

Lifecycle Building Information Modelling – Asset Management (BIM-AM) System for Buildings Operation and Maintenance

Presented by:

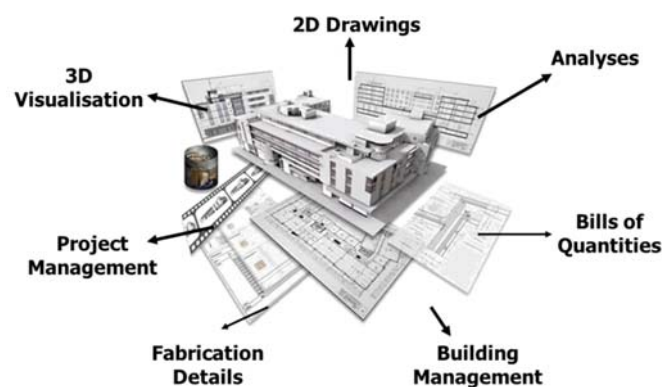
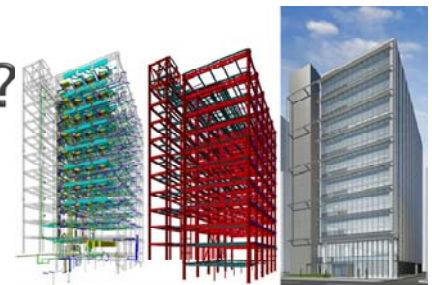
C.K. LEE

17 Nov 2016

BIM? From O&M point of view ?

► Building Information Modelling (BIM)

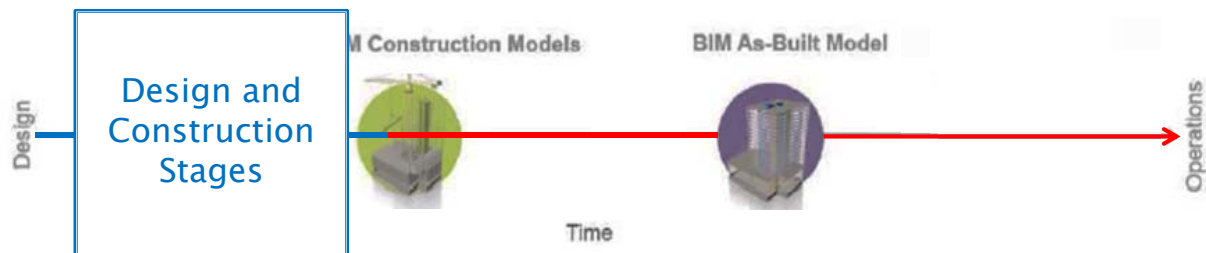
- 3D visualisation
- Clash analysis for coordination
- Object-Oriented building model with enriched information
- Information exchange, reusability and interoperability



► What are the potential benefits of applying BIM to:

- asset management (AM)
- building operation & maintenance (O&M)

90% time of building lifecycle



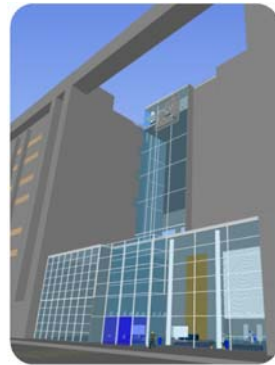
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Outline

- EMSD BIM-AM System
 - Retrospective BIM model construction
 - System architecture illustrated by showcases
- Way forward

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RETROSPECTIVE BIM MODEL CONSTRUCTION E.G. SELECTED AREAS OF EMSD HQS BUILDING



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EMSD HQs BIM Model (commenced in 2014)

Video link: http://www.emsd.gov.hk/filemanager/en/content_1148/Walkthrough_EN.mp4

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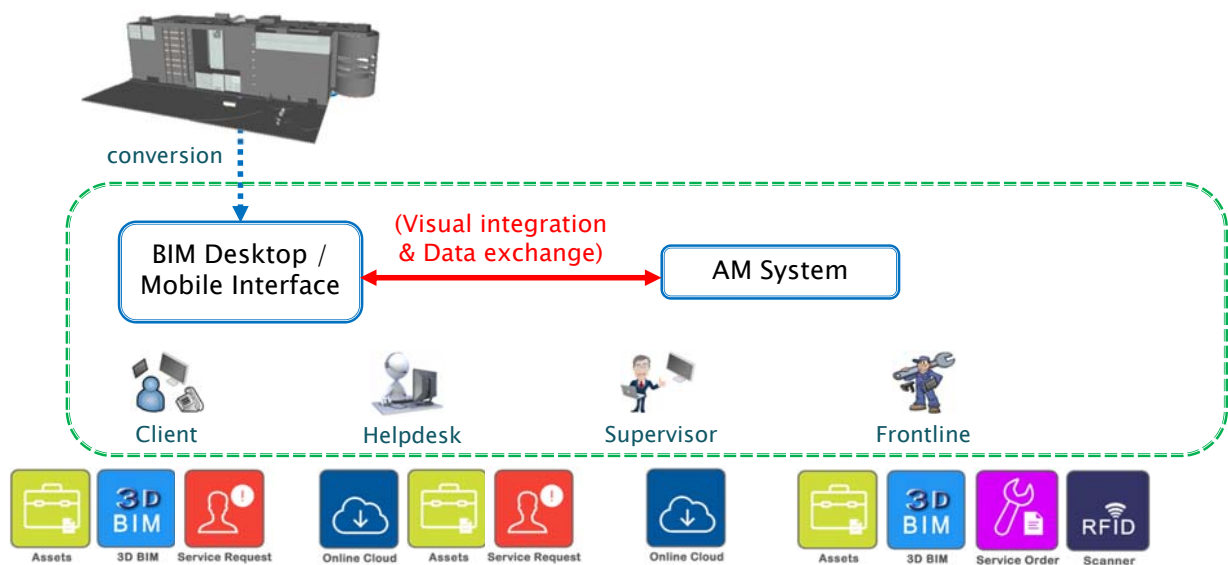


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Architecture for EMSD BIM-AM System



— Enhanced integration implemented by EMSD

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Outline

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 - Retrospective BIM model construction
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 - HVAC showcase (1.fault reporting, 2.pre-diagnosis, 3.on-site repairing)
- ▶ Way forward

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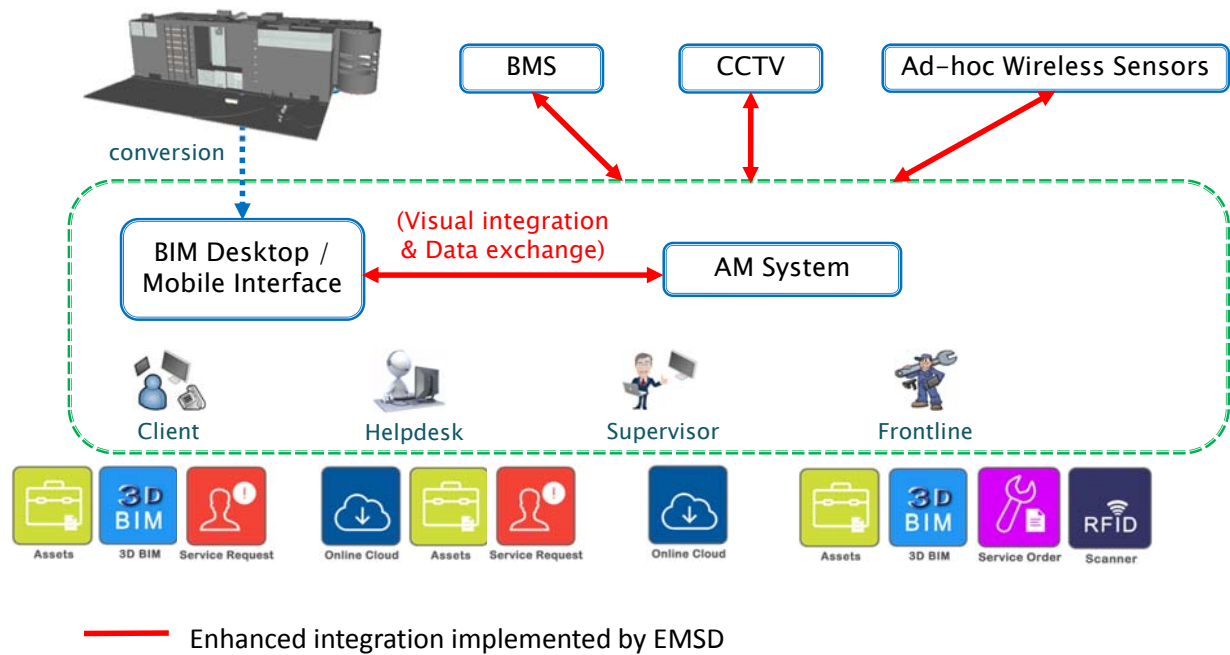
HVAC Showcase – Fault Reporting

Video link: http://www.emsd.gov.hk/filemanager/en/content_1148/HVAC_Fault_Reporting_EN.mp4

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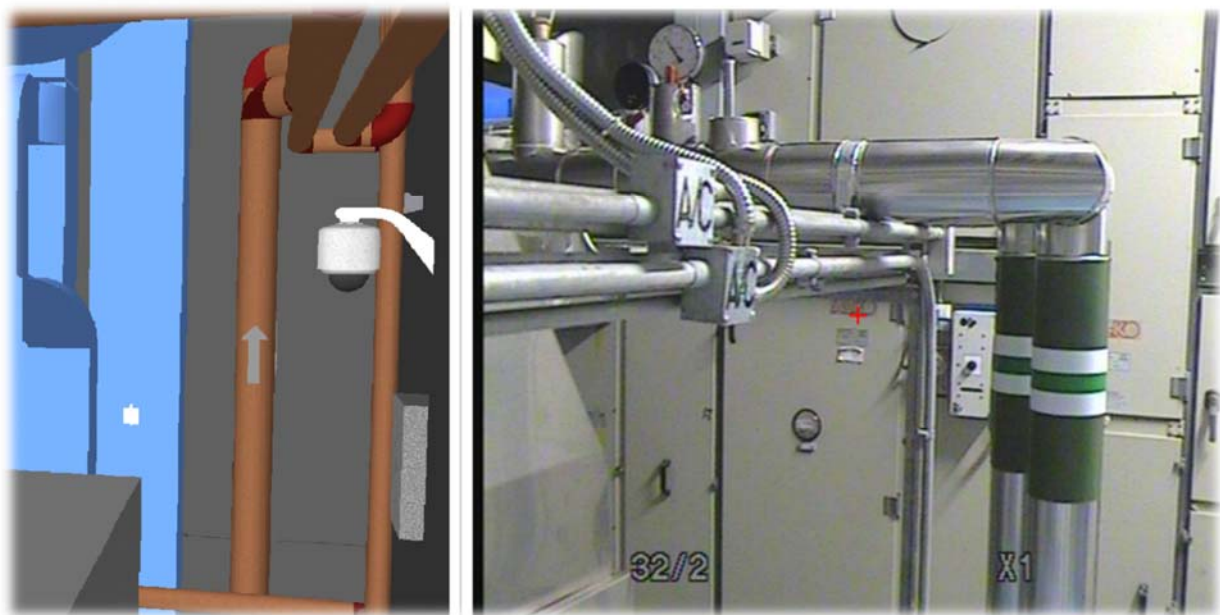


Architecture for EMSD BIM-AM System



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Interfacing with CCTV System for pre-diagnosis



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Integrating with Building Management System (BMS) for pre-diagnosis

1029820	03/03/2016 17:31	53.016	DAHU706.MA.H	MA Humidity
1029821	03/03/2016 17:31	0	DAHU706.EW.S	Energy Wheel Status
1029822	03/03/2016 17:31	0	DAHU706.EW.O	Energy Wheel Trip
1029823	03/03/2016 17:31	1.61	DAHU706.FA.DS	FA Damper Status
1029824	03/03/2016 17:31	0	DAHU706.FA.F	FA Flowrate
1029825	03/03/2016 17:31	58.6	DAHU706.FA.ENTH	FA Enthapy
1029826	03/03/2016 17:31	21.68	DAHU706.FA.T	FA Tempertaure
1029827	03/03/2016 17:31	51.5	DAHU706.FA.H	FA Humidity
1029828	03/03/2016 17:31	0	DAHU706.FA.PD	FA Filter Alarm
1029829	03/03/2016 17:31	100	VAV7F_57FDS	VAV Damper Status
1029830	03/03/2016 17:31	0	VAV7F_57FLW	VAV Flowrate
1029831	03/03/2016 17:31	22.13	VAV7F_57RMT	VAV Rm Temp
1029832	03/03/2016 17:31	38.13	VAV7F_58FDS	VAV Damper Status
1029833	03/03/2016 17:31	44	VAV7F_58FLW	VAV Flowrate
1029834	03/03/2016 17:31	22.75	VAV7F_58RMT	VAV Rm Temp
1029835	03/03/2016 17:31	38.13	VAV7F_55FDS	VAV Damper Status
1029836	03/03/2016 17:31	0	VAV7F_55FLW	VAV Flowrate
1029837	03/03/2016 17:31	25.65	VAV7F_55RMT	VAV Rm Temp
1029838	03/03/2016 17:31	100	VAV7F_56FDS	VAV Damper Status
1029839	03/03/2016 17:31	16	VAV7F_56FLW	VAV Flowrate
1029840	03/03/2016 17:31	22.4	VAV7F_56RMT	VAV Rm Temp
1029748	03/03/2016 17:30	25.5	DAHU706.TSP2	Return Temp Set PT (EMSD)

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Integrating with wireless ad-hoc devices for condition monitoring

Ad-hoc Temperature Sensor



Ad-hoc Mobile CCTV



**Select Wireless Devices
Appended to a Particular Asset**

**Ad-hoc Acoustic /Vibration
Sensor**



Ad-hoc Power Meter



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HVAC Showcase – Off-site Pre-diagnosis

Video link: http://www.emsd.gov.hk/filemanager/en/content_1148/HVAC_Pre_Diagnosis_EN.mp4

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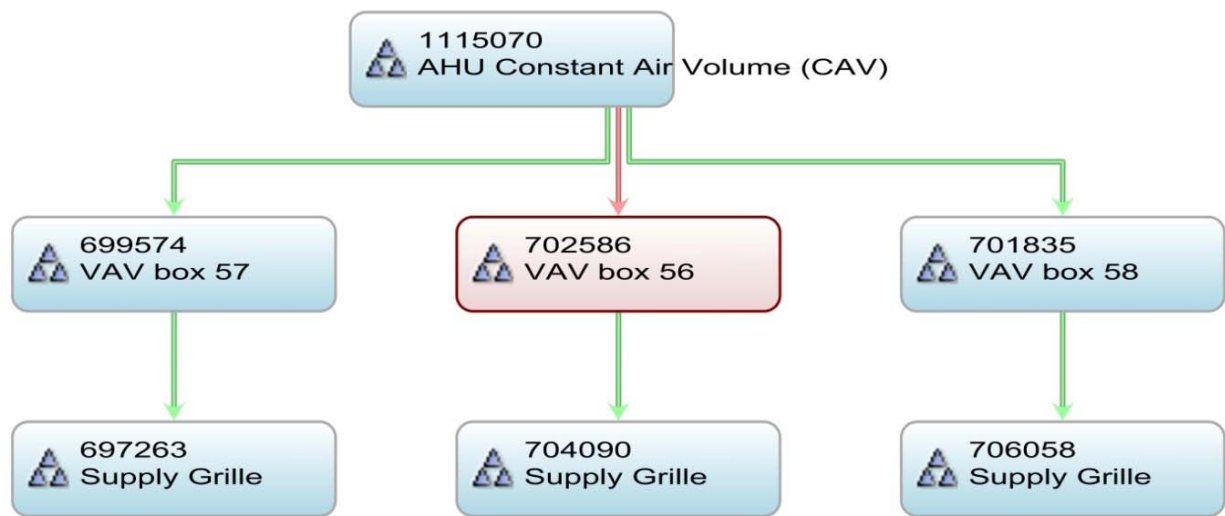
HVAC Showcase – Off-site Pre-diagnosis

- ▶ Ease of identifying fault location & faulty equipment
 - By BIM visualization and system topology

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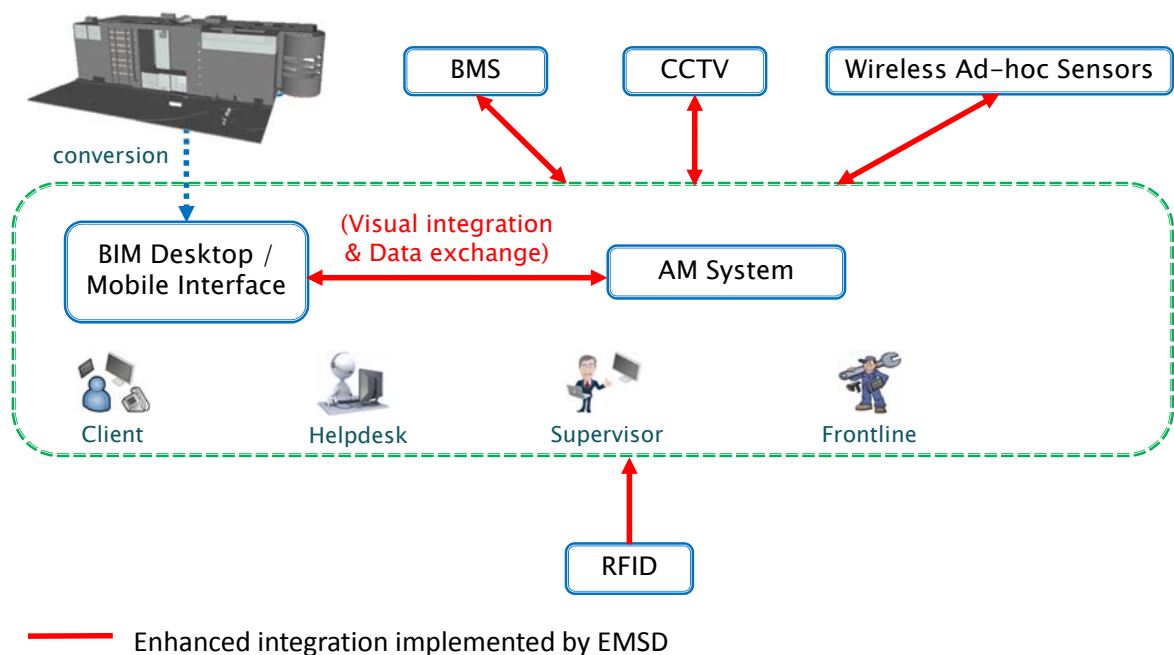


System Topology visualizing the asset relationships within a particular system for easy fault diagnosis



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Architecture for EMSD BIM-AM System



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Integrating with RFID scanning tool for locating fixed assets

Back +Scanner

1128-HK-001008 2.3.0 3.6.0 Battery 87%

29 Scan Search By ID

Equipment ID	Description	Location	System Type	Signal
1204721	Exit Sign 1	Zone 3A, 3A (Lect...	LVSB	65 %
699574	VAV box 57	Zone 3A, 3A (Lect...	HVAC	62 %
000258	AHU supply 1.4 - 2.8 m3/s	Zone 1, LOBBY	HVAC	57 %
1181403	TV Monitor at 7th Floor	Zone 2, Common...	GE	54 %
000244	Airco Unit	Ahu Room, Ahu R...	HVAC	53 %
000243	Emergency lighting decentrally fed	Zone 2, Common...	LIGHT	51 %
959953	Sprinkler Head (3)	Zone 2, Common...	FSI	48 %



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HVAC Showcase – On-site Repair

Video link: http://www.emsd.gov.hk/filemanager/en/content_1148/HVAC_Onsite_Repair_EN.mp4

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Outline

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- System architecture illustrated by showcases
 - HVAC showcase (1.fault reporting, 2.pre-diagnosis, 3.on-site repairing)
 - FSI showcase (4. incident handling by system topology & RFID verification)

▶ Way forward

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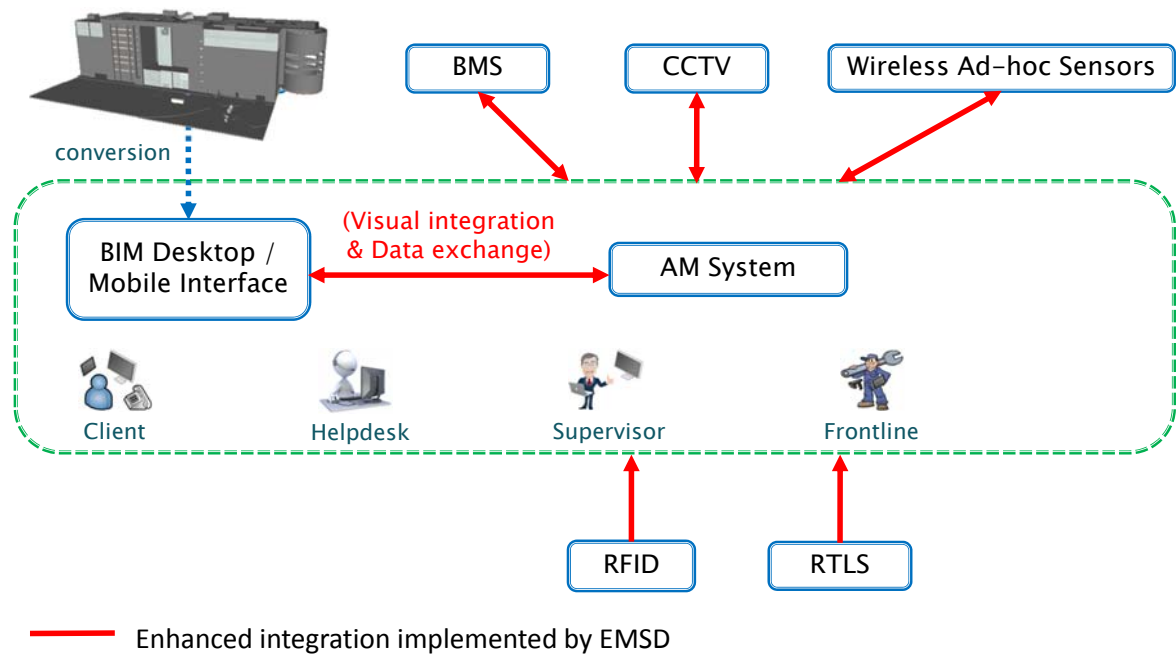
Incident Handling

Video link: http://www.emsd.gov.hk/filemanager/en/content_1148/FSI_EN.mp4

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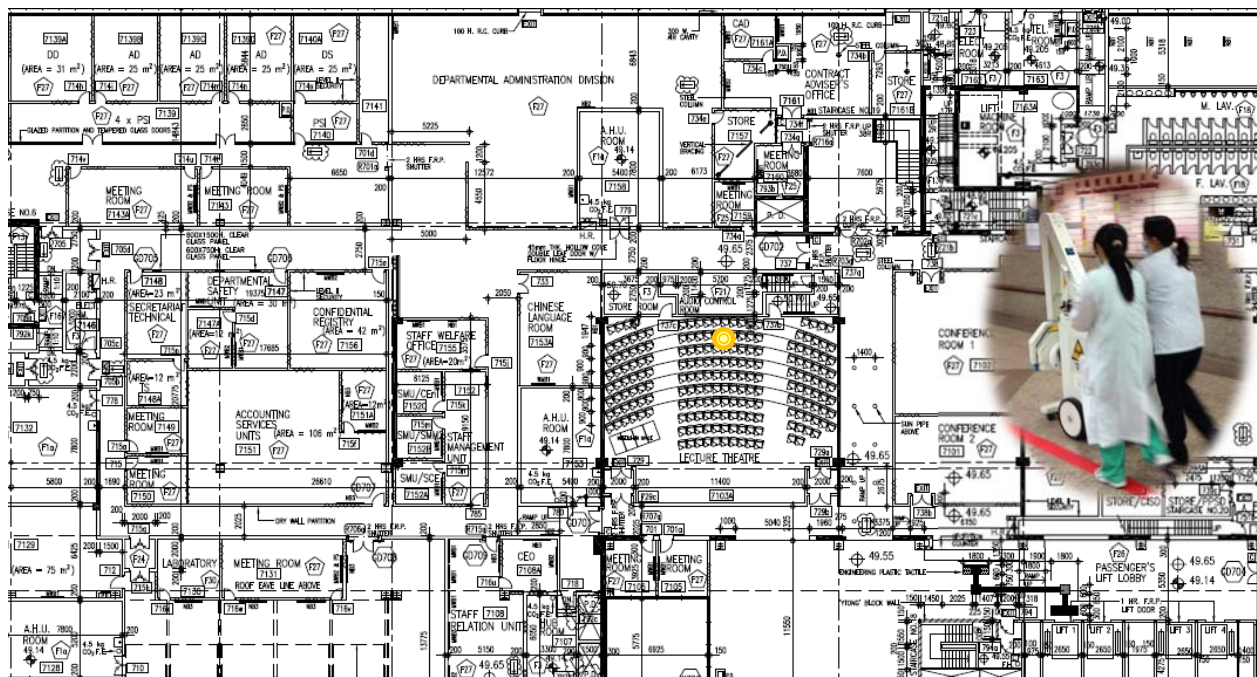


Architecture for EMSD BIM-AM System



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Interfacing with Real Time Location System (RTLS) for locating movable assets



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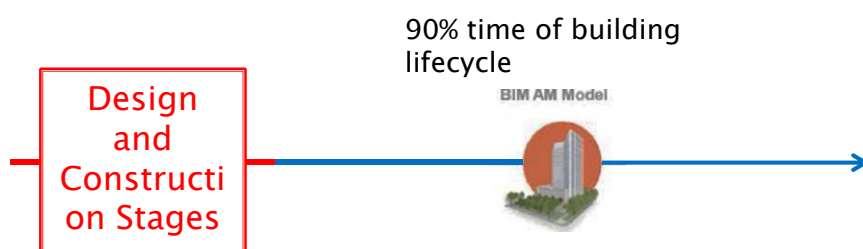
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Way Forward

- ▶ How to adopt BIM for building asset management (AM) & operation & maintenance (O&M)?
 - Early coordination at design & construction stages

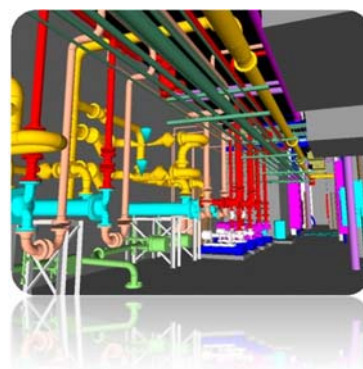
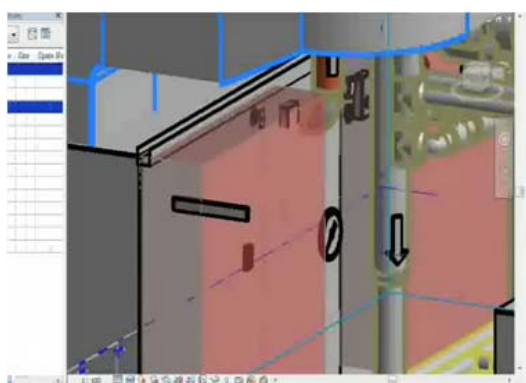


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Way Forward

► Drawing standards

- Colour scheme
- Separation of MEP subsystems in BIM model
- Visualization of maintenance clearance



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Way Forward

► Contractor submission guidelines

- Asset information requirement using EMSD standardized asset templates

- | | |
|-------------------------------|---|
| 1. LVSB | 10. Burglar Alarm and Security System |
| 2. Emergency Generator Set | 11. Broadcast Reception System |
| 3. UPS | 12. HVAC Installation |
| 4. Lift | 13. Electronics Timing & Display Installation |
| 5. Escalator | 14. Audio Electronics Installation |
| 6. Vehicles | 15. Video Electronics Installation |
| 7. Fire Services Installation | 16. Radio Electronics Installation |
| 8. Boiler Installation | |
| 9. Filtration Plant | |

Equipment No.	Equipment type	Parent Equipment 1	Associated Equipment 1	BIM GUID	RFID No.	Switchgear No.	Type of Circuit	Rating (A)	Make
123456	Switchgear (ACB)					6N1	Incomer	3200	Ellison
123457	Switchgear (MCCB)					6N2	Sub-main (Normal)	400	Merlin Gerin
123458	Switchgear (MCCB)					6N3	Sub-main (Normal)	800	Merlin Gerin

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Way Forward

- ▶ Contractor submission guidelines
 - Asset information requirement using EMSD standardized asset templates
 - E.g. asset relationship (parent-child / associated)
 - E.g. RFID tagging requirements, e.g. critical assets

Equipment No.	Equipment type	Parent Equipment 1	Associated Equipment 1	BIM GUID	RFID No.	Switchgear No.	Type of Circuit	Rating (A)	Make
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123458	Switchgear (MCCB)					6N3	Sub-main (Normal)	800	Merlin Gerin

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Way Forward

- ▶ To further establish 5 trial sites in general government buildings, hospitals, and municipal venues for internal promotion of BIM-AM application in O&M

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Way Forward

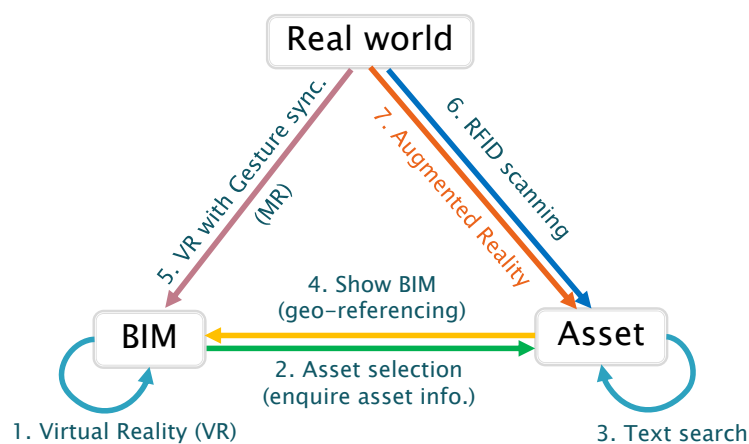
- ▶ Integrating with GIS for a holistic geographic interface for easy management of venues maintained under BIM-AM System



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Way Forward

- ▶ To enable user to get in touch with real world while interacting with virtual objects for building facilities O&M and vehicle repair



- Integration with Augmented Reality (AR)

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Thank You

