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How Digital Road-Freight Platforms Develop, and What Transfers to an Atomised Informal Market: A Comparative Case Study with Lessons for Uzbekistan

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Abstract: Typologies of digital road-freight platforms classify what platforms do; less is known about how they grow and which growth paths transfer to fragmented, largely informal markets. This paper asks which development models can be distinguished, which success factors matter at which stage, and what transfers to Uzbekistan. A structured comparative case study of seven cases in the United States, China, the European Union and Kazakhstan, analysed through two-sided-market, transaction-cost and institutional lenses and triangulated across academic, regulatory, company and press sources, identifies four models — venture-market, scale, regulatory and state-led — each with a distinct growth mechanism and risk. An evidence matrix links six success factors to the cases, and six propositions state their stage-dependent priority: critical mass, payment guarantees and ease of use dominate at entry, matching speed and the legal status of electronic documents during growth, and return-load provision at maturity. Mapping Uzbekistan's market shows load boards, on-demand services, terminal-based express operators and state information systems, but no terminal-less consolidation of partial loads. Because the electronic waybill is already mandatory, the task is to integrate it with private platforms and simplify it for individual carriers, building critical mass on one corridor before activating return-load and consolidation functions.

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1. Introduction

Over the past decade, digital platforms have become a visible part of road-freight markets. They shorten the search for loads and trucks, standardise transactions and generate data on freight flows that were previously invisible. Their paths of development differ markedly: in some markets growth was financed by venture capital, in others it came from the scale of the domestic market, and in others from the regulation of transport documents. A systematic review of the economic impact of digitalisation in transport logistics finds the field at an early stage and notes that adoption requires clear evidence of economic benefits [1].

The question is of practical importance for Uzbekistan. Road transport carries 91.1% of the tonnage moved in the country but performs only 28.9% of the tonne-kilometres, and small businesses account for 98.5% of the entities in transport and storage [2]. Inter-regional trucking is organised largely informally, through spontaneous truck stands and independent brokers. A presidential resolution of January 2025 set the task of digitalising transport and logistics processes [3], and an electronic consignment

note became mandatory for domestic carriage in 2024 [4].

Existing typologies classify platforms by function — for example, eight types of digital platforms for road-freight management [5] or a market taxonomy of digital forwarders [6] — rather than by how they reach scale. For a country that has not yet developed such platforms, the growth path matters more than the feature list. The paper therefore addresses three research questions. RQ1: which development models of digital road-freight platforms can be distinguished, and what mechanism drives each? RQ2: which success factors matter, and at which stage of a platform's development? RQ3: what transfers to an atomised, largely informal market such as Uzbekistan's?

The contribution is threefold: a classification of development paths grounded in platform-economics mechanisms; an evidence matrix that links success factors to documented cases and leads to six propositions on their stage-dependent priority; and a mapping of Uzbekistan's market and logistics performance that turns these propositions into actor-specific recommendations. Section 2 sets out the analytical framework, Section 3 the method, Section 4 the results and Section 5 discusses implications and limitations; Section 6 concludes.

1.1 Platform economics

The theory of two-sided markets is the main lens. Rochet and Tirole showed that a platform manages not only the level but the structure of prices between the sides of the market [7; 8], and Armstrong showed that per-transaction fees and multi-homing shape the form of competition [9]. A new intermediary faces a chicken-and-egg problem that it can solve by subsidising one side (divide and conquer) [10], and many platforms fail to reach the critical mass at which network effects become self-sustaining [11]. Once trust is established, users may bypass the platform and deal directly [12]. Recent work applies two-sided-market pricing to digital freight platforms with risk-averse participants [13].

1.2 Freight markets, search frictions and digital intermediaries

Empirical studies of freight markets show the value of reducing search frictions. Hubbard found that US trucks equipped with on-board computers were loaded more fully [14], and Brancaccio and co-authors that centralised matching can reduce the misallocation of transport capacity in decentralised markets [15]. Caplice classified electronic markets for truckload transport, from combinatorial auctions to open exchanges [16]. Online freight exchanges have been modelled as markets in which carriers bid for loads, with equilibrium effects on carriers' routing [17; 18]. Digital forwarders — asset-light intermediaries that combine brokerage with software — have been classified by their market orientation and described as a disruptive force in European road freight [19]. A survey of Chinese digital freight-matching platforms shows that their cooperative performance depends on pragmatic, moral and cognitive legitimacy and on government regulation [20].

1.3 Documents, institutions and informality

Electronic transport documents are an institutional precondition for digital freight. The 2008 Additional Protocol to the CMR Convention allows an electronic consignment note to replace the paper one [21], and the EU's Regulation 2020/1056 obliges authorities to accept electronic freight transport information [22]. In informal markets, however, documentation also exposes turnover to taxation, so adoption depends on whether the benefits of formality exceed its costs [23]. Transport cost burdens are particularly high in landlocked Central Asia [24]. In the Uzbek literature, Khalimov discusses the principles of new logistics services in the digital economy [25], Zufarova the role of information technologies for regional logistics companies [26] and Mannapova the formation of the market for logistics services [27]; none compares development paths of freight platforms.

1.4 Framework

Table 1 translates the three lenses into dimensions used to compare the cases. Each model in Section 4 is characterised along these dimensions, and each proposition is linked to the mechanism that motivates it.

Table 1. Analytical framework

Dimension	Mechanism (theory)	What is observed in a case
Growth driver	Subsidising one side; network effects [10; 11]	Source of funds for growth; how the first users were attracted
Liquidity	Critical mass; market thickness [11; 15]	Lanes or regions where the platform concentrated; mergers
Transaction costs	Search, negotiation and enforcement costs [14; 16]	Time to match; price setting; payment terms
Trust and leakage	Disintermediation; legitimacy [12; 20]	Escrow, ratings, insurance; incentives to stay on the platform
Institutions	Legal force of e-documents; formality costs [21–23]	Status of electronic consignment notes; tax visibility
Asset intensity	Asset-light intermediation vs terminals [6; 19]	Terminals or none; consolidation mode

Source: compiled by the authors

2. Materials and Methods

The study is a structured comparative case study with theoretical sampling. Cases were selected to maximise variation in the growth driver and in market structure and had to meet three criteria: (a) national or international significance or explicit policy relevance; (b) public documentation from at least two types of source; and (c) a growth mechanism distinct from the other cases. Seven cases met the criteria (Table 2). The unit of analysis is a platform, or a state-led system, in its market.

Table 2. Cases and sources

Case	Country	Role in the comparison	Main sources
Uber Freight	United States	Venture-funded digital broker; payment terms	Press report of launch terms; literature on digital forwarders
Convoy	United States	Venture-funded broker that failed	Press
Flock Freight	United States	Terminal-less shared truckload	Press on model, funding and strategy
Full Truck Alliance	China	Scale platform in an atomised market	Annual report ; press ; model calibrated on platform data ; survey of Chinese platforms
TIMOCOM, Trans.eu	European Union	Freight exchanges	Literature on exchanges and forwarders
eFTI framework	European Union	Regulatory driver of e-documents	Regulation ; industry body; e-CMR literature
Kazakhstan transit digitalisation	Kazakhstan	State-led model	Press; World Bank LPI

Source: compiled by the authors.

Each case was first described along the dimensions of Table 1 (within-case analysis); the cases were then compared to identify recurring patterns and the

conditions under which they appear (cross-case analysis). Statements were accepted as evidence when they were documented in at least one source; statements supported by academic, regulatory or company sources are marked as direct evidence, and those that rest on press reports or on the authors' inference are marked as such in the evidence matrix (Table 5). Market figures are reported as stated by companies or the press and were not independently verified. The stage-dependent priority of the factors is a qualitative judgement derived from the matrix and is stated as propositions to be tested, not as estimates. The Uzbek market was mapped from the official websites of the platforms and state systems as of October 2026 and from official statistics.

3. Results

3.1 Four development models (RQ1)

North America: the venture-market model. The US trucking market is highly fragmented by number of carriers, which is why load boards became its traditional matching infrastructure. From the second half of the 2010s, venture-funded digital brokers entered. Uber Freight, launched in 2017, offered instant booking at a price known in advance and promised to settle payments within a few days, against the 30 days or more that carriers traditionally waited [28]. For small carriers this eased the working-capital problem and became a strong reason to join — a subsidy to the carrier side in the sense of.

The same market supplies a cautionary case. Convoy, which had raised more than a billion dollars and was valued at 3.8 billion dollars, ceased its main operations in October 2023; its management cited a deep freight recession and the contraction of capital markets [29]. A platform whose commission income does not cover its operating costs when freight volumes fall becomes dependent on outside funding. Sustainability has to rest on a real improvement in the use of trucks — more paid trips per month — rather than on subsidies that last only as long as capital is cheap.

Terminal-less consolidation: Flock Freight. The closest analogue of consolidating partial loads without terminals is Flock Freight. In its shared-truckload model, partial loads of several shippers travel in one trailer on a multi-stop trip without terminals or intermediate rehandling, and each shipper pays for the space it occupies [30]. The company raised 215 million dollars at a valuation of 1.3 billion dollars in 2021 [31] but, during the market downturn of 2023–2024, cut staff and announced a path to profitability [32]. The case shows that consolidation without rehandling is viable as a service, and that its economics depend on the density of partial-load flows on a lane — a liquidity constraint in the sense of Table 1.

China: the scale model. Full Truck Alliance (Manbang), formed by the merger of the Yunmanman and Huochebang platforms, listed on the New York Stock Exchange in 2021 and is among the largest freight-matching platforms in the world [33; 34]. Its growth rests on the scale of the market, a high share of owner-drivers and a developed mobile-payment infrastructure; the merger itself concentrated liquidity. The Chinese model is the most relevant to Uzbekistan because it emerged in an atomised market dominated by drivers with one or two trucks. According to the company, drivers who used to wait several days for a load now find one within hours [35]; in a model calibrated on platform data, joint optimisation of matching, pricing and multiple-delivery routes could shorten the empty approach to loads by 75–82% [36]. Survey evidence from Chinese platforms adds that regulation and legitimacy condition their performance.

European Union: the regulatory model. Freight exchanges such as TIMOCOM (Germany) and Trans.eu (Poland) have long been part of the infrastructure of international road transport, and digital forwarders have entered the market more recently. What distinguishes the EU is regulation: the CMR Protocol on the electronic consignment note and Regulation (EU) 2020/1056 on electronic freight transport information, which obliges competent authorities to accept transport documents submitted electronically and sets a common technical framework [37]. The lesson is that market initiative alone is not enough: the legal force of an electronic document must be recognised by the state.

The post-Soviet region: the state-led model. Kazakhstan has announced digital

tracking of transit flows, electronic queues and solutions based on artificial intelligence [38; 39]; these reports come from the press and describe plans and pilots as much as results. The model gives priority to transit and international lanes and turns to the domestic market later. Its strength is the speed with which a regulatory framework and public resources can be mobilised; its weakness, inferred from its focus on transit corridors and large operators, is a weak fit with the needs of small domestic carriers. Table 3 summarises the four models.

Table 3. Development models of digital road-freight platforms

Model	Growth driver	Strength	Characteristic risk	Lesson for Uzbekistan
Venture-market (US)	Venture capital; subsidy to carriers	Fast growth, high-quality UX	Dependence on cheap capital; cyclical vulnerability	Revenue must rest on real efficiency gains
Scale (China)	Market scale; network effects; mergers	Works in an atomised market	Intense competition, thin margins; regulatory scrutiny	Shorter waiting for loads is the main value
Regulatory (EU)	Legal framework (e-CMR, eFTI)	Legal force of electronic documents	Slow implementation	E-documents must be integrated with platforms
State-led (Kazakhstan)	Government programmes	Resources and regulatory support	Weak fit with small carriers	Platforms must serve the lower tier of the market

Source: compiled by the authors from the case analysis.

3.2 Market segments and the value of a platform

The cases also show that the value of a matching platform depends less on the country than on the segment it serves. In segments of large fleets that plan their own capacity, coordination deficits are small and platforms act mainly as transport management systems for corporate shippers. In segments of owner-operators and very small fleets — the bulk of carriers in the US, China and Uzbekistan alike — the coordination deficit is large, and platforms grow by shortening the search for loads and guaranteeing payment (Table 4).

Table 4. Carrier segments and the potential value of a digital platform

Segment	Typical carrier	Coordination deficit	Main platform function	Potential value
Large fleets with in-house planning	Dozens to thousands of trucks	Low	Transport management, procurement	Limited
Small and medium fleets	Several to dozens of trucks	Medium	Freight exchange, capacity sourcing	Moderate
Owner-operators and micro-fleets	One to three trucks	High	Matching, payment guarantee, return loads	High

Source: compiled by the authors from the cases.

Two qualifications follow. Where the informal sector is large, a platform's

expansion depends on the tax regime: if documenting a transaction is not compensated by additional freight, carriers leave the platform. And the potential value does not turn automatically into carrier income: some of the gain reaches shippers through cheaper carriage per tonne, and some is redistributed among carriers.

3.3 Success factors and their priority by stage (RQ2)

The cross-case analysis identifies six success factors. Table 5 shows the evidence for each of them across the cases; Fig. 1 states the resulting propositions on their priority by stage.

Table 5. Evidence matrix: success factors by case (D — documented in a source; I — inferred by the authors; — not observed)

Factor	Uber Freight	Convoy	Flock Freight	FTA	EU exchanges / eFTI	Kazakhstan
Critical mass	I	D [29]	D [32]	D [33]	I	—
Matching speed	D [28]	I	—	D [35; 36]	D [16; 17]	I [38]
Payment guarantee	D [28]	I	—	I	I	—
Legal status of e-documents	—	—	—	I [20]	D [21; 22]	I [39]
Ease of use	D [28]	I	—	I	—	I
Return-load provision	—	—	D [30]	D [36]	—	—

Source: authors' analysis; numbers in brackets refer to the sources.

– **P1 (critical mass).** A freight platform creates value only on lanes where both sides are thick enough; it should concentrate on one lane or region before expanding. Evidence: FTA's merger concentrated liquidity; Convoy's dependence on volume growth; Flock's dependence on lane density.

– **P2 (matching speed).** Once a platform has users, the time from posting a load to assigning a truck becomes the main source of carrier value, because it determines waiting time. Evidence: FTA (days to hours); models of freight exchanges.

– **P3 (payment guarantee).** At entry, guaranteed and fast payment attracts small carriers more than a lower commission. Evidence: Uber Freight's launch terms.

– **P4 (legal status of e-documents).** Moving from matching to managing documented transactions requires electronic documents with legal force. Evidence: e-CMR and eFTI.

– **P5 (ease of use).** For owner-operators, a simple interface matters more than functional richness. Evidence: Uber Freight's instant booking (direct); the weak fit of state-led systems with small carriers (inferred).

– **P6 (return loads).** The ability to provide return and consolidated loads creates the largest value for carriers but works only once a lane is liquid. Evidence: Flock Freight's shared truckload; the platform-data model of multi-delivery routing.

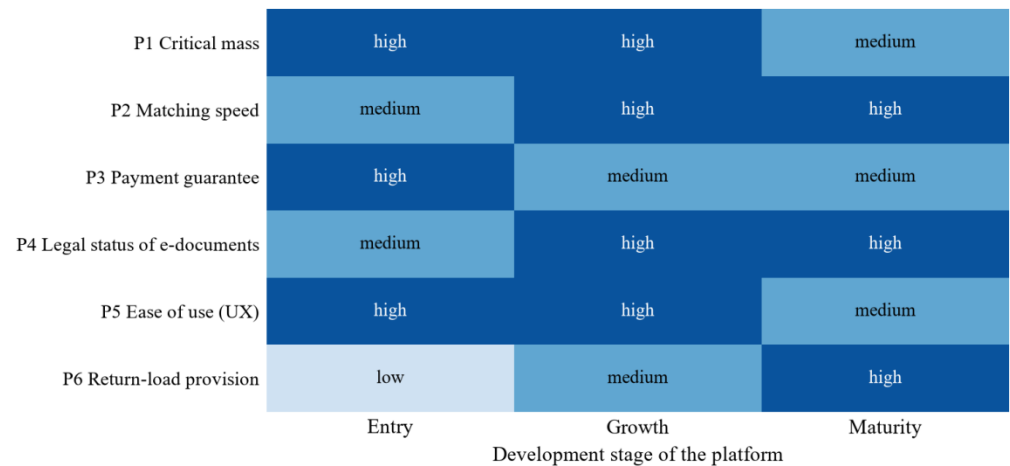


Fig. 1. Proposed priority of success factors by development stage (propositions P1–P6).

Source: authors' qualitative assessment derived from Table 5.

The implication is a sequence: critical mass is built on one lane, payment guarantees and simple tools attract the first carriers, faster matching and documented transactions follow, and return-load and consolidation functions are activated last, once the lane is liquid.

3.4 The Uzbek market and its logistics performance (RQ3)

Uzbekistan's digital freight landscape, mapped from the official websites of platforms and state systems as of October 2026, contains elements of three of the four models but not terminal-less consolidation of partial loads (Table 6).

Table 6. Digital freight services in Uzbekistan and their analogues (October 2026)

Type	Examples	Main functions	Closest model	Gap
Load boards	YUK.UZ, LOAD24; regional exchanges ATLSU, DELLA	Posting loads and trucks	Venture-market (early stage) / EU exchanges	Do not manage the transaction
Managed marketplace	Yukbozor	Bids, electronic contract, escrow payment	Venture-market	No consolidation of partial loads
Route-chain search	ATLSU route chains (in Uzbekistan since 2022)	Automatic selection of up to five loads between two cities	Exchange with optimisation	Search tool only: no booking, price allocation or trip management
On-demand services	Yandex Delivery cargo (Tashkent, up to 1.4 t); CASVA	Truck on request, mainly urban	Venture-market (urban)	Weak in inter-regional freight
Express / LTL operators	BTS Express, DPD	Terminal and branch networks	Terminal-based LTL	Capital-intensive, expensive for small shippers

State information systems	E-logistika; skladi.uz register	Data on logistics centres and warehouses	State-led	Do not serve individual carriers
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Source: official websites [41]; ATI.SU [42; 43]; E-logistika and skladi.uz [44].

Open sources reviewed in October 2026 did not reveal a platform that consolidates partial loads of several shippers without terminals and assigns them automatically to a truck at a published price per kilogram and per cubic metre. This is the segment where, by P6, the largest value lies once a lane is liquid, and where Flock Freight's experience is most relevant.

The World Bank's Logistics Performance Index confirms where the weaknesses lie (Fig. 2). In 2023 Uzbekistan scored 2.6 and ranked 88th of 139 economies; Kazakhstan scored 2.7 and ranked 79th [40]. Uzbekistan's lowest component scores are for infrastructure and for tracking and tracing (2.4 each), and its highest for timeliness (2.8). The largest gap to Kazakhstan is in tracking and tracing (2.4 against 2.8) — precisely the capability that digital freight platforms provide.

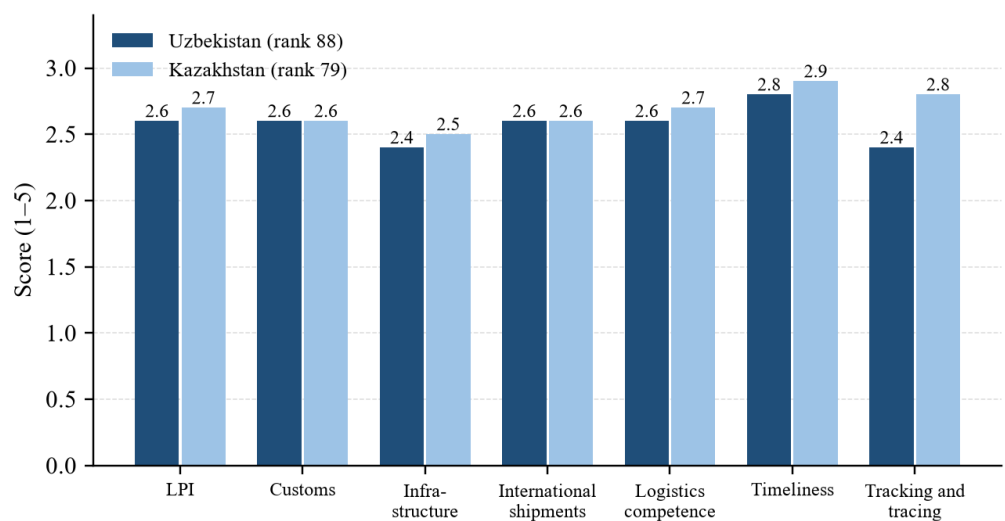


Fig. 2. Logistics Performance Index 2023: Uzbekistan and Kazakhstan by component.

Source: World Bank, *Connecting to Compete 2023*, Appendix 1 [40].

3.5 Lessons and recommendations

Combining the propositions with Uzbekistan's conditions yields five lessons, each addressed to the actor that can act on it.

- **Economic sustainability instead of subsidies (platforms; P1, P3).** Convoy shows that a model dependent on outside capital is vulnerable in a downturn. Platform revenue should grow with the number of trips it adds for carriers; temporary incentives such as a zero commission at launch should be tied to one pilot lane.

- **Integration of the electronic waybill with private platforms (tax authority, Ministry of Transport; P4).** The electronic consignment note for domestic carriage became mandatory in 2024 — from 1 April for large taxpayers and from 1 July for all businesses [41]. The task is therefore not to create its legal basis, as in the EU before eFTI, but to give private platforms an interface to issue it on behalf of carriers and to make it usable from a phone by individual entrepreneurs.

- **Opening state systems to the lower tier of the market (Ministry of Transport; P5).** E-logistika and the warehouse register are oriented towards logistics centres and large participants. Exposing their data to private platforms would let small carriers benefit without new state applications [42].

- **Payment guarantee as the entry advantage (platforms, banks; P3).** For a carrier with one truck, fast and reliable payment matters more than a small difference in tariff; escrow and payouts within days should be part of the basic functionality from the start.

- **Terminal-less consolidation on a liquid lane (platforms; P1, P6).** Consolidating partial loads without terminals is preferable to building LTL terminals in a market short of capital, but only where partial-load flows are dense enough. A long,

unbalanced lane such as Tashkent–Republic of Karakalpakstan, where empty returns are most costly, is a natural pilot.

4. Discussion

The classification complements function-based typologies: two platforms with the same functions can follow different development paths, and it is the path that determines which conditions a country must create. For Uzbekistan, the most transferable elements are China's focus on shortening the wait for loads in an atomised market, the EU's recognition of electronic documents and the US experience of terminal-less consolidation; growth financed by outside venture capital carries the highest risk [43].

A limit to transfer is the size of the informal sector. None of the models reviewed developed where a platform both creates a benefit for carriers and makes their turnover visible to the tax authority. The key condition is therefore a combination of tax regime and additional freight under which joining a platform remains worthwhile for an individual carrier.

The study has methodological limits. The cases were selected for contrast, not representativeness; several rely on press and company sources whose figures were not verified independently; the Kazakhstan case is documented mainly by the press; and the stage priorities are qualitative. The propositions should be tested with platform transaction data — for example, matching times, payment delays and return-load shares before and after launch on a pilot lane — and with surveys of carriers and shippers [44].

5. Conclusion

Four development models of digital road-freight platforms can be distinguished — venture-market, scale, regulatory and state-led — each driven by a different mechanism and exposed to a different risk (RQ1). Six success factors, linked to documented cases, suggest that critical mass, payment guarantees and ease of use dominate at entry, matching speed and the legal status of electronic documents during growth, and return-load provision at maturity (RQ2). Uzbekistan's market has load boards, managed marketplaces, express operators and state systems but no terminal-less consolidation, and its weakest logistics capability is tracking and tracing; with the electronic waybill already mandatory, the priority is to integrate it with private platforms and to build critical mass on one corridor before activating return-load and consolidation functions (RQ3). **Author contributions.** O. Akhmadov: conceptualisation, methodology, formal analysis, investigation, writing — original draft. G. Ismoilova: supervision, writing — review and editing. **Funding.** This research did not receive any specific grant from funding agencies in the public, commercial or not-for-profit sectors. **Competing interests.** O. Akhmadov is the owner and developer of the e-yuk.uz electronic freight platform, which operates in the segment discussed in Section 4.4. G. Ismoilova declares no competing interests.

Declaration of generative AI and AI-assisted technologies. During the preparation of this work the authors used Claude (Anthropic) in order to draft text and to translate it from Russian. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

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