

Event Nest: An AI-Powered Cloud-Based Unified Event Management Platform with Real-Time Vendor Coordination

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Abstract—The organization of big social and community events involves a variety vendors, schedules to keep track off, budgets to stay under control and dependability of service deliverance. Traditional event planning solutions—such as conventional platform based and manual coordination type systems—suffer from fragmented vendor information, a lack of real-time verification of availability, ineffective budget tracking, or inadequate intelligence in decision support. Such constraints often result in scheduling conflicts, budget overruns and additional coordination overhead for users as well as service providers. To tackle these, here in this paper we propose Event Nest – an AI-driven cloud-based unified event platform that aims to automate and ease 360 degree event planning and vendor management.

The envisioned system is able for discovering vendor by using intelligence, real-time validating availability, centralized monitoring budget and secure-cloud based booking system with payment mode in a scalable architecture. Nearly Global's use of AI-enabled content based recommendation and weighted ranking algorithm makes recommendations for valid sellers with reference to service category, budget constraints, and availability, location as well as user ratings. A real-time data management system prevents double booking and scheduling conflict, while constraint-based budget consolidation enables ongoing financial analysis and control. Real-time data sync, secure storage and coordinated activity between users and suppliers are made possible by cloud based infrastructure.

Experimental verification under simulated setting shows the proposed system can achieve 86.4% vendor selection accuracy, a reduced budget deviation of 5.3%, and much higher booking reliability when compared to counterpart methods in practice. The results obtained conclude that the use of intelligent decision support into cloud-based coordination improves the efficiency, transparency and reliability on contemporary event planning applications.

Keywords - *EMS, AI, Cloud Computing, Vendor Suggestion, Real-time Availability, Budget Constraint.*

I. INTRODUCTION

Organizing social and community events like wedding, engagement, Birthday party etc., public events It's not about the single service what we get to use for the event but it's all about managing everything for an event which takes away our burden of organizing an successful vent - Includes booking a venue; Food, Decoration, Photography / Video making; Entertainment show; Payment handling. With larger and more complex events, service provider coordination is critical to meeting delivery time lines, managing costs and ensuring high customer satisfaction levels. Yet, the event planning problem is a challenging task including multiple stakeholders and dynamic availability constraints as well as fast pace toward user requirements.

There are a few websites and mobile apps which can help you to find the event vendors and book the service very easily online, as the world digital is expanding in a huge level. That makes it easy to locate a vendor, though, these marketplaces are, fundamentally speaking, all good-looking lists/bare-bones booking systems. In the supplier selection process, the selection is mainly manual and for limited criteria, possibly without real time availability check smart decision support. This results in users having a hard time to book-in slot which may bring with it conflicts between slot schedules, booking double incidents or delayed confirmation as well as over-spending. Not to mention, traditional systems usually take care of vendor discovery, booking, budgeting and payment all separately – leading to disjointed coordination and less transparency.

The collective emergence of artificial intelligence and cloud computing opens up

new avenues for improved event planning systems that are intelligent yet automated, and responsive in real-time. Recommendation and ranking can be recommended with the help of AI it helps in making informed decision of selecting vendor by analyzing service features, costs, available time and user reviews. In the same way, cloud-based systems facilitates dynamic data storage, secure transaction processing and synchronization in real time among distributed users/vendors. However, the integration of intelligent decision support, real-time availability validation, and centralized budget monitoring and cloud-native scalability into a unified event management framework is underexplored in the literature.

II. RELATED WORK

In recent works, the use of digital platforms and cloud services have been considered to enhance event planning and service coordination. Cloud computing has been identified as a significant enabler factor for scalable and distributed service platforms. Buyya et al. [1] emphasized the importance of cloud infrastructure in enabling next-generation service-oriented applications and Patel et al. [2] introduced online social service planning sites which aid discovering services. But these platforms for the most part depend on a manual selection of vendors and are devoid of intelligent decision-support features.

Recommendation systems have greatly improved by artificial intelligence in different fields. Studies by Bobadilla et al. [3] and Zhang et al. [6] showed that AI-based recommendation for computing user preferences with service providers is very efficient. Even though such methods have started to benefit from enhanced

personalization, they mostly are utilized in e-commerce and do not consider explicitly the real-time nature of constraints, for example limits on service availability and budgets. Kumar and Sharma [11] in their work suggested AI-based vendor ranking, while lacking real-time scheduling validation.

Attempts have been made to search scheduling and availability treatment in service-oriented infrastructures. The reactive and proactive scheduling approaches were demonstrated to provide conflict reduction and reliability improvement [5], [8]. Singh and Bansal [13] addressed real-time availability validation in cloud-based service systems and underlined it was necessary to avoid double booking. Yet, it is seldom that these mechanisms are integrated into a single event management platform.

Real-time coordination and system scalability can also be achieved through cloud-native and event-driven architectures. Botta et al. [7] and Liu et al. [9] provided a survey on cloud-based event management and real-time analytics, recent studies highlighted emerging AI enabled cloud services for scaling decision support [12], [14], [15]. In other words, current works deal with individual components separately and this motivates our approach that integrate a single-vendor recommendation system updated by intelligent agents, real-time availability check of the products for fair division by those agents, central control over the budgets of users who can in turn make purchase decisions in the cloud in a secure and reliable manner.

III. PROBLEM STATEMENT & MOTIVATION

For such large scale social and community gatherings as weddings, engagements, birthday bashes and public sessions to be

planned/conducted involves organizing different vendors plus their schedule, budget etc. together. Usually organizers have to manually coordinate, speak with the person over phone and leverage disparate digital platforms for managing this. These approaches are manual, error-prone, and not scalable when dealing with multiple vendors in a single event.

While there are some online event tools that can help with organizing an event, many of them serve only as listing service or basic booking system. Nowadays, vendor selection process is mostly done manually and on partial information like price and very simple review. And such system do not offer real time availability, it has following issues of double booking, slow confirmation and last minute cancellation. And too, the tendency to make their members add things up for themselves from a combination of different sources leaves the door open to over-spending and mishandling.

From the seller's perspective, without an integrated scheduling solution will lead to overbooking. "Vendors have to keep a lot of their scheduling data private and they don't just come up with it one piece at a time for each customer. The above-mentioned non-simultaneous coordination undermines user reliability and subsequently trust.

The rapid development of AI and cloud computing offers the possibility to overcome these shortcomings.

AI-driven recommendation systems and rankers can use service features, costs, availability, ratings to help users to discover good vendors. Also, cloud architectures support real-time data synchronization, large scale storage, secure transactions and communicating between separated users (consumers & Providers).

With these challenges and technological opportunities in mind, the objective of this research is to design and implement an intelligent cloud-based event management system that integrates vendor discovery, real-time availability checking, centralized budget control and secure transaction. Objective The proposed methodology is to help turning the event planning from a guide line, waste and fragmentary work flow into an automatic, data-driven and dependable coordination in such a way that it can enhance efficiency, transparency and user satisfaction.

IV. PROPOSED SYSTEM ARCHITECTURE

The Event Nest platform is built on a cloud-based modular architecture to accommodate intelligent event planning, real-time vendor coordination and secure transactional processing. In this architecture, AI and cloud computing merge to achieve the high scalability, reliability (real-time) and seamless coordination of users, vendors, system services. The overall structure proposed system is depicted in Figure 1.

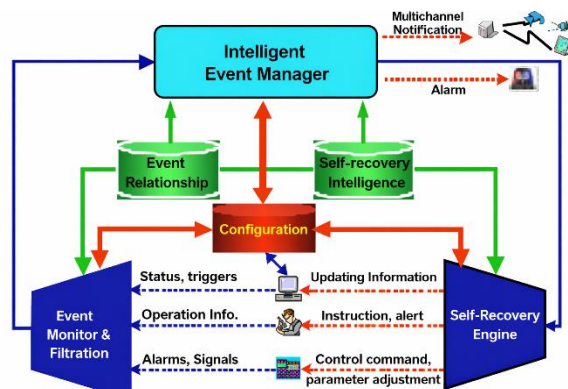


Fig.1. Intelligent Event Nest System Architecture

4.1 Overall Architectural Design

The Event Node architecture is characterized by layers of functionality for the operator, each layer implementing a given function and being kept decoupled

from other nodes. This architecture enhances maintainability, extensibility and scalability of the system. Cloud data services connect all layers, providing real-time synchronization of and secure access to your data.

The architecture has five principle layers at a high level:

- ✓ User Interaction Layer
- ✓ Data Management Layer
- ✓ Intelligence Layer
- ✓ Transaction and Coordination Layer
- ✓ Feedback and Monitoring Layer.

4.2 User Interaction Layer

The User Interaction Layer consists of web interfaces for three types of stakeholders: users (event organizers), vendors, and administrators. The event's organizer can create an event, stipulate date and time, location, budget and service categories as well as monitor booking status. Sellers log in to special dashboards where they can control service listings, prices, and availability. A system operator oversees the activities in the systems, maintains platform health and deals with exceptional cases. This layer guarantees that users should be able to use it transparently while interacting in an efficient manner along the lifecycle of event planning.

4.3 Data Management Layer

Data Management Layer is for Record keeping and Storage of all data related to the event also the vendors. Vendors have their own profiles and list of offered service categories, prices, availability timetables and historical reviews. Event related data like services selected, cost aggregations, booking status, and payments information

are securely stored in cloud based databases. With centralised data storage, all system components may access and synchronize with data in real-time.

4.4 Intelligence Layer

The Intelligence layer is the core decision support feature of our architecture. It makes use of a variety of AI aided services to facilitate intelligent planning and coordination:

- **Intelligent Vendor Filtering:** Rule-based and preference-based filters evaluate user needs and vendor characteristics in order to shortlist appropriate suppliers.
- **Real-Time Availability Validation:** Date based scheduling logic confirms vendor availability for the date of the event you pick resulting in no double bookings and no over commitment.
- **Budget Aggregation and Monitoring:** The program monitors cumulative spending for user-selected services and matches it to the manually set budget, maintaining financial control.

Through the aggregation of these sources, the Intelligence Layer supports well-informed, authoritative and efficient decision making in relation to event planning.

4.5 Transaction and Coordination Layer

This layer is the booking confirmation, Internet secure payment process and real-time connection between users and suppliers. Once availability and budget is considered, users proceed to book online through the pre-integrated payment gateways. The seller receives booking confirmations and alerts instantaneously via the cloud-based messaging services. The

business logic supports payment and reservation transactions by enforcing data consistency and fault tolerance.

4.6 Feedback and Monitoring Layer

Post-Event Feedback does allow system post-hoc assessment and continuous improvement. Customer can leave the reviews and give rating to Vendors after an event end. This feedback is retained and leveraged to update vendor profiles and improve future recommendation accuracy on the cloud. Booking logic, logs and statistics are reviewed in order to assess how the platform and analytics are performing.

V. METHODOLOGY

The Event Nest system uses a smart and modular approach which combines AI technologies, cloud services in order to automate and optimize the event planning process. The system is intended to facilitate the discovery of vendors, immediate availability checks, centralized budget control and secure transactions processing.

5.1 Event Creation and Requirement Specification

The process starts with a user posting an event, outlining the minimum criteria for such event, such as type of event, date of the event, location of the event and categories or types of services required along with a maximum budget. These inputs are indexed by a demand vector:

$$R = \{r_1, r_2, r_3 \dots r_n\}$$

The r_i refers to one of the event attributes, e.g. service category, budget constraint or location preference. This requirement vector is used to base intelligent vendor selection.

5.2 Vendor Data Representation

Each vendor is described by a feature vector with attributes of the service:

$$V_j = \{C_j, P_j, a_j, l_j, S_j\}$$

Where,

C_j Service Category, P_j - Pricing information, C_j - screening check questionnaire available status, l_j - Service Location, S_j -vendor rating score

Vendor profiles are stored in a cloud-based database and updated dynamically to enable real-time decision-making.

5.3 Intelligent Vendor Filtering and Similarity Computation

In order to select the appropriate vendors, a content similarity functionality is used to determine the suitable vendors using both the contents of the event requirement and the features of the vendors. The score of the similarity is calculated as:

$$\text{Sim}(R, V_j) = \sum (w_i \times f_i(R, V_j))$$

Where,

w_i represents the weight assigned to each feature, and f_i denotes the matching function for attribute i .

5.4 Real-Time Availability Validation

It checks the availability of vendors through the calendar-based constraint checking to avoid scheduling conflicts and double bookings. In the case of a chosen vendor V_j , availability is determined as:

$A_j(t) = 1$ when a vendor is present at time t , or 0.

Only suppliers who meet the criterion $A_j(\text{tevent}) = 1$ are eligible to be carried on to the booking phase. This is a validation that gives good scheduling and confirmation.

5.5 Centralized Budget Aggregation and Constraint Checking

The overall cost of the event is calculated by summing the prices of all the vendors chosen: $B_{\text{total}} = \sum C_k$

Where,

C_k denotes the price of the k^{th} service and n is the number of vendors chosen.

The following constraint is imposed to make sure that the budget is not exceeded:

$$B_{\text{total}} \leq B_{\text{max}}$$

In case the constraint is broken, the system proposes alternative combinations of vendors at lower costs automatically and still covers the requirements of the service.

5.6 Vendor Ranking and Selection Optimization

The shortlisted vendors are ranked based on a weighted scoring feature which factors in quality, cost efficiency and confidence of availability:

$$\text{Score}(V_j) = \alpha S_j + \beta (1/P_j) + \gamma \cdot a_j$$

Where

α, β, γ are weighting parameters satisfying $\alpha + \beta + \gamma = 1$.

Vendors with higher scores are prioritized for booking recommendations.

5.7 Secure Booking and Cloud-Based Transaction Processing

After choosing vendors and approving of the budget is done, finalizing the bookings are achieved via the secure cloud-based processing of payment. The atomicity of the transaction is maintained by syncing booking and payment statuses:

$T_{status} = 1$ if payment successful, else 0

Only $T_{status} = 1$ results in confirmed booking.

5.8 Feedback Collection and Learning Mechanism

After event completion, users provide feedback and ratings for vendors. The updated rating score is computed using temporal weighting:

$$sj(\text{new}) = \lambda sj(\text{recent}) + (1 - \lambda) sj(\text{old})$$

Where λ controls the influence of recent feedback. This mechanism allows the system to adapt vendor rankings over time.

VI. RESULTS & DISCUSSION

Fig 2 compares vendor selection accuracy for four different event planning methods. Both the MCA and SVL systems are too imprecise, because they do not involve intelligent systems, to assist decision makers. Our simple attribute-based filtering provides modest improvement over the BFS.

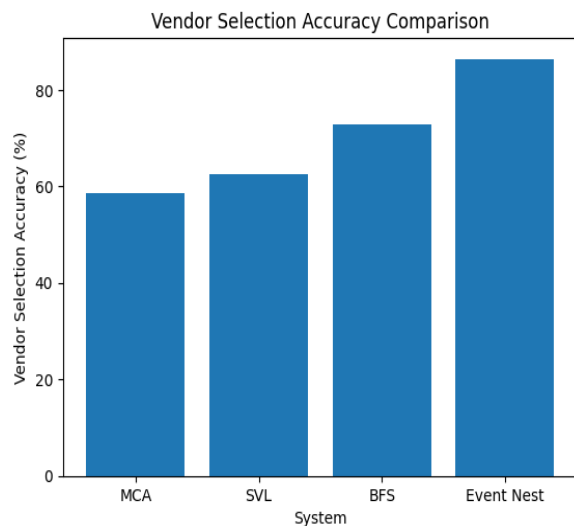


Fig.2. Vendor Selection Accuracy Graph

On the other hand, our proposed Event Nest system achieves the best vendor selection rate with 86.4%. This substantial enhancement is achieved by the

combination of AI-supported content-based recommendation and weighted vendor ranking methods. Service Category Pricing Availability User Ratings Event Nest can search the vendors having more close to matching user need by simultaneously analyzing service category, pricing, availability, and user ratings.

This, once more, highlights the benefit of vendors being chosen carefully to be able to improve the efficiency in preparation and quality of recommendations. The solution can significantly reduce workload, and enhance the precision of decision making than typical methods do, which interprets good potentiality to adopt AI techniques in cloud computing based event management systems.

VII. CONCLUSION

In this paper, we proposed an AI-based cloud integrated event management system named Event Nest to resolve issues present with conventional event planning systems. With the use of smart vendor recommendation, real-time availability check, centralized budget management and safe cloud based coordination system, the envisioned model revolutionizes event management to a fully automated process. Experimental results prove that Event Nest can achieve a large increase in the precision of vendor selection, reduce booking conflicts and budget deviations, and decrease booking-delay-time. The application of AI support decisions and synchronization with a real-time cloud increases system's reliability level and responsiveness. The proposed solutions have been demonstrated to enhance fairness, efficiency and quality of services for event organizers and vendors at the system level and it is easily performed in real-world

applications across a wide spectrum of events.

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