

Minutes StanForD2010

2016-04-04

Place:	Skogforsk, Uppsala, 2015-04-04—05
Participants:	Teemu Paldanius, Ponsse Lars Henriksson, SDC Tapio Räsänen, Metsäteho Timo Melkas, Metsäteho Joonas Kaarnamätsa, JohnDeere Rikard Jonsson, Skogforsk John Arlinger, Secretary Johan J. Möller, Chairman Skype participation: Pasi Palonen, Parker Jonas Gustafsson, Sveaskog Jonas Thorsson, Dasa Niclas Eriksson, Komatsu Fredrik Tjernberg, Komatsu Jean Plamondon, FP Innovation Mikael Eliasson, LogMax Martin Strandgard, AFORA, University of the Sunshine Coast Mikael Eliasson (by Skype)

Decision summary:

- Version 3.3 will be implemented next (February 2017) year, the final release of 4.0 will not be before February 2018.
- New fill-type (DottedFill) added to FormatFillStyle (ogi and ogr) added
- Boom angle when felling added to standard

- SpeciesgroupKey added as optional element to unclassified products
- New logistic bark function added
- BioenergyAdaptionType annotation adjusted
- Order of message attributes - decided
- Naming conventions concerning envelope was postponed to next meeting, Komatsu responsible
- ProductUserID in DeliveryDefintion ignored if ProductDefinition and SpeciesGroupDefinition are not included in fdi.

Action list:

- All randomly selected stems that are rejected by the operator must be saved in an hqc-file including a reason for rejection. This file is not to be sent to the caliper but directly to the forest company (in Sweden to SDC).
- It has been decided that OperatorUserID is to be set by the machine control system. It was strongly recommended that all control systems implement FirstName, LastName, BusinessName and BusinessID ASAP in order to be able to register machine owner specific information regarding operator identities. Elements FirstName, LastName, BusinessName and BusinessID must be possible to edit by the operator.
Additional comment at meeting: Swedish nomenclature for elements above to be added to general documentation.
- It is strongly recommended that this is made possible by a machine setting to include diameter vector in normal production reporting (hpr). However, it is left open to the manufacturers exactly how this functionality is implemented (subset of stems, all stems or some other method).
- It is recommended that it is always possible to divide up fpr.- and hpr-data in order to avoid having files with more than one single object.
- It is recommended that new systems that receives production messages (fpr and hpr) are developed in a way that it is possible to handle several different harvesting objects within one file.
- It is recommended that all manufacturers make it possible to update a product (pin) during harvesting at a harvesting object and that the GUI for operators is simple when updating a product (e.g. keeping setting for grades and color matrix).

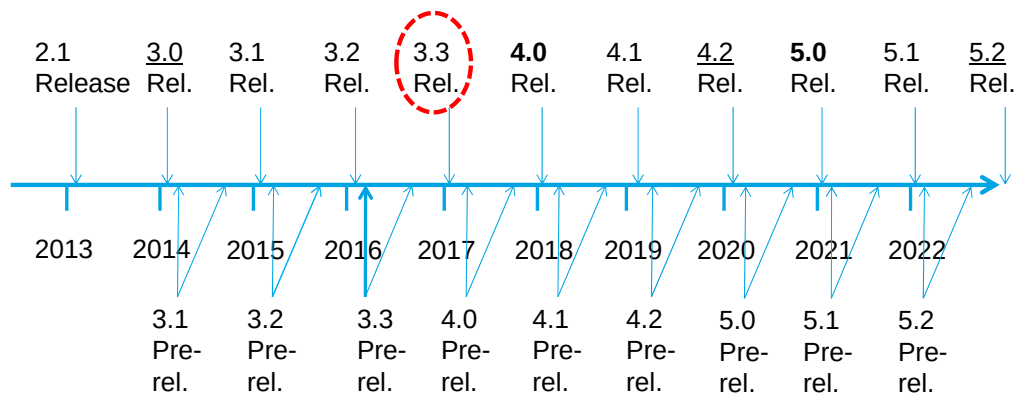
§ 1 Opening of meeting

Charman Johan J Möller opened the meeting.

§ 2 Agenda

The agenda was accepted by the meeting with one additional issue (§7).

Secretary John Arlinger went through the road map for implementing new standard version as decided at the previous meeting in November.



There was a brief discussion regarding whether there will be a need for implementing version 3.3 during the coming year or if it could be postponed another year. It was decided to discuss this issue again at the next meeting.

§3 Information about decisions at previous meetings

The decisions made at the previous meetings (2015-11-18, 2016-02-04) was presented as well as the action list compiled after those meetings.

§ 4. Issues to discuss

UPDATING FORWARDER PRODUCTION DATA

Background

It was decided to update receiverPosition at the meeting on 2015-11-18. The proposal was based on a discussion between John Arlinger and Thomas Purfurst (Bavarian State Forest) regarding coordinates in fpr-files.

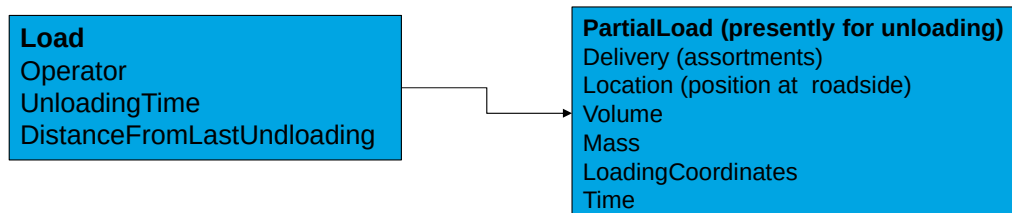
The annotation for receiverPosition was updated according to the following text: Position of coordinate registration in file: "Base machine position", "Crane tip position when felling the tree". *Observe that only "Base machine position" is relevant for all types of coordinates. Other enumerations valid only in some specific situations.*

After the discussion regarding fpr-files John Arlinger started to study the possibility of improving the forwarding structure in order to include boom angle

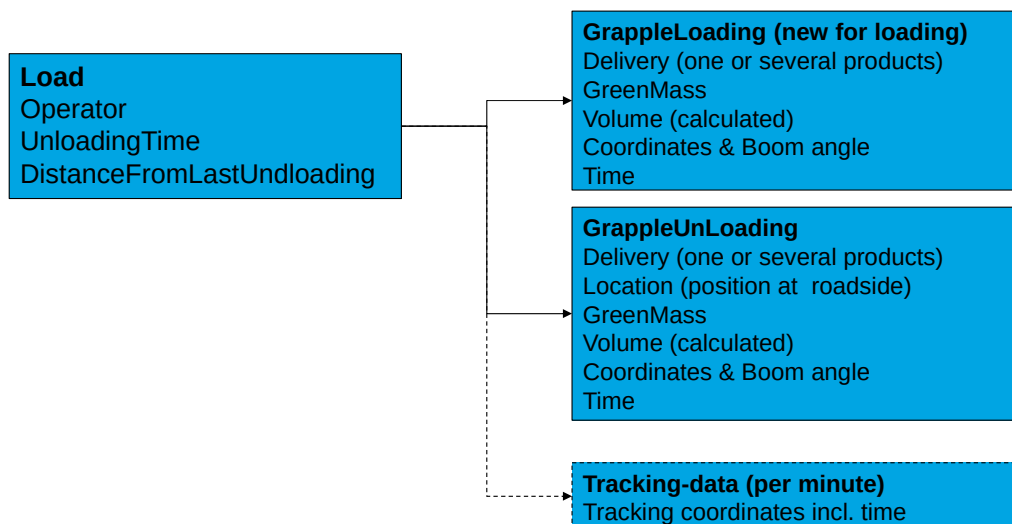
data, unloading coordinates, loading and unloading time stamps etc. However, it was deemed quite difficult to extend the present structure without making it significantly more complex and therefore more difficult to implement.

Remodel fpr-production

The present structure of the fpr-file is to a large extent a copy of the old prl-file with the exception that the old TransportObject was decided up into LocationDefinition and DeliveryDefinition. The fact that the structure for storing forwarded volumes is quite complex is partly due to the fact that it was constructed in order to handle several different estimation methods (scale, manual estimation by operator or estimation based on harvested production) and different estimation units (volume, mass, number etc). The present structure for registering forwarder production data is described in the figure below.



A solution might be to add a totally new structure developed with the assumption that the only estimation method is a scale that estimates the mass of each grapple with logs. The basic idea would be that each grapple load is scaled individually when both loading and unloading. Coordinates, time, boom angle and delivery are also registered together with the green mass of the logs. An optional structure might also be included whereby a tracking log with coordinates are stored in order to register how the forwarder drove from the landing to the harvesting site and back. A possible new structure is illustrated below.



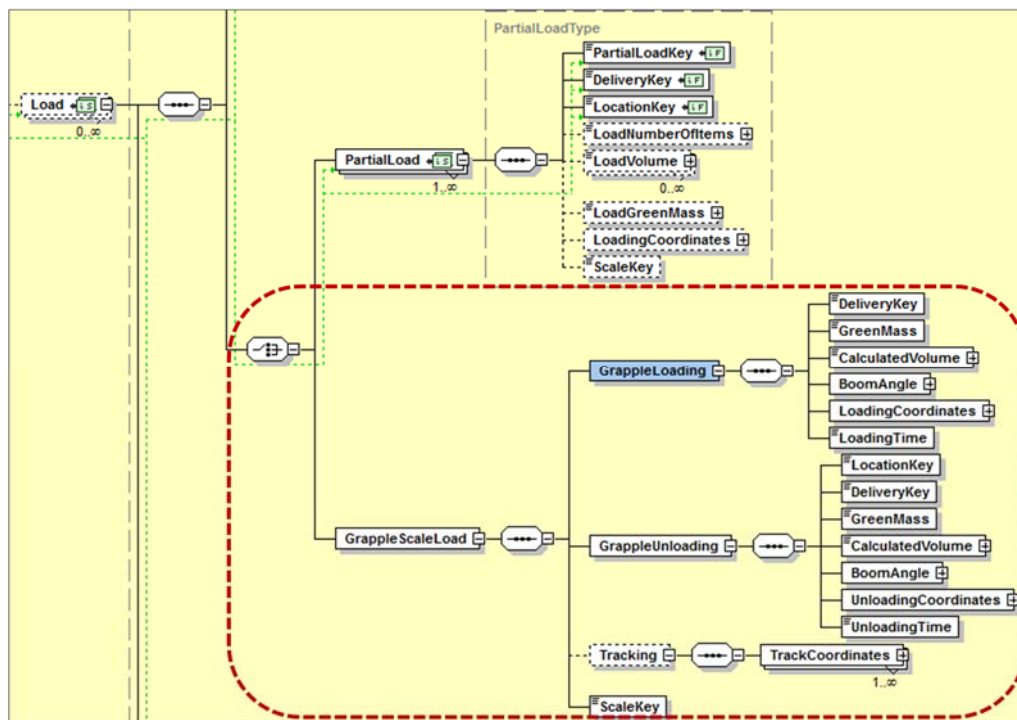


GrappleLoading (new for loading)
 Delivery (assortments)
 GreenMass
 Volume (calculated)
 Coordinates
 Boom angle
 Time



GrappleUnLoading
 Location (landing)
 Delivery (assortments)
 GreenMass
 Volume (calculated)
 Coordinates
 Boom angle
 Time

A draft schema structure is illustrated below:



The possibility of making DeliveryKey and CalculatedVolume optional was discussed. It was also pointed out by some manufacturers that the scaling precision is usually higher when unloading than when loading due to the more stable conditions at road side. It is therefore necessary to consider differences between loading and unloading data when analyzing the results. Jonas Gustafsson noted that having detailed information about unloading time and position is very relevant when trying to plan logistics in order to avoid delivering saw logs with blue stain to the saw mills.

No one at the meeting where opposed to the idea of developing this structure further. It was decided to let the secretary compile a document with a more structured proposal for an update of the fpr schema.

REGISTRATION OF REVERSING (WHEN FEEDING OF STEM IS REVERSED)

Johan Möller, 2016-03-08.

Reversing could be defined as feeding backwards away from the optimal log length.

We get a number of negative effects when we reverse feeding of a stem, for example a decrease in productivity and more frequent significant length errors

There are probably many different reasons for reversing such as manually decision, poor diameter measuring, difficult/bad price matrixes or complex combinations of price matrixes.

It was discussed whether reversing could in some way be registered per log with the following definition: *Registered if stem has been feed more than 3 dm above where log is cut.*

Several manufacturers pointed out that there are a large number of different reasons for reversing. A possible solution could be to add an element with a list of different enumeration values which would be repeatable:

- Manual reversing by operator
- Automatic reversing due to pre-delimbing of next log. (settable in harvester)
- Re-bucking (new optimal length, probably due to errors in prognosis.
- Stuck-control (reversing between log ends)

One suggestion was also to add the reversed length.

It was decided to let Skogforsk develop a more concrete proposal for the next meeting. A suggestion was also that Skogforsk test these suggestions together with one manufacturer.

NAMING CONVENTIONS CONCERNING ENVELOPE

Fredrik Tjernberg, Komatsu, 2015-09-30

Envelope can be used for a large number of different purposes. Today the only common use is for packaging all types of harvester instruction files (oin/spi/pin). In the near future it may very well be so that it is also used for forwarder instructions (fdi/foi) as well as for the geographical instruction (ogi/shp/jpg/tif). Fredrik raised the relevant question whether we should make it possible to distinguish between different envelope files through some kind of file naming recommendation.

A similar issue regarding compressed files was handled through rule 2.1:

*ZIP DEFLATE algorithm SHOULD be used as standard compression method in StanForD 2010 messages.
A “Ꞥ” SHOULD be added to the file extension of individual StanForD files*

that are compressed. A compressed hpr-file would those be given the file extension “.hprz”

One solution could be to add a rule whereby we state that when using the envelope for the following purposes we should preferably use specific file extensions:

- Harvester instructions (oin/pin/spi) → .oine
- Forwarder instructions (foi/fdi) → .foie
- Geographical instructions (ogi/shp/jpg/tif/mif etc) → .ogre
- Geographical reprots (ogr/shp/jpg/tif/mif etc) → .ogre

It should be possible to continue using env for any type of file or message.

If we add new extension the content must be strictly defined (e.g. foie MUST include both foi and fdi).

Most meeting participants were hesitant about adding new file extensions to the standard. It was also discussed whether it would be possible to add a file name prefix. However the meeting came to the conclusion that it would be better to add a new suffix to the file name (“middle name”) according to the following examples

- FileName.hrv.env → Harvesting instructions including oin/spi/pin
- FileName.frw.env → Forwarding instructions including foi/fdi
- FileName.geo.env → Geographical data including ogr/shp/jpg/tif/mif etc

It was thus suggested with the minutes that the following new implementation rule is added to the standard:

Rule#	Rule	Description/Reason	Related messages	Date
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R2.6	The following file name suffixes SHOULD be used for envelopes in the cases specified below: .hrv = Envelope including complete harvesting instruction .frw = Envelope including complete forwarding instruction .geo = Envelope including geographical data	Envelopes can be used for a large number of different purposes. The most common use is for packaging all types of harvester instruction files (oin/spi/pin). However, it can also be used for forwarder instructions (fdi/foi) and geographical instructions (ogi/shp/jpg/tif). Making it possible to distinguish between different envelope files through some kind of file naming recommendation would decrease the risk of mistakes being made in the harvester. Observe that it is possible to continue using env for any type of file or message. Examples illustrating the implementation of this rule: • FileName.hrv.env → Harvesting instructions including oin/spi/pin • FileName.frw.env → Forwarding instructions including foi/fdi • FileName.geo.env → Geographical data including ogr/shp/jpg/tif/mif etc	Oin/spi/pin /foi/fdi/ogi/ogr	2015-04-05
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§ 5. Implementation issues

RANDOMIZATION SETTINGS, REJECTED STEMS, “UNMEASURED” STEMS IN Hqc

Improvements regarding rejected stems and “unmeasured” stems in Hqc

145 harvesters are today reporting hqc to SDC. The hqc-files are converted to ktr at SDC before being imported into their system.

SenderXC can send ktr or hqc from the harvesters based on the following settings:

The screenshot shows a configuration window with several rows of settings. The 'ktr' row has the 'hqc' checkbox checked, which is circled in red. A red line connects this checkbox to the directory field 'C:\Data\AA_Test Uppföljning\'.

There are a number of advantages in using hqc instead of ktr:

- Operator identification always possible
- More stringent use of time stamps
- Coordinates always included
- Stem references between hpr and hqc available
- Much more detailed product-definitions (length/diameter classes, cutting window etc)

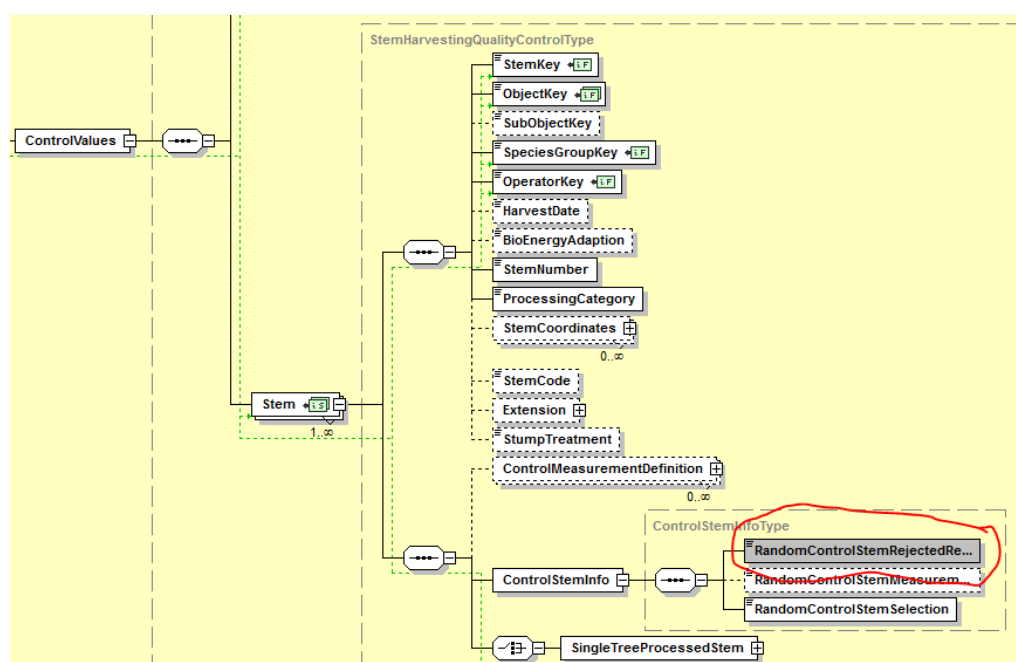
- Length margin (Övermål) included
- Diameter vector included which means some new key-figures regarding measuring quality can be calculated
- Better structures for bark functions and butt-end extrapolations.

Some problems were found once hqc started to be widely used on the Swedish market in the summer of 2015:

- Randomization based on time did not work satisfactory (it is now better but not perfect in all systems)
- Rejected stems are lost in some control systems
- Unmeasured stems are not registered at all (lost) in some control systems
- Settings for randomization not logged completely

Rejected and unmeasured stems

It is possible for the operator to reject a randomly selected control stem since it may be physically impossible to carry out a manual control measurement due to a number of different reasons. A number of different reasons are possible to register in the hqc-file per stem.



Element RandomControlStemRejectedReason has the following definition:

Reason for rejection of randomly selected stems. Enumeration list, allowed values are: "Not rejected", "Stem defect", "Out of reach", "Part of stem mixed up with other stems", "Poor weather", "Bucking system error", "Caliper broken" and "Other reasons not defined"

It was discovered during the summer of 2015 that “rejected” stems are not always sent from the harvesters to SDC.

There are very strong requirements on the Swedish market that it must be possible to estimate the proportion of rejected randomly selected control stems. It is therefore important that all rejected stems are saved in an hqc-file and made available to SDCs SenderXC software. It must be possible if a harvester is to remain within the national quality certification system.

Our recommendation is therefore that all manufacturers automatically generates an hqc-file immediately after a stem has been rejected including one of the following reasons: "Stem defect", "Out of reach", "Part of stem mixed up with other stems", "Poor weather", "Bucking system error", "Caliper broken" and "Other reasons not defined".

Variable 270, type 2, in the classic StanForD version was used for registering a running number per randomly selected control stems. The definition of var270_t2 is:

"Unique number of randomly sampled stem, used for identifying control stems. Should be 0 (or excluded) if not sampled for control. Possible for operator to reset/set. To be used even if stem is not used for control measuring (rejected according to var38)"

In most cases this variable was used for determining whether a stem was randomly selected or not. However, the original reason for introducing this variable was to use this number for marking a stem with a paper or plastic marker applied with a hammer.

Var270_t2 is normally a sequential number which means that it is increased by one for every randomization. It was discovered lately (4th of December) that this variable also has been used in order to quickly determine if any randomly selected stems has been lost or not. The loss of a control stem might be caused by deleting a stem in the caliper or by some errors in sending the file to or from the caliper. It is today with the hqc-files not possible to determine if a randomly selected stem has been lost or not.

It was discussed at the meeting 2016-02-04 that we add a strong recommendation (requirement) that all manufacturers always make certain that also randomly selected stems "not measured but accepted" are always included in the hqc-file (e.g. made available to SenderXC).

The following example illustrates how this has been handled in hqc from Dasa Forester where the third stem (StemKey 381892) was accepted but not measured by the operator (only measured by machine). Observe that a number of elements have been excluded in order to give a readable figure, the file is thus not valid.

Stem (3)	StemKey	Proc...	ControlMeasurementDefinition	ControlStemInfo	SingleTreeProcessedStem
1	379649	SingleTree Processing	logMeasur... Operator Measurer CaliperAp... SKALMAN B7.12 CaliperID 30408	RandomControlS... Not rejected RandomControlS... Randomly selected stem	DBH 297 StemDiameters diameterCategory=Over bark Log (2) 1 1 LogKey LogMeasurement (2) logM... Machine LogDia... 4 2 2 LogMeasurement (2)
2	380588	SingleTree Processing		RandomControlS... Poor weather RandomControlS... Randomly selected stem	SingleTreeProcessedStem
3	381892	SingleTree Processing		RandomControlS... Not rejected RandomControlS... Randomly selected stem	DBH 151 StemDiameters diameterCategory=Over bark Log (2) 1 1 LogKey LogMeasurement logM... Machine Meas... 2015-12-21T15:00:42+01:00 2 2 LogMeasurement logM... Machine

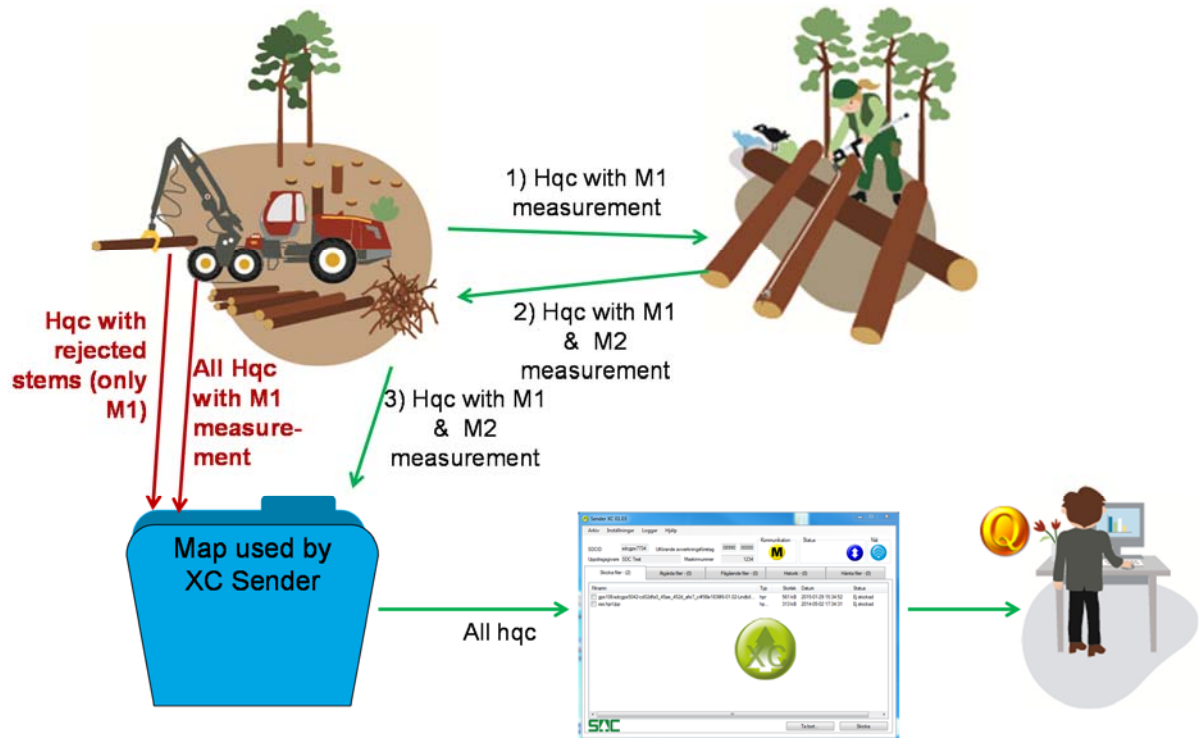
The advantage with this solution is that it does not mean any change to the standard schemas and thus can be implemented at once for all standard versions. It also gives all possible details regarding these trees (time, coordinates, operator etc). The only change required is to add a new rule.

During a separate (afternoon 2016-02-04) discussion with Fredrik Tjernskog and Mikael Eliasson (after the original meeting) it was discussed whether it would be acceptable to always generate an hqc directly after randomization. If this simple functionality is implemented it would mean that every random control stem is always reported both measured and un-measured by the operator. This is definitely an acceptable solution from a Swedish perspective. If StemKey is used it is simple to determine whether an unmeasured stem has been measured at a later stage.

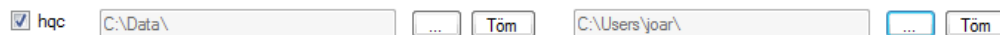
The following figure illustrates a demo-software for analysing hqc-files were rejected, measured and unmeasured stems are all reported:

StemKey	Visa i karta	Random	Rejected	Measured	Trösk	DBH	Förare	Fäll-datum	Mät-datum	Lat	Long	Slumpfrekven
381892	☒	OK	-	Not measured	GRAN	151	Sten	2015-12-21T15:00		65.304	18.374	6 (Time)
383328	☒	OK	-	Not measured	GRAN	215	Ove	2015-12-22T08:33		65.308	18.381	6 (Time)
384235	☒	OK	Stem defect	Not measured	TALL	230	Sten	2015-12-22T16:29		65.303	18.373	6 (Time)
385077	☒	OK	Stem defect	Not measured	TALL	188	Ove	2015-12-23T11:25		65.303	18.373	6 (Time)
385091	☒	OK	-	Measured M2	TALL	190	Ove	2015-12-23T11:30	2015-12-23T11:29	65.303	18.373	6 (Time)
385207	☒	OK	-	Measured M2	GRAN	164	Ove	2015-12-23T12:23	2015-12-23T12:27	65.303	18.376	6 (Time)
387833	☒	OK	-	Not measured	TALL	278	Ove	2016-01-06T08:26		65.306	18.379	5 (Time)
388938	☒	OK	-	Measured M2	TALL	178	Sten	2016-01-11T07:54	2016-01-11T07:59	65.305	18.380	5 (Time)
388968	☒	OK	-	Measured M2	GRAN	156	Sten	2016-01-11T08:19	2016-01-11T08:20	65.305	18.380	5 (Time)
389428	☒	OK	-	Measured M2	GRAN	171	Sten	2016-01-11T12:36	2016-01-11T12:38	65.305	18.380	5 (Time)
389728	☒	OK	-	Measured M2	TALL	196	Ove	2016-01-11T15:16	2016-01-11T15:15	65.304	18.378	5 (Time)
391068	☒	OK	-	Measured M2	GRAN	234	Sten	2016-01-12T10:53	2016-01-12T10:57	65.305	18.382	5 (Time)
393619	☒	OK	-	Measured M2	TALL	281	Ove	2016-01-13T18:04	2016-01-13T18:06	65.305	18.383	5 (Time)
393771	☒	OK	-	Measured M2	GRAN	268	Ove	2016-01-13T19:26	2016-01-13T19:25	65.304	18.380	5 (Time)

It is thus strongly recommended that all manufacturers always generates an hqc file with only M1-data once a stem has been randomly selected (red arrows). This means that in most cases stems will be sent twice in an hqc file, first as an “M1-file” and thereafter as an “M2-file”.

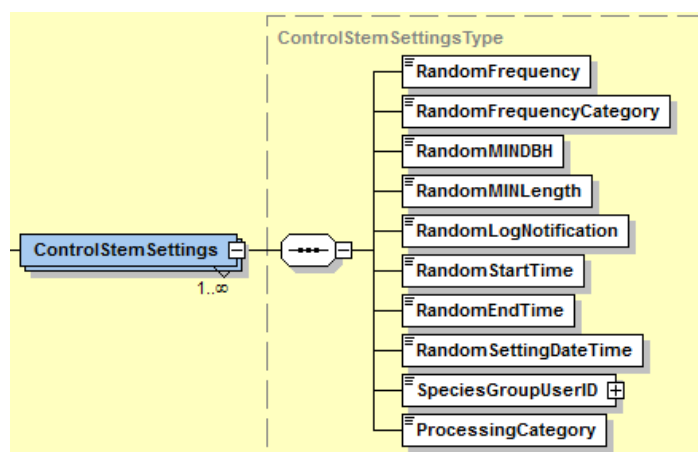


Observe that SDC’s SenderXC has the possibility to define two separate folder paths where different types of hqc might be saved by the control system.



Logg with randomization settings

The settings for randomization are registered in the following hqc-structure:



The definition of ControlStemSettings is:

Settings for random selection of control stems. Recommended that the last five settings per species group are included in an hqc-file.

It is clear that not all manufacturers are registering the five last settings but often only the last settings. This means that the exact settings used in the harvester is unknown if an hqc including several stems is reported. The settings can be changed back and forth repeatedly without this being possible to determine in the hqc.

In the long run the hqc-implementations must be according to the standard which means that at least the last 5 settings should be included.

In the short run it is probably necessary for each manufacturer to specify a recommendation concerning how reporting of hqc should be handled to avoid these problems.

UPDATE OF “RULES RANDOM SELECTION”

Based on discussion with Jonas Thorsson, Dasa, (2015-11-27) our suggestion was to update the randomization rules somewhat.

A document (Requirements random selection 151127.docx) with a number of different randomization rules with a focus on randomization based on time, was written after the meeting 2011-11-09.

One of the rules in the document was:

- *The setting in the machine MUST be so that the operator sets the average time (volume or no of stems) difference between randomly selected control stems when sampling based on time.*
It should e.g. be possible to set that it should be on an average 8 work hours between sample trees when harvesting.
 - *Number of randomly selected stems MUST remain constant per time unit (or volume or number of stems) even if we have e.g. 25% of the trees belong to a species not to be sampled (in Sweden for example aspen).*
 - *Number of randomly selected stems MUST remain constant per time unit (or volume or number of stems) even if we have e.g. 33% small trees (for example DBH<18 cm, normal case in Sweden).*

It was suggested that the requirement that the setting in the machine MUST be so that the operator sets the average volume or no of stems as a difference between randomly selected control stems when sampling based on volume or number of stems is excluded since this can cause the randomization to behave in an inconsistent way. For example the difference will vary if the randomization is set to 1/500 trees for spruce and no randomization for other species while we have a variation in the proportion of species.

It was therefore decided that the rule above is updated according to the following text:

- The setting in the machine MUST be so that the operator sets the average time ~~(volume or no of stems)~~ difference between randomly selected control stems when sampling based on time.
It should e.g. be possible to set that it should be on an average 8 work hours between sample trees when harvesting.
 - Number of randomly selected stems MUST remain constant per time unit ~~(or volume or number of stems)~~ even if we have e.g. 25% of the trees belong to a species not to be sampled (in Sweden for example aspen).
 - Number of randomly selected stems MUST remain constant per time unit ~~(or volume or number of stems)~~ even if we have e.g. 33% small trees (for example DBH<18 cm, normal case in Sweden).

It was also decided in 2011 that:

- *It is an advantage if the random sampling is balanced (not too long time in between sampling), eg in order to decreased risk for auditor traveling to an “empty site” with no randomly selected stems*

The term “balanced” is very vague. It was included when discussing different possible algorithms where some of the algorithms had a varying randomization frequency. It was decided that the recommendation regarding “balanced” sampling is excluded since it is of low relevance and vaguely defined.

- ~~*It is an advantage if the random sampling is balanced (not too long time in between sampling), eg in order to decreased risk for auditor traveling to an “empty site” with no randomly selected stems*~~

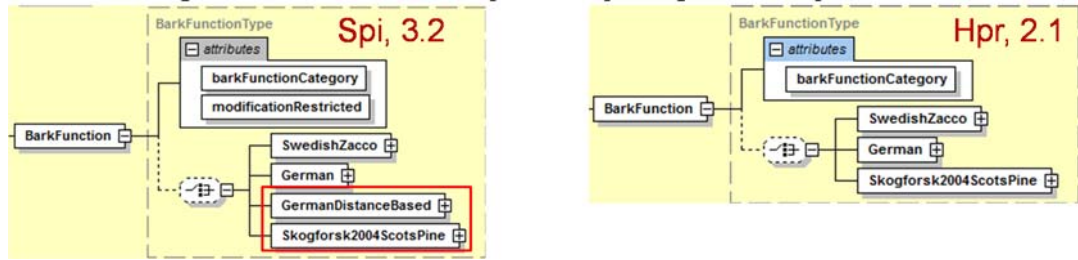
HANDLING DIFFERENT STANDARD VERSIONS

Mixing version

Jonas Thorsson, Dasa, raised the following questions that the secretary could not answer directly.

- What are the consequences if version 3.2 is used in an instruction and the output hpr is based on version 2.1?

- What are the consequences if e.g. a new bark function (logistical function) is used in an spi with version 3.2 when generating an hpr-file using 2.1?



A possible solution could be to state that mixing different versions in the control system should be avoided. This would mean that the hpr and mom must be according to version 3.2 if the instructions are based on version 3.2 .

Several different manufacturers stated that it must be possible to mix different version. They just have to do the best they can to solve these kind of situations. However, every one agrees with the fact that it is preferable to not mix different versions. The meeting therefore decided to not add any new rules regarding mixing of versions.

Retiring version 2 in machine implementations?

Joonas Karnamätsa raised the question of whether it would be acceptable to exclude version 2 from the harvester control systems once version 3 is fully implemented and tested under practical conditions?

The secretary does not see any problems from a Swedish user perspective if some manufacturers would prefer to only use version 3 since all existing tools can handle version 2 and 3. However, just prior to the meeting the secretary was notified about the fact that Sveaskog's new tool for creating pin-files is based only on version 2.1.

The meeting decided that any machine manufacturer must give a notice of at least one year before totally withdrawing support for an old major version.

FINNISH ID ISSUES

Tapio Räsänen presented some issues that were discussed at the previous Finnish StanForD meeting in March. Observe that there are no clear indications (proofs) that the issues presented below are significant problems today.

Pin & machine dialects

Optional pin elements seem to be required in some machines. Forest companies has to take those into account when creating pin. Handling risk of "machine dialects"?

- The aim is to avoid the situation that a forest company has to prepare machine-specific pin's
 - e.g. automatic creation of pin's in KAOS system

- If there are some elements that only one or some bucking systems require, it should not be mandatory to add them to pin's sent to all machines
- Which are those optional elements of pin that are required by the bucking computer to work?
 - no clear picture of the situation at the moment
 - checking by manufacturers and comparing needed ?

A question was raised about same elements in pin and oin. Which ones come back to company in hpr?

- Are there actually any such elements?
 - pin:ProductDefinition\ClassifiedProductDefinition\LoggingOrganisation vs. oin:ObjectDefinition\LoggingOrganisation

Object identities

Object identities, differences between Finland and Sweden. A problem in user interfaces from manufacturer's point of view?

- all the object identities sent in oin should come back in hpr without any changes
 - Comment from Fifth Element: "Situation is quite good already now."
 - Hqc?
- Some optional elements are mandatory in practice
 - ObjectName commonly used in Finland
- Does LoggingForm from oin return in hpr in all machines?

Updating spi in calipers

Updating spi's in different cases. How to check in machine and caliper that butt end profile tables and parameters are correct if spi is updated in machine?

Comments from secretary

As stated previously it is very important that we avoid "machine dialects". Possible discoveries of "machine dialects" must be addressed at the StanForD meetings ASAP.

Handling butt end extrapolation functions in the caliper is probably not any problem if the caliper is using hqc-file.

TIME SCHEDULE FOR IMPLEMENTATION

Harvesters

The following table for forwarders was compiled after the meeting (specify latest minor version that has been or is planned to be implemented).

Manufacturer	Major version 2	Major version 3
Opti (Ponsse)	2.1 - Q1 2015	3.1 – Q3 2016 (incl 3.1)
Timbermatic (JohnDeere)	2.1 - 2014 (1.19)	3.0 - 2015, 3.1 – 2016
LogMate	2.0 – Spring 2013	3.0 - Q4 2014
MaxiXplorer (Komatsu)	2.1 - Spring 2013	3.0 - Q1 2015 3.1 - Q1 2016
Dasa*	2.0 - Autumn 2014	3.1 Q2 2016
Motomit (Parker)		Q3-4 2015 (version 3.1)
DPII (Haglöf)	2.0 and 2.1 - Spring 2013	3.2 - Spring 2013
Silvia7	2.1 - Spring 2013	3.0 - May 2014
SDC	2.1 - December 2013 (hpr) March 2015 (incl hqc)	3.1- March 2015 (incl hqc)
WoodForce/ Fifth Element		Q3-Q4 2015. Older formats converted to 3.0. Version 3.1 used from 2016

* A conversion module is available for Dasa4/5 (oin,pin,spi,hpr)

Manufacturer	Present software version released on the market
Opti (Ponsse)	Opti4G version 4.728, 4.730 released Q2 2016
Timbermatic (JohnDeere)	1.22
LogMate	1.07.0010
MaxiXplorer (Komatsu)	3.8 (June 2016)
Dasa	1.3, 1.4 (May 2016)
Motomit (Parker)	
DP II (Haglöf)	Skalman V7.12
Silvia7	2015.3.0.0
SenderXC	1.07

Presently the following control systems can update a product, by sending a new pin, during harvesting at a site:

- Dasa
- LogMate
- MaxiXplorer (Q2 2016)

It is not possible to use the updated pin until you start on a new site in:

- Timbermatic (implemented 2016-2017)
- Opti (no implementation)
- Motomit(no implementation is planned)

ModificationRestricted has been implemented:

- Komatsu, implemented
- JohnDeere, implemented 2016-2017
- Dasa , not implemented
- Ponsse, not implemented
- Motomit, not implemented
- LogMate, implemented 2016

Forwarders

The following table for forwarders was compiled after the meeting (specify latest minor version that has been or is planned to be implemented).

Manufacturer	Major version 2	Major version 3
Opti (Ponsse)	2.1 - All messages implemented if scale is used.	3.0 and 3.1 – Q3 2016 (incl 3.1)
Timbermatic (JohnDeere)	2.1 - 2014	3.0 - 2015, 3.1 – 2016
MaxiXplorer (Komatsu)	2.1 - Fpr implemented (other files Q4, 2015)	3.0 - Fpr Q2 2015 (instructions files Q1, 2016) 3.1 – Q2 2016
Dasa		3.0 - Q4 2016 (mom and fpr)
Motomit (Parker)		No plans
Silvia7	2.1 - Fpr implemented.	3.0 - Fpr implemented
SDC	2.1 - March 2015 (fpr)	3.1 - Q4 2015 (fpr)
WoodForce/ Fifth Element		Q3-Q4 2015. Older formats converted to 3.0. Version 3.1 used from 2016

Manufacturer	Present software version released on the market
Opti (Ponsse)	Opti4G version 4.728, 4.730 released Q2 2016
Timbermatic (JohnDeere)	1.22
MaxiXplorer (Komatsu)	3.8
Dasa	No version released
Motomit (Parker)	Unkown
Silvia7	2015.3.0.0
SenderXC	1.07

Operational monitoring

The following table was compiled after the meeting. Please fill in whether mom is implemented for both harvesters and forwarder.

Manufacturer	Major version 2	Major version 3.0
Opti (Ponsse)	Forwarder and harvester ready for test, will be released Q3 2016	Forwarder and harvester ready for test, will be released Q3 2016
Timbermatic (JohnDeere)	2.1 - Forwarder (2014) 2.1 - Harvester (2014)	3.0 - Forwarder (2015) 3.0 - Harvester (2015)
MaxiXplorer (Komatsu)	2.1 - Forwarder (2014?) 2.1 - Harvester (2014?)	3.0 - Forwarder ? 3.0 - Harvester ?
Dasa	Harvester (2014) version 2.0	3.0 - Forwarder (2016) Q4 3.0 - Harvester (2016) Q1
Motomit (Parker)		?
Logmate	2.1 - Harvester (2013)	3.0 - Harvester (2014)
Silvia7	2.1 - Forwarder (2013) 2.1 - Harvester (2013)	3.0 - Forwarder (2014) 3.0 - Harvester (2014)

§ 6. StanForD2010 projects

IMPLEMENTING HARVESTER INSTRUCTIONS IN SWEDEN

SDC

Lars Henriksson presented SDC upcoming solution for distributing instructions from forest companies to forest machines (appendix 1).

It is possible to distribute un-addressed pin-files. Unaddressed distribution of PIN is based on ProductUserID to find the receiving machines. Sending unaddressed PIN only works for StanForD2010-machines.

Pin-files and any other type of file can also be sent in an addressed env-file. The address of the machine is registered in element TransmissionReceiver as illustrated below:

```
<TransmissionReceiver>sdcgpx0003</TransmissionReceiver>
```

Sender XC v 1.05 or later is needed in the machine.

The functionality will be released in June for a limited number of machines.

Sveaskog

Jonas Gustafsson, Sveaskog, presented their work on implementing the new harvesting instruction (oin/pin/spi). Sveaskog presently have approximately 10 harvesters (JohnDeere and Komatsu) that are using the new instructions as well as reporting hpr and mom. There are presently no significant problems in using the new standard. By early June they expect to have a full implementation of the new instructions in their own systems. This means that they will be starting to use the full potential of StanForD2010 for a limited number of harvesters this summer.

Jonas also described a fundamental question at Sveaskog related to the creation of oin-files:

Today we have a system for creating APT files automatically. The logging manager just points out different products that will be produced at the upcoming site. After that he just click a button and the system will create the APT file customized for a dedicated machine, that means that it will be a bit different according to the brand.

In that process he can also put some limitation for one product. For example maximum diameter could be adjusted in the Limitation matrix. That also means that for one site he could adapt things to the production situation.

Now that we have started up with the new handling with PIN-OIN we discovered that this possibility is no longer available, and we are thinking of how to do that in the future. So far we have to give the operator information of what to limit in the specific product and he have to set -1 directly in the machine when starting up the new site.

When we introduce the operator about how to handle the new standard we always try to explain how simple it is to start up a new site with the OIN file, just click and start more or less. So how could we in an easy way solve this problem? We don't want to send out ENV files for every site with the "manipulated" PIN sent along together with the actual OIN file information.. That would be like using APT files in a way.

I know that the PIN information and OIN file information should be kept apart and that the limitation matrix is connected to the PIN file and not to the OIN but is it Possible to solve this in another way?? For me it would be nice to just send that information along with the OIN.

This is just a signal to you all that this could be an issue when more Company's will start using the new way of handling harvest instructions. It would be nice to hear your opinion in this matter, perhaps you have some ideas of how to solve this.

HPR-APPLICATIONS IN HARVESTERS (SKOGFORSK)

Johan Möller presented the applications Wood value (Virkesvärde), Thinning evaluation (HprGalring) which are used in more than 100 harvesters today in Sweden. Both applications have been developed by Skogforsk. Johan also presented some results from analyses carried out based on results from these applications.

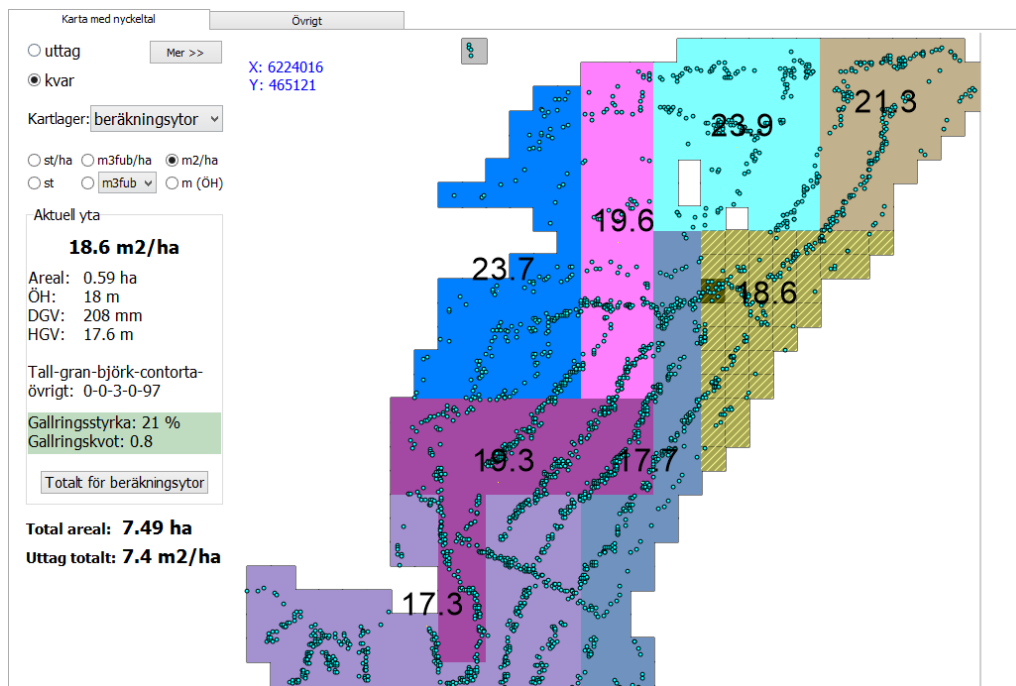


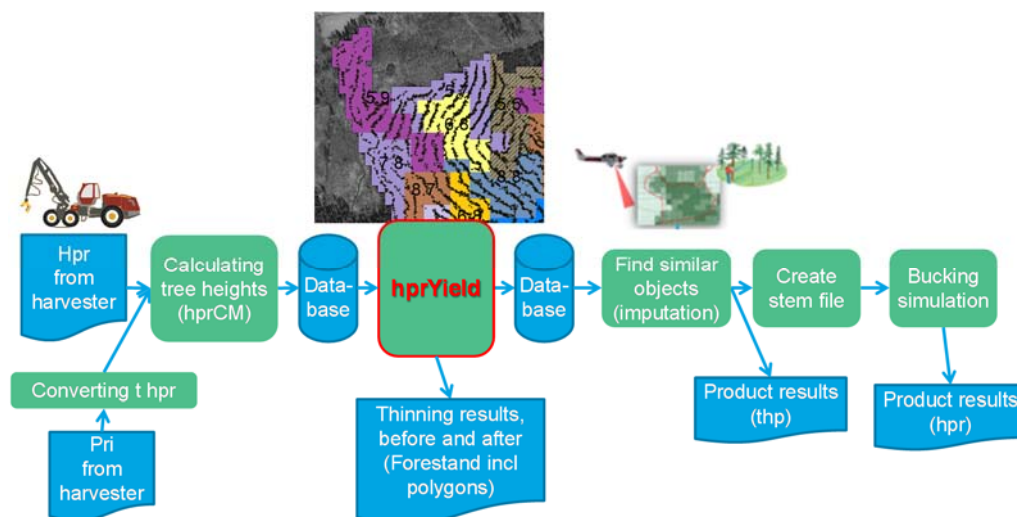
Figure illustrating a prognosis of basal area per hectare after thinning based on harvester production data after a thinning of 18.6 m²/ha.

NEW USE OF HPR-DATA IN FOREST COMPANY SYSTEMS

John Arlinger briefly presented Skogforsk work on developing dlls (hprYield and ForestPrognosis) whereby for example automatic thinning evaluations based on hpr-data can be done in forest company systems.

The basic idea is to use the demo-applications and algorithms described by Johan Möller in company information systems. The work was initiated when Skogforsk was approached by Södra, Sveaskog and SCA in order to help them in improving yield estimations before harvesting as well as doing automatic evaluations of thinnings.

The figure below illustrates the main information flows and the different modules (dlls) developed within the projects. Observe that the most central part of this system is the hprYield.dll. This dll could possibly be further developed in order to implement it into forest machine control systems. It would make it possible to e.g. easily calculate key figures per hectare.



FOREST BIG DATA (METSÄTEHO)

Timo Melkas, Metsäteho, presented results from the “Forest Big Data” project. The presentation is included in appendix 2.

USING STANFORD IN FP SUITE

Jean Plamondon, FPInnovation, presented their work on more efficient satellite data transmission and FPTrak StanForD compatibility (appendix 3). Included in this work is a proposal for a new type of stellite communication protocol (appendix 4):

The secretary pointed out after the presentation by Jean that some alternative ways to handle these issues exist:

- Including satellite protocol within the standard (some kind of standard appendix)
- Within the standard framework develop some kind of conversion tool that can be used by any one
 - dll, stylesheet etc
 - Compare with Finnish discussions about using a style sheet in order to convert an hpr-file to a “lighter” hpr version
- Leave this issue totally outside the standard, which means that whether or not to implement the protocol is totally outside the standard

There was a long discussion regarding the presentation.

- Niklas Eriksson, Komatsu, pointed out that they would prefer to view this issue as a question for communication between different back end systems (MaxiFleet → FP Suite).

- Teemu Paldanius, Ponsse, commented that they would prefer this issue to be handled by the StanForD framework in some way in order to make it possible to use this protocol also on other markets.
- Mikael Eliasson, LogMax, raised the issue about what satellite communication system is to be used and why this is not mentioned in the document.
- Johan Möller, Skogforsk, pointed out the risks with aggregated data. The chances are very high that this protocol will quickly be expanded in case some one tries to implement it on other markets or if the satellite systems allows for larger amounts of data.

It was decided to continue this discussion at the next meeting. It is recommended that appendix 3 and 4 are further studied by all manufacturers.

Skogforsk's **conclusion** after the meeting was that it seems difficult to including the proposal into the StanForD2010 standard since the opinions of the different manufacturers vary significantly. One way forward could be to include a new section to our web site where national implementation recommendations could be added.

SHORT SUMMARY OF WOODFORCE PROJECT (METSÄTEHO)

Tapio Räsänen, Metsäteho, presented a brief outline of work done within the WoodForces project (related to StanForD).

Building and testing of harvesting package is going on

- spi tests have been carried out (spi's with new pine butt end functions)
- sending of pin and oin to harvesters is working well
 - conversions from ap1 and oin were done by forest companies
 - sending to bucking computers
- simulator tests with hpr have been carried out and started now with real hpr's
 - a couple of big hpr's have been received (situation on March 17 in Fifth Element)
 - harvester piloting is started these weeks with the forest companies
- hqc and ktr tested
 - lots of problems with ktr in receiving in forest company systems
- sending of foi and fdi to forwarders is working as well
- fpr also tested
 - some errors were found
- fqc not tested much

Next two years version 3.0 will be supported only in the service

- ver. 3.1 will probably not be supported at all
- later the status of the version of each machine will be fed into the service
 - now only info if the machine is using either StanForD 2010 or StanForD Classic

WOOD-VALUE TEST OCTOBER 2016 (SKOGFORSK)

Johan Möller briefly described the harvester test that will be carried out in October 2016. All participating manufacturers will receive a written documentation in April 2016. Responsible coordinator for the project is Maria Nordström, Skogforsk.

PULP WOOD MATRIXES AND TOPLOGFREEBUCK (SKOGFORSK)

Rikard Jonsson, Skogforsk, presented the following four issues related to the implementation of TopLogFreeBuck:

- ManualFreeBuck (MFB) on the last cut? ManualFreeBuck and TopLogFreeBuck (TLFB) were combined in “StanForD-Classic”, now they are kept separate. Should ManualFreeBuck include the last cut? The meeting decided to propose for the next meeting that ManualFreeBuck should include also the last cut.
- Must both MFB and TLFB be enabled in order to manual cut the last log outside the cutting window? May, e.g. a manual cut be outside of a cutting window at the last cut with TLFB enable and MFB disabled? The meeting decided to propose for the next meeting that only MFB must be enabled in order to make a manual cut outside cutting window on the last log. It is not enough to enable TLFB since this only includes the minimum diameter search functionality.
- Definition of last log? ”Minimum diameter is within maximum length of the current log”? A possible risk is that current log is not within maximum length neither within two logs of minimum length which means that a possible new “last log” definition could be “Minimum diameter is within maximum length of the current log or not available for two logs of minimum length”. It was decided to postpone this issue to the next meeting.
- How to handle the effects of errors in the prognosis? The prognosis might e.g. predict that it is possible to cut two long logs at the top end. However when cutting the second last log it turns out that it is not possible to cut one additional log. Should the head reverse in order to enable one more log or continue to max length in order to keep up productivity? A question of value vs. costs. It was decided that this is not a standard issue.

It was thus decided to write a proposal for updating the annotations of TopLogFreeBuck and ManualFreeBuck to the next meeting.

CALIBRATION OF MULTITREEPROCESSED STEMS (SKOGFORSK)

There was no time at the meeting to present the results of the study carried out by Karin Ågren. The results will be sent out together with the final minutes.

§ 7 Other issues

The secretary briefly discussed the fact that an increasing number of members participate through Skype. It is probably an advantage in the long run if we could have some informal recommendation that everyone (excluding persons located overseas) tries to participate in person once a year.

The secretaries intention is therefore to recommend member to always try to participate in person at the autumn meeting while the spring meeting will be adjusted in order to simplify attendance through Skype.

§ 8 Next meeting

Next ordinary StanForD meeting will start at 10:00 CET, 2016-11-23 in Uppsala.

§ 9 End of meeting

Johan thanked everyone for their participation.

Distribution of Product Instructions to harvesters by using Sender XC

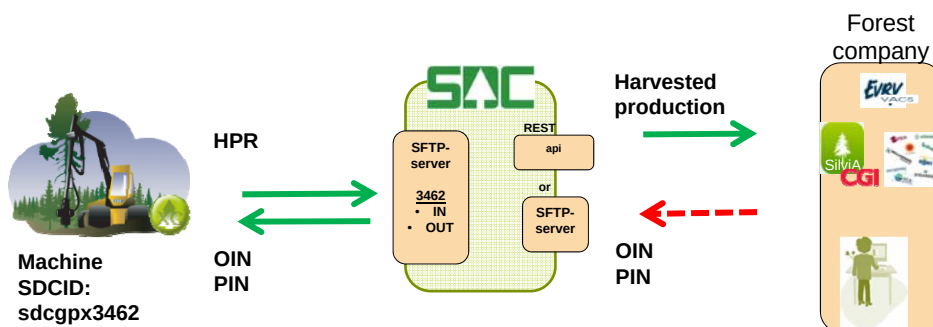
Service to send both unaddressed PIN and addressed messages to harvesters

1

www.sdc.se



New solution for distribution of messages to harvesters



PIN: Distribution unaddressed to machines which have reported volumes on the same **ProductUserID** as the uploaded one the last two months
All messages: Distribution addressed to a one or several machines (SDCID)

2

www.sdc.se



Saving used ProductUserID from HPR



HPR

SAC

Data base with reported
ProductUserID per machine (SDCID)

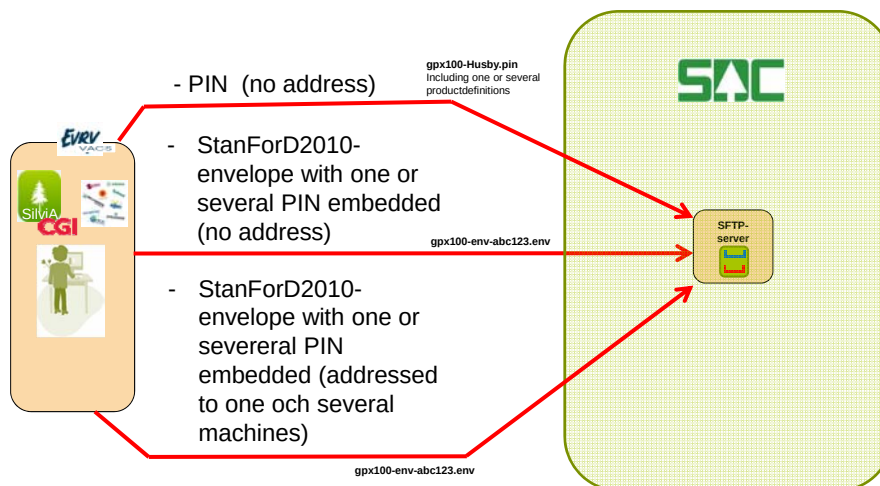
SDCID	ProductUserID	Latest date of use
sdcgpx3462	68268_BoaKv1_GRAN1_891500	2016-03-18
sdcgpx3462	68268_BoaKv1_TALL1_891500	2016-03-18
sdcgpx3462	68268_EngVed3m_TALL_JD	2016-03-18
sdcgpx3462	68268_BmavFall_TALL_691900	2016-03-18

3

www.sdc.se

SAC

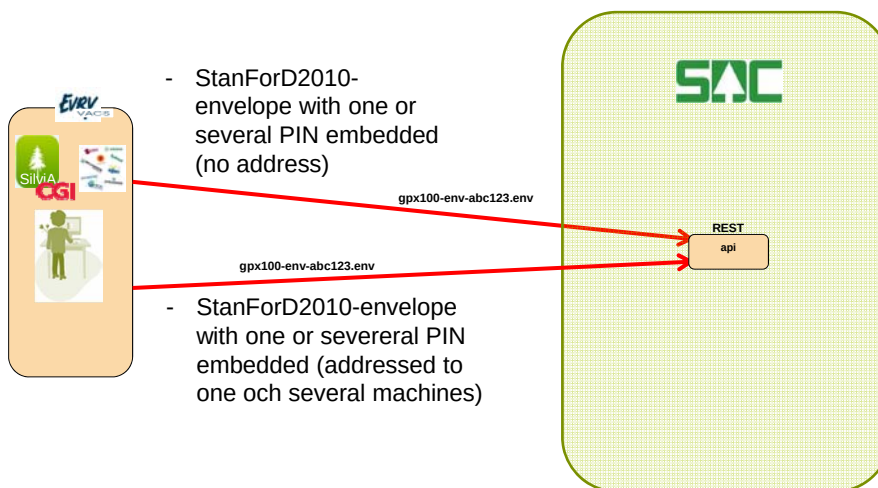
Load up messages to SDC by using SFTP



www.sdc.se

SAC

Load up messages to SDC by using REST



www.sdc.se



Necessary information in StanForD2010 envelope

```
<BusinessSender>
  <FirstName>Lars</FirstName>
  <LastName>Henriksson</LastName>
  <Email>lars.henriksson@sdsc.se</Email>
  <BusinessName>SDC EF</BusinessName>
  <BusinessID>gpx106</BusinessID>
</BusinessSender>
```

Address for confirmation

6

www.sdc.se



Address to one or several machines

```

<TransmissionInfo>
  <TransmissionID>SDC_2016789</TransmissionID>
  <TransmissionTime>2016-03-15T10:14:22 +01:00</TransmissionTime>
  <TransmissionSender>SDC EF</TransmissionSender>
  <TransmissionReceiver>sdcgpx0003</TransmissionReceiver>
</TransmissionInfo>
<TransmissionInfo>
  <TransmissionID>SDC_2016789</TransmissionID>
  <TransmissionTime>2016-03-15T10:14:22 +01:00</TransmissionTime>
  <TransmissionSender>SDC EF</TransmissionSender>
  <TransmissionReceiver>sdcgpx0153</TransmissionReceiver>
</TransmissionInfo>

```

Machine Identities

OBS! SDCID is the address

7

www.sdc.se



Matching of unaddressed PIN

Data base with used **ProductUserID** per machine (SDCID)

SDCID	ProductUserID	Latest date of use
sdcgpx3462	68268_BoaKv1_GRAN1_891500	2016-03-18
sdcgpx3462	68268_BoaKv1_TALL1_891500	2016-03-18
sdcgpx3462	68268_EngVed3m_TALL_JD	2016-03-18
sdcgpx3462	68268_BmavFall_TALL_691900	2016-03-18
sdcgpx1523	68268_BoaKv1_GRAN1_891500	2016-03-01

ProductUserID in uploaded PIN
(Husby.pin)

```

<ProductUserID>68268_BoaKv1_GRAN1_891500
</ProductUserID>
•
<ProductUserID>68268_BoaKv2_GRAN1_891500
</ProductUserID>

```

If one ProductUserID is matching the whole PIN will be distributed to that machine

The user who uploaded the PIN get a confirmation listening the matching machines

8

www.sdc.se

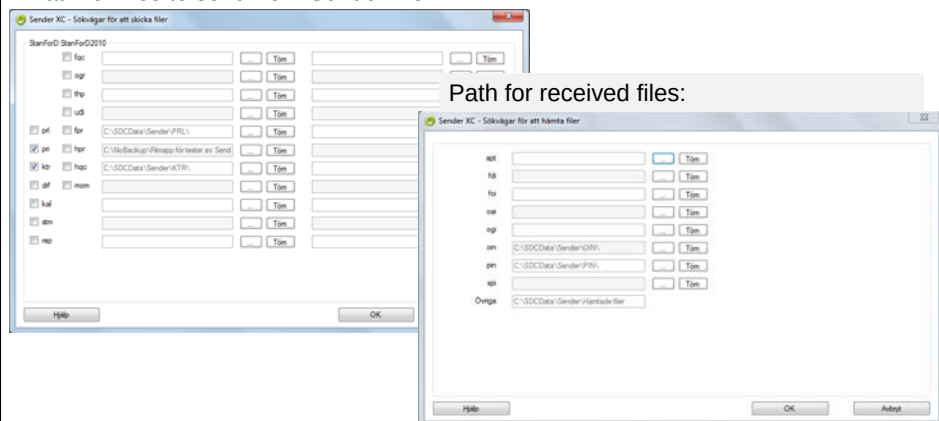


In machine



From Sender XC v 1.05 it's possible to define the directory for different downloaded StanForD2010 instruction formats

Path for files to send from Sender XC:



www.sdc.se



- Everytime you start Sender XC or send away a production file, Sender XC automatically check if there is something to download
- The operator in machine get a message from Sender XC then a new file is downloaded



10

www.sdc.se



Summary

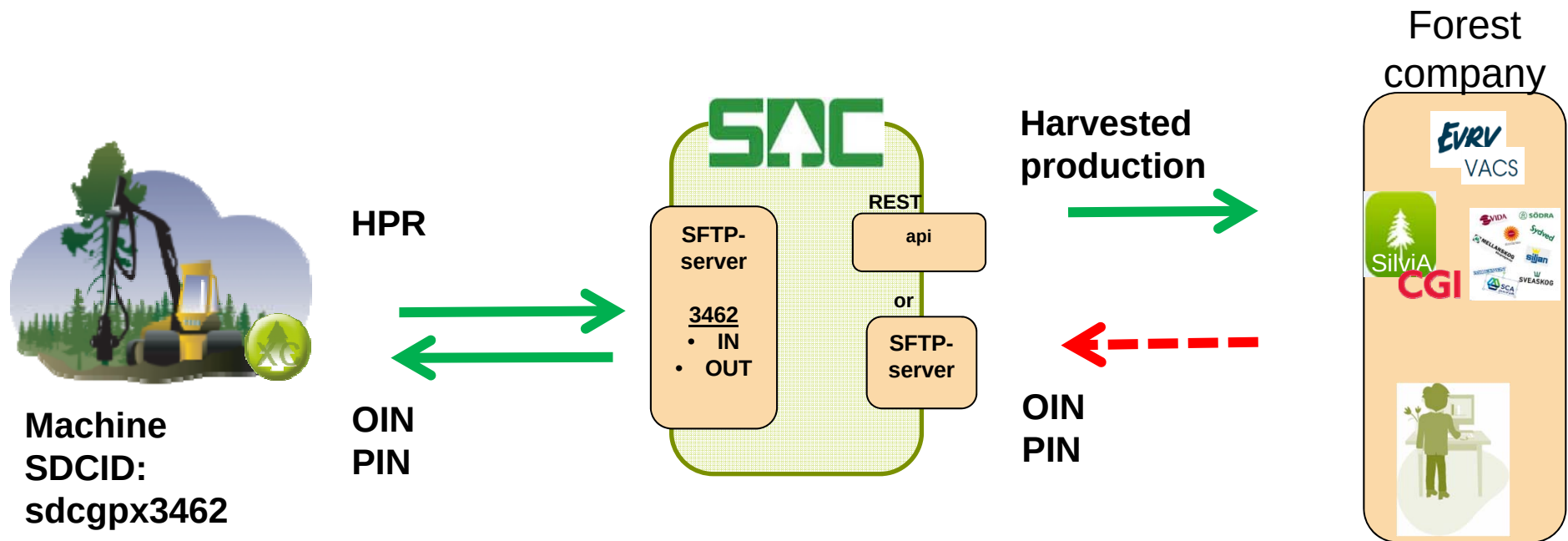
- Unaddressed distribution of PIN use ProductUserID to find the receiving machines
- Sending unaddressed PIN only works for StanForD2010-machines
- StanForD2010 envelope is used to address messages
The machine is defined by its unique SDCID
`TransmissionReceiver>sdcgpx0003</TransmissionReceiver>`
- Sender XC v 1.05 or later
- Release in June for a limited number of machines

11

Distribution of Product Instructions to harvesters by using Sender XC

Service to send both unaddressed PIN and
addressed messages to harvesters

New solution for distribution of messages to harvesters



PIN: Distribution unaddressed to machines which have reported volumes on the same **ProductUserID** as the uploaded one the last two months

All messages: Distribution addressed to a one or several machines (SDCID)

Saving used ProductUserID from HPR



HPR

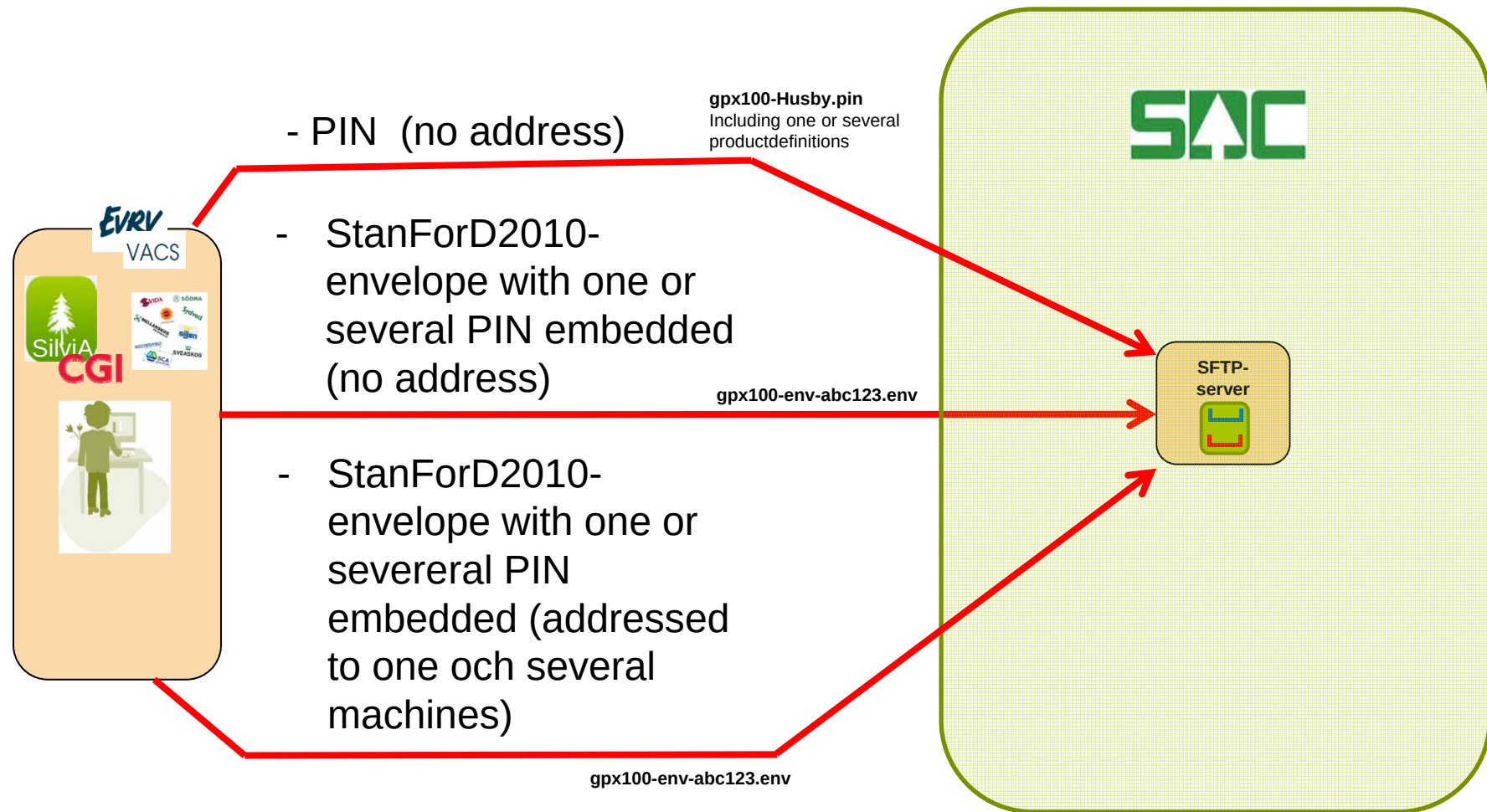


SAC

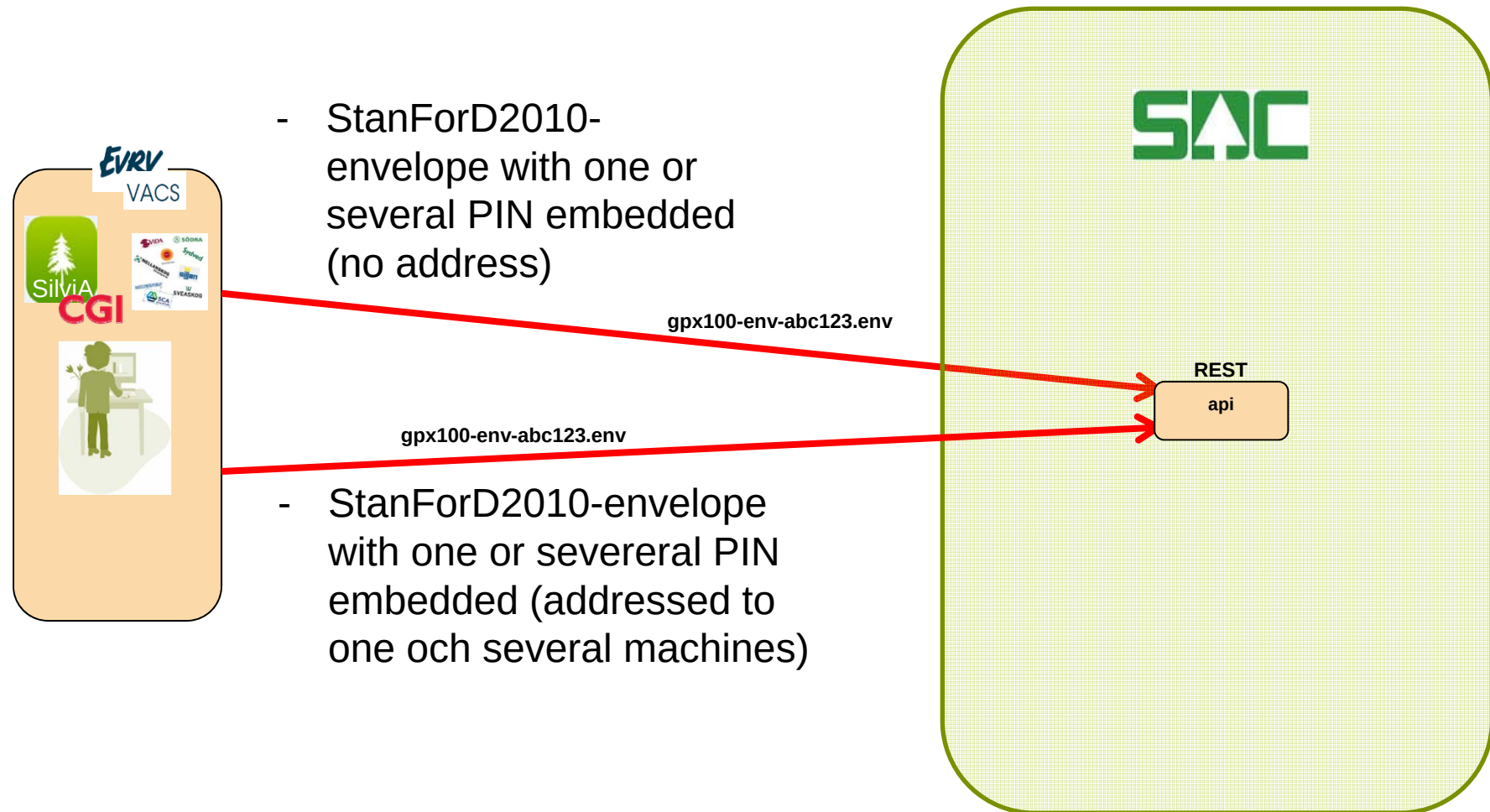
Data base with reported
ProductUserID per machine (SDCID)

SDCID	ProductUserID	Latest date of use
sdcgpx3462	68268_BoaKv1_GRAN1_891500	2016-03-18
sdcgpx3462	68268_BoaKv1_TALL1_891500	2016-03-18
sdcgpx3462	68268_EngVed3m_TALL_JD	2016-03-18
sdcgpx3462	68268_BmavFall_TALL_691900	2016-03-18

Load up messages to SDC by using SFTP



Load up messages to SDC by using REST



Necessary information in StanForD2010 envelope

<BusinessSender>

<FirstName>Lars</FirstName>

<LastName>Henriksson</LastName>

<Email>lars.henriksson@sdcs.se</Email>

<BusinessName>SDC EF</BusinessName>

<BusinessID>gpx106</BusinessID>

</BusinessSender>



Address for confirmation

Address to one or several machines

<TransmissionInfo>

<TransmissionID>SDC_2016789</TransmissionID>

<TransmissionTime>2016-03-15T10:14:22 +01:00</TransmissionTime>

<TransmissionSender>SDC EF</TransmissionSender>

<TransmissionReceiver>sdcgpx0003</TransmissionReceiver>

</TransmissionInfo>

<TransmissionInfo>

<TransmissionID>SDC_2016789</TransmissionID>

<TransmissionTime>2016-03-15T10:14:22 +01:00</TransmissionTime>

<TransmissionSender>SDC EF</TransmissionSender>

<TransmissionReceiver>sdcgpx0153</TransmissionReceiver>

</TransmissionInfo>

Machine
Identities



OBS! SDCID is the address

Matching of unaddressed PIN

Data base with used **ProductUserID** per machine (SDCID)

SDCID	ProductUserID	Latest date of use
sdcgpx3462	68268_BoaKv1_GRAN1_891500	2016-03-18
sdcgpx3462	68268_BoaKv1_TALL1_891500	2016-03-18
sdcgpx3462	68268_EngVed3m_TALL_JD	2016-03-18
sdcgpx3462	68268_BmavFall_TALL_691900	2016-03-18
sdcgpx1523	68268_BoaKv1_GRAN1_891500	2016-03-01

ProductUserID in uploaded PIN
(Husby.pin)

<ProductUserID>68268_BoaKv1_GRAN1_891500
</ProductUserID>

- <ProductUserID>68268_BoaKv2_GRAN1_891500
</ProductUserID>

If one ProductUserID is matching the whole PIN will be distributed to that machine

The user who uploaded the PIN get a confirmation listening the matching machines

In machine



From Sender XC v 1.05 it's possible to define the directory for different downloaded StanForD2010 instruction formats

Path for files to send from Sender XC:

Sender XC - Sökvägar för att skicka filer

StanForD StanForD2010

☐ fqc		...	Töm	
☐ ogr		...	Töm	
☐ thp		...	Töm	
☐ udi		...	Töm	
☐ pri	☐ fpr	C:\SDCData\Sender\PRL\	...	Töm
☒ pri	☐ hpr	C:\NoBackup\Filmapp för tester av Send	...	Töm
☒ ktr	☐ hqc	C:\SDCData\Sender\KTR\	...	Töm
☐ drf	☐ mom		...	Töm
☐ kal			...	Töm
☐ stm			...	Töm
☐ rep			...	Töm

Hjälp OK

Path for received files:

Sender XC - Sökvägar för att hämta filer

apt		...	Töm	
fdi		...	Töm	
foi		...	Töm	
oai		...	Töm	
ogi		...	Töm	
oin		C:\SDCData\Sender\OIN\	...	Töm
pin		C:\SDCData\Sender\PIN\	...	Töm
spi			...	Töm
Övriga		C:\SDCData\Sender\Hämtade filer		

Hjälp OK Avbryt

- Everytime you start Sender XC or send away a production file, Sender XC automatically check if there is something to download
- The operator in machine get a message from Sender XC then a new file is downloaded

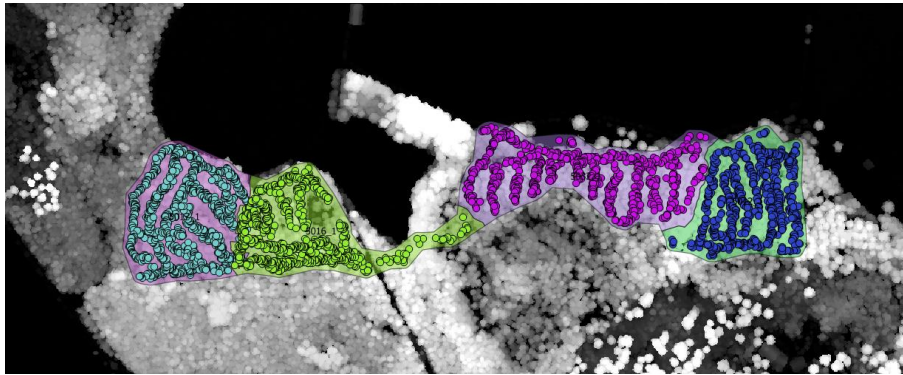


Summary

- Unaddressed distribution of PIN use ProductUserID to find the receiving machines
- Sending unaddressed PIN only works for StanForD2010-machines
- StanForD2010 envelope is used to address messages
The machine is defined by its unique SDCID
`TransmissionReceiver>sdcgpx0003</TransmissionReceiver>`
- Sender XC v 1.05 or later
- Release in June for a limited number of machines

11

**Utilizing data collected by harvester –
produce reference data for remote sensing purposes and
to update forest resource information
(data pre-calculations and procedure for stand delineation)**



CHM © Arbonaut Oy

Timo Melkas

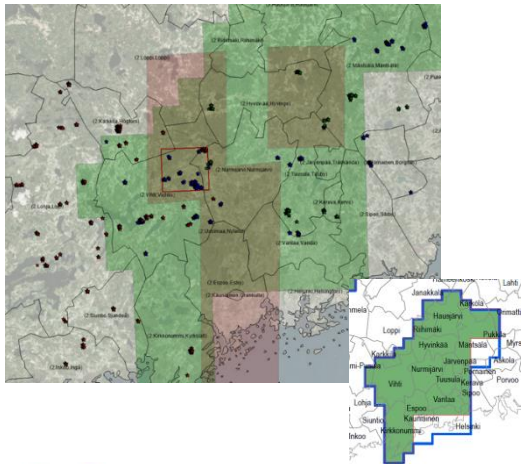
Metsäteho Oy

Forest Big Data -project
Result seminar

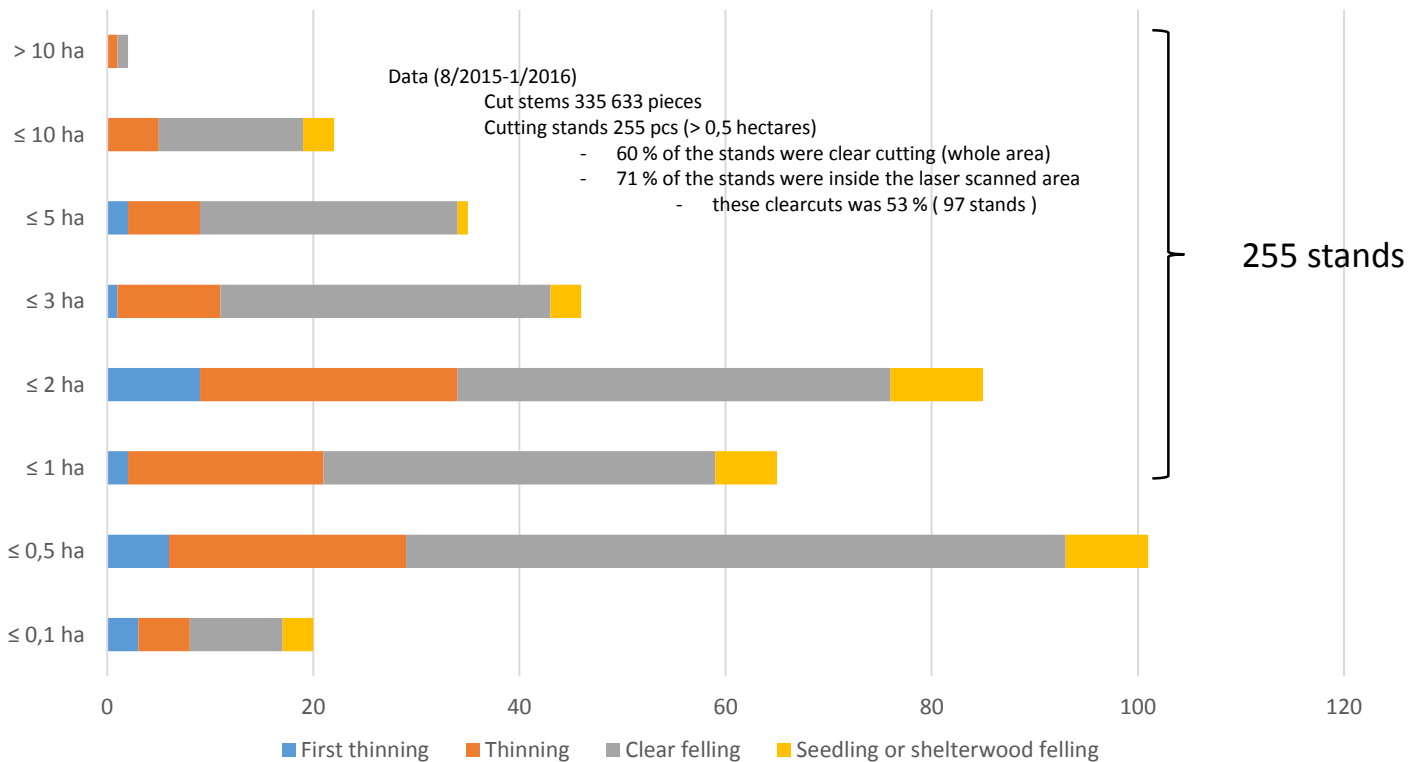
8.3.2016

Utilizing harvester data as a reference data for remote sensing purposes and to update forest resource information

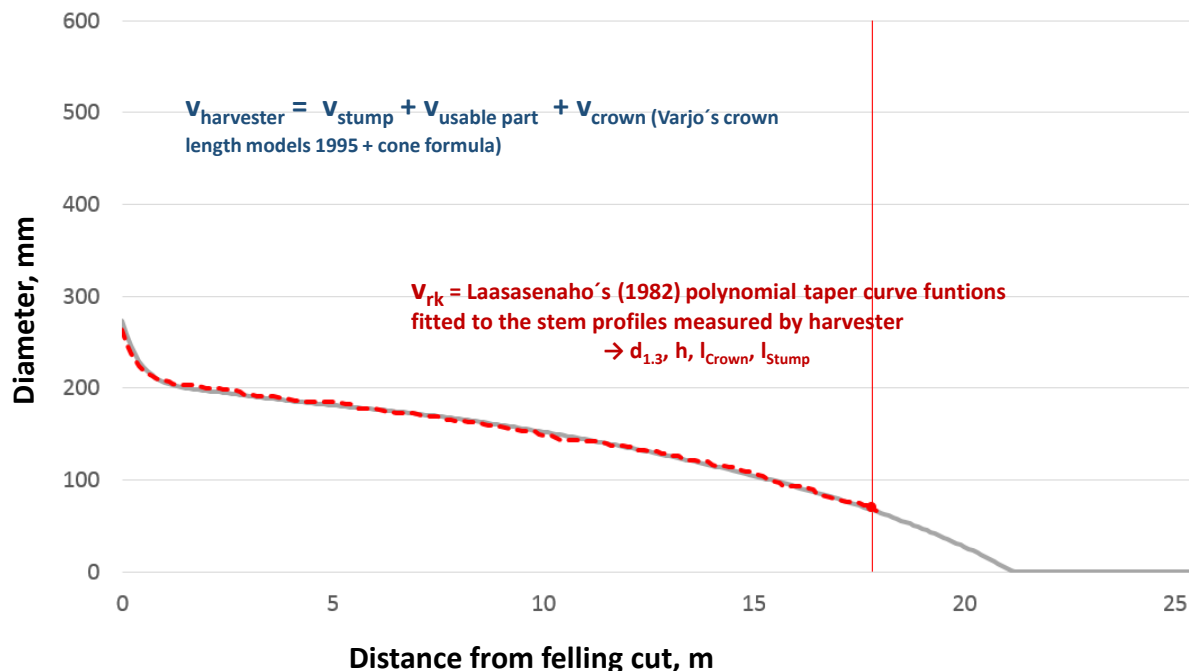
- **OBJECT:** to study harvester data potential as a reference data for remote sensing purposes (especially in final fellings) and to update forest resource information
- **IMPLEMENTATION:** The pilot was carried out at one forest inventory area of Finnish Forest Centre in collaboration with Metsäteho and its shareholders , Finland Forestry Centre , as well as Arbonaut Oy . The method is described in the report Metsäteho 237 (2015).
- **DATA:** was collected with 6 harvesters (8/2015-1/2016), 335 000 cut stems and 255 stands (> 0,5 ha)
- **PARTNERS:** Metsäteho Oy, MetsäGroup, StoraEnso, UPM, Finland Forestry Centre, Arbonaut Oy, VTT, harvester manufacturers (Ponsse, John Deere, Komatsu Forest)



Stands size distribution by logging methods (n= 376)



Calculation of harvester data

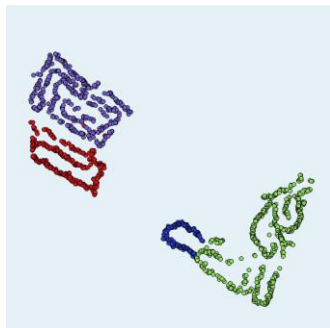


THE CALCULATION STEPS AND THE MAIN RESULTS

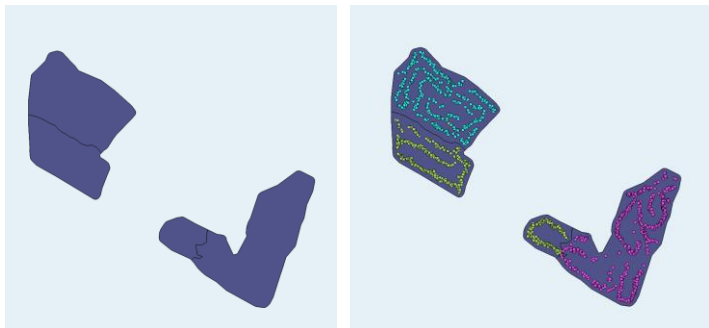
- Extract the STM- and PRD -files and download data to the database $\rightarrow$ **stem data bank**
- Volume calculation based on harvester data by assortments. Estimation of volume of tree tops and stumps.
- **Volume calculation by fitting Laasasenaho's taper curve to the stem profiles measured by harvester.**
 - Calculation of DBH, total height, crown length, and stump height.
- Checking and exporting the data to GIS -software
 - Checking and renumbering the objects, sub-objects and working areas.
- **Developing a method to produce stand delineation and strip roads to the objects based on recorded harvester locations**
- Calculation of stem information and summary information for the objects/subobjects.
 - Tree -level information (identification information, $d_{1.3}$, d_6 , d_1 , h , $h_{\text{usable part}}$, $v_{\text{assortments}}$, v_{stem})
 - Summary information for objects /subobjects (mean volume, tree species composition, mean height, mean diameter, basal area, portion of log wood)

Method to produce stand delineation and harvester strip roads

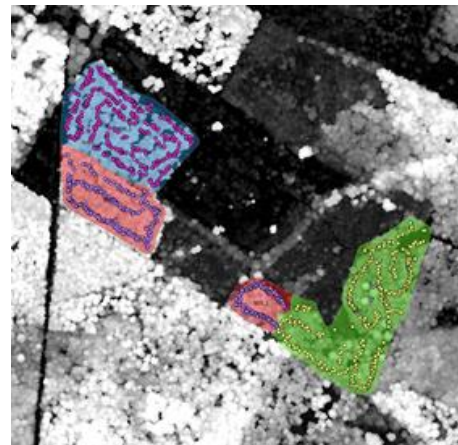
Transformation of WGS84 coordinates
to ETRS FIN35TM –system and
exporting data to GIS software



Producing stand delineation with
project-developed algorithm



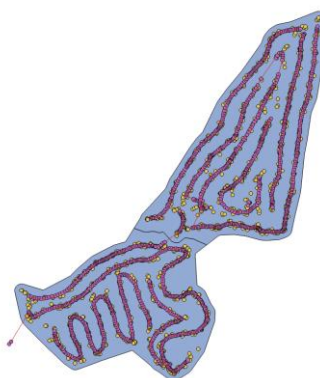
Verification of stand delineation and
comparing the data to harvester
locations and CHM - data (crown
height model data from ALS)



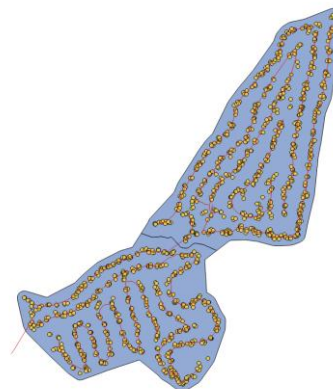
Transformation of WGS84 coordinates
to ETRS FIN35TM –system and
exporting data to GIS software

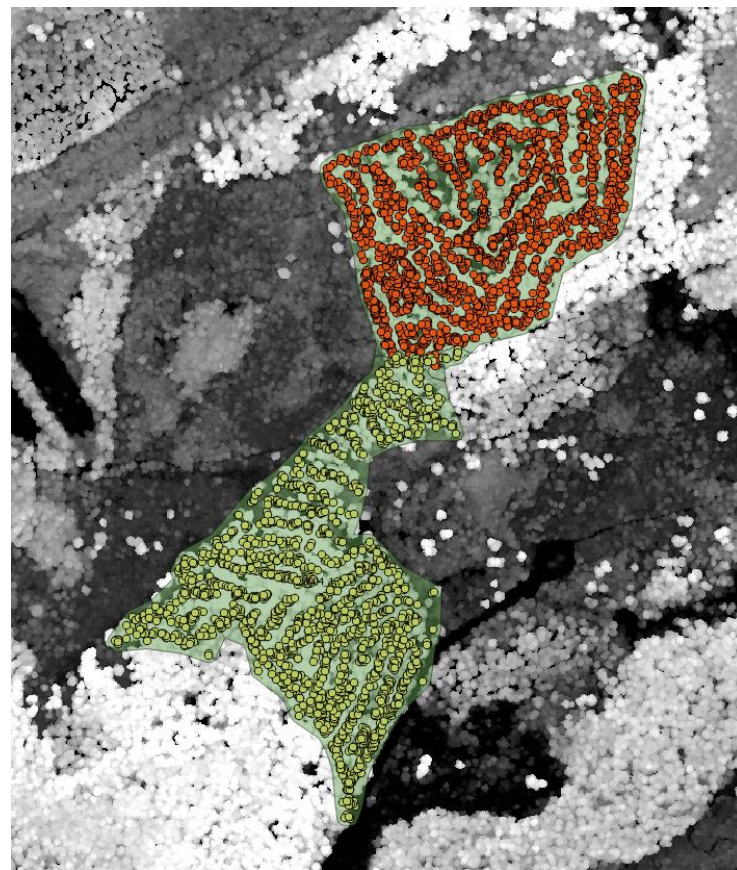
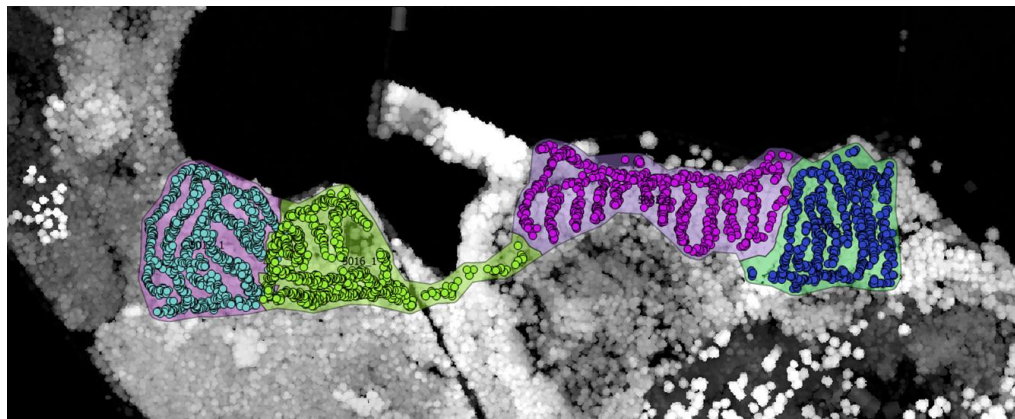
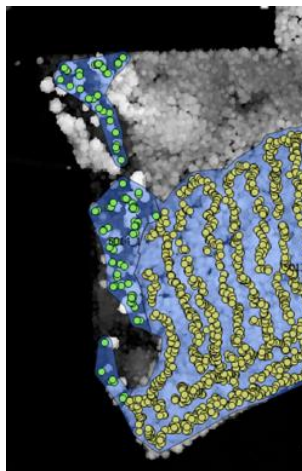
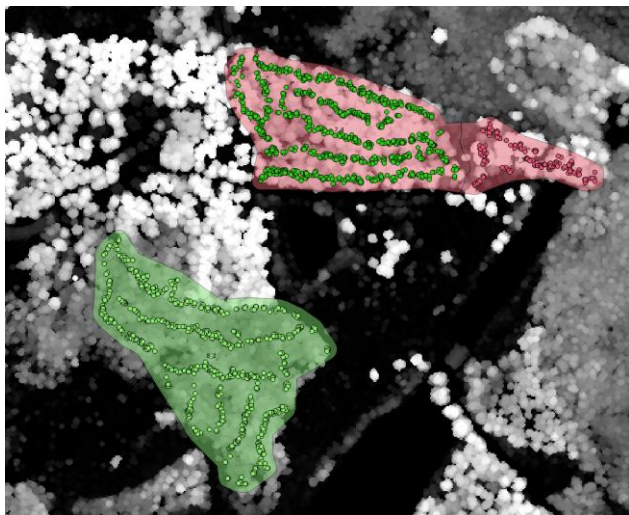


Filtering of observations



Producing harvester's strip roads (line)





CHM © Arbonaut Oy

Conclusions and further development of the method

- **Data collection works very well with all main brands (John Deere, Komatsu Forest, Ponsse), but it**
 - Requires the following of standards (**identification information** - contract number, object, subobject, stem number, starting time - , **logging method information, time stamps**) and synchronization of timber assortments in the database.
 - Requires that the harvester location and the stem profile is recorded for every tree.
 - Also material must be handled and edited into a useful format (volume pre-calculations, removing personal data)
- **Method to generate stand delineation works in thinnings and final cuttings.**
 - Based on the preliminary reviews the location accuracy of the created stand delineation seems to be quite good.
 - The next step is to automate the procedure and to test that in cooperation with the Finnish Forestry Centre , as well as to study the position accuracy of the delineation.
 - The strip road method works, but still needs further developing - especially in the individual stitches/trails and combination of overlapping strip roads.
- **In terms of utilization of reference data, the accuracy of location of felled trees is at key importance.**
 - The location accuracy can be improved by utilizing available machine information of the location of harvester head (direction and distance). In some harvesters, it is already possible to store this information into the HPR files.
 - In the future, the aim is to find out how much more accurate harvester head position data can improve the location accuracy of the reference data and availability.
- **The potential of data produced by harvesters is significant. An average of nearly 20 harvesters operate at one inventory area (200 000 ha) of Finland's Forestry Centre – thus the amount of reference data can be easily tripled**
 - If the position accuracy can be improved, we can form more reference sample plots from one stand (more variation).
 - On the other hand the size of the objects and fragmentation (heterogeneity) in particular in the Southern part of Finland poses challenges especially, when we try to form big enough sample plots (reference areas).



NOTRE NOM EST INNOVATION

Efficient satellite data transmission and FPTrak StanForD compatibility

Jean Plamondon

FPInnovations

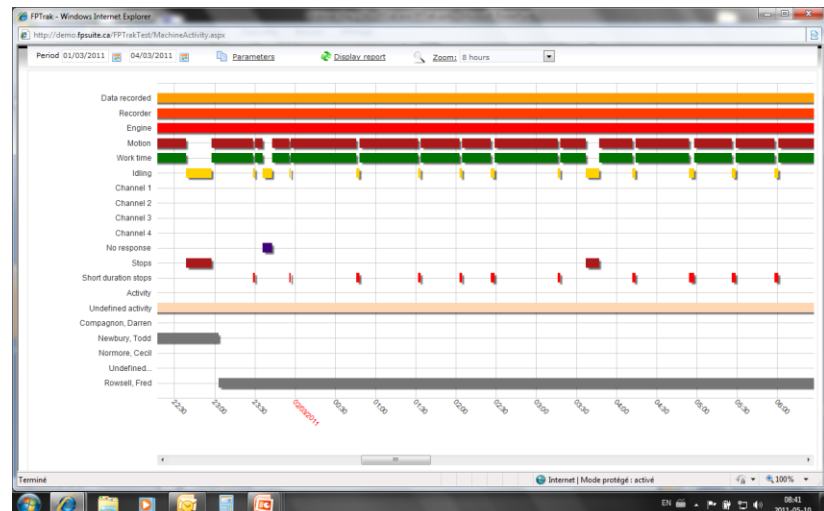
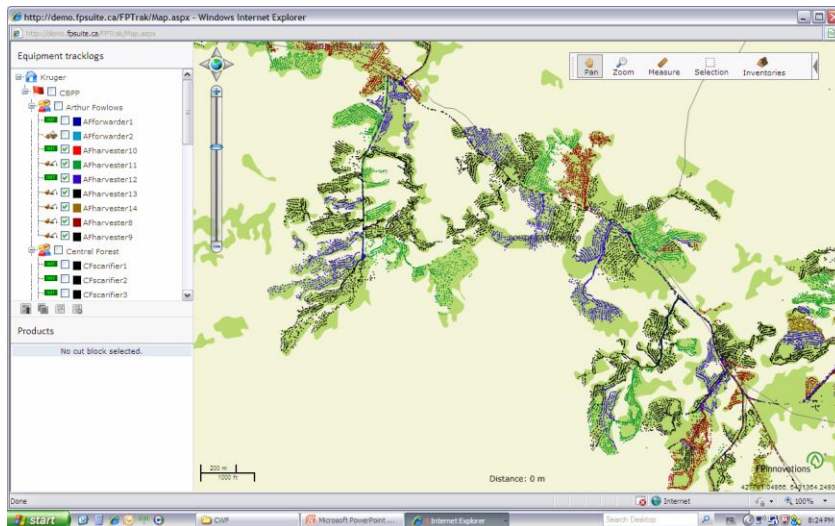
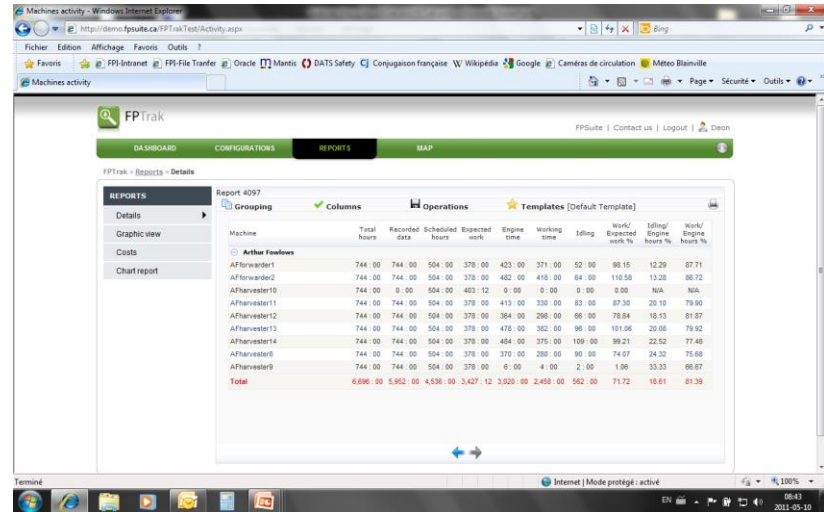
April 5th 2016



FPTrak™

Reminder

- FPInnovations' web-based reporting platform



Typical: machines with no OBC



- Or no data
- Or no useful data exchange
- But things are changing: harvesters, processors

FPTrak – Development status

- April:
 - Process regular StanForD file in FPTrak
 - Machine hours and aggregated production data in utilization report
- How will files come into FPTrak?
 - Usb and OEM syncing solutions (no good coverage)
 - Satellite via a compact message

Satellite compact message

- Satellite “packets” of data in an agreed format
- Minimal subset of pri-drf data
- SBD satellite transfer ~ 300 bytes
- FPI stopped its efforts of a “Sender” equivalent
- Offered its experience to OEM
- Ponsse will be implementing the specification (appendix 4)

Satellite compact message

Structure overview

- Binary
- Each packet must have a header
- Message type 1 - configuration
- Message type 2 – data
- Message type 3 – (optional - OEM use)
- Fully extensible

Message header

1. Data packet header

Every packet sent from a specific machine must contain header data to identify packet origin and help in extracting data contained in the packet. The following data must be found in the order it is presented:

Message	Number of bytes	Description
Machine unique ID	8	Random generated number on 8 bytes used to identify the machine. This number should be generated by the machine one time in the factory or on the first software update that will support this data format.
Message type	1	Possible values: Identify the message type (data, configurations, etc.), more details found in the following sections
Configuration ID	1	Configuration ID. This number increases by one every time the configuration is changed in the machine (which also triggers the transmission of the configuration) and rolls back to 1 after 255. Server will save configuration with this ID and will manage to use the most recent configuration for a specific ID. This configuration ID will also be sent with every data packet.
Message version Number	1	Version number of the message. Could be used to update message list and / or specific messages content over time. E.g. version 1 of message ID X means something, but version 2 means something else.

Message type 1 - configuration

2.1 Message of type 1 – Optimization System Configuration

For messages sent with message type 1, the content of the packet will be configuration data that will be used by the server system to interpret following messages (of type 2). The configuration data is the following and must be sent in the order presented in the packet. Please note that any text sent (e.g. species names) must use UTF-8 encoding.

Code (1 byte)	Description	Data	Length (bytes)	Range of values
1	Number of packets for a configuration and current packet number. Mandatory.	Number of packets used to transmit configuration	1	1-255
		Part number	1	1-255
Example: configuration requires 2 packets, first packet will contain 1,2,1 and second packet 1,2,2 (commas are not included in the byte streams)				
2	Species information. Mandatory if code 7 is not sent	Number of species, followed by a list of:	1	1-255
		Species ID	1	1-255
		Number of bytes for species name string	1	1-255
		Species name characters	Variable	
Example: 2 species (pine and spruce). Byte stream: 2,2,1,4,p,i,n,e,2,6,s,p,r,u,c,e				
3	Assortments information. Mandatory if code 7 is not sent.	Number of assortments followed by a list of:	1	1-255
		Assortment ID	1	1-255

Message type 2 - data

2.1 Message of type 1 – Optimization System Configuration

For messages sent with message type 1, the content of the packet will be configuration data that will be used by the server system to interpret following messages (of type 2). The configuration data is the following and must be sent in the order presented in the packet. Please note that any text sent (e.g. species names) must use UTF-8 encoding.

Code (1 byte)	Description	Data	Length (bytes)	Range of values
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Example: 2 species (pine and spruce). Byte stream: 2,2,1,4,p,i,n,e,2,6,s,p,r,u,c,e				
3	Assortments information. Mandatory if code 7 is not sent.	Number of assortments followed by a list of:	1	1-255
		Assortment ID	1	1-255

Transferred data, in a nutshell

- Machine unique ID
- Species, assortment or FPI “Canadian code”
- Top diameter classes (cm), length classes (dm)
- Operator information, ID, name (optional)
- Machine hours
 - ON / OFF events by operator
 - Work times
- Stem data per operator:
 - Number of stems per species and volume (0.1 m³)
- Log data per operator:
 - Number and volume of logs per species, assortments, diameters and lengths
- GPS position

Closing remarks

- FPInnovations is willing to cooperate if there is interest in the present specifications or a possible variant. Or even just discuss...
- FPTrak is not to replace the various management solutions offered by manufacturers but to complement for machines that have no reporting capability.
- We and our members and clients will have to rely on other means as well (syncing, muling solutions).



OUR NAME IS INNOVATION

Tack
Merci
Kiitos

jean.plamondon@fpinnovations.ca
martin.castonguay@fpinnovations.ca

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Protocol for Satellite Transmission of Onboard Computer Data

Draft version for preliminary comments

By:

Martin Castonguay, research leader, precision forestry

Francis Gauthier, software developer, precision forestry

Jean Plamondon, senior scientist, harvesting operations

Introduction

Sparse cellular coverage in Canadian forest regions poses a problem for the automated transfer of StanForD data files. As stakeholders increasingly see the potential value of using these data, satellite transmission becomes an option offering more convenience and a lot of reliability when compared to usb-memory or mobile app file transfer methods.

Satellite transmissions being costly, FPInnovations applied its previous expertise into the design and the implementation of a protocol to compress selected data extracted from StanForD files. The satellite transfer of the resulting packets to its system monitoring platform, FPTrak, was made by the use of custom software installed on the harvester.

Since then, FPInnovations decided to focus its activities on the FPTrak side only, relying on data transfer solution offered by manufacturers. However FPInnovations is willing to help manufacturers that wish to implement packet based satellite transmission.

Data messages created directly from OEM systems would simplify the approach previously taken by FPInnovations which required having a configuration file on the harvester to ensure proper match of species and assortment encoding. Instead, a header file could be written and sent whenever the local machine configuration is changed, without the need to receive anything from FPInnovations.

This document proposes a data format, including configuration information, designed to minimize the amount of data sent from the machine to the office. Although it originates from the need to serve the FPTrak platform, this format can easily be extended by using additional codes for additional data requirements.

1. Data packet header

Every packet sent from a specific machine must contain header data to identify packet origin and help in extracting data contained in the packet. The following data must be found in the order it is presented:

Message	Number of bytes	Description
Machine unique ID	8	Random generated number on 8 bytes used to identify the machine. This number should be generated by the machine one time in the factory or on the first software update that will support this data format.
Message type	1	Possible values: Identify the message type (data, configurations, etc.), more details found in the following sections
Configuration ID	1	Configuration ID. This number increases by one every time the configuration is changed in the machine (which also triggers the transmission of the configuration) and rolls back to 1 after 255. Server will save configuration with this ID and will manage to use the most recent configuration for a specific ID. This configuration ID will also be sent with every data packet.
Message version Number	1	Version number of the message. Could be used to update message list and / or specific messages content over time. E.g. version 1 of message ID X means something, but version 2 means something else.

2. Message content by message type

2.1 Message of type 1 – Optimization System Configuration

For messages sent with message type 1, the content of the packet will be configuration data that will be used by the server system to interpret following messages (of type 2). The configuration data is the following and must be sent in the order presented in the packet. Please note that any text sent (e.g. species names) must use UTF-8 encoding.

Code (1 byte)	Description	Data	Length (bytes)	Range of values
1	Number of packets for a configuration and current packet number. Mandatory.	Number of packets used to transmit configuration	1	1-255
		Part number	1	1-255
Example: configuration requires 2 packets, first packet will contain 1,2,1 and second packet 1,2,2 (commas are not included in the byte streams)				
2	Species information. Mandatory if code 7 is not sent	Number of species, followed by a list of:	1	1-255
		Species ID	1	1-255
		Number of bytes for species name string	1	1-255
		Species name characters	Variable	
Example: 2 species (pine and spruce). Byte stream: 2,2,1,4,p,i,n,e,2,6,s,p,r,u,c,e				
3	Assortments information. Mandatory if code 7 is not sent.	Number of assortments followed by a list of:	1	1-255
		Assortment ID	1	1-255
		Number of bytes for assortment name string	1	1-255
		Assortment name characters	Variable	
Example: 2 assortments (sawlog and pulp). Byte stream: 3,2,1,6,s,a,w,l,o,g,2,4,p,u,l,p				
4	Top diameter classes width (in centimeters). Mandatory.	Top diameter classes width value	1	1-255 cm
Example: diameters are aggregated in bins of 10 cm for counts and volume information (0-9.9, 10-19.9, 20-29.9, etc.). Byte stream: 4,10				
5	Length classes width (in decimeters). Mandatory.	Length classes width value	1	1-255 dm
Example: lengths are aggregated in bins of 1dm (0-1, 1-2, 2-3, etc.). Byte stream: 5,1				
6	Operator information. Optional.	Number of operators followed by a list of:	1	1-255
		Operator ID	1	1-255
		Number of bytes for operator name string	1	1-255

		Operator name characters	Variable	
Example: 2 operators (John and Joe). Byte stream: 6,2,1,4,J,o,h,n,2,3,J,o,e				
7	Species and assortments follow FPInnovations Canadian Species and assortment standard naming convention ¹ . Optional, but code 2 and 3 must then be mandatory.	Version number	2	1-65535

1- Please note that this standard doesn't exist yet!!!

2.2 Message of type 2 – Data packets

For messages sent with message type 2, the content of the packet will be data from the onboard system. All packets must be self-contained so that if a packet is lost, other packets do not rely on the missing information to be understood. Typically, this will mean breaking production data in smaller elements to fit with a list of machine ON / OFF events that can fit in a small packet of data (Iridium short burst maximum ~300 bytes). All packets must contain at least one machine ON / OFF event and associated production data. Note that time and production elements can be split by operators. If data is aggregated for all operators, then operator ID must be set to 0. Production information is totaled for all ON / OFF events of one operator (or all if operator 0).

Any species, assortment or operator codes must have been defined in a specific configuration prior to sending data. Data received from an unknown or incomplete configuration will be discarded. Configuration ID will be used to interpret data packets.

Code (1 byte)	Description	Data	Length (bytes)	Range of values
NOTE: all packets of type 2 also include an initial time tag on 4 bytes representing the number of seconds since January 1st, 2000. Other time elements in the packet will be offsets from this initial time tag. The initial time tag is found immediately after the packet header information. Time offsets are on 2 bytes, which means a packet can cover a little bit over 18 hours of operations. Finally, the last 3 bytes of the packet represent the final time offset of the packet. This time must be equal to the start time of the next data packet to indicate data continuity.				
1	Machine ON / OFF events by operator	Operator ID (0 means all operators)	1	0-255
		Number of events, followed by a list of:	1	1-255
		Machine ON time offset	2	0-65535

		Machine OFF time offset	2	0-65535
Example: operator 3 has 2 ON / OFF events, happening at offsets of 1 / 4 hours and 5 / 9 hours after initial time tag. Byte stream: 1,3,2,3600,14400,18000,32400				
2	Operator work time summary	Operator ID	1	0-255
		Total work time (in seconds)	2	0-65535
3	Stem information by operator and species	Operator ID (0 for all)	1	1-255
		Number of species, followed by a list of:	1	1-255
		Species ID	1	1-255
		Number of stems	2	1-65535
		Volume of stems in 0.1m3 resolution	2	0.1-6553.5
Example: Operator 0, 2 species (pine ID 5, 1000 trees and 218m3, spruce ID 7, 1234 trees and 305m3). Byte stream: 3,0,2,5,1000,2180,7,1234,3050				
4	Log information by operator (for one operator, or all, this code provide count and volume information for all possible combinations of species / assortments / diameter / length)	Operator ID (0 for all)	1	1-255
		Number of log combinations, followed by:	1	1-255
		Species ID	1	1-255
		Assortment ID	1	1-255
		Diameter (use low end of class)	1	1-255
		Length (use low end of class)	1	1-255
		Number of logs	2	1-65535
		Volume of logs in 0.1m3 resolution	2	1-6553.5
5	Initial GPS point	Time offset	2	0-65535
		GPS position	6	See notes
6	GPS point offset	Time offset	2	0-65535
		GPS position	3	See notes

2.3 Message of type 3 – Proprietary data packets

Information in packets of type 3 is reserved for manufacturers' use. The content is a stream of bytes that is proprietary to a specific manufacturer and as such, no specification is given on the encoding of this information.

3. Notes on GPS recording

In order to minimize the amount of data transferred by the system, GPS points are compacted using an initial base point followed by a series of offsets. The initial point will require 8 bytes, including time tag and code, whereas offsets will only use 5 bytes. When offsets reach the maximum value that the variable can hold or becomes negative, a new initial position is created.

The format of the GPS points is QDDMMXXXX, where:

- Q = Quadrant (0 if N or E, 1 if S or W)
- D = Degree
- M = Minute
- X = decimal of minutes

The initial GPS position truncates the longitude and latitude values to QDDMMX. The values are converted to 3 bytes for longitude and 3 bytes for latitude. To avoid having negative offsets, 0.2 minutes of degree is removed to the initial position. An offset will automatically be generated following the initial position to get the precise initial point. The offsets for longitude and latitude are formatted as XXXX and recorded on 12 bits each (3 bytes total for both values). The maximum offset for both latitude and longitude is 4095 (0x0FFF).

In records, latitude comes first, followed by longitude.

Example of GPS recording

Initial point to record: N45°59.1234', W73°01.0123'

Step 1 – subtract 0.2 minutes to both values

N45°58.9234, W73°00.8123

Step 2 – Round to 0.X minutes

N45°58.9', W73°00.8'

Step 3 – Convert to value

045589,173008

Step 4 – Record on 3 bytes for each value (code 5, include time offset on 2 bytes)

00 B2 15, 02 A3 D0

Step 5 – Calculate offset

$$N45^{\circ}59.1234' - N45^{\circ}58.9' = 0.2234$$

$$W73^{\circ}01.123' - W73^{\circ}00.8' = 0.323$$

Step 6 – Record on 12 bits for each value (code 6, include time offset on 2 bytes)

$$2234 = 0x08BA, 323 = 0x0143, \text{ result} = \mathbf{8B\ A1\ 43}$$

Next point to record: N45°59.1555', W73°01.0101

Step 1 – Calculate offsets from initial position

$$N45^{\circ}59.1555' - N45^{\circ}59.1234' = 0.0321'$$

$$W73^{\circ}01.0123' - W73^{\circ}01.0101' = 0.0022'$$

Step 2 - Record on 12 bits for each value (code 6, include time offset on 2 bytes)

$$321 = 0x0141, 22 = 0x016, \text{ result} = \mathbf{14\ 10\ 16}$$

Note that if offsets are negative or exceed 4095, a new initial position is calculated from the current point, using the same principle.