Adeneo Embedded

System software integrator

Reducing resource material consumption through IoT

A device oriented view

WORLD MATERIALS FORUM

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WORLD MATERIALS FORUM

15 Billions

In 2014

Gartner

23 Billions

In 2016

Gartner

WORLD MATERIALS FORUM

WORLD MATERIALS FORUM

50 Billions

In 2020

Gartner

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Resource material
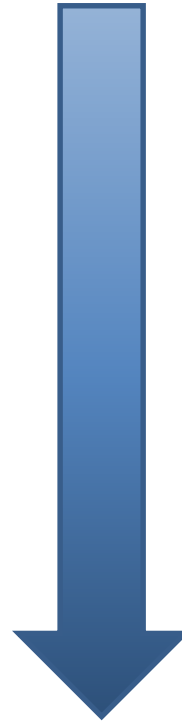
Some others already exist

Adding "connectivity" requires extra sensors, gateways, infrastructure, etc…
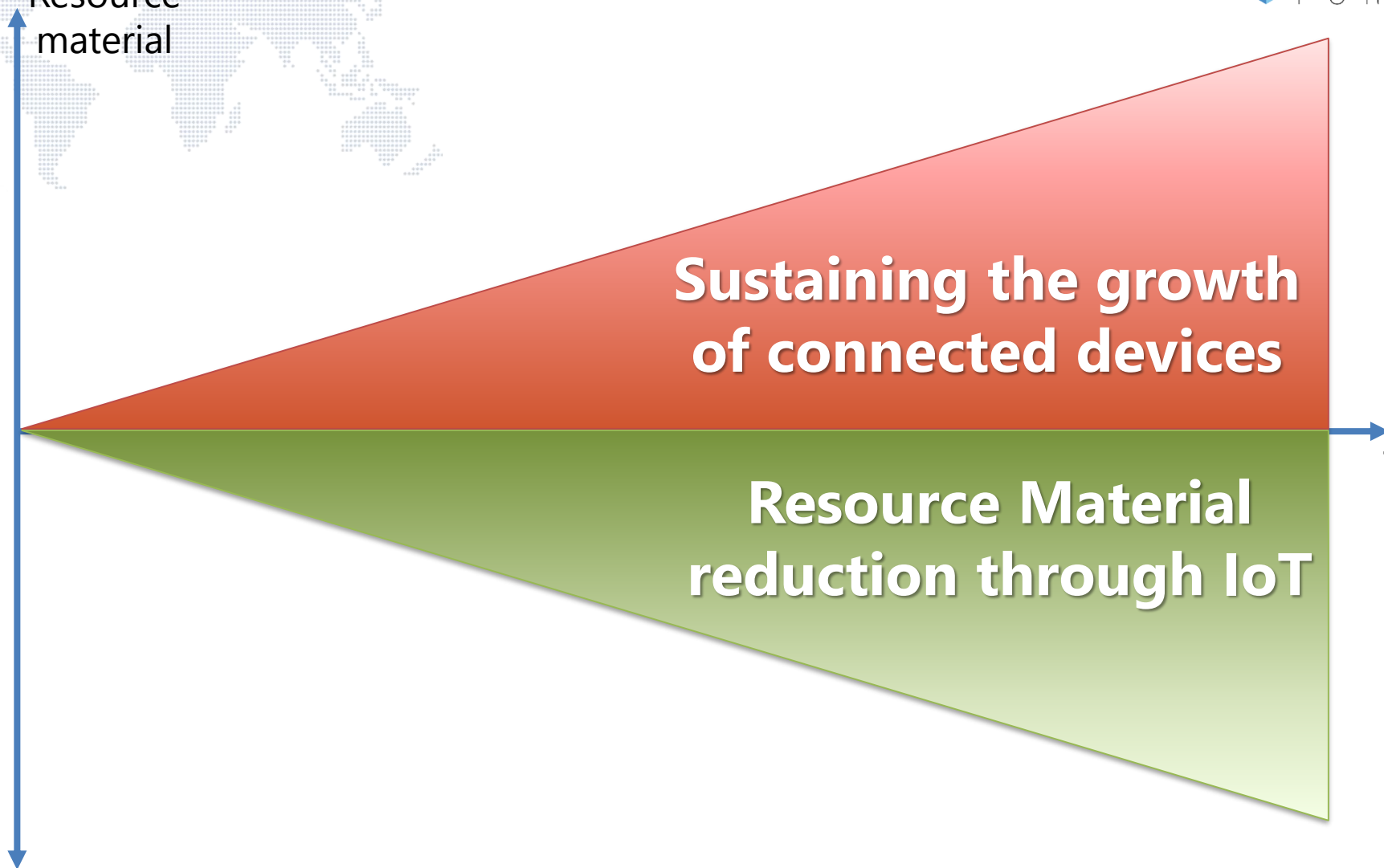
Some devices and systems will be created and produced

Represents a strong impact to resource materials

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1. Manufacturing processes optimization

2. Increasing Systems Lifespan

3. Moving from replacement to recycling

1.

MANUFACTURING PROCESSES OPTIMIZATION

Data oriented IoT usage scenario

Relies on optimizing transportation, manufacturing tools and supply chain

Not covered in this session
(focused on device oriented scenarios)

2.

INCREASING SYSTEMS LIFESPAN

From corrective to predictive maintenance

Device -> Corrective / Incident driven maintenance

Connected Device -> Preventive / Automated maintenance

Smart Connected Device -> Predictive / Automated and Optimized Maintenance

- Incident driven manual maintenance

- Corrective maintenance replacing damaged parts

- Best case: major parts replacement (mill, heater, water pump,...)

- Worst case: full equipment replacement

- Connected device reporting usage stats

- Statistic driven automated maintenance

- Preventive maintenance and cleanup allow increasing lifespan

- Fixing issues before seeing damages. Mainly minor parts replacement

Statistic driven

# of cup served,
Qty coffee grounded,
Qty milk used,
Usability, etc...
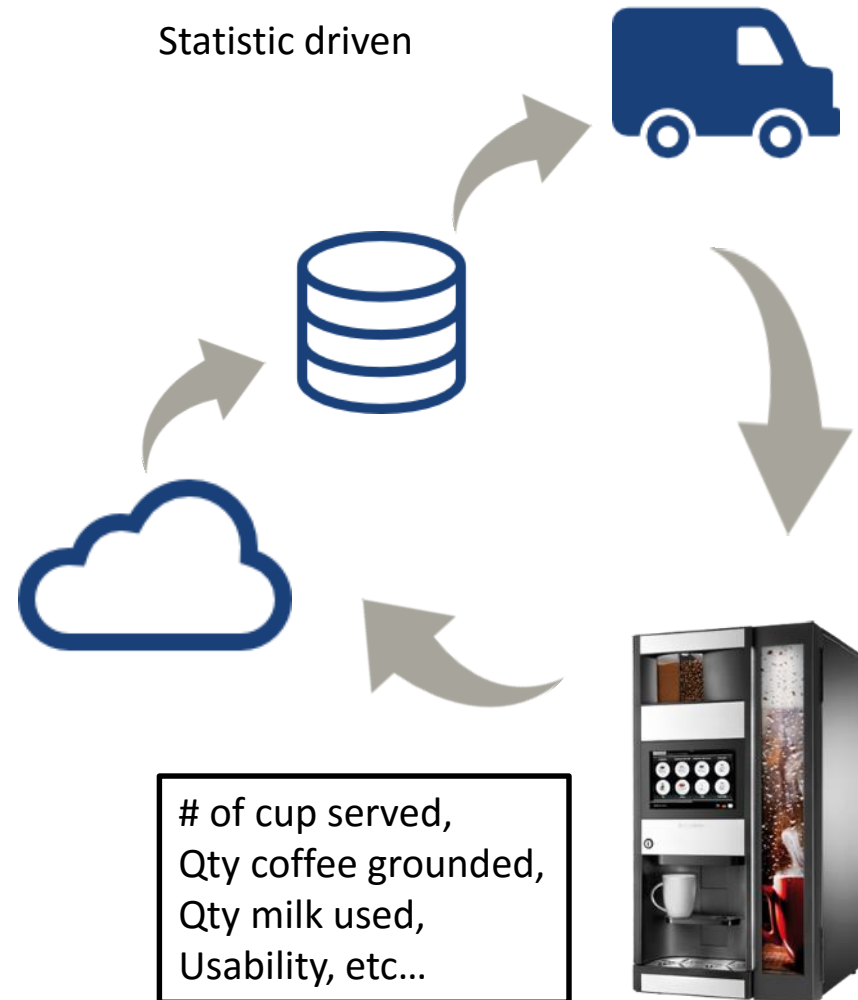
- Bring in Machine Learning Intelligence

- Intelligence driven automated maintenance

- Predictive maintenance optimizes further maintenance activity

- Impact on device lifespan (less devices with corrective maintenance) and maintenance cost (reduced useless intervention)

ML

Intelligence driven

# of cup served,
Qty coffee grounded,
Qty milk used,
Usability, etc…

3.
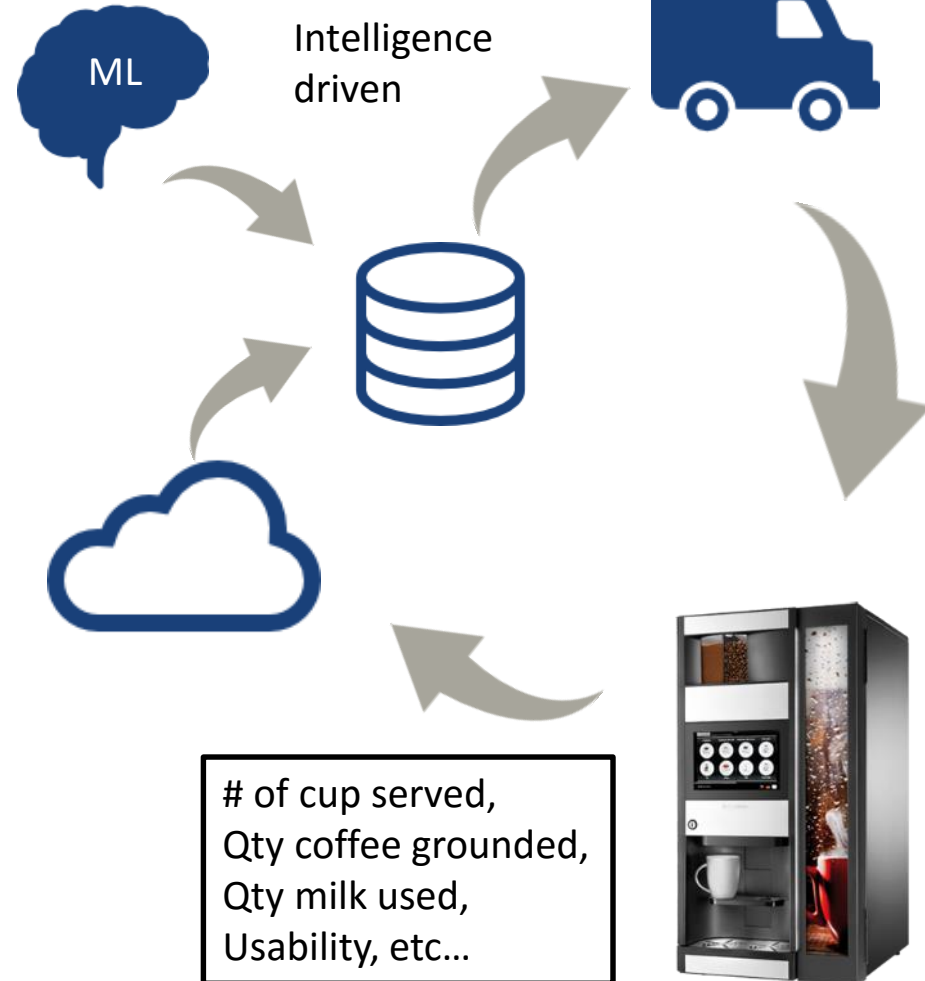
MOVING FROM REPLACEMENT TO RECYCLING

Hardware and Software efficiency through IoT

1. Data collection for better composition / material recycling -> Data centric

2. Hardware modularity for better design efficiency -> Device centric

3. Solving Hardware challenges with Software impact -> Device centric

✓ HW Modularity and adaptability

✓ Open source Hardware

✓ Longer lifespan and easier parts recycling

pi-top

The Maker's Laptop

10 hour
Battery Life

13.3" HD
Screen

Modular
Components

- ✓ Open Source policy -> ability to "hack" devices' software

- ✓ Community driven mindset of users / consumers

- ✓ Opportunity to Reduce equipments built-in obsolescence

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Upgrade devices without Hardware replacement

Benefits:
- ✓ Devices' datas cross usage giving 2nd life to equipments
- ✓ Moving from Smart Devices to Smart concepts

Creating smart systems
- ✓ Smart Cities, Smart Mobility, Smart Energy management

Create new usages for devices

Automated software upgrades adapting devices capabilities

Reduced built-in obsolescence (when combined with predictive maintenance)

Adapting devices process/behaviors based on Data mining / Analytics to reduce hardware parts' wear
- ✓ Ex: different coffee brewing process to improve coffee mill's wear

Enable new self maintenance capabilities based on failure analysis
- ✓ Ex: anticipating failures with improved embedded software detecting preliminary signs of issues

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Increased number of connected devices impact

- Limited to connectivity cost. Represents a few $ per device. Likely to be less than 10% of overall device value

Predictive maintenance impact

- Coffee machine scenario: estimation of 30% impact on parts replacement and equipment lifespan

Software modularity, upgradability and Adaptability for IoT connected devices

- Too early to measure impact potential

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System Software
Integrator
For Embedded devices
and smart objects

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