BOF DIGITAL PRINTING AND SCANNING

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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-built, 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