papiNet® Forest Wood Supply and Bioproducts

Use Case 05
Harvesting and forwarding of logs in the forest

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2.1 Objectives

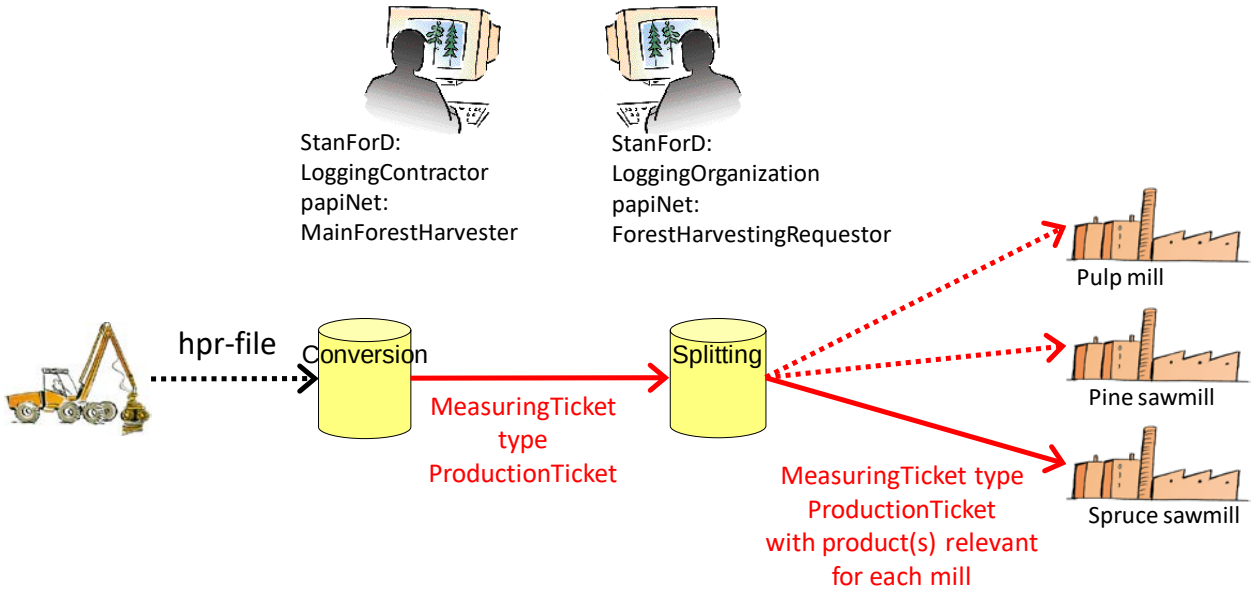
The objective of this document is to give an introduction to how StanForD 2010 data can be converted into papiNet e-documents. Observe that the document does not include a complete information chain with a large number of papiNet e-documents sent between several different business partners. The examples only illustrate separate information exchanges that may occur within many different information chains.

StanForD files must be complete, e.g. all quantities for all harvested products must be included. The papiNet standard does not require that all the details or all harvested products are included in a message. Including all data for a large number of different mills is in many cases neither suitable nor legally appropriate when communicating with only one single mill. This means that the papiNet format is a much better alternative when not all products are to be reported.

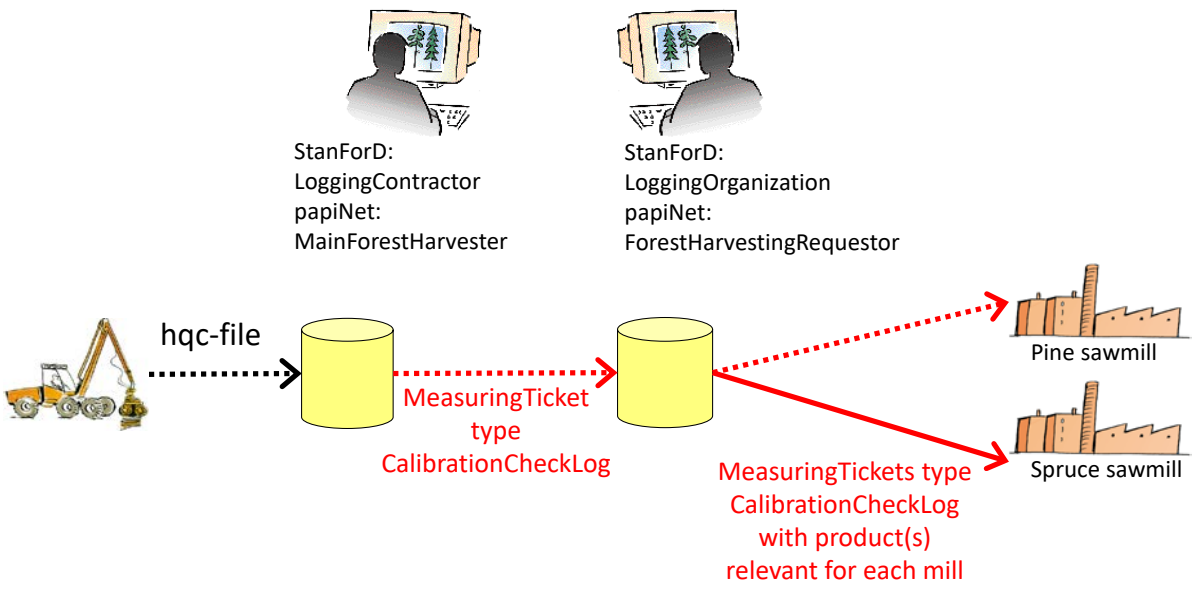
2.2 Overview

In this use case the Forest Company is both a Forest Harvesting Requestor and a Forest Forwarding Requestor, buying logging services from a logging contractor. The Forest Company is also the Supplier of sawlogs to the sawmill (EndUser). The StanForD term LoggingOrgainzation is used for both Forest Harvesting Requestor and Forest Forwarding Requestor. The logging contractor is harvesting trees and the produced logs are forwarded to roadside landings. In a logging area logs are typically produced for different mills. Observe that different mills have different product requirements. Both harvester and forwarder machines report their production on a regular basis to the logging contractor and the harvester also reports quality control data based on randomly selected control stems automatically determined by the harvester control system. The logging contractor is a Main Forest Harvester if it is responsible for the harvesting service and a Main Forest Forwarder if it is responsible for the forest forwarding service. It may be responsible for both services.

The harvested production data (StanForD 2010 hpr message) is sent to a logging contractor from the forest harvester machine. The logging contractor (MainForestHarvester) converts the harvested production data into a **MeasuringTicket type ProductionTicket** and sends it to the Forest Harvesting Requestor. The Forest Company (Supplier) can use its content to create a new **MeasuringTicket type ProductionTicket** in order to inform a mill what has been produced for this specific mill.

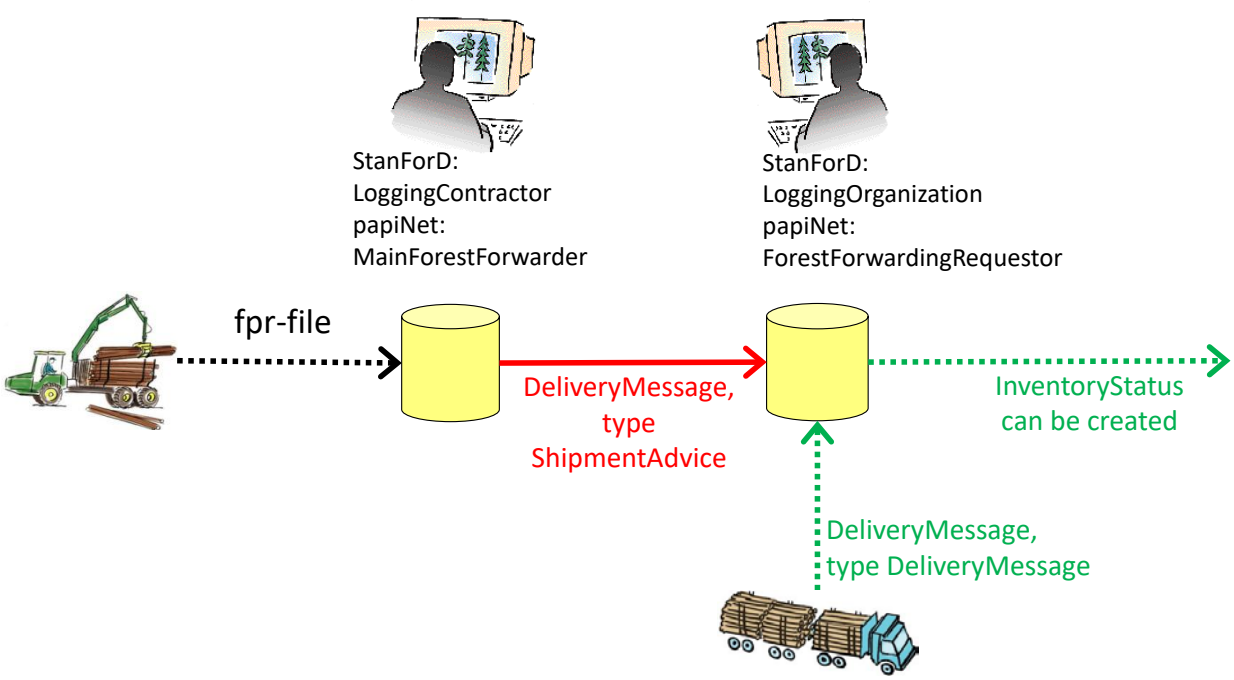


The harvesting quality control data (StanForD 2010 hqc message) is sent to a logging contractor from the forest harvester machine. The logging contractor (MainForestHarvester) converts the harvesting quality control data into a **MeasuringTicket type CalibrationCheckLog** and sends it to the Forest Harvesting Requestor. The Forest Company (Supplier) can use it to create a new **Measuring Ticket type CalibrationCheckLog** in order to inform a specific mill what to expect regarding accuracy of harvester measuring data. The mill may later use this information in order to measure the same control logs again if appropriate marking of logs with e.g. RFID has been implemented and is referenced in the **MeasuringTicket type CalibrationCheckLog**. RFID information is not included in the example file.



The forwarded production data (StanForD 2010 fpr message) is sent to a logging contractor from the forest forwarder machine. The logging contractor (MainForestForwarder) converts the forwarding production data into a **DeliveryMessage type ShipmentAdvice** and sends it to the Forest Forwarding Requestor. The Forest Company (ForestForwardingRequestor) can use the **ShipmentAdvice** to update total quantities forwarded to roadside landings. One example file is provided in this use case.

The Forest Company may receive the papiNet e-document **DeliveryMessage type DeliveryMessage** with transported quantities from roadside landings. By combining quantities in the ShipmentAdvice with quantities loaded and transported away from each landing (**DeliveryMessage type DeliveryMessage**), it is possible to calculate the remaining quantities at a roadside landing. These remaining quantities can be communicated using the papiNet e-document InventoryStatus. The data in **InventoryStatus** can be used for operative planning of transportation from roadsides. This is conceptually shown in the figure below. However, neither the **DeliveryMessage type DeliveryMessage** nor the **InventoryStatus** are part of this use case and hence not described further here.



On many markets the conversion of StanForD files into papiNet e-documents is not to be done by the logging contractor. It is instead carried out by a service provider representing the forest company. Many forest companies do not allow the logging contractors to manipulate or convert StanForD files prior to sending the files. StanForD files are in these cases sent directly from forest machines to the Forest Company or their representative using some transmission and compression software.

Included in the example xml-files are commentary references to the original StanForD elements used in the conversion to papiNet format.

The comment in the following xml-snippet illustrates that the SupplyPointCode in the ShipmentAdvice originates from the StanForD 2010 element LocationUserId:

```
<SupplyPointCode Agency="ForestForwarderRequestor">2629-01</SupplyPointCode>
<!--LocationUserId-->
```

The comment in the following xml-snippet illustrates that the Identifier of the log piles in the ShipmentAdvice originates from the StanForD 2010 elements LoadKey and PartialLoadKey:

```
<Identifier IdentifierCodeType="Carrier" IdentifierType="Primary">241_2</Identifier>
<!--LoadKey_PartialLoadKey-->
```

The comment in the following xml-snippet illustrates that the Quantity in the MeasuringTicket originates from the StanForD 2010 element LogVolume, if the attribute logVolumeCategory has the enumeration value “m3sub”:

```
<Quantity QuantityType="SolidWoodVolume" MeasuringMethodType="Automatic"
QuantityTypeContext="Measured" MeasuringAgency="ForestHarvester" MeasuringMethod="m3sub">
<!--LogVolume, logVolumeCategory="m3sub" -->
```

2.3 MeasuringTicket ProductionTicket to Forest Harvesting Requestor

The Forest Company is the Forest Harvesting Requestor buying logging services from a logging contractor. The logging contractor (MainForestHarvester) has received production data (StanForD 2010 hpr message) from a forest harvester machine. The logging contractor (MainForestHarvester) converts the harvested production data into a MeasuringTicket type ProductionTicket and sends it to the Forest Harvesting Requestor.
The Forest Harvesting Requestor is also the Measuring Party.

Scope: The MeasuringTicket contains one spruce sawlog product and one pulpwood product from one logging area. Each stem and log are provided in separate ItemInfo elements.

XML-file: UC05_2.3_MeasuringTicket_ProductionTicket_yyyymmdd.xml

2.4 MeasuringTicket ProductionTicket to End User

The Forest Company is a Supplier selling sawlogs to a Spruce Sawmill Company. The Spruce Sawmill Company is the End User. This Forest Company is also the OriginalBuyer and the buyer of the harvesting services.
The Forest Company (ForestHarvestingRequestor) has received production data from a StanForD 2010 hpr message. The Forest Company (Supplier) filters the data and sends a MeasuringTicket type ProductionTicket to the Spruce Sawmill Company (Enduser) with measuring data from the harvester including only spruce sawlog products that were produced for this particular mill. This means that pulpwood products and other irrelevant products are excluded.
The Forest Harvesting Requestor is also the Measuring Party.

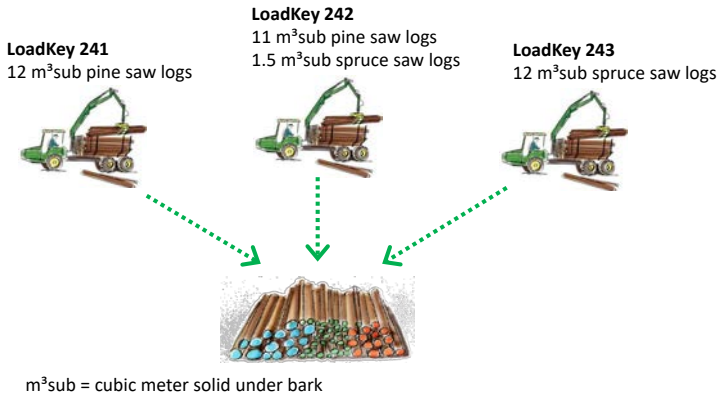
Scope: The MeasuringTicket contains one spruce sawlog product from one logging area produced for one single end user. Each stem and log are provided in separate ItemInfo elements.

XML-file: UC05_2.4_MeasuringTicket_ProductionTicket_yyyymmdd.xml

2.5 DeliveryMessage ShipmentAdvice

The Forest Company is the Forest Forwarding Requestor buying forwarding services from a logging contractor. The logging contractor (MainForestForwarder) has received forwarding data (StanForD 2010 fpr message) from a forest forwarding machine. The logging contractor (MainForestForwarder) converts the StanForD 2010 fpr message into a DeliveryMessage type ShipmentAdvice and sends it to the Forest Forwarding Requestor.
The forest forwarder machine is transporting forest wood products from the logging area in the forest to different roadside landings (SupplyPoint in papiNet and Location in StanForD 2010). The products will later be transported to different final destinations by one or more transport companies.

Scope: The DeliveryMessage contains three loads 241, 242 and 243 transported by the forest forwarder machine to one roadside landing, two loads consisting of one product each and one load with two different products.



The three loads contain two products and for each product only one PlaceFinalDestination. The forest forwarder machine will deliver additional quantities of these products which is indicated by the papiNet attribute ShipmentComplete having value "No".
Each product is reported on a separate DeliveryMessageLineItem with corresponding log piles in PackageInformation.

XML-file: UC05_2.5_DeliveryMessage_ShipmentAdvice_yyyymmdd.xml

2.6 MeasuringTicket CalibrationCheckLog to End User

The Forest Company is selling saw logs to a sawmill. The Spruce Sawmill Company is the End User. This Forest Company is also the OriginalBuyer and the buyer of the harvesting services.
The Forest Company (ForestHarvestingRequestor) has received harvesting quality control data from a StanForD 2010 hpc message. The Forest Company (Supplier) filters the data and sends a MeasuringTicket type CalibrationCheckLog to the Spruce Sawmill Company (Enduser) with harvesting quality control data including only spruce sawlog products that were produced for this particular mill
The Forest Harvesting Requestor is also the Measuring Party.

Explanations of some detailed issues are provided in section 2.6.1 below.

Scope: The Measuring Ticket contains one control measured log belonging to one product from one logging area. Quality control measurements by harvester machine, harvester operator and auditor are registered in separate Measuring Ticket Sequences.

XML-file: UC05_2.6_MeasuringTicket_CalibrationCheckLog _yyyymmdd.xml

2.6.1 References between sequences in CalibrationCheckLog

It is possible to include three types of quality control measurements in a StanForD hqc file. The different types of measurements that can be included are:

- Harvester machine measurements which are measured automatically by the harvester head. The harvester head is a component of the harvester machine itself.
- Harvester operator measurements which are measured manually by the operator typically using caliper and measuring tape.
- Auditor measurements which are measured manually by a quality auditor typically using caliper and measuring tape.

The different measurements (harvester machine, harvester operator, auditor) are stored in separate Measuring Ticket Sequences. There must be at least one reference in each MeasuringTicketSequence linking these measurements. In the example file the references between the different Measuring Ticket Sequences are based on the use of DocumentReferenceInformation as illustrated below:

```
<MeasuringNumber>42374hjw_2009-01-15 11:11:00+01:00_1</MeasuringNumber>
<!--MachineKey+CreationDate+_1 (harvester machine measurement)-->

<DocumentReferenceInformation>
    <DocumentReferenceID DocumentReferenceIDType="MeasuringNumber" AssignedBy="ForestHarvester"
                >42374hjw_20090115111100_2</DocumentReferenceID>
    <!--MachineKey+CreationDate+_2 reference to Operator measurement-->
</DocumentReferenceInformation>

<DocumentReferenceInformation>
    <DocumentReferenceID DocumentReferenceIDType="MeasuringNumber" AssignedBy="ForestHarvester"
            >42374hjw_20090115111100_3</DocumentReferenceID>
    <!--MachineKey+CreationDate+_3 reference to Auditor measurement-->
</DocumentReferenceInformation>
```

The example above illustrates that the operator and auditor measurements for the machine sequence are used to create unique Measuring Numbers “42374hjw_2009-01-15 11:11:00+01:00_2” and “42374hjw_2009-01-15 11:11:00+01:00_3” in different Measuring Ticket Sequences.

However the reader of a MeasuringTicketSequence must NOT use element MeasuringTicketReference to determine the type of measurement. Information in MeasuringSpecification are to be used in order to determine what measurement type is provided in a MeasuringTicketSequence and hence :

- Harvester machine
  MeasuringSpecification/MeasuringCodeInfo with
  MeasuringCodeType="MeasuringPurpose", Agency="ForestForwardingRequestor",
  Code=7 and CodeDescription="Quality Control, Harvester measuring log"

  MeasuringTicketSequenceLineItem/ItemMeasuringInfo/ItemInfo/PropertyValue with
  @MeasuringMethodType=Automatic

- Harvester operator
  MeasuringSpecification/MeasuringCodeInfo with
  MeasuringCodeType="MeasuringPurpose", Agency="ForestForwardingRequestor",
  Code=23 and CodeDescription="Quality Control, Operator measuring log"

  MeasuringTicketSequenceLineItem/ItemMeasuringInfo/ItemInfo/PropertyValue with
  @MeasuringMethodType=Manual

- Auditor
  MeasuringSpecification/MeasuringCodeInfo with
  MeasuringCodeType="MeasuringPurpose", Agency="ForestForwardingRequestor",
  Code=24 and CodeDescription="Quality Control, Auditor measuring log"

  MeasuringTicketSequenceLineItem/ItemMeasuringInfo/ItemInfo/PropertyValue with
  @MeasuringMethodType=Manual

An individual log has the same Identifier value regardless whether it has been measured by machine, operator or auditor:

```
<Identifier IdentifierCodeType="Measurer" IdentifierType="Primary">99_2</Identifier>
<!--StemKey+_+LogKey -->
```

2.7 Business Acknowledgement

It is recommended to use papiNet e-document Business Acknowledgement as a system acknowledgement for all types of received papiNet e-documents. An e-document receiver uses the Business Acknowledgement to notify the sender that a document has been successfully presented to the receiver's ERP system. The Status with value Success or Failure specifies whether the document content has been validated without or with errors when presented to the receiver's ERP system.

Scope: The Forest Company has sent a MeasuringTicket type ProductionTicket to the Spruce Sawmill Company. The Spruce Sawmill Company notifies the Forest Company that the

MeasuringTicket type ProductionTicket has been presented to the ERP system and validated without errors by responding with a Business Acknowledgement having Status Success.

XML-file: UC05_2.7_BusinessAcknowledgement_yyyy-mm-dd.xml

2.8 papiNet Envelope

papiNet e-documents are recommended to be wrapped into the papiNet Envelope before they are sent. The xml-file that is sent to the receiving partner consists of the papiNet Envelope and the papiNet e-document. Routing and processing of e-documents are much easier to implement in a consistent way by using the papiNet Envelope. Attachments to the papiNet e-document can also be wrapped and sent in the papiNet Envelope. Additional transmission envelopes can be used by the message service when transmitting the message.

Scope: The Forest Company sends a MeasuringTicket of type ProductionTicket to the Spruce Sawmill Company. The Spruce Sawmill Company has outsourced its IT services to an IT Company. The receiver of the transmitted message is the IT Company, i.e. the TransmissionReceiver in the papiNet Envelope. The Business Receiver is the Spruce Sawmill Company.

XML-file: UC05_2.8_papiNetEnvelope_yyyy-mm-dd.xml

3. Other general issues

3.1 Referencing of stem in a log

Below is an example indicating how to provide a stem reference in a log by including the stem identifier as a TrackingReferenceID for each log :

```
<PackageMeasuringInfo>
<ItemInfo ItemType="Stem">
        <Identifier IdentifierCodeType="Measurer" IdentifierType="Primary">992</Identifier>
        <!--StemKey -->
        <MapCoordinates MapReferenceSystem="WGS84" MapCoordinateType="LatLong">
                <!--StemCoordinates -->
                <Coordinates CoordinateFormatType="Degrees">+59.85143+15.59015</Coordinates>
        </MapCoordinates>
        <PropertyValue PropertyType="TreeDiameterBreastHeight" MeasuringMethodType="Automatic".....
.....

<ItemMeasuringInfo>
<ItemInfo ItemType="Log">
        <Identifier IdentifierCodeType="Measurer" IdentifierType="Primary">992_3</Identifier>
        <!--StemKey+_+LogKey -->
        <TrackingReferenceID ItemType="Stem" TrackingReferenceIDType="Parent">
                <Identifier IdentifierCodeType="Measurer" IdentifierType="Primary">992</Identifier>
              <!--Reference to stem using StemKey-->
        </TrackingReferenceID>
        <!--LogVolume -->
        <Quantity QuantityType="SolidWoodVolume" MeasuringMethodType="Automatic".....
        <PropertyValue PropertyType="DiameterSmallEnd" MeasuringMethodType="Automatic" ....
```

Observe that the stems are individually registered under PackageMeasuringInfo and not within ItemMeasuringInfo since the stem does not belong to any specific product.

3.2 Referencing original StanForD messages

There are many reference types supported by the papiNet standard, the following reference types are specifically to be used for StanForD messages: StanForDHarvestedProductionNumber, StanForDHarvestingQualityControlNumber and StanForDForwardedProductionNumber.

There is no unique identity per message in the StanForD standard. However, by concatenating the globally unique MachineKey with the CreationDate of the StanForD 2010 files, it is possible to create a unique id per message as illustrated in the examples below:

Reference to a StanForD hpr file

```
<DocumentReferenceInformation>
    <DocumentReferenceID DocumentReferenceIDType="StanForDHarvestedProductionNumber"
    AssignedBy="ForestHarvester">uy42374hjw_20090115115500</DocumentReferenceID>
    <!--Reference to original hpr file MachineKey+CreationDate (xxxxxxxxxxx_yyyymmddhhmmss). -->
</DocumentReferenceInformation>
```

Reference to a StanForD hqc file

```
<DocumentReferenceInformation>
    <DocumentReferenceID DocumentReferenceIDType="StanForDHarvestingQualityControlNumber"
        AssignedBy="ForestHarvester">uy42374hjw_20090115111100</DocumentReferenceID>
    <!--Reference to original hpc file MachineKey+CreationDate. (xxxxxxxxxxx_yyyymmddhhmmss). -->
</DocumentReferenceInformation>
```

Reference to a StanForD fpr file

```
<DeliveryMessageReference DeliveryMessageReferenceType="StanForDForwardedProductionNumber"
    AssignedBy="ForestForwarder">uy42374hjw_20090115111134</DeliveryMessageReference>
    <!--Reference to original fpr file MachineKey+CreationDate (xxxxxxxxxxx_yyyymmddhhmmss). -->
```

3.3 Using MeasuringMethod for properties and quantities

No standardised enumeration list with Measuring Methods will be created by papiNet. MeasuringAgency is either ForestHarvester or ForestForwarder in the examples of this Use Case.

The following table describes how Measuring Methods are used when converting StanForD files into papiNet e-documents in this Use Case:

Description	UOM	QuantityType	Measuring Method	Comments (element and attribute values in StanForD 2010)
Solid Wood vol under bark	CubicMeter	SolidWood-Volume	m3sub	LogVolume, logVolumeCategory=”m3sub” OR LogVolume, logVolumeCategory=”m3 (price)” *** VolumeDiameterCategory=”All” VolumeUnderBark=FALSE VolumeLengthCategory=”Physical length”*
				LoadVolume, loadVolumeCategory=”Volume, m3sub”**
Solid Wood vol on bark	CubicMeter	WoodVolume	m3sob	LogVolume, logVolumeCategory=”m3sob” OR LogVolume, logVolumeCategory=”m3 (price)”*** VolumeDiameterCategory=”All” VolumeUnderBark=FALSE VolumeLengthCategory=”Physical length”*
				LoadVolume, loadVolumeCategory=”Volume, m3sob” **
Vol by top measurement under bark	CubicMeter	SolidWood-Volume	m3toub	LogVolume, logVolumeCategory=”m3 (price)” *** VolumeDiameterCategory=”Top” VolumeUnderBark=TRUE volumeDiameterTopPostion=10 VolumeLengthCategory=”Length as defined in length classes”*

*Harvested production data
** Forwarded production data
*** The StanForD volume attribute “m3 (price)” is the volume which is used to calculate the monetary value of a product. The most important use for this quantity is when optimizing how to cut a stem into logs in order to maximize the value of the stem. This volume is always included in Quantity while other quantities like e.g. m3sub or m3sob are registered in InformationalQuantity. Observe that StanForD enumeration “m3 price” may include many different types of volumes. It is defined by several different attributes and parameters such as VolumeDiameterCategory and VolumeUnderBark.

In all cases described above StanForD element VolumeDiameterAdjustment must be equal to “Measured diameter in mm”.

Below is a list of Measuring Methods used for properties in the example files:

Description	Property Type	Measuring MethodType	Meas. Method	Comments (element and attribute values in StanForD 2010)
Diameter small end under bark	DiameterSmall End	Automatic	ub	LogDiameter, logDiameterCategory=”Top ub” diameterMeasurementCategory=” Average”
Diameter small end on bark	DiameterSmall End	Automatic	ob	LogDiameter, logDiameterCategory=”Top ob” diameterMeasurementCategory=” Average”
Diameter at mid-point measurement under bark	DiameterMid	Automatic	ub	LogDiameter, logDiameterCategory=”Mid ub” diameterMeasurementCategory=” Average”
Diameter at mid-point measurement on bark	DiameterMid	Automatic	ob	LogDiameter, logDiameterCategory=”Mid ob” diameterMeasurementCategory=” Average”
Diameter butt end under bark	DiameterLargeEnd	Automatic	ub	LogDiameter, logDiameterCategory=”Butt ub” diameterMeasurementCategory=” Average”
Diameter butt end on bark	DiameterLargeEnd	Automatic	ob	LogDiameter, logDiameterCategory=”Butt ob” diameterMeasurementCategory=” Average”
Length of measured item	Length	Automatic		LogLength
Length Class of measured item	LengthClassCode	Classified		LogLengthClass
Order of log within stem	TreeLogOrder	Automatic		LogKey
Code defining tree species	TreeSpecies GroupCode	Visual Estimated		SpeciesGroupInfo
Breast height diameter	TreeDiameter BreastHeight	Automatic		DBH
Harvest date	Date Production	Automatic		HarvestDate