UECS3294 ADVANCED WEB APPLICATION DEVELOPMENT
CHAPTER 1 : OVERVIEW OF WEB APPLICATION FRAMEWORKS

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What Is A Software Framework?

1)An abstraction in which software providing generic functionality can be selectively changed by additional user-written code, thus providing application-specific software.

2)A universal, reusable software environment that provides particular functionality as part of a larger software platform to facilitate development of software applications, products and solutions

3)May include support programs, compilers, code libraries, tool sets, and application programming interfaces (APIs) that bring together all the different components to enable development of a project or solution.

What Is A Web Application Framework?

1)A software framework that is designed to **support the development of web applications** including web services, web resources and web APIs.

2)Aims to alleviate the overhead associated with common activities performed in web development; for e.g., many web frameworks **provide libraries** for database access, **templating frameworks** and **session management**, and they often promote **code reuse**.

Web Application Architecture

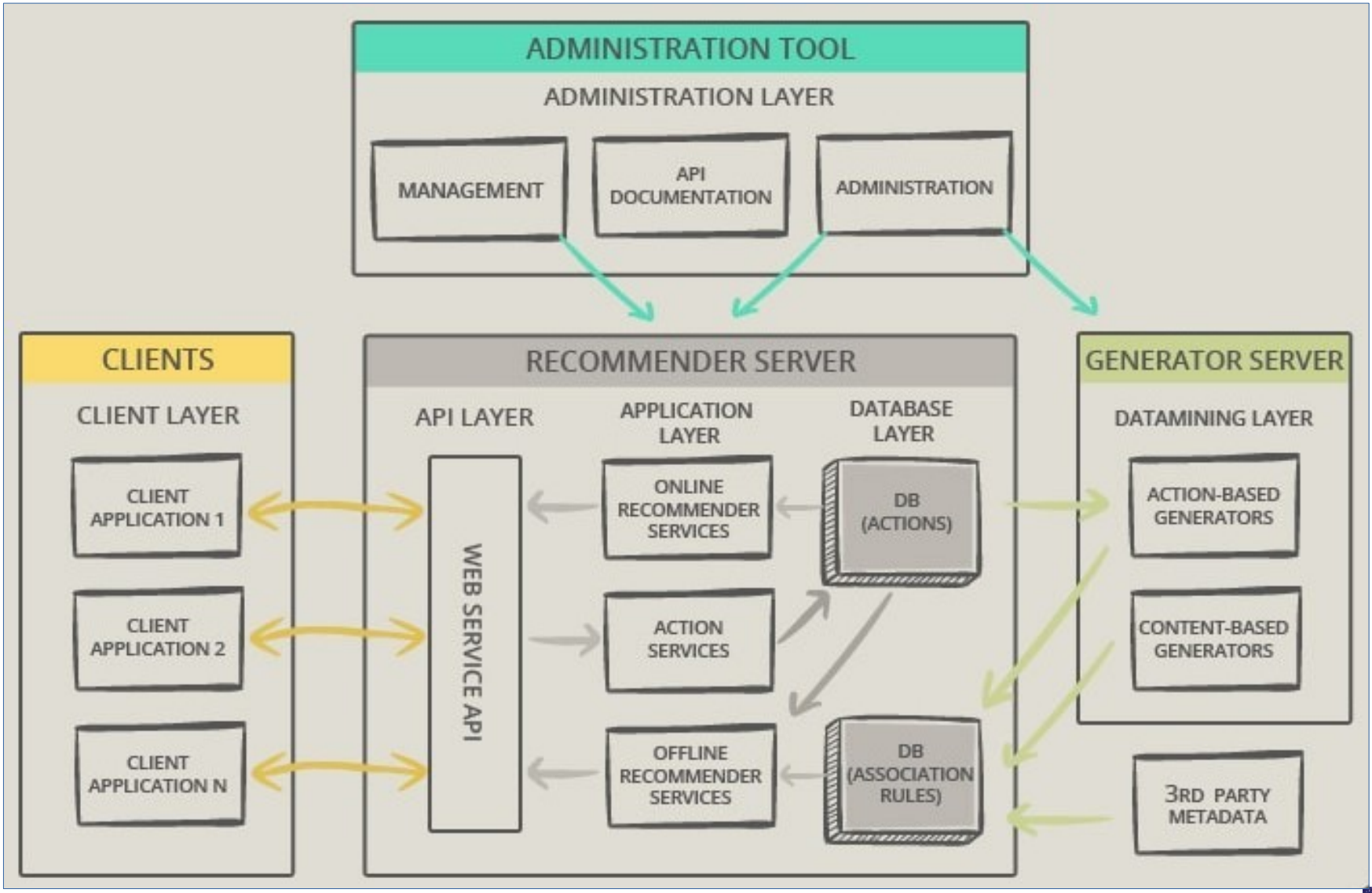


Image taken from https://existek.com/blog/web-application-architecture/

Web Frameworks Architecture

1)Most web frameworks are based on model-view-controller (MVC) architecture

- This architecture is three-tier organization
- Separates the data model with business rules from the user interface
- Considered a good practice as it modularizes code, promotes code reuse, and allows multiple interfaces to be applied
- Permits different views to be presented, such as web pages for direct access, and web service interfaces for remote applications

Web Frameworks Architecture

2)Three-tier Organization

- Applications are structured around three physical tiers: client, application, and database
- Application contains the business logic, running on a server and communicates with the client using HTTP
- Client on web applications is a web browser that runs HTML generated by the application layer

Common Features of Web Application Frameworks

1)Web template system
2)Caching
3)Security – authentication & authorization
4)Database access, mapping & configuration
5)URL mapping
6)AJAX
7)Web services
8)Web resources

Non-exhaustive list of Web Application Frameworks

There are many web application frameworks that are developed for various programming languages. The following table shows a non-exhaustive list of some of the web application frameworks in use in various web development projects.

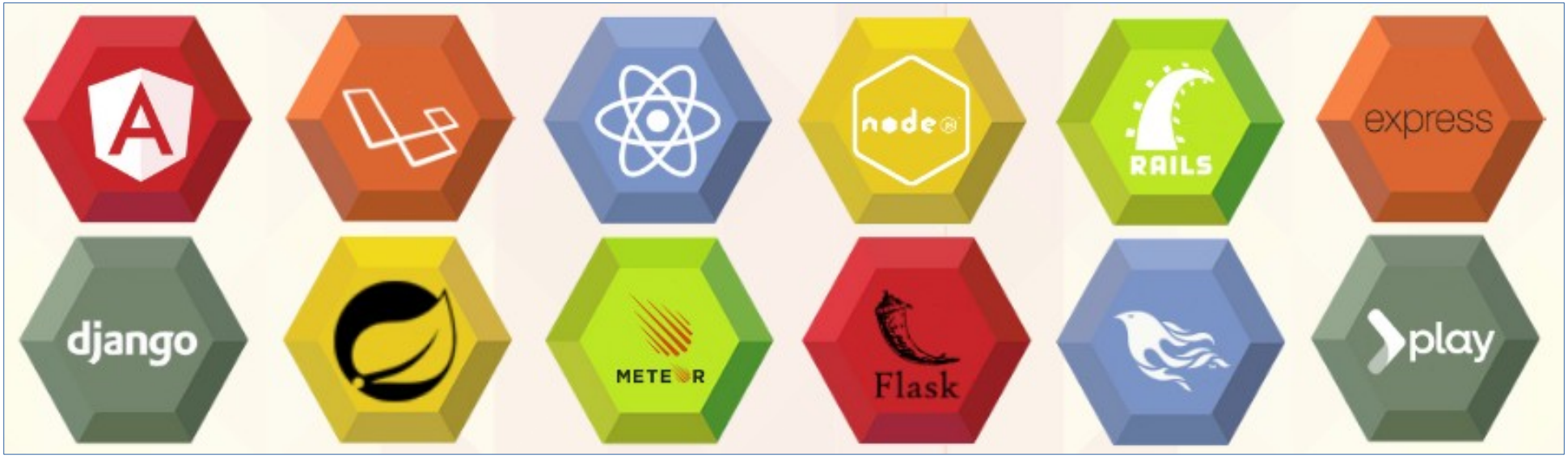


Image taken from https://www.konstantinfo.com/blog/top-web-development-frameworks/

Non-exhaustive list of Web Application Frameworks

Name	Programming Language
CakePHP	PHP
CodeIgniter	PHP
Laravel	**PHP**
Symfony	PHP
Yii	PHP
Zend Framework	PHP
Django	Python
Flask	Python
Pyramid	Python
Node.js	JavaScript
JavaServer Faces	Java
Ruby on Rails	Ruby

Image taken from https://magora-systems.com/website-vs-web-application-the-difference/

Introduction to Laravel

1) Laravel is a free, open-source PHP web framework, created by Taylor Otwell and intended for the development of web applications following the model–view–controller (MVC) architectural pattern
2) Some of the features of Laravel are a modular packaging system with a dedicated dependency manager, different ways for accessing relational databases, utilities that aid in application deployment and maintenance, and its orientation toward syntactic sugar
3) As of March 2015, Laravel is regarded as one of the most popular PHP frameworks, together with Symfony, Zend, CodeIgniter, Yii and others
4) The source code of Laravel is hosted on GitHub and licensed under the terms of MIT License

Why Laravel?

1) For an answer to this question, there are a number of things to consider. But we can summarize them as follows:

- Learning curve
- Productivity
- Performance
- Caching support
- Scalability
- Security

2) What is important for you to take note is that, you have the above non-exhaustive list of things to consider when choosing a web application framework. There is no one size fits all framework for every kind of web applications. The decision is for you or your project team members to make after considering the various aspects.

3) However, for this course, we choose Laravel, a web application framework based on the PHP scripting language to illustrate how a web application framework is used in web application development.

Why Laravel?

4)We take note that more than 80% of web applications are powered by PHP although frameworks such as Django (Python) & Node.js (server-side JavaScript) are also gaining popularity.

5)Laravel may not necessarily be the best framework in all aspects, but it is the most popular web application framework. Despite being the most popular, older frameworks such as Yii (PHP), CakePHP (PHP) and JavaServer Faces (Java) are still significantly used.

6)In your career as a web developer, you will probably find yourself learning & using different frameworks based, including those other than PHP. Remember, there is no one size fits all.

Laravel Releases

1)For **Long Term Support** (LTS) releases, Laravel provides bug fixes for **2 years** & security fixes for **3 years** from the release date.

2)For other releases, bug fixes are only provided for **6 months** while security fixes are provided for **1 year**.

Version	Release	Bug Fixes Until	Security Fixes Until
6 (LTS)	September 3rd, 2019	October 5th, 2021	September 3rd, 2022
7	March 3rd, 2020	October 6th, 2020	March 3rd, 2021
8	September 8th, 2020	April 6th, 2021	September 8th, 2021

Information available on https://laravel.com/docs/8.x/releases

Features of Laravel Framework

1. Modular Packaging
2. Eloquent ORM
3. Query Builder
4. Application Logic
5. Reverse Routing
6. RESTful Controllers
7. Class Auto Load
8. View Composers
9. Blade Template Engine
10. IoC Containers
11. Database Migrations
12. Database Seeding
13. Unit Testing
14. Automatic pagination
15. Form request
16. Artisan CLI
17. Homestead

Features of Laravel Framework

1) Bundles provide a modular packaging system since the release of Laravel 3, with bundled features already available for easy addition to applications. Furthermore, Laravel 4 uses Composer as a dependency manager to add framework-agnostic and Laravel-specific PHP packages available from the Packagist repository.
2) Eloquent ORM (object-relational mapping) is an advanced PHP implementation of the active record pattern, providing at the same time internal methods for enforcing constraints on the relationships between database objects. Following the active record pattern, Eloquent ORM presents database tables as classes, with their object instances tied to single table rows.
3) Query builder, available since Laravel 3, provides a more direct database access alternative to the Eloquent ORM. Instead of requiring SQL queries to be written directly, Laravel's query builder provides a set of classes and methods capable of building queries programmatically. It also allows selectable caching of the results of executed queries.
4) Application logic is an integral part of developed applications, implemented either by using controllers or as part of the route declarations. The syntax used to define application logic is similar to the one used by Sinatra framework.

Features of Laravel Framework

5) Reverse routing defines a relationship between the links and routes, making it possible for later changes to routes to be automatically propagated into relevant links. When the links are created by using names of existing routes, the appropriate uniform resource identifiers (URIs) are automatically created by Laravel.
6) RESTful controllers provide an optional way for separating the logic behind serving HTTP GET and POST requests.
7) Class auto loading provides automated loading of PHP classes without the need for manual maintenance of inclusion paths. On-demand loading prevents inclusion of unnecessary components, so only the actually used components are loaded.
8) View composers serve as customizable logical code units that can be executed when a view is loaded.
9) Blade templating engine combines one or more templates with a data model to produce resulting views, doing that by transpiling the templates into cached PHP code for improved performance. Blade also provides a set of its own control structures such as conditional statements and loops, which are internally mapped to their PHP counterparts. Furthermore, Laravel services may be called from Blade templates, and the templating engine itself can be extended with custom directives.

Features of Laravel Framework

10) IoC containers make it possible for new objects to be generated by following the inversion of control (IoC) principle, in which the framework calls into the application- or task-specific code, with optional instantiating and referencing of new objects as singletons.

11) Migrations provide a version control system for database schemas, making it possible to associate changes in the application's codebase and required changes in the database layout. As a result, this feature simplifies the deployment and updating of Laravel-based applications.

12) Database seeding provides a way to populate database tables with selected default data that can be used for application testing or be performed as part of the initial application setup.

13) Unit testing is provided as an integral part of Laravel, which itself contains unit tests that detect and prevent regressions in the framework. Unit tests can be run through the provided artisan command-line utility.

14) Automatic pagination simplifies the task of implementing pagination, replacing the usual manual implementation approaches with automated methods integrated into Laravel.

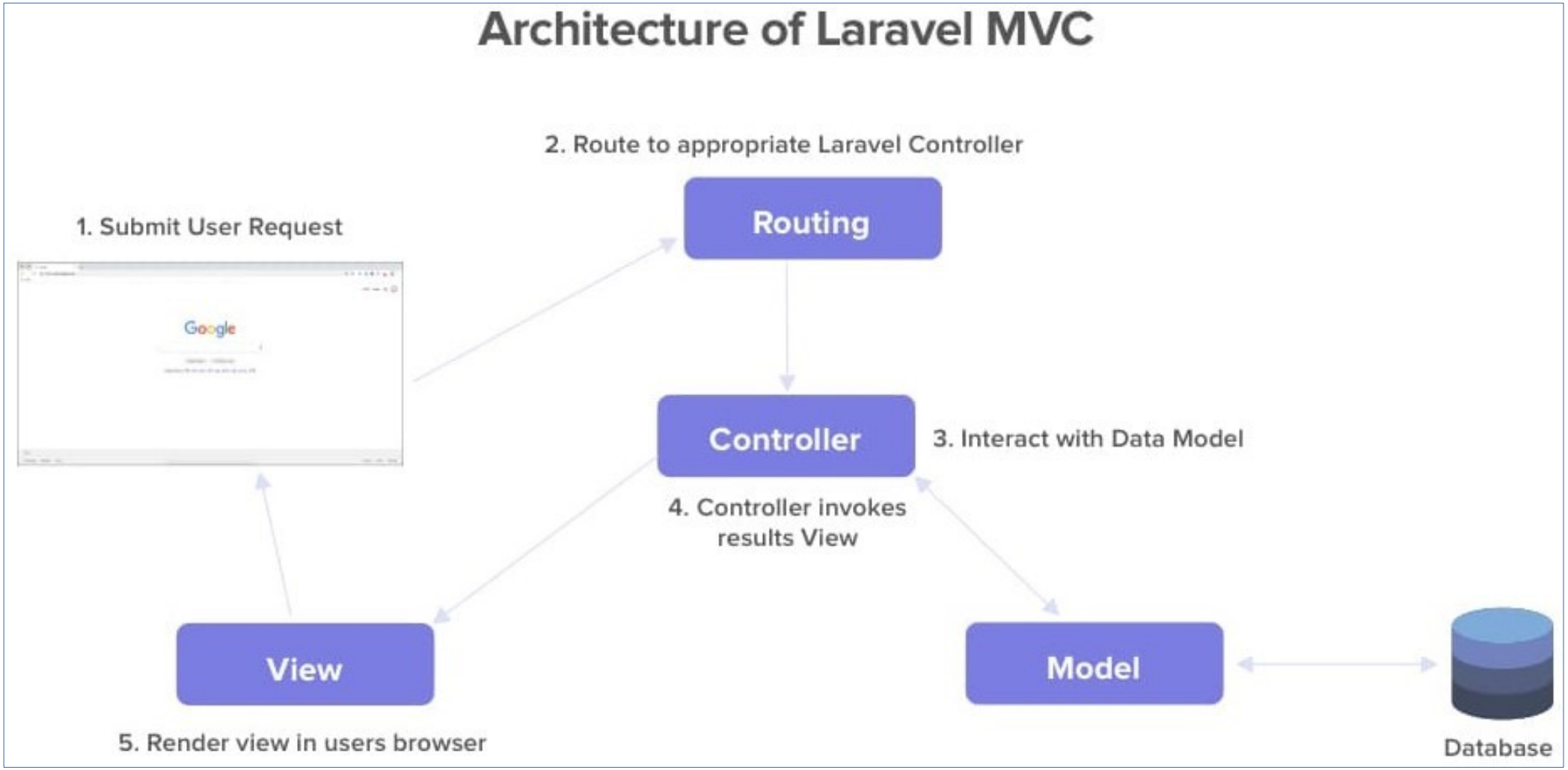
Features of Laravel Framework

15) Form request is a feature of Laravel 5 that serves as the base for form input validation by internally binding event listeners, resulting in automated invoking of the form validation methods and generation of the actual form.

16) Artisan CLI is Laravel's command-line interface (CLI). The features of Artisan are mapped to different subcommands of the artisan command-line utility, providing functionality that aids in managing and building Laravel-based applications. Common uses of Artisan include managing database migrations and seeding, publishing package assets, and generating boilerplate code for new controllers and migrations; the latter frees the developer from creating proper code skeletons. The functionality and capabilities of Artisan can also be expanded by implementing new custom commands, which, for example, may be used to automate application-specific recurring tasks.

17) Homestead - a Vagrant virtual machine that provides Laravel developers with all the tools necessary to develop Laravel straight out of the box, including, Ubuntu, Gulp , Bower and other development tools that are useful in developing full scale web applications.

Laravel Framework Architecture



Information available on https://www.netsolutions.com/insights/laravel-framework-benefits/

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