

Who is Brett Niver

- Inventor
 - Named as inventor on dozens of patents
- Automation/Technology Expert
 - Developed industrial/factory automation for Fortune 500 clients
 - Early wireless pioneer at Data General
 - Big Data/Cloud Architect at EMC
- Designer / Developer of all current IAS Technology
 - Wireless Sensors, Cellular Telemetry, SaaS
- Manager
 - At IAS grew recurring revenue on average 30% YOY

IAS Headquarters



IAS has 5000 square foot facility in the historic Whitin Machine Works mill complex on the Mumford River in Northbridge Massachusetts. Just as Paul Whitin and his family were critical in the birth of the Industrial Revolution in North America, today IAS is a pioneer in the field of applying Telemetry and IoT technology to Agriculture and other engine-driven applications.

My Office



Why “IoT” matters to our customers

- IoT provides a local point of control for remote production resources
 - Local automation
 - Real-time “reach-out-and-touch”
- IoT provides insight into production processes previously not easily available
 - Resource monitoring
 - Know before you go
 - Event/status awareness
 - Historical data
- IoT saves resources
 - Funding available from state/federal governments
 - Pays for itself very quickly
- IoT improves end product
 - Higher production quantity
 - Better quality

IoT Challenges for customers

- New Technology :
 - the rate of technological change is overwhelming to growers
 - Ag Extensions/Scientists confuse science with production.
- Nascent Market : lots of hype and dynamic change in the market.
 - Customers always will ask you to “re-invent” your product based on something they saw on TV or the Internet
 - 3rd party products go EOL quickly / Often
 - Telcos accelerating the pace of changing technology

IoT Challenges for innovators

- Funding
 - Getting money a full-time job
- New Technology :
 - the rate of technological change means pressure to change decisions
- Nascent Market : lots of hype and dynamic change in the market.
 - Customers always will ask you to “re-invent” your product based on something they saw on TV or the Internet
 - 3rd party products go EOL quickly / Often
 - Telcos accelerating the pace of changing technology
 - Supply-chain / China
 - Maker Movement

Quick Facts

IAS equipment saves MA Cranberry farmers many 10s of millions of gallons of water each year, plus the associated energy costs.

In four years, the older generation of growers has gone from not having cell phones to managing their crops via Smartphones and Tablets.

In Massachusetts alone, there are approximately 1000 pumps in Cranberry production, IAS has automated over half of them. Via channels we are currently developing we now have access to many 10s of thousands of Ag/Irrigation Pumps.

\$2.7B in energy costs for agricultural irrigation in the US in 2013, according to the 2013 Farm and Ranch Irrigation Survey.

NRCS provides funds for growers to automate irrigation. To qualify, growers must be able to monitor and control irrigation remotely, as well as provide historical data. Our technology provides all this.

The System

IAS Technology



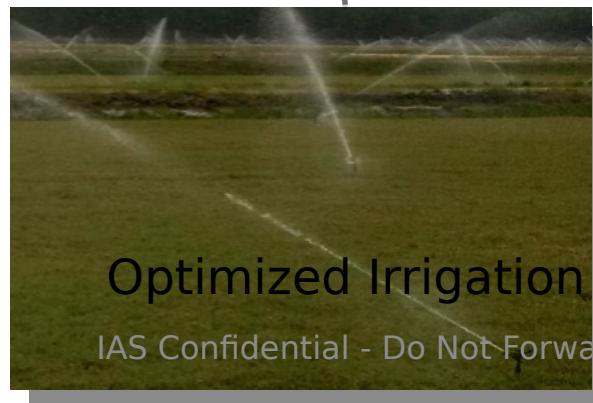
Wireless Sensors in Field



Pump-house Control



Soil Moisture Sensor

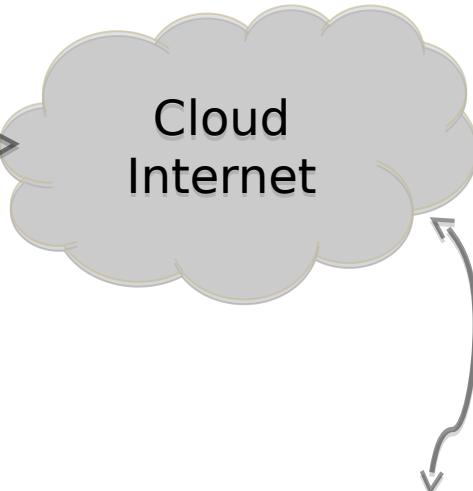


Optimized Irrigation

IAS Confidential - Do Not Forward



Farmer
controls/monitors
irrigation via
Smartphone, Tablet or
Computer



Cellular Network Architecture (current)

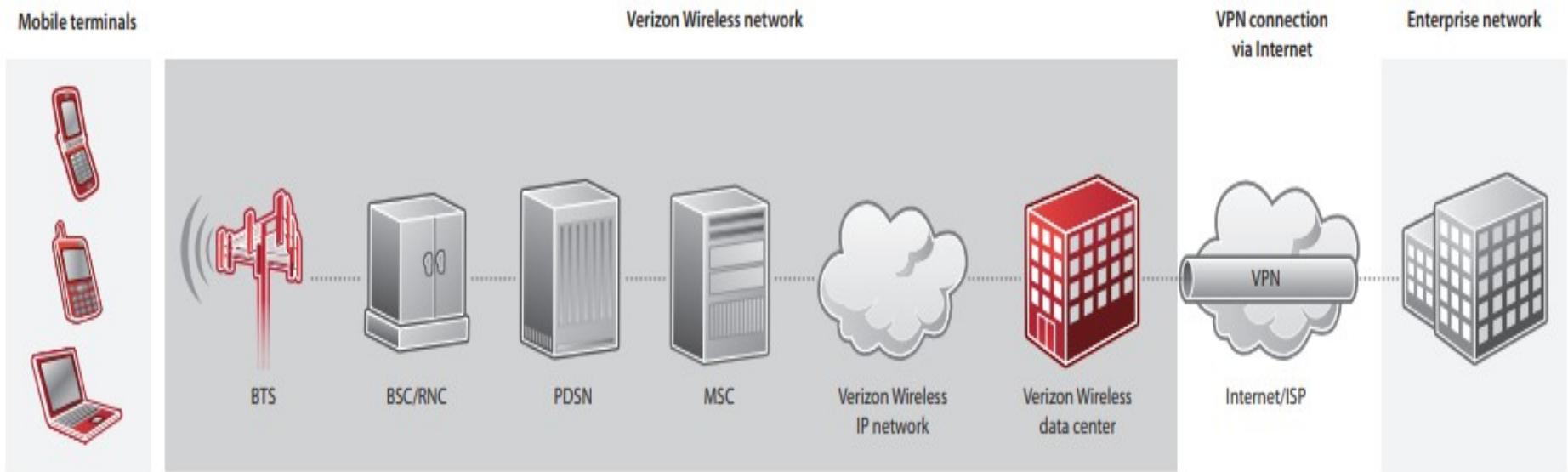
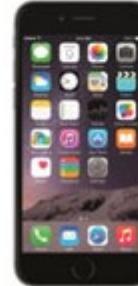


Figure 2. A customer VPN connection diagram

BSC/RNC : Base Station Controller/Radio Network Controller
PDSN : Packet Data Serving Node (terminates PPP)
MSC : Mobile Data Center

Cellular Generations, circa 2015 : Already Out of Date

1G	2G	3G	4G	5G
1981	1992	2001	2010	2020(?)
2 Kbps	64 Kbps	2 Mbps	100 Mbps	10 Gbps
Basic voice service using analog protocols	Designed primarily for voice using the digital standards (GSM/CDMA)	First mobile broadband utilizing IP protocols (WCDMA / CDMA2000)	True mobile broadband on a unified standard (LTE)	'Tactile Internet' with service-aware devices and fiber-like speeds
				?

Product Requirements (The pieces/parts)

Cranberries:

In early spring, the bud for the berry can be damaged by frost. How to protect the crop?

Citrus:

Due to an invasive species, citrus trees cannot get nutrition, and crops are failing. How to increase nutrient uptake?

Potatoes:

Center-pivots / reel-irrigation – drought protection

Apples:

Frost Protection – Filtration Control

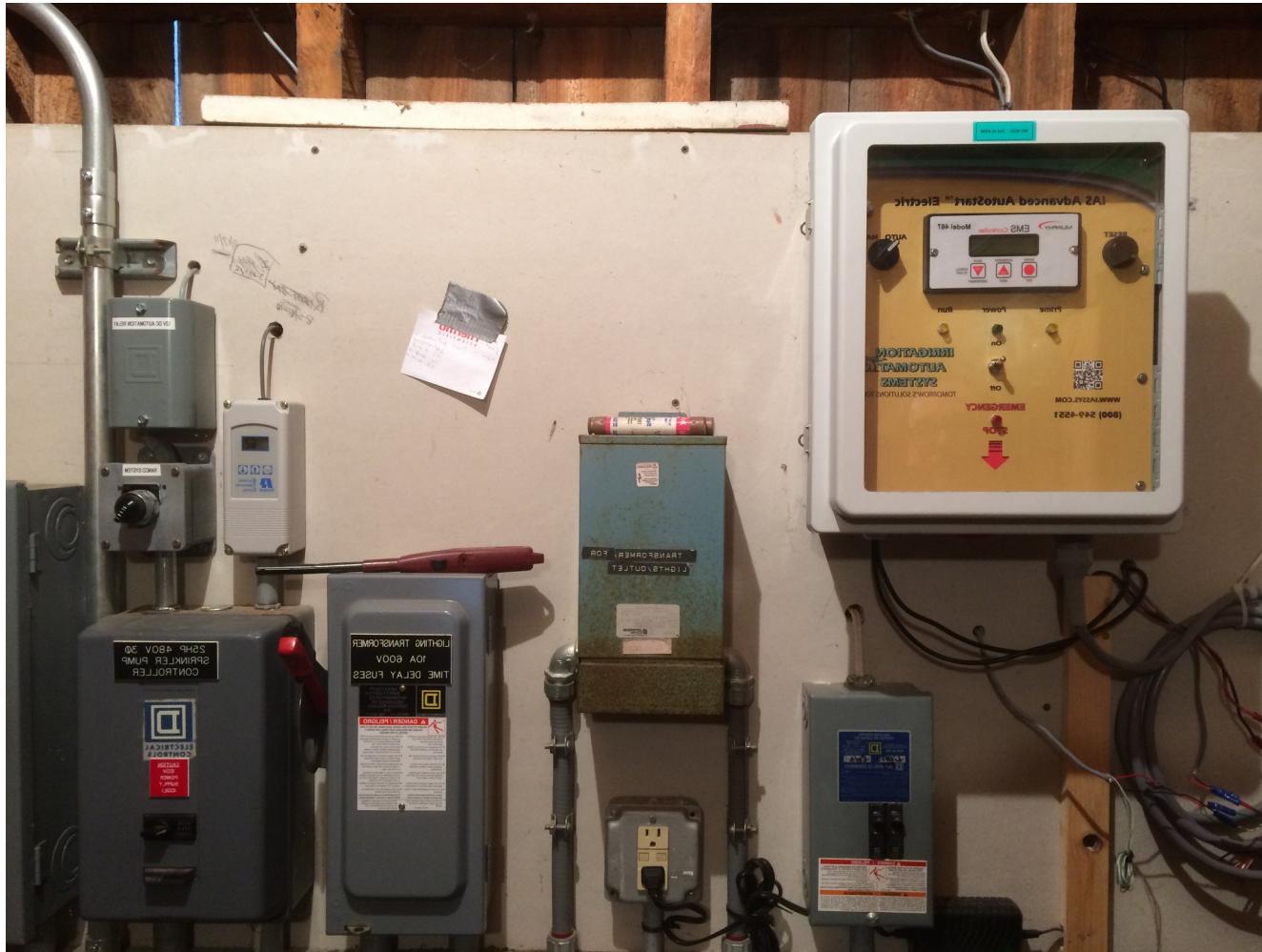
Cannabis:

CO₂/Temp/RH monitoring / control

Waste-Water:

Reservoir fills up, and can flood neighboring properties, how to protect?

Cranberry Pump House / Electric Pump (Temperature)



Cranberry Pump : Primary Requirements

- Power – most pump-houses have no power, have to run off engine battery.
 - Battery drain, monitoring, charging
- Monitor temperature on Bog
 - Either run a long wire(s) or use wireless
- Pump priming
- Pump regulation (engine driven pumps run to pressure)
- Notification to customer on
 - Start, stop, failure, etc
- On demand access to remote equipment via Internet
 - NRCS funding, etc
 -

All this leads to lots of secondary requirements!

Citrus Pump / Engine Driven Pump (Schedule)



Citrus : Same but different

- Power – lots more sun, but ...
 - Convince customers new batteries are critical
- Environmental factors
 - Sun / temperature
 - Insects
 - Electrical storms
- Priming done differently
- Timing much more critical

Lift Pump / Engine Driven Pump (Float Switch)



Waste-water Pump / Engine Driven Pump (Float Switch)

Completely un-attended:

- Need to monitor fuel, battery, engine status
- Need local autonomous control and remote control
- Site is very remote so everything has to work
- Need history of operation

Random anecdotal challenges

- Non-linear uP ADC
- Contractor issues
- Problems with 3rd party products (it's your product even if it's not)
 - Sierra Wireless modem power-supply
 - Engine controllers
 - Buggy sensors
 - Unpredictable radios
 - Poor battery life (radios)
- Telco management / interfacing / etc
 - SMS, VPNs, Generations, etc
- Certifications
 - Cellular / PTRCB Certification
 - FCC Part 15 (ISM Radios)
 - “Intrinsically Safe” / mostly Oil and Gas
 -

Multiple problems, multiple solutions, not all equal ...



Learn to love Trade Shows ...



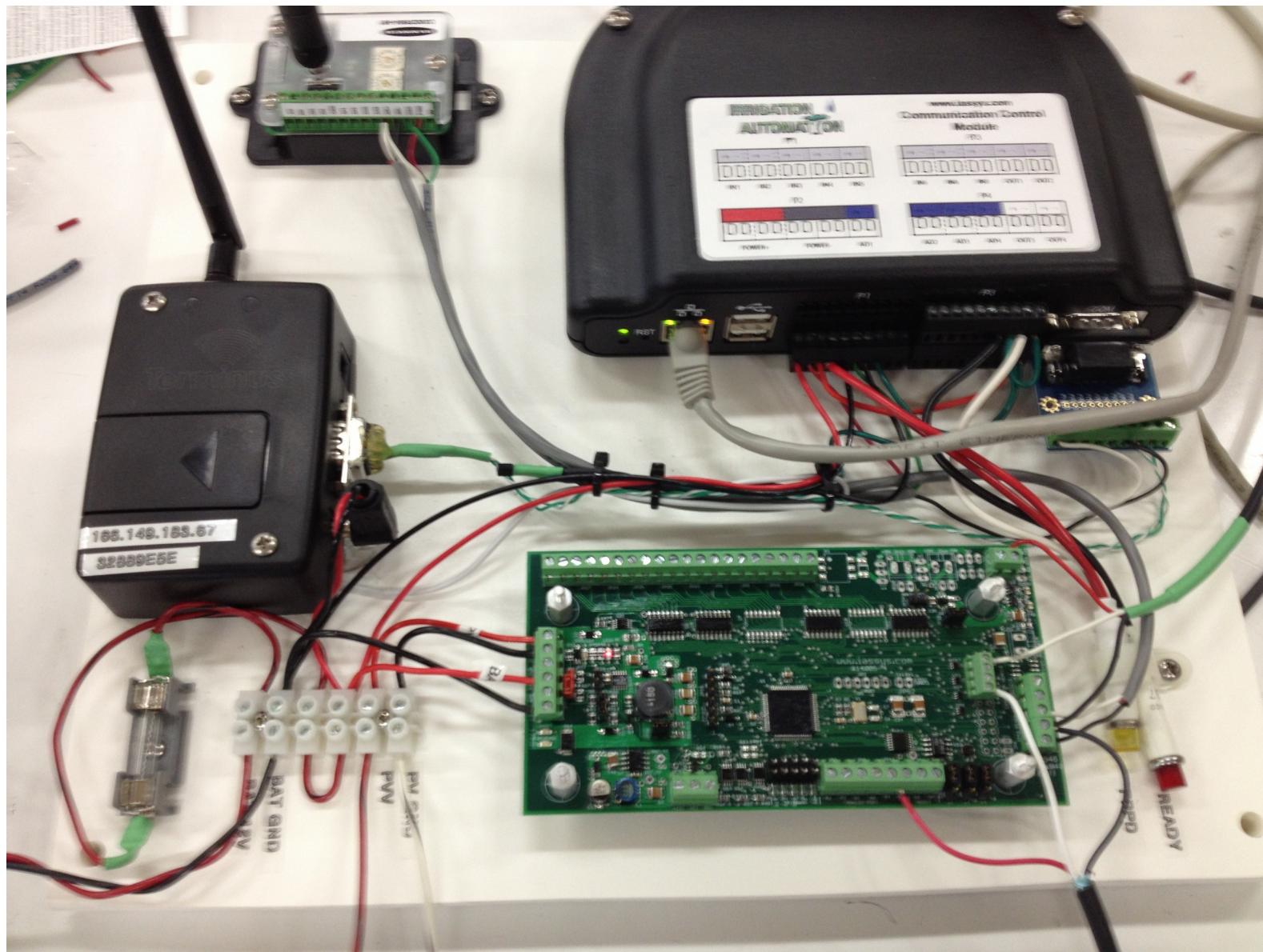
Dumb ideas ...

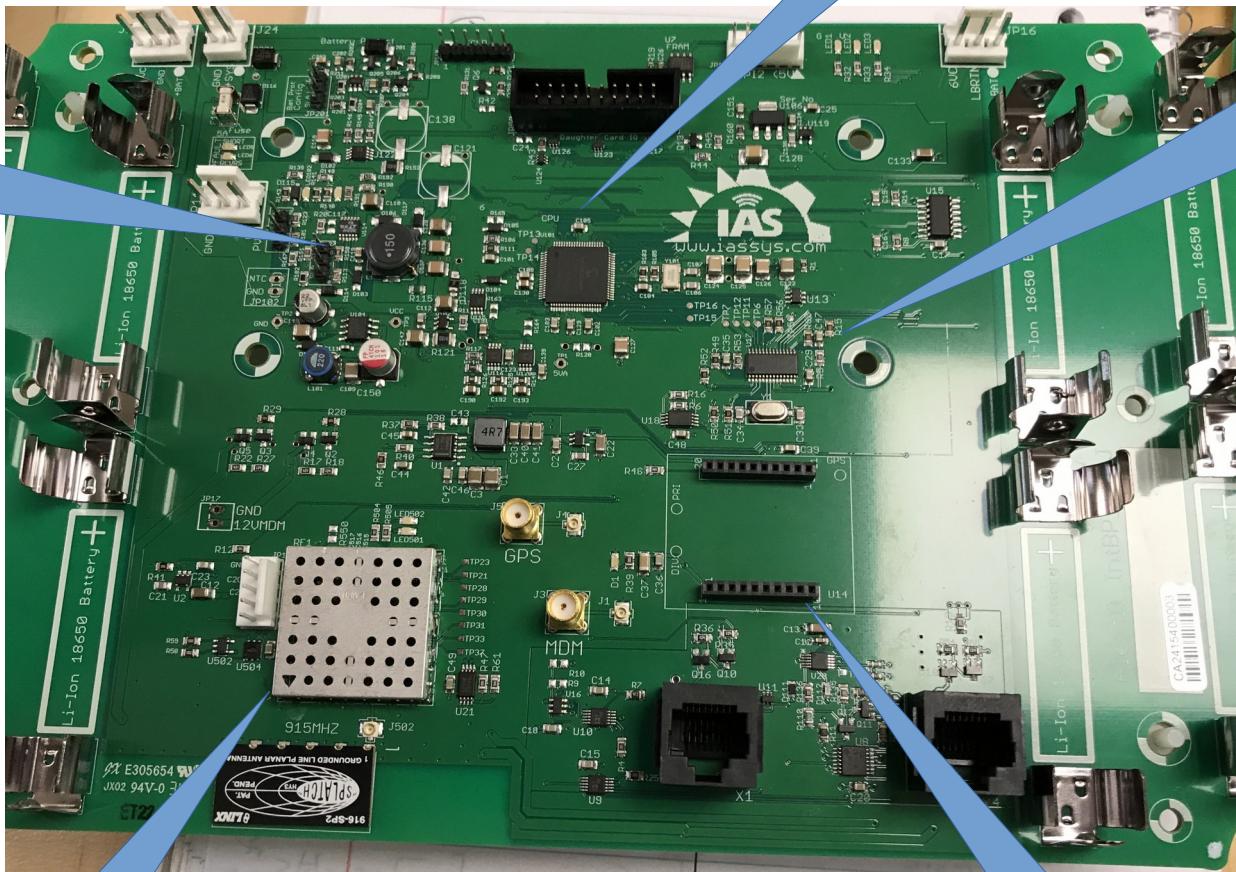


Lessons learned ...



Evolution ...





Liion or SLA
Solar Charger

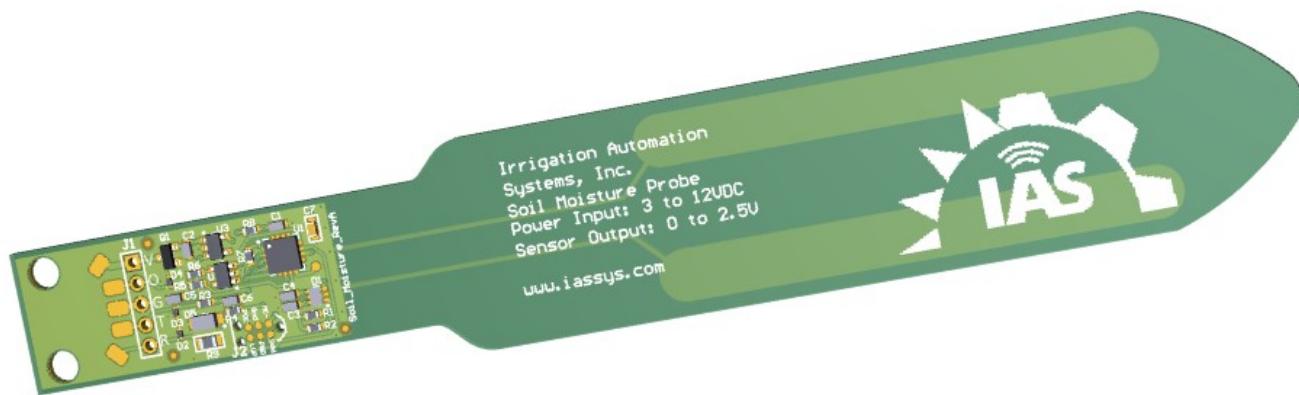
U-processor
(PIC18F)

Precision
12bit ADC

900Mhz Radio

Cell Modem

New Soil Moisture Sensor – Available this spring
- again why did we build our own?



Center Pivot : Maine Potatoes



Simple Start/Stop and
basic monitoring.



Cranberry Pickers

