

# APEX SPECIALIST SUPERBADGE

## 1. APEX TRIGGERS

### 1.1 GET STARTED WITH APEX TRIGGERS

Created an Apex trigger that sets an account's Shipping Postal Code to match the Billing Postal Code if the Match Billing Address option is selected.

```
trigger AccountAddressTrigger on Account (before insert, before update) {  
    for(Account account:Trigger.New){  
        if(account.Match_Billing_Address__c == True){  
            account.ShippingPostalCode = account.BillingPostalCode;  
        }  
    }  
}
```

### 1.2 BULK APEX TRIGGERS

Created a bulkified Apex trigger that adds a follow-up task to an opportunity if its stage is Closed Won.

```
trigger ClosedOpportunityTrigger on Opportunity (after insert, after update) {  
    List<Task> taskListToInsert = new List<Task>();  
    for(Opportunity opp: Trigger.new){  
        if(opp.stageName == 'Closed Won'){  
            Task t=new Task();  
            t.Subject = 'Follow Up Test Task';  
            t.WhatId = opp.Id;  
            taskListToInsert.add(t);  
        }  
    }  
    if(taskListToInsert.size()>0){  
        insert taskListToInsert;  
    }  
}
```

## 2. APEX TESTING

### 2.1 GET STARTED WITH APEX UNIT TESTS

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Created and installed a simple Apex class to test if a date is within a proper range, and if not, returns a date that occurs at the end of the month within the range.

```
public class VerifyDate {  
    //method to handle potential checks against two dates  
    public static Date CheckDates(Date date1, Date date2) {  
        //if date2 is within the next 30 days of date1, use date2. Otherwise use the end of the month  
        if(DateWithin30Days(date1,date2)) {  
            return date2;  
        } else {  
            return SetEndOfMonthDate(date1);  
        }  
    }  
    //method to check if date2 is within the next 30 days of date1  
    private static Boolean DateWithin30Days(Date date1, Date date2) {  
        //check for date2 being in the past  
        if( date2 < date1) { return false; }  
        //check that date2 is within (>=) 30 days of date1  
        Date date30Days = date1.addDays(30); //create a date 30 days away from date1  
        if( date2 >= date30Days ) { return false; }  
        else { return true; }  
    }  
    //method to return the end of the month of a given date  
    private static Date SetEndOfMonthDate(Date date1) {  
        Integer totalDays = Date.daysInMonth(date1.year(), date1.month());  
        Date lastDay = Date.newInstance(date1.year(), date1.month(), totalDays);  
        return lastDay;  
    }  
}
```

```
@isTest  
public class TestVerifyDate  
{  
    static testMethod void testMethod1()  
    {  
        Date d = VerifyDate.CheckDates(System.today(),System.today()+1);  
        Date d1 = VerifyDate.CheckDates(System.today(),System.today()+60);  
    }  
}
```

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### 2.2 TEST APEX TRIGGERS

Created and installed a simple Apex trigger which blocks inserts and updates to any contact with a last name of 'INVALIDNAME'.

```
trigger RestrictContactByName on Contact (before insert, before update) {  
    //check contacts prior to insert or update for invalid data  
    For (Contact c : Trigger.New) {  
        if(c.LastName == 'INVALIDNAME') { //invalidname is invalid  
            c.AddError('The Last Name "' + c.LastName + '" is not allowed for DML');  
        }  
    }  
}
```

Placing the unit tests in separate test class:

```
@isTest  
private class TestRestrictContactByName {  
  
    static testMethod void metodoTest()  
    {  
        List<Contact> listContact= new List<Contact>();  
        Contact c1 = new Contact(FirstName='Francesco', LastName='Riggio', email='Test@test.com');  
        Contact c2 = new Contact(FirstName='Francesco1', LastName =  
'INVALIDNAME',email='Test@test.com');  
        listContact.add(c1);  
        listContact.add(c2);  
  
        Test.startTest();  
        try  
        {  
            insert listContact;  
        }  
        catch(Exception ee)  
        {  
        }  
  
        Test.stopTest();  
    }  
}
```

### 2.3 CREATE TEST DATA FOR APEX TESTS

Created an Apex class that returns a list of contacts based on two incoming

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parameters: the number of contacts to generate and the last name.

```
//@isTest
public class RandomContactFactory {
    public static List<Contact> generateRandomContacts(Integer numContactsToGenerate, String FName) {
        List<Contact> contactList = new List<Contact>();

        for(Integer i=0;i<numContactsToGenerate;i++) {
            Contact c = new Contact(FirstName=FName + ' ' + i, LastName = 'Contact ' + i);
            contactList.add(c);
            System.debug(c);
        }
        //insert contactList;
        System.debug(contactList.size());
        return contactList;
    }
}
```

### 3. ASYNCHRONOUS APEX

#### 3.1 USE FUTURE METHODS

Created an Apex class with a future method that accepts a List of Account IDs and updates a custom field on the Account object with the number of contacts associated to the Account.

```
public class AccountProcessor {
    @future
    public static void countContacts(List<Id> accountIds){
        List<Account> accounts = [Select Id, Name from Account Where Id IN : accountIds];
        List<Account> updatedAccounts = new List<Account>();
        for(Account account : accounts){
            account.Number_of_Contacts__c = [Select count() from Contact Where AccountId =: account.Id];
            System.debug('No Of Contacts = ' + account.Number_of_Contacts__c);
            updatedAccounts.add(account);
        }
        update updatedAccounts;
    }
}
```

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TEST CLASS:

```
@isTest
public class AccountProcessorTest {
    @isTest
    public static void testNoOfContacts(){
        Account a = new Account();
        a.Name = 'Test Account';
        Insert a;

        Contact c = new Contact();
        c.FirstName = 'Bob';
        c.LastName = 'Willie';
        c.AccountId = a.Id;

        Contact c2 = new Contact();
        c2.FirstName = 'Tom';
        c2.LastName = 'Cruise';
        c2.AccountId = a.Id;

        List<Id> acctIds = new List<Id>();
        acctIds.add(a.Id);

        Test.startTest();
        AccountProcessor.countContacts(acctIds);
        Test.stopTest();
    }
}
```

### 3.2 USE BATCH APEX

Created an Apex class that implements the Database.Batchable interface to update all Lead records in the org with a specific LeadSource.

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```
global class LeadProcessor implements
Database.Batchable<sObject>, Database.Stateful {

    // instance member to retain state across transactions
    global Integer recordsProcessed = 0;

    global Database.QueryLocator start(Database.BatchableContext bc) {
        return Database.getQueryLocator('SELECT Id, LeadSource FROM Lead');
    }

    global void execute(Database.BatchableContext bc, List<Lead> scope){
        // process each batch of records
        List<Lead> leads = new List<Lead>();
        for (Lead lead : scope) {

            lead.LeadSource = 'Dreamforce';
            // increment the instance member counter
            recordsProcessed = recordsProcessed + 1;

        }
        update leads;
    }

    global void finish(Database.BatchableContext bc){
        System.debug(recordsProcessed + ' records processed. Shazam!');
    }
}
```

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```
@isTest
public class LeadProcessorTest {
    @testSetup
    static void setup() {
        List<Lead> leads = new List<Lead>();
        // insert 200 leads
        for (Integer i=0;i<200;i++) {
            leads.add(new Lead(LastName='Lead '+i,
                               Company='Lead', Status='Open - Not Contacted'));
        }
        insert leads;
    }

    static testmethod void test() {
        Test.startTest();
        LeadProcessor lp = new LeadProcessor();
        Id batchId = Database.executeBatch(lp, 200);
        Test.stopTest();

        // after the testing stops, assert records were updated properly
        System.assertEquals(200, [select count() from lead where LeadSource = 'Dreamforce']);
    }
}
```

### 3.3 CONTROL PROCESSES WITH QUEUEABLE APEX

Created a Queueable Apex class that inserts the same Contact for each Account for a specific state.

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```
public class AddPrimaryContact implements Queueable
{
    private Contact c;
    private String state;
    public AddPrimaryContact(Contact c, String state)
    {
        this.c = c;
        this.state = state;
    }
    public void execute(QueueableContext context)
    {
        List<Account> ListAccount = [SELECT ID, Name ,(Select id,FirstName,LastName from contacts ) FROM ACCOUNT
WHERE BillingState = :state LIMIT 200];
        List<Contact> lstContact = new List<Contact>();
        for (Account acc:ListAccount)
        {
            Contact cont = c.clone(false,false,false,false);
            cont.AccountId = acc.id
;
            lstContact.add( cont );
        }
        if(lstContact.size() >0 )
        {
            insert lstContact;
        }
    }
}
```

TEST CLASS:



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```
@isTest
public class AddPrimaryContactTest
{
    @isTest static void TestList()
    {
        List<Account> Teste = new List <Account>();
        for(Integer i=0;i<50;i++)
        {
            Teste.add(new Account(BillingState = 'CA', name = 'Test'+i));
        }
        for(Integer j=0;j<50;j++)
        {
            Teste.add(new Account(BillingState = 'NY', name = 'Test'+j));
        }
        insert Teste;

        Contact co = new Contact();
        co.FirstName='demo';
        co.LastName ='demo';
        insert co;
        String state = 'CA';

        AddPrimaryContact apc = new AddPrimaryContact(co, state);
        Test.startTest();
        System.enqueueJob(apc);
        Test.stopTest();
    }
}
```

Created an Apex class that implements the Schedulable interface to update Lead records with a specific LeadSource.

```
public class DailyLeadProcessor implements Schedulable {
    Public void execute(SchedulableContext SC){
        List<Lead> LeadObj=[SELECT Id from Lead where LeadSource=null limit 200];
        for(Lead l:LeadObj){
            l.LeadSource='Dreamforce';
            update l;
        }
    }
}
```

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TEST CLASS:

```
@isTest
private class DailyLeadProcessorTest {
    static testMethod void testDailyLeadProcessor() {
        String CRON_EXP = '0 0 1 * * ?';
        List<Lead> lList = new List<Lead>();
        for (Integer i = 0; i < 200; i++) {
            lList.add(new Lead(LastName='Dreamforce'+i, Company='Test1 Inc.', Status='Open - Not Contacted'));
        }
        insert lList;

        Test.startTest();
        String jobId = System.schedule('DailyLeadProcessor', CRON_EXP, new DailyLeadProcessor());
    }
}
```

## 4. APEX INTEGRATION SERVICES

### 4.1 APEX REST CALLOUTS

Created an Apex class that calls a REST endpoint to return the name of an animal.

```
public class AnimalLocator{
    public static String getAnimalNameById(Integer x){
        Http http = new Http();
        HttpRequest req = new HttpRequest();
        req.setEndpoint('https://th-apex-http-callout.herokuapp.com/animals/'+ x);
        req.setMethod('GET');
        Map<String, Object> animal= new Map<String, Object>();
        HttpResponse res = http.send(req);
        if (res.getStatusCode() == 200) {
            Map<String, Object> results = (Map<String, Object>)JSON.deserializeUntyped(res.getBody());
            animal = (Map<String, Object>) results.get('animal');
        }
        return (String)animal.get('name');
    }
}
```

TEST CLASS:

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```
@isTest
private class AnimalLocatorTest{
    @isTest static void AnimalLocatorMock1() {
        Test.setMock(HttpCalloutMock.class, new AnimalLocatorMock());
        string result = AnimalLocator.getAnimalNameById(3);
        String expectedResult = 'chicken';
        System.assertEquals(result, expectedResult );
    }
}
```

### ANIMALLOCATORMOCK CLASS:

```
@isTest
global class AnimalLocatorMock implements HttpCalloutMock {
    // Implement this interface method
    global HTTPResponse respond(HTTPRequest request) {
        // Create a fake response
        HttpResponse response = new HttpResponse();
        response.setHeader('Content-Type', 'application/json');
        response.setBody('{"animals": ["majestic badger", "fluffy bunny", "scary bear", "chicken",
"mighty moose"]}');
        response.setStatusCode(200);
        return response;
    }
}
```

## 4.2 APEX SOAP CALLOUTS

Generated an Apex class using WSDL2Apex for a SOAP web service.

```
public class ParkLocator {
    public static string[] country(string theCountry) {
        ParkService.ParksImplPort parkSvc = new ParkService.ParksImplPort(); // remove space
        return parkSvc.byCountry(theCountry);
    }
}
```

### TEST CLASS:

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```
@isTest
private class ParkLocatorTest {
    @isTest static void testCallout() {
        Test.setMock(WebServiceMock.class, new ParkServiceMock ());
        String country = 'United States';
        List<String> result = ParkLocator.country(country);
        List<String> parks = new List<String>{'Yellowstone', 'Mackinac National Park', 'Yosemite'};
        System.assertEquals(parks, result);
    }
}
```

### 4.3 APEX WEB SERVICES

Created an Apex REST class that is accessible at /Accounts/<Account\_ID>/contacts. The service will return the account's ID and name plus the ID and name of all contacts associated with the account.

```
@RestResource(urlMapping='/Accounts/*/contacts')
global class AccountManager {
    @HttpGet
    global static Account getAccount() {
        RestRequest req = RestContext.request;
        String acctId = req.requestUri.substringBetween('/Accounts/', '/contacts');
        Account acc = [SELECT Id, Name, (SELECT Id, Name FROM Contacts)
                      FROM Account WHERE Id = :acctId];
        return acc;
    }
}
```

TEST CLASS:

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```
@isTest
private class AccountManagerTest {

    private static testMethod void getAccountTest1() {
        Id recordId = createTestRecord();
        // Set up a test request
        RestRequest request = new RestRequest();
        request.requestUri = 'https://na1.salesforce.com/services/apexrest/Accounts/'+ recordId +'/contacts' ;
        request.httpMethod = 'GET';
        RestContext.request = request;
        // Call the method to test
        Account thisAccount = AccountManager.getAccount();
        // Verify results
        System.assert(thisAccount != null);
        System.assertEquals('Test record', thisAccount.Name);
    }

    // Helper method
    static Id createTestRecord() {
        // Create test record
        Account TestAcc = new Account(
            Name='Test record');
        insert TestAcc;
        Contact TestCon= new Contact(
            LastName='Test',
            AccountId = TestAcc.id);
        return TestAcc.Id;
    }
}
```

**APEX SPECIALIST**

### 1. Automating record creation using Apex triggers

MaintenanceRequest Trigger:

```
trigger MaintenanceRequest on Case (before update, after update) {
    if (Trigger.isUpdate && Trigger.isAfter) {
        MaintenanceRequestHelper.updateWorkOrders(Trigger.New, Trigger.OldMap);
    }
}
```

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MaintenanceRequestHelper class:

```
public with sharing class MaintenanceRequestHelper {
    public static void updateWorkOrders(List<Case> updWorkOrders, Map<Id,Case> nonUpdCaseMap) {
        Set<Id> validIds = new Set<Id>();

        For (Case c : updWorkOrders){
            if (nonUpdCaseMap.get(c.Id).Status != 'Closed' && c.Status == 'Closed'){
                if (c.Type == 'Repair' || c.Type == 'Routine Maintenance'){
                    validIds.add(c.Id);
                }
            }
        }

        if (!validIds.isEmpty()){
            List<Case> newCases = new List<Case>();
            Map<Id,Case> closedCasesM = new Map<Id,Case>((SELECT Id, Vehicle__c, Equipment__c,
            Equipment__r.Maintenance_Cycle__c,(SELECT Id,Equipment__c,Quantity__c FROM Equipment_Maintenance_Items__r)
            FROM Case WHERE Id IN :validIds));
            Map<Id,Decimal> maintenanceCycles = new Map<Id,Decimal>();
            AggregateResult[] results = [SELECT Maintenance_Request__c, MIN(Equipment__r.Maintenance_Cycle__c)cycle
            FROM Equipment_Maintenance_Item__c WHERE Maintenance_Request__c IN :ValidIds GROUP BY
            Maintenance_Request__c];

            for (AggregateResult ar : results){
                maintenanceCycles.put((Id) ar.get('Maintenance_Request__c'), (Decimal) ar.get('cycle'));
            }

            for(Case cc : closedCasesM.values()){
                Case nc = new Case (
                    ParentId = cc.Id
                    ,
                    Status = 'New',
                    Subject = 'Routine Maintenance',
                    Type = 'Routine Maintenance',
                    Vehicle__c = cc.Vehicle__c,
                    Equipment__c =cc.Equipment__c,
                    Origin = 'Web',
                    Date_Reported__c = Date.Today()
                );

                If (maintenanceCycles.containsKey(cc.Id)){
                    nc.Date_Due__c = Date.today().addDays((Integer) maintenanceCycles.get(cc.Id));
                }

                newCases.add(nc);
            }

            insert newCases;
        }
    }
}
```

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```
List<Equipment_Maintenance_Item__c> clonedWPs = new List<Equipment_Maintenance_Item__c>();
for (Case nc : newCases){
    for (Equipment_Maintenance_Item__c wp : closedCasesM.get(nc.ParentId).Equipment_Maintenance_Items__r){
        Equipment_Maintenance_Item__c wpClone = wp.clone();
        wpClone.Maintenance_Request__c = nc.Id;
        ClonedWPs.add(wpClone);
    }
}
insert ClonedWPs;
}
```

### 2. Synchronize Salesforce data with an external system using asynchronous REST callouts.

Implementing an Apex class (called WarehouseCalloutService) that implements the queueable interface and makes a callout to the external service used for warehouse inventory management. This service receives updated values in the external system and updates the related records in Salesforce.

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```
public with sharing class WarehouseCalloutService {

    private static final String WAREHOUSE_URL = 'https://th-superbadge-apex.herokuapp.com/equipment';

    // @future(callout=true)
    public static void runWarehouseEquipmentSync(){

        Http http = new Http();
        HttpRequest request = new HttpRequest();

        request.setEndpoint(WAREHOUSE_URL);
        request.setMethod('GET');
        HttpResponse response = http.send(request);

        List<Product2> warehouseEq = new List<Product2>();

        if (response.getStatusCode() == 200){
            List<Object> jsonResponse = (List<Object>)JSON.deserializeUntyped(response.getBody());
            System.debug(response.getBody());

            for (Object eq : jsonResponse){
                Map<String, Object> mapJson = (Map<String, Object>)eq;
                Product2 myEq = new Product2();
                myEq.Replacement_Part__c = (Boolean) mapJson.get('replacement');
                myEq.Name
= (String) mapJson.get('name');
                myEq.Maintenance_Cycle__c = (Integer) mapJson.get('maintenanceperiod');
                myEq.Lifespan_Months__c = (Integer) mapJson.get('lifespan');
                myEq.Cost__c = (Decimal) mapJson.get('lifespan');
                myEq.Warehouse_SKU__c = (String) mapJson.get('sku');
                myEq.Current_Inventory__c = (Double) mapJson.get('quantity');
                warehouseEq.add(myEq);
            }

            if (warehouseEq.size() > 0){
                upsert warehouseEq;
                System.debug("Your equipment was synced with the warehouse one");
                System.debug(warehouseEq);
            }
        }
    }
}
```

Building scheduling logic that executes callout and runs code daily. The name of the schedulable class is **WarehouseSyncSchedule**, and the scheduled job is named **WarehouseSyncScheduleJob**.



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```
global class WarehouseSyncSchedule implements Schedulable {  
    global void execute(SchedulableContext ctx) {  
        WarehouseCalloutService.runWarehouseEquipmentSync();  
    }  
}
```

### 4. Test automation logic to confirm Apex trigger side effects

Building tests for all cases (positive, negative, and bulk) specified in the business requirements by using a class named **MaintenanceRequestHelperTest**.

```
@istest  
public with sharing class MaintenanceRequestHelperTest {  
  
    private static final string STATUS_NEW = 'New';  
    private static final string WORKING = 'Working';  
    private static final string CLOSED = 'Closed';  
    private static final string REPAIR = 'Repair';  
    private static final string REQUEST_ORIGIN = 'Web';  
    private static final string REQUEST_TYPE = 'Routine Maintenance';  
    private static final string REQUEST_SUBJECT = 'Testing subject';  
  
    PRIVATE STATIC Vehicle__c createVehicle(){  
        Vehicle__c Vehicle = new Vehicle__C(name = 'SuperTruck');  
        return Vehicle;  
    }  
  
    PRIVATE STATIC Product2 createEq(){  
        product2 equipment = new product2(name = 'SuperEquipment',  
                                            lifespan_months__C = 10,  
                                            maintenance_cycle__C = 10,  
                                            replacement_part__c = true);  
        return equipment;  
    }  
  
    PRIVATE STATIC Case createMaintenanceRequest(id vehicleId, id equipmentId){  
        case cs = new case(Type=REPAIR,  
                           Status=STATUS_NEW,  
                           Origin=REQUEST_ORIGIN,  
                           Subject=REQUEST_SUBJECT,  
                           Equipment__c=equipmentId,  
                           Vehicle__c=vehicleId);  
        return cs;  
    }  
  
    PRIVATE STATIC Equipment_Maintenance_Item__c createWorkPart(id equipmentId,id requestId){
```

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```
Equipment_Maintenance_Item__c wp = new Equipment_Maintenance_Item__c(Equipment__c = equipmentId,
                                                                    Maintenance_Request__c = requestId);
return wp;
}

@istest
private static void testMaintenanceRequestPositive(){
    Vehicle__c vehicle = createVehicle();
    insert vehicle;
    id vehicleId = vehicle.Id;

    Product2 equipment = createEq();
    insert equipment;
    id equipmentId = equipment.Id;

    case somethingToUpdate = createMaintenanceRequest(vehicleId,equipmentId);
    insert somethingToUpdate;

    Equipment_Maintenance_Item__c workP = createWorkPart(equipmentId,somethingToUpdate.id);
    insert workP;

    test.startTest();
    somethingToUpdate.status = CLOSED;
    update somethingToUpdate;
    test.stopTest();

    Case newReq = [Select id, subject, type, Equipment__c, Date_Reported__c, Vehicle__c, Date_Due__c
                    from case
                    where status =:STATUS_NEW];

    Equipment_Maintenance_Item__c workPart = [select id
                                                from Equipment_Maintenance_Item__c
                                                where Maintenance_Request__c =:newReq.Id];

    system.assert(workPart != null);
    system.assert(newReq.Subject != null);
    system.assertEquals(newReq.Type, REQUEST_TYPE);
    SYSTEM.assertEquals(newReq.Equipment__c, equipmentId);
    SYSTEM.assertEquals(newReq.Vehicle__c, vehicleId);
    SYSTEM.assertEquals(newReq.Date_Reported__c, system.today());
}

@istest
private static void testMaintenanceRequestNegative(){
    Vehicle__C vehicle = createVehicle();
    insert vehicle;
    id vehicleId = vehicle.Id;

    product2 equipment = createEq();
    insert equipment;
    id equipmentId = equipment.Id;

    case emptyReq = createMaintenanceRequest(vehicleId,equipmentId);
```

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```
insert emptyReq;

Equipment_Maintenance_Item__c workP = createWorkPart(equipmentId, emptyReq.Id);
insert workP;

test.startTest();
emptyReq.Status = WORKING;
update emptyReq;
test.stopTest();

list<case> allRequest = [select id
                        from case];

Equipment_Maintenance_Item__c workPart = [select id
                                           from Equipment_Maintenance_Item__c
                                           where Maintenance_Request__c = :emptyReq.Id];

system.assert(workPart != null);
system.assert(allRequest.size() == 1);
}

@istest
private static void testMaintenanceRequestBulk(){
    list<Vehicle__C> vehicleList = new list<Vehicle__C>();
    list<Product2> equipmentList = new list<Product2>();
    list<Equipment_Maintenance_Item__c> workPartList = new list<Equipment_Maintenance_Item__c>();
    list<case> requestList = new list<case>();
    list<id> oldRequestIds = new list<id>();

    for(integer i = 0; i < 300; i++){
        vehicleList.add(createVehicle());
        equipmentList.add(createEq());
    }
    insert vehicleList;
    insert equipmentList;

    for(integer i = 0; i < 300; i++){
        requestList.add(createMaintenanceRequest(vehicleList.get(i).id, equipmentList.get(i).id));
    }
    insert requestList;

    for(integer i = 0; i < 300; i++){
        workPartList.add(createWorkPart(equipmentList.get(i).id, requestList.get(i).id));
    }
    insert workPartList;

    test.startTest();
    for(case req : requestList){
        req.Status = CLOSED;
        oldRequestIds.add(req.Id);
    }
    update requestList;
    test.stopTest();
}
```

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```
list<case> allRequests = [select id
                           from case
                           where status =: STATUS_NEW];

list<Equipment_Maintenance_Item__c> workParts = [select id
                                                  from Equipment_Maintenance_Item__c
                                                  where Maintenance_Request__c in: oldRequestIds];

system.assert(allRequests.size() == 300);
}
}
```

MaintenanceRequestHelper class:

```
public with sharing class MaintenanceRequestHelper {
    public static void updateWorkOrders(List<Case> updWorkOrders, Map<Id,Case> nonUpdCaseMap) {
        Set<Id> validIds = new Set<Id>();

        For (Case c : updWorkOrders){
            if (nonUpdCaseMap.get(c.Id).Status != 'Closed' && c.Status == 'Closed'){
                if (c.Type == 'Repair' || c.Type == 'Routine Maintenance'){
                    validIds.add(c.Id);
                }
            }
        }

        if (!validIds.isEmpty()){
            List<Case> newCases = new List<Case>();
            Map<Id,Case> closedCasesM = new Map<Id,Case>([SELECT Id, Vehicle__c, Equipment__c,
Equipment__r.Maintenance_Cycle__c,(SELECT Id,Equipment__c,Quantity__c FROM Equipment_Maintenance_Items__r)
FROM Case WHERE Id IN :validIds]);
            Map<Id,Decimal> maintenanceCycles = new Map<ID,Decimal>();
            AggregateResult[] results = [SELECT Maintenance_Request__c, MIN(Equipment__r.Maintenance_Cycle__c)cycle
FROM Equipment_Maintenance_Item__c WHERE Maintenance_Request__c IN :ValidIds GROUP BY
Maintenance_Request__c];

            for (AggregateResult ar : results){
                maintenanceCycles.put((Id) ar.get('Maintenance_Request__c'), (Decimal) ar.get('cycle'));
            }

            for(Case cc : closedCasesM.values()){
                Case nc = new Case (
                    ParentId = cc.Id
                    ,
                    Status = 'New',
                    Subject = 'Routine Maintenance',
                    Type = 'Routine Maintenance',
                    Vehicle__c = cc.Vehicle__c,
                    Equipment__c =cc.Equipment__c,
                    Origin = 'Web',
```

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```
        Date_Reported__c = Date.Today()
    );
    If (maintenanceCycles.containsKey(cc.Id)){
        nc.Date_Due__c = Date.today().addDays((Integer) maintenanceCycles.get(cc.Id));
    }
    newCases.add(nc);
}
insert newCases;

List<Equipment_Maintenance_Item__c> clonedWPs = new List<Equipment_Maintenance_Item__c>();
for (Case nc : newCases){
    for (Equipment_Maintenance_Item__c wp : closedCasesM.get(nc.ParentId).Equipment_Maintenance_Items__r){
        Equipment_Maintenance_Item__c wpClone = wp.clone();
        wpClone.Maintenance_Request__c = nc.Id;
        ClonedWPs.add(wpClone);
    }
}
insert ClonedWPs;
}
```

MaintenanceRequest trigger:

```
trigger MaintenanceRequest on Case (before update, after update) {
    if (Trigger.isUpdate && Trigger.isAfter){
        MaintenanceRequestHelper.updateWorkOrders(Trigger.New, Trigger.OldMap);
    }
}
```

### 5. Test integration logic using callout mocks

Building tests for callout using the included class for the callout mock (**WarehouseCalloutServiceMock**) and callout test class (**WarehouseCalloutServiceTest**) in the package.

WarehouseCalloutService class:

```
public with sharing class WarehouseCalloutService {

    private static final String WAREHOUSE_URL = 'https://th-superbadge-apex.herokuapp.com/equipment';
```

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```
//@future(callout=true)
public static void runWarehouseEquipmentSync(){

    Http http = new Http();
    HttpRequest request = new HttpRequest();

    request.setEndpoint(WAREHOUSE_URL);
    request.setMethod('GET');
    HttpResponse response = http.send(request);

    List<Product2> warehouseEq = new List<Product2>();

    if (response.getStatusCode() == 200){
        List<Object> jsonResponse = (List<Object>)JSON.deserializeUntyped(response.getBody());
        System.debug(response.getBody());

        for (Object eq : jsonResponse){
            Map<String, Object> mapJson = (Map<String, Object>)eq;
            Product2 myEq = new Product2();
            myEq.Replacement_Part__c = (Boolean) mapJson.get('replacement');
            myEq.Name
= (String) mapJson.get('name');
            myEq.Maintenance_Cycle__c = (Integer) mapJson.get('maintenanceperiod');
            myEq.Lifespan_Months__c = (Integer) mapJson.get('lifespan');
            myEq.Cost__c = (Decimal) mapJson.get('lifespan');
            myEq.Warehouse_SKU__c = (String) mapJson.get('sku');
            myEq.Current_Inventory__c = (Double) mapJson.get('quantity');
            warehouseEq.add(myEq);
        }

        if (warehouseEq.size() > 0){
            upsert warehouseEq;
            System.debug('Your equipment was synced with the warehouse one');
            System.debug(warehouseEq);
        }
    }
}
}
```

WarehouseCalloutServiceTest class:

```
@isTest
private class WarehouseCalloutServiceTest {
    @isTest
    static void testWareHouseCallout(){
        Test.startTest();
        // implement mock callout test here
    }
}
```

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```
Test.setMock(HTTPCalloutMock.class, new WarehouseCalloutServiceMock());
WarehouseCalloutService.runWarehouseEquipmentSync();
Test.stopTest();
System.assertEquals(1, [SELECT count() FROM Product2]);
}
}
```

WarehouseCalloutServiceMock class:

```
@isTest
global class WarehouseCalloutServiceMock implements HttpCalloutMock {
    // implement http mock callout
    global static HttpResponse respond(HttpRequest request){

        System.assertEquals('https://th-superbadge-apex.herokuapp.com/equipment'
, request.getEndpoint());
        System.assertEquals('GET', request.getMethod());

        // Create a fake response
        HttpResponse response = new HttpResponse();
        response.setHeader('Content-Type', 'application/json');
        response.setBody('{"_id":"55d66226726b611100aaf741","replacement":false,"quantity":5,"name":"Generator 1000
kW","maintenanceperiod":365,"lifespan":120,"cost":5000,"sku":"100003"}');
        response.setStatusCode(200);
        return response;
    }
}
```

### 6. Test scheduling logic to confirm action gets queued

Building unit tests for the class **WarehouseSyncSchedule** in a class named **WarehouseSyncScheduleTest**.

WarehouseSyncSchedule class:

```
global class WarehouseSyncSchedule implements Schedulable {
    global void execute(SchedulableContext ctx) {

        WarehouseCalloutService.runWarehouseEquipmentSync();
    }
}
```

WarehouseSyncScheduleTest class:

```
@isTest
public class WarehouseSyncScheduleTest {

    @isTest static void WarehousescheduleTest(){
```

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```
String scheduleTime = '00 00 01 * * ?';
Test.startTest();
Test.setMock(HttpCalloutMock.class, new WarehouseCalloutServiceMock());
String jobId=System.schedule('Warehouse Time To Schedule to Test', scheduleTime, new
WarehouseSyncSchedule());
Test.stopTest();
//Contains schedule information for a scheduled job. CronTrigger is similar to a cron job on UNIX systems.
// This object is available in API version 17.0 and later.
CronTrigger a=[SELECT Id FROM CronTrigger where NextFireTime > today];
System.assertEquals(jobID, a.Id,'Schedule ');
}
}
```