CONTROLLER PILOT DATA LINK COMMUNICATION in the AIR TRAFFIC CONTROL TRAINING SIMULATOR of the MAASTRICHT UPPER AREA CONTROL CENTRE

Filip Vanstraelen
Industrial Engineer - Informatics
Industrial Engineer - Construction

AIR TRAFFIC CONTROL

A service provided for the purpose of: preventing collisions between aircraft, preventing collisions on manoeuvring areas between aircraft and obstructions on the ground and expediting and maintaining the orderly flow of air traffic.

The service is provided by Air Traffic Controllers working at airports for the arrival and departure flight phases and in Air Traffic Control Centres for the en-route flight phase. Air Traffic Controllers keep track of the aircraft in their sector by monitoring their radar screen. They instruct the pilots by voice communications via their sector frequency.

CONTROLLER PILOT DATA LINK COMMUNICATION

As air traffic increases every year, sectors are getting busier. To control the increasing number of aircraft in a sector, more transmissions on the sector frequency are needed, which has led already to frequency congestion in some busy parts of Europe.

When using CPDLC, controllers send non time critical instructions to the flight deck as short text messages. The pilots respond to the instructions with a message from their message set.

As more messages are sent by CPDLC, frequency congestion and cross-transmission are avoided.

KEY DESIGN CHANGES AND IMPLEMENTATION

A new module, the P2FEP module, acts as a server process to which the MADAP Computer connects to exchange CPDLC messages with the aircraft. This module replaces the P2FEP of the On-Line environment. The P2FEP module routes CPDLC messages between the MADAP Computer and the simulated aircraft.

The Aircraft Module simulates the aircraft. Adjustments in the design allow this module to receive, store and send CPDLC messages. The adjustments implement the Data Link hardware and software on board of the aircraft.

For the simulator pilot to be able to view the messages and put in requests and replies, the Sim Pilot Positions GUI (Graphical User Interface) is redesigned with further extension of the CPDLC Message Set in mind. The interface between the Sim Pilot Positions and the Aircraft Module is also extended for this purpose.

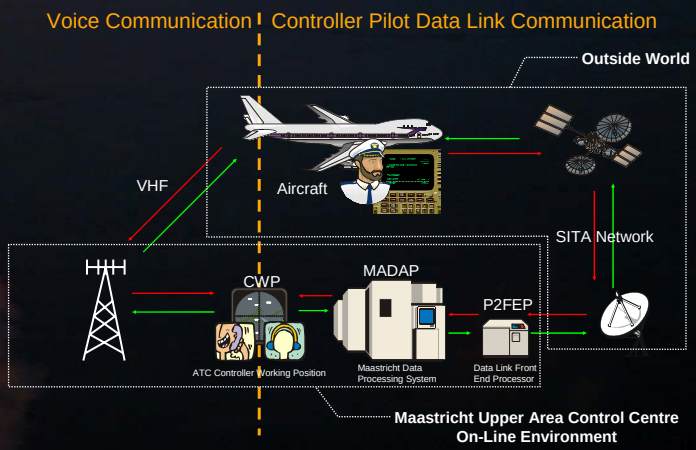
The Sim Driver has no direct connection to any external modules. All communications are routed by the Sim Router. An extension of the Sim Router makes all new and changed communications possible.

The CPDLC messages are for transmission encoded in ASN.1 notation. The new CPDLC set Encoder/decoder transforms messages from/to ADA variant records.

EUROCONTROL

EUROCONTROL, the European Organisation for the Safety of Air Navigation, which currently numbers 33 Member States, has as its primary objective the development of a seamless, pan-European air traffic management system.

Since 1972 the EUROCONTROL Maastricht Upper Area Control Centre has provided round-the-clock Air Traffic Control services to aircraft in the upper airspace of Belgium, the Netherlands, Luxembourg and the north-west of Germany.



CPDLC IN THE ATC TRAINING SIMULATOR

The Air Traffic Control Training Simulator (ATC-TRG) allows high-fidelity training of student controllers using the same user positions and software as used in the On-Line environment. The ATC-TRG also allows engineers to perform repeatable, advanced and realistic testing.

The ATC-TRG simulates the outside world and interacts transparently with the other equipment, which is exactly the same as the equipment of the On-Line Environment. The different Front End Processors are simulated as well.

Controller Pilot Data Link Communication, being a recent development, is not yet implemented in the ATC-TRG. In order to keep the Simulator consistent with the On-Line environment, Data Link must be implemented, so Air Traffic Controllers can be trained on future CPDLC developments.