
CS 249 Happy Patients App

CS 249, Fall 2017, Final Project
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Under guidance of -
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Outline

- **Happy Patients** is an application that allows users to manage and view patient data.
- Users can add, delete, update, and retrieve patient information in this application.
- The application also uses Memcache to help improve retrieval speed so that not all requests requires a Cassandra query.
- A **Policy Server** maintains cache policies and users can retrieve and update the cache policies based on the need.
- **Message consumers** listens on a message queue (in ActiveMQ) for messages published by the Happy Patients app and runs appropriate routines when messages are received.

Technologies Used

- Jersey
- Cassandra
- ActiveMQ
- Memcached
- Jetty
- Maven
- Python
- Flask
- Javascript
- JQuery
- Ajax

What we already knew?

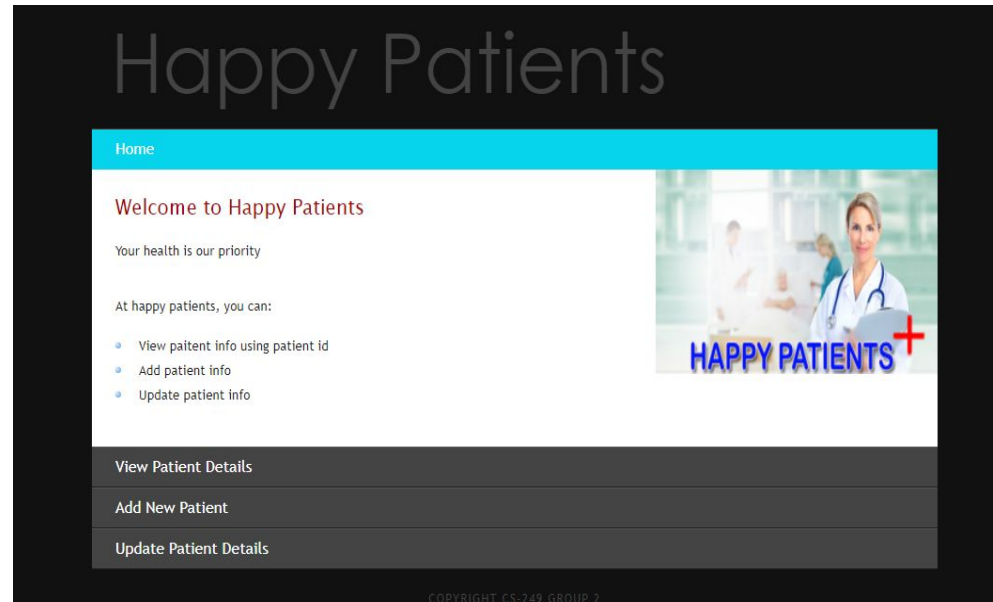
- Python Flask Server
- Jetty Container for Java Projects
- Maven Project and Dependency Management

What we had to learn from scratch?

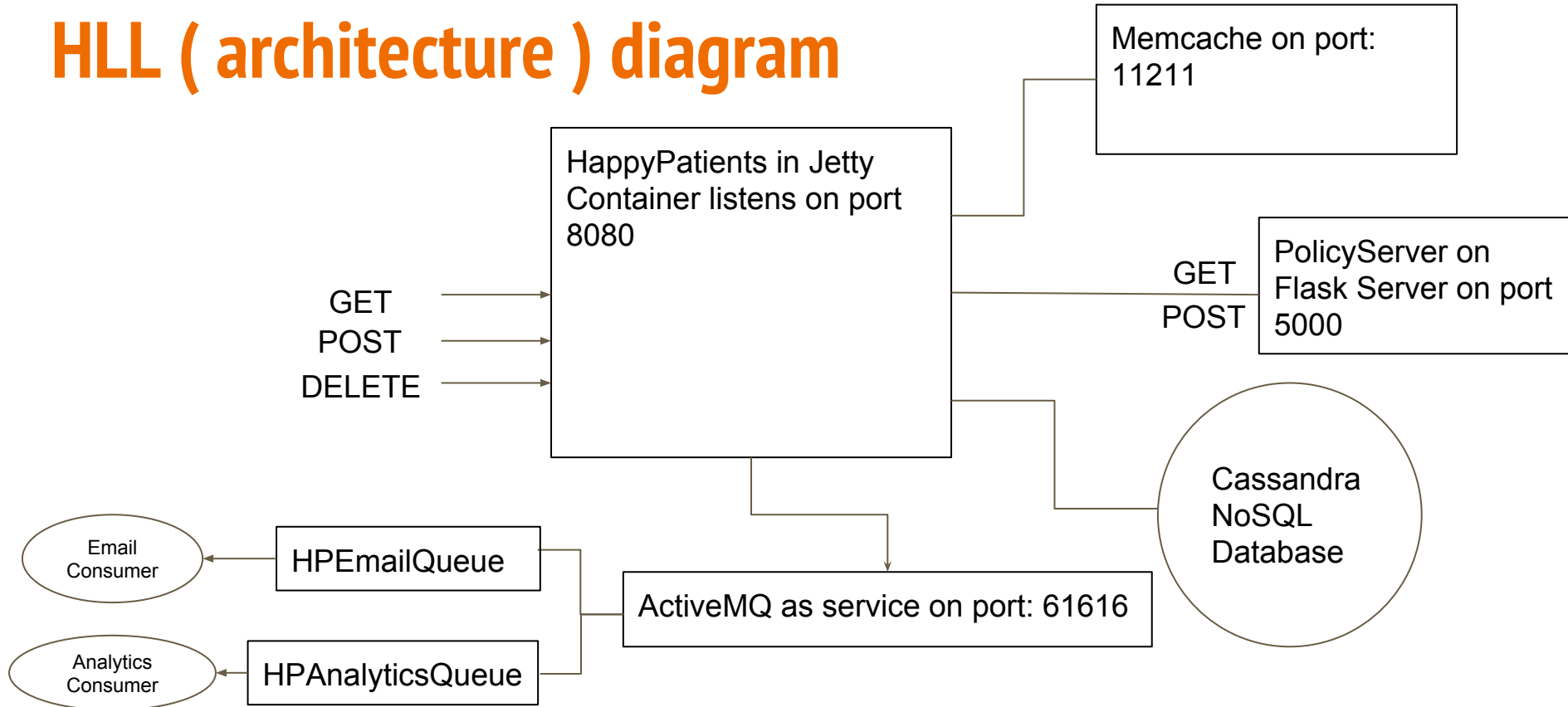
- Java Jersey Web Services Framework
- Connecting to Cassandra through Java
- Connecting to ActiveMQ through Java, and using JMS API
- Connecting to Memcache

The POC we did

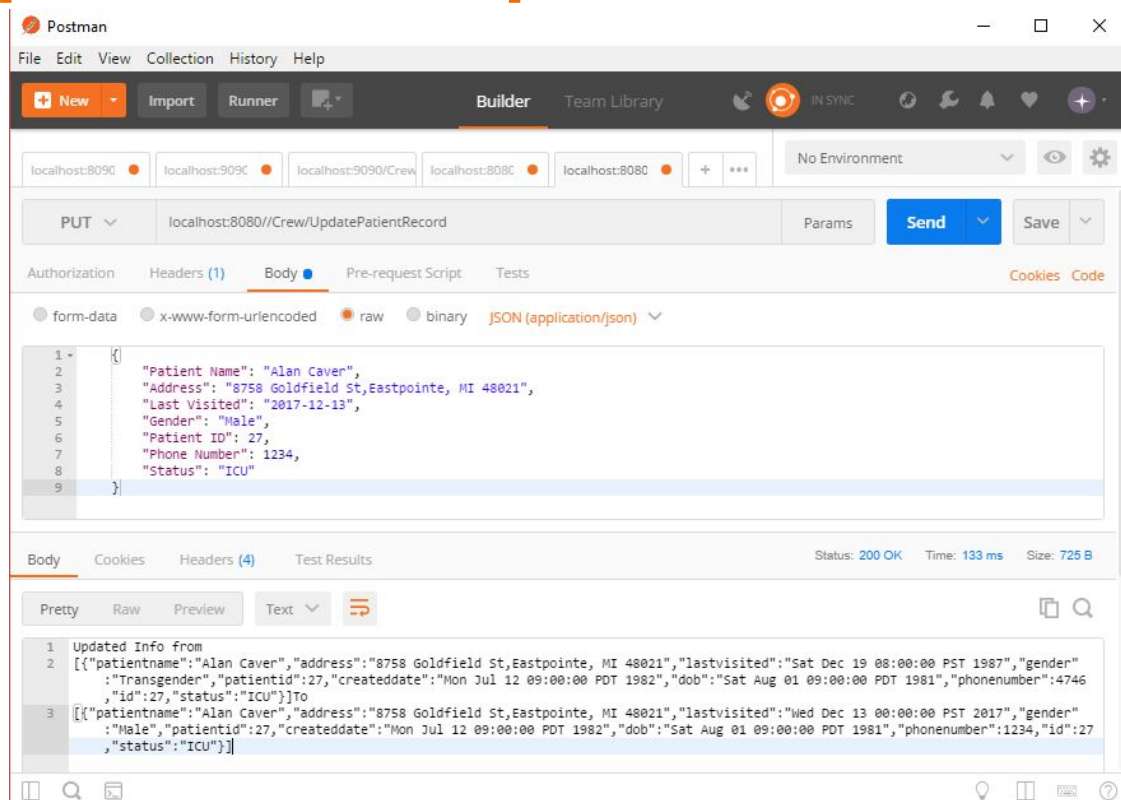
- Generated sample patient data as CSV file and import into Cassandra
- Used POSTMAN to send GET/POST/PUT requests to endpoints
- Created mock front-ends that generates HTTP requests and parses the responding JSON object



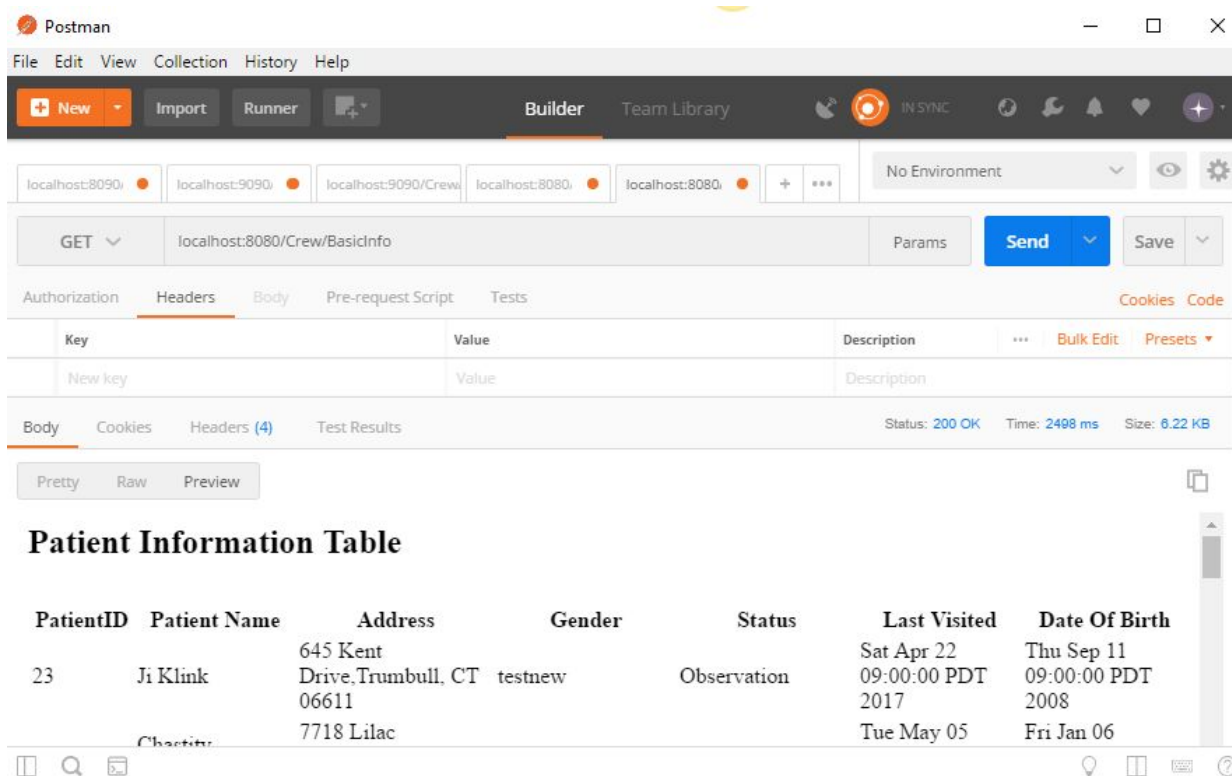
HLL (architecture) diagram



PUT Endpoint: /Crew/UpdatePatientRecord



GET Endpoint: /Crew/BasicInfo



Postman interface showing a GET request to `localhost:8080/Crew/BasicInfo`. The response is a table titled "Patient Information Table" with 7 columns: PatientID, Patient Name, Address, Gender, Status, Last Visited, and Date Of Birth. The table contains 3 rows of data.

| PatientID | Patient Name | Address | Gender | Status | Last Visited | Date Of Birth |
|-----------|--------------|------------------------------------|---------|-------------|------------------------------|------------------------------|
| 23 | Ji Klink | 645 Kent Drive, Trumbull, CT 06611 | testnew | Observation | Sat Apr 22 09:00:00 PDT 2017 | Thu Sep 11 09:00:00 PDT 2008 |
| Chastity | | 7718 Lilac | | | Tue May 05 | Fri Jan 06 |

POST Endpoint: /Crew/PatientInfo

POST localhost:8080/Crew/PatientInfo Params Send Save

Status: 200 OK Time: 2462 ms Size: 423 B

Auth Headers (1) Body Pre-req. Tests Cookies Code

form-data x-www-form-urlencoded raw binary

JSON (application/json)

1 {
2 "Patient Name": "Alan Caver"
3 }

Body Cookies Headers (4) Test Results

Pretty Raw Preview JSON

```
1 [
2   {
3     "patientname": "Alan Caver",
4     "address": "8758 Goldfield St,Eastpointe, MI 48021",
5     "lastvisited": "Sat Dec 19 08:00:00 PST 1987",
6     "gender": "Transgender",
7     "patientid": 27,
8     "createddate": "Mon Jul 12 09:00:00 PDT 1982",
9     "dob": "Sat Aug 01 09:00:00 PDT 1981",
10    "phonenumber": 4746,
11    "id": 27,
12    "status": "ICU"
13  }
14 ]
```

POST Endpoint: /Crew/PatientInfoFilter

The screenshot displays a REST client interface with the following details:

- URL:** localhost:8080/Crew/PatientInfoFilter
- Method:** POST
- Status:** 200 OK
- Time:** 150 ms
- Size:** 2.96 KB
- Request Body (JSON):**

```
{  "Filter Type": "Gender",  "Filter Value": "Male"}
```
- Response Body (JSON):**

```
[  {    "patientname": "Delinda Shirk",    "address": "8398 Sunset Dr,Tualatin, OR 97062",    "lastvisited": "Tue Apr 20 09:00:00 PDT 2021",    "gender": "Male",    "patientid": 16,    "createddate": "Wed Feb 15 08:00:00 PST 2006",    "dob": "Tue Dec 26 08:00:00 PST 2006",    "phonenumber": 6003,    "id": 16,    "status": "Ongoing"  },  {    "patientname": "Caleb Shimmin",    "address": "8388 Sheffield St,Beloit, WI 53511",    "lastvisited": "Thu Oct 23 09:00:00 PDT 2014",    "gender": "Male",    "patientid": 13,    "createddate": "Wed Apr 15 09:00:00 PDT 2009",    "dob": "Fri Feb 02 08:00:00 PST 2007",    "phonenumber": 7515,    "id": 13,    "status": "Urgent Care"  },  {    "patientname": "Afton Needham",    "address": "662 Sulphur Springs Rd,Fuquay Varina, NC 27526",    "lastvisited": "Mon Nov 07 09:00:00 PST 2006"  }]
```

POST Endpoint: /Crew/NewPatientInfoRecord

POST localhost:8080//Crew/NewPatientInfoRecord Params Send Save

Auth Headers (1) Body Pre-req. Tests Cookies Code

form-data x-www-form-urlencoded raw binary JSON (application/json)

```
1 {
2   "Patient Name": "Tom Sawyer",
3   "Address": "One Washington Square, San Jose",
4   "Gender": "Male",
5   "Created Date": "2017-10-09",
6   "DOB": "1967-05-20",
7   "Phone Number": 1234,
8   "Status": "ICU"
9 }
```

Status: 200 OK Time: 2480 ms Size: 165 B

Body Cookies Headers (4) Test

Pretty Raw Preview Text

1 Patient Added! Patient ID is 30

| | | | | | | | | | |
|----|---|---------------------------------|---------------------------------|-------------|----|---------------------------------|----------------|------|--------------|
| 10 | 8596 Sunset Dr, Iudiacin, OK 97602 | 2008-02-15 16:00:00.000000+0000 | 2008-12-20 16:00:00.000000+0000 | Male | 10 | 2021-04-20 16:00:00.000000+0000 | Delinda Shirk | 8805 | Ongoing |
| 13 | 8388 Sheffield St, Beloit, WI 53511 | 2009-04-15 16:00:00.000000+0000 | 2007-02-02 16:00:00.000000+0000 | Male | 13 | 2014-10-23 16:00:00.000000+0000 | Caleb Shimmin | 7515 | Urgent Care |
| 30 | One Washington Square, San Jose | 2017-10-09 07:00:00.000000+0000 | 1967-05-20 07:00:00.000000+0000 | Male | 30 | 2017-10-09 07:00:00.000000+0000 | Tom Sawyer | 1234 | ICU |
| 11 | 6 Tailwater Street, Lest Chicago, IL 60185 | 2011-05-28 16:00:00.000000+0000 | 2005-09-06 16:00:00.000000+0000 | Female | 11 | 2020-12-16 16:00:00.000000+0000 | Willene Kamel | 7938 | Urgent Care |
| 1 | 8654 Edgefield St, Brick, NJ 08723 | 1996-04-02 16:00:00.000000+0000 | 1990-04-25 16:00:00.000000+0000 | Female | 1 | 2006-03-22 16:00:00.000000+0000 | Jocelyn Insley | 6597 | Urgent Care |
| 19 | 662 Sulphur Springs Rd, Fuquay Varina, NC 27526 | 1996-03-21 16:00:00.000000+0000 | 1988-09-17 16:00:00.000000+0000 | Male | 19 | 2009-06-07 16:00:00.000000+0000 | Afton Needham | 6049 | Weekly Visit |
| 8 | 423 Beacon Ave, Lorton, VA 22079 | 1991-09-25 16:00:00.000000+0000 | 1989-04-15 16:00:00.000000+0000 | Transgender | 8 | 1994-07-31 16:00:00.000000+0000 | Roman Boos | 6016 | Urgent Care |
| 0 | 9482 Newport St, Whitestone, NY 11357 | 2002-05-20 16:00:00.000000+0000 | 1997-08-22 16:00:00.000000+0000 | Female | 0 | 2014-08-17 16:00:00.000000+0000 | Matilde Teal | 5791 | Weekly Visit |

DELETE Endpoint: /Crew/PatientInfo/{patientID}

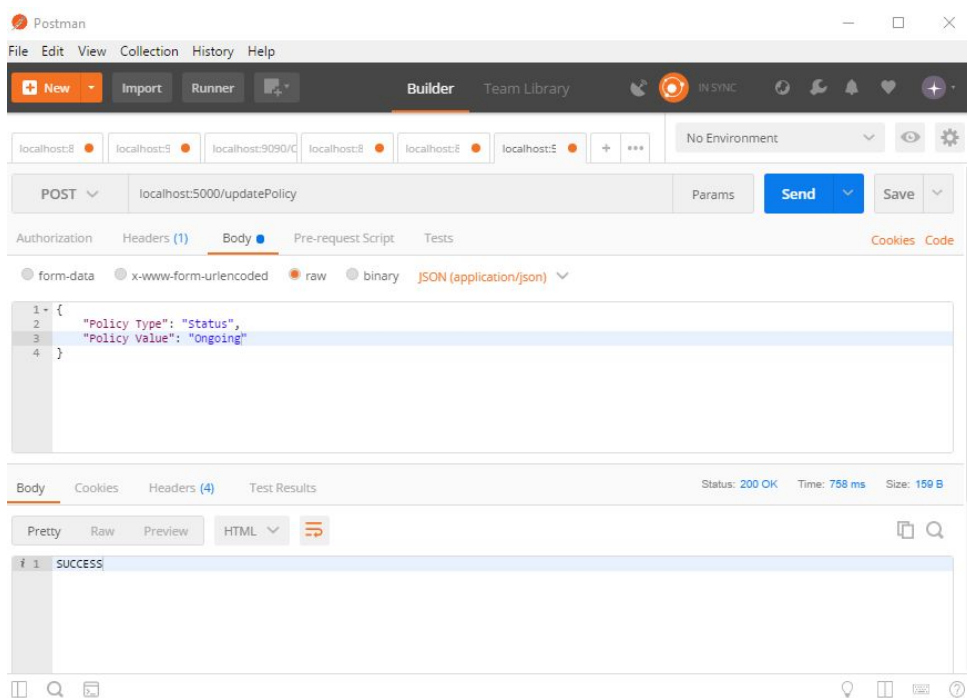
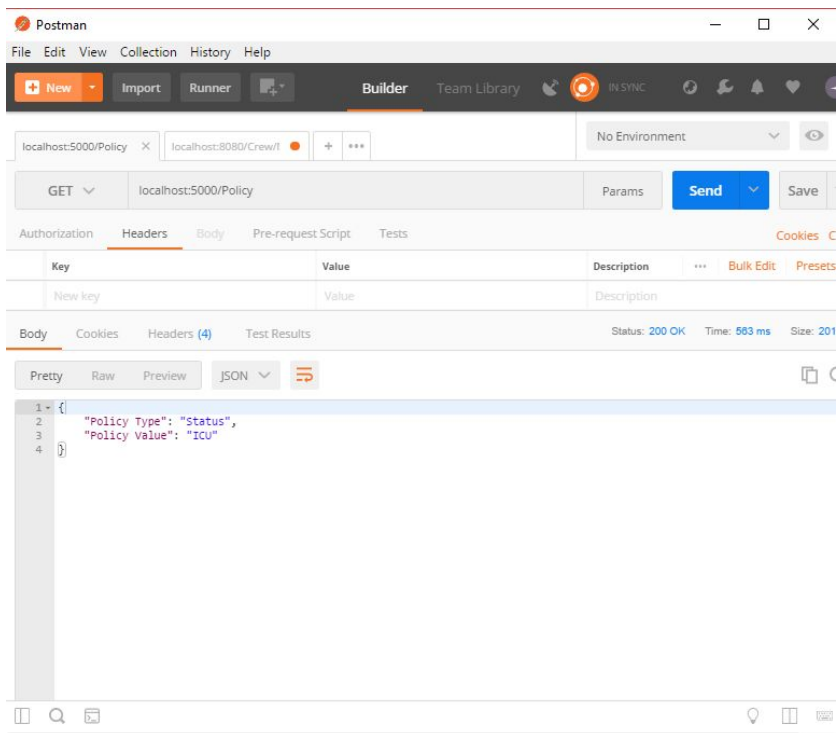
The screenshot displays a REST client interface with the following components:

- Request Bar:** Method: DELETE, URL: localhost:8080//Crew/PatientInfo/30, Params: empty, Send button.
- Request Headers:**

| Key | Value | Description |
|--|------------------|-------------|
| <input checked="" type="checkbox"/> Content-Type | application/json | |
| New key | Value | Description |
- Response Bar:** Body, Cookies, Headers (4), Test Results. Status: 200 OK, Time: 2502 ms.
- Response Body:**

```
1 Patient Record Deleted!
```

PolicyServer end points:



How we set up the environment?

- We set up the environment on both MAC and Windows
 - Install DataStax Community wrapper for Cassandra
 - Install Apache ActiveMQ as a service running in background
 - Download and run Memcache.exe
 - Do pip install for Flask for Python

Environment: Cassandra

Cassandra CQL Shell

| | | | | | | | | | |
|----|--|---------------------------------|---------------------------------|-------------|----|---------------------------------|-------------------|------|--------------|
| 20 | 7256 North Courtland Drive,Middletown, CT 0645 | 2015-05-10 16:00:00.000000+0000 | 2008-11-15 16:00:00.000000+0000 | Male | 20 | 2025-02-03 16:00:00.000000+0000 | Dorthea Kintner | 7595 | Ongoing |
| 7 | 11 Leeton Ridge St,Llnt, MI 48504 | 2010-03-09 16:00:00.000000+0000 | 2003-07-20 16:00:00.000000+0000 | Female | 7 | 2014-07-27 16:00:00.000000+0000 | Indira Marcell | 5800 | Ongoing |
| 6 | 56 Glen Eagles Rd,Desoto, TX 75115 | 1994-01-14 16:00:00.000000+0000 | 1988-07-24 16:00:00.000000+0000 | Transgender | 6 | 2013-04-07 16:00:00.000000+0000 | Sheri Rapoza | 7343 | Weekly Visit |
| 29 | 82 East 10th Street,Loxahatchee, FL 33470 | 1987-01-04 16:00:00.000000+0000 | 1986-02-24 16:00:00.000000+0000 | Transgender | 29 | 1999-12-27 16:00:00.000000+0000 | null | 7043 | Weekly Visit |
| 9 | 84 Fordham St,Lithonia, GA 30038 | 1988-10-11 16:00:00.000000+0000 | 1988-08-20 16:00:00.000000+0000 | Male | 9 | 1991-05-25 16:00:00.000000+0000 | Lucille Toole | 6073 | Closed |
| 14 | 79 Miles Ave,Dearbourn Heights, MI 48127 | 2005-06-08 16:00:00.000000+0000 | 2005-03-10 16:00:00.000000+0000 | Male | 14 | 2009-12-26 16:00:00.000000+0000 | Concetta Tome | 7065 | Weekly Visit |
| 26 | 350 NE. Gonzales St,Encino, CA 91316 | 1998-04-26 16:00:00.000000+0000 | 1998-11-20 16:00:00.000000+0000 | Male | 26 | 2010-03-04 16:00:00.000000+0000 | Bong Rosenblatt | 4257 | Closed |
| 21 | 8963 Peachtree Lane,Little Rock, AR 72209 | 1988-10-07 16:00:00.000000+0000 | 1984-01-01 16:00:00.000000+0000 | Transgender | 21 | 1995-10-14 16:00:00.000000+0000 | Tracie Kennison | 5669 | ICU |
| 17 | 9487 Blackburn Ave,Glendale Heights, IL 60139 | 2003-03-01 16:00:00.000000+0000 | 2003-11-09 16:00:00.000000+0000 | Male | 17 | 2015-06-06 16:00:00.000000+0000 | Darline Hayden | 7266 | ICU |
| 24 | 89 Branch Rd,Champlin, MN 55316 | 1986-09-03 16:00:00.000000+0000 | 1986-03-26 16:00:00.000000+0000 | Transgender | 24 | 2006-09-20 16:00:00.000000+0000 | Stony Pitone | 6633 | ICU |
| 25 | 53 Spruce St,Wilmington, MA 01887 | 1994-12-29 16:00:00.000000+0000 | 1991-10-08 16:00:00.000000+0000 | Female | 25 | 2002-12-11 16:00:00.000000+0000 | Grazyna Parkson | 6817 | Observation |
| 12 | 878 Bank St,Elgin, IL 60120 | 1997-01-02 16:00:00.000000+0000 | 1993-01-23 16:00:00.000000+0000 | Transgender | 12 | 2007-03-17 16:00:00.000000+0000 | Hipolito Inouye | 7087 | Urgent Care |
| 3 | 815 San Pablo Street,Danbury, CT 06810 | 2010-07-16 16:00:00.000000+0000 | 2006-07-18 16:00:00.000000+0000 | Male | 3 | 2026-02-06 16:00:00.000000+0000 | Lady Franceschini | 7825 | ICU |

(30 rows)

cqlsh:test001> select * from BasicInfo;

| patientid | address | createddate | dob | gender | id | lastvisited | patientname | phonenumber | status |
|-----------|--|---------------------------------|---------------------------------|---------|----|---------------------------------|------------------|-------------|--------------|
| 23 | 645 Kent Drive,Trumbull, CT 06611 | 2011-03-12 16:00:00.000000+0000 | 2008-09-11 16:00:00.000000+0000 | testnum | 23 | 2017-04-22 16:00:00.000000+0000 | Ji Klink | 4787 | Observation |
| 5 | 7718 Liliac Street,Annapolis, MD 21401 | 1992-08-02 16:00:00.000000+0000 | 1989-01-06 16:00:00.000000+0000 | Female | 5 | 1998-05-05 16:00:00.000000+0000 | Chastity Gunning | 6426 | Weekly Visit |
| 8 | 208 Silver Spear Street, Oaksh, MI 54901 | 1999-09-04 16:00:00.000000+0000 | 1999-04-26 16:00:00.000000+0000 | | | | | | |
| 10 | 9073 Bradford Court,Holland, MI 49423 | 1999-06-14 16:00:00.000000+0000 | 1998-03-05 16:00:00.000000+0000 | | | | | | |
| 16 | 8398 Sunset Dr,Tualatin, OR 97062 | 2006-02-15 16:00:00.000000+0000 | 2006-12-26 16:00:00.000000+0000 | | | | | | |
| 13 | 8388 Sheffield St,Bolot, WI 53511 | 2009-04-15 16:00:00.000000+0000 | 2007-02-02 16:00:00.000000+0000 | | | | | | |
| 11 | 6 Tallwater Street,West Chicago, IL 60185 | 2011-05-28 16:00:00.000000+0000 | 2005-09-06 16:00:00.000000+0000 | | | | | | |
| 1 | 8654 Edgefield St,Brick, NJ 08723 | 1996-04-21 16:00:00.000000+0000 | 1990-04-25 16:00:00.000000+0000 | | | | | | |
| 19 | 662 Sulphur Springs Rd,Fuquay Varina, NC 27526 | 1996-03-21 16:00:00.000000+0000 | 1988-09-17 16:00:00.000000+0000 | | | | | | |
| 8 | 423 Beacon Ave,Lorton, VA 22079 | 1991-09-25 16:00:00.000000+0000 | 1989-04-15 16:00:00.000000+0000 | | | | | | |
| 0 | 9482 Newport St,Whitestone, NY 11357 | 2002-05-20 16:00:00.000000+0000 | 1997-08-22 16:00:00.000000+0000 | | | | | | |
| 2 | 8704 Hillside St,Freehold, NJ 0772 | 1996-09-20 16:00:00.000000+0000 | 1996-02-15 16:00:00.000000+0000 | | | | | | |
| 4 | 7969 Hanover Court,Maspeth, NY 11378 | 1997-06-16 16:00:00.000000+0000 | 1996-05-15 16:00:00.000000+0000 | | | | | | |
| 18 | 9389 Bayport Street,Eastpointe, MI 48021 | 2002-03-14 16:00:00.000000+0000 | 2001-09-07 16:00:00.000000+0000 | | | | | | |
| 15 | 535 Del Monte St,Farmington, MI 48331 | 1980-01-16 16:00:00.000000+0000 | 1980-05-17 16:00:00.000000+0000 | | | | | | |
| 22 | 49 S Glenholme St,Christiansburg, VA 24073 | 1992-03-28 16:00:00.000000+0000 | 1992-09-24 16:00:00.000000+0000 | | | | | | |
| 27 | 8758 Goldfield St,Eastpointe, MI 48021 | 1982-07-12 16:00:00.000000+0000 | 1981-08-01 16:00:00.000000+0000 | | | | | | |
| 20 | 7256 North Courtland Drive,Middletown, CT 0645 | 2015-05-10 16:00:00.000000+0000 | 2008-11-15 16:00:00.000000+0000 | | | | | | |
| 7 | 11 Leeton Ridge St,Llnt, MI 48504 | 2010-03-09 16:00:00.000000+0000 | 2003-07-20 16:00:00.000000+0000 | | | | | | |
| 6 | 56 Glen Eagles Rd,Desoto, TX 75115 | 1994-01-14 16:00:00.000000+0000 | 1988-07-24 16:00:00.000000+0000 | | | | | | |
| 29 | 82 East 10th Street,Loxahatchee, FL 33470 | 1987-01-04 16:00:00.000000+0000 | 1986-02-24 16:00:00.000000+0000 | | | | | | |
| 9 | 84 Fordham St,Lithonia, GA 30038 | 1988-10-11 16:00:00.000000+0000 | 1988-08-20 16:00:00.000000+0000 | | | | | | |
| 14 | 79 Miles Ave,Dearbourn Heights, MI 48127 | 2005-06-08 16:00:00.000000+0000 | 2005-03-10 16:00:00.000000+0000 | | | | | | |
| 26 | 350 NE. Gonzales St,Encino, CA 91316 | 1998-04-26 16:00:00.000000+0000 | 1998-11-20 16:00:00.000000+0000 | | | | | | |
| 21 | 8963 Peachtree Lane,Little Rock, AR 72209 | 1988-10-07 16:00:00.000000+0000 | 1984-01-01 16:00:00.000000+0000 | | | | | | |
| 17 | 9487 Blackburn Ave,Glendale Heights, IL 60139 | 2003-03-01 16:00:00.000000+0000 | 2003-11-09 16:00:00.000000+0000 | | | | | | |
| 24 | 89 Branch Rd,Champlin, MN 55316 | 1986-09-03 16:00:00.000000+0000 | 1986-03-26 16:00:00.000000+0000 | | | | | | |
| 25 | 53 Spruce St,Wilmington, MA 01887 | 1994-12-29 16:00:00.000000+0000 | 1991-10-08 16:00:00.000000+0000 | | | | | | |
| 12 | 878 Bank St,Elgin, IL 60120 | 1997-01-02 16:00:00.000000+0000 | 1993-01-23 16:00:00.000000+0000 | | | | | | |
| 3 | 815 San Pablo Street,Danbury, CT 06810 | 2010-07-16 16:00:00.000000+0000 | 2006-07-18 16:00:00.000000+0000 | | | | | | |

(30 rows)

Task Manager

File Options View



Processes Performance App history Startup Users Details Services

| Name | PID | Description | Status | Group |
|---------------------|-------|-----------------------------------|---------|----------------|
| cplspcon | | Intel(R) Content Protection HD... | Stopped | |
| CryptSvc | 3932 | Cryptographic Services | Running | NetworkService |
| CxAudMsg | 4004 | Conexant Audio Message Ser... | Running | |
| CxUtilSvc | 3908 | CxUtilSvc | Running | |
| DataStax DDC Server | 13044 | DataStax DDC Server 3.9.0 | Running | |
| dbupdate | | Dropbox Update Service (dbu... | Stopped | |
| dbupdateam | | Dropbox Update Service (dbu... | Stopped | |
| DbxSvc | 3952 | DbxSvc | Running | |
| DcomLaunch | 560 | DCOM Server Process Launcher | Running | DcomLaunch |

Fewer details | Open Services

Environment: ActiveMQ

← → ↻ ⓘ localhost:8161/admin/queues.jsp;jsessionid=1kbmh6tte2p7k1kjku9pw3tbm 🔍 ☆ 🛡



Home | Queues | Topics | Subscribers | Connections | Network | Scheduled | Send Support

Queue Name Create Queue Name Filter Filter

Queues:

| Name ↑ | Number Of Pending Messages | Number Of Consumers | Mess |
|--------------------------|----------------------------|---------------------|------|
| EmailQueue | 0 | 0 | 0 |
| getAllIQ_a | 0 | 0 | 0 |
| getAllI1_a | 0 | 0 | 0 |
| getAllQ_20171208_1921 | 1 | 0 | 0 |
| getAllQ_a | 0 | 0 | 0 |
| getAllQ_asdf | 7 | 0 | 0 |
| getAllQ_blah | 3 | 0 | 0 |
| getAllQ_ttt20171208_1959 | 1 | 0 | 0 |

Task Manager

File Options View

Processes Performance App history Startup Users Details Services

| Name | PID | Description | Status | Group |
|-----------------|------|----------------------------------|---------|--------------------|
| ActiveMQ | 3896 | ActiveMQ | Running | |
| AdobeARMservice | 3916 | Adobe Acrobat Update Service | Running | |
| AESMSERVICE | 9864 | Intel® SGX AESM | Running | |
| AJRouter | | Alloyn Router Service | Stopped | LocalServiceNet... |
| ALG | | Application Layer Gateway Ser... | Stopped | |
| AppIDSvc | | Application Identity | Stopped | LocalServiceNet... |
| Appinfo | 6360 | Application Information | Running | netsvcs |
| AppReadiness | | App Readiness | Stopped | AppReadiness |
| AppXSvc | | AppX Deployment Service (A... | Stopped | wsappx |

⬅ Fewer details | 🔗 Open Services

Browse Active Consumers

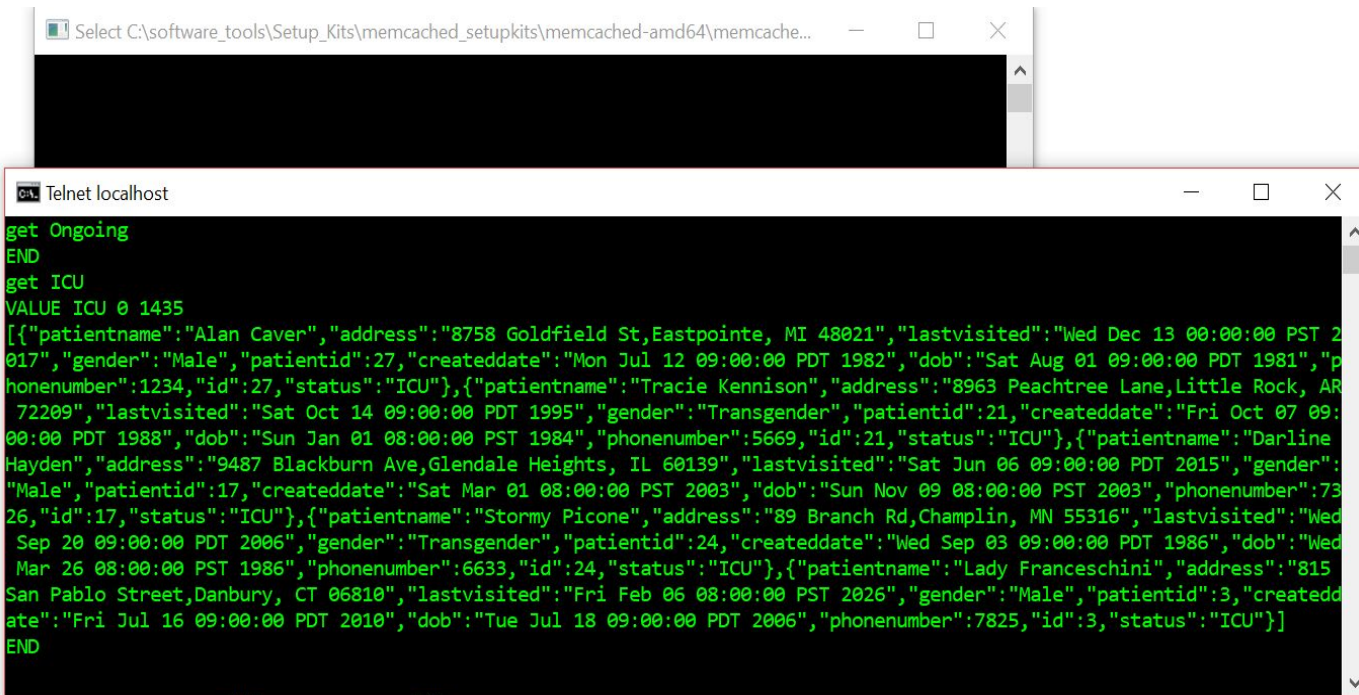
Active Producers

Send To Purge Delete

Browse Active Consumers

Environment: Memcache

Memcache telnet console:



```
Select C:\software_tools\Setup_Kits\memcached_setupkits\memcached-amd64\memcache...  
C:\ Telnet localhost  
get Ongoing  
END  
get ICU  
VALUE ICU 0 1435  
[{"patientname":"Alan Caver","address":"8758 Goldfield St,Eastpointe, MI 48021","lastvisited":"Wed Dec 13 00:00:00 PST 2017","gender":"Male","patientid":27,"createddate":"Mon Jul 12 09:00:00 PDT 1982","dob":"Sat Aug 01 09:00:00 PDT 1981","phonenumner":1234,"id":27,"status":"ICU"}, {"patientname":"Tracie Kennison","address":"8963 Peachtree Lane, Little Rock, AR 72209","lastvisited":"Sat Oct 14 09:00:00 PDT 1995","gender":"Transgender","patientid":21,"createddate":"Fri Oct 07 09:00:00 PDT 1988","dob":"Sun Jan 01 08:00:00 PST 1984","phonenumner":5669,"id":21,"status":"ICU"}, {"patientname":"Darline Hayden","address":"9487 Blackburn Ave, Glendale Heights, IL 60139","lastvisited":"Sat Jun 06 09:00:00 PDT 2015","gender":"Male","patientid":17,"createddate":"Sat Mar 01 08:00:00 PST 2003","dob":"Sun Nov 09 08:00:00 PST 2003","phonenumner":7326,"id":17,"status":"ICU"}, {"patientname":"Stormy Picone","address":"89 Branch Rd, Champlin, MN 55316","lastvisited":"Wed Sep 20 09:00:00 PDT 2006","gender":"Transgender","patientid":24,"createddate":"Wed Sep 03 09:00:00 PDT 1986","dob":"Wed Mar 26 08:00:00 PST 1986","phonenumner":6633,"id":24,"status":"ICU"}, {"patientname":"Lady Franceschini","address":"815 San Pablo Street, Danbury, CT 06810","lastvisited":"Fri Feb 06 08:00:00 PST 2026","gender":"Male","patientid":3,"createddate":"Fri Jul 16 09:00:00 PDT 2010","dob":"Tue Jul 18 09:00:00 PDT 2006","phonenumner":7825,"id":3,"status":"ICU"}]  
END
```

What we referred to learn concepts

- Jersey example:
 - <https://www.mkyong.com/webservices/jax-rs/jersey-hello-world-example/>
- Java Cassandra interaction:
 - <http://www.baeldung.com/cassandra-with-java>
- Java ActiveMQ Interaction:
 - <https://www.youtube.com/watch?v=yQcC6Z0PPes&t=879s>
 - <https://www.youtube.com/watch?v=3T-IDT-vALE>
- Memcache Interaction:
 - <https://www.tutorialspoint.com/memcached>

Code walkthrough

- 3 Main Projects:
 - “HappyPatients” main App
 - “CS249PolicyServer” cache policy server
 - “hpMessageConsumers” email and analytics consumers

Thank You