Simplifying Data In Ag

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ODA Project Lead

http://engineering.purdue.edu/oatsgroup/

http://openag.io

August 18, 2014
Background: Aaron Ault

Farmer

Beef

More Beef Coming Soon!

Corn, Soybeans, Wheat
Background: Aaron Ault

e-Stadium: Wireless Applications in a College Football Stadium

Catherine Rosenberg, Hoi-Ho Chan, Timothy J. Rogers and Vivak P. Mhatre

The Development and eStadium Testbeds for Research and Teaching Applications in Wireless Communication

Xuan Zhong, Hong Li, Muhammad Imran, and Munther Elzarka

Mobile, Cloud-Based Farm Management: A Case Study with Trello on My Farm

Aaron Ault, James Krogmeier, Dennis Buckmaster
Background: Aaron Ault

Farmer

http://engineering.purdue.edu/oatsgroup

Computer Engineer

Open Ag Tech Group at Purdue
Background: Aaron Ault

Farmer

Computer Engineer

Open Ag Tech Group at Purdue

Project Lead, Open Ag Data Alliance
How Farmers See Data Today
How Farmers See Data Today

Hassle
Usability: Example

New Field: Step 1
Usability: Example

New Field: Step 2

Finished with Field?

Have you finished working with the current field?

Yes

No
Usability: Example

New Field: Step 3

Create new or select old field

Do you want to create a new field or select an old field?

- Create New Field
- Select Field by Name
Usability: Example

New Field: Step 4

Create New Field

Edit settings by pressing each one individually.
Press the green accept button to continue.
Usability: Example

New Field: Step 5

Pattern Type

Straight AB Swaths

- Straight AB
- A+
- Identical Curve
- Pivot
Usability: Example

New Field: Step 6 - A

Implement Setup

Edit settings by pressing each one individually.

Press the green accept button to continue.

Implement Width 20’ 00”

Overlap/Skip 0°

Left/Right Offset 120° Left

Forward/Back Offset 60° Behind
Usability: Example

New Field: Step 6 - B
Usability: Example

New Field: Step 7

Confirm Configuration

Edit settings by pressing each one individually.

Press the green accept button to continue.
Usability: Example

New Field: Step 8

[Image of a user interface with buttons and a text field]
Usability: Example

New Field: Step 9
Usability: Example

New Field: Step 10
Usability: Example

New Field: Step 11
Usability: Example

New Field: Step 12
Usability: Example

New Field: Step 13

Confirm Configuration

Edit settings by pressing each one individually.

Press the green accept button to continue.

Client
Ault Farms

Farm

test2

Field

040611_0001

Event

Event_040611_0001
Usability: Example

New Field: Step 14
Usability: Example

New Field: Step 15

Confirm Configuration

Edit settings by pressing each one individually.

Press the green accept button to continue.
Usability: Example

New Field: Step 16 – A

Record Keeping

Edit settings by pressing each one individually.
Press the green accept button to continue.

- Operator
- EPA License Number
- Harvest Year
- Farm Location
Usability: Example

New Field: Step 16 – A

Scrolling Time On This Screen Alone: 33 seconds!
Data Today: An Example

Prescription Planting Maps
Data Today: An Example

Prescription Planting Maps

Meet Frank and Andy.
Data Today: An Example

Yield Data, Soil Tests, Seed Varieties
Rx Map

Frank

Local Agronomi
Data Today: An Example
Data Today: An Example

Frank's Combine with OEM A's Monitor

OEM A's Cloud

Yield Data

Frank

Yield Data, Soil Tests, Seed Varieties

Local Agronomy

Rx Map

Yield Data

Frank

Yield Data

Frank's Combine with OEM B's Monitor

OEM B's Cloud
Data Today: An Example

Frank’s Combine with OEM A’s Monitor

OEM A’s Cloud

Yield Data

Frank’s Computer

Yield Data, Soil Tests

Frank

Yield Data, Soil Tests, Seed Varieties

Rx Map

Local Agronomist

Frank’s Combine with OEM B’s Monitor

OEM B’s Cloud

Yield Data

Yield Data
Data Today: An Example
Data Today: An Example

Frank's Combine with OEM A's Monitor

Yield Data

OEM A's Cloud

Frank's Computer

Yield Data, Soil Tests

Yield Data

Fertilizer Co-op

As-Applied Fertilizer Data

Frank

Yield Data, Soil Tests, Seed Varieties

Rx Map

Local Agronomi

Frank

Seed Varieties

Yield Data

OEM B's Cloud

Seed Order Receipts

Frank's Combine with OEM B's Monitor
Data Today: An Example
Data Today: An Example

Frank’s Combine with OEM A’s Monitor

Frank’s Planter

Rx Map

Frank’s Combine with OEM B’s Monitor

Rx Map

Yield Data

OEM A’s Cloud

Frank’s Computer

Yield Data, Soil Tests

Fertilizer Co-op

As-Applied Fertilizer Data

Yield Data, Seed Varieties, Irrigator Outlines

Rx Map

Local Agronomist

Seed Data

Rx Map

Frank

Irrigator Outlines

Seed Data

Local Seed Salesman

Irrigator Outlines

Seed Order Receipts

Google Earth

Yield Data

Seed Varieties

OEM B’s Cloud

Yield Data

Agronomist’s Computer

Rx Map

Seed Data
Data Today: An Example

Wait, why do I need data again?
Data Today: An Example

Wait, why do I need data again?

Success.

4 minutes of decisions
I can’t evaluate today.....
The Promise

- Cover Crops
- Deep Till vs. No-Till vs. Minimum Till
- Effect of Manure Management
- Effect of stover removal
- Fungicide response in a dry summer
- Stratego vs. Headline
- 22 oz/acre Glyphosate vs. 32 oz/acre
- Split Fungicide Applications
- Irrigation
- Seed spacing
- Down pressure
- Silage corn vs. BMR
- Insecticide
- Starter fertilizer rate
- 20% vs. 5% Refuge vs. RIB
- GPS-based fertilizer vs. constant rate
- Variable-rate population
- Variable-rate nitrogen
- Variable-rate population by soil type
- Foliar fertilizer
- Foliar fertilizer rates
- 30-inch vs. 15-inch bean rows
- New planter vs. old planter
- Disc vs. vertical tillage
- Fall vertical tillage
- Level7 solution buffer
- Crop oil additive
- Mycogen vs. Pioneer vs. Dekalb vs. Beck’s
- Quantifying standability yield effects
- Phantom Loss
- Replant after flooding
- Real effect of planting date
The Promise

Evaluate decisions.
Make more informed ones.
What is missing?  Data
Records of things that happen
The Problem

What is missing?

Data
Records of things that happen

Why is it missing?

Bleh
I hate recordkeeping
What is missing?

Data
Records of things that happen

Why is it missing?

Bleh
I hate recordkeeping

What is the cause?

Fail
Because I never use them

>> Metaphor: knowing Hebrew vs. learning Hebrew
Data is useful if I have it. I don’t have good data because I don’t use it.
Why can’t this be better?
Why can’t this be better?

Answer: Because it doesn’t have to be better. I bought it anyway.
Competition
Competition

App Needs

- Broad Compatibility
- Low Development Cost
- Focus on Software
Competition

OEM Business Model

Monopoly
Control
System View

App Needs

Broad Compatibility
Low Development Cost
Focus on Software
“Open source” bridges the gap by enabling new markets.
“Open source” bridges the gap by enabling new markets

“Compatibility” is a feature, not a bug. Example: the Internet
The Promise

Cloud to the rescue!

Data in ag is a hassle primarily because.....
Data in ag is a hassle primarily because.....

Without the cloud, the “best ideas” just aren’t good enough.

I need answers while I’m thinking about something. Whenever. Wherever. Within 20 seconds.
What’s All This “Cloud” Business?

10 Years Ago...

<table>
<thead>
<tr>
<th>What do you do with your data?</th>
<th>I put it in this box</th>
</tr>
</thead>
<tbody>
<tr>
<td>Why?</td>
<td>Might come in handy someday</td>
</tr>
</tbody>
</table>

DATA
What’s All This “Cloud” Business?

<table>
<thead>
<tr>
<th>10 Years Ago...</th>
<th>Today...</th>
</tr>
</thead>
<tbody>
<tr>
<td>What do you do with your data?</td>
<td>What do you do with your data?</td>
</tr>
<tr>
<td>(Why?</td>
<td>(Why?</td>
</tr>
<tr>
<td>I put it in this box</td>
<td>I put it in this cloud-shaped box</td>
</tr>
<tr>
<td>Might come in handy someday</td>
<td>Might come in handy someday</td>
</tr>
</tbody>
</table>
What's All This "Cloud" Business?

<table>
<thead>
<tr>
<th>10 Years Ago...</th>
<th>Today...</th>
<th>What is the &quot;cloud&quot; for?</th>
</tr>
</thead>
<tbody>
<tr>
<td>What do you do with your data?</td>
<td>What do you do with your data?</td>
<td>It's a place to put my data</td>
</tr>
<tr>
<td>I put it in this box</td>
<td>I put it in this cloud-shaped box</td>
<td>Isn't that what the other box was for?</td>
</tr>
<tr>
<td>Why?</td>
<td>Why?</td>
<td>How is this better?</td>
</tr>
<tr>
<td>Might come in handy someday</td>
<td>Might come in handy someday</td>
<td>... it's lighter?</td>
</tr>
</tbody>
</table>
What’s All This “Cloud” Business?

The cloud is not an **end in itself**: it is a **means** to make other things **work better**.
What is it?

This is how computer scientists draw things

Source: http://upload.wikimedia.org/wikipedia/en/1/12/Sample-network-diagram.png
What is it?

This is how computer scientists draw things. That part was always “magic” because it was too hard to draw.

Stuff goes on in here.

Source: http://upload.wikimedia.org/wikipedia/en/1/12/Sample-network-diagram.png
What “Cloud” Really Means

“in the Cloud”
What “Cloud” Really Means

“in the Cloud”

= “On a Server Somewhere”
What “Cloud” Really Means

I have my data...

“in the Cloud” = “On a Server Somewhere”
What “Cloud” Really Means

I have my data...
I backup my files...

“in the Cloud”

= “On a Server Somewhere”
What “Cloud” Really Means

I have my data...
I backup my files...
I run this app...

“in the Cloud”

= “On a Server Somewhere”
My data will be good if I use it every day while managing.

The Original Tablet:

Source: http://upload.wikimedia.org/wikipedia/commons/f/f0/icon-notepad.svg
Logistics

My data will be good if I use it every day while managing.

The Original Tablet:

Source: http://upload.wikimedia.org/wikipedia/commons/f/f0/Icon-notepad.svg

Logistics

My data will be good if I use it every day while managing.

The Original Tablet:

Source: http://upload.wikimedia.org/wikipedia/commons/f/f0/Icon-notepad.svg

My data will be good if I use it every day while managing.

The Original Tablet:

Tablet Without Cloud:

Source: http://upload.wikimedia.org/wikipedia/commons/f/f0/icon-notepad.svg
My data will be good if I use it every day while managing.
My data will be good if I use it every day while managing.

The Original Tablet:  
Tablet Without Cloud:  
Connected Tablet

Source: http://upload.wikimedia.org/wikipedia/commons/f/f0/Icon-notepad.svg
My data is very secure: I keep all my data in this room.
A Word on Security

My data is very secure:
I keep all my data in
this room.

Is that a
gasoline can?

DATA STORAGE
My data is very secure:
I keep all my data in this room.

Is that a gasoline can?

Better here than in the cloud.
A Word on Security

Source: https://isc.sans.edu/survivaltime.html
Data Today: Is This Secure?
Data Today: Is This Secure?
Data Today: Is This Secure?
Data Today: Is This Secure?

Diagram showing data flow:
- Frank's Combine with OEM A's Monitor
- Yield Data
- Cloud
- Yield Data, Soil Tests
- Fertilizer Co-op
- As-Applied Fertilizer Data
- Frank's Planter
- Rx Map
- Local Agronomist
- Seed Data
- Local Seed Salesman
- Frank
- Yield Data, Soil Tests, Seed Varieties
- Local Agronomist
- Rx Map
- Seed Order Receipts
- Seed Varieties
- Irrigator Outlines
- Google Earth
- OEM A's Cloud
- OEM B's Cloud
- Seed Order Receipts
If Google Drive and Dropbox had a super-GMO-enhanced baby they would name it “OADA”...
OADA Overview

- Frank’s Combine with OEM A’s Monitor
- Fertilizer Co-op
- Agronomist’s Computer
- OEM A’s Cloud
- As-Applied Fertilizer Data
- Rx Map
- Yield Data
- OEM B’s Cloud
- Yield Data, Soil Tests, Seed Varieties, Fertilizer Data, Irrigator Outlines
- Frank’s Cloud of Choice
- Rx Map
- Rx Map
- Local Agronomist
- Frank’s Planter
- Frank’s Combine with OEM B’s Monitor

OADA REST API
OADDA Overview

Frank's Combine with OEM A's Monitor

Yield Data

OEM A's Cloud

As-Applied Fertilizer Data

Agronomist's Computer

Rx Map

Local Agronomist

Frank

Frank's Planter

Frank's Combine with OEM B's Monitor

Yield Data

OEM B's Cloud

Frank's Cloud of Choice

Rx Map

Rx Map

Fertilizer Co-op

Field Data, Soil Tests, Recipes, Fertilizer Applicator Outlines
OADA Overview

OADA Is Not a “Cloud”
OADA Overview

OADA Is Not a “Cloud”

Frank’s choice:
Frank’s farm, local retailer, Climate, CNH, Winfield, etc.
OADA Overview

OADA Is Not a "Cloud"

Frank's choice:
Frank's farm, local retailer, Climate, CNH, Winfield, etc.

Tools aren't tied to storage
OADA Overview

Long Live Transferability!

Tools aren’t tied to storage

OADA Is Not a “Cloud”

Frank’s choice:
Frank’s farm, local retailer, Climate, CNH, Winfield, etc.
OADA Overview

Long Live Transferability!

OADA Is Not a “Cloud”

Frank has complete control over who he shares data with.

Tools aren’t tied to storage

Frank’s choice: Frank’s farm, local retailer, Climate, CNH, Winfield, etc.
Frank doesn’t want to deal with data.
Frank doesn’t want to deal with data.

Frank wants the answers data can provide.
Frank doesn't want to deal with data.

Frank wants the answers data can provide.

With OADA, Frank can securely allow others to turn data into answers for him at scale.
Cohesive view of all a user’s OADA clouds
A Few OADA Use Cases

Cohesive view of all a user’s OADA clouds
Consultant’s FMIS discovers list of fields and boundaries

GET https://agcloud.com/configs/fields?expand=2

{  
  Smith30: { area: ..., boundary: ... },  
  Mont100: { area: ..., boundary: ... },  
  Schale145: { area: ..., boundary: ... },  
}
A Few OADA Use Cases

Cohesive view of all a user’s OADA clouds
Consultant’s FMIS discovers list of fields and boundaries
App to edit prescription, sync to cloud, down to tractor.

Discovery, Download, and Update

Poll or Push

Frank’s Tractor

AgCloud.com
A Few OADA Use Cases

Cohesive view of all a user’s OADA clouds
Consultant’s FMIS discovers list of fields and boundaries
App to edit prescription, sync to cloud, down to tractor.

Agronomist can also do this for a customer

AgCloud.com
A Few OADA Use Cases

Cohesive view of all a user’s OADA clouds
Consultant’s FMIS discovers list of fields and boundaries
App to edit prescription, sync to cloud, down to tractor.
Co-op watches harvest progress to plan Fall soil testing.

```
{ status: "Done",
  date: "2014-07-01",
  field: "Smith30"
}

PUT https://agcloud.com/resources/93jkf93/data

AgCloud.com
A Few OADA Use Cases

Farmer shares “Difference” or “Interest” areas

“Looks like manganese deficiency. Please check.”

Frank’s Phone

AgCloud.com

Andy’s Phone
A Few OADA Use Cases

Farmer shares “Difference” or “Interest” areas

3rd Part Yield Monitor in the Cloud

“Remember that manganese deficient area? Lost 10 bu/acre.”

AgCloud.com

Andy’s Phone
Project Roadmap

Current (Started in March):
• API Spec in v0.2
• Federated Identity full release, 1st provider soon
• 18 partners

Near Term:
• Just finished 2 beta demos
• Ramp up development in 2015

Long Term:
• Foundation formed for IP transfer, grants
How To Participate

Community

Make awesome OADA things, Discussion, CODE!

http://openag.io
How To Participate

Community
Make awesome OADA things, Discussion, CODE!

Marketing
Public partner Spread the word
How To Participate

Community:
Make awesome OADA things,
Discussion,
CODE!

Marketing:
Public partner
Spread the word

Funding:
OATS Center
Open Source Ag Foundation
Thank You

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Questions?