Ambiorix

Build for the web, the way the web works

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Introduction to Ambiorix

Web Framework for R

Ambiorix lets you build web applications and APIs entirely in R, giving you direct access to HTTP mechanisms.

Inspired by Express JS

Following the principles of the popular Node.js framework, Ambiorix brings request-response architecture to the R ecosystem.

Full HTTP Control

Handle routes, methods, parameters, and responses with precision while staying in your favorite programming language.

A web framework for R developers to build multi-page applications and APIs with the full power of HTTP.

Is Ambiorix Shiny 2.0?

NO.

Ambiorix isn't a Shiny replacement or upgrade. It's a fundamentally different approach to web development in R, based on the HTTP request-response cycle rather than reactivity.

My Journey to Ambiorix

The Problem

After building huge Shiny applications, I hit limitations:

- **Multi-page navigation** - Needed proper routing and shareable links
- **API endpoints** - Clients wanted to build their own frontends

The Dilemma

Didn't want to leave the R ecosystem, but needed web functionality beyond Shiny's capabilities

The Solution

Discovered Ambiorix - an R web framework that handles both multi-page apps and APIs!

"And he lived happily ever after"

Why should you care about Ambiorix?

Fine-grained HTTP control

Direct access to request and response objects gives you complete flexibility.

True multi-page support

Build applications with multiple pages and proper routing out of the box.

API capabilities

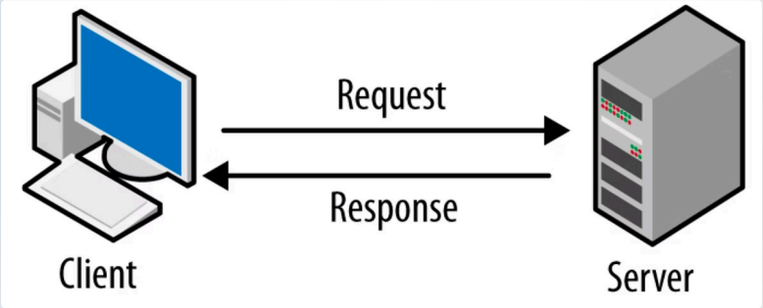
Create JSON endpoints alongside HTML pages using the same codebase.

Shiny vs. Ambiorix: A Comparison

Shiny	Ambiorix
Single Page Applications	Multi-Page Applications
Pre-built UI components	No pre-built components (build from scratch)
Bootstrap & jQuery by default	Use whatever frontend libraries you wish
Reactive framework built-in	No reactivity by default
WebSockets by default	HTTP requests by default

Shiny: Batteries plugged in. Plug and Play.

Ambiorix: Build everything from *scratch*.



The Request-Response Cycle

Every interaction on the web, from loading a page to submitting a form, follows this fundamental cycle:

Client Initiates

Your web browser or application sends a request to a server.

The Request

A message detailing what the client wants (e.g., a specific web page, data) is sent.

Server Processes

The server receives the request, processes it, and prepares a response.

The Response

The server sends back the requested data, an HTML page, or an action confirmation.

This continuous **HTTP Cycle** forms the backbone of how web applications, including those built with Ambiorix, communicate.

Data Dashboard Demo

Explore R datasets

mtcars, iris, airquality

HTML interface for humans

Beautiful tables and visualizations

JSON API for machines

Programmatic access to the same data

[Live Demo Time!]

Hello World: Request → Response

hello-world.R R

```r
library(ambiorix)

app <- Ambiorix$new()

app$get("/", function(req, res) {
  res$send("Hello from Ambiorix!")
})

app$start(port = 3000)
```

The cycle in action:

01

Browser requests `GET /`

02

Handler function receives `req`, `res` objects

03

We send response with `res$send()`

Brief Overview of HTTP Methods

GET

Retrieve a resource from the server

```
app$get("/data", handler)
```

PUT

Update an existing resource

```
app$put("/data/:id", handler)
```

POST

Create a new resource on the server

```
app$post("/data", handler)
```

DELETE

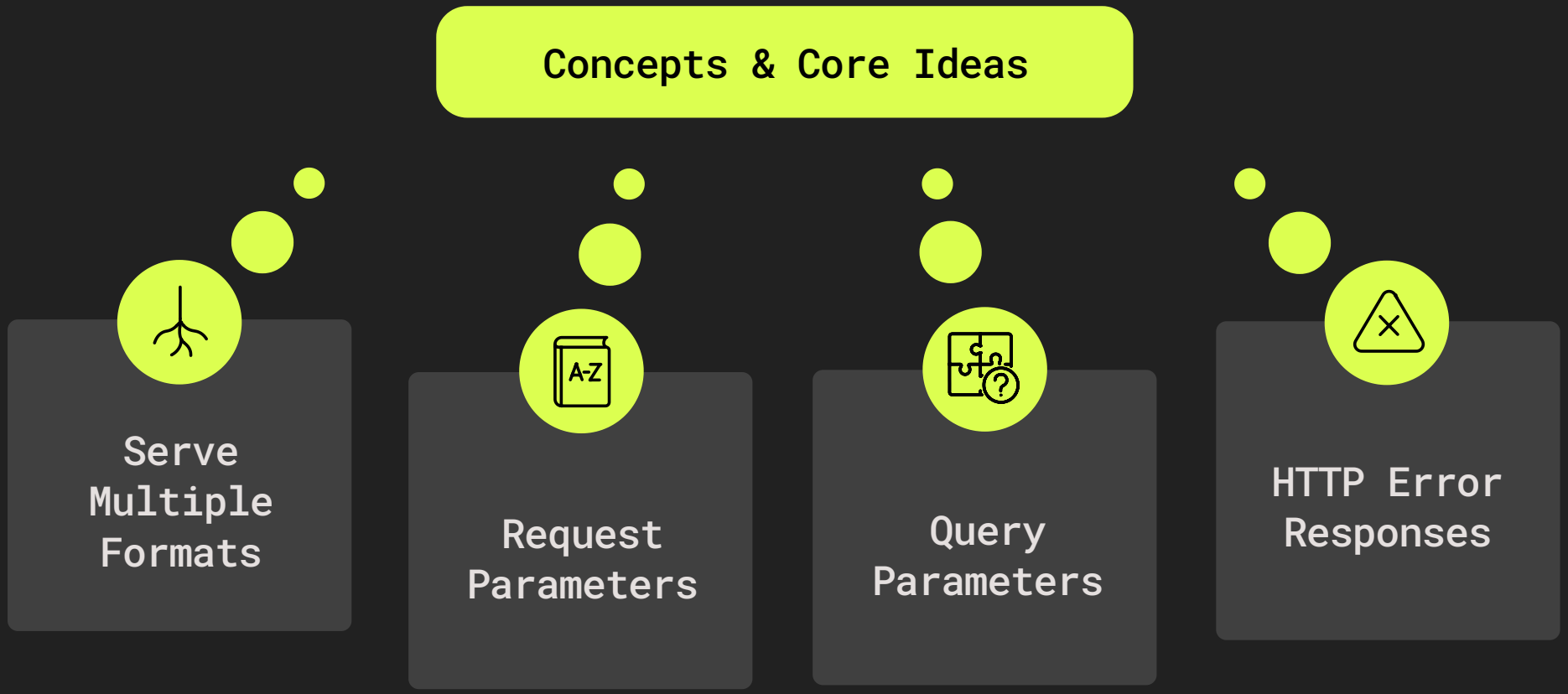
Remove a resource from the server

```
app$delete("/data/:id", handler)
```

Ambiorix gives you handlers for all standard HTTP methods, making it perfect for RESTful APIs.

Let's Now Talk About The Demo App

Time to explore the demo application. We'll break down its core components and the Ambiorix concepts behind them.



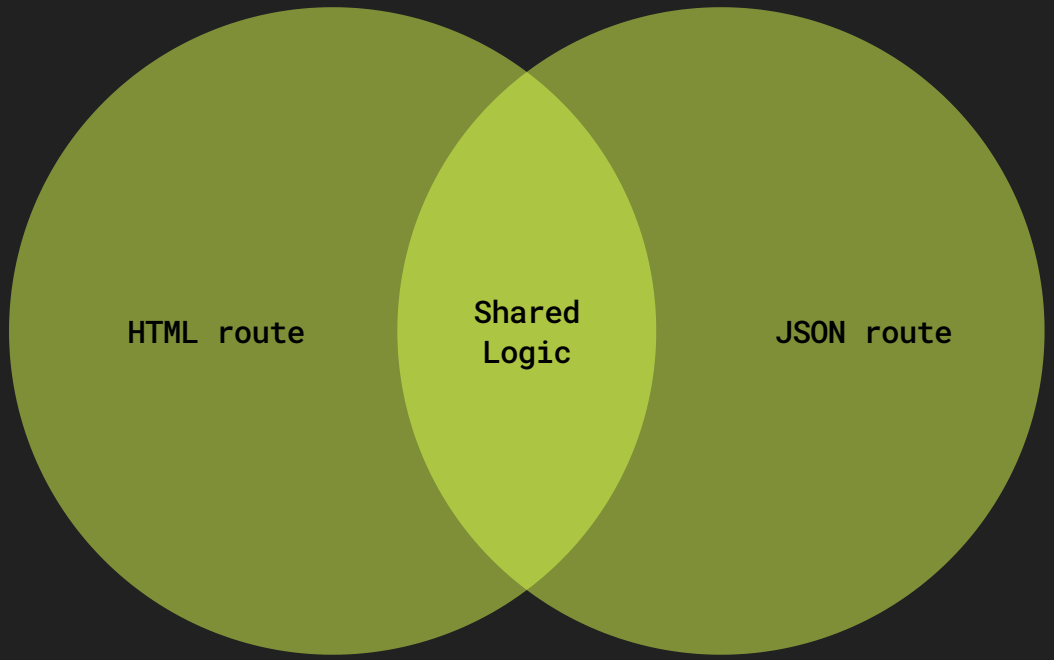
Same Data, Different Formats

One Core R Function:

```
get_dataset_summary("mtcars")
# Returns: list with statistics,
# sample data, etc.
```

Two Interfaces:

- **Browser:** Beautiful HTML tables and charts
- **API:** Raw JSON for programmatic access



Key insight: Write business logic once, serve it multiple ways!

Same Data, Different Formats

app.R R

```r
# ----HTML route----
app$get("/datasets/:name", function(req, res) {
  data <- get_dataset_summary(req$params$name)
  res$send(create_html_page(data)) # Returns HTML
})

# ----JSON route----
app$get("/api/datasets/:name/summary", function(req, res) {
  data <- get_dataset_summary(req$params$name) # Same function!
  res$json(data) # Returns JSON
})
```

Route Parameters

`/datasets/mtcars`

Motor Trend Car Road Tests

`/datasets/iris`

Edgar Anderson's Iris Data

`/datasets/airquality`

New York Air Quality

Route Parameters

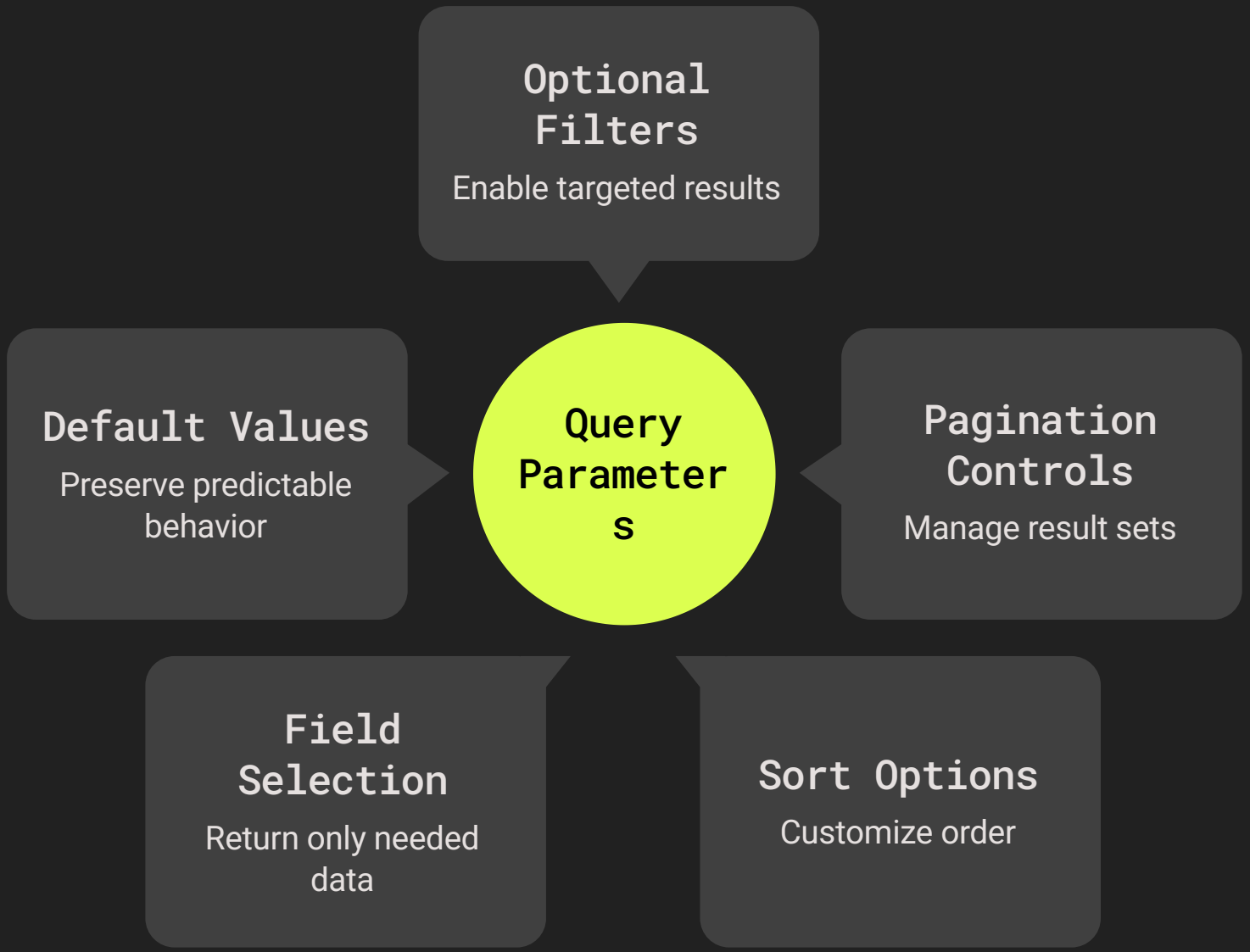
app.R R

```r
app$get("/datasets/:name", function(req, res) {
  dataset_name <- req$params$name
  summary <- get_dataset_summary(dataset_name)

  res$send(create_dataset_page(summary))
})
```

Creating dynamic URLs is effortless!

Query Parameters



Query Parameters

Example API Calls:

- `/api/datasets/mtcars/data` → All rows
- `/api/datasets/mtcars/data?limit=5` → First 5 rows
- `/api/datasets/iris/data?limit=10` → First 10 rows

Standard web patterns that developers expect

Query Parameters

app.R R

```r
app$get("/api/datasets/:name/data", function(req, res) {
  dataset_name <- req$params$name
  limit <- req$query$limit # ?limit=10

  data <- get_dataset_data(dataset_name, limit)
  res$json(data)
})
```

Common HTTP Error Responses

Understanding and communicating errors effectively is crucial for building robust web applications. Ambiorix allows precise control over these responses.

400 Bad Request

The server cannot process the request due to client error, such as malformed syntax or invalid request parameters.

404 Not Found

The requested resource could not be found on the server. This indicates a valid request for an unknown URL.

500 Internal Server Error

A generic error message indicating an unexpected condition or server-side issue that prevented the fulfillment of the request.

Proper HTTP status codes & helpful error messages

Ambiorix enables you to set custom status codes and provide helpful error messages, guiding clients in debugging and ensuring proper web standards are followed.

HTTP Error Responses

app.R R

```r
api_dataset_summary_get <- function(req, res) {
  dataset_name <- req$params$name

  if (!is_valid_dataset(dataset_name)) {
    response <- list(
      error = "Dataset not found",
      message = sprintf(
        "Dataset '%s' not found. Available datasets: mtcars, iris, airquality",
        dataset_name
      )
    )

    res$status <- 404L
    return(res$json(response))
  }

  summary_data <- get_dataset_summary(dataset_name)

  res$json(summary_data)
}
```

Try Ambiorix Today

GitHub

ambiorix-web/ambiorix

Website

ambiorix.dev

Demo Code

ambiorix-web/positconf2025

Get started:

```
install.packages("ambiorix")
# Run the demo from /demo folder
```

Thanks!

Questions?

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