



ARTS POSLog V6.0

Volume 4: Rounding Technical Specification

February 10, 2014 – Last Call Working Draft

TABLE OF CONTENTS

1. Abstract.....	3
1.1 OVERVIEW	3
2. Referenced Documents.....	4
3. ARTS Common Header	5
4. Use Case: Rounding.....	6
4.1 SCENARIO: ROUNDING OF TRANSACTION TOTALS.....	6
4.2 SCENARIO: TRACKING DIFFERENCES ASSOCIATED WITH ROUNDING	7
4.3 SCENARIO: ROUNDING OF POINTS	8
4.4 SCENARIO: ROUNDING OF DISCOUNT AMOUNTS	9
4.5 SCENARIO: ROUNDING OF TENDER AMOUNTS	10
4.6 SCENARIO: ROUNDING UP	11
5. Document History.....	13
6. Version History.....	14
7. GLOSSARY	15

Table of Figures

Figure 1: ARTS Common Header Domain View.....	5
Figure 2: ARTS Common Header Representation.....	5

Table of ARTS XML Samples

4.1 Conformance XML Instance Document – Rounding of Transaction Totals	6
4.2 Conformance XML Instance Document – Tracking Differences Associated with Rounding	7
4.3 Conformance XML Instance Document – Rounding of Points	8
4.4 Conformance XML Instance Document – Rounding of Discount Amounts.....	9
4.5 Conformance XML Instance Document – Rounding of Tender Amounts	10
4.6 Conformance XML Instance Document – Rounding Up.....	11

1. Abstract

1.1 Overview

According to specific legislation rules or currency specifics in several countries, rounding of amounts is required. To which kind of amounts – transaction totals, tender amounts, or others – the rounding rules apply may differ from country to country.

A retailer may also decide on his own to round amounts in favor of the customer in specific situations like e.g. when the customer returns items, or when he is granted a discount.

Rounding is always done by using a defined method (round-up or round-down) and with a defined precision (e.g. the smallest possible denomination of the currency used for tendering).

For example, because of its cost, Canada is phasing out the penny and allowing retailers to round cash tenders to cover the difference. Cash payments or transactions only will need to be rounded, either up or down, to the nearest five-cent increment. For example if the amount is \$1.01 or \$1.02 the cash tender will be rounded down to \$1.00. However if the amount is \$1.03 or \$1.04, the cash tender will be rounded up to \$1.05.

In Canada these only apply to cash transactions, checks and transactions using electronic payments—debit, credit and payments cards—do not need to be rounded, because they can be settled electronically to the exact amount.

The interesting twist in Canada is to allow the rounding of the amount on either the transaction or on the change given back to the customer. For example if the amount of the transaction is \$4.92, the transaction can be rounded down to \$4.90 or the change given back can be rounded up to \$0.10 (in this case the receipt will show \$4.92). If the customer pays with a credit/debit then the amount is \$4.92 and no rounding takes place.

2. Referenced Documents

- **ARTS Technical Committees Development Process V6.0.4 2009/11/30**
- **ARTS XML Best Practices V2.2 2010/11/11**
- **ARTS Best Practice for Process Modeling V1.0.0 2011/01/04**
- **A RTS SOA Best Practices Technical Report V1.2**
- **ARTS XML Interface Conformance Tool Manual V1.0 2005/08/11**

These documents are available for download from <http://nrf.com>

3. ARTS Common Header

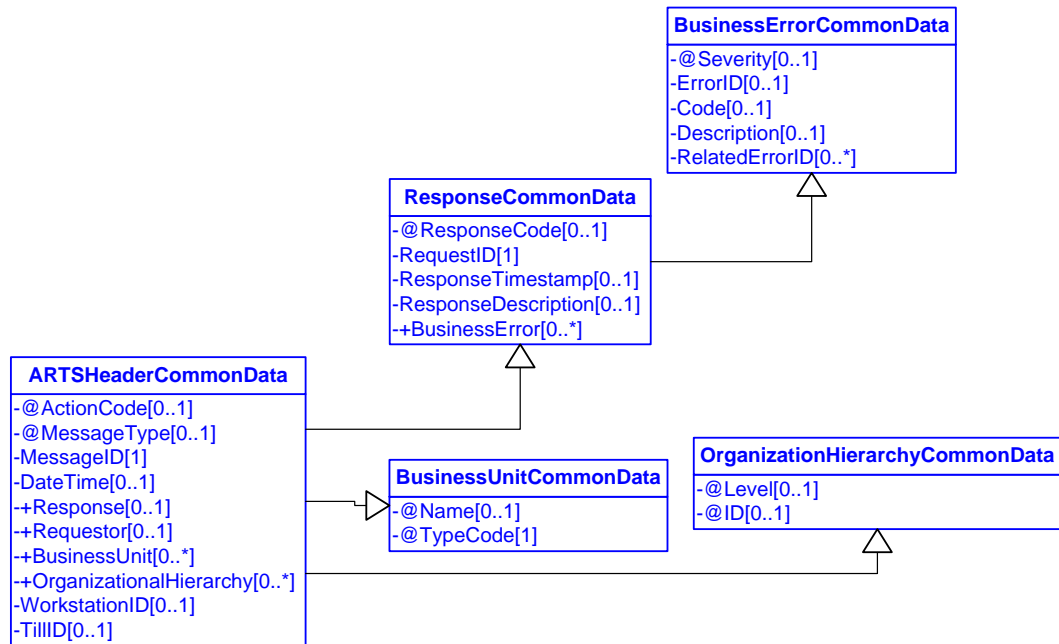


Figure 1: ARTS Common Header Domain View

The ARTS common header is used in all service name schemas. It provides the ability to set session level information and return business error information in one standard format to all SOA implementations.

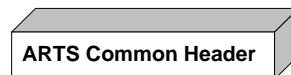


Figure 2: ARTS Common Header Representation

Since this structure is common to all service name schemas, it will not be replicated below. In place of the details, the attached box will be used to represent this complex type structure.

4. Use Case: Rounding

4.1 Scenario: Rounding of Transaction Totals

Brief Description

In some countries, cash transaction totals are to be rounded to multiples of a defined currency denomination. This applies, for example in Finland, where transaction totals are to be rounded to multiples of .05 EUR.

Scenario Description

Hakon buys a bottle of milk for 1.19 EUR and some bread for 1.49 EUR. His total of 2.68 EUR is rounded up to 2.70 EUR. The rounded amount is .02 EUR.

Data

Rounding amount for the transaction

- Threshold Value
- Amount
- Direction

4.1 Conformance XML Instance Document – Rounding of Transaction Totals

```
<?xml version="1.0" encoding="UTF-8"?>
<POSLog xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://www.nrf-arts.org/IXRetail/namespace/
  ../POSLogV6.0.0.xsd"
  MajorVersion="6" MinorVersion="0" FixVersion="0"
  xmlns="http://www.nrf-arts.org/IXRetail/namespace/">
  <Transaction>
    <BusinessUnit>
      <UnitID>Speciality Sandwich Shop</UnitID>
    </BusinessUnit>
    <WorkstationID>POS5</WorkstationID>
    <SequenceNumber>4294967295</SequenceNumber>
    <OperatorID>John</OperatorID>
    <RetailTransaction>
      <LineItem>
        <!-- milk -->
        <Sale>
          <POSIdentity>
            <POSItemID>01234567890123</POSItemID>
          </POSIdentity>
          <ExtendedAmount Currency="EUR">1.19</ExtendedAmount>
        </Sale>
        <SequenceNumber>1</SequenceNumber>
      </LineItem>
```

```
<LinItem>
  <!-- bread -->
  <Sale>
    <POSIdentity>
      <POSItemID>sdf</POSItemID>
    </POSIdentity>
    <ExtendedAmount Currency="EUR">1.49</ExtendedAmount>
  </Sale>
  <SequenceNumber>2</SequenceNumber>
</LinItem>
<LinItem>
  <Tender TenderType="Cash">
    <Amount>2.70</Amount>
    <Rounding RoundingDirection="Up">2.70</Rounding>
  </Tender>
  <SequenceNumber>3</SequenceNumber>
</LinItem>
</RetailTransaction>
</Transaction>
</POSLog>
```

4.2 Scenario: Tracking Differences Associated with Rounding

Brief Description

In some countries, tax amounts are to be rounded to multiples of a defined currency denomination. This applied, for example in Slovakia prior to adopting the Euro (EUR). During the Slovak Koruna (SKK) era, tax amounts were rounded to multiples of 0.10 SKK.

In some areas, the total sales amount is rounded to the nearest even amount.

Scenario Description

Sam bought a loaf of bread for 2.95 EUR. The register rounded it up to 3.00 EUR when the customer indicated they were paying with cash.

Data

4.2 Conformance XML Instance Document – Tracking Differences Associated with Rounding

```
<?xml version="1.0" encoding="UTF-8"?>
<POSLog xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://www.nrf-arts.org/IXRetail/namespace/
  ../POSLogV6.0.0.xsd"
  MajorVersion="6" MinorVersion="0" FixVersion="0"
  xmlns="http://www.nrf-arts.org/IXRetail/namespace/">
  <Transaction>
    <BusinessUnit>
      <UnitID>Speciality Sandwich Shop</UnitID>
    </BusinessUnit>
```

```
<WorkstationID>POS5</WorkstationID>
<SequenceNumber>4294967295</SequenceNumber>
<OperatorID>John</OperatorID>
<RetailTransaction>
  <LineItem>
    <!-- bread -->
    <Sale>
      <POSIdentity>
        <POSItemID>sdf</POSItemID>
      </POSIdentity>
      <ExtendedAmount Currency="EUR">2.95</ExtendedAmount>
    </Sale>
    <SequenceNumber>1</SequenceNumber>
  </LineItem>
  <LineItem>
    <Tender TenderType="Cash">
      <Amount>3.00</Amount>
      <Rounding RoundingDirection="Up">.05</Rounding>
    </Tender>
    <SequenceNumber>2</SequenceNumber>
  </LineItem>
</RetailTransaction>
</Transaction>
</POSLog>
```

4.3 Scenario: Rounding of Points

Brief Description

The retailer gives points to customers taking part in a specific loyalty program. In most cases, the number of points is calculated as a defined percentage of the purchased eligible amount. The result is to be rounded to whole points (no decimal places).

Scenario Description

Claudia buys a crate of beer for 9.99 EUR. The retailer gives 1 loyalty point per 1 EUR. So Claudia earns 9 points for this transaction (partial EUR amounts are not included in the calculation).

Data

Points' rounding amount

4.3 Conformance XML Instance Document – Rounding of Points

```
<?xml version="1.0" encoding="UTF-8"?>
<POSLog xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://www.nrf-arts.org/IXRetail/namespace/
  ../POSLogV6.0.0.xsd"
  MajorVersion="6" MinorVersion="0" FixVersion="0"
  xmlns="http://www.nrf-arts.org/IXRetail/namespace/">
  <Transaction>
    <BusinessUnit>
      <UnitID>Speciality Sandwich Shop</UnitID>
```



```
</BusinessUnit>
<WorkstationID>POS5</WorkstationID>
<SequenceNumber>4294967295</SequenceNumber>
<OperatorID>John</OperatorID>
<RetailTransaction>
  <LineItem>
    <!-- crate of beer -->
    <Sale>
      <POSIdentity>
        <POSItemID>sdf</POSItemID>
      </POSIdentity>
      <ExtendedAmount Currency="EUR">9.99</ExtendedAmount>
    </Sale>
    <SequenceNumber>1</SequenceNumber>
  </LineItem>
  <LineItem>
    <Points>
      <AmountForPoints>9</AmountForPoints>
      <Rounding RoundingDirection="Down">.99</Rounding>
    </Points>
    <SequenceNumber>2</SequenceNumber>
  </LineItem>
</RetailTransaction>
</Transaction>
</POSLog>
```

4.4 Scenario: Rounding of Discount Amounts

Brief Description

In some countries, discount amounts are rounded to multiples of a defined currency denomination. This applies to Switzerland, where discount amounts are to be rounded to multiples of 0.05 Swiss Francs (CHF).

Scenario Description

Heidi buys a mobile phone which costs 149.00 CHF. She receives a 3% discount = 4.47 CHF. This amount is rounded up to 4,50 CHF and a final total of 135.50 CHF.

Data

For each discount:

- Rounding amount

4.4 Conformance XML Instance Document – Rounding of Discount Amounts

```
<?xml version="1.0" encoding="UTF-8"?>
<POSLog xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://www.nrf-arts.org/IXRetail/namespace/
  ../POSLogV6.0.0.xsd"
  MajorVersion="6" MinorVersion="0" FixVersion="0"
  xmlns="http://www.nrf-arts.org/IXRetail/namespace/">
  <Transaction>
```

```
<BusinessUnit>
  <UnitID>Speciality Phone Shop</UnitID>
</BusinessUnit>
<WorkstationID>POS5</WorkstationID>
<SequenceNumber>4294967295</SequenceNumber>
<OperatorID>John</OperatorID>
<RetailTransaction>
  <LineItem>
    <!-- Phone -->
    <Sale>
      <POSIdentity>
        <POSItemID>sdf</POSItemID>
      </POSIdentity>
      <RegularSalesUnitPrice Currency="EUR">140.00</RegularSalesUnitPrice>
      <ExtendedAmount Currency="EUR">135.50</ExtendedAmount>
      <DiscountAmount>4.47</DiscountAmount>
      <RetailPriceModifier>
        <SequenceNumber>1</SequenceNumber>
        <Amount Action="Subtract">4.47</Amount>
        <Rounding RoundingDirection="Up">4.50</Rounding>
      </RetailPriceModifier>
    </Sale>
    <SequenceNumber>1</SequenceNumber>
  </LineItem>
</RetailTransaction>
</Transaction>
</POSLog>
```

4.5 Scenario: Rounding of Tender Amounts

Brief Description

In some countries, tender amounts are rounded to multiples of a defined currency denomination. This applies to the Czech Republic where local cash amounts are rounded to multiples of 1 Czech Koruna (CZK). (This only applies to cash tendering; when paying with credit cards, no rounding applies.)

Scenario Description

Petr buys a crystal bowl for 499.99 CZK. He wants to pay cash. So he has to pay 500 CZK and receives no.

Data

For each tender:

- Rounding amount

4.5 Conformance XML Instance Document – Rounding of Tender Amounts

```
<?xml version="1.0" encoding="UTF-8"?>
<POSLog xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://www.nrf-arts.org/IXRetail/namespace/
  ../POSLogV6.0.0.xsd"
  MajorVersion="6" MinorVersion="0" FixVersion="0"
```

```
xmlns="http://www.nrf-arts.org/IXRetail/namespace/">
<Transaction>
  <BusinessUnit>
    <UnitID>Speciality Phone Shop</UnitID>
  </BusinessUnit>
  <WorkstationID>POS5</WorkstationID>
  <SequenceNumber>4294967295</SequenceNumber>
  <OperatorID>John</OperatorID>
  <RetailTransaction>
    <LineItem>
      <!-- crystal bowl -->
      <Sale>
        <POSIdentity>
          <POSItemID>sdf</POSItemID>
        </POSIdentity>
        <RegularSalesUnitPrice Currency="CZK">499.99</RegularSalesUnitPrice>
        <ExtendedAmount Currency="CZK">500.00</ExtendedAmount>
        <RetailPriceModifier>
          <SequenceNumber>1</SequenceNumber>
          <Amount Action="Add">.01</Amount>
          <Rounding RoundingDirection="Up">.01</Rounding>
        </RetailPriceModifier>
      </Sale>
      <SequenceNumber>1</SequenceNumber>
    </LineItem>
    <LineItem>
      <Tender>
        <Amount Currency="CZK">500.00</Amount>
      </Tender>
    </LineItem>
  </RetailTransaction>
</Transaction>
</POSLog>
```

4.6 Scenario: Rounding Up

Brief Description

In some areas, the grand sales amount is rounded to the nearest even amount.

Scenario Description

Rounding up: Sam bought a loaf of bread for 2.97 EUR. The register rounded it up to 3.00 EUR.

<Rounding RoundingDirection="Up" >0.03</Rounding>Rounding Down:

Rounding Down: Sam bought a loaf of bread for 3.02 EUR. The register rounded it down to 3.00 EUR.

<Rounding RoundingDirection="Down" >0.02</Rounding>>

4.6 Conformance XML Instance Document – Rounding Up

```
<?xml version="1.0" encoding="UTF-8"?>
<POSLog xmlns="http://www.nrf-arts.org/IXRetail/namespace/"
```

```
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www.nrf-arts.org/IXRetail/namespace/
..\POSLogV6.0.0.xsd"
MajorVersion="6">
<Transaction>
  <BusinessUnit>
    <UnitID TypeCode="RetailStore">12</UnitID>
  </BusinessUnit>
  <WorkstationID TypeCode="POS">5</WorkstationID>
  <SequenceNumber>12345</SequenceNumber>
  <OperatorID OperatorName="Ash Manager" OperatorType="Cashier"
WorkerID="029384757">205</OperatorID>
  <CurrencyCode>EUR</CurrencyCode>
  <RetailTransaction>
    <LineItem>
      <Sale ItemType="Stock">
        <POSIdentity>
          <POSItemID>01234567890123</POSItemID>
        </POSIdentity>
        <MerchandiseHierarchy Level="Department">407</MerchandiseHierarchy>
        <Description> loaf of bread </Description>
        <RegularSalesUnitPrice>3.10</RegularSalesUnitPrice>
        <ExtendedAmount>2.95</ExtendedAmount>
        <Quantity>1</Quantity>
        <RetailPriceModifier>
          <SequenceNumber>1</SequenceNumber>
          <Amount Action="Subtract">0.15</Amount>
        </RetailPriceModifier>
      </Sale>
      <SequenceNumber>1</SequenceNumber>
    </LineItem>
    <LineItem>
      <Tender TenderType="Cash" TypeCode="Sale">
        <Amount>5.00</Amount>
        <TenderChange>
          <Amount>2.00</Amount>
        </TenderChange>
        <Rounding RoundingDirection="Up">0.05</Rounding>
      </Tender>
      <SequenceNumber>2</SequenceNumber>
    </LineItem>
  </RetailTransaction>
  <TillID>5</TillID>
</Transaction>
</POSLog>
```

5. Document History

6. Version History

Version 1.0

Overview

New Features

Sections	Description of Change
	-

Minor fixes

Deprecation

Sections	Description of Change
	-

Compatibility/Dependencies Issues

Previous Document

7. GLOSSARY

Term	Definition

Wikipedia:

Eine Besonderheit in der Schweiz ist die Rappenrundung. Obwohl in der Schweiz durchaus nach Bedarf mit [Rappen](#) gerechnet wird, werden jedoch keine Beträge kleiner als 5 [Rappen](#) in [Bargeld](#) bezahlt oder in Rechnung gestellt. Effektive Geldbeträge müssen entsprechend gerundet werden. Sofern kaufmännisch gerundet wird, geschieht dies nach folgendem Schema:

Ausschlaggebend für die Rundung ist die Mitte zwischen 0 und 5 Rappen, resp. zwischen 5 und den nächsten 10 Rappen. Wenn die zu rundende Zahl gleich oder höher als die Mitte ist, wird aufgerundet, ansonsten abgerundet.

Beispiel

- 1,000–1,024 → 1,00
- 1,025–1,074 → 1,05
- 1,075–1,099 → 1,10

Soll nicht kaufmännisch gerundet, sondern grundsätzlich abgerundet werden, geschieht dies nach dem folgenden Schema:

Beispiel

- 1,000–1,049 → 1,00
- 1,050–1,099 → 1,05
- 1,100–1,149 → 1,10

Für die Berechnung der kaufmännischen Rappenrundung muss der zu rundende Betrag mal 20 gerechnet werden. Anschließend wird dieses Resultat auf 0 Stellen kaufmännisch gerundet. Am Ende wird der gerundete Betrag wieder durch 20 geteilt. Dieses Konzept ist auch in anderen Ländern bekannt, so unter anderem in [Finnland](#), bei der die kleinste Währungseinheit die 5-Eurocent-Münze ist.

<http://www.eu-info.de/euro-waehrungsunion/euro-muenzen/Rueckseiten-Euro-Muenzen/euro-muenzen-deutschland/8268/>

In den Niederlanden dürfen seit 1. September 2004 alle Einzelhändler die Endbeträge an den Kassen auf fünf Cent auf- beziehungsweise abrunden, der einzelne Warenpreis etwa im Supermarkt ist davon nicht betroffen. In Finnland gibt es schon aus der Zeit vor dem Euro ein Gesetz, das Rundungen erlaubt. De facto sind dort keine Ein- und Zwei-Cent-Münzen mehr im Umlauf.

Finland:

in the case of cash payment the amount which is to be paid is rounded to multiples of 0,05 €:

0,00 .. 0,02 --> 0,00
0,03 .. 0,07 --> 0,05
0,08 .. 0,09 --> 0,10

Wikipedia:

In the Switzerland is the cent rounding. Although the Switzerland quite as needed [cents](#) is expected, but no amounts are less than 5 [cents](#) in [cash](#) paid or invoiced. Effective amounts of money must be rounded accordingly. If commercial rounds, this is done as follows:

The mean between 0 is essential for rounding and 5 centimes, or between 5 and the next 10 cents. If the number to be rounded is equal to or higher than the Middle, rounded up, otherwise rounded off.

Example

- 1.000 1,024 → 1.00
- 1,025 1,074 → 1.05
- 1,075 1,099 → 1.10

Should not commercial rounded but basically rounded off, this is done according to the following scheme:

Example

- 1.000 1,049 → 1.00
- 1,050 1,099 → 1.05
- 1,100 1,149 → 1.10

For the calculation of the commercial cent rounding the amount to be rounded will be times 20. Then rounds the result to 0 commercial bodies. At the end, the rounded amount is again divided by 20.

This concept is known in other countries, such as in [Finland](#), where the smallest unit of currency is the 5-cent coin.

<http://www.EU-info.de/euro-waehrungsunion/euro-muenzen/Rueckseiten-Euro-Muenzen/euro-muenzen-Deutschland/8268/>

In the Netherlands all retailers must round off since September 1, 2004 up or Endbeträge at the cash register to five cents, the single price of goods in the supermarket is not affected. In Finland , there is a law that allows roundingen already from the time before the euro. De facto no one and two cent coins are more in circulation there.

Finland:

in the case of cash payment the amount of which is to be paid is rounded to multiples of 0.05 €:

0,00 .. 0,02 --> 0,00
0,03 .. 0,07 --> 0,05
0,08 .. 0,09 --> 0,10