OpenQM

Building a CGI Web Server

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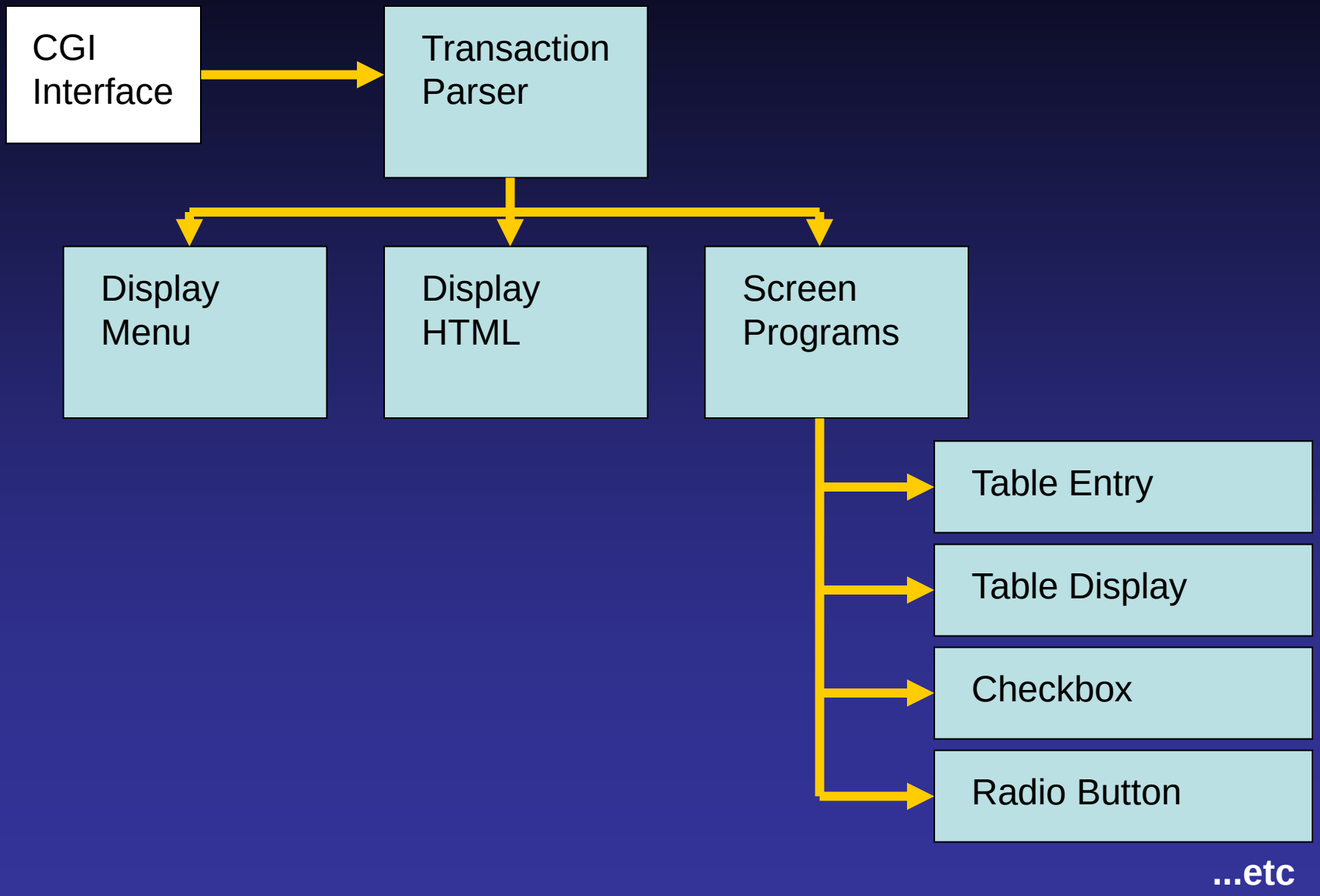
What We Are Going To See Today....

How to build a web server as a multi-value Basic application using no additional tools.

These examples are based on QM but can be adapted for other environments.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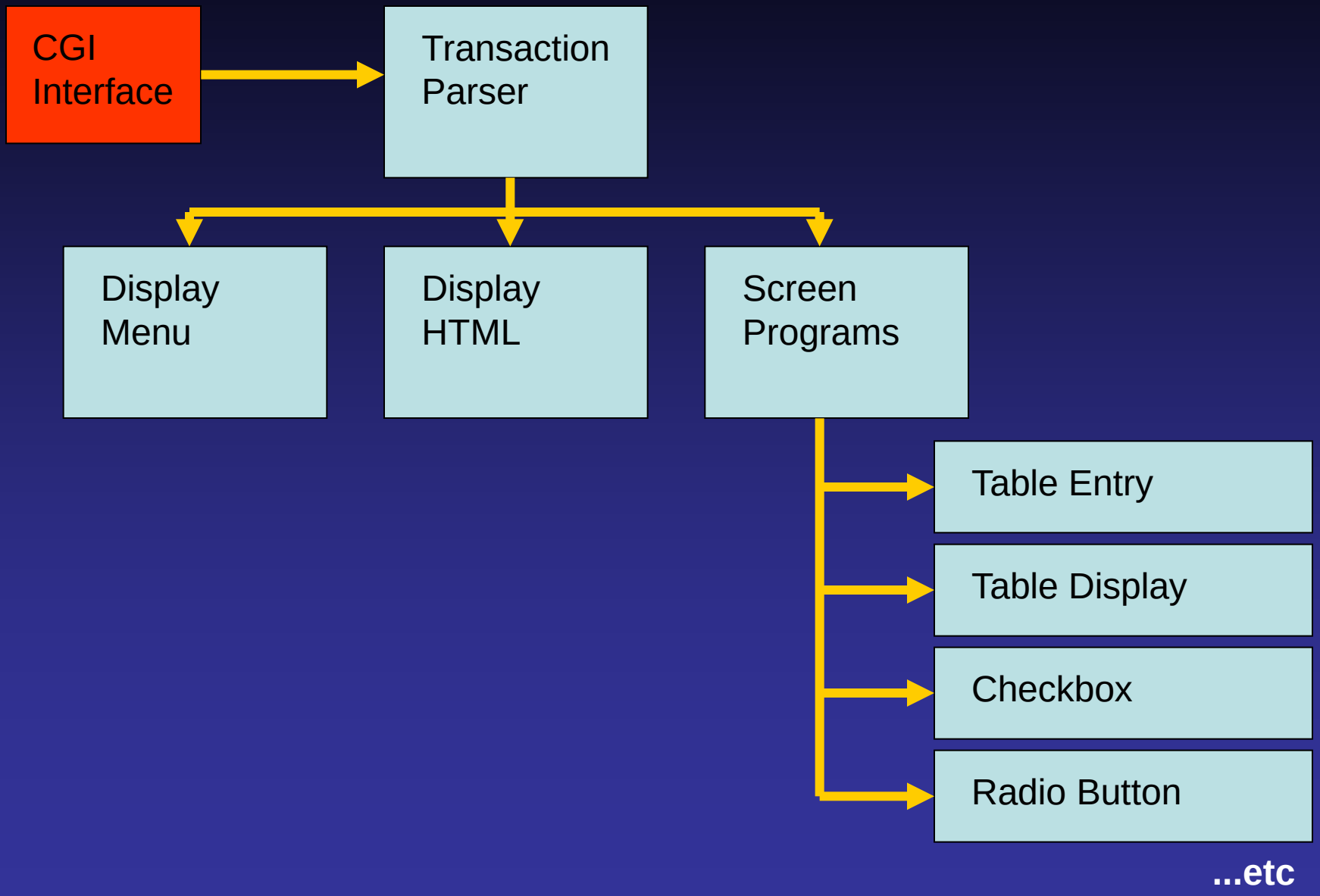
Display Menu
Display HTML
Screen Programs
Table Entry
Table Display
Checkbox
Radio Button
...etc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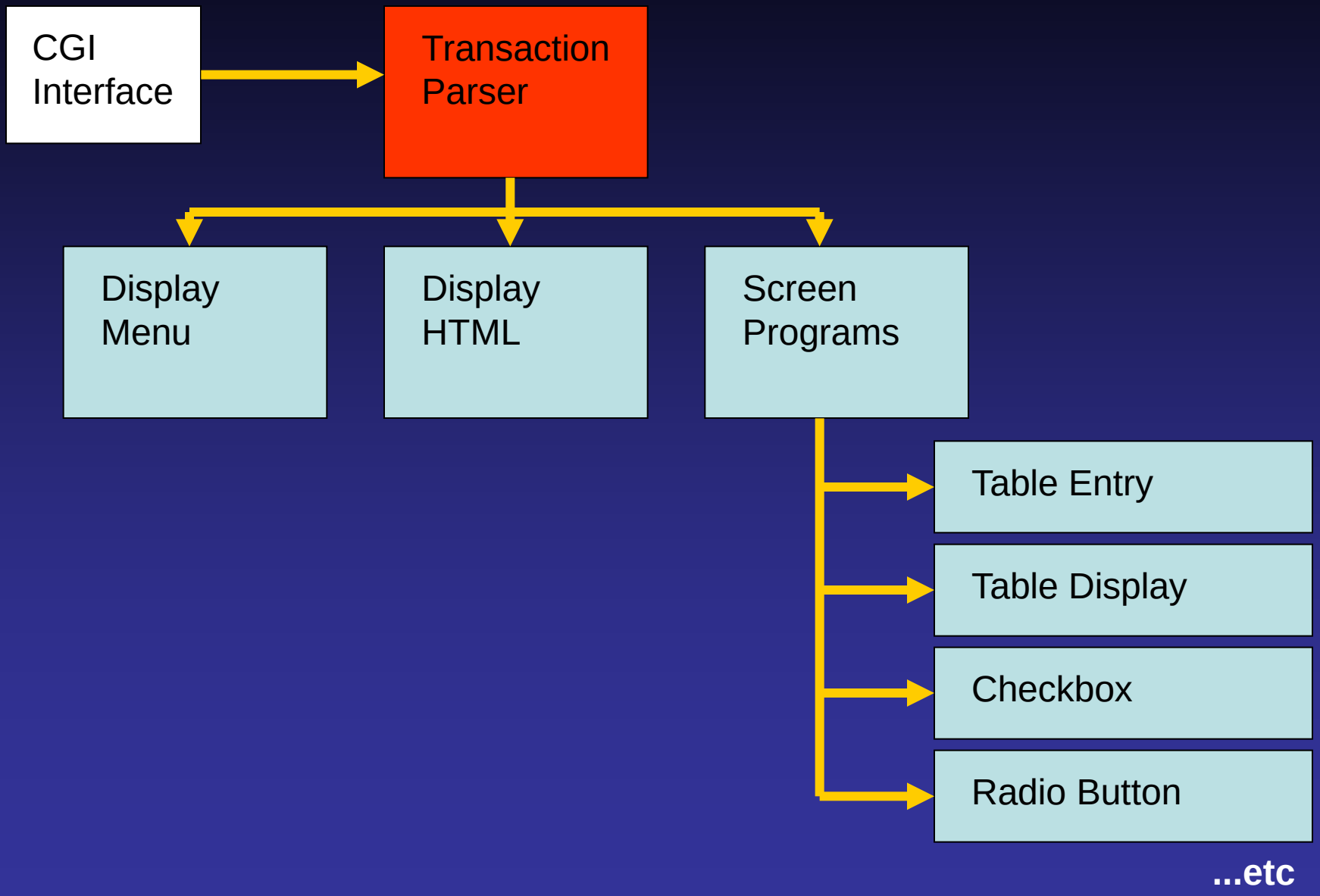
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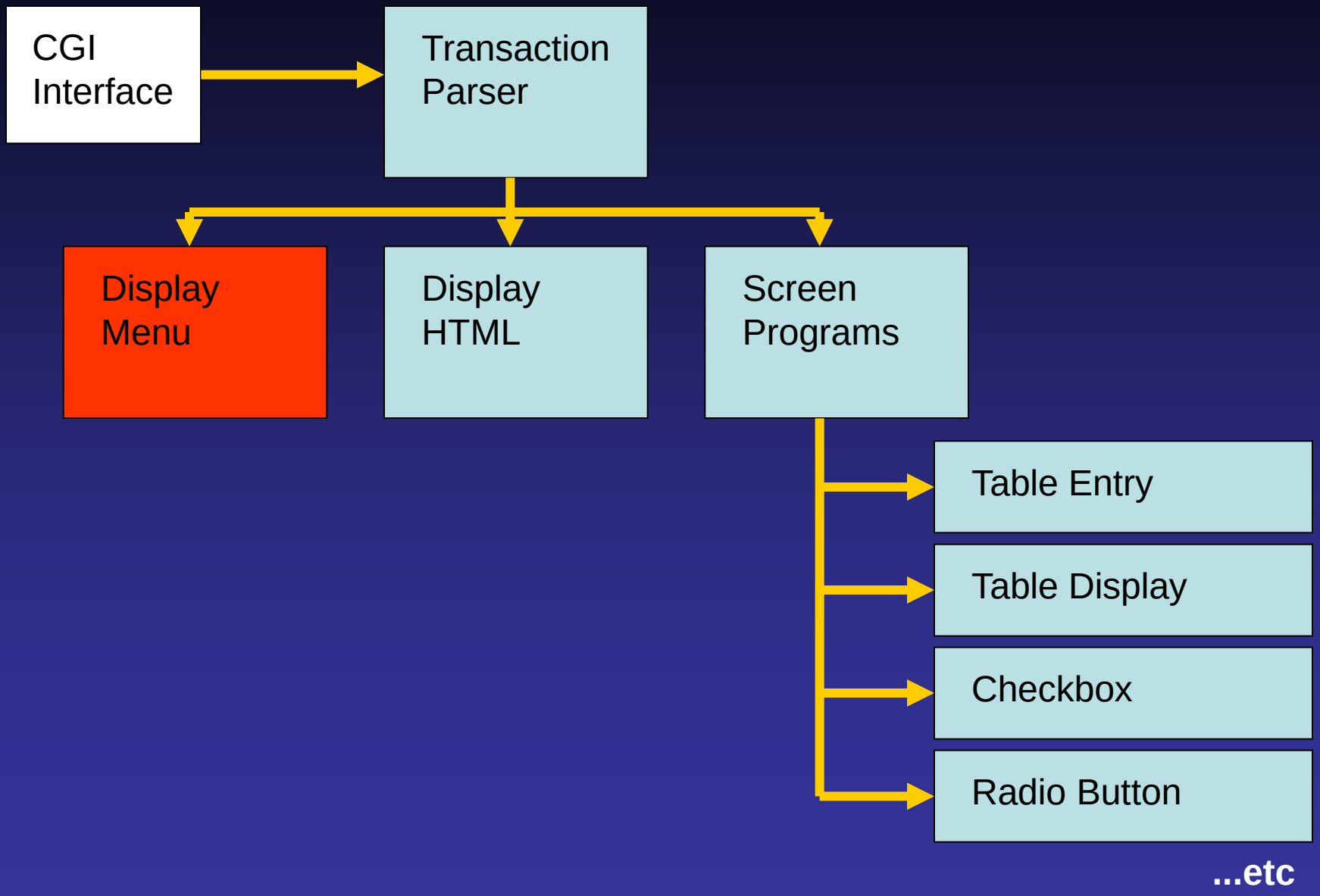
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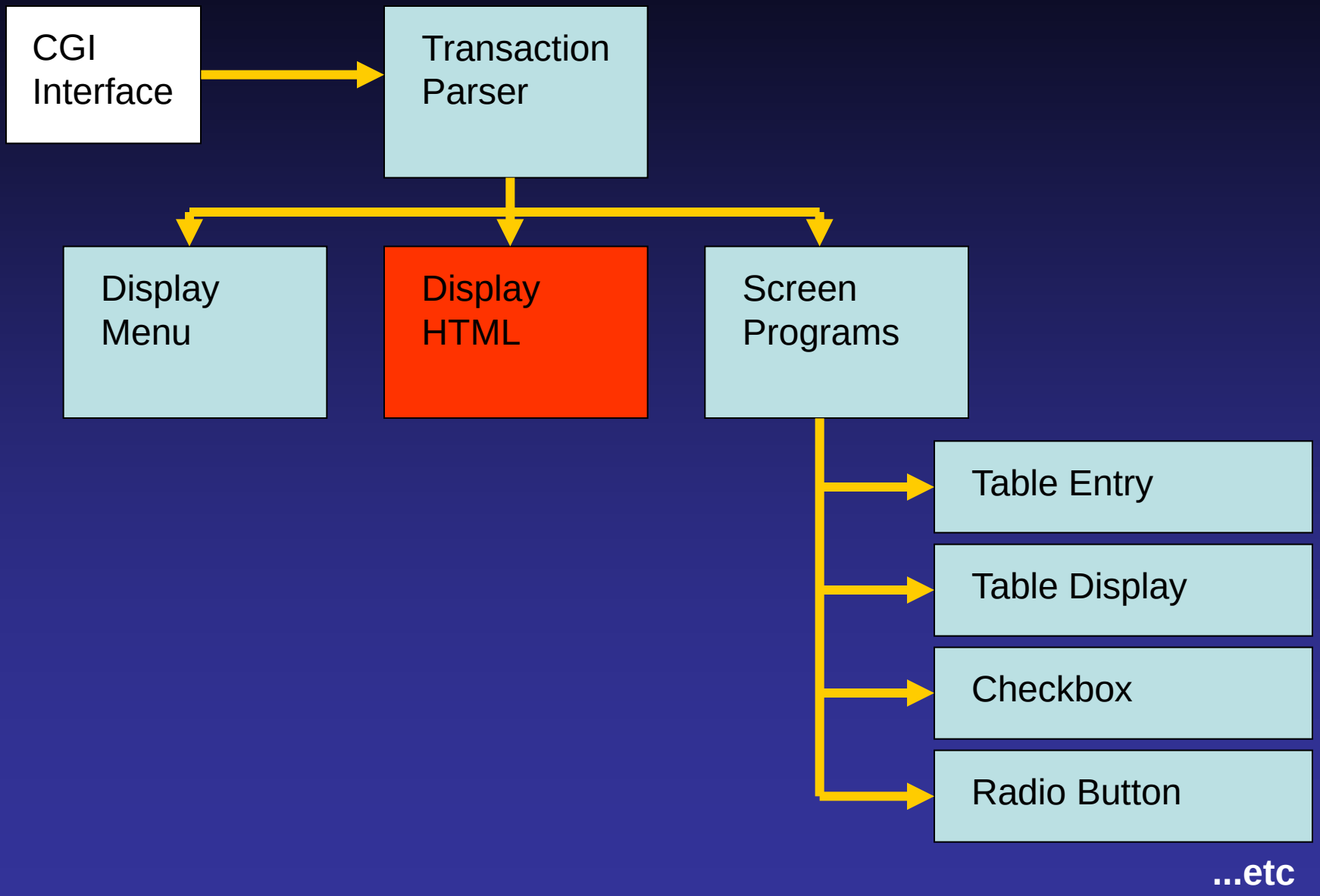
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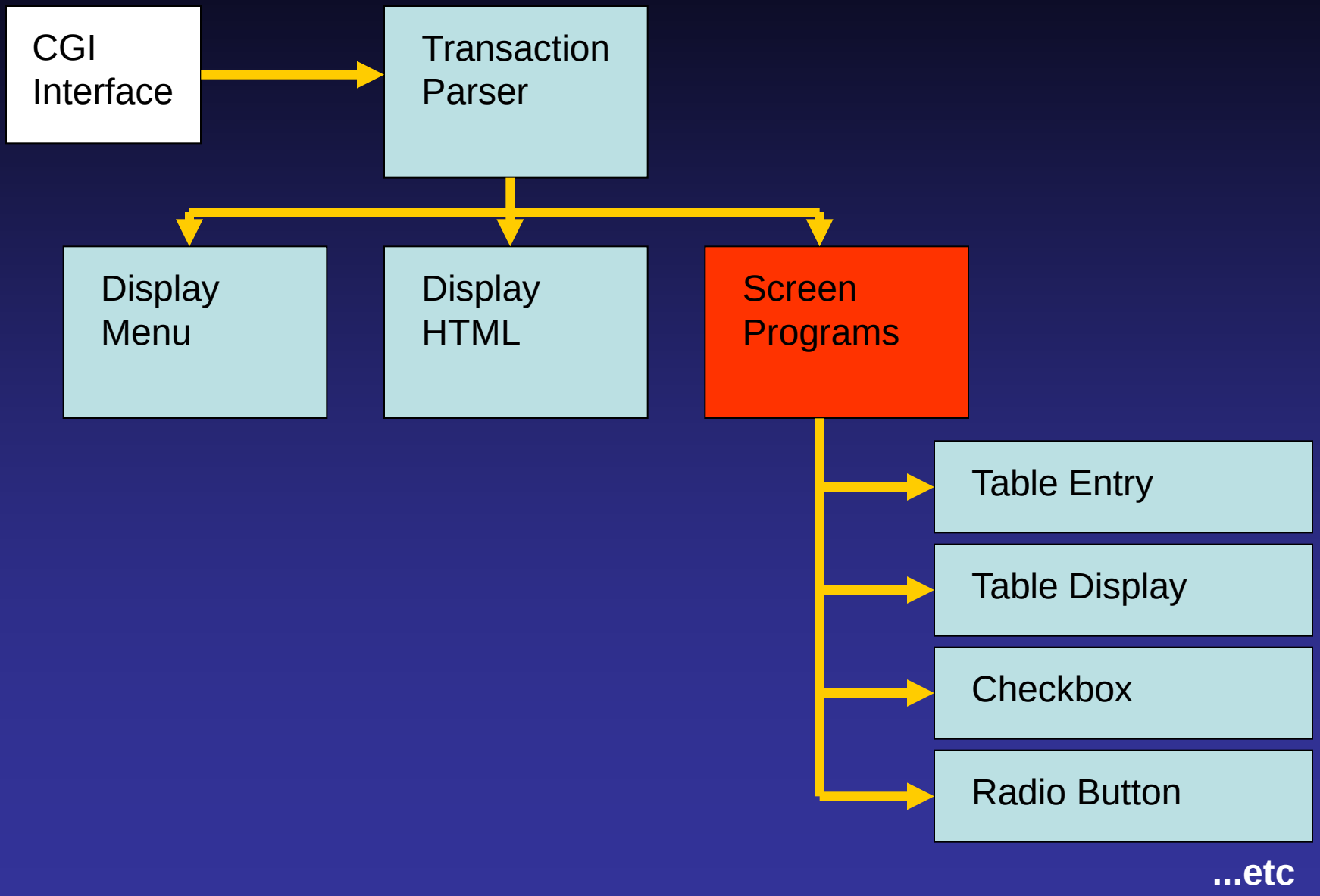
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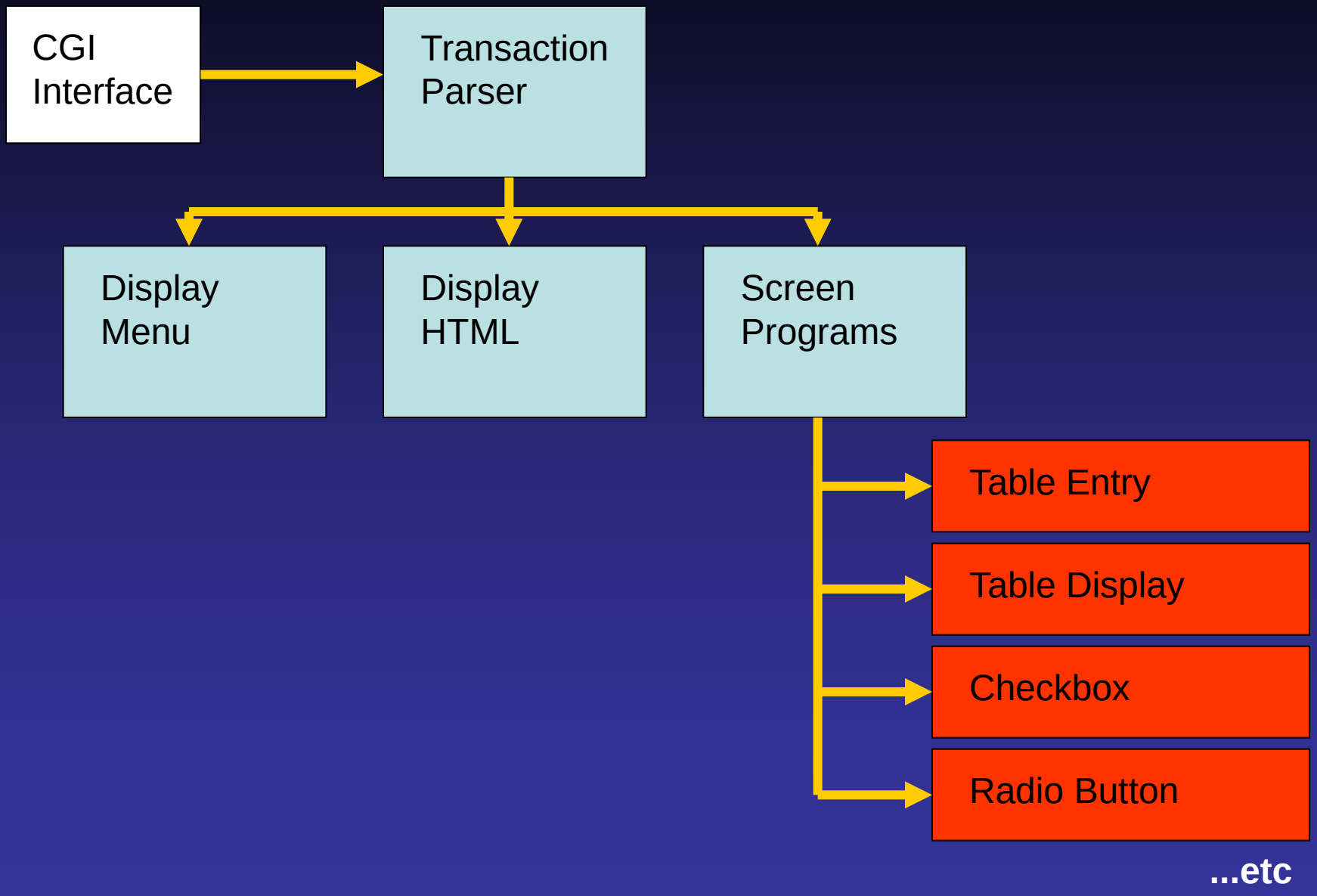
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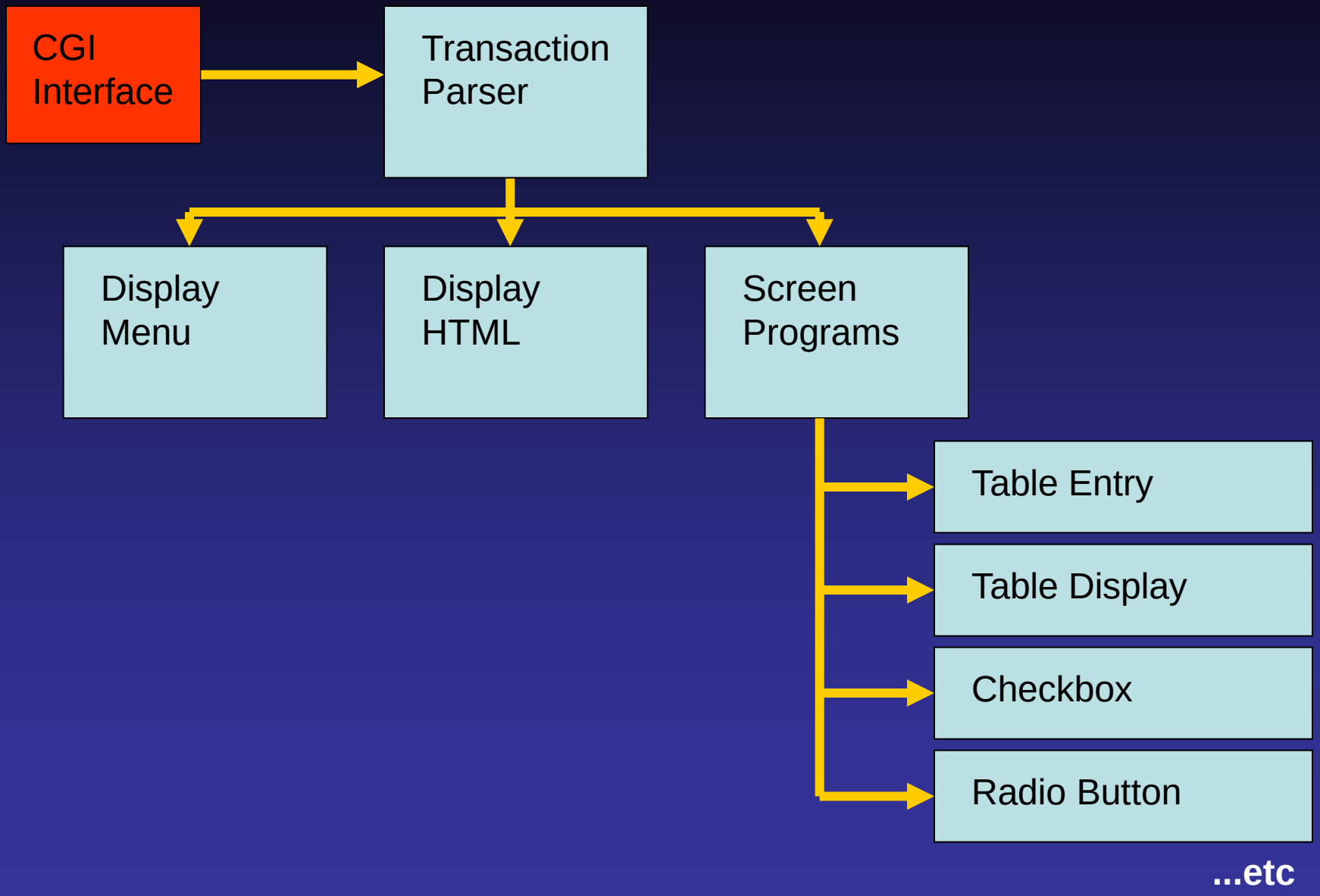
Web Page Generation Data Files

USERS	User authentication
SESSIONS	Persistent data management
HTML	Template HTML pages
MENUS	Dynamic menu content
LOG	Diagnostic transaction log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The CGI Interface Program

mysite.com/cgi/cgi.exe?t0=m&t1=links&x=jlfo9d9pqn

URL

All text before the ? is the web address of the CGI program.

Parameters

All items after the ? are parameters separated by ampersands.

The CGI Interface Program

The parameters and other data are passed to the C program via environment variables:

REQUEST_METHOD	GET or POST
REMOTE_ADDR	IP address of client
HTTP_HOST	Domain name from URL
QUERY_STRING	Parameters for GET
CONTENT_LENGTH	Data length for POST

The CGI Interface Program

The C program opens a database connection and calls the parser subroutine, passing in the parameters from the incoming message.

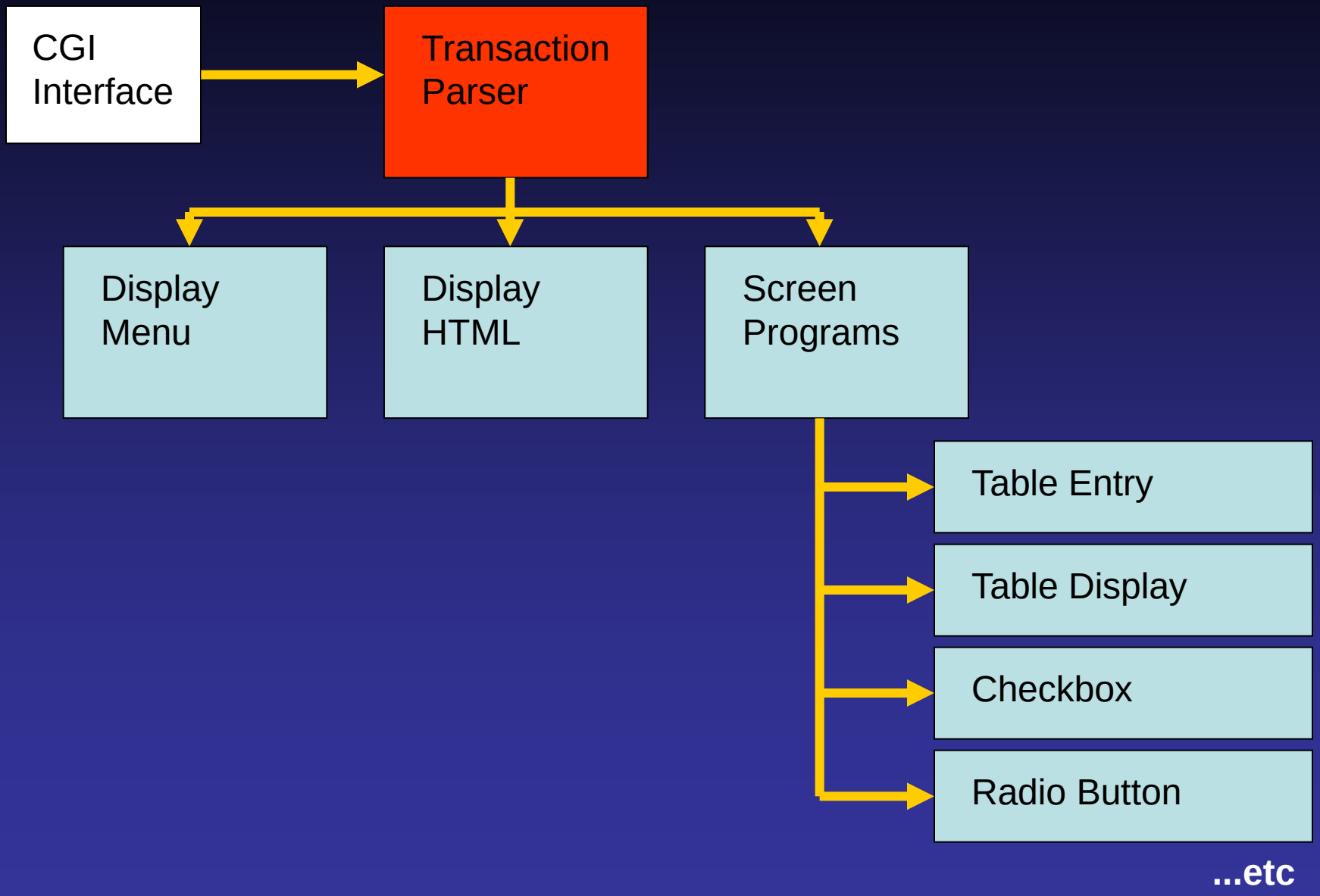
The response is passed back from the subroutine through an argument variable.

For long responses, the data is written to a temporary file and the pathname is returned by the subroutine.

The C program sends the response back to the client browser.

The CGI Interface Program

```
if (!QMConnect(SERVER_ADDRESS, SERVER_PORT,
                    SERVER_USER, SERVER_PASSWORD,
                    SERVER_ACCOUNT))
  {
   strcpy(Response, "The server may be offline.");
  }
 else
  {
   QMCall("CGI", 3, InputData, Params, Response);
   QMDisconnect();
  }
```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The Transaction Parser

The parameters in the incoming message are entirely under application control.

Our use is:

T*n*	Text item
B*n*	Button
C*n*	Checkbox
R*n*	Radio button
X	Session id

The Transaction Parser

The parser copies the parameter values to fields within dynamic arrays for each data type.

Special encoding of restricted characters is handled during this operation.

Our parser also supports multi-valued parameters but we will ignore this here.

We use T0 to identify the program to be executed to handle the incoming request.

The Transaction Parser

For example:

T0 = M	Menu action
T0 = H	Template HTML page display
T0 = *xxx*	Execute named program

The name can have a "phase" number appended to represent the stage in a multi-screen sequence.

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The Transaction Parser

The parser constructs the new page by merging:

- Fixed text (style definitions, banner, etc)
- The menu bar
- The page body

This is returned to the CGI interface program via an argument variable or a temporary file.

The Transaction Parser – Session Ids

Web transactions are separate events with no automatic persistence of data.

We need to track some persistent data:

- User authentication and access level
- Displayed menus

Each connection is given a random session id that is carried forwards from one transaction to the next.

The Transaction Parser – Session Ids

Persistent data is stored in the SESSIONS file.

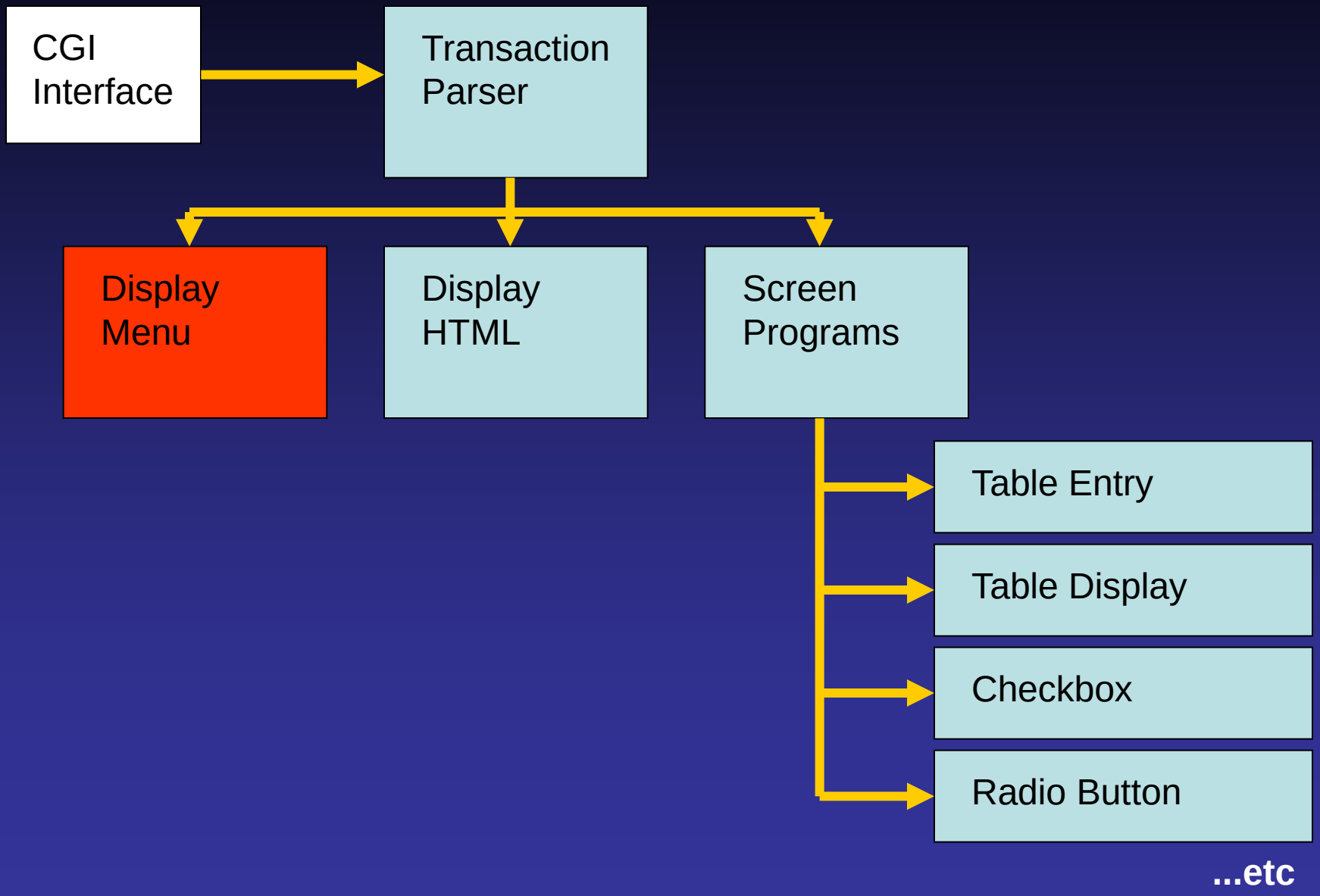
The X parameter links to the session record.

This is cross-checked against IP address, etc.

Every action checks the user's access level.

Session ids timeout after one hour of inactivity.

Old sessions are cleared out periodically.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Displaying Menus

We use a two level menu system where clicking on a top level item expands/collapses it.

The name of the top level menu to be displayed is stored in the SESSIONS file.

The underlying menu system can support multiple levels.

The expand/collapse action may also change the displayed page.

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Displaying Menus

Menu templates are stored in the MENUS file.

Each entry contains:

- Displayed text
- Target item type (menu, HTML, program, URL)
- Target identity
- Access filter
- Action on expand
- Action on collapse

Displaying Menus

```
function display.menu
$include common.h

   menu = '<br><div align="right"><font size="2">'

   gosub show(1, ses.rec<S.AREA>)
   menu := '</font></div>'

   return menu
```

Displaying Menus

```
local subroutine show(depth, mnu.id)
   private mnu.rec, num.items, mnu.idx, text, type, action, filter

   read mnu.rec from mnu.f, upcase(mnu.id) then
      num.items = dcount(mnu.rec<M.TEXT>, @vm)
      for mnu.idx = 1 to num.items
         text = change(mnu.rec<M.TEXT, mnu.idx>, ' ', ' ')
         type = mnu.rec<M.TYPE, mnu.idx>
         action = mnu.rec<M.LINK, mnu.idx>
         filter = mnu.rec<M.FILTER, mnu.idx>

         if filter = '' or index(filter, ses.rec<S.LEVEL>, 1) then
            * ----- Menu items construction goes here -----
         end
      next mnu.idx
   end
   return
end
```

Displaying Menus

* Menu items

```
begin case
   case type = 'H'   ;* HTML document
      menu := '<a href="':link('h','t1=':action):'">'
      menu := if depth = 1 then '<b>':text:'</b>' else text
      menu := '</a><br>'

   case type = 'M'   ;* Menu
      menu := '<a href="':link('m','t1=':action):'">'
      menu := if depth = 1 then '<b>':text:'</b>' else text
      menu := '</a><br>'
      locate upcase(action) in ses.rec<S.MENUS,1> setting pos then
         gosub show(depth + 1, action)
      end
```

Displaying Menus

```
  case type = 'P'   ;* Program
     menu := '<a href="':link(action):'">'
     menu := if depth = 1 then '<b>':text:'</b>' else text
     menu := '</a><br>'

   case type = 'U'   ;* URL
     menu := '<a href="http://':action:'">'
     menu := if depth = 1 then '<b>':text:'</b>' else text
     menu := '</a><br>'

   case 1
     menu := text : '<br>'
end case
```

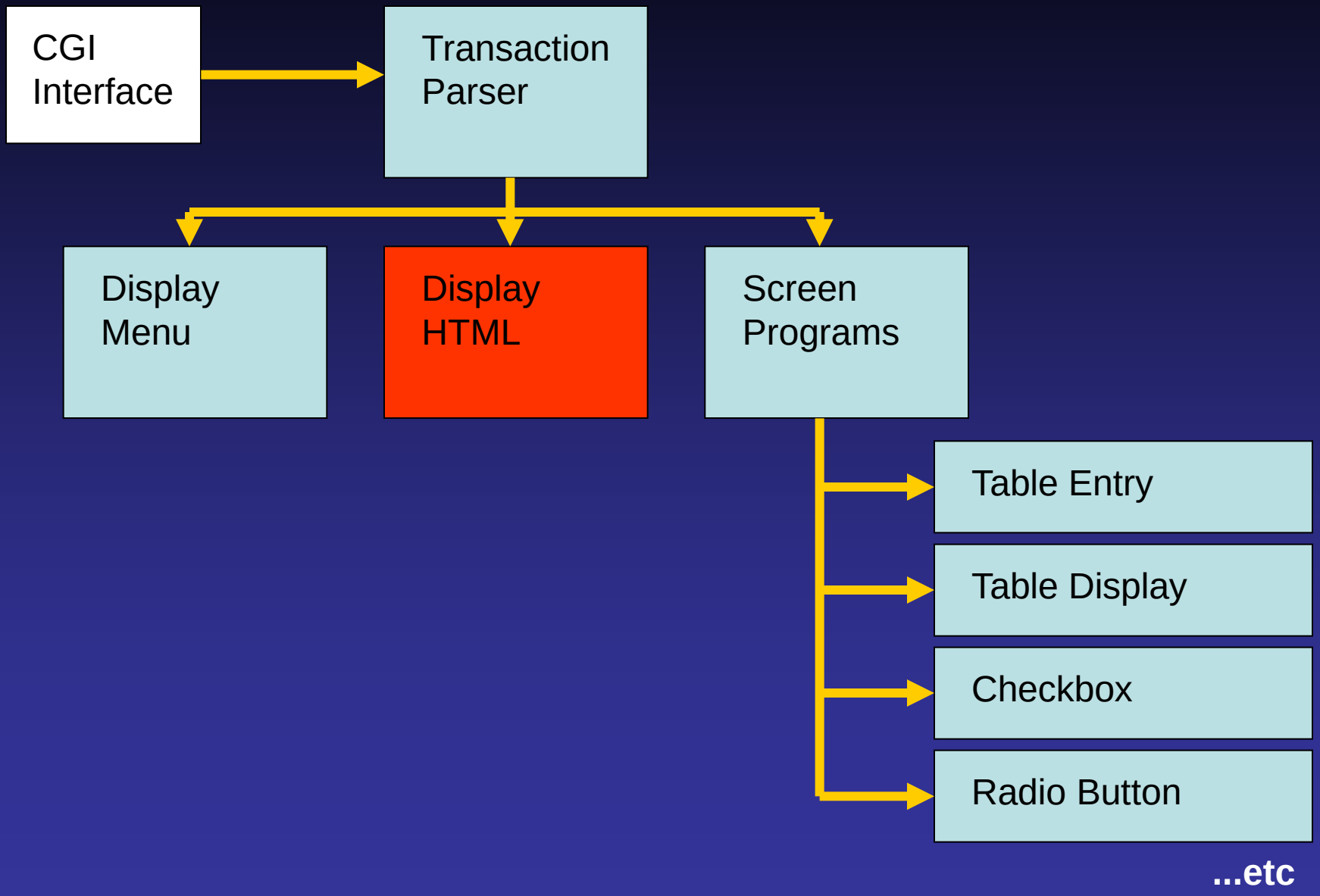
Displaying Menus – Link Generation

```
function link(screen.name, arg1, arg2, arg3, arg4, arg5, arg6) var.args
$include common.h

   s = '?T0=':screen.name:'&X=':session.id

   if assigned(arg1) then s := '&' : arg1
   if assigned(arg2) then s := '&' : arg2
   if assigned(arg3) then s := '&' : arg3
   if assigned(arg4) then s := '&' : arg4
   if assigned(arg5) then s := '&' : arg5
   if assigned(arg6) then s := '&' : arg6

   return (s)
end
```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Displaying HTML Pages

Some pages are pre-stored HTML.

May be a whole page or just some part of a page.

Stored "pages" may be nested to any depth.

This can contain special tokens to insert variable data into the page.

Also supports conditional inclusion of parts of the page.

SHOW.HTML(page, args)

HTML Page Insertion Tokens

Enclosed in <<...>> brackets.

<<CGI.LINK>>	The CGI program URL
<<HTML.xxx>>	Insert HTML item xxx
<<SESSION.ID>>	Insert session id
<<TKN.xxx>>	Insert text from record xxx
<<name>>	Insert named variable
<<n>>	Insert argument n

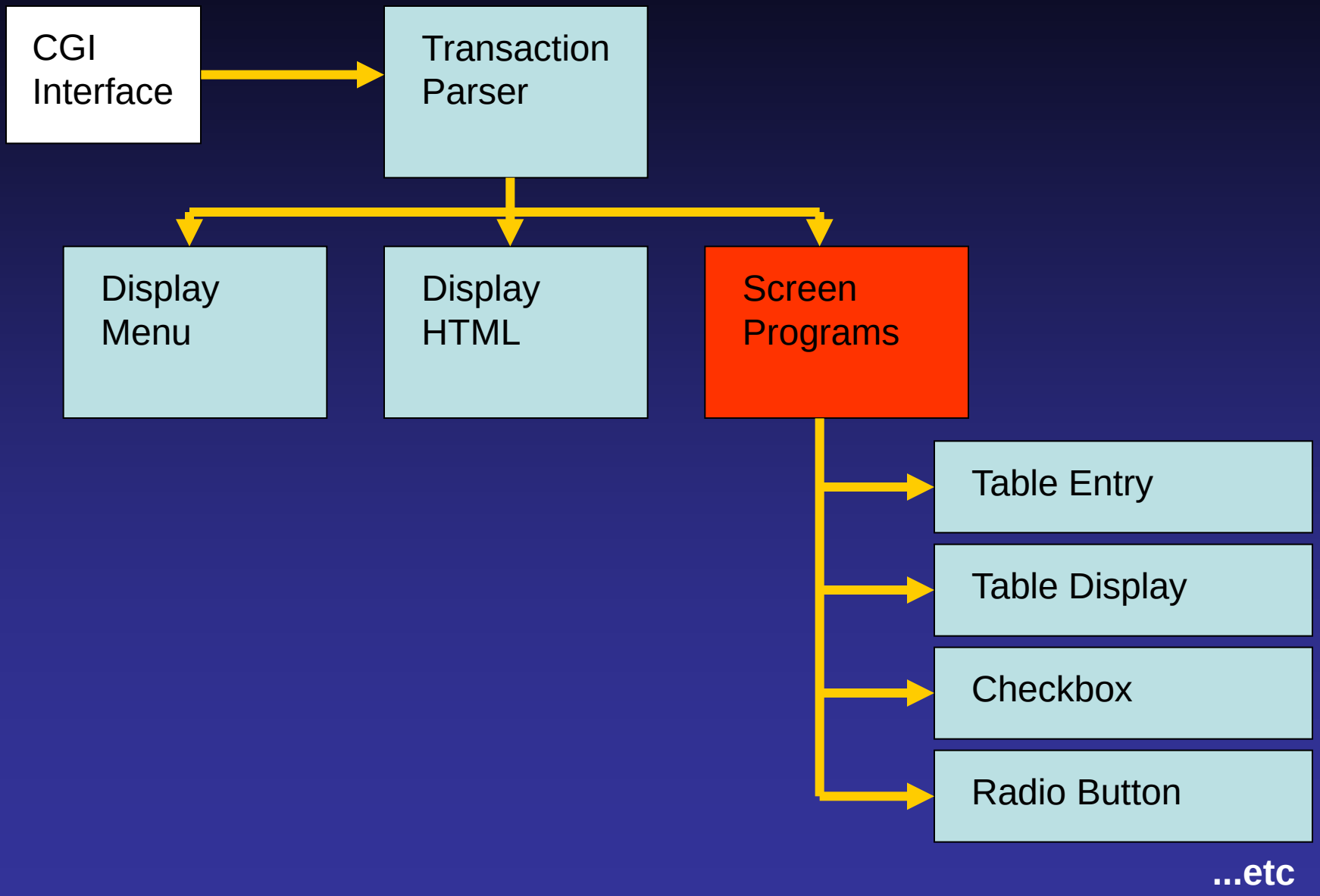
HTML Page Named Variables

!name value

Allows one stored page element to set data to be used in another nested element.

HTML Page Conditional Inclusion

?IS level	Only if user has this access
?IS.NOT level	User does not have this access
?	Unconditional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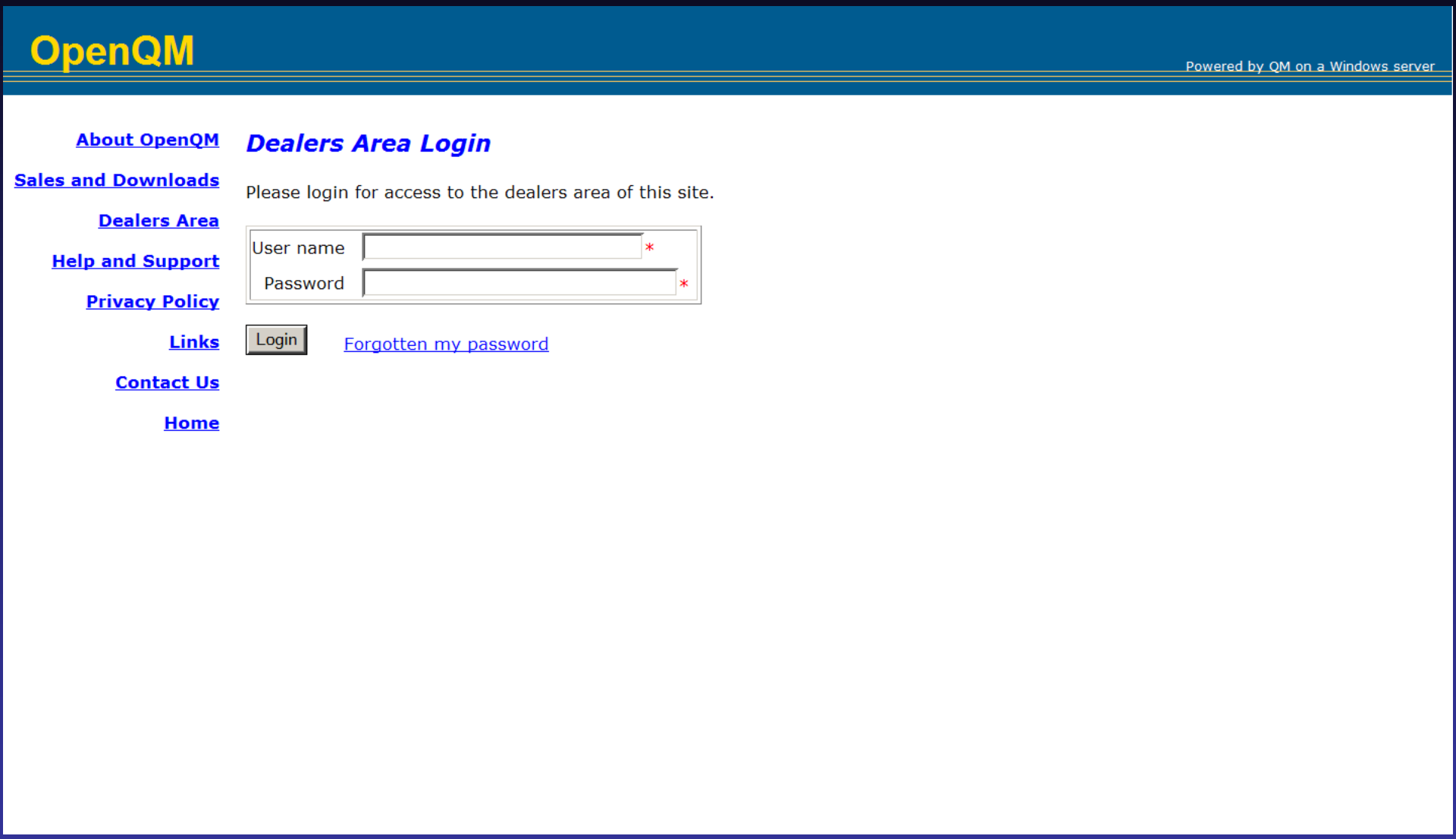
Screen Programs

These handle the main interactive pages.

The program name is formed from a fixed prefix followed by the alphabetic part of the T0 parameter.

Any numeric part forms the "phase", defaulting to 1.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Please login for access to the dealers area of this site.
User name
Password
Login
Forgotten my password

Screen Programs

```
program s.login
$include common.h
   begin case
      case phase = 1
         gosub display.form

      case phase = 2
         begin case
            case b<1>   ; gosub logon.user
            case b<2>   ; gosub forgotten.password
         end case

      case phase = 3
         gosub forgotten.password

      case phase = 4
         gosub request.password
   end case
   return
```

Screen Programs

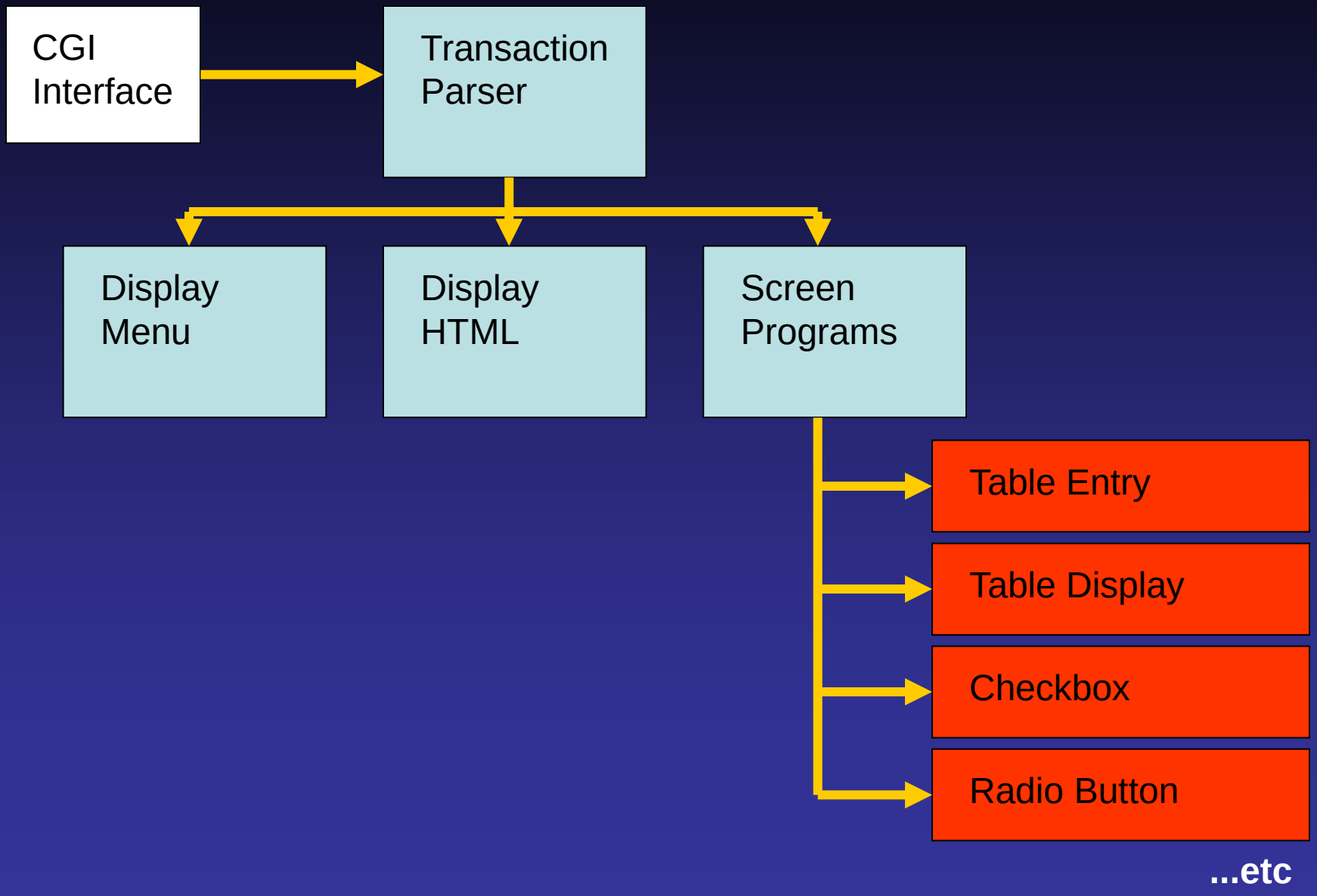
```
display.form:
   body = title('Dealers Area Login')
   body := form('login2')

   body := '<p>Please login for access to the dealers area of this site.</p>'
   body := '<table rules="none">'
   body := table.entry(1, 'User name', @true)
   body := table.entry(2, 'Password||password', @true)
   body := '</table><br>'

   body := button(1, 'Login')
   body := '      '
   body := '<a href="':link('LOGIN3'):'">Forgotten my password</a>'

   body := '</form>'
   body := set.focus('T1')

   return
```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Screen Programs

```
function title(text)
$include common.h

   return '<h1>' : text : '</h1>'
end
```

Screen Programs

```
function form(link)
$include common.h

   s = '<form method="POST" name="form" action="':cgi.link:'">'
   s := '<input type="hidden" name="X" value="':session.id:'"/>'
   s := '<input type="hidden" name="T0" value="':link:'"/>'

   return s
end
```

Screen Programs

```
function table.entry(idx, text, mandatory)
$include common.h
   left.text = field(text, '|', 1)
   width = field(text, '|', 2) ; if width = '' then width = 35

   s = '<tr><td align="right">':left.text:' </td>'
   s := '<td align="left"> '
   s := '<input type="text" name="T':idx:'"'
   if t.err<idx> then s := ' style="background: lightsalmon"'
   s := ' size="':width:'" value="':t<idx>:'"/>'
   if mandatory then s := '<font color="#FF0000">*</font>'
   s := '</td></tr>'

   return (s)
end
```

Screen Programs

```
function button(idx, text, disable) var.args
   s = '<input type="submit" value="':text:'" name="B':idx:""

   if assigned(disable) then
      if disable then s := ' onclick="this.disabled=true;form.submit();"'
   end

   s := '/>'

   return s
end
```

Screen Programs

```
function checkbox(idx, checked)
$include common.h

   s = '<input type="checkbox" name="C':idx:'" value="C':idx:""
   if checked then s := ' checked="checked"'
   if c.err<idx> then s := ' style="background: lightsalmon"'
   s := '/>'

   return s
end
```

Screen Programs

```
function set.focus(name)
$include common.h

   s = '<script type="text/javascript">'
   s := 'document.form.':name:'.focus();'
   s := '</script>'

   return s
end
```

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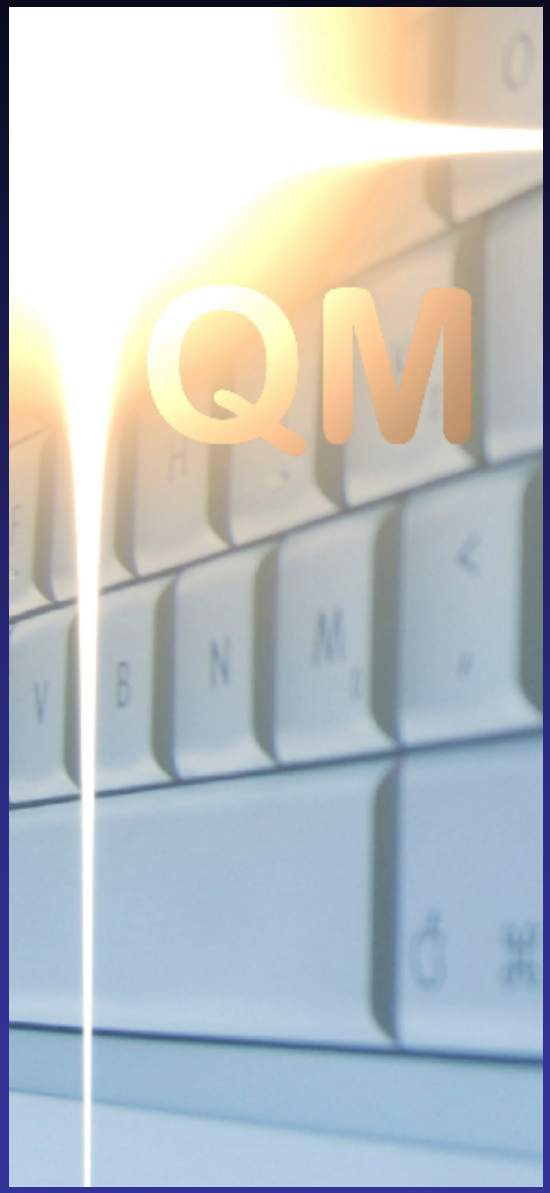
QUESTIONS?



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