

## Supporting the Legal Practitioner: LKBS or Web?<sup>1</sup>

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**ABSTRACT** *The legal practitioner is a knowledge worker. Two distinct technologies may be of assistance to this type of professional: legal knowledge-based system technology and Internet World Wide Web technology. In this paper we investigate the relation between legal knowledge-based systems and the Internet. Legal knowledge-based systems have long been surrounded by much optimism, but despite the efforts over the last 20 years, the number of practical applications actually in use is still small. On the other hand, the WWW technology, which in a practical form has been around for only a few years, is gaining momentum and is expected to have a serious impact on many fields of society, including the legal domain. We look at both technologies and try to answer the question of where the future of both technologies lies.*

### Computer support for the legal domain

Modern professional life without computers is almost unthinkable. With the help of computers and computer networks we are now able to acquire, store, retrieve, process, transport and present information which may be useful for all kinds of decision-making. The value of computers as decision-support systems is now acknowledged in many domains and many persons in very different professions use decision-support systems.

The potential of computers has also gained attention in the legal domain. Legal professionals like lawyers, legal scholars and solicitors are aware that computers cannot only serve as word-processors, but may also support legal problem-solving. Legal problem-solving spans a broad spectrum of tasks, ranging from adjudication in Social Welfare (DHSS), resolving civil disputes between parties, to devising the best defence for a suspect in a criminal case. In all cases law has to be applied to the facts, and *finding* both the facts and the law may be supported by computers. But also the *application* of Law to the facts may be assisted by computers.

With respect to this possibility of assistance to legal professionals in legal problem-solving, two different developments can be noted.

On the one hand, for well over 20 years now, research on Legal Knowledge-Based Systems (LKBS) has taken place. One of the driving forces behind LKBS research is the idea of providing legal professionals with adequate information and knowledge to solve problems. Researchers not only try to gain a more fundamental insight into legal reasoning, but they also attempt to develop practical decision-support systems. The success of this applied research, measured in terms of the extent to which applications have been implemented, is

fairly limited. Only a few systems have found their way to the desk of the legal professional and even fewer have acquired a permanent position.

On the other hand, we see a rapid development of telecommunication via computers. The Internet (or the Net) is receiving more and more attention in society. Admittedly, the attention given to the Net in the media by far exceeds the usefulness of the Web at present. Many legal professionals are already showing interest in the Net. And despite the fact that the Net in its current form has only been around for about 4 years, it is already clear that it will only be a matter of a few years before the use of the Net by legal professionals will be standard practice.

In this paper we will look into these two technologies and assess the strengths and weaknesses of both for the legal practitioner. We will account for the relative 'failure' of LKBS research and we will show the potential of WWW technology. To set the stage we begin with a short discussion of both technologies. Then, in the third section, we compare them on a number of dimensions relevant to this discussion. In the fourth section we will give some recommendations concerning the road to follow for LKBS researchers and to others working in the domain of legal information systems. And finally, we end with a conclusion and a number of questions for further research.

### **LKBS and the Web: an overview**

The two technologies we discuss in this paper, legal knowledge-based systems on the one hand and WWW technology on the other, are relatively new. In order to make a comparison possible we will first discuss both of them and see how they have developed.

#### *Legal Knowledge-Based Systems*

Artificial Intelligence (AI) tries to frame intelligent reasoning in computers and to make 'intelligent' computer programs. Very early it was recognized that intelligent performance of both humans and computers requires a great deal of factual knowledge. This means that the development of systems that demonstrate a general (artificial) intelligence would be practically impossible, for they would require enormous knowledge bases. It was thus recognized that AI research should aim at developing more specific systems, confined to domains with limited zones of knowledge. Limitation to a domain reduces the amount of knowledge to be incorporated, which makes it possible to aim for systems which can make expert-like decisions in that domain.

These 'expert systems', as they were soon called, are computer programs which are concerned with knowledge domains of limited size. The early results in expert systems such as MYCIN (Buchanan & Shortliffe, 1984) and PROSPECTOR (Hayes-Roth, 1987, p. 287) proved that this idea was very promising. It was believed that expert systems had a glorious future and that they would be of help in many domains.

The advances in AI were also expected to produce results in the field of law (Buchanan & Headrick, 1970). It was thought that the formal nature of many legal domains would make them very suitable for representation in expert systems. High hopes were expressed about the possibilities of computer programs that could perform tasks that until then could only be fulfilled by legal

experts. Research focused on capturing legal reasoning in computer systems and on finding suitable ways of representing legal knowledge.

This research into legal expert systems led to several prototype systems, of which the most well-known examples are: The rule-based model of the British Nationality Act (Sergot, 1988), TAXMAN (McCarty, 1980) and LEGOL (Stamper, 1980). These systems were initially research systems and not full-grown commercial applications. After this first wave, a new generation of legal expert systems followed. Well-known projects of this second generation are: the Alvey Demonstrator Project (Bench-Capon, 1991), JURICAS (de Mulder, 1984; van Noordwijk & Stubbe, 1986), PROLEX (van den Berg *et al.*, 1987) and TESSEC (Nieuwenhuis, 1989).

Although these new systems also started as research projects, the potential for application in actual legal practice was soon discovered. Implementation of these expert systems in the real world became part of the research. Some of them actually came into service. Unfortunately, they ultimately failed. Although all systems showed the practical possibilities AI and Law had to offer and were received with some enthusiasm by the public, the research community criticized them. It was said that these systems were 'not really intelligent' and could not solve the problems legal professionals were really interested in, like the so-called hard cases.<sup>2</sup> The systems also lacked fundamental aspects of real legal knowledge, such as being capable of handling the open texture of legal concepts and the means to perform defeasible reasoning, which is also fundamental in law. It must be noted here that for domains in which routine decisions (like Social Welfare adjudication) prevail these systems were, and still are, useful to relieve the burden of adjudication.

After the phase of these first legal expert systems, the research into AI and Law diversified. The developments are best noticed when browsing through the proceedings of the International Conference on Artificial Intelligence and Law of 1991 (38 papers) and 1995 (35 papers).<sup>3</sup>

Firstly, we notice a decline in papers about practical systems in the observed period (25 in 1991, 14 in 1995). Secondly, the amount of fundamental research into logics underlying legal reasoning is increasing (5 papers in 1991, 11 in 1995). Topics included in this type of research are: deontic logics, non-monotonic logics, dialectical logics, etc. Thirdly, we see a growing interest in more advanced knowledge representation schemes and more advanced methods of retrieval of legal knowledge. The number of papers about conceptual representation schemes grew from 4 papers in 1991 to 7 papers in 1995. An interesting instance of the early research is Dick (1991). Finally, we see a growing attention for automated analysis of legal sources. Under this type of research we may classify statistical analysis of legal text material (Sweighofer *et al.*, 1995) and the developments in neural networks (Opdorp *et al.*, 1991).

Much of the current research is no longer directly aimed at the development of practical systems, but at gathering theoretical insights into the possibility of modelling legal knowledge and legal reasoning. It seems as if the AI-and-Law community has recognized that making real intelligent systems is very difficult and (possibly) not rewarding enough.

### *WWW technology*

In the last few decades we have seen a development from Mainframes to Personal Computers. The introduction of computers in daily work commenced

with (dumb) terminals connected to the company Mainframe. At the end of the 1980s these mainframes and terminals were largely replaced by personal computers at people's desktops. Personal computers in the office are being integrated in local-area networks to share documents and services. And lately these LANs are integrated or replaced by wide-area networks, like the Internet. In a sense this last development resembles the terminal-mainframe situation, but with notable differences as we will see.

The emerging large-scale networks are considered so important that people now talk of the Information Superhighway as the panacea for almost all problems. This is, of course, not realistic, and we will focus on the dirt-track known as the Internet in the next part of the discussion. We will look at the general development of communication via the Net and at the meaning of this development for the legal professional.

Until about 1993, the Internet consisted only of a large number of interconnected computers, mainly at universities and research institutes. The Internet was mainly used for e-mail between researchers and for the exchange of files between institutions. Although there was much information available on the Net, it required some zen of Internet to find it. The programs with which Internet could be accessed were difficult to understand and access to information sources on the Net required at least a basic understanding of the operation of mainframes and minis.

The development of the World Wide Web (WWW, or the Web) marks a change in this situation. The Web offers a way to make documents available on the Net in a standardized form, so that they can be accessed with the help of a 'Web browser' (e.g. EXPLORER and NETSCAPE) which are available for all current types of operating systems and which are easy to use.

Underlying the Web technology are two simple concepts: a document format (HTML) and hyperlinks (HTTP). HTML (HyperText Markup Language) is a simple text markup language which allows for the formatting of documents. It tells the browser what to do with certain parts of a document, such as display this sentence in a larger typeface, or this embedded file is a movie clip. The browser takes care of all processing of the document. The server supplies the raw data. Hyperlinks allow the provider to define 'hot spots' in a document which in turn allow the user to jump from one document (which may be on any computer on the Net) to another document (which may be on any other computer on the Net), just by clicking on that 'hot spot' with the mouse. This enables creators of Web pages (as WWW documents are commonly called) to create information webs.<sup>4</sup>

The availability of (free) Web browsers, the simplicity of the markup language and the possibility of adding images, sounds and movies to pages, are the most important factors that account for the success of the Web. The growth in number of information providers is enormous and so is the growth of Internet users. The Web has developed from almost nothing to a huge system containing millions of documents in only 2 years.<sup>5</sup> The number of Internet users doubles every few months.

Web technology, as we will call the mechanisms underlying the World Wide Web, is important for several reasons. The infrastructure for information exchange is already available to both provider and consumer of information services. The user connects to a service provider (the Internet on-ramp) and from that moment on has access to everything on Internet. There is no need to connect

(by modem or other means) to the individual content providers, nor is there a need to install and configure the software for different services. Once the browser and its plug-in modules work, the user can concentrate on the information quest.

The content provider also benefits from the infrastructure. Providing access to information requires the installation of a Web server software and HTML documents and possibly extensions to the server software to perform tasks like search in a database. The actual access to the provided information services runs via the Internet. This means that the content provider does not need to worry about how to give his clients access to his services. The infrastructure is already there.

The HTTP and HTML protocol enable uniformity in services and applications. A few programmes (most importantly the browser) give access to an enormous amount of distinct services, just like a word processor can be used for many documents. The front end to the service is a standard piece of software, relieving the burden to develop these front ends for each service.

*The Web and the legal professional.* It is clear that the Web shows an interesting development for the legal professional. The legal practitioner needs (legal) information to make adequate decisions. On the one hand, this means that general knowledge of the legal field (which can be acquired through vocational and on the job training) is needed. On the other hand, it means that specific and up-to-date information with respect to the legal questions at hand is needed, in particular concerning statute law in force in a certain domain and the developments in case law.

Until now, this information had to be collected in large local libraries and through subscription to juridical handbooks. Electronic legal databases such as Westlaw and Lexis in the US and Nlex, Kluwer Juridische Databank and PARAC in The Netherlands, have only played a minor role in reducing this need for paper-based documents. Reasons for the limited role that on-line databases hitherto have played in the Netherlands are, for instance, computer illiteracy among jurists, the difficulties in gaining access to databases by modem, the slow data rates over telephone lines and the pricing of the services.<sup>6</sup>

The potential for electronic media to play a more significant role for the legal practitioner increases through the developments on the Web. Technical barriers to the use of on-line databases are cleared by the Internet providers. Owing to the use of word-processors much source material is available in electronic form nowadays, which makes it easier to publish it electronically, especially since publishers are making a transition to storing source material in SGML format, which can be transformed into other formats relatively easily. From the perspective of the user, the Web offers possibilities to search for legal information all over the world, thereby reducing the need for maintaining private libraries and handbooks.

Although at this moment the amount of legal information on the Net is still rather limited,<sup>7</sup> both government agencies and publishers are starting to publish (legal) information on the Internet. One of the best examples in the Netherlands is the OpMaat service provided by the SDU (the Dutch Stationary Office) since September 1994. This system allows users to retrieve all official publications of the Dutch Government (Statutes, proceedings of parliament, etc.). OpMaat operates by means of interest profiles, thereby alleviating the need to enter

search queries,<sup>8</sup> and presents the documents in Portable Document Format (PDF), which are ready to print.

### LKBS and Web technology compared

LKBS and Web technology are both potentially useful for the legal professional. From the discussion above it is clear that there are significant differences in what they have to offer. We will compare them on four relevant dimensions:

- the type of support to the user,
- the overall benefit for the user (intended and realized),
- the practice of system development,
- the relationship (appeal) to the user.

#### *Type of support to the user*

In comparing LKBS and the Net in the context of their contributions as decision-support systems for the legal professional, the first distinction that can be made is on the type of support the technologies offer. We identify four different types of support:

1. Computers and networks may play a role in the *communication* between people. Networks enable communication between individuals or groups of people without the need for simultaneous presence of sender(s) and receiver(s). While this in itself is not new (think of ordinary mail), the speed, low cost and the fact that transferred information usually remains in editable form (in contrast to, e.g. faxes) is relatively new.
2. Both the Web and LKBS provide means for *storing* information and knowledge. On the Web this is generally done in the form of documents and databases. In LKBS this may also be done in the form of different knowledge representation formalisms. Both types of technology also provide possibilities to *retrieve* stored information. The Web technology focuses on the search for information which is distributed over many systems. LKBS research is directed at intelligent searching and matching on a local knowledge base with a known structure.
3. *Structuring and formalizing* available information can support human decision-making. Computer tools can be of assistance in this task. Especially in LKBS this is a topic of research. Examples along this line are the norm frames as developed in van Kralingen (1995) for the analysis of norms, Reason-Based Logic (Leenes *et al.*, 1995) for analysing legal dialogues and the EXPERTISZE project (Kordelaar, 1993), which focuses on the analysis of legislation. On the Web we now see a growing need to structure information, because otherwise it will be an information soup in which no-one can find their way. Projects are being developed to structure large amounts of information with the use of Thesauri (e.g. the mentioned OpMaat system).
4. LKBS research and especially the research into legal expert systems has focused on *providing reasoned advice*. The experts system, instead of the human, is supposed to do the legal problem-solving. Web technology merely

**Table 1.** Focus of LKBS and Web on types of support for the user

	Communicate	Store and retrieve	Organize	Reason
The Web	++	++	+	-
LKBS	+	+	+	+

offers information with which human problem-solvers have to do the problem-solving themselves.

Table 1 shows the different types of support and the suitability of both LKBS and the Net to deliver this support. The Net is particularly suitable for communication support and for storing and retrieving information. LKBS research has always focused on automated reasoning and although it did not succeed too well in this aim (hence only one '+') it is also considered to have virtues for the other three types of support.

*The overall benefit for the user (intended and realized)*

The intended benefits for the user of both types of systems differs considerably. LKBS research has aimed primarily at developing systems capable of reasoning and it has done so in an ambitious manner. The notions of 'Artificial Intelligence' and 'Expert Systems' convey the idea of developing systems which can reason as well as human experts, or even better. However, the idea that LKBS can take the place of lawyers and judges has proved far too optimistic. The legal expert systems available today cannot keep up with the promise. The systems generally concern limited and very well-structured domains in which they can deal with routine cases. When a case crosses the boundaries of the domain, or when it proves to be a 'hard case', LKBS do not perform well. The results produced by the expert system in those cases are close to worthless because it is hard to establish the validity of the advice.

The Web, on the other hand, only raises only expectations about communication and available information. It offers information, which the user has to interpret and apply themselves. At this time the amount of valuable legal information on the Web is fairly limited. But there are some worthwhile services available now [OpMaat, ADW (statutory provisions with annotations and comments in the Netherlands)] and more will be available in the very near future. The Web will be an information source for legal professionals. The danger that raised expectations will not be met is rather small. If the user does not find the information (s)he is looking for, (s)he has to look somewhere else, or has to settle for something else. Browsing the Web in this respect resembles searching for a book in a library. You know you may not always find what you are looking for, but as long as there is a fair amount of useful information you will come back.

*Development and maintenance*

The development and maintenance of LKBS systems and Web technology systems is quite different. This relates to one major difference between the

technologies, namely in the level of coding needed to incorporate knowledge and information in the system.

A statement that holds for both LKBS and the Web is that information and knowledge to be incorporated in the system must be available in a form understandable by the system and compatible with the type of operations the system is supposed to perform. This means that the developer of a legal information system has to translate legal knowledge from its original form (the form in which it is found, e.g. written texts) into the format required by the system.

Especially for the development of rule-based systems (still the major technique for developing practical expert systems), this poses serious problems. Legal sources are not meant to be used mechanically and therefore much has to be added for the computer to be capable of reasoning with this knowledge. Rule-based expert systems typically require a labour-intensive coding of knowledge, which has to be performed by a coding specialist or 'knowledge engineer'. Since during the process many arbitrary design decisions have to be made, it is difficult to have a team of knowledge engineers working on an LKBS. It should be acknowledged that other LKBS techniques like neural networks and case-based reasoning systems are less affected by the problem of coding (in both instances simpler levels of manual coding suffice). The research into automated analysis of legal texts also holds a promise here.

Web technology does not aim at reasoning with the knowledge; it serves as a large distributed library. Because of this more limited aim, knowledge and information on the Web can be more loosely related, and relatively simple coding schemes suffice. For the HTML tagging scheme, this coding can even be done automatically by computers. As mentioned before, it is relatively easy for a publisher to use the same source for both printed and electronic versions of publications. The simple coding requirements and the low consistency requirements provide the Net with four major advantages:

- the Net can develop incrementally (new knowledge can be added easily);
- almost everyone can add knowledge to the Net;
- adding knowledge to the Net is relatively inexpensive;
- the process of adding knowledge to the Net is fast, meaning that the system can be kept up-to-date.<sup>9</sup>

#### *The additional incentives to adopt the technology*

The final dimension we compare the technologies on is partly associated with the differences described above. It concerns the additional incentives for the user and the developer to adopt the technology. These additional incentives differ on two dimensions: investment and appeal.

In the first place, investment in LKBS is still a matter of investing in single applications. This means that the practitioner who deals with several legal specialities has to invest in several separate systems with cost for training and maintenance for each. The Web, on the other hand, is a one time investment in software. After gaining access to the Internet one only has to register separately for commercial services.

Another advantage of Web technology is that it serves many information needs, not only legal needs. The browser can be used for all sorts of information

**Table 2.** Characteristics of Web and LKBS compared

	Keyword	The Web	LKBS
Type of support		Communicate ( + + ) store and retrieve ( + + ) Organize ( + )	Communicate ( + ) Store and retrieve ( + ) Organize ( + ) Reason ( + )
Benefit for the user	Level of support	Providing information about all sorts of legal questions	Intelligent assistance in simple cases in a strictly limited domain
Development	Coding	Simple, fast	Difficult, slow
	Development team	Multiple providers supplying one system	Individuals or small groups making separate systems
	Development	Bottom up	Top down
Incentive to adopt	Investment	One time only decision	Separate investment decisions
	Sexiness	Multimedia Global communication	Text and numbers Local PC

retrieval, be it weather services, investment services or just plain game-playing. Web technology can also be used within the office, the same way it is used on the Internet. This use of Web technology is called Intranet. Memos, documents, legal briefs, links to material on the WWW and the like can all be placed on an internal Web server and accessed by the universal Web browser.

Finally, the Web is more appealing. In LKBS the interaction with the user is mainly text-based: the user types in information and sees the responses of the system on his monitor. The Web, however, combines pictures, sounds, movies, text and thus can be used to present information in an attractive form. Moreover, the user may discover the world by travelling the virtual world which the Web actually is. Although one might say that in the legal domain content comes first, we believe that this appeal can certainly influence a decision to invest in technology.

The comparison of the two technologies can be summarized as shown in Table 2.

### The future

In the preceding section we have compared LKBS and the Net with respect to their practical meaning for legal decision-support. This comparison has led to several insights, based on which we can now formulate some recommendations for the Law and computers community.

First, in our opinion, the legal expert systems of the first generations were not really failures in a technical sense, but they were made failures both by the hyped expectations (really intelligent systems) and the unreal ambitions of the LKBS research community. Both researchers and potential users of LKBS products should be more aware of this and should learn that convincing, intelligent systems are far beyond our reach at the moment, and that practical applications

for limited and well-structured domains are already there. While academic researchers may choose to continue using the concepts of 'Expert Systems' and 'Artificial Intelligence' as a description of their ultimate goals, developers of practical systems probably should refrain from these terms altogether and rather use a less ambitious expression like 'juridical software'.

Second, although fundamental research in AI and Law should still focus on developing coding techniques needed for real legal reasoning, applied LKBS research should aim at developing coding schemes which are practical. Coding schemes that are somewhere between the intricate coding techniques used in LKBS of today and the perhaps too simple and too general technique of HTML tagging are necessary for building larger systems. New coding techniques should reduce the need for special coding experts (because there will always be too few of them) and allow more people to work together on a single project. Only if we find such coding techniques will it be possible to improve systems that can be kept up-to-date.

Third, we should strive for an integration of LKBS and Web technology. One first step may be to use the Net as a carrier for LKBS. Not only is it possible to spread LKBS products via the Net, it is also possible to construct systems that can be accessed over the Net. Using Java in combination with all the other possibilities of current browsers, makes it possible to create very effective front ends for such systems. Anyone with a browser can have access to useful expert systems. Integration can go even further; as Soper & Bench-Capon (1992) have pointed out, expert system technology can be enhanced with hypertext and hypermedia techniques, which now form the basis of HTML and the popular WWW browsers. Lenk (1990) describes systems in which a computer can service the user with normal information retrieval (as on the Web), LKBS and on-line connections with legal professionals in some distant back-office.

Finally, the Net is becoming an important source of legal knowledge. LKBS researchers should investigate the possibilities of using this source in their system development. Especially relevant in this respect is the possibility of (semi-) automated acquisition of legal knowledge for knowledge-based systems. As more data become available on the Net, it becomes possible to analyse them with statistical methods. The SALOMON project at CU Leuven goes some way along this line (Moens & Uyttendale, 1995). It may well be that the real future of AI and Law lies in this direction. The results of automatic knowledge extraction from large amounts of data are promising. Although the construction of legal knowledge-based systems capable of performing 'real' legal reasoning is still far beyond our capabilities, we know that one of the main obstacles for this goal is the amount of knowledge needed to do the problem-solving. Until now knowledge representation of large knowledge bases was done by hand. When large amounts of legal information become available on the Web and we succeed in developing (semi-) automated knowledge acquisition, who knows where we will reach.

## **Conclusion**

In this paper we may have suggested that the Web is the tool for all legal problem-solvers, and that we should bury LKBS research. This, of course, is not so. What we suggest is that we should use both technologies for tasks they are good at, and the same goes for the legal practitioner. Computers are highly

capable of performing routine tasks. In legal domains LKBS can be used to perform these routine tasks, as shown by numerous examples. The future in LKBS research, in the short run, lies in finding suitable (simple) domains and tasks to use LKBS on, and not to strive for expert artificial legal reasoners. People, on the other hand, are fairly good at problem-solving; let them solve the more difficult cases. One of the bottlenecks they face is the lack of relevant information. In this respect the Web may be useful. If we see the Web as an enormous library with (intelligent) tools to locate relevant information, then the Web is what a legal practitioner needs. Information can be obtained quickly, cheaply and in editable form.

A problem we have not discussed in this paper is the question of how to locate relevant information. The Web already shows an information explosion, and it gives the user few tools to handle the information overload it presents. This, of course, is where the real challenges lie for (Law and) computer researchers. As Simon (1976) and Silver (1991) argue, an increase in the amount of information available to a decision-maker does not eliminate the information problem. Rather it leads to a shift in needs. Instead of more information, people will want systems which support their selection of information and systems which really support decision-making. LKBS research may provide these systems. And so, as the Web increases the amount of legal information available, it also increases the demand for real Legal Knowledge Based Systems. Systems that can cope with the various types of knowledge and that can reason about the relevance of legal information. This research will keep us busy for quite some time.

## Notes

1. This is an adapted version of 'Large-scale computer networks and the future of legal knowledge-based systems' presented at the Jurix '95 conference.
2. See Hage *et al.* (1994) for an account about the distinction between hard and complex cases.
3. Inventory made by the second author.
4. Hence the name World Wide Web.
5. According to Hobbes' Internet Timeline (<http://info.isoc.org/zakon/Internet/History/HIT.html>) the number of *hosts* on the internet increased from 4 in 1969 to about 1000 in 1984, 100,000 in 1989; 1 million in 1992; 10 million in 1996 and 20 million in 1997.
6. Personal communication with one of the database publishers.
7. The German University of Saarbrücken and the American Cornell Law School, for instance, both maintain pointers to relevant legal material on the Internet.
8. There is, of course, an option to search the complete database.
9. See, for instance, project Hermes (<http://www.law.cornell.edu>), which provides US Supreme Court rulings very soon after they are passed.

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