LBX Futures

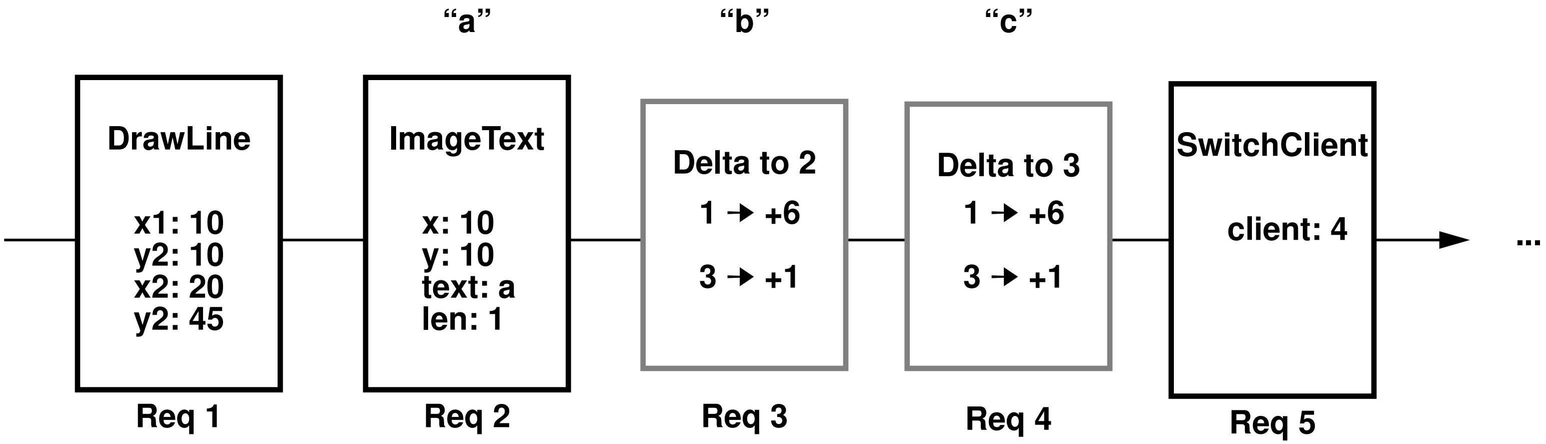
- X Consortium effort chaired by NCD and Xerox
- Layer on PPP, CSLIP, etc.
    - Becoming common
    - Allows access to other services (e.g. printing, SNMP, XDM)
- Suggest improvements to XDMCP
- Look for alternatives to LZW
- Stabilize design by end of 1992
- Provide sample implementation in R6 in 1993

Host vs. Modem Compression

- Compression in host and display
    - Compression gets data at memory bus speeds
    - Fewer bytes sent over serial interface (latency, interrupts)
- Don’t want to depend on modem error correction
    - Not all modems have features
    - Still need to protect against host dropping (e.g. silo overflows)
- Allows modems to concentrate on transmission
    - Doing compression in modem adds latency
- LZW esp. well-suited to compressing Deltas

Delta Replacement

- Previous 16 requests < 64 bytes cached on both sides
- If byte delta against previous request is smaller, send that instead



“a”

“b”

“c”

DrawLine
x1: 10
y2: 10
x2: 20
y2: 45
Req 1

ImageText
x: 10
y: 10
text: a
len: 1
Req 2

Delta to 2
1 → +6
3 → +1
Req 3

Delta to 3
1 → +6
3 → +1
Req 4

SwitchClient
client: 4
Req 5

...

Caching

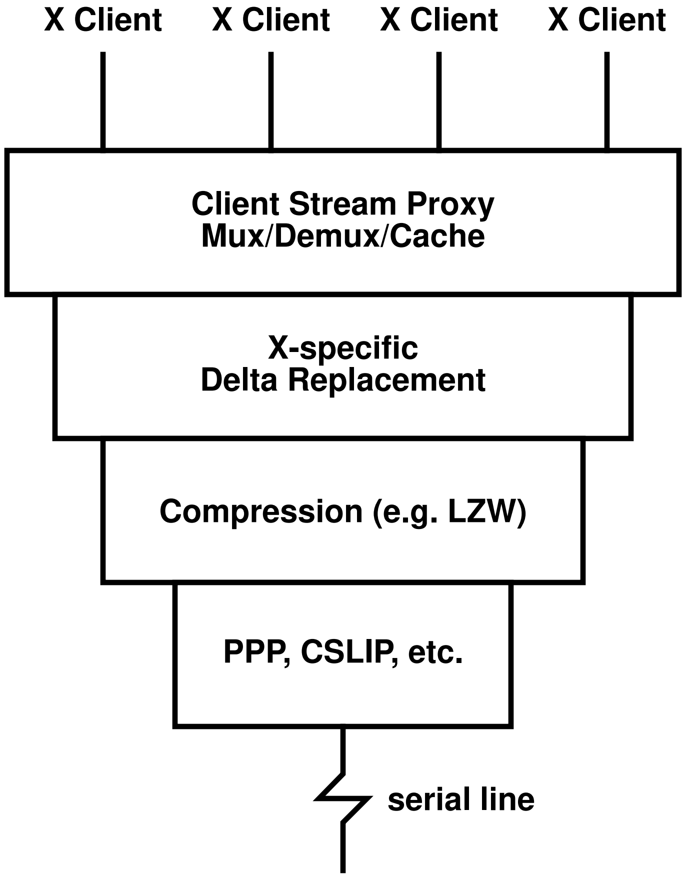
- Proxy caches info when it can
    - Connection startup data
    - Keymaps
    - Font metrics
    - Atom tables
    - Window Properties
    - Colormap entries
- Avoids sending data if possible
    - Hold window properties until asked for
    - Allows selection data to not go through LBX wire
- Allow image compression on bitmaps, pixmaps

Client Stream Muxing

- Client streams merged on X request boundaries
- X-style pseudo-requests inserted as delimiters
  - Create new client
  - Switch subsequent requests to given client
  - Kill a given client
- Host side watches for GrabServer/UngrabServer
  - Blocks other clients during grab
  - Decreases buffering needed in display
  - Avoids wasting time transmitting other client requests
  - Grab and Ungrab still transmitted

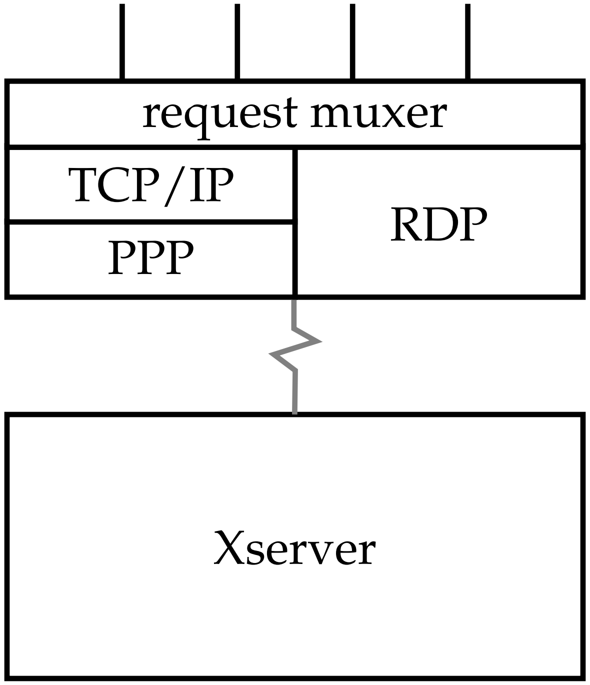
LBX Architecture

- Host-side Pseudo X Server
  - muxes communication
  - caches common data
  - avoids sending data if it can
  - delta removal
  - compression
  - PPP, CSLIP, etc.
- Display-side OS
  - does reverse of above
  - sort of just another network
  - still have local clients (eg. wm)



Where Should the System Be Split?

- X Server in display vs. X Server on host



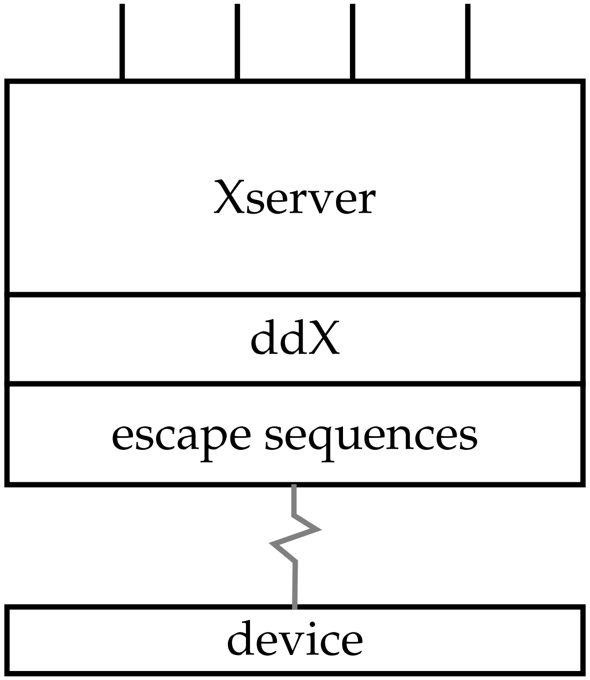
request muxer

TCP/IP

PPP

RDP

Xserver



Xserver

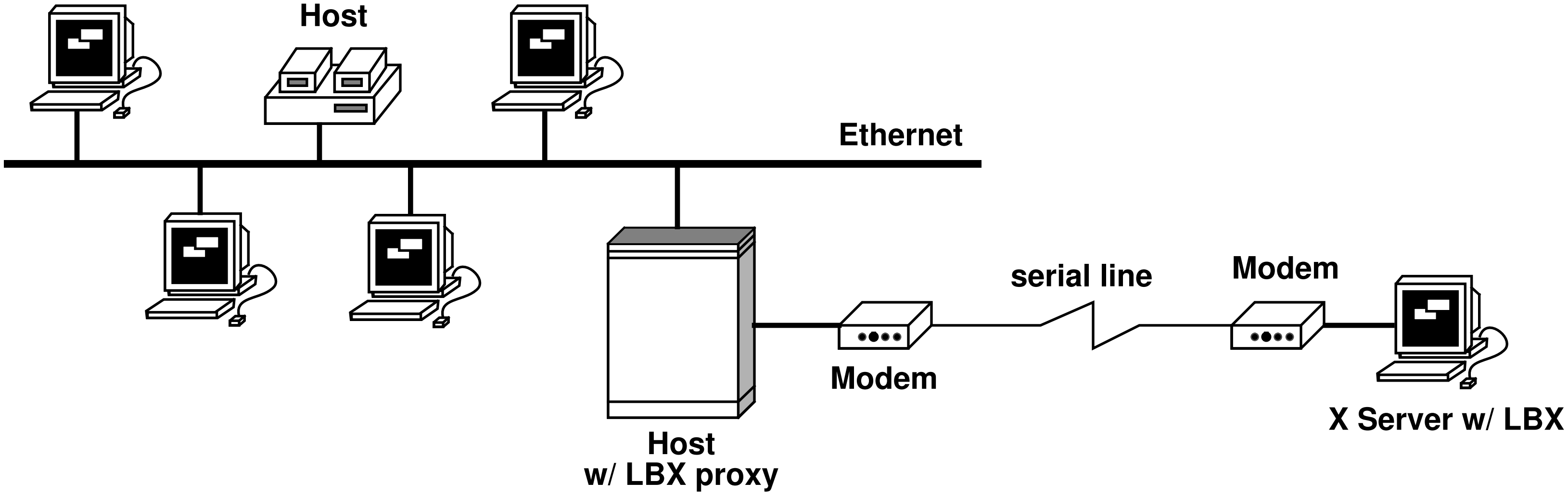
ddX

escape sequences

device

What is LBX?

- Protocol for running X over serial lines
- Transparent to users and applications



Low Bandwidth X:
Running X Over Serial Lines

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