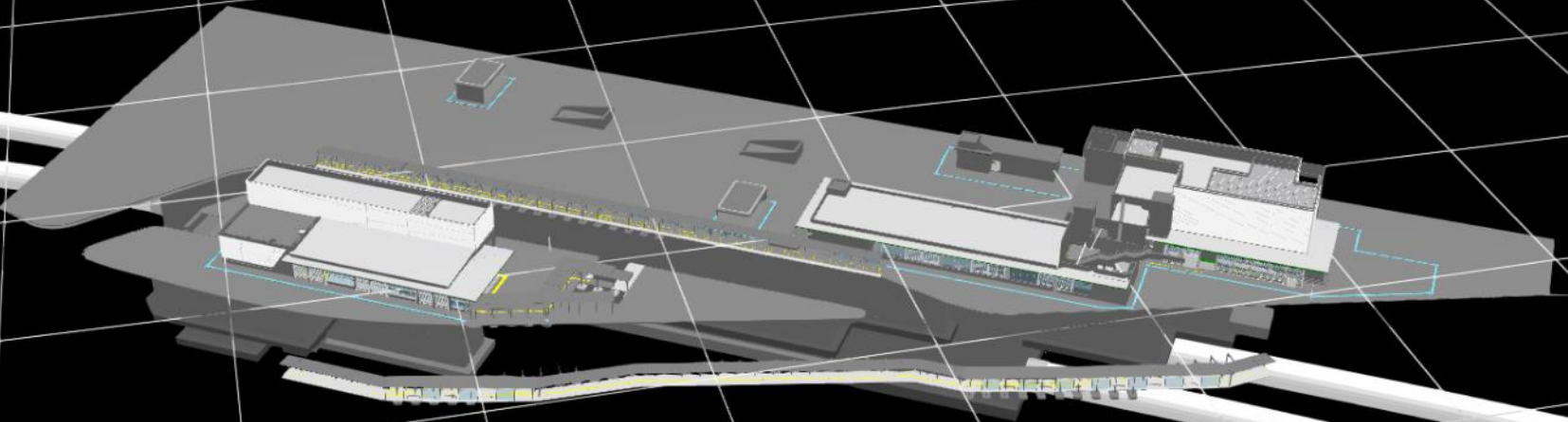


# From 1's & 0's to Bricks & Mortar

## Taking BIM from the Cloud to Site



Ir. Ronan Collins  
@ronan\_kl

Share Knowledge  
Educate & Inspire

Source: USGS, NOAA, NASA, GSA, CDC, CERCLA, NRECA, NCEAS, NLS, OS, MMA, Grandfathered, and the GIS User Community.

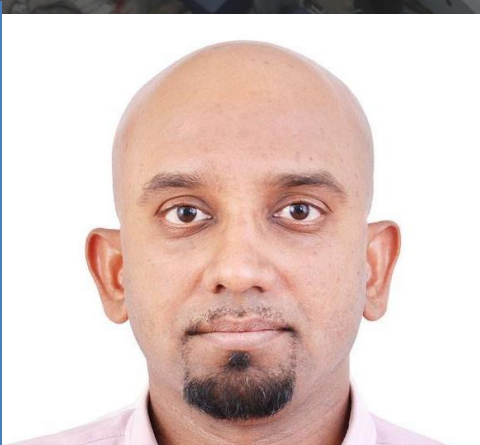
# Share Knowledge Educate & Inspire

# From 1's & 0's to Bricks & Mortar

## Taking BIM from the Cloud to Site







**Our People are BIM Innovators ... This is Their Story**



# Gamuda Land and IBS



Devendran Krishnamoorthy  
GM - IBS Design



Lydia Anak Nyomek  
BIM Architect



We design & manufacture using BIM



## BIM Studio Launch

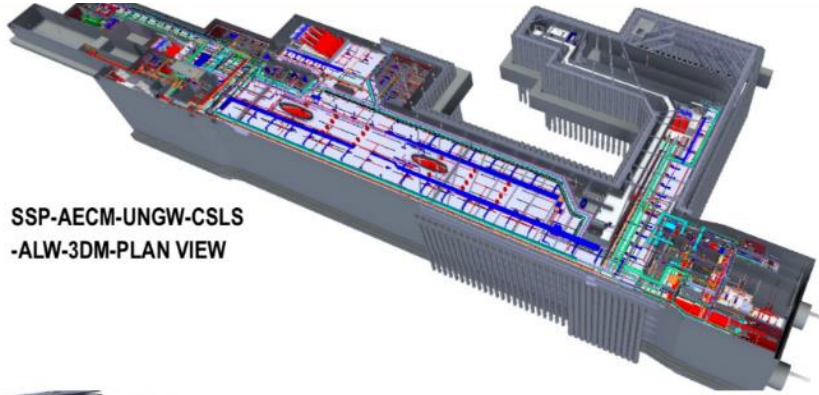
Posted by Kamini Raja Singgam

222 Views

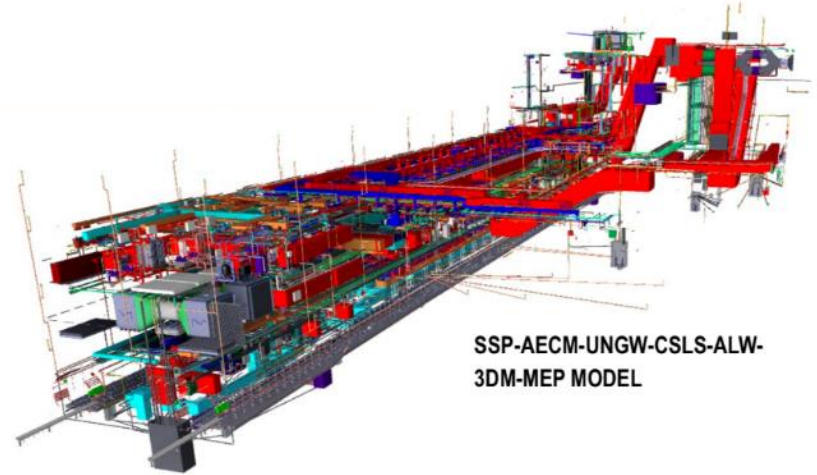




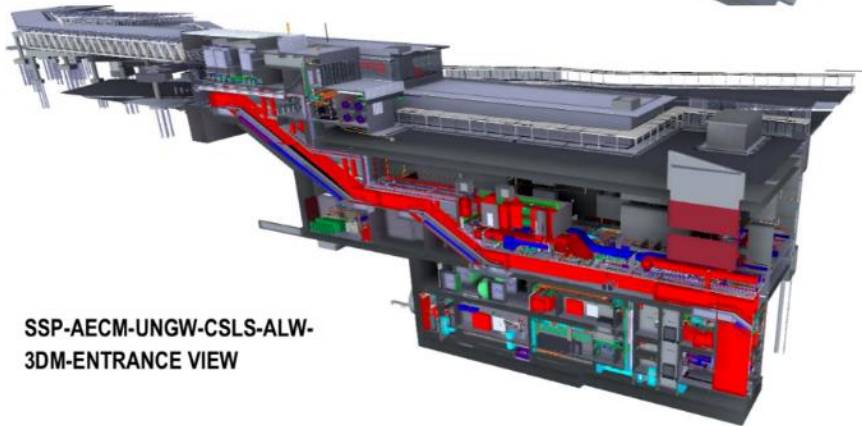
# MRT Station BIM – We Model Everything



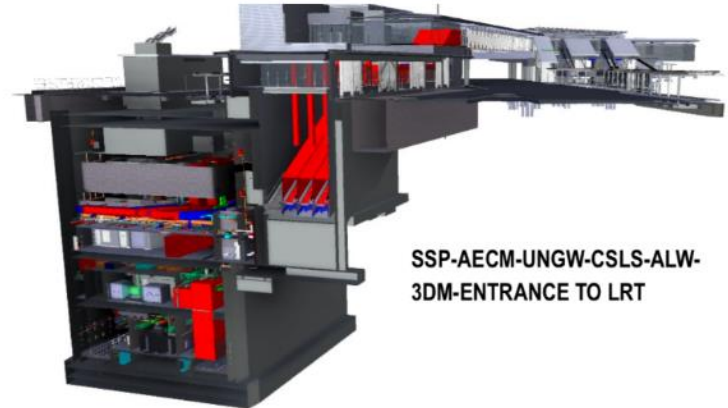
SSP-AECM-UNGW-CSLS  
-ALW-3DM-PLAN VIEW



SSP-AECM-UNGW-CSLS-ALW-  
3DM-MEP MODEL



SSP-AECM-UNGW-CSLS-ALW-  
3DM-ENTRANCE VIEW



SSP-AECM-UNGW-CSLS-ALW-  
3DM-ENTRANCE TO LRT

# Titiwangsa Site Model





# Gamuda Buildings & Engineering



Aloysies Nathan  
BIM Manager



## CIDB Accredited BIM Managers

Rahimee Musa  
BIM Lead







# BIM Team Gamuda Building Unit

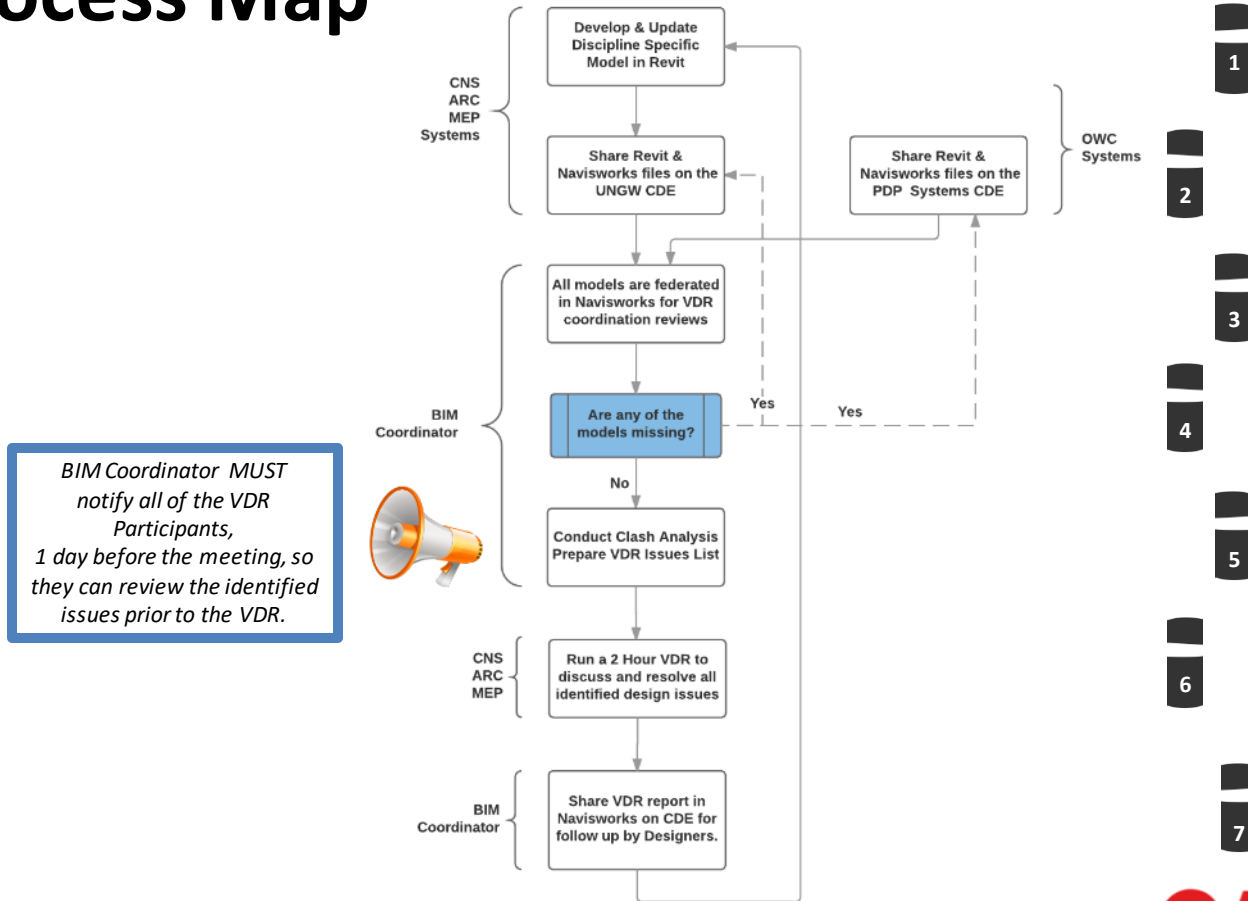
# Virtual Design Reviews



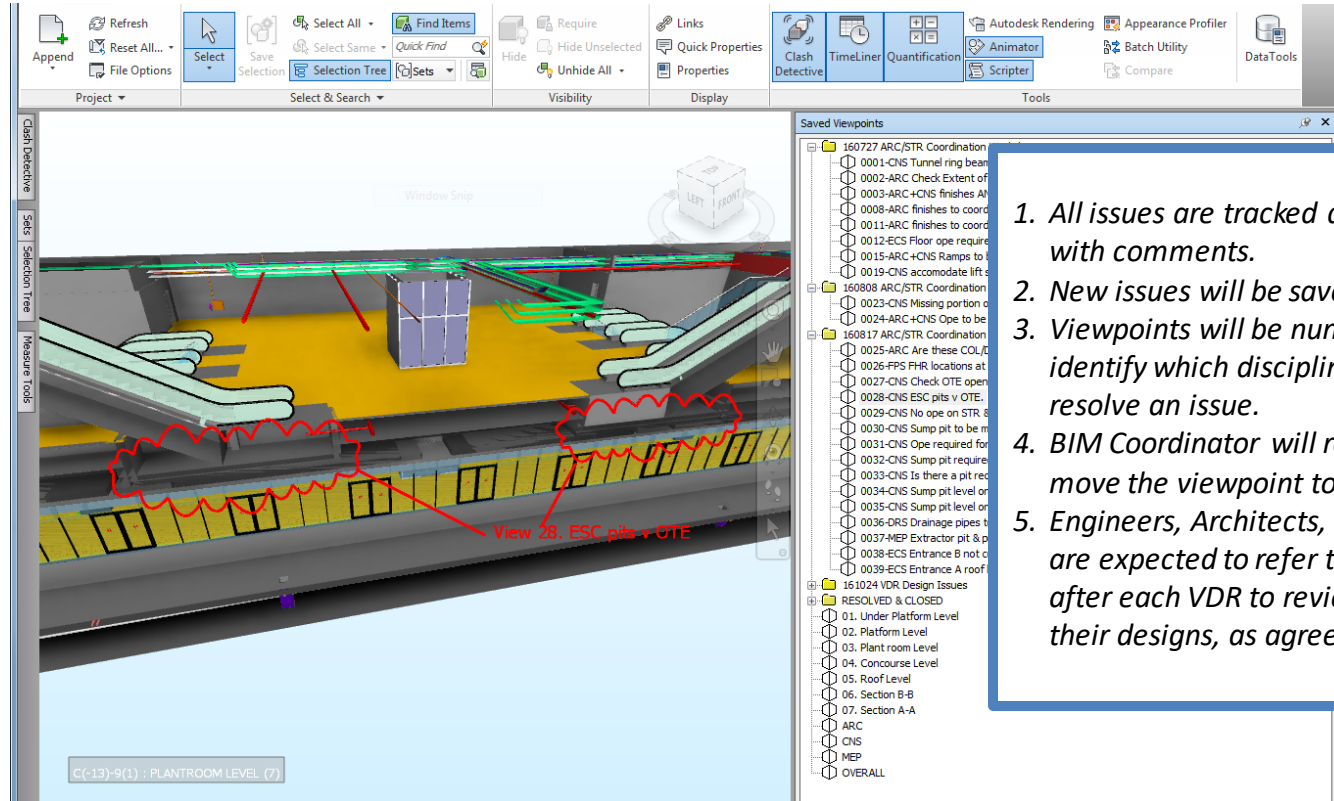
BIM Coordination Meeting between consultants & contractor.  
Solving Architectural, Structural and M&E issues before construction.  
Saving a lot of valuable time and avoiding site problems



# VDR Process Map



# Virtual Design Review Process



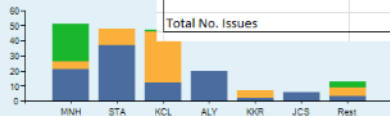
1. All issues are tracked as Saved Viewpoints in Navisworks with comments.
2. New issues will be saved in a dated folder for each VDR.
3. Viewpoints will be numbered from 0001 to 9999 and will identify which discipline needs to revise their designs to resolve an issue.
4. BIM Coordinator will review previous issues and if resolved move the viewpoint to a "Resolved & Closed" folder.
5. Engineers, Architects, BIM coordinators and technicians are expected to refer to the Navisworks .NWD on the CDE after each VDR to review the raised issues and amend their designs, as agreed, to resolve them.



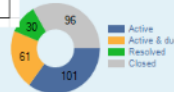
# Virtual Design Review Process

## STWS - Sentul West Station

Project owner: -  
Can close: Project leaders and creator  
Duration: 27-02-2017 - ...  
Issues: 288  
Team members: 33

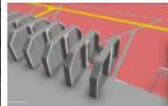


Date of Report	14 August 2017
14 days or less	109
14 to 28 days	29
More than 1 month	54
<b>Total No. Issues</b>	<b>192</b>

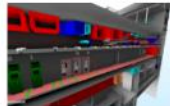


Edit project

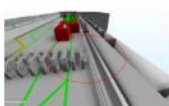
My settings



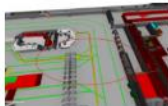
20 - 0135-OWC-CL-SY207 TKG Ah...  
Ahmad SS07  
Resolved, Normal  
Design phase, Concourse Le...



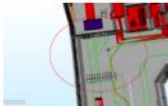
87 - 0215-OWC to align TVM with A...  
Ahmad SS07  
Active, Normal  
Design phase, Concourse Le...



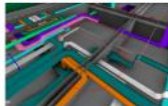
144 - SY029 - 207-ARC - Coordinat...  
Ahmad SS07  
Resolved, Normal  
Design phase, Concourse Le...



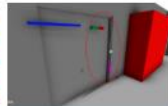
157 - SY046 - 207/103 - Coordinat...  
Ahmad SS07  
Active, Normal  
Design phase, Concourse Le...



158 - SY047 - 207/103 - New Inverlin...  
Ahmad SS07  
Active, Normal  
Design phase, Concourse Le...



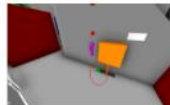
238 - 0353-ELE Cable trays collide ...  
Alex Yeung  
Active, Normal  
Design phase, Under Platform...



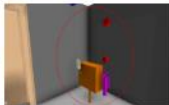
239 - 0354-FPS misplaced  
Alex Yeung  
Active, Normal  
Design phase, Platform Level



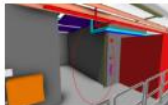
240 - 0355-FPS misplaced  
Alex Yeung  
Active, Normal  
Design phase, Platform Level



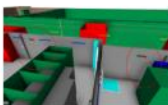
241 - 0356-MEP\_Floor trap misplac...  
Alex Yeung  
Active, Normal  
Design phase, Platform Level



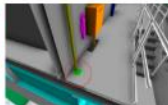
242 - 0357-FPS misplaced  
Alex Yeung  
Active, Normal  
Design phase, Platform Level



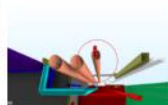
243 - 0358-MEP\_FPS misplaced  
Alex Yeung  
Active, Normal  
Design phase, Platform Level



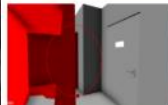
244 - 0359-MEP\_FPS misplaced  
Alex Yeung  
Active, Normal  
Design phase, Platform Level



245 - 0360-MEP\_Floor trap misplac...  
Alex Yeung  
Active, Normal  
Design phase, Platform Level



246 - 0361-MEP\_Pipes collided  
Alex Yeung  
Active, Normal  
Design phase, Platform Level



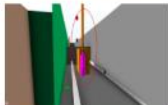
247 - 0362-MEP\_Hydrant misplaced  
Alex Yeung  
Active, Normal  
Design phase, Concourse Le...



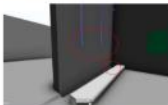
248 - 0363-MEP\_FPS and floor trap...  
Alex Yeung  
Active, Normal  
Design phase, Concourse Le...



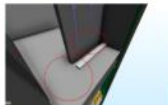
250 - 0365-MEP\_Floor trap misplac...  
Alex Yeung  
Active, Normal  
Design phase, Concourse Le...



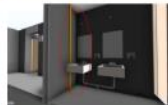
250 - 0366-MEP\_FPS and floor trap...  
Alex Yeung  
Active, Normal  
Design phase, Concourse Le...



250 - 0379-MEP\_Misplaced tapflo...  
Alex Yeung  
Active, Normal  
Design phase, Concourse Le...

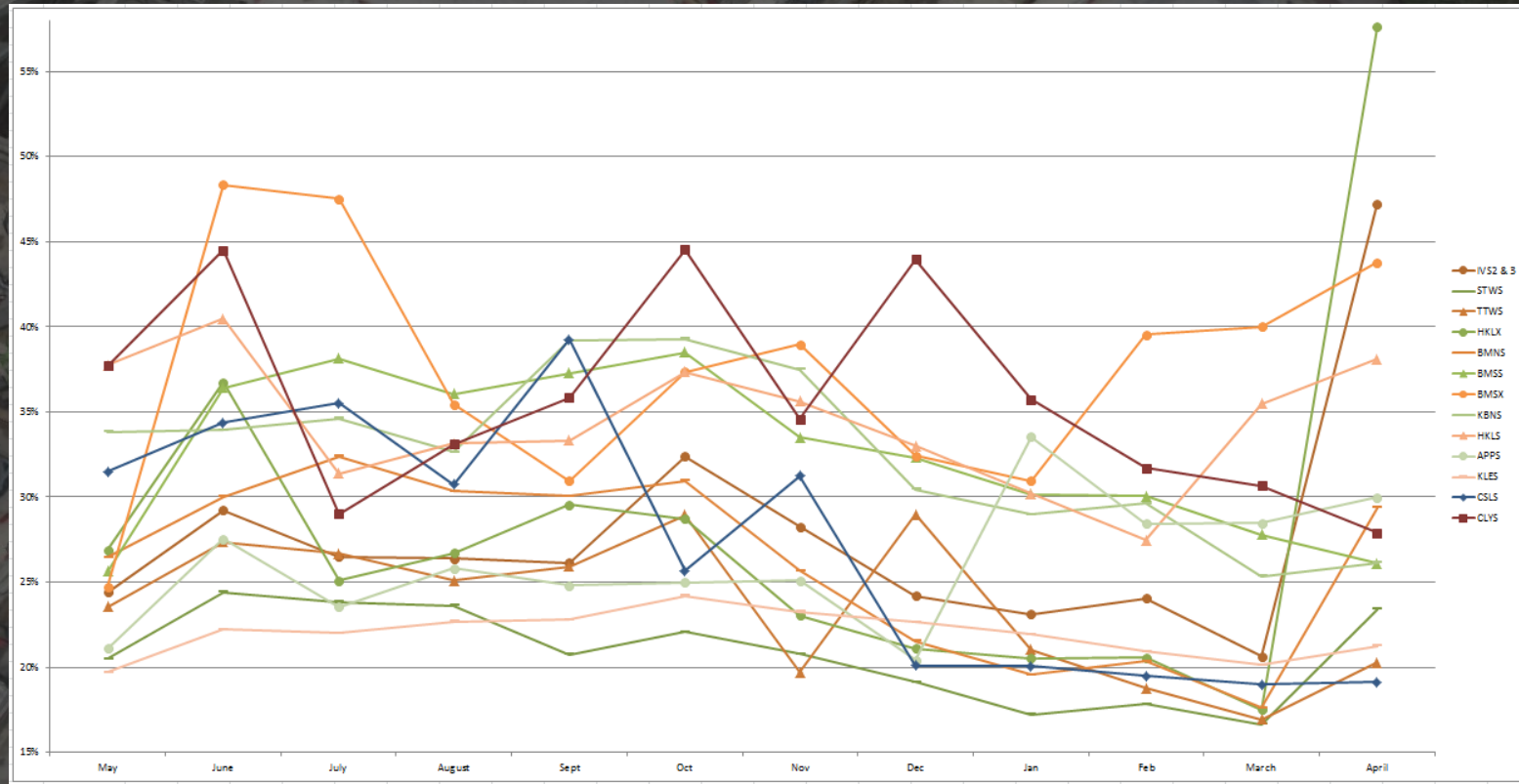


260 - 0381-ARC-MEP\_Misplaced ta...  
Alex Yeung  
Resolved, Normal  
Design phase, Concourse Le...



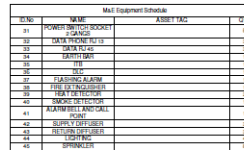
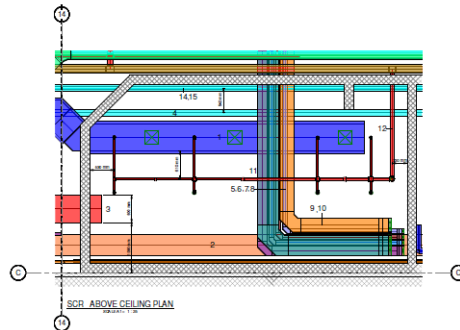
261 - 0382-MEP\_DRS Pipe placem...  
Alex Yeung  
Active, Normal  
Design phase, Concourse Le...

# Coordination Issues Tracker





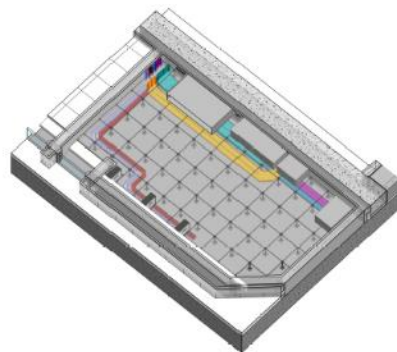
SAMPLE



Labels: 10/15/15 to 10/15/15 (all dates)		10/15/15 (all dates)	
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 all	all	 all	all
 10/15/15	10/15/15	 10/15/15	10/15/15
 10/15/15	10/15/15	 10/15/15	10/15/15
 10/15/15	10/15/15	 10/15/15	10/15/15
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 10/15/15	10/15/15	 10/15/15	10/15/15
<b>10/15/15</b>		<b>10/15/15</b>	
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 10/15/15	10/15/15	 10/15/15	10/15/15
 10/15/15	10/15/15	 10/15/15	10/15/15







SAMPLE

[illegible][illegible]

Designed By: Designer	Reviewed By: Reviewer
Drawn By: Author	Print: 1 of 1
Reviewed By: Designer	Date:
Notes: Notes - Add to drawing outside limits when no content	

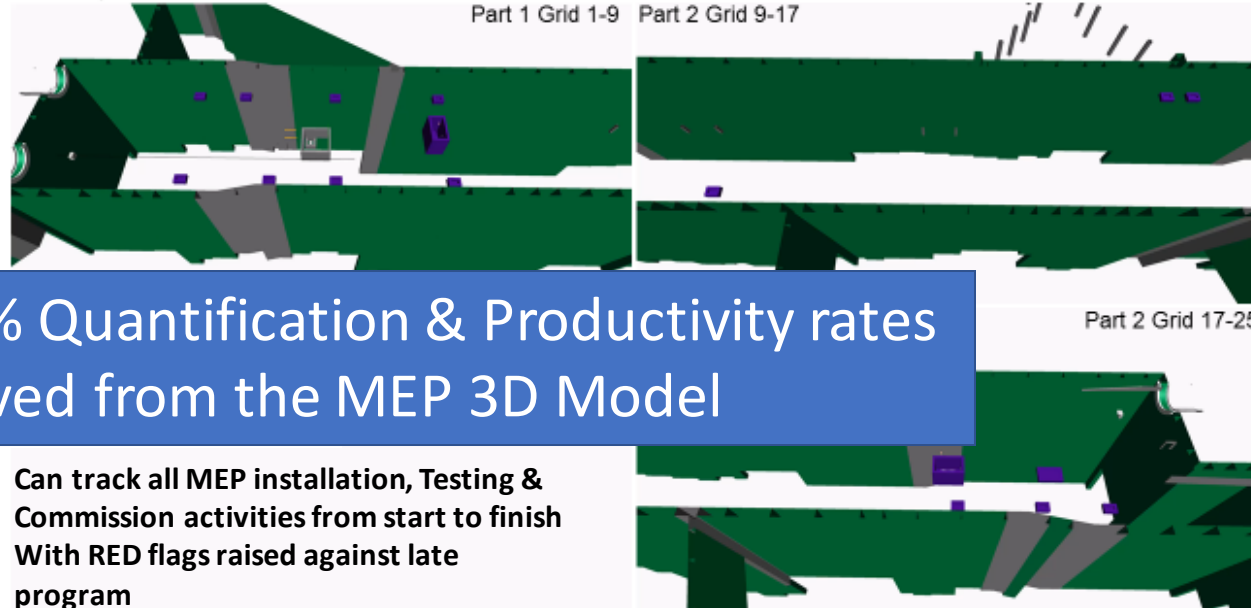
Drawing Title:

**DANCE & KARAOKE NORTH**  
**STATION**

# KBNS 4D Planned CIP for M&E

KBNS STATION  
Planning Template – M & E  
Based on Template CIP

 **MMC-GAMUDA**   
KVMRT (T) SDN BHD

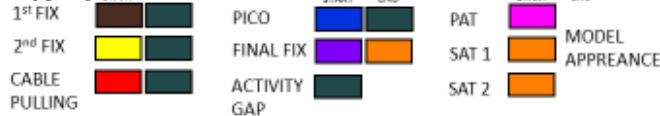


100% Quantification & Productivity rates  
derived from the MEP 3D Model

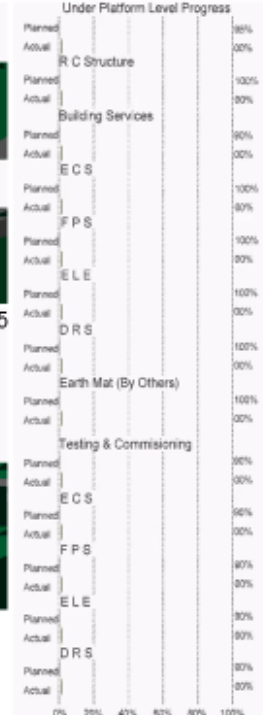
Can track all MEP installation, Testing &  
Commission activities from start to finish  
With RED flags raised against late

program

Appearance Profiles :  
items



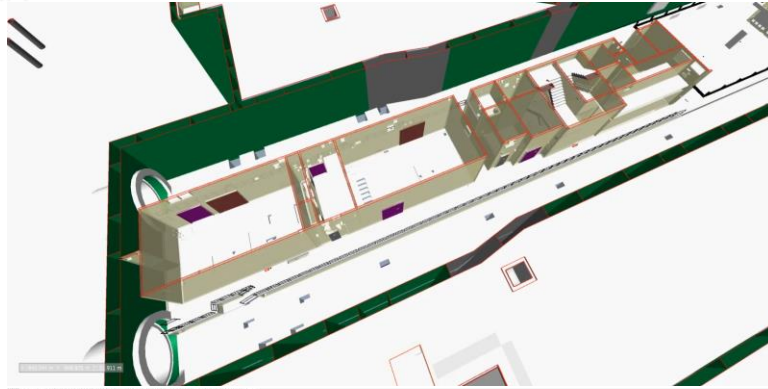
Under Platform Level M&E  
Programmer 15/10/19 to 26/06/2020



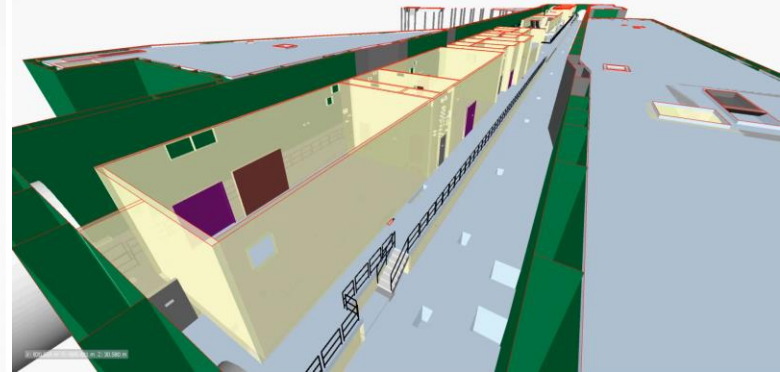
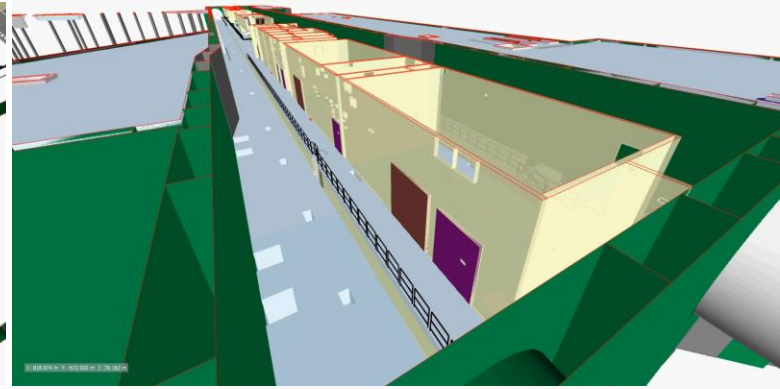
# KBNS STATION

## Planning Template – M & E

Based on Template CIP






Monday 8:00:00 AM 7/13/2020 Day=1 Week=1  
New Data Source (Root) [58%]  
KAMPUNG BARU NORTH STATION [M&E 54%]  
SITE INSTALLATION [60%]  
Platform Level [28%]  
ABWF Platform [54%]  
ABWF Zone 1 [76%]  
ABWF 1st Fix (Civil 76%)  
ABWF Zone 2 [76%]  
ABWF 1st Fix (Civil 76%)  
ABWF Zone 3 [54%]  
ABWF 1st Fix (Civil 54%)  
Building Services [28%]  
Zone 2 - BufferArea4 [33%]  
Under Platform Level [45%]  
Building Services [45%]  
DRS [90%]  
T&C [40%]  
ECS [25%]  
FPS [25%]  
ELE [40%]  
DRS [40%]



ZONE 1

### Appearance Profiles :

	START	END		START	END		START	END
1 <sup>st</sup> FIX			PICO			PAT		
2 <sup>nd</sup> FIX			FINAL FIX			SAT 1		MODEL
CABLE			ACTIVITY			SAT 2		APPEARANCE
PULLING			GAP					

Platform Level M&E Programmer  
15/07/20 to 01/06/2021



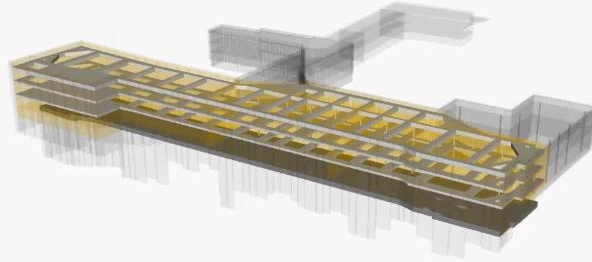
# TITIWANGSA STATION CONSTRUCTION PROGRESS UP TO OCTOBER 2018

Based on Baseline 3.0 rev

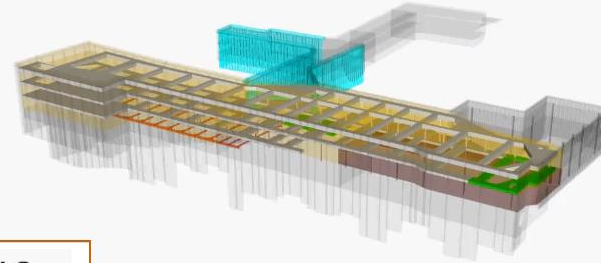
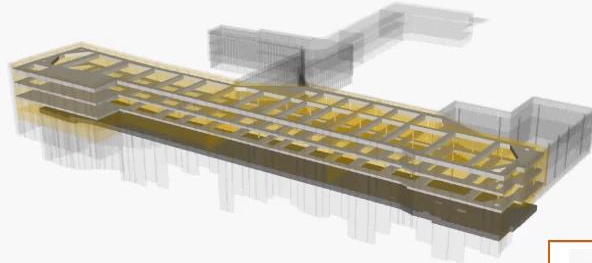
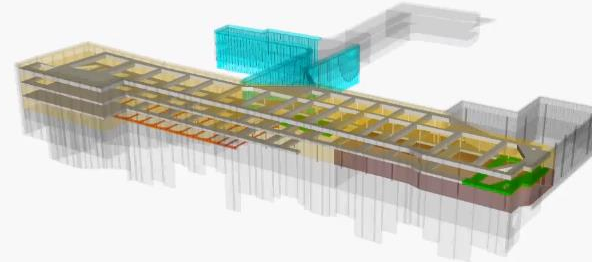
PLANNED

ACTUAL

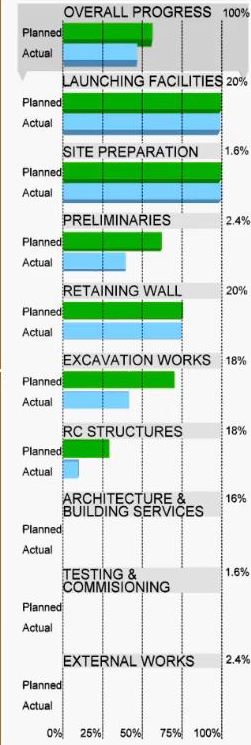
Progress : 56.25%





Progress : 44.95%





01 Jul 2018







Appearance Profiles :

	START	END
RETAINING WALL		
EXCAVATION		

	START	END
RC STRUT / SLAB		
RC WALL / COLUMN		

	START	END
RECTIFICATION		
ABOVE ROOF STRUCTURE		

	START	END
DISASSEMBLE		
STEEL STRUT		

# Application of 5D BIM & Role of QS

5D QTO

Revision  
Management

Model Validation

Progress  
Payments

Virtual Trade  
Packages



# Benefits of 5D - BIM

- **Accurate** estimates
- Save time by **automation** of the process using BIM processes
- Detailed models can generate quantity take-offs of the materials and assemblies which are then integrated with estimating software.
- Generate and update the **Cost Plan** to supply and install each building component.
- Cost information adds level of **Transparency** in the project budget
- Increases **Certainty** in the budget
- Facilitate **Value Engineering** in design and construction phases.
- Reduce the contingencies that are carried in traditional construction projects, resulting in a **Lower Cost**



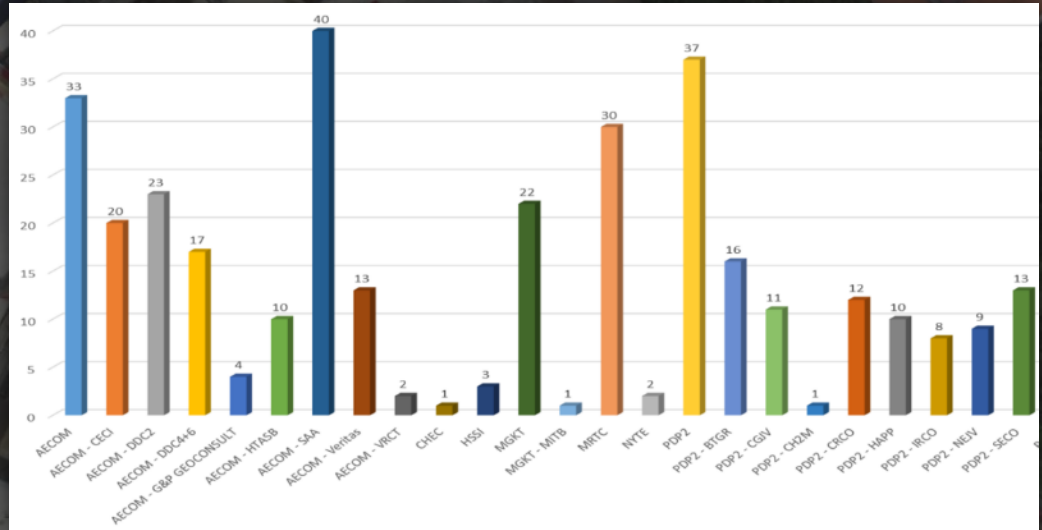
# CDE Common Data Environment

# Key Points

- CDE = single source of truth & makes collaboration easier
- Use common and compatible formats e.g. Revit, Navisworks, IFC2x3
- Share data frequently
- Early communication ensures less costly to fix errors on site

# Common Data Environment

- 1,800 Users
- 3,600 Model Files
- > 55,000 docs
- 1 Tb of Data

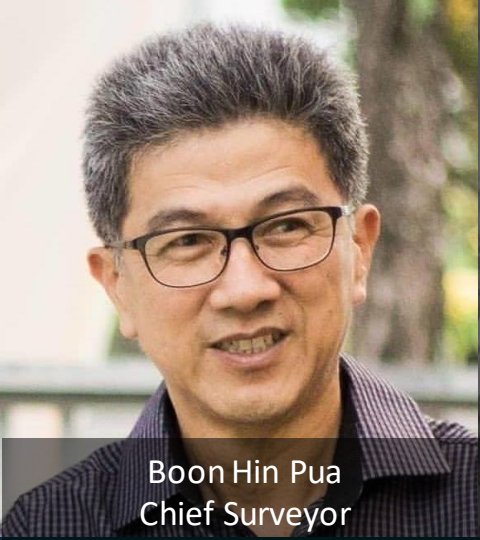




# Information Shared on CDE

- Model Files (.rvt .nwc .ifc)
- Design Visualizations
- Federated Models
- Virtual Design Review Reports
- Coordination Issue Tracker
- Drawings
- Schedules & Equipment Lists
- Link GIS to BIM on the CDE
- Collection of Data for Facility Management

# Gamuda's Site Teams



Boon Hin Pua  
Chief Surveyor



Tony Joseph  
GIS Manager

## Leveraging BIM in the field





# Awareness is KEY ... The Future is NOW !

Have YOU tested any of these technologies ?

VR = Virtual Reality

AR = Augmented Reality

UAV = Drones

Photogrammetry

Laser Scanning

3D Printing Models

3D Printed Building

Modular Off-Site Fabrication

Data Analytics

Blockchain



**Start with identifying a Problem ...**

**Then determine a construction technology solution to solve it!!**



20.Feb.2019



# Point Cloud Validation



Use Point Clouds to verify existing conditions and model key interfaces

X: -753.795 m Y: -86.353 m Z: 38.538 m





### Image

Image ID

Dimensions

5472 x 3648

Width

5472 pixels

Height

3648 pixels

### GPS

Latitude

3; 10; 28.716200000000782

Longitude

101; 41; 45.02020000000283

Altitude

88.727

### File

Name

DJI\_0010.JPG

Item type

JPEG image

Folder path

D:\TTWS Context Capture...

Date created

20/02/2017 09:08

Date modified

20/02/2017 09:08

Size

8.13 MB



Link Photogrammetry to BIM



Posted by NICK MORECOCK  
6 Views  
SITE CONTEXT CAPTURE  
FROM NOV 2017 TO SEP 2018.



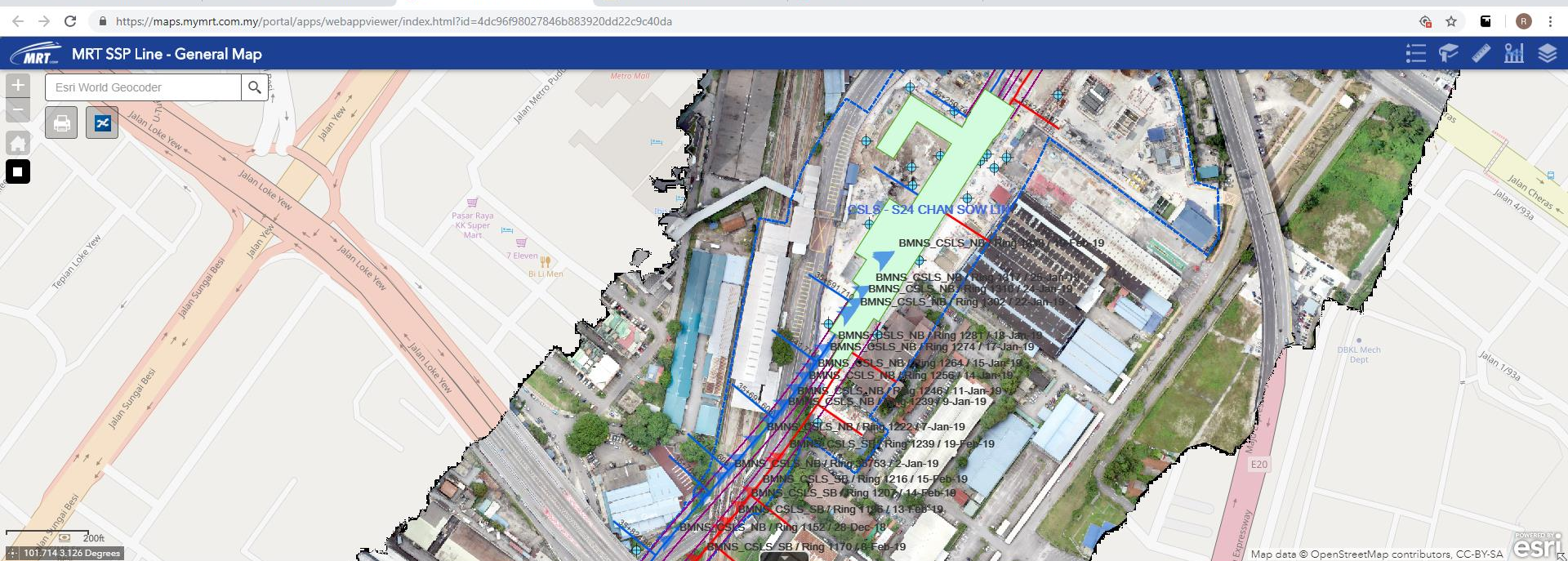
Nov-17   Dec-17   Jan-18   Feb-18   Mar-18   Apr-18   May-18   Jun-18   Jul-18   Aug-18   Sep-18



-0:25 HD 1080P 30FPS







TBM_Location									
Station SSP Elevated Feb 2018									
Station SSP Underground Version K Jan 2019									
Alignment SSP Underground Version K Jan 2019									
Alignment Marker SSP Underground Version K Jan 2019									
Alignment SSP Elevated Feb 2018									
CrossOver_Underground_SSP_Feb2018									
CrossPassages_Underground_SSP_Feb2018									
SH									
Options									
Filter by Map Extent									
Zoom to									
Clear Selection									
Refresh									
OBJECTID	Date	Name	Ring No	Chainage	X	Y	Z	Direction	
255	14-Feb-19	BMNS_CSLS_SB	1,207	35,762	1,430.574	-5,246.74	8.085	Southbound	
257	15-Feb-19	BMNS_CSLS_NB	1,338	35,553	1,535.576	-5,066.743	7.62	Northbound	
260	15-Feb-19	BMNS_CSLS_SB	1,216	35,749	1,438.768	-5,236.648	8.004	Southbound	
262	18-Feb-19	BMNS_CSLS_NB	1,338	35,553	1,536.576	-5,066.743	7.62	Northbound	
265	18-Feb-19	BMNS_CSLS_SB	1,235	35,722	1,455.386	-5,215.37	7.835	Southbound	
267	19-Feb-19	BMNS_CSLS_NB	1,338	35,553	1,536.576	-5,066.743	7.62	Northbound	
270	19-Feb-19	BMNS_CSLS_SB	1,239	35,717	1,458.401	-5,211.381	7.804	Southbound	



# Gamuda's Digital Site Teams



David Kong  
QAQC Manager



Fareez Razak  
Engineer



## Leveraging Digital Forms in the field



## Fieldview Scope



High risk  
SHE  
inspection



Daily  
site  
reporting



Defects  
and issue  
management



SHE  
incident  
reporting



SHE work  
permit



Energy  
usage &  
waste  
reporting



Work  
inspection  
& approval



Work  
progress  
monitoring

Highpark  
Suites

RSKU  
Kundang

RSKU Serai

RSKU Cyber  
Valley

RSKU  
Puncak  
Bestari

Setia City  
Mall 2

Stonor 3

RSKU Jade  
Hills

Plot H  
Gamuda  
Gardens

Legend:

LIVE

IN-PROGRESS



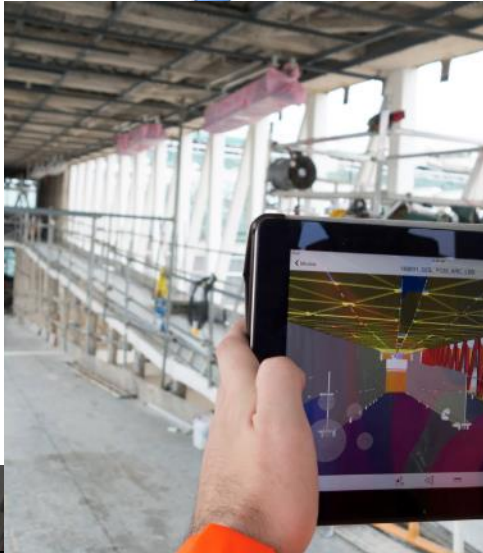
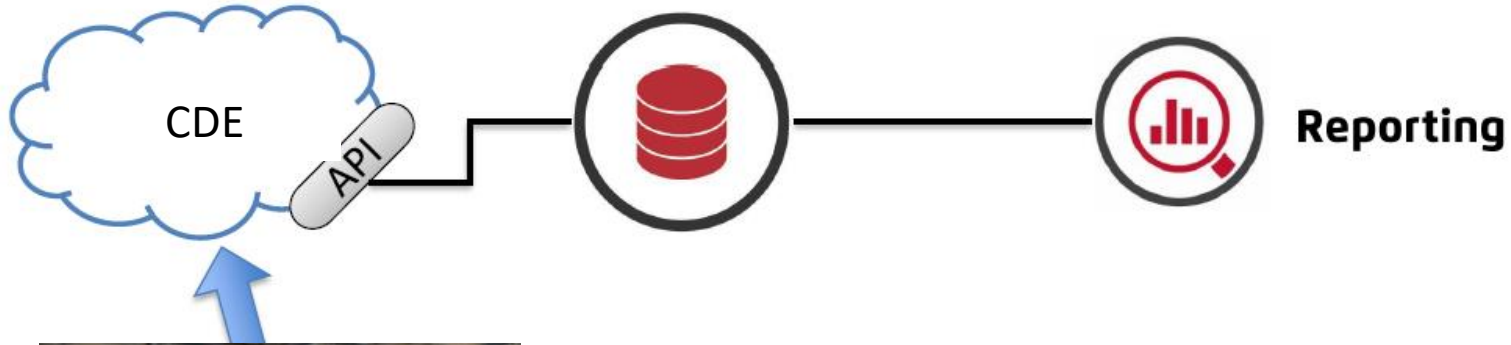
- For new project only, starting from Plot H Gamuda Gardens -

- For new project only, starting from Plot H Gamuda Gardens -





# Digital Forms on Site – Linked to Progress Payment





# Form Dashboard

Aug 17, 2018

☐ Bandar Malaysia North Station (BMNS)  
☐ Bandar Malaysia South Station (BMSS)  
☐ Chan Sow Lin Station (CSLS)

[Select all](#)
[Deselect all](#)

Reprompt

**Form Status Key**  
■ In Progress  
■ Closed  
■ Approved

**Form Type Key**  
■ QAQC  
■ OPS  
■ SHE



## FORMS RAISED THIS WEEK

300

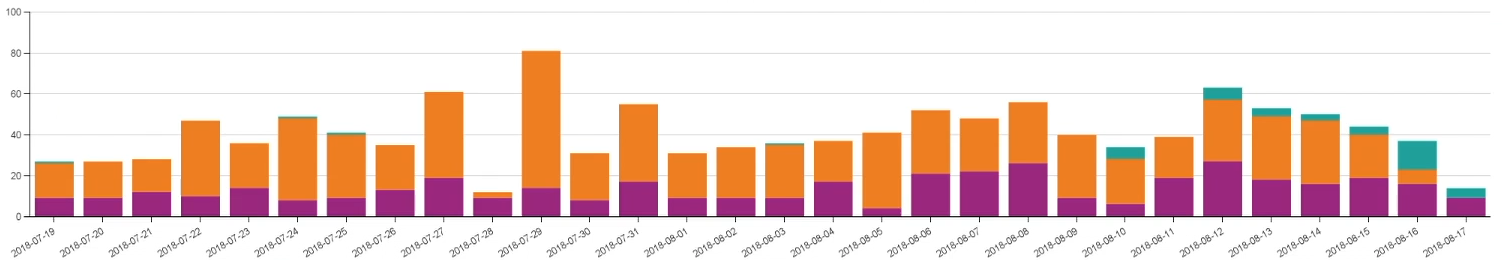
## STATUS OF FORMS RAISED THIS MONTH



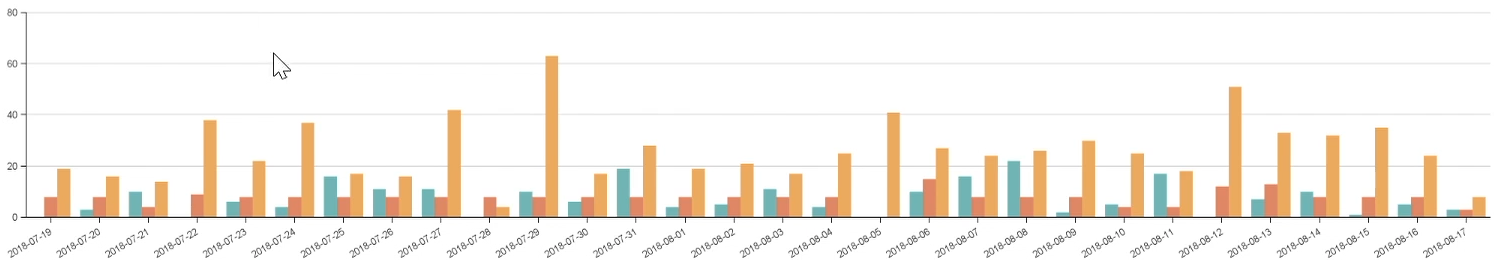
## STATUS OF FORMS RAISED LAST MONTH



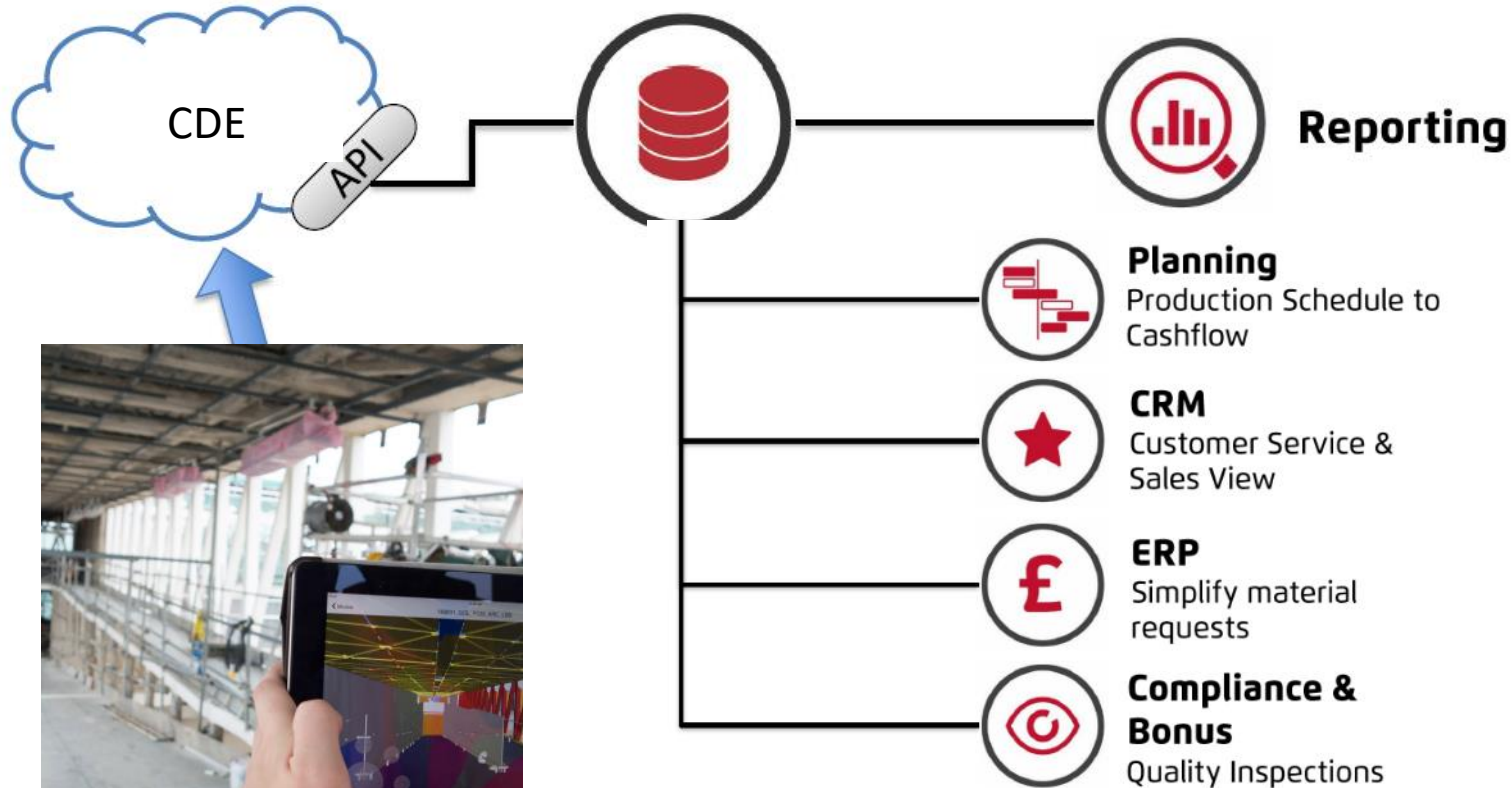
Number of Forms Issued | By Form Status | Last 30 Days



Number of Forms Issued | By Form Type | Last 30 Days



# Digital Forms on Site – Linked to Progress Payment





# Industry Challenge...

Shortage of competent digital consultants and contractors.

**We do NOT train or develop enough people in our industry!**



# Staff Training

Digital Seminars

Project On-Boarding

Process Skills Training

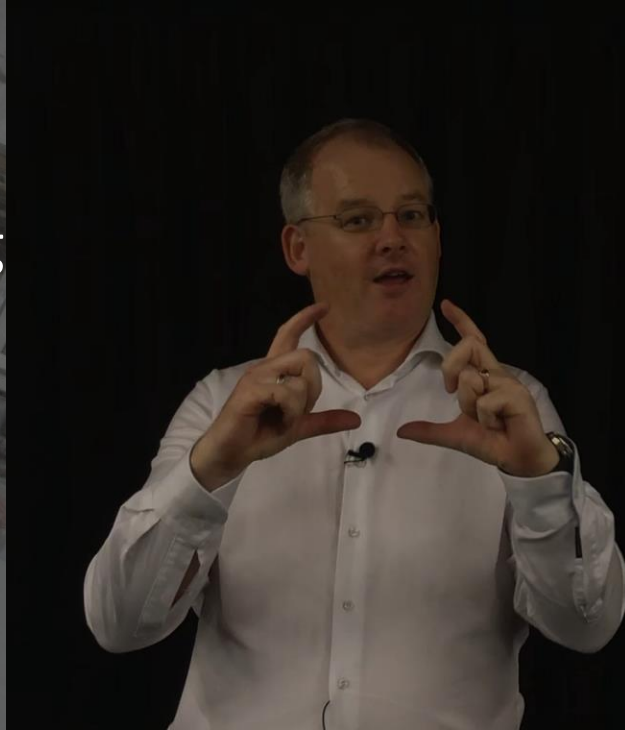
On The Job Support

Self Learning

Peer to Peer Sharing

E-learning Platforms

Discussion Forums



 **GAMUDA**

 **GAMUDA**





Posted by MyMRT Underground

6,388 Views







**Our People are BIM Innovators ... This is Their Story**

