

De-Stress Me : **A Personal Digital Assistant for Stress Detection and Treatment Recommendation**

05.12.2022

William Ingold

Geonsun Lee

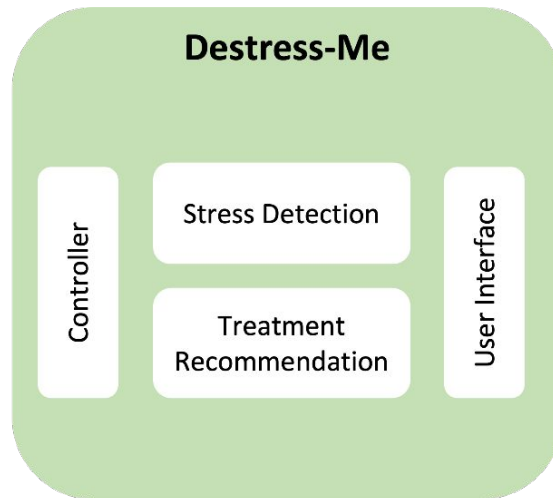
YoonKyung Shon

Irtaza Shahid

Hyemi Song



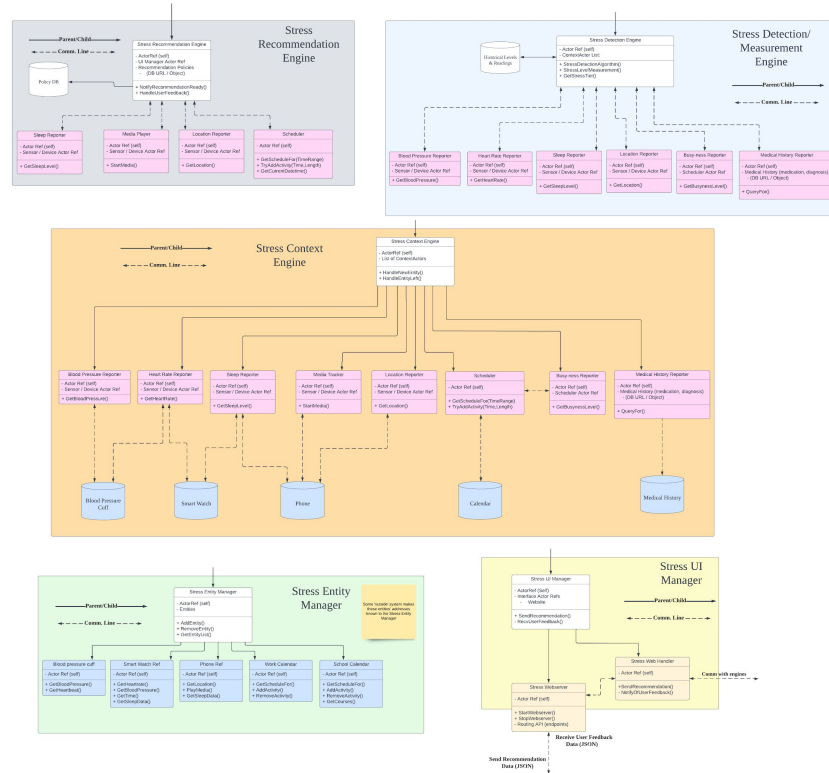
- Sensors
- Smart phone
- Smart watch
- ⋮



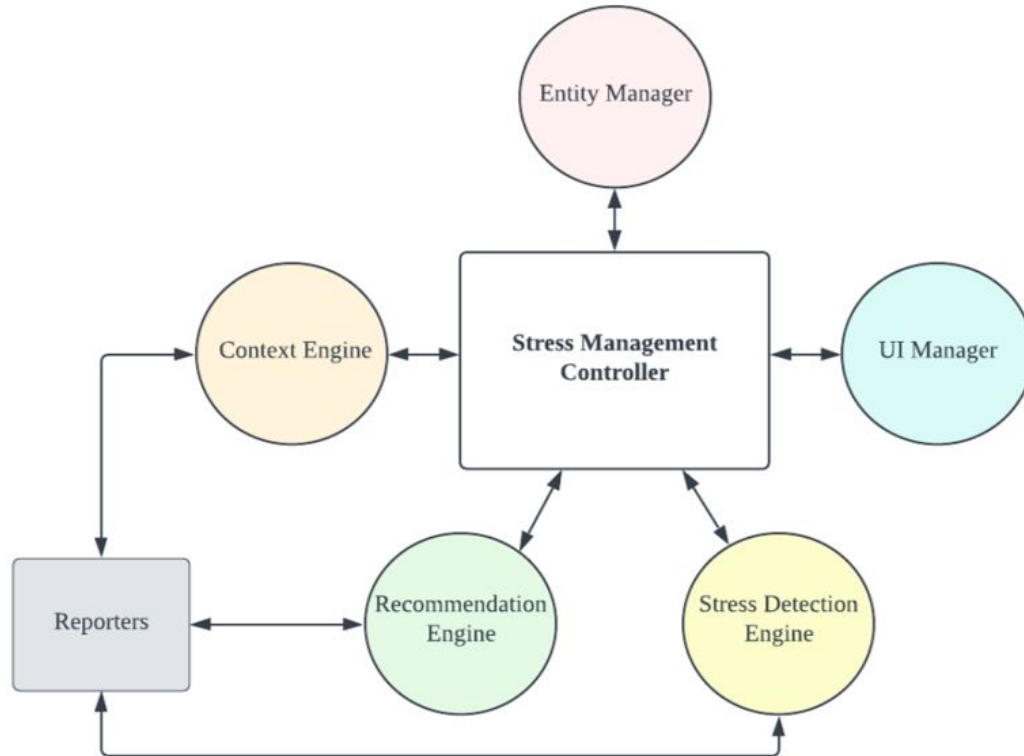
- Treatments



System Architecture



System Architecture



Scenario DB

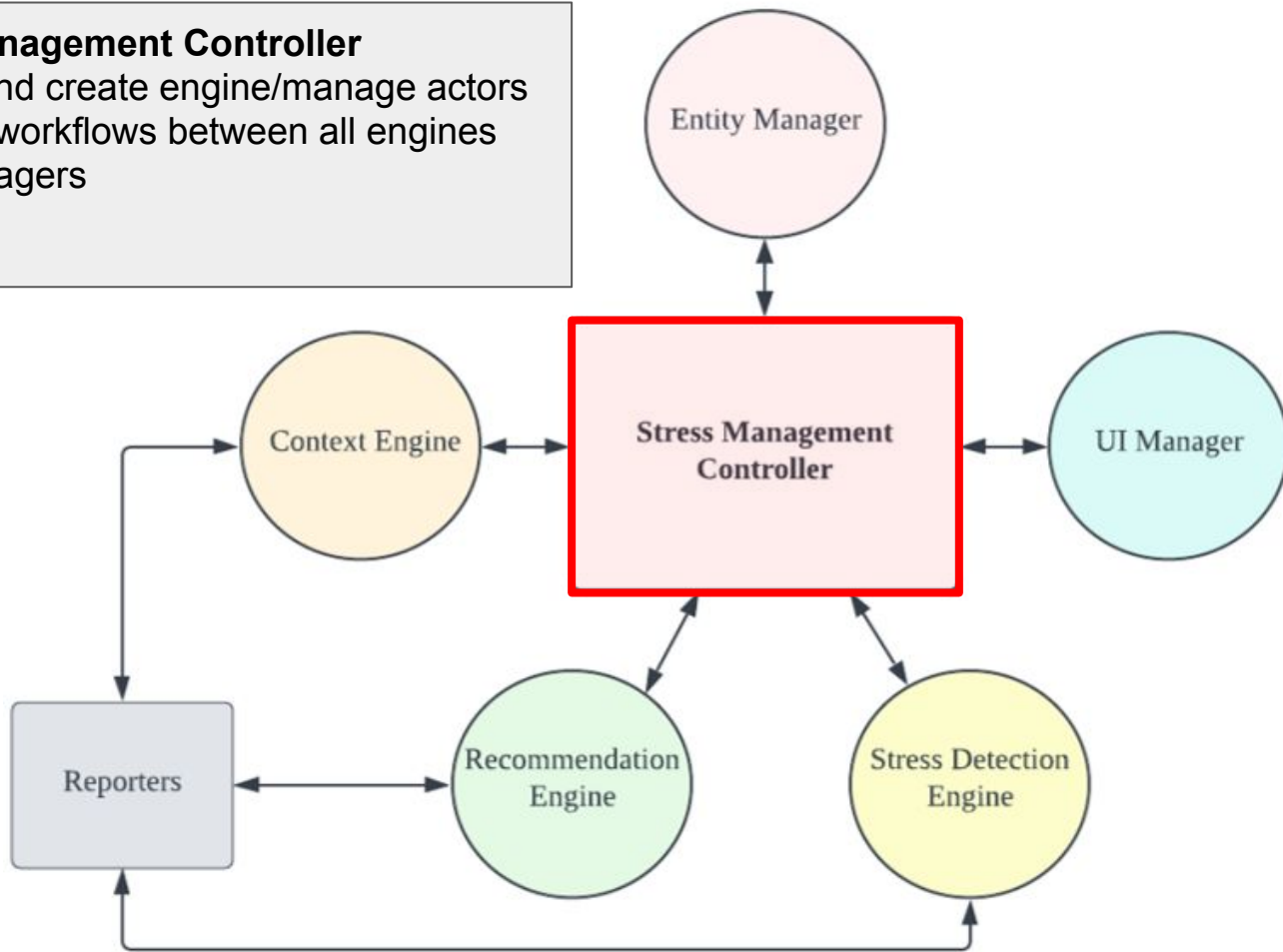
id		DateTime	Event	Location	Schedule	Heartbeat	Bloodpressure	Sleephours
		Search column...	Search column...	Search column...	Search column...	Search column...	Search column...	Search column...
1	1	2022-04-17T08:00:00	wakeup	home	NULL	60	100/75	3
2	2	2022-04-17T08:30:00	breakfast	home	NULL	72	102/75	3
3	3	2022-04-17T09:00:00	work	office	work	87	105/80	3
4	4	2022-04-17T09:30:00	work	office	work	83	115/85	3
5	5	2022-04-17T10:00:00	meeting	office	meeting1	88	125/86	3
6	6	2022-04-17T10:30:00	meeting	office	meeting1	97	125/87	3
7	7	2022-04-17T11:00:00	class	classroom	class	98	123/81	3
8	8	2022-04-17T11:30:00	class	classroom	class	84	123/81	3
9	9	2022-04-17T12:00:00	class	classroom	class	76	124/82	3
10	10	2022-04-17T12:30:00	lunch	restaurant	NULL	78	124/82	3
11	11	2022-04-17T13:00:00	lunch	restaurant	NULL	70	125/80	3
12	12	2022-04-17T13:30:00	work	office	work	80	132/85	3
13	13	2022-04-17T14:00:00	meeting	office	meeting2	103	135/86	3
14	14	2022-04-17T14:30:00	meeting	office	meeting2	107	133/86	3
15	15	2022-04-17T15:00:00	pda-treatment	home	meeting3	90	130/85	3
16	16	2022-04-17T15:30:00	pda-treatment	home	meeting3	83	128/84	3
17	17	2022-04-17T16:00:00	pda-treatment	home	work	60	122/82	3
18	18	2022-04-17T16:30:00	pda-treatment	home	work	58	120/80	3

Demo

Github link:<https://github.com/wingold-student/cmsc818g-pda>

Management Controller

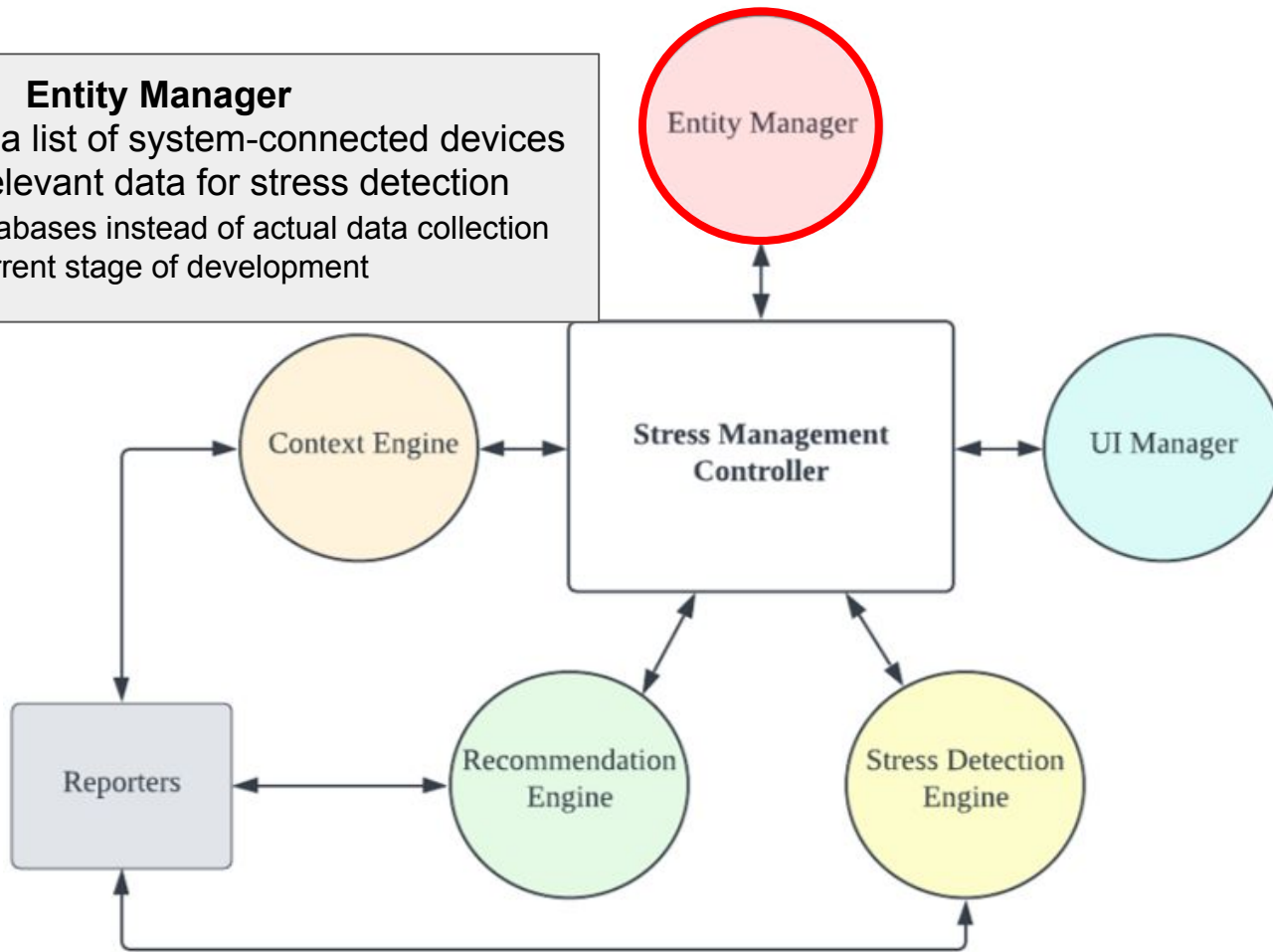
- Spawn and create engine/manager actors
- Manage workflows between all engines and managers

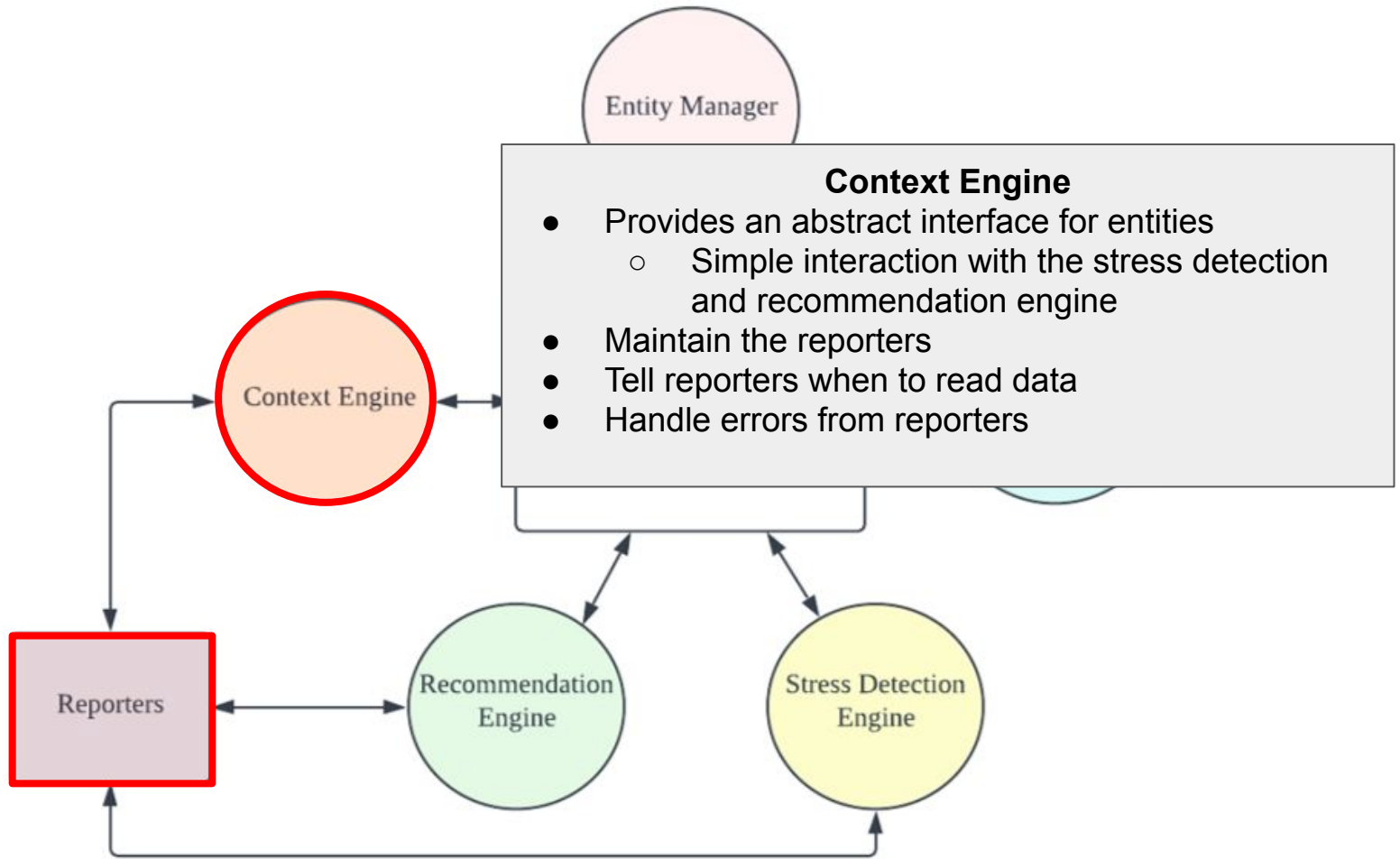


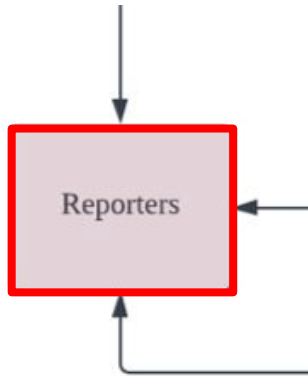
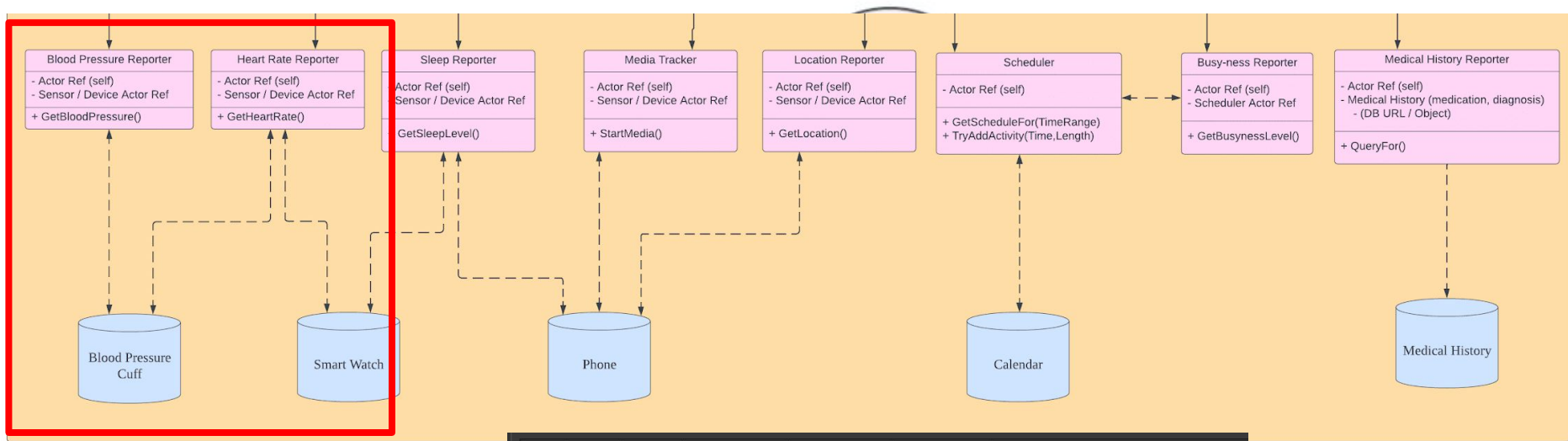
Entity Manager

- Maintains a list of system-connected devices
- Sort out relevant data for stress detection

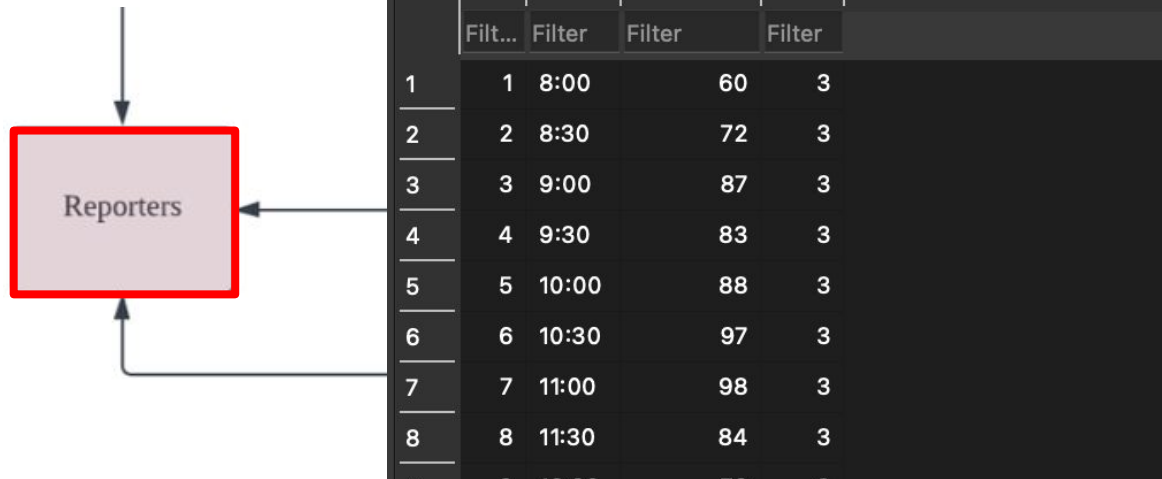
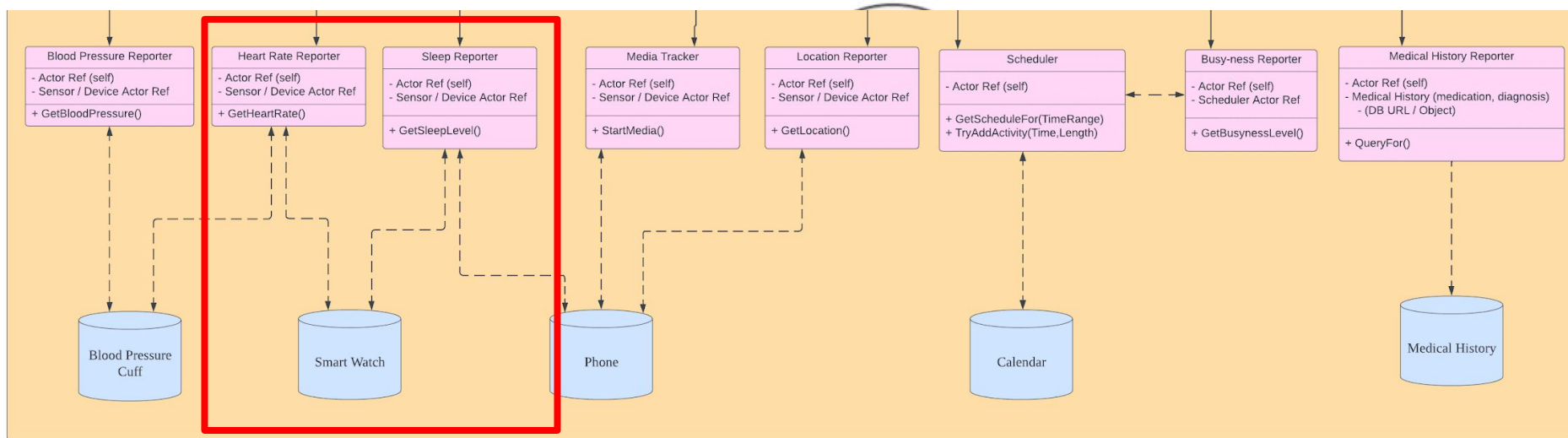
*Used devices databases instead of actual data collection process for our current stage of development

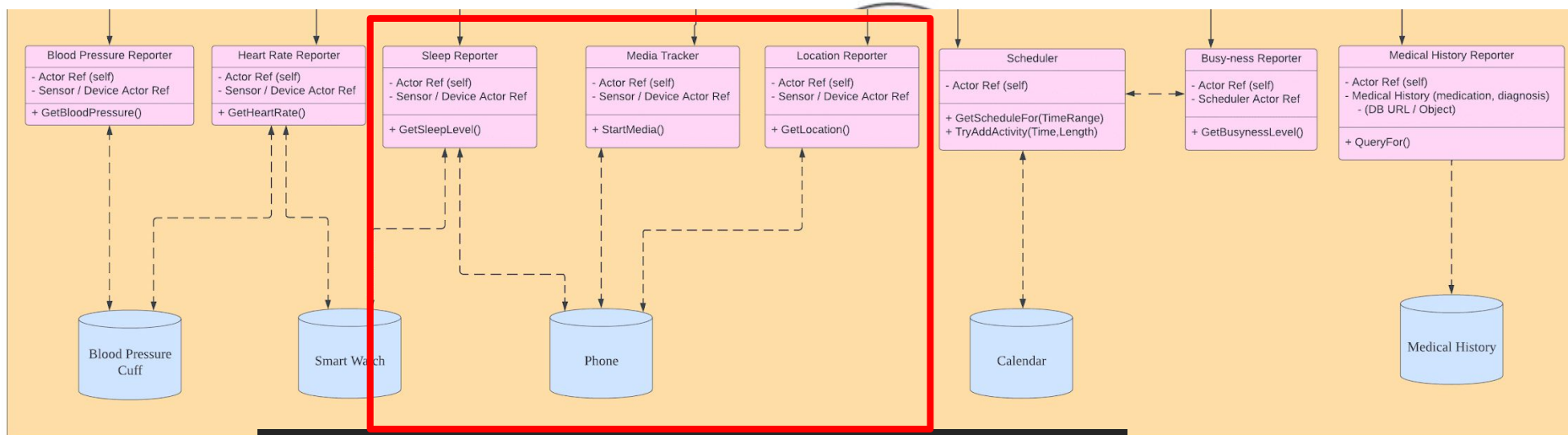




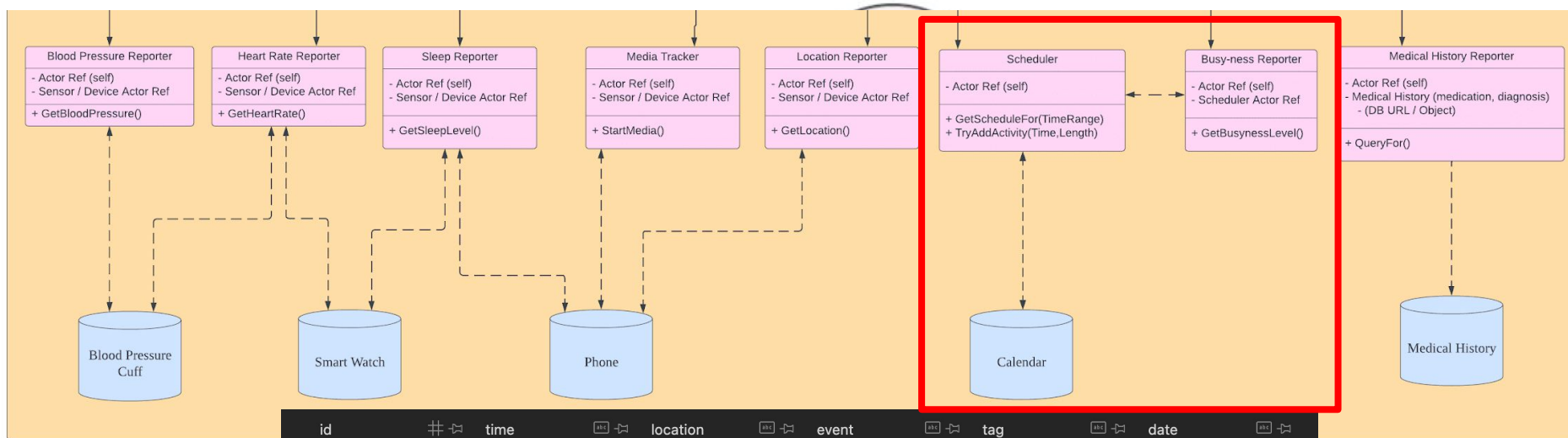


	id	time	bp-systolic	bp-diastolic	heart-rate
	Filter	Filter	Filter	Filter	Filter
1	1	8:00	100	68	60
2	2	8:30	110	62	72
3	3	9:00	104	72	87
4	4	9:30	111	73	83
5	5	10:00	128	71	92
6	6	10:30	126	80	83
7	7	11:00	143	80	139
8	8	11:30	135	82	128
9	9	12:00	125	78	132
10	10	12:30	120	62	78
11	11	13:00	103	63	70

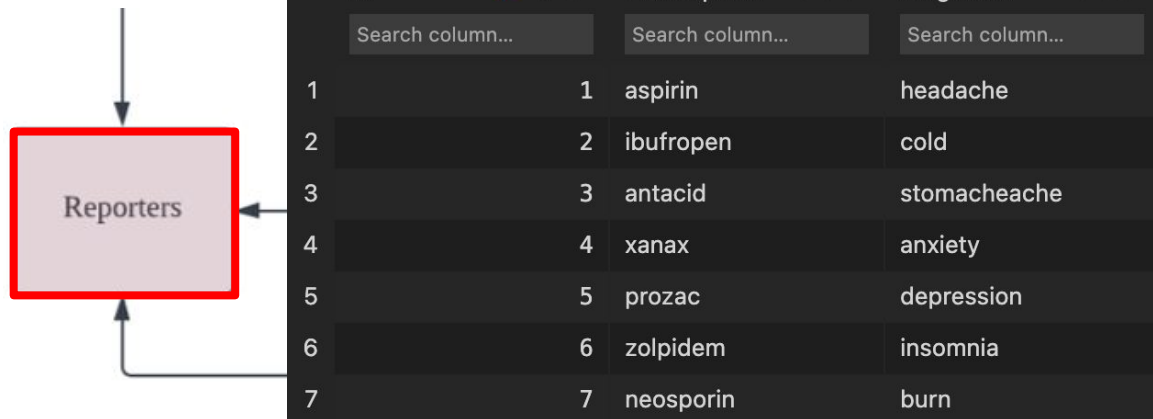
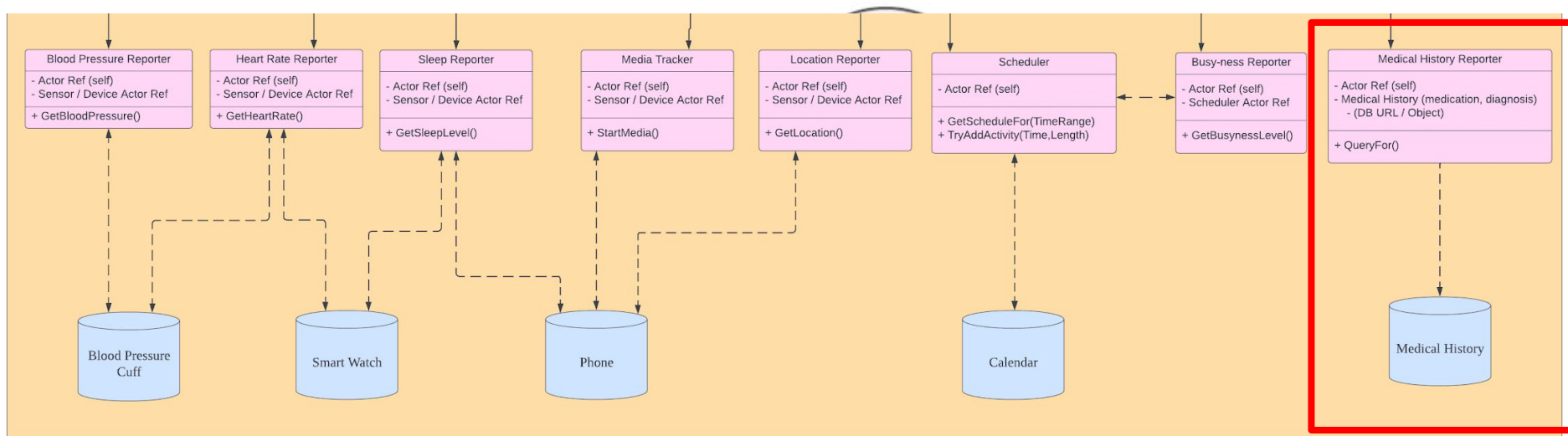


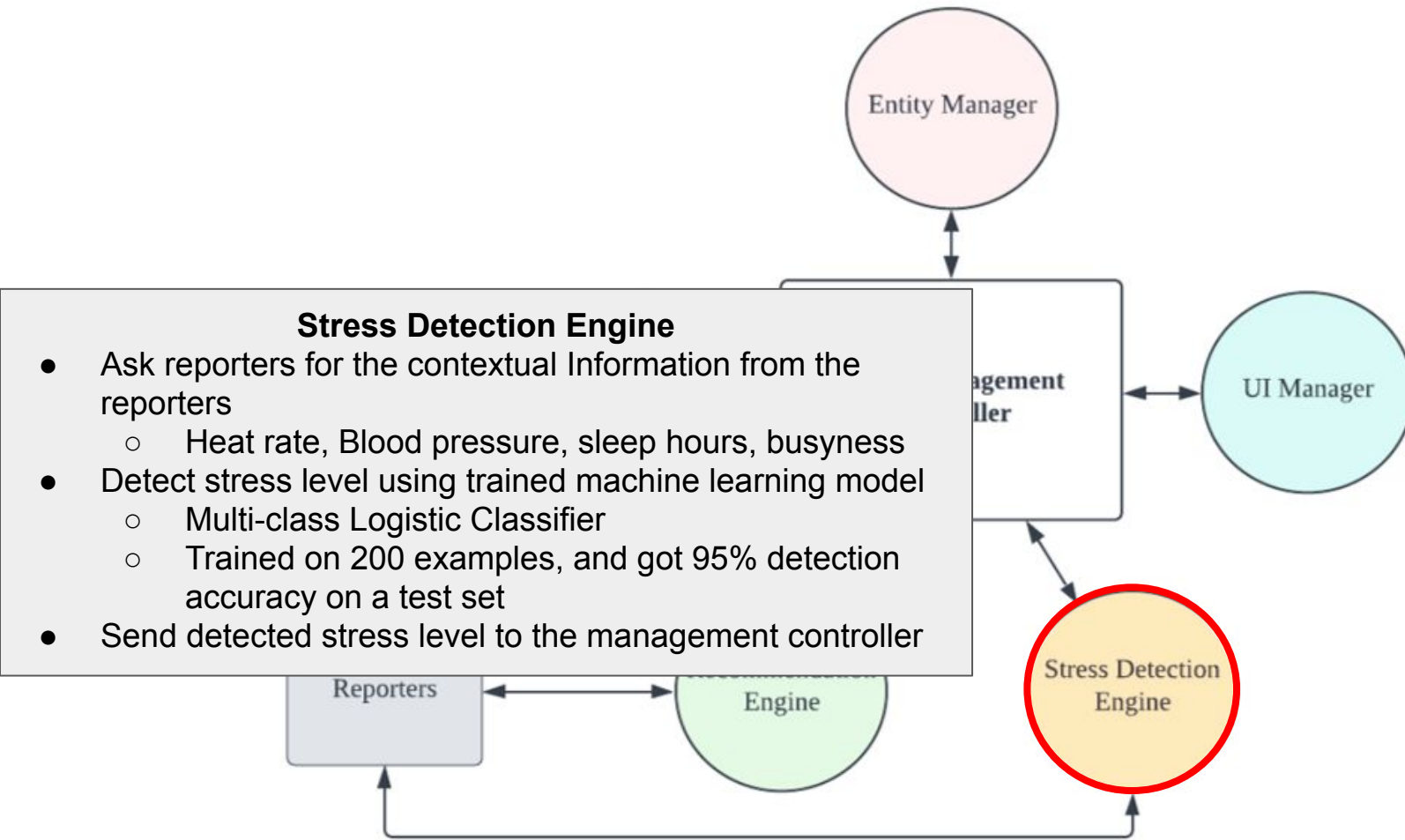


id	time	sleep	location	busyness
Search column...	Search column...	Search column...	Search column...	Search column...
1	1 8:00		3 home	2
2	2 8:30		3 home	2
3	3 9:00		3 office	3
4	4 9:30		3 office	3
5	5 10:00		3 office	3
6	6 10:30		3 office	3
7	7 11:00		3 classroom	4
8	8 11:30		3 classroom	4
9	9 12:00		3 classroom	4
10	10 12:30		3 restaurant	3
11	11 13:00		3 restaurant	3
12	12 13:30		3 office	3
13	13 14:00		3 office	4



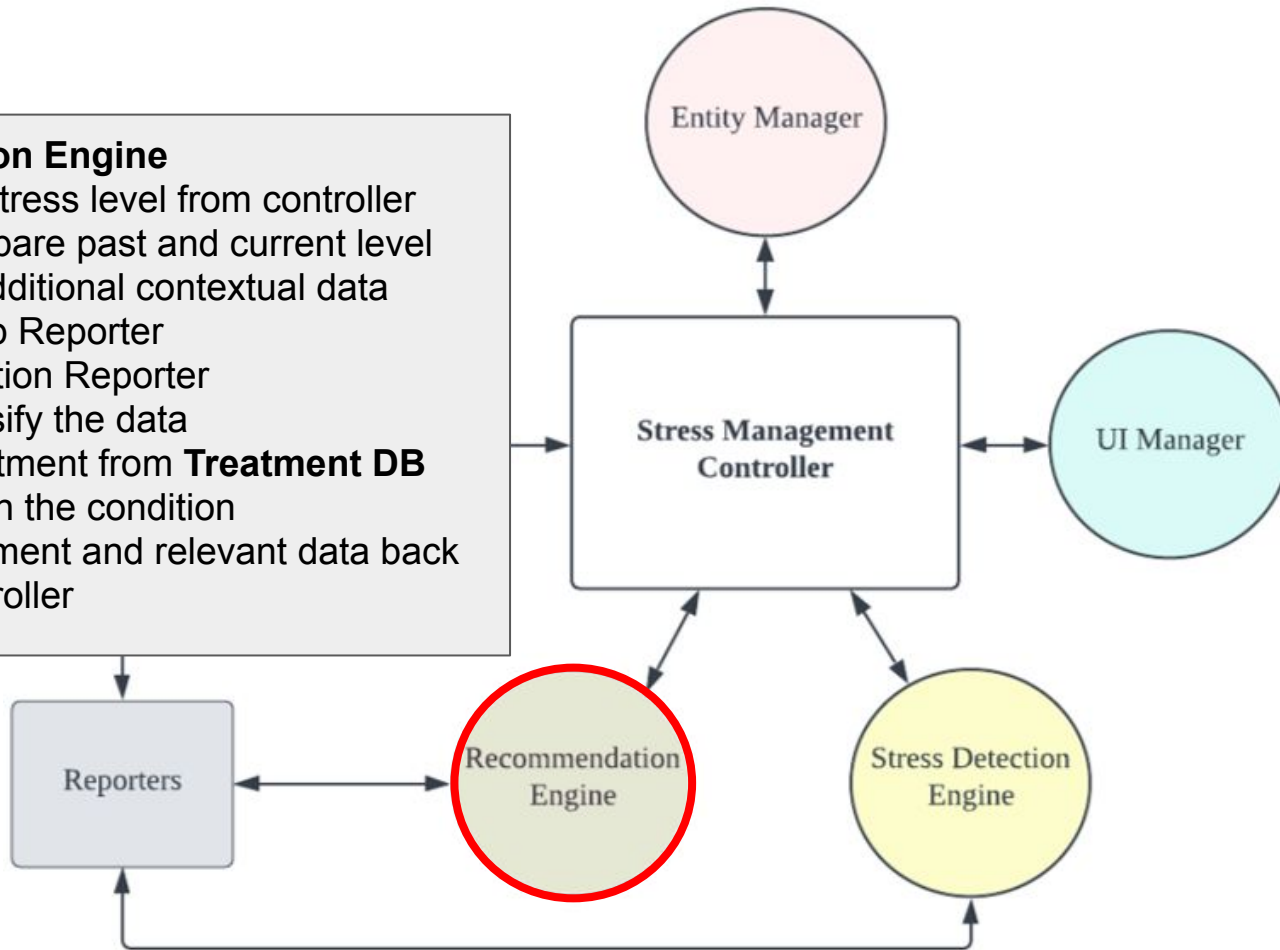
id	#	time	location	event	tag	date
1	1	08:00	home	wakeup	home	2022-05-12
2	2	08:30	home	eat	home	2022-05-12
3	3	09:00	office	work	work	2022-05-12
4	4	09:30	office	work	work	2022-05-12
5	5	10:00	office	work	work	2022-05-12
6	6	10:30	office	work	work	2022-05-12
7	7	11:00	classroom	class	work	2022-05-12
8	8	11:30	classroom	class	work	2022-05-12
9	9	12:00	classroom	class	work	2022-05-12
10	10	12:30	restaurant	eat	work	2022-05-12
11	11	13:00	restaurant	eat	work	2022-05-12
12	12	13:30	office	work	work	2022-05-12
13	13	14:00	office	work	work	2022-05-12





Recommendation Engine

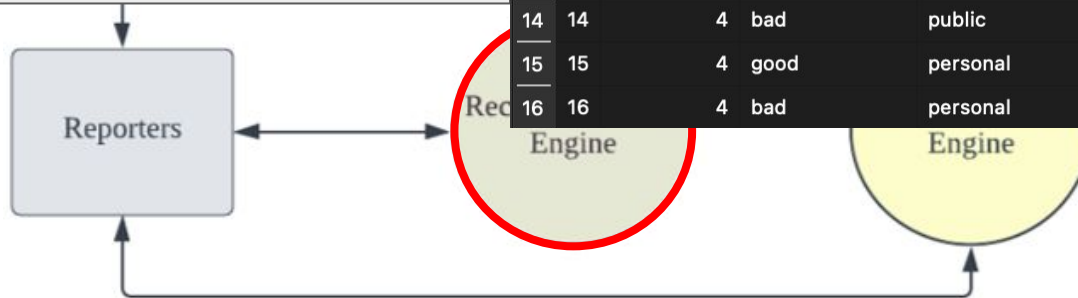
- Receives stress level from controller
 - Compare past and current level
- Retrieve additional contextual data
 - Sleep Reporter
 - Location Reporter
 - Classify the data
- Select treatment from **Treatment DB**
 - Match the condition
- Send treatment and relevant data back to the controller



Recommendation Engine

- Receives stress level from controller
 - Compare past and current level
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 - Location Reporter
 - Classify the data
- Select treatment from **Treatment DB**
 - Match the condition
- Send treatment and relevant data back to the controller

	id	stress-level	sleep-condition	location-condition	treatment
	Fi...	Filter	Filter	Filter	Filter
1	1	1	good	public	deep breathing exercise
2	2	1	bad	public	deep breathing exercise
3	3	1	good	personal	deep breathing exercise
4	4	1	bad	personal	deep breathing exercise
5	5	2	good	public	meditation
6	6	2	bad	public	meditation
7	7	2	good	personal	work out
8	8	2	bad	personal	take a walk
9	9	3	good	public	mindfulness meditation
10	10	3	bad	public	mindfulness meditation
11	11	3	good	personal	relaxation to music
12	12	3	bad	personal	relaxation to music
13	13	4	good	public	cancel plans
14	14	4	bad	public	cancel plans and get some sleep
15	15	4	good	personal	contact therapist or close friends and family
16	16	4	bad	personal	contact therapist or close friends and family



UI Manager

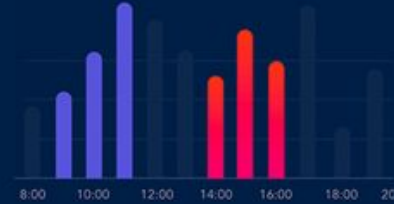
- A web app interface for users to visually inspect
 - Real-time physiological data

Entity Manager

s Management
Controller

De-Stress Me

Stress level dashboard



Heartbeat rate 72/min

Blood pressure 110/62

Sleep hours 3hrs

Dashboard

My profile

All Treatments

UI Manager

- A web app interface for users to visually inspect
 - Real-time physiological data
 - Stress level notifications

Hyemi's PDA

Stress level dashboard

Stress level has
reached L4 from
L3

Stress Level is high.
Follow this
treatment: You may want
to cancel some plans and
get some sleep

Learn more

Decline

Sleep hours

3hrs

Dashboard

My profile

All Treatments

UI Manager

- A web app interface for users to visually inspect
 - Real-time physiological data
 - Stress level notifications
 - Treatment recommendations

Entity Manag

s Manager
Controller

Try Taking a Walk

Follow this instruction!

Take a walk



How Helpful was the treatment?



I am done!

Dashboard

My profile

All Treatments

UI Manager

- A web app interface for users to visually inspect
 - Real-time physiological data
 - Stress level notifications
 - Treatment recommendations
- Manual input page for
 - Subjective context data
 - Treatment ranking

Entity Manager

s Mar
Contr

All Treatments

Close

Deep breathing exercise



Meditation



Work out



Take a walk



Mindfulness meditation



Cancel plans



Cancel plans and get some sleep



Relaxation to music



Contact therapist or close friends/family

Dashboard

My profile

All Treatments

My profile

Close

My current feeling...

Sad

Gloomy

Good

Happy

Quick updates: my medical info.

My feeling is

Save

Updated medical info.

My heartbeat suddenly increased without reasons today.

Dashboard

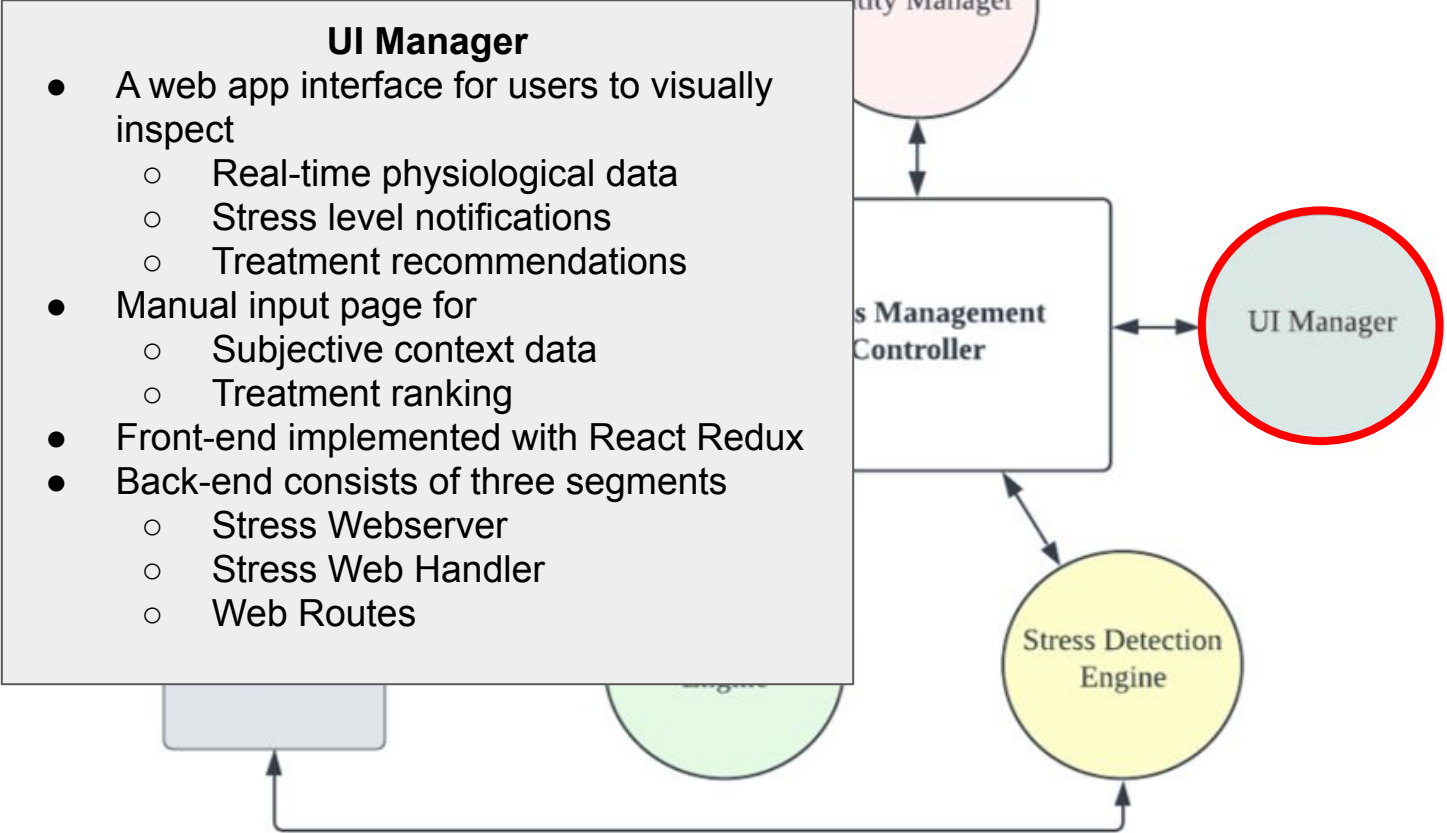
My profile

All Treatments

UI Manager

- A web app interface for users to visually inspect
 - Real-time physiological data
 - Stress level notifications
 - Treatment recommendations
- Manual input page for
 - Subjective context data
 - Treatment ranking
- Front-end implemented with React Redux
- Back-end consists of three segments
 - Stress Webserver
 - Stress Web Handler
 - Web Routes

- ## UI Manager
- A web app interface for users to visually inspect
 - Real-time physiological data
 - Stress level notifications
 - Treatment recommendations
 - Manual input page for
 - Subjective context data
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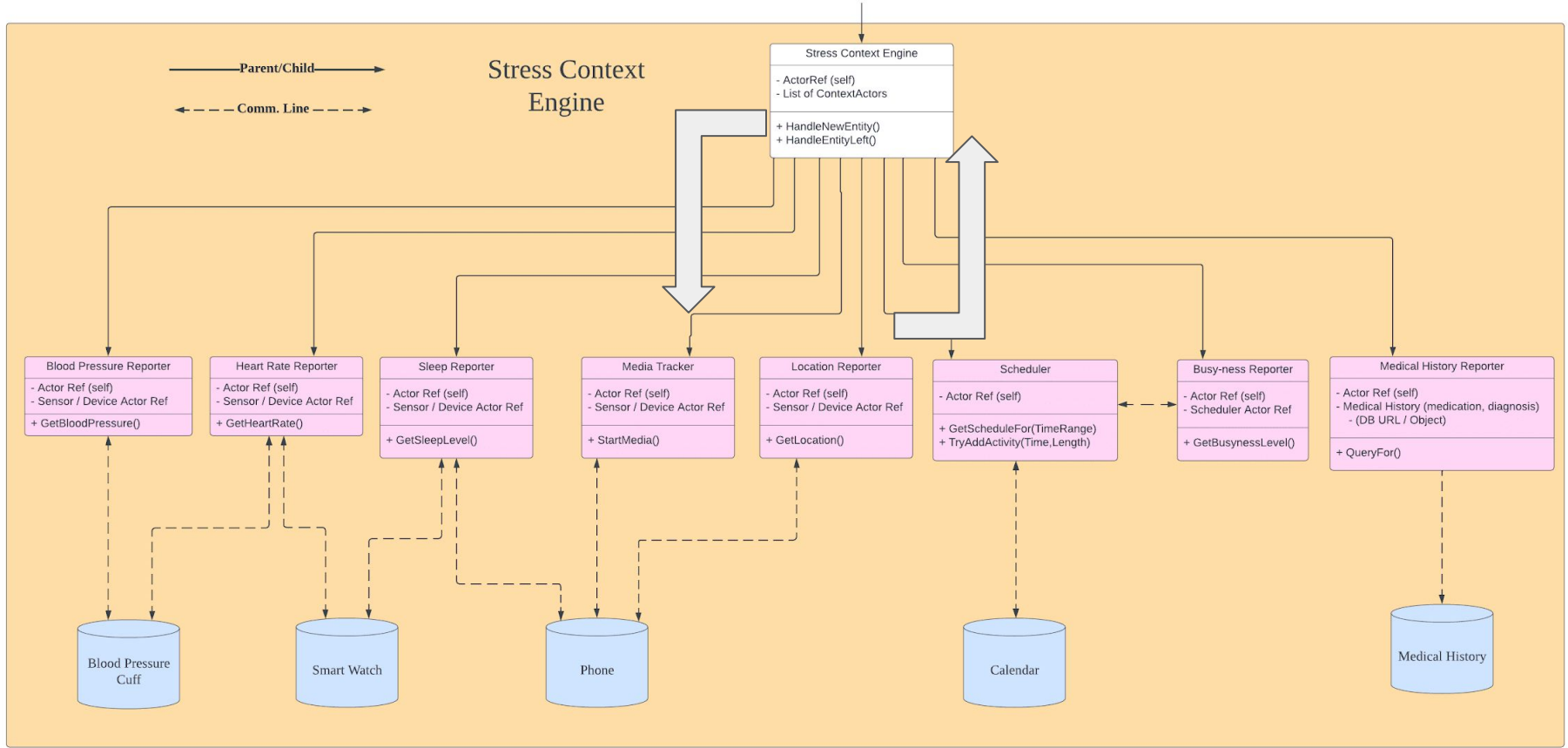


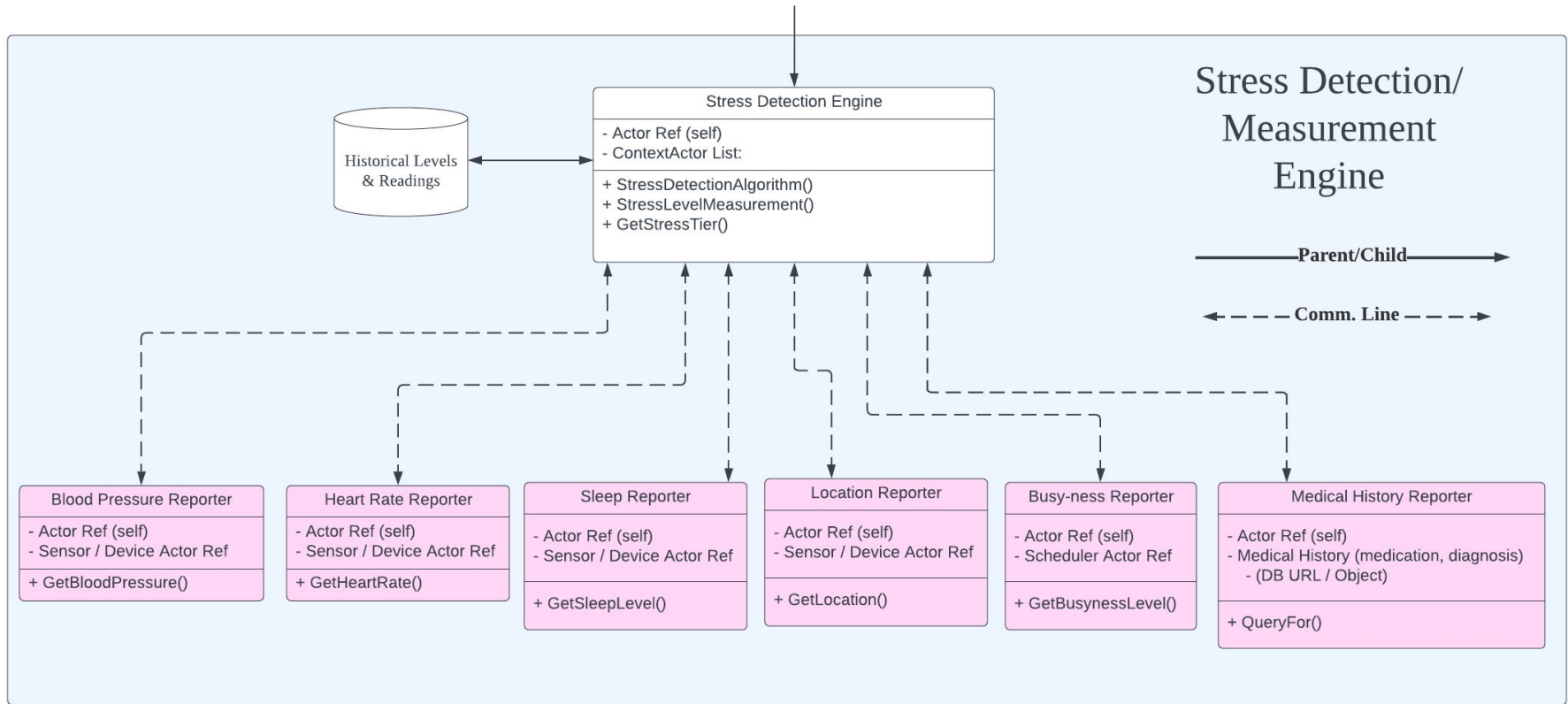
Conclusion & Future work

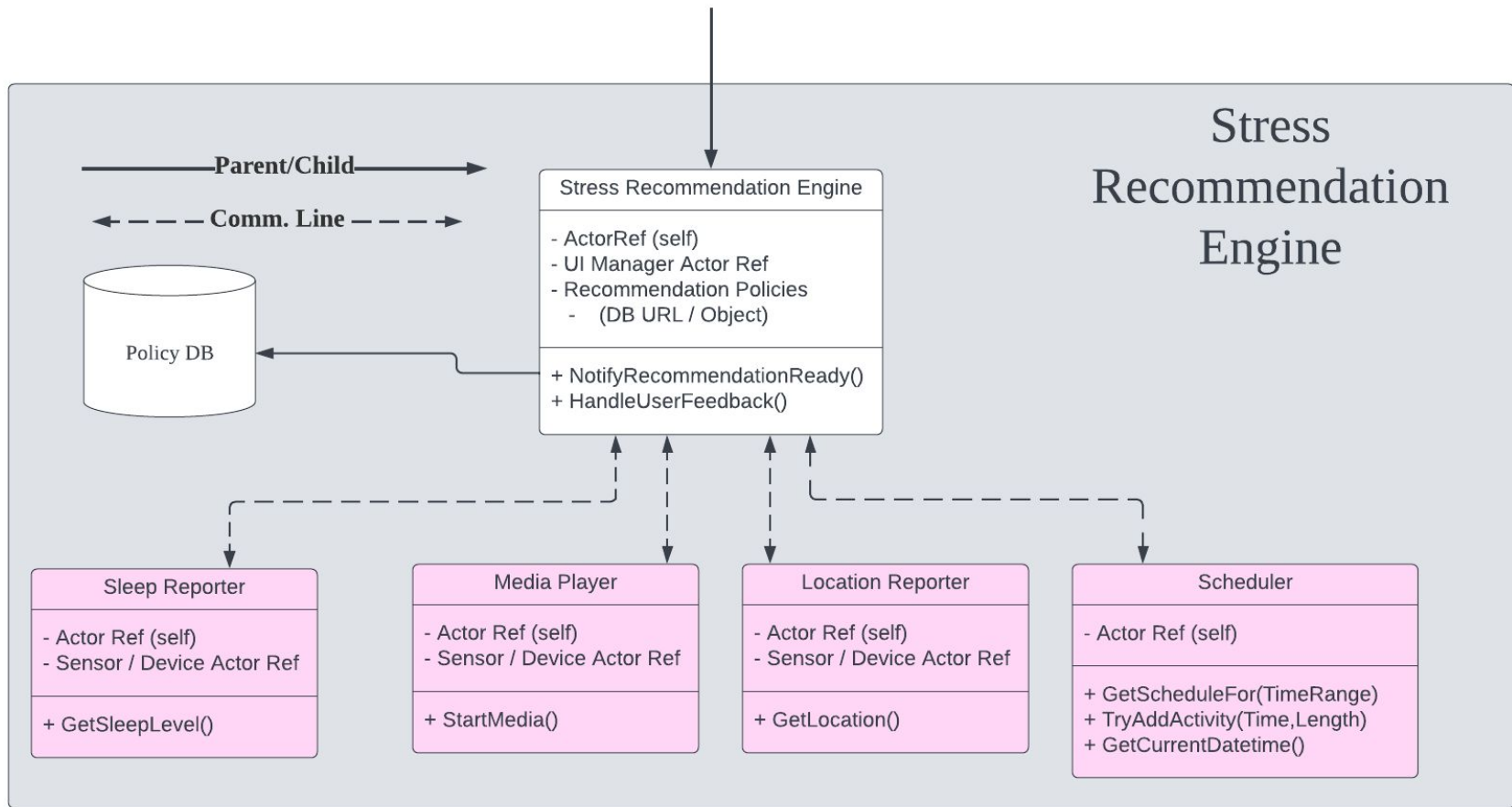
- We present ***De-Stress Me***
 - A stress treatment PDA architecture that is both scalable and extensible
 - Utilizes a model that detects user's stress level based on context information in addition to sensor data
 - A stress-relief treatment recommendation system to provide context-based personalized treatments
- Improve detection model
 - Obtain larger dataset
 - Compare sota algorithms
- Seek credible resources for stress-relief treatment
- Utilize manual input to reinforce detection and recommendation engines
- Evaluate the effectiveness and usability of ***De-Stress Me***
 - Conduct a diary study and compare with baseline

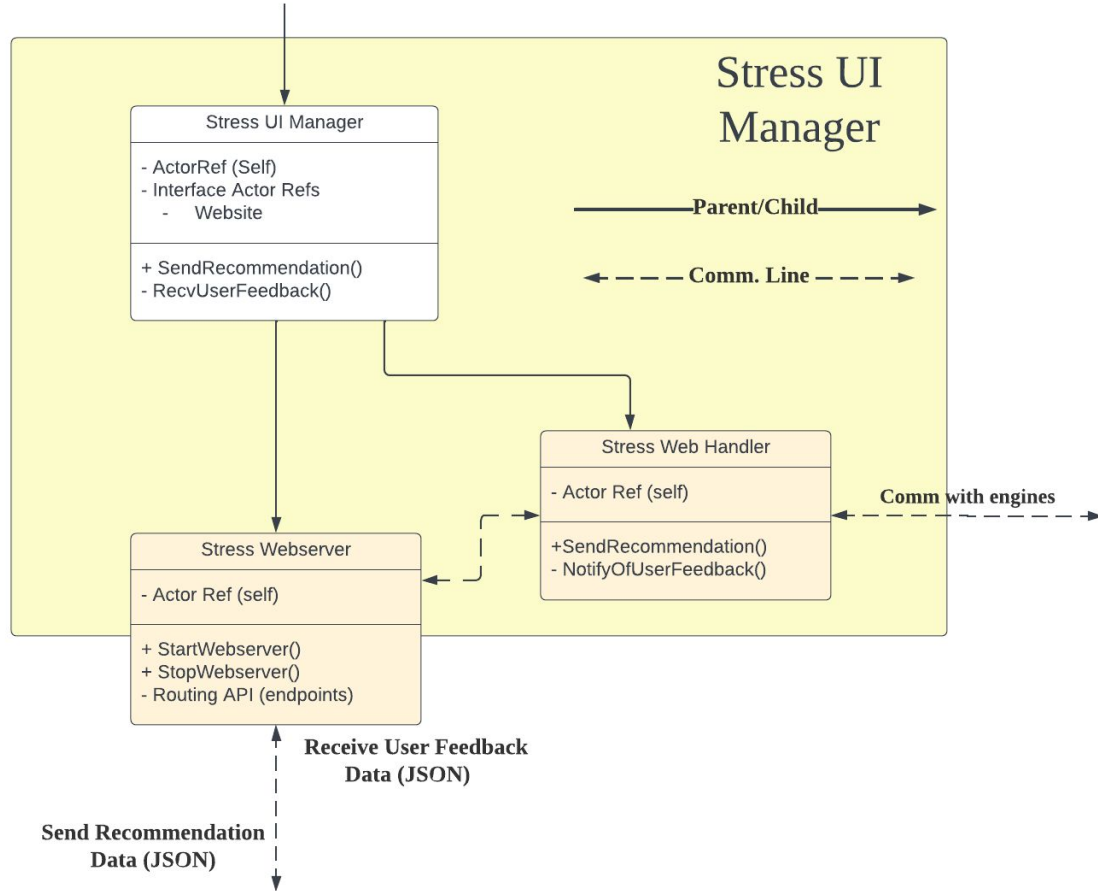
Questions or Comments?

Backup









Scenario

Date/Time	Event	Location	Schedule	Heartbeat	BloodPressure	SleepHours	Stresslevel	User React	treatment	Notes		
2022 04 17 8:00	wake up	home		60	100/75	3	2			Wake up		
2022 04 17 8:30	breakfast	home		72	102/75	3	2			eat		
2022 04 17 9:00	work	office	work	87	105/80	3	2			go to work		
2022 04 17 9:30	work	office	work	83	115/85	3	2			working at the office		
2022 04 17 10:00	meeting	office	meeting1	88	125/86	3	2			joining the meeting, beginning of the meeting a surge in stress level		
2022 04 17 10:30	meeting	office	meeting1	97	125/87	3	2			stress level increased		
2022 04 17 11:00	class	classroom	class	98	123/81	3	3	decline	deep breath	tentative recommendation sent since the user is in a class room		
2022 04 17 11:30	class	classroom	class	84	123/81	3	3			cancel recommendation		
2022 04 17 12:00	class	classroom	class	76	124/82	3	3			remain on class		
2022 04 17 12:30	lunch	restaurant		78	124/82	3	3	decline	cancel meeting	eat		
2022 04 17 13:00	lunch	restaurant		70	125/80	3	3			eat		
2022 04 17 13:30	work	office	work	80	132/85	3	3			user is preparing for a meeting		
2022 04 17 14:00	meeting	office	meeting2	103	135/86	3	4	accept	cancel meeting	stress level goes even higher		
2022 04 17 14:30	meeting	office	meeting2	107	133/86	3	4			another meeting in 2 hours but the pda asks to cancel it		
2022 04 17 15:00	pda-treatment	home	meeting3	90	130/85	3	3	accept	impactful treatment1	follows treatment and goes back home to rest		
2022 04 17 15:30		home	meeting3	83	128/84	3	3			home		
2022 04 17 16:00	pda-treatment	home	work	60	122/82	3	2	decline	impactful treatment2	get more treatment from pda		
2022 04 17 16:30		home	work	58	120/80	3	2					

Scenario

Date/Time	Event	Location	Schedule	Heartbeat	BloodPressure	SleepHours	Stresslevel	User React	treatment	Notes			
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2022 04 17 8:30	breakfast	home		75	98		2			eat			
2022 04 17 9:00	work	office	work				2			go to work			
2022 04 17 9:30	work	office	work				2			working at the office			
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2022 04 17 11:00	class	classroom	class				3	decline	deep breath	tentative recommendation sent since the user is in a class room			
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2022 04 17 12:00	class	classroom	class				3			remain on class			
2022 04 17 12:30	lunch	restaurant					3	decline	cancel meeting	eat			
2022 04 17 13:00	lunch	restaurant					3			eat			
2022 04 17 13:30	work	office	work				3			user is preparing for a meeting			
2022 04 17 14:00	meeting	office	meeting2				4	accept	cancel meeting	stress level goes even higher			
2022 04 17 14:30	meeting	office	meeting2				4			another meeting in 2 hours but the pda asks to cancel it			
2022 04 17 15:00	pda-treatment	home	meeting3				3	accept	impactful treatment1	follows treatment and goes back home to rest			
2022 04 17 15:30		home	meeting3				3			home			
2022 04 17 16:00	pda-treatment	home	work				2	decline	impactful treatment2	get more treatment from pda			
2022 04 17 16:30		home	work				2						