

Improving Farm Management

AgGateway's ADAPT



Thank you for the opportunity to share with you the work the agriculture industry is doing through AgGateway.

Do these questions look familiar?

- Did I make money on this field last year?
- What should I do with this field? Keep renting? Buy it? Let it go?
- Do I need bigger equipment?
- Do my retailer's invoices match the amounts of product I'm applying to my fields?
- How do my sustainability metrics compare to average?



First, let me ask you a few questions; see if any look familiar.

Did I make money on this field last year? What should I do with this field? Keep renting? Buy it? Let it go?

Do I need bigger equipment? Do my retailer's invoices match the amounts of product I'm applying to my fields?

How do my sustainability metrics compare to average?

All of these questions represent farmer **business problems**. And all of these problems have something in common: they can only be solved with accurate, usable data.

Do you or your customers have any of these problems?

- Different brands of equipment; they all collect valuable data, but each speaks its own language.
- Many software programs to do anything with my agronomic or field operations data.
- Customers want evidence of sound agronomic practices and being a good steward of the land, but it's just too complicated to get all the data I need.



Now, let's examine a set of problems.

I have different brands of equipment; they all collect valuable data, but each speaks its own language.

I have to use many software programs in order to do anything with my agronomic or field operations data.

My customers want me to show that I'm using sound agronomic practices and being a good steward of the land; they're also interested in traceability. I want to do all of this, but it's just too complicated to get all the data I need.

These **interoperability** problems make it difficult for us to help solve our customers' business problems. And those customers do not like it; they need to run their business using data from multiple different systems.

AgGateway

- The whole industry has the same business problems, but can't solve them because we can't **interoperate**.
- AgGateway provides a framework for companies to find problems they have in common (like interoperability) and **collaborate** to solve them for their customers' benefit.



- It turns out that the whole agricultural industry has business problems like these, but can't easily solve them because it has been so hard for different technology providers to interoperate.
- AgGateway provides a framework for companies to find problems they have in common, such as interoperability in field operations and supply chain, and to collaborate on finding solutions that can benefit their customers and the whole industry.

What is ADAPT?

- Ag Data Application Programming Toolkit (ADAPT)
- A huge problem for software companies is having to manage integrations with multiple partners.
- What does ADAPT do?
 - It enables communications between Machine / Implement Control Systems (MICS) and Farm Management Information Systems (FMIS) as well as among different FMIS.
- It is geo-political context independent (strong emphasis on enabling international use).



ADAPT is a toolkit of software tools or libraries that can be incorporated into farm management software to help improve farmers' data. Improving the quality of farmers' data and managing integrations with multiple partners is a huge problem for software companies. ADAPT helps solve that problem, too.

ADAPT enables communications between the controllers on farm machinery, called "machine / implement control systems", or MICS, and farm management software, also called FMIS, and it does this in a way that enables the toolkit to be used internationally.

What's a "Common Object Model"?

- Modern software uses *object models* to represent data.
- ADAPT's participating companies have worked together for years to agree on an object model that can help the industry interoperate.
- This object model was kept very generic and flexible, recognizing that different farmers document their processes differently.
- This common object model is open-source (Eclipse Public License). Anyone can use it free of charge.



Modern software uses *object models* to represent data.

ADAPT's participating companies have worked together for years to agree on an object model that can help the industry interoperate.

This object model was kept very generic and flexible, recognizing that different farmers document their processes differently, and it is open-source (using the Eclipse Public License). Anyone can use it free of charge.

What are “plug-ins”?

- ADAPT makes handling different formats easier.
- Plug-ins translate data formats both to and from the ADAPT common object model.
- Plug-ins accomplish interoperability.
- The common object model and the framework that manages the plug-ins are open source.



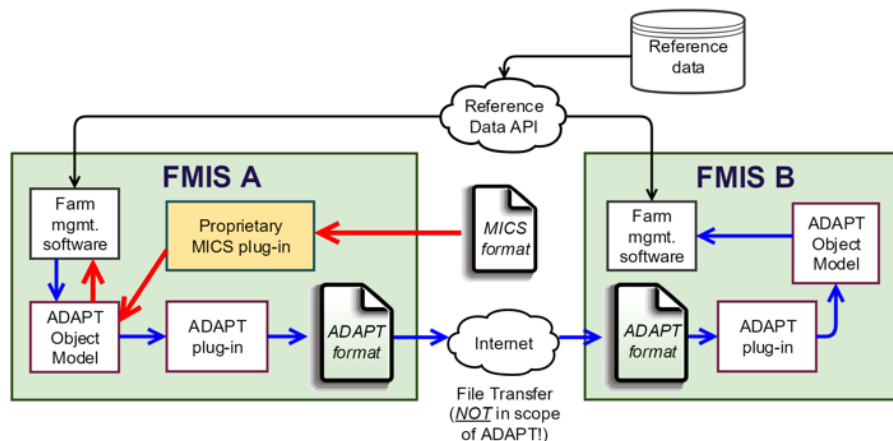
ADAPT is designed to make things easier by letting everyone who owns a format to integrate with the ADAPT common object model. Once!

Plug-ins are software libraries that translate back and forth between a data format and the ADAPT common object model.

To accomplish interoperability, companies write plug-ins for their proprietary software.

Because the common object model and the framework that manages the plug-ins are open source, companies can license them however they want.

How ADAPT works



- The red arrows show data import from a farm machine.
- The blue arrows show an FMIS-to-FMIS communication example.



Let's briefly discuss how ADAPT works, using two examples.

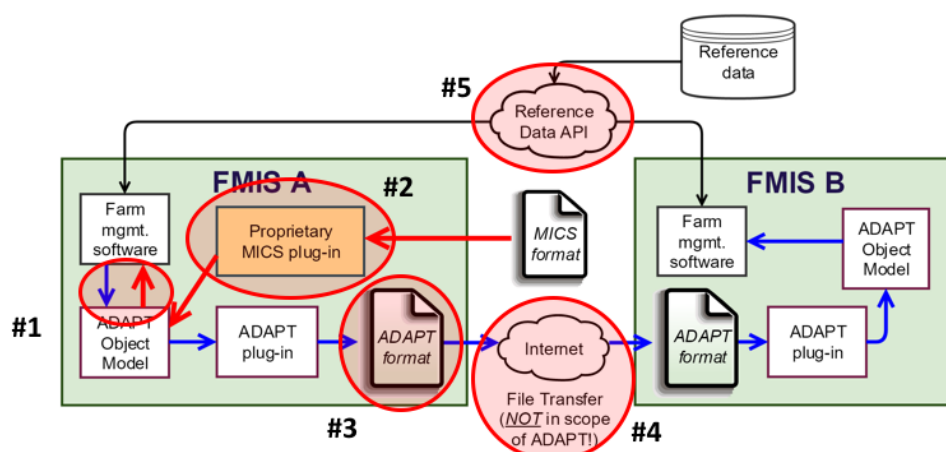
The first example, represented by the red arrows, shows how ADAPT can be used to import data into a farm management system from a farm machine.

The software is labeled "FMIS A"; it consists of the original proprietary farm management software, able to create and use instances of the ADAPT common object model. A proprietary plug-in takes data files from the machine / implement control system (the machine, in other words) and converts it into ADAPT data objects that the farm management software can use.

The second example shows data transfer between two different farm management information systems, FMIS A and B. This could happen if the farmer wanted to exchange documents with an advisor, or a service provider, for example.

.

5 Key Concepts about ADAPT



Let's review what we've discussed and introduce a few more ideas, as we focus on five key concepts about ADAPT.

#1 - ADAPT's power is in its common object model

#2 - ADAPT uses a plug-in architecture to transform data

#3 - ADAPT serialization enables lossless FMIS-to-FMIS transfer

#4 - ADAPT is NOT a file **transfer** mechanism

#5 - ADAPT leverages the use of controlled vocabularies. The Reference Data system allows sharing identifiers for products and other resources, so they **mean** the same thing to all participants in a data exchange.

What about internationalization?

- Growers need ever-increasing amounts of field operations data.
- This usually includes a lot of country- and state-specific information (product registration numbers, tax information, etc.)
- Capturing all of this data in an industry-wide common object model is very difficult: requirements change very often!
- AgGateway's SPADE and ADAPT teams devised a way to keep the data model very generic, but to allow users throughout the world to define and use data points in the data model that are customized to their own geopolitical context: The **ContextItem System**
- Anyone can submit requests for ContextItem definitions to be added to the system; farm management systems can then receive these definitions over the internet.



10



It turns out that it's critically important for farm management software to fully represent the farmer's local business processes, and the data involved. That means a lot of country and state-specific information, which might change often.

This kind of information is not what we usually think about when discussing international standards, and indeed, including it in a common object model creates a lot of problems for companies, which need to have stable versions of software for as long as possible, and look to avoid creating specific versions of their data models for different geographies if at all possible.

AgGateway's ContextItem System reconciles these competing needs, using extensible vocabularies that farm management systems can read from the internet and understand, and that anyone can request extensions to.

What is the value of ADAPT?

- **Farmers**
 - Makes it easier to “move data” among multiple systems.
 - Freedom to choose among different software / equipment providers.
 - Can focus more on leveraging data in their businesses.
- **FMIS Companies**
 - Reduce cost and development time to translate data from a variety of formats.
 - Can focus on delivering more functionality to customers.
 - ADAPT is designed from the start to be international in scope.
- **Equipment Manufacturers**
 - Simplify engagement with multiple software/FMIS companies for all countries they do business in.
 - Increase adoption of their field operations data technology globally.
- **Input Manufacturers**
 - Make it easier to use their products in accordance with their label.
 - Make it easier to have direct engagement with farmers and farm data.



ADAPT provides value to multiple stakeholders. Here we show four clear examples: farmers, farm management information system companies, equipment manufacturers, and manufacturers of inputs such as seeds and crop protection products. ADAPT offers value to each of them, in several ways.

How can I get involved?

- Start here:
 - Find the high-level flyer here: <http://bit.ly/1VQQsWR>
 - The site at www.adaptframework.org contains links to the ADAPT source code
 - It also contains links to data model documentation
- The ADAPT Team provides onboarding / mentoring
 - Send questions and comments to adapt.feedback@aggateway.org
- Remember: This is an open-source effort!
 - The code and materials are distributed according to the Eclipse Public License
 - You can contribute to the code!
- Talk about ADAPT with your customers!



Getting involved in ADAPT is very simple.

A great starting point is the [adaptframework.org](http://www.adaptframework.org) website. It contains links to the source code and multiple other resources.

The ADAPT team also has an email address that you can use to send in questions and comments.

Remember that ADAPT is an open-source effort; although the governance process is handled through an AgGateway-North America committee, anyone anywhere can contribute code and propose changes and additions.

Finally, talk to your customers about ADAPT, and about how you are investing effort in bringing them interoperability solutions with it!

Thank you!

To learn more, talk to
Rod Conner (rod.conner@aggatewayglobal.net) or
Jim Wilson (jim.wilson@aggatewayglobal.net)



Thank you for your attention. Please feel free to reach out to us with any questions you may have about AgGateway and ADAPT.