WRENCH: Cyberinfrastructure Simulation Workbench

https://wrench-project.org

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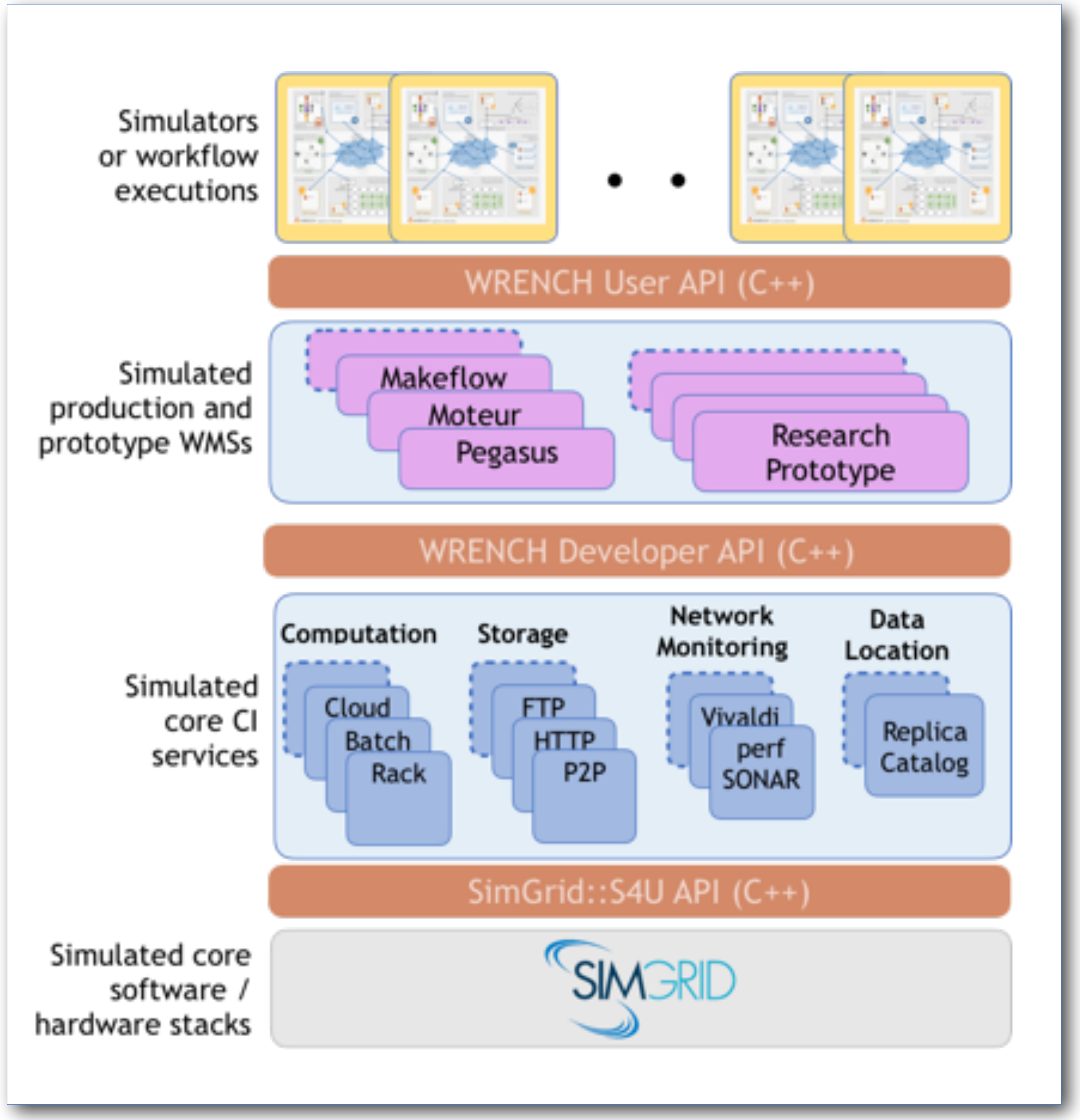
MOTIVATION

- ✦ **Disconnect between CI theory and practice**
  - ✦ Many theoretical results are not useful to practitioners
  - ✦ Theoretical results are obtained with unrealistic models
- ✦ **Real-World Experiments are Limited**
  - ✦ Limited to particular platform configurations
  - ✦ Limited by specifics of the software infrastructure that impose constraints on CI application executions
  - ✦ Limited Experimental Scope impedes progress / discovery

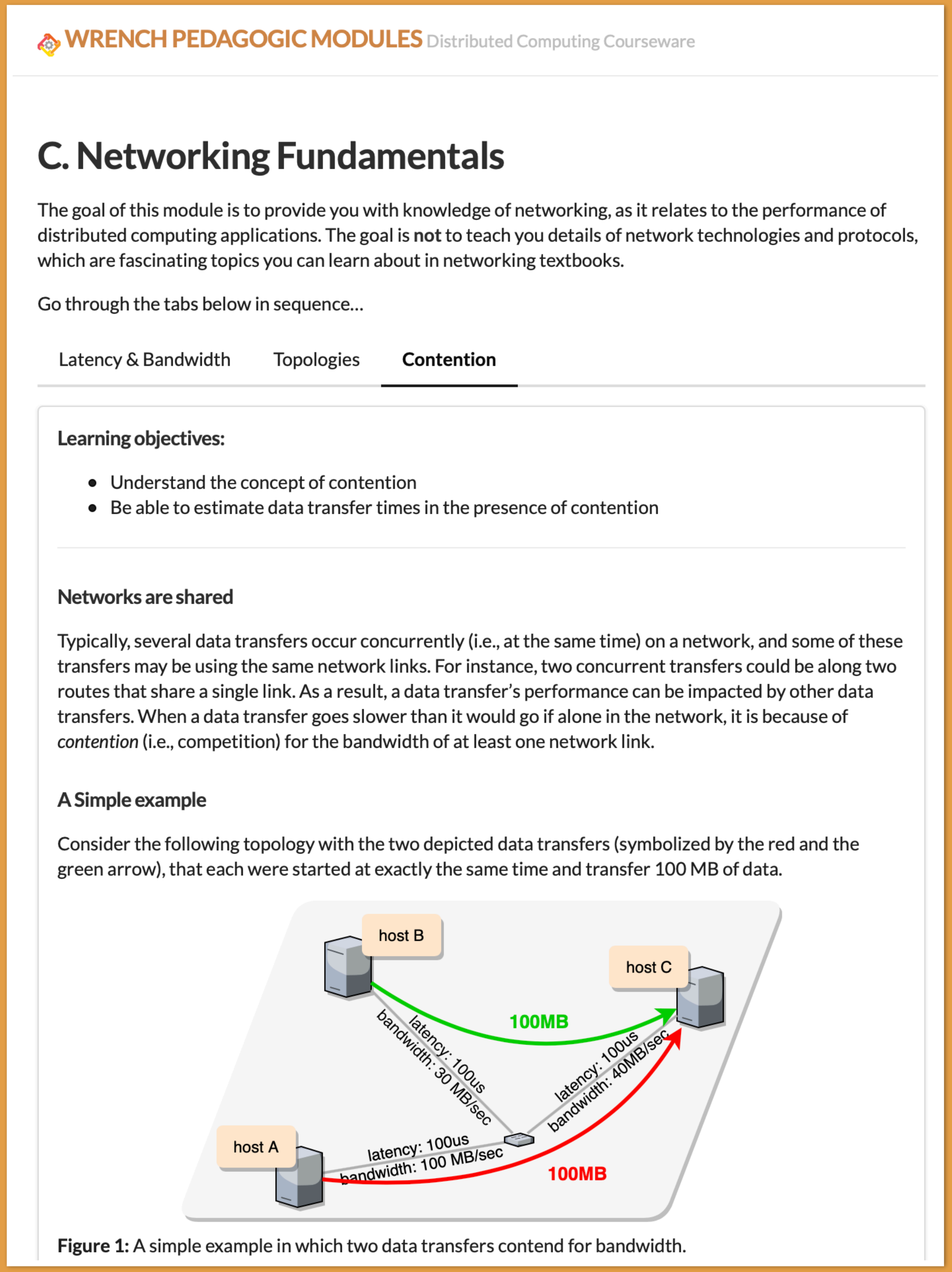
OBJECTIVES

- ✦ **Simulation**
  - ✦ In some fields of Computer Science simulation is a standard research and development methodology
- ✦ **Simulation-driven engineering life cycle**
  - ✦ The ability to easily develop accurate CI simulators, from which research products evaluated via experimental simulation could be seamlessly integrated into actual CI platforms



WRENCH PEDAGOGICAL MODULES

Simulation-driven self-contained pedagogic modules supported by WRENCH-based (accurate and scalable) simulators



WRENCH PEDAGOGIC MODULES Distributed Computing Courseware

C. Networking Fundamentals

The goal of this module is to provide you with knowledge of networking, as it relates to the performance of distributed computing applications. The goal is **not** to teach you details of network technologies and protocols, which are fascinating topics you can learn about in networking textbooks.

Go through the tabs below in sequence...

Latency & Bandwidth | Topologies | **Contention**

Learning objectives:

- Understand the concept of contention
- Be able to estimate data transfer times in the presence of contention

Networks are shared

Typically, several data transfers occur concurrently (i.e., at the same time) on a network, and some of these transfers may be using the same network links. For instance, two concurrent transfers could be along two routes that share a single link. As a result, a data transfer's performance can be impacted by other data transfers. When a data transfer goes slower than it would go if alone in the network, it is because of *contention* (i.e., competition) for the bandwidth of at least one network link.

A Simple example

Consider the following topology with the two depicted data transfers (symbolized by the red and the green arrow), that each were started at exactly the same time and transfer 100 MB of data.

Figure 1: A simple example in which two data transfers contend for bandwidth.

https://wrench-project.org/wrench-pedagogic-modules