

# Next Generation SPENVIS: Current status - 3rd party developments - Release

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# Next Generation SPENVIS

- Context:  
ESA General Support Technology Programme (be, es, de)
- ESA Technical officer:  
David Rodgers & Hugh Evans (ESTEC/TEC-EES)
- Consortium:



# Why are the drawbacks of the current software?

- Rigid work flow for model access and no flexibility in model coupling
- Not easy plug-in of new models by model developers
- Splitting between orbital and positional models
- Import of user data
- Lack of advanced access (machine-to-machine)
- Organic software



# Main objective of SPENVIS Next Generation

Implementation of a new SPENVIS system as

a web-based service-oriented distributed framework

supporting plug-in of models

related to the hazardous space environment,  
and including both

- user-friendly interface for rapid analysis and
- a machine-to-machine interface

for interoperability with other software tools



## Additional objectives

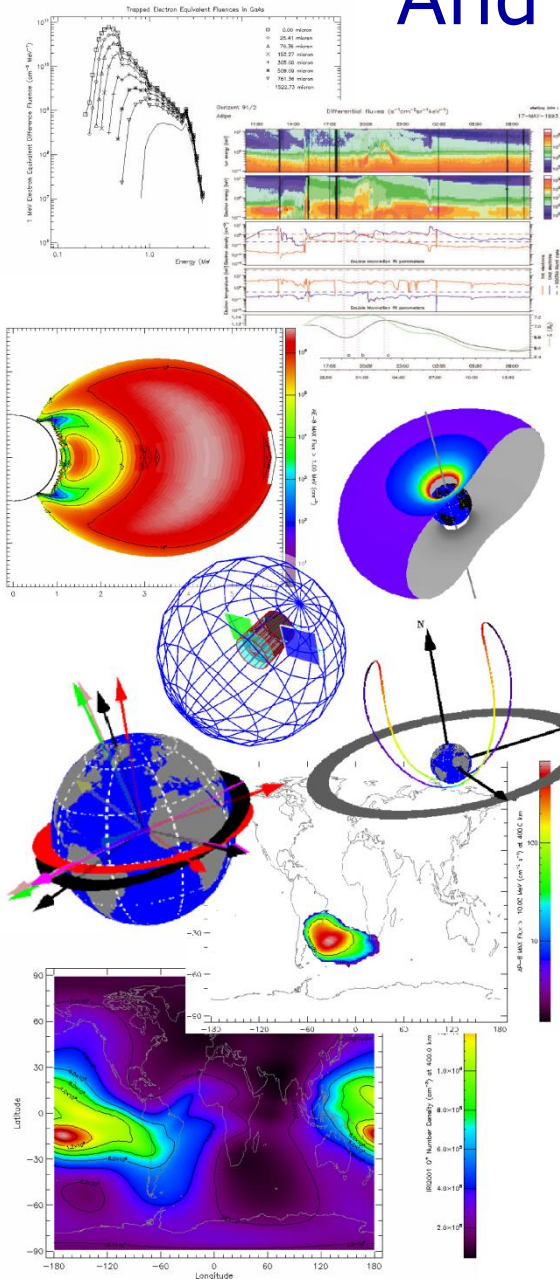
- Maintaining continuity with SPENVIS user community
- Implementing new models of the space environment and effects
- Taking advantage of results from other ESA activities  
e.g VISPANET, REST-SIM, SEISOP
- Insuring compliance with SSA design and requirements (future integration)



# And expectations are quite high

Since current system is successful...

- Internationally recognized
- Managed & developed by a trusted group of experts
- User friendly WWW interface
- Quality of the model input pages
- High-quality graphical representations
- Transparent interconnection of the different models
- Background help
- Persistence of the system



# Work strategy to achieve NG

SPENVIS 4.x

Operation, maintenance  
and some improvements

Operation and  
maintenance



Next Generation

Designing new  
architecture

Developing  
framework

Migrating  
cur. models

Implement  
new models

Testing

Migrating  
users

Operation  
and  
maintenance



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# Current status and next schedule

## Past

- Review of the existing system and way forward
- Software Requirement Specification
- Preliminary Design Review (March 2013)

## Future

July 2013

- Critical Design Review
- Framework kernel

November 2013

- Human-Machine Interface
- SDK for model develop.

February 2014

- Machine-Machine Interface
- SPENVIS-4 Models

May 2014

- System integration



- Review of the existing system and way forward
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November 2013

- Human-Machine Interface
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February 2014

- Machine-Machine Interface
- SPENVIS-4 Models

May 2014

- System integration
- Beta testers

August 2014

- New models
- User migration

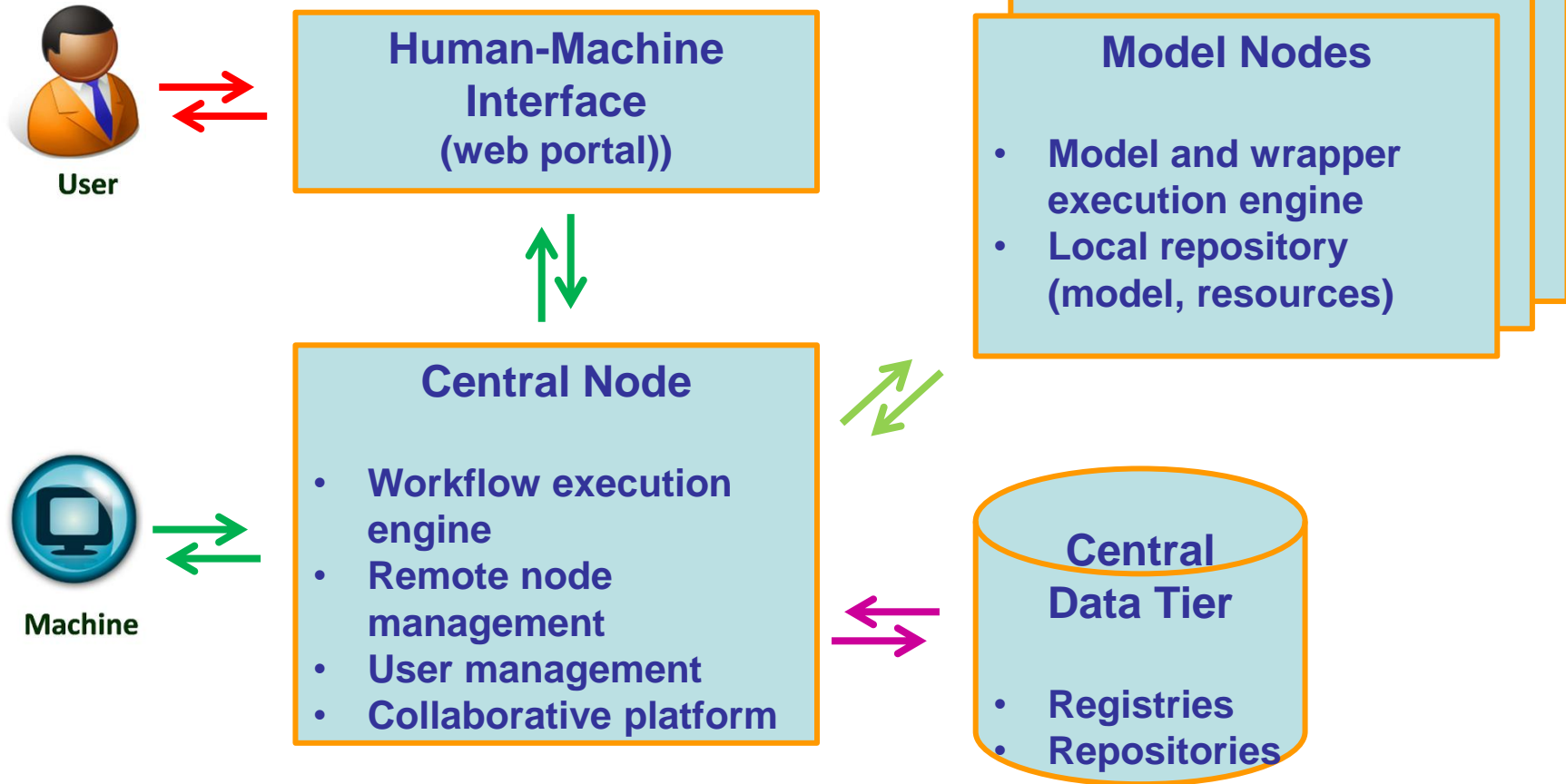


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# Next Generation

## Framework Architecture



# Next Generation Framework Architecture

- Multi-tier architecture
  - Presentation layer  
(human-machine & machine-machine interface)
  - Logical layer (central node)
  - Data tier
  - Model nodes
- Distributed architecture
  - Model nodes are either local or remote
- Workflow execution engine
- Plug-in of space environment models
  - Models packaged in bundles that are deployed on model nodes
  - Wrappers for converting native input/output into SPENVIS-NG data stream (VOTable based)

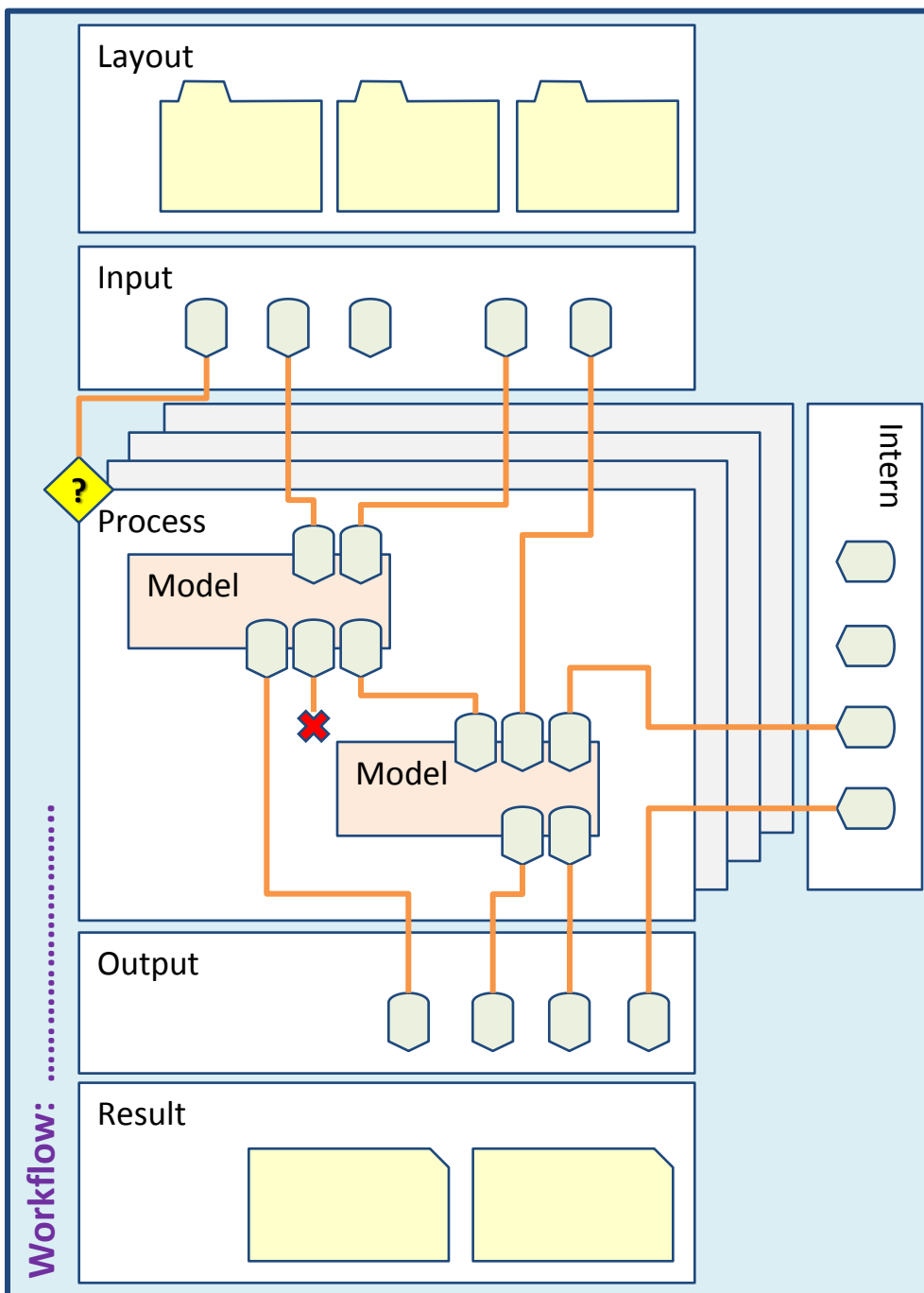


## Some SPENVIS-NG component details

- ↔ SSA Baseline requirements promoting JAVA technologies insuring cross-platform computing environment.
- presentation layer:  
Liferay content management framework
- Model node:  
Java EE application deployed on Glassfish server
- Central data tier:
- MySQL database



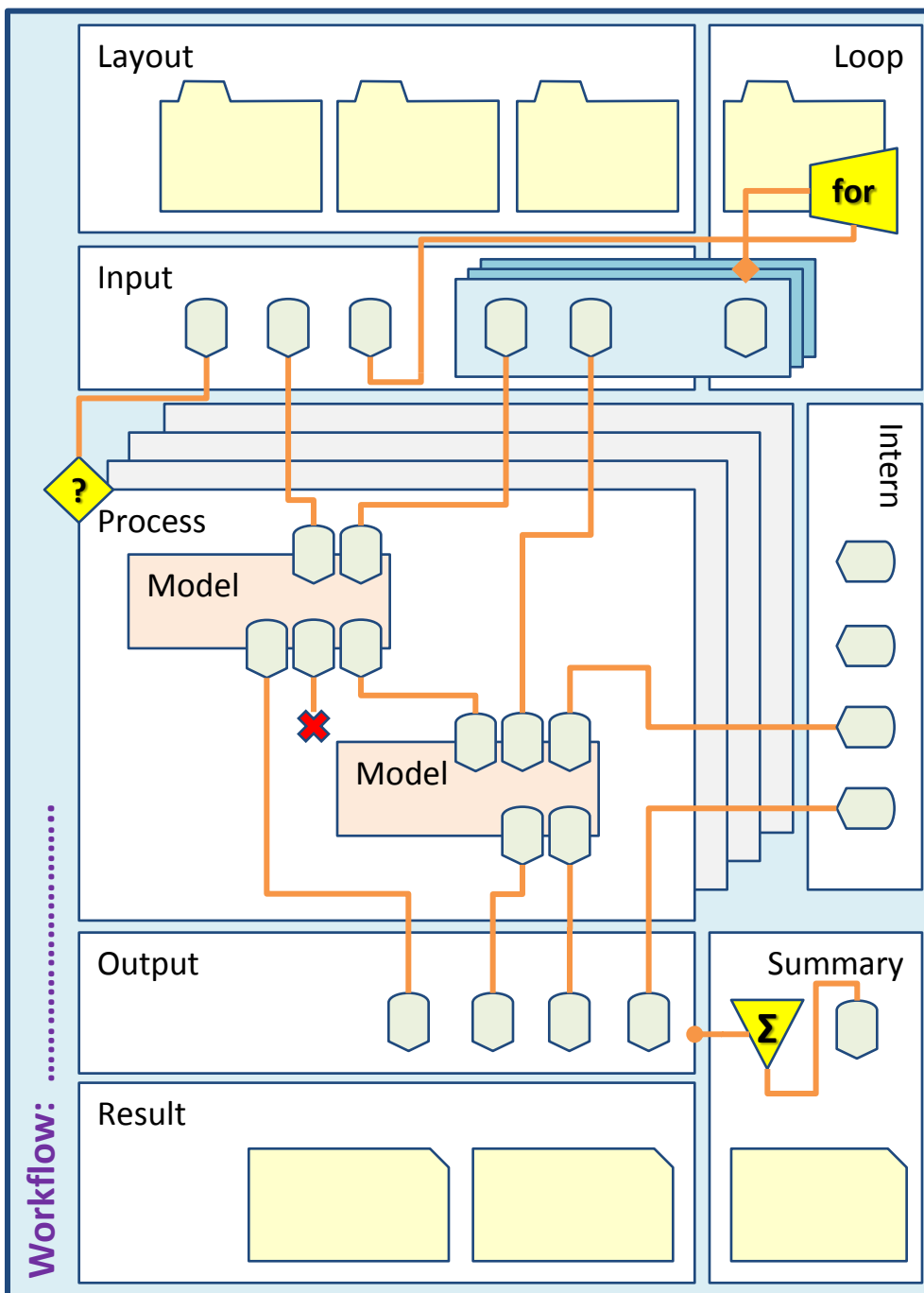
# Workflow concept



- Defining model relationship
- Allowing conditional relationship
- Including display logic for the presentation layer
- Resources are either parameters, (time) series or atomic files
- (Single) loop-aggregation mechanism, e.g. mission segments
- Workflow editor



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# Bundles for space environment models or tools

- Model bundle = ZIP package containing
  - Model binary executables (when Fortran, C, C++,...) or script files (when PHP, Python,...) or JAR files
    - Including wrappers
  - Specific model resources (e.g. libraries, static data)
  - Instructions to execute the model
  - Test suites (regression test)
- “Instructions to execute the model” =
  - One manifest file (XML, inspired by SPASE data model)
  - A set of input/ output templates (i.e. VOTable)
  - An execution control script (Ant).



# Support to model developers

## 1. For plugin a model into SPENVIS-NG

- On the model node:
  - Common extension with some utilities (e.g. generic wrappers)
- Software Development Kit
  - Tools, documentation and example files supporting the bundle creation

## 2. For accessing SPENVIS-NG from an external application

- Application Programming Interface
  - Methods/ functions accessing the SPENVIS models through the machine-machine interface



# Next Generation Summary

- The next generation framework is a complete re-design of the system taking advantage of the current technologies
- SPENVIS-NG will result into a web-service oriented distributed framework
- Much care is devoted to the integration of external tool/model of the space environment
- Beta release should be available for mid 2014
- SPENVIS-4 is maintained meanwhile and tools will be provided to support the user migration



# New models

(see tutorials)

- The ESA MEO model
- The ESA Interplanetary Electron Model (IEM)
- The ESA Slot Region Radiation Environment Model (SRREM)
- Updates to the JOREM Radiation Environment Model
- An interface to the ESA SEPEM solar proton models and integration with the SEPEM system
- The Badwar and O’Niel cosmic ray model
- The NASA AE-9 and AP-9 models
- The NASA TPM model



- Consortium
- Contact
- Public documents
- Links

The Space Environment Information System (SPENVIS) had been under continual development since 1996 for ESA by BIRA, providing the world community with an on-line resource for evaluating the space environment. SPENVIS-4 is a World Wide Web based interface to a comprehensive set of models of the space environment. It has been operational for more than ten years now and has a mature international user community of about 2000 registered users who use the system for various purposes, e.g. mission analysis and planning, educational support, and running models for scientific applications.

Within the ESA/GSTP-5 programme, funding has been provided for the development of a next generation of this resource. The informatics technology available today has evolved considerably from what was state of the art in 1995, where web servers were limited to basic html pages and cgi-scripts. Within the scope of this development the framework and models of the SPENVIS system will be reviewed, restructured and reengineered using current web design techniques and programming methodologies, providing a new, extensible and open framework for the integration of current and future space environment models.

Distributed architectures for space data analysis and collaborative engineering have been investigated through several ESA activities (SAAPS, SEDAT, VISPANET, SEPEM, REST-SIM) from which potential requirements and solutions for the SPENVIS-5 project may emerge. The advantages of a distributed approach are that the resources are acquired, developed and maintained at an "expert centre" where the competences and necessary supporting facilities reside and are available as needed by a "coordination node" in response to end-user needs and in compliance with any access restrictions that may apply. The new system is foreseen to be operated in the context of ESA's SSA programme.

### Consortium



### Contact

- **Prime contractor:** Michel Kruglanski (BIRA)
- **ESA technical officers:** David Rodgers & Hugh Evans (TEC-EES)