Modelling Judicial Context in Argumentation Frameworks

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Abstract. Much work using argumentation frameworks treats arguments as entirely abstract, related by a uniform attack relation which always succeeds unless the attacker can itself be defeated. However, this does not seem adequate for legal argumentation. Some proposals have suggested regulating attack relations using preferences or values on arguments and which filter the attack relation, so that, depending on the audience addressed, some attacks fail and so can be removed from the framework. This does not, however, capture a central feature of legal reasoning: how a decision with respect to the same facts and legal reasoning varies as the judicial context varies. Nor does it capture related context dependent features of legal reasoning, such as how an audience can prefer or value an argument, yet be constrained by precedent or authority not to accept it. Nor does it explain how certain types of attack may not be allowed in a particular procedural context. For this reason, evaluation of the status of arguments within a given framework must be allowed to depend not only on the attack relations along with the preference or value of arguments, but also on the nature of the attacks and the context in which they are made. We present a means to represent these features, enabling us to account for a number of factors currently considered to be beyond the remit of formal argumentation frameworks. We give several examples of the use of approach including: appealing a case, overruling a precedent, and rehearing of a case as a civil rather than criminal proceeding.

Introduction

Since their introduction in [2], abstract Argumentation Frameworks (AF) have provided a fruitful tool for the analysis of the acceptability of arguments in a debate, comprising a set of arguments some of which conflict. In [2], arguments are entirely abstract and related only by a uniform attack relation. This attack relation always succeeds: an argument that is attacked can be accepted only if an argument can be found to defeat its attackers. For some applications, however, such as legal argumentation, which will be the focus of this paper, it is useful to allow attacks to fail. Since a court must reach a decision, it requires a rational basis for deciding, for example, between a pair of mutually

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attacking arguments. For this reason, AFs have been enriched to allow attacks to succeed or fail depending on properties of the arguments involved as in preference-based AF (PAF) of [3] or value-based AF (VAF) of [4]. In effect, the success or failure of the attack is *filtered* by these properties so that unsuccessful attacks may be removed, and the results of standard AFs applied.

There has been discussion in the literature of how one can justify the exercise of discretion when a court decides between two potentially acceptable but conflicting arguments. We follow the suggestion of [5] and [6] in saying that the decision is made on the basis for a preference for the value promoted by accepting the chosen argument. Such values may be legal principles, such as a conflict between an argument which is would promote a "bright line" and one which would promote "flexibility", or social principles as when one argument would promote equality and another individual freedom. The relation between values and precedents is elaborated in [7]. Thus in the remainder of the paper we assume that a court will choose which argument to accept relative to the court's ranking over the values which the arguments promote. Thus new decisions both reveal the value ranking of the court, and this ranking is used to determine decisions where precedents are followed.

While VAFs accommodate reasoned choice based on legal principles or social purposes, there are other aspects of legal argumentation, in particular, the notions of *precedent*, *precedence*, and *procedure* as found in *juridical hierarchies* which are not addressed. Precedent here refers to cases which are decided by a court at one point and are subsequently used to guide a decision in another case (upheld) or not (overturned). Precedence refers to the hierarchical relationships between courts; it is reflected in terms of the relationships between legal settings and their effects in determining the decision in a case. Procedure refers to what arguments a court finds *legally* admissible relative to some proof standard. In some contexts, while a court may be sympathetic to an argument, the court cannot accept it because that court is obliged to follow a previous decision (precedent), or a decision made by a superior court (precedence), or an argument may be legally inadmissible relative to the court's proof standard (e.g. civil versus criminal proceedings). The nature of the appeals process means that different courts are able to come to different decisions on the same set of arguments. Given these observations, we can see that the evaluation of the status of arguments within a given framework must be allowed to depend not only on the attack relations, nor only on these together with the intrinsic strength of arguments relative to an audience, but also on the ways in which attacks may succeed or fail relative to the contexts and the relationships among contexts in which the arguments and attacks appear. In this paper we will propose a method for accommodating these features using further extensions to AFs.

A set of cases has previously been represented as an AF in [8] and as a VAF in [9]. A means of rewriting VAFs by adding certain auxiliary arguments so that both the object level arguments and meta-level arguments expressing preferences between values are included in the framework [10]. In this paper we describe and exemplify a general approach to address the contextual issues relating to legal argumentation across juridical contexts.

The approach has several components. Most generally, it is a *static* rather than *dynamic* approach in that we provide a structure for the legal system of courts, which we

model following the description of the system. With respect to this structure, we evaluate claims relative to legal contexts which reflect the values of a legal context revealed in previous decisions along with precedent, precedence, and procedure. As the legal context changes, the outcome changes.

More particular components are:

- We distinguish between object-level arguments and meta-level arguments in argumentation frameworks, where the meta-level arguments represent properties *of* arguments in the object-level frameworks. Our approach focusses on the meta-level arguments. In a legal context, the object-level arguments are the *legal claims* while the meta-level arguments are about the claims.
- Each object-level attack relation is represented in terms of a set of meta-level arguments in a *structure* of attacks.
- The meta-level arguments are subsorted and the attack relations on them are subsorted. The attacks represent *conceptual* relationships among the meta-level arguments.
- The *justification* of some meta-level arguments and their relations is based on the object-level arguments and their relations. Other meta-level arguments and their relationships are justified with respect to the judicial system they represent.

In structuring the relations between meta-level arguments, the guiding principle is that attacks on other arguments are used to defend certain other arguments against attackers which are weaker in the appropriate respect. We see several examples of this below. However, once given the meta-level arguments and their relations, we can abstract from the subsorts of arguments and attacks to reduce the structure to an abstract AF. Thus, while our analysis accounts for additional phenomena and adds additional machinery, it benefits from the theoretical results and algorithms which apply to AFs ([11] and [12]).

We distinguish our approach, where we examine argumentation *across* juridical contexts, from argumentation *within* a juridical context. For instance, [13] focus on the dialectical, dialogical, and procedural aspects of arguments for or against a particular claim *within one legal context*. They model *dialectical* argumentation in terms of premises, rules, and conclusions along with critical questions. Proof standards and burdens of proof may shift *within the legal context* among the parties and so contribute to determining the outcome of that particular case. In contrast, we take the *outcome* of a dialectical argument *within a juridical context* as *input* to our analysis, where we consider outcomes *as the juridical context changes*. In a sense, rather than legal protagonists arguing a case before one court, in our analysis, the courts *themselves* are the protagonists. Thus, issues such as premises and critical questions are not directly relevant to our analysis. Furthermore, we abstract over a range of complexities of proof standards and burdens of proof in order to focus on the *legal* admissibility of an argument. Like [8], we represent a *body of case law, not a particular case*; it is, then, more abstract than [13].

The contributions of the paper are the representation of judicial contexts in an AF, incorporating the central meta-level arguments directly in an AF so that given the AF, one need only reason with respect to the graph. This also implies that the AF has nodes with rich content and the attack relation is fine-tuned to the particular nodes.

The structure of the paper is as follows. Section 1 contains a discussion of relevant aspects of the (English) legal system. In particular, we describe the appeals process, change of use of precedent, and proof standards. A hypothetical working example is presented. In subsequent sections, each of these aspects of the legal system is provided with a graph which is a subgraph of a graph which represents the overall reasoning in the legal system with respect to judicial context. In section 2, argumentation frameworks are outlined, particularly the extension to meta-level arguments, which provide some initial motivation. Section 3 introduces an alternative version of the extended framework, which explicitly introduces additional meta-level elements and relations. With this, we represent object-level arguments and associated values in section 3.2. Section 3.2 presents the appeals process as a case moves through the legal hierarchy. Section 3.3 discusses how precedents are set with respect to values in a structured argument network. Section 3.4 provides our analysis of procedures and proof standards. In section 3.5, we show how we accommodate change in the law relative to social change. This is followed by a presentation of the legal principle of *lex posteriori* in Section 3.5. In section 3.6, the various subgraphs are brought together into the graph which represents reasoning with respect to judicial context. We demonstrate the system with respect to our hypothetical working example. We end with section 4 on related work and observations about opportunities for future work developing our approach.

1 Judicial Contexts

In this section we consider the aspects of the English Legal System which we address in this paper. Each aspect illustrates how the juridical context can determine the outcome of a case. We have simplified and abstracted over several complexities of the legal system such as the number of courts, their hierarchical relationships, precedent relationships, and other notions of proof standards.

1.1 Appeals Process

The lowest level of the legal hierarchy is the *Crown Court*, where trials on indictment come before a judge and jury. The evidence, legal arguments, and the decision are given according to the procedures specified for the Crown Court. In particular, the Crown Court is *bound* by precedents decided by courts higher in the legal hierarchy. The decisions on points of law made in a Crown Court are not binding on any higher level, nor are they binding on other judges in another Crown Court, though they are *persuasive*. We refer to a *ratio decidendi* as the legal principle on which the decision is based. Where there are two (or more) available precedents on which to base a decision, the legal principle of *lex posteriori* is applied, where the more recent precedent is taken to hold sway in deciding the current case.

The difference between *binding* and *persuasive* precedents is important. A binding precedent is a decided case which a given court *must* follow in making a decision on the case before it, though this depends on the similarities between the cases. In order to depart from a previous decision, some distinguishing feature or features must be identified between the cases [14]. A persuasive precedent is one which is not binding,

but which can be applied should it not conflict with a binding precedent and the court which applies the precedent chooses to do so. Just how a court chooses to follow a precedent (where it can) or to give a different judgement depends on a range of factors which we do not explicitly address since it is another instance of differentiating between two available choices along the lines as discussed in [4] and [9]. For our purposes, we simply assert the status of the precedent (binding or persuasive) and provide the means to reason with either.

Cases decided in the Crown Court may be appealed to a higher level *Court of Appeals*. Cases can be reconsidered on matters of evidence or of law; for matters of law, there is a claim that the law has been misapplied, the rule of law which was applied is no longer desirable, or some application of the law was inappropriately missed. In effect, the *ratio decidendi* of the prior decision is somehow faulty.

At appeal, judges do not retry the case, but hear the evidence and arguments. The Court of Appeals can overturn a decision of a Crown Court. While the decisions of a Court of Appeals are binding on Crown Courts, the decisions of a higher court are binding on Courts of Appeals. Moreover, a Court of Appeal is bound by the decision of another Court of Appeal, with a range of exceptions (cf. *Young v Bristol Aeroplane Co Ltd* [1944] KB 718). Typically a case in the Court of Appeals is heard by three judges.

A case may be appealed from the Court of Appeal to the highest court – the *House of Lords*. The evidence and arguments are heard again, before five judges, called Law Lords. However, the Law Lords who judge the case are not bound by decisions made at either of the two lower courts. Following *Practice Statement [1966] 3 All ER 77*, the House of Lords is not even obligated to follow its own previous decisions.

1.2 Change of Use of Precedent

In general it is considered desirable for decisions made in previous cases to be applied in subsequent cases since this makes for consistency of treatment, a greater certainty as to what the law is, and stability in the system. This is the motivation for the ways in which precedents bind decisions as described above. On occasion, however, social changes may make it desirable that precedents are abandoned. This cannot be done lightly, but it is essential that it be possible if courts are to be able to adapt to changes in society at large. An example is provided by *Miliangos v George Frank (Textiles) Ltd [1976] AC 443*, where the House of Lords overruled its own previous decision concerning *Re United Railways [1961] AC 1007* and in favor of allowing damages to be awarded in a foreign currency. This was in response to a radical change in the exchange rate mechanism that had developed in the interim. Prior to 1966, the House of Lords was bound to follow all its prior decisions under the principle of *stare decisis*; however, following the *Practice Statement [1966] 3 All ER 77*, the House of Lords granted itself the right to depart from its previous decisions where it seems right to do so.

1.3 Standards of Proof

Courts may adopt different *procedural* settings in which to try a case. For our purposes, we consider just *civil procedures* and *criminal* procedures. In both settings, evidence must attain a given degree of *standard of proof* in order to be taken into consideration

in the court, where a standard of proof is taken to be a degree of support the evidence has.

In criminal proceedings a very high standard of proof, often expressed as *beyond reasonable doubt* is required. Depriving a citizen of his liberty is rightly considered a very serious matter, and a person is presumed innocent until guilt is established. This presumption is very strong: it should be maintained if there are any reasonable grounds for doubt. However, civil proceedings, where the victim seeks compensation, uses a lower standard of proof, termed *balance of probabilities* or *preponderance of evidence*. This difference means that on the basis of the same facts, some arguments which were rejected as *legally* inadmissible by the criminal court will be considered and accepted by the civil court. There are a number of examples where the difference between proof standards in different procedural settings is crucial such as cases of rape, murder, and negligence, perhaps the most famous being the O.J. Simpson murder case in 1994. We also consider a proof standard weaker than either of these, *scintilla of evidence*.[1]

1.4 A Static Legal System

The legal system as we have described it has both *dynamic* and *static* elements: a case "moves" between levels in the judicial hierarchy upon appeal or between procedural contexts; moreover, the legal process is inherently *dialogic* in the sense that a case is argued by antagonistic sides. However, for our purposes, we focus on the *static* aspects. At each point in time, where a case is submitted, it is evaluated with respect to a fixed structure; that is, we model the effect of the appeal, not the process of appeal. Given a court, the claims, the procedural context, precedents, the proof standards, and evidential status of the claims, we can determine the decision. One would then model the dynamic process as changes over the static model.[2]

1.5 *Pier v. Postson* – A Hypothetical Working Example

To make the discussion concrete, we create a hypothetical working example which is based on *Pierson v. Post* (based on [8]).[3] Actual cases present a range of issues and problems from which we abstract in order to present our model of reasoning with judicial context in argumentation frameworks. We call our hypothetical working example *Pier v. Postson*.

For this example, we assume that Pier was pursuing a fox in an uninhabited land though Postson killed and carried off the fox. It is not disputed that Postson knew that

[1] While the distinction between proof standards in civil and criminal procedures is clear, proof standards for tribunals is more complex and unclear. As we are addressing judicial hierarchies, we focus on civil cases and assume the proof standard is met.

[2] While the appeals process generally involves cases moving *upwards* the legal hierarchy, cases can also, in effect, move downwards. The term *Certiorari* is a remedy in which a decision of an inferior court is reviewed by a higher court which can quash the decision and demand a rehearing in the inferior court.

[3] See [15] for a presentation of central issues and a dissenting position on the role of Pierson v. Post in discussions of the law. [15] argues that Pierson v. Post ought to have been considered as a *tort* case, malicious interference with the hunt, rather than a *property* case.

Pier was hunting the fox or that Pier knew that Postson was the killer of the fox. We shall call Pier the hunter and Postson the killer. The central issue at stake is who has property rights to the fox – the hunter or the killer? The case is presented before a Crown Court sitting as a *civil* assembly, which decided in favour of the hunter. The case was appealed to the Court of Appeals on the issue of whether the hunter had acquired property in the fox. The Court of Appeals decided in favour of the killer. The reason given by the majority of the justices was that killing the fox as opposed to hunting the fox supported a *bright line in the law*, which is an important *value* in that it promotes peace and order in society. The dissenting minority view was that the case should have been decided for the hunter since the hunter *pursued vermin*, which is an important value in service to the community.

While the original case of *Pierson v. Post* was not argued on the basis of legal precedents, we want to consider their role in judicial decision making. Therefore, we suppose a hypothetical precedent decided in another Crown Court concerning a case in which a hunter pursued a hawk, which was killed by another, which we call *Wier v. Postal* and which was decided in favour of the hunter rather than the killer, since the value of pursuing vermin was ranked of a greater value than a bright line in the law. We assume that *Wier v. Postal* ws not appealed. However, as noted above, precedents set by Crown Courts are *persuasive*, but not *binding* on another Crown Court's decision. So, we presume the Crown Court addressing *Pier v. Postson* was persuaded by the precedent and upheld it. On appeal to the Court of Appeals, the decision by the Crown Court on *Pier v. Postson* is overturned; the precedent by another Crown Court on *Wier v. Postal* is from an inferior court, so need not be taken into consideration by the Court of Appeals.

In Crown Court, we assume that both Pier's hunting and Postson's killing of the fox satisfy the proof standard for Preponderance of Evidence in support of the claim that each possesses the fox, for otherwise, there would be no claim brought before the court. By the same token the Court of Appeals sits as a civil assembly. Consequently, proof standards play no role in this case. A more complex case would either have to involve a civil/criminal distinction or to apply to tribunals, where different proof standards may hold at different levels of the court.

2 Argumentation Frameworks and Extensions

We give first an outline of *Argumentation Frameworks* AF [2], then discuss how these are expressed with meta-level arguments in [16] and [10]. This sets the main conceptual, formal, and representational elements of our analysis of judicial context in section 3.

An AF comprises objects, relations, and definitions of auxiliary concepts. We take [2] as the most abstract system. In AFs, there is one set of undifferentiated objects, *arguments*, which can be seen as nodes in a graph; while there is some ambiguity concerning the term *argument* and the way it is used in the literature, we need not concern ourselves with this here [17]; therefore, to avoid problems, so we prefer to use the terminology of nodes rather than arguments. There is one undifferentiated relationship between the nodes, the *attack* relation, which can be represented as a graph in which attacks are arcs between nodes representing the arguments.

Fig. 1. a_1 Attacks a_2

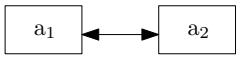

Fig. 2. a_1 and a_2 attack each other

Definition 1. *An argumentation framework* AF *is a pair* $< \mathcal{X}^A, \mathcal{R}^A >$*, where* $\mathcal{X}^A$ *is a set of* objects*,* $\{a_1, a_2, \ldots, a_n\}$ *and* $\mathcal{R}^A$ *is an* attack *relation between objects. For* $\langle a_i, a_j \rangle \in \mathcal{R}^A$ *we say the the object* a_1 *attacks object* a_2*. We assume that no object attacks itself.*

The relevant auxiliary definitions are as follows, where S is a subset of $\mathcal{X}^A$:

Definition 2. *We say that* $p \in \mathcal{X}^A$ *is* acceptable with respect to S *if for every* $q \in \mathcal{X}^A$ *that attacks* p *there is some* $r \in S$ *that attacks* q*. A subset,* S*, is* conflict-free *if no argument in* S *is attacked by any other argument in* S*. A conflict-free set* S *is* admissible *if every* $p \in S$ *is acceptable to* S*. A* preferred extension *is a maximal (w.r.t.* $\subseteq$*) admissible set. The object* $p \in \mathcal{X}^A$ *is* credulously accepted *if it is in at least one preferred extension, and* sceptically accepted *if it is in* every *preferred extension.*

We can represent the AF where $\mathcal{X}^A = \{a_1, a_2\}$ and $\mathcal{R}^A = \{< a_1, a_2 >\}$ as in Figure 1. The preferred extension is $\{a_1\}$ and a_1 is sceptically accepted. Figure 2 represents an AF where nodes attack one another – $\mathcal{X}^A = \{a_1, a_2\}$ and $\mathcal{R}^A = \{< a_1, a_2 >, < a_2, a_1 >\}$. In this AF, the preferred extensions are $\{a_1\}$ and $\{a_2\}$, so a_1 and a_2 are each credulously accepted, and neither are sceptically accepted. Clearly, where a_1 and a_2 are in an *asymmetrical* attack, there is only one preferred extension, while where they are in a *symmetrical* attack, there are two; we use this distinction to model *hierarchy*, as we shall see.

In Figure 1, nodes are in attack relations. Furthermore, we make several *meta-level* statements relative to this AF: a_1 *defeats* a_2; a_1 *is justified*; and *something defeats* a_2. The statement a_1 *defeats* a_2 expresses a successful attack between specific arguments, which is an attack in which the first argument is not itself attacked and defeated; *something defeats* a_2 is a more general form, where we do not specify just what attacks the second argument. To say that a_1 *is justified* means not only that is it acceptable with respect to some set of arguments, but expresses *why* it is acceptable in virtue of the other arguments in that set. These are meta-level statements in that they are statements we make about the nodes a_1 and a_2 which represent arguments in the object-level framework.

In addition, we may observe, that classic AFs do not distinguish among *sorts* of attack relations, nor do they express *in virtue of what one node attacks another*, just that given the attack relation, one can calculate extensions. The fundamental reason is

that where the nodes represent something which is atomic, there can be no explanation for why one node attacks another.

Where the nodes represent more contentful information as is necessary for the representation of judicial context, then we can to justify why one node attacks another more specifically. Of course, we may understand intuitively why two statements conflict and so could be represented in an AF attack relation (see a similar discussion in a body of case law in [8]). For example, consider a situation where two individuals **P** and **O** exchange statements indicated with a_1 and a_2 [10, p.241]):

Dialogue A
P: "Today will be dry in London since the BBC forecast sunshine" = a_1
O: "Today will be wet in London since CNN forecast rain" = a_2

While neither a_1 nor a_2 are true when they are uttered (being as they are about an indeterminate future), the content associated with them is nonetheless clearly in conflict, which we infer from the meanings of the words "dry" and "wet". The attack between a_1 and a_2 is justified since we have a specific intuition about why the content of the nodes are in conflict. We can represent the nodes and attacks as in Figure 2.

In [2], there is no way for an attack itself to be defeated. However, the preferences or values one ascribes to nodes may make attacks unsuccessful [3] and [4]. However, in these approaches, one represents and reasons with preferences and value external to the graph. [16] provides an extension of AFs of [2] to account for preferences or values directly in the AF graph. The analysis is initiated from the notion of *attacks on attacks* relative to the values of the nodes. For example, our previous dialogue could be continued with:

Dialogue B (Continues Dialogue A)
P: "But the BBC is more trustworthy than CNN" = a_3

Thus, though from the previous dialogue, where a_1 attacks a_2 and a_2 attacks a_1, intuitively a_3 undermines the attack of a_2 on a_1 with respect to values (which news source is more trustworthy). We can say that a_3 is a higher level attack than the attacks between a_1 and a_2. The dialogue is represented as in Figure 3. Additional nodes can be provided.

Formally this accommodated with an additional sort of attack relation in the AF between a a node and an arc (which represents an attack relation); an attack on an arc (if successful) removes that arc from the determination of node extensions. Following [10, p.242]), we have:

Definition 3. *An extended argumentation framework* EAF *is a tuple* $< \mathcal{X}^A, \mathcal{R}^A, \mathcal{D}^A >$, *where* $\mathcal{X}^A$ *is a set of* objects, $\{a_1, a_2, \ldots, a_n\}$ *and* $\mathcal{R}^A$ *is an* attack *relation between objects,* $\mathcal{R}^A \subseteq \mathcal{X}^A \times \mathcal{X}^A$, *and* $\mathcal{D}^A$ *is an* object attacking an attack relation $\mathcal{D}^A \subseteq (\mathcal{X}^A \times \mathcal{R}^A)$. *If (C, (A, B)), (C',(B,A)) ∈* $\mathcal{D}^A$, *then (C,C'), (C',C) ∈* $\mathcal{R}^A$.

Intuitively it is clear from the examples in [16] where an attacking argument, say a_3, attacks attack relations between other arguments, say a_1 and a_2, in virtue of the intuitive content of a_1, a_2, and a_3. However, just what guides such attacks is not formalised. For example, suppose we add the following to the previous dialogue:

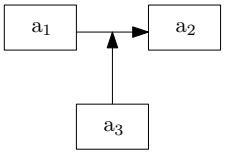

Fig. 3. Extended Argumentation: A attacks B, C attacks the attack

Dialogue C (Continues Dialogue B)
P: "Today the London Stock Exchange will go up according to the New York Times" = a_4
O: "Today the London Stock Exchange will go down according to Financial Times" = a_5

Intuitively a_3 has no bearing on the relationship between a_4 and a_5 since the news organisations mentioned in a_4 and a_5 are not found in a_3. However, *formally* there is no explanation why a_3 does not attack the arc between a_4 and a_5 since the nodes are atomic. In any case, given the attacks, the extensions can be determined.

Although it is not our purpose in this paper to formally justify *when* arguments attack one another, we do rely on the intuitions of attack such as outlined in the Dialogues A-C. However, we make the AF less abstract by making use of more explicit information in the nodes.

A move in the direction of less abstract nodes and justified attack relations is made in [10], where the higher level attacks of [16] are rewritten in terms of additional nodes in a structured attack relation, where the additional nodes *directly represent meta-level statements*. The rewrite is shown to be sound and complete [10].

In [10], an AF as graphically represented in Figure 2 is rewritten to an AF as represented in Figure 4, while an extended AF in Figure 3 is represented as in Figure 5. We discuss each of these in turn.

In Figure 4, we have nodes which represent the meta-level statements such as a_1 *being justified*, a_1 *attacks* a_2, or a_1 *is defeated* about object-level arguments a_1 and a_2. In an AF with object-level arguments, the nodes represent only the object-level arguments; in an AF with meta-level arguments, the nodes represent only the meta-level arguments. However, we say the meta-level arguments are *about* the object-level arguments. More informally and for our *legal domain*, we call object-level arguments such as a_1 and a_2 *claims* and meta-level arguments such as a_1 *being justified*, a_1 *attacks* a_2, or a_1 *is defeated*, which are *statements* about claims a_1 and a_2. It is important to keep the object-level and meta-level graphs distinct as it avoids problems of the interpretation of the nodes; that is, if in an AF a_1 is a node and a_1 *is justified* is a node, the "levels" would be conflated since a_1 *is justified* contains a node, namely a_1.[4]

[4] An attractive alternative to allow the representation of both levels in one AF would be to use a natural language referential mechanism of pronominal anaphora. For instance, in a context with a tree one can make a statement about the object "it is tall" without confusion. By the same

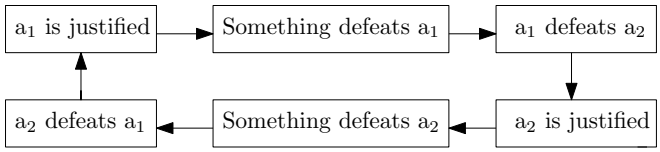

Fig. 4. a_1 and a_2 attack each other

In the rewrite in [10], the nodes which express meta-level statements about the object-level arguments are in specified attack relations that represent the content of such attacks on arcs. The node which represents the statement a_1 *is justified* attacks the node *Something defeats* a_1 which attacks a_1 *defeats* a_2; in turn, this attacks a_2 *is justified*, which attacks *Something defeats* a_2 which attacks a_2 *defeats* a_1. To close the circle, a_2 *defeats* a_1 attacks a_1 *is justified*. We have two preferred extensions:

- $\{a_1\ is\ justified, a_1\ defeats\ a_2, Something\ defeats\ a_2\}$
- $\{a_2\ is\ justified, a_2\ defeats\ a_1, Something\ defeats\ a_1\}$

In both preferred extensions, the elements themselves reflect the concepts otherwise expressed at the meta-level concerning the nodes.

Note that just as in previous AFs, we do not formally express in virtue of what one node attacks another. However, in this extended framework, there is a clear intuitive relationship between the nodes, namely conceptual incompatibility. If a node is justified, then there cannot be some other node which defeats it; if something defeats the given node, then that given node cannot defeat some other node; if one node defeats another node, then the second node cannot be justified. Note as well a statement such as *Something defeats* a_1 does not say what defeats it, just that something does; as we discuss further below, there are a variety of means to defeat a node.

We refer to graphs with a pattern which represents justifications, defeats, and attacks as in Figure 4 as our *fundamental structure of attack* in an extended framework. To such a fundamental structure, additional structure is added, which changes the justification of nodes.

In the rewrite of [10], an attack on an attack relation is represented as an attack by a node which represents a value ranking on a node which represents the defeat of one argument by another. As such, it represents the VAFs of [4], where the objective was to use values to determine which of two (or more) preferred extensions are chosen relative to the *values* of the nodes. Rather than Figure 3 we have Figure 5.

Figure 5 represents an AF where nodes are added to represent statements of value rankings (i.e. $v_1 > v_2$ and $v_2 > v_1$) as well as statements of the *audiences* which we take to adhere to a value ranking. In [4], audiences are *total* orderings of values, so an audience can contain some ordering such as $v_1 > v_2$. The nodes for value rankings and audiences stand in attack relations which indicate which nodes are to *remain* given

token, supposing the pronoun it_1 *refers* to the claim a_1, it_1 *is justified* would be well-formed without incorporating the object-level. However, we leave this for future work.

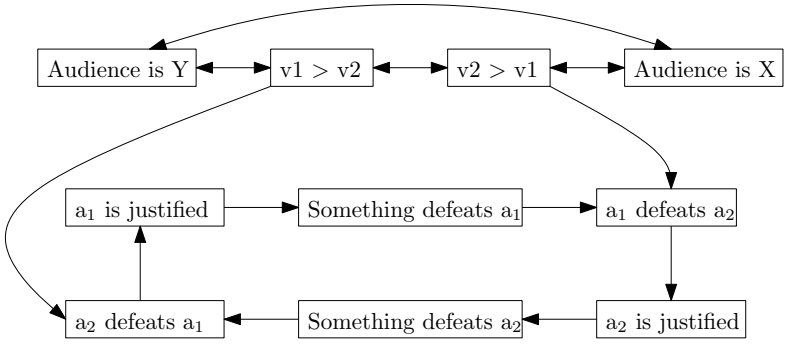

Fig. 5. a_1 and a_2 attack one another relative to values

successful attacks and to indicate compatibility among the elements: intuitively $v_1 > v_2$ and $v_2 > v_1$ attack one another; the audience attacks the value ranking which it does *not* endorse, which thereby indicates, ceteris paribus, the value ranking it does endorse; the audiences attack one another to reflect the "antagonism" among the audiences and also to maintain the relationship between an audience and an audience's values.[5]

Given this, we have two preferred extensions which are determined by what nodes are assumed. Assuming an *Audience is Y* which contains the ordering $v_2 > v_1$, it attacks $v_1 > v_2$ and an *Audience is X* which contains the ordering $v_1 > v_2$. The remaining value ranking is $v_2 > v_1$, which is consistent with *Audience is Y*. In turn, under the assumption that a_1 is associated with value v_1, and a_2 is associated with value v_2, then the node $v_2 > v_1$ attacks and defeats *a_1 defeats a_2*. Consequently, *a_2 is justified* and *a_2 defeats a_1* are in the preferred extension, but *a_1 is justified* not. Thus, one preferred extension is: $\{Audience\ is\ Y, v_2 > v_1, a_2, a_2\ defeats\ a_1, Something\ defeats\ a_1\}$. The other is calculated similarly. Just as in [4], this framework can differentiate preferred extensions relative to values of nodes and value rankings. This is the meta-level expression of the related value-based framework.

We should emphasise that in [4] *audiences* are total orders of value rankings. There is, in a sense, some redundancy in Figure 5 where there are both audiences and value rankings. In this paper, we maintain the distinction between audiences and value rankings since in a judicial context the *status* of an audience may have a bearing on the outcome; that is, two audiences with the same total value ranking may determine different extensions since they interact with other elements of the framework.

In [10], several aspects have been left implicit in the formalisation: the association of nodes with values; the justification of attack relations such as between audiences and value rankings, and value rankings and defeat statements. In [4], these elements are explict in the formalisation, yet not represented directly in the AF. For our purposes, these are worth making explicit in the AF since they facilitate representation and reasoning in an AF of judicial context.

[5] This does not preclude modes with richer structures of audiences and values.

In the extensions to the value-based approaches, the core idea is to add nodes in structured attack relations which lead to preferred extensions that contain information about the claims (i.e. a_1 and a_2), namely whether they are justified, whether they are defeated, and which node defeats them. In Figure 5, the value ranking node attacks a node of the fundamental structure of attack, and in virtue of this, we change the outcome. We view the value ranking mechanism as a *subgraph* of the overall AF graph of which it is a part in that by adding or removing it, we can relativise the outcome of the preferred extensions of the fundamental structure of attack.

In the following section our approach to judicial contexts is an elaboration of this approach of adding meta-level information in structured attack relations as subgraphs of a graph which includes the fundamental structure of attack.

3 Representing Legal Context

In this section, we develop and articulate ideas of extended argumentation frameworks to provide an analysis of judicial context in an argumentation framework. Our goal is a graph which represents judicial context such that given decisions of a level of court (the audience), procedure (criminal or civil), precedent (if any), value ranking, values of claims, and standard of proof of the claims, we can determine which claims are justified. This final graph is presented in Figure 12 in section 3.6. To justify and illustrate each of the components, over the course of the subsections below, we decompose this graph into several subgraphs each of which represents one component of legal reasoning in judicial contexts.

Our general strategy is to add a subgraph (some structure of nodes in attack relations) of which some nodes attack nodes of some other subgraph; the example is nodes of the subgraph of audiences and value-rankings attacking nodes of the fundamental structure of attack in Figure 5. However, one additional aspect is that we build subgraphs with some intermediate structure: we determine the *base-level* nodes which then combine into *intermediate* nodes, which may interact with other intermediate nodes, ultimately leading to attacks on nodes of some other subgraph.

In section 1, we introduced a variety of issues related to judicial contexts. We looked at how the values of a court majority determine the outcome of a legal decision. We then considered *precedence relations*, where decisions by higher courts trump decisions by lower courts (*lex superiori*). We discussed *precedents*. Finally, we had an overview of issues related to *standards of proof*. For each of these issues, we introduce and discuss a subgraph. Note that we do not consider the merits of the claims; our concern is how they have been received by the various assemblies. Moreover, we only discuss a single conflict: in a body of case law, there are usually several related conflicts.

In the following subsections, we present a series of *subgraphs* of an overall graph of an AF, which appears in section 3.6; each of the subgraphs is explained and exemplified so the complex final graph can be understood. Our approach is to have nodes that represent atomic and complex expressions in specified attack relations; the complex expressions are justified in virtue of the atomic expressions. We create the space of possible nodes and attack relations (a selection from the logical space of possible

nodes and attacks in consideration of space); given choices in this space with respect to atomic expressions, we can calculate the resultant preferred extension.

We begin with a reconstruction of [10], discussed with respect to Figure 5, making explicit the association of nodes with values. Following in this vein, we connect the output nodes to our fundamental structure of attack. We call this the *Arguments and Values* subgraph, and it highlights some of the key moves in composing the subgraphs. Then we turn to our analysis of precedence in judicial hierarchies along with values. This is presented in two stages: the construction of contexts and value rankings; the relationship between value rankings and valued claims. We refer to this as the *Precedence* subgraph. Nodes of the Precedence subgraph are connected to nodes of the Arguments and Values subgraph. With this, we can calculate preferred extensions of justified nodes relative to contexts and values. We introduce precedents in the *Precedents* subgraph, showing how precedents can effect a current case relative to the court hierarchy and value ranking. Finally, procedural contexts and standards of proof are introduced in the *Proof Standards* subgraph. Additional topics bearing on change of law and the legal principle of *lex posteriori* are discussed.

3.1 Arguments and Values Subgraph

In this subgraph, nodes are associated with values along with value rankings. Given such associations, nodes are then used to attack nodes of the fundamental structure of attack. This is, in effect, simply an elaboration of Figure 5. We simplify here and assume that our claims a_1 and a_2 can have values v_1 or v_2, but the claims cannot both have the same value; we could have further articulated the graph to represent associations of individual claims and particular values, but it would lead to more of a graph than is needed. Furthermore, the value rankings are a strict ordering. Note again for clarity that what represented arguments (i.e. nodes) a_1 and a_2 in [2] and [16] are *claims* in our presentation. About claims one can make *statements* such as a_1 *has* v_1, where v_1 is a value. Statements here are the *nodes* of the AF.

In Figure 6, we form complex expressions from the values that claims have and the value rankings: if an extension has the node for a_1 *has* v_1, and a_2 *has* v_2 along with the node for $v_1 > v_2$, then the extension has the node a_1 *has* v_1, a_2 *has* v_2, *and* $v_1 > v_2$. Furthermore, the attack relations are intuitively obvious: $v_2 > v_1$ attacks a_1 *has* v_1, a_2 *has* v_2, *and* $v_1 > v_2$ since the values are in conflict. By the same token, the complex expressions attack statements which are incompatible with it. While there is a degree of redundancy in this, having such distinct nodes facilitates the analysis (see discussions of intermediate concepts [18], [19], [20], and [21]).

Now we are in a position to consider the impact of this latter node, a_1 *has* v_1, a_2 *has* v_2, *and* $v_1 > v_2$, with respect to the fundamental structure of attack. Rather than putting the calculation of defeat of a claim relative to values of claims and value rankings in the meta-theory, we directly incorporate into the AF those nodes which represent values of claims and value rankings. For example, in Figure 7, the node a_1 *has* v_1, a_2 *has* v_2, *and* $v_1 > v_2$ which represents the values of the claim and the value ranking attacks the node a_2 *defeats* a_1. We use this notion of attack relative to value rankings for simplicity. By comparison, in [4], a node a_1 defeats another node a_2 in the graph only if the value of a_1 has an equal or higher value on the value ranking than the value of a_2; if so,

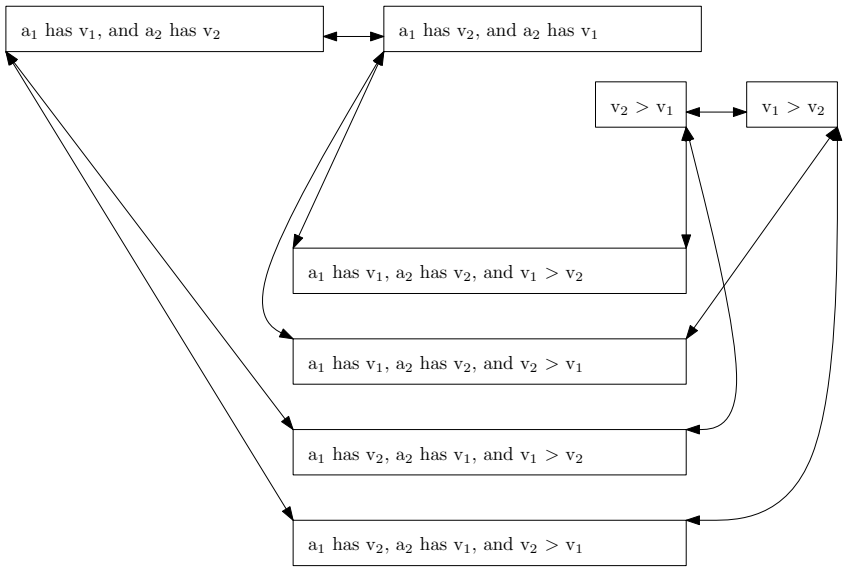

Fig. 6. Arguments and Values

then it is justified to claim that a_1 defeats a_2, and conversely it is not justified that a_2 defeats a_1. This is the reason why a node representing a_1 *has* v_1, a_2 *has* v_2, *and* $v_1 > v_2$ attacks the node a_2 *defeats* a_1, but leaves a_1 *defeats* a_2. Similar reasoning applies to the other attacks. Note that the attacks here are *not* symmetrical, for the complex expression implies the defeat statement which is eliminated and not vice versa.

Note that we have two subgraphs Figure 6 and Figure 7 of a larger graph. The larger graph is broken into parts for ease of presentation; where one finds the same nodes in two (or more) graphs, it is to be assumed that these are in fact the same node and the graph can be redrawn to reflect this. As mentioned earlier, all the subgraphs are composed into one graph in Figure 12.

If we just consider the four nodes (i.e. ignoring the intermediate nodes) a_1 *has* v_1 *and* a_2 *has* v_2, a_2 *has* v_1 *and* a_1 *has* v_2, $v_1 > v_2$, and $v_2 > v_1$, these give rise to four preferred extensions with respect to the justified claim.

- {a_1 *has* v_1 *and* a_2 *has* v_2, $v_1 > v_2$, a_1 is justified}
- {a_1 *has* v_1 *and* a_2 *has* v_2, $v_2 > v_1$, a_2 is justified}
- {a_2 *has* v_1 *and* a_1 *has* v_2, $v_1 > v_2$, a_2 is justified}
- {a_2 *has* v_1 *and* a_1 *has* v_2, $v_2 > v_1$, a_1 is justified}

This shows that where we want the result to be just one justified claim, we must determine *both* the values of claims and value rankings; fixing only one will result in two preferred extensions each with a different justified claim.

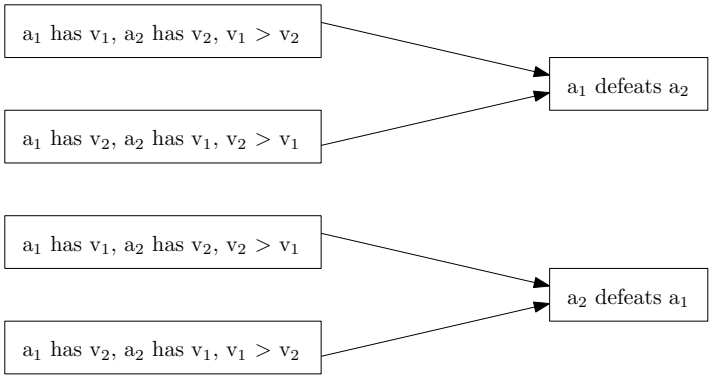

Fig. 7. Arguments, Values, and Defeat

3.2 Precedence Subgraph

One aspect of judicial decision making is the imposition of value rankings relative to a legal context in determining the outcome. For the moment, we assume there are no precedents so that every case is decided on its merits relative to the value ranking of the court in which the case is made. While a decision may be decided either way *prior* to being argued in a legal context, the role of the courts is to decide one way or the other, though this may be overturned later on appeal. While we may assume Figure 5 represents *arbitrary* audiences and their correlated value rankings, we want to associate judicial contexts with value rankings such that only the value ranking of the given judicial context is *active* in determining the outcome of the decision. If the case is presented before a Crown Court, then the value ranking of that court ought to predominate over the value ranking which represents some non-judicial audience; if the case is presented before the House of Lords, then the House of Lords value ranking ought to predominate.

In terms of the AF, precedence relations between courts appears as the *imposition* of the value ranking of the superior court on the inferior court; the value ranking of a superior court which yields a particular decision must be adopted by the inferior courts, but not vice versa. In terms of the graph, we want an extension in which appears not only the court making the decision, but also all courts lower in the judicial hierarchy which also have the same value ranking. From this extension, we want to exclude all courts higher in the hierarchy than the one making the decision as well as all courts with other value rankings.

We have independent representations of attacks between court levels as well as between value rankings; we then have complex expressions that represent the value rankings associated with particular court levels, using courts and value rankings to attack these complex expressions. Following our previous observation, we distinguish value rankings from audiences: different audiences may have the same value ranking, but be distinct in other respects (importantly with respect to precedent).

With respect to Figure 8, the attack relations been statements with values are obvious. The attack relations between courts is interesting for it reflects a *conceptual* incompatibility, not a logical incompatibility; the legal system is defined in such a way that no court can both sit at a Crown Court and a Court of Appeals (similarly for the other pairs). In terms of ontologies, we say the courts are disjoint; in lexical semantics [22] a range of oppositional terms are observed such as *master-slave* or *teacher-pupil*. Furthermore, note the distinct attack relations between court levels and statements of values of a court, where, for example, *Crown Court* attacks both $v_1 > v_2$ *in Court of Appeals* and $v_1 > v_2$ *in House of Lords*, while *Court of Appeals* attacks $v_1 > v_2$ *in House of Lords*. The lower court eliminates the higher courts from consideration. Though this is perhaps counterintuitive, it reflects the imposition of the value ranking of higher courts on lower courts, as discussed above and exemplified below.

With respect to Figure 8, consider the two following examples. Suppose an undecided case is submitted to a Crown Court and the value ranking of that court are $\mathrm{v}_1 > \mathrm{v}_2$, the preferred extension is:

- $\{Crown\ Court,\ v_1 > v_2, v_1 > v_2\ in\ Crown\ Court\}$

In this, nothing is justified concerning the values of superior courts; $v_1 > v_2$ is *sceptically accepted* and only with respect to one court level, the Crown Court. In contrast, if the same case were to be submitted directly to the House of Lords and the values of the court were $\mathrm{v}_1 > \mathrm{v}_2$, then we have three preferred extensions:

- $\{House\ of\ Lords, v_1 > v_2, v_1 > v_2\ in\ House\ of\ Lords\}$
- $\{House\ of\ Lords, v_1 > v_2, v_1 > v_2\ in\ Court\ of\ Appeals\}$
- $\{House\ of\ Lords, v_1 > v_2, v_1 > v_2\ in\ Crown\ Court\}$

Here the value ranking $v_1 > v_2$ is sceptically accepted and with respect to every level of court. In other words, a decision in the House of Lords along with its value ranking justifies that the House of Lords' value ranking holds in subordinate courts as well. By the same token, a decision in the Court of Appeals justifies the value ranking in both Courts of Appeals and Crown Courts, but does not justify the value ranking in the House of Lords.

The judicial hierarchy is expressed in terms of how higher courts determine the value ranking that hold of lower courts, but not vice versa; in other words, it reflects the power of which court decides a question set to the legal system.

In Figure 9, we connect the values of courts in Figure 8 with the values of claims and value rankings in Figure 6 and then with the fundamental structure of attack in Figure 4. Since Figure 7 gives us the justifications of claims given values of claims and value rankings, we can justify the claims relative to judicial context and value rankings in a judicial hierarchy using Figure 9. It is worth noting that once the claims are assigned values and the value ranking is determined, the particular court has little substantive effect on determining the justified claim since these are already determined by the values on claims and the value ranking. What is significant is the "spreading" effect on value rankings among the courts, which is novel. In addition, the role of the subgraph on courts and values is more significant when we consider interactions between a current court and precedents.

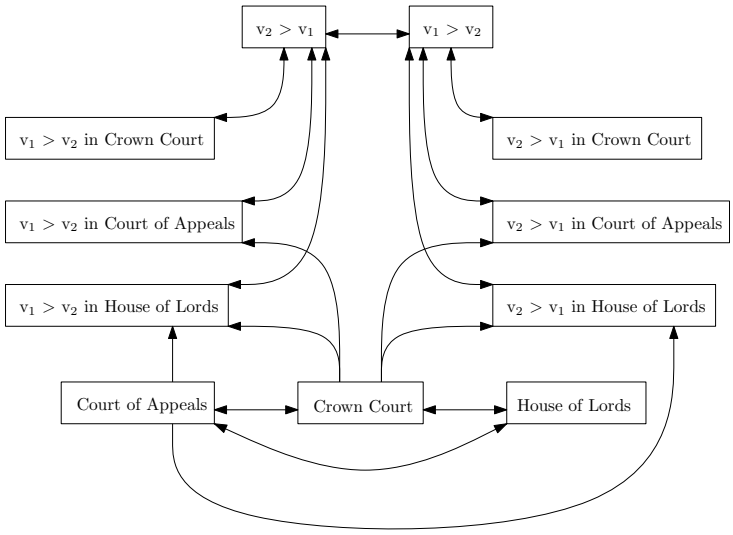

Fig. 8. Courts and Values

As one picks courts, value rankings, and values of claims, the preferred extensions are determined which express the justifications of the claims a_1 and a_2. For example, suppose the court is a Crown Court, where the value ranking is $v_1 > v_2$, a_1 has v_1, and a_2 has v_2. For clarity, we have left out some of the intermediate nodes, which are easily calculated.

– $\{Crown\ Court, v_1 > v_2, v_1 > v_2\ in\ Crown\ Court,$
$a_1\ has\ v_1\ and\ a_2\ has\ v_2, a_1\ defeats\ a_2, a_1\ is\ justified\}$

The point here is that the Crown Court does not impose its value ranking on the other levels of the judicial hierarchy, which are underdetermined.

In contrast, if the court is the House of Lords, where the value ranking is $v_2 > v_1$, a_1 has v_1, and a_2 has v_2, then the preferred extension is:

– $\{House\ of\ Lords, v_2 > v_1, v_2 > v_1\ in\ Crown\ Court,$
$v_2 > v_1\ in\ Court\ of\ Appeals, v_2 > v_1\ in\ House\ of\ Lords,$
$a_1\ has\ v_1\ and\ a_2\ has\ v_2, a_2\ defeats\ a_1, a_2\ is\ justified\}$

Here we see that the House of Lords does determine the value ranking for the other courts in the judicial hierarchy, which must all be consistent with the value ranking of the House of Lords.

We claim this models the *appeals* process in a judicial hierarchy, for as the case passes through the judicial hierarchy, the case is decided by the court and imposed on courts lower in the judicial hierarchy. There is an important note to emphasise in this process: *the values ascribed to the claims at the court of first instance must be maintained as the case is appealed*. Otherwise, as we saw at the end of section , the justified

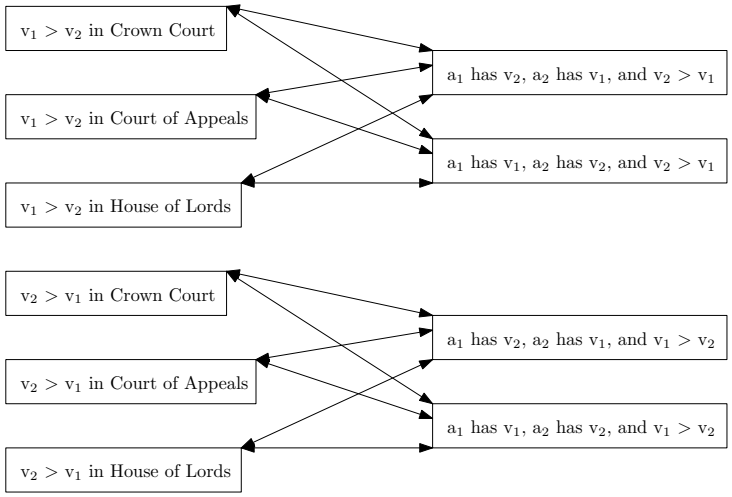

Fig. 9. Courts, Arguments, Values, and Value Rankings

claim varies according to the values on claims and the value ranking; however, we want only the value ranking to vary the justified claim. This is consistent with legal practice, where the court of first instance fixes the facts which are maintained throughout the appeals process.

3.3 Precedents Subgraph

To this point, we have represented the hierarchical relationships between the courts and the bearing of values claims and value rankings on the justification of claims. However, it is an "atemporal" representation of a current case: every change of judicial context can change the outcome, but interactions between precedents and judicial context play no role. In order for precedent to play a role, it must be capable of changing the outcome of the current case for that which would otherwise follow. We follow a logic similar to previous graphs: we assume that the values of a precedent case of a higher court filter the values of lower courts in the current case by eliminating those courts and values.

In the following, we assume a six-place relation which stands for an intermediate concept *Precedent* which is defined with the following set of elements. There is a set of judicial contexts {Crown Court, Court of Appeals, House of Lords}, a set of value rankings, a set of claims $\{a_1,...,a_n\}$, a set of similarity statements, and a set of claim value statements. Judicial contexts, value rankings, and claims are familiar from above. The claim value statements are of the form a_i *has* v_j as before. The similarity statements are of the form $a_i \approx a_j$, where a_i and a_j are claims from among the set of claims; it is a similarity statement in that the arguments a_i and a_j are similar as determined by case-based reasoning ([23], [24]). This is the expression which makes the precedent relevant to the current case. How a particular precedent is determined to apply relative to a current case is not crucial; we can assume that case-based reasoning locates an

appropriate precedent and applies it to the case at hand, assuming some means to make such a case-based comparison.

With this, *Precedent* $\subseteq$ (judicial contexts $\times$ value rankings $\times$ claims $\times$ claims $\times$ similarity statement $\times$ similarity statement $\times$ claim value $\times$ claim value). In Figure 10, we illustrate a subgraph with three sample precedents. This subgraph relates to Figure 8 with respect to value rankings and judicial contexts. :

1. Precedent(Crown Court, $v_1 > v_2$, a_3, a_4, $a_3 \approx a_1$, $a_4 \approx a_2$, a_3 has v_1, a_4 has v_2)
2. Precedent(Court of Appeals, $v_2 > v_1$, a_5, a_6, $a_5 \approx a_1$, $a_6 \approx a_2$, a_5 has v_1, a_6 has v_2)
3. Precedent(House of Lords, $v_1 > v_2$, a_7, a_8, $a_7 \approx a_1$, $a_8 \approx a_2$, a_7 has v_1, a_8 has v_2)

The first represents a precedent made in Crown Court where the value ranking was $v_1 > v_2$, where the decision concerned two claims a_3 and a_4 which were in conflict and bore the values v_1 and v_2 respectively. These claims are respectively similar to a_1 and a_2. The decision is given by the court according to the value ranking and values of the claims: a_3 is justified and a_4 is not justified. Similar points can be made about the other examples. While a more complex graph could be provided to represent precedents, it is more straightforward for our purposes to provide this high-level intermediate concept.

Notice here that we have a series of precedents that all may bear on a_1 and a_2, made in different courts and with different value rankings. In effect, we can consider that a decision made in a Crown Court in Precedent 1 is overturned in a Court of Appeals, which is again overturned in the House of Lords, thereby upholding the initial precedent. However, only in section 3.5 do we discuss issues of Lex Posteriori. Yet, in Figure 10, we represent with the attack relation the relationships between these precedents in virtue of the judicial hierarchy: a precedent set by the House of Lords trumps a precedent set by the Court of Appeals, which trumps a precedent set by the Crown Court.

Along with this representation of precedent, the precedent attacks the other relevant nodes with which it conflicts. First, we consider attacks of precedents on value rankings. In Figure 10, Precedent(Crown Court, $v_1 > v_2$, a_3, a_4, $a_3 \approx a_1$, $a_4 \approx a_2$, a_3 has v_1, a_4 has v_2) asymetrically attacks the node representing $v_2 > v_1$. Without this attack, the precedent could not determine the outcome of the current case; in effect, this attack allows the precedent to impose its value ranking on the judicial system. However, if the precedent is itself attacked, then the attack of the precedent on the value ranking fails and the precedent does not impose its value ranking, which is otherwise be chosen by the court which is deciding the case.

Next, consider the attacks between precedents and current judicial contexts (court value rankings such as nodes $v_2 > v_1$ in Crown Court). There are two parameters to consider: the comparative value rankings and the comparative roles of the court in the judicial hierarchy. Note that it is not always the case that where the value rankings between precedents are different than the current judicial context, the nodes attack one another, for the attack is conditioned on the comparative roles of the courts in the judicial hierarchy. These formally represent the differences between *persuasive* and *binding* precedents in judicial contexts. We have the following illustrations:

1. Precedent(Crown Court, $v_1 > v_2$, a_3, a_4, $a_3 \approx a_1$, $a_4 \approx a_2$, a_3 has v_1, a_4 has v_2) *attacks* and *is attacked by* $v_2 > v_1$ in Crown Court

2. Precedent(Crown Court, $v_1 > v_2$, a_3, a_4, $a_3 \approx a_1$, $a_4 \approx a_2$, a_3 has v_1, a_4 has v_2) *is attacked by* $v_2 > v_1$ in Court of Appeals
3. Precedent(Court of Appeals, $v_2 > v_1$, a_5, a_6, $a_5 \approx a_1$, $a_6 \approx a_2$, a_5 has v_1, a_6 has v_2) *attacks* $v_1 > v_2$ in Court of Appeals

In [1.], a precedent set in a Crown Court is *persuasive* on another Crown Court; the current case can be decided either according to value ranking of the precedent or the value ranking of the current court. How a current court decides which to follow is (presumably) another "higher" layer of value judgement. In [2.], a precedent set in a Crown Court is not binding or persuasive on a Court of Appeals; that is, the current court is free to decide the case (i.e. decide the value ranking) as it sees fit (though this might be to uphold the precedent). In [3.], a precedent set by a Court of Appeals is binding on a Court of Appeals; the current court must abide by a decision made by another Court of Appeals, for where such a precedent holds, the current court cannot decide contrary to the value ranking established in the precedent. In these examples, we see that the attacks are determined according to the roles of the courts in the judicial hierarchy and their relationships.

In general, precedents set in a higher level court asymmetrically attack precedents set in a lower level court. Precedents set in a higher level court asymmetrically attack current courts at a lower level. A higher level current court attacks a lower level precedent. Attacks between a precedent set in courts of the same level as the current court are sometimes symmetrical (e.g. Crown Court and House of Lords), but sometimes asymmetrical (Court of Appeals). As such symmetrical attacks give rise to two (or more) preferred extensions, these indicate discretion to follow or reject the precedent. We assume some other means to guide the discretion, for example, some additional value ranking in the current court. The logic of the relationships is that precedents and judicial hierarchy interact to eliminate assertions of value rankings according to the relative strength of the current court or precedent in the judicial hierarchy. In light of this, where there is a precedent, we cannot determine the value ranking until the effect of the precedent in the court context has been evaluated. Finally, we assume that where a statement is not indicated in terms of the *Precedent* relation (e.g. *Crown Court*), then it is taken to bear on a current case.

Suppose that we only have the precedent which is set in a Crown Court (thus there are no other precedents in the graph). In this precedent, a_3 is justified and a_4 is not justified given the values of the claims and the value ranking of the court. We assume that a_1 has value v_1 and a_2 has value v_2. The case is taken to a Crown Court, which has value ranking $v_1 > v_2$. As the precedent and the current court attack one another, we have two preferred extensions. If the current Crown Court accepts the values of the precedent (so $v_1 > v_2$ *in Crown Court* appears in the extension) and so *upholds* the precedent, then the precedent attacks $v_2 > v_1$ *in Crown Court*, $v_2 > v_1$ *in Court of Appeals*, and $v_2 > v_1$ *in House of Lords*, as well as $v_2 > v_1$. With reference to Figure 8, the current Crown Court defeats all the nodes with Court of Appeals and House of Lords. With reference to Figure 9, the value ranking and judicial context are: $v_1 > v_2$, $v_1 > v_2$ *in Crown Court*. Consequently, a_1 *is justified* in the preferred extension (among other elements).

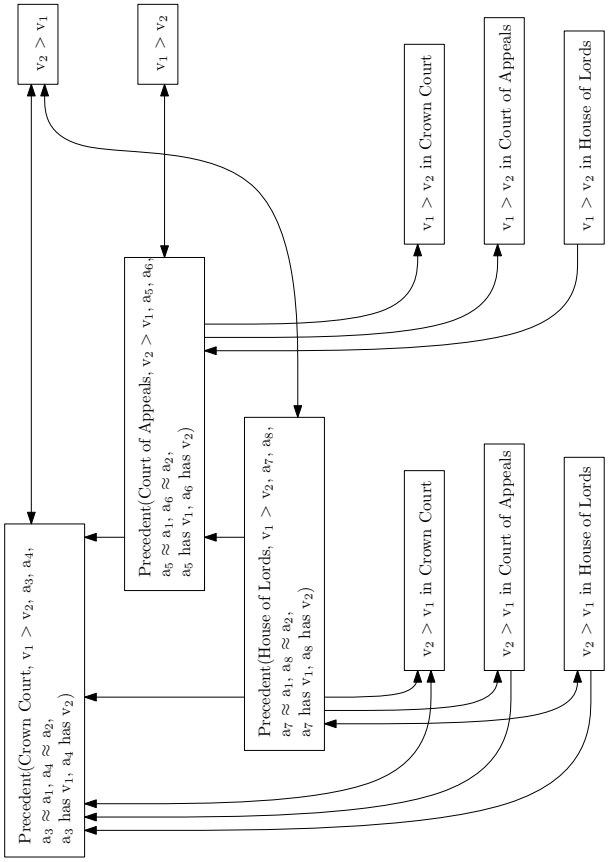

Fig. 10. Precedent in the Judicial Hierarchy

The case has been appealed to the Court of Appeals, where (suppose) the value ranking is $v_2 > v_1$ relative, and we have assumed that on appeal the values of claims are maintained, so a_1 has v_1, and claim a_2 has v_2. If the value ranking of the precedent held, then similar to the precedent case, the decision in the current case would be that a_1 is justified. However, the court level and its value ranking attack the precedent from the Crown Court. Thus, *the decision is overturned in the current case in the Court of Appeals so that a_2 is justified*.

In these two examples, the current court has, in effect, a choice of value ranking to follow. Consider a different scenario in which the current court has no choice to follow its own value ranking. Suppose the only precedent is Precedent(Court of Appeals, $v_2 > v_1$, a_5, a_6, $a_5 \approx a_1$, $a_6 \approx a_2$, a_5 has v_1, a_6 has v_2) *attacks* $v_1 > v_2$ in Court of Appeals, and the current court is a Court of Appeals with value ranking is $v_1 > v_2$. The claims and values are: a_1 has v_1, and claim a_2 has v_2. In this scenario, if there were no precedent or a precedent in line with the value ranking of the current case, then *a_1 is justified* would

be in the preferred extension. However, the precedent does hold and asymmetrically attacks $v_1 > v_2$ *in Court of Appeals* and the value ranking $\mathrm{v}_1 > \mathrm{v}_2$. Consequently, $v_2 > v_1$ *in Court of Appeals* and the value ranking $\mathrm{v}_2 > \mathrm{v}_1$ are in the extension, from which it follows that a_2 *is justified* is in the preferred extension. In this instance, the Court of Appeals is bound to follow a precedent, though this is not in keeping with its own value ranking.

In this way, we account for the the appeals process relative to precedent and precedence.

3.4 Proof Standards Subgraph

In this section, we discuss and represent the conditions of *legal* admissibility under different types of procedure and relative to standards of proof that the claim supports. A claim which is admitted into the framework will satisfy a particular *proof standard* (PS) with respect to the case under consideration.

For our presentation, we abstract over the relationship between proof standards and burdens of proof (see [13]). While [13] discuss four levels of PS arranged in a hierarchy from lower to higher, we discuss only three. Just as we have associated claims with values, we also associate a claim with the proof standard it satisfies. We are *not* representing that which determines whether a particular claim satisfies a given proof standard. For example, in the *O.J. Simpson murder trial*, a criminal court did not decide that Simpson murdered his ex-wife Nicole Brown Simpson and her friend Ronald Goldman in 1994 since the requisite standard of proof, *Beyond Reasonable Doubt*, was not shown to hold between the evidence and the claim. However, *given the same evidence and legal arguments*, a civil court decided that Simpson was guilty of their wrongful deaths; in this case, the requisite weaker standard of proof, *Preponderance of Evidence*, was met to support the claim. In the same vein, we are considering just whether the claim meets the requisite proof standard, not how the proof standard is determined. We refer to the proof standard on a claim as the claim's *evidential status*. However, we presume proof standards can be accommodated to notions of AF as below:[6] In Figure 11, we indicate the proof standard on a claim such as a_2 with a_2 *has Scintilla*, a_2 *has Preponderance of Evidence*, and a_2 *has Beyond Reasonable Doubt*.

- Scintilla of Evidence (S): the evidence is credulously accepted, meaning that there is at least one preferred extension in which the evidence holds. The evidence has some support, but support does not necessarily outweigh attacks.
- Preponderance of Evidence (PE): the evidence is accepted in the majority of preferred extensions. The support for the evidence outweighs attacks on it.
- Beyond Reasonable Doubt (BRD): the evidence is sceptically accepted, meaning that the evidence holds in every preferred extension. There is no successful attack on the evidence.

Under different procedures, different proof standards are used to determine whether a claim is legally admissible under that procedure: where no judicial proceedings apply

[6] We are abstracting over the relationship between supporting evidence and proof standards as well as the analysis in AFs, which are substantive topics for future research.

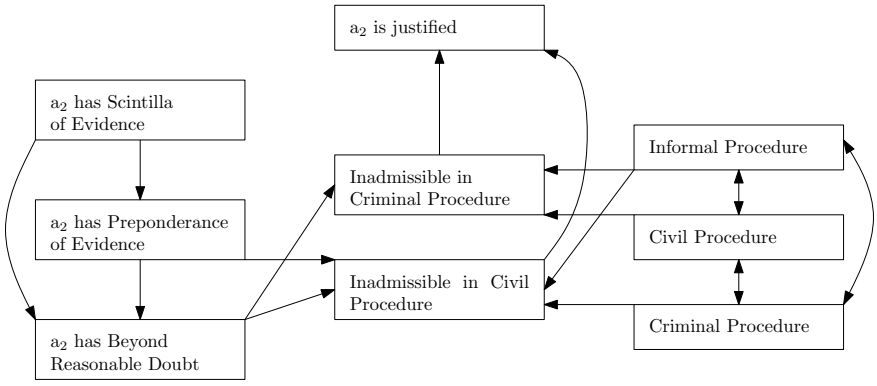

Fig. 11. Proof Standards and Procedural Context

(as in an informal discussion), S may be sufficient, while in civil proceedings, at least PE is required, and in criminal proceedings BRD is required. In Figure 11, these procedural contexts are represented as *Procedure is Informal*, *Procedure is Civil*, and *Procedure is Criminal*.

We are interested to represent the relationship between a *given an evidential status of a particular claim*, the *procedural context*, and the *admissibility of the claim relative to the proof standard and procedural context*. Where the evidential status of the claim is not sufficient with respect to the procedural context, then that claim is *inadmissible* and so cannot be *justified*; if the node which represents inadmissibility is eliminated, then the claim is admissible (but not necessarily justified).

In our representation, we have nodes that represent inadmissibility of a claim in difference procedural contexts; the inadmissibility nodes attack the node that represents that the claim is justified. Where this attack fails, the claim is admissible. We have nodes that represent the different proof standards associated with the claim. If a claim has only S, then it is inadmissible under both civil and criminal procedures; thus, the node which represents the claim bearing this proof standard does not attack either nodes for inadmissibility. If an argument has PE, then the node attacks inadmissibility under a civil procedure in which instance, the claim is admissible under that procedure and potentially justified. However, it is not admissible under a criminal procedure, so if the court sits as a criminal court, the argument is inadmissible. Finally, if the argument has BRD, then it is admissible under either civil or criminal procedures.

Note the asymmetrical relationships between S, PE, and BRD: if the argument only has S, then it does not also have PE and BRD. Therefore, neither of the inadmissibility nodes are eliminated. If a claim only has PE, then it eliminates BRD; it is admissible under civil procedure, but not under criminal procedure. A claim which has PE is *also* compatible with S. On the other hand, if a claim has BRD, it is admissible whether under civil or criminal procedures, which is compatible with S and PE.

At this point, we can turn to fixing the procedural context. The informal procedure eliminates inadmissibility under both civil and criminal procedures since there is no

applicable notion of admissibility; in other words, in an informal context, any claim is admissible, though not necessarily justified. The Civil context eliminates inadmissibility under criminal procedure. The Criminal context eliminates the civil procedure. Note that the contexts attack one another since they are mutually incompatible.

It is the *combination* of the evidential status of the claim along with the context that determines whether the claim is inadmissible relative to the procedural context. For example, if the context is informal and the claim has BRD, the claim is (potentially) justified; if the context is civil and the claim has BRD, the claim is (potentially) justified under a civil procedure; if the context is criminal and the argument has PE, the claim is not justified since a claim with PE is not admissible under a criminal procedure.

3.5 Additional Topics

In this section, we briefly outline how changes in law and the legal principle of *lex posteriori* would be handled.

Change in Law The relationships between the courts in the judicial hierarchy allow that Crown Courts and the House of Lords may *overturn* a legal precedent (at the appropriate level of the courts in the judicial hierarchy), which signifies a *change in the law*. In the representation in Figure 10, precedent cases and current cases in Crown Courts and the House of Lords (separately) *attack* one another. Consequently, in each instance, there are two preferred extensions, one with the precedent and one with the current case. How a decision is reached as a choice between these two extensions may be determined by yet another *value* selection such as initially motivated VAFs [9]. We could introduce this meta-level structure directly, but it adds little of substance to the approach, so we leave it aside here.

Lex Posteriori *Lex Posteriori* is the legal principle that, given two (or more) precedents to guide a decision in a current case and which may otherwise conflict, the more recent precedent is preferred to an earlier precedent. In terms of our approach, this is straightforwardly accommodated. We suppose precedents can be compared in terms of claims and values, so we are only interested in precedents in which the cases are relevant (similar claims which have the same values as the current case), but the *value* ranking between the precedents is different (so there is a conflict between the precedents); consequently, each precedent would justify a different claim in the current case. Finally, we introduce an additional *temporal* parameter into the precedents such as *t = 02-10-1995*, meaning that the case was decided on 02-10-1995. Finally, we assume that temporally *later* precedents asymmetrically attach temporally *earlier* precedents. Thus, a more recent precedent eliminates an older precedent.

For instance, suppose *Precedent(Crown Court,* $v_1 > v_2$*,* b_1*,* b_2*,* $b_1 \approx a_1$*,* $b_2 \approx a_2$*,* b_1 *has* v_1*,* b_2 *has* v_1*, t = 02-10-1995)* and *Precedent(Crown Court,* $v_2 > v_1$*,* c_1*,* c_2*,* $c_1 \approx a_1$*,* $c_2 \approx a_2$*,* c_1 *has* v_1*,* c_2 *has* v_2*, t = 05-11-1960)*. Both serve as precedents for a current case involving a_1 and a_2; they show opposing value rankings $v_1 > v_2$ and $v_2 > v_1$, so they can be understood to attack one another. However, given our temporal condition, which represents *lex posteriori*, the precedent dated 05-11-1960 asymmetrically attacks and defeats (supposing no further attackers) the precedent dated 02-10-1995.

3.6 An Integrated Graph with *Pier v. Postson*

In the following, we discuss our hypothetical case *Pier v. Postson* as it is appealed from a Crown Court to a Court of Appeals where there is only one precedent (*Pier v. Postson*) (which simplifies the graph somewhat) and the values associated with the claims have been fixed. We evaluate the case with respect to Figure 12, which is a graph (simplified where possible) which integrates all the subgraphs we have discussed before.

In the precedent *Wier v. Postal*, a decision was made in a Crown Court for the hunter (a_3, which means the hunter is entitled to possess), against the killer (a_4, which means the killer was entitled to possess), and the values are pursuing vermin (v_1) and a bright line in the law (v_2),where $v_1 > v_2$. This implies that a_3 has v_1 and a_4 has v_2. The claim a_3 is justified in the precedent.

– Precedent(Crown Court, $v_1 > v_2$, a_3, a_4, $a_3 \approx a_1$, $a_4 \approx a_2$, a_3 has v_1, a_4 has v_2)

The case of *Pier v. Postson* is brought before a Crown Court sitting as a civil court where a decision for the hunter is a_1 (the hunter is entitled to possess) and a decision for the killer is a_2 (the killer is entitled to possess). These decisions are associated with values, where a_1 has v_1 and a_2 has v_2. The current Crown Court is not bound by the precedent, which means that the current Crown Court can set its value ranking as either $v_1 > v_2$ or $v_2 > v_1$. We assume it sets the value ranking to $v_1 > v_2$ (suppose it has a high value on being conservative). Finally, we assume that both Pier's pursuit of the fox and Postson's killing of the fox meet that proof standard of Preponderance of Evidence in support of either decision, which passes the requisite proof standard for a civil procedure (for simplicity the Figure 12 shows on admissibility for a_2, which is similar for a_1). Therefore, admissibility does not rule out one or the other claim.

As we can see, the current Crown Court upholds the decision of the precedent set by a Crown Court and decides for the hunter since a_1 *is justified*. The preferred extension is (leaving out some intermediate nodes):

– {Crown Court, $v_1 > v_2$, a_1 has v_2, a_1 has v_1, a_2 has v_2,
a_1 has Preponderance of Evidence, a_2 has Preponderance of Evidence,
Civil Procedure, a_1 defeats a_2, Something defeats a_2, a_1 is justified.}

Subsequently, the case is appealed to a Court of Appeals. At the Court of Appeals, the value rankings could again go either way. However, the Court of Appeals decides in favour of the killer using the value ranking of $v_2 > v_1$ (presumably the court has "progressive" views on hunting). In addition, the precedent set in a Crown Court is overruled. Therefore, the preferred extension is:

– {Precedent(Crown Court, $v_1 > v_2$, a_3, a_4, $a_3 \approx a_1$, $a_4 \approx a_2$, a_3 has v_1, a_4 has v_2),
Court of Appeals, $v_2 > v_1$, a_1 has v_2, a_2 has v_1, a_2 has Preponderance of Evidence,
Context is Civil, a_2 defeats a_1, Something defeats a_1, a_2 is justified.}

For one final example, suppose a different hypothetical precedence *Vier v. Poster* which is much like *Wier v. Postal* except that it is decided in a Court of Appeals and the value ranking is $v_1 > v_2$. Rather than Figure 12, we would have a graph with this

one precedent which attacks all nodes with value ranking $v_2 > v_1$ and all nodes with court at House of Lords. Where the case is presented at the Court of Appeals, even if the court desired to decide the case on the basis of value ranking $v_2 > v_1$, it could not as the precedent asymmetrically attacks nodes with that ranking. In effect, the precedent imposes its value ranking on both the Crown Court and Court of Appeals, no matter what other value ranking those courts may desire. Thus, the preferred extension is:

– {Precedent(Court of Appeals, $v_1 > v_2$, a_5, a_6, $a_5 \approx a_1$, $a_6 \approx a_2$, a_5 has v_1, a_6 has v_2), Crown Court, Court of Appeals, $v_1 > v_2$, a_1 has v_1, a_2 has v_2,
a_1 has Preponderance of Evidence, a_2 has Preponderance of Evidence,
Civil Procedure, a_1 defeats a_2, Something defeats a_2, a_1 is justified.}

4 Discussion

In this paper we have presented an approach to handling notions of judicial context in argumentation frameworks. Our approach introduces modes to represent concepts of the legal domain and their relations in a structured argument network, so that we are able to explicitly express decisions for defeat of a claim relative to the assembly, values, value ranking, proof standards, and precedent. The current paper addresses several aspects of legal reasoning not accounted for in [9] since it adds a range of aspects which determine a decision.

Some previous research in AI and Law touches on issues related to our discussion. [25] takes into consideration the judicial hierarchy in making a decision on a claim. However, it is not set in an argumentation framework, but rather assigns aspects of a decision "points" which are summed, for example, the higher the court, the more the points. It does not consider the ways that courts have of establishing precedence, nor does it consider admissibility. In HYPO and CATO, well-known proposals on case-based reasoning ([23] and [24]), cases in the case base serve as precedents which bear on a current case. However, there is no representation of reasoning with the judicial hierarchy as all precedents have equal weight. Thus, determinations are not relativised to the different courts or procedural contexts.

We have illustrated our approach with three examples: appeals and social change which show precedence and precedent, and a change in the nature of proceedings which illustrates variable admissibility. In every case, however, we have restricted ourselves to a single conflict between a pair of arguments. To move to a more complete treatment of all aspects of judicial context we need to explore the following issues.

There are a range of interesting issues in legal reasoning which we have not addressed. For example, courts often are comprised of several judges who cast their decisions into majority and minority opinions. Recording the different opinions may be important for later judgements and so are worth recording. We have not represented this distinction as it does not effect decisions in a current case for the problems we are modeling. In addition, we have not represented *lex specialis*, which is the doctrine that a law governing a specific subject matter is not overridden by a law which only governs general matters. In our representation, this would mean that we would have to have some sort of "containment" relation between cases, where one is viewed as a more

specific instance of another. If cases are presumed to subsume other cases, and if this information is included in the precedent relation, then this says that there is no attack of a more general on a more specific. This leaves unclear just what is the attack relation between them, if any. We would have two preferred extensions, each about a different "level" of the cases.

Other areas in which this line of research could be taken:

- Represent a body of case law such as in [9] by merging particular conflicts into cases, and cases into the corpus of decisions.
- Provide a range of sources of inadmissibility in addition to failure to meet the required PS. For example, evidence derived from illegal search and seizure may be legally inadmissible. This may require us to further articulate the A-to-I attacks with auxiliary arguments.
- Consider how an evidential status is determined.
- Incorporate into the analysis *burden of proof* [13], which relates participants in legal contexts to the argument network.

These are just several topics for future work in representing judicial context which have been beyond the reach of representation in AFs. Our approach offers great potential to provide a well-founded representation of arguments in legal case law as well as for other areas where contextual issues are crucial in determining the status of arguments.

References

1. A. Wyner and T. Bench-Capon, "Modelling judicial context in argumentation frameworks," in *Computational Models of Argument - Proceedings of COMMA 2008* (P. Besnard, S. Doutre, and A. Hunter, eds.), Frontiers in Artificial Intelligence and Applications, pp. 417–428, IOS Press, 2008.
2. P. M. Dung, "On the acceptability of arguments and its fundamental role in nonmonotonic reasoning, logic programming and n-person games," *Artificial Intelligence*, vol. 77, no. 2, pp. 321–358, 1995.
3. L. Amgoud and C. Cayrol, "On the acceptability of arguments in preference-based argumentation," in *Proceedings of the 14th Annual Conference on Uncertainty in Artificial Intelligence (UAI-98)*, (San Francisco, CA), pp. 1–7, Morgan Kaufmann, 1998.
4. T. J. M. Bench-Capon, "Persuasion in practical argument using value-based argumentation frameworks.," *J. Log. Comput.*, vol. 13, no. 3, pp. 429–448, 2003.
5. D. Berman and C. Hafner, "Representing teleological structure in case-based legal reasoning: the missing link," in *Proceedings of the Fourth International Conference on Articial Intelligence and Law*, pp. 50–59, 1993.
6. G. C. Christie, *The Notion of an Ideal Audience in Legal Argument*. Kluwer Academic Publishers, 2000.
7. T. Bench-Capon and G. Sartor, "Theory based explanation of case law," in *Proceedings of the Eighth International Conference on AI and Law*, (New York), pp. 12–21, ACM Press, 2001.
8. T. Bench-Capon, "Representation of case law as an argumentation framework.," in *Legal Knowledge and Information Systems, Proceedings of Jurix 2002* (T. Bench-Capon, A. Daskalopoulu, and R. Winkels, eds.), (Amsterdam), pp. 103–112, IOS Press, 2002.

9. T. J. M. Bench-Capon, "Try to see it my way: Modelling persuasion in legal discourse.," *Artif. Intell. Law*, vol. 11, no. 4, pp. 271–287, 2003.
10. S. Modgil and T. Bench-Capon, "Integrating object and meta-level value-based argumentation," in *Computational Models of Argument - Proceedings of COMMA 2008* (P. Besnard, S. Doutre, and A. Hunter, eds.), Frontiers in Artificial Intelligence and Applications, IOS Press, 2008. To Appear.
11. P. E. Dunne and T. J. M. Bench-Capon, "Coherence in finite argument systems," *Artificial Intelligence*, vol. 141, no. 1, pp. 187–203, 2002.
12. T. Bench-Capon, S. Doutre, and P. E. Dunne, "Audiences in argumentation frameworks," *Artificial Intelligence*, vol. 171, pp. 42–71, 2007.
13. T. Gordon, H. Prakken, and D. Walton, "The carneades model of argument and burden of proof," *Artificial Intelligence*, vol. 171, pp. 875–896, 2007.
14. A. Wyner and T. Bench-Capon, "Argument schemes for legal case-based reasoning," in *Legal Knowledge and Information Systems. JURIX 2007* (A. R. Lodder and L. Mommers, eds.), (Amsterdam), pp. 139–149, IOS Press, 2007.
15. A. McDowell, "Legal fictions in *Pierson v. Post*," *Michigan Law Review*, vol. 105, pp. 735–777, 2007.
16. S. Modgil, "An abstract theory of argumentation that accommodates defeasible reasoning about preferences," in *ECSQARU* (K. Mellouli, ed.), vol. 4724 of *Lecture Notes in Computer Science*, pp. 648–659, Springer, 2007.
17. A. Wyner, T. Bench-Capon, and K. Atkinson, "Three senses of "argument"," in *Computable Models of the Law: Languages, Dialogues, Games, Ontologies* (G. Sartor, P. Casanovas, R. Rubino, and N. Casellas, eds.), LNAI 4884, p. To Appear, Springer, May 2008.
18. A. Ross, "Tû-tû," *Harvard Law Review*, vol. 70, pp. 812–825, 1957.
19. L. Lindahl, "Deduction and justification in the law. the role of legal terms and concepts," *Ratio Juris*, vol. 17, pp. 182–202, 2004.
20. K. D. Ashley and S. Brüninghaus, "A predictive role for intermediate legal concepts," in *Legal Knowledge and Information Systems, Proceedings of Jurix 2003* (D. Bourcier, ed.), (Amsterdam), pp. 153–162, IOS Press, 2003.
21. K. Atkinson and T. Bench-Capon, "Legal case-based reasoning as practical reasoning," *Artificial Intelligence and Law*, vol. 13, pp. 93–131, 2006.
22. A. Cruse, *Lexical Semantics*. Cambridge University Press, 1986.
23. K. Ashley, *Modeling Legal Argument: Reasoning with Cases and Hypotheticals*. Cambridge, MA: Bradford Books/MIT Press, 1990.
24. V. Aleven, *Teaching case-based argumentation through a model and examples*. PhD thesis, University of Pittsburgh, 1997.
25. A. Kowalski, "Case-based reasoning and the deep structure approach to knowledge representation," in *ICAIL '91: Proceedings of the 3rd international conference on Artificial intelligence and law*, (New York, NY, USA), pp. 21–30, ACM, 1991.

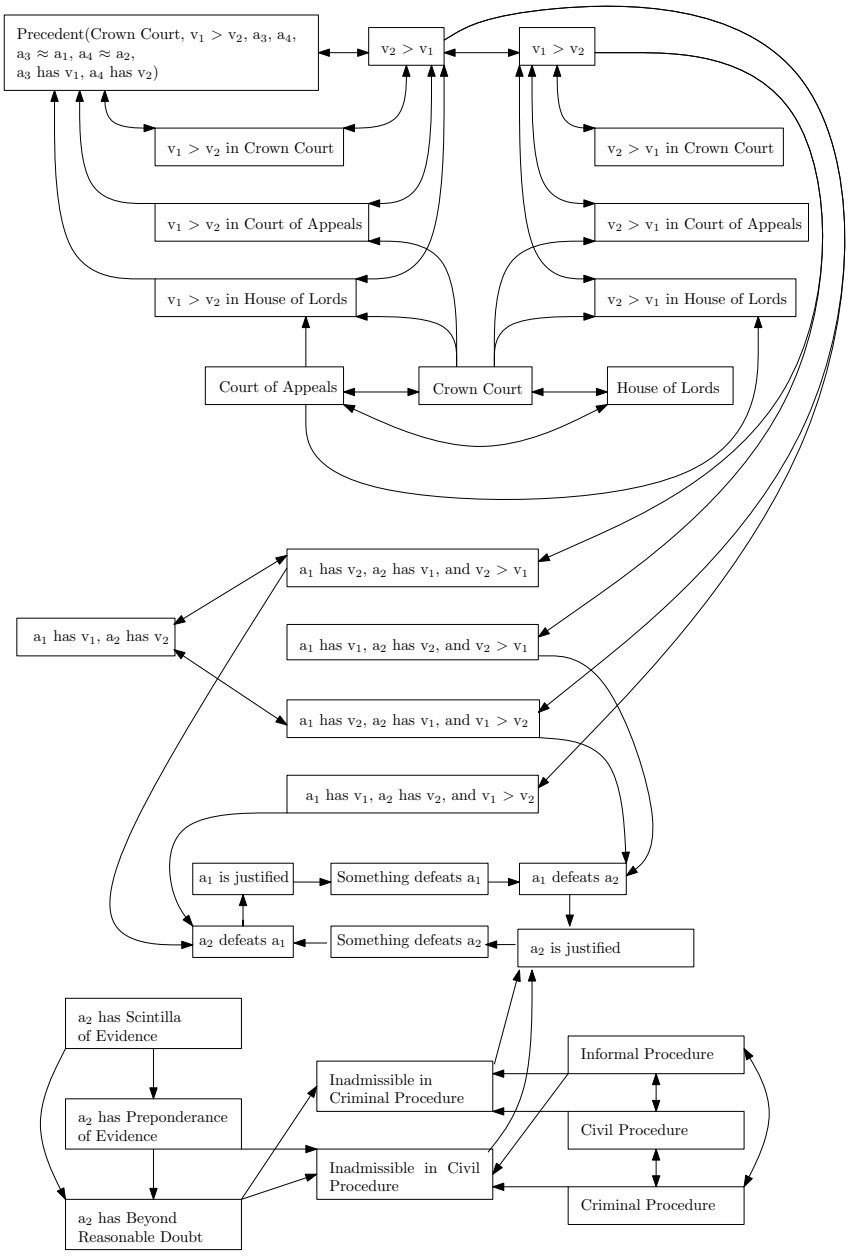

Fig. 12. The Subgraphs Connected