

Automated Storage & Retrieval System Market – Global Industry Size, Share, Trends, Opportunity, and Forecast, 2018-2028 Segmented By Type (Autostore, Carousel, Mid Load, Mini Load, Unit Load, and Vertical Lift Module), By Function (Assembly, Distribution, Kitting, Order Picking, Storage, Others), By Industry Vertical (Aviation, Automotive, Chemicals, Retail & E-Commerce, Food & Beverages, Healthcare & Pharmaceuticals, Metals & Heavy Machinery, Semiconductors & Electronics, Others), By Region, and By Competition

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## **Abstracts**

The Global Automated Storage and Retrieval System (AS/RS) market has undergone a remarkable evolution, marked by substantial growth and transformative changes. This progression has been propelled by a convergence of factors that are reshaping strategies in supply chain management, warehousing practices, and industrial automation. The rising demand for enhanced efficiency, precision, and cost-effectiveness in logistics and warehousing operations has positioned AS/RS technology as a pivotal solution, offering a myriad of advantages across various industries.

A fundamental impetus driving the AS/RS market is the global pivot toward automation, spanning diverse sectors. Enterprises have come to recognize the advantages of automating repetitive and routine tasks to minimize errors, curtail labor expenses, and elevate overall operational efficiency. AS/RS systems stand at the forefront of this automation wave, empowering businesses to automate the storage and retrieval of



goods in warehouses and distribution centers. This trend is particularly pronounced in industries such as e-commerce, manufacturing, pharmaceuticals, and logistics, where precision and speed are paramount considerations.

The surge in e-commerce and the escalating demand for seamless omnichannel retail experiences serve as catalysts for the expansion of the AS/RS market. The landscape of consumer behavior has been fundamentally reshaped by online shopping, fueling expectations for swift order fulfillment, diverse product offerings, and flexible delivery options. AS/RS systems have emerged as indispensable solutions to address these challenges. They automate pivotal processes like order picking, packing, and shipping, effectively reducing order processing times and minimizing errors. Additionally, microfulfillment centers (MFCs) equipped with AS/RS technology are cropping up in urban areas to cater to consumers' desires for same-day or even one-hour deliveries. The AS/RS market plays a pivotal role in facilitating the optimization of supply chain and logistics networks in response to the e-commerce boom.

Escalating labor costs and workforce-related challenges are substantial driving forces for AS/RS adoption. Labor expenditures constitute a significant portion of operational costs in warehousing and distribution. To mitigate these costs and address labor shortages, companies are turning to automation. AS/RS systems excel in tasks such as order picking, material transport, and inventory management, offering precision and efficiency while diminishing reliance on labor. Furthermore, the imperative for swifter order fulfillment and heightened operational efficiency has led to an intensified focus on automating warehousing processes. AS/RS solutions play a pivotal role in optimizing workforce allocation, empowering enterprises to allocate human resources for more strategic roles within the supply chain.

The imperative to optimize storage space and reduce real estate costs is propelling the adoption of AS/RS systems, particularly in densely populated urban areas. Maximizing the utilization of available space is a critical concern for businesses operating in regions where real estate is both expensive and scarce. AS/RS technology is adept at addressing this challenge, efficiently harnessing vertical storage space in warehouses and distribution centers through the stacking of items vertically and the use of compact storage grids. This space optimization not only results in substantial savings in real estate costs but also allows companies to operate in more compact, cost-effective facilities. The capability to maximize storage space while minimizing the physical footprint holds particular value in industries such as manufacturing and logistics, where the management of large inventories is imperative.



Efficient and precise inventory management stands as a significant driving force behind AS/RS adoption. Maintaining meticulous control over inventory has become a top priority for companies seeking to meet customer demands, minimize holding costs, and mitigate the risks of stockouts or overstock scenarios. AS/RS systems provide the capacity for real-time visibility and control over inventory. These solutions, equipped with advanced tracking and software systems, possess the ability to accurately monitor product movement, track shelf life, and facilitate just-in-time inventory replenishment. This level of precision elevates customer satisfaction by ensuring product availability while curbing waste and excess inventory, translating into substantial cost savings. Furthermore, in industries where strict regulatory compliance is paramount, such as pharmaceuticals and food storage, AS/RS systems endowed with automated tracking and reporting capabilities help maintain traceability and adherence to industry standards.

The rapid pace of technological advancements and the integration of Industry 4.0 principles are propelling the evolution of AS/RS systems. Industry 4.0, characterized by the fusion of digital technologies with physical systems, is ushering in a new era of intelligent, interconnected automation. AS/RS systems are undergoing enhancements that encompass features such as artificial intelligence (AI), machine learning, data analytics, and the Internet of Things (IoT). These technologies enable predictive maintenance, real-time data analysis, and proactive system optimization. AS/RS systems are becoming more adaptive and responsive to shifting demand patterns, enabling businesses to operate with heightened agility. Additionally, the integration of AS/RS systems into broader enterprise systems, such as warehouse management systems (WMS) and enterprise resource planning (ERP) software, is enabling end-to-end visibility and control over supply chain operations. This connectivity is driving efficiency, curtailing lead times, and enhancing decision-making processes.

**Key Market Drivers** 

Rising E-commerce and Omnichannel Retail Trends

The continued growth of e-commerce and the evolution of omnichannel retail experiences are significant drivers of the global AS/RS market. As consumers increasingly turn to online shopping, businesses are grappling with the need for rapid order fulfillment, accurate inventory management, and efficient supply chain operations. AS/RS systems play a pivotal role in addressing these challenges.

In e-commerce, AS/RS technology enables the automation of order picking, packing,



and shipping processes, significantly reducing order processing times and minimizing errors. Micro-fulfillment centers (MFCs) equipped with AS/RS systems are being strategically positioned in urban areas to meet consumers' demands for same-day or even one-hour deliveries. Additionally, AS/RS solutions are integral to facilitating click-and-collect options, enhancing the omnichannel shopping experience.

This driver is fueled by consumers' expectations for quick, error-free deliveries and their desire for seamless online and offline shopping experiences. As e-commerce and omnichannel retail continue to flourish, the AS/RS market is poised for sustained growth, as businesses increasingly rely on automation to meet evolving consumer demands.

Increasing Labor Costs and Workforce Challenges

Rising labor costs and ongoing workforce challenges are driving the adoption of AS/RS systems across industries. Labor costs constitute a significant portion of operational expenses in warehousing and distribution. With the increasing demand for faster order fulfillment and greater efficiency, businesses are turning to automation as a solution to reduce their reliance on manual labor and mitigate the impact of labor shortages.

AS/RS systems are designed to handle tasks such as order picking, material transport, and inventory management with precision and speed. By automating these processes, companies can not only reduce labor costs but also optimize their workforce by reallocating human resources to more strategic roles within the supply chain.

Furthermore, the ongoing challenges in finding and retaining skilled labor, especially in the field of logistics and material handling, are pushing companies to invest in AS/RS technology. Automation helps mitigate the risks associated with workforce turnover and ensures consistent and efficient warehouse operations.

Need for Space Optimization and Real Estate Savings

The pressure to optimize storage space and reduce real estate costs is a compelling driver for the adoption of AS/RS systems. In densely populated urban areas, where real estate comes at a premium, maximizing the use of available space is crucial for businesses. AS/RS technology is designed to do just that.

AS/RS systems are renowned for their ability to efficiently utilize vertical space in warehouses and distribution centers. By stacking items vertically and employing



compact storage grids, these systems can significantly increase storage capacity within the same physical footprint. This space optimization not only reduces real estate expenses but also allows businesses to operate in smaller, more cost-effective facilities.

The need for space optimization extends beyond urban settings. In industries such as manufacturing and logistics, where large inventories must be managed, AS/RS solutions enable efficient storage and retrieval, making the most of available space and reducing the need for costly expansions.

Enhanced Inventory Management and Accuracy

Accurate and efficient inventory management is a critical driver for AS/RS adoption. Businesses across industries are recognizing the importance of maintaining precise control over their inventory to meet customer demands, minimize carrying costs, and reduce the risk of stockouts or overstock situations.

AS/RS systems offer the capability to maintain real-time inventory visibility and control. With advanced tracking and software systems, these solutions can accurately track product movement, monitor shelf life, and facilitate just-in-time inventory replenishment. This level of accuracy not only enhances customer satisfaction by ensuring product availability but also minimizes waste and excess inventory, resulting in cost savings.

Additionally, in industries where strict regulatory compliance is essential, such as pharmaceuticals and food storage, AS/RS systems with automated tracking and reporting capabilities help maintain traceability and adherence to industry standards.

Technological Advancements and Industry 4.0 Integration

The rapid pace of technological advancements and the integration of Industry 4.0 concepts are driving the evolution of AS/RS systems. Industry 4.0, characterized by the fusion of digital technologies with physical systems, is ushering in a new era of smart, connected automation.

AS/RS systems are being enhanced with features such as artificial intelligence (AI), machine learning, data analytics, and the Internet of Things (IoT). These technologies enable predictive maintenance, real-time data analysis, and proactive system optimization. AS/RS systems are becoming more adaptive and responsive to changing demand patterns, allowing businesses to operate with greater agility.



Moreover, the integration of AS/RS systems into broader enterprise systems, such as warehouse management systems (WMS) and enterprise resource planning (ERP) software, is enabling end-to-end visibility and control over supply chain operations. This connectivity is driving efficiency, reducing lead times, and enhancing decision-making processes.

Key Market Challenges

Initial Implementation Costs and ROI Concerns

One of the primary challenges in the AS/RS market is the significant upfront costs associated with the installation and implementation of these systems. AS/RS solutions are considered capital-intensive investments, encompassing expenses related to system design, equipment procurement, installation, and integration with existing warehouse management systems (WMS) and enterprise resource planning (ERP) systems. For many businesses, especially smaller enterprises, these initial expenditures can be a barrier to entry.

Moreover, concerns regarding the return on investment (ROI) can deter potential buyers. Calculating the ROI of an AS/RS system can be complex, as it involves considering factors such as labor savings, improved inventory management, and increased throughput. Navigating this challenge requires thorough cost-benefit analysis and a clear understanding of how long it will take for the AS/RS system to generate cost savings and operational efficiencies that justify the initial investment.

Scalability and Flexibility Limitations

While AS/RS systems offer impressive automation and optimization capabilities, they can sometimes be inflexible when it comes to scaling up or adapting to changing operational needs. Expanding the capacity of an existing AS/RS system or reconfiguring it to accommodate new products or processes can be costly and complex. This lack of scalability and adaptability can pose challenges for businesses in industries with rapidly evolving product lines or seasonal demand fluctuations.

Additionally, the customization required to integrate AS/RS solutions into unique operational environments can be time-consuming and costly. Achieving the right balance between automation and flexibility is a continual challenge in the AS/RS market.



### Maintenance and Downtime Risks

AS/RS systems are complex and require regular maintenance to ensure optimal performance. Maintaining the mechanical components, software systems, and robotics can be resource-intensive. Unexpected breakdowns or system malfunctions can lead to costly downtime, disrupting operations and potentially impacting customer service.

Managing maintenance schedules, training staff to address common issues, and having spare parts readily available are crucial aspects of mitigating these risks. Companies also need to develop robust contingency plans to minimize the impact of unexpected downtimes, as any interruption in the supply chain can have cascading effects.

## Integration with Existing Infrastructure

Integrating AS/RS systems with existing warehouse infrastructure, including conveyors, shelving, and material handling equipment, can be a complex undertaking. Legacy systems and outdated software can pose compatibility challenges when attempting to implement AS/RS technology seamlessly. This integration challenge can result in project delays, increased implementation costs, and potential disruptions to ongoing operations.

Furthermore, ensuring that AS/RS systems communicate effectively with broader enterprise systems, such as ERPs and WMS, is critical for achieving end-to-end visibility and control over the supply chain. Achieving this integration requires meticulous planning, skilled IT personnel, and ongoing support to maintain system compatibility and data flow.

### Skilled Workforce and Training Needs

Another significant challenge facing the AS/RS market is the need for a skilled workforce to operate and maintain these complex systems effectively. AS/RS systems require personnel with specialized knowledge in robotics, automation, software programming, and system troubleshooting. Finding and retaining such talent can be a challenge, as the demand for these skills often outpaces the available workforce.

Additionally, ongoing training and upskilling of existing employees are necessary to ensure that the workforce can adapt to new technologies and evolving system requirements. Investing in workforce development programs and partnerships with educational institutions is essential to address this challenge and ensure the smooth



operation of AS/RS systems.

Key Market Trends

Integration of Advanced Robotics and AI in AS/RS Systems

The AS/RS market is witnessing a transformative shift with the integration of advanced robotics and artificial intelligence (AI). These technologies are redefining AS/RS systems, making them more intelligent, adaptable, and efficient. Robotics, including autonomous mobile robots (AMRs) and robotic arms, are being seamlessly incorporated into AS/RS solutions, enhancing their flexibility and agility. AI and machine learning algorithms are optimizing storage, predicting demand patterns, and boosting overall system performance. This trend responds to the demand for responsive and adaptable supply chain operations, offering real-time data analysis to maximize throughput, reduce labor costs, and improve efficiency.

Expansion of AS/RS Applications in E-commerce and Omnichannel Retail

E-commerce's exponential growth and the rise of omnichannel retail experiences are expanding the scope of AS/RS applications. AS/RS systems are now pivotal for meeting the challenges posed by swift order fulfillment and diverse product offerings in e-commerce. Micro-fulfillment centers (MFCs) equipped with compact AS/RS systems are cropping up in urban areas, enabling same-day and one-hour deliveries to meet heightened customer expectations. Additionally, AS/RS technology facilitates automated click-and-collect solutions, enhancing the omnichannel shopping experience. With e-commerce on the ascent and consumers expecting rapid, error-free deliveries, AS/RS solutions are transforming supply chain strategies and optimizing logistics networks.

Sustainability and Green Warehousing

Sustainability has become a prominent theme in the AS/RS market, with businesses prioritizing eco-friendly practices in their operations. Green warehousing initiatives aim to minimize the environmental footprint of logistics and storage operations, and AS/RS systems play a significant role in this effort. They contribute to sustainability by optimizing energy usage, reducing warehouse footprint, using sustainable materials in construction, and minimizing product waste. This trend resonates with companies' commitment to corporate social responsibility, offering cost savings and operational efficiencies in the long term.



## Expansion of AS/RS in Cold Storage and Pharmaceutical Industries

The cold storage and pharmaceutical sectors are experiencing substantial growth in AS/RS applications. These industries require precise temperature control, stringent inventory management, and fast, accurate order fulfillment, making AS/RS systems a natural fit. In cold storage, AS/RS technology automates the storage and retrieval of perishable goods, preserving their quality. In pharmaceuticals, AS/RS systems ensure the efficient storage and retrieval of drugs and medical supplies while adhering to strict regulations. As these industries grow and demand advanced solutions, the adoption of AS/RS technology is expected to increase, emphasizing compliance, precision, and product integrity.

#### On-Demand and Cloud-Based AS/RS Solutions

The adoption of on-demand and cloud-based AS/RS solutions is revolutionizing automation by offering flexibility and scalability. Traditional AS/RS systems often required substantial upfront investments and lengthy implementations. In contrast, on-demand and cloud-based AS/RS solutions are highly scalable, reducing maintenance overheads with remote monitoring and maintenance capabilities. They also enable rapid deployment and accessibility from anywhere, making real-time warehouse management more convenient. Small and medium-sized enterprises (SMEs) particularly benefit from these flexible solutions, driving their adoption and expanding the AS/RS market.

### Segmental Insights

## **Function Insights**

Order Picking segment dominates in the global automated storage & retrieval system market in 2022. The order picking function within the AS/RS market has emerged as the dominant segment, fueled by the rapid growth of e-commerce, changing consumer expectations, and the need for efficient supply chain management. Here are the key factors contributing to the dominance of order picking focused AS/RS systems. The explosive growth of online shopping has revolutionized the retail landscape. Consumers now expect fast, accurate, and on-time delivery of their orders. AS/RS systems specializing in order picking are instrumental in meeting these demands by automating the retrieval and packaging of products, resulting in swift order fulfillment. Order picking AS/RS systems are designed to minimize errors and optimize the efficiency of the order fulfillment process. These systems use robotic technology and advanced software



algorithms to select and pack items accurately, reducing the risk of mistakes and improving overall operational efficiency. Moreover, the globalization of supply chains and the need for efficient cross-border shipping have made order picking AS/RS systems crucial in international trade. They facilitate the consolidation and accurate preparation of goods for shipment, helping businesses meet international delivery standards.

## Type Insights

Autostore segment dominates in the global automated storage & retrieval system market in 2022. Autostore systems have gained significant prominence and are poised to dominate the global AS/RS market. These systems are characterized by their grid of bins or storage pods, combined with autonomous robotic shuttles that efficiently retrieve items from within the grid. Autostore systems have several key advantages that make them a leading choice in the market such as autostore systems are highly efficient in maximizing storage space. Their compact grid layout and vertical stacking capabilities ensure that warehouses can make the most of their available space, especially in densely populated areas where real estate is at a premium. Moreover, Autostore systems are versatile and adaptable to a wide range of industries. They excel in handling small to medium-sized items, which aligns perfectly with the needs of industries such as e-commerce, automotive, electronics, and pharmaceuticals.

Additionally, autostore robots are designed for high-speed and precision. They can retrieve items quickly and with minimal errors, making them ideal for businesses with fast order fulfillment requirements, a critical factor in the competitive e-commerce landscape.

### Regional Insights

Asia-Pacific dominates in the global Automated Storage & Retrieval System market in 2022. This dominance can be attributed to a combination of economic, technological, and demographic factors that have converged to create a thriving environment for AS/RS adoption and growth in the region. Asia-Pacific has experienced robust economic growth over the past few decades, leading to an expansion of various industries, including manufacturing, e-commerce, and logistics. As businesses seek to optimize their operations and increase efficiency, AS/RS systems have become a key solution to manage and streamline their supply chain and storage needs.

Moreover, the rise of e-commerce giants like Alibaba (China), Amazon (throughout Asia-



Pacific), and Flipkart (India) has driven the demand for efficient warehousing and order fulfillment systems. AS/RS technology plays a critical role in ensuring timely and accurate order processing, which is essential in the highly competitive e-commerce landscape.

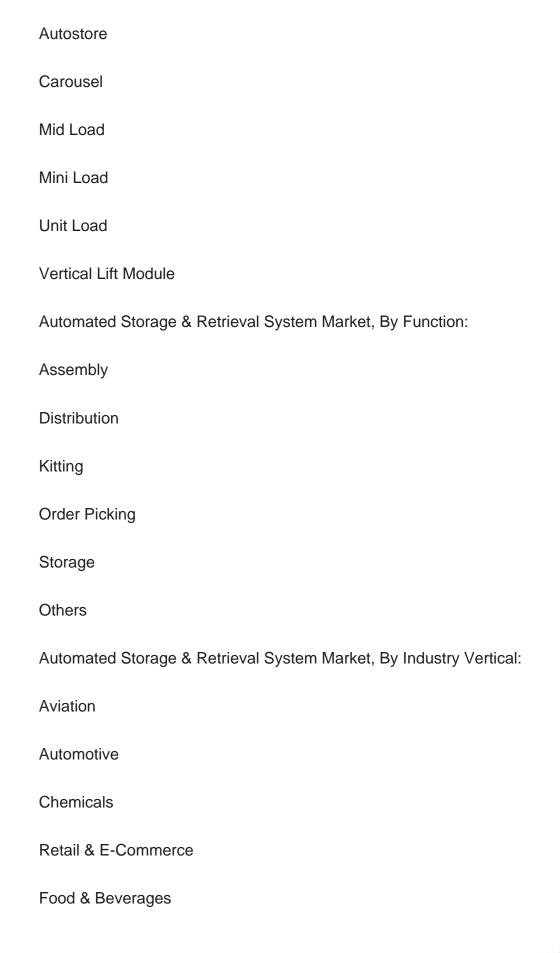
Furthermore, many countries in Asia-Pacific are densely populated, leading to limited available space for warehousing and storage. AS/RS systems, with their ability to maximize vertical storage space, have become a necessity in urban areas where land costs are high and space is at a premium.



In this report, the Global Automated Storage & Retrieval System Market has been segmented into the following categories, in addition to the industry trends which have also been detailed below:

Automated Storage & Retrieval System Market, By Type:







Healthcare & Pharmaceuticals
Metals & Heavy Machinery
Semiconductors & Electronics
Others
Automated Storage & Retrieval System Market, By Region:
North America
United States
Canada
Mexico
Europe
Germany
France
United Kingdom
Italy
Spain
South America
Brazil
Argentina
Colombia
Asia Pacific

Asia-Pacific



China
India
Japan
South Korea
Australia
Middle East & Africa
Saudi Arabia
UAE
South Africa
Competitive Landscape
Company Profiles: Detailed analysis of the major companies present in the Global Automated Storage & Retrieval System Market.
Available Customizations:
Global Automated Storage & Retrieval System Market report with the given market data, Tech Sci Research offers customizations according to a company's specific needs. The following customization options are available for the report:
Company Information
Detailed analysis and profiling of additional market players (up to five).



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12.2.4.4.2.3. By Industry Vertical

12.2.4.5. Australia Automated Storage & Retrieval System Market Outlook

12.2.4.5.1. Market Size & Forecast

12.2.4.5.1.1. By Value

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12.2.4.5.2.1. By Type

12.2.4.5.2.2. By Function

12.2.4.5.2.3. By Industry Vertical

### 13. MARKET DYNAMICS

## 13.1. Drivers



## 13.2. Challenges

### 14. MARKET TRENDS AND DEVELOPMENTS

### 15. COMPANY PROFILES

<ol><li>15.1. Daifuku Co., Ltd</li></ol>	) Lt	ı Co	fuku	aif	. D	.1.	5	1
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- 15.1.1. Business Overview
- 15.1.2. Key Revenue and Financials
- 15.1.3. Recent Developments
- 15.1.4. Key Personnel
- 15.1.5. Key Product/Services Offered
- 15.2. Murata Machinery, Ltd.
  - 15.2.1. Business Overview
  - 15.2.2. Key Revenue and Financials
  - 15.2.3. Recent Developments
  - 15.2.4. Key Personnel
  - 15.2.5. Key Product/Services Offered

### 15.3. SSI Schaefer AG

- 15.3.1. Business Overview
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- 15.3.3. Recent Developments
- 15.3.4. Key Personnel
- 15.3.5. Key Product/Services Offered

### 15.4. TGW Logistics Group GmbH

- 15.4.1. Business Overview
- 15.4.2. Key Revenue and Financials
- 15.4.3. Recent Developments
- 15.4.4. Key Personnel
- 15.4.5. Key Product/Services Offered

### 15.5. Kardex Group

- 15.5.1. Business Overview
- 15.5.2. Key Revenue and Financials
- 15.5.3. Recent Developments
- 15.5.4. Key Personnel
- 15.5.5. Key Product/Services Offered

### 15.6. Knapp AG

- 15.6.1. Business Overview
- 15.6.2. Key Revenue and Financials



- 15.6.3. Recent Developments
- 15.6.4. Key Personnel
- 15.6.5. Key Product/Services Offered
- 15.7. Mecalux S.A.
  - 15.7.1. Business Overview
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  - 15.7.3. Recent Developments
  - 15.7.4. Key Personnel
  - 15.7.5. Key Product/Services Offered
- 15.8. Dematic (Kion Group AG)
  - 15.8.1. Business Overview
  - 15.8.2. Key Revenue and Financials
  - 15.8.3. Recent Developments
  - 15.8.4. Key Personnel
- 15.8.5. Key Product/Services Offered
- 15.9. Swisslog Holding AG
  - 15.9.1. Business Overview
  - 15.9.2. Key Revenue and Financials
  - 15.9.3. Recent Developments
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- 15.9.5. Key Product/Services Offered
- 15.10. System Logistics S.p.A.
  - 15.10.1. Business Overview
  - 15.10.2. Key Revenue and Financials
  - 15.10.3. Recent Developments
  - 15.10.4. Key Personnel
  - 15.10.5. Key Product/Services Offered

### 16. STRATEGIC RECOMMENDATIONS

## 17. ABOUT US & DISCLAIMER



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