Encoding Byzantine Seals: SigiDoc

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Abstract

English. This paper will illustrate the current state of development of SigiDoc, an XML-based and TEI-compliant effort for the encoding of Byzantine seals. SigiDoc represents the first attempt to extend the digital approach — already applied to inscriptions, coins and papyri — to Byzantine seals (and bread stamps). The project — which has been discussed, albeit without results, in the framework of Byzantine studies since the early 2000s — was taken up in 2015 by Alessio Sopracasa as part of his Marie Curie fellowship, and the work is currently continuing through a collaboration between Paris, London and Cologne, particularly with Martina Filosa. SigiDoc is in a fairly advanced development phase and currently allows the display of metadata dealing with the seal as an object, such as physical description, history of the seal, typology, description of the iconography, as well as the critical edition of the legend, along with *apparatus criticus* and commentary. The transformation of XML documents into a webpage, various indexing possibilities, a search interface as well as multi-lingual features are delivered to SigiDoc by EFES (EpiDoc Front-End Services).

Italiano. Obiettivo del contributo è illustrare lo stato attuale dello sviluppo di SigiDoc, uno strumento basato su XML e conforme a TEI per la codifica dei sigilli bizantini. SigiDoc rappresenta il primo tentativo di estendere l'approccio digitale — già applicato ad epigrafi, monete e papiri — ai sigilli bizantini (facilmente adattabile alla codifica degli stampi eucaristici). Il progetto — del quale si è discusso in seno alla bizantinistica internazionale sin dall'inizio degli anni 2000, ma senza risultati — è stato intrapreso nel 2015 da Alessio Sopracasa nell'ambito di una fellowship Marie Curie ed il lavoro continua oggi in collaborazione tra Parigi, Londra e Colonia, in particolare con Martina Filosa. SigiDoc si trova in una fase di sviluppo piuttosto avanzata e permette attualmente la visualizzazione dei metadati (descrizione fisica, storia del sigillo, tipologia, descrizione dell'iconografia), l'edizione critica della legenda, insieme all'apparato critico ed al commento. SigiDoc si serve di EFES (EpiDoc Front-End Services) per la visualizzazione web provvisoria dei documenti XML, per l'indicizzazione, per le opzioni multilingua, nonché per l'interfaccia di ricerca.

1 Byzantine Sigillography and Digital Humanities

SigiDoc is an effort providing XML-based and TEI-compliant encoding standards for Byzantine seals. It represents the first attempt to extend the digital approach, which in the past decade has already been applied to inscriptions, coins and papyri[1], to Byzantine seals, and, with minor adjustments, to other coin-like objects, such as bread stamps. Already presented to the international community of Byzantine sigillographers during the 12th International Symposium of Byzantine Sigillography held in May 2019 at the Hermitage Museum, St. Petersburg, SigiDoc will be presented at the 9th Annual Conference AIUCD for the first time to a wide community of digital humanists.

Seals are the only survivors of the written documents used in daily administration of the Byzantine Empire, the former Eastern Roman Empire (4th to 15th century). These small discs, mostly made of lead, commonly have an iconographic representation on one side (a saint, the Virgin, etc.) and a legend — with name, at times surname, dignities, functions, places — on the other. Hence, what we call "seal" is both the object bearing an impression and the impression itself, left on the disk by a tool called *boulloterion*, i.e. the matrix (only six of these tools survive nowadays in comparison to the extant 80/100,000 seals' impressions). The seals greatly

[1] A comprehensive and up-to-date list of projects related to inscriptions, coins and papyri within the Digital Humanities can be found at: <https://wiki.digitalclassicist.org/Category:Projects>.

improved our knowledge of the central and provincial administrative apparatus of the State, the Church, and the Army, and thanks to them the Byzantine administrative, political, and social history is gradually being rewritten. But the impact of the seals is still limited, since access remains restricted to a very small number of researchers, the great amount of unpublished material is widely scattered across museums, libraries, and private collections, and the paper publications are fragmented and far from being widely available.

Despite this situation, unlike sister ancillary disciplines such as epigraphy, papyrology or numismatics, Byzantine sigillography has not received much attention from the Digital Humanities for a long time, although this has been a wish of at least part of the scientific community since the 2000s. Resumed and abandoned several times without significant results, the project has finally been revived by the authors. SigiDoc strives to combine traditional research methods and scholarship in the field of Byzantine sigillography with the technologies offered by the Digital Humanities. In fact, standards for scientific publications within Byzantine sigillography have been established during the 20th century with the works by Vitalien Laurent[2], George Zacos[3], Nicolas Oikonomides[4], Jean-Claude Cheynet[5], and Werner Seibt[6]: hence, one of the main tasks of SigiDoc has been to convert these standard publications into a digital and TEI-compliant form, while partially reassessing them and providing them with more consistency.

2 What SigiDoc is and for what purpose it has been developed

At the time this paper is written, SigiDoc is in an advanced *beta* version and it will hopefully be close to its 1.0 version by the time the AIUCD annual conference takes place.

SigiDoc is largely based on the ongoing experience of EpiDoc, a collaborative effort that provides guidelines and tools for the encoding of scholarly editions of ancient documents; alongside the scientific objectives, EpiDoc developed also an educational asset, with the didactic experiences of EpiDoc training weeks, showing great potential in teaching traditional epigraphy and papyrology.[7] EpiDoc uses a subset of the TEI standard for the representation of texts in digital form[8], having clearly established itself as the most robust and widely supported format for encoding editions of ancient texts on different text-bearing objects.

Far from being only a simple adaptation and implementation of existing solutions, from a technical point of view, SigiDoc is: 1) a schema, merged with EpiDoc's one; 2) a template, i.e. SigiDoc's edition structure; 3) a stylesheet for web visualisation; 4) a set of stylesheets for the critical edition of the legends on seals, derived from EpiDoc but adapted to the needs of Byzantine sigillography; 5) a highly customised version of EFES (see below); 6) a set of guidelines (for metadata, leidenisation, indexing, etc.); 7) a set of files intended to be shared among all the future SigiDoc projects and expanded through the time and the experience, in order to avoid superfluous duplications on one hand, and to ensure consistency on the other (IDs' lists, controlled vocabularies, authority lists, ontologies, etc.).[9]

SigiDoc is intended for both the creation of digital-born editions of Byzantine seals as well as for the digital conversion of paper publications, and it has been conceived in order on one hand, to provide the users with a common ground for developing their projects, on the other, also to give them the freedom to customise their approach.

During its presentation in St. Petersburg, the community of Byzantine sigillographers gave an enthusiastic feedback to SigiDoc, and several projects aimed at the creation of online *corpora* are now waiting for SigiDoc 1.0 to be released, thus ensuring both its dissemination and implementation. These projects involve leading scholars in the field of Byzantine studies — such as Prof. Jean-Claude Cheynet, Prof. Claudia Sode, Dr. Vivien Prigent — as well as important cultural institutions, such as the Bibliothèque Nationale de France (Paris), the

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[2] See Vitalien Laurent. 1963–1981. *Le Corpus Des Sceaux de L'empire Byzantin, Voll. 1–5*, Paris.

[3] See George Zacos and Alexander Veglery. 1972. *Byzantine Lead Seals, Vol. 1*, Basel.

[4] See Nicolas Oikonomides. 1986. *A Collection of Dated Byzantine Lead Seals*. Washington, D.C.

[5] See Jean-Claude Cheynet, Turan Gokyildirim, and Vera Bulgurlu. 2012. *Les Sceaux Byzantins du Musée Archéologique d'Istanbul, Istanbul; id. and Maria Campagnolo-Pothitou. 2016. Sceaux de la collection Georges Zacos au Musée d'art et d'histoire de Genève, Geneva.*

[6] See Werner Seibt. 1978, *Die byzantinischen Bleisiegel in Österreich I. Teil, Kaiserhof*, Vienna; *id.* and Alexandra-Kyriaki Wassiliou. 2004. *Die Byzantinischen Bleisiegel in Österreich, Vol. 2, Zentral- und Provinzialverwaltung*, Vienna.

[7] Gabriel Bodard and Simona Stoyanova. 2016. *Epigraphers and Encoders: Strategies for Teaching and Learning Digital Epigraphy*, in Gabriel Bodard and Matteo Romanello (eds.), *Digital Classics Outside the Echo-Chamber. Teaching, Knowledge Exchange & Public Engagement*, p. 51–68, London, available: <http://dx.doi.org/10.5334/bat>.

[8] Tom Elliott, Gabriel Bodard, Hugh Cayless *et al.* 2006-2016. *EpiDoc: Epigraphic Documents in TEI XML*. Online material, available: <http://epidoc.sf.net>, delivers thorough information about history and mission of EpiDoc and offers always up-to-date versions of the EpiDoc Guidelines as well as documentation, software and tools to work with EpiDoc.

[9] In section 3, this paper will address only a selection of these topics.

Dumbarton Oaks Research Library and Collection (Harvard's research institute for Byzantine Studies in Washington D.C.), the Epigraphic and Numismatic Museum of Athens and the Geneva Museum of Art. Researchers, museums, public institutions, as well as private collectors will be able to get a definite and stable record of their Byzantine seals, thus preventing deterioration and making their collections available for research, teaching, and presentation to the general public.

Thanks to the increasing number of SigiDoc-based projects, the long-term aim is to ensure dissemination, sharing, and sustainability of the data, and to make available a very wide range of published and unpublished material, edited to a high scholarly standard. SigiDoc has not been conceived just to realise individual projects (an interesting, though limited aim): the use of the same guidelines and set of tools is intended to allow the creation of a common search interface, through which all *corpora* will be virtually unified in a higher-order catalogue, enabling actions going from the simple cross-referencing to the advanced search throughout every *corpus* published in SigiDoc standard.

Through a dedicated website, the developers will ensure a proper dissemination of SigiDoc. The website (http://sigidoc.huma-num.fr/) — which is, as for now, empty — will host SigiDoc's documentation as well as all the aforementioned materials needed to run it. Through this site the user will be informed about the life of SigiDoc: status of SigiDoc-based projects, training sessions and events, technical updates, etc.

In order to use SigiDoc, a formal training is needed. Training weeks as well as shorter training events will take place regularly (once or twice a year): they are inspired by the well-established EpiDoc training weeks, which have repeatedly shown the feasibility as well as the effectiveness of this teaching format. Through in-depth training, SigiDoc will be able to increase the dissemination and continuity of sigillography itself, while the creation of a new professional figure, i.e. the digital sigillographer, will facilitate the integration between the traditional and the digital approach to Byzantine seals. Consequently, the foundation of a more interrelated scientific community will be laid: a network of digital Byzantine sigillographers is still a *desideratum* within the larger community of Byzantine sigillography; in order to achieve this goal, a common scientific and prac-tical ground delivered by a standard like SigiDoc is much needed.

3 Main Features of SigiDoc

3.1 TEI-XML Template and Data Encoding

SigiDoc XML template organises the information in hierarchical mark-up inside three main common ele-ments of the standard TEI structure: 1) <teiHeader/> for metadata; 2) <facsimile/> for the digital reproduction of the artefact; 3) <text/> for the legend's critical edition, commentary and bibliography.

teiHeader: among the data nested inside this element, SigiDoc stresses the importance of providing each seal with a unique numerical identifier (being it the first attempt of systematic categorisation in Byzantine sigillography).To preserve consistency, a common file of ID numbers will be shared among all the SigiDoc projects.

Several thesauri and controlled vocabularies are being prepared: among them, the classification of the seal (imperial, military, etc.), the milieu of the issuer, the language(s) of the legend, the work type (original impres-sion, drawing, verbal description, etc.), the material, the layout (iconography only, text only, both, etc.), the execution (struck, cast, printed, etc.), the shape, the iconography (see below). All these lists will be provided in different languages (English, French, German, and Italian by default, but each project will be able to cus-tomise their languages).

The preservation history of the seal is a major concern, not only in establishing which is the current repos-itory of a seal, but also in being able to follow it through its different displacements, which is of the utmost importance especially when the seal enters a private collection or is sold in an auction. Byzantine seals are increasingly present in online auctions: thanks to SigiDoc it will be easier to follow them before they disappear in private collections; the leading journal in the field — *Studies in Byzantine Sigillography*[10] — includes a final section listing the seals sold through auctions, but its biannual publication (without photos of the seals) limits its effectiveness, whereas with SigiDoc the information will be updated without any delay, thus promot-ing its circulation and its scientific study.

An important part of the metadata is devoted to the findspot and the find circumstances: these data contribute significantly to the historical interpretation of the seal, helping to establish both the areas directly administrated by the Byzantine Empire and those — outside the Empire — of contact or influence. Unfortunately,

[10] See <https://www.degruyter.com/view/serial/36534>.

this kind of data is often lacking for Byzantine seals, and this makes particularly valuable the preservation of this information and its linking with similar data among different *corpora*.

The iconography deserves here a special mention: this is a key element to Byzantine sigillography, but also one of the most challenging due the numerous and specific iconographic typologies to be found on Byzantine seals. In SigiDoc 1.0 this topic will be addressed in two ways: a short and general identification of the iconographic theme (according to a shared controlled vocabulary), and a detailed description. However, the degree of details in iconographic description is perhaps the most changing criterion in Byzantine sigillographic editions: this is the reason why a standard tool for the description of images is being developed, in order to introduce consistency in sigillographic editions, and to restore the importance of this feature, too often neglected. This tool will be released after the launch of SigiDoc 1.0.

Links and relationships both within the *corpora*, and between texts and external datasets can be established and realised as hyperlinks in SigiDoc: the data is being enriched and its interoperability is being increased using online resources and authority files such as prosopographies and geographical gazetteers.[11]

Facsimile: The digital reproduction of the seals will be displayed as a digital facsimile above the edition: in case of seals in bad state of preservation, some of the ongoing projects (especially those based in Cologne and Paris) will provide images created with RTI technology (Reflectance Transformation Imaging).[12] Of course, digital reproductions won't be always available, especially for seals edited between the 19th and the 20th century and of which no trace can be found: in this case, we have often drawings or verbal descriptions.

Text: As far as the critical edition of the seals is concerned, variant readings and restorations are encoded in TEI, thus enabling the generation of *apparatus criticus*, parallel texts, and diplomatic editions; moreover, the leidenisation of the legend allows for a full editorial interpretation based on the Leiden conventions (especially Panciera), but adapted according to the sigillographic editorial standards.[13] For the diplomatic edition, SigiDoc uses AthenaRuby[14], a Unicode-compliant font based on the lettering/epigraphy of Byzantine coins and seals, and designed by Joel Kalvesmaki at the Center for Byzantine Studies at Dumbarton Oaks (Washington D.C.). AthenaRuby is currently the most accurate Greek font in terms of the lettering of Byzantine coins and seals. It is not yet widely used within the sigillographic (and numismatic) community due to the preference accorded by them to more abstract yet more approximate fonts, such as New Athena. Being the lettering of the legend a key factor in dating and contextualising a *specimen*, SigiDoc's developers promote and strongly recommend the use of AthenaRuby for the encoding of Byzantine seals: the diplomatic edition carried out with this font delivers a more accurate representation of the seal's lettering, thus facilitating its understanding even without the observation of the digital reproduction.

3.2 Web Visualisation and Data Valorisation: Contribution from (and to) EFES (EpiDoc Front-End Services)

EFES (EpiDoc Front-End Services)[15], which builds upon existing tools such as Kiln[16], is a highly customisable platform which allows expert and less expert users to get, in a relatively easy and fast way, four main critical features for a TEI-XML based *corpus*: multiple indices, multilingual options, faceted search interface, and a (raw) webpage. TEI-XML files created in SigiDoc, their XSLT stylesheets, as well as part of their tagging have been designed to be best dealt with in EFES. In 2018 SigiDoc became one of the pilot projects using and testing EFES and, in this way, actively contributing to its development, being also the only non-strictly epigraphical project.

The most notable contribution of EFES to SigiDoc is certainly the creation, based on Authority Lists, of automatic indices. The lemmatisation of words and the identification of relevant entities within the legend, as well as the encoding of key words and terms, enable the indexing of words, personal names, geographical entities, offices, titulatures, and other features of philological, epigraphical, and historical interest at large.

[11] See, for example, *Prosopography of the Byzantine World* (<http://pbw2016.kdl.kcl.ac.uk/>); *Prosopographie der mittelbyzan-tinischen Zeit* (<http://www.degruyter.com/view/db/pmbz/>); *Pleiades* (<http://pleiades.stoa.org/>).

[12] For further information regarding RTI technology and its application in sigillographic studies, see Franz Fischer and Stephan Makowski. 2017. *Digitalisierung von Siegeln mittels Reflectance Transformation Imaging (RTI)*, Paginae historiae – Sborník Národ-ního archivu, 25/1, p. 137–141, available: <http://kups.ub.uni-koeln.de/id/eprint/7882>.

[13] For example, the rendering after transformation of several kinds of <gap/> tags has been changed.

[14] AthenaRuby is an OpenType and Unicode-compliant font. For documentation, tools, and selected bibliography visit: <https://www.doaks.org/resources/athena-ruby>.

[15] See <https://github.com/EpiDoc/EFES/wiki> for the technical documentation and <https://github.com/EpiDoc/EFES/wiki/User-Guide> for detailed guidelines and user guide.

[16] See <https://github.com/kcl-ddh/kiln> for the documentation.

SigiDoc users will be able to potentially index every feature deemed relevant for their corpus: the previous listing of indexed features — featuring the most common indices in Byzantine sigillographic publications — is what the authors recommend to all future SigiDoc projects in order to harmonise their indices. Nonetheless, a higher degree of specialisation will be enabled: for example, thanks to the consistent use of AthenaRuby, it will be possible to index — and, ultimately, to search for — single variant letters within the legend.

The using made by SigiDoc of EFES is essentially based on the customisation of the solutions offered by it: this is especially true for the use of Athena Ruby instead of generic Greek capital letters in the diplomatic edition; the XSLT stylesheet organising the webpage, in order to create a list of fields appropriate for Byzantine sigillography; the EpiDoc stylesheets used for the edition of the legends; and, of course, the customisation of the indices and the search interface.

During the next months some improvements related to EFES — mainly concerning further indexing features and automatic bibliographic references — will be delivered.

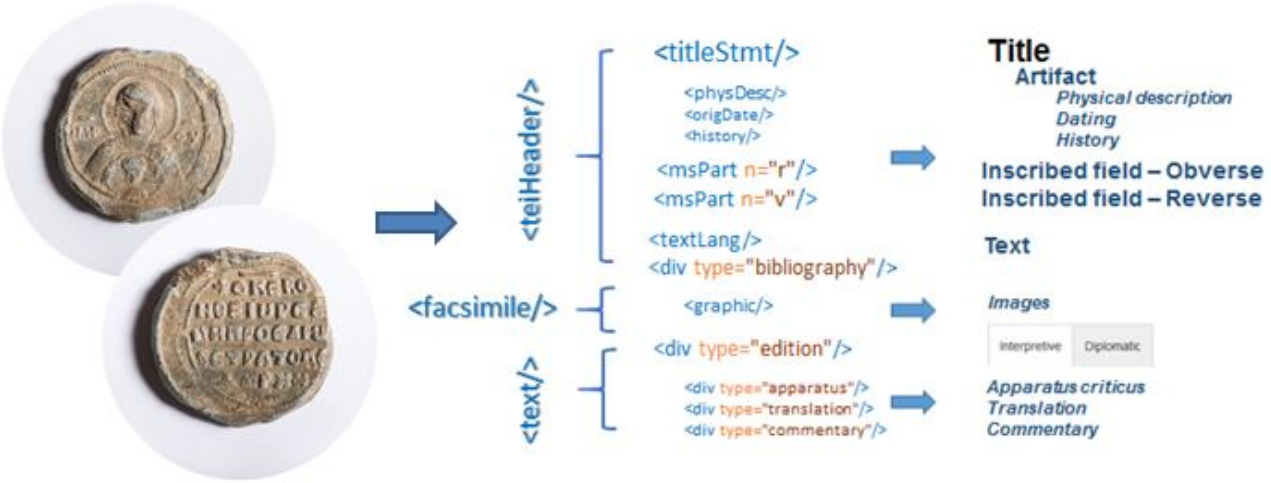

Figure 1. From the seal (left) to the EFES-generated webpage (right), through the SigiDoc XML template (middle).

Conclusions

Digital Byzantine sigillography is an entirely new discipline: SigiDoc has therefore been designed for users with no prior computer skills but with a background in Byzantine sigillography or Byzantine history at large. SigiDoc's aim is to deliver a (reasonably) easy and ready-to-use tool, with a template ready to be filled in according to the need of each project; but this also means that a more advanced user will be able to go further and customise it to a larger extent.

The visibility and availability of data coming from an increasingly number of seals, jointly with the possibility of establishing relations among them, will push further our knowledge of several aspects of Byzantine history, allowing the specialists to carry out analysis in several directions (i.e. the structure of Byzantine society and the relations among individuals and families, the organisation of the administration, the role of personal piety in the choice of the iconography, art history, but also sigillographic epigraphy or lettering, the "writing uses", the Greek language, etc., including the evolution of all these aspects throughout the centuries).

Albeit most of these research directions (and many others) already existed before SigiDoc, thanks to it their analysis will be greatly enhanced, in a way and to an extent extremely difficult to reach without this tool.

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