

# Article

## Different Approaches to Enterprise Architecture

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### Abstract

*Enterprise Architecture (EA) is a description of an enterprise from an integrated business and IT perspective intended to bridge the communication gap between business and IT stakeholders and, thereby, improve business and IT alignment. Unfortunately, many companies are dissatisfied with popular heavyweight approaches to EA due to their excessive clumsiness and rigidity. At the same time, alternative lightweight and flexible approaches to EA have also been proposed; however, their existence is not widely acknowledged. In this article I briefly describe these alternative approaches to EA, compare them with the widely-known heavyweight approach, and illustrate their applications in real companies.*

### Keywords

Enterprise Architecture (EA), problems, approaches, traditional, MIT, DYA

### INTRODUCTION

Presently, Information Technology (IT) plays a significant role in improving the competitive positions of many companies. However, many companies investing substantial funds in IT systems do not get the expected returns. Often the effectiveness of IT investments is undermined due to misalignment of business and IT plans. In other words, IT departments often implement information systems that do not address the real strategic needs of their companies.

In order to address the potential misalignment between business and IT strategies the concepts of information systems architecture and then Enterprise Architecture (EA) were introduced (Kotusev 2016). EA is an overarching plan describing organizations from the integrated business and IT viewpoints. EA takes a holistic perspective and shows the relationship between business goals, strategies and processes, and IT capabilities, systems, and technologies. Typically, EA describes business, data, applications, and technology domains and their relationship (TOGAF® 2011). Using EA helps bridge the communication gap between business and IT stakeholders, improve the alignment between business and IT plans, and, thereby, increase the returns on IT investments. Presently, the potential of EA as a powerful organizational instrument is widely recognized and the majority of large companies have started EA programs (van der Raadt et al. 2007).

The classical approach to EA was inspired by conventional engineering and architecture methods (Spewak and Hill 1992). Unsurprisingly, it is largely mechanistic, relies on extensive formal documentation, and advocates following strict sequences of steps to

develop and use EA. This traditional heavyweight step-wise approach to EA was highly influential and essentially shaped the modern understanding of EA theory and practice (Spewak & Tiemann 2006). In fact, most modern EA methodologies are derived from this traditional approach. Unsurprisingly, they also recommend developing a considerable volume of EA documentation and suggest approximately the same sequence of steps to practice EA (Bernard 2012; FEAF 1999; TOGAF 2011).

Many companies willing to improve their business and IT alignment embark on EA journeys following popular formal and heavyweight approaches to EA such as the TOGAF Architecture Development Method (ADM) (TOGAF 2011). Unfortunately, many of these companies fail to succeed with EA because of the excessive rigidity and clumsiness of selected approaches (Holst & Steensen 2011; Lohe & Legner 2014). At the same time, alternative, more lightweight and flexible approaches to EA had also been proposed (Ross et al. 2006; Wagter et al. 2005). These alternative approaches can help EA practitioners struggling with the popular heavyweight documentation-oriented approaches to master EA and achieve better alignment. However, the alternative approaches were undeservedly left unnoticed by EA practitioners and academics and even the very existence of different approaches to EA is still not widely recognized (Kotusev et al. 2015). In this article I will discuss the alternative lightweight approaches to EA, compare them with the traditional heavyweight approach, and illustrate these approaches at work in real companies practicing EA.

## TRADITIONAL APPROACH TO EA

The traditional approach to EA, as a revamped version of the earlier IBM's Business Systems Planning (BSP) approach (Kotusev 2016), was initially presented by Spewak and Hill (1992) and subsequently inspired most modern EA methodologies (Armour et al. 1999; Bernard 2012; FEAF 1999; TOGAF 2011). These methodologies suggest that EA is developed step-by-step by enterprise architects who are competent in both business and IT, and possess good communication and systems thinking skills. First, enterprise architects study the current business processes and IT landscape and then document them in detail with a large number of models, diagrams, or blueprints. Second, enterprise architects develop the desired long-term future state according to the strategic plans and objectives of the organization's executives. Typically, the future state development starts from the business architecture as the main driver of EA efforts and then proceeds to the data, applications, and technology architectures. Third, enterprise architects analyze the gaps between the current and future states and develop the transition plan describing the information systems that should be implemented to transform the organization into the envisioned target state from the current position. After being developed, this transition plan is used by the project teams implementing the necessary IT systems under the supervision of enterprise architects. When the plan is implemented, a new EA project or iteration is initiated to carry out the same sequence of steps all over again. In the course of this process, business stakeholders are also expected to use EA documentation for analysis and decision-making.

The traditional approach to EA is shown schematically in Figure 1.

The advantage of the traditional approach is its conceptual simplicity and intuitive appeal. EA planning for the whole organization is carried out in a centralized manner by a small dedicated team and does not require significant involvement of other stakeholders. Since most EA activities are accomplished by a group of expert enterprise architects, it is not necessary for an organization to be particularly IT-savvy to use this approach. Therefore, the traditional approach to EA is best applied at small, centralized, and stable organizations, especially if their competitive advantages are not very dependent on IT.

A successful case of the traditional approach to EA is illustrated in Vignette 1 (overleaf).

## PROBLEMS OF THE TRADITIONAL APPROACH

The traditional approach to EA is, undoubtedly, the most discussed and widely known approach to EA. Essentially, it defines the present understanding of EA

practice as well as the understanding of the very notion of EA. Unsurprisingly, the concept of EA and traditional approach to EA are synonymous for many practitioners.

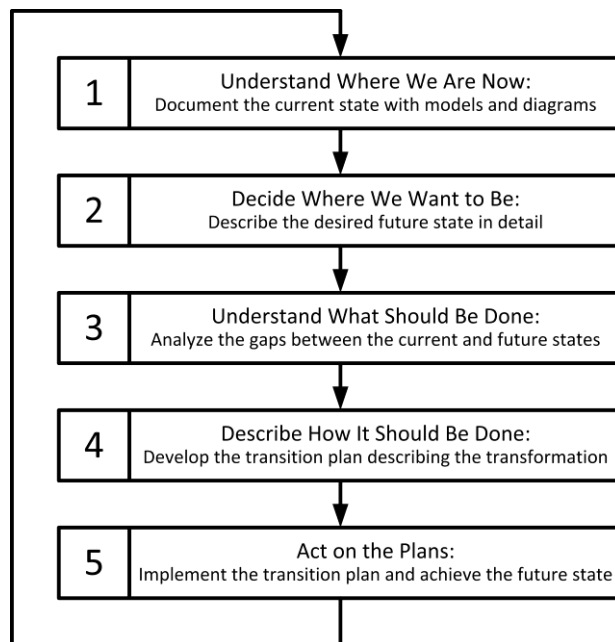


Figure 1: The Traditional Approach to EA

However, despite its popularity in EA literature, the traditional approach to EA is heavily criticized. EA practitioners disparage the traditional approach for its excessive clumsiness because it prescribes following overly complicated processes and creating an unreasonable number of descriptive models (Lagerstrom et al. 2011). EA efforts often fail and many companies become disillusioned with EA altogether because of the overly mechanistic focus of the traditional EA methodologies (Holst & Steensen 2011).

*"The problem here is that the enterprise isn't an ordinary system like a machine or a building, and can't be architected or engineered as such." (Bloomberg 2014, p.1).*

Lohe and Legner (2014) identify three typical problems with the traditional approach to EA and all of them result from its mechanistic, documentation-oriented, heavyweight, and clumsy nature:

1. Unreasonable efforts needed to create and maintain the necessary EA documentation due to high organizational complexity, large scope, and dynamic environment
2. Low utilization of EA documentation due to its poor quality, obsolescence, wrong level of detail, and mismatch with the real information needs of its stakeholders
3. Poor integration of EA practice into the organization due to its isolated step-wise lifecycle

These problems make the traditional approach unsuitable for large, dynamic, and decentralized organizations working in volatile environments and requiring significant involvement of various stakeholders in decision-making processes.

An unsuccessful case of the traditional approach to EA is illustrated in Vignette 2.

**Successful traditional approach to EA at Australian Bureau of Statistics (Gregor et al. 2007; Lynch 2006)**

Australian Bureau of Statistics (ABS) is one of the most admired statistical agencies in the world. It is a relatively small and stable government organization operating since 1905. Currently ABS employs more than 3,000 people and provides a high-quality statistics in two major areas: economic and population.

The EA program at ABS was initiated in 1999 when the ABS executive formed a small and multi-disciplinary architecture team of four people responsible for EA development. The architecture team works according to the home-grown EA method based on the traditional EA methodologies and frameworks. Therefore, the ABS approach to EA includes documenting the current state, developing the target state, analyzing the gaps, and then identifying the necessary IT investments to close these gaps.

The architecture team completed the first version of the necessary EA documentation in September 2001 and then updated it to version 2.0 in March 2003. Subsequently, EA documentation is reviewed and updated on a periodical basis every 6-12 months by the technical leadership team headed by the CIO. EA documentation describes ABS at three abstraction levels: business, logical, and physical. After being developed or updated, EA documentation is communicated to all ABS employees with a number of A3 size posters demonstrating the main architectural diagrams. The ABS EA Director argues that EA is “a corporate artifact to be ‘taken away and used’ by all staff at ABS”. Thereby, EA guides the activities of multiple business and IT stakeholders at ABS.

Using EA helps ABS to achieve a high degree of alignment between business objectives and organizational information systems. Unsurprisingly, EA practice at ABS is highly respected by other government organizations. However, most Australian agencies could not replicate the ABS success with EA due to their larger scopes, more dynamic businesses, and decentralized environments.

**Vignette 1: Successful Traditional Approach to EA**

**Unsuccessful traditional approach to EA at the US Federal Government (Gaver 2010)**

In 1996 US Congress had enacted the Clinger-Cohen Act obliging the Federal Government and all its departments to develop consistent architectures in order to improve the usage of information systems in this large and decentralized organization. As a response, in 1999 the Federal CIO Council initiated the Federal Enterprise Architecture (FEA) program and published the corresponding FEA Framework (FEAF). FEAF suggested describing business, data, applications, and technology architectures in a segmented manner and embodied the traditional approach to EA including documenting current and future states, analyzing gaps, developing transition plans, and implementing them.

However, the FEA program has faced numerous challenges since its inception. The huge efforts required to create EA documentation undermined the institutional commitment and lowered the priority of EA-related activities. A lack of common understanding of what should be included in EA and terminological issues in FEAF caused disputes and misunderstanding among various program participants. Manual modeling was a very slow process and EA documents often got outdated before being delivered. Most managers who were expected to work with EA documentation could not understand it, especially if they were unfamiliar with modeling.

Consequently, EA diagrams were unsuitable for analysis and reporting and the data from architecture repositories was almost never used. Producing EA documentation quickly turned into an end in itself. EA-related activities hindered normal IT activities instead of facilitating them. Periodical EA maturity assessments showed that the overall EA maturity of the Federal Government was decreasing rather than increasing over the years.

Therefore, despite the best efforts of the architects involved in the program, FEA produced only minimal value for the money spent and never accomplished its original goals. Taking into account that the total expenditures for the program exceeded a billion dollars and much of it (perhaps even most of it) had been wasted, FEA is arguably the most impressive failure of the traditional approach to EA. “*Look at all the efforts that have been launched under the idea of architecture and all the money that has been spent under the umbrella of architecture that has all resulted in unusable shelfware*”, commented Paul Brubaker, co-author of the Clinger-Cohen Act.

**Vignette 2: Unsuccessful Traditional Approach to EA**

## ALTERNATIVE APPROACHES TO EA

As a reaction to the aforementioned problems of the traditional approach to EA caused by its clumsiness and sluggishness, two alternative, more pragmatic approaches to EA had been proposed by Ross et al. (2006) and Wagter et al. (2005). These approaches are more flexible and can help overcome the typical challenges associated with the heavyweight traditional approach. However, they were undeservedly left unnoticed by EA practitioners and academics (Kotusev et al. 2015).

I will discuss them further under the titles MIT (Ross et al. 2006) (because it was developed at MIT) and DYA (Wagter et al. 2005) (because this title is given by its authors) since they do not have any established titles in EA literature.

### MIT Approach

The MIT approach to EA was derived from research findings at Massachusetts Institute of Technology (MIT) Sloan School of Management by Ross et al. (2006). Ross et al. (2006, p.vii) argue about the historic ineffectiveness of the traditional approaches to EA and criticize them for:

*“... remoteness from the reality of the business and their heavy reliance on mind-numbing detail represented in charts that look more like circuit diagrams than business descriptions and that are useful as little more than doorstops.”*

According to the MIT approach, as a first step of EA program business and IT executives should decide on the organizational operating model, defined as:

*“the necessary level of business process integration and standardization for delivering goods and services to customers”*

Ross et al. (2006) argue that an operating model provides a more clear, actionable, and stable basis for EA development than a business strategy. As a second step, business and IT executives should collaboratively develop the core diagram – a critical EA document describing the main business and IT capabilities, corporate data, principal customers, and key technologies. The core diagram is a one-pager that represents a long-term abstract enterprise-level architectural vision reflecting the integration and standardization requirements of the chosen operating model. Finally, business and IT executives should design and implement the IT engagement model, defined as:

*“the system of governance mechanisms assuring that business and IT projects achieve both local and company-wide objectives”*

The IT engagement model includes three essential elements:

1. Enterprise-level IT governance – top management decision-making framework including the core diagram
2. Project management – disciplined project delivery methodology with necessary checkpoints
3. Linking mechanisms – processes and committees ensuring the connection between enterprise-level decisions and project-level activities

After the IT engagement model is established, EA embodied in the core diagram is continuously translated into concrete project-level decisions through the linking mechanisms involving business and IT managers on different organizational levels. Therefore, in the MIT approach each IT project eventually accomplishes both local and global objectives and gradually moves a company towards the desired long-term architectural vision.

The MIT approach to EA is shown schematically in Figure 2.

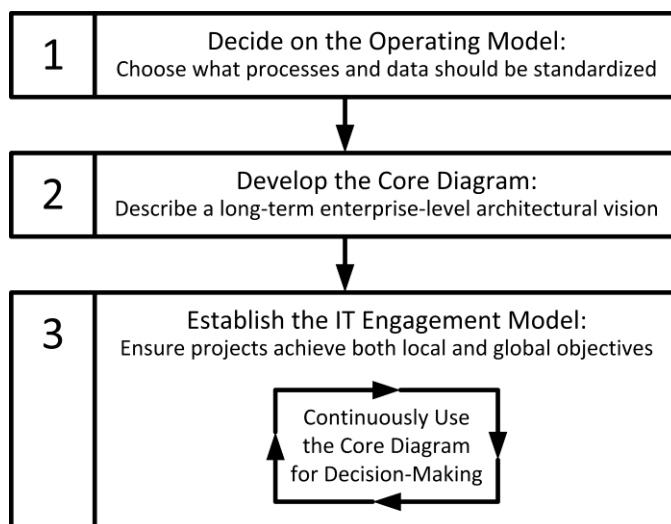


Figure 2: The MIT Approach to EA

The MIT approach to EA facilitates the balance between enterprise-wide and local needs. It provides an organization with a long-term global architectural vision but leaves enough flexibility to react to emerging short-term local requirements. However, the MIT approach requires a very considerable involvement of business stakeholders with an EA program and the establishment of complex architecture governance mechanisms permeating the whole organization. Therefore, the MIT approach is best applied at large and complex organizations with relatively stable business models heavily dependent on IT for achieving competitive advantages in their markets.



A successful case of the MIT approach to EA is illustrated in Vignette 3.

### DYA Approach

The DYA (DYnamic Architecture) approach to EA was developed at Sogeti Nederland in 2001 and presented internationally by Wagter et al. (2005). Wagter et al. (2005) criticize the traditional approach to EA for its impracticality and notice that following the recommended processes and developing the heaps of recommended documentation often result in useless “paper tigers” instead of working architecture.

The DYA approach advocates “just enough, just in time” architecture; no EA is designed until there is a need for it. All EA activities in the DYA approach are carried out by architectural services and always triggered by concrete business initiatives emerging in the process of the strategic dialogue when business and IT managers collaboratively decide on which objectives to pursue. After business and IT leaders have determined the potential business initiatives to be implemented, they are elaborated into concrete business cases and project proposals and the role of architectural services in this process is to provide necessary principles and models to facilitate decision-making, impact analysis, and financial analysis. Then, architectural services prepare a project-start architecture describing the scope, design choices, standards and guidelines for the new IT project in order to ensure that this project seamlessly fits into the existing IT landscape and larger picture. Development teams typically use provided project-start architectures in their projects (development with architecture). However, sometimes projects are implemented without project-start architectures (development without architecture) if there are justifiable reasons for it; for instance, acute time pressure, legacy systems involved, or necessary resources unavailable.

The DYA approach to EA is shown schematically in Figure 3.

The advantage of the DYA approach is its totally pragmatic “just enough, just in time” attitude towards EA. It provides the right stakeholders with the right EA documentation at the right time for the right purpose. The DYA approach focuses only on concrete business initiatives instead of abstract intangible visions emphasizing utilitarianism, agility, and flexibility. Naturally, the DYA approach does not imply any long-term strategic planning beyond individual business initiatives potentially undermining the general strategic effectiveness. Therefore, the DYA approach is best applied at organizations operating in very vibrant, dynamic, and unpredictable environments and markets.

A successful case of the DYA approach to EA is illustrated in Vignette 4.

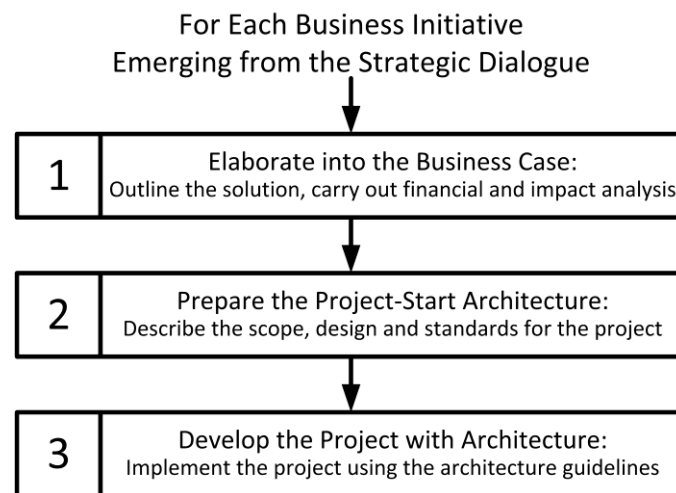


Figure 3: The DYA Approach to EA

### COMPARISON OF THE THREE APPROACHES TO EA

Each of the three approaches discussed employs EA to facilitate business and IT alignment. However, each of them employs it in a different manner, follows different logic, and even the very nature of EA is different in each of them (Kotusev et al. 2015). Unsurprisingly, each approach has its own advantages, disadvantages, and situations when it is best applied.

Comparison of the three approaches to EA is summarized in Table 1.

### CONCLUSION

EA is an important organizational instrument employed by many large companies to improve the quality of their IT landscapes and align them with the business goals and strategies. Traditionally, EA is associated with a large number of models and complicated processes. However, heavyweight and documentation-oriented EA methodologies often fail due to their excess rigidity. On the other hand, alternative, more flexible and lightweight EA methodologies have also been proposed but their existence is, arguably, not recognized by the majority of EA practitioners and academics. In this article I presented a broad overview of existing EA methodologies, briefly described them, illustrated their work on real-world examples of EA practice, and compared them with each other. Since this article provides only a brief review of EA methodologies and covers only a tip of the EA iceberg, I encourage the readers to study the different approaches to EA in detail using their definitive publications (Ross et al. 2006; TOGAF 2011; Wagter et al. 2005).

**Successful MIT approach to EA at Delta Air Lines (Ross et al. 2006; Weill & Ross 2004)**

Delta Air Lines, established in 1929, is one of the world’s largest airlines. Currently Delta employs more than 77,000 people and serves an extensive US and international network including more than 300 destinations on six continents.

The EA program at Delta started in 1997 when its newly appointed CEO found that organizational information systems were developed independently by different functional units and isolated from each other. EA activities followed the MIT approach and were driven by Delta’s CIO who assembled a team of senior executives to define the role of IT in the company. The executive team decided on four standard enterprise-wide processes supported by IT (customer experience, operational pipeline, business reflexes, and employee relationship management) and nine global databases critical to their execution. After that, IT leaders chose the appropriate IT infrastructure to support these processes and data and the resulting high-level architectural vision was fixated in Delta’s core diagram. Totally, it took about 60 iterations before all the members of the executive team agreed on the core diagram. This core diagram was subsequently used by Delta’s governance bodies for decision-making to allocate IT investments and prioritize projects. Combining the simultaneous investments in applications and underlying infrastructure helped balance short-term and long-term needs and eventually build a solid platform for implementing new business initiatives in a timely manner.

In a few years after the commencement of EA program, Delta had significantly improved its financial results and moved from last to first on main industry indicators; for instance, on-time departures, customer satisfaction, and lost baggage.

**Vignette 3: Successful MIT Approach to EA**

**Successful DYA approach to EA at BNM Banking Group**

BNM Banking Group (fictional name due to anonymity requirements) is a large international financial institution with multi-billion dollar revenues. BNM employs more than 26,000 people and is among the top 100 largest banks in the world. It operates in a very dynamic market in the Asia-Pacific (APAC) region and provides a full spectrum of financial services to individual and institutional customers.

BNM started a full-scale EA program in 2004 with the help of consultants and then fine-tuned the EA methodology according to its specific needs and environment. The EA function at BNM works in the logic of the DYA approach and produces three main deliverables: blueprints, Solution Architecture Documents (SADs), and High-Level Designs (HLDs). Blueprints are abstract deliverables intended for executive-level stakeholders (board of directors, executive committee, strategy team, etc.). SADs and HLDs are more concrete and technical deliverables intended for lower-level stakeholders (business and IT operations, project managers, project teams, etc.). At first, senior business and IT executives try to define potential initiatives to be implemented in line with the general strategic direction of the bank. Then, the EA function develops a blueprint for each initiative providing the initial assessment of its value, cost, solution, impact, and risks to facilitate informed decision-making. After the initiative has been approved by all top-level stakeholders, the EA function develops SADs outlining its conceptual implementation and then HLDs describing its detailed technical implementation. Finally, EA documentation is passed to program and project managers driving the actual implementation of the initiative according to the planned architecture.

EA at BNM provides the effective instruments to align IT capabilities and business needs, coordinate change, facilitate simplicity and re-usability, consolidate and standardize the IT landscape, speed up the delivery of new IT systems, and gradually decommission the legacy ones.

**Vignette 4: Successful DYA Approach to EA**

Approach to EA	Traditional	MIT	DYA
Definitive source(s)	Spewak & Hill (1992), Bernard (2012), TOGAF (2011), and other sources	Ross et al. (2006)	Wagter et al. (2005)
The essence of approach	Document current state, describe future state, analyze gaps, develop transition plan, and implement it	Decide on operating model, develop core diagram, and then use it for decision-making at all organizational levels to balance local and global needs	For each business initiative prepare diagrams for decision-making and then project-start architectures for implementation
Essential EA artifacts	Detailed current state, detailed future state, transition plan	Core diagram (abstract enterprise-wide architectural vision)	Principles and policies for the whole organization, supporting documents for individual initiatives

Approach to EA	Traditional	MIT	DYA
Key terms	Current/future (as-is/to-be, baseline/target) state, gap analysis, transition plan (roadmap), iteration	Operating model, core diagram, IT engagement model, linking mechanisms	Strategic dialogue, architectural services, development with(out) architecture, project-start architecture
Advantages	Conceptually simple, does not require significant involvement of stakeholders, organization can be not IT-savvy	Provides a long-term global architectural vision but leaves enough flexibility to react on emerging short-term local requirements	Pragmatic, flexible, and agile, provides only necessary documents for the right stakeholders at the right time for the right purpose
Disadvantages	Scope can be too large, plans can be unstable, documentation can be incomprehensible, isolated from other organizational activities	Requires considerable involvement of business stakeholders and establishment of complex governance mechanisms	Does not imply any long-term strategic planning beyond individual business initiatives, can undermine general strategic effectiveness
Applicability	Small, centralized, and stable organizations where competitive advantages are not very dependent on IT	Large and complex organizations with relatively stable business models dependent on IT for achieving competitive advantages	Organizations operating in very vibrant, dynamic, and unpredictable environments and markets

**Table 1: Comparison of the Three Approaches to EA**

## ABOUT THE AUTHOR

Svyatoslav Kotusev is a researcher at RMIT University, Melbourne, Australia. He has spent the last three years studying EA practices in organizations. Prior to his academic career he held various software development and architecture positions in industry. He is a TOGAF® Certified expert. Svyatoslav can be reached at [kotusev@kotusev.com](mailto:kotusev@kotusev.com).

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