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# ASAM ODS and web-services for acoustic data analysis

Acoustic data analysis

ASAM ODS / Web Service

Automatic test reporting

Example of application in AIRBUS Design Office

Crash Test Expo Europe

16-18 June 2009



# Overview

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## ASAM ODS

- History
- Architecture
- Base model
- ATHOS server

## Acoustic data management

- How does it fit in with ASAM ODS?
- Software architecture
- OdsWebService
- General overview

## TrackReport

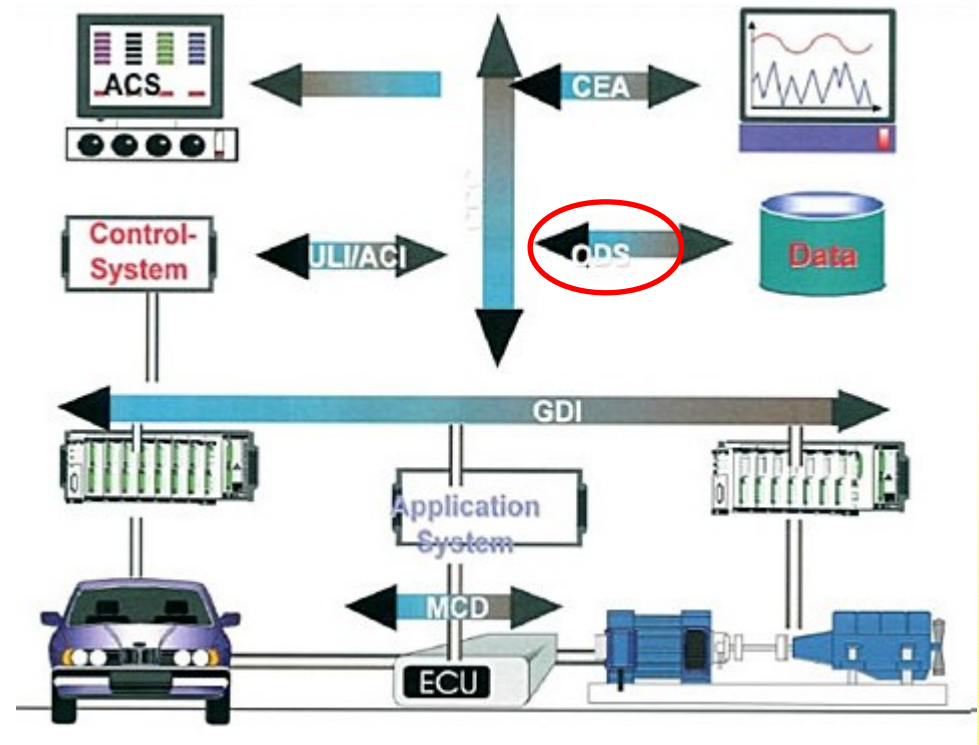
- Overview
- The new acoustic library
- Demo



# ASAM association

## Association for Standardization of Automation and Measuring Systems

- Initiative of German Car manufacturers
- Standards for data models, interfaces and syntax specifications
- Applications: testing, evaluation, simulation
- More than 120 members



*ASAM interfaces for testing systems*



# ASAM ODS standard

## Open Data Services: version 5.1.1

### What for?

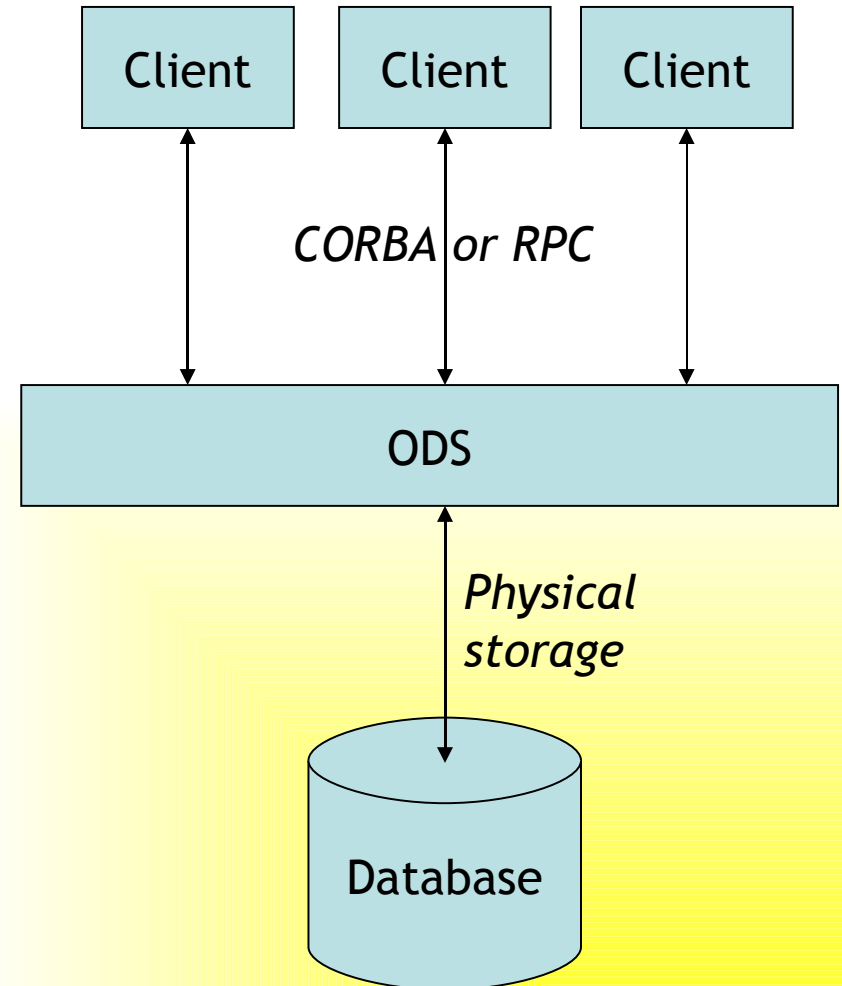
- Universal interpretation of data
- Model management
- Data storage & retrieval
- Data exchange syntax & format

### How?

- Defined by a standard
- Implemented by a server
- Over a DBMS
- Provides a CORBA or RPC interface

### Our clients

...usually use CORBA



## Object-based architecture

### Base model

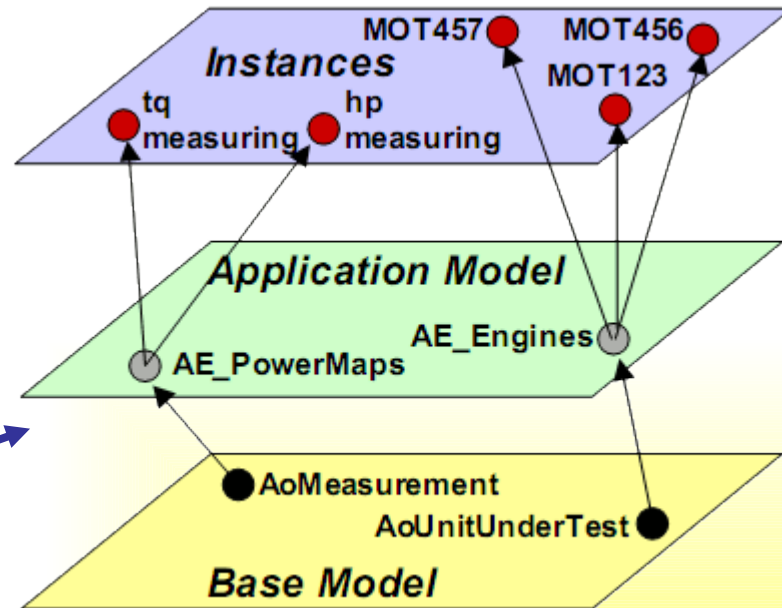
Minimal set of objects  
Rough data classification  
Covers the needs of various application areas

### Application model

Specialization of the elementary bricks  
Adapted to specific needs

### Instances

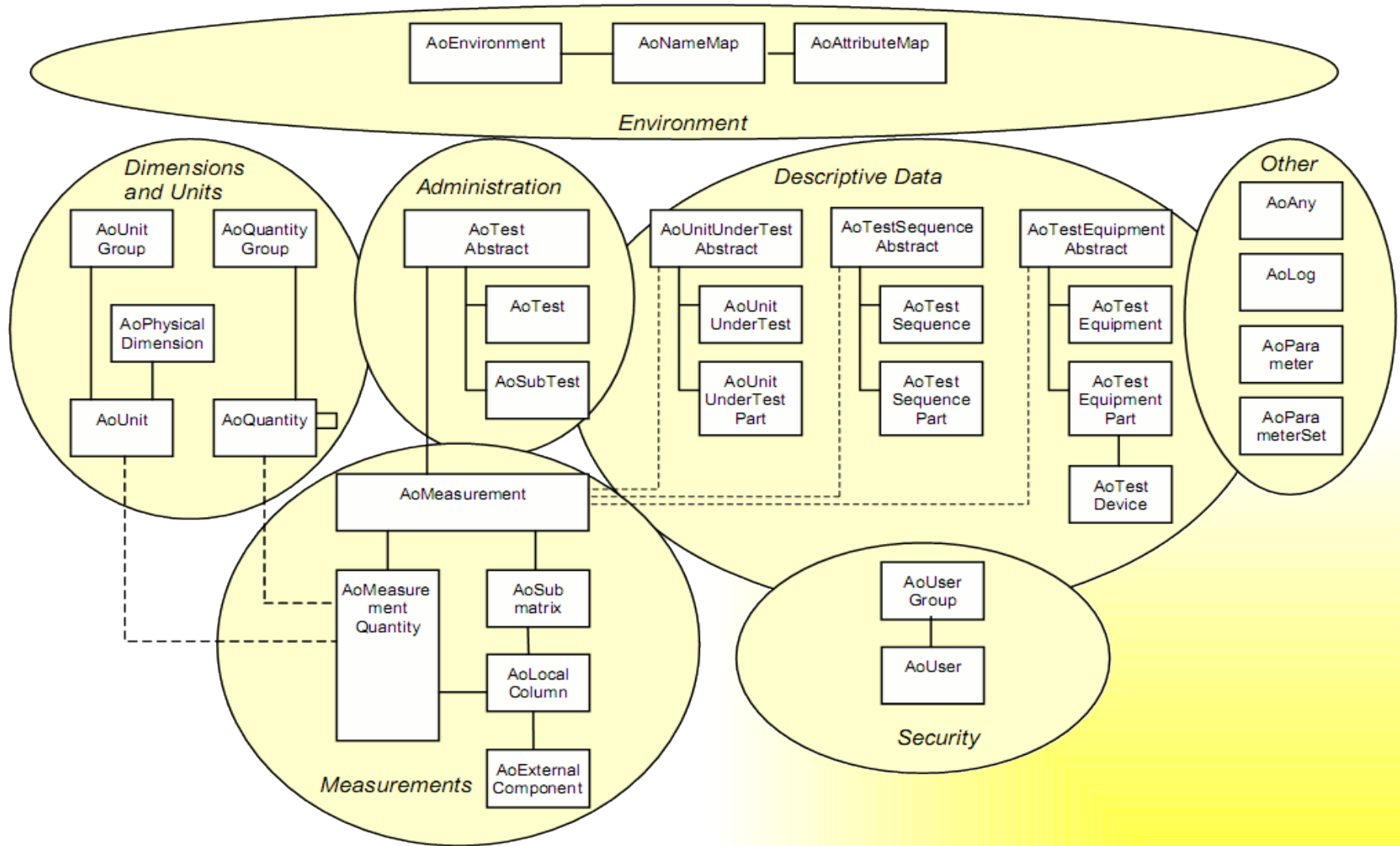
Testing systems create instances of application elements.  
They are stored by the ODS server.



*Example relation between base model, application model and instances*



# ASAM ODS Base model



- Created by HighQSoft GmbH
- ASAM ODS v5 compliant
- CORBA and RPC implementation
- Full multithreading capabilities
- Mixed mode support
- Extended query support
- Various databases support

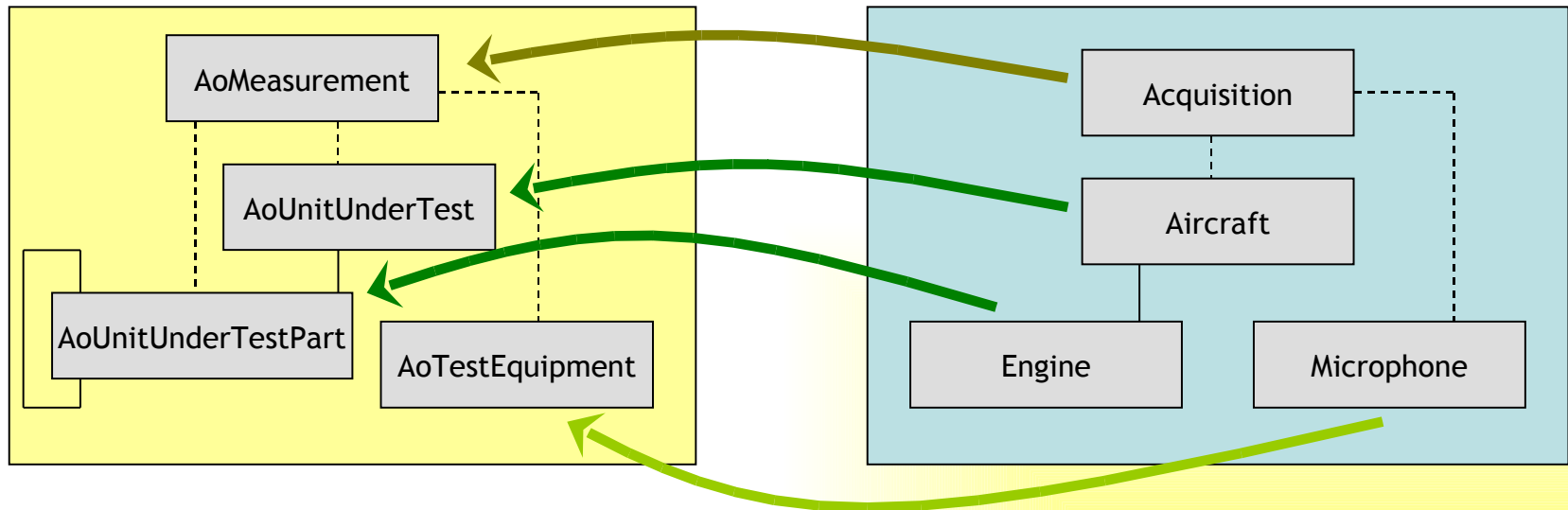
That's why ORME chose ATHOS for their aircraft noise data management projects.



# Acoustic data management

Acoustic flight tests of aircrafts produce huge amounts of data

The hierarchy of concepts involved in the certification process fits in very well with the ASAM ODS base model



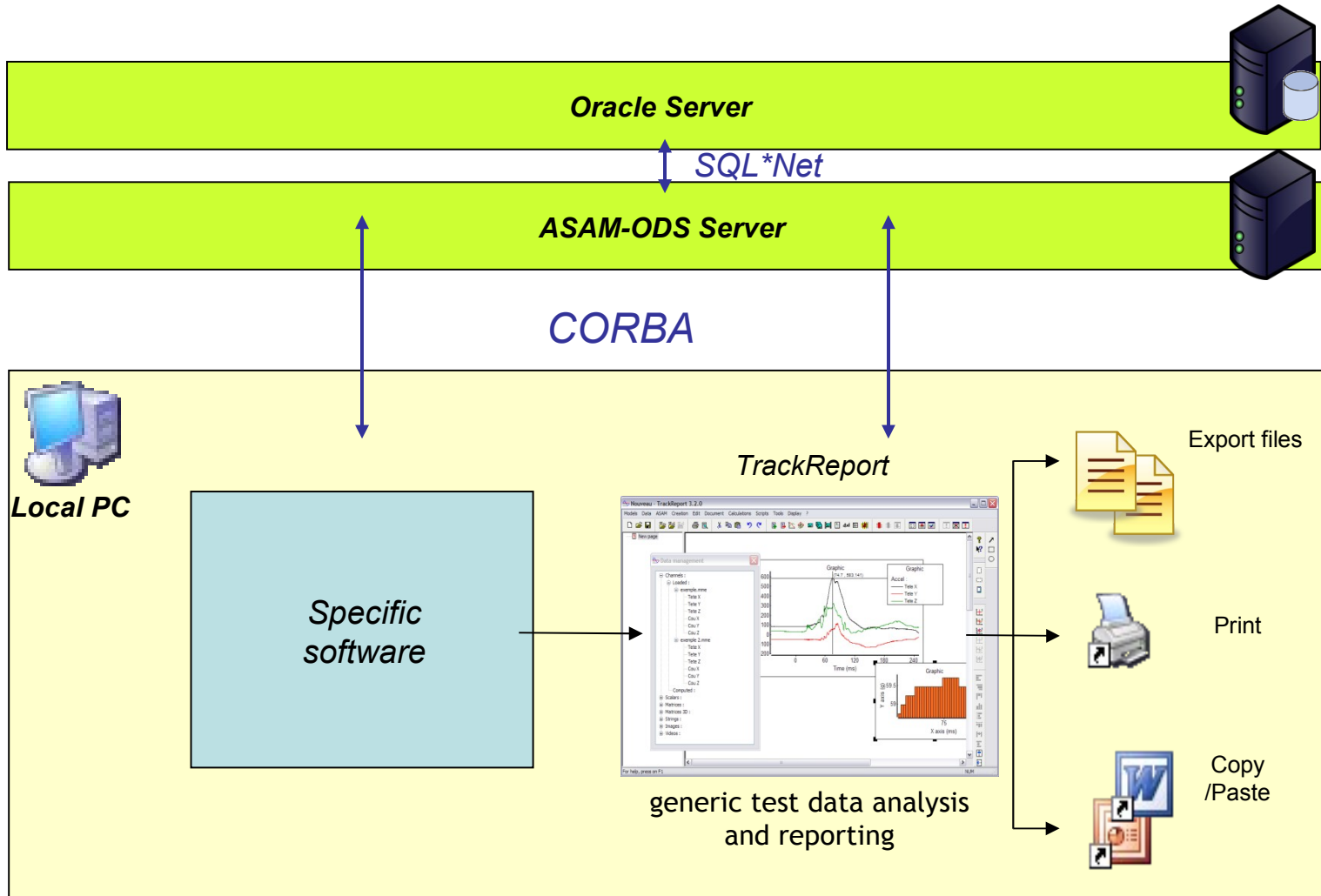
Security-related requirements would be fulfilled too

- Instance-wise authorizations
- Element-wise authorizations



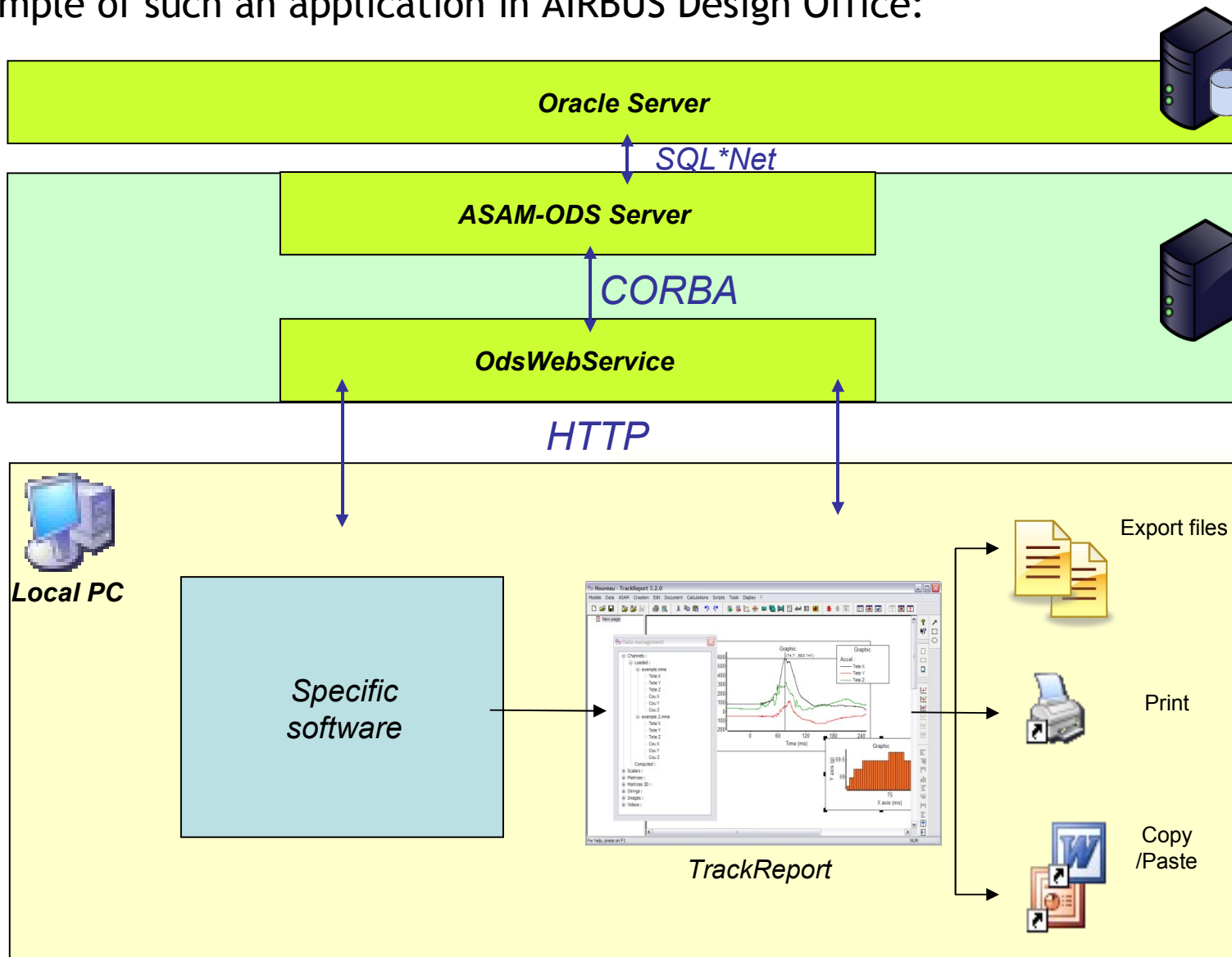


# Software architecture

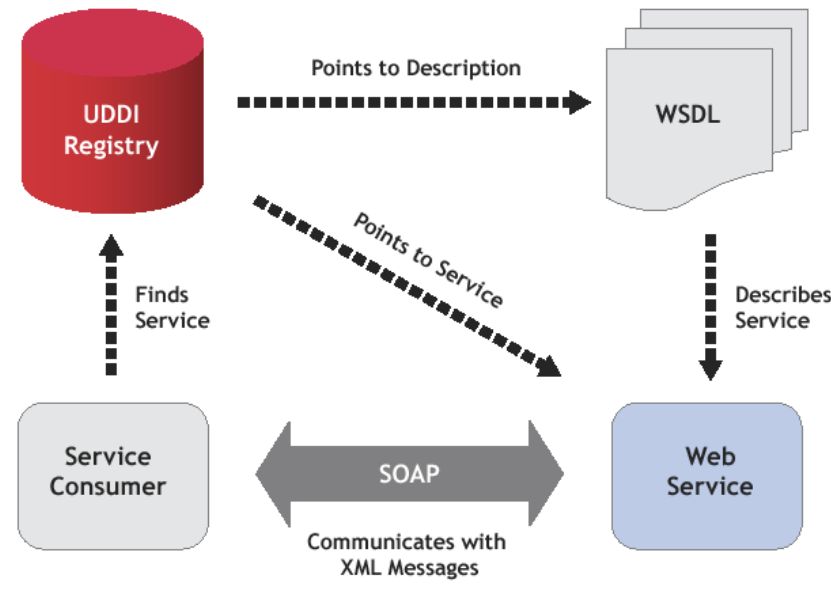


# Software architecture

Example of such an application in AIRBUS Design Office:



## What is a web service?



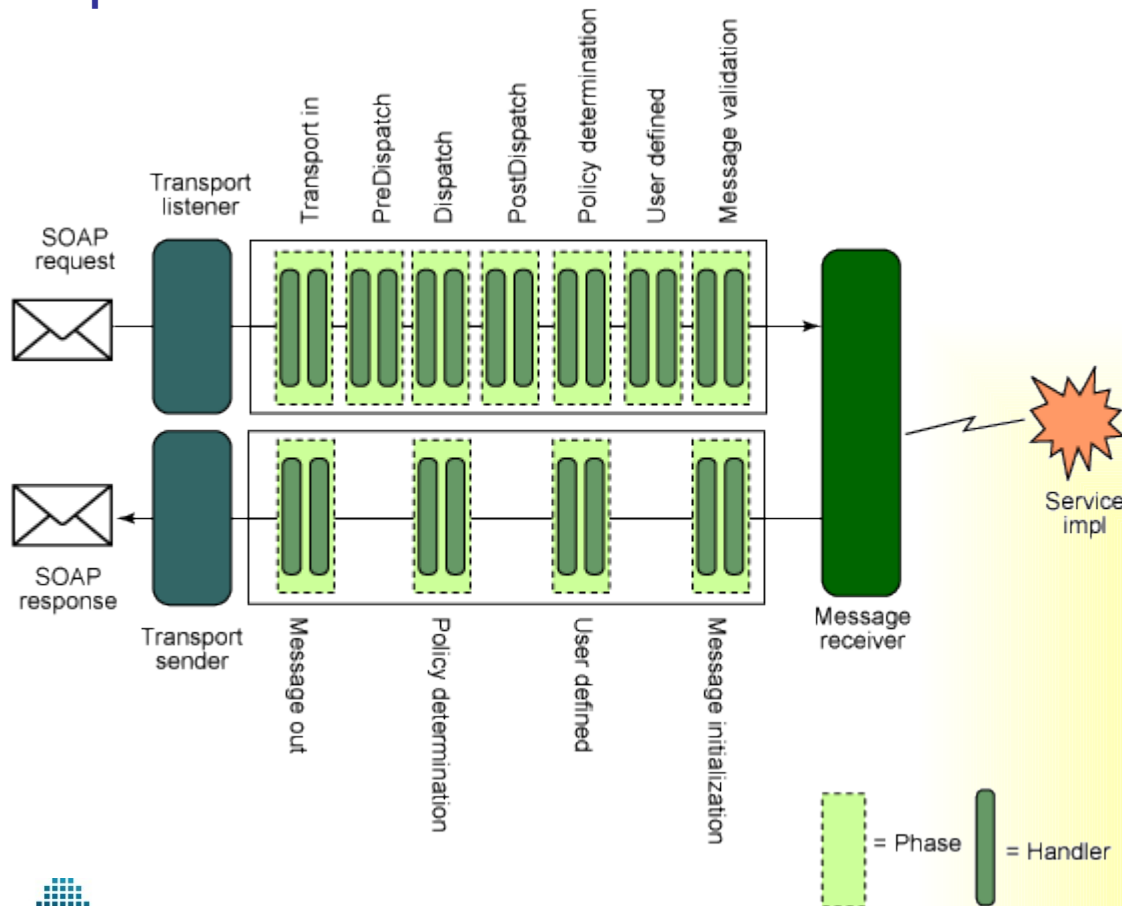
- Definition from W3C: "Web Service is a software application identified by a URI, whose interfaces and bindings are capable of being defined, described, and discovered by XML artifacts and which supports direct interactions with other software applications using XML-based messages via internet-based protocols".



# OdsWebService

OdsWebService is hosted by Apache Axis2 web services engine

## Apache Axis2

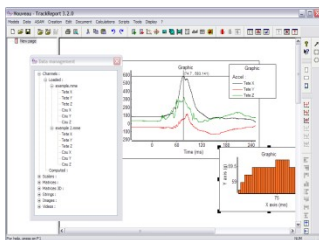


**Why do we need a web service engine?**

- Changes to the Web services landscape
- Performance
- Ease of use



# OdsWebService: Sample message exchange



Remote client

```
<?xml version="1.0" encoding="ISO-8859-1" ?>
<soapenv:Envelope
  xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/">
  <soapenv:Body>
    <tns:getAttributes
      xmlns:tns="http://www.orme-toulouse.com/OdsWebService/xsd">
      <tns:aid>4</tns:aid>
      <tns:iid>241</tns:iid>
      <tns:id_attr_name>id</tns:id_attr_name>
      <tns:attribute name="type" />
      <tns:attribute name="aircraft_version" />
      <tns:attribute name="status" />
      <tns:attribute name="creator_name" />
    </tns:getAttributes>
  </soapenv:Body>
</soapenv:Envelope>
```

*Request*

```
<?xml version="1.0" encoding="ISO-8859-1" ?>
<soapenv:Envelope
  xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/">
  <soapenv:Body>
    <tns:getAttributesResponse
      xmlns:tns="http://localhost/OdsWebService/xsd">
      <tns:attribute tns:ods_type="DT_LONGLONG">
        <tns:name>aircraft_version</tns:name>
        <tns:value tns:flag="15">240</tns:value>
        <tns:unit_id>0</tns:unit_id>
      </tns:attribute>
      <tns:attribute tns:ods_type="DT_ENUM">
        <tns:name>status</tns:name>
        <tns:value tns:enumeration_type="result_status"
          tns:flag="15">non_validated</tns:value>
        <tns:unit_id>0</tns:unit_id>
      </tns:attribute>
      <tns:attribute tns:ods_type="DT_STRING">
        <tns:name>creator_name</tns:name>
        <tns:value tns:flag="15">user1</tns:value>
        <tns:unit_id>0</tns:unit_id>
      </tns:attribute>
    </tns:getAttributesResponse>
  </soapenv:Body>
</soapenv:Envelope>
```

*Response*



OdsWebService



# TrackReport

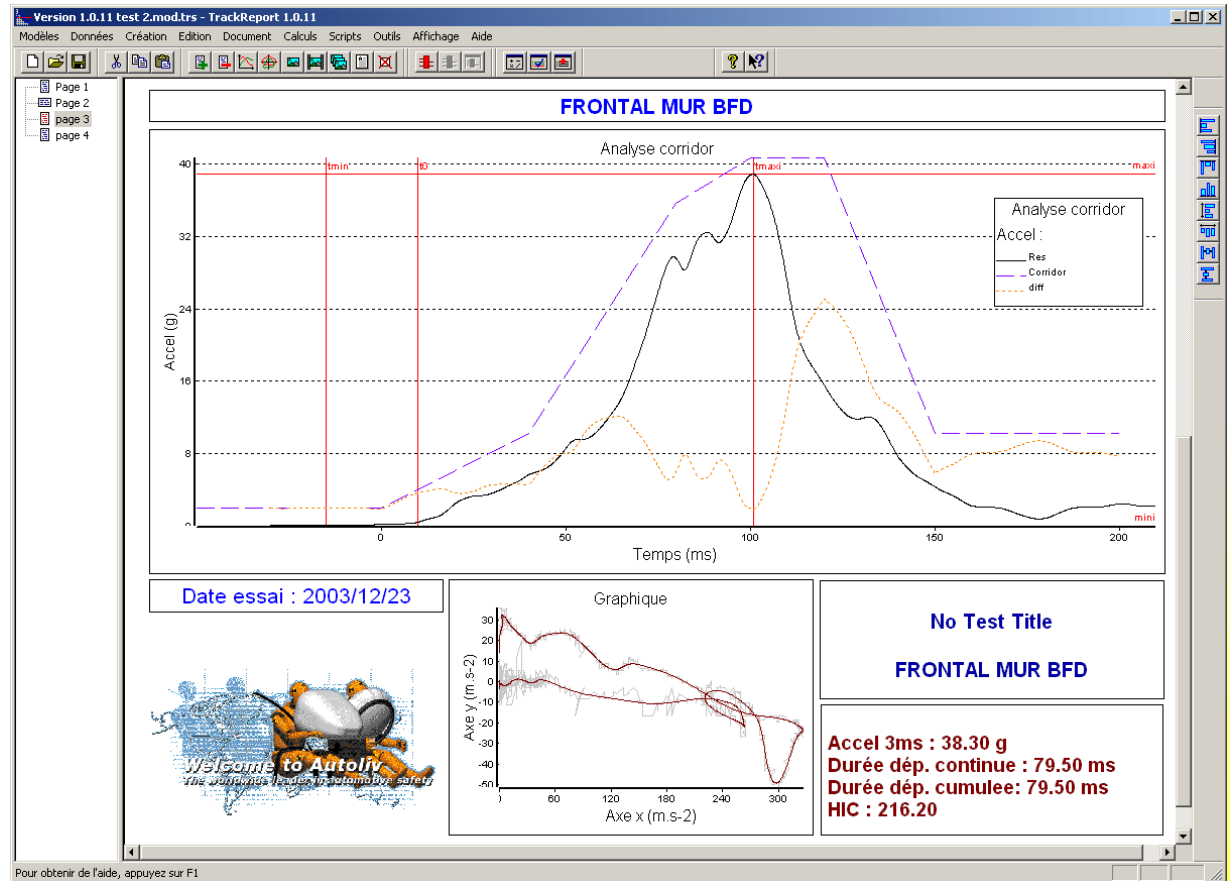
TrackReport is a graphical test report design tool

## Graphical objects:

- Curves  $y=f(x)$
- Parametric curves
- Images
- Image sequences
- AVI videos
- Dynamic text areas
- Tables
- ...

## Synchronization:

- Double cursors
- Curve/video synchro



# TrackReport

## Computation libraries:

- Arithmetic
- Numerical analysis
- Automotive
- Text strings
- Movies
- GUI
- Interpolation
- Signal
- Statistics
- Data synthesis
- Trigonometry
- Channels
- ...

## Unit manager :

- Automatic conversions
- Unit symbols management

**Pile de calculs**

```
***** VITESSES *****  
vx = INTEGR(x (filtree), -15.052, 0)  
vy = INTEGR(y (filtree), 4, 0)  
vz = INTEGR(z (filtree), -10, 0)  
module vitesse = RES3D(vx,vy,vz)  
  
***** CRITERES BIOMECHANIQUES *****  
(HIC,,) = HIC (res,,,0.00 ms, 50.00 ms, 36.00 ms)
```

**HIC**

Résultat : HIC max (scalaire)  
HIC

Composante X ou résultante :  
sélection de la voie : Tete X AVD Hrt  
Filtre

Instant t0 (scalaire ou valeur en ms)  
à partir de t0 Filtre

Résultat : T1 (scalaire)  
t1 = Calcul du HIC ( Tete Y AVD Hrt Filtre )

Composante Y : sélection de la voie : Tete Y AVD Hrt  
Filtre

Durée (ms)  
pendant 150

Résultat : T2 (scalaire)  
t2

Composante Z : sélection de la voie : Tete Z AVD Hrt  
Filtre

Delta temps max (ms)  
36

Annuler OK

**Gestionnaire d'unités**

- Sans unité
  - +
- Temps
  - +
- Distance
  - +
- Surface
  - +
  - m<sup>2</sup>
- Volume
  - +
  - m<sup>3</sup>
- Angle
  - +
  - rad
  - deg
- Vitesse
  - +
- Vitesse Rotation
  - +
- Accélération
  - +
- Accélération Rotation
  - +
  - rd.s<sup>-2</sup>
- Masse
  - +
  - kg
  - gr
  - t
- Effort
  - +

Ajouter un type d'unité  
Ajouter une unité  
Ajouter un symbole  
Supprimer  
Retour aux unités  
OK  
Annuler

**Aperçu rapide**

z (signed)

Axe y (m.s<sup>-2</sup>)

Axe x (s)



# TrackReport

## TrackL Scripts:

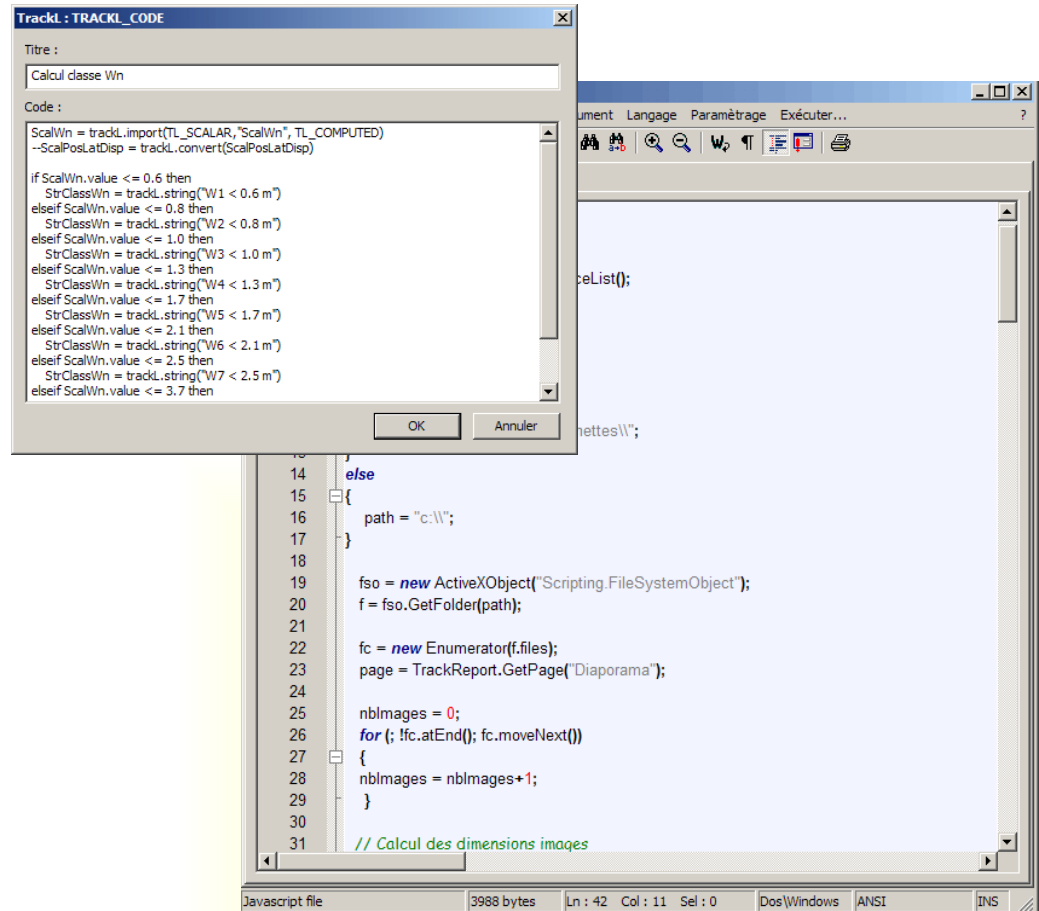
- Vector calculus
- New calculation functions

## JavaScript:

- New calculation interfaces
- Task automation
- Dynamic reports
- TrackReport driving

## Plug-in development Kit:

- New calculation functions
- New data readers



The image shows two overlapping windows. The top window, titled 'TrackL : TRACKL\_CODE', contains a script for calculating window classes based on width. The bottom window shows a JavaScript file with code for file system operations and report generation.

```
Titre :
Calcul classe Wn

Code :
ScalWin = trackL.import(TL_SCALAR, "ScalWin", TL_COMPUTED)
--ScalPostLatDisp = trackL.convert(ScalPostLatDisp)

if ScalWin.value <= 0.6 then
  StrClassWn = trackL.string("W1 < 0.6 m")
elseif ScalWin.value <= 0.8 then
  StrClassWn = trackL.string("W2 < 0.8 m")
elseif ScalWin.value <= 1.0 then
  StrClassWn = trackL.string("W3 < 1.0 m")
elseif ScalWin.value <= 1.3 then
  StrClassWn = trackL.string("W4 < 1.3 m")
elseif ScalWin.value <= 1.7 then
  StrClassWn = trackL.string("W5 < 1.7 m")
elseif ScalWin.value <= 2.1 then
  StrClassWn = trackL.string("W6 < 2.1 m")
elseif ScalWin.value <= 2.5 then
  StrClassWn = trackL.string("W7 < 2.5 m")
elseif ScalWin.value <= 3.7 then

}
else
{
  path = "c:\\";
}
fso = new ActiveXObject("Scripting.FileSystemObject");
f = fso.GetFolder(path);
fc = new Enumerator(f.files);
page = TrackReport.GetPage("Diaporama");
nblimages = 0;
for (; !fc.atEnd(); fc.moveNext())
{
  nblimages = nblimages+1;
}
// Calcul des dimensions images
```



- Logarithmic sum / difference / average
- A, B, C weighting
- Neat-band  $\leftrightarrow$  Third-octave-band  $\leftrightarrow$  Octave-band conversions
- Atmospheric absorption
- Directivity indexes
- Spherical divergence estimation
- Spectrum / matrix OASPL computation
- Noisiness, PNL, TPNL, EPNL
- Tone correction



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Demo...

