Surveillance User Interface Specification

March 2003
Version 1.0
formal/03-03-62

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Preface

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The type styles shown below are used in this document to distinguish programming statements from ordinary English. However, these conventions are not used in tables or section headings where no distinction is necessary.

Helvetica bold - OMG Interface Definition Language (OMG IDL) and syntax elements.

Courier bold - Programming language elements.

Helvetica - Exceptions

Terms that appear in italics are defined in the glossary. Italic text also represents the name of a document, specification, or other publication.

Acknowledgments

The following company submitted this specification:

• THALES ATM

Reference Documents

OMG, Surveillance Request for Proposal, transprt/00-01-09

Eurocontrol, Radar Surveillance in En-Route Airspace and Major Terminal Areas, Edition 1.0 from March 1997, SUR.ET1.ST01.1000-STD-01-01
Demystifying CNS/ATM, CANSO CNS/ATM Working Group, Final Version (June 1999)

Overall CNS/ATM architecture for EATCHIP, ASE.ET1.ST02-ADD-01-00, version 1.0, 18/08/1997

Interface Specification, Application of ASTERIX to ARTAS (DIS/SUR/ARTAS.ASTX.015), version 6.0, 10th Sept. 99

Surveillance Development Roadmap, Eurocontrol, working draft, edition 0-18, 4 December 2000

System/Segment Specification for ARTAS, version 6.3, 10 October 2000
Interface Specification

1.1 Introduction

This document refers to the CORBA ATC architecture white paper. The context of this specification is relative to ATC components identified in the CORBA ATC architecture reference model.

This specification is a subset of the Surveillance Manager Interface, it represents the basic client interface. Enhanced client interfaces along with server side interfaces will be addressed in future specifications.

1.2 Interface Introduction

The interface is based on AXTERIX category 030. This is related to the Exchange of Air Situation Pictures.

The Interface definition is a translation of AXTERIX syntax in IDL syntax. The data CATEGORY 030 : Exchange of Air Situation Pictures defines all items that can be transmitted by the Surveillance Server to its User(s) in the frame of any Track Information Service.

This interface shall be used with typed event COSservice. The Surveillance service is defined according to the service name defined in the COSnaming service.

<table>
<thead>
<tr>
<th>Data Item Number</th>
<th>Reference Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I030/050</td>
<td></td>
<td>ARTAS TRACK NUMBER</td>
</tr>
<tr>
<td>I030/060</td>
<td></td>
<td>TRACK MODE 3/A</td>
</tr>
<tr>
<td>I030/070</td>
<td></td>
<td>TIME OF LAST UPDATE</td>
</tr>
<tr>
<td>I030/080</td>
<td></td>
<td>ARTAS TRACK STATUS</td>
</tr>
</tbody>
</table>
1.3 Description of Data Items

1.3.1 Description of Data Items of CATEGORY 030 and IDL Definition

1.3.1.1 I030/050 :ARTAS TRACK NUMBER

Definition: Identification of an ARTAS track.

```c
typedef unsigned long Natural;
const Natural MIN_NATURAL = 0;
const Natural MAX_NATURAL = 2147483647;
```

```c
typedef Natural TrackId;
const TrackId NULL_TRACK_ID = 0;
```

1.3.1.2 I030/060 :TRACK MODE 3/A

Definition: Mode 3/A identity associated to the track.

```c
typedef octet SsrCode[4];
```

```c
struct RealModeA
{
    boolean is_validated;
    boolean is_garbled;
    boolean is_track_mode_changed;
    SsrCode ssr_code;
};
```
1.3.1.3 1030/070 : TIME OF LAST UPDATE

Definition: Absolute time stamping of the information provided in the track message, in the form of elapsed time since last midnight.

typedef SFloat ADuration;
const ADuration DAY_IN_SECONDS = 86400.0;

1.3.1.4 1030/080 : ARTAS TRACK STATUS

Definition: Status of an ARTAS track.

defined enum TargetType
{  
    TEST_TARGET,
    LIVE_TARGET,
    UNKNOWN_TARGET
};

defined enum TrackType
{  
    TENTATIVE_TRACK,
    CONFIRMED_TRACK,
    UNKNOWN_TRACK
};

defined enum RadarUpdate
{  
    PR_SSR_TRACK,
    PR_MULTITRACK,
    SSR_MULTITRACK,
    PR_SSR_MONOTRACK,
    SSR_MONOTRACK,
    PR_MONOTRACK,
    UNKNOWN_RADAR_UPDATE
};

defined enum SlantRangeCode
{  
    SLR_USING.MODEC,
    SLR_USING_CALCULATED_HEIGHT,
    SLR_USING_ASSUMED_HEIGHT,
    SLR_NOT_CORRECTED,
    UNKNOWN_SLANT_RANGE_CODE
};
enum SpecialCode
{
    DEFAULT_SPECIAL_CODE,
    UNLAWFUL_INTERFERENCE,
    RADIOCOMMS_FAILURE,
    EMERGENCY,
    UNKNOWN_SPECIAL_CODE
};

struct TrackStatus
{
    TargetType target_type;
    TrackType track_type;
    boolean uses_aircraft_derived_data;
    boolean is_coasted;
    boolean is_coasted_apart_from_lateral_trac;
    RadarUpdate radar_update;
    boolean is_terminated;
    boolean is_created;
    SlantRangeCode slant_range_code;
    SpecialCode special_code;
    boolean is_amalgamated;
    boolean is_spi_set;
    boolean is_military_emergency;
};

1.3.1.5 130/90 TRACK QUALITY

Definition: track quality.
    unsigned short track_quality;

1.3.1.6 CALCULATED TRACK POSITION

// LAT LONG COORDINATES
typedef SFloat Azimuths;
typedef Azimuths LatAzimuths;
typedef Azimuths LongAzimuths;

enum Hemisphere {
    NORTH,
    SOUTH
};

enum LatLongDirection {
    EAST,
    WEST
};

struct Latitude {

Hemisphere lat_hemis;
LatAzimuths lat_azim;
};

struct Longitude {
    LatLongDirection long_dir;
    LongAzimuths long_azim;
};

// 2D Position in a LAT/LONG coordinates system
struct LatLong2DPosition {
    Latitude latit;
    Longitude longit;
};

1.3.1.7 1030/130 : CALCULATED TRACK ALTITUDE

Definition: Calculated altitude of an aircraft.

enum CalculationMode {
    THREED_HEIGHT,
    TRIANGULATED_HEIGHT,
    FROM_COVERAGE_HEIGHT,
    ASSUMED_HEIGHT,
    UNKNOWN_CALCULATION_MODE
};

typedef long Integer;
typedef Integer Feet;

struct CalculatedTrackAltitude {
    CalculationMode calculation_mode;
    Feet track_altitude;
};

1.3.1.8 130/140 : LAST MEASURED MODE C

Definition: Mode C code of the last nearest neighbor plot containing a Mode C and used to update the track.

typedef boolean Is_valid_Mode_C_code;
typedef boolean Is_garbled_information;

struct LastMesuredModeC {
    boolean Is_valid_Mode_C_code;
    boolean Is_garbled_information;
}
1.3.1.9 I030/180: CALCULATED TRACK VELOCITY (POLAR)
Definition: Calculated track velocity expressed in polar co-ordinates.

Velocity-heading component is relative to True North.

typedef float SFloat;
typedef SFloat Knots;
typedef SFloat Azimuths;

struct TrackVelocity
{
    Knots  groundspeed;
    Azimuths  heading;
};

union OptTrackVelocity switch (boolean) {
    case TRUE :
        TrackVelocity track_velocity;
    case FALSE :
        Empty field;
};

1.3.1.10 I030/200: MODE OF FLIGHT
Definition: Calculated Mode-of-Flight of an aircraft.

struct Tendencies {
    VerticalTendency         vertical;
    HorizontalTendency      horizontal;
    SpeedTendency           speed;
};

1.3.1.11 I030/220: CALCULATED RATE OF CLIMB/DESCENT
Definition: Calculated rate of Climb/Descent of an aircraft.

1.3.1.12 I030/240: CALCULATED RATE OF TURN
Definition: Calculated Rate of Turn expressed in degrees per second.

1.3.1.13 130/270: LOCAL TRACK
Definition: The local track number is a value representing a unique reference to a track record within the track data-base of a radar local tracker.

typedef unsigned long Natural;
typedef Natural LocalTrackNumber;

1.3.1.14 130/290 : PLOT AFGE
Definition: A set of plot related ages.

typedef float Duration;
typedef Duration SecondDuration;
struct PlotAge
{
    SecondDuration modeA_age;
    SecondDuration modeC_age;
};

1.3.1.15 130/360 : MEASURED POSITION
Definition: Measured position of an aircraft

struct MeasuredPosition
{
    Miles Rho;
    Azimuths Theata;
};

1.3.1.16 1030 Track
Definition: State Vector and list of radar track

struct StateVector
{
    ADuration last_update_time; // 1030/070
    TrackStatus track_status; // 1030/080
    unsigned short track_quality; // 1030/090
    LatLong2DPosition latlong_position;
    CalculatedTrackAltitude calculated_track_altitude; // 1030/130
    LastMesuredModeC last_mesured_mode_C; // 1030/140
    Feet measured_mode_c; // 1030/150
    Tendencies tendencies; // 1030/200
    FeetPerMinute rate_of_climb_descent; // 1030/220
    DegreesPerSecond rate_of_turn; // 1030/240
struct RadarTrack
{
    TrackId track_id;            // I030/050
    LocalTrackNumber local_track_number;  // I030/270
    StateVector state_vector;
};

typedef sequence<RadarTrack> RadarTracksList;

1.3.1.17 Surveillance Manager interface operation

Definition: Interface to be implemented by a typed push consumer.

interface SurveillanceManagerAsterix30
{
    void TracksUpdate(in RadarTracksList trackEvent);
};
module SurveillanceAxterix30
{

    //
    // I030/080
    //
    enum TargetType
    {
        TEST_TARGET,
        LIVE_TARGET,
        UNKNOWN_TARGET
    };

    enum TrackType
    {
        TENTATIVE_TRACK,
        CONFIRMED_TRACK,
        Unknown_Track
    };

    enum RadarUpdate
    {
        PR_SSR_TRACK,
        PR_MULTITRACK,
        SSR_MULTITRACK,
        PR_SSR_MONOTRACK,
        SSR_MONOTRACK,
        PR_MONOTRACK,
        UNKNOWN_RADAR_UPDATE
    };

    enum SlantRangeCode
    {
SLR_USING_MODEC,
SLR_USING_CALCULATED_HEIGHT,
SLR_USING_ASSUMED_HEIGHT,
SLR_NOT_CORRECTED,
UNKNOWN_SLANT_RANGE_CODE
);

denum SpecialCode
{
  DEFAULT_SPECIAL_CODE,
  UNLAWFUL_INTERFERENCE,
  RADIOCOMMS_FAILURE,
  EMERGENCY,
  UNKNOWN_SPECIAL_CODE
};

struct TrackStatus
{
  TargetType target_type;
  TrackType track_type;
  boolean uses_aircraft_derived_data;
  boolean is_coasted;
  boolean is_coasted_apart_from_lateral_trac;
  RadarUpdate radar_update;
  boolean is_terminated;
  boolean is_created;
  SlantRangeCode slant_range_code;
  SpecialCode special_code;
  boolean is_amalgamated;
  boolean is_spi_set;
  boolean is_military_emergency;
};

// II030/100
//

typedef float   SFloat;
typedef SFloat  Miles;

struct XY2DPosition
{
  Miles x_pos;
  Miles y_pos;
};

// LAT LONG COORDINATES
typedef SFloat Azimuths;
typedef Azimuths LatAzimuths;
typedef Azimuths LongAzimuths;

enum Hemisphere {
    NORTH, SOUTH
};

enum LatLongDirection {
    EAST, WEST
};

struct Latitude {
    Hemisphere lat_hemis;
    LatAzimuths lat_azim;
};

struct Longitude {
    LatLongDirection long_dir;
    LongAzimuths long_azim;
};

// 2D Position in a LAT/LONG coordinates system
struct LatLong2DPosition {
    Latitude latit;
    Longitude longit;
};

// I030/130

enum CalculationMode {
    THREED_HEIGHT, TRIANGULATED_HEIGHT, FROM_COVERAGE_HEIGHT, ASSUMED_HEIGHT, UNKNOWN_CALCULATION_MODE
};

typedef long Integer;

typedef Integer Feet;
struct CalculatedTrackAltitude
{
    CalculationMode calculation_mode;
    Feet track_altitude;
};

typedef boolean Is_valid_Mode_C_code;
typedef boolean Is_garbled_information;

struct LastMesuredModeC
{
    boolean Is_valid_Mode_C_code;
    boolean Is_garbled_information;
    Feet Mode_C;
};

//
// I030/180
//
typedef SFloat Knots;

struct TrackVelocity
{
    Knots groundspeed;
    Azimuths heading;
};

//
// I030/200
//
enum VerticalTendency
{
    CLIMB,
    STEADY,
    DESCENT
};

enum HorizontalTendency
{
    LEFT,
    STRAIGHT,
    RIGHT
};

enum SpeedTendency
{  
   ACCELERATE,
   DECELERATE,
   MAINTAIN
};

struct Tendencies
{
   VerticalTendency  vertical;
   HorizontalTendency  horizontal;
   SpeedTendency  speed;
};

//
// I030/220
//

typedef SFloat  FeetPerMinute;

//
// I030/240
//

typedef SFloat  DegreesPerSecond;
typedef SFloat  ADuration;
typedef unsigned long Natural;
typedef Natural LocalTrackNumber;
typedef float    Duration;
typedef Duration SecondDuration;

struct PlotAge
{
   SecondDuration  modeA_age;
   SecondDuration  modeC_age;
};

struct MesuredPosition
{
   Miles  Rho;
   Azimuths  Theata;
};
struct StateVector
{
    ADuration last_update_time;  // I030/070
    TrackStatus track_status;    // I030/080
    unsigned short track_quality; // I030/090
    LatLong2DPosition latlong_position; // I030/100
    CalculatedTrackAltitude calculated_track_altitude; // I030/130
    LastMesuredModeC last_mesured_mode_C;  // I030/140
    TrackVelocity track_velocity; // I030/180
    Tendencies track_tendencies;  // I030/200
    FeetPerMinute rate_of_climb_descent;  // I030/220
    DegreesPerSecond rate_of_turn; // I030/240
    PlotAge Plot_Age;  // I030/290
    MesuredPosition Mesured_Position; // I030/360
};

//  // I030/50
//

typedef Natural TrackId;

const TrackId NULL_TRACK_ID = 0;

typedef sequence<TrackId> TrackIdList;

struct RadarTrack
{
    TrackId track_id;  // I030/050
    LocalTrackNumber local_track_number; // I030/270
    StateVector state_vector;
};

typedef sequence<RadarTrack> RadarTracksList;

interface SurveillanceManagerAsterix30
{
    void TracksUpdate(in RadarTracksList trackEvent);
};
## Acronyms and Abbreviations

<table>
<thead>
<tr>
<th>Acronym/Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>°</td>
<td>Degree (angle)</td>
</tr>
<tr>
<td>ARTAS</td>
<td>ATC Radar Tracker And Server</td>
</tr>
<tr>
<td>ASTERIX</td>
<td>All Purpose STructured Eurocontrol Radar Information EXchange</td>
</tr>
<tr>
<td>ATC</td>
<td>Air Traffic Control</td>
</tr>
<tr>
<td>AVENUE</td>
<td>ATM Validation ENvironment for Use towards EATMS, TRANSPORT RESEARCH PROGRAMME, DG7 - TRANSPORT/AIR TASK N° 4.1.3/24A</td>
</tr>
<tr>
<td>CAT</td>
<td>Data Category</td>
</tr>
<tr>
<td>EATCHIP</td>
<td>European Air Traffic Control Harmonisation and Integration Programme</td>
</tr>
<tr>
<td>EOP</td>
<td>End of Picture</td>
</tr>
<tr>
<td>EWPD</td>
<td>EATCHIP Work Programme Document</td>
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<tr>
<td>f</td>
<td>Scaling factor</td>
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<tr>
<td>FRN</td>
<td>Field Reference Number</td>
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<tr>
<td>FSPEC</td>
<td>Field Specification</td>
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<tr>
<td>FX</td>
<td>Field Extension Indicator</td>
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<tr>
<td>ICAO</td>
<td>International Civil Aviation Organization</td>
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<tr>
<td>LEN</td>
<td>Length Indicator</td>
</tr>
<tr>
<td>LSB</td>
<td>Least Significant Bit</td>
</tr>
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<td>Abbreviation</td>
<td>Description</td>
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</tr>
<tr>
<td>NM</td>
<td>Nautical Mile, unit of distance (6 080 feet)</td>
</tr>
<tr>
<td>RDP</td>
<td>Radar Data Processing (system)</td>
</tr>
<tr>
<td>REP</td>
<td>Field Repetition Indicator</td>
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<tr>
<td>RFS</td>
<td>Random Field Sequencing</td>
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<td>RSSP</td>
<td>Radar Systems Specialist Panel</td>
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<tr>
<td>s</td>
<td>second, unit of time</td>
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<td>SAC</td>
<td>System Area Code</td>
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<td>SIC</td>
<td>System Identification Code</td>
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<td>SOP</td>
<td>Start Of Picture</td>
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<tr>
<td>SP</td>
<td>Special Purpose Indicator</td>
</tr>
<tr>
<td>SPF</td>
<td>Standard Precision Format</td>
</tr>
<tr>
<td>STFRDE</td>
<td>Surveillance Task Force on Radar Data Exchange</td>
</tr>
<tr>
<td>UAP</td>
<td>User Application Profile (see Definitions)</td>
</tr>
<tr>
<td>UTC</td>
<td>Coordinated Universal Time</td>
</tr>
</tbody>
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This is the first formal version of this specification.

OMG documents used to create this specification:

- Submission document: transprt/01-06-01
- FTF Report: dtc/02-10-04
- Proposed available specification: dtc/02-10-05