AgGateway's Core Documents for Field Operations:

A model for representing field operations business process data requirements

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Problem / Motivation

- Modern farming requires increasingly detailed records of field operations such as planting, spraying, fertilization and harvest. Motivations:
  - Regulatory pressure, and
  - Supply-chain interest in traceability and sustainability.
- Growers and their partners use multiple "documents" to exchange field operations information as part of their business processes.
  - There has been work done on standardizing farm processes (ISO 22006), but the documents and many of the terms used within them have yet to be unambiguously defined.

AgGateway

- Nonprofit consortium of 240+ members
- Mission: Promote, enable and expand eAgriculture.
  - Strong emphasis on implementing existing standards
  - Strong emphasis on collaboration
- Membership
  - Open; over 240 members, primarily businesses.
  - Other organizations typically join as Associate members
  - There is a category for individual memberships.
- Funding: Member dues, project fees, and service subscriptions, dependent on volume of business.
- Authority: De facto (Implementation by stakeholders)
- Expertise: Supply chain and field operations business processes

Participants

Ag Connections
Ag Leader
AGCO
AgGateway
AgIntegrated
AgJunction
AgWorks
Agrian, Inc.
Agri-Intranet
AgSense
Agtelligent
Ally Precision
BASF
Bayer CropScience
Brandt
Campbell Scientific
CDMS
Ceres Solutions
CLAAS
CNH Industrial
Co-Alliance
Conservis
Crop IMS
CropMetrics

Decagon Devices
Digi-Star
DTN
F4F Agriculture
Farmobile
GeoSys
GROWMARK
Heartland Co-op
Helena Chemical
Hemisphere GPS
Insero
Irrinet
Irrometer
Iteris
John Deere
J.R. Simplot
Land O'Lakes
Lindsay
MapShots
Monsanto
OAGi
Onfarm Systems
Praxidyn
Premier Crop Systems

ProAg
Rain and Hail
Ranch Systems
River Valley Coop
Software Solutions Integrated
Southern States Coop
SST Software
Syngenta
Raven
Topcon
Trimble
Valmont Industries
Vita Plus
Wilbur-Ellis
Willard Agri-Service
Winfield
Wysocki
XS Inc
ZedX
Individuals:
Aaron Ault (Purdue/OADA)
Andrew Balmos (Purdue/OADA)
Charles Hillyer (TAMU AgriLife)

The Core Documents (to date)

- **Plan**
  - "This is how we are going to grow this crop this season"
- **Observations and Measurements**:
  - "This is happening out in the field"
- **Recommendation**
  - "This is what I recommend we do about it"
- **Work Order**
  - "This is what we are going to do"
- **Work Record**
 - "This is what we actually did"

# Core Documents and their Relationships
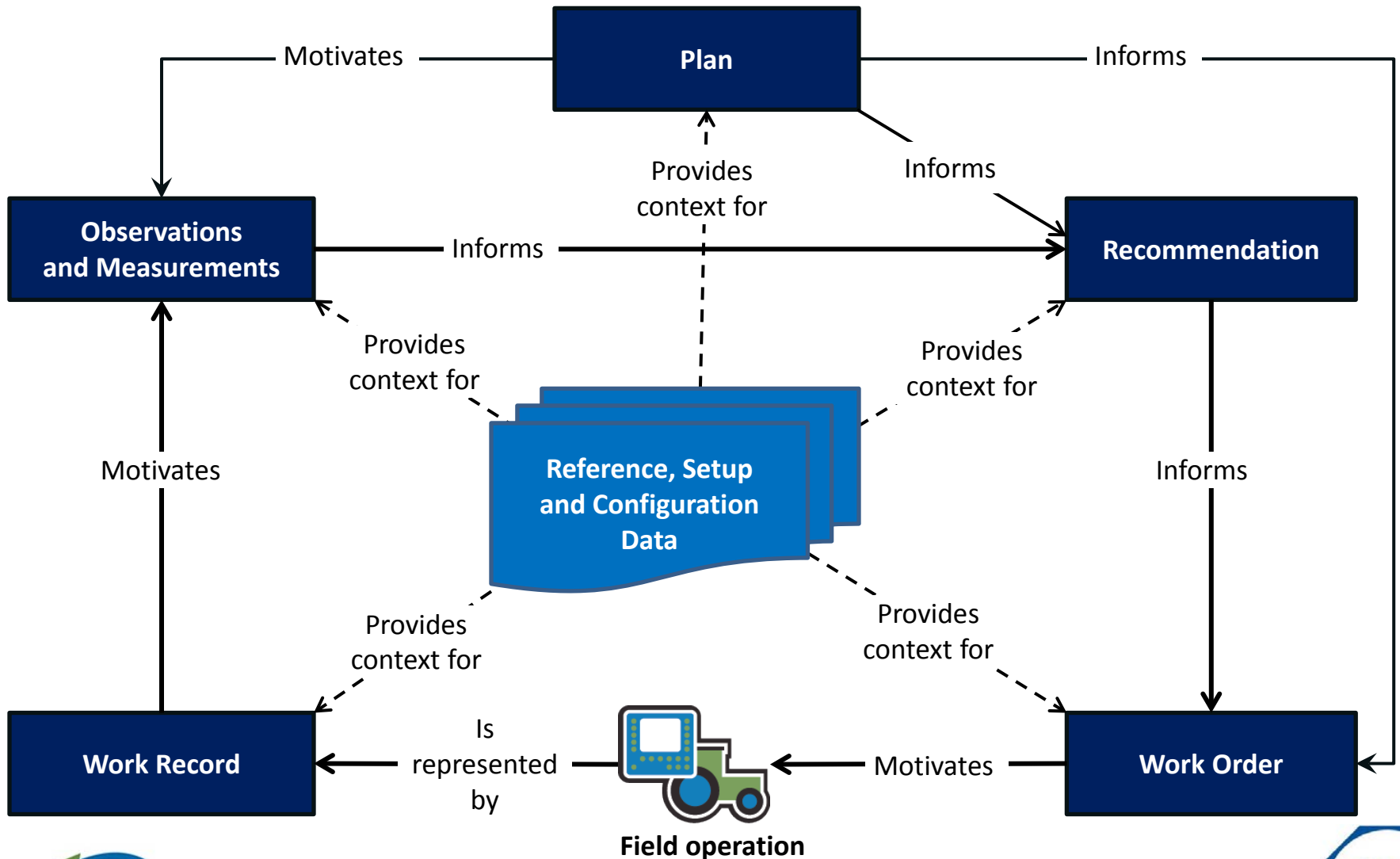
More on Relationships

- The documents rarely stand on their own:
  - they exist as part of a complex network of decision-making processes within a grower's operation, and
  - they reflect the data requirements of their corresponding process(es).
- Core Documents are linked through various relationships:
  - **Causal** (e.g., a Recommendation *informs* a Work Order),
  - **Contextual** (e.g., a product label helps identity an insecticide used in a Work Order), and
  - **Compositional** (e.g., photographs and sound files can form part of a scouting report / observations & measurements document).

Core Document Flow
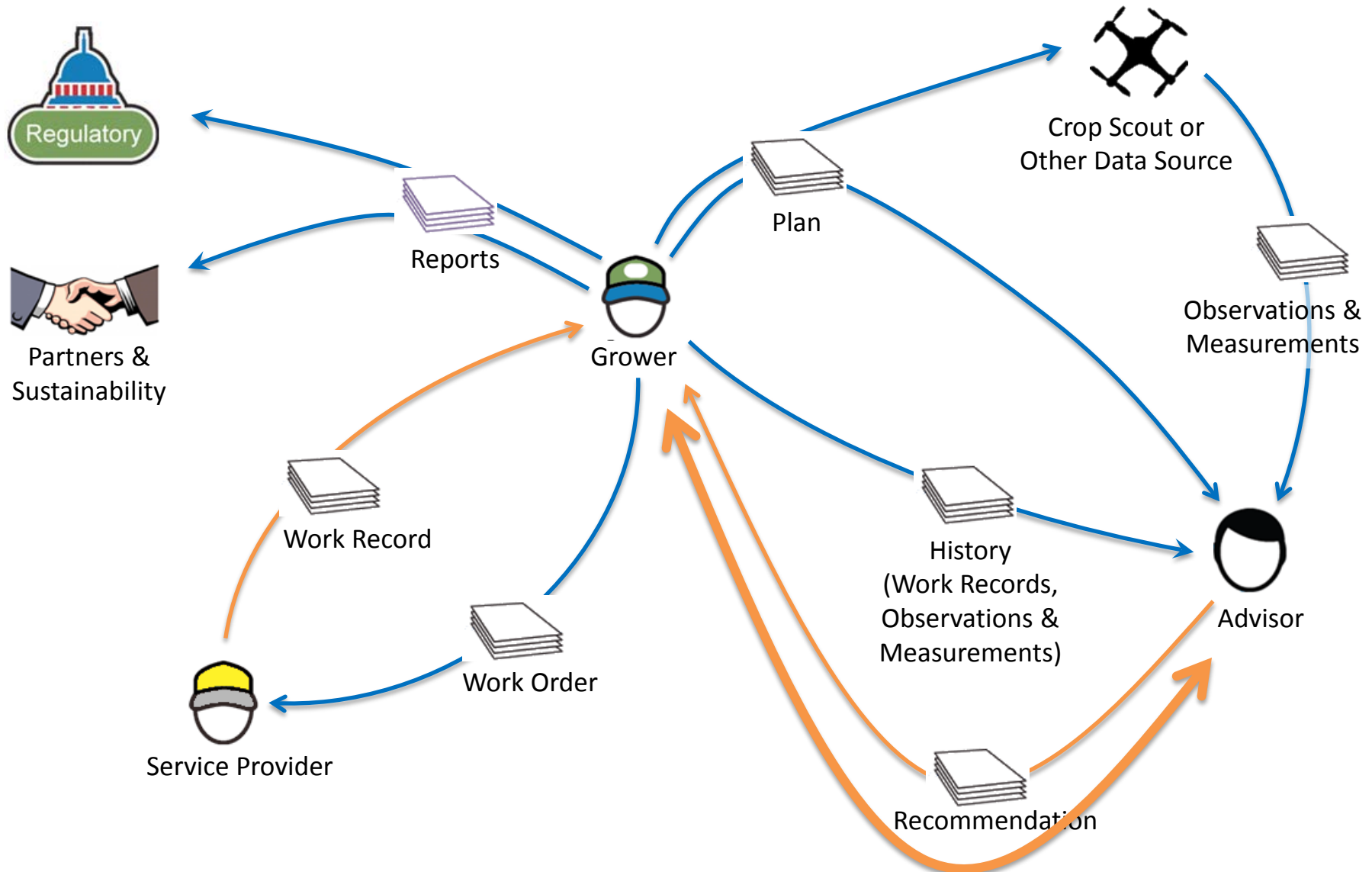
Hierarchy and Extensibility
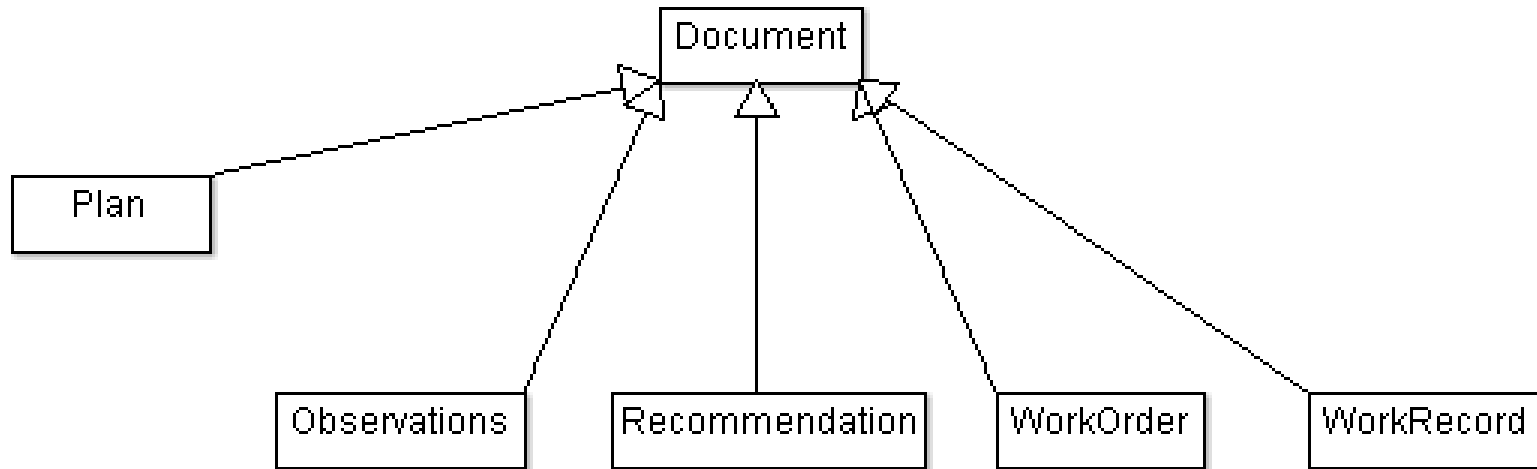
- Core Documents have similar data content, but they differ in their intent / context of use.
- There will likely be more documents defined as new use cases are captured:
  - Hierarchical: e.g.: Seeding plan, manure management plan, irrigation plan, etc. could be specializations of Plan.
  - Supporting vs Core: Recommendation requests, acknowledgements, etc.

Data contained in the Core Docs

- **What**: The products or services being applied, or the data being reported.

- **Where**: Grower / Farms / Fields / Cropzones / GPS locations.

- **Who**: People involved and their roles: grower, operator, agronomist, trucker, customer, etc.

- **When**: When should / did the operation happen?

- **How**: Product rates, equipment settings, etc.

- **With What**: What equipment is involved?

- **Why:** What was the reason for performing the operation?

- **Context items**: A generic system to encode geopolitical-context-dependent information such as (for the US) FSA, EPA, DOT numbers, and so forth.

Discussion

- Legitimacy: This work emerged from actual user stories.
- Wide range of granularity / usage across different users & FMIS.
- Enables principled decision-making
  - recording causal relationships between actions, causes, results
  - Implications for traceability, sustainability metric calculations, etc.
- The emphasis on controlled vocabularies and standardized semantics is expected to result in:
  - Greater data quality
  - Greater data exchange in agricultural field operations
  - Greater usability of research data
- Next steps:
  - Fleshing out Observations & Measurements (per ISO 19156)
  - Standardizing report specifications
  - Opportunity for ADAPT-mediated growth, interfacing with supply-chain documents

Questions?
(Including how you can participate)

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