

APEX TRIGGERS

Get Started with Apex Trigger :

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

Bulk Apex Triggers :

```
trigger ClosedOpportunityTrigger on Opportunity (after insert, after update) {
    List<Task> tasklist = new List<Task>();
    for(Opportunity opp: Trigger.New){
        if(opp.StageName == 'Closed Won'){
            Tasklist.add(new Task(Subject = 'Follow Up Test Task',WhatId = opp.Id));
        }
    }
    if(tasklist.size()>0){
        insert tasklist;
    }
}
```

APEX TESTING

Get Started with Apex Unit Tests :

-> Create an Apex class:

```
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
    @TestVisible 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
    @TestVisible 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;
    }
}

```

-> Place the unit tests in a separate test class:

```

@Test
public class TestVerifyDate {
    @Test static void Test_CheckDates_case1(){
        Date D= VerifyDate.CheckDates(date.parse('01/01/2020'),
date.parse('01/05/2020'));
        System.assertEquals(date.parse('01/01/2020'),D);
    }
    @Test static void Test_CheckDates_case2(){
        Date D= VerifyDate.CheckDates(date.parse('01/01/2020'),
date.parse('05/05/2020'));
        System.assertEquals(date.parse('01/31/2020'),D);
    }
    @Test static void Test_DateWithin30Days_case1(){
        Boolean flag = VerifyDate.DateWithin30Days(date.parse('01/01/2020'),
date.parse('12/30/2019'));
        System.assertEquals(false,flag);
    }
    @Test static void Test_DateWithin30Days_case2(){
        Boolean flag = VerifyDate.DateWithin30Days(date.parse('01/01/2020'),
date.parse('02/02/2020'));
        System.assertEquals(false,flag);
    }
    @Test static void Test_DateWithin30Days_case3(){
        Boolean flag = VerifyDate.DateWithin30Days(date.parse('01/01/2020'),
date.parse('01/15/2020'));
        System.assertEquals(true,flag);
    }
    @Test static void Test_SetEndOfMonthDate(){
        Date returndate = VerifyDate.SetEndOfMonthDate(date.parse('01/01/2020'));
    }
}

```

```
}  
}
```

Test Apex Triggers :

-> Create an Apex trigger on the Contact object :

```
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');  
        }  
    }  
}
```

-> Place the unit tests in a separate test class :

```
@isTest  
public class TestRestrictContactByName {  
    @isTest static void Test_insertupdateContact(){  
        Contact cnt = new Contact();  
        cnt.LastName = 'INVALIDNAME';  
  
        Test.startTest();  
        Database.SaveResult result = Database.insert(cnt,false);  
        Test.stopTest();  
  
        System.assert(!result.isSuccess());  
        System.assert(result.getErrors().size()>0);  
        System.assertEquals('The Last Name "INVALIDNAME" is not allowed for  
DML', result.getErrors()[0].getMessage());  
    }  
}
```

Create Test Data for Apex Tests :

-> Create an Apex class in the public scope :

```
public class RandomContactFactory {
    public static List<Contact> generateRandomContacts(Integer numcnt,string
lastname){
    List<Contact> contacts = new List<Contact>();
    for(Integer i=0;i<numcnt;i++){
        Contact cnt = new Contact(FirstName = 'Test '+i, LastName= lastname);
        contacts.add(cnt);
    }
    return contacts;
}
}
```

Asynchronous Apex

Use Future Methods:

-> Create an Apex class:

```
public class AccountProcessor{
    @future
    public static void countContacts(List<Id>accountIds){
        List<Account> accountsToUpdate = new List<Account>();
        List<Account> accounts = [Select Id,Name,(Select Id from Contacts)from Account
Where Id in :accountIds];
        For(Account acc:accounts){
            List<Contact> contactlist = acc.Contacts;
            acc.Number_Of_Contacts__c = contactlist.size();
            accountsToUpdate.add(acc);
        }
        update accountsToUpdate;
    }
}
```

```

    }
}

```

-> Create an Apex test class:

```

@IsTest
private class AccountProcessorTest{
    @IsTest
    private static void testCountContacts(){
        Account newAccount=new Account(Name='Test Account');
        insert newAccount;
        Contact newContact1=new
Contact(FirstName='John',LastName='Doe',AccountId=newAccount.Id);
        insert newContact1;
        Contact newContact2=new
Contact(FirstName='Jane',LastName='Doe',AccountId=newAccount.Id);
        insert newContact2;
        List<Id>accountIds=new List<Id>();
        accountIds.add(newAccount.Id);
        Test.startTest();
        AccountProcessor.countContacts(accountIds);
        Test.stopTest();
    }
}

```

Use Batch Apex :

-> Create an Apex class:

```

global class LeadProcessor implements Database.Batchable<sObject>{
    global Integer count=0;
    global Database.QueryLocator start(Database.BatchableContext bc){
        return Database.getQueryLocator('SELECT ID,LeadSource FROM Lead');
    }
    global void execute (Database.BatchableContext bc,List<Lead> L_list){
        List<lead> L_list_new = new List<lead>();
        for(lead L:L_list){
            L.leadsource='Dreamforce';
            L_list_new.add(L);
            count+=1;
        }
        update L_list_new;
    }
}

```

```

    }
    global void finish(Database.BatchableContext bc){
        system.debug('count=+count');
    }
}

```

-> Create an Apex test class:

```

@isTest
public class LeadProcessorTest{
    @isTest
    public static void testit(){
        List<lead> L_list=new List<lead>();
        for(Integer i=0;i<200;i++){
            Lead L = new lead();
            L.LastName ='name'+ i;
            L.Company = 'Company';
            L.Status = 'Random Status';
            L_list.add(L);
        }
        insert L_list;
        Test.startTest();
        LeadProcessor lp =new LeadProcessor();
        Id batchId = Database.executeBatch(lp);
        Test.stopTest();
    }
}

```

Control Processes with Queueable Apex :

-> Create an Apex class :

```

public class AddPrimaryContact implements Queueable{
    private Contact con;
    private String state;
    public AddPrimaryContact(Contact con,String state){
        this.con=con;
        this.state=state;
    }
    public void execute(QueueableContext context){

```

```

        List<Account> accounts=[Select Id,Name,(Select FirstName,LastName,Id from
contacts)
                                from Account where BillingState=:state Limit 200];
        List<Contact> primaryContacts = new List<Contact>();
        for(Account acc:accounts){
            Contact c = con.clone();
            c.AccountId=acc.Id;
            primaryContacts.add(c);
        }
        if(primaryContacts.size() > 0){
            insert primaryContacts;
        }
    }
}

```

-> Create an Apex test class:

```

@isTest
public class AddPrimaryContactTest{
    static testmethod void testQueueable(){
        List<Account>testAccounts=new List<Account>();
        for(Integer i=0;i<50;i++){
            testAccounts.add(new Account(Name='Account'+i,BillingState='CA'));
        }
        for(Integer j=0;j<50;j++){
            testAccounts.add(new Account(Name='Account'+j,Billingstate='NY'));
        }
        insert testAccounts;
        Contact testContact=new Contact(FirstName='John',LastName='Doe');
        insert testContact;
        AddPrimaryContact addit=new addPrimaryContact(testContact,'CA');
        Test.startTest();
        system.enqueueJob(addit);
        Test.stopTest();
        System.assertEquals(50,[Select count() from Contact where accountId in (Select Id
from Account where BillingState='CA')]);
    }
}

```


Schedule Jobs Using the Apex Scheduler:

-> Create an Apex class:

```
global class DailyLeadProcessor implements Schedulable {
    global void execute(SchedulableContext ctx) {
        List<Lead> lList = [Select Id, LeadSource from Lead where LeadSource = null];

        if(!lList.isEmpty()) {
            for(Lead l: lList) {
                l.LeadSource = 'Dreamforce';
            }
            update lList;
        }
    }
}
```

-> Create an Apex test class:

```
@isTest
public class DailyLeadProcessorTest {
    //Seconds Minutes Hours Day_of_month Month Day_of_week optional_year
    public static String CRON_EXP = '0 0 0 15 4 ? 2023';

    static testmethod void testScheduledJob(){
        List<Lead> leads = new List<Lead>();

        for(Integer i = 0; i < 200; i++){
            Lead lead = new Lead(LastName = 'Test ' + i, LeadSource = '', Company = 'Test
Company ' + i, Status = 'Open - Not Contacted');
            leads.add(lead);
        }

        insert leads;

        Test.startTest();
        // Schedule the test job
        String jobId = System.schedule('Update LeadSource to DreamForce', CRON_EXP,
new DailyLeadProcessor());

        // Stopping the test will run the job synchronously
    }
}
```

```

        Test.stopTest();
    }

}

```

Apex Integration Services

Apex REST Callouts :

-> Create an Apex class:

```

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');
    }
}

```

-> Create a test class:

```

@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 );
    }
}

```

```
}
```

Apex SOAP Callouts:

-> Create a class:

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

-> Create a test class:

```
@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);  
    }  
}
```

Apex Web Services :

-> Create an Apex class :

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

```
}  
}
```

-> Create unit tests :

```
@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. Automate record creation using Apex triggers :

-> Create a trigger : MaintenanceRequest

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

-> Create a class: MaintenanceRequestHelper

```
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);
                }
            }
        }

        //When an existing maintenance request of type Repair or Routine Maintenance is
        closed,
        //create a new maintenance request for a future routine checkup.
        if (!validIds.isEmpty()){
            Map<Id,Case> closedCases = 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>();

//calculate the maintenance request due dates by using the maintenance cycle
defined on the related equipment records.
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'));
}

List<Case> newCases = new List<Case>();
for(Case cc : closedCases.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 multiple pieces of equipment are used in the maintenance request,
    //define the due date by applying the shortest maintenance cycle to today's
date.
    //If (maintenanceCycles.containsKey(cc.Id)){
        nc.Date_Due__c = Date.today().addDays((Integer)
maintenanceCycles.get(cc.Id));
    //} else {
        // nc.Date_Due__c = Date.today().addDays((Integer)
cc.Equipment__r.maintenance_Cycle__c);
    //}

    newCases.add(nc);
}

```

```

insert newCases;

List<Equipment_Maintenance_Item__c> clonedList = new
List<Equipment_Maintenance_Item__c>();
for (Case nc : newCases){
    for (Equipment_Maintenance_Item__c clonedListItem :
closedCases.get(nc.ParentId).Equipment_Maintenance_Items__r){
        Equipment_Maintenance_Item__c item = clonedListItem.clone();
        item.Maintenance_Request__c = nc.Id;
        clonedList.add(item);
    }
}
insert clonedList;
}
}
}

```

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

-> Create a class : WarehouseCalloutService

```

public with sharing class WarehouseCalloutService implements Queueable {
    private static final String WAREHOUSE_URL = 'https://th-superbadge-
apex.herokuapp.com/equipment';

```

//Write a class that makes a REST callout to an external warehouse system to get a list of equipment that needs to be updated.

//The callout's JSON response returns the equipment records that you upsert in Salesforce.

```

@future(callout=true)
public static void runWarehouseEquipmentSync(){
    System.debug('go into runWarehouseEquipmentSync');
    Http http = new Http();
    HttpRequest request = new HttpRequest();

    request.setEndpoint(WAREHOUSE_URL);
    request.setMethod('GET');

```

```

    HttpResponse response = http.send(request);

    List<Product2> product2List = new List<Product2>();
    System.debug(response.getStatusCode());
    if (response.getStatusCode() == 200){
        List<Object> jsonResponse =
        (List<Object>)JSON.deserializeUntyped(response.getBody());
        System.debug(response.getBody());

        //class maps the following fields:
        //warehouse SKU will be external ID for identifying which equipment records to
        update within Salesforce
        for (Object jR : jsonResponse){
            Map<String,Object> mapJson = (Map<String,Object>)jR;
            Product2 product2 = new Product2();
            //replacement part (always true),
            product2.Replacement_Part__c = (Boolean) mapJson.get('replacement');
            //cost
            product2.Cost__c = (Integer) mapJson.get('cost');
            //current inventory
            product2.Current_Inventory__c = (Double) mapJson.get('quantity');
            //lifespan
            product2.Lifespan_Months__c = (Integer) mapJson.get('lifespan');
            //maintenance cycle
            product2.Maintenance_Cycle__c = (Integer) mapJson.get('maintenanceperiod');
            //warehouse SKU
            product2.Warehouse_SKU__c = (String) mapJson.get('sku');

            product2.Name = (String) mapJson.get('name');
            product2.ProductCode = (String) mapJson.get('_id');
            product2List.add(product2);
        }

        if (product2List.size() > 0){
            upsert product2List;
            System.debug('Your equipment was synced with the warehouse one');
        }
    }
}

public static void execute (QueueableContext context){

```



```

        System.debug('start runWarehouseEquipmentSync');
        runWarehouseEquipmentSync();
        System.debug('end runWarehouseEquipmentSync');
    }
}

```

3.Schedule synchronization using Apex code:

-> Create a class : WarehouseSyncSchedule

```

global with sharing class WarehouseSyncSchedule implements Schedulable {
    // implement scheduled code here
    global void execute (SchedulableContext ctx){
        System.enqueueJob(new WarehouseCalloutService());
    }
}

```

-> Create a class : WarehouseCalloutService

```

public with sharing class WarehouseCalloutService implements Queueable {
    private static final String WAREHOUSE_URL = 'https://th-superbadge-
apex.herokuapp.com/equipment';

```

//Write a class that makes a REST callout to an external warehouse system to get a list of equipment that needs to be updated.

//The callout's JSON response returns the equipment records that you upsert in Salesforce.

```

    @future(callout=true)
    public static void runWarehouseEquipmentSync(){
        System.debug('go into runWarehouseEquipmentSync');
        Http http = new Http();
        HttpRequest request = new HttpRequest();

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

        List<Product2> product2List = new List<Product2>();
    }
}

```

```

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

            //class maps the following fields:
            //warehouse SKU will be external ID for identifying which equipment records to
update within Salesforce
            for (Object jR : jsonResponse){
                Map<String,Object> mapJson = (Map<String,Object>)jR;
                Product2 product2 = new Product2();
                //replacement part (always true),
                product2.Replacement_Part__c = (Boolean) mapJson.get('replacement');
                //cost
                product2.Cost__c = (Integer) mapJson.get('cost');
                //current inventory
                product2.Current_Inventory__c = (Double) mapJson.get('quantity');
                //lifespan
                product2.Lifespan_Months__c = (Integer) mapJson.get('lifespan');
                //maintenance cycle
                product2.Maintenance_Cycle__c = (Integer) mapJson.get('maintenanceperiod');
                //warehouse SKU
                product2.Warehouse_SKU__c = (String) mapJson.get('sku');

                product2.Name = (String) mapJson.get('name');
                product2.ProductCode = (String) mapJson.get('_id');
                product2List.add(product2);
            }

            if (product2List.size() > 0){
                upsert product2List;
                System.debug('Your equipment was synced with the warehouse one');
            }
        }
    }

    public static void execute (QueueableContext context){
        System.debug('start runWarehouseEquipmentSync');
        runWarehouseEquipmentSync();
        System.debug('end runWarehouseEquipmentSync');
    }

```

```

    }
}

```

4. Test automation logic to confirm Apex trigger side effects

-> Create a trigger :

```

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

```

-> Create a 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);
                }
            }
        }
    }
}

```

//When an existing maintenance request of type Repair or Routine Maintenance is closed,

//create a new maintenance request for a future routine checkup.

if (!validIds.isEmpty()){

```

    Map<Id,Case> closedCases = 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>();

//calculate the maintenance request due dates by using the maintenance cycle

defined on the related equipment records.

```
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'));  
}
```

```
List<Case> newCases = new List<Case>();
```

```
for(Case cc : closedCases.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 multiple pieces of equipment are used in the maintenance request,  
    //define the due date by applying the shortest maintenance cycle to today's
```

date.

```
    //If (maintenanceCycles.containsKey(cc.Id)){  
        nc.Date_Due__c = Date.today().addDays((Integer)  
maintenanceCycles.get(cc.Id));  
    //} else {  
        //    nc.Date_Due__c = Date.today().addDays((Integer)  
cc.Equipment__r.maintenance_Cycle__c);  
    //}
```

```
    newCases.add(nc);
```

```
}
```

```
insert newCases;
```

```

        List<Equipment_Maintenance_Item__c> clonedList = new
List<Equipment_Maintenance_Item__c>();
        for (Case nc : newCases){
            for (Equipment_Maintenance_Item__c clonedListItem :
closedCases.get(nc.ParentId).Equipment_Maintenance_Items__r){
                Equipment_Maintenance_Item__c item = clonedListItem.clone();
                item.Maintenance_Request__c = nc.Id;
                clonedList.add(item);
            }
        }
        insert clonedList;
    }
}
}
}

```

-> Create a test class :

```

@isTest
public with sharing class MaintenanceRequestHelperTest {

    // createVehicle
    private static Vehicle__c createVehicle(){
        Vehicle__c vehicle = new Vehicle__C(name = 'Testing Vehicle');
        return vehicle;
    }

    // createEquipment
    private static Product2 createEquipment(){
        product2 equipment = new product2(name = 'Testing equipment',
            lifespan_months__c = 10,
            maintenance_cycle__c = 10,
            replacement_part__c = true);
        return equipment;
    }

    // createMaintenanceRequest
    private static Case createMaintenanceRequest(id vehicleId, id equipmentId){
        case cse = new case(Type='Repair',
            Status='New',
            Origin='Web',
            Subject='Testing subject',
            Equipment__c=equipmentId,

```

```

        Vehicle__c=vehicleId);
    return cse;
}

// createEquipmentMaintenanceltem
private static Equipment_Maintenance_Item__c createEquipmentMaintenanceltem(id
equipmentId,id requestId){
    Equipment_Maintenance_Item__c equipmentMaintenanceltem = new
Equipment_Maintenance_Item__c(
    Equipment__c = equipmentId,
    Maintenance_Request__c = requestId);
    return equipmentMaintenanceltem;
}

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

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

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

    Equipment_Maintenance_Item__c equipmentMaintenanceltem =
createEquipmentMaintenanceltem(equipmentId,createdCase.id);
    insert equipmentMaintenanceltem;

    test.startTest();
    createdCase.status = 'Closed';
    update createdCase;
    test.stopTest();

    Case newCase = [Select id,
                    subject,
                    type,
                    Equipment__c,
                    Date_Reported__c,

```

```
Vehicle__c,  
Date_Due__c  
from case  
where status ='New'];
```

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

```
list<case> allCase = [select id from case];  
system.assert(allCase.size() == 2);
```

```
system.assert(newCase != null);  
system.assert(newCase.Subject != null);  
system.assertEquals(newCase.Type, 'Routine Maintenance');  
SYSTEM.assertEquals(newCase.Equipment__c, equipmentId);  
SYSTEM.assertEquals(newCase.Vehicle__c, vehicleId);  
SYSTEM.assertEquals(newCase.Date_Reported__c, system.today());  
}
```

```
@isTest
```

```
private static void testNegative(){  
    Vehicle__C vehicle = createVehicle();  
    insert vehicle;  
    id vehicleId = vehicle.Id;
```

```
product2 equipment = createEquipment();  
insert equipment;  
id equipmentId = equipment.Id;
```

```
case createdCase = createMaintenanceRequest(vehicleId,equipmentId);  
insert createdCase;
```

```
Equipment_Maintenance_Item__c workP =  
createEquipmentMaintenanceItem(equipmentId, createdCase.Id);  
insert workP;
```

```
test.startTest();  
createdCase.Status = 'Working';  
update createdCase;  
test.stopTest();
```

```

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

Equipment_Maintenance_Item__c equipmentMaintenanceltem = [select id
                    from Equipment_Maintenance_Item__c
                    where Maintenance_Request__c = :createdCase.Id];

system.assert(equipmentMaintenanceltem != null);
system.assert(allCase.size() == 1);
}

@isTest
private static void testBulk(){
    list<Vehicle__C> vehicleList = new list<Vehicle__C>();
    list<Product2> equipmentList = new list<Product2>();
    list<Equipment_Maintenance_Item__c> equipmentMaintenanceltemList = new
list<Equipment_Maintenance_Item__c>();
    list<case> caseList = new list<case>();
    list<id> oldCaseIds = new list<id>();

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

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

    for(integer i = 0; i < 300; i++){

equipmentMaintenanceltemList.add(createEquipmentMaintenanceltem(equipmentList.g
et(i).id, caseList.get(i).id));
    }
    insert equipmentMaintenanceltemList;

    test.startTest();
    for(case cs : caseList){

```



```

        cs.Status = 'Closed';
        oldCaseIds.add(cs.Id);
    }
    update caseList;
    test.stopTest();

    list<case> newCase = [select id
                        from case
                        where status ='New'];

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

    system.assert(newCase.size() == 300);

    list<case> allCase = [select id from case];
    system.assert(allCase.size() == 600);
}
}

```

5. Test integration logic using callout mocks :

-> Create a class :

```

public with sharing class WarehouseCalloutService implements Queueable {
    private static final String WAREHOUSE_URL = 'https://th-superbadge-
apex.herokuapp.com/equipment';

```

//Write a class that makes a REST callout to an external warehouse system to get a list of equipment that needs to be updated.

//The callout's JSON response returns the equipment records that you upsert in Salesforce.

```

@future(callout=true)
public static void runWarehouseEquipmentSync(){
    System.debug('go into runWarehouseEquipmentSync');
}

```

```

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

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

List<Product2> product2List = new List<Product2>();
System.debug(response.getStatusCode());
if (response.getStatusCode() == 200){
    List<Object> jsonResponse =
(List<Object>)JSON.deserializeUntyped(response.getBody());
    System.debug(response.getBody());

    //class maps the following fields:
    //warehouse SKU will be external ID for identifying which equipment
records to update within Salesforce
    for (Object jR : jsonResponse){
        Map<String,Object> mapJson = (Map<String,Object>)jR;
        Product2 product2 = new Product2();
        //replacement part (always true),
        product2.Replacement_Part__c = (Boolean)
mapJson.get('replacement');
        //cost
        product2.Cost__c = (Integer) mapJson.get('cost');
        //current inventory
        product2.Current_Inventory__c = (Double) mapJson.get('quantity');
        //lifespan
        product2.Lifespan_Months__c = (Integer) mapJson.get('lifespan');
        //maintenance cycle
        product2.Maintenance_Cycle__c = (Integer)
mapJson.get('maintenanceperiod');
        //warehouse SKU
        product2.Warehouse_SKU__c = (String) mapJson.get('sku');

        product2.Name = (String) mapJson.get('name');
        product2.ProductCode = (String) mapJson.get('_id');
    }
}

```

```

        product2List.add(product2);
    }

    if (product2List.size() > 0){
        upsert product2List;
        System.debug('Your equipment was synced with the warehouse one');
    }
}

}

public static void execute (QueueableContext context){
    System.debug('start runWarehouseEquipmentSync');
    runWarehouseEquipmentSync();
    System.debug('end runWarehouseEquipmentSync');
}

}

```

-> Create a test class:

```

@Test
private class WarehouseCalloutServiceTest {
    // implement your mock callout test here
    @Test
    static void testWarehouseCallout() {
        test.startTest();
        test.setMock(HttpCalloutMock.class, new WarehouseCalloutServiceMock());
        WarehouseCalloutService.execute(null);
        test.stopTest();

        List<Product2> product2List = new List<Product2>();
        product2List = [SELECT ProductCode FROM Product2];

        System.assertEquals(3, product2List.size());
        System.assertEquals('55d66226726b611100aaf741',
product2List.get(0).ProductCode);
        System.assertEquals('55d66226726b611100aaf742',
product2List.get(1).ProductCode);
        System.assertEquals('55d66226726b611100aaf743',
product2List.get(2).ProductCode);
    }
}

```

```
}
}
```

-> Create a mock test class:

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

        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"},{"_id":"55d662267
        26b611100aaf742","replacement":true,"quantity":183,"name":"Cooling
        Fan","maintenanceperiod":0,"lifespan":0,"cost":300,"sku":"100004"},{"_id":"55d66226726b6
        11100aaf743","replacement":true,"quantity":143,"name":"Fuse
        20A","maintenanceperiod":0,"lifespan":0,"cost":22,"sku":"100005"}]');
        response.setStatusCode(200);

        return response;
    }
}
```

6. Test scheduling logic to confirm action gets queued:

-> Create a class :

```
global with sharing class WarehouseSyncSchedule implements Schedulable {
    // implement scheduled code here
    global void execute (SchedulableContext ctx){
        System.enqueueJob(new WarehouseCalloutService());
    }
}
```

-> Create a test class:

```
@isTest
public with sharing class WarehouseSyncScheduleTest {
    // implement scheduled code here
    @isTest static void test() {
```

```

String scheduleTime = '00 00 00 * * ? *';
Test.startTest();
Test.setMock(HttpCalloutMock.class, new WarehouseCalloutServiceMock());
String jobId = System.schedule('Warehouse Time to Schedule to test',
scheduleTime, new WarehouseSyncSchedule());
CronTrigger c = [SELECT State FROM CronTrigger WHERE Id =: jobId];
System.assertEquals('WAITING', String.valueOf(c.State), 'JobId does not match');

Test.stopTest();
}
}

```

-> Create a mock test class :

```

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

        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"},{"_id":"55d662267
26b611100aaf742","replacement":true,"quantity":183,"name":"Cooling
Fan","maintenanceperiod":0,"lifespan":0,"cost":300,"sku":"100004"},{"_id":"55d66226726b6
11100aaf743","replacement":true,"quantity":143,"name":"Fuse
20A","maintenanceperiod":0,"lifespan":0,"cost":22,"sku":"100005"}');
        response.setStatusCode(200);

        return response;
    }
}

```

