

Improving Performance of Complex Dynamic Websites Using ORM, Entity Framework, SQL Server and MVC

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Abstract: Presently, Every day the numbers of internet users is increasing exponentially and they come across numbers of websites. The user expect high performance website. The numbers of website users increases if it is user friendly and faster. These website are visited on different devices like mobile, tablet or desktop so accordingly it should function to attract users again and again so modern website need to be developed accordingly. In this present work the MVC architecture, entity framework, and ORM has been used to manage the complex dynamic websites. Thus high performance is achieved and development time and cost is reduced.

Keywords: ORM, MVC, Entity framework, Web Performance

1. INTRODUCTION

Complex and dynamic web applications need to be designed and developed very tactfully in order to gain high performance and popularity among the users having different bandwidth and devices. The website performance is affected by many factors like User Interface design (UI), database design and network speed. The response time should be higher to deal with complex web applications. The responsive and optimised websites are more revenue generating.

In 2007 Amazon reported that for every 100 MS increase in load time of Amazon.com their sales decreased by 1%. Google also reported similar results in 2006 with their Google Maps product. Google found that by reducing the size of the page from 100KB to 80KB, their traffic shot up by 10% in the first week and then 25% in the following three weeks [12]. 57 % website users will leave a site after waiting 3 seconds for a page load.80% person will never return and half of these spread its negative experience among the people. This propaganda reduces the revenue and causes great loss to the dynamic websites owners. Mobile first technology is dominant as one fifth population of the world access website on mobile thus device adaptation nature of the website is more important. The web

performance can be estimated as load performance, rendering performance and programming performance. The design pattern of the website matters from different point of view like user interface design, programming, and database design. Many modern website design and development methodologies are used to develop complex websites with heavy databases. Different design patterns for web application design are used like DNA architecture, two tier, three tier and N-tier architecture. MVC design pattern is one of the best architecture to develop modern web applications which is supported by modern web browsers and different devices. The Asp.net MVC uses HTML5, CSS3, JQUERY, Java Script, and Bootstrap, Razor View Engine, Entity framework to develop modern mobile first applications.

2. BACKGROUND

MVC (Model, View and Controller) is a design pattern to develop responsive and modern web applications. It is an open source available in the market. Because of its robustness the scalability and maintainability of the web application becomes easier.

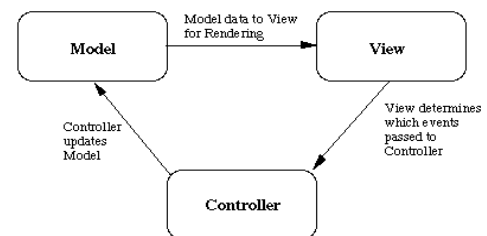


Figure1. MVC Design Pattern

It allows less coupling among the modules and parallel development. The web page renders in ideal time and reduces HTTP request on server. Asp.net MVC also uses razor view engine. Razor is an ASP.NET programming syntax used to create dynamic web pages with the C# or Visual Basic .NET programming languages. Razor was in development in June 2010 and was released for Microsoft Visual Studio 2010 in January 2011. Razor is a simple-

syntax view engine and was released as part of ASP.NET MVC 3 and the Microsoft WebMatrix tool set [13].

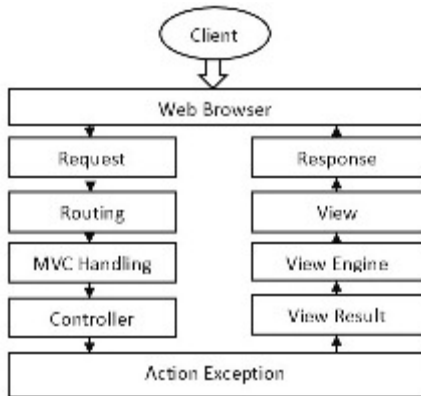


Figure2. MVC Page Life Cycle Using Razor View Engine

ORM is a tool used to store data from entity state to relational database like MS SQL Server automatically in easy and maintainable way. ORM has three main parts: Domain class objects, Relational database objects and Mapping information on how domain objects map to relational database objects (tables, views & stored procedures)[1].

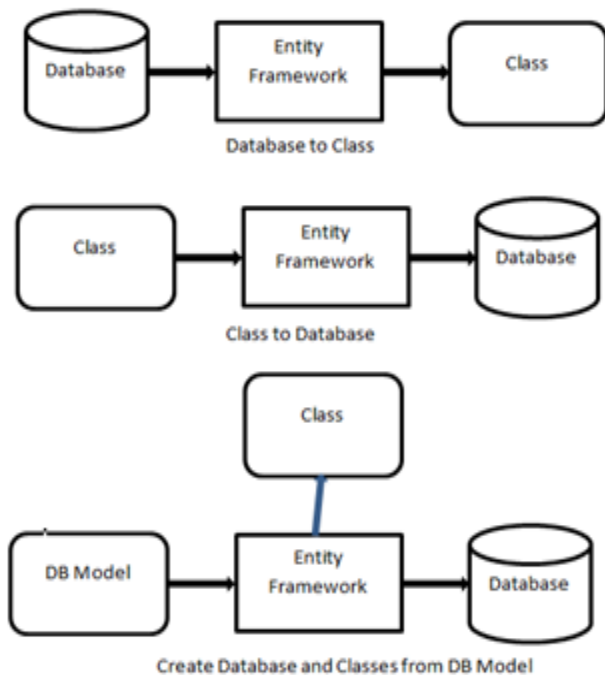


Figure 3. Entity Framework

Using ORM database design is kept separate from domain class design. Due to this application becomes extendable,

robust and maintainable and standard CRUD operation (Create, Read, Update & Delete) are maintained automatically. There is need to write manual programmes. ORM is implemented using entity framework.

3. IMPLEMENTATION

The project has been developed in Microsoft visual studio 2013 IDE with ASP.NET MVC using C# on Microsoft Windows7 operating system. IIS7 has been used as a webserver. An object-oriented database management system SQL SERVER 2008 is used as a backend. The hardware and software requirements are given in the **table 1** below:

Hardware Requirement			
	Min	Recommended	Used
Processor	400MHZ	2.10GHZ	Intel® Core TM-I3@2.10GHZ
RAM	256 MB	1GB	256 MB
Software Requirements			
Operating System	Windows 7		
Application Software	Microsoft Visual Studio Microsoft .NET Framework4.0 MS SQL SERVER 2008		

Table 1. Hardware and Software Requirement

To start the developments of the project install Microsoft Visual Studio, Microsoft .NET Framework4.0 and MS SQL SERVER 2008. The open Microsoft Visual Studio 2013 as shown in the **figure .4** below. Select File Menu then Project the below given window will open. Now, Selecting MVC Project Template as given in **figure 5**. By right clicking the solution explorer add entity data model as given in the **figure 6**. It will establish database connection with MS SQL Server 2008 and will fetch all the database objects like tables, views and stored procedures as given in the **figure 7**. The ORM also generates classes for the corresponding entries and direct mapping helps in avoiding the data type mismatch problem. The key constraint and validation are activated by the HTML helper classes of the Razor View Engine. The Bootstrap CSS, java script and jquery avails to rendering fast to the webpages in the browser hence the web performance increases. The ACID property of the database is automatically handled by entity framework and ORM. The large and complex application is developed rapidly and the robustness, scalability, maintainability and robustness of the application remains good.

4.2 Performance Test Reports

Load test name	LoadTest2
Description	
Start time	25/11/2015 8:41:57 PM
End time	25/11/2015 8:51:57 PM
Warm-up duration	00:00:00
Duration	00:10:00
Controller	Web run
Number of agents	1
Run settings used	Run Settings1

Table 3. Test Run Information

Max User Load	25
Tests/Sec	20.4
Tests Failed	0
Avg. Test Time (sec)	0.67
Transactions/Sec	0
Avg. Transaction Time (sec)	0
Pages/Sec	20.4
Avg. Page Time (sec)	0.66
Requests/Sec	20.40
Requests Failed	4
Requests Cached Percentage	0
Avg. Response Time (sec)	0.66
Avg. Content Length (bytes)	57,909

Table 4. Overall Results

URL (Link to More Details)	95% Page Time (sec)
http://50.6.255.131/Admin/Candidates	1.38

Table 5. Key Statistic Top 5 Slowest Pages

Name	95% Test Time (sec)
WebTest2_Avg	1.39

Table 6. Key Statistic: Top 5 Slowest Tests

Name	Scenario	Total Test	Failed Test(% of Total)	Avg. Test Time (sec)
Web Test2_Avg	Scenario	12,222	4(0.033)	0.67

Table 7. Test Result

URL	Scenario	Test	Avg. Page Time(sec)	Count
http://50.6.255.131/Admin/Candidates	Scenario 1	WebTest2	0.66	12221

Table 8. Page Result

Machine Name	% Processor Time	Available Memory at Test Completion (Mb)
mssql1007.ixwebhosting.com	59.0	851

Table 9. Controller and Agents Resources

6. Improved Query Response Time

Thus from the above analysis the query response time is directly proportional to the line of codes which are executed. $QRT \propto LOC$ (Line of codes) [11]

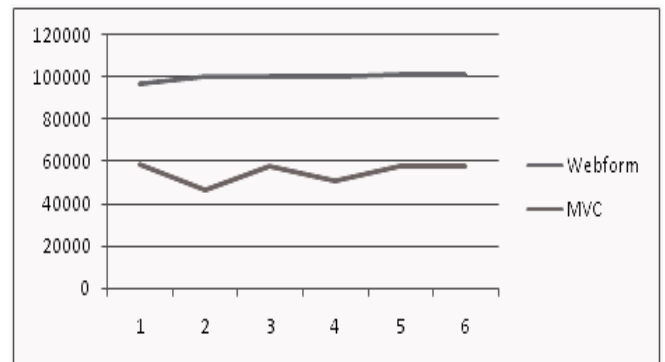


Figure 8. Web Page Rendering Comparison Chart

7. CONCLUSION

The results of the present work show that higher web performance is achieved using MVC, ORM and entity framework. The development cost reduces because of object relation mapping with the database objects in the MS SQL Server. The ease of the design pattern causes the best rendering of the webpages in different browsers and different devices. So responsive and mobile first web development has become easier and the management of complex dynamic websites becomes faster and more revenue and customer interest.

8. REFERENCES

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