

# Cryptomarkets and the future of illicit drug markets

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## 2.1 Introduction

A cryptomarket is an online marketplace platform bringing together multiple vendors and listing mostly illegal and illicit goods and services for sale. Cryptomarkets have the same look and feel as surface web, or ‘clearweb’, marketplaces such as eBay and Amazon, and they allow their customers to search and compare products and vendors. What differentiates these markets from established clearweb marketplaces, however, is that they offer anonymity. Cryptomarkets employ a range of strategies to hide the identities of their participants, make transactions anonymous and conceal the physical locations of servers. These include anonymisation services, such as Tor (The Onion Router), that hide a computer’s IP address when accessing the site (see Chapter 3); decentralised and relatively untraceable cryptocurrencies, such as bitcoin and litecoin, for making payments; and encrypted communication between market participants. Like some others (e.g. Barratt, 2012; Martin, 2013) we employ the term ‘cryptomarkets’, following early use of this term in hacker forums, but we note that the term ‘dark net markets’ is also gaining currency (e.g. Buxton and Bingham, 2015).

Although the academic research literature on cryptomarkets is growing (e.g. Barratt, 2012; Barratt et al., 2013; Martin, 2013; Van Hout and Bingham, 2013a, 2013b, 2014; Aldridge and Décaray-Hétu, 2014; Barratt et al., 2014; Martin 2014; Phelps and Watt, 2014; Buxton and Bingham, 2015; Dolliver, 2015; Décaray-Hétu et al., under review; Aldridge and Décaray-Hétu, under review), our understanding of these marketplaces has been shaped in no small part by journalists (e.g. Bartlett, 2014)<sup>(1)</sup>, bloggers (e.g. Ormsby, 2014) and other independent researchers (e.g. Branwen, 2015). Through a combination of these efforts, we are able here to piece together evidence about and conjecture on the implications of cryptomarkets<sup>(2)</sup> for global and local drug markets.

This chapter begins by sketching a brief history of these markets and the technologies that gave rise to them. We chart the growth of the first cryptomarket, Silk Road, its demise, and the proliferation since of such marketplaces in spite of law enforcement activities. We show that, despite the growth

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<sup>(1)</sup> Also ‘Wired,’ <http://www.wired.com/author/andygreenberg>

<sup>(2)</sup> It is important to note that our understanding of cryptomarkets is limited by the fact that these markets are, by their very nature, hidden. The ones that have come to the attention of researchers and others interested in documenting their activities tend to be English language and dominated by drug sales.

and popularity of these markets, they tend to be short-lived, and their success substantially hampered by the growth of mistrust amongst market participants due to scams and, to a more limited extent, law enforcement activities. At present, cryptomarkets represent only a tiny fraction of the global drug trade. Their effect on how illicit drugs change hands is therefore minimal in global terms. Their potential for expansion is hampered by the fact that, given the risks of making international shipments, vendors elect to ship domestically in the absence of strong ‘push’ factors to do otherwise, and by the fact that the postal system through which all shipments must ultimately reach their destination remains a weak link. Nevertheless, drug cryptomarkets have substantial advantages for both buyers and sellers, and should be considered, we argue, a significant drug market innovation. They allow vendors operating on these markets to sell to unknown customers (thus shifting drug markets back to ‘open’, as opposed to the ‘closed’ markets many have become as a result of mobile phone technology) and to do so on a global scale; their appeal to drug sellers and their customers cannot be ignored.

We then consider how drug cryptomarkets, or some decentralised version of these (see Buxton and Bingham, 2015), may be likely to impact on the global drug trade should they overcome existing obstacles, continue to grow and ultimately flourish. Cryptomarkets allow for the possibility of a direct link between drug-using buyers and producers, growers or synthesisers of illicit drugs, and may eventually serve to cut out some of the middle level of the market. On the other hand, we know that a substantial proportion of cryptomarket customers are drug dealers themselves, sourcing stock to sell offline, thereby allowing cryptomarkets to function in a middle market location. We conclude that both of these characterisations are likely to be true, depending on the drug in question. Finally, we consider the possibility that drug cryptomarkets may have some capacity to reduce the harm caused by drug markets by reducing the violence sometimes associated with these markets by virtue of their virtual location.

## **2.2 A brief history of drug cryptomarkets**

Silk Road was the first cryptomarket devoted predominantly to the sale of illicit drugs, including cannabis, a wide range of psychedelic drugs, stimulant drugs such as cocaine, and prescription medications (Christin, 2013). Drugs were purchased online from vendors displaying eBay-style shopfronts and delivered through postal services. Buyers were protected by a system of escrow: they ‘paid’ for their purchases in the anonymous and difficult to trace cryptocurrency bitcoin (so no need for identity-carrying credit card payments), but payments were not released to vendors until buyers were satisfied with their deliveries (Aldridge and Décar-Hétu, 2014). This market functioned

successfully because it was part of the hidden or ‘dark’ web, where all communications are anonymised by the Tor service. The site was launched in February 2011 and ran successfully for over two and a half years until the US FBI seized it on 2 October 2013.

Within weeks of Silk Road’s closure, Silk Road 2.0 was launched, although by this time rival marketplaces were vying for dominance. One of these, Sheep, quickly grew to a size comparable to that of Silk Road, but a few weeks later its administrators shut down the site, claiming that a user had exploited a security loophole and stolen 5 400 bitcoins of their users’ money (at the time worth around USD 6 million) (Pangburn, 2013), although many believed this was an ‘exit scam’ by the marketplace administrators, designed to enable them to abscond with the funds themselves.

Throughout 2014, marketplaces grew in size, with Pandora, Agora, Hydra, Evolution and Silk Road 2.0 competing to win back the trust of vendors and buyers once the possibility of scams by marketplace administrators became apparent. Another exit scam by market administrators occurred on 18 March 2015, when the Evolution marketplace closed, with administrators reportedly having stolen USD 12 million from buyer and seller accounts (Woolf, 2015), with others since this time.

In November 2014, a little over a year after the original operation against Silk Road, cryptomarkets were hit once again by law enforcement agencies in Europe and the United States, in Operation Onymous. This time, multiple marketplaces were targeted, including Silk Road 2.0, Cloud 9 and Hydra (Department of Justice, 2014). Although many smaller marketplaces were also shut down, only the administrator of Silk Road 2.0 was arrested, alongside a small number of vendors. What was reportedly unique to this particular operation, however, was the undercover agent who had been involved from the start of the market working as an administrator (Afilipoae and Shortis, 2015). As a result, the very aspect of cryptomarkets that provided their users with confidence in the platform — anonymity — may simultaneously have undermined that confidence; anonymity obscures the identities of criminals and law enforcement actors alike.

In spite of scams and law enforcement efforts, however, cryptomarkets continue to proliferate. Independent researcher Gwern Branwen, who has been systematically documenting and archiving these markets, found that 43 new markets opened in 2014 and 46 markets closed. Most of these closures, he estimates, were due to scams by marketplace administrators (or outside hacks), with only six closures attributable to law enforcement. Of the markets remaining in operation, nine had opened during 2014 (Branwen, 2015). Soska and Christin (2015) found that these marketplaces are extraordinarily resilient, with law enforcement ‘take downs’ resulting primarily in vendor displacement to other marketplaces. In summary, cryptomarkets tend to have a fairly short life, and their longevity is reduced more by scams than by law enforcement crackdowns. Our own data

collection efforts tell us that, at the time of writing, four marketplaces are open, each with over 1 000 active listings.

The emergence of online sales of illicit drugs has been detailed by Buxton and Bingham (2015). They, and Martin (2014), refer to Markov's description of marijuana transactions as far back as 1971 between students at Stanford University and MIT using technology at the artificial intelligence laboratories that became the foundation of the Internet. As we and others have discussed elsewhere (Aldridge and Décar-Hétu, 2014; Buxton and Bingham, 2015; Décar-Hétu and Aldridge, in submission), however, cryptomarkets are the direct descendants of markets for a range of illegal goods and services that emerged in the late 1990s and early 2000s. These markets were hosted in Internet Relay Chat (IRC) chat rooms and online discussion forums, providing participants with virtual locations where they could meet to arrange transactions. These 'first-generation' online criminal markets were popular but not engineered for security; indeed, they did little to obfuscate the location of their servers. This led to a series of highly publicised arrests and shutdowns (Poulsen, 2012), and enabled law enforcement officials to access public and private messages as well as logs of connections, leading them directly to market participants. These markets, furthermore, were not terribly efficient; it was difficult to assess before purchase the trustworthiness of vendors or the quality of the goods and services they sold. Because of the rudimentary security features of these online platforms, therefore, criminal operators there could face a considerable degree of victimisation both from vendors and platform administrators (Décar-Hétu and Aldridge, under review).

Cryptomarkets, the 'second-generation' online criminal markets, represent a step change in criminal innovation (Aldridge and Décar-Hétu, 2014). Visually, they look just like any other legitimate online marketplace (eBay, for example): they bring together a range of vendors in one location, each listing products for sale, and allow customers to comparison-shop. They offer the same opportunities for networking and carrying out business transactions as the first-generation criminal markets, but in a much more secure environment. Cryptomarkets did not invent any technology *per se*, but they brought together four security measures never used in conjunction before. First, cryptomarkets require that participants make their payments in virtual currencies such as bitcoin. Transactions made in virtual currencies are exceptionally difficult to trace and their use does not entail checks by regulatory agencies, for example in relation to anti-money laundering legislation. Second, cryptomarkets require that their participants use an anonymising protocol, such as Tor or the Invisible Internet Project (I2P), to hide their identities when connecting to them. Cryptomarkets also take advantage of these protocols to hide their IP addresses, thereby hindering the ability of law

enforcement to seize their servers. The remaining two measures are aimed at providing buyers with security and confidence in relation to their transactions. Cryptomarkets use escrow systems, and finally, they employ feedback or purchase review systems similar to those found on large online merchant sites such as Amazon and eBay. Buyers can check the feedback scores for vendors and their products to help them evaluate the likelihood that they'll be buying the product they want from a trusted vendor (Van Hout and Bingham, 2013).

### **2.3 The impact of cryptomarkets on global and local drug markets**

A number of estimates — by Christin (2013) and by Aldridge and Décar-Hétu (2014) — of revenue generation <sup>(3)</sup> on Silk Road before it was first shut down suggest that the marketplace generated around USD 16.7 million in 2012 and USD 89.7 million in 2013 <sup>(4)</sup>. Estimating the value of the global trade in illicit drugs, by comparison, is notoriously difficult (Reuter and Greenfield, 2001). Estimates regularly quoted in the media that ostensibly derive from the UNODC estimates range from USD 300 billion to USD 1.3 trillion annually, but the methodologies employed, it has been argued, generate little more than wild guesses (Thoumi, 2005). Even in the absence of a sensibly derived estimate of the global drug trade, however, we can be sure that sales on cryptomarkets are likely to represent only a tiny fraction of the global drug trade.

This should be unsurprising, since the bulk of supply and trafficking activities in the worldwide drug trade rely on conventional interpersonal networks of drug manufacturers, wholesalers and brokers (Martin, 2014). At first glance, then, it seems unlikely that cryptomarkets will have had much of an impact on traditional drug markets.

However, as Martin goes on to argue persuasively:

Cryptomarkets transform conventional drug sales by facilitating the creation of global networks of offenders. These networks comprise both vendors and purchasers of illicit

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<sup>(3)</sup> These estimates were made possible by the automated feedback system that strongly encouraged buyers to leave feedback on vendors, so that feedback could be used as a proxy measure for a transaction with reasonable confidence. Our research indicated that about 88 % of buyers posted publicly available feedback after a purchase (Aldridge and Décar-Hétu, under review). By multiplying the number of transactions received by the price of a listing, it was possible to estimate the sales generated on cryptomarkets with a high level of certainty.

<sup>(4)</sup> By the time of its closure, the first Silk Road was a well-functioning, confident, successful and growing market; no cryptomarket since has operated with the same success or in an environment with the same confidence, and, even if some of these second-generation markets generate high revenues, their instability and short lifespans suggest that our best source of data about a well-functioning cryptomarket remains the first Silk Road.

drugs who, once online, are able to conduct a range of illicit activities not only on an unprecedented scale, but also with a degree of freedom that significantly exceeds what is possible through conventional, interpersonal criminal networks. ... This suggests that cryptomarkets facilitate a form of illicit drug sales that is qualitatively different from the conventional, offline variety. (Martin, 2014, p. 10)

In other words, it seems likely that the kind of trade facilitated by drug cryptomarkets may not simply replace conventional trade but supplement it, for example by catering to a different kind of buyer, able to purchase a range of substances not previously available to them. Christin (2014) has recently underlined the importance of this question for future research: do cryptomarkets primarily displace drug purchases from traditional markets or instead provide access to drugs for those without previous access?

We have already discussed the loss of confidence in cryptomarket platforms on the part of both buyers and vendors following scams and law enforcement activities, creating a potential limiting factor for the future growth of drug cryptomarkets, but there are additional factors that may impose limitations on the growth of these markets. Access to them requires a certain amount of technological knowledge; for example a buyer needs to understand how to use Tor or another anonymising service and how to purchase and use a cryptocurrency. Some of those who are willing and able to learn to use these services may simply mistrust the security they afford, particularly in light of media coverage of arrests associated with cryptomarkets. Furthermore, cryptomarket drug purchases require advance planning: some drug users may be unwilling to plan their drug use sufficiently in advance, preferring instead to make purchases from known dealers, in person, who can supply their requirements as and when the desire for consumption arises. Another limitation on the growth of cryptomarkets arises from the fact that drugs must be sent using postal systems, with the accompanying risks that result from monitoring and seizure, which can take place both within and at borders. It seems likely that some drug users may be unwilling to purchase from cryptomarkets because of a reluctance to have illicit drugs sent to them through the post, perceiving that doing so carries risks and preferring their existing access to drugs through known and trusted retail dealers.

This concern about the risks of sending/being sent illicit drugs through the post may be heightened where drugs are shipped across international borders. Shipping across borders carries greater risks for both vendors and their buyers because of the increased chance that a package will be searched and confiscated. From the vendor's point of view, this increases the risk of customer dissatisfaction if a package is not received, potentially affecting the vendor's ever-important feedback rating. From

the customer's point of view, having illegal goods shipped to an address formally connected to them might be a risk they are especially unwilling to take if those packages risk being confiscated or held at borders. Shipments across international borders also simply take more time and cost more than purchases made within local jurisdictions. For all these reasons, both customers and vendors may prefer illegal goods to be shipped only within their own country's borders.

The authors' own research, based on data collected from Silk Road in September 2013, just before closure, confirmed this: vendors generally chose only to ship domestically (71 % of US vendors, for example) unless there were substantial 'push' factors to do otherwise. Our multivariate analysis found six such push factors: (i) insufficient domestic demand for illicit drugs; (ii) a perceived lower effectiveness of law enforcement, making it safer for vendors to operate internationally with impunity; (iii) a lower GDP per capita that limits the purchasing power of local customers; (iv) a lower vendor rating which makes it more difficult to compete on the national level against vendors who have a perfect rating score; (v) the scope of the products offered by vendors measured by the number of listings offered and; (vi) the sale of smaller packages (as measured in weight) given that it should be easier for these packages to pass through the inspections at the borders undetected (Décaray-Hétu et al., under review). These results suggest that, although cryptomarket vendors can theoretically sell in a global marketplace, many elect not to in the absence of substantial factors pushing them to do so.

Even though cryptomarkets still have a minor market share in the overall illicit drug trade, evidence suggests that they may be expanding. Research by Barratt, et al. (2014) using Global Drugs Survey data, suggests that among survey respondents who usually buy their own (primarily recreational) drugs, access to drugs via SR1 was not insubstantial. In Australia, the UK and the USA, 7%, 10% and 18% of the sample (respectively) had consumed drugs purchased via SR1, and just over half of these had self-purchased (so between 5-10%). Customers appreciate the ease of access and the quality and range of products that cryptomarkets offer, as well as perceiving these markets as providing them with a higher level of security than street drug markets (Barratt et al., 2014). Drug sellers perceive the likelihood of arrest to be substantially reduced and appreciate access to a much larger potential market of buyers (Van Hout and Bingham, 2014).

This last point — cryptomarket vendors having access to a larger market of buyers — has important implications for the potential effects of drug cryptomarkets on local and global drug markets. Cryptomarket dealers can effectively transcend the physical restrictions of a local drug market — the limited number of people they could physically reach to transact with — to supply, through postal delivery, a (potentially) worldwide market. In recent years, many drug markets have moved from

'open' to 'closed', in which drug dealers sell only to those customers with whom they have trusted relationships (see May and Hough, 2004). However, cryptomarkets reverse this arrangement, with vendors able to transact with unknown customers, whom they encounter only in the virtual sphere (Aldridge, 2012; Aldridge and Décar-Hétu, 2014).

There is some debate about the extent to which drug cryptomarkets, if they continue to proliferate and grow, will change the structure of drug markets. To the extent that these markets allow a direct link between drug-using customers and producers, cryptomarkets may serve to cut out some of the middle or wholesale level in the drug market chain (Martin, 2013) and/or may reduce the links in the chain between producer and end-user. We have argued, in contrast, that cryptomarkets may instead in part function at the middle level of the drug market.

Our evidence is derived from an analysis of the nearly 12 000 listings on Silk Road downloaded in September 2013, only weeks before it was shut by the FBI (Aldridge and Décar-Hétu, 2014). We found that a substantial proportion of the transactions on Silk Road could be characterised as 'business-to-business'. Many of the transactions conducted there were for drugs in quantities and at prices typical of purchases made by drug dealers sourcing stock. The terminology employed by vendors in some instances made this explicitly clear; for example, one cannabis seller stated: 'This is a mid-grade commercial hash perfect for resale due to the low price.' The average prices for the drugs advertised in the top 20 % of most expensive listings were consistent with purchases made for resale: cannabis, mean = USD 1 474.93; opioids, mean = USD 1 683.85; prescription drugs, mean = USD 1 129.65; psychedelics, mean = USD 1 932.80; and stimulants, mean = USD 1 547.62. This was also true in the top 40 % of most expensive listings for ecstasy (mean = USD 2 071.91). These high-priced listings generated between 31 % and 45 % of the revenue for the subset of particular drugs in those categories for which we have quantity information coded. The quantities of drugs sold (in the top 20 % of highest *quantity* listings) were also indicative of large-scale purchases consistent with resale intent: herbal cannabis, mean = 269 g; Xanax, mean = 8 850.45; LSD, mean = 172 blotters; cocaine, mean = 36 g. This appeared to be the case also for the top 40 % of highest quantity listings for MDMA (mean = 26 g). The fact that vendors gave substantial discounts for bulk purchase seems likely to have further facilitated the likelihood that purchases made there by drug dealers could have made for profitable offline resale. These large-sized purchases could have been made by customers for a number of reasons, such as for personal use over a long period or 'social supply' (with the purchases made by one individual on behalf of a group of friends) (Aldridge, Measham et al. 2011, Coomber and Moyle, 2013). However, the sometimes very large

prices/sizes of the purchases provide compelling evidence that a substantial proportion of customers on Silk Road were drug dealers sourcing stock.

Therefore, Silk Road functioned as a virtual broker, connecting upper-, mid- and retail-level sellers. So although it is possible, as Martin (2013) argued, that drug cryptomarkets may directly connect producers/synthesisers with drug users buying for their own use, thereby cutting out the middle level of the market, our findings suggest that cryptomarkets may also perform a middle market function. It seems likely that both of these characterisations may be true simultaneously, depending on the drug in question. We suspect, for example, that direct producer–user transactions are more likely for the kinds of drugs where small-scale producers can operate without large-scale international networks (cannabis, for example, and easy-to-produce psychedelic drugs such as mushrooms, varieties of NBOMe and DMT). These direct producer–user transactions seem much less likely for drugs such as cocaine or heroin, both of which require large-scale international networks for distribution. We have not yet disentangled the potential effects that the online drug trade has on global and local markets in this regard, and this remains a fruitful avenue for future research.

Finally, we consider the possibility that cryptomarkets may have the capacity to reduce the harm caused by drug markets in some important ways. Others (e.g. Ormsby, 2014; Van Hout and Bingham, 2014; Caudeville, see Chapter 7) refer to the online culture of harm reduction that was evident in the first Silk Road, and many have referred to the high level of purchase satisfaction amongst its customers, suggesting that drug quality may be superior to that in traditional retail drug markets. Recent research by Caudeville (see Chapter 7) shows positive results on the quality of cryptomarket purchases for 129 samples submitted by cryptomarket customers to Energy Control's testing service. In 120 (93 %) of the samples submitted, the drug that customers thought they had purchased was the only psychoactive substance detected. The purity of cocaine samples submitted ( $n = 54$ ) was high (mean 70.4 % purity) compared with that we see reported for street seizures in the United Kingdom for example, which averaged 38 % in 2013 (Burton et al., 2014). In addition to the possibility of these markets being ‘good’ in this sense for drug users, these markets may also be ‘good’ for drug dealers and for the environments in which they operate. Before the advent of online availability of bulk-quantity illicit drugs, dealers had to have on-the-ground connections and relationships of trust built with middle-level drug dealers and/or importers in order to be able to acquire product (McCarthy and Hagan, 2001; Morselli, 2001), as well as a tough reputation (Topalli et al., 2002). With the advent of the cryptomarket, almost anyone with sufficient technological skills

can access stock. In other words, the type of ‘subcultural capital’ (Thornton, 1995) required to be a drug dealer is likely to be different for those who operate on a cryptomarket.

This new type of drug dealer is also likely to be relatively free from the violence typically associated with traditional drug markets (Caulkins and Reuter, 2009). Traditional illicit markets do not have the state (police, trading standards) to adjudicate disputes; in virtual markets, the marketplaces have regulatory mechanisms that function in this way (escrow, seller and buyer trust metrics, marketplace adjudication of disputes), removing some of the unstable factors in illegal markets. Because of the virtual location of online drug markets, in addition to the presence of conflict-reducing features such as escrow and bitcoin, violence and theft are likely to be reduced. It is probable that these changes will have a deep impact on the skills needed to succeed in criminal markets. In the drug cryptomarket era, having good customer service and writing skills, and a good reputation, via feedback, as a vendor or buyer may be more important than muscles and face-to-face connections.

Although it may seem self-evident that the virtual location of online drug markets should reduce violence because interactions there occur in virtual rather than in physical space, this potential capacity of cryptomarkets to reduce harm may have limitations. Our research (Aldridge and Décarie-Hétu, 2014) showed that cryptomarket customers are likely to include drug dealers sourcing stock to sell offline. For this reason, cryptomarkets remain ‘anchored’ in offline drug markets, with vendors there also purchasing offline to sell online. The requirement, therefore, to operate either wholesale purchase or retail sales in offline drug markets means that cryptomarket users may still be victims and perpetrators of violence connected with these face-to-face transactions. In addition, harm can manifest itself in forms other than real-world violence: threats; damage to reputation; ‘doxing’ (hacking and then threatening to expose the victim’s identity) and other forms of blackmail; theft and fraud; and cyber-bullying. Finally, the violence associated with drug markets may be culturally, politically and socially conditioned (Bourgois, 2003; Johnson et al., 2006), rather than arising as a function of the illegal market itself. To the extent that these external conditions remain unchanged, the ability of cryptomarkets to reduce violence and conflict may be limited. All these questions need to be addressed empirically.

## 2.4 Conclusion

Cryptomarkets are still very much in their infancy. Market administrators are learning how best to protect their activities and their participants from law enforcement, while law enforcement actors are learning how to investigate and clamp down on this drug market innovation. One important

question must therefore be asked: given the potential we've discussed here for harm reduction to arise from the online drug trade — for drug dealers, for users and within the markets themselves — should drug cryptomarkets be a high priority for law enforcement? We might consider reframing the problem: instead of deeming cryptomarkets problematic because the criminals operating there are harder for law enforcement to reach, perhaps we should consider the possibility that cryptomarkets reduce the problems associated with this kind of criminality. The extent to which harm might actually be reduced by cryptomarkets, however, remains an open question that requires systematic empirical research.

The impact that cryptomarkets have will depend largely on the shifting balance between the success of those seeking to set up and run effective cryptomarkets with longevity, on the one hand, and the investigative success of law enforcement, on the other. Law enforcement may seem to have the upper hand, having successfully closed large cryptomarkets two years in a row. However, the limited number of arrests made and quantity of drugs seized, and the proliferation of markets that has followed each law enforcement effort, suggest that these police operations are having only a limited impact. For now, it seems inevitable that the Internet will continue to be a source of drug market innovation.

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