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Traffic Synchronisation

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INTRODUCTION: Traffic Synchronization

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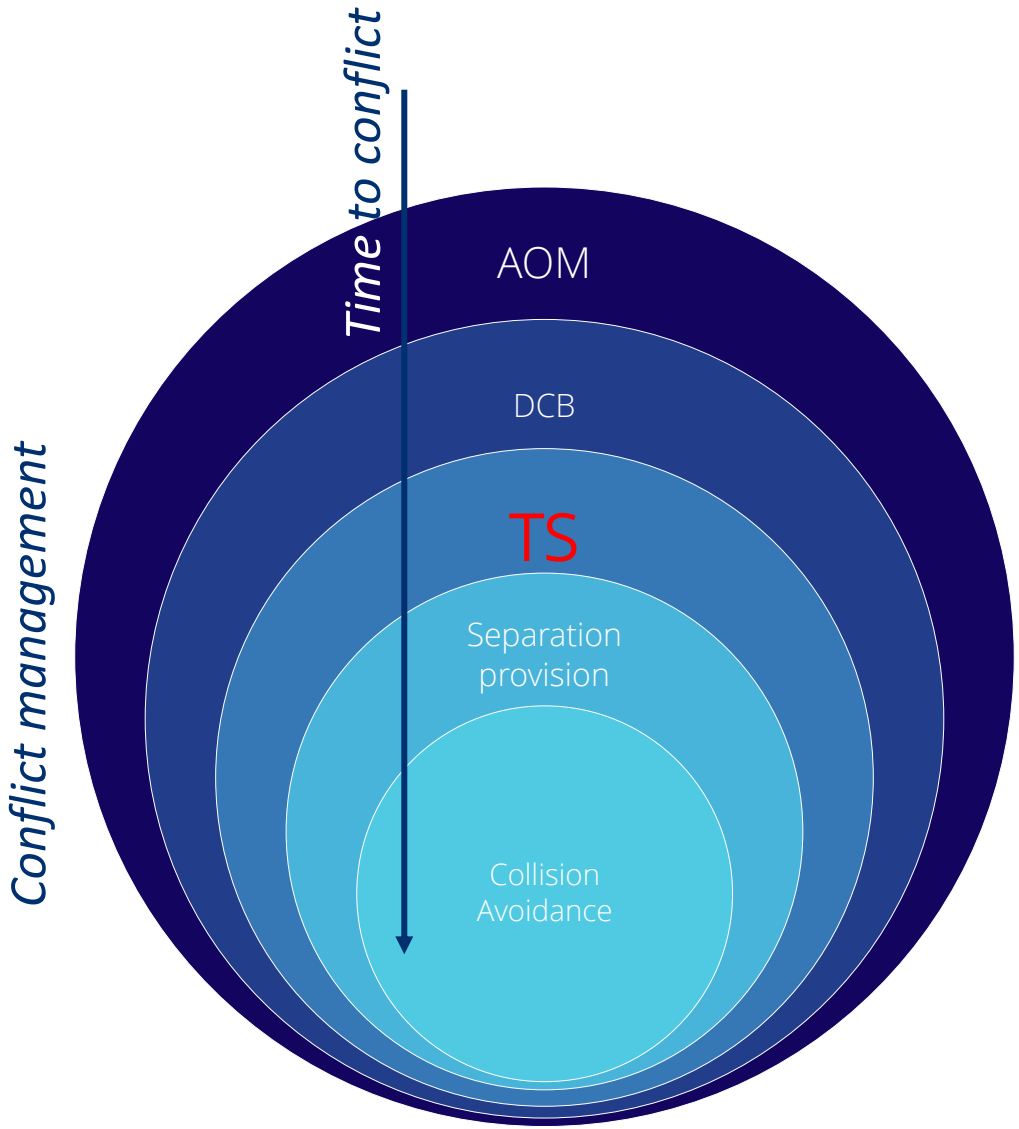

Definition Global Air Traffic Management Operational Concept

Traffic synchronisation refers to the tactical establishment of a safely, orderly and efficient flow of air traffic.

Traffic synchronisation, conflict management and demand and capacity balancing are interrelated and will become fully integrated, leading to a continuous and organised flow of traffic.

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Traffic Synchronization is like solving a packing puzzle

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Note: throughout these slides we will continuously attempt to represent a four-dimensional problem using two-dimensional means, with varying degrees of success

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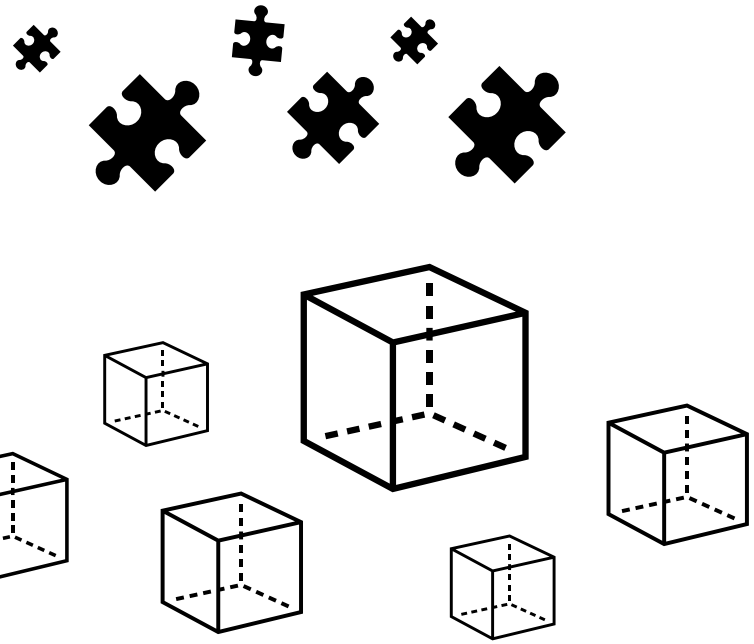
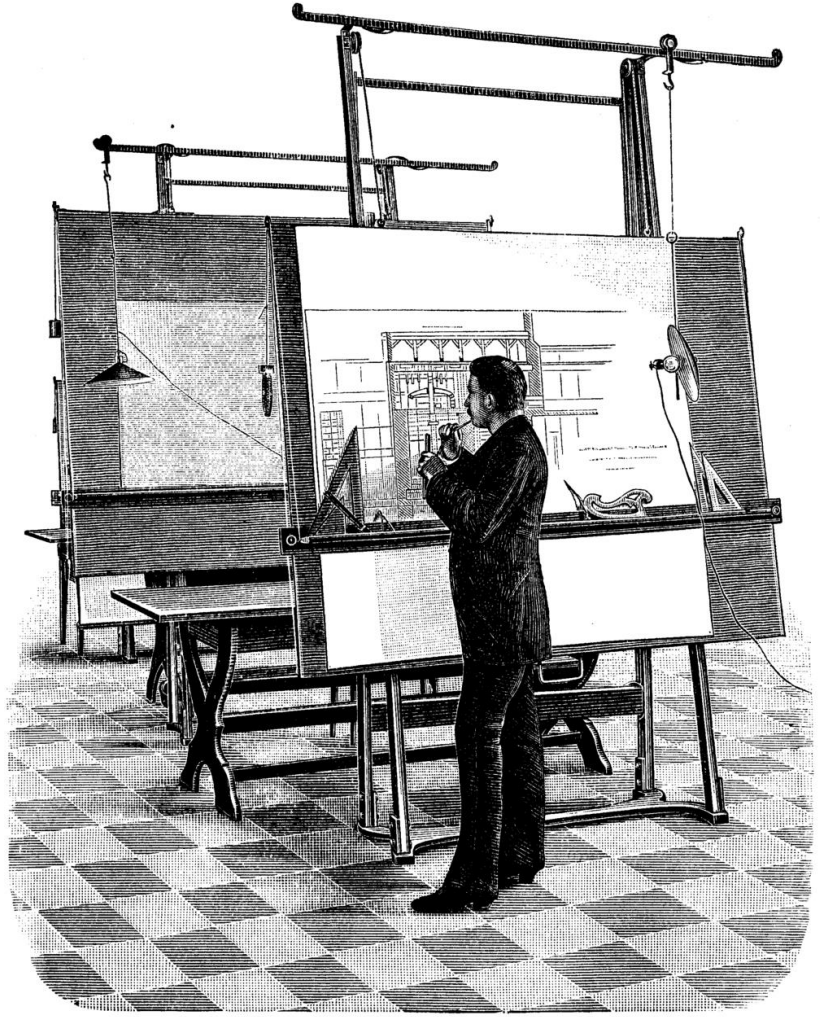
AOM is the game designer

- Defines the boxes (i.e. airspace structure)
- Describes how pieces can be (i.e. applicable rules)





- It’s a dynamic process (boxes can change!)

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Airspace users are the manufacturing machines

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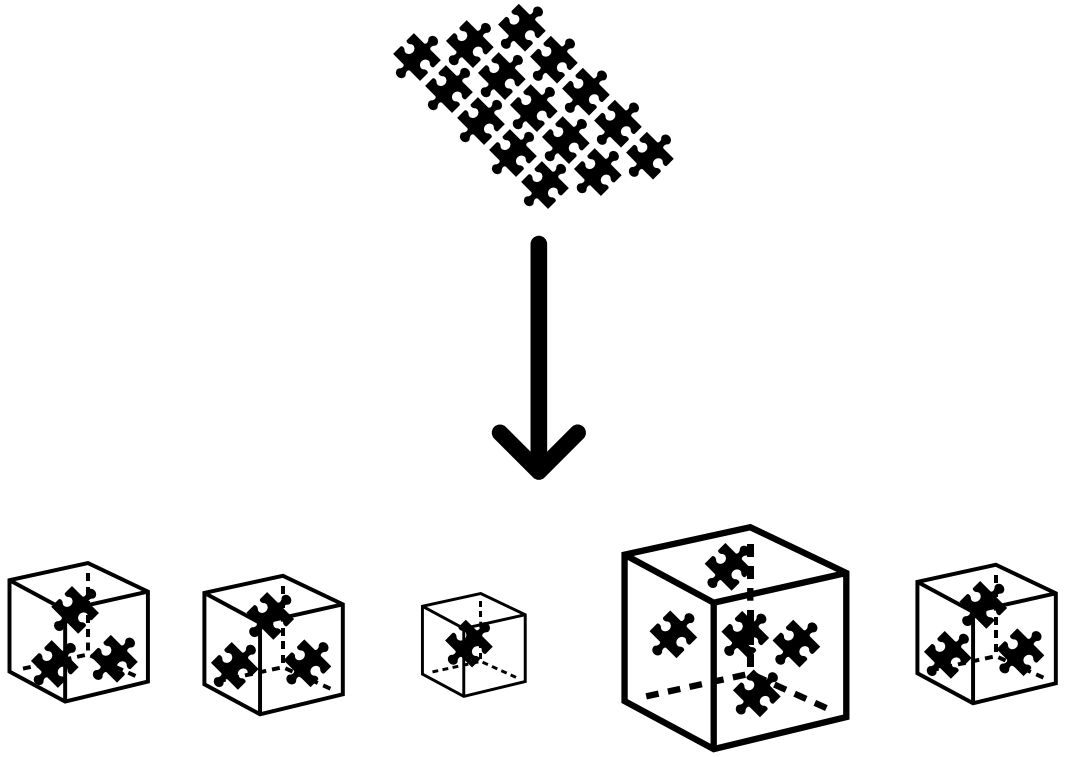
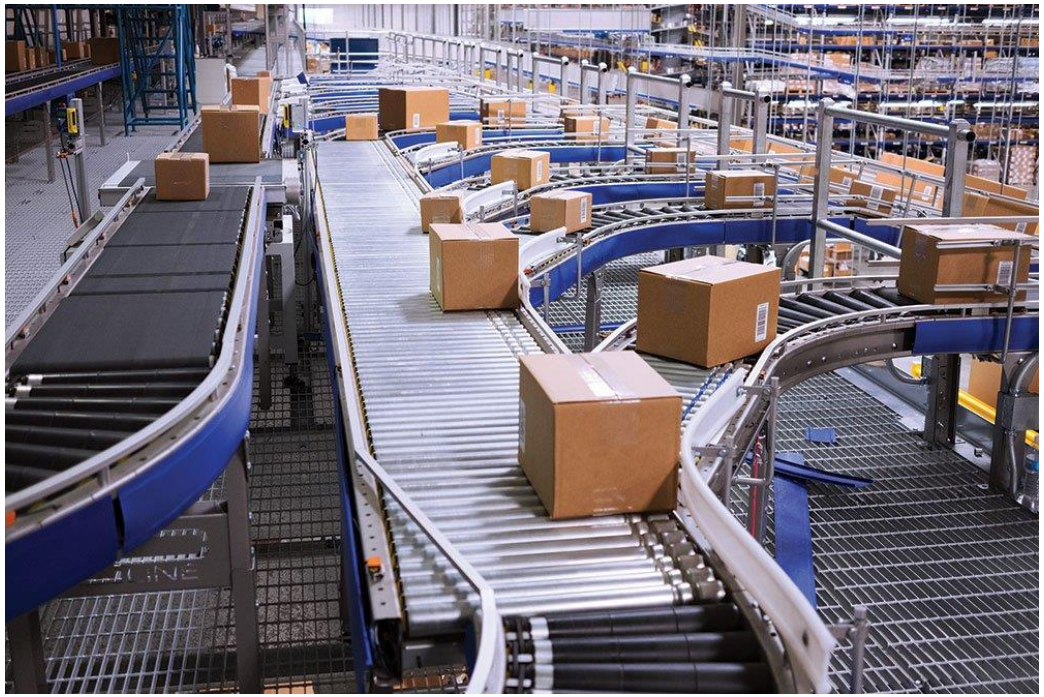
- Create the pieces (i.e. airspace demand) according to dynamic needs and established rules

DCB are the sorting belts

- Distribute demand in the available airspace
- Make more space available when needed





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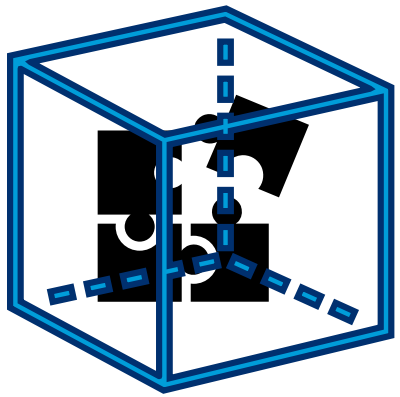
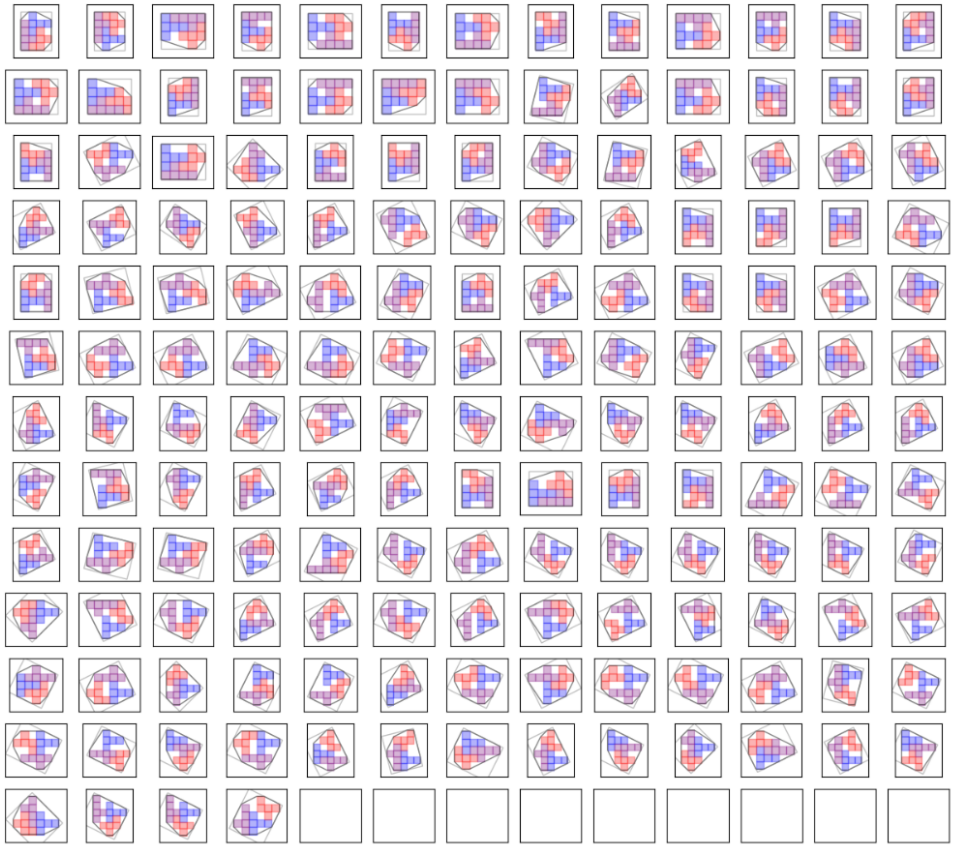
TS is the person attempting to solve the puzzles

- TS finds the proper way to arrange the pieces into each box



Each box is in 4D!



- DCB is in place to ensure the puzzle can be solved!

TS in the short term horizon

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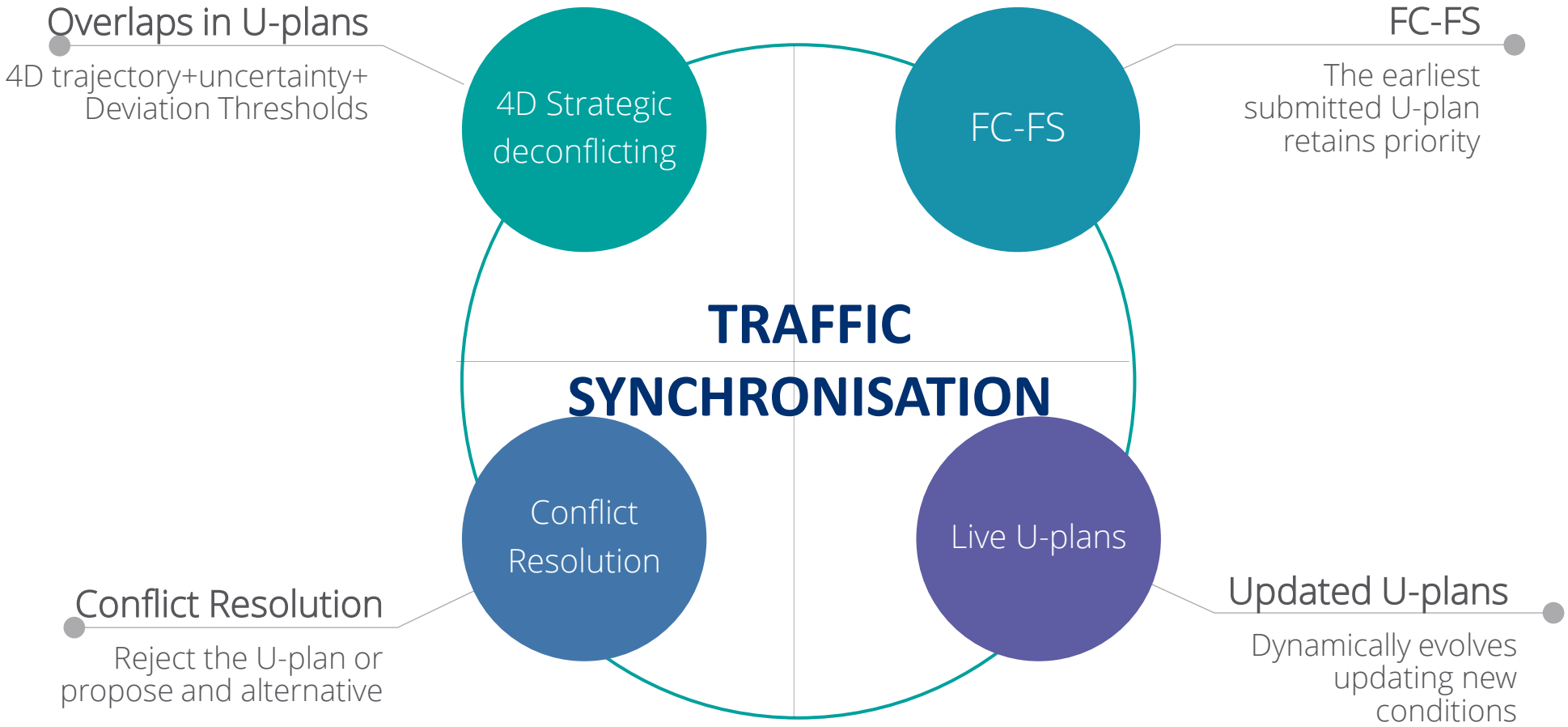

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TS in the short term horizon

4D Strategic deconflicting

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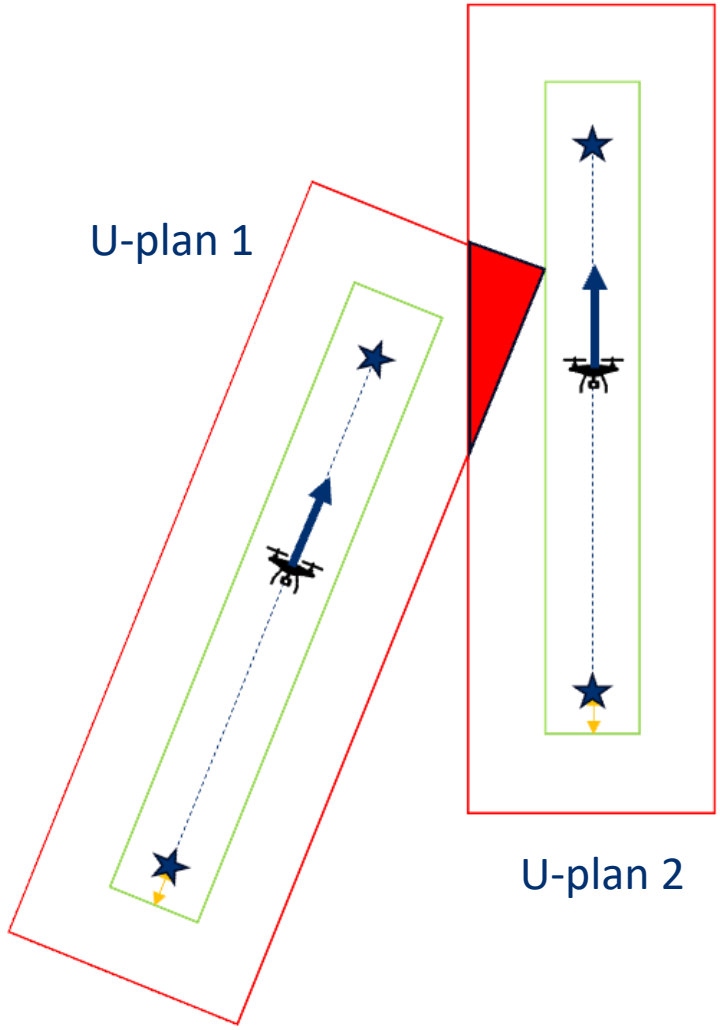
- Traffic synchronization is materialised via the strategic deconfliction of U-plans.

- To do so, the UAS flight authorisation service checks for overlaps between U-plans

- U-plan is composed of:
  - Intended flight trajectory
  - Uncertainties (e.g. TSE)
  - Deviation Threshold



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4D Strategic deconflicting

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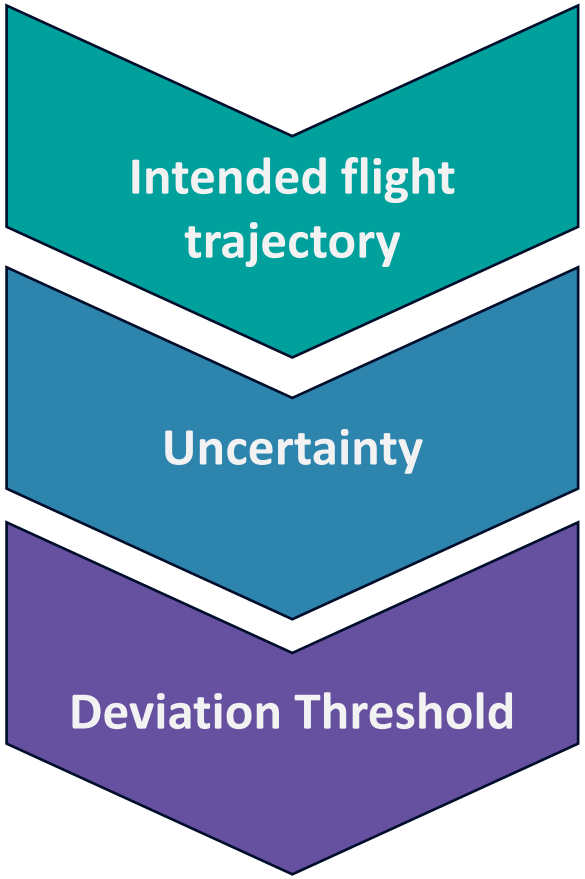
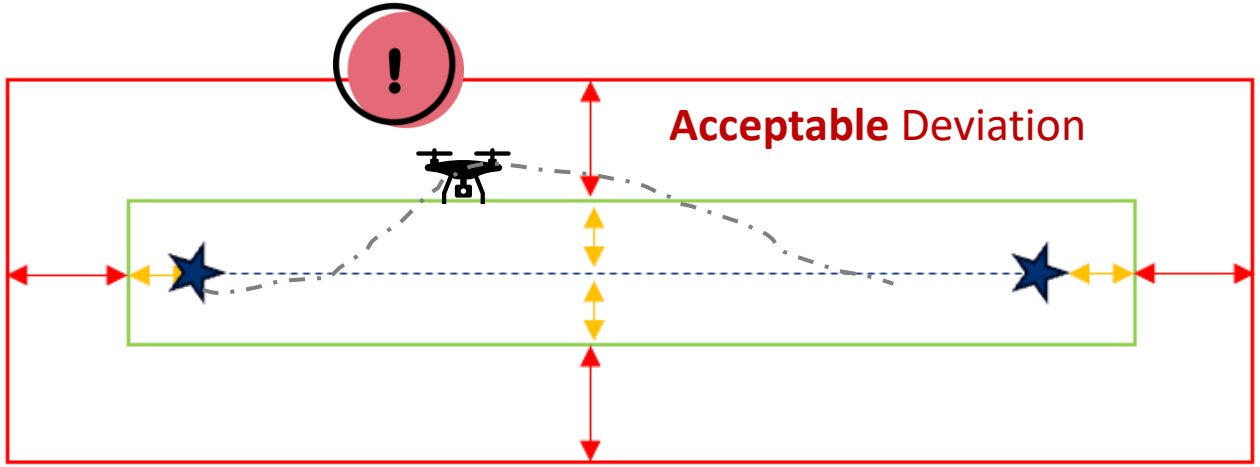


The **intended flight trajectory** is the path expected to be flown by the autopilot (or remote pilot) based on the definition of the trajectory according to the mission objectives

Every mission inherently involves both spatial and temporal uncertainty

Deviation thresholds define the acceptable deviation from a planned intent defined by a UAS operator (the 4D trajectory defined in the UAS flight authorisation request).



The plan can be expressed using an arbitrary number of 4D volumes.

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TS in the short term horizon

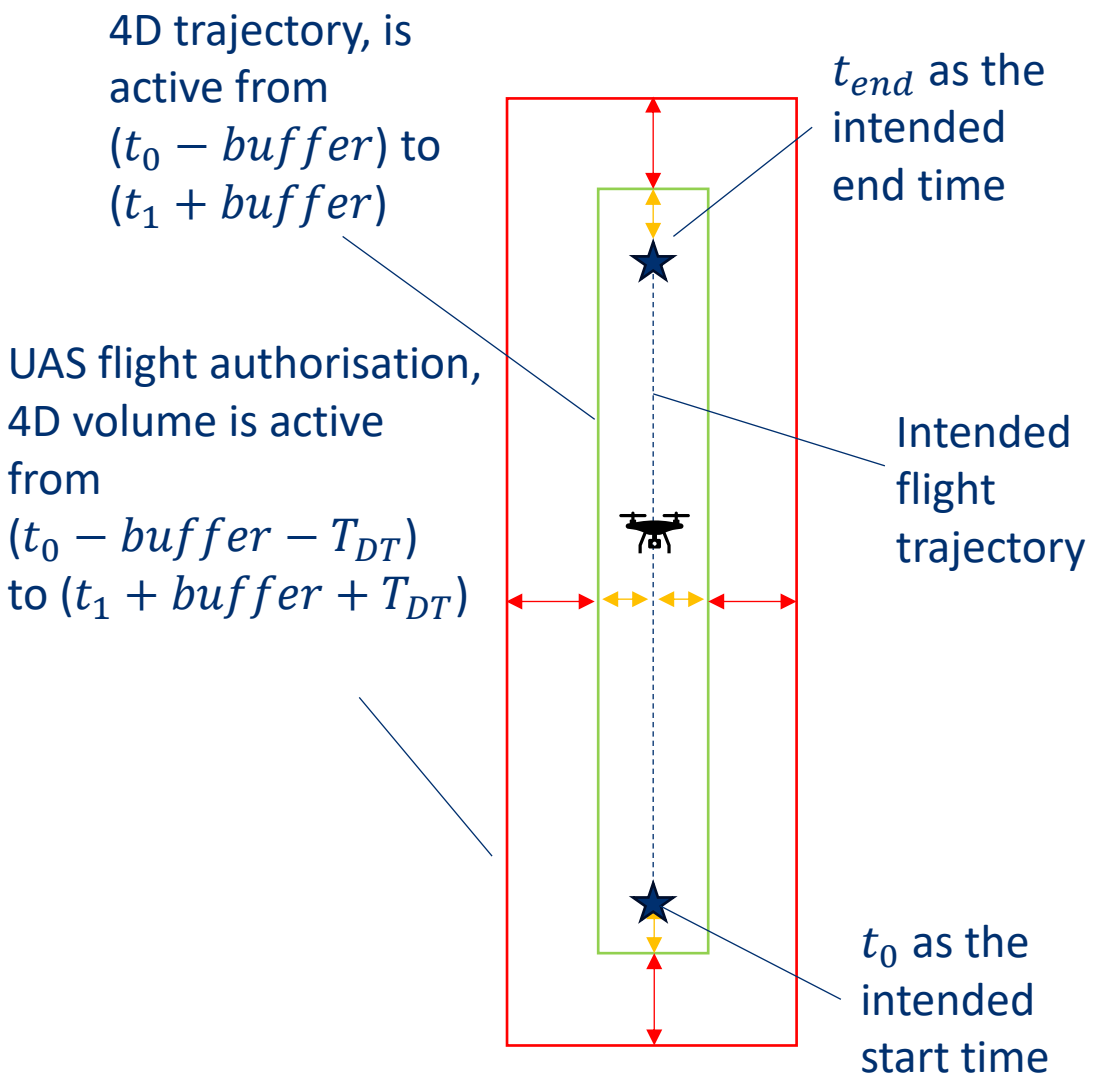
1. UAS operator defines the intended flight trajectory/area according to the mission targets. As many 4D waypoints/segments as required.

2. UAS operator defines the 4D trajectory (in Specific category, equivalent to the flight geography)

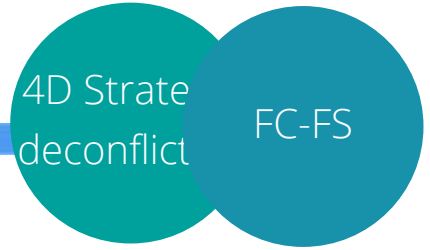
3. USSP adds the deviation thresholds to the 4D trajectory to create the UAS flight authorisation

4. USSP checks if the UAS flight authorisation is free of conflict with already authorised flights* * Of equal or higher priority

5. If there is no conflict, USSP accepts the flight authorisation request and notifies the UAS operator, indicating the allowed deviation thresholds



TS in the short term horizon



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- First-come, first-served (FC-FS) principle, whereby the earliest submitted U-plan retains priority in case of a conflict.

- Special UAS operations may have higher priority than regular operations and may be accepted even when they conflict with previously submitted U-plans, meaning that the latter must then be amended or withdrawn.

- A binary priority scheme might evolve in the future into more sophisticated processes with multiple priority levels.

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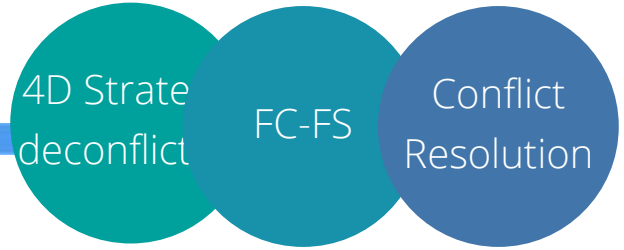
TS in the short term horizon



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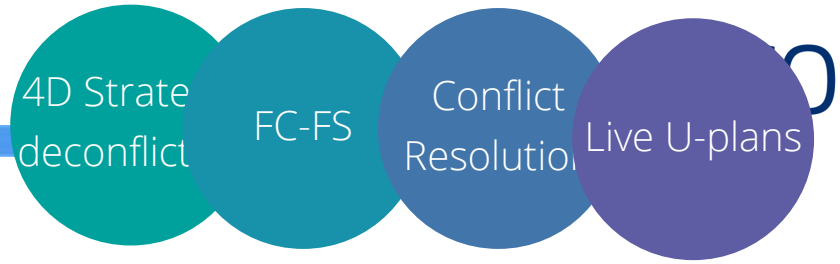
- Conflict resolution remains optional in the STH. USSPs can just reject the U-plan request
- EU 2021/664. Article 10(2)(b): USSP check … that the UAS flight authorisation request is free of intersection in space and time with any other notified UAS flight authorisations …
- EU 2021/664. Article 10(6): “proper arrangements to resolve conflicting UAS flight authorisation requests received from UAS operators by different U-space service providers”
- It is expected that within STH, delay will be applied to 4D volumes
- A seemingly simple alternative, such as modifying the trajectory, would alter the mission volumes and could potentially affect its assigned SAIL

TS is the short term horizon



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- Traffic synchronisation covers both the **establishment** and the **maintenance** of a safe and expedient flow of traffic.
- Additional mechanisms are put in place to ensure that the U-plan is updated whenever the conditions require. For example, in case of dynamic airspace restrictions or in contingency situations.
- USSPs must continually check accepted and active U-plans against dynamic changes to ensure they remain free of conflict with airspace restrictions and potential new high-priority operations and must take the necessary action to amend or withdraw conflicting U-plans, coordinating with UAS operators as necessary.

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