

Presented by

Pierre GAUFILLET

Software Engineering Specialist

Using some content from Gérard LADIER & Romain BERRENDONNER

Avionics and Simulation Products
AIRBUS

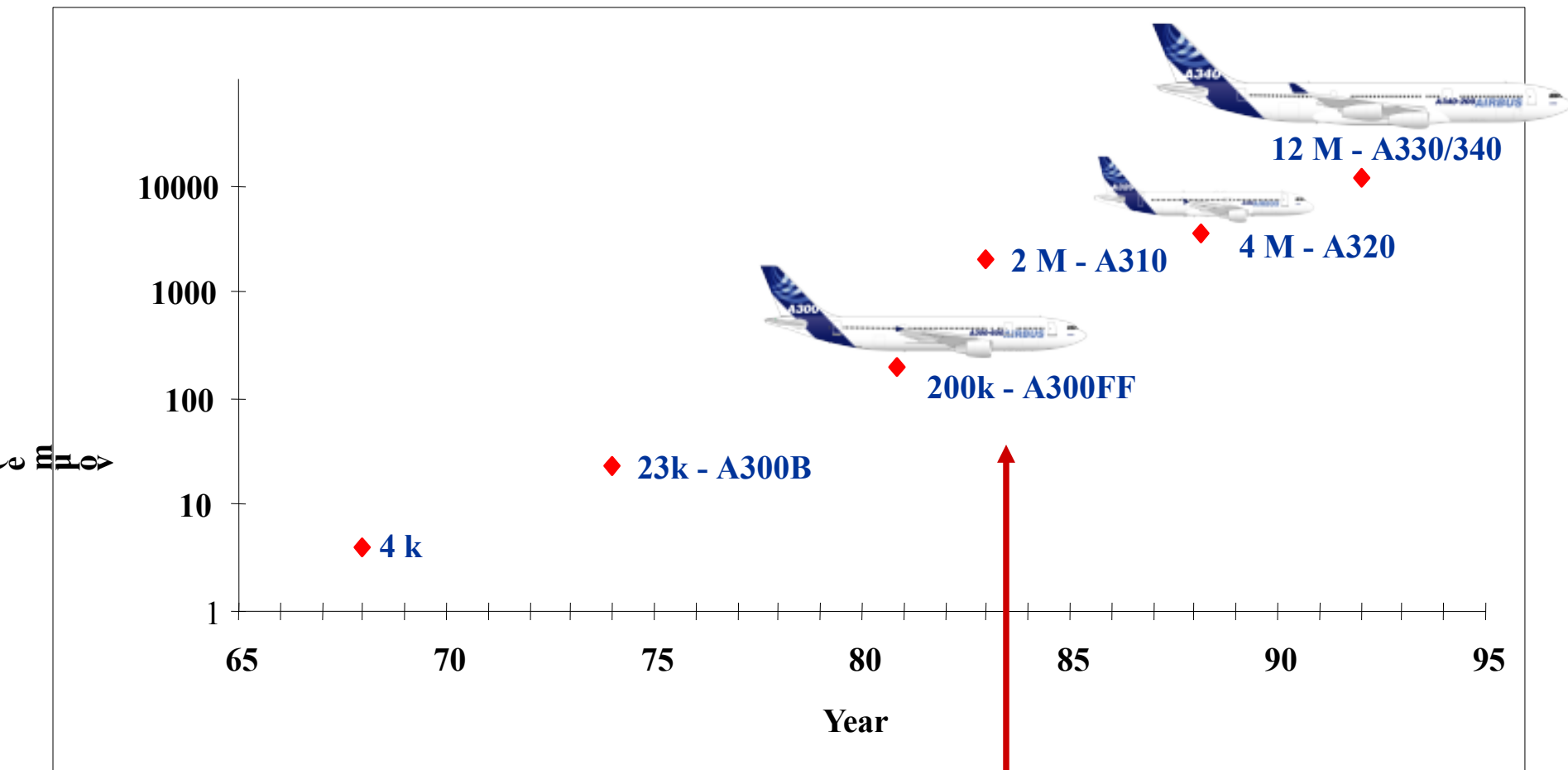


OPEES

Open Platform for the Engineering of Embedded Systems

The avionics software beginnings

- First significant use of software for avionics : the 80's



The avionics software beginnings

At that time, and for some years, « software » seemed nearly synonymous with « bug »... :

EQUIPEMENTS AVIONIQUE

LA COMPLEXITE DES LOGICIELS EMBARQUES MENACE LA SECURITE DES AVIONS

Nombre d'incidents survenus récemment à des Boeing 747 sont imputés à des erreurs logicielles. Des problèmes analogues dans la mise au point des C17 et F14D remettent une nouvelle fois en question le rôle qu'on attribue aux calculateurs embarqués.

3000 avions. Hélicoptères pour ses passagers, le char avait été retardé alors que l'avion volait en altitude à 31000 pieds (9400 mètres). Mais l'appareil n'a pu reproduire le contrôle de puissance automatique et épuisé ses réserves sous une accélération de 3G. L'appareil entraîna la perte d'une partie du revêtement de l'aile qui, en se détachant, alla entraver la queue de l'appareil. Le 747 fut obligé de prater sans autres dommages.

Et après les problèmes techniques de l'Europe, des problèmes de sécurité ont été constatés en Amérique.



British Airways signale 10 accidents d'origine logicielle survenus notamment sur ses 747.

PAR JEAN DUPONT

Les avions de ligne sont de plus en plus équipés de logiciels embarqués. Mais ces logiciels sont souvent développés par des sociétés qui ne sont pas spécialisées dans l'aviation. En conséquence, les avions sont de plus en plus vulnérables à des erreurs logicielles.

NEWS

COMPUTER WEEKLY AUGUST 13 1992

Boeing opposes tests on safety-critical software

Tony Collins, US AIRCRAFT manufacturer Boeing wants to dilute an already weakened avionics standard on the testing of safety-critical and other software.

In a letter to a standards-writing committee it urges

come into operation next year.

But Boeing says the checks would "go well beyond" the existing US Federal Aviation Regulations which cover software inspections and tests. The manufacturer says it is "opposed to the use of

turer could contest a rejection of its software. Also, Boeing says spot-checks by certification authorities would undermine the tests carried by its employees. "Validation of the life-cycle processes should be left to the applicant (Boeing) rather than the certification authority," says a letter

nical Concepts for Aviation in Seattle, US, has already rejected calls from the British Computer Society for the mandatory independent testing of all safety-critical software used in computerized aircraft such as the Airbus A320.

However, the committee has included a provision in its certification

RESEARCH PAPER

CAD: COMPUTER-AIDED DISASTER

PETER MELLOR
Centre for Software Reliability, C
Northampton Square, London EC
e-mail: p.mellor@csr.crl.ac.uk

Computers can kill (or have other undesirable effects). This paper describes a number of recent disasters in which computers have been wholly or partly to blame, including the Therac-25, which caused overdoses of radiation to its patients, and the crashes of the

The great disk initialization disaster
In 1986 a consultant had volunteered to format a diskette. He had no experience in using the software, and approached the manufacturer. The sequence of events was disastrous. The consultant departed after installing all the software on his personal computer. The office manager had no experience in using the software, and approached the manufacturer. The sequence of events was disastrous. The consultant departed after installing all the software on his personal computer.

resting and serious (it is funny and amusing) 'ch... with everything! They say for all types of ser... computerized. The... g machine is a typic... (It can sometime... (It can sometime...)

Hig
Vol.
PP

System/software engineering tools: a short story

- From the very beginning, we have needed tools to develop the avionics software at the requested dependability/productivity levels
- As there was nearly nothing available on the market place, major airframers / equipment suppliers in Europe developed their own solutions (make) :
 - ▶ Automatic Code Generation, Process Management, Test automation, etc.
- Progressive reorientation of our companies on our “specific skills” led to the move from “make” to “buy” :
 - ▶ The internal tools are transferred to editors who industrialize them (SCADE, RTRT, etc.) which leads to
 - ... improving them through massive investment
 - ... trying to sell them on a “larger” scale ... that today doesn’t actually exist
- Leading to the current situation of the software tools market for dependable embedded systems...

Long term availability...



One example : AIRBUS A300

- The program began in 1972 and production stopped in 2007

2007-1972 = 35 years...

- The support will last until 2050

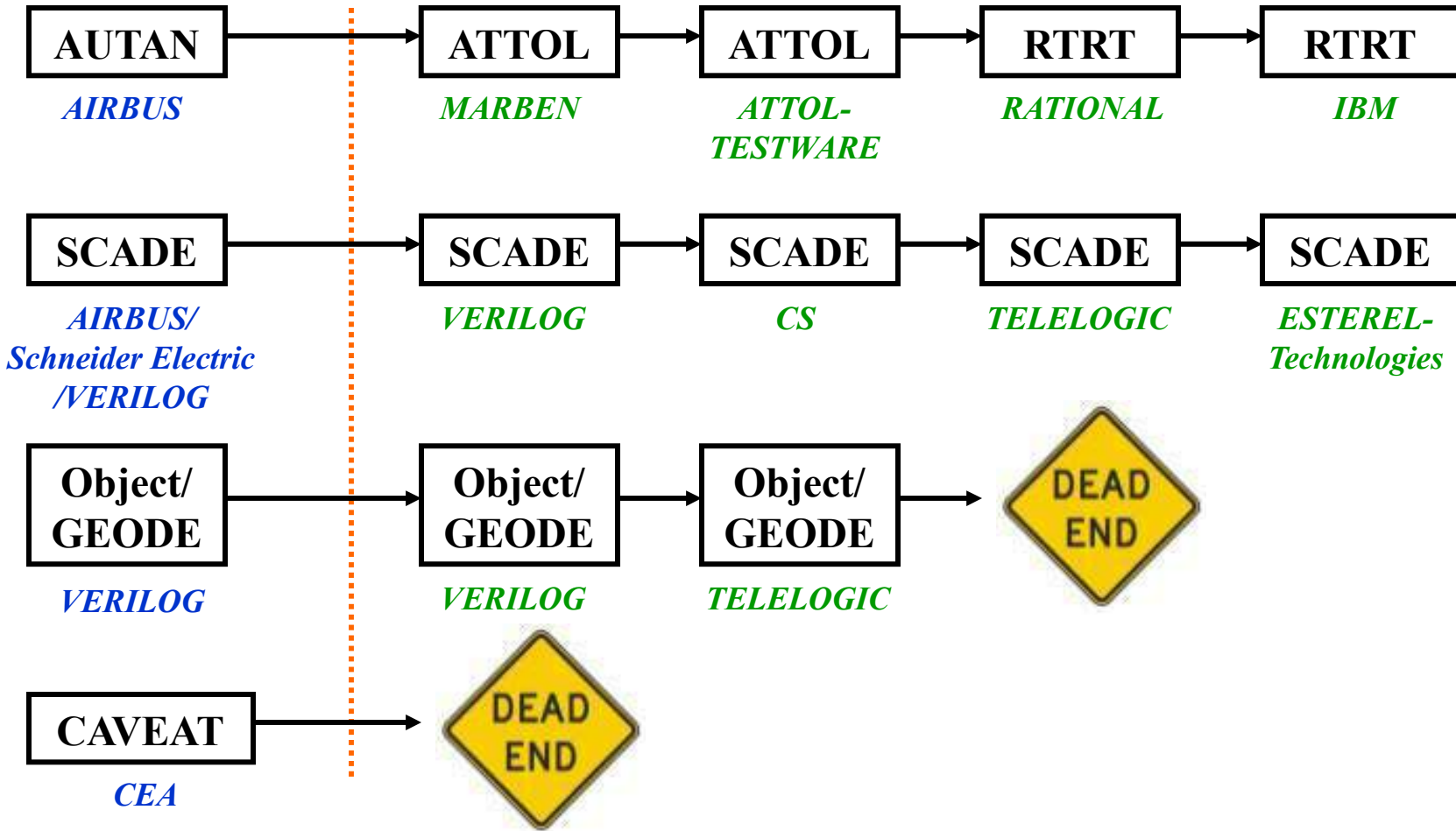
2050-1972 = 78 years !!!

On board software development for very long lifecycle products

... and volatility

Industry /
research centres

Commercial world



=> mastering, continuity, long term availability not always guaranteed...

Distribution difficulties

- Most of our software are developed with partners and sub-contractors in an **extended enterprise** mode :
 - Availability of development tools is not problem-free in this context :
 - **deployment** cost,
 - number of licenses, etc.
 - It may become impossible to manage when some tools integrated in our development framework are **not distributed anymore** :
 - Code controller commercial tool: we discovered that distribution had been stopped when a new sub-contractor asked for new licenses...
- And sometimes, we face unacceptable practices :
 - Example : tool move to a new machine, without any order change

Quantité	Description	Prix unitaire	Remise	Montant
1	Environnement Ada VAX/VMS croisé 68K.	15 000,00 €	50%	7 500,00 €

Quantité	Description	Prix unitaire	Remise	Montant
1	Environnement Ada VAX/VMS croisé 68K.	15 000,00 €	93%	1 000,00 €

⇒ Value for money ???

Many innovative tools are not distributed

- Too many tools developed by Airbus equipment suppliers , or innovative tools available in research labs as prototypes , are not largely available :
 - ▶ They are essential for the developments but not easily endorsed by classical means due to the investment required
 - ▶ They are most of the time de facto “proprietary” and thus not easily available for deployment on a large scale
 - ▶ They are too specialized and/or too costly for a profitable business in a very small market => no stable vendor => very few users => vendors crisis ,...

The result :

stagnation (and even decline) of the offer of innovating tools

leading to a

stagnation of the overall productivity

of embedded system developments

Open-Source: a solution ?

The Members of Eclipse

- 167 members
 - 14 Strategic Members
 - 3 Enterprise Members
- 949 committers, representing 75+ organizations

L'Open Source pousse les éditeurs à l'abandonware

par Alain Lefebvre, vice-président du groupe SQLI (www.sqli.com)

Strategic Members



Enterprise Members



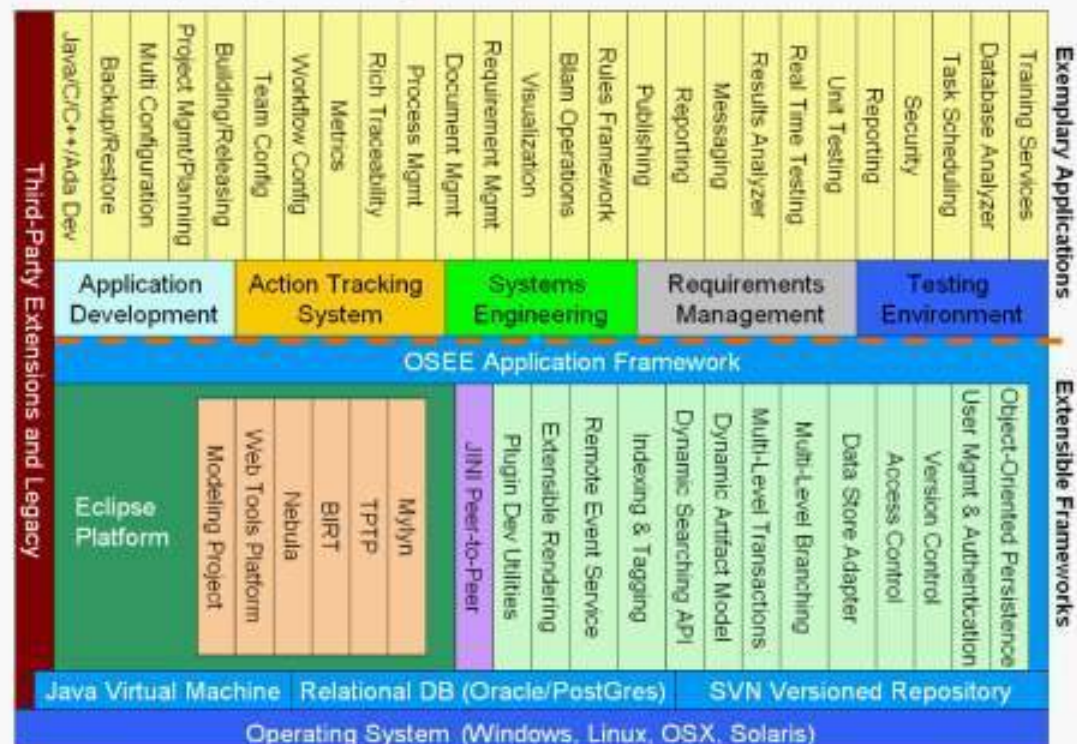
Articles : Microsoft se met à l'open-source

Posté par Boa Treize (page perso). Modéré le 05 avril 2004.

Informatique

Le logiciel libre passe à l'ère industrielle

Open System Engineering Environment Architecture



For all these reasons, Airbus commits itself...

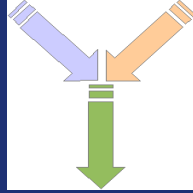
...with other industrial partners in the Aerospace Valley, Minalogic and Systematic Competitiveness clusters:

- ▶ To the Open Source approach for system/software engineering: TOPCASED, GENEAUTO, Framac, etc.
- ▶ In an extended industrial partnership:
 - Trans domains synergy (Aeronautics, Space, Automotive, etc.)
 - Software service companies
 - Tool vendors
- ▶ In partnership with the academic community (research & education)

Open Source Tools Status at Airbus

- Open source engineering tools are already available and deployed in aircraft programmes and already proved their resilience to providers volatility
- Currently running and future research projects will complete the tool chains
- The next step is to ensure long term maintenance and evolution of the tools through adequate infrastructure and organization

→ This is the purpose of OPEES initiative



OPEES

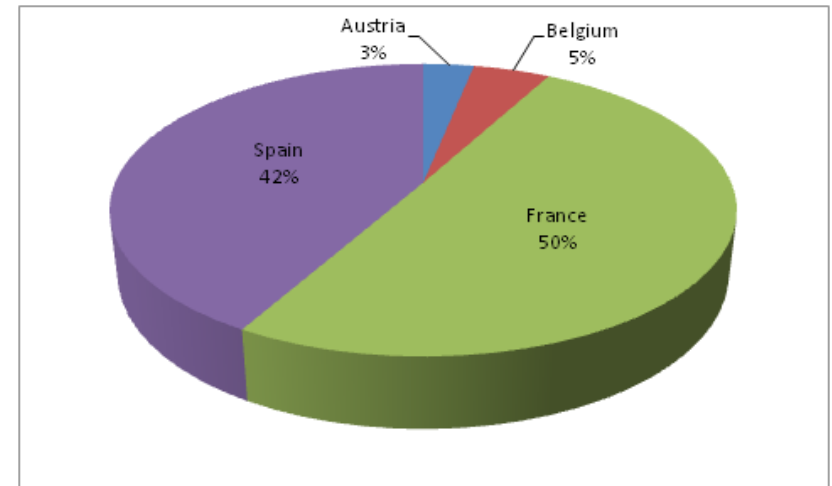
**Ensuring long-term availability of
critical / embedded
systems engineering technologies
to secure industry competitiveness and
development**



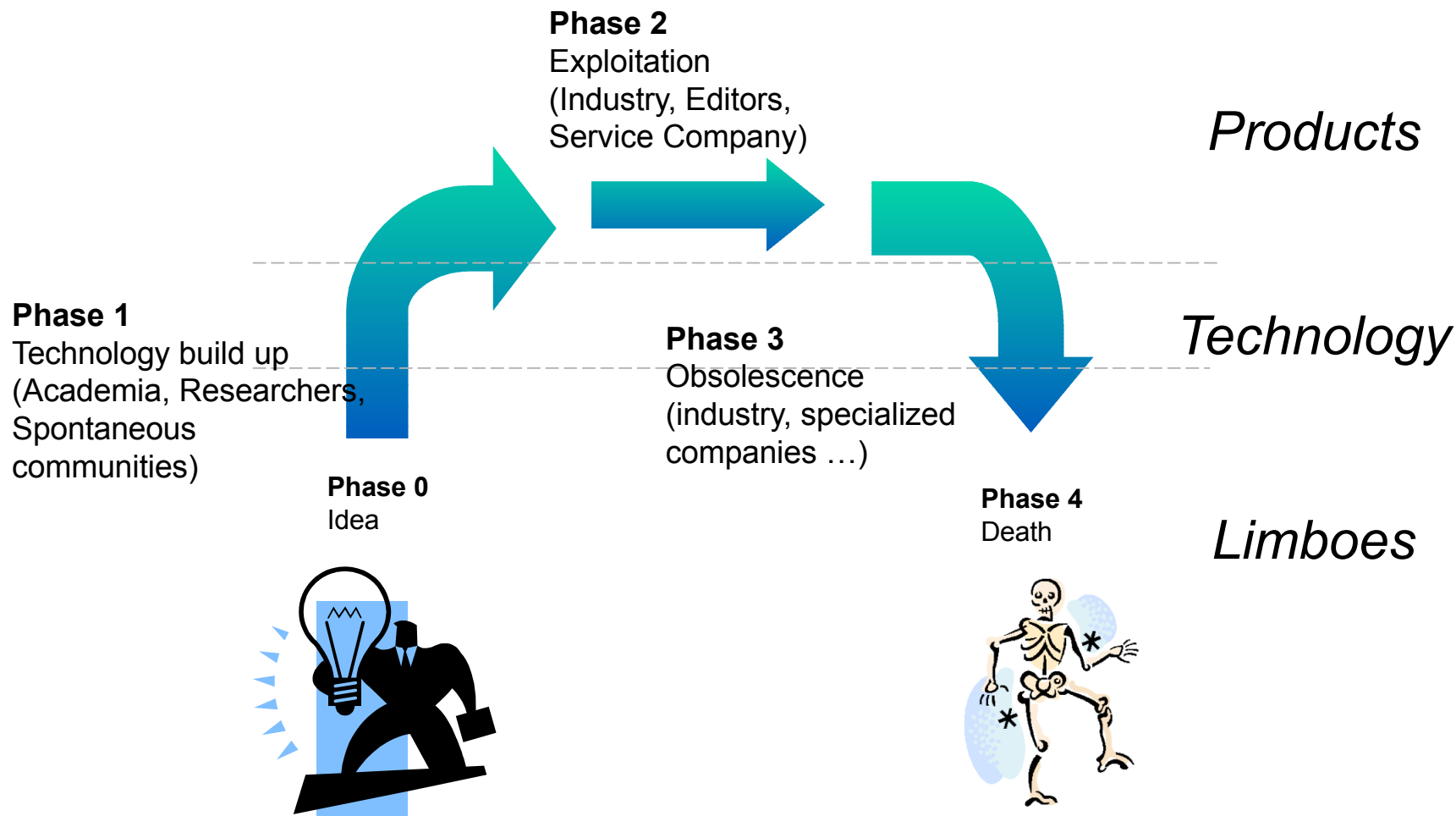
INFORMATION TECHNOLOGY FOR EUROPEAN ADVANCEMENT

ITEA OPEES Facts

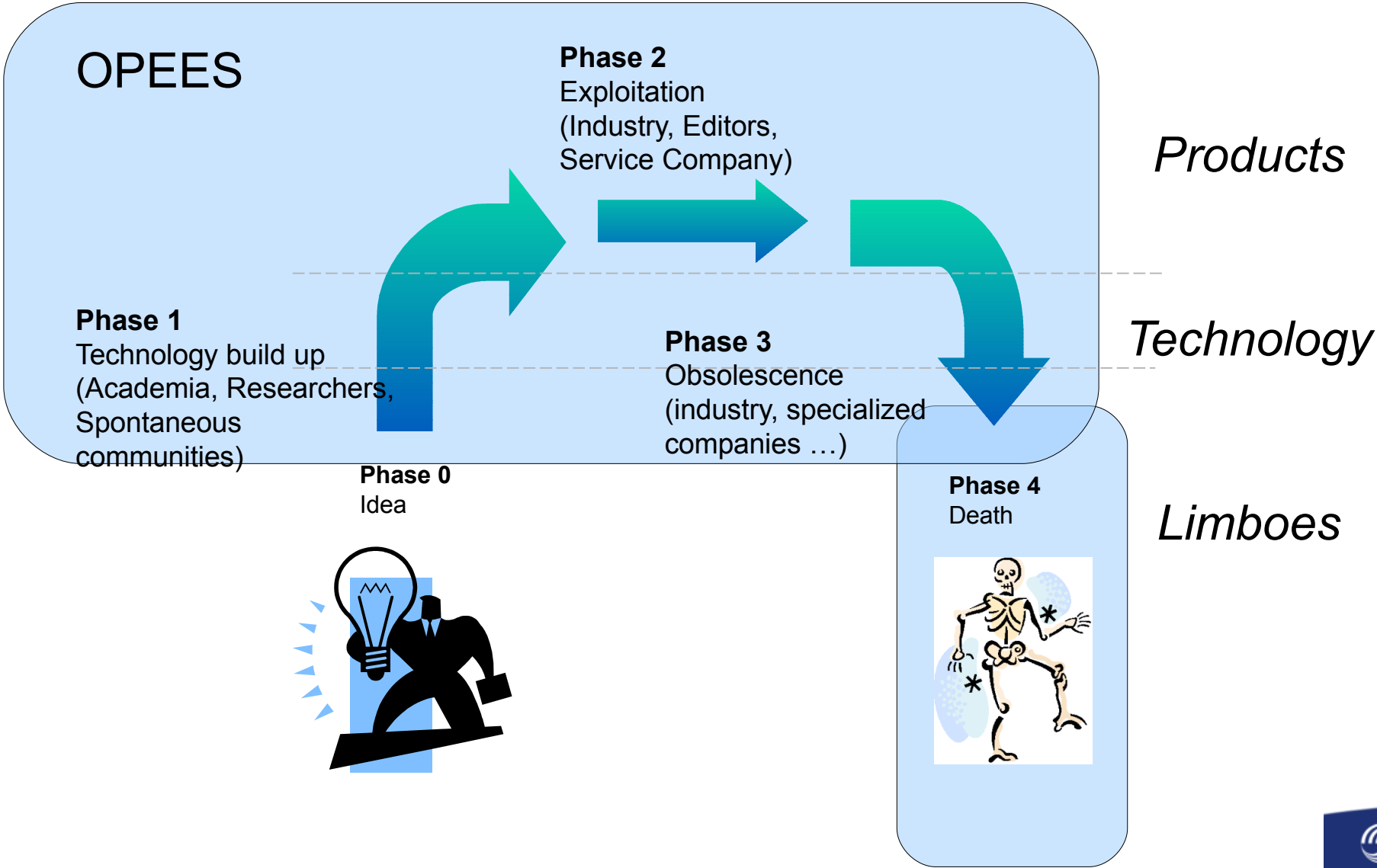
- Started in 2010 for 3 years
- OPEES is defining an organisation dedicated to open source long term support.
- 30 European partners including Airbus, Astrium, ATOS Origin, BARCO, CEA, CNES, Continental VDO, Dassault Aviation, Ericsson, the European Software Institute, INRIA, Thales, Universidad Politecnica de Valencia, University of Skövde, etc.
- The resulting organization will be open to new partners.



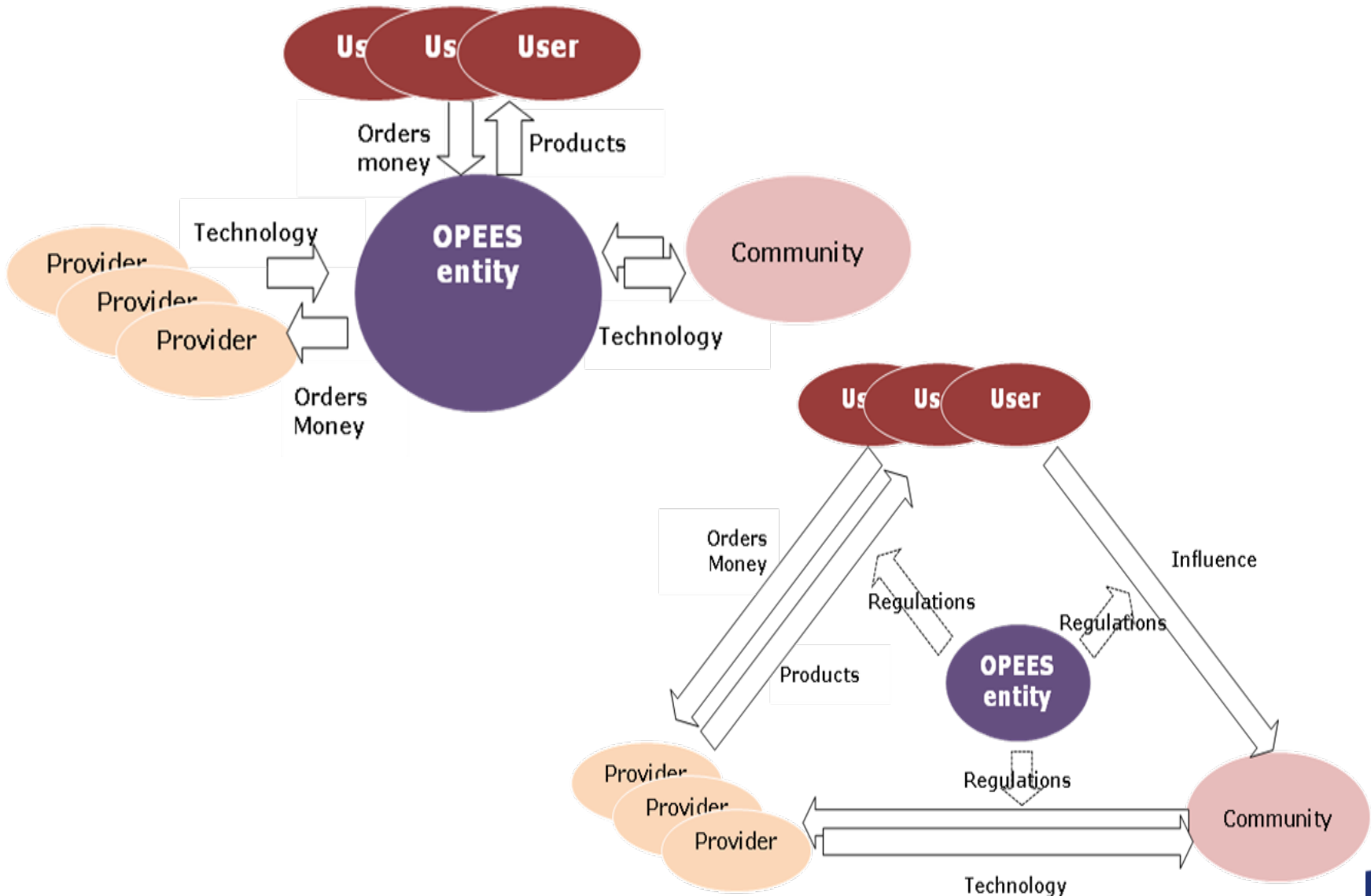
Software Lifecycle



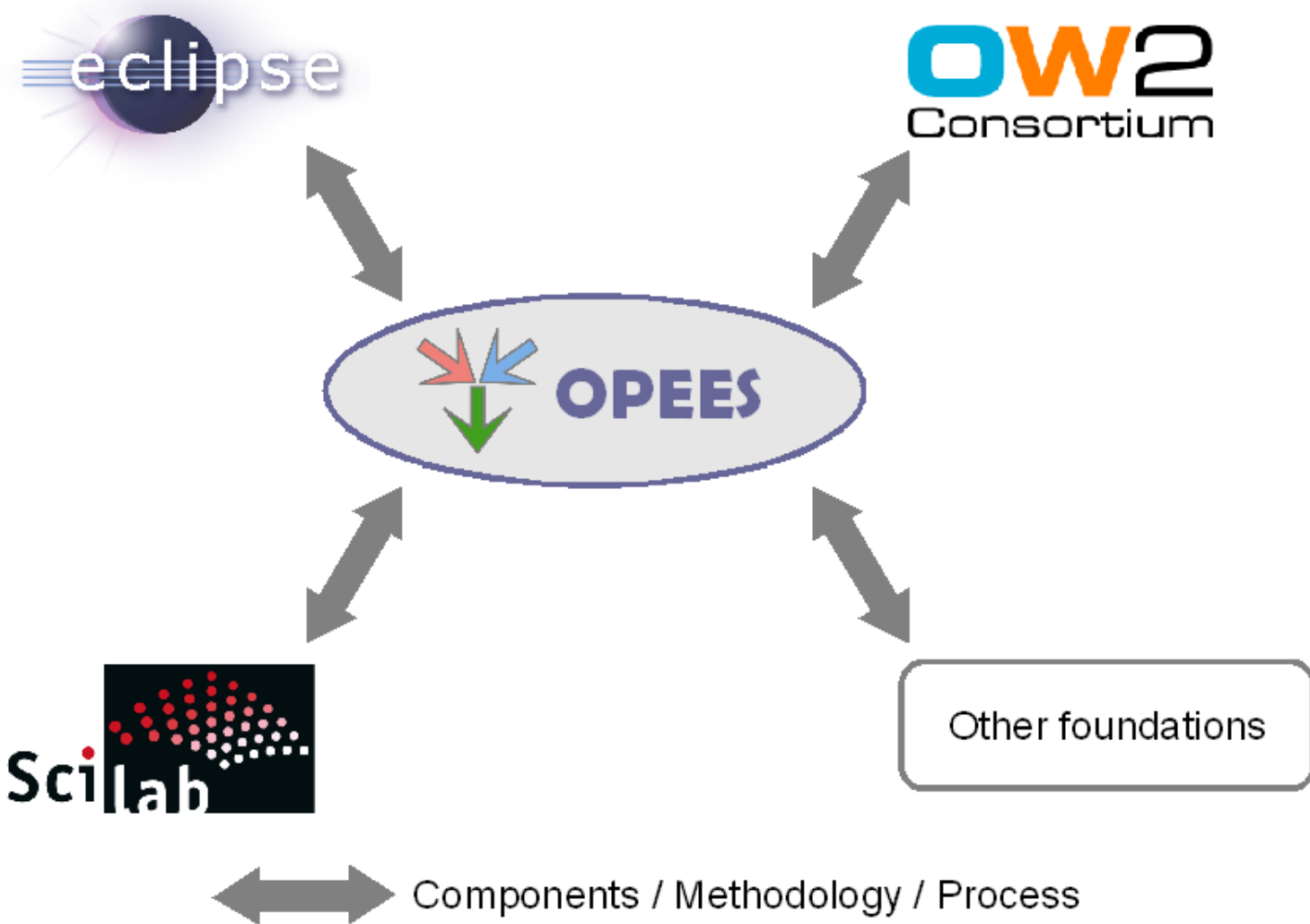
Software Lifecycle



Integrated or Regulative Organization ?



OPEES interactions with Open Source Foundations



Thank you for your attention!

Pierre GAUFILLET

AIRBUS

pierre.gaufillet@airbus.com

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