Prediction Methods Mashup: Setup and Use

1   Introduction

The Prediction Methods mashup is designed to demonstrate some different methods of triggering a prediction using Thingworx Analytics:

- API Realtime Prediction
- Analytics Manager: Event
- API Batch Prediction

It's probably most interesting to use this mashup and at the same time, review the Services code in Thing: concreteHelper. That way you will get a more detailed understanding of the different methods used to trigger a prediction.

The mashup uses a simple dataset showing different inputs to concrete (e.g. water, coarse aggregate, fine aggregate, age etc) and the resulting compressive strength. A prediction model predicts compressive strength based on different inputs entered.

The dataset was taken from this site:
https://archive.ics.uci.edu/ml/datasets/Concrete+Compressive+Strength

2   Thingworx Version

The entities were created and tested with TWX version 8.3

3   Resources

The following files are needed for this scenario:

Entities.twx		*Allows import of Thingworx entities*

concrete.json		*Needed to create an Analytics Dataset*

concrete.csv		*Needed to create an Analytics Dataset*

Optional files:

scriptSourceCode.zip	*Source code for services in concreteHelper. Note that this file is only included for convenience as the source code is contained in Entities.twx anyway*

4 Import Entities

In Thingworx Composer, import … From File … Type=Entity, Source=Single File, File Name= Entities.twx (or Entities.xml)

5 Create Dataset

Open Analytics Builder … Data … New:

Dataset Name = concrete

File Containing Dataset Field Configuration (JSON format) = concrete.json

File Containing Dataset Data (CSV format) = concrete.csv

Dataset has Header = True

6 Create Model

Open Analytics Builder … Models … New:

Model Name = concrete1

Dataset = concrete

Goal = CompressiveStrength

Filter = all_data

Excluded Fields from Model = none

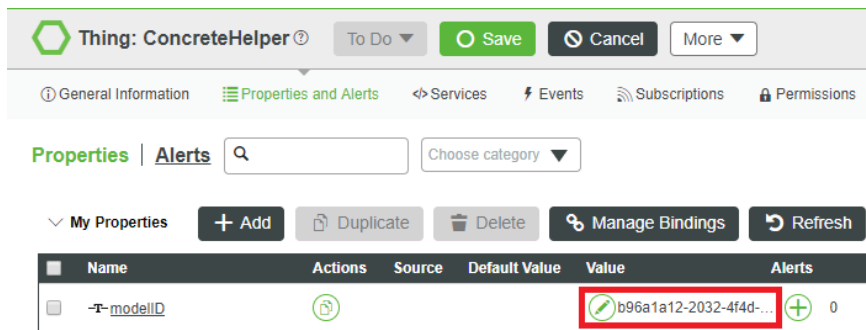Advanced Model Configuration tab = leave default settings

7 Set Model ID

Open Analytics Builder … View Model …

Copy Model Result Id to the clipboard as shown below:
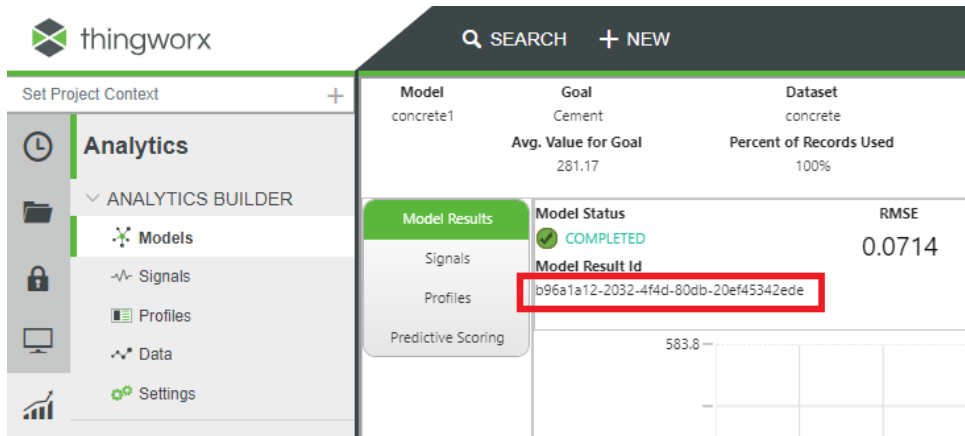
Navigate to Thing: ConcreteHelper and set modelID value to the value in your clipboard as shown below:
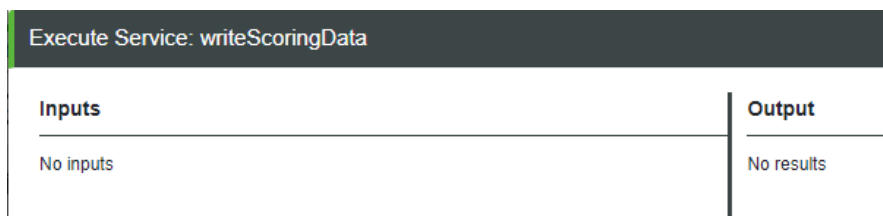

8 Write Scoring Data

We now need to write some records for scoring to a data table to make it easy to use the mashup (by loading pre-set values). In order to do this you need to execute the following service:

ConcreteHelper.writeScoringData

The service does not display any outputs after completion, see below:
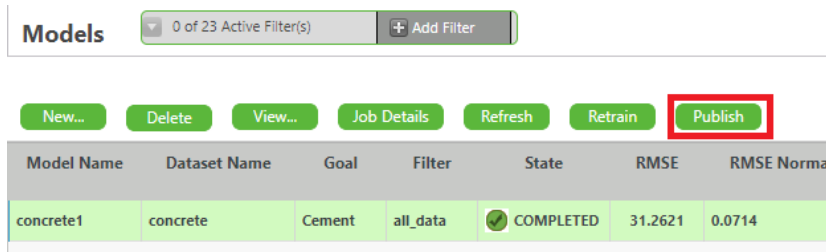

9 Create Analysis Provider

In Analytics Manager, create an analysis provider with the following details:

Provider Name = AnalyticsServer

Connector = TW.AnalysisServices.AnalyticsServer.AnalyticsServerConnector

10 Publish your Model

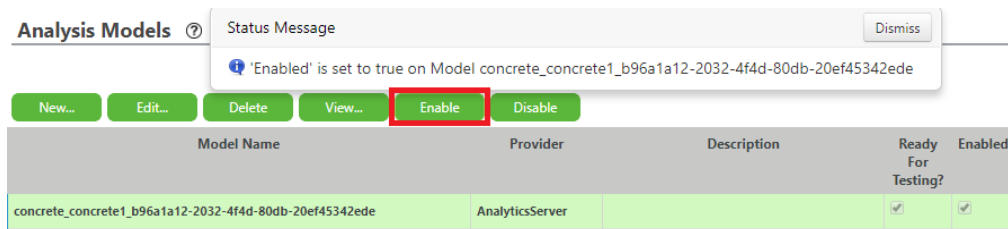In Analytics Builder ... Models ... select concrete1 and click Publish.

11 Enable your Model

In Analytics Manager ... Analysis Models ... select your model and click Enable.

12 Create Analysis Event

In Analytics Manager ... Analysis Events ... create an new event with the following settings:

13 Event Inputs Mapping

In Analytics Manager … Analysis Event select the event you created and click Map Data …

Now select Inputs Mapping and set Source Type = Thing, source = ConcreteHelper and Map All inputs.

See also the screenshot below:

ConcreteHelper:AnyDataChange

Analysis Event ⑦

Browse and Map Properties to Inputs

Source Type (Required) :	Thing ▼
Source (Required) :	ConcreteHelper ✖

Information

Inputs Mapping

Results Mapping

Properties to be Mapped :

- _Age[NUMBER]
- _Cement[NUMBER]
- _CoarseAggregate[NUMBER]
- _CompressiveStrength[NUMBER]
- _CompressiveStrength_mo[NUMBER]
- _FineAggregate[NUMBER]
- _FlyAsh[NUMBER]
- _Slag[NUMBER]
- _Superplasticizer[NUMBER]
- _Water[NUMBER]
- causalTechnique[STRING]
- description[STRING]
- errorMessage[STRING]
- goalField[STRING]
- importantFieldCount[INTEGER]
- importantFields[INFOTABLE]
  - FIELDNAME[STRING]
  - FIELDVALUE[NUMBER]=0.0
  - key[STRING]
- key[STRING]
- modelID[STRING]
- name[STRING]
- tags[TAGS]
- thingTemplate[THINGTEMPLATENAME]

Map All

Map

Remove

Input Data Shape :

- _Age[NUMBER]=0.0 <-- ConcreteHelper[_Age]
- _Cement[NUMBER]=0.0 <-- ConcreteHelper[_Cement]
- _CoarseAggregate[NUMBER]=0.0 <-- ConcreteHelper[_Coa
- _FineAggregate[NUMBER]=0.0 <-- ConcreteHelper[_FineAg
- _FlyAsh[NUMBER]=0.0 <-- ConcreteHelper[_FlyAsh]
- _Slag[NUMBER]=0.0 <-- ConcreteHelper[_Slag]
- _Superplasticizer[NUMBER]=0.0 <-- ConcreteHelper[_Supe
- _Water[NUMBER]=0.0 <-- ConcreteHelper[_Water]
- causalTechnique[STRING] <-- ConcreteHelper[causalTechn
- goalField[STRING] <-- ConcreteHelper[goalField]
- importantFieldCount[INTEGER]=0 <-- ConcreteHelper[impo
- key[STRING] <-- ConcreteHelper[key]
- thingName[STRING]

14 Event Results Mapping

Leave Target Type = Event Source and Map All Results as shown below:

ConcreteHelper:AnyDataChange
Analysis Event ⑦

Browse and Map Results to Properties

Information

Inputs Mapping

Results Mapping

Target Type (Required) : Event Source ▼

Target (Required) : ConcreteHelper

Results Data Shape :

- _CompressiveStrength[NUMBER]=0.0 --> ConcreteHelper[_
- _CompressiveStrength_mo[NUMBER]=0.0 --> ConcreteHel
- errorMessage[STRING] --> ConcreteHelper[errorMessage]
- importantFields[INFOTABLE] --> ConcreteHelper[importantF
- key[STRING] --> ConcreteHelper[key]

Map All

Map

Remove

Mapped to Properties :

- _Age[NUMBER]
- _Cement[NUMBER]
- _CoarseAggregate[NUMBER]
- _CompressiveStrength[NUMBER]
- _CompressiveStrength_mo[NUMBER]
- _FineAggregate[NUMBER]
- _FlyAsh[NUMBER]
- _Slag[NUMBER]
- _Superplasticizer[NUMBER]
- _Water[NUMBER]
- causalTechnique[STRING]
- description[STRING]
- errorMessage[STRING]
- goalField[STRING]
- importantFieldCount[INTEGER]
- importantFields[INFOTABLE]
  - FIELDNAME[STRING]
  - FIELDVALUE[NUMBER]=0.0
  - key[STRING]
- key[STRING]
- modelID[STRING]
- name[STRING]
- tags[TAGS]
- thingTemplate[THINGTEMPLATENAME]

Click Close to exit this dialog.

15 Analysis Event: Enable

In Analytics Manager, select your event and click Enable as shown below:

Analysis Events ⑦ | 0 of 14 Active Filter(s) | + Add Filter

| New... | Map Data... | Delete | View... | **Enable** | Disable | Replay |

Enabled?	Event Source	Event Name	Event Property	Alert Name	Provider Name
☑	ConcreteHelper	DataChange	_Cement		AnalyticsServer

The Simple Prediction Mashup is now ready for use!

16 Using the Mashup

You can open the mashup by adapting this URL and then pasting into your browser:

http://<your-servername:port>/Thingworx/Mashups/concreteMash

You should see the blank mashup load as shown below:

The aim of the mashup is to allow you to enter inputs on the left and use the buttons on the right to trigger predictions using different methods. Additional hints / details are shown in the subsections below.

16.1 Load Values

The Load Values button allows you to load a pre-defined set of input data (to avoid having to type out all fields)1. To do this, type in an identifier from 1 to 20 and click Load Values as shown below:

This will save you time, as you don't need to type input values manually, however you are free to do so, or to edit the input values if you wish.

16.2 Realtime Scoring

Once you have input some values you can click Realtime Scoring and you should see a Compressive Strength result shown in the middle of the screen. This is the prediction from the system of what the compressive strength would be for such a concrete mixture.

16.3 Predict Using Manager

This button demonstrates the use of Analytics Manager for getting a prediction based on input values. Set some input values, then click Reset, this resets the Compressive Strength result to 0. Now click Predict using Manager and after some seconds (around 10 secs on my system) you should see the compressive strength result update automatically.

Note that the script executed when you click Predict using Manager does not actually trigger the prediction directly. It only sets the input field values, however there is an Analysis Event which triggers when the input values change and this is what causes the predicted Compressive Strength to update.

16.4 Batch Scoring

Set your input values and click Batch Scoring. You get a job ID returned. You can now copy this job ID into the input box on the line below, and click Retrieve Result. The Compressive Strength prediction should update.

Cement	351.5	
Slag	140.5	
Fly Ash	6	
Water	222	
Superplasticizer	0	
Coarse Aggregate	939	
Fine Aggregate	577	
Age	277	

Identifier 3   **Load Values**

Compressive Strength   **54.00**

Realtime Scoring

Reset   **Predict using Manager**   Takes a few seconds ...

Batch Scoring   bff52e82-65c3-4445-9def-d6bb505ebb5b

Retrieve Result   bff52e82-65c3-4445-9def-d6bb505ebb5b