

ARTBASE ARCHIVE: CONTEXT & HISTORY

1

About this report series

This report is part #1 in a series documenting the research process and practice of Lozana Rossenova, a PhD researcher embedded at Rhizome between 2016–2020. These reports trace the development of a practice-based interaction design research project, starting with a Discovery and User Research Phase. This Phase includes the study of the organizational context and history, documented in Report #1; gathering information about past and current use-cases and user expectations, documented in Report #2, as well as a review of the current landscape of digital design for cultural heritage archives and collections, documented in Report #3. The next Phase—Design Exploration, including low-fidelity sketches and prototypes and continuing the conversations with users, is documented in Report #4. This report also includes a summary of the Evaluation Phase, since it is an iterative process throughout the other Phases, rather than one final step. The final outcomes of the Design Specification Phase, wherein the initial design proposals are transformed into interactive prototypes and specific recommendations for a data model schema, can be found under the [Prototypes](#) and [Data Models](#) sections of the PhD portfolio website, respectively.

About the researcher

Lozana Rossenova is a digital designer and researcher, and a PhD candidate at London South Bank University's Centre for the Study of the Network Image. Her PhD is a practice-based collaboration with Rhizome. Lozana is particularly interested in working with open source and community-driven approaches to infrastructure, which organizes, stores and makes cultural heritage data accessible. Her current research focuses on born-digital archives and born-digital art. Her PhD project develops design methods which build understanding across diverse communities of practice and facilitate informed interaction, favoring nuance and complexity over reductive simplification.

This research is made possible through funding from the AHRC in the UK and additional support by Rhizome.

Contents

Executive summary	3
1 History of the ArtBase	7
1.1 Vision and mission statement	7
1.2 Accession and collection policies	10
1.3 Backend setup and data management	21
1.4 User interface design	31
1.5 Cataloguing and findability	37
1.6 Archive users	47
1.7 Exhibition histories	48
1.8 Timeline of ArtBase development 1999–2019	50
2 The digital preservation programme	53
2.1 Preservation strategies	53
2.2 Wikibase setup	67
2.3 Database audit 2015–16	75
2.4 Archive interface(s)	83
3 Institutional needs and goals	89
3.1 Towards a design brief for the ArtBase	89
3.2 Infrastructure and database architecture	92
3.3 User interface	94
3.4 Future vision for the ArtBase	101
Appendix	106
References	112

A note on terminology

This report mentions a few different terms to talk about varieties of born-digital art. *Born-digital art* generally refers to artworks which rely on computers and networks for their production and performativity. The term *new media art* is used on occasion to refer to works which may also use computational media, but could encompass various forms of installations, as well as physical components. *Net art* is the term used most often in the literature referenced by this report to describe works archived in the ArtBase. It is broader than the earlier *net.art* which focused on a specific group of mostly European artists during the mid-to-late-1990s. *Net art*, as described by Michael Connor in the publication supplementing the Net Art Anthology online exhibition (Connor, 2019), is not just about the creative use of the net, but also about examining the conditions of participation in it. In that sense, it can involve performative or participatory elements outside a browser window. Even so, in the ArtBase, the primary experiential context for the artworks is the Internet.

Executive summary

Introduction

The ArtBase archive was established in 1999. Its vision and conception at the time was closely tied with Rhizome's position as an influential mailing list with an active community, including some of the first artists working on the internet.

The ArtBase is also an international and diverse archive (with over 2000 artworks to date), primarily hosting works of net art, but also including "works that employ materials such as software, code, websites, moving images, games, and browsers," as stated on the ArtBase homepage. With its expansion in size and scope as well as complexity over the years, the commitment to preservation in the ArtBase has become an increasingly conscious effort at Rhizome.

This report traces some key historical developments with regards to the ArtBase establishment, database structure and interface design, in order to set out the scope and ambition for a multi-year redesign process beginning with this PhD research project and continuing under the direction of the preservation team at Rhizome.

Methods

This report documents the initial Phase of the PhD research project—Discovery and User Research. This phase corresponds to the "Requirements gathering" phase in typical interaction design workflows (Shneiderman et al., 2018, p.131). However, one of the goals of the PhD project is to question the traditional understanding of "system requirements" and how these are gathered via traditional user research. To do this, I have applied qualitative research methods, such as literature review and ethnographic observation, towards the study of the organizational context and history of the case study institution. Throughout this research, I have aimed to position the archive not as a system that needs new requirements for a brand new implementation, but a system that can build upon and explore its own historical context. In addition, I have conducted semi-structured interviews with past and current staff members, and participated in frequent group discussions with the preservation team, in order to gather insights about past and current use-cases of the archive, and to learn more about the institutional ambitions, plans and expectations for the redesigned archive.

Structure of the report

The first part of the report looks at the historic setup of the archive, its founding goals, the structure, and accession policies. This part of the report does not aim to trace a complete organizational and archival history, but rather to study which points in that history were translated into decisions that impacted the archive's interface and interaction design, and further—what some of the limitations of these translations were.

The second part of the report looks at the development of preservation strategies at Rhizome since 2015, which can be divided into three primary areas of focus—software preservation, network preservation, and structured preservation metadata.

The final, third section of the report sets out a series of propositions to be explored further, in lieu of a fixed brief for the redesign of the ArtBase. It includes feedback and insights from past and current staff members, identifies some key areas of concern with regards to organizational policies, the infrastructure setup of the archive and the interaction design challenges for the frontend interface. Finally, it outlines a set of ideas for the future of the archive, which are listed in the key findings below.

Key findings

Part one—archive history

- ▶ Historically, works have been accessioned into the ArtBase as one of two possible digital artifacts, referred to as “cloned objects” and “linked objects”. The existence of these two types of entities has largely resulted in the current “**hybrid mode**” of the archive—i.e. the archive as a collection, which contains artworks fully available in the archive (the cloned objects), as well as the archive as documentation of artworks (the records for the linked objects). To start with, it proved to be a flexible strategy, but the unstable access to the latter “linked objects” due to link rot eventually led to the decision to stop accepting them, while software obsolescence complicated access to the “cloned objects”.
- ▶ There were three main phases of **accession policy changes** in the archive: a) Open submission (until ~2010); b) Filtered submission (2010–2015); c) Closed / by invitation only (2015 onwards). The changes in policy impacted the design of the archive, too, resulting in a series of frontend redesigns, which corresponded to the main Rhizome website brand at the time. However, these frontend solutions did not fully address the more complex underlying issues concerning data provenance, archive trustworthiness and long-term preservation.

Part two—digital preservation programme development

- ▶ Since 2015, Rhizome's primary archival focus has been on developing **new tools and approaches** to address the digital preservation challenges facing the ArtBase.
- ▶ Rhizome's primary approach to **software preservation** is emulation. This can be facilitated in the form of pre-configured, containerized (remote) browsers—via the framework developed for the oldweb.today project—with the aim of providing access to web-based artworks in a functional context similar to the context at the time of their creation. For full environment emulation, e.g. at the operating system level, which is sometimes needed for software-based art, Rhizome have worked together with researchers at the University of Freiburg to develop the Emulation-as-a-Service platform.
- ▶ Rhizome's primary approach to **network preservation** is facilitated through their decentralized web archiving tool: Webrecorder. Webrecorder records server-client traffic in real time as the user browses a webpage. Additionally, it allows archive augmentation and extraction of material from existing web archives such as the Internet Archive. Contemporary artworks which link out to external data sources or exist across third-party platforms can now be accessioned and restored, if needed, as complete WARC archives and then replayed with Rhizome's bespoke replay instance of Webrecorder: Webenact. While ethical and ontological questions with regards to the boundaries of the archival artifact remain open, tools such as Webrecorder and Webenact allow preservation staff to "artifactualize" seemingly diffuse artworks.
- ▶ The final focus of the preservation research at Rhizome over the past few years has been representing the **ArtBase metadata** into a structured, i.e. machine-readable and open format, and enriching it with additional data related to preservation tasks associated with specific artworks. Linked open data—an open and standard form of structured data for the web—has been an ongoing goal for many institutions in the GLAM (galleries, libraries, archives and museums) community. The representation of ArtBase data in Wikibase, an open source data platform part of the Wikimedia application ecosystem, provides an opportunity to explore how linked data could benefit preservation and maintenance in a heterogeneous born-digital archive.
- ▶ The advantage of **Wikibase** over other collection management systems for Rhizome's use-case is that there are no pre-set hierarchies or ontologies. Wikibase can function as an ontological sandbox and space for experimentation; there is no need to follow prescribed standards or conventions utilised by other organizations. Additionally, Wikibase can also enable data in the ArtBase to be connected to other structured linked data databases which contain data about people, places or things, if and when needed, including connections to other metadata standards and vocabularies expressed as linked data, such as the Getty's AAT, TGN, and ULAN, among others.



Part three—visions for the future

The following list indicates the key areas of concern and ongoing debate among Rhizome staff members with regards to the future vision for the ArtBase archive.

- ▶ **Transparentct communications:** there is a need for greater transparency in terms of how the institution communicates policy and operations decisions with regards to the ArtBase to the broader community;
- ▶ **Historicizing the archive:** there is a need for a cohesive institutional narrative around the ArtBase, after 20 years of history;
- ▶ **Institutional archives:** there should be a place for the wider institutional archives at Rhizome, and the ArtBase may also be a fitting solution for that;
- ▶ **An extension of the artistic program:** the ArtBase should play a stronger role in relation to the broader curatorial pursuits at Rhizome;
- ▶ **Comprehensiveness:** the ArtBase doesn't need to continue to aim for comprehensiveness in an ever-expanding field, but rather focus on micro projects and collaborations;
- ▶ **Access to restored artworks:** access to artworks could be better; automating the launch of artworks in emulated environments (i.e. remote browsers) is desirable, but restoring functional access to all artworks is not a priority, as the archive can be valuable in other ways, too;
- ▶ **Open or closed platform:** there is some interest in opening up submissions to the ArtBase once again, but there are also concerns about the challenges in terms of moderation, managing resources, as well as ensuring diversity and inclusivity to traditionally underrepresented communities;

1 History of the ArtBase

This section outlines the early history of the ArtBase, the events and motivations around its creation, the policies of accession and presentation of the artworks and the different stages of updates to these policies. The aim is not to trace a complete organizational and archival history, but rather to highlight some of the points in that history which were translated into decisions that impacted the archive's information architecture and interface design. This section also points to some of the limitations or challenges of these translations, but more detailed discussions of current measures to overcome these challenges and scope for further work are discussed in the following two sections.

1.1 Vision and mission statement

Establishment

The vision and conception of the ArtBase upon its establishment in 1999 is closely tied with Rhizome's position at the time as an influential mailing list with an active community, including some of the first artists working on the Internet. Following on from developments in the email list, which became not only a forum to exchange ideas, but also a stage to present new works and projects, the ArtBase was established "to serve as a more permanent and accessible index to the broad catalog of web based work emerging from the community" (Owens, 2012). As Mark Tribe explains in an interview with Lauren Ptak from 2010, by 1999 Rhizome had already been archiving texts from the email list into what became the TextBase, which is no longer active. Still "there was a lot of net art being made that wasn't necessarily archived anywhere" (Tribe in Ptak, 2010). Tribe points out the lack of an art market and collecting institutions for net art as some of the main reasons why Rhizome started the ArtBase as a permanent archive for early works of net art, net.art and other works within the broader *new media art* category (*ibid*). Similar arguments have been quoted by other staff members who joined the organization later on (Cornell & Hwang, in Jones et al., 2006; Corcoran, in Graham, 2014). While there had been other organizations working with new media art in Europe for at least a few decades before the ArtBase was established, as well as other online mailing lists or initiatives, such as The Thing, Turbulence, Ada'web, netzspannung, among others (Jones, 2010; Blome & Wijers, 2010), few have been able to stay active as long as Rhizome or maintain an accessible archive as large as the ArtBase.



“The ArtBase is a unique collection, it is a very valuable resource for those learning about the field. But it is not a static thing, it is not a room full of objects. The fact that it is online, and the tools and applications employed are constantly changing, requires us to constantly evaluate our preservation standards.”

(Cornell, in Jones et al., 2006).

The ArtBase is an international and diverse archive with over 2000 artworks to date. It primarily hosts works of net art, but also includes “works that employ materials such as software, code, websites, moving images, games, and browsers”, as stated on the ArtBase homepage.¹ With its expansion in size and scope, the commitment to preservation in the ArtBase has become a more conscious effort at Rhizome. But the need for such preservation efforts was recognised even earlier. The document of agreement for submitting artworks to the ArtBase included the following statement: “The goals of the ArtBase are to preserve new media art for the future and to provide access to new media art in a context of relevant information and critical discourse”² (Rhizome Artbase Cloned Object Agreement). Nevertheless, financial constraints meant the first full-time staff member whose role was primarily concerned with preservation, Ben Fino-Radin, didn’t join Rhizome until 2011.

“The last decade saw a great period of growth in the ArtBase, and the preservation field at large. What began as a web platform for presenting and sharing art work, grew into an effort more conscious of preservation and bibliographic practices.”

(Fino-Radin, 2011)

1 <https://rhizome.org/art/artbase/> [Accessed 23 May, 2019]

2 It is worth noting that in the first few years of the ArtBase, Rhizome used the term *new media art* to refer to items in the archive and had a wider focus in its collection policies. Since then the focus of the organization has narrowed down towards archiving and preserving net art specifically—i.e. art reliant on the Internet for its reperformance and not requiring physical installation components (Espenschied, 2017).

An archive or a collection?

“Initially, I thought we should frame it as an archive for a few reasons—it felt more consistent with the principles of accessibility and inclusiveness, which is to say that to me collection had connotations or implications of curated selectivity.”

(Tribe, 2018)

“Definitely I think it’s more of an archive, than a collection. There is a lineage that the ArtBase comes from—a lot of artists that worked online in early net art also had curated online museums or exhibitions, so I see it as originally coming out of that tradition.”

(Fino-Radin, 2018)

While referred to as an “archive” in earlier texts, references to the ArtBase as a “collection” become interchangeable with “archive” in later publications (e.g. see: Graham, 2014). In a discussion on modes of collection, Beryl Graham explains that since “new media are both tools for collection management or archives and media from which to make art,” i.e. “the means of production is also the means of distribution and exhibition”, then “it might be useful to distinguish between two different kinds of archives in relation to collection” (Graham, 2014, p.48). She quotes Dekker & Somer-Miles in distinguishing between the archive as documentation of art and the archive as a collection of art (*ibid*). The latter can “really only be counted as such if the artwork is fully available in the archive” (Dekker & Somer-Miles, 2011, in Graham, 2014, p.48). But there might also be “hybrid modes” where “in true new media fashion an archive might contain both art and its documentation” (Graham, 2014, p.48). Graham then mentions Rhizome’s ArtBase as one such example of a hybrid mode of collecting (*ibid*).

In line with this conceptualization of a hybrid mode, current staff members don’t consider the ArtBase either just as an *archive* or a *collection* (Rossenova, 2017). In a paper developing the concept of “autonomous archives”³, Lawrence Liang (2015) proposes a further useful characterization for archival initiatives existing

³ According to Liang, autonomous archives are independent initiatives that exist outside of and supplement official state records, and instead of reproducing existing forms of practice, they have the potential to “creatively produce the concept of the archive”. These archives can create “new ways of thinking about how we access our individual and collective experiences” (Liang, 2015, p.10).

outside official state structures—rather than thinking about “the archive” as an institution or a specific set of practices, Liang proposes considering the archive an “emergent form” (p.10). In that sense, the ArtBase’s hybrid archive form—somewhere between an archive and a collection—can also be considered to be still emerging. Certainly, within Rhizome, there has been a shift away from thinking about the ArtBase as a sharing platform or a future-oriented space, which aims to collect multiple expressions of a new form of art for the future (Tribe in Ptak, 2010; Fino-Radin, 2011). Instead, it is being reconceptualized as a more retrospective environment where preservation, restoration and reperformance are increasingly important (Rossenova, 2017). And further, this conception of the archive may change yet again, as new preservation tools and practices emerge from within, as well as outside the institution.

1.2 Accession and collection policies

Accession

The ArtBase is an international and online-only archive. Storage and preservation of any physical objects is outside Rhizome’s institutional capacity (Fino-Radin, 2011). Historically, works have been accessioned as one of two possible digital artifacts, referred to as “cloned objects” and “linked objects”. The existence of these two types of entities in the archive has largely resulted in the current “hybrid mode” of the archive—wherein some archival records include copies of the works (the cloned objects), whereas others include only documentation or metadata (the records for the linked objects).

“The idea was that we would attempt to include everything that was within the boundaries of new media art, as we then understood it. We realized pretty quickly that in many cases we couldn’t collect the work itself, sometimes because the artist didn’t want to give it to us, other times it was because it was difficult for technological reasons. So we would collect information about the work, metadata. When we had the work itself, we called it a cloned object. For a linked object, we just linked to it and had all the metadata.”

(Tribe, 2018)

When the ArtBase was originally being set up, Mark Tribe consulted various net artists to get their feedback on what would be a most optimal framework for the archive (Tribe in Ptak, 2010). Many net artists at the time were based in Europe and there was some doubt about sharing their work with an American

organization (which used to be for-profit⁴). Some of the questions Tribe received from artists related to the complex server-based works—“What would it mean to have two copies in two places?” (*ibid*). Other artists were opposed to the idea of preservation (*ibid*), since early net art oftentimes intentionally opposed traditional institutional frameworks such as museums and archives (Daniels, 2009). The compromise solution was to offer artists the choice of how they want their work to be presented in the ArtBase. Cloned objects meant that artists would hand over digital files, which would be copied on Rhizome’s servers and presented in the ArtBase under a rhizome.org sub-domain. Alternatively, if the artists did not want to supply their source files to Rhizome or there was no straightforward technical capacity to do so,⁵ then they could simply provide the descriptive metadata for the work (artist, title, year, short description) and a link to the artwork’s URL hosted elsewhere. While it was a flexible strategy in the beginning, the unstable access to the latter “linked objects” due to link rot would eventually bring Rhizome to the decision to stop accepting them.

“Although the ArtBase recently adopted a new collection policy that accepts only archival objects, it continues to suffer from the past acceptance of ‘linked object’.”

(Fino-Radin, 2011)

A recent audit of a section of the linked objects in the ArtBase has exposed multiple dysfunctional artworks—either parts within the artworks or entire domain names have expired and result in 404s or redirects to irrelevant results. However, there is still value in retaining the old source links, even when broken, as many of them are still searchable in other online archives such as the Internet Archive. Researchers and conservators can use these source links to trace the works across existing web archives in order to attempt restoration efforts, or to research the provenance of the works and their relation to an artists’ wider body of work.

Collection policy documentation

Rhizome’s early collection policies were documented in the form of the “ArtBase Cloned Object Agreement” and “ArtBase Linked Object Agreement”. Artists were required to submit a signed copy of one of these agreements alongside their respective “cloned” or “linked” artworks, submitted to the ArtBase.

4 In the wake of the dot com bubble, Rhizome used to be rhizome.com and a for-profit company, supported by a commercial sister company—StockObjects. In 1998, Rhizome changed its status to a non-profit to avoid pressure from investors and ensure its long-term viability. See also Durón, 2016.

5 E.g. In the case of a complex server-side setup, or if parts of the work were inaccessible to the artist (institutionally, technically or skills-wise), or in cases when the work was technically tied to its location via absolute URLs being used. (Espenschied, 2017)

Cloned object agreement on Rhizome's website, ca 2005.

(screenshot: 2017)

The screenshot shows a web browser window with the URL http://rhizome.org:80/artbase/cloned_agreement.rhiz. The page title is "RHIZOME.ORG > AT THE NEW MUSEUM". The main content is titled "ArtBase Cloned Object Agreement". A sidebar on the left contains links for "Art", "Text", "Calendar", "Opportunities", "Web Hosting", "About Rhizome", and "Community". The "Community" section on the right shows 52 online users. The central text discusses the terms and conditions for artists to contribute their artwork to the ArtBase, mentioning preservation, rights, and obligations. It includes sections like "General Information", "Your Rights", "Our Obligations", "Representations; Disclaimers; Limitation of Liability", "Indemnification", "Survival", and "Miscellaneous". At the bottom, it says "Agreed and accepted by: <NAME OF ARTIST>" and "Rachel Green for Rhizome.org <DATE OF AGREEMENT>".

These agreements covered a range of legal issues pertaining to the archiving of the works while at the same time the artists were able to retain complete control over the intellectual property rights within the artworks. The documents further explained the conditions of use under which Rhizome could present the works in exhibitions or promotional materials. In an advisory report regarding the setup and running of the ArtBase archive, curator and academic Richard Rinehart recommended that: “these agreements [should] form the core of a more formal internal collection policy [...] This policy would, among other things, spell out in greater detail the internal functions relating to preservation, access, metadata creation, strategies for backup, security provisions, etc” (Rinehart, 2002). While the notion of preservation was mentioned in these original agreements, there were no strict commitments made on Rhizome’s part with regards to the specifics of their preservation programme (Cornell, in Jones et al., 2006). This was largely due to the limited financial and staff resources dedicated to the ArtBase particularly in the early years of its establishment (*ibid*).

A further recommendation with regards to Rhizome’s collection policies was put forward in Rinehart’s report: “Rhizome should endeavour to purchase or otherwise obtain legal copies of software needed to run the artworks contained in the Rhizome ArtBase[...] Working out permissions and agreements for the reuse and potential modification of original software will be an absolute requirement for any organization using emulation as a preservation strategy.” (Rinehart, 2002). This type of policy is particularly relevant with regards to current emulation strategies employed at Rhizome. Digital Preservation Director Dragan Espenschied and Software Curator Lyndsey Moulds have implemented the collection of software, in particular various browser applications, as part of their long-term preservation strategy for Rhizome, but have not yet implemented clearing licenses as official policy (Espenschied, 2019). So far Rhizome’s policy has been to rely on its non-profit status as an organization dedicated to promoting the arts for educational and non-commercial purposes, as well as to take advantage of the provisions in The Digital Millennium Copyright Act (DMCA). The DMCA contains a “safe harbor” provision under which as long as sites remove archival copies of software if copyright owners send “takedown notices” then no copyrights are violated (Rosenthal, 2015). This policy has also been adopted by the Internet Archive. Attempting to obtain official licenses for all types of software needed to run artworks in the ArtBase is not financially or operationally feasible for an organization the size of Rhizome (Rossenova, 2017), particularly in the case of old and obsolete software, no longer supported or distributed by an official license-holder.⁶

Submission process

Variations in the submission process for the ArtBase can be summarised in the following three phases: a) Open submission (until 2010); b) Filtered submission (2010–2015); c) Closed / by invitation only (2015 onwards).

⁶ Additionally, the latest legal developments in terms of legacy software put forward by the Harvard Cyber Law Clinic indicate more flexibility in software rights for preservation in the context of cultural heritage. (Lee & Abert, 2018)

Selection Criteria for the ArtBase in 2001 during the open submission phase. (screenshot: 2017)

The screenshot shows a web browser window for the Wayback Machine archive of Rhizome.org. The URL is https://web.archive.org/web/20010210095546/http://rhizome.org:80/artbase/9.php3. The page title is "Rhizome home page". On the left, there's a sidebar titled "artbase" with links like "Featured Objects", "About the Rhizome ArtBase", "Selection Criteria", and "Submit an Art Object to the ArtBase". The main content area is titled "Selection Criteria" and contains text about the definition of net art and a list of evaluation criteria. At the top right, there are links for "new to rhizome?", "contact us", "support rhizome", "jobs", "info", "LOGIN", "EMAIL", "PASSWORD", "Become a member", "Forgot your password?", and "Help". A navigation bar at the bottom includes "fresh", "artbase", "alt.interface", "email lists", "store", "events", and "links".

Submission is still open for members, but less information about the process or criteria is available, 2011. (screenshot: 2017)

The screenshot shows a web browser window for the Wayback Machine archive of Rhizome.org. The URL is https://web.archive.org/web/20110812013201/https://rhizome.org/accounts/login/?next=/artbase/submit/. The page title is "Rhizome | Login". The top navigation bar includes "ARTBASE", "COMMUNITY", "PROGRAMS", and "JOIN". Below it, there's a "Home / Login" link and a "LOGIN TO RHIZOME" button. The main form has fields for "USERNAME/EMAIL ADDRESS" and "PASSWORD". Below the form, there are links for "New to Rhizome? Click here to sign up" and "Forgot your username or password? Click here". At the bottom, there's a "LOGIN" button and a footer menu with links for ARTBASE, EDITORIAL, COMMUNITY, PROGRAMS, ABOUT RHIZOME, and YOUR ACCOUNT.

a) Open submission (until 2010)

Initially, submission of artworks to the ArtBase was open to all. Artists could submit their work either as a cloned copy or as a link. They had to submit the relevant artist agreement and fill out a form with regards to descriptive metadata (artist name, work title, date, artist description, licensing information, technical details) (Hwang in Jones et al., 2006). A technical questionnaire required for the cloned artworks was based on concepts related to media preservation strategies developed by the Variable Media Network (VMN) and asked questions regarding browsers and operating systems, programming languages, component file formats, etc. (Fino-Radin, 2011; 2018;) (see the [Appendix](#)) . Despite best efforts to collect as much technical metadata as possible using questionnaires, the current amount of data available in the ArtBase indicates that very few of these questionnaires were filled out completely (Fino-Radin, 2018). Additionally, little of the data that was gathered has proven useful for recent restoration efforts by Rhizome's preservation team (Rossenova, 2017) (see [p.43](#)).

“A questionnaire was one of the first things that I started looking at when I got to Rhizome. I tried to make a very path-focused questionnaire that had questions that were only specific to what kind of work you’re talking about based on your answers, and I quickly realized that it was just completely impossible. ... Since then, I have learned that qualitative research is much more effective than any questionnaire. I think the questionnaire impulse comes out of this desire to impose logic and order on something that is relatively chaotic. Art that uses technology is complicated and chaotic and hard to understand from a preservation standpoint. But I find artist interviews and more sociological research far more effective in getting the kind of information that you need for long-term preservation.”

(Fino-Radin, 2018)

During the open submission phase, all submitted artworks were accepted into the ArtBase provided they could be categorized as “new media art”, i.e. as long as they utilised “emerging media technologies” and “somehow engaged with their cultural significance” (Tribe in Ptak, 2010). In an interview with Beryl Graham, Heather Corcoran, the Executive Director of Rhizome during this period,

explained this filtering process: “They filtered for relevance, not for quality—so only new media art, but all new media art. [...] Mark Tribe explained the rationale to me as this: philosophically, they were opposed to filtering for quality because they felt they might end up rejecting works that would later be deemed important. Especially in the early years of this new art form, it seemed arrogant to them to assume they had an objective sense of what would be historically significant.” (Corcoran, in Graham, 2014, p.98).

Filtered submission (2010–2015)

As the field matured, and the number of artworks in the ArtBase grew over the first 10 years since its establishment, new strategies were necessary in order to keep the archive sustainable. In another quote from her interview with Graham, Corcoran explains this new phase in the history of the ArtBase: “[...] we are able to judge which works are and will be significant, in terms of their contribution to the field and culture more broadly [...] So the growth of the field necessitates the filtering, but also gives us the knowledge and the insight necessary to do it.” (*ibid*)

“Since around 2008, we have focused more of our energies on highlighting and addressing serious issues with digital archiving. Basically, it became clear that the ArtBase, while valuable as a database of information on works that artists had generally written themselves, was not serving the purpose of keeping actual artworks accessible over time. As such, it wasn’t going far enough to address the broader problems of cultural memory of net art. At that point, Rhizome shifted into a research phase. Since then, we’ve worked on developing new metadata standards for net art, as well as new tools and approaches to digital preservation.”

(Connor, 2016)

During this phase of the submission process, acceptance into the ArtBase became more selective, but there were other new features enabled within the Rhizome web platform that aimed to encourage user participation and community-building. Artists could create their own *artist portfolio* pages within the Rhizome platform and submit any work they wanted there. Increasingly, though, artists moved their online activities to other (mainly social media) platforms

and the portfolios on rhizome.org became increasingly populated by students following school assignments (Rossenova, 2017). Consequently, this also added pressure on the sustainability of the system. When artworks were submitted to the portfolio pages, they were also submitted for consideration to the archive. Even though not all of them were accepted, this process produced quite a lot of ambiguity. The distinction between the archive and what were essentially self-promotional tools for artists or students became less clear (Rossenova, 2017), as exemplified in the screenshots on pp.18–19. With the most recent redesign of the Rhizome website and the ArtBase platform, these community engagement features were closed down. The portfolio pages, however, were not simply taken offline. Rhizome archived them and made them available in a sub-domain at <http://legacy-profiles.rhizome.org/>—so artists would be able to download their portfolio pages either as a zipped folder of assets (viewable in a browser), or a WARC archive, viewable with apps such as Webrecorder Player.

Closed / by invitation only (2015–)

Since 2015 and the launch of the redesigned Rhizome website, submissions to the ArtBase have been closed. As stated on the ArtBase webpage: “[...] currently works are added to the collection by curatorial invitation and through Rhizome’s commissioning and exhibition programs” (<https://rhizome.org/art/artbase/>). This is partly due to the fact that the preservation team has focused on restoring works from the archive which have been inoperable for a long time, as well as on building tools to facilitate this restoration. Michael Connor has positioned this shift in focus roughly starting after the end of the open submission period around 2008 (Connor, 2016).

In addition, new acquisitions have been partly put on hold, as new tools have become necessary in order to be able to archive artworks which are increasingly “diffuse” (Fino-Radin, 2011). Rather than discrete HTML or CSS files, they are hosted on third-party platforms, e.g. Tumblr, or involve performances on social media, e.g. Instagram, over time. The traditional paradigm of saving archival file copies fails in such cases.

“Dragan [Espenschied] has worked with Ilya Kreymer to come up with a concept of recording the web rather than saving the file. It’s not a video but a recording of the code of, say, Instagram or Yelp, and a framework for replaying it, so you can revisit the experience of seeing the work in its original environment in a web browser.”

(Connor, 2016)

Artist portfolio pages in the Rhizome community platform, 2011.
(screenshot: 2017)

The screenshot shows the Rhizome website from January 2011. At the top, there's a banner for 'RECENTLY UPDATED PORTFOLIOS' featuring five artist portfolios: 'Split by Sol Rezza', 'My Boyfriend Came Back From The War by Olia Lialina', 'Postcards From Google Earth, Bridges by Clement Valla', 'NOTHING TO SEE HERE by Tsa Communications', and '1.1 Acre Flat Screen by eteam'. Below this, another row of portfolios is displayed: 'Floccus by Golan Levin', 'Xmas Katana by Shamus Clisset', 'Oss by Comment by Comment by Comment', 'Ancestralworship.Com by Duncan Malashock', and 'Sl Dumpster by eteam'. The Rhizome logo is at the top left, and a navigation bar with links for 'ARTBASE', 'COMMUNITY', 'PROGRAMS', and 'JOIN' is at the top right. The date '22 Jan 2011 - 26 Nov 2013' is visible in the top left corner of the page area.

Archived portfolio page for artist Anthony Antonellis, as previewed in Webrecorder Player.
(screenshot: 2017)

The screenshot shows a Webrecorder Player interface displaying the Anthony Antonellis portfolio from December 2011. The top navigation bar includes 'RHIZOME', 'Journal', 'Artbase', 'Community', and 'Programs'. The main content area shows two sections: 'ARTBASE (4)' and 'PORTFOLIO (2)'. Under 'ARTBASE', there are four items: 'behold behold .com', 'Endangered GIF Preserve', 'Facebook Bliss', and 'put it on a pedestal .com'. Under 'PORTFOLIO', there are two items: 'Impulse 101' and 'Photoshop Skillz'. The bottom navigation bar includes links for 'Community', 'Announce', 'Discuss', 'Portfolios', 'Profiles', 'Jobs Board', and 'Mailing Lists'. On the right side of the interface, there are links to the artist's website, Facebook page, and Twitter account.

An artwork by artist Anthony Antonellis which is accessible from his portfolio page, but is actually part of the ArtBase, as previewed in Webrecorder Player. (screenshot: 2017)

The screenshot shows a web browser window titled 'Webrecorder Player'. The URL is <http://rhizome.org/artbase/artwork/54004/>. The page title is 'Endangered GIF Preserve (2012)'. Below it says 'by Anthony Antonellis'. A large image on the left shows a white dove flying over the text 'Endangered GIF Preserve' and the website 'anthonyantonellis.com/gif-preserve'. To the right is a text block: 'Every day image files from Wikipedia and Wikimedia are nominated for deletion. Some of these images have survived several deletion requests, while others have been nominated for speedy deletion.' It also mentions 'I'm starting a GIF Preserve in order to save endangered GIFs from permanent deletion. Each animated GIF is marked with the date of rescue and a link to its original Wiki habitat.' Below this is a 'Tags' section with 'animated gif net.art wikimedia'. On the right, there's a 'RELATED WORKS' section with thumbnail images and a 'SAVED BY' section.

Another artwork by Anthony Antonellis, but this one is only part of his portfolio and is not actually included in the ArtBase. However, the interface presenting the artwork is exactly the same as the ArtBase interface and therefore potentially confusing. The metadata is also the same as for the artworks that are actually part of the ArtBase.

(screenshot: 2017)

The screenshot shows a web browser window titled 'Webrecorder Player'. The URL is <http://rhizome.org/portfolios/artwork/53386/>. The page title is 'Photoshop Skillz (2011)'. Below it says 'by Anthony Antonellis'. A large image on the left shows a diamond-shaped pattern of overlapping colored squares (red, yellow, green, blue). To the right is a text block: 'Photoshop Skillz is lowfi video artwork which showcases the artist's skills using Photoshop's basic tools and filters. The work demonstrates the visibility of the "artist's hand" in new media.' It also mentions 'The video features music from the 8-bit performer Bikecore.' Below this is a 'Tags' section with 'net.art photoshop video'. On the right, there's a 'RELATED WORKS' section with thumbnail images and a 'COMMENTS' section stating 'This artwork has no comments. You should add one!'. There's also a 'LEAVE A COMMENT' section with a 'LOG IN' button.

Submission to the
ArtBase is closed
since 2015.
(screenshot: 2017)

The screenshot shows a dark-themed web page for Rhizome's ArtBase. At the top right, there is a logo for "RHIZOME" with a small "ART" icon below it. On the far left, a vertical sidebar contains links to "HOME", "ANTHOLOGY", "BLOG", "EVENTS", "PRESERVATION", "ARTBASE", "OLDWEB.TODAY", "WEBRECODER.IO", "COMMUNITY", and "ABOUT US". Below this sidebar, there are two buttons: "SEARCH" and "LOGIN". The main content area starts with a heading "The ArtBase is Rhizome's archive of digital art, freely accessible to the public online." followed by a paragraph about the ArtBase's history and its role in preserving net art. Another paragraph discusses the transition from open submissions to curatorial invitation. A third paragraph explains the Digital Preservation program. At the bottom of the main content area, there is a "FILTER" section with dropdown menus for "DATE" (from and to), "ARTIST NAME" (Name and Title), and buttons for "CLEAR FIELDS" and "FILTER".

The artworks selected to be accessioned into the archive are either of historical interest and “widely cited pieces” or “test cases that are useful for archival research” (Connor, 2016). A recent example that fulfils these criteria is Amalia Ulman’s piece *Excellences & Perfections*. It is a piece that has received significant attention in the art world and in the media, and at the same time it has been a useful test case for Rhizome’s strategies to preserve performances on social media which evolve over time (see [section 2](#)).

1.3 Backend setup and data management

Historic setup

The initial structure of the ArtBase followed a “basic web model” (Fino-Radin, 2011). It was conceived as a web database structured around a custom taxonomy, devised by Rhizome staff members, as Mark Tribe recalls: “We had cloned objects, where we had a copy of the work, and linked objects, where all we had was metadata. And we had to come up with a whole taxonomy. What do you put in those fields? Basically, Alex [Galloway] and Jennifer [Crowe] and I just made them up. We didn’t really make that much reference to other standards out there.” (Tribe in Ptak, 2010). He elaborated further on the lack of standard references:

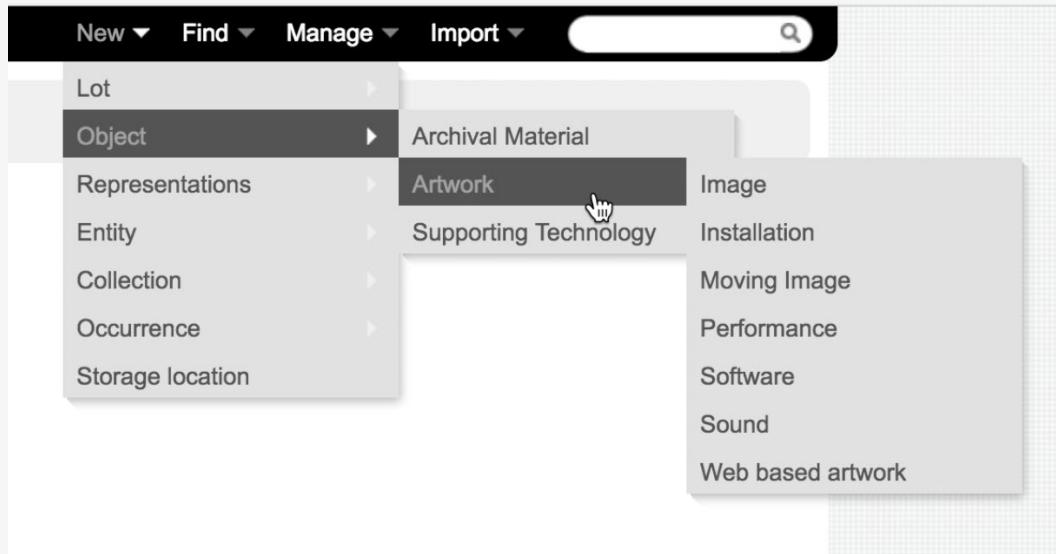
“[...] there were existing models; I just didn’t go and look at them. We could’ve looked at how the Getty does things or the libraries or other museums do things. I had some experience with that already, because we had some structured metadata for the text objects, which I just made up myself.” (*ibid*).

“I was aware there were these other metadata standards out there, but they never seemed to map that well. So we made it up from scratch using common sense. We had the obvious fields like artists names and where they’re from, and when the work was created, what technologies it used. We had genre and categories. Some of them had only a select number of fields that you could choose from, and some of them were more open. We basically saved all that metadata, and I assumed we could conform it with other standards, as we got involved with the Getty and others, and [could] create shared standards.”

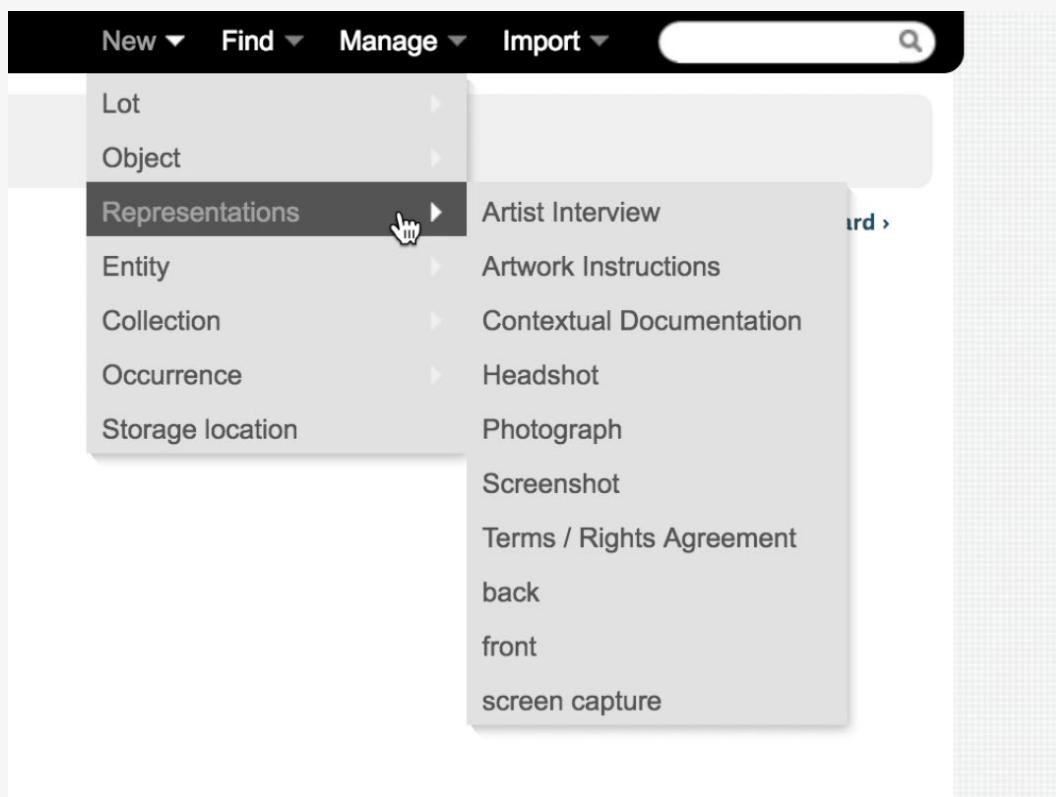
(Tribe, 2018)



Types of artworks which can be added into the Collective Access CMS.
(screenshot: 2017)



Types of representations which can be added into the Collective Access CMS. Except for screen capture, there are no representations that pertain to born-digital art specifically, though.
(screenshot: 2017)



The early model of the ArtBase followed common web conventions at the time, rather than any particular archival or information science model. Contributing factors included the limited organizational resources during Rhizome's early years, Tribe's previous experience with web design as opposed to conventional archival or museum training, as well as the relative novelty of born-digital art archives at the time and lack of canonical examples from larger institutions. This had an impact on all subsequent iterations of the backend setup (see also [section 1.5](#)).

"The generation of rhizome.org when I joined was in Django and there were two databases—there was a MySQL database and there was CatchDB. But everything was in one system (Django). We would go into a standard default backend and that's where comment moderation was, that's where you would write your blogpost, there were just different sections. There was an ArtBase section where you would curate artworks, moderate submissions, but you couldn't manage controlled vocabularies, for example. That's one of the reasons to move to Collective Access, it was just much better managed data governance."

(Fino-Radin, 2018)

Collective Access

The first move of the ArtBase towards a more standardised records system started after the archive moved away from open submission—once the organization had the resources to hire a full-time staff member to maintain the ArtBase and run the preservation programme. In his report on the state of the preservation programme at Rhizome from 2011, Ben Fino-Radin describes the initial stages of this move: "An effort lead by Rhizome's Director of Technology Nick Hasty along with David Nolen, and Mushon Zer-Aviv, elevated the ArtBase's management system from a basic web model to an authoritative records system. This transition allowed Rhizome to initiate contributions and collaborations with institutional collections such as the Getty and ArtStor. This evolution was years in the making and currently exists in beta, remaining under constant development." (Fino-Radin, 2011). There is no more information published about the specifics of the records system described here, but in his report, Fino-Radin includes the metadata schemas which were aimed to be implemented at the time, following the Dublin Core metadata standard.

View of artwork record page in Collective Access CMS. Elements such as physical description are irrelevant for net art.
(screenshot: 2017)

CollectiveAccess

RESULTS (1/11) →

Editing Artwork: Telematic Surveillance (rza.artwork.2003.13)

Add a Code under this Duplicate this artwork Hide media

Object identifier: rza.artwork.2003.13

Alternate identifiers: 10654

Preferred names: Telematic Surveillance

Dates: Date 2003 Type Creation date

Related entities:

Physical Description

B I S | Source

User: Dragan Espenschied > Preferences > Logout | © 2013 Whirl-i-Gig, CollectiveAccess is a trademark of Whirl-i-Gig [2.0789s/103.25M]

Technical metadata page in Collective Access CMS. No relevant information is added. The format for adding the information does not seem to be able to handle relevant information such as references to PUIDs (identifiers in the PRONOM database system).
(screenshot: 2017)

CollectiveAccess

RESULTS (1/11) →

Editing Artwork: Telematic Surveillance (rza.artwork.2003.13)

Add a Code under this Duplicate this artwork Hide media

Supporting technologies:

Technical Narrative

Save Cancel Delete

Save Cancel Delete

The only form of representation for net artworks that the system accommodates is linear media, such as images or video/audio files.
 (screenshot: 2017)

This screenshot shows the CollectiveAccess software interface for managing digital artifacts. The main window title is "CollectiveAccess" and the sub-section is "Editing Artwork". The object being edited is "Telematic Surveillance (rza.artwork.2003.13)". On the left, there's a sidebar with tabs: "Artwork Basic Info", "Administrative Info" (which is selected), "Documentation", "Technical Profile", "Summary", and "Log". The main content area displays a "Media representations" section. It shows a thumbnail of a blank screen, labeled "[BLANK] PRIMARY". Below the thumbnail, it says "File name rza.artwork.2003.13_10654.gif", "Format GIF", "Dimensions 500p x 325p; 4 bpp; RGB; 0.0mb", "Type Screenshot", and "Status Approved". There are buttons for "Save", "Cancel", and "Delete". At the bottom right, there are links for "Make primary", "Edit full record", and "Download".

Exploring the artwork within the system doesn't work, because it doesn't accommodate interaction. Clicking on the object name link under "explore" simply reopens the record for the artwork in a new tab.
 (screenshot: 2017)

This screenshot shows the CollectiveAccess software interface with the "Administrative Info" tab selected from the sidebar. The main content area has several sections: "Related objects", "Related Exhibition or Event", "Hierarchy navigation", and "Location in hierarchy". In the "Hierarchy navigation" section, "Telematic Surveillance" is listed with a "Show in browser" button. Below this is a search bar with the placeholder "Click object names to explore. Click on an arrow icon to open a object for editing." and a "Find:" input field. A list of objects is shown, with "Telematic Surveillance (rza.artwork.2003.13)" highlighted. At the bottom, there are "Save", "Cancel", and "Delete" buttons.



Early stage in the adoption of Wikibase as a records management system, 2015–17.
(screenshot: 2017)

The screenshot shows the main page of the Rhizome Catalog. At the top, there is a banner with the text "Set \$wgLogo to the URL path to your own logo image." Below the banner, the page has a standard MediaWiki header with tabs for "Main page" (selected), "Discussion", "Read", "View source", and "View history". A search bar is also present. The main content area includes sections for "Indexes", "Shortcuts", and "Getting started", each with a bulleted list of links. On the left side, there is a sidebar with links to "Main page", "Recent changes", "Random page", "Help", "Tools" (including "What links here", "Related changes", "Special pages", "Printable version", "Permanent link", and "Page information"), and "In other languages". At the bottom of the page, there is a note about the last modification date (27 December 2016, at 17:33), a footer with links to "Privacy policy", "About Rhizome Catalog", and "Disclaimers", and a "Powered by MediaWiki" logo.

Index of the types of records entered in Rhizome's catalogue, 2015–17.
(screenshot: 2017)

The screenshot shows the "Indexes" page of the Rhizome Catalog. The page title is "Indexes" and it is part of the "Rhizome Catalog" namespace. The content area lists "Properties (All properties used in Rhizome's catalog)" followed by a bulleted list of categories: "Artworks", "Persons", "Collectives", and "File Formats". The page has a similar structure to the main page, with a sidebar on the left containing links to "Main page", "Recent changes", "Random page", "Help", "Tools", and "In other languages". The footer includes a note about the last modification date (2 January 2017, at 09:37), links to "Privacy policy", "About Rhizome Catalog", and "Disclaimers", and a "Powered by MediaWiki" logo.

The report also includes crosswalks from Dublin Core fields to CDWA-lite (Getty Institute's Categories for the Description of Works of Art) (see p.46), signaling the interest at the time to enable interoperability between the ArtBase and other archival and cultural heritage institutions.

“We were looking for content standards, i.e. when we’re offering this field of metadata what are we actually asking for, because that was always a topic of confusion internally at Rhizome—what is this field supposed to mean? Semantics weren’t documented and I think that was the rationale behind the mapping to other standards.”

(Fino-Radin, 2018)

By the end of his tenure at Rhizome, Fino-Radin had completed the transfer of ArtBase data to Collective Access, a free open-source software for managing and publishing museum and archival collections, which also comes pre-configured with a few metadata standards (<http://www.collectiveaccess.org/>). However, the system still required further improvement to meet the needs of the ArtBase archive, as shown in some of the screenshots on pp.24–25. After Fino-Radin’s departure from Rhizome, the new preservation director—Dragan Espenschied—opted to go in a different direction. Espenschied was interested in moving beyond museum-standard systems altogether—to look for alternative solutions that might better suit the needs of a heterogeneous born-digital archive such as the ArtBase (Espenschied, 2019). Instead of improving upon a standards-compliant system, such as Collective Access, which would enable interoperability between Rhizome’s archive and other cultural heritage collections based on standardized ontologies, the alternative was to look to the emerging field of linked open data repositories. With linked open data standards-compliance is not a pre-requisite for data linking and exchange and there is more flexibility to operate outside the constraints of standard metadata schemas. Even though the Collective Access instance was not publicly launched in the end, the move of the data from the original web database into this more structured environment did support the data transfers that followed next.

Wikibase

When the entire Rhizome platform was redesigned in 2015, Espenschied initiated the transfer of the ArtBase data away from Collective Access and into Wikibase, a free and open-source software system for creating, managing and sharing structured data (<http://wikiba.se/>). Allowing more flexibility to accommodate various types of data, WikiBase was considered better-suited to the diverse needs of the ArtBase.

Updated homepage view of the ArtBase Wikibase, now also including a link to the Wikidata Query Service, which is integrated with the updated Wikibase installation, 2019. (screenshot: 2019)

The screenshot shows a web browser window with the title "Rhizome Catalog" and the URL "staging.catalog.rhizome.org/wiki/Main_Page". The page features a large, colorful abstract image at the top left with the word "RHIZOME" overlaid. The main content area includes a navigation bar with "Main page" (highlighted), "Discussion", "Read", "View source", "View history", and a search bar. Below the navigation is a section titled "Main Page" with links to "Indexes" and "Query Service". A "Shortcuts" section lists "New Property", "New Item", "To-Do List", and "WikiResources". A "Getting started" section provides links to "Configuration settings list", "MediaWiki FAQ", "MediaWiki release mailing list", and "Localise MediaWiki for your language". On the left side, there is a sidebar with links to "Main page", "Recent changes", "Random page", "Help", "Tools", "What links here", "Related changes", "Special pages", "Printable version", "Permanent link", "Page information", and "In other languages". At the bottom of the page, it says "This page was last edited on 19 June 2018, at 12:05." and includes links to "Privacy policy", "About Rhizome Catalog", and "Disclaimers". A "Powered By MediaWiki" logo is at the bottom right.

“In general, we found that classic database systems are very limited for our purposes. Databases for collections in the art and museum sector tend to use categories that are assigned to classic art: there, an artwork usually has one creator, a single date of creation, it has a physical location and maybe dimensions. The Wikibase software, with its basic schema of items, properties and qualifiers, offers a lot more flexibility to describe an ever-changing field like Internet Art. You don’t need to have a fixed worldview in place before you can start describing your objects; you can experiment, feel your way into it, and change the meaning of concepts over time.”

(Espenschied, in Fauconnier et al., 2018)

On the other hand, WikiBase in 2015 was a new system maintained by a non-profit (the Wikimedia Foundation chapter in Berlin) with limited resources. As the software was not developed to serve the needs of a specific knowledge domain, user adoption has been slow—primarily including experimental personal and academic projects, with virtually no use-cases from the GLAM sector at the time. Nevertheless, steady improvements in the ease of deployment (and related documentation) and a growing community of users and developers contributing to the software, led by a few pioneering initiatives, including Rhizome’s use-case, have stimulated fresh conversations, community meetings and events in 2018–19.⁷ This is significant, since the benefits of linked open data can only be enacted in a network of federated repositories (see pp.66–67).

Storage infrastructure

Rhizome has used a variety of storage strategies for its data over the years and backup has always been a priority. As early as 2002, when Richard Rinehart wrote his advisory report for the ArtBase, the importance of archival storage infrastructure was considered: “Rhizome needs to have a backup and/or archiving strategy in place for at least three types of content: digital files comprising works of (cloned) art in the ArtBase; digital files comprising associated metadata (ArtBase database tools and files); and digital files of the original application software. It is recommended that metadata (database and associated files) not be archived, but kept ‘online’ as a working document. This

⁷ See https://www.wikidata.org/wiki/Wikidata:WikiProject_Wikidata_for_research/Meetups and <https://wikimediafoundation.org/2018/10/24/wikibasenyc-conference/> [Accessed May 27, 2019]

The text-based listing layout of the first ArtBase interface, 2001.
(screenshot: 2017)

This screenshot shows the 'artbase' section of the Rhizome website. At the top, there's a sidebar with a navigation menu including 'Featured Objects', 'About the Rhizome', 'ArtBase', 'Selection Criteria', 'Notes on indexing', 'Cloned vs. linked art objects', 'Sample Linked Object Agreement', 'Sample Cloned Object Agreement', and 'Advisory Panel'. Below this is a link to 'Submit an Art Object to the ArtBase'. The main content area is titled 'Featured Art Objects' and lists three items: 'Sous Terre - The Subnetwork' by gregory chatonsky, 'This is the Time of Your Life' by Juliet Ann Martin, and 'it is now safe to turn off your computer.' by Michael Daines. A section titled 'All Art Objects' follows, displaying a dense list of entries such as '%20wrong' by jodi, '123456789px' by Arcangel Constantini, '1999' by joan escofet, '1kikus.mov' by doron golan, '2012' by Peter Laining, '3wires' by Maria Lavman, '402zoom/visual-noise' by simon scheiber, '7.11--7.11' by doron golan, '7sky.mov' by doron golan, 'android mantra' by Brian Mackern, 'A Classical Study of Photography Using the Closest Subject Matter at Hand' by creactrix.org, 'A digital quilt project' by curt cloninger, et al., 'A Tracing' by Jason Nelson, 'Absolut Net Art' by Eryk Salvaggio, 'AfterSherriLevine.com' by Michael Mandiberg, 'AfterWalkerEvans.com' by Michael Mandiberg, 'Artist Resource Online' by Jennifer and Kevin Cohen, , Keith Frank, 'Aisworld' by Jennifer and Kevin Cohen, 'Almod Hong' by Arturo Herrera, 'Altercation 2.0' by reynald drouhin, 'Ambientmachina' by marc lafa, 'amorphoscapes' by STANZA, 'an american work of art in progress' by Cary Peppermint, 'An Anchor for Witnessing' by Electronic Disturbance Theater, 'Animal Locomotion' by Myron Turner, 'Anti-Capitalist Operating System' by Andy Cox, 'another world' by idmash, 'Antennae' by Miklos Legrady, 'ARTificial ART' by Kurt Baumann, 'Artist Protection & Benefit Program website' by Sally Minker and Jennifer Sloan, 'As I May Write' by Sally Pryor, 'b.ALT.kids' by Igor Strojmiser, 'bakteria' by Arcangel Constantini, 'Balkan Layers: Macedonian Diary' by Linda Lauro-Lazin, and 'Barcode' by Andy Deck.

Text-based listing of excerpts alongside small image thumbnails, 2002.
(screenshot: 2017)

This screenshot shows the 'artbase' section of the Rhizome website. The layout is more structured than in 2001, featuring a sidebar on the left with links like 'Art + Text', 'Calendar', 'Opportunities', 'Services', 'About Rhizome', and 'Community'. The main content area is divided into three columns: 'Art + Text', 'Fresh Art', and 'Community'. The 'Art + Text' column contains sections for 'Fresh Art' (with a 'NOTE' link) and 'Rhizome Commissions'. The 'Fresh Art' section lists several entries with small thumbnail images: 'ada1852' by Christopher Fahey (Type: Text, Software, Game; Genre: Historical, Database, Contextual, Conceptual; Keyword: posthuman, net.art, memory, language, interface, game, artificial life), 'Serial Letters' by Xavier Malbreil (Type: Visual Text; Genre: Narrative; Keyword: language, interact, identity), and 'Sketches for a reactive self portrait' by Mogens Jacobsen (Type: Visual; Genre: Participatory, Generative, Formalist; Keyword: interface, interact, identity). The 'Community' column on the right includes a login form for email and password, a link to 'Forgot your password? Help', and a status message '8 online / 21915 total'.

database should be routinely backed up in case of emergencies [...] The basic idea is that the original files should not be changed at all in the preservation effort, but that the storage media on which they reside will need to be routinely changed or migrated." (Rinehart, 2002). Rinehart elaborates that storage media includes read-only, fixed media such as CDs or DVDs, or re-writable hard disks or tapes (only if redundancy is built in to compensate risk of erasure). He further recommends checking that the files are still accessible every 3 years and if not, migrating⁸ files to another storage medium. This type of migration of files from one physical medium to another may be appropriate in larger institutions with in-house physical infrastructure, but for an Internet-based organization such as Rhizome, cloud storage is more convenient. Under guidance from Dragan Espenschied the infrastructure was updated to take advantage of the flexibility of cloud storage services. As NDSR-resident Morgan McKeehan writes in her Rhizome residency report from 2016, the update led to: "[...] significantly improving redundancy and geographic distribution for Rhizome's storage infrastructure by migrating the collections from local storage at the New Museum and on external drives, to cloud-based remote storage through a mix of services provided by Amazon Web Services." (McKeehan, 2016).

1.4 User interface design

Text-based listings (1999–2011)

The early interface design iterations of the ArtBase reflected contemporaneous conventions and due to the slow speeds and predominantly text-heavy characteristics of the early web, the interface consisted of primarily text-oriented lists which were navigated via vertical scroll and pagination (once the number of artworks reached a few hundred). Browsing the ArtBase entries at the time was facilitated by alphabetised lists for *artist*, *title*, or *keywords* (which eventually became *tags*). Browsing by *date* was introduced in 2007.

Image-based grids (2011–2015)

By the time the "Web 2.0" era in the history of the internet was well established, Rhizome introduced a more visually-led interface for the ArtBase with image-based grids becoming core elements for navigation over text-based excerpts structured in list format. The grid pages were also paginated with about 25 works visible per page. The archive could be sorted alphabetically by *artist*, *title*, *tag* or *archived* (a listing which includes cloned objects only). Additionally each artwork was associated with a series of *tags*, which generated a list of related artworks displayed on each individual artwork's page.

⁸ It is worth pointing out that migration here is not to be confused with the digital preservation strategy of migration which postulates migrating files from one type of format to another, e.g from Word Perfect to PDF. Rinehart addresses this type of migration in his report as well, but he argues against it in favour of retaining original file formats and employing emulation in order to provide access.

Redesign of the platform, but listing structure with small image thumbnails retained, 2008.
(screenshot: 2017)

Move towards an image-based grid with pagination, 2011.
(screenshot: 2017)

Update of the ArtBase homepage: carousel with large image features introduced, 2012.
(screenshot: 2017)

Welcome, Guest [LOG IN](#) [JOIN](#) forgot password? Support Rhizome! [SEARCH](#)

RHIZOME ARTBASE COMMUNITY PROGRAMS JOIN

Home / Artbase FEATURED | BROWSE | TIMELINE | MEMBER EXHIBITIONS | ABOUT | SUBMIT

FEATURED WORK Deleted Cities (2011) RICHARD VUGEN archive browser community Documentary geocities gif History homepage information map nostalgia

Founded in 1999, the Rhizome ArtBase is an online archive of new media art containing some 2163 art works, and growing. The ArtBase encompasses a vast range of projects by artists all over the world that employ materials such as software, code, websites, moving images, games and browsers to aesthetic and critical ends. We welcome submissions to the ArtBase; they are reviewed by our curatorial staff on a monthly basis. [Read More »](#)

BROWSE: WORKS ARTISTS TAGS

COLLECTIONS

- Formalism & Glitch** These works highlight practices that embrace the aesthetics and formal qualities inherent in the web, operating systems, software errors, and glitches.
- Code** These works embody three of the oldest creative practices existing at the intersection of art & computation: Data Visualisation, and Generative, and parametric art.
- Digital Archivalism** Artistic practices have long involved modes of collecting and archivalism. This collection seeks to highlight these strategies in dialog with internet based practices.

Browsing the ArtBase through a visual timeline, 2011.
(screenshot: 2017)

Welcome, Guest [LOG IN](#) [JOIN](#) forgot password? Support Rhizome! [SEARCH](#)

RHIZOME ARTBASE COMMUNITY PROGRAMS JOIN

Home / Artbase / Timeline FEATURED | BROWSE | TIMELINE | MEMBER EXHIBITIONS | ABOUT | POLICY | SUBMIT

1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011

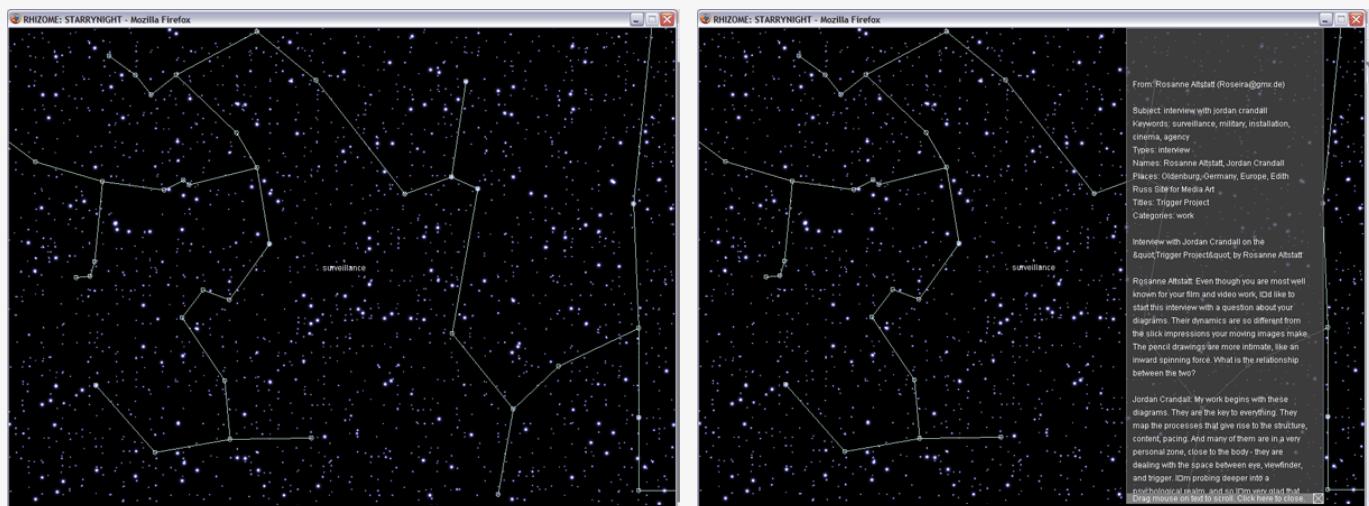
Nov	Dec	2012	Feb	Mar	Apr	May	Jun	Jul	Aug

Timeline copyright SIMILE - www.code.google.com/p/simile-widgets/ Mar 25 Apr 1 Apr 8

Latest redesign of the ArtBase landing page & browsing interface, 2015–2017.
(screenshot: 2017)

The screenshot shows the Rhizome ArtBase landing page. At the top left is a vertical navigation menu with links to HOME, ANTHOLOGY, BLOG, EVENTS, PRESERVATION, ARTBASE, OLDMER TODAY, RHIZOME.ORG, COMMUNITY, and ABOUT US. At the top right is the Rhizome logo with the word "ART" below it. Below the header is a text block about the ArtBase's mission to preserve digital art. A search/filter bar allows users to search by DATE (from/to), ARTIST NAME, and TITLE, with options to clear fields and filter results. The main content area displays a grid of 16 thumbnail images, each with a title and artist name. The thumbnails include various artworks such as "LOW END CERTIFIED" by NATE SILVER, "KILL THAT CAT" by MOUCHE, "SQRRL" by JOHN RUSSELL, "Guadalupe Rosales" by GUADALUPE ROSALES, "Beautiful Frog" by PORPENTINE, "FROG SETTINGS" by PORPENTINE, "LINCOLN HD SCANS" by OLIVER LARIC, "FROG" by OLIVER LARIC, "REGINALD BROOKS" by REGINALD BROOKS, "THORNE BRANDT" by THORNE BRANDT, "JONAS LUND" by JONAS LUND, "DINA KELBERMAN" by DINA KELBERMAN, and "HEN WE HAVE EACH OTHER WE HAVE EVERYTHING" by ANNA ANTHROPY.

Starry Night (2001).
Image source:
marktribe.net.



But there were other ways to discover artworks, too. There was a *featured* section, a dynamic *visual timeline* widget, as well as member-curated *exhibitions* from within the archive. Later on (2012–), the landing page was updated to include a carousel of large features (a common device on magazine and other media websites at the time), as well as special staff-curated exhibitions introducing key works from the archive. All these elements were introduced as entry points into an archive which was already hosting over 2000 artworks, many more than most net art collections at other arts institutions.

Latest redesign (2015–)

The latest redesign of the Rhizome platform overhauled the look and feel of the ArtBase, as well as its previous access provisions. While the grid was updated to fit within the overall website grid and include larger thumbnail images, the artwork titles were no longer immediately visible. Instead, the user had to hover over the image thumbnail to view the title, which significantly reduces accessibility compared to earlier versions of the interface.

“The rationale was that [the classic version] looked more like a traditional archive, but we couldn’t vouch for the content in a way that a traditional museum can vouch for everything that is in their archive. And so the whole idea was to de-emphasize the claim to credibility of what was in the Artbase, it was trying to negotiate what we could vouch for. There was such disparity between various artifacts, that ‘stepping back’ was thought to be the best way [forward]... The ArtBase design reflects the fact that we had questions about it or strategies that were unresolved and thus the final form is aligned with the overall site strategy, whereas the ArtBase always requires a bespoke treatment... So the end result is something that I find to be good for just looking around, but not necessarily for research or for communicating our overall preservation strategy, because those things [weren’t] fully articulated until 2016.”

(Kaplan, 2018)

The listing of artworks remained alphabetical and could be filtered by *artist* and *title*. *Date* became a filter field with values “to” and “from”. The keyword search functionality was no longer available and tagging was completely removed as a feature of the interface. Over the years, the mix of folksonomies and staff-approved vocabularies have resulted in a tagging structure of arguable usefulness for discovery in the archive. Given the minimal amount of metadata available for each work, tags—a somewhat redundant historical legacy element—nevertheless provided additional entry points into the archive. The lack of any contextual relationships between artworks in the current Artbase interface means that there is only a single entry point to each artwork, which significantly reduces discoverability. Additional features, such as thematic collections, the timeline and member-curated exhibitions, were also removed from this latest interface design. A limited number of staff-curated exhibitions were retained. However, there is no semantic relationship between artworks in these exhibitions outside the manually curated exhibition pages accessible from the ArtBase landing page. Goals for the next stage redesign of the interface are explained further in [section 3](#).

Alternative approaches

Alternative approaches to the standard database interface have been explored throughout the ArtBase’s history. As early as 2001–2, Mark Tribe initiated a commissioning project, titled Alt.Interface, to reenvision the interface of the ArtBase and/or the text archive which was still maintained—the TextBase. One of the most compelling visions was created by Alex Galloway Mark Tribe and Martin Wattenberg (<http://archive.rhizome.org/exhibition/interface/>). *StarryNight* represents each piece of work in the text archive as a star in the night sky. Clicking on stars creates constellations based on shared keywords and allows access into related texts. Other (re)visions of the archival structure included *ada1852* by Christopher Fahey—an AI character intended to assist users in their discovery process in the ArtBase; *ContextBreeder* by John Klima—an algorithm and 3D interface into the Rhizome ArtBase, which “breeds” related artworks based on selections by the user; and *Troika* by Lisa Jevbratt where each object in the archive is displayed as one coloured pixel—the object is accessed by clicking on the pixel and colours change over time as a result of users making traces in the database. None of these artwork/interfaces are accessible anymore. A partial restoration of *Starry Night* was included in the Net Art Anthology exhibition in 2019 (<https://anthology.rhizome.org/starrynight>).

In 2008, a researcher from the Getty Institute wrote a report on the ArtBase during a residency at Rhizome and raised important questions around metadata structures and the interface of the ArtBase. Ward Smith addressed the difficulties of a heterogeneous born-digital archive having to be forced into existing structured vocabularies which were originally developed around analogue collections. In effect, he argued for a federated linked data approach to the organization of information in the archive (see [p.67](#)). He further argued for more user control and agency within navigating the archive and resolving potential

“tensions” at the interface design level. Such an approach could in fact be quite interesting in relation to the more flexible structure of Wikibase, as well as ideas around multi-platform presentation and a move away from a centralized archive. With the Net Art Anthology project Rhizome are in effect already exploring such an expanded approach to the archive.

“I would like to advocate strategies that allow existing systems (via APIs, libraries, modules for Content Management Systems, etc) that dynamically link controlled vocabularies with other forms of classification, such as different types of tagging (social, expert, faceted, game-context, etc) — even search and word collocation information, allowing ecosystems of meaning and historical context (and debates of meaning) — to be visualized and navigated by users. This would not be a crosswalk mapping (where all unresolvable particularities reside in ‘notes’), but instead an application space where all this information is visibly, and in qualified ways, bound to digital objects (both representational and born-digital), and where the intersubjective and historical tensions between terms and methods could be visible.”

(Smith, 2008)

1.5 Cataloging and findability

Being able to filter or sort an archival database in ways that support better findability and discoverability depends in large extends to the way metadata is structured in the database and then exposed in the user interface.

Metadata

In his advisory report, Richard Rinehart outlined the core types of metadata needed to be collected for each artwork—descriptive, administrative and technical. However, there are multiple questions yet to be answered in terms of the details that determine what constitutes sufficient metadata of each type.

Keywords are used to describe artworks in 2005.
(screenshot: 2017)

The screenshot shows the Rhizome.org homepage. At the top, there's a banner for 'INTERNET ARCHIVE WayBackMachine' with '4 captures' and the date '17 Nov 04 – 25 May 05'. The main navigation bar includes 'Art + Text', 'Calendar', 'Opportunities', 'Web Hosting', 'About Rhizome', and 'Community'. The 'Art + Text' section on the left has links for 'Art', 'Submit Your Artwork', 'Browse Art by Artist', 'Browse Art by Keyword', 'Browse Art by Title', 'ArtBase Management Policy', 'Report: Preserving the ArtBase', 'Linked Object Agreement', 'Cloned Object Agreement', 'ArtBase Selection Criteria', 'Rhizome Exhibitions', and 'Member-Curated Exhibits'. The 'Art Object' section in the center features a post titled 'Merry Christmas' by 'olia_liliana' dated 11.01.2003. The post discusses Java Applets and their impact on web browsers. The 'Community' sidebar on the right shows '27 online' and a login form.

Rhizome Terms and Artist Terms are used to describe artworks in 2008.
(screenshot: 2017)

The screenshot shows the Rhizome.org homepage from 2008. The top navigation bar includes 'ART', 'COMMUNITY', 'ABOUT', and a 'SEARCH' bar. A banner at the top right shows '18 MAY 2008'. The main content area features a post titled 'informational distance between cities' by 'santiago ortiz' with a creation date of '4.22.2008' and a publication date of '5.03.2008'. The post discusses the concept of informational distance between cities based on Google search results. To the right, there are sections for 'ARTBASE' (with links to Rhizome Vocabulary, Selection Criteria, etc.) and 'ACTIVE TERMS' (listing terms like 'Abstract Actions', 'Animation', 'audio', 'body', etc.). A 'FEATURED ARTWORK' section shows a thumbnail for 'micrerevolt' by cat mazza.

“Rhizome will need to manage two types of metadata in the preservation process (some of this metadata is already captured and managed in the ArtBase). It is standard practice in the cultural heritage community to identify at least three types of metadata: descriptive (information which is used to search for, identify, and explain the artwork being described); administrative (information needed for the internal management of the artwork such as legal, storage, and non-public provenance information); and technical (information about the infrastructure and materials of an artwork necessary for preservation and handling). Rhizome should capture or create these three types of metadata, once for the artwork and again for the technology.”

(Rinehart, 2002)

Descriptive categories

Descriptive metadata has been collected for most artworks in the ArtBase to various degrees of completeness. Defining what complete descriptive data for a net art piece looks like is complicated by the fact that categories such as *artist name*, *artwork title* and *date* are oftentimes less straightforward than they might appear. Many net artworks have multiple creators or involve actors with less clearly defined roles—whether the artist worked with a network of collaborators, or the artwork involves the participation of the users/audience in order to be performed. This particular issue has been addressed to some extent via the *collaborator(s)* field proposed in the metadata schema described in Ben Fino-Radin’s preservation report from 2011. The date field presents further complications. Oftentimes artworks have a time dimension too, i.e. they develop over time and may change and evolve. Capturing this time aspect is not readily facilitated by standard metadata schemas. There is also the issue of the type or format of the artwork. While most works in the ArtBase could loosely be described as net art, there are some works which are software-based, rather than web-based, or works which take the form of games or simply digital videos. Additionally, some works exist in archival WARC formats (facilitated by Webrecorder and Webenact), which is closer to what would traditionally be referred to as documentation. This alone requires some basic metadata to differentiate net artworks from other formats present in the ArtBase and to enable

Tags are used to describe artworks in 2011.
(screenshot: 2017)

http://rhizome.org/artbase/artwork/26384/

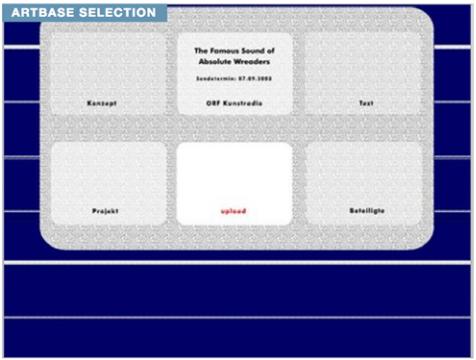
15 captures | 24 Jan 11 – 19 Sep 15 | MAY OCT DEC
◀ 21 ▶ | 2010 2011 2013

Welcome, Guest | LOG IN | JOIN | forgot password? | Support Rhizome! | SEARCH >

RHIZOME ARTBASE COMMUNITY PROGRAMS JOIN

Home / Artbase | FEATURED | BROWSE | TIMELINE | MEMBER EXHIBITIONS | ABOUT | POLICY | SUBMIT

The Famous Sounds of Absolute Wreaders (2003) ↗ by Johannes Auer

ARTBASE SELECTION

The Famous Sound of Absolute Wreaders
ORF Kunstradio
Konzept
Text
Projekt
upload
Befolgen

Like 0 | Tweet

The Famous Sound of Absolute Wreaders (concept and direction: Johannes Auer) is a cooperative project by six authors or net activists and deals with writing/reading/processing on the Internet: Who is speaking? What is an author? Does the Reader become a Wreader? The project was produced in 2003 for the Austrian broadcasting company's (ORF) 'Kunstradio' and is accessible on the Internet. The Famous Sound started with one work of digital literature per artist, to which another artist in the group reacted with a printable text. The text material created in this way was then processed by a human editor (Auer) and a text machine and finally performed in this version by two speakers for the radio program. Furthermore, six new pieces of digital literature were produced by the artists involved, as a reaction to this process.

Tags: Animation audio Collaborative Conceptual contextual DHTML digital email Flash identity interact Internet Javascript Johannes Auer; Reinhard Doebl; Sylvia Egger; Olive kunstradio.at

FULL DESCRIPTION

The Famous Sound of Absolute Wreaders (concept and direction: Johannes Auer) is a cooperative project by six authors or net activists and deals with writing/reading/processing on the Internet: Who is speaking? What is an author? Does the Reader become a Wreader? The project was produced in 2003 for the Austrian broadcasting company's (ORF) 'Kunstradio' and is accessible on the Internet. The Famous Sound started with one work of digital literature per artist, to which another artist in the group reacted with a printable text. The text material created in this way was then processed by a human editor (Auer) and a text machine and finally performed in this version by two speakers for the radio program. Furthermore, six new pieces of digital literature were produced by the artists involved, as a reaction to this process.

WORK METADATA

Year Created:	2003
Submitted to:	Thursday Sep 2nd, 2004
ArtBase:	
Permalink:	http://kunstradio.cyberfiction.ch/
Work Credits:	Johannes Auer, creator
License:	 Creative Commons: Attribution-Noncommercial-Share Alike

RELATED WORKS



COMMENTS

This artwork has no comments. You should add one!

LEAVE A COMMENT

You must be logged in to post a comment. [LOG IN](#)

expression of that in the user interface. At some point the category “not web”⁹ was considered in Rhizome, but it hasn’t been solidified or implemented in any way. As Morgan McKeehan observes during her 2015/6 audit project: “Within the audit parameters, the “documentation/not web” category has not yet settled on a final selection for public facing terms.” (McKeehan, 2016).

“Though many practitioners associate with one another in a variety of inter-disciplinary formations, they do not necessarily see themselves part of a common project, and often resist naming and canonization. The stabilization of genre requires a considerable amount of time.”

(Smith, 2008)

Another issue which remained unresolved by the 2015 redesign of the ArtBase was the genre category. In earlier iterations of the ArtBase interface, keywords or tags, as well as thematic collections, were used to associate terms such as ‘glitch art’, ‘hypertext’ and ‘tactical media’ with specific artworks. Assigning such terms to artworks was of course highly subjective and possibly even problematic in a field as heterogeneous as that of net art. This has further complicated the issue of tagging and the potential usefulness—or deficiency—of assigning arbitrary terms as metadata to records in the ArtBase.

Tagging

Tagging has existed in various forms since the start of the ArtBase. The first iteration of this popular categorisation strategy took the form of “keywords” (1999–2005). These keywords were general terms that reflected the form and content of the artworks, but did not follow any prescribed schema or controlled vocabulary.

In 2006, after a change in the ArtBase interface design (alongside a general update of Rhizome’s website), a new tagging strategy was adopted. This involved a combination of “Artist terms” and “Rhizome terms” associated with each artwork (2006–2011). The artist terms were essentially a folksonomy—a user-generated classification system, wherein artists added ‘tags’ to their artworks upon submission to the ArtBase. While a popular way of structuring information in various image-oriented platforms, such as Flickr for example, the use of folksonomies for tagging is problematic when it comes to access and retrieval due to the lack of precision in the terms and as Ward Smith has written in his report from 2008: “Ultimately the so-called “wisdom of crowds” may not manifest

9 This category has also been retrospectively applied to artworks from the earlier years of the ArtBase when there was a wider scope to collect new media art as opposed to just net art. See also note on p.4 for more details.

beyond the most basic terms. Folksonomies can generate recall terms, but lack precision for satisfying the needs of expert communities. [...] Specifically, the need for expertise — not just in subject matter, but also in metadata — becomes increasingly necessary." (Smith, 2008)

"Tagging and folksonomies are, in 2012, completely standard features that have been debated in the information science community years ago in terms of their cost, benefit, and risk. So it is clear and proven that they are valuable. But our position is that they shouldn't be the backbone of cataloguing and findability."

(Corcoran in Graham, 2014)

Since 2011, the ArtBase has used only a single category for keywords associated with an artwork. The category was simply called "Tags" and consisted of a mix of user-generated and staff-generated keywords. Staff filtered which user-generated keywords to be used and which can be left out. In her interview with Beryl Graham, Heather Corcoran discussed Rhizome's views on tagging at the time: "Currently, artists can assign tags to the descriptive record of their work. This is augmented by tagging done by Rhizome's curatorial assistants, referring also to a collection of tags that have been deemed particularly useful and are given greater weight in search indexing [...] While the value of tagging in the context of museum collections is well established [...] this can't be the sole backbone of searchability and browsability. We are building a new management system for the Artbase that introduces several new facets of findability, including work type (web, software, moving image, image, etc), geolocation (birthplace of the artist), or material/technologies (like browser version or operating system—information we currently have but isn't yet browsable), just to name a few." (Graham, 2014, p.100–101). While there is a clear acknowledgement in this statement that tagging shouldn't be the only way to facilitate cataloguing and enable discovery in the archive, the other proposed strategies have not been implemented yet.

The greater the number of tags associated with archival items—whether folksonomies or generated by staff (as in the case of the "Rhizome terms")—the less meaningful they become in terms of organizing the archive or providing information for faceted search structures. There is also the issue of outdated metadata—whereas in 2002, for example, tagging an artwork with "JavaScript" might have been a useful distinction from other artworks, nowadays most websites use JavaScript, so this wouldn't be a useful term of distinction. Although many of the tags collected in the ArtBase over the years may not be useful for the description, sorting or understanding of the works, the decision to completely remove tags in the latest redesign of the Rhizome website and the ArtBase

interface in 2015 is surprising. Tags are (as Corcoran mentioned in her earlier stated quote) a commonly used structuring device in archives and other digital platforms utilised by museums and various other institutions and therefore represent an established user interaction pattern which does not have to be discarded completely.

Narrative descriptions

Beyond tagging, another aspect of descriptive metadata which could be considered a helpful strategy in cataloguing and supporting search in the archive are narrative descriptions. Given the wide range of works in the ArtBase, oftentimes the only viable way to describe or document important aspects of an artwork remains narration (Smith, 2008). Narration in text or video format could help describe some key elements, concepts or modes of interaction in a work, and support the preservation of contextual information difficult to convey through other formal categorisation methods or tags. Most artworks in the archive already have short text descriptions provided by the artists, but there is scope for these to be supplemented and expanded with additional narration in the future.

Administrative metadata

Some administrative metadata relating to acquisition date (or acquisition procedures) and various catalogue ID numbers (corresponding to the database migrations across different formats and collection management systems) has been collected and preserved. However, an important aspect of collection administration—the data relating to copyright licensing—is not considered reliable among Rhizome staff members. For a long time, the default field for licensing in the submission form was “Creative Commons” (see the [Appendix](#)). Many artists simply left that field in its default state, possibly without fully understanding the implications of this license (Rossenova, 2017). Moving to the new, redesigned archive interface, Rhizome would benefit from clarifying any doubts about licenses on a case-by-case basis with the artists, so corrected data wherever necessary can be presented to users.

Technical metadata

The data that is even less complete than descriptive and administrative data in the ArtBase is technical metadata. Technical fields in the submission form were oftentimes left blank. Furthermore, not all the fields in submission form and questionnaire are useful for the purpose of restoring works. Specific browser dependencies or environment configurations may be crucial, whereas other more general requirements (such as: which OS was used for the work’s creation?) may be less relevant, when it comes to web-based restoration and reperformance (Rossenova, 2017) (see the [Appendix](#)). What is more, there is the question of how much technical metadata is the minimum that needs to be collected for effective preservation. Richard Rinehart observed in 2002 that: “It should be explicit to the submitting artist that they should select only as many technology choices as are minimally necessary to run the work [...]” (Rinehart, 2002). He did not however outline in any great detail what might be included in the “minimally necessary” amount of metadata.

“It should also be noted that not every technical detail about a given software application or hardware platform need be exhaustively recorded in the ArtBase; such technology is better documented on a technical level elsewhere, but the ArtBase needs to relate such technology to specific works of art, and to contain sufficient detail about such technology to allow accurate identification of it well into the future.”

(Rinehart, 2002)

A further issue to consider in this regard is that the ArtBase is not the place where a deep level of technical metadata is best to be kept and recorded. With the emergence of online registries of technical information, such as PRONOM, maintained by the UK National Archives, technical details can be stored in external databases, while the records in the ArtBase simply refer to the necessary PUID (PRONOM Unique Identifiers).¹⁰ The efforts of providing PUIDs for the dependencies identified in the ArtBase’s most recent audit report conducted by Morgan McKeehan are linked to the ongoing collaborative efforts between Rhizome and researchers at other institutions to find efficient ways to support technical preservation metadata and link that to records in the ArtBase.

“It is equally important that the metadata created for this be consistent with other metadata standards in the arts and cultural heritage communities. This is to support the long-term maintenance of ArtBase metadata, to make it possible to integrate this metadata into existing collection management software as a way of ensuring that it can be used in daily institutional practice, and lastly to enable the integration of information about new media art collections with information about other types of collections from different institutions.”

(Rinehart, 2002)

10 As the PRONOM information website states: “PRONOM is a resource for anyone requiring impartial and definitive information about the file formats, software products and other technical components required to support long-term access to electronic records and other digital objects of cultural, historical or business value.” (<https://www.nationalarchives.gov.uk/PRONOM/Format/proFormatSearch.aspx?status=listReport> [Accessed 3 September, 2017])

Standards compliance

The importance of compliance with standards with regards to the way information is kept and recorded in the ArtBase has been raised at various stages throughout the development of the archive. Still, in the two decades since the ArtBase was established, the existing collection management software systems have remained focused on accommodating the needs of collections of digitized born-analogue objects, rather than web-based artifacts. At the same time collections of born-digital artworks have largely remained separate and not integrated with other types of collections within institutions which collect contemporary art (See Report #3). Efforts across various institutions to release open data about their collections and LODLAM (Linked Open Data in Libraries, Archives and Museums) discussions have remained focused on digitized paintings and other physical objects.¹¹ Technical complexities and heterogeneity among the works continue to make such efforts within collections of born-digital art far more demanding on resources. This raises the question whether compliance with standards should remain a goal for an archive of net art.

In his report from 2011, Ben Fino-Radin discussed the implementation of metadata schemas in the ArtBase: “The ArtBase’s metadata schema [...] plays a key role in allowing for not only the searchability and browsability of the archive, but also in streamlining the monitoring of obsolescence.” (Fino-Radin, 2011). His report outlined a schema that could be mapped across to standards such as Dublin Core and CDWA-light (see p.46). However, these standard schemas were not developed with consideration for the specificity of net artworks. With the move away from Collective Access—a system which could support standard metadata schemas used in museums—towards Wikibase, which is domain-agnostic, these mappings were not pursued further.

In 2016, during the audit for artworks’ technical dependencies, Morgan McKeehan developed a schema that described metadata about dependencies in PREMIS (Preservation Metadata Maintenance Activity), the “international standard for metadata to support the preservation of digital objects”.¹² McKeehan demonstrated how the PREMIS statements can then be mapped to a range of other standards—CDWA, VRA-CORE, MODS, EAD (see p.80). The complexity and level of detail necessary to achieve this mapping correctly, however, requires significant time and resources which has not yet been feasible to scale across the entire ArtBase. The existence of a number of international standards suited to the needs of large institutions such as National Libraries does not resolve the

11 See: <http://lodlam.net/> [Accessed 3 September, 2017]. A look through the proposals for the 2017 LODLAM challenge for example reveals the type of collections involved in the projects—aggregated digitized library or archive holdings, such as Europeana or the British Museum’s vast collection of digitized artifacts. Source: <https://summit2017.lodlam.net/category/challenge-entries/> [Accessed 3 September, 2017]

12 See: <https://www.loc.gov/standards/premis/> [Accessed 3 September, 2017]

ArtBase	Dublin Core	CDWA-lite
Title	Title	Title (2.1.1)
Byline	Creator	Name of Creator (4.1.1.1)
Created Date	Date (Created)	Display Creation Date (12)
Description	Description	Descriptive Note (17.1.1)
Tags	Subject	Classification (16.1)
Other Artists	Contributor	Name of Creator (4.1.1.1) with Role Creator (4.5)
Technologies	Type	Term Materials Techniques (8.1.1)
Format	Format	Classification (16.1)
State Ed.		Display Edition (9.2)
Collective	Contributor	Name of Creator (4.1.1.1) with Role Creator (4.5)
Exhibitions	Publisher	Label For Related Work/Group/Collection/Series (19.1.3)
License	Rights	Rights for Work (20)
URL	Relation (Has Part)	Location/Repository Set (14.1)

Table outlining the descriptive metadata schema and corresponding mappings to Dublin Core and CDWA, as proposed in Ben Fino-Radin's report from 2011.

A	B	C	D	E	F	G	H	I	J
1		completeness				importance			
2									
3	property #	item #	item #	item #	item #	item #	item #	item #	item #
4		ok	broken	don't know	n/a	essential	somewhat	not	n/a
5	internal resources	P87	Q4897	Q4898	Q4899	Q4900	Q4920	Q4921	Q4922
6	external media	P94	Q4912	Q4913	Q4914	Q4915	Q4924	Q4925	Q4926
7	external services	P95	Q4916	Q4917	Q4918	Q4919	Q4928	Q4929	Q4930
8	browser plugins	P86	Q4932	Q4933	Q4934	Q4935	Q4936	Q4937	Q4938
9		item #							
10		Not Web				webrecording	"web-based artwork"	= notNotWeb	
11	documentation or not web	P89	Q4908						
12									
13		item #	item #	item #	item #	item #			
14		none	java	Flash	Shockwave	Quicktime			
15	browser plug-ins	P86	Q4895	Q4901	Q4902	Q4903	Q4904		
16									
17		item #	item #	item #					
18		low	medium	high					
19	risk from external links	P88	Q4907	Q4906	Q4905				
20									
21		item #	item #	item #	item #				
22	stoplights		red	yellow	green	none			
23									
24	other properties created								
25	importance: allowed values	P96							
26	completeness: allowed values	P97							
27	allowed values	P98							

View of an excel spreadsheet outlining the controlled vocabularies and properties used in the recent ArtBase audit (McKeehan, 2016).

challenges for smaller organizations to maintain standards compliance across their collections, nor does it provide the necessary guidance on how these standards could be practically implemented on the level of internal database structure or user-facing interface design.

Controlled vocabularies

Despite the challenges for implementing international metadata standards across a heterogeneous collection such as the ArtBase, which has evolved organically over time, the implementation of controlled vocabularies for structuring metadata can be helpful. Controlled vocabularies allow for consistency in access to metadata across the backend and the user-facing frontend interface, as well as the automation of appropriate preservation actions or presentation strategies, as Morgan McKeahan argued in her audit of the ArtBase in 2015/16.

“By adopting a controlled vocabulary for qualitative evaluation of a range of variables, and translating the output of this assessment into a consistent framework describing causes and manifestations of damage, the audit seeks to provide a workable foundation for communicating to users the access quality of Internet-based artworks within this collection.”

(McKeehan, 2016)

1.6 Archive users

Use outside the institution

So far there hasn't been a comprehensive study into archive users and user behaviours in the ArtBase. In 2014, Heather Corcoran noted: “We don't have detailed usability reports on the ArtBase specifically, but anecdotally we can say a few different types of people use it. First academics: students, professors, and researchers. They get in touch asking for more information on works or to interview us about pieces. They are using the ArtBase as a primary research tool for their research projects.

Second: curators: they use Rhizome more generally as a way to stay in touch with new artists working in the media arts field, and ArtBase in order to find works first-hand they may include in their shows. We get them asking us for contracts for artists sometimes or for more information on a piece.

Third, artists: they use it wherever they need institutional affiliation, such as grant proposals or artist visa applications. They also use it to support or double

up the archive efforts of their work, relieved they don't have to do it themselves, and send people to view the work on Rhizome.

Of course, we know that lots of general Rhizome site visitors also check out the ArtBase to explore this art form. Recently we've been posting images of works in the ArtBase to our Tumblr with links back, and from this gained over 20,000 followers to our account in just over two months. So these people are viewing the ArtBase, with a different kind of entry point." (Corcoran, in Graham, 2014, p.101)

This quote identifies some users and possible use cases in the ArtBase, but further user research is needed in order to validate these propositions and explore other potential use cases. Report #2 outlines the user research carried out in 2017–18.

Users inside the institution

The case for internal use at the institution needs further research, too: preservation and curatorial staff may need to access the ArtBase for various programming reasons. Preservation staff need to maintain the records—adding in new research that has been carried out on particular works, maintaining consistent levels of accessibility, monitoring for obsolescence, etc. Curatorial staff may also need to use the ArtBase for research purposes, for preparation of new programmes or exhibitions, as well as for monitoring and identifying gaps in the collection, which may require new acquisitions (Rossenova, 2017). Insights from discussions and interviews with staff are outlined in [section 3](#) of this report.

1.7 Exhibition histories

Works from the archive have been selected for various exhibitions and special events throughout the ArtBase history. The artist agreements signed upon submission gave Rhizome the right to exhibit the works.

Institutional partnerships

Rhizome has entered partnerships with other institutions for various special events or shows, and since becoming an affiliate resident at the New Museum, the museum has been a primary partner in multiple events.

"The combination of the online and the physical relates to many aspects of Rhizome's work. The preservation strategies are well developed [...] and obviously affect what can be collected [...] The relationship with the physical space of the New Museum means that the museum has had to understand new media in various ways."

(Graham, 2014, p.97)

Exhibitions staged at, or organized in partnership with the New Museum include: *ArtBase 101*, 2005; *Montage: Unmonumental Online*, 2008; as well as the *First Look: New Art Online* series which is ongoing since 2012 and is hosted on the New Museum website. In 2017, *First Look* was augmented with a VR edition, released as an app in the Oculus store, the App store and Google Play, as a joint endeavour by Rhizome and the New Museum.

More recently, Rhizome has partnered with other institutions in digital preservation efforts, such as the restoration and online presentation of the Theresa Duncan CD-ROMs, where Rhizome partnered with the University of Freiburg, who provided the Emulation-as-a-Service framework (bwFLA EaaS) for the presentation of the CD-ROMs as part of the *First Look Online* series. Institutional partnerships are important for Rhizome both for their curatorial, as well as preservation programmes, and they provide opportunities for future restoration, preservation and presentation of works from the ArtBase, too.

Online curation

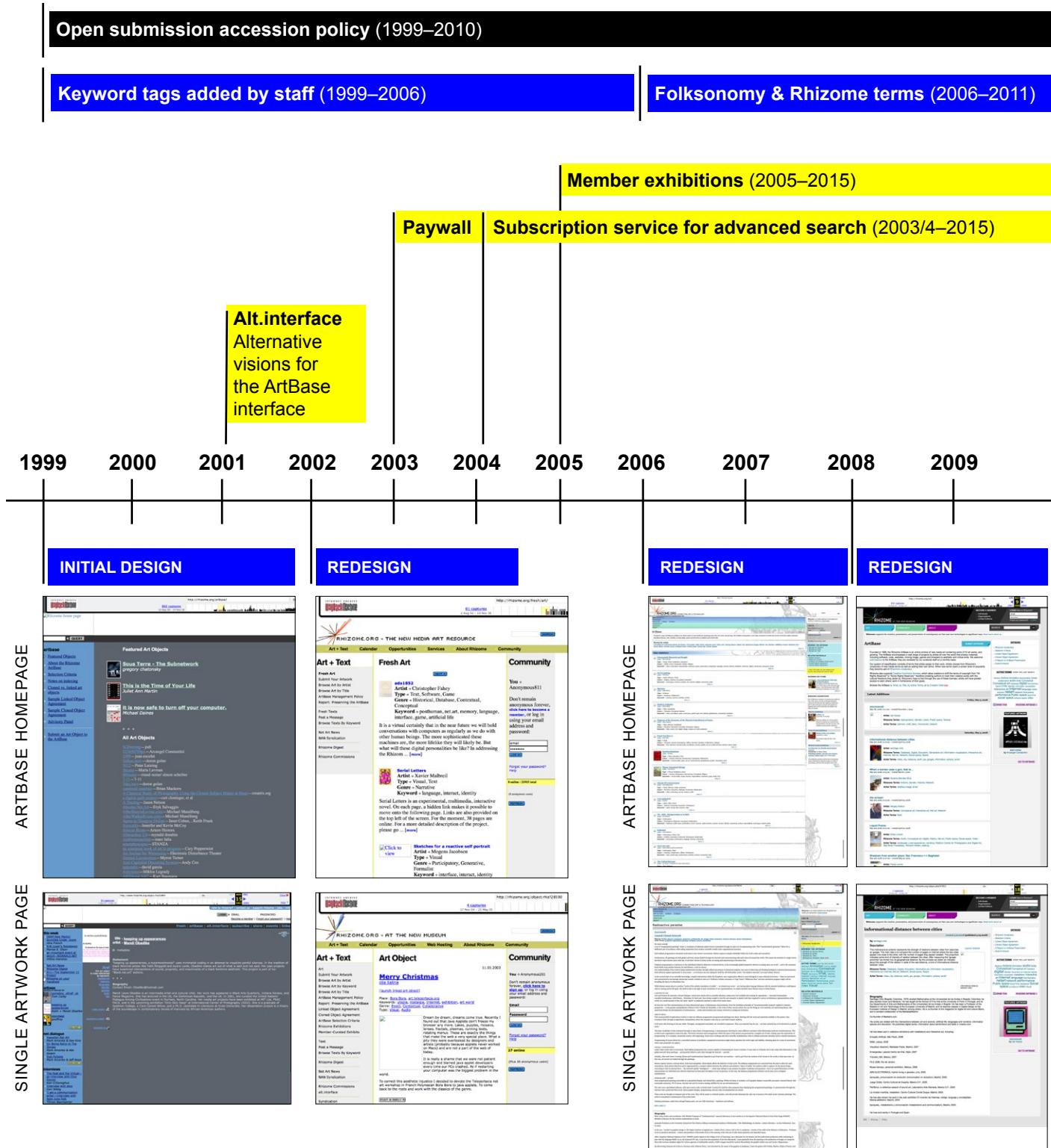
Below is a list of online exhibitions organized by or in partnership with Rhizome

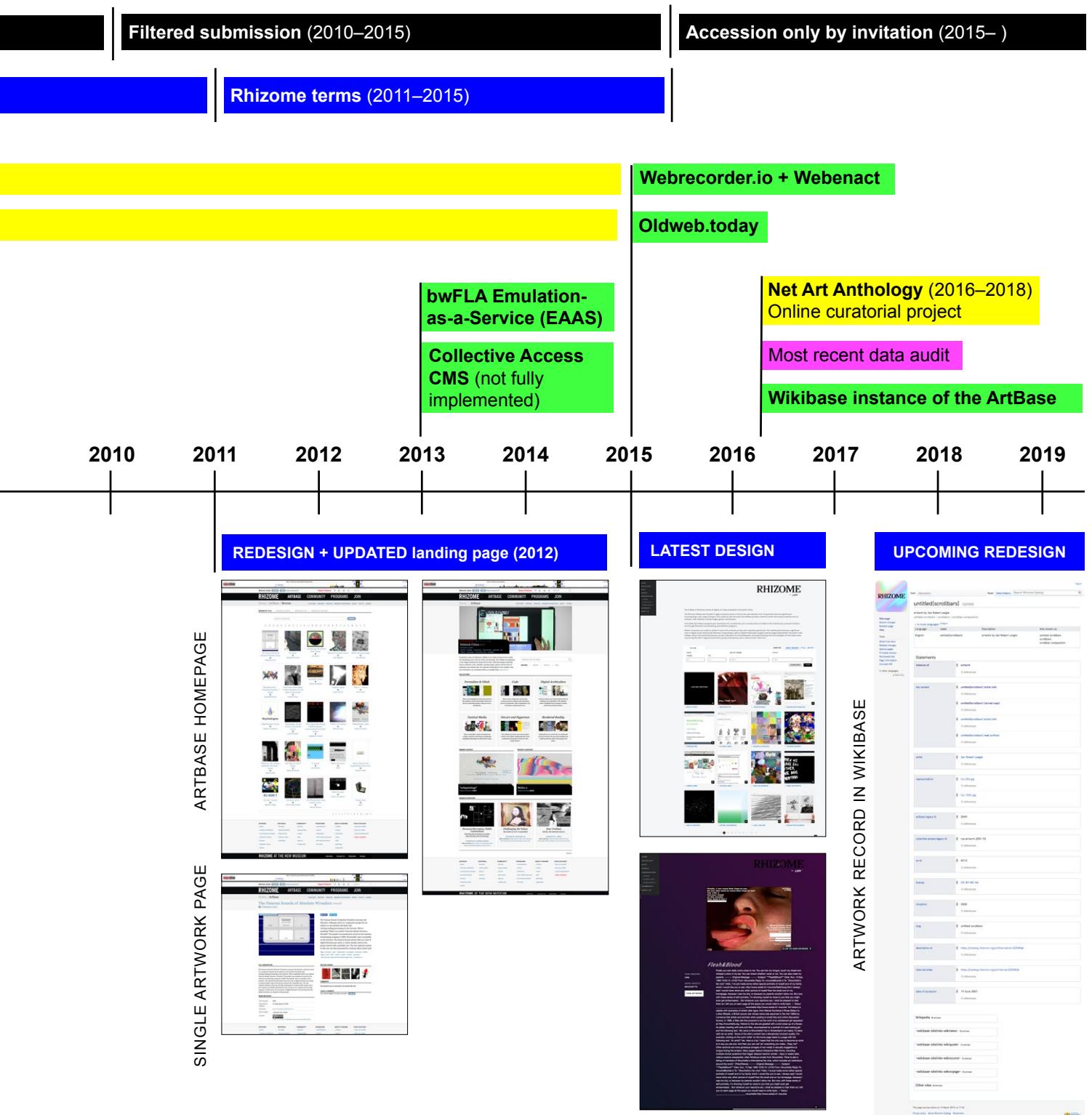
- *Alt.interface*, 2000*
- *Low Level All Stars*, 2005
- *Location is everything*, 2005*
- *City/Observer*, 2005*
- *Net Art's Cyborg[feminist]s, Punks, and Manifestos*, 2005
- *Raiders of the Lost ArtBase*, 2005*
- *Time Shares*, 2006–7
- *Google Art, or How to Hack Google*, 2007
- *Montage: Unmonumental Online*, 2008
- *Fw re re*, 2009*
- *HTML Color codes*, 2009
- *Splashback: Rhizome.org Splash Pages*, 2009*
- *First Look: New Art Online*, 2012–ongoing
- *Collection: Hypertext*, 2015*
- *Collection: Archive as Artwork*, 2016*
- *Net Art Anthology*, 2016–2018*
- *First Look VR*, 2017
- *Google Cultural Institute Exhibits*, 2017*
- *The Art Happens Here: Net Art's Archival Poetics*, 2019*

(*Exhibitions which include artworks curated from the ArtBase archive.)

Inclusion of artworks from the archive in online exhibitions is a great strategy to increase access and discovery in the archive. At the moment, however, there is no contextual link between works which have been included in exhibitions and their records in the ArtBase. Including data about exhibition histories within the ArtBase data structures could enhance contextual relationships between works and provide additional entry points into the ArtBase.

1.8 Timeline of ArtBase development 1999–2019





2 The digital preservation programme 2015–2019

Since closing submission to the ArtBase and moving the data to Wikibase, Rhizome's digital preservation programme has focused on research projects supporting the long-term access and performativity of artworks in the archive. The following sub-sections examine the strategies that have emerged in relation to preservation, the specifics of the Wikibase setup including associated challenges and opportunities, findings from the most recent audit of the database, and implications related to the archival interface and the archive's use-cases.

2.1 Preservation strategies

The development in preservation strategies at Rhizome can be divided into three primary areas of focus—software preservation, network preservation, and structured preservation metadata (Rossenova, 2017).

Software preservation

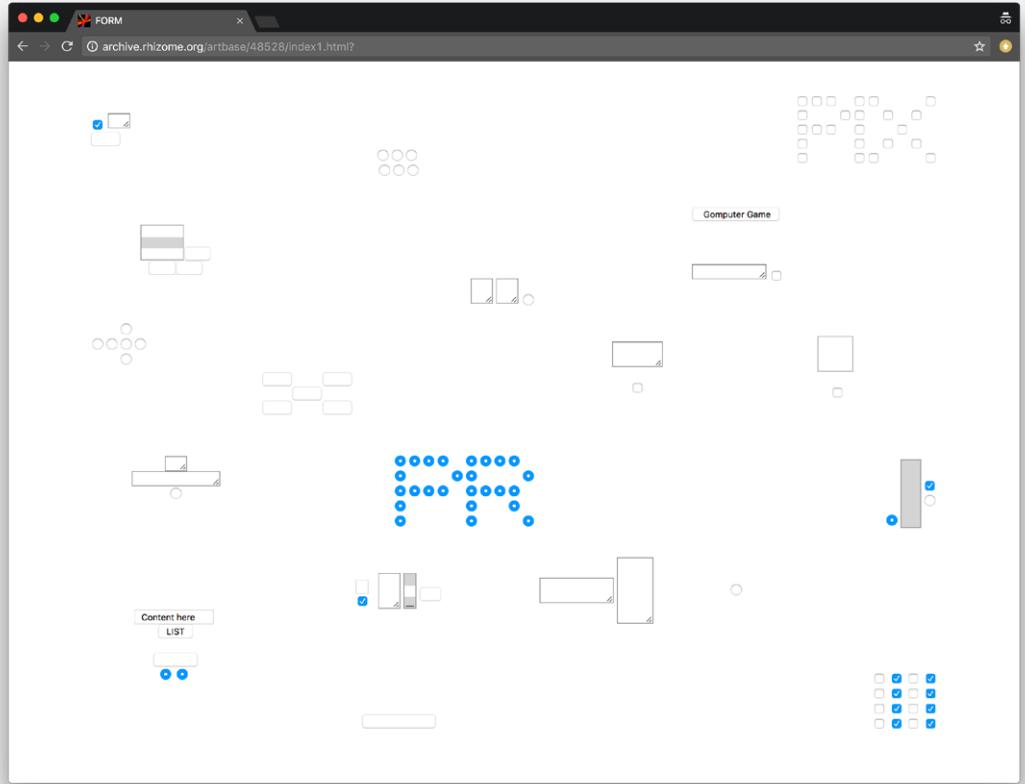
The key strategies for software preservation have generally been described by the preservation community as storage, migration, emulation and reinterpretation (Rinehart, 2002). Since a brief overview to Rhizome's approach to storage and backup was provided in [section 1.3](#), the following sections focus on the rest of the preservation strategies in relation to Rhizome preservation programme.

Migration

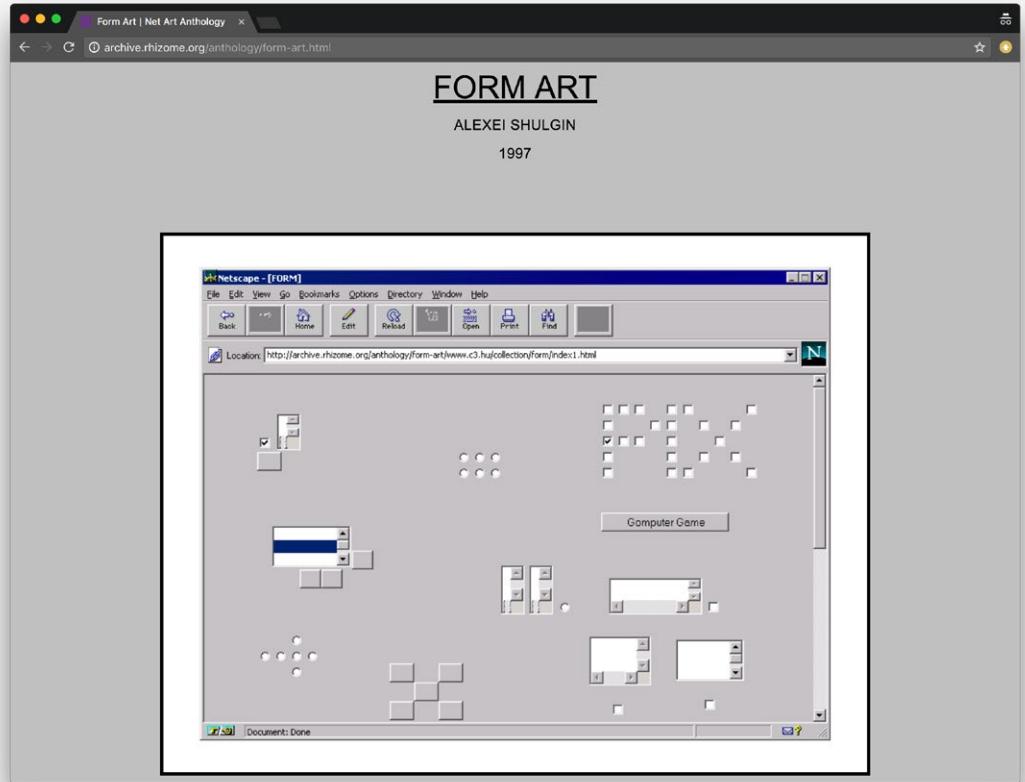
The strategy of migrating content between different digital formats is more commonly applied in libraries and archives than arts institutions: file format or programming language used in born-digital artworks have aesthetic, as well as art historical significance beyond the level of ‘content’ as understood in the context of digital text documents within a library, for instance. As early as 2002, Richard Rinehart recommended emulation as a more suitable strategy for Rhizome than migration, in order to better preserve the aesthetic and historical characteristics of the formats and languages used by the artists (Rinehart, 2002). In 2011, Ben Fino-Radin also noted that migration—if ever utilised in the ArtBase—will probably remain “best suited for application to simple assets such as images, sound, and video” (Fino-Radin, 2011), because in most cases an update in the encoding of a single image or sound file format would have less impact on the overall experience of an artwork than updating its entire code base.



Form Art (1997)
accessed in a
contemporary browser
through the link in the
ArtBase.
(screenshot: 2017)



Form Art (1997)
restaged in a remote
browser in the Net Art
Anthology.
(screenshot: 2017)



“All current forms of emulation focus on the stand-alone computer and not the network per se. Many net artworks integrate the Internet into the work—for instance, calling in live data-streams from servers around the world. Emulation will never be able to emulate the entire Internet environment needed for some artworks, but there may be ways to mitigate this condition”

(Rinehart, 2002).

Recent developments in tools built by Rhizome, such as oldweb.today and Webrecorder aim to indeed mitigate this condition. Commenting on the efficiency of emulation efforts to run multiple works over the same infrastructure, in his report from 2011, Ben Fino-Radin further noted the need for a “museum quality browser” (Fino-Radin, 2011).

“This establishes the need for a “museum quality browser”—one that runs on contemporary infrastructures and provides legacy support for archaic protocols and markup of the early days of Internet Art.”

(Fino-Radin, 2011)

The framework of oldweb.today enables this ‘museum-quality’ environment where legacy support for older protocols and browser plug-ins is enabled by running containerized browsers in Docker¹³ and serving these within the user’s own browser—essentially providing browser-based emulation for the web. The abstracted environments of oldweb.today could then be combined with any number of artworks (both as web archives or hosted on the live web). The fact that legacy browsers can be deployed within users’ own browsing environments is also significant. One of the key problems Fino-Radin observed with his

13 Docker is a popular container-as-a-service platform. Containers are a form of lightweight virtual machines—“a way to package software in a format that can run isolated on a shared operating system. Unlike VMs, containers do not bundle a full operating system - only libraries and settings required to make the software work are needed.” Source: <https://www.docker.com/what-docker> [Accessed 3 September, 2017]

UI for the admin access to the bwFLA EaaS framework.
(screenshot: 2017)

The screenshot shows a web-based administrative interface for the bwFLA EaaS framework. The title bar says 'EMIL' and the URL is 'emil.eaas.uni-freiburg.de/emil-admin-ui/#/wf-s/standard-envs-overview'. On the left, there's a sidebar with options like 'Environments', 'Object Environments', 'Software', 'Import Environments', 'Create Base Environment', and 'Change Keyboard layout'. The main area is titled 'Environments' and lists several environment configurations:

- Apple Mac OS 7.5 [Configure environment] [Edit description] [export] [Delete]
n.a.
- Apple Mac OS 9 [Configure environment] [Edit description] [export] [Delete]
n.a.
- Atari 1040ST (68000 CPU) [Configure environment] [Edit description] [export] [Delete]
n.a.
- BBC Microcomputer [Configure environment] [Edit description] [export] [Delete]
n.a.

At the bottom right, there are navigation buttons for pages 1 through 5, with page 1 highlighted.

UI for in-browser emulation in the EaaSI sandbox, supported by the Software Preservation Network.

There is a list of actions available to users, including a new interaction pattern: locking a user's cursor to the emulation frame upon click & releasing it via the ESC button.
(screenshot: 2019)

The screenshot shows a Linux desktop environment within a browser window. The title bar says 'EaaSI Public Emulation Portal'. The desktop has a dark orange background. A menu bar at the top includes 'Applications', 'Places', 'System', and icons for help and search. The 'Applications' menu is open, showing categories like 'Accessories', 'Games', 'Graphics', 'Internet', 'Office', 'Sound & Video', and 'Add/Remove...'. The 'Graphics' category is expanded, and 'GIMP Image Editor' is selected, with its description 'Create and edit images or photographs' visible. A status bar at the bottom right shows the date and time: 'Wed Aug 28, 11:51 AM'. A window titled 'Scribus 1.2.5' is open in the foreground.

concept for a “museum-quality browser” was adding an extra step to the user interaction model and requiring users to download and use a browser other than the one they use in their native OS setup. By enabling browser-based emulation for old browsers, artworks from the archive can be displayed within the environments they were originally created for, such as early versions of Netscape Navigator or Microsoft’s Internet Explorer, without requiring users to download and install additional software. The benefits of providing access to legacy environments is evident with works which rely heavily on aesthetics derived from contemporaneous components, such as Alexei Shulgin’s *Form Art*, (1997), as evidenced in its restaging as part of the Net Art Anthology project (2017).

Emulation—bwFLA EaaS

Emulation plays an important role in preserving fidelity to original functionalities and aesthetics. When it comes to emulation of environments for software-based artworks, it is essentially about providing access to an artwork’s functional context at the time of its creation, which is closely connected to the user’s experience of the work.

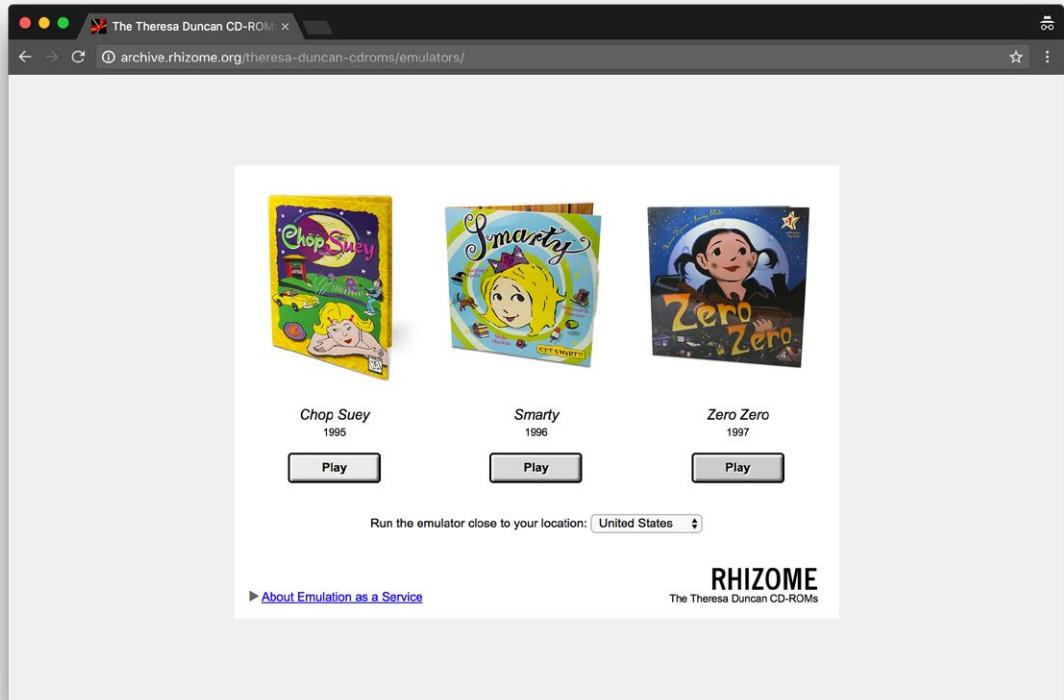
For Rhizome, emulation for software-based artworks has been facilitated through the **bwFLA** (Functional Long-term Archiving [in Baden-Württemberg state institutions]) **Emulation-as-a-Service** project run at the University of Freiburg: “The Emulation-as-a-Service architecture simplifies access to preserved digital assets allowing end users to interact with the original environments running on different emulators. Ready-made emulation components provide a flexible web service API allowing for development of individual and tailored digital preservation workflows.”¹⁴ The efficiency of this system lies in the fact that the bottom layer, hardware infrastructure, and the mid layer, the operating system, within a computing environment stack are abstracted from the top layer – the digital artifact. Various environments can be picked by users within a graphical user interface and deployed via distributed cloud computing services to quickly and efficiently present an emulated environment within the end user’s own browser.¹⁵

“In most cases the best way to render a certain digital object is using its creating applications, since these cover most of the object’s significant properties, hence providing an authentic and possibly an interactive user experience. Therefore, emulation is a key strategy to provide a digital object’s native environment and thus maintain its original characteristics, look & feel and utility.”¹⁴

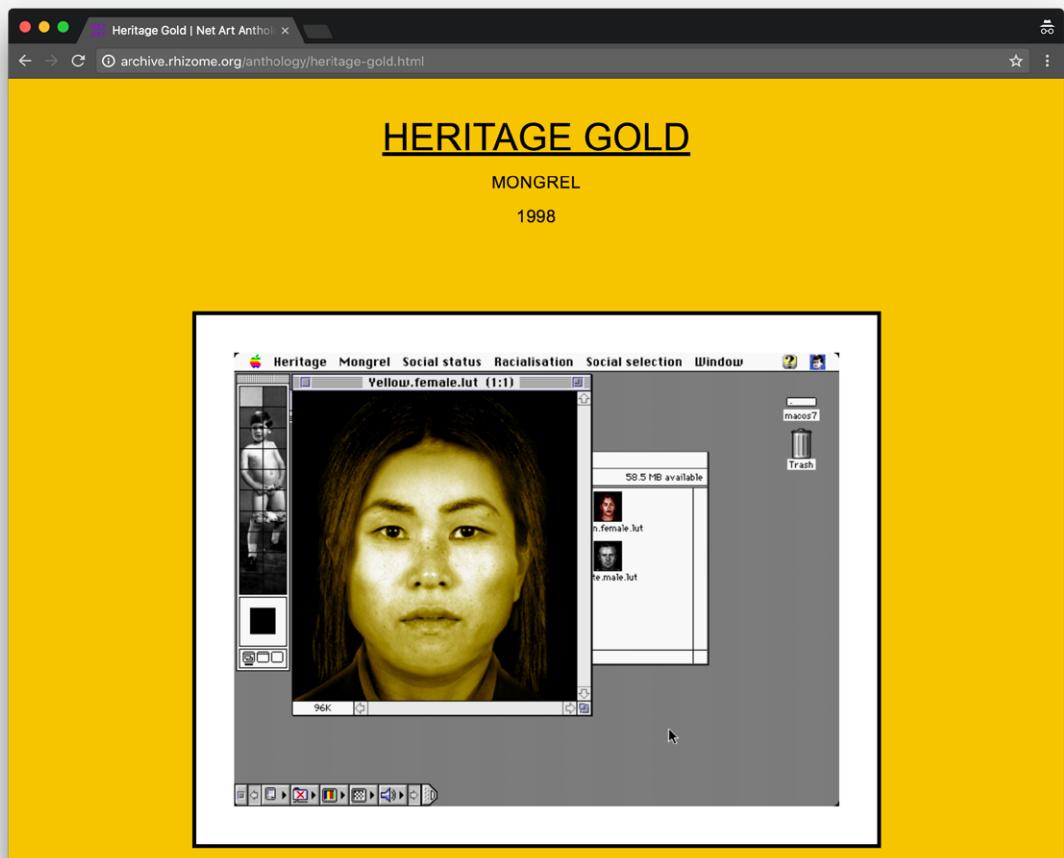
14 Introduction to Emulation-as-a-Service – <http://eaas.uni-freiburg.de/> [28 May, 2019]

15 A sample workflow from a related project be demo-ed here: <https://www.softwarepreservationnetwork.org/eaasi-sandbox/> [Accessed 18 August, 2019]

Theresa Duncan game CD-ROMs (1995–7) presented as part of the First Look online exhibitions. Made accessible again via EaaS, 2015.
(screenshot: 2017)



Mongrel, *Heritage Gold* (1998), restaged via EaaS as part of the Net Art Anthology.
(screenshot: 2017)



This infrastructure has been particularly useful for the restoration of CD-ROM artworks (such as Theresa Duncan's games CD-ROMs), or for the reperformance of artworks based on obsolete software, such as Mongrel's *Heritage Gold*, recently restaged in the Net Art Anthology online exhibition. There is less demand for software preservation via EaaS for artifacts within the archive at the moment, since full-scale system emulation is not required for the presentation of web-based works presented in legacy browsers (Rossenova, 2017). Nevertheless, while for the time being legacy browsers used to present historic artworks can run in Docker, in the future, it might even be necessary to emulate Docker environments in order to serve the legacy browsers. Even though that may not be necessary for a long time, the development of flexible deployment of EaaS remains an important step forward in software preservation.

Software collection

In order to be able to emulate legacy browsers and software environments, Rhizome initiated its own software collection. Under an IMLS (Institute of Museum and Library Services) grant and through employing a full-time Software Curator—Lyndsey Moulds, Rhizome is collecting software needed for the preservation of artworks in the ArtBase and its curatorial programmes such as Net Art Anthology. The current repository contains predominantly browsers and browser plug-ins, and is available here: <http://software.rhizome.org/>

In addition, Rhizome are collaborating with the digital preservation team at Yale University Libraries who are developing standards and best practices for collecting and modeling metadata relating to software artifacts and software preservation.¹⁶ This collaboration is informing Rhizome's approach to including software artifacts and metadata in the ArtBase as part of the in-house software preservation efforts.¹⁷

Reinterpretation

As a method of software preservation, reinterpretation presents the most radical move away from the original work. As Ben Fino-Radin has noted in 2011: "When a piece of software no longer runs on contemporary infrastructures, one cannot simply convert it. Reinterpretation calls for delving into the uncompiled source of the software, and repairing whatever is the root cause of its obsolescence. In some cases this may be as simple as altering the format of the compiled software, while in others it may call for a fundamental re-write of the software's source code." (Fino-Radin, 2011). An example of reinterpretation with the goal of preservation is the recently completed restoration of the early net artwork *Brandon* (1998–99) by artist Shu Lea Cheang. Since its commission for the permanent collection of the Guggenheim in 1998, the artwork has become

16 See <https://guides.library.yale.edu/digitalpreservation/welcome> [28 May, 2019]

17 The author in conversation with Kat Thornton, digital conservator and semantic architect at Yale Libraries, 15 November 2017.

dysfunctional in various ways: “Certain pages and data were no longer accessible; text and image animations no longer displayed properly; and many internal and external links were broken.”¹⁸ To restore access, the Guggenheim conservation team decided to completely re-write the entire codebase of the artwork. The reinterpreted artwork was also presented as part of Rhizome’s Net Art Anthology in April 2017.

Another act of reinterpretation could be considered the restaging of an email performance—as opposed to simply presenting the text of emails within the records page of the artwork. Examples include the Mezangelle email performances and the VNS Matrix piece presented in the Net Art Anthology.

However, reinterpretation is only applicable to individual artworks, on a case by case basis, and can therefore be highly resource-intensive. Emulation, on the other hand, provides an environment wherein multiple works can be accessed and reperformed as needed. Given Rhizome’s limited preservation resources, reinterpretation is, in most cases, less feasible compared to emulation.

Network preservation

Hosted live web

For artworks in the ArtBase which do not reference external data sources or rely on third-party platforms, hosting instances of the artworks on Rhizome’s servers is a straightforward way to secure the preservation of these artworks in the ArtBase archive. If artworks rely on obsolete plug-ins or specific browser aesthetics, they can simply be presented inside the abstracted legacy browser environments of the oldweb.today framework. An example of such a work is Alexei Shulgin’s *Form Art* (1997), see p.54.

Web archiving

For works which link to external data sources, a version of the artwork in the form of a WARC archive, including the necessary external sources, is often a more appropriate form of network preservation than simply hosting a copy of the artwork files on Rhizome’s servers. An example of an artwork which was recently preserved as a web archive and presented in the Net Art Anthology is Marisa Olson’s *Marisa’s American Idol Audition Training Blog* (2004–5). The original artwork is still accessible as a “linked object” in the ArtBase, but contains multiple links to broken and/or no longer active pages. However, the web archived preservation copy of the work contains links directed to the archived versions of those external resources instead. Whenever possible, this web archived version of the work includes archived linked resources contemporary to the artwork’s production.

¹⁸ Excerpted from this blog post: <https://www.guggenheim.org/blogs/checklist/restoring-brandon-shu-lea-cheangs-early-web-artwork>, which details the work’s condition and the actions of the conservation team. [Accessed 3 September, 2017]

Webrecorder

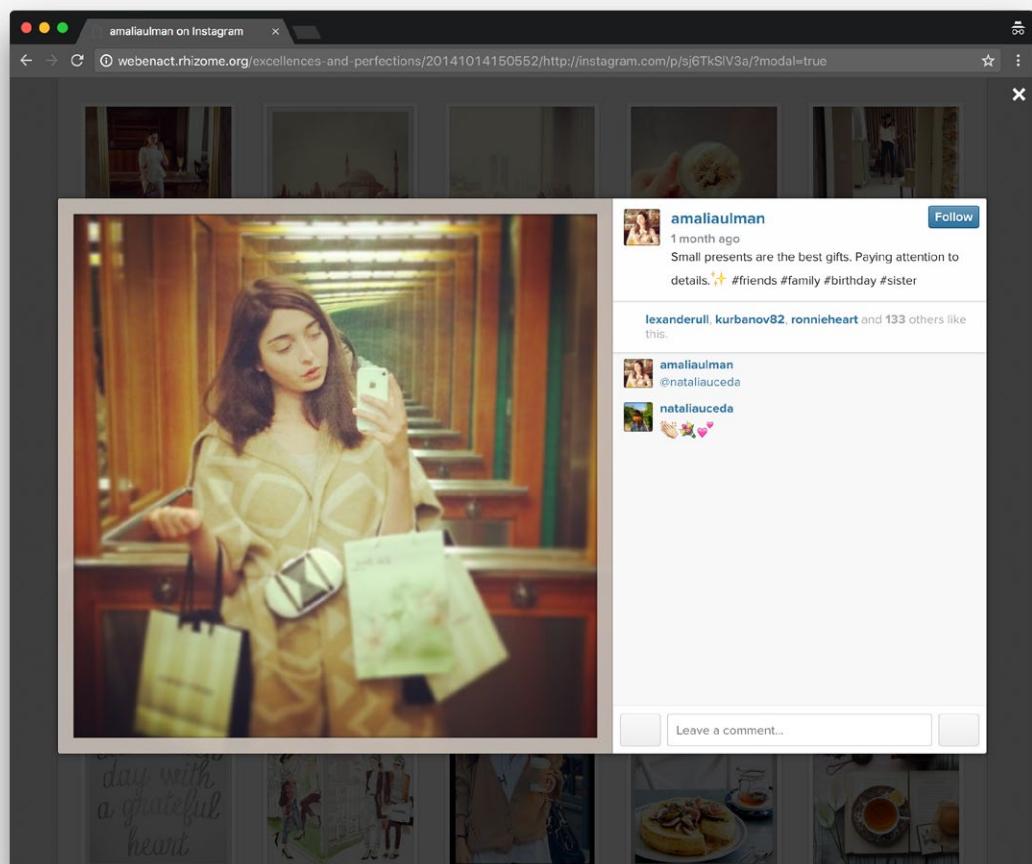
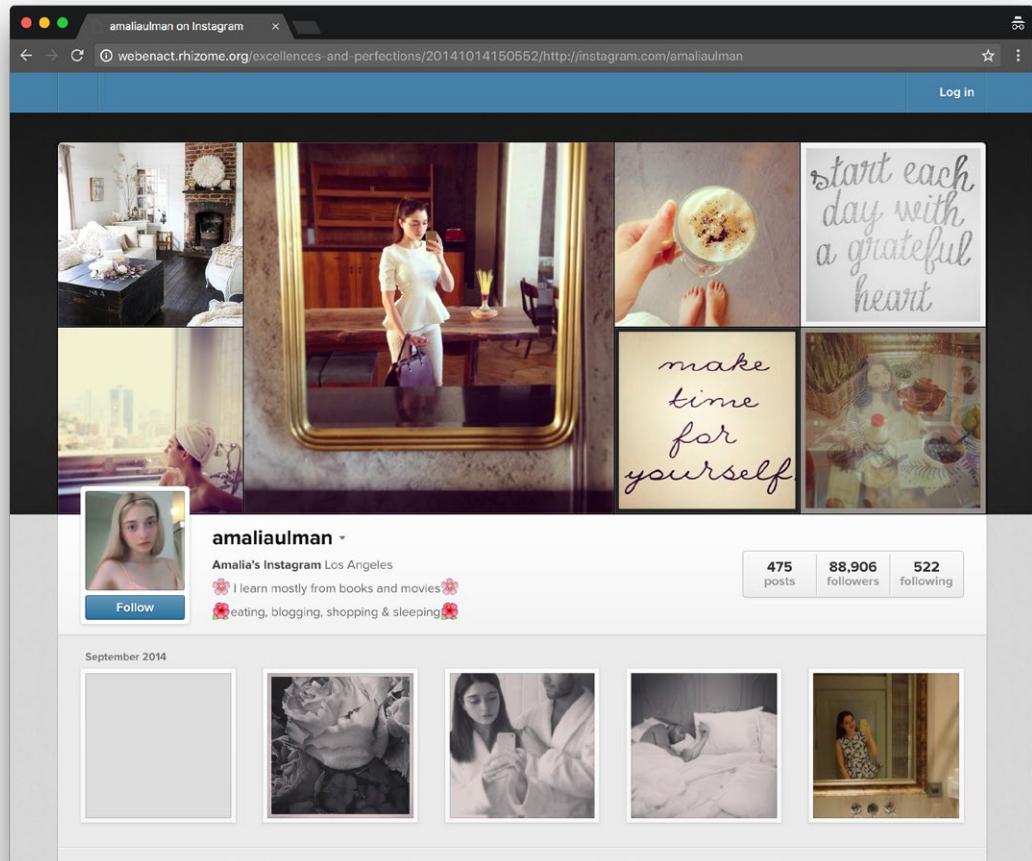
Contemporary artworks which exist across third-party platforms and those which were originally submitted only as “linked objects” to the ArtBase can now be accessioned and restored as complete archival WARC files if captured with Rhizome’s web archiving tool Webrecorder.¹⁹ Webrecorder is an open-source tool built by Ilya Kreymer in collaboration with Dragan Espenschied which is maintained by a team of developers and designers at Rhizome. It records server-client traffic in real time as the user browses a webpage. Additionally, it facilitates archive augmentation and extraction of material from existing web archives such as the Internet Archive and the UK Web Archive. The tool also has the capacity to run containerized browsers; a feature first introduced with oldweb.today, which enables users to launch browsers that are specially configured with support for Flash and Java. This makes it possible to both record and replay artworks from the archive which are no longer accessible via contemporary browsers.

“What most differentiates Webrecorder is its focus on ‘dynamic web content.’ The web once delivered documents, like HTML pages. Today, it delivers complex software customized for every user, like individualized social media feeds. Other existing digital preservation solutions were built for that earlier time and cannot adequately cope with what the web has become. Webrecorder, by contrast, focuses on all that dynamic content, such as embedded video and complex javascript, addressing our present and future.”¹⁹

Webrecorder can now be used to capture and acquire works that run on proprietary third-party platforms such as Instagram, Tumblr and Yelp. Previously, such artworks could only have been included in the archive as “linked objects”. Now they can be recorded as complete WARC archives and then replayed with Rhizome’s bespoke replay instance of Webrecorder – **Webenact** (<http://webenact.rhizome.org/> [Accessed 28 May, 2019]). While Webenact is not yet integrated with the ArtBase infrastructure, the archived artworks are accessible via links within the ArtBase. An added characteristic of Webenact, which is not available in the publicly released version of Webrecorder, is the ability to modify the WARC files which are being replayed. This has enabled such customisation as disabling certain outgoing links or augmenting the archival

19 See the About page here: https://webrecorder.io/_faq [Accessed 28 Aug, 2019]

Amalia Ulman,
*Excellences and
Perfections* (2014)
“artifactualized”
in a Webrecorder
capture, presented via
Webenact. The original
interface of Instagram
at the time is preserved.
(screenshot: 2017)



instance of the artwork with a custom set of emoji icons as may be necessary to guarantee the completeness of the archival artifact and its boundaries. An example is the bespoke WARC file recording of Amalia Ulman's *Excel/lenes and Perfections* Instagram performance, where the old Instagram interface and original emoji character set has been retained, and links going outside the project such as avatar links to the profile pages of users who have commented on the performance have been disabled. While ethical and ontological questions with regards to the boundaries of the archival artifact remain open, tools such as Webrecorder and Webenact allow preservation staff to "artifactualize" a diffuse artwork—i.e. create a container for it, which retains a high degree of fidelity (Espenschied & Cerf, 2017) (see p.64)

Dealing with Diffusivity

Unlike digitized born-analogue objects, net artworks are not discrete digital objects, but rather depend on specific software and network environments to be executed and rendered. They often change over time and require specific user input in order to be performed. This creates multiple challenges for cataloguing the works and providing long-term access in the archive.

"Diffusivity is a term that refers to works whose data is not contained within one simple object, works that reference external databases, or dynamic and real-time data sources. Diffusivity also refers to works that do not exist solely in one location, but as a series of actions over a variety of locations and platforms [...] A work that is diffuse presents a data structure that is diametrically opposed to singular authority and ownership."

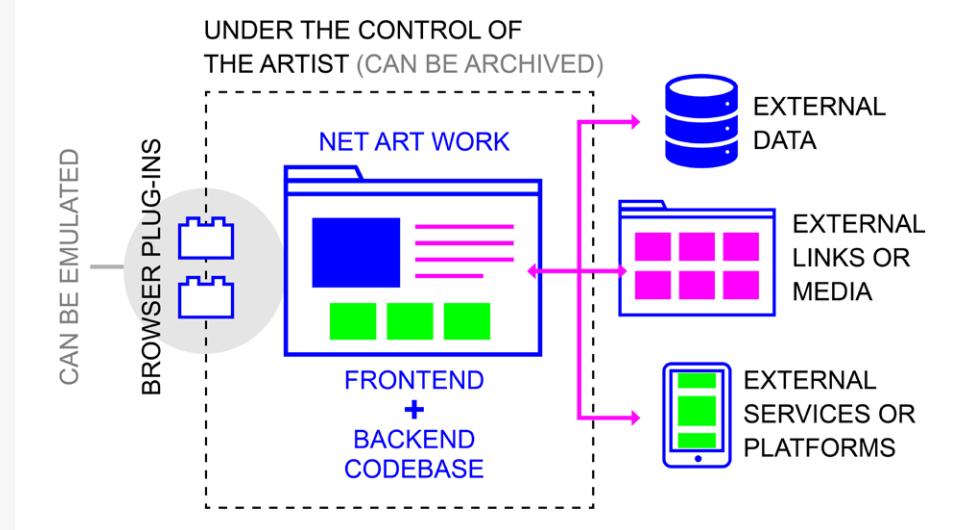
(Fino-Radin, 2011)

Difficulties of defining object boundaries

The qualities described above contribute to the artwork's 'diffusivity' and pose difficulties in defining an object boundary. This lack of a clear boundary around a specific object makes it challenging to archive net artworks and manage the archive by following traditional museological and conservation principles. These principles tend to be reliant on outdated notions of singular authority, ownership and ultimately authenticity,²⁰ which guide how institutional standards for collections, records, metadata and collection management systems are set up.

20 The ways in which such notions potentially hinder the operations of the online archive of net art are important, but elaborating on these is beyond the scope of this current report.

Illustration of the various elements that contribute to the "diffusivity" of net art.



“One of the most common examples of these works’ permeability is the frequency of conceptual and structural reliance on hyperlinks that incorporate Web content spanning domains as inseparable threads within the viewer’s total experience of a work of art. Outmoded software and related dependencies reflecting the rapid changes of the past twenty years of Web development contribute another significant source of instability, and are particularly well represented within the ArtBase.”

(McKeehan, 2016)

Recently, the preservation tasks at Rhizome have shifted from conceptually defining boundaries to observing processes. This involves conceptualising the various components of an artwork as parts of processes which facilitate the performance of the artwork, rather than thinking of these components as objects within or outside some arbitrary boundary. This new archival paradigm privileges performance over objecthood.

“With Webrecorder, any network request that is launched from a certain object is considered part of that object, no matter if conceptually it is not within the technical realm of the ‘core’ piece. For instance, if a web site embeds a Google maps widget, that gets loaded, and then the boundary is automatically extended to include Google Maps. In EaaS, the whole computer system (and potentially other systems on the network) is considered a requirement, without needing to specify that you need the Arial font—it is enough to say that an object needs to run on Windows 98 which comes with Arial. If a program fails, the environment will need to be changed or enriched with other software, which in turn extends the boundary.”

(Espenschied, 2017)

Third Party services

Net art works are often hosted on third-party platforms. Capturing such artworks within the original context of their location, when it is not owned or maintained by the artists themselves, poses multiple challenges. These platforms are complex, dynamic, link out to various other data sources, often change their interfaces and, ultimately, they are proprietary.

“The location of artworks in third-party services, such as Tumblr or Instagram blogs, currently represents one of the largest problems among new acquisitions, and should be added to the condition reports or other data collection method that Rhizome uses.”

(McKeehan, 2016)

While recording these works with Webrecorder is valuable in providing a snapshot of the work at a particular time, in some ways a Webrecorder capture is closer to a form of high fidelity documentation of the work, like video documentation, rather than providing a faithful representation of the artwork's user experience. Yet, the immense popularity of various social media platforms guarantees that such works will continue to be created and they will remain a challenge for online archives in terms of accession and maintenance.

Structured preservation metadata

The final focus of the preservation research at Rhizome over the past few years has been representing the data from the ArtBase into a structured (i.e. machine-readable), open format, and enriching it with additional data related to preservation tasks associated with specific artworks. Linked open data (LOD)—an open and standard form of structured data for the web—has been an ongoing goal for many institutions in the GLAM (Galleries, Libraries, Archives and Museums) community. While LODLAM (Linked Open Data in Libraries, Archives and Museums) events and challenges have generated various interesting projects in recent years, these have primarily dealt with records of homogeneous digitized collections. The representation of ArtBase data in Wikibase provides an opportunity to explore how linked data could benefit preservation and maintenance in a heterogeneous born-digital archive.

Wikibase uses an abstracted model of the general linked data concept of subject-predicate-object triplets when structuring data. Data that is represented as structured statements in Wikibase can be exported in RDF²¹ format and represented in a graph database (e.g. Blazegraph), queriable via SPARQL²² endpoints²³. Rhizome's interest in supporting standard RDF data and SPARQL queries is twofold. First, this can enable linking ArtBase data to other databases which contain structured data about people, places or things (such as Wikidata). Second, it enables the transformation of data from one schema or vocabulary to another whenever necessary. In other words, interoperability is possible without the need to strictly follow a specific metadata standard (Espenschied, 2017).

21 RDF stands for Resource Description Framework which provides a generic graph-based data model for describing linked data, including the relationships between pieces of data. Source: <http://linkeddata.org/faq> [Accessed 3 September, 2017]

22 SPARQL is an acronym for SPARQL Protocol and RDF Query Language. It is an RDF query language, i.e. a semantic query language for databases, and is able to retrieve and manipulate data stored in RDF format. Source: <https://en.wikipedia.org/wiki/SPARQL> [Accessed 3 September, 2017]

23 A SPARQL endpoint is a conformant SPARQL protocol service, which enables users to query a database via the SPARQL language. Source: http://semanticweb.org/wiki/SPARQL_endpoint.html [Accessed 3 September, 2017]

This is facilitated through federated linked data.²⁴ Federated linked data enables users to interact with a single uniform user interface in order to access and query data from multiple databases—even if the constituent databases are heterogeneous.

“Wikibase dramatically lowers the barrier of entry to Linked Open Data publication and editing. Archives and libraries usually talk a lot about metadata—how their collections should be described, which fields should be used... Many of these problems have been solved with Linked Data. You still need to discuss metadata, but you don’t have to agree on everything down to the tiniest detail. In one database, a person can be called a ‘creator’, in another database a ‘programmer’; with Linked Data you can bridge these differences.”

(Espenschied, in Fauconnier et al., 2018)

2.2 Wikibase setup

Data model

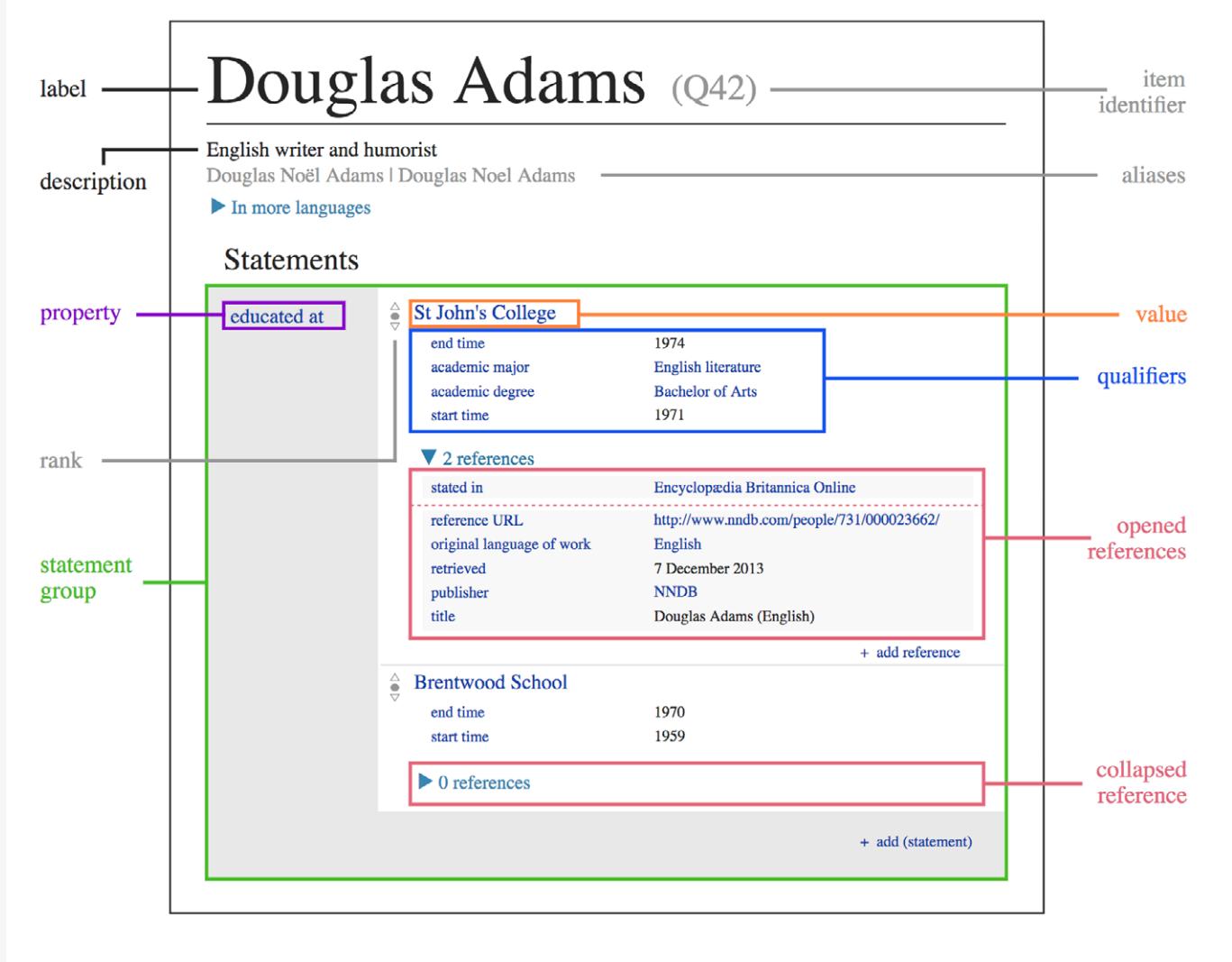
Structured data in Wikibase is represented through the Wikidata data model. The core syntax of the data model follows RDF principles, and is organized in subject-predicate-object triples.^{25, 26} These translate to item-property-value in terms of Wikidata/Wikibase syntax. The data descriptions are structured as statements consisting of claims and references. Statements are composed of properties associated with items and their respective values. Statements can have references, too. Without a reference, a statement is simply a claim. Claims can also have qualifiers—these are sub-properties which can add additional detail about a claim—e.g. what time period does this claim relate to.²⁷ Adding qualifiers to claims enriches the data set and can create more interesting and nuanced results in data queries (Thornton et al., 2017).

24 A federated database system transparently maps multiple autonomous database systems into a single federated database. Source: https://en.wikipedia.org/wiki/Federated_database_system [Accessed 3 September, 2017]

25 Resource Description Framework (RDF) is a standard set out by the W3C for modelling Linked Open Data. See: <https://www.w3.org/TR/REC-rdf-syntax/> and <https://www.w3.org/TR/rdf-schema/> [Accessed 23 July, 2018]

26 See: <https://www.w3.org/TR/rdf11-primer/#section-triple> [Accessed 23 July, 2018]

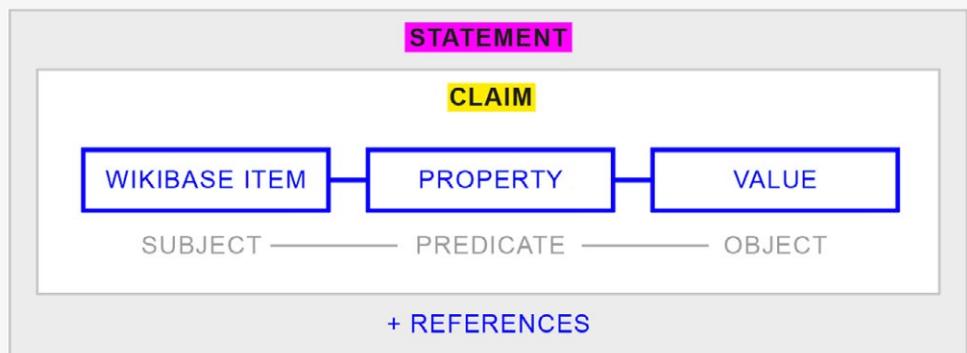
27 See also: <https://www.mediawiki.org/wiki/Wikibase/DataModel/Primer> [Accessed 23 July, 2018]



Graphic representation of the data model in Wikidata with a statement group and opened references.

Source: https://www.mediawiki.org/wiki/Wikibase/DataModel/Primer#/media/File:Datamodel_in_Wikidata.svg

Syntax diagramme of the Wikibase data model.



has variant	<ul style="list-style-type: none"> untitled[scrollbars] (archived) 0 references untitled[scrollbars] (web archive) 0 references
-------------	---

Example representation of an artwork with multiple instantiations from Rhizome's ArtBase Wikibase. Artwork is untitled[scrollbars] by artist Jan Robert Leegte. (screenshot: 2017)

artbase legacy tags	<ul style="list-style-type: none"> übermorgen, james baumgartner, sofia, SILVER SERVER, Florida, edit bulgaria, [V]ote-auction: bringing capitalism and democracy <div style="border: 1px solid red; padding: 5px; margin-top: 5px;"> source HANS BERNHARD </div> ▼ 0 references + add reference tactical, Readymade, Participatory, historical, Event, Documentary, edit Database, contextual, Conceptual, Collaborative, War, tactical media, resistance, netart, globalization, Perl, Javascript, HTML, Flash, email, DHTML, Virtual <div style="border: 1px solid red; padding: 5px; margin-top: 5px;"> source Rhizome </div> ▼ 0 references + add reference
---------------------	--

Example from Rhizome's ArtBase Wikibase showing how sources of data statements can be added through additional property-value pairs called qualifiers. (screenshot: 2017)

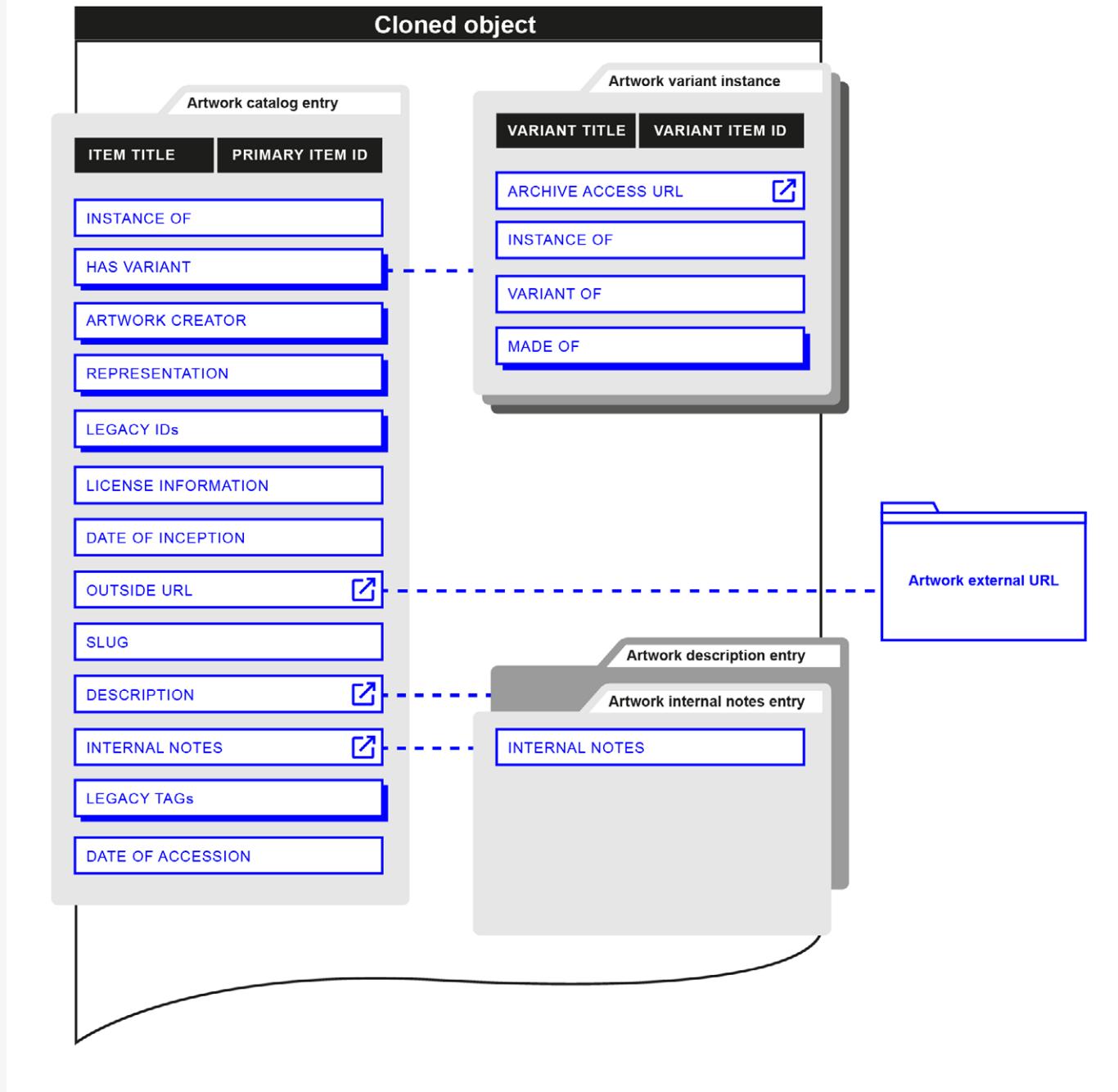


Diagramme schematic of the current metadata structure for a cloned object artwork in WikiBase.

Knowledge representation

The advantage of Wikibase above other collection management systems—for Rhizome’s use-case—is that there are no pre-set hierarchies or ontologies (Fauconnier et al., 2018). New items and properties can be created within the database. New properties should ideally be matched to existing properties in Wikidata, which makes it easier to query data across different databases, but there is no system requirement to do so.

Wikibase can function as an ontological sandbox and space for experimentation – there is no need to follow prescribed standards or conventions utilised by other organizations, even Wikidata. Rhizome can develop experimental models for information structuring and change/update these as needed over time (*ibid*).

Furthermore, Rhizome values the proposition of Wikibase that knowledge is represented as claims and statements, not facts and truth. In Rhizome’s heterogeneous archive where information may come from different sources, there are no canonical objects or canonical data (Espenschied, 2017). Instead, through the use of qualifiers and references to data sources, the archive can avoid contentious notions of neutrality and rather, record its own potentially biased sources. In addition, the data model in Wikibase allows each property to be associated with multiple values, and to reference these as needed.²⁸ This is particularly useful for artworks which have multiple instantiations, rather than one canonical version, and in the case of digital art and net art, this is often the case.²⁹ In the ArtBase, these instantiations are referred to as ‘variants’.

ArtBase implementation

The current structure of the ArtBase abstracts the storage of the cloned/archival copies of works on Rhizome’s cloud storage infrastructure from their representative records in Wikibase. The Wikibase records are a complete copy of all data that was previously stored in Collective Access (see p.23), but by splitting archival files from the record of the works, the structure allows for an added level of flexibility.

Cloned objects are associated with artwork record pages, assigned unique item ID in Wikibase. The pages for these records include statements with properties such as: *artwork’s title, creator, representation* (i.e. image files associated with the work), various *legacy IDs* from previous instantiations of the ArtBase, *license information, date of inception, slug, legacy tags* (if any), *date of acquisition*. Long-form narrative texts are added via statements with properties *description* and *internal notes*. Both list URLs, which link to separate text pages in Wikibase, as long, non-structured text cannot be added directly into a statement on the main data page of a record.

28 This capability within Wikidata has been referenced as ‘plurality’: ‘It would be naive to expect global agreement on the “true” data, since many facts are disputed or simply uncertain. Wikidata allows conflicting data to coexist and provides mechanisms to organize this plurality.’ (Vrandečić & Krötzsch, 2014)

29 See: Depocas et al. (2003); Laurenson (2006); and Dekker, (2014).

A record page for a cloned object artwork in the Wikibase system.
(screenshot: 2017)

The screenshot shows a detailed view of a Wikibase record page for the item "Web Stalker" (Q3958). The page header includes links for "Lozenz Resources", "Tiki", "Preferences", "Watchlist", "Contributions", and "Log out". A search bar at the top right contains the text "Search Rhizome Catalog".

The main content area is titled "Statements" and lists various properties and their values:

- Instance of:** artwork (with 0 references, edit, add reference, add)
- has variant:** Web Stalker (archived) (with 0 references, edit, add reference, add)
- creator:**
 - I/O/D (with 0 references, edit, add reference, add)
 - Colin Green (with 0 references, edit, add reference, add)
 - matthew fuller (with 0 references, edit, add reference, add)
 - Simon Pope (with 0 references, edit, add reference, add)
- representation:**
 - Ca-1051.gif (with 0 references, edit, add reference, add)
 - Ca-3092.jpg (with 0 references, edit, add reference, add)
 - Ca-3093.m4v (with 0 references, edit, add reference, add)
 - Ca-3094.jpg (with 0 references, edit, add reference, add)
- artbase legacy id:** 1694 (with 0 references, edit, add reference, add)
- collective access legacy id:** rza.artwork.2001.129 (with 0 references, edit, add reference, add)
- ca id:** 2524 (with 0 references, edit, add reference, add)
- license:** CC-BY-NC-SA (with 0 references, edit, add reference, add)
- inception:** 1997 (with 0 references, edit, add reference, add)
- outside URL:** http://www.backspace.org/foaf# (with 0 references, edit, add reference, add)
- slug:** web-stalker (with 0 references, edit, add reference, add)
- description at:** https://catalog.rhizome.org/w/Description/Q3958# (with 0 references, edit, add reference, add)
- artbase legacy tags:**
 - source: I/O/D, Colin Green, matthew fuller, Simon Pope (with 0 references, edit, add reference, add)
 - tactical, information map, Formatted, underground, interface, HTML, download, Visual source: Rhizome (with 0 references, edit, add reference, add)
- internal notes:** https://catalog.rhizome.org/w/internal/Q3958# (with 0 references, edit, add reference, add)
- date of accession:** 19 August 2001 (with 0 references, edit, add reference, add)

At the bottom of the page, it says "This page was last modified on 26 October 2015, at 12:11." and includes links for "Privacy policy", "About Rhizome Catalog", and "Disclaimer". A small logo for "Wikibase" is also present.

A record page for a variant of a cloned object artwork in the Wikibase system.
(screenshot: 2017)

Set \$wgLogo
to the URL path to your own logo image.

Main page Recent changes Random page Help Tools What links here Related changes Special pages Printable version Permanent link Page information Concept URI In other languages Add links

Item Discussion Read View history Search Rhizome Catalog Log in

Web Stalker (archived) (Q3959)

No description defined

In more languages Configure

Language	Label	Description	Also known as
English	Web Stalker (archived)	No description defined	

Statements

archive access URL: http://archive.rhizome.org/artbase/1694/index.html 0 references

Instance of: variant 0 references

variant of: Web Stalker 0 references

made of:

- Windows Portable Executable amount 3 0 references
- ZIP Format amount 2 0 references
- Plain Text File amount 6 0 references
- Audio Interchange File Format (1.2) amount 1 0 references
- Unknown file format amount 7 0 references
- JPEG File Interchange Format (1.02) amount 4 0 references
- Audio Interchange File Format (compressed) amount 220 0 references
- Graphics Interchange Format (89a) amount 2 0 references
- Windows New Executable amount 1 0 references
- Text Configuration file amount 1 0 references
- Cascading Style Sheet amount 1 0 references
- Hypertext Markup Language amount 37 0 references

Rhizome (0 entries)

This page was last modified on 10 July 2015, at 19:55.
Privacy policy About Rhizome Catalog Disclaimers

Powered by MediaWiki



An entry for a linked object artwork in the Wikibase system.
(screenshot: 2017)

Set \$wgLogo to the URL path to your own logo image.

[Read](#) [View history](#) [Search Rhizome Catalog](#)

Item Discussion
[Read](#) [View history](#) [Search Rhizome Catalog](#)

The Sour Thunder (Q4345)

No description defined

+ In more languages [Configure](#)

Language	Label	Description	Also known as
English	The Sour Thunder	No description defined	

Statements

- instance of [artwork](#) [edit](#)
+ 0 references [+ add reference](#) [+ add](#)
- creator [Mendi+Keith Obadike](#) [edit](#)
+ 0 references [+ add reference](#) [+ add](#)
- representation [Ca-285.jpg](#) [edit](#)
+ 0 references [+ add reference](#)
- [Ca-1410.gif](#) [edit](#)
+ 0 references [+ add reference](#) [+ add](#)
- arbase legacy id [3366](#) [edit](#)
+ 0 references [+ add reference](#) [+ add](#)
- collective access legacy id [rza.artwork.2002.190](#) [edit](#)
+ 0 references [+ add reference](#) [+ add](#)
- ca id [4188](#) [edit](#)
+ 0 references [+ add reference](#) [+ add](#)
- license [CC-BY-NC-SA](#) [edit](#)
+ 0 references [+ add reference](#) [+ add](#)
- inception [2002](#) [edit](#)
+ 0 references [+ add reference](#) [+ add](#)
- outside URL [http://www.blacknetart.com/sour](#) [edit](#)
+ 0 references [+ add reference](#) [+ add](#)
- slug [the-sour-thunder](#) [edit](#)
+ 0 references [+ add reference](#) [+ add](#)
- description at [https://catalog.rhizome.org/w/Description:Q4345](#) [edit](#)
+ 0 references [+ add reference](#) [+ add](#)
- arbase legacy tags [Narrative, Conceptual, social space, performance, live, language, identity, broadcast, audio, RealPlayer, MP3, HTML](#) [edit](#)
source [Rhizome](#)
+ 0 references [+ add reference](#) [+ add](#)
- internal notes [https://catalog.rhizome.org/w/Internal:Q4345](#) [edit](#)
+ 0 references [+ add reference](#) [+ add](#)
- date of accession [2 September 2002](#) [edit](#)
+ 0 references [+ add reference](#) [+ add](#)

This page was last modified on 26 October 2015, at 12:16.
[Privacy policy](#) [About Rhizome Catalog](#) [Disclaimers](#)



An artwork record in the database is distinguished as such, via a statement with property *instance of* used with the value ‘artwork’. An artwork can have multiple ‘variants’, which are assigned their own record pages with unique item IDs. They are distinguished by using property *instance of* with the value ‘variant’, followed by property *variant of* used with the corresponding artwork record page. The record page for a variant also contains a link to the *URL* of the archival copy of the work, and a *made of* statement which is associated with the file formats that are part of the work. Each of these formats is associated with its own unique item in the database and is linked with the corresponding mime type (if available) and PUID from the PRONOM registry maintained by The National Archives.

In short, this data model implementation allows a single artwork to exist as multiple variants in the database. These variants might consist of a cloned copy supplied by the artist; a web archived copy, captured with Webrecorder; an emulated instance prepared for an exhibition, etc. Descriptive and administrative metadata are stored with the record page of the artwork, while technical metadata is stored separately with each variant record of the work.

For linked objects, there is a single record page in Wikibase, which lacks the “has variant” property. In addition to the properties listed above for the artwork record page, a linked object record also includes the value(s) for the property *outside URL*, where the external link(s) for that artwork is listed. The *outside URL* property is also applicable to cloned objects, but can only be used if such a URL was provided by the artist upon the submission of the work. In these cases, there is a possibility to access the artwork either via the archived ‘clone’ URL from the ArtBase or via this external URL provided by the artist.

2.3 Database audit 2015–16

The most recent database audit of the ArtBase was conducted by NDSR resident Morgan McKeehan in collaboration with Dragan Espenschied. The audit documentation lists the total number of artwork records in Wikibase at 2897. Of these, McKeehan audited all the ‘cloned objects’—objects which have an archival copy stored on Rhizome storage infrastructure. The audit comprised of 837 artworks, which means that the majority of artworks in the ArtBase are ‘linked objects’—objects which are only recorded in the ArtBase, but not stored there. These artwork records are associated with a link out of the ArtBase to an artists’ own copy of the work.

Cloned object dependencies

The main focus of McKeehan’s audit of the ArtBase, and specifically the cloned objects, was to estimate the level of damage the works have sustained over the years since the establishment of the archive. Many of the works dating to the ’90s include components which are now obsolete. McKeehan conducted qualitative analysis of the artworks and developed a metadata schema to describe artwork

	A	B	C	D	E	F	G	H	I	J	K	L	M	
1		BrowserPlugins:P86								IRC: Internal Resources Completeness P=87				
2			complete	indeterminate	broken	n/a				complete	indeterminate	broken	n/a	
3			Q4932	Q4934	Q4933	Q4935				Q4897	Q4899	Q4898	Q4900	
4	essential	Q4936				0	IR-importance			essential	Q4920			
5	moderate	Q4937		-1		0	moderate			moderate	Q4921			
6	not important	Q4938					not important			not important	Q4922			
7	n/a	Q4939					n/a			n/a	Q4923			
8	no plugins	Q4895												
9														
10	risk from External Links - P88									External Media Completeness P=94				
11	low	moderate	high	n/a						complete	indeterminate	broken	n/a	
12		Q4907	Q4906	Q4905			EM-importance			Q4912	Q4914	Q4913	Q4915	
13							essential	Q4924			Embedded Media: Damaged	Embedded Media: Broken		
14							moderate	Q4925			Embedded Media: Damaged	Embedded Media: Damaged		
15							not important	Q4926				Embedded Media: Damaged		
16							n/a	Q4927				Embedded Media: Damaged		
17														
18										ESC:External Services Completeness P=95				
19										complete	indeterminate	broken	n/a	
20							ES-importance			Q4916	Q4918	Q4917	Q4919	
21	essential		Q4928				essential							
22	moderate		Q4929		1.0	-1.0	moderate							
23	not important		Q4930		0.5	0.0	not important							
24	n/a		Q4931		0.5	0.0	n/a							
25														

Damage assessment categories and properties
with associated spotlight values, developed by
Morgan McKeahan, 2016.

‘dependencies’. The term ‘dependency’ covers a range of component categories which contribute to the diffusivity of net art works and, over time, can become obsolete and/or dysfunctional. These include both software-performance-related dependencies, as well as resource dependencies, e.g. media, hyperlinks, data, etc. Based on her analysis, McKeehan provided qualitative assessments as to the relative importance of these dependencies to the overall experience of the work. The categories she used to make her damage assessments included 5 key elements for each artwork:

- **Internal resources**: extent to which these are missing and/or damaged;
- **Browser plug-ins**: which (if any) obsolete plug-ins the artworks depend on;
- **External embedded media**: extent to which these are missing and/or damaged;
- **External services**: extent to which external data service such as Twitter feeds, for instance, embedded in the work are missing and/or damaged;
- **External links risk**: level of dependency of the work on external links which are or can become broken;

For each of these categories, McKeehan qualitatively assessed whether the element was *broken*, *working (or complete)*, *undetermined* or *n/a*. She also assessed relative importance ranging from: *essential*, *moderate*, *not important* or *n/a*. Risk for external links was measured as *low*, *medium* or *high*. The results from the audit were meant to provide data which can feed into some visual user feedback on the frontend interface indicating the level of accessibility of the artwork. Additionally, the audit data could be used to establish which works need additional attention or restoration work. The data on damage levels and relative importance was logged with terms from controlled vocabularies, enabling automation for data analysis. Of the 837 artworks which McKeehan audited, 153 were identified to have client-side issues such as browser plug-in dependencies. The plug-ins which were searched for in the audit include Flash, Java, Shockwave/Director, and Quicktime.

“The goal of the metadata element set developed in this project is to articulate types and degrees of damage to artworks affecting their rendering as websites within a browser.”

(McKeehan, 2016)

In her assessment report, McKeehan raised concerns over the qualitative assessment methodology used in her audit. However, after I conducted an independent audit of a sample of 50 cloned artworks, I found that McKeehan’s

assessments were correct in terms of providing enough information to inform the user experience for someone coming to the ArtBase and going to access one of these works. With the exception of 3 artworks where I would have qualified levels of damage importance slightly differently, most of the other works behaved as expected based on the damage assessment provided in McKeehan's audit. Further user testing will be needed to confirm whether the damage assessments are able to manage user access expectations more widely.

One element which was not covered in the audit, but which nonetheless impacts the user experience of an artwork is the reliance on pop-ups. Many of the historic artworks in the ArtBase use pop-ups as an integral element of the interaction design of the artwork and with many contemporary browsers blocking pop-ups by default, users may not be able to experience the artwork as intended. A strategy here could be to also include a warning label not only for damaged artworks or artworks reliant on browser plug-ins, but also for artworks which utilise pop-ups as an interaction elements. That way users may anticipate that they need to unblock pop-ups in order to view the particular artwork. Alternatively such works can also be represented in legacy browsers, similar to works which require Flash or Java plug-ins and therefore would be experienced better in an emulated (or containerized) browsing environment with such plug-ins made available.

Metadata standards mapping

After conducting the audit of the ArtBase, McKeehan mapped all the gathered dependencies data to PREMIS semantic units and components: "I created a data dictionary for the audit elements, mapped the elements into PREMIS, and created PREMIS XML templates for my suggestions for modeling the audit and the browser plug-ins as a PREMIS Object, Event, and Environment entities." (McKeehan, 2016). The PREMIS expressions were further mapped to corresponding elements in CDWA, Dublin Core, LIDO, MODS, VRA-Core, EAD. While PREMIS seemed like the most flexible system able to describe a wide range of elements associated with the artwork records, it also requires a lot of time and staff resources to express all metadata in PREMIS semantics. The crosswalks which McKeehan created to other common metadata standards, on the other hand, highlight the limitation of these systems—various PREMIS elements were all mapped to the same expression in these standards such as <Condition/examination history> or <Physical description>. If all the elements which are expressed as separate components in PREMIS are translated into the same <description> unit in other metadata systems, then these components will largely lose their specificity and usefulness. The very names of elements in other systems such as <Physical description> point to the origin of these metadata standards in collections of analogue objects, and highlight their inadequacy when applied to born-digital materials. Between the complexity of a system such as PREMIS and the oversimplification of other metadata standards in the visual arts and cultural heritage fields, it seems that online collections of born-digital artifacts are still underserved when it comes to archival description standards.

Documentation

McKeehan developed some further documentation as part of her audit which is likely to be useful for future auditing and collection management of the ArtBase. She created Google Forms to collect responses into CSV spreadsheets with relation to the audit of both cloned and linked objects in the ArtBase. She also created a separate Google Form for intake of new artworks, but this template is yet to be tested in practice.

In terms of documenting the results of the audit, she created a detailed data dictionary mentioned above. She also created an XML template containing an example PREMIS record for an archived artwork in the Artbase. The record contains the following PREMIS object entities: object of type *Representation*, which refers to the artwork, object of type *intellectualEntity*, which refers to the associated environment of browser plug-ins information, and *Event*, which refers to the 2015–16 audit data. Finally, she created an XML template for describing the various browser plug-in dependencies from the audit into PREMIS object entities.

McKeehan also proposed ways of translating the gathered audit data into properties in Wikibase: “The last phase of metadata work in the Residency focused on implementing the audit elements within Rhizome’s Wikibase. [...] I translated all metadata elements from the audit process into Wikibase properties and items, and created these within Rhizome’s catalog.” (McKeehan, 2016).

What is perhaps lacking from McKeehan’s documentation is more detailed guidelines and workflows to demonstrate how to integrate the XML data descriptions with artwork records in the ArtBase. Nevertheless, the data dictionaries and XML templates she developed do supply contextual information which can be used when establishing taxonomies for metadata structuring during the ArtBase redesign. Furthermore, following McKeehan’s data dictionaries, properties in Wikibase could be mapped to several standard schemas. Linked data federation supported via these mappings would then enable standards-compliant querying in the ArtBase, if required in the long term.

Design implications

Finally, McKeehan’s residency project considered how data from the audit could be communicated via the user interface. However, there has not yet been any attempt to express artwork dependencies or access state (functional or damaged) in the ArtBase interface. McKeehan proposed exploring two possible approaches: “The first approach would be [...] using a visual ‘stoplight’ system of green, yellow, or red labels, to indicate that an artwork is OK, has some problems, or probably won’t run at all in a contemporary browser without additional plug-ins. The second approach would use separate text-based labels for each of the categories of problems identified [...]” (McKeehan, 2016). Neither approach was directly implemented, but both approaches provide a good starting point for user testing with prototype designs.



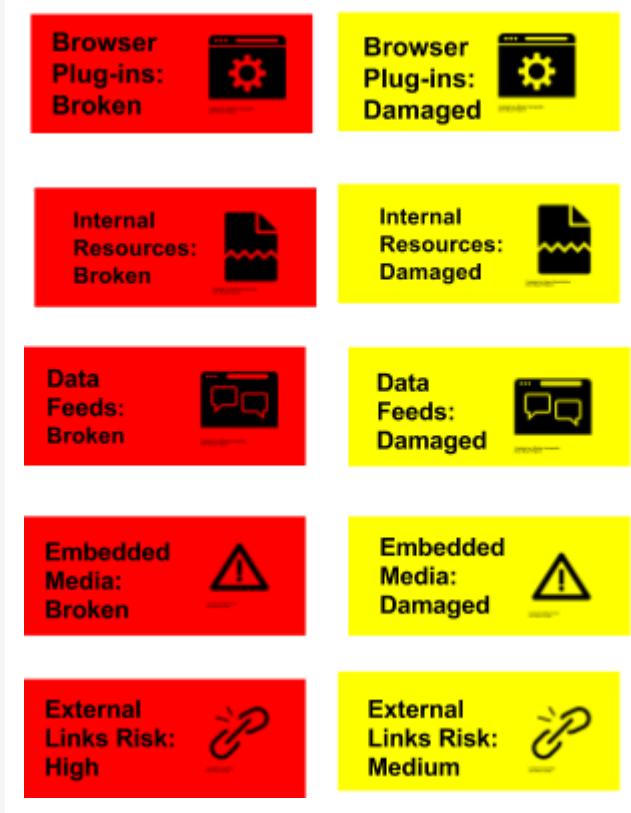
Artbase element - from Audit parameters	Browser plug-ins
Rationale	Artworks relying on browser plug-ins are the most likely to have a high degree of damage as a result of rendering difficulties due to unsupported plug-ins; in many cases these works are completely inaccessible. This category identifies which plug-ins are needed for each artwork.
Definition	Browser plug-ins required for full rendering/functioning of this artwork
Source Field in audit sheet	if applicable, plugins listed in "Look Out For" Audit sheet column for this artwork
PREMIS semantic unit (container)	environmentDesignation
PREMIS semantic components	environmentName
Data constraint/format	controlled vocabulary = items in wikibase
PREMIS Semantic Component for expected values	environmentName
Controlled Vocabulary for Expected Values (items in wikibase)	none, java, Flash, Shockwave, Quicktime
User-facing Label in Rhizome Website	Browser plug-ins : (Broken / Damaged)
Repeatable? (y/n)	y/ note: repeat at container/semantic unit level in PREMIS
Obligation	optional
CDWA	Condition/Examination History
LIDO	<lido:objectDescriptionWrap> or <lido:eventWrap>
DC property	Description
MODS	<mods:physicalDescription> or <mods:note>
VRA-CORE	<vra:descriptionSet><vra:description>
EAD	<physdesc> <processinfo> (in <archdesc>)

View of the data mappings for one of the elements, browser plug-ins, from Morgan McKeehan's audit, 2016.

Artbase element - from Audit parameters	Internal resources- completeness
Rationale	Earlier archiving of artworks, or restoration of archived works, may have failed to capture all resources (such as images, documents, and internally-linked pages) included within the identified domain of an artwork. This property measures the overall degree of completeness of these resources, by visual observation of browser-rendered webpages, to look for indicators of missing resources such as broken image links, 404 pages, and non-functioning links to other html pages within this website.
Definition	A qualitative expression of the degree of completeness of the internal resources within an artwork/website.
Source Field in audit sheet	missing resources: quality
PREMIS semantic unit (container)	significantProperties
PREMIS semantic components	significantPropertiesType
Data constraint/format	controlled vocabulary = items in wikibase
PREMIS Semantic Component for expected values	significantPropertiesValue
Controlled Vocabulary for Expected Values (items in wikibase)	complete, cannot be determined, broken, n/a
User-facing Label in Rhizome Website	Internal Resources : (Broken / Damaged)
Repeatable? (y/n)	n
Obligation	optional
CDWA	Condition/Examination History
LIDO	<lido:objectDescriptionWrap> or <lido:eventWrap>
DC property	Description
MODS	<mods:physicalDescription> or <mods:note>
VRA-CORE	<vra:descriptionSet><vra:description>
EAD	<physdesc> <processinfo> (in <archdesc>)

View of the data mappings for one of the elements, internal resources completeness, from Morgan McKeahan's audit, 2016.

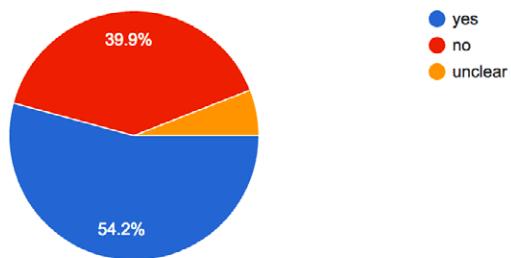
Prototype ideas for expressing artwork dependencies on the user interface of the ArtBase developed by Morgan McKeehan, 2016.



Charts with the results of the 2016 audit of linked objects in the ArtBase, which was completed through a Google Form and the following statistics were generated.

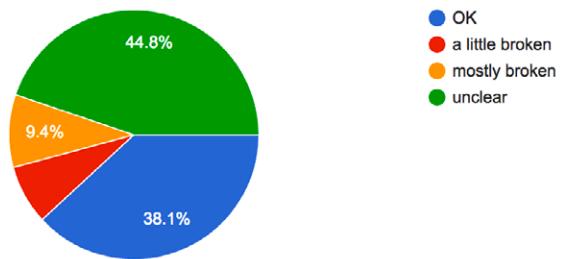
Is the artwork still present at the original URL ("access-outside URL")?

404 responses



Is the artwork OK or broken?

404 responses



Linked objects

In addition to McKeehan's audit cloned artworks, an audit of over 400 of the linked artworks in the ArtBase was carried out by Rhizome intern Dillon Petito in 2016. Of these artworks, ~55% were found to be still at the same external link location, whereas ~40% were not at that link location anymore, ~5% were deemed to be unclear. Of those artworks which were found in the same location, less than 40% were fully functional, whilst ~10% were found to be broken, ~5% to have some damage, and the remainder were deemed unclear. In summary, a large proportion of the linked artworks in the artbase are not fully accessible anymore. Still, the fact that the ArtBase provides a the URL of the original external link means that users can potentially access at least some of these works in external archives, such as the Internet Archive. McKeehan's proposals to use labelling on the frontend interface in order to state the level of damage cloned works have sustained, could also be suitable for linked works. The label could specify whether the work is still functional or whether the user should try accessing it in an external web archive. Eventually, this service could be automated—linked artworks which are known to be damaged could be automatically looked up in external archives. If a version of the artwork is available within another archive, such as the Internet Archive, this could be served to the user in an external link via a containerized browser (similar to the oldweb.today interface structure).

2.4 Archive interface(s)

At the time of writing this report (2019), the ArtBase is accessible via a link from the main Rhizome website and its interface design reflects the rhizome.org redesign from 2015. In this interface, the user is provided with very little information for each artwork; less than that made available in the previous iteration of the interface.³⁰ Elements such as tags, related artworks and any indication whether the artwork is a 'cloned' or 'linked' object is removed. A single year is provided, which indicates the year of the artwork's creation. The date of acquisition, previously also visible to the user, has been removed.

The interface is not integrated with the data in Rhizome's Wikibase. There are several data elements currently available in the Wikibase records which are not made visible to users, but could be with the new redesign. Examples include differentiation between inception date and acquisition date, an indication whether the artwork is "cloned" or just "linked", and differentiation between multiple artwork variants, if they exist.

In addition to the main ArtBase database interface, Rhizome's preservation work on projects such as the Net Art Anthology has utilized a number of other applications which require user interaction via a graphical interface. All of these application GUIs and their connections (or lack thereof) to the ArtBase database need to be considered in the redesign process.

³⁰ See: <http://classic.rhizome.org/artbase/> [Accessed 30 May, 2019]

A view of the user interface presenting an artwork in the ArtBase: very little information about the artwork is exposed to the user.
(screenshot: 2017)

The screenshot shows a dark-themed website for RHIZOME. At the top right, the word "RHIZOME" is written in large white letters, with ".ART—" below it. On the left, there's a vertical navigation menu with links like HOME, ANTHOLOGY, BLOG, EVENTS, PRESERVATION, ARTBASE, OLDERNTODAY, WEBRECORDER.IO, COMMUNITY, and ABOUT US. Below the menu, the word "EDITOR" is visible. The main content area features a large image of a person's face with their tongue sticking out. Overlaid on the image is text: "Finally, I can come that close to you", "Do you also want to come that close to me?", "Yes / No", "Put your cheek on the monitor", and "How does it feel?". To the right of the image, the text "My tongue In Tokyo" is visible. Below the image, there's a form with fields for "name" and "email", a "Send me your answer" button, and a note: "If you want to do the same exercise and access the following pages". A "CLICK TO VIEW ARTWORK" button is at the bottom right of the image area.

Flesh&Blood

YEAR CREATED:
1998

WORK CREDITS:
MOUCHETTE

[VIEW ARTWORK](#)

Finally you can really come close to me. You can lick my tongue, touch my cheek and whisper a story in my ear. You can check whether I exist or not. You can also meet my parents. ----- Original Message ----- Subject: ***Flesh&Blood*** Date: Sun, 13 Sep 1998 19:05:10 +0100 From: Mouchette Reply-To: mouche@xs4all.nl To: "Mouchette's fan club" Hello, I've just made some rather special portraits of myself and of my family which I would like you to see. <http://www.xs4all.nl/~mouche/flesh/tong.html> I always said I would never show any other picture of myself than the small one on my homepage, because I was too shy, or because my parents wouldn't allow me. But now, with these series of self-portraits, I'm showing myself so close to you that you might even get embarrassed... But whatever your reactions are, I shall be pleased to hear them so I left you on each page all the space you would need to write back. -- "bisou" mouchette <http://www.xs4all.nl/~mouche> *Art history is replete with examples of artistic alter egos, from Marcel Duchamp's Rose Selavy to Luther Blissett, a British soccer star whose name was assumed in the mid-1990s by numerous Net artists and activists when posting to email lists and online discussion forums. In 1996, a Web site that purports to be the work of an adolescent girl appeared at <http://mouchette.org>. Visitors to the site are greeted with a lurid close-up of a flower, its petals crawling with ants and flies, accompanied by a portrait of a sad-looking girl and the following text: 'My name is Mouchette/ I live in Amsterdam/ I am nearly 13 years old/ I am an artist.' Some of the site's content has a deceptively innocent quality. For example, clicking on the word 'artist' on the home page leads to a page with the following text: 'An artist? Yes. Here is a tip: I heard that the only way to become an artist is to say you are one. And then you can call "art" everything you make... Easy, he?' Other sections are more grotesque (images of raw meat) or sexually suggestive (a tongue licking the screen). Many pages feature interactive Web forms, including multiple-choice questions that trigger delayed reaction emails – days or weeks later, visitors receive unexpected, often flirtatious emails from Mouchette. There is also a listing of members of Mouchette's international fan club, which includes art institutions around the world." (Tibor/Reena) ----- Original Message ----- Subject: ***Flesh&Blood*** Date: Sun, 13 Sep 1998 19:05:10 +0100 From: Mouchette Reply-To: mouche@xs4all.nl To: "Mouchette's fan club" Hello, I've just made some rather special portraits of myself and of my family which I would like you to see. I always said I would never show any other picture of myself than the small one on my homepage, because I was too shy, or because my parents wouldn't allow me. But now, with these series of self-portraits, I'm showing myself so close to you that you might even get embarrassed... But whatever your reactions are, I shall be pleased to hear them so I left you on each page all the space you would need to write back. -- "bisou" mouchette <http://www.xs4all.nl/~mouche>

Webenact

Artworks which have been recorded with Webrecorder in order to be represented in the ArtBase are currently accessible via the Webenact interface. Webenact is essentially a (re)player for web archives. At the moment Webenact is separate from the ArtBase records system. This is important: the fact that storage is abstracted from the records database in Wikibase enables Webenact to be used as an efficient access system. In the Wikibase setup, there is an archive access URL for each artwork variant item which can be pointed anywhere—for example, to a page with a containerized browser with appropriate preconfigured settings, to an external link, or to a page with Webenact archive replay.

“The artbase cannot be a platform that embodies all the preservation techniques that we have, but it can point to a URL that is under our control. Because sometimes you might think—do you actually want to embed something in a page? In many case you don’t want to do that. And since we have linked objects, they might be linked outside the archive, but these links can also be presented in a remote browser. There are lots of options and we want to keep this really flexible.”

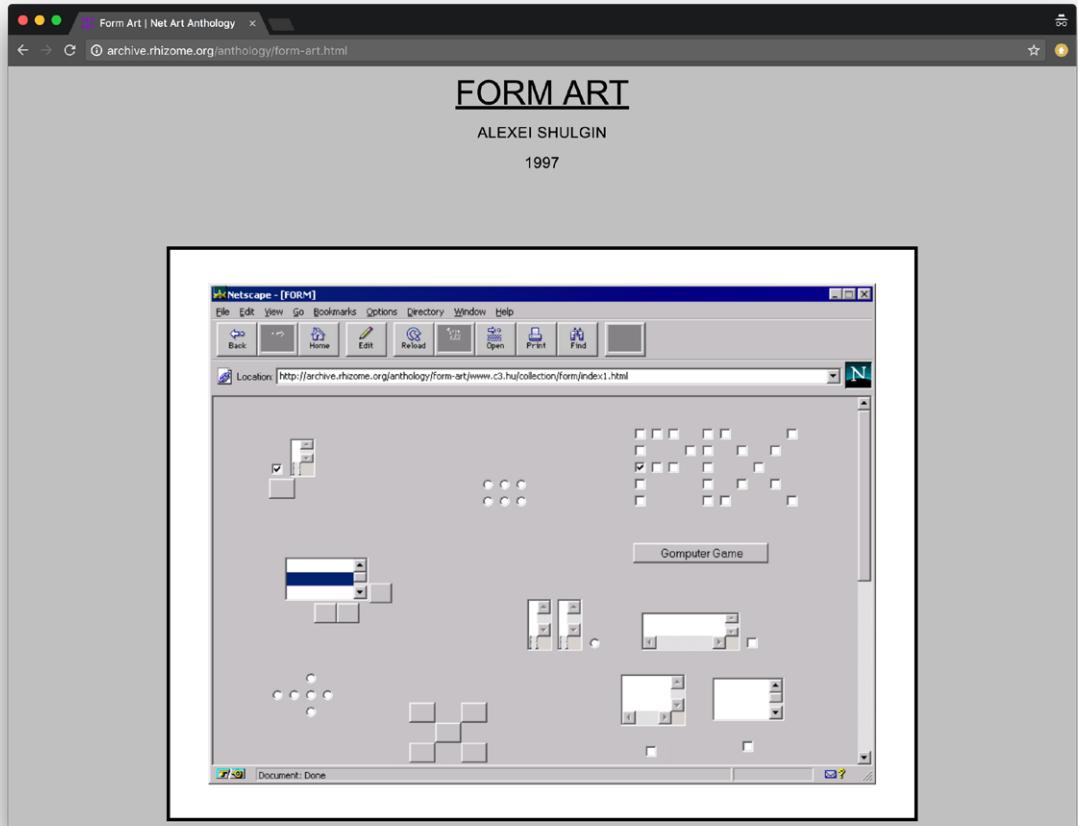
(Espenschied in Rossenova, 2017)

Preconfigured (remote) browsers

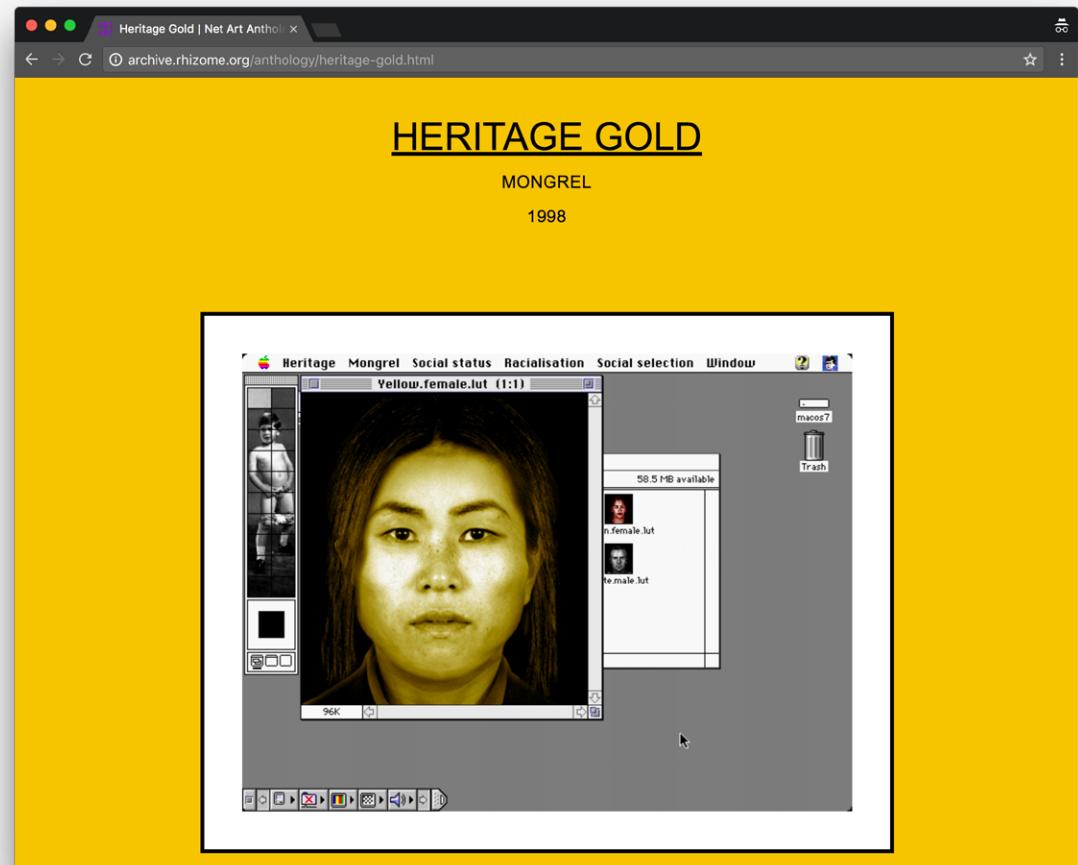
Following this logic, containerized browsers (also referred to as remote browsers within Rhizome)³¹ with specific preconfigurations could be deployed as access mechanisms for various historic artworks. This has not been implemented in the ArtBase yet, but it has been tested and proven to be a successful strategy when applied to numerous examples in the Net Art Anthology. Due to the distributed cloud computing and queueing setup implemented with the oldweb.today framework, multiple artworks can be presented in remote browsers in a sustainable and efficient way without using up excessive server resources.

31 The glossary prepared for the Webrecorder project provides the following definition: Preconfigured (remote) browser—a version of a web browser that is self contained and fixed with the default settings assigned to it (preconfigured). Source: <https://guide.webrecorder.io/> [Accessed 18 August, 2019].

Example of the browser-within-a-browser interaction paradigm using remote browsers in the Net Art Anthology exhibition (screenshot: 2017).



Example of the computer-within-a-computer interaction paradigm using EaaS in the Net Art Anthology exhibition (screenshot: 2017).



Some challenges in terms of the interface design remain—how are users made aware that the remote browser is a fully interactive system and not a static secondary representation (such as a screenshot, for instance)? Maintaining visual links between the artwork record page and a remote browser instance requires the introduction of interface design elements which allow navigation between the two. Additionally, institutional affiliation may be necessary in cases when emulated browsers are deployed in a separate page and there is no other clear reference to Rhizome or the ArtBase. Furthermore, there is the challenge users to navigate the *browser-within-a-browser* paradigm and grasp the visual language of an artwork's contemporaneous environment, which is likely to contain interaction design element that are outdated and not in common use.

Emulation-as-a-Service

Currently, there are few artworks in the ArtBase which require full scale emulation in order to be restored to full (or partial) functionality. For the rare cases that do need emulation the bwFLA EaaS system would be the appropriate preservation strategy.

“Deploying this system across artworks in the collection would be relatively easy. What is foreseeable is that anything that requires 3D graphics will need this more in-depth emulation. Where we see a lot of potential is that this can be integrated with oldweb.today at some point in time.”

(Espenschied in Rossenova, 2017)

Similarly to the remote browsers interface, with emulation, users will need to navigate a *computer-within-a-computer* paradigm which might involve outdated or even unknown interaction design components. Being able to guide users through such systems will be a further interface design challenge. And again, institutional affiliation for Rhizome, and possibly EaaS, in the form of logos or “back-to” reference links may be necessary to be integrated in the emulation system’s user experience.

3 Institutional needs and goals

3.1 Towards a design brief for the ArtBase

This section is dedicated to outlining a set of key issues with regards to the redesign process of the archive which were developed in response to an analysis of existing archival data, the history of the archive and its place within the larger institutional history (discussed within previous sections of this report), as well as a series of meetings with Rhizome staff members. The bulk of the insights with regards to technical questions of infrastructure and interface design came out of frequent meetings and discussions with the preservation team at Rhizome. Some additional insights—and particularly the remarks regarding the future of the archive ([section 3.4](#))—emerged through individual interviews and group discussions with other members of the curatorial and operations teams, as well as some previous staff members at the institution. Less a traditional design brief (which can oftentimes be an attempt to set solutions before establishing what are the key questions and issues to be addressed), the following sections look for productive directions for the subsequent design enquiry based on gauging internal institutional needs, existing policies, and any gaps or unsettled areas within those policies.

“The initial promise of the ArtBase was ongoing access. In the early 2000s it became obvious how much of an arduous commitment that was. That initial commitment wasn’t signed off with a full understanding of what that would take in the long term and it’s taken us nearly 20 years to catch up to that commitment.”

(Kaplan, 2018)

This research project established that the commitment to developing sophisticated research approaches and tools for the preservation and archiving of complex born-digital artworks remains the primary and most clearly articulated goal within Rhizome.

There are, however, several strategic areas with regards to the current and future organizational policy towards the archive that remain open questions among staff members. Acknowledging these questions, rather than obscuring or avoiding them, can have a constructive impact on the overall organizational strategy towards delivery of a redesigned archive. Learning from some of the missed opportunities during the redesign process in 2014–15, when questions were left unacknowledged ([section 1.4](#)), undertaking user research with staff—i.e. internal users—aimed to probe the questions that staff members are asking themselves, and point towards shared areas of concern which can form new strategic goals moving forward.

These include the question of framing the ArtBase as an *archive* or a *collection*. Most interviewed staff members agreed that since artworks were never acquired in the traditional sense of a museum collection, *archive* is probably the more accurate definition. Still questions remained, particularly in relation to how the right messaging is communicated to other users.

“The big question remains is the Artbase an archive or a collection. I have heard the question from other people and find it hard to explain, because even if I say it's an archive, some people still associate archives with ownership in ways that are not helpful for digital art. I usually try to explain it as something between an archive and a database. There is additional confusion between community archive and institutional archive. People may perceive it as a community archive, but when they ask how to get into it—there are institutional policies in place.”

(Dean, 2018)

A further extension to that issue is the unresolved question of whether other parts of the institutional archives at Rhizome fit within the ArtBase framework or not.

“I think we're getting to the question of whether we consider Rhizome's curated projects and its institutional archive of artists and collaborators to be part of the ArtBase? Or whether we begin to move away from that. And that's a decision I believe we need to make as we move into the 20th anniversary of the ArtBase, because I don't think that that's settled.

“These institutional archives haven’t been acquired into the Artbase yet, primarily because the process is so different from what the ArtBase used to be, that there really needs to be some way that that difference is made clear to visitors.”

(Connor, 2018)

Both aspects of this issue—what the ArtBase is and what its framework could encompass—point to the need to better articulate the form and context of the archive to end-users through mission statements on the archive’s webpage, additional metadata, or communication via other Rhizome media channels.

And finally, the question of whether the ArtBase should become “a specialist research database put together by Rhizome, or is something that has a more collaborative aspect with collaborative features” (Michael Connor, interview, 05.04.2018) remained open throughout the scoping and planning of the redesign process. Different staff members worried about the implications of moving in either direction—historicizing the archive or opening it to crowdsourcing again.

“Is the ArtBase something we still accession things into? You can imagine populating it, but I would want to see a big strategy around that and what that means for the future. How does that relate to Webrecorder for decentralized archives or are we going to be accessioning those, too?”

(Kaplan, 2018)

Opening a space to debate this question with staff members during the redesign process was productive, as it highlighted the need for the new archival system to be flexible enough to accommodate a move in either direction. Even if one specific direction had been chosen during the redesign briefing, the history of the archive shows that organizational policies can change and any archival system should ideally not be tied too strictly to a single policy. To avoid the pitfalls the archive already suffered when it moved from a crowd-sourced to a closed platform—and left plenty of confusion and disaffected users in the process—requires an approach to the design of the archival system which can accommodate change and has the flexibility to allow (a form of) openness, as well as (some level of) institutional curation and historicization. The following sections outline some of the elements that could contribute towards such system design.

3.2 Infrastructure and database architecture

Storage

As Rhizome has already moved its storage infrastructure to cloud storage services with Amazon and Google, the next step in providing access to artworks in the ArtBase would be to utilize distributed cloud computing to launch remote browsers or full environment emulation when necessary for the presentation of certain historic artworks. This can be done in an efficient and sustainable way either through the queueing system already in place with the oldweb.today framework, or through EaaS.

Pluralistic metadata

The complex history of the ArtBase, including the open submission phase, and the development of the net art field as a whole—where artists operated with a DIY spirit and artworks often changed in parts or in full, while institutions did not canonize the information—are just some of the reasons Rhizome needs to come to terms with the fact that the archive metadata will likely never be consistently good (Espenschied, 2017). On the other hand, the organization can embrace the stance that there is also historical value in the messy form of the archival metadata—testimony to a field in flux.

“[...] data changes and is pluralistic, just like every encounter with a web page is different for everybody”

(Espenschied, 2017)

A goal for the new archival framework would be to make this fact more transparent to the users of the archive. On the backend—this could be facilitated by the addition of qualifiers such as “source” to metadata fields in Wikibase. On the frontend—the different sources (or hierarchies) of metadata would need to be negotiated and presented to the end users in a clear way.

Just-in-time vs just-in-case interoperability

Rhizome’s digital preservation director, Dragan Espenschied has proposed a just-in-time vs just-in-case approach to metadata standards (Espenschied, 2017), i.e. working with standards as and when needed on a case by case basis, as opposed to adopting a specific standard for the purpose of future interoperability with other institutions or standards’ bodies. There are currently no other organizations interested in taking custodianship over Rhizome’s collection. Hence, the application of a metadata standard to the ArtBase for the sake of interoperability is more theoretical than practical (*ibid.*). Additionally, existing standards are neither developed for, nor well suited to the case of net art (see section 1.3). What is more, standards in the fields of information science are

not fixed entities: new standards are developed all the time, while established standards can also change and evolve.

Given these circumstance, an approach that is able to respond (just-in-time) to the need for interoperability, if and when it occurs, seems better suited to the aims and goals of Rhizome. A just-in-time approach would develop an appropriate crosswalk if the archive ever needs to interface with another collection. Additionally, when all the archive data is represented as linked data in Wikibase, federated queries via a SPARQL endpoint would enable querying across databases conforming to different standards (Rossenova et al., 2019) (see also p.78). So, in this sense, a just-in-time approach powered by linked data is more efficient and future-proof than aiming to conform to a particular standard, which may be revised before it is ever used for querying or database interoperability.³²

Minimal preservation information

The issue of what constitutes a minimum amount of technical metadata necessary for the preservation of artworks has already been raised in previous preservation reports on the ArtBase, and in section 1.5 of this report. The difficulty of defining what a useful minimum is cannot be resolved simply by implementing any particular type of metadata schema. A more productive way of thinking about this has been proposed by Dragan Espenschied, taking a cue from the EaaS system and focusing on performativity rather than object description. To configure an EaaS environment for a specific artwork presentation, preservation staff should know what deviation of this environment from the default EaaS environment is needed. The “minimal preservation information”, therefore, is that which needs to be changed in a stock installation of Windows 98, for instance, to make a particular artwork run: “The default—Win98 in this case—is defined as an object, that like in natural science can be examined rather than it having to be described. While Win98 is in its sum a description of its behavior (software code), this approach assumes it can be captured and preserved in a stable, definable form. That means preservation takes on a different perspective: instead of seeing software from the view of a producer of software (such as a software publisher or developer), it takes the perspective of a software user.” (Espenschied, 2019).

Integrate audit metadata

Metadata from the most recent audit of artwork dependencies and damage levels (McKeehan, 2016) needs to be entered into the Wikibase records. Any changes, additions or updates to the terminology and controlled vocabularies used in the audit should also occur at that stage.

32 For example, when version 3.0 of the digital preservation metadata standard PREMIS was published in 2015, it did not retain backward compatibility with the previous versions (2.0–2.2). Consequently, records expressed in PREMIS 2.0–2.2 had to be restructured (in some cases significantly) in order to comply with PREMIS 3.0. See: <https://www.loc.gov/standards/premis/changes-3-0.html> [Accessed 18 August, 2019]

Accessible archive backend

Wikibase provides a relatively flexible and customizable structure which should be utilized to ensure the backend of the ArtBase is accessible to various staff members who may need to view or edit the archival records. This includes curatorial staff, as well as preservation staff. Appropriate guidelines and workflow documentation need to be created. Several staff members pointed out that while they would consider being involved in the backend editing to some degree, more effort in improving literacy around the database is needed.

“It’s about literacy—how do I access the backend and add something there. My job is curatorial, but sometimes I have to talk about preservation, but I don’t really know how to preserve artworks. So it’s about improving literacy internally, too.”

(Dean, 2018)

“It just needs to be clear what the pathway is to add an artwork. It doesn’t have to be something I do myself, it doesn’t happen all the time, it’s a fairly low intensity archiving process at the moment. We just need to have a process in place.”

(Connor, 2018)

3.3 User interface

Frontend interface design

The data in Wikibase needs to be modelled to suit the preservation goals of Rhizome, including the addition of the audit metadata, but this process should not be carried out without considering how users will interact with the database. Should all users (including staff) simply use the Wikibase default interface as a way into the archive—with some light CSS styling of fonts, logos and page templates? Or should there be a separate, custom-branded portal, which is designed specifically for external users, whereas staff access the default Wikibase interface and use it to perform backend tasks such (cataloging, auditing, etc.)?

Discussions with staff and external users (documented in Report #2) highlighted some distinct benefits and drawbacks to both approaches. On one hand, the Wiki interface is recognisable to many users already—particularly its collaborative editing features and version control. It also already looks like a database, thus serving to indicate that the archive is something separate from the main Rhizome

website—an issue which has not been clearly addressed in the past. On the other hand, some users pointed out that in contrast to Wikipedia, Wikibase is heavily data-driven, and lacks visuals. Both are crucial in generating interest and uptake by an audience beyond the academic research field.

“I think the most confusing element is the language: ‘instance of’, ‘variant of’... what does this all mean to users?”

(Connor, 2018)

Having multiple entry points into the archive could better serve the variety of use-case scenarios possible with the ArtBase.

“Possibly the ideal situation would be to have multiple interfaces—one designed to be similar to other museum archive interfaces, with images and thumbnails and more narrative information. But the wiki interface can also be there, providing query access for more advanced users.”

(Moulds, 2018)

Artwork pages

Several key questions concerning the design of the interface for individual artwork pages have been identified by this study. How access possibilities are communicated to users? And how are artworks represented visually? As static documentation and/or fully interactive environments? And finally, how are artworks contextualised with additional metadata?

Functional access identifier

The issue of how users are able to access the works via the ArtBase interface became ever-more pressing as the number of artworks grew, while obsolescence and link-rot hindered functional access to an ever-expanding number of older works. What visual and textual cues should be provided to distinguish cloned artworks from linked ones, or to indicate artworks which may have broken or missing elements? Such problems remained unexplored in previous iterations of the interface design.

The new user interface needs to develop a visual and editorial design proposal for identifying the functionality level of an artwork based on the audit for dependencies and damage assessment (McKeehan, 2016). Whether this is the iconographic “stoplight” system, or a different text-based label solution, multiple options need to be prototyped and tested with users.

Access entry points

The tools and methods developed through Rhizome's preservation programme over the past several years can be applied to artworks in the archive in various ways, depending on their specific preservation and access needs.

"The ArtBase cannot be a single centralised platform that embodies all the preservation techniques that Rhizome uses, but it can point to a URL that is under our control."

(Espenschied in Rossenova, 2017)

Archive access URLs associated with artwork variants in Wikibase could be used to point to cloned copies on Rhizome's servers, but also to pages launching remote browsers or to pages with Webenact instances. Preconfigured (remote) browsers could be used to present some of the historic works in contemporaneous environments. The legacy 'linked objects', which already represent external links out of the ArtBase, could also be a link to an outside source running in a remote browser.

Artwork representations

There are multiple challenges for the interface design with regards to the presentation of artworks in emulated environments and remote browsers. How do users navigate and interact with an artwork when faced with the browser-within-a-browser interface paradigm—which is the result of presenting artworks in preconfigured (remote) browsers? How are users made aware that the emulated browser is a fully interactive environment, though it might also have specific limitations? Communicating to contemporary audiences how to understand and navigate the contextual environment of a historic artwork (e.g. a Netscape Navigator browser) remains a complex interface design problem requiring further research. Interaction patterns which help users to distinguish between their cursor's movement in their local host environment or the artwork's emulated environment, or help to communicate if keyboard shortcuts and/or right-click context menus are operable in each respective environment, etc., are yet to be fully explored, prototyped and tested.

Additionally, deploying full emulated environments within an iframe usually places users in a queue, or produces a delay before the system loads. Such breaks and interruptions in the continuity of a user's browsing activity need to be communicated via clear, consistent messaging across the entire ArtBase. In addition, an affiliation with Rhizome and other third parties who maintain the emulation framework, EaaS, may need to be acknowledged visually within the browser window where the emulation is running. Similarly, in the case of works which are presented via Webenact or the Webrecorder replay engine, a visual identifier of the fact that the user is accessing a web archive may be necessary

in order to clearly state that the presentation is an archival capture of the artwork, rather than files or links originally submitted by the artist.

Another issue that needs further research is whether accessibility on mobile devices is important for archive users (and to what degree). There is anecdotal evidence that most digital archives are still primarily accessed on desktop devices, but how long will this be the case? How mobile devices might be able to render remote browsers or run browser-based software emulation effectively requires more research in the future.

Finally, static documentation of artworks also provides important visual information, particularly when emulation or other forms of interactive representation are not feasible. The most obvious form of static documentation is a screenshot. Most artworks in the archive already have screenshot images associated with them. But these are often inconsistent in terms of format, size or proportions. **Improving the quality and consistency of screenshots in the archive will be a challenge not only in terms of scale, but also curatorial subjectivity. What is the most representative screenshot of a complex interactive artwork?**

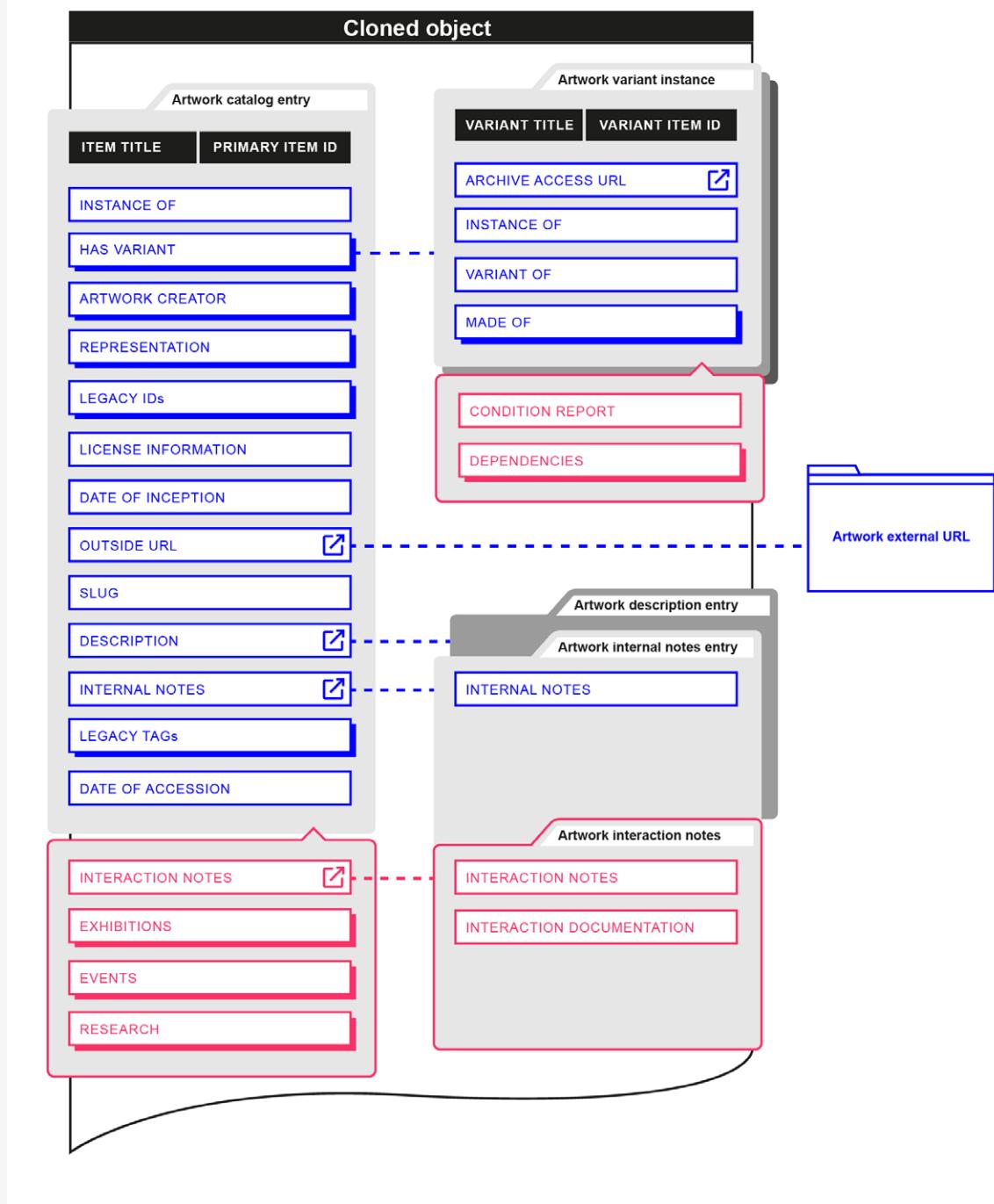
“The challenge is that interfaces are so reliant on images, on visuals, and these artworks are all websites—what are you going to do with them? You could automate creating screenshots, but does it mean you’re going to get a good one? If I can point to an actual archive that has done that, I would point to the Internet Archive and their software collection.”

(Fino-Radin, 2018)

Static documentation can also be presented in the form of videos. This approach is common within time-based media conservation, but it is resource-intensive. The idea of crowdsourcing this form of documentation for the Artbase has been proposed previously, but so far there has been no implementation. It remains an open possibility for the future, perhaps suitable if the archive were to move towards an open submission policy again.

“An idea I had towards the end of my time at Rhizome, was getting artists to do video click-throughs with their voice-over. In a way it’s a similar idea to Webrecorder, in a very low-tech way, but high-touch, very personal and subjective. I was always into the idea of crowdsourcing, so let anyone make one of these and submit it.”

(Tribe, 2018)



Possible additions to the current metadata structure for artwork records in WikiBase (outlined in red)—aiming to expand presentation and contextualisation possibilities. Outgoing link icons indicate where a user is taken to a new page in the archive which contains longer natural language description, as opposed to a short structured data value. Double box outlines indicate multiple values (e.g. made of).

Additional contextualization

As well as providing an entry point to a functional representation of the artwork, additional context is often needed to help a user make sense of what they are seeing and how it relates to other data in the archive and the net art field at large.

So far, contextual information has been absent in previous iterations of the interface, or there has been partial contextualization, but not necessarily comprehensive or systematic.

“It’s not clear what’s the status of the works—what’s in the ArtBase, what’s not. It’s not clear what you’re looking at when you get to the artwork page. You don’t know that the artwork description was authored by an artist. None of it is contextualised in a way that tells a story of what the viewer is looking at, and so unless people have done a lot of the work themselves, the archive doesn’t offer much value.”

(Connor, 2018)

In discussions with users and staff, narrative descriptions have been identified as useful devices for providing contextual information for artworks. However, the current archival records in the ArtBase contain widely different styles of narrative descriptions. Many of these have been supplied by the artists themselves, or the provenance of the description is unclear. At the same time, researchers and curatorial staff have carried out extensive research into some of the artworks on the occasion of special events or exhibitions. When such detailed research is available, it should be possible to present this in the ArtBase records. A recent example is the comprehensive research carried out for works exhibited in the Net Art Anthology. The interface design of the ArtBase needs to be able to accommodate different levels of narrative descriptions and provide description provenance when available. It should be possible to clearly differentiate between new descriptions sourced from peer-reviewed publications or essays, and the older, often unverified descriptions stored in the archival database.

Contextualization should be provided throughout the archival interface—in the form of narrative descriptions on individual artwork pages, and also in the form of links between database entities—e.g. links between artworks and relevant exhibitions, essays or other relevant historical research. This would support better integration between the archive and the curatorial programmes. Several staff members suggested that linking relevant texts from Rhizome’s blog archive to artwork records in the ArtBase would provide valuable contextual information, especially to users and staff members who were not part of the founding Rhizome community.



“What I think is useful to have is continuity between the publishing archive and the ArtBase—providing links between artworks and texts or essays about those works. Finding things on rhizome.org written even less than 10 years ago can be difficult. It would be useful for everyone who is trying to retrace these histories to have everything collected in one place. Some staff members might already know all these links, but many other people wouldn’t.

“Links to exhibition histories would be also useful. The artwork archive could gesture towards an exhibitions archive and vice versa.”

(Dean, 2018)

Search and discoverability

Creating links between artworks and other database entities, enables users to discover artworks, texts and ideas without relying solely on keyword-search. Good search results based on keywords alone are hard to achieve for most services (other than Google), and therefore the archive interface should not rely exclusively on a search box interaction. A common strategy in archival interfaces is to use faceted sorting—based on a few predetermined categories—to enhance discovery. But relying on predetermined categories can often be inflexible and restrictive for heterogeneous collections. Practitioners who have developed alternative interaction patterns for search and discovery in online archives and collections include George Oates, Mitchell Whitelaw, and Florian Kräutli (see Report #3), though their work has not yet fully explored the possibilities of working with linked open data.

A further approach to enhance the search facilities in the ArtBase is to take advantage of the Wikibase infrastructure and develop a custom GUI for running queries over the SPARQL endpoint. Such a GUI should not require highly specialised data science knowledge. However, as per discussions with Rhizome staff, this remains outside the immediate scope of this research project.

“I would be interested in looking at [a SPARQL query GUI] as a separate funded project. I think most users would just want to put a word into a box and go... I think the problem would be training people to understand all these terms, properties and values.”

(Connor, 2018)

Lastly, there is additional interest in exploring more serendipitous methods for discovery. Sorting by colour (for example) is an already wide-spread interaction pattern for collection discovery, which can be seen in the Cooper Hewitt online archive, the Rijks Museum digital archive, etc. However, the reliance of this and other similar algorithmic methods on high quality (and consistency) of images is problematic for the ArtBase, due to the already mentioned challenges of creating good static representations of interactive works.

3.4 Future vision for the ArtBase

Following discussions around the needs for infrastructural and interface changes to the current systems in place, staff were asked to share their thoughts on the future of the ArtBase and what policy changes might be needed. The following bullet points indicate key areas of concern and ongoing debate, illustrated with direct quotes.

- ▶ **Transparent communications—there is a need for greater transparency in terms of how the institution communicates policy and operations decisions with regards to the ArtBase to the broader community;**

“The most important thing is for the ArtBase to be more “honest” about what it is and what data it contains. At the moment it is unclear how things got there and why they are in the state they are in. It doesn’t really own its history.”

(Moulds, 2018)

- ▶ **Historicizing the archive—there is a need for a cohesive institutional narrative around the ArtBase, after 20 years of history;**

“We have to decide upon our role as an institution—are we telling the story, or is everyone else telling the story? And after a certain point, we have to decide that we are telling the story and that it is informed by a community and the history of Rhizome—for streamlining and for accuracy. Oftentimes—with the Net Art Anthology—there are so many conflicting stories, which would be exhaustive for someone to check. And we have so many trolls.

“The ArtBase can be a real hub of knowledge. If we add there everything we’ve done in terms of research and the publishing history, then it can become the most useful net art archive on the Internet. We are almost there, but everything is not so well linked yet. I also think it’s more useful as a historic knowledge hub [rather than an open submission platform], because the idea of a net art community is so different and people are not doing net art in the same way. There are still net art communities, but they are very different. And Rhizome has a such a long history of being at the centre of this community that it needs to tie up that history in a cohesive story. And then [we still need to] do the new community work, but I don’t think they’re the same project.” (Dean, 2018)

- Institutional archives—there should be a place for the wider institutional archives at Rhizome, and the ArtBase may also be a fitting solution for that;

"The Net Art Anthology exhibition should be archived. Once it ends, it already becomes a form of archive, and the information should be integrated into the ArtBase. It would be great if the ArtBase could become the main hub. There are many more research documents prepared alongside the Anthology, which are not in the exhibition. These are currently stored in different places, but could be entered in the ArtBase.

"I never got a clear sense if all artworks we commission or exhibit should be in the ArtBase, but my feeling is that anything that passes through Rhizome should be in there." (Dean, 2018)

- An extension of the artistic program—the ArtBase should play a stronger role in relation to the broader curatorial pursuits at Rhizome;

"I think it needs to be better integrated into our artistic programme again, because when the ArtBase was originally created it was fully integrated. Our accessioning policies should reflect everything that we are doing more generally to support the art we're interested in. The ArtBase started the conversation about archives of born-digital works that look different to existing archives. We wanted to challenge archives and institutions, and question how artists relate to archives and archival practices. Now we have a full expression of that through these platforms that we've developed, e.g. Webrecorder—a platform that is about decentralising web archives overall, empowering individuals to maintain copies of their own work, etc. But of course we're still trying to figure out new ways to do things and we're invested in Wikidata and we want to be able to open out specific works of our collection to new research and have things linked." (Kaplan, 2018)

- Comprehensiveness—the ArtBase doesn't need to continue to aim for comprehensiveness in an ever-expanding field, but rather focus on micro projects and collaborations;

"I think that the next phase should be that the ArtBase as a comprehensive archive of the field should be over and we should have more micro archives—working in tandem and supporting other organizations.

"I think that Rhizome should continue archiving and that this should be just a reflection of our curatorial position over time. The idea of the past was collecting at scale, and I think we should move away from that, and develop more specific focuses, so pursue more projects like the Net Art Anthology. But that becomes an institutional perspective and we can support other organizations doing something similar. I don't think the goal should be comprehensiveness. I think it should be collaboration and having a position. I think we should have a collection that's

our archive, but then I also think we should provide infrastructure so that people who aren't really into institutions can do their own archiving. So that's not the ArtBase, that's infrastructure that we provide to people to create their archives.”
(Connor, 2018)

- ▶ Access to restored artworks—access to artworks could be better; automating launching artworks in emulated environments (i.e. remote browsers) is desirable, but restoring functional access to all artworks is not a priority, as there are other values to the archive, too;

“In a perfect world it would be good to have everything in there in an accessible state, but a) it's not realistic; b) it also creates more of a collection impression than an archive, so it becomes harder to say it's not a collection; and also it's still useful just as an information archive, it's almost like Rhizome's library.”
(Dean, 2018)

“I would love to see Rhizome also take a hard stance on emulation-as-a-service, even beyond what they're doing already with oldweb.today. It would be really great if they applied some heuristics to say 10 years from now, automatically load this piece in a browser from 5 years ago. It's technically possible. They have the creation dates of the works. I think it will be harder with the more recent ones, so maybe there is a cut off point—works from 1994–2000 get emulated. That would be incredible. Because if they integrate the emulation with everything just by default, I think the utility of the Artbase as a platform then becomes undeniable.”
(Fino-Radin, 2018)

“There's access to the information about the work and then there's access to the work. I don't know about access to the work, because that's another level of difficulty. If there's a work that's simply vanished or unplayable, I don't think we should restore everything, we should selectively restore. Access to the metadata is really valuable. Knowing that a book existed and having a picture of its cover is really valuable, even if you don't have the book. Knowing that an artwork was made in a certain year that used Flash... that's really important. I think restore as much as you can, but make the data accessible.” (Tribe, 2018)

- ▶ Open or closed platform—there is some interest in opening up submissions to the ArtBase once again, but there are also concerns about the challenges in terms of moderation, managing resources, as well as ensuring diversity and inclusivity to traditionally underrepresented communities;

“For me, it makes sense to go back and try to fill the gaps by accessioning major historic works that are not there. But for contemporary work—it should be works that we commission or show in an exhibition, rather than just what's happening in the field.” (Dean, 2018)

"Rhizome's ArtBase was set up at a moment when there was this idea that everyone can be an artist and it felt quite democratic. My fear is that if the ArtBase moves into a new phase where it's reactivated in a collective way, it becomes something more like a portfolio site. It sort of was like that in the past, but I think becoming a platform where people can curate themselves is further mental tax on artists at a time when everyone's forced to promote themselves online constantly. ... So that is my big question—how do we not be a portfolio site that's basically forcing artists to self-promote, or tapping into that need that artists feel to self-promote, and actually serve something that's more intentional and collaborative and collective." (Connor, 2018)

"Looking at all these great tools that Rhizome has built now, if they could leverage those tools and integrate them with the ArtBase, offering that to the community—that's huge. Artists will want to participate. But that's still a lot of institutional overhead, because you can't open it up to everything, because then people will submit spam, people will submit something that's not art. Then you need to have moderation, potentially you need to have curation, and if so—what's the criteria and who and why and how?" (Fino-Radin, 2018)

"I think it should be open for submissions. I think there should be a mix. Let anybody submit work by completing a form and uploading some files and then there should be an initial screening and if people upload irrelevant porn, then it should be deleted. But anything that meets the minimum criterion of being relevant, of being digital art, should be included and then some work out of that might be selected for rigorous archiving, where metadata is vetted and work is done to actually accession the work. It's fine to also reach out to people and invite them and help them put their work in. If there's a work that you think we should have and the artist is too busy to submit, it's fine to do it by invitation.

"And for the older artworks, too, you could reach out to the artists and invite them to contribute more data. But you have to build interfaces for that. It's a lot of communication back and forth. I think I'm still into openness and inclusiveness, but all of this is contingent on resources.

"Talking about the future, to what extent does Rhizome take responsibility for the constituents of its community and the artists that it serves. We're really working on diversifying the board of directors, and staff, and making sure programming is diverse and inclusive and equitable, but the world of art and technology in Rhizome's history will tend to perpetuate Rhizome's existence as a mostly white, male scene. Looking back at the ArtBase, there's probably a lot of cultural perspectives that are underrepresented. Then going forward, who do we proactively reach out to? And how do we generate interest and participation among communities of people who are historically underrepresented?"

(Tribe, 2018)

“I’m open to rebranding the archival space within Rhizome, but I’m also just open to changing the accession terms. We’ve changed the accession terms many times in the ArtBase history. I don’t know if ArtBase is a great name anymore. I like it in some ways, but it’s not necessarily requisite in other ways.”
(Kaplan, 2018)

Appendix: Submission form ca. 2013

RHIZOME Journal Artbase Community Programs

despens 

LET'S SAY I SUBMIT, THEN WHAT?
You are invited to contribute documentation of your artwork to Rhizome by creating a free account and adding artworks to your user profile. The artwork would be accessible to the public via your profile page.'

BASE ARTWORK INFORMATION | ARTWORK MEDIA | ARTWORK DETAILS | ARTWORK LICENSE AND AGREEMENT POLICY

TITLE
TwiLight

URL
<http://1x-upon.com/~despens/twilight/>

SUMMARY
Twilight was a screensaver for ATARI TOS, developed from 1991 to 1997. Several modules were released throughout the years, including BatC-Phants, North Sea 2000, Penguin Party, Ballonx, Butterflies, The Insane Cook, and Five Mutants. All graphics and animations were created between 1991 and 1993 using Degas Elite and Cyberpaint II on an ATARI ST, with no more than 16 colors. The software works on any ATARI TOS compatible system, including but not limited to: TOS itself, MagiC, MagiC Mac, MagiC PC, MultiTOS, Geneva, and MultiGEM.

STATEMENT

DESCRIPTION

CREATED DATE
DATE: TODAY |
TIME:

BYLINE
Default will be "Dragan Espenschied"

SAVE OR PUBLISH
Your artwork will be added to your portfolio and submitted to the ArtBase for acceptance upon completion and publishing.

Artbase » Browse Member Exhibitions About Submit About Us Membership

This Appendix presents the only documentation available for the process of submitting an artwork to the ArtBase, before open submission was closed. The screenshots here are from a Webrecorder capture made by Dragan Espenschied on 4th Sept., 2019. The screenshots present the view for a logged in user in the process of submitting an artwork.

LET'S SAY I SUBMIT, THEN WHAT?

You are invited to contribute documentation of your artwork to Rhizome by creating a free account and adding artworks to your user profile. The artwork would be accessible to the public via your profile page.'

[BASE ARTWORK INFORMATION](#) | [ARTWORK MEDIA](#) | [ARTWORK DETAILS](#) | [ARTWORK LICENSE AND AGREEMENT POLICY](#)

IMAGES

MAIN IMAGE (470w x 355h)



Delete this image?

[Change this image?](#)

No file chosen

THUMBNAIL IMAGE (135w x 170h)

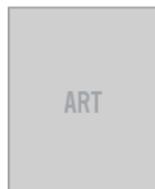


Delete this image?

[Change this image?](#)

No file chosen

LARGE, SCREEN SIZED IMAGE (1024w x 768h)



[Change this image?](#)

No file chosen

WIDE IMAGE (950w x 375h, can be cropped or padded)



Delete this image?

[Change this image?](#)

No file chosen

VIDEO

Link to an external video (YouTube, Vimeo, Blip.tv, etc)

AUDIO

Upload an audio file (5MB max)

 No file chosen

[Link to an external audio file](#)

SAVE OR PUBLISH

Your artwork will be added to your portfolio and submitted to the ArtBase for acceptance upon completion and publishing.

The first and second steps of the process, required submitting narrative text descriptions and representative linear media (images / video / audio). The text fields already indicate some lack of clarity as to what should be in the 'summary', 'statement' or 'description fields', and the results can be seen in multiple records of the ArtBase where information is missing or it has been simply duplicated.

LET'S SAY I SUBMIT, THEN WHAT?

You are invited to contribute documentation of your artwork to Rhizome by creating a free account and adding artworks to your user profile. The artwork would be accessible to the public via your profile page.'

BASE ARTWORK INFORMATION | ARTWORK MEDIA | **ARTWORK DETAILS** | ARTWORK LICENSE AND AGREEMENT POLICY

TECHNOLOGIES USED

Please select a technology from the list below.*

[ADD TECHNOLOGY+](#)

Categories	Types	Versions
Internet Protocols		
File Formats		
Mark up language		
Augmented Reality (AR)		
applications		
E-Mail		
Software		
Browser		

*If your artwork is using a technology not listed above, please tell us about that technology in the technology overview field below.

Technologies

- No technologies selected yet

TECHNOLOGY OVERVIEW

Please provide an overview of the technical aspects of the artwork. Describe how the artwork works, and list all technologies involved in the creation of the work, including version number if possible. We will use this information to develop our list of technologies.

TAGS

Please separate tags by commas, e.g. "video, interactive, painting, computer vision, net.art"

screen saver, pixel art, graphics, German, freeware

FORMAT

Please state the format of the work
(eg. website, video, software, painting, audio, etc)

Software

STATE OR EDITION

Please detail the state, edition or version of the work
(1st edition, version 2.2, 3 of 8, etc)

TAG APPROVAL

THE BELOW ARE USER SUBMITTED TAGS.

- Check the box to verify the tag is only if you think it is an appropriate, high quality, and general descriptor.
- This will also promote the tag to Rhizome's list of approved tags.

screen saver pixel art graphics
 German freeware

THE BELOW IS A LIST OF RHIZOME APPROVED TAGS.

- Tags already selected for the artwork are checked.
- You can add already existing approved Rhizome tags by checking them and saving the artwork.
- Unchecking a tag will remove that tag from that artwork, as well as remove that tag from the list of approved tags if this is the only artwork with that tag.

- | | | |
|--|--|--|
| <input type="checkbox"/> 3D | <input type="checkbox"/> 3D Printing | <input type="checkbox"/> Abstract |
| <input type="checkbox"/> access | <input type="checkbox"/> Actions | <input type="checkbox"/> activism |
| <input type="checkbox"/> additive | <input type="checkbox"/> Additivism | <input type="checkbox"/> allegory |
| <input type="checkbox"/> manufacturing | <input type="checkbox"/> animated .gif | <input type="checkbox"/> animated gif |
| <input type="checkbox"/> Animation | <input type="checkbox"/> Anti-art | <input type="checkbox"/> Antiquity |
| <input type="checkbox"/> Appropriation | <input type="checkbox"/> architecture | <input type="checkbox"/> archive |
| <input type="checkbox"/> art history | <input type="checkbox"/> art world | <input type="checkbox"/> artificial life |
| <input type="checkbox"/> Artistic | <input type="checkbox"/> audio | <input type="checkbox"/> baroque |
| <input type="checkbox"/> collaboration | <input type="checkbox"/> BBS | <input type="checkbox"/> bio |
| <input type="checkbox"/> biography | <input type="checkbox"/> Collaborative | <input type="checkbox"/> broadcast |
| <input type="checkbox"/> browser | <input type="checkbox"/> colorful | <input type="checkbox"/> censorship |
| <input type="checkbox"/> cinema | <input type="checkbox"/> community | <input type="checkbox"/> collider |
| <input type="checkbox"/> colonialism | <input type="checkbox"/> conference | <input type="checkbox"/> commercialization |
| <input type="checkbox"/> commodification | <input type="checkbox"/> corporate | <input type="checkbox"/> Conceptual |
| <input type="checkbox"/> Conceptual art | <input type="checkbox"/> data | <input type="checkbox"/> contextual |
| <input type="checkbox"/> copyright | <input type="checkbox"/> death | <input type="checkbox"/> craft |
| <input type="checkbox"/> CuSeMe | <input type="checkbox"/> Destruction | <input type="checkbox"/> data-mosh |
| <input type="checkbox"/> Database | <input type="checkbox"/> disappearance | <input type="checkbox"/> design |
| <input type="checkbox"/> desire | <input type="checkbox"/> download | <input type="checkbox"/> DHTML |
| <input type="checkbox"/> digital | <input type="checkbox"/> email | <input type="checkbox"/> Documentary |
| <input type="checkbox"/> Domain | <input type="checkbox"/> fashion | <input type="checkbox"/> drone |
| <input type="checkbox"/> education | <input type="checkbox"/> film | <input type="checkbox"/> Event |
| <input type="checkbox"/> exhibition | <input type="checkbox"/> fund | <input type="checkbox"/> Feminism |
| <input type="checkbox"/> Feminist | <input type="checkbox"/> gender | <input type="checkbox"/> Flash |
| <input type="checkbox"/> Formalist | <input type="checkbox"/> geometric | <input type="checkbox"/> futurism |
| <input type="checkbox"/> game | <input type="checkbox"/> glitch | <input type="checkbox"/> Generative |
| <input type="checkbox"/> Generative art | <input type="checkbox"/> Google image | <input type="checkbox"/> gif |
| <input type="checkbox"/> gifbite | <input type="checkbox"/> search | <input type="checkbox"/> globalization |
| <input type="checkbox"/> Google Earth | <input type="checkbox"/> historical | <input type="checkbox"/> government |
| <input type="checkbox"/> hand-drawn | <input type="checkbox"/> HTML | <input type="checkbox"/> hack |
| <input type="checkbox"/> homepage | <input type="checkbox"/> identity | <input type="checkbox"/> History |
| <input type="checkbox"/> Hypertext | <input type="checkbox"/> Information | <input type="checkbox"/> humor |
| <input type="checkbox"/> information map | <input type="checkbox"/> visualization | <input type="checkbox"/> immersion |
| <input type="checkbox"/> Interactive art | <input type="checkbox"/> interface | <input type="checkbox"/> installation |
| <input type="checkbox"/> .java | <input type="checkbox"/> javascript | <input type="checkbox"/> interact |

[ADD ANOTHER SUPPORT+](#)

The third step of the process involved a lengthy questionnaire regarding 'technologies used', format and other identifying information such as tags.

FOOTNOTES

Please add any footnote links pertinent to the work

Title	<input type="text"/>
Link	<input type="text"/>
Delete	

[ADD ANOTHER FOOTNOTE+](#)

- | | | |
|--|--|--|
| <input type="checkbox"/> Java | <input type="checkbox"/> Javascript | <input type="checkbox"/> labor |
| <input type="checkbox"/> language | <input type="checkbox"/> litserv | <input type="checkbox"/> live |
| <input type="checkbox"/> machine | <input type="checkbox"/> machinima | <input type="checkbox"/> Manifesto |
| <input type="checkbox"/> marginality | <input type="checkbox"/> market | <input type="checkbox"/> materialism |
| <input type="checkbox"/> media activism | <input type="checkbox"/> meme | <input type="checkbox"/> memory |
| <input type="checkbox"/> minimal | <input type="checkbox"/> Modification | <input type="checkbox"/> Montage |
| <input type="checkbox"/> MP3 | <input type="checkbox"/> Narrative | <input type="checkbox"/> nature |
| <input type="checkbox"/> net.art | <input type="checkbox"/> netart | <input type="checkbox"/> network |
| <input type="checkbox"/> new materialism | <input type="checkbox"/> nostalgia | <input type="checkbox"/> Off-line |
| <input type="checkbox"/> offline | <input type="checkbox"/> Oil | <input type="checkbox"/> painting |
| <input type="checkbox"/> Participatory | <input type="checkbox"/> pattern | <input type="checkbox"/> performance |
| <input type="checkbox"/> Perl | <input type="checkbox"/> politics | <input type="checkbox"/> posthuman |
| <input type="checkbox"/> Posthumanism | <input type="checkbox"/> postmodern | <input type="checkbox"/> privacy |
| <input type="checkbox"/> private space | <input type="checkbox"/> Psychedelic | <input type="checkbox"/> public space |
| <input type="checkbox"/> publish | <input type="checkbox"/> queer | <input type="checkbox"/> QuickTime |
| <input type="checkbox"/> radio | <input type="checkbox"/> Rapid Prototyping | <input type="checkbox"/> Readymade |
| <input type="checkbox"/> RealPlayer | <input type="checkbox"/> resistance | <input type="checkbox"/> responsibility |
| <input type="checkbox"/> Revolution | <input type="checkbox"/> robot | <input type="checkbox"/> rumor |
| <input type="checkbox"/> Sculpture | <input type="checkbox"/> Second Life | <input type="checkbox"/> security |
| <input type="checkbox"/> Shockwave | <input type="checkbox"/> Social classes | <input type="checkbox"/> social space |
| <input type="checkbox"/> software | <input type="checkbox"/> sound | <input type="checkbox"/> sound art |
| <input type="checkbox"/> space | <input type="checkbox"/> surf club | <input type="checkbox"/> surveillance |
| <input type="checkbox"/> tactical | <input type="checkbox"/> tactical media | <input type="checkbox"/> Technology |
| <input type="checkbox"/> technophobia | <input type="checkbox"/> Telematic | <input type="checkbox"/> television |
| <input type="checkbox"/> Text | <input type="checkbox"/> the radical outside | <input type="checkbox"/> Third World |
| <input type="checkbox"/> trippy | <input type="checkbox"/> tumblr | <input type="checkbox"/> Twitter |
| <input type="checkbox"/> underground | <input type="checkbox"/> utopia | <input type="checkbox"/> video |
| <input type="checkbox"/> violence | <input type="checkbox"/> Virtual | <input type="checkbox"/> Virtual reality |
| <input type="checkbox"/> Visual | <input type="checkbox"/> VRML | <input type="checkbox"/> War |
| <input type="checkbox"/> webcam | <input type="checkbox"/> YouTube | |

ARTISTS INVOLVED AND ROLES

Please list any other artists involved with this work along with their role in the creation of the work.

Name	<input type="text"/> Alvar Freud
Roles	<input type="text"/> Creator
Delete	

Name	<input type="text"/> Peter Scheerer
Roles	<input type="text"/> Creator
Delete	

Name	<input type="text"/> Dragan Espenschied
Roles	<input type="text"/> Creator
Delete	

[ADD ANOTHER ARTIST+](#)

COLLECTIVE (IF APPLICABLE)

If this Artwork was created by a collective, please provide the collective's name

ARTICLES AND ESSAYS

Please add any articles referencing the work

Title	<input type="text"/>
Author	<input type="text"/>
Publication	<input type="text"/>
Link	<input type="text"/>
Delete	

[ADD ANOTHER ARTICLE+](#)

EXHIBITIONS

Please list any exhibitions or shows that have involved this artwork

Title	<input type="text"/>
Curator	<input type="text"/>
Link	<input type="text"/>
Location	<input type="text"/>
Delete	

[ADD ANOTHER EXHIBITION+](#)

COMMENTS

Allow Comments on this artwork?

SAVE OR PUBLISH

Your artwork will be added to your portfolio and submitted to the ArtBase for acceptance upon completion and publishing.

[DELETE](#)

[UPDATE](#) [VIEW](#)

This part of the submission form was often left blank, due to the extreme level of detail, with little explanation of what is the purpose of these fields.

For example, while a Programming Language with a specific version or a specific File format could be filled in, a browser or an operating system are not necessarily the same order of 'technology'. A website programmed with JavaScript and containing .png files could be experienced on any number of browsers and operating systems.

Furthermore, keeping this type of questionnaire up-to-date is unsustainable in the long run, as new versions keep proliferating, while artworks themselves may be modified by the artists or the archivists. As the outdated 'Web Application' category shows, the sheer variety of platforms available for artists to use will need constant updating.

Ultimately, the value of this information for preservation of the artworks is marginal, even when filled in completely, compared to the much more specific data gathered for dependencies of the artworks during the ArtBase audit in 2015–16.

TECHNOLOGIES USED

Please select a technology from the list below.*

ADD TECHNOLOGY+

Categories	Types	Versions
applications	Mozilla Firefox	1.5
E-Mail	Internet Explorer	2
Software	Safari	3
Browser	Netscape Navigator	3.5
Operating System	Opera	3.6
Programming Language	Chrome	4.0 (beta)
Hardware		
Web Application		

*If your artwork is using a technology not listed above, please tell us about that technology in the technology overview field below.

TECHNOLOGIES USED

Please select a technology from the list below.*

ADD TECHNOLOGY+

Categories	Types	Versions
Browser	Windows	1
Operating System	Mac OS	2
Programming Language	Linux	2.03
Hardware	Arch Linux	3
Web Application	CentOS	3.1
Database	Fedora	OS/2
JavaScript Library	Gentoo Linux	NT
Plugin Object	Kubuntu	NT 3.1

*If your artwork is using a technology not listed above, please tell us about that technology in the technology overview field below.

TECHNOLOGIES USED

Please select a technology from the list below.*

ADD TECHNOLOGY+

Categories	Types	Versions
Software	Perl	
Browser	Javascript	
Operating System	PHP	
Programming Language	Java	
Hardware	Python	
Web Application	Ruby	
Database	CSS	
JavaScript Library	Max/MSP	

*If your artwork is using a technology not listed above, please tell us about that technology in the technology overview field below.

TECHNOLOGIES USED

Please select a technology from the list below.*

ADD TECHNOLOGY+

Categories	Types	Versions
Software	Blogging Application	Blogger
Browser		tumblr
Operating System		Wordpress
Programming Language		Twitter
Hardware		Movable Type
Web Application		
Database		
JavaScript Library		

*If your artwork is using a technology not listed above, please tell us about that technology in the technology overview field below.

LET'S SAY I SUBMIT, THEN WHAT?

You are invited to contribute documentation of your artwork to Rhizome by creating a free account and adding artworks to your user profile. The artwork would be accessible to the public via your profile page.'

BASE ARTWORK INFORMATION | ARTWORK MEDIA | ARTWORK DETAILS | ARTWORK LICENSE AND AGREEMENT POLICY

CREATIVE COMMONS LICENSE CHOICE
(OPTIONAL)

Applying one of the licenses below will convey these permissions in searchable computer-readable and legal forms when your work is displayed, making it easy for other artists and members of the public to find your works to use and remix on terms you specify.

If you don't want people to be allowed to copy and distribute your work, please answer "No" to the following question and your work will retain "All Rights Reserved" copyright.

CURRENT LICENSE



Creative Commons: Attribution-Noncommercial-Share Alike

Copy the html below to your Web site to let your visitors know what license applies to your work.

```
<a rel="license" href="http://creativecommons.org/licenses/by-nc-sa/3.0/"></a><br />This work is licensed under a <a rel="license" href="http://creativecommons.org/licenses/by-nc-sa/3.0/">Creative Commons: Attribution-Noncommercial-Share Alike</a>
```

CHANGE LICENSE

Click here to change *Twilight's* license

Use Creative Commons License?

- No (All Rights Reserved)
- Yes

Select Creative Commons License

Allow commercial uses of your work? ([more info](#))

- Yes
- No

Allow modifications of your work? ([more info](#))

- Yes
- Yes, as long as others share alike ([more info](#))
- No

License

Creative Commons: Attribution-Noncommercial-Share Alike

RHIZOME ARTBASE AGREEMENT

Rhizome ArtBase Artist Agreement Policy

This agreement sets out the terms and conditions by which you agree to allow us to include or link to ["TITLE OF ARTWORK"] in the Rhizome ArtBase. This agreement also sets out the terms and conditions by which Rhizome agrees to accept your artwork into the ArtBase.

I. General Information

The Rhizome ArtBase is an online archive of new media art that is maintained by Rhizome at the New Museum a non-profit arts organization in New York City. The ArtBase provides public access and exposure to a comprehensive collection of new media art, serves as a platform for artists to present their work and preserves key artworks for the future.

CLICK HERE TO AGREE TO THE ARTBASE AGREEMENT FORM

SAVE OR PUBLISH

Your artwork will be added to your portfolio and submitted to the ArtBase for acceptance upon completion and publishing.

[DELETE](#)

[UPDATE](#)

[VIEW](#)

The final stage in the submission process included a form to pick licensing options. This screenshot shows how the CC-BY-NC-SA license was the option selected by default. But whether the artists submitting the works were fully aware of the implications of this license, or were properly informed about what other options they had remains unclear.

License

- Creative Commons: Attribution-Noncommercial-Share Alike
- Creative Commons: Attribution-Noncommercial
- Creative Commons: Attribution-Noncommercial-No Derivative Works
- Creative Commons: Attribution
- Creative Commons: Attribution-Share Alike
- Creative Commons: Attribution-No Derivative Works

References

- Blome, G. & Wijers, G. (2010) Visibility, Distribution and Memory through Networks and Collaboration, in Dekker, A. (ed.) *Archive2020: Sustainable Archiving of Born-Digital Cultural Content*. Amsterdam: Virtueel Platform. pp. 50–60.
- Connor, M. (2016) Interview, in Hoare, N. et al. (eds) *The New Curator*, London: Laurence King.
- Connor, M. (2018) Michael Connor in conversation with Lozana Rossenova. 15 March and 05 April, 2018.
- Connor, M. (2019) Net Art's Material: The Making an Anthology, in: Connor, M., Dean, A., and Espenschied, D. (eds.) *The Art Happens Here: Net Art Anthology*. Rhizome, pp. 5–12.
- Daniels, D. (2009) Reverse engineering modernism with the last avant-garde, in Daniels, D. & Reisinger, G. (eds). *Net pioneers 1.0: Contextualizing early net-based art*. Berlin: Sternberg Press. pp. 15–64.
- Dean, A. (2018) Aria Dean in conversation with Lozana Rossenova. 19 March, 2018.
- Dekker, A., (2014) Enabling the Future, or How to Survive FOREVER: A study of networks, processes and ambiguity in net art and the need for an expanded practice of conservation, PhD dissertation, Goldsmiths, University of London.
- Depocas, A., Ippolito, J., & Jones, C. (2003) *Permanence Through Change: The Variable Media Approach*, New York; Montreal: Guggenheim Museum; Daniel Langlois Foundation for Art, Science, and Technology.
- Durón, M. (2016) A Net Art Pioneer Evolves With the Digital Age: Rhizome Turns 20. *ARTnews*. Available from: <https://www.artnews.com/art-news/news/a-net-art-pioneer-evolves-with-the-digital-age-rhizome-turns-20-6884/> [Accessed 28 August, 2019]
- Espenschied, D. (2017) Feedback on “Discovery Phase & User Research”. Personal email to: Lozana Rossenova, 29 June 2017.
- Espenschied, D. and Cerf, V. (2017) Preservation by accident is not a plan: Vint Cerf and Dragan Espenschied in conversation. Available from: <https://rhizome.org/editorial/2017/may/30/preservation-by-accident-is-not-a-plan/> [Accessed 31 May 2017]

Espenschied, D. (2019) Personal email to: Lozana Rossenova. 12 Feb, 2019.

Fauconnier, S., Espenschied D., Moulds, L., and Rossenova, L. (2018) Many faces of Wikibase: Rhizome's archive of born-digital art and digital preservation—interview with Dragan Espenschied, Lyndsey Moulds, Lozana Rossenova, Wikimedia blog, 6 Sept. 2018. Available from: <https://wikimediafoundation.org/news/2018/09/06/rhizome-wikibase/> [Accessed 28 August, 2019]

Fino-Radin, B. (2011) Digital Preservation Practices and The Rhizome ArtBase. Available from: <http://media.rhizome.org/artbase/documents/Digital-Preservation-Practices-and-the-Rhizome-ArtBase.pdf> [Accessed 24 February 2017]

Fino-Radin, B. (2018) Ben Fino-Radin in conversation with Lozana Rossenova. 19 March, 2018.

Graham, B. (2014) Self-collection, Self-exhibitions? Rhizome and the New Museum, in Graham, B. (ed.) *New Collecting: Exhibiting and Audiences after New Media Art*. Farnham, Surrey, England; Burlington, Vermont: Ashgate. pp. 97–110.

Graham, B. (2014) Modes of Collection, in Graham, B. (ed.) *New Collecting: Exhibiting and Audiences after New Media Art*. Farnham, Surrey, England; Burlington, Vermont: Ashgate, pp. 29–56.

Jones, C., (2006) Conversation with Rhizome: conversation between Rhizome's Lauren Cornell, Marisa Olson, and Francis Hwang, with Caitlin Jones and Galen Joseph Hunter. January 3, 2006. Available from: http://www.eai.org/resourceguide/exhibition/computer/interview_rhizome.html [Accessed 23 May 2017]

Jones, C. (2010) Do it Yourself: Distributing Responsibility for Media Arts Preservation and Documentation, in Dekker, A. (ed.) *Archive2020: Sustainable Archiving of Born-Digital Cultural Content*. Amsterdam: Virtueel Platform. pp. 40–59.

Laurenson, P. (2006) 'Authenticity, Change and Loss in the Conservation of Time-Based Media Installations', *Tate Papers*, 6, 2006, pp.1–14. Available from: <http://www.tate.org.uk/research/publications/tate-papers/06/authenticity-change-and-loss-conservation-of-time-based-media-installations> [Accessed 23 July, 2018]

Lee, K. Y. & Albert, K. (2018) A Preservationist's Guide to the DMCA Exemption for Software Preservation. Boston: Software Preservation Network. Cyberlaw Clinic at the Berkman Klein Center, Harvard University. Available from: <http://www.softwarepreservationnetwork.org/1201-exemption-guide-for-software-preservationists/> [Accessed 27 May 2019]

Liang, L. (2015) The dominant, the residual and the emergent in Archival Imagination. *Spheres: Journal of Digital Cultures*. (2). Available from: <http://spheres-journal.org/the-dominant-the-residual-and-the-emergent-in-archival-imagination/> [Accessed 28 August, 2019]

Kaplan, Z. (2018) Zachary Kaplan in conversation with Lozana Rossenova. 19 March, 2018.

McKeehan, M. (2016) Born-Digital Preservation in the Rhizome ArtBase. New York: National Digital Stewardship Residency. Available from: http://ndsr.nycdigital.org/wp-content/uploads/2016/08/mckeehan_final_report.pdf [Accessed 24 February 2017]

Moulds, L. (2018) Lyndsey Moulds in conversation with Lozana Rossenova. 15 March, 2018.

Owens, T. (2012) ArtBase and the Conservation and Exhibition of Born Digital Art: An Interview with Ben Fino-Radin. *The Signal*, 1 May 2012, Available from: <https://blogs.loc.gov/thesignal/2012/05/artbase-and-the-conservation-and-exhibition-of-born-digital-art-an-interview-with-ben-fino-radin/> [Accessed 23 May 2017]

Ptak, L. (2010) Interview with Mark Tribe. Available from: <http://www.as-ap.org/oralhistories/interviews/interview-mark-tribe-founder-rhizome> [Accessed 23 May 2017]

Rhizome Cloned Object Agreement. Available from: https://www.eai.org/user_files/supporting_documents/Cloned%20Object.pdf [Accessed 23 May 2017]

Rinehart, R. (2002) Preserving the Rhizome ArtBase. Available from: <http://media.rhizome.org/artbase/documents/Preserving-the-Rhizome-ArtBase.pdf> [Accessed 23 May 2017]

Rosenthal, D. (2015), Emulation & Virtualization as Preservation Strategies, Available from: https://mellon.org/media/filer_public/0c/3e/0c3eee7d-4166-4ba6-a767-6b42e6a1c2a7/rosenthal-emulation-2015.pdf [Accessed 23 May 2017]

Rossenova, L. (2017) Transcript of group interview with Rhizome staff by the author, 13 February, 2017.

Shneiderman, B., Plaisant, C., Cohen, M., Jacobs, S. and Elmqvist, N. (2018) *Designing the user interface: strategies for effective human-computer interaction*. 6th, global ed. Boston: Pearson.

Smith, W. (2008) Challenges for the cataloging of new media art. Available from: <http://media.rhizome.org/artbase/documents/Cataloging-New-Media-Art.pdf> [Accessed 23 May 2017]

Thornton, K. et al., 'Modeling the Domain of Digital Preservation in Wikidata', in Proceedings of the 14th International Conference on Digital Preservation iPRES 2017, Kyoto, Japan, September 25–29, 2017, pp. 2, 5, 6. Available from: <https://ipres2017.jp/wp-content/uploads/7.pdf> [Accessed 23 July, 2018]

Tribe, M. (2018) Mark Tribe in conversation with Lozana Rossenova. 19 March, 2018.

Vrandečić, D. & Krötzsch, M. (2014) 'Wikidata: a free collaborative knowledgebase', *Communications of the ACM*, vol. 57, no.10, 2014, pp. 79, 83.

Copyright statement

This report is licensed under the CC BY-NC-SA 4.0 license.

Read the full text here: <https://creativecommons.org/licenses/by-nc-sa/4.0/legalcode>

Note on images: some screenshots in this report may feature artworks licensed under different terms, and the author of the report does not hold any rights over these images. Any use of representative images in this report is for educational purposes only.

