

Towards a Traceability Solution in the Canadian Forest Sector

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Problem description

- Loss of information related to certified wood's origin.
- Lack of information related to raw material control.
- Loss of information throughout transformation process stages.

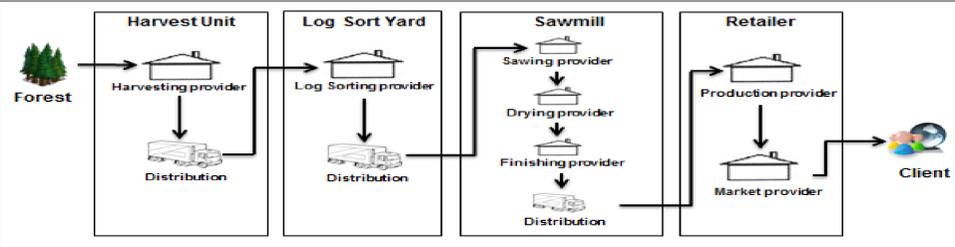


Figure 1 Forestry wood supply chain

Objectives

1. Maintain traceability certification through the forestry value chain:
 - Provide meaningful information
2. Significant savings:
 - Minimize unnecessary decommissioning
 - Maximize the yield of the desired product
3. Better overall control of the information and material flows might:
 - Optimize the efficiency of production in the forestry network
 - Minimize environmental impact.

Related Work

Traceability definition

Traceability is used in different manufacturing and services applications (apparel, healthcare, logistics, defense, pharmaceutical, etc.)

There are several traceability definitions in the literature:

- [1] defined traceability as the tracking of dynamic interactions between process and objects.
- Traceability provides means to verify the chain of custody and the origin of the timber [2]
- [3] defined traceability as a process of systematic practice and information traded among different providers in the chain to be able to preserve the product identity and its origin.
- [4] cited that traceability is the way by which we can make information available at different stages along the forestry-wood production chain.
- GS1 defines traceability as the ability to trace the history, application or location of that which is under consideration [5].

Information communication standard

Different standards and norms have been developed in different areas to ensure reliable traceability systems such as:

- GS1 the global traceability standard for healthcare used in the medical sector;
- ISO 22005 feed and food traceability standard;
- JIS (JISx0510) to track car components in Toyota plants, etc.

ICT (Information and Communication Technology) traceability system

- Implementing traceability in the forestry value chain requires that several technologies are combined and integrated to operate as a system;
- ICT traceability system is the core of traceability concept;
- Movement detection of each product in different process stage requires the implementation of ICT architecture to collect reliable information.

TrACS (Traceability for Complex Systems) is tested in an example drawn from a system to control chemical reactions at a catalyst plant [6].

+ This approach applies heterogeneous techniques to integrate an extensible traceability framework. - Provide a poor integration with users because they must make these decisions themselves throughout traceability process.

SOFIA platforms that optimize contractors order logistic management developed for the forestry sector in Finland [7].

+ Ensures a sustainable ICT infrastructure for forestry operations by integrating several technologies; - But it remains preparatory project and there is no validation proof of this platform in industry.

The Indisputable Key project develop an ICT traceability system to manage forestry supply chain based on RFID identification [8].

- However they don't take into consideration the dynamic and the interoperability aspects in the proposed traceability system.

Traceability requirements

- Provider's (type) identification (Harvest Units, Log Sort Yards, Sawmills, Retailers, etc.)
- Product identification (RFID, Barcode, etc.)
- Communication information standard (eFIDS (e-Forestry Industry Data Standards), GS1, StanForD (Standard for Forest machine Data and Communication), Papinet)

References

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5. GS1, *GS1 Standards Document - Business Process and System Requirements for Full Supply Chain Traceability*, in *GS1 Global Traceability Standard*. 2010.
6. Cleland-Huang, J., G. Zement, and W. Lukasik. A heterogeneous solution for improving the return on investment of requirements traceability. in *Requirements Engineering Conference, 2004. Proceedings. 12th IEEE International*. 2004.
7. Costa, C., et al., *A Review on Agri-food Supply Chain Traceability by Means of RFID Technology*. Food and Bioprocess Technology, 2013. 6(2): p. 353-366.
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Proposed solution

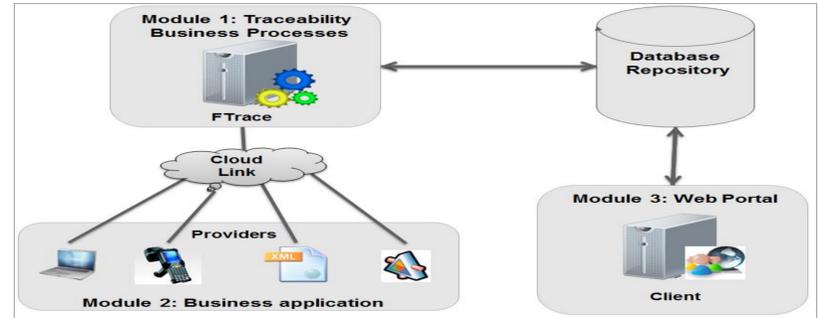


Figure 2 FTrace Information and Communication System

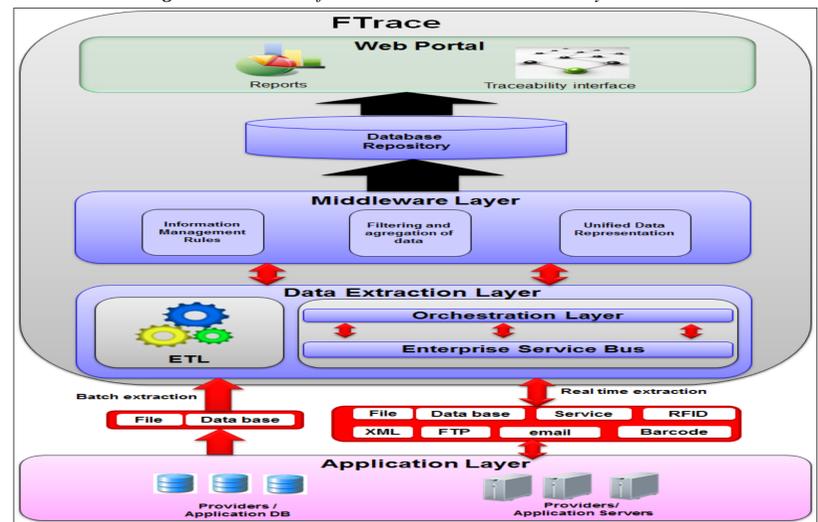


Figure 3 Traceability proposed system

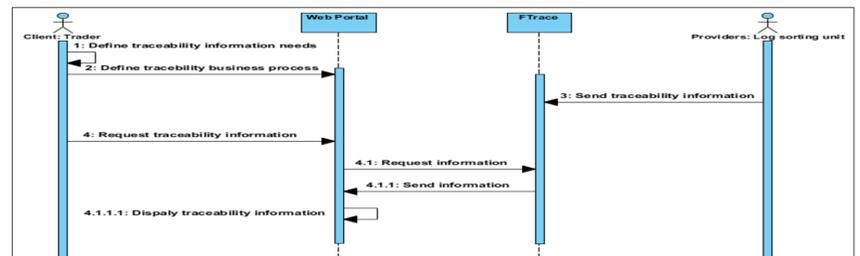
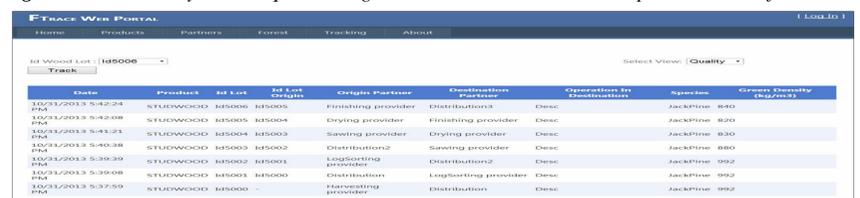


Figure 4 Traceability UML sequence diagram in the Forest Sector- Example Scenario definition



Case	Product	ML Unit	ML Unit Origin	Original Producer	Distribution Producer	Operation ID	Species	Current Identity (log/m ³)
10/13/2013 5:42:04 PM	STUDWAC002	855006	855006	Harvesting provider	Distribution2	Desc	JackPine	850
10/13/2013 5:42:08 PM	STUDWAC002	855005	855004	Drying provider	Finishing provider	Desc	JackPine	820
10/13/2013 5:42:23 PM	STUDWAC002	855003	855003	Sawing provider	Drying provider	Desc	JackPine	830
10/13/2013 5:40:38 PM	STUDWAC002	855002	855002	Distribution2	Sawing provider	Desc	JackPine	880
10/13/2013 5:38:39 PM	STUDWAC002	855002	855003	Log sorting provider	Distribution2	Desc	JackPine	952
10/13/2013 5:35:08 PM	STUDWAC002	855003	855000	Distribution2	Log sorting provider	Desc	JackPine	952
10/13/2013 5:37:50 PM	STUDWAC002	855000		Harvesting provider	Distribution	Desc	JackPine	952

Figure 5 FTrace web portal

Conclusion

- The proposed solution increase collaboration between the different supply chain actors through tracing the business processes execution, orchestrating different providers, integrating the different IT application used throughout the wood process and offer a scalable traceability system. In this project and regarding data extraction, we have tested two adapters to communicate with the application layer (XML file and RFID tags).
 - A primitive unified data representation model is proposed based on two communication standards: Papinet and StanForD.
 - The proposed traceability architecture will allow some companies engaging in a traceability journey to access new and traditional markets especially if customers impose the use of any kind of certification.
 - The collected information could help companies to optimize their value chain based on better management of transportation flows of raw material and by keeping the right inventory in the best place.
- Future Work:**
- We should add the other adapters such as barcode and web services.
 - A more precise specification of data representation should be defined in order to guarantee the availability of information needed for certification purposes.