BalticLSC Software Technical Recommendations

BalticLSC Software Feedback Workshops report
Version 1.0

Priority 1: Innovation

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Executive summary

The technical recommendations contain various recommendations for designing BalticLSC-compliant software tools in the future. These recommendations are based on comments, issues and questions formulated by external feedback workshops participants. They provide additional, practical guidance for potential further developers of LSC tools.

The feedback from the workshops is significant for further work. At this stage of development, they are general guidelines for the future improvements of the BalticLSC Software and development of other LSC solutions for SMEs. High-performance computing has already gained a place in the operations of large companies, but the wider use of SMEs is still in its infancy. It is hoped that the low-cost computing service will accelerate development and bring new opportunities for SMEs to develop their products and business.

The technical partners responsible for the BalticLSC Software design and implementation tried to incorporate as much feedback received during the earlier stages of the project as possible. The feedback received at the end of the project, when the BalticLSC Prototype was fully operational and after many improvements, has been written down to help future efforts in updating and developing BalticLSC Software and other LSC solutions.

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1. Introduction

1.1 Objectives and scope

The technical recommendations contain various recommendations for designing BalticLSC-compliant software tools in the future. These recommendations are based on comments, issues and questions formulated by external feedback workshops participants. They provide additional, practical guidance for potential further developers of LSC tools.

1.2 Relations to Other Documents

This main output document gathers and organizes the BalticLSC Software Feedback workshop results. The Software and Platform Feedback workshops were organized together with sererate paths after an introduction and general discussion about the BalticLSC Environment. Therefore, this document remains in close relation with O3.4 and O4.5, which also describe results of these workshops.

These workshops and the final output was based on O5.2 - O5.4 – the design and documentation reports of the BalticLSC Software which together with O6.2 The BalticLSC Software Prototype were used during the workshops.

Additionally the O6.3 – BalticLSC Handbook was used to prepare the workshops and finally the O6.4 – BalticLSC Knowledge Transfer Strategy derives from the experiences from the BalticLSC Software Feedback workshops described in this report.

1.3 Intended Audience

This document is intended to people and organizations that work on the future development of BalticLSC Software and similar LSC systems and tools. The feedback gained during the initial workshops has been already implemented by the technical partners working on the BalticLSC Software where possible. The remaining feedback has been written down in this report to allow for future updates or development of similar tools using experience and knowledge obtained during the BalticLSC project.

2. Workshops

2.1 Workshop assumptions and Covid-19 impact

At the same time the Software feedback workshops were supposed to be started the Covid-19 pandemic started and Europe and significantly impacted the organization of in-person workshops.

Firstly, a decision was made to postpone the workshops until the end of the pandemic. At that point officials expected to lift the restrictions in a couple of weeks or months. Unfortunately, this didn't happen and after more time passed a decision was made to move the workshops to online form. This required additional preparation and change in workshop structure (it is more difficult to engage participants for longer, the discussion is usually limited in online environment). This changes, combined with the initial feedback regarding difficulties of some participants to understand what the BalticLSC Software is doing just by seeing its design documents, leaded to a new online form of combined workshops. This new form, after few additional adjustments proved to be effective.

As an additional way to gather feedback during the Covid-19 pandemic one-on-one workshops were also organized. This special structure allowed for more direct approach to the outside participants, resulting in much more detailed feedback than compared to the open online workshops described in previous paragraph.

At the end of the project period, in summer 2021 the opportunity emerged to organize some in-person workshops where possible. This opportunity was used, however based on decision made earlier, the online format remained the default. This decision proved to be correct, as many participants had objections towards in-person meeting and were willing to participate only in remote meetings.

2.2 Workshop plan

Because of the problems identified during the first round of workshops the BalticLSC Software Feedback Workshops were combined with BalticLSC Environment and BalticLSC Platform Feedback workshops. This allowed to maximize the amount of feedback gained from interested participants. Therefore, such unified workshop structure for 2021 was proposed (with Platform and Software sessions held simultaneously):

A) Introduction to the BalticLSC project

Presentation of the project and its goals

B) BalticLSC Environment presentation and discussion

Introduction to the BalticLSC Environment and its evaluation in form of moderated discussion

C) BalticLSC Platform Session

Practical presentation of the BalticLSC Platform followed by the moderated discussion

D) BalticLSC Software Session

Practical workshop during which participants created and run their own Computation Application on the BalticLSC Network. Feedback gathered during moderated discussion and from problems/issues the participants had while using the BalticLSC Software.

E) Questions for workshop evaluation

　　A quick questionnaire to evaluate the workshops.

This report focusses on feedback gathered during part D of the workshops. However, it is worth noting, that a lot feedback is common for the BalticLSC Environment, Platform and Software as they are strictly connected and one consists of the other two.

The discussions in each step were moderated with the use of questions provided in Appendix I at the end of the document.

2.3 BalticLSC Software Session Plan

The BalticLSC Software Session focused on practical experience of workshop participants with the BalticLSC Software Prototype. During this session everyone was already familiar with the principles of BalticLSC Environment after the previous presentation.

A) Application Store (Figure 1) presentation and adding FaceRecognizer app to Computation Cockpit
B) Computation Cockpit (Figure 2) presentation and creation of new Computation Task for FaceRecognizer
C) Data Shelf (Figure 3) presentation and new FaceRecognizer Data Set definition
D) Starting the newly created Computation Task with new Date Sets
E) Computation Task details and log presentation
F) FaceRecognizer CAL diagram presentation and overview
G) FaceRecognizer Computation Task results
H) Development Shelf (Figure 4) presentation and selection modules to private Toolbox
I) New Computation Application in CAL Editor (Figure 5)
J) CAL Editor presentation and live example of making Edger Computation Application in CAL followed by everyone creating their own Edger Computation Application in CAL
K) Creating of own Application Release of newly created Computation Application
L) Running of newly created Computation Application via Computation Cockpit
M) Final discussion and feedback gathering

During the workshops every interested participant received a specially created workshop account on BalticLSC Prototype and used example data provided by us.

Feedback gathering during the BalticLSC Software Session didn't limit to feedback reported by the participants. During the session the presenters and special observers noted down every problem or question the participants had during the session. These problems and questions were later analysed by the BalticLSC Software developers to look for ideas for new improvements to be made to the BalticLSC Software. This allowed to introduce many changes helping with User Experience during the project duration, hence resulting in a much better version of a solution at the end of the project.

Figure 1 BalticLSC Software – Application Store

Figure 2 BalticLSC Software – Computation Cockpit

Figure 3 BalticLSC Software – Data Shelf

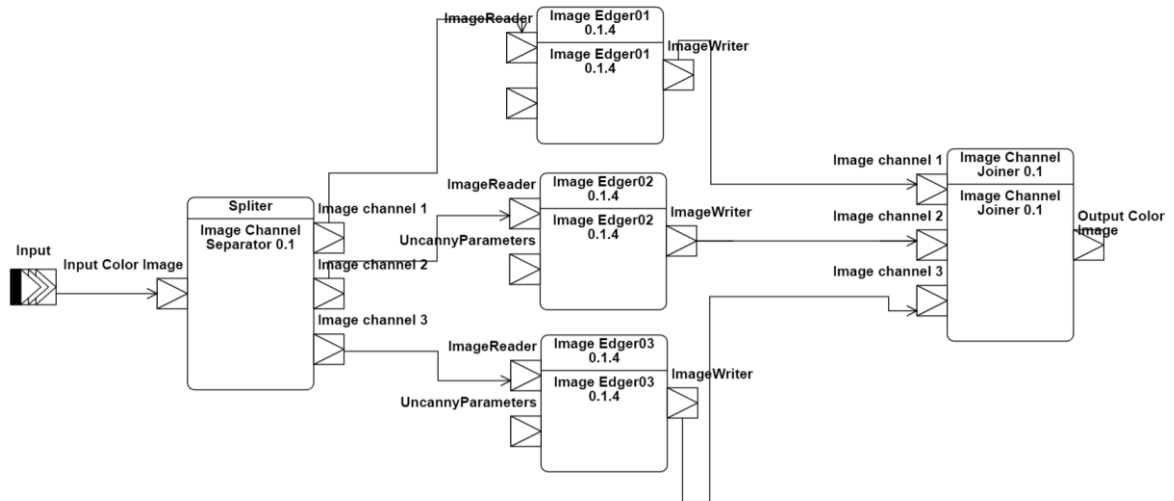*Figure 4 BalticLSC Software – Development Shelf*

Figure 5 BalticLSC Software – CAL Editor – Example of Edger Computation Application created by workshop participant

3. Baltic LSC Software review

The BalticLSC Software has been reviewed by independent reviewer. Their answer has been enhanced with additional remarks esteeming from feedback workshops. The final review has divided into 2 parts: the review of the BalticLSC Demo video and the User Interface and User Experience directly by using the computation platform.

3.1 Part 1: Review of the BalticLSC Demo Video

A presentation video of the BalticLSC Software (referred to as computation platform or just platform to simplify the public communication[1]) can be viewed on the project's website (https://www.balticlsc.eu/balticlsc-demo/). The presentation clearly explains how and for what the computation platform can be used. The video describes the operation of the BalticLSC Software well and gives an idea of the possibilities of using high-performance computing with the help of two examples. The demo video is good in duration and is moving at the right pace. It will be important to produce more videos and instructions in the future so that users can get more information as needed.

The possibilities of the BalticLSC Software could be explained in more detail in separate videos. It could be more informative to show new users the input and output folders and how they work. This leaves the user with a clear picture of what is being processed, where they can be found and how the data will be added. The new user immediately gets the overall picture and finds the information they need.

The presentation of the BalticLSC menus was clear in the video. There are a lot of features, and an in-depth introduction to them is not appropriate in the first introductory video. More information can be found in the BalticLSC Handbook and more videos can be made if needed.

In the Initiate Task menu, a cluster can be selected. Currently, only clusters that are part of the BalticLSC Network investment are available (WUT, IMCS, RISE, TSP, MTC). More options can be added as new clusters are added from outside of the consortium. The video opens the Advanced section, which shows the different types of processors in use. The differences and benefits of adjusting CPU, GPU and Memory values are not presented here, but more information can be found in the BalticLSC Handbook and this may not be of interest to all users.

From the start of the module, it would be a good idea to have a little explanation of the processing, the delay and wait times, and the prioritization of the rules of procedure. Explaining the logic of Face Recognizer and Image Processor is a good way to give the user a clearer picture of what's going on in the background. Displaying the results on video works well.

3.2 Review of the BalticLSC Software User Interface and User Experience (UI & UX)

When logging in with a demo user, the color palette is simple, calm and analytical. Within this schedule, the BalticLSC Software has been in good working order, but its development will

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[1] People had a difficulty to understand the difference between BalticLSC Software and Platform and in different outside videos and other materials the BalticLSC Environment or its parts are being referred to as platform or computation platform to simplify the communication.

continue after the project. From the perspective of user interface development, feedback has been collected from end users, from whom we have gained a good insight into their needs.

The landing page is currently the App store, in a future a custom landing page could be worth considering. In the next version of the BalticLSC Software, after logging in own login ID, you could create a personalized main page, for example, showing previous projects or progress of currently running computations depending from users preferences.

You could put a Search option in the App Store where you can search for apps indexed by other authors by category or name. The "latest / most popular" show section could also be user friendly.

The Computation Cockpit could be categorized either by box or using the drop-down menu. Currently, Cockpit has only a few applications, but with more extensive use later, there will be a lot of data, calculations, and applications that can be tricky to handle.

The data set page could also have drop-down menus, a search box, or the ability to categorize them by name, type, date, etc.

A Toolbox menu could be added to the Development Shelf to make it easier to see what you really need or don't. When creating your own application, the tools on the page are in a mixed order, making them difficult to use. Of course, there may be other ways to use the tools more efficiently that could be explored in the future.

There is currently a link to a demo video from the Help for the demo menu. The number of instructions and links evolves with use and experience. Sure, these things will get better over time, too, but the tutorial video series is one good option. The video series could be as follows: Getting Started, Basics, Advanced, and Developer. The help could also include a text version of the tutorial as well as an indexed directory option.

The use of the BalticLSC Software should be developed in a more guiding direction. Now the user needs to be able to switch between menus, but in practice the process steps are repetitive. Thus, it would be easier for the user when the platform guides the user forward in the process and provides clear feedback on the success of the execution. Feedback is considered very important by users.

4. Workshops Feedback

The workshops were attended by various IT experts and other specialists interested in LSC from companies from different fields and universities. Their feedback has been very important, the technical teams tries to incorporate as much of it as possible during the project duration. The summary of gathered feedback is provided below.

4.1 Module development templates or SDKs

The Computation Module development process using REST APIs can be quite difficult for non-IT developers. By preparing module templates in different popular programming languages and by creating dedicated SDKs the module development process would be much easier and would require less resources.

4.2 Data structure for Computation Modules

Multiple independent module developers can lead to use of non-matching data structures. This limits the possibilities to combine the modules into apps using CAL. There are several possible solutions: a) Introduce new Data Transformation means into the CAL; b) Build specific Data Transformation modules library. Regardless of the cases, typical data manipulation operations are needed, e.g., merge, split, copy, etc..

4.3 Support for multi-container Computation Module

Currently a single atomic Computation Module is a single container (not to mistake with Computation Application being used as a single Computation Module) and the only way to support multiple containers is to create a Computation Application which significantly increases the development effort and slows down the computation by introducing a need for additional orchestration. A possible solution could be an introduction of multi-container Computation Module, which would still have a main container responsible for communication with other Computation Modules. Introduction of additional containers would be useful, if the module requires a database engine, like, MySQL. Another alternative is to provide such containers as services, but this limits the scope of different software to be used.

4.4 API access to the BalticLSC Software

Some companies would benefit from BalticLSC Environment if they could access and use the BalticLSC Software to run computations via an API (Application Programming Interface). This would allow for an automation of computation task execution without the need for a real person to use the graphical User Interface.

4.5 Build in data transformation operations

Large-scale computations require the use of different data sources, commonly coming in different formats. The BalticLSC Software should allow for seamless data transformation. This

would allow, not only for Computation Module integration, but also for use of wider range of data sources without the need of extra work from the end user.

4.6 Academic use

Universities have a number of studies and projects that utilize high-performance computing that also benefit from BalticLSC computation platform. In addition to these, there are topics in the teaching content that require high computing power. A clearly defined academic program would be helpful in incorporating the BalticLSC to the educational process.

4.7 SMEs and universities cooperation on BalticLSC

The use of high-performance computing is common for students and researchers in the IT fields of universities. There are public high-performance platforms available to universities, but they can only be used for research. For companies, the use of these platforms is only possible by participating in projects and research. It is hoped that the BalticLSC Software will provide universities with more applied research collaboration, as SMEs have the opportunity to use affordable computing capacity.

Cooperation between different fields and faculties of higher education should be increased. Finding useful new uses for high-performance computing requires an understanding of the needs of the industry and IT expertise in data processing. Cooperation would improve communication between sectors, making it possible for new ideas to emerge.

4.8 LSC affordability by SMEs

For IT companies, BalticLSC computing platform provides new opportunities for the development of new products and services. The development of software for IT companies has been limited by the lack of computing capacity suitable for use by SMEs. Computing services from large service providers are too expensive for most SMEs. The BalticLSC-type service will provide an opportunity for IT companies to develop new types of software. In the future, software can be developed for SMEs that requires high-performance computing when operating costs are at a reasonable level. This offers companies completely new development opportunities and new business.

4.9 SMEs problem with finding and using data

One of the challenges in developing new applications was the lack of good quality data. SMEs do not have classified information about processes or customers. Finding correlations between different situations and activities requires the collection of a sufficient amount of data.

SMEs need guidance and support in gathering information. For many SMEs, access to data is unfamiliar and they have no idea of the opportunities it offers. Gathering quality information today is not even difficult or requires anything special, as most electronic processes collect information - it is often not understood to take advantage of it.

4.10 Selling data on BalticLSC

SMEs and other LSC users often require specific data of good quality to profit on advanced computations. Some companies would be interested to provide such data commercially. BalticLSC could include such functionalities to extend the Providers to not only computation power providers but also data providers.

4.11 Permanent data storage

BalticLSC by design doesn't allow for permanent data storage on the computation clusters. Some potential users would be interested in permanently keeping their data on the platform. Such features would make BalticLSC more similar to cloud providers, however it created serious issues with data protection policies required when permanently storing users data.

4.12 Cloud storage integrations

Many companies store their data on cloud storage. Integrating such outside storages into BalticLSC Software as Data Sets would simplify the use of BalticLSC for some end-users. At the same time the BalticLSC doesn't have problems with legal issues regarding permanent data storage.

4.13 Unknown pricing

During the project, we were unable to determine the full cost of the BalticLSC platform and services, so we were unable to determine the price of the service. The pricing of the service must be known or at least be able to be estimated before users are involved. Pricing for this type of service is not easy when there are multiple parties and roles in the service. The roles and costs of platform developers, module developers, service providers, hardware administrators, etc. are difficult to define in advance. Pricing must definitely be in order if the BalticLSC platform is to be used more widely. Only after pricing can different parties evaluate its utilization in their own business.

4.14 Difficulties with understanding the possible uses of BalticLSC by non-technical people

The wider utilization of the use of high-performance computing in SMEs requires information about its possibilities. Business resources are limited and are often spent running everyday life. Artificial intelligence, machine vision, and other computational applications are difficult to understand in traditional industries. It is difficult for people in the IT and traditional fields to talk when neither understands the other. One does not understand IT slang and the other does not understand real processes.

4.15 Need for more examples of successful solution

The applications and successful implementations of the calculation need to be better highlighted. The benefits of use and more examples of implementation processes should be published. The concrete benefits are understandable and companies are able to make assessments of the return on investment.

4.16 Using BalticLSC in Start-ups

The problem of expensive HPC and/or the lack of code competencies affect especially start-up companies and SMEs. The impact of the problem is that the start-up companies get a longer time to market or miss out of business opportunities. A successful solution would include a relatively cheap access to LSC/HPC, ready to use-modules/applications, possibility of multi-input code language enabling the use of e.g. Python (open source and cheap), and tutorials as well as some kind of expert assistance accompanying the BalticLSC.

Annex I - Workshops questions

The following set of questions was prepared for the joined workshops (Platform and Software workshops held at the same time with common introduction to the BalticLSC Environment and later discussions in separate Platform and Software paths):

A)   Introduction to the BalticLSC – information we gather every feedback we get

Does performing computation through the platform make sense to you?

What are your expectations regarding this workshop?

B)   Introduction to the BalticLSC Environment

Would you apply/use the BalticLSC in your work? And WHY?

What is lacking in the system for you to use it in your work?

In what areas would you apply this? Or in what areas you see the potential to use BalticLSC?

What are your expectations from computation tools (in the future)?

Are the security measures sufficient for your work specifics?

C)   Platform Session

Would it be possible to share your resources in this network?

How would you use it in your work?

What kind of benefits do you expect?

Do you have unused resources?

D)   Software Session

How would you use it in your work?

Do you see yourself as a client? (Is it something you would pay for?)

What kind of benefits do you expect?

Is it user-friendly?

How do you find data management in the system (Data Pins, Data Shelf etc.)?

Would you develop an application in BalticLSC for yourself/someone else/marketplace?

E)   Questions for workshop evaluation:

1)   On the scale from 1 to 5 did the workshop content live up to your expectations? (very disappointed) 1 – 2 – 3 – 4 – 5 (exceeded my expectations)

Comments…………………………………………….

2)   On the scale from 1 to 5 how did you like the workshop format?

(very disappointed) 1 – 2 – 3 – 4 – 5 (exceeded my expectations)

Comments…………………………………………….

3) Do you have any recommendations to improve the training session?
   a. If yes, which?

4) Will you recommend the BalticLSC workshop to others?
   a. Yes / No, and why?