Community cyberinfrastructure for modeling earth-surface processes

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CSDMS

share resources, collaborate

COMMUNITY
SUPPORT

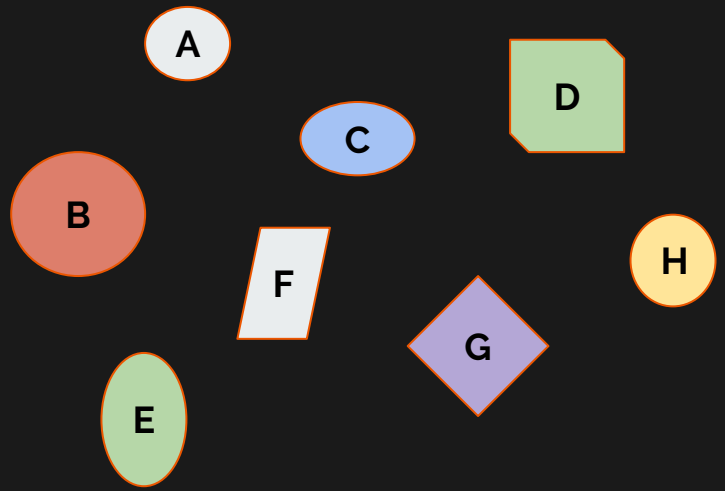
create, run, test, analyze, and apply models

COMPUTING
RESOURCES

learn and teach

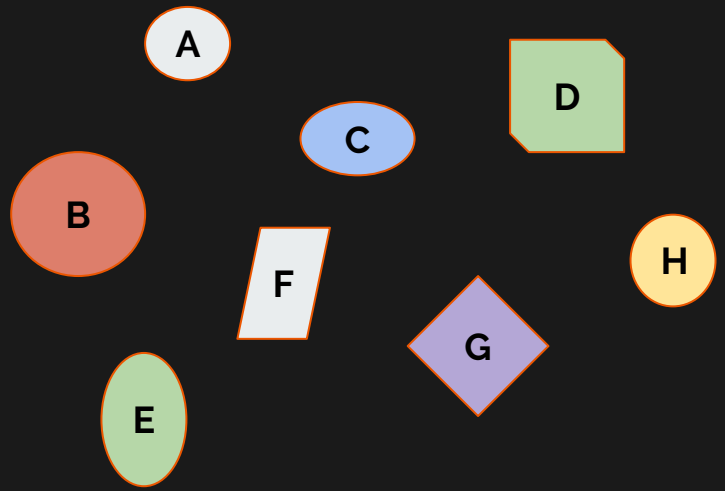
EDUCATION
OPPORTUNITIES

The CSDMS modeling philosophy



Step 1: Write models
Step 2: ???
Step 3: Science!

The CSDMS modeling philosophy



Step 1: Write models
Step 2: CSDMS Modeling Framework
Step 3: Science!

Problem:
How can we standardize access to models?

Basic Model Interface (BMI)

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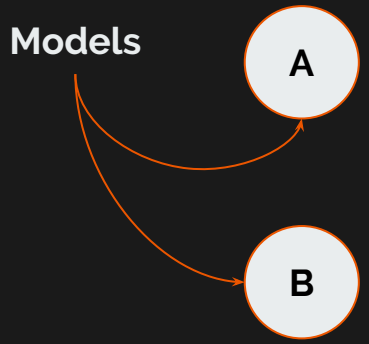
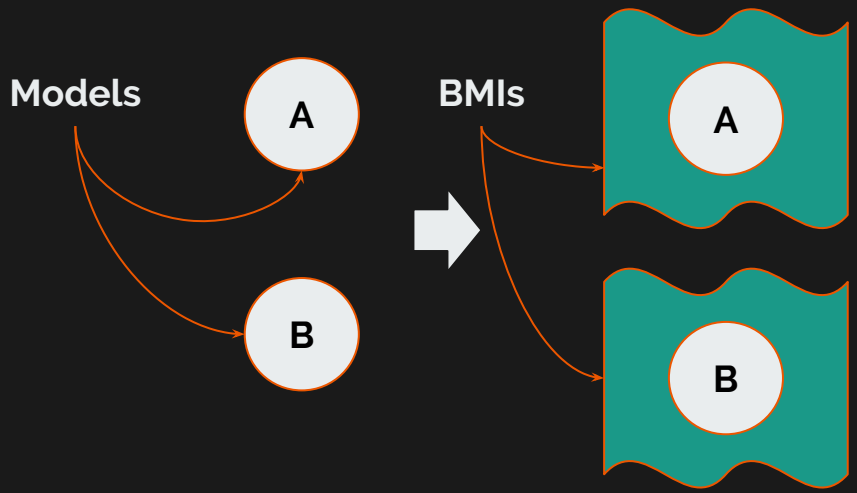
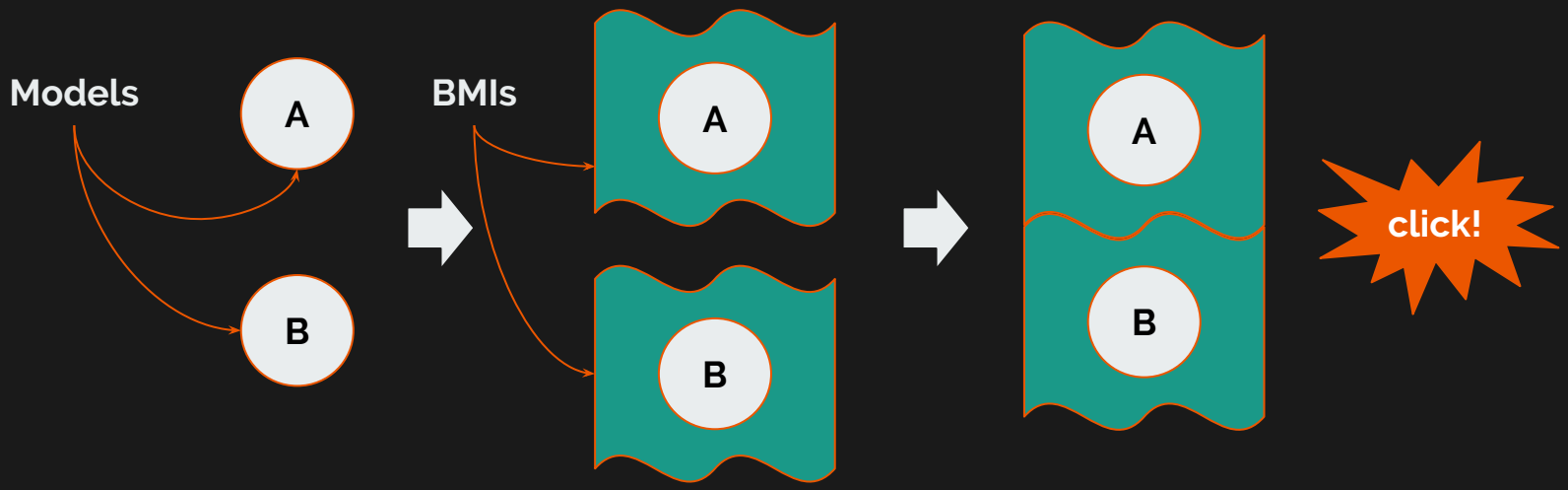


Basic Model Interface (BMI)



Basic Model Interface (BMI)



Problem:
How can we ensure that information exchanged between models is the same?

CSDMS Standard Names

CSDMS Standard Names

temperature

CSDMS Standard Names

temperature

surface

CSDMS Standard Names

dry bulb

temperature

surface

CSDMS Standard Names

dry bulb

temperature

virtual

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CSDMS Standard Names

dry bulb

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dry bulb

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diurnal mean

temperature

10 m

instantaneous

virtual

surface

potential

CSDMS Standard Names

CSDMS Standard Names

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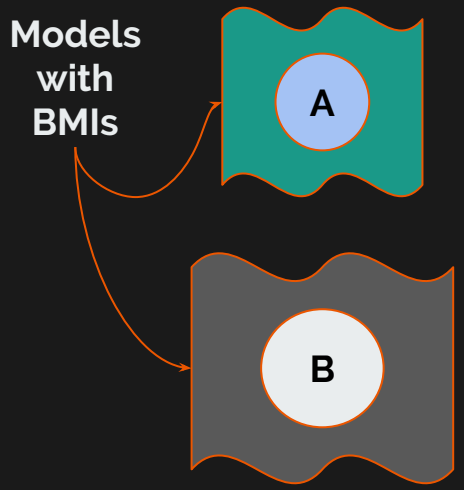
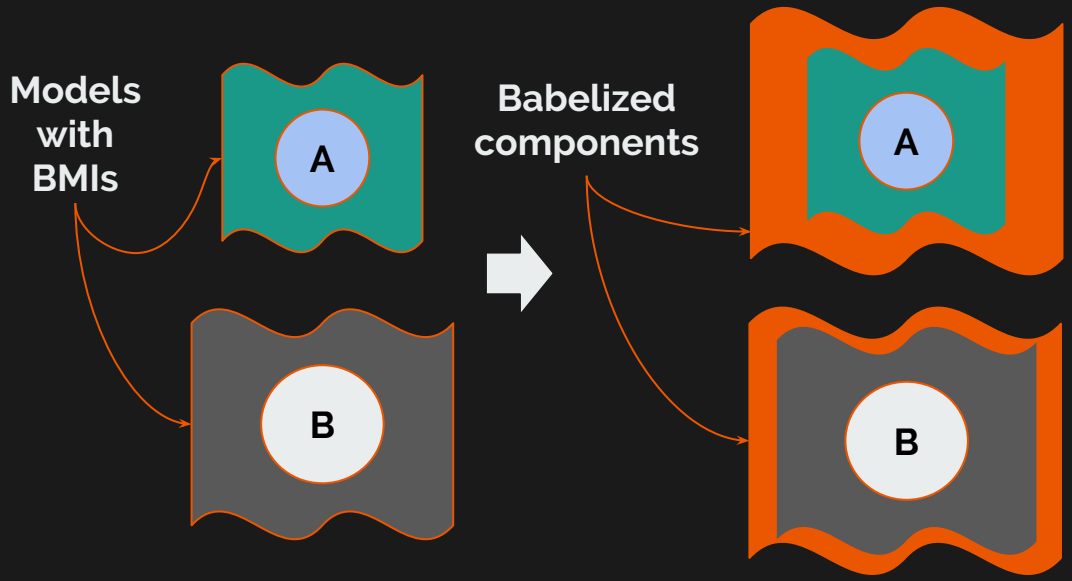
Problem:
How can we couple models written in different languages?

Babel*

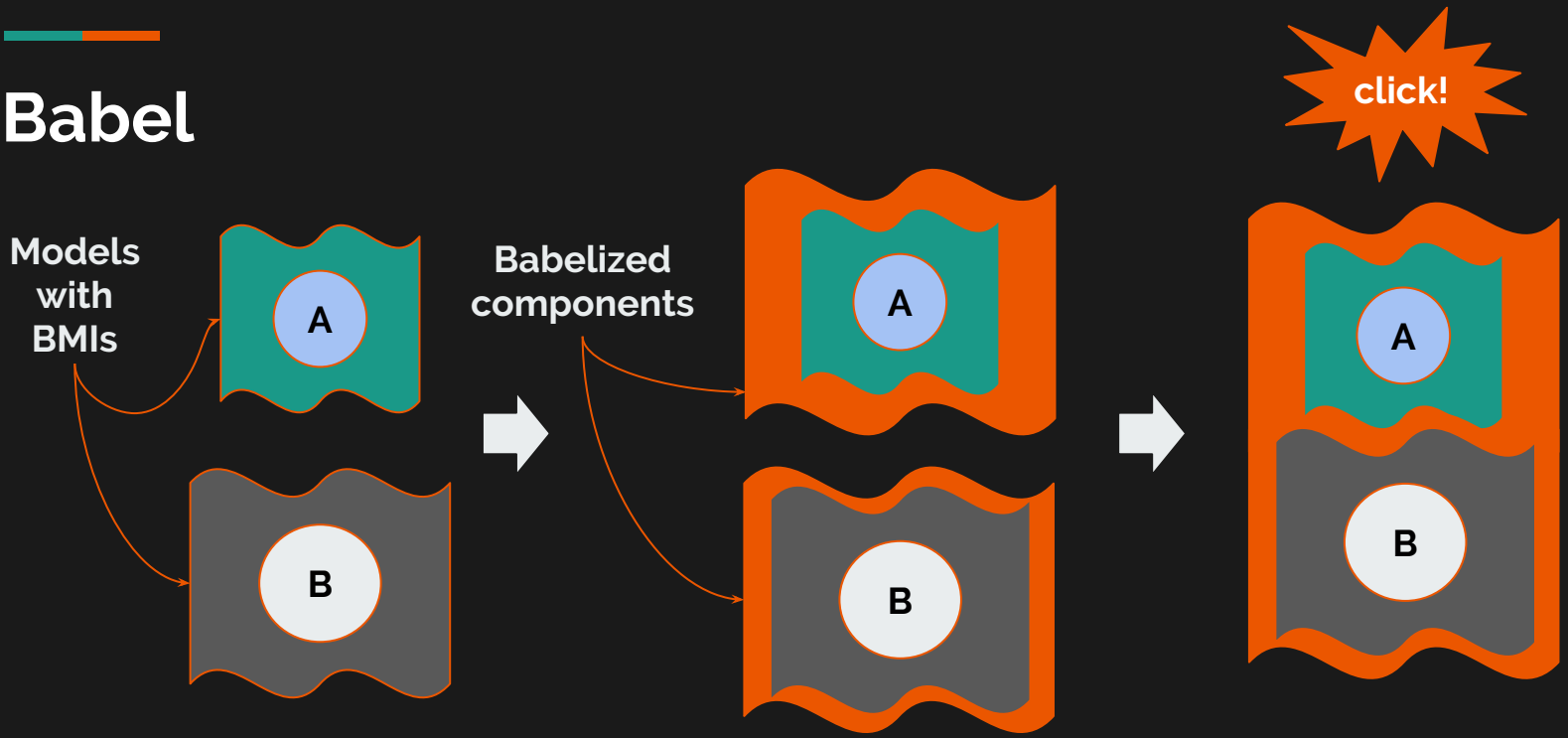
Babel



Babel



Babel



Problem:
How can we put all this together?

Python Modeling Toolkit (PyMT)

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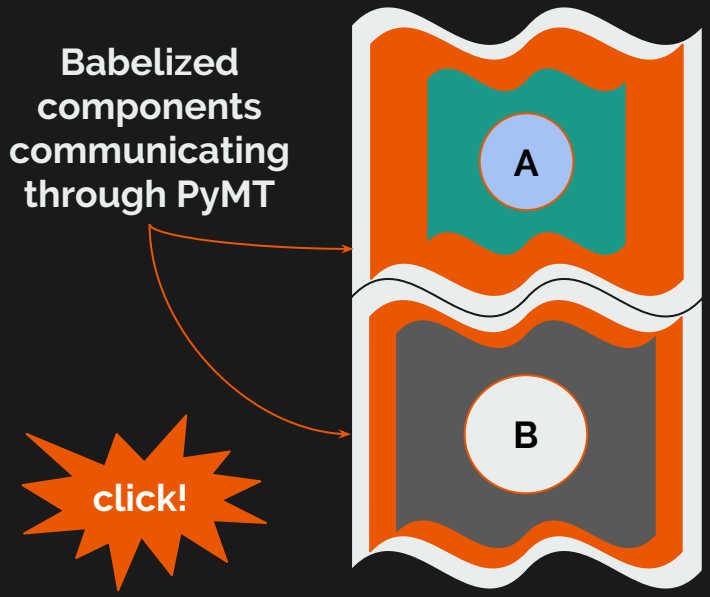


```
from pymt.components import Sedflux3D

model = Sedflux3D()
(fname, initdir) = model.setup()
model.initialize(fname, dir=initdir)
for _ in xrange(10):
    model.update()
model.finalize()
```

Todo

- Replace Babel
- Coupling with data
- Modeling in a geospatial context
- Decrease time/effort from model → component
- Better documentation and examples

Links

CSDMS: https://csdms.colorado.edu

BMI: https://csdms.colorado.edu/wiki/BMI_Description

Standard Names: https://csdms.colorado.edu/wiki/CSDMS_Standard_Names

PyMT: https://csdms.colorado.edu/wiki/Tools_portal#PyMT

Summary

CSDMS cyberinfrastructure supports a bottom-up, community-driven modeling effort that seeks to accelerate the pace of discovery in earth-surface dynamics.

Thank you!