SEED: Towards a Shared Evaluation Environment for Software-Defined-Network Applications

SENDATE-Workshop

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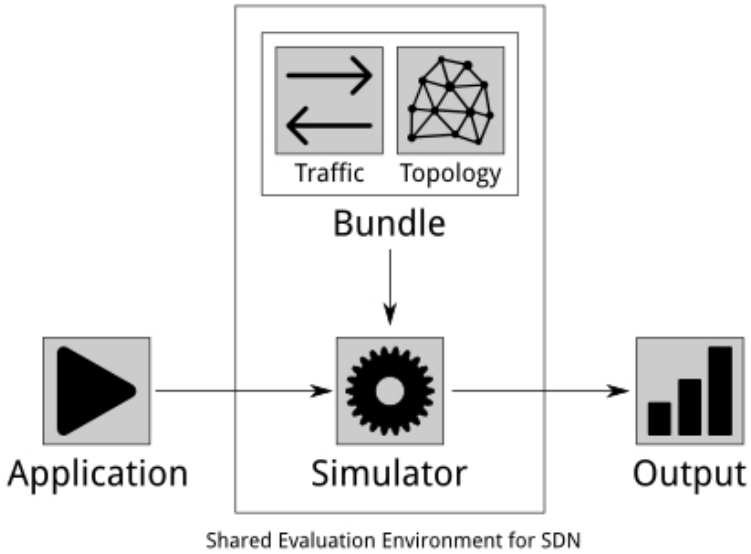
INSTITUTE OF TELEMATICS — DEPARTMENT OF INFORMATICS



Research in Practice

- Student research project
- 2 semesters
- ✓ Identify state of the art
- ✓ Write project application
- → Conduct research project
- Write research paper

Source: xkcd.com

Goal

Focus of the overall project:

Shared Evaluation Environment for SDN Applications

Focus of this presentation:

Project Presentation & Feedback

Evaluation of SDN Apps

Typical problems arise

- Reproducibility (networks too large)
- Comparibility (different scenarios)
- Representativity (realistic scenarios)

$\Longrightarrow$ Evaluation process is often time consuming and error-prone

$\Longrightarrow$ Ease evaluation and review of SDN Apps

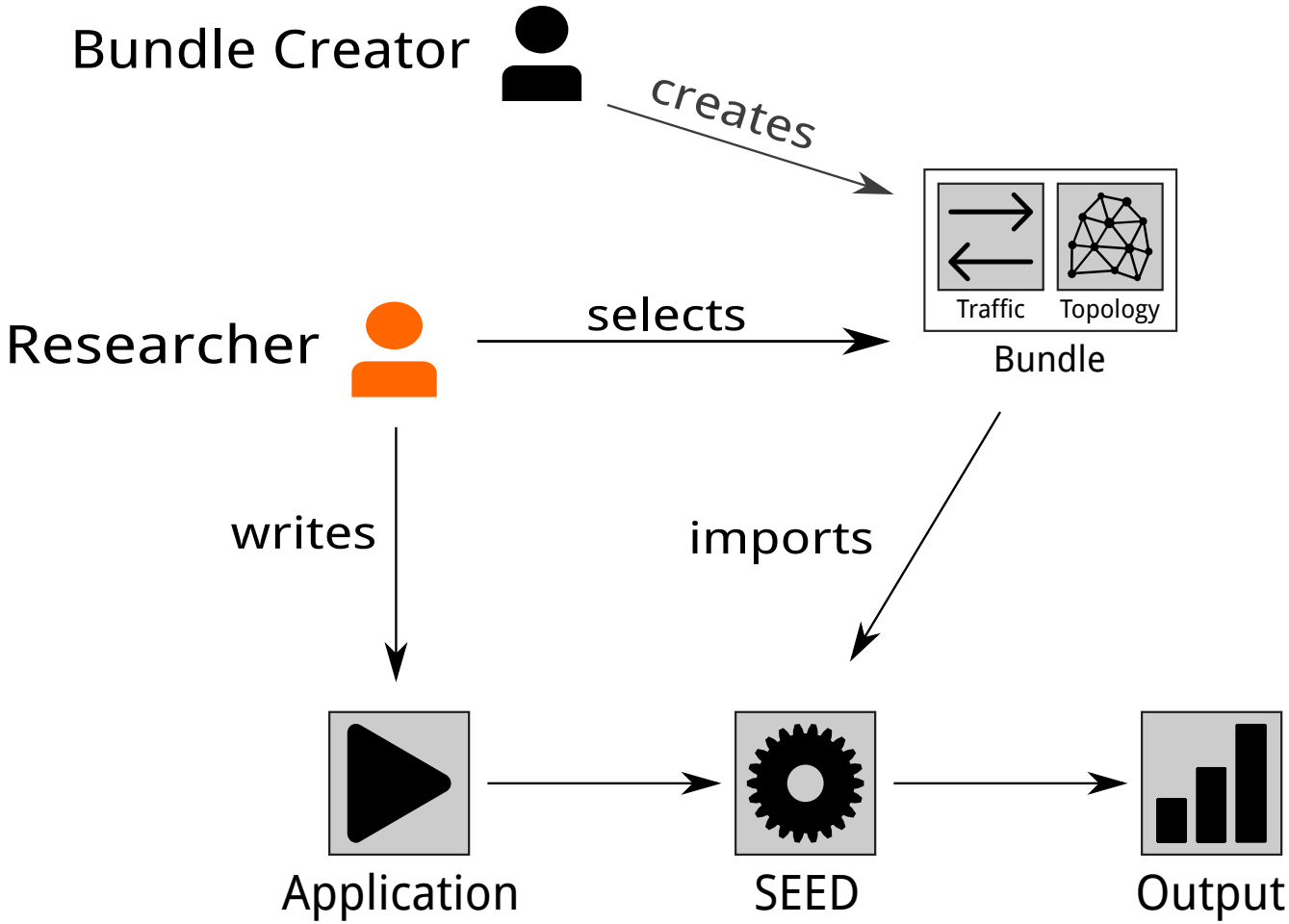
Outline

- Vision
  - Shared Evaluation Environment for SDN (SEED)
  - Scenario Bundles
- Related Work
- Questions

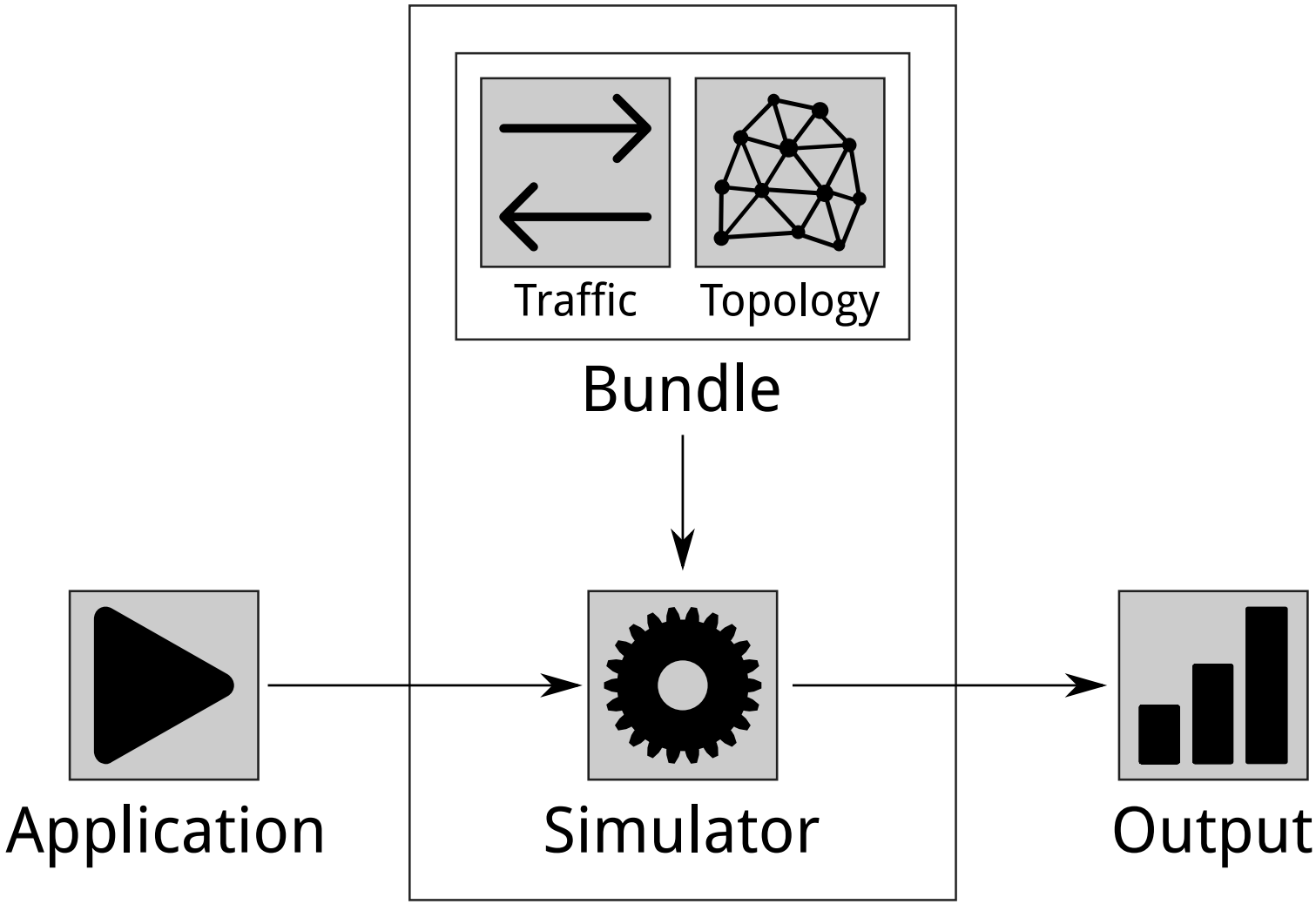
Vision

Shared Evaluation Environment for SDN (SEED)

SEED - Workflow

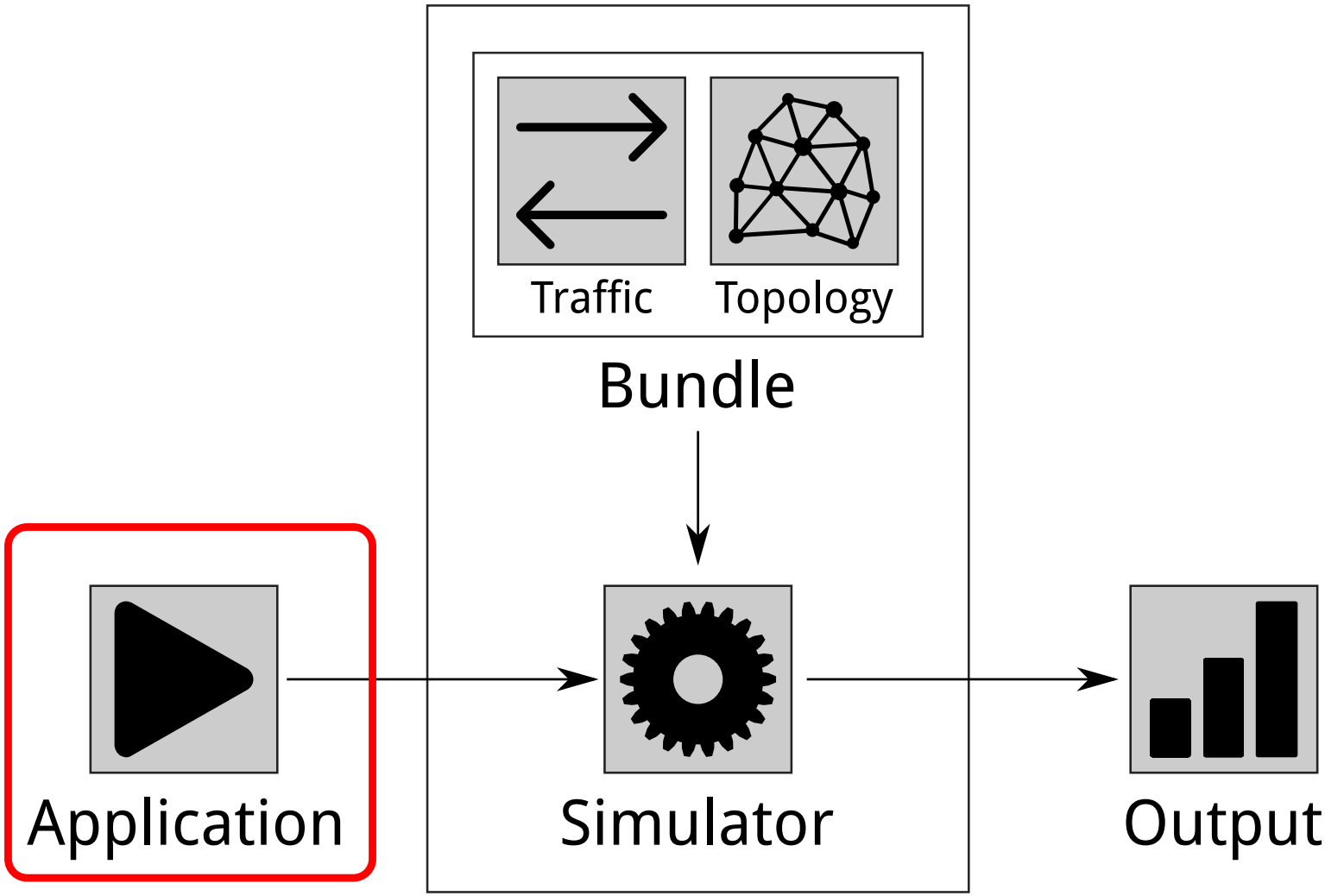


SEED



Shared Evaluation Environment for SDN

SEED



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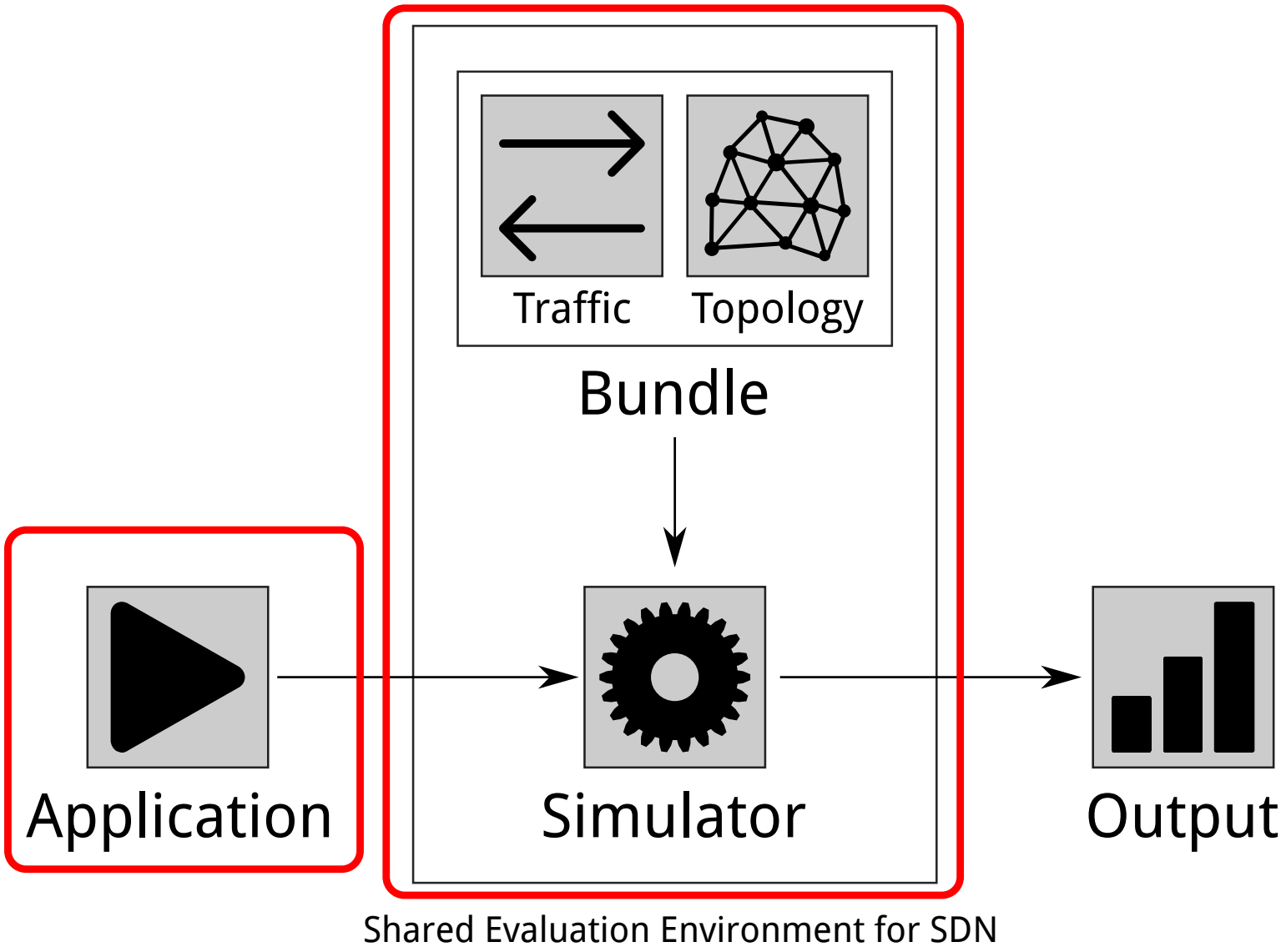
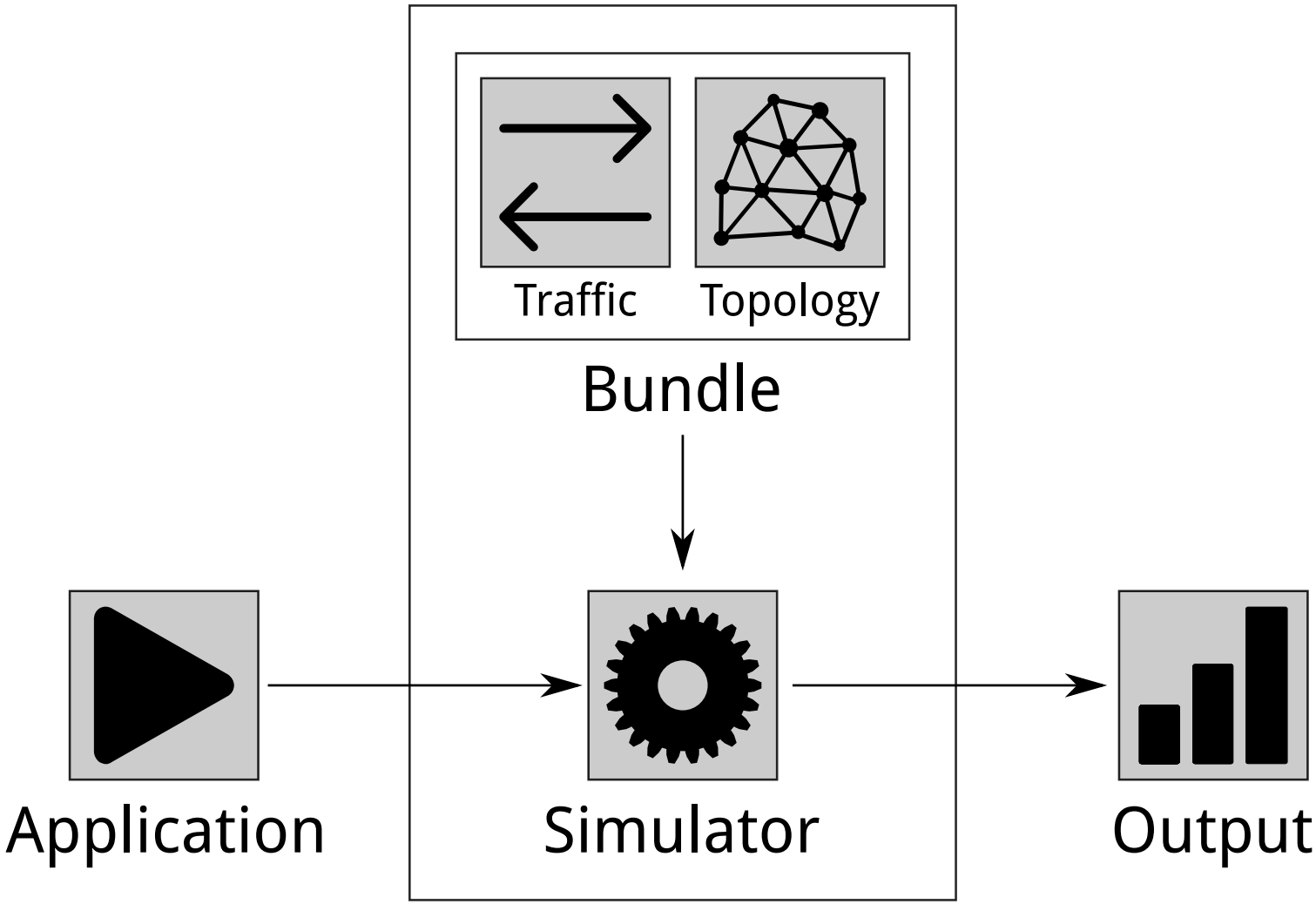
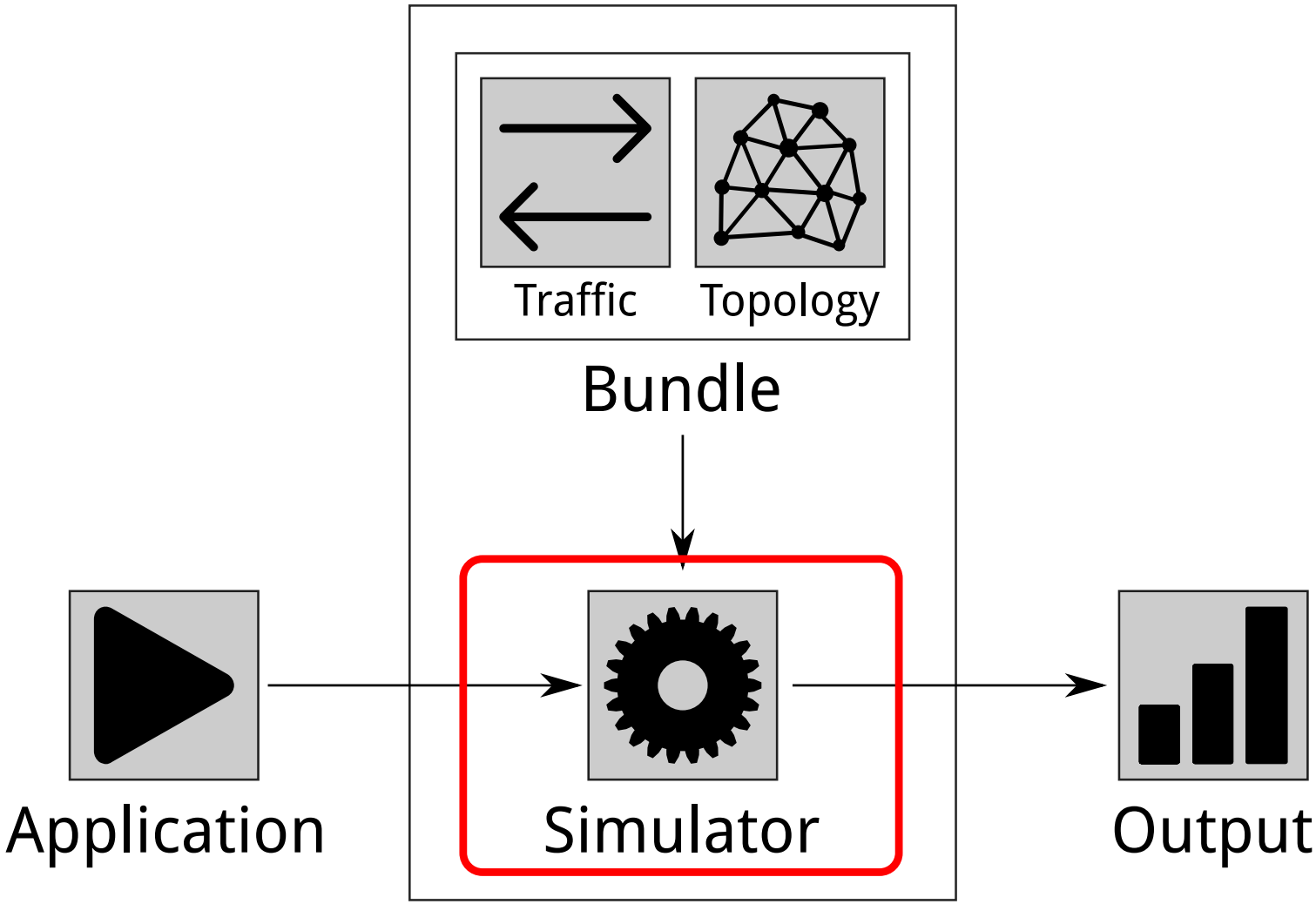

Traffic
Topology
Bundle
Application
Simulator
Output
Shared Evaluation Environment for SDN

SEED



Shared Evaluation Environment for SDN

SEED



Shared Evaluation Environment for SDN

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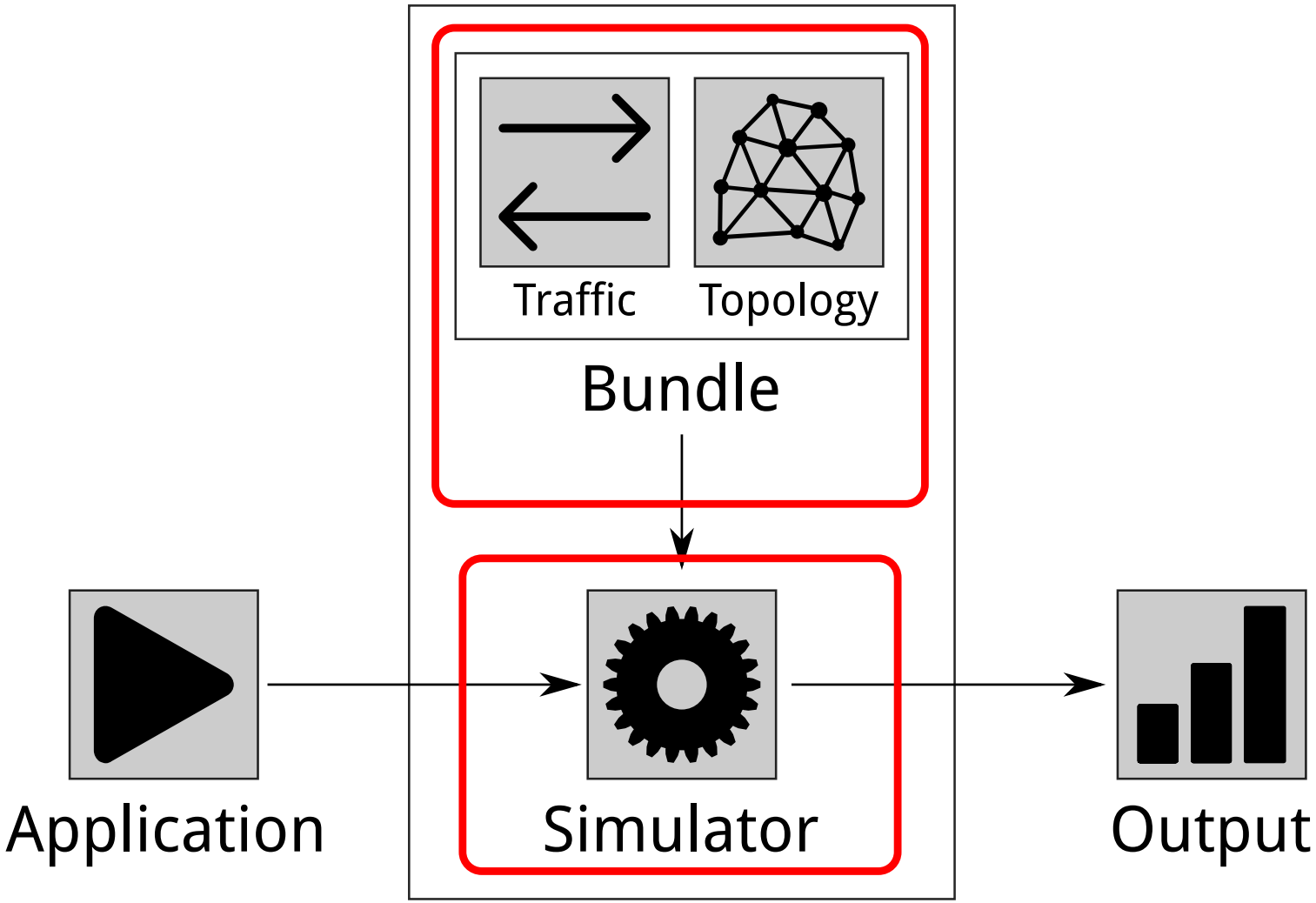
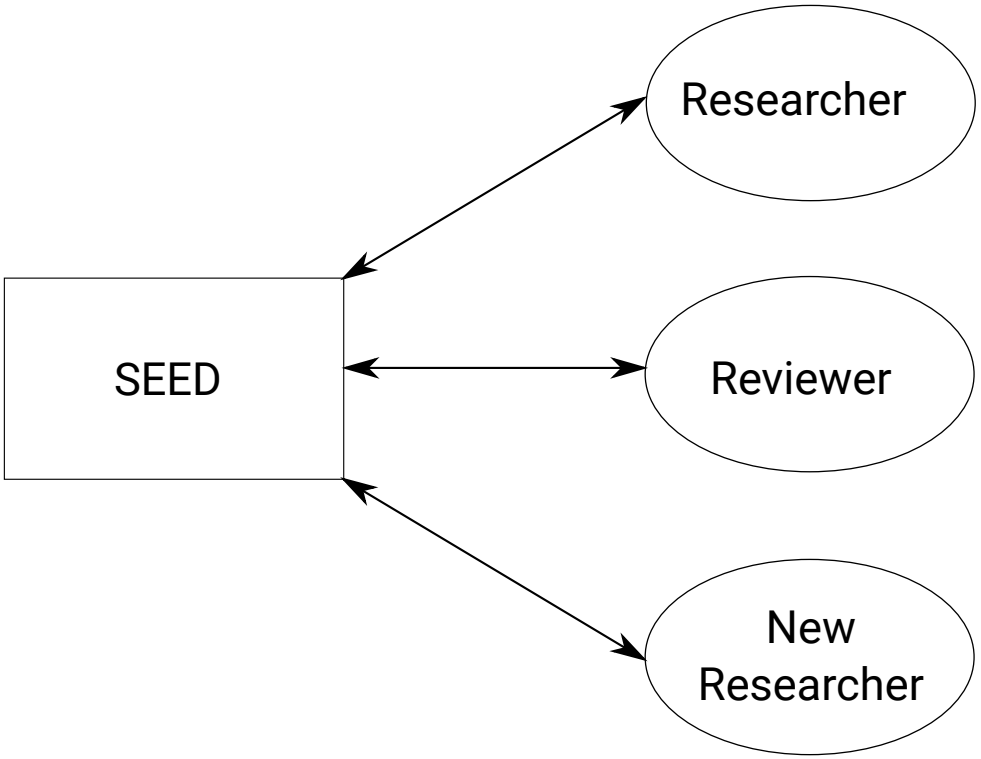


Shared Evaluation Environment for SDN

SEED - Expected Advantages



Evaluate in (additional) proven scenarios + fast setup

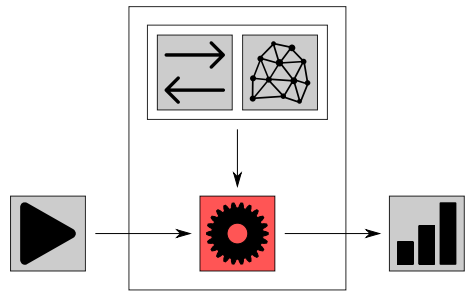
Simpler review process:
1. download
2. run

Build upon + easier comparison with own app

- Low setup overhead
- Easy sharing of applications & scenarios
- Enables reuse & independent validation

Simulator

- Current Simulator: ns-3 + OFSwitch13 (**Chaves2016**)
  - More complete OpenFlow v1.3 support
  - Virtual TCAM
- Other Options
  - fs-sdn (**Sommers2011**): Limited OpenFlow v1.0 support
  - OMNeT++: OpenFlow v1.2 extension (**Klein2013**)
  - FLEO (**Anggono2016**): Currently examining suitability



Vision

Scenario Bundles

Topologies and Traffic

Sources for topologies:

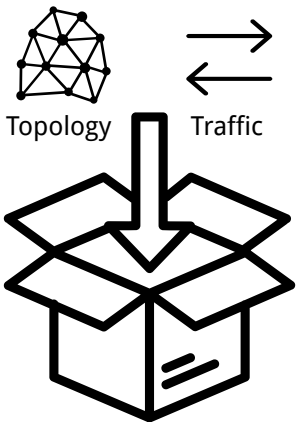
- Generators: Often not representative
- Datasets: Often not provisioned

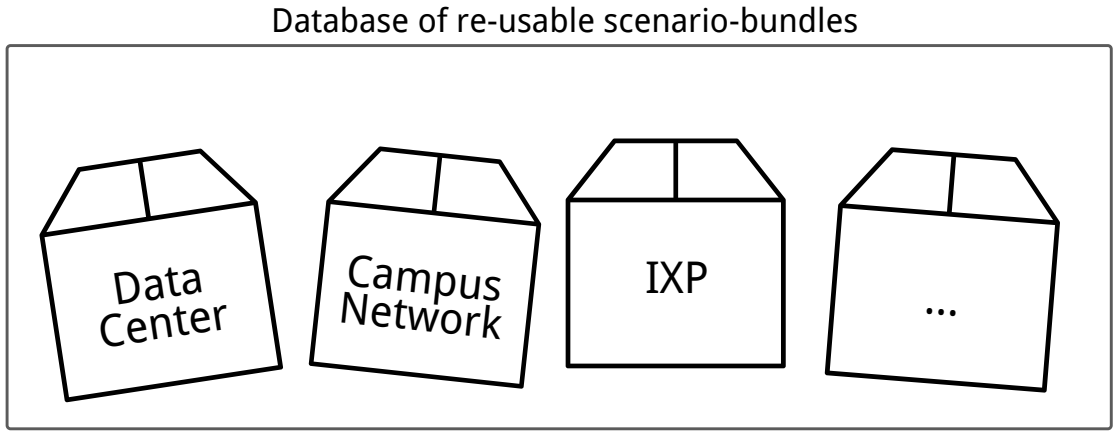
Sources for traffic:

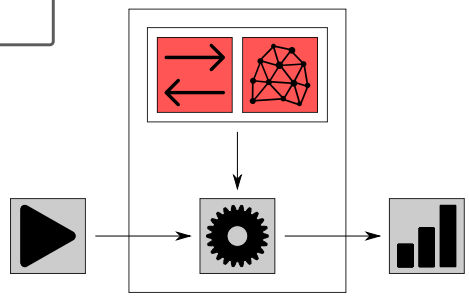
- Generators: Hidden configuration peculiarities
- Traces: Can not be re-used in different scenarios

$\Longrightarrow$ Choice and correct configuration complicated

Scenario Bundles







Datacenter

Fat-Tree &
Enterprise Traffic,
Asymmetric Fat-Tree &
Web Traffic

Campus

Stanford backbone
(**180587**)
Enterprise Traffic
(**Pang2005**)

IXP

Based on AMSIX

WAN

Based on Google B4

Related Work

Related Work

- SAFE (**Perrone2012**)
- FNSS (**Saino2013**)
- Student Reproduction (**Yan2017**)

Existing Tools

Simulation Automation Framework for Experiments (SAFE):

- Web-based start of experiments
- Worker pool
- Experiments and results database
- \+ Aided plotting of results
- – Limited features to ease specification

$\Longrightarrow$ Offers interesting features but introduces overhead

Existing Tools

Fast Network Simulation Setup (FNSS):

- Modular approach
- \+ Import and generation of topologies
- \+ Provisioning of topologies
- \+ Integration into different simulators
- \+ Allows saving configurations to file
- – Limited node configuration
- – No SDN-configuration
- – Insufficient traffic specification

$\Longrightarrow$ Good starting point

Efforts of reproduction

reproducingnetworkresearch.wordpress.com/:

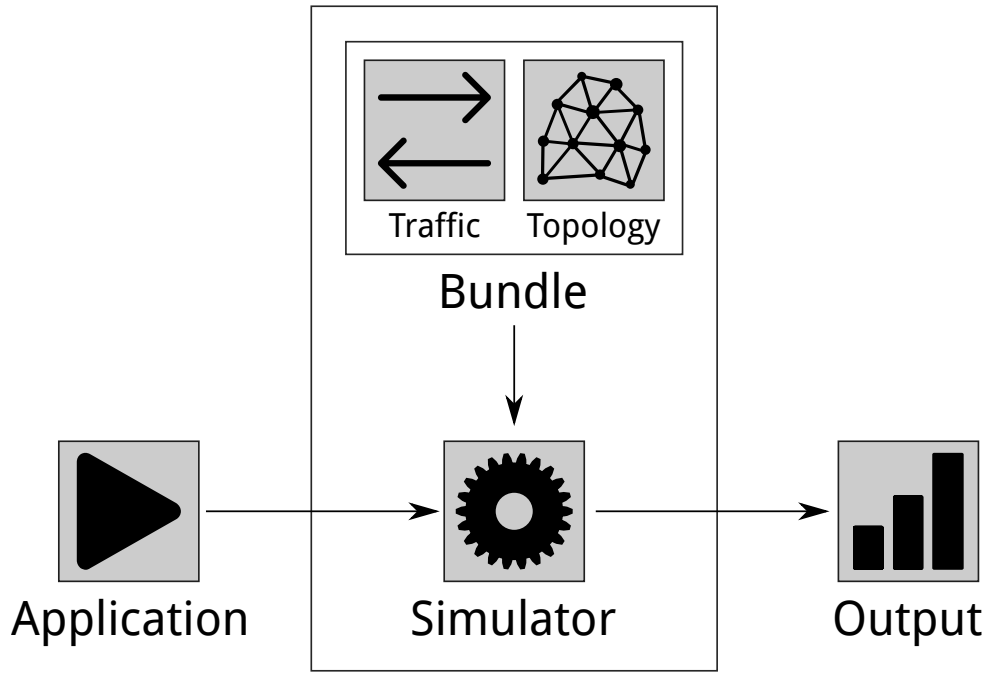
- Student program
- Groups of students try to reproduce papers
- Usually usage of original code from authors

\+ Encourages researchers to publish clean deliverables

\+ Gives insights into actual reproducibility

– Some papers redone multiple times

– Usually only exact replication, no evaluation in different scenarios



Shared Evaluation Environment for SDN

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Sources I

Icons: thenounproject.com

References I

Sources