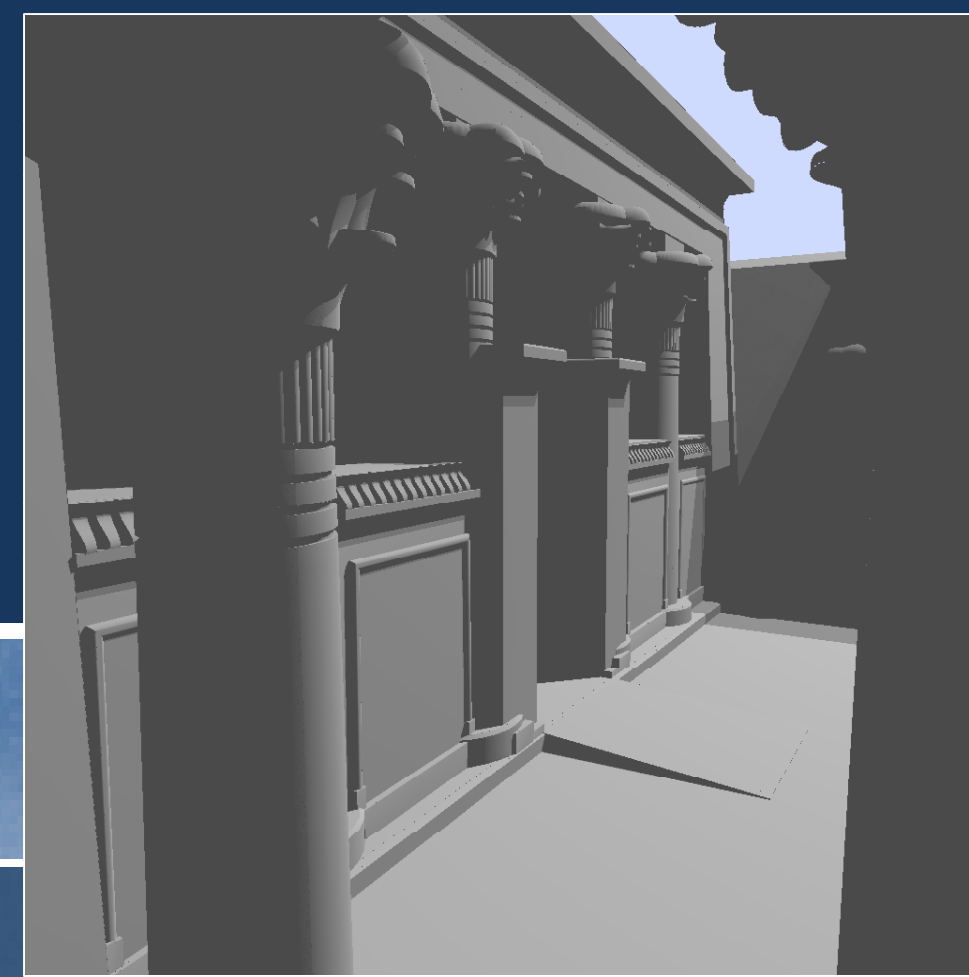


# Toward Stream Filtered Ray Tracing on a DSP

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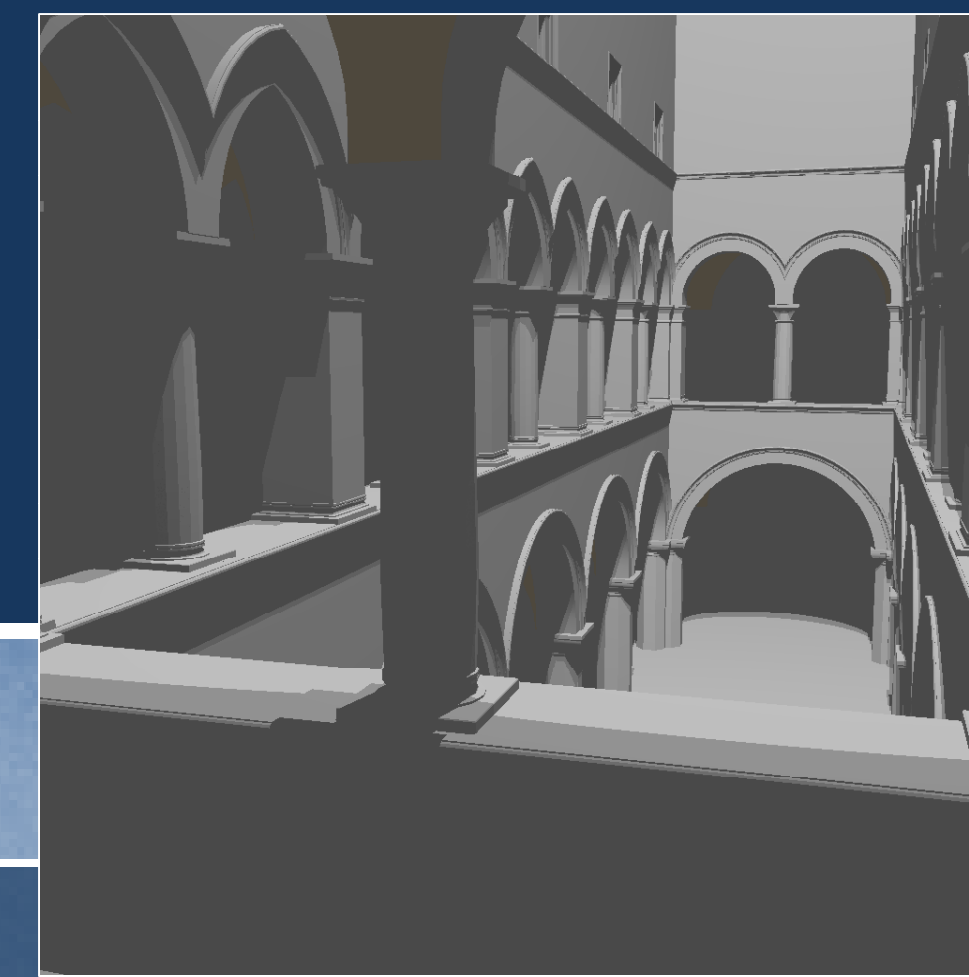
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## Introduction

This work-in-progress explores the implementation of stream filtered ray tracing using the Storm-1 stream processing architecture developed by Stream Processors, Inc. This poster presents our efforts to map the stream filtering approach to the Storm-1 processor and highlights the current progress toward a full-featured ray-based rendering system for the architecture.

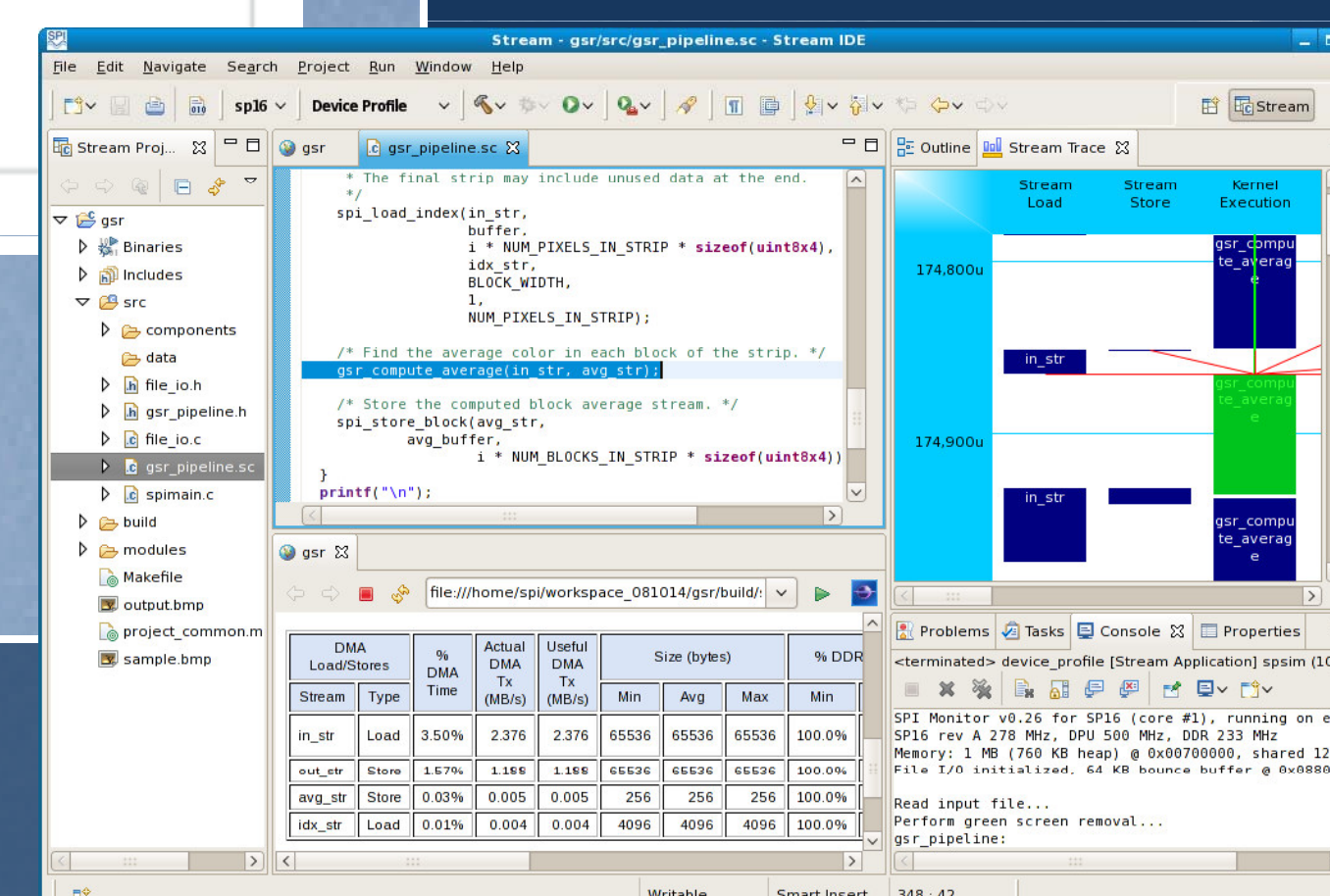
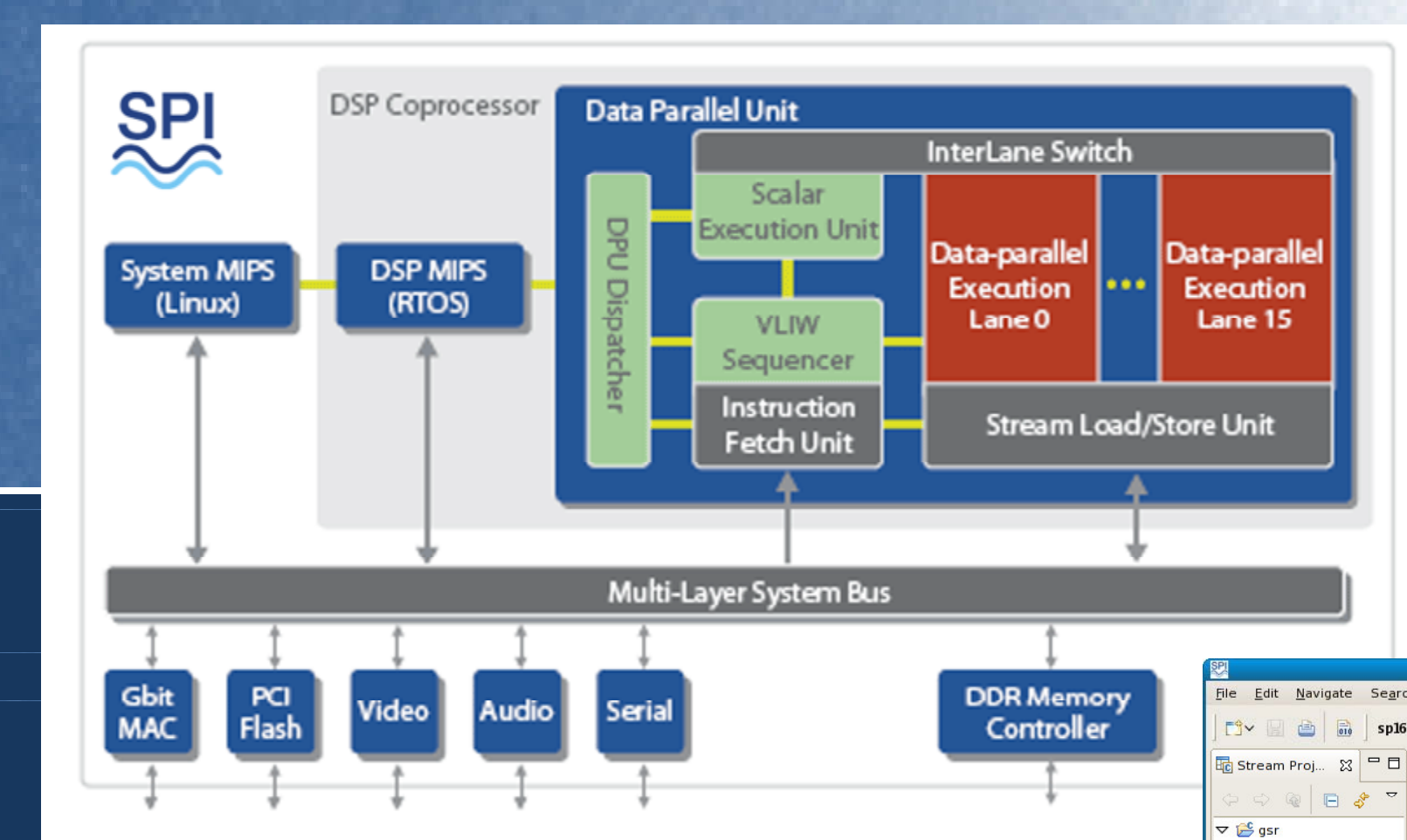
## Current status

To support ray tracing on the integer-only data-parallel unit of Storm-1 processors, we have implemented a full-featured integer ray tracing pipeline targeting environments that lack hardware support for the IEEE 754 floating-point standard [Heinly et al. 2010]. Images generated with the integer ray tracer are shown above.

In addition to the integer-only ray tracing pipeline we have:

- developed a library of 32- and 64-bit integer operations for the data-parallel unit, including complex functions such as multiword square root and 64-bit/32-bit division;
- created an object-oriented framework for creating and managing computational tasks and data movement across the architecture's RISC processor and the data-parallel unit; and
- implemented a prototype rendering system based on stream filtering to leverage the compute capabilities of the Storm-1 processor.

The system, though still under active development, demonstrates the feasibility of high-performance rendering with stream filtering. Upon completion, we hope to have a full-featured ray-based rendering system for use with the Storm-1 series processors.



```
out stream filter<property>(in stream)
{
  foreach ray in in_stream
    if (ray.test(property) == true)
      out_stream.add(ray)
  return out_stream
}
```

Gribble and Ramani [2008] have shown that the core operations in ray tracing, including traversal, intersection, and shading, can be written as a sequence of stream filters.

## Target architecture: SPI Storm-1 series processors

The stream filtering approach opens a new design space that offers many interesting implementation alternatives and provides a compelling design for future ray-based graphics hardware [Ramani et al. 2009].

More immediately, however, our work targets a full implementation of stream filtered ray tracing on the Storm-1 series processors developed by Stream Processors, Inc. [SPI 2008]. The Storm-1 architecture is based on a standard RISC processor that offloads performance-critical tasks to an integer-only, data-parallel processing unit designed to exploit parallelism using conditional streams [Kapasi et al. 2000].

## References

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