Illinois Institute of Technology
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Department of Computer Science

FINAL REPORT

CS 586

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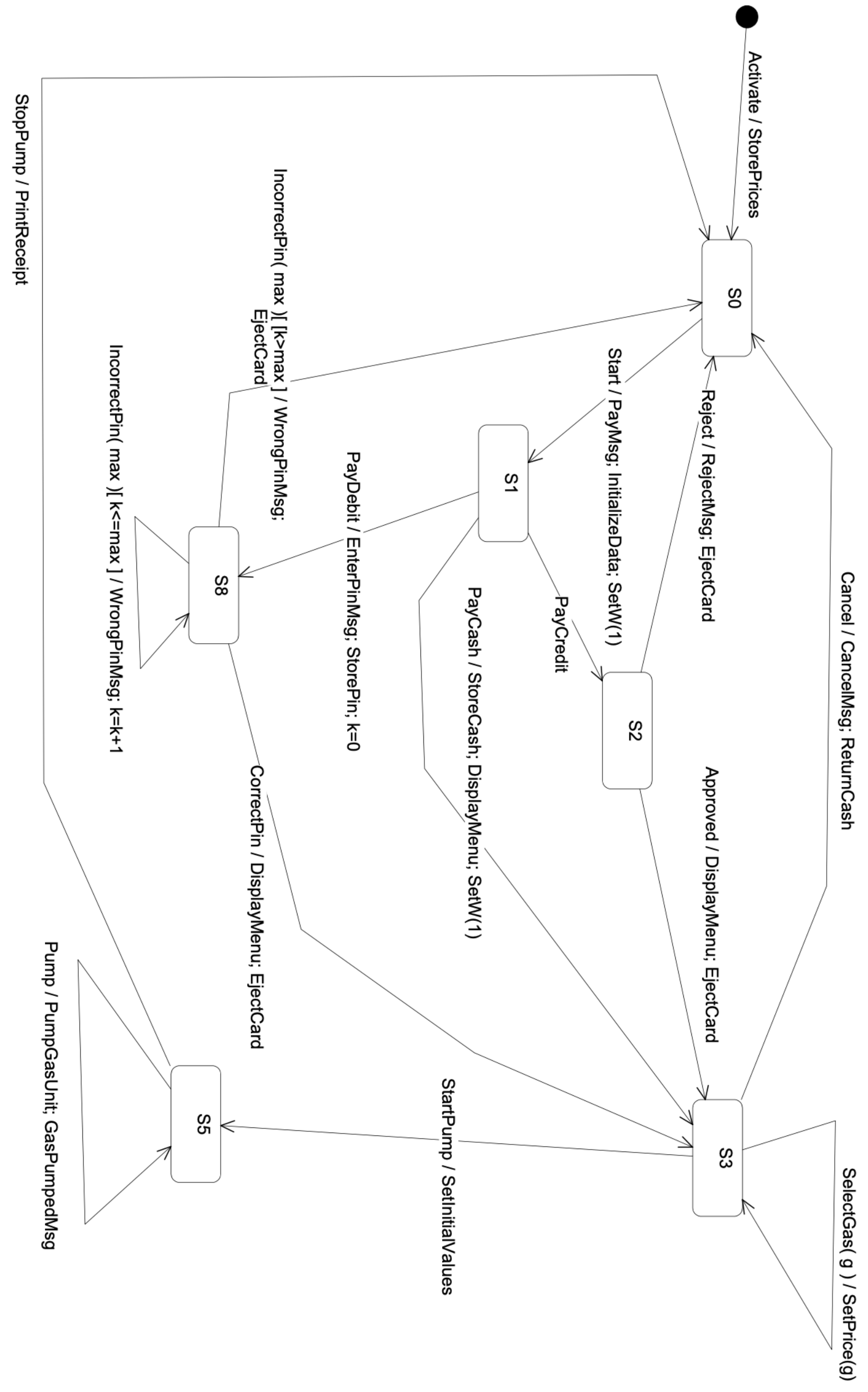
- SelectGas(int g)
- CorrectPin()
- IncorrectPin(int max)

1.2. Meta-actions

Action	**Description**
StorePrices	// stores price(s) for the gas from the temporary data store
PayMsg	// displays a type of payment method
StoreCash	// stores cash from the temporary data store
DisplayMenu	// display a menu with a list of selections
RejectMsg	// displays credit card not approved message
SetPrice(int g)	// set the price for the gas identified by g identifier as in SelectGas(int g)
SetInitialValues	// set G (or L) and total to 0;
PumpGasUnit	// disposes unit of gas and counts # of units disposed
GasPumpedMsg	// displays the amount of disposed gas
PrintReceipt	// print a receipt
CancelMsg	// displays a cancellation message
ReturnCash	// returns the remaining cash
WrongPinMsg	// displays incorrect pin message
StorePin	// stores the pin from the temporary data store
EnterPinMsg	// displays a message to enter pin
InitializeData	// set the value of price to 0 for GP-2; do nothing for GP-1
EjectCard()	// card is ejected
SetW(int w)	// set value for cash flag

1.3. State diagram


Activate / StorePrices
S0
Start / PayMsg; InitializeData; SetW(1)
S1
Reject / RejectMsg; EjectCard
Cancel / CancelMsg; ReturnCash
PayCredit
S2
PayCash / StoreCash; DisplayMenu; SetW(1)
Approved / DisplayMenu; EjectCard
PayDebit / EnterPinMsg; StorePin; k=0
S8
IncorrectPin(max)[k>max] / WrongPinMsg; EjectCard
IncorrectPin(max)[k<=max] / WrongPinMsg; k=k+1
CorrectPin / DisplayMenu; EjectCard
S3
SelectGas(g) / SetPrice(g)
StartPump / SetInitialValues
S5
Pump / PumpGasUnit; GasPumpedMsg
StopPump / PrintReceipt

1.4. Pseudocode

Operations of the Input Processor (GP-2)

```
Activate(float a, float b, float ) {
        if((a>0) && (b>0) && (c>0)) {
                d->temp_a = a;
                d->temp_b = b;
                d->temp_c = c;
                m->Activate()
        }
}

Start() {
        m->Start();
}

PayCredit() {
        m->PayCredit();
}

Reject() {
        m->Reject();
}

PayDebit(string p) {
        d->temp_p=p;
        m->PayDebit();
}

Pin(string x) {
        if (d->pin==x) m->CorrectPin()
        else m->InCorrectPin(1);
}

Cancel() {
        m->Cancel();
}

Approved() {
        m->Approved();
}


Diesel() {
    m->SelectGas(3)
}

Regular() {
    m->SelectGas(1)
}

Super() {
    m->SelectGas(2)
}

StartPump() {
    if (d->price>0) m->StartPump();
}

PumpGallon() {
    m->Pump();
}

StopPump() {
    m->StopPump();
}

FullTank() {
    m->StopPump();
}
```

Notice:
pin: contains the pin in the data store
m: is a pointer to the MDA-EFSM object
d: is a pointer to the Data Store object
SelectGas(g): Regular: g=1; Super: g=2; Diesel: g=3

Operations of the Input Processor (GP-1)

```
Activate(int a) {
        if(a>0) {
                d->temp_a = a;
                m->Activate();
        }
}

Start {
        m->Start();
}

PayCash(int c) {
        if(c>0) {
                d->temp_c = c;
                m->PayCash();
        }
}

PayCredit() {
        m->PayCredit();
}

Reject() {
        m->Reject();
}

Approved() {
        m->Approved();
}

Cancel() {
        m->Cancel();
}

StartPump() {
        m->StartPump();
}
```

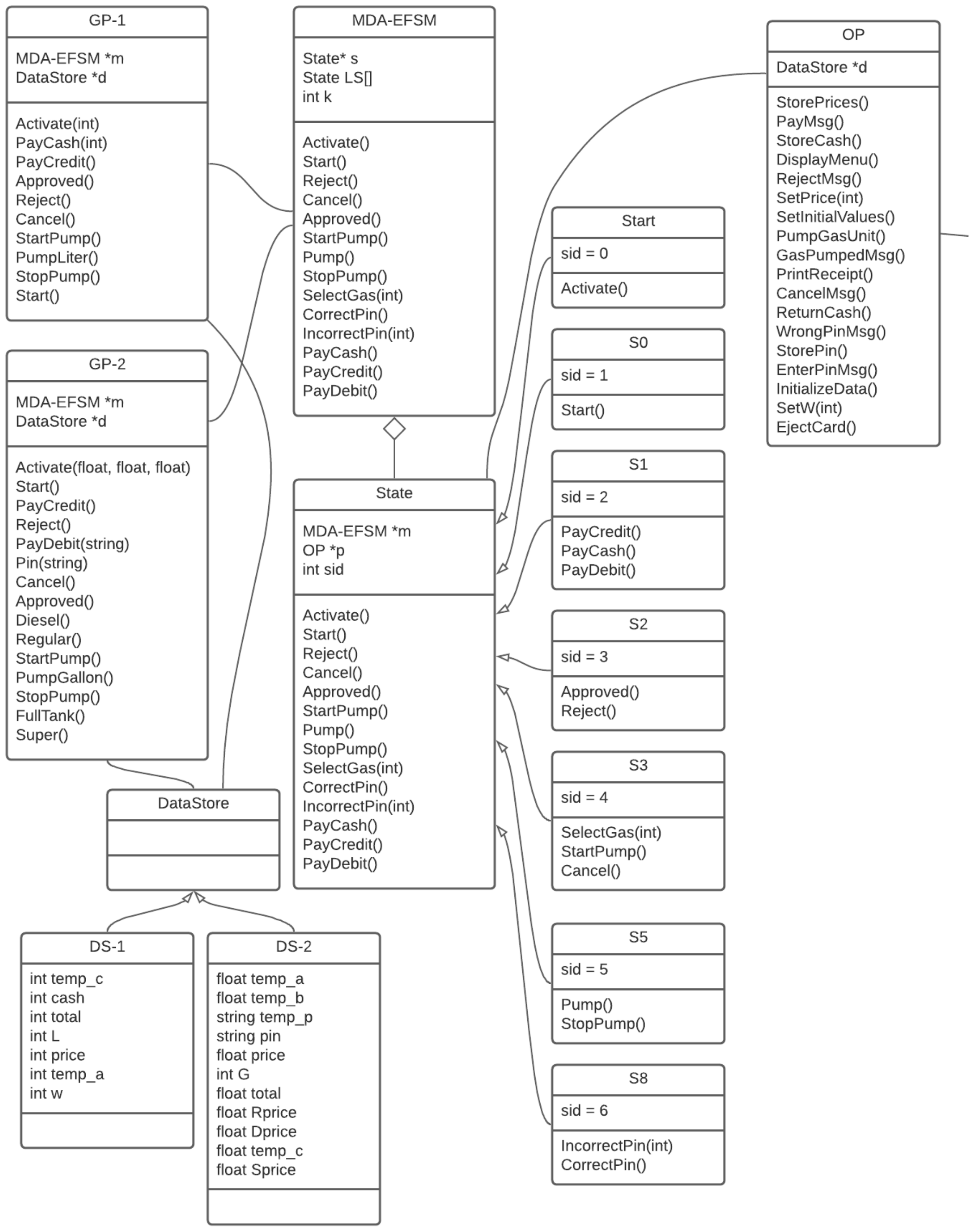
```
PumpLiter() {
        if (d->w == 1)
                m ->Pump()
        else if (d->cash>0) && (d->cash < d->price*(d->L+1))
                m->StopPump();
        else
                m->Pump()
}

StopPump() {
        m->StopPump()
}
```

Notice:
cash: contains the value of cash deposited
price: contains the price of the selected gas
L: contains the number of liters already pumped w: cash flag (cash: w=0; otherwise: w=1)
cash, L, price, w are in the data store
m: is a pointer to the MDA-EFSM object
d: is a pointer to the Data Store object

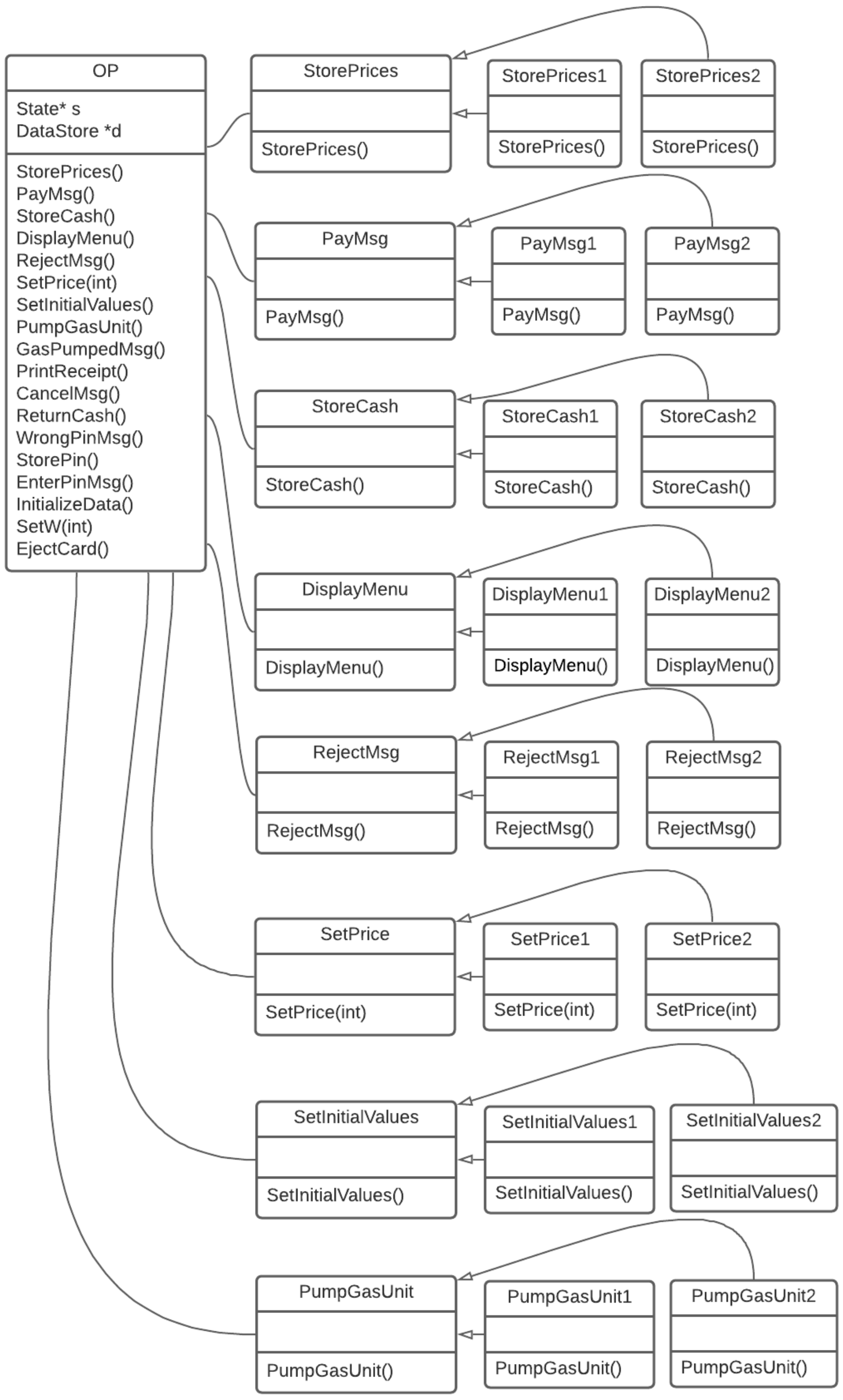
2. Class Diagrams

2.1. State pattern

It follows a centralized version.

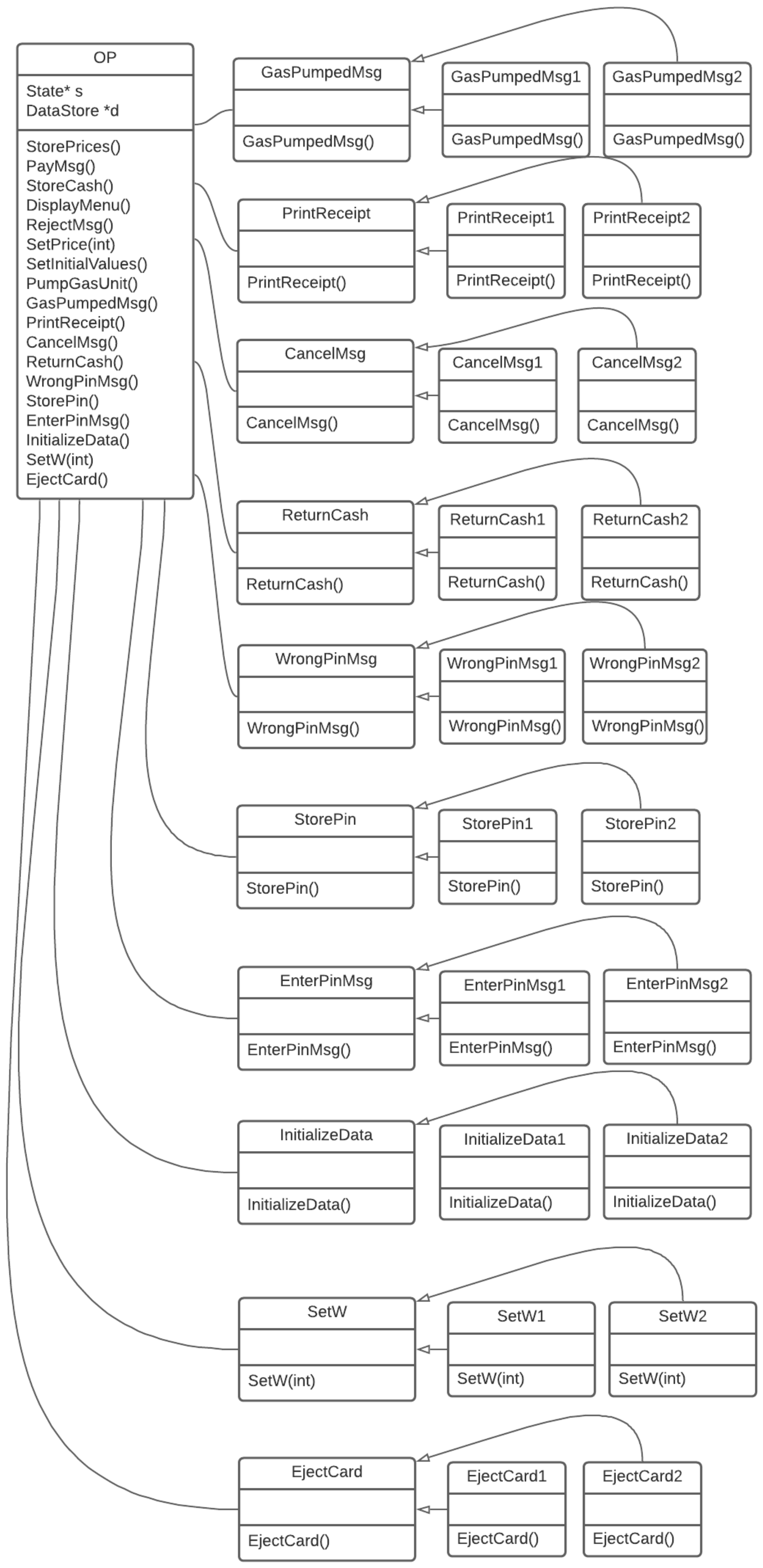


2.2. Strategy pattern

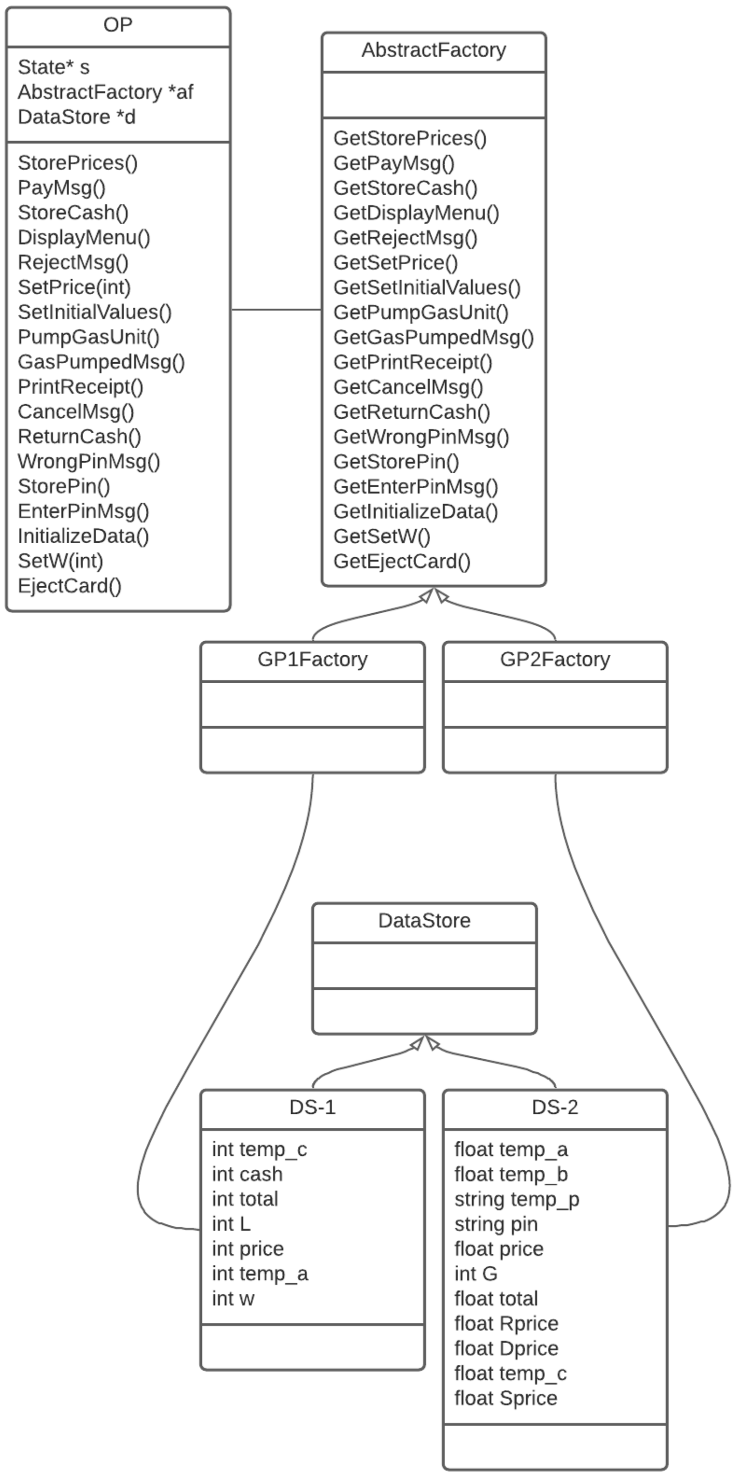


(continued)

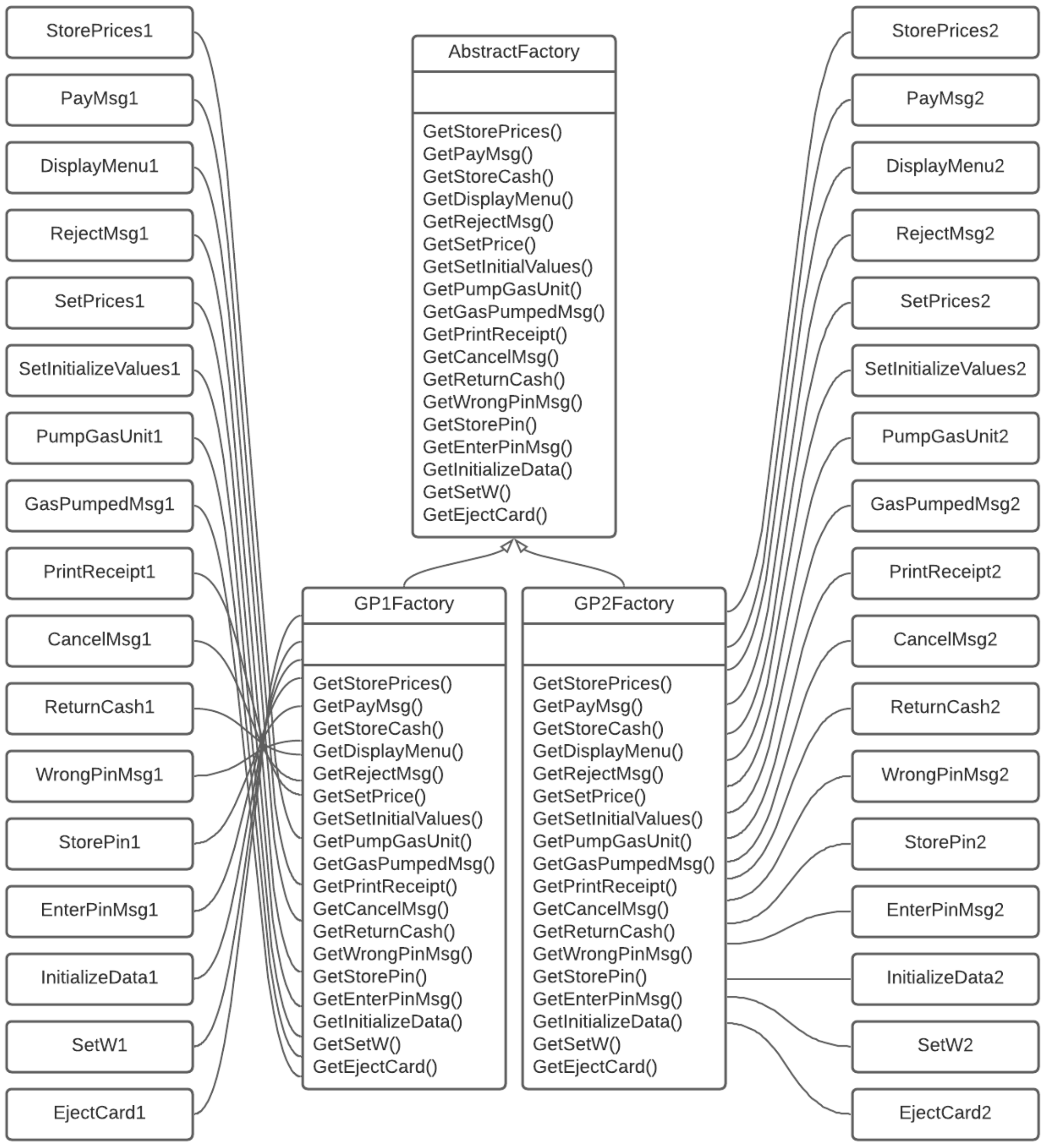
Gas Pump Design (CS586 Final Project)



2.3. Abstract factory pattern



(connections to strategy methods are shown on the next page)


StorePrices1
PayMsg1
DisplayMenu1
RejectMsg1
SetPrices1
SetInitializeValues1
PumpGasUnit1
GasPumpedMsg1
PrintReceipt1
CancelMsg1
ReturnCash1
WrongPinMsg1
StorePin1
EnterPinMsg1
InitializeData1
SetW1
EjectCard1
AbstractFactory
GetStorePrices()
GetPayMsg()
GetStoreCash()
GetDisplayMenu()
GetRejectMsg()
GetSetPrice()
GetSetInitialValues()
GetPumpGasUnit()
GetGasPumpedMsg()
GetPrintReceipt()
GetCancelMsg()
GetReturnCash()
GetWrongPinMsg()
GetStorePin()
GetEnterPinMsg()
GetInitializeData()
GetSetW()
GetEjectCard()
GP1Factory
GP2Factory
StorePrices2
PayMsg2
DisplayMenu2
RejectMsg2
SetPrices2
SetInitializeValues2
PumpGasUnit2
GasPumpedMsg2
PrintReceipt2
CancelMsg2
ReturnCash2
WrongPinMsg2
StorePin2
EnterPinMsg2
InitializeData2
SetW2
EjectCard2

3. Class Specifications

3.1. Class Responsibilities

Class	**Responsibility**
GP-1	Input processor (Gas Pump 1)
GP-2	Input processor (Gas Pump 2)
MDA-EFSM	It accepts meta-events (to be implemented by different states). It serves as the context class.
State	It has all the abstract methods for meta-events.
Start	Initial state (LS[0])
S0	Classes (or states) that implement all the abstract methods from *State* class. (S0 → LS[1], S1 → LS[2], S2 → LS[3], S3 → LS[4], S5 → LS[5], S8 → LS[6])
S1	
S2	
S3	
S5	
S8	
OP	Output processor. It executes actions invoked by MDA-EFSM. It gets the object from concrete factories (GP1Factory and GP2Factory) and executes the invoked method.
StorePrices	It is the "interface" or abstract strategy class for method StorePrices.
StorePrices1	It is the strategy class for GP1 (Gas Pump 1).
StorePrices2	It is the strategy class for GP2 (Gas Pump 2).
PayMsg	It is the "interface" or abstract strategy class for method PayMsg.
PayMsg1	It is the strategy class for GP1 (Gas Pump 1).
PayMsg2	It is the strategy class for GP2 (Gas Pump 2).
StoreCash	It is the "interface" or abstract strategy class for method StoreCash.
StoreCash1	It is the strategy class for GP1 (Gas Pump 1).
StoreCash2	It is the strategy class for GP2 (Gas Pump 2).
DisplayMenu	It is the "interface" or abstract strategy class for method DisplayMenu.
DisplayMenu1	It is the strategy class for GP1 (Gas Pump 1).
DisplayMenu2	It is the strategy class for GP2 (Gas Pump 2).
SetPrice	It is the "interface" or abstract strategy class for method SetPrice.
SetPrice1	It is the strategy class for GP1 (Gas Pump 1).
SetPrice2	It is the strategy class for GP2 (Gas Pump 2).
RejectMsg	It is the "interface" or abstract strategy class for method RejectMsg.
RejectMsg1	It is the strategy class for GP1 (Gas Pump 1).
RejectMsg2	It is the strategy class for GP2 (Gas Pump 2).
SetInitialValues	It is the "interface" or abstract strategy class for method SetInitialValues.
SetInitialValues1	It is the strategy class for GP1 (Gas Pump 1).
SetInitialValues2	It is the strategy class for GP2 (Gas Pump 2).

PumpGasUnit	It is the "interface" or abstract strategy class for method PumpGasUnit.
PumpGasUnit1	It is the strategy class for GP1 (Gas Pump 1).
PumpGasUnit2	It is the strategy class for GP2 (Gas Pump 2).
GasPumpedMsg	It is the "interface" or abstract strategy class for method GasPumpedMsg.
GasPumpedMsg1	It is the strategy class for GP1 (Gas Pump 1).
GasPumpedMsg2	It is the strategy class for GP2 (Gas Pump 2).
PrintReceipt	It is the "interface" or abstract strategy class for method PrintReceipt.
PrintReceipt1	It is the strategy class for GP1 (Gas Pump 1).
PrintReceipt2	It is the strategy class for GP2 (Gas Pump 2).
CancelMsg	It is the "interface" or abstract strategy class for method CancelMsg.
CancelMsg1	It is the strategy class for GP1 (Gas Pump 1).
CancelMsg2	It is the strategy class for GP2 (Gas Pump 2).
ReturnCash	It is the "interface" or abstract strategy class for method ReturnCash.
ReturnCash1	It is the strategy class for GP1 (Gas Pump 1).
ReturnCash2	It is the strategy class for GP2 (Gas Pump 2).
WrongPinMsg	It is the "interface" or abstract strategy class for method WrongPinMsg.
WrongPinMsg1	It is the strategy class for GP1 (Gas Pump 1).
WrongPinMsg2	It is the strategy class for GP2 (Gas Pump 2).
StorePin	It is the "interface" or abstract strategy class for method StorePin.
StorePin1	It is the strategy class for GP1 (Gas Pump 1).
StorePin2	It is the strategy class for GP2 (Gas Pump 2).
EnterPinMsg	It is the "interface" or abstract strategy class for method EnterPinMsg.
EnterPinMsg1	It is the strategy class for GP1 (Gas Pump 1).
EnterPinMsg2	It is the strategy class for GP2 (Gas Pump 2).
InitializeData	It is the "interface" or abstract strategy class for method InitializeData.
InitializeData1	It is the strategy class for GP1 (Gas Pump 1).
InitializeData2	It is the strategy class for GP2 (Gas Pump 2).
SetW	It is the "interface" or abstract strategy class for method SetW.
SetW1	It is the strategy class for GP1 (Gas Pump 1).
SetW2	It is the strategy class for GP2 (Gas Pump 2).
EjectCard	It is the "interface" or abstract strategy class for method EjectCard.
EjectCard1	It is the strategy class for GP1 (Gas Pump 1).
EjectCard2	It is the strategy class for GP2 (Gas Pump 2).
AbstractFactory	It is the abstract factory class for OP.
GP1Factory	It is the concrete factory class for GP1 (Gas Pump 1).
GP2Factory	It is the concrete factory class for GP2 (Gas Pump 2).
DataStore	It holds the abstract DataStore class.
DS-1	It holds the concrete data for GP1 (Gas Pump 1).
DS-2	It holds the concrete data for GP2 (Gas Pump 2).

3.2. Class Operation Responsibilities

Class GP1:
This class has the input processor operations.

```
Activate(int a) {
    if(a>0) {
        d->temp_a = a;
        m->Activate();
    }
}

Start {
    m->Start();
}

PayCash(int c) {
    if(c>0) {
        d->temp_c = c;
        m->PayCash();
    }
}

PayCredit() {
    m->PayCredit();
}

Reject() {
    m->Reject();
}

Approved() {
    m->Approved();
}

Cancel() {
    m->Cancel();
}

StartPump() {
    m->StartPump();
}
```

```
PumpLiter() {
        if (d->w == 1)  m ->Pump()
        else if (d->cash>0) && (d->cash < d->price*(d->L+1))
                m->StopPump();
        else
                m->Pump();
}

StopPump() {
        m->StopPump();
}
```

Class GP2:
It has all the methods for input processor GP2.

```
Activate(float a, float b, float ) {
        if((a>0) && (b>0) && (c>0)) {
                d->temp_a = a;
                d->temp_b = b;
                d->temp_c = c;
                m->Activate()
        }
}

Start() {
        m->Start();
}

PayCredit() {
        m->PayCredit();
}

Reject() {
        m->Reject();
}

PayDebit(string p) {
        d->temp_p=p;
        m->PayDebit();
}
```

```
Pin(string x) {
        if (d->pin==x) m->CorrectPin()
        else m->InCorrectPin(1);
}

Cancel() {
        m->Cancel();
}

Approved() {
        m->Approved();
}


Diesel() {
        m->SelectGas(3)
}

Regular() {
        m->SelectGas(1)
}

Super() {
        m->SelectGas(2)
}

StartPump() {
        if (d->price>0) m->StartPump();
}

PumpGallon() {
        m->Pump();
}

StopPump() {
        m->StopPump();
}

FullTank() {
        m->StopPump();
}
```

Class MDA-EFSM: → Context class

```
public MDA_EFSM(OP p) {
                // initlalize all the states
                LS = new State[7];
                LS[0] = new Start(this, p);
                LS[1] = new S0(this, p);
                LS[2] = new S1(this, p);
                LS[3] = new S2(this, p);
                LS[4] = new S3(this, p);
                LS[5] = new S5(this, p);
                LS[6] = new S8(this, p);
                s = LS[0];       // starting point
                k = 0;           // pin attempt count
        }

        // meta-events to be implement by states
        public void Activate()           { s.Activate(); }
        public void Start()      { s.Start(); }
        public void Reject()     { s.Reject(); }
        public void Cancel()     { s.Cancel(); }
        public void Approved()           { s.Approved(); }
        public void StartPump() { s.StartPump(); }
        public void Pump()               { s.Pump(); }
        public void StopPump()           { s.StopPump(); }
        public void SelectGas(int g) { s.SelectGas(g); }
        public void CorrectPin() { s.CorrectPin(); }
        public void IncorrectPin(int max) { s.IncorrectPin(max); }
        public void PayCash()            { s.PayCash(); }
        public void PayCredit() { s.PayCredit(); }
        public void PayDebit()           { s.PayDebit(); }
}
```

Class State:
All abstract methods to be implemented by concrete states.

Class Start:

```
Activate() {
        if (m.s == m.LS[0]) {
                p.StorePrices();
                m.s = m.LS[1];
        }
}
```

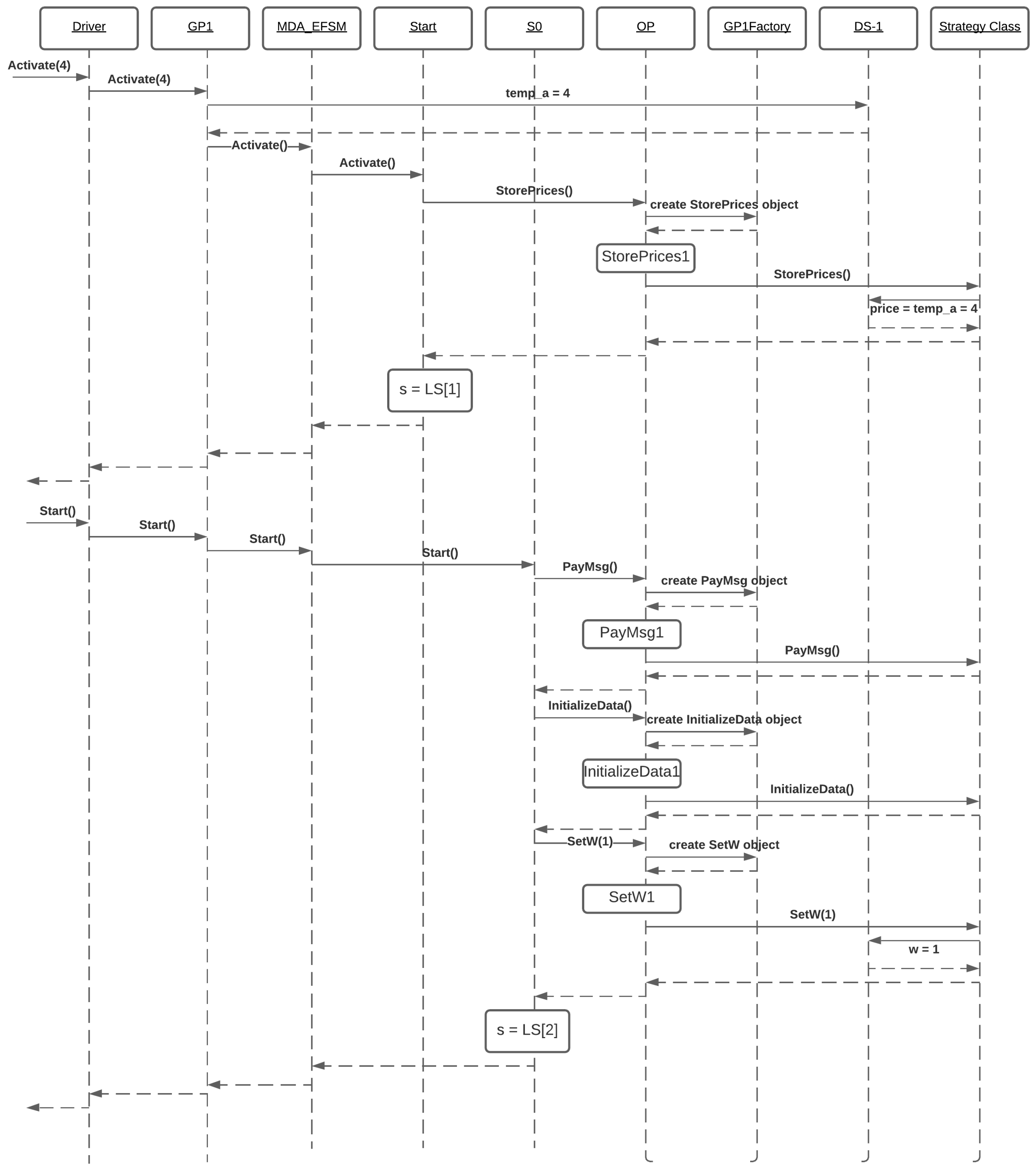
Class S0:

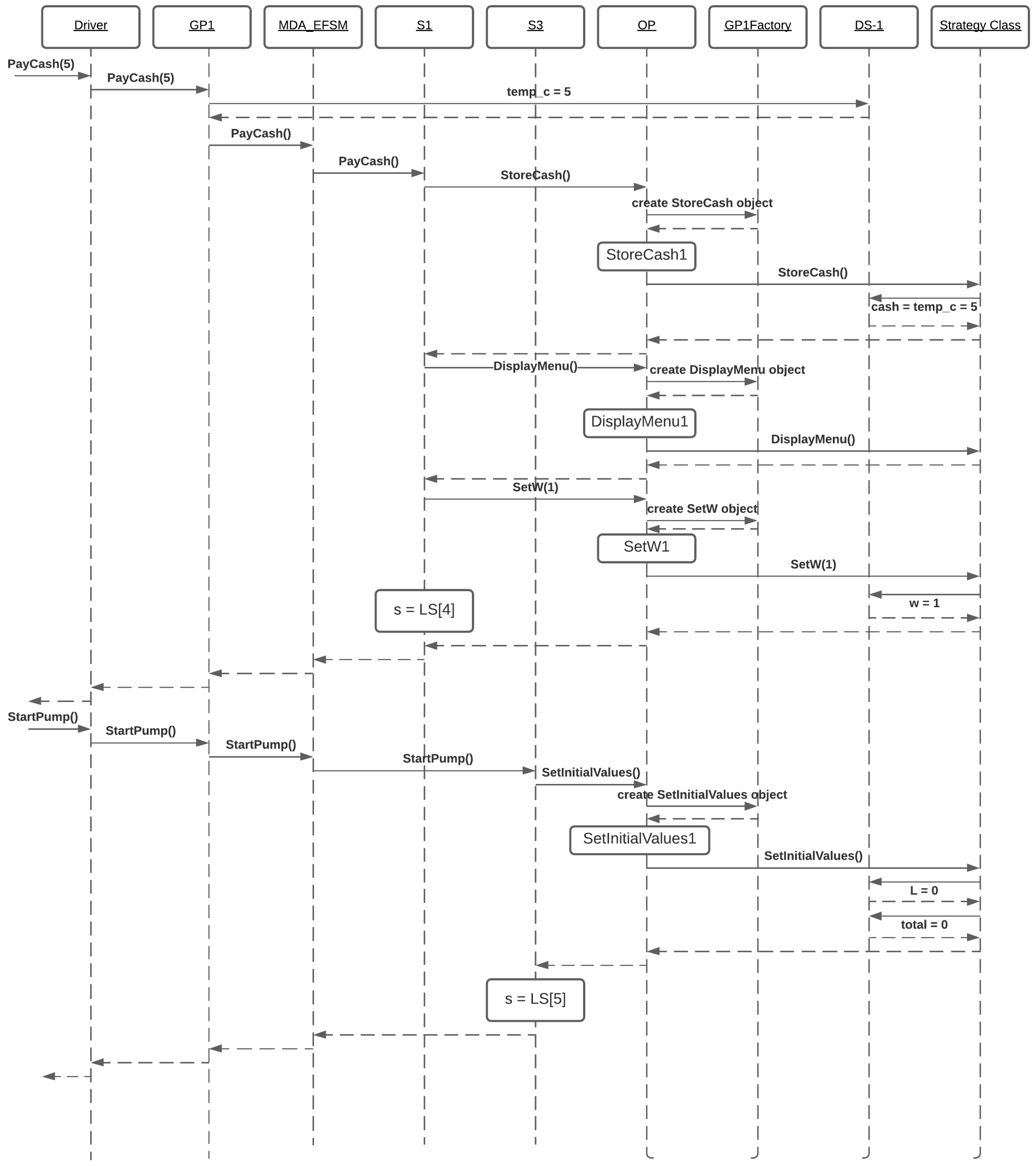
```
Start() {
		if (m.s == m.LS[1]) {
			p.PayMsg();
			p.InitializeData();
			p.SetW(1);
			m.s = m.LS[2];
			System.out.println("Current State: S1");
		}
	}
}
```

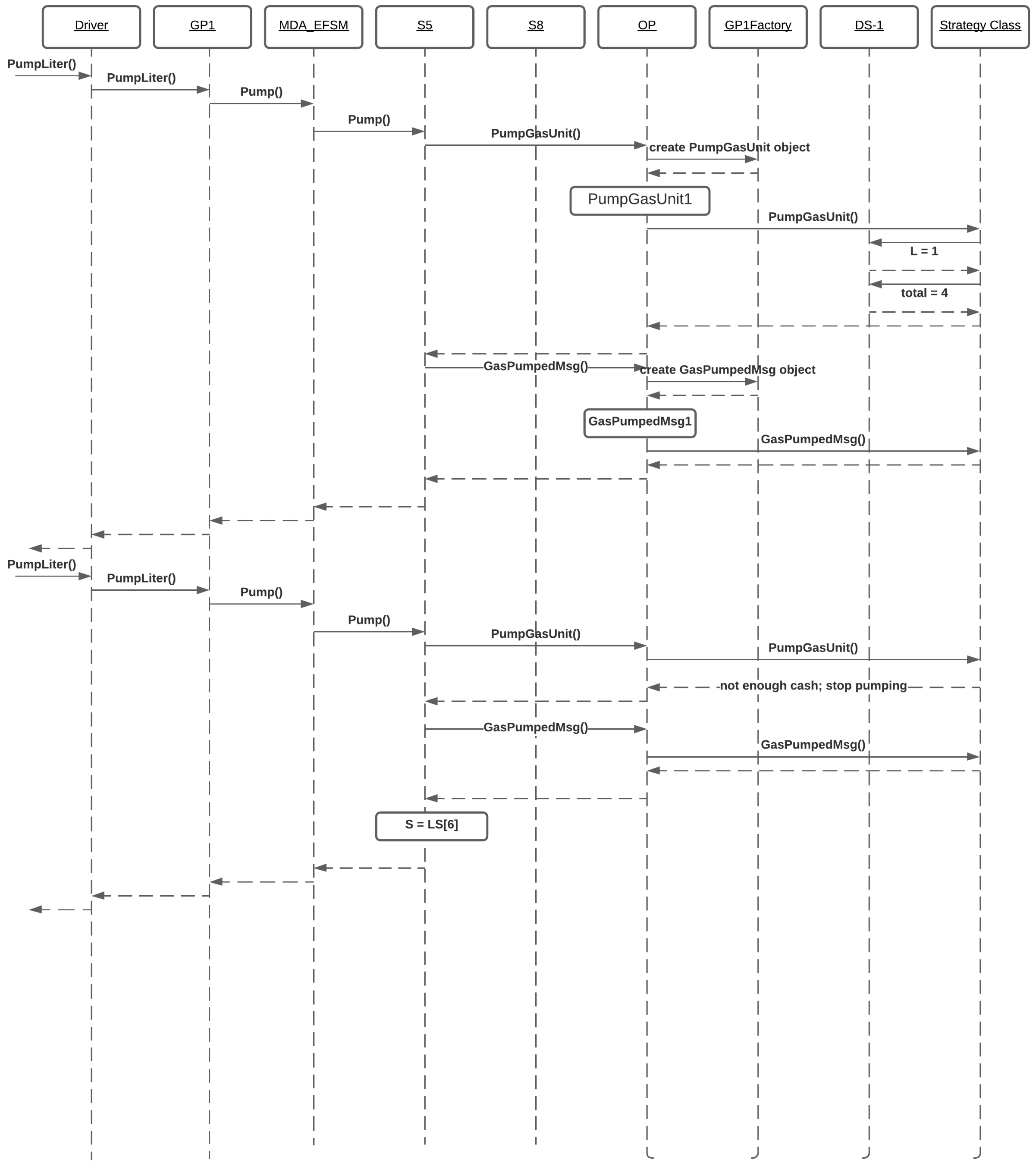
4. Dynamics

4.1. Scenario I (GP1)

Activate(4), Start(), PayCash(5), StartPump(), PumpLiter(), PumpLiter()

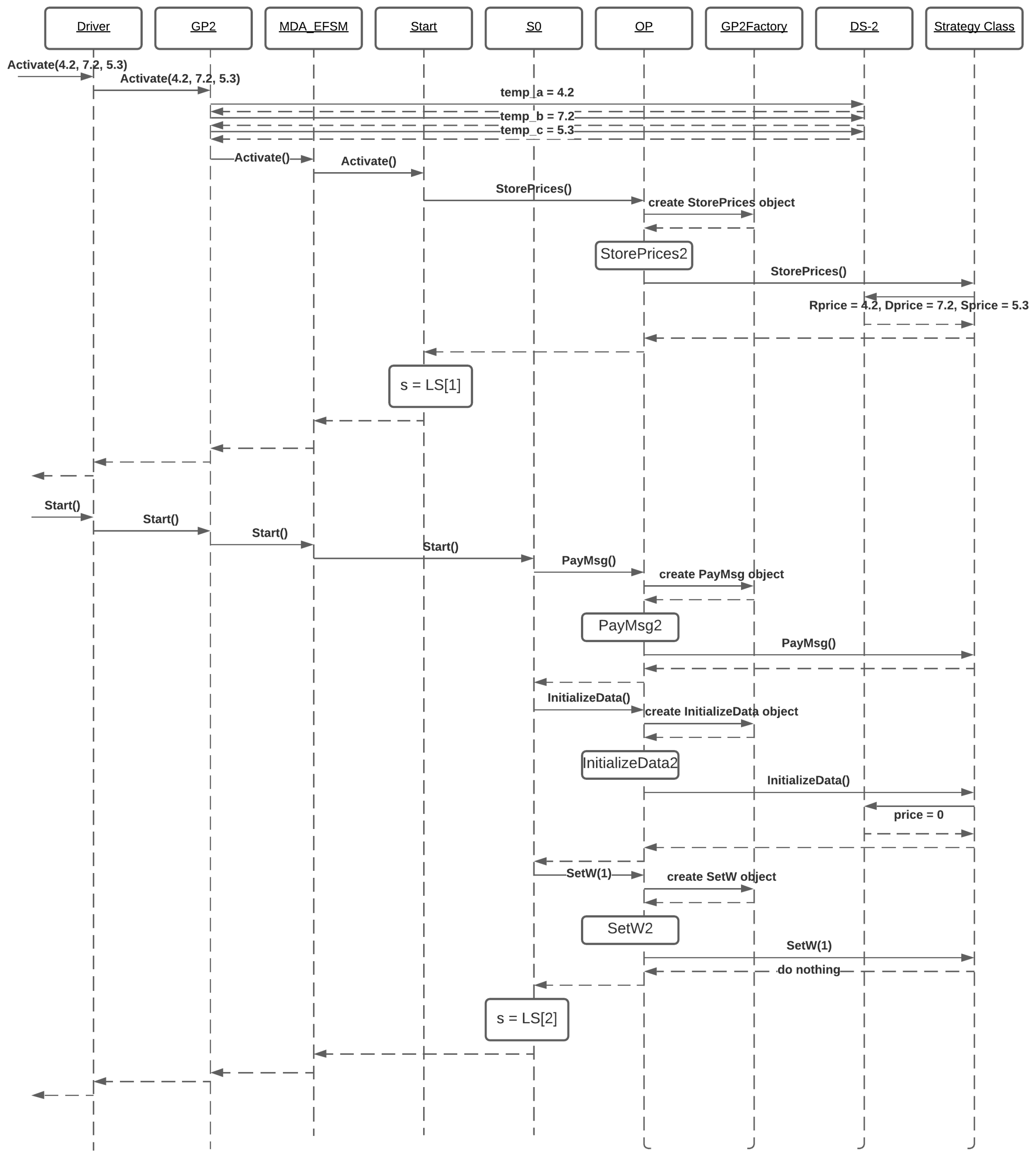



Driver
GP1
MDA_EFSM
S1
S3
OP
GP1Factory
DS-1
Strategy Class
PayCash(5)
PayCash(5)
temp_c = 5
PayCash()
PayCash()
StoreCash()
create StoreCash object
StoreCash1
StoreCash()
cash = temp_c = 5
DisplayMenu()
create DisplayMenu object
DisplayMenu1
DisplayMenu()
SetW(1)
create SetW object
SetW1
SetW(1)
w = 1
s = LS[4]
StartPump()
StartPump()
StartPump()
StartPump()
SetInitialValues()
create SetInitialValues object
SetInitialValues1
SetInitialValues()
L = 0
total = 0
s = LS[5]

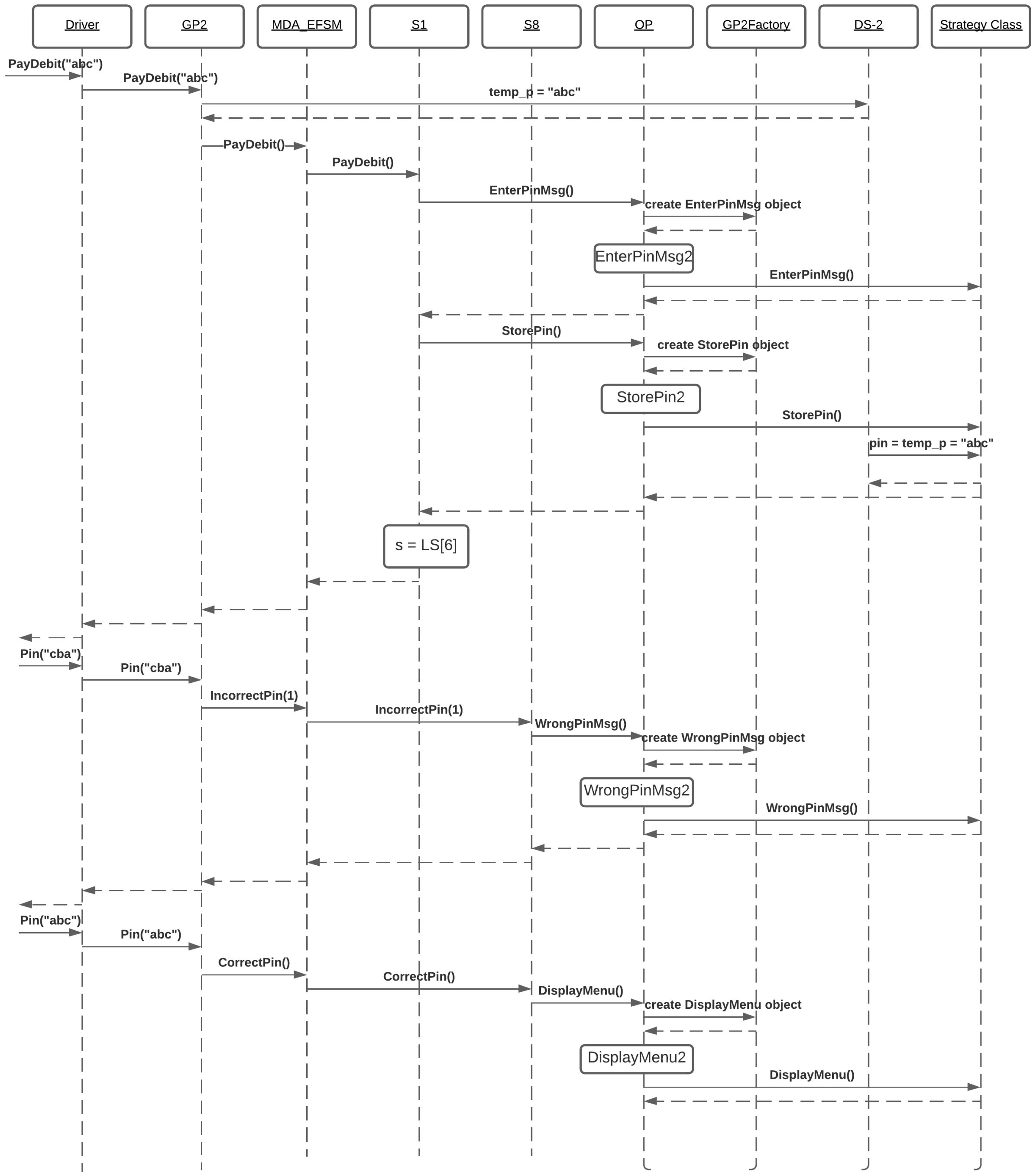

Driver
GP1
MDA_EFSM
S5
S8
OP
GP1Factory
DS-1
Strategy Class
PumpLiter()
PumpLiter()
Pump()
Pump()
PumpGasUnit()
create PumpGasUnit object
PumpGasUnit1
PumpGasUnit()
L = 1
total = 4
GasPumpedMsg()
create GasPumpedMsg object
GasPumpedMsg1
GasPumpedMsg()
PumpLiter()
PumpLiter()
Pump()
Pump()
PumpGasUnit()
PumpGasUnit()
not enough cash; stop pumping
GasPumpedMsg()
GasPumpedMsg()
S = LS[6]

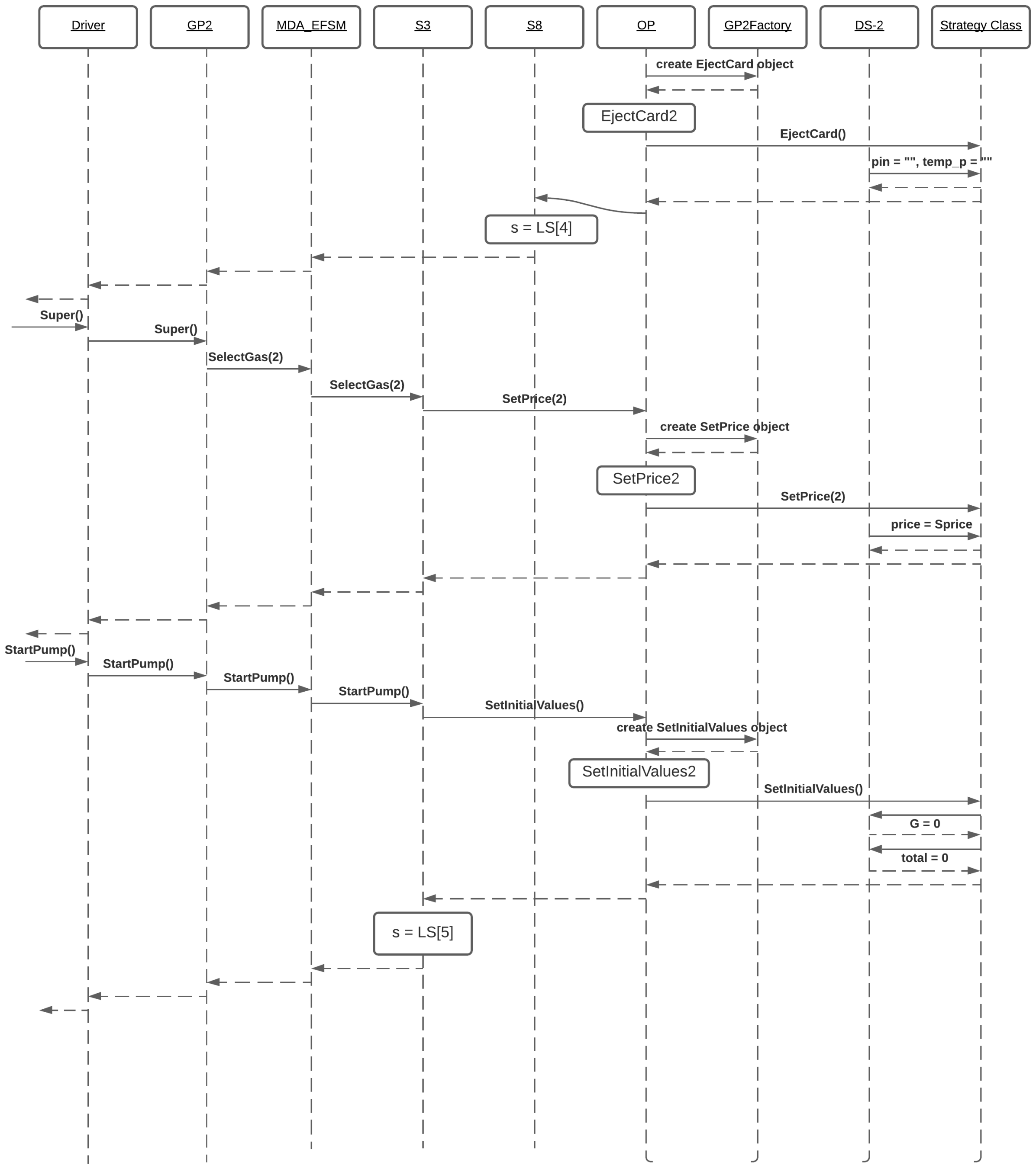
4.2. Scenario II

Activate(4.2, 7.2, 5.3), Start(), PayDebit(“abc”), Pin(“cba”), Pin(“abc”), Super(), StartPump(), PumpGallon(), FullTank()

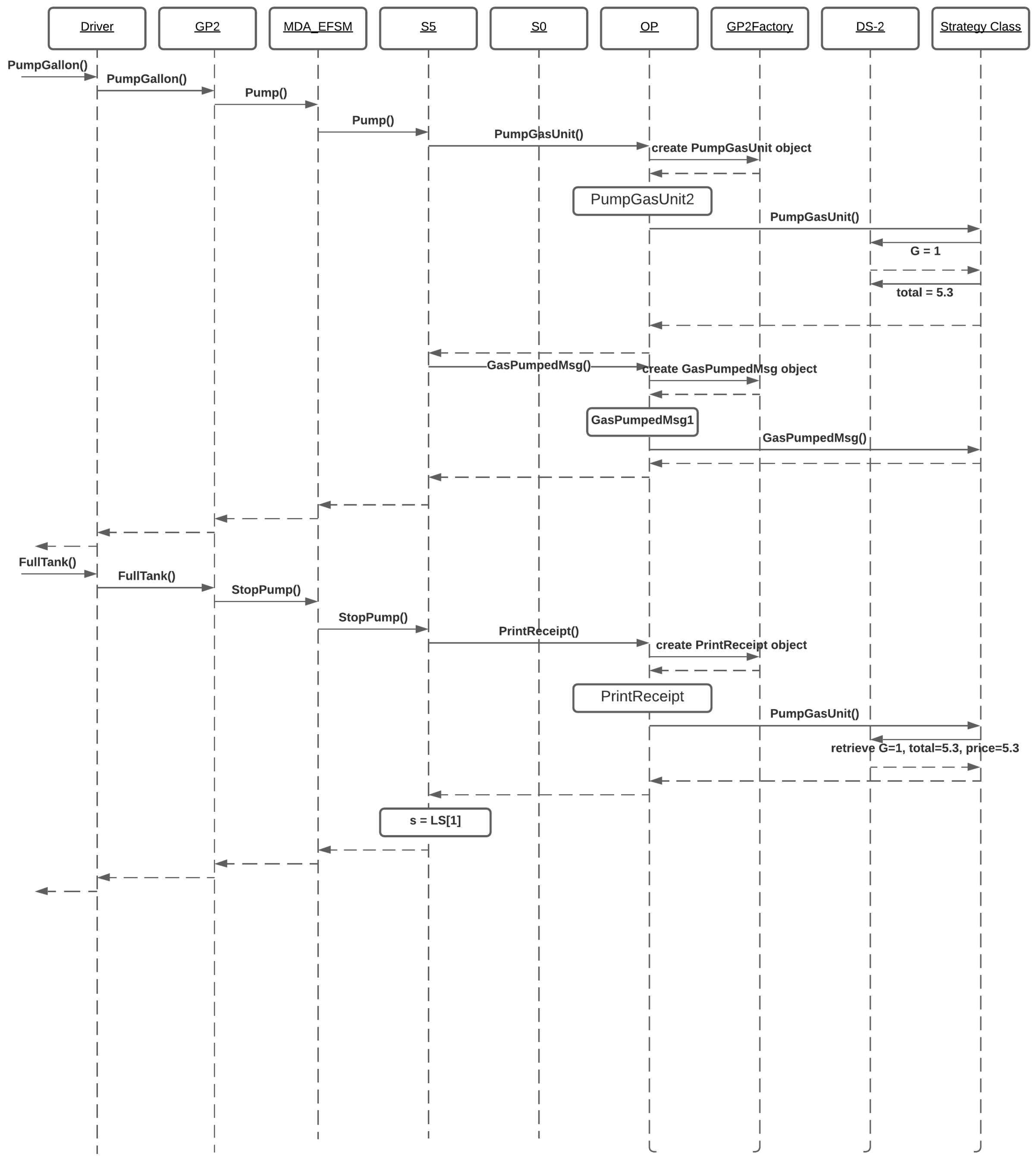


Gas Pump Design (CS586 Final Project)




Driver
GP2
MDA_EFSM
S3
S8
OP
GP2Factory
DS-2
Strategy Class
create EjectCard object
EjectCard2
EjectCard()
pin = "", temp_p = ""
s = LS[4]
Super()
Super()
SelectGas(2)
SelectGas(2)
SetPrice(2)
create SetPrice object
SetPrice2
SetPrice(2)
price = Sprice
StartPump()
StartPump()
StartPump()
StartPump()
SetInitialValues()
create SetInitialValues object
SetInitialValues2
SetInitialValues()
G = 0
total = 0
s = LS[5]

Gas Pump Design (CS586 Final Project)


Driver
GP2
MDA_EFSM
S5
S0
OP
GP2Factory
DS-2
Strategy Class
PumpGallon()
PumpGallon()
Pump()
Pump()
PumpGasUnit()
create PumpGasUnit object
PumpGasUnit2
PumpGasUnit()
G = 1
total = 5.3
GasPumpedMsg()
create GasPumpedMsg object
GasPumpedMsg1
GasPumpedMsg()
FullTank()
FullTank()
StopPump()
StopPump()
PrintReceipt()
create PrintReceipt object
PrintReceipt
PumpGasUnit()
retrieve G=1, total=5.3, price=5.3
s = LS[1]