**OPTIMIZING THE NATIONAL ASSOCIATION OF INSURANCE COMMISSIONERS’ SYSTEM FOR ELECTRONIC RATE AND FORMS FILING THROUGH THE IMPLEMENTATION OF COMPUTABLE CONTRACTS CONCEPTS AND ARTIFICIAL INTELLIGENCE TECHNOLOGIES**

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The National Association of Insurance Commissioners (NAIC) occupies a central position in the regulation of insurance in the United States, where, the regulation of insurance remains largely a matter of state authority, with each state setting its own rules and agenda. In all of this diversity of regulation, NAIC provides a number of coordination functions among the various states. One of its most prominent services is the System for Electronic Rate and Forms Filing (SERFF). This platform provides a centralized filing spot for insurance company products, rates and contracts. A SERFF filing can be directed by the insurer to a selection of regulators through a single process, without the need to file separately on a state-by-state basis.

The SERFF system is currently undergoing a much-needed updating. While representing a needed upgrade, this new system will still be limited by its reliance on traditional natural language documents submitted via PDF. If it went a step further, embracing computable contracts concepts and artificial intelligence technologies together as underlying technology enablers, NAIC would radically improve existing uses of SERFF, enable other constituencies to use and benefit from the system, accelerate regulatory oversight, provide insurers with robust analytics about existing and potential markets, and set the stage for the eventual implementation of a fully computable contract filing regime.

NAIC defines SERFF as a “smart internet application” that is “designed to enable companies to send and states to receive, comment on, and approve or reject insurance industry rate and form filings.”[[1]](#footnote-2) In its current update, NAIC is modifying the 23-year-old rate filing system to take advantage of numerous developments in the areas of document management, document workflow, and text processing.[[2]](#footnote-3) Once completed, the current modification to SERFF will make the system ripe for a subsequent modification – implementing computable contracts concepts and artificial intelligence technologies. Innovations in the fields of computable contracts and artificial intelligence technologies are already being considered in other regulated fields.[[3]](#footnote-4) The benefit of adding these technologies to SERFF, after the current upgrade is completed, will broaden its uses and constituencies while increasing the speed and accuracy of regulatory review.

Currently, insurers and regulators are the constituencies for SERFF, which is administered by NAIC. NAIC exists, in large part, to protect insurance consumers. According to its website, NAIC “provides expertise, data, and analysis for insurance commissioners to effectively regulate the insurance industry and protect consumers.” The goal of SERFF, according to NAIC, “is to provide a cost-effective method for the handling of insurance policy rate and form filings between regulators and insurance companies.”[[4]](#footnote-5) The modifications to SERFF advocated for by this paper would allow NAIC to both protect and empower insurance consumers and brokers by creating a more transparent and usable SERFF. Insurers would also benefit by obtaining information about the insurance marketplace.

NAIC’s current SERFF changes aim to improve its speed and functionality for its primary users, insurers and regulators. The goal of the project is, according to NAIC’s website, to improve operational efficiency, regulatory consistency, reduce product review complexity, and provide more features for users.[[5]](#footnote-6) NAIC believes the benefits of the project include modernization of document management and workflow. Ultimately, NAIC hopes to indirectly benefit insurance consumers by adding efficiencies to its rate and form filing system. However, adding computable contracts technologies to SERFF would directly benefit insurance consumers, as well as insurers, and encourage the entire filing process to move towards a more fully automated computable contract model.

Insurance forms, such as those filed with NAIC through the SERFF system, are contracts. They are legally enforceable promises made by an insurer to make payments based upon the occurrence of a condition in consideration of the payment of premiums by the insurance consumer. Insurance forms are amenable to computable contracts by programing the definition of events that trigger coverage, testing coverage against exclusions set forth in the form, and establishing a set of if-then-else rules to delineate the consequences of the triggering event. Moreover, insurance forms filed with SERFF contain data that is valuable to insurers, NAIC, consumers and brokers.

A computable contract is a contract that is intelligible to both humans and computers.[[6]](#footnote-7) The term “computable contract” was first used and discussed by Harry Surden, who envisioned using computing technology to produce a contract that is “able to be automatically generated by rules-based processes.”[[7]](#footnote-8) Ideally automated computable contracts “envision expressing the rights duties, and processes defined in a contract directly in machine-executable code.”[[8]](#footnote-9) They are contracts that are “partially or entirely expressed in some form of formal specification or high-level programming language, assisted with user-friendly interfacing.”[[9]](#footnote-10) While drafting a contract in computer code as opposed to natural language may seem to be a radical departure from current practice, it is not. Indeed, well written natural language contracts “already display a high level of structured thinking” that is not dissimilar to machine-executable code.[[10]](#footnote-11)

The following is a partial list of the benefits of SERFF supporting, if not requiring, computable contracts as the submission format for SERFF. Such a step would:

1. Enable regulators, insurers, brokers, and consumers to compare and contrast policies from various insurers for a given line of business.
2. Enable regulators, insurers, brokers, and consumers to determine if a given type of coverage is offered in a given jurisdiction or jurisdictions.
3. Enable regulators to use premiums and claims data from a given company and correspond that to the coverage, endorsements, custom values, and exclusions the company used in the myriad of combinations of those elements in policies actually purchased. This will enable regulators to better understand what various customers actually have in their policies and how that related to individual outcomes in an analytical way.
4. Enable comparison of results from above items across companies as well.

The limited meta-data in submissions under the NAIC proposed updates cannot support the above solutions. That system will accept submissions of PDFs for forms that are electronically filed by insurers. PDFs, even those that have been OCRed (optical character recognition), contain no meta data related to legal and insurance specific aspects that are necessary to enable the above solutions. Such OCRed PDFs provide no way to relate the parts to the whole within a given policy and no way to relate parts of one policy with another in a reliable and systematic way. While there will be some data values set at the time of upload, these are fields set manually by the person uploading the forms, and the values are simple tags related to the entire policy as a whole with no data tied to the key parts of a policy like the list of coverages, endorsements, custom values, or the list of exclusion, etc. All of the listed benefits, and others, become easy to implement if SERFF were to adopt computable contracts as the submission type required for forms that insurers electronically file because these computable contracts are inherently structured data that has meta data related to the various parts of one policy to its other parts and the whole. The approach also permits relating the corresponding parts and the entire policy from one company to those of another. Further, leading insurance companies already have initiatives to create structured data for all policy forms and their component parts. So NAIC should really be working to create a system to get the benefit the innovative participants who are already utilizing computable contact technologies.

The solutions above, enabled by computable contracts, might best be illustrated by a few specific examples. Consider a traveler who recently landed an airport and is offered the option to purchase additional insurance for a car rental. Under NAIC’s proposed updates to SERFF, the traveler would almost certainly be unable to make a meaningful comparison of the policies. If SERFF used computable contracts, on the other hand, NAIC and/or others offering analytic tools could easily enable the comparison of coverages. NAIC’s primary purposes, as articulated in their Articles of Incorporation, includes “[p]rotect[ing] the public interest, promot[ing] competitive markets and facilitat[ing] the fair and equitable treatment of insurance consumers; and [p]romot[ing], in the public interest, the reliability, solvency and financial solidity of insurance institutions.” Therefore, NAIC could better achieve its purpose by the use of computable contracts, which would “provide its user with an overview of their current policies and needs, with an analysis of overlap and gaps.”[[11]](#footnote-12) Moreover, computable contracts “can help a user compare available insurance products and craft a portfolio of insurance products that meets his needs at minimal cost.”[[12]](#footnote-13)

In a separate example corresponding to item 2 above, a nonprofit’s insurance has been nonrenewed. The policy it had was a package that included liability for the difficult risk that a foster family agency faces, property coverage for their tangible property, and auto physical damage. Their broker informs the nonprofit that no admitted carrier will offer such a package because insurers are reticent to take on foster care liability. Presently, and even with the proposed updates to SERFF, there is no way for the nonprofit, or its broker, to search for and identify appropriate and available coverage in their state. Utilizing computable contracts in SERFF, however, would enable NAIC to assist insureds and brokers in identifying replacement coverage, or the absence thereof.

An intermediate step, between natural language contacts and computable contracts exists that could be used as an interim solution or that could be used during the ingestion of the policy documents to implement a system that is strictly computable contracts.

Artificial intelligence technologies that sit on top of natural language contracts can bring powerful computational tools to better understand, at speed, the data situated in these natural language contracts. Natural language processing and machine learning can be employed to mine contracts, or a group of contracts, for valuable data that can then be fashioned and analyzed in a myriad of useful ways.[[13]](#footnote-14) Indeed, “contract analytics”, which uses “Artificial Intelligence based approaches are currently being deployed to help speed up the process of search for, retrieving and analyzing information from large bodies of text-based contracts.”[[14]](#footnote-15) While using artificial intelligence tools on top of natural language contracts may not confer the full benefits of an automated computable contract, this approach does offer improvements in contracting process.[[15]](#footnote-16) Moreover, the benefits of using artificial intelligence technologies would highlight the increased benefits of a fully computable contract filing regime.

Building artificial intelligence technologies into SERFF is feasible. While, ideally, insurers would file fully automated computable contracts with SERFF and many insurers are already implementing computable contracts for their own purposes, few insurers are fully converted to computable contracts. So, while many could start filing computable contracts today if SERFF supported it, currently, insurers file natural language contracts and/or forms with NAIC as that is all that is supported and the present NAIC update will also not support computable contracts as a submission format. Modifying SERFF to apply artificial intelligence technologies to the natural language filings of insurers would be a significant step towards a fully computable contract model while also adding significant value to the SERFF system. More importantly, artificial intelligence will radically reduce the person hours needed to create computable contracts from natural language contracts that all insurance companies maintain today as the embodiment of their products.

Insurers and regulators would benefit from the use of artificial intelligence technologies in SERFF. Regulatory efficiency would be vastly increased by the use of these technologies in SERFF because it would allow for increased automation in the review and analysis of rates and forms. “[Artificial Intelligence] tools can be applied to automate regulatory process such as administrative work, dossier filing, data extraction, auditing, the implementation of regulations, and quality management.”[[16]](#footnote-17) Automation of the regulatory process through the use of artificial intelligence would add alacrity and accuracy to the system by allowing for the computational comparison of proposed forms to existing regulations. The results of the automated review of filings could then be quickly communicated to insurers and regulators allowing for prompt regulatory decisions and increased speed to market of insurance products.

Employing artificial intelligence technologies in the SERFF filing system would also benefit consumers and insurance brokers. As it is currently designed, and even after the ongoing modification is complete, the SERFF system offers little direct benefit to insurance consumers. In its current state, SERFF allows consumers to search filed forms with very limited and rudimentary search capabilities. Given NAIC’s expressed goals for the ongoing modification[[17]](#footnote-18), it cannot be presumed that search capabilities and functionality will be significantly improved by the current modification project. Indeed, even the possibility of increased search functionality is inherently limited without translating natural language filings through the use of natural language processing because human composed search queries invariably result in false positives and false negatives far in excess of the errors of today’s state of the art AI systems. Therefore, adding these technologies will allow insurance consumers and brokers to see what forms have been filed and approved by their state’s commissioners. Moreover, it would allow insurance consumers and brokers to easily compare rates and coverages. Rather than requiring the consumer or broker to review entire portions or forms, specific policy language could be searched, compared, and reviewed across multiple offerings.

While computable contracting in its more complete form has not yet been embraced by all insurance companies, some pioneers are leading with deployed systems. A wider adoption can be anticipated over the next few years. Implementing these computable contracting concepts into SERFF, together with the use of artificial intelligence to facilitate such an implementation would allow insurers and regulators to provide all the benefits listed in the section above on computable contracts in a way that is economically feasible initially, and actually cheaper and better once the initial ingestion of contacts and support for AI is complete.

Currently, SERFF focuses on accepting filings for review and approval.[[18]](#footnote-19) The ongoing SERFF modification does not, in any material way, seek to add additional functionality.[[19]](#footnote-20) NAIC is building a better filing system. However, bringing computable contract ideals and artificial intelligence technologies to SERFF would allow consumers to see pricing information and what insurance products are being sold in a given location. This takes the benefits beyond comparing coverages, and would allow all constituencies -- NAIC, state regulators, insurance brokers, consumer groups and/or insurers themselves -- to implement more authoritative price comparison tools and analysis related to consumer value and availability. Obviously, this would significantly benefit insurance consumers and brokers by presenting them with real time analytics regarding the availability and pricing of insurance products.

Some of these benefits would result from the use of differential privacy and homomorphic encryption on top of the computable contracts system by leveraging more details about actual policies issues and consumer specifics. Details about such benefits and implementing them is ripe for the subject of a future article. But in short differential privacy would allow data from all consumers getting a given coverage type to be shared without revealing any more information about the consumers than was known before the data was collected, and at the same time allow the analysis of trends and value delivered to consumers across large numbers of consumers, by regulators, brokers, and consumers. Homomorphic encryption would allow regulators, brokers, consumers, and insurers to get coverage, value delivered, and details regarding fair treatment of individual consumers, without any specific individual consumer data being provided in an unencrypted form. Both of these use cases would be enabled by computable contracts and in fact both differential privacy and homomorphic encryption can be bolted on with very little integration work once a SERFF system with computable contracts was in place.

Finally, the use of computable contracting technologies would benefit consumers, brokers, and insurers by providing insurers with increased market feedback regarding their existing products and help them better appreciate the needs of their consumers and brokers. Under the proposals advocated for in this paper, NAIC could provide insurers with information regarding the search and comparisons made in SERFF by consumers and brokers. This would allow the development of specialized and bespoke insurance products that would better reflect the needs of the market. Moreover, it would allow insurers to make informed decisions regarding the expansion or contraction in existing markets and the development of new markets and products.

 **Conclusions.** NAIC is in the process of improving SERFF in a way that will directly benefit regulators and insurers. However, adding computable contracting concepts and artificial intelligence technologies to SERFF would vastly expand its functionality and constituency, while setting into motion the process of a fully automated computable contract filing regime. Such an addition would speed up and increase accuracy in the regulatory process. Moreover, computable contract technologies would benefit insurance consumers and brokers by allowing for increased search functionality and reducing the complexity of form language and rate comparisons. It would also allow consumers, brokers, and insurers to better understand the offerings and requirements of the existing insurance marketplace. This in turn would allow insurers to be more responsive to the marketplace.

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