



Price Presentation Engine (PPE) Specification

Version 1.0

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Document History

Date	Description of Change
1/11/01	Draft
5/01/01	Version 1.0

Overview

As hardware and bandwidth costs drop, retailers seek new outlets for marketing merchandise. Requirements continue to emerge where business rules need to be used and presented consistently across various devices such as price scanners, electronic price labels, and POS devices. In the past, each price presentation required a unique application native to that device. The complex rules used to determine and present prices were interpreted using different languages and different tool kits. This approach brought inconsistent results. Consistency in pricing has become more than just a requirement. It is a source of liability. One solution to this problem would be to run a single POS application; but this prevents exploitation of specific hardware strengths. By creating a single service to apply business rules, the potential of the presentation layer will be maximized.

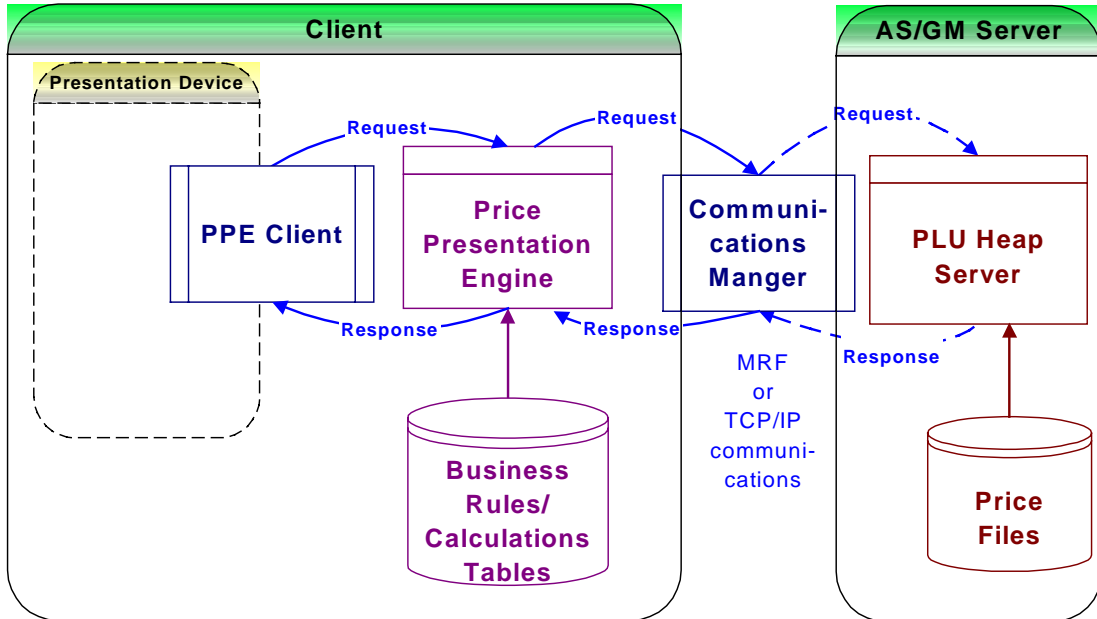
The Price Presentation Engine (PPE) is a portable software component that uses the pricing policies of the business to calculate the price of merchandise items. It uses time and date criteria to determine pricing over a known timeline and presents pricing information in XML format to external media devices such as Web catalogs, kiosks, price checkers, and electronic price labels.

The benefits of the Price Presentation Engine to retailers include:

- Runs on multiple platforms
- Ensures consistent pricing across all platforms and devices
- Pricing policies are easily implemented through plain text files, eliminating the need for source code changes
- PPE delivers pricing through the entire timeline, which ensures that the presentation device has all future price events

Architecture

The Price Presentation Engine distributes data with simple, autonomous software objects.



Presentation Device

The Presentation Device is the application-specific presentation layer, such as a web kiosk or POS application.

PPE Client

The PPE Client is the broker between the presentation device and the PPE Engine and isolates the presentation logic from the Price Presentation Engine. It parses the XML data for presentation and uses COM to communicate to the Price Presentation Engine.

Price Presentation Engine

The Price Presentation Engine uses business rules and calculation tables to act on item pricing information it receives from the PLU Heap Server.

Business Rules/Calculations Tables

The logic used to calculate pricing is stored in independent, external tables. This makes it possible to change the logic without recompiling the software.

Communications Manager

The Communications Manager sends request and response message between the PLU Heap Server and the Price Presentation Engine. It uses TCP/IP protocol if PPE is stored on the client, or MRF if PPE is stored on the AS/GM server.

PLU Heap Server

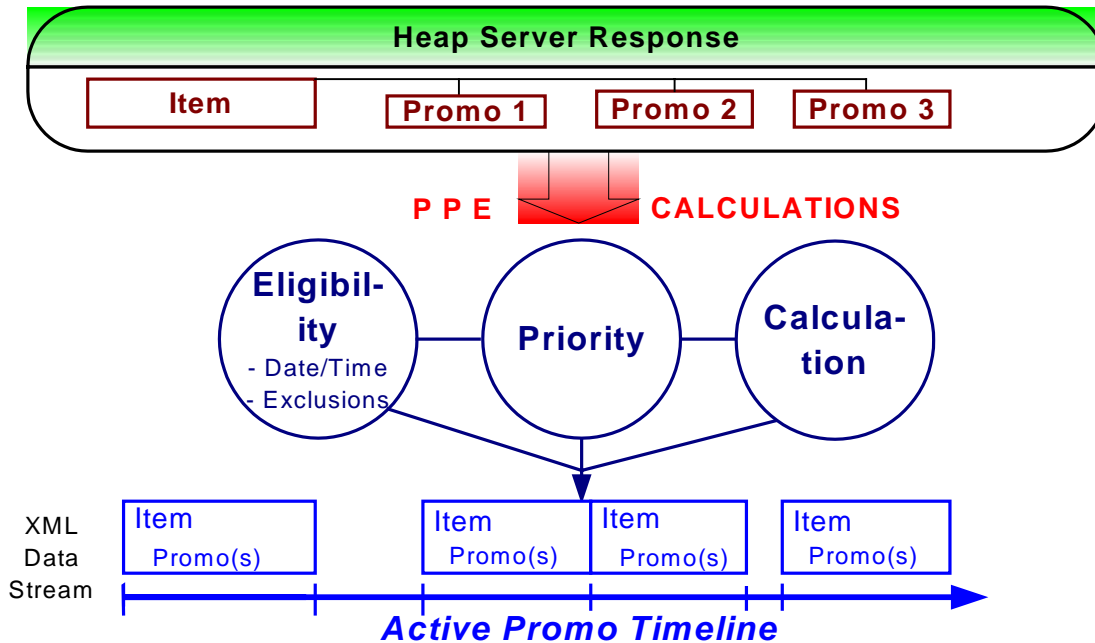
The PLU Heap Server accesses item data from the price files on the server and feeds that information to the Price Presentation Engine.

Price Files

Item and promotional data are extracted from the Price Lookup (PLU), Promo Map, Promo, and Global Markdown files on the AS/GM Server.

Calculations

The Price Presentation Engine receives the basic item, promo, and pricing information from the PLU Heap Server and uses defined PPE variables to produce an XML data stream that includes item and promo data along the complete timeline.



Eligibility

The eligibility of a promo is determined using date and time criteria received from the Price files on the server and exclusion criteria stored in PPE tables.

Priority

The priority of a promo is determined using information stored in the user-defined PPE Business Rules and Promo Tables.

Calculation

User-defined business rules are applied in calculating the promotional price. These rules are stored in the Business Rules Table.

Active Promo Timeline

A timeline is created that includes priority, exclusion, start and stop times. Each milestone in the timeline causes a re-evaluation of the item and creates a separate section in the XML output stream.

Configuration Tables

The data used by the Price Presentation Engine to qualify promotions and calculate prices is stored in the following external configuration files:

- Business Rules Table
- Exclusion Rules Table
- Variable Table
- Constant Table
- Promo Rules Table

All of these tables store data in ASCII format and use commas as field delimiters.

Business Rules Table

The Business Rules Table contains the rules for calculating prices. It also establishes the priority, which determines the order in which discounts will be applied.

File Name: business_rules.flat

Record Layout:

	Source		Destination	
ID	Accumulator	Action	Accumulator	Priority

Valid Actions:

MULTIPLY
 SET
 SUBTRACT
 MULTIPLY_VALUE
 SET_VALUE
 AND
 OR

Configuration Tables (continued)

Exclusion Rules Table

If an item has multiple overlapping promotions, the Exclusion Rules Table can be used to find the best promo.

File Name: exclusion_rules.flat

Record Layout:

ID	Variable Field	Action
----	----------------	--------

Valid Actions:

FIND_MAX

FIND_MIN

Variable Table

The Variable Table contains user-defined variables, such as sale price and extended price, that are used for data identification and to apply business rules to price calculations.

File Name: variable_table.flat

Record Layout:

Type Indicator.Variable Name

Valid Type Indicators:

I. for Item

P. for Promotion

Configuration Tables (continued)

Constant Table

The Constant Table defines constants that will be used in the price calculations. For example, you might use the Constant Table to define a constant that could be added to or subtracted to the end time of a promotion.

File Name: constant_table.flat

Record Layout:

Constant Name	Definition
---------------	------------

Promo Rules Table

The Promo Rules Table uses previously defined business rules and exclusion rules to define a specific promotion.

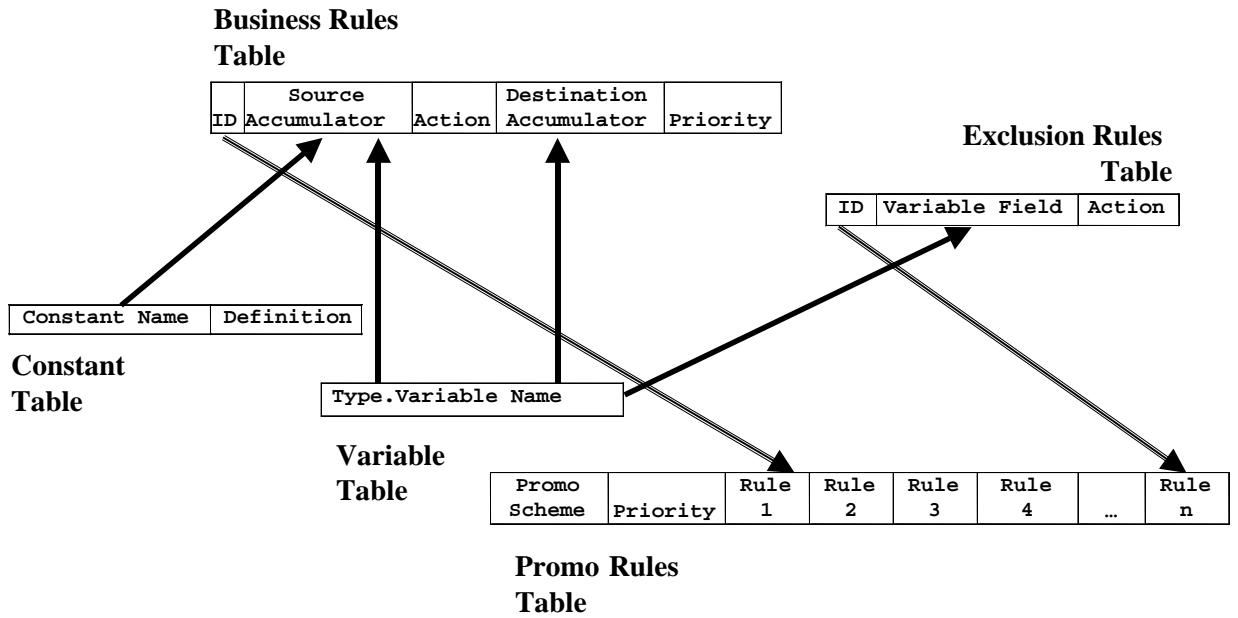
File Name: promo_rules.flat

Record Layout:

Promo Scheme	Priority	Rule 1	Rule 2	Rule 3	Rule 4	...	Rule n
--------------	----------	--------	--------	--------	--------	-----	--------

Configuration Tables (continued)

Relationship between PPE Table Elements



Other Data Relationships

The Price Presentation Engine uses PLU and Promo file data received from the server. This data varies from one system to another, based on the specific needs of each enterprise. Examples of the type of data that may be received from the server are shown below.

PLU File Data

PLU_DEPT_NUMBER
PLU_REGULAR_PRICE
...

Note: This example shows a subset of the complete PLU File data that might be received from the server. The data fields in the PLU file vary from one system to another.

Promo File Data

PROMO_SCHEME
PROMO_DOLLAR_OFF
PROMO_PERCENT_OFF
PROMO_START_DATE
PROMO_START_TIME
PROMO_STOP_DATE
PROMO_STOP_TIME
...

Note: This example shows a subset of the complete Promo File data that might be received from the server. The data fields in the Promo File vary from one system to another.

Price Presentation Example

The following example illustrates the ease with which special pricing can be implemented with PPE.

Table Definitions

Variable Table Definition

variable_table.flat: [Variable Type].[Variable Name]

I.PLU_REGULAR_PRICE I.INTER_PRICE I.PLU_SALE_PRICE P.IMPACT_PRICE
--

In this example, the I.PLU_REGULAR_PRICE variable is established to store the price received from the PLU File on the Server. I.INTER_PRICE is an intermediate variable that will be used for calculations. I.PLU_SALE_PRICE will store the final selling price. P.IMPACT_PRICE will store the savings for a promotion.

Constant Table Definition

constant_table.flat: [Constant Name],[Definition]

FIXED_DISCOUNT, 100

A fixed discount amount of \$1.00 is established for use by Promo Scheme 200 and Business Rule 1050, which are defined below. *Note:* "Promo Scheme" is used to describe a category of promotions, such as % off, \$ off, and tiered discounts.

Exclusion Rules Table Definition

exclusion_rules.flat: [Rule ID],[Variable Field],[Action]

1, PROMO_PERCENT_OFF, FIND_MAX
2, PROMO_DOLLAR_OFF, FIND_MAX
3, P.IMPACT_PRICE, FIND_MAX

Exclusion rules are established to exclude all but the preferred promotion. In this example, the Exclusion Rules 1 and 2 will find the maximum percent discount, the maximum dollar discount. Exclusion Rule 3 is used to apply the best discount between two different types of overlapping promotions.

Business Rules Table Definition

business_rules.flat: [Rule ID],[Source],[Action],[Destination],[Priority]

999, PLU_REG_PRICE, SET, I.PLU_SALE_PRICE
1000, PLU_REGULAR_PRICE, SET, I.PLU_REGULAR_PRICE, 001
1001, PLU_REGULAR_PRICE, SET, I.INTER_PRICE, 002
1002, I.INTER_PRICE, SET, P.IMPACT_PRICE, 003
1020, PROMO_PERCENT_OFF, MULTIPLY, P.IMPACT_PRICE, 020
1030, PROMO_DOLLAR_OFF, SUBTRACT, P.IMPACT_PRICE, 030
1040, P.IMPACT_PRICE, SUBTRACT, I.PLU_SALE_PRICE, 040
1050, FIXED_DISCOUNT, SUBTRACT, I.PLU_SALE_PRICE, 050

The Business Rules Table establishes calculations that will determine the sale price of an item for promos that use that rule in the Promo Table (see below). In this example, Business Rules are used to apply percent off and dollar off discounts. Business Rule 1050 is also established to subtract a fixed discount amount. The order in which the rules will be applied is established by the Priority assigned.

Promo Rules Table Definition

promo_rules.flat: [Promo Scheme],[Priority],[Rule 1],[...],[Rule n]

100, 1, 999, 1000, 1001, 1002, 1020, 1, 3, 1040
200, 2, 999, 1000, 1001, 1002, 1030, 2, 3, 1040, 1050
402, 5, 999, 1000, 1001, 1002, 1020, 1

The Promo Rules Table brings together Business Rules and Exclusion Rules. It also establishes the priority in which the discount for each Promo Scheme will be applied.

In this example, Promo Scheme 100 uses Business Rules 1000, 1001, 1002, 1020 (to apply a percent off discount), and 1040 (to set the sale price), along with Exclusion Rules 1 and 3 (to find the maximum discount amounts).

Promo Scheme 200 uses the same Business Rules but substitutes 1030 (to apply a dollar discount) for 1020 (percent discount). It also uses Business Rule 1050, which subtracts the fixed amount of \$1.00 from the sale price.

Note that Promo Scheme 100 and 200 both use exclusion rule 3, which says that the promotion with the maximum P . IMPACT_PRICE (amount of savings) should be applied over the other, when they overlap.

Promo scheme 402 does not use any exclusion rules; it may be applied along with other promotions.

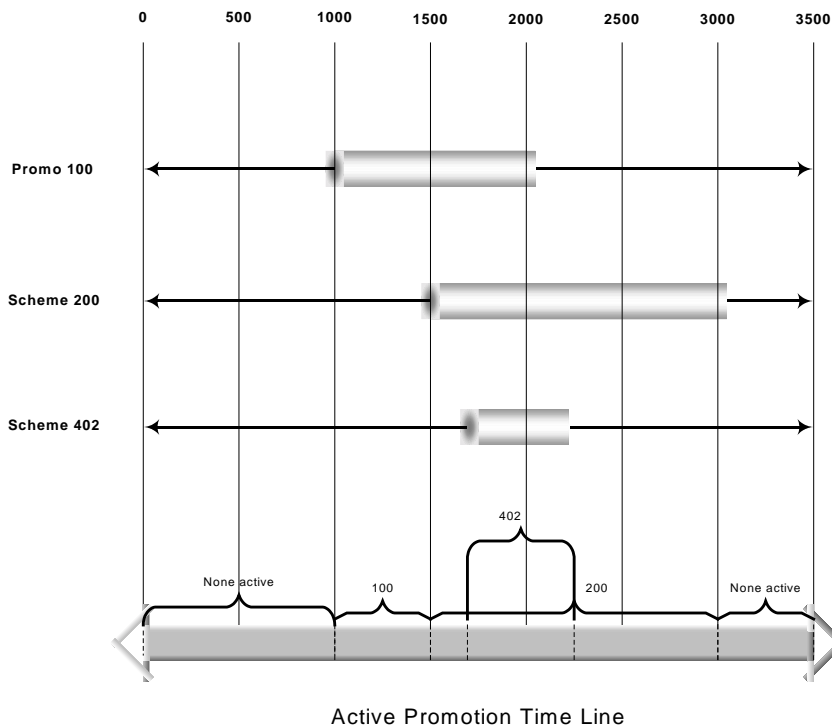
Exclusion Rule Evaluation and Timeline Determination

After the eligible promotions and the sale price has been established, the Price Presentation Engine creates a timeline, using start and stop times received from the Promo File on the Server. If any promotions overlap, the Price Presentation Engine uses the rules established by the Exclusion Rules table.

Promo Scheme	Start	Stop	Exclusion Rule	P.IMPACT PRICE
100	1000	2000	3	750
200	1500	3000	3	800
402	1700	2200	None	N/A

In this example, all the promos overlap. Promo Schemes 100 and 200 use Exclusion Rule 3, which orders the promotion by P.IMPACT_PRICE.

The following chart represents the active time range for each promotion.



Since Promo Schemes 100 and 200 exclude each other (with Exclusion Rule 3), when they overlap, only the one with the maximum savings will be applied. Since Promo scheme 402 has no exclusions, it will be applied along with either Scheme 100 or 200.

PLU and PROMO File Data

This example uses the following item information, received from the PLU and the Promo files on the server. Note that this is partial data and that this data varies from one system to another.

PLU File Data:

```
ITEM_DESCRIPTION = SPORTS APPAREL  
PLU_REGULAR_PRICE = 2499  
...
```

Promo File Data:

```
PROMO_CODE = 785535  
PROMO_SCHEME = 100  
PROMO_DOLLAR_OFF = 0  
PROMO_PERCENT_OFF = 30000  
PROMO_START_DATE = 1114  
PROMO_START_TIME = 1000  
PROMO_STOP_DATE = 1114  
PROMO_STOP_TIME = 2000  
...
```

```
PROMO_CODE = 5377  
PROMO_SCHEME = 200  
PROMO_DOLLAR_OFF = 800  
PROMO_PERCENT_OFF = 0  
PROMO_START_DATE = 1114  
PROMO_START_TIME = 1500  
PROMO_STOP_DATE = 1114  
PROMO_STOP_TIME = 3000  
...
```

```
PROMO_CODE = 800849  
PROMO_DOLLAR_OFF = 0  
PROMO_SCHEME = 402  
PROMO_PERCENT_OFF = 40000  
PROMO_START_DATE = 1114  
PROMO_START_TIME = 1700  
PROMO_STOP_DATE = 1114  
PROMO_STOP_TIME = 2200  
...
```

XML Output

Using the data elements in this example, PPE will generate the following XML stream.

```
<ESL>

  <ITEM>
    <DESCRIPTION>SPORTS APPAREL</DESCRIPTION>
    <PLU_NUMBER>0000400010130016</PLU_NUMBER>
      <START_TIME>0</START_TIME>
      <STOP_TIME>1000</STOP_TIME>
      <I.PLU_REG_PRICE>2499</I.PLU_REG_PRICE>
      <I.INTER_PRICE>2499</I.INTER_PRICE>
      <I.PLU_SALE_PRICE>2499</I.PLU_SALE_PRICE>
    </ITEM>

  <ITEM>
    <DESCRIPTION>SPORTS APPAREL</DESCRIPTION>
    <PLU_NUMBER>0000400010130016</PLU_NUMBER>
      <START_TIME>1000</START_TIME>
      <STOP_TIME>1500</STOP_TIME>
      <I.PLU_REG_PRICE>2499</I.PLU_REG_PRICE>
      <I.INTER_PRICE>2499</I.INTER_PRICE>
      <I.PLU_SALE_PRICE>1749</I.PLU_SALE_PRICE>
      <PROMO>
        <P.IMPACT_PRICE>750</P.IMPACT_PRICE>
      </PROMO>
    </ITEM>

  <ITEM>
    <DESCRIPTION>SPORTS APPAREL</DESCRIPTION>
    <PLU_NUMBER>0000400010130016</PLU_NUMBER>
      <START_TIME>1500</START_TIME>
      <STOP_TIME>1700</STOP_TIME>
      <I.PLU_REG_PRICE>2499</I.PLU_REG_PRICE>
      <I.INTER_PRICE>2499</I.INTER_PRICE>
      <I.PLU_SALE_PRICE>1599</I.PLU_SALE_PRICE>
      <PROMO>
        <P.IMPACT_PRICE>800</P.IMPACT_PRICE>
      </PROMO>
    </ITEM>
```

Continued - see next page ➔

XML Output (continued)

```
<ITEM>
  <DESCRIPTION>SPORTS APPAREL</DESCRIPTION>
  <PLU_NUMBER>0000400010130016</PLU_NUMBER>
    <START_TIME>1700</START_TIME>
    <STOP_TIME>2200</STOP_TIME>
    <I.PLU_REG_PRICE>2499</I.PLU_REG_PRICE>
    <I.INTER_PRICE>2499</I.INTER_PRICE>
    <I.PLU_SALE_PRICE>1499</I.PLU_SALE_PRICE>
    <PROMO>
      <P.IMPACT_PRICE>800</P.IMPACT_PRICE>
    </PROMO>
    <PROMO>
      <P.IMPACT_PRICE>1000</P.IMPACT_PRICE>
    </PROMO>
  </ITEM>

  <ITEM>
  <DESCRIPTION>SPORTS APPAREL</DESCRIPTION>
  <PLU_NUMBER>0000400010130016</PLU_NUMBER>
    <START_TIME>2200</START_TIME>
    <STOP_TIME>3000</STOP_TIME>
    <I.PLU_REG_PRICE>2499</I.PLU_REG_PRICE>
    <I.INTER_PRICE>2499</I.INTER_PRICE>
    <I.PLU_SALE_PRICE>1599</I.PLU_SALE_PRICE>
    <PROMO>
      <P.IMPACT_PRICE>800</P.IMPACT_PRICE>
    </PROMO>
  </ITEM>

  <ITEM>
  <DESCRIPTION>SPORTS APPAREL</DESCRIPTION>
  <PLU_NUMBER>0000400010130016</PLU_NUMBER>
    <START_TIME>3000</START_TIME>
    <STOP_TIME>3500</STOP_TIME>
    <I.PLU_REG_PRICE>2499</I.PLU_REG_PRICE>
    <I.INTER_PRICE>2499</I.INTER_PRICE>
    <I.PLU_SALE_PRICE>2499</I.PLU_SALE_PRICE>
  </ITEM>

</ESL>
```