

Ground and Air Considerations for Urban Air Mobility Passenger Transport Operations

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How can Urban Air Mobility be operated?

From Vertidrome...

PAW-Layout for low to medium traffic densities [1]



Linear-Expandable-Drive-Through (LIEDT) layout for high-density traffic densities [2]



... To Urban Airspace

Slot based Approach (SBA)



Trajectory based Approach (TBA)



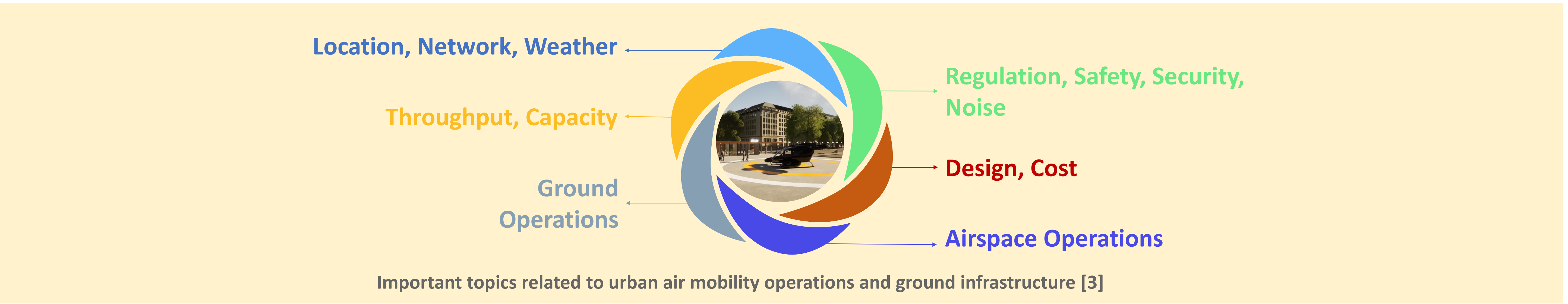
Corridor based Approach (CBA)



Methodic segmentation into building blocks, based on characteristics of each concept



What needs to be considered?



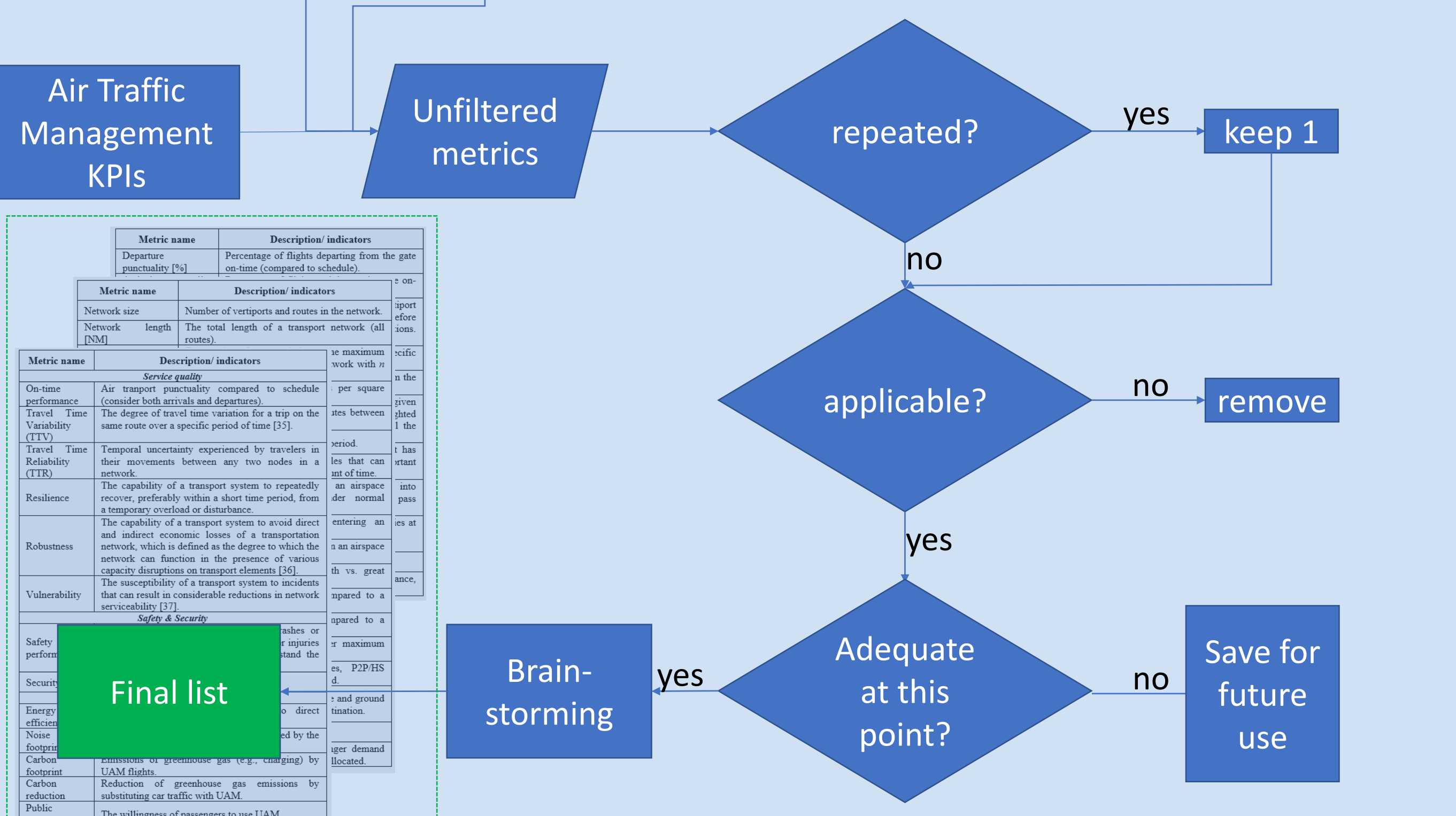
How to evaluate the proposed concepts?

Vertidrome Airside Level of Service (VALoS) evaluation concept

Vertirdome Airside Level of Service				Requirements				
				PAX	eVTOL	Vertidrome (Punctuality)		
Stakeholders	Vertidrome Operator	eVTOL Operator	PAX	Acceptable	$\emptyset d_{PAX}$	$t_{AFT} - t_{NFT}$	$\geq 95\%$ flights d_{TF}	Metric
					≤ 2 Minutes	≤ 5 Minutes	≤ 2.5 Minutes	Objective
				Non-Acceptable	$\emptyset d_{PAX}$	$t_{AFT} - t_{NFT}$	$< 95\%$ flights d_{TF}	Metric
					> 2 Minutes	> 5 Minutes	≤ 2.5 Minutes	Objective

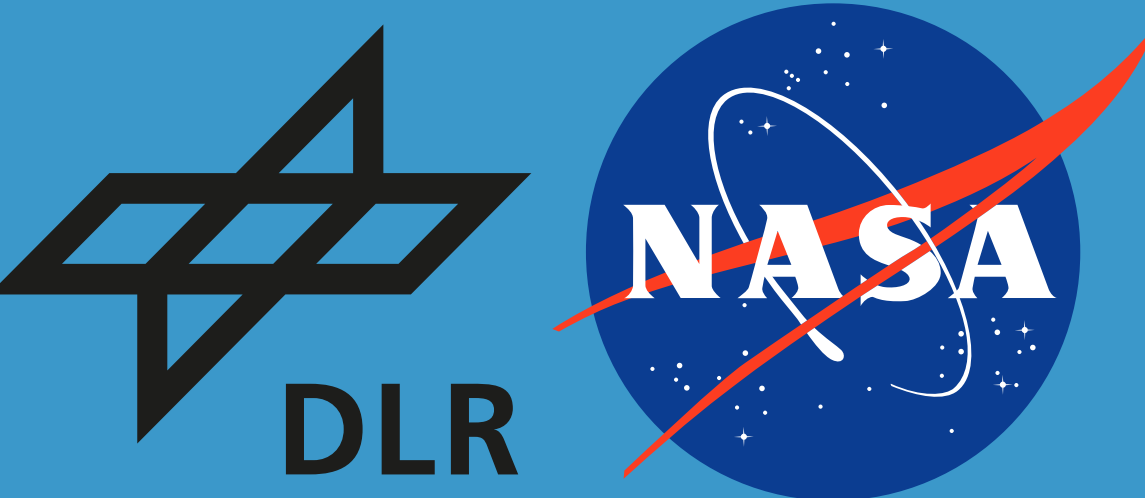
Vertidrome airside level of service (VALoS) evaluation concept for the key stakeholders vertidrome operator, eVTOL operator and passenger. d=Delay, t=Time, AFT = actual flight time, NFT= nominal flight time, TF = total flight time, PAX = passenger [4]

Methodic approach of collecting performance metrics from different domains and application on UAM



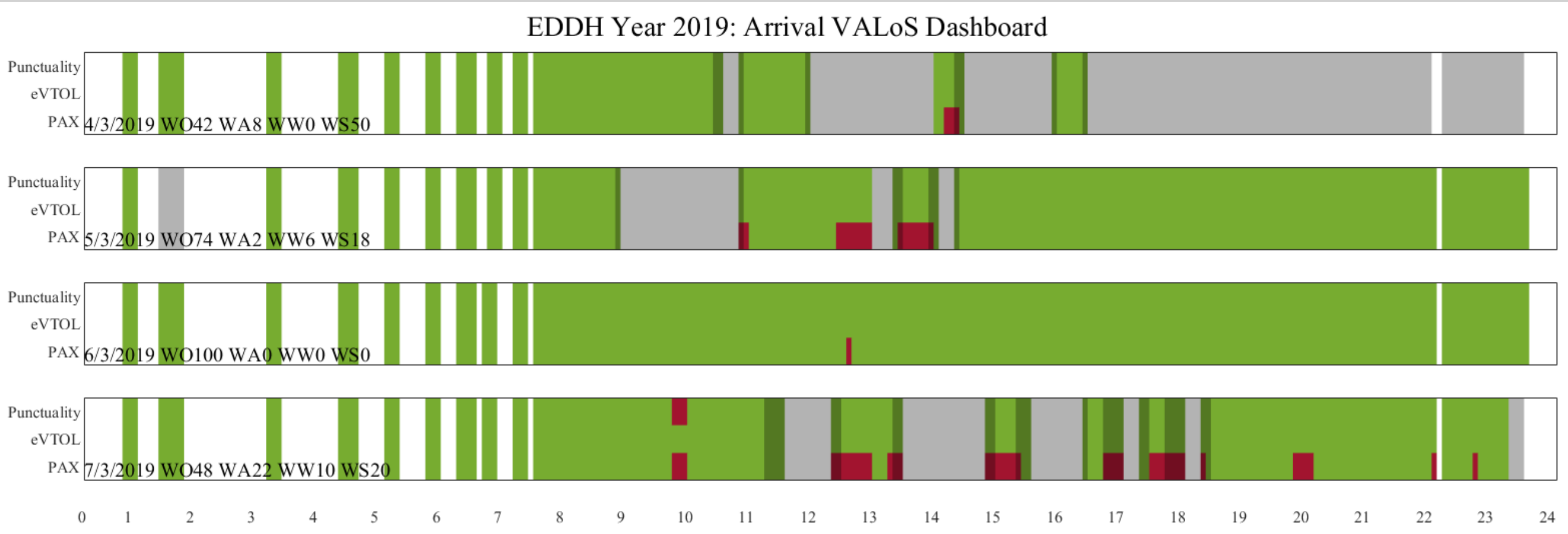
Methodic approach of collecting performance metrics from different domains and application on UAM

International Cooperation: ATM-X



- Concepts and metrics
- Legislations
- Joint Publications
- Regular exchange meetings
- 5 year collaboration plan (2020-2025)

4-Day VALoS Dashboard for March 4-7, 2019 for a vertiport located at Hamburg Airport under wind and gust constraints. Grey equals cancellations [5]



[1] S. Leib, "Ausarbeitung und Implementierung eines UAM Vertiport Layout Designs mit zugehörigem Betriebskonzept in eine Vertiportsimulation," Bachelorthesis, Technical University of Applied Sciences Würzburg-Schweinfurt.

[2] K. Schweiger, F. Knabe, and B. Korn, "An exemplary definition of a vertidrome's airside concept of operations," Aerospace Science and Technology, Oct. 2021, doi: 10.1016/j.ast.2021.107144.

[3] K. Schweiger and L. Preis, "Urban Air Mobility: Systematic Review of Scientific Publications and Regulations for Vertiport Design and Operations," Drones, vol. 6, no. 7, p. 179, Jul. 2022, doi: 10.3390/drones6070179.

[4] K. Schweiger, F. Knabe, and B. Korn, "Urban Air Mobility: Vertidrome Airside Level of Service Concept," in AIAA AVIATION 2021 FORUM, VIRTUAL EVENT: American Institute of Aeronautics and Astronautics, Aug. 2021. doi: 10.2514/6.2021-3201.

[5] K. Schweiger, R. Schmitz, and F. Knabe, "Evaluating the Impact of Wind on Urban Air Mobility eVTOL Operations: Implications for Vertiport Airside Traffic Flows," Manuscript submitted, Drones.