

Air Traffic Management & the Digital Airspace Twin



Daily flight operations are just a part of a modern ANSP. The overall process of safe & efficient airspace management, stakeholder engagement, technology modernization & training, procedure development make-up an incredibly complex and dynamic set of challenges. A digital airspace twin will not only help manage today's activity but lay the foundation for the dynamic airspace of tomorrow."

— **Alex Sauriol**, Flight Corp, alex@theflightcorp.com



Unity develops a world class real-time development & visualization platform. The Unity engine is at the heart of many digital twins, across multiple mission-critical industry verticals. The platform's ability to visualize complex environments and our approach towards open collaborative communities has led to one of the world's largest and fastest growing communities of creators."

— **Greg Melling**, Unity, greg.melling@unity3d.com

2022: The Flight Revolution

On any given day, there are over 100k commercial flight operations globally. Outside of the pandemic period, daily flights have remained relatively stable, generally growing by a few percentage points yearly. This is changing. The introduction and pace of investment in new aircraft including eVTOL, unmanned drones and lighter than air could see a more than 10x rise in commercial daily flight operations by the end of the decade.

This paper outlines the importance of digital airspace twin technology to help accelerate the safe introduction of new lower airspace management practices as well as improve the efficiency, sustainability and performance in traditional airspace.



What is a Digital Airspace Twin?

The implementation of a digital twin typically involves replicating the constituent parts of a complex system in a virtual environment. Digital twins are used today in everything from building maintenance to aircraft design and manufacturing. The value of digital twins for organizations ranges from improving productivity and performance to enhancing business outcomes; fundamentally, a digital twin provides an organization with a cohesive platform to manage complexity.

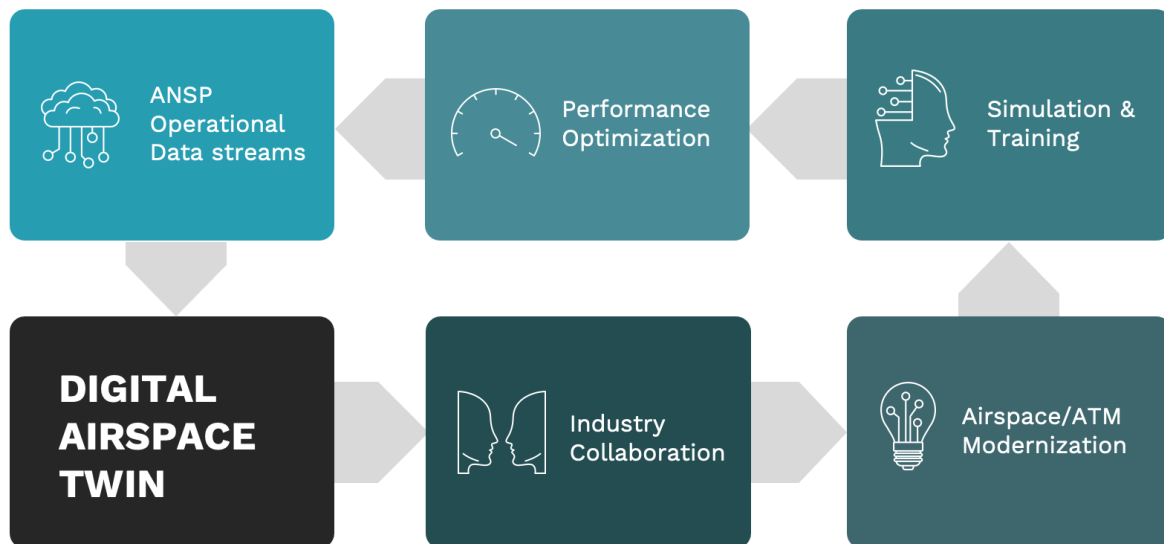
The air traffic management of national airspace is a highly complex and dynamic system. Each single flight operation is the tip of an iceberg that includes airspace design, control and management schemes, regulatory oversight, human in the loop separation and advisory and hundreds of different sub-systems and sensors. Each function has evolved and has been refined over several generations in collaboration with many different aviation stakeholders. For ANSPs, efficiently managing the day-to-day operations of today's flight volume can be a challenge – a future airspace with more than 10x the traffic and complexity can be a daunting prospect. For an ANSP, a digital airspace twin will not only help optimize today's operation but create an innovation platform for the airspace of tomorrow.



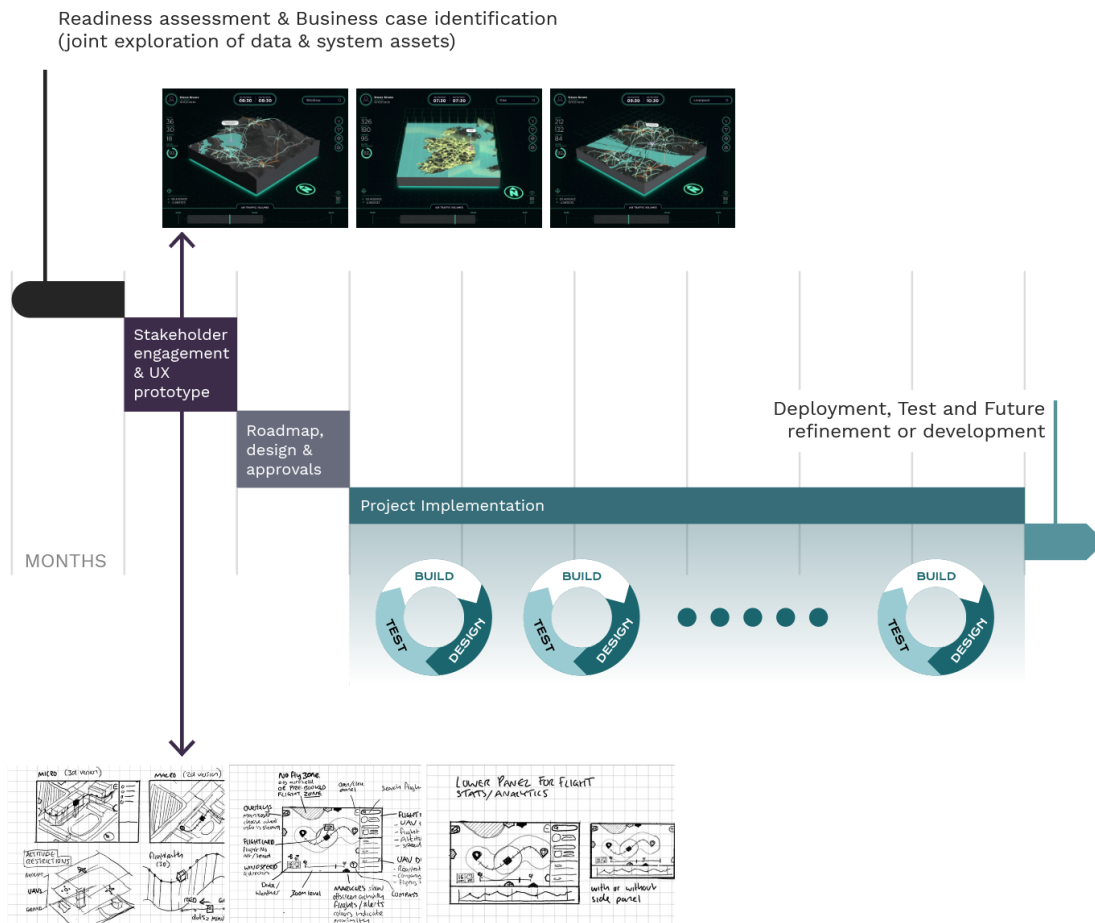
Digital Airspace Twin — Today's use cases

For an ANSP, regulator or commercial flight operator there are multiple use cases for a Digital Airspace Twin.

ANSP	Airspace management, design, simulation. Stakeholder collaboration, research and procedure development. Real-time trend-analysis, exception management & service performance optimization.
UAS/UTM Operators	Strategic mission planning, BVLOS safety case & regulatory preparation. Route optimization. Fleet management.
Regulators	Deep learning and data-based decision making. Risk analysis and incident review.
Airlines & Commercial Aviation	Traffic prediction, modeling and simulation.
Airports	Traffic prediction, modeling, forecasting & optimization.
Municipalities	Service and lower airspace monitoring. Noise/privacy and complaint management.
Military	Real-time modeling & simulation
General Aviation	Planning and collaboration



Solution Implementation



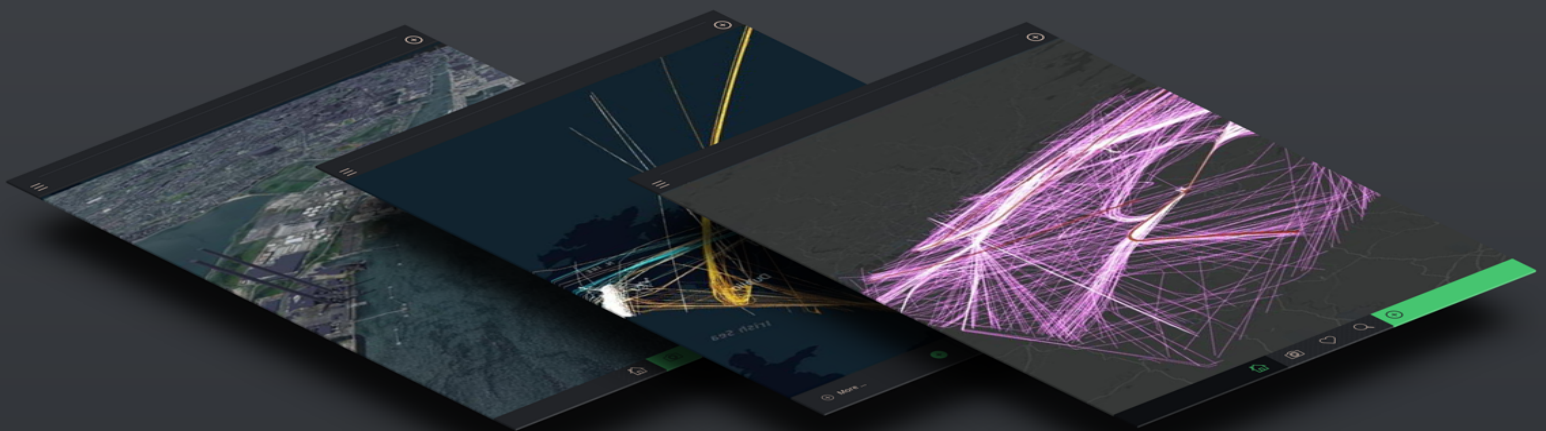
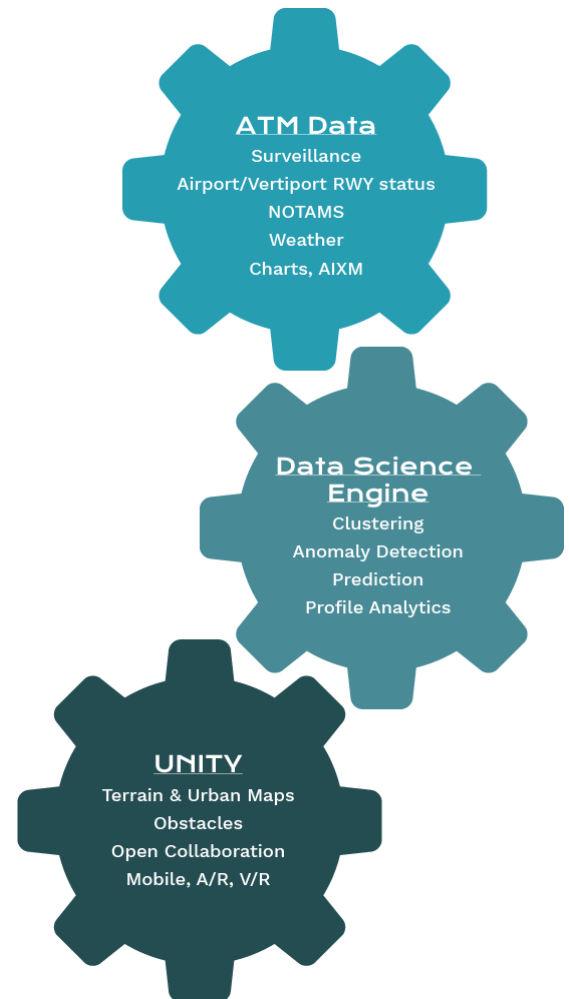
Typical solution implementation is focused on agility and cost with a goal of establishing a collaborative development approach and stakeholder ecosystem. The goal with the first phase is for the rapid assessment of existing data capabilities and junction points. Stakeholder engagement involves end user workshops to maximize cross-organizational benefits of platform implementation. The final implementation and deployment aim to leave the organization with a self-sustaining twin capability that can be enhanced incrementally over the long term.

Connecting ATM Data to the Virtual Airspace Cloud

The Digital Airspace Twin platform is built to maximise flexibility & scalability. This includes providing a secure compatibility layer to existing ATM Data Streams and an open API for future surveillance. The platform fully exploits the extensibility of on-demand cloud provisioning for high performance data-science analysis and deep learning.

The Unity engine, connected to our cloud API provides users with high performance digital twin visualization capability across several different platforms from large scale fixed installations to lightweight distributed mobile, A/R and V/R.

Unity's Open ecosystem means tapping into one of the world's largest and fastest growing talent pool of digital asset creators.



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