



POLITECNICO
MILANO 1863



SMARTBUILDING ITALIA ROADSHOW 2020 LA PROGETTAZIONE

LA PROGETTAZIONE BIM COME PREMESSA ALL'EFFICIENZA ENERGETICA

Politecnico di Milano

Project/Construction Management
assistant professor

DigiPlace

EU Construction Digital Platform
project coordinator

UNI

BIM CT033/SC05 *president*
BIM CEN – ISO *national expert*

BIM A+

EU BIM Master Erasmus+
deputy manager, A+5 coordinator



BIMReL

IT SmartCE Product Digital Library
scientific manager

INNOvance

IT Construction Digital Platform
scientific manager

CCLM

Center Construction Law Management
scientific board

Building Smart IT (2005/15)

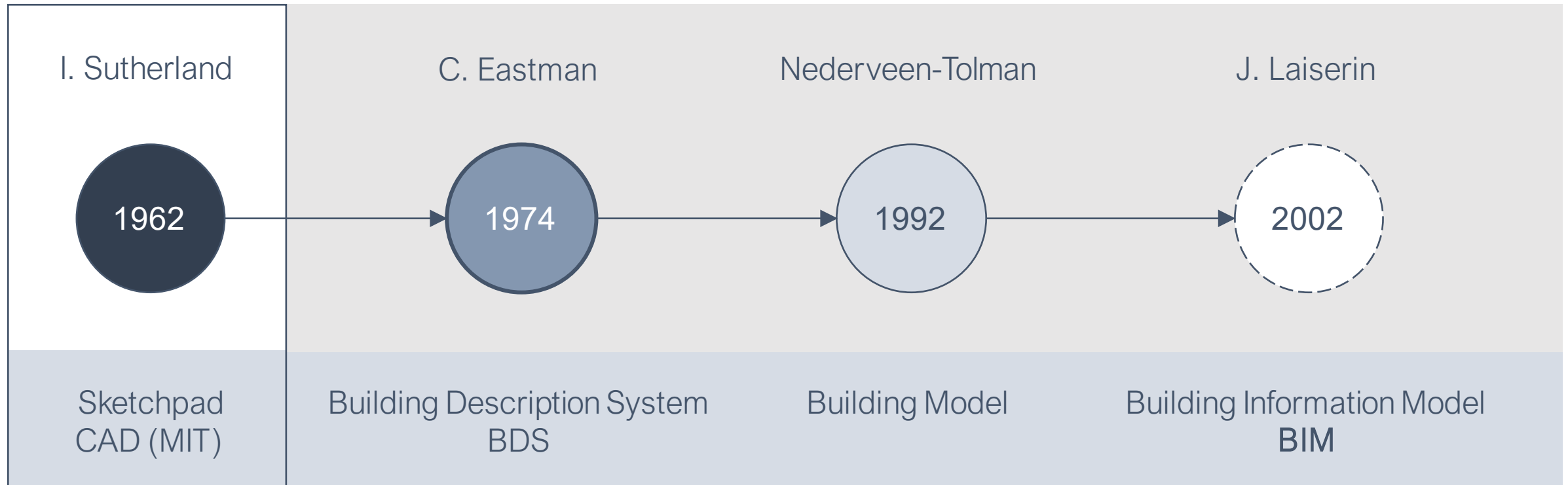
House of Open BIM - IFC standard
CEO member / treasurer



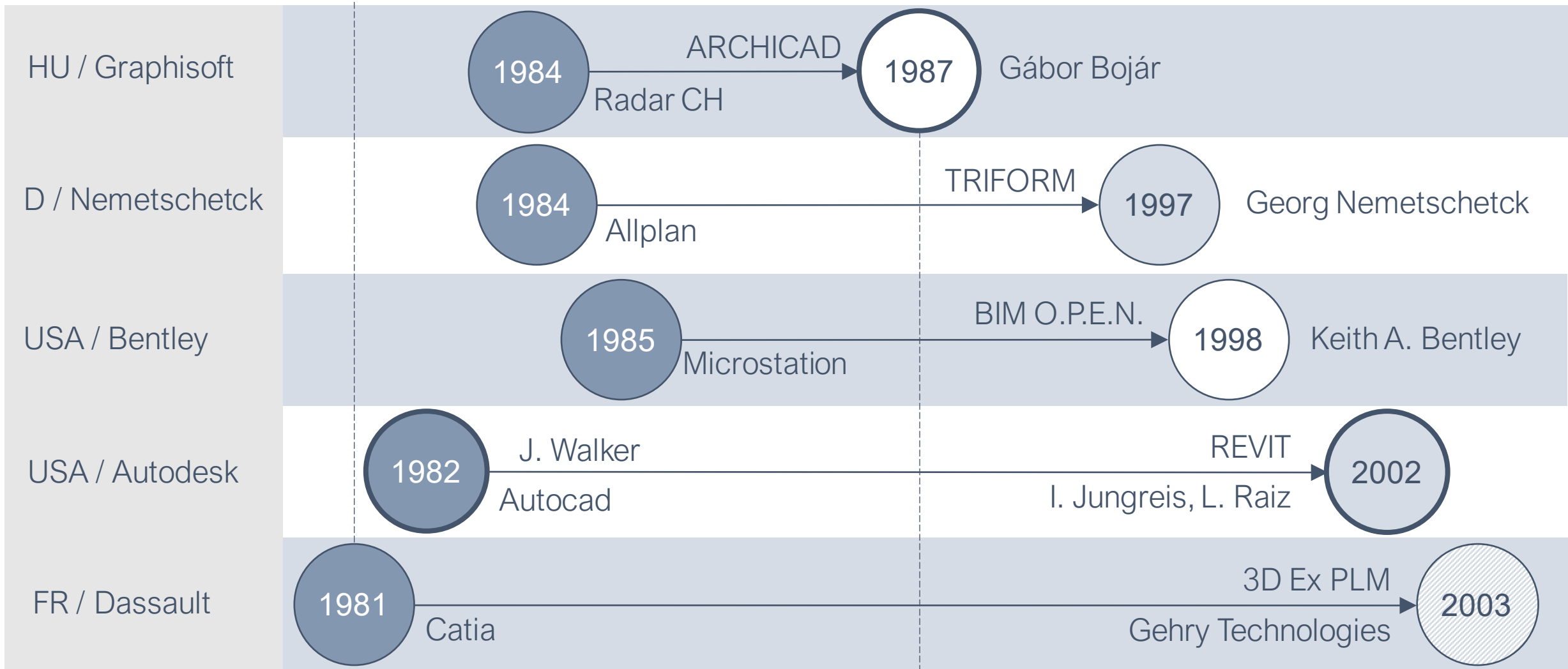
strumento



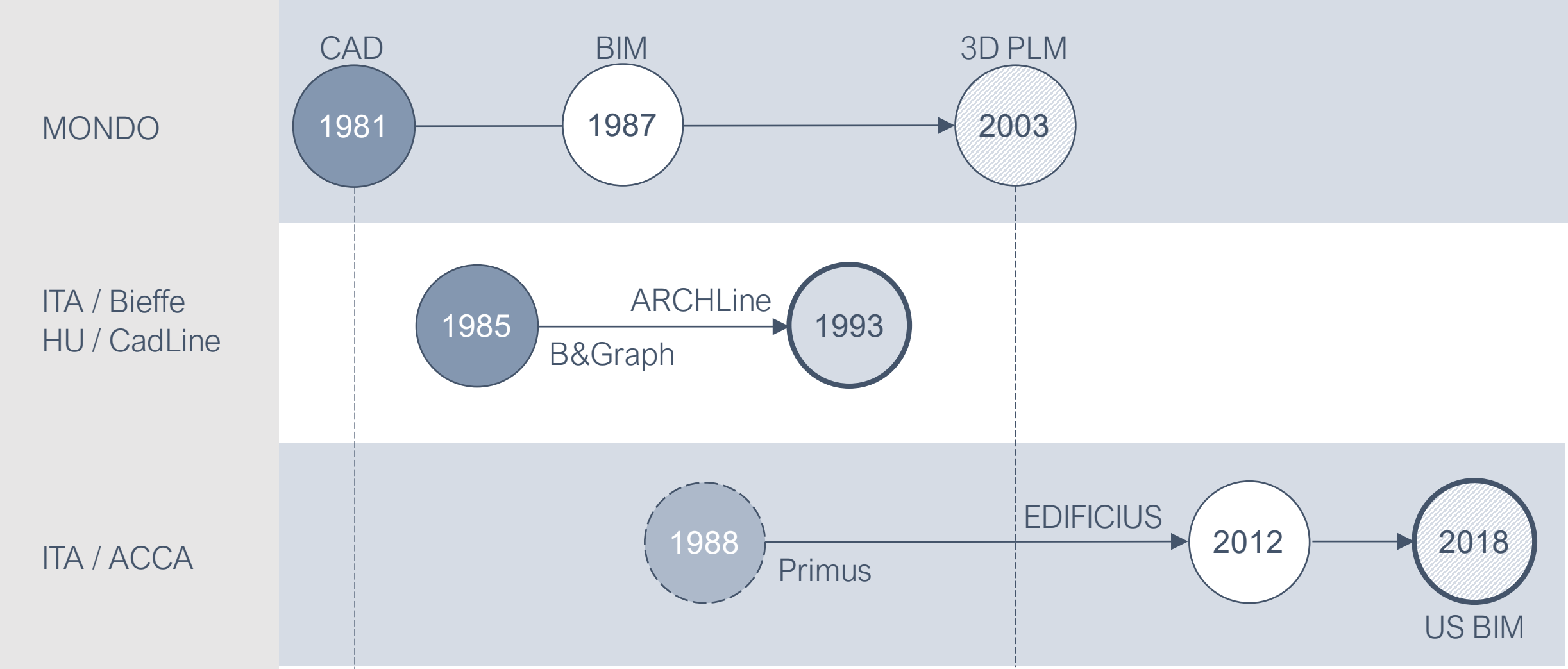
storia del BIM, la teoria



storia del BIM, il software



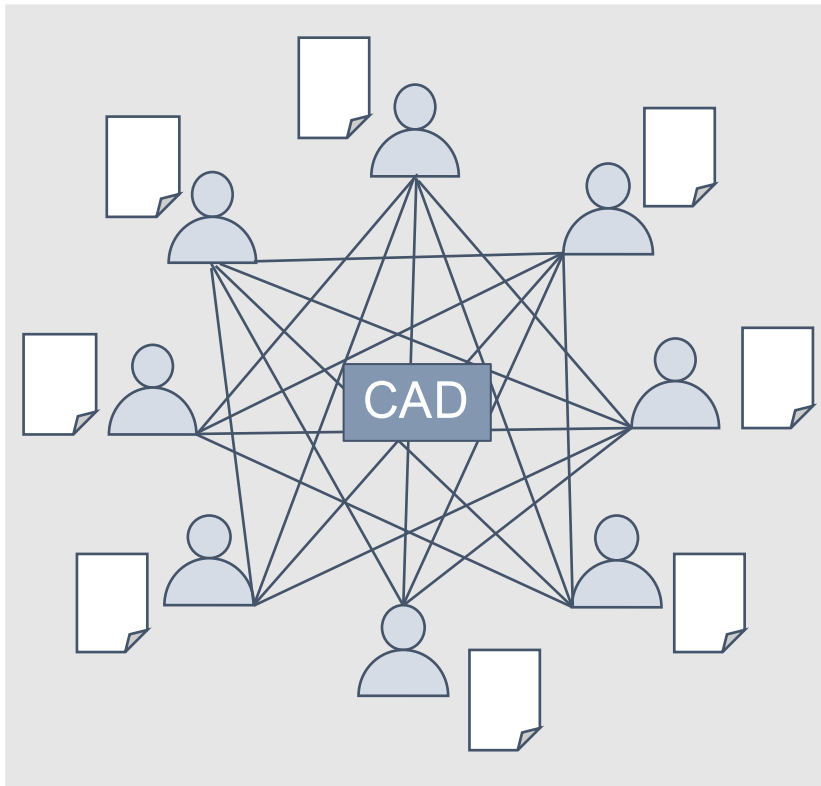
storia del BIM, il software - italia



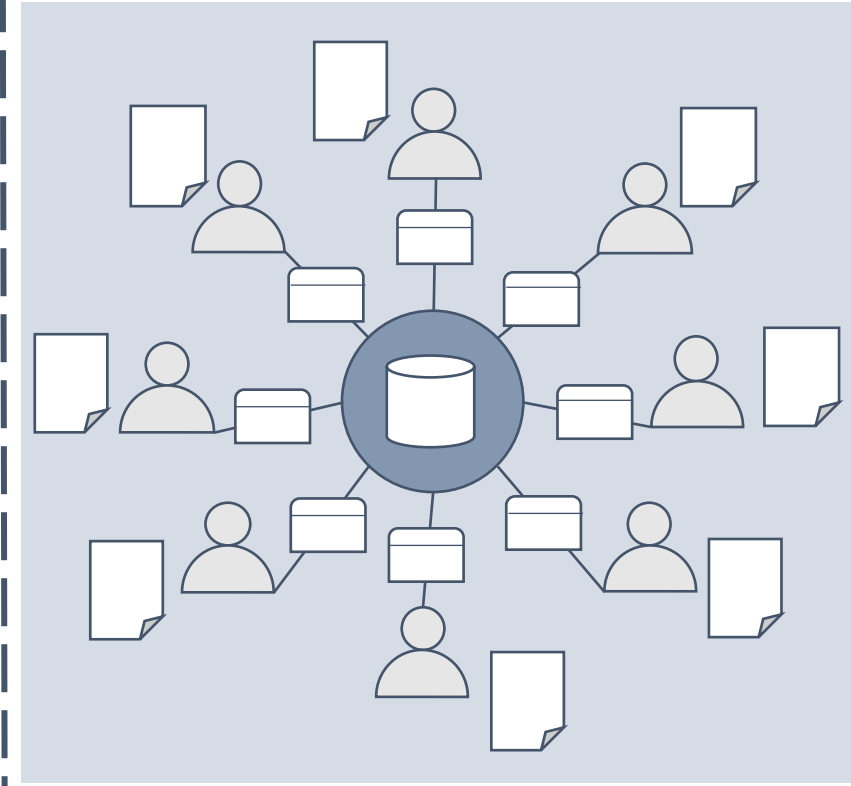
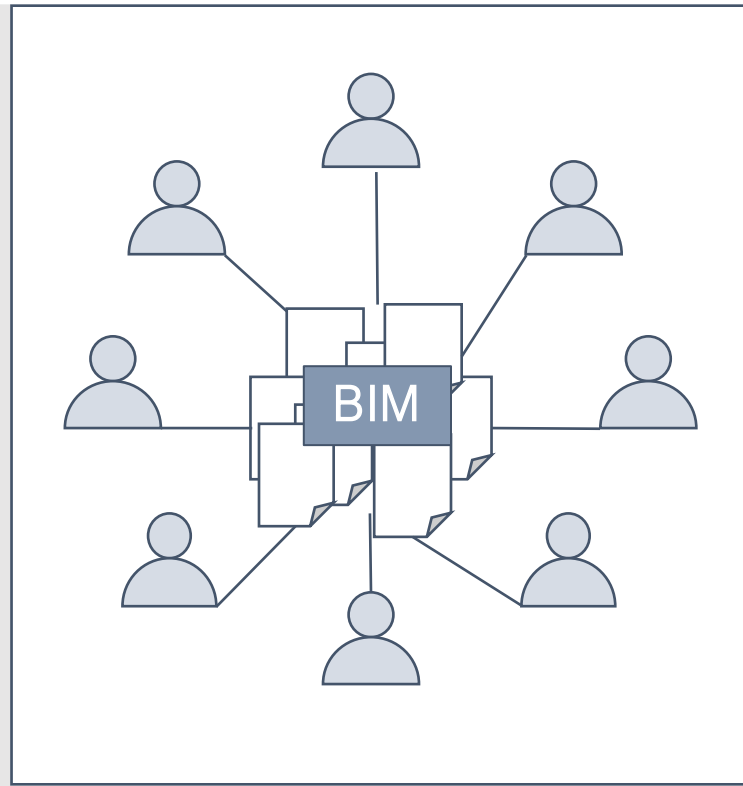
modello dati



metodo o strumento

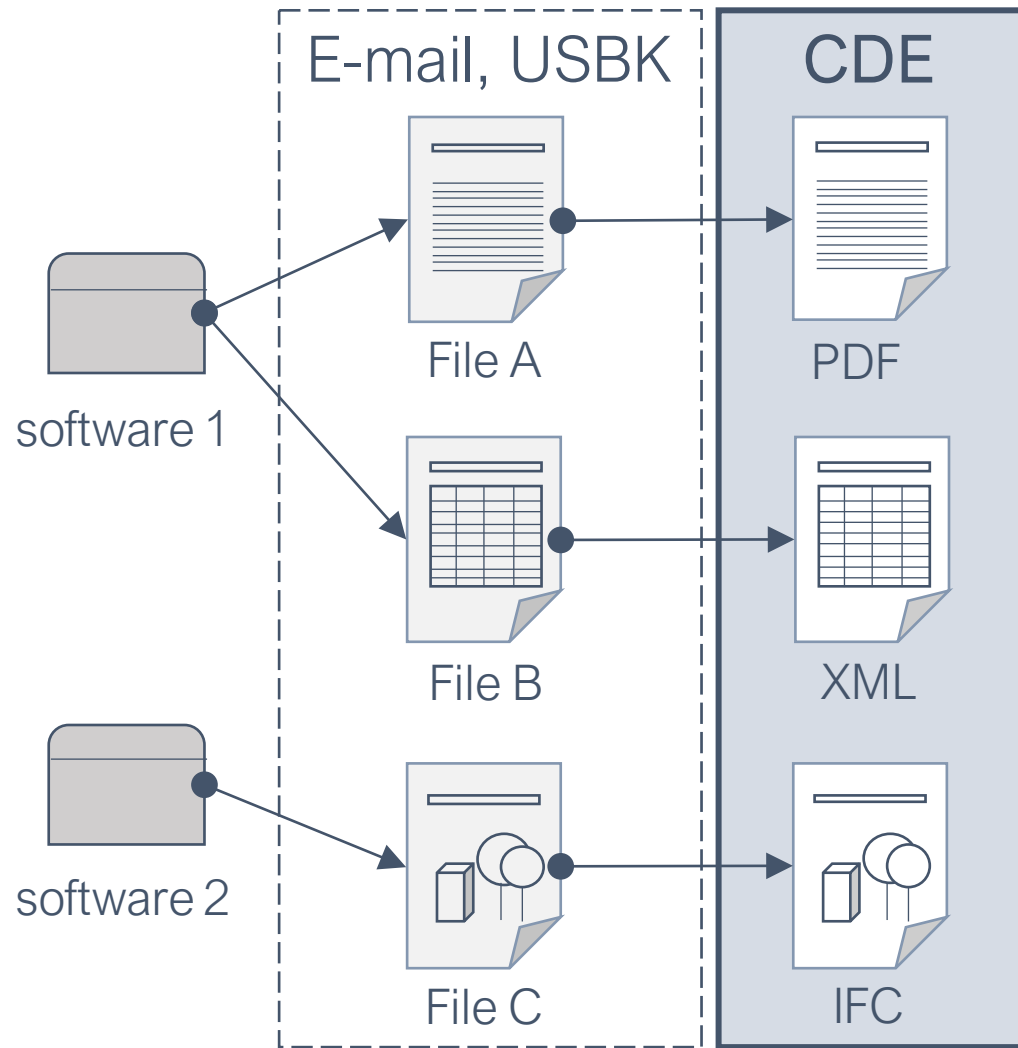


METODO



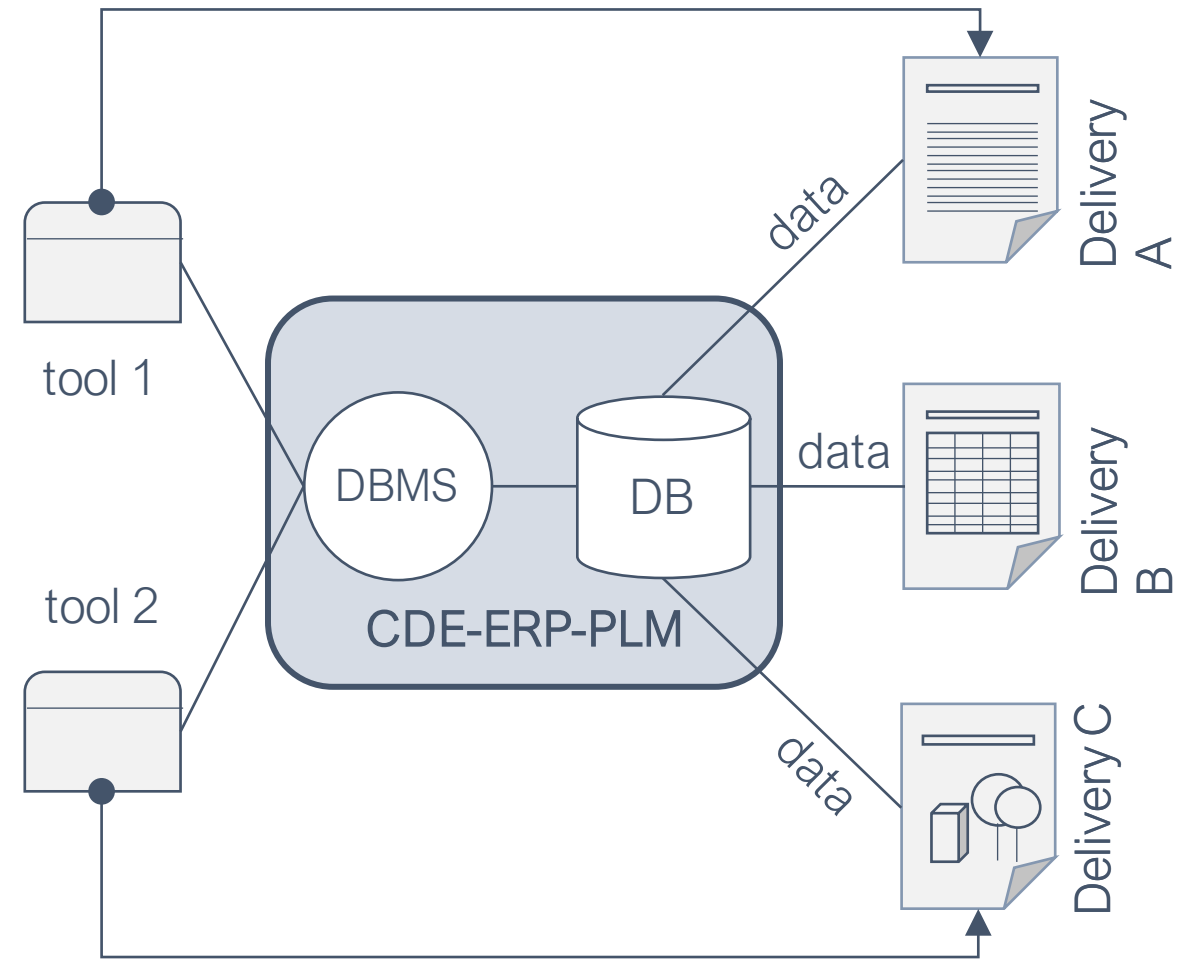
STRUMENTO

db/ambienti di condivisione dati



(UK PAS) LEVEL 2 – ISO 19650 STAGE 2

(UK PAS) LEVEL 3 ISO 19650 STAGE 3



classi ed oggetti



programmazione ad oggetti

PARADIGMI/LINGUAGGI (sintesi)

LOW LEVEL:

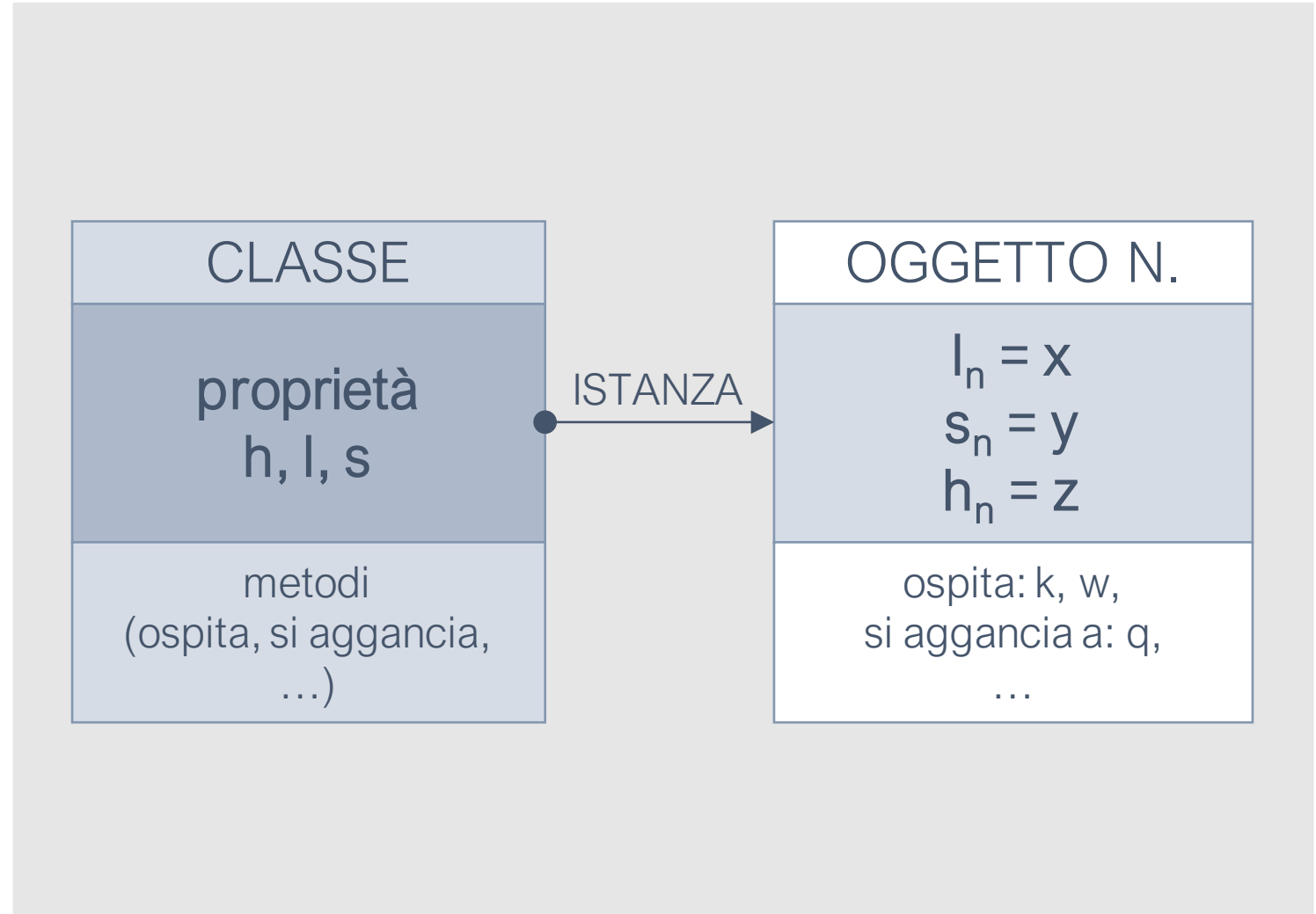
- Machine Code

ASSEMBLER:

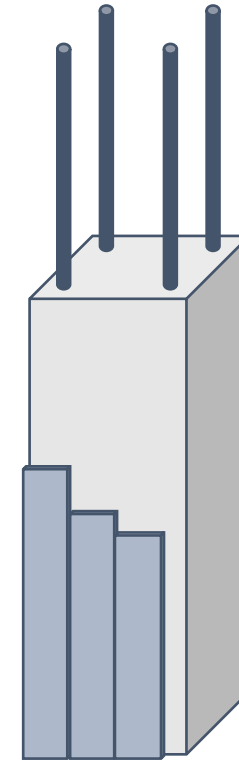
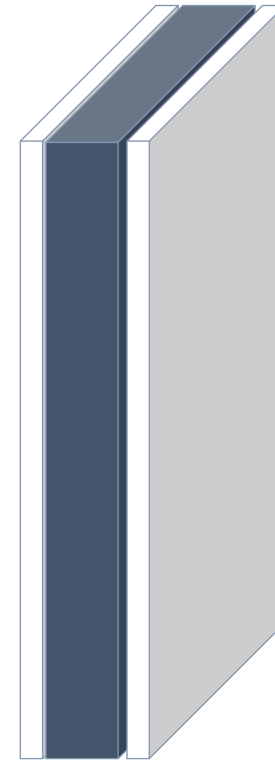
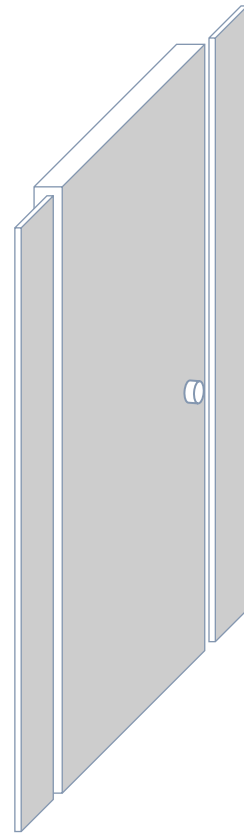
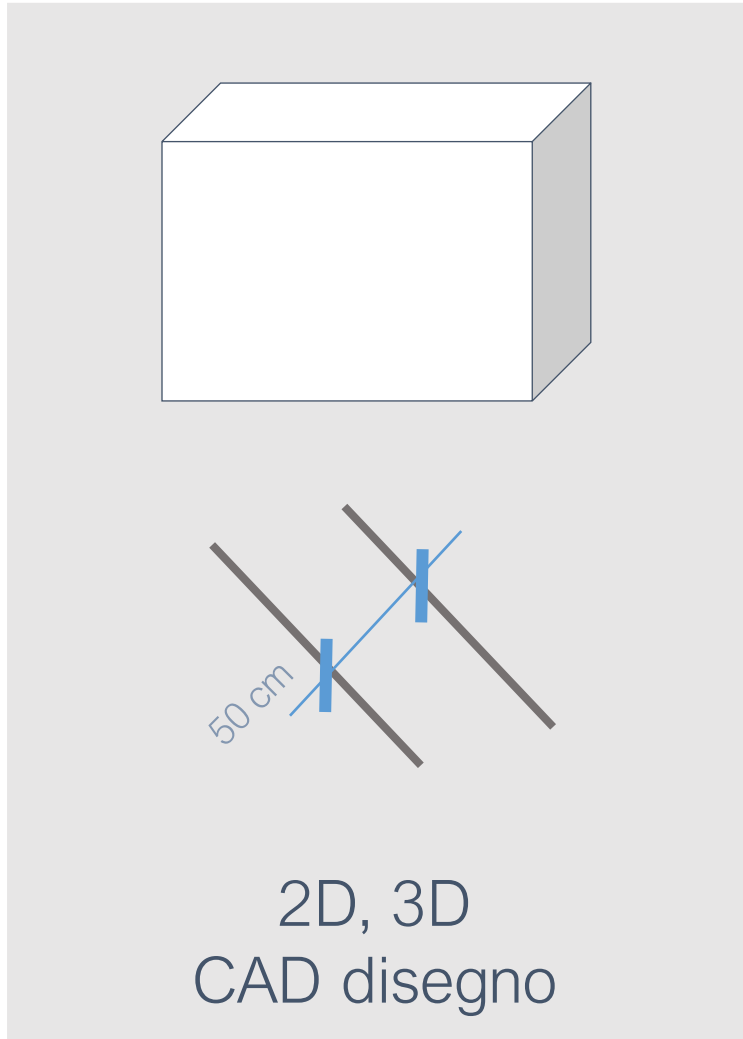
- Assembly

HIGH LEVEL:

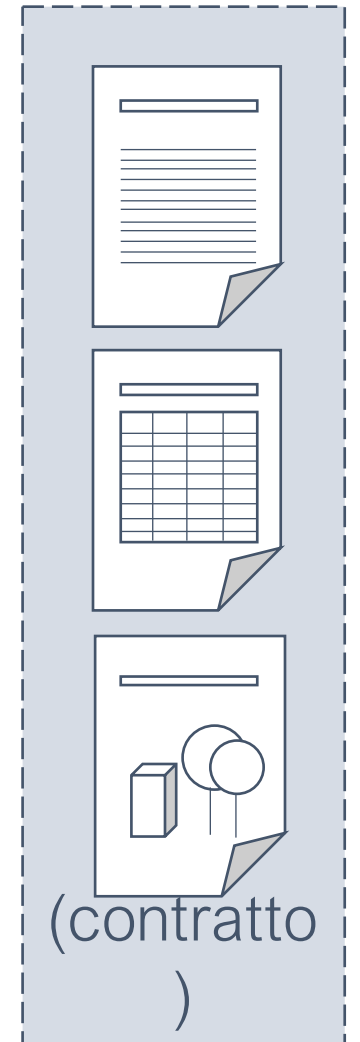
- Imperativi
 - Algoritmici (Fortran, Cobol, Algol...)
 - Procedurali (C, Pascal, Basic..)
- Dichiarativi
 - Funzionali (Lisp)
 - Logici - AI (Prolog)
 - DSL (SQL)
- Ad Oggetti
 - Puri (Simula, Smaltalk)
 - Imperativi (C++, C#, Java..)



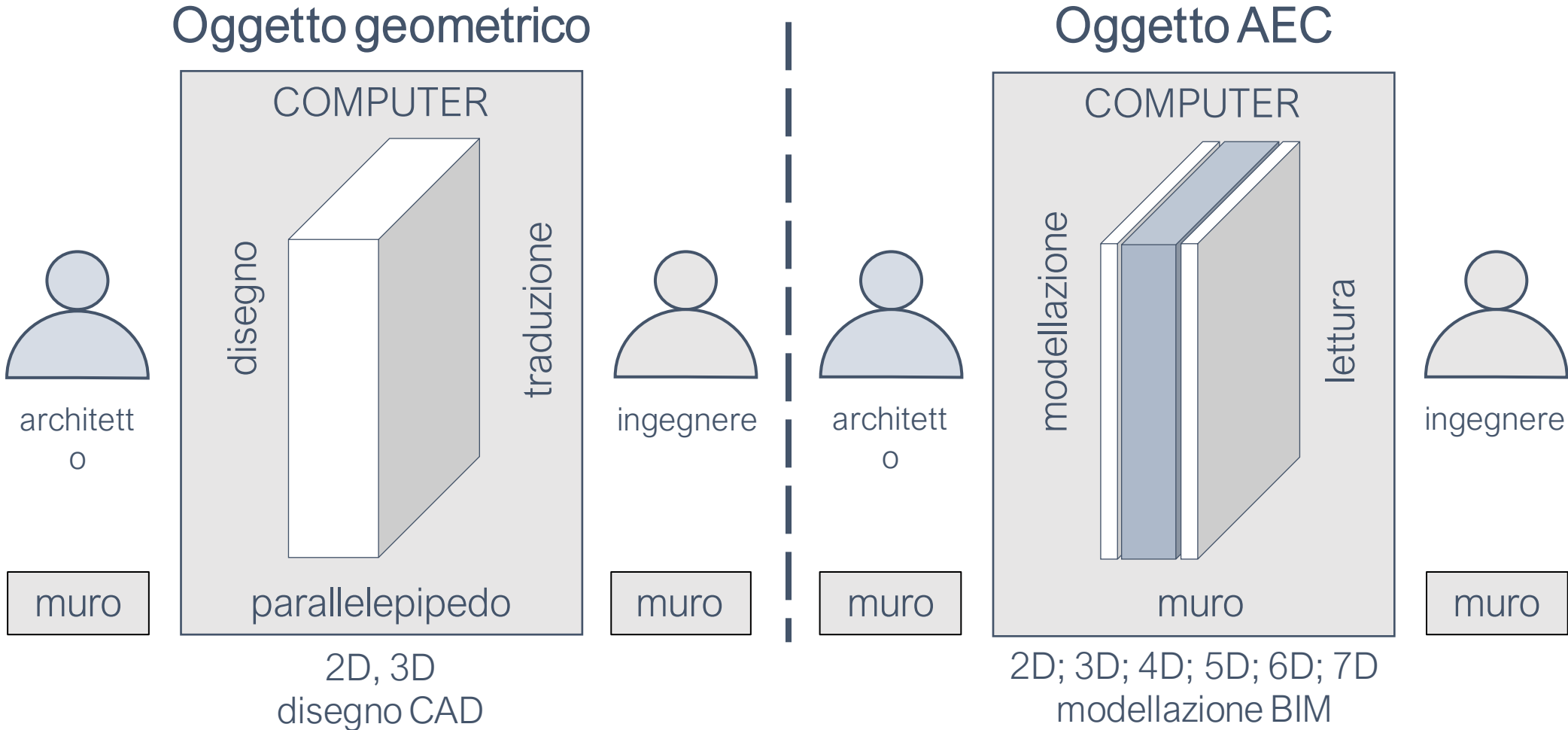
cad (disegno) / bim (simulazione)



2D; 3D; 4D; 5D; 6D; 7D
BIM simulazione



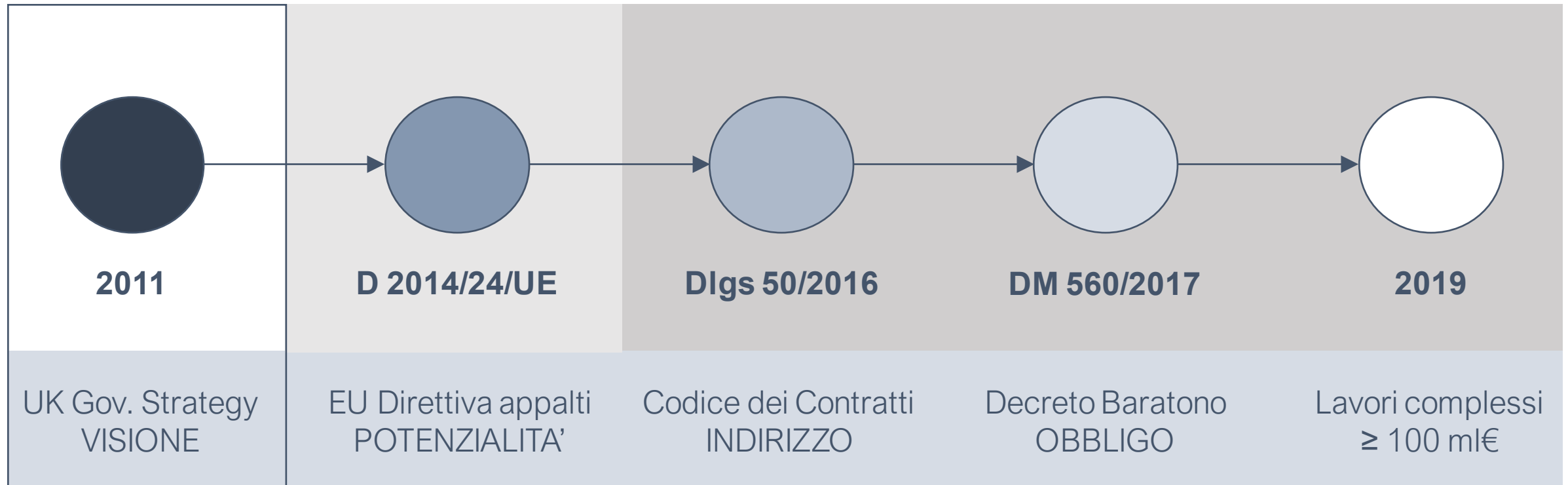
domini, geometrico / AEC



metodo



normativa cogente



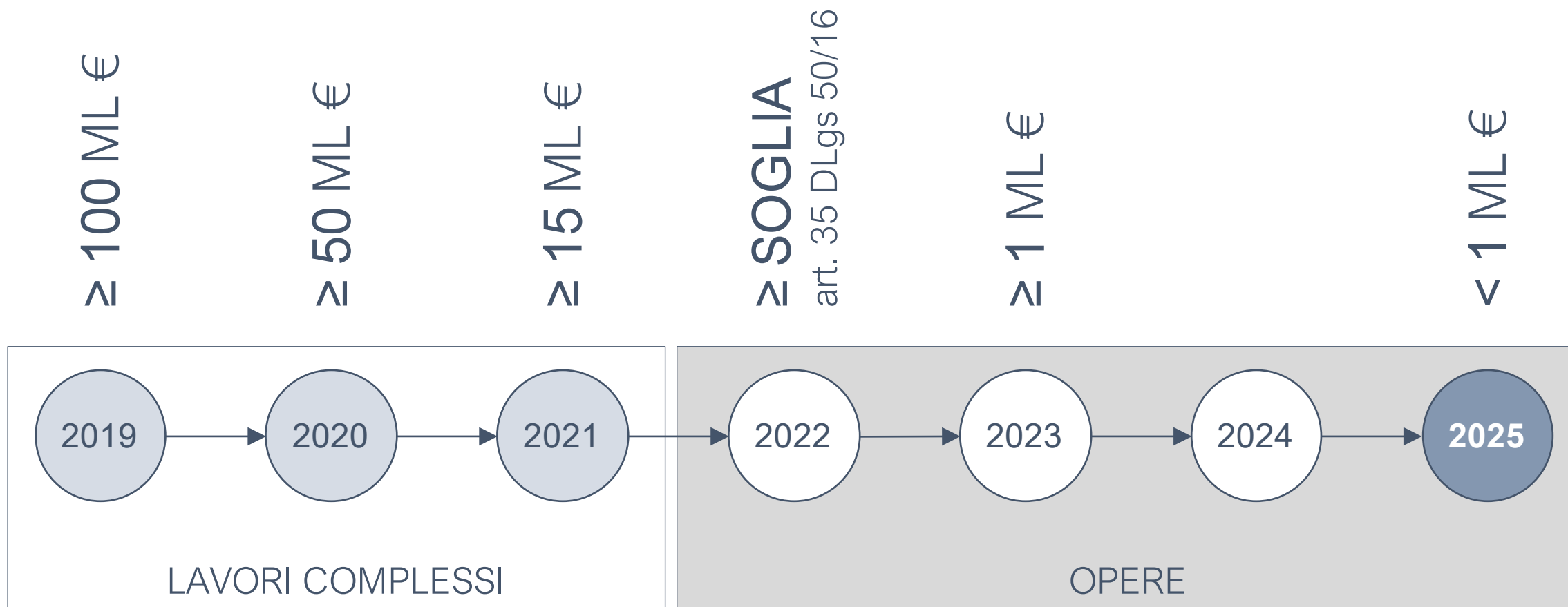
appalti pubblici

ANNO	APPALTI	IMPORTO	C.I.
2015/16	30	//	//
2017	99	36,7 m€	//
2018	291/302	246,5 m€	36
2019	478	296,3 m€	110

Fonte: ANCE/OICE



progressiva obbligatorietà (dm560/2017)



normazione volontaria



riferimenti UK

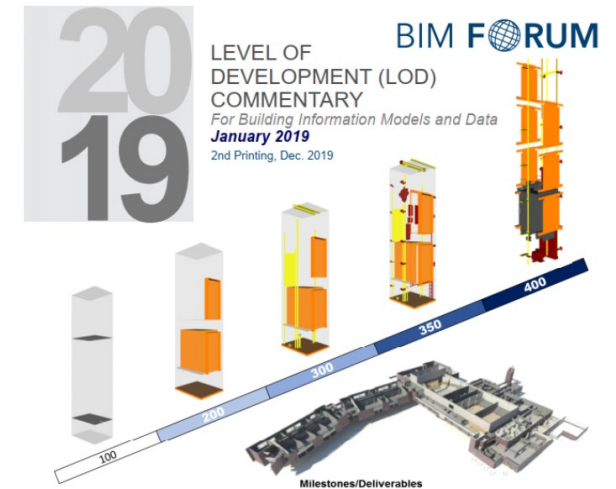
- Royal Institute of British Architects (RIBA)
- UK BIM Task Force Group
- National British Standard (NBS)

- BSI 1192-1:2007 (ritirata – ISO19650)
- BS-PAS 1192-2:2013 (ritirata)
- BS-PAS 1192-5; -6
- BS-PAS 1192-3:2014
- NBL National BIM Library
- BIM Toolkit
- CIC BIM Protocol:2013
- BS-PAS 1192-4:2014 COBie - Construction Op. Building Inform. Exchange



riferimenti USA

- American Institute of Architects (AIA);
 - National Institute of Building Sciences - buildingSMART all - (NIBS);
 - US chapter of buildingSMART International (BIMforum);
 - US Army Corps of Engineers (USACE).
-
- AIA Contract Document G202-2013, B.I.M. Protocol Form;
 - AIA E203–2013, Building Information Modeling and Digital Data Exhibit;
 - AIA G201–2013, Project Digital Data Protocol Form;
 - National BIM Standard U.S. – V3:2013 (NBIMS-US);
 - National CAD Standard U.S. – V6:2014 (NCS-US);
 - BIMforum LOD specification (2013-2019);
 - National BIM Guide for Owners;
 - BIM Project execution Planning Guide V2.1:2011;
 - USACE BIM contract requirements (UBR)



Baseline	Additional		Part 1 - Attribute Description		Part 2 - LOD Profile			Part 3 - Project Specific Milestones (Example)					
	Attribute	Units	Option Examples	Commentary	100	200	300	350	400	Est. 1	Est. 2	Check	Submit
Construction	Surf		applied/Model/Structure applied/Model/Structure (Structure/Shell)										
Material	Surf		applied/Structure/Panel applied/Structure/Panel applied/Structure/Panel										
Thermal Resistance	Surface	R-Value											
Coordination Resistance			applied/Model/Structure										
Wind Load Capacity		psf											
Clipping Method			applied/Structure/Top applied/Structure/Top applied/Structure/Top										
Class - Material			applied/Structure/Panel										
Class - Configuration			applied/Structure/Panel										
Class - Condition			applied/Structure/Panel applied/Structure/Panel applied/Structure/Panel										
Class - Coating			applied/Structure/Panel applied/Structure/Panel applied/Structure/Panel										
Class - Use			applied/Structure/Panel applied/Structure/Panel applied/Structure/Panel										



norme internazionali



standard

Nazionali

IT - (EN standard)
UNI 11337:2009 (1) -3
UNI 11337:2017 -1 -4 -5 -6 -7

UK - (EN standard)
BS (PAS) 1192 (1 -2) -3 -4 -5 -6

DE - (EN standard)
DIN SPEC 91400 – 91391-1
(CDE)

FR - (EN standard)
AFNOR PR XP P07-150

CEN/TC442

Information Management (IM)
EN ISO 19650 -1-2

Industry Foundation Classes (IFC)
EN ISO 16739 -1
Information Delivery Manual (IDM)
EN ISO 29481 -1 (2)
Framework for Classification (IFD)
EN ISO 12006 -2

Level Of Information Need
prEN 17412

prEN 17473 - SmartCE
prEN 17439 - 10650 CEN guide

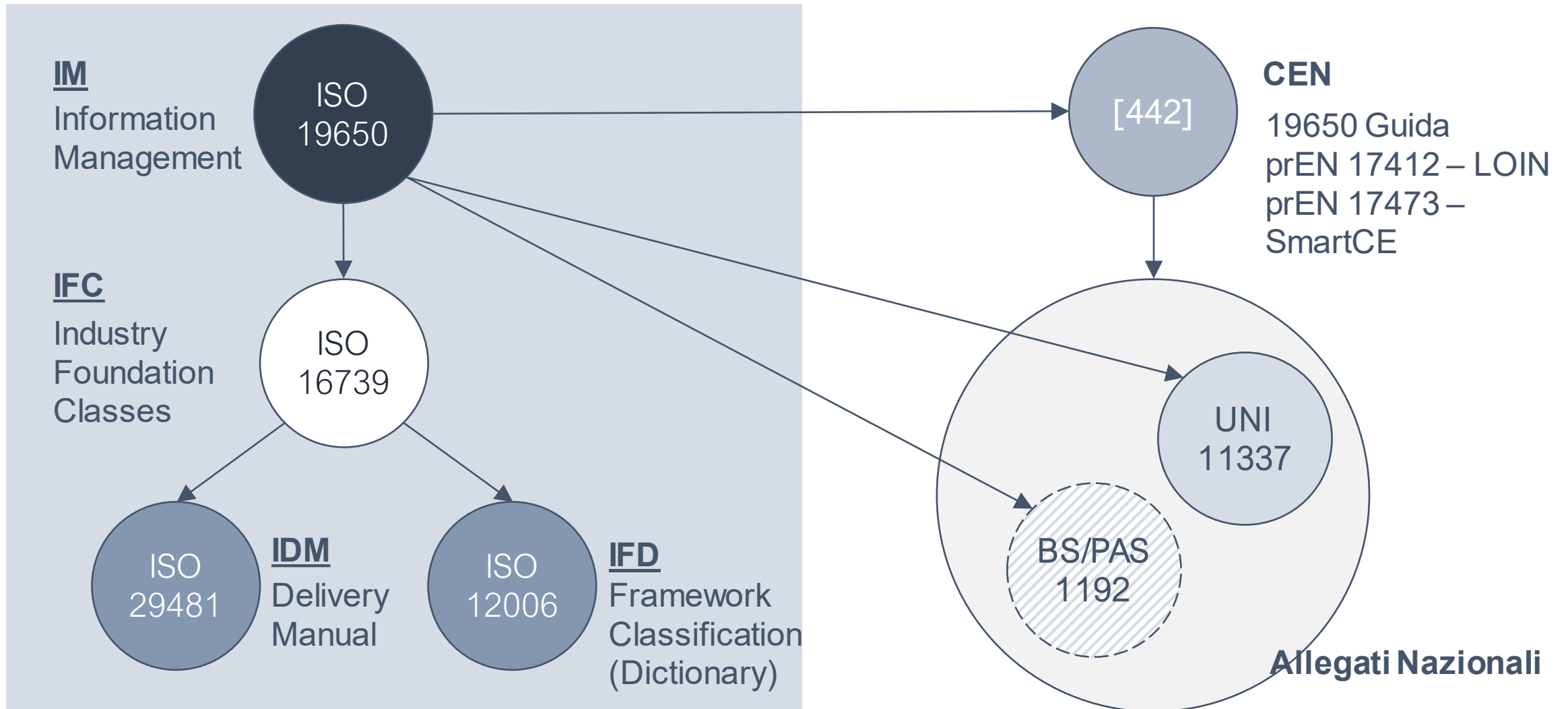
ISO/TC59/SC13/WG 13

Information Management
ISO 19650 -1-2:2018

ISO STEP 10303 (11 – 21)
ISO 6707 (eng. works vocabulary)
ISO 12006-2-3 (classification)
ISO TS 12911:2012 («EIR»)
ISO 16354:2013 (object library)
ISO 16739:2005/13 (IFC 2x3/4.0)
ISO 16757-1-2 (product data)
ISO 21597 (container)
ISO DS 22014 (AEC library)
ISO 22263 (proj. info. management)
ISO 23386-23387 (obj attribute)
ISO 29481 -1 -2 -(IFD /3 MVD)



normativa volontaria - mappa



LOD – LOIN / prEN 17412



prEN 17412 fabbisogno infrom. (ISO 19650-

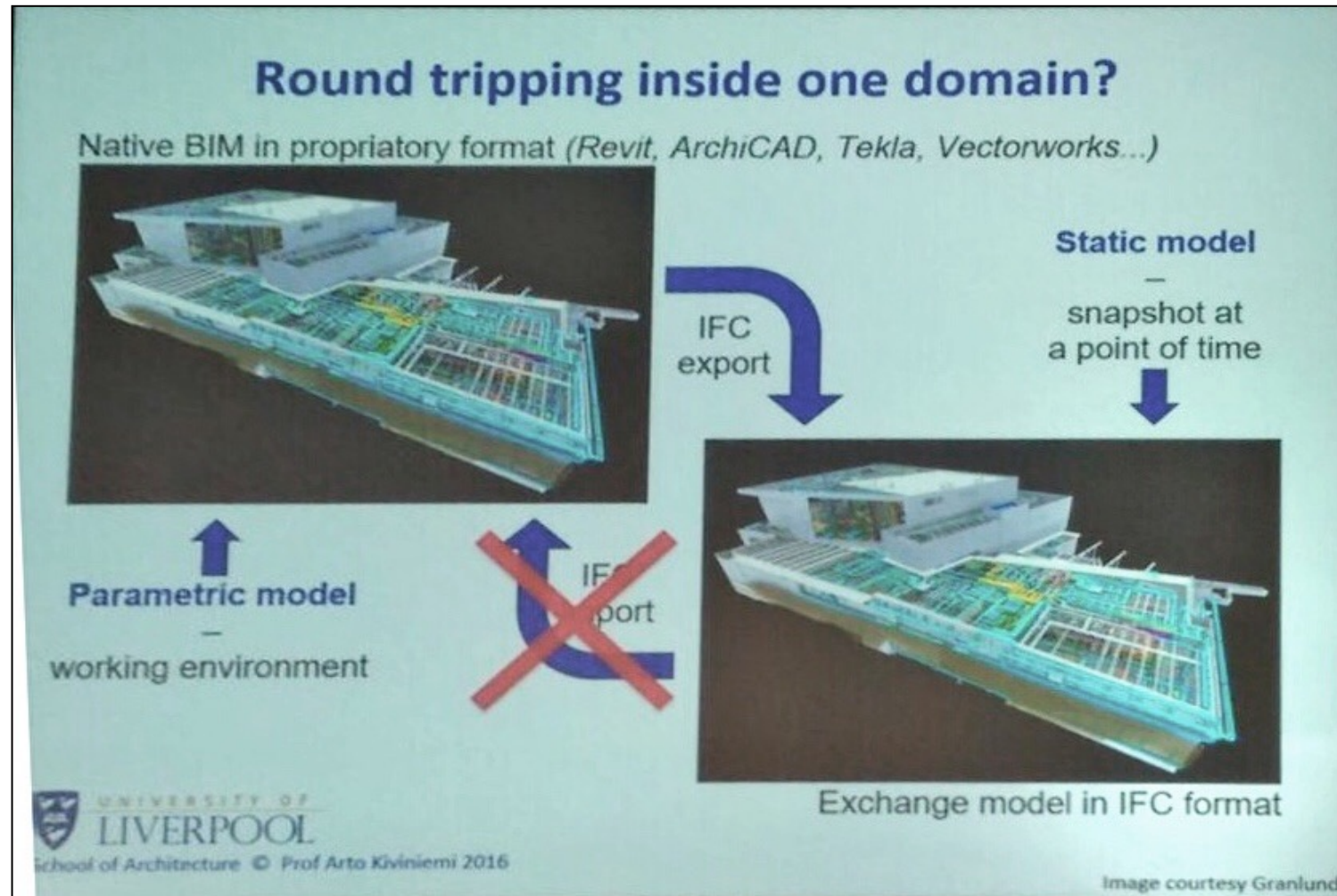
1)



ISO 16739 - IFC



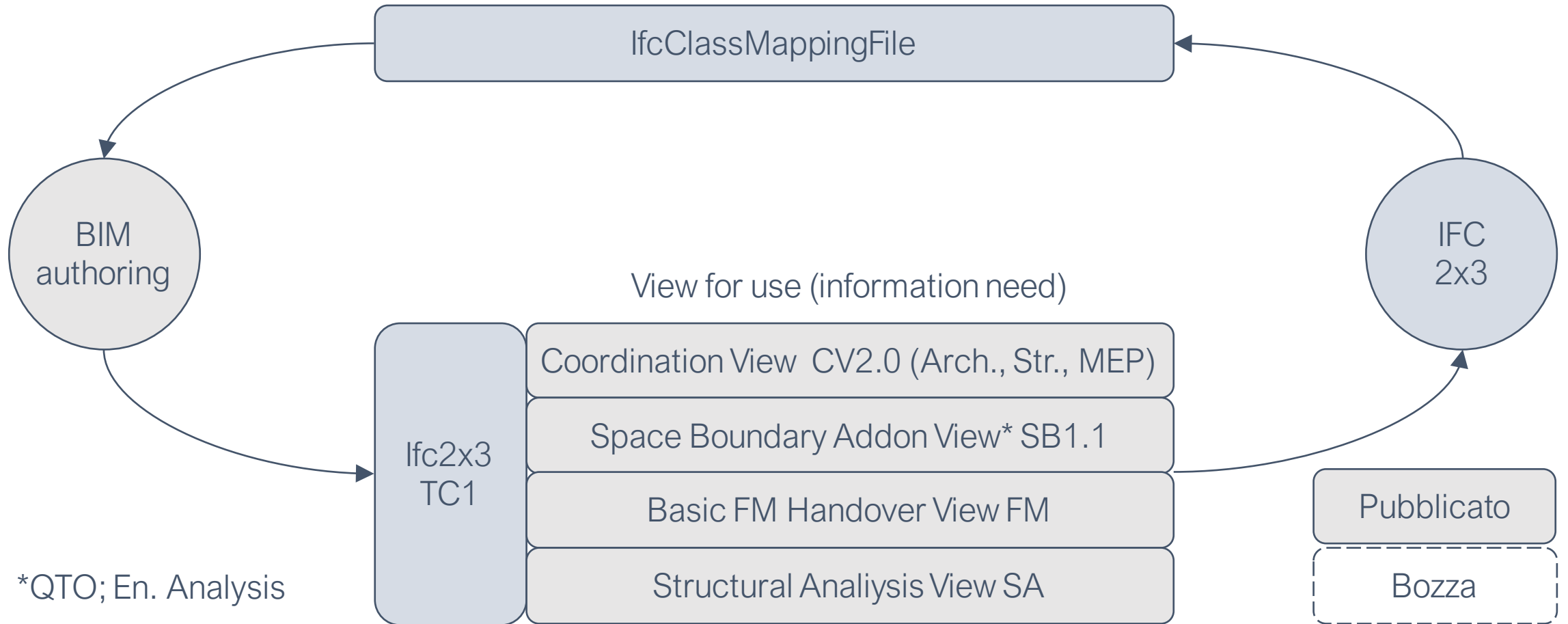
modello statico (non parametrico)



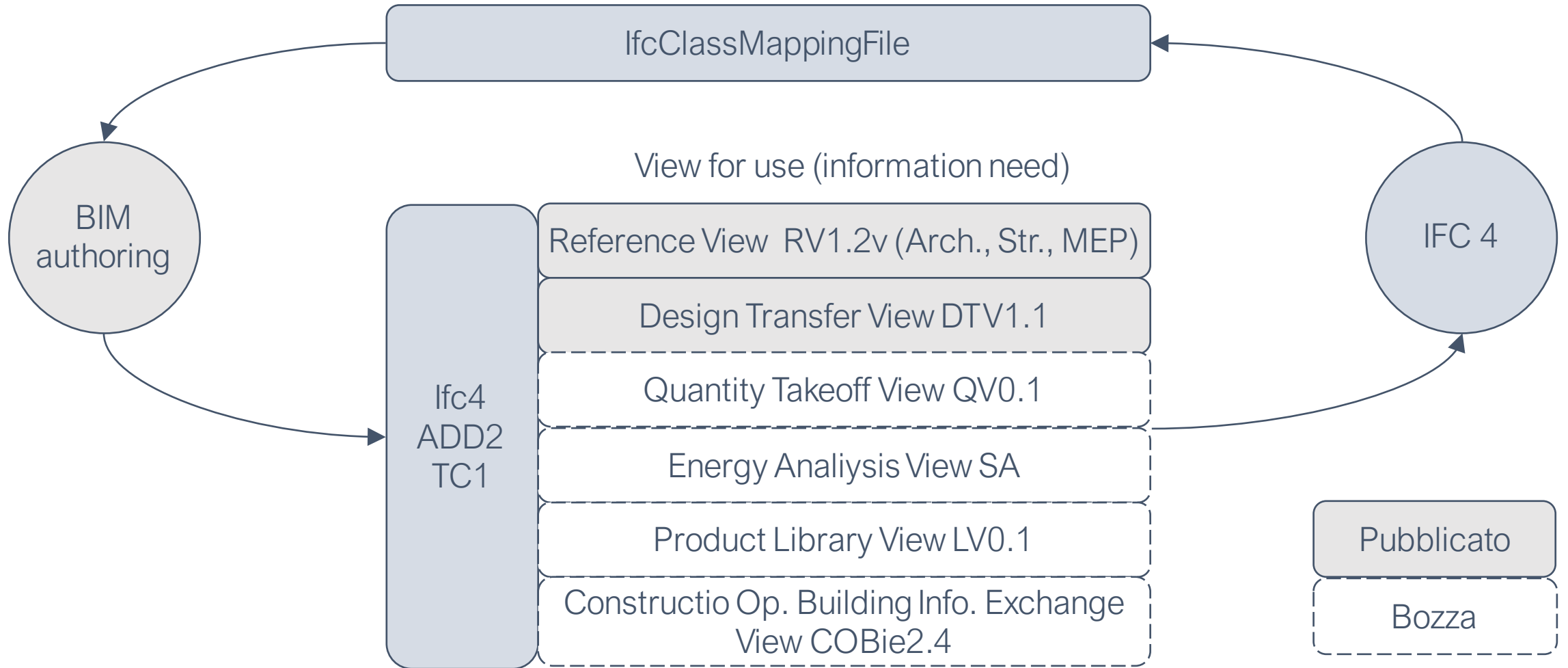
prof. Arto Kiviniemi



model view definition IFC 2x3



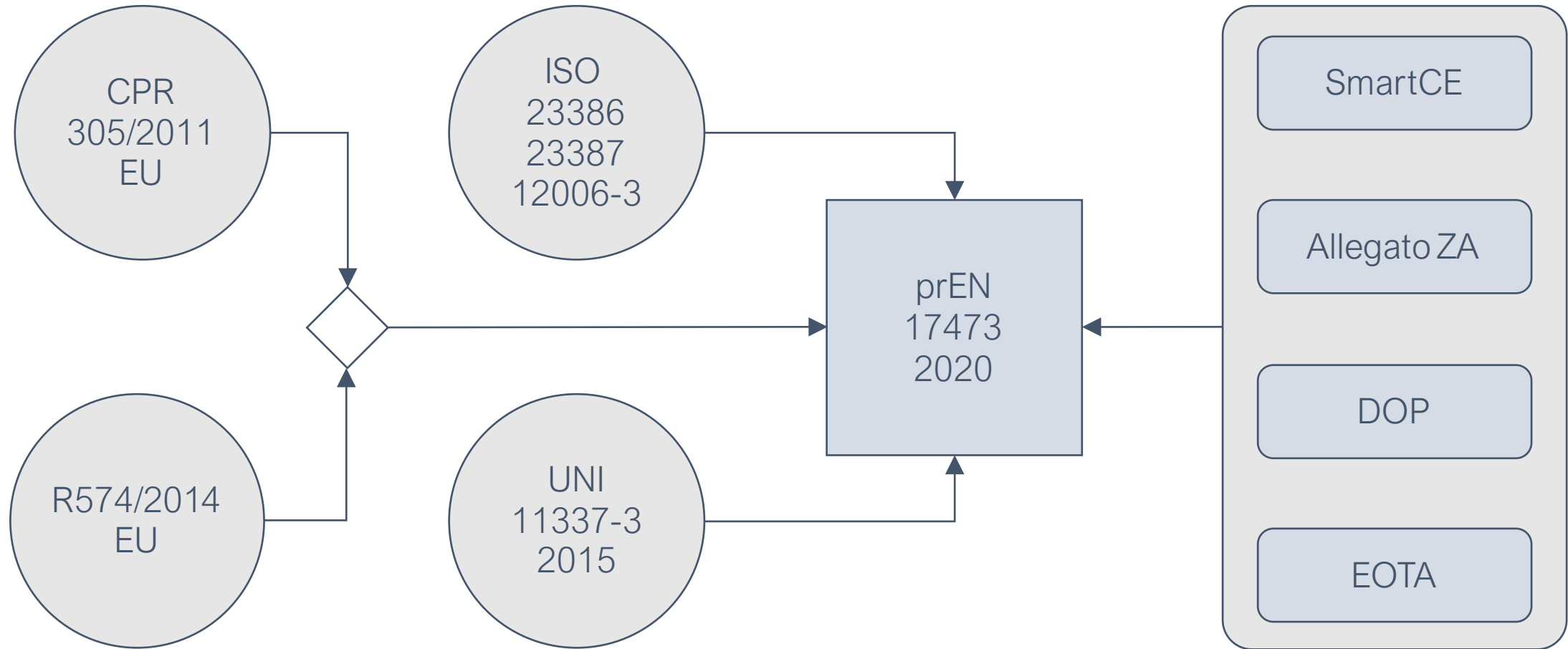
model view definition IFC 4



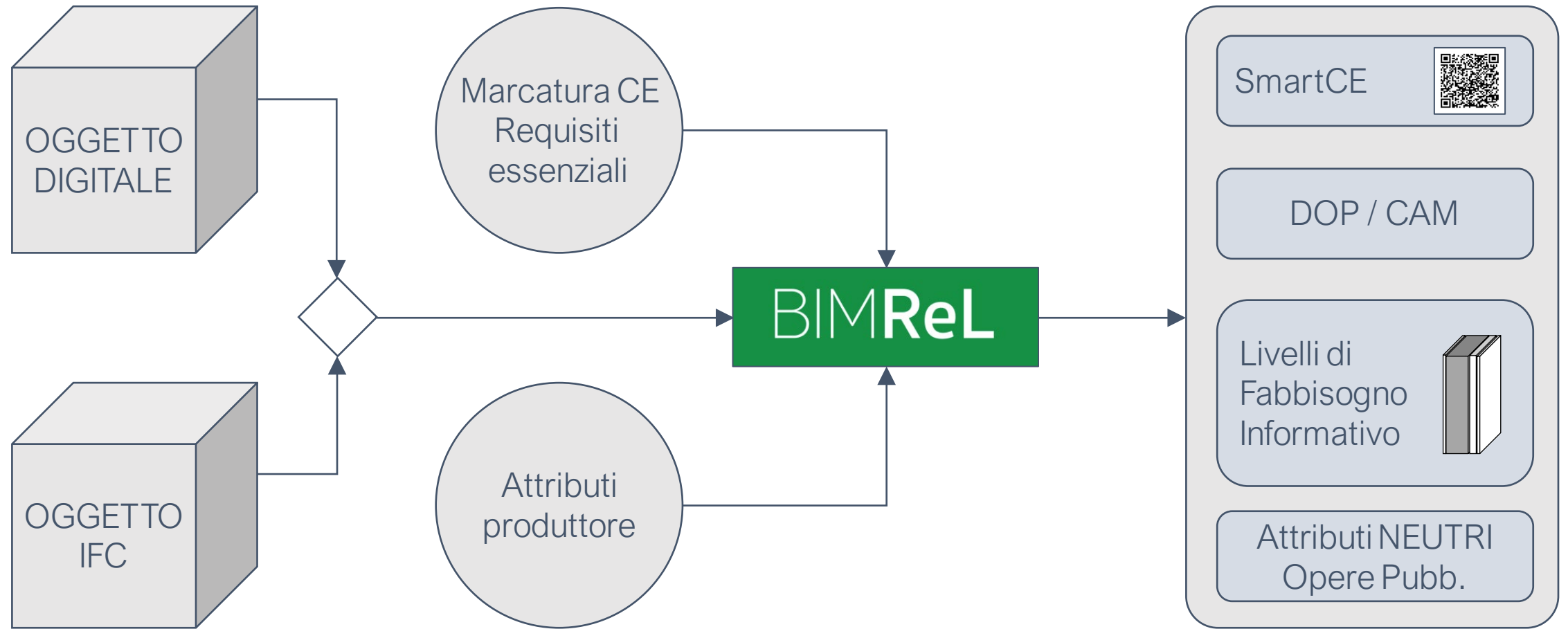
prEN 17473



prEN17473 - product attribute



BIMReL – standard library



UNI - CT33- SC05 - 11337
BIM e gestione digitale dei processi
informativi delle costruzioni



tavolo tecnico uni 11337:2017 (100 membri)



UNI/CT 033/GL 05
UNI 11337:2017



ISO/TC 59/SC 13/WG 13
ISO 19650:2018



CEN/TC 442/WG 01, 02, 03, 04
“Building Information Modelling”



struttura della norma

UNI 11337:2009

Edilizia e opere di ingegneria civile

Criteri di codificazione di opere e prodotti da costruzione, attività e risorse

Identificazione, descrizione e interoperabilità

UNI 11337:2017

Edilizia e infrastrutture

Gestione digitale dei processi informativi delle costruzioni (BIM)

parte 1:17

principi (annex ITA 19650-1)

parte 7:18

qualificazione figure

parte 2:20

denominazione e classificazione

parte 8:20

annex ITA 19650-2

parte 3:15

(schede informative) LOI e LOG

parte 9:20

fascicolo del costruito AIR,
AIM

parte 4:17

LOD (LOIN e oggetti)

parte 10:20

verifica amministrativa

parte 5:17

gestione modelli ed elaborati
(CDE)

parte 11:20

sicurezza, block-chain

parte 6:18

capitolato informativo (pGI, PIR,
PIM)

parte 12:19

PdR 74/2019 (OIB, OIR)

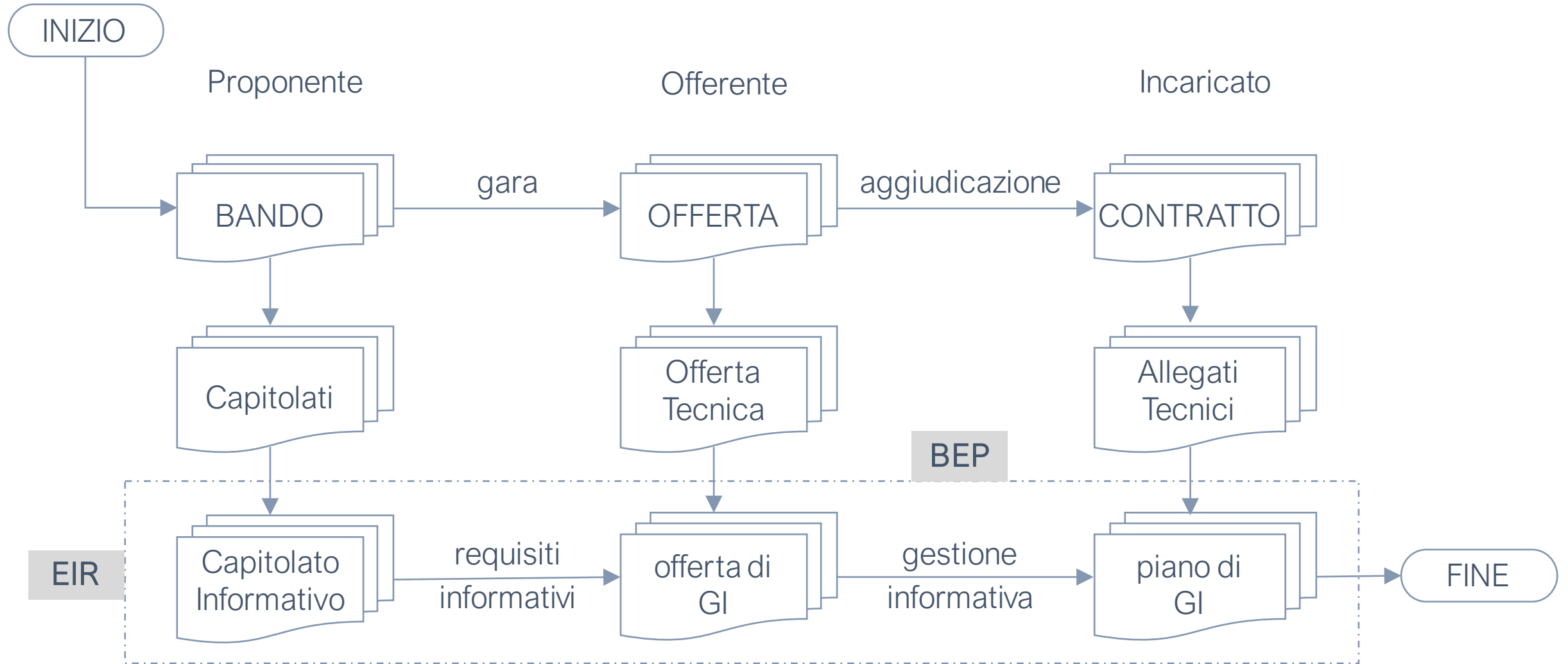


sottocommissione BIM e gruppi di lavoro

UNI/TC 033/SC 05	P1	BIM E gestione digitale dei processi informativi delle costruzioni
WG 01;	P2	Classi informative, codificazione e identificazione
WG 02;	P3	Attributi informativi, struttura e schemi
WG 03;	P4	LOIN, struttura per il mercato nazionale
WG 04;	P5	Ambienti di collaborazione e condivisione e strumenti di gestione
WG 05;	P6	Capitolato informativo (OIR, PIR, PIM, CI, oGI, pGI)
WG 06;	P7,P8	Qualifica del personale operante in BIM e flussi informativi
WG 07;	P9	Fascicolo del costruito (AIR, AIM)
WG 08;	P10	Gestione amministrativa BIM



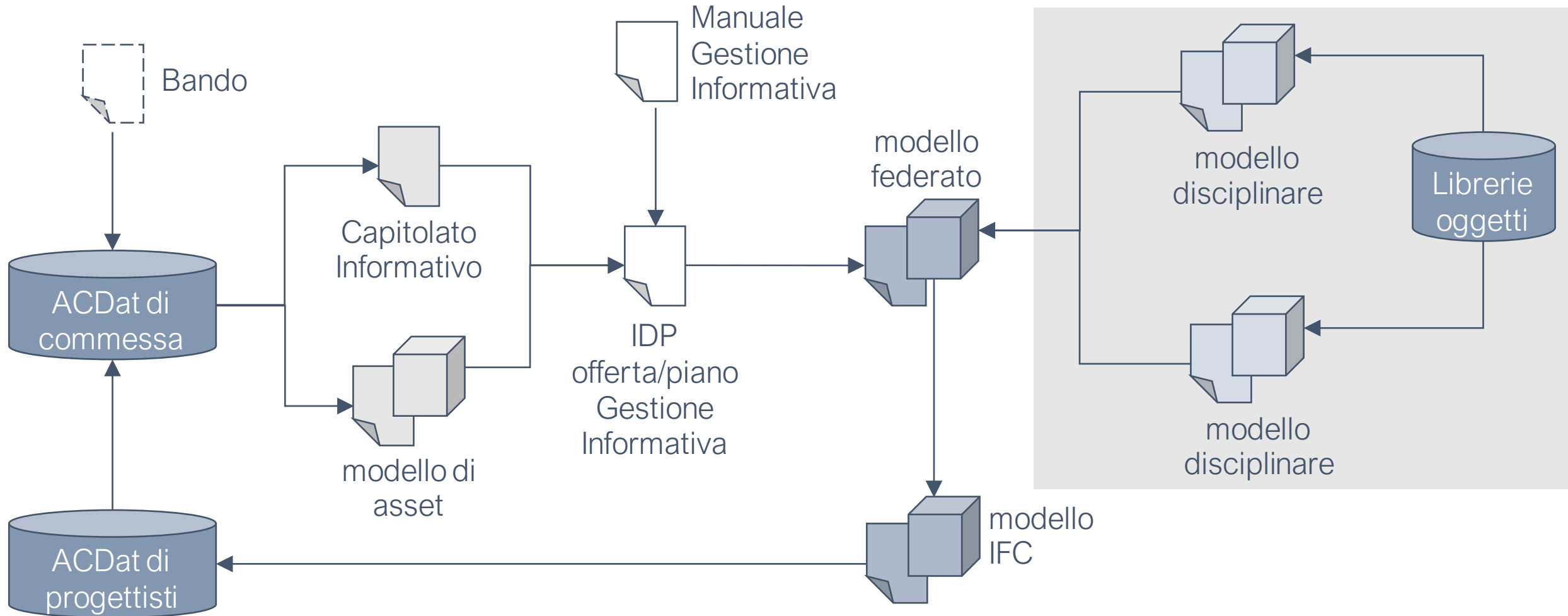
flusso informativo di commessa (uni11337)



qualificazione figure

LIVELLO	PM	BIM Management		
	ISO 21500	USA	UK	UNI
Organizzaz.	Proposal Manager	Information Manager	//	BIM Manager
Commessa	Project Manager	BIM Manager	Information Manager	//
			Task Inform. Manager	
	PM Staff (Communication)	BIM Coordinator	Interface Manager	BIM Coordinator
		BIM Specialist	Information originator	BIM Specialist
	//	//	CDE Manager	

progettisti



progettisti

Formazione:

- Formazione sulle normative e gli standard; analisi degli aspetti legislativi e le norme tecniche (UNI EN ISO 19650, UNI 11337);
- Formazione sui software; conoscenza degli strumenti differenziata per disciplina, ruolo e competenze;
- Formazione sull'uso dei linguaggi aperti; schema IFC (UNI EN ISO 16739), PDF, XML;
- Formazione professionale; BIM Manager, BIM Coordinator (per disciplina), BIM Specialist (per disciplina), ACDat/CDE manager (UNI 11337 parte 7);
- Formazione sui processi organizzativi (UNI PR 11337 parte 12), Project e Information management, team working, ecc.

Strumentazione HD e SW:

- Banda larga;
- Workstations ad alte prestazioni grafiche e lavagne interattive;
- Spazi e servizi cloud (storage su server europei, nel caso di commesse pubbliche);
- Software di BIM authoring (mono o pluridisciplinari);
- Software specialistici (computo, programmazione, calcolo, ecc.);
- Ambienti di condivisione dati (ACDat/CDE);
- Software di BIM review;
- Software GIS;
- Strumenti e software di rilievo (laser scanner, droni, ecc.);
- Strumenti e software per la realtà virtuale e aumentata;
- Piattaforme di direzione lavori (obbligo da maggio 2108);
- Implementazione sistemi "BIM" con sistemi informativi esistenti; ERP, ecc.



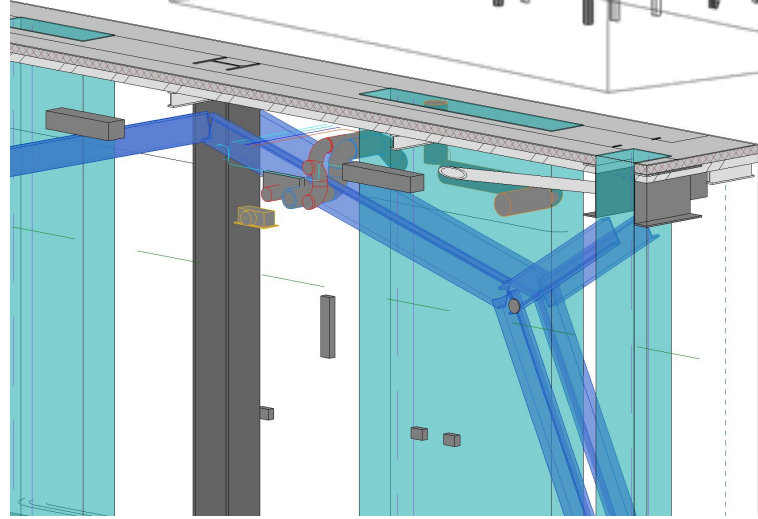
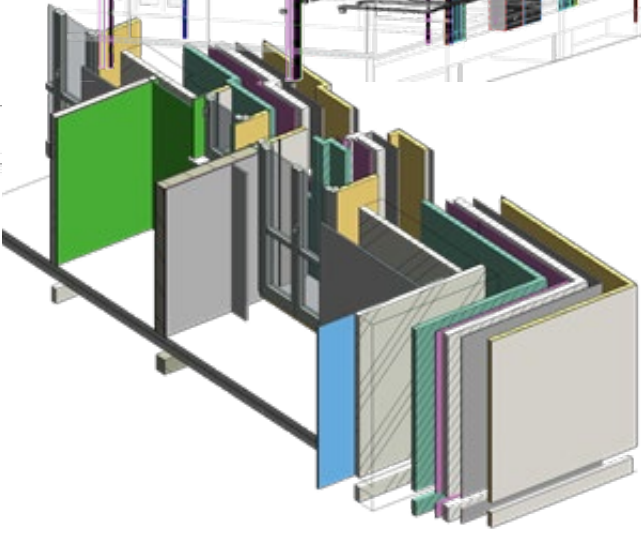
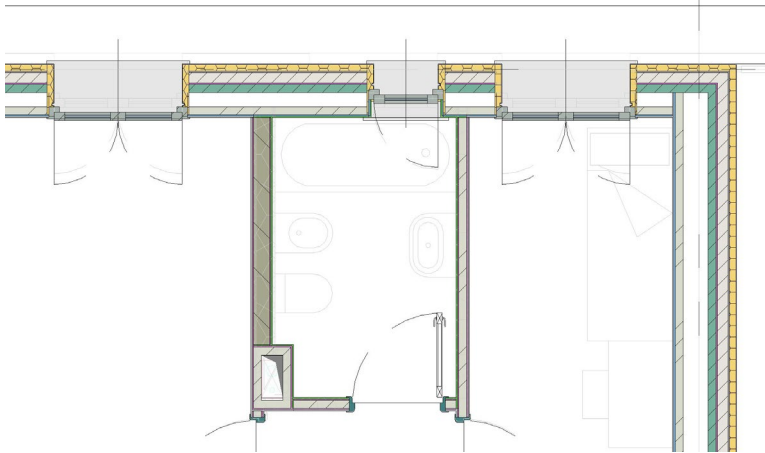
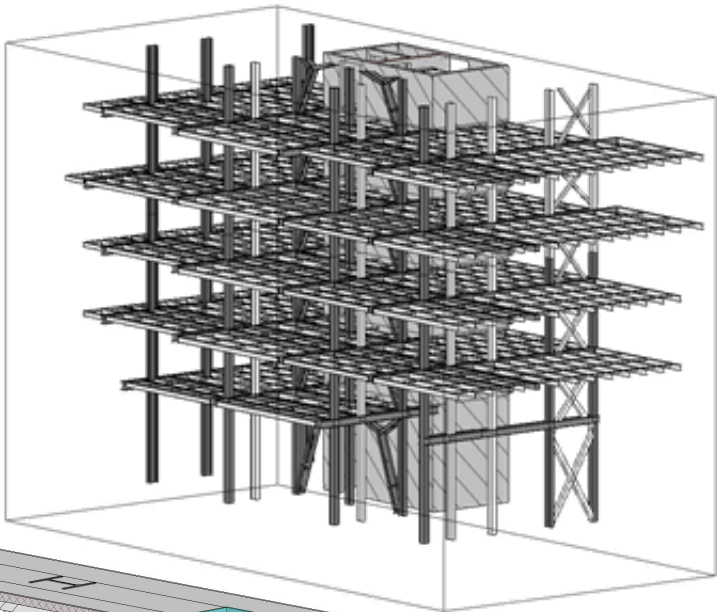
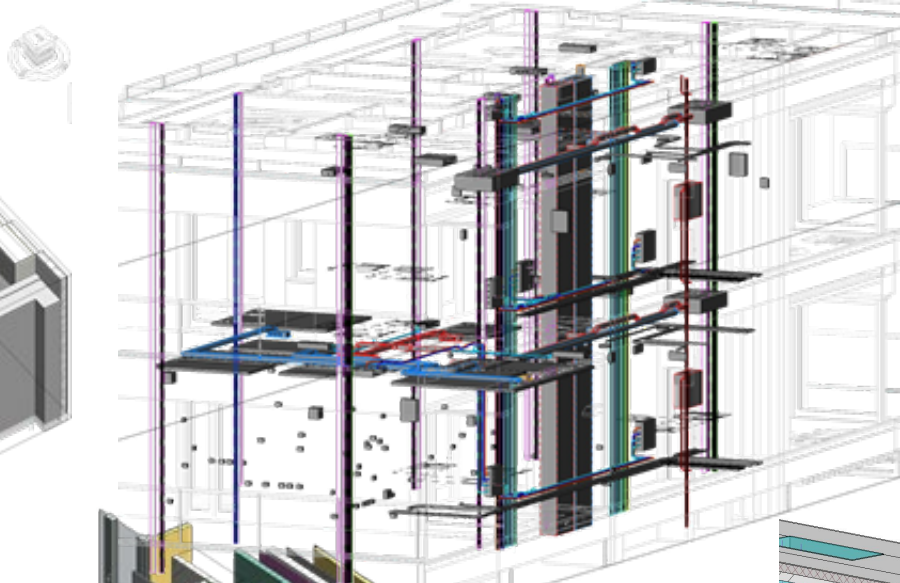
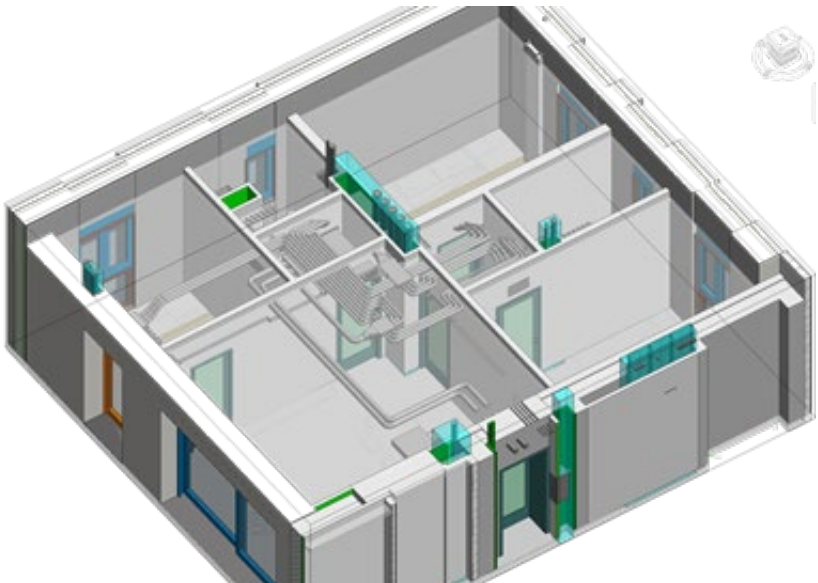
progettisti

Processi:

- Manuale di gestione informativa dell'organizzazione;
- Capitolato informativo standard (per fornitura servizi specialistici);
- Offerta e piano di Gestione Informativa standard di servizi (BEP);
- Regole di modellazione, interne e per collaboratori esterni (specialisti);
- Matrice dei ruoli/responsabilità e dei rischi;
- Schema matrice di code e clash, piano di coordinamento;
- Librerie di oggetti proprietarie;
- Regole di implementazione dell'ACDat/CDE.



progettazione

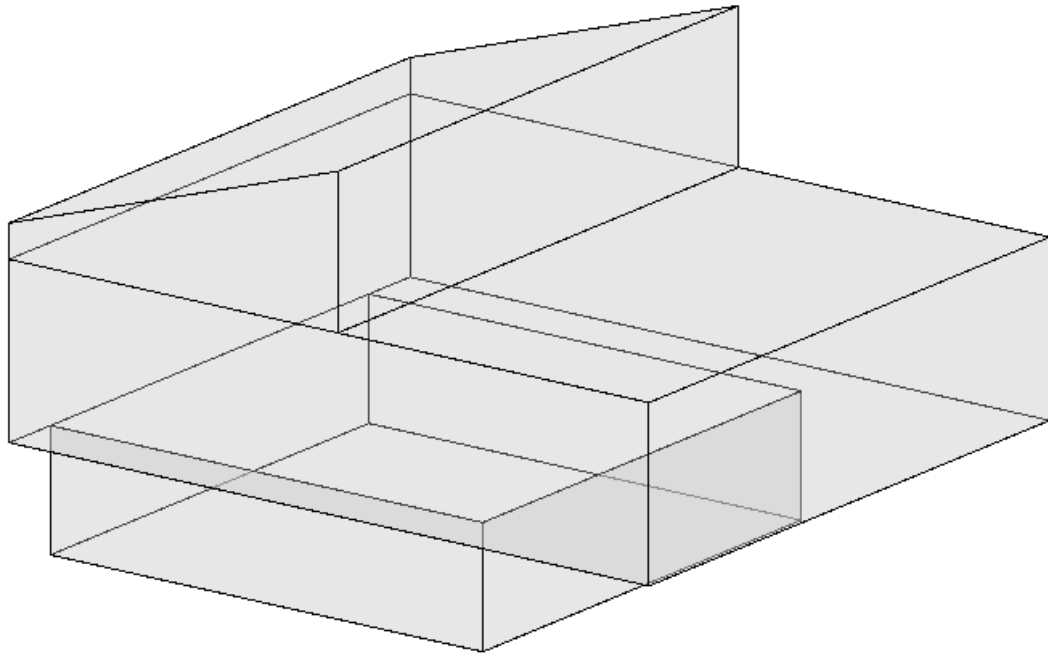


Abitare in magliolina

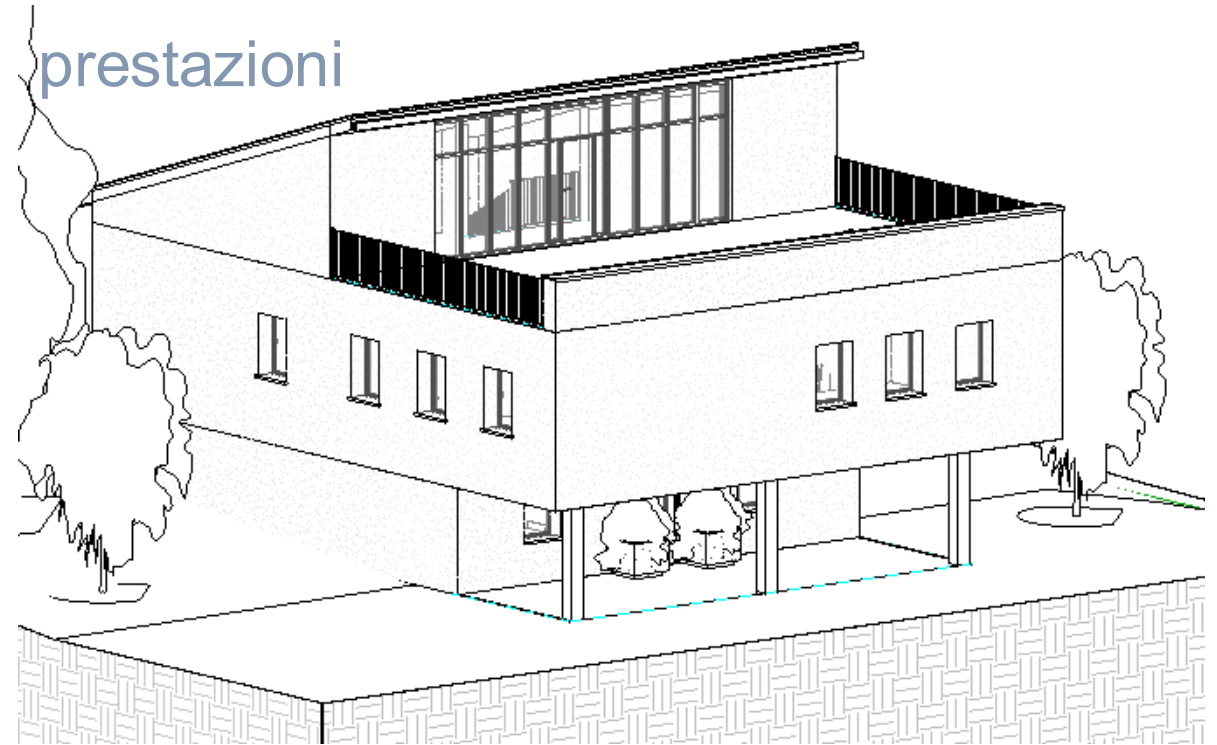


modelli energetici

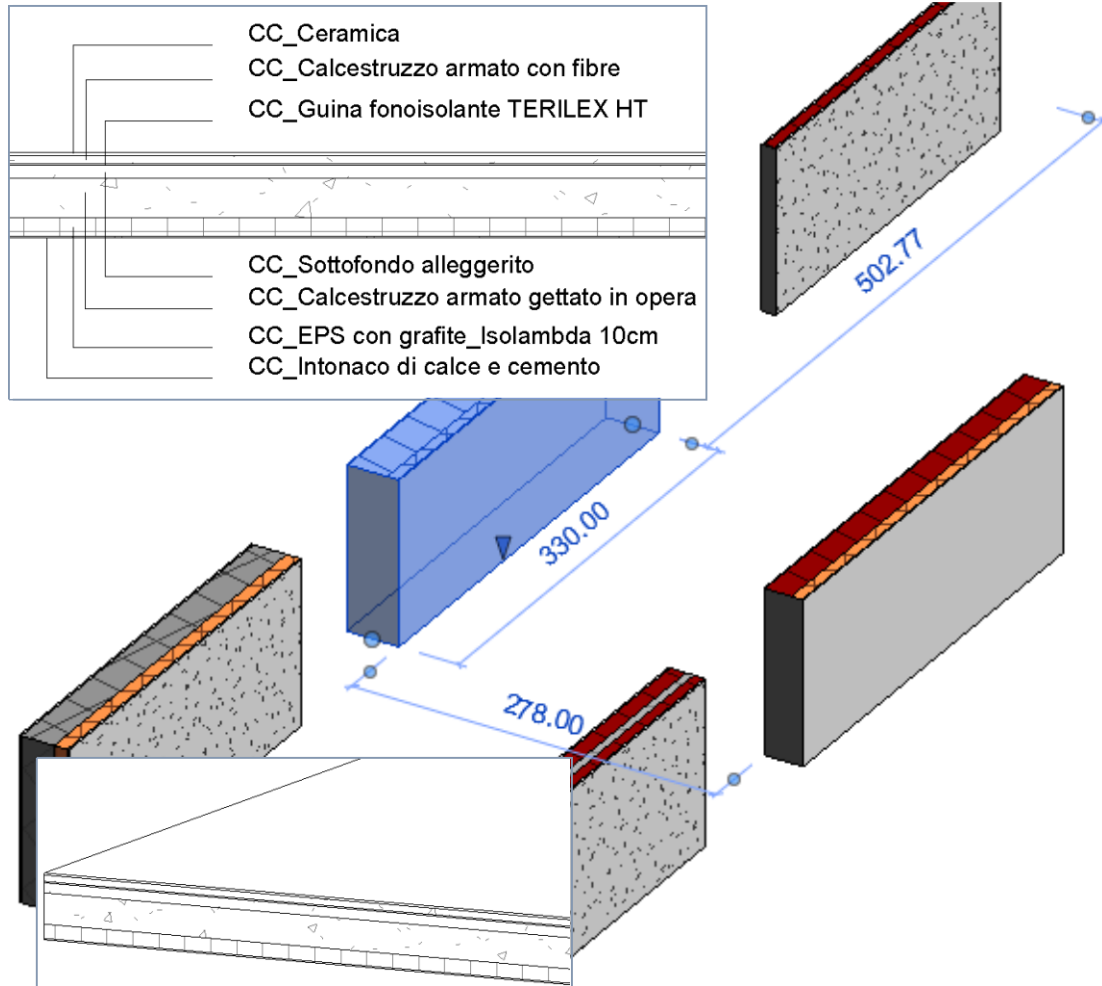
INVOLUCRO - Volumi



ARCHITETTURA – Elementi e prestazioni



oggetti energetici



Template oggetti casaclima

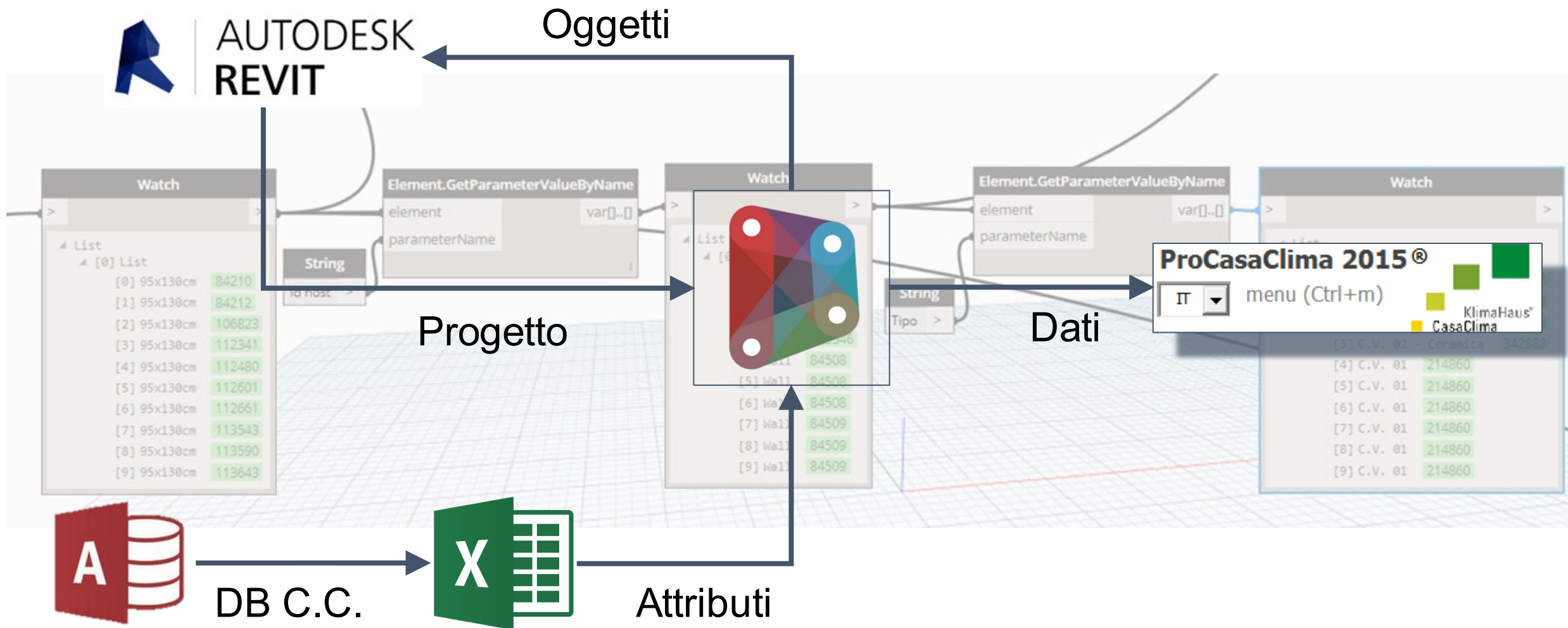
	Funzione	Materiale	Spessore
1	Finitura 1 [4]	CC_Ceramica	1.50
2	Contorno del nucleo	Strati sopra ripiegatur	0.00
3	Sostrato [2]	CC_Calcestruzzo arm	4.50
4	Sostrato [2]	CC_Guina fonoisolant	1.00
5	Sostrato [2]	CC_Sottofondo alleg	7.00
6	Struttura [1]	CC_Calcestruzzo arm	22.00
7	Contorno del nucleo	Strati sotto ripiegatur	0.00
8	Strato Termico/Came	CC_EPS con grafite_Is	10.00
9	Finitura 1 [4]	CC_Intonaco di calce	1.00

Descrizione
 Descrizione assieme
 Codice assieme
 Contrassegno tipo
 Resistenza al fuoco
 Costo

Generale

CC_Ombreggiatura solare invernale	1.000000
CC_Ombreggiatura solare estiva	1.000000
CC_Ombreggiatura cielo	1.000000
CC_Grado di assorbimento	0.600000
CC_Coefficiente di emissione infrarossa	0.930000
CC_Tipo_ID	1.000000
CC_Tipo	parete esterna non ventilata

flusso di dati



grazie



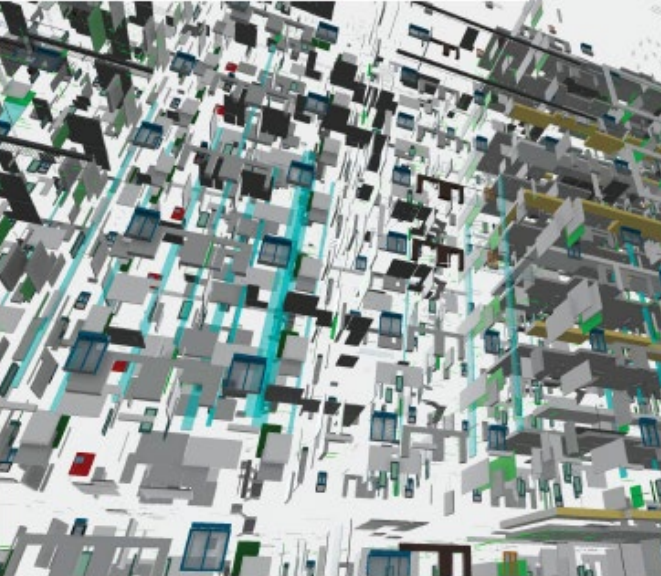
@arcabobc




alberto pavan

Cozia riservata a MIUR - IRIS Re.Publi@Polimi

Alberto Pavan - Claudio Mirarchi - Matteo Giani



BIM: METODI E STRUMENTI
Progettare, costruire e gestire nell'era digitale

 **tecniche nuove**

alberto pavan
economia digitale

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