IPC-HERMES-9852

The global standard for "M2M" in SMT assembly

People who are online,
please present yourself and your company in the chat

WELCOME

to

12th The Hermes Standard Initiative meeting

Productronica & Online, Nov 13th 2023

Markus Mittermair

Chair of The Hermes Standard Initiative

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Markus Mittermair and Annett Dell from Rehm will guide you through the Meeting

Agenda

proposal

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Agenda of 12th **The Hermes Standard (IPC-HERMES-9852)** Initiative Meeting

The Hermes Standard Initiative meeting @ Productronica & Microsoft Teams		
Welcome • Introduction of new initiative members • Recap 11th Meeting in January 2023	Markus Mittermair Chair of the Initiative	13:00
Workgroup "Hermes test & validation" • Presentation of a test & simulation environment	Håkan Sandell Mycronic	13:20
Technical issues & decisions – Version 1.5 "Route" attribute lost in Hermes v1.5	Markus Mittermair Chair of the Initiative	13:40
Workgroup "Hermes Use-Cases" • Extension Best Practices Document • Adaption Hermes Specification	Thomas Marktscheffel ASMPT	13:50
IPC-Hermes Joint Standard Agreement	Markus Mittermair/Chris Jorgensen Chair of the Initiative/IPC	14:10
Introduction to IPC WORKS	Thomas Marktscheffel ASMPT	15:00
Organizational issues & decisions • Next meeting	Markus Mittermair Chair of the Initiative	15:15
Wrap-up and end of meeting @ 15:30	All participants	15:25

Regarding documentation the meeting will be recorded!

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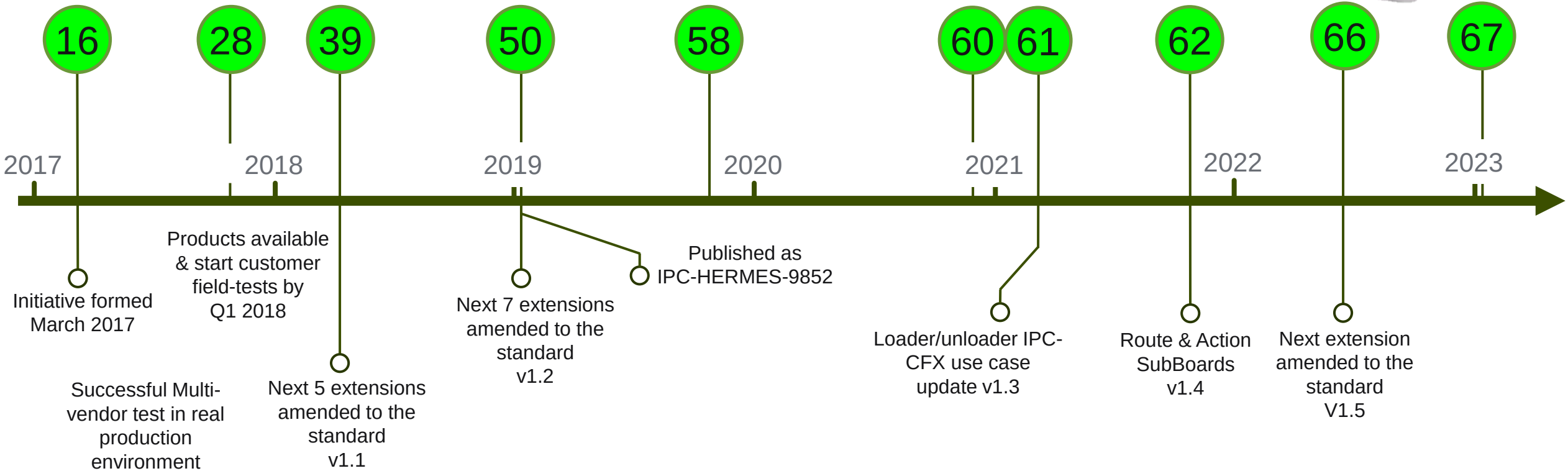
The Hermes Standard Initiative
A broad foundation across the entire industry assures global acceptance

4IR.UK British Systems
6TL Engineering
ACHAT5 Engineering
allSMT
ASM Assembly Systems
ASSCON
ASYS
Besi
Bright Machines
BTU
CKD
CTI Systems
cts
Digitaltest
ECD
Essemtec
EUNIL
EXELSIUS
FAMECS
FlexLink
GKG
GÖPEL electronic
Hanwha
Heller Industries
IBL Löttechnik
Innomelt
IPTE
ITW EAE
Japan Unix
JOT Automation
Keysight Technologies
KIC
Koh Young
kolb Cleaning Technology
Kulicke & Soffa
Kurtz Ersa
MagicRay Technology
Mirtec
MYCRONIC
Nordson ASYMTEK
Nordson Test & Inspection
NUTEK
OMRON
OSAI
PARMI
PEMTRON
Rehm Thermal Systems
Rejoint
RG Elektrotechnologie
Saki Corporation
Scheid IT
SEHO Systems
SEICA
SICK
SMT Thermal Discoveries
Solderstar
Sonic Technology
SPEA S.p.A
SYNEO
TAKAYA Corporation
Test Research Inc. (TRI)
Universal Instruments Corp.
Viscom
ViTrox
YJ LINK
YXLON

Current 67 members of the initiative as per January 2023

The Hermes Standard Initiative
Start simple & grow fast



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Welcome

new members

We had a few prospects, but no one followed the new member invitation. If a new prospect is present, they should report later. The formal part can also be repeated.

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What happened since last meeting

Apex January 2023 San Diego

We built three working Groups.

Who work independent from each other

Group	Group	Group
Hermes Use-Cases -- 8 Meetings	Test and Validation -- 7 Meetings	IPC-Hermes Joint-Standard Agreement -- 4 Meetings

The result of each group is really presentable.

Many thanks to everyone who has been involved

Especially at Hakan Sandell, Thomas Marktscheffel and Chris Jorgenson regarding support or management of the working groups.

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Hermes Test Workgroup

Håkan Sandell 2023-05-04

Members of the Working Group Test & Verification

Håkan Sandell – Mycronic

Leif Reichert – ASM Assembly Systems

Thomas Marktscheffel – ASM Assembly Systems

Tom Guerts – IPTE

Charlie Zhu – CyberOptics

Previous work – Test Plan

Test scenarios for Hermes Standard Compliance

- **Shall** be passed before releasing Hermes Standard Firmware

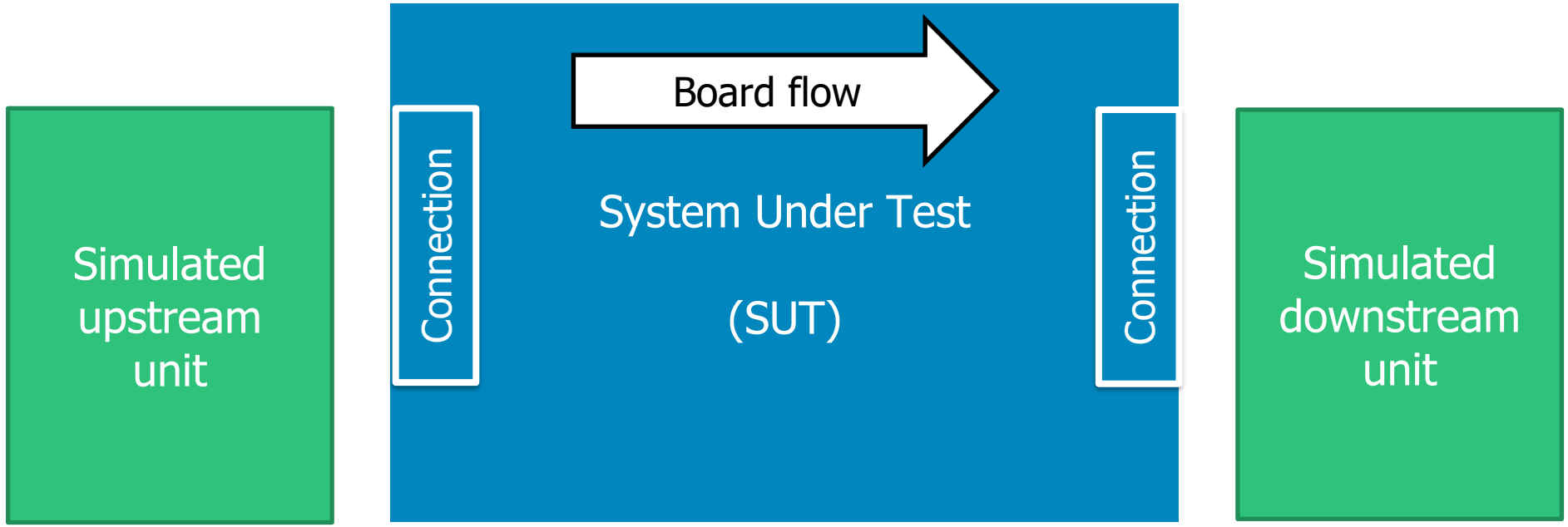
Test scenarios for workflows based on Hermes Standard

- **Should** be used as implementation and test guidance

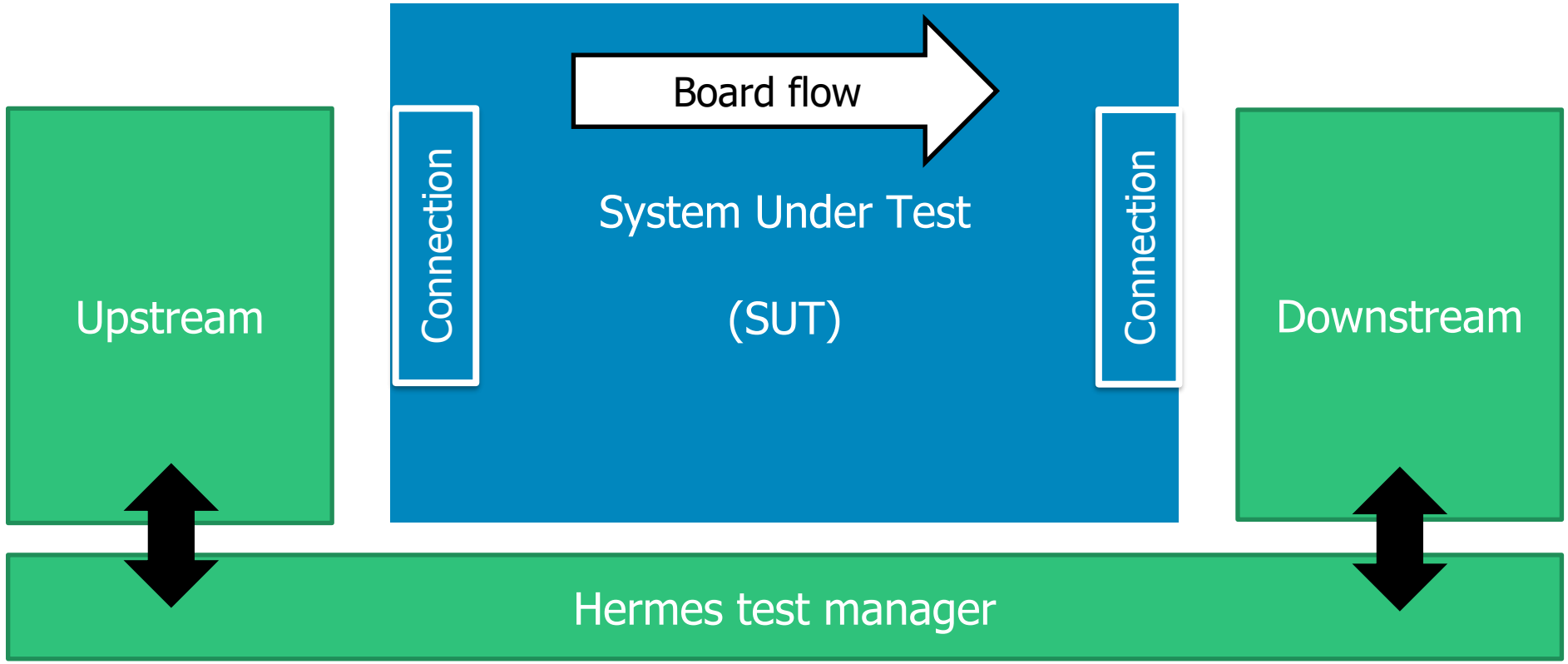
Abandoned due to low interest from member community

Test Plan

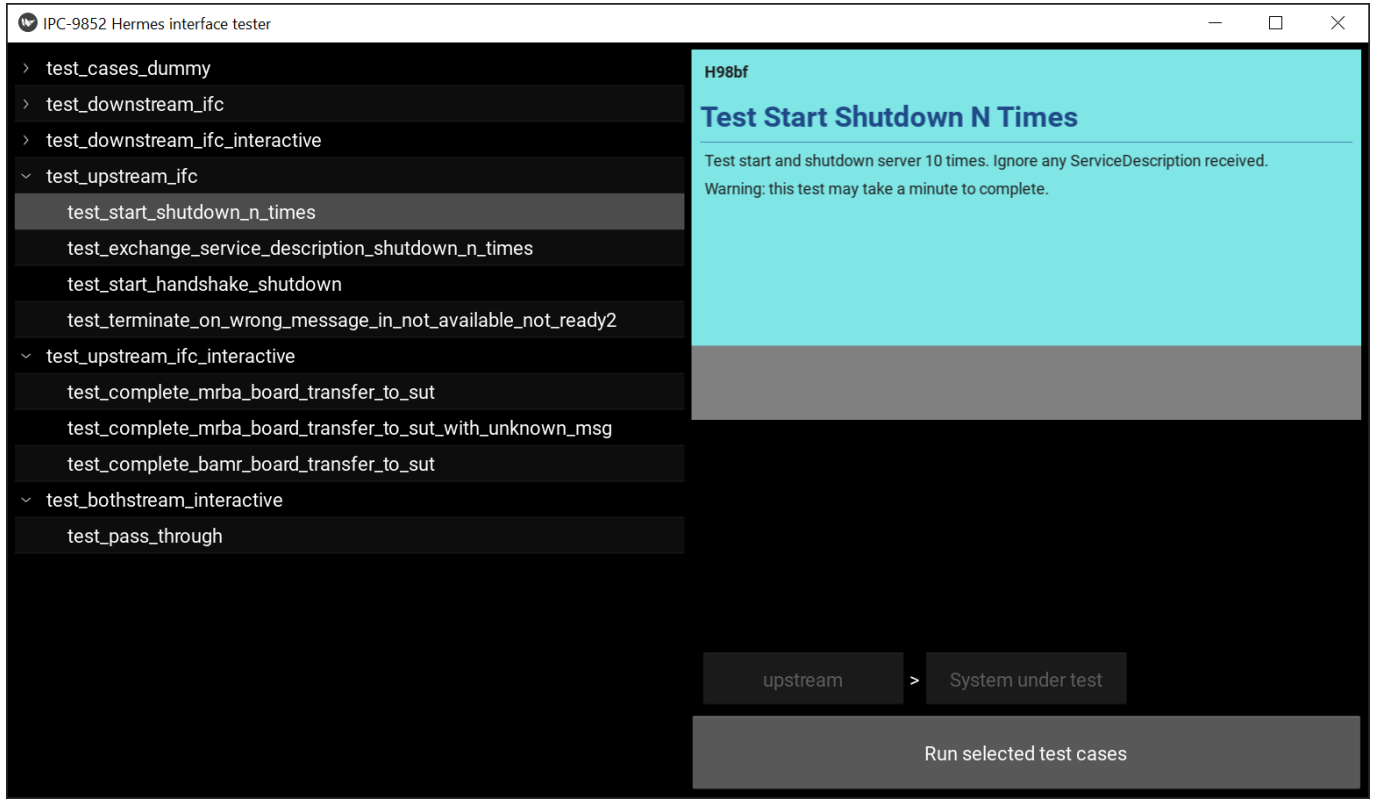
Results November 2023 – A Test Environment



Introducing “Hermes Test Manager”



Feature Summary

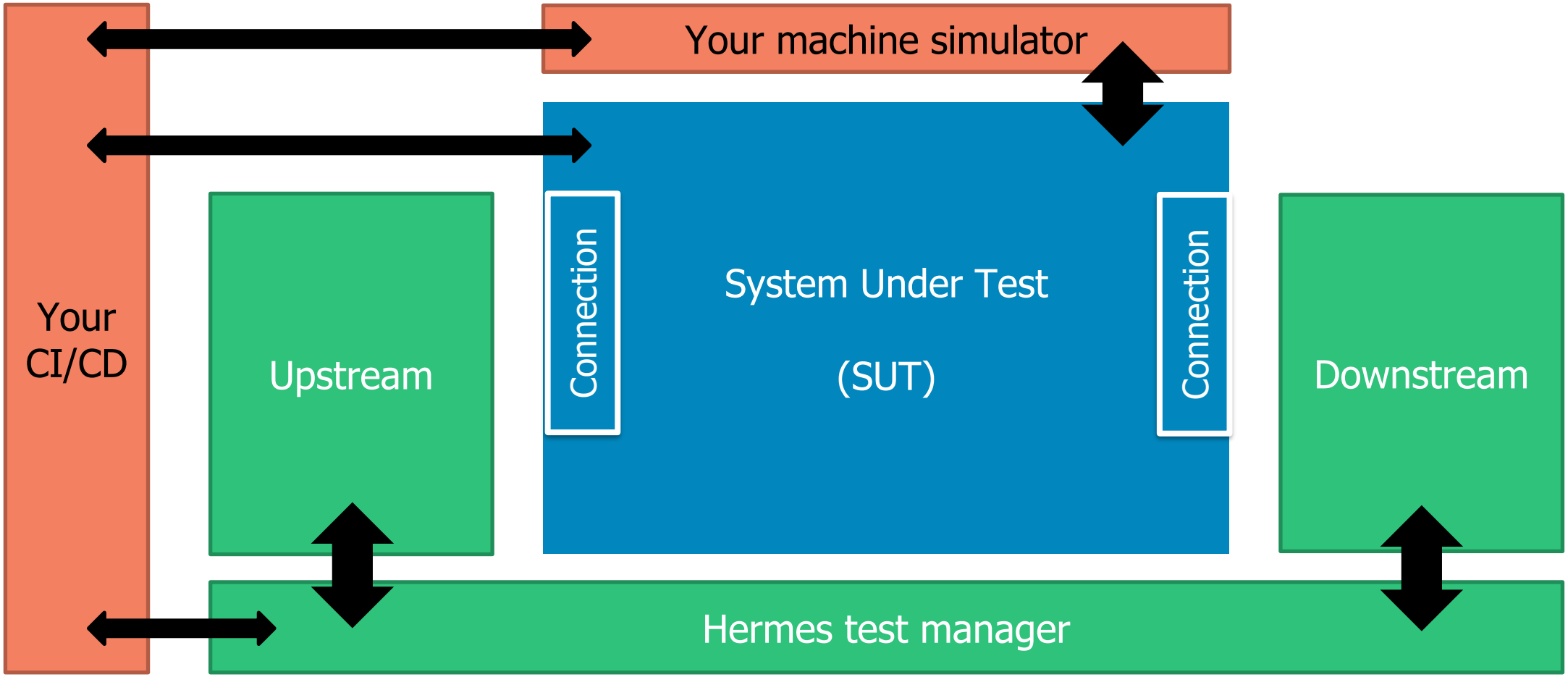


Test framework for Hermes Protocol

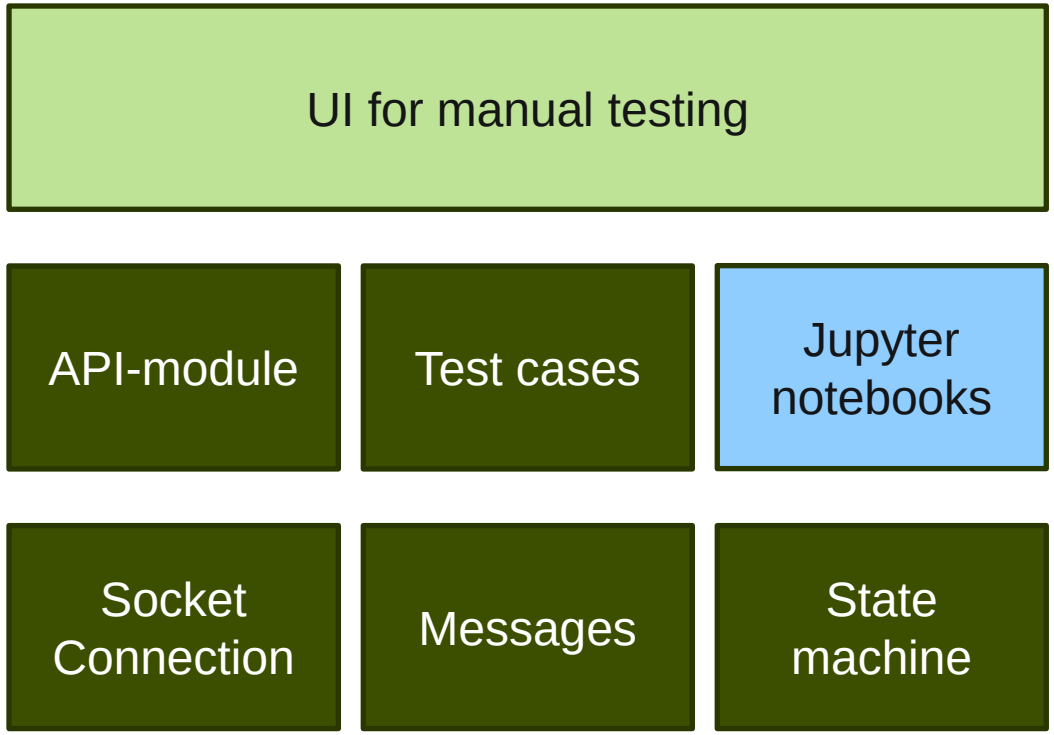
- Python language
- 18 test cases (2023-11-01)

- Alternative usage scenarios supported
- Stand-alone user interface
- From IDE e.g., Visual Studio Code
- Jupyter notebook
- Pytest
- API using Python modules

“Hermes Test Manager” API for automated testing



Project Structure



.app
The hitmanager app using Kivy multi platform framework

.mgr.hermes_test_manager
.test_cases
.notebooks

.ipc_Hermes

Note: The core modules are designed for a test application, may not be suitable to other purposes

Available at github.com/hermes-org/acceptance_tests

Configuration & Logs

Using GUI component => Ini-file style configuration, template created on first use

- **System under test IP address + Port**
- **Port used by test manager, default 50103**
- **Debug level [Debug, Info, Warning, Error]**

Standard Python Logging

- **Full configuration of log streams and format possible when not using GUI component**

List of test cases 2023-11-01

Upstream

- start_shutdown_n_times()
- exchange_service_description_shutdown_n_times()
- start_handshake_shutdown()
- terminate_on_wrong_message_in_not_available_not_ready2()

Interactive Tests

- complete_mrba_board_transfer_to_sut()
- complete_mrba_board_transfer_to_sut_with_unknown_msg()
- complete_bamr_board_transfer_to_sut()

Up- & Downstream

- pass_through()

Downstream

- connect_disconnect_n_times()
- connect_service_description_disconnect_n_times()
- connect_2_times()
- connect_handshake_disconnect()
- unknown_attribute()
- maximum_message_size()
- multiple_messages_per_packet()
- terminate_on_wrong_message_in_not_available_not_ready()

Interactive Tests

- complete_board_transfer_from_sut()
- complete_board_transfer_with_unknown_msg()

Conclusions

This is Open Source, with both “good & bad & ugly”

This is first version – a minimal viable product ;-)

Collaborate using GitHub – report issues or fix them!

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Route attribute lost in Hermes
Version 1.5

Markus Mittermair

Route attribute lost in Hermes Version 1.5

We had two proposals, both point in the same direction

- Is SendBoardInfo Missing Attributes?
- Route attribute got lost in v1.5

BoardAvailable has some more attributes than the message SendBoardInfo which is the answer of QueryBoardInfo and which restore the Hermes data. This would be a new proposal, but fact is, the Route attribute was included in Version 1.4 but absent in version 1.5.

	BoardAvailable V1.4 and V1.5	SendBoardInfo V1.4	SendBaordInfo V1.5
Weight	yes	no	no
Route	yes	yes	**no**
Action	yes	no	no
SubBoards	yes	no	no

The Route will be added again in Version 1.6, the others could be decided next time.

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Work Group:

Hermes Use Cases

Thomas Marktscheffel, ASMPT GmbH & Co. KG

Participants of Workgroup “Hermes Use Cases”

ASMPT	Tom Marktscheffel
ASYS	Kai Kammers
ERSA	Hélène Schloter
Nano Dimension / Essemtec	Bruno Müller
IPTE	Tom Geurts
Mycronic	Peter Sundström
Rehm	Markus Mittermair
Scheid IT	Markus Scheid
Sick	Christian Fritsch, Paul Langenbacher
MMT / SYNEO	Vincent Levannier

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Objectives of Workgroup “Hermes Use Cases”

- The Hermes Standard specifies machine-to-machine communication for transferring Boards and associated data
- The transferred data comprises a lightweight Digital Twin of the Board
- The Hermes Standard ensures consistency of this lightweight Digital Twin along the entire SMT Line
- Hence, this lightweight Digital Twin is an ideal basis for additional workflows for this SMT Line

The Workgroup “Hermes Use Cases” prepares recommendations for using Hermes and for implementation of Use Case using Hermes Data

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Recommendations for the HERMES Best Practices Document (I)

Encoding of attributes with type float shall be limited to 3 digits after the decimal point

- Encoding of attributes with type float should have 2 digits after the decimal point

When a client tries to connect to a machine that already has an active HERMES connection, then this machine will refuse the connection and send a notification with *NotificationCode 2* "Connection refused due to established connection" and it is recommended to send a *Severity 2* "Error".

- Add as a recommendation the HERMES Best Practices Document

FlippedBoard is missing as a possible parameter in our description of Hermes-driven automatic program change

- FlippedBoard is added to the list of possible parameters in our description of Hermes-driven automatic program change in the "IPC-HERMES-9852 Best Practices" document

Handling of empty strings is cumbersome and leads again and again to questions when troubleshooting a Hermes installation

- We recommend to allow empty strings and be prepared to handle them
- An empty string indicates that the upstream machine can handle the parameter, but doesn't know its value

Recommendations for the HERMES Best Practices Document (II)

Recommended Usage of *BoardForecast* with and without *ForecastId*

- Expediting Machine Response to Upcoming Changes
- Support of Gate Conveyor (Telescopic Conveyor)
- Handling of *BoardForecast* by a Shuttle

BoardForecast with vs. without ForecastId

BoardForecast without ID and without response

- BoardForecast without ID and without response from downstream machine will be sent for information of downstream machine, e.g., to improve overall SMT line performance.
  Recommendation: BoardForecast without ID shall be sent with every Board to ensure synchronization of state of all machines in the SMT Line

BoardForecast with ID and with response

- BoardForecast with ID and with response from downstream machine will be sent to ensure availability / ability of downstream machine to handle coming boards.
  Example: Upon arrival of a board, Oven sends BoardForecast with ID to Buffer to ensure that Buffer can take this board. If Buffer does not confirm, Oven will not let board in.

Expediting Machine Response to Upcoming Changes (I)

Upcoming change for machine that can stop the board at the output conveyor

- When receiving a *BoardAvailable* or *BoardForecast* message
  → if machine is empty, i.e. no board is inside, it should send a *BoardForecast* message without *ForecastId*
  → if machine is not empty, i.e. one or more boards are inside, it should wait until it is empty and then send a *BoardForecast* message without *ForecastId*

- If the data in the received *BoardAvailable* or *BoardForecast* message indicates a product change, the machine should send a *BoardForecast* message without *ForecastId* before starting the preparation for product change

Expediting Machine Response to Upcoming Changes (II)

Upcoming change for machine that cannot stop the board at the output conveyor

- When receiving a *BoardAvailable* or *BoardForecast* message
  → if machine is empty, i.e. no board is inside, it should send a *BoardForecast* message with *ForecastId* and wait for a *MachineReady* message with same *ForecastId*
  → if machine is not empty, i.e. one or more boards are inside, it should wait until it is empty, then send a *BoardForecast* message with *ForecastId* and wait for a *MachineReady* message with same *ForecastId*
- A machine that receives a *BoardForecast* message with *ForecastId* should include this *ForecastId* when sending a *MachineReady* message
- If the data in the received *BoardAvailable* or *BoardForecast* message indicates a product change, the machine should send a *BoardForecast* message with *ForecastId* before starting the preparation for product change

Support of Gate Conveyor (Telescopic Conveyor)

Gate Conveyor normally open

- Use a *BoardForecast* message without *ForecastId*
- As soon as an estimate is available for the timespan until the board is ready for downstream, a *BoardForecast* message should be sent
- Resolution of the estimated time shall be above 1 second

Gate Conveyor normally closed

- *BoardForecast* shall be used in a similar way as for normally open Gate Conveyor
- In addition, it should be avoided opening a normally closed Gate Conveyor when a board is eminent to be transferred

Handling of BoardForecast by a Shuttle

Shuttle 1-to-N Lanes

- Make it a configuration option whether *BoardForecast* will be sent downstream to all lanes or only specific lanes.
- In case of different products *BoardForecast* should not be sent downstream.
  In the case of similar products on all lanes the *BoardForecast* can be sent.

Shuttle N-to-1 Lanes

- Send *BoardForecast* of the Board that will arrive first – this is indicated by the property *TimeUntilAvailable*
  → *BoardForecast* with lower value of *TimeUntilAvailable* will be sent first

Proposed Amendments to the HERMES Standard

Further detail the HERMES Standard:

- section 3.1: Add “Unknown messages must be discarded, never pass on !”
  2.3.6 “Any unknown message, which is received, shall be ignored and discarded to keep upward compatibility.”
  2.5.3 “Any unknown message, which is received, shall be ignored and discarded to keep upward compatibility.”
  3.1 “To keep upward compatibility, any message or attribute unknown by an implementation can be ignored and discarded.”
  → change 2.3.6, 2.5.3 and 3.1 all the same text: “To keep upward compatibility, any message or attribute unknown by an implementation shall be ignored and discarded.”
- section 3.4: *MachineId* in *ServiceDescription* shall not be empty, same as in *BoardAvailable* message.
  → change to “any non-empty string”

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Let’s Vote

Proposed Amendments to the HERMES Standard

Yes

- We will include the minor adjustments towards clarity and consistency in specification 1.6

No, we will not

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IPC-Hermes Standard Agreement

Markus Mittermair

Chris Jorgenson

As proposed on The Hermes Standard Webside

The Hermes Standard Initiative was founded March 22nd & 23rd, 2017 by 16 SMT equipment suppliers.

It's objectives are

- to provide a standard for seamless machine-to-machine communication using existing standards
- to ensure physical board transfer together with the board's data

The Hermes Standard Initiative has since grown to more than 60 members (as of November 2020).

In July 2018, IPC adopted The Hermes Standard as an IPC standard and named it IPC-HERMES-9852.

The Hermes Standard and IPC
History & Background

Since The Hermes Standard is now an IPC standard, further development of Hermes could be facilitated by moving the Initiative closer towards IPC work methods. By adopting more of IPC's rules and procedures the effort for managing. The Hermes Standard Initiative could be lowered and scope and traction in the market could be increased:

1. The limitation of The Hermes Standard Initiative to equipment suppliers only may narrow the view just to technical topics concerning machine-2-machine communication. However, using Hermes data may enable many more workflows that are not specified in The Hermes Standard, but are of great interest of manufacturers. Hence, bringing in members other than equipment suppliers could help securing best fit of scope for Hermes.
2. The Hermes Chair carries a lot of organizational workload to keep The Hermes Standard Initiative running. IPC could offload some of these management efforts and, thus, help the Hermes Chair to focus more on driving the innovation of The Hermes Standard.

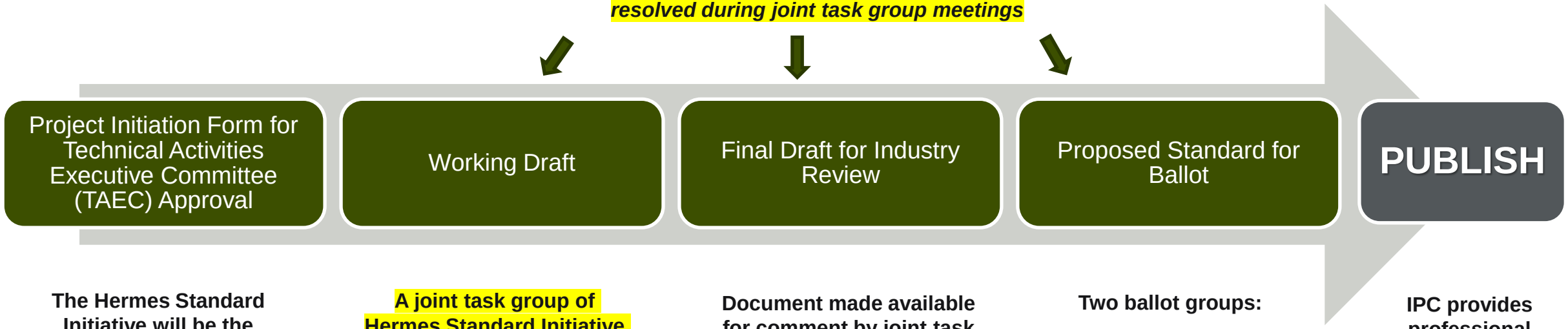
IPC-HERMES-9852 Joint Development

Feedback on the Proposal:

- **my company is a member of the Hermes Standard Initiative, but not a member of the IPC organization. I hope this is also OK.**

IPC-HERMES-9852 Joint Development

All comments from official calls for comments at any stage will be resolved during joint task group meetings



The Hermes Standard Initiative will be the originating task group (OTG)

IPC forms task group to work with Hermes Initiative members

A joint task group of Hermes Standard Initiative members, IPC task group members and other interested parties will develop the draft

Document made available for comment by joint task group, IPC Committee Chair Council and IPC Technical Activities Executive Committee

Two ballot groups:

Hermes Standard Initiative members vote during member meeting

IPC ballot group votes using IPC Works

Document needs to meet consensus requirements applicable to each group

IPC provides professional desktop publishing services

Notes

- IPC will provide staff liaison to Hermes Initiative
  - Manage documentation and ensure process meets MoU and standardization procedures
  - Compile comments, attend meetings, distribute documents for comment and ballot, etc.
- Both groups will use IPC Works
  - Standards collaboration intranet site used for all IPC standardization projects
  - Document exchange, commenting, communications, meeting announcements, etc.

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Let’s Vote

IPC-HERMES-9852 Joint Development

Yes

- Yes we will open The Hermes Standard for our cutomers / manufacuturs
- Yes, IPC should help us to manage the interests and requirments of customers / manufacturers
- Yes, the working platform will be in future IPC-Works and not The Hermes Proposal site any more.

No, we will not

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Work Group:

IPC-Works

Thomas Marktscheffel, ASMPT GmbH & Co. KG

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Organizational issues

IPC-HERMES-9852 Joint Development

As consequence:

1. **The Hermes Proposal forum is replaced by IPC Works from now on.**
2. **A joint task group of Hermes Standard Initiative members, IPC task group members and other interested parties will define the future development process and work on the upcoming tasks.**

Who is interested?

The Hermes Standard initiative
Location and timing for next meeting

Principles agreed

- The Initiative meets (at least) **once a year** to make respective decisions. A fair can be a good date (e.g. Productronica for Kick-Off). The venue should be agreed in a **rotating** manner.
- **Rules** can be **established or changed** on such meetings (with majority decision of **present** members)
- **Invitations are sent to all interested vendors** who (for example) register themselves on The Hermes Standard website and wish to be informed about news and activities. Also Initiative Members should be displayed at the website, (current status of implementation visible only on members website!)
- Who once **actively participated** is an Initiative member and can vote to shape the development of The Hermes Standard.
- There is **one vote per company**. A **majority decision** will be taken by the participants **present**.

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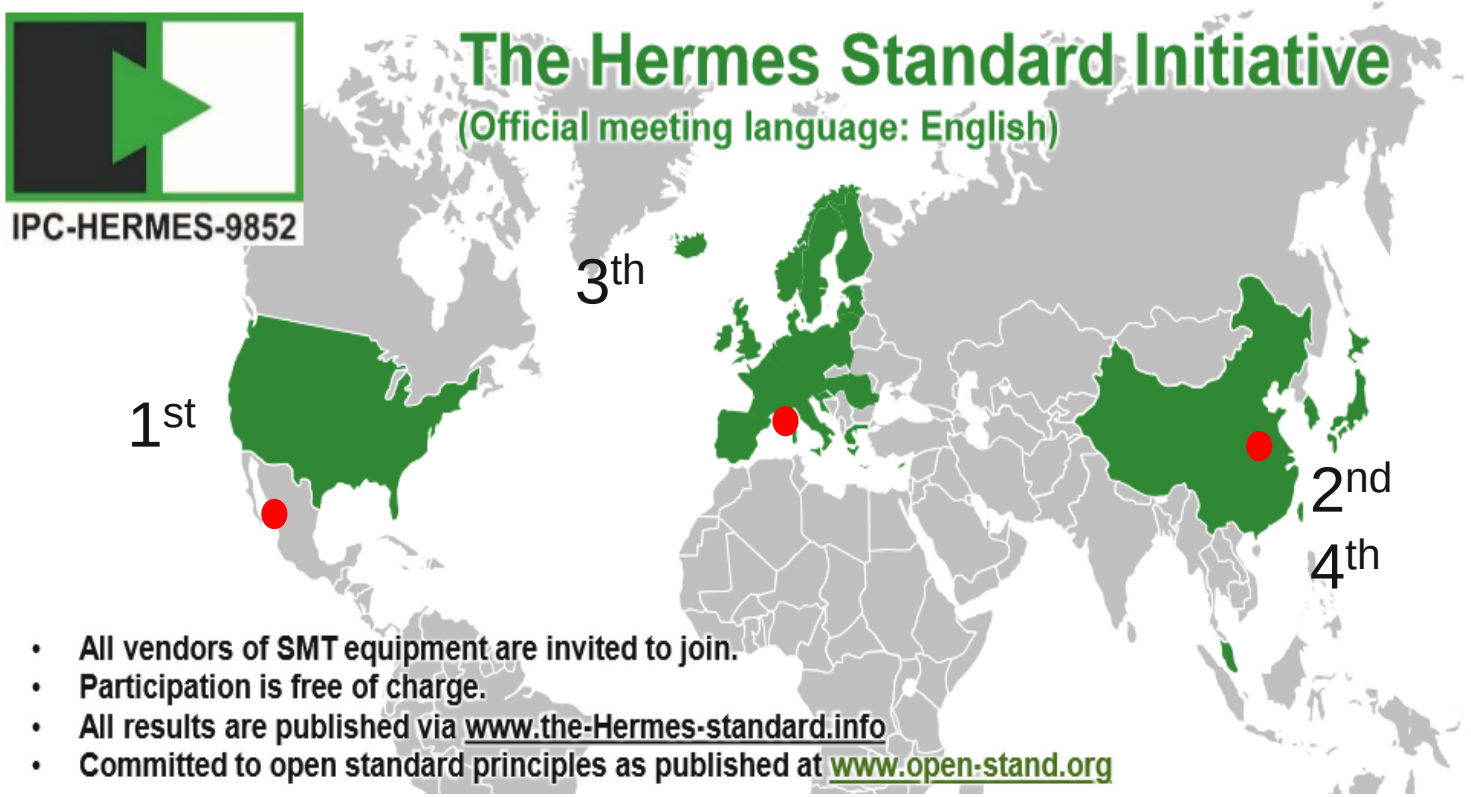
Next meeting

organizational issues and decisions

Markus Mittermair

Chair of The Hermes Standard Initiative

The Hermes Standard initiative
Location and timing for 13th meeting



Suggestions for next meeting 2024

1) APEX EXPO Anaheim, California April 6-11

2) Nepcon Shanghai April 24-26

3) SMT Connect June 11-13

4) Nepcon Asia Shenzhen November 6-8

5) Other suggestions

Where and when should next meeting take place?

The initiative decided (x yes/x no) to hold the next meeting …

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Wrap-up

End of the meeting

Let´s simplify the life of our customers!

The Hermes Standard Initiative

The Hermes Standard for vendor independent machine-to-machine communication in SMT Assembly.