



Welcome to AEF

# Interoperability

## Allowing machines to understand each other

Norbert Schlingmann, General Manager

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## Content

- Introduction AEF main goals
- Future networks and communications
- Collaboration with ETSI and CEMA
- Outlook

## What's AEF doing

### → Agricultural Industry Electronics Foundation

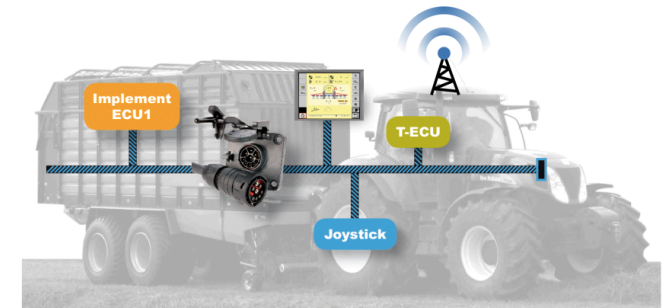
- Founded on October 28, 2008
- 8 major agricultural equipment manufacturers and 3 Associations
- Up to 200 member companies

### → Worldwide support of ISOBUS implementation

- Structured in 11 project teams
- Supported by 5 international test lab to certify products

### → Define standards for Ag industry

- Focus on Tractor – Implement connection using ISOBUS
- Coordinate activities and developments



## AEF combines ISOBUS and Ag industry needs

STANDARDIZATION

**ISOBUS**

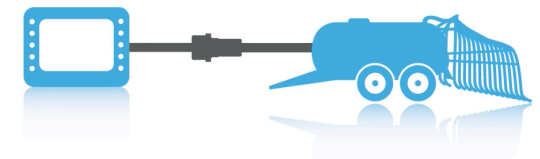
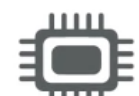
INTEGRATION



USER ORIENTED



COMPATIBILITY



### → Main goals

- Create solutions based on ISOBUS
- Define standards for Ag industry
- Focus on Tractor – Implement connection
- Coordinate activities and developments
- Communicate via interfaces

## Ag industry landscape – Lots of different tractors and implements

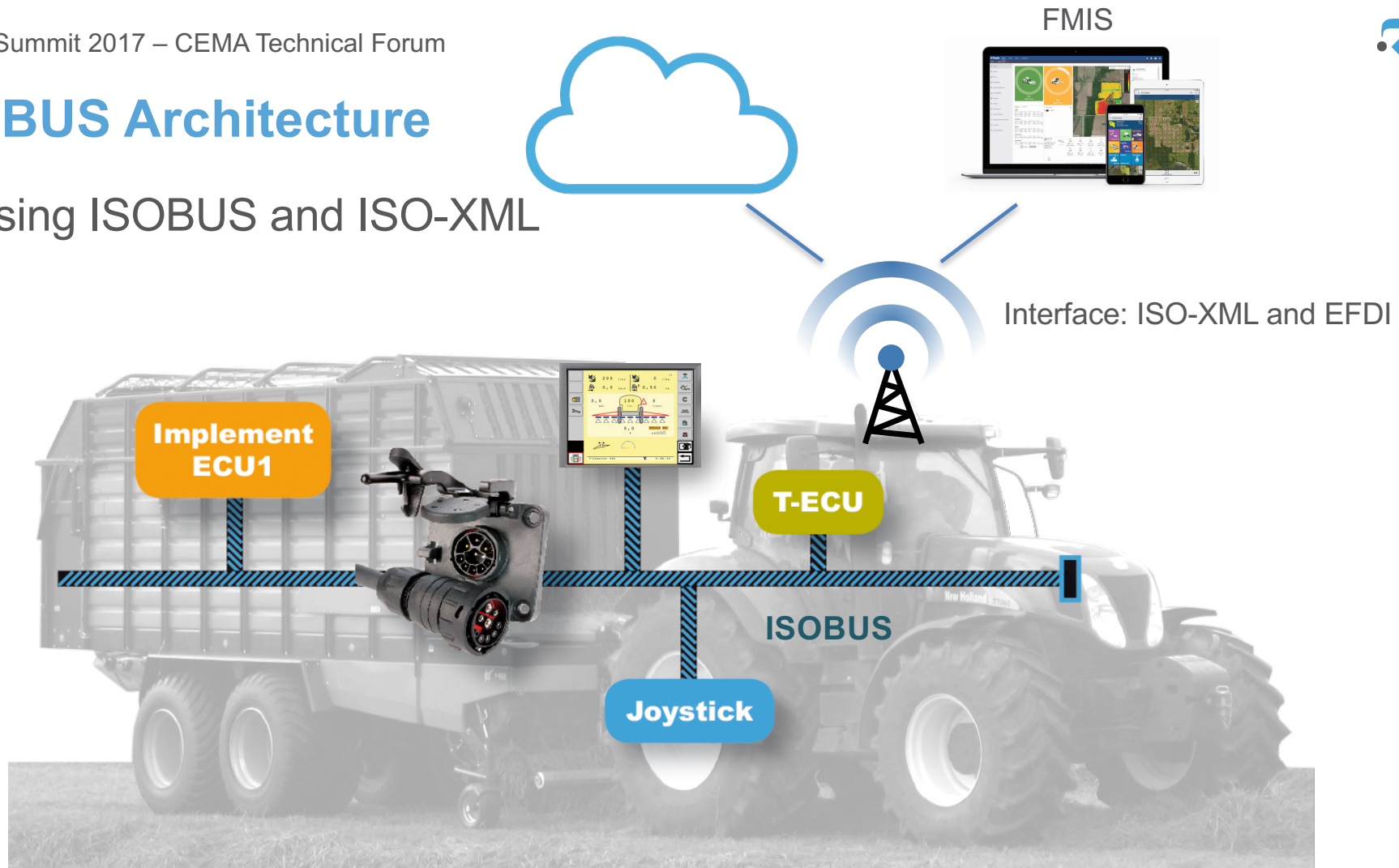
→ Working machine = Tractor + Implement

- Most of them equipped with ISOBUS
- Data exchange between working machine and outside world



# ISOBUS Architecture

→ Using ISOBUS and ISO-XML



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## Future Networks and Connectivity

- TIM – Tractor Implement Management
- Data Management / FMIS interfaces
- High Speed ISOBUS
- Wireless Infield Communications



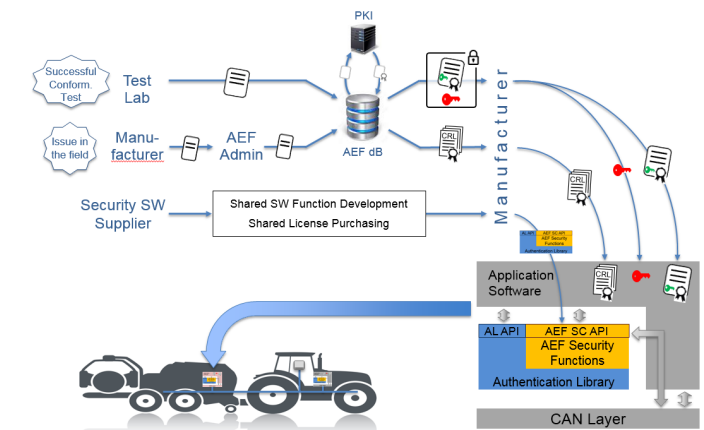
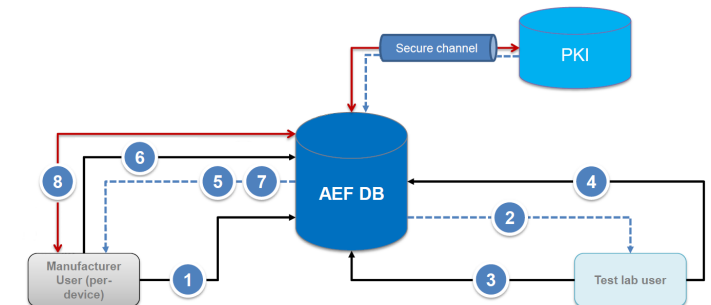
## TIM – Tractor Implement Management

→ Implement controls tractor by using

- Certificate handling with PKI infrastructure
- Manufacturer gets certificates after passed test
- Digital certificates can be downloaded

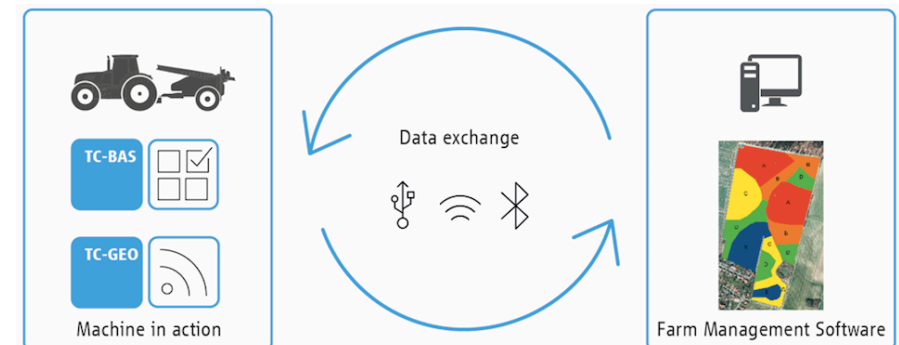
→ Security library developed for manufactures

- Check validity of digital certificates
- Allow to open TIM system when certificates are available
- Follow security standards



## Data exchange Machine – FMIS

- Data exchange is standardized in ISO11783, Parts 10 & 11
- Currently data is transported by USB stick
  - No longer adequate and useful
- Direct wireless communication of task data is necessary
- AEF has developed a new data transmission system, called EFDI
  - EFDI stands for Extended FMIS Data Interface
    - It replaces the function of the USB stick in the Machine / FMIS chain
  - Communication channels could be
    - Bluetooth
    - Wireless LAN
    - Mobile Communications

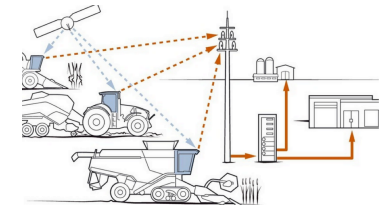


## High-Speed-ISOBUS

- Existing ISOBUS is CAN based
  - Speed and bandwidth are at their limit
- Exploring concepts for increasing bandwidth on the Bus, to ease and speed up data exchange
  - Ethernet technology in the scope
- This will lead to
  - The expansion of diagnostics
  - The support of electric drives
  - M2M communications
  - Connection of real-time video systems



## Challenges for radio based M2M communication



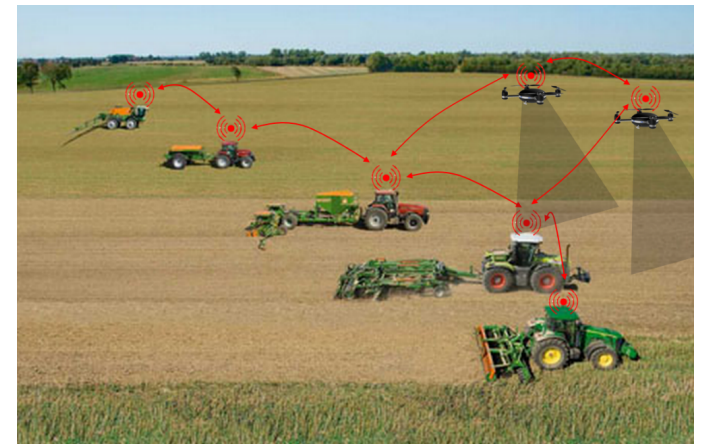
### → Edge conditions for agrarian used areas

- Machines operate in areas with low population density
- Low bandwidth and bad cellular coverage
- 90% of the world population today is connected via cell phone
- Only 30% of the landscape is covered by cellular radio and even less with 3G

### → General demand for the standardization of a wireless direct M2M communication for agricultural in field usage

## Wireless In-field Communication

- AEF has begun investigating technologies to meet the industries future needs
  - Existing technologies 802.11-based Wifi standards
  - Car-to-car standard 802.11p
  - System architecture has to allow upcoming communication standards like 5G
- Definition of protocols and methods to exchange data
- User Cases include:
  - Process Data Exchange
  - Co-operative machines
  - Camera and Remote Terminal



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## Collaboration with ETSI

→ AEF was selected to be part of an ETSI – Project

- Involved organisations: ETSI, CEMA and oneM2M
- Interface based on a warning message to vehicles passing-by
  - Pilot: “Tractor leaves field and entering a road”

→ Main goals

- Show Communication between different sectors
  - Without consolidation between sector – Silos and gaps will remain
  - Looking for technical reports that show cooperation
- Need of safety and security between the sectors has to be addressed

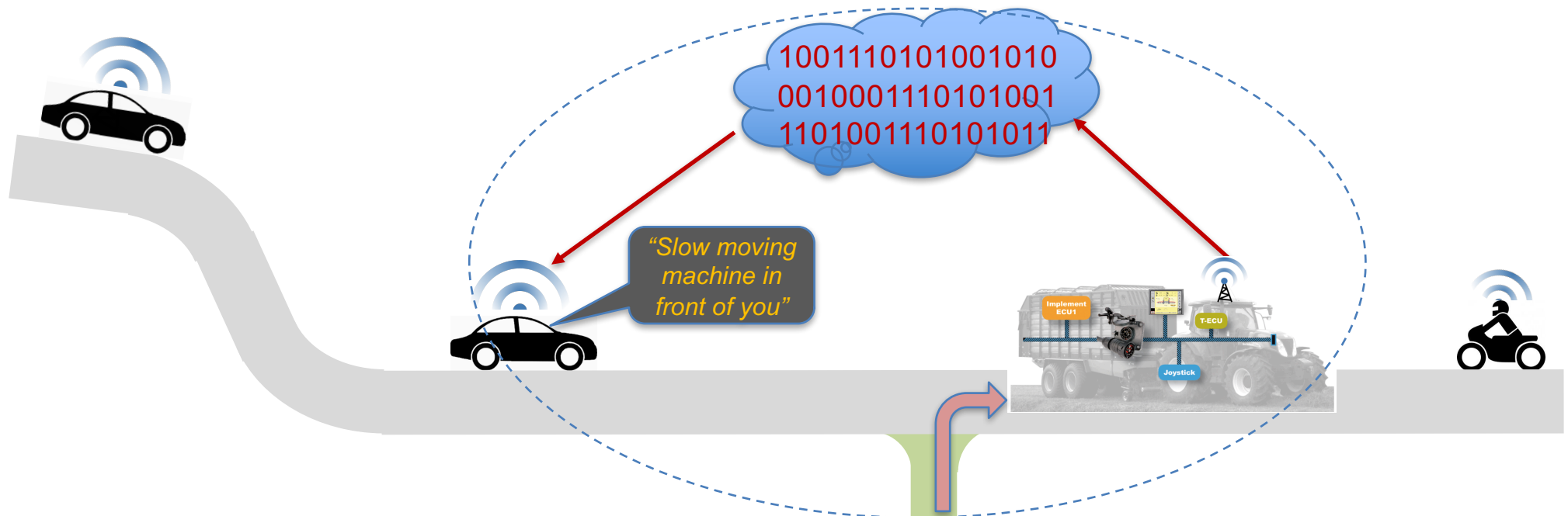
ETSI → European Telecommunication Standards Institute



## Pilot: Tractor leaves field and entering a road

Use case: Tractor leaves field entering a road

- Send information when entering a street
- All cars within a range gets a message: *Slow moving machine in front of you*



## AEF could identify a gap for IoT

### → AEF fulfils the industry need for safety standards

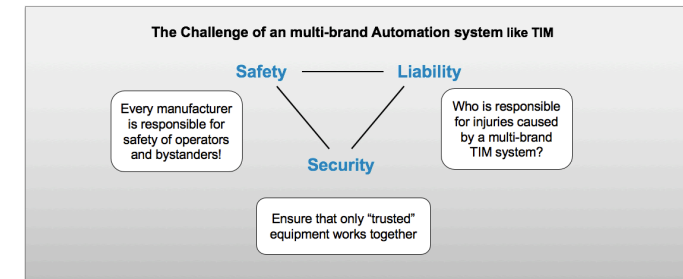
- Providing guidelines
- Insuring compatible and safe Ag equipment

### → Security

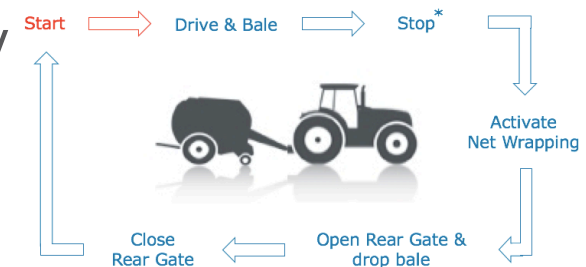
- Provide conformity to ISO25119
- Manage complex systems

### → IoT landscape needs more emphasis on safety and security

- AEF provides safe and secure data
- The Ag sector legacy of safety and security needs to continue



### Tractor implement management



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## Summary

- Data has to be easily managed for improved usage by the end customer
  - Manage interoperability by using existing infrastructure and defined interfaces
    - like ISO-XML and the new EFDI protocol
  - Organize data interaction from M2M or from M2C based solutions
- EFDI to transfer data during machine operability is on the way
- New wireless communication channels to transfer data from machine-to-machine have to be developed
- High-Speed-ISOBUS will be a revolution for tractor communication systems
- Continue the legacy of safe and secure Ag equipment

The farmer expects easy access, at all times, to the data needed to optimize his field and machines operations.  
In the end he must stay connected.



Thank you for your attention.

Questions?  
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