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# Standard Web Application for Flight Booking

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***Abstract*— Web services are loosely coupled software components that are a popular implementation of the service-oriented architecture. Web services have been extended to give value-added customized services to users through service composition. Online flight booking is a major application of Web service. Travelers are also relying more on travel review sites when booking. However, one of the major problems of development of the online reservation system is when we are connecting web services from different web service providers then we have to develop different programs to calling each of them. Because, each service providers provide different data formats as their response data. Therefore, Engineers have to learn about that from the bottom of the line. Another problem of the existing online reservation systems is reservation systems are different with each other. That is increasing the complexity of the system when using the consumer. There are not available travel agent web site standards. When a new system is built it's hard to find the proper standard methodology. So that makes very hard to developers, architectures, business peoples to develop a system that internationally accepted. This research studies mainly focusing on defining those standards and each and every travel agency sites will be on the same standards so that the users and other parties who are involved in the travelling purpose will find very easy to use this reservation systems because there is the same standard which is internationally accepted.**

***Keywords—web service, JSON, booking systems***

## I. INTRODUCTION

Internet is the latest in a long series of communication technologies. As stated in the term "an internet service presents a classification of objects to perform a certain services to different users". Society is generally known as a group of people who deal in a virtual environment, adopting online services in various societies gives the opportunity to model and formulate contents. Communication services become one of the most important applications in the world for providing clients with the intellectual services. The online booking system for the meeting and seminar halls will provide flexible and sustainable services for saving time and emulate mistakes. From the other hands, users are looking for an interactive and easy way to communicate and do their jobs via Internet. The usefulness of the providing such a reservation service is to help administration staffs in their daily work by making their reservation up to schedule, connected, and generating reports easily. Most of these applications build and design based on a certain strategy to fit the expected needs and generate the user desires. Different strategy units perform to varying levels against each other, and come at varying satisfaction.

Goal of the every booking agency is to sell more rooms and make profit. Yet, without an online booking system, user will have to rely on phone calls and walk-ins only to make reservations. An online booking system works all the time [1], which gives freedom to potential visitors to book a room anytime they want. It also maximizes sales because provider is not limited to the working hours. In fact, studies show that a 24/7 online reservation system greatly increases the number of hotel bookings.

Flight reservation system will make provider's staff more efficient. They will not be phone waiting for guest calls. Another major benefit of the online flight reservation system is that it is much easier to create, publish, promote and sell packages and add-ons online. Booking Agency can combine them or let customer to choose the package they need. This will further increase the revenue of the booking agency while customers will be able to get exactly what they want.

The online travel industry primarily made up with travel e-commerce sites and review sites. Travel e-commerce sites specialize in the selling of travel products such as flights, hotels, and rental cars. These can be either purchased directly through a travel company's website, such as the Lufthansa website, or through an online travel agency (OTA), such as Expedia [2]. Travel review websites, such as Trip Advisor [3], allow travellers to post their experience of hotels, restaurants and other hospitality purchases online. These companies often generate revenue via advertisements on their sites.

Travellers are also relying more on travel review sites when booking. The share of United States travellers who said travel review sites influence their travel choices increased by 10 precent between 2014 and 2015. The leading travel site used in United States based on number of visits was, however, not an online travel agency. As of October 2016, TripAdvisor, which operates primarily as a review site, gained the highest share of travel website visits by 13.8 precent [4].

However, one of the major problems of development of the online reservation system is when we are connecting web services from different web service providers then we have to develop different programs to calling each of them. Because, each service providers provide different data formats as their response data. Therefore, Engineers have to learn about that from the bottom of the line. Another problem of the existing online reservation systems is reservation systems are different with each other that increase the complexity of the system when using the consumer.

In this paper, we proposed JSON format for response data for reservation web service providers, and provide a

significant model for the reservation web services to keep their standards and reduce the complexity of reservation system when check the consumer. The JSON format of the output of web service response mainly considers the capacity of the response message and reducing the complexity. In this paper, we focus on online flight booking system.

The rest of this paper is organized as follows. In section II, we present the proposed web application. Section III discusses functional based clustering process. Section IV describes our proposed QoS aware clustering approach. Section V discusses our experiment and its evaluation. In Section VI, we discuss related works. Finally, Section VII concludes the paper.

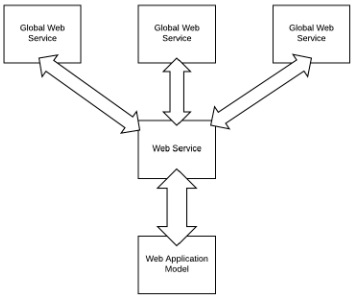


Fig. 4. Web service architecture

## II. PROPOSED WEB SERVICE

### A. Collecting and Analyzing Data

First, we created a questioner related to online booking system. We collected data from foreigners who travel in Sri Lanka and Web service developers who are involving in developing flight-booking system. Further, existing booking services were analysed to identify key features. Airline filter and outbound and inbound times filter were two identified filters among them. Mentioning Baggage size on result page and Airline ratings and rating filters are features suggested by the consumers. Developers suggest flexible type search feature.

### B. Designing

Figure 1 shows the web service architecture. Important part and very complex part are planning and designing the result page. According to discussed information and consumer suggestions of booking websites, we have designed a result page block. When designing the model of the system we have to consider about two main parts such as the web service and the web application.

### C. Implementation

C#, HTML, CSS, Jquery, Angularjs were used as development languages. MS SQL was the database management system. Development framework was .net framework.

### D. Identify the JSON object properties and tables

JSON object uses for invoke data from web servers. According to requirements, we have to decide what kind of JSON property we have to invoke for result page. We have designed two property tables called Itinerary and Flights. Then we developed the web application that used by MVC (Model View Controller) framework and three tire architecture. Figure 2 shows the three-tier architecture.

Assume we want to select or recommend a Web service from collection of functionally equivalent services with varying QoS values. Then, selection algorithm has to select a service with optimal QoS values from all the services in the search space. However, if we cluster the services based on QoS values, then we can reduce the search space as in Fig 1. First, we can identify the cluster with better QoS values (i. e. cluster 3) and then, selection algorithm can limit the searching process within the cluster.

Back-end of the web application was developed by c# language and entity framework was used for the access to the database. SQL DBMS uses for manage the local database. Local database has seven (7) tables. Local database was used because of fixed data. If those data also come from web services that affect to the system processing time and data usage. To reduce system processing time and data usage we used local database for those fixed data those tables are airline table, flight destinations mapping table, flight fares table, subscribers table, airline codes table, airport code table, and city code table.

Front end of the web application was developed by C# razor bootstrap, jquery and angular. This application has some frond end logics because of that, we have used angular controller on front end. Presentation layer of the project was developed according to MVC architecture.

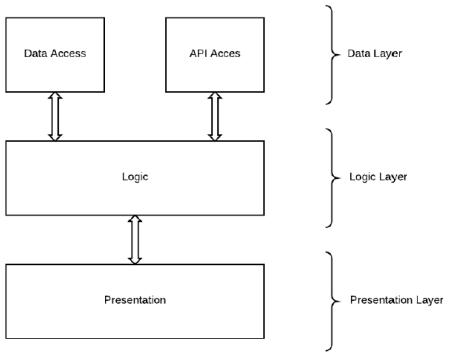


Fig. 5. Three tire architecture

## III. RESULTS AND DISCUSSION

Search inputs page of the flight booking application was designed by a common way that usually can see on booking websites. Figure 3 shows the interface of the main page. Departure input, Arrival input, Departure date, Return date, Passenger inputs, One-way type button, Return type button

and +/- 3 Days input are some input box and button in the page.

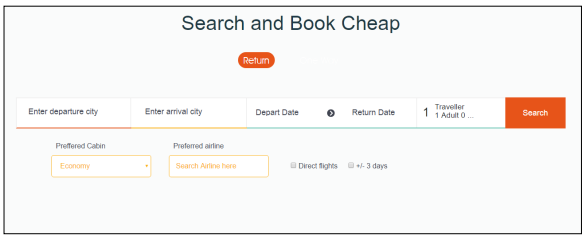


Fig. 6. Interface of main page

Most important part is the result page model. In that, we have to focus about lot of things. According to our research when discuss with the developers and consumer that related to the booking systems they most of the times mentions the airline filtering methods.

E.g. – Someone like to select their itinerary from British Airways so we have to provide British airways itineraries. For that, all the itinerary results were grouped by its' airline. Following fig. 4 shows results of return type search inputs. As the result, page system will show one div to each airline. If consumer wants to see other itineraries of particular airline, he/ she has to click on more flight combination button. Figure 5 shows the interface. When select the itinerary, system shows details window of particular itinerary as following fig. 6.

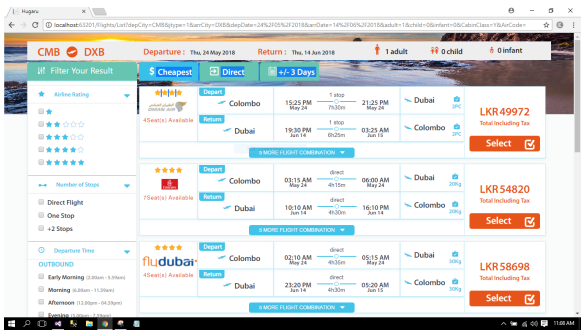


Fig. 7. Results page

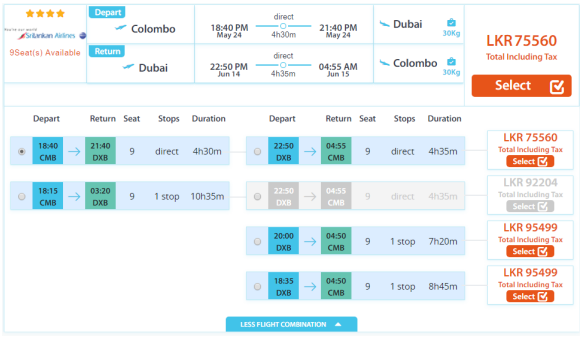


Fig. 8. More Flight Combination view

Fig. 9. Details window

JSON objects were used for the parse data between web application and web service. Travel agent organizations can use this format for their web services as a standard. This JSON object must be including all the dynamic data to the result page. Following fig. 7. shows sample flight table JSON object.


```
{
"Flights": {
"RfNo": 5,
"SegOrd": 2,
"LegNo": 1,
"OptCt": 2,
"ARL_COD": "9W",
"FLI_NUM": "542",
"DEP_ARP": "BOM",
"DEP_DAY": "We",
"DEP_DAT": "110718",
"DEP_TIM": "0920",
"ARR_ARP": "DXB",
"ARR_DAY": "We",
"ARR_DAT": "110718",
"ARR_TIM": "1100",
"EQP_COD": "Boeing 73H",
"MEA_COD": "-",
"NUM_STO": 1,
"DEP_TER": "2",
"ARR_TER": "1",
"ACC_TIM": "x",
"ELAP_TIM": "0310",
"GRO_TIM": "0105",
"Class": "W",
"DEP_ARR_DAT_DIF": "0",
"InfoVia": "AM",
"TechnicalStop": "-",
"Codeshare": "NO",
"ReplaceAir": "XX",
"FareBasis": "W2SP1MLK",
"MajorCabin": "M",
"Baggage": "2PC",
"Extras": "-",
"FliRefNo": "D542"
}
}
```


Fig. 10. Sample JSON format

Details of some attributes are given bellow.

| Attribute Name | Type | Description |
|---|---|---|
| RfNo | Int | Reference Number |
| SegOrd | Int | Segment Order |
| LegNo | Int | Leg Number |
| OptCt | Int | Option Code |
| ARL_COD | String | Airline Code |
| FLI_NUM | String | Flight Number |
| DEP_ARP | String | Departure Airport |
| DEP_DAY | String | Departure Day |
| DEP_DAT | String | Departure Date |
| DEP_TIM | String | Departure Time |
| ARR_ARP | String | Arrival Airport |
| ARR_DAY | String | Arrival Day |
| ARR_DAT | String | Arrival Date |
| ARR_TIM | String | Arrival Time |
| EQP_COD | String | Equipment Code |
| MEA_COD | String | |
| NUM_STO | Int | |
| DEP_TER | String | Departure Terminal |
| ARR_TER | String | Arrival Terminal |
| ACC_TIM | String | |
| ELAP_TIM | String | |
| GRO_TIM | String | |
| Class | String | Passenger Class |

## IV. Related Works

Mobile application is the one of the most important things in human day-today life. For expeditiously analysing the potential advantages of the Mobile Airline Reservation System (MARS), research work [5] investigated existing procedure of seat reservation in the Nigerian Aviation Industry and clarified potential advantages of the broad selection of MARS. The paper discussed about the five product compositional model of MARS and presumed that its power usage with ongoing versatile access the nation over can spare time, cost, and different dangers. Research work [6] discussed about the better mobile applications of flight ticketing. According to that, 90% of travel bookings are done online. Airlines still sell the majority of tickets, but finding and comparing them now takes place on third-party ticket search engines that offer flights from thousands of suppliers globally. This article says higher competition of the travel industry will be better for the travellers and bad news for the flight ticket industry because of higher competition means lower profit margins, which translates to cheaper ticket for the end-consumer.

Researcher [7] provided a summary of the study that was undertaken to design and implement an airline reservation system. The airline reservation system designed in that project was developed using PHP, Java script and HTML. The researchers reviewed the literature of reservation systems and explored the advantages and limitations of reservation system in real life situations. He also used interviews and questionnaire methods during the data collection phase. Case tools and data flow diagram were used during the development process to simulate the process of airline reservation and ticket booking. The outcome of the study was an online airline reservation system tested and implemented in the case study Rwenzori Airlines to book, schedule and reserve flights.

According this the history of the computer reservation systems (CRS) in airline industry days back to 1970s. The airline began modifying and enhancing their internal reservation system to make the sale of airline tickets through agent more efficient. The CRS gives travel agent for information about flight schedules, fares and seat availability. It enables to flight reservation and issue of tickets automatic. An agent based mobile airline search and booking system is being developed. In addition, they provided a method to perform the search of the airline using biometrics. [8]

In this paper, we proposed JSON format for response data for reservation web service providers, and provide a significant model for the reservation web services to keep their standards and reduce the complexity of reservation system when check the consumer.

## V. Conclusion

Travel industry is a one of major industry around the world. Airline Reservation System (ARS) has led to ease of airline ticketing, flight scheduling and provided a mean for customers to access and book flights with ease and in time. It has also increase the speed with which information about customers are retrieved, handled and flight scheduling it tasked. There are not available travel agent web site standards. When a new system is built, it's hard to find the proper standard methodology. So that makes very hard to developers, architectures, business peoples to develop a system that internationally accepted. This research is mainly focusing on defining set of standards so that every travel agency sites will be on the same standard. Users and other parties who are involved in the travelling purpose will find very easy to use this reservation system because there is an internationally accepted standard.

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