Oder Calc Engine

v1.0

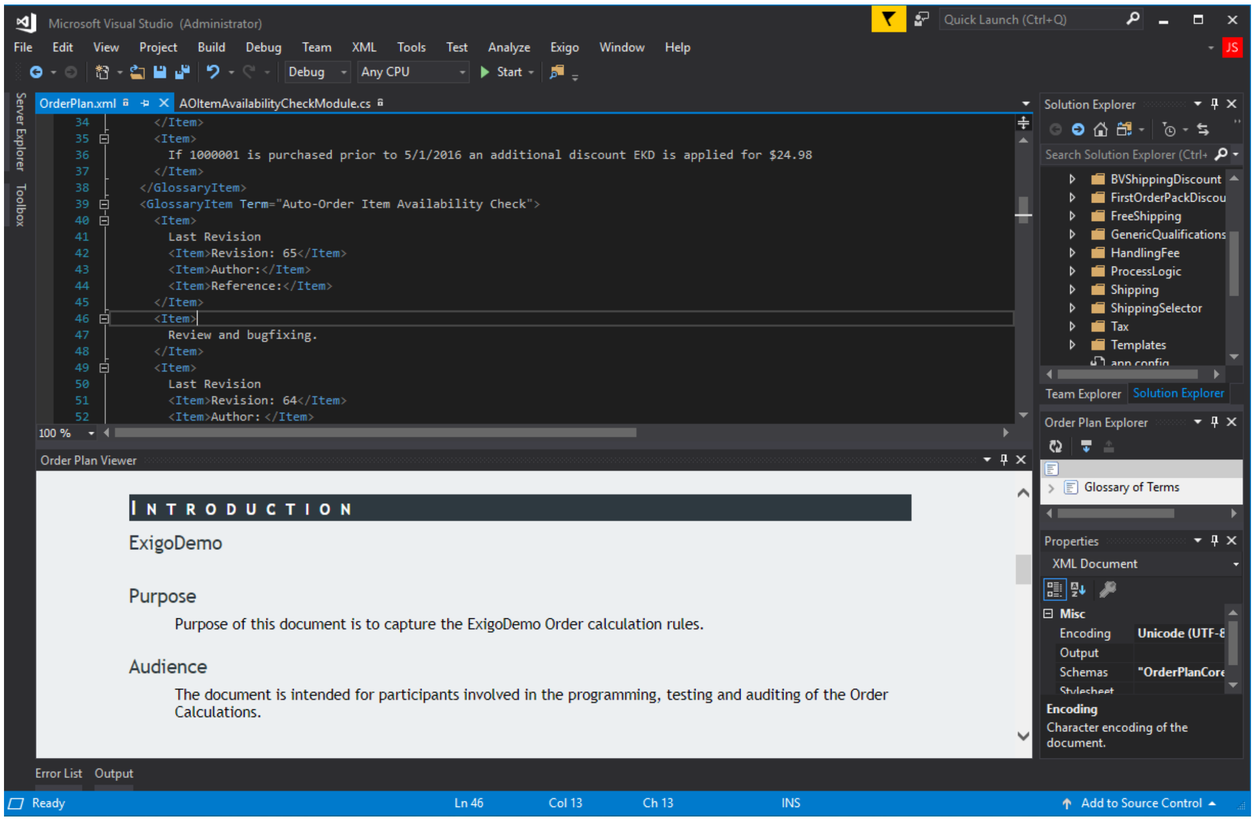
Order Calculation Engine

Order calculation and processing is at the core of the Exigo Platform. The Order Calculation Engine provides a robust and highly customizable platform for developers to easily extend and test changes.

ENVIRONMENT

Exigo has built a **Visual Studio 2012 plug-in** which allows your development team to **create new order plan projects, test out changes,** and **check in code** to be used by the central engine. With version control built in, you simply **"check in"** your changes and instruct the platform to **"deploy latest version".** Each "check in" **creates a new version number** which can be compared against older versions to document changes. When you are ready to have your changes go live you simply press the **"deploy"** button. The platform will start to use your new assemblies and will mark all new orders with the new version number.

As you add to and configure your project, there is a human-readable document which is **auto-generated.** This allows non-programmers to review business rules:



```
        </Item>
        <Item>
          If 1000001 is purchased prior to 5/1/2016 an additional discount EKD is applied for $24.98
        </Item>
      </GlossaryItem>
      <GlossaryItem Term="Auto-Order Item Availability Check">
        <Item>
          Last Revision
          <Item>Revision: 65</Item>
          <Item>Author:</Item>
          <Item>Reference:</Item>
        </Item>
        <Item>
          Review and bugfixing.
        </Item>
        <Item>
          Last Revision
          <Item>Revision: 64</Item>
          <Item>Author: </Item>
```

INTRODUCTION

ExigoDemo

Purpose

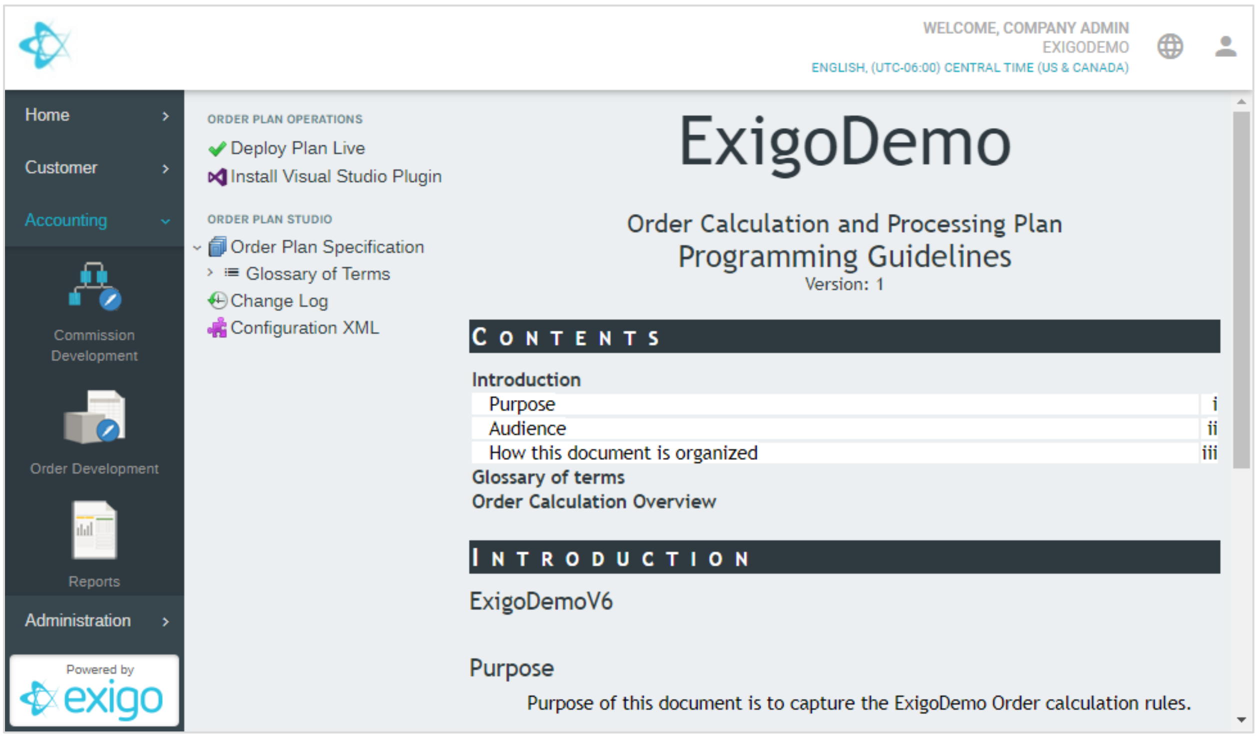
Purpose of this document is to capture the ExigoDemo Order calculation rules.

Audience

The document is intended for participants involved in the programming, testing and auditing of the Order Calculations.

Encoding
Character encoding of the document.

Once you've checked in your code you can review the changes with the rest of the team view the web **navigation tool:**



ExigoDemo

Order Calculation and Processing Plan
Programming Guidelines
Version: 1

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INTRODUCTION

ExigoDemoV6

Purpose

Purpose of this document is to capture the ExigoDemo Order calculation rules.

MODULAR PIPELINE ARCHITECTURE

The engine itself leaves all specific calculation tasks to your **implementation project**. It uses a pipeline architecture where all calculation tasks are delegated to your modules in the order they are declared. The pipeline starts at the top and conditionally runs the applicable modules. This gives ultimate control to the end developer to dictate when, if, and in what order any module can run.

At its core all modules inherit from **OrderModule:**

```
public class OrderModule
{
    public abstract void Process(Order order);
}
```

Implementation classes override the **Process function**.

The following calculates shipping at 10% of the subtotal of an order:

```
public class SimpleShippingModule : OrderModule
```

```
{
    public override void Process(Order order)
    {
        order.ShippingAmount = order.SubTotal * .10M;
    }
}
```

The modules are then registered to in the pipeline by declaring them in OrderPlan.xml.

The following shows a simple pipeline where first shipping then tax is calculated:

```
<CalculatePipeline>
  <Module Description="Shipping" ModuleClass="SimpleShippingModule" />
  <Module Description="Tax"      ModuleClass="USTaxModule" />
</CalculatePipeline>
```

CONDITIONAL MODULES

In a real world implementation there will be many different types of s**hipping, tax, volume, discounting** and **other types** of calculations. In any given run only a subset of the modules would be executed. An example might be a new order with a shipping type of FedEx going to an address in California. In this case neither the UPS shipping module nor the Canadian tax module should run.

The calculation pipeline gives a convenient set of qualifiers which can be attached to each module. The benefit of adding the qualifiers instead of a simple "if" statement in your code, is the **audit trail** found embedded in the logging. With every order calculation a full audit trail is saved documenting **which modules were skipped and why.**

As a simple example the following states that the **SimpleShippingModule** should only be run if the order is in Warehouse 1:

```
<CalculatePipeline>
  <Module Description="Shipping" ModuleClass="SimpleShippingModule">
    <Qualifications>
      <Order WarehouseID="1"/>
    </Qualifications>
  </Module>
  <Module Description="Tax"      ModuleClass="USTaxModule" />
</CalculatePipeline>
```

This can also be expressed in the shorthand syntax:

```
<CalculatePipeline>
  <Module Description="Shipping" ModuleClass="SimpleShippingModule" Order-WarehouseID="1" />
  <Module Description="Tax"      ModuleClass="USTaxModule" />
</CalculatePipeline>
```

This logging will note all qualifications per module and what the value of the expression was at the time. This becomes helpful to determine after the fact why a module was or was not executed even if the data changes in the future.

CUSTOM QUALIFICATIONS

You will run into instances where the built in qualifiers do not cover some new business rule. For example, you may want to add a discounting module where the requirement is the customer must have 100 or more PV for the month. After looking in the built-in qualification methods, you do not find one which covers this. You can easily **create your own resembling:**

```
public class MustHave100PVQualification : QualificationModule
{
    public override bool Qualifies(Order order)
    {
        return (Source.Volume[Volumes.PV] >= 100M);
    }

    public override string GetRequiredDisplay(Order order)
    {
        return "100";
    }

    public override string GetActualDisplay(Order order)
    {
        return Source.Volume[Volumes.PV].ToString();
    }
}
```

Then you can **register it in the pipeline** using:

```
  <Module Description="Discounting" ModuleClass="MyDiscountingModule">
    <Qualifications>
                         <Qualification Description="Must Have 100 PV"
                       QualificationClass="MustHave100PVQualification"/>
    </Qualifications>
  </Module>
```

When evaluating whether to run your module the engine will first make a call to the **Qualifies function** of your class. It will also call the **GetRequiredDisplay** and **GetActualDisplay** when building the log to ensure a clear audit trail exists detailing the value of the variable at the time of calculation.

NESTED MODULES

Modules can be nested. A nested module **only executes if its parent has executed**. The following example only calls into a module dealing with Utah tax overrides if the order is being shipped to Utah and has run the US based tax rules:

```
  <Module Description="US Tax" ModuleClass="USTaxModule" Order-Country="US">
```

```
    <Module Description="Nutritional Utah Overrides"
        ModuleClass="USTaxUtahOverridesModule" Order-State="UT" />
  </Module>
```

AUDIT LOG

Nothing is more frustrating than not being able to answer clearly why a certain number has calculated the way it has. The engine creates a clear and verbose audit trail which records not only which modules have run and why, but it contains a full change log to see which modules changed which properties to what. This audit trail is saved with every order which preserves this audit trail going back in time.

Following is a snipped from this audit trail. This portion states that US tax module ran because it satisfied the qualification that the country be US. It then spits out every property that this module has changed. Here we see it is assigning tax values and percentages. **This becomes highly useful when there are multiple modules overriding the same properties.**

```
<Module Ran="True" Description="Tax" Type="" Time="0">
<Module Ran="True" Description="United States Sales Tax" Type="DevFirstTests.Tax.TaxUSModule "
Time="0">
<Qualification Qualifies="True" Description="Order.Country is US" Type="dyn6" Required="US "
Actual="US" Time="0" />
          <Change Name="Order.TaxCountry" From="" To="US" />
          <Change Name="Order.TaxCity" From="" To="DALLAS" />
          <Change Name="Order.TaxState" From="" To="TX" />
          <Change Name="Order.TaxZip" From="" To="75247" />
          <Change Name="Order.TaxCounty" From="" To="DALLAS" />
          <Change Name="OrderDetail(103).IsTaxedInRegion" From="false" To="true" />
          <Change Name="OrderDetail(103).TaxStateRate" From="0" To="6.2500" />
          <Change Name="OrderDetail(103).TaxCityRate" From="0" To="1.0000" />
          <Change Name="OrderDetail(103).TaxCountyLocalRate" From="0" To="1.0000" />
          <Change Name="OrderDetail(103).CityTax" From="0" To="0.09" />
          <Change Name="OrderDetail(103).StateTax" From="0" To="0.56" />
```

CONCLUSION

The Order Calculation Engine provides a highly customizable modular approach to managing all the pieces which go into the final numbers of an order. It becomes quite simple to **add new dynamic shipping methods, integrate with a 3rd party tax provider** or simply **add discounting logic.**

With a clear audit trail it also adds clarity to which modules have run and which have contributed to the final numbers.

Forward any specific questions to davidt@exigo.com