

Advancing Dispute Resolution Beyond the State through Bitcoin

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Bitcoin’s decentralized and programmable nature can be leveraged to produce judgments that are enforceable without state coercion, creating fully private and voluntary dispute resolution systems that have the potential to extend the rule of law to communities lacking access to fair and reliable courts.

I. Introduction: The Enforcement Problem.

Civil justice systems resolve disputes by producing judgments. And those judgments “differ from all other decisions in society — they are binding, enforceable, and backed ultimately by the coercive powers of the state.”¹ An unenforceable judgment is merely symbolic. When judgments cannot be enforced, the legitimacy of the legal system comes into question. Without legitimacy, disputants are less likely to voluntarily abide by judgments.²

Private Alternative Dispute Resolution (ADR) systems, such as arbitration and mediation, share the same inherent vulnerability of enforcement. Enforceable outcomes affirm the effectiveness of “a settlement process and reenforc[e] parties’ incentives” to participate in an ADR system.³ But unenforceable outcomes will disincentivize participation.⁴

For this reason, since the rise of the nation-state, private ADR has mostly existed in the shadow of state-run courts.⁵ Arbitral awards are not self-executing. If a disputant refuses to

¹ Richard Susskind, *ONLINE COURTS AND THE FUTURE OF JUSTICE* 19 (2019).

² “At the heart of dispute resolution lies the concept of legitimacy, which is ultimately premised on trust — trust in the system, trust in the process, and trust in its fairness — and therefore a willingness to abide by outcomes.” Orna Rabinovich-Einy & Ethan Katsch, *Blockchain and the Inevitability of Disputes: The Role for Online Dispute Resolution*, 2019 J. Disp. Resol. 47, 72 (2019).

³ Ellen E. Deason, *Enforcing Mediated Settlement Agreements: Contract Law Collides with Confidentiality*, 35 U.C. Davis L. Rev. 33, 37–38 (2001).

⁴ Orna Rabinovich-Einy & Ethan Katsh, *Technology and the Future of Dispute Systems Design*, 17 Harv. Negotiation L. Rev. 151, 162–63 (2012) (identifying “challenges to the enforcement of resolutions and decisions reached through” online dispute resolution as a significant unresolved issue).

⁵ Bruce Benson has detailed how dispute resolution was a private endeavor well before the existence of nation-states, and in many cases was coopted by the sovereign. *See* BRUCE L. BENSON,

comply, the other party must petition the courts to enforce the award, once again calling upon the coercive power of the state.⁶ Private Online Dispute Resolution (ODR) systems (those that use software and the internet) are no different.⁷

Private and public dispute resolution systems, therefore, have traditionally depended on a functioning state-run legal system. This is problematic for the more than 4 billion people living outside the protection of the law without access to justice⁸ or the 54% of the global population that lives under some form of authoritarian rule.⁹ And it's not just the developing world or autocracies where access to justice is lacking. In the United States, between 2017 and 2021,

THE ENTERPRISE OF LAW: JUSTICE WITHOUT THE STATE 338-39 (2011) (“In particular, arbitration has taken a much more complex ‘legalistic’ character, arbitration is less a summary proceeding, concern for government-imposed laws is relatively more significant, and arbitration is costlier.”).

⁶ See Riikka Koulu, LAW, TECHNOLOGY AND DISPUTE RESOLUTION: PRIVATISATION OF COERCION 71 (2019) (“ADR decisions struggle with accessing enforcement in those cases where the decision is not followed on a voluntary basis. Traditionally, ADR decisions had to resort to the state’s enforcement mechanism, which meant that they were subordinated to ex ante control of due process before being enforced.”); NANCY ROGERS, ROBERT BORDONE, FRANK SANDER, DESIGNING SYSTEMS AND PROCESSES FOR MANAGING DISPUTES 408–09 (2019) (explaining enforcement mechanisms for arbitral awards).

⁷ Rabinovich-Einy & Katsh, at 162–63.

⁸ See OECD, LEVERAGING THE SDGs FOR INCLUSIVE GROWTH: DELIVERING ACCESS TO JUSTICE FOR ALL 2 (2016), available at <https://www.oecd.org/gov/delivering-access-to-justice-for-all.pdf> (last visited Dec. 16, 2023). Another study of 179 states found that men do not have access to justice in 123 countries, and women do not have access to justice in 127. See *Access to Justice for Women*, OUR WORLD IN DATA, <https://ourworldindata.org/grapher/access-to-justice-women-row> (last visited Dec. 16, 2023); *Access to Justice for Men*, OUR WORLD IN DATA, <https://ourworldindata.org/grapher/access-to-justice-men-row> (last visited Dec. 16, 2023).

⁹ See ECONOMIST INTELLIGENCE UNIT, EIU DEMOCRACY INDEX, available at <https://www.eiu.com/n/campaigns/democracy-index-2021/> (last visited Dec. 20, 2023). By another measure, over 70% of the global population lives under a form of autocracy. *People Living in Democracies and Autocracies*, OUR WORLD IN DATA, https://ourworldindata.org/grapher/people-living-in-democracies-autocracies?stackMode=relative&country=~OWID_WRL. (last visited Dec. 16, 2023).

66% of the population experienced at least one legal issue, but only 49% of those issues were resolved.¹⁰ The justice gap between low- and high-income earners is well documented.¹¹

If state-run courts are failing to furnish the rule of law to most of humanity, an alternative is required. But how can judgments be enforced in the absence of the state's alleged monopoly on coercion?

Although rare today¹², examples of fully private enforcement exist. To create enforceable decisions without state-backed coercion, ADR systems must possess at least one of two key attributes:

1. Control over the flow of funds, and/or
2. A community of shared norms.

The archetypal example of the first attribute is eBay, with its tight control over the flow of funds through PayPal. An example of the second attribute is the Benoam insurance dispute system in Israel, which adjudicates a limited number of recurring issues between repeat disputants within a community of insurance companies (and also controls the flow of funds through a clearinghouse). Both are ODR systems that use software and the internet, not face-to-face hearings, to adjudicate disputes without any involvement from state-backed courts. And both systems are entirely voluntary: at the time disputants choose to join the eBay or Benoam communities, they execute agreements to use the ODR systems to resolve disputes with other community members.

This paper proposes a new class of dispute resolution system that enables any community to resolve its disputes through control over the flow of funds. This new class of ODR uses the Bitcoin network, the world's most decentralized communication protocol for the transfer of value. By anchoring dispute resolution systems into Bitcoin's interoperable, programmable, and global network, self-executing monetary judgments can be rendered that do not rely on the courts for enforcement.¹³

¹⁰ MARTIN GRAMATIKOV, ET AL., THE HAGUE INST. FOR INNOVATION OF LAW, INST. FOR THE ADVANCEMENT OF THE AM. LEGAL SYS., JUSTICE NEEDS AND SATISFACTION IN THE U.S. 3 (2022), available at <https://iaals.du.edu/sites/default/files/documents/publications/justice-needs-and-satisfaction-us.pdf> (last visited Dec. 16, 2023).

¹¹ LEGAL SERVS. CORP., THE JUSTICE GAP: MEASURING THE UNMET CIVIL LEGAL NEEDS OF LOW-INCOME AMERICANS (2017), available at <https://justicegap.lsc.gov/the-report/> (last visited Dec. 16, 2023).

¹² BENSON, *supra* note 5, at 337-38 (“[I]t was during the years prior to 1920 that arbitration began to catch on, particularly among trade associations, so the process was well established before government coercion was available.”)

¹³ Bitcoin's relevant attributes will be examined in Section III; however, a full explanation of exactly how Bitcoin works is beyond the scope of this paper. A helpful primer is Yan Pritzker's

The paper proceeds as follows. Section II examines existing ODR systems that have achieved significant separation from state-run courts to determine the attributes most conducive to private enforcement. Section III explains why the Bitcoin network is particularly well-suited to incorporate and extend those attributes. Finally, section IV offers two specific use cases for ODR on Bitcoin, or, BDR.

INVENTING BITCOIN (2019). More in-depth, technical explanations can be found in Andreas Antonopolous's MASTERING BITCOIN (2d ed. 2017), as well as THE INTERNET OF MONEY (2016).

II. Private Enforcement in Existing ODR Systems.

A. Traditional, “Off-Chain” ODR.

1. eBay: Payment Integration and Crowdsourcing.

eBay’s control over the flow of funds between disputants through PayPal is widely recognized as integral to its private enforcement of ODR decisions.¹⁴ Private enforcement is particularly important for eBay because the vast majority of disputes on its platform involve low-value financial transactions. It is not economical for buyers and sellers to take their disputes to court; therefore, without a very low-cost private system of arbitration, use of the marketplace would remain minimal at best.

In addition to eBay’s direct control over funds, which is a general characteristic of the eBay platform worldwide, another specific ODR design has evolved in India: a crowdsourced “Community Court” for resolving disputes over reviews.¹⁵ If a seller thinks they received an undeserved review from a buyer, they can log into the Community Court and explain their case.¹⁶ The system allows the seller to upload evidence in the form of images, text, or other files. The Community Court software will then automatically contact the buyer and provide them with the same opportunity and ability to respond to the seller’s submission. The seller is afforded a text-based rebuttal within a limited amount of time.¹⁷

After the submissions are completed, the Community Court software randomly selects a panel of 21 jurors.¹⁸ Jurors are required to apply for the position and meet eligibility criteria

¹⁴ See Koulu at 76 (“In addition to providing an e-commerce platform for sellers and buyers, eBay has access to the world’s largest Internet payment company, PayPal, which has been a subsidiary of eBay since 2002. The combination of access to the payment method and internal dispute resolution procedure is necessary for producing an effective private enforcement mechanism.”); ROGERS, ET AL., *supra* note 6, at 118 (“eBay also developed its own enforcement processes. This was possible both because eBay managed the flow of money between the parties via its PayPal subsidiary and because eBay could restrict or remove users from the platform at any time.”).

¹⁵ “eBay India’s Community Court leveraged the best judgement of other eBay users to decide whether a contested eBay review should be deleted.” Amy J. Schmitz & Colin Rule, *Online Dispute Resolution for Smart Contracts*, 2019 J. Disp. Resol. 103, 117 (2019).

¹⁶ Colin Rule & Chittu Nagarajan, *Crowdsourcing Dispute Resolution Over Mobile Devices*, 6-7 (2011), available at <http://colinrule.com/writing/mobile.pdf> (last visited Dec. 16, 2023). Colin Rule and Harpreet Singh, “ODR and Online Reputation Systems,” *ONLINE DISPUTE RESOLUTION: THEORY AND PRACTICE* 192-93 (Mohamed Abdel Wahab, Daniel Rainey & Ethan Katsh, eds.) (2013), available at http://www.ombuds.org/odrbook/rule_singh.pdf (last visited Dec. 21, 2023); ROGERS, ET AL. at 118–120.

¹⁷ Rule & Nagarajan at 6-7.

¹⁸ *Id.*

based on their history on eBay.¹⁹ After the jurors review both the buyer's and seller's submissions, each juror is asked if they agreed with the buyer, the seller, or if they cannot make a decision.²⁰ If the majority agree with the seller, then the case is decided in the seller's favor and the negative feedback is removed from eBay's system. If the majority disagrees with the seller, then the feedback stands.²¹

The Community Court guards against fraud and collusion by "assigning cases out to jurors on a first-come, first-served basis" and putting time limits on juror access to the case and materials.²² The Community Court software also screens jurors based on their transaction histories to ensure none of the empaneled jurors have transacted with the disputing buyers/sellers.²³ eBay continually monitors outcomes and juror voting data to check for consistency and coherence. "If a juror displays some concerning patterns," the Community Court will "refer them cases that have already reached an outcome (for example, more than half have already voted one way or another, so the resolution is already known) as a test." eBay can eventually remove problematic jurors from the Community Court altogether.²⁴

Although it is a crowdsourced system of volunteers, the designers discovered over the first three years of operation that "the eBay Court has had more than enough jurors apply," and "the platform has not needed to compensate jurors for their service in order to keep them engaged."²⁵ The designers attribute this to the unique nature of eBay, which "has long had an active community with extremely engaged users."²⁶

The eBay Community Court demonstrates that crowdsourced dispute resolution can be effective, at least with a limited scope, without direct financial incentive schemes if embedded within a community with shared norms and customs.

2. Community Courts Via Mobile Phone in Afghanistan.

In 2010, local communities in Afghanistan explored partnering with American lawyers and dispute systems designers to pilot a mobile telephone-based dispute resolution system called the

¹⁹ *Id.*

²⁰ *Id.*

²¹ *Id.*

²² *Id.* at 7.

²³ *Id.*

²⁴ *Id.*

²⁵ Rule & Singh at 193.

²⁶ *Id.*

“Mobile Jirga” or “M-Jirga”.²⁷ The strategy was to leverage mobile technology to “leapfrog costly intermediary steps and move right to the most modern systems” for the developing world.²⁸

The state-run courts of the Karzai administration were failing to establish the rule of law.²⁹ The Taliban were seen by many in Afghanistan as delivering more efficient and fair justice than the American-backed government, in part because they used the traditional, informal “Jirga” system.³⁰ The Jirga system also had the advantage of being local. Difficult travel conditions made attendance in formal courts in Kabul unrealistic.³¹

Two of the M-Jirga designers, Colin Rule (eBay’s chief dispute resolution designer) and Chittu Nagarajan, describe the traditional Jirga process this way:

To convene a jirga, one or both of the parties to a dispute formally invite tribal elders to attend. Usually food is provided for the elders who attend (e.g. a cow or a sheep is killed for the occasion). The size of the jirga panel varies depending on the nature and seriousness of the issue. If six or more men are asked to mediate a dispute between individuals in different villages or tribes, half of the panel will be drawn from one side and half from the other in order to keep balance between the parties.

To solve a dispute, the men on the jirga panel (it is almost always men) gather in a mosque or under a tree and discuss the situation in depth. During the proceedings, all members of the panel have equal say, but in practice everyone pretty much accepts the solution chosen by the most influential and respected members. Every member is entitled to state his point of view and make suggestions. It is considered very important for the atmosphere of the discussion to remain calm and respectful.³²

Jirga decisions are rendered orally and no record is kept of the adjudication.³³ Jirga decisions implement restorative justice, not retributive, and so “there’s no question of punishment

²⁷ Rule & Nagarajan at 2. *See also* Spencer Ackerman, *Can Cellphones Bring Justice in Afghanistan?*, WIRED (Oct. 18, 2010), <https://www.wired.com/2010/10/can-cellphones-bring-justice-in-afghanistan/> (last visited Dec. 20, 2023).

²⁸ Rule & Nagarajan at 2

²⁹ Ackerman.

³⁰ *Id.* Rule & Nagarajan at 10.

³¹ Rule & Nagarajan at 9.

³² *Id.* at 10.

³³ *Id.*

or jail time in the outcomes rendered,” somewhat obviating the need for enforcement through coercion.³⁴

The M-Jirga design proposed a remote Jirga process through mobile phone technology:

Disputants could call a special number on their mobile phone to begin the process. The hotline number could be advertised around the country on posters or leaflets, or provided at the USAID hosted legal centers. Facilitators will communicate with the disputants and enable them to verbally record their cases. Both sides to the dispute will be able to hear and respond to the statements from the other side. Once both parties are satisfied with the case they have put together, a panel of elders will then be convened by phone. The elders will hear the statements from both sides and then be able to weigh in with their decision, and to record their rationale. The final decision will then be shared with the disputants, and each disputant will be able to review the recorded statements of the elders.³⁵

The system was designed to be flexible, matching elders with disputants according to the dialect or language spoken.³⁶ And feedback from participants would be crucial to tailor the system to reflect on-the-ground realities and cultural norms.³⁷

The M-Jirga design offers an example of tailoring dispute resolution systems to the communities using them. M-Jirga deployed modern communication technology to facilitate the functioning of traditional, local, community-based courts as an alternative to ill-fitting state-run systems, which were widely perceived as corrupt and ineffectual.

3. Benoam: An Industry Community Court.

A rare example of a particular industry in a country creating and running its own private legal system outside of state-run courts is Israel’s “Benoam” system. Benoam “handles the vast majority of property damages claims between insurance companies in Israel (‘fender-bender’ claims).”³⁸ These claims are referred to Benoam through an ODR system and database in which all insurance companies operating in Israel have contractually agreed to participate.³⁹ Benoam’s

³⁴ *Id.* at 11.

³⁵ Rule & Nagarajan at 11–12.

³⁶ *Id.* at 12.

³⁷ *Id.*

³⁸ Orna Rabinovich-Einy and Ethan Katsh, “Lessons from Online Dispute Resolution for Dispute Systems Design,” *ONLINE DISPUTE RESOLUTION: THEORY AND PRACTICE*, 67 (Mohamed Abdel Wahab, Daniel Rainey & Ethan Katsh, eds.) (2011).

³⁹ *Id.* See also Orna Rabinovich-Einy & Roe Tsur, *The Case For Greater Formality In ADR: Drawing On The Lessons Of Benoam’s Private Arbitration System*, 34 *Vt. L. Rev.* 529, 544 (2009) (“The vast majority of Israeli insurance companies, which controlled more than 95% of the auto

complete adoption by the insurance industry has led dispute resolution scholars Orna Rabinovoch-Einy and Ethan Katsch to conclude that Benoam has “in effect displaced the court system in this particular domain of disputes.”⁴⁰

The Benoam agreement contains detailed Articles of Arbitration that set forth the rules of the system.⁴¹ There are almost never any in-person hearings. Most claims are decided “on written pleadings and evidence submitted and stored digitally,” which is possible due to the “generally uncomplicated nature of the claims and the fact that there is a limited set of recurring typical cases.”⁴² Data is transferred automatically from the insurance companies’ internal databases onto forms for greater efficiency, and information on “decisions flow[s] from Benoam to the Insurance Association for the execution of rulings.”⁴³

Benoam does not use jurors or crowdsourcing to arbitrate, but rather professional, expert third-party neutrals, who “include retired judges, attorneys, appraisers, traffic examiners, and Certified Public Accountants (CPAs).”⁴⁴ Arbitrators are incentivized to render consistent and well-reasoned decisions through continued engagement by Benoam, and those arbitrators who are “singled out as ... ‘leading’ arbitrator[s], whose decisions are not reversed on appeal and whose rulings set important precedents” can expect a steady stream of cases.⁴⁵ Indeed, the role of Benoam arbitrator has become attractive over the years, creating competition that increases the quality, expertise, and impartiality of prospective arbitrators⁴⁶ And the risk that arbitrators will create precedent favorable to particular disputants over others is further minimized “by the fact that users are repeat players who typically alternate between the plaintiff and defendant positions.”⁴⁷

These and other factors confer a perception of fairness to the Benoam system, thereby reinforcing its use. For example, “the availability of an internal appeals mechanism before another arbitrator or a panel of arbitrators proved an effective ex post mechanism for

insurance market, accepted the solution offered by the Benoam system and signed an arbitration agreement under which they were obligated to file all their subrogation ‘fender bender’ claims through Benoam (Agreement or Arbitration Agreement).”

⁴⁰ Rabinovich-Einy & Katsh (2011) at 67.

⁴¹ Rabinovich-Einy & Tsur at 544.

⁴² Rabinovich-Einy & Tsur at 545.

⁴³ Rabinovich-Einy & Katsh (2012) at 187–88.

⁴⁴ Rabinovich-Einy & Tsur at 545.

⁴⁵ Rabinovich-Einy & Katsh (2012) at 185; Rabinovich-Einy & Tsur at 560.

⁴⁶ Rabinovich-Einy & Tsur at 560.

⁴⁷ Rabinovich-Einy & Katsh (2012) at 185.

strengthening fairness.”⁴⁸ The appeals process also allows Benoam to resolve fundamental questions that may arise.⁴⁹ “Landmark decisions” from appellate panels are published to Benoam’s website, without identifying the parties to the claim.⁵⁰ This creates a form of *stare decisis*, or binding precedents that must be followed within the system.⁵¹ Such precedents create consistency among decisions, thereby further reinforcing perceptions of fairness.

Benoam is able to enforce its decisions privately by operating a clearinghouse to automatically transfer funds and settle the aggregate of awards amongst insurance companies on a monthly basis.⁵² The insurers grant Benoam authorization to withdraw and deposit funds directly from their accounts through the general agreement. As the leading experts on the system describe it: “The ability to execute arbitration awards swiftly and *independently of courts* allows Benoam to substitute power and authority for *consent*.”⁵³ This independence and reliance on consent is “a central factor in [Benoam’s] success and legitimacy.”⁵⁴

4. Próspera Arbitration Center: Private Courts for Private Cities.

Another example of private dispute resolution at societal scale is the Próspera Arbitration Center (PAC). Próspera is a semi-autonomous “Zone for Economic Development and Employment” (ZEDE) on the island of Roatán in Honduras.⁵⁵ Próspera is part of the Free Cities movement, which aims to place individual liberty and voluntary choice at the center of governance through the creation of semi-autonomous territories within nation-states.⁵⁶ The Próspera ZEDE was created by the Honduran National Congress through a constitutional amendment, and its existence is further stabilized through bilateral international agreements.⁵⁷

⁴⁸ *Id.* at 184.

⁴⁹ Rabinovich-Einy & Tsur at 546.

⁵⁰ Rabinovich-Einy & Katsh (2012) at 184.

⁵¹ Rabinovich-Einy & Katsh (2012) at 184.

⁵² Rabinovich-Einy & Tsur at 546.

⁵³ Rabinovich-Einy & Tsur at 548 (emphasis added).

⁵⁴ Rabinovich-Einy & Katsh (2012) at 189.

⁵⁵ *Platform*, HONDURAS PRÓSPERA, <https://prospera.hn/platform> (last visited Dec. 16, 2023).

⁵⁶ *See* FREE CITIES FOUND., <https://free-cities.org/> (last visited Dec. 16, 2023).

⁵⁷ *See Platform*, *supra* note 55. *See also* PRÓSPERA ZEDE, <https://pzgps.hn/> (last visited Dec. 16, 2023); *All Publications*, PRÓSPERA ZEDE, <https://pzgps.hn/all-publications/> (last visited Dec. 16, 2023).

Próspera residents sign an “Agreement of Coexistence” with the operating entity that sets forth the parties’ obligations and rights and specifies how disputes will be resolved.⁵⁸ Rules and regulations are published in a Charter & Bylaws, which includes a Resident Bill of Rights, as well as the Roatan Common Law Code.⁵⁹ The Agreement specifies arbitration as the exclusive mode of dispute resolution between residents or between the residents and operating entities.

The PAC is a separate business entity with which the Próspera operator contracts for dispute resolution services.⁶⁰ As a separate company, the PAC is also available to provide arbitration services to other special economic zones or even between private individuals.⁶¹ The PAC employs professional, expert arbitrators with experience as former judges, constitutional law professors, and practicing lawyers.⁶² The PAC issues both binding and nonbinding decisions. While not a full ODR system, the PAC claims to leverage technological solutions to drive efficiencies in decision-making (indeed, it does not currently have a physical forum).⁶³

Although striving to be a private dispute resolution system, enforcement of PAC decisions nonetheless leads back to the courthouse door. The PAC’s website explains that “[a]wards of the PAC are enforceable internationally pursuant to the New York and Panama Conventions,” thus requiring a court subject to those conventions to confirm and enforce awards whenever there is noncompliance.⁶⁴

The PAC nonetheless offers a real-world model of an independent dispute resolution entity, whose jurisdiction can be established *ex ante*, through voluntary contracts, on a *society-wide scale*. Being an independent business, the PAC offers its services to many different communities, broadening its sources of funding, thereby increasing its likelihood of longevity as a stable forum. Moreover, with increased funding comes the ability to attract skilled and high-quality expert arbitrators, whose employment further confers legitimacy to the dispute resolution program.

⁵⁸ See PRÓSPERA ZEDE E-RESIDENT AGREEMENT OF COEXISTENCE, available upon request at <https://eprospera.hn/residency>.

⁵⁹ *All Publications*, supra note 57.; PRÓSPERA ZEDE, *Charter, Bylaws, Carta Constitutiva y Reglamentos*, <https://pzgps.hn/charter-bylaws-carta-constitutiva-y-reglamentos/> (last visited Dec. 16, 2023).

⁶⁰ PRÓSPERA ARBITRATION CENTER, <https://pac.hn/> (last visited Dec. 20, 2023).

⁶¹ *Id.*

⁶² *Id.*

⁶³ See *Services*, PRÓSPERA ARBITRATION CENTER, <https://pac.hn/services/> (last visited Dec. 20, 2023).

⁶⁴ PRÓSPERA ARBITRATION CENTER, <https://pac.hn/> (last visited Dec. 20, 2023).

B. “On-Chain” ODR.

1. Bitcoin-Based Dispute Resolution: The Bisq Trading Network.

The Bisq Network facilitates decentralized, peer-to-peer bitcoin exchanges for fiat and other cryptocurrencies through client software and a communication protocol.⁶⁵ Bisq is operated and maintained through a Decentralized Autonomous Organization (DAO).⁶⁶ The Bisq DAO is a loose affiliation of contributors who are incentivized to write open-source code or participate in operational roles through rewards in the BSQ token, which is redeemable for bitcoin, other cryptocurrencies, or fiat.⁶⁷ BSQ also confers voting rights, which are used to direct the DAO’s collective action.

To preserve its decentralized, peer-to-peer nature, Bisq has designed a system of resolving disputes between traders that involves minimal intervention from DAO members and, importantly, is partially self-executing. At no point during a trade are trader funds custodied by the Bisq DAO or its members. Instead, as part of every trade, buyers and sellers lock up a percentage of the trade amount as a security deposit, along with the bitcoin trade amount, in a time-locked, 2-of-2 multi-signature escrow Bitcoin address, to which each of the traders has one key.⁶⁸ Both traders must sign with their keys to release the funds. But if the traders do not sign the transaction before the time-lock expires, the funds are sent to a donation address controlled by DAO members (more on this shortly).

Bisq publishes a table of penalties for trading infractions, which are assessed out of the escrow amounts and awarded to the wronged party through the dispute resolution process, as follows.⁶⁹

⁶⁵ BISQ WIKI, https://bisq.wiki/Main_Page (last visited Dec. 20, 2023).

⁶⁶ *DAO*, BISQ, <https://bisq.network/dao/> (last visited Dec. 20, 2023).

⁶⁷ *Introduction to the DAO*, BISQ WIKI, https://bisq.wiki/Introduction_to_the_DAO (last visited Dec. 20, 2023); *Bisq DAO for Bitcoin Maximalists*, BISQ, <https://bisq.network/blog/bisq-dao-for-bitcoin-maximalists/> (last visited Dec. 20, 2023).

⁶⁸ *Introduction*, BISQ WIKI, <https://bisq.wiki/Introduction> (last visited Dec. 20, 2023); *Security Deposit*, BISQ WIKI https://bisq.wiki/Security_deposit (last visited Dec. 20, 2023).

⁶⁹ *Table of Penalties*, BISQ WIKI, https://bisq.wiki/Table_of_penalties (last visited Dec. 20, 2023); *Trading Rules*, BISQ WIKI, https://bisq.wiki/Trading_rules (last visited Dec. 20).

Bisq’s dispute resolution system has three levels: trader chat, mediation, and arbitration.⁷⁰ The first level, trader chat, is designed to avoid conflict.⁷¹ Once an offer has been accepted, traders can communicate with each other through a chat box. Bisq encourages communication between traders and sets rules and best practices for using the chat function to avoid fraud and facilitate respectful and productive discussions towards completing trades.⁷² Trader chat leverages the benefits of “asynchronous, text-based online exchanges,” which allow “participants to be reflective” and “consider their comments before posting,” further enabling a respectful line of communication conducive to resolving misunderstandings and completing trades.⁷³

The second level of Bisq’s dispute resolution system is mediation.⁷⁴ Either trader can request mediation at any time once a trade is open, which will initiate a chat directly between each trader and the mediator — but it ends the chat function between the two traders. Mediators are DAO members who post BSQ bonds to ensure performance and fidelity, and which can be confiscated by vote of the DAO. The mediator receives information about the dispute through the chat and then suggests a non-binding payout to resolve the dispute (sourced from the 2-of-2 multi-signature Bitcoin escrow). The mediator may suggest that the breaching party pay a penalty to the wronged party based on the pre-published schedule of infractions (which include cancelling trades, requesting personal data, suggesting payment terms different from the agreed-upon trade, attempting communication outside of the Bisq client).⁷⁵ If both parties agree to the proposed resolution, they click a button that signs the transaction and releases the funds held in the 2-of-2 multi-signature address according to the mediator’s proposal. If one party rejects the proposed resolution, the dispute is escalated to arbitration, the third and final level of the Bisq dispute resolution process.

The arbitrator is also a bonded DAO member. Once the mediator’s suggestion is rejected, or the time-locked escrow address expires, the disputed funds are sent to the donation address and arbitration is initiated.⁷⁶ The arbitrator assesses the details of the dispute through

⁷⁰ *Dispute Resolution*, BISQ WIKI, https://bisq.wiki/Dispute_resolution (last visited Dec. 20, 2023).

⁷¹ “[T]he heart of both dispute resolution and dispute prevention lies in communication between parties as part of a decision-making process.” Rabinovich-Einy & Katsh (2011) at 59. *See also* Susskind at 67.

⁷² *Dispute Resolution*, *supra* at 70.

⁷³ Rule & Nagarajan at 4–5 (“ODR was able to leverage the intimacy of technology to access disputes at a much earlier stage. In the eBay and PayPal context, the ODR systems we designed were available to buyers at the first inkling that a problem might exist. That enabled the ODR process to help the buyer diagnose the problem they were experiencing, and begin resolving it before escalation with the seller could take place.”).

⁷⁴ *Dispute Resolution*, *supra* at 70.

⁷⁵ *Table of Penalties*, BISQ WIKI, https://bisq.wiki/Table_of_penalties (last visited Dec. 20, 2023).

⁷⁶ *Dispute Resolution*, *supra* at 70.

chat. But, unlike mediation, there are no additional penalties. Whichever party the arbitrator sides with receives only their security deposit back, and the bargained-for bitcoin, if so entitled. Thus, “the total arbitration payout will be **less** than the mediation payout.”⁷⁷ This design is intended to incentivize resolution at mediation (or earlier) and discourage resort to arbitration, which Bisq views as being reserved “for extreme circumstances.”⁷⁸

Although the final level of dispute resolution in Bisq requires human intervention and control to execute fully, Bisq is correct to describe its process as an attempt to “make ... bitcoin confiscatable, enabling a sort of mutually assured destruction to drive dispute resolution on Bisq without trusted third parties.”⁷⁹ It is an attempt to overcome Bitcoin’s seizure resistance to remedy wrongs – but only where the aggrieved party and perpetrator have voluntarily assented to this system in advance. It is a system built on consent, not coercion.

2. Crowdsourced Arbitration through Smart Contracts: Kleros.

Kleros is a dispute resolution service that uses smart-contracts and crowdsourced decision-making (similar to eBay India’s Community Court). The system is designed primarily to resolve conflicts related to blockchain activity, but also resolves “off-chain,” or real-world, disputes, mostly involving freelance and work-for-hire contracts.⁸⁰ Kleros is built on the Ethereum blockchain and is not interoperable with Bitcoin. While innovative, Kleros’s ODR architecture incentivizes jurors to divine in advance what the most popular judgment will be and vote for that outcome, rather than the judgment they might consider legally correct.

⁷⁷ *Id.*

⁷⁸ *Id.*

⁷⁹ *Id.*

⁸⁰ KLEROS, *Court*, DOCS.KLEROS.IO, <https://kleros.gitbook.io/docs/products/court> (last visited Dec. 20, 2023).

To use Kleros, disputants must designate Kleros as their arbitrator *ex ante* in a smart contract.⁸¹ Users access Kleros’s platform through a web app interface, or front end.⁸²

Kleros’s crowdsourcing design works by enlisting anonymous “jurors” who stake a certain number of Kleros’s own token, “Pinakion,” to demonstrate interest in being randomly selected for cases.⁸³ The disputants then present their cases to the jurors asynchronously through the app, and jurors secretly commit to vote for one particular party.⁸⁴ Jurors are unable to communicate with one another and they must provide justification for their votes to the parties.⁸⁵

Once the voting is closed, the votes are revealed, and the party with the majority of juror votes prevails.⁸⁶ The jurors in the minority (designated “incoherent”) are penalized with the loss of their staked tokens, which are transferred to the jurors in the majority (those designated

⁸¹ Clément Lesaege, Federico Ast, and William George, *Kleros: Short Paper v.1.0.7* (2019), available at https://kleros.io/static/whitepaper_en-8bd3a0480b45c39899787e17049ded26.pdf (last visited Dec. 20, 2023) (hereinafter “Kleros White Paper”) (“Smart contracts have to designate Kleros as their arbitrator.”); KLEROS, *Smart contract integration with Kleros Court (Arbitrator)*, DOCS.KLEROS.IO, <https://kleros.gitbook.io/docs/integrations/types-of-integrations/1.-dispute-resolution-integration-plan/smart-contract-integration> (last visited Dec. 20, 2023). See also DANIEL STABILE, KIMBERLY A. PRIOR, ANDREW M. HINKES, *DIGITAL ASSETS AND BLOCKCHAIN TECHNOLOGY: US LAW AND REGULATION 26* (2020) (Smart contracts “were originally described by Nick Szabo in 1997 as ‘contractual clauses (such as collateral, bonding, delineations of property rights, etc.) which can be embedded in the hardware and software we deal with, in such a way as to make breach of contract expensive (if desired, sometimes prohibitively so) for the breacher.’ Smart contracts became a popular model for innovation with the adoption of blockchain systems that natively facilitate transfers of digital assets without reliance on centralized authorities. Smart contracts can automatically transmit value and data based upon the operation of ‘if then’ logic without the need for the software to interface with external systems or require external inputs. Likewise, smart contracts can be designed to execute the terms of a transaction upon the occurrence of some external event.”).

⁸² See KLEROS, *Court*, COURT.KLEROS.IO, <https://court.kleros.io/> (last visited Dec. 20, 2023).

⁸³ Schmitz & Rule at 118–19. KLEROS, *PNK Token*, DOCS.KLEROS.IO, <https://kleros.gitbook.io/docs/pnk-token> (last visited Dec. 20, 2023).

⁸⁴ *Id.*

⁸⁵ KLEROS, *Kleros FAQ*, DOCS.KLEROS.IO, <https://docs.kleros.io/kleros-faq#are-jurors-required-to-provide-a-justification-for-their-vote-is-the-justification-revealed-to-the-d> (last visited Dec. 20, 2023).

⁸⁶ Kleros White Paper at 7–8.

“coherent”).⁸⁷ “Coherent” jurors are also separately paid in ether from arbitration fees that the disputants pay to the Kleros court protocol, with fees rising as a dispute is appealed.⁸⁸

This crowdsourcing model is based on the game theory concept of “Schelling points.”⁸⁹ The jurors must guess what most of their peers will decide and vote accordingly.

The major drawback of resolving disputes through Schelling points is that it does not incentivize the jurors to vote for the *correct legal result*, only the most likely to be *popular*.⁹⁰ Indeed, Kleros does not provide any legal structure or guidance to jurors, nor does it apply any particular jurisdiction’s laws or community’s norms.⁹¹ Kleros’s jurors simply cast votes based on their own subjective beliefs about the merits of the dispute, while also guessing at other jurors’ beliefs. Essentially, jurors attempt to discern what other jurors will think is a “fair” outcome. But what is perceived as “fair” may not accurately reflect what the disputants *actually contracted for*. As one critic put it, “the focus of the game incorrectly shifts to incentivize a juror to vote for an outcome that diverges from the ‘right’ legal result,” and “forces the decisionmaker to care more about her own well-being than the well-being of the disputants,” thereby diverting “away from a straightforward legal analysis.”⁹²

An incentive model like Kleros’s that produces legally or contractually inconsistent or even arbitrary outcomes risks its own legitimacy in the eyes of its potential users.⁹³ Where Kleros succeeds, however, is in its automatic enforcement of decisions and its voluntary nature. Because it leverages the smart contracting functionality of the Ethereum blockchain, Kleros’s decisions are self-executing and deliver value from the liable party directly to the injured party, peer-to-peer — without resort to the state-run court system. And because parties must agree to use Kleros *ex ante* when entering into smart contract transactions, just like parties to traditional contracts can choose to arbitrate disputes before the American Association of Arbitrators, for example, it is entirely consensual and voluntary.

⁸⁷ Kleros White Paper at 6–7. See also KLEROS, *Law on Blockchain: Become a Juror – Dispute Resolution on Ethereum*, BLOG.KLEROS.IO, <https://blog.kleros.io/become-a-juror-blockchain-dispute-resolution-on-ethereum/> (Apr. 21, 2020) (last visited Dec. 20, 2023).

⁸⁸ Kleros White Paper at 7–8.

⁸⁹ Kleros White Paper at 2 (“Thomas Schelling described focal point(s) for each person’s expectation of what the other expects him to expect to be expected to do. The Schelling Coin uses this principle to provide incentives to a number of agents who do not know or trust each other to tell the truth.”) (internal quotation marks omitted);

⁹⁰ See Michael Buchwald, *Smart Contract Dispute Resolution: The Inescapable Flaws of Blockchain-Based Arbitration*, 168 U. Penn. L. Rev. 1369, 1404–05 (2020).

⁹¹ *Id.* at 1406.

⁹² *Id.* at 1405–06.

⁹³ *Id.* at 1406–07.

C. Requirements for Fully Private Enforcement.

The ODR systems of eBay, Benoam, the Bisq Network, and Kleros achieve private enforcement of judgments through their control over the flow of disputants' funds. Of these systems, only Kleros is not directly embedded in a larger community with shared norms or rules. These systems can be considered fully private and self-reliant, with no need to seek enforcement in court.

In contrast, the M-Jirga model and the Próspera Arbitration Center, while embedded within specific communities, do not control the flow of disputant funds, and as such cannot be entirely independent of the court system. The M-Jirga system attempted to pair disputants with elders who spoke the same dialects and, presumably, shared similar cultural norms. But the reputational factors that encourage voluntary compliance with traditional Jirga decisions (shame or expulsion from the local community) may have been attenuated or altogether eliminated by the M-Jirga's country-wide scale. In the case of the Próspera Arbitration Center, reputational pressure incentivizing compliance is present when one or both disputants reside in Próspera. Noncompliance with PAC arbitral awards may also be a breach of the agreement signed by the residents, ultimately resulting in eviction or expulsion. But the PAC is not completely private, as it maintains a link to state-run courts through the option to obtain a court-ordered judgment enforcing the arbitral award.

The forgoing survey of truly private—that is, independent of the court system—ODR systems demonstrates that control of funds is a sufficient condition to achieve private enforcement of decisions. In addition, when ODR systems are integrated into enduring communities, shared norms and behavioral expectations facilitate decision-making and increase perceptions of the ODR system's legitimacy and fairness.

III. The Bitcoin Protocol Can Enable Private Enforcement of ODR Decisions.

A. Programmable Money.

The private enforcement mechanisms of eBay and Benoam “hinge ... on the availability of digital databases that allow for effortless connections between financial data and resources on the one hand, and resolution outcomes on the other.”⁹⁴ At no point is a court order necessary to coerce compliance with decisions. The monetary judgments are simply executed by the digital systems.

Bitcoin is programmable money that exists on a globally distributed database (the blockchain). Bitcoin's programmability allows the financial data native to its protocol (amount of bitcoin held in a disputants' addresses, for example) to connect with resolution outcomes produced

⁹⁴ Rabinovich-Einy & Katsh (2012) at 189.

off-chain by ODR systems. For example, using tools like Discreet Log Contracts⁹⁵ or Bitcoin Miniscript⁹⁶, bitcoin transactions can be constructed that operate as agentless, noncustodial escrow, releasing funds to a disputant upon issuance of an ODR decision. Specific applications of this feature are explored in Section IV.

Using Bitcoin as the currency and financial database for dispute resolution obviates the need to construct and maintain proprietary databases (like Benoam's) from scratch. And Bitcoin, by design, eliminates the need to trust the centralized database provider, because transactions are constantly reconciled on every node in the Bitcoin network. Nodes with nonconforming databases fall out of consensus and are ignored.

Bitcoin also obviates the need for ODR systems to introduce their own tokens like Bisq's BSQ or Kleros's PNK. Issuing new tokens introduces unnecessary regulatory risk and can misalign incentives between the system's developers, disputants, and neutral decision-makers.⁹⁷ Additionally, forcing users to obtain niche tokens to access the dispute resolution system creates friction to adoption.⁹⁸ Bitcoin's native token can enable any function a bespoke token would serve

⁹⁵ See *Discreet Log Contracts*, DIGITAL CURRENCY INITIATIVE, <https://dci.mit.edu/smart-contracts> (last visited Dec. 20, 2023); Théo Pantamis, *Oracle-based Conditional Payments on Bitcoin*, BLOG.LNMARKETS.COM, <https://blog.lnmarkets.com/oracle-based-conditionnal-payment-on-bitcoin-2/> (last visited Dec. 20, 2023).

⁹⁶ See *Miniscript*, BITCOIN.SIPA.BE, <https://bitcoin.sipa.be/miniscript/> (last visited Dec. 20, 2023); Aaron Von Wirdum, *Miniscript: How Blockstream Engineers are Making Bitcoin Programming Easy(er)*, BITCOIN MAGAZINE, <https://bitcoinmagazine.com/technical/miniscript-how-blockstream-engineers-are-making-bitcoin-programming-easier> (Aug. 20, 2019) (last visited Dec. 20, 2023).

⁹⁷ Allen Farrington has described those “DeFi” incentives thus:

Given VCs [venture capital investors] have immediate and total exit liquidity, their incentives are to not to nurture a highly uncertain business for as long as it takes to stabilize its return profile, but to maximize i) the amount of tokens they are allocated for free as early as possible and, ii) the price at which they can unload it as quickly as possible. Given protocol developers (the equivalent of companies) are similarly directly exposed to the immediate price rather than the long-term value of the capital they are responsible for creating, their incentives are equally aligned with VCs and misaligned with buyers and holders of the token.

Allen Farrington & Anders Larson, *Green Eggs and Ham: Decentralized Finance: The Good, The Bad, and the Ugly*, 18 (2022), available at <https://www.uncerto.com/green-eggs-and-ham>.

⁹⁸ In a recent report on technology and ODR, the United Nations Conference on Trade and Development concluded similarly:

Acquiring and using PNK tokens, Kleros' native token, requires a relatively elevated level of knowledge about manipulating cryptocurrencies. This can be a barrier of entry, particularly when compared with more accessible tokens such as BTC or ETH, which have a more developed technology services ecosystem built

within a dispute resolution system (for example, staking value to prevent Sybil attacks⁹⁹, or rewarding jurors for participation).

Integration with Bitcoin allows any ODR system to gain control over the flow of funds necessary to privately enforce arbitration decisions.

B. Community Money.

Embedding ODR systems directly into communities, both online and offline, will further support private enforcement. A community focus enables the system to be tailored to its users: to reflect cultural norms and better address the needs of disputants.¹⁰⁰

Communities in El Salvador, Peru¹⁰¹, South Africa¹⁰², Guatemala¹⁰³, Cameroon¹⁰⁴, Brazil¹⁰⁵, and Costa Rica¹⁰⁶ are already participating in the Bitcoin economy and are driving Bitcoin adoption. Bitcoin-native ODR systems could complement the economic transformations occurring in any one of these localities and provide a vehicle for achieving rule of law that might otherwise be lacking under their respective state-run justice systems.

Moreover, the global, borderless nature of the Bitcoin protocol means that people from around the world can be linked together into online communities through a common medium of exchange. And because the Bitcoin protocol is permissionless, it is also inclusive. Those excluded from the account-based global financial system can access Bitcoin's digital payment rails and join these emerging communities without needing to open or maintain a bank account. Bitcoin therefore has far greater potential reach than a closed, permissioned payments network like PayPal, which requires all transacting parties to have bank accounts in order to operate. The Bitcoin

around them. As a result, the risks of financial loss remain elevated for potential users of PNK without the right level of technical education.

UNCTAD, TECHNOLOGY AND THE FUTURE OF ONLINE DISPUTE RESOLUTION (ODR) (2023), available at https://unctad.org/system/files/official-document/tcsditcinf2023d5_en.pdf (last visited Dec. 17, 2023).

⁹⁹ See Kleros White Paper at 4.

¹⁰⁰ E.g., Rule & Nagarajan at 12.

¹⁰¹ MOTIV, <https://motiv.ngo/program/pay-with-bitcoin/> (last visited Dec. 20, 2023).

¹⁰² BITCOIN EKASI, <https://bitcoinekasi.com/> (last visited Dec. 20, 2023).

¹⁰³ Rikki, *Dispatch from Guatemala's Bitcoin Lake, a Bitcoin Community Built on Grassroots Adoption*, BITCOIN MAGAZINE, <https://bitcoinmagazine.com/culture/dispatch-from-guatemala-bitcoin-lake> (Jan. 12, 2023) (last visited Dec. 20, 2023).

¹⁰⁴ @_BitcoinMt, TWITTER, <https://twitter.com/BitcoinMt> (last visited Dec. 20, 2023).

¹⁰⁵ PRAIA BITCOIN BRAZIL, <https://praiabitcoin.org/en/> (last visited Dec. 20, 2023).

¹⁰⁶ BITCOIN JUNGLE, <https://www.bitcoinjungle.app/> (last visited Dec. 20, 2023).

network embodies the principle that justice should be accessible to all, not only those with bank accounts, credit cards, or state-issued identification.

C. Decentralized, Neutral Money.

An ODR system that intends to operate independently of the state must be anchored to a financial infrastructure that is neutral and immune to capture. Bitcoin's decentralization eliminates that risk. Bitcoin achieves its unparalleled decentralization and resilience through:

- An immutable ledger distributed across tens of thousands of computers¹⁰⁷,
- which is secured by an equally distributed and large proof-of-work mining network¹⁰⁸,
- all run on code upgraded through an opt-in, voluntary process that ensures perpetual backward-compatibility¹⁰⁹.

In order for an ODR system to be fully independent from the state, not only must the financial infrastructure it makes use of be decentralized; the process of dispute resolution it employs also must be decentralized. Where this is not the case, users of the ODR system are exposed to counterparty risk even if the underlying financial infrastructure they make use of is devoid of such risk.

Consider the Bisq Network's dispute resolution system, which is anchored to Bitcoin. Bisq harnesses Bitcoin's decentralization to create largely self-enforcing decisions through time-locked transactions at the mediation stage. But Bisq also uses a fallback donation address controlled by the DAO at the arbitration stage, with decisions executed by the arbitrator directly

¹⁰⁷ One recent estimate of all nodes (visible and unreachable) was 49,163. See BITNODES, <https://bitnodes.io/nodes/all/> (last visited Dec. 17, 2023). Additionally, the hardware requirements for running the validating node software are very low, allowing anyone with an old laptop or single-board computer and access to the internet to store the entire blockchain and validate every transaction.

¹⁰⁸ The Bitcoin network is estimated to use 156.33 TWh of electricity annualized as of December 20, 2023. See CAMBRIDGE CENTRE FOR ALTERNATIVE FINANCE, CAMBRIDGE BITCOIN ELECTRICITY CONSUMPTION INDEX, <https://ccaf.io/cbeci/index> (last visited Dec. 20, 2023). Any attacker seeking to force a reorganization of the most recently added blocks of transactions would need to control 51% of the mining network, *i.e.*, the dedicated proof-of-work servers plus the energy necessary to power them. And, after China's mining ban in the summer of 2021, the mining hash-rate (number of PoW servers on the network) is more globally distributed than ever, making physical seizure of 51% of servers highly improbable. See CAMBRIDGE CENTRE FOR ALTERNATIVE FINANCE, *Bitcoin Mining Map*, CAMBRIDGE BITCOIN ELECTRICITY CONSUMPTION INDEX, https://ccaf.io/cbeci/mining_map (last visited Dec. 20, 2023).

¹⁰⁹ See Yan Pritzker, INVENTING BITCOIN 81–85. Voluntary upgrades means that malicious code cannot be surreptitiously pushed onto all the Bitcoin nodes. Each node-runner must actively consent to an upgrade, allowing time for bugs and attacks to be discovered. And no one group or entity can unilaterally change Bitcoin's code. See generally Jameson Lopp, *Who Controls Bitcoin Core?*, CYPERPUNK COGITATIONS, <https://blog.lope.net/who-controls-bitcoin-core/> (Dec. 15, 2028) (last visited Dec. 20, 2023).

paying parties. This introduces centralization and custodial risk. Disputants with funds in the DAO's address are exposed to the risk of the project's failure or theft of funds by DAO members. The arbitrator is likewise exposed to these risks, which could affect the arbitrator's reimbursement. Finally, by taking custody of trade funds in a donation address it controls, the DAO exposes its members and contributors to regulatory and compliance risks.

Additional risks manifest where the disputants are not fully anonymous and a centralized dispute resolution platform maintains custody of funds (such as eBay and PayPal). Centralized custodians have the power to censor disputants and can be influenced or coerced into doing so. For these reasons, dispute systems seeking fully private enforcement must be designed in a way that removes or minimizes these custodial and centralization risks.

As discussed more fully below, Bitcoin-native tools exist now to enable decentralized arbitration designs that avoid such pitfalls.

D. Open-Source, Transparent, and Interoperable Money.

A feature shared by Bisq and Kleros that is critical for the long-term success of a private alternative to state-run legal systems is the open-source licensing of the underlying code. This allows anyone to view, audit, propose changes to, and redistribute the system's code, and therefore increases perceptions of the ODR system's transparency and legitimacy.

Open-source ODR software does not exist outside of the cryptocurrency industry. This "trade secrets" problem persistently undermines perceptions of fairness among users of centralized ODR systems:

Novel fairness issues emerge when software mediates or resolves disputes. Participants using a private online negotiation service to resolve buyer-seller disputes cannot tell whether the software operates neutrally. That ignorance may lead buyers to suspect that the provider designs the software to favor sellers who typically pay the provider for the service and to certify them as compliant with dispute resolution results. Transparency might help, but private providers protect the trade secrets in their software. Even if the invisible software rarely contributes to unfairness, people may refuse to put themselves in a situation of having to use the software if they do not trust it.¹¹⁰

¹¹⁰ ROGERS, ET AL., *supra* note 6, at 249.

Bitcoin eliminates this problem because it is entirely open source¹¹¹, as are its most popular scaling protocols, the Lightning Network and FediMint.¹¹² Open source code provides a type of transparency that is crucial for building trust in a software system; greater trust, in turn, encourages adoption and use of the software. By inspecting the code themselves or relying on independent third-party evaluations, users of open-source ODR systems can know that the software code is not favoring the operators of a platform, private city, government, company, or the more powerful party in a bilateral contract.¹¹³

IV. Bitcoin Dispute Resolution (BDR) Use Cases.

With the foregoing principles in mind, let us consider two use cases for Bitcoin-based ODR, or BDR. The first example explores BDR's potential to resolve "real-world" disputes, and the second explores its ability to resolve "online" or "e-commerce" disputes.

A. Local Community Courts.

Imagine a small rural town, hours away from the nearest government judicial center. Alice, a town resident, hits Bob's dog with her motor scooter. Bob incurs veterinary bills for his injured dog and wishes to hold Alice accountable, but Alice refuses to reimburse Bob. Alice and Bob have no prior legal relationship, although they know each other as neighbors. Bob could attempt to bring a small claims action against Alice in court, but that would require substantial time and effort if the operations of local government courts are not fully digital. And even if they are fully digital, it may take many months or years to prosecute the claim to disposition.

But if the town had a Bitcoin-based economy and both Alice and Bob held funds in a community pool, a BDR system could render a decision and automatically transfer funds from Alice to Bob. Such a BDR system is possible using a second-layer protocol built on top of the Bitcoin protocol (similar to SMTP for email, which integrates into TCP/IP).

¹¹¹ See Satoshi Nakamoto (satoshi), BITCOINTALK.ORG (Dec. 10, 2009, 08:49:02 PM), <https://bitcointalk.org/index.php?topic=13.msg46#msg46> (explaining, "[b]eing open source means anyone can independently review the code. If it was closed source, nobody could verify the security. I think it's essential for a program of this nature to be open source.").

¹¹² *What is a Fedimint?*, FEDIMINT.ORG, <https://fedimint.org/docs/GettingStarted/What-is-a-Fedimint> (last visited Dec. 20, 2023).

¹¹³ Colin Rule & Mark James Wilson, "Online Resolution and Citizen Empowerment: Tax Appeals and Court Resolutions in North America," DIGITAL TRANSFORMATION AND ITS ROLE IN PROGRESSING THE RELATIONSHIP BETWEEN STATES AND THEIR CITIZENS 116 (2020) (discussing how "transparency can build trust and work to ensure fairer outcomes across the board" when employing dispute resolution technology).

The FediMint protocol¹¹⁴ is an example of such a second-layer protocol. FediMint enables a trusted federation of community members to control the keys to a community bank, or mint. The mint’s multi-signature wallet controls the flow of funds. Users deposit bitcoin into the mint and receive instantly redeemable e-cash IOUs denominated in bitcoin in their wallet apps. Transactions between users of these IOUs are instant (requiring no confirmation on the base Bitcoin blockchain), private, and can even be conducted offline.¹¹⁵

FediMint further extends Bitcoin’s capabilities through modules. The core of the protocol is the “ability to agree on and process transactions,” and “[t]he possible input and output types of these transactions are defined by modules.”¹¹⁶ The two necessary modules run the logic for the wallet and e-cash mint, but other modules like “smart contracts or even a federated market place could be implemented.”¹¹⁷ FediMint’s developers intend these “3rd party modules” to be “driven by the needs of the fedimint community.”¹¹⁸ In other words, communities will be able to pick and choose, or develop for themselves, the apps to run on their community’s financial operating system.

A ßDR system could be implemented as one of these FediMint modules. The ßDR module would be granted the necessary control over the federation users’ funds to achieve enforcement without state-run court intervention. And because of FediMint’s modularity, a community could choose from various ßDR module designs (jury of community members, panel of arbitrators, random crowdsourced jurors, etc.) or service providers, plugging in the one that best suits that specific community.

A private city like Próspera could implement a FediMint with a ßDR module to obtain fully private enforcement of judgments. In such a private FediMint-powered community, our dispute between Alice and Bob would proceed as follows:

1. Alice and Bob take up residence in the local community and sign a “Resident Agreement of Coexistence,” agreeing in advance to the specified ßDR system.
2. Alice and Bob deposit and maintain a minimum amount of Bitcoin (specified by the “Resident Agreement of Coexistence”) into the community FediMint upon

¹¹⁴ *What is a Fedimint?*, FEDIMINT.ORG, <https://fedimint.org/docs/GettingStarted/What-is-a-Fedimint> (last visited Dec. 20, 2023).

¹¹⁵ One company, Fedi, is deploying FediMint software and wallets with these features to communities now. See FEDI, INC., *Features*, FEDI.XYZ, <https://www.fedi.xyz/features> (last visited Dec. 20, 2023).

¹¹⁶ *Architecture*, FEDIMINT.ORG, <https://fedimint.org/docs/MiniMintDetails/Architecture> (last visited Dec. 20, 2023).

¹¹⁷ *Id.*

¹¹⁸ *Running a Fedimint*, FEDIMINT.ORG, <https://fedimint.org/docs/GettingStarted/Running-a-Fedimint> (last visited Dec. 20, 2023).

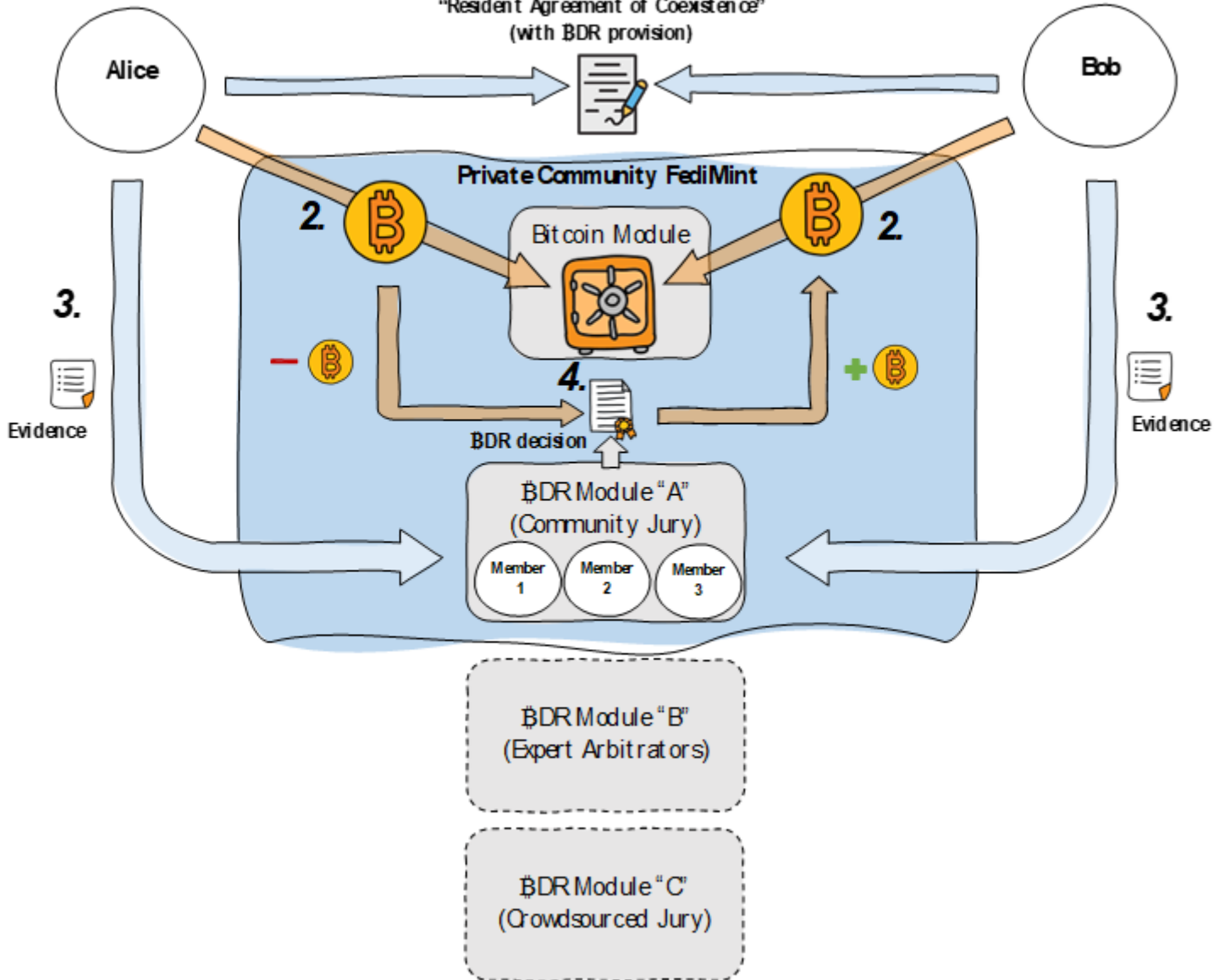
taking up residence, and continue to use the FediMint wallet for their daily transactions.¹¹⁹

3. A dispute arises between Alice and Bob (Alice injures Bob's dog), and both parties submit their evidence (documents, text-based testimony, photographs, etc.) asynchronously through the FediMint community app to the ßDR panel.
4. The ßDR panel issues its decision, transferring some of Alice's bitcoin to Bob in satisfaction of the judgment. Alice and Bob's wallets reflect the transfer.

¹¹⁹ To further incentivize users to keep funds in their community wallet, a sliding cap could be imposed on the amount of damages a user could recover if they themselves bring a claim. For example, if a certain threshold amount of funds were in the community wallet, then a user could recover 100% of their claim; but if the threshold amount slipped below the threshold by 10%, their potential recovery in future disputes would likewise be reduced by 10%.

1

"Resident Agreement of Coexistence"
(with BDR provision)



By unshackling itself from traditional civil justice systems, a ßDR system deployed through a FediMint can also extend beyond mere dispute resolution services and approach justice more holistically.¹²⁰ The FediMint wallet used by the community could incorporate a “know your rights” tab to educate residents on their rights and responsibilities (as set forth by the relevant governing contracts or even local law and customs). The wallet could utilize a grievance assessment wizard as a first step in the ßDR process, which would categorize the conflict through a series of basic questions and propose tailored solutions based on the type of dispute.¹²¹

B. Open-Source Software Development.

ßDR is particularly well-suited for globally-distributed communities with online economies. The free, open-source software (FOSS) development ecosystem is one such community. FOSS funding can take the form of ad hoc “bounties” that promise payment for a requested solution, feature, or project. One problem with bounties is that grantors have complete discretion over payment. Developers who build a solution must trust the bounty grantor to pay upon presentation of the work product (which is, of course, open-source and without copyright). The developer lacks enforceable assurances that they will be compensated for their work. The grantor can amend the bounty criteria on the fly. Or the grantor can simply deny payment by taking the position that the work product doesn't meet the previously stated criteria. Developers have limited recourse if a dispute arises.

A ßDR system could spread the risk evenly across grantors and developers, and create efficiencies by automating the process of bounty funding, review, and collection. A panel of experienced, independent, third-party reviewers could be selected as “jurors” by a coordinator service to adjudicate whether a bounty's criteria has been met. The review panel's decision would trigger release of the grant funds from a bitcoin-native, non-custodial escrow. Grantors would contemporaneously fund the escrow when they post a bounty to a public bulletin board.

¹²⁰ Susskind refers to this as the “extended court,” which would include “tools to help users understand their rights, duties, and options open to them, facilities that assist litigants to marshal their evidence and formulate their arguments, and systems that advise on or bring about non-judicial settlement.” Susskind at 61.

¹²¹ A “grievance assessment process will seek, in the first instance, to settle some pretty basic questions, such as the following. Does your problem concern (a) an injury you have suffered, (b) some money you are owed, (c) a product or service with which you are unhappy, or (d) a problem arising from a contract? Is your problem with (a) an individual, (b) a business, (c) a public body? When did the problem occur? Where did the problem arise?” Susskind at 125. *See also* Rule & Wilson at 114 (summarizing a “common design” for dispute “diagnosis wizard” that can assess and propose resolutions to “small claims disputes,” “landlord tenant disputes,” and “family disputes”).

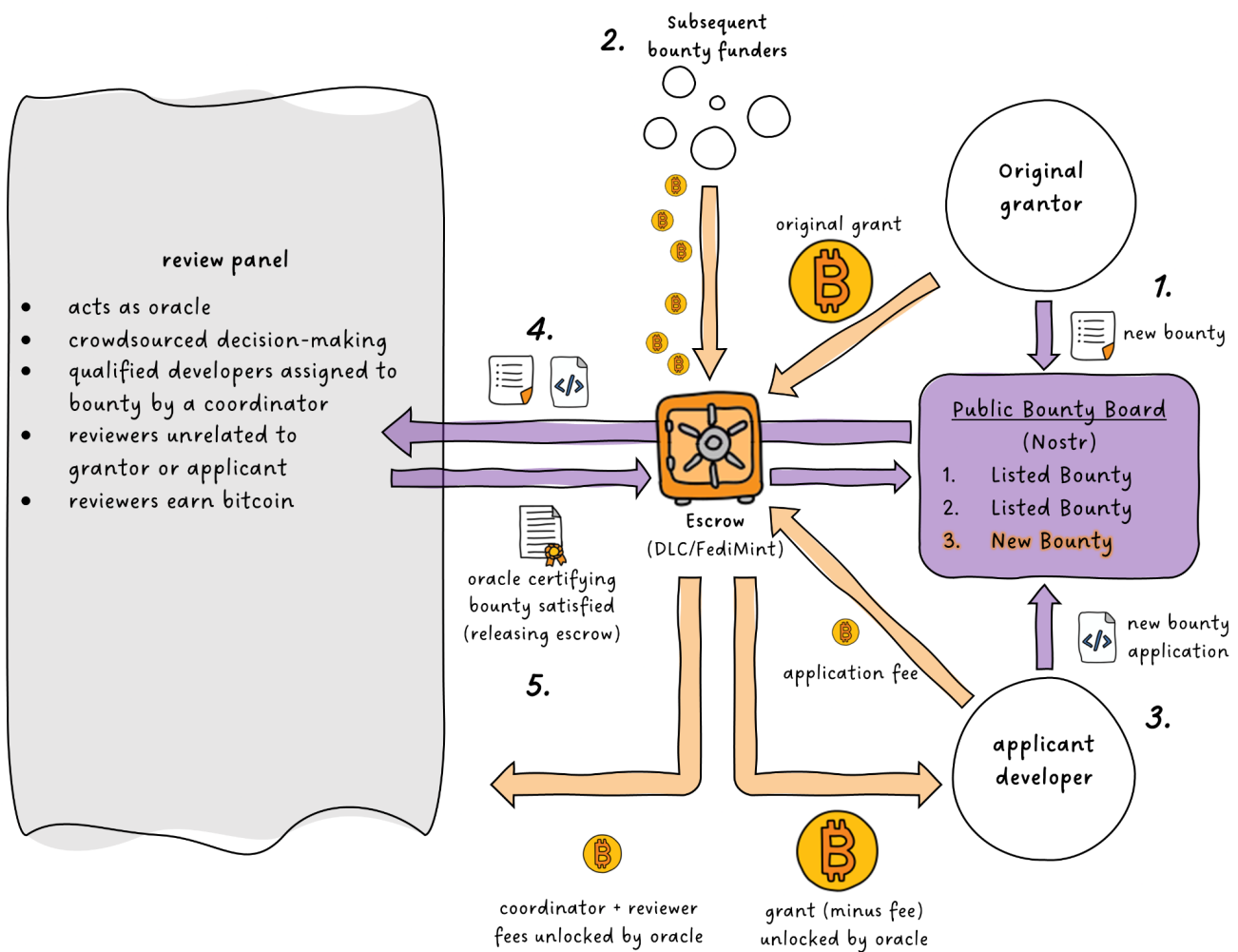
The bounty board and system communications can be conducted through the decentralized nostr (Notes and Other Stuff Through Relays) data protocol.¹²² Participants can be identified by a unique nostr public key. Nostr allows the content of certain communications (direct messages) to be encrypted, while other communications (such as public bounty posts) can remain public.

Noncustodial escrow can be deployed through bitcoin-native tools like Discreet Log Contracts, the FediMint protocol, or Bitcoin miniscript.

An example of how a bounty could progress through the BDR system follows:

1. The Grantor posts a bounty to a bounty bulletin board, detailing the criteria for the project. At the same time, Grantor funds the bounty by depositing bitcoin in escrow.
2. Developers and additional funders view the listed bounties, choosing those on which to work or contribute more funds.
3. Applicant Developer applies for the bounty by submitting the code and other supporting documentation or resources to the bounty Review Panel. Applicant Developer pays a nonrefundable application fee that is placed into escrow.
4. The Review Panel Coordinator assigns the bounty application and Grantor's criteria to a Review Panel of at least three developers, unrelated to either the Grantor or Applicant Developer.
 - a. If a majority of the Review Panel determines that the work product meets the bounty's criteria, the funds will be released from escrow to Applicant Developer, less fees for the Review Panel members and Coordinator.
 - b. If a majority of the Review Panel determines the bounty's criteria have not been met, no funds will be released except the Review Panel and Coordinator fees.
5. The Review Panel transmits its decision to all participants. If the participants disagree with the decision of the Review Panel, they can initiate an appeal within a set amount of time before funds are released from escrow.

¹²² NOSTR, *Nostr-Protocol/Nostr: A Truly Censorship-Resistant Alternative To Twitter That Has A Chance Of Working*, GITHUB.COM, <https://github.com/nostr-protocol/nostr> (last visited Dec. 20, 2023).



Private BDR systems such as the one described here can drive efficiencies and provide assurances that better facilitate the flow of commerce in FOSS funding and other online economies.

V. Conclusion.

Because private enforcement of ODR outcomes requires the system to control the flow of funds between its users, very few systems have achieved full separation from state-run courts. Those that have (for example, eBay and Benoaam) were built by stakeholders and entities with vast resources capable of deploying their own digital payment networks or clearinghouses.

The global, interoperable, permissionless nature of the Bitcoin network now enables any community, regardless of its location or size, to create ODR systems that use programmable money to generate self-executing judgments. These systems can only obtain control over user funds with the voluntary consent of the disputants. This means that state-backed coercion can be removed from the dispute resolution process entirely.

The Bitcoin network and its native asset provide democratic tools for communities to establish the rule of law, irrespective of the quality, efficacy, or fairness of any particular state-run court. Transforming ODR into ßDR will advance and normalize the practice of dispute resolution without the state, expanding access to justice for all of humanity.