Recording and communicating local data is a challenge

Current trends in sustainability, traceability and compliance reporting demand that growers gather and report ever-increasing amounts of data as part of their everyday field operations. Specific requirements for what data to collect, how often to do so, and in what format, are constantly evolving and are highly dependent on the grower’s farm location or geopolitical context.

Software implementations that handle this geopolitical context-dependent data (GPCDD) face an ever-moving target, especially when trying to use standards to exchange data: standards are typically not made to accommodate GPCDD.

Simple GPCDD examples

- **EPA Number:** In the United States, crop protection products have a registration number that must be reported when documenting product use.

- **Cadastral Data:** In many jurisdictions, fields have multi-attribute legal descriptions. For example, in the western United States the Public Land Survey System (PLSS) uses 7-8 attributes (township, range, section, etc.) In contrast, Germany uses only 3 attributes for the same purpose (Gemarkungsschlüssel, Flurnummer, Flurstücksnrumber).

AgGateway has a solution!

AgGateway developed the ContextItem system to overcome these challenges. It is usable by AgGateway’s ADAPT (www.adaptframework.org), but also by ISO 11783 files and proprietary systems. It is readily extensible to include user-submitted definitions.

Why is this important?

The ContextItem system enables software to tag data objects with regulatory and other business-specific attributes. It enables your systems to communicate these data to your partners, and the “dictionary” that explains the meaning of the ContextItems is available to all.

The API can tell you how to use a particular ContextItem

ContextItems are similar to a data structure called a key-value pair (think "US EPA-N: 123-4567"). The key ("US-EPA-N") has a matching ContextItem-Definition, accessible through an API, that provides additional information, such as how to interpret the value (in this case, “123-4567”), what units of measure to use (if needed), how many characters are valid, and where it is relevant.

Requesting new ContextItemDefinitions:

It’s quick and easy to add new items to this system. Contact AgGateway’s Controlled Vocabularies Working Group at cvwg@AgGateway.org.
Quick intro to the ContextItem system for developers

The simple UML class diagram at right shows the contents of a ContextItem.

**Code** is a string, used as the key to get the corresponding ContextItemDefinition from the API; use `https://api.contextitem.org/def/[code]`.

**Value** is a string, but can encode a number, a date, an enumerated value, a boolean, etc. The corresponding ContextItemDefinition specifies the data type of Value.

**ValueUoM** specifies a unit of measure, where needed.

**TimeScopes** can be used to tag the ContextItem with relevant dates (e.g. the expiration date of a license number).

**NestedItems** enables multi-attribute data like the PLSS example, where a PLSS ContextItem has a nested Township, Range, Section, etc.

Pain points targeted by the ContextItem System

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<th>Pain point</th>
<th>Why it hurts</th>
<th>The ContextItem solution</th>
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<td>Farmer business processes require GPCDD, but standards don’t support it.</td>
<td>If FMIS can’t include data the farmer needs (e.g., US FSA field identifier, German Bundessortenamt id for varieties), its value to the farmer is limited.</td>
<td>ContextItemDefinitions can be created for the GPCDD of interest, and a list of ContextItems can be added to software objects.</td>
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<td>Different software and hardware have different code lists for crops, operations, etc.</td>
<td>Merely converting from one format to another does not solve interoperability problems, because meaning can be lost. We are still far from having single, canonical lists for crops, operations, etc.</td>
<td>Annotating objects with ContextItems bearing values from widely used lists (e.g., EPPO crop codes) enables FMIS to recognize the content even if the primary identifier is not recognized.</td>
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<td>Handling new data requires recompilation, redeployment of FMIS software.</td>
<td>Accommodating frequent software updates can overwhelm companies’ software lifecycle management, especially if they have a large number of users (e.g., large retailers).</td>
<td>Adding a new variable to the ContextItem system API, targeted to a particular object model class and geopolitical context, is very quick and simple. Software can query the API for all the information needed to capture / display a new attribute.</td>
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How to use ContextItems

- ADAPT objects typically have an optional list of ContextItems you can use to add GPCDD.
- Users of ISO 11783-10 task files can also use the system, attaching ContextItems via the link list file defined in ISO 11783-10 Annex E. (Contact us for details)
- You can use ContextItems in your own software: just clone the format! Look at ADAPT source code, and the data model in the paper behind the QR code.
- ContextItems can be nested! The PLSS example shown previously is a good example of this.

What we want from you

Read the paper, look at the source code, try out the API. Consider using this technology in your software solutions and reach out to our team if you have any questions!