Project Title: Smart Pharmacy Inventory Tracker

Phase 4: Process Automation (Admin)

Executive Summary:

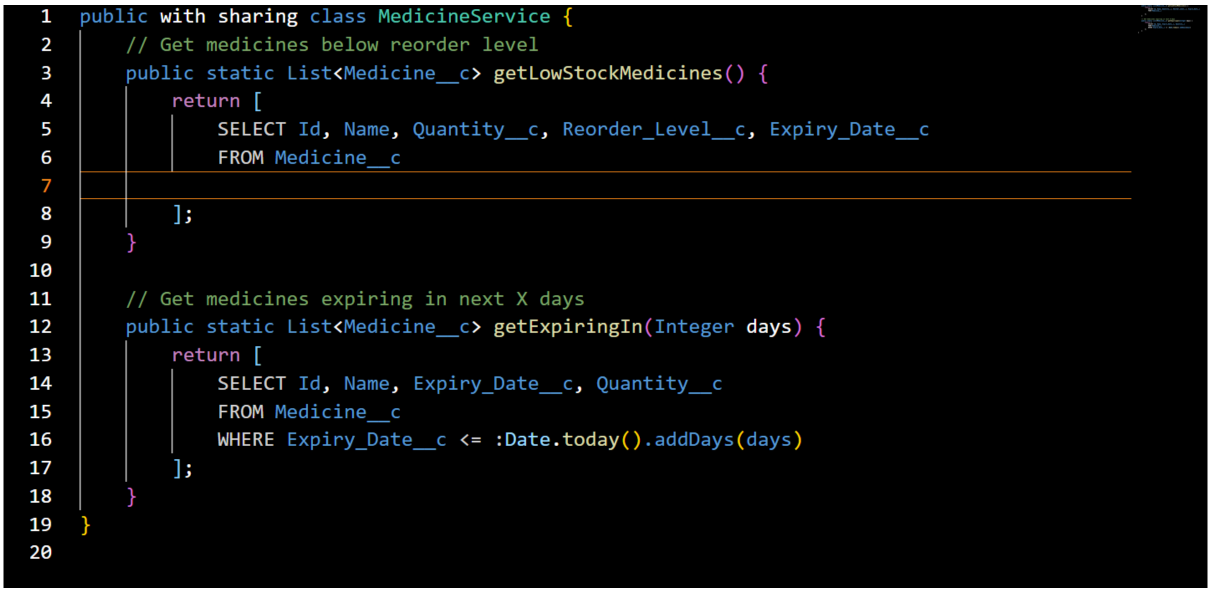
Phase 5 introduces Apex programming to extend the Smart Pharmacy Inventory Tracker beyond declarative automation. With Apex, we implemented business logic that ensures medicines are automatically tracked, expired stock is prevented from being sold, and inventory reorder processes run smoothly. Key features include a best-practice trigger framework, service classes for modular code, and asynchronous Apex for handling bulk updates and scheduled expiry checks.

Classes & Objects:

Created Apex classes to encapsulate core logic for the Medicine__c object.

Example (MedicineService.cls)

```
public with sharing class MedicineService {
  // Method to update stock after prescription issue
  public static void reduceStock(List<Medicine__c> meds) {
    for (Medicine__c med : meds) {
      if (med.Quantity__c > 0) {
        med.Quantity__c -= 1; // reduce by 1 unit
      }
    }
  }
  // Method to mark expired medicines
  public static void markExpired(List<Medicine__c> meds) {
    for (Medicine__c med : meds) {
      if (med.Expiry_Date__c < Date.today()) {
        med.Status__c = 'Expired';
      }
    }
    }
}
```



```
public with sharing class MedicineService {
    // Get medicines below reorder level
    public static List<Medicine__c> getLowStockMedicines() {
        return [
            SELECT Id, Name, Quantity__c, Reorder_Level__c, Expiry_Date__c
            FROM Medicine__c

        ];
    }

    // Get medicines expiring in next X days
    public static List<Medicine__c> getExpiringIn(Integer days) {
        return [
            SELECT Id, Name, Expiry_Date__c, Quantity__c
            FROM Medicine__c
            WHERE Expiry_Date__c <= :Date.today().addDays(days)
        ];
    }
}
```

Apex Triggers & Trigger Design Pattern:

Implemented one-trigger-per-object pattern for Medicine__c. The trigger delegates to a handler for clean code.

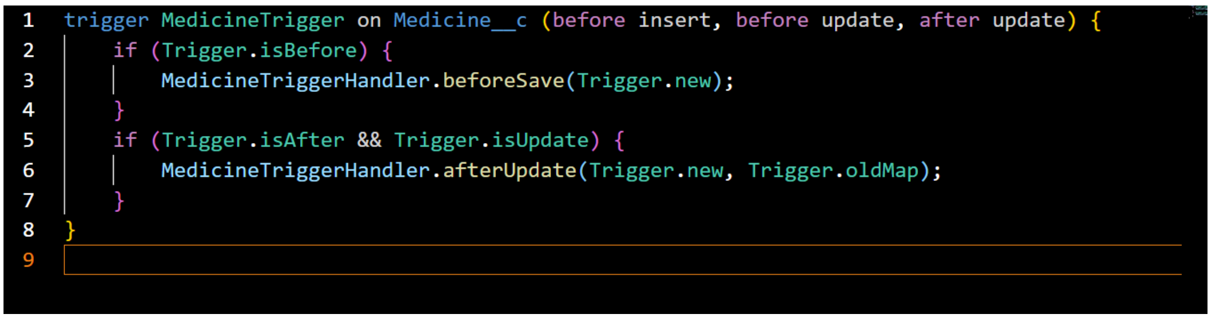
Example (MedicineTrigger.trigger)

```
trigger MedicineTrigger on Medicine__c (before insert, before update, after update) {
    new MedicineTriggerHandler().run();
}
```

Example (MedicineTriggerHandler.cls)

```
public class MedicineTriggerHandler {
    public void run() {
        if (Trigger.isBefore && (Trigger.isInsert || Trigger.isUpdate)) {
            MedicineService.markExpired((List<Medicine__c>) Trigger.new);
        }

        if (Trigger.isAfter && Trigger.isUpdate) {
            List<Medicine__c> updatedMeds = new List<Medicine__c>();
            for (Medicine__c med : (List<Medicine__c>) Trigger.new) {
                Medicine__c oldMed = (Medicine__c) Trigger.oldMap.get(med.Id);
                if (med.Quantity__c < oldMed.Quantity__c) {
                    updatedMeds.add(med);
                }
            }
            if (!updatedMeds.isEmpty()) {
                MedicineService.reduceStock(updatedMeds);
            }
        }
    }
}
```

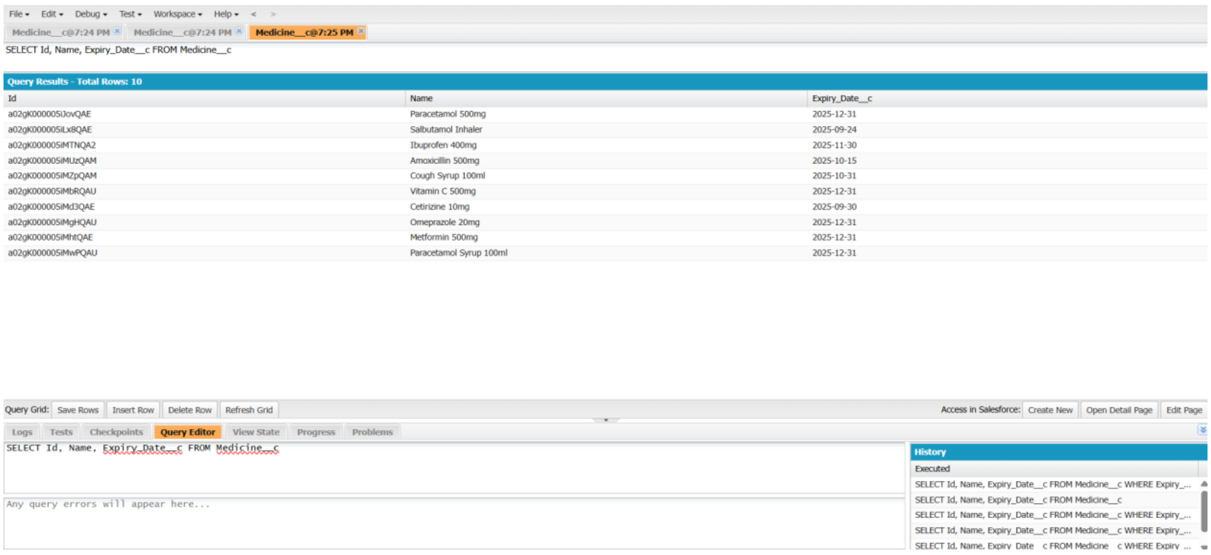


```
trigger MedicineTrigger on Medicine__c (before insert, before update, after update) {
    if (Trigger.isBefore) {
        MedicineTriggerHandler.beforeSave(Trigger.new);
    }
    if (Trigger.isAfter && Trigger.isUpdate) {
        MedicineTriggerHandler.afterUpdate(Trigger.new, Trigger.oldMap);
    }
}
```

<u>SOQL & SOSL:</u>

SOQL Example**:** Fetch all medicines with low stock.

```
List<Medicine__c> lowStockMeds = [
    SELECT Id, Name, Quantity__c, Reorder_Level__c
    FROM Medicine__c
];
```



SELECT Id, Name, Expiry_Date__c FROM Medicine__c

Query Results - Total Rows: 10

Id	Name	Expiry_Date__c
a02gK000005iJovQAE	Paracetamol 500mg	2025-12-31
a02gK000005iLx8QAE	Salbutamol Inhaler	2025-09-24
a02gK000005iMTNQA2	Ibuprofen 400mg	2025-11-30
a02gK000005iMUzQAM	Amoxicillin 500mg	2025-10-15
a02gK000005iMZpQAM	Cough Syrup 100ml	2025-10-31
a02gK000005iMbRQAU	Vitamin C 500mg	2025-12-31
a02gK000005iMd3QAE	Cetirizine 10mg	2025-09-30
a02gK000005iMgHQAU	Omeprazole 20mg	2025-12-31
a02gK000005iMhtQAE	Metformin 500mg	2025-12-31
a02gK000005iMwPQAU	Paracetamol Syrup 100ml	2025-12-31

Query Grid: Save Rows Insert Row Delete Row Refresh Grid
Access in Salesforce: Create New Open Detail Page Edit Page
Logs Tests Checkpoints Query Editor View State Progress Problems

```
SELECT Id, Name, Expiry_Date__c FROM Medicine__c
```

```
Any query errors will appear here...
```

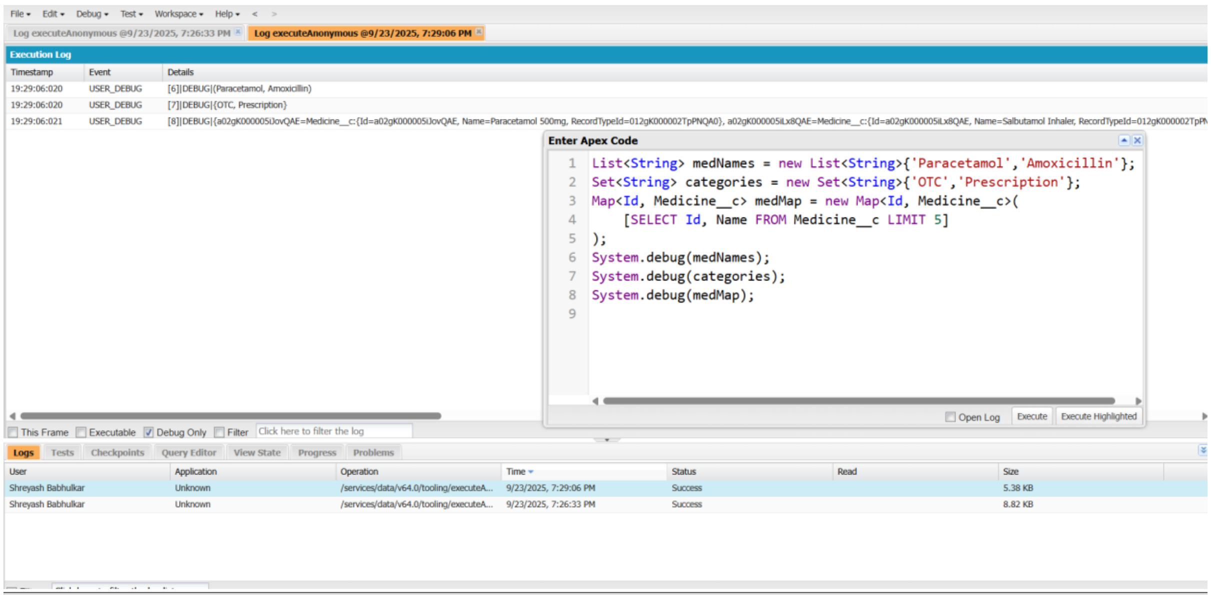
History

Executed
SELECT Id, Name, Expiry_Date__c FROM Medicine__c WHERE Expiry_...
SELECT Id, Name, Expiry_Date__c FROM Medicine__c
SELECT Id, Name, Expiry_Date__c FROM Medicine__c WHERE Expiry_...
SELECT Id, Name, Expiry_Date__c FROM Medicine__c WHERE Expiry_...
SELECT Id, Name, Expiry_Date__c FROM Medicine__c WHERE Expiry_...

Collections & Control Statements:

Example**:** Using List, Set, and Map for medicines.

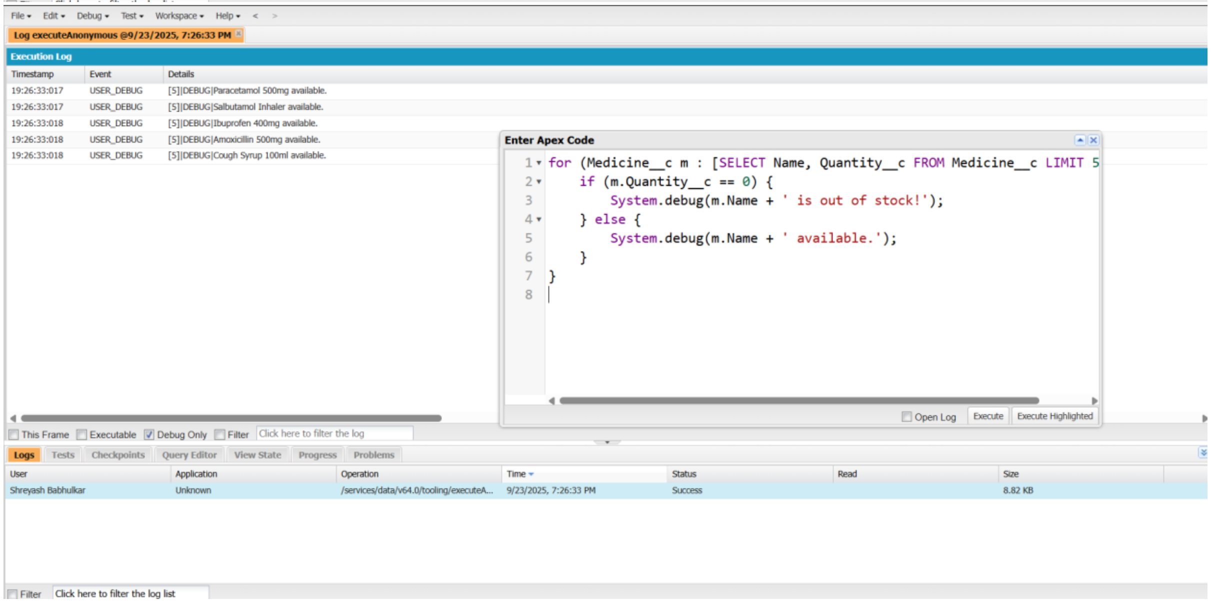
```
public Map<Id, String> getMedicineNames(List<Medicine__c> meds) {
   Set<Id> medIds = new Set<Id>();
   for (Medicine__c med : meds) {
      medIds.add(med.Id);
   }
   Map<Id, Medicine__c> medsMap = new Map<Id, Medicine__c>(
      [SELECT Id, Name FROM Medicine__c WHERE Id IN :medIds]
   );
   Map<Id, String> results = new Map<Id, String>();
   for (Id medId : medsMap.keySet()) {
      results.put(medId, medsMap.get(medId).Name);
   }
   return results;
}
```


File Edit Debug Test Workspace Help
Log executeAnonymous @9/23/2025, 7:26:33 PM
Log executeAnonymous @9/23/2025, 7:29:06 PM
Execution Log
Enter Apex Code
This Frame Executable Debug Only Filter Click here to filter the log
Open Log Execute Execute Highlighted
Logs Tests Checkpoints Query Editor View State Progress Problems

```
Timestamp      Event        Details
19:29:06:020   USER_DEBUG   [6]|DEBUG|(Paracetamol, Amoxicillin)
19:29:06:020   USER_DEBUG   [7]|DEBUG|{OTC, Prescription}
19:29:06:021   USER_DEBUG   [8]|DEBUG|{a02gK000005iJovQAE=Medicine__c:{Id=a02gK000005iJovQAE, Name=Paracetamol 500mg, RecordTypeId=012gK000002TpPNQA0}, a02gK000005iLx8QAE=Medicine__c:{Id=a02gK000005iLx8QAE, Name=Salbutamol Inhaler, RecordTypeId=012gK000002TpPN
```

```
List<String> medNames = new List<String>{'Paracetamol','Amoxicillin'};
Set<String> categories = new Set<String>{'OTC','Prescription'};
Map<Id, Medicine__c> medMap = new Map<Id, Medicine__c>(
    [SELECT Id, Name FROM Medicine__c LIMIT 5]
);
System.debug(medNames);
System.debug(categories);
System.debug(medMap);
```

User	Application	Operation	Time	Status	Read	Size
Shreyash Babhulkar	Unknown	/services/data/v64.0/tooling/executeA...	9/23/2025, 7:29:06 PM	Success		5.38 KB
Shreyash Babhulkar	Unknown	/services/data/v64.0/tooling/executeA...	9/23/2025, 7:26:33 PM	Success		8.82 KB


File Edit Debug Test Workspace Help
Log executeAnonymous @9/23/2025, 7:26:33 PM
Execution Log
Enter Apex Code
This Frame Executable Debug Only Filter Click here to filter the log
Open Log Execute Execute Highlighted
Logs Tests Checkpoints Query Editor View State Progress Problems
Filter Click here to filter the log list

```
Timestamp      Event        Details
19:26:33:017   USER_DEBUG   [5]|DEBUG|Paracetamol 500mg available.
19:26:33:017   USER_DEBUG   [5]|DEBUG|Salbutamol Inhaler available.
19:26:33:018   USER_DEBUG   [5]|DEBUG|Ibuprofen 400mg available.
19:26:33:018   USER_DEBUG   [5]|DEBUG|Amoxicillin 500mg available.
19:26:33:018   USER_DEBUG   [5]|DEBUG|Cough Syrup 100ml available.
```

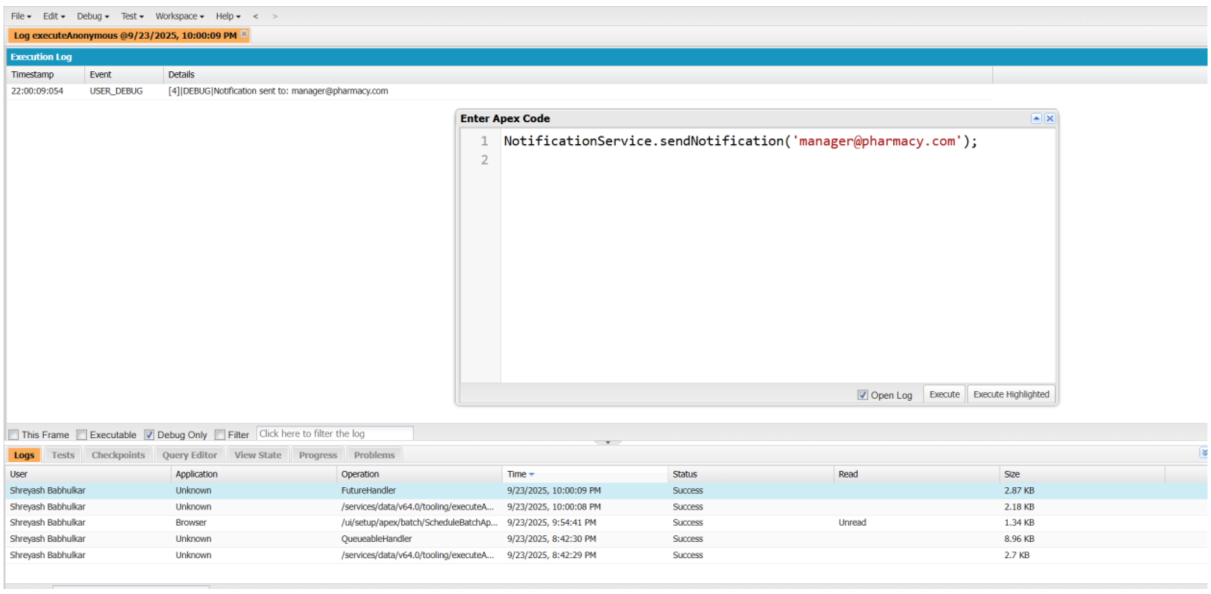
```
for (Medicine__c m : [SELECT Name, Quantity__c FROM Medicine__c LIMIT 5
    if (m.Quantity__c == 0) {
        System.debug(m.Name + ' is out of stock!');
    } else {
        System.debug(m.Name + ' available.');
    }
}
```

User	Application	Operation	Time	Status	Read	Size
Shreyash Babhulkar	Unknown	/services/data/v64.0/tooling/executeA...	9/23/2025, 7:26:33 PM	Success		8.82 KB

Asynchronous Apex Processing:

- Future Method (API Callout Simulation):

```
public class SupplierService {
  @future(callout=true)
  public static void notifySupplier(Id medicineId) {
    System.debug('Notifying supplier for medicine: ' + medicineId);
  }
}
```


File Edit Debug Test Workspace Help < >
Log executeAnonymous @9/23/2025, 10:00:09 PM
Execution Log
Enter Apex Code
Open Log
Execute
Execute Highlighted
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Executable
Debug Only
Filter
Click here to filter the log
Logs Tests Checkpoints Query Editor View State Progress Problems

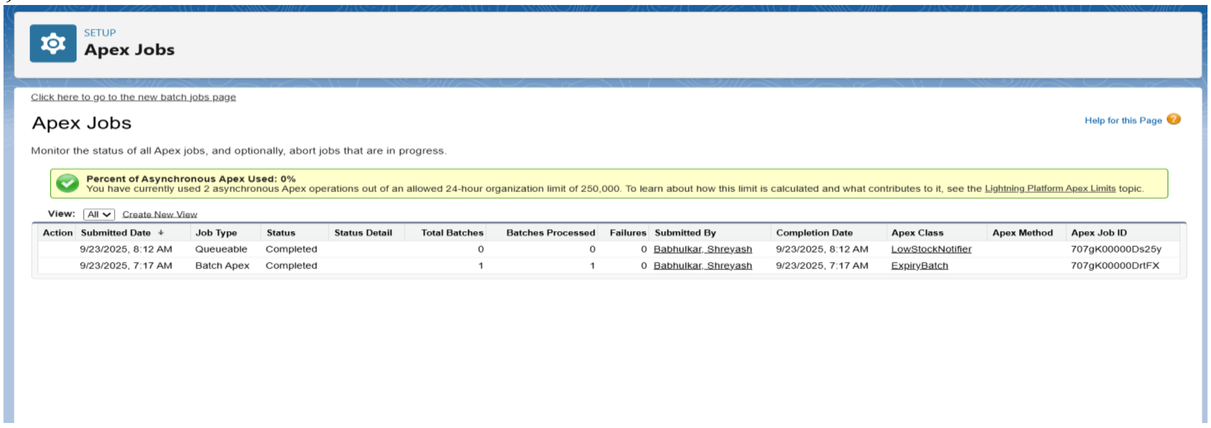
Timestamp	Event	Details
22:00:09:054	USER_DEBUG	[4]|DEBUG|Notification sent to: manager@pharmacy.com

```
NotificationService.sendNotification('manager@pharmacy.com');
```

User	Application	Operation	Time	Status	Read	Size
Shreyash Babhulkar	Unknown	FutureHandler	9/23/2025, 10:00:09 PM	Success		2.87 KB
Shreyash Babhulkar	Unknown	/services/data/v64.0/tooling/executeA...	9/23/2025, 10:00:08 PM	Success		2.18 KB
Shreyash Babhulkar	Browser	/ui/setup/apex/batch/ScheduleBatchAp...	9/23/2025, 9:54:41 PM	Success	Unread	1.34 KB
Shreyash Babhulkar	Unknown	QueueableHandler	9/23/2025, 8:42:30 PM	Success		8.96 KB
Shreyash Babhulkar	Unknown	/services/data/v64.0/tooling/executeA...	9/23/2025, 8:42:29 PM	Success		2.7 KB

- <u>Queueable Apex (Complex Processing</u>**):**

```
public class RestockJob implements Queueable {
    private Id medicineId;
    public RestockJob(Id medId) { this.medicineId = medId; }
    public void execute(QueueableContext context) {
        System.debug('Processing restock for medicine: ' + medicineId);
    }
}
```

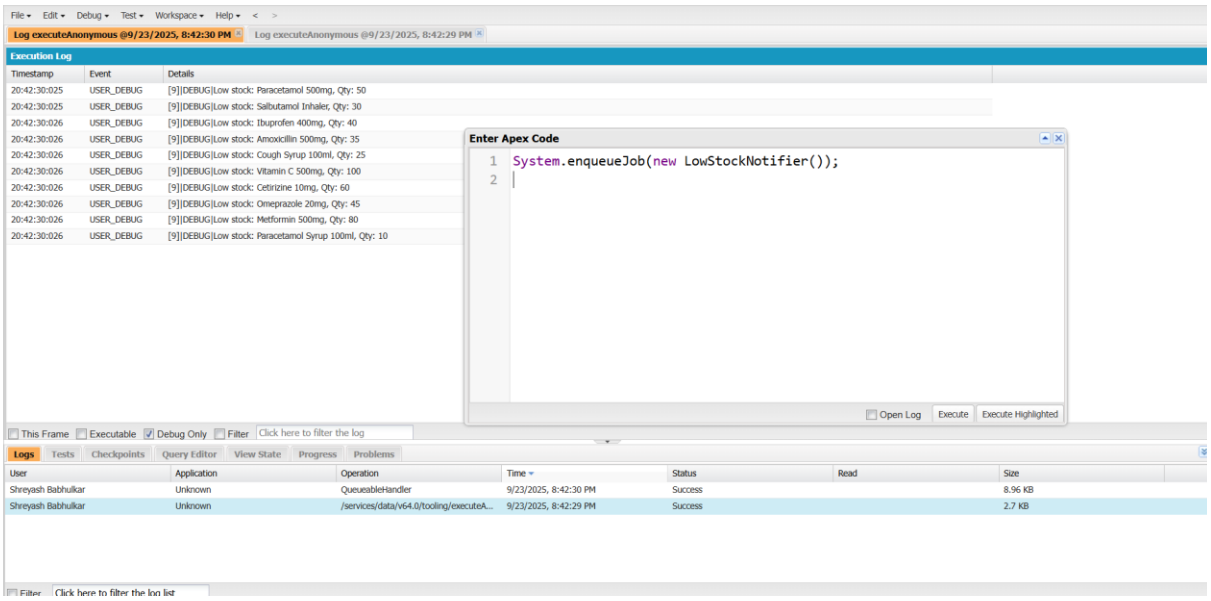


Apex Jobs

Monitor the status of all Apex jobs, and optionally, abort jobs that are in progress.

Percent of Asynchronous Apex Used: 0%
You have currently used 2 asynchronous Apex operations out of an allowed 24-hour organization limit of 250,000. To learn about how this limit is calculated and what contributes to it, see the Lightning Platform Apex Limits topic.

Action	Submitted Date	Job Type	Status	Status Detail	Total Batches	Batches Processed	Failures	Submitted By	Completion Date	Apex Class	Apex Method	Apex Job ID
	9/23/2025, 8:12 AM	Queueable	Completed		0	0	0	Babhulkar, Shreyash	9/23/2025, 8:12 AM	LowStockNotifier		707gK00000Ds25y
	9/23/2025, 7:17 AM	Batch Apex	Completed		1	1	0	Babhulkar, Shreyash	9/23/2025, 7:17 AM	ExpiryBatch		707gK00000DrtFX


File Edit Debug Test Workspace Help
Log executeAnonymous @9/23/2025, 8:42:30 PM
Log executeAnonymous @9/23/2025, 8:42:29 PM
Execution Log
Enter Apex Code
Open Log
Execute
Execute Highlighted
This Frame
Executable
Debug Only
Filter
Click here to filter the log
Logs
Tests
Checkpoints
Query Editor
View State
Progress
Problems
Filter
Click here to filter the log list

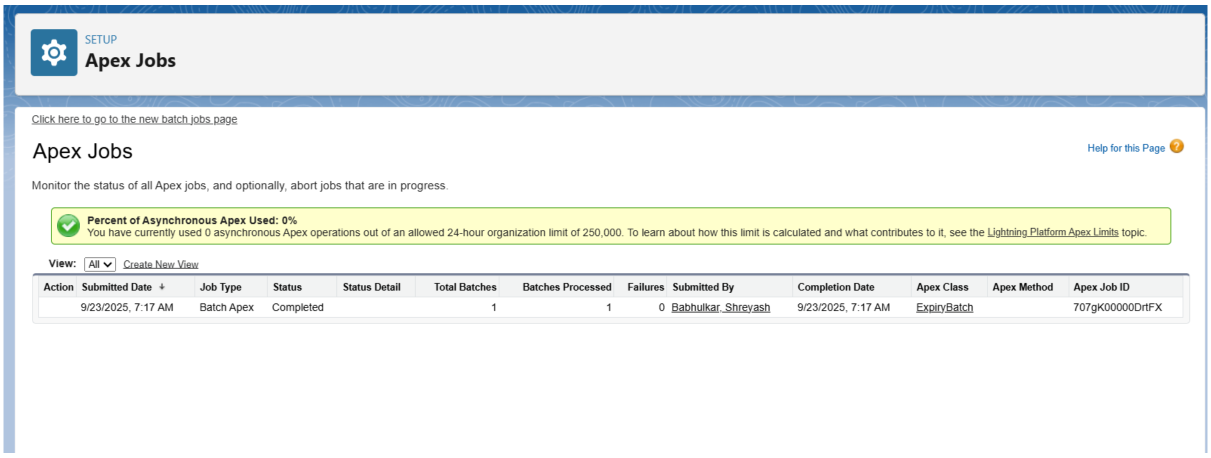
```
Timestamp      Event        Details
20:42:30:025   USER_DEBUG   [9]|DEBUG|Low stock: Paracetamol 500mg, Qty: 50
20:42:30:025   USER_DEBUG   [9]|DEBUG|Low stock: Salbutamol Inhaler, Qty: 30
20:42:30:026   USER_DEBUG   [9]|DEBUG|Low stock: Ibuprofen 400mg, Qty: 40
20:42:30:026   USER_DEBUG   [9]|DEBUG|Low stock: Amoxicillin 500mg, Qty: 35
20:42:30:026   USER_DEBUG   [9]|DEBUG|Low stock: Cough Syrup 100ml, Qty: 25
20:42:30:026   USER_DEBUG   [9]|DEBUG|Low stock: Vitamin C 500mg, Qty: 100
20:42:30:026   USER_DEBUG   [9]|DEBUG|Low stock: Cetirizine 10mg, Qty: 60
20:42:30:026   USER_DEBUG   [9]|DEBUG|Low stock: Omeprazole 20mg, Qty: 45
20:42:30:026   USER_DEBUG   [9]|DEBUG|Low stock: Metformin 500mg, Qty: 80
20:42:30:026   USER_DEBUG   [9]|DEBUG|Low stock: Paracetamol Syrup 100ml, Qty: 10
```

```
System.enqueueJob(new LowStockNotifier());
```

User	Application	Operation	Time	Status	Read	Size
Shreyash Babhulkar	Unknown	QueueableHandler	9/23/2025, 8:42:30 PM	Success		8.96 KB
Shreyash Babhulkar	Unknown	/services/data/v64.0/tooling/executeA...	9/23/2025, 8:42:29 PM	Success		2.7 KB

- <u>Batch Apex (Expired Stock Cleanup):</u>

```
public class ExpiredMedicineBatch implements Database.Batchable<sObject> {
   public Database.QueryLocator start (Database.BatchableContext bc) {
      return Database.getQueryLocator(
         'SELECT Id, Status__c FROM Medicine__c WHERE Expiry_Date__c < TODAY'
      );
   }
   public void execute(Database.BatchableContext bc, List<Medicine__c> scope) {
      for (Medicine__c med : scope) {
         med.Status__c = 'Expired';
      }
      update scope;
   }
   public void finish(Database.BatchableContext bc) {
      System.debug('Expired medicines updated successfully.');
   }
}
```



Apex Jobs

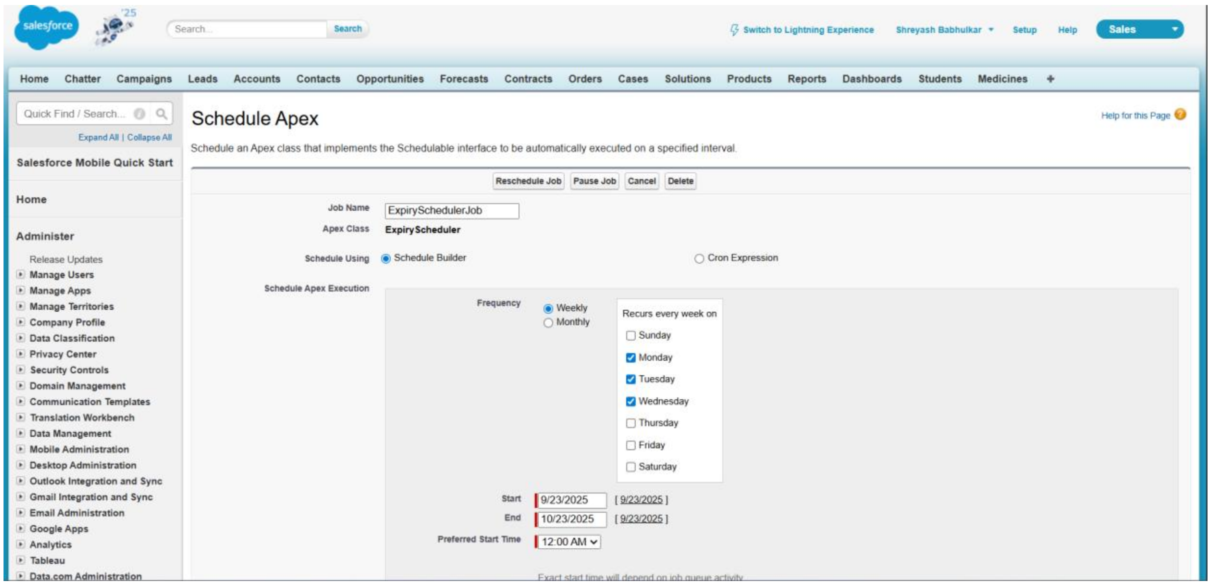
Monitor the status of all Apex jobs, and optionally, abort jobs that are in progress.

Percent of Asynchronous Apex Used: 0%
You have currently used 0 asynchronous Apex operations out of an allowed 24-hour organization limit of 250,000. To learn about how this limit is calculated and what contributes to it, see the Lightning Platform Apex Limits topic.

Action	Submitted Date	Job Type	Status	Status Detail	Total Batches	Batches Processed	Failures	Submitted By	Completion Date	Apex Class	Apex Method	Apex Job ID
	9/23/2025, 7:17 AM	Batch Apex	Completed		1	1	0	Babhulkar, Shreyash	9/23/2025, 7:17 AM	ExpiryBatch		707gK00000DrtFX

- <u>Scheduled Apex:</u>

```
public class ScheduleExpiryCheck implements Schedulable {
   public void execute(SchedulableContext sc) {
      Database.executeBatch(new ExpiredMedicineBatch(), 100);
   }
}
```



Schedule Apex

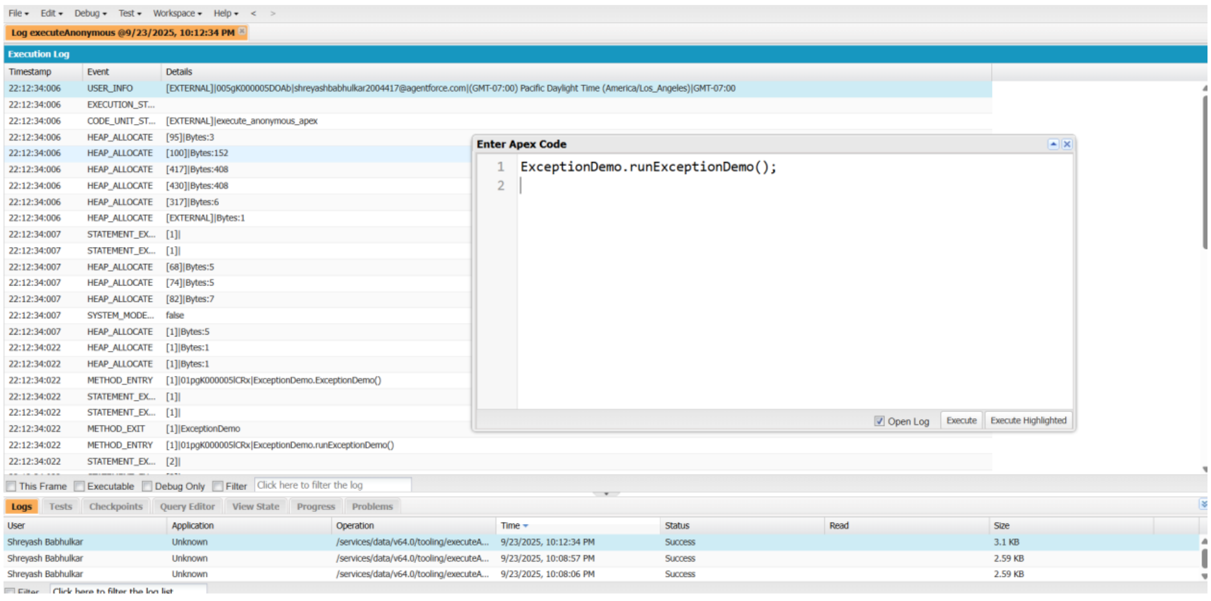
Schedule an Apex class that implements the Schedulable interface to be automatically executed on a specified interval.

Job Name: ExpirySchedulerJob
Apex Class: ExpiryScheduler
Schedule Using: [✓ Schedule Builder] Cron Expression
Schedule Apex Execution
Frequency: [✓ Weekly] Monthly
Recurs every week on: Sunday [✓ Monday] [✓ Tuesday] [✓ Wednesday] Thursday Friday Saturday
Start: 9/23/2025 [9/23/2025]
End: 10/23/2025 [9/23/2025]
Preferred Start Time: 12:00 AM
Exact start time will depend on job queue activity

<u>**Exception Handling:**</u>

```
public static void safeUpdate(List<Medicine__c> meds) {
   try {
      update meds;
   } catch (DmlException e) {
```

```
            System.debug('Error: ' + e.getMessage());
        }
    }
```



```
ExceptionDemo.runExceptionDemo();
```

```
Timestamp      Event            Details
22:12:34:006   USER_INFO        [EXTERNAL]|005gK000005DOAb|shreyashbabhulkar2004417@agentforce.com|(GMT-07:00) Pacific Daylight Time (America/Los_Angeles)|GMT-07:00
22:12:34:006   EXECUTION_ST...
22:12:34:006   CODE_UNIT_ST...  [EXTERNAL]|execute_anonymous_apex
22:12:34:006   HEAP_ALLOCATE    [95]|Bytes:3
22:12:34:006   HEAP_ALLOCATE    [100]|Bytes:152
22:12:34:006   HEAP_ALLOCATE    [417]|Bytes:408
22:12:34:006   HEAP_ALLOCATE    [430]|Bytes:408
22:12:34:006   HEAP_ALLOCATE    [317]|Bytes:6
22:12:34:006   HEAP_ALLOCATE    [EXTERNAL]|Bytes:1
22:12:34:007   STATEMENT_EX...  [1]|
22:12:34:007   STATEMENT_EX...  [1]|
22:12:34:007   HEAP_ALLOCATE    [68]|Bytes:5
22:12:34:007   HEAP_ALLOCATE    [74]|Bytes:5
22:12:34:007   HEAP_ALLOCATE    [82]|Bytes:7
22:12:34:007   SYSTEM_MODE...   false
22:12:34:007   HEAP_ALLOCATE    [1]|Bytes:5
22:12:34:022   HEAP_ALLOCATE    [1]|Bytes:1
22:12:34:022   HEAP_ALLOCATE    [1]|Bytes:1
22:12:34:022   METHOD_ENTRY     [1]|01pgK000005lCRx|ExceptionDemo.ExceptionDemo()
22:12:34:022   STATEMENT_EX...  [1]|
22:12:34:022   STATEMENT_EX...  [1]|
22:12:34:022   METHOD_EXIT      [1]|ExceptionDemo
22:12:34:022   METHOD_ENTRY     [1]|01pgK000005lCRx|ExceptionDemo.runExceptionDemo()
22:12:34:022   STATEMENT_EX...  [2]|
```

User	Application	Operation	Time	Status	Read	Size
Shreyash Babhulkar	Unknown	/services/data/v64.0/tooling/executeA...	9/23/2025, 10:12:34 PM	Success		3.1 KB
Shreyash Babhulkar	Unknown	/services/data/v64.0/tooling/executeA...	9/23/2025, 10:08:57 PM	Success		2.59 KB
Shreyash Babhulkar	Unknown	/services/data/v64.0/tooling/executeA...	9/23/2025, 10:08:06 PM	Success		2.59 KB