INTERNATIONAL ELECTROTECHNICAL COMMISSION

Information from IEC TC65 to IEEE 802

Saint John's, Canada, 06. Sep. 2017

Establishing a joint group between IEC 65C/MT9 and IEEE 802.1 to an industry profile using TSN

Ludwig WINKEL – Siemens AG

IEC TC 65 *INDUSTRIAL-PROCESS MEASUREMENT, CONTROL AND AUTOMATION*

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Secretary: **R. BELLIARDI (FR)**
Assist. Sec: **B. DUMORTIER (FR)**

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AG: ADVISORY GROUP
16

SC 65A
SYSTEM ASPECTS

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WG4: E.M.C. Requirements
Convenor: **B. JAEKEL (DE)**   25

WG14: Funtional Safety Guide
Convenor: **R. BELL (GB)**   21

WG15: Alarm systems
Convenor: **D.G. DUNN (US)**   24

WG16: IEC 61069
Convenor: **R.KRETSCHMANN (US)** 11

WG17: Human Factors and FS
Convenor: **H. SCHAUB (DE)**   23

MT61508-1/2 Maintenance
Convenor: **R. BELL (GB)**   58

MT61508-3 Maintenance
Convenor: **A. CANNING (GB)**   53

MT61511 FS for Process Ind.
Convenor: **V. MAGGIOLI (US)**   62

MT61512 Batch Control systems
Convenor: **R. DWIGGINS (US)**   14

AHG16 Human factors and FS
Convenor: **H. SCHAUB (DE)**   16

AHG17: Terminology
Convenor: **R. Kretschmann (US)**   8

SC 65B
MEASUREMENT & CONTROL DEVICES

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WG5: Temperature Sensor
Convenor: **M. GOTOH (JP)**   23

WG6: Testing & Evaluation
Convenor: **D. FANTONI (IT)**   25

WG7: Programmable control sy.
Convenor: **R.KRETSCHMANN(US)** 67

WG9: Final Control Elements
Convenor: **A. GLENN (US)**   15

WG14: Analyzing Equipment
Convenor: **J. TATERA (US)**   23

WG15: Function Block
Convenor: **J. CHRISTENSEN(US)** 17

WG16: Power sources
Convenor: **L. WINKEL (DE)**   11

JWG7: LOP Pressure Measuring
Convenor: **P. ZGORZELSKI(DE)**   10

JWG 8: LOP Temperature
Convenor: **D. BOGHUN (DE)**
Convenor: **P. ZGORZELSKI (DE)**   10

JWG 17: LOP valves&process regulators
Convenor: **R. OKUTSU (JP)**   11

PT61207-7: Gas Analyzers
Convenor: **J. WANG (CN)**   5

PT62829: Chemometrics
Convenor: **M. MAIWALD (DE)**   7

PT62492-2: Radiation thermom.
Convenor: **M. GOTOH (JP)**   6

PT61987-24: Chemometrics
Convenor: **P. ZGORZELSKI (DE)**   11

SC 65C
INDUSTRIAL NETWORKS

Chairman: **T. CAPEL (CA)**
Secretary: **V. DEMASSIEUX (FR)**
Assist.Sec: **B. DUMORTIER (FR)**

MT9: Fieldbus Maintenance
Convenor: **L. WINKEL (DE)**   59

JWG10: Industrial Cabling
Convenor: **F. RUSSO (IT)**   42

WG12: FS for fieldbus
Convenor: **V. DEMASSIEUX (FR)** 38

WG13: Cyber Security
Convenor: **T. PHINNEY (US)**   25

WG15: High Availability network
Convenor: **G. HOERCHER (DE)**   41

WG16: Wireless
Convenor: **JD. DECOTIGNIE(CH)**   48

WG17: Wireless Coexistance
Convenor: **L. WINKEL (DE)**   32

Overview
- **380 Standards**
- **58 working groups**
- **1436 seats, 684 experts**
- **30 countries**
- **94 Publications in last financial year**

SC 65E
DEVICES AND INTEGRATION IN ENTERPRISE SYSTEMS

Chairman: **J. BRIANT (FR)**
Secretary: **B. LATTIMER (US)**
Assistant Sec: **C.ROBINSON(US)**

WG2: Prod. Prop. & Class
Convenor: **P. ZGORZELSKI (DE)** 11

WG3: Commissioning
Convenor: **T. KNOHL (DE)**   4

WG4: Field Device Tools
Convenor: **C.DIEDRICH (DE)**   14

WG7: Function Block + EDDL
Convenor: **C.DIEDRICH (DE)**   16

WG8: OPC
Convenor: **I. WEBER (DE)**   21

WG9: Automation ML
Convenor: **B. GRIMM (DE)**   13

WG10: Device Management
Convenor: **I. VERHAPPEN (CA)**   6

JWG5: Enterprise Control SI
Convenor: **D. BRANDL (US)**   26

JWG6: Device Profile.
Convenor: **I. WEBER (DE)**   9

WG 11: Condition Monitoring
Convenor: **M. Wollschlaeger(DE)**10

AHG 1: Smart Manufacturing Information Models
Convenor: **P. JUHEL (FR)**   21

WG1: Terms & Definitions
Convenor: **W. CRAEMER (DE)**   6

WG10: Net & Syst. Security
Convenor: **L. NEITZEL (US)**   73

WG12: P&I P&ID PCE-CAE
Convenor: **G. MAYR (DE)**   10

JWG13: Safety requirements
Convenor: **R.KRETSCHMANN(US)** 34

JWG14: Energy Efficiency(EEIA)
Convenor: **G. HOERCHER (DE)**   42

WG15: Documents f.Process Industry
Convenor: **S. SCHÜLER(DE)**   11

WG16: Digital Factory
Convenor: **T. HADLICH(DE)**   29

WG17: Smart Grid Interface
Convenor: **T. ISHIKUMA (JP)**   18

WG18: Cause and Effect Table
Convenor: **H. WEBER (DE)**   9

WG19: Lifecycle Mgmt.
Convenor: **M. ULLEMEYER (DE)**   11

WG20: Framework Safety&Security
Convenor: **K. DEMACHI (JP)**   31

JWG 21: Smart Manufacturing Reference Model(s)
Convenor: **M. Hankel (DE)**   6

AHG 2: Reliability
Convenor: **LU, Ding (CN)**   10

AHG 3: Smart Manufacturing Framework and Architecture
Convenor: **R. HEIDEL(DE)**   33

Yellow are the groups that will be involved in **Smart Manufacturing**

IEC TC65 overview of todays Member Countries and Liaisons

IEC TC65 Scope

TC65 provides today a framework of standards for the industry

- **Vertical: from enterprise through control and sensors/actuators to the process/product**
- **Life cycle phases: from design, engineering, commissioning, operation to decommissioning**
- **Horizontal: all industry e.g. batch, continuous, discrete**
- **Supply chain: from inquiry to distribution and maintenance**
- **System scope:**
    - **interfaces to other domains e.g. Smart Grid,**
    - **open interfaces e.g. OPC UA for the office floor,**
    - **open integration of components and communication**
- **Non functional requirements are supported e.g. safety, security, real time responses, reliability, etc.**

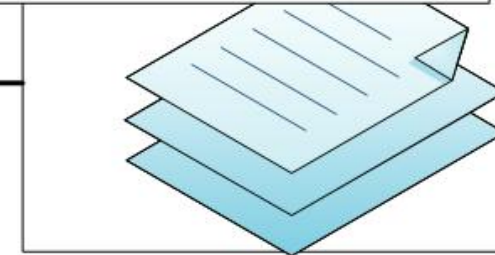**See:** http://www.iec.ch/dyn/www/f?p=103:7:0::::FSP_ORG_ID,FSP_LANG_ID:1250,25

Industrial communication networks -

FIELDBUS SPECIFICATIONS –

IEC 61158 Fieldbus Types

PART 1: *Overview and guidance for the IEC 61158 and IEC 61784 series*
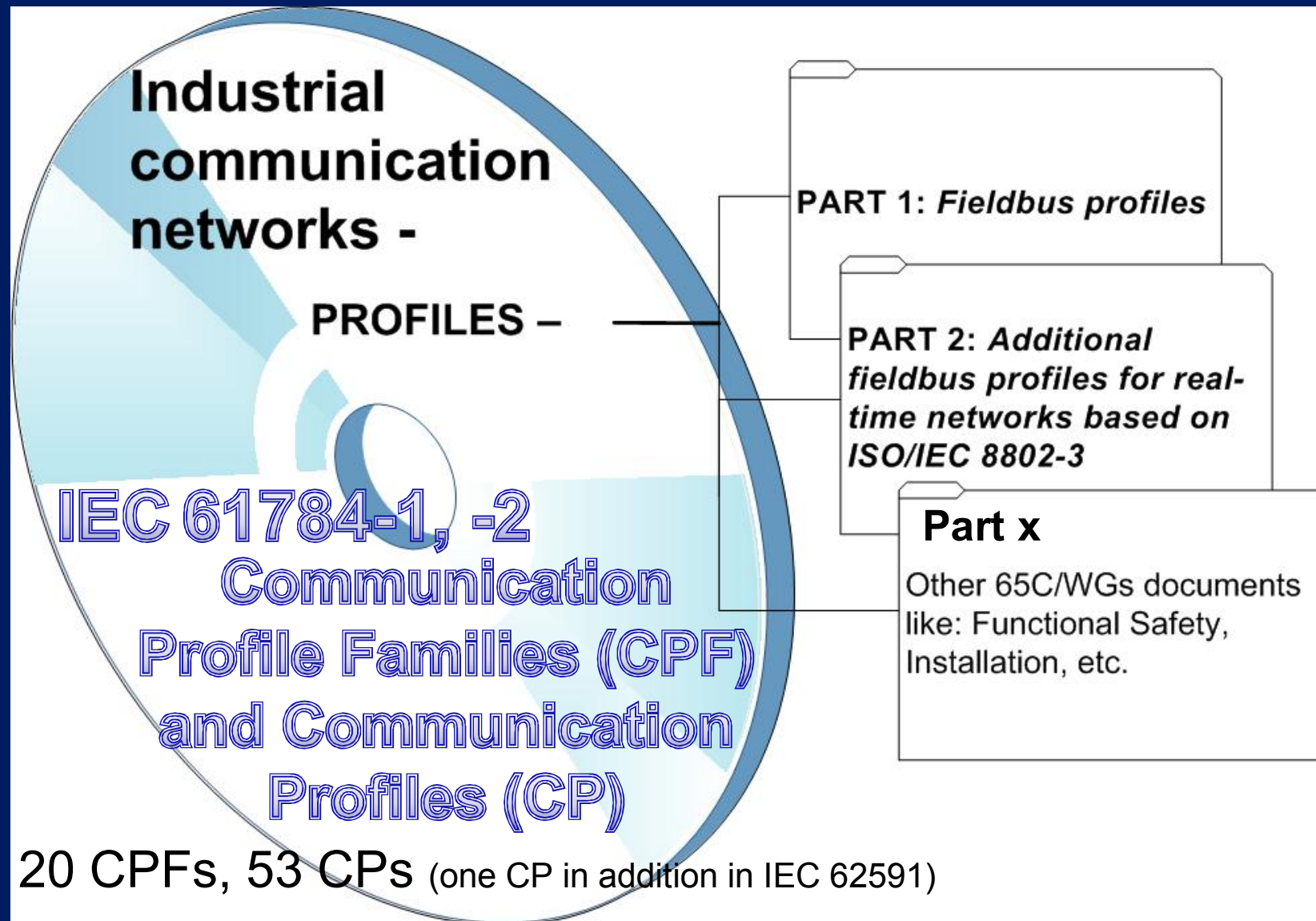
PART 2: *Physical layer specification and service definition*

PART 3, 4, 5 and 6: *Data / Application Layer protocol specification and service definition*

Industrial communication networks -

PROFILES –

IEC 61784-1, -2
Communication Profile Families (CPF) and Communication Profiles (CP)

PART 1: *Fieldbus profiles*

PART 2: *Additional fieldbus profiles for real-time networks based on ISO/IEC 8802-3*

Part x

Other 65C/WGs documents like: Functional Safety, Installation, etc.

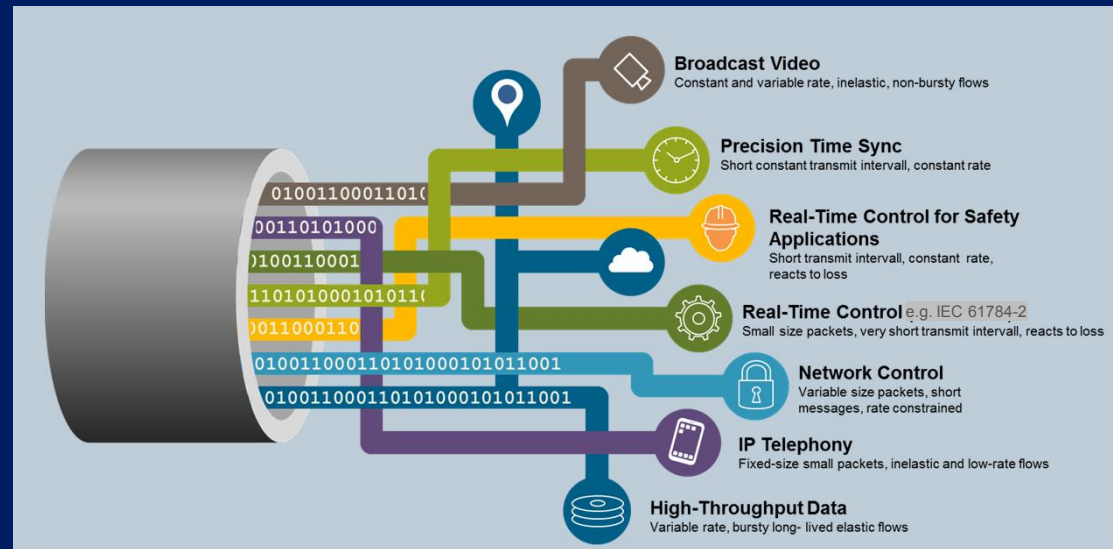20 CPFs, 53 CPs (one CP in addition in IEC 62591)

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Maintenance for IEC 61158 and IEC 61784-1 and IEC 61784-2 (Fieldbus)

- **83 published documents in 2014 on about 21 000 pages per language.**

- **87 documents expected in the 2018 edition (2 more CPFs with each 2 additional documents)**

TSN Objectives in Industrial Networks

- Convergence of multiple applications, which share a common network and get the required QoS each.

- Standardized interface for end-stations to gain guaranteed Quality of Service (QoS) for
  - Real-time communication,
  - Bounded low latency,
  - High availability.

Synchronization	Low Latency
Robustness	High Availability

TSN = **multiple IEEE Standards:**
(e.g.: IEEE 802.1ASbt, IEEE 802.1Qbu, IEEE 802.1Qbv, IEEE 802.1Qca, IEEE 802.1CB, IEEE 802.1Qcc)

Membership

- 65C/MT9 is convened by Ludwig Winkel (DE).
- 53 experts from 14 NCs plus 9 experts nominated from 9 D-Liaison partners.

TSN Objectives in Industrial Networks

- **TSN allows maintaining determinism with the confidence of being able to satisfy the requirements of less demanding traffic sharing the medium. The meaning of convergence in TSN is the successful convergence of critical control, non-critical control, and data streams on a single network.**

TSN defines **sub-standards** – **not a single protocol** (see http://www.ieee802.org/1/pages/tsn.html)!

TSN Profile Objectives

- Configuration Models

- User Network Interface (UNI)

- Network Internal Interface (NII)

- Synchronization: IEEE 1588, IEEE 802.1AS

- TSN Features:

  - Traffic Scheduling and Shaping

  - Robustness and Redundancy

- Security (MAC SEC)
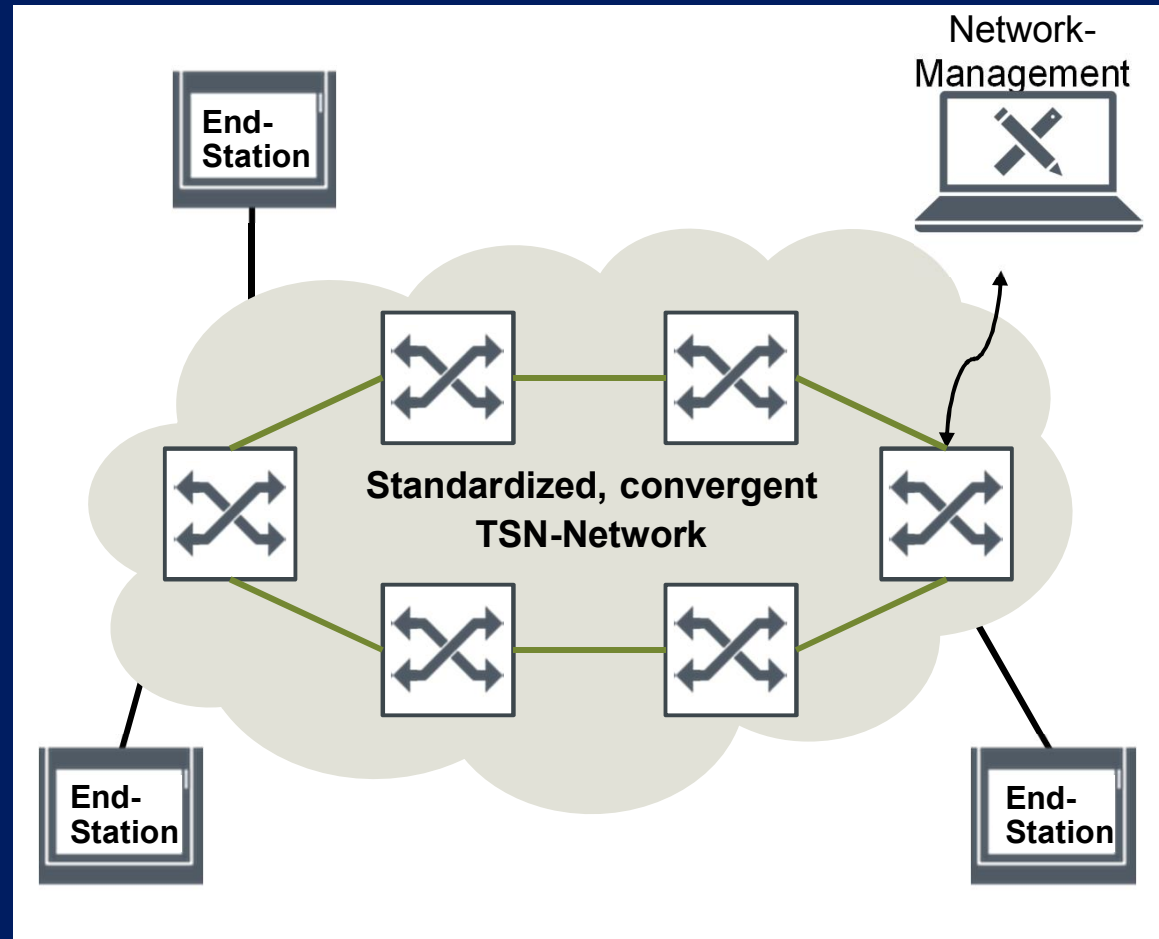
Need for a „Industrial Automation Profile"

- **Several different application domains were driving and influencing different Amendments of IEÈE 802.1, so that not all of them make sense for „Industrial Automation Applications".**

- **Examples of application domains:**
  - **Audio/Video Bridging**
  - **Measurement**
  - **Industrial Automation**
  - **Automotive**

TSN (Time-sensitive Networking)

- **Effects of TSN**
  - **Standard Ethernet becomes real-time capable even with a mixed traffic.**
  - **„Any" Ethernet based Communication can make use of real-time capabilities**
    - **OPC UA**
    - **…**
  - **TSN enables a technology-push based on Standard Ethernet Components**
- **Precondition**
  - **TSN supporting hardware, firmware and software**

End-Station

Network-Management

Standardized, convergent TSN-Network

End-Station

End-Station

Conclusion

- **The motivation of IEC 65C/MT9 to establish a joint effort of IEC and IEEE is that we will have the competence of IEEE 802 on board to specify the profile and if there will be gaps to have a short and quick relation to amend the technology suitable for the industrial automation industries.**

- **The process to form and work jointly together is described in the "Guide to IEC/IEEE Cooperation";** This brochure, as well as other documents and guidelines concerning IEC IEEE cooperation can be can be accessed at http://www.iec.ch/iec-ieee or directly on http://standards.ieee.org/develop/intl/iec_ieee_coop.pdf

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THANK YOU!