Why EaaSI? System Overview

EaaSI Webinar Series 1

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Ethan: Alright, welcome everybody. Thank you so much for joining us at today's webinar. My name is Ethan Gates and I'm the Software Preservation Analyst at Yale University and for those who maybe aren't fully aware already Yale University is the host to the EaaSI program of work. So today we are presenting why EaaSI a system overview which is going to be our roundtable discussion with Mark Suhovecky, Don Brower, Christian Dahlhausen and Chip German. Your EaaSI staff lead for this episode is going to be Klaus Rechert, Lead Emulation Architect for EaaSI. This webinar is kicking off the first in our series of four that's going to cover key components of the EaaSI program of work. Just some Zoom housekeeping before we get started. If you have any questions during the presentation please type them into the chat box in your Zoom control panel. Jessica Myerson is going to be monitoring them during the presentation and I will bring them back up during our Q&A session at the end so we can present those to our fabulous panel of speakers here. Also, please mute yourself and turn your video off during the webinar to maximize the quality of the recording if you can. You should be automatically muted when you are joining the Zoom call, but just a reminder that that helps us a lot with these large calls so all webinar recordings in the future are also going to be made available on the EaaSI website with transcripts so don't worry you're not going to miss anything. So I'm just going to start off by introducing our guest speakers and members of the EaaSI network. Mark Suhovecky is the data curation developer at the University of Notre Dame's Hesburgh Library. He works on their institutional repository CurateND. He has also worked in research and high performance computing as well as corporate IT and holds degrees in computer science and mathematics and is pursuing a Master's in Library and Information Science. Don Brower is a product owner for the University of Notre Dame's Institutional Repository, again CurateND and before that he was a software developer and lecturer. He has a Ph.D. in mathematics. Christian Dahlhausen is a DevOps engineer at Academic Preservation Trust at the University of Virginia working on maintaining and automating the AP Trust Preservation repository. Prior to his work at UVA he worked for multiple startups as a software engineer, DevOps engineer and data scientist. Christian is a German citizen and holds degrees in Business Information Systems and Systems Engineering. And Chip German is Program Director for the Academic Preservation Trust based at the UVA library where he is also Senior Director for Scholarly Communication. He is about to take on additional duties as the interim associate university librarian, yay Chip, for Research and Learning Services and previously served as Vice President for Information Resources Libraries in IT at two medium sized public universities and before that worked for twenty years at UVA in a range of jobs including Chief of Staff to the President. So it gives me great pleasure to hand it straight over to Klaus Rechert our EaaSI staff lead who is going to introduce us with a system overview of the key components of EaaSI and how EaaSI is different from EaaS. So Klaus take it away. Tell us what is EaaSI.

Klaus: Greetings from Freiburg. My name is Klaus. I'm representing the Open SLX Company. It's a spinoff from the University of Freiburg and together with the team here in Freiburg we were the developer of Emulation as a Service and now we are so happy and excited to be a part of this project and actually improving the emulation strategy. So I'm going to share my slides. So since we do not have a lot of time I don't want to do a deep dive into all the philosophical and technical aspects of emulation let's just quickly define and reiterate the terms and the goals of our emulation strategy in context of research of libraries and museums and archives. The problem set actually is depicted on the top. User provided objects to be rendered to perform or to run. So it's not only that we have a huge number of objects but we have a huge number of different (inaudible) so and additionally the objects are maintained by users and stored and managed independently. To render these objects we require technical runtime consisting of software and hardware and that's what we call…so in the middle layers that's what we call a software environment which is usually a combination of an operating system and in stored software. Software on…remaining on its original media like software to be installed is considered as an object and should be treated on the top level maybe with some additional properties and additional metadata. Well and then to make software environments work we need appropriate hardware. If not available anymore we need a hardware equivalent or what we call emulator. The goal of this whole thing is actually to make emulations (inaudible) especially in context of so many objects and the diversity of users and how they want to access these objects. So this is the EaaS Technology Stack. So what we did is we translated these three layers into individual components, also organized a 3D layer. On top we the object archive suitable to…to store and to maintain user uploaded objects in a very simple version or in a more complex version connect to user or to an institutional repository. Of course on the bottom we have components to manage and to orchestrate emulators and all these is…well stored and maintained independently because while the user owns its objects and wants to…and they are stored at the user site and emulation is service provider as the service provider maintains the emulator (inaudible). So we have or we use technical metadata to bind these three layers together. And what we do is we combine these layers based on…on…on technical metadata that we have on demand so this is…here comes the service part. So given the metadata we can react…reenact the whole stack. So in this example we run an emulator with a preconfigured Windows 98 and we call a user uploaded object from the object repository all on demand and all yeah in the distributed fashion. So why EasSI? Well emulation as a service scales were also for technical, but it did not scale well with users. So EaaSI or the goal of EaaSI is to make emulation easier and more accessible, improve usability in the UI. The UI is…or will be improved by…which will be presented in a different webinar I think so. Make emulation extremely distributed emulation service; this is where I come in today. Improve discovery and description as well as the access option. But I'm focusing today on the more technical part and on the vision as emulation as a truly distributed service. So the goal is that someone produces this environment and put some effort in producing a proper Windows 98 environment and to be able to share this. So we as part of this project the Yale University library will provide thousands of pre-configured software environments. So we need infrastructure to share these among the EaaSI network. Once they are available on the EaaSI network

you should be able to improve them because well not everything is set up properly or the way you like it in the first run so we want to give you the tools to improve any environment and to share it again to the others and we want to if someone has the technical metadata and downloads and replicates and environment the environment should be reproducible like it should run the same way or less the same way as a run (inaudible). For this we have to improve what we call the image archive. We split it into two parts: the (inaudible) private (inaudible) where this is your work area where you built the environments, you work with the environments and improve whatever needs improvement. After you have done everything certainly environments are worth sharing; there will be a public environment at the bottom where you can publish them and make them available. Optionally we can assign these public environments handle entry. Complementary we introduced a remote archive, which is essentially OAI-PMH Harvester. So this system is as complementary to the public archive which is OAI-PMH Provider. This is the way we anticipate to share environments and metadata among the EaaSI network participants. So how does it work? You have a remote; you have a list of all available remote environments which can be searched. You search for something like (inaudible) environments and then you can replicate it, work with it and share it and publish it again. We also improved the object layer. We added the simple user upload object archive, but more importantly we allowed direct access to objects where we have the METS data. We also have a connector interface which has currently on the partly integrated implementation Preservica, more to come. And on the other hand to make emulation setups reproducible we containerized emulators. So we used the container technology just to have hashes and a repository where we can pinpoint certain versions and to independently store and retrieve emulators. So if you publish an environment we note or we note the version of the emulator used in this environment. We put it into the metadata. So if someone is replicating that environment the emulator itself is also downloaded into the Eaas infrastructure implicitly so that this environment started with exactly the same emulator that the producer has used to create the environment in the first place to reduce all the additional problems that can occur if you move an emulation environment from one (inaudible) with another one. Also part of the one-time infrastructure is a complete new EaaSI installer which should reduce the hassle to install EaaSI a lot. EaaSI is still a complex product, but my colleague have tried very hard to make it as easy as possible to install your own instance locally. And the whole setup is not cloud ready; we are very close to publishing a cloud instance, but also to publish a cloud installer currently only tailored for the new cloud but more is to come. Some important links and repositories I think most of them are also available on our website. There is the EaaSI handbook which covers both the installation side and also the user side. We have the EaaSI installer; it is available from gitlab; very important if you do the installation to tag the latest release and all the packaged emulators are also available on gitlab. So that was the basic overview of what EaaSI is; what we have done previously in EaaSI, and what EaaSI can do right now. We still have a year to go so there is more development to come and hopefully there will be another webinar where we explain the new developments on that so.

Ethan: Thank you so much Klaus. This was fantastic and I'm really impressed at how briefly you got through so much information so thank you so much. We're going to take this opportunity to transition in our moderated discussion with our node hosts so they can take this great information that we've gotten from Klaus and see what it's looking like sort of on the ground in the organizational context at our various node hosts. So how this is going to work I'm going to pose a few questions to our node hosts representatives, Mark, Don, Christian and Chip. I'll pose question and direct it first off straight to one of our representatives. I'm keeping an eye on time and moving us along through each of the questions. Everyone will get at least one question before we move on to audience Q&A but if we have time and others from our panel want to chip in with some of their own experiences that will be great, but I'm going to start off with Chip for our first question. So Chip could you talk about what interested you and the University of Virginia in becoming a node host in the first place? What…you know looking at presentations like this from EaaSI and seeing what kind of content or user needs that your organization this could help address?

Chip: Yeah, happy to do that. You're able to hear me okay?

Ethan: I can hear you perfectly, thanks Chip.

Chip: Great. So I'll broaden the notion of it. I think answering the question of why we're interested in this technology is the answer to why we quickly jumped at the opportunity to do the node host so I'm going to go a little higher up and you know it all boils down to something that we'd like to do that we can't do now. A metaphor I always overuse is this one depends on which part of the elephant you touch how you answer the question of what engages you the most about exploring this technology to solve your problem and when you think about it the notion of emulation and software preservation is some elephant big size. The possibilities for emulation to extend the usable life of software pretty wide ranging and I think you can illustrate that by thinking about the questions, the breadth of questions that you could ask along these lines so it could be like what kind of software are we talking about? Are we talking about commercial software or custom built software for research purposes by our researchers at our institutions for example? Whether they want it for example it might be making games playable long after their platforms are obsolete or it might be verifying results of research. But who's trying to use it? I'll put myself in a couple of roles here. It could be me in my pajamas on my home laptop or it could be me the researcher doing very focused research work at a workstation in a special collections I guess what we used to call and still call reading room. It's the last example that drove some of the UVAs interest. A specific case that comes up we're using it both in the EaaSI project and the related FCoP project that will probably come up for discussion a little later on too and that is a specific case that involved the gift of digital papers from an architect through our special collections unit here at the UVA library. It includes materials that depend on an evolving set over the work of this architect of versions of design software so that's a clear cut used case and one that drives our interest in part. For me personally the driver was more about the pioneering digital projects that faculty by various institutions had put together dating back mainly to the late 80's and early 90's. All of them have software and operating

system dependencies and all are suffering through. For us to keep some access to them right now they're all suffering through what we kind of euphemistically call deprecation which I think in fact is a life support by cutting off some important functionalities and that's sort of like keeping a patient alive through a series of amputations. Emulation just seems like a much more attractive option to me and to us in general you know that image sort of makes me think of Robocop, the movie Robocop, but I don't want to extend that too far. It goes astray really quickly, but the point is faculty digital projects have been a major motivator for me and I'm happy to say for others here who are involved in similar work but those kinds of use cases drove us to thinking that emulation offered a great opportunity for the development of another tool to try to get at this kind of problem and we were happy to volunteer to be in a node role to make sure that we contributed to the larger community work on this as well as looking after our own interests and our own needs. So I'll stop there.

Ethan: Perfect. Chip, thanks so much. I think that's a really great summary of the high level needs that EaaSI can fulfill and emulations can fulfill. I'm interested to transition over to Mark. Given what Chip is saying I'm assuming that at Notre Dame there are very similar broad user needs in terms of access to digital papers, special collections resolving software dependencies on software dependencies, deprecation on deprecation, but could you speak a little bit more about the specifics of deploying and testing EaaSI to solve these problems and in other words to go into integrating the EaaSI platform into the broader technology ecosystem at your organization? What are some of the challenges that you're seeing and actually applying emulation as a strategy?

Mark: Okay. Well the big driver for our university is four years into a five year what they call a cloud first initiative so we are trying to get out of the data center business. If we were going to put it up we had to do it as a cloud service and here in the Notre Dame library we have an enterprise group that has a cloud infrastructure using Amazon web services so that's the route that our particular node chose to use. I'm going to just touch on the specifics of that implementation briefly in the chat. I actually put a link to a web post that I did back literally in our beta testing that goes through the boring details if you want to be down (inaudible). But very briefly we actually have stood up (inaudible) EaaSI instance as an Amazon EC2 instance and all of the installation instructions and configurations are built into what's called the cloud formation script so it's very easy for us to tear down and reinstall the system. One of the things as we've been testing that we've been finding out in our infrastructure pretty much all of our back end storage is cloud storage and as we went through the EaaSI testing protocol and beta we found out kind of by trial and error that there were in a current implementation of EaaSI there were a lot of configurable options that if you do (inaudible) them you were going to run the EaaSI server out of space so by trial and error we pretty much learned the last two and a half months or so that to get all of our emulation images and our (inaudible) space and everything else (inaudible) into an Amazon hosted storage. I think another thing we're still working on, we're not at a production capacity yet, there aren't many groups in the library that are using this, it's really just the four of us here that work on the EaaSI project, and so we don't have a good feel for how we're going to size this and so we're still trying to

come up with a resource budget as far as how much (inaudible). We have a hundred emulated titles or how many concurring emulations could we support things like that and I think at the very end and this is maybe something that Klaus could touch on a little bit is some of the things we're going to have to do to actually get EaaSI to work in our larger technological infrastructure is that our Legacy software collection and some of the curated software source that we have I mean we would like to be able to run software that's in our catalog through a link that's in the catalog and part of doing that in our ILS will involve the person that's going to have to use our identity management system so we don't really have any sort of identity management hooked up on top of our EaaSI layer. We have just a real simple login and password and our university is in the process of actually transitioning to a new identity management system. In fact we're cutting over in two weeks so part of the work for us for EaaSI would be tying that in with like our institutional login so that we could offer links to our own (inaudible) in a cataloging or say through our institutional repository. This is a little off but, another thing right now is that the emulations we have done in testing we have done ourselves and we have a group here at Notre Dame that actually does digitalization as a business so I'm sure they're much better than I am so I have piles of things like Apple versions of Galaxian and what have you, but I need to tie in an expert rather than me being the bottleneck.

Speaker: Sorry, I just want to thank you for bringing in those examples Mark.

Speaker: Yeah everyone needs Galaxian and Oregon Trail, yeah.

Speaker: I did want to chime in on your previous point about identity management. Klaus might be able to say more about this, but I just wanted to point out for everyone that that is absolutely on the road map for I believe fall release to work on authentication and integration if Klaus has any more to say about that or any of Mark's other points.

Klaus: Integration, not only authorization and authentication, but integration is a very important aspect of the second year. We were working on that. We are trying to find a proper middle ground to cover because every institution has slightly different requirements and a slightly different system setup so we are trying currently to figure out what is an appropriate middle ground for instance authentication integration.

Ethan: Yeah that's great thanks Klaus. I really appreciate everyone sort of you know in the network bearing with us as we kind of figure out what it takes to scale emulation services infrastructure by doing it and working that out along the way. As long as we have just a quick moment here I would be interested if Christian as the sort of DevOps you know Mark's counterpart over at Virginia, if there are any infrastructural concerns that you're thinking of that you want to bring up as long as we're on this topic. Anything that Mark didn't mention.

Christian: Not in particular, but actually the previous topics were quite a good segway for my question if I can continue with that.

Ethan: Yeah let's just go into that. I believe could Christian's mentioning that we have another question lined up for him as the challenges for adopting and provisioning EaaSI as a service on campus and I think you're right this discussion leads pretty naturally into that one so let's just go ahead there.

Christian: Yeah, so I gave it some thought and I thought like for me or for us there's like four major areas or challenges for provisioning and adoption of the EaaSI services. The (inaudible) service in the library is one is the integration part like Klaus mentioned with the different landscapes of different institutions integrating EaaSI on service into them and making them available to use for patrons and library staff is certainly a challenge to integrate it and also the provision for use is also one I feel like requires manual work to identify systems or system configuration for objects running or should run in for example on a desk pad software has had a lot of versions. I know from previous work experience that some of the versions like some of the CAD drawings that were made in AutoCAD 12 or whatever didn't work in 13 and had to be migrated or had to be accessible and be used and I think as some aspect of mail curation if you want to provide that access to different digital items and the other thing is cost like Mark mentioned earlier is that it's uncertain how a service would be used and how many people use it and so how to size the infrastructure and staff for (inaudible) usage is a little bit difficult. In the EaaSI project we make an effort to estimate that and take data from other project members to get a better estimate on that. And then the last point I want to bring up is actually a long work from UVA mentioned that to me that is staff training and user outreach like I said earlier that a curation of like emulation environments visual items may have to be done manually and also public outreach of the patrons and making them aware of the service that we have and making users understand what benefit or how much easier it could make their work if they have like a Windows 95 with AutoCAD 10 or something in order to open all the digital objects. Yeah.

Ethan: I want to plug our October webinar which will be specifically on configuration workflows and if that particular aspect of the project peaks their interest we'll definitely be diving more into that where I guide that since that is a lot of the work that I do. Well yeah. Since you've brought up users and sort of transitioning into user services and what EaaSI looks like once it gets to them I think that's a good moment to pass over to Don. How do you see this EaaSI platform fitting into your portfolio of user services you know existing library access systems at Notre Dame? Are there specific departments or services at Notre Dame that you already considered integrating this with and speaking to? Can you step back a little bit maybe at this point and talk about that?

Don: Sure, yeah. I don't think we necessarily found every workplace where EaaSI could fit in this but we have a few places that we're starting so I mean naturally providing access to our like old digital content such as like old CD-ROM titles or like old supplementary like disks that came with purchased books as one of our first use cases. Of course this is going to evolve too as we work on…this is also

involving our digital preservation strategy as that gets worked out as well. Another place where we've seen it possibly used is with like we kind of see EaaSI as setting like kind of next to the repository so like if there is content in the repository that could benefit from it like could we also use EaaSI to help support access to that to those files such as we do have some software in there including some people who like deposited like not only the sources but like the jar files for like a mobile app. Another place where we looked is like a special collections with like artifacts and like that they have received so they're like hard drives from like thumb drives like can EaaSI be used to like access those files possibly that would be like more locked down instance maybe like you have to be on premise but there…and then and also as Mark mentioned we have our Center for Visual Scholarship that has a retro computing collection with like Apple II's Commodore 6, TRS-80's and the number one problem with that is we only have so much hardware, but then we also have the software aspect of collections so can EaaSI provide a way to have a broader way for access to that software. An interesting thing is that the EaaSI can support other CPU types than just like the Intel platform so we can use those kind of things. I'm excited about that. Then in like a bigger user service picture which is still very fuzzy right now is can we use EaaSI to help support research data services and I'm not really sure what that would look like at the moment like it's just kind of vague like this is supporting like either research software like it necessarily I don't know necessarily to like review or interpret results like maybe someone like someone put all the stuff like in KaleidaGraph and we need to see it or even like is it something like ReproZip or something like (inaudible) works on like with like can you…can we make like a bundle of a…of a software and then also have like an emulated platform that it runs on so we can have…so this is more thinking about preservation not accessing old Legacy content but can we figure out a way to actually like have a format for preserving current content for the future and I think that's probably the most exciting thing but it's very fuzzy right now so.

Ethan: Yeah, no I think that's a great point to bring up that because this is part of the broader software preservation discussion there are ways in which EaaSI or emulation service platforms can help not only Legacy collections, but there are these very intriguing possibilities for data being generated today and envisioning what services could come out of that is an exciting aspect of this project. And I'm curious if anyone from the Virginia team wants to sort of chime in here on the same question in terms of possible services or different applications for patron use and user use that they're seeing in their context.

Speaker: I think Don's list of examples are pretty similar to ours. We have a lot of very practical people here with very practical problems to solve and as soon as we're able to show them what this is capable of doing and we prove its scalability and manageability to deliver from a staff perspective and physical perspectives like does it have to be on a dedicated work station, can it be used in a distributed fashion, those kinds of questions. I can give you a list of ten and after we were able to show it to the rest of the librarians here we'd have a list of 150 uses that pop into people's minds right away. It's got really wide-ranging potential.

Speaker: Yeah, I'd say speaking from the EaaSI staff team part of the challenges often scoping this idea into proving what we can do in a certain amount of time just because the possibilities are so endless, but like we are so excited to find out what that means when we take these big ideas and actually apply them in institutional context. Are there any other sort of thoughts on our current line of discussion from the panel before we perhaps even start taking questions from the audience because I can see we've already got a few good ones lined up.

Klaus: Just want to make a quick remark on the research data side on the research data management side. This is a really emerging and hot topic because we now see that data is intervened with software so you need or it's likely that you need software to make sense of the data in the future. Emulation is one to do that but what we currently saw was mostly visual access, interactive access to like CD-ROMS to make research data management workflows even in an archive way where we need to think about new ways of access like non-interactive access, machine access. This will be one of the major future directions of the development of the access part of EaaSI.

Ethan: Great. Thanks Klaus. Yeah and thanks everyone for this sort of first round. Thanks Don, Mark, Christian and Chip for guiding us through this first round of questions. I want to go ahead and take some time for questions from attendees now. As a reminder if anything has popped up during the session or if anything is popping up into your head right now please just type your questions into the Zoom group chat and we'll snag it and make sure we communicate that to our speakers. I want to circle back. There was a question from the University of Toronto I believe on Mark's presentation that either Mark or perhaps Klaus could clarify. Could you expand on what you were saying about running out of space without proper configurations and what exactly the issue was there when you were implementing?

Mark: Sure, So I think one of the underlying technologies in EaaSI is Docker. Docker has a number of overlayed file systems and what I found was that by default if you don't configure the Docker its working storage is in the root file system of the EaaSI server so when I actually got to the point where I had enough emulations and things that I was copying around. No matter what I did I was always running the EaaSI file system out of space so I ended up configuring Docker. In fact this is our general solution for anything we have to store for EaaSI. We store off the machine in a persistent AWS volume which we attach when we rebuild the machine. We attach it and then we just reattach it so it's just finding all those little places so what we ended up doing for Docker is we changed the data route to write all of the Docker temp files and overlays on our persistent (inaudible) and now (inaudible) file. Does that answer you University of Toronto?

Ethan: Okay. Thank you. Perfect. Thanks Mark.

Klaus: I may add a few things.

Ethan: Yes, please Klaus.

Klaus: Yes, we need some space to work on especially and there was a major issue we need some temporary space for repackaging emulators. As a thought we use Docker or the Docker repository or the (inaudible) repository to package emulators to make it convenient to retrieve them and to work with them locally and have assured version, assured of the hash that you actually have the exact same version as the other one. This requires some space. We don't use Docker for the emulators locally so we download a lot of data and unpack it and we work it. As Mark pointed out we improved it over time so we factored out most (inaudible) which requires space and so you can have now configuration options where you can factor out like (inaudible) directory where you actually have space where you can put temporary storage on. We (inaudible) improve this together with (inaudible) to make the documentation as comprehensible and to actually make people aware of these issues.

Speaker: Yeah and I think this is a great point to bring up the documentation class since we had another question from Steven Klein about again where we can find technical documentation about EaaSI. Given that there was such limited time in your opening presentation there is clearly a lot of detail that we can't get through in the webinar, but we should emphasize that all of our documentation and the open source code for an EaaSI node is available through the EaaSI gitlab page so that's gitlab.com/EaaSI. You'll find our repositories and the user handbook is a great place to start in terms of leading you where to go to those repositories, how to download because we should emphasize that even though the sort of some of the networked pieces of the EaaSI network are for you know legal and intellectual property reasons that we'll get into in a future webinar are keep us from sharing certain pieces of information about how to link EaaSI node installations. They are absolutely available for anyone to try running at their own institution. So we would emphasize starting there and keeping an eye on the gitlab page for all code and documentation purposes. Let's see. I'm going to see if there are any other great questions in here. We've got a question from Gerard Cohen from the Preservation Policy Posse of that posse. Are there guidelines for researchers not currently requiring emulation to record their environments in an EaaSI understandable reproducible or ingestible way? He's thinking of the fast moving digital landscape dependencies, scientific reproducibility. Yeah I think this is speaking to some broader software preservation workflows and how EaaSI fits into that basically the question of how to prepare possibly materials for in just into EaaSI you know broader workflow sense. Would anyone from the panel maybe Chip or Don like to speak on that or have had any thoughts on this question?

Speaker: I'll jump in really quickly with just a very broad comment and I think Chris has highlighted the issue of the complexity of the environments and how important it is to have a clear understanding of essentially metadata of all the components because EaaSI as a library of possible elements that could be placed together to create a virtual environment seems to me to be pretty flexible and growing with additional software made available through it and so the trick is putting the combination of things together necessary to build the environment that's needed to accomplish the specific task so it does seem to me that it's like we're always telling researchers we need metadata; that's my particular take on it and I'll invite the others to refine that with smarter comments.

Ethan: I just got a reminder from Jessica that that's another one of our webinar topics down the line will be on metadata and and optimizing metadata for software collections to work with these workflows but if anyone else has thoughts right now yes so that webinar is in September.

Speaker: I mean my thought is just this is I think also playing towards like software (inaudible) in general which is as Chip said is huge and what works for one person will probably not work for another and I also think that there's still there's not really a consensus on what it means like how much or what is actually qualities needed to be preserved like I think it's a very open end question so like institutions don't really have any policies around (inaudible) software yet so (inaudible). I don't know it's a huge question.

Speaker: An ongoing discussion that we're also having with the crowd in the FCoP project as Chip mentioned earlier. Yeah it's part of a broader conversation yeah. Let's see I just want to make sure we have time to get through all these questions so Aaron Davis from Colorado State archives is asking about the pricing structure for the service and is it space based, subscription? He's also interested in how integration with Preservica would look. I mean I can answer off the top that for at least the first round of funding for the EaaSI project which is through June 2020 it is a sort of guided targeted network model of partnership with specific institutions as in discussions, but for the business model side of what EaaSI will look like beyond June 2020 we are working with the Educopia Institute as a project partner to investigate those models whether a subscription or space based model makes the most sense that is part of the research and investigation into infrastructural models that EaaSI is part of the EaaSI program's work and yes and we should also mention that nodes are tracking their infrastructural and staff costs as we go along here in this first project so we can get that information to future partners, future institutions so they have a better idea of whether it needs to be a data driven cost model or what have you. What makes the most sense can actually offer firm numbers, firm research on that to others if that answers that question and Preservica specifically I mean maybe Klaus would be able to talk a little bit about this about how integration with Preservica could look. I know from Yale's end of that it's possible.

Klaus: It's very brief. It was powered to see how we can do this in general. It's currently constantly evolving. All we can do basically is retrieve objects like CD-ROM objects or similar (inaudible) collection from Preservica together with some metadata and make it available seamlessly in EaaSI so you can browse them in EaaSI and just run them. That's the very brief version of it if you're interested.

Speaker: Yes, sorry. I know that. Integration with larger services is a question for sure. That again gets into specifics of each particular repository or management system that you're talking with. Definitely think we're interested in investigating down the road. There's a great last question here I think that will help us wrap up from Michelle (inaudible) from Cornell. Could we talk a little bit more about the end user experience and how an end user runs an emulator whether it's a browser or locally on the

computer? I think Klaus can maybe speak to a little bit about what current end user access services look like.

Speaker: Well the typical end user access is via browser so the user does not have to do anything but the system is provided either by the local institutions like the university library as a meeting room setup or as a cloud setup in a more private cloud setup or as a service provider so the user is just using a browser based interface where he clicks and naturally interacts with the environment. The other access options which are more targeted to museums which (inaudible) so they are flexible options but the typical option is browser based access by the user.

Speaker: I think this is a perfect opportunity to plug the public EaaSI sandbox which is being released hopefully later today. We bare watch for the software preservation network Twitter account. We are excited to launch a version of the EaaSI platform that is accessible to all because it is populated entirely with open source software and open source environments. That's going to be a sandboxed controlled environment where anyone is going to be able to launch that and explore a little bit and get a better sense of what this browser based access that Klaus is talking about looks like and what environment administration and management might look like from a UI standpoint. So please watch the software preservation network website and Twitter account for some blasts coming out about that extremely soon. We've covered all of our questions here so I just want to give one more chance to the group chat to see if anything else has come up.

Speaker: So there's a question about CD-ROM.

Speaker: Ah, yes. I'm just going to say it out loud. We've got one from Gerard Cohen again on how you get over the hardware and format issue in like a CD-ROM example.

Speaker: So we require that the CD-ROM is already (inaudible) as an (inaudible) image and then either we allow the user to upload it directly from its computer or (inaudible) the CD-ROM is part of (inaudible) repository where it can be retrieved on demand.

Speaker: I think Jessica mentions that we are going to get into more details of that workflow both from a metadata and configuration perspective in future webinars, the metadata one coming in September and configuration in October so please keep an eye out for those and rejoin us then. One last chance we're still not quite at the top of the hour so can we post the sandbox URL. Not yet. I think we are looking on just some last minute touch ups, but we will have that please again watch the Twitter account it's very soon I promise. I'll throw it back to our guests and our panel if there is any kind of last thoughts on our great round table of guests is there anything else that you wanted to cover in this session before we wrap up?

Chip: This is Chip I'm just going to emphasize the plug for the next episode the August one on the legal and institutional policy frameworks. The reason I thought of that was in the question of what the user

experience is like some of that has to do with what's appropriate use under the law for some of the emulated environments that we have and you can hear much more detailed discussion of that from the experts in that space in August.

Ethan: Yeah so that's a great transition into our wrap up. Thank you Chip to remind for everyone to join us in August for our next episode in the EaaSI webinar series as I said that's EaaSI legal and institutional policy frameworks. We're going to be joined in that webinar by (inaudible) from UC San Diego and Brandon Butler from the University of Virginia and Software Preservation Networks Law and Policy advisor there so that will be led by our EaaSI project investigator (inaudible) Cochran and we really thank everyone for joining us today. I want to again thank Mark, Don, Chip and Christian and Klaus for guiding us through this fantastic overview. I hope everyone here learned a lot. Keep questions coming at us through your preferred platform and we will see you next month. Thanks everyone.

Jessica: A huge thanks to everyone, speakers and attendees included. That was great. Thanks.

End of audio.