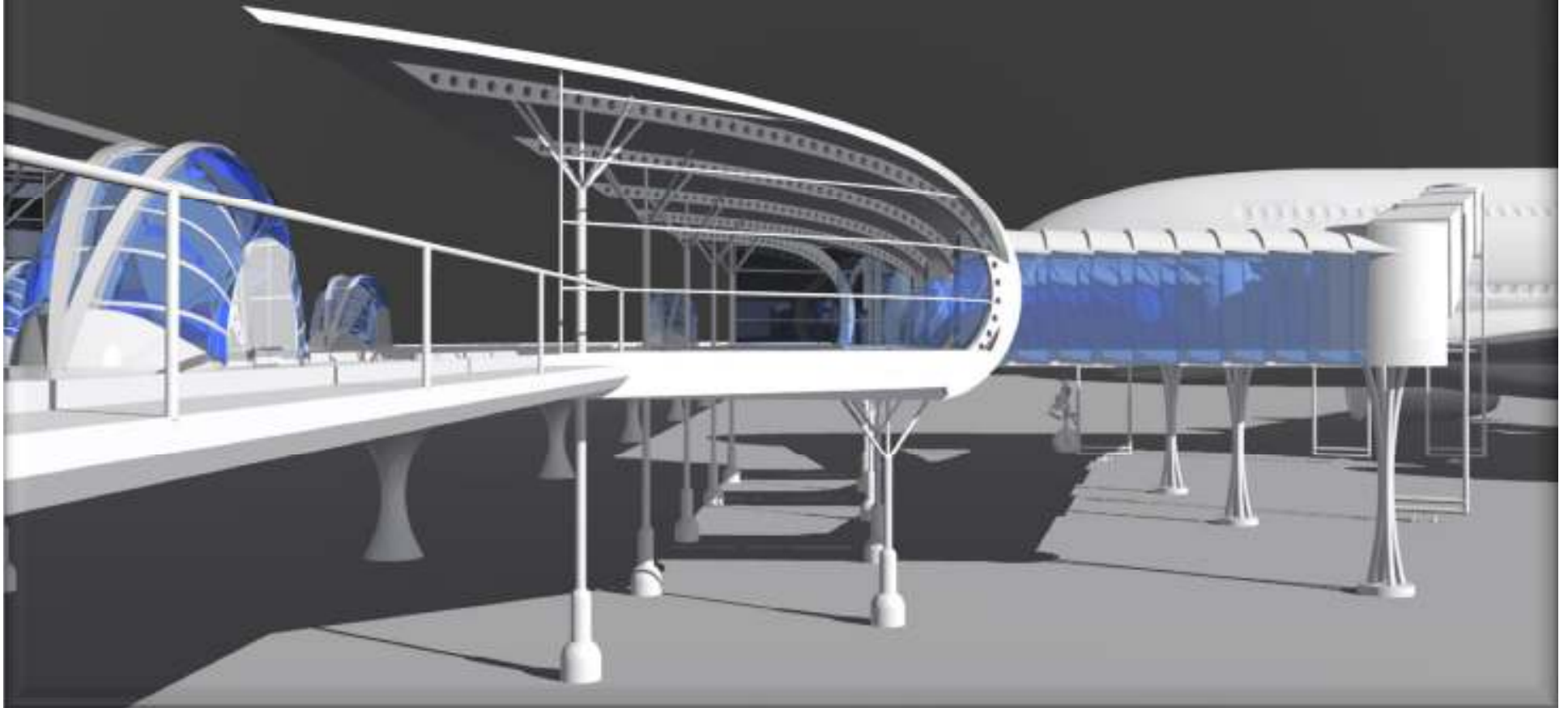
Patent Pending

Aircraft Boarding Station



Patent Pending

Aircraft Boarding Station



- Aircraft boarding station connects guideways to boarding bridges
- Covered boarding station (enclosed as required)

Patent Pending

Aircraft Boarding Station



Patent Pending

- **A380 offloading (550 passengers in 12 minutes)**
 - Dwell time 30 seconds per PRT vehicle
 - 4 passengers per vehicle
 - 96 passengers per vehicle docking bay per 12 minutes
 - 6 bays needed (up to 9 bays available) – 6 bays x 96 passengers = 576 (offloaded in 12 minutes)

- Up to nine PRT bays
- Or three bays for 12 passenger GRT¹
- Smaller stations for
 - Smaller aircraft
 - Situations with quick loading enabled by all passengers having common destination
- Nearby staging of vehicles

¹Group rapid transit (GRT) is a larger vehicle operating on the same guideway

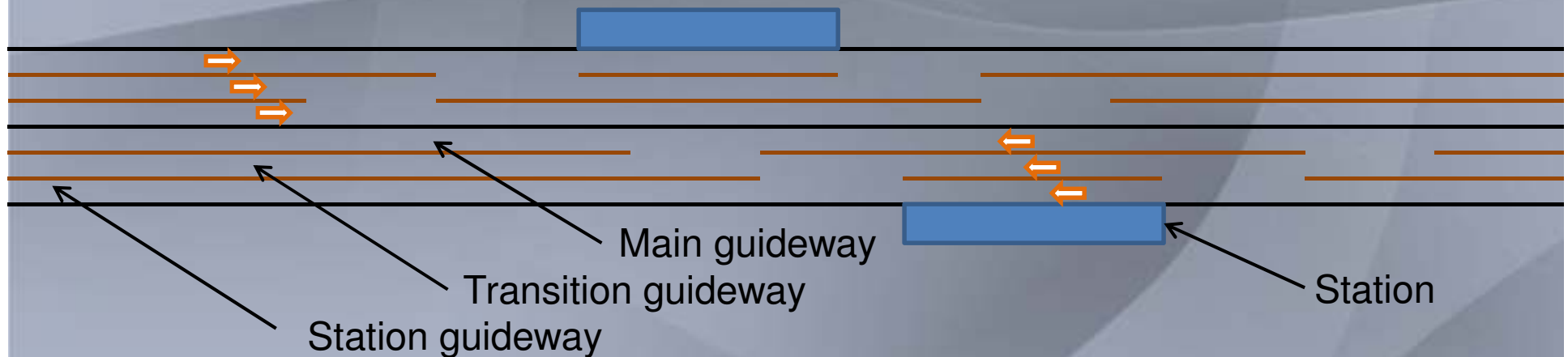


Guideway Capacity Options

- **3 Simultaneous A380s offloading (1,650 passengers in 15 minutes)**
 - 4 passengers per PRT vehicle
 - 412 vehicles in 15 minutes
 - 2.2 second headway required
 - 2.0 second headway possible at 10 mph
- **Or**
 - 12 passengers in 3 platooned PRT vehicles
 - 138 platoons in 15 minutes
 - 6.5 second headway (4 seconds possible)
- **Or**
 - 12 passengers in GRT vehicle at 6.5 second headway
 - 138 GRT vehicles in 15 minutes

Guideway Design

- Triple guideway in each direction
 - 10 mph main through guideway (higher speeds away from station areas)
 - 5 mph transition guideway with vehicle storage
 - 5 mph station guideway with vehicle storage



- **Cost savings result from**
 - **Terminal size reduced**
 - Ticketing area significantly reduced
 - Security waiting area eliminated
 - Circulation area reduced
 - Hold rooms consolidated & reduced
 - **Ramp area reduced**
- **Savings more than offset costs of**
 - PRT system integration
 - Increased concession area
- **Net result is $\pm 25\%$ capital cost savings**

Operating Costs

- **Cost savings result from**
 - Reduced building O&M costs
- **Savings more than offset costs of**
 - PRT system O&M costs
- **Net result is $\pm 30\%$ operating cost savings**
- **Additional benefit**
 - Increased concession revenues



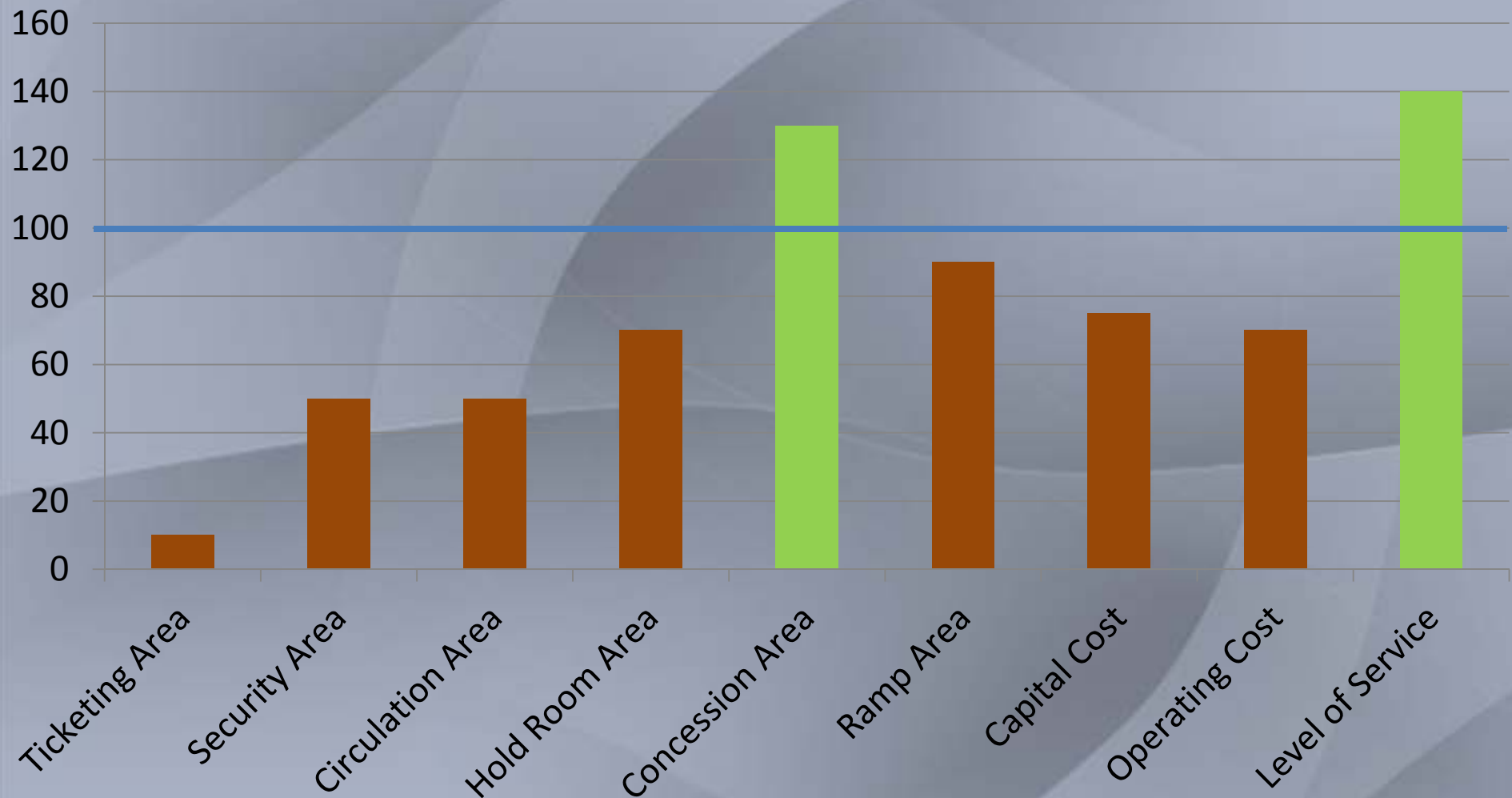
Level of Service Improvements



- **Greatly reduced walking distances & times**
- **Seated transit & waiting**
- **Reduced traveler uncertainty**
- **Enhanced security**
- **Easier way-finding**
- **Expanded concessions**
- **A pleasant airport experience**

Optimization Opportunities

Percent of Conventional Terminal/Concourse



- Each airport application is different
- Detailed simulation and design of each specific application is required

- **PRT is available now**
- **Enables improved service at lower cost**
- **Enables improved security at lower cost**
- **Can eliminate unscreened people and bags from public buildings**
- **Improves revenue opportunities**
- **Retrofitting existing facilities may be possible**
- **Puts joy back in air travel**

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