
CS 249 Happy Patients App

CS 249, Fall 2017, Final Project
Presented by -
Rashmeet Kaur Khanuja, Anusha Vijay, Steven Yen

Under guidance of -
Prof. Tanuja Phadke

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?

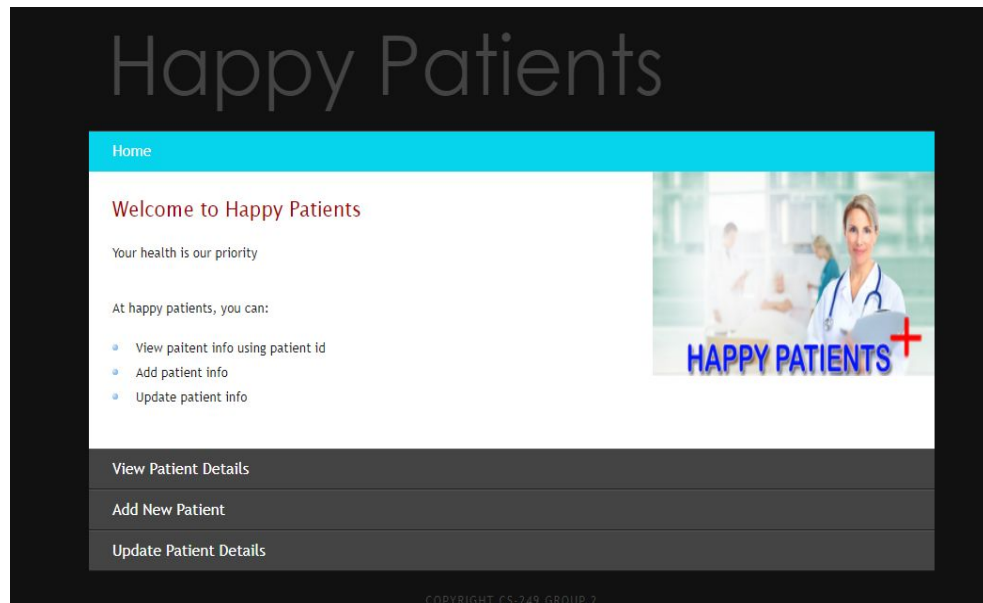
- Python Flask Server
- Jetty Container for Java Projects
- Maven Project and Dependency Management

What we had to learn from scratch?

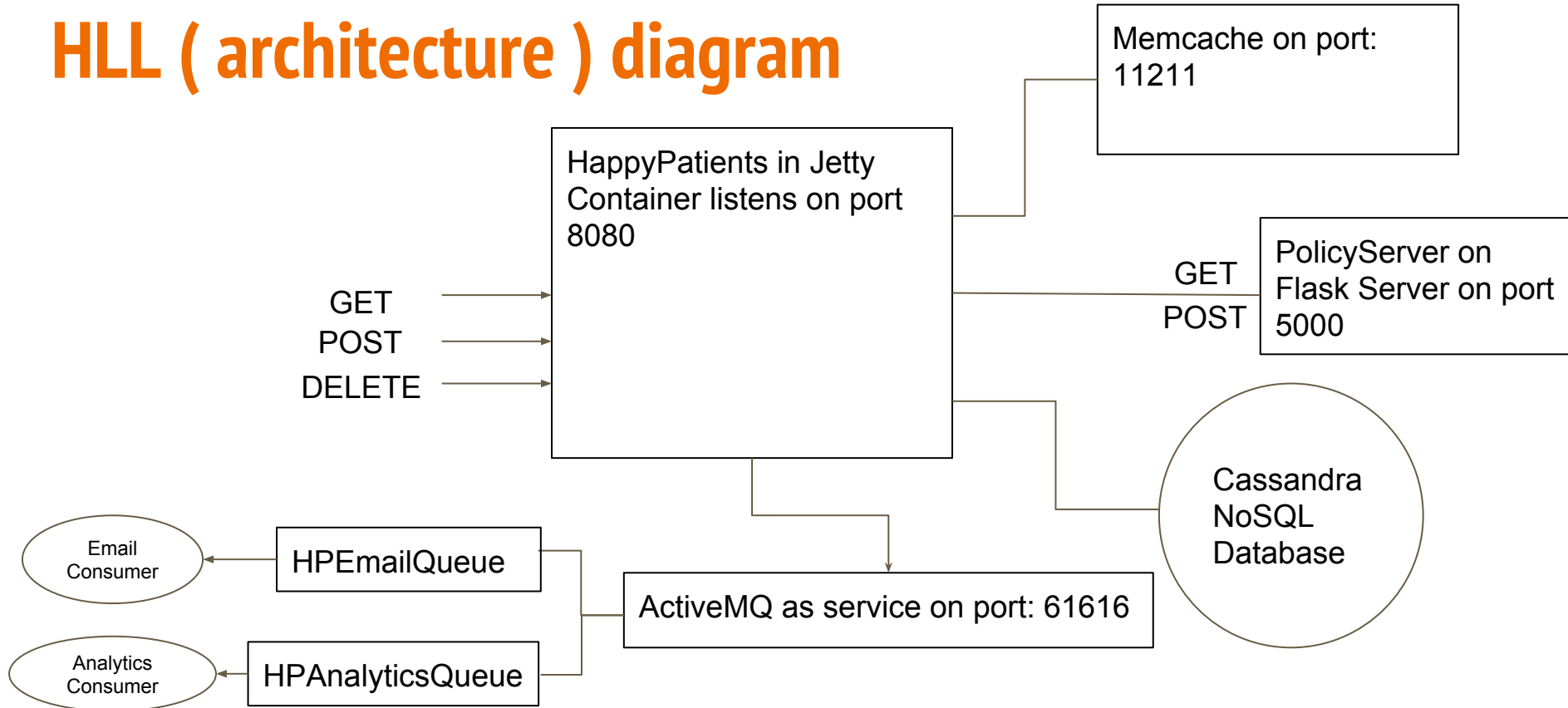
- Java Jersey Web Services Framework
- Connecting to Cassandra through Java
- Connecting to ActiveMQ through Java, and using JMS API
- Connecting to Memcache

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

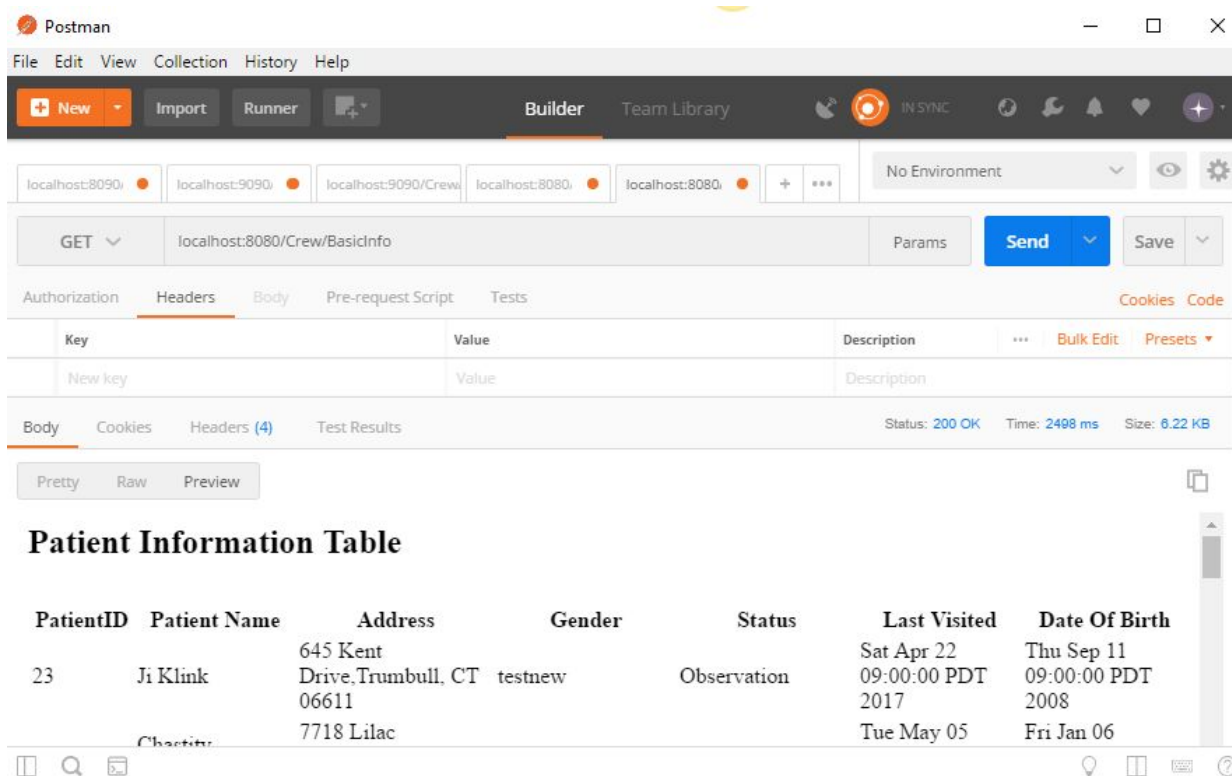
The image shows the Postman application interface. At the top, the title bar says "Postman". Below it is a menu bar with "File", "Edit", "View", "Collection", "History", and "Help". The main toolbar includes buttons for "New", "Import", "Runner", "Builder", and "Team Library". The "Builder" tab is active, showing a request configuration for a PUT method to the endpoint "localhost:8080/Crew/UpdatePatientRecord". The "Body" tab is selected, and the request body is a JSON object:

```
{  "Patient Name": "Alan Caver",  "Address": "8758 Goldfield St,Eastpointe, MI 48021",  "Last Visited": "2017-12-13",  "Gender": "Male",  "Patient ID": 27,  "Phone Number": 1234,  "Status": "ICU"}
```

. The response status is "200 OK", with a time of "133 ms" and a size of "725 B". The response body is displayed in the "Body" tab, showing a JSON array of two objects:

```
[{"patientname": "Alan Caver", "address": "8758 Goldfield St,Eastpointe, MI 48021", "lastvisited": "Sat Dec 19 08:00:00 PST 1987", "gender": "Transgender", "patientid": 27, "createddate": "Mon Jul 12 09:00:00 PDT 1982", "dob": "Sat Aug 01 09:00:00 PDT 1981", "phonenumber": 4746, "id": 27, "status": "ICU"}], [{"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", "phonenumber": 1234, "id": 27, "status": "ICU"}]]
```


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 08:00:00 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	Female	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}

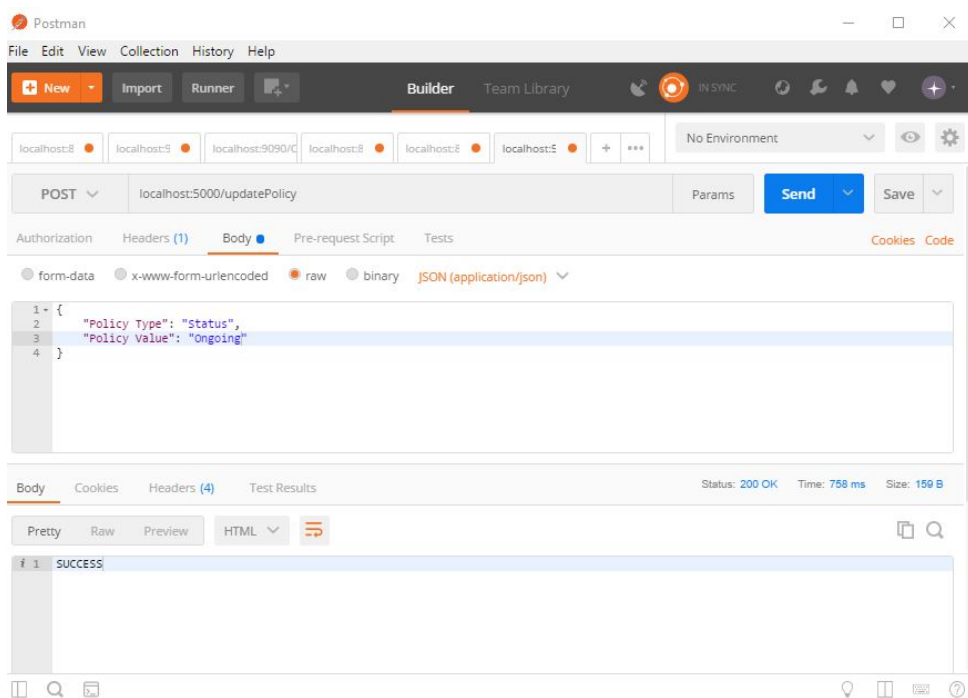
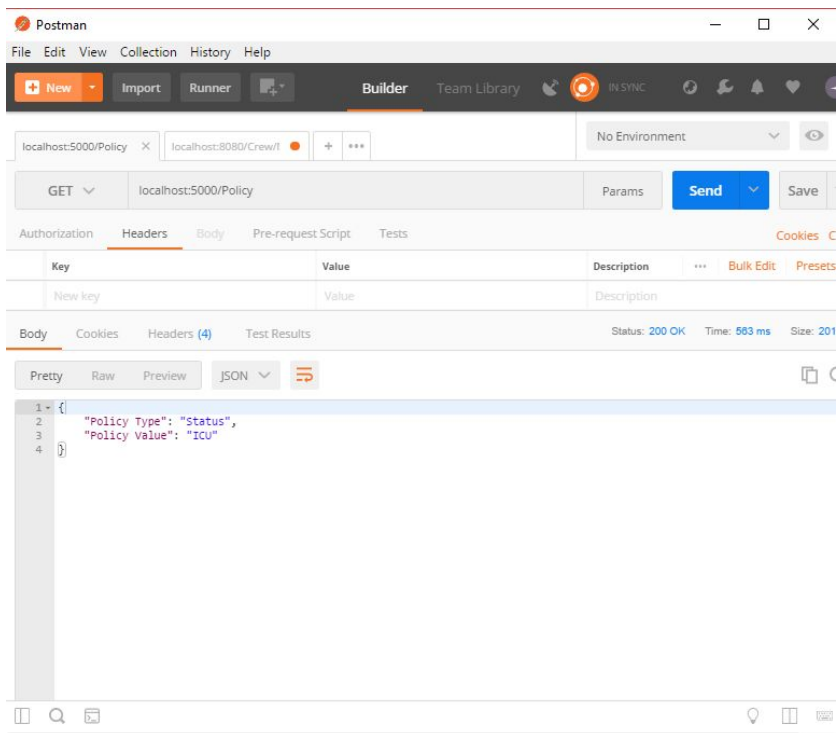
The screenshot displays a REST client interface with the following components:

- 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 48061	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=1kbmh6tte2p7k1kjku9pw3tbn 🔍 ☆ 🏠



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	
AESMSservice	9864	Intel® SGX AESM	Running	
AJRouter		AllJoyn 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

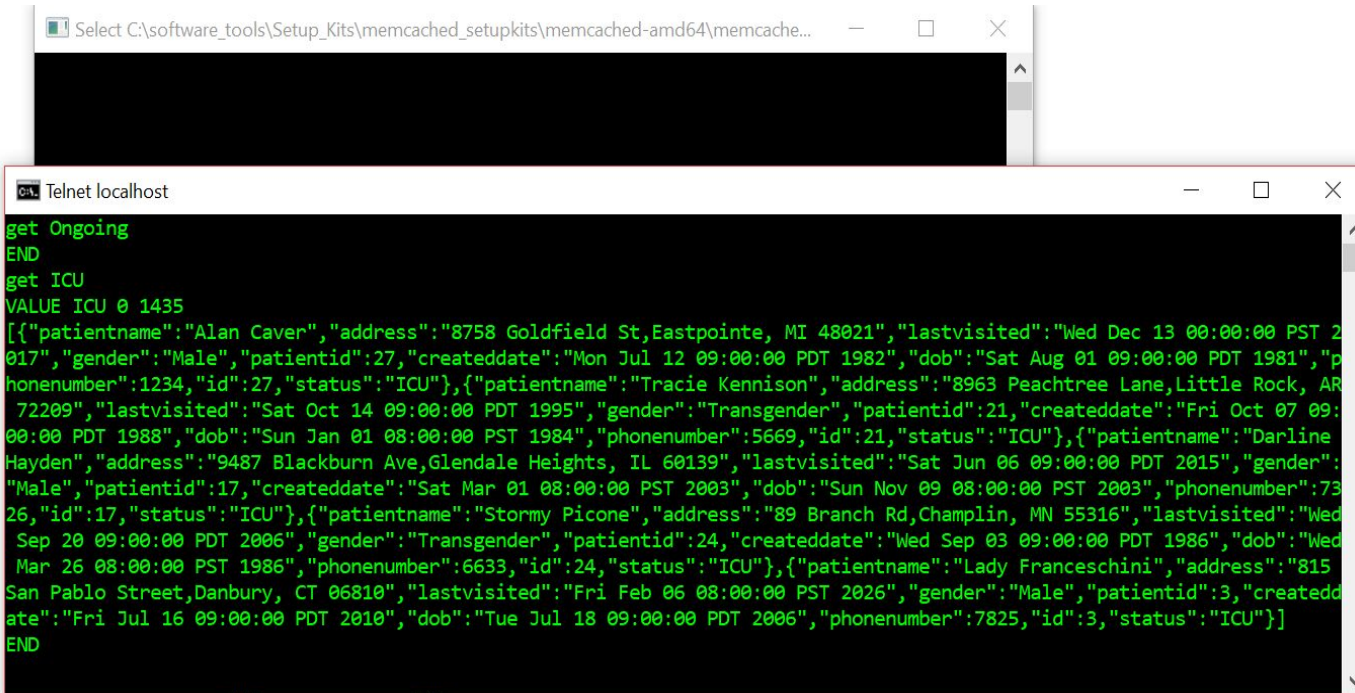
Active Producers

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","phonenummer":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","phonenummer":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","phonenummer":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","phonenummer":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","phonenummer":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 analytis consumers

Thank You