



POWER5 and HPS Programming Strategies: HPS

**Charles Grassl
IBM
July, 2004**

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Agenda

- **High Performance Switch**



High Performance Switch (HPS)

- Also Known As “Federation”
- Follow on to SP Switch2
 - Also known as “Colony”
- Specifications:
 - 2 Gbyte/s (bidirectional)
 - 5 microsecond latency
- Configuration:
 - Up to four adaptors per node
 - 2 links per adaptor
 - 16 Gbyte/s per node



HPS Specifications

	Latency [microsec.]	Bandwidth, single [Mbyte/s]	Bandwidth, multiple [Mbyte/s]
Current	10	1350	1500
Expected	→ 8 → 5	1400	2000



HPS Software

- **MPI-LAPI (PE V4.1)**
 - Uses LAPI as the reliable transport
 - Library uses threads, not signals for async activities
- **Existing applications binary compatible**
- **New performance characteristics**
- **New environment variables**
 - Some old ones ignored



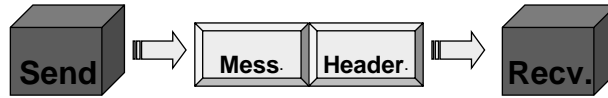
Underlying Message Procedures

- | | |
|---|---|
| <ul style="list-style-type: none">▪ Protocols:<ul style="list-style-type: none">– Eager– Rendezvous– MP_EAGER_LIMIT<ul style="list-style-type: none">– Range: 0 - 65536 | <ul style="list-style-type: none">▪ Mechanisms<ul style="list-style-type: none">– Packet– Bulk– MP_BULK_MIN_MSG_SIZE<ul style="list-style-type: none">– Range: any non-negative integer |
|---|---|

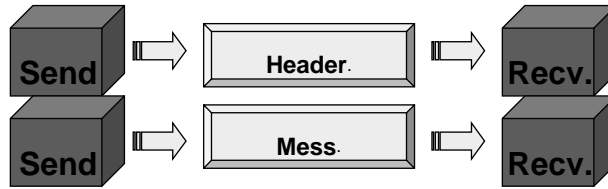


MPI Transfer Protocols

**Small Messages:
Eager**



**Large Messages:
Rendezvous**



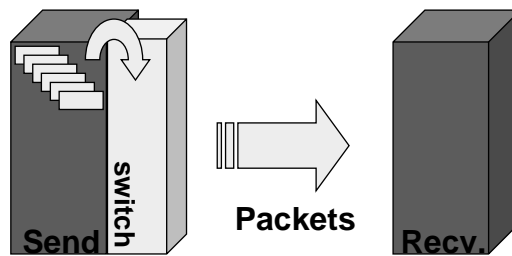
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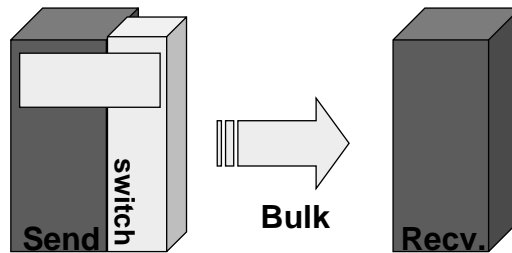


MPI Transfer Mechanisms

**Small Messages:
Packets**



**Large Messages:
Bulk**

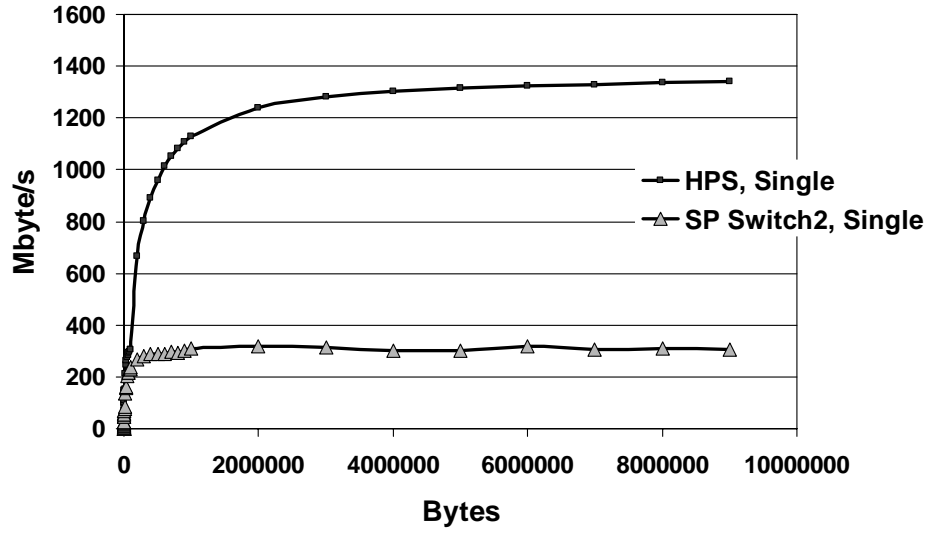


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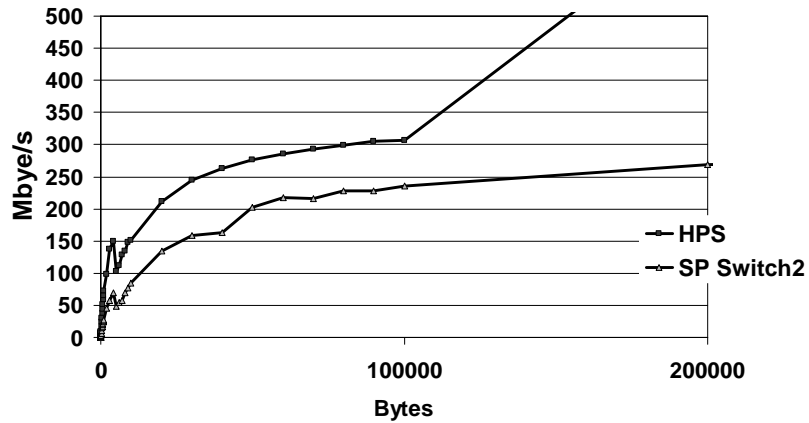
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MPI Bandwidth

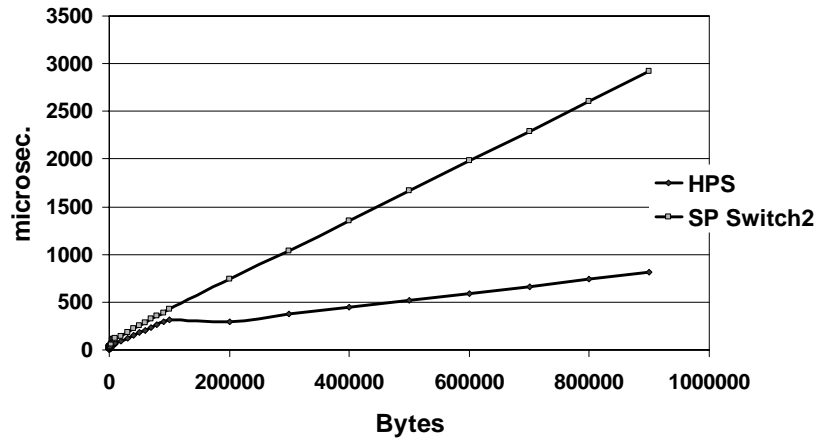


MPI Bandwidth Smaller Messages

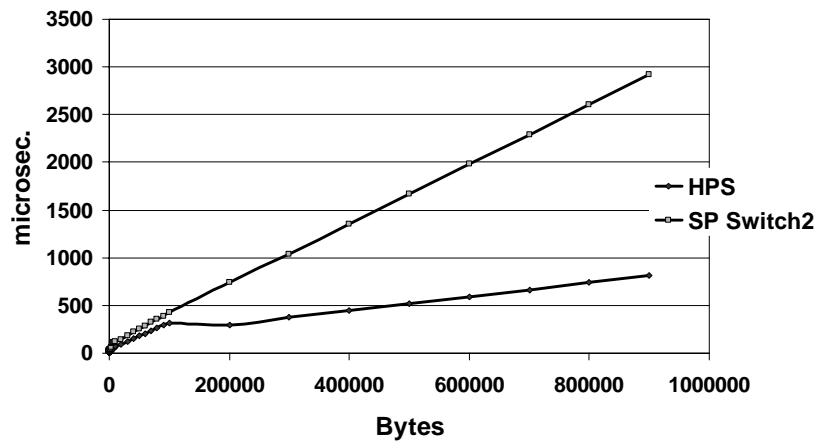




Performance: Latency Eager Limit Crossover

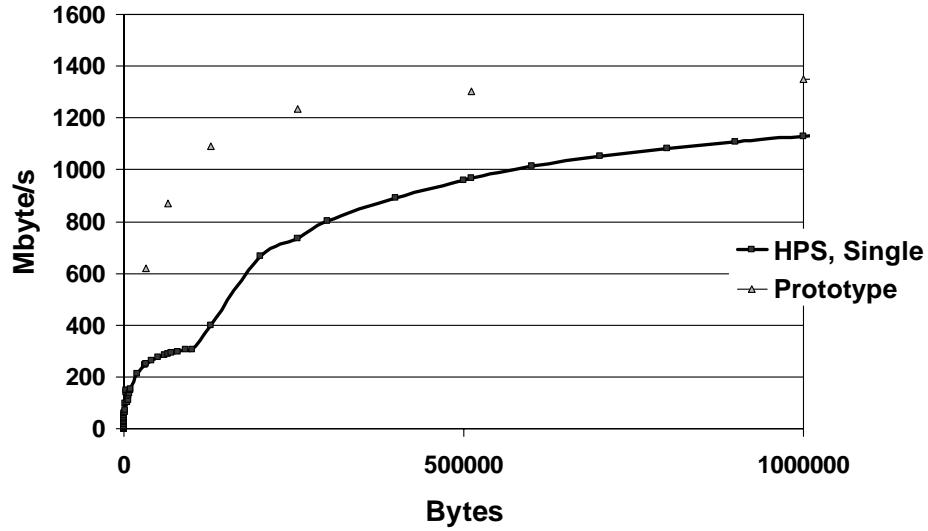


Performance: Latency Bulk Transfer Crossover





MPI Bandwidth: Prototype



HPS Performance

- High asymptotic peak bandwidth
 - ~4x vs. Colony
- Extra “kink” in performance curve
 - Bulk Transfer
- Small message performance will improve...
 - New microcode
 - Memory bandwidth limits

