ADAPT

Agricultural Data Application Programming Toolkit

August 2016 - InfoAg

Presentation Goal

Update on industry effort to provide a production level, open source toolkit for use by the precision ag industry to improve "interoperability of precision ag data"

Precision Agriculture Industry needs

Customers (primarily the users of the data such as farmers and agronomists) find it difficult to extract the value from "the data" in large part because it is difficult to translate field operations data into the applications needed to aggregate, analyze and create insights.

Or… **"Why doesn't all this stuff 'talk' to each other?"**

# "Precision Ag Data Interoperability" what is this?

Long standing issue (1989 example)
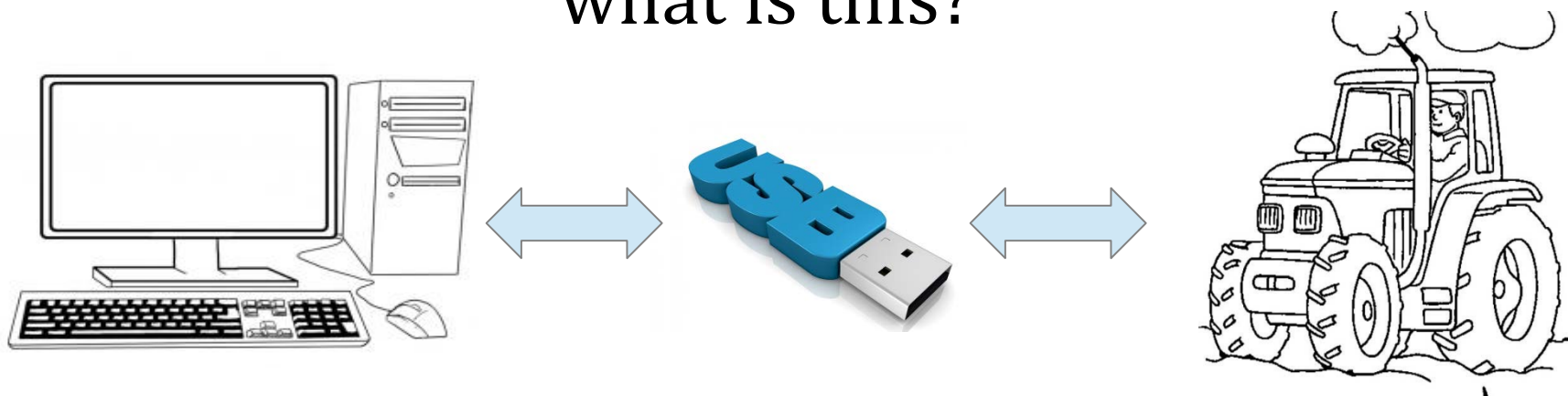
i) ISO 11783 – broad interpretations / inconsistent implementations
ii) ESRI Shapefile format
iii) Multiple OEM data formats
iv) Legacy hardware
v) Software systems that need to consume data from multiple sources

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ADAPT Oversight Committee

Ag Connections, Ag Leader, AGCO, Agrian, CNH Industrial, Central Valley Ag Coop, CLAAS, Conservis, Independent Data Management, John Deere, Land O' Lakes, Monsanto, Premier Crop Systems, ProAg, Raven Industries, Software Solutions Integrated, SST Software, Syngenta, Topcon Precision Agriculture, Trimble, Uptake and ZedX

ADAPT Oversight Committee

We are currently focused around the process of **data translation** between self-propelled machinery and business systems
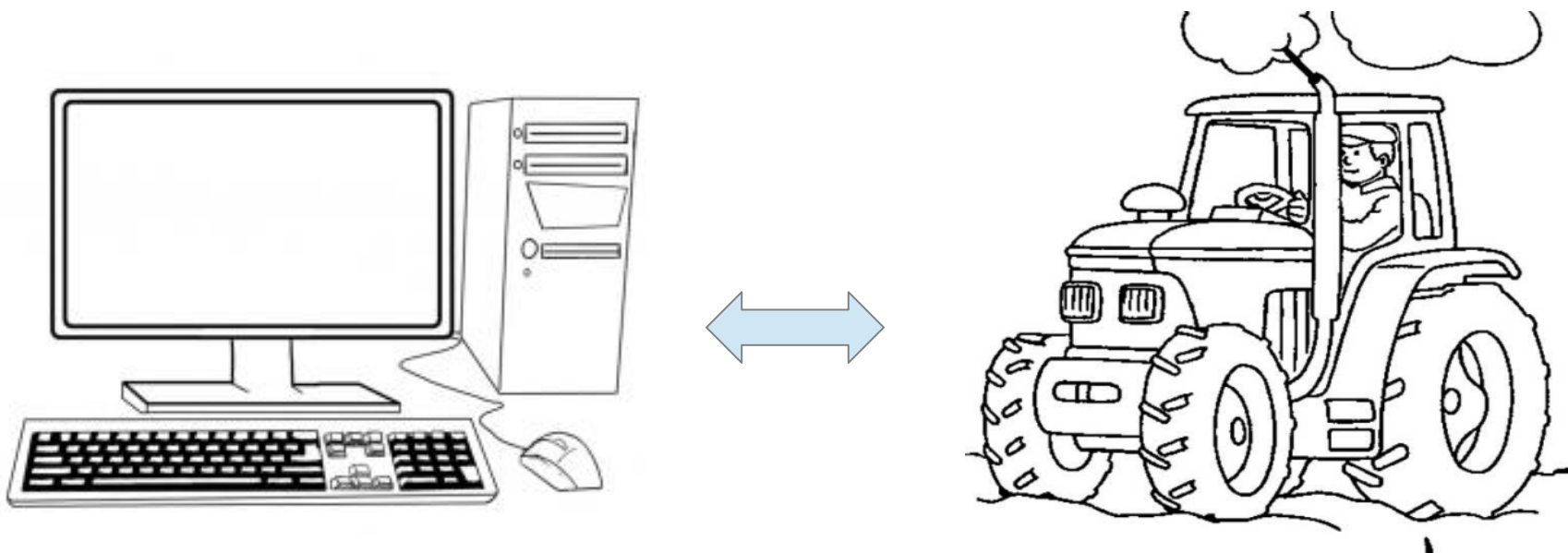
ADAPT Oversight Committee

These efforts will be expanded in the near future to be more generic:
data translation from Business Systems to "Field Devices"
(e.g., include irrigation controllers, field scouting applications)

Our Motivation

Our goal as an industry is to enable customer choice, increase what customers can "do with data" and ultimately increase adoption of "precision ag technologies"

Our Motivation

The scope of this effort is _global_.

ADAPT: The "Building Blocks"

FMIS

Farm Management Information System (FMIS) – could be desktop, mobile-based, web/cloud/…
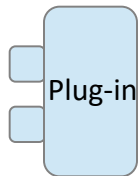
MICS

Mobile Implement Control System (MICS) – focused on the "equipment display" but can be generalized to include systems that i) "collect field data" and/or ii) execute work instructions (from FMIS)
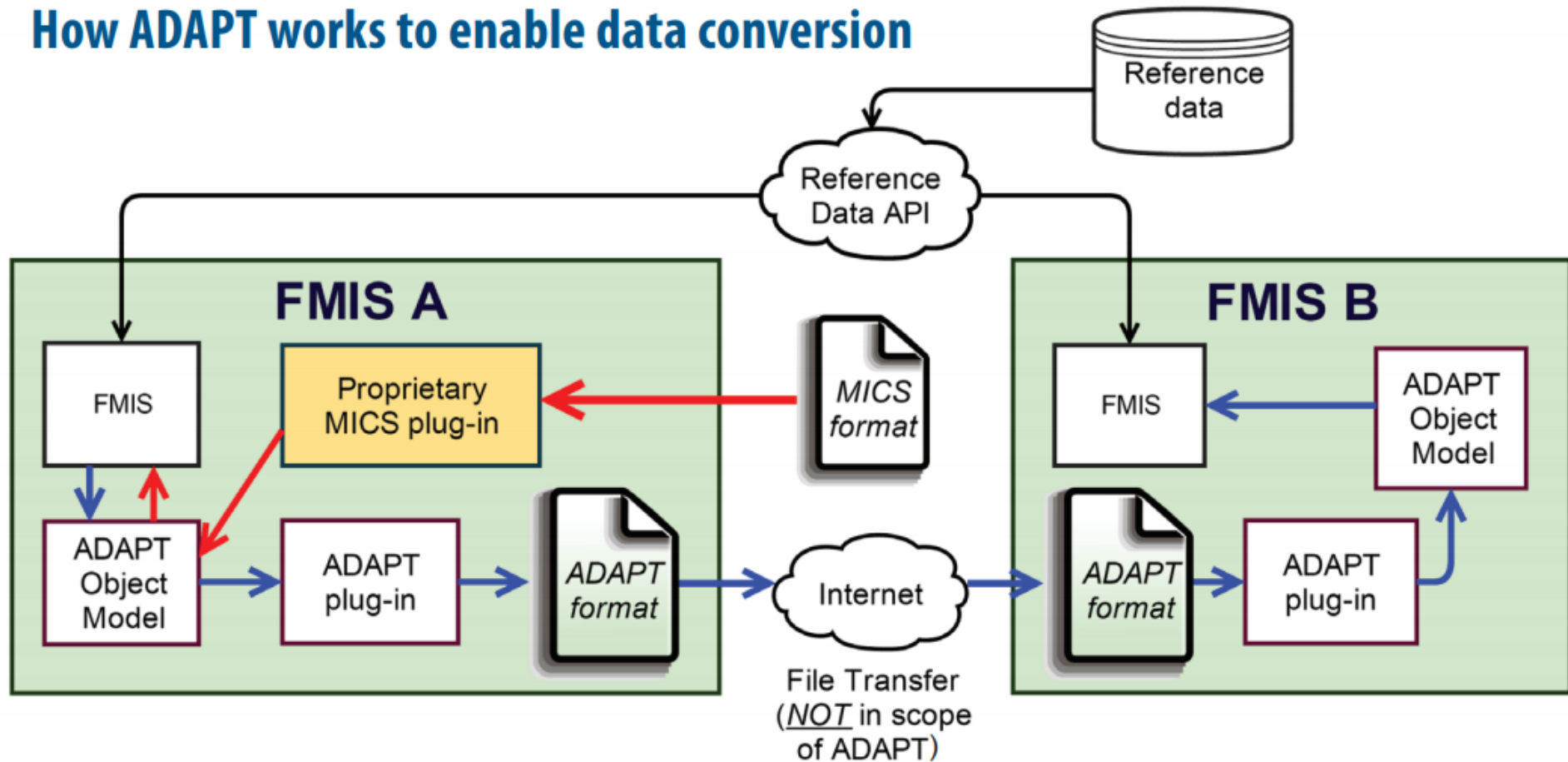
ADAPT

ADAPT – AgGateway open source SDK, integrated into systems under AgGateway licensing terms

Plug-in

ADAPT Plug-in – specific data translation plug-in which can be easily *integrated into a specific instance of ADAPT*. A specific plug-in can be created/licensed by i) AgGateway, ii) equipment manufacturers, iii) entities (e.g., USDA), iv) FMIS companies, v) individuals, etc.

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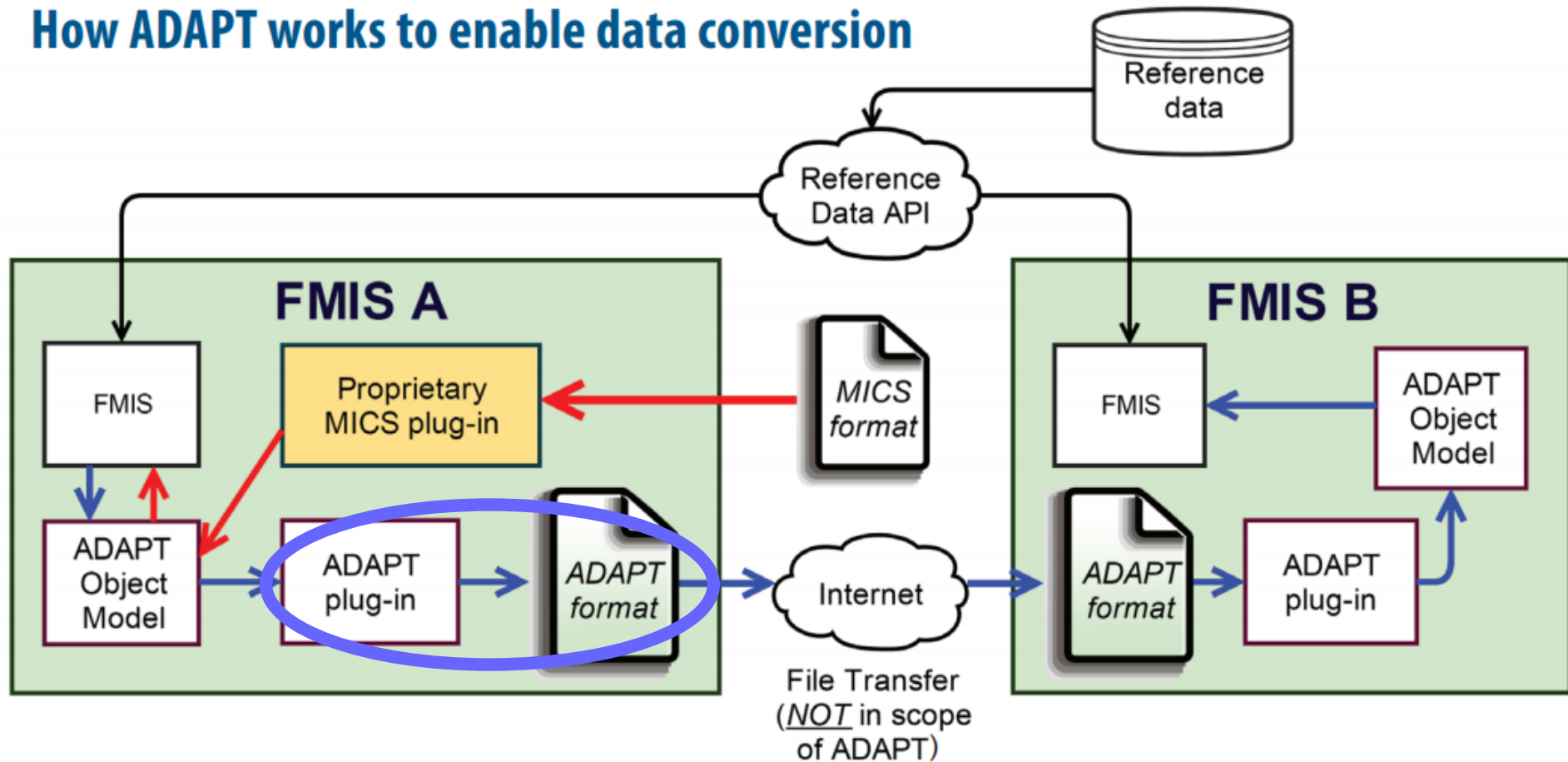# How ADAPT works to enable data conversion

The figure above shows two examples of data conversions and flows.

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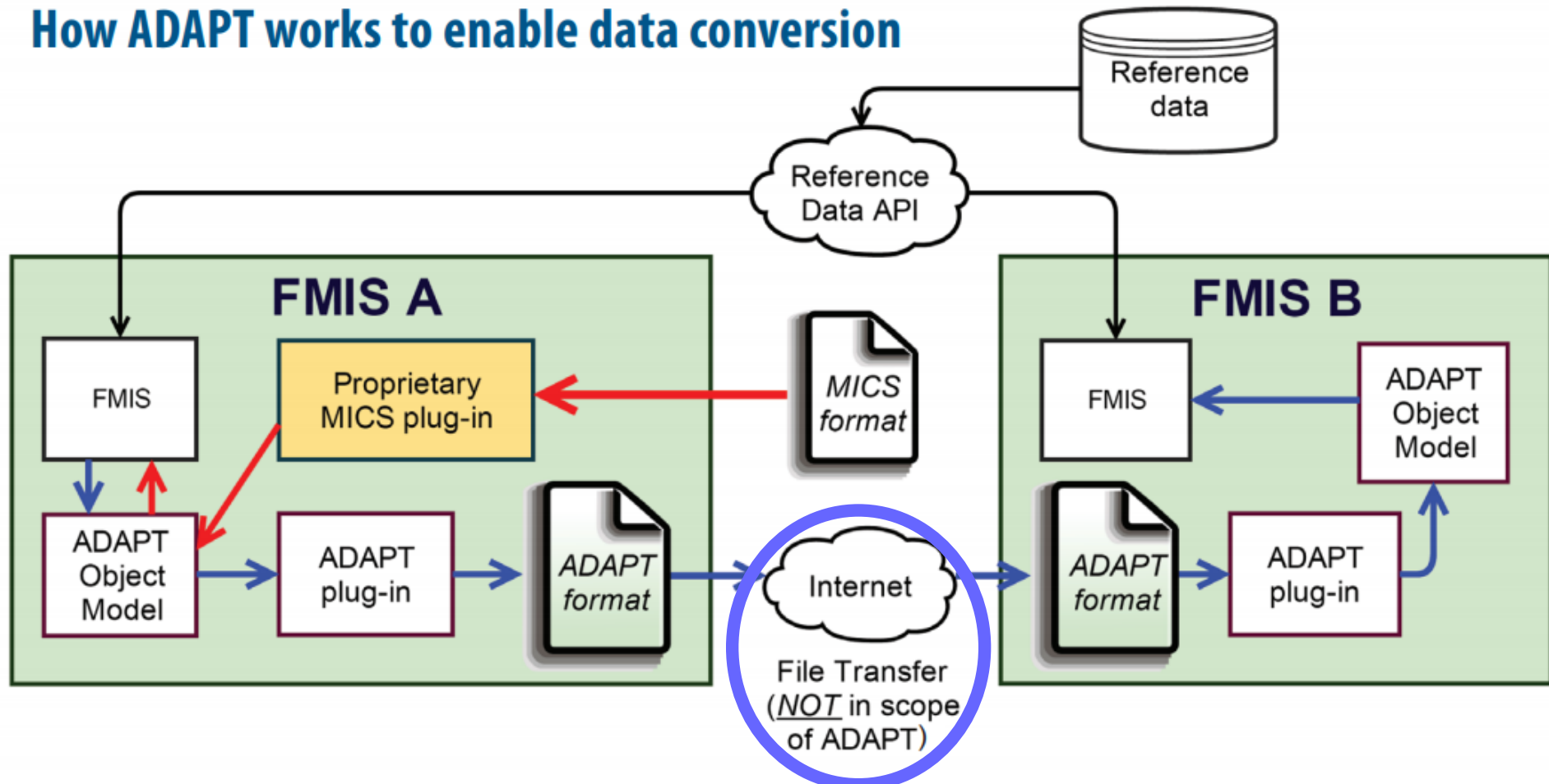
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AgGateway
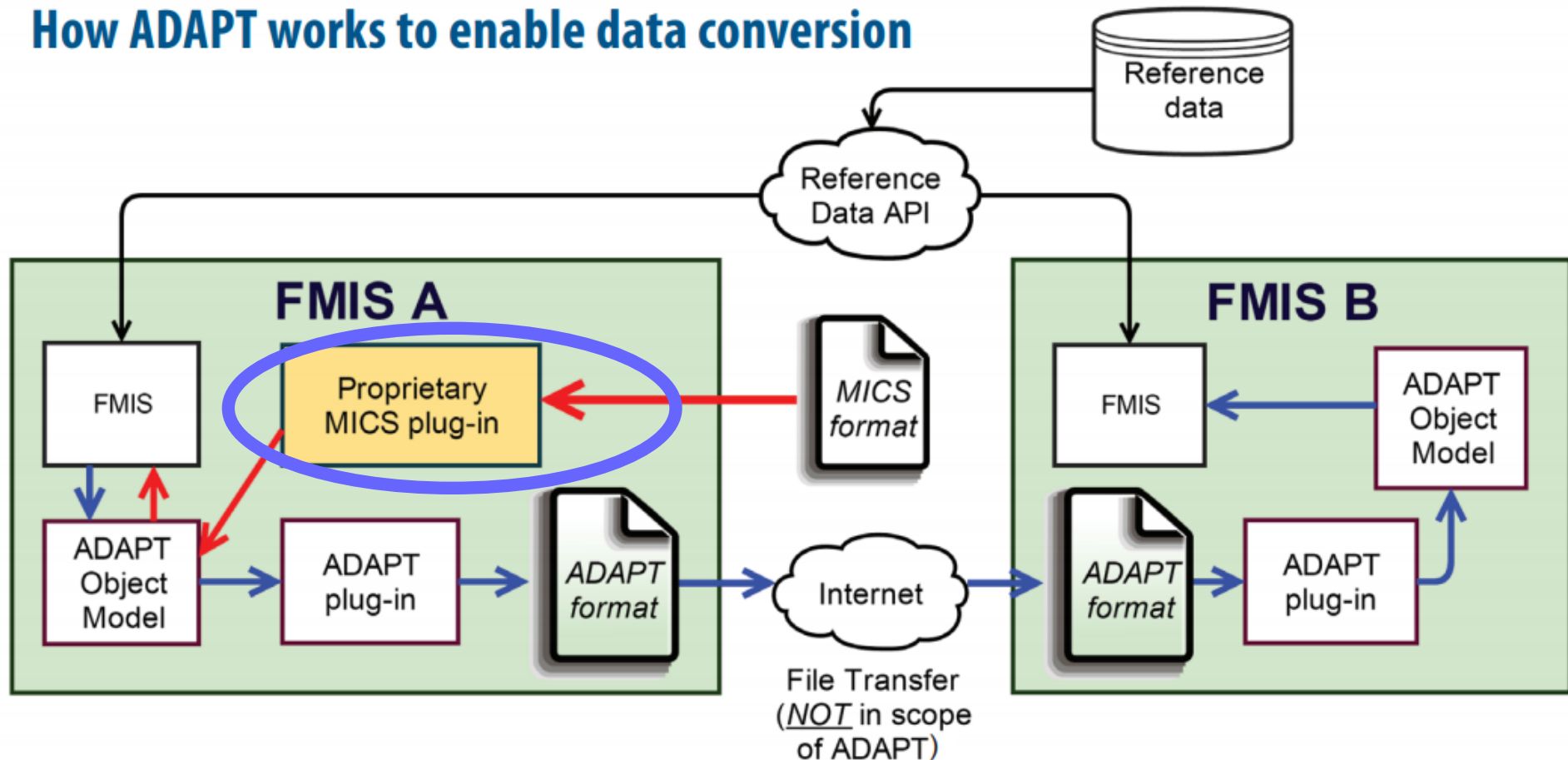
How ADAPT works to enable data conversion

The figure above shows two examples of data conversions and flows.

ADAPT focuses on data translation, not ownership

The ADAPT Oversight Committee is not focused on data ownership issues, we are looking to other efforts to lead that.

"No, it's MY data!"

1. ADAPT is an OSS project

ADAPT is an Open Source Software (OSS) project

This is a fundamentally different approach from previous efforts!

Business advantages: An Open Source <u>*community*</u> provides a way for individuals and companies to collaborate on projects that would be difficult to achieve on their own.

Technical advantages: with source code readily available, users will help you debug quickly and <u>*promote rapid code enhancements*</u>.

1. ADAPT is an OSS project

AgGateway is the steward of the ADAPT Framework software asset

ADAPT uses the Eclipse Public License version 1.0

2. As an OSS, ADAPT will continue to evolve

- Technical Team working to compile a matrix of the use cases the ADAPT Data Framework supports today.

- John Deere has been able to create plug-ins for several of their data formats using the current Framework.

2. As an OSS, ADAPT will continue to evolve

- Tremendous amount of work on the ADAPT Framework data model

- Incorporates discussions of consistent usage of data model, translation to the different formats (ISO, OEMs, FMIS)

➔ Plan
➔ Recommendation
➔ WorkOrder
➔ WorkItem
➔ WorkItem Operation
➔ WorkRecord
➔ LoggedData
➔ Document
➔ FieldBoundary
➔ Product (Chemical, Fertilizer, TankMix)
➔ Shape (all geometry)
➔ Spatial Prescription
➔ Manual Prescription
➔ Crop and Variety
➔ Summary
➔ ContextItem

➔ Grower, Farm, Field, Cropzone, Contactinfo, Location, Facility
➔ TimeScope
➔ Compound Identifier
➔ Manufacturer and Brand
➔ SetupData
➔ SetupCatalog
➔ Document
➔ Enumeration Members
➔ UOM and DDI representations
➔ Machine
➔ Implement
➔ Guidance
➔ Operator
➔ Load
➔ Load Destination
➔ Note
➔ ReferenceLayer

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3. Who intends to create a plug-in?

AGCO Corporation
Ag Leader Technology
CLAAS
CNH Industrial
Deere & Company
Raven Industries
Topcon Precision Agriculture
Trimble Navigation

4. How will plug-in licensing work?

Eclipse allows participants to license plug-ins separately, so they can control or commercialize their plug-ins outside of Eclipse
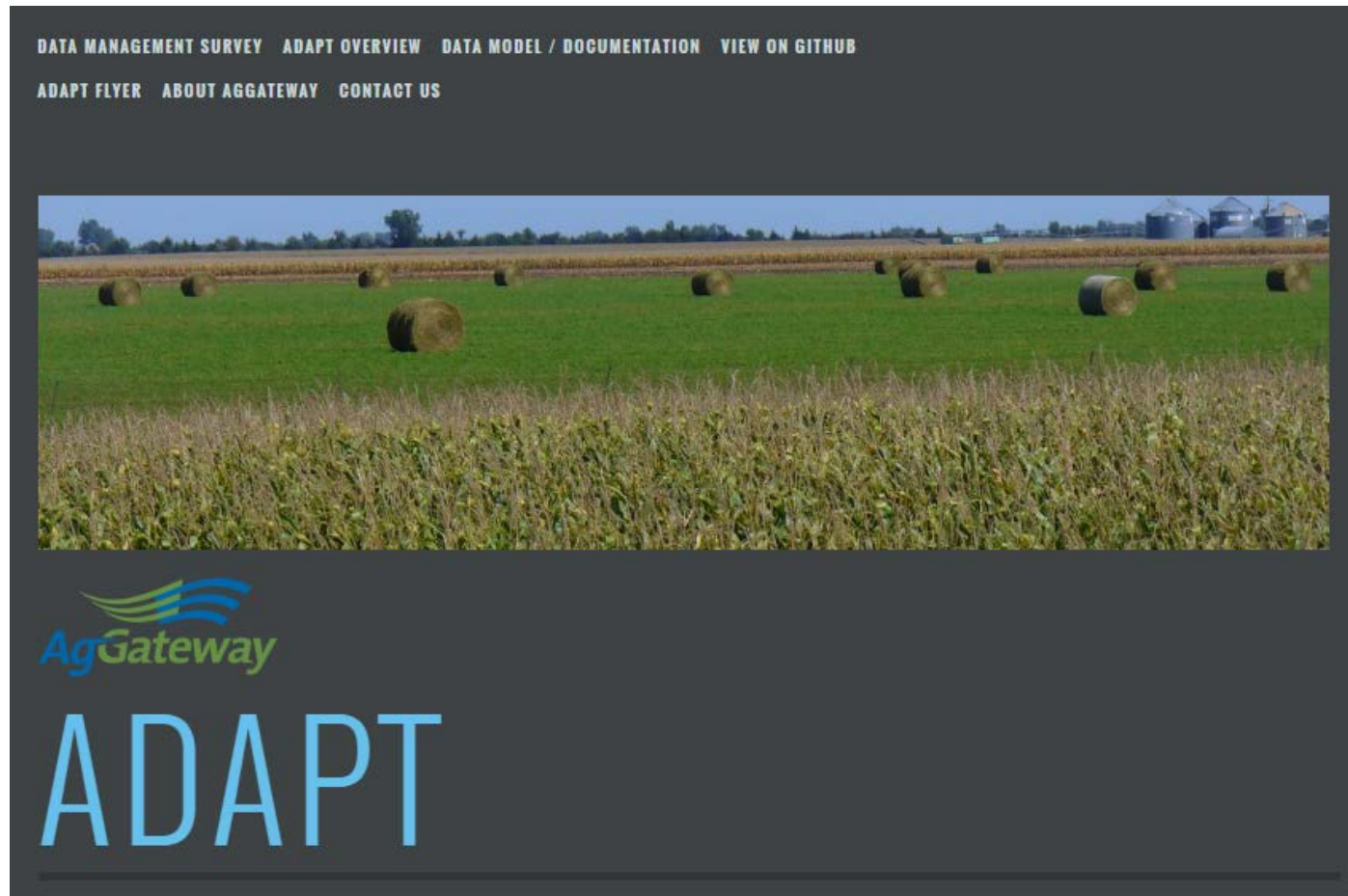

HAVE IT YOUR WAY.

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4. How will plug-in licensing work?

The ADAPT team is working on an ISO-11783 ADAPT plug-in

AgGateway will be the steward of this software asset (an OSS component)

The plug-in will be licensed under the Eclipse Public License version 1.0

5. How do I learn more?
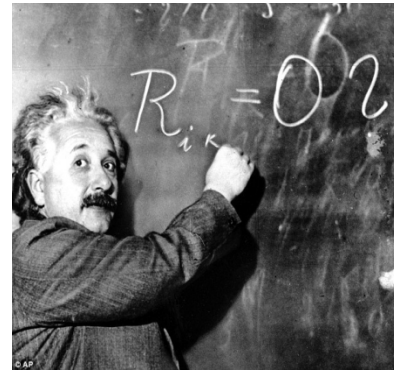
Please visit our website: adaptframework.org

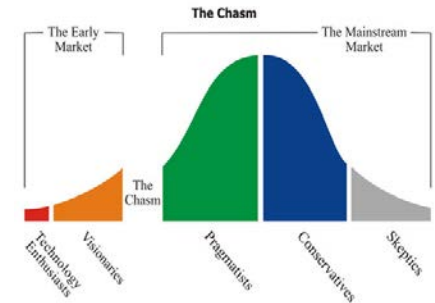# Precision Agriculture: Market Opportunity

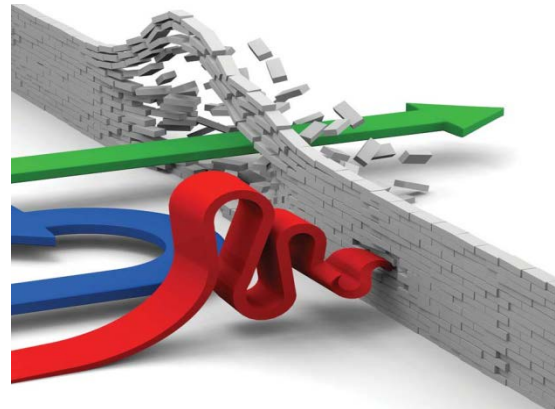*"Why doesn't all this stuff 'talk' to each other?"*

This is <u>no longer a theory</u>

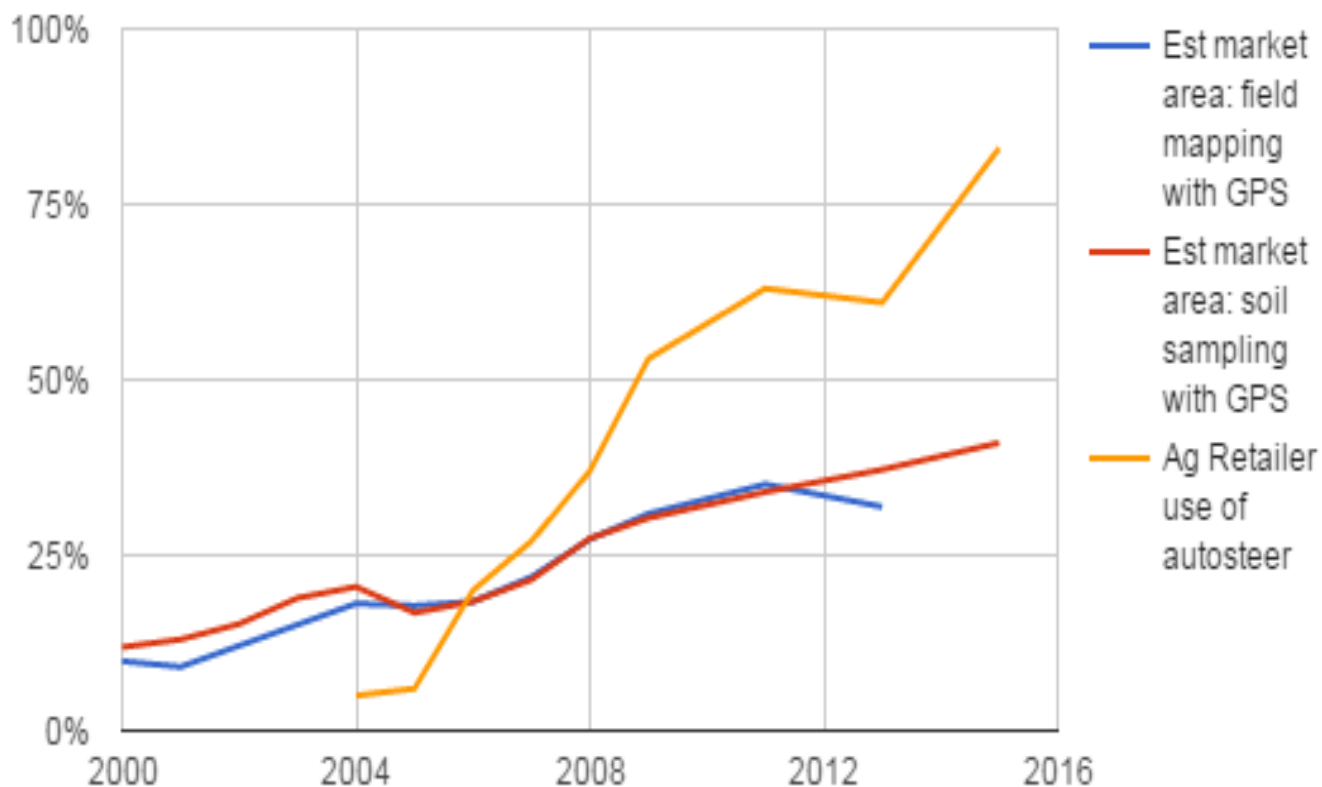What has adoption looked like over 20 years?

What might it look like if the interoperability issue is solved?

Precision Agriculture: Market Opportunity

CropLife / Purdue Precision Ag Survey* (combined 2013 and 2015)

*Note: survey of primarily Ag Retailers

What will it take to become **Agriculture**?

CropLife / Purdue Precision Ag Survey results:
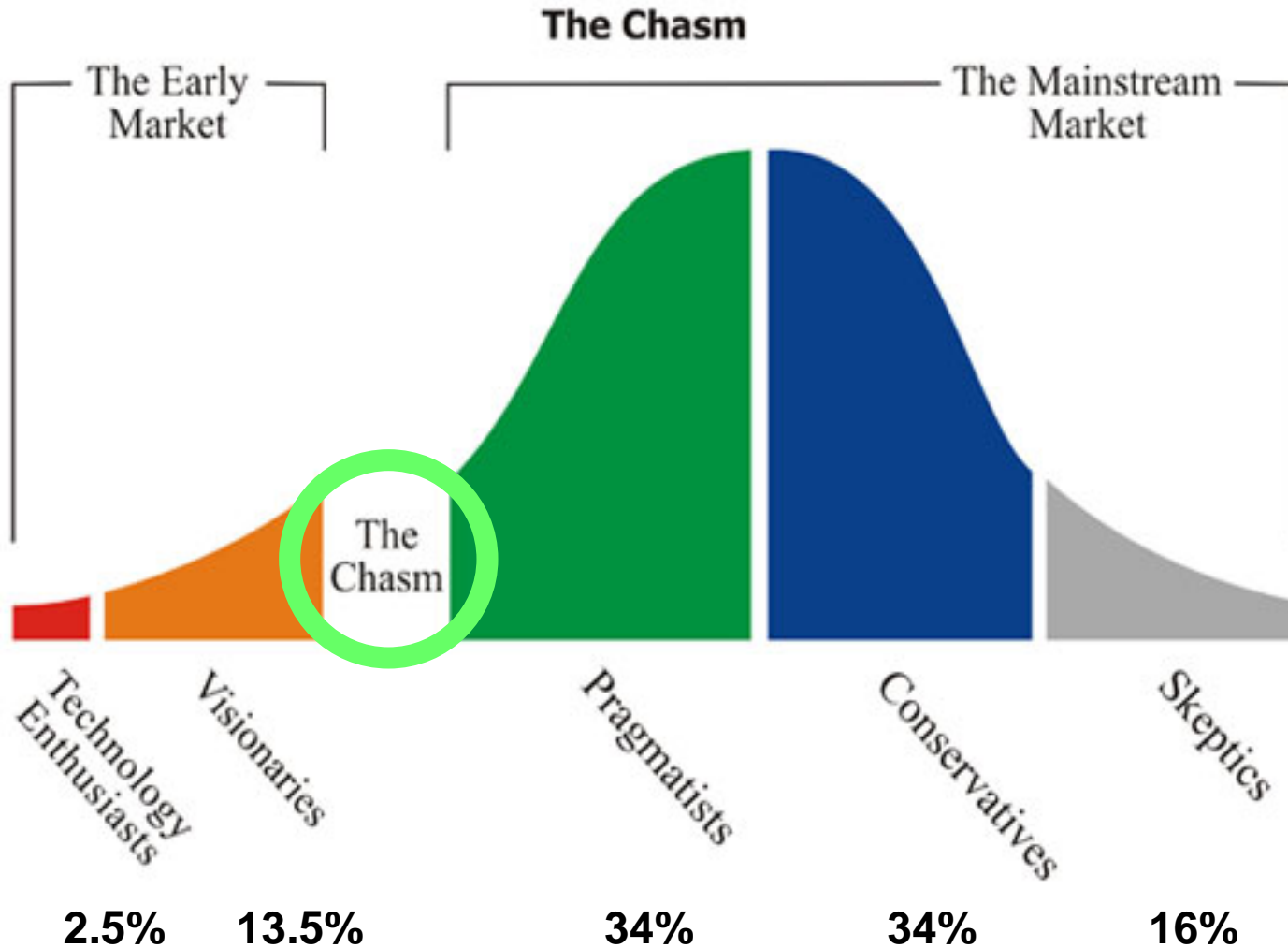## Estimated Market Area Use

Technology/Service	2015 Adoption	Acres***
Ag Retailer use of autosteer*	84%	142.8 million
Yield monitor with GPS**	43%	73.1 million

*Note: assuming Ag Retailer adoption levels for growers
**Note: question not asked in 2015, assuming similar trend line from soil sampling question
***Note: assuming 170 million acres of corn and soybean production in the United States

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What will it take to become **Agriculture**?

Is the lack of interoperability really slowing down adoption?

adaptframework.org Data Management Survey:

HOW EASY OR DIFFICULT DO YOU FIND IT TO COMPILE AND ANALYZE DATA FROM VARIOUS SOURCES?

Response	Percentage
Easy	4.5%
Somewhat Easy	13.5%
Moderately Difficult	41%
Very Difficult	41%

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Seen this somewhere else??

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Is the lack of interoperability really slowing down adoption?

| Response	Percentage	Adoption Category	Adoption Percentage
Easy	4.5%	Tech Enthusiasts	2.5%
Somewhat Easy	13.5%	Visionaries	13.5%
Moderately Difficult	41%	Pragmatists	34%
Very Difficult	41%	Conservatives & Skeptics	50%

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Is the lack of interoperability really slowing down adoption?

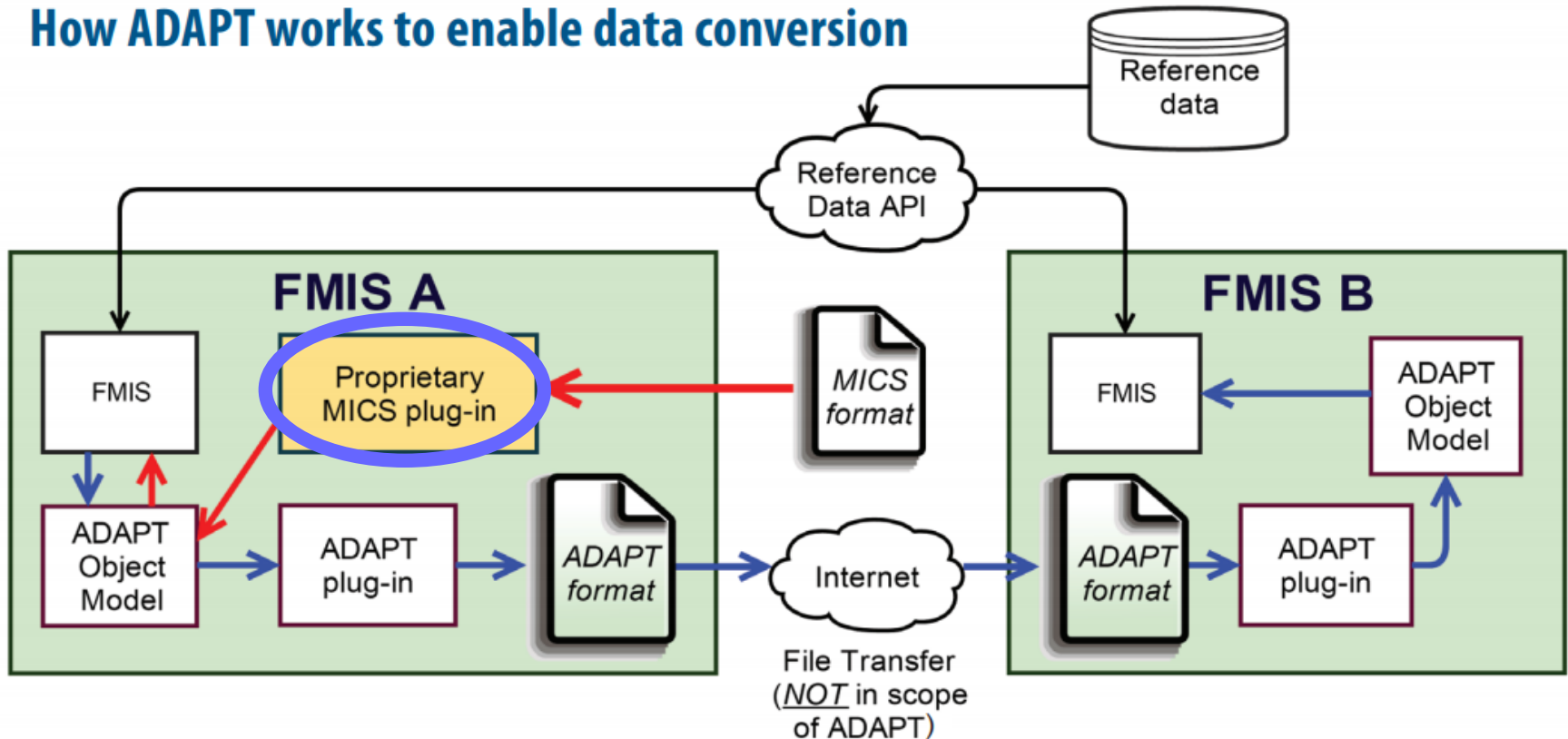| Response	Percentage	Adoption Category	Adoption Percentage
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Crossing The Chasm
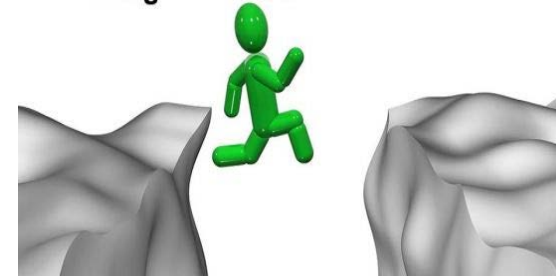
Important milestone reached for MICS plug-ins!

Crossing The Chasm

How ADAPT works to enable data conversion

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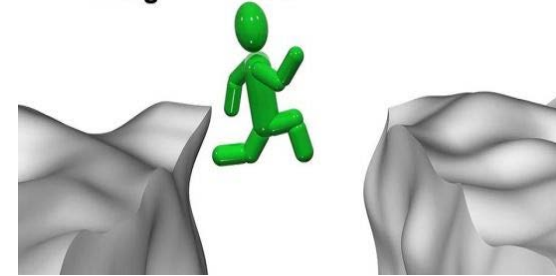
Work ahead for FMIS companies....

Crossing The Chasm
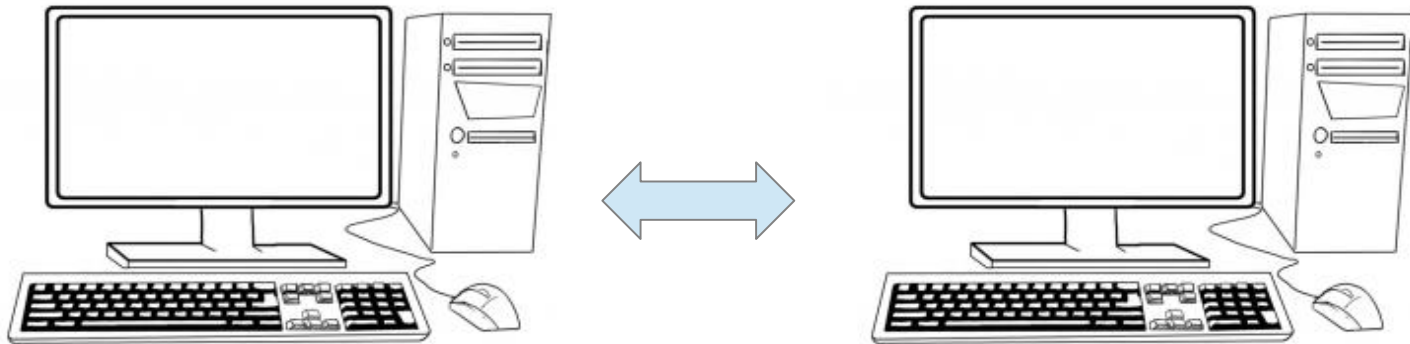

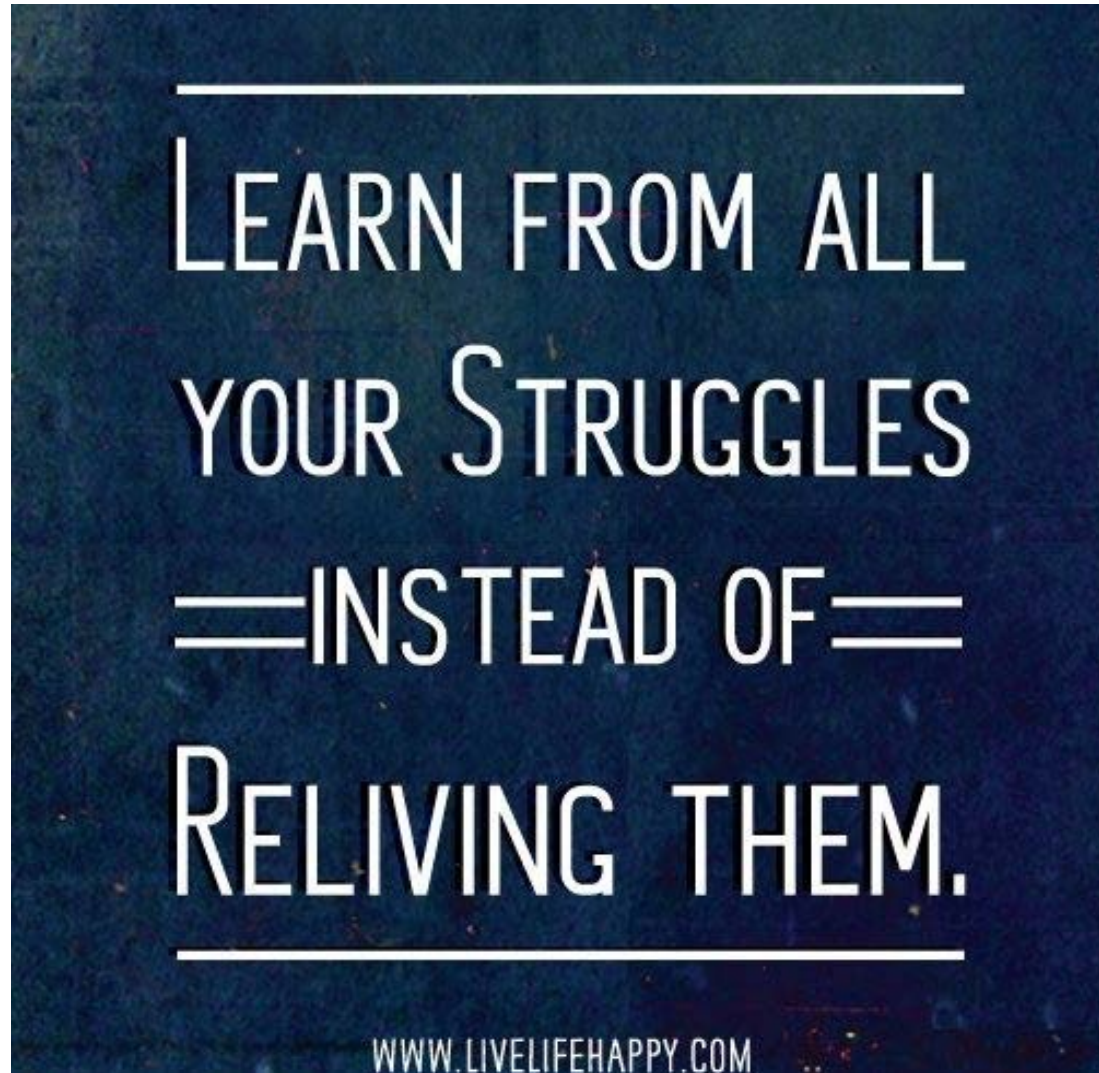**How ADAPT works to enable data conversion**
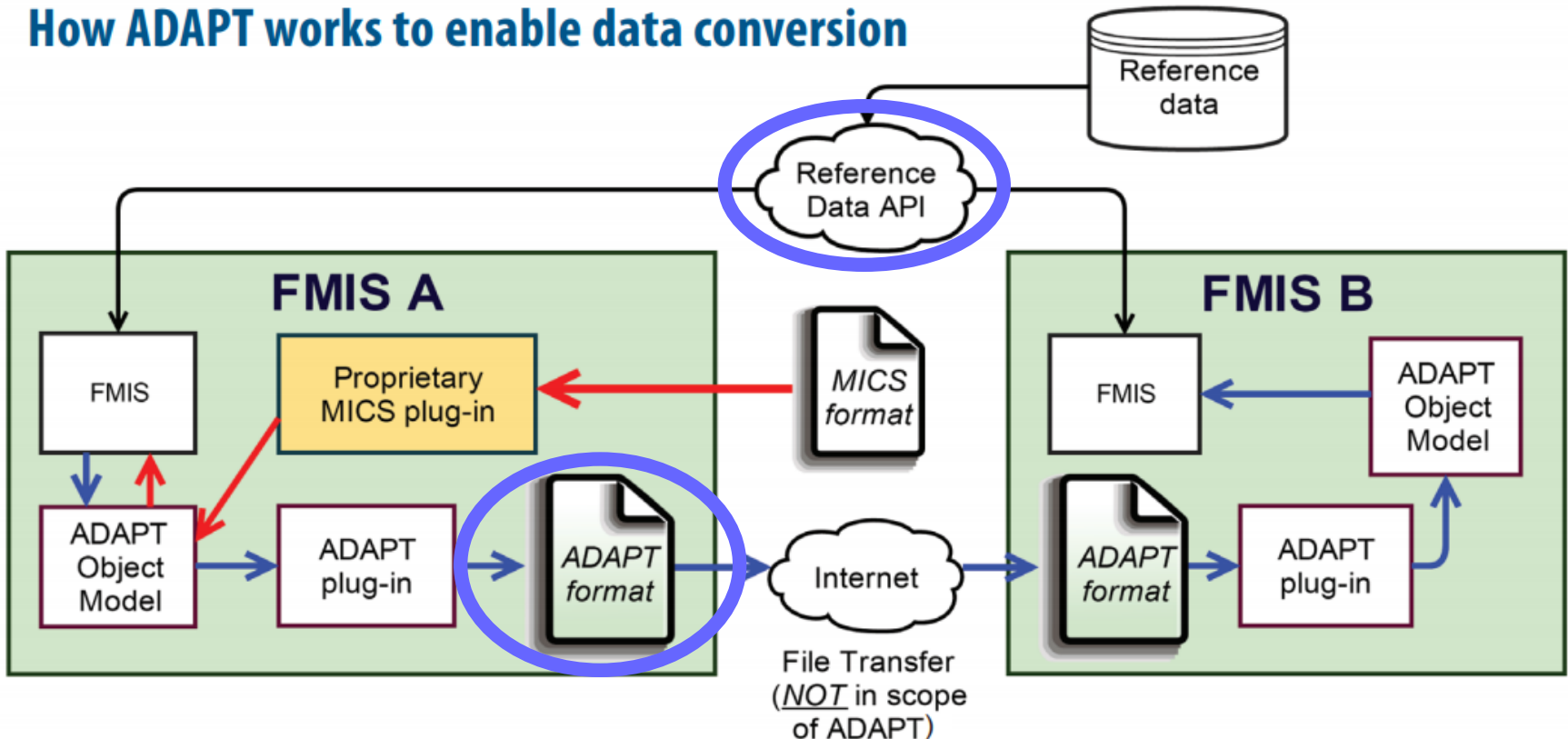
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Translating data from different business systems

My colleagues tell me there is another way....

Translating data from different business systems

My Engineering Team says – we can "get there" faster by creating our own format (*Note: assuming other systems will use our APIs*)

My Business Team says – we want to be integrated, but why is it so complicated???

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Haven't we been here already??

Opportunity ahead for FMIS companies….

FMIS companies to consider building plug-ins for proprietary formats or specialized translations.

For example:

MyAgData plans to build plug-in for USDA compliance reporting

There are 124 companies that are members of AgGateway's Precision Ag Council

Please join our effort!

adaptframework.org

THE END
THANK YOU FOR YOUR TIME