

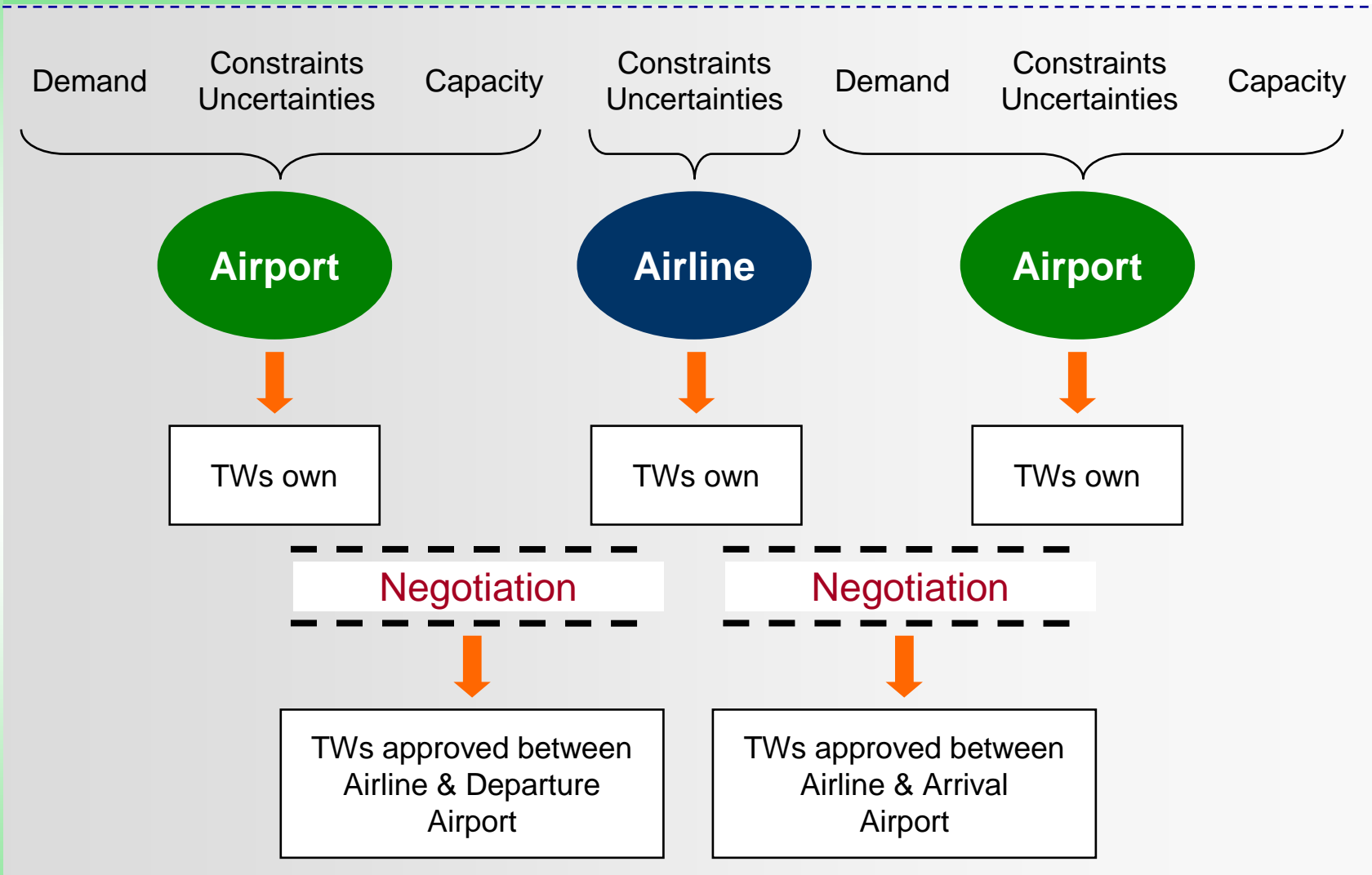


CATS Workshop

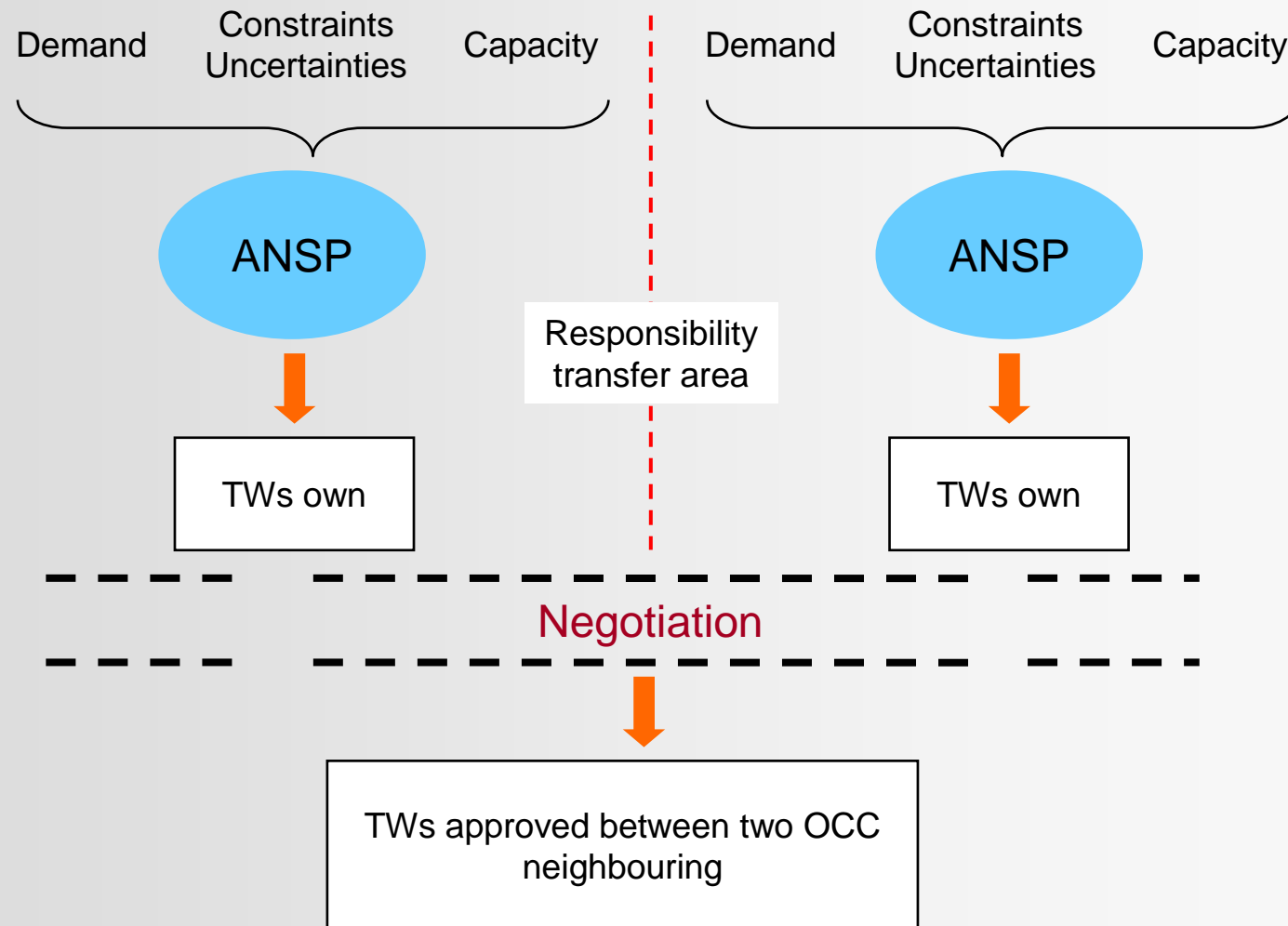
Target Windows modelling

Ion Berechet
Air France Consulting

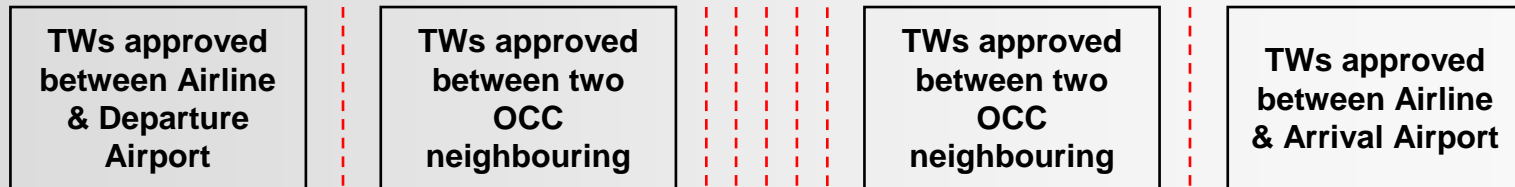
Cooperation between local organizations through TWs



Cooperation between local organizations through TWs



Global consolidation of TWs



Integration of known disruptions

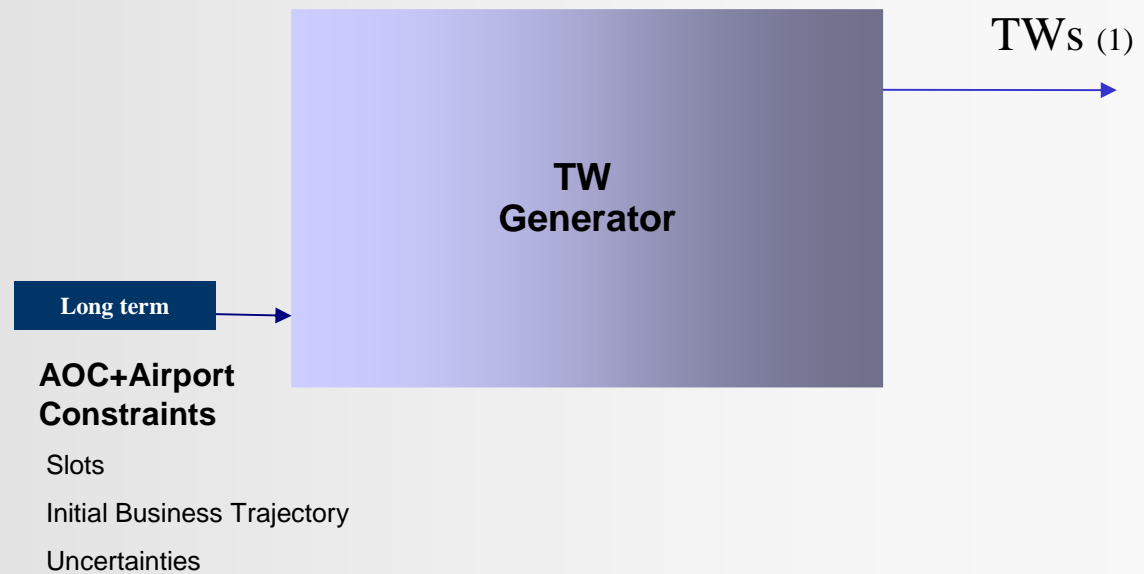
Negotiation



TWs approved by all actors

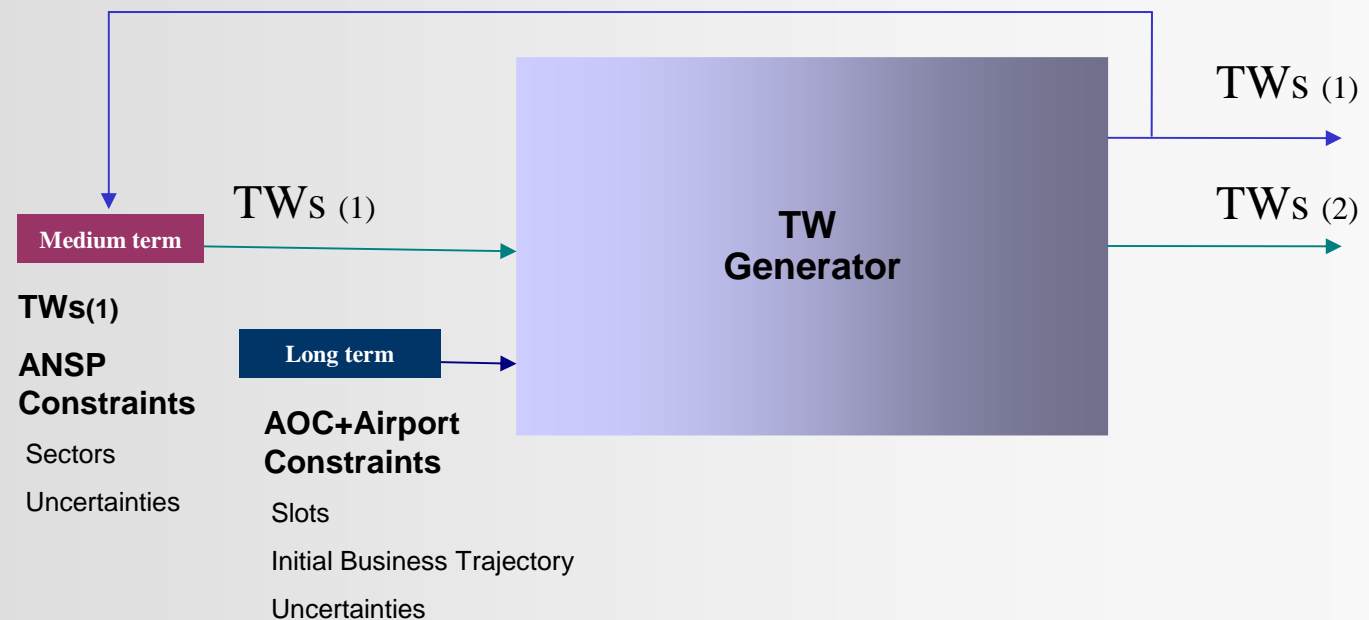
Iterative process for TW generation

Long term



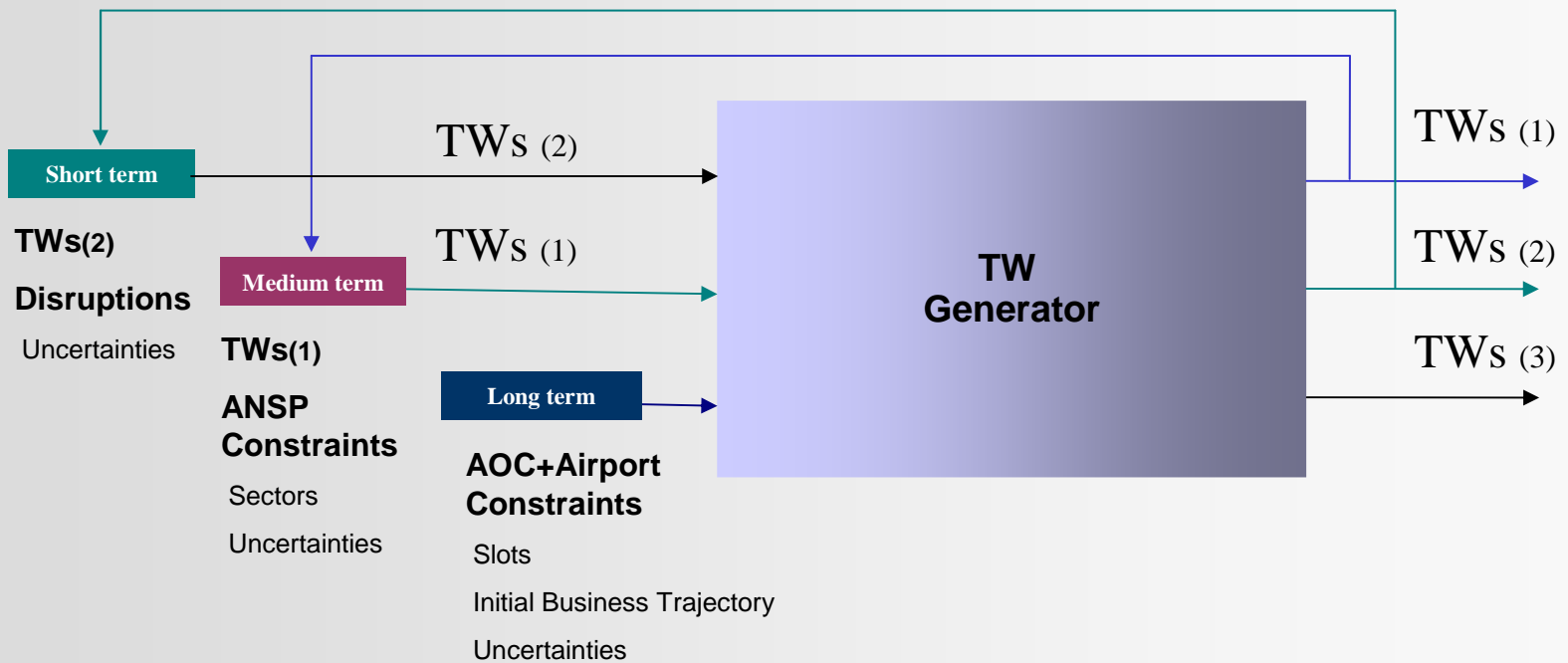
Iterative process for TW generation

Medium term

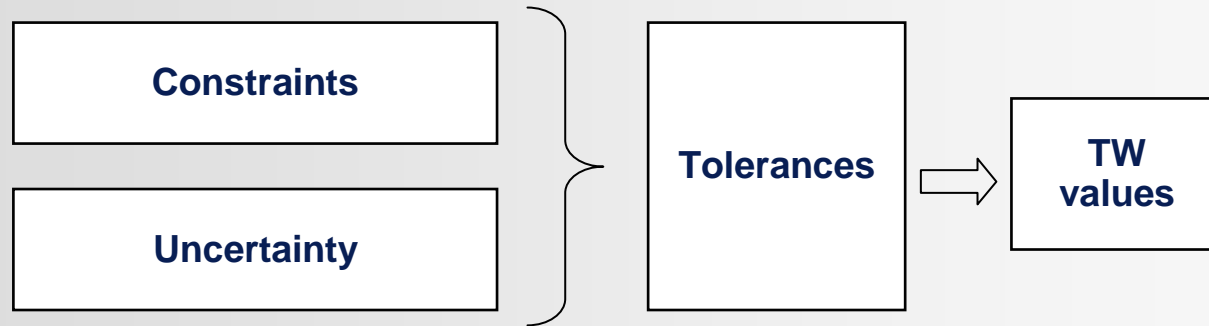


Iterative process for TW generation

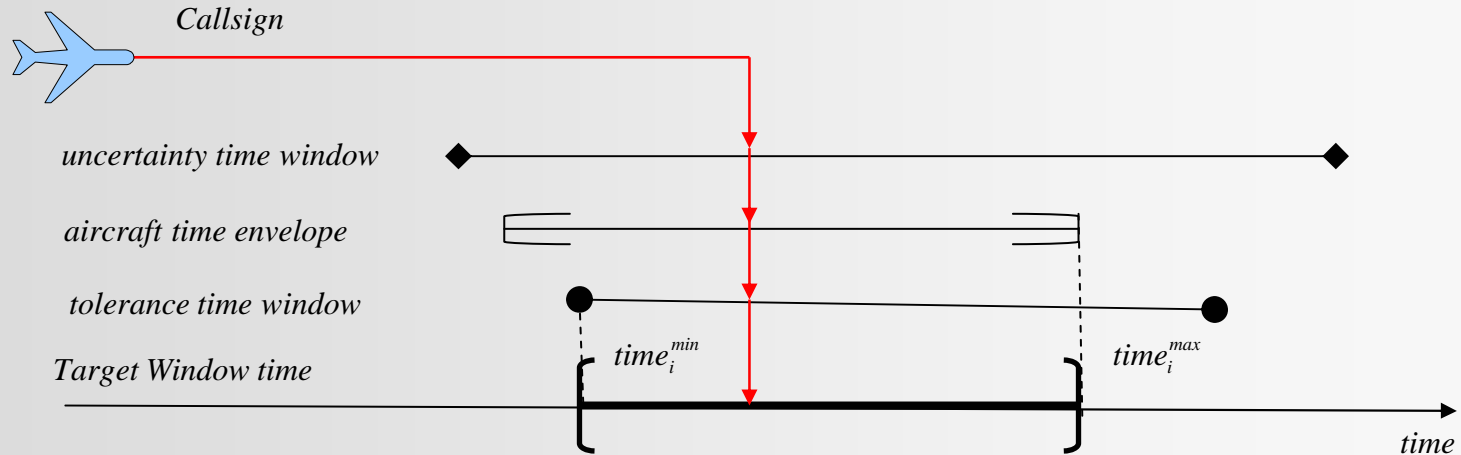
Short term



Basic principles of TW calculation

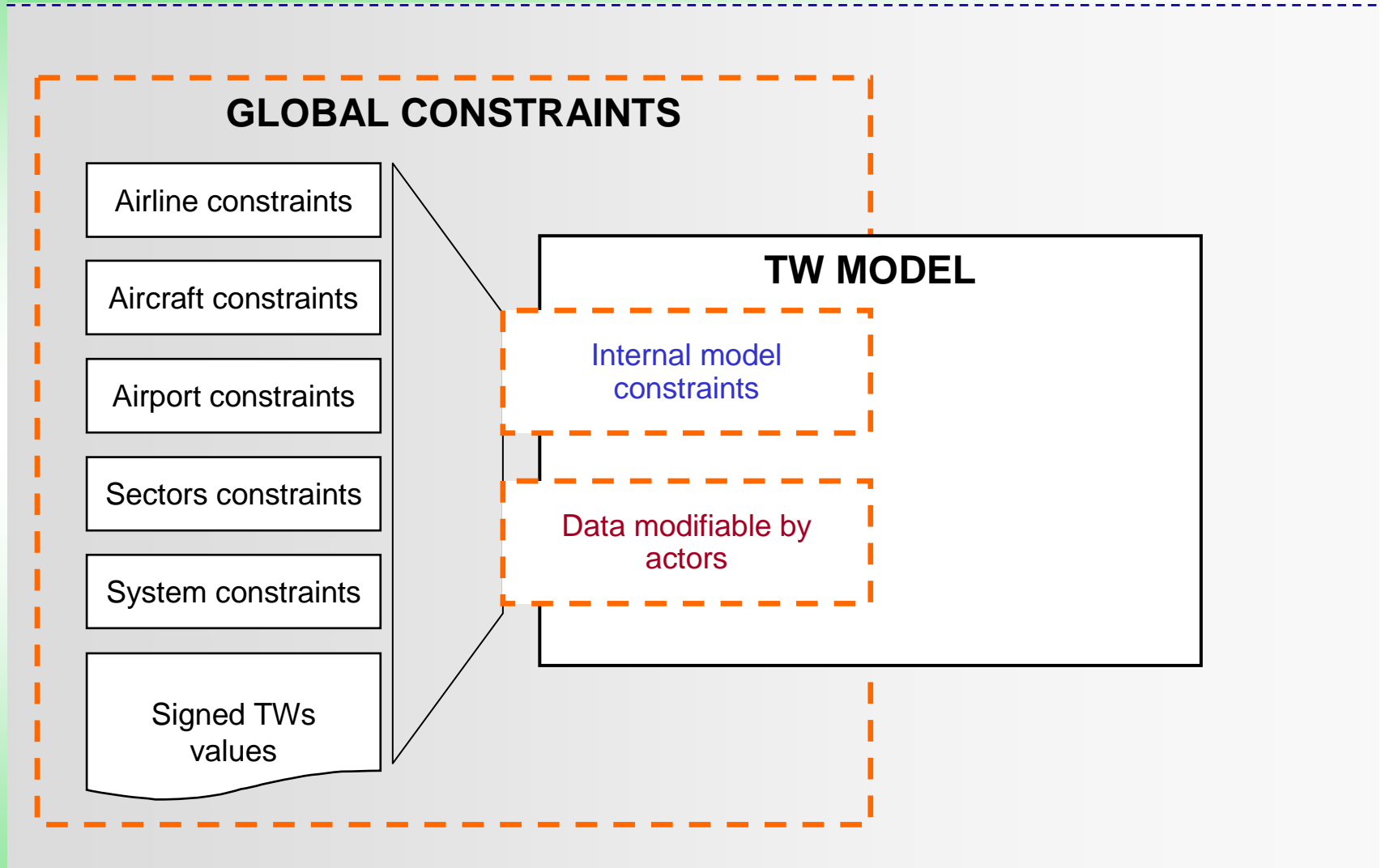


Example



$$\begin{aligned} \min_time \text{ Target Window} &= \max\{\min(\text{time_acceptance},), \min(\text{aircraft_time_envelope})\} \\ \max_time \text{ Target Window} &= \min\{\max(\text{time_acceptance}), \max(\text{aircraft_time_envelope})\} \end{aligned}$$

Constraints for TW model



Global constraints for TW model (1)



- Airline constraints
 - Departure and Arrival time
 - Ideal of arrival hour H-15 min to H+5 min
 - Linked to rotations and passengers transit (other flight)
 - List of waypoints from Aircraft route
 - Speed and Flight level values at some waypoints
 - optimum profile
 - not hard constraint
 - Destination airport (if change)
- Airport constraints
 - Departure and arrival capacity
 - Meteorological constraints → reduced capacity
 - Infrastructure constraints → reduced capacity
 - TTA (for SESAR, out of AMAN horizon)
 - Geoposition (lat/long)

Global constraints for TW model (3)



■ Sector constraints

- Capacity
- Environmental constraints
 - meteorological constraints → interval time restriction / area
 - military area constraints → interval time restriction / area
- Paired level constraint
 - Odd FL constraint
 - Even FL constraint
- Altitude limits
 - lower altitude of sector in feet
 - upper altitude of sector in feet
- Boundary points geo position (lat/long)
- Sector boundary constraints / TW
 - No SUP TW near X nm from boundary sector (proposed X = 10 nm)
 - No SUP TW near X nm of crossing points

Global constraints for TW model (1)



■ Aircraft constraints

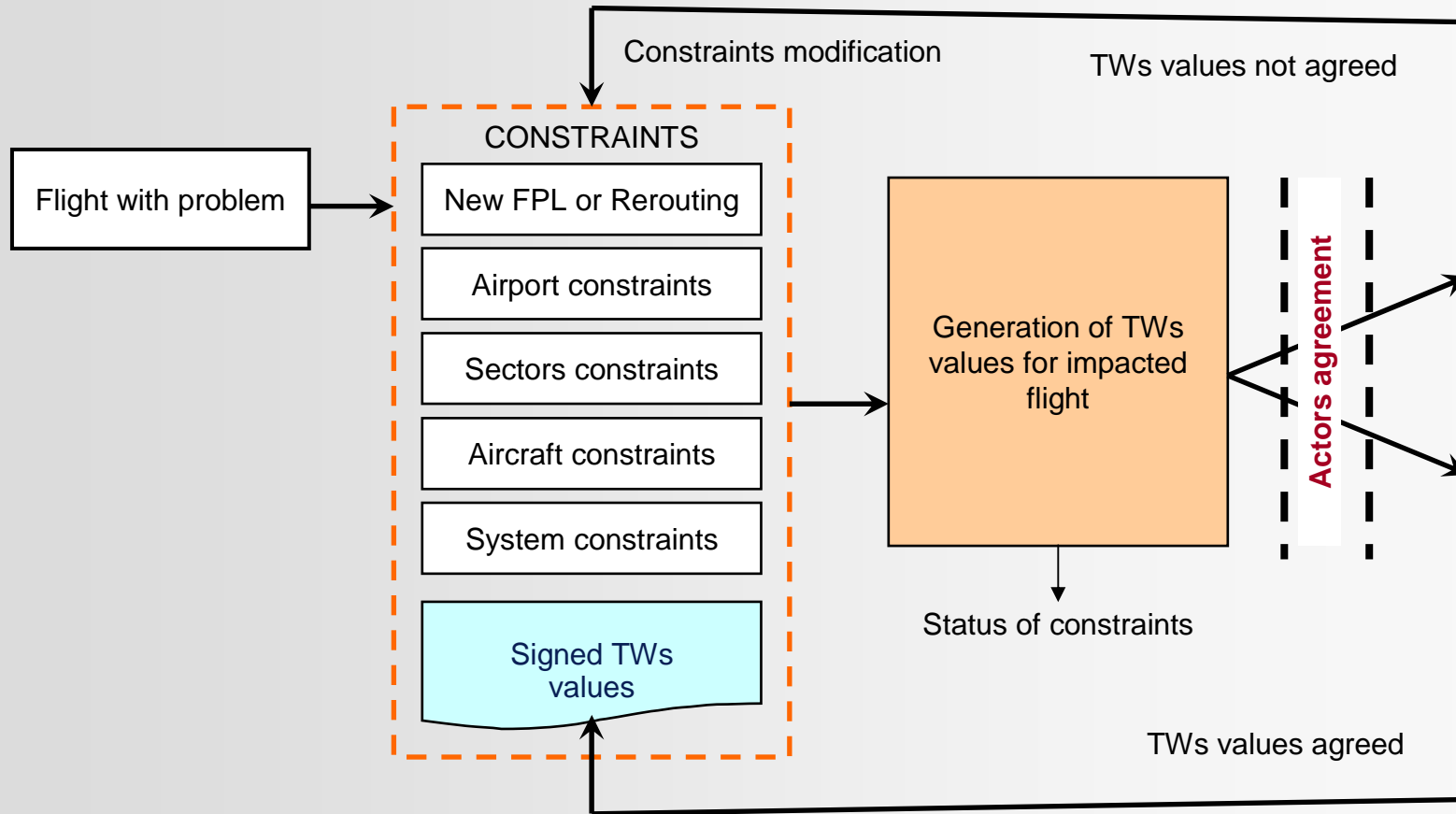
- Aircraft envelop data in normal conditions
 - MinOperational speeds (CAS, TAS and MACH) / FL
 - MaxOperational speeds (CAS, TAS and MACH) /FL
- Aircraft Performance data in normal conditions
 - maximum altitude
 - rate of climb (ROC)
 - rate of descent (ROD)
- Aircraft failure
 - max speed of the aircraft
 - max FL of the aircraft

■ System constraints

- The safety issues, regarding the number of TW overlapping at the same time, same area, same FL...
 - Minima Separation TWs constraints
- Signed TWs values for other flights

TW modelling for the renegotiation phase

Dynamic constraints integration



Next steps



- Description of global TW model
- Integration of dynamic constraints in automatic TW generator which will be used for HIL3

Thanks for your attention !