

60.000 clashes – 60 nodes – 60 seconds

'Automation' Example
Navisworks Clash Tracking



Thorsten Strathaus
Flanagan Lawrence

UK DYNAMO USER GROUP | SOUTH
#TStrathaus 26th July 2016



60.000 clashes – 60 nodes – 60 seconds

'Automation' Example
Navisworks Clash Tracking

DynaWorks16
Adam Sheather
#Gytaco

Alto Apartments
Wembley Park
UK BIM Level 2
Bi-weekly Model Federations



Thorsten Strathaus
Flanagan Lawrence

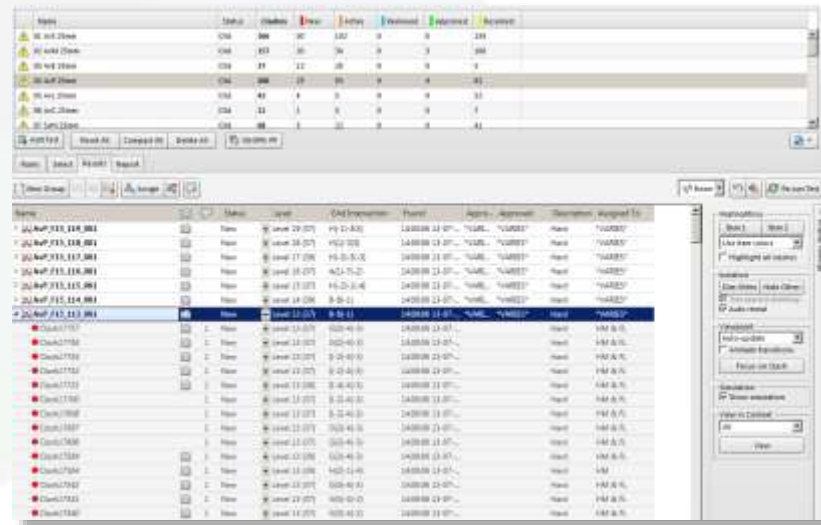
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Standard Navisworks Clash Analysis

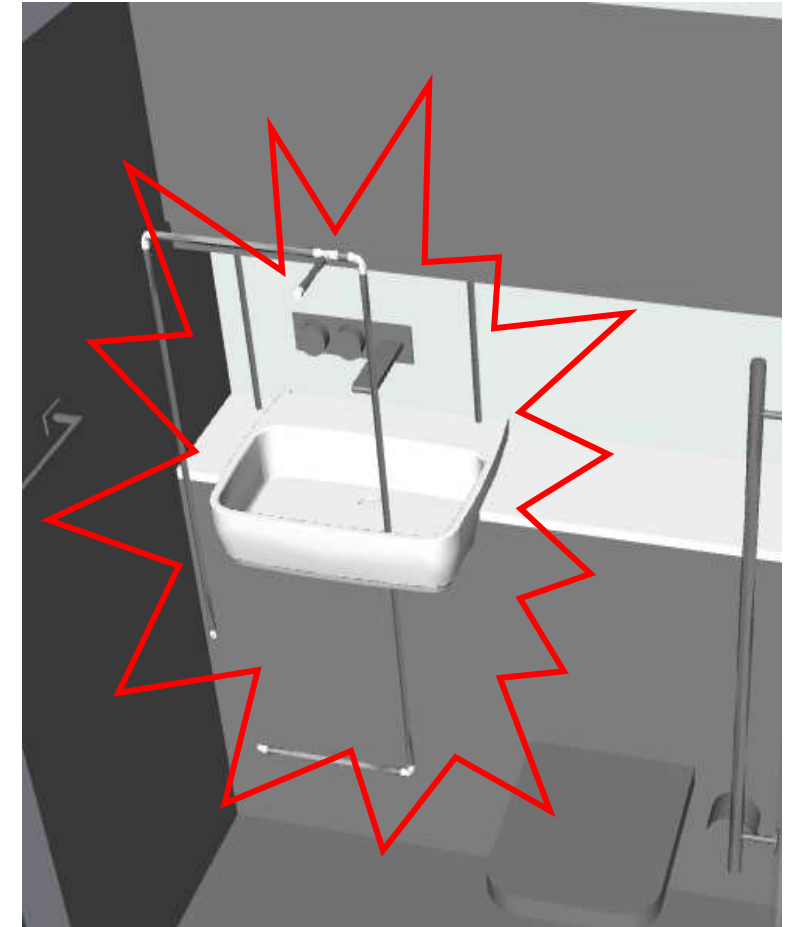
'Automation' Example Navisworks Clash Tracking

- Use an existing Clash Analysis



The screenshot displays the Navisworks interface with a Clash Analysis table. The table lists various clash items, including clashes between different levels (e.g., Level 11.01, Level 11.02) and clashes between different elements (e.g., Clash 1791, Clash 1792). The table columns include Item, Status, Clash ID, Clash Description, Clash Location, Clash Date, Clash Type, Clash Category, Clash Severity, Clash Resolution, and Clash Action. The table is filtered to show only clashes that are 'New' and 'Unresolved'.

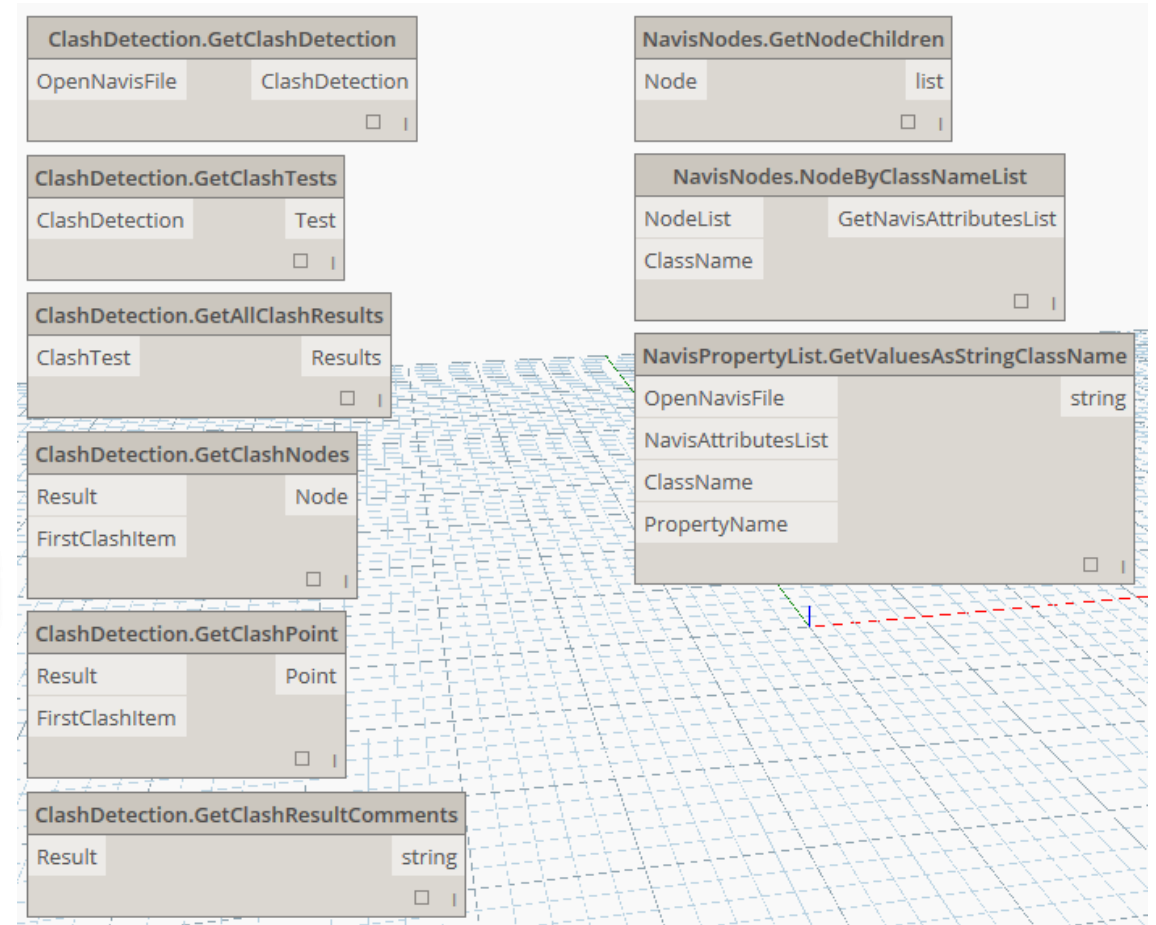
Item	Status	Clash ID	Clash Description	Clash Location	Clash Date	Clash Type	Clash Category	Clash Severity	Clash Resolution	Clash Action
Clash 1791	New	1791	Clash between Level 11.01 and Level 11.02	Level 11.01	2016-07-26	Clash	Clash	High	Clash	Clash
Clash 1792	New	1792	Clash between Level 11.01 and Level 11.02	Level 11.01	2016-07-26	Clash	Clash	High	Clash	Clash
Clash 1793	New	1793	Clash between Level 11.01 and Level 11.02	Level 11.01	2016-07-26	Clash	Clash	High	Clash	Clash
Clash 1794	New	1794	Clash between Level 11.01 and Level 11.02	Level 11.01	2016-07-26	Clash	Clash	High	Clash	Clash
Clash 1795	New	1795	Clash between Level 11.01 and Level 11.02	Level 11.01	2016-07-26	Clash	Clash	High	Clash	Clash
Clash 1796	New	1796	Clash between Level 11.01 and Level 11.02	Level 11.01	2016-07-26	Clash	Clash	High	Clash	Clash
Clash 1797	New	1797	Clash between Level 11.01 and Level 11.02	Level 11.01	2016-07-26	Clash	Clash	High	Clash	Clash
Clash 1798	New	1798	Clash between Level 11.01 and Level 11.02	Level 11.01	2016-07-26	Clash	Clash	High	Clash	Clash
Clash 1799	New	1799	Clash between Level 11.01 and Level 11.02	Level 11.01	2016-07-26	Clash	Clash	High	Clash	Clash
Clash 1800	New	1800	Clash between Level 11.01 and Level 11.02	Level 11.01	2016-07-26	Clash	Clash	High	Clash	Clash



DynaWorks16 Components

'Automation' Example Navisworks Clash Tracking

- Use an existing Clash Analysis
- Intro to Dynaworks



Workflow

'Automation' Example Navisworks Clash Tracking

- Use an existing Clash Analysis
- Intro to Dynaworks
- Simple Database Access



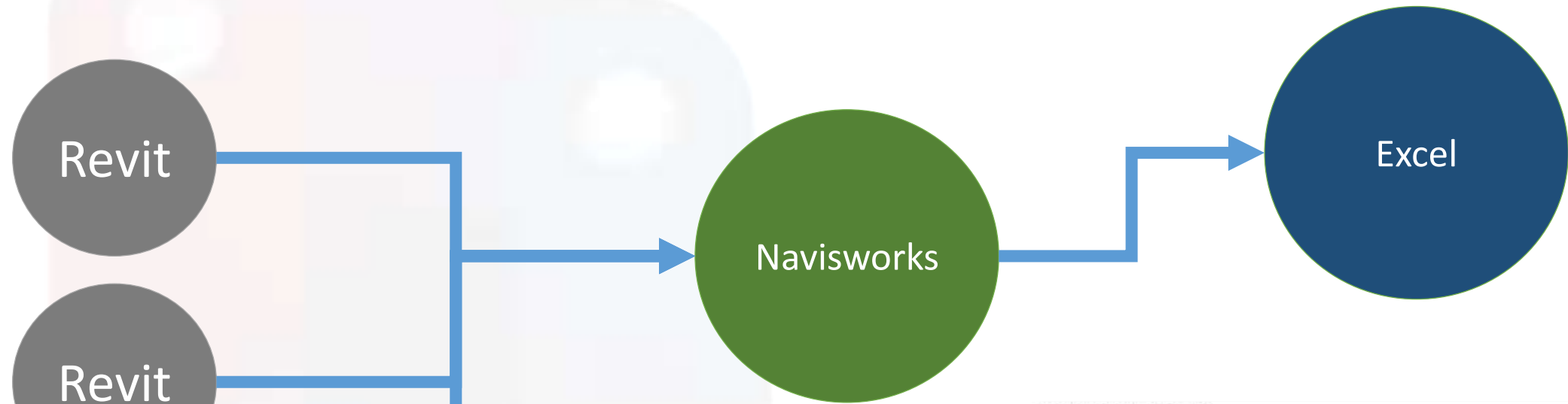
Goal

'Automation' Example Navisworks Clash Tracking

- Use an existing Clash Analysis
- Intro to Dynaworks
- Simple Database Access
- Automated Clash & Performance Tracking



Project setup



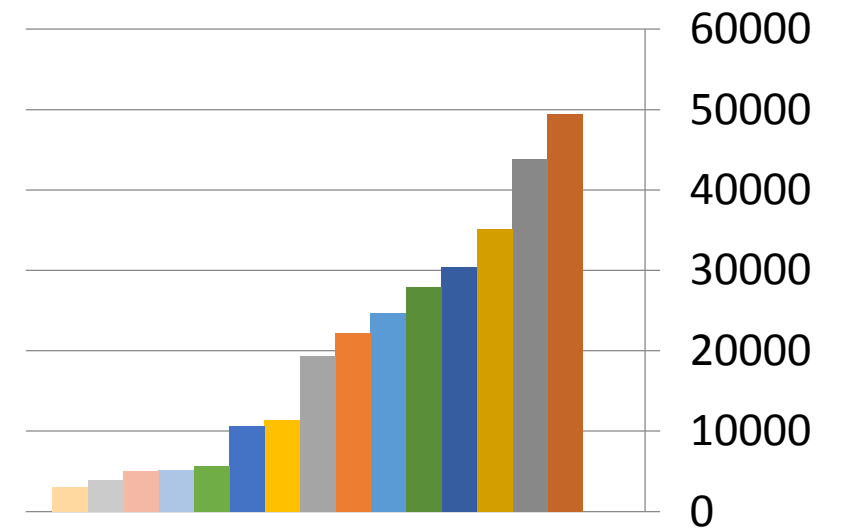
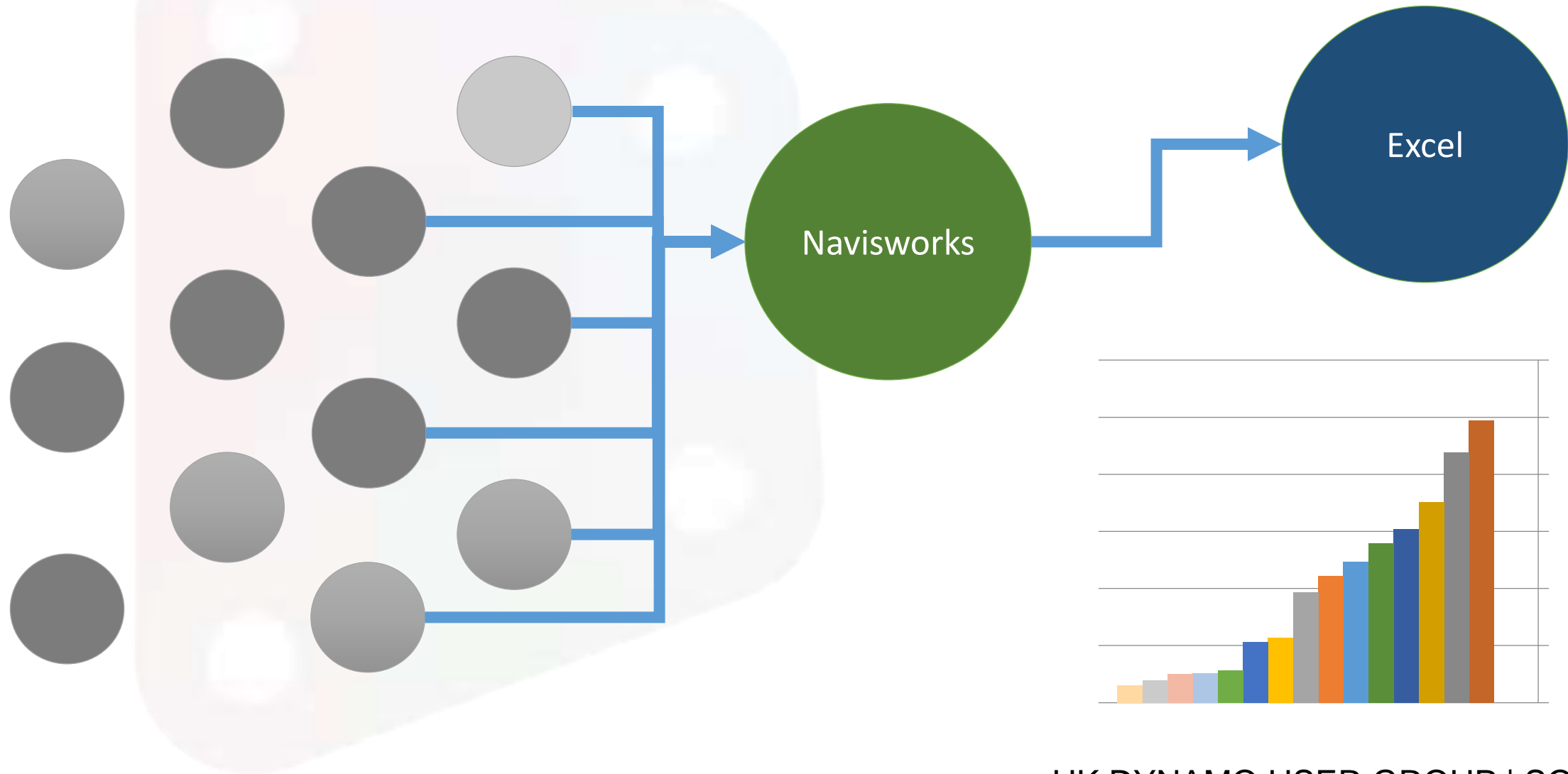
Federated Model Clash Report 03
Hammersmith Grove Phase 2
08/01/16 10:00:00 AM

Avs 50mm

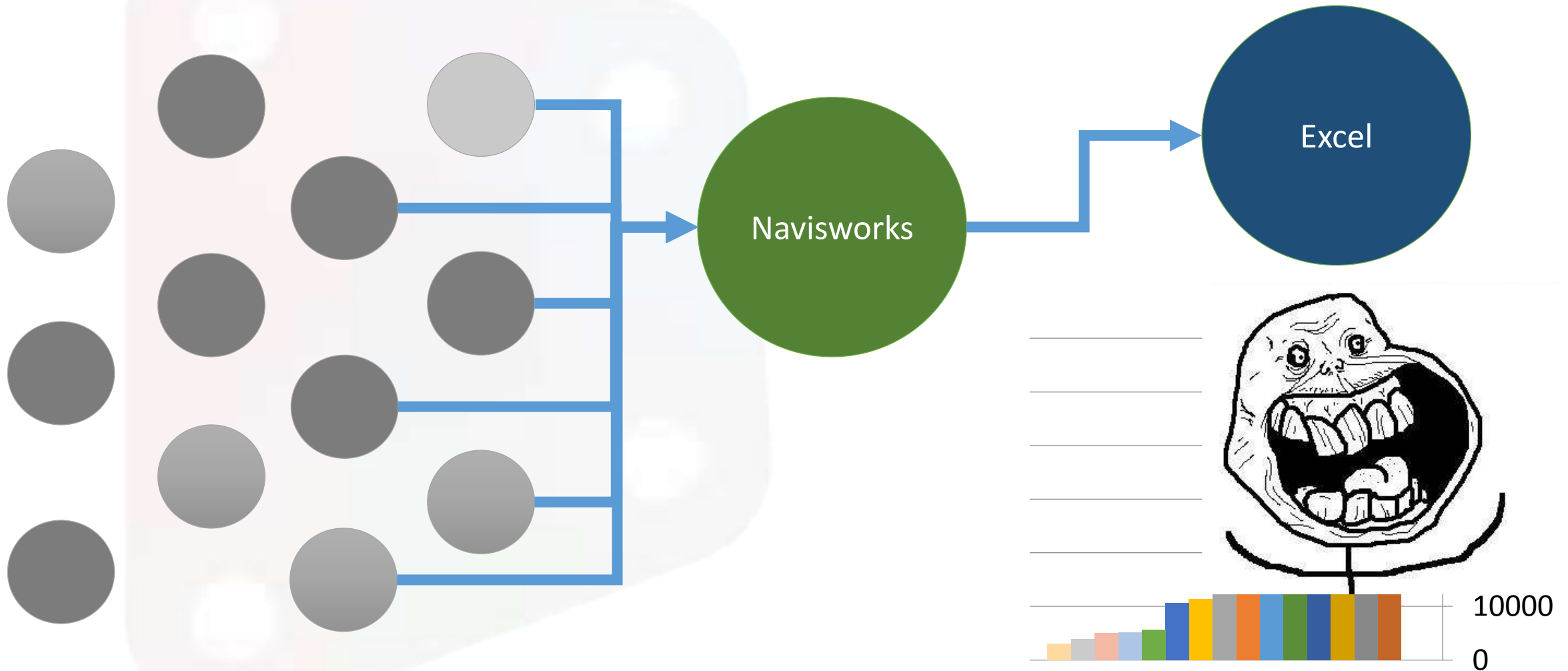
Clash ID	Clash Name	Category	Clash Type	Clash Description	Clash Location	Clash Date	Clash Status	Clash Owner	Clash Assignee	Clash Resolution
1	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM
2	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM
3	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM
4	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM
5	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM
6	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM
7	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM
8	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM
9	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM
10	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM	AVS_50MM



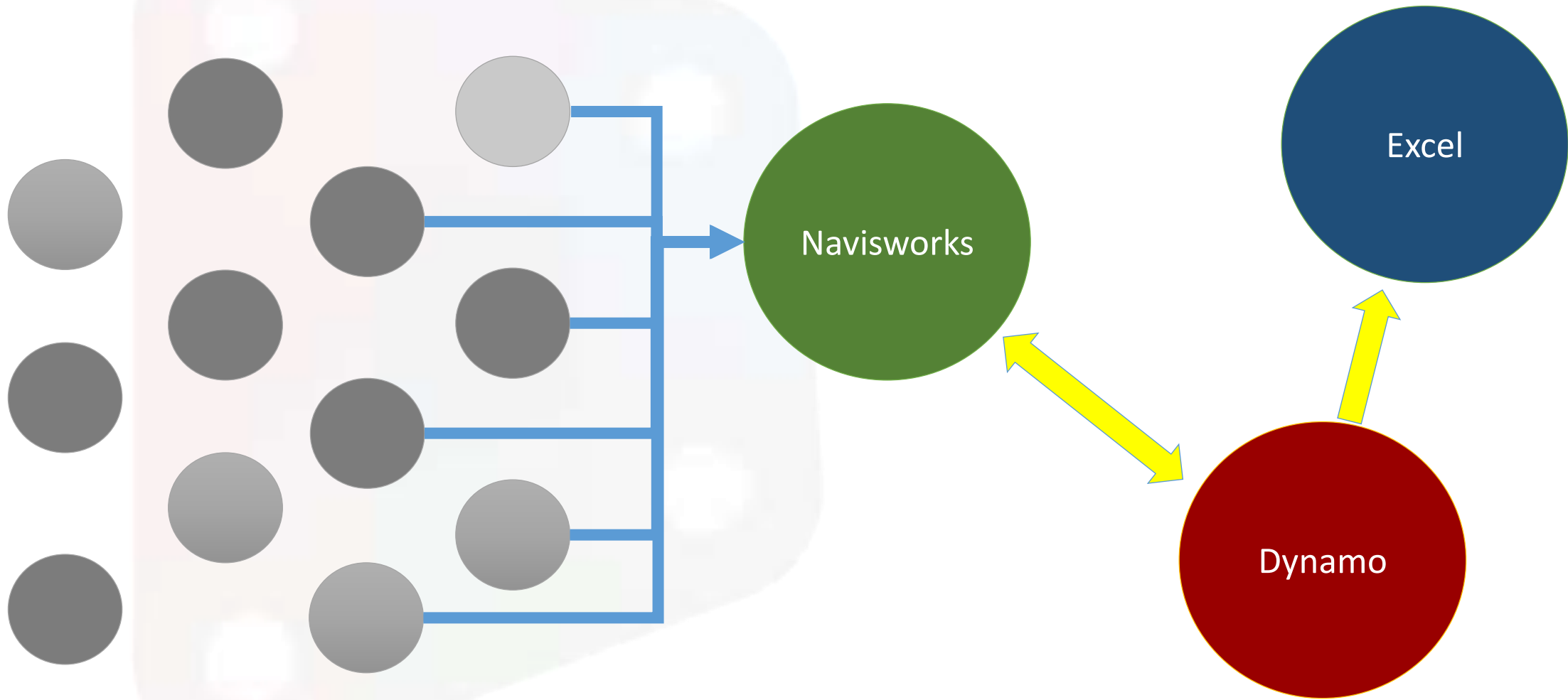
A bit later



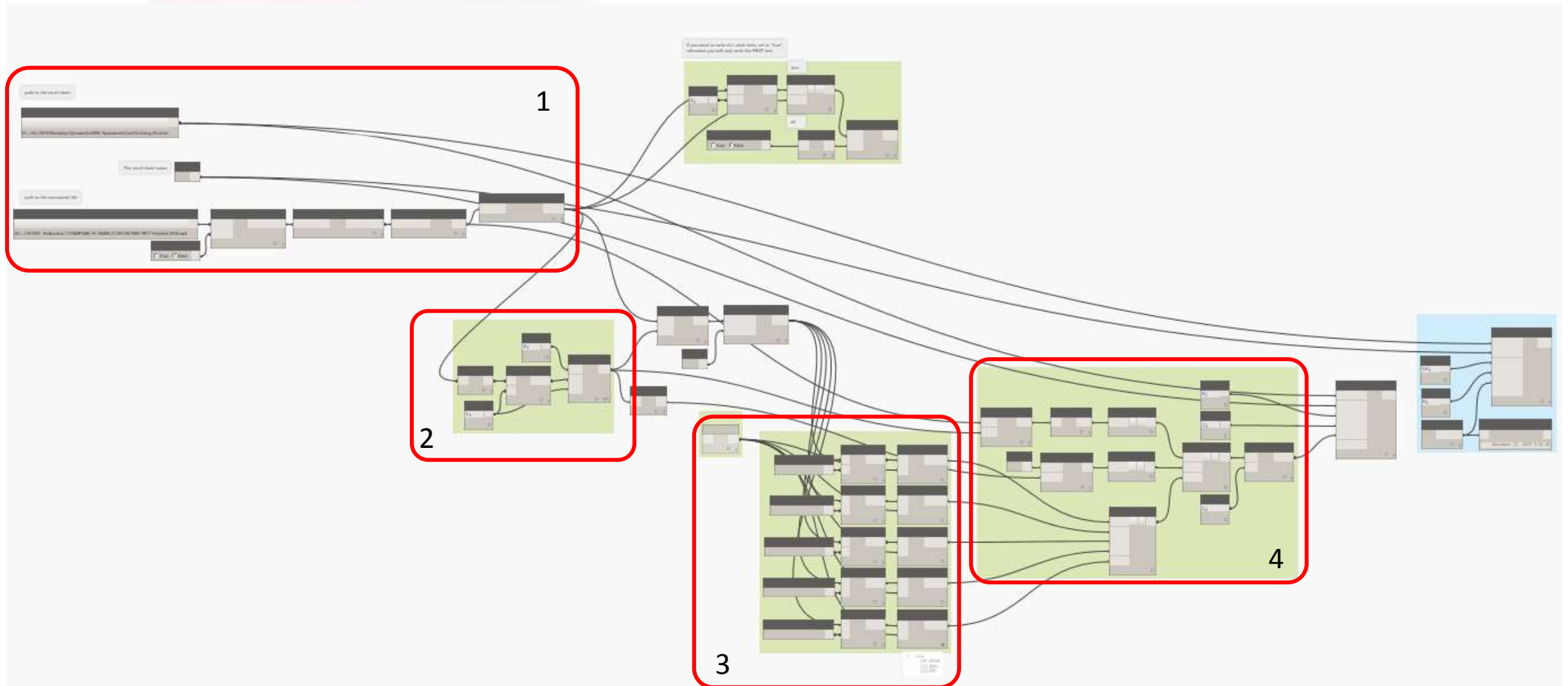
A bit later..



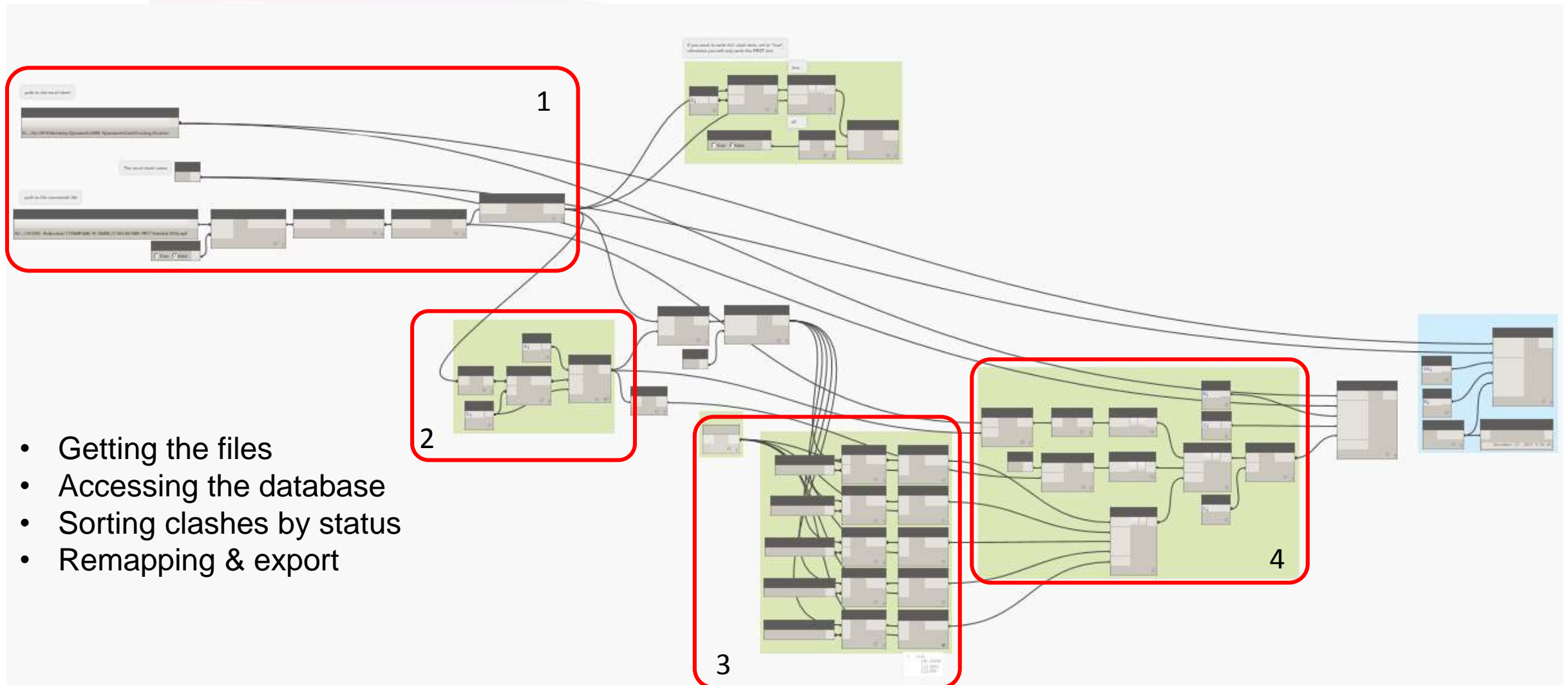
Automation as solution



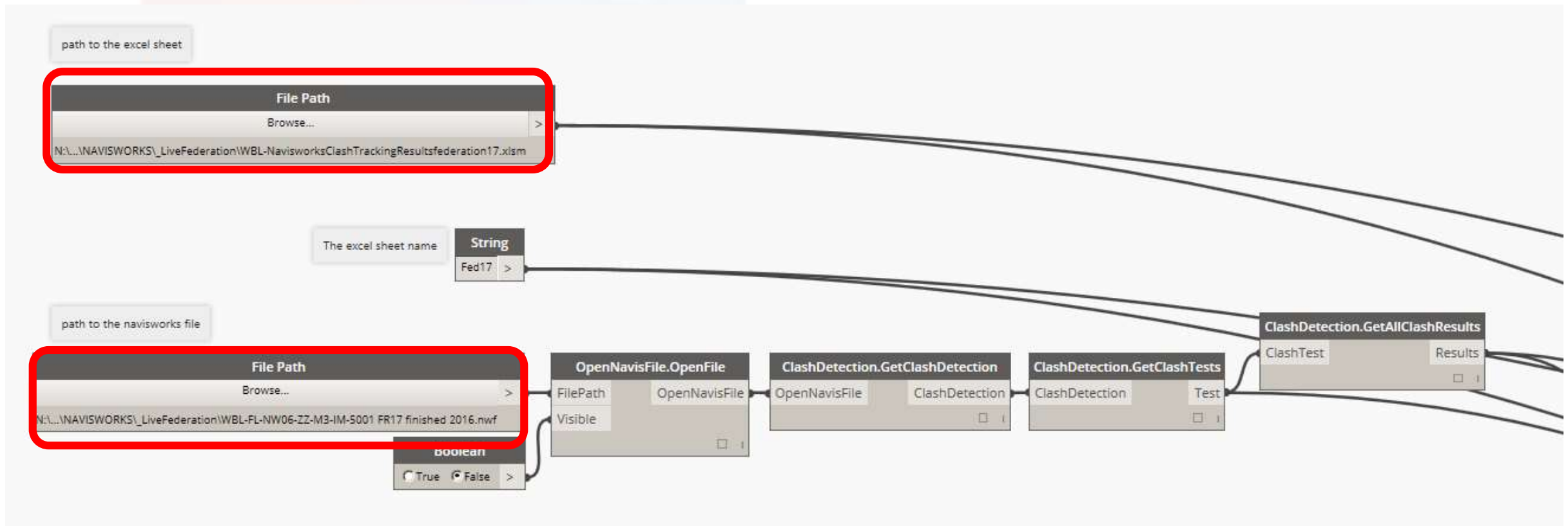
Dynamo Graph



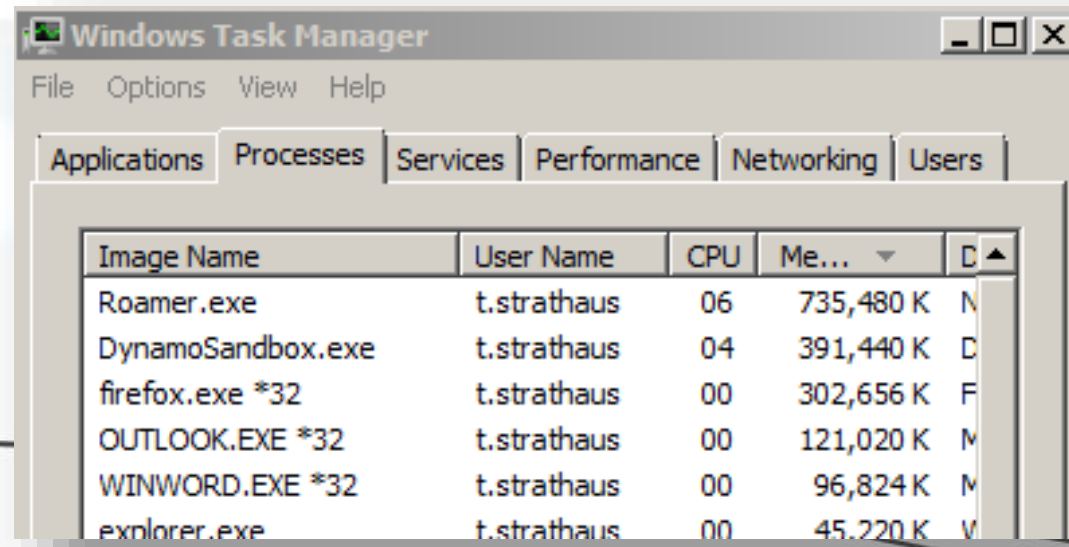
Dynamo Graph



Getting started



The roamer



A screenshot of the Windows Task Manager window, specifically the 'Processes' tab. The window title is 'Windows Task Manager' and it has a menu bar with 'File', 'Options', 'View', and 'Help'. The tabs at the bottom are 'Applications', 'Processes', 'Services', 'Performance', 'Networking', and 'Users'. The 'Processes' tab is active, showing a list of running processes. The columns are 'Image Name', 'User Name', 'CPU', 'Me...', and 'D'. The processes listed are: Roamer.exe (User: t.strathaus, CPU: 06, Memory: 735,480 K), DynamoSandbox.exe (User: t.strathaus, CPU: 04, Memory: 391,440 K), firefox.exe *32 (User: t.strathaus, CPU: 00, Memory: 302,656 K), OUTLOOK.EXE *32 (User: t.strathaus, CPU: 00, Memory: 121,020 K), WINWORD.EXE *32 (User: t.strathaus, CPU: 00, Memory: 96,824 K), and explorer.exe (User: t.strathaus, CPU: 00, Memory: 45,220 K).

Image Name	User Name	CPU	Me...	D
Roamer.exe	t.strathaus	06	735,480 K	M
DynamoSandbox.exe	t.strathaus	04	391,440 K	D
firefox.exe *32	t.strathaus	00	302,656 K	F
OUTLOOK.EXE *32	t.strathaus	00	121,020 K	M
WINWORD.EXE *32	t.strathaus	00	96,824 K	M
explorer.exe	t.strathaus	00	45,220 K	V

path to the excel sheet

File Path

Browse...

N:\...\NAVISWORKS\LiveFederation\WBL-NavisworksClashTrackingResultsfederation17.xlsm

The excel sheet name

String

Fed17

path to the navisworks file

File Path

Browse...

N:\...\NAVISWORKS\LiveFederation\WBL-FL-NW06-ZZ-M3-IM-5001 FR17 finished 2016.nwf

boolean

☐ True ☒ False

OpenNavisFile.OpenFile

FilePath

OpenNavisFile

Visible

ClashDetection.GetClashDetection

OpenNavisFile

ClashDetection

ClashDetection.GetClashTests

ClashDetection

Test

ClashDetection.GetAllClashResults

ClashTest

Results

The screenshot shows a Node-RED workflow for clash detection. The workflow consists of the following nodes and connections:

- String** node: Contains the text "Fed17".
- Boolean** node: Set to "False".
- OpenNavisFile.OpenFile** node: Receives input from the String and Boolean nodes. It has a "FilePath" input and an "OpenNavisFile" output.
- ClashDetection.GetClashDetection** node: Receives input from the OpenNavisFile.OpenFile node. It has an "OpenNavisFile" input and a "ClashDetection" output.
- ClashDetection.GetClashTests** node: Receives input from the ClashDetection.GetClashDetection node. It has a "ClashDetection" input and a "Test" output.
- ClashDetection.GetAllClashResults** node: Receives input from the ClashDetection.GetClashTests node. It has a "ClashTest" input and a "Results" output.
- List** node: Displays the output of the ClashDetection.GetAllClashResults node. It shows a list of clash results, including clash IDs, descriptions, and test results.

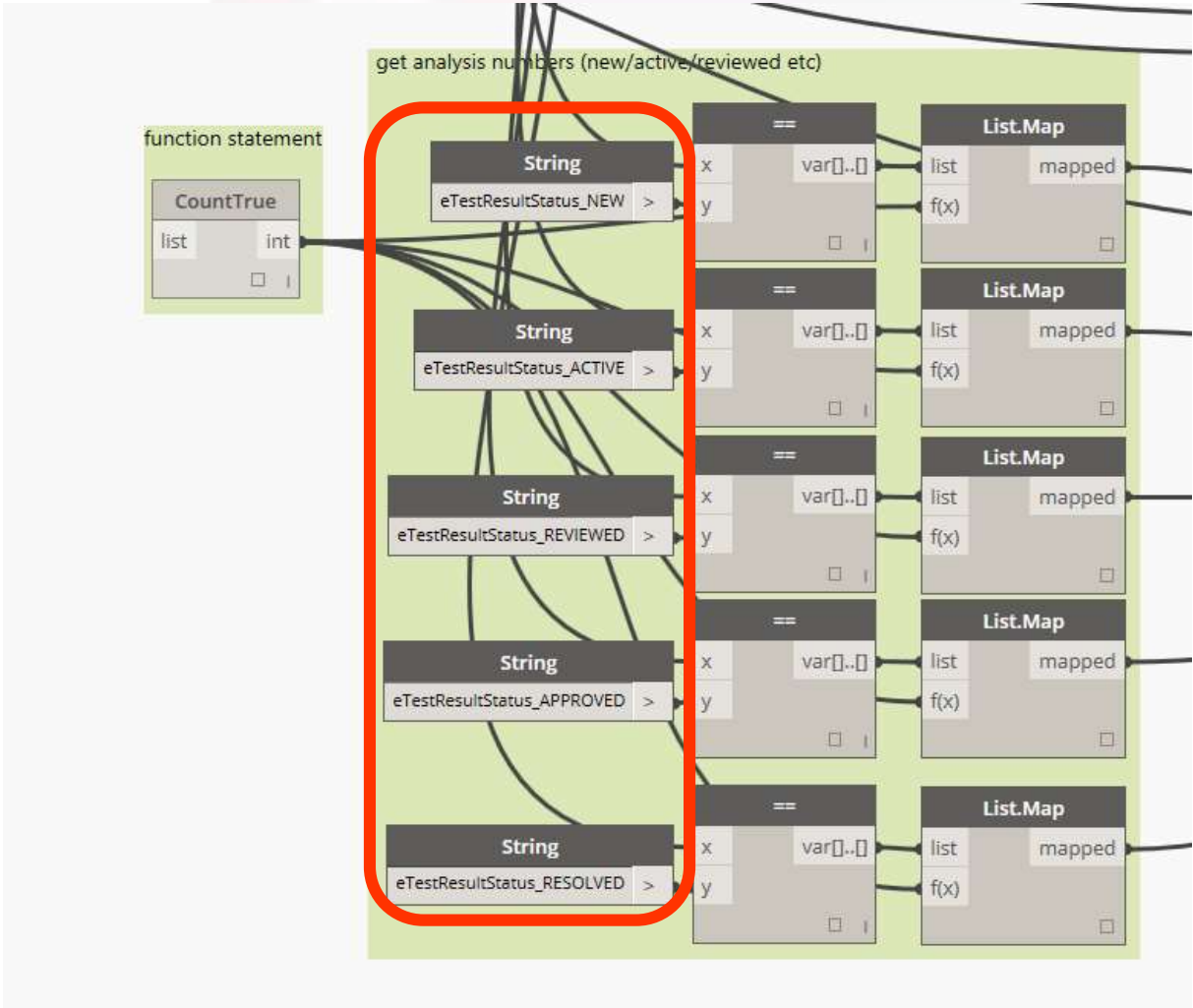
The List node output is as follows:

```

List
[0] List
[0] Clash16987 eTestResultStatu
[1] Clash16986 eTestResultStatu
[2] Clash16965 eTestResultStatu
[3] Clash16964 eTestResultStatu
[4] Clash16951 eTestResultStatu
[5] Clash16950 eTestResultStatu
[6] Clash16949 eTestResultStatu
[7] Clash16948 eTestResultStatu
[8] Clash16947 eTestResultStatu
[9] Clash16946 eTestResultStatu
[10] Clash16945 eTestResultStat
[11] Clash16944 eTestResultStat
[12] Clash16812 eTestResultStat
[13] Clash16811 eTestResultStat
[14] Clash16810 eTestResultStat
[15] Clash16809 eTestResultStat
[16] Clash16808 eTestResultStat
[17] Clash16807 eTestResultStat
[18] Clash16806 eTestResultStat
[19] Clash16805 eTestResultStat
[20] Clash16804 eTestResultStat
[21] Clash16803 eTestResultStat
[22] Clash16802 eTestResultStat
[23] Clash16801 eTestResultStat
[24] Clash16800 eTestResultStat
[25] Clash16799 eTestResultStat
[26] Clash16798 eTestResultStat
[27] Clash16797 eTestResultStat
[28] Clash16796 eTestResultStat
[29] Clash16795 eTestResultStat
[30] Clash16794 eTestResultStat
[31] Clash16793 eTestResultStat
[32] Clash16792 eTestResultStat
[33] Clash16791 eTestResultStat
[34] Clash16790 eTestResultStat
[35] Clash16789 eTestResultStat
[36] Clash16788 eTestResultStat
[37] Clash16787 eTestResultStat
[38] Clash16786 eTestResultStat
[39] Clash16785 eTestResultStat
[40] Clash16784 eTestResultStat
[41] Clash16783 eTestResultStat
[42] Clash16782 eTestResultStat
[43] Clash16781 eTestResultStat
[44] Clash16780 eTestResultStat
[45] Clash16779 eTestResultStat
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[48] Clash16776 eTestResultStat
[49] Clash16775 eTestResultStat
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[51] Clash16773 eTestResultStat
[52] Clash16772 eTestResultStat
[53] Clash16771 eTestResultStat
[54] Clash16770 eTestResultStat
[55] Clash16769 eTestResultStat
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[57] Clash16767 eTestResultStat
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[59] Clash16765 eTestResultStat
[60] Clash16764 eTestResultStat
[61] Clash16763 eTestResultStat
[62] Clash16762 eTestResultStat
[63] Clash16761 eTestResultStat
[64] Clash16760 eTestResultStat
[65] Clash16759 eTestResultStat
[66] Clash16758 eTestResultStat
[67] Clash16757 eTestResultStat
[68] Clash16756 eTestResultStat
[69] Clash16755 eTestResultStat
[70] Clash16754 eTestResultStat
[71] Clash16753 eTestResultStat
[72] Clash16752 eTestResultStat
[73] Clash16751 eTestResultStat
[74] Clash16750 eTestResultStat
[75] Clash16749 eTestResultStat
[76] Clash16748 eTestResultStat
[77] Clash16747 eTestResultStat
[78] Clash16746 eTestResultStat
[79] Clash16745 eTestResultStat
[80] Clash16744 eTestResultStat
[81] Clash16743 eTestResultStat
[82] Clash16742 eTestResultStat
[83] Clash16741 eTestResultStat
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[100] Clash16724 eTestResultStat
[101] Clash16723 eTestResultStat
[102] Clash16722 eTestResultStat
[103] Clash16721 eTestResultStat
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[105] Clash16719 eTestResultStat
[106] Clash16718 eTestResultStat
[107] Clash16717 eTestResultStat
[108] Clash16716 eTestResultStat
[109] Clash16715 eTestResultStat
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[111] Clash16713 eTestResultStat
[112] Clash16712 eTestResultStat
[113] Clash16711 eTestResultStat
[114] Clash16710 eTestResultStat
[115] Clash16709 eTestResultStat
[116] Clash16708 eTestResultStat
[117] Clash16707 eTestResultStat
[118] Clash16706 eTestResultStat
[119] Clash16705 eTestResultStat
[120] Clash16704 eTestResultStat
[121] Clash16703 eTestResultStat
[122] Clash16702 eTestResultStat
[123] Clash16701 eTestResultStat
[124] Clash16700 eTestResultStat
[125] Clash16699 eTestResultStat
[126] Clash16698 eTestResultStat
[127] Clash16697 eTestResultStat
[128] Clash16696 eTestResultStat
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[130] Clash16694 eTestResultStat
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[132] Clash16692 eTestResultStat
[133] Clash16691 eTestResultStat
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[135] Clash16689 eTestResultStat
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[138] Clash16686 eTestResultStat
[139] Clash16685 eTestResultStat
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[152] Clash16672 eTestResultStat
[153] Clash16671 eTestResultStat
[154] Clash16670 eTestResultStat
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[156] Clash16668 eTestResultStat
[157] Clash16667 eTestResultStat
[158] Clash16666 eTestResultStat
[159] Clash16665 eTestResultStat
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[212] Clash16612 eTestResultStat
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[223] Clash16601 eTestResultStat
[224] Clash16600 eTestResultStat
[225] Clash16599 eTestResultStat
[226] Clash16598 eTestResultStat
[227] Clash16597 eTestResultStat
[228] Clash16596 eTestResultStat
[229] Clash16595 eTestResultStat
[230] Clash16594 eTestResultStat
[231] Clash16
```



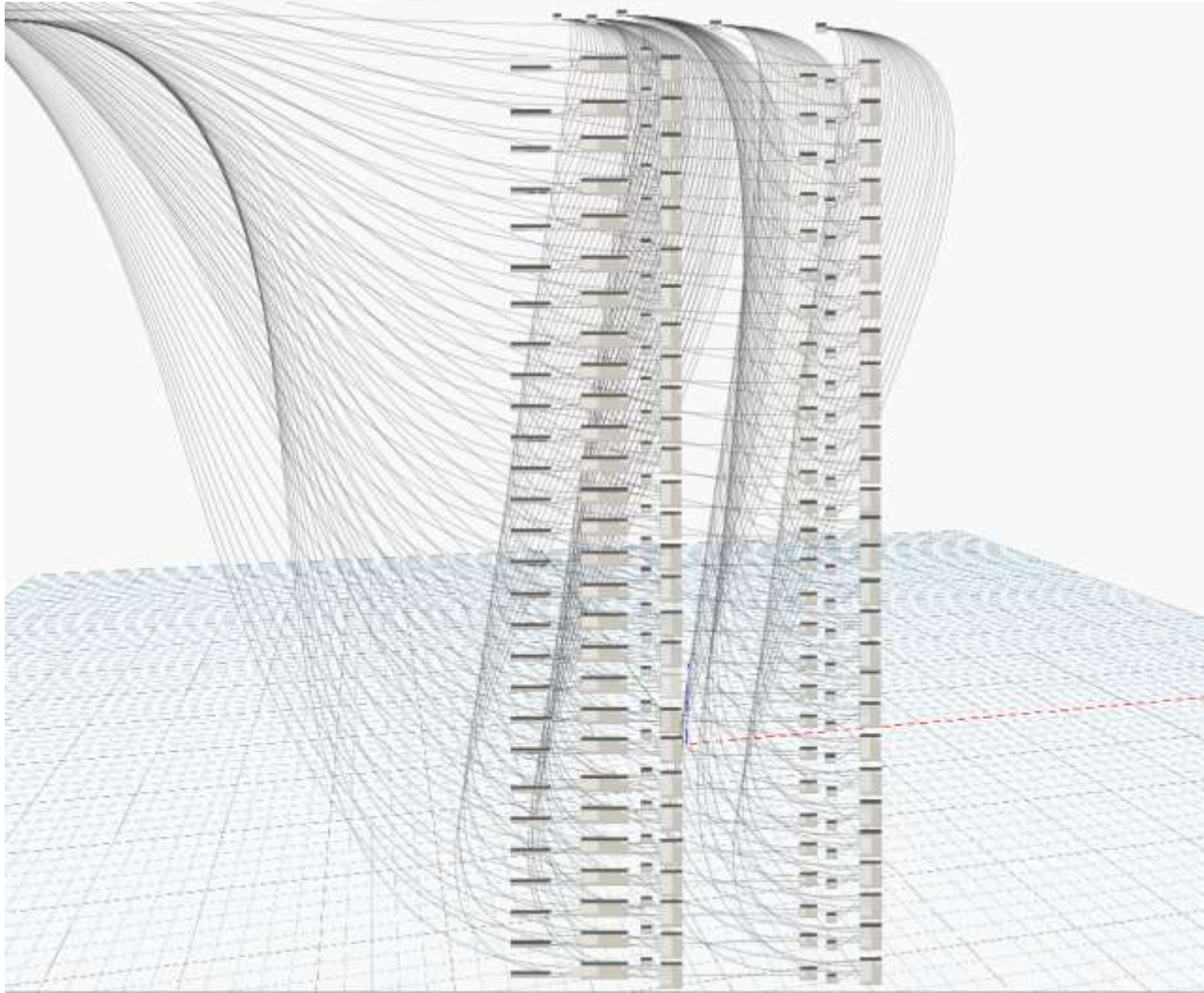
Sorting Clashes by Status



Status	Clashes	New	Active	Reviewed	Approved	Resolved
Old	404	38	126	0	0	240
Old	160	1	41	0	0	118
Old	39	1	30	0	0	8
Old	203	6	114	0	0	83
Old	48	4	10	0	0	34
Old	14	2	3	0	1	8
Old	77	2	28	0	1	46
Old	9	3	1	0	1	4
Old	168	24	70	0	0	74

- “eTestResultStatus_NEW”
- “eTestResultStatus_ACTIVE”
- “eTestResultStatus_REVIEWED”
- “eTestResultStatus_APPROVED”
- “eTestResultStatus_RESOLVED”

Repetitive Nodes – List Management



50 AvP 0-fire rated Part. Wall 10mm

51 AvP Facade 10mm

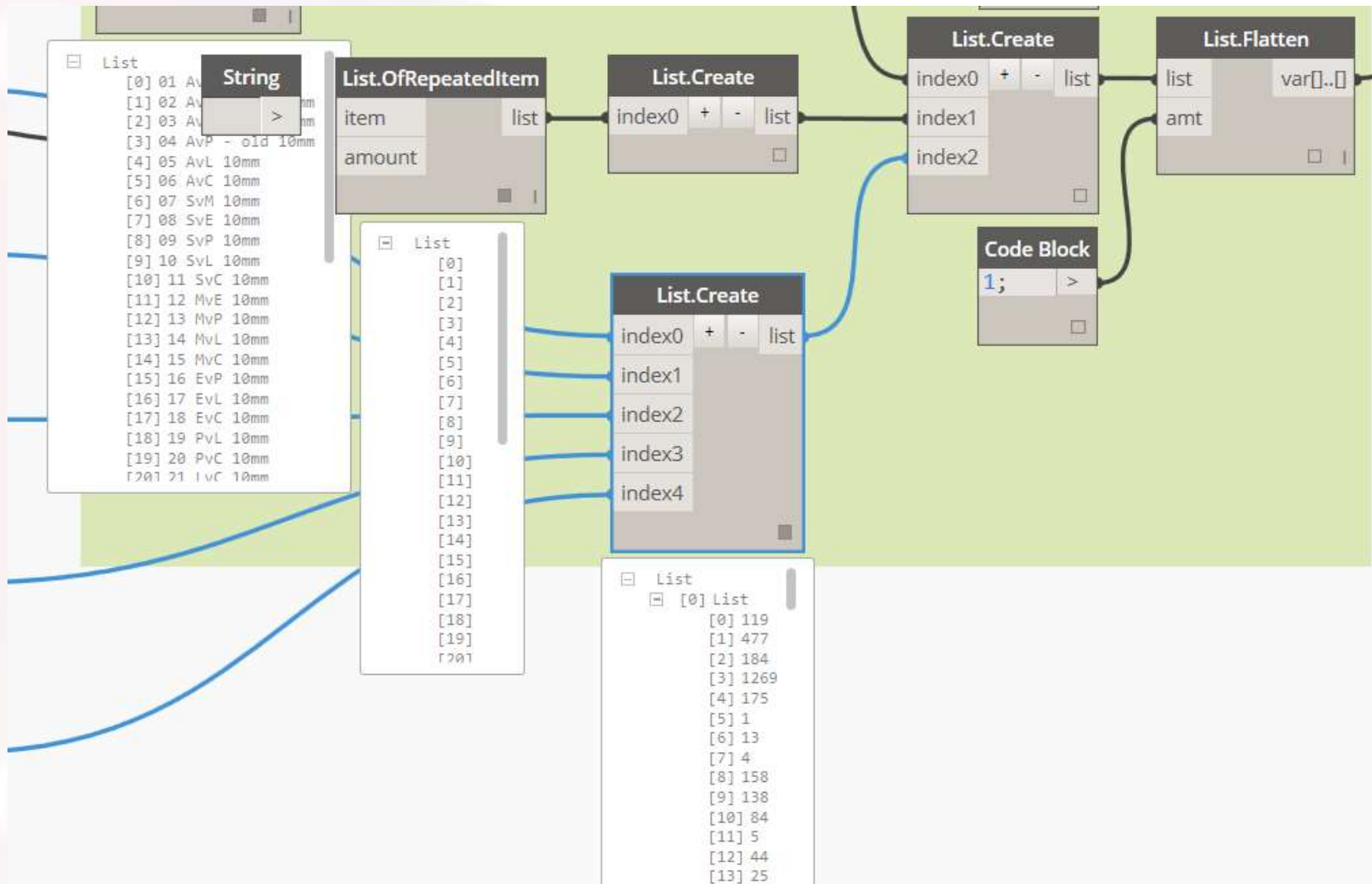
52 AvP Pods 10mm

53 AvP ZZ 10mm

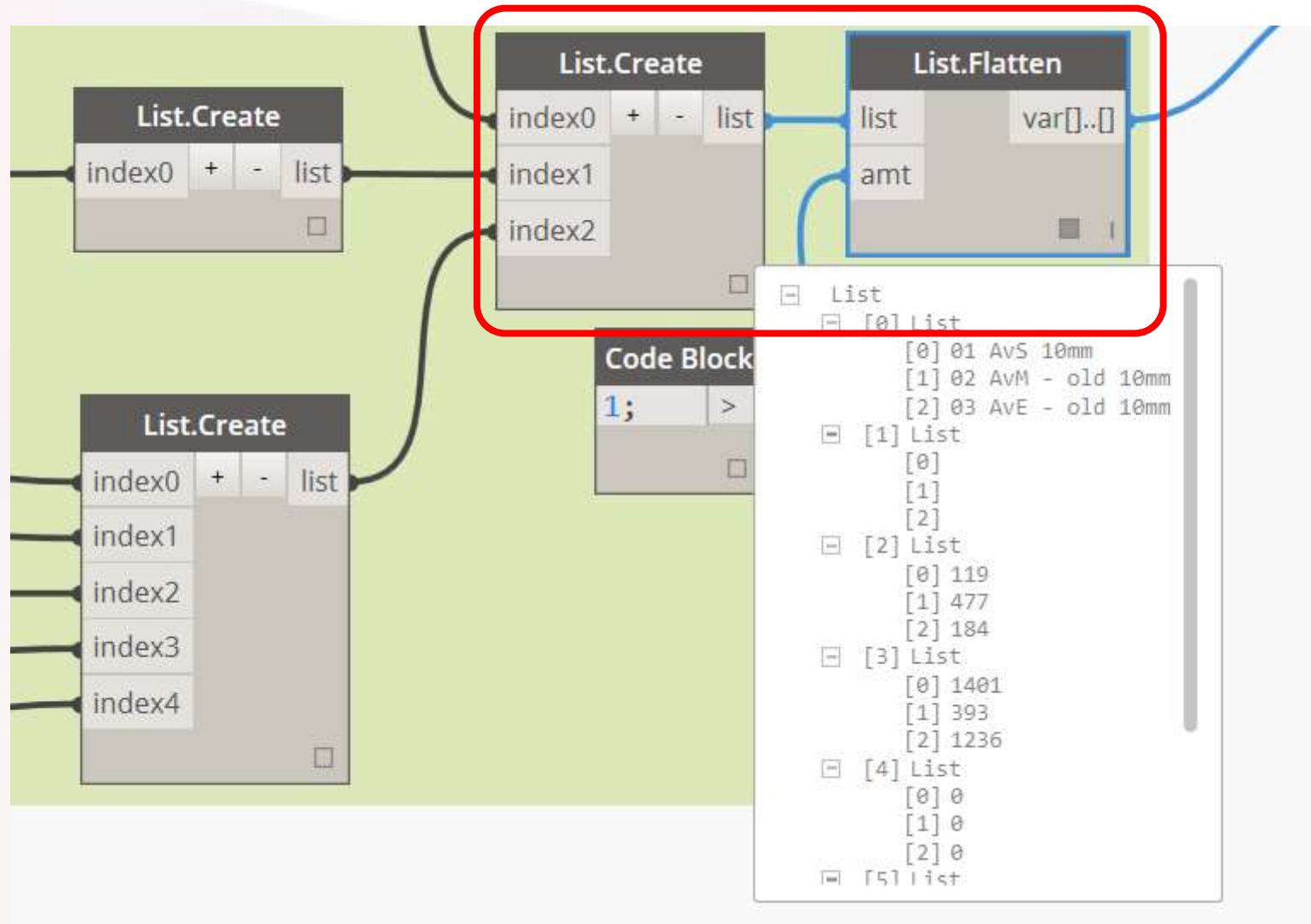
54 AvP Dura Grating 10mm



Re-Mapping ...



Flattening Lists of Lists into Excel format



Data Transfer

	A	B	C	D	E
1	Clashtest		01 AvS 10mm	02 AvM - old 10mm	03 AvE - old 10mm
2					
3	New		119	477	184
4	Active		1401	393	1236
5	Reviewed		0	0	0
6	Approved		1235	0	0
7	Resolved		15196	2831	879
8					
9					
10	Unresolved New+Active		1520	870	1420
11	Total		17951	3701	2299
12					
13					
14					
15					
16	last data exchange				
17	16/11/2015 12:41				
18					
19					
20					
21					
22					

CLEAR CELLS

[-] List
[-] [0] List
■ [0] 01 AvS 10mm
[1] 02 AvM - old 10mm
[2] 03 AvE - old 10mm
[-] [1] List
■ [0]
[1]
[2]
[-] [2] List
■ [0] 119
[1] 477
[2] 184
[-] [3] List
■ [0] 1401
[1] 393
[2] 1236
[-] [4] List
■ [0] 0
[1] 0
[2] 0
[-] [5] List

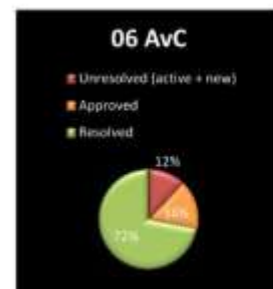
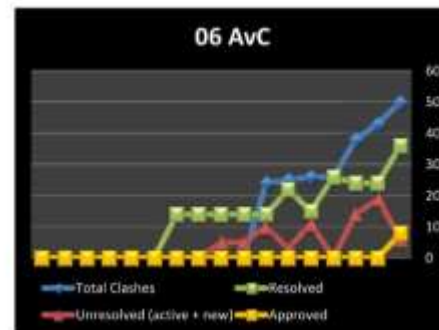


Dynamo Graph

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y
1	Clashes Total																								
2																									
3	Row Labels	Sum of Fed16	Sum of Fed15	Sum of Fed14	Sum of Fed13	Sum of Fed12	Sum of Fed11	Sum of Fed10	Sum of Fed09	Sum of Fed08	Sum of Fed07	Sum of Fed06	Sum of Fed05	Sum of Fed04	Sum of Fed03	Sum of Fed02	Sum of Fed01	Total Clashes							
4	01 AvS	16606	16369	16113	15016	11822	10884	10153	9785	8967	5017	4580	3371	3163	3039	2135	1442	01 AvS							
5	02 AvM - old	3224	2851	3071	2503	2324	2161	1931	1765	1544	1406	1341	1251	1228	1224	1161	1075	02 AvM - old							
6	03 AvE - old	2115	1968	1786	95	95	77	54	53	33	16	16	12	12	12	10	3	03 AvE - old							
7	04 AvP -old	22260	17950	15093	10824	10120	8885	6991	5663	4207	1895	1850	109	64	60	5	0	04 AvP - old							
8	05 AvL	576	527	471	370	366	358	284	222	160	70	48	37	11	9	0	0	05 AvL							
9	06 AvC	43	38	26	26	25	24	19	19	14	14	14	0	0	0	0	0	06 AvC							
10	07 SvM	651	611	907	893	879	876	843	809	714	682	665	609	602	602	507	473	07 SvM							
11	08 SvE	36	34	26	8	8	8	8	8	8	8	8	8	8	8	8	5	08 SvE							
12	09 SvP	7043	6699	4344	4160	4039	4021	3854	3469	3469	2005	1962	124	60	60	9	0	09 SvP							
13	10 SvL	492	481	446	377	377	359	343	265	198	135	80	61	27	21	0	0	10 SvL							
14	11 SvC	509	490	395	254	251	203	160	123	5	68	68	0	0	0	0	0	11 SvC							
15	12 MvE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12 MvE							
16	13 MvP	2	2	2	2	2	2	1	0	0	0	0	0	0	0	0	0	13 MvP							
17	14 MvL	72	68	52	14	14	14	14	14	7	1	1	0	0	0	0	0	14 MvL							
18	15 MvC	6	5	4	4	4	4	3	2	2	2	2	0	0	0	0	0	15 MvC							
19	16 EvP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16 EvP							
20	17 EvL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17 EvL							
21	18 EvC	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18 EvC							
22	19 PvL	28	22	14	14	13	12	12	8	8	4	4	0	0	0	0	0	19 PvL							
23	20 PvC	52	10	1	1	1	1	0	0	0	0	0	0	0	0	0	0	20 PvC							
24	21 LvC	20	20	20	20	20	20	20	20	19	19	19	0	0	0	0	0	21 LvC							
25	22 AvEC	572	526	331	166													22 AvEC							
26	23 SvEC	505	488	426	287													23 SvEC							
27	24 MvEC	198	178	158	33													24 MvEC							
28	25 EvEC	10	6	0	0													25 EvEC							
29	26 PvEC	21	5	2	0													26 PvEC							
30	27 LvEC	34	33	21	6													27 LvEC							
31	28 CvEC	81	69	54	36													28 CvEC							
32	30 AvM 0-fire rated Part. Wall	1187																30 AvM 0-fire rated Part. Wall							
33	31 AvM Façade	101																31 AvM Façade							
34	32 AvM Pods	35																32 AvM Pods							
35	33 AvM ZZ	345																33 AvM ZZ							
36	40 AvE 0-fire rated Part. Wall	58																40 AvE 0-fire rated Part. Wall							
37	41 AvE Façade	13																41 AvE Façade							
38	42 AvE Pods	0																42 AvE Pods							
39	43 AvE ZZ	1944																43 AvE ZZ							



Automated Tracker

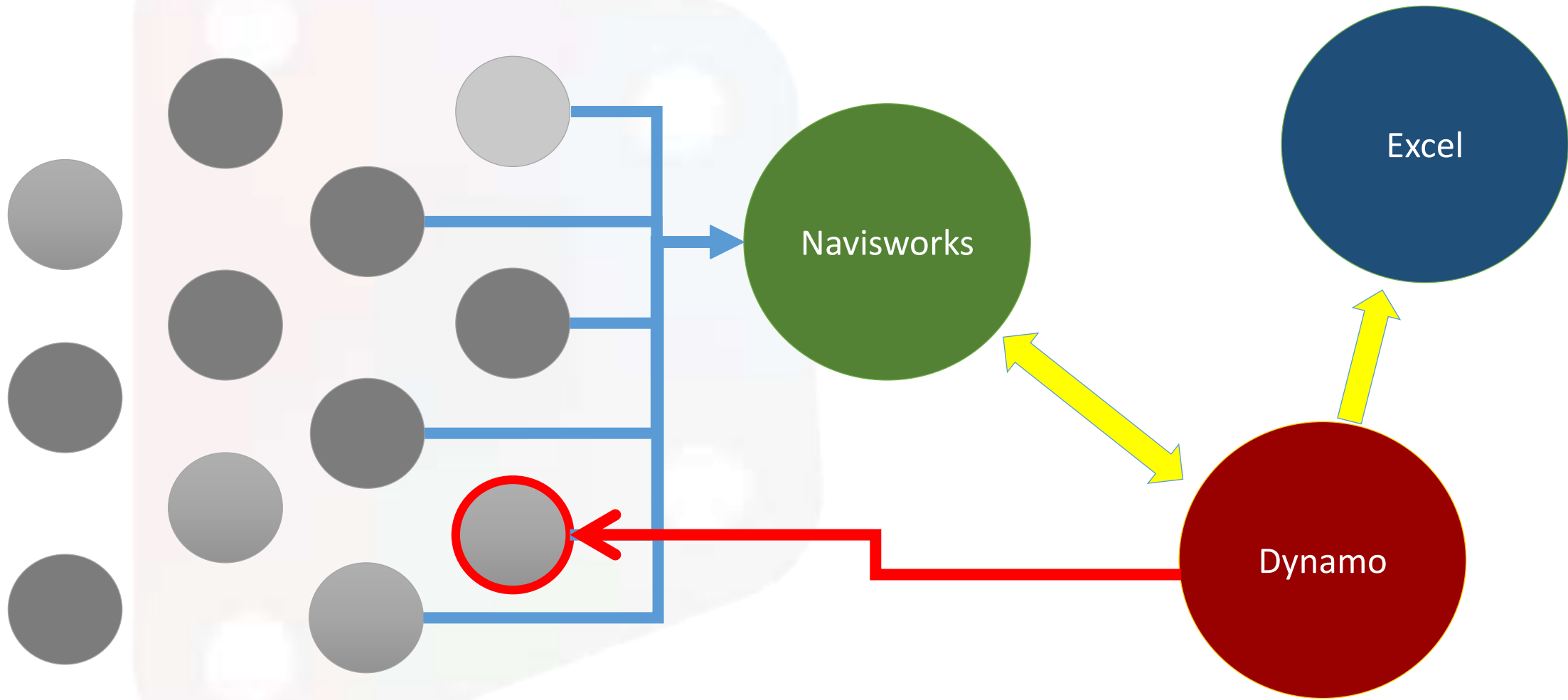




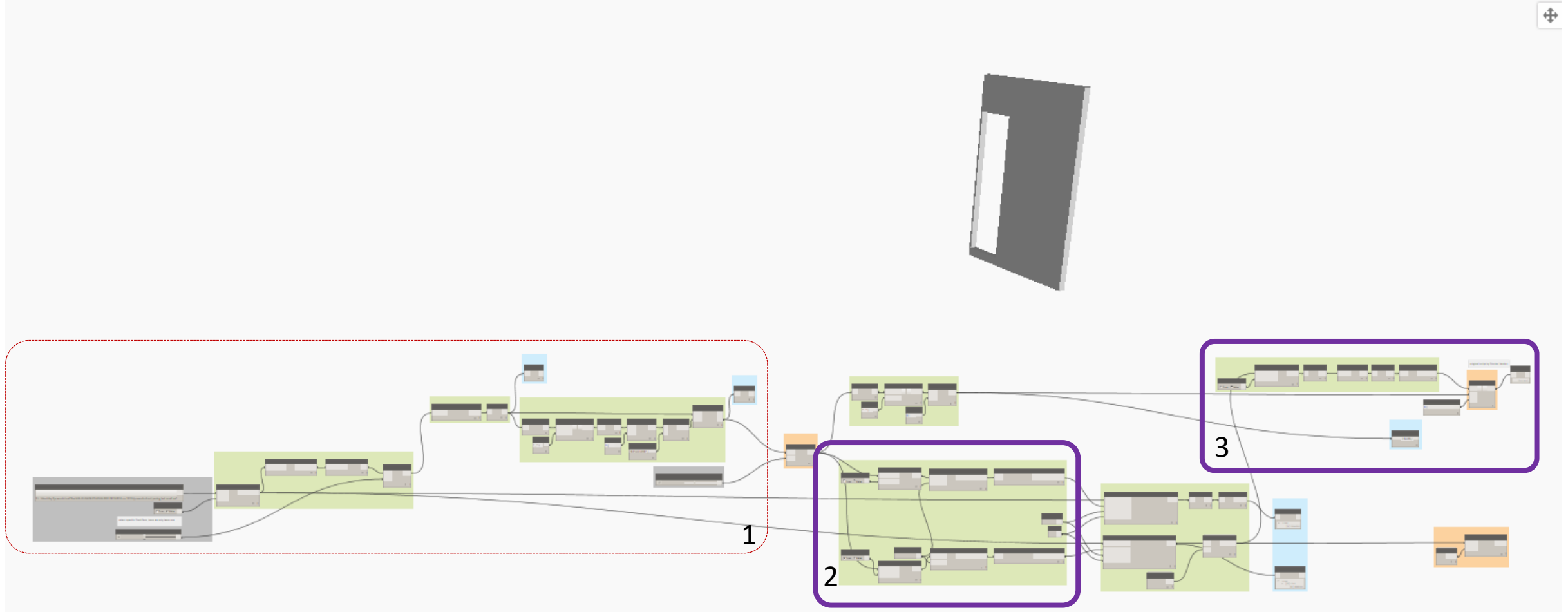
End of part I



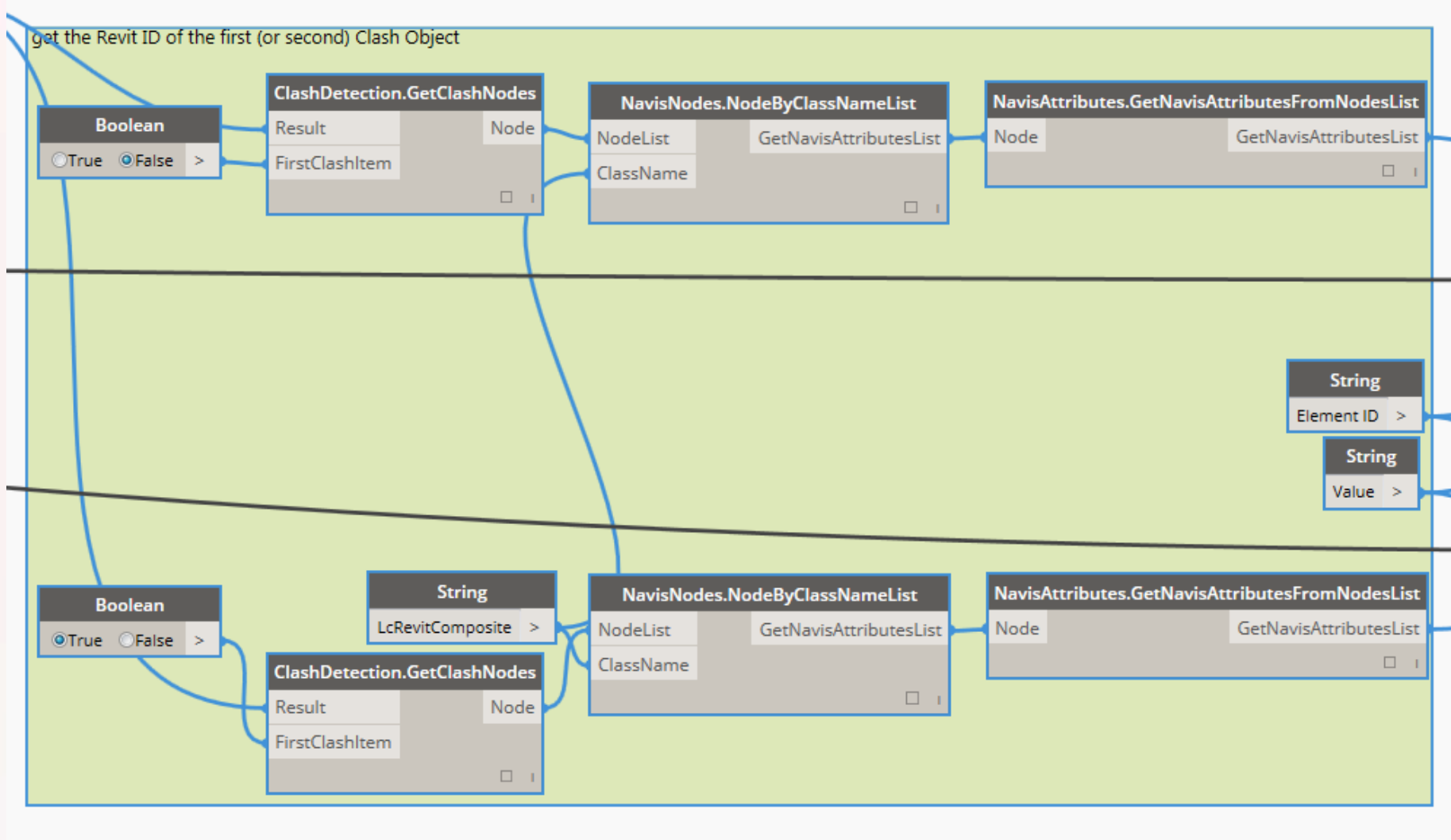
Automation as solution



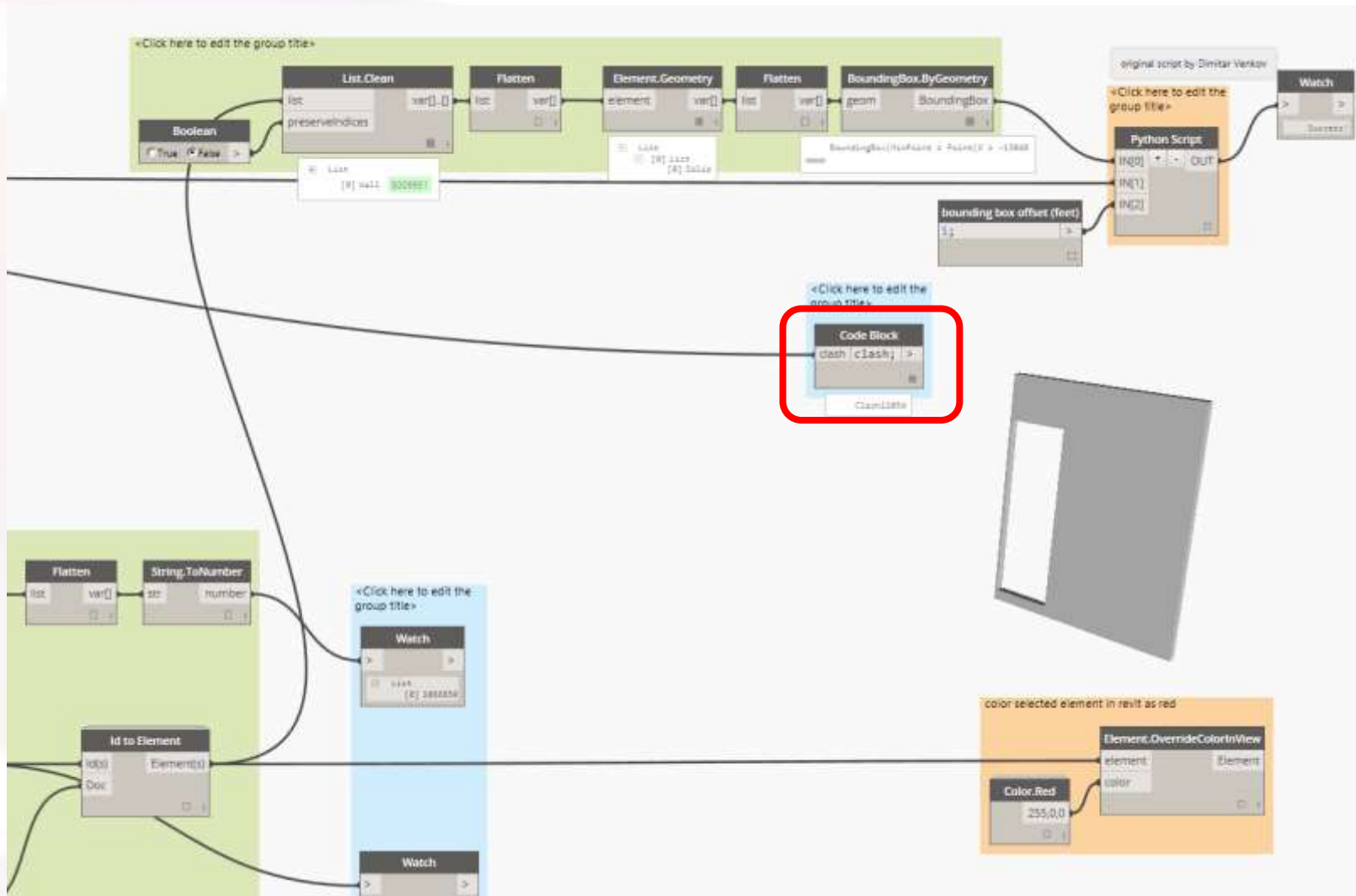
Revit Auto-Section Box



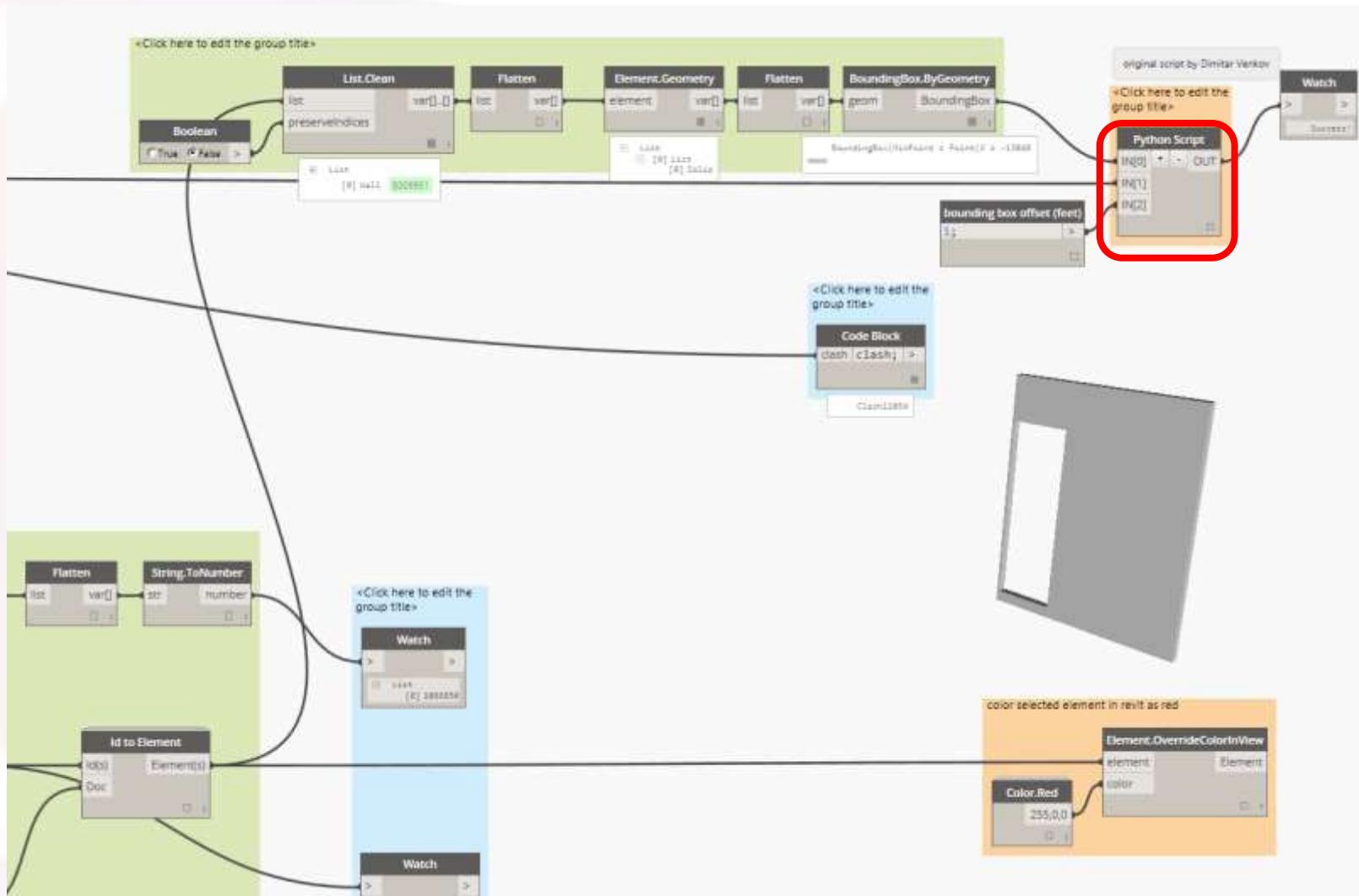
Getting Data from Item 1 and 2



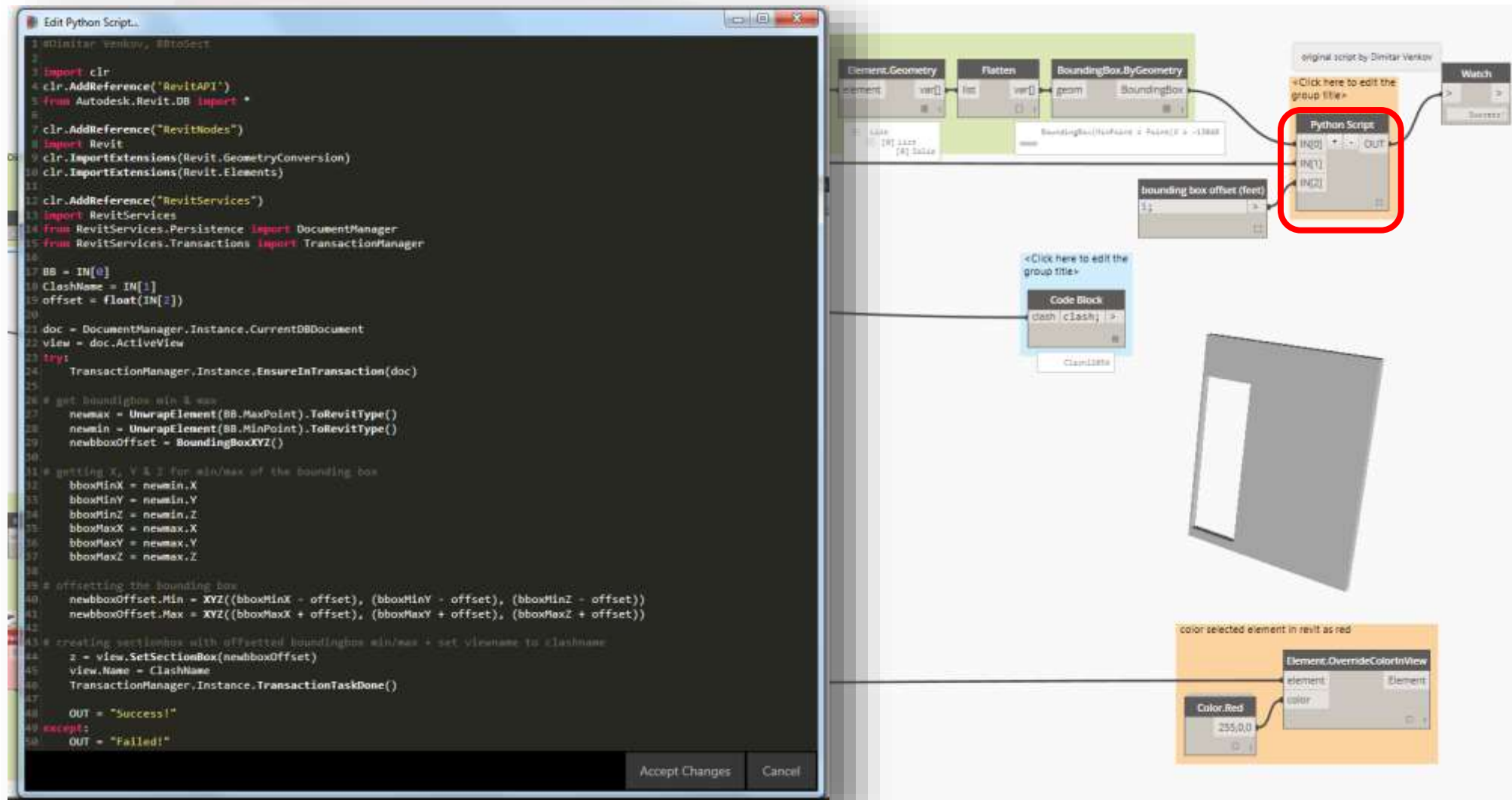
Get Clash No.



Create Section Box



Python API Access



Python script by Dimitar Venko

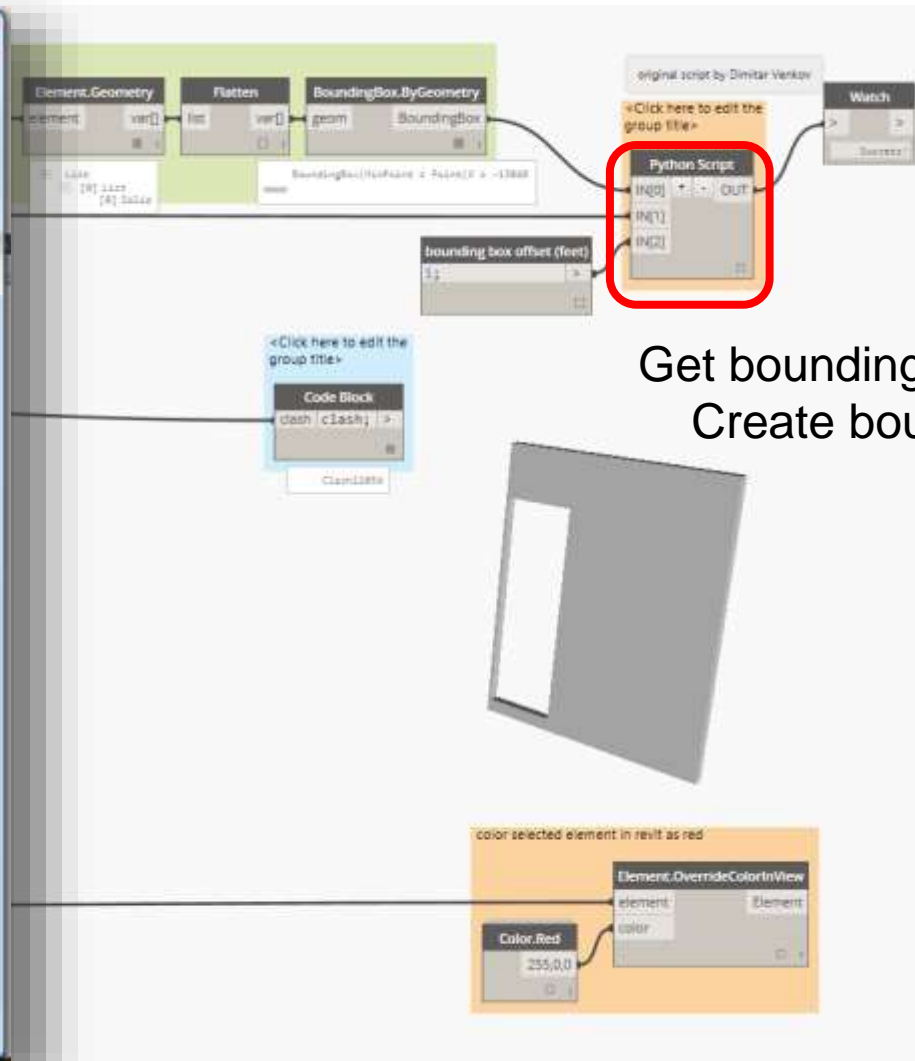
UK DYNAMO USER GROUP | SOUTH
#TStrathaus 26th July 2016



Python API Access

```
1 #Dimitar Venkov, BBtoSet
2
3 import clr
4 clr.AddReference('RevitAPI')
5 from Autodesk.Revit.DB import *
6
7 clr.AddReference("RevitNodes")
8 import Revit
9 clr.ImportExtensions(Revit.GeometryConversion)
10 clr.ImportExtensions(Revit.Elements)
11
12 clr.AddReference("RevitServices")
13 import RevitServices
14 from RevitServices.Persistence import DocumentManager
15 from RevitServices.Transactions import TransactionManager
16
17 BB = IN[0]
18 ClashName = IN[1]
19 offset = float(IN[2])
20
21 doc = DocumentManager.Instance.CurrentDBDocument
22 view = doc.ActiveView
23 try:
24     TransactionManager.Instance.EnsureInTransaction(doc)
25
26     # get boundingbox min & max
27     newmax = UnwrapElement(BB.MaxPoint).ToRevitType()
28     newmin = UnwrapElement(BB.MinPoint).ToRevitType()
29     newbboxOffset = BoundingBoxXYZ()
30
31     # getting X, Y & Z for min/max of the bounding box
32     bboxMinX = newmin.X
33     bboxMinY = newmin.Y
34     bboxMinZ = newmin.Z
35     bboxMaxX = newmax.X
36     bboxMaxY = newmax.Y
37     bboxMaxZ = newmax.Z
38
39     # offsetting the bounding box
40     newbboxOffset.Min = XYZ((bboxMinX - offset), (bboxMinY - offset), (bboxMinZ - offset))
41     newbboxOffset.Max = XYZ((bboxMaxX + offset), (bboxMaxY + offset), (bboxMaxZ + offset))
42
43     # creating sectionbox with offsetted boundingbox min/max + set viewname to clashname
44     z = view.SetSectionBox(newbboxOffset)
45     view.Name = ClashName
46     TransactionManager.Instance.TransactionTaskDone()
47
48     OUT = "Success!"
49 except:
50     OUT = "Failed!"
```

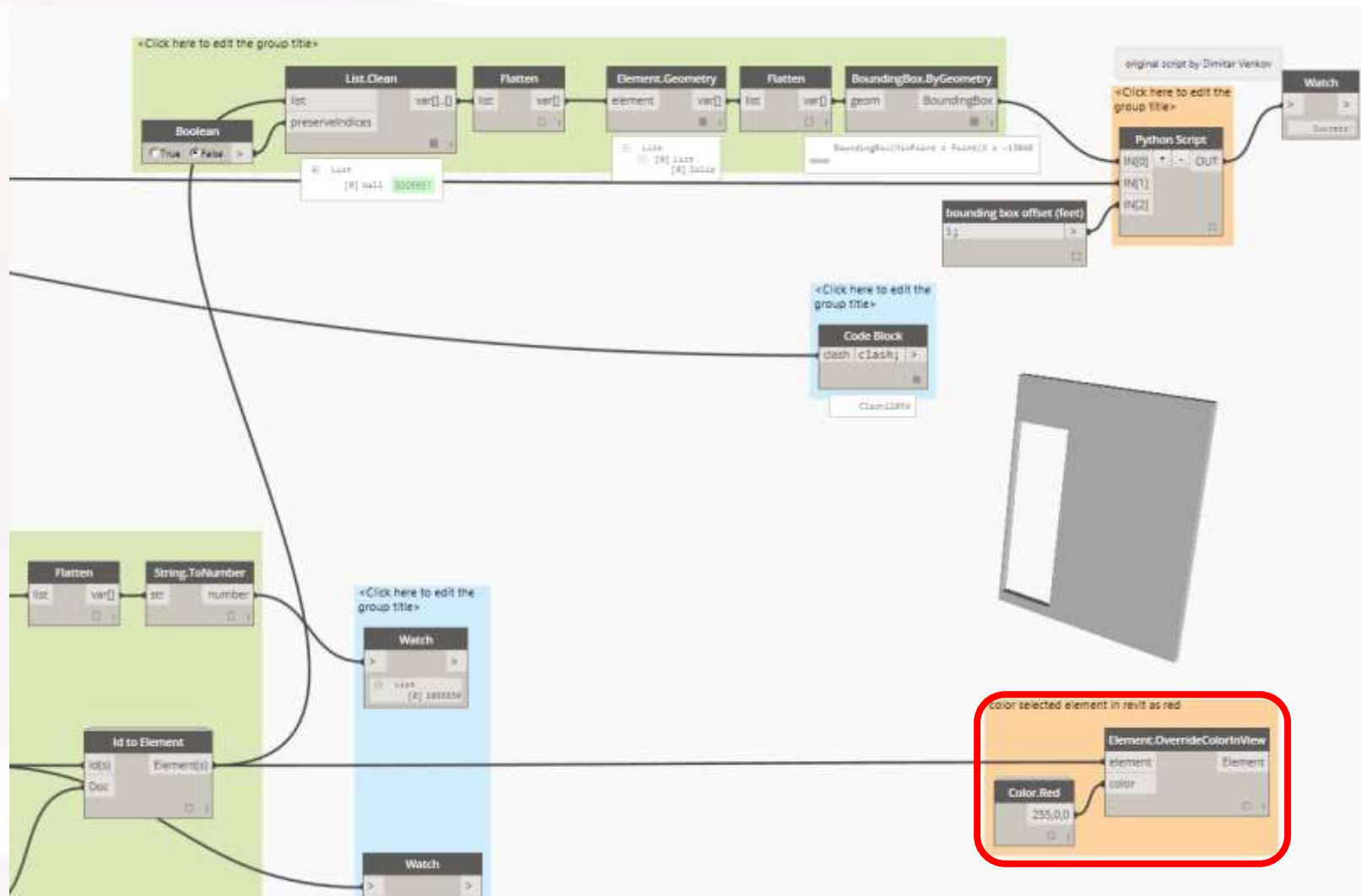
Python script by Dimitar Venko



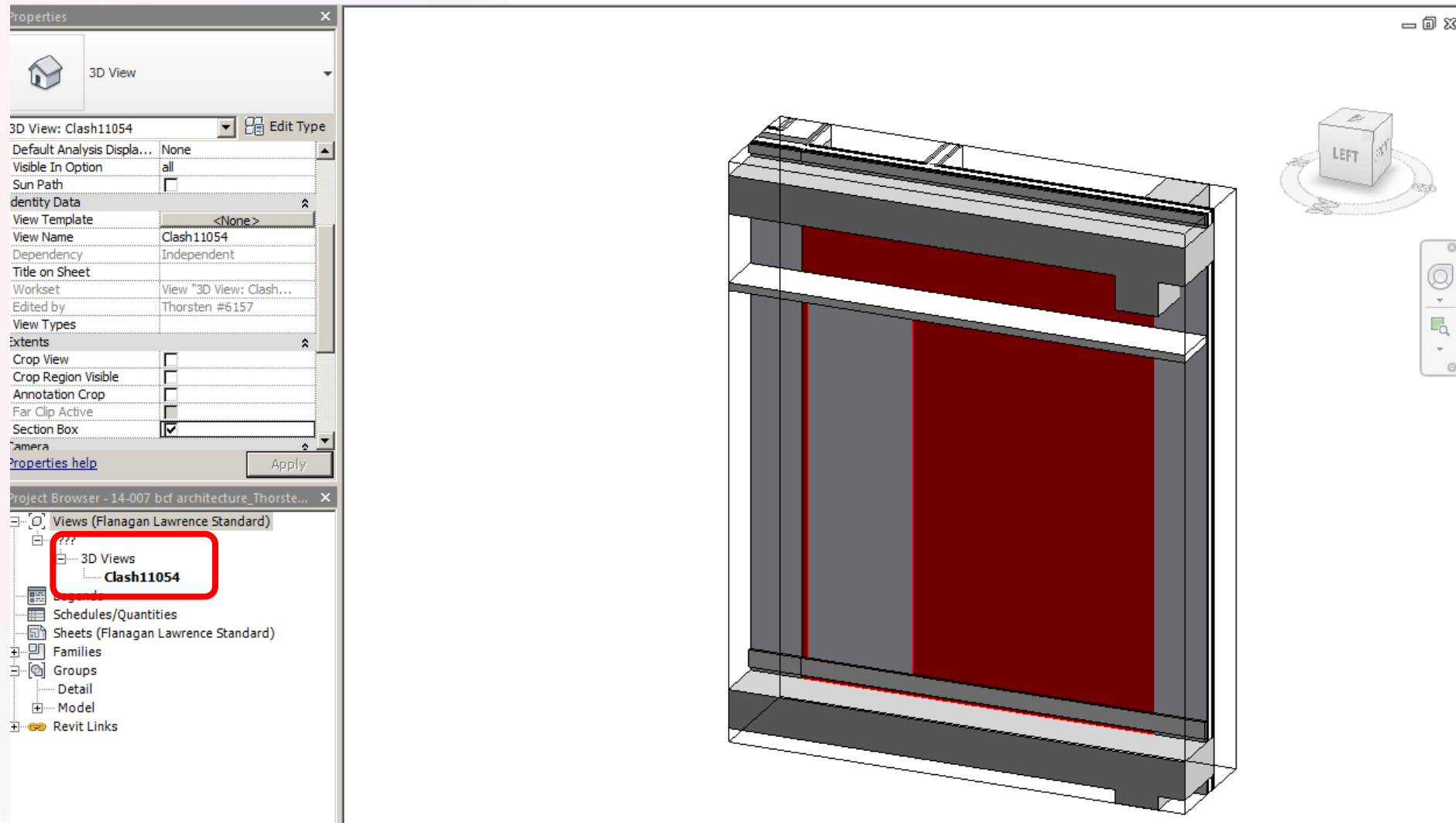
Get element
Get bounding box from element
Create bounding box in Revit



Override Colour of Element to Highlight



Generated View in Revit





End of part II

