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MATRIC NO: 10/ENG01/017

DEPARTMENT: CHEMICAL ENGINEERING

ENG 224 CLASSWORK

Covid-19 has causes a serious pandemic across the world, with serious impacts been felt in all areas of humanities. As a young engineer working with a multi-national health company, you are saddle with a huge responsibility of designing web-based application that can detect, display, rate (degree of infection), store, transmit data obtained wirelessly and access the data via the web together with other features which the board of directors allow you to come up with.

1. **Design the application following the software development cycle.**
2. **Critically discuss the hardware and software features.**
3. **Support your answer with a flowchart and an algorithm.**
4. **Draw the Top-down or Bottom-up design approach of the application.**

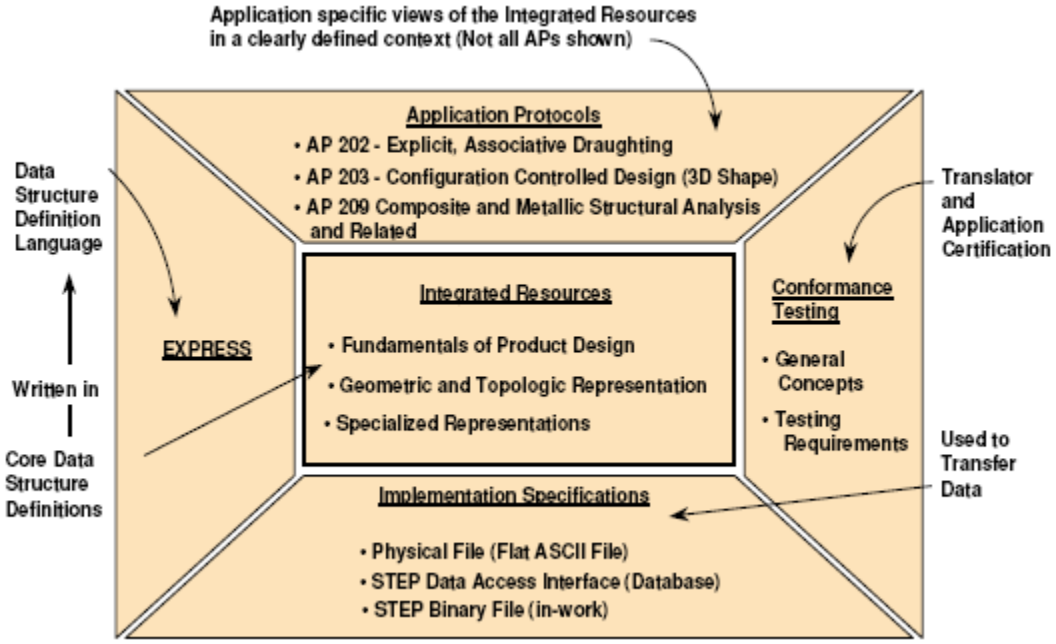
ANSWERS

Update for AIAA CGNS Team

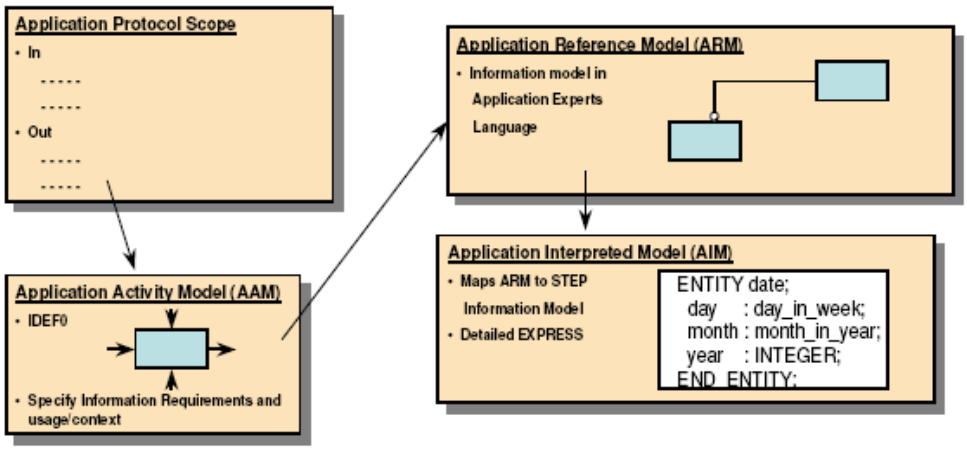
Overview

- Overview of STEP Architecture
- AP209 E2 Modularization Approach and Progress
- High Level AP209 E2 Engineering Analysis Composition
- Applicable Recent Integrated Resource Developments
- Remaining Tasks
- Future Cooperations

Elements of the ISO 10303 STEP Standard



STEP Application Protocol (AP) Components



Applicable Recent Engineering Analysis Integrated Resource Developments

- Parts 50 and 51 provide the mathematical basis for the definition and representation of fields and expressions

    - Including external binary format representation
- Parts 52 and 53 provide the remaining basis for structured and unstructured meshes
    - Part 110 adds further detail for Fluid Dynamics
- Part 107 provides the linkage between existing Part 104-based FEA and the above

Part 50: Mathematical constructs

Part 51: Mathematical description

Part 52: Mesh based topology

Part 53: Numerical analysis

Part 104: Finite element analysis

Part 107: FEA definition relationships

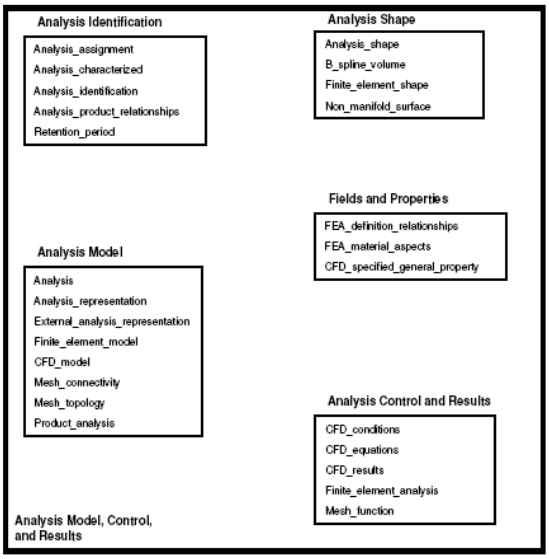
Part 110: Mesh based computational fluid dynamics

Modularization Approach and Progress

- Primary Objective
    - Modify/include existing modules (203 E2, PDM)
    - Create Materials, and Composites modules from AP209 E1
    - Create FEA modules from AP209 E1
    - Create Engineering Analysis Core Model (EACM) Fields modules from newly developed STEP Integrated Resources
    - Create Structured/Unstructured Grids and Analyses from STEP integrated resources derived from the integration of the AIAA CGNS standard and EACM
        - Fluid Dynamics and Heat Transfer (ESA STEP/TAS - TBD) are initial goals
    - Create Implementation and AP modules (TBD)
- Progress
    - Application Reference Models (ARMs) have been created, compiled, and EXPRESS-G diagrams drawn for all but the Implementation and AP modules
- Stretch Objective

- Create Nonlinear Analyses by enhancing IRs and Modules (TBD)

High Level AP209E2 Engineering Analysis Modular Composition



See backup charts for complete high-level planning model.

Remaining Tasks

- Complete the copying of ARM object and attribute definitions into modular publishing format
- Copy in existing ARM-AIM mapping tables
- Create mapping tables for new CFD and mesh-based numerical analysis modules
- Create final long form EXPRESS AIM (implementation form)
- Send out for ISO ballot

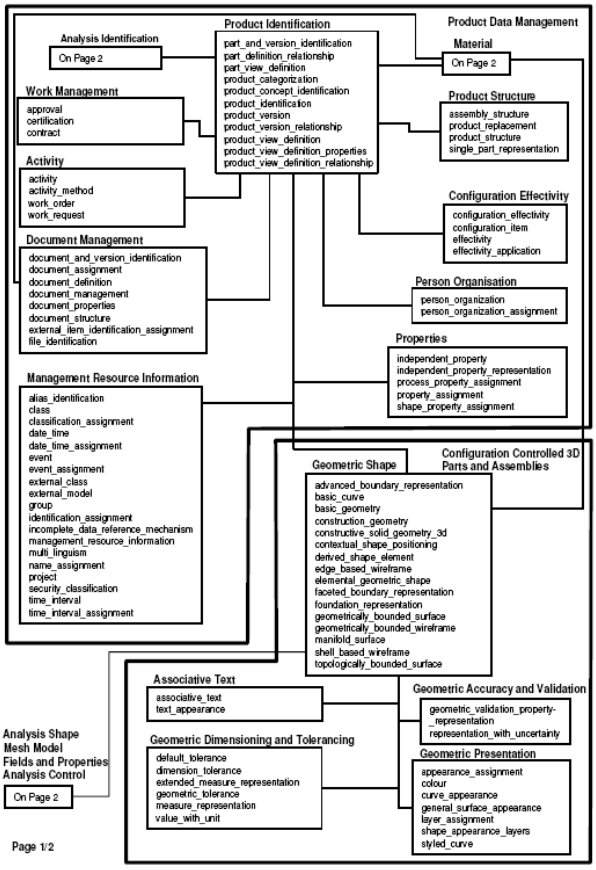
Potential Areas of Cooperation

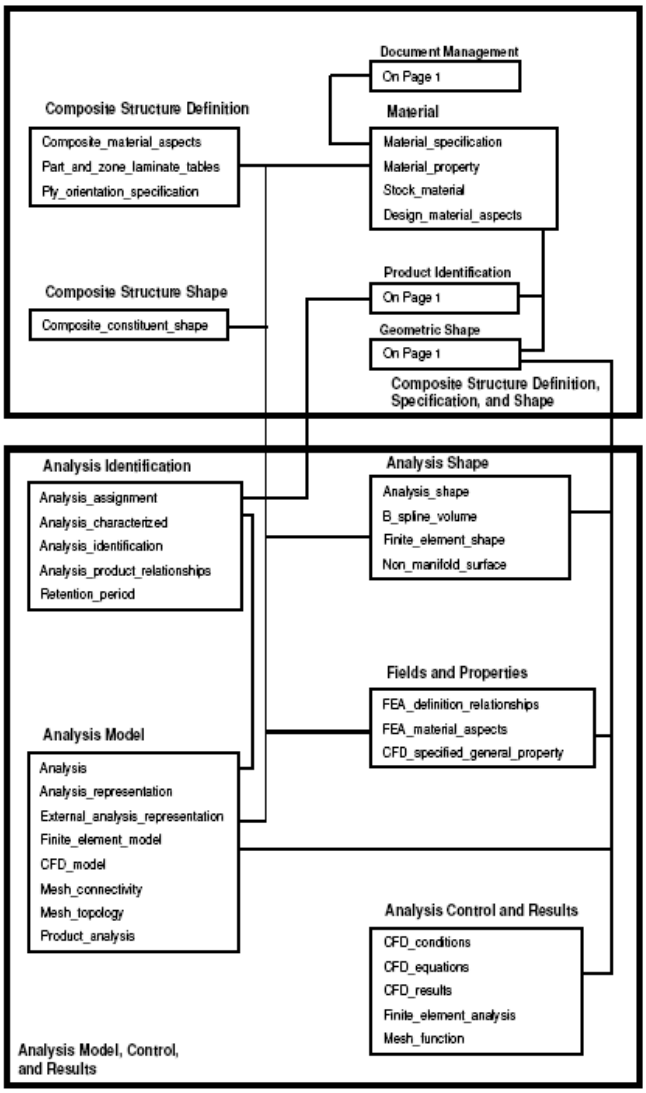
- STEP has been creating an new Binary implementation form based upon HDF-5
    - David Price of EuroSTEP has been doing this under VIVACE funding
    - CGNS has as well
- Experience has taught us that in order to really get widespread implementation a high-level API must be developed
    - ISO STEP Engineering Analysis team would definitely like to get a lessons learnt and advice from CGNS team on their experiences with this

- Since the CGNS model was (fairly) faithfully used in the integration with other STEP IRs we should be able to come very close, if not exactly, to the existing CGNS API for the CFD subset

Backup Slides

AP209 E2 High Level Planning Model

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Product Identification
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Geometric Shape
On Page 1
Composite Structure Definition, Specification, and Shape
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Mesh_topology
Product_analysis
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CFD_equations
CFD_results
Finite_element_analysis
Mesh_function
Analysis Model, Control, and Results