Notes for week 10 part 1 (Multimedia Conferencing)

Conference Architectures

Centralized
- Single point of control and failure
- Overall delay for users = \(2n_{\text{net}} + (n-1)n_{\text{mix}}\)
- Delay is dominated by \(n_{\text{mix}}\)
- \(n_{\text{net}}\) = network delay from user to controller (and vice-versa)
- \(n_{\text{mix}}\) = time to mix 2 audio signals

Distributed
- No single point of control/failure
- All users connected to each other
- Doesn’t scale well – the number of virtual connections increases by \(n^2\)
- Delay = \(2n_{\text{net}}\) (for send and receive)

Hierarchical/Hybrid
- Handles more users
- Delay depends upon level of hierarchy tree
Hierarchical/Hybrid (cont.)

- Since the amount of delay for a hierarchical design varies based on the number of sublevels.
- To determine the level of nesting, a dynamic programming technique is required.

Ex: Which design is better for 10 users?

*Delay for A:  \( T(10) = \max \{ [T(4) + t_{\text{net}}], T(6)] + t_{\text{mix}} \)*
*Delay for B:  \( T(10) = \max \{ [T(3) + t_{\text{net}}], T(7)] + t_{\text{mix}} \)*

Whether design A or design B is better depends on the value of \( t_{\text{net}} \). If \( t_{\text{net}} \) is very large, then design B will save time by doing more mixing in the right subtree. Otherwise, design A will be better by splitting the mixing time more evenly.

To determine the overall best setup for a hierarchical design, a dynamic programming technique is required.
Control Aspects of Multimedia Design

1. Multiple conferences – i.e. sub-conferences existing within a conference.
2. Symmetric vs. Asymmetric – are all users using the same channels? (audio, video, or both?)
3. Heterogeneous vs. Homogeneous – In a homogeneous conference, no alteration is made to the data. In a heterogeneous conference, alterations to the data are allowed – like speech to text)
4. Static vs. Dynamic – Can users leave/join at any time?
5. Transient vs. Persistent – does the conference always exist, or only at certain times?
6. Access Control – who is allowed to send/receive during a conference?