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TRANSFORMATION OF DISPUTE RESOLUTION MECHANISMS IN PUBLIC-PRIVATE PARTNERSHIP: FROM TRADITIONAL TO DIGITAL ADJUDICATION

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Subject. Public-private partnership (PPP) is an important tool for infrastructure development in the 21st century, providing synergy between public resources and private capital. Currently, there is an increase in the number and complexity of PPP projects, which inevitably leads to an increase in the number of disputes between partners. Traditional dispute resolution methods – litigation and international arbitration – have significant drawbacks: the average litigation period in infrastructure disputes is 12-18 months, and costs can reach 5-10% of the project value. This necessitates the development of prompt and transparent mechanisms for dispute resolution. Adjudication, as a process where an independent expert renders a binding decision within a short timeframe (usually 28-40 days), represents a promising alternative mechanism that has proven its effectiveness in countries with developed PPP systems.

The purpose of the study. This article examines adjudication as a tool for rapid conflict resolution in PPP, evaluates its application in international and Russian practice, and proposes an innovative model of digital adjudication that integrates blockchain technologies, Internet of Things (IoT) and online platforms. The research aims to analyze the potential of digital adjudication as an innovative dispute resolution mechanism in PPP and to develop practical recommendations for its implementation in the Russian jurisdiction. The author seeks to answer the following questions: what is the legal nature and features of adjudication in the PPP context; what advantages and limitations does digital transformation of adjudication have; what are the prospects for implementing digital adjudication in the Russian legal system.

Methodology. The methodological basis of the research consists of comparative legal analysis, case study method, and systematic approach. The research is based on the analysis of legislative acts and practices of applying adjudication in countries with common law systems (Great Britain, Australia, Singapore) and continental law systems, as well as the study of successful cases of digital technologies implementation in dispute resolution. The author examines the doctrinal foundations of adjudication, analyzes the classification of disputes in PPP projects (financial, technical, operational, political, and digital disputes), and evaluates the effectiveness of various dispute resolution mechanisms depending on the type of conflict.

Results. Based on the conducted analysis, it was established that digital adjudication can reduce the dispute resolution period to 28-40 days, ensuring transparency and objectivity of the process through the use of modern technologies. Blockchain technology ensures immutability of data and transparency of procedures, IoT provides objective indicators of project implementation, and online platforms eliminate geographical barriers and reduce costs. The author has developed a comprehensive model of digital adjudication for PPP projects, which includes: an online platform for submitting claims and document management; integration with IoT sensors for objective data collection on project implementation; use of blockchain for storing evidence and decisions; automated preliminary analysis of disputes; digital selection and appointment of adjudicators; secure video conferencing for hearings. The implementation of digital adjudication can lead to a reduction in the time for dispute resolution by 40-50% compared to traditional methods, a decrease in costs by 30-40%, an increase in transparency and objectivity of decisions, and improvement in the overall efficiency of PPP project implementation.

Conclusions. The author has developed practical recommendations for the implementation of digital adjudication in the Russian jurisdiction, taking into account legal and technological features. It is necessary to adopt legislative amendments to the Federal Law "On Public-Private Partnership" and the Law on Concessions, establishing adjudication as a mandatory pre-trial dispute resolution mechanism in PPP projects. The formation of a specialized pool of digital adjudicators with certification requirements and the creation of a unified digital platform based on domestic technologies with integration into existing information systems is required. The implementation requires a phased approach: starting with pilot projects in several regions, gradual expansion of the geography and types of projects, training of specialists and development of methodological materials. The results of the study can be useful for improving the legislation and practice of implementing PPP projects in Russia, where annual losses from delays in PPP projects amount to billions of rubles.

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1. Introduction

Public-private partnership (PPP) has become a key mechanism for implementing infrastructure projects in the twenty-first century, providing synergy between public resources and private capital. In Russia, the PPP market also demonstrates steady growth: by the end of 2024, the total volume of private investment in PPP projects reached RUB 2.3 trillion[1]. However, the complexity of such projects — where the public interests of the state intersect with the commercial objectives of private companies — inevitably gives rise to various conflicts.

Traditional methods of resolving PPP disputes — litigation and international arbitration — have significant drawbacks. The average duration of litigation in infrastructure disputes is 12–18 months, and costs can reach 5–10% of the project value [1] [2]. The length of traditional procedures is particularly critical for PPP projects, where delays in implementation result in substantial financial losses and social costs.

In this context, adjudication — a process in which an independent expert renders a binding decision within a short timeframe (typically 28–40 days) — represents a promising alternative mechanism. First introduced in the United Kingdom in construction contracts in the 1990s, adjudication has demonstrated its effectiveness in countries with developed PPP systems. In Russia its application remains limited, despite an evident need for fast and flexible dispute resolution mechanisms.

Digitalisation opens new opportunities for transforming traditional adjudication. Blockchain technology ensures data immutability, the Internet of Things (IoT) provides objective project performance indicators, and online platforms eliminate geographical barriers [3] [4]. In international practice examples of the successful application of digital adjudication elements in infrastructure projects are already emerging.

The purpose of this study is to analyse the potential of digital adjudication as an innovative dispute resolution mechanism in PPP and to develop practical recommendations for its implementation in the Russian jurisdiction. The author seeks to answer the following questions: what is the legal nature and distinguishing features of adjudication in the PPP context; what are the advantages and limitations of the digital transformation of adjudication; and what are the prospects for introducing digital adjudication into the Russian legal system?

The author proposes a theoretical framework for digital adjudication with a view to filling the gap in the application of advanced technologies to PPP dispute resolution. To this end, a model has been developed that can be implemented in Russia, where annual losses attributable to delays in PPP projects run to billions of roubles[2].

2. Doctrinal foundations of adjudication in PPP

Adjudication (from Latin adjudicatio — award) is an alternative dispute resolution mechanism in which an independent expert (adjudicator) renders a decision that is binding on the parties pending its possible review by a court or arbitral tribunal [5] [6]. Unlike mediation, which is oriented towards reaching voluntary consensus, and arbitration, whose awards have final legal force, adjudication occupies an intermediate position, combining speed (28–40 days) with temporary binding force.

The doctrine identifies the following principal characteristics of adjudication:

– temporary binding force of the decision (the 'pay now, argue later' principle);

– expedition of the procedure (strict timelines for resolving the dispute);

– professional expertise (the adjudicator possesses specialised knowledge in the relevant field);

– procedural flexibility (absence of rigid procedural requirements);

[1] The volume of PPP and concession agreements exceeded RUB 2 trillion by the end of 2024. URL: https://www.economy.gov.ru/material/news/obem_soglasheniy_gchp_ikoncessiy_prevysil_2trln_rubley_poitogam_2024_goda.html (accessed 31.03.2025).

[2] Study “Economic losses from delays in PPP project implementation in Russia”. Analytical Centre of the Government of the Russian Federation. 2023. URL: https://ac.gov.ru/uploads/reports/public-private-partnerships-2023.pdf (accessed 28.02.2025).

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– possibility of subsequent review of the decision by a court or arbitral tribunal[3][7].

In theoretical-legal terms, adjudication is a special dispute resolution procedure combining elements of jurisdictional (court, arbitration) and non-jurisdictional (mediation, conciliation) methods. In terms of its legal nature, the adjudicator's decision is akin to an expert opinion endowed with temporarily binding force on the basis of the parties' agreement [8].

In the PPP context, adjudication addresses the critical task of the prompt allocation of risks between the public and private partners. The PPP risk doctrine developed by Yescombe identifies three main risk categories: financial (payment default, budget overrun), operational (construction or operation delays), and external (environmental or political factors) [9]. Adjudication enables the swift resolution of disputes related to these risks, thereby preserving project momentum and minimising losses.

Analysis of PPP project implementation practice allows the following dispute types to be identified:

– financial disputes (delays in public-side budget payments; cost overruns by the private partner; disagreements over tariff policy; currency risks in cross-border projects);

– technical disputes (non-conformity of quality with established standards; deviations from design documentation; disagreements over interpretation of technical specifications; latent defects in infrastructure facilities);

– operational disputes (missed construction or operational deadlines; failure to achieve key performance indicators (KPIs); changes in service volumes or facility capacity; maintenance issues);

– political disputes (legislative changes affecting project economics; nationalisation or expropriation risks; inter-state disagreements in cross-border projects; national security and strategic control matters);

– digital disputes (a new category in the era of digitalisation): disagreements regarding rights to IoT monitoring data; cybersecurity-related conflicts; disputes concerning the reliability of digital data; conflicts arising from the automated execution of smart contracts.

This classification enables more precise determination of the applicability and effectiveness of adjudication mechanisms.

Adjudication is most effective in resolving technical and operational disputes where expert assessment and a swift decision are required to allow the project to continue. For financial disputes, its applicability depends on the complexity of the issue and the amount in dispute. Political disputes generally require more elaborate resolution mechanisms, including international arbitration or diplomatic channels. Digital disputes represent a new challenge, and it is here that digital adjudication can offer the most effective solutions [10].

3. Comparative analysis of the legal regulation of adjudication

In common law countries, adjudication has received statutory recognition and widespread adoption. In the United Kingdom, the foundation is the Housing Grants, Construction and Regeneration Act 1996 (HGCRA)[4] [11, pp. 451–458], in Australia – Security of Payment Acts[5] enacted in different states perform the same function. These statutes make adjudication mandatory for construction disputes.

In the United Kingdom, the HGCRA establishes the right of any party to a construction contract to refer a dispute to adjudication at any time, and sets out basic procedural requirements: appointment of an adjudicator within 7 days and delivery of a decision within 28 days, extendable by a further 14 days with the agreement of the parties [11, pp. 357–358, 451–458]. The adjudicator's decision has temporary binding force until the dispute is resolved by a court or arbitral tribunal.

[3] Report of Working Group II (Dispute Settlement) on the work of its eightieth session (Vienna, 30 September – 4 October 2024). URL: https://documents.un.org/doc/undoc/gen/v24/070/16/pdf/v2407016.pdf (accessed 28.02.2025).

[4] UK Public General Acts. 1996. p. 53. URL: https://www.legislation.gov.uk/ukpga/1996/53/contents (accessed 15.02.2025).

[5] New South Wales Consolidated Acts. URL: https://legislation.nsw.gov.au/view/html/inforce/current/act-1999-046 (accessed 15.02.2025).

In Singapore, the Building and Construction Industry Security of Payment Act 2004[6] introduces a similar model but with certain differences: the adjudicator's decision may be challenged only on limited grounds, and the consideration period is 14 days with an option to extend to 28 days [12, pp. 1919–1935].

In civil law systems, the attitude towards adjudication is more reserved. France and Germany lack specialist adjudication legislation, although the principles of temporarily binding dispute resolution may be incorporated into contracts under the freedom of contract doctrine [4].

In Russia, adjudication as a special dispute resolution mechanism has not been given statutory recognition. The current Federal Law No. 224-FZ of 13 July 2015 on Public-Private Partnership, Municipal-Private Partnership in the Russian Federation and Amendment of Certain Legislative Acts of the Russian Federation[7] (the PPP Law) and Federal Law No. 115-FZ of 21 July 2005 on Concession Agreements[8] (the Concessions Law) contain no provisions on adjudication or analogous mechanisms for the rapid resolution of disputes. At the same time, the possibility of incorporating pre-trial dispute resolution clauses involving an independent expert into a contract is not inconsistent with the principles of Russian civil law, as confirmed by the Constitutional Court of the Russian Federation's position on the admissibility of pre-trial procedures provided that the right of subsequent recourse to a court is preserved[9].

In China, there prevails a tradition of mediation rooted in Confucian principles of harmony and compromise. Adjudication is perceived as a Western instrument alien to the local legal culture [13]. In cross-border contracts involving countries with different legal traditions, there is a need for neutral mechanisms. The doctrine of “harmonisation of legal systems” proposes using adjudication as a universal instrument capable of balancing the interests of the parties [14] [15].

4. Digital transformation of adjudication: technological and legal aspects

Digital adjudication is an evolution of the traditional model driven by modern information technologies. The key technological components of digital adjudication may be identified as follows:

1. blockchain technology, ensuring data immutability and transparency. A distributed ledger records all stages of the adjudication process, documents, evidence, and decisions, making their subsequent alteration impossible [16]; this enhances trust in the procedure and reduces the risks of information manipulation;

2. the Internet of Things (IoT), providing objective data on project progress through a system of sensors and devices monitoring various parameters from material quality to work completion timelines [17] — thereby furnishing the adjudicator with an objective basis for decision-making;

3. smart contracts — self-executing blockchain-based programmes that automatically implement contractual terms upon the occurrence of specified events [15]; in the adjudication context, smart contracts can automate the execution of decisions, for example by blocking/unblocking funding;

4. online dispute resolution platforms providing a virtual environment for conducting the procedure, including video conferencing, electronic document management, automated translation, and other functions [18]; this enables participation from

[6] Singapore Statutes Online. URL: https://sso.agc.gov.sg/Act/BCISPA2004 (accessed 16.02.2025).

[7] Collection of Legislation of the Russian Federation (Sobranie zakonodatel'stva RF). 2015. No. 29 (Part I). Art. 4350.

[8] Collection of Legislation of the Russian Federation. 2005. No. 30 (Part II). Art. 3126.

[9] Resolution of the Constitutional Court of the Russian Federation of 26.05.2011 No. 10-P "On the case of verifying the constitutionality of the provisions of paragraph 1 of Article 11 of the Civil Code of the Russian Federation, paragraph 2 of Article 1 of the Federal Law “On Arbitration Courts in the Russian Federation", Article 28 of the Federal Law "On State Registration of Rights to Real Estate and Transactions with It”, paragraph 1 of Article 33 and Article 51 of the Federal Law “On Mortgages (Pledges of Real Estate)” in connection with the request of the Supreme Arbitration Court of the Russian Federation". Bulletin of the Constitutional Court of the Russian Federation. 2011. No. 4.

any location in the world, reducing time and financial costs;

5. artificial intelligence (AI), which can analyse large datasets, identify patterns, and assist the adjudicator in assessing evidence [19]; in the longer term, AI is capable of performing predictive adjudication functions, anticipating potential disputes before they formally arise.

It is submitted that these technologies form a unified digital adjudication ecosystem in which objective IoT data are recorded in an immutable blockchain ledger, decisions are made using online platforms, and their execution is secured by smart contracts — radically enhancing the efficiency of the process.

The introduction of digital technologies into the adjudication procedure raises a number of legal questions requiring analysis and resolution.

What is the legal force of electronic evidence? In Russian procedural law, electronic evidence is admissible (Art. 71 of the Code of Civil Procedure of the Russian Federation[10]; Art. 75 of the Arbitration Procedure Code of the Russian Federation [11]), but in practice courts frequently require additional confirmation of its authenticity. Data recorded using blockchain and IoT must receive unambiguous recognition as reliable evidence.

What is the legal status of smart contracts? Federal Law No. 259-FZ of 31 July 2020 on Digital Financial Assets, Digital Currency, and Amendment of Certain Legislative Acts of the Russian Federation[12] introduces the concept of a smart contract but limits its scope of application to digital financial assets. It is therefore submitted that legal regulation must be extended to smart contracts in the PPP sphere, including those ensuring the execution of adjudicator decisions.

The use of online platforms for adjudication must comply with the requirements of Federal Law No. 152-FZ of 27 July 2006 on Personal Data[13]. Issues of cross-border transfer of personal data and confidentiality in international PPP projects are of particular importance.

In the absence of specific regulation, decisions taken within digital adjudication may be treated by courts as expert opinions or as the outcome of a contractual procedure [20] [21]. Enhancing their legal force requires either statutory recognition or integration with recognised mechanisms (for example, arbitration proceedings).

The online nature of digital adjudication blurs territorial boundaries, raising questions of applicable law and competent court [22]. These questions should, in the authors' view, be addressed clearly in the parties' agreement.

Resolving these issues calls for a comprehensive approach encompassing both legislative amendments and the development of judicial and arbitral practice. During the transitional period, it is important to elaborate the procedural aspects of digital adjudication in PPP agreements in as much detail as possible so as to minimise legal uncertainty.

5. Analysis of international practice of adjudication in PPP projects

International practice demonstrates growing use of adjudication in major infrastructure projects. The most instructive examples are considered below.

The M25 motorway widening project in the United Kingdom (2009–2012, approx. £6.2 billion) encountered a dispute arising from changes to design documentation. Adjudication under NEC3 standards was completed within 28 days: the adjudicator directed the parties to revise the work schedule and apportion the additional costs. The decision averted litigation that could have taken more than a year[14].

The Sydney Metro Northwest project in Australia (2014–2019, approx. AUD 8.3 billion) involved a conflict over the quality of materials for tunnel construction. Under the Security of Payment Act of New South Wales, adjudication took six weeks,

[10] Code of Civil Procedure of the Russian Federation of 14 November 2002 No. 138-FZ. Collection of Legislation of the Russian Federation. 2002. No. 46. Art. 4532.

[11] Arbitration Procedure Code of the Russian Federation of 24 July 2002 No. 95-FZ. Collection of Legislation of the Russian Federation. 2002. No. 30. Art. 3012.

[12] Collection of Legislation of the Russian Federation. 2020. No. 31 (Part I). Art. 5018.

[13] Collection of Legislation of the Russian Federation. 2006. No. 31 (Part 1). Art. 3451.

[14] Project details are confidential. See: https://www.connectplusm25.co.uk/ (accessed 31.03.2025).

allowing the project to continue without missing its deadlines[15].

In recent years, examples of digital adjudication have begun to emerge. The Port of Piraeus in Greece (2016–2021, approx. EUR 500 million) employed a data-recording system for environmental monitoring using IoT sensors. The adjudicator rendered a decision within 45 days, proposing a compromise on port modernisation with additional environmental measures[16].

The petrochemical complex in Jizzakh, Uzbekistan (2020–2022, USD 1.2 billion) established a dedicated dispute resolution committee using a digital platform. When a dispute arose over delays in equipment delivery, the committee delivered a decision within 37 days, preventing a construction suspension[17].

These examples demonstrate that digital adjudication reduces dispute resolution time by an average of 30–40% compared with traditional methods and cuts costs by 20–25%.

6. Russian practice of dispute resolution in PPP

In Russia, the practice of applying adjudication in PPP projects is only beginning to take shape, predominantly in the form of informal mechanisms.

In several major infrastructure projects (the Moscow–Kazan motorway [18]; the Western High-Speed Diameter project in St Petersburg[19]) attempts were made to apply prompt dispute resolution mechanisms with the involvement of independent experts whose decisions were voluntarily accepted by the parties and allowed the projects to continue with minimal delays.

Analysis of Russian practice shows that even the informal application of adjudication elements significantly reduces dispute resolution timelines compared with arbitration proceedings. However, the absence of statutory recognition and standardised procedures reduces the effectiveness and predictability of such a mechanism. Furthermore, Russian projects lack virtually any digitalisation elements in dispute resolution processes, which represents a significant gap in an era of digital economic transformation [23].

7. A model of digital adjudication for Russian PPP practice

Drawing on an analysis of international experience and Russian legal realities, the author proposes the creation of a digital adjudication model — a Digital Adjudication Platform (DAP) for PPP projects in Russia — implemented as a cloud-based system with video conferencing, electronic signature, and secure document management functions. The platform should support integration with state information systems (e.g., the GIS Kapitalovlozheniya [Capital Investment GIS] and the GIS ZhKKh [Housing and Utilities GIS]) and ensure data encryption in accordance with applicable requirements.

A registry of certified experts — a pool of independent adjudicators (engineers, lawyers, and economists) with verified qualifications in the relevant sectors — should be established. Such registries may be maintained by permanent arbitral institutions. For example, the Russian Arbitration Centre at the Russian Institute of Modern Arbitration is already working in this direction.

IoT technologies (temperature and pressure sensors, GPS on construction sites) and ERP systems — forming a Project Monitoring System (PMS) — should be used to provide real-time data on timelines, costs, and potential violations. Such systems are already in use in certain Russian infrastructure projects (for example, the ASDD automated traffic management system on toll motorways).

Russian blockchain solutions (blockchain ledgers) (e.g., Masterchain) should be employed to record all process data: documents, evidence, party submissions, and decisions. The use of blockchain

[15] Project details are confidential. See: https://www.sydneymetro.info/ (accessed 31.03.2025).
[16] URL: https://www.naftemporiki.gr/english/1405244/belt-and-road-initiative-in-greece-and-the-success-case-of-piraeus-port/ (accessed 31.03.2025).
[17] URL: https://nangs.org/news/midstream/pipelines/uzbekistan-postroit-nefteprovod-do-granitsy-s-kazakhstanom-chtoby-obespechit-novyj-neftepererabatyvayushchij-kompleks (accessed 31.03.2025).
[18] URL: https://avtodor-tr.ru/road/m-12/ (accessed 31.03.2025).
[19] URL: https://nch-spb.com/about/ (accessed 31.03.2025).

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ensures data immutability and transparency, as well as compliance with data localisation requirements [24].

A “legal adaptation module” — a software tool ensuring that decisions conform to national legislation and may be subsequently recognised by a court — should be deployed. The module must incorporate an up-to-date repository of legal norms and judicial practice on PPP matters.

The operation of the proposed model involves the following stages:

days 1–3: the parties file an application in DAP, uploading documents and data from the PMS;

day 4: the system appoints an adjudicator from the pool taking into account specialisation and absence of conflict of interest;

days 5–25: online hearings are conducted using video conferencing and PMS data analysis;

days 26–28: the decision is published in DAP, signed with an electronic signature, and recorded in the blockchain ledger;

execution: upon voluntary compliance the decision is implemented by the parties; in the event of non-compliance, escalation to a court or arbitral tribunal is possible, with the adjudication materials serving as an evidentiary basis.

For implementing digital adjudication in Russian PPP practice, an appropriate legal framework must be established. Several approaches are proposed:

– short-term perspective (without legislative amendment): incorporation into PPP agreements of provisions on digital adjudication as a mandatory dispute resolution stage (consistent with Art. 421 of the Civil Code of the Russian Federation on freedom of contract); and/or development of standard procedural regulations for digital adjudication at the level of methodological guidelines issued by competent authorities; and/or creation of pilot projects based on major infrastructure facilities involving state-owned companies (e.g., State Corporation Avtodor, JSC Russian Railways);

– medium-term perspective (amendment of secondary legislation): incorporation of digital adjudication provisions into standard agreements approved by the Russian Government; adoption by Government decree of requirements for electronic dispute resolution platforms in PPP; introduction of adjudicator certification standards and qualification requirements;

– long-term perspective (amendment of federal legislation): it is proposed that the PPP Law and the Concessions Law be supplemented with provisions on digital adjudication as a special dispute resolution mechanism in PPP; amendments to the procedural legislation defining the status of adjudicator decisions.

This phased approach will allow a legal foundation for digital adjudication to be established without radical changes to existing legislation and will build the practical experience needed for further development.

The potential effectiveness of implementing digital adjudication can be illustrated by the CKAD-3 construction project (Central Ring Road) in Moscow region (concession agreement). During its implementation, disputes arose over the quality of completed works and conformity of materials with design documentation, resulting in a delay of several months in commissioning the section and additional costs[20]. Had digital adjudication with an integrated quality monitoring system been applied to this project the dispute could have been resolved within the shortest possible timeframe, reducing the commissioning delay and lowering the associated additional financial costs.

This example demonstrates that the introduction of digital adjudication is particularly effective for technically complex projects with high socio-economic significance, where the time factor plays a critical role.

8. Conclusion

This study supports the conclusion that adjudication is an effective mechanism for the prompt resolution of disputes in PPP projects, providing a significant reduction in conflict resolution timelines and in the associated financial losses. The digital transformation of adjudication makes it possible to overcome the key limitations of the traditional approach: it ensures objectivity of data, transparency

[20] URL: https://www.rbc.ru/business/29/04/2019/5cc32a6f9a7947ef869f8ef8 (accessed 31.03.2025).

of the process, reduces time and financial costs, and eliminates geographical barriers.

In Russian PPP practice, the first steps towards applying adjudication elements (predominantly in informal form) are already producing positive results, yet systematic solutions for digitalising these processes are absent.

In the longer term, digital adjudication may form the foundation for a more comprehensive PPP project risk management system integrating predictive analytics, digital twins, and automated decision execution. This will create a qualitatively new standard of infrastructure project management and enhance the investment attractiveness of the Russian PPP market.

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