Big Data in a Warehouse

PROMAT 2015
McCormick Place South | Chicago
March 23-26, 2015
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Presented by:

Rudi Lueg, VP

W&H SYSTEMS
INNOVATIVE PROCESSES & TECHNOLOGY SOLUTIONS

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Take aways after 20 minutes

- Meaning of
  - Big Data (4 V's)
  - Internet Of Things
  - Industry 4.0
- Impact on warehouse automation

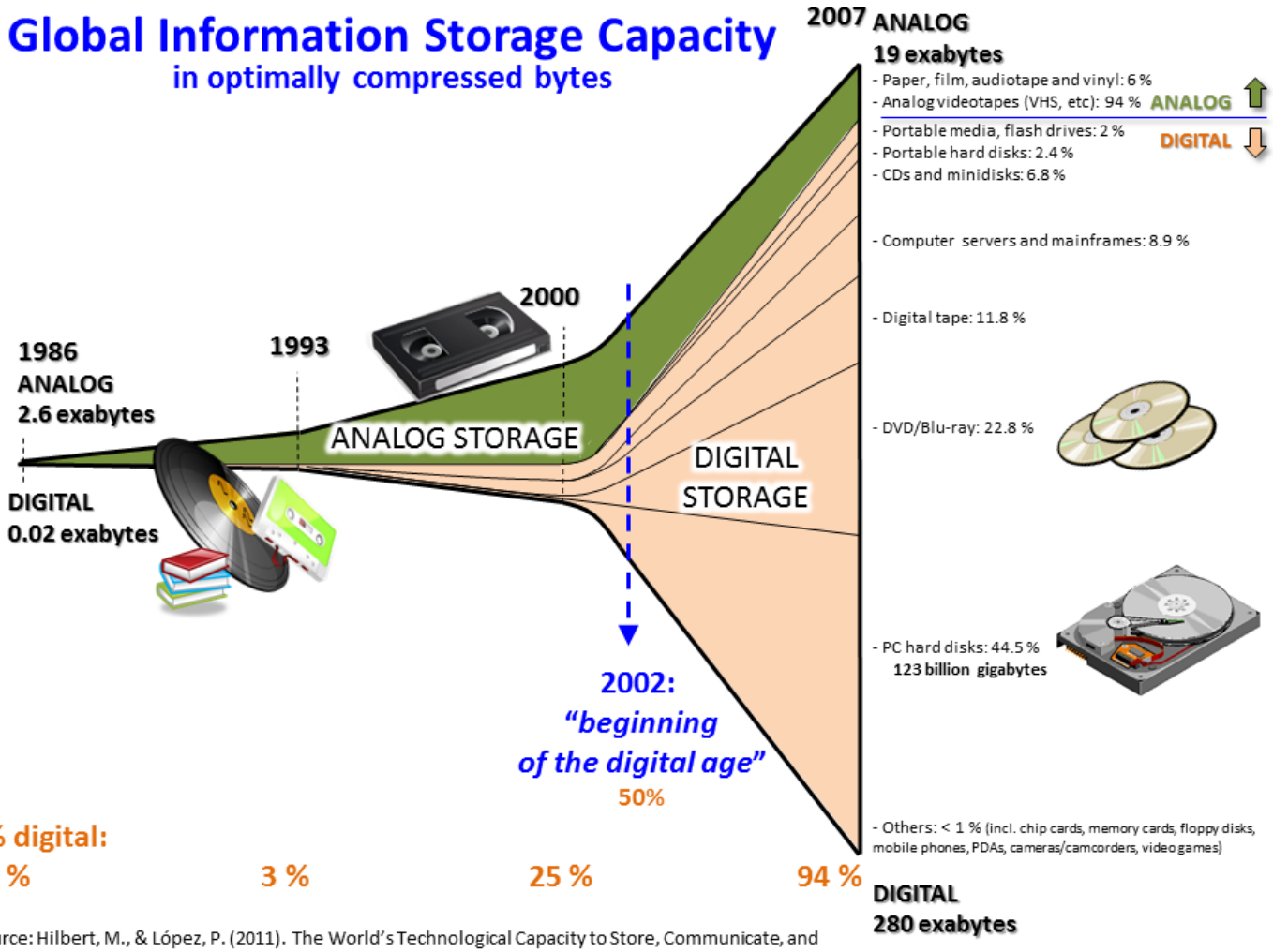
Big Data

extremely large data sets that may be analyzed computationally to reveal patterns, trends, and associations, especially relating to human behavior and interactions.

Google

Global Information Storage Capacity

in optimally compressed bytes



2007 **ANALOG**
19 exabytes

- Paper, film, audiotape and vinyl: 6 %
- Analog videotapes (VHS, etc): 94 % **ANALOG**

DIGITAL

- Portable media, flash drives: 2 %
- Portable hard disks: 2.4 %
- CDs and minidisks: 6.8 %
- Computer servers and mainframes: 8.9 %
- Digital tape: 11.8 %

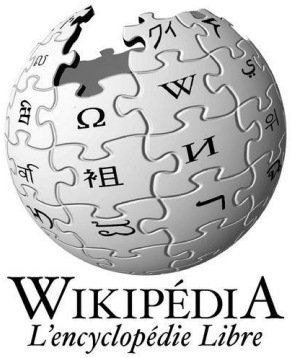
- DVD/Blu-ray: 22.8 %

- PC hard disks: 44.5 %
  123 billion gigabytes
- Others: < 1 % (incl. chip cards, memory cards, floppy disks, mobile phones, PDAs, cameras/camcorders, video games)

DIGITAL
280 exabytes

Source: Hilbert, M., & López, P. (2011). The World's Technological Capacity to Store, Communicate, and Compute Information. *Science*, 332(6025), 60 –65. http://www.martinhilbert.net/WorldInfoCapacity.html

Storage doubles every 40 month



FIND WHAT'S

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The FOUR V's of Big Data

From traffic patterns and music downloads to web history and medical records, data is recorded, stored, and analyzed to enable the technology and services that the world relies on every day. But what exactly is big data, and how can these massive amounts of data be used?

As a leader in the sector, IBM data scientists break big data into four dimensions: **Volume, Velocity, Variety and Veracity**

Depending on the industry and organization, big data encompasses information from multiple internal and external sources such as transactions, social media, enterprise content, sensors and mobile devices. Companies can leverage data to adapt their products and services to better meet customer needs, optimize operations and infrastructure, and find new sources of revenue.

By 2015
4.4 MILLION IT JOBS
will be created globally to support big data, with 1.9 million in the United States

Volume
SCALE OF DATA

40 ZETTABYTES
[43 TRILLION GIGABYTES]
of data will be created by 2020, an increase of 300 times from 2005

It's estimated that
2.5 QUINTILLION BYTES
[2.3 TRILLION GIGABYTES]
of data are created each day

6 BILLION PEOPLE
have cell phones

WORLD POPULATION: 7 BILLION

Most companies in the U.S. have at least
100 TERABYTES
[100,000 GIGABYTES]
of data stored

Variety
DIFFERENT FORMS OF DATA

As of 2011, the global size of data in healthcare was estimated to be
150 EXABYTES
[161 BILLION GIGABYTES]

By 2014, it's anticipated there will be
420 MILLION WEARABLE, WIRELESS HEALTH MONITORS

4 BILLION+ HOURS OF VIDEO
are watched on YouTube each month

30 BILLION PIECES OF CONTENT
are shared on Facebook every month

400 MILLION TWEETS
are sent per day by about 200 million monthly active users

Velocity
ANALYSIS OF STREAMING DATA

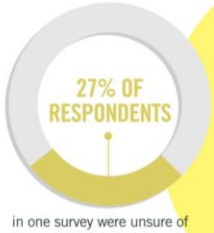
The New York Stock Exchange captures
1 TB OF TRADE INFORMATION
during each trading session

Modern cars have close to
100 SENSORS
that monitor items such as fuel level and tire pressure

By 2016, it is projected there will be
18.9 BILLION NETWORK CONNECTIONS
– almost 2.5 connections per person on earth

Veracity
UNCERTAINTY OF DATA

1 IN 3 BUSINESS LEADERS
don't trust the information they use to make decisions



in one survey were unsure of how much of their data was inaccurate

Poor data quality costs the US economy around
$3.1 TRILLION A YEAR

Sources: McKinsey Global Institute, Twitter, Cisco, Gartner, EMC, SAS, IBM, MEPTEC, QAS

IBM

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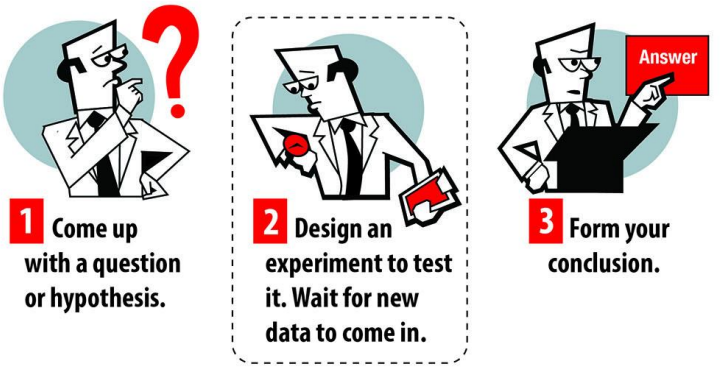
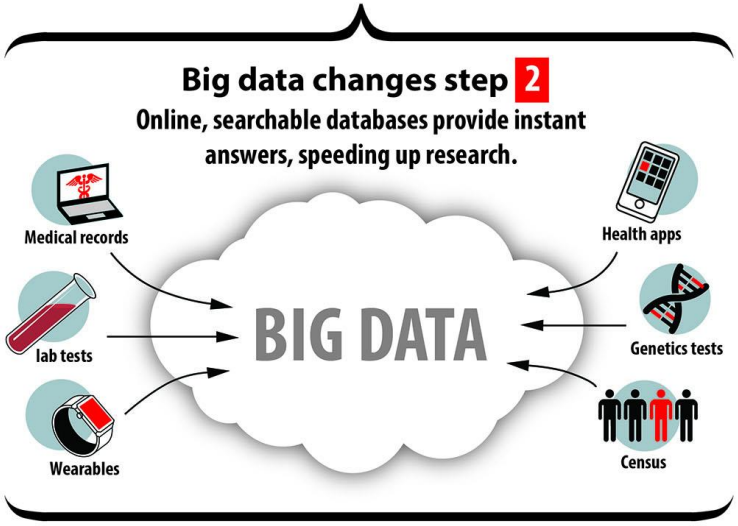
How can big data change science?

Here's how medical research traditionally works:





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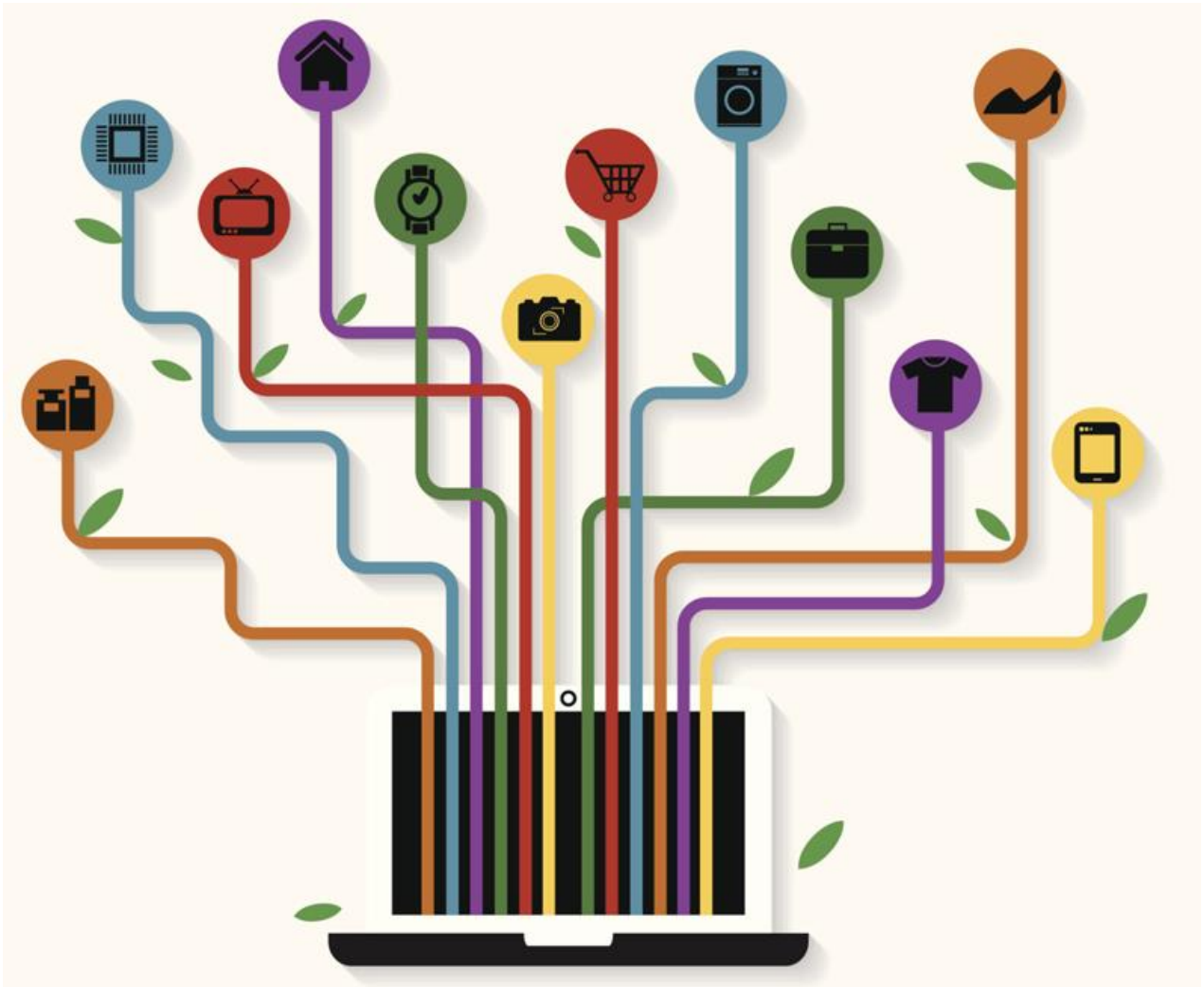
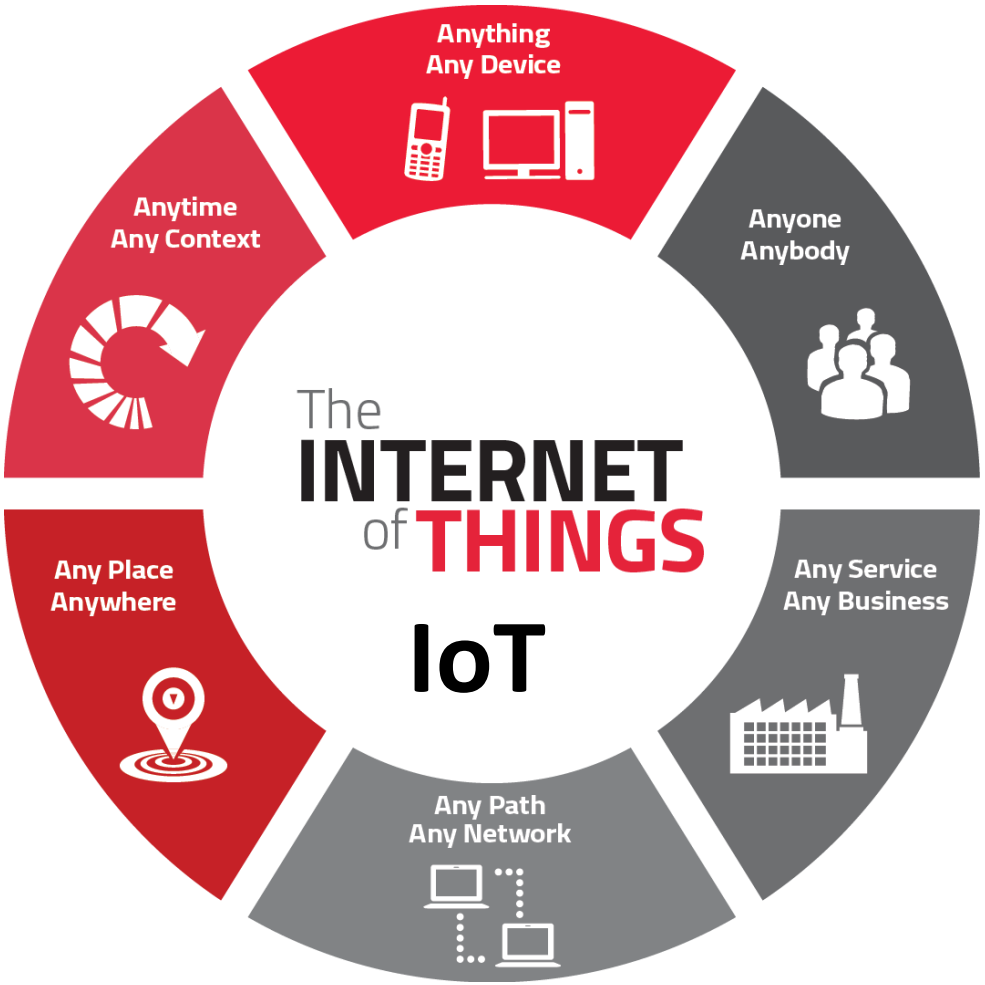
Big Data – What's going on?

- UPS Saving gas
- Macy's What's in the store?
- Ford Smarter cars, road and cities
- Google Big Query
- US Fed Owns 6 of the 10 supercomputers in the world
- Germany Keeping its Manufacturing edge
- Facebook 50 billion photos
- eBay 90PB in Hadoop, turnover $3500/second
- Google Traffic information by your smartphone

Internet Of Thinks



Everything From This 1991 Radio Shack Ad You Can Now Do With Your Phone


Anything
Any Device
Anyone
Anybody
Any Service
Any Business
Any Path
Any Network
Any Place
Anywhere
Anytime
Any Context
The
INTERNET
of THINGS
IoT

The Problem:

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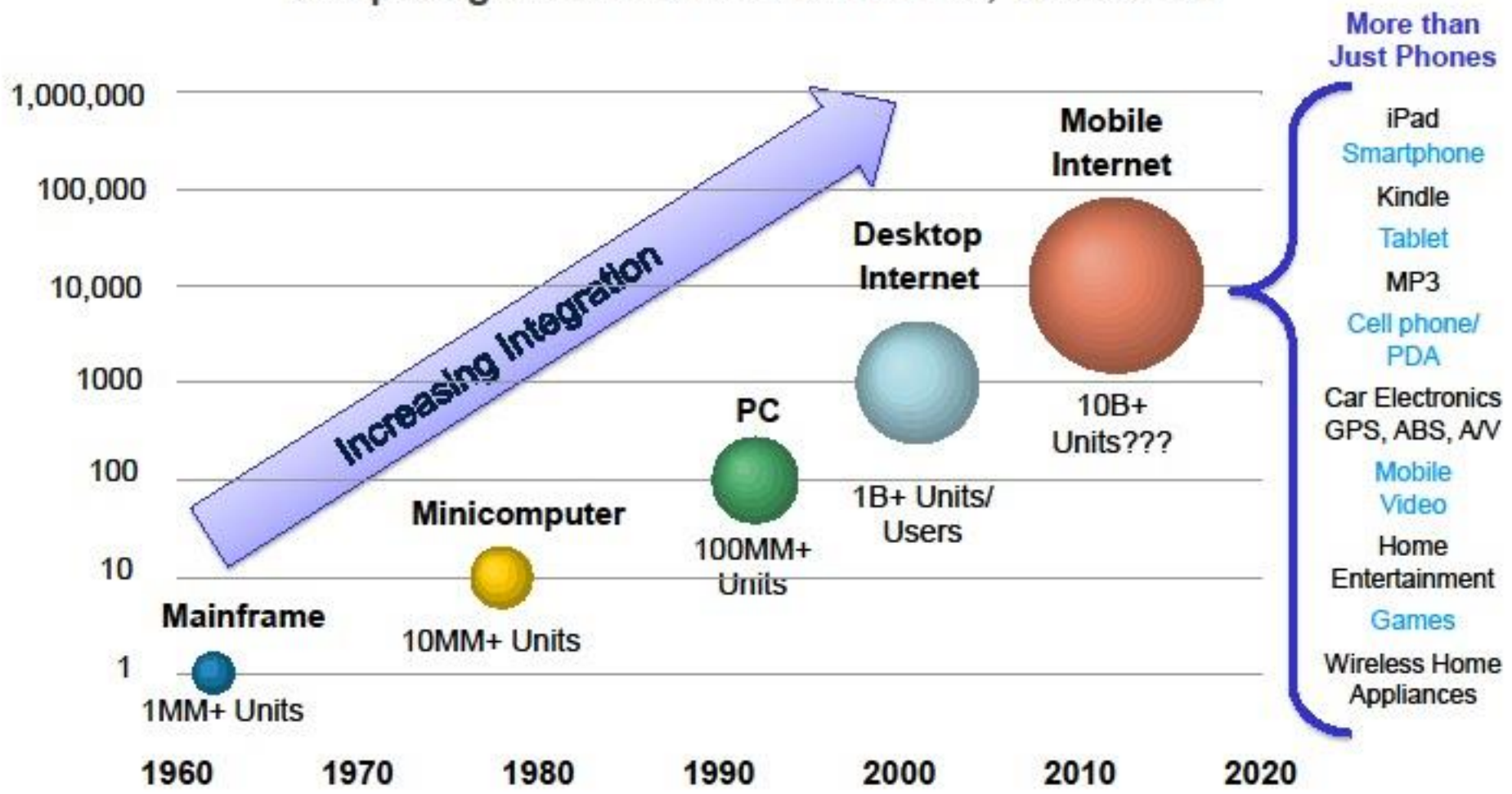
Computing Growth Drivers Over Time, 1960-2020E



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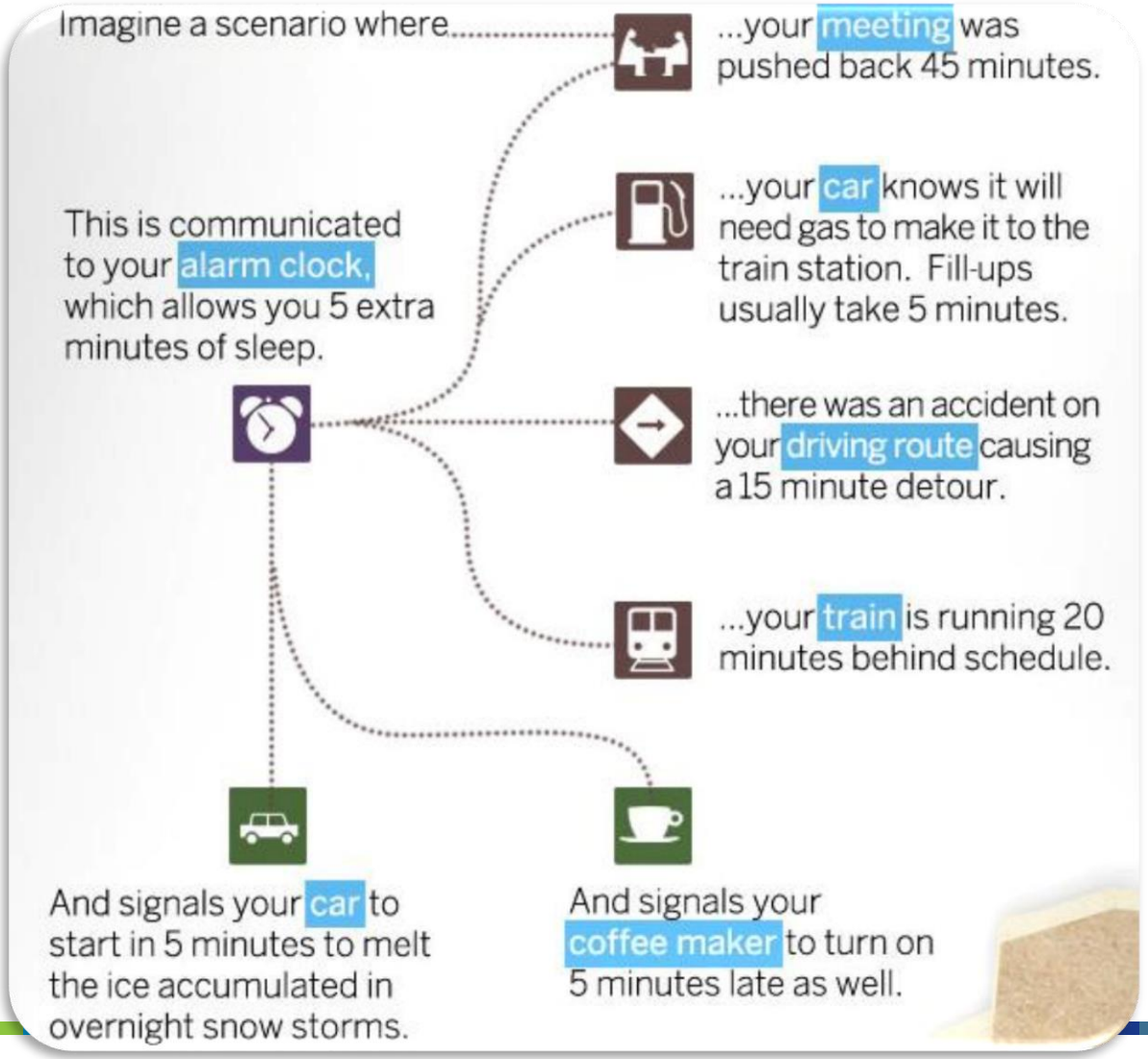
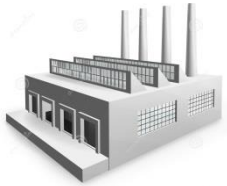
IoT


Imagine a scenario where...
...your meeting was pushed back 45 minutes.
...your car knows it will need gas to make it to the train station. Fill-ups usually take 5 minutes.
This is communicated to your alarm clock, which allows you 5 extra minutes of sleep.
...there was an accident on your driving route causing a 15 minute detour.
...your train is running 20 minutes behind schedule.
And signals your car to start in 5 minutes to melt the ice accumulated in overnight snow storms.
And signals your coffee maker to turn on 5 minutes late as well.

Industry 4.0

Industrial Revolution



4th Internet

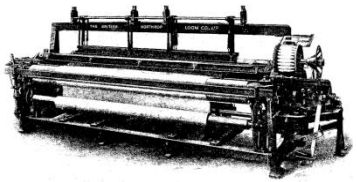
- Smart Product, IoT
- Big data, predictive analysis

3rd software

- Automation, Centralized Systems
- PLC, Computer, SCADA, HMI

2nd electrical

- Electrical energy powers Conveyors
- Fordism



1st mechanical

- Steam engine, Water Power
- Loom

1800 1900 1970 2010

Industry 4.0
http://en.wikipedia.org/wiki/Industry_4.0

Smart Manufacturing Leadership Coalition (SMLC)
http://www.smartmanufacturingcoalition.org

Big Data in the Warehouse

Operations

- Staffing
- Service level

Maintenance

- Predictive
- Automated

Traditional Automation Approach

Today

Tomorrow

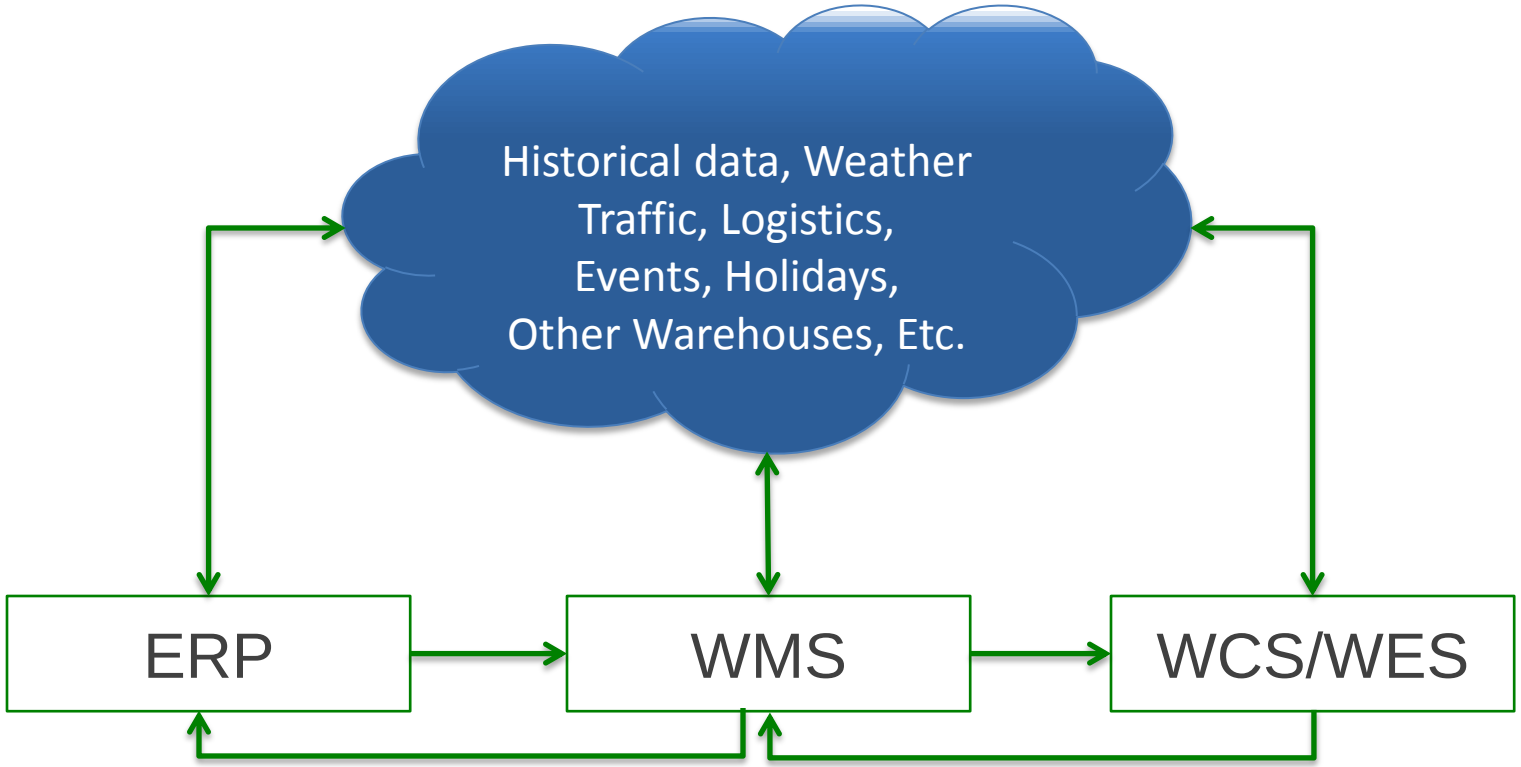
Minutes

Hours

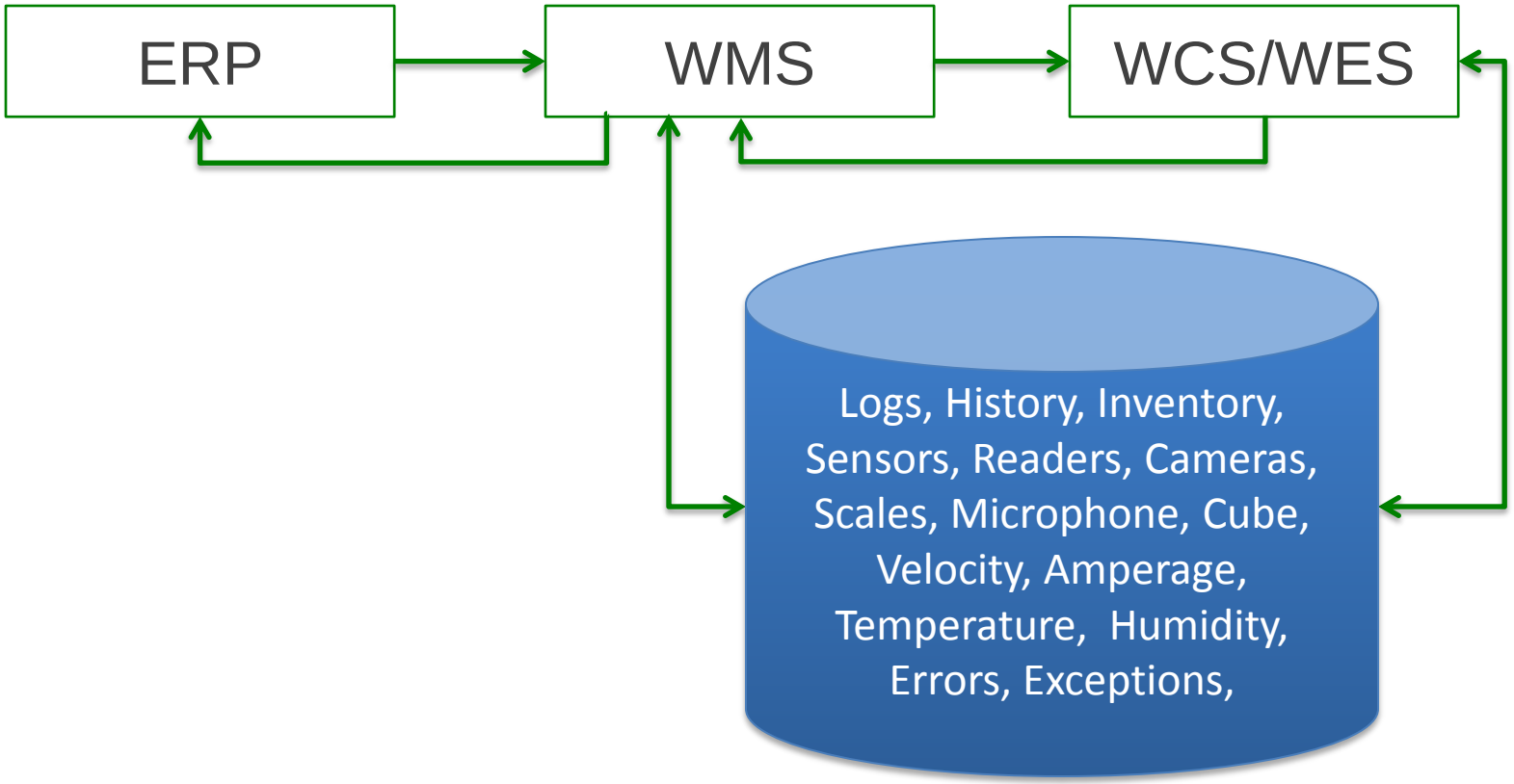
Days

Years

Big Data - external



Big Data - internal



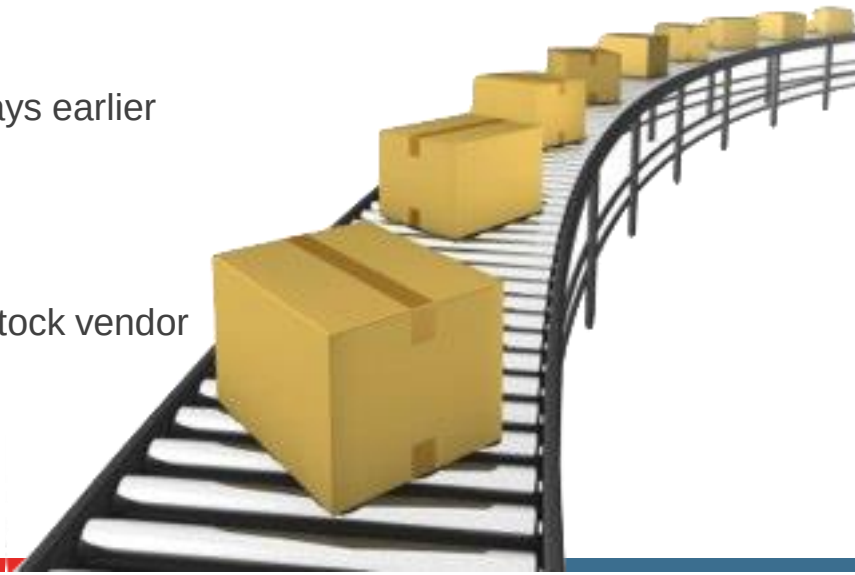
Big Data - Examples

Shipping Sorter:
Adjust speed based on carton size and weight, number of polybags and humidity to avoid re-crics

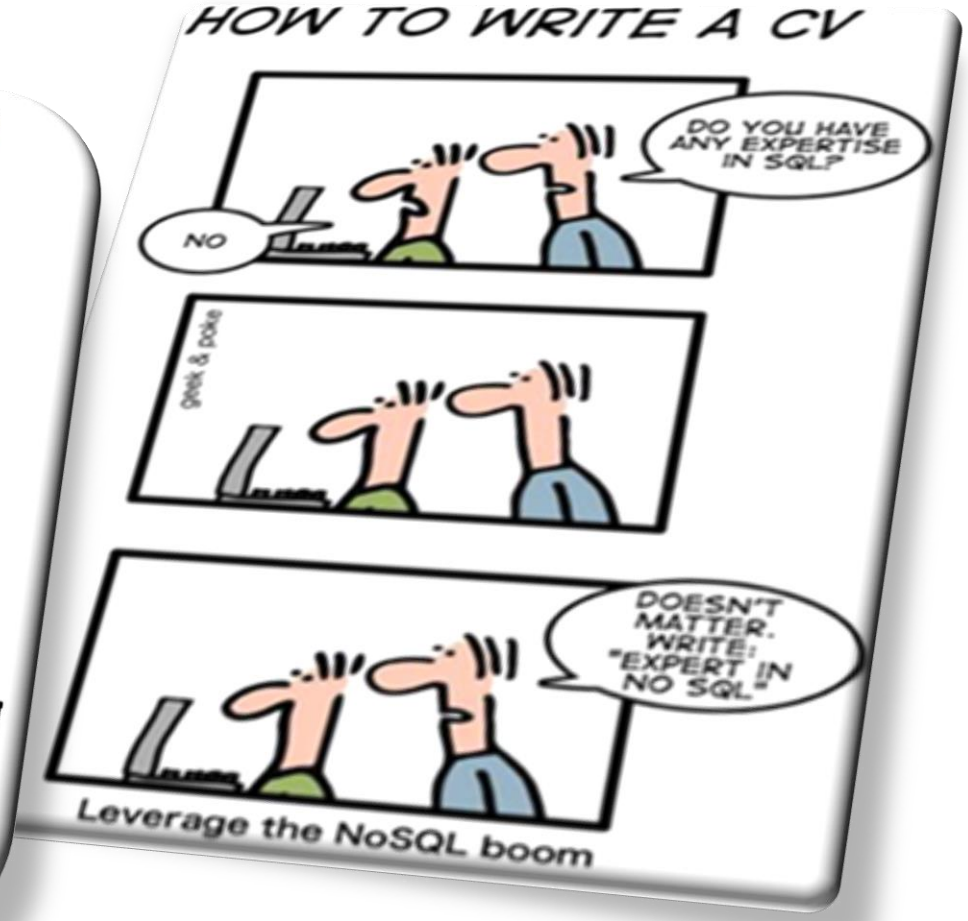
DTC Visibility:
Exact position of items for an order in the DC visible on smart phone

Service Level:
Measuring sub systems and operation to recognize delays earlier
Fulfillment performance vs. slotting, order pattern

Maintenance:
Barcode read quality may indicate a specific printer or stock vendor
Amperage, weight und age of a motor triggers
predictive (smart) maintenance



ARRIVALS
BIG DATA
TG'11
"Your recent Amazon purchases, Tweet score and location history makes you 23.5% welcome here."


HOW TO WRITE A CV
DO YOU HAVE ANY EXPERTISE IN SQL?
NO
geek & poke
DOESN'T MATTER. WRITE: "EXPERT IN NO SQL"
Leverage the NoSQL boom

iPad
2:37 PM
12%
(5)
May 19 2014 8:23PM
8h 17m
May 20 2014 4:09AM
refreshed: 2:37:13 PM
Progress By Pickline
Current Wave = 111
CLSTR 116 73.3%
FCMAA 114 92.8%
FCMBB 116 89.7%
FCMCC 113 78.4%
FCONE 112 92.0%
FCTWO 118 79.9%
HYPER 115 59.5%
PXONE 116 76.1%
TShirts 114 89.4%
0 1,000 2,000 3,000 4,000 5,000
Productivity
22,641
11,999
2,830 /hr
24,452
14,671
1,375 /hr
25,357
13,629
2,251 /hr
Expected time of completion: 4:10 AM
Cartons by Door
Door 2 104 33.5%
Door 3 102 34.3%
Door 4 105 34.4%
Door 5 103 32.5%
Door 6 106 33.4%
Door 7 102 32.1%
Door 8 104 33.6%
Door 9 101 33.6%
0 1,500 3,000 4,500 6,000 7,500
Total Expected
22,641
24,452
25,357
Pickline Perfom by Time
400
350
300
250
200
150
100
50
0
Quantity
FCMAA
FCONE
7p
12a
5a
Hours During Shift
Sign out
Dashboard
Reports
Event Log
Support
Preferences
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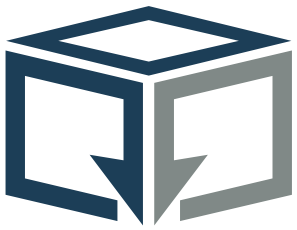

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