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**ICOM'01, ICOM'05 AND**  
**ICOM'08**

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# **AN AUTONOMOUS INTEGRATED ARCHITECTURE FOR THE NEXT GENERATION AIR TRAFFIC MANAGEMENT AND AVIONICS SYSTEMS**

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## **ABSTRACT**

The evolution of avionics systems being stand-alone platforms to an integrated system is progressing in unison with the advancement in Information and Communications Technology (ICT). As the ICT moves forward to ever more integration of the information provision and utilization, various components of the aviation environment, the air traffic control system, the avionics systems and the ground operations management system all need to be integrated together to handle the complexity and data overload of modern aviation operations. This paper presents a novel autonomous architecture based on mobile agents to address the new design issues in the field. A part of the integrated system was simulated and the results demonstrate that the prime issues of complex and high volume data handling could be addressed using the proposed system in addition to controlling the network congestion.

## **1. GENERAL INFORMATION**

Air traffic control is assuming increasing complexity with ever increasing traffic congestion. The data exchange among various components of the air traffic control system, mainly the traffic management system, the airborne avionics and the allied airport communication services is taking on increasing importance in both operational and experimental contexts. Various schemes are currently being investigated to address the problem of congestion and standardization in the management of air traffic. One of the techniques involves the modeling of traffic prediction to obtain expected delay in traffic [1]. Closely related to the problem of congestion reduction through flight planning is the computation of complexity metrics [2, 3]. These values may help the ATC system in finding which area of airspace controllers must care about. This knowledge may lead to better load balancing between control sectors or planning of new routes for the aircraft.

However, these approaches have so far failed to address the key issue in the air space management problem, i.e., the reduction of air traffic congestion in the data link across the entire spectrum of air traffic management system. This paper presents a relatively new information service system architecture [4] that holds the potential to address the issue of load reduction in the air traffic management system. The architecture is based on the demand-oriented service pattern of a congested air traffic management system. A subsystem of such architecture was simulated and the results predict an overall reduction in data congestion.

## **2. AN OVERVIEW OF MOBILE AGENTS**

The details of mobile agents and their employment in a distributed environment can be found elsewhere [5, 6]. Here, only a brief introduction of mobile agents and their role in a network based information system will be discussed. The term mobile agent is often context-dependent and has two separate and distinct concepts: mobility and agency. The term agency implies having the same characteristics as that of an agent. These are self-contained and identifiable computer programs that can move within the network from node to node and act on behalf of a user or other entity. These can halt execution from a host without human interruption [7].