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Tashkent state transport university

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Application of Internet of Things technologies to improve the operational reliability of the gas supply system in vehicles

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Abstract: This study analyzes the possibilities and outcomes of applying Internet of Things (IoT) technologies to improve the operational reliability of the gas supply system in vehicles running on compressed natural gas (CNG). In this research, a monitoring system was developed based on pressure, temperature, flow, and gas leakage sensors, edge devices (ESP32, Raspberry Pi), and the ThingsBoard cloud platform. The system performs real-time data collection, alerting, and diagnostic functions, contributing to the optimization of service intervals. The implementation of the IoT system increases the probability of failure-free operation of system components and significantly reduces the number of failures and malfunctions. According to experimental research results, the effectiveness of the system was evaluated based on the reduction of failure functions, the reliability indicators of failure-free operation, and the analysis of maintenance and repair activities.

Keywords: IoT (Internet of Things), vehicle, MAN A22, compressed natural gas (CNG), gas supply system, operational reliability, failure and malfunction, real-time monitoring of failure-free operation, technical diagnostics, probability of failure-free operation, maintenance

Internet of Things texnologiyalarini transport vositalarning gaz ta’minot tizimi ekspluatasion ishonchliligini oshirishda qo‘llash

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Annotatsiya: Siqilgan tabiiy gaz (STG) yonilg‘isida ishlovchi transport vositalarining gaz ta’minot tizimining ekspluatatsion ishonchliligini oshirishda Internet of Things (IoT) texnologiyalarining qo‘llanilish imkoniyatlari va natijalari tahlil qilish. Ushbu tadqiqot ishida bosim, harorat, oqim va gaz sizish sensor(datchik)lari, edge qurilmalar (ESP32, Raspberry Pi) va ThingsBoard bulutli platformasiga asoslangan monitoring tizimi ishlab chiqildi. Ushbu tizim real vaqt rejimida ma’lumot yig‘ish, ogohlantirish va diagnostika funksiyalarini bajarar ekan, servis intervallarini optimallashtirishga yordam berdi. IoT tizimi joriy etilgach, tizim elementlarning buzilmasdan ishlash ehtimolligi oshadi, buzilish va nosozliklar sonini sezilarli darajada kamaytirish imkonini beradi. Tizimning samaradorligi eksperimental tadqiqot natijalariga ko‘ra buzilish funksiyalari vujudga kelishini kamaytirish, ishonchlilikning buzilmaslik xususiyati va texnik servis hamda joriy ta’mirlash ishlari tahlili asosida baholandi.

Kalit so‘zlar: IoT(Internet of Things), transport vositasi, MAN A22, siqilgan tabiiy gaz (STG), gaz ta’minot tizimi, ekspluatatsion ishonchlilik, buzilish va nosozlik, buzilmasdan ishlash real vaqt monitoringi, texnik diagnostika,buzilmasdan ishlash ehtimolligi, texnik servis

1. Kirish

Transport tizimining zamonaviy talablari, ekologik xavfsizlik va ekspluatatsion ishonchlilikni oshirishni talab qiladi. Ayniqsa, siqilgan gaz (STG) bilan ishlovchi transport vositalarda ta’minot tizimi yuqori bosimda tizim elementlari ishlaydi, bunda ishonchlilik muhim rol o‘ynaydi. An’anaviy texnik servisda buzilishlarni oldindan aniqlay olmaydi. Shuning uchun ekspluatatsiya davrida bu tizimining texnik xolati, uning elementlari ishonchliligiga bog’liq. IoT (Internet of Things) texnologiyasi yordamida gaz ta’minot tizimini real vaqt rejimida monitoring qilish orqali buzilish va nosozliklarni oldindan aniqlash hamda ekspluatatsiya davrida ularni kamaytirish imkoniyatlari yaratiladi.

IoT texnologiyalarini **gaz ta’minot tizimini r**eal vaqtda monitoring qilish uchun qo‘llash amaliyoti dunyoning bir qancha rivojlangan davlatlarida yo‘lga qo‘yilgan. Quyidagi jadvalda **STG avtobuslarda** “IoT” monitoring tizimlari joriy etilgan davlatlar oid misollar keltirilgan(1-jadval):

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1-jadval

STG avtobuslarda “IoT” monitoring tizimlari joriy etilgan davlatlar [2]

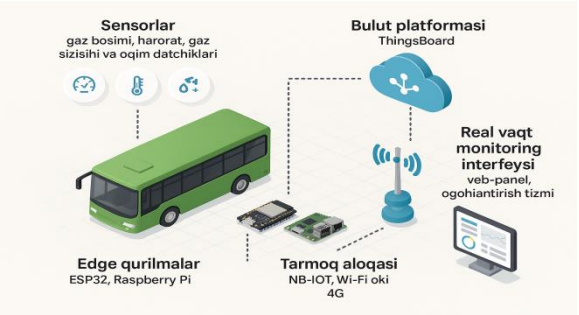
T/R	Davlat	Avtobuslar	“IoT” tizim/platformasi	Qo‘llanish sohasi
1.	Germaniya	MAN Lion’s City 12G / 18G, Mercedes-Benz Citaro NGT	Bosch IoT Suite, ZF telematik modullari	Harorat, bosim, gaz oqimi, gaz sifati monitoringi
2.	Shvetsiya	Scania Citywide LF STG	Scania Fleet Management + IoT sensorlar	Ekspluatatsion sharoit (muz, namlik), gaz sarfi, MTBF, TXK
3.	AQSh	New Flyer Xcelsior STG, Gillig Low Floor STG	Cummins Connected Diagnostics, Verizon IoT	Nosozlik kodi, ogohlantirish, GPS integratsiya
4.	Janubiy Koreya	Hyundai Universe STG, Daewoo BS106	KT Smart Bus platformasi	Bosim, harorat, ekologik monitoring, servis algoritmi
5.	Hindiston	Tata Starbus STG, Ashok Leyland JanBus STG	Bharat IoT platformasi	Xavfsizlik, portlash oldini olish, servis xotirasi
6.	Xitoy	Yutong ZK6128HG, King Long STG	Mahalliy IoT tizimlari	Gaz holati, nosozlik kodi, avtomatik tuzatish

Ushbu jadvaldan ko’rish mumkinki O‘zbekistonda ekspluatatsiya qilinayotgan avtobuslarda ham qo’llansa ularning rejali texnik servisi va ta’mirlash ishlari raqamlashtiriladi va avtobuslarning ishlash rejimlari hamda texnik tayyorgarlik, ishga chiqish koeffisiyentlari oshardi.

O’zbekistonda MAN A22 STG, Yutong ZK6126HG, King Long STG kabi siqilgan tabiiy gazda ishlaydigan transport vositalarda harakat tizimning ishonchliligini oshirishda ushbu “IoT” texnologiyasini qo’llansa “Avtobus saroyilari” va “Avtotexxizmat” korxonalarida transport vositalarning bosim sensor (datchik)lari, real vaqt monitoring (test tarzida), texnik servis tavsiyalari asosida servis xizmati davriyligi va tartibotini qayta shakllantirish va samaradorligini oshirish imkonini beradi.

2. Tadqiqot metodologiyasi

IoT tizimining avtobuslarda qo’llanishi tartibi quyidagi ketma-ketlikdan borat:



1-rasm. IoT tizimining avtobuslarda qo’llanishi tartibi

Ushbu rasmdan Sensorlar gaz bosimi, harorat, gaz sizishi va oqim datchiklari kabi qurilmalar, Edge qurilmalar: ESP32, Raspberry Pi (ushbu qurilma tavsiya sifatida keltirilgan), tarmoq aloqasi: Wi-Fi yoki 4G kabilar, bulut platformasi: ThingsBoard (bu platform ham tavsiya), real vaqt monitoring interfeysi: kompiyuter, plashet, androidlar, veb-panel, ogohlantirish tizimi bo’ladi va avtobuslarning texnik xolatini real vaqt moboyni nazorat qilsh imkonini beradi.

Statistik tahlil, diagnostika protokollari asosida buzilish va nosozliklar tahlilini olib elektron tarzda doimiy ravishda shakllanadiva texnik servisni raqamlashtiradi.

Bulut platformasini ishlashi bo’yicha qisqacha ma’lumot berib ketadigan bo’lsak.

Bulut platformasi (yoki inglizcha: *Cloud platform*) — bu foydalanuvchining qurilmalaridan (masalan, IoT sensorlar, edge qurilmalar) kelayotgan ma’lumotlarni **masofaviy serverlarda saqlash, tahlil qilish va boshqarish imkonini beruvchi raqamli xizmatlar to‘plami**dir.

IoT tizimlarida bulut platformasi markaziy nerv markazi vazifasini bajaradi — barcha sensorlar, qurilmalar va vizual interfeyslar aynan bulut orqali bog‘lanadi.

2-jadval

Bulut platformasining vazifalari

T/R	Asosiy vazifalar	Tavsifi
1	**Ma’lumot yig‘ish**	Sensor(datchik)lar va edge qurilmalar jo‘natgan ma’lumotlarni qabul qiladi
2	**Saqlash (Storage)**	Yig‘ilgan real vaqt ma’lumotlarini xavfsiz saqlaydi (uzoq muddatga)
3	**Tahlil (Analytics)**	Buzilmasdan ishlash funksiyasi, TS, buzilish va nosozliklar kabi tahliliy natijalarni hisoblaydi
4	**Ko‘rsatish (Dashboard)**	Grafiklar, jadvallar, oqim holati — hammasi veb-interfeys orqali ko‘rsatiladi
5	**Ogohlantirish (Alerts)**	Bosim, harorat yoki gaz sizish me’yordan chiqsa SMS, e-mail yuboradi
6	**Integratsiya (API)**	Servis markazi yoki serverlar tizimi bilan avtomatik bog‘lanish

Bulut platformasining ishlash rejimi (IoT STG tizimi misolida)

Quyidagi bosqichlar orqali ishlaydi:

I. *Sensor(datchik) va edge qurilmalar*

- Reduktor bosimi, harorat, oqim, gaz sizishi o‘lchanadi
- Edge qurilma (ESP32 yoki Raspberry Pi) ma’lumotni yig‘adi va siqadi

2. Ma’lumot uzatish

- 4G /Wi-Fi /NB-IoT orqali bulut platformasiga yuboriladi
- JSON yoki MQTT formatlarida

3. Bulut platformasida ishlov berish

- ***ThingsBoard, Azure IoT, AWS IoT, Google Cloud IoT*** kabi platformalarda:
- Ma’lumotlar real vaqt bazasiga tushadi
- Har bir tizim element holati tahlil qilinadi (odatda Python /Node-RED orqali)
- Buzilmasdan ishlash davri, texnik servis davriyligi, ko’rsatkichlarni me’yyoridan chetga chiqish holatini nazorat qiladi va avariya ehtimoli kabi hisob-kitoblar bajariladi

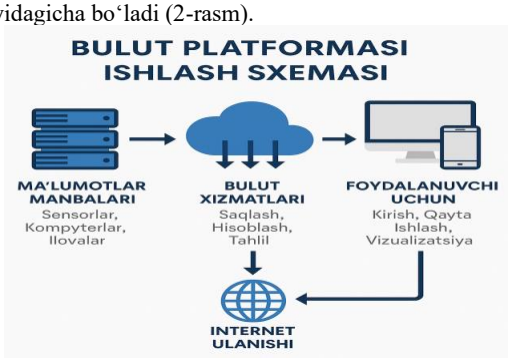
4. Vizual interfeys

- Texnik xodim veb-panelda transport vositasini yoki uning tizimi va tizim elementlarini ko‘radi
- Raqamlar, grafiklar, ogohlantirishlar (qizil/yashil/yellow indikatorlar bilan)

5. Aloqa va integratsiya

- Transport vositasidagi diagnostika tizimi bilan sinxron
- Texnik servis davriyliklariga avtomatik integratsiya qilinadi (plan/prognoz)

Shu sababli, tizim samaradorligini oldindan baholash, uning samaradorligini mo‘tadilligini ta’minlashda muhim omillardan hisoblanadi. Ushbu usullar bilan so‘rovlarga xizmat ko‘rsatishning sifat samaradorligini aniqlash uchun ommaviy xizmat ko‘rsatish modellaridan foydalanish maqsadga muvofiqdir. Buning uchun bir qancha modellar mavjud bo‘lib, yuqorida ko‘rib o‘tilgan tizim uchun quyidagi matematik modeldan $M_1/M_2/V/m< \infty$ foydalanish mumkin. Bu yerda, m kutish joylari soni, V- xizmat ko‘rsatish qurilmalari soni, M_1 – oddiy tasodifiy so‘rovlar oqimi, M_2 – xizmat ko‘rsatish davomiyligi. Ushbu model asosida yuqoridagi 1-rasmda keltirilgan ketma-ketlik quyidagicha bo‘ladi (2-rasm).



2-rasm. Bulut platformalarini ishlash sxemasi

3-jadval

Bulut platformasining afzalliklari

T/R	Afzallik	Tavsif
1	Masofaviy kirish	Servis muhandisi har qanday joydan tizimni ko‘ra oladi
2	Arxivlangan ma’lumot	O‘tgan oy/yil bo‘yicha tahlil qilish mumkin
3	Tashqi servis bilan bog‘lanish	ERP, SAP yoki texnik xizmat CRMlariga integratsiya
4	Avtomatik ogohlantirishlar	Buzilish va nosozlik haqida oldin xabar beradi (e-mail, Telegram bot va h.k.)
5	Buzilayotgan elementlar nomenklaturasi	Qanday tizim element eng ko‘p buzilayotgani aniqlanadi

Misol: MAN A22 avtobusidagi gaz reduktorida **bosim pasayishi** ro‘y beradi:

- Sensor(datchik) bu ma’lumotni edge qurilma orqali ThingsBoard platformasiga yuboradi
- Tizim uni normadan past deb baholab, **"warning"** signal chiqaradi
- Texnik xodim vizual panelda ogohlantirishni ko‘radi
- Servisga avtomatik buyurtma shakllanadi → qisqa muddatda ta’mirlash.

3. Natija va muhokamalar

Eksperiment Toshkent shahridagi 44 ta MAN A22 avtobuslari asosida 2023–2024 yillarda gaz ta’minot tizimidagi buzilish va nosozliklarni taxlilini IoT tizimisiz holatini olinsa va ehtimoliy tizim joriy etilgach, quyidagi natijalar kuzatilishi ehtimolligi mavjud:

4-jadval

IoT tizimi qo’llanilgan va qo’lanilmaganda gaz ta’minot tizimi gaz reduktorlari ishonchliligi taxlili

T/R	Ko‘rsatkich	IoT tizimsiz	IoT tizimi qo’llanganda ehtimoliy qiymatlar
1	Reduktor nosozliklari (2 yil davomida aniqlangan), dona	15	9
2	Reduktorning buzilishgacha o’rtacha yurgan yo’li, 1000 km	200	370
3	Reduktor nosozligi va reduktorga bo’lgan talab tufayli ishga chiqmasdan qolish vaqti, kun	90	30
3	Injektor nosozliklari, dona	10	6
4	Diagnostika aniqligi, %	past	yuqori (97%)
5	Servis samaradorligi	o‘rta	yuqori

IoT tizimi qo’llanganda ehtimoliy qiymatlari STG avtobuslarda “IoT” monitoring tizimlari joriy etilgan davlatlarning statistik natijalariga qiyoslangan holatda tanlangan.

IoT texnologiyasining MAN A22 avtobuslarining gaz ta’minot tizimida qo‘llanilishi ekspluatatsion ishonchlilikni oshirishda muhim ahamiyat kasb etmoqda.

Biroq amaliyotda tizimni joriy etish bilan bog‘liq bir qator muammolar mavjud.

- Sensor(datchik)larning ishlash muhitiga nisbatan zaifligi: chang, yuqori harorat, va bosim o‘zgarishlari sensorlarning ishlash muddatini qisqartiradi.
- Tarmoq aloqasi cheklangan hududlarda ishlamay qolishi mumkin (Wi-Fi, 4G, NB-IoT).
- Servis xodimlarining IoT tizimi bo‘yicha malakasi yetarli emas.

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- Import qilingan qurilmalarning ehtiyot qismlari tezda yetkazilmasligi tufayli nosozliklarni bartaraf etish uzoq davom etadi.
- Ma'lumotlar xavfsizligi va shifrlash mexanizmlari yetarlicha ishonchli emas.
- Dastlabki investitsiya xarajatlari yuqori bo'lib, barcha transport korxonalari buni o'zlashtira olmaydi.

Kelajakdagi IoT texnologiyalarining avtomobilsozlikda rivojlanish yo'nalishlari

- 5G asosidagi IoT texnologiyalarining joriy etilishi orqali ultra past kechikishli monitoring imkoniyati paydo bo'ladi.
- Sun'iy intellekt (AI) yordamida katta ma'lumotlar tahlili asosida oldindan nosozlikni bashorat qilish imkoniyati yaratiladi.
- Raqamli nusxa (Digital Twin) texnologiyasi yordamida virtual simulyatsiyalar orqali ekspluatatsion tahlil chuqurlashtiriladi.
- Blockchain texnologiyasi orqali ma'lumotlarning xavfsiz va shaffof almashinuvi ta'minlanadi.
- Simsiz va quyosh energiyasida ishlovchi sensorlar orqali energiya mustaqilligi ta'minlanadi.
- Modular interfeyslar yordamida barcha avtobus turlari uchun mos universal tizimlar ishlab chiqiladi.

IoT texnologiyalarining to'g'ri joriy etilishi MAN A22 STG avtobuslarida gaz ta'minot tizimi tizim elementlarining ishlash barqarorligini ta'minlaydi, nosozliklarni oldindan aniqlash imkonini beradi va servis xizmatini optimallashtiradi. Ammo, mavjud texnik, iqtisodiy va kadrlar muammolari hal etilmas ekan, tizimning to'liq joriy qilinishi qiyin bo'ladi. Shu sababli, yaqin kelajakda yuqorida sanab o'tilgan innovatsion yo'nalishlar asosida harakat qilinishi zarur.

4. Xulosa

IoT tizimi MAN A22 avtobuslarining gaz ta'minot tizimi ishonchliligini oshirishda samarali yechim bo'lib xizmat qildi. Nosozliklarni erta aniqlash, TXK algoritmlarini yangilash va real vaqt monitoringi transport sohasida katta imkoniyatlar ochadi va korxonada iqtisodiy jihatdan imkoniyatlarini yaxshilash imkonini beradi. IoT tizimining MAN A22 avtobuslar saroyiga iqtisodiy jihatdan ta'siri

Ushbu tahlilda IoT texnologiyasi joriy etilishi natijasida MAN A22 rusumli 44 ta STG avtobuslar ishlatiladigan 5-avtobus saroyida yuzaga keladigan iqtisodiy yutuq baholandi. Taqqoslovchi hisob-kitoblar 1 yillik siklda qabul qilingan, kuniga o'rtacha 2 500 000 so'mlik daromad deb qabul qilsak.

5-jadval

IoT texnologiyasi joriy etilishi iqtisodiy samara

T/R	Ko'rsatkichlar	IoT yo'q	IoT mavjud
1	Nosoz avtobuslar soni(gaz taminot tizimida doimiy nosozliklar bo'lgab avtobuslar soni)	3	1
2	Har biri ishlamay qolgan kunlar soni(ekspriment o'tkazilgan davr moboynida ishga chiqmagan o'rtacha kunlar soni,	30	10
3	Bir avtobusning kunlik o'rtacha daromadi (million so'm)	2, 5	2,5
4	Umumiy yo'qotish (IoT yo'q)(million so'm)	225	
5	Umumiy yo'qotish (IoT bor) (million so'm)		25
6	IoT tizimi joriy etilgach iqtisodiy samara (million so'm)		200

Ko'rinib turibdiki, IoT tizimi joriy etilgach, avtobuslarning ekspluatatsion nosozliklariga javoban kamroq ishga chiqmaslik holatlari kuzatilgan. Bu esa saroy byudjetida taqriban 200 million so'mgacha iqtisod qilishga olib kelgan.

Yuqoridagilardan kelib chiqqan holda STG ballonli avtobuslarda IoT texnologiyasini qo'llanganda quyidagi tavsiyalar berish mumkin:

- Har 60 000 kmda chuqur texnik diagnostika
- IoT tizimlarini barcha STG avtobuslarda joriy etish
- Servis zaxiralarini statistik tahlilga asoslab rejalashtirish
- Diagnostika malakasini oshirish uchun treninglar tashkil etish.

Foydalangan adabiyotlar / References

[1] Al-Fuqaha, A., Guizani, M., Mohammadi, M., Aledhari, M., & Ayyash, M. (2015). Internet of Things: A survey on enabling technologies, protocols, and applications. IEEE Communications Surveys & Tutorials, 17(4), 2347–2376.

[2] Wang, K., Hu, K., & Zhang, Y. (2021). Fault detection and diagnosis in STG fuel supply systems using intelligent IoT monitoring. Journal of Intelligent Transportation Systems, 25(2), 182–195.

[3] A.A. Tojiboyev, Q.M. Sidiqnasarov, K.I. Ibrohimov, N.V. Kusnetsov. Ishonchlilik nazariyasi va diagnostika asoslari: Oliy o'quv yurtlari bakalavrlari uchun darslik. T.: "Extremum-Press" 2015. 296 b.

[4] Cairo Air Improvement Project Compressed Natural Gas Component Operations and Maintenance Manual for CTA and GCBC CNG Garages. Chemonics International, Inc. USAID/Egypt, Office of Environment. Cummins Westport, Inc. Engine Overview: March 2015

[5] Abdinabi Abdirakhmonovich Tadjibayev, Vasik Ulashevich Jovliyev, and. Mirjahan Istam ugli Ergashev. Advantages and disadvantages of operating gas cylinder vehicles // Central Asian Journal of Mathematical Theory and Computer Sciences 02.02 (2023): 102-107.

[6] Tadjibayev Abdinabi Abdiraxmonovich, Jovliyev Vasik Ulashevich "Gaz ballonli avtomobillarni ekspluatatsiyasi afzalliklari va kamchiliklari" // Образование наука и инновационные идеи в мире №16, 03.2023

[7] Tadjibaev A.A. Determination of the coefficient of technical readiness of trucking companies depending on the availability of spare parts. TARCI, Bulletin 2/2017. Pages 98-103

[8] Tadjibaev A.A. Influence of the resources of replacement parts on the reliability of vehicles during operation. TARCI, Bulletin 1/2020. P. 3-9

[9] Tadjibaev A.A. “Determination of the required quantity of spare parts for the car park” 187-194 pp. Ministry of Transport of the Republic of Uzbekistan. Ministry ofInnovative Development of the Republic of Uzbekistan. International scientific-practical seminar "Innovations in avtomobile transport: the main direction between science and business" 18-19 September 2019 y Tashkent.

[10] Tadjibaev A.A. Research on the reliability and risk of road transport enterprises. Collected materials the international scientific-technical conference "Prospects of road transport and engineering communication infrastructure" 24-25 November 2017 y. Tashkent.

[11] Tadjibayev A.A. Avtomobillarning ishonchliligini ekspluatatsiya jarayonida tadqiq etish. /monografiya/; - Toshkent: “Innovatsiya-Ziyo”, 2022. 150 b.

[12] Kadirshaev T., Tadjibaev A., Ibrahimov K. Improving the Technological Accounting of Maintenance Stations Located in Cities, AIP Conference Proceedings 2789,040091(2023) research article June 23 2023 https://doi.org/10.1063/5.0145667

[13] Tadjibayev A.A., Jovliyev V.U., and Ergashev M.I. "Advantages and disadvantages of operating gas cylinder vehicles" Central Asian Journal of Mathematical theory and Computer Sciences 02.02 (2023): 102-107.Лившиц Б.С., Пшеничников А.П., Харкевич А.Д. Теория телетрафика. М.: Связь, 1979.

[14] A.A. Tadjibaev, V.U. Jovliev, S.O. Narziev, I.T. Karimov. Determination of the gas reducer resource of gas cylinder buses. Fifteen International Conference on Thermal Engineering: Theory and Applications May 28-June 1, 2024 Tashkent, Uzbekistan

[15] Abdinabi A. Tadjibayev, Vasik U. Jovliyev. Evaluation of operational reliability indicators. E3S Web of Conferences 587, 03014 (2024) GreenEnergy 2024 https://doi.org/10.1051/e3sconf/202458703014.

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