4D BIM-ORIENTED DIGITAL PROJECT CONSTRUCTION MANAGEMENT for AEC INDUSTRY

FRANCESCO RUPERTO

francesco.ruperto@uniroma1.it

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A1. Introduction and Objectives

Description

Experimentation of information management workflows aimed at managing the temporal dimension of the construction project.

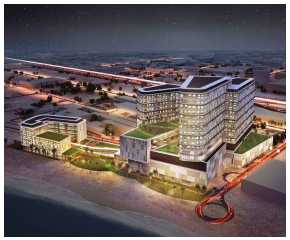
BIM 4D simulation processes methods and tools to support construction companies in Risk Management and Construction Planning.

Framework

- Phases
  - Preconstruction;
  - Construction;
  - Handover.
- Reference Stakeholder
  - Construction Company Project Manager;
- Stakeholder objectives
  - Phases Planning, Tasks Scheduling;
  - Resources optimization, waste limitation ;
  - Quality delivering without dates and cost overrun.

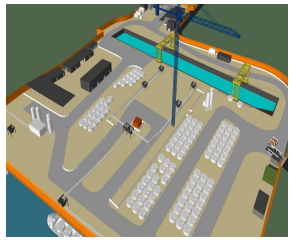
A2. Definitions and field of application. Model Uses

New Middle East Hospital Complex. Case Study 1



- **General model USES**
  - 1010 Architectural Modelling
  - 1050 Concrete Structures Modelling
- **Domain Model Uses**
  - 4010 Constructability Analysis

New Scandinavian Metro Station. Case Study 2



- **General model USES**
  - 1220 Infrastructure & Underground Systems Modelling;
- **Domain Model Uses**
  - 4010 Constructability Analysis

A3. Construction PM traditional tools. Product/Work Breakdown Structure

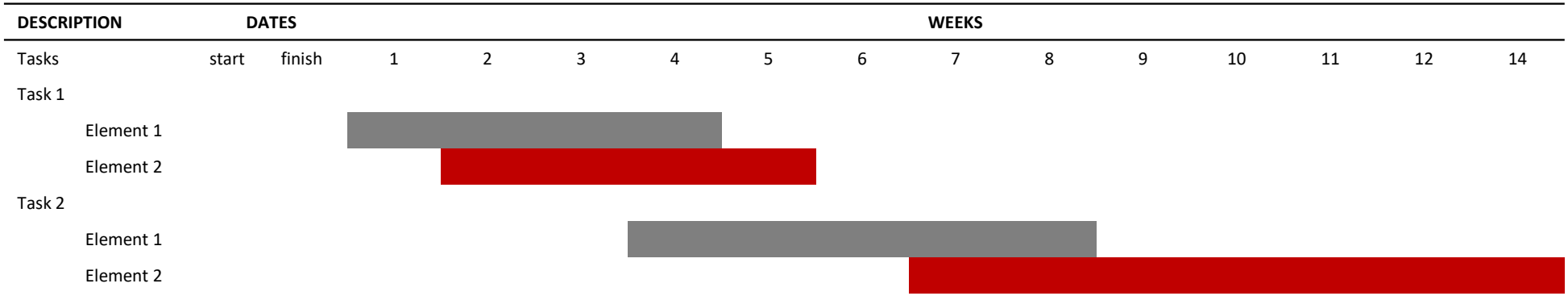
PBS - Product Breakdown Structure

House	Structures	Foundations
		Elevations
		.....
	Shell	Walls
		Windows
		...
	...	...
		...

WBS - Work Breakdown Structures

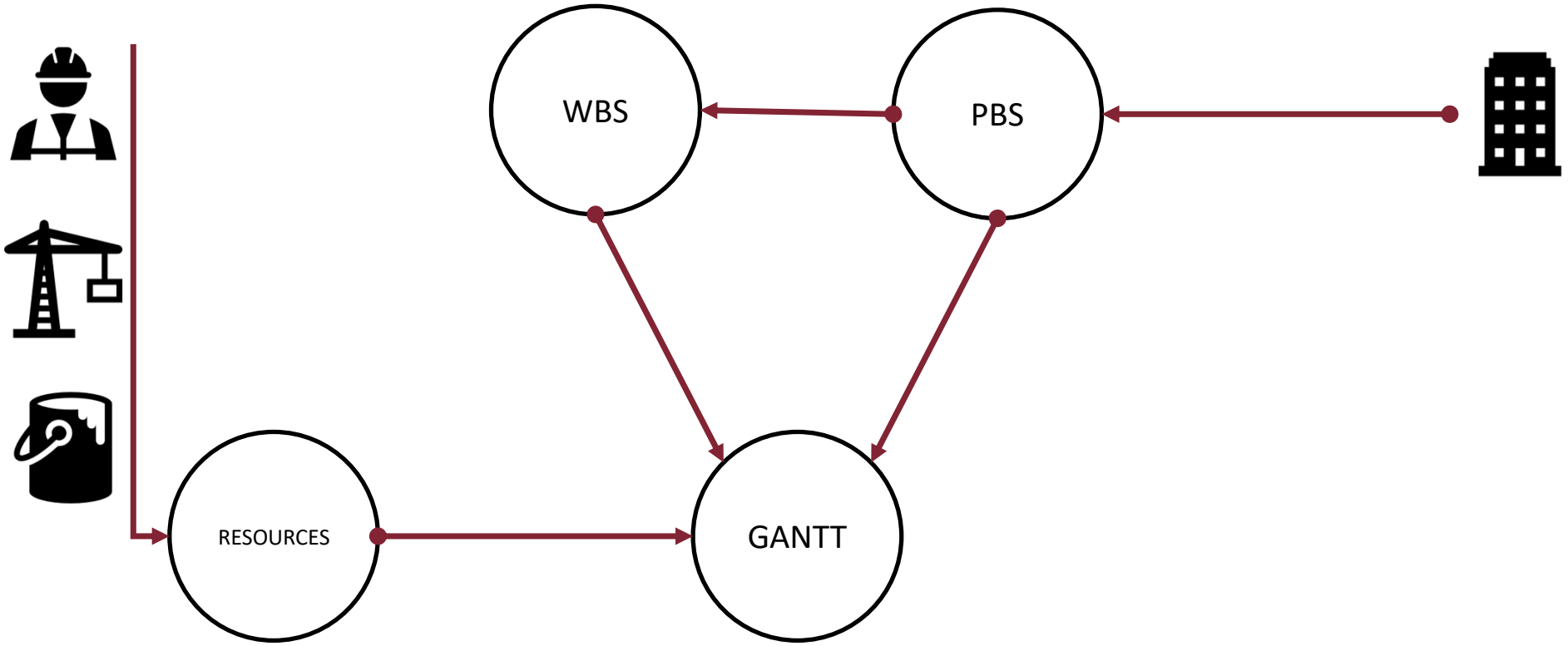
House	Structures	Task 1
		Task 2
		Task 3
	Shell	Task 1
		Task 2
		Task 3
	...	...
		...

Gantt



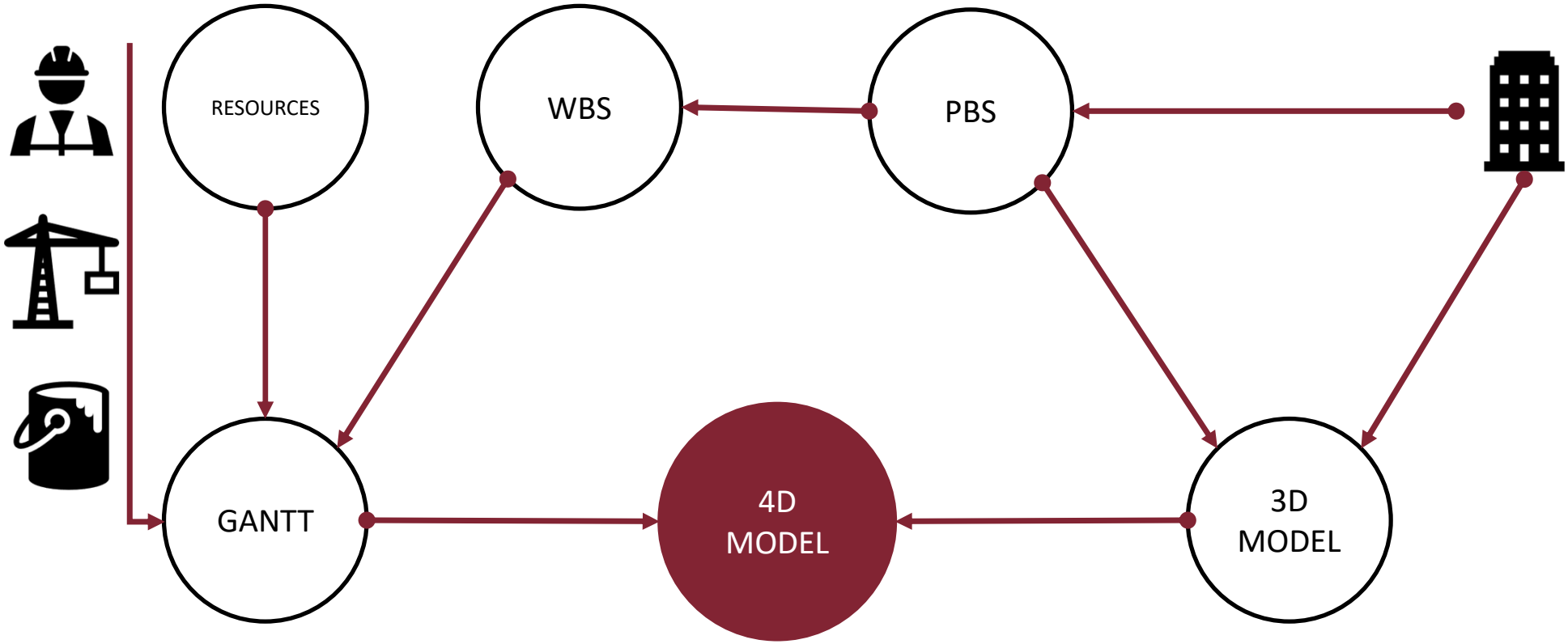
A4. Construction PM traditional workflow

- GANTT Workflow



A5. 4D construction PM workflow

- 4D Modeling workflow



B1. How we did it. Case study 1

New Hospital Complex

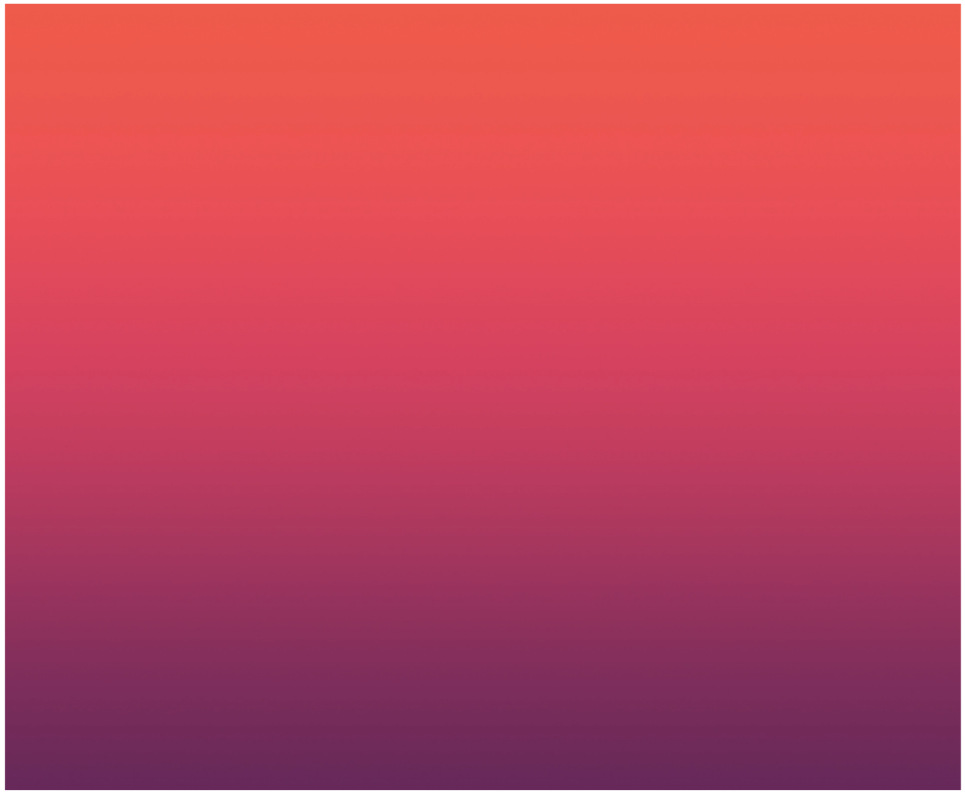
- Main building 241.600 m^2
- Three towers the highest 18 floors;
- Annex building 49,206 $m^{2.}$
- Multy storey car parking 1300 parking spaces: 2 storey basement;
- Three pedestrian walkways.

B2. How we did it? Case study 1 Simulation

Main workflow

- Definition of a workflow, through the structuring of a WBS, in order to define a activities identification and management able to follow one another, in the construction process, architectural and structural discipline referred.
- Time planning of the construction phases, with the help of Synchro Pro software, which allowed to link the BIM model's object with the corresponding task;
- Planning of human and material resources necessary for the realization, through the elaboration of materials and man-hours necessary for the process, calculation.

4D Simulations

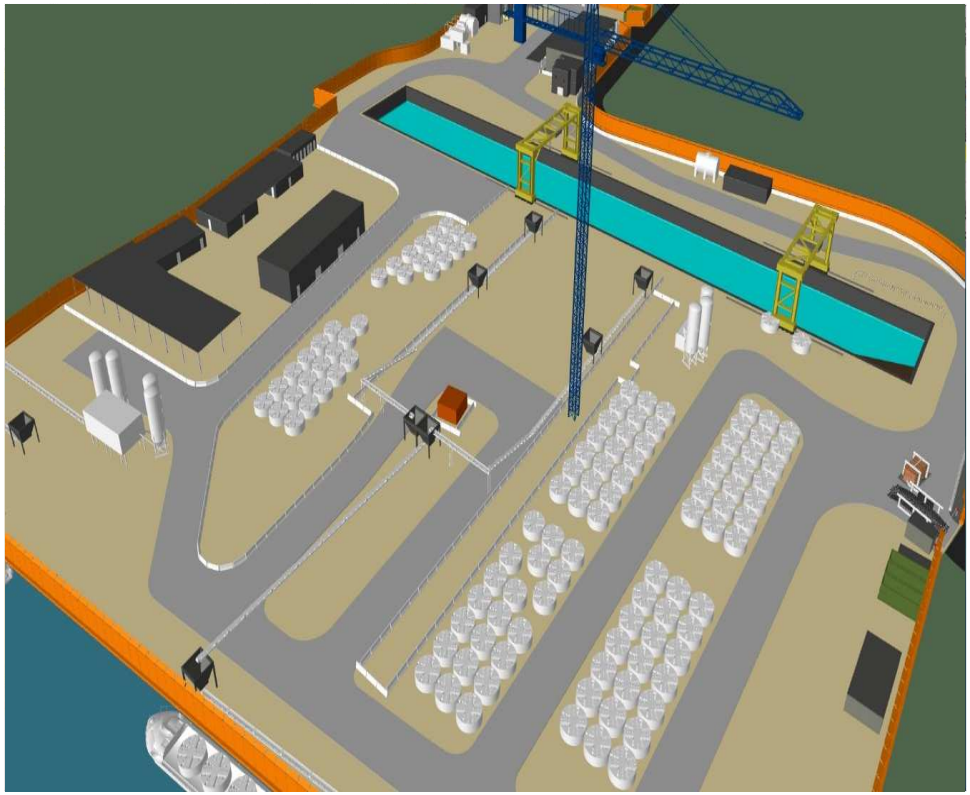


B3. How we did it. Case study 2

New Metro Station

- Site development:
- Phase 1 - Site preparation;
- Phase 2 - Excavation, preparation of cranes, equipment and storage areas;
- Phase 3 - Preparation of a system of conveyor belts for disposal of the waste soil;
- Phase 4 - Assembly of the TBM machine and construction of the tunnel excavation;
- Phase 5 - Civil works for the construction of the metro station and finishes;
- Step 6 - Dismantling the construction site.

4D Simulations



C1. Conclusions

Criticality

- Knowledge of construction scheduling and general construction process;
- Hard skills related to 4D simulation tools;
- Needs to let the modeling team and the planning team collaborate in advance of the traditional processes;
- Needs to share well-defined standards and information codes;
- Needs to adjust the procedures in a corporate information management manual.

Potential value

- Better understanding of the phasing schedule by the owner and project participants and showing the critical path of the project;
- Dynamic phasing plans of occupancy offering multiple options and solutions to space conflicts;
- Integrate planning of human, equipment and material resources with the BIM model to better schedule and cost estimate the project
- Identification of schedule, sequencing or phasing issues;
- Increased productivity and decreased waste on job sites

C2. Possible improvements for a corporate full 4D adoption

Information Requirements

- Corporate **Organization IR**
  - Information Requirements in relation to the *organizational objectives*
- Corporate **Project IR**
  - Information Requirements in relation to *delivery of an asset*
- Corporate **Asset IR**
  - Information Requirements in relation to the *typology of building or infrastructure*

LOIN

- The level of Information needs of each information deliverable should be determined according to its purpose.

Container-based collaborative working method

- The collaborative production of information should be defined in general terms of structured information container based collaborative working to be achieved.

Thanks for your attention

francesco.ruperto@uniroma1.it

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