# When can we unplug the radio and telephone?

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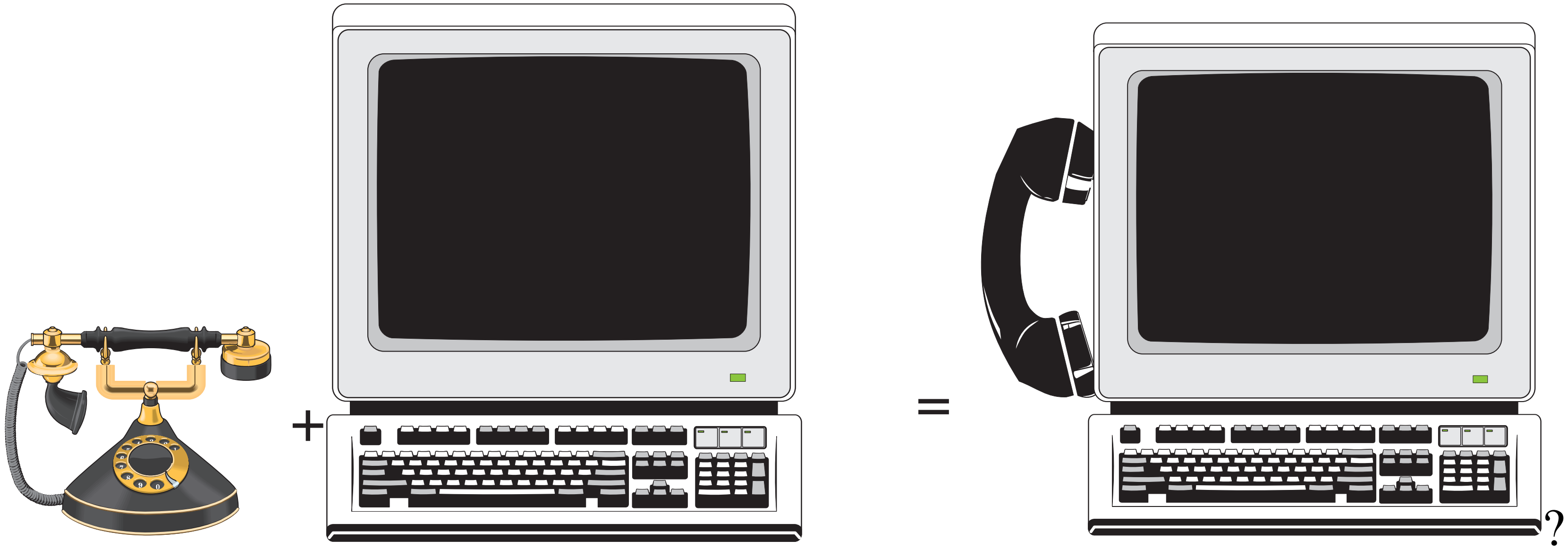
# Challenges




Still waiting for true communication integration:

- audio at least as difficult as video
- integration of diverse multimedia applications
- network support

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# Audio

- X-window-like libraries usually just make life difficult
- need: media agent, for both remote and local audio (➠ *one* playout delay)
- audio interfaces: low latency, independent input/output, single copy
- CPU's with efficient support for DSP operations (multiply-accumulate)
- timestamped audio to allow correlation, echo cancellation
- system libraries: coding, AGC, rate conversion, silence detection, …

# Video

- uncompressed 24-bit video over system bus (sometimes grabber, always display)
- several video windows ➠ display is worse, more difficult for hardware
- hardware dithering, YUV-conversion more helpful than compression?

# Network Support

- ATM: connection management promises pain (UNI 4.0: receiver joins)
- charging for congestion-induced, variable quality?
- VR combines stringent e-e delay + high frame rates, resolution