Structured Analysis
Electronic Door Lock System

Team Presentation #1

2013.10.04

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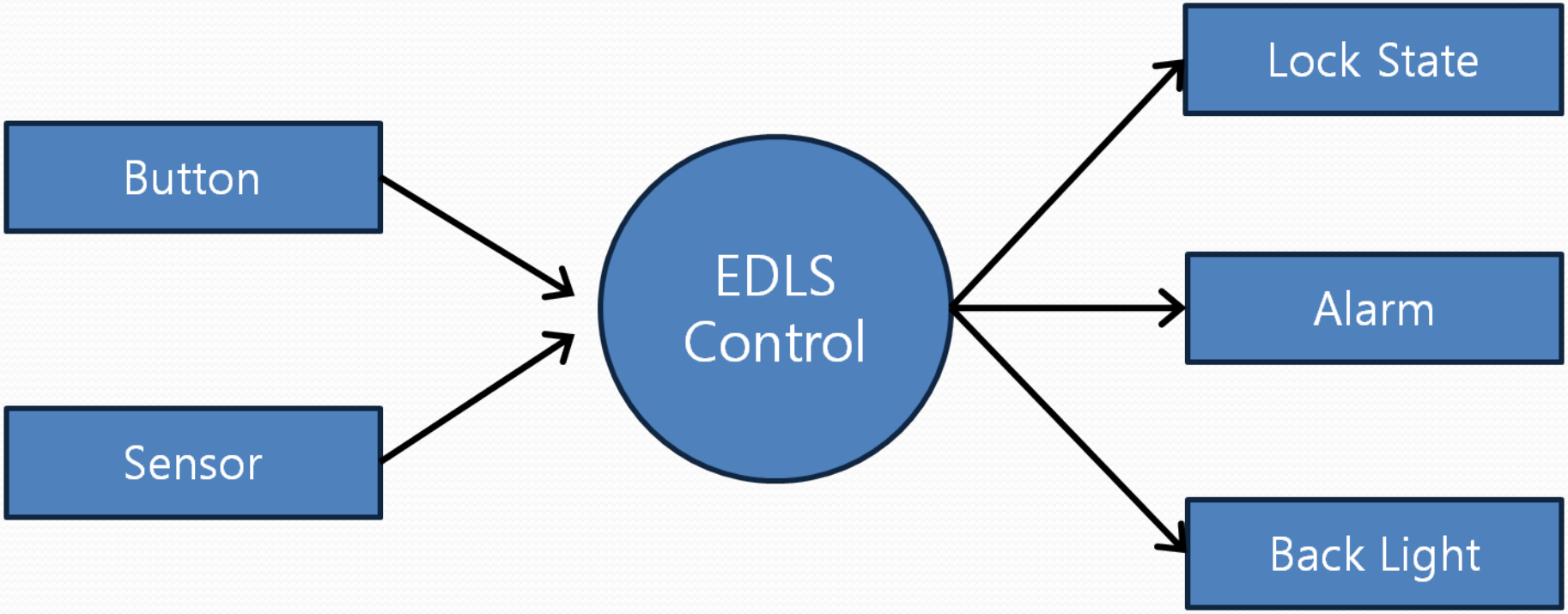
Statement of purpose

Statement of Purpose

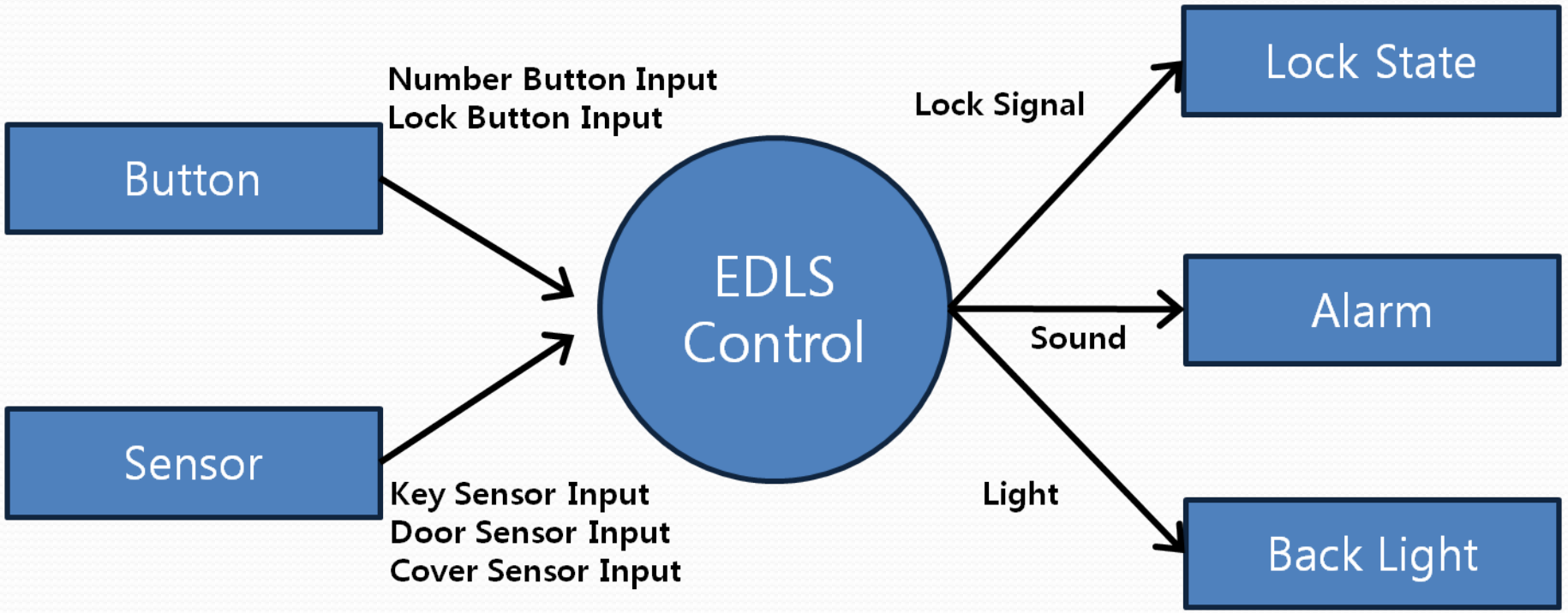
- If its lock button is clicked, it changes the lock state to lock or unlock.
- You can set a password to lock the door and you should input the correct password to door open when the next time you input password.
- You can also unlock the door by input right key.
- It has display function such as Back Light and Alarm.
- We do not consider detail control on Hardware.

System context diagram

Basic System Context Diagram



System Context Diagram



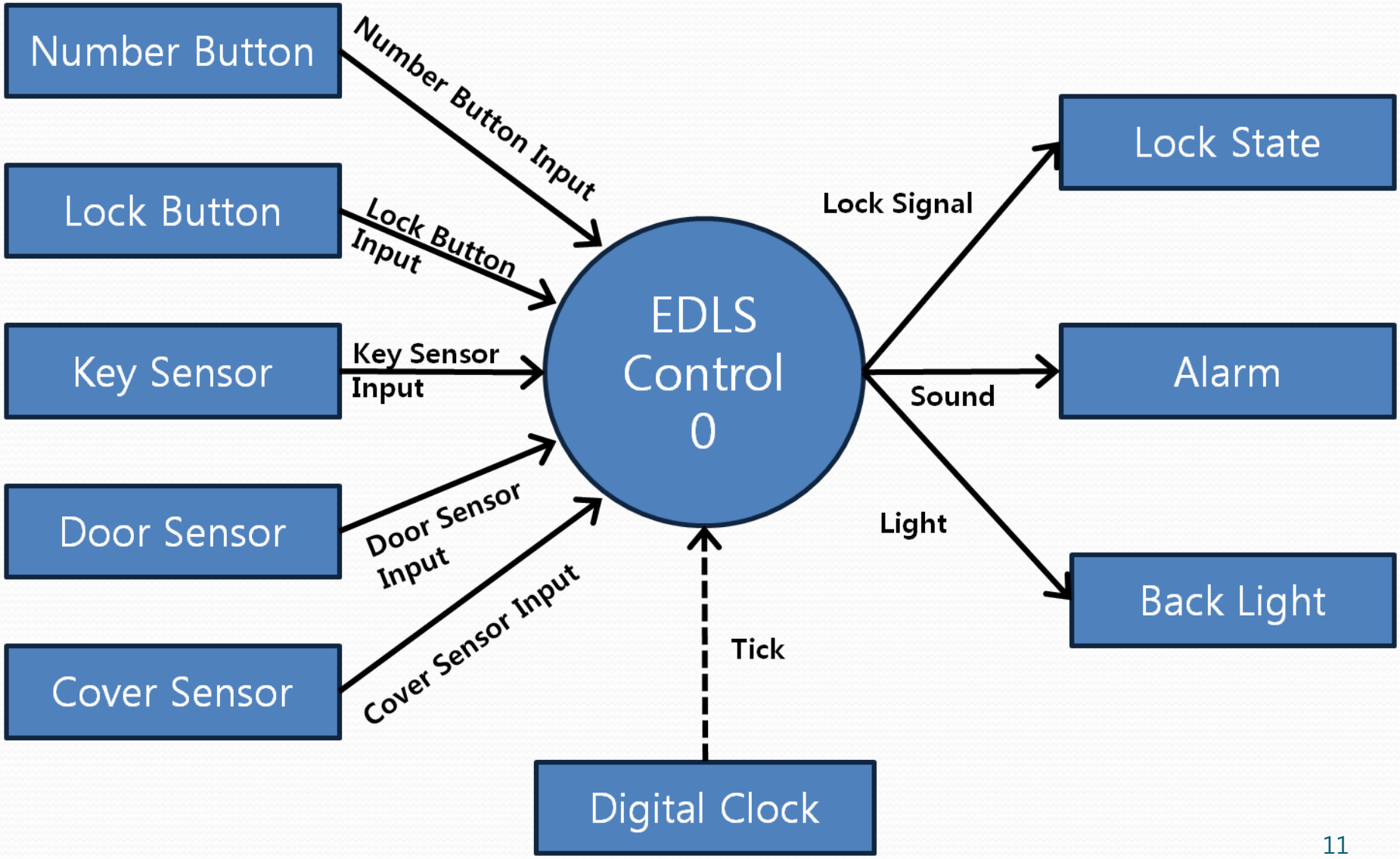
Event list

Event List

Input/Output Event	Description
Number Button Input	Detects click of the number buttons from 0 to 9
Lock Button Input	Detects click of the lock button
Key Sensor Input	Detects key that user touches to it
Door Sensor Input	Detects open/close state of the door
Cover Sensor Input	Detects open/close state of the cover
Light	Turn the light on / off
Sound	Makes a sound (Sound 1 / Sound 2 / Sound 3)
Lock Signal	Controls the door's unlock/lock state

Data flow diagram

DFD Level 0


Number Button
Lock Button
Key Sensor
Door Sensor
Cover Sensor
Digital Clock
Number Button Input
Lock Button Input
Key Sensor Input
Door Sensor Input
Cover Sensor Input
Tick
EDLS Control 0
Lock Signal
Sound
Light
Lock State
Alarm
Back Light

DFD Level 0

- Process Specification (1/1)

Reference No.	0
Name	EDLS Control
Input	Number Button Input, Lock Button Input, Key Sensor Input, Door Sensor Input, Cover Sensor Input, Tick
Output	Lock Signal, Light, Sound
Process Description	It is main control of Electronic Door Lock System. If there is any Button Input or Sensor Input, it reads values of the inputs and sends Lock Signal / Light / Sound Data to Lock State, Back Light and Alarm.

DFD Level 0

- Data Dictionary (1/1)

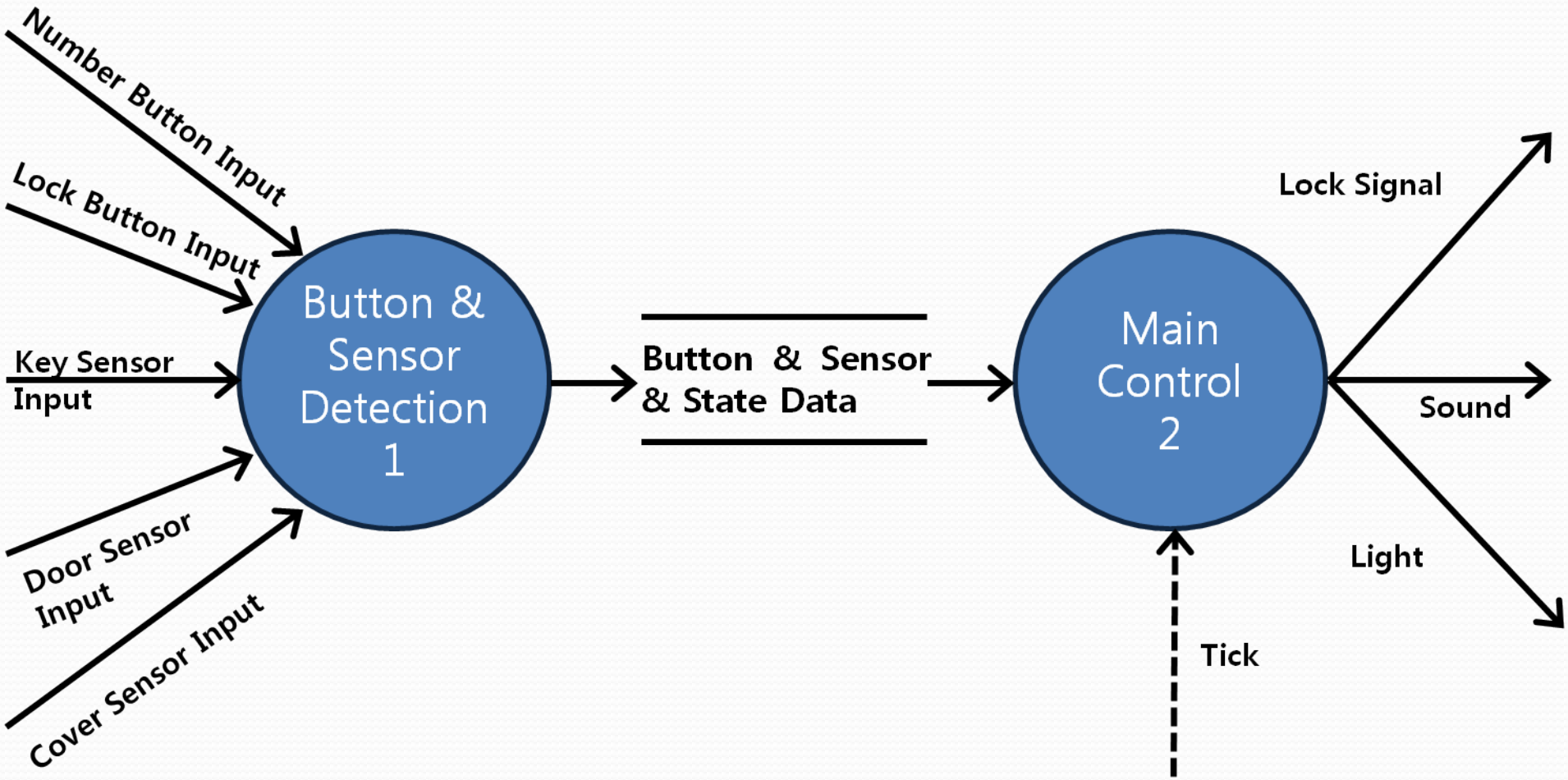
Input/Output Event	Description	Format / Type
Number Button Input	Detects click of the number buttons from 0 to 9	Decimal number from 0 to 9, Interrupt
Lock Button Input	Detects click of the lock button	Analog Value, Interrupt
Key Sensor Input	Detects key that user touches to it	Analog Value, Interrupt
Door Sensor Input	Detects open/close state of the door	Analog Value, Interrupt
Cover Sensor Input	Detects open/close state of the cover	Analog Value, Interrupt
Light	Turn the light on / off	On / Off
Sound	Makes a sound (Sound 1 / Sound 2 / Sound 3)	Sound 1 / Sound 2 / Sound 3
Lock Signal	Controls the door's unlock/lock state	Unlock / Lock

DFD Level 0

- Process Specification (1/1)

Reference No.	0
Name	EDLS Control
Input	Number Button Input, Lock Button Input, Key Sensor Input, Door Sensor Input, Cover Sensor Input, Tick
Output	Lock Signal, Light, Sound
Process Description	It is main control of Electronic Door Lock System. If there is any Button Input or Sensor Input, it reads values of the inputs and sends Lock Signal / Light / Sound Data to Lock State, Back Light and Alarm.

DFD Level 1


Number Button Input
Lock Button Input
Key Sensor Input
Door Sensor Input
Cover Sensor Input
Button & Sensor Detection 1
Button & Sensor & State Data
Main Control 2
Lock Signal
Sound
Light
Tick

DFD Level 1

- Process Specification (1/1)

Reference No.	1
Name	Button & Sensor Detection
Input	Number Button Input, Lock Button Input, Key Sensor Input, Door Sensor Input, Cover Sensor Input
Output	Button & Sensor Data
Process Description	It detects selected button or activated sensor. If two or more button signals come in this process, it chooses the signal which has the highest priority.

Reference No.	2
Name	Main Control
Input	Button & Sensor & State Data, Tick
Output	Lock Signal, Light, Sound
Process Description	This is the main control of the EDLS system. It reads the button & sensor & state data and commands for display and lock state changing.

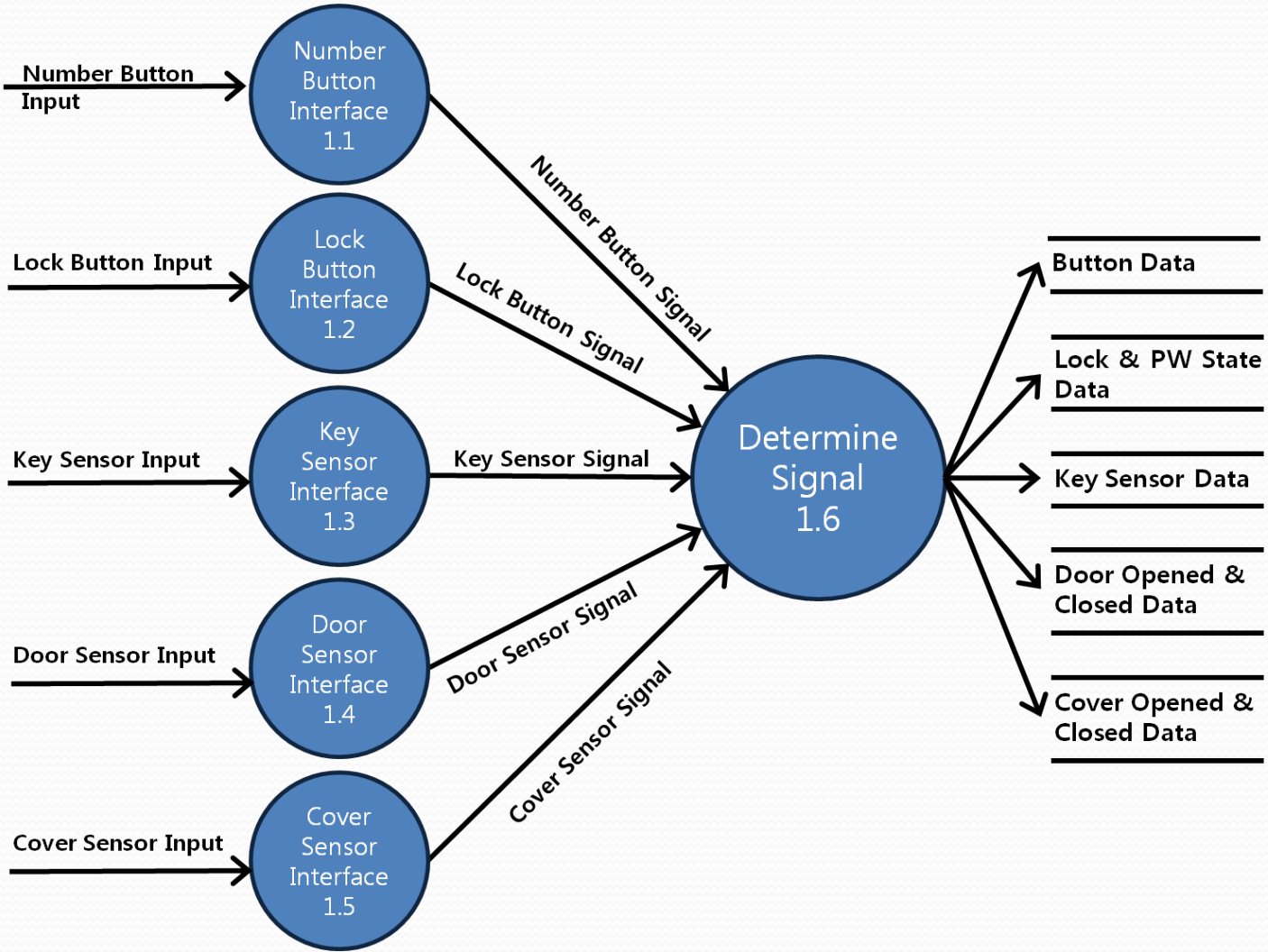
DFD Level 1

- Data Dictionary (1/1)

Input/Output Event	Description
Button & Sensor & State Data	It saves button data, sensor data, and state data of the system. State Data includes Lock and PW Data

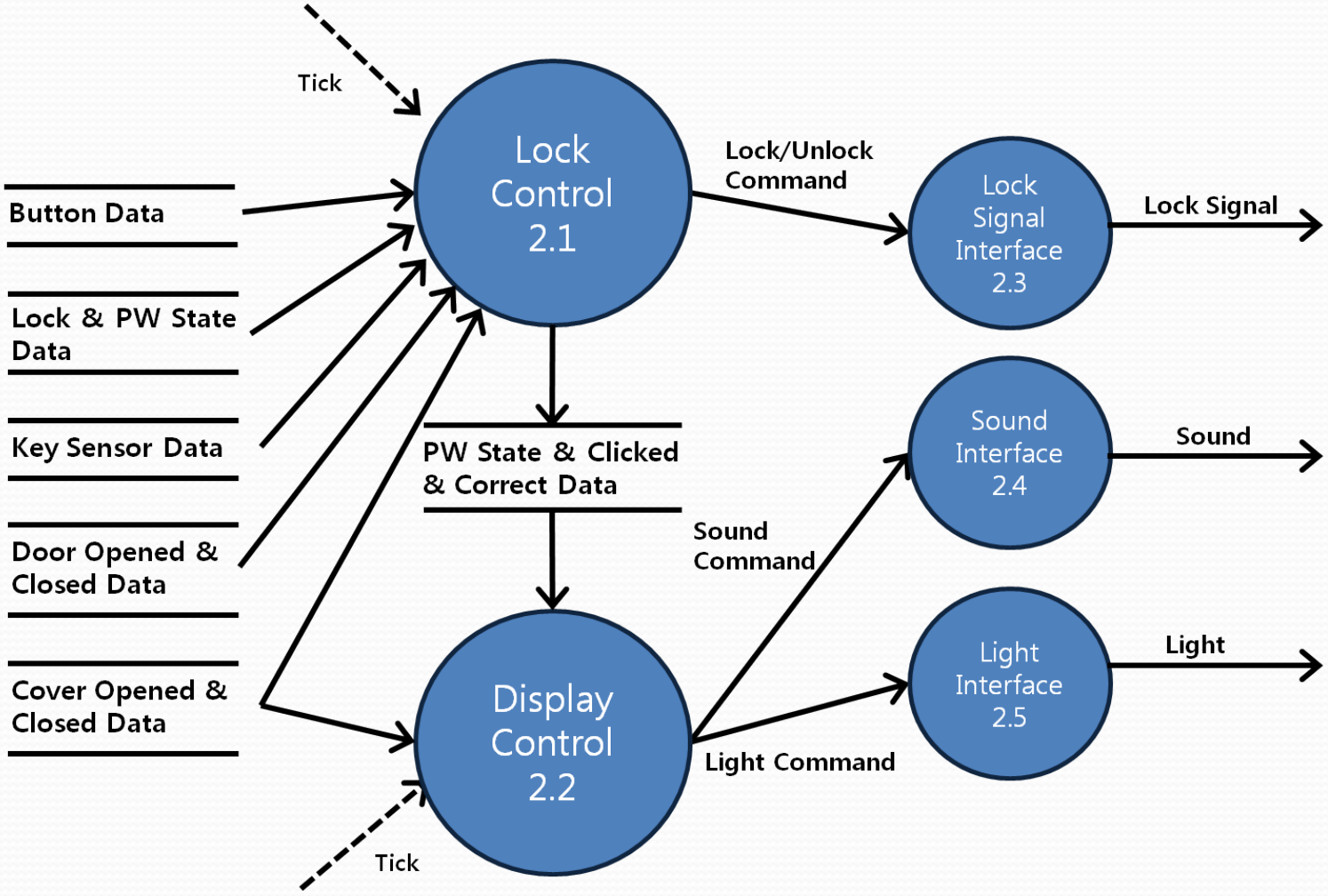
DFD Level 2

- DFD(1/2)
  - DFD enlarge for Input Interfaces 1.1 ~ 1.5 & Determine Signal



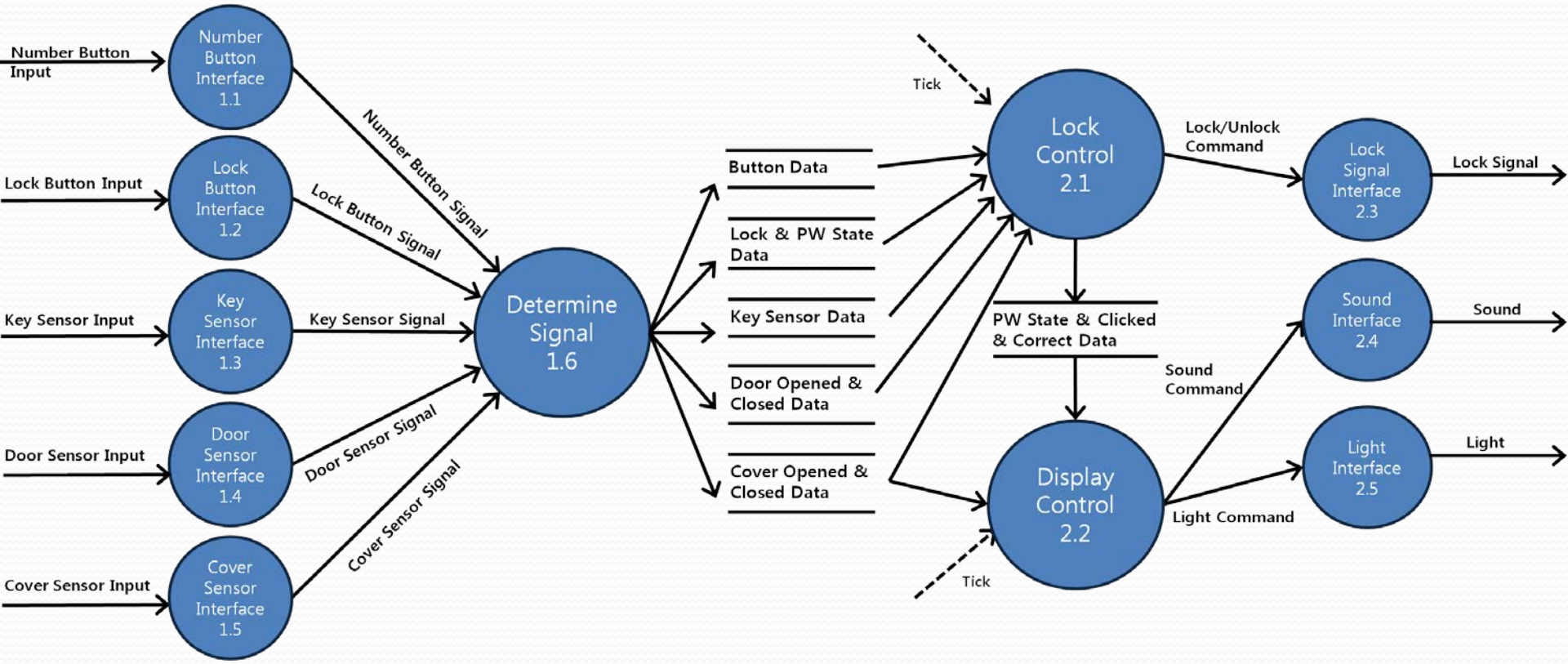
DFD Level 2

- DFD(2/2)
  - DFD enlarge for Lock / Display Control & Output Interfaces 2.3 ~ 2.5



DFD Level 2

- DFD(2/2)
  - DFD overall for Level 2



DFD Level 2

- Process Specification (1/8)

Reference No.	1.1
Name	Number Button Interface
Input	Number Button Input
Output	Number Button Signal
Process Description	Checks the value of the Number Button input, and changes it as a digital signal that could be read by Determine Button process. It makes decimal number to binary number.

Reference No.	1.2
Name	Lock Button Interface
Input	Lock Button Input
Output	Lock Button Signal
Process Description	Checks the value of the Lock Button input, and changes it as a digital signal that could be read by Determine Button process. It makes a boolean type value(true→1 / false→0).

DFD Level 2

- Process Specification (2/8)

Reference No.	1.3
Name	Key Sensor Interface
Input	Key Sensor Input
Output	Key Sensor Signal
Process Description	Checks the value of the Key Sensor Input, and changes it as a digital signal that could be read by Determine Button process. It makes a boolean type value(true→1 / false→0).

Reference No.	1.4
Name	Door Sensor Interface
Input	Door Sensor Input
Output	Door Sensor Signal
Process Description	Checks the value of the Door Sensor Input, and changes it as a digital signal that could be read by Determine Button process. It makes a boolean type value(true→1 / false→0).

DFD Level 2

- Process Specification (3/8)

Reference No.	1.5
Name	Cover Sensor Interface
Input	Cover Sensor Input
Output	Cover Sensor Signal
Process Description	Checks the value of the Cover Sensor Input, and changes it as a digital signal that could be read by Determine Button process. It makes a boolean type value(true→1 / false→0).

DFD Level 2

- Process Specification (4/8)

Reference No.	1.6
Name	Determine Signal
Input	Number Button Signal, Lock Button Signal, Key Sensor Signal, Door Sensor Signal, Cover Sensor Signal
Output	Button Data, Lock & PW State Data, Door Opened & Closed Data, Cover Opened & Closed Data, Key Sensor Data
Process Description	It detects signal value. If two or more signals come in this process, it chooses the signal which has the highest priority and send it to the data storages. The Lock State Data, PW State Data are generated and initialized. It also sends Number Button Clicked Data(boolean type) when sends Number Button Data. When detects door sensor or cover sensor, it makes and sends Door Opened & Closed Data and Cover Opened & Closed Data.

DFD Level 2

- Process Specification (5/8)

Reference No.	2.1
Name	Lock Control
Input	Button Data, Lock & PW State Data, Door Opened & Closed Data, Cover Opened & Closed Data, Key Sensor Data, Tick
Output	PW State & Clicked & Correct Data, Lock/Unlock Command
Process Description	This is the main control of lock process. It receives Button Data, PW State Data and Door & Cover Opened & Closed Data, Key Sensor Data then it makes a decision to Lock or Unlock the door. It sends PW State & Clicked & Correct Data to Display Control.

DFD Level 2

- Process Specification (6/8)

Reference No.	2.2
Name	Display Control
Input	Cover Opened & Closed Data, PW State & PW Clicked & Correct Data, Tick
Output	Sound Command, Light Command
Process Description	This is the main control of display process. It receives Cover Opened & Closed Data and PW State & PW Clicked & Correct data, checks those data and sends the proper display commands such as sound and light commands to Sound and Light Interface.

DFD Level 2

- Process Specification (7/8)

Reference No.	2.3
Name	Lock Signal Interface
Input	Lock/Unlock Command
Output	Lock Signal
Process Description	If there is lock command from Lock Control, the Interface reads it and sends a lock signal for change the lock state(lock/unlock) to a lock device. It also changes the Lock State Data.

Reference No.	2.4
Name	Light Interface
Input	Light Command
Output	Light
Process Description	If there is light command from Display Control, the Interface reads it and sends a light signal to turn on or off the back light.

DFD Level 2

- Process Specification (8/8)

Reference No.	2.5
Name	Sound Interface
Input	Sound Command
Output	Sound
Process Description	If there is sound command from Display Control, the Interface reads it and sends a sound signal to make sounds.

DFD Level 2

- Data Dictionary (1/3)

Input/Output Event	Description	Format / Type
Number Button Signal	Binary number that is changed from decimal number.	Binary number, Interrupt
Lock Button Signal	Boolean type data that is true if the Lock Button is clicked.	True / False, Interrupt
Key Sensor Signal	Boolean type data that is true if the key is the right key to unlock door.	True / False, Interrupt
Door Sensor Signal	Boolean type data that is true if the Door is closed.	True / False, Interrupt
Cover Sensor Signal	Boolean type data that is true if the cover is closed.	True / False, Interrupt

DFD Level 2

- Data Dictionary (2/3)

Input/Output Event	Description	Format/Type
PW State Data	It saves Integer Array Data used to check password. It includes PW Array	
Lock/Unlock Command	Commands to make a Lock Signal	
Sound Command	Commands to make a Sound Signal	
Light Command	Commands to make a Light Signal	
Button Data	It includes Number Button Data and Lock Button Data generated by Determine Signal.	/Interrupt
Lock State Data	It saves Boolean data. If Door Lock State is unlock, saves false, and if Door Lock State is lock, saves true.	True, False/ Interrupt

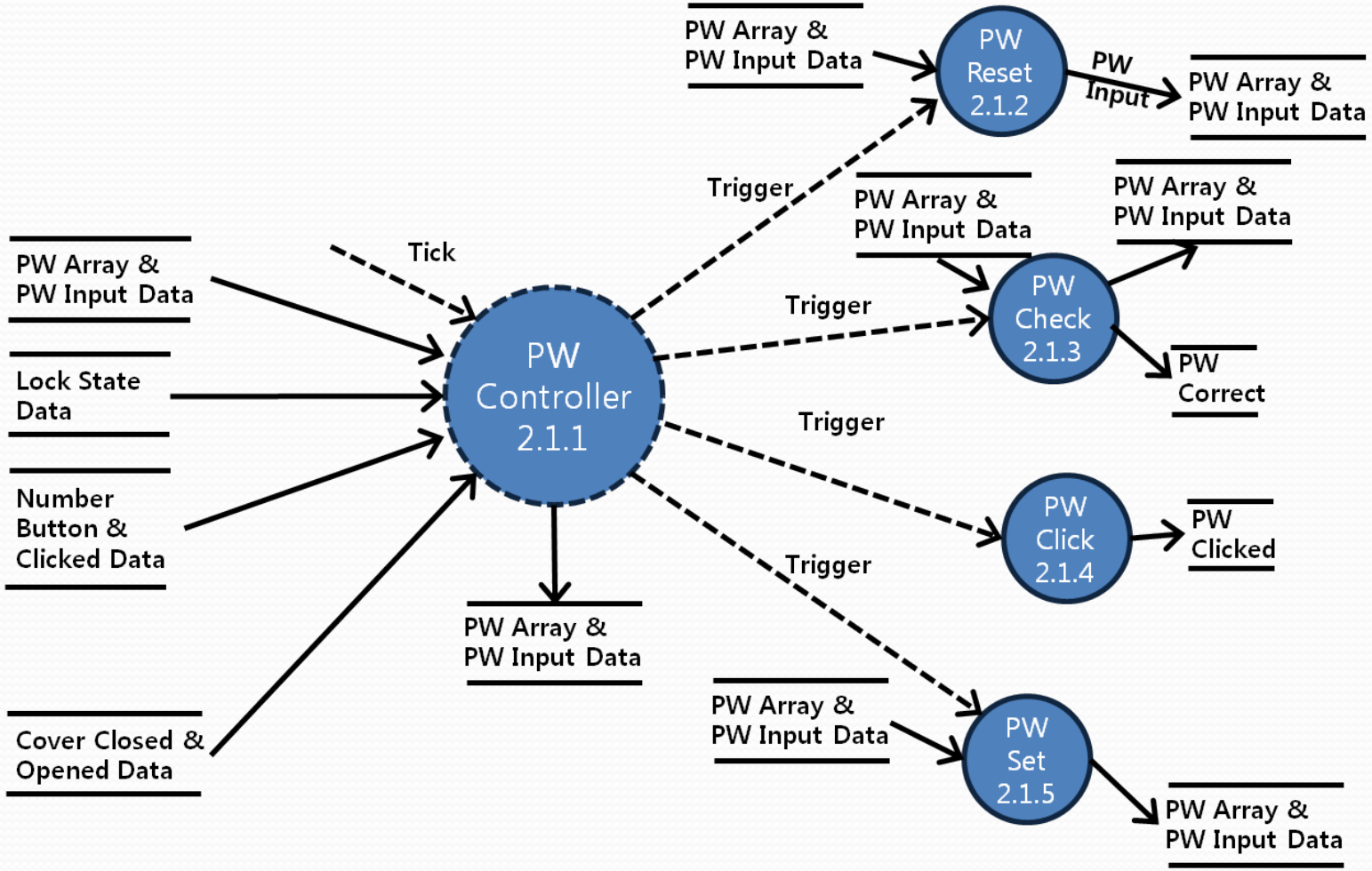
DFD Level 2

- Data Dictionary (3/3)

Input/Output Event	Description	Format/Type
Key Sensor Data	It saves Boolean data used to check Key Sensor detects right key.	True/False , Interrupt
Door Opened & Closed	It saves Boolean data used to check Door Sensor detects the door is closed. (If door is opened Door Opened is True, or Door Closed is True).	True/False , Interrupt
Cover Opened & Closed	It saves Boolean data used to check that the cover is closed or opened(If cover is opened Cover Opened is True, or Cover Closed it True).	True/False, Interrupt

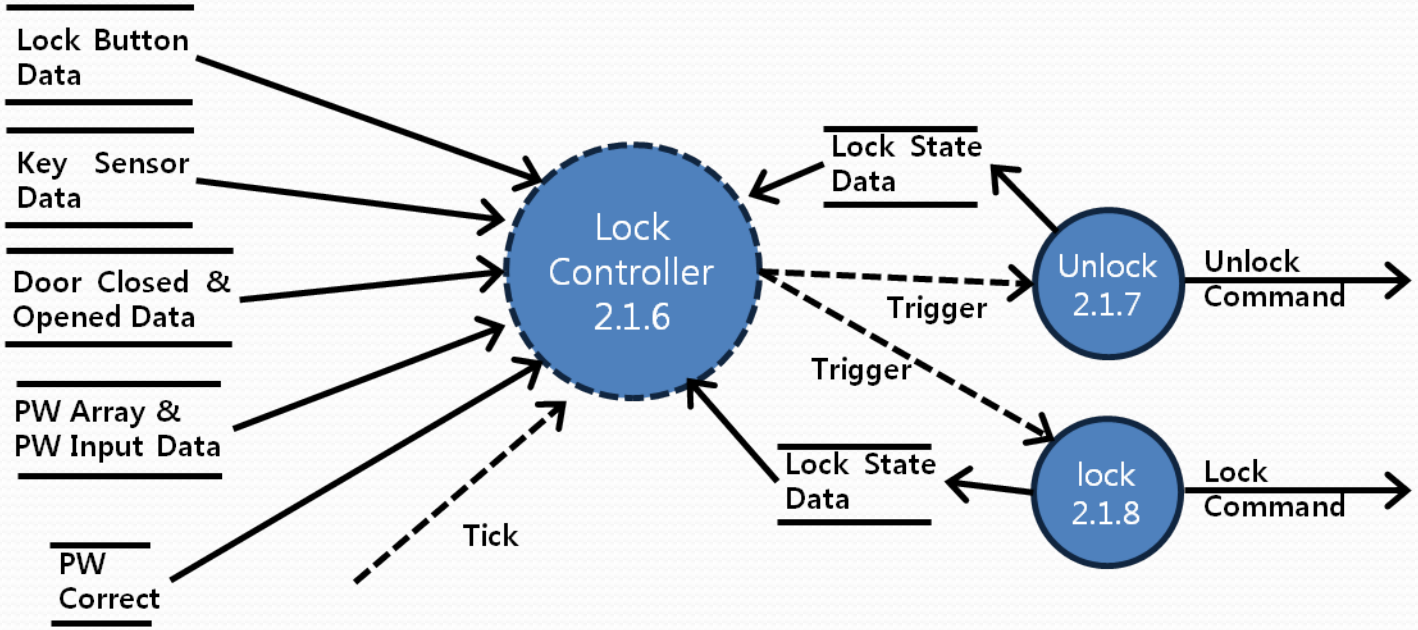
DFD Level 3

- DFD(1/5)
  - DFD enlarge for PW Controller & process 2.1.2 ~ 2.1.5



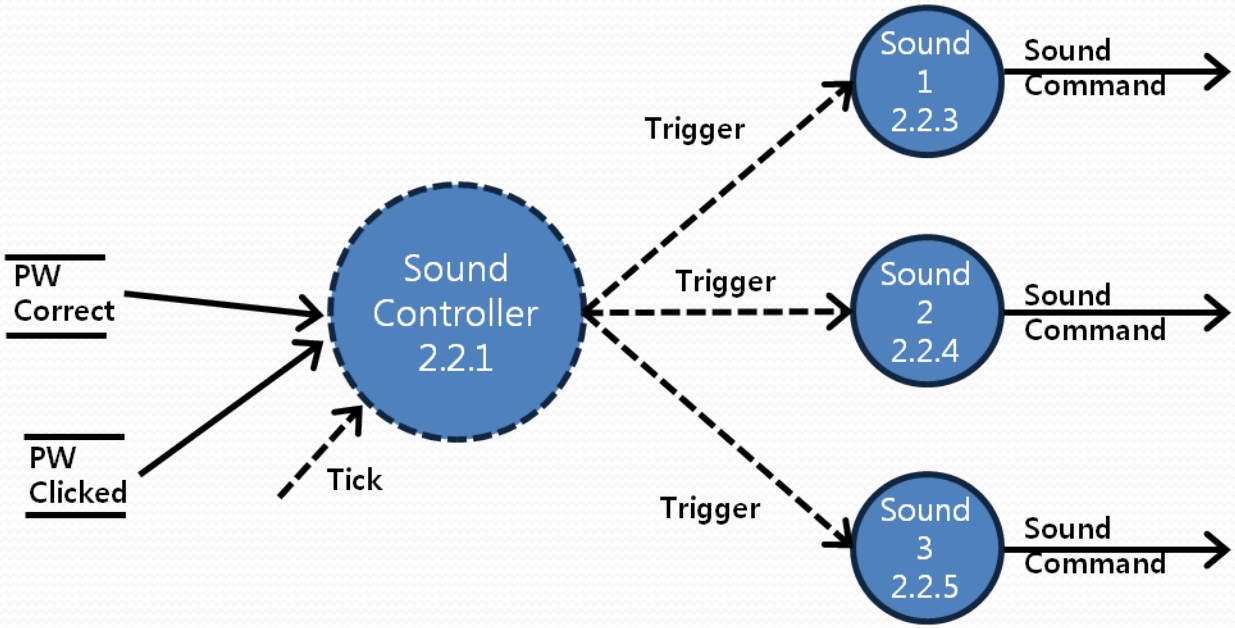
DFD Level 3

- DFD(2/5)
  - DFD enlarge for Lock Controller & process 2.1.7 and 2.1.8



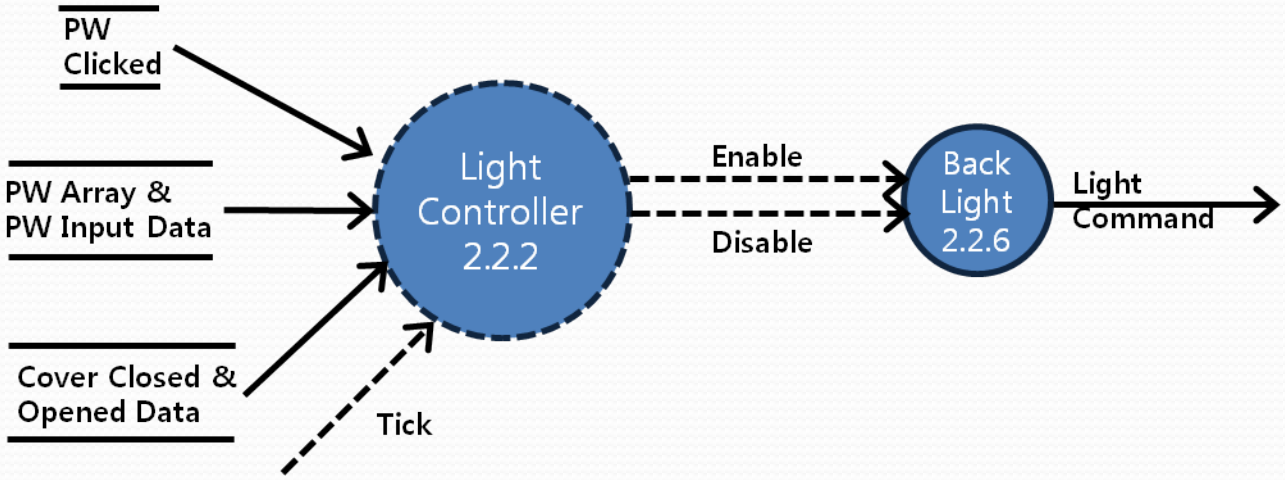
DFD Level 3

- DFD(3/5)
  - DFD enlarge for Sound Controller & process 2.2.3 ~ 2.2.5



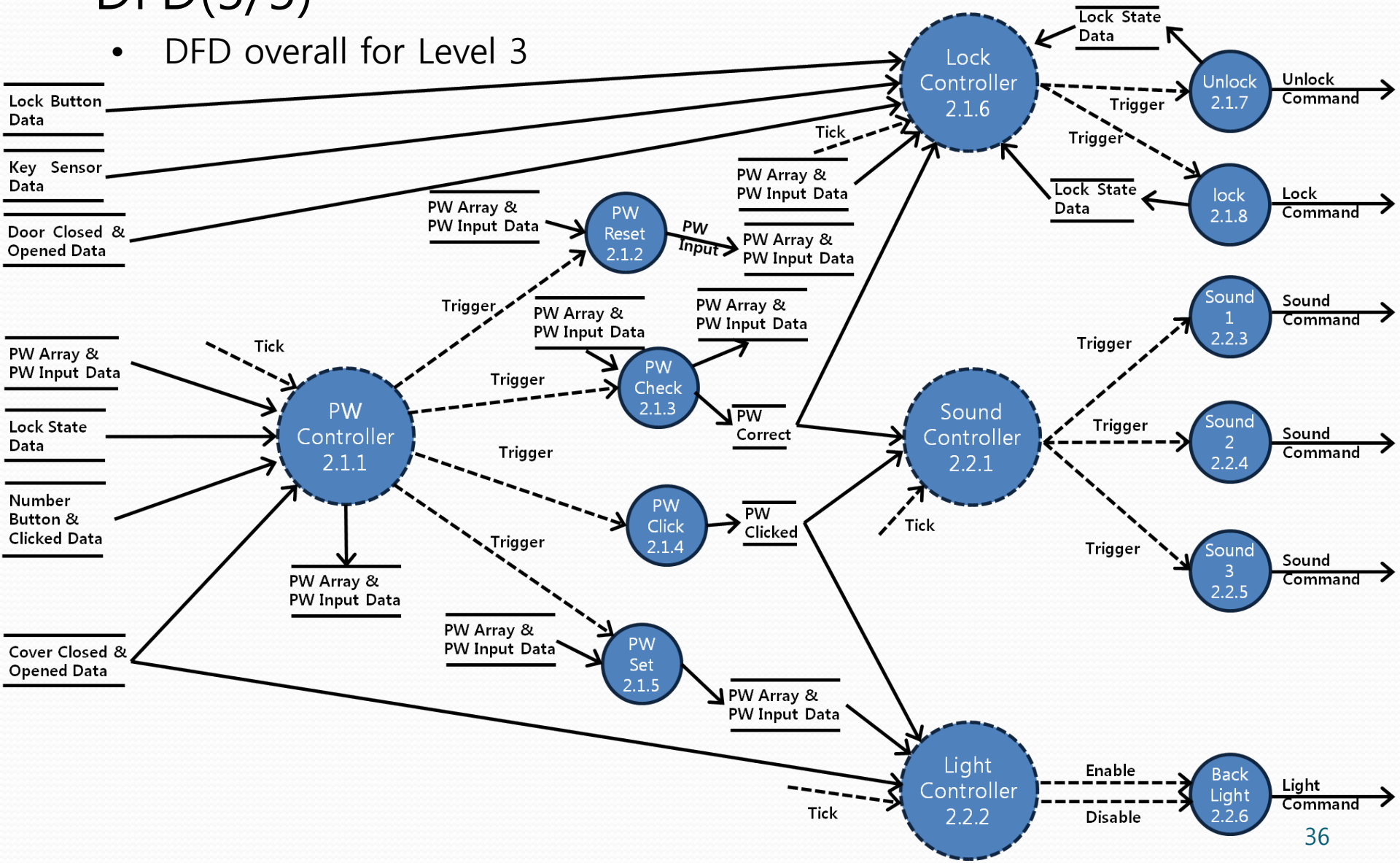
DFD Level 3

- DFD(4/5)
  - DFD enlarge for Light Controller & process 2.2.6



DFD Level 3

- DFD(5/5)
  - DFD overall for Level 3



DFD Level 3

- Process Specification (1/9)

Reference No.	2.1.1
Name	PW Controller
Input	PW Input & PW Array Data, Cover Opened & Closed Data , Tick
Output	Trigger
Process Description	If Lock State Data is false, it doesn't operate below processes. If Number Button Clicked is True, it sends a trigger to the PW Click, saves Number Button Data in PW Input Data, initializes counting time and starts counting time. If there is no input of Number Button Data for 10 seconds, it sends a trigger to PW Reset. When PW Input is full, it sends a trigger to PW Set if PW Array Data is null, or PW Check. If the Cover Closed Data is input as True, it sends a trigger to PW Reset and stop counting.

DFD Level 3

- Process Specification (2/9)

Reference No.	2.1.2
Name	PW Reset
Input	PW Input & PW Array Data, Trigger
Output	PW Input
Process Description	If Trigger is input, It initializes PW Input.

Reference No.	2.1.3
Name	PW Check
Input	PW Input & PW Array Data, Trigger
Output	PW Input & PW Array Data
Process Description	If Trigger is input, compare PW Input with PW Array. If they are equal it sends PW Correct Data as True, or sends PW Correct Data as False. Then it initializes PW Input.

DFD Level 3

- Process Specification (3/9)

Reference No.	2.1.4
Name	PW Click
Input	Trigger
Output	PW Clicked
Process Description	If Trigger input, it sends PW Clicked as True.

Reference No.	2.1.5
Name	PW Set
Input	PW Input & PW Array Data, Trigger
Output	PW Input & PW Array Data
Process Description	If Trigger is input, It copies PW Input into PW Array Data. Then it initializes PW Input Data.

DFD Level 3

- Process Specification (4/9)

Reference No.	2.1.6
Name	Lock Controller
Input	Lock Button Data, Key Sensor Data, Door Closed & Opened Data, Lock State Data, PW Correct Data, PW Input & PW Array Data, Tick
Output	Trigger
Process Description	If Lock State Data is True and PW Array Data is not null, When Lock Button Data or Key sensor Data or PW Correct Data is input as True, sends a Trigger to Unlock. If Lock State Data is False and PW Array Data is not null, When Lock Button Data is input as True or when Door Closed & Opened Data is not received within 3 seconds , it sends a Trigger to Lock.

DFD Level 3

- Process Specification (5/9)

Reference No.	2.1.7
Name	Unlock
Input	Trigger
Output	Lock State Data , Unlock Command
Process Description	If Trigger is input, it changes the Lock State Data to False and sends the Unlock Command to Lock Interface.

Reference No.	2.1.8
Name	Lock
Input	Trigger
Output	Lock State Data , Lock Command
Process Description	If Trigger is input, it changes the Lock State Data to True and sends the Lock Command to Lock Interface.

DFD Level 3

- Process Specification (6/9)

Reference No.	2.2.1
Name	Sound Controller
Input	PW Correct Data, PW Clicked, Tick
Output	Trigger
Process Description	It can be input Boolean type data. If PW Correct Data is input as TRUE, sends Trigger to Sound 1, as FALSE, sends Trigger to Sound 2. When PW Clicked is input as True, it initializes counting time and starts time counting. If counting time is 10 seconds or more it sends Trigger to Sound3.

DFD Level 3

- Process Specification (7/9)

Reference No.	2.2.2
Name	Light Controller
Input	PW Clicked, Cover Closed & Opened Data, PW Input & PW Array Data, Tick
Output	Enable, Disable
Process Description	When Cover Opened or PW Clicked is input as True, it sends Enable to Back Light and it initializes counting time and starts time counting(but, if PW Array is null it doesn't count). Then if counting time is 10 seconds or more, it sends Disable to Back Light and stop counting time. When Cover Closed is input as True it sends Disable to Back Light and stop counting time.

DFD Level 3

- Process Specification (8/9)

Reference No.	2.2.3
Name	Sound 1
Input	Trigger
Output	Sound 1 Command
Process Description	It sends sound 1 command when Trigger input.

Reference No.	2.2.4
Name	Sound 2
Input	Trigger
Output	Sound 2 Command
Process Description	It sends sound 2 command when Trigger input.

Reference No.	2.2.5
Name	Sound 3
Input	Trigger
Output	Sound 3 Command
Process Description	It sends sound 3 command when Trigger input.

DFD Level 3

- Process Specification (9/9)

Reference No.	2.2.6
Name	Back Light
Input	Enable, Disable
Output	Light Command
Process Description	It sends Light Command to turn on the Back Light when it received Enable. It sends Light Command to turn off the Back Light when it received Disable.

DFD Level 3

- Data Dictionary (1/2)

Input/output Event	Description	Format / Type
Number Button Data	It saves Integer type data used to make password data.	Integer (0~9), Interrupt
Number Button Clicked Data	It saves Boolean type data used to check whether Number Button is clicked or not. When Number Button is clicked, it is True.	True/False, Interrupt
Lock Button Data	It saves Boolean data used to check whether Lock Button is clicked or not. When Lock Button is clicked, it is True.	True/False, Interrupt

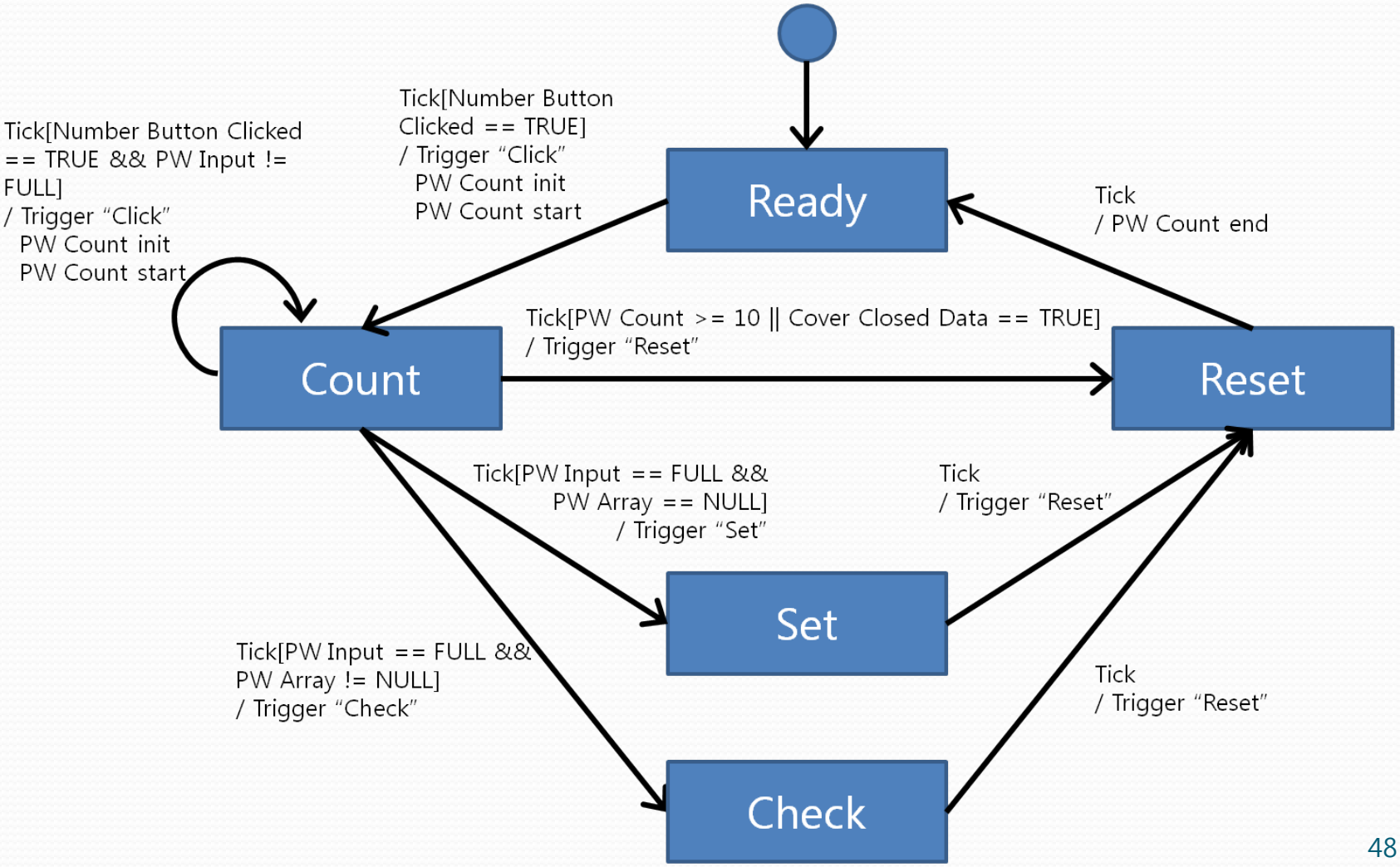
DFD Level 3

- Data Dictionary (2/2)

Input/output Event	Description	Format / Type
PW Array & PW Input Data	These data are included in PW State. PW Input Data is made up four Number Button Data in incoming order. PW Array Data also saves integer array data used to checks PW Input Data.	null, Integer Array[4]
PW Correct Data	Using information generated by PW Check Process, it saves Boolean data whether the password is correct or not.	True / False, Interrupt
PW Clicked	The data generated by PW Clicked. It sends Boolean data. (It sends true when PW Click.)	True / False, Interrupt

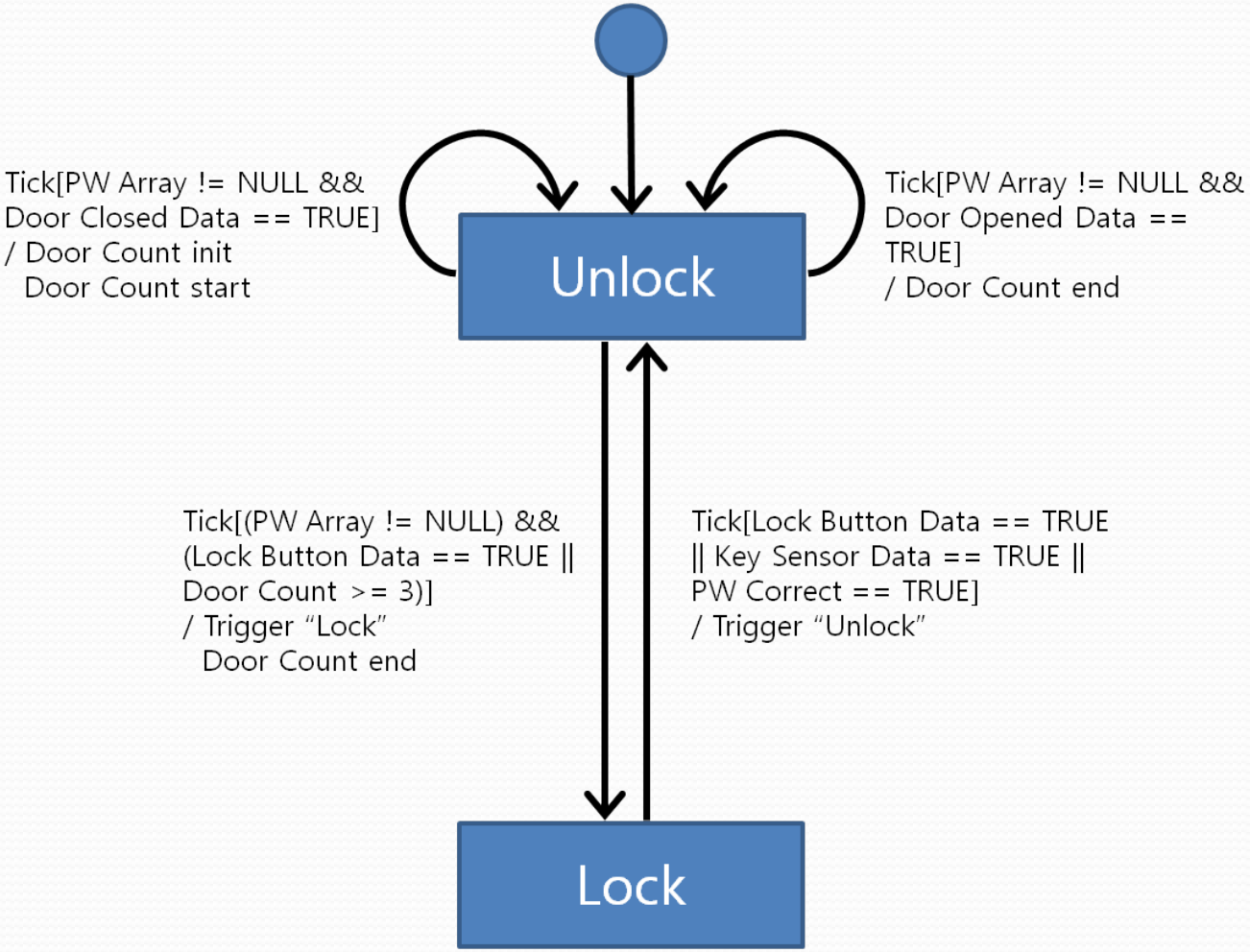
DFD Level 4

- State Transition Diagram (1/4)
  - STD for PW Controller(2.1.1)



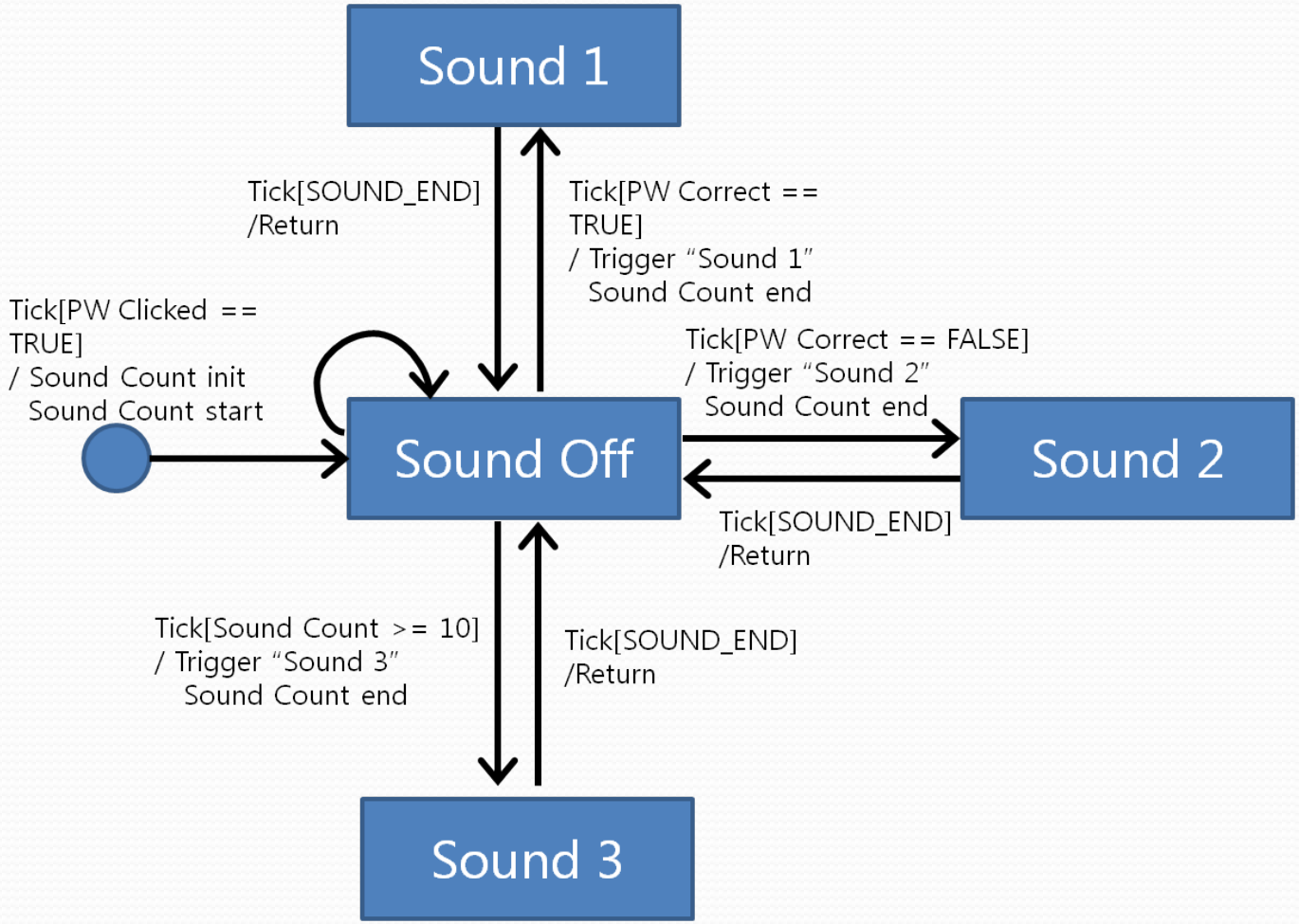
DFD Level 4

- State Transition Diagram (2/4)
  - STD for Lock Controller(2.1.6)



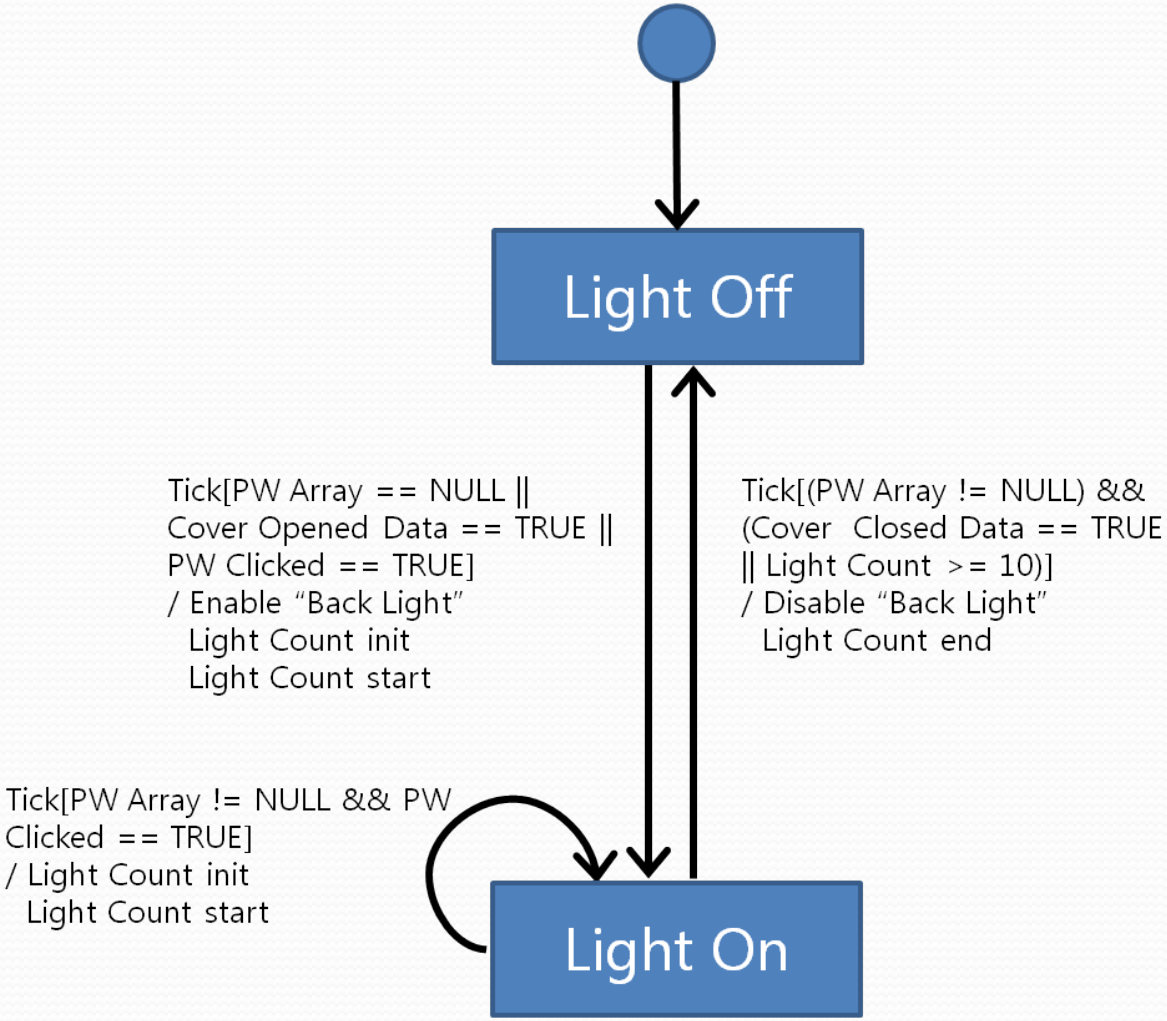
DFD Level 4

- State Transition Diagram (3/4)
  - STD for Sound Controller(2.2.1)

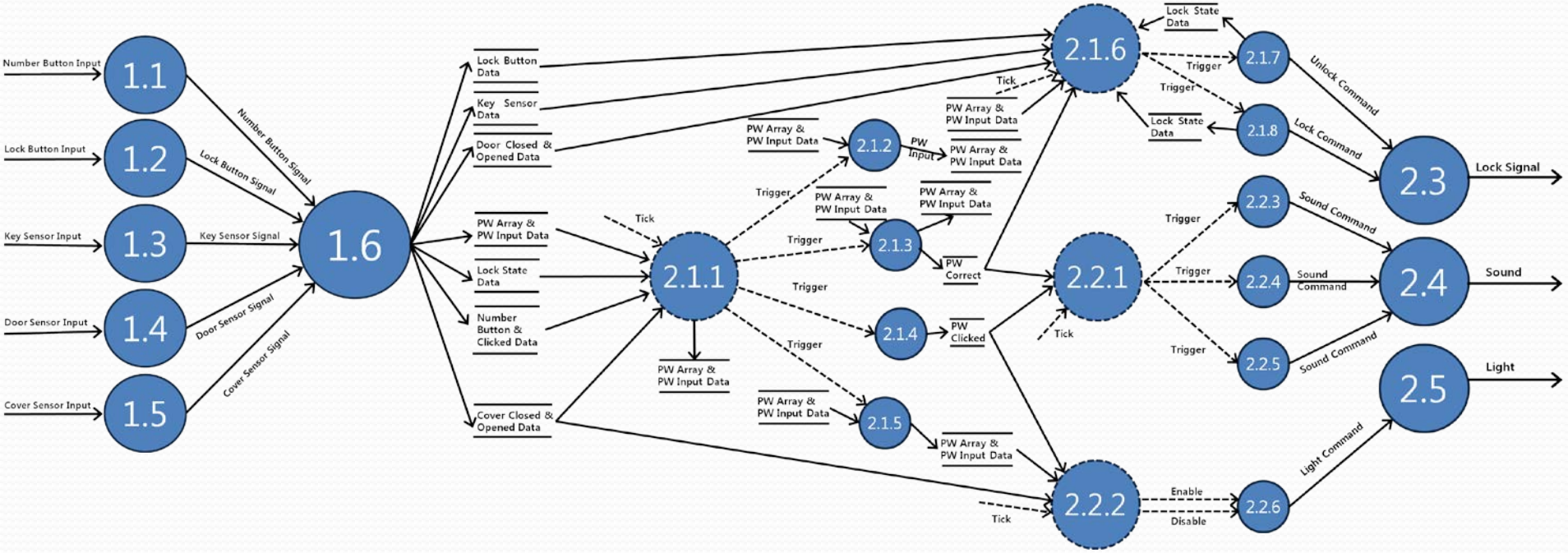


DFD Level 4

- State Transition Diagram (4/4)
  - STD for Light Controller(2.2.2)



Overall DFD


Number Button Input
Lock Button Input
Key Sensor Input
Door Sensor Input
Cover Sensor Input
1.1
1.2
1.3
1.4
1.5
Number Button Signal
Lock Button Signal
Key Sensor Signal
Door Sensor Signal
Cover Sensor Signal
1.6
Lock Button Data
Key Sensor Data
Door Closed & Opened Data
PW Array & PW Input Data
Lock State Data
Number Button & Clicked Data
Cover Closed & Opened Data
Tick
2.1.1
PW Array & PW Input Data
Trigger
2.1.2
PW Input
PW Array & PW Input Data
2.1.3
PW Correct
2.1.4
PW Clicked
2.1.5
PW Array & PW Input Data
2.1.6
Tick
PW Array & PW Input Data
Lock State Data
2.1.7
2.1.8
Unlock Command
Lock Command
2.2.1
Tick
2.2.2
Enable
Disable
2.2.3
2.2.4
2.2.5
2.2.6
Sound Command
Light Command
2.3
Lock Signal
2.4
Sound
2.5
Light

Q&A

Thank You