Semi-automatic validation chain
-
SPIS Maintenance Activity

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SPINE meeting – March 17th 2014

Introduction

Outline:

1°) Context

2°) Realisation

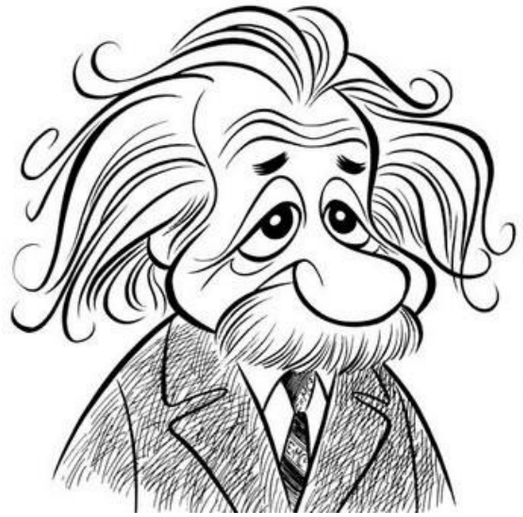
3°) Perspectives

Introduction

Context

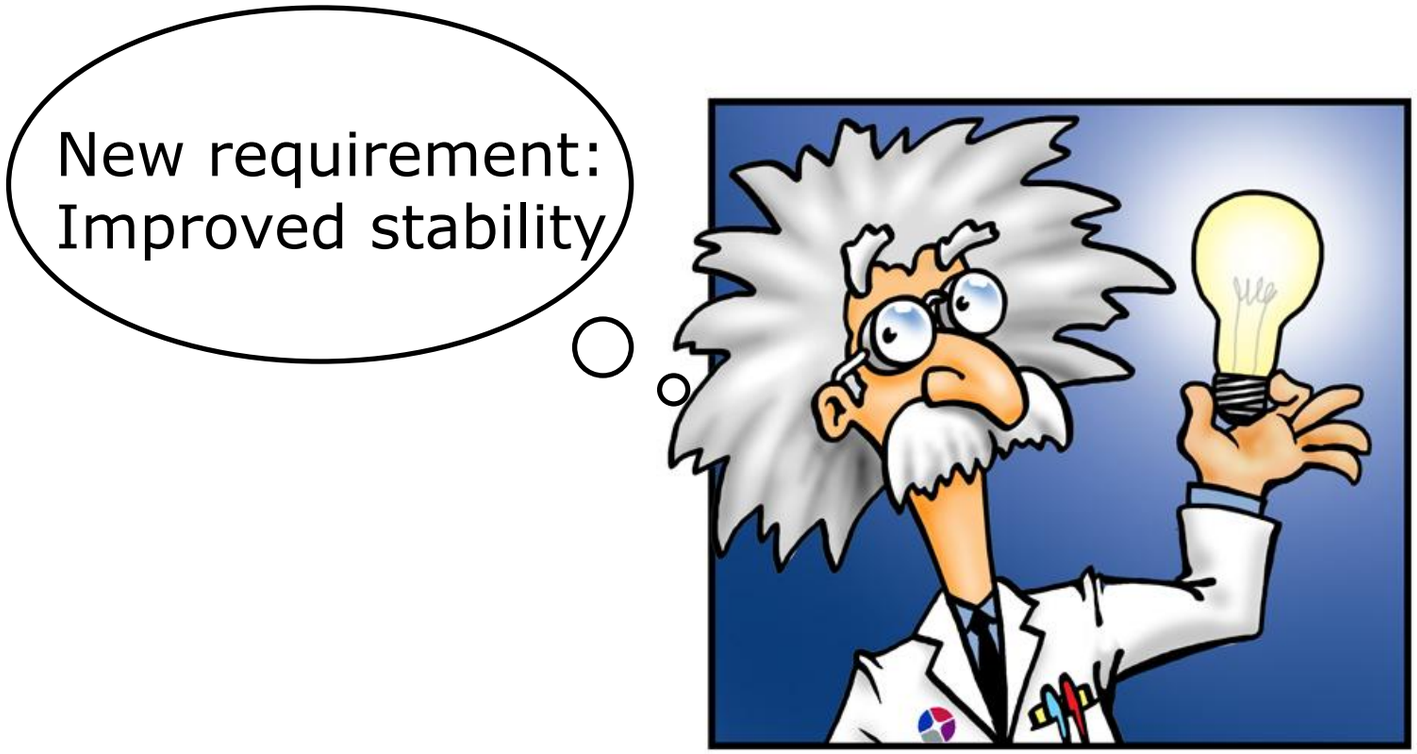
Introduction

Context



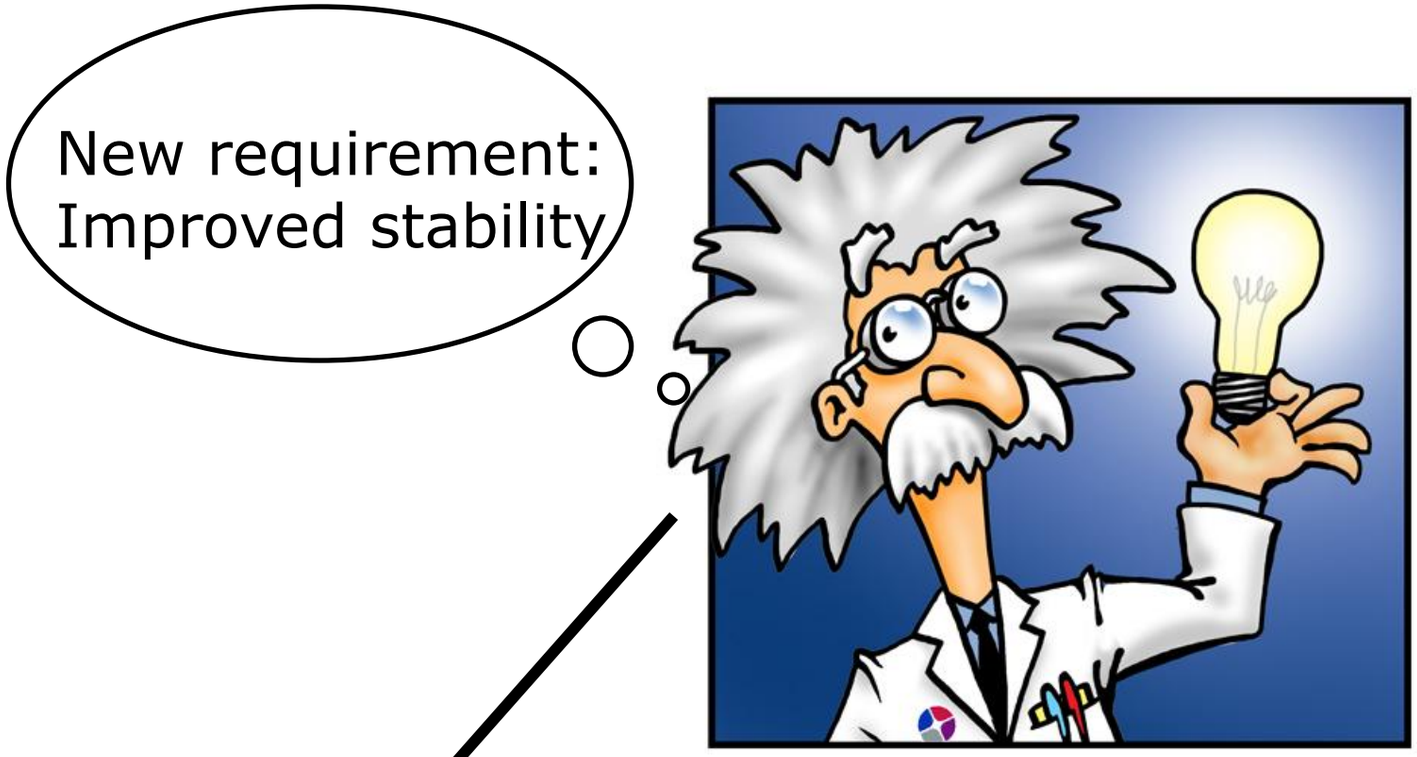
Introduction

Context



Introduction

Context



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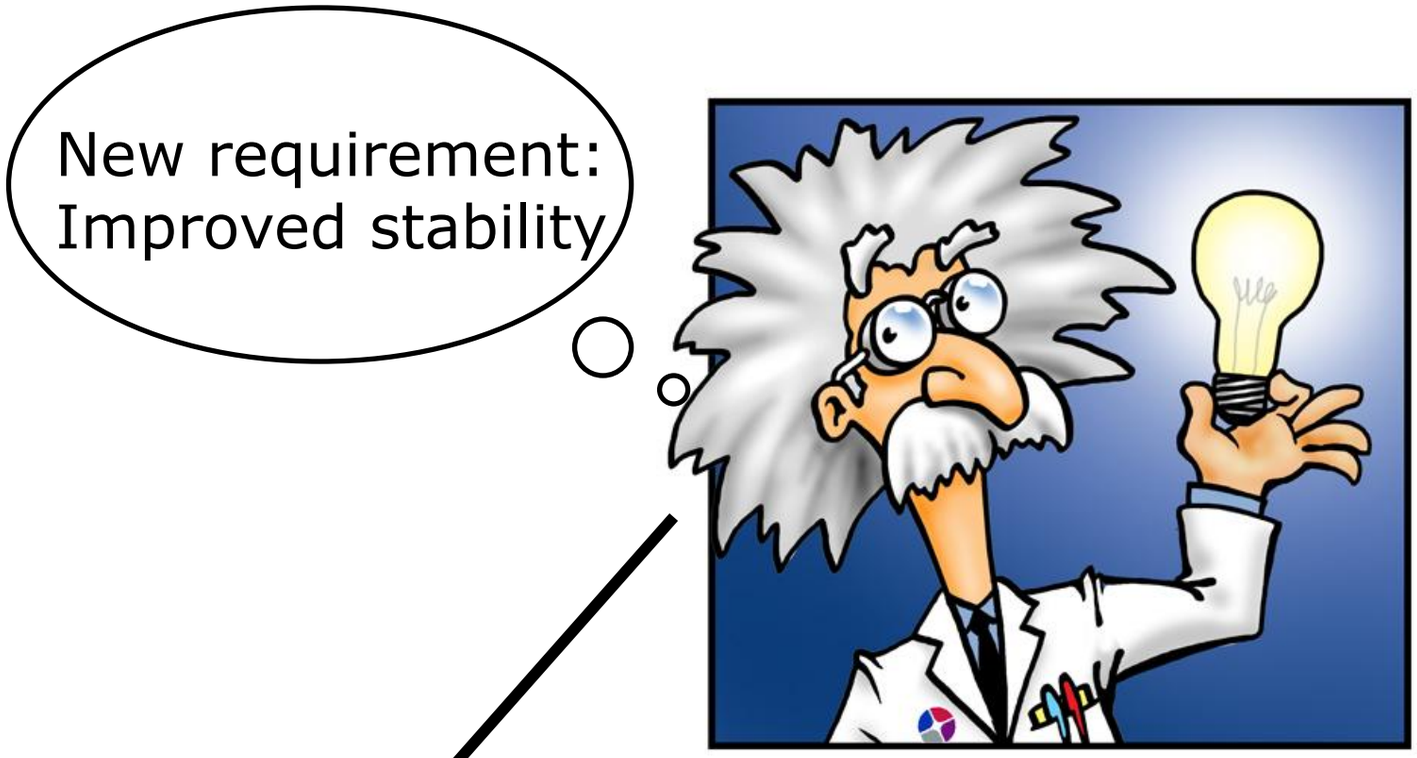
Context



Unexpected functional regression

Introduction

Context

Aside from low level software regressions, the addition of new features can impact physical results of modelling software.

The outputs of SPIS are time series, 3D trajectories, surface and volume data where statistical noise exist.

How do you know if results of simulation modeled with a new SPIS version software is valid?

Objective of SPIS maintenance activity:
Provide a semi-automated mechanism to validate numerical simulation results on unstructured 3D meshes.

SPIS Maintenance activity was developed in the frame of ESA contract reference XXX in collaboration with ONERA

A validation chain can be used to detect possible regressions introduced by new features

Validation chain description

Validation chain description
-
SPIS is fully integrated in the validation chain

Validation chain description

Developer

Development version of the SPIS software

Validation chain

Validation chain description

Developer

New feature

Development version of the SPIS software

Validation chain

Validation chain description

Developer

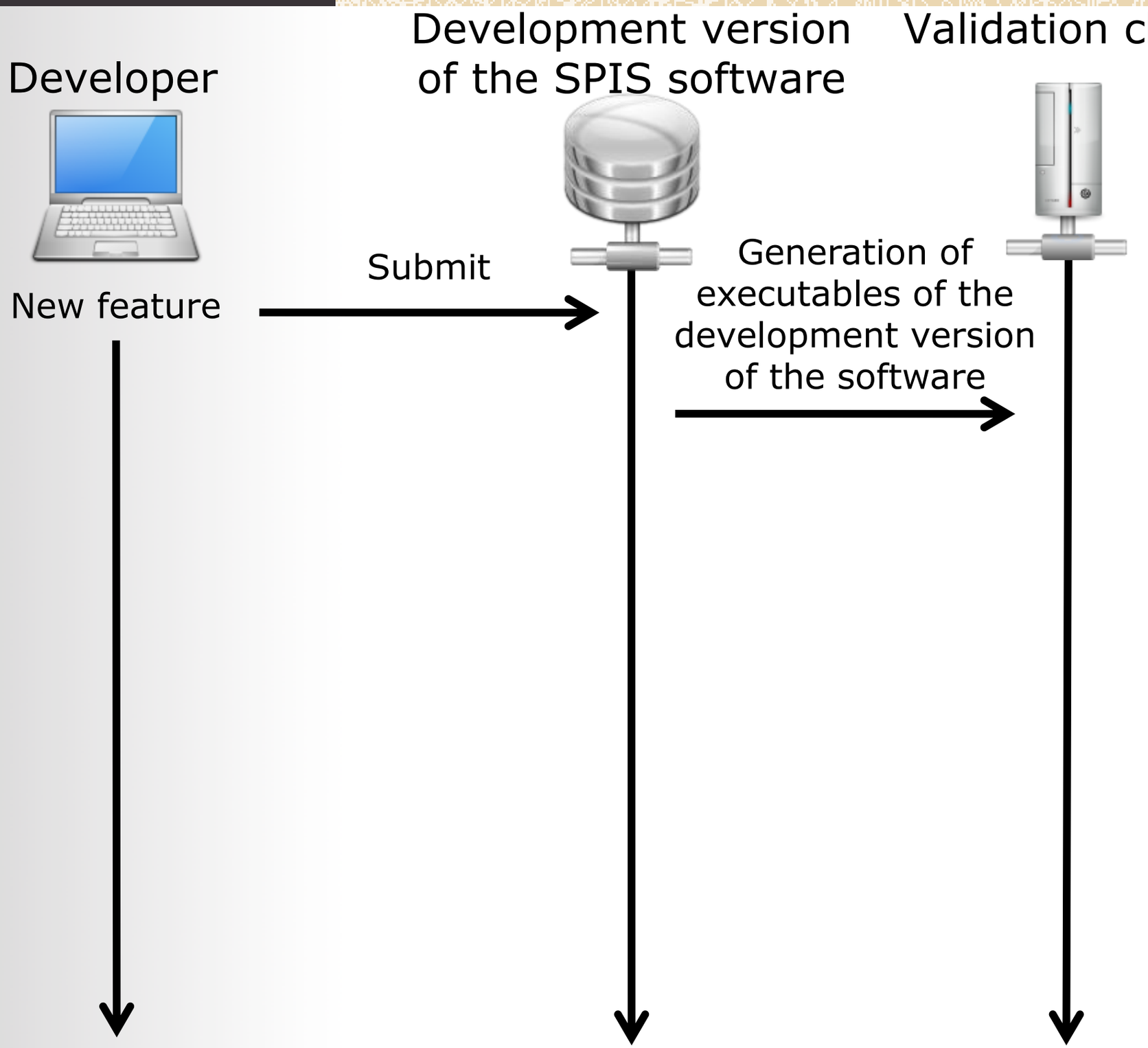
New feature

Development version of the SPIS software

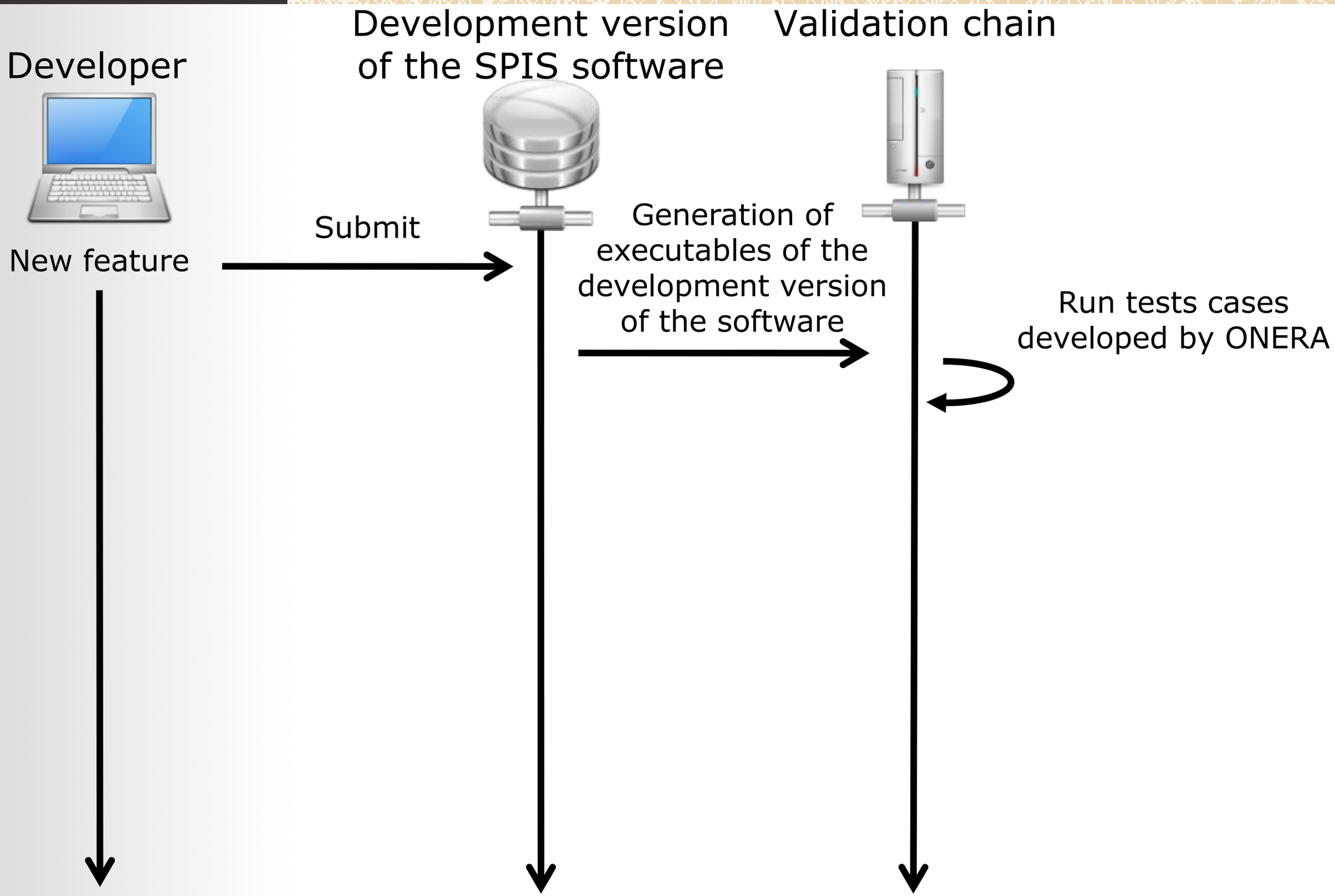
Submit

Validation chain

Validation chain description



Validation chain description



Validation chain description

17 test cases built by ONERA

List of all these reference cases which model a big part of SPIS functionalities:

SPIS_NRC_Child_Langmuir_small
SPIS_NRC_CylindricalprobeLDB
SPIS_NRC_CylindricalprobeSDN
SPIS_NRC_CylindricalprobeSDN
SPIS_NRC_EcrossB
SPIS_NRC_Equipot_comparison_case_v2
SPIS_NRC_GEO_ECSSWC
SPIS_NRC_GEO_NASAWC
SPIS_NRC_MultipleSource_MultipleVolInteract
SPIS_NRC_Plasma_wake
SPIS_NRC_SphereCharging_case1_BTPIC_MB
SPIS_NRC_SphereCharging_case1_PIC_MB
SPIS_NRC_SphereCharging_case1_PIC_PIC
SPIS_NRC_SphericalprobeLDB_case1
SPIS_NRC_SphericalprobeSDB_negative_pot
SPIS_NRC_SphericalprobeSDB_positive_pot
SPIS_NRC_Thin_wires_case_v2

Validation chain description

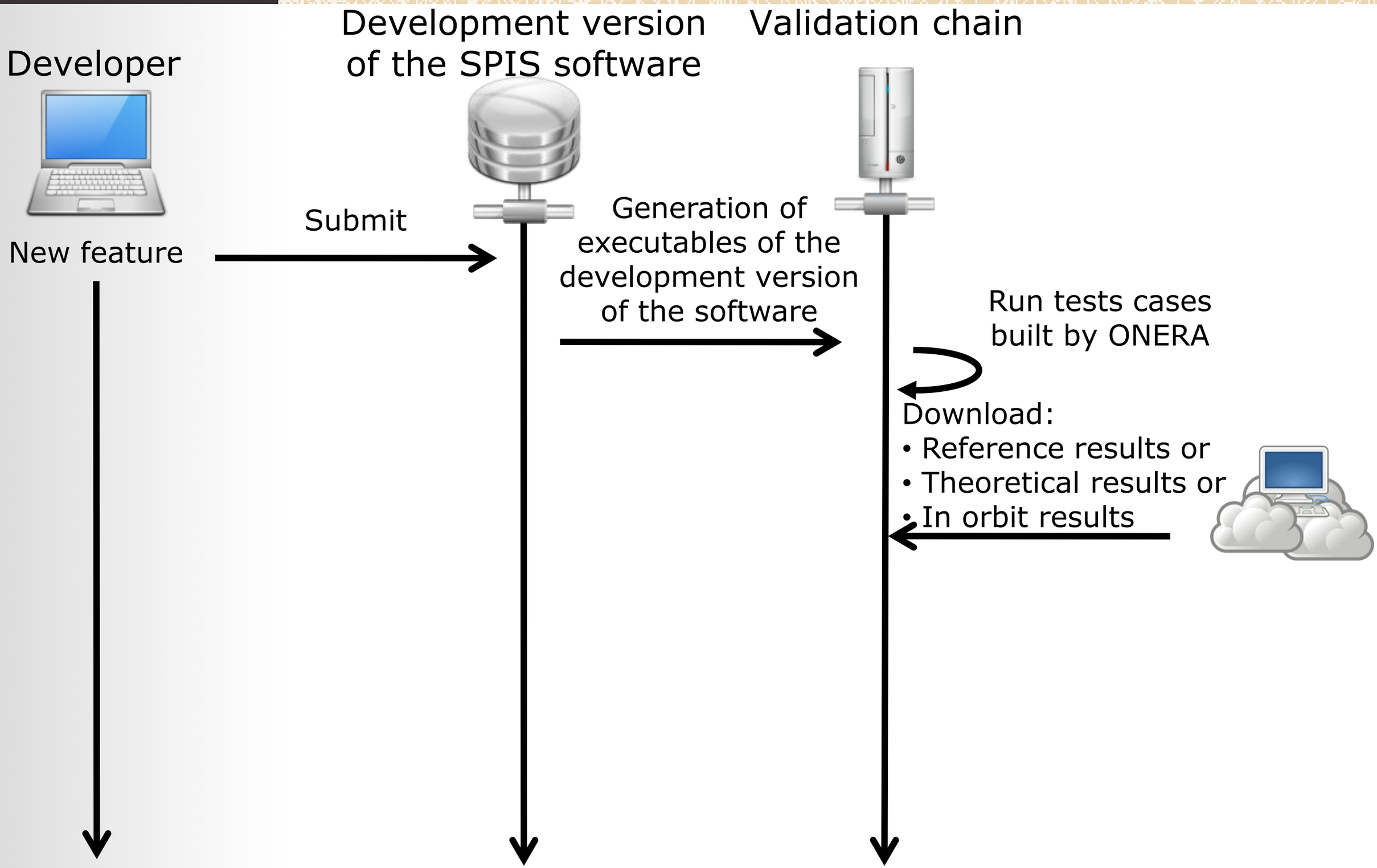
The size of all these projects is about 1.5 GB

The all time to process all these test cases costs about 4 days on the validation chain

An average of 3 CPU-hours per project but some take more than 10 hours

A complete validation of a modelling software is a complex task and is highly demanding in computing resources

Validation chain description



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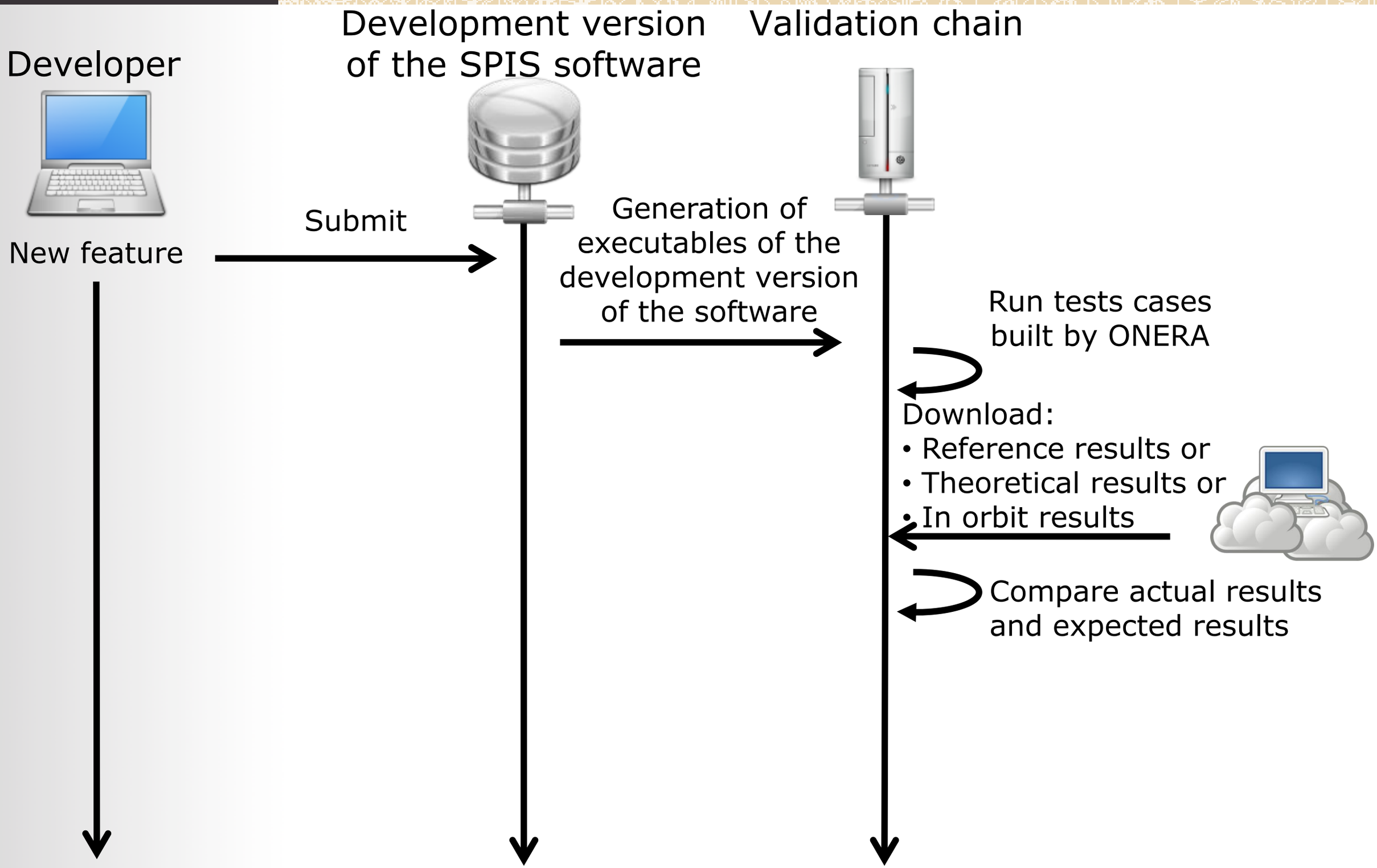
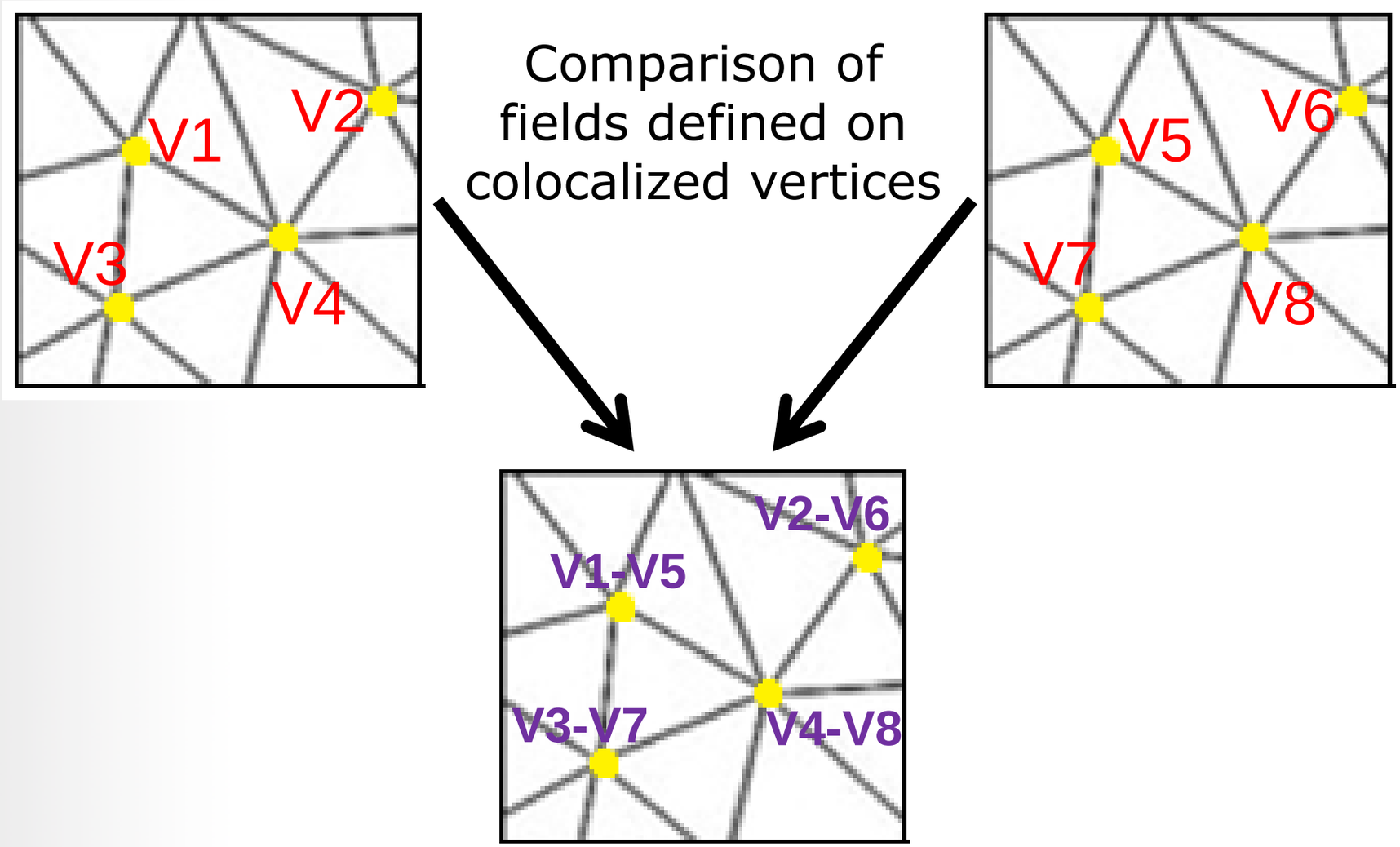


Validation chain description

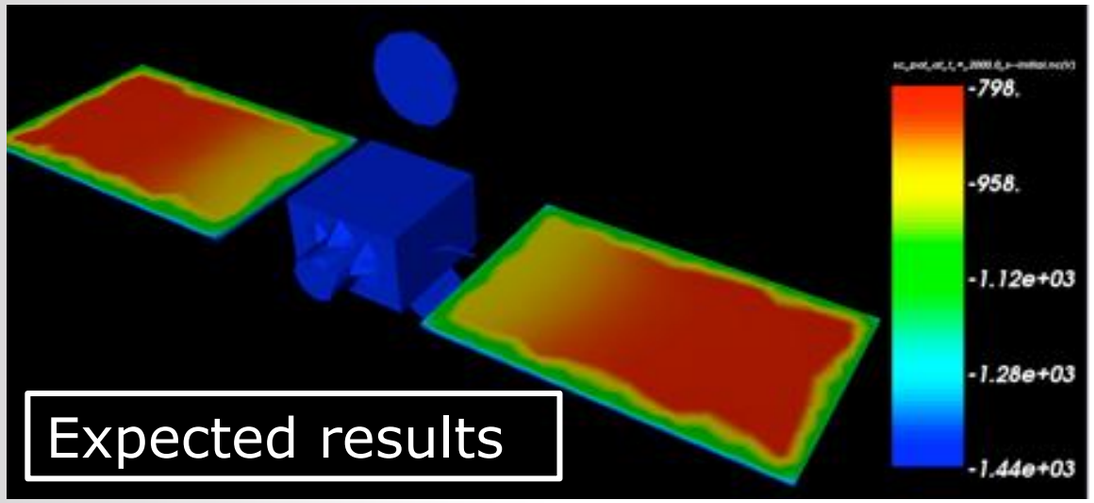
Principle:



This development has the support of student project at engineering school ISIMA, France

Validation chain description

Comparison of reference results and test results



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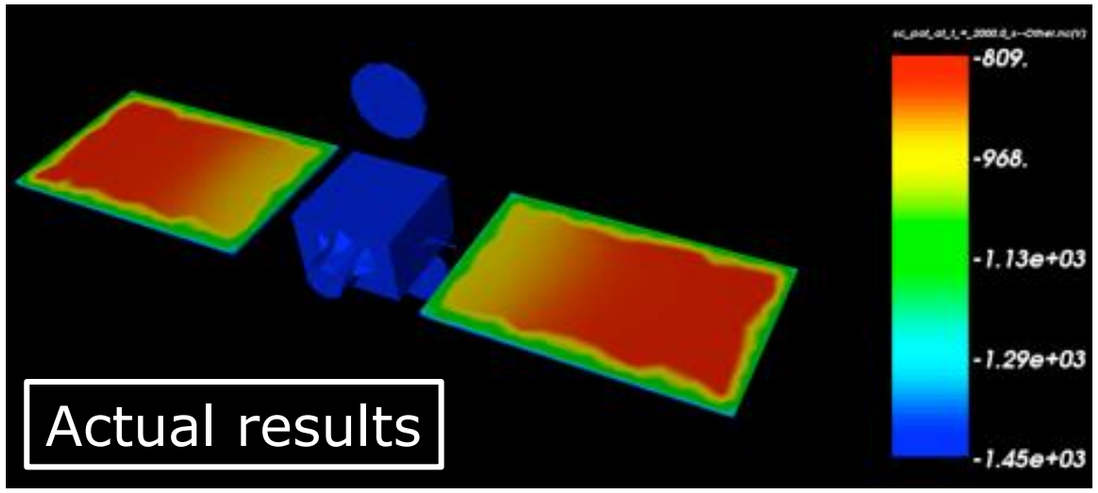

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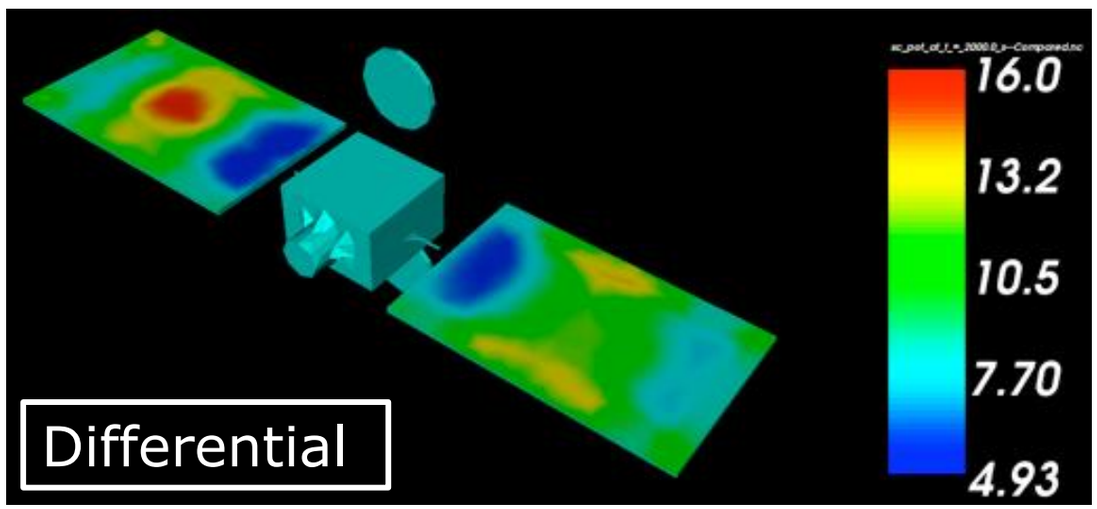

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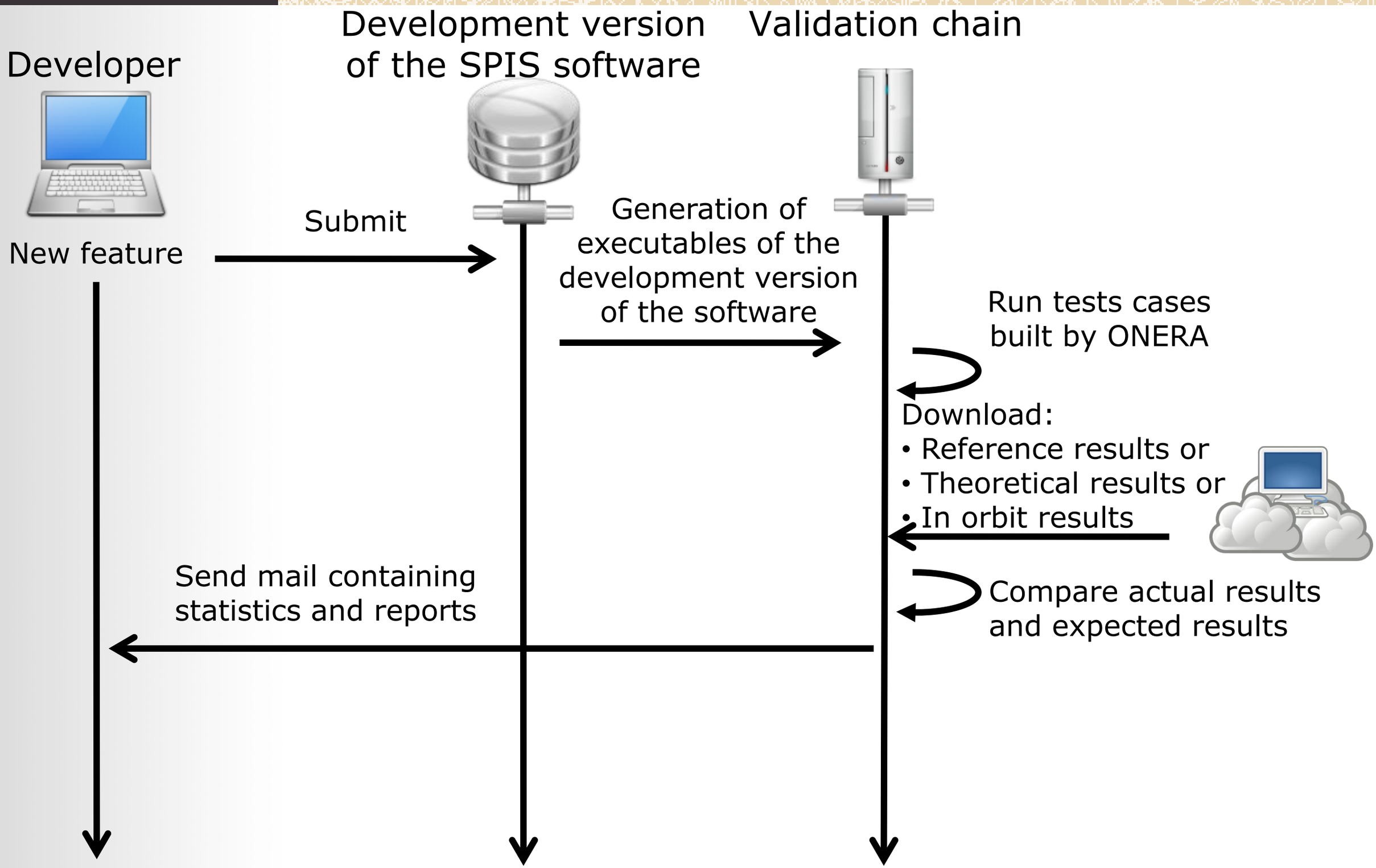


Validation chain description

Developer

Development version of the SPIS software

Validation chain

New feature

Submit

Generation of executables of the development version of the software

Run tests cases built by ONERA

Download:
- Reference results or
- Theoretical results or
- In orbit results

Compare actual results and expected results

Send mail containing statistics and reports

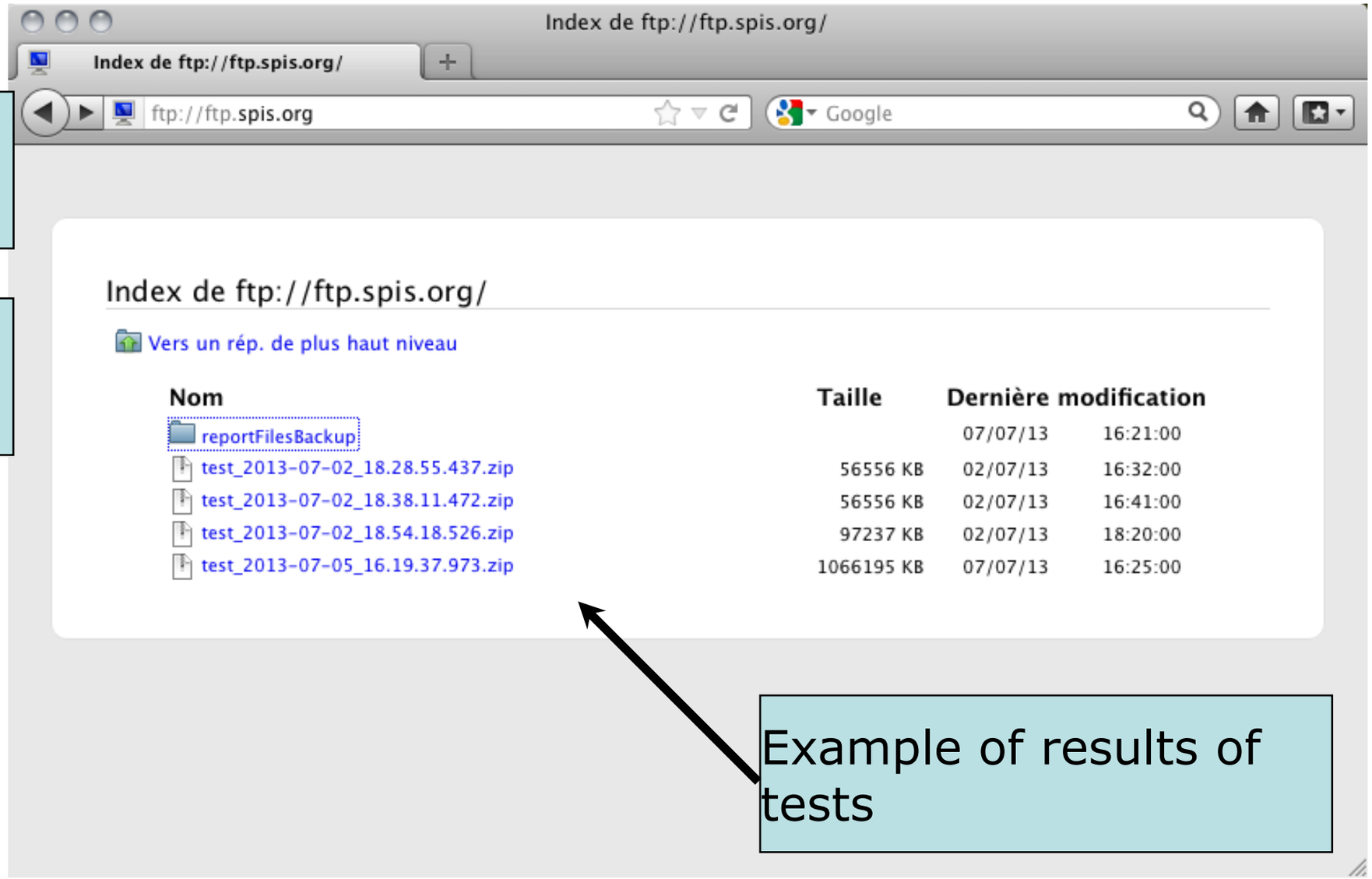
Analysis and validation

Validation chain description

A central FTP server has been installed to centralize processed data.

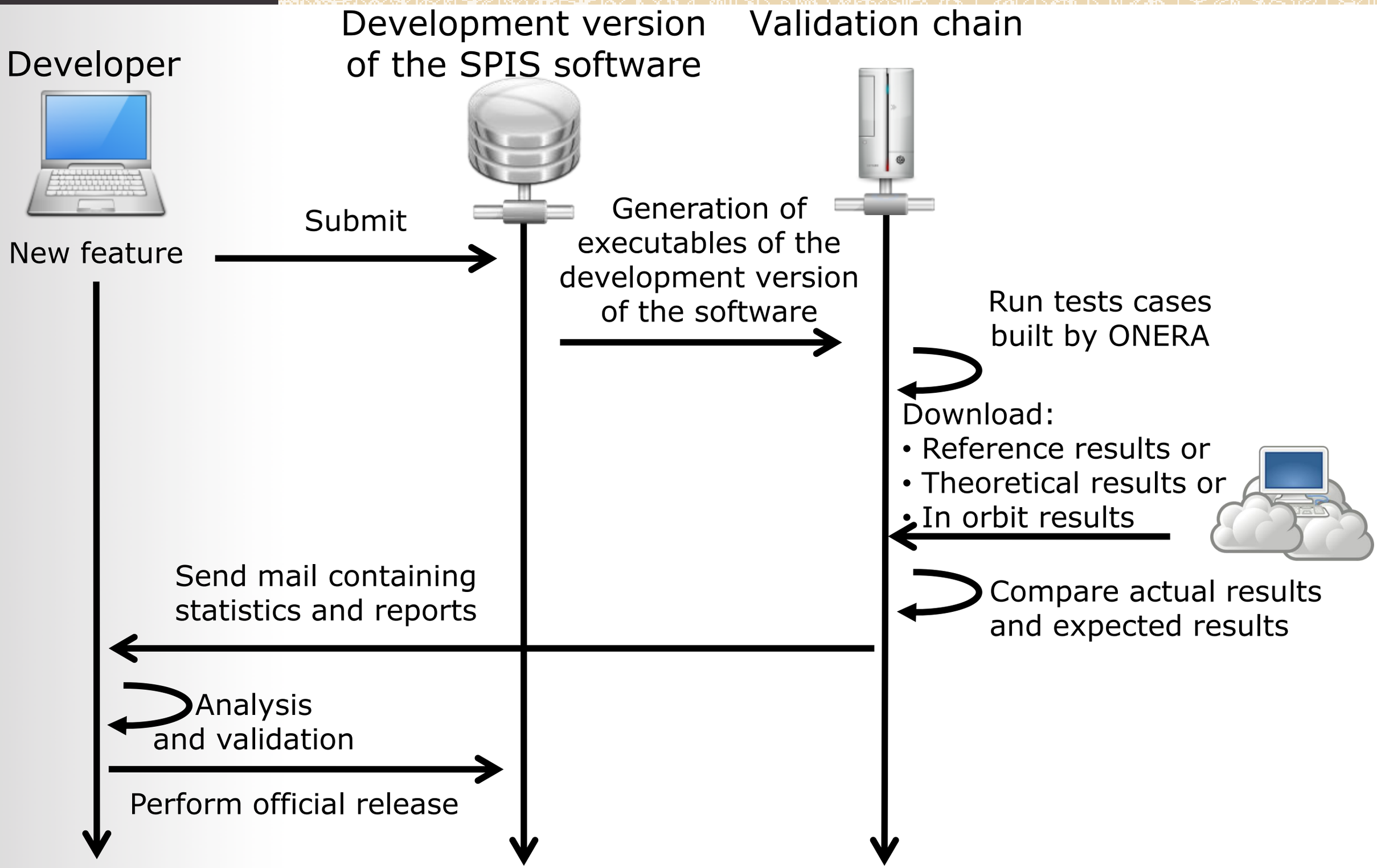
Access through a simple Web browser

Secured access (login/password)



If results are different, physicist has to interpret why and if the actual is the expected error

Validation chain description



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Analysis and validation

Perform official release

HAPPY USERS

Perspectives

Add some new statistical metrics

Improve the quality and the form of the reports automatically generated

Add new comparison capabilities

- Comparison of fields defined on edges, faces or polyhedra
- Comparison of fields defined on different 3D unstructured meshes (non colocalization vertices)
- Support of engineering school ISIMA, France

Add automatic analysis, for example if some metrics are out of bounds of threshold defined with physicists

Improve automatic control in case of simulation disfunction (crash, non-convergence, disk/memory saturation...)

Thank you for your attention

Any questions?

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