

Build Bug Reporting System

MSc in Web and Mobile Development

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Software Development Process

Software Development Process is all about imposing a structure in the development of software. It is an important process as it aims to create a software product that meets user's objectives. This process consists of some stages that need to be considered to develop a solution for users.

Planning

When the coursework was handed out, the first step done was project planning, where the focus was on a big picture where ideas for the project goal began.

Goal of the project

The goal of this project was to develop a Bug Reporting System that will be used by QAs, DEVs, and POs. This system will give the opportunity to view reported bugs, filter and sort them, delete, update specific bug and report a new bug.

Project Scheduling

Project scheduling is fundamental for planning and taking control in project management. To be sure that all the necessary work will be done, [Project Management Log](#) document was filled during the project development period.

Choosing IDE

When it came to choose an integrated development environment (IDE) for this project, it was not so difficult because during the course we used Visual Studio Code where I had the opportunity to see that this IDE gives a lot of useful extensions and features that speeds the process of development.

By just right clicking and pressing Format Document, a better format and indented code was set. Additional to that, I have installed SCSS Formatter extension and by just selecting all page and using the shortcut “Shift+Alt+F”, code in SCSS file was formatted and indented.

Requirements Analysis

In the software development process, requirements analysis is a fundamental part. On this way, I have tried to analyse coursework’s requirements carefully. After that, I started to have a general idea on setting tasks for completing this project. As I already mentioned, [Project Management Log](#) document was used as a tool to keep track of time and tasks.

At the same time, I reviewed the lessons that we had in this course in order to know how to resolve and develop the requested tasks.

The system that we were requested to develop, should communicate via HTTP with already developed APIs.

Before continuing, I used Postman Tool to check API Calls (available endpoints).

Design and Prototype

After I figured out what features Bug Reporting System should have, I started thinking on user experience. One way of crafting the user experience was to begin with sketches of how pages and content should look in this application. As home page of the application, Bug List Page is shown, on which all the bugs and their information are shown. Part of this page are items that give users opportunities to filter bugs, sort bugs bidirectionally, navigate through pages, update bugs and delete bugs. Update Bug Page is another page, which will be shown after the user wants to update a specific bug. For reporting a new bug, Report Bug Page is created that is responsible of this action.

Using Bootstrap with Angular

Bootstrap is the most popular CSS framework for web front-end development. It is great and simplifies developing responsive, mobile-first web sites. Bootstrap can be used together with Angular, so based on its benefits I decided to use it.

To add Bootstrap in Angular project I used npm command in VS Code terminal. Then I imported it in style.scss where global styles of the application are set.

Using Font Awesome Icons in Angular

To indicate the purpose of the buttons, I wanted to set some icons in them. To do that I have used Font Awesome icons. First of all, I used npm command to install it in my project and then I have imported FontAwesomeModule in app.component.ts. These kinds of icons used are: plus, trash, pencil, sorting ascending and descending and search.

Using Angular Material

For showing messages, while validating forms on submit, I used MatSnackBar from Angular Material. Firstly, I needed to set up Angular Material in the project. Then I imported MatSnackBarModule in app.module.ts .

Using Angular CLI

In order to initialize, develop and maintain this Angular application directly from the terminal I used Angular CLI which is a command-line interface tool. For doing those processes, I used Angular CLI commands like: ng new, serve, generate etc.

Development

After requirements have been analysed and tasks have been set, I have started coding.

By using ng new command the application was created, and then with ng serve -o the development server was started and it looked after project's source files, rebuilt the app if there were any modified files. Ng serve uses default port number 4200 to run Angular application. So the application URL will be <http://localhost:4200>.

Then as Angular provides a built-in Live Reload Web Server, it made it to quickly and easily to see changes updated in the browsers as soon as I made changes in code.

Model

In order to hold data corresponding to the ones that are in API, I have created models of Bug and Comments.

Bug has id, title, description, priority, reporter, status, updatedAt and createdAt. While comment has id, description and reporter.

Routing

Navigation Bar consists of Bug List and Report Bug. It will be hidden for mobile devices and by clicking hamburger menu, it will be shown again.

Here routerLink was used to make navigation item a link that initiates navigation to a route (bugs and addBug) defined in app-routing module and routerLinkActive directive to highlight which route is currently active.

Service

By using `ng g service bug` command I created `bug.service.ts`.

As I needed to communicate via HTTP protocol with APIs, I used HTTPClient Service class provided by Angular. On this way, HttpClient service uses observables for all calls to handle requests and responses. GET, POST, PUT, DELETE http methods are used and the given available endpoints (APIs) to make different requests. Apart from that sort, search and pagination methods are created. Regarding these methods, I will talk more about in Testing section.

Bug List Page

Bug List Page contains a table with information corresponding to the headers Title, Priority, Reporter, Created Date and Status. Interpolation is used to take values of bugs. Here I can mention that as from API, priority has values 1, 2, 3 I have made a function to give string description for each value and to show them in table. Also pipe is used for changing date format of Created Date.

Reactive forms are used to handle form inputs. `FormGroup` is bounded in form to create communication between model and form containing the inputs. `FormControlName` is used to bind each input to the form control defined in `FormGroup`. And `FormBuilder` is used to construct new `FormGroup` instance and `FormControls`.

Except them, above the table I have added the possibility to search bugs based on Title as the main search then by clicking button Extend filters, there will be shown other search criteria (properties). `*ngIf` directive was used to evaluate condition of collapse for showing or not the div with search fields. Values in these search filters of priority, reporter, status are taken from arrays defined in component where `*ngFor` directive was used to get all items of these arrays. For looking after search input changes while filtering, `valueChanges` event is used where it looks after the property that you are filtering on and the searched value or selected value by index then by calling `advancedSearchBug()` method shows the filtered bugs. Last but not least, in order to clear filters immediately `clearFilters()` is called to reset the filtering part (form).

In head of the table, I set sort icons on each property headers: Title, Priority, Reporter, Created Date and Status. `ngClass` directive was used to change CSS class of icon as ascending or descending based on clicked property. Additional to that, button icon click event triggers `sortBug()` function for sorting purpose.

For pagination, with `*ngFor` directive page-items are displayed based on the total number of items divided by items in one page. On these items clicked `selectPage()` function will be triggered for pagination purpose. Class binding `[class.active]` was used for setting page-items as active but `[class.disabled]` was used to disable them while

filtering and searching, then for previous and next page when you are at the first page and last page.

Delete Bug

From Bug List Page, there is the possibility to click on Delete Button, which will trigger function `deleteBug()` which deletes a bug based on its specific id.

Update Bug Page

From Bug List Page, there is the possibility to click on Update Button, which by using router will navigate to `updateBug/id` path. For this page, I have used reactive forms as well. To set values got from API I used `patchvalue()` method from Angular Formgroup. At the same time, here property bindings `[value]` were used to bind values in view template. Except reactive forms, I wanted to see how template driven forms work and I used them for comments. Compared with reactive forms, here `#Comment` was set to “`ngModel`” and then called to validate the comment, also `[(ngModel)]` was used as two-way data binding to keep synced the view with model. Regarding comments, you can update the existing comment, add new comment or delete comment by clicking on corresponding buttons, on which functions are triggered. As far as I was able to see for template driven approach, logic is driven from the template, on the other hand for reactive-driven approach, logic is in the component class.

For submitting the update form (submit event bind by `ngSubmit` triggers `onSubmitUpdate()` function), the form should be valid. This means that all the fields must be filled where `Validators.required` was set except for status field, for which the value is requested to be selected if reporter is QA, for which I have used `valueChanges` event that looks after form changes, on this case for reporter field and based on it makes validation for status field. Additional to that, `*ngIf` directive was set to evaluate condition of each field and submit event.

Last but not least, on submit Updated Date will get the day that you update the bug by using new Date() to get current date.

Create Bug Page

From the navigation bar, expect Bug List, there is Report Bug from which you can navigate to Create Bug Page. Reactive Forms were used for all fields, expect for comments for which template driven were used as in Update Bug Page. Regarding comments same opportunities remain here, adding more than one comment, deleting added comment by mistake.

For submitting the create form (submit event bind by ngSubmit triggers onSubmitCreate() function), the form should be valid by setting Validators.required for each Form Control. Additional to that, *ngIf directive was set to evaluate condition of each field and submit event.

As for Updated Date in Update Bug Page, here Create Date is read only field.

Last but not least, on submit Create Date will get the day that you create the bug by using new Date() to get current date. Furthermore, based on the format that API stores updatedAt and createdAt values, I have used toISOString() method to return in the same format as it is in API.

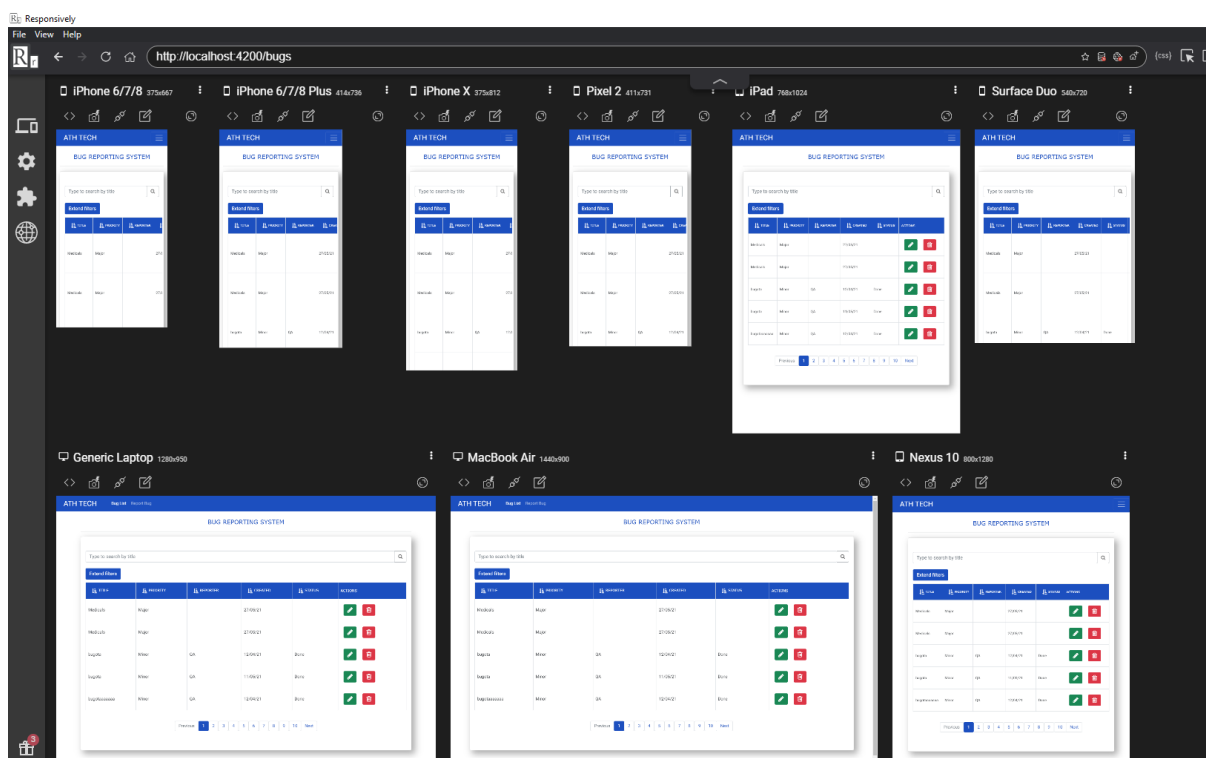
Testing

Responsiveness Testing

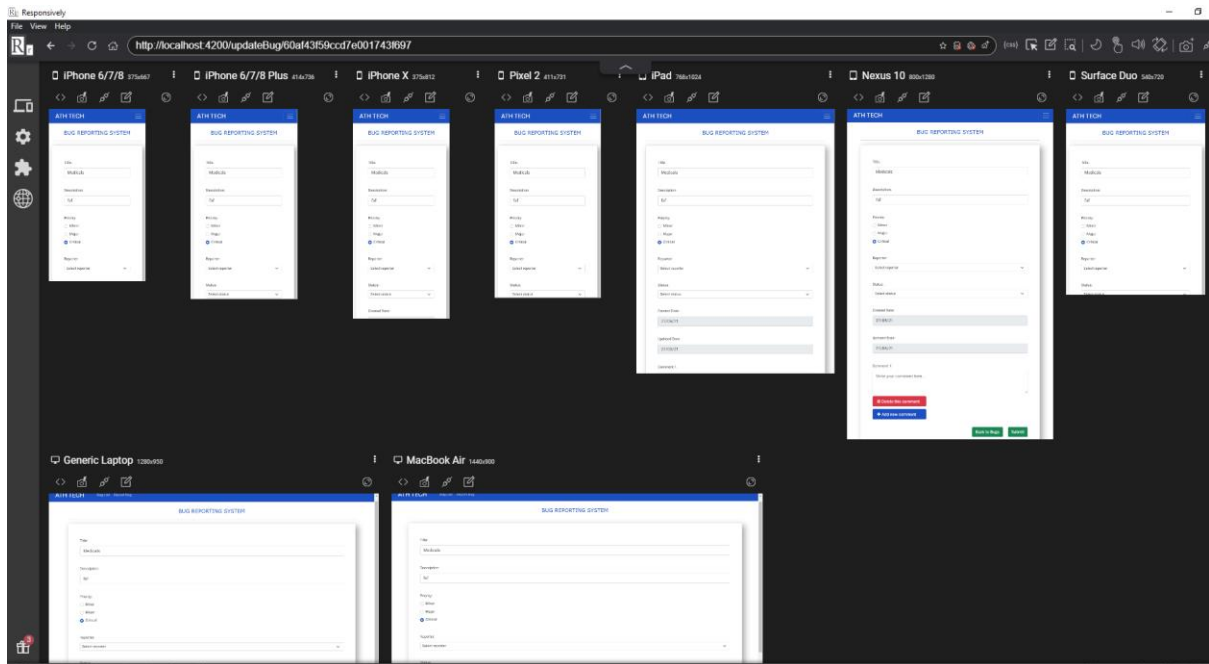
In order to see if the application is shown as expected and good on the other devices as I was able to see in my laptop, except reducing the browser size, for this purpose I have used Responsively App, to see how each page in the application is shown in different devices, as well. Bootstrap usage makes it easier to manage this issue of responsiveness, at the same time, Media Query was set followed by maximum (for screen size equal or less than the defined value) width, i.e. for font style inside the table in the Bug List Page. Additional to that, relative length units that specify a length relative to another length property (rem) or absolute length units that are fixed and appear exactly to that size (px) were applied and rechecked if they look good in different screen sizes.

Below you may see screenshots while testing each page on different devices:

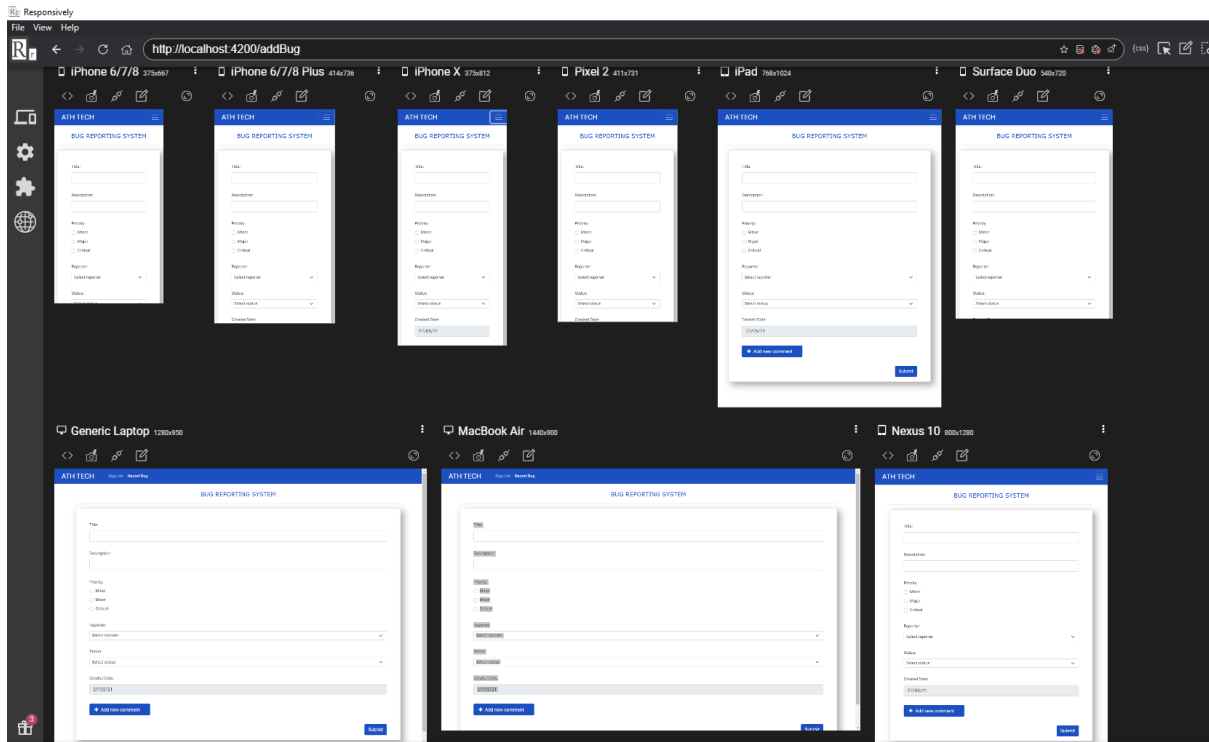
Bug List Page:



Update Bug Page:



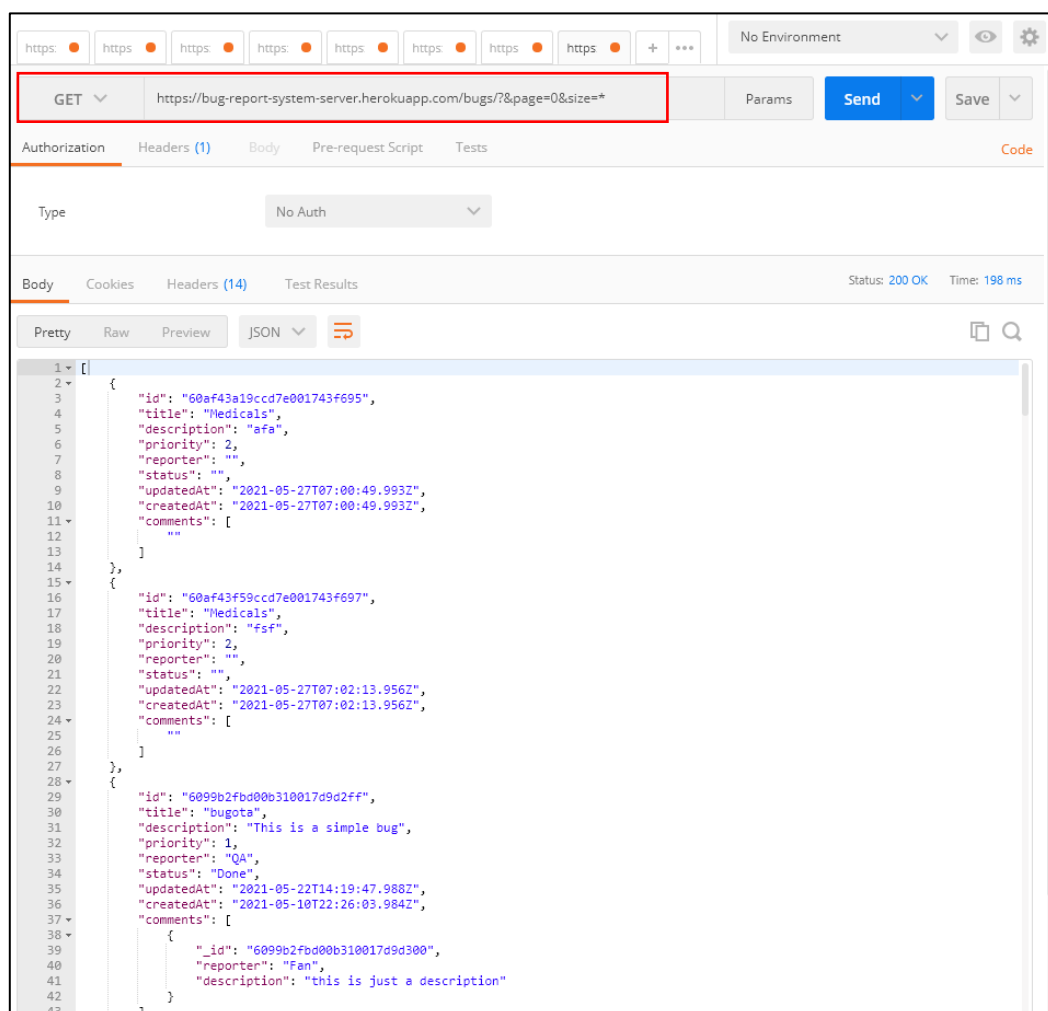
Report Bug Page:



API Testing

While developing this application for the features that were linked to APIs, I tested them using Postman Tool.

Endpoint: <https://bug-report-system-server.herokuapp.com/bugs> shows only 10 last bugs. Thus to show all created bugs in Bug List Page I called the endpoint: https://bug-report-system-server.herokuapp.com/bugs/?&page=0&size=* by get http method in service.



BugReportingSystem
localhost:4200/bugs

ATH TECH

BUG REPORTING SYSTEM

Extend filters

TITLE	PRIORITY	REPORTER	CREATED	STATUS	ACTIONS
Medicals	Major		27/05/21		<div></div> <div></div>
Medicals	Major		27/05/21		<div></div> <div></div>
bugota	Minor	QA	12/04/21	Done	<div></div> <div></div>
bugota	Minor	QA	11/05/21	Done	<div></div> <div></div>
bugotaaaaaaa	Minor	QA	12/04/21	Done	<div></div> <div></div>

Previous
1
2
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7
8
9
10
Next

Endpoint: <https://bug-report-system-server.herokuapp.com/bugs/:id> is used to get specific bug by id after we select Edit button in Bug List Page, by using get http method in service.

The screenshot shows a web browser window with the title 'BugReportingSystem'. The address bar displays 'localhost:4200/updateBug/6074a8c58bbde600172206d9', where the ID '6074a8c58bbde600172206d9' is highlighted with a red rectangle. The form contains the following fields:

- Title:** A text input field containing 'bugota'.
- Description:** A text input field containing 'This is a simple bug'.
- Priority:** A radio button group with three options: 'Minor', 'Major' (selected), and 'Critical'.
- Reporter:** A dropdown menu showing 'QA'.
- Status:** A dropdown menu showing 'Done'.
- Created Date:** A date input field showing '12/04/21'.
- Updated Date:** A date input field showing '26/05/21'.
- Comment 1:** A text area containing 'this is just a description'.

At the bottom of the form, there is a red button with a trash icon and the text 'Delete this comment'.

https https https https https https https https https + ... No Environment

GET https://bug-report-system-server.herokuapp.com/bugs/6074a8c58bbde600172206d9 Params Send Save

Authorization Headers (1) Body Pre-request Script Tests Code

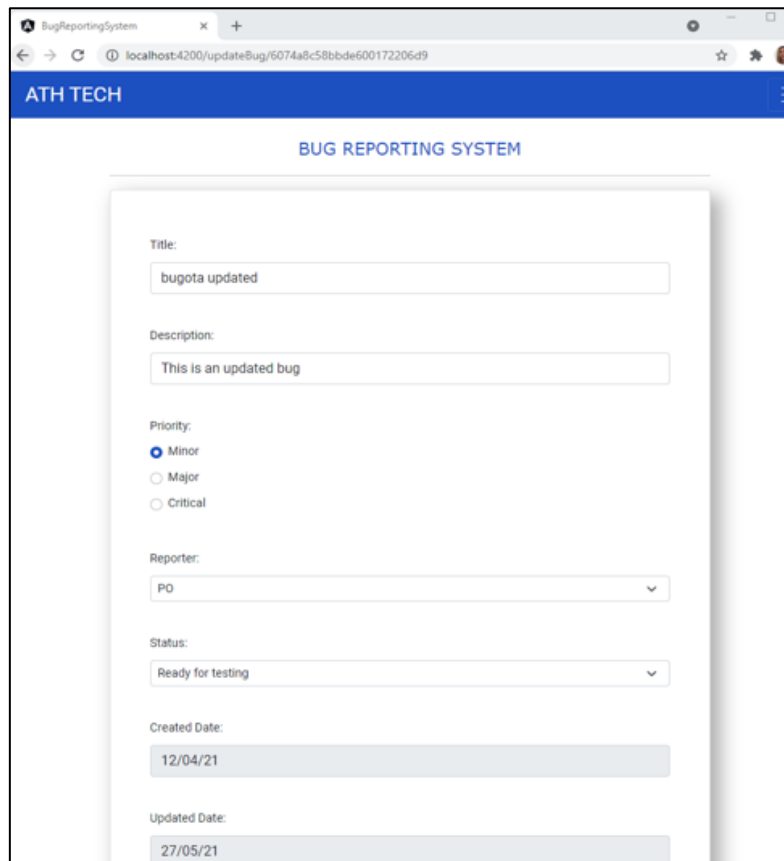
Type No Auth

Body Cookies Headers (9) Test Results Status: 200 OK Time: 330 ms

Pretty Raw Preview JSON

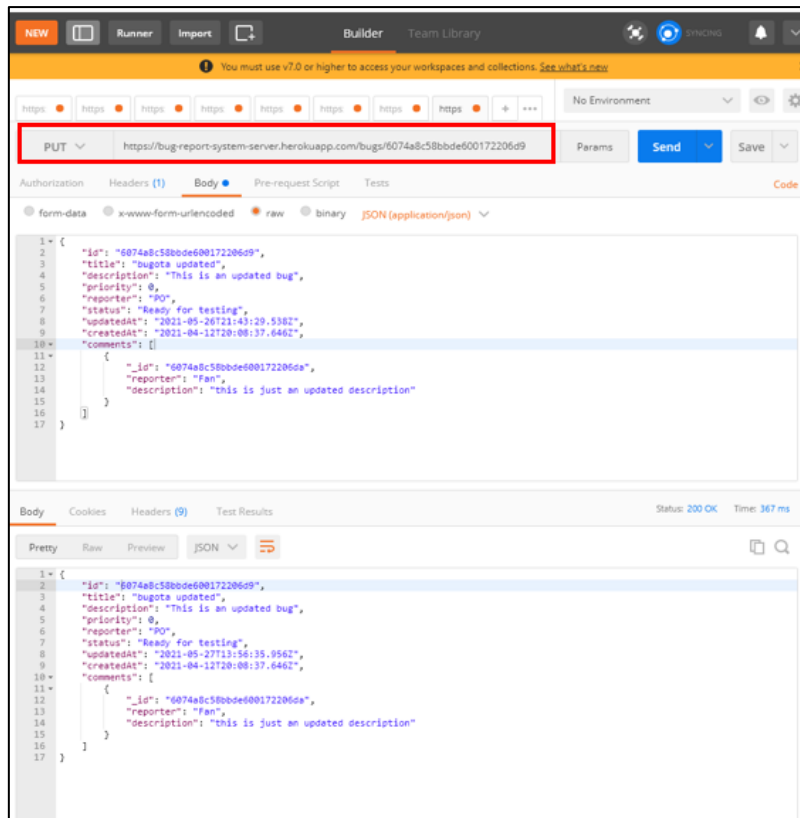
```
1 {
2   "id": "6074a8c58bbde600172206d9",
3   "title": "bugota",
4   "description": "This is a simple bug",
5   "priority": 1,
6   "reporter": "QA",
7   "status": "Done",
8   "updatedAt": "2021-05-26T21:43:29.538Z",
9   "createdAt": "2021-04-12T20:08:37.646Z",
10  "comments": [
11    {
12      "_id": "6074a8c58bbde600172206da",
13      "reporter": "Fan",
14      "description": "this is just a description"
15    }
16  ]
17 }
```


Put http method was used in service to update the bug. Fields can be updated. Comments can be deleted, modified, or created as new ones.

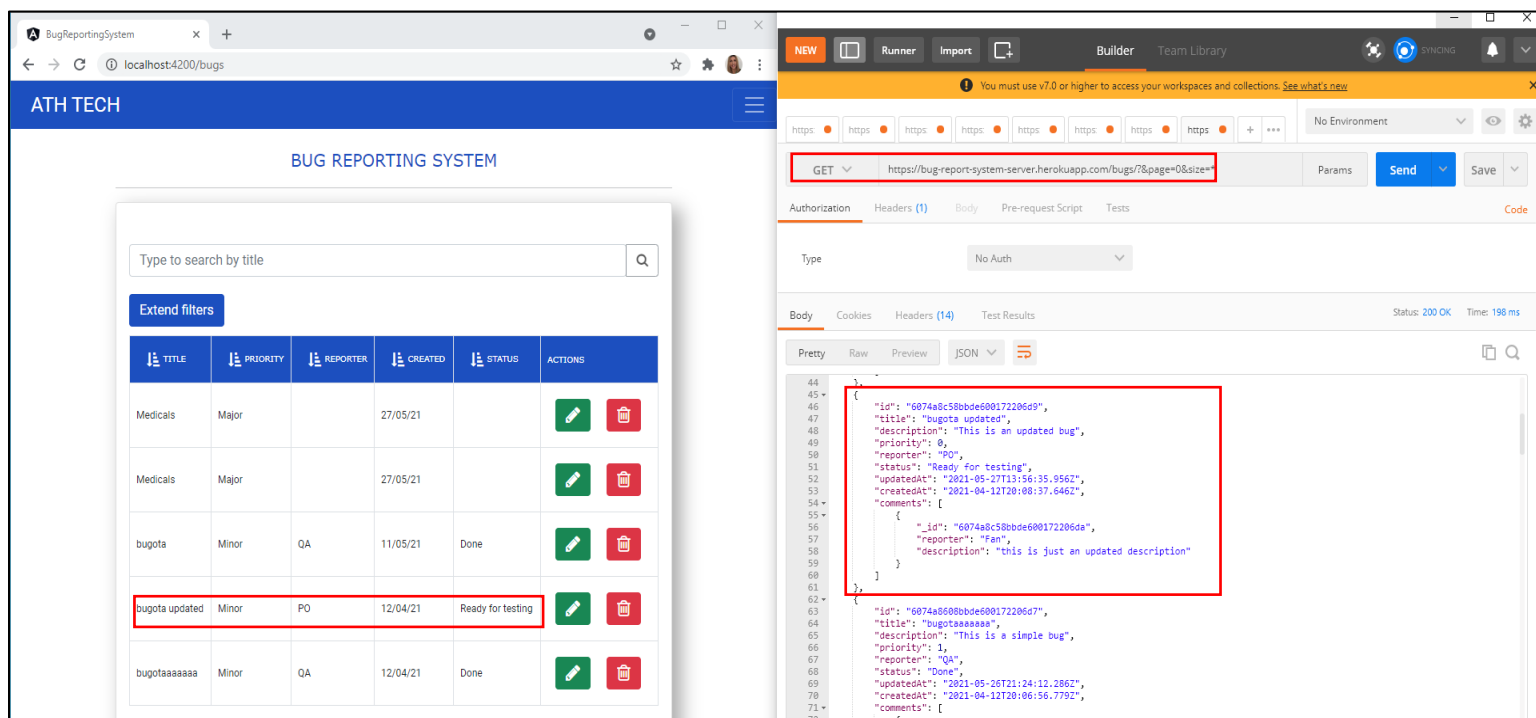


The screenshot shows a web browser window with the title 'BugReportingSystem'. The address bar shows 'localhost:4200/updateBug/6074a8c58bbde600172206d9'. The page has a blue header with 'ATH TECH' and a main heading 'BUG REPORTING SYSTEM'. The form contains the following fields:

- Title: bugota updated
- Description: This is an updated bug
- Priority: ☒ Minor, ☐ Major, ☐ Critical
- Reporter: PO (dropdown)
- Status: Ready for testing (dropdown)
- Created Date: 12/04/21
- Updated Date: 27/05/21



After I got back to Bug List Page and checked Postman, I was able to see the updated bug.



Apart from that, while updating the comments, there is the opportunity to delete them or create new ones.

The screenshot shows a web browser window with the URL `localhost:4200/updateBug/6074a8c58bbde600172206d9`. The page title is "BUG REPORTING SYSTEM". The form contains the following fields:

- Title: `bugota updated`
- Description: `This is an updated bug`
- Priority: ☒ Minor, ☐ Major, ☐ Critical
- Reporter: `PO` (dropdown menu)
- Status: `Ready for testing` (dropdown menu)
- Created Date: `12/04/21`
- Updated Date: `27/05/21`

At the bottom of the form, there is a blue button labeled "Add new comment", a green button labeled "Back to bugs", and a green button labeled "Submit".

The screenshot shows a REST client window with the URL `https://bug-report-system-server.herokuapp.com/bugs/?&page=0&size=*`. The response is a JSON array of bug objects. The first object is highlighted with a red box:

```
{
  "id": "6074a8c58bbde600172206d9",
  "title": "bugota updated",
  "description": "This is an updated bug",
  "priority": 0,
  "reporter": "PO",
  "status": "Ready for testing",
  "updatedAt": "2021-05-27T14:56:08.345Z",
  "createdAt": "2021-04-12T20:08:37.646Z",
  "comments": []
}
```

BugReportingSystem x +

localhost:4200/updateBug/6074a8c58bbde600172205d9

Title:
bugota updated

Description:
This is an updated bug

Priority:
☒ Minor
☐ Major
☐ Critical

Reporter:
PD

Status:
Ready for testing

Created Date:
12/04/21

Updated Date:
27/05/21

Comment 1:
Update again

Delete this comment

Comment 2:
Update again

Delete this comment

Add new comment

```
GET https://bug-report-system-server.herokuapp.com/bugs/?&page=0&size=*

Type: No Auth

Body:
  Pretty Raw Preview JSON
  {
    "priority": 1,
    "reporter": "QA",
    "status": "Done",
    "updatedAt": "2021-05-22T14:19:47.988Z",
    "createdAt": "2021-05-10T22:26:03.984Z",
    "comments": [
      {
        "_id": "6099b2fbd00b310017d9d300",
        "reporter": "Fan",
        "description": "this is just a description"
      }
    ]
  },
  {
    "id": "6074a8c58bbde600172206d9",
    "title": "bugota updated",
    "description": "This is an updated bug",
    "priority": 0,
    "reporter": "PO",
    "status": "Ready for testing",
    "updatedAt": "2021-05-27T15:00:33.577Z",
    "createdAt": "2021-04-12T20:08:37.646Z",
    "comments": [
      {
        "_id": "60afb4119c27820017e66f6a",
        "reporter": "",
        "description": "Update again"
      },
      {
        "_id": "60afb4119c27820017e66f69",
        "reporter": "",
        "description": "Update again 2"
      }
    ]
  },
  {
    "id": "60afb1739c27820017e66f68",
    "title": "bugota updated",
    "description": "This is an updated bug",
    "priority": 0,
    "reporter": "PO"
  }
]
```

Expect update feature, there is delete feature from which a specific bug by id can be deleted by using delete http method in service.

By using post http method in service, a new bug can be created, after input fields are filled. Additional to that, more than one comment can be added or deleted if created by mistake.

ATH TECH

Report Bug

BUG REPORTING SYSTEM

Title:
New bug

Description:
Creating new bug

Priority:
☒ Minor
☐ Major
☐ Critical

Reporter:
QA

Status:
Ready for testing

Created Date:
27/05/21

Comment 1:
This is a new bug

Delete this comment

Add new comment

Submit

BugReportingSystem

localhost:4200/addBug

BUG REPORTING SYSTEM

Title:
New bug

Description:
Creating new bug

Priority:
☒ Minor
☐ Major
☐ Critical

Reporter:
QA

Status:
Ready for testing

Created Date:
27/05/21

Comment 1:
This is a new bug

Delete this comment

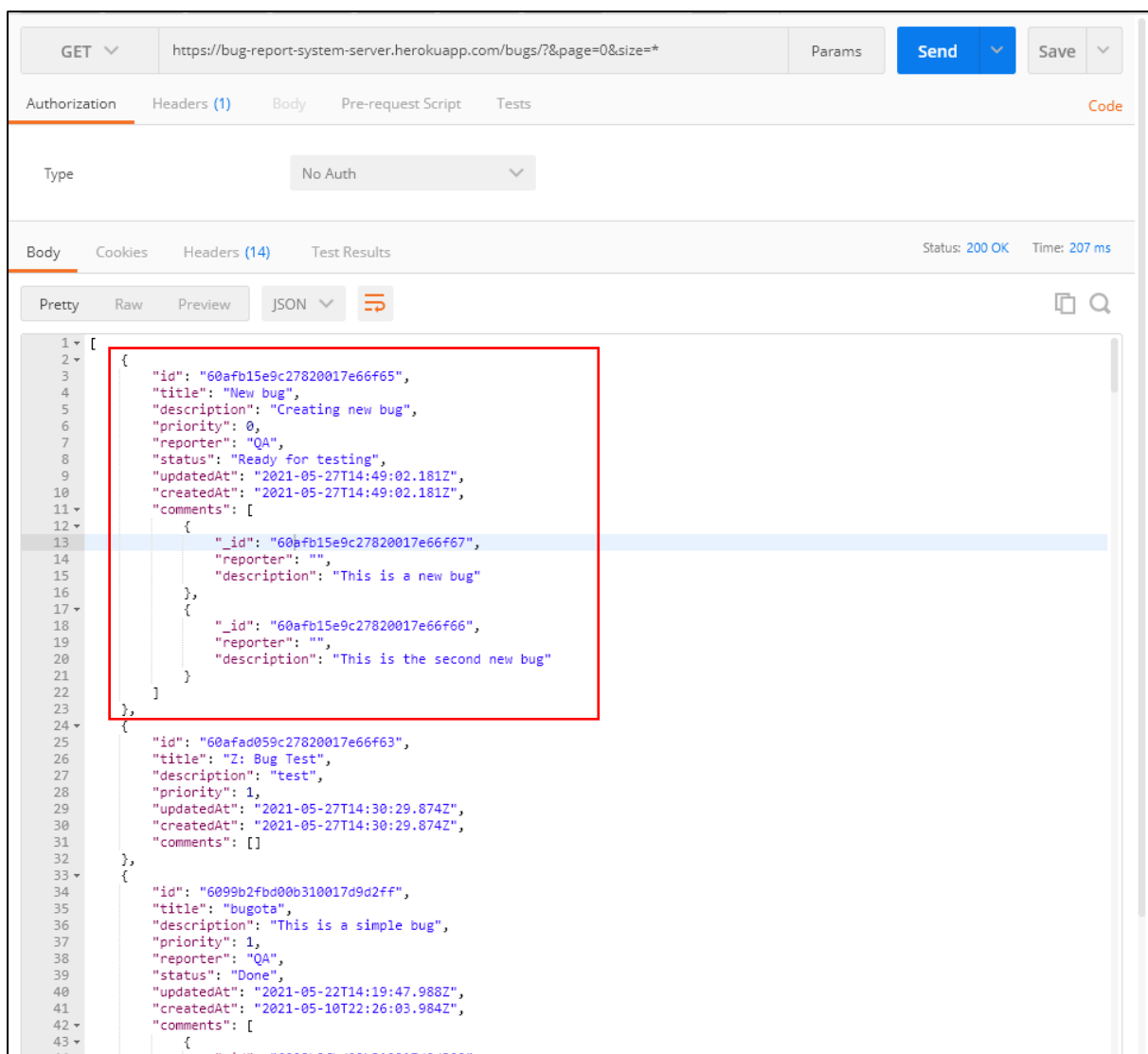
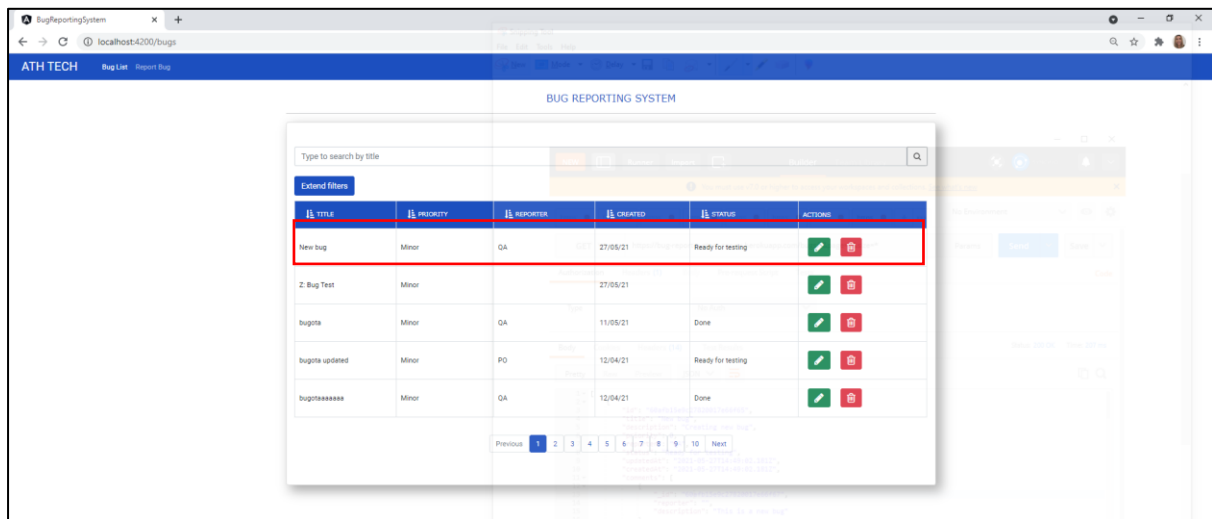
Comment 2:
This is the second new bug

Delete this comment

Add new comment

Submit

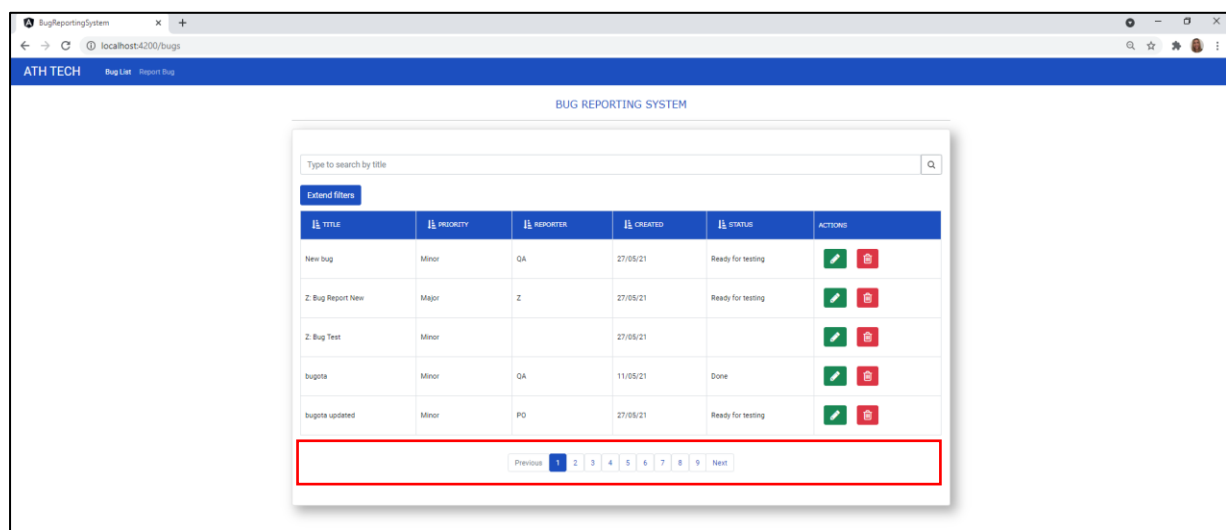
After I got back to Bug List Page and checked Postman, I was able to see the new created bug.



Except CRUD methods, I have made some other testing in Postman regarding Pagination, Sorting and Searching features that this application offers.

Pagination:

https://bug-report-system-server.herokuapp.com/bugs/?&page=0&size=* endpoint was used to get all bugs, then for page I passed page number as parameter and for size I passed number of bug items divided for each page As items per page, I have set 5. So, for example if there are 45 bugs in total then they will be divided in 9 pages as seen below:



In order to handle cases when total number of bug items divided by 5 does not return 0 as remainder then I have used `Math.ceil()` method. Thus, if there will be 46 item then, one bug item will be shown on the 10th page

Sorting:

https://bug-report-system/server.herokuapp.com/bugs/?&page=0&size=*

&sort=\${property},\${order} endpoint was used where for property parameter I passed the selected property and as order I passed ascending and descending based on sort icon clicked. Additional to that, the same remains for page number and size passed parameters as I already mentioned in pagination part.











On this way, in the header of the table when you select the icon attached to the property, bugs will be sorted.

Title descending sorted

BUG REPORTING SYSTEM

Type to search by title

Extend filters

🔍 TITLE	🔍 PRIORITY	🔍 REPORTER	🔍 CREATED	🔍 STATUS	ACTIONS
zxc	Major	PO	22/12/20	Ready for testing	 
xoxoxo	Major	PO	21/12/20		 
xovzxcvzx	Minor	DEV	22/12/20	Ready for testing	 
testtest	Major	DEV	23/03/21	Ready for testing	 
test bug	Minor	QA	22/12/20	Ready for testing	 

Previous 1 2 3 4 5 6 7 8 9 Next

https https https https https https https https + ... No Environment

GET https://bug-report-system-server.herokuapp.com/bugs/7&page=0&size=5&sort=title,desc Params Send Save

Authorization Headers (1) Body Pre-request Script Tests Code

Type No Auth

Body Cookies Headers (14) Test Results Status: 200 OK Time: 185 ms

Pretty Raw Preview JSON

```

1 [
2   {
3     "id": "5fe2231c7125f00017c51b66",
4     "title": "zxc",
5     "description": "zxczxc",
6     "priority": 2,
7     "reporter": "PO",
8     "status": "Ready for testing",
9     "updatedAt": "2020-12-22T16:47:24.608Z",
10    "createdAt": "2020-12-22T16:47:24.608Z",
11    "comments": []
12  },
13  {
14    "id": "5fe0be9ba93a200179717ee",
15    "title": "xoxoxo",
16    "description": "aaa",
17    "priority": 2,
18    "reporter": "PO",
19    "status": null,
20    "updatedAt": "2020-12-21T15:26:19.192Z",
21    "createdAt": "2020-12-21T15:26:19.192Z",
22    "comments": []
23  },
24  {
25    "id": "5fe1dd0f7125f00017c51b11",
26    "title": "xcvzxcvxz",
27    "description": "zcvzxv",
28    "priority": 1,
29    "reporter": "DEV",
30    "status": "Ready for testing",
31    "updatedAt": "2020-12-22T11:55:45.575Z",
32    "createdAt": "2020-12-22T11:48:31.519Z",
33    "comments": [
34      {
35        "_id": "5fe1dec17125f00017c51b17",
36        "reporter": "asdfsadf",
37        "description": "sdfsaf"
38      }
39    ]
40  },
41  {
42    "id": "6059cfe442e5e1001731de05",











```

The same can be done for other properties as well where actions done and results will go on the same way.

Type to search by title

Q

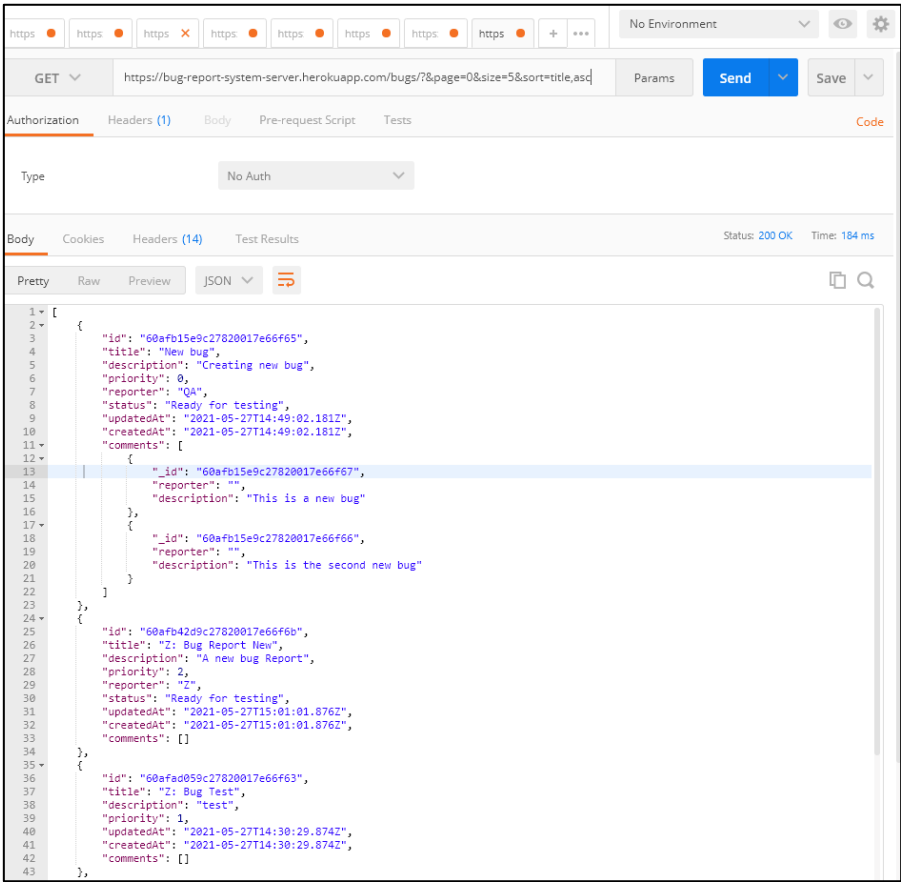
Extend filters

TITLE	PRIORITY	REPORTER	CREATED	STATUS	ACTIONS
New bug	Minor	QA	27/05/21	Ready for testing	 
Z: Bug Report New	Major	Z	27/05/21	Ready for testing	 
Z: Bug Test	Minor		27/05/21		 
bugota	Minor	QA	11/05/21	Done	 
bugota updated	Minor	PO	12/04/21	Ready for testing	 

Previous

123456789

Next



Advanced Search:

Following I have shown the most advanced opportunity that this application gives. Where the result is of bug is shown after I have filled title input field, selected priority, reporter and status.

As endpoint <https://bug-report-system-server.herokuapp.com/bugs/>

Is used as basic URL for this feature, then based on selected and written data properties and its values are appended in this URL as query parameters.

BUG REPORTING SYSTEM

Choose priority:

Minor

Choose reporter:

PO

Choose status:

Ready for testing

Hide filters

Clear filters

🔍 TITLE	🔍 PRIORITY	🔍 REPORTER	🔍 CREATED	🔍 STATUS	ACTIONS
huge_bugd	Minor	PO	22/12/20	Ready for testing	<div><div></div><div></div></div>

Previous

1

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7

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Next

References

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www.angular.io/cli

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www.angular.io/guide/reactive-forms

www.material.angular.io/components/snack-bar/overview