**Apex Triggers:**

1)Get Started with Apex Triggers:

Challenge:

**Create an Apex trigger**

Create 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. Fire the trigger before inserting an account or updating an account.

**Pre-Work:**  
Add a checkbox field to the Account object:

* Field Label: Match Billing Address
* Field Name: Match\_Billing\_Address  
  Note: The resulting API Name should be Match\_Billing\_Address\_\_c.
* Create an Apex trigger:
  + Name: AccountAddressTrigger
  + Object: **Account**
  + Events: before insert and before update
  + Condition: Match Billing Address is true
  + Operation: set the Shipping Postal Code to match the Billing Postal Code

**My Work:**

## Code for AccountAddressTrigger:

## trigger AccountAddressTrigger on Account (before insert,before update) { for(Account account:Trigger.New){ if(account.Match\_Billing\_Address\_\_c==True){ account.ShippingPostalCode=account.BillingPostalCode; } }

2)Bulk Apex Triggers**:**

Challenge:

**Create a Bulk Apex trigger**

Create a bulkified Apex trigger that adds a follow-up task to an opportunity if its stage is Closed Won. Fire the Apex trigger after inserting or updating an opportunity.

* Create an Apex trigger:
  + Name: ClosedOpportunityTrigger
  + Object: **Opportunity**
  + Events: after insert and after update
  + Condition: Stage is Closed Won
  + Operation: Create a task:
    - Subject: Follow Up Test Task
    - WhatId: the opportunity ID (associates the task with the opportunity)
  + Bulkify the Apex trigger so that it can insert or update 200 or more opportunities

**My Work:**

Code for ClosedOpportunityTrigger:

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:

1)Get Started with Apex Unit Tests:

Challenge:

**Create a Unit Test for a Simple Apex Class**

Create and install 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. You'll copy the code for the class from GitHub. Then write unit tests that achieve 100% code coverage.

* Create an Apex class:
  + Name: VerifyDate
  + Code: **[Copy from GitHub](https://github.com/developerforce/trailhead-code-samples/blob/master/VerifyDate.cls)**
* Place the unit tests in a separate test class:
  + Name: TestVerifyDate
  + Goal: 100% code coverage
* Run your test class at least once

**My Work:**

Code for VerifyDate Class:

public class VerifyDate {

public static Date CheckDates(Date date1, Date date2) {

if(DateWithin30Days(date1,date2)) {

return date2;

} else {

return SetEndOfMonthDate(date1);

}

}

@TestVisible private static Boolean DateWithin30Days(Date date1, Date date2) {

if( date2 < date1) { return false; }

Date date30Days = date1.addDays(30); //create a date 30 days away from date1

if( date2 >= date30Days ) { return false; }

else { return true; }

}

@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;

}

}

Code for TestVerifyDate Class:

@isTest

private class TestVerifyDate {

@isTest static void Test\_CheckDates\_case1(){

Date D =VerifyDate.CheckDates(date.parse('01/01/2020'),date.parse('01/05/2020'));

System.assertEquals(date.parse('01/05/2020'),D);

}

@isTest 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);

}

@isTest static void Test\_DateWithin300Days\_case1(){

Boolean flag = VerifyDate.DateWithin30Days(date.parse('01/01/2020'),date.parse('12/30/2019'));

System.assertEquals(false,flag);

}

@isTest static void Test\_DateWithin300Days\_case2(){

Boolean flag = VerifyDate.DateWithin30Days(date.parse('01/01/2020'),date.parse('02/02/2020'));

System.assertEquals(false,flag);

}

@isTest static void Test\_DateWithin300Days\_case3(){

Boolean flag = VerifyDate.DateWithin30Days(date.parse('01/01/2020'),date.parse('01/15/2020'));

System.assertEquals(true,flag);

}

}

2)Test Apex Triggers:

Challenge:

**Create a Unit Test for a Simple Apex Trigger**

Create and install a simple Apex trigger which blocks inserts and updates to any contact with a last name of 'INVALIDNAME'. You'll copy the code for the class from GitHub. Then write unit tests that achieve 100% code coverage.

* Create an Apex trigger on the Contact object
  + Name: RestrictContactByName
  + Code: **[Copy from GitHub](https://github.com/developerforce/trailhead-code-samples/blob/master/RestrictContactByName.cls)**
* Place the unit tests in a separate test class
  + Name: TestRestrictContactByName
  + Goal: 100% test coverage
* Run your test class at least once

**My Work:**

Code for RestrictContactByName Trigger:

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');

}

}

}

Code for TestRestrictContactByName 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());

}

}

3)Create Test Data for Apex Tests:

Challenge:

**Create a Contact Test Factory**

Create an Apex class that returns a list of contacts based on two incoming parameters: the number of contacts to generate and the last name. Do not insert the generated contact records into the database.  
  
NOTE: For the purposes of verifying this hands-on challenge, don't specify the @isTest annotation for either the class or the method, even though it's usually required.

* Create an Apex class in the public scope
  + Name: RandomContactFactory (without the @isTest annotation)
* Use a Public Static Method to consistently generate contacts with unique first names based on the iterated number in the format Test 1, Test 2 and so on.
  + Method Name: generateRandomContacts (without the @isTest annotation)
  + Parameter 1: An integer that controls the number of contacts being generated with unique first names
  + Parameter 2: A string containing the last name of the contacts
  + Return Type: List < Contact >

**My Work:**

Code for RandomContactFactory Class:

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:**

1)Use Future Methods:

Challenge:

**Create an Apex class that uses the @future annotation to update Account records.**

Create 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. Write unit tests that achieve 100% code coverage for the class. Every hands-on challenge in this module asks you to create a test class.

* Create a field on the Account object:
  + Label: Number Of Contacts
  + Name: Number\_Of\_Contacts
  + Type: **Number**
  + This field will hold the total number of Contacts for the Account
* Create an Apex class:
  + Name: AccountProcessor
  + Method name: countContacts
  + The method must accept a List of Account IDs
  + The method must use the @future annotation
  + The method counts the number of Contact records associated to each Account ID passed to the method and updates the 'Number\_Of\_Contacts\_\_c' field with this value
* Create an Apex test class:
  + Name: AccountProcessorTest
  + The unit tests must cover all lines of code included in the **AccountProcessor** class, resulting in 100% code coverage.
* Before verifying this challenge, run your test class at least once using the Developer Console Run All feature

**My Work:**

Code for AccountProcessor 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;

}

}

Code for AccountProcessorTest 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();

}

}

2)Use Batch Apex:

Challenge:

**Create an Apex class that uses Batch Apex to update Lead records.**

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

* Create an Apex class:
  + Name: LeadProcessor
  + Interface: Database.Batchable
  + Use a QueryLocator in the start method to collect all Lead records in the org
  + The execute method must update all Lead records in the org with the LeadSource value of Dreamforce
* Create an Apex test class:
  + Name: LeadProcessorTest
  + In the test class, insert 200 Lead records, execute the LeadProcessor Batch class and test that all Lead records were updated correctly
  + The unit tests must cover all lines of code included in the **LeadProcessor** class, resulting in 100% code coverage
* Before verifying this challenge, run your test class at least once using the Developer Console Run All feature

**My Work:**

Code for LeadProcessor 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);

}

}

Code for LeadProcessorTest 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();

}

}

3)Control Processes with Queueable Apex:

Challenge:

**Create a Queueable Apex class that inserts Contacts for Accounts.**

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

* Create an Apex class:
  + Name: AddPrimaryContact
  + Interface: Queueable
  + Create a constructor for the class that accepts as its first argument a Contact sObject and a second argument as a string for the State abbreviation
  + The execute method must query for a maximum of 200 Accounts with the BillingState specified by the State abbreviation passed into the constructor and insert the Contact sObject record associated to each Account. Look at the sObject clone() method.
* Create an Apex test class:
  + Name: AddPrimaryContactTest
  + In the test class, insert 50 Account records for BillingState NY and 50 Account records for BillingState CA
  + Create an instance of the AddPrimaryContact class, enqueue the job, and assert that a Contact record was inserted for each of the 50 Accounts with the BillingState of CA
  + The unit tests must cover all lines of code included in the **AddPrimaryContact** class, resulting in 100% code coverage
* Before verifying this challenge, run your test class at least once using the Developer Console Run All feature

**My Work:**

Code for AddPrimaryContact 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;

}

}

}

Code for AddPrimaryContactTest:

@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 addict = new addPrimaryContact(testContact, 'CA');

Test.startTest();

system.enqueueJob(addict);

Test.stopTest();

System.assertEquals(50,[Select count() from Contact where accountId in (Select Id from Account where BillingState='CA')]);

}

}

4)Schedule Jobs Using the Apex Scheduler:

Challenge:

**Create an Apex class that uses Scheduled Apex to update Lead records.**

Create an Apex class that implements the Schedulable interface to update Lead records with a specific LeadSource. (This is very similar to what you did for Batch Apex.)

* Create an Apex class:
  + Name: DailyLeadProcessor
  + Interface: Schedulable
  + The execute method must find the first 200 Lead records with a blank LeadSource field and update them with the LeadSource value of Dreamforce
* Create an Apex test class:
  + Name: DailyLeadProcessorTest
  + In the test class, insert 200 Lead records, schedule the DailyLeadProcessor class to run and test that all Lead records were updated correctly
  + The unit tests must cover all lines of code included in the **DailyLeadProcessor** class, resulting in 100% code coverage.
* Before verifying this challenge, run your test class at least once using the Developer Console Run All feature

**My Work:**

Code for DailyLeadProcessor Class:

global class DailyLeadProcessor implements Schedulable{

global void execute(SchedulableContext ctx){

List<lead> leadstoupdate = new List<lead>();

List<lead> leads = [Select id from Lead Where LeadSource = NULL Limit 200];

for(Lead l:leads){

l.leadSource = 'Dreamforce';

leadstoupdate.add(l);

}

update leadstoupdate;

}

}

Code for DailyLeadProcessorTest Class:

@isTest

public class DailyLeadProcessorTest {

public static String CRON\_EXP = '0 0 0 15 7 ? 2022';

static testmethod void testScheduledJob(){

List<Lead> leads =new List<Lead>();

for(Integer i=0;i<200;i++){

Lead l = new Lead(

FirstName = 'First ' +i,

LastName = 'LastName',

Company = 'The Inc'

);

leads.add(l);

}

insert leads;

Test.startTest();

String jobId = System.schedule('ScheduledApexTest',CRON\_EXP,new DailyLeadProcessor());

Test.stopTest();

List<Lead> checkleads = new List<Lead>();

checkleads = [Select Id from Lead Where LeadSource = 'Dreamforce' and Company = 'The Inc'];

System.assertEquals(200,checkleads.size(),'Leads were not created');

}

}

# Apex Integration Services:

1)Apex REST Callouts:

Challenge:

**Create an Apex class that calls a REST endpoint and write a test class.**

Create an Apex class that calls a REST endpoint to return the name of an animal, write unit tests that achieve 100% code coverage for the class using a mock response, and run your Apex tests.  
  
**Prework**: Be sure the Remote Sites from the first unit are set up.

* Create an Apex class:
  + Name: AnimalLocator
  + Method name: getAnimalNameById
  + The method must accept an Integer and return a String.
  + The method must call https://th-apex-http-callout.herokuapp.com/animals/<id>, replacing <id> with the ID passed into the method
  + The method returns the value of the **name** property (i.e., the animal name)
* Create a test class:
  + Name: AnimalLocatorTest
  + The test class uses a mock class called AnimalLocatorMock to mock the callout response
* Create unit tests:
  + Unit tests must cover all lines of code included in the **AnimalLocator** class, resulting in 100% code coverage
* Run your test class at least once (via **Run All** tests the Developer Console) before attempting to verify this challenge

**My Work:**

Code for AnimalLocator Class:

public class AnimalLocator {

public static String getAnimalNameById(Integer animalId) {

String animalName;

Http http = new Http();

HttpRequest request = new HttpRequest();

request.setEndpoint('https://th-apex-http-callout.herokuapp.com/animals/'+animalId);

request.setMethod('GET');

HttpResponse response = http.send(request);

// If the request is successful, parse the JSON response.

if(response.getStatusCode() == 200) {

Map<String, Object>r=(Map<String, Object>)

JSON.deserializeUntyped(response.getBody());

Map<String, Object> animal=(Map<String,Object>)r.get('animal');

animalName = string.valueOf(animal.get('name'));

}

return animalName;

}

}

Code for 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('{"animal":{"id":1,"name":"chicken","eats":"chicken food","says":"cluck cluck"}}');

response.setStatusCode(200);

return response;

}

}

Code for AnimalLocatorTest Class:

@isTest

private class AnimalLocatorTest{

@isTest static void getAnimalNameByIdTest() {

// Set mock callout class

Test.setMock(HttpCalloutMock.class, new AnimalLocatorMock());

// This causes a fake response to be sent

// from the class that implements HttpCalloutMock.

String response = AnimalLocator.getAnimalNameById(1);

System.assertEquals('chicken', response);

}

}

2)Apex SOAP Callouts:

Challenge:

**Generate an Apex class using WSDL2Apex and write a test class.**

Generate an Apex class using WSDL2Apex for a SOAP web service, write unit tests that achieve 100% code coverage for the class using a mock response, and run your Apex tests.  
  
**Prework**: Be sure the Remote Sites from the first unit are set up.

* Generate a class using this using [this WSDL file](https://th-apex-soap-service.herokuapp.com/assets/parks.xml):
  + Name: ParkService (Tip: After you click the **Parse WSDL** button, change the Apex class name from **parksServices** to ParkService)
  + Class must be in public scope
* Create a class:
  + Name: ParkLocator
  + Class must have a **country** method that uses the **ParkService** class
  + Method must return an array of available park names for a particular country passed to the web service (such as Germany, India, Japan, and United States)
* Create a test class:
  + Name: ParkLocatorTest
  + Test class uses a mock class called ParkServiceMock to mock the callout response
* Create unit tests:
  + Unit tests must cover all lines of code included in the **ParkLocator** class, resulting in 100% code coverage.
* Run your test class at least once (via **Run All** tests the Developer Console) before attempting to verify this challenge.

**My Work:**

Code for ParkService Class:

//Generated by wsdl2apex

public class ParkService {

public class byCountryResponse {

public String[] return\_x;

private String[] return\_x\_type\_info = new String[]{'return','http://parks.services/',null,'0','-1','false'};

private String[] apex\_schema\_type\_info = new String[]{'http://parks.services/','false','false'};

private String[] field\_order\_type\_info = new String[]{'return\_x'};

}

public class byCountry {

public String arg0;

private String[] arg0\_type\_info = new String[]{'arg0','http://parks.services/',null,'0','1','false'};

private String[] apex\_schema\_type\_info = new String[]{'http://parks.services/','false','false'};

private String[] field\_order\_type\_info = new String[]{'arg0'};

}

public class ParksImplPort {

public String endpoint\_x = 'https://th-apex-soap-service.herokuapp.com/service/parks';

public Map<String,String> inputHttpHeaders\_x;

public Map<String,String> outputHttpHeaders\_x;

public String clientCertName\_x;

public String clientCert\_x;

public String clientCertPasswd\_x;

public Integer timeout\_x;

private String[] ns\_map\_type\_info = new String[]{'http://parks.services/', 'ParkService'};

public String[] byCountry(String arg0) {

ParkService.byCountry request\_x = new ParkService.byCountry();

request\_x.arg0 = arg0;

ParkService.byCountryResponse response\_x;

Map<String, ParkService.byCountryResponse> response\_map\_x = new Map<String, ParkService.byCountryResponse>();

response\_map\_x.put('response\_x', response\_x);

WebServiceCallout.invoke(

this,

request\_x,

response\_map\_x,

new String[]{endpoint\_x,

'',

'http://parks.services/',

'byCountry',

'http://parks.services/',

'byCountryResponse',

'ParkService.byCountryResponse'}

);

response\_x = response\_map\_x.get('response\_x');

return response\_x.return\_x;

}

}

}

Code for ParkLocator Class:

public class ParkLocator {

public static List<String> country(String country){

ParkService.ParksImplPort parkservice =

new parkService.ParksImplPort();

return parkservice.byCountry(country);

}

}

Code for ParkLocatorTest Class:

@isTest

private class ParkLocatorTest {

@isTest static void testCallout() {

// This causes a fake response to be generated

Test.setMock(WebServiceMock.class, new ParkServiceMock());

// Call the method that invokes a callout

String country = 'United States';

List<String> result = ParkLocator.country(country);

List<String> parks = new List<String>();

parks.add('Yosemite');

parks.add('Yellowstone');

parks.add('Another Park');

// Verify that a fake result is returned

System.assertEquals(parks, result);

}

}

2)Apex Web Services:

Challenge:

**Create an Apex REST service that returns an account and its contacts.**

Create 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. Write unit tests that achieve 100% code coverage for the class and run your Apex tests.

**Prework**: Be sure the Remote Sites from the first unit are set up.

* Create an Apex class
  + Name: AccountManager
  + Class must have a method called getAccount
  + Method must be annotated with **@HttpGet** and return an **Account** object
  + Method must return the **ID** and **Name** for the requested record and all associated contacts with their **ID** and **Name**
* Create unit tests
  + Unit tests must be in a separate Apex class called AccountManagerTest
  + Unit tests must cover all lines of code included in the **AccountManager** class, resulting in 100% code coverage
* Run your test class at least once (via **Run All** tests the Developer Console) before attempting to verify this challenge

**My Work:**

Code for AccountManager:

@RestResource(urlMapping='/Accounts/\*/contacts')

global with sharing class AccountManager {

@HttpGet

global static Account getAccount() {

RestRequest request = RestContext.request;

// grab the caseId from the end of the URL

String accountId = request.requestURI.substringBetween('Accounts/','/contacts');

Account result = [SELECT Id, Name, (Select Id,Name from Contacts) from Account where Id=:accountId];

return result;

}

}

Code for AccountManagerTest:

@IsTest

private class AccountManagerTest {

@isTest static void testGetContactsByAccountId() {

Id recordId = createTestRecord();

// Set up a test request

RestRequest request = new RestRequest();

request.requestUri =

'https://yourInstance.my.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 accountTest = new Account(

Name='Test record');

insert accountTest;

Contact contactTest = new Contact(

FirstName='John',

LastName='Doe',

AccountId=accountTest.Id

);

insert contactTest;

return accountTest.Id;

}

}

**Apex Specialist:**

1)Automate Record Creation:

Code for MaintenanceRequest Trigger:

trigger MaintenanceRequest on Case (before update, after update) {

if(Trigger.isUpdate && Trigger.isAfter){

MaintenanceRequestHelper.updateWorkOrders(Trigger.New, Trigger.OldMap);

}

}

Code for 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);

}

}

}

//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:

Code for WarehouseCalloutService 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');

}

}

3)Schedule synchronization:

Code for WarehouseSyncSchedule Class:

global with sharing class WarehouseSyncSchedule implements Schedulable {

// implement scheduled code here

global void execute (SchedulableContext ctx){

System.enqueueJob(new WarehouseCalloutService());

}

}

4)Test automation logic:

Code for MaintenanceRequest Trigger:

trigger MaintenanceRequest on Case (before update, after update) {

if(Trigger.isUpdate && Trigger.isAfter){

MaintenanceRequestHelper.updateWorkOrders(Trigger.New, Trigger.OldMap);

}

}

Code for 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);

}

}

}

//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;

}

}

}

Code for MaintenanceRequestHelperTest 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;

}

// createEquipmentMaintenanceItem

private static Equipment\_Maintenance\_Item\_\_c createEquipmentMaintenanceItem(id equipmentId,id requestId){

Equipment\_Maintenance\_Item\_\_c equipmentMaintenanceItem = new Equipment\_Maintenance\_Item\_\_c(

Equipment\_\_c = equipmentId,

Maintenance\_Request\_\_c = requestId);

return equipmentMaintenanceItem;

}

@isTest

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 equipmentMaintenanceItem = createEquipmentMaintenanceItem(equipmentId,createdCase.id);

insert equipmentMaintenanceItem;

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 equipmentMaintenanceItem = [select id

from Equipment\_Maintenance\_Item\_\_c

where Maintenance\_Request\_\_c = :createdCase.Id];

system.assert(equipmentMaintenanceItem != 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> equipmentMaintenanceItemList = 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++){

equipmentMaintenanceItemList.add(createEquipmentMaintenanceItem(equipmentList.get(i).id, caseList.get(i).id));

}

insert equipmentMaintenanceItemList;

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 callout logic:

Code for WarehouseCalloutService 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');

}

}

Code for WarehouseCalloutServiceMock 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":"55d66226726b611100aaf742","replacement":true,"quantity":183,"name":"Cooling Fan","maintenanceperiod":0,"lifespan":0,"cost":300,"sku":"100004"},{"\_id":"55d66226726b611100aaf743","replacement":true,"quantity":143,"name":"Fuse 20A","maintenanceperiod":0,"lifespan":0,"cost":22,"sku":"100005"}]');

response.setStatusCode(200);

return response;

}

}

Code for WarehouseCalloutServiceTest Class:

@IsTest

private class WarehouseCalloutServiceTest {

// implement your mock callout test here

@isTest

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);

}

}

6)Test scheduling logic:

Code for WarehouseCalloutServiceMock 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":"55d66226726b611100aaf742","replacement":true,"quantity":183,"name":"Cooling Fan","maintenanceperiod":0,"lifespan":0,"cost":300,"sku":"100004"},{"\_id":"55d66226726b611100aaf743","replacement":true,"quantity":143,"name":"Fuse 20A","maintenanceperiod":0,"lifespan":0,"cost":22,"sku":"100005"}]');

response.setStatusCode(200);

return response;

}

}

Code for WarehouseSyncSchedule Class:

global with sharing class WarehouseSyncSchedule implements Schedulable {

// implement scheduled code here

global void execute (SchedulableContext ctx){

System.enqueueJob(new WarehouseCalloutService());

}

}

Code for WarehouseSyncScheduleTest 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();

}

}