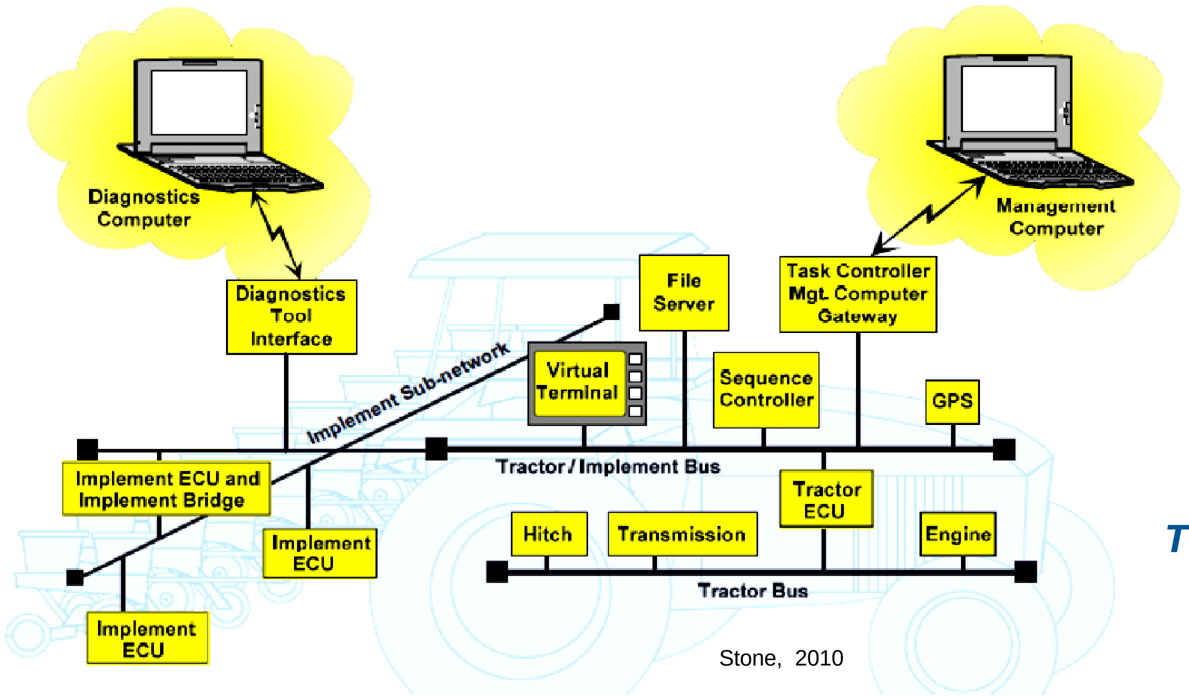
ISOBUS in European Precision Agriculture



Stone, 2010

Hermann
Auernhammer
Freising-Weihenstephan
Germany

The Second International Summit on Precision Agriculture

ISTPA 2014

2014 Sep 12-15

Beijing

China

Agenda

1. **Agricultural BUS-Systems**

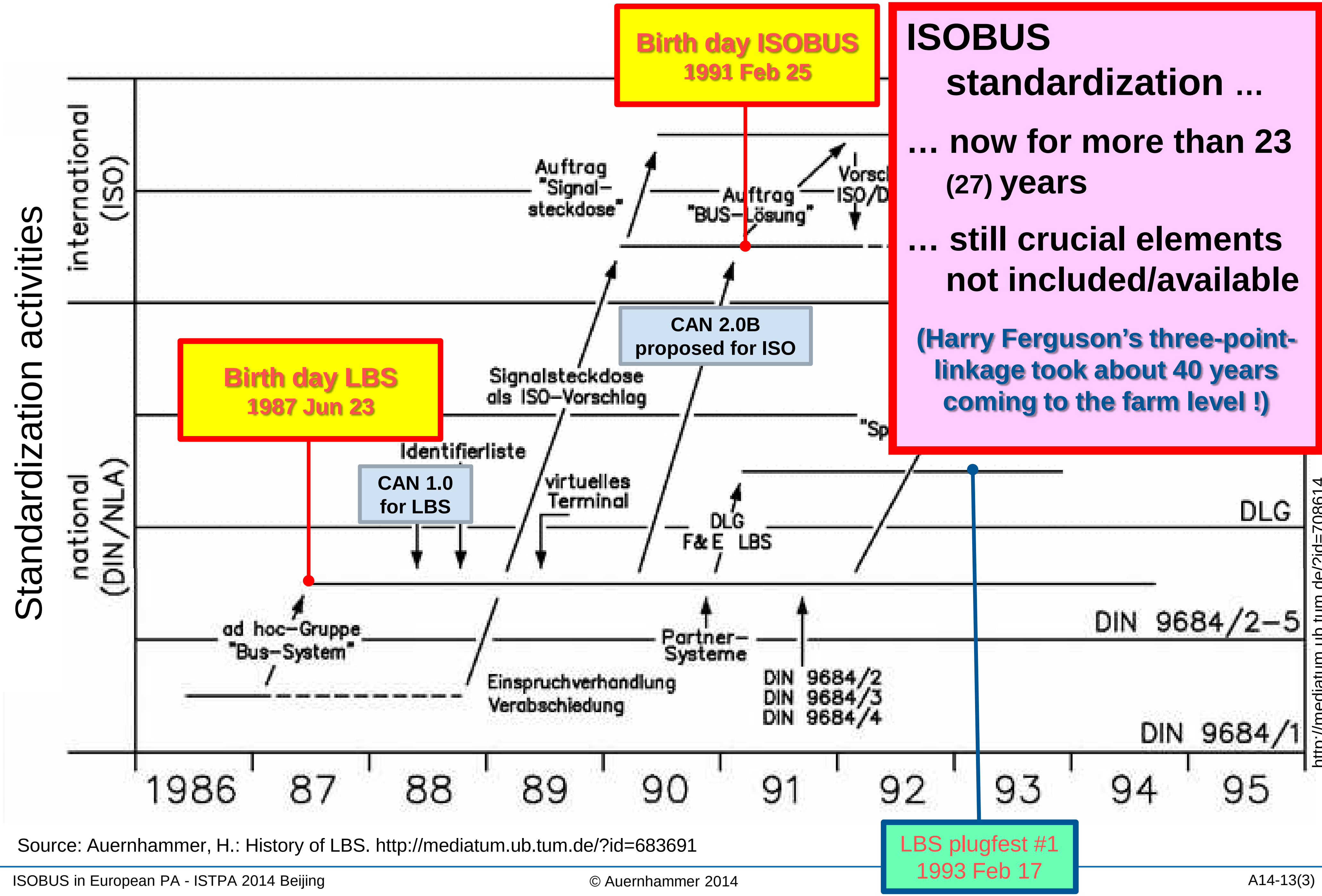
2. **ISOBUS UT in Precision Agriculture**
   - Supplier groups
   - Sensor integration
   - Acceptance

3. **TIM for more precise implement work**
   - In-house
   - Bi-lateral

4. **Companies preparation for the new age**

5. **Conclusions**

ISOBUS – a long lasting story



ISOBUS standardization …

… now for more than 23 (27) years

… still crucial elements not included/available

(Harry Ferguson's three-point-linkage took about 40 years coming to the farm level !)

Source: Auernhammer, H.: History of LBS. http://mediatum.ub.tum.de/?id=683691

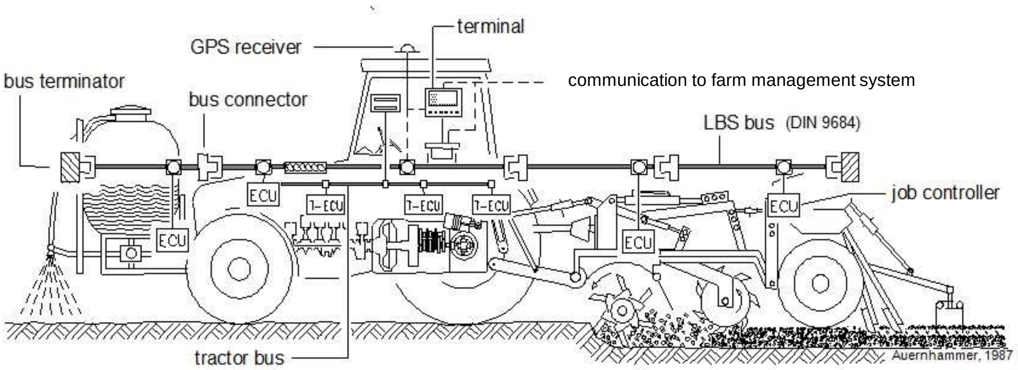
LBS & ISOBUS – big differences?

Landwirtschaftliches BUS-System (LBS)

(Agricultural BUS-System (LBS))

DIN 8694, part 2 - 4

- standardized 1987 – 1997 -

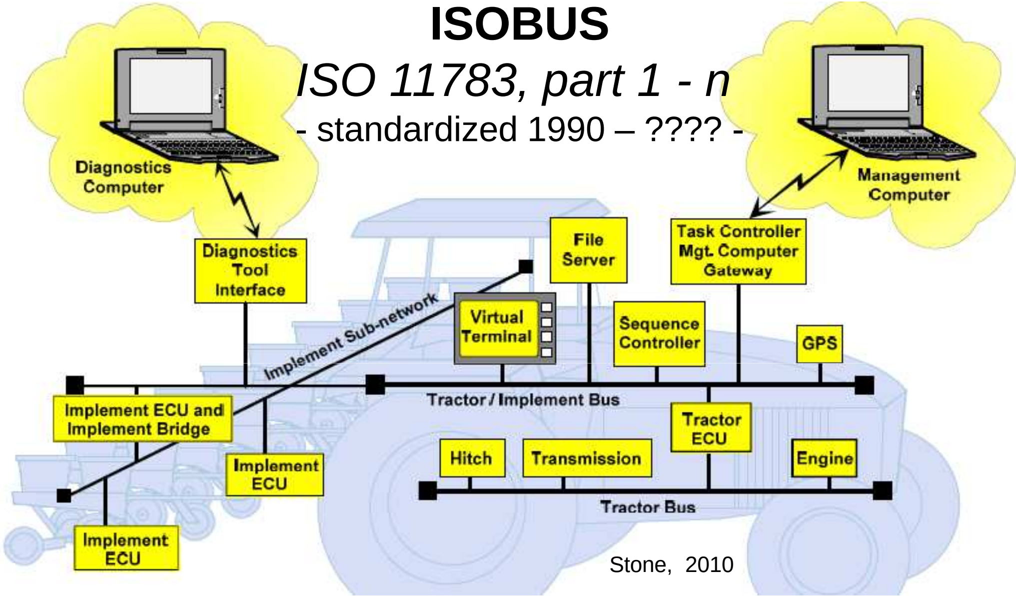


- European standardization group ($D_{Initiator, Lead}$,NL, DK, F, GB) started 1987
- CAN1.0 with 125 kB/s, ECU's , Virtual Terminal, Task Controller, Connection to On-Farm-PC
- Implement Sub-Network integrated
- Diagnostics discussed but not integrated
- Proprietary messages not allowed
- Plugfest for independent development and test

ISOBUS

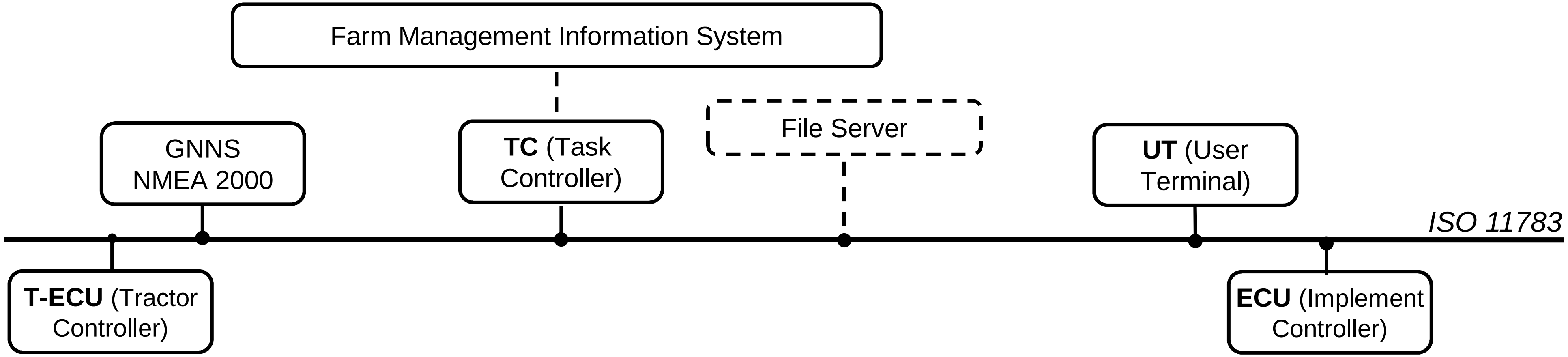
ISO 11783, part 1 - n

- standardized 1990 – ???? -



- European North & American standardization group ($DIN_{Initiator,}$ CA_{Lead}) started 1990
- CAN 2.0B with 250 kB/s, ECU's, Virtual Terminal, Task Controller, Connection to On-Farm-PC
- Implement Sub-Network integrated
- Diagnostics integrated
- Proprietary messages allowed
- Plugfest's for independent development and test
- Standard follows strictly OSI in ISO
- Additional items added / under development

ISOBUS today – UT for implement control accepted



- In higher engine-powered tractors ISOBUS connectors are standard equipment following class I (II when extended front mounting is available)
- Any equipment manufacturer with electronic implement control guaranties the usage of certified user terminals (UT)
- Electronic implement control is today state-of-the-art in sprayers and spreaders, often in seeders and planters too and upcoming in slurry-tankers
- In sprayers mainly map-based section control is installed
- (Spin) Spreaders are mainly used together with NIR-sensors targeting maximum yield per plot
- Automatic documentation is basic configuration in application implements (as-applied maps), but non-electronic implements (particularly tillage equipment) are still out of automatic data acquisition

ISOBUS today – UT's offered by supplier groups

Tractor companies
(e.g. AGCO, CNH, JD, …)

- Used for implement control mainly (certified ISOBUS conformity)
- Tractor internal control and information
- **Usage of proprietary (company specific) messages**

Electronic companies
(e.g. Müller, Reichhardt, WTK, …)

- **Used for implement control mainly (certified ISOBUS conformity)**
- **Touch screen (wide and upright format)**
- Manufacturer independent
- **Tailored to specific client specifications** (OEM)

Implement companies
(e.g. CCI-Group, …)

- **Used for implement control mainly** (certified ISOBUS conformity)
- **Similar M2M-Interface for implement control of all group member companies**

ISOBSUS today – proprietary (NIR)sensor integration

Wired integration

- The European market leader with more than 1.000 installed units integrates its NIR-sensors (passive and active) through wired RS232 connection to the ISOBUS-UT
- Spreader control strategy normally follows the principle of “getting maximum yield per plot” (risk of over-fertilization)
- Map-based control is an option
- Map-overlay is recommended to last N-dressing

Wireless integration

- Newly offered N-Sensor by FRITZMEIER is connected by Bluetooth to the ISOBUS-UT
- Spreader control normally follows the “map-overlay” strategy (less over-fertilization)

ISOBUS today – implement optimization by *p*TIM (in-house)

- Up to now in any tractor implement combinations the tractor (the driver) controls the implement
- But to do a more efficient (more precise) task the implement has to control the tractor (in ISOBUS called “Tractor Implement Management TIM”)

Initiated by a sequence control of the Implement-ECU

1. Tractor is stopped,
2. the round baler opens the hatch door
3. the bale is drawn out,
4. the hatch door is closed and
5. the tractor moves ahead

“In-house TIM” → *p*TIM

- Usage of proprietary messages
- Company-own safety responsibility
- Stimulate/dominate the market

ISOBUS today – implement optimization by *p*TIM (bi-lateral)

- Up to now in any tractor implement combinations the tractor (the driver) controls the implement
- But to do a more efficient (more precise) task the implement has to control the tractor (in ISOBUS called “Tractor Implement Management TIM”)

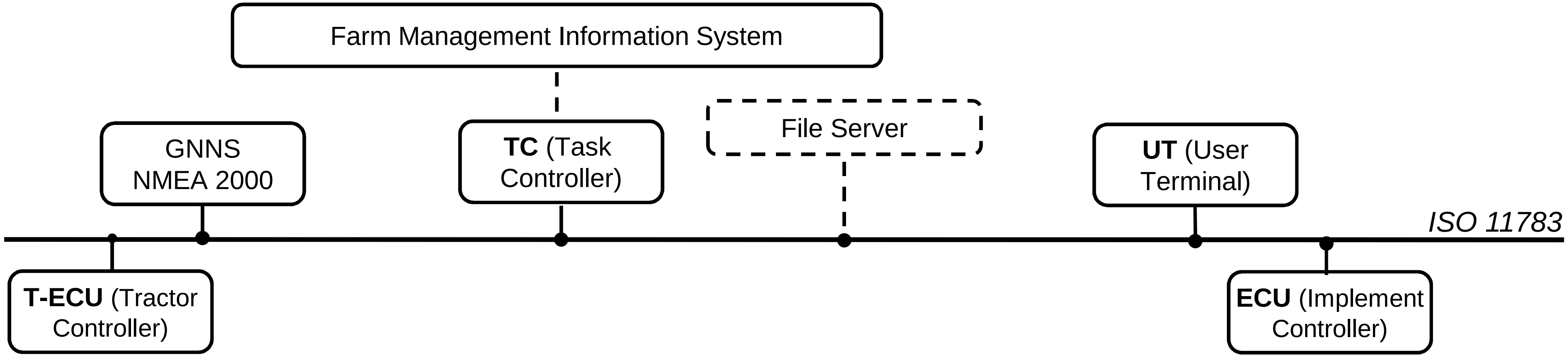
Initiated by the Implement-ECU the tractor speed is modified depending from rotor torque and incoming swath size

MAX-Mode	ECO-Mode
Loading performance max. 95 % efficiency	Loading performance adjusted by the driver between 70 and 90 % efficiency

“Bi-lateral TIM” → *p*TIM

- Usage of proprietary messages
- Selected equipment
- Bi-lateral company-approved safety responsibility
- Stimulate/dominate the market

ISOBUS today – companies ready to go



- In **tractor companies** electronic units increased in number of employees and in importance of development (pre-development)
- Nearly all **equipment manufacturer** (SME's) with more than about 100 employees established own electronic units to assure the sovereignty of company-specific solutions and getting independence
- **SME's** create cooperation's
  1. to a more powerful influence of the standardization,
  2. to be more competitive against "Full- and Long-Liners" and
  3. to have a greater standing in the product export.

ISOBUS in European Precision Agriculture - Conclusions

After more than 25 years of standardization the ISOBUS is coming to the farm level and to Precision Agriculture

ISOBUS solutions are mainly used for site specific applications with sprayers and spreaders

There is a wide choice of User Terminals

Online-sensing still needs proprietary solutions

Besides “Variable Rate Application” and “Auto Steer (not part of ISOBUS)” “Tractor-Implement-Management TIM” allows more productive and more environmentally friendly equipment applications in Precision Agriculture