ECE 695R: System-on-Chip Design

Module 5: Networks-on-chip
Lecture 5.6: Switching Strategy I

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What characterizes an NoC?

- **Topology**
  - Physical interconnection structure of the network

- **Routing Algorithm**
  - Selection of the path that a message follows

- **Switching Strategy**
  - How the resources in a route are allocated to a message
  - circuit switching vs. packet switching

- **Flow Control Mechanism**
  - How is the rate of data transmission managed?
  - what happens when congestion is encountered?
Switching strategies

• *Determine how network resources are allocated to packets traversing the network*

• Circuit switching (connection-oriented)
  – Data and control (connection setup) phases are separated
  – The connection setup results in resources being reserved for data transfer

• Packet switching (connection-less)
  – Data is divided into packets
  – Every packet is composed of a control part (*header*) and a data part (*payload*)
  – Packets are self contained; there is no need to set up a connection

• Virtual Circuit Switching
  – Create virtual “circuits” or connections that are multiplexed onto physical links
Circuit switching

- Phases: circuit set-up, utilization, (tear-down)
- Predictable transmission for utilization vs. unpredictable time for circuit set-up
- Minimizes buffering requirements
- May lead to poor resource utilization

**Circuit set-up**
- Two traversals
- Latency/Bandwidth overhead
- Request packet can be buffered

**Circuit utilization**
- Third traversal
- Contention-free transmission
- Potential for low resource utilization