# Allow me to say at the beginning

## This presentation is a request for help

# First, some background

## I am a member of an application development team

### We are not tool developers

### We are not ontology developers or knowledge coders

## We depend on those folks and use their tools and ontologies to develop applications

# Now to the use case

## The one I'll present today is an application to automate equipment

### Specifically, agricultural equipment

## I'll itemize a subset of domain specific components so you hear the core idea

### Location together with comprehensive data about the location

### Protective chemicals, such as pesticides, nutrition and vaccines

### Threats to the food supply such as inadequate moisture, inadequate nutrition, insects, bacteria and virus

### Mechanization such as tillers, sprayers and harvesters

# Our objective

## Consider a sprayer - a device that delivers a chemical solution to crops

## We want to help make an intelligent sprayer

## An intelligent sprayer would

### Read electronic instructions from a material safety data sheet

### Read environmental data from sensors; data about biological threats and environmental conditions

### Compose and formulate a chemical solution in real time

## And then,

### Selectively deliver the solution at a specific location

# We've made progress

## I'll itemize a subset of working components

### Soil ontology

### Soil segmentation - US only - in 3'x3'x3' cubes

### Soil chemistry, largely based on Chemical Entities of Biological Significance (ChEBI)

### Atmospheric chemistry based on subset of Earthster Core Ontology (ECO) and Semantic Web Earth Environmental Terminology (SWEET)

### Atmospheric chemistry - US only - by time (i.e., growing seasons)

### Biologics by location - US only

#### Microbiology

#### Insects and entomology

### Plant Ontology (PO)

### Growth conditions by species and varieties (cultivars)

### Threats by species

### Sensor ontology

### Sample sensor data, primarily about air quality

# Now I travers from the practical to the theoretical

## We don't have real sensors that produce the desired data

## We don't have machinery that we can automate for

### Sensing

### Mixing

### Applying

### Error handling

## What we do have is the ISO 11783 tractors and machinery for agriculture and forestry serial control and communications data network (commonly referred to as "ISO Bus" or "ISOBUS")

### We have mapped the approximate 340 components, together with their units-of-measure, to an ontology (mapping XSD specifications to their ontology equivalents).

### We have integrated the ontology based on ISO 11783 with the AgroRDF ontology

## What we need to do next

### Using the vernacular, we need to design a subset of a Tesla without building a Tesla or GigaFactory

### We need to construct a simulator so that customers can visualize the process before investing in the mechanization to implement the process

## And this is very important

### The solution needs to be an open platform to support interoperability

### The right-to-repair equipment in agriculture may be more important than any other sector because of the cost of the machinery

# In summary

## This is a 100 mile journey

## We have the building blocks

## We are approaching the last mile.

## We think we've solved 80% of the problem; but the reality is that 80% remains to be done

## The fastest route to success is to create a simulator - activated by ontology-based specifications, SHACL constraints and realistic sensor-based data.

## We need help building a simulator