

# Efficient Resource Reservation for Remote Isochronous Connections via IEEE1394.1 Bridges

IEEE 1394.1 Standards Meeting

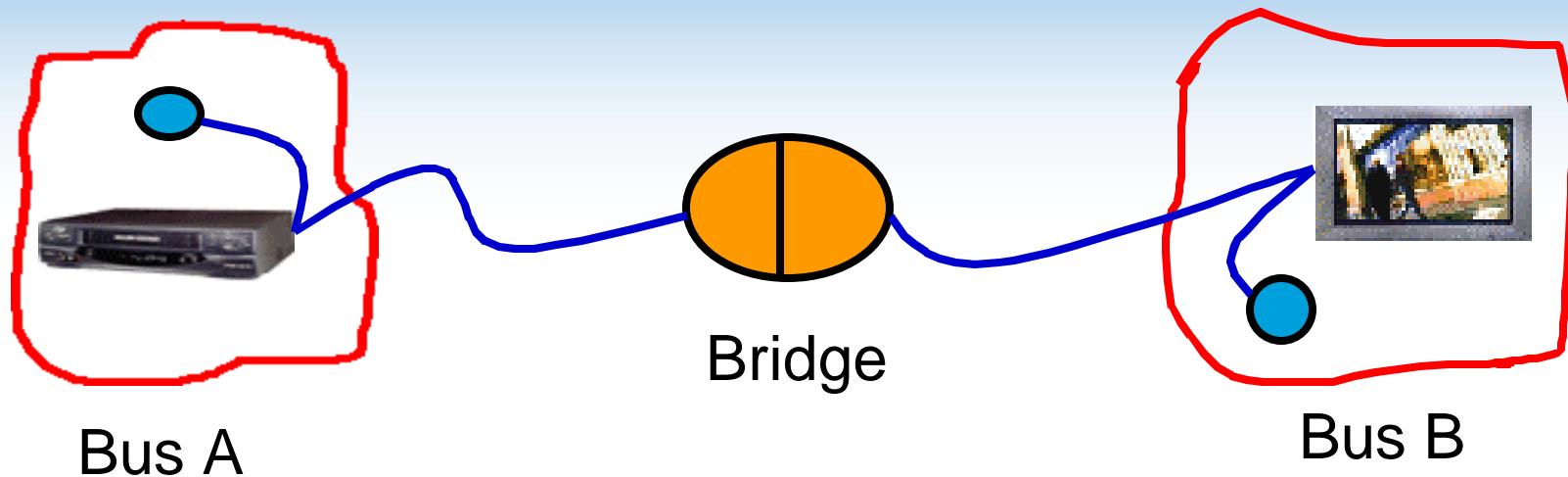
July 22-23, 1999

Dr. Subrata Banerjee

Philips Research-Briarcliff Manor, New York

# General Concept

- Example Scenario (Set-Top\_Box to TV):



- Reserve bandwidth, buffers, and channel
  - In Bus A, Bridge, and Bus B

# General Concept (contd.)

- Isochronous connection initiator or controller requests from the bridge bandwidth  $B$  time units every isochronous cycle
- If capacity is available then the bridge reserves  $B$  time units for the connection and allocates an isochronous channel number
- $B$  time units is reserved for the connection until released
- The source can utilize up to  $B$  time units per isochronous cycle

# Inefficiency of Current Approach

- Reservation requests are at peak rate - may lead to significant wastage
- Example: MPEG2 Transport Stream/IEC61883
  - 188byte MPEG pkt. + 4byte timestamp = 192 bytes
    - $192 = 8 \times 24$  or  $4 \times 48$  or  $2 \times 96$  or  $1 \times 192$
  - IEEE1394 isochronous pkts may contain 32, 24, 16, 8, 4, 2, 1 or 0 24-byte data blocks
  - If a TS rate is just over 4 data blocks per isochronous cycle then occasionally 8 data blocks will be sent in some isochronous cycle
  - Need to reserve capacity almost double the required capacity - 50% wastage!

# Why A Better Solution is Needed?

- Bridge fabric may not be as fast as 1394 bus
  - There may not be lot of capacity to waste
  - Important for wireless bridge fabric
  - Phone line, power line, Ethernet are other options
- Bridge needs input from applications on their “true” bandwidth demands
  - Some application may ask for  $B$  Mbps and actually use  $B$  Mbps
  - Some applications may be forced to ask for  $B$  Mbps but use only slightly over  $B/2$  Mbps

# Proposal to the Committee

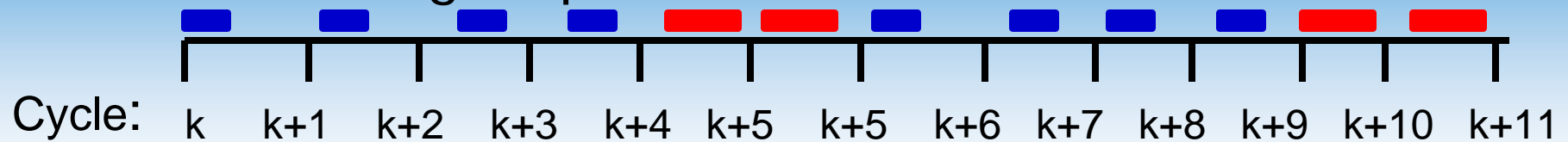
- Remote iso. connection request shall include:
  - Avg. bandwidth demand -  $B_{av}$  kbits/iso. cycle
  - Peak bandwidth demand -  $P$  kbits/iso. cycle
  - Maximum burst length -  $M$  iso. Cycles
  - Min bandwidth demand -  $B_{min}$  kbits/iso. cycle
  - Average bandwidth demand from the beginning of one burst to the beginning of the next shall not exceed  $A$  bits/iso. Cycle

# Proposal to the Committee (contd.)

- Form Bridge's point of view:
  - Allow connection if:
    - available bandwidth  $\geq B_{av} + \textit{overhead}$
    - available buffer space  $\geq M^*(P - B_{av}) + B_{av} * \langle \textit{constant} \rangle$
    - iso. Channel number available
  - To keep implementation simple:
    - Statistical multiplexing gain among multiple isochronous connections is not exploited
    - Assumed: reservation within a 1394 bus is at peak rate

# Proposal to the Committee (contd.)

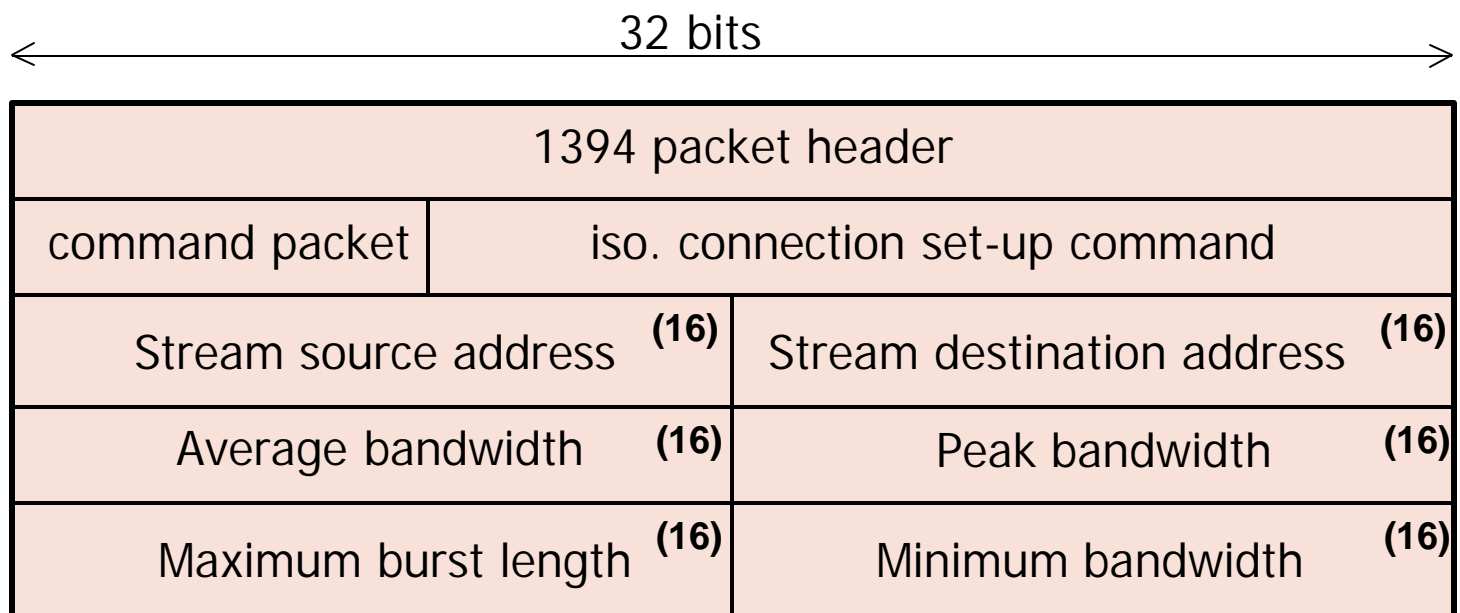
- Form Bridge's point of view (contd.):



- Constant delay for transfer of all isochronous packets - may vary from channel to channel
  - Some packets have to be delayed more than others

# Proposal to the Committee (contd.)

- Implementation of this approach
  - Optional for bridges
    - Reserve at peak rate if possible, otherwise reject req.
  - **Mandatory** for iso. connection setup initiator



# References

- Reservation of bridge resources -  
Kazunobu Toguchi (BR009R00)
- ISO Stream Setup & Release -  
Subrata Banerjee (BR014R00)
- Isochronous owner observation -  
Kazunobu Toguchi (BR016R00)
- Command based iso setting -  
Kazunobu Toguchi (BR032R00)
- New Transaction Type For 1394 Bridge Control -  
Dick Scheel (BR052R00)
- IEC61883 Standard
- Acknowledgments: Takashi Sato & Ted Eilley