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X-TEAM D2D: MODELING FUTURE SMART AND SEAMLESS TRAVEL IN EUROPE

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ABSTRACT

Future transportation technologies will change the way passengers travel to their destinations. In Europe, there is an ambition to achieve door-to-door travel times of no longer than four hours by 2050. For this, air transport will need to be integrated into the overall multimodal transport network in a smart and efficient way. Inspired by this challenge, project X-TEAM D2D will develop a Concept of Operations for integrating Air Traffic Management and Urban Air Mobility into an overall multimodal transport network, considering the urban and extended urban environment up to a regional extent. This study presents the preliminary results of the expected performance of the intermodal transport network in the following decades. The results provide insight into the expected impact of future smart transport technologies on passengers travel.

1 INTRODUCTION

According to a United Nations report, by 2100, the world population is expected to reach approximately 10 billion people, and by 2050 more than 68% of the worldwide population will live in urban areas. This growth will dramatically impact future transport demand. To serve the future mobility needs of such a large population, physical infrastructure, transport systems, traffic management, operational processes, and information systems will be seamlessly integrated. To achieve such integration in a smart and efficient way, it is necessary to explore and define how future transport technologies will impact the passengers' journey. This task comprises the focus of this case study related to the X-TEAM D2D project.

2 MODELING FUTURE TRAVEL MODES

The X-TEAM D2D project aims to create a Concept of Operations (ConOps) to integrate existing and future transport modes into the overall multimodal transport network. As this task focuses on very complex systems, these ConOps will be validated using a simulation framework. In this framework, a passenger's door-to-door journey is simulated in the environment of a European urban area, considering the following parts: 1) travel from a passenger's home in a small town to a regional airport, 2) flight from a regional airport to a hub airport, and 3) travel from a hub airport to a passenger's destination in a medium-sized city.

This paper focuses only on door-to-airport and airport-to-door parts of the journey in 2025 and 2035. Nevertheless, the flight time is considered in the form of a delay.

In the X-TEAM D2D simulation model, the existing and future transport technologies are implemented following a multilayer approach, where first, the existing transport network is created and verified. Then, the future transport modes are added, considering relevant assumptions and ConOps. Characteristics of many of these future technologies are still unknown; therefore, in the project, a set of expert-based assumptions has to be made regarding the characteristics and operational ways of those technologies.

The simulation model was developed in a general-purpose commercial discrete event simulation software, Simio, and consists of three groups of elements. The first group, dynamic entities, represent passengers and transport vehicles. The second group is static elements, representing transport stations or transport access points and modeled as capacitated servers. The last group is formed by a set of nodes and edges connected into a network.

The case study simulation experiments consider two scenarios of a complete door-to-door journey. In the first scenario, representing a possible state of urban transportation in 2025, business passengers use public buses to get to the town train station and take a train to a regional airport. In the airport, they take a flight to another country's hub airport. On arrival at this airport, the passengers rent a car and drive to their destination in a city. In the second scenario, corresponding to a possible state of the urban transport network in 2035, business passengers use a form of pooled individual electric transport (e.g., electric scooter) to get to the landing site of an air taxi (e-VTOL), from which they take a direct flight to the regional airport. From this airport, they fly to another country (same as in the first scenario). On arrival at the hub airport, passengers use an electric car-sharing service to get to the destination address in the city.

3 PRELIMINARY RESULTS AND CONCLUSIONS

In this case study, simulation was used to evaluate the impact of some of the future transport technologies on business passengers traveling in Europe. According to the initial results, emerging technologies such as individual electric transport and electric vertical take-off and landing aircraft, if readily accessible in urban areas in 2035, could reduce business passengers' travel time by nearly 30%.

In the simulated scenarios, it was assumed that passengers arrange and plan their journey in advance, saving time on searching and booking the trips. In future work, the simulation model will be extended to reflect the potential transport modes in 2050. Furthermore, more passenger profiles will be added to the study. Additionally, the influence of different disruption scenarios on the possibility of having door-to-door travel in less than four hours will be further investigated.

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