University of the West of England
BRISTOL

MODULAR PROGRAMME

ASSESSMENT SPECIFICATION

Module Details

Module Code UFEEHJ-30-2	**Run** 08SEP/1 AY	**Module Title** Operating Systems and Systems Administration
Module Leader Ian Johnson	**Module Tutors** Nigel Gunton, Ian Johnson	
Component and Element Number B2		**Weighting: (% of the Module's assessment)** 25%
Element Description Coursework - 2		**Total Assignment time** 18 hours

Dates

Date Issued to Students 23/02/09	**Date to be Returned to Students** 5th May 2009
Submission Place **PROJECT ROOM - 2Q30** **(Help Desk open 9.00 - 6.00pm)**	**Submission Date** 2nd April 2009
	Submission Time **2.00 pm**

Deliverables

As per attached specification

Module Leader Signature

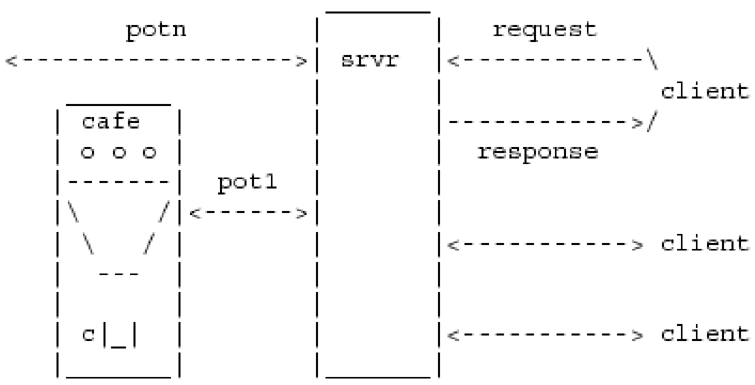
Ian Johnson

You May Work Either Individually or In Pairs For This Assignment

Requirements

The design and development of an RFC2324 compliant Coffee Pot Server.

Most modern applications include network or Internet connectivity. In order to gain a better understanding of the role of an operating system and networking software in supporting such applications, you are to design and implement a standards compliant server and a client. This will support HTCPCP, the Hyper-Text Coffee-Pot Control Protocol. This protocol is designed to allow the remote control of coffee brewing machines via the internet. An HTCPCP server accepts requests from remote clients and uses these requests to manage the coffee machine. The server provides responses based on the status of the coffee brewing machine.



In order to achieve this you will need to :-

1. Read and understand RFC2324. This provides an introduction to RFCs (Request For Comments). RFCs are the standards documents of the Internet, all key protocols are described and defined in them. Networking software is required to comply with the defined standards if it is to interact correctly with other software using the same protocols. Note that, as with all protocols during their development phase, their are some ambiguities in RFC2324. It is up to you to recognize and interpret these ambiguities and omissions in such a way that reflects your understanding of the intent of RFC2324. This should be documented as the first part of the deliverables. Credit will be given for the quality of decisions made at this stage.

2. Compare the set of request messages and responses provided below, in BNF, with the written descriptions shown in RFC2324. Decide which of this set of messages and responses should be generated by the client and which by the server. These messages will be encapsulated within HTTP and should include any extensions to HTTP that may be required at both client and server end. Your decisions and modifications should be documented and again credit will be given for the standard of your documentation.

3. Develop a full top-level finite state design for both the client and the server. Please note that the most complex areas are:
   - Parsing user input in the client and constructing a valid request.

   - Parsing the request message in the server and building an appropriate response.

   Your design MUST show how you undertake the parsing.

Implement the design using C or if you wish C++. You will be expected to use the code examples provided, it will be up to you to decide which of the examples are the most appropriate. These are all available via the links on the modules web-page http://www.cems.uwe.ac.uk/~irjohnso. Note that these pages are only available on-site. The majority of examples are in C. If you use code from other sources then it must be clearly identified as such and you must be able to explain its functionality to your lab tutor.

Note that in the absence of a coffee machine you will have to simulate it by either

a) implementing variables in the server to represent the coffee machine status

   or

b) reading and writing to a file holding the coffee machine status

   or

c) implementing a coffee machine which is controlled by the server

Note

Your coffee-pot server is not required to provide all additions but must recognize the additions list and respond with an appropriate message.

Deliverables:

You must include in your assignment machine readable source code on either floppy disk or CD. Be warned, plagiarism detection software may be used to detect overly similar work.

1) A short (< 500 words) description in your own words that shows your understanding of RFC2324. 0% to 10%.

2) Documentation describing the messages and responses of your system. 0% to 10%

3) Your design(s). 0% to 30%

4) Your code for the client and the server. This must be signed and dated by your lab tutor to whom it must have been demonstrated successfully. The lab tutor must indicate the degree to which s/he considers it to have met the requirements. 0% to 30%

You may wish to demonstrate the following stages :-

- A stand-alone client with user input from the keyboard and output to the screen.
- A stand-alone server with input from either the keyboard or a file and output to the screen or to a file.
- The combination of your client and server. The server should print out the request message and the client should print out the response message.

Alternatively, you can demonstrate the finished system, provided it works!

A further 20% is available for quality of design or quality of code or for demonstrating your client/server against a third party client/server. Factors to be considered will include clarity of the design, the degree to which the design matches the code, commenting, robustness and testing. In addition marks in this section may be awarded for extending the assignment specification through for example, implementing a multithreaded server, or a GUI front-end as an optional interface to your client. Such extensions should be agreed in advance with your lab tutor.

Note that the overall quality of the documentation that you hand in will affect the mark allocated. Spelling, layout, code comments etc are all important.

Code printed so that it is difficult to read, truncated by the edge of the page etc will lose you marks!

Useful Suggested BNF

```
coffee-url  =  "coffee" ":" [ "//" host ] ["/" pot-designator ] ["?" additions-list ]

pot-designator = "pot-" integer  ; for machines with multiple pots
   additions-list = #( addition )

HTCPCP-message   = Request | Response     ; HTCPCP/0.1 messages

        generic-message = start-line
                          *(message-header CRLF)
                          CRLF
                          [ message-body ]

       start-line      = Request-Line | Status-Line
       message-header = field-name ":" [ field-value ]
       field-name     = token
       field-value    = *( field-content | LWS )
       field-content  = <the OCTETs making up the field-value
                        and consisting of either *TEXT or combinations
                        of token, separators, and quoted-string>

       message-body = entity-body

       Method   = "PROPFIND"           ; Section 2.1.3
                | "GET"                ; Section 2.1.2
                | "BREW"               ; Section 2.1.1
                | "POST"               ; Section 2.1.1
                | "WHEN"               ; Section 2.1.4
                | extension-method

       extension-method = token


        Request       = Request-Line
                        *((request-header
                          | entity-header ) CRLF)
                        CRLF
                        [ message-body ]

      Request-Line = Method SP Request-URI SP HTCPCP-Version CRLF

      Request-URI    = "*" | absoluteURI | abs_path | authority


       request-header =   Accept-Additions         ; Section 2.2.2.1
                          | Safe-Condition         ; Section 2.2.1.1
```

Server responses

```
Response      = Status-Line
                *((response-header
                 | entity-header ) CRLF)
                CRLF
                [ message-body ]
```

```
Status-Line = HTCPCP-Version SP Status-Code SP Reason-Phrase CRLF
```

The first digit of the Status-Code defines the class of response. The last two digits do not have any categorization role. There are 5 values for the first digit:

- o 1xx: Informational - Request received, continuing process
- o 2xx: Success - The action was successfully received, understood, and accepted
- o 3xx: Redirection - Further action must be taken in order to complete the request
- o 4xx: Client Error - The request contains bad syntax or cannot be fulfilled
- o 5xx: Server Error - The server failed to fulfill an apparently valid request

```
Status-Code    = "100"   ; Continue
               | "200"   ; OK
               | "400"   ; Bad Request
               | "401"   ; Unauthorized
               | "402"   ; Payment Required
               | "403"   ; Forbidden
               | "404"   ; Not Found
               | "406"   ; Not Acceptable
               | "410"   ; Gone
               | "501"   ; Not Implemented
               | "503"   ; Service Unavailable
```

```
response-header =  Age
                 | Retry-After
                 | Safe

entity-header  = Accept-Additions
```

```
Retry-After  = "Retry-After" ":" ( HTTP-date | delta-seconds )
Safe              = "Safe" ":" safe-nature
  safe-nature         = "yes" | "no" | conditionally-safe
  conditionally-safe  = "if-" safe-condition
  safe-condition      = "user-awake" | token
```

Entity Body

```
entity-body := Content-Encoding( Content-Type( data ) )
```

The entity body of a POST or BREW request MUST be of Content-Type "message/coffeepot". Since most of the information for controlling the coffee pot is conveyed by the additional headers, the content of "message/coffeepot" contains only a coffee-message-body:

```
coffee-message-body = "start" | "stop"
```

Accept-Additions header field

```
Accept-Additions = "Accept-Additions" ":"
                   "#"(addition-type [accept-params])

 addition-type  =  ( "*"
                   | milk-type
                   | syrup-type
                   | sweetener-type
                   | spice-type
                   | alcohol-type
                   ) * ( ";" parameter)

 milk-type      =  ( "Cream" | "Half-and-half"
                   |"Whole-milk" | "Part-skim"
                   |"Skim" | "Non-dairy" )

 syrup-type     =  ( "Vanilla" | "Almond" | "Raspberry")

 sweetener-type =  ( "White-sugar" | "Sweetener"
                    |"Raw-cane" | "Honey")

 spice-type     =  ( "Cinnamon" | "Cardamon" )

 alcohol-type   =  ( "Brandy" | "Rum" | "Whiskey"
                   | "Aquavit" | "Kahlua" )

 parameter      =  number | volume

     number     =  ("1"|"2"|"3"|"4"|"5")
     volume     =  ("dash"|"splash"|"little"|"medium"|"lots")
```

Safe-Condition header field

```
Safe-Condition    =  ("user-awake" | token )
```