DFC++ FRAMEWORK

A novel approach for flexible signal processing on embedded systems

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AGENDA

1. Introduction
2. Framework Structure
3. Data Transport Mechanisms
4. Platform Support
5. Conclusion

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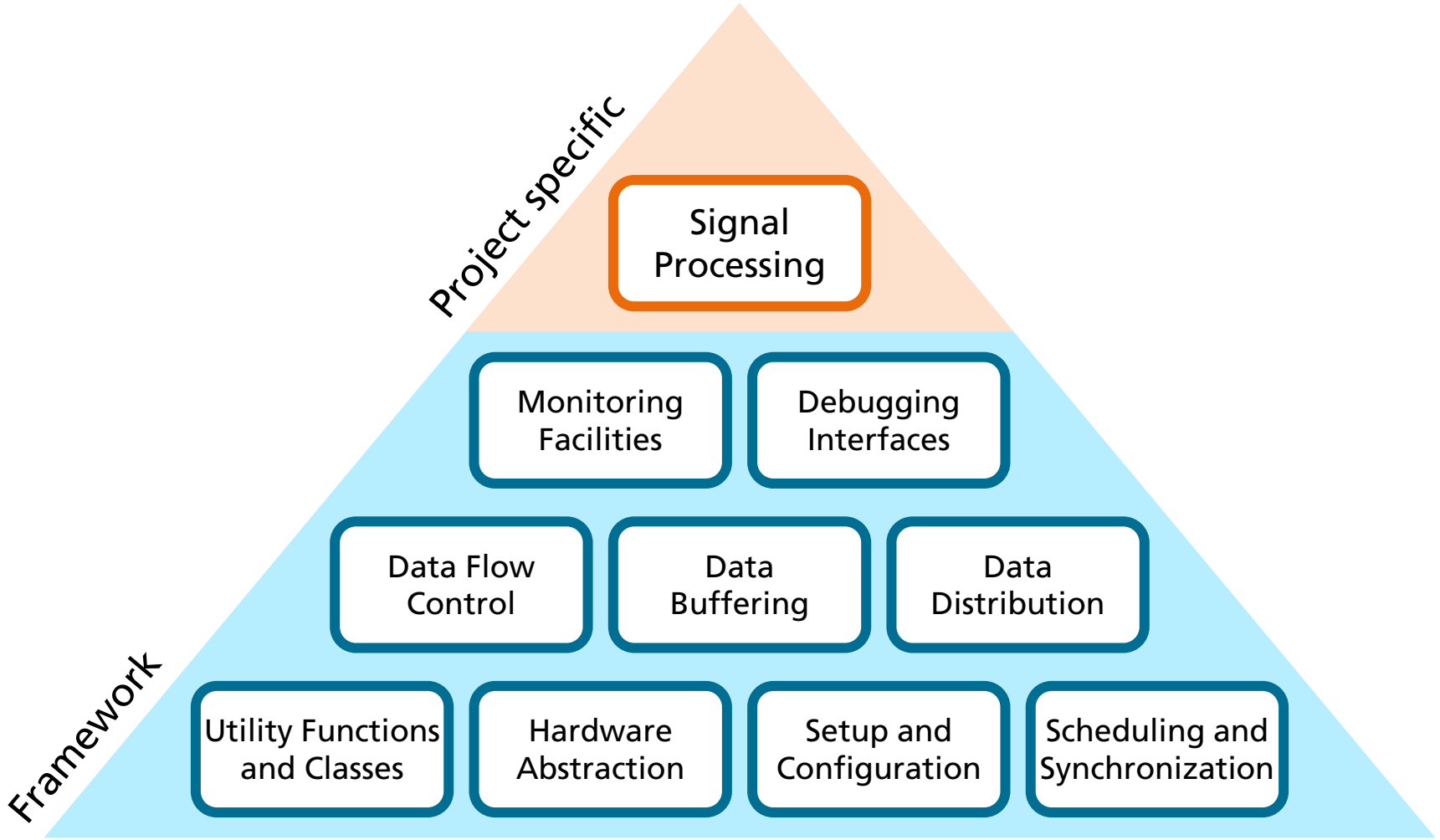
SDR Frameworks

- Implementation of basic facilities and mechanisms
- Definition of common interfaces and structures

✓ More efficient SDR development

Basic Facilities and Mechanisms

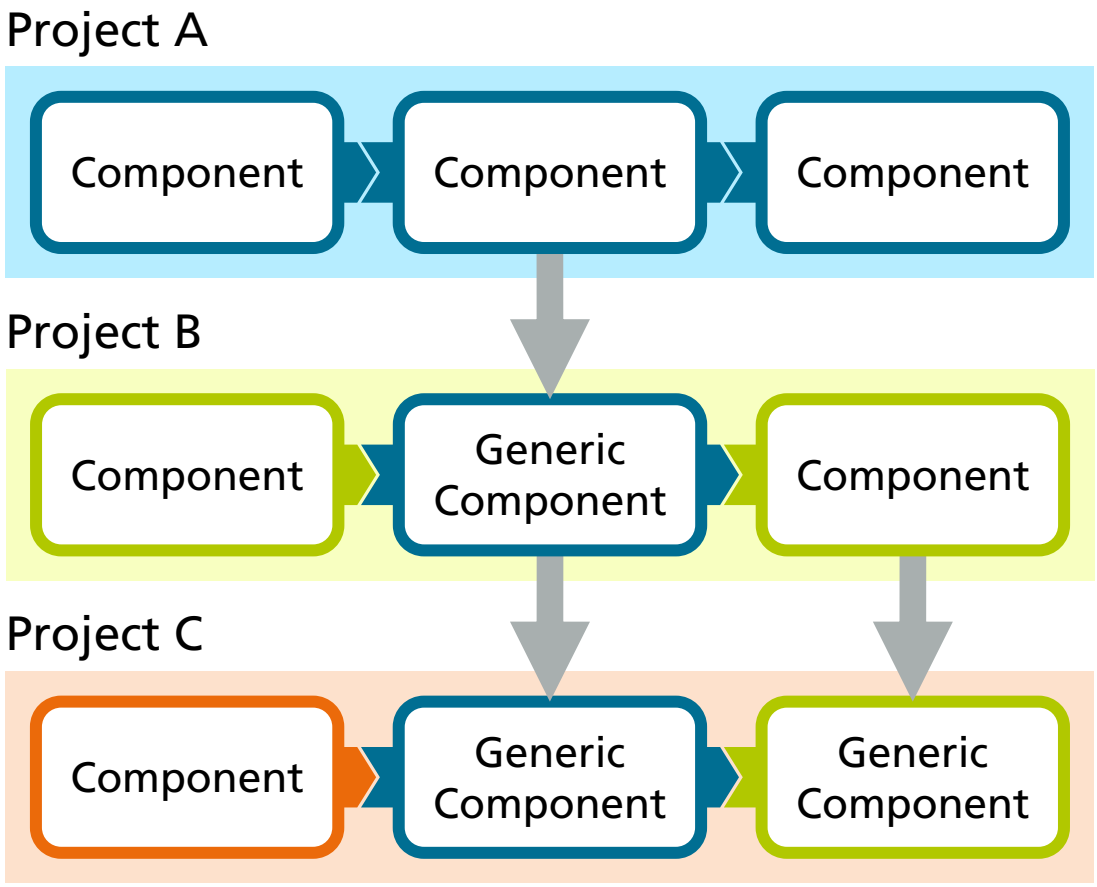


Basic Facilities and Mechanisms

- Allows focusing on development of signal processing algorithms
- Reduces effort allocated in auxiliary and peripheral functionality
- Provides a familiar environment for designers across projects

✓ Acceleration of development processes

Common Interfaces and Structures

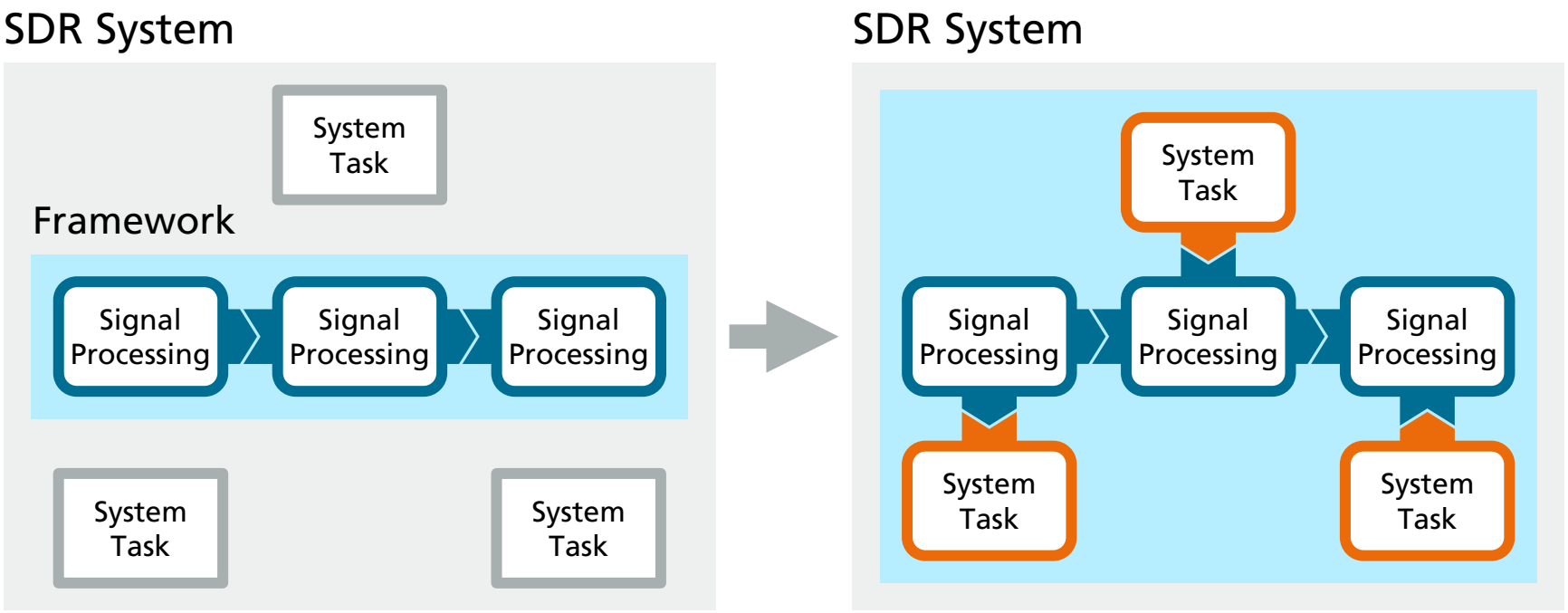


Common Interfaces and Structures

- Improved reusability of components across different projects
- Growing library of generic components aids future projects
- Configuration interfaces simplify the design of generic components

✓ Exploitation of cross-project synergies

Flexibility and Portability



Flexibility and Portability

- Integrate more functionality within the framework
- Simplify maintenance and live debugging
- Cover different platforms with a unified approach

✓ Leveraging of framework advantages

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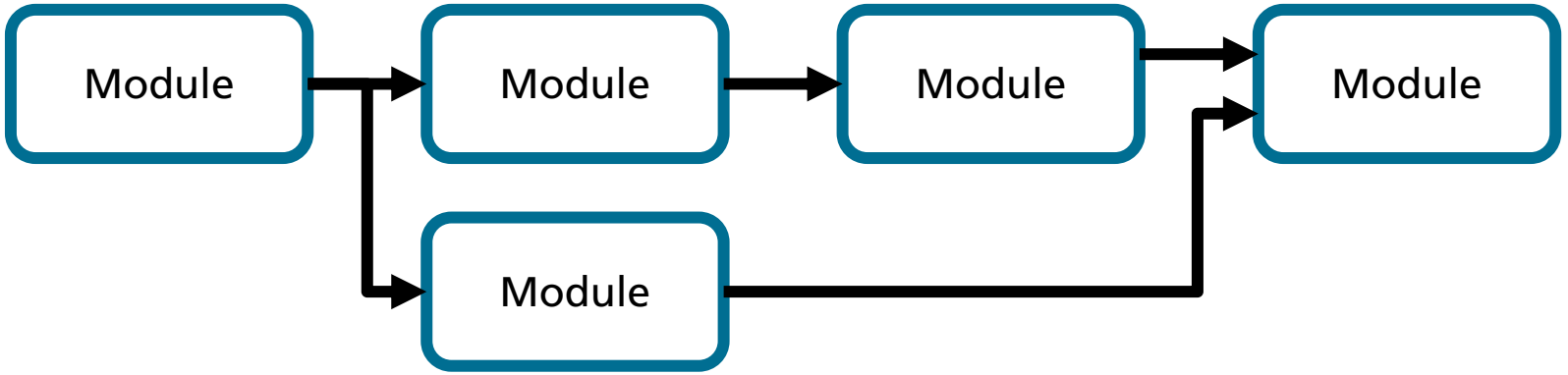
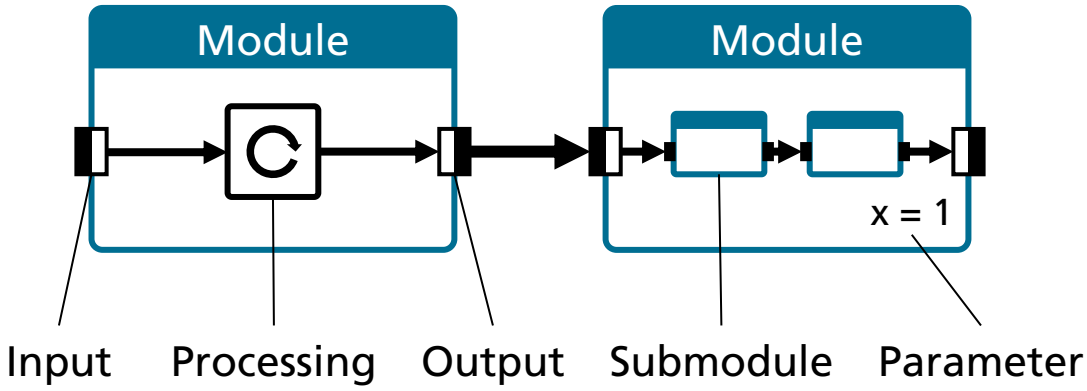
Framework Structure

- Components are organized in autonomous modules
- Modules have standardized interfaces
- Processing chains are formed by connecting multiple modules



Modules

- Every processing component is implemented as a module
- Inputs and outputs provide data interfaces
- Parameters provide configuration interfaces
- Other modules can be added as submodules

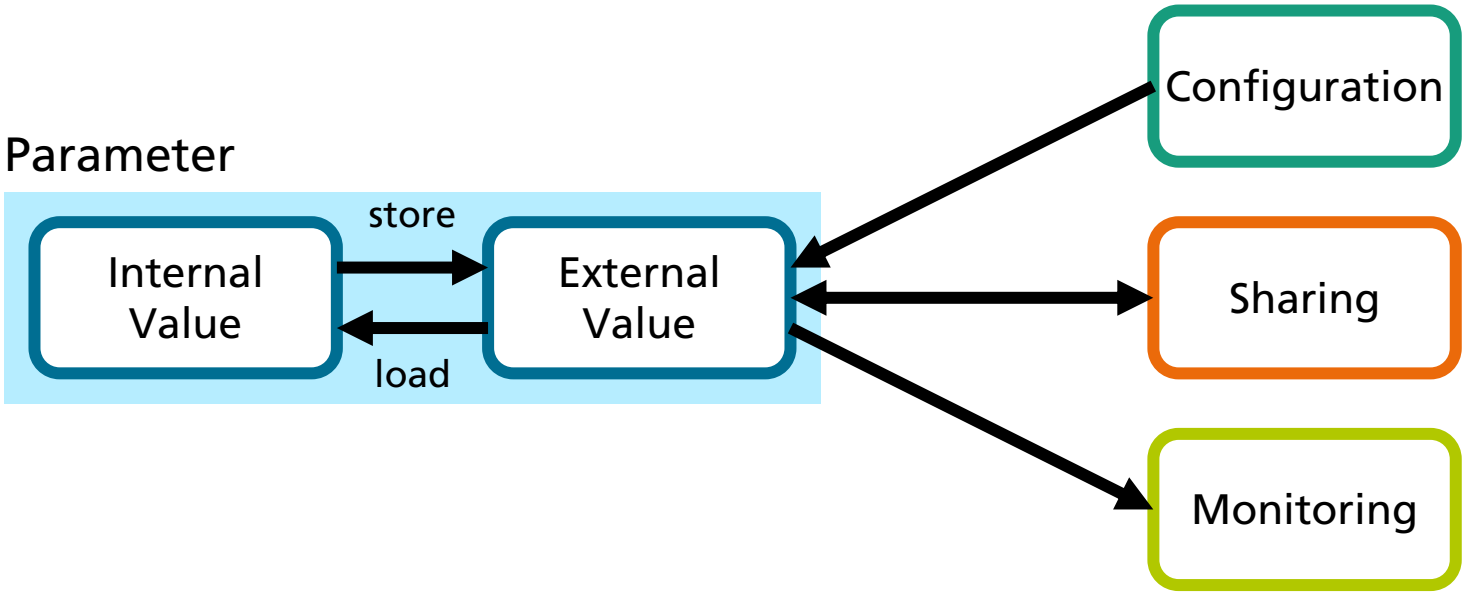


Inputs and Outputs

- Manage data exchange between modules
- Multiple inputs can be connected to one output
- Allow dynamic reconnecting at runtime
- Provide data buffering and flow control
- Reverse channel to signal request status

Parameters

- Standardized interface for configuration and monitoring
- Can be connected to shared parameters
- Separation of internal and external value ensures consistency



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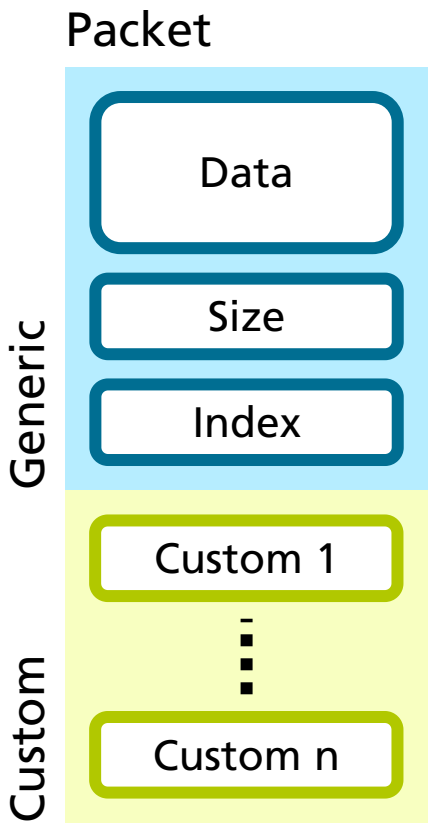
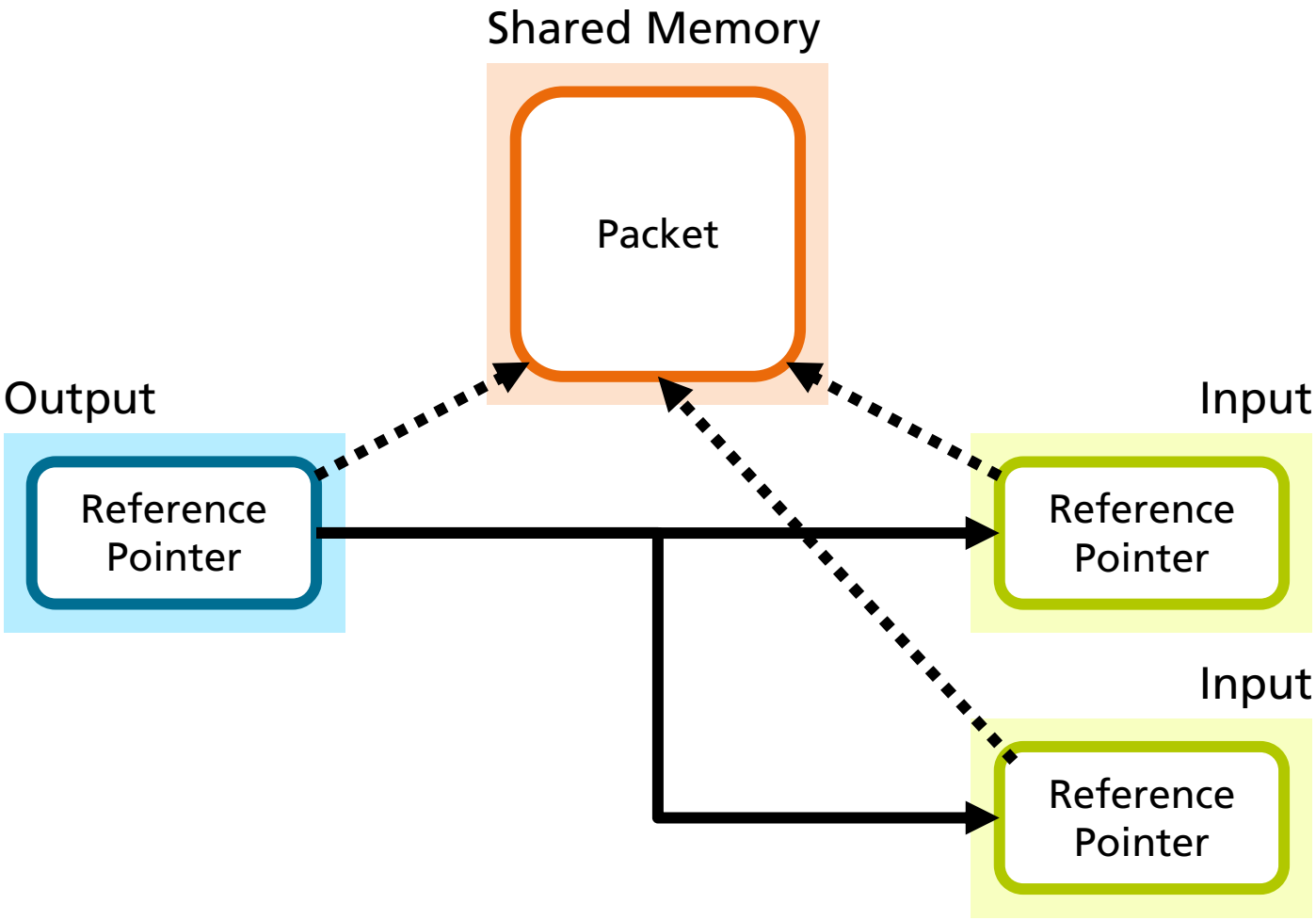
Data Organization

- Data organized in packets of variable size and type
- Generic data packets for simple raw data transfer
- Custom packet types can add arbitrary meta information
- Packets are handled via reference pointers

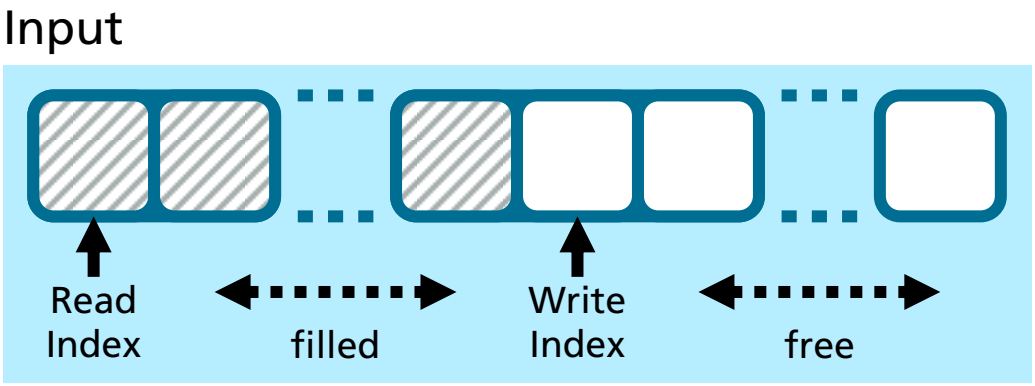


Data Propagation



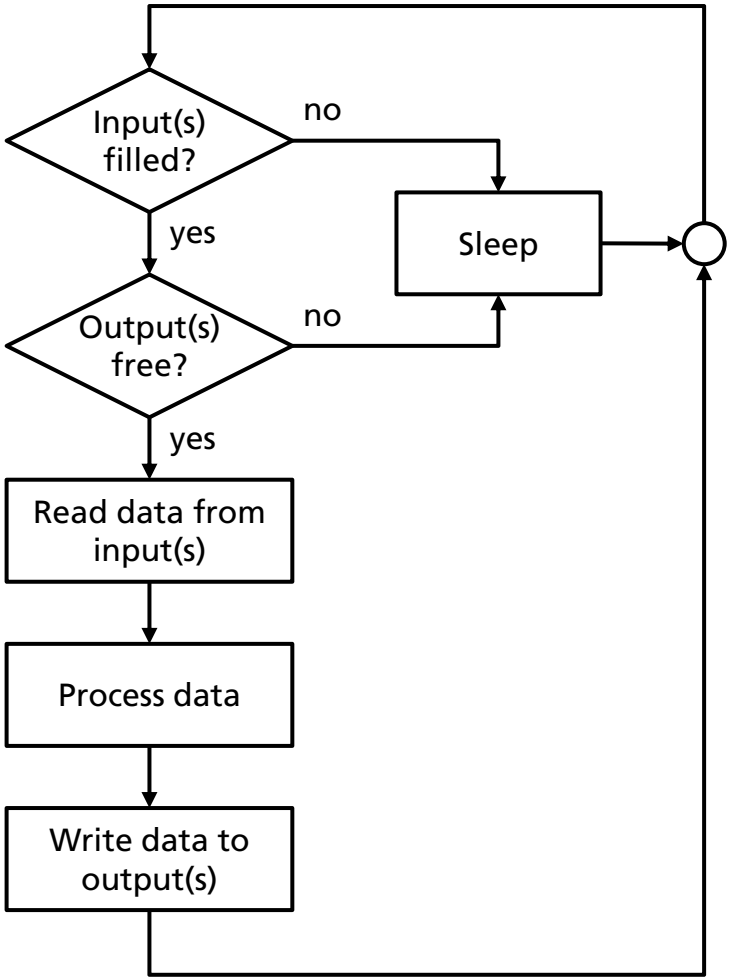
Packet Queue

- Inputs have a Packet queue to store reference pointers
- Ring buffer allows independent write and read access
- Lock free operation via atomic fill level synchronization
- Adjustable queue length to optimize for latency or performance



Flow Control

- Flow control via two sided queue query procedure
- Handles source, sink or throughput limited paths
- Load balancing through dynamic suspension



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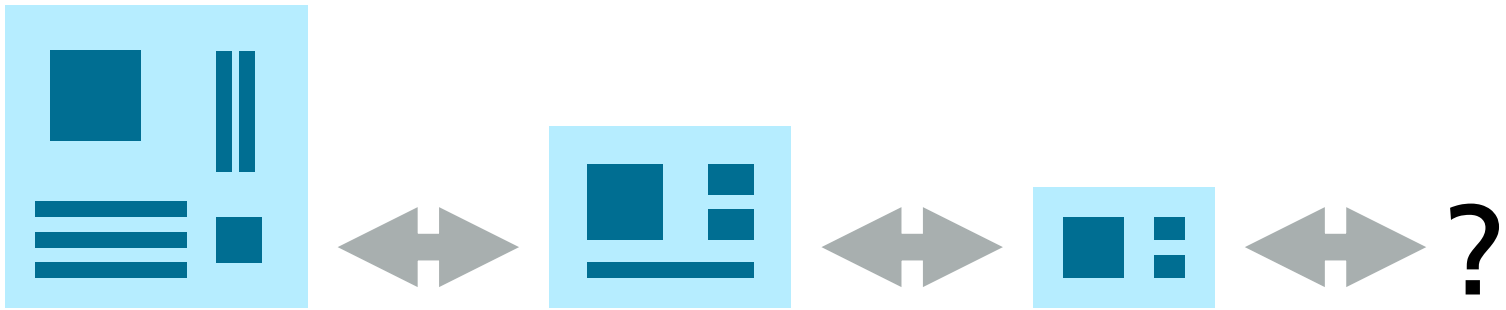
Portability

- Framework entirely written in C++
- No C++11, Boost or other large libraries required
- Dependencies isolated on internal abstraction Layer
- Low level utilities available to user modules



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Conclusion

- ✓ Flexibility
  - Fully runtime dynamic routing of data paths
  - Adaptive flow control for variable data rates
- ✓ Performance
  - Entire framework implemented in native C++
  - Reference pointer based data distribution
- ✓ Portability
  - No dependencies on large external libraries
  - Isolated platform dependent interface layer

QUESTIONS?

Thank you for listening!