

PAOLO BORIN









L'applicazione del BIM alle
infrastrutture di trasporto

Title

Rapporti e occasioni dell'applicazione del Building Information Modeling alla progettazione infrastrutturale



... construction is now a distant follower

	Circa 1940s	Circa 2016	Key advances	Productivity Growth ¹
Agriculture			Land assembly and automation for scale Advanced bioengineering to increase yields	1,512
Manufacturing			Entirely new concepts of flow Modularized and standardized designs Aggressively automated to increase production	760
Retail			Utilized scale advantages and cutting edge logistics to provide affordable goods to the masses	699
Construction			Limited improvements in technological capabilities, production methods, and scale	6

¹ Cumulative real growth in the United States, %, 1947-2010



@UNIPD DICEA

LDR GROUP

GIORDANO BORIN

BERNARDELLO BASSO





@UNIPD DICEA
LDR GROUP BORIN
GIORDANO BORIN
BERNARDELLO BASSO

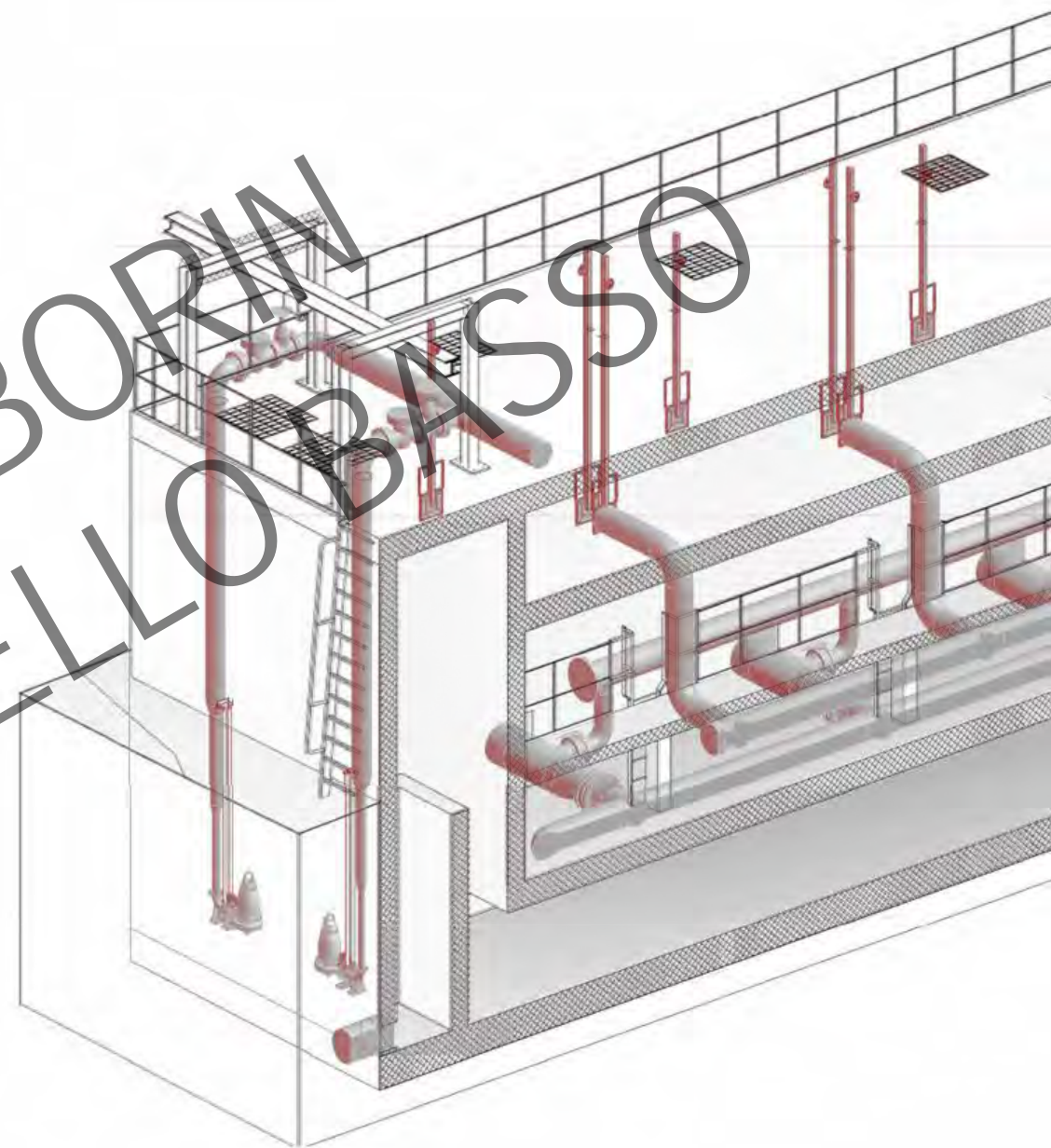
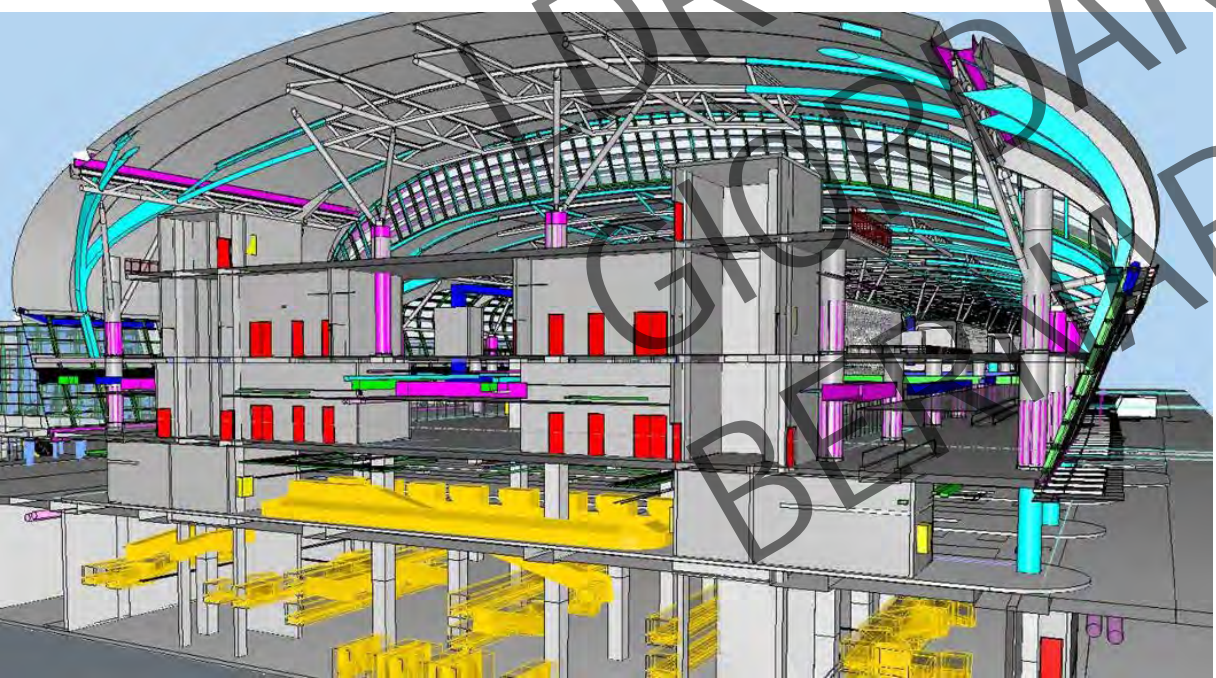
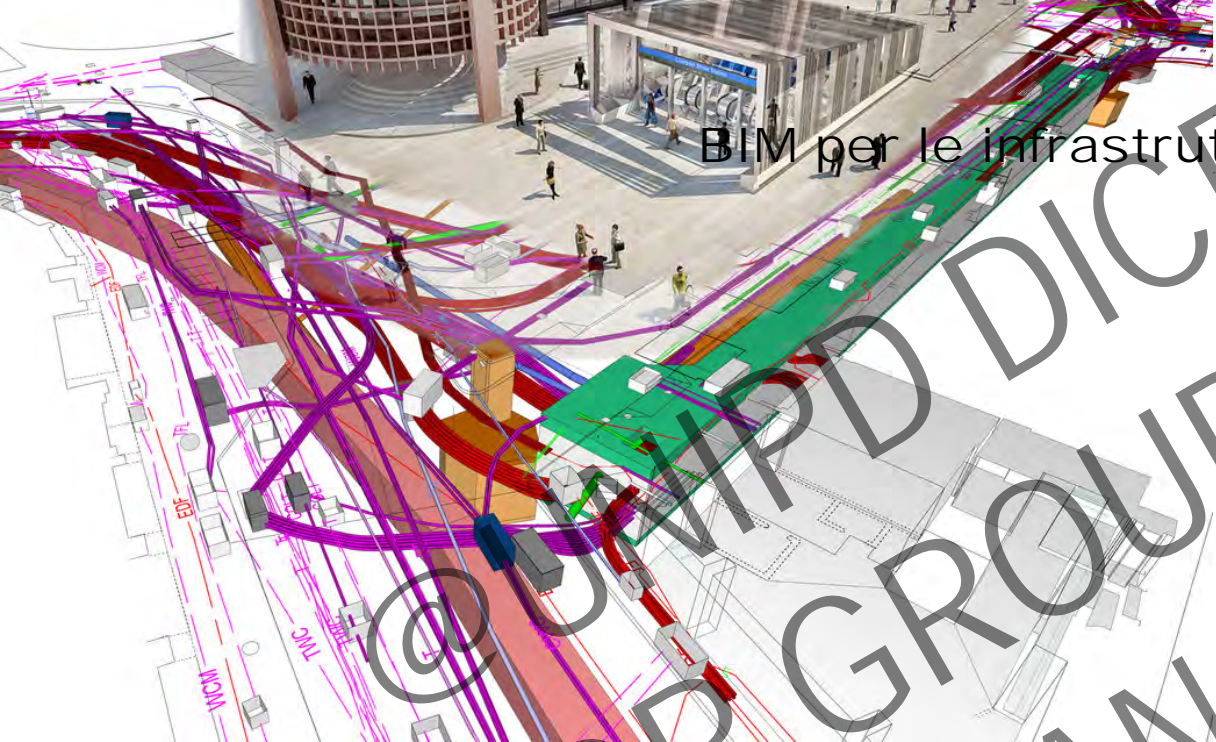


BIM per INFRASTRUTTURE?

use
of a shared digital representation of a
built *asset*
to facilitate
design,
construction and
operation processes
to form
a reliable basis for decisions

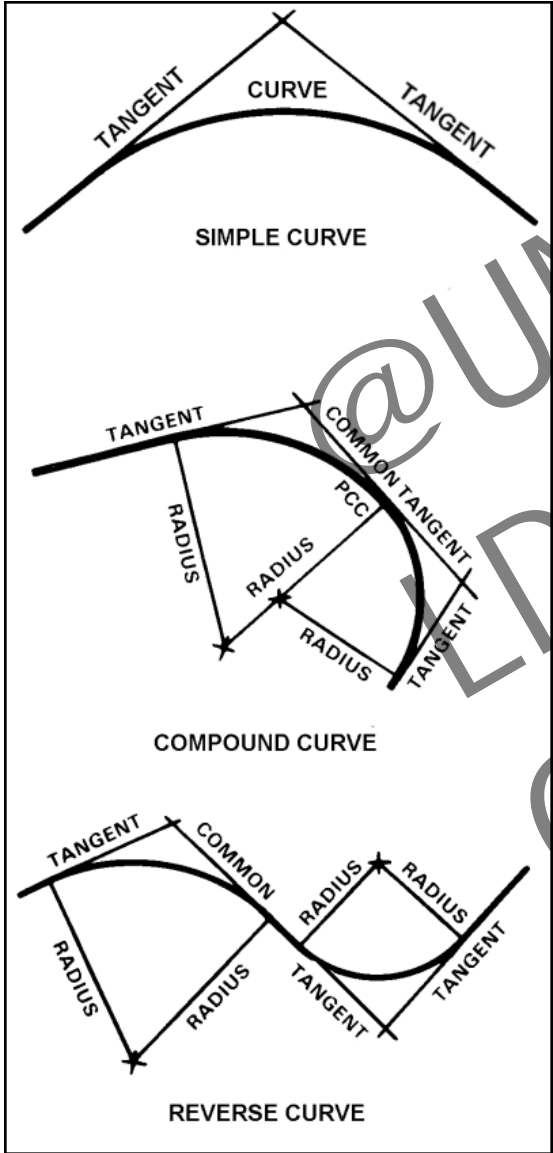
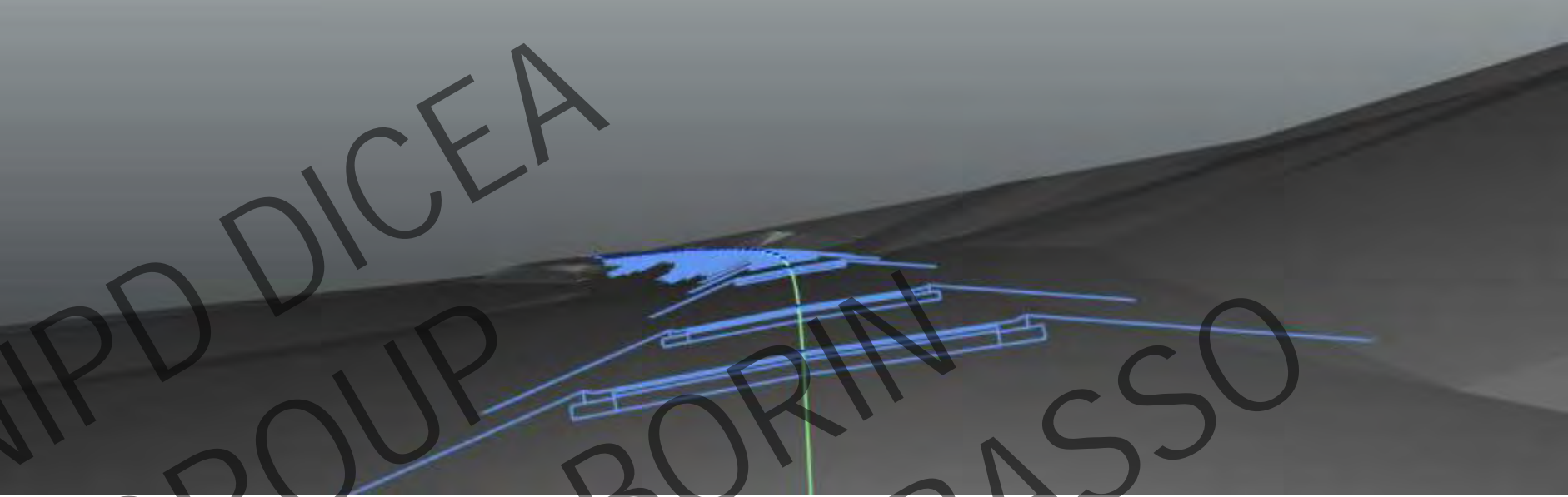
use
of a shared digital representation of a
built *asset*
to facilitate
design,
construction and
operation processes
to form
a reliable basis for decisions

BIM per le infrastrutture?



BIM

Rapporti / Occasioni

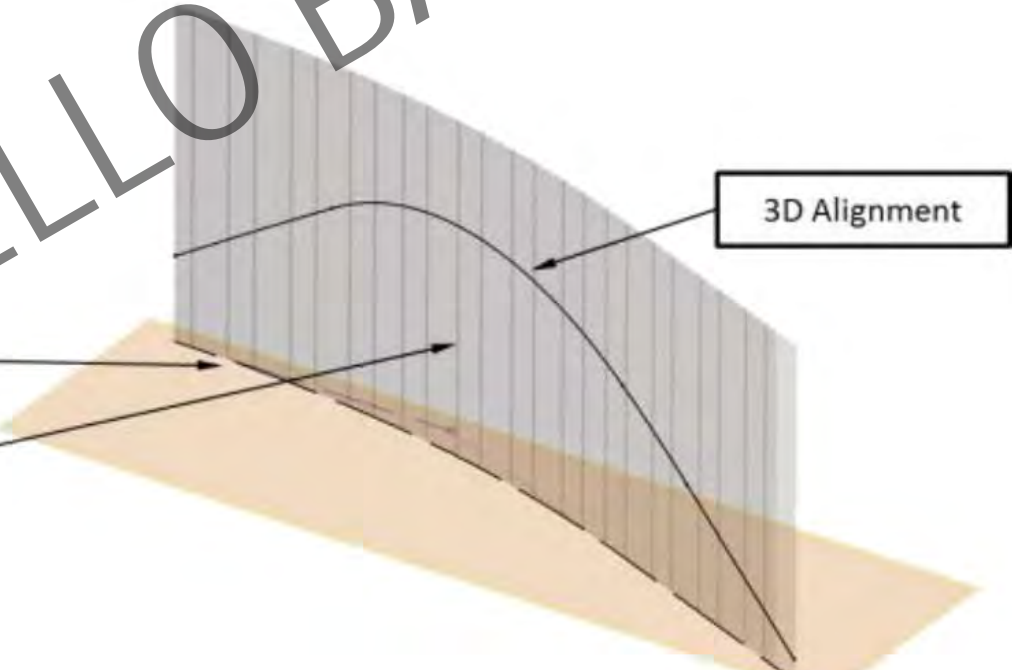


2D Alignment

Horizontal Alignment

Vertical Alignment

3D Alignment



J. Amann, D. Singer, A. Borrmann, Extension of the Upcoming IFC Alignment Standard with Cross Sections for Road Design, in Proceedings of the ICCBEI 2015, 2015

Semantics

- Dictionary



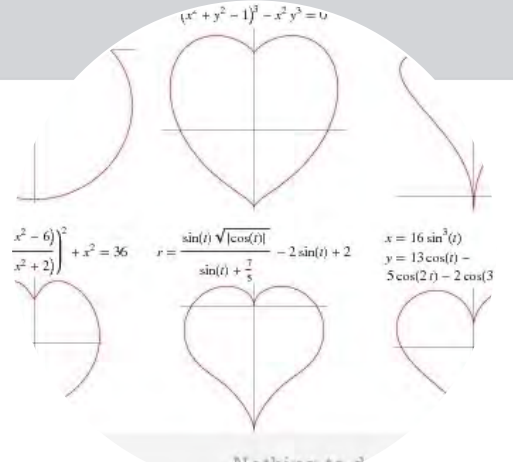
Information management

- Properties organized by hierarchical structures



Parametric Modeling

- Geometric rules to create objects



Semantics

Parallelepipedo verticale

- Muro
- Colonna

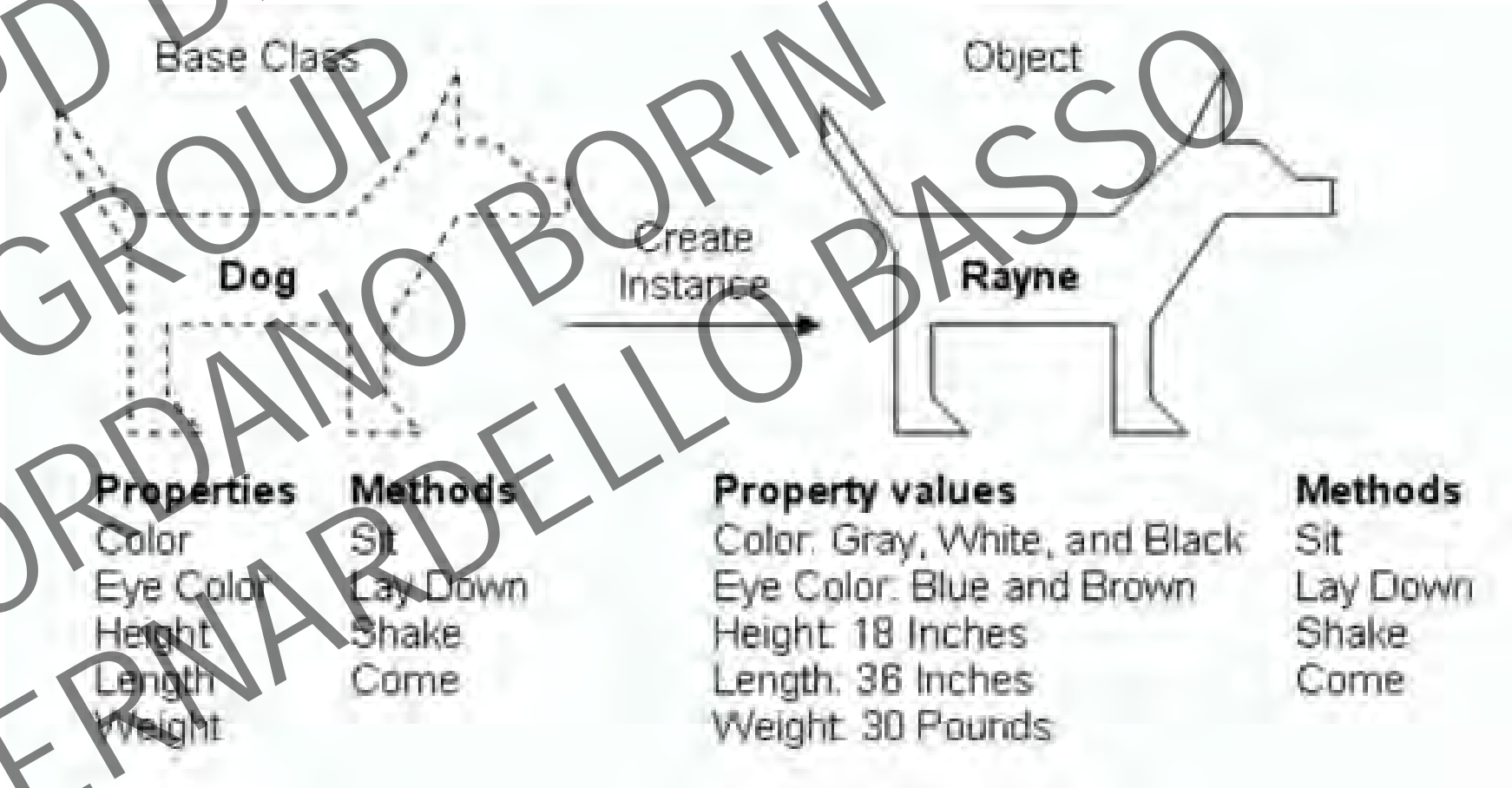
Parallelepipedo

- Solaio
- Terreno
- Copertura piana

Cilindro

- Pilastro circolare (colonna dorica?)
- Impianto di illuminazione esterna
- Pluviale

Information management



Parametric
Modeling

Cosa vuol dire parametrizzare?

Quale è la definizione geometrica di una muratura?

Di un solaio?

Di una finestra?

Di un pilastro?

Di una tubazione?

BIM

Rapporti / Occasioni

BIM Uses?

Coordinamento di progetto

Controllo del progetto

Valutazioni economiche / temporali

Integrazione delle informazioni

Scan to BIM (quali infrastrutture in Italia?)

Facility Management (committenza?)

Valutazione delle alternative

Personalizzazione attraverso VPL

Integrazione delle informazioni

GIS BIM



standard

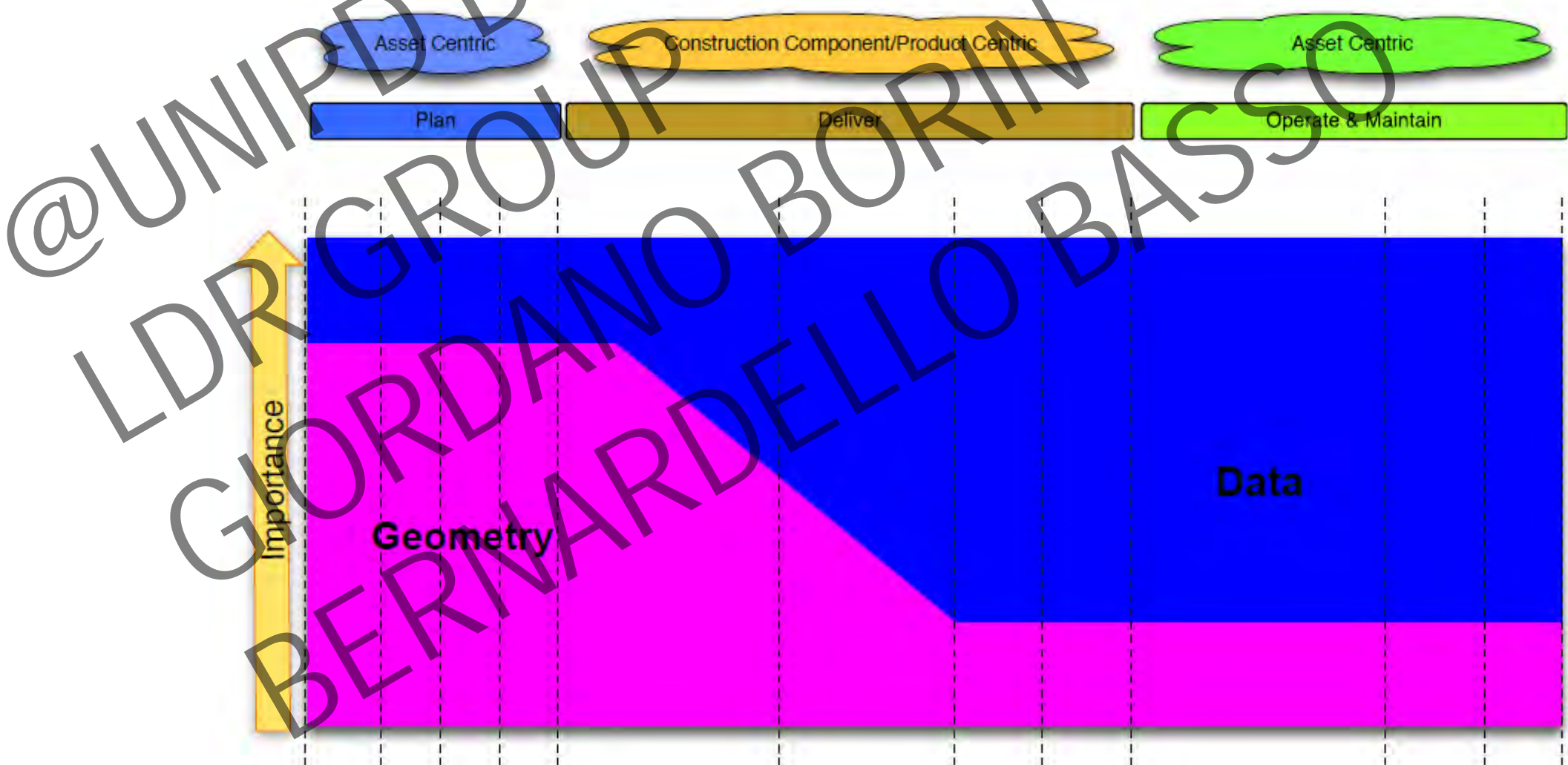
Asset Hierarchy (V. Succor, 2011).
Partially adopted from ESTE, buildingSMART, and ISO 15926

Scan to BIM (quali infrastrutture?)

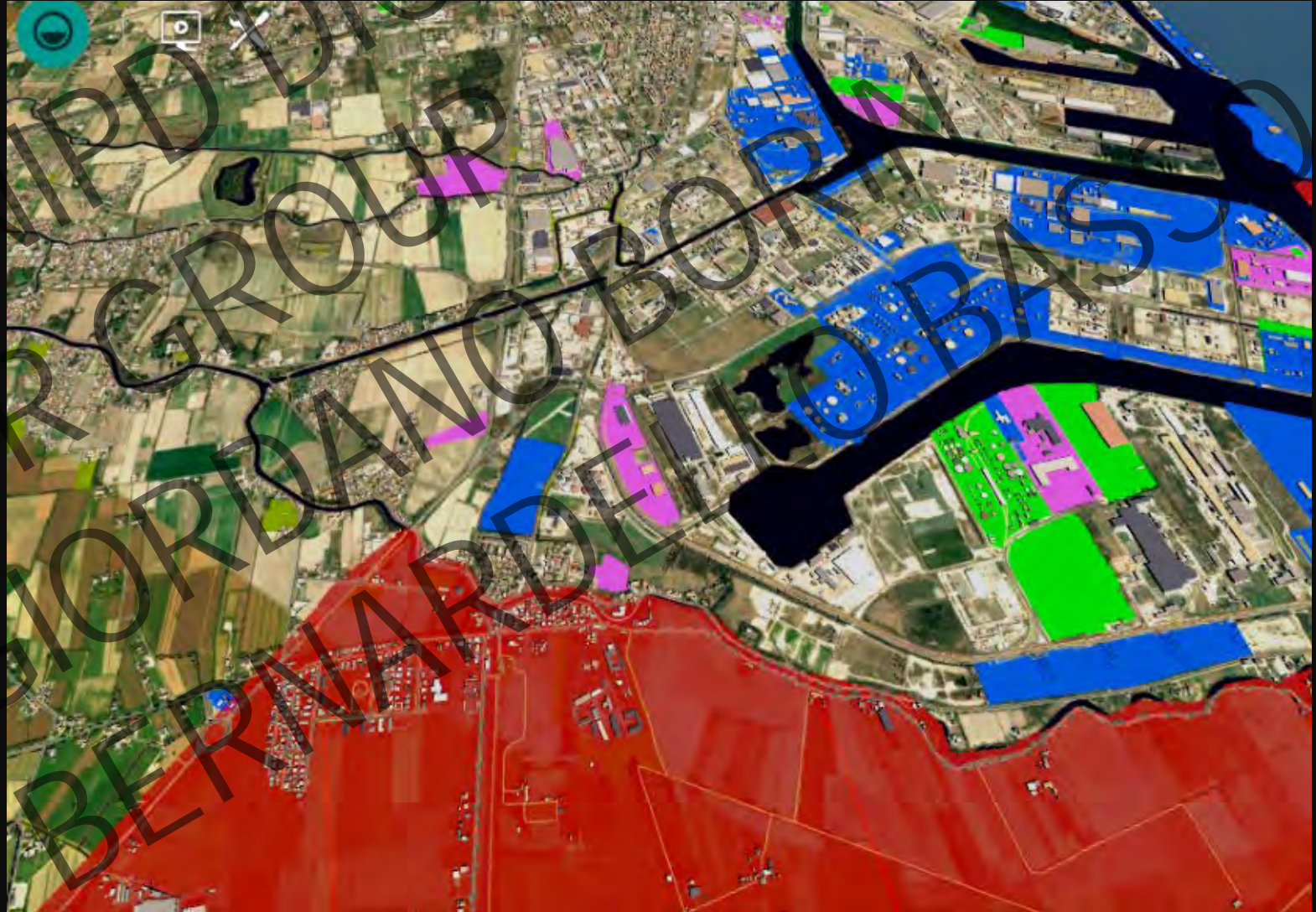


LDR GIORDANO
GIORDANO
BERNARDELLO

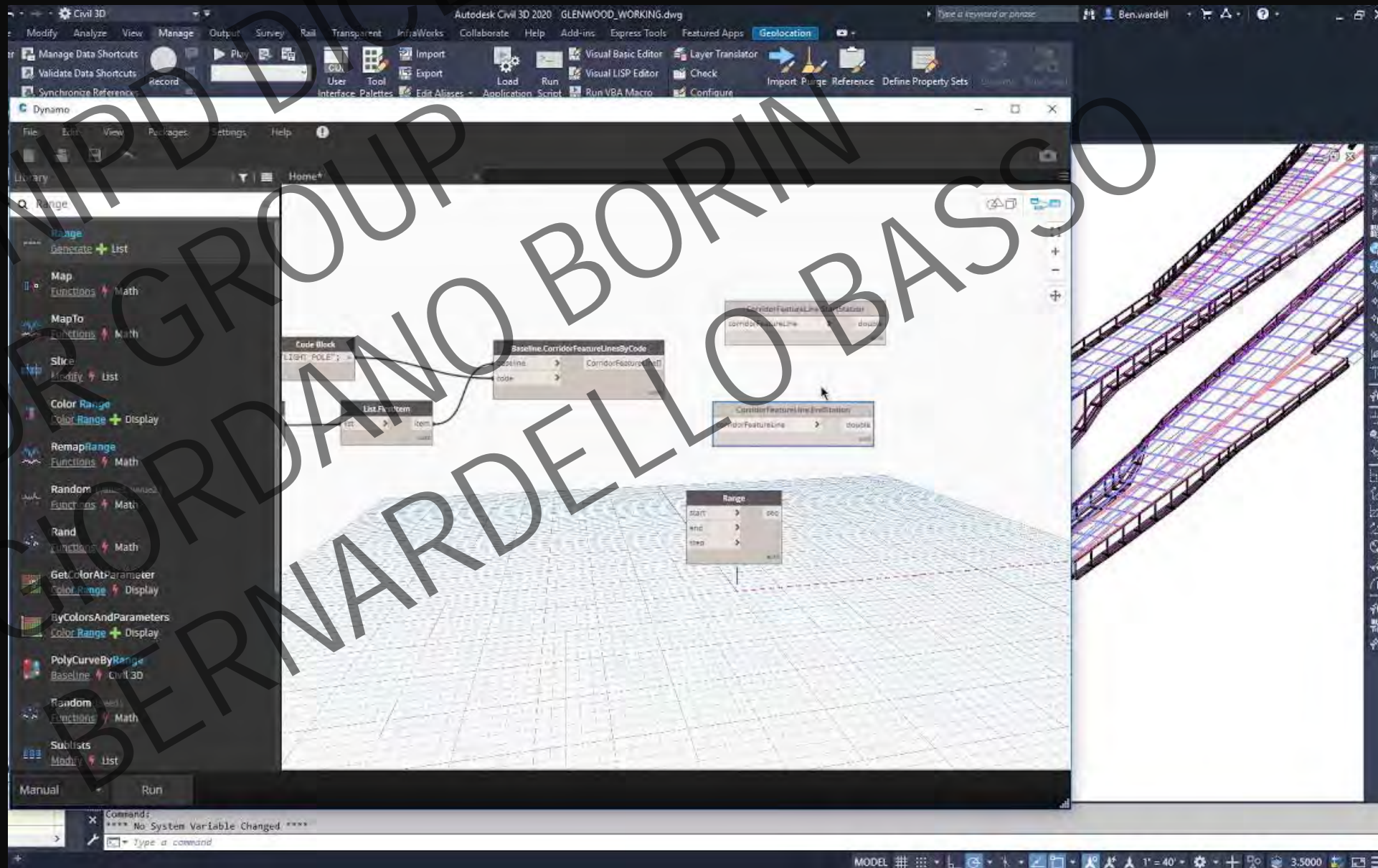
Facility Management (committenza?)



Valutazione delle alternative



Personalizzazione attraverso VPL



Documento ANAC

Nell'ottica di **selezionare un operatore adeguatamente qualificato** per l'esecuzione della prestazione oggetto di affidamento, appare più adeguato valorizzare l'esperienza maturata in materia di metodi e strumenti elettronici nell'ambito dell'offerta economicamente più vantaggiosa, per il **tramite del criterio della professionalità e adeguatezza dell'offerta e, soprattutto, del criterio delle caratteristiche metodologiche dell'offerta**

Partendo dal presupposto che uno dei vantaggi conseguibile con il ricorso ai metodi e agli strumenti elettronici è quello di una gestione più efficiente del processo di manutenzione delle opere, **la stazione appaltante nella definizione del piano di formazione del personale** non può non tener conto del fatto che anche coloro che saranno deputati alla gestione delle opere dovrebbero possedere adeguate competenze in materia.

Autodesk: Revit / InRoads / MicroStation

Bentley: Open Roads | Rail | Bridge / Microstation

Trimble: Novapoint / Quadri / Sketchup / Tekla

MIDAS?

Allplan?

CSI?

Classi di
oggetti

Classi di
relazione

Proprietà
Quantitative

BuildingElementProxy,
Covering,
Beam,
Column,
Door,
Member,
Railing,
Wall,
Lab,
Stair,
File,
Roofing,
Plate

IfcRelDecomposes
SpatialStructureElement
StructuralElement

Property set
muro
Property set
caratteristiche
una pila
Property set
di ogni prodotto
Quantity set
travi



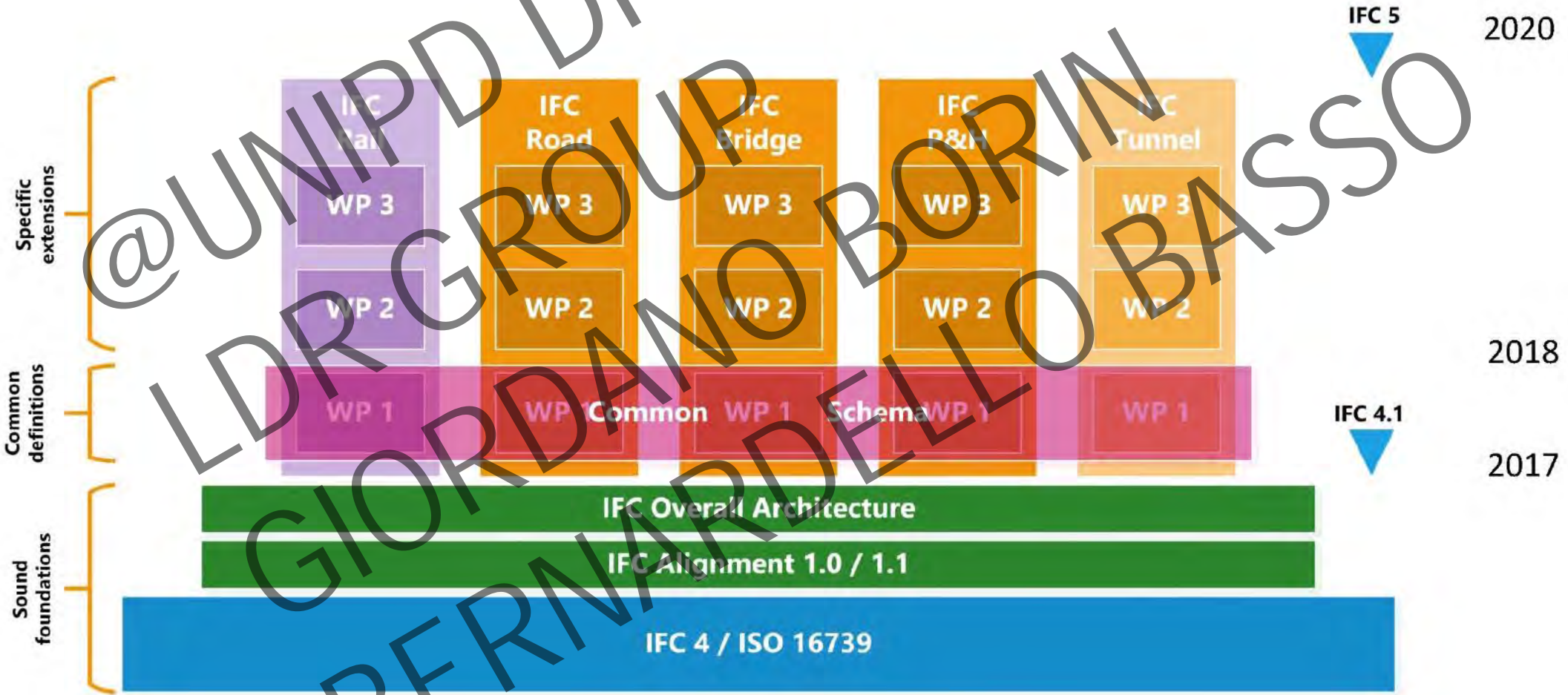
Construction

Controls

HVAC

Structural



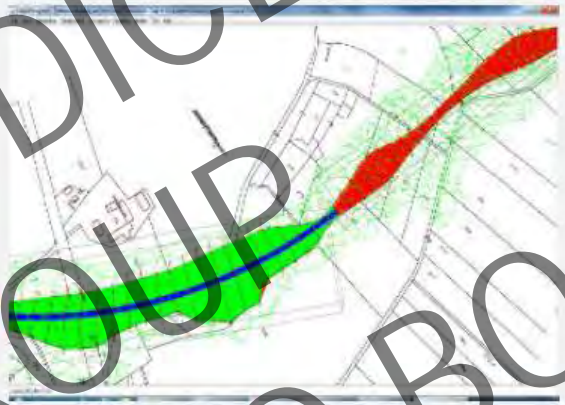


Source: InfraRoom (2017). [InfraRoom Project Program 2017 - 2019](#)

BIM

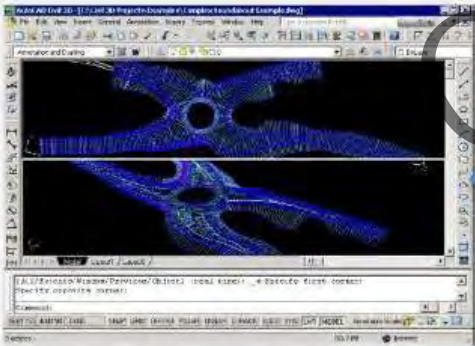
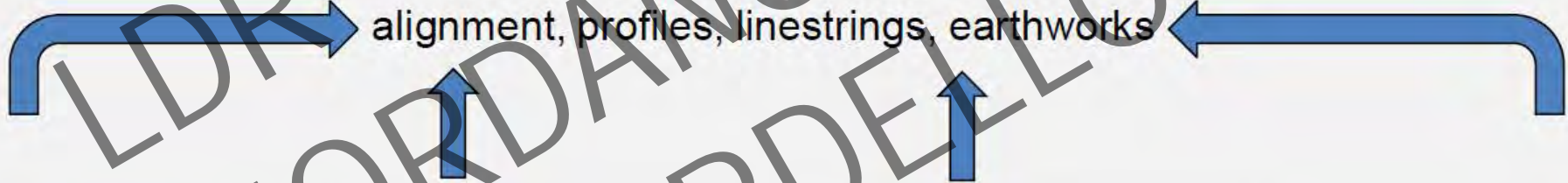
Rapporti / Occasioni

Interoperabilità

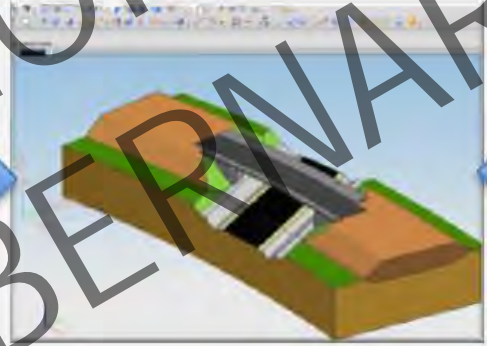


Overall architecture

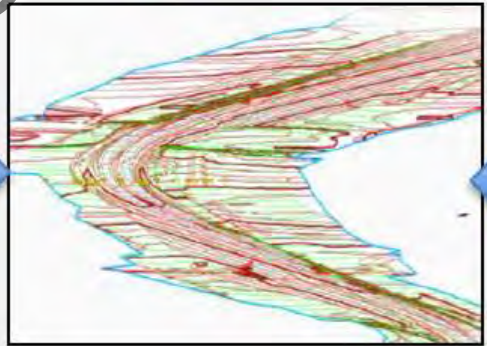
alignment, profiles, linestrings, earthworks



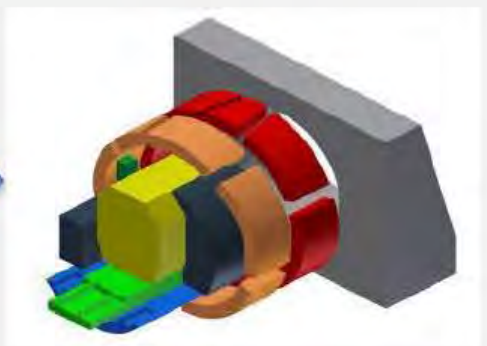
IFC-Road



IFC-Bridge

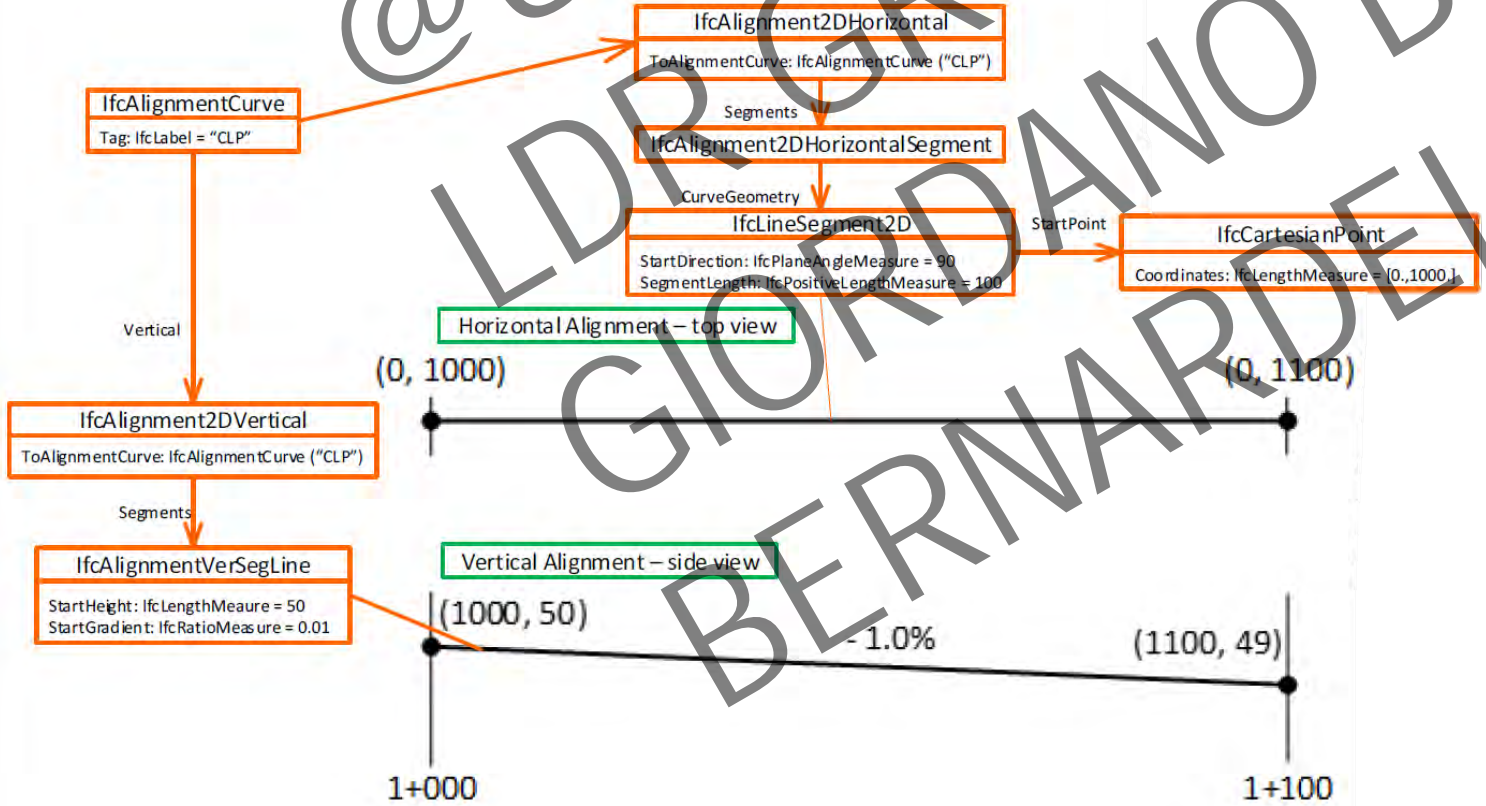


IFC-Railway

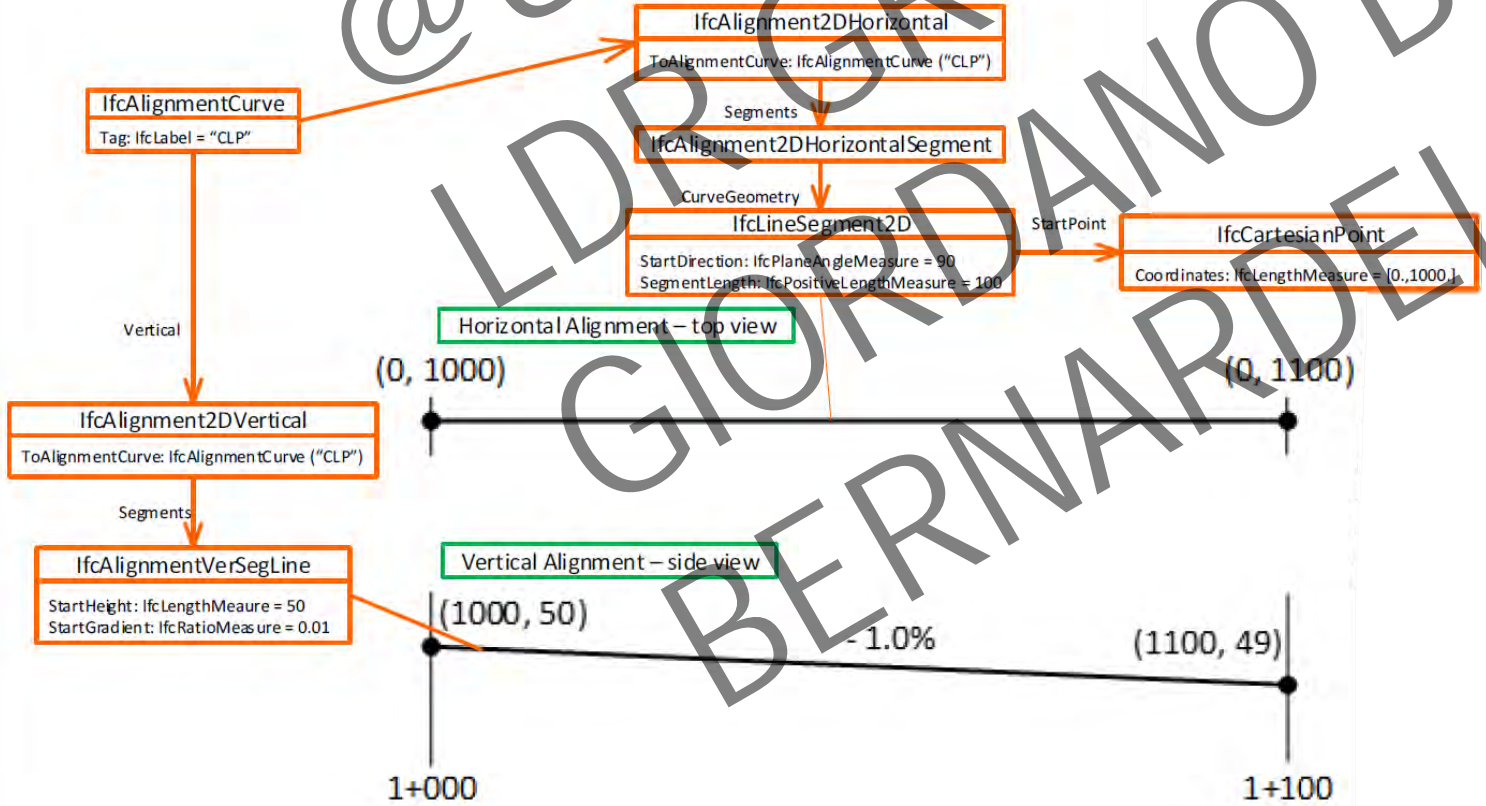


IFC-Tunnel

BIM



BIM

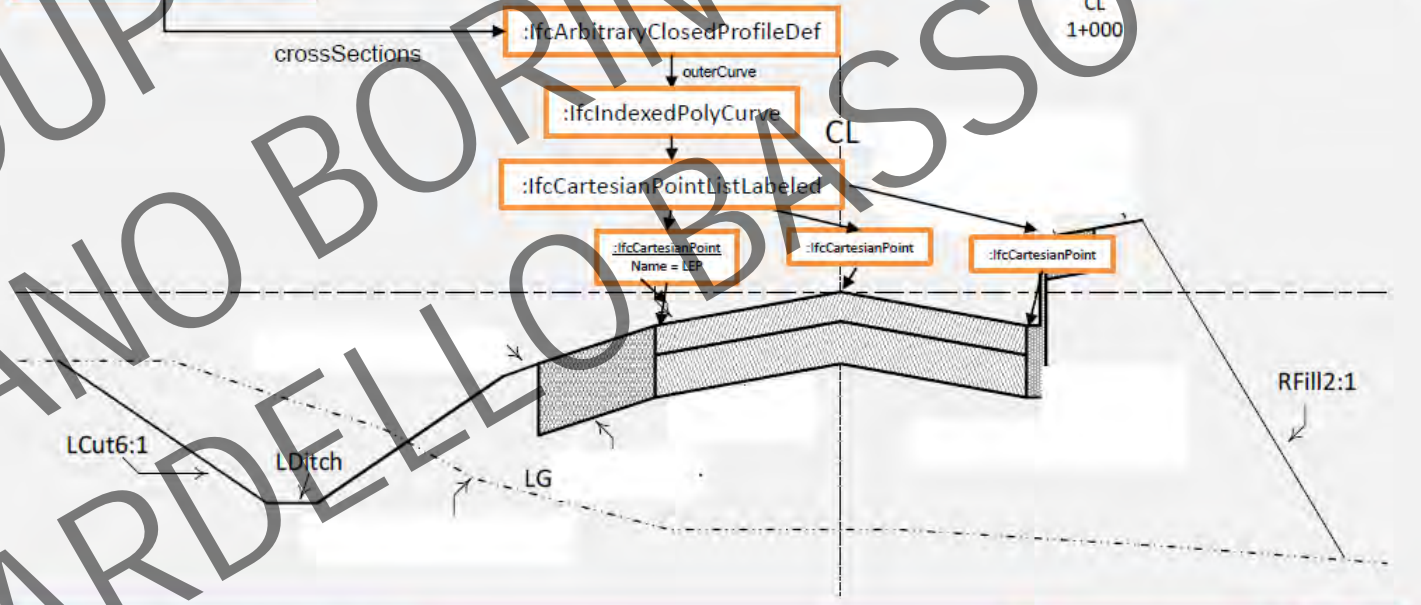
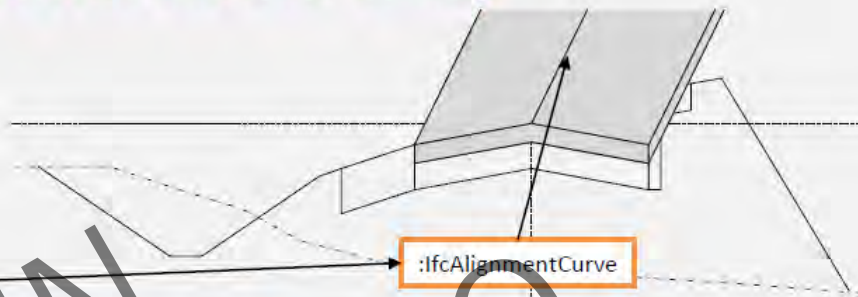
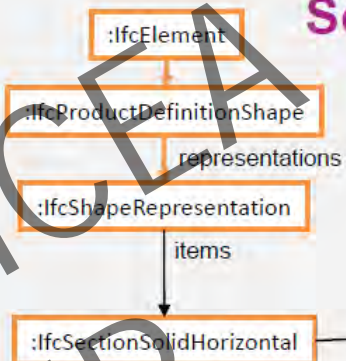


BIM

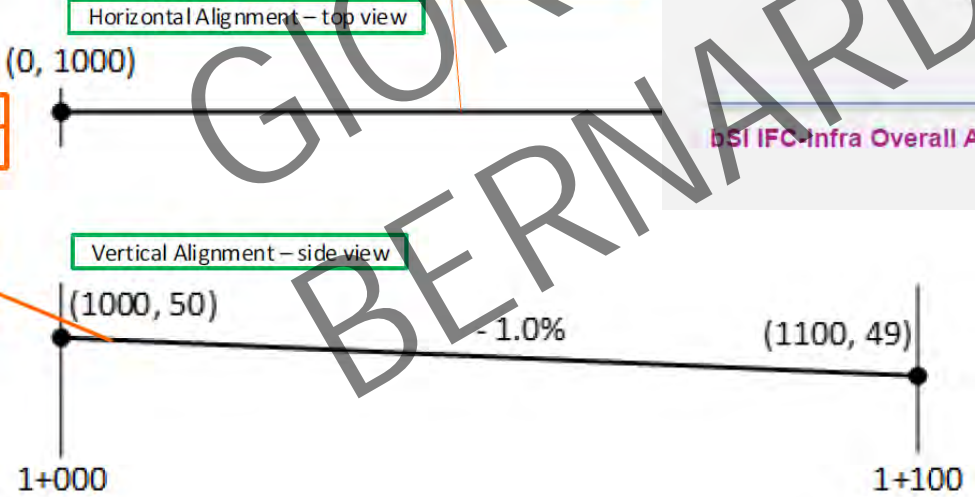
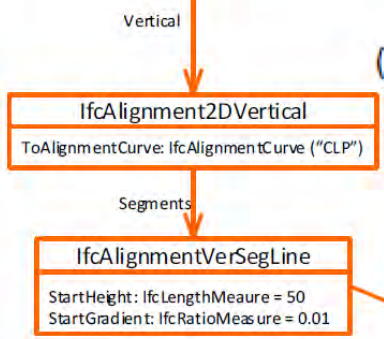
Rapporti / Occasioni

Starting from

Solid rep: Cross section sweep



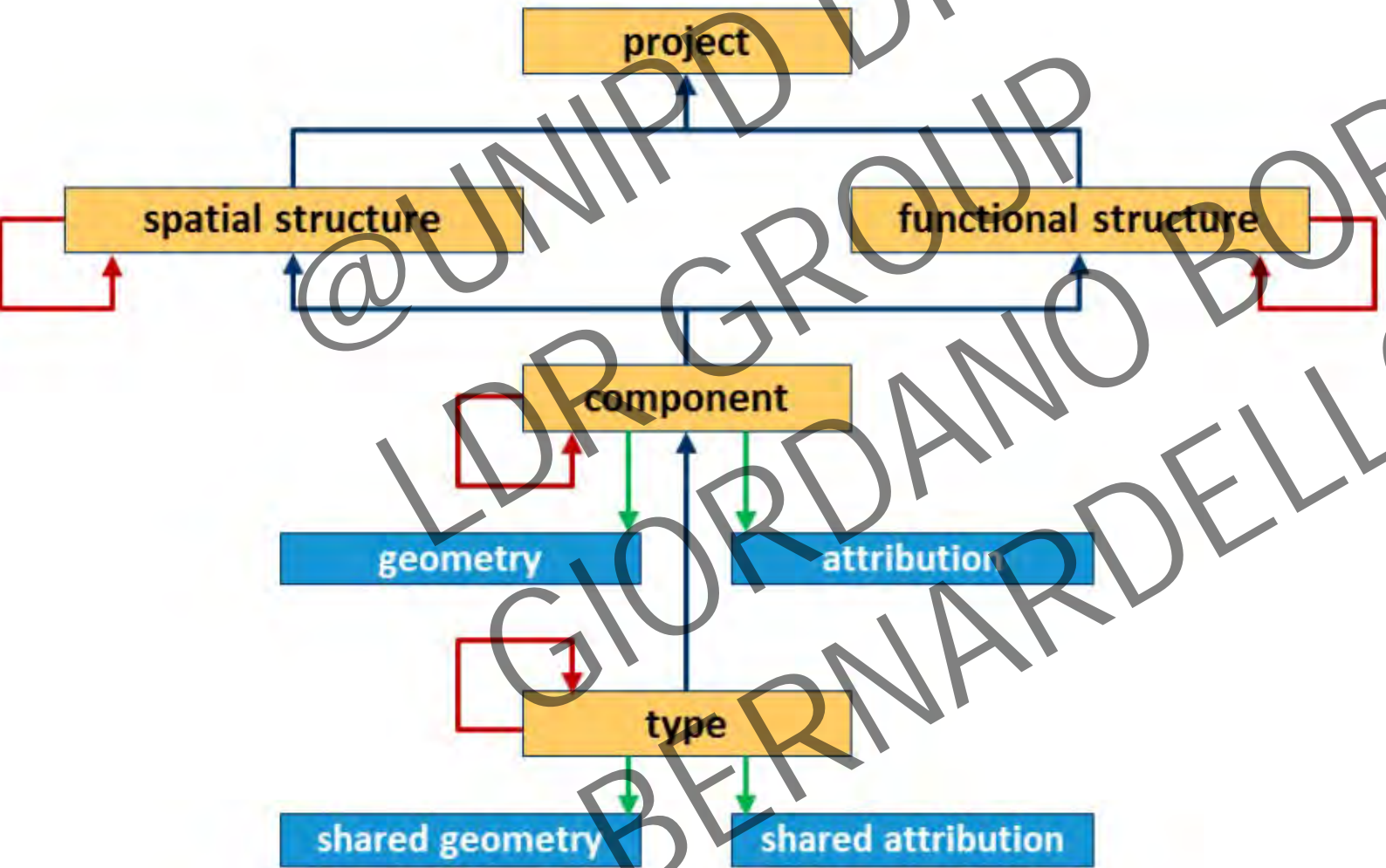
BSI IFC-Infra Overall Architecture



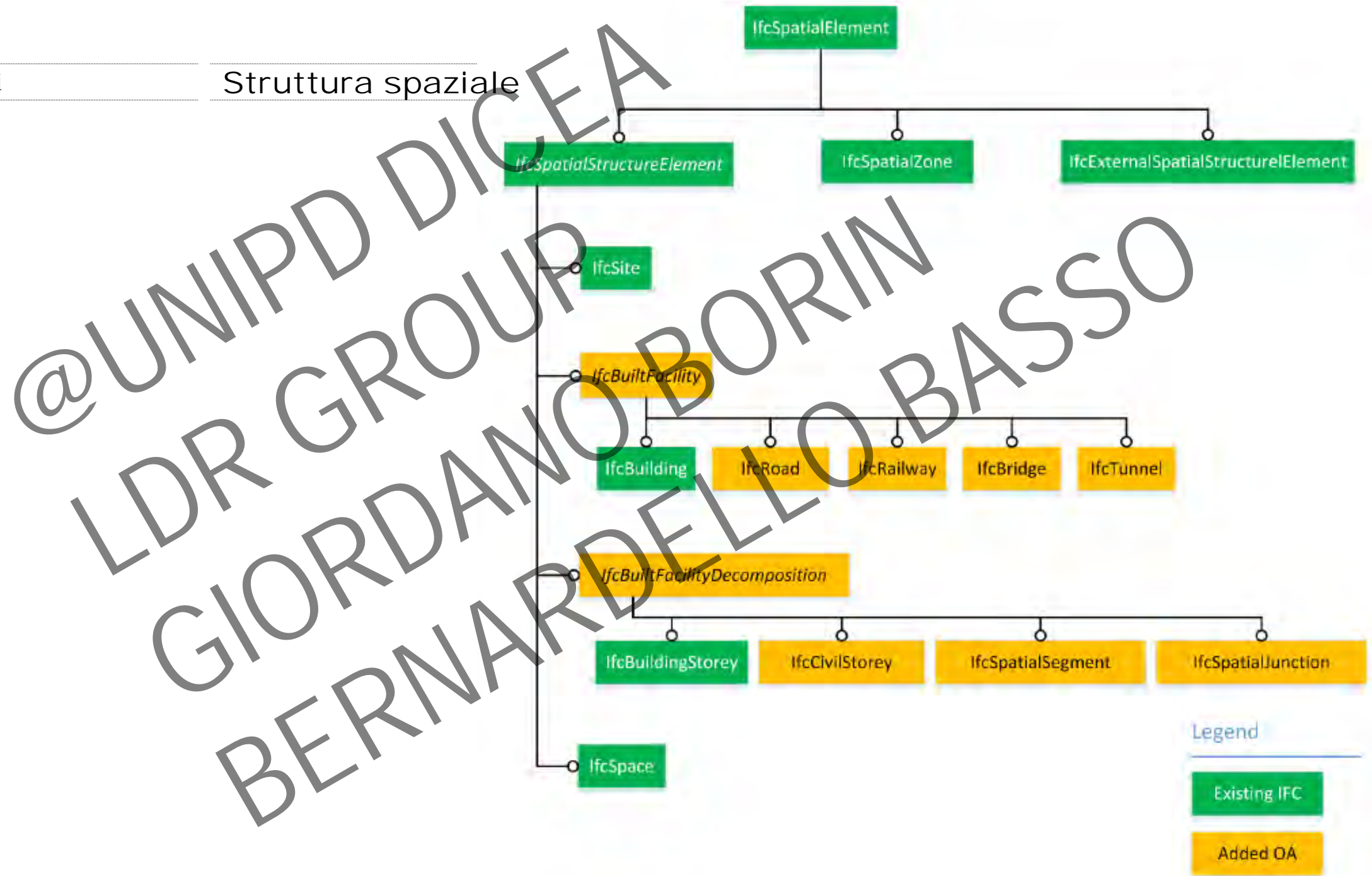
BIM

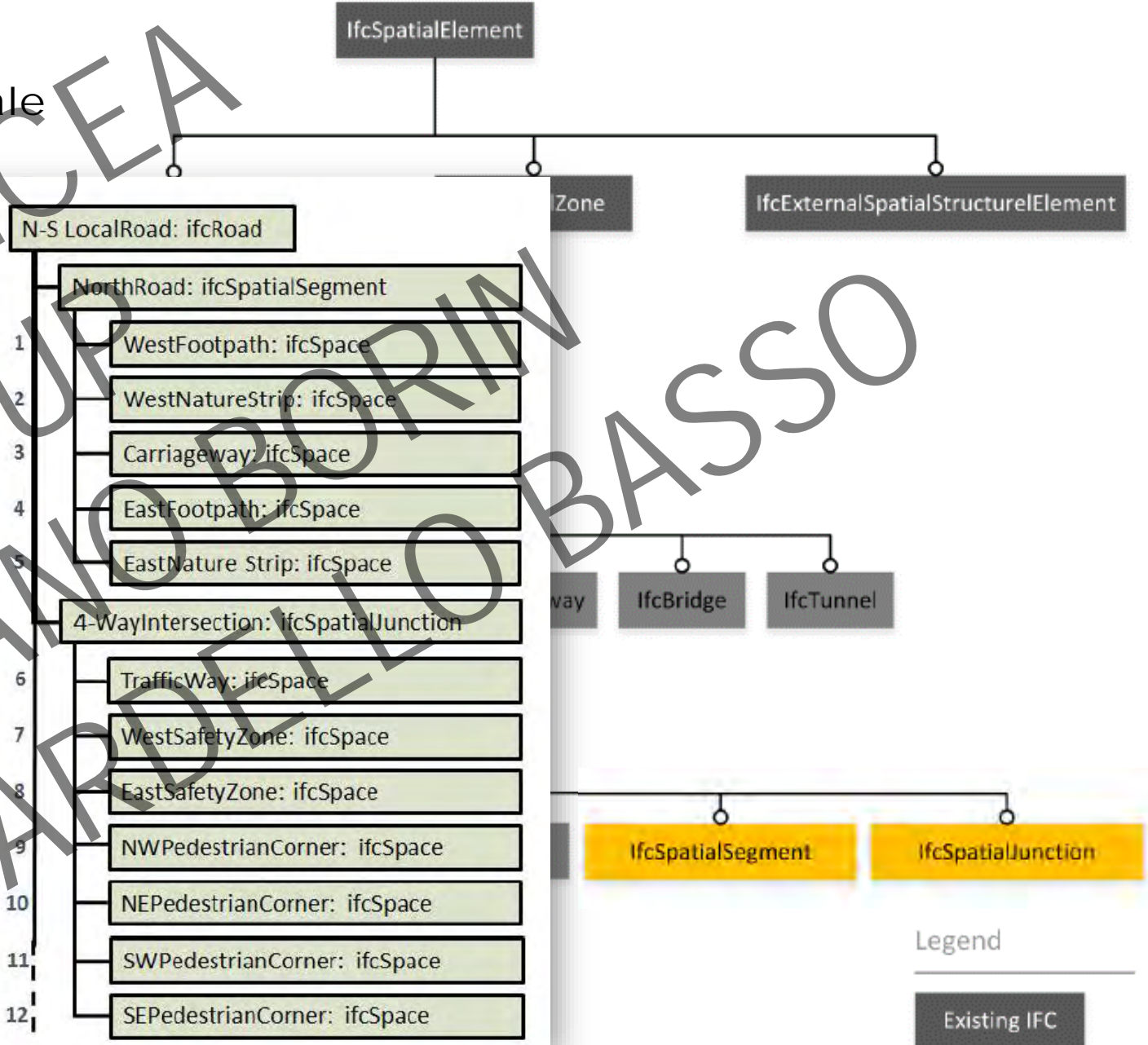
Rapporti / Occasioni

Struttura spaziale

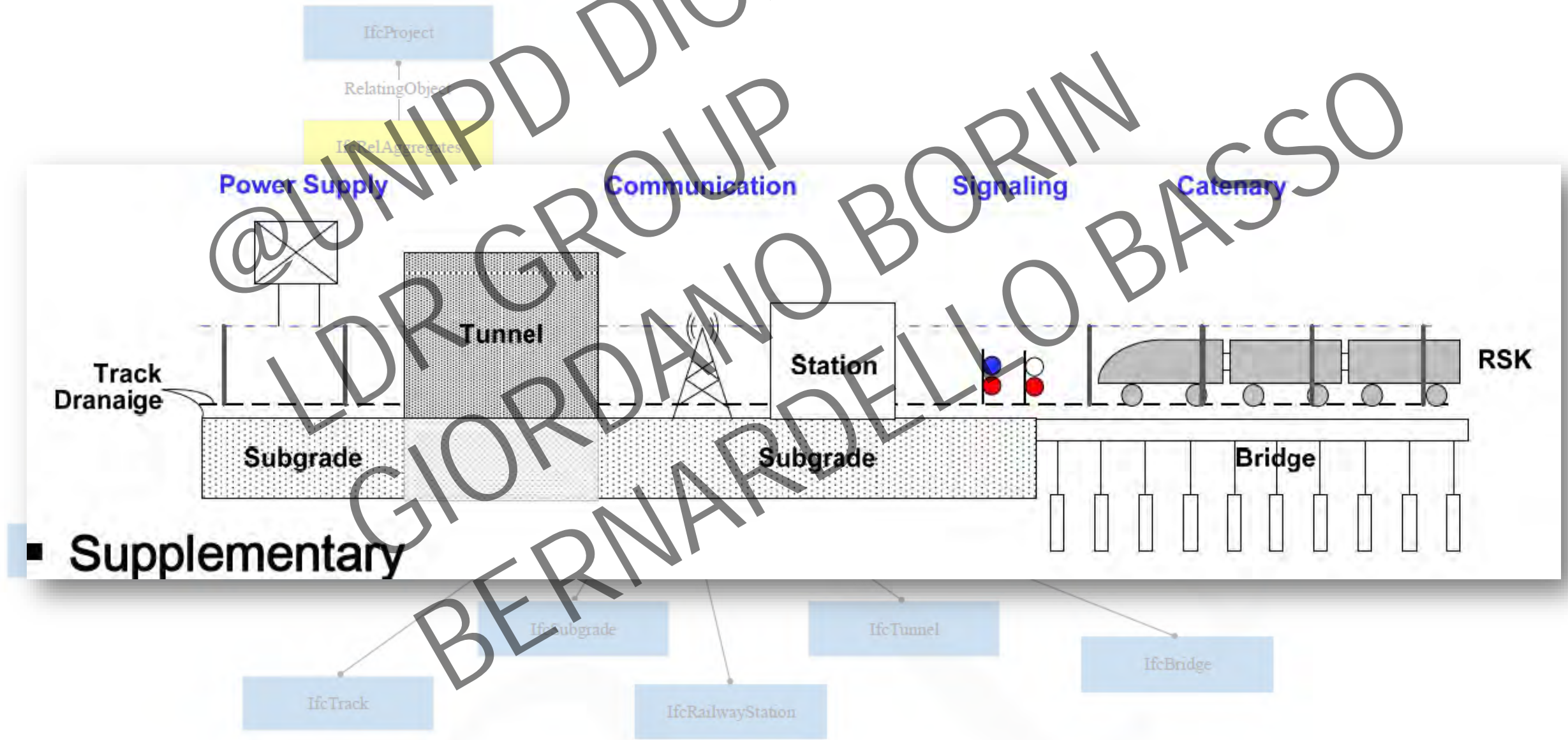


@UNIPD DICEA
LDR GROUP
GIORDANO BORIN
BERNARDELLO BASSO









Supplementary

Interfaces to Rail-Schema

Power

Track
Dranaige

Sub

■ Suppleme

Lightning
on portal

Fundament
on
platform

Alignment of
cable canal

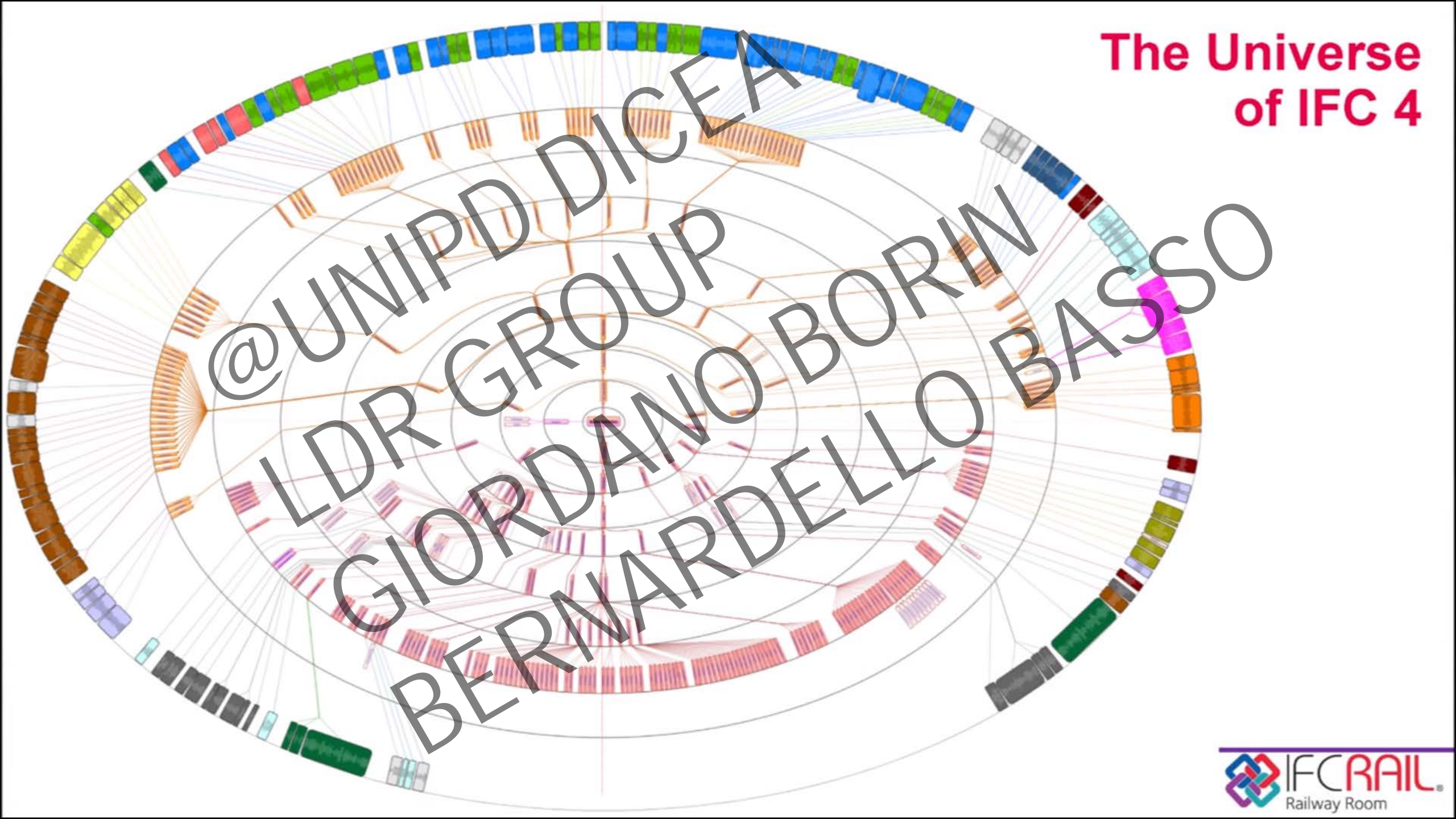


Clock on portal

Bridge
over track

Level crossing
between platforms

The Universe of IFC 4



CLASSI

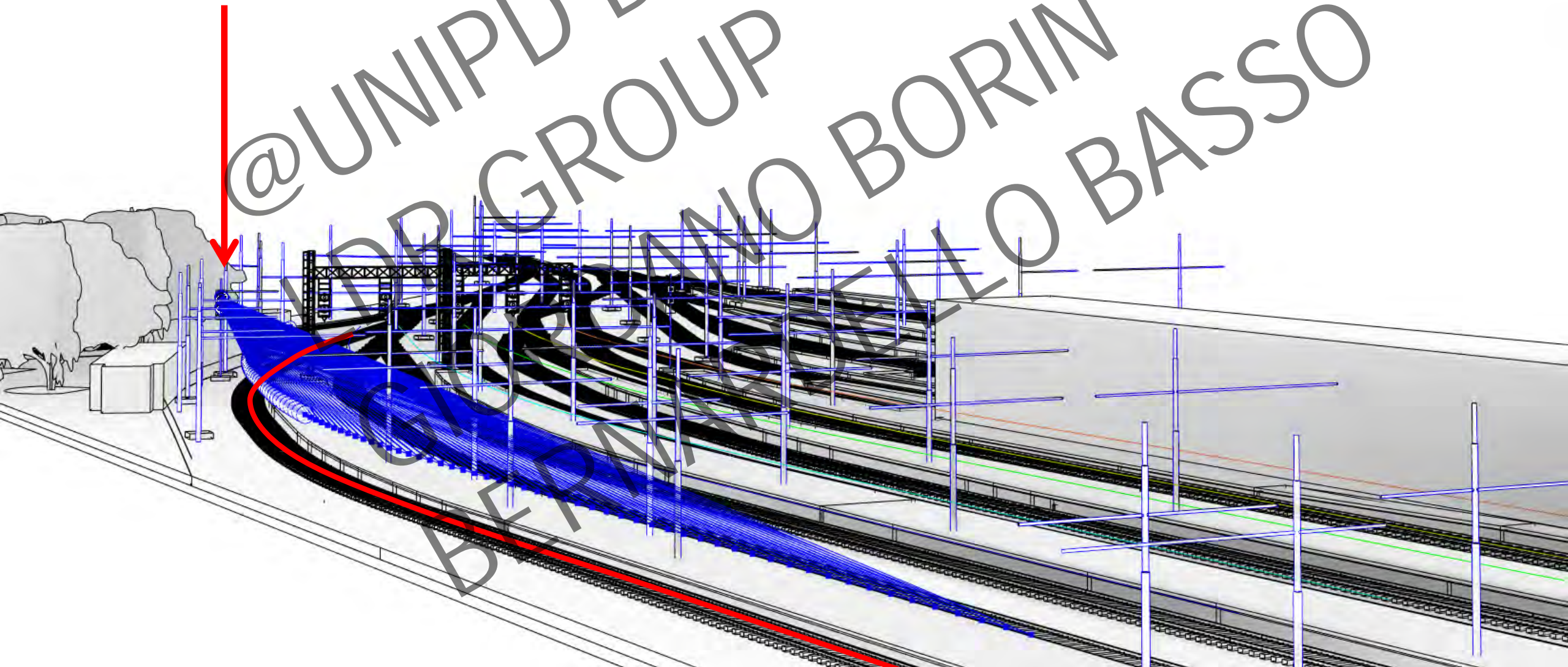
IfcAlignment
IfcSignal

STRUTTURA SPAZIALE

IfcRailwayStation
IfcRail

VPL

Dynamo



PAOLO BORIN

L'applicazione del BIM alle
infrastrutture di trasporto

Grazie dell'attenzione

paolo.borin@unipd.it

@borinpaolo (twitter)

