

BPie

Building Programming information exchange

WHAT ?

WHY ?

WHO ?

HOW ?

Rolf Jerving

CEO dRofus Inc.

What is *Building Programming* ?

“Building programming is the process of collecting (and exchanging) all requirements the building must fulfill.” (IDM work group, 2008)

WHY ?

- ***”Success will be based on our ability to capture the hearts and pocketbooks of owners”*** (Deke Smith, January 9th, 2013)
- **BPie enables checking of how/if design and construction meets the requirements.**
- **With BPie we can**
 - Standardize how a space program should be organized. Rules for names and ID’s on spaces
 - Standardize how different detailed requirements to functions, zones, spaces, systems and equipment should be expressed and exchanged
 - Make it possible to develop automated checking of design vs. program utilizing an open data format, IFC
- **Specific national, organizational, or project requirements will come in addition to the BPie requirements**

Several previous bS projects with similar scope

- Portfolio and Asset management – Performance Requirements (**PAMPeR**)
- International Alliance for Interoperability's **AR-5 Project**
- The buildingSMART international Room Data Sheet “**Aquarium**” project
- United States General Services Administration project (**Concept Design BIM 2010** – Spatial Program Validation)
- buildingSMART alliance Spatial Compliance information exchange (**Scie**) project
- BPie builds partly on these previous initiatives

WHO ? Proces Map – work group (2007/2008)

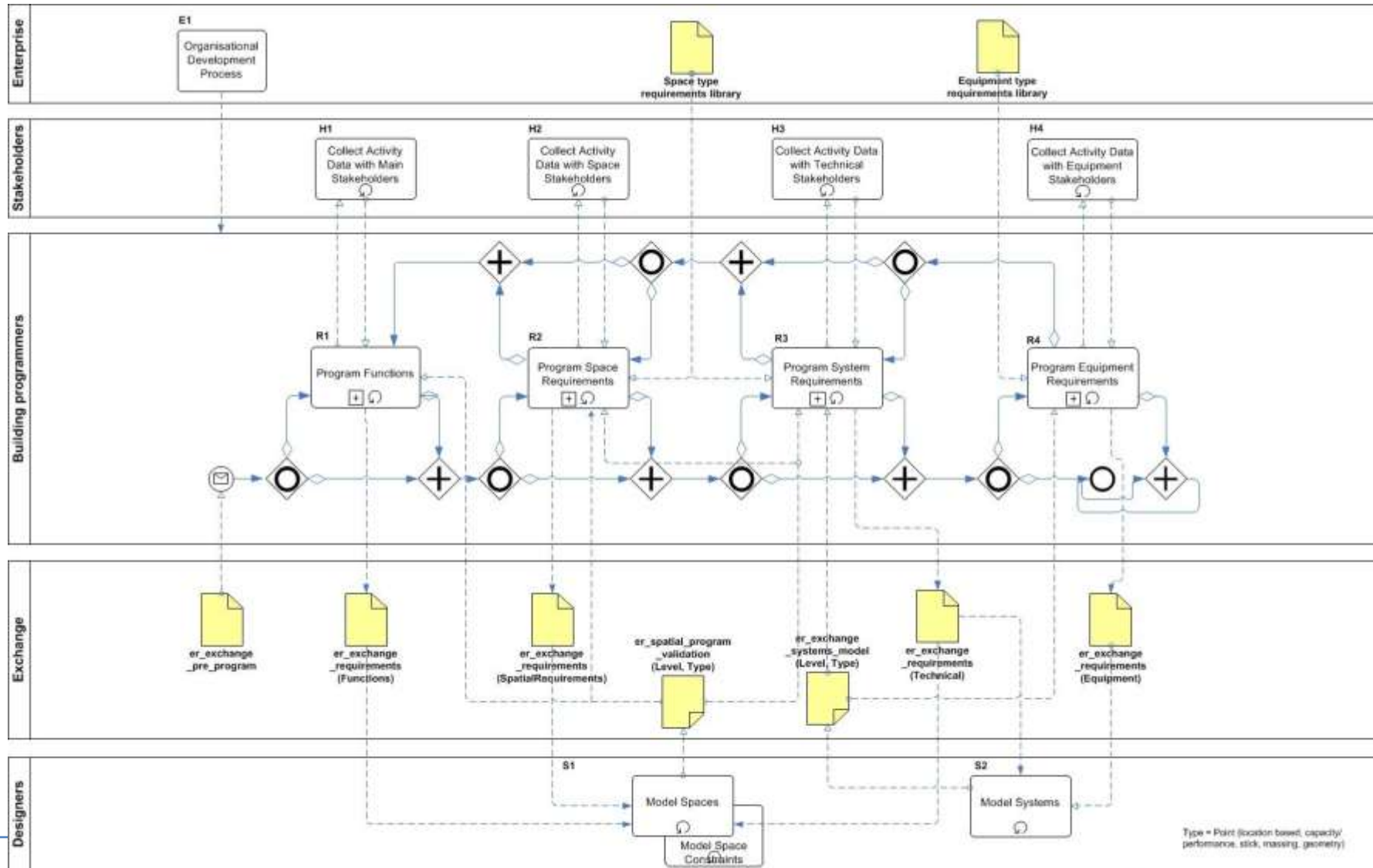
Name	Organization	Comments
Francoice Szigeti	International Centre for Facilities (ICF)	President, TEAG — The Environmental Analysis Group, and Vice President, International Centre for Facilities (ICF). Vice Chair, ASTM Subcommittee E06.25 Whole Buildings and Facilities,
Gerald Davis	International Centre for Facilities (ICF)	CFM, AIA, is President/CEO, International Centre for Facilities and Chairman, TEAG – The Environmental Analysis Group. He is the current Chair, ASTM Subcommittee E06.25 on Whole Buildings and Facilities, USA voting delegate to ISO Technical Committee 59 on Building Construction
Susan Nachtigall	U.S. Army Corps of Engineers Engineer Research and Development Center Construction Engineering Research Laboratory	Architect and Reseacher in Collaborative Engineering Design Processes. Worked with the Corps since 2001
Jeffrey Wix	AEC3	Director AEC3 Ltd. Member of IAI Model Support Group responsible for Management and FM schemas. An originating author of the Information Delivery Manual (IDM).
Mathias Weise	AEC3	Consultant
Frode Mohus	The Directorate of Public Construction and Property, Norway	(Mr BIM !) Coordinator for the Directorates BIM-strategy
Ole Kristian Kvarsvik	The Directorate of Public Construction and Property, Norway	Coordinator for the Directorates BIM-strategy
Knut Borgen	The Directorate of Public Construction and Property, Norway	Building programmer in the Directorate of Public construction and property.
Torer F. Berg	SINTEF Building and Infrastructure	Senior Reseacher. Engineer. MsC in Proj.Man. 1992. Working area: Building process- early phases, construction phases. P.t. responsible for developing the BIM-manual for Statsbygg/HIBO (and Industrial Housing). Mangement of departments and teams at Byggforsk from 1995.
Knud-Fredrik Mohn	The Norwegian Defence Estate Agency	More than 30 years experience within (commercial) property, building and constructions related to program development. Main contact and coordinator of NDEA's involvement in BuildingSmart.
Rolf Jerving	dRofus	CEO of dRofus and Nosyko. Worked as project leader for building programming and equipment planning in large complex building projects. Initiated the IDM for building programming in 2007.
+ Several other participants from companies like dRofus, Hospitalitet, CF Moller, Data Design System (DDS)		

ER work group (2010/2011)

Name	Organization
Frode Mohus	The Directorate of Public Construction and Property, Norway
Thomas Liebich	AEC3/bS International
Konrad Stuhlmacher	AEC3
Reijo Hänninen	Granlund
Tuomas Laine	Granlund
Arto Kiviniemi	Salford
Ole Kristian Kvarsvik	dRofus
Rolf Jerving	dRofus

2012 : Extensive collaboration with Bill East and his team

Proces Map



Type = Print (location, level, capacity, performance, stick, missing, geometry)

Type = Space Relationship Matrix
 Bubble Diagram
 Missing Model
 Space Function/Type Identification
 Equipment in Space
 Level = Main, Detailed, Unitary

Building programming PM_Building_Programming	Authors: IDM Building Programming Group Version: 0.5 Status: Working	Created: 01/02/2007 Modified: 20/01/2010 Modified: 19/09/2011	0.2 - Room functions collected 0.3 - Gateways added for routing 0.4 - Modifications from Holmerjard 0.45 - Removed Zone 0.5 - Included ER Space program in ER SpatialRequirements	
© International Alliance for Interoperability 2007-2010	bpmn_space_programming			

Proof of Concept – Validation of BPie requirements

Solibri Model Checker – Clinic file. Requirements exported from dRofus as BPie

The screenshot displays the Solibri Model Checker interface. The main window shows a 3D model of a building with various rooms and corridors highlighted in orange and pink. The left sidebar contains several panels:

- Checking**: A table listing rules and their status.
- Results**: A section for displaying results, currently empty.
- Info**: A section for providing additional information, currently empty.

Rule	Status
dRofus_demo	
Minimum Headroom	Warning
Spaces need to be classified in the Category classification	Pass
Minimum doorway width	Warning
Minimum doorway height	Warning
Window sill height	Pass
Direct Daylight	Warning
Number of electrical outlets	Warning
Water Basins	Warning
Toilets	Warning
Floor drain	Warning
Distances Between Spaces	Warning

At the bottom of the interface, the status bar shows: Rule: BIM Coordinator Selected: 0

Door width – not wide enough

The screenshot displays the Solibri Model Checker interface. The main window shows a 3D perspective view of a room with a brown door. The left sidebar contains a 'Checking' panel with a list of rules. The 'Minimum doorway width' rule is highlighted in red, indicating a failure. Below it, the 'Results' panel shows a list of results, with the following entry highlighted in red:

- (B) Space.-1.100 ; GROUP IS[1023]: None of the "Width" values match
 - (B) Space.-1.100 ; GROUP IS[1023]: None of the "Width" values match
 - (B) Door.-1.92
 - (B) Space.-1.100 ; GROUP IS[1023]

The 'Info' panel at the bottom left provides details for the selected result:

(B) Space.-1.100 ; GROUP IS[1023]: None of the "Width" values match

Description: [View links](#)

None of the components match the requirement "Width" > "ePset_SpaceDoorRequirements.MinimumWidth".

Location:
(B) First Floor
GROUP IS[1023]

Electrical Outlets – to few in design

The screenshot displays the Solibri Model Checker interface. The main window shows a 3D architectural model of a building with a room highlighted in blue. The room is labeled "IMMUNIZ'N ROOM 1D40".

The left sidebar contains the following sections:

- Checking:** A list of ruleset items. The rule "Number of electrical outlets" is highlighted in blue.
- Results:** A list of results. The result "(B) Space.-L.101 : IMMUNIZ'N ROOM[1D40]: Count (6) of the components does not match the requirement: ≥ 3.0 " is highlighted in blue. Below it, three sub-items are listed: "(A) Outlet.207", "(A) Outlet.215", and "(A) Outlet.230".
- Info:** A detailed view of the selected result, showing the description "Count (6) of the components does not match the requirement: ≥ 3.0 ", the location "First Floor IMMUNIZ'N ROOM[1D40]", and a "Description" field.

The bottom status bar shows "Role: BIM Coordinator" and "Selected: 0".

Number of toilets – to many

The screenshot displays the Solibri Model Checker interface for a project named 'Clinic_dRofus_test'. The 'Checking' panel on the left lists various rules, with 'Toilets' highlighted in blue. The 'Results' panel shows two error messages: '(B) Space.-1.26 : W. TOILET[1A09]: Count (2) of the components does not match the requirement: = 1.0' and '(B) Space.0.82 : W. TOILET[2C24]: Count (2) of the components does not match the req'. The 'Info' panel provides details for the selected error, including the description 'Count (2) of the components does not match the requirement: = 1.0' and the location '(B) First Floor W. TOILET[1A09]'. The 3D model on the right shows a blue wireframe of a building with a room highlighted in light blue, containing two pink toilet models. Labels in the model include 'Corridor 1AC3', 'M. TOILET 1A12', and 'M. TOILET 1A09'. The status bar at the bottom indicates 'Role: BIM Coordinator' and 'Selected: 0'.

Proximity – Not fulfilling max. walking distance from Space classified 13-15 11 34 11: Office to 13-41 11 14 21: Restroom

Checking

Rule	Status
Minimum Headroom	OK
Spaces need to be classified in the Category classification	OK
Minimum doorway width	Warning
Minimum doorway height	Warning
Windows all height	Warning
Direct Daylight	Warning
Number of electrical outlets	Warning
Water Basins	Warning
Toilets	Warning
Floor drain	Warning
Distances Between Spaces	Warning

Results

No Filtering Automatic

Spaces Too Far [0/3]

- Route from Class = 13-15 11 34 11: Office to Class = 13-41 11 14 21: Restroom [0/3]
- (B) Space.0.6 : DENTAL SURGEON OFFICE[2A04] 32.14 m
- (B) Space.0.8 : SUPER OFFICE[2A02] 29.45 m
- (B) Space.0.8 : SUPER OFFICE[2A02]
- Related Components

Info

(B) Space.0.8 : SUPER OFFICE[2A02] 29.45 m

Description: [Hyperlinks](#)

There are no spaces, whose Class = 13-41 11 14 21: Restroom within 25.00 m from (B) Space.0.8 : SUPER OFFICE[2A02]. Distance to the nearest space is 29.45 m.

Location:
(B) Second Floor
SUPER OFFICE[2A02]

Role: BIM Coordinator Selected: 0

Programmed vs. designed area

Validation with an IFC model server (dRofus)

The screenshot shows the dRofus software interface for a project named "Nytt Østfoldsykehus, Kalnes". The interface includes a left-hand navigation pane with a tree view of functions and rooms, a central data table, and a 3D model of the building structure. A callout box with a double-headed arrow points to the 3D model, stating "Instant program validation across 12 large Revit Models".

Function	# Rooms	# IfcSpace	Programmed net	Designed net	Diff net (Design-Programmed)	Color
Nytt Østfoldsykehus, Kalnes	4253	4177	40.528.90	80.297.30	39.368.40	
07 - Prehospitale tje	99	99	1.124.00	1.147.79	23.79	
08 - Kirurgi, ortoped	106	105	1.441.00	1.444.16	3.16	
09 - Gynekologi og i	157	155	1.705.00	1.771.83	66.83	
10 - Medisinsk serv	303	301	3.867.00	3.787.70	79.30	

3D model ready

re@db2.nosyko.no/ostfold IFC; MODELSTORE/Ostfold_samlet (RW) [Revit]

Equipment validation

IFC Model server (dRofus)

Equipment in room - 12.01.029

Created: 7/9/2010 12:50 PM By: eki
 Last modified: 9/27/2012 8:43 AM By: khaugen

12.01.029 - Operasjon: Unik

FF&E Number	Name	Quantity	Quantity in model	To be modeled:
012.01.002	Uttaksentral, anestesie...	1	1	Yes
012.01.007	Uttaksentral, karug, an...	1	1	Yes
012.02.004	Lampe, operasjon > 100	1	1	Yes
012.02.005	Lampe, operasjon, hånd...	16	0	No
012.02.007	Oppheng til flatskjerm, led...	2	2	Yes
012.02.016	Kamerafeste til operasjon...	1	0	No
012.02.018	Kamera, lampe, operasjon...	1	0	No
012.03.001	Operasjonsbord/systemb...	1	1	Yes
012.03.004	Operasjonsbord/systemb...	1	0	Yes
012.03.010	Operasjonsbord/systemb...	1	1	Yes
012.03.025	Leingautstyr, voksen div...	1	0	No
012.03.032	Operasjonsbord, div. tilleg...	1	0	No
012.04.007	Stativ med balle, rullest...	1	0	No
012.04.008	Oppstinn, 1 tinn høy	1	0	No
012.04.009	Oppstinn, 2 tinn	1	0	No
012.04.010	Instrument/kompresskast	2	2	No
012.04.012	Hengerekt for kompressor	1	0	No
012.04.015	Skinne, vegg - utstyr til u...	1	1	Yes
012.04.016	Stativ for oppheng av ut...	1	0	No
012.10.025	Overvåking, anestesestapp	1	0	No
012.20.010	Ventilasjonsgang inkl. mas...	1	0	No
012.20.011	Ventilasjonsgang inkl. mas...	1	0	No
012.20.012	Ventilasjonsgang inkl. mas...	1	0	No
012.20.013	Oppheng for ventilasjon...	4	0	No

Prog. area:	Designed...	RDS status	Equipment status	Covering status	Etasje
0.00	1.95	Avledet fra SR.021	Unik	Ikke opprettet	
0.00	1.98	Avledet fra SR.021	Unik	Ikke opprettet	
0.00	1.98	Avledet fra SR.021	Unik	Ikke opprettet	
50.00	51.04	Avledet fra SR.015	Avledet fra SR.015	Ikke opprettet	03

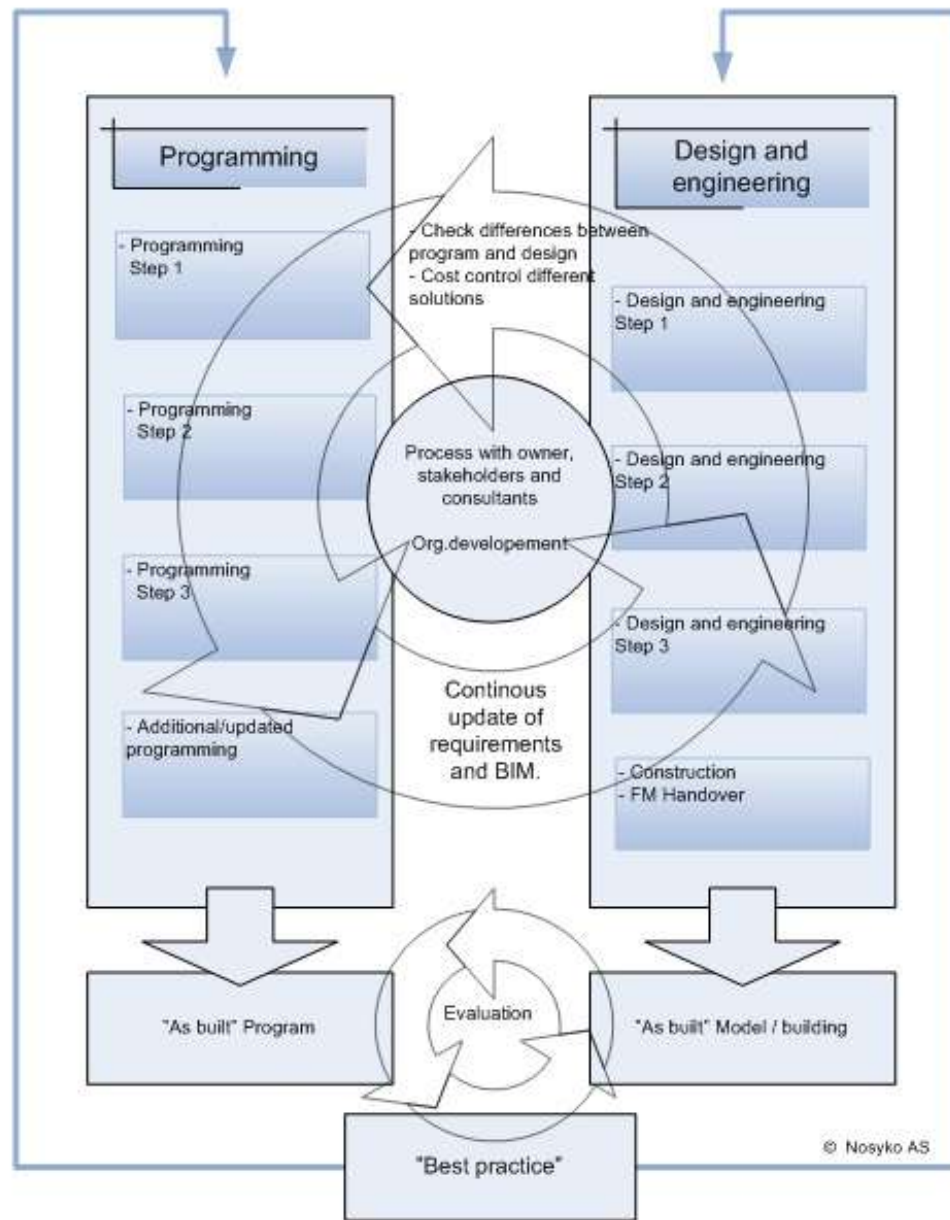
Number of rooms: 106 Total programmed area 1632.00 Total area 1685.12

3D model ready

je@db2.nosyko.no/ostfold IFC; MODELSTORE/Ostfold_samlet (RW) [Revit]

Detailed view + validation of planned against modeled equipment in an operating room. (Note the "to be modeled" column to the left)

HOW ?



Future developments

- **Open process – better results if more organizations / people get involved - both owners, designers, software vendors and others**
- **The parameters proposed in this first version is not static. Needs to be enhanced with other generic requirements that is relevant to many**
- **The BPie effort will (hopefully) continue with the other ER's in the process map in order to build a complete requirements model**