CGS: Indoor Guidance Application

LYU1502 - Spring 2016

Supervised By: **Prof. Michael R. Lyu**

Choi Mei Shan (1155045904)

Wong Tsz Kin (1155038146)

Outline

- Review on 1st Semester
- Introduction – Project Expansion
- Improvement Features
- Conclusion
- System Demonstration

Review on 1st Semester

Review - Video

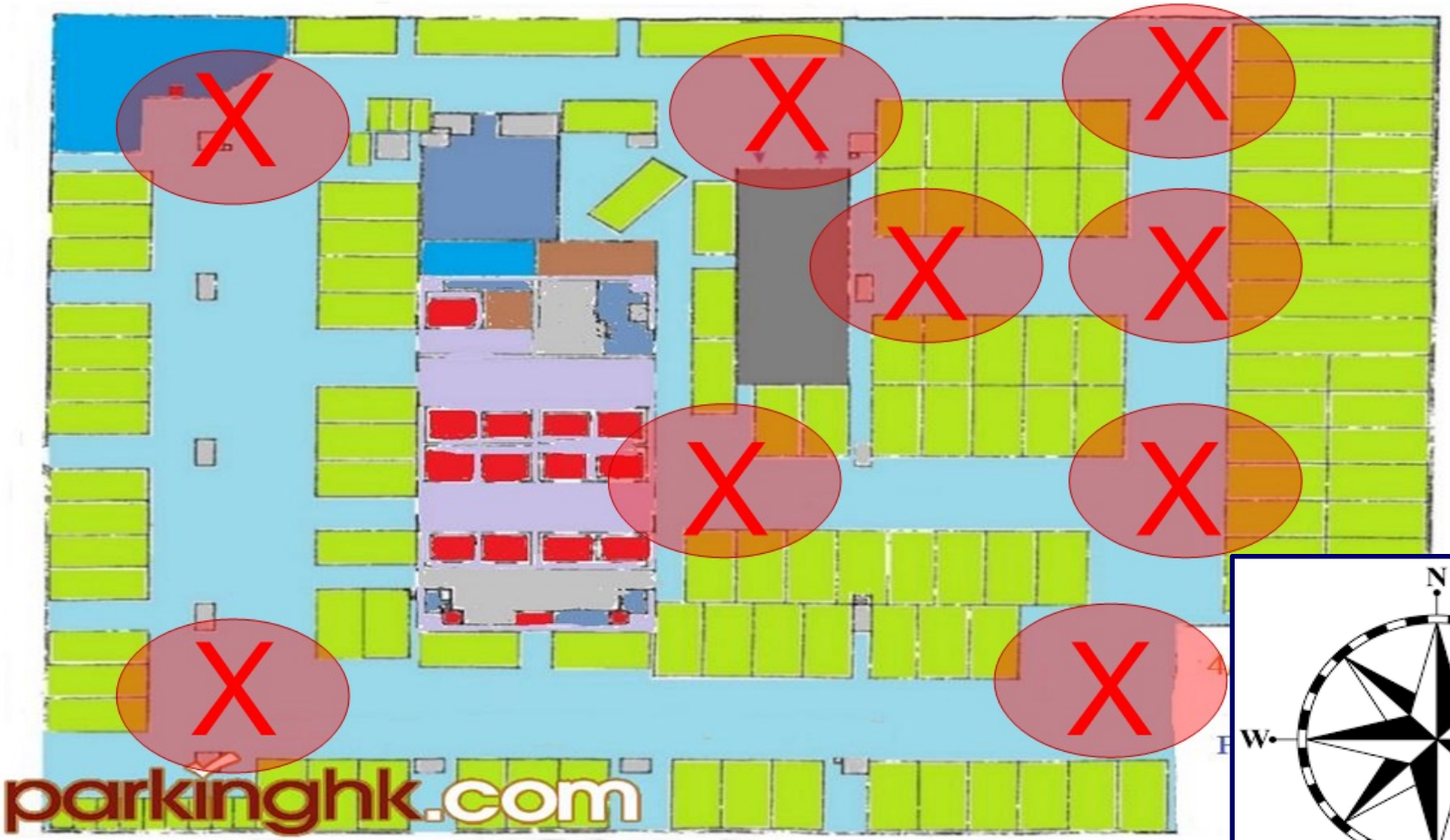
Review – Algorithm of Guidance

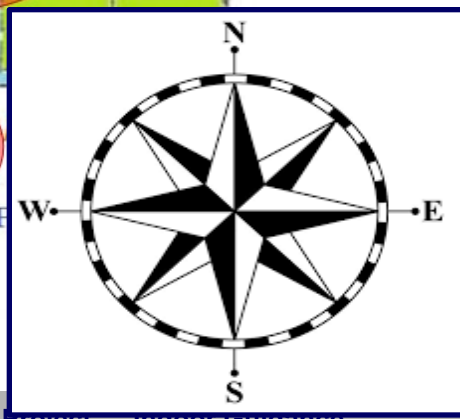
- **Car-park Guidance System**
  - How to archive guidance in car park?

- **2 things**
  - Current Location (Where am I?)
  - Target Location (Where am I going?)

Review – Algorithm of Guidance

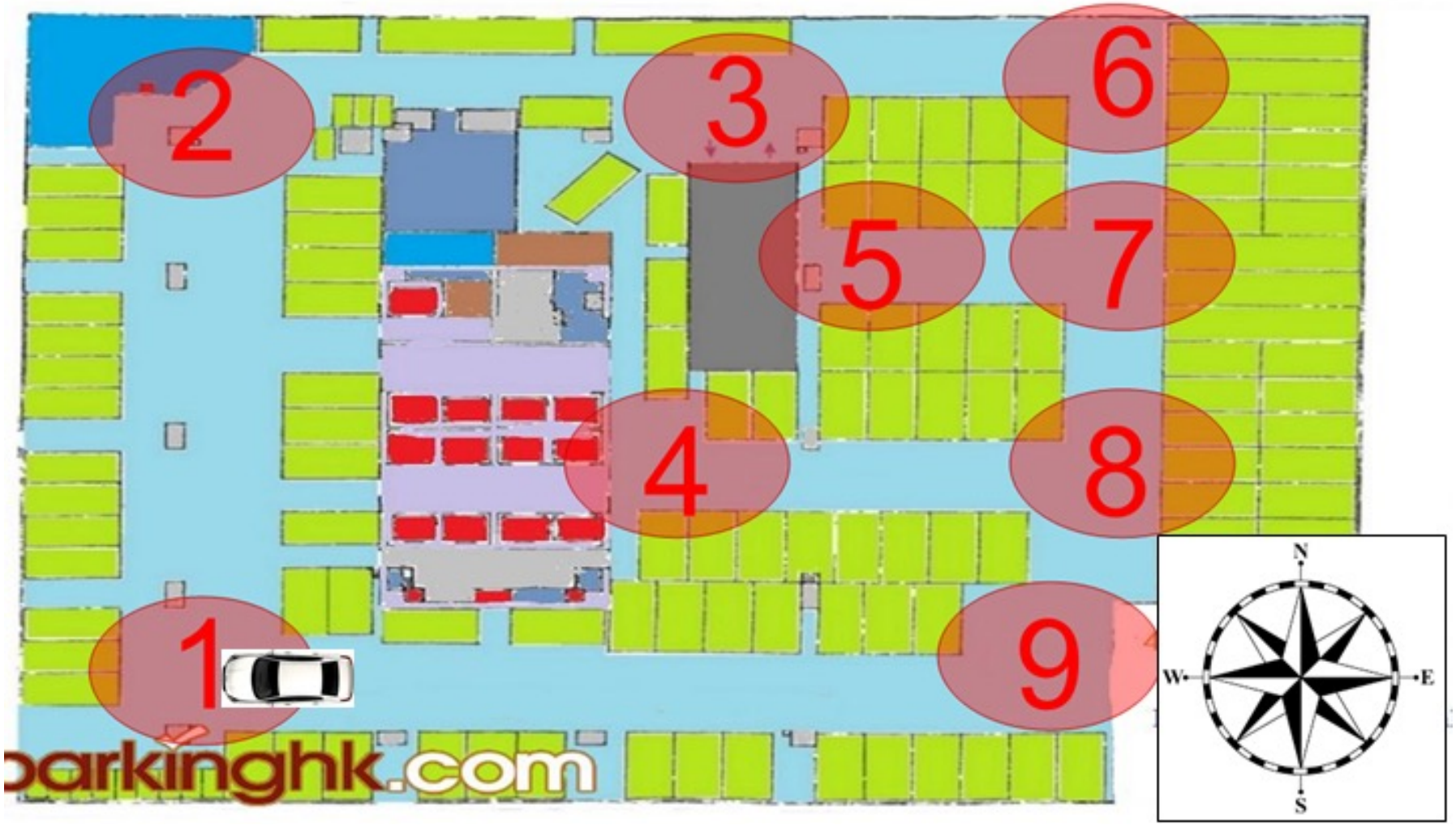
Car-park Guidance System





Review – Algorithm of Guidance

- **Example** (From ***Beacon 1*** to ***Beacon 3***)



Review – Algorithm of Guidance

Example (From *Beacon 1* to *Beacon 3*)

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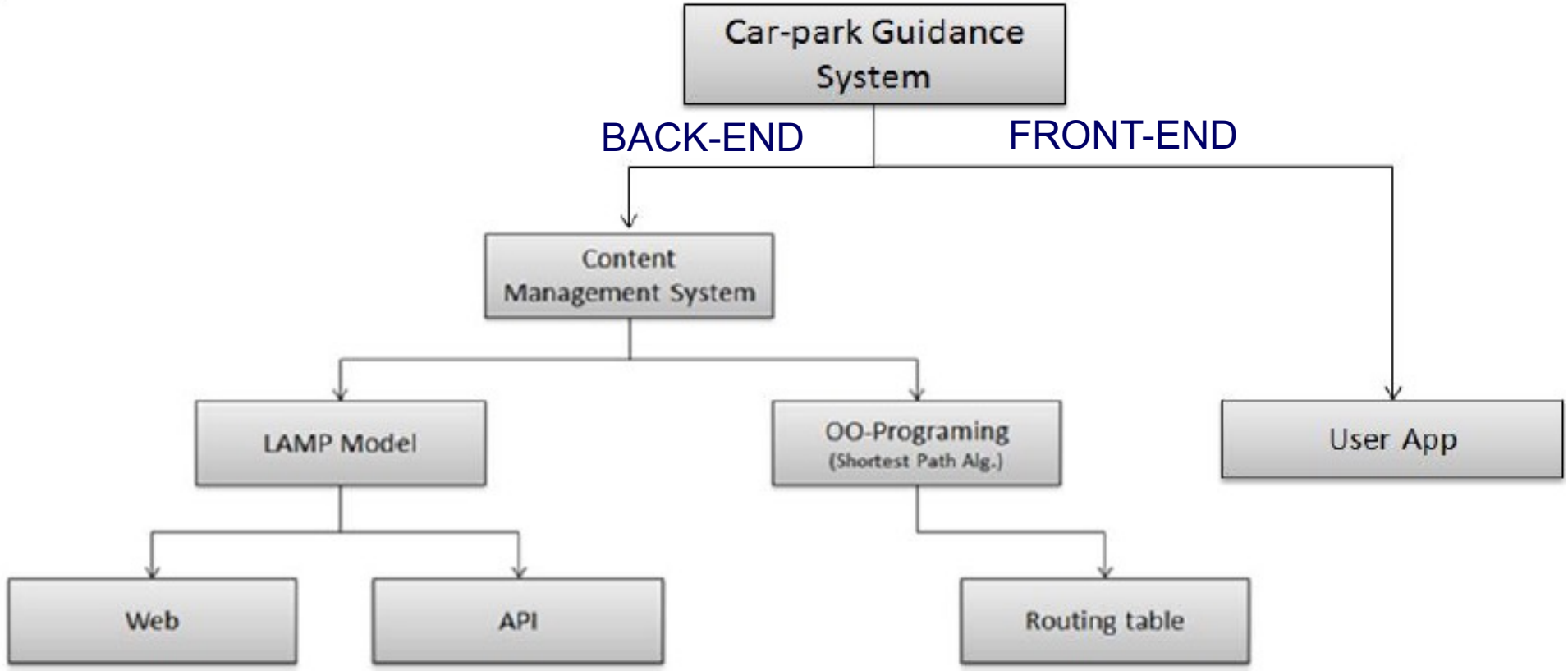
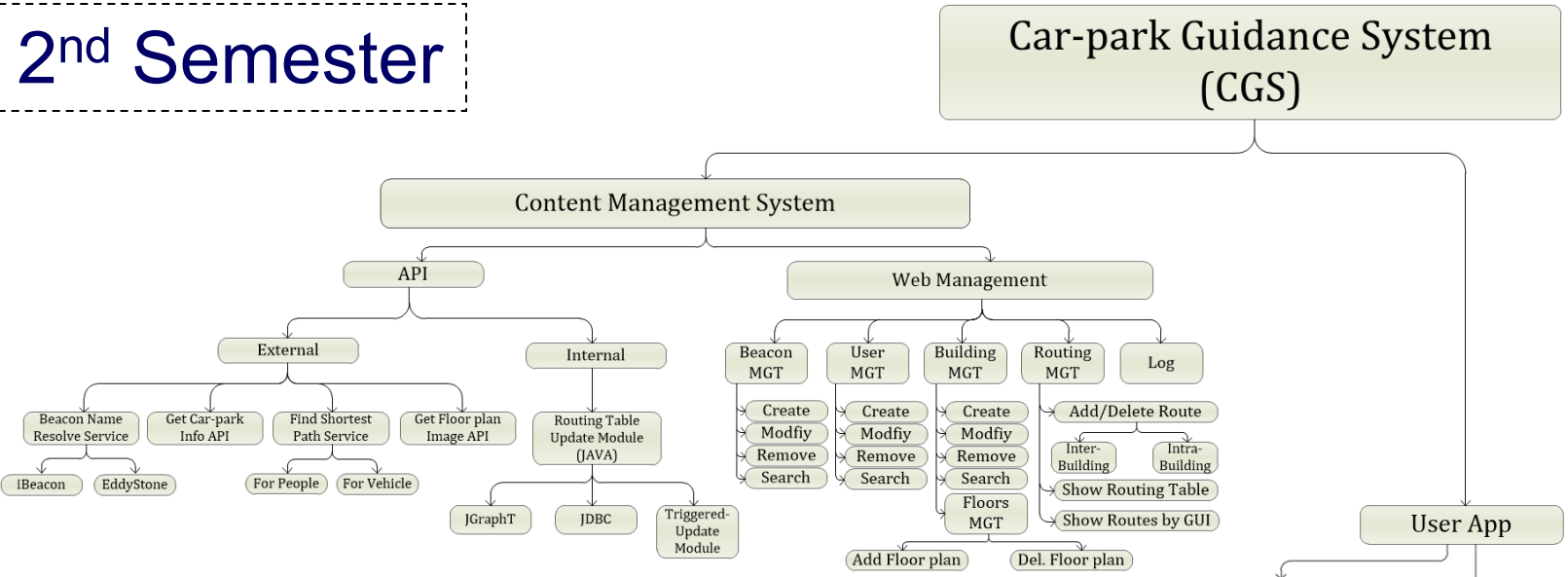
Review

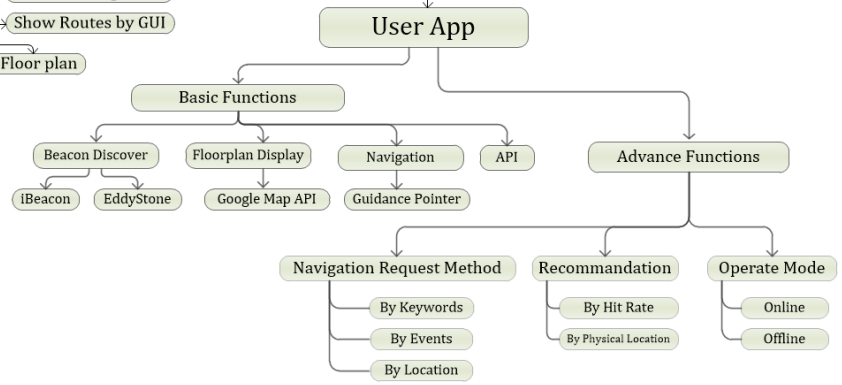

Car-park Guidance System
BACK-END
FRONT-END
Content Management System
LAMP Model
OO-Programing
(Shortest Path Alg.)
User App
Web
API
Routing table

2nd Semester – Project Extension

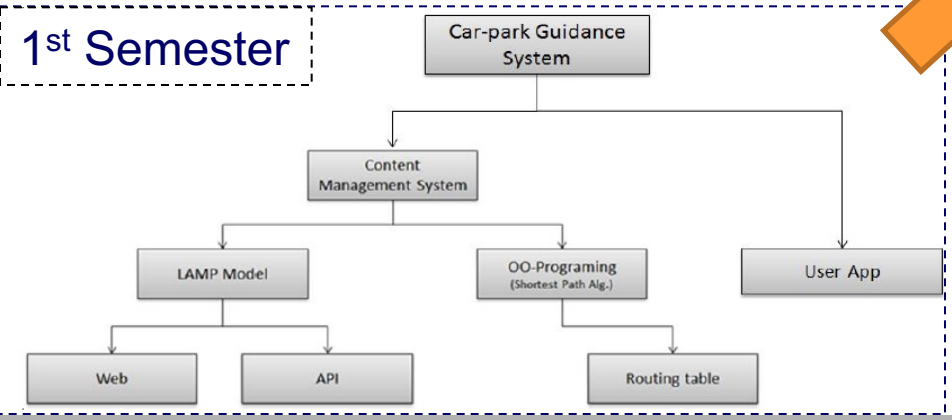
Project Extension

2nd Semester



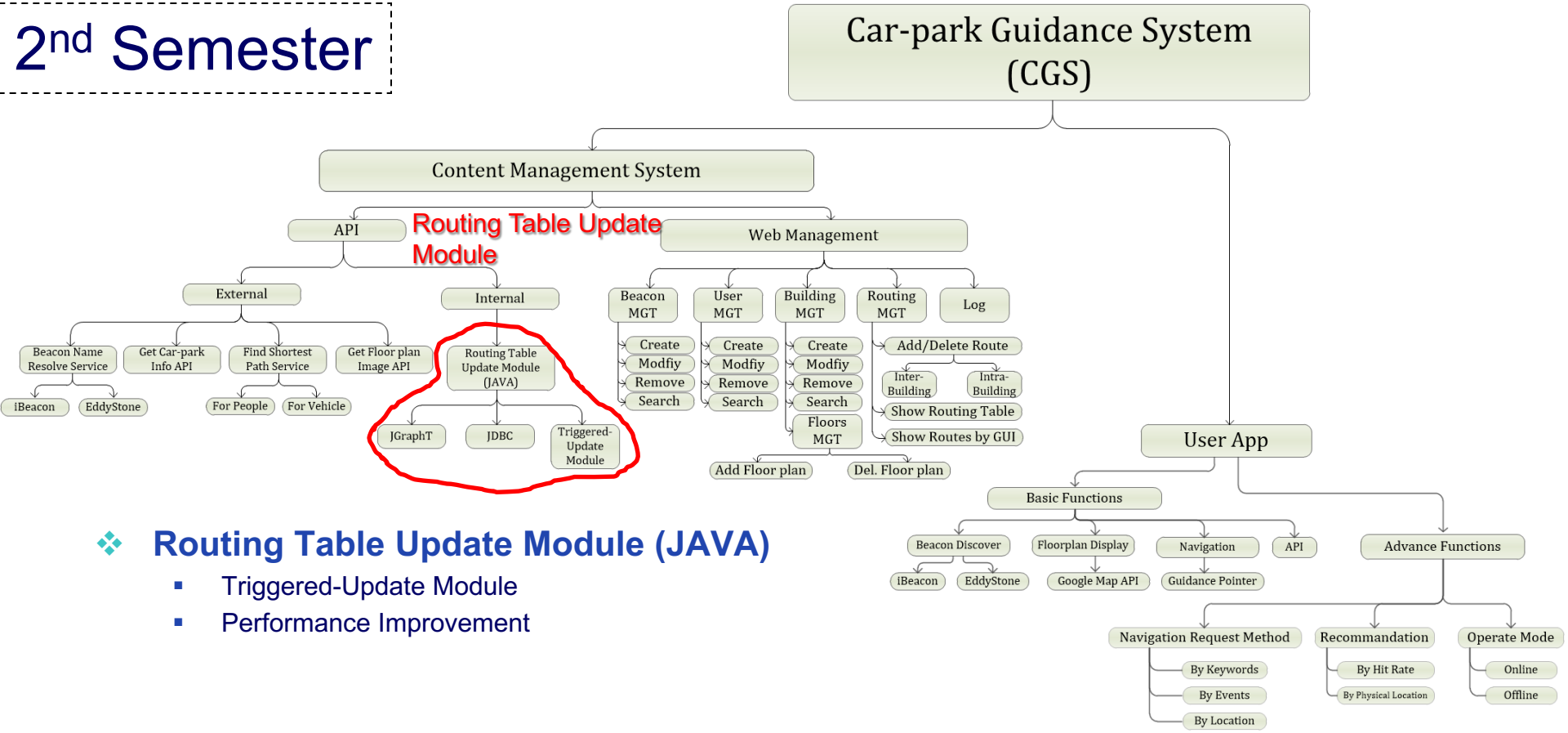


1st Semester



Project Extension

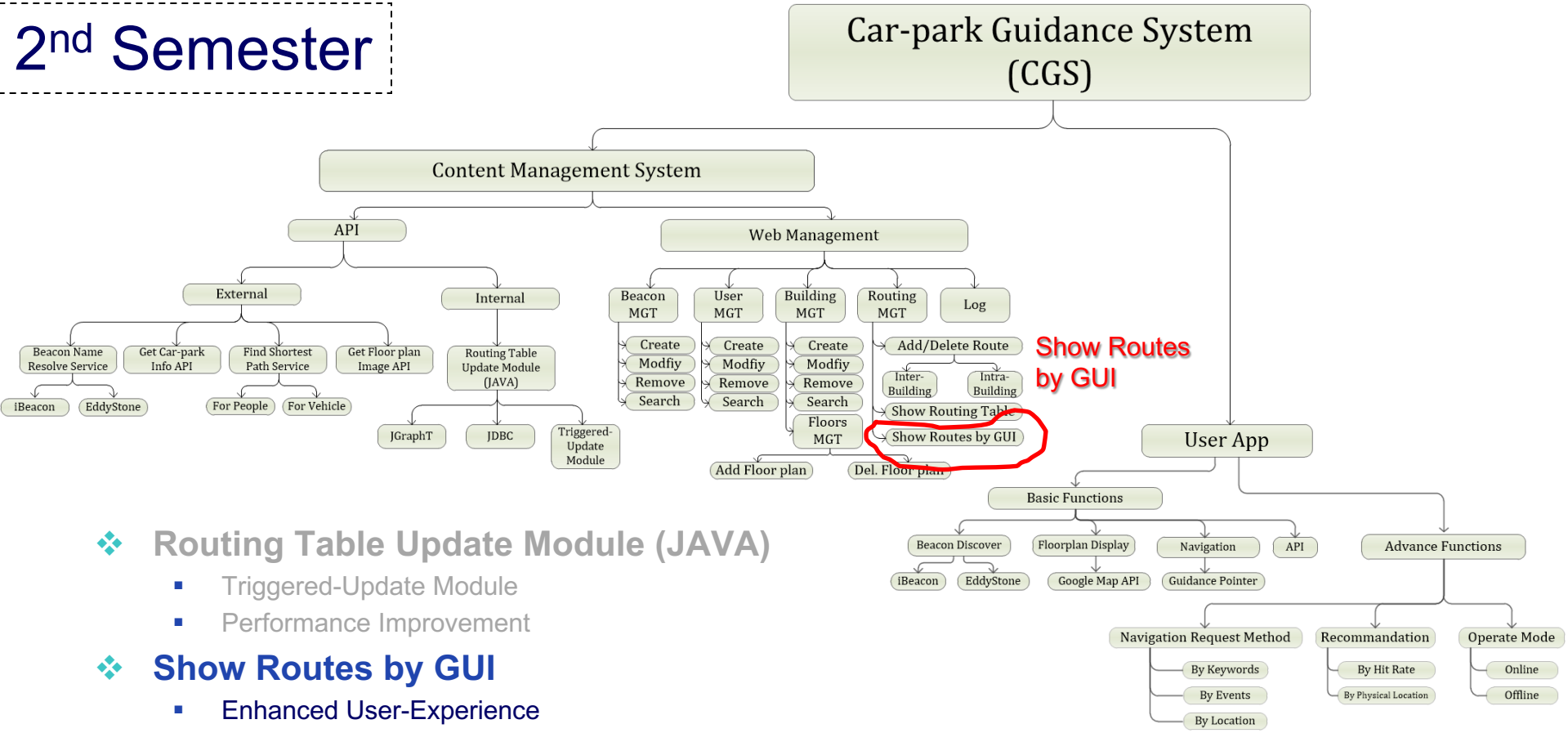
2nd Semester



- **Routing Table Update Module (JAVA)**
  - Triggered-Update Module
  - Performance Improvement

Project Extension

2nd Semester



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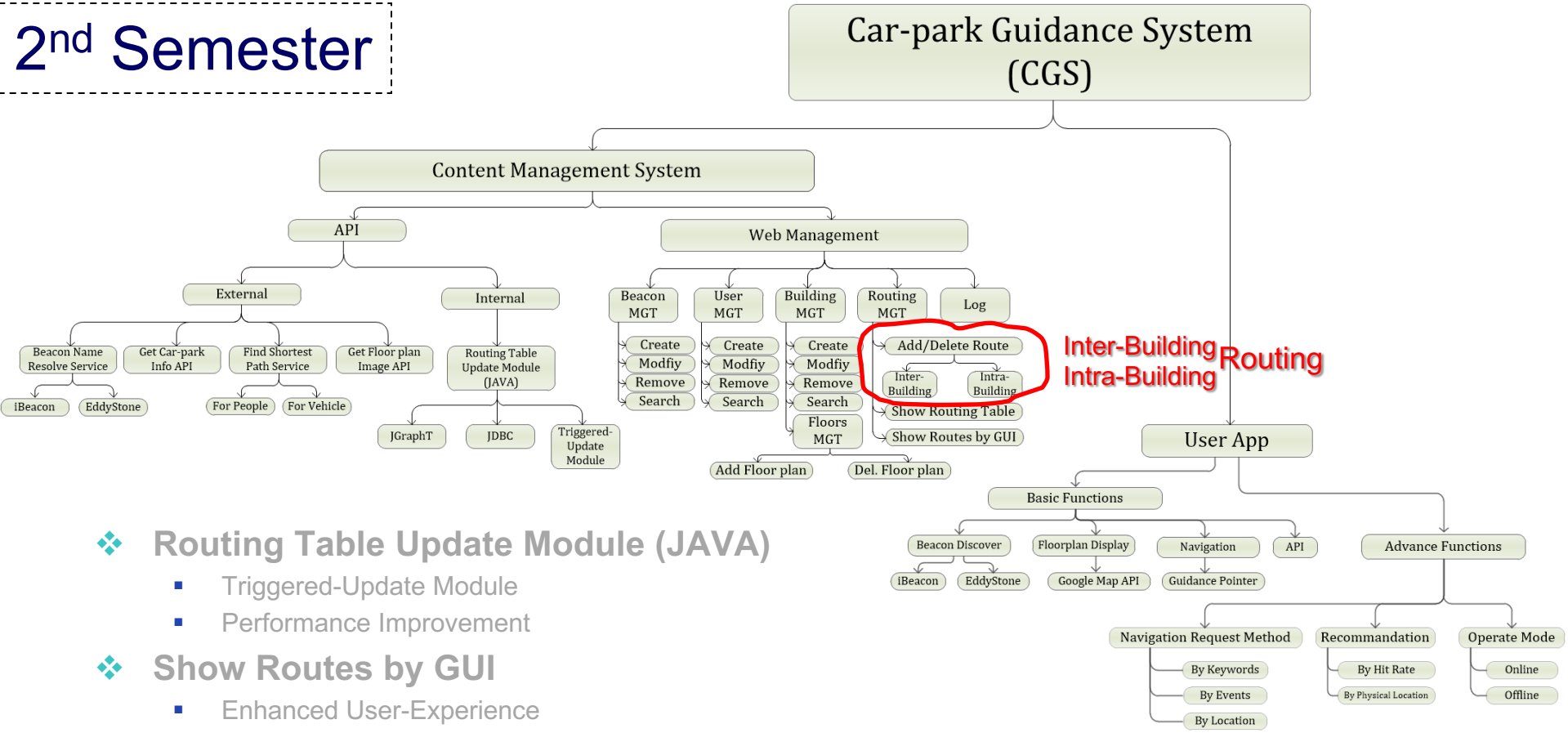
  - Enhanced User-Experience

Project Extension

2nd Semester



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  - Navigation inside a building
  - Navigation outside a building

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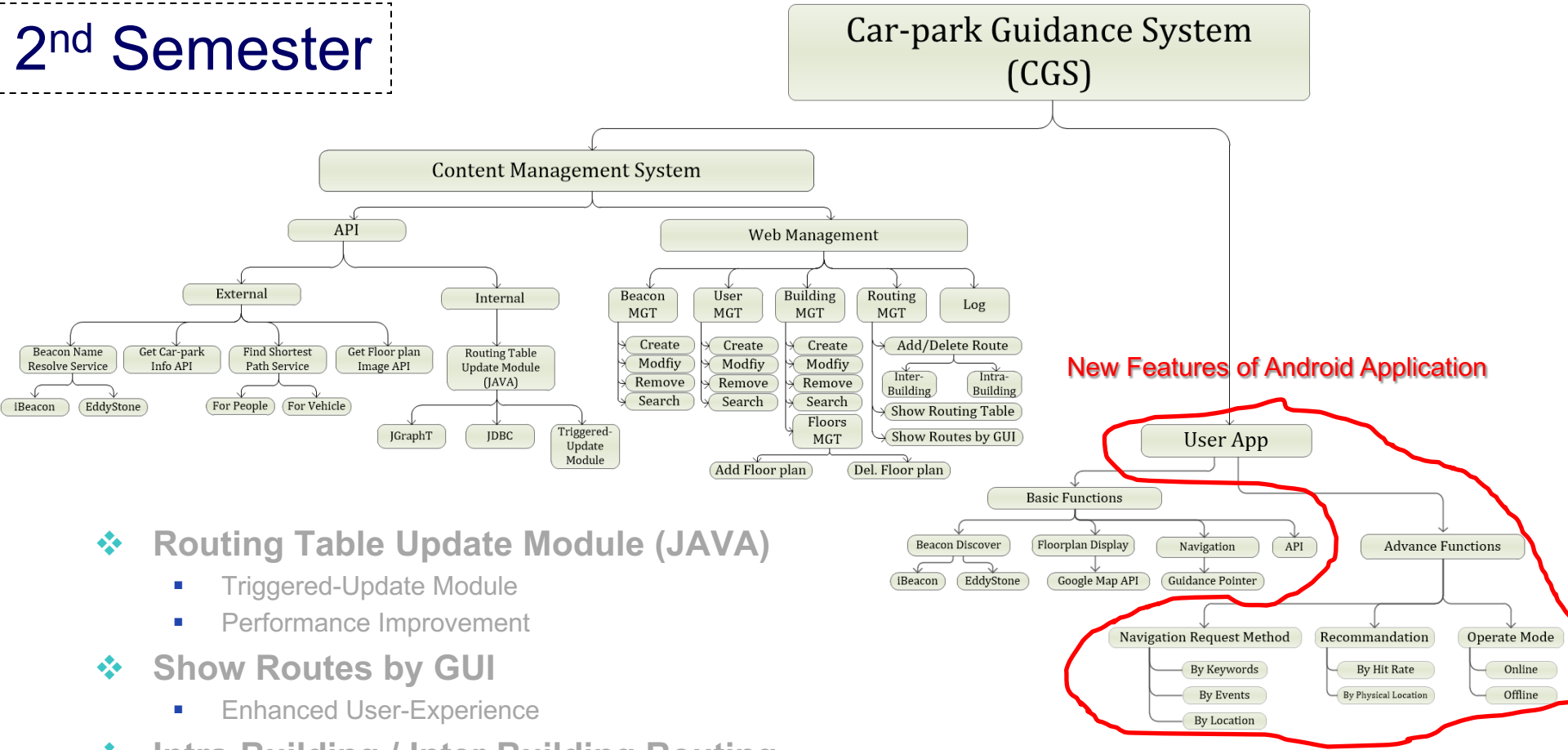
2nd Semester



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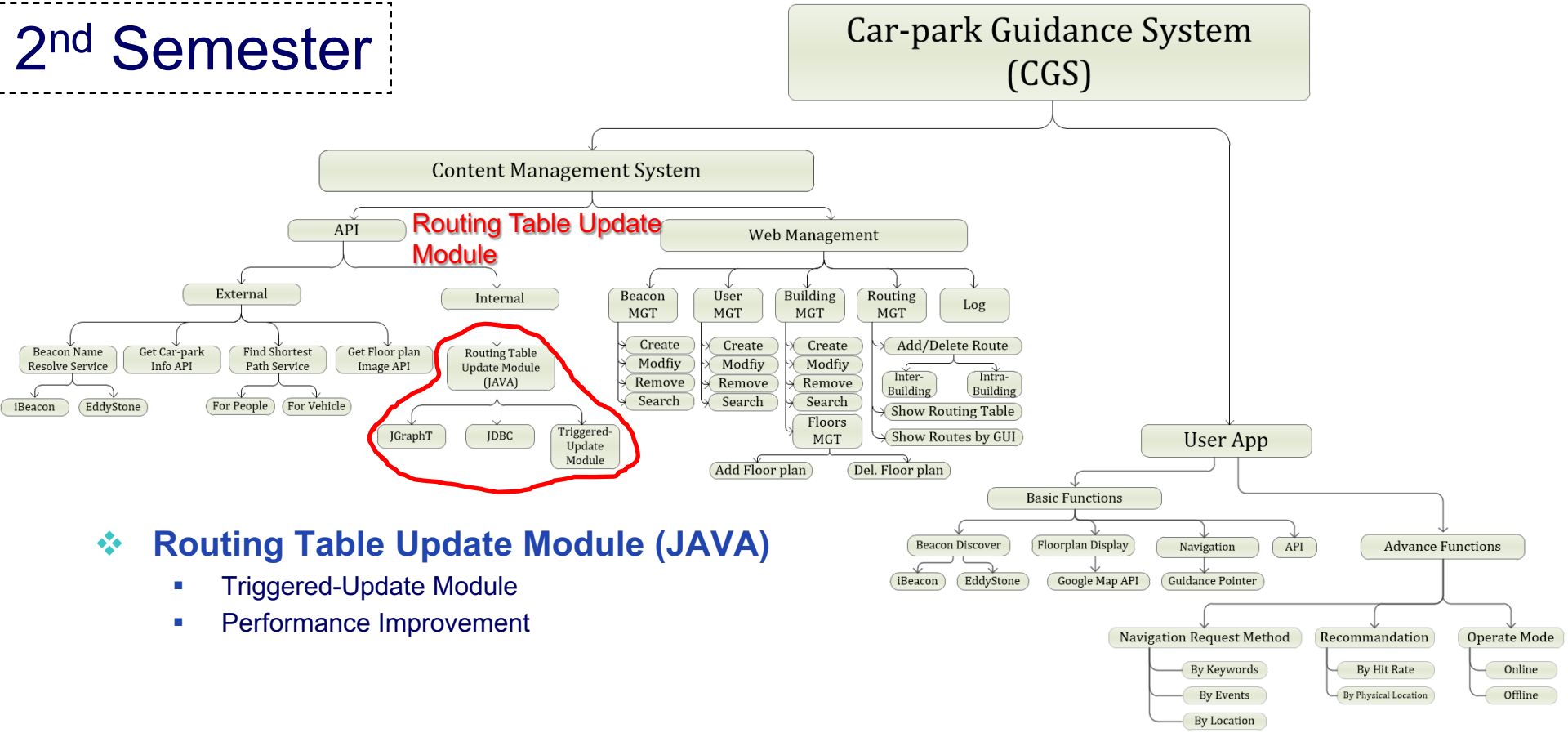
  - Navigation outside a building

- **New Features of Android Application**
  - Navigation Request Method
  - Recommendation

Routing Table Update Module

Routing Table Update Module

2nd Semester



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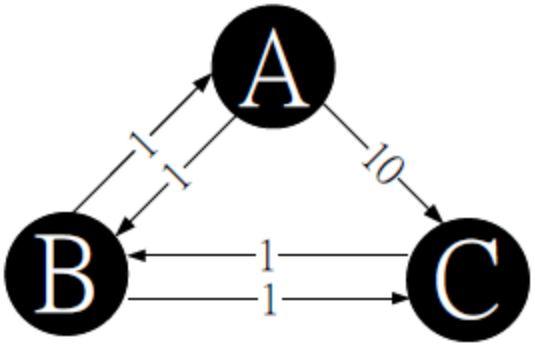
Routing Table Update Module

2 Functions:

- Calculates shortest paths based on current topology
- Stores all shortest paths to database as Routing Table



Routing Table					
TS	Src	Dest	Next Hop	Dir	Cost
1	A	B	B	SW	1
1	A	C	B	SW	1
1	B	A	A	NE	1
1	B	C	C	E	1
1	C	A	B	W	1
1	C	B	B	W	1

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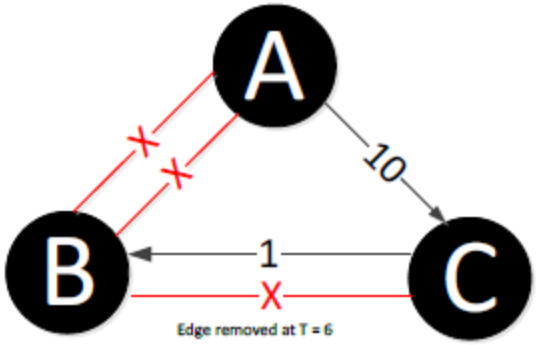

Topology Changed!

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TS	Src	Dest	Next Hop	Dir	Cost
1	A	B	B	SW	1
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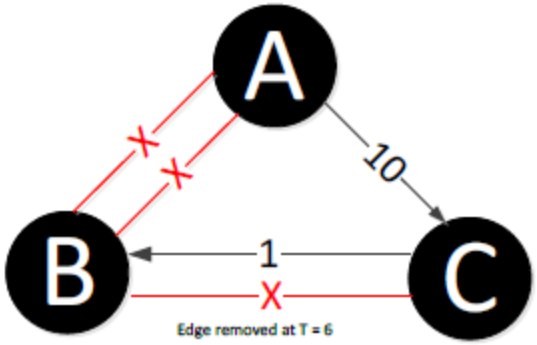

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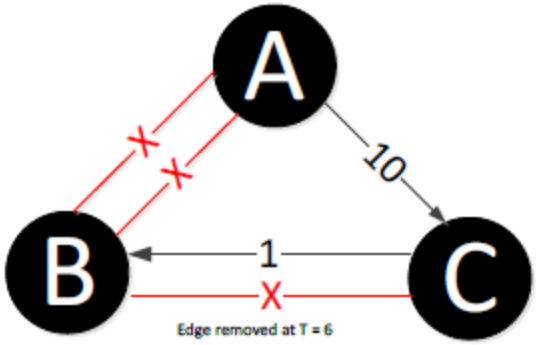
1	C	A	B	W	1
1	C	B	B	W	1

UPDATE NEEDED

Routing Table Update Module

2 Functions:

- Calculates shortest paths based on current topology
- Stores all shortest paths to database as Routing Table



Topology Changed!

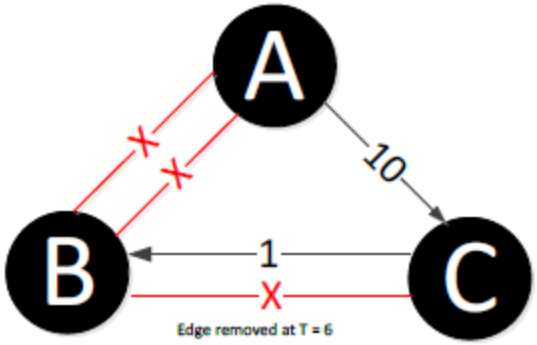
Routing Table

TS	Src	Dest	Next Hop	Dir	Cost
… Wait module to Update …					
1	C	B	B	W	1

Routing Table Update Module

2 Functions:

- Calculates shortest paths based on current topology
- Stores all shortest paths to database as Routing Table



Topology Changed!

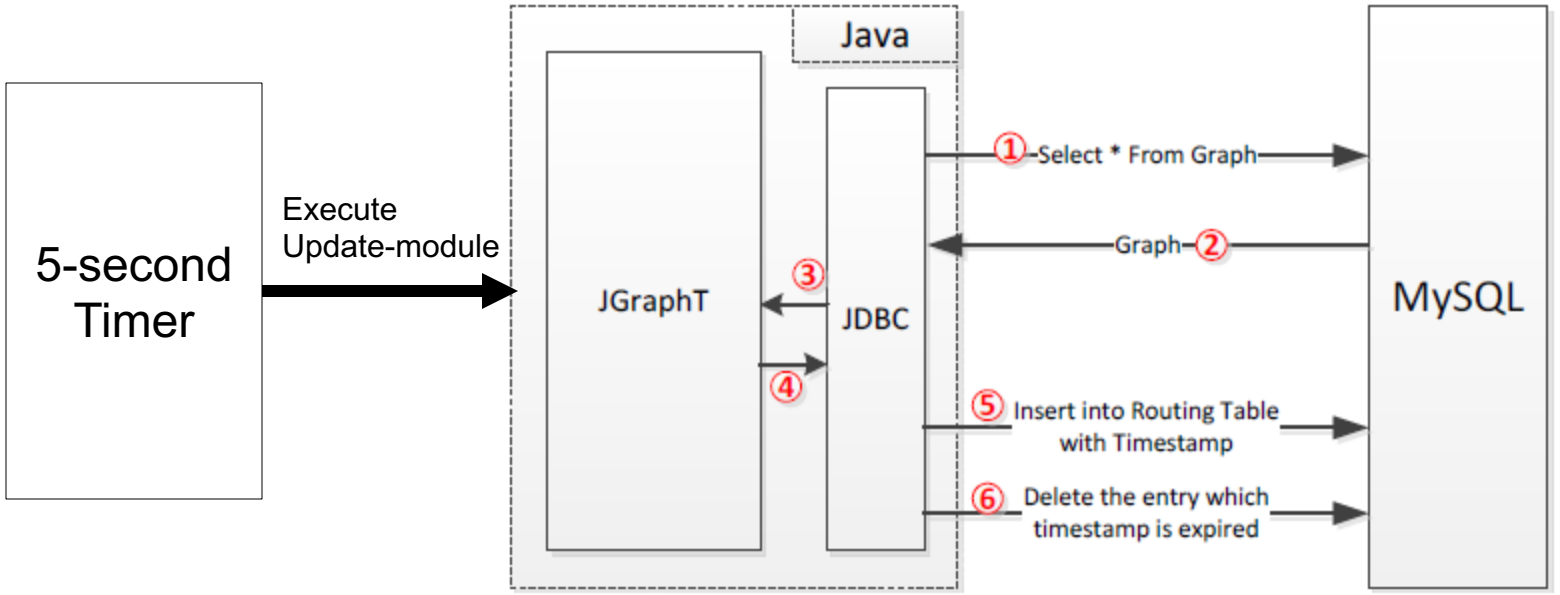
Routing Table					
TS	Src	Dest	Next Hop	Dir	Cost
3	A	B	C	SE	10
3	A	C	C	SE	10
3	C	B	B	W	1

Updated

Routing Table Update Module

Calculate Shortest Paths for every 5 Seconds (Semester 1)

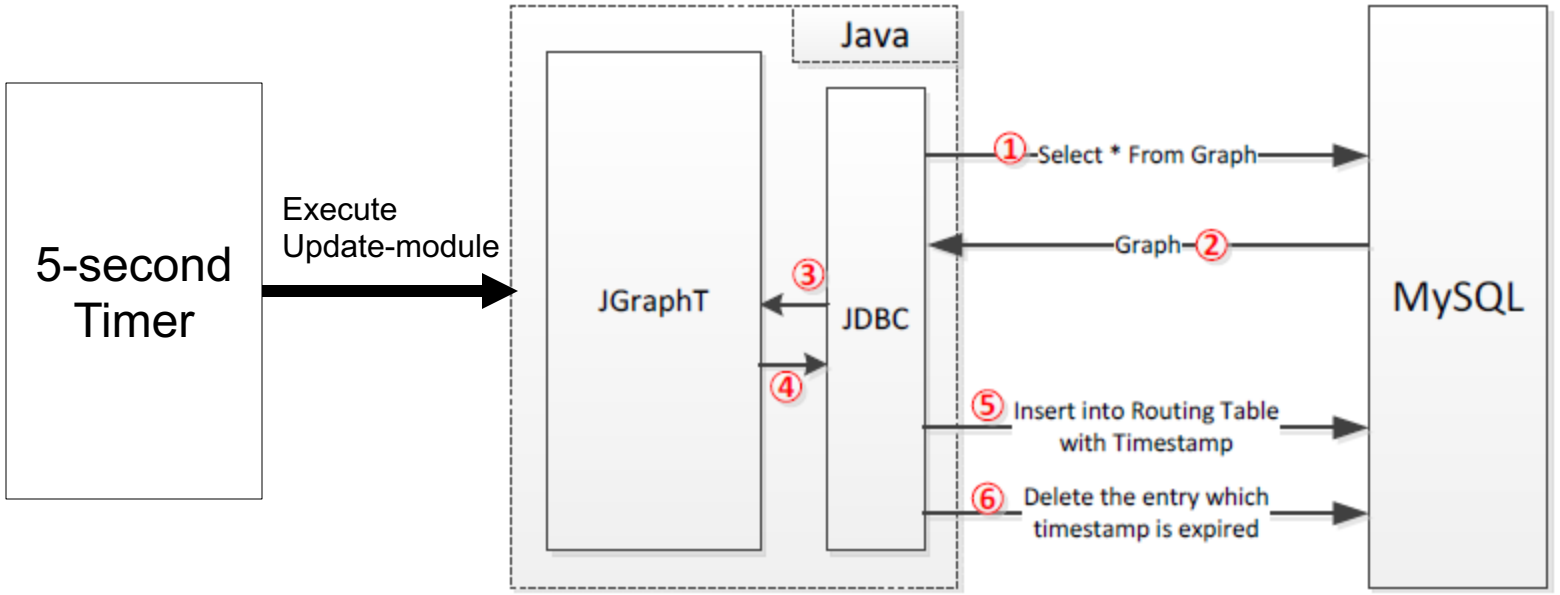
Periodic Update Approach



Routing Table Update Module

It work fine, except it's wasting computing resource in most of the time.

Periodic Update Approach



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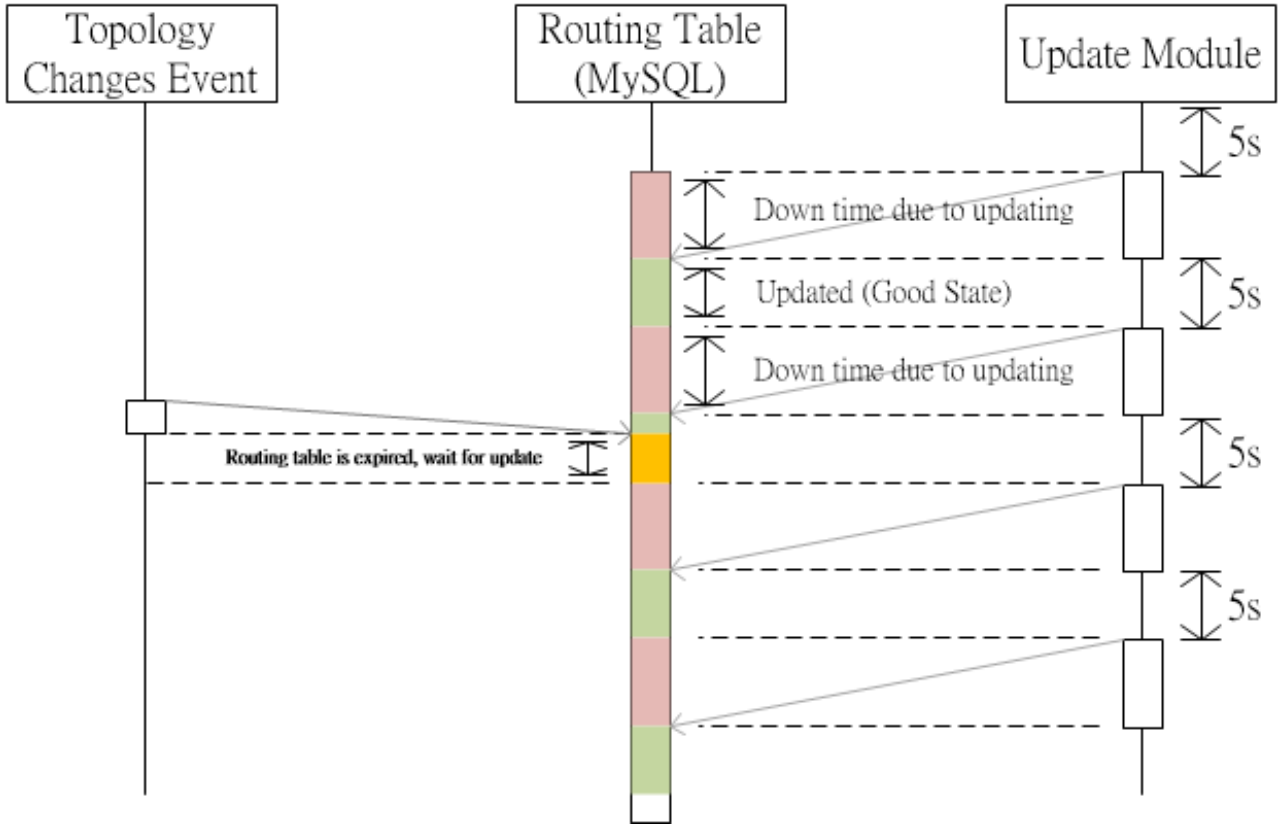
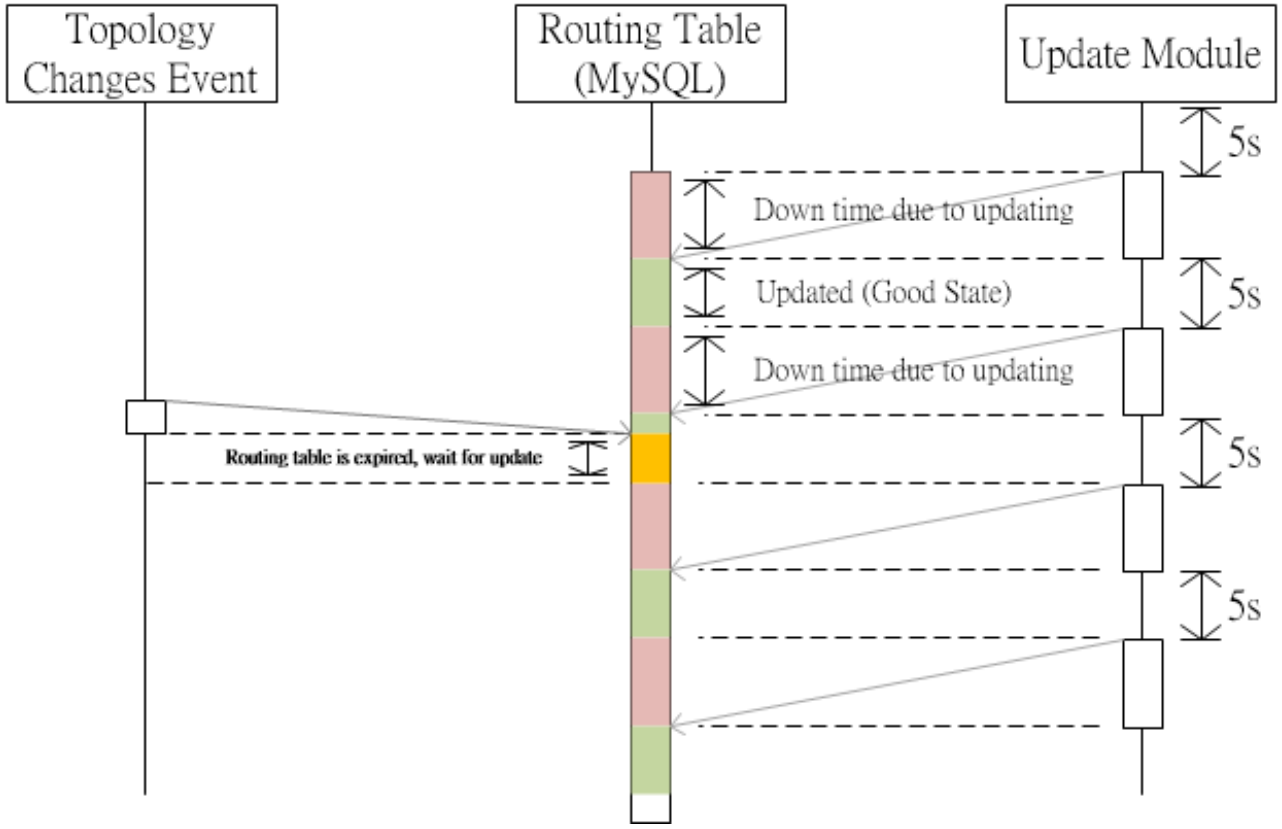


Routing Table Update Module

Availability of Routing Table is LOW

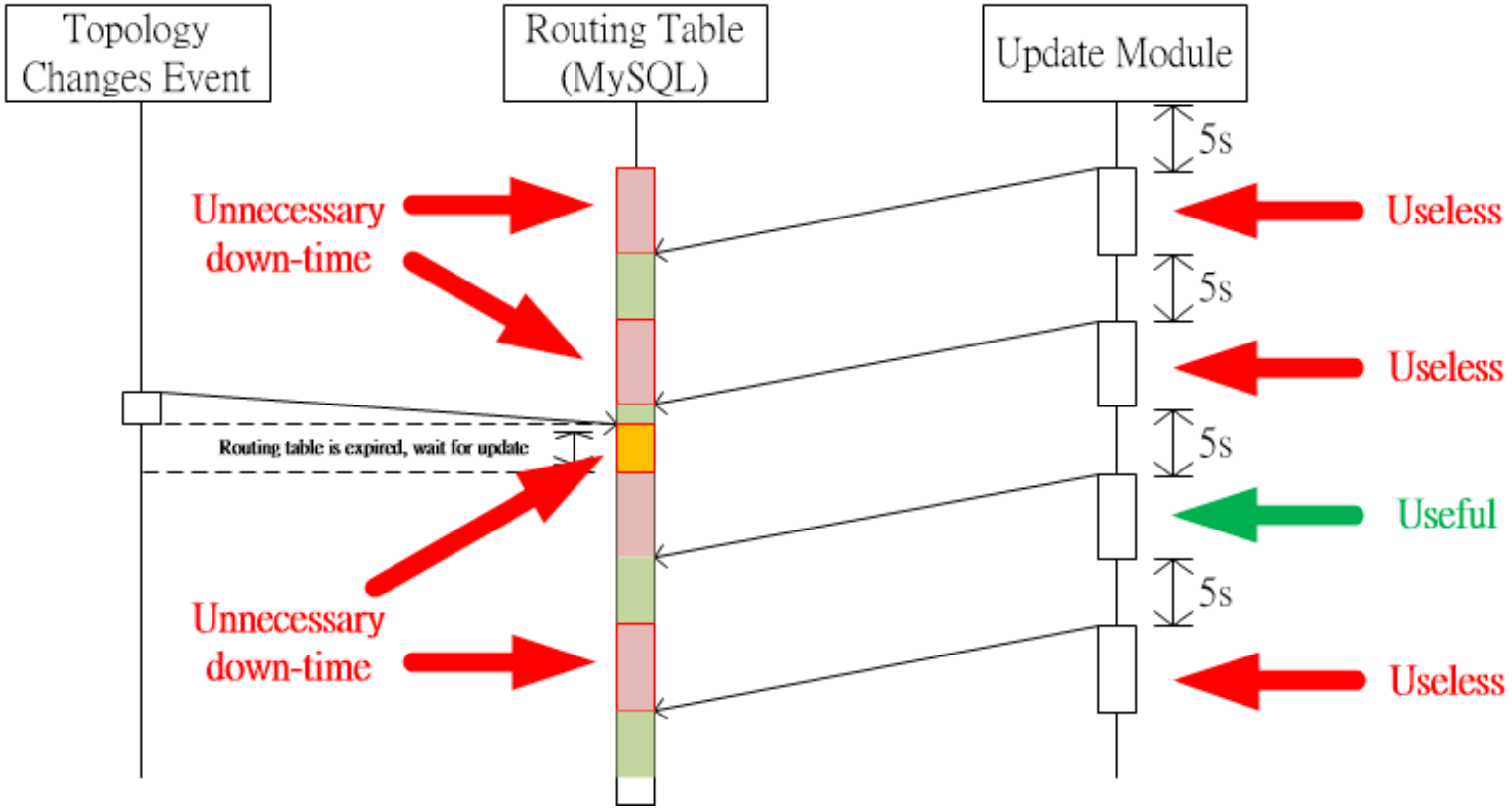
Periodic Update Approach



Routing Table Update Module

- Routing Table NO need to update when topology remain unchanged

Periodic Update Approach

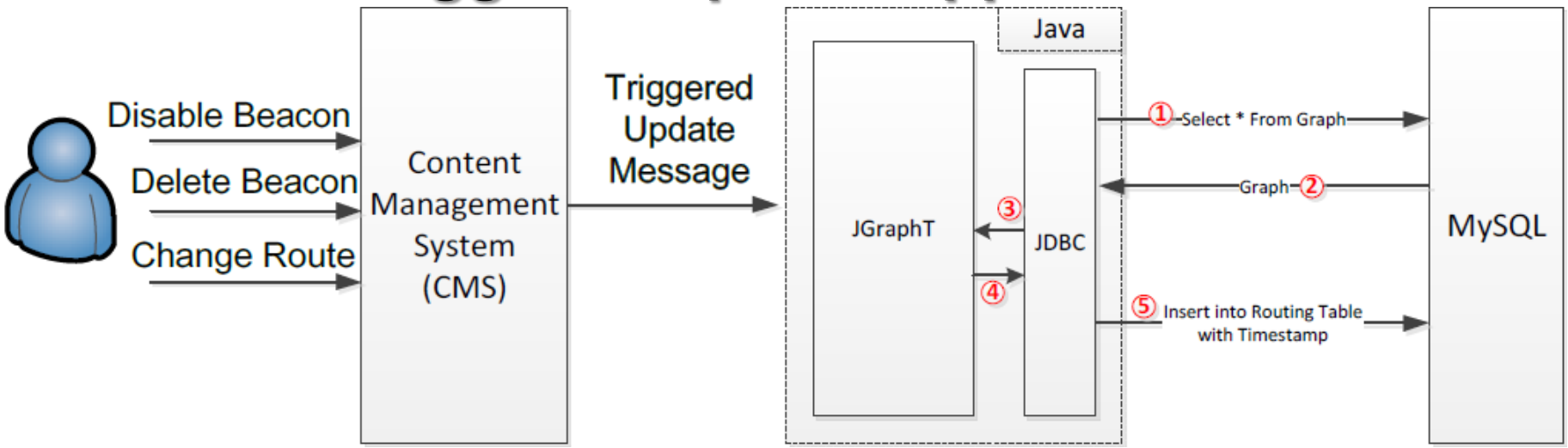


Routing Table Update Module

- We introduce TRIGGEED UPDATE APPROACH in 2nd semester to enhance the performance

- Trigger Message will be generated when topology is changed.
  - *E.G. Disable Beacon / Delete Beacon / Change Route*

Triggered Update Approach



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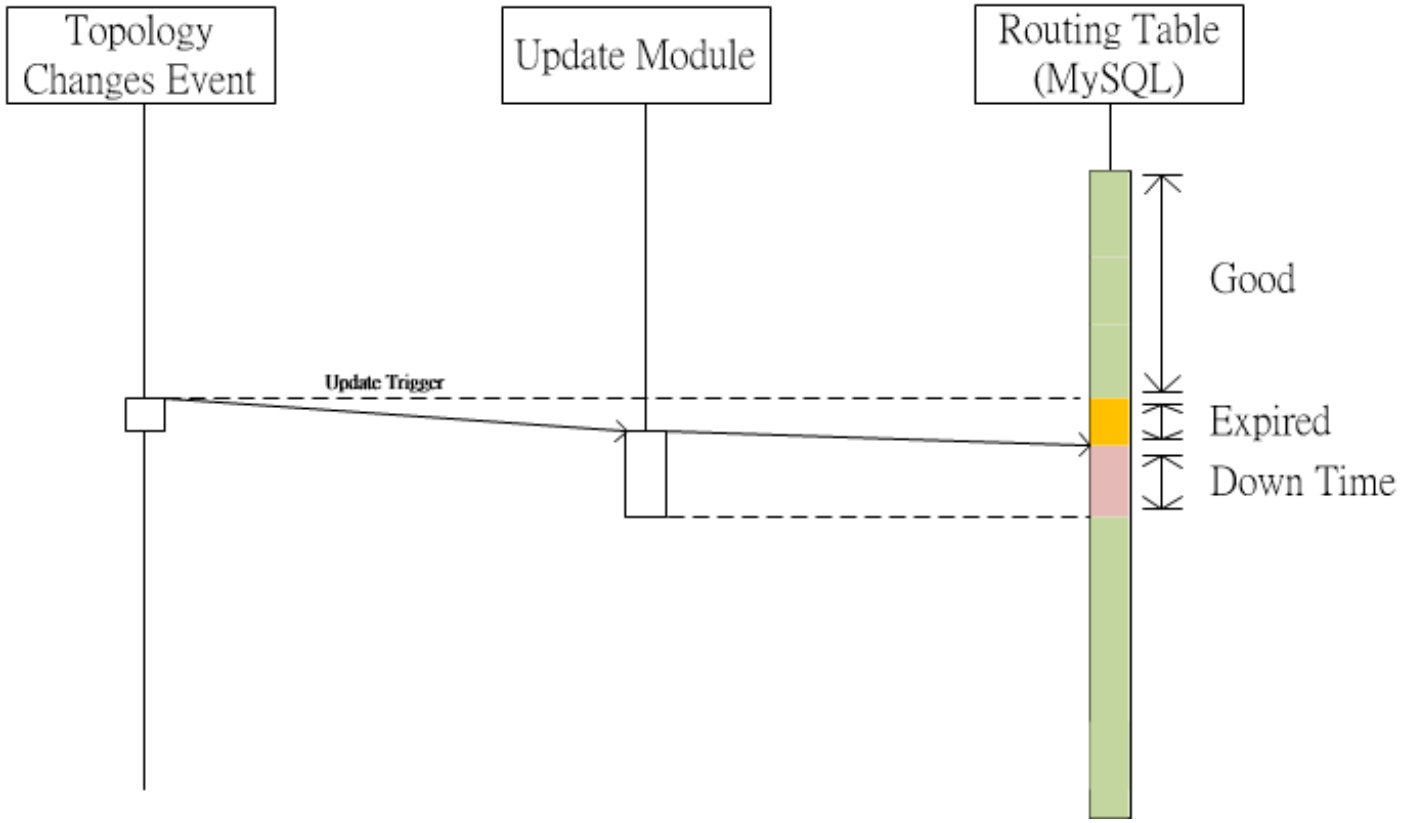
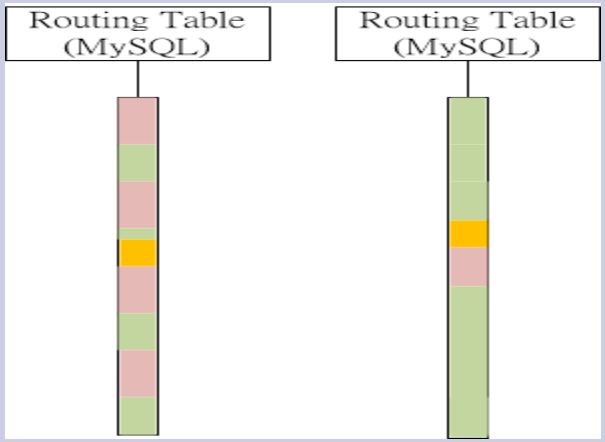
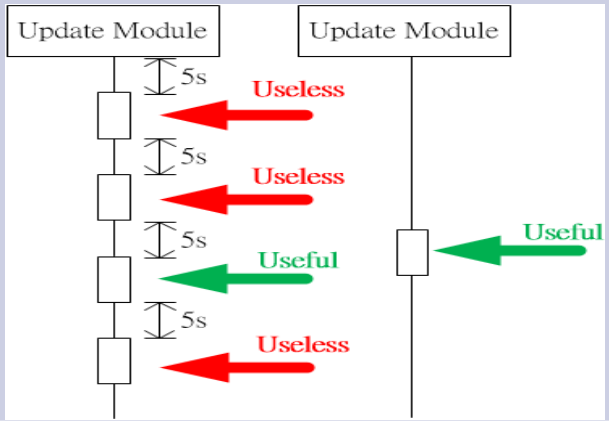
Triggered Update Approach



Routing Table Update Module

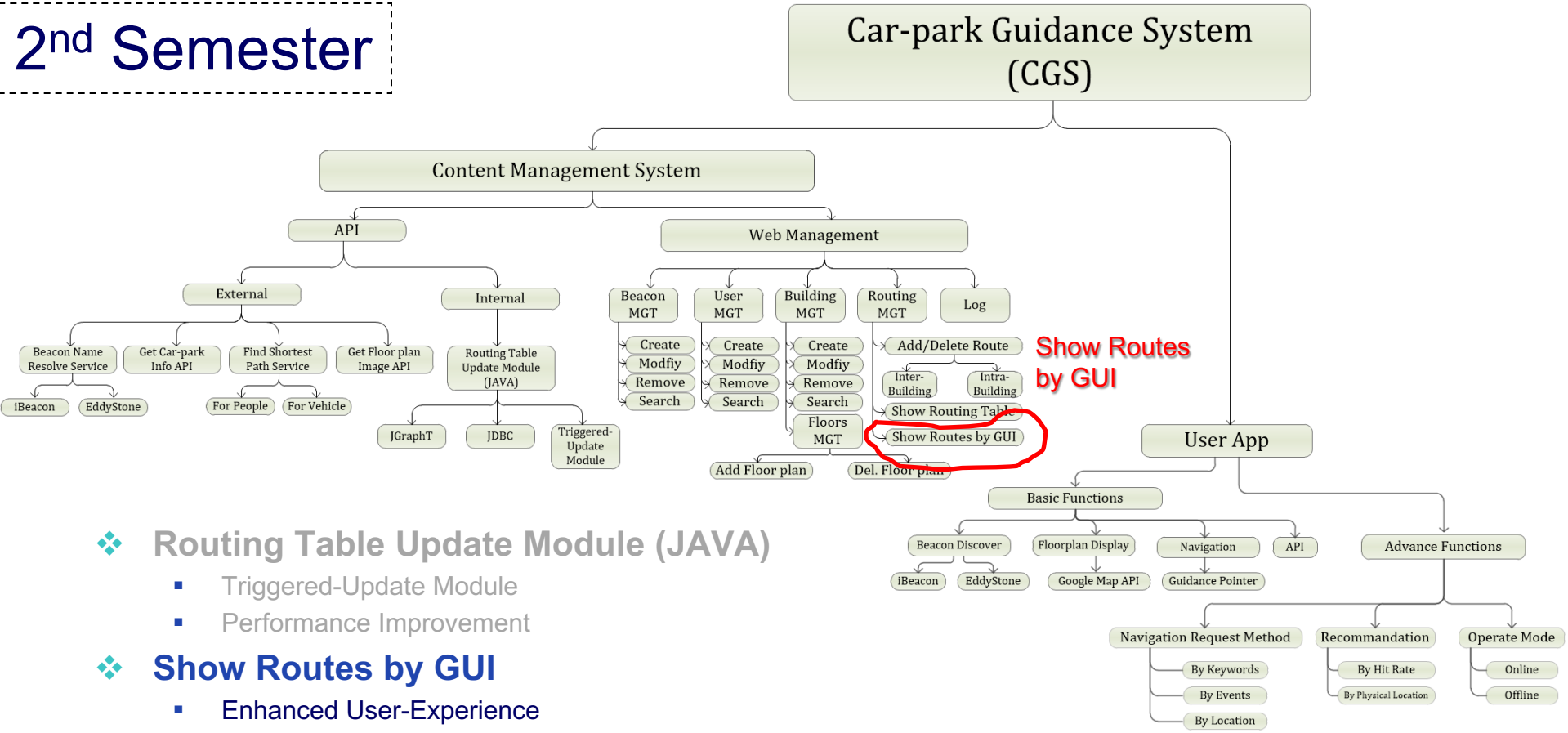
What's improved?

Periodic Update	Semester 1	Semester 2	Triggered Update
Down Time:			Down Time:
300% more			300% reduced
Useless Module Call:			Useless Module Call:
3			0

Improved GUI of Content Management System

Show Routes by GUI

2nd Semester



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- **Show Routes by GUI**
  - Enhanced User-Experience

Show Routes by GUI

What is it?

- For Administrator to review the routes setting using GUI mode.

Show Routes by GUI

What is it?

- For Administrator to review the routes setting using GUI mode.
- Routing Table is hard to imagine as a graph by human.

Record	Source	Destination	Next Hop	Direction	Hop Count	Total Cost	Type	Revision No.
6346	uTzA (BID:4)	HSH_1F_REF1 (Hide) (BID:45)	4xPj (BID:27)	W	6	6	P	71129
6347	uTzA (BID:4)	HSH_121 (BID:46)	4xPj (BID:27)	W	7	7	P	71129
6348	uTzA (BID:4)	HSH_1F_Cargo_Lobby (BID:47)	4xPj (BID:27)	W	6	6	P	71129
6349	uTzA (BID:4)	HSH_123 (BID:48)	4xPj (BID:27)	W	4	4	P	71129
6351	uTzA (BID:4)	HSH_101 (BID:50)	4xPj (BID:27)	W	5	5	P	71129
6352	uTzA (BID:4)	HSH_102 (BID:51)	4xPj (BID:27)	W	7	7	P	71129
6353	uTzA (BID:4)	HSH_102A (BID:52)	4xPj (BID:27)	W	8	8	P	71129
6354	uTzA (BID:4)	HSH_1F_Stair_NE (BID:53)	4xPj (BID:27)	W	8	8	P	71129
6357	uTzA (BID:4)	HSH_1F_Stair_SE (BID:56)	4xPj (BID:27)	W	9	9	P	71129
6358	uTzA (BID:4)	HSH_901 (BID:57)	4xPj (BID:27)	W	5	5	P	71129

Showing 71 to 80 of 2,951 entries (filtered from 3,423 total entries) Previous 1 … 7 8 9 … 296 Next

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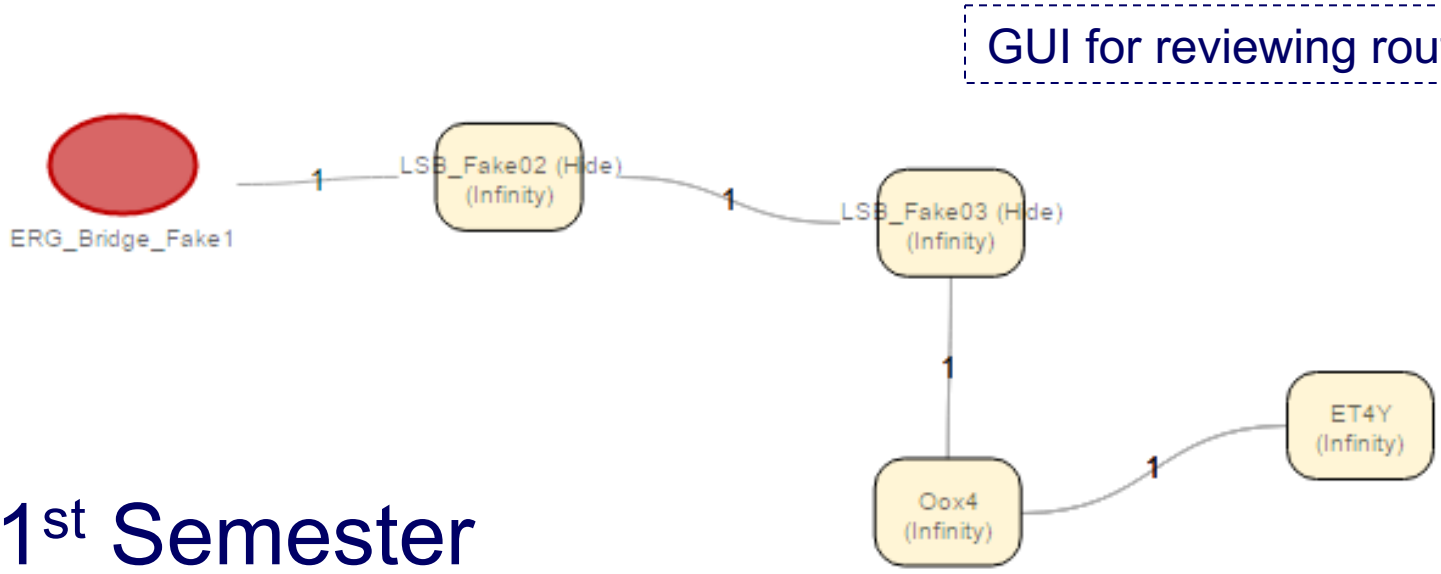
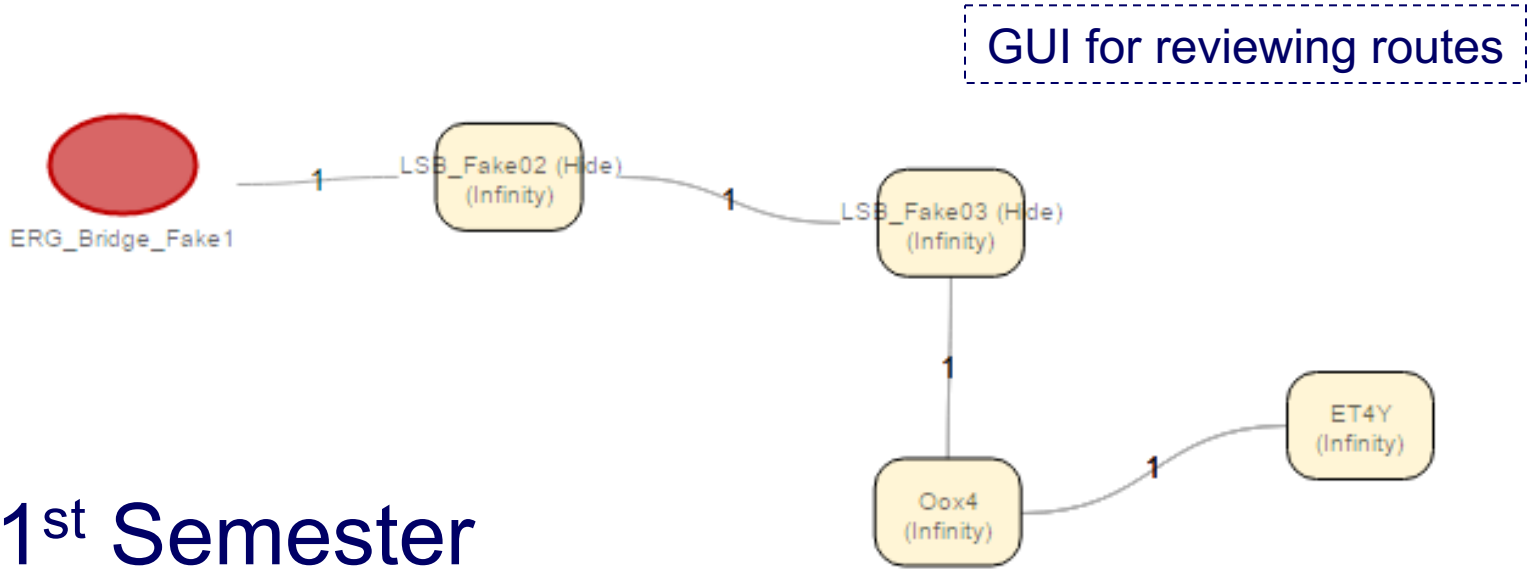


1st Semester

Show Routes by GUI

Problem?

- Information is missing from the given GUI
  - Physical Location?
  - Inefficient to display large amount of Vertexes



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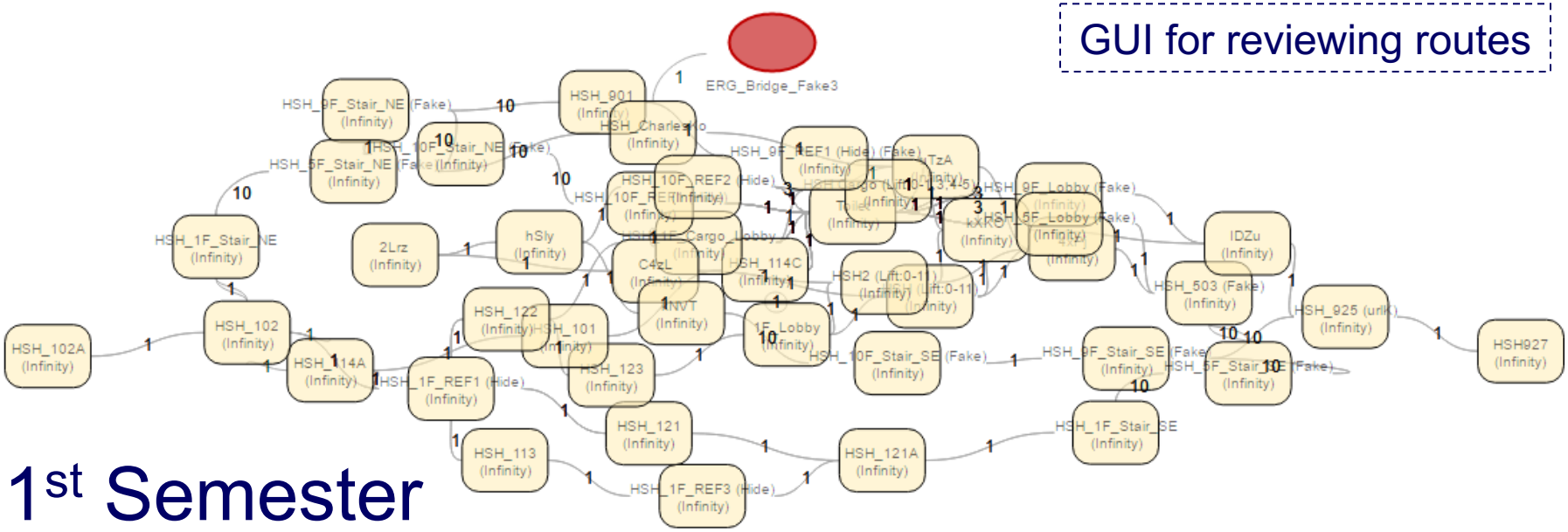
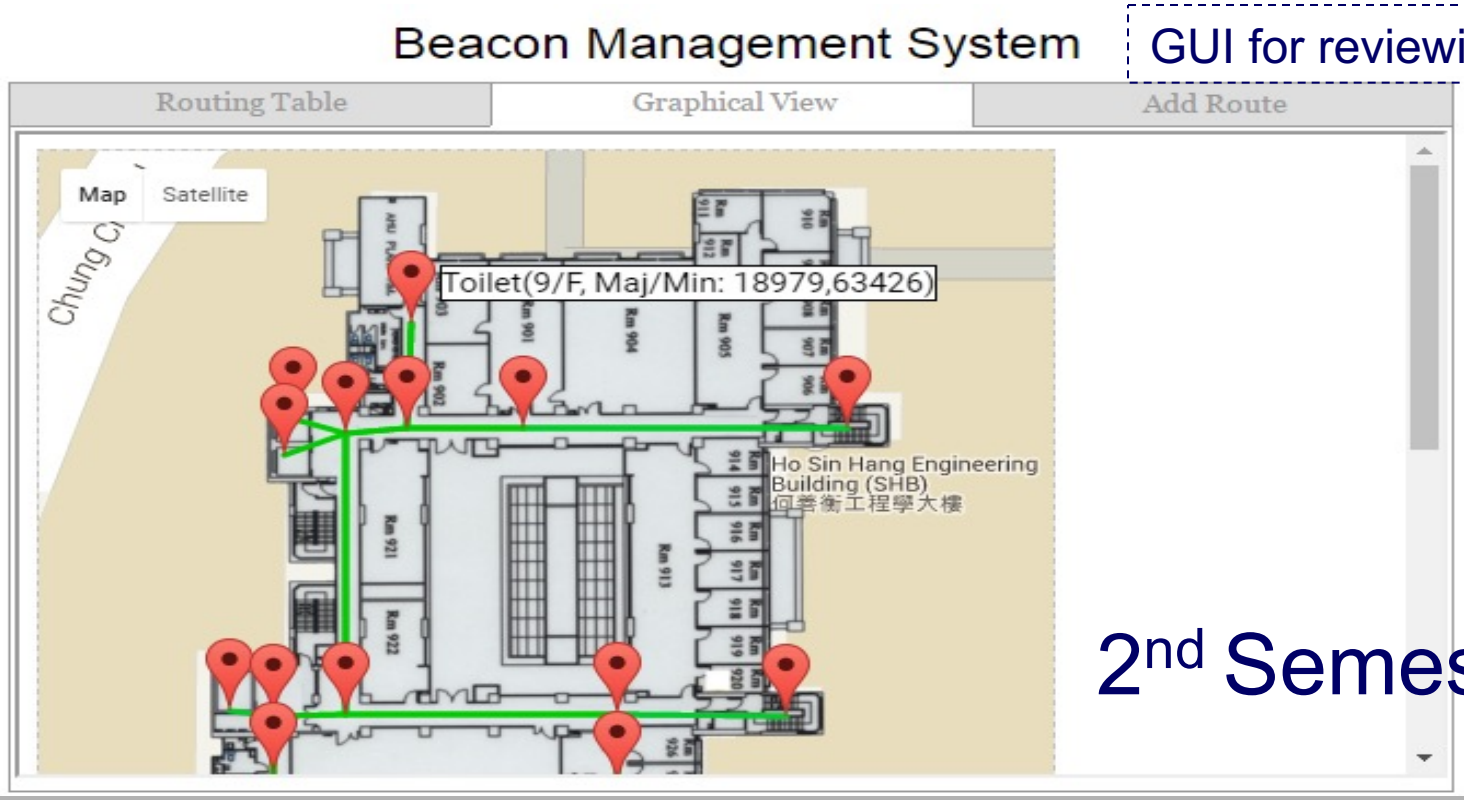


1st Semester

Show Routes by GUI

Improvement?

- We changed the design of GUI to be more user-friendly in the 2nd semester.
- More information is provided in GUI



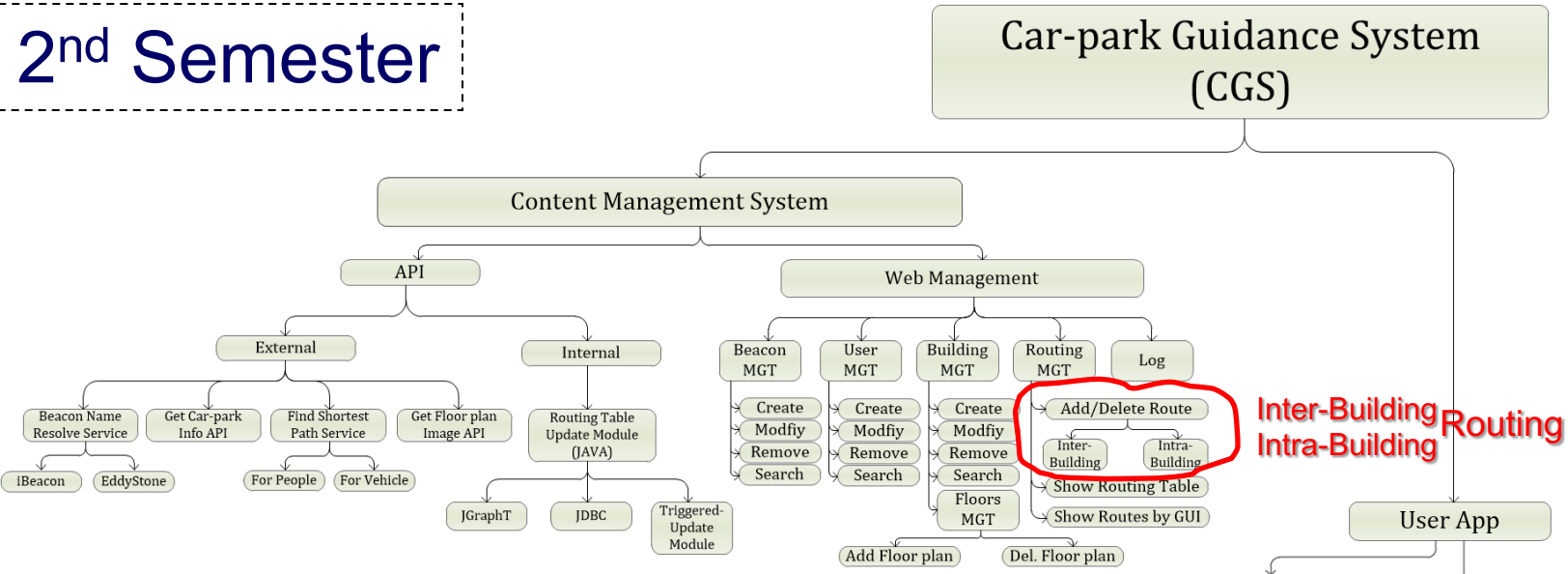
GUI for reviewing routes

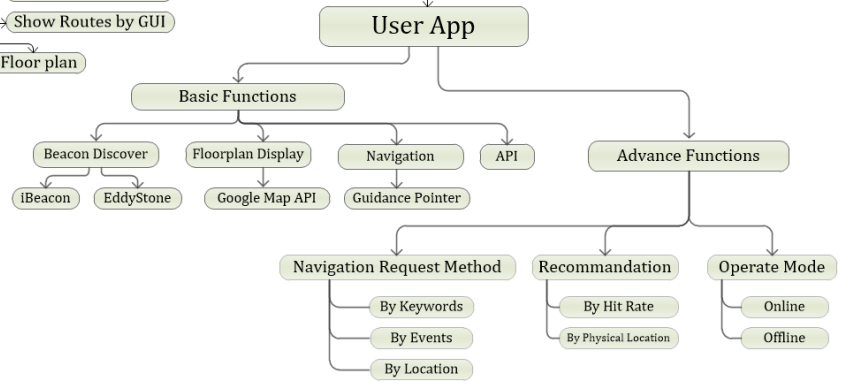
2nd Semester

Inter-Building Routing

Inter-Building Routing

2nd Semester





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  - Triggered-Update Module
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- **Intra-Building / Inter-Building Routing**
  - Navigation inside a building
  - Navigation outside a building

Inter-Building Routing

Inter-Building Routing

- Navigation outside a building

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Inter-Building Routing

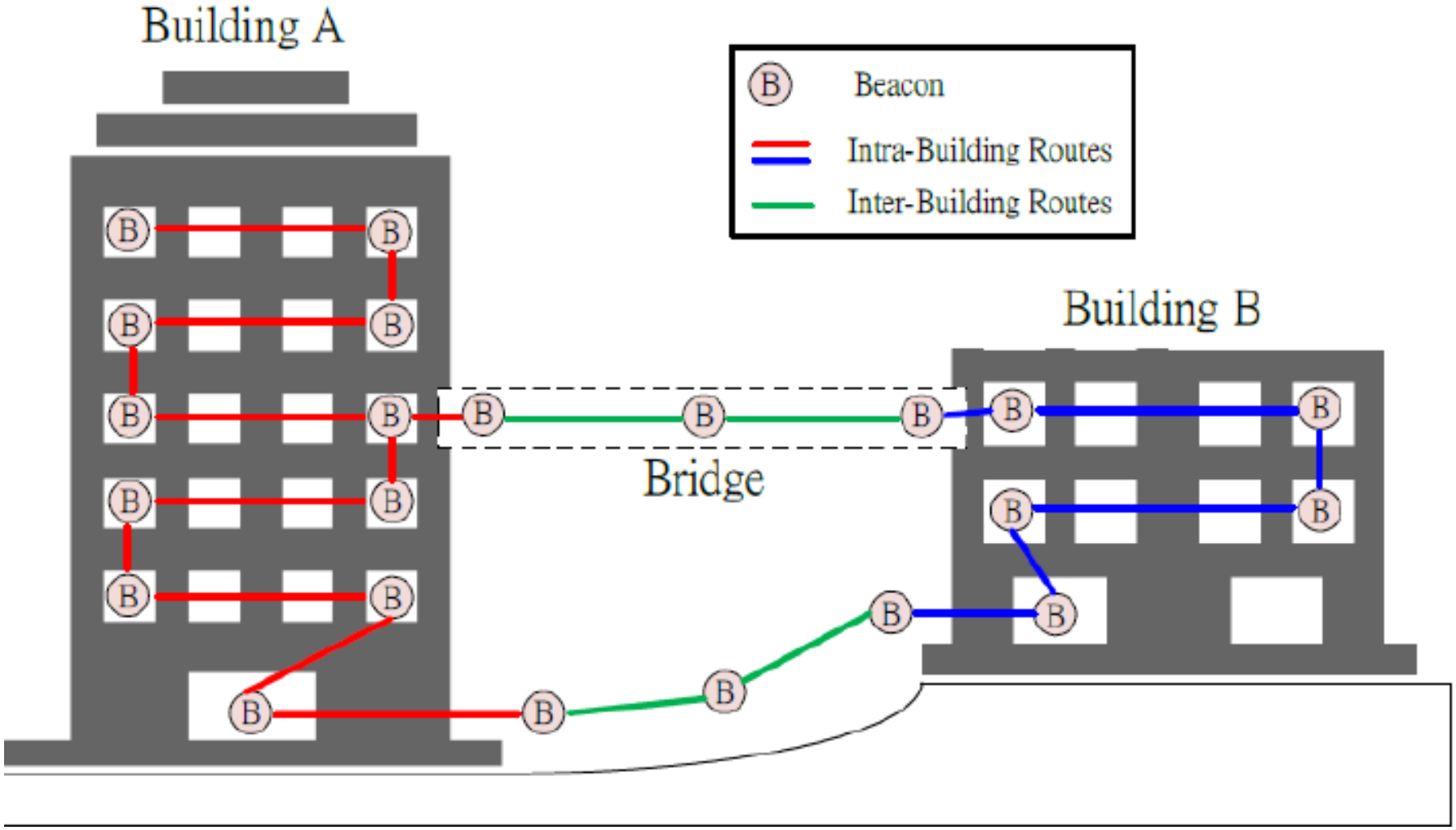
- Navigation outside a building

Intra-Building Routing

Intra-Building Routing

- Navigation inside a building

Intra-Building Routing



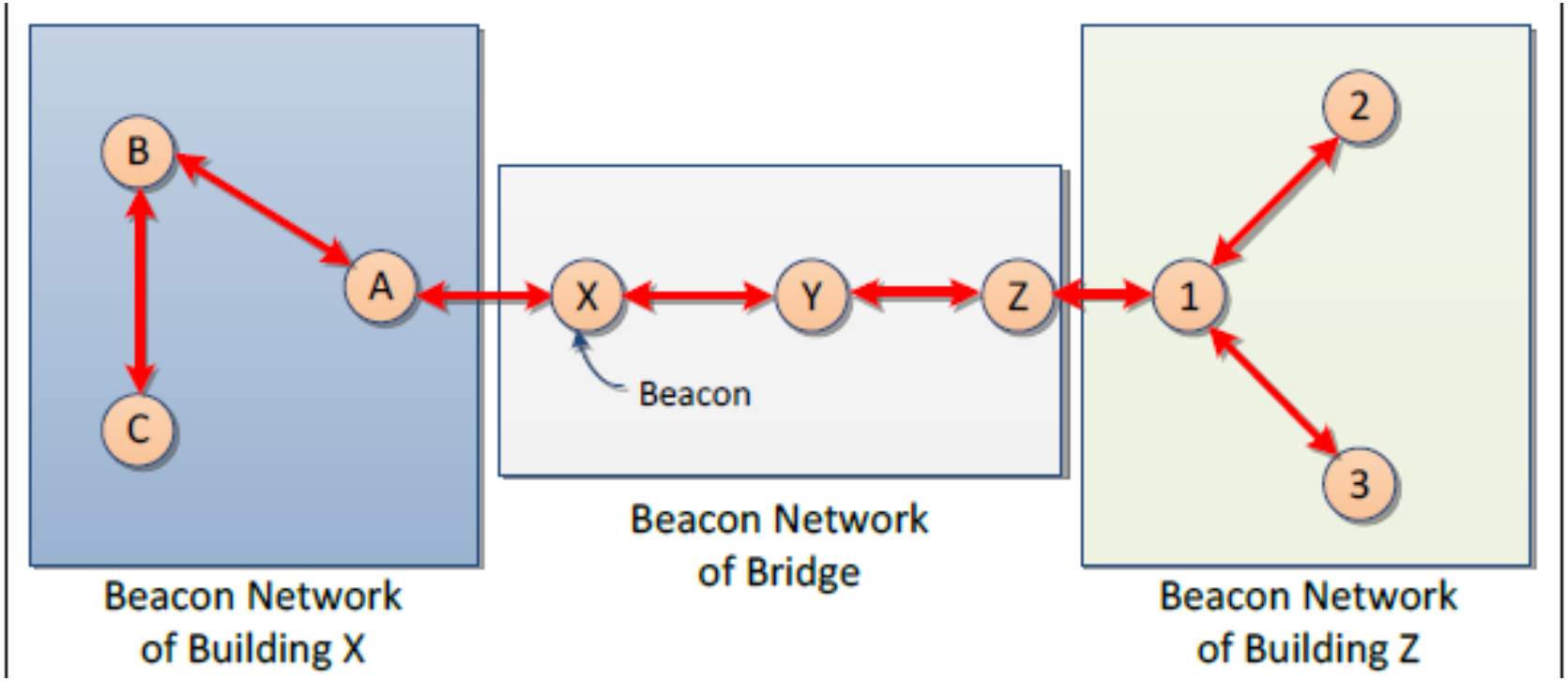
Intra-Building Routing

OK, but Why?

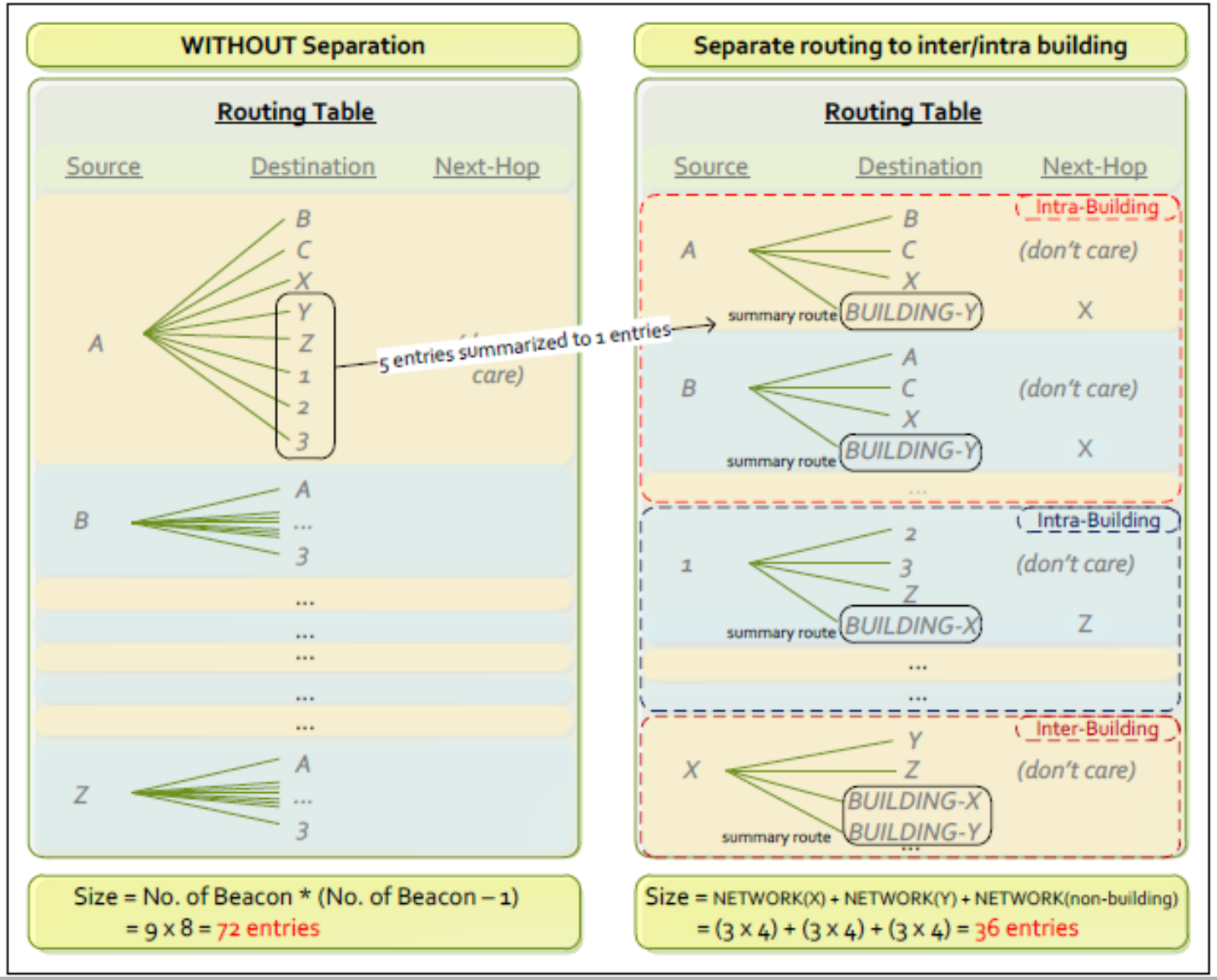
- Different Buildings cannot treat as a one single building due to:
  - Different Floor Plan
  - Different Floor Level
  - Different Physical Location
- Route Summarization
  - Enhance the performance

Route Summarization

- Reduce the size of routing table
  → Performance increased
- Let's Consider the following example:



Route Summarization



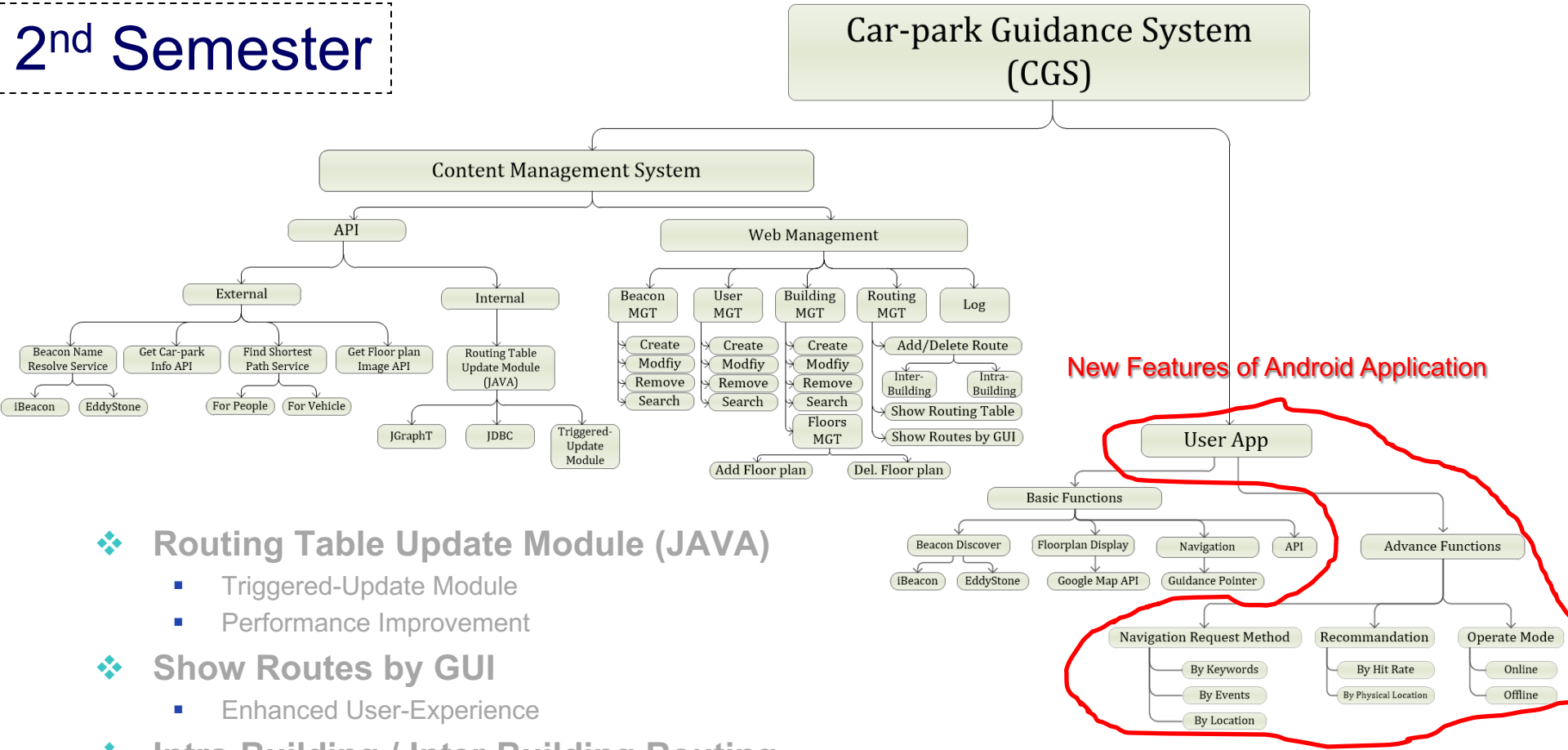
Route Summarization

- Size of routing table is reduced by 100% for the case has only 2 buildings.
- ~200% for 3 buildings…etc.
- Performance in calculating shortest path also enhanced. (Routing Table Update Module)

Advanced Feature of Android

Project Extension

2nd Semester



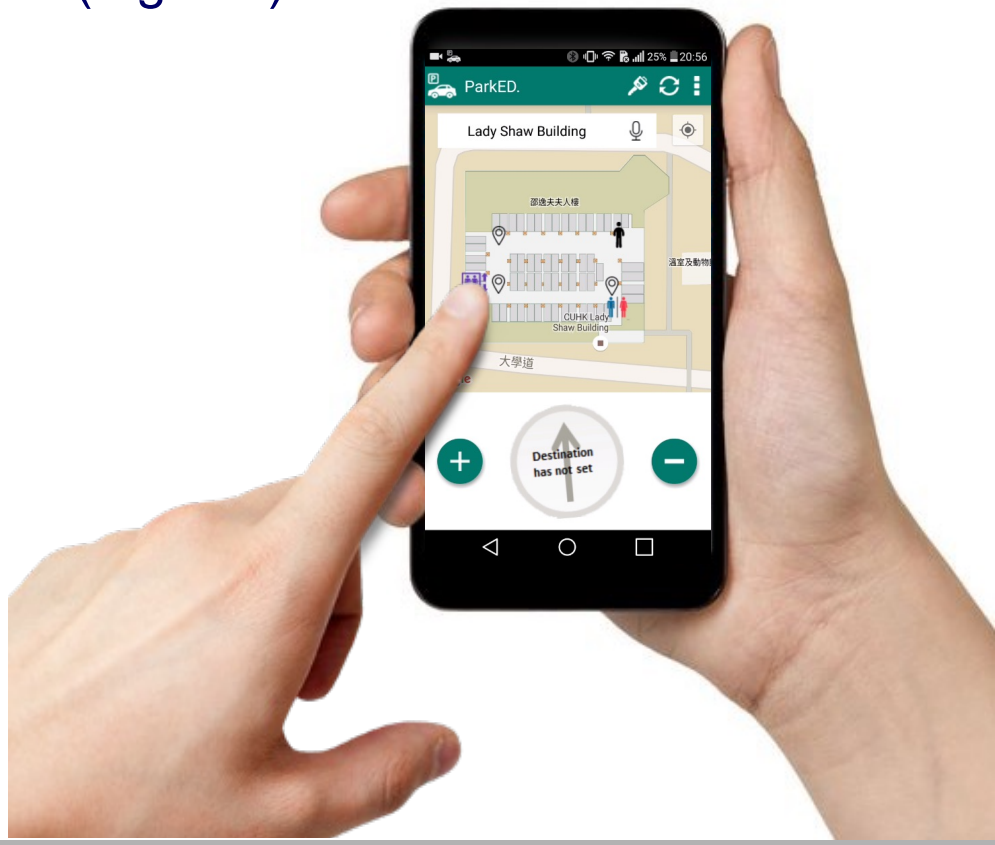
- **Routing Table Update Module (JAVA)**
  - Triggered-Update Module
  - Performance Improvement
- **Show Routes by GUI**
  - Enhanced User-Experience
- **Intra-Building / Inter-Building Routing**
  - Navigation inside a building
  - Navigation outside a building

- **New Features of Android Application**
  - Navigation Request Method
  - Recommendation

Navigation Request Method – 1st Semester

- **Input Method: "Tap on the destination (By Location)"**
  - How its work?

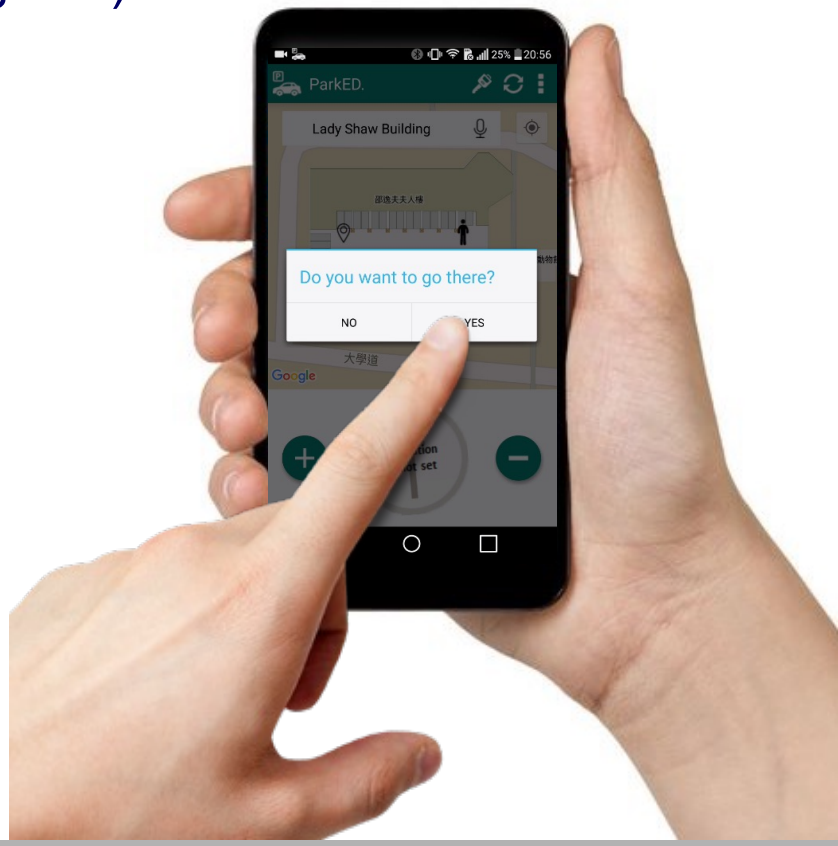
1) Press the destination marker (e.g. Lift)



Navigation Request Method – 1st Semester

- **Input Method: "Tap on the destination (By Location)"**
  - How its work?

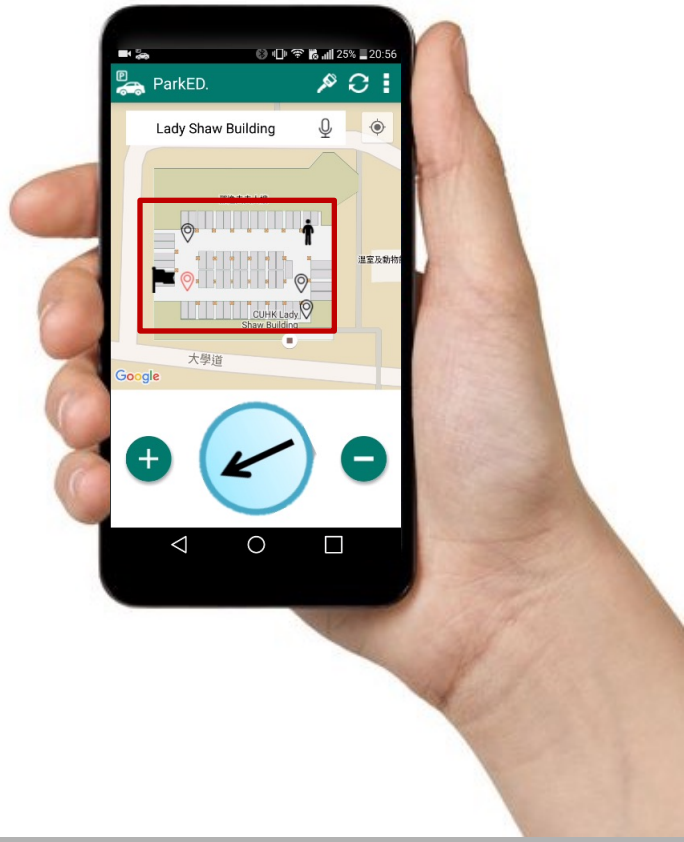
1) Press the destination marker (e.g. Lift)
2) Confirm the selected one is the destination



Navigation Request Method – 1st Semester

- **Input Method: "Tap on the destination (By Location)"**
  - How its work?

1) Press the destination marker (e.g. Lift)
2) Confirm the selected one is the destination
3) The shortest path will be shown



Navigation Request Method – 2nd Semester

- **Input Method: "Search (By Keywords)"**
  - How its work?

1) Press Search Button

Navigation Request Method – 2nd Semester

- **Input Method: "Search (By Keywords)"**
  - How its work?

1) Press Search Button
2) Input Keywords

Navigation Request Method – 2nd Semester

- **Input Method: "Search (By Keywords)"**
  - How its work?

1) Press Search Button
2) Input Keywords
3) Select the location (e.g. FYP Presentation)

Navigation Request Method – 2nd Semester

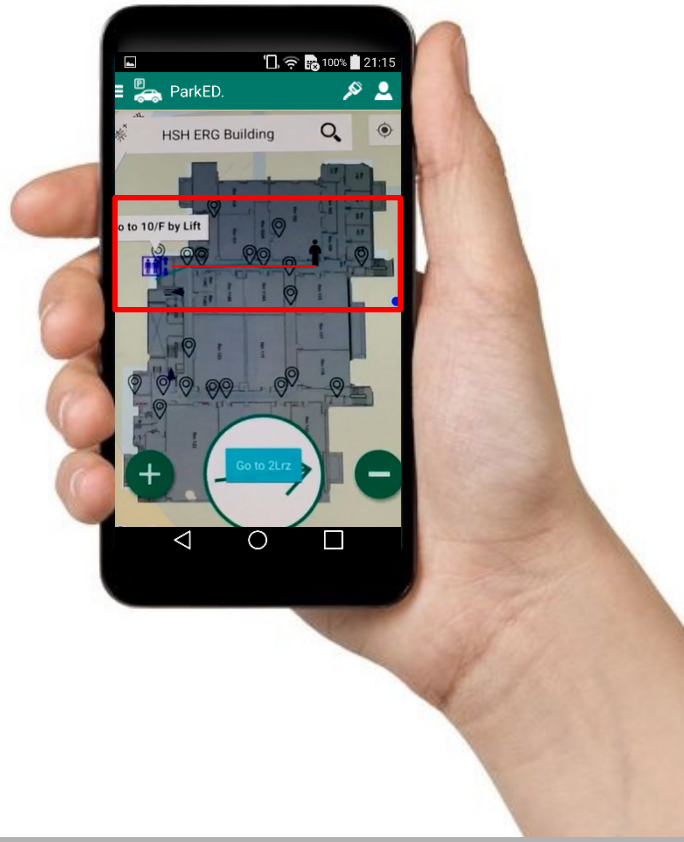
- **Input Method: "Search (By Keywords)"**
  - How its work?

1) Press Search Button
2) Input Keywords
3) Select the location (e.g. FYP Presentation)
4) Press Confirm Button

Navigation Request Method – 2nd Semester

- **Input Method: "Search (By Keywords)"**
  - How its work?

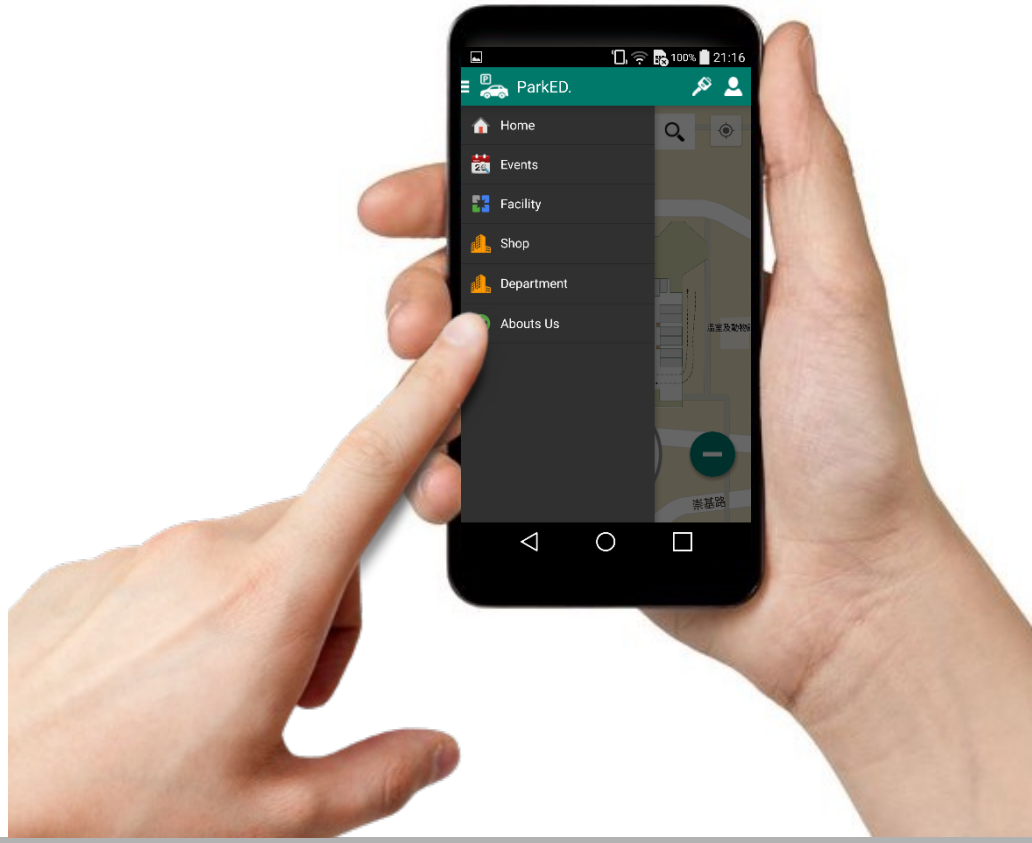
1) Press Search Button
2) Input Keywords
3) Select the location (e.g. FYP Presentation)
4) Press Confirm Button
5) The shortest path will be shown



Navigation Request Method – 2nd Semester

- **Input Method: "Search (By Events)"**
  - How its work?

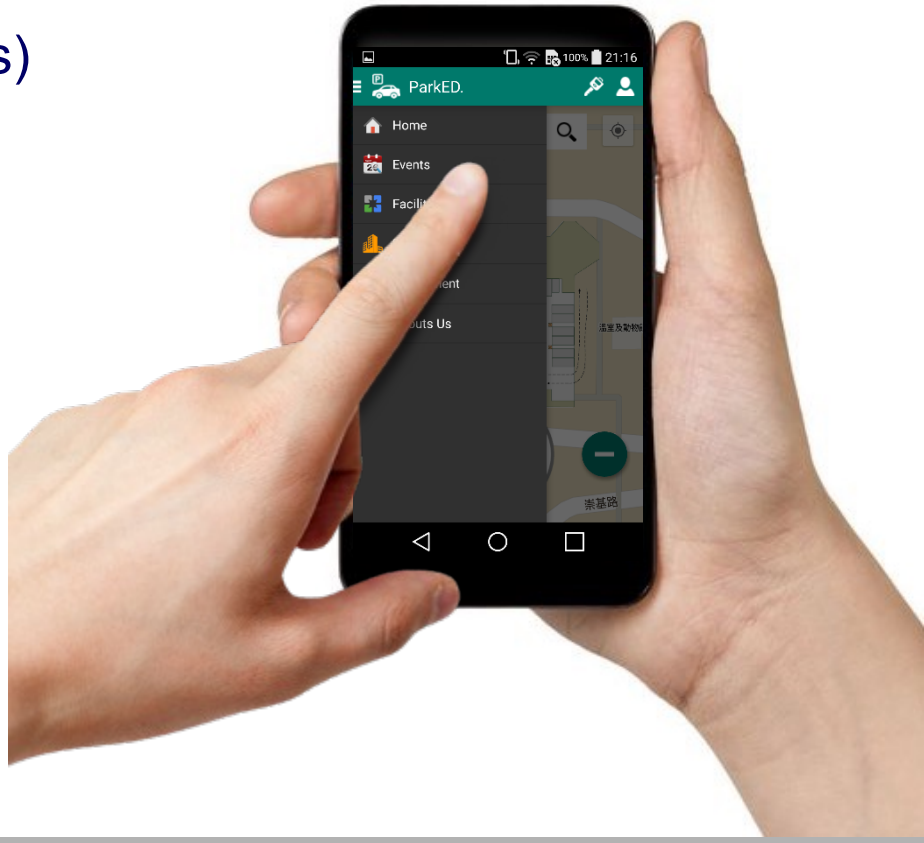
1) Sliding right to open the menu



Navigation Request Method – 2nd Semester

- **Input Method: "Search (By Events)"**
  - How its work?

1) Sliding right to open the menu
2) Select one catalog (e.g. Events)



Navigation Request Method – 2nd Semester

- **Input Method: "Search (By Events)"**
  - How its work?

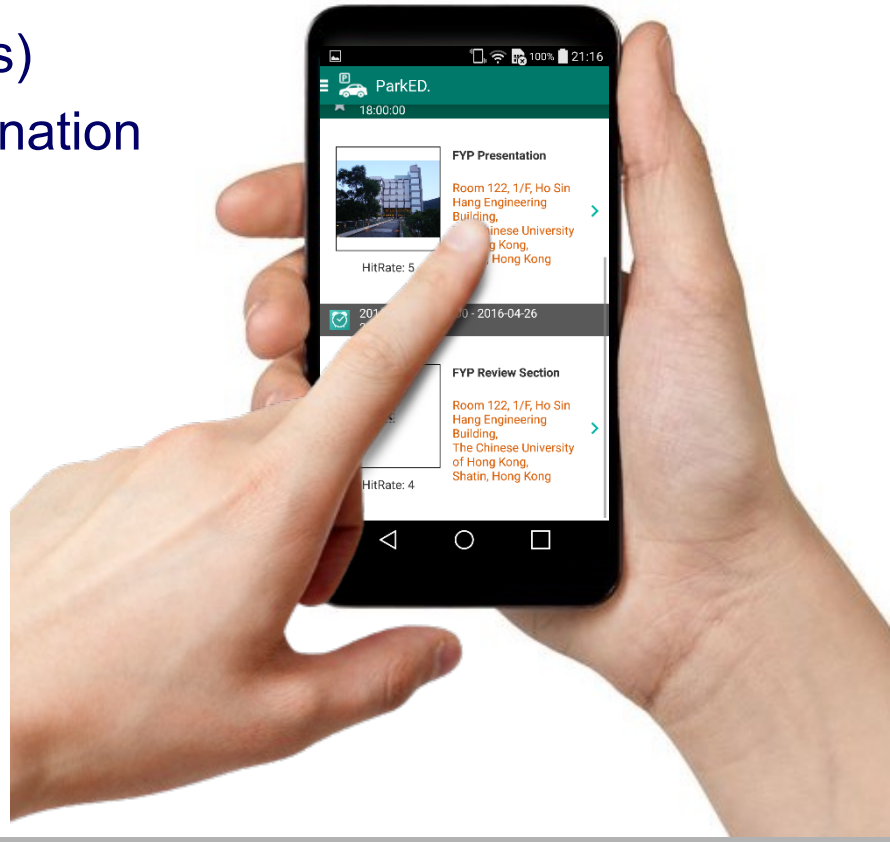
1) Sliding right to open the menu
2) Select one catalog (e.g. Events)
3) Choose one event as the destination (e.g. FYP Presentation)

Navigation Request Method – 2nd Semester

Input Method: "Search (By Events)"

- How its work?

1) Sliding right to open the menu
2) Select one catalog (e.g. Events)
3) Choose one event as the destination (e.g. FYP Presentation)

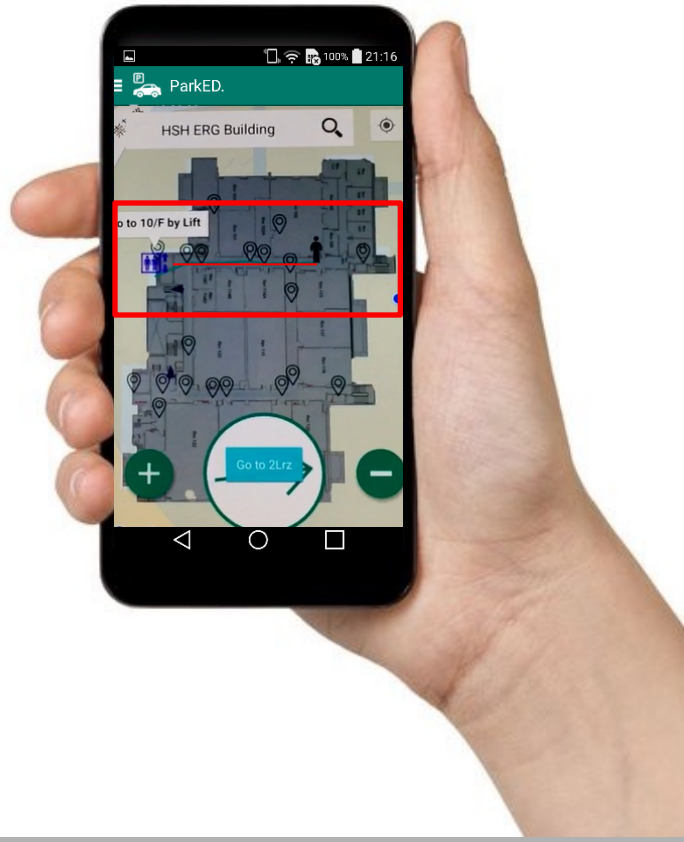


Navigation Request Method – 2nd Semester

Input Method: "Search (By Events)"

- How its work?

1) Sliding right to open the menu
2) Select one catalog (e.g. Events)
3) Choose one event as the destination (e.g. FYP Presentation)
4) The shortest path will be shown



Recommendation

Why we need it?

- Actually, there are a bunch of location information stored in database.

Browse | Structure | SQL | Search | Insert | Export | Import | Operations

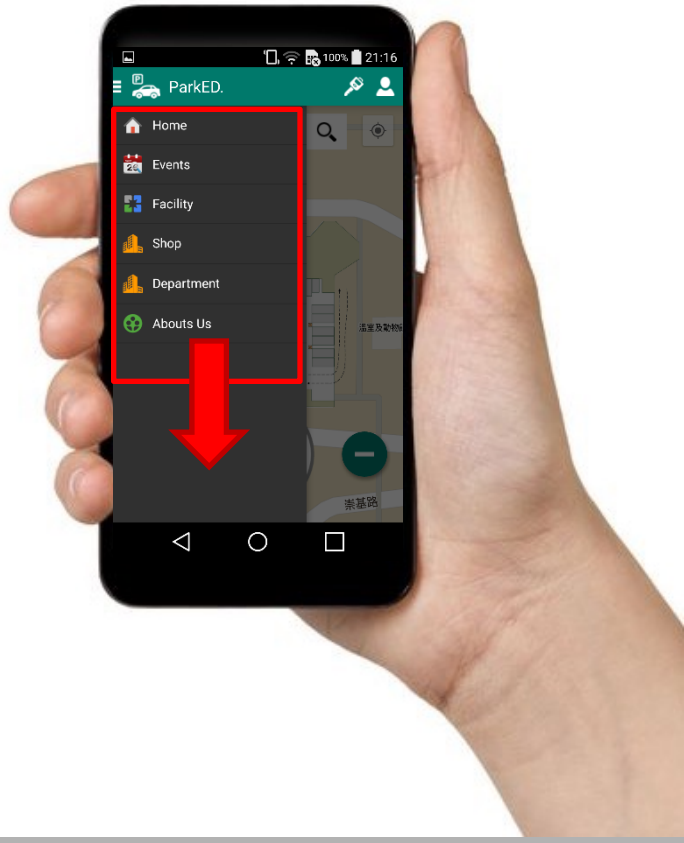
BName	Name	Location	BDescript	Image	HitRate	Catalog	StartDate	EndDate	Latitude	Longitude
2Lrz	FYP Presentation	Room 122, 1/F, Ho Sin Hang Engineering Building, ...	NULL	https://uploa	7	Events	2016-04-25 09:30:00	2016-04-26 18:00:00	22.4178566318875	114.207200556993
2Lrz	HSH 1021B	10/F, Ho Sin Hang Engineering Building, The Chin...	NULL	NULL	0	Other	NULL	NULL	22.4180983836132	114.207353442907
AIT_G04	Public Talks Series by Guest Artists, The Art of C...	AIT G04, An Integrated Teaching Building, The Chi...	NULL	http://www.cp	47	Events	2016-04-29 15:00:00	2016-04-29 16:00:00	22.41632	114.211894
CLP_57	Bubble	Shop 57, Citylink Plaza, 1 Sha Tin Station Circuit...	NULL	NULL	18	Shop_A	NULL	NULL	22.3825135837829	114.18783634901
Franklin_LG_1	PARKnSHOP	LG, John Fulton Centre, The Chinese University of ...	NULL	NULL	12	Shop_A	NULL	NULL	22.4181758680517	114.204570651054
HSH927	HSH 927	9/F, Ho Sin Hang Engineering Building, The Chine...	NULL	NULL	0	Other	NULL	NULL	22.418054372433	114.207411780953
HSH927	Professor Michael LYU Rung Tsong	9/F, Ho Sin Hang Engineering Building, The Chine...	NULL	NULL	0	Other	NULL	NULL	22.418054372433	114.207411780953
HSH927	Professor Irwin King	9/F, Ho Sin Hang Engineering Building, The Chine...	NULL	NULL	0	Other	NULL	NULL	22.418054372433	114.207411780953
HSH_101	HSH 101 VIEW Lab	Room 101, 1/F, Ho Sin Hang Engineering Building, ...	NULL	NULL	0	Other	NULL	NULL	22.4180983836132	114.207353442907

Recommendation

Why we need it?

- If every catalog are displayed, the app will Not be user-friendly.

1) Menu List will become very long

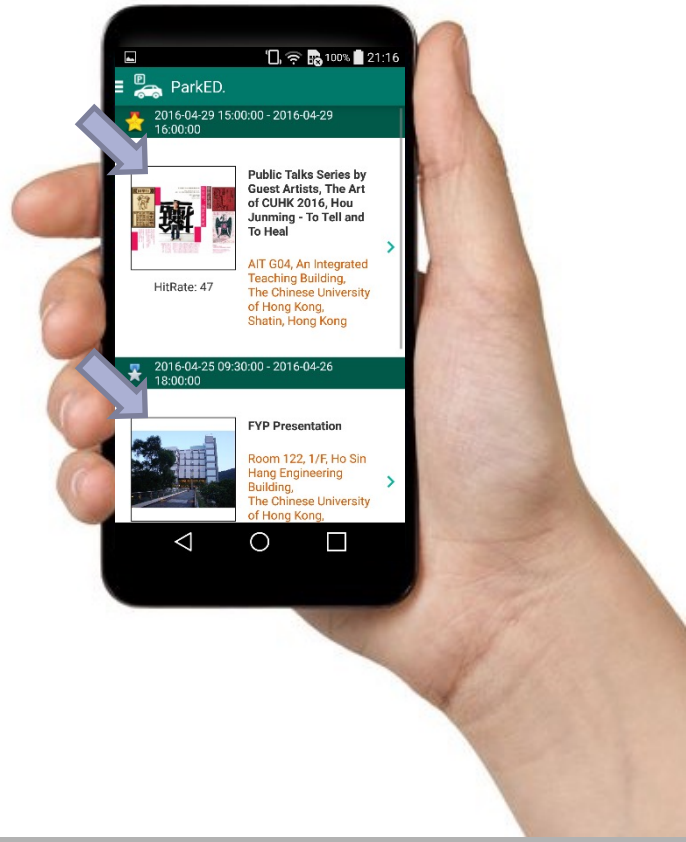


Recommendation

Why we need it?

- If every catalog are displayed, the app will Not be user-friendly.

1) Menu List will become very long
2) Some location will not be found in some catalog (e.g. current location is Fanling)

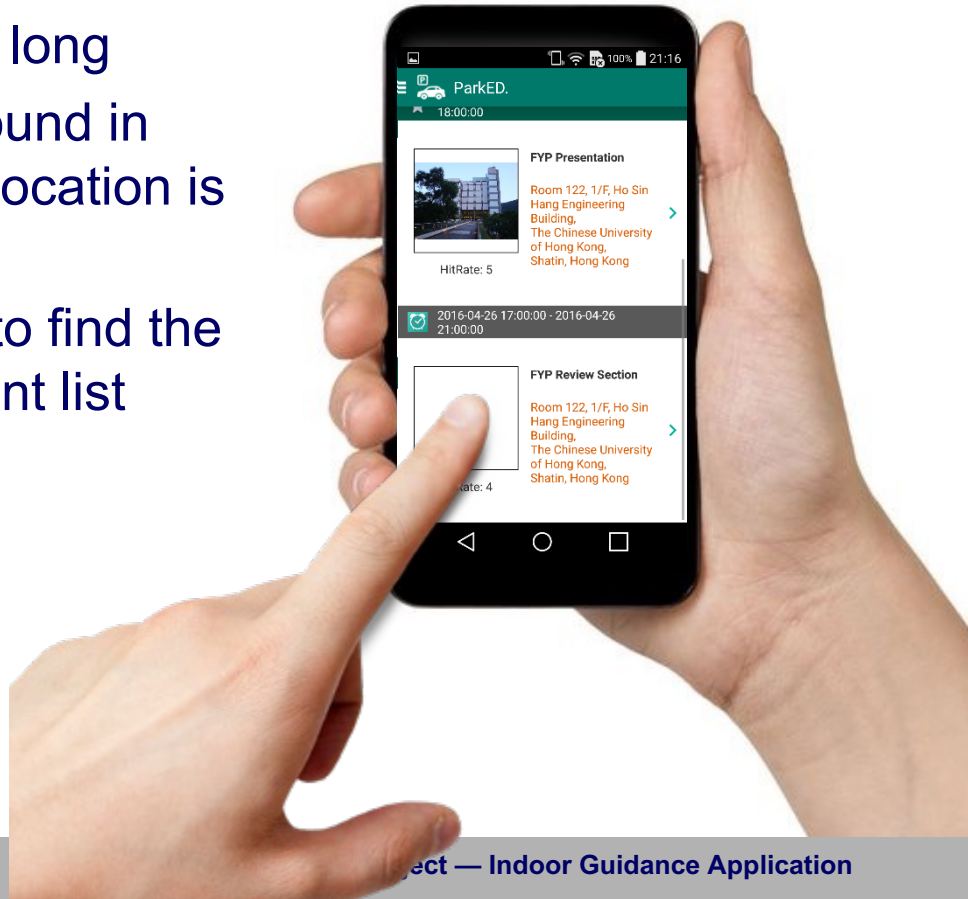


Recommendation

Why we need it?

- If every catalog are displayed, the app will Not be user-friendly.

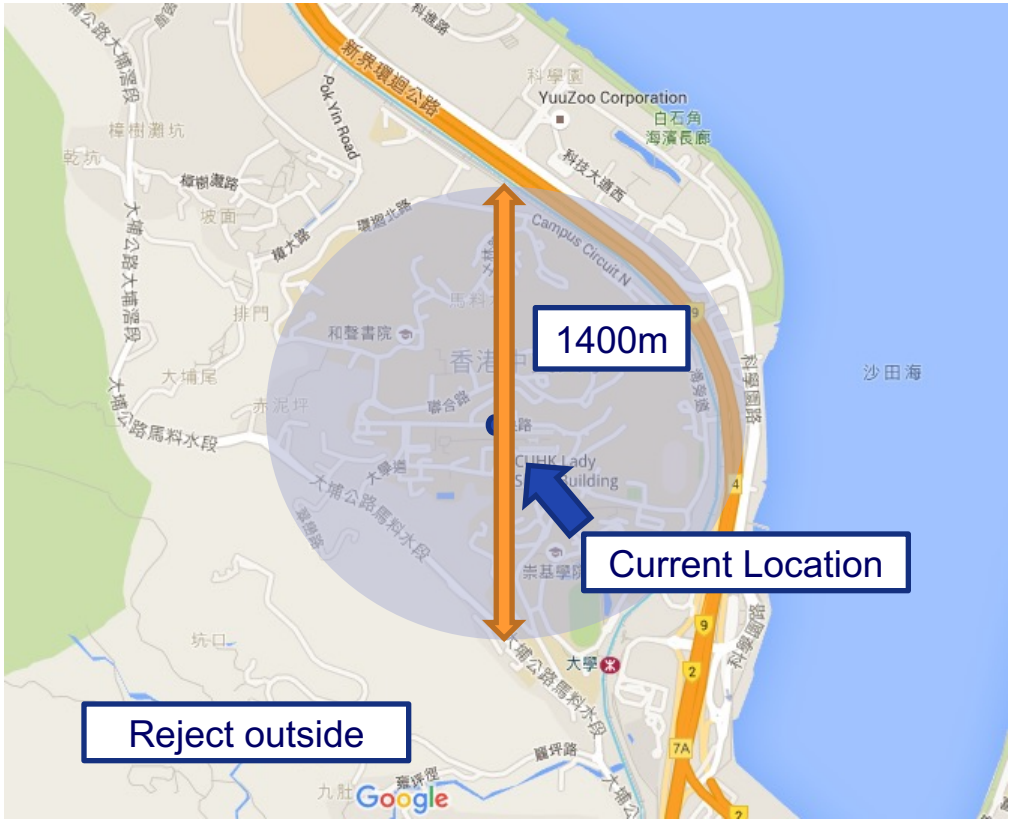
1) Menu List will become very long
2) Some location will not be found in some catalog (e.g. current location is Fanling)
3) Need to spend lots of time to find the destination inside the content list

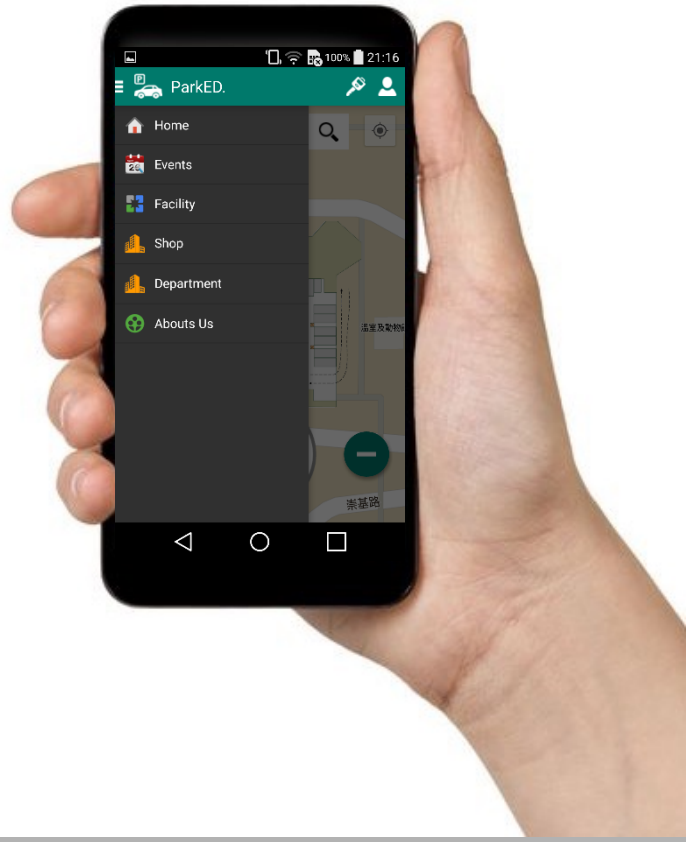


Recommendation

How can we achieve?

- Based on GPS, reject all locations which are outside the range (around 1400m, and accuracy < 40)





Recommendation

How can we achieve?

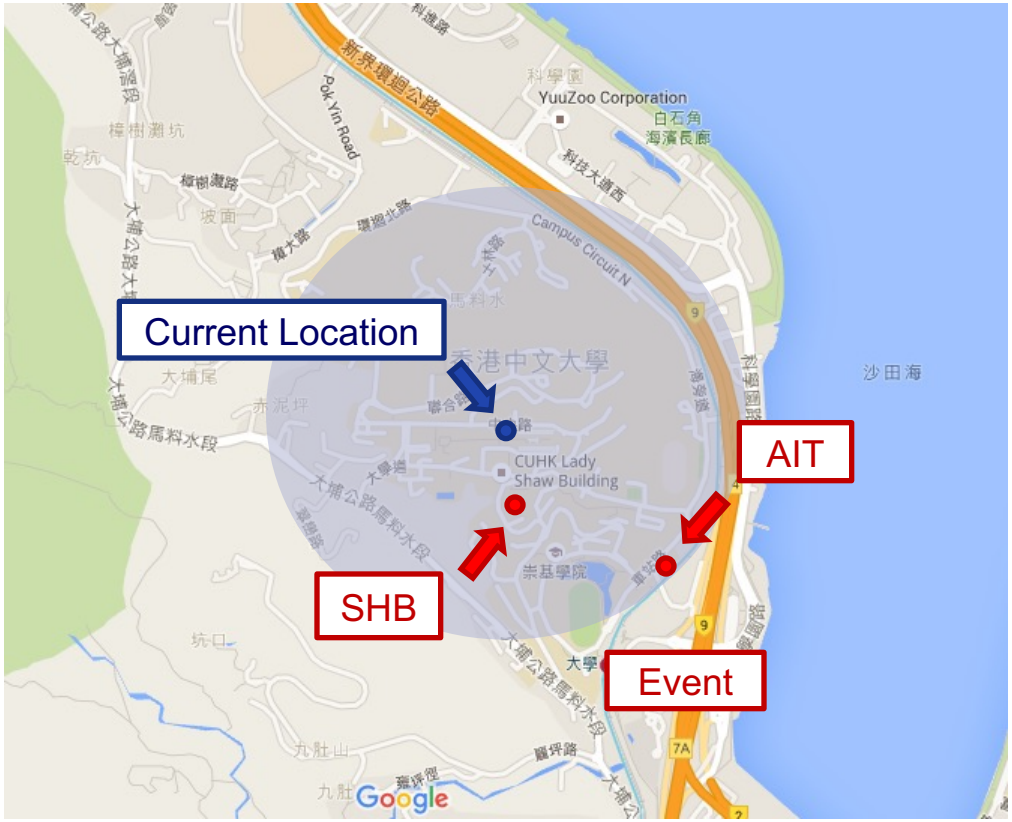
- If the current location is CUHK…
- Here are some location in CUHK only

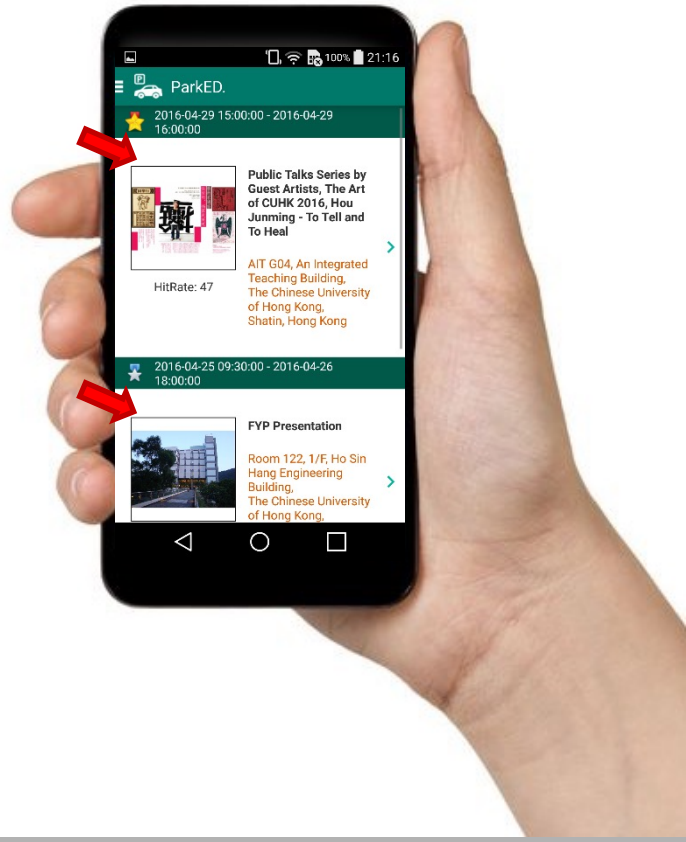
Name	Location	Catalog
Public Talks Series by Guest Artists, The Art of CUHK 2016, Hou Junming - To Tell and To Heal	AIT G04, An Integrated Teaching Building, The Chinese University of Hong Kong, Shatin, Hong Kong	Events_A
PARKnSHOP	LG, John Fulton Centre, The Chinese University of Hong Kong, Shatin, Hong Kong	Shop_A
Department of Computer & Science & Engineering CSE	10/F, Ho Sin Hang Engineering Building, The Chinese University of Hong Kong, Shatin, Hong Kong	Department_A

Recommendation

How can we achieve?

- On the “Event” page

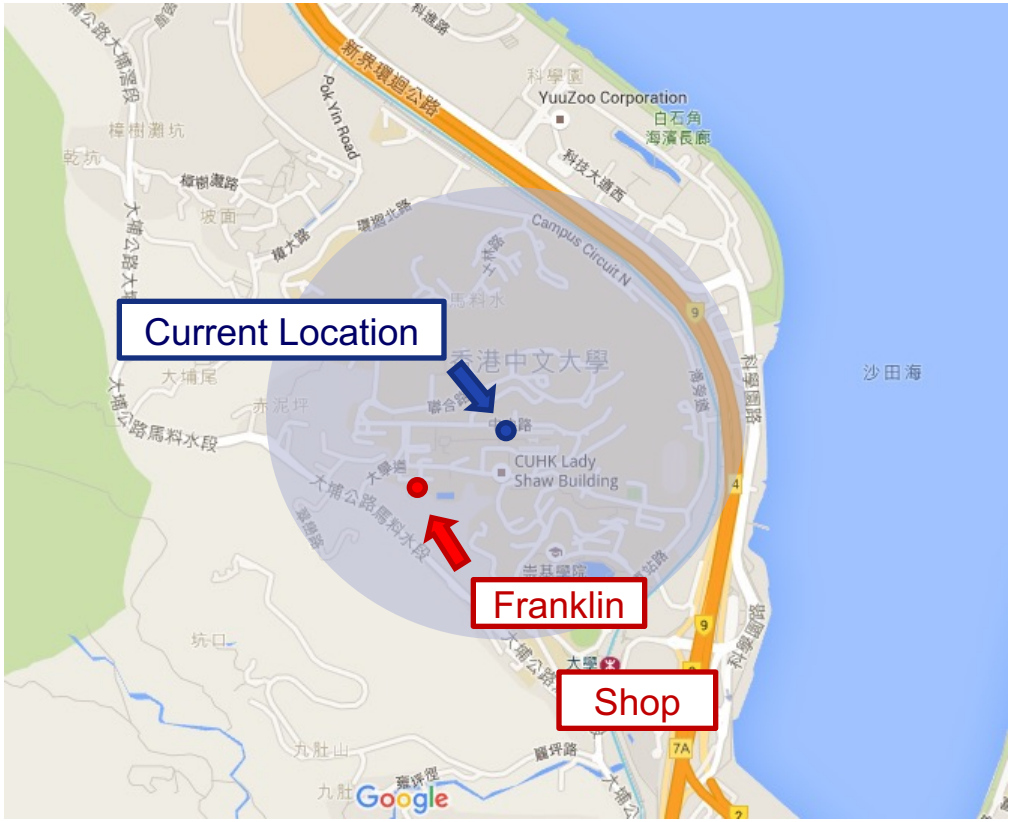


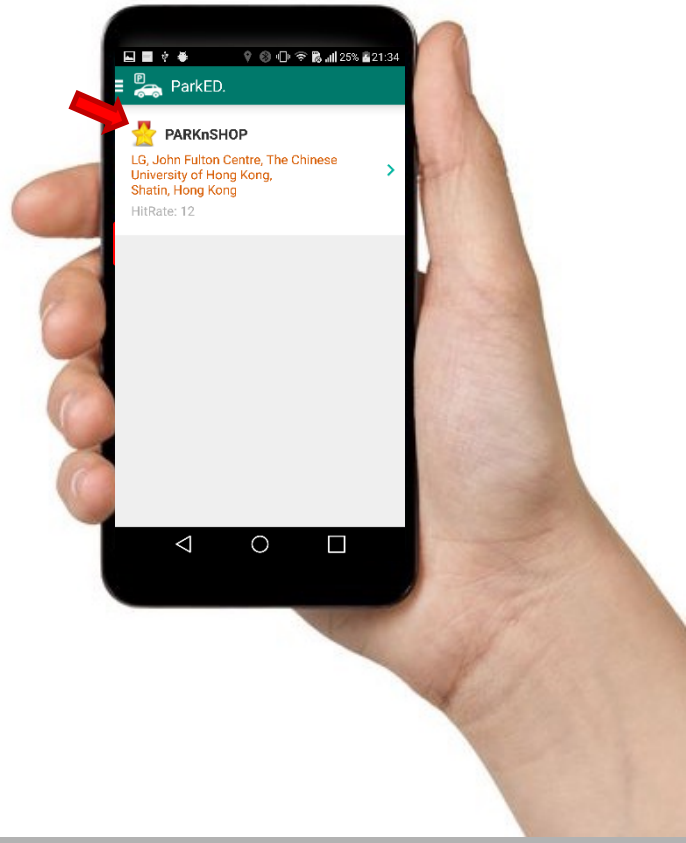


Recommendation

How can we achieve?

- On the “Shop” page

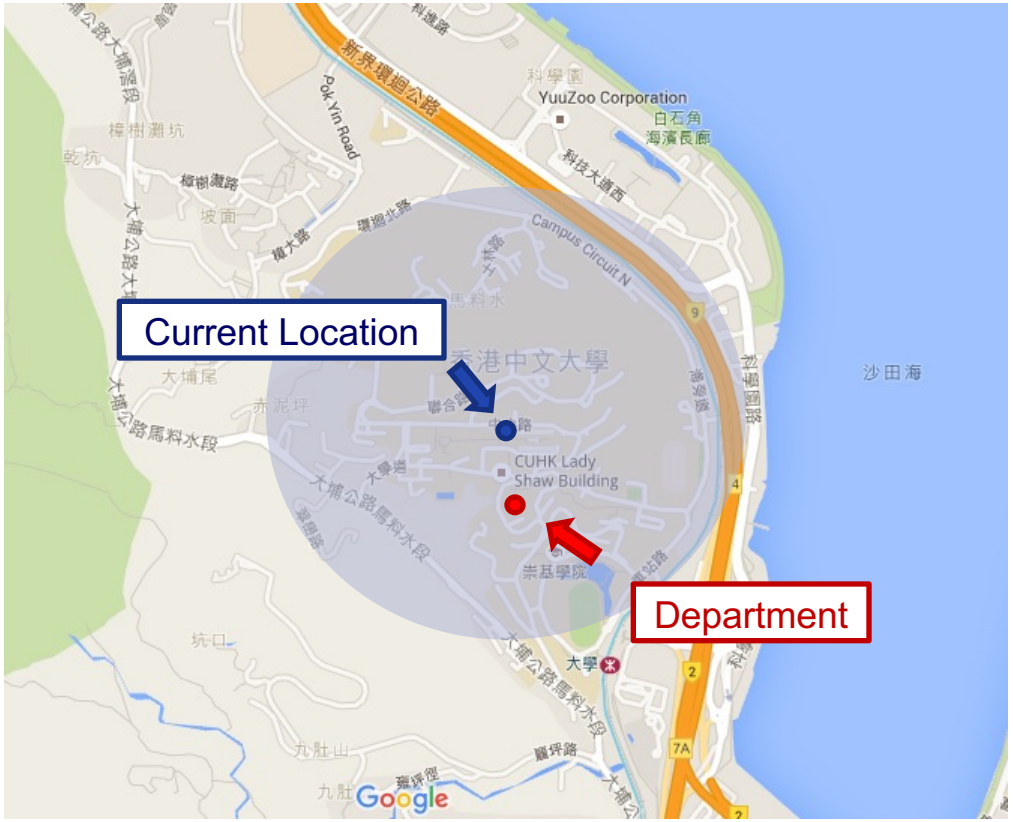


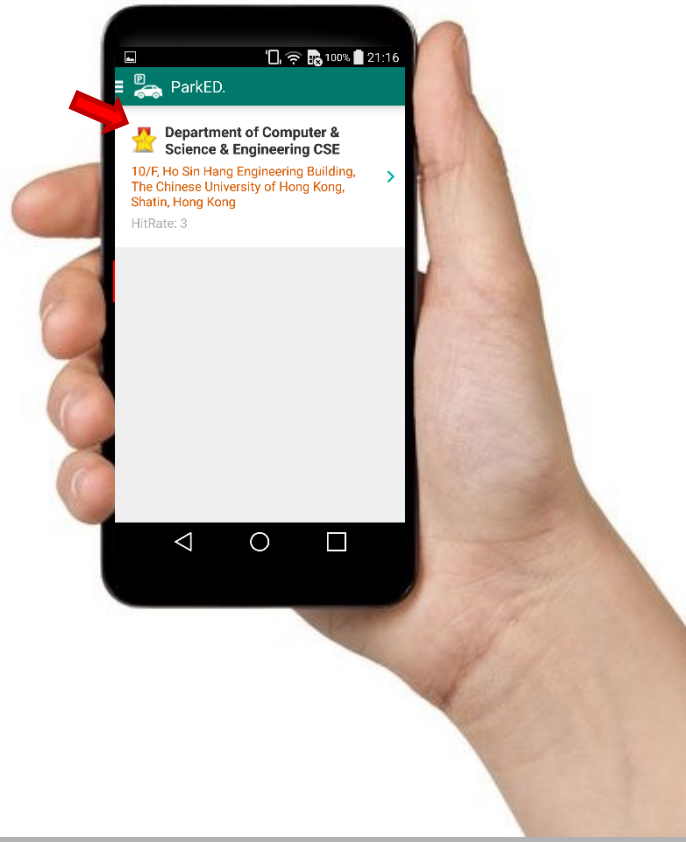


Recommendation

How can we achieve?

- On the “Department” page





Recommendation

How can we achieve?

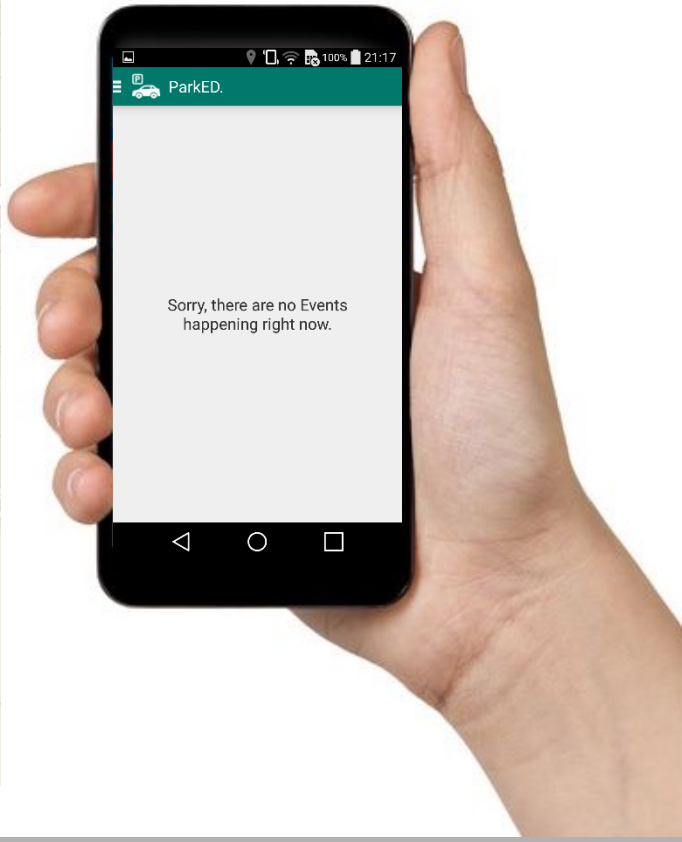
- If the current location is Fanling…
- Here are some location in Fanling only

Name	Location	Catalog
McDonald's	Shop 2A & 2B, G/F, Union Plaza, 9 Wo Muk Road, Luen Wo Hui, Fanling	Shop_A
Pizza Hut	Shop 56A, G/F, Union Plaza, 9 Wo Muk Road, Luen Wo Hui, Fanling	Shop_A

Recommendation

How can we achieve?

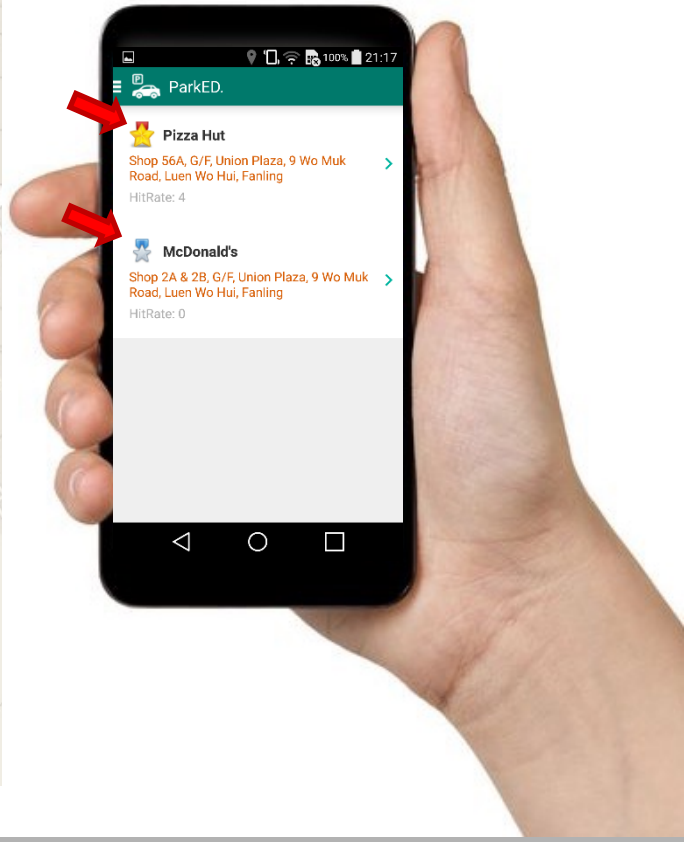
- On the “Event” page



Recommendation

How can we achieve?

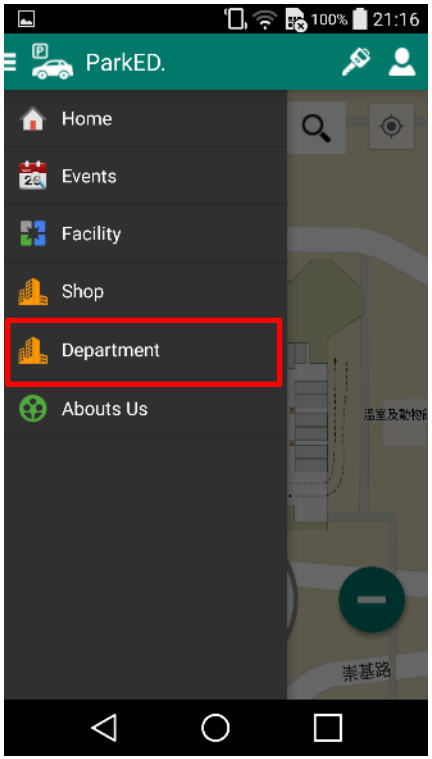
- On the “Shop” page



Recommendation

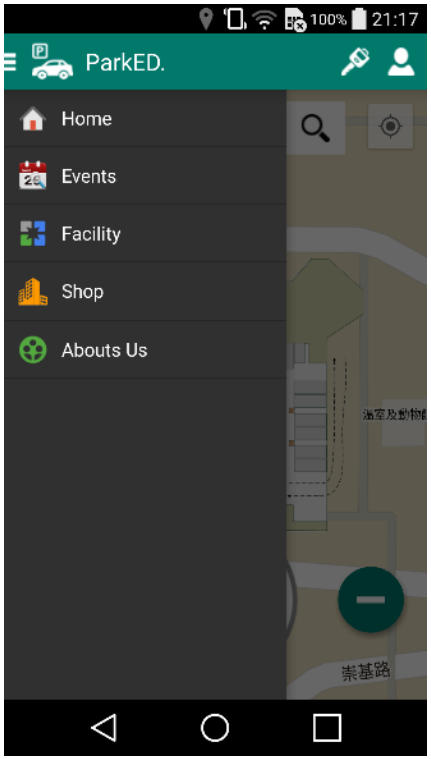
How can we achieve?

- Where is “Department” in this case?



CUHK

?



Fanling

Recommendation

- **Let's go through more details in different scenarios**
  - IF Event is **out of date**, then it will not be shown in the app

Browse | Structure | SQL | Search | Insert | Export | Import | Operations

Name	Location	BDescription	Image	HitRate	Catalog	StartDate	EndDate	Latitude
Department of Computer & Science & Engineering CSE	10/F, Ho Sin Hang Engineering Building, The Chine...	*NULL*	*NULL*	3	Department_A	*NULL*	*NULL*	22.4180983836132
FYP Presentation	Room 122, 1/F, Ho Sin Hang Engineering Building, ...	*NULL*	https://upload.wikimedia.org/wikipedia/commons/thu...	7	Events	2016-04-25 09:30:00	2016-04-26 18:00:00	22.4178566318875
FYP Meeting	Room 122, 1/F, Ho Sin Hang Engineering Building, ...	*NULL*	*NULL*	13	Events	2016-04-18 16:00:00	2016-04-18 17:00:00	22.4178566318875
FYP Review Section	Room 122, 1/F, Ho Sin Hang Engineering Building, ...	*NULL*	*NULL*	5	Events	2016-04-26 17:00:00	2016-04-26 21:00:00	22.4178566318875
Public Talks Series by Guest Artists, The Art of C...	AIT G04, An Integrated Teaching Building, The Chi...	*NULL*	http://www.cpr.cuhk.edu.hk/resources/events/photo/...	47	Events	2016-04-29 15:00:00	2016-04-29 16:00:00	22.41632

Recommendation

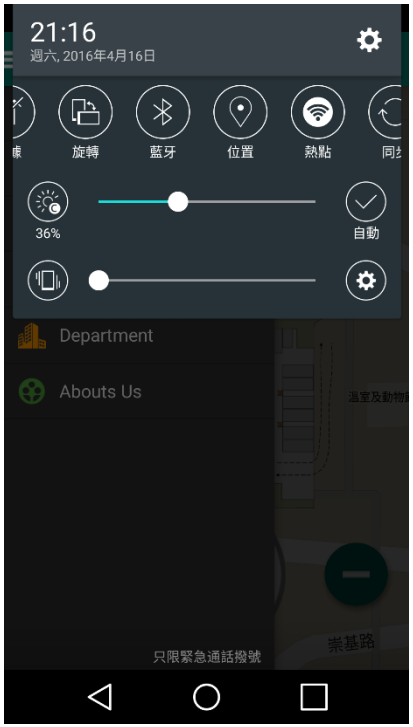
- **Let's go through more details in different scenarios**
  - IF Event is **on the current date**, then

Browse | Structure | SQL | Search | Insert | Export | Import | Operations

Name	Location	BDescription	Image	HitRate	Catalog	StartDate	EndDate	Latitude
Department of Computer & Science & Engineering CSE	10/F, Ho Sin Hang Engineering Building, The Chine...	*NULL*	*NULL*	3	Department_A	*NULL*	*NULL*	22.4180983836132
FYP Presentation	Room 122, 1/F, Ho Sin Hang Engineering Building, ...	*NULL*	https://upload.wikimedia.org/wikipedia/commons/thu...	7	Events	2016-04-25 09:30:00	2016-04-26 18:00:00	22.4178566318875
FYP Meeting	Room 122, 1/F, Ho Sin Hang Engineering Building, ...	*NULL*	*NULL*	13	Events	2016-04-18 16:00:00	2016-04-18 17:00:00	22.4178566318875
FYP Review Section	Room 122, 1/F, Ho Sin Hang Engineering Building, ...	*NULL*	*NULL*	5	Events	2016-04-26 17:00:00	2016-04-26 21:00:00	22.4178566318875
Public Talks Series by Guest Artists, The Art of C...	AIT G04, An Integrated Teaching Building, The Chi...	*NULL*	http://www.cpr.cuhk.edu.hk/resources/events/photo/...	47	Events	2016-04-29 15:00:00	2016-04-29 16:00:00	22.41632

Recommendation

- **Let's go through more details in different scenarios**
  - IF GPS is disable or its accurate value is too high (*low accurate value is better), then…



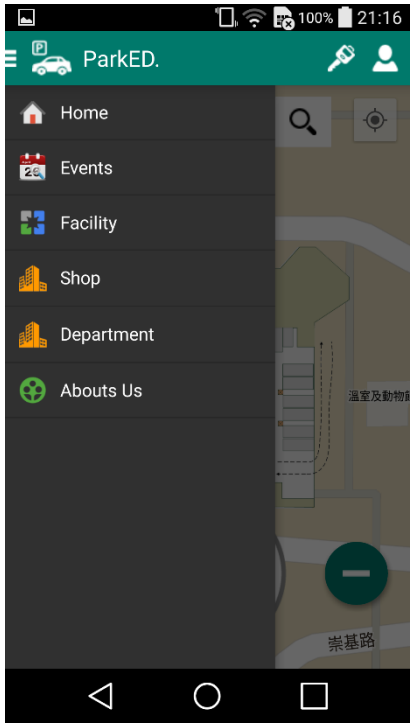
OR

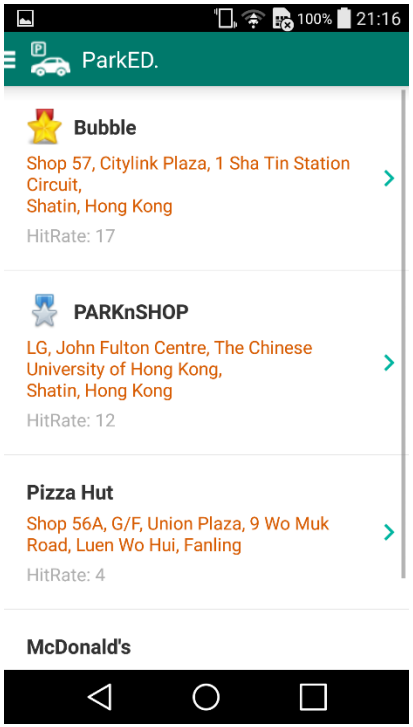
High accurate value (Large Circle)

Low accurate value (Small Circle)

Recommendation

- **Let's go through more details in different scenarios**
  - IF GPS is disable or its accurate value is too high (*low accurate value is better), everything will be shown

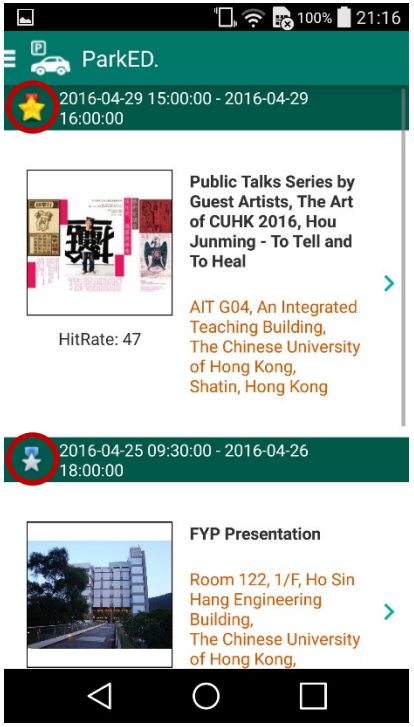


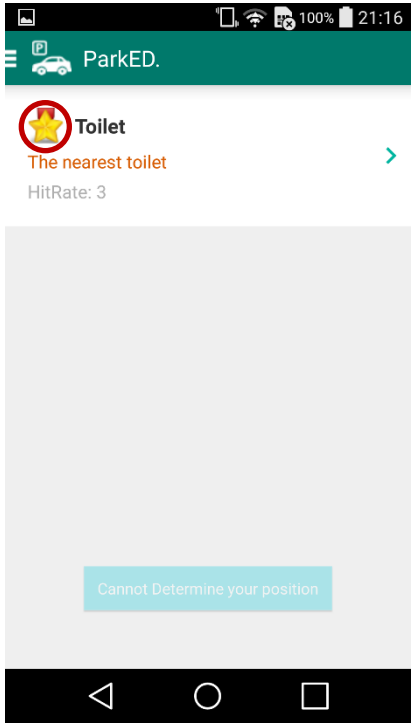


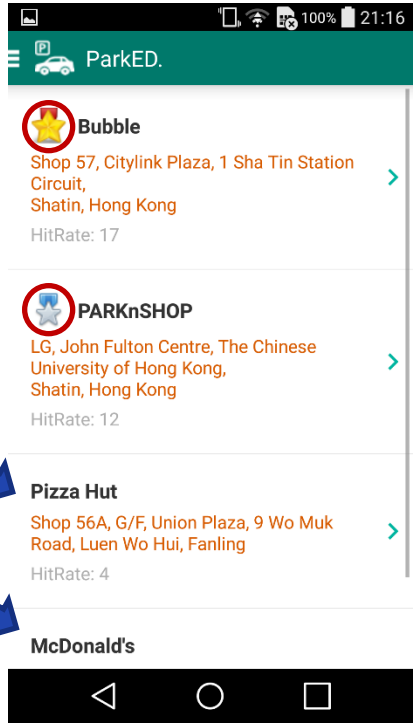
Recommendation

Display the content of each catalog

- Every contents in catalog are sort by “Hit Rate”



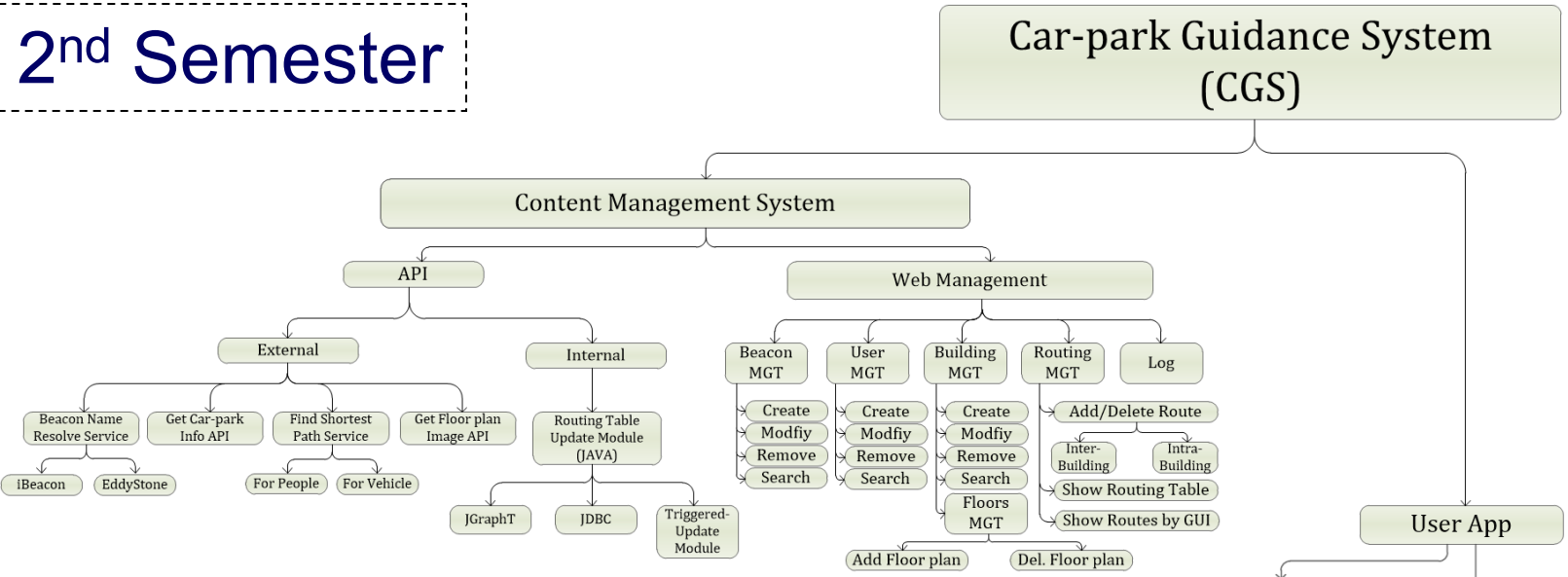


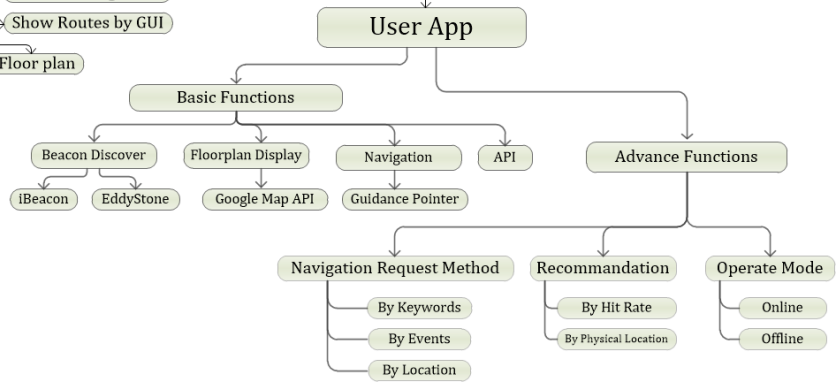


Conclusion

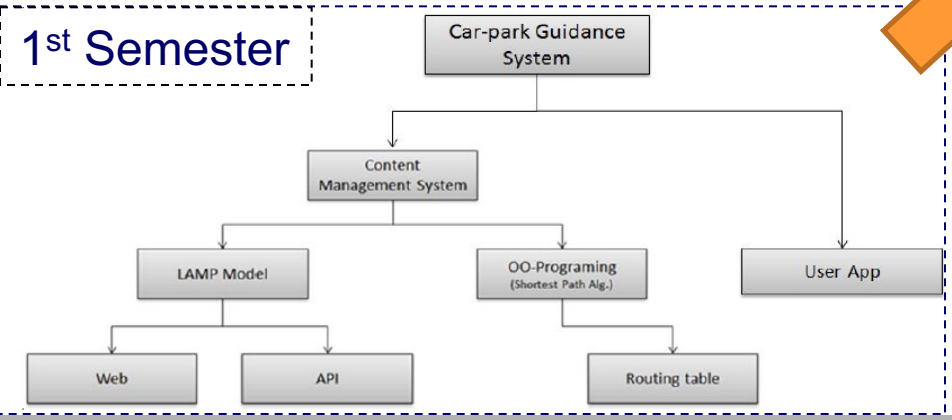
Project Tree

2nd Semester





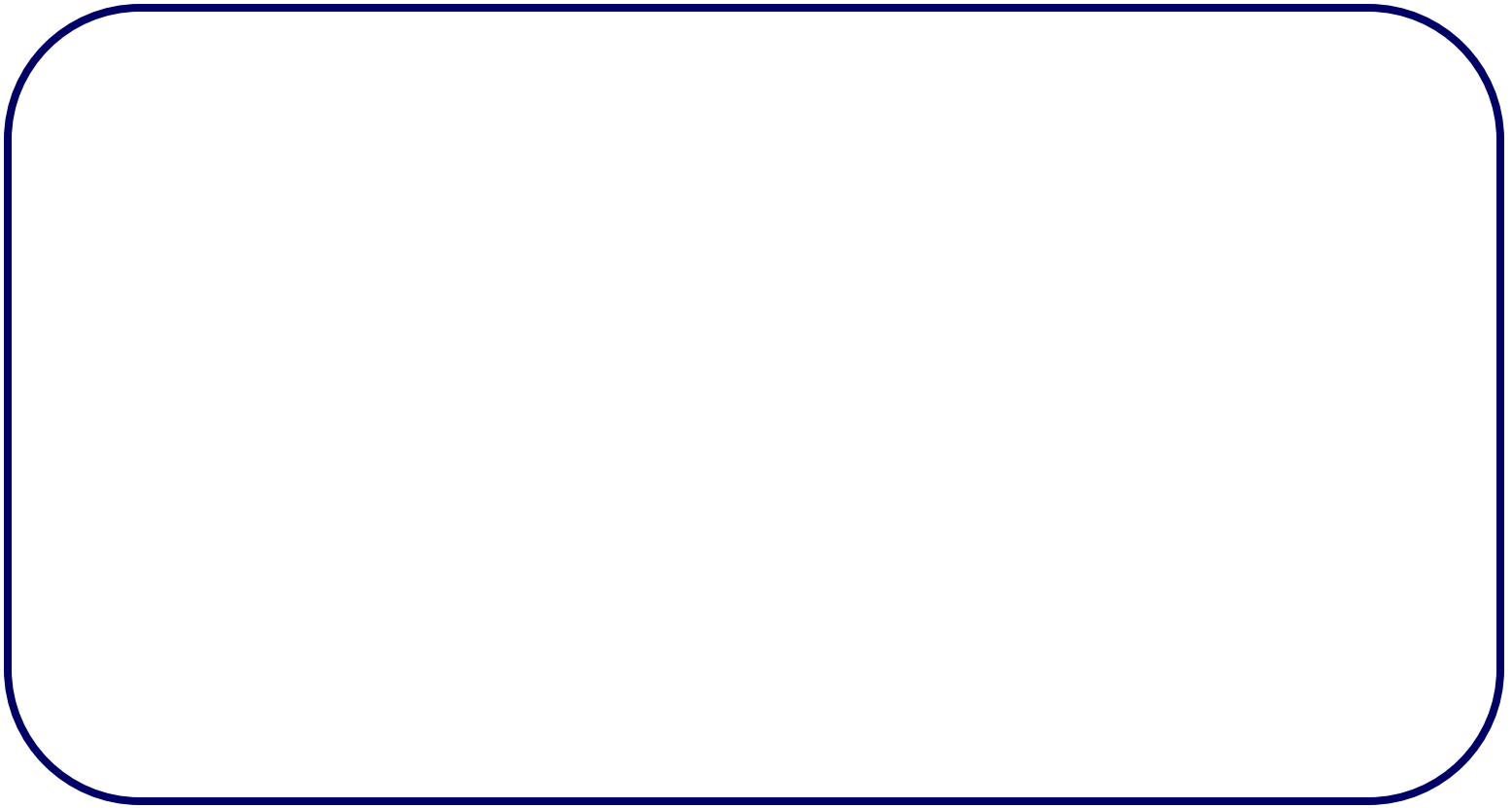
1st Semester



Function Demonstration

Demo

- Video



Q&A