What is D1 Queue Manager?

- Managers message and queries for servers and clients
- Communicates with servers and clients over TCP/IP socket networking
- Prioritizes queries and queues them for the databases

What does D1QM do?

- Works as a client to server databases and stagers
- Works as a server to client web query interface
- Accepts, validates, and tracks queries submitted by clients
- Monitor s status of query processing
- Processes messages from servers and clients
- Monitors server connection
- Notify clients of query results
- Reconnect to server(s) if the server(s) disconnected

Requirements

1. Input Parameters
   - Get query parameters expressed as a query string
   - Get query ID expressed as a string
   - check the query parameters for validity
   - Assign a priority number to each valid query
2. Logging Capability
   - Shall log the query to a log file
   - Shall log the following information
     - Error message
     - Server message
     - Client message,
     - Time stamps

Requirements (cont‘d)

3. Message management
   - Read and recognize valid query status message
   - Send a message back to the client to indicate acceptance or rejection
   - Notify the user if an unprocessable query is received
   - Notify users when a query is successfully processed
   - Notify users of timeout when connecting to servers
4. Sending query to servers
   - Send a query to servers in an order of priority
   - Record time a query is sent to each server

Requirements (cont‘d)

5. Tracking query process
   - Track each step of the process
   - Record the time a query submitted, validated, and finished
   - Record query results
6. System communication
   - Communicate with servers and clients through TCP/IP socket connection
7. Server reconnection
   - Reconnect to a server after a server disconnection

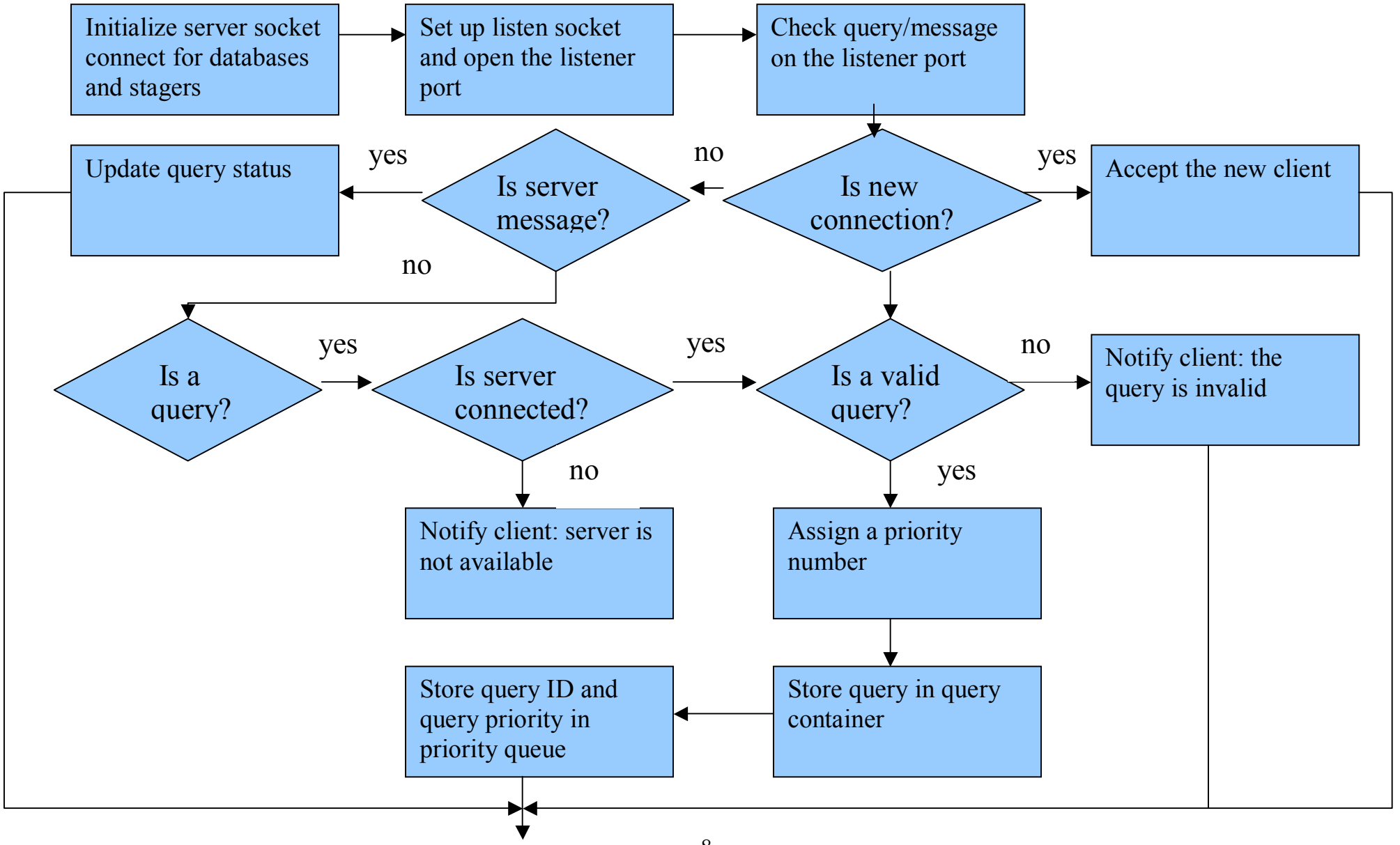
TO DO

- Implement incomplete message handling
- Expand query priority classification
- Expand more detail query validation
- Implement program shut down

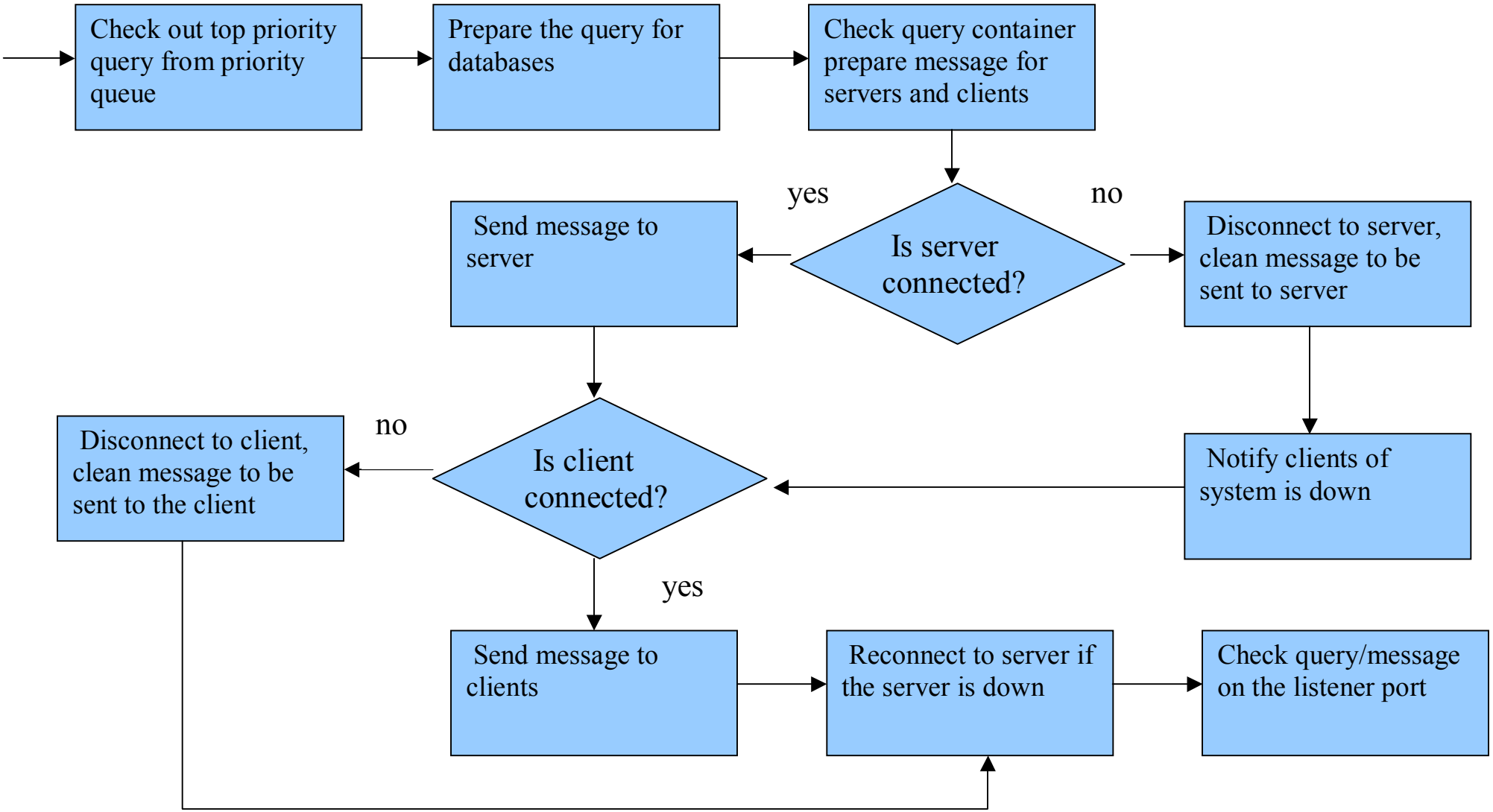
Class Hierarchy

Socket	implements a raw socket TCP/IP calls
ServerSocket	implements a server socket connection and communication
ClientSocket	implements a client socket connection and communication
MQMSocket	implements multi-servers and multi-clients socket connection and communication
Query	defines query information
QueryMap	stores query information described by class Query (map type container)
Queue	defines query ID and query priority number
PriorityQueue	maintains query in a critical order according to its priority number
Selector	selects a socket descriptor that is available to be read
ServerData	defines server information
ServerMap	stores server information, a map type container
SocketException	throws an exception
QueryCheck	validates a query

Program flow



Program flow (cont'd)



Configuration files

- Configuration file for each server:
  D1Conf.txt:
  45278
  fafnir.gsfc.nasa.gov

- Configuration file for listener socket
  MainConf.txt:
  4725

Define main variables

1. int listener,sd, fd; // socket descriptor
2. int D1sd = -1, D2sd = -1, Stg1sd =-1, Stg2sd=-1; // server socket descriptor
3. std::string status, LogMesg, ErrorMesg;
4. std::string servernam;
5. list <int> *SDList = new list <int>; // socket descriptor list
6. list <string> *KeyToBeRM = new list <string>; // to be removed query id list
7. list <TList> *MesgToServer = new list <TList> ; // message to server list
8. list <TList> *MesgToClient = new list <TList> ; // message to client list
9. TQueue *PQueue = new Tqueue; // Priority queue container

*TList: c-structure with fields of message ID, message size, message, and socket descriptor

Set up server and listen sockets (code sample)

```
3.   QMQSocket *QM = new MQMSocket;              // Set an object *QM
4.   .try{                                      // Set listener
5.       ConfFname = “ListenConfig.txt";
6.        (*QM).SetListener(ConfFname);         // create QM server to clients
7.        listener = (*QM).GetListener();       // get the socket descriptor
8.   }
9.    catch(SocketException& err){
10.         cout << "Exception was caught in creating listener:" <<
                    err.description()<<endl;
11.         exit(1);
12.   }
14.     try{                                     // Set D1 server
15.          ConfFname = "D1Config.txt";
16.          servername = "D1";
17.          if ((*QM).SetServer(ConfFname, servername))
              D1sd = (*QM).GetServerSd();
18.    }
19.     catch(SocketException& err){
20.         (*QM).ReSetServerFlag();
21.         cout << "Exception was caught:" << err.description()<<endl;
22.    }
```

Read in message/query (code sample)

```
1. If (!(*QM).SelectReadFd()) throw SocketException( "Standing by\n");
2. while ((fd =(*QM).GetReadFd())!=-1){  // get the ready socket descriptor
3. try{
5.   if (fd == listener){                  //  new connection
6.     sd = (*QM).GetNewClient();  // get the new connection socket descriptor
7.     }
8.   else if (fd == D1sd || fd == D2sd || fd == Stg1sd || fd == Stg2sd){
9.      *InMesg = (*QM).GetServerMesg(fd);    // get message from server
10.    ...
11.   }
12.  else{                                    //  from client
13.     (*InMesg) = (*QM).GetClientMesg(fd); // get message from client
14.    ...
15.   }
16. }                                        // end try
17. catch(SocketException& err){
18.  close (fd); // close connection
19.
20.  if (fd == D1sd) D1sd =-1;  .            // reset descriptor
21. …
22.    }
```

Prepare query for D1 (code sample)

```
3.    Queue *pq = new Queue;
4.    Query *r = new Query;
5.    if (!(*PQueue).empty()) {  // if priority queue is not empty
6.      *pq = (*PQueue).top();   // get the top priority query ID
7.      string key = [(*pq).GetQKey();
8.      // Get the corresponding query from query container
9.      *r = (*QueryMap)[key];
10.     // Implemet query/mesg to be send to D1
11.      (*OutMesg) = GetOutMesg(3001, (*pq).GetQKey(),(*r).GetQuery(),D1sd);
12.     // store the query/mesg in a message list to be sent to D1
13.      (*MesgToServer).insert((*MesgToServer).end(),(*OutMesg));
14.
15.      (*PQueue).pop();// remove the top query from priority queue
16.    }
```

Check query container

```
1.  For ( it= (*MapQuery).begin(); it != (*MapQuery).end(); it++ ) {
2.   // check timeout for servers
3.   clock_t Timer = (*it).second.GetTimeToServer(servername);
4.   if( (elapsed_time(Timer,mark_time()) > TimeLimit) && (Timer!= 0.0) ){
5.   string status = "Time_out_for_"+servername;
6.    …
7.      }
8.   // check for finished query
9. if(atoi((S1CStatus.substr(0,4)).c_str()) == WEB_QUERY_RESULTS_RECEIVED &&
            atoi((S1SStatus.substr(0,4)).c_str()) == MERGE_FINISHED &&
            atoi((S2SStatus.substr(0,5)).c_str()) == D2_MERGE_FINISHED &&
            atoi((S2CStatus.substr(0,4)).c_str()) ==
                              WEB_D2_QUERY_RESULTS_RECEIVED)
10.        (*KeyToBeRM).insert((*KeyToBeRM).end(),(*it).first);
11.  ..
12.}
13.
14. …
```

Send message to server (code sample)

```
1.  // Send mesg  to server
2.  while (!(*MesgToServer).empty()){ // check  message to be sent to servers
3.      try{
4.  *OutMesg = (*MesgToServer).back(); // get message from message list
5.  (*QM).SendServerMesg(OutMesg);   //  send the message to server
6.  (*MesgToServer).pop_back();        // remove the message from the list
7.      ...
8.      }
9.      catch ( SocketException& err ) {
10.         close((*OutMesg).Tsd;    // close the connection to the server
11.           ...
12.     }
13.
```

Server reconnection (codes sample)

```
2.    if ((*QM).Is_SysDown() == 1 ){  // check if there is system crashes
3.      try{
4.        double ServerTimer = TConnect;  // time to reconnect server
5.        (*QM).ReconnectServer(ServerTimer);   // reconnect to server
6.     // get the reconnect server name, and set the socket descriptor
7.        if ((*QM).GetServerName() == "D1") D1sd == (*QM).GetServerSd();
8.        ...
9.    }
10.    catch(SocketException& err){
11.      LogMesg = "Could not reconnect to "+(*QM).GetServerName();
12.     .... // logging
13.    }
14.
```