Transur web system with node.js transportation management for Cooperativa de transporte de pasajeros inter cantonal Urcuquí.

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Abstract.*The project involves the implementation of a web application for managing information of the Cooperativa de transporte inter cantonal Urcuquí.*
Using the XP development methodology and Node.js technology, which is linked in the stack MEAN.IO (MongoDB, Express, Angular and Node.js).
The application offers high scalability and responsive interfaces on mobile devices (Tables, laptops) and desktops.

The feasibility study is conclusive mention that: The responsiveness of the administrative staff to requests for information, had an estimated response between 15 and 30 minutes, only on working days. It is necessary to implement a software application on the Internet with reliable information on the cooperative transport units, partners, drivers, routes and frequencies, safely and permanently updated. Thus strengthening the domestic production of the cooperativa de transporte de pasajeros inter cantonal Urcuquí.
To finally conclude with a study of the cost - benefit and responsiveness to inquiries before and after implementation of application Transur.

Keywords

XP, Node.js, MEAN.IO, Mongodb, Angular.

Resumen. *El proyecto consiste en la implementación de una aplicación web para la gestión de información de la cooperativa de transporte inter cantonal Urcuquí.*

Utilizando la metodología de desarrollo XP y la tecnología node.js, la cual está vinculada en la pila MEAN.IO (Mongodb, Express, Angular y Node.js).

La aplicación ofrece prestaciones de alta escalabilidad e interfaces responsivas en dispositivos móviles (Tables, laptos) y computadoras de escritorio.

El estudio de factibilidad es concluyente en citar que: La capacidad de respuesta del personal administrativo a las peticiones de información, tenían un tiempo estimado de respuesta entre 15 y 30 minutos, únicamente en días y horas laborales. Siendo necesaria la implementación de una aplicación Informática en Internet, con información confiable de la cooperativa sobre unidades de transporte, socios, conductores, rutas y frecuencias, de forma segura, permanente y   actualizada. Fortaleciendo así la producción interna de la cooperativa de transporte de pasajeros inter cantonal Urcuquí.

Para finalmente concluir con un estudio del costo - beneficio y la capacidad de respuesta a las peticiones de información antes y después de la implementación de la aplicación Transur.

Palabras Claves

XP, Node.js, MEAN.IO, Mongodb, Angular.

1. Introduction

The implementation of activities of collecting, processing and consolidation of information management of the cooperativa de transporte inter cantonal Urcuquíis deficient by the isolated storage of records and manual processing of data, without using a computer system to ensure centralizing information with a light and inexpensive technology. It then requires a software tool that manages the integrity of stored information , allowing linking Transur web system with Node.js for effective implementation of institutional activities .
Institutional administration, aware of these limitations is exposed interested in improving their own productivity , namely , improving within the institution. Generally productivity indicators in transport services are associated with traffic problems or physical distribution of transport

units, aimed at meeting the needs of users. In this context as: DOLCE, J. in the work **Fleet Management** provides a list of indicators of productivity of a transport fleet, which, according to a functional division of the shipping company must: Global indicators, in the office, in platform maneuvering and route.

From the above indicators one of the most important for the continuity of this project is the indicator in the office, which is quoted in the book *Productividad en el transporte mexicano*. To assess the productivity of the offices of the Transport Company it was decided to have the indicator requests serviced / hour with the updated logging capability institutional information diagnosis, the development of a web-based system that incorporates the institutional activities and conducting a cost - benefit analysis to Transur web system implementation.

2.   Materials and methods

In order to identify the different relevant aspects of this research was directly related: objectives, variables, indicators, techniques and information sources in a matrix relationship illustrated in Table 1 and Table 2.

Goals diagnostics
Establish the elements in which domestic productivity is based in the offices of the Cooperativa de Transporte de pasajeros inter cantonal Urcuquí.
An analysis of the recording capacity of units of transport, routes , frequencies , partners and drivers of Cooperativa de Transporte de pasajeros inter cantonal Urcuquí.

Table 1. Goals diagnostics

Variables	Indicators	Techniques
Productivity	Responsiveness to information requests per hour	Polls and interviews
	Information recording capacity per hour	Polls and interviews

Table 2. Variables Indicators and Techniques

2.1 Selection from sample

For representative selection of all individuals involved in the administrative process of the cooperative is the population, it will be subjected to a statistical evaluation with the participation of sampling.   The estimable population for this project is shown in Table 3.

Nro.	office	Quantity
1	Presidente	1
2	Gerente	1
3	Socios	34
4	Personal administrativo	2
5	Choferes	11
	Total	49

Tabla 3. Muestra

In determining the sample for this project the following technical criteria cited by citing MSc JÁCOME , W., " If the population is less than or equal to 50, it will work with census, in which all members of the population will be assessed ".   Therefore a census be conducted between all related people in the institution.

2.2 Approach problem

With the analysis and interpretation of survey results it concludes that the control bodies conduct regular ground transportation to transport fleets reviews, requiring legalization updated units and partners transport driver's information.   The Cooperativa de Transporte de pasajeros intercantonal Urcuquí currently has limited administrative staff conducting the search of institutional information with software tools like spreadsheets , which leads to having the information scattered individual files , having to consolidate information and plan routes weekly worksheets. The responsiveness of the administrative staff to requests for information has an estimated 15 to 30 minutes working days and hours, while otherwise no inquiries are made. A minimal increase in demand for activities in administrative personnel would eliminate the ability to process so much information, resulting in loss of credibility and prestige of the institution directly affecting the dissemination of information results. Such drawbacks overshadow the institutional image, to control the transport agencies and provide poor service to the community urcuquirense.   The   implementation   of   a   computer application in Internet Transur , reliable information on the cooperative transport units , partners , drivers, routes and frequencies , safely and permanently updated , which contribute   to   the   development   and   institutional strengthening of domestic production still needed the prestigious Cooperativa de transporte de pasajeros inter cantonal Urcuquí.

2.3 Software Tools

JavaScript   on   the   server   may   be   impossibly   for developers who worked exclusively with client-side JavaScript concept.   Tools server-side JavaScript are actually projects aimed at testing laboratory and do not have   extensive   documentation.   Among   the   main alternatives tools server-side JavaScript can be cited: **EJScript**, **RingoJS**, **and Node.js.**

Comparative analysis tools Server -side JavaScript

To establish a comparative analysis tools JavaScritpt server side, a set of features designed to compare the advantages and disadvantages between EJScript, RingoJS and Node.js. **Architecture:** Architecture in the JavaScript

tools, defined in a high level design and implementation of software structure. **Integration:** Integration is testing is the software testing phase in which individual software modules are combined and tested as a single entity. **Speed:** Determines the degree of optimization tools where the web server side applications reside. **Access to documents:** Analyzed in relation to the quantity and quality of available for learning and application development documentation. For choosing the suitable alternative between the JavaScript server-side tools for project implementation , in Table 4 show the comparison criteria with their respective score : **Low**: 0-3 **Middle**: 4-6 **Good**: 7-8 **High**: 9-10.

Criteria from comparison	Tools Server-side JavaScript		
	EJScript	RingoJS	Node.js
Architecture	7	5	8
Integration	7	4	8
Integration withDataBase	8	4	8
Speed	7	5	8
Access to documents	7	3	7
Total	36	21	39

Table 4: Comparative analysis tools Server-side JavaScript

Regarding the score shown in Table 4, it can be noted that the Node.js technology, has the best score at both the application will be implemented in version 0.10.26 and 2.2.7 MongoDB housed in an IDE JetBrains web Storm 8.0.3 and controller versions GIT .With the release of development tools for Node.js, JavaScript, server-side, optimizing building web, robust and maintainable applications it is necessary. By analogy with LAMP (Linux, Apache, MySql, Php), MEAN.IO is an acronym for the MongoDB , Express, and Node.js angularjs technologies, which make up the so-called "stack MEAN " whose common feature is the presence of the JavaScript programming language , of what is hoped to have all ideal tools for building web end-to-end applications (Frontend, Backend and Database).

Comparison between Node.js web server and Apache / Tomcat

To establish a comparative analysis of the responsiveness of a one Node.js server vs Apache server, a test is carried out with the tester apache (Apache Bench ab).The test is performed with the tester referred to rule out any bias in the results for the Web Server Node.js. Apache v.7.0.56 and Node.js v.0.10.20 servers on a machine 2Ghz Intel G2002 and 2 GB of RAM is installed locally and on an equal footing . The tabulation of the data is performed based on three parameters: No. Requests per second (ms), Response time for each request (ms) and Estimated response time to all requests (ms), these parameters are cited by: FERNANDEZ, A. scalable systems specialist. Finally setting the responsiveness of the web server

Node.js and cost - benefit analysis of the application Transur production.

3. Results

After completing the tests are conclusive, the high capacity of the Node.js web server on the web Apache / Tomcat server on the following parameters: No. Requests per second (ms), Response time for each request (ms) and Estimated response time to all requests (ms).
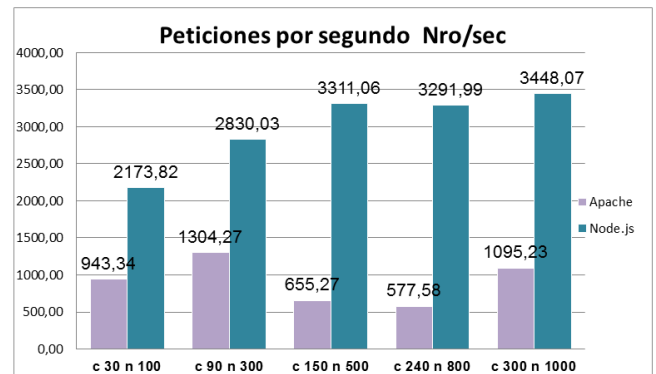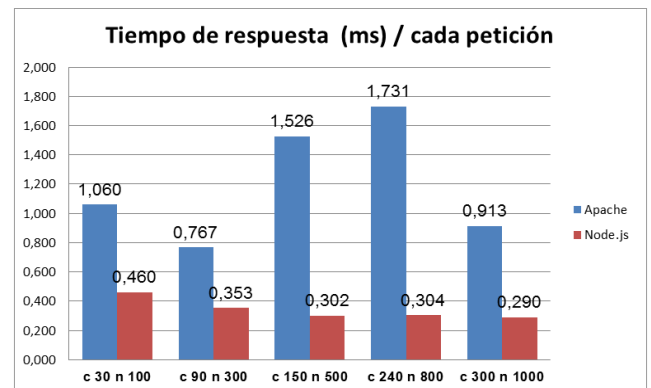

Fig.1.No. Requests per second (ms)

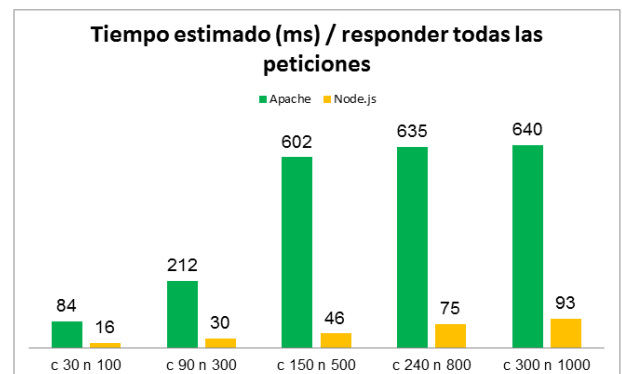**Fig. 2**. Response time for each request (ms)

Fig. 3 Estimated response time to all requests / (ms)

The responsiveness of Node.js server application Transur production under the following parameters: **$ ab -c 240 -n 800 http://23.236.61.78:3000/**, with an attendance of 240 and 800 petitions, shows an acceptable application performance, values are:

Requests per second: [#/sec]	245,38
Time per request: [ms]	4,075
Percentage of the requests served (ms)	1813

Table 5. Transur load test server

If the time server requests , exceeded the 5 (ms) , there would be a deterioration in the responsiveness of the server , having to implement any chance of scalability. The 800 requests and 30% of attendance (240) is an estimated range of applications for the first 20 months from the start of production of the Transur application. The Table 6 reflects the profitability of Transur project. Once past the $ 3,215.00 cost of application deployment at the beginning of the month 26, the profitability of $ 85.00 US dollars shown.

Period	Period/Mont	Saving/ Expenses	Profitability
1	12 months	$1584,00	$0,00
2	24 months	$3168,00	$0,00
3	1 month	$3300,00 ($3215,00)	$85,00
	2 month	$3432,00	$217,00
	3 month	$3564,00	$349,00
	4 month	$3696,00	$481,00
	5 month	$3828,00	$613,00
	6 month	$3960,00	$745,00

Table 6. Profitability of the project

Table 7 shows a significant increase in responsiveness to requests and registration of corporate information by implementing Transur .

Indicator	Work sheets	App. Transur
Responsiveness to information requests per hour	**Monday – Friday**	**Everyday**
	15-30min	1-2 min
	4	30
Indicator	**Work sheets**	**App. Transur**
Information recording capacity per hour (Routes)	**Monday - Friday**	**Everyday**
	60 min	60 min
	10	50

Table 7: Indicators with the implementation of application Transur

4. Conclusions

The information recording capacity and institutional response to requests for information, has significantly improved internal productivity of the Cooperativa de transporte intercantonal Urcuquí, , with the implementation of the Transur web application.

The cost - benefit analysis determines that from the month 26 of the start of production of the Transur application, saving cut operating expenses, the cost of

application deployment with an initial yield of $ 85.00 US dollars.

Load tests performed between web Apache / Tomcat and Node.js server with the tester apache (Apache Bench ab) were instrumental in demonstrating the capacity of the Node.js web server on different Web servers .

The goal of load testing is to respond to the business objective questions, with real data. Example: How many requests will be answered by the Transur system within 5 (ms) ? The answer is 800 requests with a turnout of 30% (Table 5)

Gratefulness

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About the Author

Xavier CANGÁS The author of this work , I wear a full of eccentricities within permitted by his alma mater student life, being the first and only speaker in the 2nd International Meeting of FLISOL event (Latin American Festival of Installation of Free Software) held at the premises of the Faculty of Applied Science at the Technical University of the North.

The realization of the event dedicated to his late grandfather , who became one of the main mentors of their personal and academic life.

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