BOF DIGITAL PRINTING AND SCANNING

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August 2018

CREATING AN AS-BUILT MOCKUP

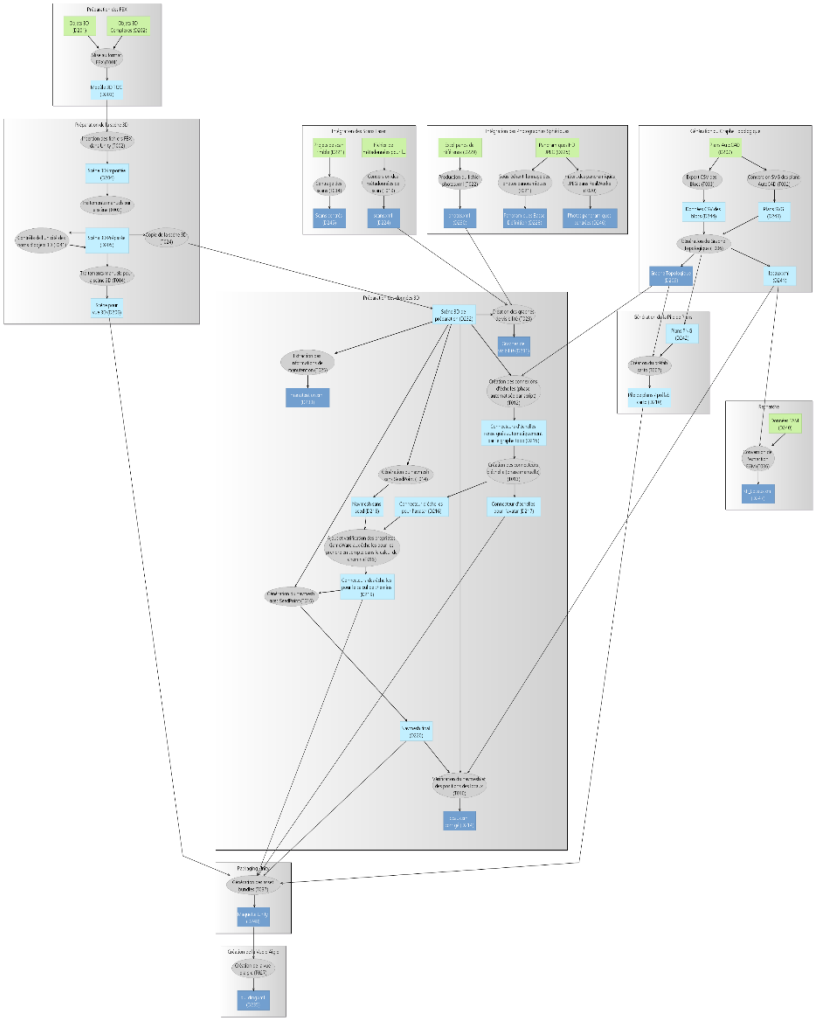
- **Only the last series of EDF's nuclear reactors have been designed in 3D**
  - 5 (EPR – under construction – and N4) out of 59
- **Important services can be offered thanks to an as-built 3D mockup**
  - Training
  - Operations preparation (equipments identification, operation area marking …)
  - Operations planning (compatibility of simultaneous operations …)
- **An as-built mockup must be created**
  - At least one per design
    - Similarities make reuse possible
  - Containing different types of information
    - 3D (point clouds, meshes)
    - 2D Plans
    - Spherical photos
    - Semantics (walls, slabs, doors, ladders …)

THE NEED FOR TRANSFORMATION

- **Reference mockup**
  - Created for a set of uses
    - Precision
    - Information
  - Consistent
  - Independent of application technologies
- **Applicative mockup**
  - Optimised for a specific software
    - Format
    - Only the relevant information
  - Some additional information may be included
    - Built upon existing data
    - Added manually

THE TRANSFORMATION TOOLCHAIN

- **The first of a line**
  - One per target software
  - Parts are shared (depending on uses)
- **A specific formalism**
  - Document all the required information
  - Make simultaneous editing easy (wiki)
  - Consistency enforced thanks to a metamodel



SEMANTIC ENRICHMENT

- **Scanning at a low level**
  - Surface acquisition (geometry, appearance material)
- **Reconstructing semantics requires specific knowledge**
  - Domain specialist to help with the reconstruction
  - Design information (CAD, P&ID …) to be consolidated with the mock-up
  - Prior knowledge in order to limit the domain of Inverse procedural modeling
- **Semantic knowledge is not always required**
  - The mock-up is built for a specific set of use cases, requirements depend upon those.
- **Generic yet extensible formats are a good first interchange format**
  - X3D, COLLADA
  - Semantic formats (IFC, CityGML …) should be used for interchange when data is more complete.

USING A STANDARD TEXTUAL FORMAT

- **Tools availability**
  - An open international standard improves tools availability
- **Easy writing/parsing makes lots of uses possible**
  - Writing ad-hoc tools
  - Understanding of the content of available files
- **In the VRML/X3D world :**
  - VRML encoding easy to read and write, hard to parse
  - XML encoding easy to write and parse
    - Use code generation !
- **Not as efficient for publication**
  - Other encodings exist.

REAL-LIFE USES IN OUR CURRENT TOOLCHAIN

- **VRML used as an exchange format from modeling tools**
  - Solidworks, Realworks
  - Good support for the base aspects
- **VRML used as a logging format**
  - Generated by transformation tools
- **Evolutions include X3D experiments**
  - Depending on the tools involved
  - Exchange format (FME, Blender)
  - Publication format (X3DOM)

CONCLUSION

- **For as-buit, semantics are not available from the beginning**
  - More specific formats are useless for the first steps.
  - Extensibility is good for progressive enrichment.
- **VRML is good, X3D is better**
  - Easy to write, read, parse
  - XML encoding makes the support easy
- **X3D support depends upon the tool**
  - Despite the common data model, some tools still only support VRML
- **An X3D to X3D tool would help**
  - AOPT mostly working on a technical level
  - Reorganize the scene graph
  - Consolidate with other data
  - Prepare the scene for specific uses