Moving the Needle with Smarter Data Capture

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SENIOR DATA SYSTEMS ARCHITECT

CROSS I.T. SERVICES & SOLUTIONS, LLC

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About Me

While working…

- Senior Data Systems Architect with Cross I.T. Services and Solutions
- Bachelors of Science in Electrical Engineer from Grove City College
- 20+ years experience in the Steel and Metal Packaging Industry
- Seven years of PLC and AC/DC Drive Programming and Troubleshooting Experience

While playing…

- Roller coaster enthusiast
- Musician i.e. singer and trombone player
- Runner, training for my second marathon
- Primary tennis-ball-thrower for three dogs
- Star Wars LEGO collector

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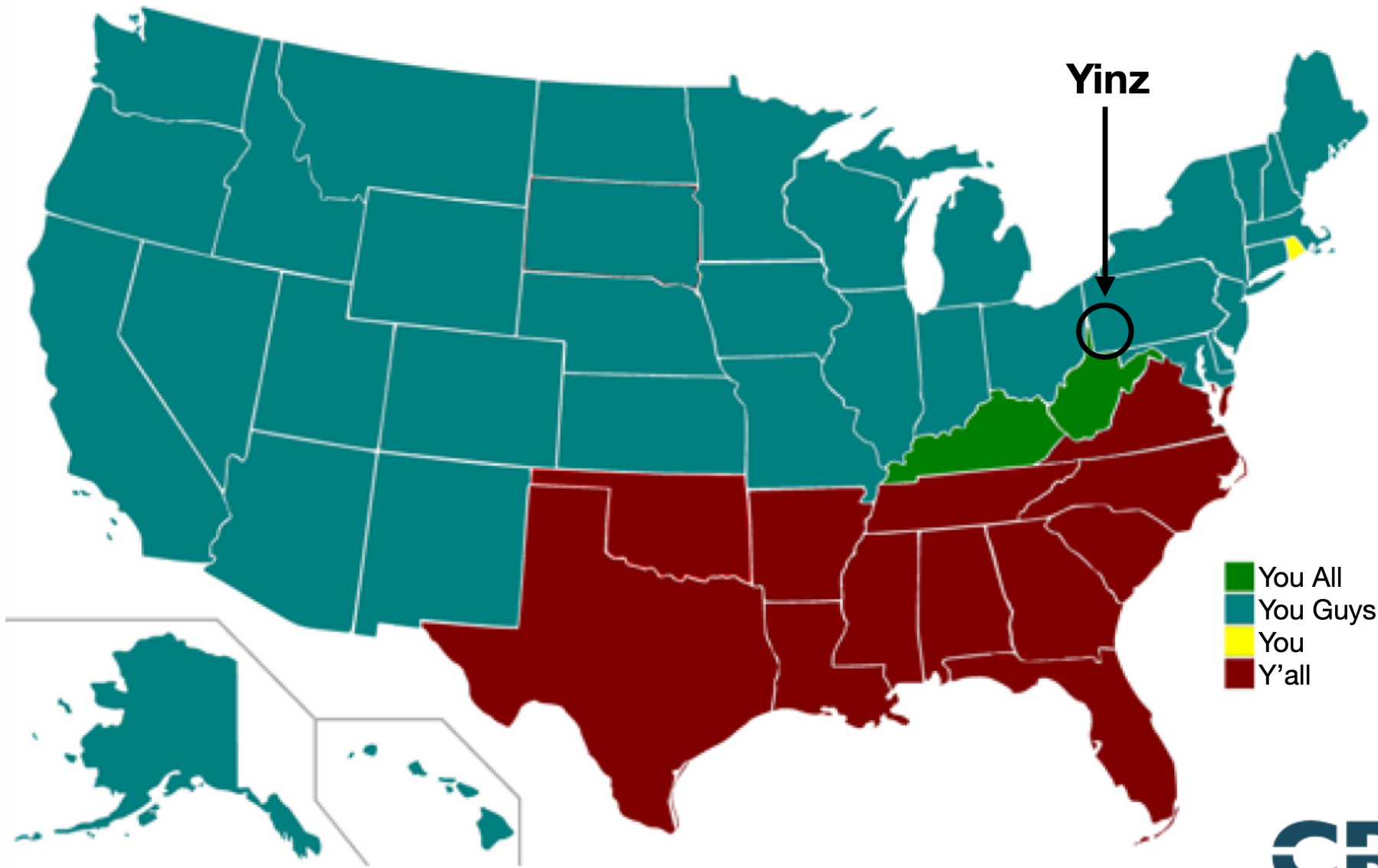
Before We Begin…

Technology is rife with acronyms

- This session will reference a number of TLAs and FLAs
- I'll do my best to expand each one as we get to it

What did he say?

- Born and raised in western Pennsylvania
- Fluent in Pittsburgh-ese
- Yinz = everyone in the room



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The Value of Data

The world constantly changes and changes quickly

- The volatility in the steel industry
- The volatility in the world i.e. 2020 and COVID-19

We need to adapt appropriately

- What direction does the business take?
- How do we address the quality issue?
- What do we do with our supply chain?

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See the Whole Picture

A lesson from Abraham Wald

- Part of the Statistical Research Group at Columbia University during World War II
- Helped the Allies figure out how to better-protect planes from enemy artillery

Recognize the assumptions in play

- Are the assumptions justified?
- Are we dealing with survivorship bias?

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Remove the Obstacles

Streamline data collection

- Build the process so the focus is on the important information
- Don't ask questions when you already know the answer

Technologies already in play

- Barcode scanning
- NFC and RFID Tags
- iBeacons

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Barcode Scanning

1D barcodes

- A tried-and-true method
- Improves the accuracy of the data i.e. no typos

2D barcodes

- Provide access to complete information
- A number of format options – QR code, Data matrix, Aztec code
- Work well with smart phones

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QR Codes

Our preferred method

- QR = Quick Response
- Store up to 4,296 alphanumeric or 7,089 numbers
- Has four error correction levels

Use JSON

- JSON = JavaScript Object Notation
- Standard for storing and sharing name/value pairs and/or arrays of information

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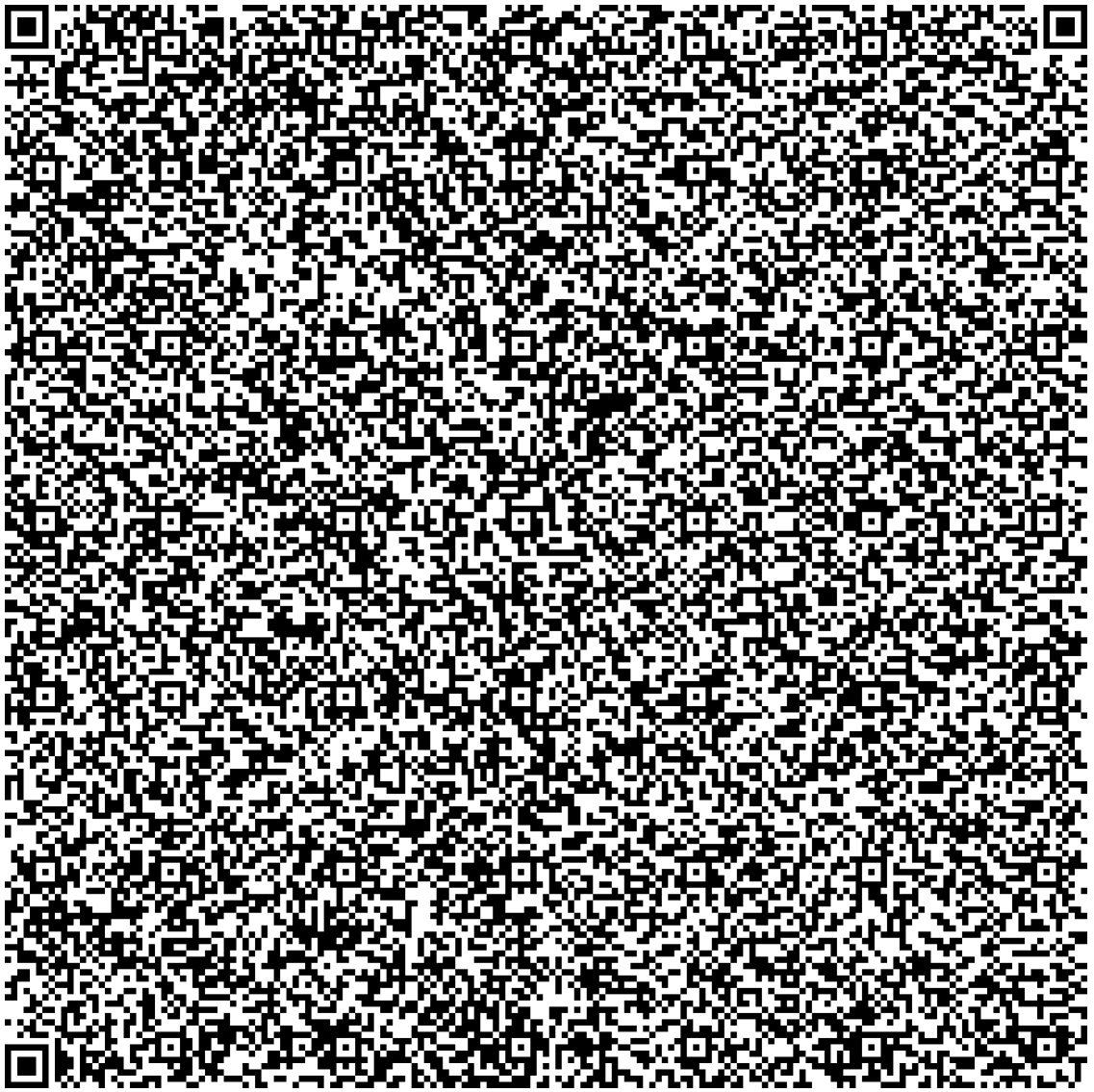
QR Code Example #1

Four score and seven years ago our fathers brought forth on this continent, a new nation, conceived in Liberty, and dedicated to the proposition that all men are created equal.

Now we are engaged in a great civil war, testing whether that nation, or any nation so conceived and so dedicated, can long endure. We are met on a great battle-field of that war. We have come to dedicate a portion of that field, as a final resting place for those who here gave their lives that that nation might live. It is altogether fitting and proper that we should do this.

But, in a larger sense, we can not dedicate -- we can not consecrate -- we can not hallow -- this ground. The brave men, living and dead, who struggled here, have consecrated it, far above our poor power to add or detract. The world will little note, nor long remember what we say here, but it can never forget what they did here. It is for us the living, rather, to be dedicated here to the unfinished work which they who fought here have thus far so nobly advanced. It is rather for us to be here dedicated to the great task remaining before us -- that from these honored dead we take increased devotion to that cause for which they gave the last full measure of devotion -- that we here highly resolve that these dead shall not have died in vain -- that this nation, under God, shall have a new birth of freedom -- and that government of the people, by the people, for the people, shall not perish from the earth.

Abraham Lincoln
November 19, 1863



QR Code Example #2

{
"Elwood Blues" : "It's 106 miles to Chicago, we got a full tank of gas, half a pack of cigarettes, it's dark... and we're wearing sunglasses.",
"Jake Blues" : "Hit it!"
}

RFID and NFC Tags

What are they?

- RFID = Radio Frequency Identification
- NFC = Near Field Communication
- Technology that allows wireless data transmission using radio waves

How does it work?

- Operates on the principle of inductive coupling
- Any stored data on the tag is wirelessly transmitted to the reader

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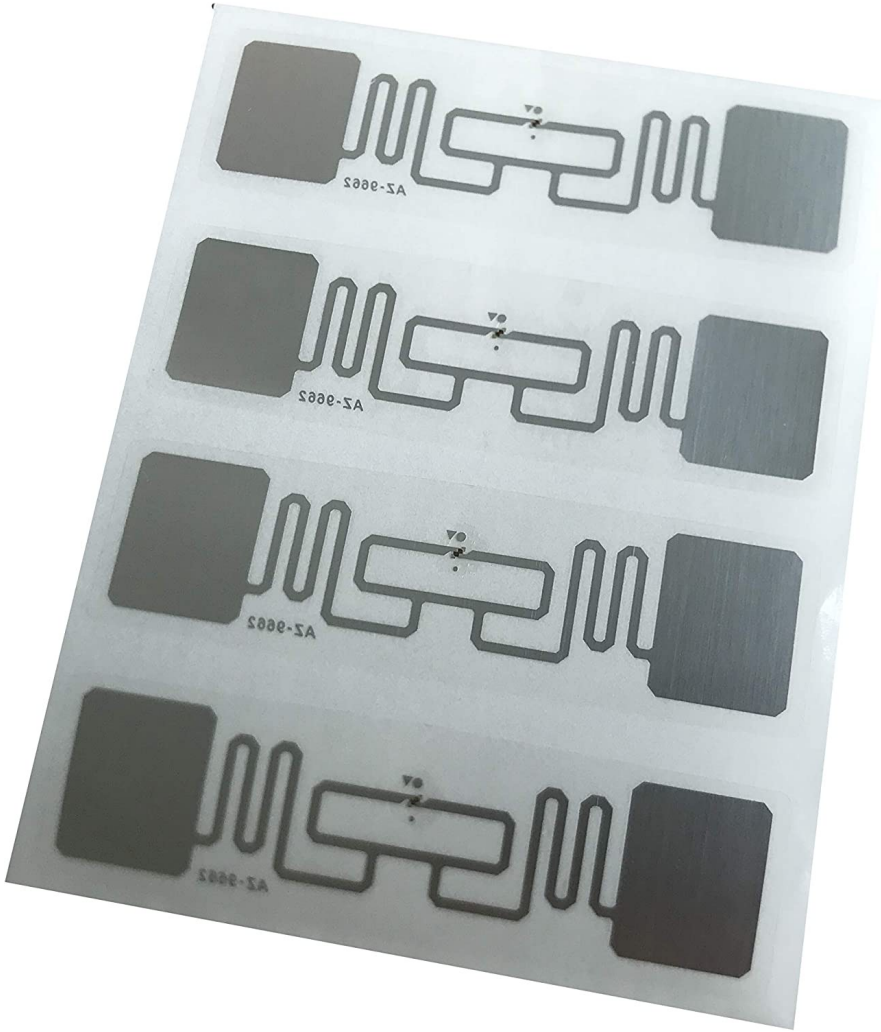
RFID and NFC Tags

Transmission range differentiates RFID and NFC

- RFID = Long range e.g., Turnpike Toll Collection
- NFC = A few centimeters to contact distance e.g., Tap To Pay

Advantages

- Lower power consumption
- Does not require pairing or manual input to establish a connection
- Not affected by dirt like a barcode



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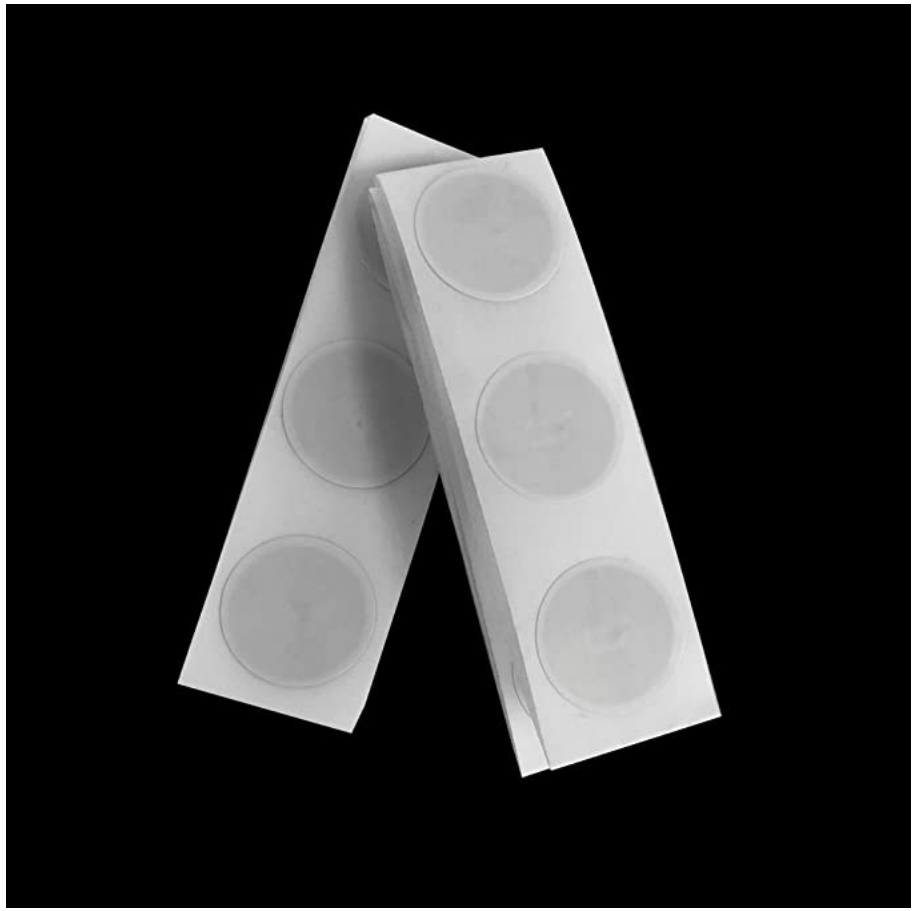

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iBeacons

iBeacon is a protocol developed by Apple

- Introduced in 2013
- Hardware transmitters, or beacons, are a class of BLE devices (Bluetooth Low Energy)
- Enables smart devices to perform actions when in proximity to an iBeacon

Application

- Used as an indoor positioning system
- Distribute messages at a specific Point of Interest
- The broadcasting beacon is only a 1-way transmitter to the receiving device

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IoT Devices

Internet of Things Device

- Physical object, or thing, embedded with sensor(s), software, and other technologies
- Connects and exchanges data with other devices and systems over the internet

Seamless communication between people, processes, and things

- Share and collect data with minimal human intervention
- The physical world meets the digital world - and they cooperate.

IIoT

Industrial Internet of Things

- Application of IoT technology in industrial settings
- Use machine-to-machine communication to achieve wireless automation and control
- Combine IIoT devices with cloud-based services to analyze quality or production data in real time

Improve processes based on the collected data

- Monitor and analyze machines continuously to ensure they are performing within required tolerances
- Use wearables to monitor human health analytics and environmental conditions
- Monitor the health of machines and trigger service calls for preventive maintenance

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Application of IoT (or IIoT)

Top three challenges

- Security
- Cost of integration
- Lack of standards

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Improve the Analysis

Does the data really say that?

- Incomplete data sets will yield an incorrect result
- Improper review of a full data set can still lead to the wrong conclusion

Look at the whole picture

- Visualize the data i.e. charts and graphs
- Process (or pre-process) the data

Data Visualization

A picture really is worth a thousand words

- Charts and graphs; dashboard
- Most business systems now provide a built-in charting tools

Use a data visualization tool

- For compartmented data in different systems
- Many options to choose from
  - Tableau
  - Google Charts
  - ChartBlocks
  - Charts.js

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Machine Learning

Part of Artificial Intelligence

- Understand and build methods that leverage data to improve performance on some set of tasks
- ML algorithms are used in a wide variety of applications

Benefits

- Automation
- Less reliance on human interaction
- Scope of improvement
- Efficient data handling

ML in Industry

Potential applications

- Picture analysis i.e. categorization of subject
- Text analysis i.e. sentiment analysis
- Speech recognition
- Predictive text

In Summary

Take advantage of new technology

Do not encumber the users

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“…your scientists were so preoccupied with whether or not they could, they didn’t stop to think if they should.”

IAN MALCOLM – JURASSIC PARK (1993)

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Thank You!

Questions & Answers

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