

UNIVERSIDAD MARIANO GÁLVEZ DE GUATEMALA

FACULTAD DE INGENIERIA EN SISTEMAS DE INFORMACIÓN Y CIENCIAS DE LA COMPUTACIÓN

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INTRODUCCIÓN

1. CONTEXTO

Plataforma de Control de Pedidos Multiplataforma

Tecnologías: Next.js + Spring Boot + Maven + MariaDB + PostgreSQL

La empresa MultiPedidos S.A. administra pedidos de distintos clientes y proveedores en varias regiones.

Por políticas internas y requerimientos técnicos:

- › El módulo de Clientes y Pedidos debe operar en una base MariaDB (infraestructura regional).
- › El módulo de Proveedores y Facturación debe operar en una base PostgreSQL (infraestructura corporativa).
- › Ambos módulos deben compartir una lógica de negocio común (cálculos, validaciones y descuentos) implementada en una librería Maven compartida.

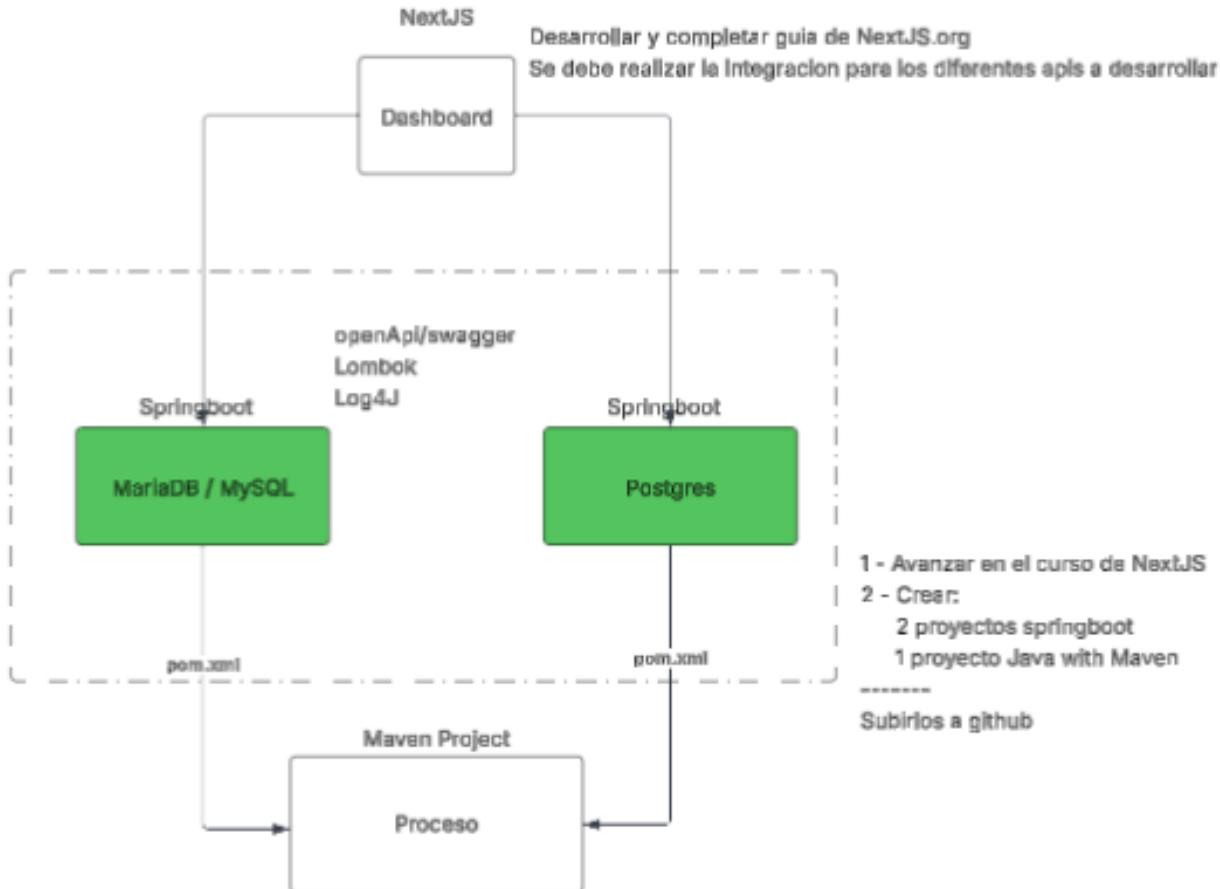
El Dashboard en Next.js será el panel administrativo que muestre información combinada proveniente de ambos servicios.

2. Objetivo General

Diseñar e implementar una solución completa con arquitectura distribuida, integrando:

- › Un frontend web en Next.js (tutorial oficial de [Next.org](#)).
- › Dos microservicios Spring Boot independientes con persistencia en bases de datos distintas.
- › Un proyecto Maven reutilizable que funcione como dependencia común para ambos microservicios.

El propósito es que los estudiantes piensen como arquitectos de software, definan la comunicación entre componentes, la lógica compartida y la integración de datos en una arquitectura modular.



3. Tecnologías implementadas

- Backend: Spring Boot 3.5.7 con Java 17
- Bases de datos: MariaDB y PostgreSQL
- Frontend: Next.js 16 con React 19 y TypeScript
- Gestión de dependencias: Maven
- Documentación API: OpenAPI/Swagger

4. Arquitectura

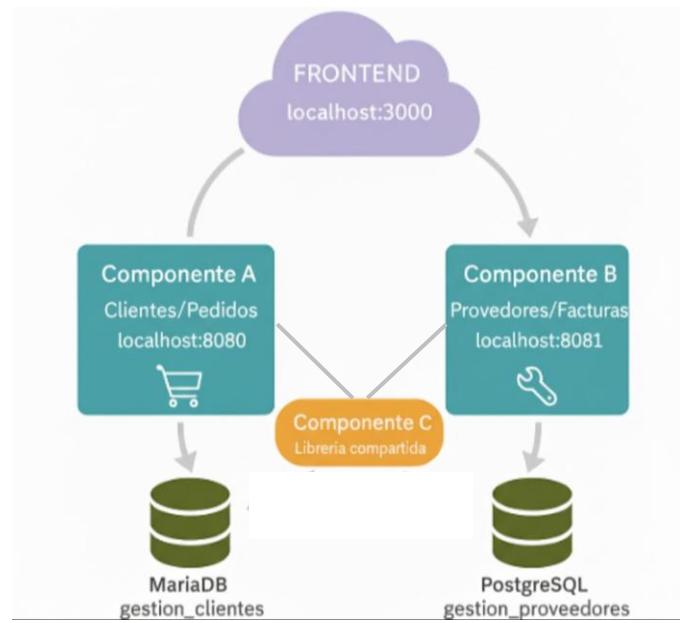
4.1. Diagrama de Arquitectura

Dashboard (Next.js) → consume APIs REST → Componente A + B

Componente A (8080) → MariaDB

Componente B (8081) → PostgreSQL

Ambos usan → Componente C (librería compartida)



5. COMPONENTE A - CLIENTES Y PEDIDOS

5.1. Configuración

Dependencias: Spring Boot 3.5.7, JPA, Web, MariaDB, OpenAPI, componente-c

```

componente-a > pom.xml
 1  <?xml version="1.0" encoding="UTF-8"?>
 2  <project xmlns="http://maven.apache.org/POM/4.0.0" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 3   | xsi:schemaLocation="http://maven.apache.org/POM/4.0.0 https://maven.apache.org/xsd/maven-4.0.0.xsd">
 4   | <modelVersion>4.0.0</modelVersion>
 5   | <parent>
 6   |   | <groupId>org.springframework.boot</groupId>
 7   |   | <artifactId>spring-boot-starter-parent</artifactId>
 8   |   | <version>3.5.7</version>
 9   |   | <relativePath/> <!-- lookup parent from repository -->
10   | </parent>
11   | <groupId>com.empres.a</groupId>
12   | <artifactId>componente-a</artifactId>
13   | <version>0.0.1-SNAPSHOT</version>
14   | <name>componente-a</name>
15   | <description>Demo project for Spring Boot</description>
16   | <url/>
17   | <licenses>
18   |   | <license/>
19   | </licenses>
20   | <developers>
21   |   | <developer/>
22   | </developers>
23   | <scm>
24   |   | <connection/>
25   |   | <developerConnection/>
26   |   | <tag/>
27   |   | <url/>
28   | </scm>
29   | <properties>
30   |   | <java.version>17</java.version>
31   | </properties>
32   | <dependencies>
33   |   | <dependency>
34   |   |   | <groupId>org.springframework.boot</groupId>
35   |   |   | <artifactId>spring-boot-starter-data-jpa</artifactId>
36   |   | </dependency>
37   | <dependency>
```

```

componente-a > pom.xml
  2 <project xmlns="http://maven.apache.org/POM/4.0.0" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  3 <dependencies>
  4   </dependency>
  5   <dependency>
  6     <groupId>org.springframework.boot</groupId>
  7     <artifactId>spring-boot-starter-web</artifactId>
  8   </dependency>
  9
 10  <dependency>
 11    <groupId>org.mariadb.jdbc</groupId>
 12    <artifactId>mariadb-java-client</artifactId>
 13    <scope>runtime</scope>
 14  </dependency>
 15  <dependency>
 16    <groupId>org.springframework.boot</groupId>
 17    <artifactId>spring-boot-starter-test</artifactId>
 18    <scope>test</scope>
 19  </dependency>
 20
 21  <dependency>
 22    <groupId>org.springdoc</groupId>
 23    <artifactId>springdoc-openapi-starter-webmvc-ui</artifactId>
 24    <version>2.6.0</version>
 25  </dependency>
 26  <dependency>
 27    <groupId>com.empresia</groupId>
 28    <artifactId>componente-a</artifactId>
 29    <version>0.0.1-SNAPSHOT</version>
 30  </dependency>
 31
 32  </dependencies>
 33
 34  <build>
 35    <plugins>
 36      <plugin>
 37        <groupId>org.springframework.boot</groupId>
 38        <artifactId>spring-boot-maven-plugin</artifactId>
 39      </plugin>
 40    </plugins>
 41  </build>

```

5.2. Base de Datos

Conexión: jdbc:mariadb://localhost:3306/componentea_db

Usuario: root

DDL Auto: update (crea tablas automáticamente)

```

componente-a > src > main > resources > application.properties
  1  spring.application.name=componente-a
  2  spring.datasource.url=jdbc:mariadb://localhost:3306/componentea_db
  3  spring.datasource.username=root
  4  spring.datasource.password=root123
  5  spring.datasource.driver-class-name=org.mariadb.jdbc.Driver
  6
  7  spring.jpa.hibernate.ddl-auto=update
  8  spring.jpa.show-sql=true
  9
 10 springdoc.api-docs.path=/api-docs
 11 springdoc.swagger-ui.path=/swagger-ui/index.html
 12

```

Swagger: <http://localhost:8080/swagger-ui/index.html>

5.3. Modelos

Cliente: @Entity con id, nombre, email, teléfono

```
componente-a > src > main > java > com > empresa > a > model > Cliente.java
 1  package com.empresa.a.model;
 2
 3  import jakarta.persistence.*;
 4  import com.fasterxml.jackson.annotation.JsonIgnore;
 5  import java.util.List;
 6
 7  @Entity
 8  public class Cliente {
 9    @Id
10    @GeneratedValue(strategy = GenerationType.IDENTITY)
11    private Long id;
12    private String nombre;
13    private String correo;
14
15    @OneToMany(mappedBy = "cliente", cascade = CascadeType.ALL)
16    @JsonIgnore
17    private List<Pedido> pedidos;
18
19    public Cliente() {}
20
21    // Constructor con parámetros
22    public Cliente(String nombre, String correo) {
23      this.nombre = nombre;
24      this.correo = correo;
25    }
26
27    // Getters y setters
28    public Long getId() {
29      return id;
30    }
31
32    public void setId(Long id) {
33      this.id = id;
34    }
35
36    public String getNombre() {
37      return nombre;
38    }
39
40    public void setNombre(String nombre) {
41      this.nombre = nombre;
42    }
43
44    public String getCorreo() {
45      return correo;
46    }
47
48    public void setCorreo(String correo) {
49      this.correo = correo;
50    }
51
52    public List<Pedido> getPedidos() {
53      return pedidos;
54    }
55
```

Pedido: @Entity con id, fecha, total, estado, clientId

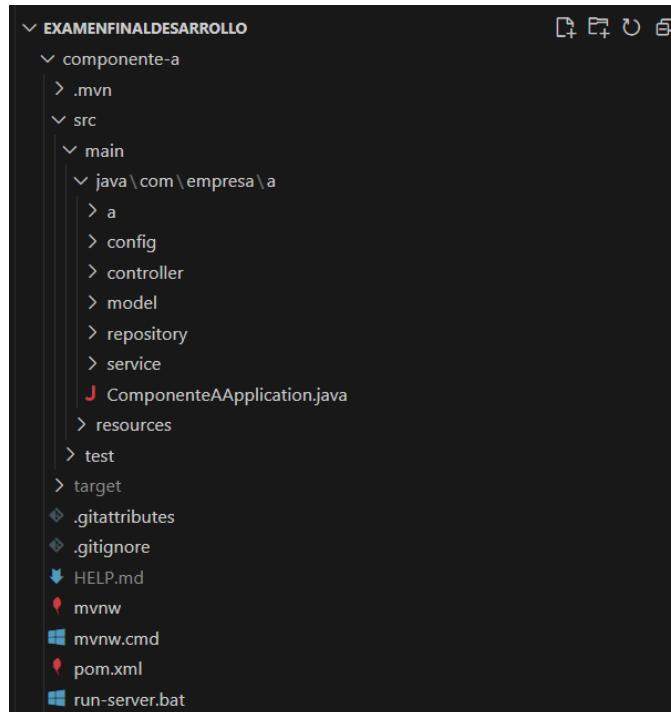
```
componente-a > src > main > java > com > empresa > a > model > Pedido.java
  1 package com.empresa.a.model;
  2
  3 import jakarta.persistence.*;
  4 import java.util.List;
  5
  6 @Entity
  7 public class Pedido {
  8     @Id
  9     @GeneratedValue(strategy = GenerationType.IDENTITY)
10     private Long id;
11     private String descripcion;
12     private Double total;
13
14     @ManyToOne
15     @JoinColumn(name = "cliente_id")
16     private Cliente cliente;
17
18     @ElementCollection
19     @CollectionTable(name = "pedido_productos", joinColumns = @JoinColumn(name = "pedido_id"))
20     private List<Producto> productos;
21
22     public Pedido() {}
23
24     // Constructor con parametros (opcional)
25     public Pedido(String descripcion, Double total, Cliente cliente) {
26         this.descripcion = descripcion;
27         this.total = total;
28         this.cliente = cliente;
29     }
30
31     // Getters y setters
32     public Long getId() {
33         return id;
34     }
35
36     public void setId(Long id) {
37         this.id = id;
38     }
39
40     public String getDescripcion() {
41         return descripcion;
42     }
43
44     public void setDescripcion(String descripcion) {
45         this.descripcion = descripcion;
46     }
47
48     public Double getTotal() {
49         return total;
50     }
51
52     public void setTotal(Double total) {
53         this.total = total;
54     }
55
56     public Cliente getCliente() {
57         return cliente;
58     }
59
60     public void setCliente(Cliente cliente) {
61         this.cliente = cliente;
62     }
63
64     public List<Producto> getProductos() {
65         return productos;
66     }
67
68     public void setProductos(List<Producto> productos) {
69         this.productos = productos;
70     }
71 }
```

Anotaciones JPA: @Id, @GeneratedValue(IDENTITY)

5.4. Arquitectura del Código

Patrón MVC:

- › Controller: Endpoints REST (@RestController, @RequestMapping)
- › Service: Lógica de negocio (@Service, @Autowired)
- › Repository: Persistencia (JpaRepository)
- › Model: Entidades JPA



Endpoints: GET/POST/PUT/DELETE para /api/clientes y /api/pedidos

5.5. CORS

Permite peticiones desde localhost:3000 (frontend) hacia localhost:8080

```
componente-a > src > main > java > com > empresa > A > config > CorsConfig.java
 8  public class CorsConfig implements WebMvcConfigurer {
 9
10    @Override
11    public void addCorsMappings(CorsRegistry registry) {
12      registry.addMapping("/api/**")
13        .allowedOrigins("http://localhost:3000")
14        .allowedMethods("GET", "POST", "PUT", "DELETE", "OPTIONS")
15        .allowedHeaders("Content-Type", "Authorization", "X-Requested-With", "Accept")
16        .allowCredentials(true)
17        .exposedHeaders("Content-Type")
18        .maxAge(3600);
19    }
20 }
```

6. COMPONENTE B - PROVEEDORES Y FACTURAS

6.1. Configuración

Similar a Componente A pero con PostgreSQL y Lombok. Puerto 8081.

```
componente-b > pom.xml
 1  <?xml version="1.0" encoding="UTF-8"?>
 2  <project xmlns="http://maven.apache.org/POM/4.0.0" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 3   xsi:schemaLocation="http://maven.apache.org/POM/4.0.0 https://maven.apache.org/xsd/maven-4.0.0.xsd">
 4   <modelVersion>4.0.0</modelVersion>
 5   <parent>
 6     <groupId>org.springframework.boot</groupId>
 7     <artifactId>spring-boot-starter-parent</artifactId>
 8     <version>3.5.7</version>
 9     <relativePath/> <!-- lookup parent from repository -->
10   </parent>
11   <groupId>com.empresab</groupId>
12   <artifactId>componente-b</artifactId>
13   <version>0.0.1-SNAPSHOT</version>
14   <name>componente-b</name>
15   <description>Demo project for Spring Boot</description>
16   <url/>
17   <licenses>
18     <license/>
19   </licenses>
20   <developers>
21     <developer/>
22   </developers>
23   <scm>
24     <connection/>
25     <developerConnection/>
26     <tag/>
27     <url/>
28   </scm>
29   <properties>
30     <java.version>17</java.version>
31   </properties>
32   <dependencies>
33     <dependency>
34       <groupId>org.springframework.boot</groupId>
35       <artifactId>spring-boot-starter-data-jpa</artifactId>
36     </dependency>
37     <dependency>
38       <groupId>org.springframework.boot</groupId>
39       <artifactId>spring-boot-starter-web</artifactId>
40     </dependency>
41
42     <dependency>
43       <groupId>org.postgresql</groupId>
44       <artifactId>postgresql</artifactId>
45       <scope>runtime</scope>
46     </dependency>
47     <dependency>
48       <groupId>org.springframework.boot</groupId>
49       <artifactId>spring-boot-starter-test</artifactId>
50       <scope>test</scope>
51     </dependency>
52     <dependency>
53       <groupId>org.springdoc</groupId>
54       <artifactId>springdoc-openapi-starter-webmvc-ui</artifactId>
55       <version>2.6.0</version>
56     </dependency>
57     <dependency>
58       <groupId>org.projectlombok</groupId>
59       <artifactId>lombok</artifactId>
60       <version>1.18.32</version>
61       <scope>provided</scope>
62     </dependency>
63     <dependency>
64       <groupId>com.empresab</groupId>
65       <artifactId>componente-c</artifactId>
66       <version>0.0.1-SNAPSHOT</version>
67     </dependency>
68
69   </dependencies>
```

6.2. Base de Datos

Conexión: jdbc:postgresql://localhost:5432/componenteb_db

Usuario: postgres

Puerto: 8081

```
componente-b > src > main > resources > application.properties
1  spring.application.name=componente-b
2  spring.datasource.url=jdbc:postgresql://localhost:5432/componenteb_db
3  spring.datasource.username=postgres
4  spring.datasource.password=postgres123
5  spring.datasource.driver-class-name=org.postgresql.Driver
6  spring.jpa.hibernate.ddl-auto=update
7  spring.jpa.show-sql=true
8  server.port=8081
9  springdoc.api-docs.path=/api-docs
10 springdoc.swagger-ui.path=/swagger-ui/index.html
```

6.3. Modelos con Lombok

@Data de Lombok genera getters/setters/toString automáticamente

Proveedor: id, nombre, contacto, teléfono, email

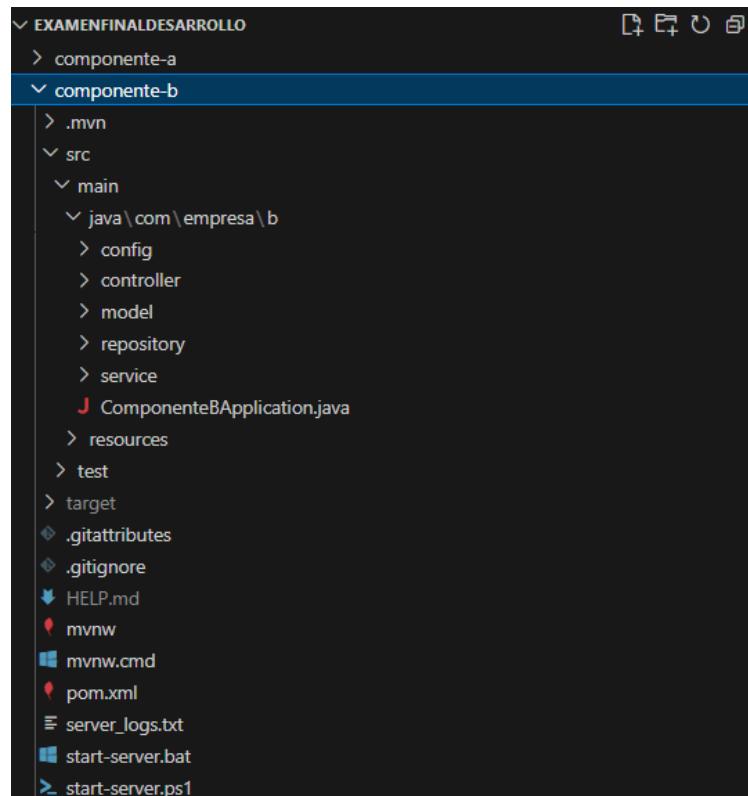
```
componente-b > src > main > java > com > empresa > b > model > J Proveedor.java
1  package com.empresa.b.model;
2
3  import jakarta.persistence.*;
4  import lombok.Data;
5
6  @Data
7  @Entity
8  @Table(name = "proveedores")
9  public class Proveedor {
10     @Id
11     @GeneratedValue(strategy = GenerationType.IDENTITY)
12     private Long id;
13
14     @Column(nullable = false)
15     private String nombre;
16
17     @Column(nullable = false)
18     private String correo;
19
20     private String telefono;
21
22     @Column(nullable = false)
23     private String contacto;
24 }
```

Factura: id, numero, fecha, monto, estado, proveedorId

```
componente-b > src > main > java > com > empresa > b > model > Factura.java
 1 package com.empresa.b.model;
 2
 3 import com.fasterxml.jackson.annotation.JsonIgnoreProperties;
 4 import jakarta.persistence.*;
 5 import lombok.Data;
 6
 7 @Data
 8 @Entity
 9 @Table(name = "facturas")
10 public class Factura {
11     @Id
12     @GeneratedValue(strategy = GenerationType.IDENTITY)
13     private Long id;
14
15     private String numero;
16
17     private Double totalFactura;
18
19     @ManyToOne(fetch = FetchType.EAGER)
20     @JoinColumn(name = "proveedor_id")
21     @JsonIgnoreProperties("facturas")
22     private Proveedor proveedor;
23 }
```

6.4. Arquitectura

Misma estructura que A.



7. COMPONENTE C - LIBRERÍA COMPARTIDA

7.1. POM.XML

Proyecto Maven puro (sin Spring Boot)

GroupId: com.empres

ArtifactId: componente-c

Sin dependencias externas

Compilación Java 17

```
componente-c > pom.xml
1  <?xml version="1.0" encoding="UTF-8"?>
2  <project xmlns="http://maven.apache.org/POM/4.0.0" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
3    xsi:schemaLocation="http://maven.apache.org/POM/4.0.0 https://maven.apache.org/xsd/maven-4.0.0.xsd">
4    <modelVersion>4.0.0</modelVersion>
5
6    <groupId>com.empres</groupId>
7    <artifactId>componente-c</artifactId>
8    <version>0.0.1-SNAPSHOT</version>
9    <name>componente-c</name>
10   <description>Librería Maven compartida con utilidades de negocio</description>
11
12  <properties>
13    <java.version>17</java.version>
14    <maven.compiler.source>17</maven.compiler.source>
15    <maven.compiler.target>17</maven.compiler.target>
16    <project.build.sourceEncoding>UTF-8</project.build.sourceEncoding>
17  </properties>
18
19  <dependencies>
20    <!-- Sin dependencias de Spring - Maven puro -->
21  </dependencies>
22
23  <build>
24    <plugins>
25      <plugin>
26        <groupId>org.apache.maven.plugins</groupId>
27        <artifactId>maven-compiler-plugin</artifactId>
28        <version>3.11.0</version>
29        <configuration>
30          <source>${java.version}</source>
31          <target>${java.version}</target>
32        </configuration>
33      </plugin>
34    </plugins>
35  </build>
36
37 </project>
```

7.2. Clases Utilitarias

Métodos de validación, formateo y cálculos compartidos entre Componentes A y B.

```
componente-c > src > main > java > com > empresa > c > Utils.java
 1 package com.empresa.c;
 2 import java.io.BufferedReader;
 3 import java.io.InputStreamReader;
 4 import java.net.HttpURLConnection;
 5 import java.net.URL;
 6 import java.util.List;
 7 import java.util.UUID;
 8 public class Utils {
 9     public static double calcularTotal(List<Double> valores) {
10         if (valores == null || valores.isEmpty()) return 0.0;
11         return valores.stream().mapToDouble(Double::doubleValue).sum();
12     }
13
14     public static String generarCodigoUnico(String tipo) {
15         return tipo.toUpperCase() + "-" + UUID.randomUUID().toString().substring(0, 8).toUpperCase();
16     }
17
18
19
20     public static String invocarEndpointGET(String urlStr) throws Exception {
21         URL url = new URL(urlStr);
22         HttpURLConnection con = (HttpURLConnection) url.openConnection();
23         con.setRequestMethod("GET");
24         con.setConnectTimeout(5000);
25         con.setReadTimeout(5000);
26
27         int status = con.getResponseCode();
28         BufferedReader in = new BufferedReader(new InputStreamReader(
29             status >= 200 && status < 300 ? con.getInputStream() : con.getErrorStream()
30         ));
31         StringBuilder content = new StringBuilder();
32         String line;
33         while ((line = in.readLine()) != null) content.append(line);
34         in.close();
35         con.disconnect();
36         return content.toString();
37     }
38 }
39

componente-c > src > main > java > com > empresa > c > Util > MetodosCompartidos.java
 1 package com.empresa.c.util;
 2
 3 import java.util.List;
 4 import java.util.UUID;
 5
 6 public class MetodosCompartidos {
 7
 8     // Método para generar un código único por tipo de entidad
 9     public static String generarCodigoUnico(String tipoEntidad) {
10         return tipoEntidad.toUpperCase() + "-" + UUID.randomUUID().toString().substring(0, 8);
11     }
12
13     // Método para calcular total
14     public static double calcularTotal(List<Double> precios) {
15         return precios.stream().mapToDouble(Double::doubleValue).sum();
16     }
17
18     // Método para calcular total con IVA (12% por defecto)
19     public static double calcularTotalConIVA(double subtotal) {
20         return calcularTotalConIVA(subtotal, 0.12);
21     }
22
23     // Método para calcular total con IVA personalizado
24     public static double calcularTotalConIVA(double subtotal, double tasaIVA) {
25         return subtotal * (1 + tasaIVA);
26     }
27
28     // Método para aplicar descuento porcentual
29     public static double aplicarDescuento(double total, double porcentajeDescuento) {
30         return total * (1 - (porcentajeDescuento / 100.0));
31     }
32
33     // Método para calcular total con IVA y descuento
34     public static double calcularTotalConIVAYDescuento(double subtotal, double porcentajeDescuento) {
35         return calcularTotalConIVAYDescuento(subtotal, porcentajeDescuento, 0.12);
36     }
37
38     // Método para calcular total con IVA personalizado y descuento
39     public static double calcularTotalConIVAYDescuento(double subtotal, double porcentajeDescuento, double tasaIVA) {
40         double conDescuento = aplicarDescuento(subtotal, porcentajeDescuento);
41         return calcularTotalConIVA(conDescuento, tasaIVA);
42     }
43
44     // Ejemplo de integración circular: invoca endpoint de A o B
45     public static void notificarRegistro(String urlEndpoint) {
46         try {
47             var connection = new java.net.URL(urlEndpoint).openConnection();
48             connection.getInputStream().close();
49             System.out.println("Notificación enviada correctamente a: " + urlEndpoint);
50         } catch (Exception e) {
51             System.err.println("Error al notificar: " + e.getMessage());
52         }
53     }
54 }
```

7.3. Maven Install

Instala el JAR en ~/.m2/repository/

componentes A y B

```
Windows PowerShell
PS C:\Users\Rocio López\Desktop\ExamenFinalDesarrollo\componente-b> .\mvnw.cmd clean install
[INFO] Scanning for projects...
[INFO]   from pom.xml
[INFO]     > com.empresa.b:componente-b >
[INFO] Building componente-b 0.0.1-SNAPSHOT
[INFO]   from pom.xml
[INFO]     [ jar ]
[INFO]
[INFO] --- clean:3.4.1:clean (default-clean) @ componente-b ---
[INFO] Deleting C:\Users\Rocio López\Desktop\ExamenFinalDesarrollo\componente-b\target
[INFO]
[INFO] --- resources:3.3.1:resources (default-resources) @ componente-b ---
[INFO] Copying 1 resource from src\main\resources to target\classes
[INFO] Copying 1 resource from src\main\resources to target\classes
[INFO]
[INFO] --- compiler:3.14.1:compile (default-compile) @ componente-b ---
[INFO] Recompiling the module because of changed source code.
[INFO] Compiling 11 source files with java [debug parameters release 17] to target\classes
[INFO] /C:/Users/Rocio López/Desktop/ExamenFinalDesarrollo/componente-b/src/main/java/com/empresa/b/controller/FacturaController.java: C:\Users\Rocio López\Desktop\ExamenFinalDesarrollo\componente-b\src\main\java\com\empresa\b\controller\FacturaController.java: uses unchecked or unsafe operations.
[INFO] /C:/Users/Rocio López/Desktop/ExamenFinalDesarrollo/componente-b/src/main/java/com/empresa/b/controller/FacturaController.java: Recompile with -Xlint:unchecked for details.
[INFO]
[INFO] --- resources:3.3.1:testResources (default-testResources) @ componente-b ---
[INFO] skip non existing resourceDirectory C:\Users\Rocio López\Desktop\ExamenFinalDesarrollo\componente-b\src\test\resources
[INFO]
[INFO] --- compiler:3.14.1:testCompile (default-testCompile) @ componente-b ---
[INFO] Recompiling the module because of changed dependency.
[INFO]
[INFO] --- surefire:3.5.4:test (default-test) @ componente-b ---
[INFO]
[INFO] --- jar:3.4.0:jar (default-jar) @ componente-b ---
[INFO] Building jar: C:\Users\Rocio López\Desktop\ExamenFinalDesarrollo\componente-b\target\componente-b-0.0.1-SNAPSHOT.jar
[INFO]
[INFO] --- spring-boot:3.5.7:repackage (@ componente-b ---
[INFO] Replacing main artifact C:\Users\Rocio López\Desktop\ExamenFinalDesarrollo\componente-b\target\componente-b-0.0.1-SNAPSHOT.jar with repackaged archive, adding nested dependencies in BOOT-INF/
[INFO] The original artifact has been renamed to C:\Users\Rocio López\Desktop\ExamenFinalDesarrollo\componente-b\target\componente-b-0.0.1-SNAPSHOT.jar.original
[INFO]
[INFO] --- install:3.1.4:install (default-install) @ componente-b ---
[INFO] Installing C:\Users\Rocio López\Desktop\ExamenFinalDesarrollo\componente-b\pom.xml to C:\Users\Rocio López\.m2\repository\com\empresa\b\componente-b\0.0.1-SNAPSHOT\componente-b-0.0.1-SNAPSHOT.pom
[INFO] Installing C:\Users\Rocio López\Desktop\ExamenFinalDesarrollo\componente-b\target\componente-b-0.0.1-SNAPSHOT.jar to C:\Users\Rocio López\.m2\repository\com\empresa\b\componente-b\0.0.1-SNAPSHOT\com
ponente-b-0.0.1-SNAPSHOT.jar
[INFO]
[INFO] BUILD SUCCESS
[INFO]
[INFO] Total time: 14.837 s
[INFO] Finished at: 2025-11-15T11:11:49-06:00
[INFO]
PS C:\Users\Rocio López\Desktop\ExamenFinalDesarrollo\componente-b>
```

```
Windows PowerShell
PS C:\Users\Rocio López\Desktop\ExamenFinalDesarrollo\componente-a> .\mvnw.cmd clean install
[INFO] Scanning for projects...
[INFO]   from pom.xml
[INFO]     > com.empresa.a:componente-a >
[INFO] Building componente-a 0.0.1-SNAPSHOT
[INFO]   from pom.xml
[INFO]     [ jar ]
[INFO]
[INFO] --- clean:3.4.1:clean (default-clean) @ componente-a ---
[INFO] Deleting C:\Users\Rocio López\Desktop\ExamenFinalDesarrollo\componente-a\target
[INFO]
[INFO] --- resources:3.3.1:resources (default-resources) @ componente-a ---
[INFO] Copying 1 resource from src\main\resources to target\classes
[INFO] Copying 1 resource from src\main\resources to target\classes
[INFO]
[INFO] --- compiler:3.14.1:compile (default-compile) @ componente-a ---
[INFO] Recompiling the module because of changed source code.
[INFO] Compiling 14 source files with java [debug parameters release 17] to target\classes
[INFO] /C:/Users/Rocio López/Desktop/ExamenFinalDesarrollo/componente-a/src/main/java/com/empresa/a/controller/PedidoController.java: C:\Users\Rocio López\Desktop\ExamenFinalDesarrollo\componente-a\src\main\java\com\empresa\controller\PedidoController.java: uses unchecked or unsafe operations.
[INFO] /C:/Users/Rocio López/Desktop/ExamenFinalDesarrollo/componente-a/src/main/java/com/empresa/a/controller/PedidoController.java: Recompile with -Xlint:unchecked for details.
[INFO]
[INFO] --- resources:3.3.1:testResources (default-testResources) @ componente-a ---
[INFO] skip non existing resourceDirectory C:\Users\Rocio López\Desktop\ExamenFinalDesarrollo\componente-a\src\test\resources
[INFO]
[INFO] --- compiler:3.14.1:testCompile (default-testCompile) @ componente-a ---
[INFO] Recompiling the module because of changed dependency.
[INFO] Compiling 1 source file with javac [debug parameters release 17] to target\test-classes
[INFO]
[INFO] --- surefire:3.5.4:test (default-test) @ componente-a ---
[INFO] Using auto detected provider org.apache.maven.surefire.junitplatform.JUnitPlatformProvider
[INFO]
[INFO] 
[INFO] T E S T S
[INFO]
[INFO] Running com.empresa.a.ComponenteAApplicationTests
11:13:25.515 [main] INFO org.springframework.test.context.support.AnnotationConfigContextLoaderUtils -- Could not detect default configuration classes for test class [com.empresa.a.ComponenteAApplicationTests]: ComponenteAApplicationTests does not declare any static, non-private, non-final, nested classes annotated with @Configuration.
11:13:25.794 [main] INFO org.springframework.boot.test.context.SpringBootTestBootstrapper -- Found @SpringBootTestConfiguration com.empresa.a.ComponenteAApplication for test class com.empresa.a.ComponenteAApplicationTests
[INFO]
[INFO] 
[INFO] :: Spring Boot ::          (v3.5.7)
```

8. DASHBOARD FRONTEND

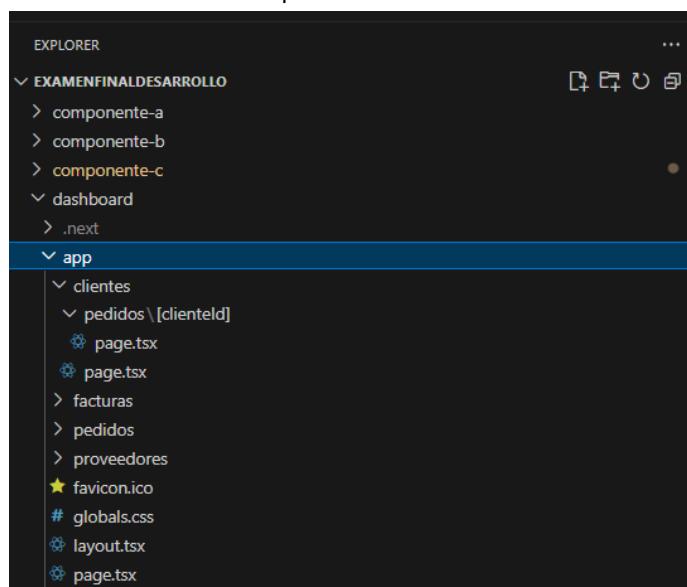
8.1. Configuración

Next.js 16.0.2, React 19, TypeScript, Tailwind CSS

```
dashboard > {} package.json > ...
1  {
2    "name": "dashboard",
3    "version": "0.1.0",
4    "private": true,
5    // Debug
6    "scripts": {
7      "dev": "next dev",
8      "build": "next build",
9      "start": "next start",
10     "lint": "eslint"
11   },
12   "dependencies": {
13     "react": "19.2.0",
14     "react-dom": "19.2.0",
15     "next": "16.0.2"
16   },
17   "devDependencies": {
18     "typescript": "^5",
19     "@types/node": "^20",
20     "@types/react": "^19",
21     "@types/react-dom": "^19",
22     "@tailwindcss/postcss": "^4",
23     "tailwindcss": "^4",
24     "eslint": "^9",
25     "eslint-config-next": "16.0.2"
26   }
27 }
```

8.2. Estructura de Rutas

- › App Router de Next.js: /clientes, /pedidos, /proveedores, /facturas
- › Rutas dinámicas: /pedidos/info/[id]



8.3. Servicios API

Funciones fetch para consumir APIs:

fetchClientes() → localhost:8080/api/clientes

fetchProveedores() → localhost:8081/api/proveedores

CRUD completo (GET, POST, PUT, DELETE)

```
dashboard > lib > TS api.ts > ...
1 // API Configuration
2 const API_BASE_A = process.env.NEXT_PUBLIC_API_A || "http://localhost:8080/api";
3 const API_BASE_B = process.env.NEXT_PUBLIC_API_B || "http://localhost:8081/api";
4
5 export { API_BASE_A, API_BASE_B };
6
7 // Helper function to make API calls with better error handling
8 export async function fetchAPI(url: string, options?: RequestInit) {
9   try {
10     console.log(`[API] Llamando a: ${url} con método: ${options?.method || "GET"} `);
11
12     const headers: HeadersInit = {
13       "Content-Type": "application/json",
14       ...options?.headers,
15     };
16
17     const response = await fetch(url, {
18       ...options,
19       headers,
20     });
21
22     console.log(`[API] Response status: ${response.status}`);
23
24     if (!response.ok) {
25       const errorText = await response.text();
26       console.error(`[API] Error response body:`, errorText);
27       throw new Error(`API Error ${response.status}: ${errorText}`);
28     }
29
30     const responseText = await response.text();
31     console.log(`[API] Response text:`, responseText);
32
33     // Parse JSON de manera segura
34     if (!responseText) {
35       return null;
36     }
37
38     try {
39       const data = JSON.parse(responseText);
40       console.log(`[API] Response data:`, data);
41       return data;
42     } catch (jsonError) {
43       console.error("[API] Error parsing JSON:", jsonError);
44       // Si falla el parsing, devolvemos el texto como está
45       return responseText;
46     }
47   } catch (error) {
48     console.error("[API] Fetch error:", error);
49     throw error;
50   }
51 }
```

9. COMPILACIÓN Y EJECUCIÓN

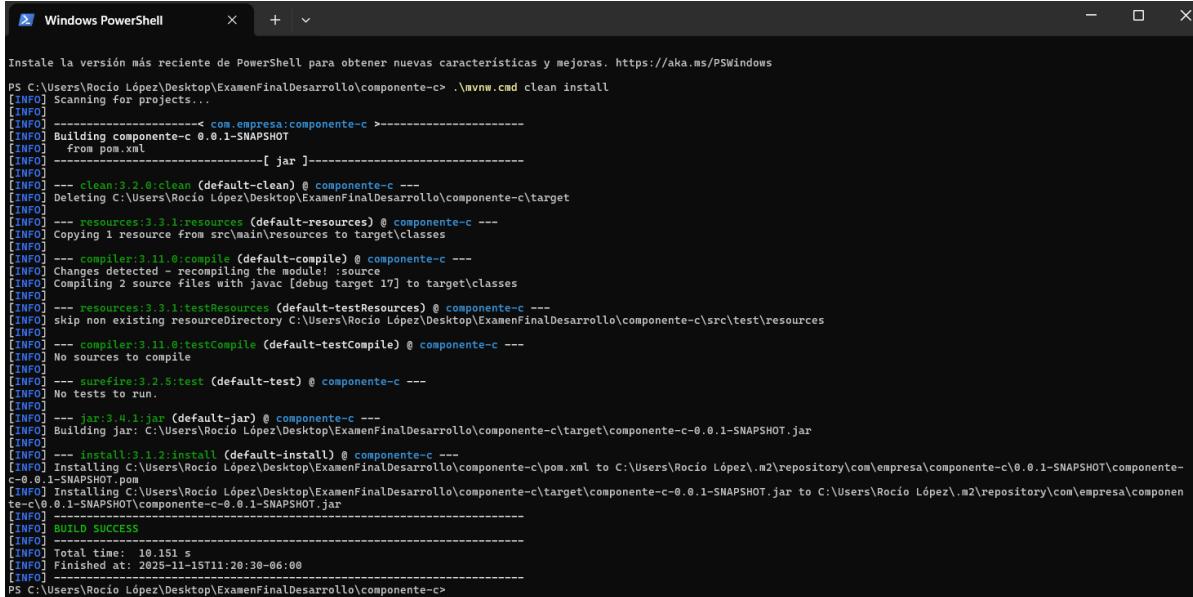
9.1. Componente A

```
PS C:\Users\Rocío López\Desktop\ExamenFinalDesarrollo\componente-a> .\mvnw.cmd clean compile
[INFO] Scanning for projects...
[INFO]
[INFO] -----< com.empresa.a:componente-a >-----
[INFO] Building componente-a 0.0.1-SNAPSHOT
[INFO]   from pom.xml
[INFO] -----[ jar ]-----
[INFO]
[INFO] --- clean:3.4.1:clean (default-clean) @ componente-a ---
[INFO] Deleting C:\Users\Rocío López\Desktop\ExamenFinalDesarrollo\componente-a\target
[INFO]
[INFO] --- resources:3.3.1:resources (default-resources) @ componente-a ---
[INFO] Copying 1 resource from src\main\resources to target\classes
[INFO] Copying 1 resource from src\main\resources to target\classes
[INFO]
[INFO] --- compiler:3.14.1:compile (default-compile) @ componente-a ---
[INFO] Recompiling the module because of changed source code.
[INFO] Compiling 14 source files with javac [debug parameters release 17] to target\classes
[INFO] /C:/Users/Rocío López/Desktop/ExamenFinalDesarrollo/componente-a/src/main/java/com/empresa/a/controller/PedidoController.java: C:\Users\Rocío López\Desktop\ExamenFinalDesarrollo\componente-a\src\main\java\com\empresa\pedidoController.java uses unchecked or unsafe operations.
[INFO] /C:/Users/Rocío López/Desktop/ExamenFinalDesarrollo/componente-a/src/main/java/com/empresa/a/controller/PedidoController.java: Recompile with -Xlint:unchecked for details.
[INFO]
[INFO] BUILD SUCCESS
[INFO]
[INFO] Total time: 6.561 s
[INFO] Finished at: 2025-11-15T11:23:22-06:00
[INFO]
PS C:\Users\Rocío López\Desktop\ExamenFinalDesarrollo\componente-a>
```

9.2. Componente B

```
PS C:\Users\Rocío López\Desktop\ExamenFinalDesarrollo\componente-b> .\mvnw.cmd clean compile
[INFO] Scanning for projects...
[INFO]
[INFO] -----< com.empresa.b:componente-b >-----
[INFO] Building componente-b 0.0.1-SNAPSHOT
[INFO]   from pom.xml
[INFO] -----[ jar ]-----
[INFO]
[INFO] --- clean:3.4.1:clean (default-clean) @ componente-b ---
[INFO] Deleting C:\Users\Rocío López\Desktop\ExamenFinalDesarrollo\componente-b\target
[INFO]
[INFO] --- resources:3.3.1:resources (default-resources) @ componente-b ---
[INFO] Copying 1 resource from src\main\resources to target\classes
[INFO] Copying 1 resource from src\main\resources to target\classes
[INFO]
[INFO] --- compiler:3.14.1:compile (default-compile) @ componente-b ---
[INFO] Recompiling the module because of changed source code.
[INFO] Compiling 11 source files with javac [debug parameters release 17] to target\classes
[INFO] /C:/Users/Rocío López/Desktop/ExamenFinalDesarrollo/componente-b/src/main/java/com/empresa/b/controller/FacturaController.java: C:\Users\Rocío López\Desktop\ExamenFinalDesarrollo\componente-b\src\main\java\com\empresa\b\controller\FacturaController.java uses unchecked or unsafe operations.
[INFO] /C:/Users/Rocío López/Desktop/ExamenFinalDesarrollo/componente-b/src/main/java/com/empresa/b/controller/FacturaController.java: Recompile with -Xlint:unchecked for details.
[INFO]
[INFO] BUILD SUCCESS
[INFO]
[INFO] Total time: 6.948 s
[INFO] Finished at: 2025-11-15T11:23:30-06:00
[INFO]
PS C:\Users\Rocío López\Desktop\ExamenFinalDesarrollo\componente-b>
```

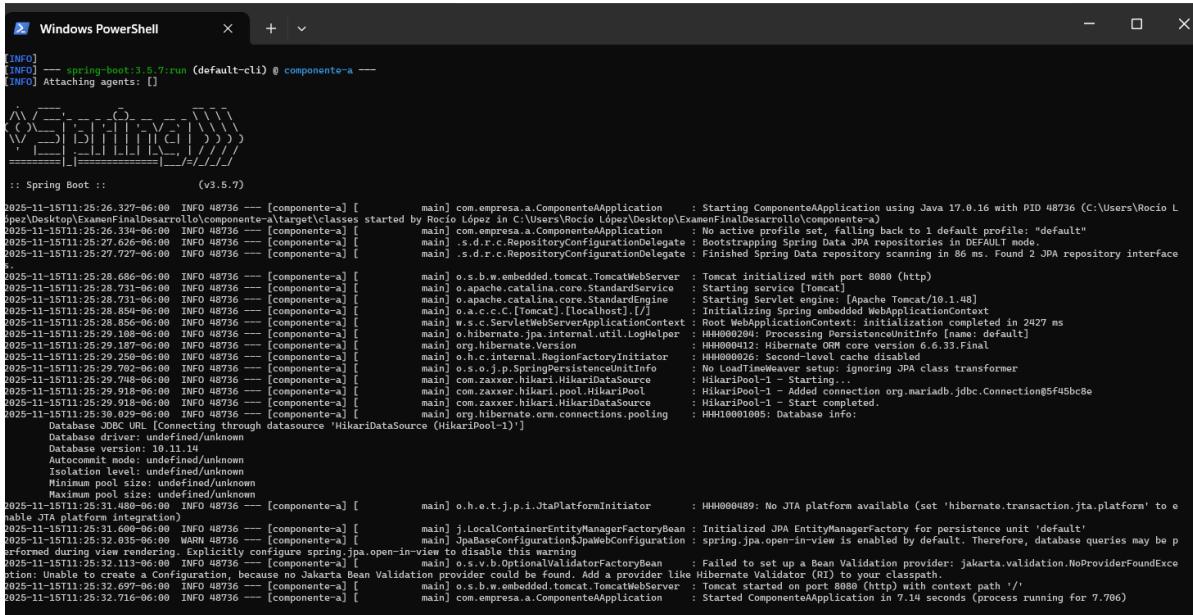
9.3. Componente C



```
PS C:\Users\Rocio López\Desktop\ExamenFinalDesarrollo\componente-c> .\mvnw.cmd clean install
[INFO] Scanning for projects...
[INFO]
[INFO] --- com.empresa:componente-c 0.0.1-SNAPSHOT
[INFO]   from pom.xml
[INFO]   [ jar ]
[INFO]
[INFO] --- clean:3.2.0:clean (default-clean) @ componente-c ---
[INFO] Deleting C:\Users\Rocio López\Desktop\ExamenFinalDesarrollo\componente-c\target
[INFO]
[INFO] --- resources:3.3.1:resources (default-resources) @ componente-c ---
[INFO] Copying 1 resource from src\main\resources to target\classes
[INFO]
[INFO] --- compiler:3.11.0:compile (default-compile) @ componente-c ---
[INFO] Changes detected - recompiling the module! :source
[INFO] Compiling 2 source files with javac [debug target 17] to target\classes
[INFO]
[INFO] --- resources:3.3.1:testResources (default-testResources) @ componente-c ---
[INFO] skip non existing resourceDirectory C:\Users\Rocio López\Desktop\ExamenFinalDesarrollo\componente-c\src\test\resources
[INFO]
[INFO] --- compiler:3.11.0:testCompile (default-testCompile) @ componente-c ---
[INFO] No sources to compile
[INFO]
[INFO] --- surefire:3.2.5:test (default-test) @ componente-c ---
[INFO] No tests to run.
[INFO]
[INFO] --- jar:3.4.1:jar (default-jar) @ componente-c ---
[INFO] Building jar: C:\Users\Rocio López\Desktop\ExamenFinalDesarrollo\componente-c\target\componente-c-0.0.1-SNAPSHOT.jar
[INFO]
[INFO] --- install:3.1.2:install (default-install) @ componente-c ---
[INFO] Installing C:\Users\Rocio López\Desktop\ExamenFinalDesarrollo\componente-c\pom.xml to C:\Users\Rocio López\.m2\repository\com\empresa\componente-c\0.0.1-SNAPSHOT\componente-c-0.0.1-SNAPSHOT.pom
[INFO] Installing C:\Users\Rocio López\Desktop\ExamenFinalDesarrollo\componente-c\target\componente-c-0.0.1-SNAPSHOT.jar to C:\Users\Rocio López\.m2\repository\com\empresa\componente-c\0.0.1-SNAPSHOT\componente-c-0.0.1-SNAPSHOT.jar
[INFO]
[INFO] BUILD SUCCESS
[INFO] Total time: 10.151 s
[INFO] Finished at: 2025-11-15T11:28:30-06:00
[INFO]
PS C:\Users\Rocio López\Desktop\ExamenFinalDesarrollo\componente-c>
```

9.4. Backend

Componente A - .\mvnw.cmd spring-boot:run

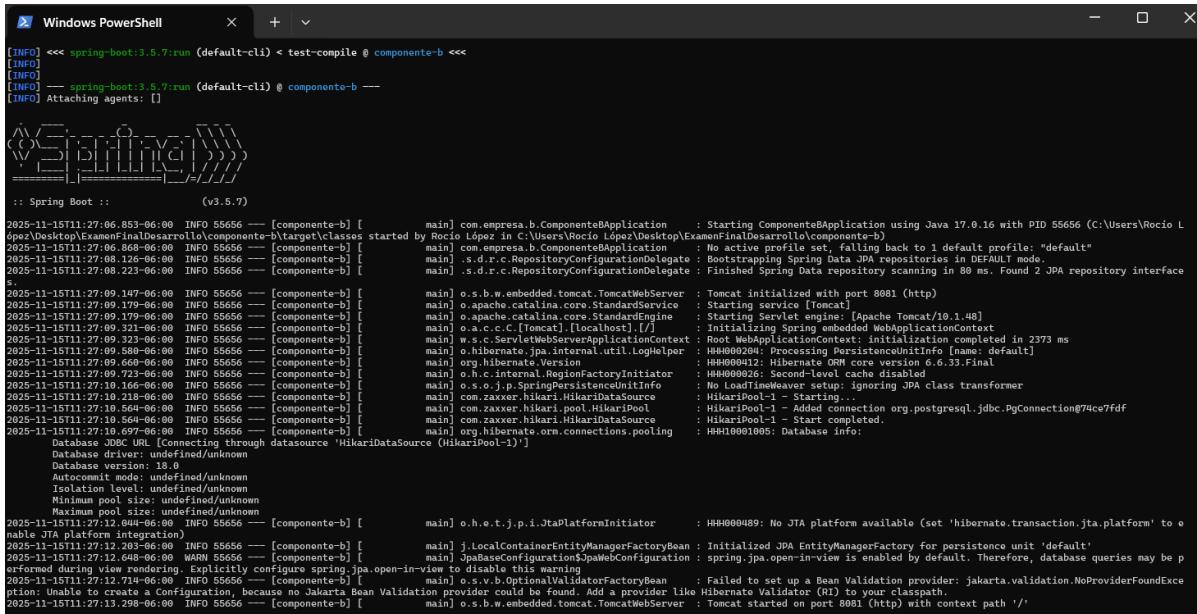


```
PS C:\Users\Rocio López\Desktop\ExamenFinalDesarrollo\componente-a> .\mvnw.cmd spring-boot:run
[INFO] --- spring-boot:3.5.7:run (default-cli) @ componente-a ---
[INFO] Attaching agents: []

:: Spring Boot ::      (v3.5.7)

2025-11-15T11:25:26.327-06:00 INFO 48736 --- [componente-a] [           main] com.empresa.a.ComponenteAApplication : Starting ComponenteAApplication using Java 17.0.16 with PID 48736 (C:\Users\Rocio López\Desktop\ExamenFinalDesarrollo\componente-a)
2025-11-15T11:25:26.327-06:00 INFO 48736 --- [componente-a] [           main] com.empresa.a.ComponenteAApplication : No active profile set, falling back to 1 default profile: "default"
2025-11-15T11:25:26.327-06:00 INFO 48736 --- [componente-a] [           main] o.s.b.w.embedded.tomcat.TomcatWebServer : Tomcat initialized with port 8080 (http)
2025-11-15T11:25:26.327-06:00 INFO 48736 --- [componente-a] [           main] o.s.b.w.embedded.tomcat.TomcatWebServer : Starting service Tomcat
2025-11-15T11:25:26.327-06:00 INFO 48736 --- [componente-a] [           main] o.s.b.w.embedded.tomcat.TomcatWebServer : StandardService[Apache Tomcat/10.1.48]
2025-11-15T11:25:26.327-06:00 INFO 48736 --- [componente-a] [           main] o.a.c.c.C.[Tomcat].[localhost].[/] : Initializing Spring embedded WebApplicationContext
2025-11-15T11:25:26.327-06:00 INFO 48736 --- [componente-a] [           main] w.s.c.ServletWebServerApplicationContext : Root WebApplicationContext: initialization completed in 2427 ms
2025-11-15T11:25:26.327-06:00 INFO 48736 --- [componente-a] [           main] o.h.b.HibernateJpaInternalUtil$Helper : HHH000204: Processing PersistenceUnitInfo [name: default]
2025-11-15T11:25:26.327-06:00 INFO 48736 --- [componente-a] [           main] o.h.b.HibernateVersion : HHH000412: Hibernate ORM core version 6.33.Final
2025-11-15T11:25:26.327-06:00 INFO 48736 --- [componente-a] [           main] o.h.b.HibernateJpaInternalUtil$Helper : HHH000022: JDBC connection pool size = 1; cache disabled
2025-11-15T11:25:26.327-06:00 INFO 48736 --- [componente-a] [           main] o.s.o.j.p.SpringPersistenceUnitInfo : No LoadTimeWeaver setup; ignoring JPA class transformer
2025-11-15T11:25:26.327-06:00 INFO 48736 --- [componente-a] [           main] com.zaxxer.hikari.HikariDataSource : HikariPool-1 - Starting...
2025-11-15T11:25:26.327-06:00 INFO 48736 --- [componente-a] [           main] com.zaxxer.hikari.HikariPool : HikariPool-1 - Added connection org.mariadb.jdbc.Connection@5f45bc8e
2025-11-15T11:25:26.327-06:00 INFO 48736 --- [componente-a] [           main] com.zaxxer.hikari.HikariDataSource : HikariPool-1 - Start completed.
2025-11-15T11:25:26.327-06:00 INFO 48736 --- [componente-a] [           main] org.hibernate.orm.connections.PoolingConnectionProvider : HHH00001005: Database info:
Database JDBC URL [Connect via through datasource 'HikariDataSource (HikariPool-1)']
Database driver: undefined/unknown
Database version: 10.11.14
Autocommit mode: undefined/unknown
Isolation level: undefined/unknown
Min/max pool size: undefined/unknown
Maximum pool size: undefined/unknown
2025-11-15T11:25:31.480-06:00 INFO 48736 --- [componente-a] [           main] o.h.e.t.j.p.i.JtaPlatformInitiator : HHH000489: No JTA platform available (set 'hibernate.transaction.jta.platform' to enable JTA platform integration)
2025-11-15T11:25:31.600-06:00 INFO 48736 --- [componente-a] [           main] j.LocalContainerEntityManagerFactoryBean : Initialized JPA EntityManagerFactory for persistence unit 'default'
2025-11-15T11:25:32.113-06:00 INFO 48736 --- [componente-a] [           main] DatabaseConfigurationWithJpaWebConfiguration : spring.jpa.open-in-view is enabled by default. Therefore, database queries may be performed during view rendering. Explicitly configure spring.jpa.open-in-view to disable this warning
2025-11-15T11:25:32.113-06:00 INFO 48736 --- [componente-a] [           main] o.s.v.b.OptionalValidatorFactoryBean : Failed to set up a Bean Validation provider: jakarta.validation.NoProviderFoundException: Unable to create a Configuration, because no Jakarta Bean Validation provider could be found. Add a provider like Hibernate Validator (HV) to your classpath.
2025-11-15T11:25:32.697-06:00 INFO 48736 --- [componente-a] [           main] o.s.b.w.embedded.tomcat.TomcatWebServer : Tomcat started on port 8080 (http) with context path '/'
2025-11-15T11:25:32.716-06:00 INFO 48736 --- [componente-a] [           main] com.empresa.a.ComponenteAApplication : Started ComponenteAApplication in 7.14 seconds (process running for 7.706)
```

Componente B - .\mvnw.cmd spring-boot:run



```
[INFO] <>< spring-boot:3.5.7:run (default-cli) < test-compile @ componente-b <<<
[INFO]
[INFO] --- spring-boot:3.5.7:run (default-cli) @ componente-b ---
[INFO] Attaching agents: []

:: Spring Boot ::   (v3.5.7)

2025-11-15T11:27:06.853+06:00 INFO 55656 --- [componente-b] [main] com.empresa.b.ComponenteBApplication : Starting ComponenteBApplication using Java 17.0.16 with PID 55656 (C:\Users\Rocio Lópe
z\Desktop\ExamenFinalDesarrollo\componente-b\target\classes started by Rocio López in C:\Users\Rocio López\Desktop\ExamenFinalDesarrollo\componente-b)
2025-11-15T11:27:06.868+06:00 INFO 55656 --- [componente-b] [main] com.empresa.b.ComponenteBApplication : No active profile set, falling back to 1 default profile: "default"
2025-11-15T11:27:08.126+06:00 INFO 55656 --- [componente-b] [main] .s.d.r.c.RepositoryConfigurationDelegate : Bootstrapping Spring Data JPA repositories in DEFAULT mode.
2025-11-15T11:27:08.223+06:00 INFO 55656 --- [componente-b] [main] .s.d.r.c.RepositoryConfigurationDelegate : Finished Spring Data repository scanning in 80 ms. Found 0 JPA repository interface
s.

2025-11-15T11:27:09.147+06:00 INFO 55656 --- [componente-b] [main] o.s.b.w.embedded.tomcat.TomcatWebServer : Tomcat initialized with port 8081 (http)
2025-11-15T11:27:09.179+06:00 INFO 55656 --- [componente-b] [main] o.apache.catalina.core.StandardService : Starting service [Tomcat]
2025-11-15T11:27:09.180+06:00 INFO 55656 --- [componente-b] [main] o.apache.catalina.core.StandardEngine : Starting Servlet engine: [Apache Tomcat/10.1.16]
2025-11-15T11:27:09.181+06:00 INFO 55656 --- [componente-b] [main] o.a.catalina.startup.ContextConfig : Initializing Spring embedded WebApplicationContext
2025-11-15T11:27:09.323+06:00 INFO 55656 --- [componente-b] [main] o.a.c.ServletContextListenerApplicationConte
xt : Root WebApplicationContext: initialization completed in 2373 ms
2025-11-15T11:27:09.580+06:00 INFO 55656 --- [componente-b] [main] o.hibernate.jpa.internal.util.LogHelper : HHH000204: Processing PersistenceUnitInfo [name: default]
2025-11-15T11:27:09.660+06:00 INFO 55656 --- [componente-b] [main] org.hibernate.Version : HHH000412: Hibernate ORM core version 6.6.33.Final
2025-11-15T11:27:09.723+06:00 INFO 55656 --- [componente-b] [main] o.h.e.t.j.p.i.JtaPlatformInitiator : HHH000026: Second-level cache disabled
2025-11-15T11:27:09.724+06:00 INFO 55656 --- [componente-b] [main] o.h.e.t.j.p.SynchronizationInitiator : No LoadTimeWeaver configured, ignoring JPA class transformer
2025-11-15T11:27:10.218+06:00 INFO 55656 --- [componente-b] [main] o.con.zaxxer.hikari.HikariDataSource : HikariPool-1 - Starting...
2025-11-15T11:27:10.564+06:00 INFO 55656 --- [componente-b] [main] com.zaxxer.hikari.pool.HikariPool : HikariPool-1 - Added connection org.postgresql.jdbc.PgConnection@74ce7fdf
2025-11-15T11:27:10.564+06:00 INFO 55656 --- [componente-b] [main] o.hibernate.jpa.internal.EntityManagerFactoryImpl : HikariPool-1 - Start completed.
2025-11-15T11:27:10.697+06:00 INFO 55656 --- [componente-b] [main] org.hibernate.orm.connections.Pooling : HHH10001085: Database info:
Database JDBC URL (Connecting through datasource 'HikariDataSource (HikariPool-1)')
Database driver name: unknown
Database version: 18.0
Autocommit mode: undefined/unknown
Isolation level: undefined/unknown
Minimum pool size: undefined/unknown
Maximum pool size: undefined/unknown
Max acquire count: undefined/unknown
2025-11-15T11:27:12.086+06:00 INFO 55656 --- [componente-b] [main] o.h.e.t.j.p.i.JtaPlatformInitiator : HHH000489: No JTA platform available (set 'hibernate.transaction.jta.platform' to enable JTA platform integration)
2025-11-15T11:27:12.203+06:00 INFO 55656 --- [componente-b] [main] j.LocalContainerEntityManagerFactoryBean : Initialized JPA EntityManagerFactory for persistence unit 'default'
2025-11-15T11:27:12.648+06:00 WARN 55656 --- [componente-b] [main] JpaBaseConfiguration$JpaWebConfiguration : spring.jpa.open-in-view is enabled by default. Therefore, database queries may be performed during view rendering. Explicitly configure spring.jpa.open-in-view to disable this warning
2025-11-15T11:27:13.000+06:00 INFO 55656 --- [componente-b] [main] o.h.e.t.j.p.i.JtaPlatformInitiator : Failed to set up a Bean Validation provider: jakarta.validation.NoProviderFoundException: Unable to create a Configuration, because no Jakarta Bean Validation provider could be found. Add a provider like Hibernate Validator (HV) to your classpath.
2025-11-15T11:27:13.298+06:00 INFO 55656 --- [componente-b] [main] o.s.b.w.embedded.tomcat.TomcatWebServer : Tomcat started on port 8081 (http) with context path '/'
```

9.5. Frontend



```
next-server (v16.0.2)          + | -
Windows PowerShell
Copyright (C) Microsoft Corporation. Todos los derechos reservados.

Instale la versión más reciente de PowerShell para obtener nuevas características y mejoras. https://aka.ms/PSWindows

PS C:\Users\Rocío López\Desktop\ExamenFinalDesarrollo\dashboard> npm run dev

> dashboard@0.1.0 dev
> next dev

  ▲ Next.js 16.0.2 (Turbopack)
  - Local:          http://localhost:3000
  - Network:        http://192.168.56.1:3000
  - Environments:  .env.local

✓ Starting...
✓ Ready in 1894ms
○ Compiling / ...
GET / 200 in 5.2s (compile: 4.8s, render: 435ms)
```

10. Demostración

10.1. SWAGGER A

Endpoints de Cliente y Pedido

The screenshot shows the Swagger UI interface for API A. At the top, it displays the URL `localhost:8080/api-docs`. Below this, the title "OpenAPI definition" is followed by a green "OAS 3.0" badge. The main content area is divided into sections for different controllers:

- cliente-controller**: Contains five methods:
 - GET /api/clientes/{id}
 - PUT /api/clientes/{id}
 - DELETE /api/clientes/{id}
 - GET /api/clientes
 - POST /api/clientes
- pedido-controller**: Contains four methods:
 - GET /api/pedidos
 - POST /api/pedidos
 - GET /api/pedidos/{id}
 - DELETE /api/pedidos/{id}

At the bottom, there is a "Schemas" section containing definitions for Client, Pedido, and Producto.

10.2. Swagger B

Endpoints de proveedores y facturas.

The screenshot shows the Swagger UI interface for API B. At the top, it displays the URL `localhost:8081/api-docs`. Below this, the title "OpenAPI definition" is followed by a green "OAS 3.0" badge. The main content area is divided into sections for different controllers:

- proveedor-controller**: Contains five methods:
 - GET /api/proveedores
 - POST /api/proveedores
 - GET /api/proveedores/{id}
 - DELETE /api/proveedores/{id}
- factura-controller**: Contains five methods:
 - GET /api/facturas
 - POST /api/facturas
 - GET /api/facturas/{id}
 - DELETE /api/facturas/{id}

At the bottom, there is a "Schemas" section containing definitions for Proveedor and Factura.

11. DASHBOARD

11.1. Home

Página principal con navegación a todas las secciones.

The screenshot shows the home page of the Multiproductos S.A. application. The left sidebar has a dark theme with blue highlights for 'CLIENTES Y PEDIDOS' and 'PROVEEDORES Y FACTURAS'. The main area displays a welcome message: 'Bienvenido a Multiproductos S.A.' followed by a list of features: 'Clientes y Pedidos', 'Proveedores y Facturas', and 'Integración Centralizada'. Below this are four summary cards: 'Total Clientes 5' (with a people icon), 'Total Pedidos 5' (with a box icon), 'Total Proveedores 5' (with a building icon), and 'Total Facturas 3' (with a document icon). At the bottom, there's a footer with the copyright notice: '© 2025 Multiproductos S.A. - Todos los derechos reservados'.

11.2. Gestión de Clientes

Tabla con clientes obtenidos del API (puerto 8080).

The screenshot shows the 'Gestión de Clientes' (Client Management) section. The left sidebar shows 'CLIENTES Y PEDIDOS' selected. The main area has a title 'Gestión de Clientes' with a '+ Nuevo Cliente' button. Below is a table with columns: ID, Nombre, Correo, and Acciones. The table contains five rows of client data:

ID	Nombre	Correo	Acciones
001	Rocio López	rlopeza19@umzug.edu.gt	Ver Pedidos Borrar
002	Karla Ruano	karlar@prueba2.com	Ver Pedidos Borrar
003	Mario Beltrán	mbeltran12@prueba.com	Ver Pedidos Borrar
004	Lucía Pérez	luperes@prueba3.com	Ver Pedidos Borrar
005	Guisela Alvarado	galvarado@prueba4.com	Ver Pedidos Borrar

At the bottom, there's a footer with the copyright notice: '© 2025 Multiproductos S.A. - Todos los derechos reservados'.

Gestión de Clientes

+ Nuevo Cliente

Crear Nuevo Cliente

Nombre

Ej. Juan Pérez

Correo Electrónico

Ej. juan@example.com

Guardar

Cancelar

The screenshot shows a web browser window for 'Multiproductos S.A.' with the URL 'localhost:3000/clientes/pedidos/1'. The page title is 'Multiproductos S.A.' and the subtitle is 'Panel de Control - Gestión de Pedidos y Facturas'.

Left Sidebar:

- Inicio
- CLIENTES Y PEDIDOS** (selected)
- Cuentas
- Pedidos
- PROVEEDORES Y FACTURAS**
- Proveedores
- Facturas

Client Profile Section:

Rocio López
rlopeza19@iumg.edu.gt

Total de Pedidos: 1 | Monto Total: Q.8599.00 | Cliente ID: #001

Pedidos Registrados:

ID PEDIDO	CÓDIGO	CANTIDAD ARTÍCULOS	TOTAL
#17	PEDIDO-F11ECD71	1	Q.8599.00

Artículos:

Producto	P. Unitario	Cantidad	Subtotal
VICTRIX	Q.8599.00	1	Q.8599.00

Buttons:

- + Crear Nuevo Pedido para este Cliente

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11.3. Gestión de Pedidos

The screenshot displays two views of a web application for managing orders at Multiproductos S.A.

Main View (Top): The title bar shows "Multiproductos S.A." and "Panel de Control - Gestión de Pedidos y Facturas". The left sidebar has sections for "CLIENTES Y PEDIDOS" (Clients, Orders) and "PROVEEDORES Y FACTURAS" (Suppliers, Invoices). The main content area is titled "Gestión de Pedidos" and shows a table of existing orders:

ID	Descripción	Cliente ID	Total	Acciones
P001	PEDIDO-3833267E	003	Q.3,599.00	Detalle Borrar
P002	PEDIDO-065AA019	002	Q.8,599.00	Detalle Borrar
P003	PEDIDO-F11ECD71	001	Q.8,599.00	Detalle Borrar
P004	PEDIDO-8D4F543A	004	Q.7,198.00	Detalle Borrar
P005	PEDIDO-E05F366C	005	Q.8,599.00	Detalle Borrar

New Order View (Bottom): A modal dialog titled "Gestión de Pedidos" is open, with a green button "+ Nuevo Pedido" in the top right. The form is titled "Crear Nuevo Pedido". It includes fields for "Cliente" (Client) with a dropdown menu "Seleccionar cliente...", "Productos" (Products) with a dropdown menu "Seleccionar producto...", and input fields for "Precio Unidad" (Unit Price), "Cantidad" (Quantity), and "Subtotal". Below the product section is a button "+ Agregar Producto" (Add Product). At the bottom are buttons "Guardar Pedido" (Save Order) and "Cancelar" (Cancel).

The screenshot shows a web browser window with the URL `localhost:3000/pedido...`. The title bar indicates it's a Google Chrome instance. The main content area displays the "Multiproductos S.A." application. The sidebar on the left has a dark theme with blue highlights for the selected menu items: "CLIENTES Y PEDIDOS" (Clients and Orders) and "PROVEEDORES Y FACTURAS" (Suppliers and Invoices). Under "CLIENTES Y PEDIDOS", there are links for "Clientes" and "Pedidos". Under "PROVEEDORES Y FACTURAS", there are links for "Proveedores" and "Facturas". The main content area has a header "Información del Pedido" and sub-sections for "Cliente: Rocio Lopez (001)", "ID Pedido: P003", "Código: PEDIDO-F11ECD71", and "Total Pedido: Q.8,599.00". It also shows "Artículos en Pedido: 1" and "Total del Pedido: Q.8,599.00". Below this is a table titled "Artículos del Pedido" with one row for "VICTUS" at a unit price of "Q.8,599.00" and quantity "1", totaling "Q.8,599.00". The footer contains the copyright notice "© 2025 Multiproductos S.A. - Todos los derechos reservados".

11.4. Gestión de Proveedores

Lista de proveedores del API (puerto 8081).

The screenshot shows a web browser window with the URL `localhost:3000/proveedores...`. The title bar indicates it's a Google Chrome instance. The main content area displays the "Multiproductos S.A." application. The sidebar on the left has a dark theme with blue highlights for the selected menu items: "CLIENTES Y PEDIDOS" (Clients and Orders) and "PROVEEDORES Y FACTURAS" (Suppliers and Invoices). Under "PROVEEDORES Y FACTURAS", there are links for "Proveedores" and "Facturas". The main content area has a header "Gestión de Proveedores" and a button "+ Nuevo Proveedor". A table lists five suppliers with columns: ID, Nombre, Correo, Teléfono, Contacto, and Acciones. The data is as follows:

ID	Nombre	Correo	Teléfono	Contacto	Acciones
001	ACME S.A.	acmesa@prueba1.com	58964758	Gerente	Ver Facturas Borrar
002	BURGUER KING	burguerk@prueba2.com	22000000	Gerente	Ver Facturas Borrar
003	Banco Industrial	biguate@prueba3.com	85961475	Colaborador	Ver Facturas Borrar
004	Distribuidora Electronica	electrodis@prueba4.com	25698741	Asesor de Ventas	Ver Facturas Borrar
005	Banco industrial	banco@gmail.com	56997412	Gerente	Ver Facturas Borrar

The footer contains the copyright notice "© 2025 Multiproductos S.A. - Todos los derechos reservados".

Gestión de Proveedores

+ Nuevo Proveedor

Crear Nuevo Proveedor

Nombre
Ej. ACME S.A.

Correo Electrónico
Ej. ventas@acme.com

Teléfono
Ej. +56912345678

Contacto
Ej. Gerente de Ventas

Guardar **Cancelar**

11.5. Gestión de Facturas

The screenshot shows a web browser window for the 'Multiproductos S.A.' application. The URL in the address bar is 'localhost:3000/facturas'. The page title is 'Multiproductos S.A.' and the subtitle is 'Panel de Control - Gestión de Pedidos y Facturas'.

The left sidebar has two main sections: 'CLIENTES Y PEDIDOS' (Clients and Orders) and 'PROVEEDORES Y FACTURAS' (Suppliers and Invoices). Under 'CLIENTES Y PEDIDOS', there are links for 'Clientes' and 'Pedidos'. Under 'PROVEEDORES Y FACTURAS', there are links for 'Proveedores' and 'Facturas'. The 'Proveedores' link is currently selected, highlighted with a blue background.

The main content area is titled 'Gestión de Facturas' and features a table with the following data:

ID	Número	Proveedor	Total	Acciones
001	FACT-6F84015F	ACME S.A.	Q.72.00	Ver Detalle Borrar
005	FAC-7B198ABD	BURGUER KING	Q.3,599.00	Ver Detalle Borrar
006	FAC-6876FAA0	Banco industrial	Q.0.00	Ver Detalle Borrar

A brown button at the top right of the table says '+ Nueva Factura' (New Invoice).

At the bottom of the page, a footer bar contains the text '© 2025 Multiproductos S.A. - Todos los derechos reservados'.

Gestión de Facturas

+ Nueva Factura

Crear Nueva Factura

Proveedor

Seleccionar proveedor...

Productos

Seleccionar producto... Q.0.00 1 Q.0.00

+ Agregar Item

Marca | Precio Unitario | Cantidad | Subtotal

NIT

Ej. 1234567890

C/F

Seleccionar...

Total Factura: Q.0.00

Guardar Factura

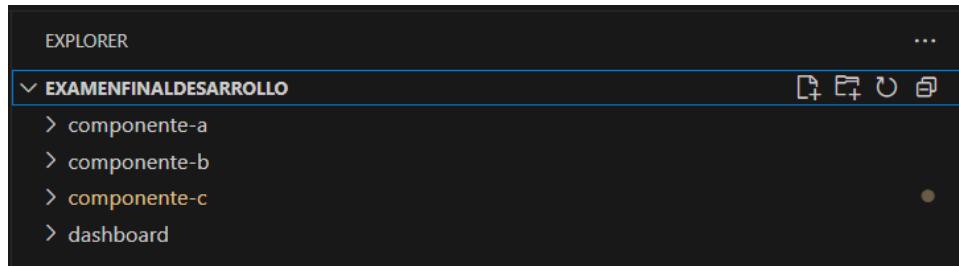
Cancelar

The screenshot shows a web browser window for the URL `localhost:3000/factur...`. The page title is "Multiproductos S.A." and the subtitle is "Panel de Control - Gestión de Pedidos y Facturas". On the left, a sidebar menu includes "Inicio", "CLIENTES Y PEDIDOS" (Clients and Orders), "Proveedores" (Suppliers), and "Facturas" (Invoices). The "FACTURAS" section is currently selected. The main content area displays a detailed invoice receipt titled "FACTURA". The receipt header includes the invoice number "Nº FACTURA FACT-6F84015F" and the supplier ID "PROVEEDOR ID 015". The "PROVEEDOR" section lists the supplier's details: ACME S.A., acmesa@prueba1.com, 58964758, and Gerente. Below this, the "SUBTOTAL" is listed as "Q.64.29" and the "IVA (12%)" as "Q.7.71", resulting in a "TOTAL FACTURA" of "Q.72.00". At the bottom of the receipt are two buttons: "Volver a Facturas" (Return to Invoices) and "Imprimir" (Print).

12. ESTRUCTURA DEL PROYECTO

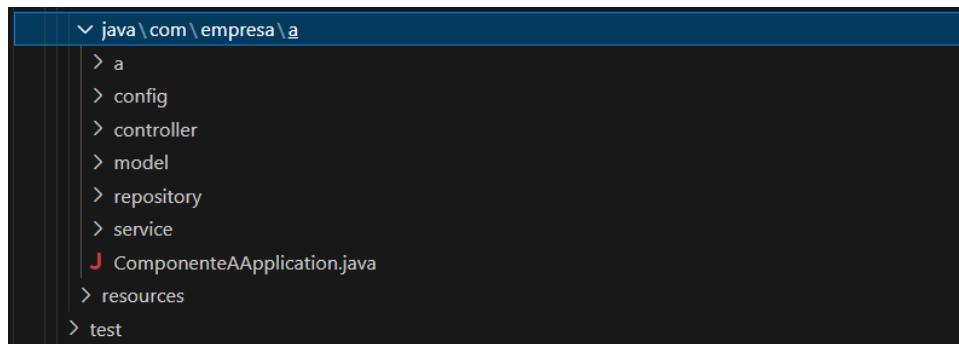
12.1. Vista General

Arquitectura de microservicios con 3 componentes backend y 1 frontend.



12.2. Estructura Interna

Patrón MVC estándar de Spring Boot. Separación de responsabilidades.



CONCLUSIÓN

Las conclusiones del proyecto reflejan el cumplimiento de los objetivos planteados y la correcta implementación de una arquitectura moderna, escalable y orientada a buenas prácticas de desarrollo. A lo largo del proceso se logró diseñar, construir e integrar múltiples componentes que trabajan de manera independiente y coordinada, garantizando robustez, mantenibilidad y eficiencia en el flujo general del sistema. Entre los principales logros alcanzados se destacan:

- Arquitectura de microservicios con servicios independientes
- Cada componente con su propia base de datos (MariaDB y PostgreSQL)
- Librería compartida (componente-c) para código reutilizable
- APIs REST documentadas con Swagger
- Frontend moderno con Next.js y TypeScript
- Configuración CORS para integración frontend-backend
- Persistencia con JPA/Hibernate
- Gestión de dependencias con Maven

APRENDIZAJE

- Diseño e implementación de microservicios
- Spring Boot y Spring Data JPA
- Next.js App Router y React hooks
- Integración de múltiples tecnologías
- Resolución de problemas de configuración

ANEXOS

Comandos Principales

```
PS C:\Users\Rocío López\Desktop\ExamenFinalDesarrollo\dashboard> npm run dev
```

```
PS C:\Users\Rocío López\Desktop\ExamenFinalDesarrollo\componente-a> .\mvnw.cmd spring-boot:run
```

```
PS C:\Users\Rocío López\Desktop\ExamenFinalDesarrollo\componente-b> .\mvnw.cmd spring-boot:run
```

```
PS C:\Users\Rocío López\Desktop\ExamenFinalDesarrollo\componente-c> .\mvnw.cmd clean install
```

URLs del Sistema

Componente A API:	http://localhost:8080/api/
Componente A Swagger:	http://localhost:8080/swagger-ui/index.html
Componente B API:	http://localhost:8081/api/
Componente B Swagger	<u>http://localhost:8081/swagger-ui/index.html</u>
Dashboard	http://localhost:3000