



Time4Sys

Performance Monitoring & Predictions

Experimentation and evaluation of Time4Sys
(WARUNA)



Technical context : FMS (Flight Management System)



Example: the FMS in an Airbus A320 cockpit

Navigation

Flight Planning

Trajectory & Predictions

Guidance

Interfaces management

Datalink



OPEN

Legacy Excel model

- All input data are copied (by hand) in the model
- Simplified model of the Real Time behaviour is programmed under Excel

Advantages:

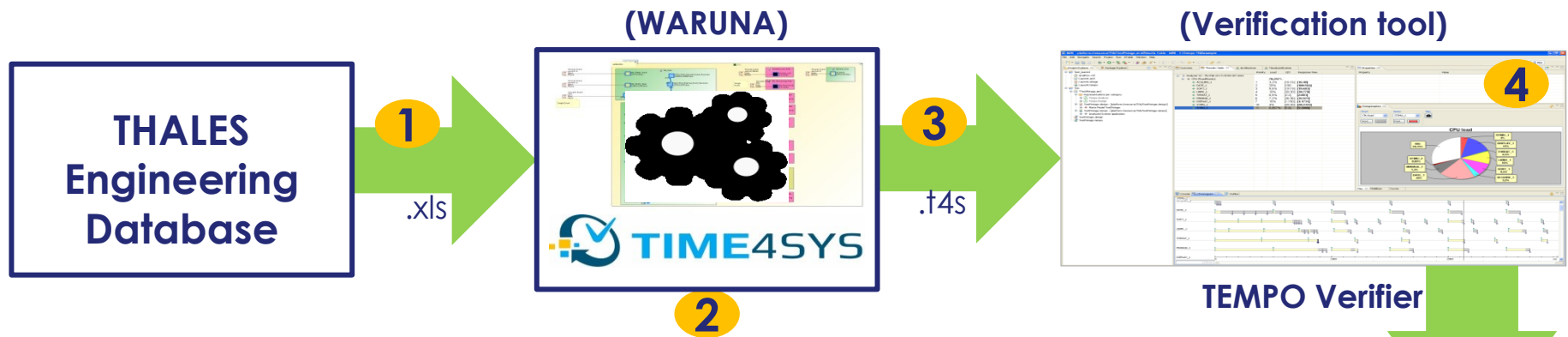
- Excel tool
- Already available

Drawbacks:

- Complex to use and comprehend
- Modelled Real Time behaviour too simplistic
- Not maintained - Knowledge lost
- Not evolutionary
- Complex Excel file with possible errors
- Not suited for the Product Line policy

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Timing scheduling verification integrated to THALES engineering database



- 1** Excel file extracted from Thales database with all use-cases and data to be analysed
- 2** The pivot model Time4Sys (T4S) solves the semantics gaps through model transformations
- 3** T4S models are injected in the scheduling analysis & simulation tool TEMPO Verifier
- 4** TEMPO Verifier computes the worst/best case latencies and the distribution for all use-cases
- 5** Outputs of TEMPO Verifier : Results in CSV files & Gantts explaining the worst case scenarios.

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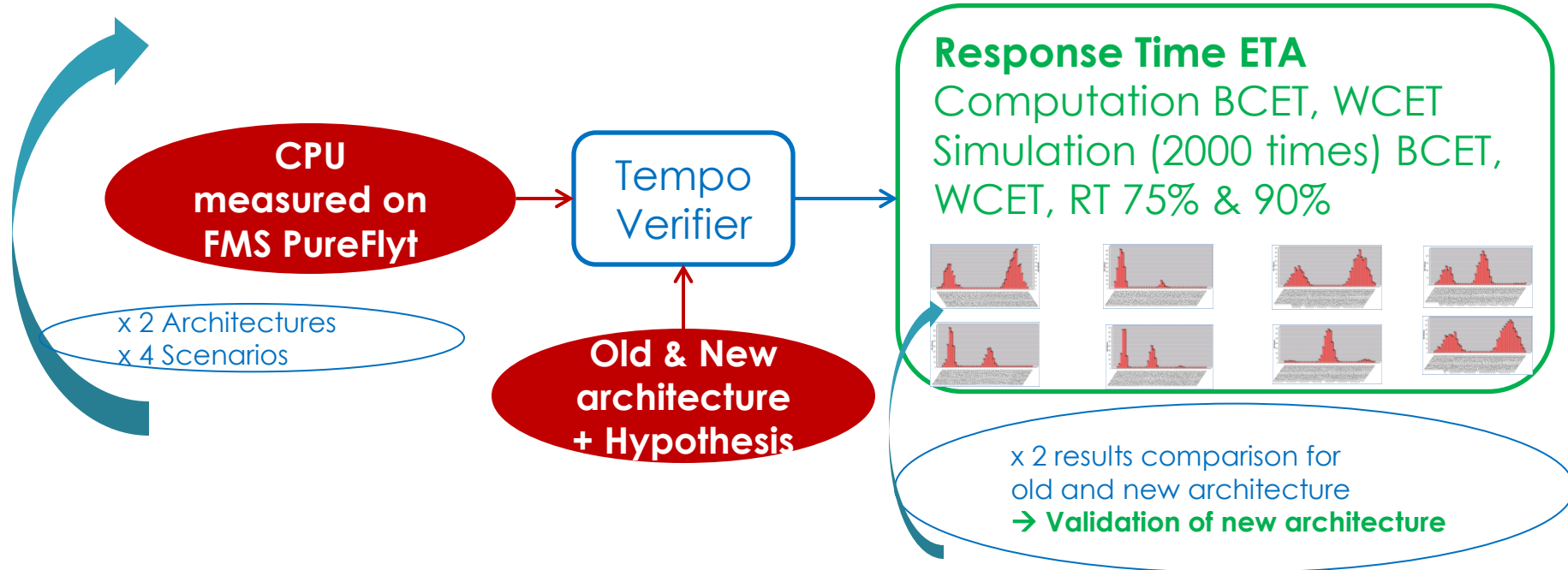


Impact assessment of function1 of the FMS



Process

- Impact evaluation of i4D functions on response time for Estimated Time Of Arrival (ETA) computation.

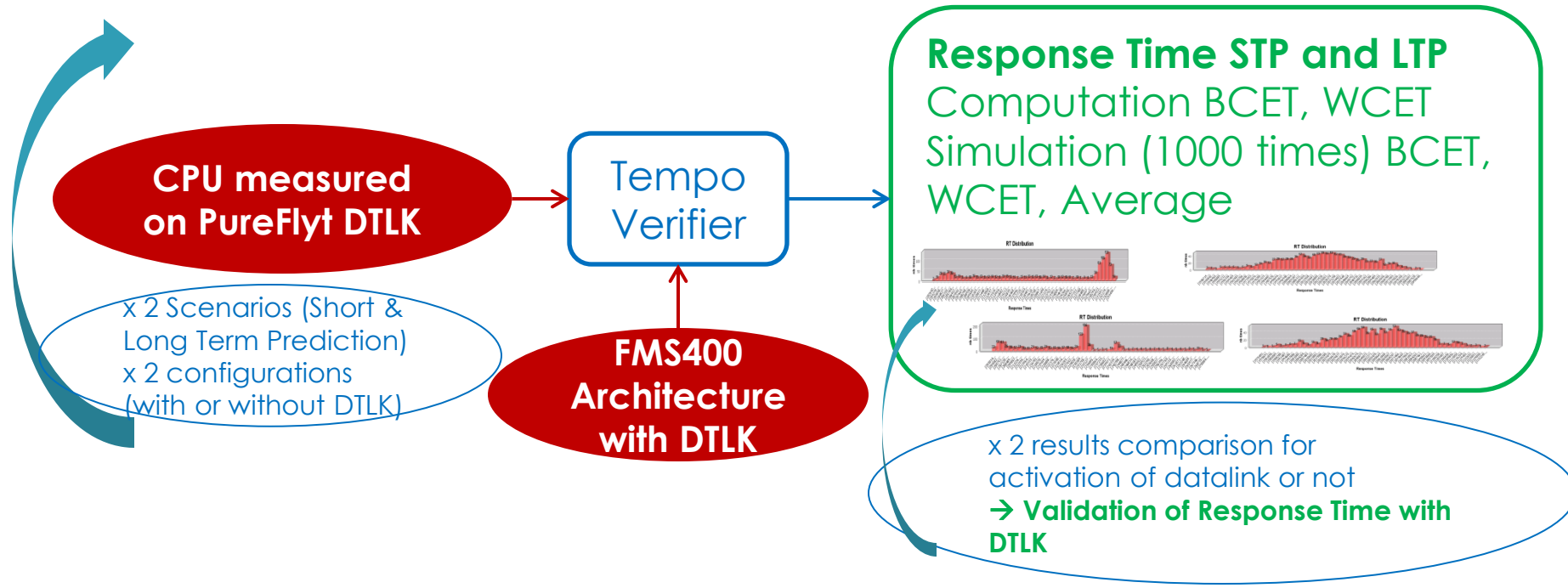


Impact assessment of function 2

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Process

- Impact evaluation of datalink introduction on response time for Short and Long Term predictions.



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Assets brought by Time4Sys / Tempo Verifier



Best case computation

New!

Show the best possible response time

Response time simulation

New!

Allow computing percentile response times

Separation of A653 mechanism from functional and technical architecture.

New!

- A653 mechanism are implemented in the tool

- Functional and technical architectures are provided in the excel input file

More reliable worse case computation

Prediction process mastered by the performance engineering team

Faster new architecture performance evaluation

Visual real time datagrams

New!

Allow debugging input data

Allow faster improvement of proposed architecture

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Based of the Time4Sys and Tempo Verifier

- All existing data are imported/exported as much as possible
- A653 Real Time behaviour has been verified

Advantages:

- A part of the input data (SW architecture description) is imported from the real architecture database (less errors)
- Tool evolutions are possible in order to simulate and analyse complex Real Time behaviours
- Allow use cases superposition
- Results are more visual and allow accurate analysis if needed
- Graphical representation of the worst case allows identifying bottlenecks
- Documents reports can be easily generated

Drawbacks:

- Effort to learn and validate the tool
- Need for support and services from SME to develop and maintain Time4Sys and appropriate verification tool

THALES is engaged in the T4S deployment inside the group

- Time4Sys is working very efficient and innovative: we proof it.
 - Used in operation now !!
- More deployment in THALES is ongoing!: TOSA, Avionics Networks, THALES DMS

URGENT: Time4sys not available for everyone !!

- Critical to make Time4Sys a success and to disseminate.
- THALES need to share the evolutions of Time4Sys to make it economically viable.

THALES teams not expert and autonomous in Time4Sys

- Need for services from SME
 - To bring support
 - To adapt Time4sys for THALES needs and evolutions
- Need for verification tools and related services.
 - MAST tool bridge not available for everyone
 - ROMEO tool bridge not available for everyone