

Additional Topics 2004 Paper 7 Question 15 (AH)

(relates to lectures 1-3 by A Hopper)

(a)

- A stateless client is simple
- State is not lost if the client crashes
- Creating new clients is easy
- Management of the server side is potentially easier because it is centralized
- Mobility comes “for free” because the client can be re-started at another place with no difficulty

(b)

- Basic primitive is “put a rectangle of pixel data at a given x,y position”
- Initial interaction is
 - Authenticate in some way if required
 - Set up connection; server sends width and height in its ”natural” format
 - Client chooses pixel format and encoding
- Then
 - Client requests screen update
 - Server sends screen update
 - Client processes screen update
 - Client sends keyboard and pointer events as they happen

(c)

- Raw encoding is where pixel data is sent in left to right scanline order
- Run length (RRE) encoding describes rectangle differences from a single background colour rectangle
- Hextile encoding is like RRE but across 16x16 pixel boundaries

- Copy rectangle encoding is used where the client already has the pixel data somewhere in the frame buffer; this is good when a user moves a window across the screen
- JPEG, MPEG

(d)

- RRE, Hextile give a compression factor of about 10-20 and are simple
- Using Zlib for compression of raw pixel data can give factors of 50 but is complex
- Applying Zlib to Hextile is a good intermediate compromise and gives a factor of about 30
- Hybrid schemes which include JPEG/MPEG are ok but information is lost
- It is all influenced by available bandwidth: on the same machine use raw data, at medium bandwidths use a hybrid scheme, at low bandwidths start throwing information away for example by reducing the number of colours
- Encoding/compression schemes which permit caching help maintain performance when available bandwidth is low