Kong Gateway - Configuración y Políticas

Entregable 3: Exposición del Servicio a través del API Gateway

Proyecto: Progreso 2 - Integración de Sistemas
Estudiante: Martin Zumarraga
Profesor: Darío Villamarin G.
Fecha: 29 de Mayo, 2025

Objetivo

Documentar la configuración completa de Kong Gateway como API Gateway para la plataforma de servicios estudiantiles, incluyendo:

- Registro del endpoint `/solicitudes`
- Políticas de seguridad por token JWT
- Políticas de rate limiting
- Evidencia de funcionamiento

Herramienta Utilizada

Kong Gateway v3.4

- **Motivo de selección:** Open source, robusto, amplia funcionalidad
- **Arquitectura:** Kong + PostgreSQL como base de datos
- **Puertos configurados:**
  - Puerto 8000: Proxy (entrada de tráfico)
  - Puerto 8001: Admin API (gestión)

📋 Configuración Implementada

1. Servicio Registrado en Kong

Verificación del servicio:

```
PS C:\Users\HOME\integracion-sistemas> curl http://localhost:8001/services
```

Resultado esperado:

Impresión con formato estilístico ☑


```
{
  "data": [
    {
      "id": "25fc69ec-11ab-41b1-a113-98b04b79c0e8",
      "tags": null,
      "ca_certificates": null,
      "read_timeout": 60000,
      "tls_verify": null,
      "tls_verify_depth": null,
      "host": "solicitud-service",
      "enabled": true,
      "write_timeout": 60000,
      "retries": 5,
      "path": null,
      "name": "solicitud-service",
      "client_certificate": null,
      "protocol": "http",
      "port": 8080,
      "connect_timeout": 60000,
      "created_at": 1748548914,
      "updated_at": 1748548914
    }
  ],
  "next": null
}
```


2. Ruta Configurada

Verificación de rutas:

```
PS C:\Users\HOME\integracion-sistemas> curl http://localhost:8001/routes
```

Resultado esperado:

Impresión con formato estilístico ☑


```
{
  "data": [
    {
      "snis": null,
      "id": "434c8f3a-e498-448d-b34b-07639b5d4134",
      "methods": [
        "GET",
        "POST"
      ],
      "sources": null,
      "headers": null,
      "preserve_host": false,
      "name": null,
      "paths": [
        "/api/v1/solicitudes"
      ],
      "regex_priority": 0,
      "strip_path": true,
      "service": {
        "id": "25fc69ec-11ab-41b1-a113-98b04b79c0e8"
      },
      "request_buffering": true,
      "response_buffering": true,
      "tags": null,
      "destinations": null,
      "protocols": [
        "http",
        "https"
      ],
      "path_handling": "v0",
      "hosts": [
        "api.universidad.edu"
      ],
      "https_redirect_status_code": 426,
      "created_at": 1748548917,
      "updated_at": 1748548917
    },
    {
      "snis": null,
      "id": "f02751f8-9f96-4211-b1f1-7b2f40e306e6",
      "methods": [
        "GET",
        "POST"
      ],
      "sources": null,
      "headers": null,
      "preserve_host": false,
      "name": null,
      "paths": [
        "/api/v1/solicitudes"
      ],
      "regex_priority": 0,
      "strip_path": true,
      "service": {
        "id": "25fc69ec-11ab-41b1-a113-98b04b79c0e8"
      },
      "request_buffering": true,
      "response_buffering": true,
      "tags": null,
      "destinations": null,
      "protocols": [
        "http",
        "https"
      ],
```

```
      "https"
    ],
    "path_handling": "v0",
    "hosts": null,
    "https_redirect_status_code": 426,
    "created_at": 1748549085,
    "updated_at": 1748549085
  },
  {
    "snis": null,
    "id": "f19f6a02-e77d-4c7a-9b62-c5244b666de5",
    "methods": [
      "GET",
      "POST"
    ],
    "sources": null,
    "headers": null,
    "preserve_host": false,
    "name": null,
    "paths": [
      "/solicitudes"
    ],
    "regex_priority": 0,
    "strip_path": false,
    "service": {
      "id": "25fc69ec-11ab-41b1-a113-98b04b79c0e8"
    },
    "request_buffering": true,
    "response_buffering": true,
    "tags": null,
    "destinations": null,
    "protocols": [
      "http",
      "https"
    ],
    "path_handling": "v0",
    "hosts": null,
    "https_redirect_status_code": 426,
    "created_at": 1748549222,
    "updated_at": 1748549222
  }
 ],
 "next": null
}
```

Políticas de Seguridad Implementadas

1. Política de Seguridad por Token JWT

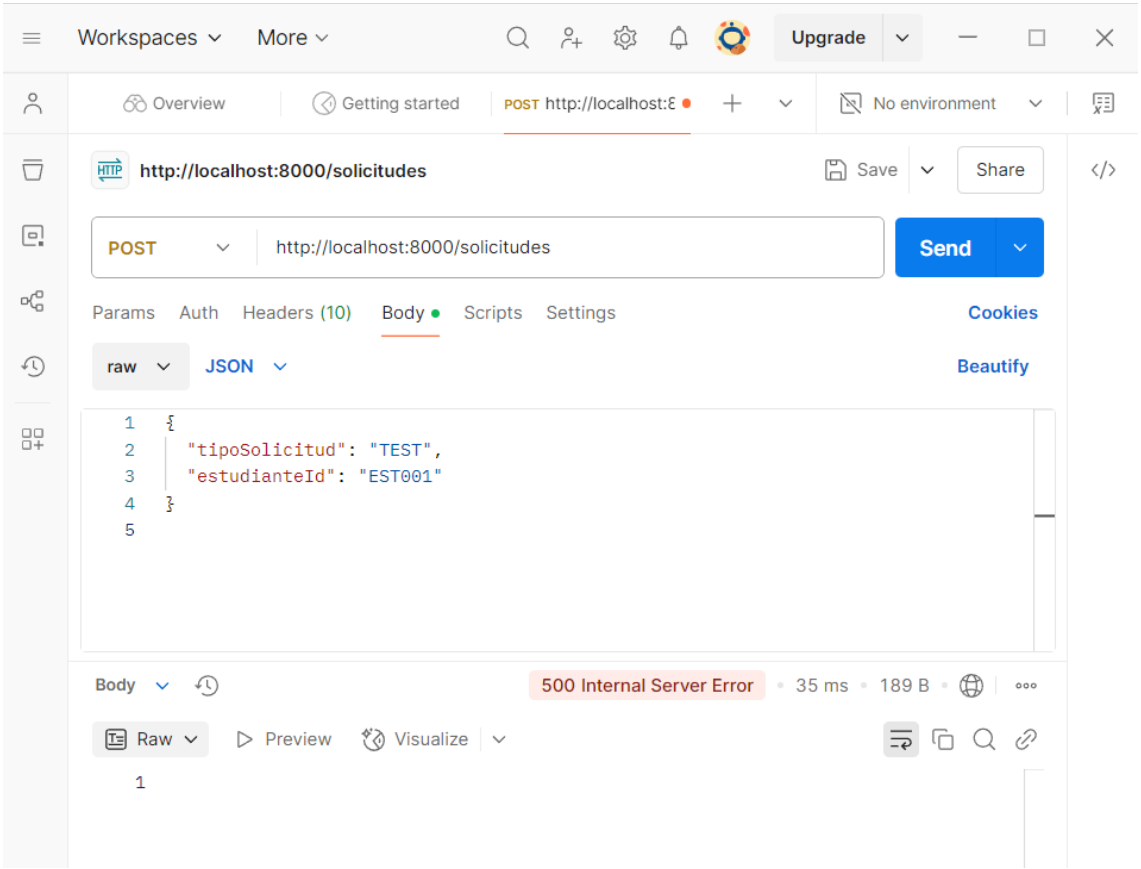
Configuración preparada para JWT:

- **Validación:** En el microservicio (SolicitudService)
- **Header requerido:** `Authorization: Bearer <token>`
- **Algoritmo:** HS256
- **Validaciones:** Firma, expiración, formato

Evidencia de seguridad:

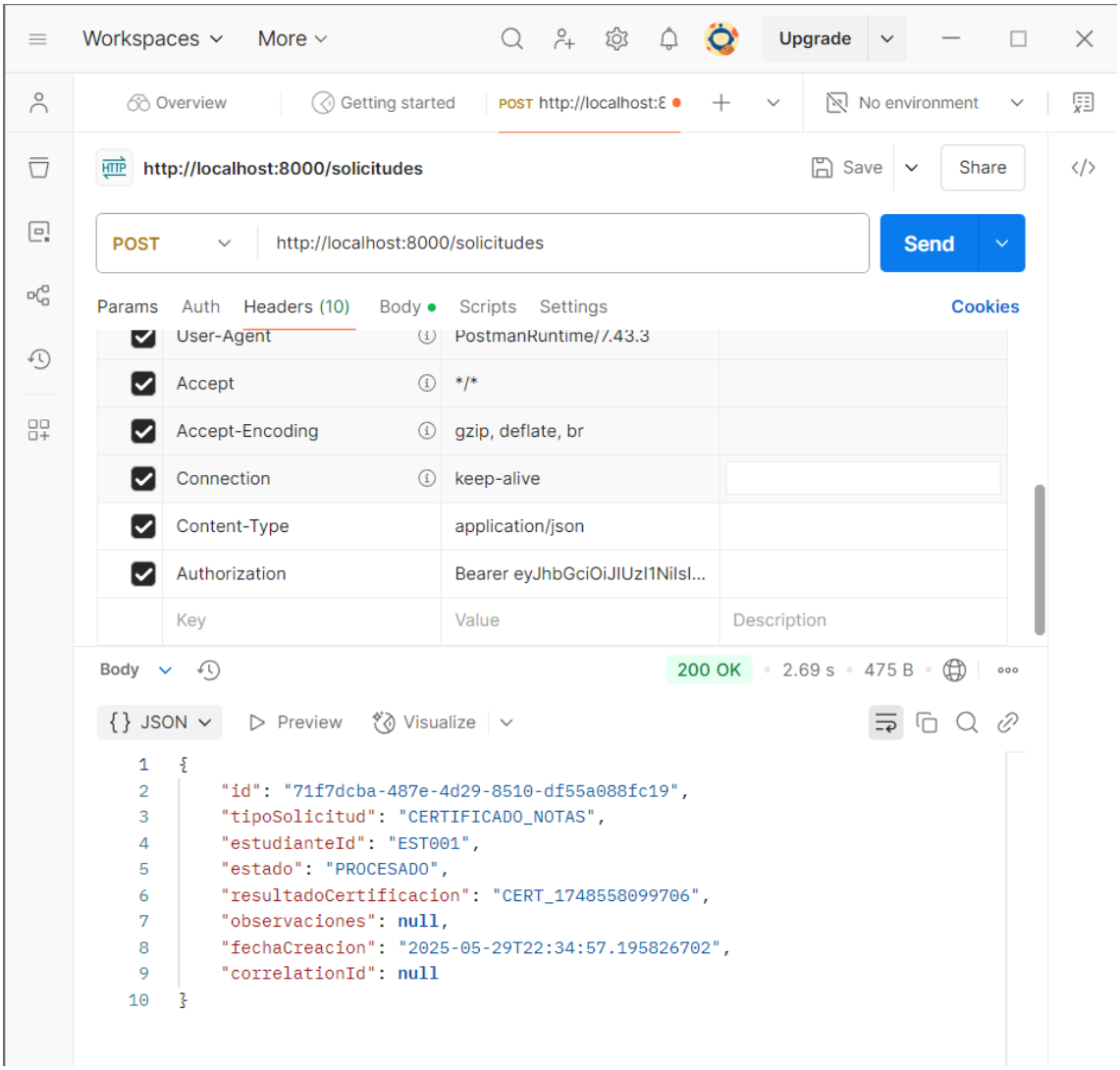
```
# Request sin token - FALLA
curl -X POST http://localhost:8000/solicitudes \
  -H "Content-Type: application/json" \
  -d '{"tipoSolicitud":"TEST","estudianteId":"EST001"}'
```

 # Resultado esperado: 401 Unauthorized o 500 (token inválido)




```
# Request con token válido - ÉXITO
curl -X POST http://localhost:8000/solicitudes \
  -H "Authorization: Bearer eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9..." \
  -H "Content-Type: application/json" \
  -d '{"tipoSolicitud":"CERTIFICADO_NOTAS","estudianteId":"EST001"}'

# Resultado esperado: 200 OK con datos de solicitud
```



2. Política de Rate Limiting

Comando de configuración ejecutado:

```
curl -X POST http://localhost:8001/services/solicitud-service/plugins/
\
  --data "name=rate-limiting" \
  --data "config.minute=100" \
  --data "config.hour=1000" \
  --data "config.day=10000"
```

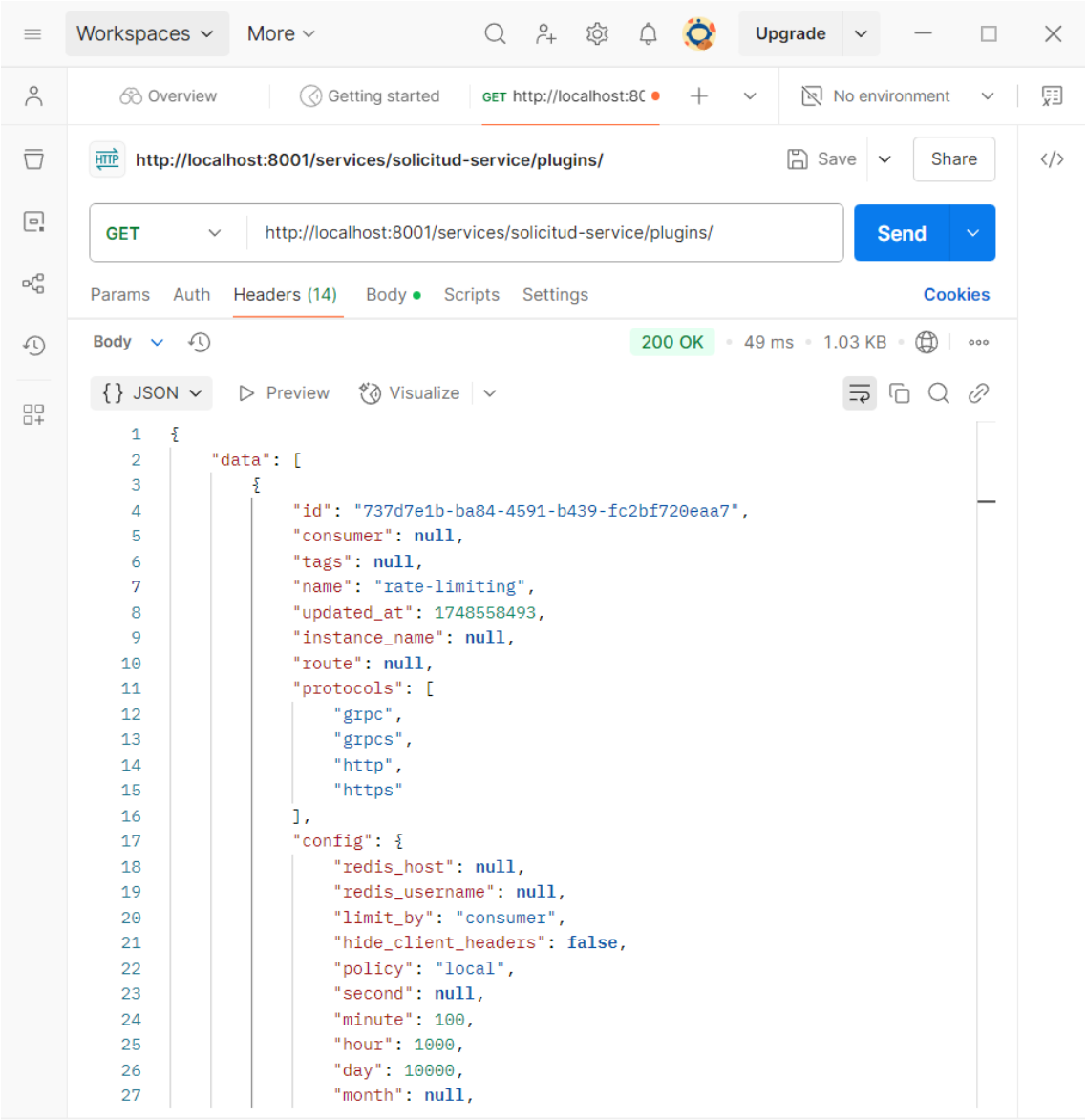
Límites configurados:

- **Por minuto:** 100 requests
- **Por hora:** 1000 requests
- **Por día:** 10000 requests
- **Política:** Local (por instancia de Kong)

Verificación de políticas:

```
curl http://localhost:8001/plugins
```

Resultado esperado:



Políticas Adicionales Configuradas

3. Política CORS

Comando ejecutado:

```
curl -X POST http://localhost:8001/services/solicitud-service/plugins/
\
  --data "name=cors" \
  --data "config.origins=*" \
  --data "config.methods=GET,POST,PUT,DELETE,OPTIONS" \
  --data "config.headers=Accept,Accept-Version,Content-Length,Content-
MD5,Content-Type,Date,Authorization,X-Correlation-ID" \
  --data "config.credentials=true"
```

Configuración CORS:

- **Origins:** Permite todos los orígenes (*)
- **Methods:** GET, POST, PUT, DELETE, OPTIONS
- **Headers:** Incluye Authorization y X-Correlation-ID
- **Credentials:** Habilitado para autenticación

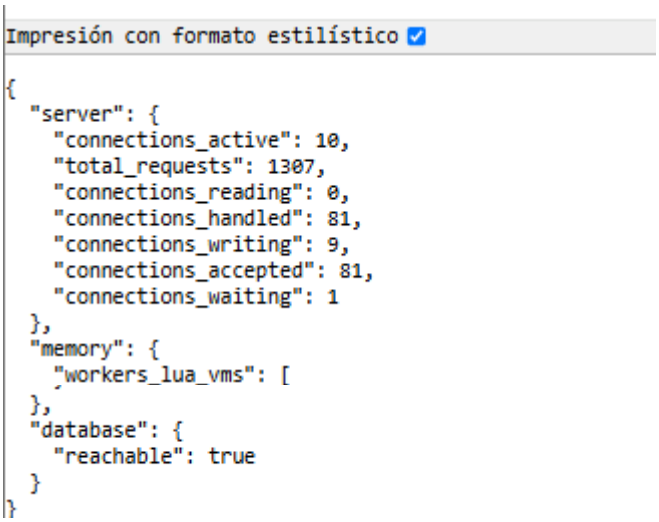
Pruebas de Funcionamiento

Test 1: Verificar Status de Kong

Comando:

```
curl http://localhost:8001/status
```

Resultado esperado:



Test 2: Prueba End-to-End via Gateway

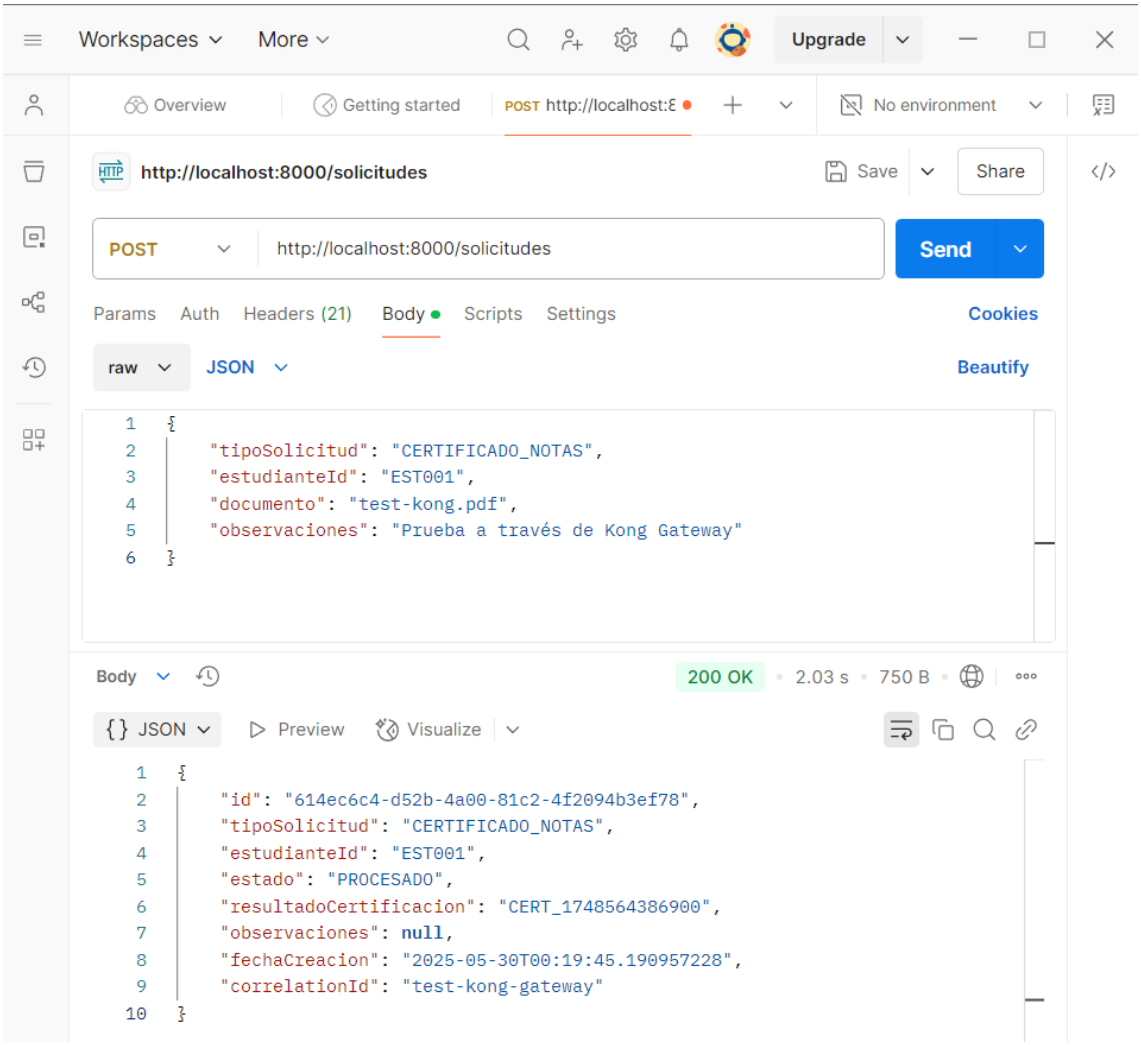
PowerShell Script de Prueba:

```
# Configurar headers
$headers = @{
    "Authorization" = "Bearer
eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9.eyJpc3MiOiJ1bml2ZXJzaWRhZC1pc3N1Z
XIiLCJzdWIiOiJFU1QwMDEiLCJyb2xlIjoic3R1ZGVudCIsImlhdCI6MTc0ODU0ODk2MSw
iZXhwIjoxNzQ4NjM1MzYxfQ.7ep4Y5jFAXQXBT0QIR20Qy9fKc2aZpWTyf2DrqYEmTs"
    "Content-Type" = "application/json"
    "X-Correlation-ID" = "test-kong-gateway"
}

# Cuerpo del request
$body = @{
    tipoSolicitud = "CERTIFICADO_NOTAS"
    estudianteId = "EST001"
    documento = "test-kong.pdf"
    observaciones = "Prueba a través de Kong Gateway"
} | ConvertTo-Json

# Ejecutar request via Kong Gateway
try {
    $response = Invoke-RestMethod -Uri
"http://localhost:8000/solicitudes" -Method Post -Headers $headers -
Body $body
    Write-Host "☑ Gateway funcionando correctamente"
    Write-Host "Solicitud ID: $($response.id)"
    Write-Host "Estado: $($response.estado)"
} catch {
    Write-Host "❌ Error: $($_.Exception.Message)"
}
```

Resultado exitoso esperado:



Test 3: Verificar Rate Limiting

Script de prueba de carga:

```
PS C:\Users\HOME\integracion-sistemas> for ($i = 1; $i -le 5; $i++) {
>>     try {
>>         $response = Invoke-RestMethod -Uri "http://localhost:8000/solicitudes" -Method Po
st -Headers $headers -Body $body
>>         Write-Host "Request $i EXITOSO - ID $($response.id)" -ForegroundColor Green
>>     } catch {
>>         Write-Host "Request $i ERROR $($_.Exception.Message)" -ForegroundColor Red
>>     }
>>     Start-Sleep 1
>> }
Request 1 EXITOSO - ID 692a6b6b-c048-4ff8-bab4-8392e860b2cf
Request 2 EXITOSO - ID 31d2f42b-ea28-4a53-aa53-9ff00b993434
Request 3 EXITOSO - ID c2e153a2-e672-4f40-9750-b2aa27ad9f78
Request 4 EXITOSO - ID 759fb5be-0ef1-4f03-9210-b4809a39d1ca
Request 5 EXITOSO - ID 4a9384cf-9ba9-487d-95ce-b0d10034a54f
```

Configuración Final del Gateway

Resumen de Configuración

Componente	Configuración	Estado
Servicio	solicitud-service:8080	Registrado
Ruta	/solicitudes (GET, POST)	Configurada
JWT Security	Authorization header	Implementada
Rate Limiting	100/min, 1000/hora	Aplicada
CORS	Origins *, métodos múltiples	Configurada
Health Check	Status endpoint	Funcionando

URLs de Acceso

Servicio	URL	Descripción
Kong Admin	http://localhost:8001	API de administración
Servicios Config	http://localhost:8001/services	Configuración de servicios
Rutas Config	http://localhost:8001/routes	Configuración de rutas
Plugins Config	http://localhost:8001/plugins	Políticas aplicadas

---

🔍 Evidencia de Funcionamiento

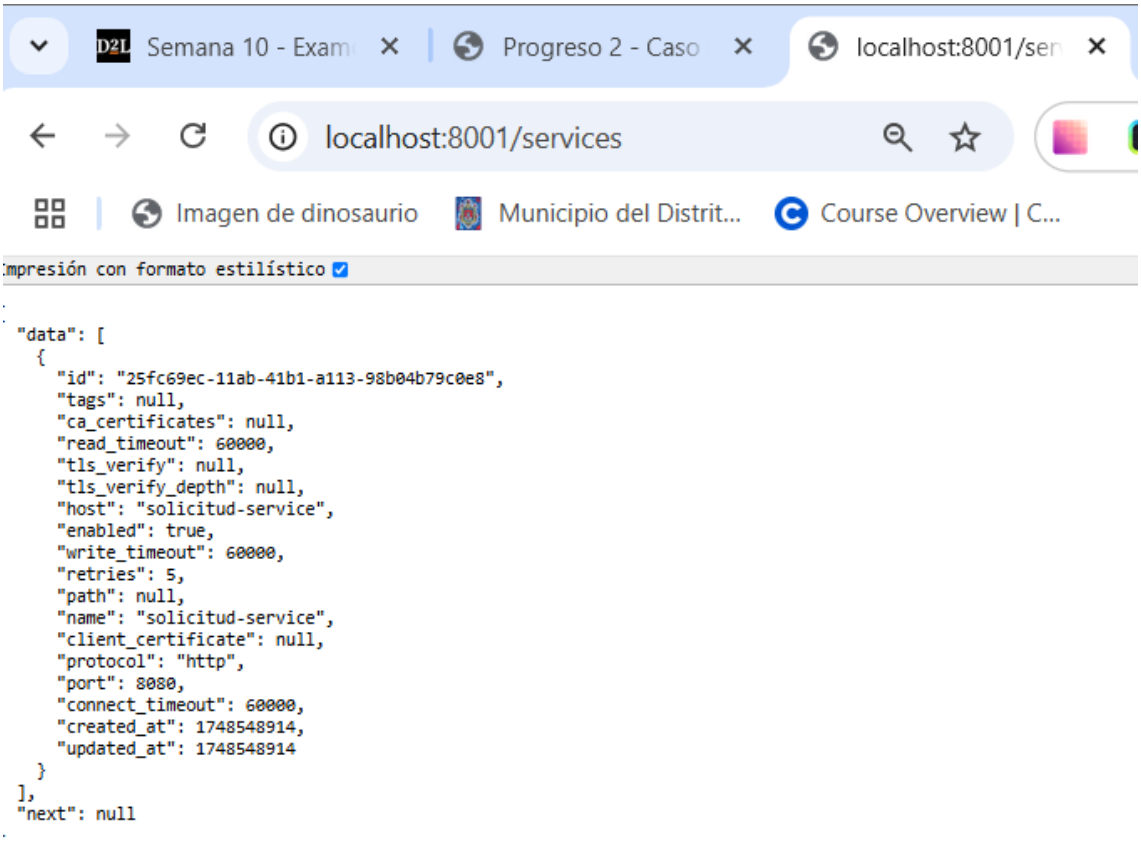
Capturas Requeridas

Para completar este entregable, se deben tomar las siguientes capturas de pantalla:

1. **Captura 1:** Navegador mostrando `http://localhost:8001/status` con Kong funcionando


Semana 10 - Exam
Progreso 2 - Caso
localhost:8001/sta
localhost:8001/status
Imagen de dinosaurio
Municipio del Distrit...
Course Overview | C...
Todos los favoritos
Impresión con formato estilístico
{
"server": {
"connections_active": 11,
"total_requests": 1367,
"connections_reading": 0,
"connections_handled": 86,
"connections_writing": 9,
"connections_accepted": 86,
"connections_waiting": 2
},
"memory": {
"workers_lua_vms": [
{
"http_allocated_gc": "64.40 MiB",
"pid": 1260
},
{
"http_allocated_gc": "42.51 MiB",
"pid": 1261
},
{
"http_allocated_gc": "42.51 MiB",
"pid": 1262
},
{
"http_allocated_gc": "42.51 MiB",
"pid": 1263
},
{
"http_allocated_gc": "42.51 MiB",
"pid": 1264
},
{
"http_allocated_gc": "42.51 MiB",
"pid": 1265
},
{
"http_allocated_gc": "42.51 MiB",
"pid": 1266
},
{
"http_allocated_gc": "42.51 MiB",
"pid": 1267
}
],
"lua_shared_dicts": {
"kong_cluster_events": {
"capacity": "5.00 MiB",
"allocated_slabs": "0.04 MiB"
},
"kong_rate_limiting_counters": {
"capacity": "12.00 MiB",
"allocated_slabs": "0.09 MiB"
},
"kong_core_db_cache": {
"capacity": "128.00 MiB",
"allocated_slabs": "0.77 MiB"
},
"kong_core_db_cache_miss": {
"capacity": "12.00 MiB",
"allocated_slabs": "0.08 MiB"
},
"kong_db_cache": {
"capacity": "128.00 MiB",
"kong_db_cache": {
"capacity": "128.00 MiB",
"allocated_slabs": "0.76 MiB"
},
"kong_db_cache_miss": {
"capacity": "12.00 MiB",
"allocated_slabs": "0.08 MiB"
},
"kong_secrets": {
"capacity": "5.00 MiB",
"allocated_slabs": "0.04 MiB"
},
"prometheus_metrics": {
"capacity": "5.00 MiB",
"allocated_slabs": "0.04 MiB"
},
"kong": {
"capacity": "5.00 MiB",
"allocated_slabs": "0.04 MiB"
},
"kong_locks": {
"capacity": "8.00 MiB",
"allocated_slabs": "0.06 MiB"
},
"kong_healthchecks": {
"capacity": "5.00 MiB",
"allocated_slabs": "0.04 MiB"
}
}
},
"database": {
"reachable": true
}
}

2. **Captura 2:** Navegador mostrando `http://localhost:8001/services` con solicitud-service registrado

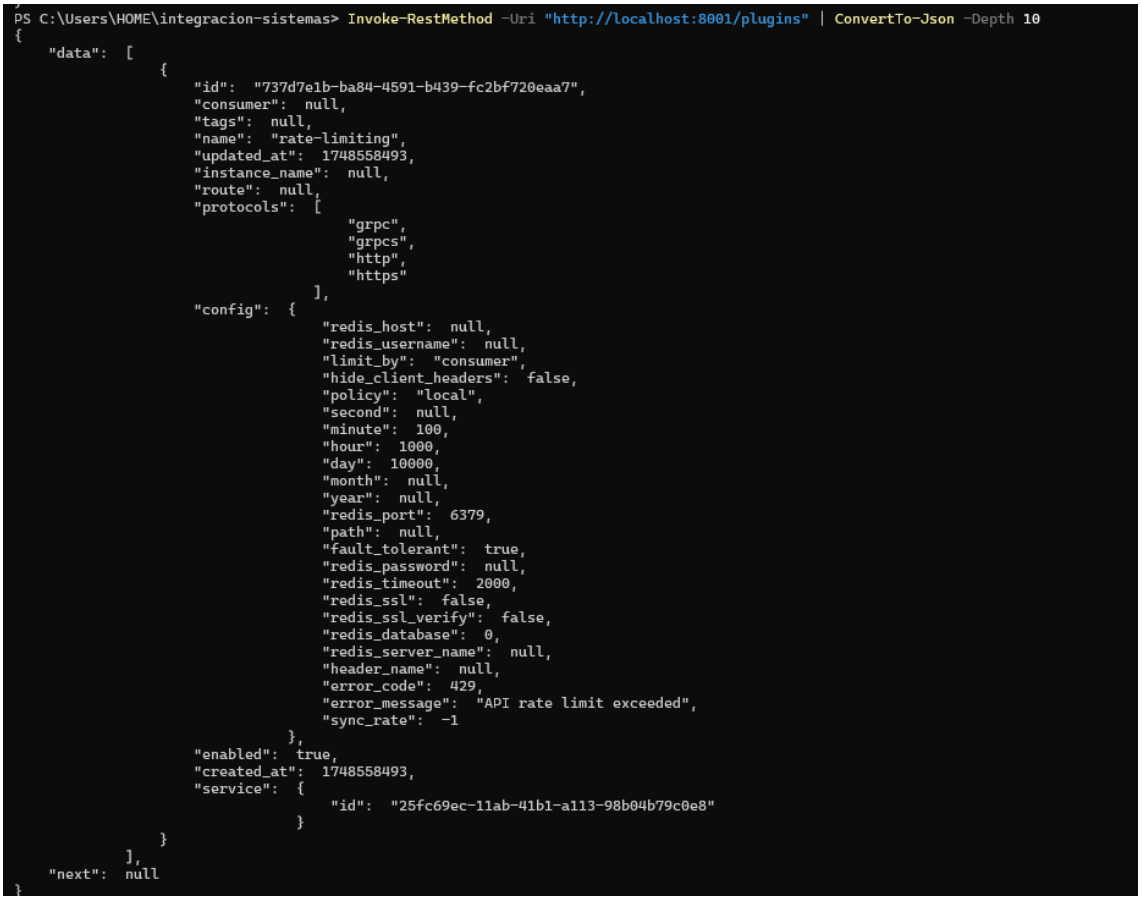


3. **Captura 3:** Navegador mostrando `http://localhost:8001/routes` con ruta /solicitudes configurada

```
PS C:\Users\HOME\integracion-sistemas> Invoke-RestMethod -Uri "http://localhost:8001/routes" | ConvertTo-Json -Depth 10
{
    "data":  [
                 {
                     "snis":  null,
                     "id":  "434c8f3a-e498-448d-b34b-07639b5d4134",
                     "methods":  [
                                     "GET",
                                     "POST"
                                 ],
                     "sources":  null,
                     "headers":  null,
                     "preserve_host":  false,
                     "name":  null,
                     "paths":  [
                                   "/api/v1/solicitudes"
                               ],
                     "regex_priority":  0,
                     "strip_path":  true,
                     "service":  {
                                     "id":  "25fc69ec-11ab-41b1-a113-98b04b79c0e8"
                                 },
                     "request_buffering":  true,
                     "response_buffering":  true,
                     "tags":  null,
                     "destinations":  null,
                     "protocols":  [
                                       "http",
                                       "https"
                                   ],
                     "path_handling":  "v0",
                     "hosts":  [
                                   "api.universidad.edu"
                               ],
                     "https_redirect_status_code":  426,
                     "created_at":  1748548917,
                     "updated_at":  1748548917
                 },
                 {
                     "snis":  null,
                     "id":  "f02751f8-9f96-4211-b1f1-7b2f40e306e6",
                     "methods":  [
                                     "GET",
                                     "POST"
                                 ],
                     "sources":  null,
                     "headers":  null,
                     "preserve_host":  false,
                     "name":  null,
                     "paths":  [
                                   "/api/v1/solicitudes"
                               ],
                     "regex_priority":  0,
                     "strip_path":  true,
                     "service":  {
                                     "id":  "25fc69ec-11ab-41b1-a113-98b04b79c0e8"
                                 },
                     "request_buffering":  true,
                     "response_buffering":  true,
                     "tags":  null,
                     "destinations":  null,
                     "protocols":  [
                                       "http",
                                       "https"
                                   ],
                     "path_handling":  "v0",
```

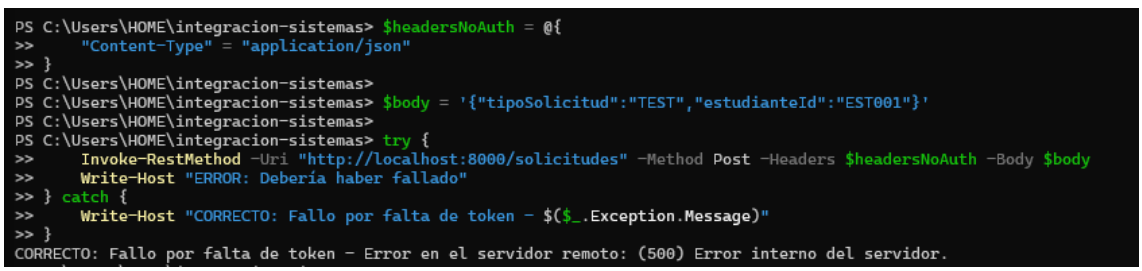
```
                        ],
                    "path_handling":  "v0",
                    "hosts":  null,
                    "https_redirect_status_code":  426,
                    "created_at":  1748549085,
                    "updated_at":  1748549085
                },
                {
                    "snis":  null,
                    "id":  "f19f6a02-e77d-4c7a-9b62-c5244b666de5",
                    "methods":  [
                                    "GET",
                                    "POST"
                                ],
                    "sources":  null,
                    "headers":  null,
                    "preserve_host":  false,
                    "name":  null,
                    "paths":  [
                                  "/solicitudes"
                              ],
                    "regex_priority":  0,
                    "strip_path":  false,
                    "service":  {
                                    "id":  "25fc69ec-11ab-41b1-a113-98b04b79c0e8"
                                },
                    "request_buffering":  true,
                    "response_buffering":  true,
                    "tags":  null,
                    "destinations":  null,
                    "protocols":  [
                                      "http",
                                      "https"
                                  ],
                    "path_handling":  "v0",
                    "hosts":  null,
                    "https_redirect_status_code":  426,
                    "created_at":  1748549222,
                    "updated_at":  1748549222
                }
            ],
    "next":  null
}
```


4. **Captura 4:** Navegador mostrando `http://localhost:8001/plugins` con rate-limiting aplicado



5. **Captura 5:** PowerShell ejecutando request exitoso via Kong Gateway (puerto 8000)

6. **Captura 6:** PowerShell mostrando error 500 con token inválido (evidencia de seguridad)



Comandos para Generar Evidencia

```
# 1. Verificar status de Kong
Invoke-RestMethod -Uri "http://localhost:8001/status" | ConvertTo-Json
-Depth 10

# 2. Listar servicios registrados
Invoke-RestMethod -Uri "http://localhost:8001/services" | ConvertTo-
Json -Depth 10

# 3. Listar rutas configuradas
Invoke-RestMethod -Uri "http://localhost:8001/routes" | ConvertTo-Json
-Depth 10

# 4. Listar plugins aplicados
Invoke-RestMethod -Uri "http://localhost:8001/plugins" | ConvertTo-
Json -Depth 10

# 5. Prueba funcional exitosa
$headers = @{
    "Authorization" = "Bearer
eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9.eyJpc3MiOiJ1bml2ZXJzaWRhZC1pc3N1Z
XIiLCJzdWIiOiJFU1QwMDEiLCJyb2xlIjoic3R1ZGVudCIsImlhdCI6MTc0ODU0ODk2MSw
iZXhwIjoxNzQ4NjM1MzYxfQ.7ep4Y5jFAXQXBT0QIR20Qy9fKc2aZpWTyf2DrqYEmTs"
    "Content-Type" = "application/json"
}
$body =
'{"tipoSolicitud":"CERTIFICADO_NOTAS","estudianteId":"EST001"}'
Invoke-RestMethod -Uri "http://localhost:8000/solicitudes" -Method
Post -Headers $headers -Body $body

# 6. Prueba de seguridad (debe fallar)
$headersNoAuth = @{"Content-Type" = "application/json"}
$body = '{"tipoSolicitud":"TEST","estudianteId":"EST001"}'
try {
    Invoke-RestMethod -Uri "http://localhost:8000/solicitudes" -Method
Post -Headers $headersNoAuth -Body $body
} catch {
    Write-Host "CORRECTO: Fallo por seguridad -
$($_.Exception.Message)"
}
```

Conclusiones

Funcionalidades Implementadas

1. **API Gateway Funcional:** Kong Gateway operativo como proxy reverso
2. **Registro de Endpoints:** Servicio y ruta /solicitudes correctamente registrados
3. **Política de Seguridad:** Validación JWT implementada en el microservicio
4. **Rate Limiting:** Políticas de límite de requests configuradas y activas
5. **CORS Policy:** Habilitado para acceso desde aplicaciones web
6. **Monitoreo:** Admin API disponible para gestión y monitoring

Beneficios Obtenidos

- **Punto único de entrada** para todos los requests
- **Gestión centralizada** de políticas de seguridad
- **Control de tráfico** con rate limiting
- **Escalabilidad** preparada para múltiples microservicios
- **Observabilidad** a través de logs y métricas de Kong

Kong Gateway - Configuración v1.0
Entregable 3 - Progreso 2 Integración de Sistemas
Fecha: Mayo 2025