

CECS 475

Lab Assignment 1

Due date: Monday, February 13

40 points

In this lab assignment, you create an application that models the ups and downs of a particular stock. The value of a stock is assumed to change by plus or minus a specified number of units after every time unit (such as one hour). A notification is generated each time a stock changes more than a specified number of units above or below its initial value. A collection of brokers who control the stock must receive this notification. The range within which the stock can change every time unit and the threshold above or below which collection of brokers who control the stock must be notified are specified when the stock is created (using its constructor).

You shall design and implement a C# application that satisfies the specification given above. This application involves .NET EventHandler events, threads, and text file processing.

When an event of this type is fired, the stock's name, initial values, current values, and the number of changes in value can be sent to the listener . The sending information is sent to the console window and a text file. You are required to use built-in .NET EventHandler delegate in your solution.

Create the class Stock with the following attributes:

- Stock name
- Stock initial value
- Maximum change (the range within a stock can change every time unit)
- Notification threshold (the threshold above or below which the collection of brokers who control the stock must be notified)

You are required to implement other members in the class Stock that are needed. When a stock object is created, a thread is started. This thread causes the stock's value to be modified every 500 milliseconds. If its value changes from its initial value by more than the specified notification threshold, an event method is invoked. This invokes the stock Event and multicasts a notification to all listeners who have registered with stock Event.

Create the class StockBroker which has fields broker name and stocks, a List of Stock. This latter field is not used in this application but could be used to obtain the stocks currently controlled by a given broker. The addStock method registers the Notify listener with the stock (in addition to adding it to the list of stocks held by the broker). This Notify method outputs to the console the name, value, and the number of changes of the stock whose value is out of the range given the stock's notification threshold.

The listing below presents a main driver class, StockApplication.

```
static void Main(string[] args)
{
    Stock stock1 = new Stock("Technology",160, 5, 15);
    Stock stock2 = new Stock("Retail",30, 2, 6);
    Stock stock3 = new Stock("Banking", 90, 4, 10);
    Stock stock4 = new Stock("Commodity", 500, 20, 50);

    StockBroker b1 = new StockBroker("Broker 1");
    b1.AddStock(stock1);
    b1.AddStock(stock2);

    StockBroker b2 = new StockBroker("Broker 2");
    b2.AddStock(stock1);
    b2.AddStock(stock3);
    b2.AddStock(stock4);

    StockBroker b3 = new StockBroker("Broker 3");
    b3.AddStock(stock1);
    b3.AddStock(stock3);

    StockBroker b4 = new StockBroker("Broker 4");
    b4.AddStock(stock1);
    b4.AddStock(stock2);
    b4.AddStock(stock3);
    b4.AddStock(stock4);
}
```

The output sample (All the column must be left alignment):

Broker	Stock	Value	Changes	Date and Time
Broker 2	Banking	102	5	2/2/2022 1:23:25 PM
Broker 3	Banking	102	5	2/2/2022 1:23:25 PM
Broker 4	Banking	102	5	2/2/2022 1:23:25 PM
Broker 2	Commodity	559	5	2/2/2022 1:23:25 PM
Broker 4	Commodity	559	5	2/2/2022 1:23:25 PM
Broker 1	Technology	176	6	2/2/2022 1:23:25 PM
Broker 2	Technology	176	6	2/2/2022 1:23:25 PM
Broker 3	Technology	176	6	2/2/2022 1:23:25 PM
Broker 4	Technology	176	6	2/2/2022 1:23:25 PM
Broker 2	Commodity	562	6	2/2/2022 1:23:25 PM
Broker 4	Commodity	562	6	2/2/2022 1:23:25 PM
Broker 2	Banking	104	6	2/2/2022 1:23:25 PM
Broker 3	Banking	104	6	2/2/2022 1:23:25 PM
Broker 4	Banking	104	6	2/2/2022 1:23:25 PM

Broker 1	Retail	37	7	2/2/2022 1:23:26 PM
Broker 4	Retail	37	7	2/2/2022 1:23:26 PM
Broker 1	Technology	179	7	2/2/2022 1:23:26 PM
Broker 2	Technology	179	7	2/2/2022 1:23:26 PM
Broker 3	Technology	179	7	2/2/2022 1:23:26 PM
Broker 4	Technology	179	7	2/2/2022 1:23:26 PM
Broker 2	Commodity	569	7	2/2/2022 1:23:26 PM
Broker 4	Commodity	569	7	2/2/2022 1:23:26 PM
Broker 2	Banking	105	7	2/2/2022 1:23:26 PM
Broker 3	Banking	105	7	2/2/2022 1:23:26 PM
Broker 4	Banking	105	7	2/2/2022 1:23:26 PM
Broker 1	Retail	38	8	2/2/2022 1:23:26 PM
Broker 4	Retail	38	8	2/2/2022 1:23:26 PM
Broker 1	Technology	182	8	2/2/2022 1:23:26 PM
Broker 2	Technology	182	8	2/2/2022 1:23:26 PM
Broker 3	Technology	182	8	2/2/2022 1:23:26 PM
Broker 4	Technology	182	8	2/2/2022 1:23:26 PM
Broker 2	Commodity	571	8	2/2/2022 1:23:26 PM
Broker 4	Commodity	571	8	2/2/2022 1:23:26 PM
Broker 2	Banking	107	8	2/2/2022 1:23:26 PM
Broker 3	Banking	107	8	2/2/2022 1:23:26 PM
Broker 4	Banking	107	8	2/2/2022 1:23:26 PM
Broker 1	Retail	39	9	2/2/2022 1:23:27 PM
Broker 4	Retail	39	9	2/2/2022 1:23:27 PM
Broker 1	Technology	185	9	2/2/2022 1:23:27 PM
Broker 2	Technology	185	9	2/2/2022 1:23:27 PM
Broker 3	Technology	185	9	2/2/2022 1:23:27 PM
Broker 4	Technology	185	9	2/2/2022 1:23:27 PM
Broker 2	Commodity	573	9	2/2/2022 1:23:27 PM
Broker 4	Commodity	573	9	2/2/2022 1:23:27 PM
Broker 2	Banking	109	9	2/2/2022 1:23:27 PM
Broker 3	Banking	109	9	2/2/2022 1:23:27 PM
Broker 4	Banking	109	9	2/2/2022 1:23:27 PM
Broker 1	Retail	40	10	2/2/2022 1:23:27 PM
Broker 4	Retail	40	10	2/2/2022 1:23:27 PM
Broker 1	Technology	188	10	2/2/2022 1:23:27 PM
Broker 2	Technology	188	10	2/2/2022 1:23:27 PM
Broker 3	Technology	188	10	2/2/2022 1:23:27 PM
Broker 4	Technology	188	10	2/2/2022 1:23:27 PM
Broker 2	Commodity	581	10	2/2/2022 1:23:27 PM
Broker 4	Commodity	581	10	2/2/2022 1:23:27 PM
Broker 2	Banking	111	10	2/2/2022 1:23:27 PM
Broker 3	Banking	111	10	2/2/2022 1:23:27 PM
Broker 4	Banking	111	10	2/2/2022 1:23:27 PM
Broker 1	Retail	41	11	2/2/2022 1:23:28 PM
Broker 4	Retail	41	11	2/2/2022 1:23:28 PM

Broker 2	Commodity	587	11	2/2/2022 1:23:28 PM
Broker 4	Commodity	587	11	2/2/2022 1:23:28 PM
Broker 1	Technology	189	11	2/2/2022 1:23:28 PM
Broker 2	Technology	189	11	2/2/2022 1:23:28 PM
Broker 3	Technology	189	11	2/2/2022 1:23:28 PM
Broker 4	Technology	189	11	2/2/2022 1:23:28 PM
Broker 2	Banking	114	11	2/2/2022 1:23:28 PM
Broker 3	Banking	114	11	2/2/2022 1:23:28 PM
Broker 4	Banking	114	11	2/2/2022 1:23:28 PM
Broker 1	Retail	42	12	2/2/2022 1:23:28 PM
Broker 4	Retail	42	12	2/2/2022 1:23:28 PM
Broker 2	Commodity	597	12	2/2/2022 1:23:28 PM
Broker 4	Commodity	597	12	2/2/2022 1:23:28 PM
Broker 1	Technology	192	12	2/2/2022 1:23:28 PM
Broker 2	Technology	192	12	2/2/2022 1:23:28 PM
Broker 3	Technology	192	12	2/2/2022 1:23:28 PM
Broker 4	Technology	192	12	2/2/2022 1:23:28 PM
Broker 2	Banking	116	12	2/2/2022 1:23:28 PM
Broker 3	Banking	116	12	2/2/2022 1:23:28 PM
Broker 4	Banking	116	12	2/2/2022 1:23:28 PM
Broker 1	Retail	43	13	2/2/2022 1:23:29 PM
Broker 4	Retail	43	13	2/2/2022 1:23:29 PM
Broker 2	Commodity	609	13	2/2/2022 1:23:29 PM
Broker 4	Commodity	609	13	2/2/2022 1:23:29 PM
Broker 1	Technology	196	13	2/2/2022 1:23:29 PM
Broker 2	Technology	196	13	2/2/2022 1:23:29 PM
Broker 3	Technology	196	13	2/2/2022 1:23:29 PM
Broker 4	Technology	196	13	2/2/2022 1:23:29 PM
Broker 2	Banking	117	13	2/2/2022 1:23:29 PM
Broker 3	Banking	117	13	2/2/2022 1:23:29 PM
Broker 4	Banking	117	13	2/2/2022 1:23:29 PM
Broker 1	Retail	44	14	2/2/2022 1:23:29 PM
Broker 4	Retail	44	14	2/2/2022 1:23:30 PM
Broker 1	Technology	200	14	2/2/2022 1:23:30 PM
Broker 2	Technology	200	14	2/2/2022 1:23:30 PM
Broker 3	Technology	200	14	2/2/2022 1:23:30 PM
Broker 4	Technology	200	14	2/2/2022 1:23:30 PM
Broker 2	Commodity	626	14	2/2/2022 1:23:30 PM
Broker 4	Commodity	626	14	2/2/2022 1:23:30 PM
Broker 2	Banking	120	14	2/2/2022 1:23:30 PM
Broker 3	Banking	120	14	2/2/2022 1:23:30 PM
Broker 4	Banking	120	14	2/2/2022 1:23:30 PM
Broker 1	Retail	45	15	2/2/2022 1:23:31 PM
Broker 4	Retail	45	15	2/2/2022 1:23:31 PM
Broker 2	Commodity	639	15	2/2/2022 1:23:31 PM
Broker 4	Commodity	639	15	2/2/2022 1:23:31 PM

Broker 1	Technology	203	15	2/2/2022 1:23:31 PM
Broker 2	Technology	203	15	2/2/2022 1:23:31 PM
Broker 3	Technology	203	15	2/2/2022 1:23:31 PM
Broker 4	Technology	203	15	2/2/2022 1:23:31 PM
Broker 2	Banking	122	15	2/2/2022 1:23:31 PM
Broker 3	Banking	122	15	2/2/2022 1:23:31 PM
Broker 4	Banking	122	15	2/2/2022 1:23:31 PM
Broker 1	Retail	46	16	2/2/2022 1:23:31 PM
Broker 4	Retail	46	16	2/2/2022 1:23:31 PM
Broker 2	Commodity	651	16	2/2/2022 1:23:31 PM
Broker 4	Commodity	651	16	2/2/2022 1:23:31 PM
Broker 1	Technology	206	16	2/2/2022 1:23:31 PM
Broker 2	Technology	206	16	2/2/2022 1:23:31 PM
Broker 3	Technology	206	16	2/2/2022 1:23:31 PM
Broker 4	Technology	206	16	2/2/2022 1:23:31 PM
Broker 2	Banking	123	16	2/2/2022 1:23:31 PM
Broker 3	Banking	123	16	2/2/2022 1:23:31 PM
Broker 4	Banking	123	16	2/2/2022 1:23:31 PM
Broker 2	Commodity	663	17	2/2/2022 1:23:32 PM
Broker 4	Commodity	663	17	2/2/2022 1:23:40 PM
Broker 1	Technology	210	17	2/2/2022 1:23:40 PM
Broker 2	Technology	210	17	2/2/2022 1:23:40 PM
Broker 3	Technology	210	17	2/2/2022 1:23:40 PM
Broker 4	Technology	210	17	2/2/2022 1:23:40 PM
Broker 1	Retail	47	17	2/2/2022 1:23:40 PM
Broker 4	Retail	47	17	2/2/2022 1:23:40 PM
Broker 2	Banking	124	17	2/2/2022 1:23:40 PM
Broker 3	Banking	124	17	2/2/2022 1:23:40 PM
Broker 4	Banking	124	17	2/2/2022 1:23:40 PM
Broker 1	Technology	213	18	2/2/2022 1:23:40 PM
Broker 2	Technology	213	18	2/2/2022 1:23:40 PM
Broker 3	Technology	213	18	2/2/2022 1:23:40 PM
Broker 4	Technology	213	18	2/2/2022 1:23:40 PM
Broker 1	Retail	48	18	2/2/2022 1:23:40 PM
Broker 4	Retail	48	18	2/2/2022 1:23:40 PM
Broker 2	Banking	125	18	2/2/2022 1:23:40 PM
Broker 3	Banking	125	18	2/2/2022 1:23:40 PM
Broker 4	Banking	125	18	2/2/2022 1:23:40 PM
Broker 2	Commodity	668	18	2/2/2022 1:23:40 PM
Broker 4	Commodity	668	18	2/2/2022 1:23:40 PM
Broker 1	Technology	215	19	2/2/2022 1:23:41 PM
Broker 2	Technology	215	19	2/2/2022 1:23:41 PM
Broker 3	Technology	215	19	2/2/2022 1:23:41 PM
Broker 4	Technology	215	19	2/2/2022 1:23:41 PM
Broker 2	Commodity	682	19	2/2/2022 1:23:41 PM
Broker 4	Commodity	682	19	2/2/2022 1:23:41 PM

Broker 2	Banking	126	19	2/2/2022 1:23:41 PM
Broker 3	Banking	126	19	2/2/2022 1:23:41 PM
Broker 4	Banking	126	19	2/2/2022 1:23:41 PM
Broker 1	Retail	49	19	2/2/2022 1:23:41 PM
Broker 4	Retail	49	19	2/2/2022 1:23:41 PM
Broker 1	Technology	217	20	2/2/2022 1:23:41 PM
Broker 2	Technology	217	20	2/2/2022 1:23:41 PM
Broker 3	Technology	217	20	2/2/2022 1:23:41 PM
Broker 4	Technology	217	20	2/2/2022 1:23:41 PM
Broker 2	Commodity	689	20	2/2/2022 1:23:41 PM
Broker 4	Commodity	689	20	2/2/2022 1:23:41 PM
Broker 2	Banking	129	20	2/2/2022 1:23:41 PM
Broker 3	Banking	129	20	2/2/2022 1:23:41 PM
Broker 4	Banking	129	20	2/2/2022 1:23:41 PM
Broker 1	Retail	50	20	2/2/2022 1:23:41 PM
Broker 4	Retail	50	20	2/2/2022 1:23:41 PM
Broker 1	Technology	221	21	2/2/2022 1:23:42 PM
Broker 2	Technology	221	21	2/2/2022 1:23:42 PM
Broker 3	Technology	221	21	2/2/2022 1:23:42 PM
Broker 4	Technology	221	21	2/2/2022 1:23:42 PM
Broker 2	Commodity	692	21	2/2/2022 1:23:42 PM
Broker 4	Commodity	692	21	2/2/2022 1:23:42 PM
Broker 2	Banking	131	21	2/2/2022 1:23:42 PM
Broker 3	Banking	131	21	2/2/2022 1:23:42 PM
Broker 4	Banking	131	21	2/2/2022 1:23:42 PM
Broker 1	Retail	51	21	2/2/2022 1:23:42 PM
Broker 4	Retail	51	21	2/2/2022 1:23:42 PM
Broker 1	Technology	223	22	2/2/2022 1:23:42 PM
Broker 2	Technology	223	22	2/2/2022 1:23:42 PM
Broker 3	Technology	223	22	2/2/2022 1:23:42 PM
Broker 4	Technology	223	22	2/2/2022 1:23:42 PM
Broker 2	Commodity	700	22	2/2/2022 1:23:42 PM
Broker 4	Commodity	700	22	2/2/2022 1:23:42 PM
Broker 1	Retail	52	22	2/2/2022 1:23:42 PM
Broker 4	Retail	52	22	2/2/2022 1:23:42 PM
Broker 2	Banking	134	22	2/2/2022 1:23:42 PM
Broker 3	Banking	134	22	2/2/2022 1:23:42 PM
Broker 4	Banking	134	22	2/2/2022 1:23:42 PM
Broker 1	Technology	225	23	2/2/2022 1:23:43 PM
Broker 2	Technology	225	23	2/2/2022 1:23:43 PM
Broker 3	Technology	225	23	2/2/2022 1:23:43 PM
Broker 4	Technology	225	23	2/2/2022 1:23:43 PM
Broker 2	Commodity	701	23	2/2/2022 1:23:43 PM
Broker 4	Commodity	701	23	2/2/2022 1:23:43 PM
Broker 1	Retail	53	23	2/2/2022 1:23:43 PM
Broker 4	Retail	53	23	2/2/2022 1:23:43 PM

Broker 2	Banking	135	23	2/2/2022 1:23:43 PM
Broker 3	Banking	135	23	2/2/2022 1:23:43 PM
Broker 4	Banking	135	23	2/2/2022 1:23:43 PM
Broker 1	Technology	229	24	2/2/2022 1:23:43 PM
Broker 2	Technology	229	24	2/2/2022 1:23:46 PM
Broker 3	Technology	229	24	2/2/2022 1:23:46 PM
Broker 4	Technology	229	24	2/2/2022 1:23:46 PM
Broker 2	Commodity	715	24	2/2/2022 1:23:46 PM
Broker 4	Commodity	715	24	2/2/2022 1:23:46 PM
Broker 2	Banking	137	24	2/2/2022 1:23:46 PM
Broker 3	Banking	137	24	2/2/2022 1:23:46 PM
Broker 4	Banking	137	24	2/2/2022 1:23:46 PM
Broker 1	Retail	54	24	2/2/2022 1:23:46 PM
Broker 4	Retail	54	24	2/2/2022 1:23:46 PM
Broker 2	Banking	140	25	2/2/2022 1:23:46 PM
Broker 3	Banking	140	25	2/2/2022 1:23:46 PM
Broker 4	Banking	140	25	2/2/2022 1:23:46 PM
Broker 1	Technology	233	25	2/2/2022 1:23:46 PM
Broker 2	Technology	233	25	2/2/2022 1:23:46 PM
Broker 3	Technology	233	25	2/2/2022 1:23:46 PM
Broker 4	Technology	233	25	2/2/2022 1:23:46 PM
Broker 2	Commodity	729	25	2/2/2022 1:23:46 PM
Broker 4	Commodity	729	25	2/2/2022 1:23:46 PM
Broker 1	Retail	55	25	2/2/2022 1:23:46 PM
Broker 4	Retail	55	25	2/2/2022 1:23:46 PM

Grading:

Do the lab assignment in two ways:

- Use thread to synchronize the output to the console window and text file
 - Use async to synchronize the output to the console window and text file
1. Each group has 3 team members. Each team members works on the lab assignment. The team member can collaborate on the lab work. Each team member demonstrates the lab to each other and uploads project file to Canvas.
 2. All team members submit the following (add initial of your first name and last name to the end of the file name):
 - a. The lab assignment. Zip project file and
 - b. A pdf file with code and runtime output for each member. There are two outputs: console window and text file.
 - c. a pdf file showing the coding to implement synchronization using thread and async.

3. Choose one team member to write the completion of the lab assignment for each team member on the Comment box of Canvas. All the team members must agree with the completion of each team member.

The program run successfully with correct output (100% completion)

The program run successfully with incorrect output (60% completion)

The program has syntax errors or is incomplete (40% completion)

The program has few coding and syntax errors (30% completion)

There is no submission (0%)