UKWF Technical Webinar – Thursday 18 July 2022

WELMEC Working Group 7 – Software approvals and risk assessments

Hosted by Ian Turner

Introduction

- As a European Working Group – WELMEC's mission is to develop and maintain confidence in legal metrology in Europe
- WELMEC covers all aspects of software
- UKWF sit on the group and play an active role
- The group works closely with CECIP to provide support and gather industry views
- The group is driving a number of key projects – although each one can take time to resource and deliver

WG7 Guides

- Guide 7.2 - Software Guide (Measuring Instruments) (Version 2021)
- Guide 7.3 - Reference Architectures based on WELMEC Guide 7.2 (Version 2020)
- Guide 7.4 - Exemplary Applications of WELMEC Guide 7.2 2020 (Version 2020)
- Guide 7.5 - Software in NAWI's (Non-automatic Weighing Instruments Directive 2014/31) (Version 2020)
- Guide 7.6 - Software risk assessment for Measuring Instruments 2021 (Version 2021)

WG7 Guides – Guide 7.2

- The Guide 7.2 is the ‘base guide’ and all of the others exist to help understand this one
- Quite old and has developed in a piecemeal fashion
- Can appear complicated but when the structure and the meanings are understood, it works well
- Aimed primarily at the type examination stage but is used by market surveillance officers
- Re –issued regularly to make sure it is kept up to date

WG7 Guides

- Historically NAWI's were covered by the Guide 2.3
- This has been revoked and now the Guide 7.2 is the default guide – this will be clarified more clearly in future editions
- A new extension has been approved - extension O-General purpose operating systems
- Software is described as a *general-purpose operating system* if system resources of a measuring instrument (CPU, memory, interfaces) are administrated by that software and are made available to the legally relevant application. In addition, the operating system has a multi-user capacity and an administration mode (multi-user operating system)

Recent changes in the Guide 7.2

- The extension O has been approved by WG7 and the revised Guide will be published shortly
- It has been decided to review the Guide to ensure it is for for the future
- Will be a number of working groups that will be operating
- Sub-group on “New Technologies” – this is a group which discusses the opportunities for the future
- Horizon Scanning
- Two sub-groups on the review of the Guide 7.2
- Evolution of WELMEC Software Guides
- Recast of the Guide 7.2

Guide 7.3

- Reference architectures based on the Guide 7.2

- The aim of the Guide is to provide an architectural template for mapping measuring instrument
- Designs based on new technological developments to the requirements of WELMEC Guide 7.2.
- Outlines a set of reference architectures that are in the market
- Lists the boundary conditions for the architecture
- Lists specific attack vectors that would need to be considered when undertaking the risk assessments
- Specific about the extensions that will apply to each architecture
- Well thought out and put together document

Guide 7.4

- Exemplary applications of WELMEC Guide 7.2

- The Guide provides specific technical solutions for selected general architectures of instruments
- Indicates how these acceptable solutions fulfil the requirements laid down in WELMEC Guide 7.2.
- In doing so, it also illustrates the requirements laid down in WELMEC Guide 7.2 on a technical level
- Should be seen as the sister Guide for 7.3

Guide 7.5 - Software in NAWIs

- This document is intended to provide guidance on the software requirements in accordance with the Non-automatic Weighing Instruments Directive (NAWID) 2014/31/EU
- It is a cross reference table between the Guide 7.2 (2019) and the EN45501 (2015)
- Useful as a gap analysis between the two as NAWIs are effectively subject to the requirements of the Guide 7.2
- Will need to be updated for the new extension O and any changes to the review of the Guide 7.2

Guide 7.6

- Software risk assessments for Measuring Instruments

- Outlines how notified bodies shall assess the risks relating to the essential requirements and software
- Describes a method of making that assessment
- Targeted at manufacturers to help them undertake an adequate risk assessment
- Includes and element of understanding the attackers motivation
- Fundamental to a proper understanding of risk with software
- Must always fight against the notion of more and more regulation for perceived rather than actual risk
- Complicated document but does lead to transparency

Guide 7.6

- Software risk assessments for Measuring Instruments

- MID and NAWID require to submit "*…an adequate analysis and assessment of the risk(s).*" for Modules B, D1, F1, G (NAWID) or Modules A, A2, B, D1, E1, F1, G, H, H1 (MID)
- No particular format or procedure required
- A harmonized procedure according to Guide 7.6 allows for comparable extents and results
- Guide 7.6 is NOT mandatory!

Guide 7.6

- Software risk assessments for Measuring Instruments

Structure of Guide 7.6

- Follows the idea of ISO/IEC27005:

*"A risk is a combination of the **consequences** that would follow from the occurrence of an unwanted event and the **likelihood** of the occurrence of the event"*

- Sections:
  - 1 Terminology
  - 2 Workflow of Risk Assessment
  - 3 Risk Identification
  - 4 Risk Analysis: Analysis of Attack Vectors
  - 5 Risk Evaluation
  - 6 Risk Assessment Report
  - 7 References

Guide 7.6

- Software risk assessments for Measuring Instruments

Section 2: Workflow of Risk Assessment

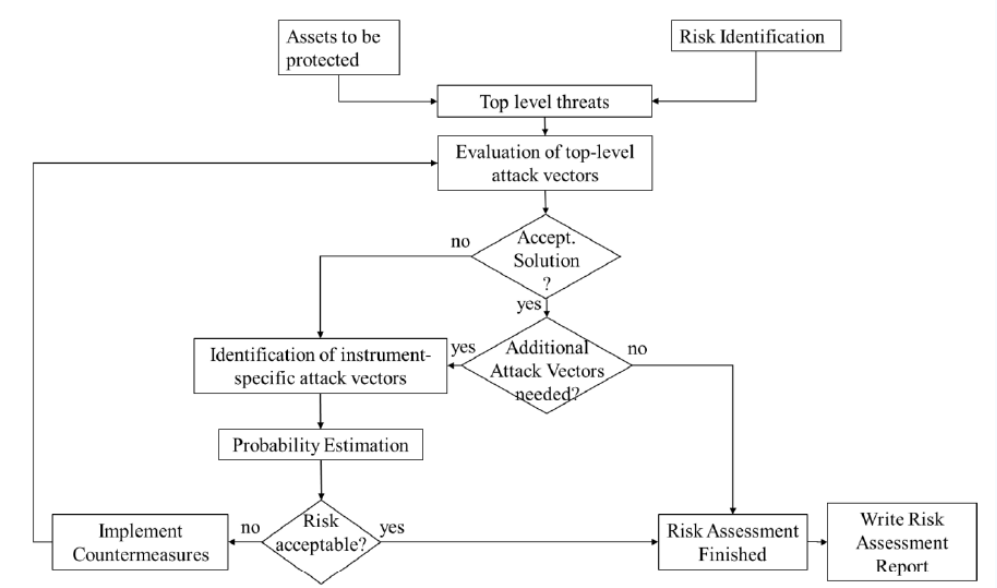

Figure 2-1: Workflow of the risk assessment procedure.

1. Risk Identification (see Section 3): This process results in a list of unwanted events (threats to assets) derived from the legal requirements of the MID [1].
2. Risk Analysis (see Section 4): During this stage, the identified threats are assigned a quantitative or qualitative risk measure by evaluation of so-called attack vectors. Depending on the assigned risk class for the instrument type (see WELMEC Guide 7.2 [3]), only simple generic attacks (most instruments of risk class C and lower) or more complex attacks (mainly risk class D and higher) should be investigated. For complex attacks, Attack Probability Trees (AtPT) can be used to help with the evaluation.
3. Risk Evaluation (see Section 5): Here, the risk is calculated in the context of the examined measuring instrument and its anticipated field of application, to determine if the residual risk (after risk mitigation) is acceptable.

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- Software risk assessments for Measuring Instruments

Section 3: Risk Identification

Nr.	High-level attack vector	Requirement (Annex I, MID [1])
1	inadmissible influence on the main assets* **through other software**	• 7.1 • 7.2 • 7.6 • 8.3 • 8.4
2	inadmissible influence on the main assets **through the user interface**	• 7.1 • 7.2 • 8.3 • 8.4
3	inadmissible influence on the main assets **through the communication interface**	• 7.1 • 7.2 • 8.1 • 8.3 • 8.4
4	inadmissible influence on the main assets **through replacing hardware of the measurement instrument**	• 7.1 • 8.2
5	inadmissible influence on the main assets **through replacing software**	• 8.3 • 8.4

Nr.	Asset	Security properties	Requirement (Annex I, MID [1])*
1	legally relevant software	• availability • integrity • authenticity	• 7.1 • 7.2 • 7.6 • 8.3 • 8.4
	identification of the legally relevant software	• availability • integrity • authenticity	• 7.6 • 8.3
	evidence of an intervention of the legally relevant software	• availability • integrity • authenticity	• 8.2 • 8.3
	Adequate protection of the legally relevant software	• availability	• 8.1
2	legally relevant parameters	• availability • integrity • authenticity	• 7.1 • 8.4
	Adequate protection of the legally relevant parameters	• availability • integrity • authenticity	• 8.2 • 8.3
	Evidence of an intervention[1] of the legally relevant parameters	• availability • integrity • authenticity	• 8.1
3	measurement result, including the measurement result relevant data	• availability • integrity	• 7.1 • 8.4
	Adequate protection	• availability • integrity • authenticity	• 8.1
4	record of a measurement result	• availability • integrity	• 11.1 • 11.2
	Adequate protection	• availability • integrity • authenticity	• 8.2 • 8.3
	Evidence of an intervention[1]	• availability • Integrity • authenticity	• 8.1
5	indicating the measurement result: • markings • Indication of the measurement result: clear and unambiguous	• availability • integrity • authenticity	• 7.1 • 9 • 10.2 • 7.1 • 10.1 • 10.2 • 10.4
	Adequate protection	• availability • integrity • authenticity	• 8.1

Main assets derived from Essential Requirements in MID/NAWID

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- Software risk assessments for Measuring Instruments

Section 3: Risk Identification (section 3.4.1 gives a graphical representation of high-level attacks on the main assets)

3.4.1.1 Attacks on legally relevant software

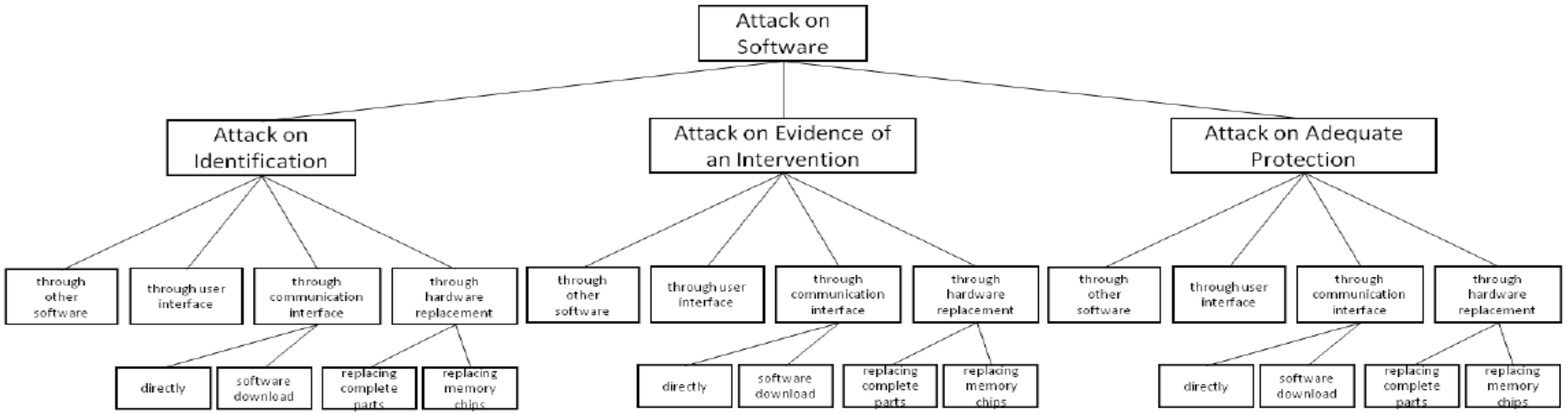

Figure 3-2: Generic AtPT for threats pertaining to the manipulation of software and its derived assets.

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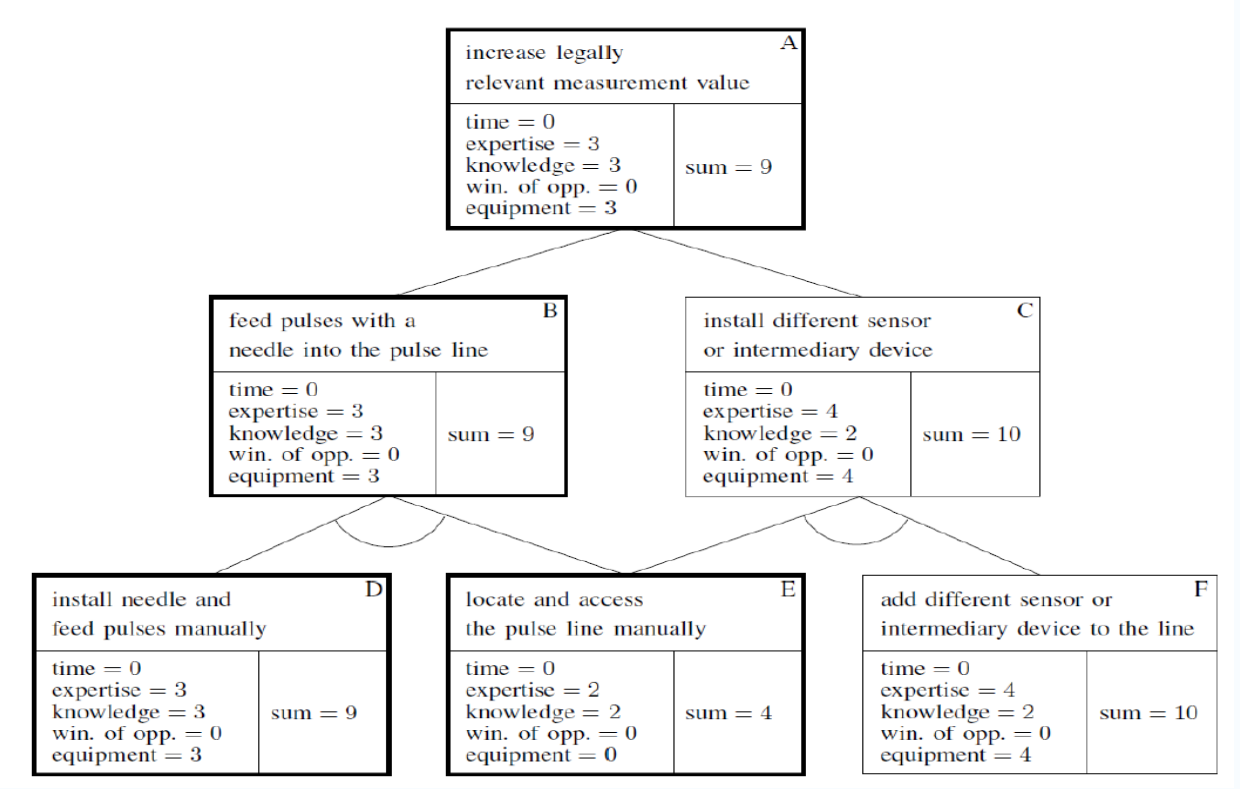
Section 3: Risk Identification (section 3.4.1 gives an example of an instrument specific attack vector and to how to calculate the risk score)



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Section 4: Risk Analysis-Analysis of attack vectors

Attack ID	Attack vector description	Time	Expertise	Knowledge	Window of opportunity	Equipment	Total	Impact	Justification
AVx1									
AVx2									
AVx3									

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- Software risk assessments for Measuring Instruments

Section 5: Criteria to be assessed

- Time, Expertise, Knowledge, Window of Opportunity, Equipment
- Additional: Assessment of the impact - impact score is 1 for attacks executed once affecting all future (or past) measurements, or 1/3 for attacks needing to be repeated for each individual measurement event
- ANNEX B gives a clear description how to assess the criteria

Expertise	Points	Remarks
Layman	0	With respect to IT skills, a layman is any person able to browse websites with a PC.
Proficient	3	A proficient user would be anyone able to find, install and use specialized software (such as a network sniffer) for a specific task.
Expert	6	Anyone able to write, build and use specific software to perform a certain task would count as an expert.
Multiple expert	8	The expertise level "multiple expert" should only be chosen when expertise in more than one field (software development, cryptography, hardware development) is required to implement an attack.

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Section 5: Risk Evaluation

For risk class C and lower: risk score <4 acceptable.
No score needed in case of countermeasures for all attack vectors.
For risk class D and higher: tbd by assessor

5.1 Risk evaluation in the context of a measuring devices purpose and the respective motivation of an attacker:

- 5.1.1: Attacker’s Benefit
- 5.1.2: Attacker’s risk of being suspected
- 5.1.3: Attacker’s Risk, when getting caught

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Section 5: Risk Evaluation

5.1 Risk evaluation in the context of a measuring devices purpose and the respective motivation of an attacker:

- 5.1.1: Attacker's Benefit
- 5.1.2: Attacker's risk of being suspected
- 5.1.3: Attacker's Risk, when getting caught

- This takes into account that if something is possible, it does not necessarily mean that somebody would try to do it…

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- Annexes
- Annex A: Checklist (Excel file)
- Annex B: Tables (e.g. point scores) and Examples
- Annex C: Report Format
- Annex D: Assessment of Attack Probability Trees

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Harmonization:

- CECIP presented an “Artificial cloud-based weighing device” for risk assessment comparison (by different NBs)
- Results were “interesting”
- Another workshop (comparison?) planned by PTB

Any questions?