D2.6 TECHNICAL IMPROVEMENTS REPORT – M30

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LIST OF ABBREVIATIONS

D - Deliverable

FMIS - Farm Management Information System

IoF2020 – The Internet of Food and Farm 2020

IoT – Internet of Things

IP – Ingress Protection

KPI – Key Performance Indicator

M – Month

MVP – Minimum Viable Product

NIR – Near Infra Red

OC – Open Call Use Case

UAT – User Acceptance Testing

RTI – Returnable Transport Item

TRL – Technology Readiness Level

UC – Use Case

WP – Work Package

PROJECT SUMMARY

The internet of things (IoT) has a revolutionary potential. A smart web of sensors, actuators, cameras, robots, drones and other connected devices allows for an unprecedented level of control and automated decision-making. The project Internet of Food & Farm 2020 (IoF2020) explores the potential of IoT-technologies for the European food and farming industry.

The goal is ambitious: to make precision farming a reality and to take a vital step towards a more sustainable food value chain. With the help of IoT technologies higher yields and better-quality produce are within reach. Pesticide and fertilizer use will drop and overall efficiency is optimized. IoT technologies also enable better traceability of food, leading to increased food safety.

Nineteen use-cases organised around five trials (arable, dairy, fruits, meat and vegetables) develop, test and demonstrate IoT technologies in an operational farm environment all over Europe, with the first results expected in the first quarter of 2018.

IoF2020 uses a lean multi-actor approach focusing on user acceptability, stakeholder engagement and the development of sustainable business models. IoF2020 aims to increase the economic viability and market share of developed technologies, while bringing end-users' and farmers' adoption of these technological solutions to the next stage. The aim of IoF2020 is to build a lasting innovation ecosystem that fosters the uptake of IoT technologies. Therefore, key stakeholders along the food value chain are involved in IoF2020, together with technology service providers, software companies and academic research institutions.

Led by the Wageningen University and Research (WUR), the 100+ members consortium includes partners from agriculture and ICT sectors, and uses open source technology provided by other initiatives (e.g. FIWARE). IoF2020 is part of Horizon2020 Industrial Leadership and is supported by the European Commission with a budget of €30 million.

EXECUTIVE SUMMARY

This document, entitled "D2.6 - Technical Improvements Report" provides an overview of the technical challenges the original 19 IoF2020 use cases (UCs) have encountered during their product updates in the first 30 months of the project, what solutions they found and what still needs to be tackled. This report is the result of a collaboration of WP2, UC, the technical trial chairs and with WP3. The content is partly derived from previous reporting by the original 19 UC (Progress Reports, presentation at the stakeholder event in Prague, UC work plan), partly by contacts with the use cases (trial telco's, physical trial meetings, discussions in Prague) and finally also through Feedback and Advancement Plans from WP3 and WP2 input. For each UC the following questions were answered: What was the UC's originally planned IoT product?, What was the incentive for improvements?, Which options have the UC looked into?, What is now the solution that the UC have come to?, What are the remaining open questions/challenges?, If applicable, is the updated product now being deployed in one of the testbeds? Based on the provided answers to these questions some conclusions could be made. It's clear that the main incentives for the UCs to incorporate technical improvements to their IoT product can be broken down to feedback from users, trial failures, commercial upscaling, problems during development and business requirements. **16 groups of technical issues** encountered could be identified with which various UCs struggled. These are summarized and provided with a specific UC example. The top 5 of technical issues consists of challenges related to the **placement of sensors/ devices** during deployment, **sensor accuracy**, **network coverage and reliability**, **interoperability** – connecting with other devices and on top of the list stands **dashboard user interface**. Besides, these UCs also reported on optimizing the sensor/device **hardware** to make it more robust for placement in a farm environment. UC are gathering a large amount of data coming from various data sources, which causes challenges to not **lose any data**, but also to guarantee access to **quality data**, to streamline the **data processing** and to find a good balance between collecting data frequently while guaranteeing **sufficient autonomy** of wireless IoT sensors. This data is feeding **prediction algorithms** that are being tested in various farm conditions and farm management regimes. Data also comes from external devices, delivered in various file formats that sometimes isn't straightforward to be incorporated in the UCs models. End-users and stakeholders, have their own wishes on **features** and **alerts** they want to see on the developed IoF dashboards. Furthermore, UCs are also confronted with **standardization** issues or the lack thereof. Finally, UCs have been confronted with **calamities**, for which advanced mitigation plans were not available and which asked for some technical inventiveness on the part of the UCs.

For some of the grouped technical issues it is clear that they occurred in the early phases of the project (loss of data issues, sensor accuracy, hardware design) and solutions have been found by now. Others, like for instance dashboard user interface adjustments are currently a hot topic for the

UC. Since user acceptance testing is running, feedback is gathered on how users perceive the visual output of the developed IoT products. Other issues will require more constant attention such as updating prediction algorithms. Deployment of the developed IoF2020 devices in other testbeds, with different farm organizations and management, in different climatic regions, etc. will require in some cases further fine-tuning of said algorithms. Clear trends on shifts from one type of technical issues in the early phases of the project to current ongoing challenges is not so easy to detect. This is partly due to the large diversity in the UCs and also by the different stages in the MVP (Minimal Viable Product) cycle of the UCs.

Identifying, tackling and overcoming all these technical challenges has been a learning process for the UCs. Quite a few of the lessons leant relate to the interaction with the users of the developed IoT and in particular to the importance of a strong relation with the test bed farmers. Important is to pay enough attention to the correct training of the users with the devices and to provide a proper explanation as to the possibilities of the system. Important is to make the system as easy to use as possible and establish early on what the priorities are for the users of the developed IoT solution. Multiple field tests are beneficial to further improve the IoT product, to tackle unforeseen challenges and for optimizing the installations on the field. One also needs to keep also in mind that multiple actors are often involved for installing devices or for obtaining information from different data sources and first trial runs might not provide you with all the planned results at once. Additionally, (internet) connectivity might not be optimal at test beds (farm, slaughterhouses, vineyards) so real-time data might not always be available and this challenge could also result in loss of data. So in your trial planning one might want to keep this in mind and select for instance a crop system that has several harvesting cycles per year, which would allow you to perform several trial runs per year and hence obtain more results. Quite a lot of data is collected during trials. Robustness of and streamlining data processing is often underestimated but vital processes in the development of the IoT product. In relation to this, sufficient attention should be directed to the type, frequency and way of data collection and storage which is essential for the productivity/quality of the developed product. This decision might also have consequences for the power consumption and battery lifetime of the product. Essential is to safeguard the quality of the data, of which (sensor) calibration and standardization is a vital part. Standardization of both hardware and software elements reduces the barrier to adoption. However, for the standard to be accepted and adopted, it is necessary to get the whole industry on board. To become successful, disseminating the lessons learned and collaboration with the standardisation organisations, the main technology players in the different farming sectors but also with the other IoF2020 UCs is important.

The summary of lessons learnt in the first 30 months of the IoF2020 project is a first attempt to contribute this and should also provide guidance to the 14 Open call UC and others to progress faster by keeping these in mind.

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1. INTRODUCTION

This document, entitled “D2.6 - Technical Improvements Report” has been developed by Task T2.4 “Technical Improvements” in close connection with Task T2.3 “Feedback collection and performance monitoring”. The document provides an overview of the technical challenges the original IoF2020 UCs have encountered during the first 30 months of the project, what solutions they found and what still needs to be tackled. This report is the result of a collaboration of WP2, the use cases (UC), the technical trial chairs and WP3. The content is partly derived from previous reporting by the original 19 use cases (Progress Reports, presentation at the stakeholder event in Prague, UC work plan), partly by contacts with the use cases (trial telco’s, physical trial meetings, discussions in Prague) and finally also through Feedback and Advancement Plans from WP3 and WP2 input.

Since the open call, 14 new UC (OC UC) stepped into the IoF2020 project at M24 of the project. Since these UCs are only in M6, they have not undergone several iterations of their IoT product yet, nor are all their components already up and running. Hence, they have not contributed to this current reporting of technical improvements. This report will be published again at month 48 and will then include the report of all 33 UCs. This report with its lessons’ learnt should help the OC UC progress faster in their technical developments and prevent them from making detours that the original UCs already had experiences with.

From the start, IoF2020 embraces a demand-driven methodology in which end-users from the agri-food sector are actively involved during the entire development process aiming at cross-fertilisation, co-creation and co-ownership of results. All technologies in the use cases have a value-proposition for end-users: e.g. improving safety, efficiency, quality, lowering difficulty, variability and costs. When starting with their UC within the IoF2020 project, their proposed IoT technology was still in the developmental stage with starting TRL levels ranging from 4-5 upwards. Progressing with their product to test in more relevant environments and into operational testing brought to light technical challenges and bottlenecks but also undervalued end-user and stakeholder needs. These were all incentives to improve, insert or remove technical features.

By passing through this cycle, the technology is altered with a new set of features and a new minimum viable product (MVP) compared to the beginning of the process. The choice of features is directly influenced by the end-users and value-chain stakeholders, translating into a new and improved MVP (MVP 2) compared to initial deployment (MVP 1), delivering higher value for the end-user. This cycle is repeated again to test the new set of features and fine tune them to deliver higher value to the end-user, better fit into the existing production processes and satisfy food-industry standards. The result will be the second release, wherein the cycle will be repeated again. Deliverable 2.6 gives an overview of the technical challenges the UCs encountered when progressing through this MVP cycle and reflects to the MVP status the UC are currently in. This differs among UCs. All have developed their first MVP, but some are already on MVP4 or have a product on the market. How many MVP cycles the UCs' products have gone through and will still go through depends upon amongst other things to the company strategy, client willingness for continuous product updates, starting TRL level of the IoT device at the start of the project, etc. Sometimes, MVPs are actually related to multiple products. An overview of current MVP status is presented in Table 1 at the end of this document.

With the help of WP4 – Task 4.3 "Validation of user acceptability", a user acceptance testing was developed that the UCs could use to retrieve valuable feedback from their users and stakeholders on their MVPs. By understanding and translating key issues demanded by end-users and stakeholders improvement in the quality, value and relevance of their product can be achieved.

In the IoF2020 project we strongly believe in this lean multi-actor approach as an innovative combination of the multi-actor approach and lean start-up methodology that overcomes major barriers to adoption of IoT technologies in European agriculture. It does this by fostering co-creation of technology. Results from a small step in product development are tested and measured in the operational environment to guide the next step, scaling up to a wide variety of productive environments and consulting with all stakeholders to address acceptability. The resulting products and services are appropriate for European societies, lower environmental footprints, and have a good fit into target markets.

The technical challenges encountered by the UCs in the first 30 months of the project are presented in this report. A description is provided for each UC of what their intended IoT solution was and what they have developed at this stage of the project and where it is deployed. Information is provide as to the incentives for technical updates, the solutions they've looked into, challenges they are still facing and the timeline for their MVP planning. In an effort to provide the UCs with a broader expert view on their current progress in their UC, representatives from the technical WP3, have screened the reports (Progress Reports, presentation at the stakeholder event in Prague, UC work plan) of the UCs and provided feedback. This feedback and suggestions for further improvement can also be found back in this report. Based on all this information, 16 common technical challenges could be identified. An overview of them is described in detail in the conclusion section of this report together with the main lesson's learned provided by the UCs and based on their experiences during development and testing in the deployment sites.

2. APPROACH & METHODOLOGY

Per trial each of the original 19 UCs was asked to answer the following questions:

- What was the UC's originally planned IoT product?
- What was the incentive for improvements? (for instance feedback from end users, or problems during deployment)
- Which options have the UC looked into (related to the lessons learnt)?
- What is now the solution that you have come to?
- What are the remaining open questions/challenges?
- If applicable, is updated product now being deployed in one of the testbeds? Are users pleased with the updated product?

Furthermore, during IoF2020's stakeholder event in Prague (March 2019) UCs presented the progress in their UC. WP representatives were asked to provide feedback to the UCs based on this presentation and all available reports the UCs have submitted over the last 2 year (progress report and Installation, customization and integration report and their initial work plan). The feedback from WP3 on the technical progress of the UCs has also been incorporated in this report and provides UCs with insights on how to further improve their IoT solution. The WP3 representatives provided their impression on the following aspects:

- General impression regarding UC progress from WP3 perspective
- UC strong points from WP3 perspective
- UC weak points from WP3 perspective
- Technological development in the UC
- IoT architecture of the UC
- Standardization issues the UC(might) encounters

Finally also the MVP planning of the UC as presented during the Prague stakeholders event is added to this report to indicated in which iteration cycle the UC is presently in.

3. RESULTS

This section is confidential and is only accessible for members of the consortium, including the Commission Services

4. CONCLUSIONS

4.1. INCENTIVES

The main incentives for the UCs to incorporate technical improvements to their IoT product can be broken down to user feedback, trial failures, commercial upscaling, problems during development and business requirements. User feedback often comes from, but is not limited to, the farmers on the fields or in the barns that are working with the product during the trials. They provide crucial information on the performance of the products and on desired features that from a practical and commercial perspective are crucial for the success and the implementation of the product on the long run. Based on the users' feedback some of the UCs are moving towards pilot upscaling and go-to-market strategy and have stated that user acceptance testing (UAT) methodology used in IoF2020 helped them understand the needs and requirements of the user. Quite a few UCs report that training of the users in the developed technology is key and have placed more resources and attention towards that goal.

4.2. TECHNICAL CHALLENGES

Sixteen groups of technical issues could be identified based on the first reporting of technical improvements by the original 19 UCs (see Table 1). In the top 5 we find technical issues related to the placement of sensors/ devices during deployment. For instance a UC in the arable trial encountered some issues with the positioning of the NIR sensor on the harvester resulting in incomplete data collection. Lesson learnt for them is that installment of NIR sensors on harvester systems are not as simple as "plug and play", there is more to it, more experience needs to be obtained and also efforts on training of device users should be increased. However most UCs have surpassed this phase by now and have optimized the placement of sensors. However, when devices go through the MVP cycle, updated versions might also need to have the optimal placement of it re-evaluated, which is why for some this is still an ongoing technical issue. Not only device and sensor placement can be a challenge, also sensor accuracy and sensor calibration has been a hot topic for 11 of the 19 original UCs. Some UCs discovered that sensors they've used weren't sufficiently accurate for their purpose, and they are now integrating and installing better ones in their system. It remains a challenge and tradeoff between quality and price (high enough quality at a still low cost). Sometimes the initially selected sensor didn't meet the goals of the UC. One UC selected another wristband system to gather information on acceleration motion continuously instead on event-based approach. That way no information got lost. Still ongoing in most UCs, is another top 5 technical challenge, i.e. problems with network reliability, network coverage. This relates among other things to limited connectivity in places where for instance SigFox has not sufficiently been rolled out, or other UCs looking into network coverage, reliability and performance optimization. One UC redesigned their LoRa connectivity board to improve the LoRa transmitter performances (reach and power consumption). They now reach up to 3km, and are still optimizing to reach the targeted goal of 4.5km. Interoperability and connecting with other devices is another one of these highly encountered technical issues that the majority of the UCs faced and are still working on. One UC for instance struggled with the limitation that some interconnected device data could only be manually downloaded for their FMIS. They've been in contact with tech providers to get automatic export options, which was possible for some through software updates or even custom-made options for some data sources. Out of necessity, they even had to develop their own custom-made automatic download procedures, which of course remains sensitive to changes in the download environment. Top of the technical issues list and an ongoing process in most of the 15 UCs that reported it is fine-tuning and optimizing the dashboard user interface. Certainly, user feedback is essential for this step. Based on farmers feedback, improvements have been implemented to make information panels easier and the information more readily accessible. Furthermore, the amount of directly available technical data in the dashboard was reduced. For a UC, it became clear that the technical data is necessary for their prediction algorithms, but the end user is primarily interested in the recommendations. These recommendations should be and are now on the forefront, while interested users can still find the tech details when they browse a bit deeper in the system. Related to the dashboard and based on user feedback, various UCs also reported on including additional features and alerts. These features can be as straight forward as including a bar code scanner, to a more substantial adjustment in one UC. Here a stakeholder requested to also include feed consumption information in the dashboard. With the shift in one UC to outdoor tracking of free grazing cattle, farmers now desired to have an alert when one animal is not anymore in the proximity of the herd. Trials on different types of farms, also bring challenges to the prediction algorithms. In one of the dairy UC's adjustments to its oestrus detection algorithm were needed in one of its testbeds, where the cattle is more outside grazing compared to its other testbeds. Key for all UCs is of course not losing any relevant data. Although not frequently reported, some UCs did experience losses and have found a solution to this problem. One UC sometimes lost data when the connection to the gateway was established, but the subsequent connection to the cloud from the gateway was hampered. Their sensors have some internal storage capacity, but the info gets deleted once send to the gateway, while the gateway sends the info into the to cloud as it gets it and has no internal storage capabilities. So, when no internet connectivity is available for the gateway to connect to the cloud, the transmitted data got lost. They implemented a mechanism that checks the MQTT connection and they're now sending the info collected by the sensors to the cloud only when it is possible to transfer it. Most UCs do have to handle a large amount of data. Streamlining data processing, has been or still is on the plate of some of the IoF2020 UCs. For some UCs, an important challenge is to run their service in real-time to deliver advices on the selected fields at the right time. This requires the development of a set of data processing tasks: development of satellite + IoT data fusion; model correction; application of the decision rules. One UC changed how data was ingested and hence tackled their encountered platform problems related to the large amount of data they gather. For those UCs that struggle with efficient power management/low battery lifetime, software updates sometimes in combination with reduced data collection have helped to decrease power consumption and increase battery lifetime. Hardware design adjustments, making them in most case more robust has been solved in most cases. Quite a few of them performed tests conform IP (Ingress Protection) standards. These define the level of sealing effectiveness of electrical enclosures against intrusion from foreign bodies such as dust and water. Standardization issues were mainly reported in the arable trial for which the majority is still looking into the best solution. One example form a UC is the standardized processing of variable rate application task maps. Currently, task maps are made with different software packages and models. The UC’s challenge is to bring standardized results in the Akkerweb platform. Quality of data is primal, especially when building prediction models and not always straightforward to verify. One UC has performed accuracy testing with a logbook in which the users were documenting the real location in comparison to the detected RTI (Returnable Transport Item) position. Throughout the first 30 months of the IoF2020 project, some UC have endured unexpected events, calamities for which advanced mitigation plans were not available and which asked for some technical inventiveness on the part of the UCs. These were on the one hand weather related, for instance the drought in large parts of Europe in the summer of 2018 has caused changes in the planned trials on the fields and meadows for some. On the other hand re-structuring of partner organisations has caused one UC to change parts of its testbeds. The tread of African Swine fever in some parts of Europe, has limited test bed visits, resulting in more online communication to set up the farm deployment. One UC learnt the hard way that not all actors in the food chain are ready for openness and transparency in the chain and they retracted their involvement in the UC which led the UC to approach and include new stakeholders.

For some of the grouped technical issues it is clear that they occurred in the early phases of the project (loss of data issues, sensor accuracy) and solutions have been found by now. Others, like for instance dashboard user interface adjustments are currently a hot topic for the UCs. Since user acceptance testing is running, feedback is gathered on how users perceive the visual output of the developed IoT products. Other issues will require more constant attention such as updating prediction algorithms. Deployment of the developed IoF2020 devices in other testbeds, with different farm organizations and management, in different climatic regions, etc. will require in some cases further fine-tuning of said algorithms. Clear trends on shifts from one type of technical issues in the early phases of the project to current ongoing challenges is not so easy to detect. This is partly due to the large diversity in the UCs and also by the different stages in the MVP cycle of the UCs. All have developed their first MVP (Minimal Viable Product) while others are already on MVP4 or have a product on the market. But also progress in the MVP cycle is difficult to compare between UCs and is amongst other things depending on the company strategy, client willingness for continues product updates, starting TRL level of the IoT device at the start of the project, etc. Sometimes, MVPs are actually related to multiple products. An overview of current MVP status is also presented in Table 1 underneath.

Table 1: Overview of the 16 technical issues most commonly encountered by the IoF2020 use cases in the 5 different trials.

	TRIAL 1	TRIAL 2	TRIAL 3	TRIAL 4	TRIAL 5
Efficient power management		2	1 2		
Sensor Placement	2 1	2	3 1	1 2	1
Additional alerts		2			1 1
Additional features		2 1 1	1	2	1
Network communication	1 1	1 2	1 2 1	1	1
Data loss	1	2			1
Data processing	1 1	1 1			1 1
Interoperability	2	2	1 2	4	1
Calamities	1 2	1	1 1	1	3
Dashboard user interface	1 1	1 2	4	3	2
Sensor accuracy / calibration	1 1	3	1 1	3	1
Hardware design / placement		2	1		1
Quality of data	3	1	3		1
Prediction algorithms	3	2		1	1 2
Standardization	1 3				
Data file formating	2				1
MVP cycle	4 4 1 3	4 3 2 F	3 3 2 2	3 2 3 3	2 2 1

The numbers in the full circles, indicate the number of UCs in that trial that encountered this specific technical issue. Of the original 19 UCs, 4 UCs are in Trial 1 to 4, and 3UCs in Trial 5. Green indicates technical challenges which the UCs already overcame, orange indicates ongoing challenges for the UCs, and the green-orange gradient depicts challenges that the UCs have already been tackling and are nearing completion. In the bottom row, the MVP cycle status of each of the 19 original IoF2020 UCs is presented. One dairy UCs has already reached for one product a final MVP (F) and is working subsequently on an new IoT platform and is in MVP1 phase for that product.

4.3. LESSONS LEARNT

Identifying, tackling and overcoming all the above mentioned technical challenges has been a learning process for the UCs. Their **lessons learnt** are summarized below and might help the 14 open call UCs and others to progress faster by keeping them in mind.

- Interaction with farmers requires a lot of support, to explain the features/advices and to get their feedback of what they finally did in the field
- Farmer relationship is key for accelerated adoption, for pointing out 'pain points', and validation of solutions
- When designing your dashboard, make the presentation of the information easy and straight forward. Think about what the end users want to see. In many cases they are interested in the recommendations not so much in the technical details. These recommendations should be on the forefront, while interested users could still find the tech details when they browse a bit deeper in the system.
- System interoperability is a core issue: farmer engagement is unlikely if required to input the same information across multiple platforms. Make operations for the users as easy as possible.
- The demonstration of the added value of a new technology requires a lot of field testing, in several places for several years. This a particular challenge for farming applications**.**
  Related to this, maybe select a cropping system that has multiple harvesting cycles per year, so as to obtain trial results more frequently.
- There is still a long way to go to have a seamless process from the field sensors to the farmers machines and computers. One complexity is the number of actors involved in his process. Adopting a modular architecture is important to allow integration of these modules in a service.
- Installing sensors in the field is quite often not a ready 'plug and play' application. Many field tests need to be done to gather experience. Also trainings with users of the devices needs to be included and spend a substantial amount of resources on this.
- It is important to collect first all the feedback/points for improvement of all test sites prior to making adjustments. Previously feedback that came in was often directly implemented into the solution which needed adjustments again a few weeks later when new feedback came in.
- The demonstration of the added value of a new technology requires a lot of field testing. Keep in mind that internet connection at farms and slaughterhouses might not be so good and it might not always be possible to have data in real-time.
- Be aware to not loose data when problems with internet/network connectivity occur. Longer and bigger local storage might be advisable to make sure that all data is still available when connectivity to the cloud or platform is not feasible for a longer time.
- It is desirable that the battery life of sensors is as long as possible, keep this in mind when designing your trial set up. Ask yourself the question, if so many data gathering points are needed, can some software tweaks help to consume less power, etc.
- Robustness of data processing is a key issue that we have underestimated. This is of particular importance for passive measurements.

- Calibration, calibration, calibration: especially when working with multiple data streams it is vital to maintain data integrity
- Some UCs are conquering new territories regarding standards for cloud communication related to machinery, which requires defining new solutions rather than implementing existing standards. When working in a small group it might only be possible to make a proof of concept of a technology. For the standard to be accepted and adopted, it is necessary to get the whole industry on board. To become successful, disseminating the lessons learned and collaborating with the standardisation organisations is very important.
- The importance of standards: In order to facilitate integration of various on-farm data streams, standardisation of both the hardware and software elements of the platform reduces the barrier to adoption.
- Collaboration with other use cases (vertical) on specific topics like spatial data analysis can be improved. There is not so much data shared, neither the specific knowledge on algorithms. Everybody (all use cases) seems to have too much challenges on their own side that need to be fixed, limiting the time and opportunity to reach out to each other. This issue will receive increased focus in terms of improvement point for the next phases.
- When encountering problems with PC overload, possible solutions are: (i) Reduce frequency of data monitoring, (ii) Increase computer performance, (iii) Copy files before transfer, (iv) Decrease frequency of data copy & transfer; (v) Monitoring of computer performance and frequent restarts to avoid crashes
- In the case that only manual data download are available from interconnected devices, one might think about asking the technology providers for export options (this could be made available through update of the software or custom-made for some data sources by tech providers), when all of the above is not possible, one might build its own custom-made automatic download procedure, but keep in mind that this remains sensitive to changes in the download environment.