# Software Development for IMET Corporation

Student: Sebastian Casas
Primary Advisor: Dr Orlando Hernandez

# Agenda

- Introduction and Background
- Project Goals and Specifications
- Implementation and Tasks
- Results
- Remaining Steps
- Conclusion

# IMET CORPORATION

Southampton, PA

IMET Corporation is an award-winning resource for contract manufacturing, electronics engineering and product development for medical, industrial, military, and consumer products.

Provide Solutions To Customers Through:

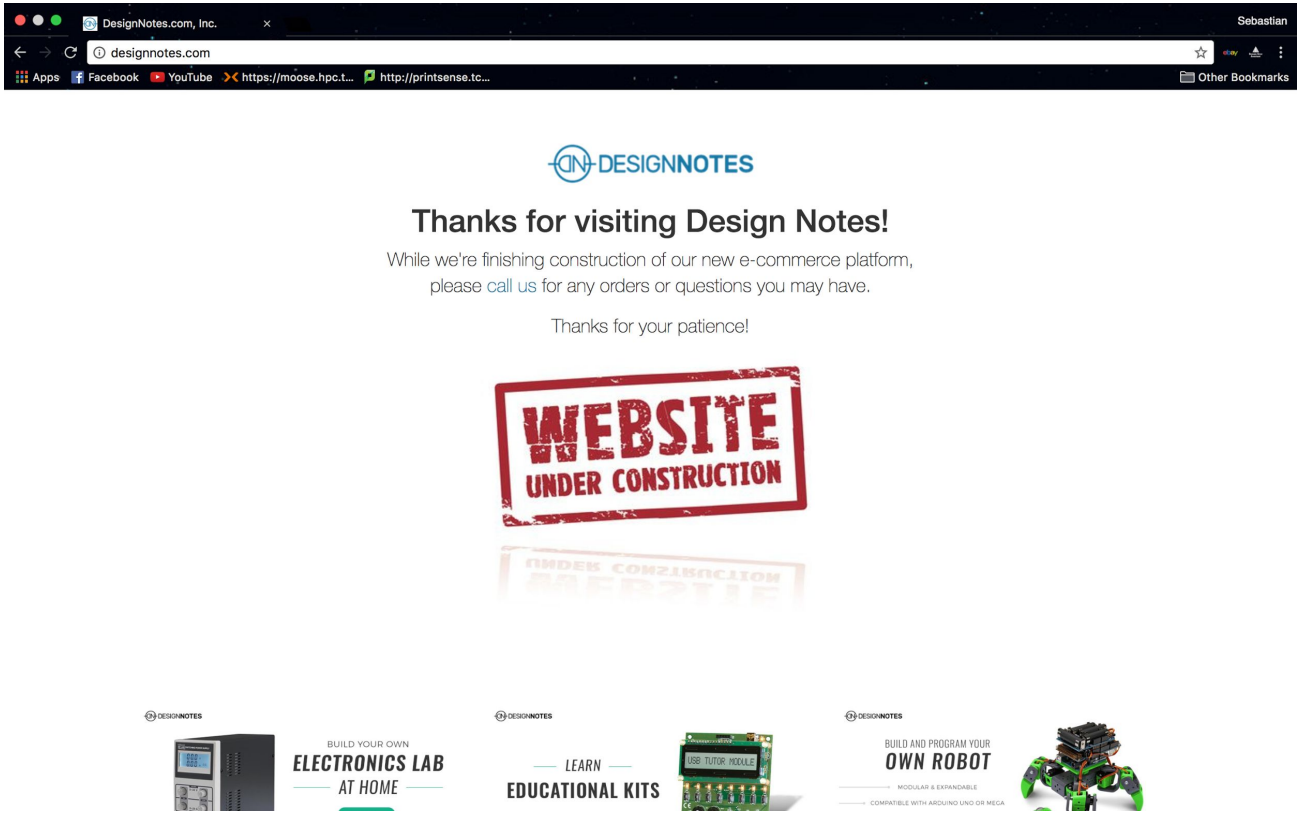
- PCB Assembly
- Contract Manufacturing
- Electronics Engineering
- Product Development

# Background

Motivation For Project

- Currently, IMET does not have any procedures set to handle extra parts in their inventory
- This interferes with the efficiency and costs the company more money
  - Selling extra parts can increase profit
  - Improves efficiency
- This project addresses those issues

# Website Under Renovations



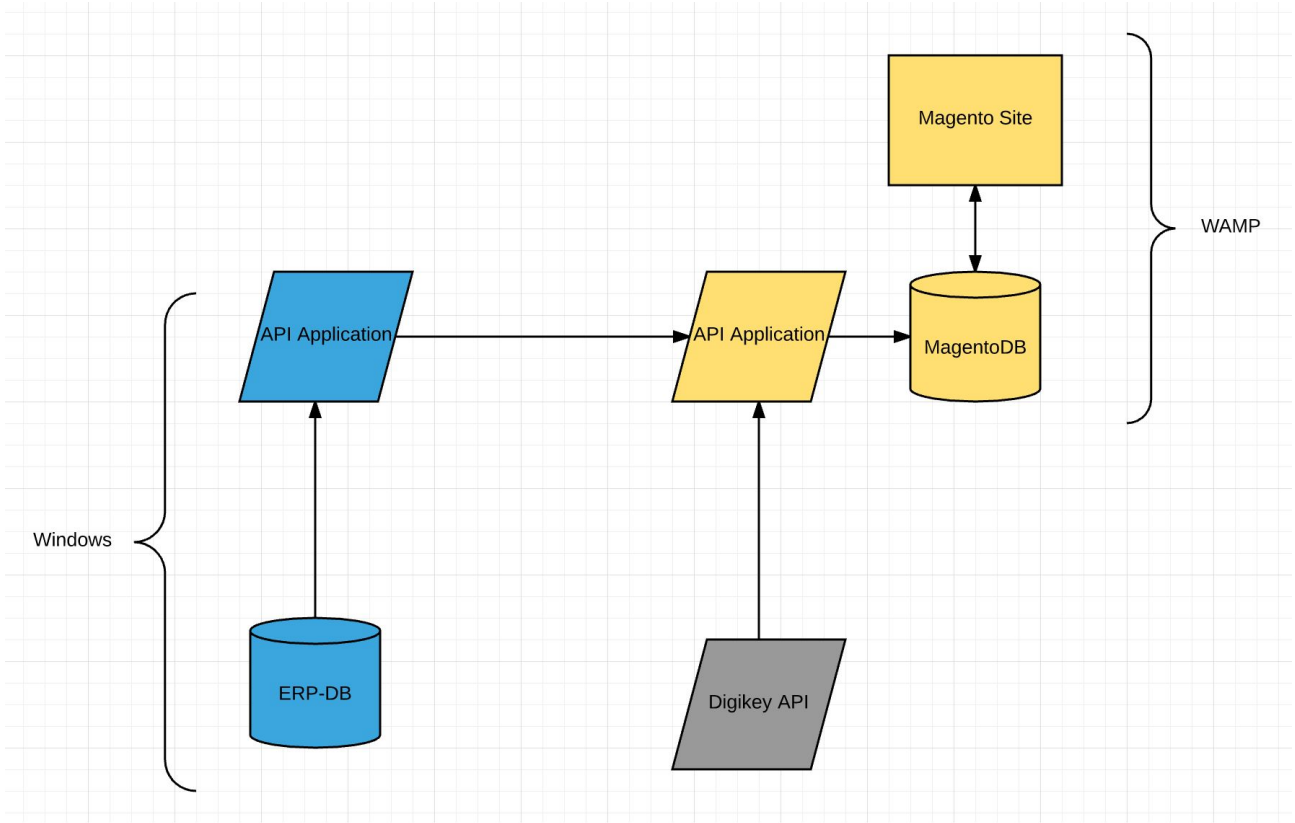
# Project Goals


- Obtain the excess parts in the inventory that are available
- Use DigiKey Application Programming Interface (API) to obtain any information on part that may be missing
- Load Information to a local server
  - Must have Magento E-Commerce Installed
- Once information is loaded to Magento E-Commerce, it will be populated to Design Notes

# Software Requirements Specifications

| | |
|---|---|
| **Operating System** | Windows for SQL, C#<br>OS X for C#, Magento |
| **Primary Coding Language** | C#, Microsoft SQL (PHP needed for Magento Ecommerce) |
| **Type of Project** | Database Management, Microsoft Visual Studio, Xarmin Studio |
| **Audience** | IMET Administrators |
| **Software Management Process** | Agile |
| **Software Quality Attributes** | The system shall be maintainable |
| | The system shall be testable |
| **Key Functionalities Needed** | Must get access to IMET inventory |
| | Search for available parts |
| | Get part information |
| **Full Requirements in Software Requirements Specification** | |
| | |

# Server Diagram



# Work Plan


Task 1: Startup Meeting

Task 2: Learn Required Languages

Task 3: Obtain Required Equipment/Software

Task 4: Access Inventory To Fetch Parts

Task 5: Convert Data To XML Output

Task 6: Connect To DigiKey API

Task 7: Load Information to Magento Server

Task 8:  Test Product

Task 7: Documentation

# Obtaining Parts From The Inventory

- Originally, this required the use of Microsoft Structured Query Language (SQL)
  - Created a stored procedure that queries to a specific stock location
  - Use a prepared statement in C# to execute the stored procedure
- Focus shifted away from SQL as IMET moved away from EXACTMAX database
- New format involves pulling the available parts from QuickBooks
  - An output CSV file is obtained that includes the available parts
  - Contents of CSV file need to be converted into some sort of API output

# Implementation SQL

- The first step was to review the documentation of the database to become familiar with the structure
- Available parts located in a specific stock location
- Make necessary queries to get to that location
- Create stored procedure to execute the set of queries



158. Part_Vendor (MAX File ID: 7)

158.1. Fields

| Column Name | Data Type | Allow Null | Identity | ETL Add | ETL Upd | Comments |
|---|---|---|---|---|---|---|
| PRTNUM_07 | char(30) | N | N | M | M | Part Identifier |
| VENID_07 | char(20) | N | N | M | M | Vendor Identifier |
| VENPRT_07 | char(30) | N | N | O | O | Vendors Part Number |
| COST1_07 | float | N | N | O | O | Price Per Purchase Uom #1 |
| BREAK1_07 | float | N | N | O | O | Price Break Quantity #1 |
| COST2_07 | float | N | N | O | O | Price Per Purchase Uom #2 |
| BREAK2_07 | float | N | N | O | O | Price Break Quantity #2 |
| COST3_07 | float | N | N | O | O | Price Per Purchase Uom #3 |
| BREAK3_07 | float | N | N | O | O | Price Break Quantity #3 |
| NOTE1_07 | char(25) | N | N | O | O | Note |
| MFGPRT_07 | char(25) | N | N | M | M | Manufacturing Part Number |
| QACODE_07 | char(3) | N | N | O | O | QA Pass/Fail Code |
| MPASS_07 | float | N | N | O | O | Month-to-Date Pass Quantity |
| MFAIL_07 | float | N | N | O | O | Month-to-Date Fail Quantity |
| YPASS_07 | float | N | N | O | O | Year-to-Date Pass Quantity |
| YFAIL_07 | float | N | N | O | O | Year-to-Date Fail Quantity |
| PREFER_07 | char(1) | N | N | M | M | Preferred Flag |
| MCOMP_07 | char(3) | N | N | O | O | Multi-Company (Not currently used) |
| MSITE_07 | char(3) | N | N | O | O | Multi-Site (Not currently used) |
| UDFKEY_07 | char(15) | N | N | M | M | User Defined Key |
| UDFREF_07 | char(25) | N | N | O | O | User Defined Reference |
| TAXCDE_07 | char(7) | N | N | O | O | Tax Code |
| MPNMFG_07 | char(15) | N | N | M | M | Manufacturer's Name |
| SERVICEID_07 | char(10) | N | N | M | M | SubContract Service ID |
| BASECHG_07 | float | N | N | O | O | SubContract Base Charge |
| XDFINT_07 | int | Y | N | N | N | Integer field for use by custom applications |
| XDFFLT_07 | float | Y | N | N | N | Floating point field for use by custom applications |
| XDFBOL_07 | char(1) | Y | N | N | N | Boolean field for use by custom applications (Y, N) |
| XDFDTE_07 | smalldatetime | Y | N | N | N | Date field for use by custom applications |
| XDFTXT_07 | char(100) | Y | N | N | N | String field for use by custom applications |
| FILLER_07 | char(50) | Y | N | O | O | Legacy Filler field |
| MAXID | bigint | N | Y | N | N | Unique Identifier |
| CreatedBy | varchar(100) | Y | N | O | O | MAX User that created the record |

# Implementation C#

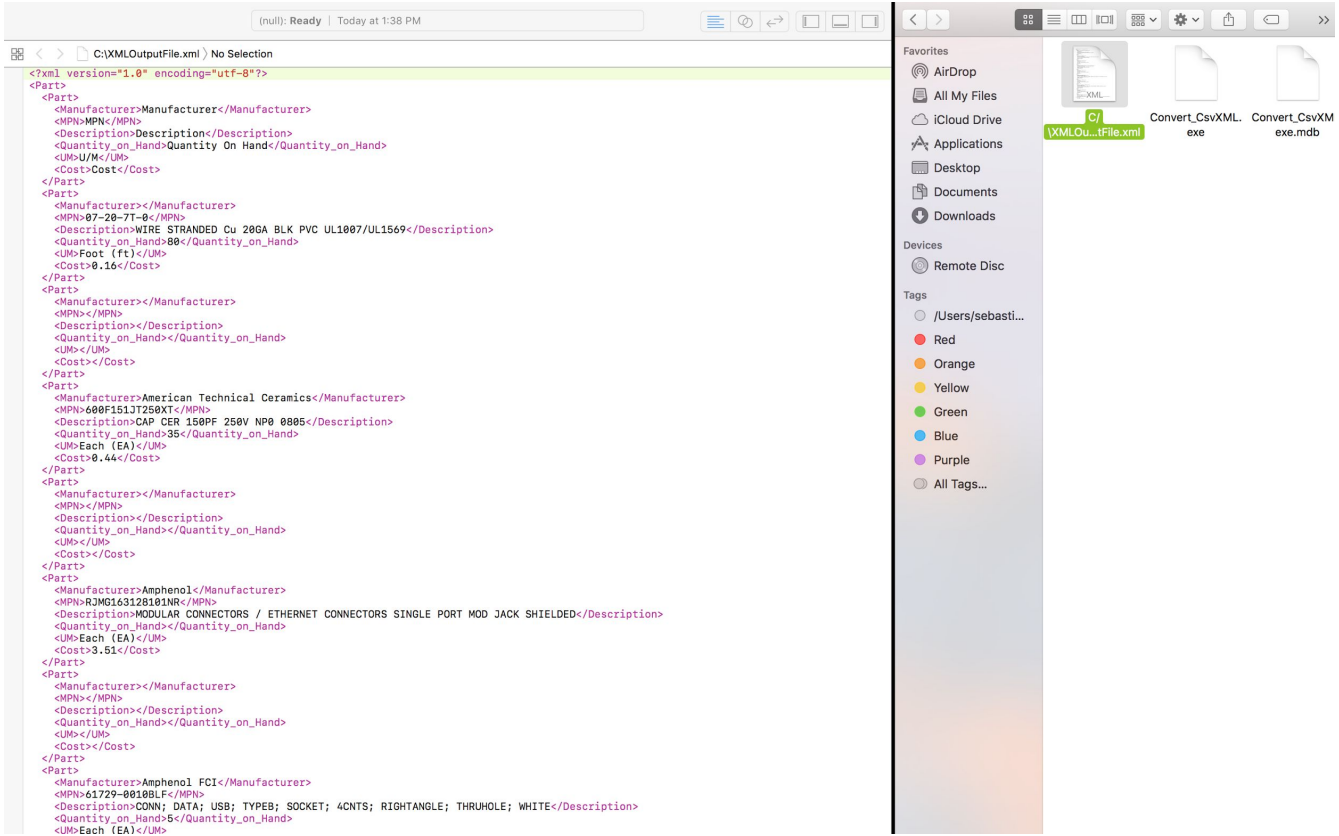
- Used Language Integrated Query (LINQ)
  - LINQ is a data querying methodology which provides querying capabilities to .NET languages with a syntax similar to a SQL query.

```
namespace Convert_CsvXml
{
    class Convert
    {
        static void Main()
        {
string[] lines = File.ReadAllLines(@"/Users/sebastiancasas/Projects/Convert_CsvXML/output.csv");

            XElement xml = new XElement("Part",
                from str in lines
                let columns1 = str.Split(',')
                select new XElement("Part",
                    new XElement("Manufacturer", columns1[0]),
                    new XElement("MPN", columns1[1]),
                    new XElement("Description", columns1[2]),
                    new XElement("Quantity_on_Hand", columns1[3]),
                    new XElement("UM", columns1[4]),
                    new XElement("Cost", columns1[5])
                )
            );

            xml.Save(@"C:\XMLOutputFile.xml");
        }
    }
}
```

# Result


(null): Ready | Today at 1:38 PM
C:\XMLOutputFile.xml 〉No Selection
<?xml version="1.0" encoding="utf-8"?>
<Part>
<Manufacturer>Manufacturer</Manufacturer>
<MPN>MPN</MPN>
<Description>Description</Description>
<Quantity_on_Hand>Quantity On Hand</Quantity_on_Hand>
<UM>U/M</UM>
<Cost>Cost</Cost>
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<Description></Description>
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<UM></UM>
<Cost></Cost>
<Manufacturer>Amphenol FCI</Manufacturer>
<MPN>61729-0010BLF</MPN>
<Description>CONN; DATA; USB; TYPEB; SOCKET; 4CNTS; RIGHTANGLE; THRUHOLE; WHITE</Description>
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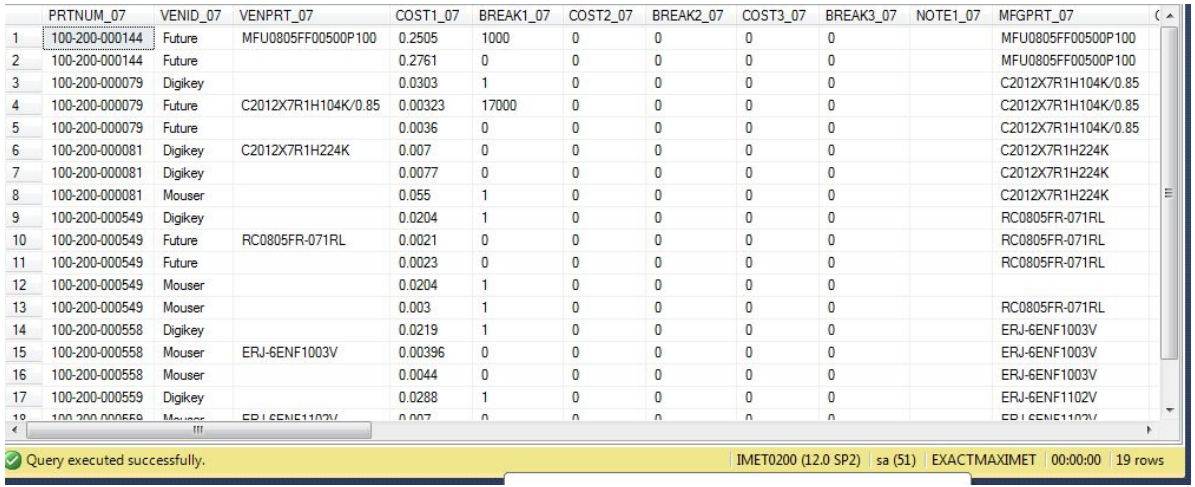
<UM>Each (EA)</UM>
Favorites
AirDrop
All My Files
iCloud Drive
Applications
Desktop
Documents
Downloads
Devices
Remote Disc
Tags
/Users/sebasti...
Red
Orange
Yellow
Green
Blue
Purple
All Tags...
C/
\XMLOu...tFile.xml
Convert_CsvXML.exe
Convert_CsvXMLexe.mdb

# SQL Results

- Returned items are those that will be populated to Design Notes
- A stored procedure was created to return the table shown in one query as opposed to several
- MFGPRT_07 will be used to look up the part using Digi-Key's API



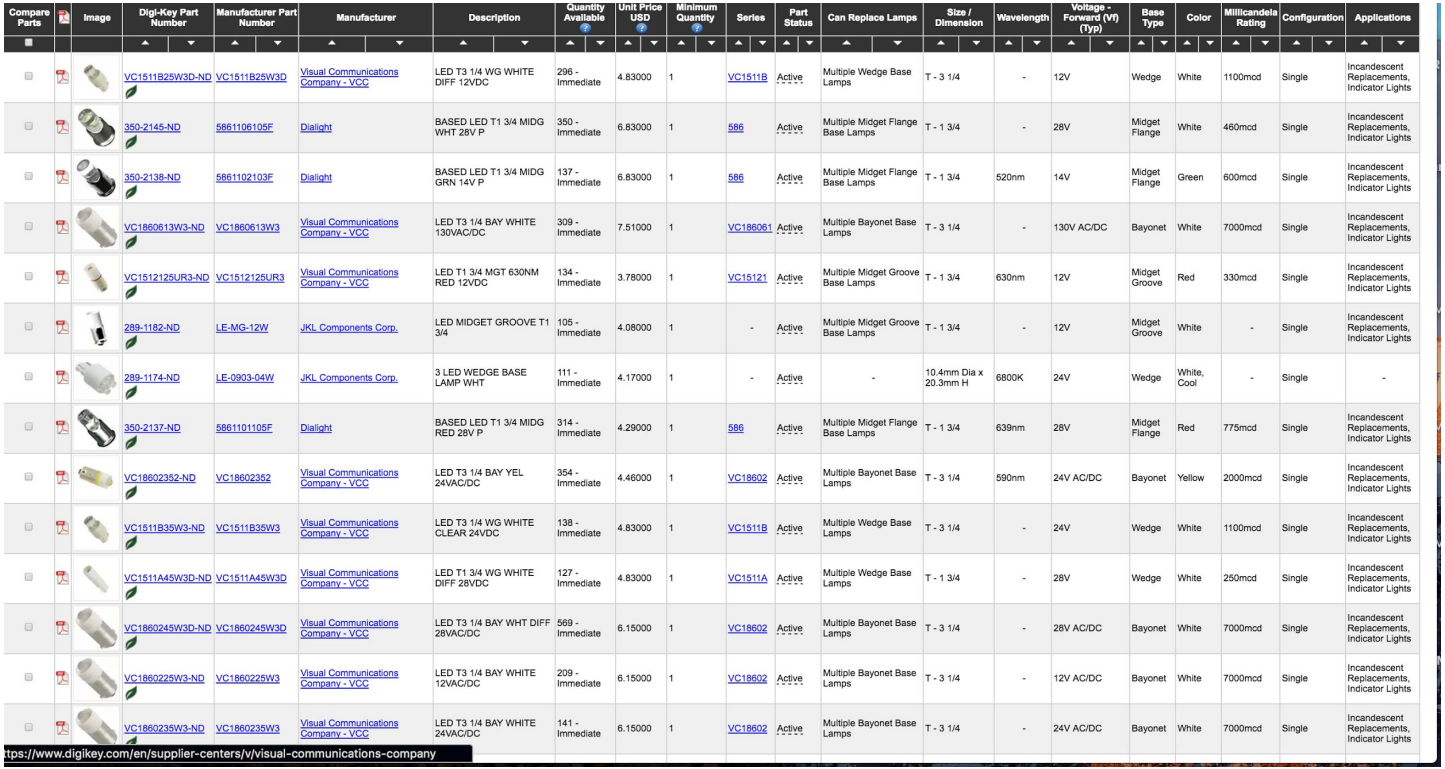
| | PRTNUM_07 | VENID_07 | VENPRT_07 | COST1_07 | BREAK1_07 | COST2_07 | BREAK2_07 | COST3_07 | BREAK3_07 | NOTE1_07 | MFGPRT_07 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 100-200-000144 | Future | MFU0805FF00500P100 | 0.2505 | 1000 | 0 | 0 | 0 | 0 | | MFU0805FF00500P100 |
| 2 | 100-200-000144 | Future | | 0.2761 | 0 | 0 | 0 | 0 | 0 | | MFU0805FF00500P100 |
| 3 | 100-200-000079 | Digikey | | 0.0303 | 1 | 0 | 0 | 0 | 0 | | C2012X7R1H104K/0.85 |
| 4 | 100-200-000079 | Future | C2012X7R1H104K/0.85 | 0.00323 | 17000 | 0 | 0 | 0 | 0 | | C2012X7R1H104K/0.85 |
| 5 | 100-200-000079 | Future | | 0.0036 | 0 | 0 | 0 | 0 | 0 | | C2012X7R1H104K/0.85 |
| 6 | 100-200-000081 | Digikey | C2012X7R1H224K | 0.007 | 0 | 0 | 0 | 0 | 0 | | C2012X7R1H224K |
| 7 | 100-200-000081 | Digikey | | 0.0077 | 0 | 0 | 0 | 0 | 0 | | C2012X7R1H224K |
| 8 | 100-200-000081 | Mouser | | 0.055 | 1 | 0 | 0 | 0 | 0 | | C2012X7R1H224K |
| 9 | 100-200-000549 | Digikey | | 0.0204 | 1 | 0 | 0 | 0 | 0 | | RC0805FR-071RL |
| 10 | 100-200-000549 | Future | RC0805FR-071RL | 0.0021 | 0 | 0 | 0 | 0 | 0 | | RC0805FR-071RL |
| 11 | 100-200-000549 | Future | | 0.0023 | 0 | 0 | 0 | 0 | 0 | | RC0805FR-071RL |
| 12 | 100-200-000549 | Mouser | | 0.0204 | 1 | 0 | 0 | 0 | 0 | | |
| 13 | 100-200-000549 | Mouser | | 0.003 | 1 | 0 | 0 | 0 | 0 | | RC0805FR-071RL |
| 14 | 100-200-000558 | Digikey | | 0.0219 | 1 | 0 | 0 | 0 | 0 | | ERJ-6ENF1003V |
| 15 | 100-200-000558 | Mouser | ERJ-6ENF1003V | 0.00396 | 0 | 0 | 0 | 0 | 0 | | ERJ-6ENF1003V |
| 16 | 100-200-000558 | Mouser | | 0.0044 | 0 | 0 | 0 | 0 | 0 | | ERJ-6ENF1003V |
| 17 | 100-200-000559 | Digikey | | 0.0288 | 1 | 0 | 0 | 0 | 0 | | ERJ-6ENF1102V |

Query executed successfully. | IMET0200 (12.0 SP2) | sa (51) | EXACTMAXIMET | 00:00:00 | 19 rows

# Digi-Key Application Programming Interface

- Digi-Key is the fourth largest electronic component distributor in North America and a broad-line distributor of board level components.
- DigiKey API Portal allows access to Digi-Key's APIs
  - Create a digikey account and register application to API
  - Go through OAuth 2.0 security protocols to establish access to API
    - The goal here is to obtain an access token that will allow you to make calls to the API and return the information needed

# Digi-Key Example Search

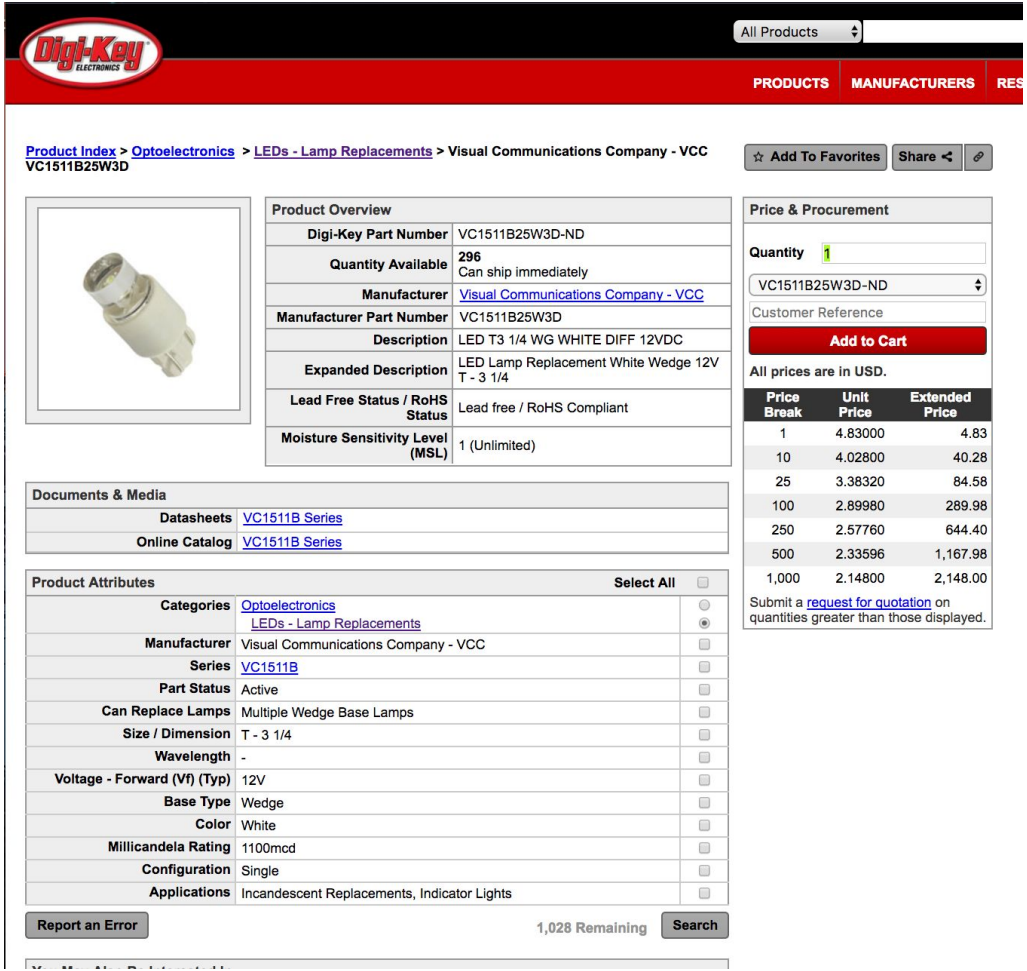


| Compare Parts | Image | Digi-Key Part Number | Manufacturer Part Number | Manufacturer | Description | Quantity Available | Unit Price USD | Minimum Quantity | Series | Part Status | Can Replace Lamps | Size / Dimension | Wavelength | Voltage - Forward (Vf) (Typ) | Base Type | Color | Millicandela Rating | Configuration | Applications |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | VC1511B25W3D-ND | VC1511B25W3D | Visual Communications Company - VCC | LED T3 1/4 WG WHITE DIFF 12VDC | 296 - Immediate | 4.83000 | 1 | VC1511B | Active | Multiple Wedge Base Lamps | T - 3 1/4 | - | 12V | Wedge | White | 1100mcd | Single | Incandescent Replacements, Indicator Lights |
| | | 350-2145-ND | 5861106105F | Dialight | BASED LED T1 3/4 MIDG WHT 28V P | 350 - Immediate | 6.83000 | 1 | 586 | Active | Multiple Midget Flange Base Lamps | T - 1 3/4 | - | 28V | Midget Flange | White | 460mcd | Single | Incandescent Replacements, Indicator Lights |
| | | 350-2138-ND | 5861102103F | Dialight | BASED LED T1 3/4 MIDG GRN 14V P | 137 - Immediate | 6.83000 | 1 | 586 | Active | Multiple Midget Flange Base Lamps | T - 1 3/4 | 520nm | 14V | Midget Flange | Green | 600mcd | Single | Incandescent Replacements, Indicator Lights |
| | | VC1860613W3-ND | VC1860613W3 | Visual Communications Company - VCC | LED T3 1/4 BAY WHITE 130VAC/DC | 309 - Immediate | 7.51000 | 1 | VC18606 | Active | Multiple Bayonet Base Lamps | T - 3 1/4 | - | 130V AC/DC | Bayonet | White | 7000mcd | Single | Incandescent Replacements, Indicator Lights |
| | | VC1512125UR3-ND | VC1512125UR3 | Visual Communications Company - VCC | LED T1 3/4 MGT 630NM RED 12VDC | 134 - Immediate | 3.78000 | 1 | VC15121 | Active | Multiple Midget Groove Base Lamps | T - 1 3/4 | 630nm | 12V | Midget Groove | Red | 330mcd | Single | Incandescent Replacements, Indicator Lights |
| | | 289-1182-ND | LE-MG-12W | JKL Components Corp. | LED MIDGET GROOVE T1 3/4 | 105 - Immediate | 4.08000 | 1 | - | Active | Multiple Midget Groove Base Lamps | T - 1 3/4 | - | 12V | Midget Groove | White | - | Single | Incandescent Replacements, Indicator Lights |
| | | 289-1174-ND | LE-0903-04W | JKL Components Corp. | 3 LED WEDGE BASE LAMP WHT | 111 - Immediate | 4.17000 | 1 | - | Active | - | 10.4mm Dia x 20.3mm H | 6800K | 24V | Wedge | White, Cool | - | Single | - |
| | | 350-2137-ND | 5861101105F | Dialight | BASED LED T1 3/4 MIDG RED 28V P | 314 - Immediate | 4.29000 | 1 | 586 | Active | Multiple Midget Flange Base Lamps | T - 1 3/4 | 639nm | 28V | Midget Flange | Red | 775mcd | Single | Incandescent Replacements, Indicator Lights |
| | | VC18602352-ND | VC18602352 | Visual Communications Company - VCC | LED T3 1/4 BAY YEL 24VAC/DC | 354 - Immediate | 4.46000 | 1 | VC18602 | Active | Multiple Bayonet Base Lamps | T - 3 1/4 | 590nm | 24V AC/DC | Bayonet | Yellow | 2000mcd | Single | Incandescent Replacements, Indicator Lights |
| | | VC1511B35W3-ND | VC1511B35W3 | Visual Communications Company - VCC | LED T3 1/4 WG WHITE CLEAR 24VDC | 138 - Immediate | 4.83000 | 1 | VC1511B | Active | Multiple Wedge Base Lamps | T - 3 1/4 | - | 24V | Wedge | White | 1100mcd | Single | Incandescent Replacements, Indicator Lights |
| | | VC1511A45W3D-ND | VC1511A45W3D | Visual Communications Company - VCC | LED T1 3/4 WG WHITE DIFF 28VDC | 127 - Immediate | 4.83000 | 1 | VC1511A | Active | Multiple Wedge Base Lamps | T - 1 3/4 | - | 28V | Wedge | White | 250mcd | Single | Incandescent Replacements, Indicator Lights |
| | | VC1860245W3D-ND | VC1860245W3D | Visual Communications Company - VCC | LED T3 1/4 BAY WHT DIFF 28VAC/DC | 569 - Immediate | 6.15000 | 1 | VC18602 | Active | Multiple Bayonet Base Lamps | T - 3 1/4 | - | 28V AC/DC | Bayonet | White | 7000mcd | Single | Incandescent Replacements, Indicator Lights |
| | | VC1860225W3-ND | VC1860225W3 | Visual Communications Company - VCC | LED T3 1/4 BAY WHITE 12VAC/DC | 209 - Immediate | 6.15000 | 1 | VC18602 | Active | Multiple Bayonet Base Lamps | T - 3 1/4 | - | 12V AC/DC | Bayonet | White | 7000mcd | Single | Incandescent Replacements, Indicator Lights |
| | | VC1860235W3-ND | VC1860235W3 | Visual Communications Company - VCC | LED T3 1/4 BAY WHITE 24VAC/DC | 141 - Immediate | 6.15000 | 1 | VC18602 | Active | Multiple Bayonet Base Lamps | T - 3 1/4 | - | 24V AC/DC | Bayonet | White | 7000mcd | Single | Incandescent Replacements, Indicator Lights |

ttps://www.digikey.com/en/supplier-centers/v/visual-communications-company

# Sample Datasheet

- The output includes the information needed
  - Picture
  - Cost
  - Description



All Products

PRODUCTS MANUFACTURERS RES

Product Index > Optoelectronics > LEDs - Lamp Replacements > Visual Communications Company - VCC VC1511B25W3D

☆ Add To Favorites | Share

**Product Overview**

| | |
|---|---|
| Digi-Key Part Number | VC1511B25W3D-ND |
| Quantity Available | 296<br>Can ship immediately |
| Manufacturer | Visual Communications Company - VCC |
| Manufacturer Part Number | VC1511B25W3D |
| Description | LED T3 1/4 WG WHITE DIFF 12VDC |
| Expanded Description | LED Lamp Replacement White Wedge 12V T - 3 1/4 |
| Lead Free Status / RoHS Status | Lead free / RoHS Compliant |
| Moisture Sensitivity Level (MSL) | 1 (Unlimited) |

**Price & Procurement**

Quantity 1

VC1511B25W3D-ND

Customer Reference

Add to Cart

All prices are in USD.

| Price Break | Unit Price | Extended Price |
|---|---|---|
| 1 | 4.83000 | 4.83 |
| 10 | 4.02800 | 40.28 |
| 25 | 3.38320 | 84.58 |
| 100 | 2.89980 | 289.98 |
| 250 | 2.57760 | 644.40 |
| 500 | 2.33596 | 1,167.98 |
| 1,000 | 2.14800 | 2,148.00 |

Submit a request for quotation on quantities greater than those displayed.

**Documents & Media**

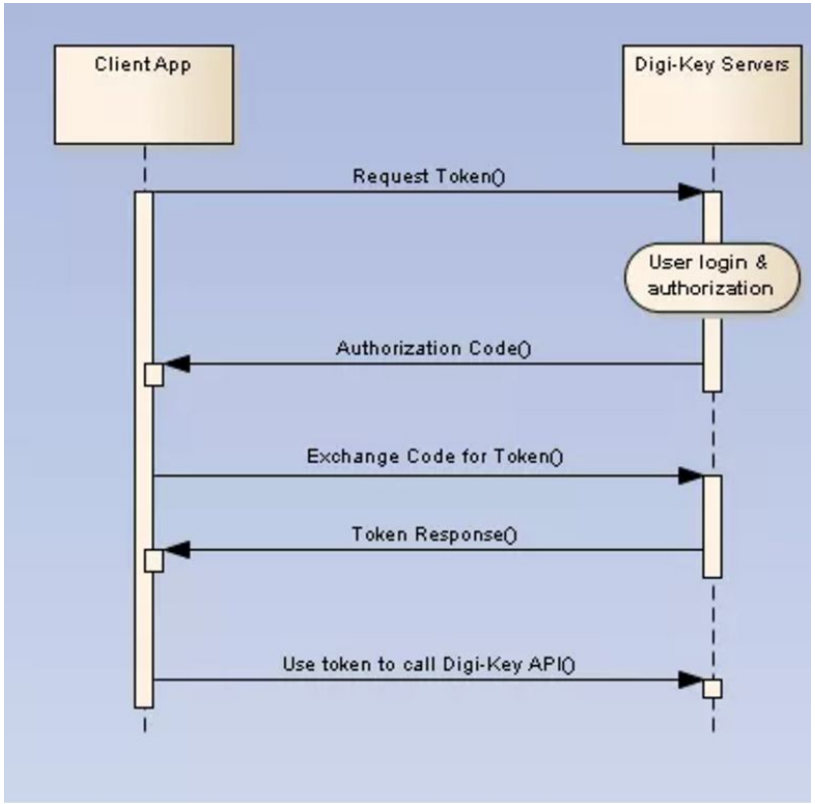
| | |
|---|---|
| Datasheets | VC1511B Series |
| Online Catalog | VC1511B Series |

**Product Attributes** Select All

| | |
|---|---|
| Categories | Optoelectronics<br>LEDs - Lamp Replacements |
| Manufacturer | Visual Communications Company - VCC |
| Series | VC1511B |
| Part Status | Active |
| Can Replace Lamps | Multiple Wedge Base Lamps |
| Size / Dimension | T - 3 1/4 |
| Wavelength | - |
| Voltage - Forward (Vf) (Typ) | 12V |
| Base Type | Wedge |
| Color | White |
| Millicandela Rating | 1100mcd |
| Configuration | Single |
| Applications | Incandescent Replacements, Indicator Lights |

Report an Error 1,028 Remaining Search

# OAuth 2.0



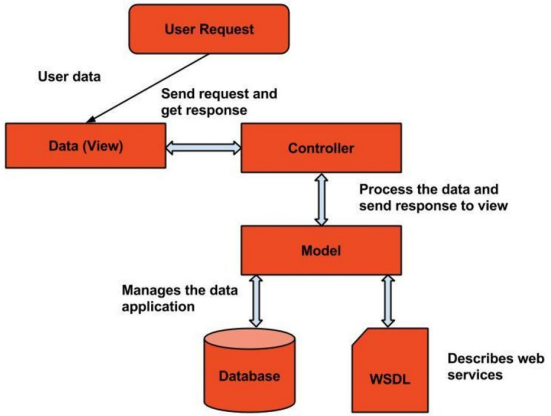

Digi-Key OAuth 2.0 Tutorial

Steps To Implement Framework

- Register Application
  - Obtain Client Secret and Secret ID
- Request Authorization
- Application redirects to endpoint
  - https://sso.digikey.com/as/authorization.oauth2
  - Authenticates User
- The result is an authorization code, which Digi-Key's Authorization Server returns to application in a query string
- Exchange code and client ID and secret for a token and refresh token
  - Refresh tokens are used for offline access

# Magento E-Commerce

- Open Source E-Commerce Platform
- Magento Community Edition (CE)
- Once data is pushed to Magento server, Magento takes care of the rest
  - Data is pushed onto local (Amazon-Based) server and accessed via ssh on terminal
  - Once you ssh into server you are in the desired terminal




```
Connection to ec2-34-198-24-146.compute-1.amazonaws.com closed.
MacbookPro:.ssh sebastiancasas$ ssh -i "MagentoDesignNotes.pem'
Last login: Mon May  1 17:20:15 2017 from 159.91.108.96

       __|  __|_  )
       _|  (     /   Amazon Linux AMI
      ___|\___|___|

https://aws.amazon.com/amazon-linux-ami/2017.03-release-notes/
12 package(s) needed for security, out of 16 available
Run "sudo yum update" to apply all updates.
[ec2-user@ip-
```

# Problems Encountered

Semester 1

- Access to Microsoft SQL on Windows
  - Using OS X, attempted to run an instance of Windows on AWS EC2
  - Purchased laptop that did not meet hardware specs required for installation

Final Solution: IMET provided a functional laptop

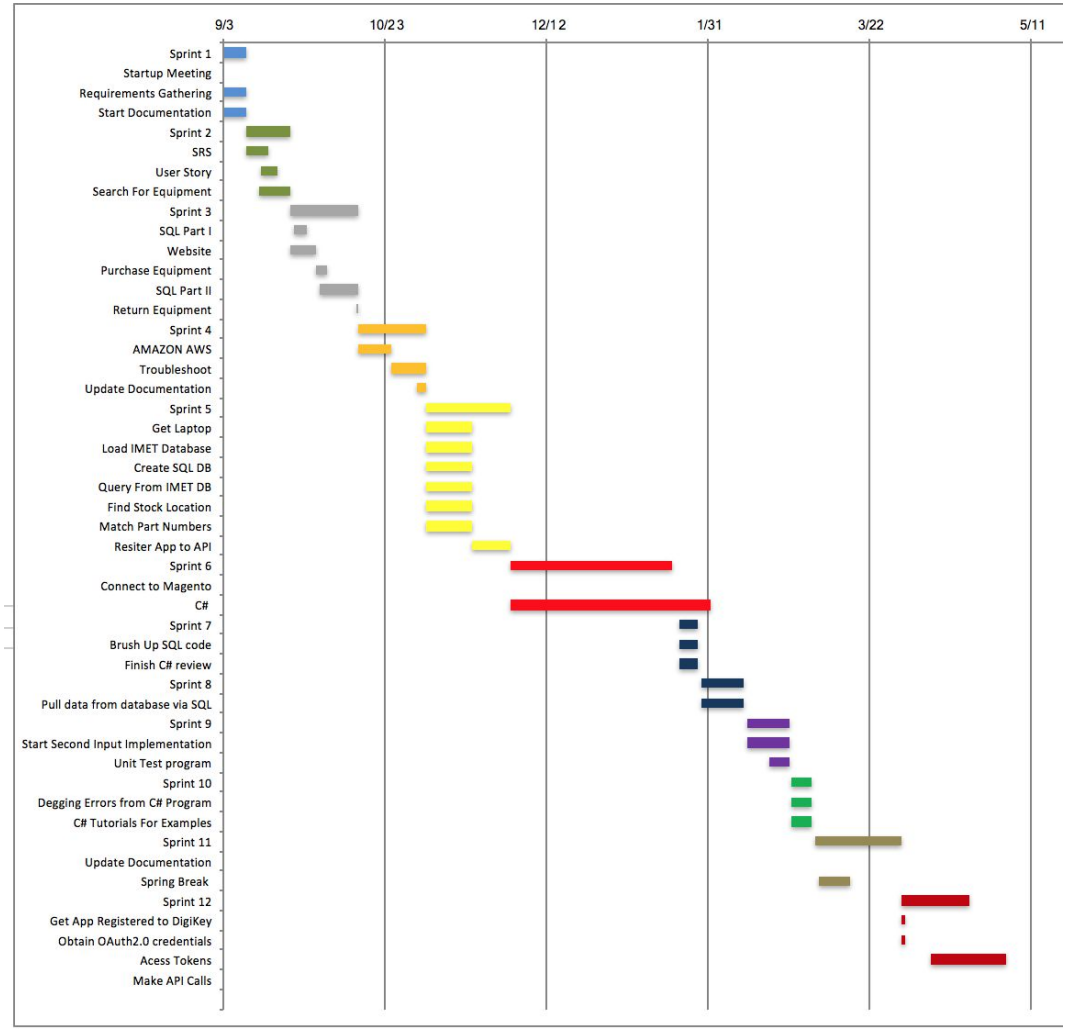
Semester 2

- IMET is in the process of redesigning Design Notes
  - Shifting away from EXACTMAX
- New implementation needed to be created for obtaining parts from the inventory
- OAuth 2.0 Authorization Framework is complex to implement
  - The implementation was started
  - Completed as much as could be done by the deadline
- Debugging errors from unit testing

# Remaining Steps

- Finish implementing the OAuth 2.0 authentication framework to obtain token
- Push data to magento server
- SQL stored procedure can still be implemented in the future
- IMET’s development team are finishing updates to the website before it goes live
    - Provide IMET with all documentation to continue the task and for future changes

# Sprint Chart



# Summary

- The goal of this project is to develop software for IMET that will improve the efficiency of their inventory management
  - Inventory control improves a company's efficiency and profit
- Languages learned for this project were mainly SQL and C#
- Senior project budget was not used

# Acknowledgments


- Primary Advisor: Dr Orlando Hernandez, TCNJ
- Secondary Advisor: Tom Krol, IMET
- Technical Advisor: Chintan Sutaria, CalcuQuote

# Thank You For Your Time

Questions?