Summary

Adding a Ptolemy Domain...

- Can create new design capabilities while leveraging the Ptolemy architecture and design resources.
- Requires thorough understanding of your computational specialization.
  - refer to existing Domains for examples.

Remember...

- Don't reinvent the wheel.
- It's not commercial software... some adventure and risk.

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Typical Domain Extensions (cont.)

- **NEWDomain - Supports creation of inter-domain mechanisms like NEWToUniversal and NEWFromUniversal, and NEWWormhole.**
- **NEWWormhole - Dual-natured building block at domain interfaces.**
- **NEWTarget - Supervises execution within target system; used by code generation domains mostly.**

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Typical Domain Extensions

Since Ptolemy is OO, many extensions, specializations are possible; some are required to have an operational domain.

- **NEWScheduler - Sequences execution of blocks based on domain semantics.**
- **NEWPortHole - Supports data transfer mechanism for the domain.**
- **NEWStar - Enforces sequence of getting/sending data or events relative to execution. Specific functional stars inherit this behavior.**
- **NEWTo/NEWFromUniversal - Builds correct PortHole/ EventHorizon combos for NEWWormholes; implements Wormhole data transfer.**

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Mechanics: Mkdom and Domain Class Templates

- To create domain-specific class templates:

```
% cd ~ptolemy/src/domains/; mkdir new;
% cd new; mkdom new
```

- Creates:

```
make.template (!!)
    .../new/kernel
NEWDomain.cc (NEWDomain and default NEWTarget)
NEWGeodesic.h
NEWPortHole.h  NEWPortHole.cc
NEWScheduler.h  NEWScheduler.cc
NEWStar.h  NEWStar.cc
NEWWormhole.h  NEWWormhole.cc
    (NEWWormhole and NEWTo/NEWFromUniversal)

.../new/stars
NEWNop.pl
```

- Compiles (!!), but does little more.

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The Process... an Overview (cont.)

- Create few basic Stars for the domain for testing.
  - debug basic semantics.
- Build up and debug a library of domain-specific Stars.
- Debug heterogeneous interactions.

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The Process... an Overview

- **Scope out the computational specialization you need.**
  - what rules regulate the firing of actors?
  - what rules dictate how/when data is transferred between actors?
  - code generation domains - what supervisory functions are required?
  - are new data types needed?
- **Create outlines for new domain classes (see next slide).**
- **Map the functionality onto domain-specific classes derived from kernel classes.**
  - need to understand and accommodate mismatches
  - create any new classes required to support the new semantics
- **Consider semantic mapping issues between domains, too.**
  - how will/should the domain interact with others?
  - what semantics are built in vs. left for designer?

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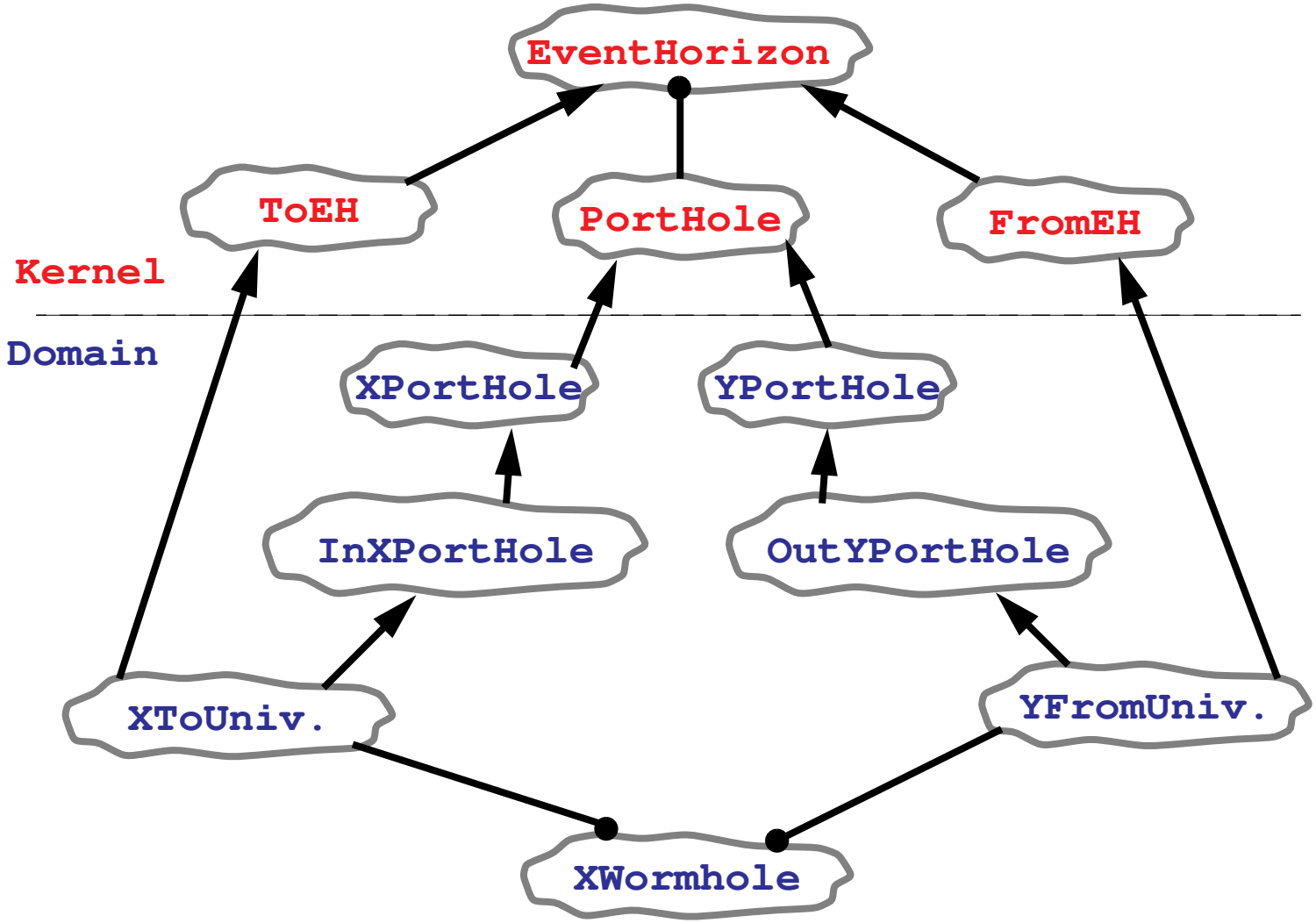
More Domain-Specific Classes



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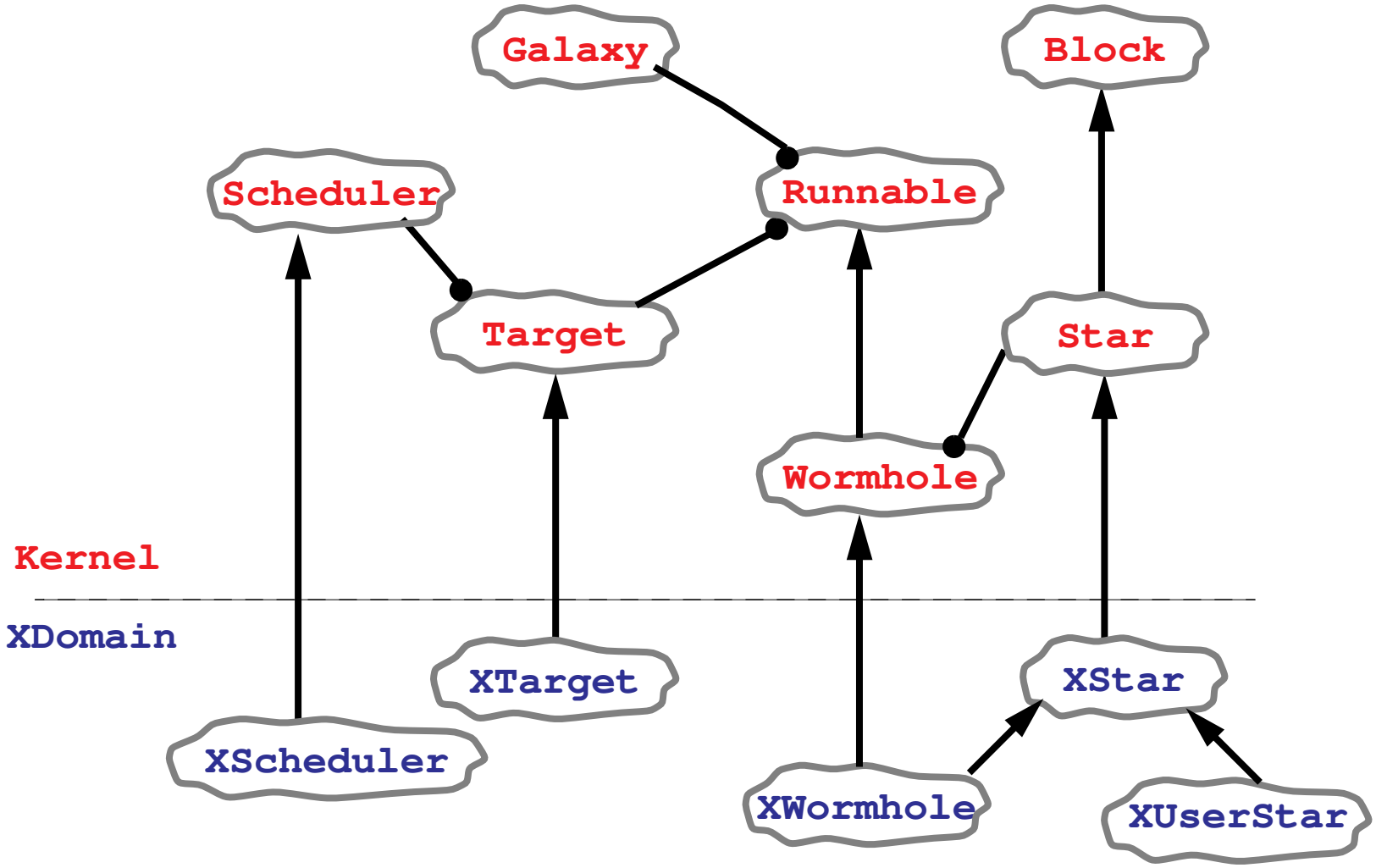
Domain-Specific Classes



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Kernel Classes - The Basis for Domain Extensions

- **The Ptolemy kernel defines a set of C++ object classes that implement key abstractions common to all design systems.**
- **Objects derived from these base classes will interoperate in predictable ways.**
- **The key abstractions built into the kernel classes include mechanisms for:**
  - **managing the execution thread of control within the design**
  - **transferring data between actors**
  - **maintaining a consistent picture of time across design elements with potentially very differing concepts of time and how time progresses**

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Alternatives to Defining an Entirely New Domain

- **Derive from a existing Domain.**
  - efficient way to customize existing computation models
  - example: BDF and DDF leverage from SDF
- **Create a new Target.**
  - use an existing code generation Domain with a Target specialized to your application/architecture

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Motivations for Defining a New Domain

- **Create a tool based on a specialized model of computation.**
  - more natural design
  - efficient simulation
  - code generation for simulation acceleration or prototyping hardware and software
- **Leverage from an established tool framework.**
- **Gain interoperability with other Ptolemy domains.**
  - support heterogeneous design
  - utilize domain libraries for analysis, display, etc.

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Extending Ptolemy with New Domains

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