

Blockchain for Humanity Global Challenge

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#BLOCKCHAIN4HUMANITY GLOBAL CHALLENGE



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**TURNING
INVISIBLE
CHILDREN INTO
INVINCIBLE
ONES**





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FOREWORD

Today, more than a billion people around the world lack that most basic of human rights: recognized personhood. Lack of officially recognized identity (ID) impacts every aspect of life: civil, economic, educational and political, among many others. Without a valid proof of identity, many basic services are out of reach. Critically, this represents a real danger for the most vulnerable: children, women and migrants who have been uprooted and are fleeing poverty, violence and war.

The examples are too many to count. Some of you may already be familiar with the story of Meena, dramatized in the eponymous 2014 film, who was eight years old when she was kidnapped by her uncle and sold to a brothel in India. For more than a decade, Meena was forced into sexual slavery. She gave birth to two children while in captivity, whom she later tried to rescue after her own escape. Her children's lack of official registration made that virtually impossible. Meena's perpetrators repeatedly tried to sell her children and use their bodies for the organ trade. Without their valid birth certificates or a recognized ID of her own, Meena – like many other women in her situation – nearly failed to save her children and regain her life.

There are many other, lesser known stories, such as that of Natasha, duped into becoming a sex slave in a Turkish brothel at age 16. When she



was caught by police and thrown into prison for a crime she didn't commit, it was impossible for social workers to rescue her as an abducted minor: her fake ID said she was 20. She thus suffered abuse, rape, and violence when she was in a brothel, and injustice, cruelty, and hypocrisy after she left. Without recognized proof of their mere existence, these women and their children are subject to a perpetual cycle of vulnerability and violence that seldom ends.

Men, too, are affected by lack of identification and can easily fall prey to human traffickers who then coerce them into modern slavery and exploitation. Only these past months, the world was shocked by news of smugglers in Libya who were auctioning off illegal migrants as slaves. The World Bank has recognized that the legal invisibility of undocumented people and unregistered children makes it more likely that their disappearance and

exploitation will go unnoticed by authorities. These “invisibles” are vulnerable to human traffickers, who often use fake ID documents to transport them across borders. Once trafficked, children and adults are sold to brothels, exploited and abused, and even used for the illegal human organ trade.

Recognized proof of identity is the right of every single person on our planet. The impact of extending this right to all would be overwhelmingly positive for human kind. And yet, there have long been deeply complex barriers to access. Until recently, this necessary vision for the future – where everyone on Earth has access to proof of personal, unique identity, allowing them to claim their human rights and pursue more prosperous, free and healthy lives – was an unattainable goal.

Thankfully, a combination of awareness, international will, and technology offers new hope. As part of its Sustainable Development Goals, the United Nations (UN) expressly states, in target 16.9, the goal of providing legal identity to all, including birth registration, by 2030. This represents the first time in our history that providing everyone with an official identity has been set forth as a global goal. It is a momentous opportunity we should not miss.

To achieve this vision, we must harness the power of innovation and leverage the opportunities presented by new technologies and approaches. Advances in biometric

identification and the emergence of distributed ledger technologies such as blockchain technologies are shedding light on new possibilities for fighting the worst crimes against humanity.

Technology itself is not a silver bullet, nor the single answer to the humanitarian challenges we face. But it can act as a catalyst and provide the platform and incentives for collaboration.

One step in this direction is the partnership between the World Identity Network (WIN), United Nations agencies and a broad range of stakeholders, including private sector companies, academia, governments and non-governmental organizations, working together on the world’s first pilot initiative that will use blockchain technology to help combat child trafficking. Growing up as a poor child in Moldova and having found myself in the street at a very young age, I know firsthand what it means to be defenseless, to be hungry, to be exposed to risks. This is why I’m particularly proud of this initiative and the multi-stakeholder collaboration that the “Blockchain for Humanity” effort has fostered. It is only by working together that we will bring about positive change in the world.

Dr. Mariana Dahan

Co-founder and CEO
World Identity Network (WIN)

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The views expressed in the report are those of the authors and do not necessarily represent those of the organizations and institutions to which they belong.



INTRODUCTION

In a world in turmoil and of increasing insecurity due to conflict, poverty and inequality, and climate change, children are especially vulnerable. Protracted conflicts such as those in Afghanistan, Syria and Yemen result in the destruction of civilian infrastructure, including hospitals, energy supply, water, sanitation and hygiene facilities, putting millions of children at risk of disease and death.

According to United Nations statistics, approximately 50 million children have been forced from their homes. This figure includes both those who are compelled to migrate to improve their livelihoods and a growing number of forcibly displaced children. Many seek sanctuary in safer places: some on the move with their parents, others sent away or having fled to find refuge and opportunities for survival.

Whether on their own or with their parents, children migrating to “safer” countries are at extremely high risk of violence, abuse and exploitation. Like millions of migrants, unable to

access safe and legal routes, children are dependent upon smugglers and strangers to reach foreign lands. It is this relationship, the transfer of authority and loss of personal agency, which may give rise to situations of extreme vulnerability.

Even when children do not move, they can be profoundly affected by the migratory choices made by their parents and caregivers. In both developing and transitional states where governance is weak, children left behind by parents or other primary caregivers may become more vulnerable to predators in their home communities — sometimes by the very relatives or friends entrusted by parents to care for them. In far too many cases, the migration or loss of parents and relatives results in the loss of authority figures and the breakdown of social networks, which often makes children fall prey to traffickers. It also leaves children exposed to criminal gangs, military conscription, forced labor and coercion into prostitution.

One key factor exacerbating children's vulnerability is their lack of personal identification. Children who lack identifying documentation to prove who they are, their age, where they are from, or with whom they rightfully belong face increased odds of being forced into dangerous situations, including modern slavery.

Global estimates indicate that the births of approximately 230 million children under the age of five have never been recorded (UNICEF, 2016). The vast majority of them live in the world's poorest countries.

In the absence of ID documents, children have no means to prove they exist and may in fact be "invisible" to governments. For development agencies, the absence of data and ID documentation hinders the design, planning and delivery social programs. Furthermore, the lack of personal ID has compound effects: children are denied access to life- and resource-enhancing activities such as education, health care and social services. This lack of identification is seldom remedied over time, resulting in more than 1 billion people in the world unable to prove who they are (World Bank, 2018).

In many instances of migration, especially with forced displacement, birth or civil registry documents might be lost — if they were issued in the first place — and secondary identifiers are stripped away. For children, the inability to prove nationality, age or family relationships has deep implications. As is the case for adults, those who lack identity documents may face greater difficulties than

“Undocumented children are easy prey for human traffickers, who often use fake identification documents to transport them across borders. Once trafficked, these children and minors are sold to sex brothels, caught in modern slavery rings, and even used for the illegal human organ trade. Lack of identification makes children “invisible” to local authorities and non-governmental organizations willing to help.”

Drawing on original research and resources, this report reframes the challenges for identifying and protecting children as a result of the migration crisis in the Middle East and Europe, as well as the ensuing risks of trafficking and abuse. It discusses new approaches to the identification of children and highlights the important role that existing and emergent technologies — including innovations in biometrics and blockchain technology — can play in establishing their identities. The report concludes with recommendations for further research and lists some immediate actions that would be needed to turn these ‘invisible’ children into invincible ones.

merely proving their entitlement to nationality, residency or even refugee status. In both developing and developed countries, including the United States (US) and European Union (EU) Member States, the absence of documentation may leave people subjected to detention, criminal penalization or deportation as adults, and it can impede their efforts to reunite with family or to repatriate after crises have subsided.

Lack of identification makes it harder for authorities to quickly remove children from at-risk situations, such as from the control of traffickers, child-labor factories or brothels, or from forced marriages.

The problem slows efforts to bring justice and healing to the children

rescued from these situations. In addition to protecting children and adults from the negative effects of life without documentation, birth registration and personal identification may have additional advantages and is correlated with better health outcomes due to timely immunizations (Plan International, 2017).

What are the approaches and solutions needed to address this issue? Are there innovations and new technologies that can be leveraged to catalyze progress towards identification for all, and in particular for those marginalized, the most vulnerable and disenfranchised: the “invisible children”?



THE SCOPE OF THE CRISIS AND RELATED CHALLENGES FACING MIGRANT CHILDREN

We are experiencing a period of unprecedented migration. According to the latest United Nations statistics, there are more than 257.7 million people living outside their country of birth, and this number is growing (UN DESA, 2017). The prevalence of child migration is also evident. Since the Second World War, the number of forcibly displaced people has never been greater. UNHCR estimates that there are now approximately 65.6 million refugees and internally displaced people worldwide (UNHCR, 2017a).

For millions of people, migration is an involuntary act — the product of coercion, deception or force. As the United Nations High Commissioner for Human Rights noted,

“Migrants, notably those in an irregular situation, tend to live and work in the shadows, afraid to complain, denied rights and freedoms, and disproportionately vulnerable

to discrimination, exploitation and marginalization...Human rights violations against migrants, including denial of access to fundamental rights such as the right to education or the right to health, are often closely linked to discriminatory laws and practice, and to deep-seated attitudes of prejudice and xenophobia against migrants” (OHCHR, 2018)

Among migrating populations, there is an extraordinarily high presence of children, both reported as accompanying adults and listed as refugees in their own right. Alarmingly, children account for more than half of the world’s refugees — an estimated 1 in every 200 children in the world is a refugee (UNHCR, 2016). In Europe, the scale of the problem was deepened by the refugee and migration crisis, which saw a five-fold increase in unaccompanied child migration in 2015 (UNICEF, 2017).

Children who have been forcibly displaced may be subject to the same dangers and obstacles that adults face. They are often hungry, sleep-deprived and desperate, dependent on local authorities and charitable organizations they may encounter en route. They suffer from discrimination and prejudice, with poor access to education, housing and health. Displaced children typically lose valuable childhood years, and with them opportunities for their economic, social and personal development.

A chief threat faced by migrants — especially unaccompanied migrant children — is the danger of being trafficked. While there are many forms of trafficking, the 2016 Global Report on the Trafficking of Persons defines it as: *“...the recruitment, transportation, transfer, harboring or receipt of persons, by means of the threat or use of force or other forms of coercion, of abduction, of fraud, of deception, of the abuse of power or of a position of vulnerability or of the giving or receiving of payments or benefits to achieve the consent of a person having control over another person, for the purpose of exploitation.”*

Children constitute one of the most commonly detected groups of global trafficking victims

Even before the recent migration crisis, the UN Office on Drugs and Crime estimated that children ranged from 25% - 30% of total trafficking victims between 2012 and 2014.

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According to UN Women, over 70 percent of all trafficking victims are women and children. Three in four trafficked women and girls are sexually exploited (UN Women, 2017).

According to reports, victims were largely trafficked for sexual exploitation, while trafficking for forced labor was also registered. Child victims were forcibly engaged in the production of goods and delivery of services, such as domestic and agricultural labor. In addition, police and international law enforcement authorities have reported trafficking involving forced marriage, benefit fraud, pornography production, and organ removal (UNODC, 2016).

Even in the wealthier countries of North America, Europe and the Middle East, nearly a third of trafficked persons are child victims, thus countering the assumption that the trafficking of children is limited to developing states with poor governance.

Europe has consistently been a target for trafficking, and child trafficking is prevalent across the continent. At the peak of the migration crisis in 2015, more than one million people reached Europe in search of sanctuary. Among them were a large number of unaccompanied minors from the Middle East, Africa and South Asia (European Commission, 2016). For these children, the protection challenges on the journey to Europe — as well as on its territory — could not be overstated. The prevalence of trafficking among the child victims is especially worrying.

The European Commission confirmed that nearly 20 percent of victims of trafficking registered in the EU between 2013 and 2014 were children (European Commission, 2016).

Recent reports from refugee transit points in the United Kingdom, Greece and along the Balkan corridor in Serbia present a disturbing account of how unaccompanied children have been coerced into criminal activities, including selling sex for their own survival (Human Trafficking Foundation, 2017).

Interviews conducted by UNHCR reveal that the most commonly alleged protection incidents witnessed or experienced by respondents — including children — were violence and emotional abuse committed by third parties (smugglers, local police, other travelers), arduous routes, detention or being kept against their will by persons other than the authorities.

Reports of criminal gangs in the Calais 'Jungle' and the presence of traffickers were widespread and indeed, all along their journey, from Africa and the Middle East to Europe, thousands of children had been exposed to trafficking (Human Trafficking Foundation, 2017).

Lack of personal identification (ID) is what makes trafficking more likely to occur

Among the many hardships faced by the migrants — including starvation, sleep deprivation, exhaustion, anxiety and other health issues — it is the separation from proof of personal identity (or lack of thereof) that contributes to making the migrants even more vulnerable to human traffickers.

Following the journey of 47 unaccompanied migrants heading from Africa and the Middle East to Europe, we detected a number of abuses that took place at several points on the journey to Italy and to Greece. The migrants in this study had come from a range of countries including: Afghanistan (4), Egypt (5), Eritrea (7), Gambia (13), Ghana (2), Guinea (4), Ivory Coast (1), Mali (3), Nigeria (14), Somalia (4), Sudan (1), Syria (91), and Senegal (1); a further 10 individuals were from other countries (Middlesex, 2017).

Here is how one trafficked migrant described how his documentation was torn up in front of him and he became enslaved:

Our investigation — conducted jointly with a team of researchers from Middlesex University — revealed that many migrants to Europe are stripped of their ID documents by smugglers or local intermediaries, who then exploit and coerce them into trafficking.

“So as I looked into their eyes, they pointed their guns at me and in a short period of time, three bullets were fired in my direction. After three days I couldn’t hear anything because the gun fired three bullets! After that, they seized us and threw us in an isolation cell, it was as dark as the night there, every single day spent there felt like a night not a day...I stayed two weeks imprisoned in such conditions.”

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Such accounts have been confirmed by an independent UNHCR study,

which highlighted the incidence of exploitation, including coercing unaccompanied children into trafficking and modern slavery-type situations (UNHCR, 2017b).

Lack of personal ID is a critical issue and one that cannot be overstated. Recognized proof of identity is needed for every single person on our planet; as basic as it is, its impact would be overwhelmingly positive for human kind.





VULNERABILITIES OF CHILDREN LEFT BEHIND BY PARENT MIGRATION

Most of us can hardly imagine the vulnerabilities faced by children who migrate. Even more difficult to understand is the impact of migration on a separate group of children: those left behind by parents who migrate. In the vast majority of cases, parent migration is spurred by the desire to improve the overall wellbeing of a migrant's family and, importantly, provide better future opportunities for their children. However, gains in financial stability are often accompanied by impacts which increase the vulnerability of children left behind. As the Migration Policy Institute notes, "Children left behind are a vulnerable category unlike any other and deserve policy-specific attention."

United Nations statistics note that children left behind may be at greater risk of abuse, domestic violence, drug abuse and teenage pregnancy (UNICEF, 2016).

Measuring the causal impacts of parental migration is complex.

While noting some positive economic impact of migration for families in Central Asia and Romania, for example, studies have shown predominantly negative social impacts, such as a lack of parental guidance, child aggressiveness, depression, increased illness and consequent increased school absence rates.

Denied role models and emotional support, children separated from their parents face unprecedented obstacles throughout their childhood.

According to the IOM, in some countries, girls left behind are more vulnerable to sexual abuse by male members of an extended household or from within the community. Child placement in specialized institutions did not prove to be a solution.

A World Bank study on the topic reported that both children

institutionalized in orphanages and those left by migrating parents were highly susceptible to human trafficking (World Bank, 2000).

It is also important to remember that a person does not need to cross an international border to be considered a victim of trafficking, and that victims and traffickers often have the same background, and in some cases, are family. A final risk factor to consider is the rising use of

the Internet and digital social media among children. The Internet is “providing new spaces for traditional forms of crimes, including increased use by organized criminals operating on trafficking in human beings” (European Commission, 2016). The absence of tools for uniquely identifying someone online enables the hidden recruitment of victims over shorter periods of time and on a much larger scale than ever before.





THE CASE OF HUMAN TRAFFICKING IN MOLDOVA

The trafficking of women and girls from Eastern and Southeastern Europe escalated following the collapse of Soviet Union and years of failing economic performance.

Still the poorest country in Europe, Moldova has been trying to stop child trafficking for decades. In spite of these efforts, Moldova's status was downgraded to Tier 2 Watch List in the 2017 Trafficking in Persons Report (US Department of State, 2017).

Echoing the conclusions of other major governments and non-government institutions, the US Department of States describes Moldova as, "a source country for men, women, and children subjected to sex trafficking and forced labor."

Pervasive corruption, particularly in law enforcement and the judiciary, impeded prosecutions and influenced the outcomes of cases, including cases against complicit officials. Law enforcement efforts were hampered by worsening legal and organizational obstacles, including changes in the national anti-trafficking investigative body. Authorities identified and assisted fewer victims, and victims continued to suffer from intimidation from traffickers.

Moldovans try to leave the country in the hope of economic opportunities and work abroad, but as a result they become trapped by criminal gangs into sexual or

labor exploitation, often lured by fake job ads.

This also leaves behind vulnerable children who are deprived of parental attention and strong authority figures. In the absence of solid institutions dedicated to child protection (civil registries, a robust criminal justice system, educational oversight and support) and in the presence of pressures such as poverty and low levels of human development, this situation foments some of the critical factors that help match demand with the availability of child trafficking (UNODC, 2016).

In one local assessment conducted by UNICEF, in which Moldovan children described the problems they think they might confront in the future, responses related to the violation of social rules, including trafficking in children. Adult respondents, who had been charged with looking after these minors, also mentioned human trafficking and labor exploitation among the major concerns about the children in their care (UNICEF, 2016).

Our own research, based on visits to local orphanages and on numerous interviews with victims who are not in institutions and are not being cared for by any organization in Moldova or abroad, reveal that many children of past and current trafficking victims also face the risk of being trafficked.



(IN)VISIBILITY – IDENTIFICATION AS A CORNERSTONE OF CHILD SAFETY AMIDST MIGRATION CRISIS

The vulnerability of both child migrants and children left behind in the wake of parent migration is heightened by one key factor that these two groups often have in common: the lack of a form of identification that indicates, at the very least, who they are, who their parents/custodians are, where they are from, and their age. While this same problem often faces adult migrants who also often lack (or lose) forms of identification, it is children who are especially vulnerable to being manipulated, pressured or forced into helpless silence.

Invisible children are children at risk:

“The legal invisibility of unregistered children makes it more likely that their disappearance and exploitation will go unnoticed by authorities”

(Plan International, United Nations Representative, 2017).

This global problem manifests appallingly in its link to the continued problem of human trafficking. All too often, both adult and child victims of human trafficking lack legal identification. Alternatively, their traffickers will forcibly confiscate their documents, increasing their own power and their victims’ vulnerability. Child victims of trafficking are often also unaware of any rights they might have, and the lack of ID further limits their freedom of movement and makes them afraid of establishing outside contact.

Possession of a functional identifying document can be a key tool in protecting children and improving their access to rights. A valid ID can help prevent the unlawful transport or harboring of children by identifying merely their age.

Indeed, the presence of an ID makes it harder for people transport children across borders or over long distances without proper parental consent.

The presence of an ID can give welfare and law enforcement officials an opportunity to intervene in suspicious situations and quickly assess whether more investigative or protective action is warranted. Proof of age can indicate to authorities whether a child is old enough to work or be married or whether they should lawfully be at school during certain hours. It is a deterrent to a child mistakenly being treated as an adult in the criminal justice system. Even when the system fails in trafficking prevention, if a child is later identified as a victim and rescued, proof of country of origin, legal residency, or parentage can help speed family reunification.

Plugged into an effective and reliable identification system at the supra-national level, advanced data analysis can be used to track where trafficking networks or situations have emerged or, more hopefully, used to anticipate dangerous conditions and initiate action before new routes, networks or situations manifest.

Child trafficking is a multifaceted challenge which should be addressed with a matching multidimensional approach. Digital identity management, however, is central to addressing many aspects of the problem.



“The vast majority of victims of trafficking are not identified, and consequently do not have access to their rights to assistance, support and protection. Instead they can be at all times deported, detained or treated like criminals themselves” (European Commission, 2016).





POTENTIAL FOR NEW TECHNOLOGIES TO CREATE BETTER IDENTIFICATION SYSTEMS

Target 16.9 of the Sustainable Development Goals ratified by the United Nations in 2015 aims to achieve “legal identity for all, including birth registration” by 2030. Many governments, multilateral and non-government organizations, and private-sector partners have since doubled-down their efforts to broaden and reinforce legal identification systems.

Reforms, which have largely revolved around transitioning from paper-based identification systems to digital ones, have the added potential to decrease corruption, strengthen governance, and broaden access to the rights and protections legal identities offer.

New technologies, such as emergent blockchain technologies, have characteristics that can help expand access to verifiable identification, enhance security, improve portability and give people greater control over their most sensitive identifying data.

For our purposes, it is helpful to consider ‘blockchain technology’ in its broadest sense, as a distributed (as opposed to centralized) transaction recording system that employs a model of consensus to create, validate and store a chain of verifiable records via an established set of automated rules.

While blockchain technology can be constructed and deployed in many different ways (see below), overall, the various architectures promise certain advantages over centralized legacy systems – for example: reduced costs (with automation and by reducing the need for costly intermediaries or for auditing); increased resilience (by distributing the processes of both record-keeping and transaction-processing); improved data security (via decentralization, via transparent and automated processing, and via the creation of an immutable record that makes the data resistant to tampering).

A further promise made by many blockchain technologists is that

it facilitates the creation of self-sovereign identities. A self-sovereign identity allows the individual to control how much, when (under what specific circumstances) and with whom their personal identification data are shared. It is also, ideally, portable and completely outside the control of a centralized authority. Self-sovereign designs built on blockchain technology allow the self-controlled, peer-to-peer sharing of personal data, without unnecessary intermediaries or centralized honeypots of data. However, it remains to be seen how this concept can be applied in cases involving minors, where questions of digital identity ownership (possession and/or control over the identity) involve both children and their guardians. A further question is how the so-called 'right to be forgotten' can be viable if an identity system is built around an immutable blockchain structure.

Leveraging blockchain as a tool to fight child trafficking is a logical application of this technology to one of the world's more pressing issues. Of course, technology itself cannot magically undo economic, political or cultural hurdles. However, it would be an incredible oversight on the part of stakeholders to miss the opportunities presented by this new development and the willingness of technologists to collaborate in the search for effective new tools.

Innovation, we must acknowledge, brings with it new challenges and risks. One of the primary risks inherent in any data system that deals with personally identifiable information is that insufficient data security could allow sensitive

information to be corrupted, stolen, deleted, ransomed or otherwise 'hacked,' or used by authorities to target, harm or otherwise control. In the specific case of blockchain, many of the architectural solutions proposed by advocates are still untested.

While proponents laud the security of blockchain architecture, several applications built on top of blockchain platforms have been hacked or flaws in their code exploited. These attacks have not so much exposed vulnerabilities in the decentralized computing network that runs the core ledger itself as they have exposed flaws in an array of centralized services that have emerged to provide an interface with the non-blockchain world. Nonetheless, these problems point to a development challenge and emphasize the need for solutions that do not leave users dependent on poorly regulated entities for inputting data into a blockchain.

These problems are all the more worrisome when biometric information is involved. Biometric identifiers use data gathered from a person's body (such as iris scans, fingerprints, DNA) or behaviors (voice recognition) to uniquely identify them. The advantages of using biometric information over passwords, smart cards or other authentication devices are apparent: it cannot be lost, forgotten, or guessed, and is very resistant to forgery. Already, increasing segments of the population are more willing to exchange biometric data for easier or more pleasurable experiences: using your fingerprint to open your

Designing an identity system would involve considering the security around storing both personally identifiable information (including biometric data) and the transactions involving this data.

smartphone, or allowing an App to instantly tag faces in your photos, for example. However, biometric information warrants special security because it cannot be changed or withdrawn by the individual in the case of theft or of loss of trust. It is an unchangeable identifier that can potentially be used to access even more information about the user at a later date, or to surveil them indefinitely. This has not stopped massive private and public projects from increasingly using this data: from India's Aadhaar identity system to Facebook's massive database of faces. Even the UNHCR has launched pilot programs that use iris scans to identify benefit recipients.

Importantly, questions about privacy and security are highly related to how blockchain-based software protocols are designed. Blockchain technology will constitute only part of any identification system: other systems and forms of hardware and software will likely be involved as well (e.g., computers, tablets, or mobile phones used during the on-boarding process).

Some blockchain enthusiasts talk about putting data "on the blockchain," but is this somewhat misleading. There are major limits to how much data can or should be stored in a system that is mostly used as a record of transactions. There are in fact many different ways to store data on or around blockchain-based platforms, with the distributed

ledger used solely to periodically log changes in the state of that data.

The storage of some amount of personally identifiable information, along with transaction data, can theoretically be part of the blockchain infrastructure ('on chain') or kept 'off chain' in, for example, in other encrypted hardware environments. There are different security and usability implications for each. As of now, the generally preferred model treats the blockchain not as a store of data but as a permissions-managing system for sharing information with third-party service providers. Using a private key confirmed in blockchain transactions, the rightful owner of a set of personal identifiable information can selectively assign access rights to elements of that data, which reside in one or more off-chain environments. Within this framework, however, there are numerous competing design considerations, each of which has profound security and privacy ramifications.

Other potential problems involving blockchain-based solutions include whether the technology can be scaled to a large enough size, and the large amounts of energy consumption required to run them. These issues are currently confined to public, "permissionless" blockchains such as Bitcoin's, in which there are no explicit

Balancing both the promises and challenges of these new technologies, we cannot lose site of the core human problem that we are seeking to address. We must remember that the problem of human trafficking, like the multiple other problems exacerbated by the lack of functional identification documents, has persisted and even worsened in the face of existing technologies and approaches.

restrictions on any computer joining the decentralized network as a validator of the ledger. The security proposition for such systems hinges on the validators engaging in a computational competition for cryptocurrency rewards, encouraging a “race” for Bitcoins that tends to increase electricity demand. Private, or “permissioned” blockchains, which are built around a fixed set of identified and authorized computers, can be readily scaled with minimal computational requirements. However, there is a security trade-off: as these networks hinge on the say-so of an authorizing entity with the power to make alterations to transactions, the ledger falls short of the ideal of immutability and is, arguably, more vulnerable to hacking.

In order for blockchain technology to be considered for the important work of making vulnerable people less vulnerable, and not more so, technologists will have to work with other stakeholders to overcome any communications gaps. Understanding how this technology works, and not just trusting it blindly, is crucial to allowing fully informed decisions to be made.

Balancing both the promises and challenges of these new technologies, we cannot lose site of the core human problem that we

are seeking to address. We must remember that the problem of human trafficking, like the multiple other problems exacerbated by the lack of functional identification documents, has persisted and even worsened in the face of existing technologies and approaches.

We must remember stories such as that of a young girl, lured by a scam and forced into sex trafficking at the age of 16. She was caught by police with forged documents that gave her age as 20, making it practically impossible for a local NGO or social workers to rescue her from a jail sentence. The girl suffered abuse, rape and violence when she was in the brothel; then she faced injustice and cruelty in the legal system. Now imagine if she could use an automated system to retrieve trustworthy information about herself from anywhere, giving her the power to securely prove who she is and where she does belong. Digital identity enabled by blockchain has the potential to change lives, and we have an obligation to explore this possibility.

To identify and more thoroughly vet new blockchain-based approaches to the identity problem, several UN agencies have partnered with the World Identity Network, launching a Global Challenge that seeks to source

ideas to combat child trafficking using blockchain technology.

The “Blockchain for Humanity” Global Challenge was announced during the Blockchain Humanitarian Summit hosted by Fordham University in New York in November, 2017. This open call for ideas and contributions invited the general

public, private companies, academia and non-governmental organizations to submit their proposals to combat child trafficking in Moldova using blockchain-based solutions. Below we provide highlights from three proposals, along with a preliminary assessment of what we can learn from these and other approaches.

Blockchain for Humanity Global Challenge

#WIN
#BLOCKCHAIN4HUMANITY GLOBAL CHALLENGE



UNOPS



unite
IDEAS

“BLOCKCHAIN FOR HUMANITY” GLOBAL CHALLENGE

The “Blockchain for Humanity” Global Challenge is a collaboration between the World Identity Network (WIN), the United Nations Office for Project Services (UNOPS), and the United Nations Office of Information and Communications Technology (UN-OICT) to explore blockchain technology to help combat child trafficking in Moldova.

This challenge resulted in a collection of detailed concepts and project designs that can be further enhanced and used by the Government of Moldova for project implementation. The challenge aimed at developing concepts that are scalable and applicable to other contexts as well, including other countries around the world where the prevalence of child trafficking is high.

This Challenge focused on addressing the following aspects of this multi-faceted issue:

ESTABLISHING A PERSONAL DIGITAL IDENTITY FOR CHILDREN

Undocumented children and minors can become easy prey for human traffickers, who often use fake identification documents to transport them across borders. Once trafficked, minors are sold to sex brothels, caught in modern slavery rings, and even used for the illegal human organ trade. Digital identity on the blockchain may offer a significantly higher chance of catching traffickers and, by securing data on an immutable ledger, further make any repeat trafficking attempts more traceable and preventable.

However, concerns over the privacy of the personal data should be identified and clarified, along with possible methods for addressing them. The proposed solution was expected to allow establishing a unique, secure, digital identity for children and minors aged 0-14 y/o (pilot size: approx. 350,000 children, with modalities of linking children’s personal identities to that of their family members).

SETTING UP A BLOCKCHAIN PLATFORM FOR THE INTEGRATED ID SYSTEM

The proposed solutions were expected to offer a method for securing identity data around a blockchain-based platform, making an immutable record of the actual or attempted exit of a minor without parents’ permission, outside the borders of Moldova.

The integrated ID system was expected to cover the total population (size: 3,500,000 people) or a subset, and to explain and justify the choice between these two options. Issues such as “the right to be forgotten” and the self-sovereign control of data were also addressed in the proposed solutions.

AUTOMATING COMMUNICATION

Potential or actual victims of trafficking are often times isolated and lack support and help in critical circumstances. However, traditional communication tools such as direct contact with a social worker may not work in this context. It was encouraged that the proposed solutions would allow the use of artificial intelligence (AI) tools, for instance, to help recognize and detect patterns of behavior and automate communication with victims.

Exploring innovative technologies, such as blockchain technology, and their application for social benefit requires a significant human investment and time commitment. In an attempt to accelerate research, experimentation and knowledge sharing among governments worldwide on the application of technology to Sustainable Development Goals, the Blockchain4Humanity challenge used the Unite Ideas crowdsourcing platform provided by UN-OICT, which enables public contributions of open-source software and openly available system designs by leading technology companies, academia, civil-society and the general public. All the materials issuing from this challenge are publicly available at <https://ideas.unite.un.org>.

Highlights from submissions to the Global Challenge:

The following is intended not as a ranking of proposals but as a sampled survey to demonstrate the breadth of proposed models.

ConsenSys Blockchain for Social Impact



CONSENSYS

The Blockchain Social Impact team from ConsenSys started their proposal by pointing out that a

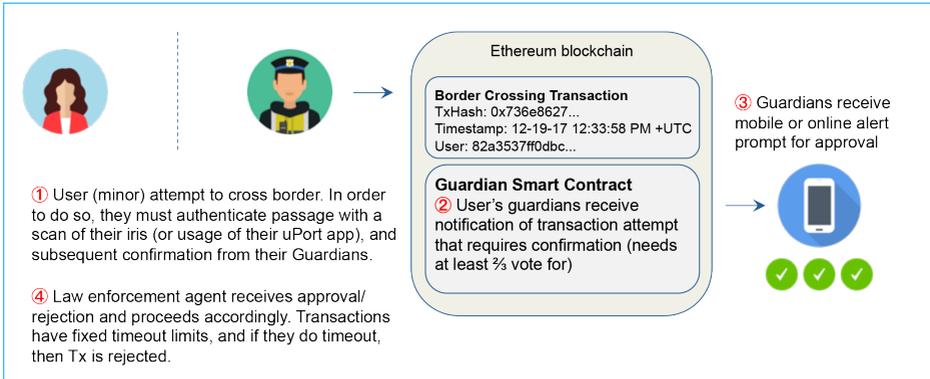
blockchain-based, self-sovereign digital identity has far more utility in the social impact space and in developing countries than it does in developed nations. This is because the majority of the citizenry of the latter rely upon centralized data repositories to project “who they are” online, making the introduction of a self-sovereign identity for them “a parallel commodity rather than a behavioral change in identity management.” By contrast, people in developing economies cannot count on the same degree of reliability among centralized record-keepers. Furthermore, they are less likely to have their own dedicated smartphones, making it more difficult to establish unique, mobile, immutable digital identities, let alone associate them with attributes over time. This is often the case with refugees, and it is certainly the case with children.

Recognizing this, the ConsenSys team suggests a niche approach built around biometric identifiers to address specific aspects of human trafficking in/from Moldova:

- Safely verifying the job market to avoid false postings
- Developing immutable identities for at-risk youth and human trafficking survivors
- Developing permissioned transactions so that the guardians of these stakeholders are notified
- Tracking law enforcement agent and shelter staff actions at border checkpoints and shelters respectively
- Automating the process of hotline support for survivors in need and/or people searching for missing persons

The identification element of their approach has a two-pronged target: to protect minors from being trafficked and to protect survivors from being re-trafficked. The team proposes creating unique, pseudo-anonymous, digital identities, with the use of cryptographically protected biomarker data (retina and fingerprint) for authentication without the need of a device. The biometric information will be hashed (a cryptographic function) and stored (on or off-chain). Upon an authentication request, the user’s identity is compared to the on-chain state’s list of registered identities. A request for authentication can take place as an adult is trying to pass a border checkpoint with a minor or suspected minor. The authentication request can also generate a

Illustration from the solution by ConsenSys



notification to a child's guardian that a transaction (border crossing) needs to be permissioned, as the schema demonstrates.

The permissioned nature of the blockchain would require minors and parents to authorize transactions, like leaving the country or in other contexts identified as "at risk" situations.

The team also recommends partnering with local anti-trafficking organizations to on-board children,

as well as verifying the job market to avoid false postings. This proposal also suggests leveraging the identity management system's network of registered users as a method for better communicating information on missing persons in response to hotline inquiries. By immutably saving references to hotline requests for support, information on such inquiries can aid investigations and support anti-trafficking studies.

Exonum to Solve Identity Problems in Moldova

A team from the Bitfury Group proposed an Exonum blockchain-based permissioned solution that would create a single, tamper-resistant ‘source of truth’ and allow auditing by external parties such as NGOs. This immutable data set would store all facts of border crossing for minors, provide an immutable data set for analytical tools to track possible illegal activities, and create a digital ID service for people without existing formal ID.

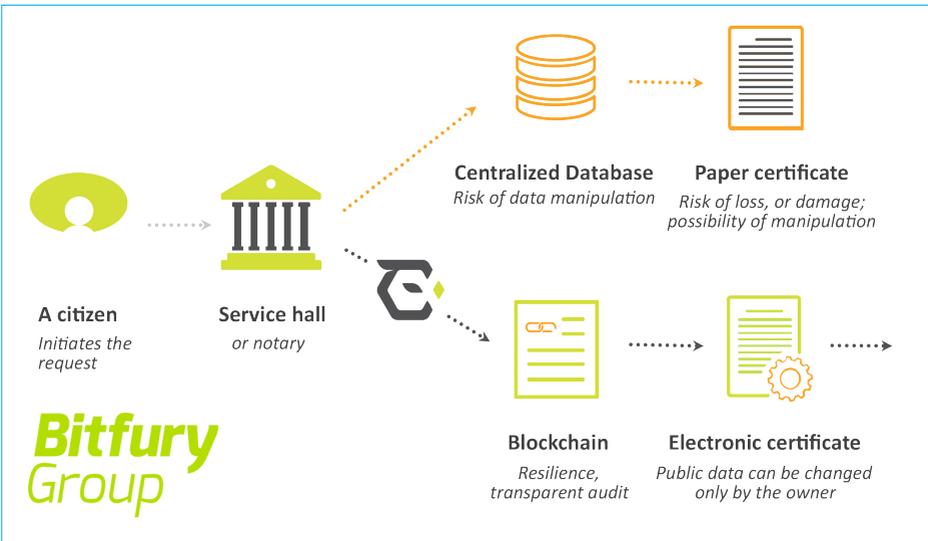
Digital identities would be built around documents associated with a person that have been timestamped and stored inside the blockchain as a fingerprint (i.e., not in their original form). Applications called smart-contracts can be used to generate cryptographic proofs that obtain

answers to specific queries (such as ‘is this person less than 18 years old?’) without putting unnecessary personally identifiable data at risk.

Based on its internationally recognized technical expertise, the Bitfury team proposes a solution that combines the benefits of private (more control) and public (more security) blockchains. The group’s track record of successfully implementing blockchain-based projects within government structures, combined with their regional footprint, makes it a partner of choice for many post-Soviet countries. Exonum is currently being implemented under e-government projects in Ukraine and land titling in the Republic of Georgia. Features of their proposed architecture include:

- Exonum nodes divided into two groups: validators (the ones

Illustration from the solution by BitFury Group



that take part in the consensus algorithm) and auditors (full nodes which provide additional security, auditability and transparency). Auditor nodes can be run by local NGOs and UN-empowered organizations to provide the highest level of auditability.

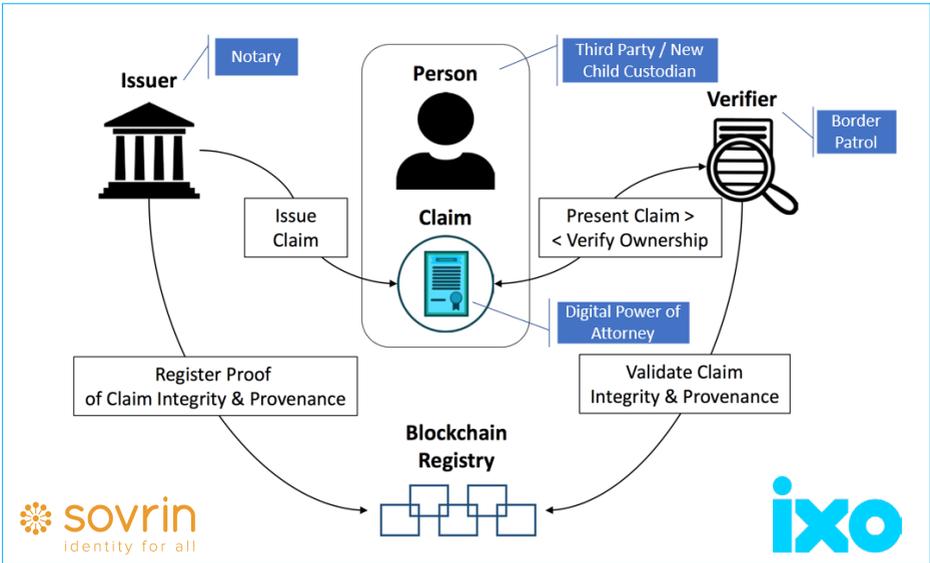
- The permissioned Exonum blockchain is anchored to a public blockchain (periodic saving of a system state hash to a public blockchain) in order to raise the security of the system to the public blockchain level. This makes it even more resistant to retrospective changes (history changing attacks).
- Integrations with 3rd party systems are done using the public API of Exonum Services (Exonum acts as a middleware between these systems and Services). Exonum Services are easy to deploy and maintain, which means that additional use cases can be explored in the same production environment. Moreover, Exonum is capable of running multiple use cases on the same hardware.
- End users are able to interact with 3rd party systems (and Exonum) while being forced to verify the presence of the data in the blockchain, as well as its anchoring.

Decentralized IDs for Self-Sovereignty of Future Generations

A consortia formed by independent consultants, Sovrin and iXO Foundation proposed a solution that prevents children from being transported across borders on semi-falsified or forcefully signed documents. They note that child trafficking is a phenomenon engendered by a number of factors, such as migrant parents so desperate to reunite with children that they rely upon smugglers, local government corruption, the prevalence of counterfeit documents, and loosely regulated borders. As no one technology can address all of these factors, the proposed idea targets a very specific dimension of the overall problem: eliminating the ability to forge power of attorney (POA) documentation and other identifying documents, which ultimately lead to the illegal/semi-illegal border crossing of vulnerable children with unverified adult guardians.

In their proposed architecture, biometric data and certain personally identifiable information of children, parents, and designated non-parent custodians would be collected and stored off-chain in a cloud agent using a private-public key infrastructure that prevents unauthorized users from accessing personal information. Decentralized digital identities will be stored on a blockchain with the ability to access associated private cloud agents which securely store the POA and other personal information off-chain. A physical copy of the POA would also contain a digitally verifiable

Illustration from the solution by consortia formed by independent consultants, Sovrin and ixo Foundation



component such as a QR code for border patrol to verify that the child and custodian are who they say they are, and possess the necessary permissions to travel. The border agent can also use this blockchain-based system to record that the crossing happened.

This team stresses the need to include local stakeholders in the planning and implementation of this system, as this will help identify the local conditions that might provide barriers to the implementation of a technology tool (e.g., local corruption, mistrust of outsiders or of authority), and they have already identified a range of international partners and advisors to work with, as well as local partners familiar with challenges faced on the ground.

A notable feature of this proposal was its authors' detailed awareness

of the barriers that could block the implementation of any proposed technical solution. They emphasized that a broad collaborative team will be crucial for the success of this or any project, highlighting the need for the following:

- Local partners that know the territory and are persistent in their work.
- Local authorities who are invested in the project (they note that in countries like Moldova the average monthly wage is below US\$300 and bribery is common, undermining local trust in government and making the partnership with local government a potential weak link)
- International partners with experience in the technology space (especially eID and

blockchain) and who have worked on related implementations

- Global experts in designing solutions for human trafficking
- Academic partners who will independently assess the progress and the impact of the project and give transparent feedback and suggestions for optimization
- International partners to insure the scalability of the project
- International support and engagement with Europol, Frontex and the Organization for Security and Cooperation in Europe, and EU member state police forces
- Financial support from private and public funds
- Direct access to modern slavery and human trafficking

publications for global dissemination of project outcomes

- At least one other partner country

This is echoed in the proposal (below) made by a local player – AlfaSoft company, which is also grounded in the realities of the Moldovan context.

Anti-Trafficking Information System to Prevent Minor/Child Trafficking

The team from AlfaSoft developed a solution that integrates with preexisting infrastructures and country's legacy ID registration systems. The proposed approach is being informed by AlfaSoft's extensive experience in the e-government space and systems integration in Moldova and abroad. The team understands the lack of trust in a multi-stakeholder

Illustration from the solution by AlfaSoft



environment and the frequent problem of corruption and record falsification. They recommend a blockchain-based solution precisely because it operates on the principle of offering mathematic trust where interpersonal trust does not exist. Notably, the AlfaSoft team recommends decentralization of data entry points, automation (via smart contracts) and immutability (of the chained, hashed blocks of data) of the records. The team has developed a specific application (ATIS), which builds on previous work done in conjunction with UNICEF in Moldova. The application works on either the Bitcoin or Ethereum platforms and can be used to generate cryptographic proofs of children's identities without putting personally identifiable data at risk.

AlfaSoft's ATIS is designed to integrate with the national registration office, the border control and immigration service and the department of social services in Moldova - among the key players and partners to be involved in the implementation of the solution as shown above.

One important factor that this proposal highlighted is the need to work with local stakeholders who understand unique local contexts, challenges, and concerns, based upon local infrastructures and legacy systems.

Key takeaways

Each of these proposals approaches the problem from a different perspective. In fact, it is almost certain that the best approach is one

that would combine elements from these and other proposals. No one proposal will be complete. Part of the opportunity this challenge presents is to share ideas, tools, and strategies that might never have occurred to isolated groups/teams trying to solve this problem in a vacuum.

Still, any time a solution is offered for a problem, a list of valid concerns "they didn't think of" can be generated. We consider this stage useful precisely for the opportunity to generate these and other important questions. But the existence of these questions and many other challenges should not keep us from brainstorming ideas and forming the partnerships that can generate actionable responses.

A few outstanding concerns that will need to be addressed before any implementation can occur include:

- How specifically does one type of blockchain technology (the software solution) differ from other possible contenders, as well as from the use of pre-existing non-blockchain solutions?
- How will any technology solution fare in the face of corrupt officials, powerful organized crime syndicates, and others who have an interest in the perpetuation of child trafficking?
- How do we deal with the problem of getting "good" (accurate, lawfully collected) data into the system? Will parents be willing participants if they lack trust in local or state governments?

- How can we get ‘buy-in’ from neighboring states, their authorities and security personnel (e.g., their border control personnel)?
- How well and how safely can biometric technology be used to capture information from children? How secure can we really keep this and other personally identifiable information?
- Can children’s data be erased or can they remove potentially identifying information about themselves from “immutable” ledgers once they become legal adults (the right to be forgotten)?
- If the proposal involves the use of public and private keys that allow access to personally

identifiable information (e.g., a numeric code that proves ownership of a digital ID), how do they address problems around key management and loss?

- What kind of metrics need to be developed in order to measure effective impact and compare with other existing options?

In order for blockchain technology to be considered for the important work of making vulnerable people less vulnerable, and not more so, technologists will have to work with other stakeholders to overcome any communication gaps. Understanding how this technology works, and not just trusting it blindly, is crucial to allowing fully informed decisions to be made.

Blockchain technology is not a silver bullet for this or any problem. Any proposed solution will be a preventative measure aimed at reducing the number of trafficking attempts, and it will need to go hand in hand with significant policy action and significant structural reforms.



CALL FOR ACTION

Human trafficking is a multifaceted problem, stemming from human greed and feeding on the fertile ground provided by all those involved in the process: from those who actually sell other human bodies, to the traffickers, the agents and officials paid to look the other way, the businesspeople who turn a blind eye in the pursuit of profit, to those who pay for coerced sex, forced labor or the illicit organ trade.

Similarly, the lack of access to formal identification is equally complex, related to political will, economic reality, infrastructure challenges, and historically-derived, deeply cultural ideas about personhood and who should and shouldn't belong.

These two relentless problems are interconnected in the sense that addressing identification inequality can offer a powerful tool to chip

away at the problem of human trafficking. Creating and deploying this tool will involve collaboration and commitment from a diverse body of actors. Those in government, extra-governmental organizations and the technology sector are especially well positioned to commit resources and dedicate themselves to a combined effort aimed at developing these resources both for individuals and with their participation.

It is well beyond time that, in congruence with UN Sustainable Development Goals, global actors invest in the development of more economic, secure, and widely available identification technologies. New advances such as the growing application of blockchain technologies have created an opportunity to develop self-sovereign identification tools based on distributed, cryptographically

New identification technologies are of particular importance to children, who as a group overwhelmingly lack identification, especially in the developing world.

secure platforms that can offer individuals greater security and control over the circulation and use of their identifying attributes. This in turn can enhance personal safety at a time in which this type of data can be abused not only by rogue criminal actors, but also lost, stolen, or manipulated by the large centralizing entities that increasingly seek to exploit personal data.

New identification technologies are of particular importance to children, who as a group overwhelmingly lack identification, especially in the developing world.

Although we need to proceed with great caution, there is no excuse for inaction. This is a moment of great potential to address some of the world's toughest and most seemingly intractable problems, and the moment must be seized.

Harnessing the power of emerging technologies and approaches will require strong political will and leadership, at both global and local levels, matched with strong individual incentives to take part in this undertaking. This is why it is critical for international development organizations to work with a multitude of stakeholders to be able to create truly enabling environments that are conducive to social change.

Similarly, private sector companies and alliances formed to advance crypto-investments may also consider supporting the cause, through socially responsible investments in specific digital identity projects, or in pooled funding mechanisms, such as, for

instance, a CryptoFund dedicated to humanitarian action.

It is our abiding hope that this will inspire a new form of activism and a global movement that encourages us all to rethink and redefine the concept of recognized personhood, continuously improving and crafting this cornerstone of our human evolution.



Donor funding can support the scaling-up of innovative pilots, such as the ones described in this report, to help mainstream the use of the blockchain technology in humanitarian contexts.

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ACRONYMS USED

AI	Artificial intelligence
API	Application program interface
EU	European Union
ID	Identification
LSE	London School of Economics
IHA	Institute of Global Affairs and the Institute of International Humanitarian Affairs at Fordham University
IOM	International Organization for Migration
NGO	Non-governmental organization
POA	Power of attorney
QR	Quick response code
UN	United Nations
UN-OICT	United Nations Office of Information and Communications Technology
UNDP	United Nations Development Programme
UNICEF	The United Nations Children's Fund
UNHCR	United Nations High Commissioner for Refugees
UNODC	United Nations Office on Drugs and Crime
UNOPS	United Nations Office for Project Services
US	The United States of America
WIN	World Identity Network



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