

# Survey v3

siiba

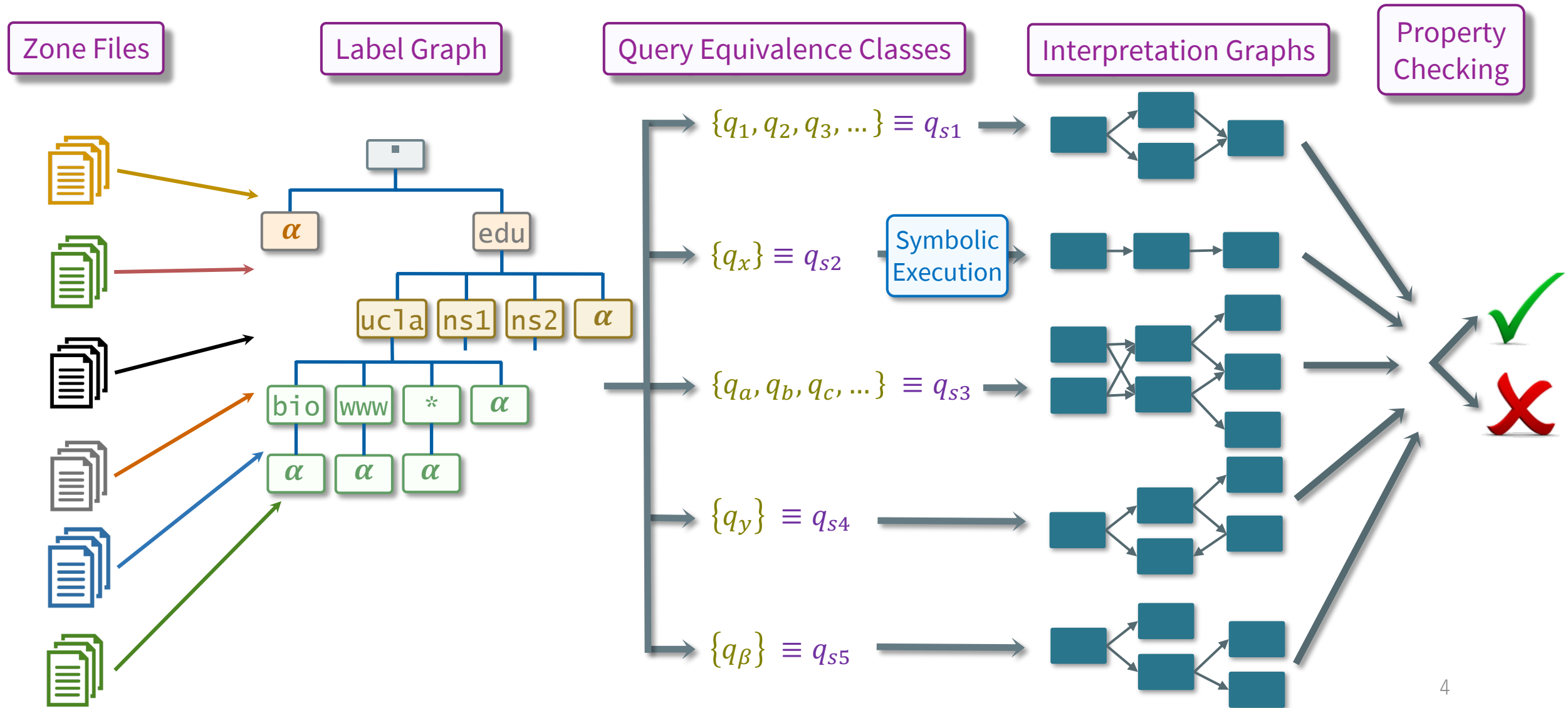
# Today's contents

1. Analyzing DNS zone files using GRoot
2. Network modeling using Zen (Microsoft Research)

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# Verification flow of the zone files in GRoot



# Analyzing com/net/org/se zone files

## Property list

- Delegation Consistency
- Response Consistency (CNAME, A, AAAA, MX)
- Rewrite Blackholing
- Lame Delegation
- Structural Delegation Consistency
- Zero TTL
- DNAME Substitution Check

# Analyzing com/net/org/se zone files

No error was found in these properties ...

- no parent-relation, simple job setting

## Cyclic Zone Dependency in the zone files

	<b>Number of Cyclic Zone Dependency</b>
org	27
net	26
se	7

A process killed  
in analyzing .com zone files ....

# Thoughts using Groot

Writing specification and property is hard ...

- Zone files have more objects than network config files

Network config analysis is more fun for me as of now ...

- No experience of operating DNS servers

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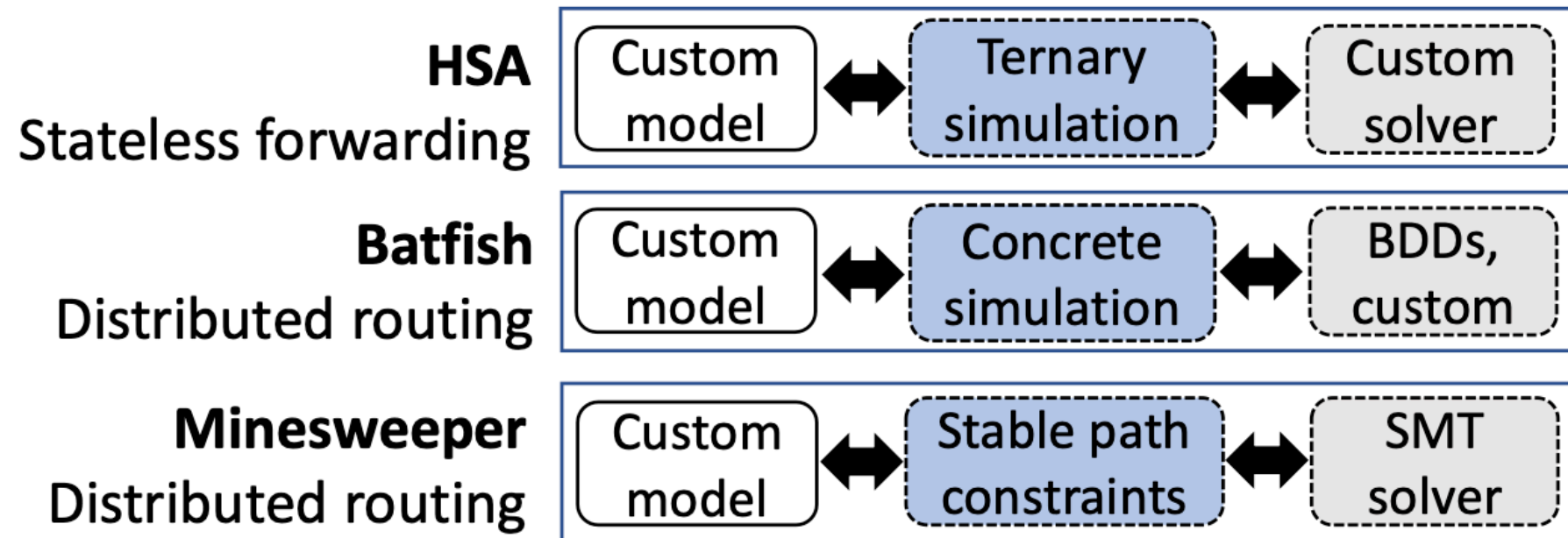
# What is Zen ?

A General Framework for Compositional Network Modeling  
(HotNets 2020)

- Intermediate language for network modeling and analysis
- Implemented in C#

# Current network verification system

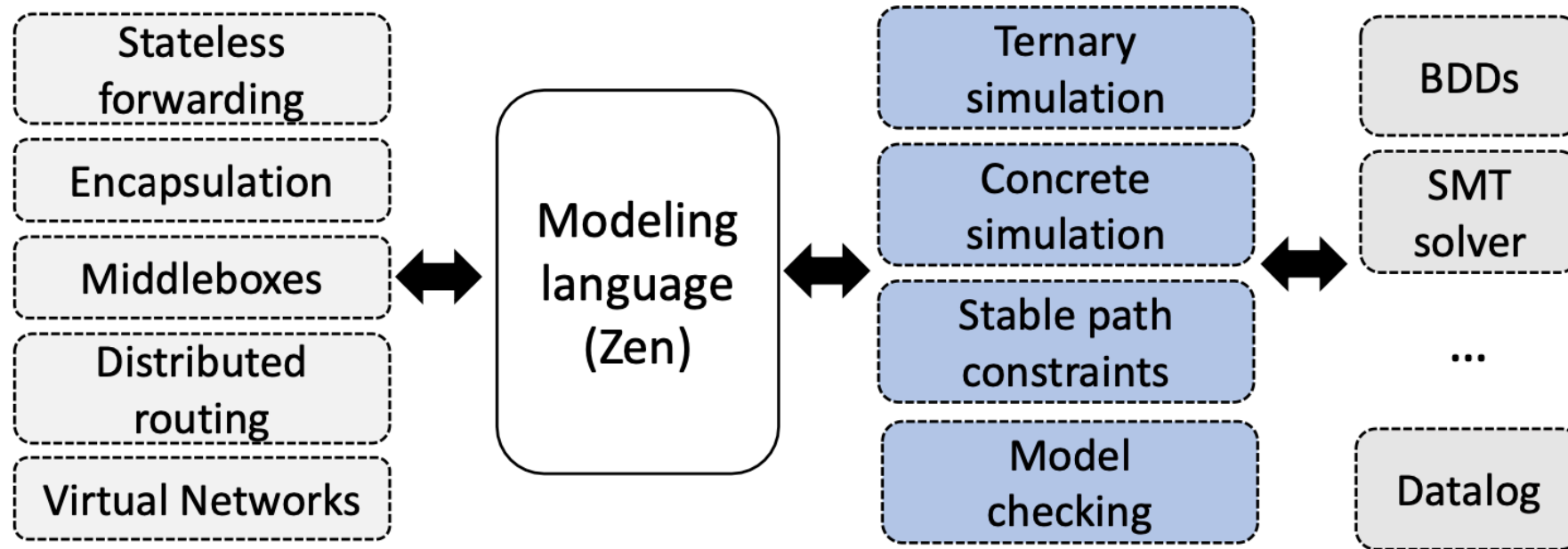
Network model and analysis engine is tightly-coupled



→ hard to develop new functions/protocols

# Zen: A language for compositional network modeling

Decoupling network functions and analysis engines



# Quantitative evaluation of Zen

Network Component	Zen Lines	Existing systems
Access Control Lists	28	> 500 (Batfish)
LPM-based Forwarding	18	> 900 (HSA)
Route Map Filters	75	> 1000 (Minesweeper)

Figure: Lines of code to express common network functions

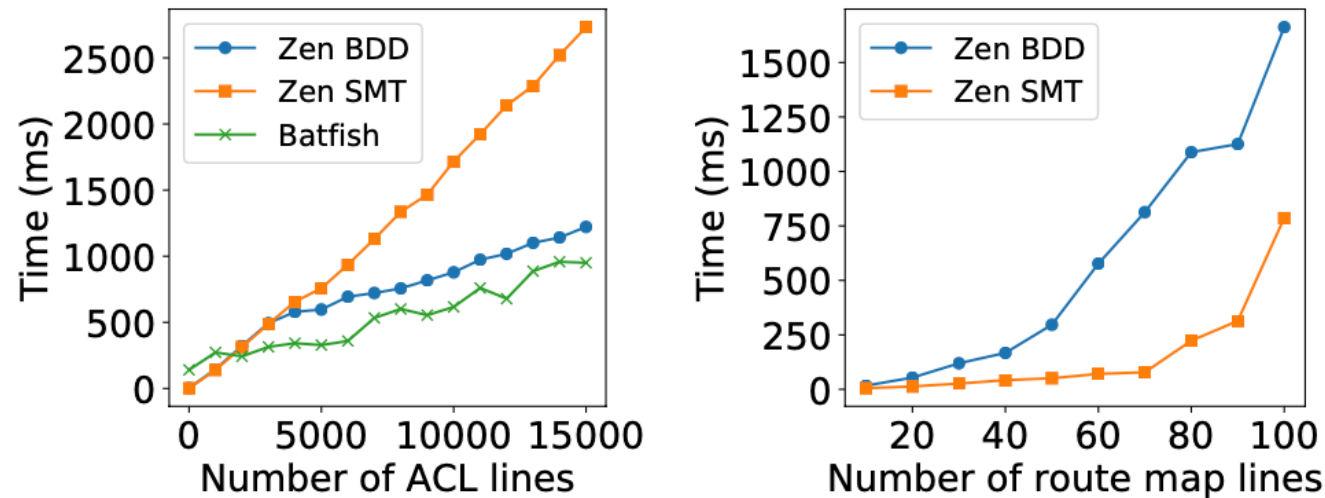
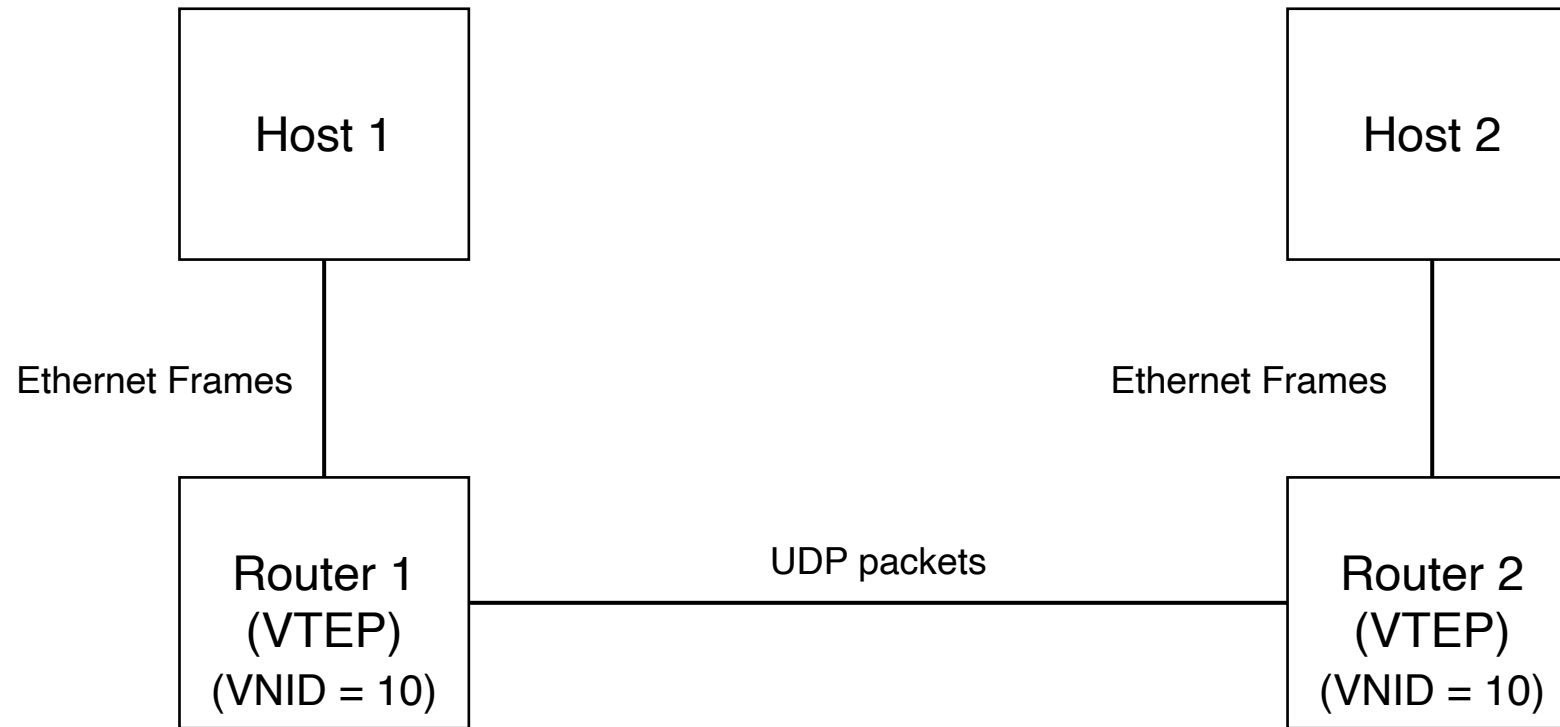


Figure: microbenchmarks for random ACLs and route maps

# Modeling a simple Vxlan network



VTEP = Vxlan Tunneling Endpoint

VNID = Vxlan Network Identifier

# Modeling a simple Vxlan network

Implemented Vxlan features using only 100-200 lines of code

```
> wc *.cs
1908 23 574 v1.57 f      518 Device.cs
2010 25 11-98-48 65.p 557 Eth.cs
3365 44 3365 88.pdf 1200 EthHeader.cs
3422 69 3425 169.pdf 1866 ForwardingTable.cs
3426 62 3434 140.pdf 1662 Interface.cs
Algor 81 hem 265 2419 Ip.cs
Bl-4 132 352 3931 IpHeader.cs
Eu5v 26 XUAIm 50.jpg 580 Udp.cs
Netw 52 97 1329 UdpHeader.cs
Prof 24 ional 48 L_TL 568 Vxlan.cs
SFC_ 45 80 1071 VxlanHeader.cs
> 220 568 7072 VxlanNetworkTest.cs
> 34 61 953 VxlanOuter.cs
> s 34 61 970 VxlanPacket.cs
zsh: 57 mmand 110 t fo 1679 VxlanTunnelEndPoint.cs
> 44 83 1192 sPacket.cs
~/De 972 bad: 2277 27567 total
```

# Weak points of Zen

```
> wc *.cs
1908 23 574 v1.57 f 518 Device.cs
2010 25 11-98-48 65 pc 557 Eth.cs
3365 44 3365 88 pdf 1200 EthHeader.cs
3422 69 3425 169 pdf 1866 ForwardingTable.cs
3426 62 3434 140 pdf 1662 Interface.cs
Algo 81 hem 265 2419 Ip.cs
B1-4 132 352 3931 IpHeader.cs
Eu5v 26 XUAIm 50 jpg 580 Udp.cs
Netw 52 97 1329 UdpHeader.cs
Profe 24 ional 48 L_TL 568 Vxlan.cs
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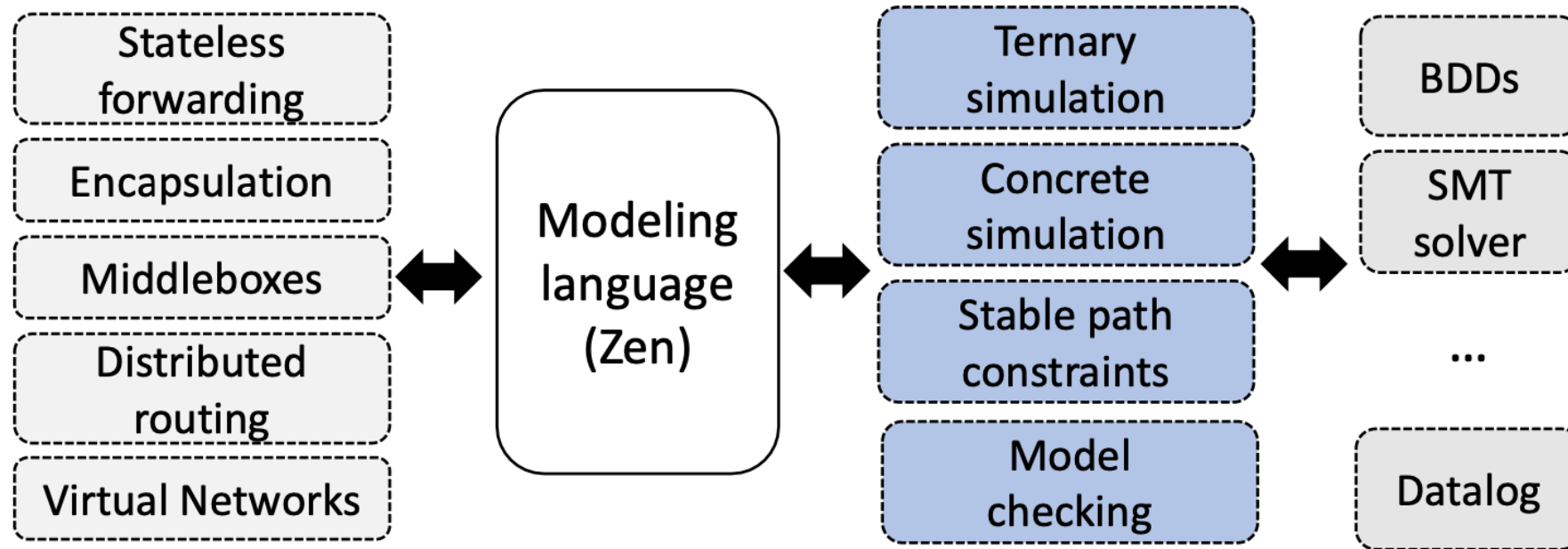
We need to implement a model of network for the verification

- 200 lines of code for the simple topology ...

→ can not scale to large networks

# Weak points of Zen

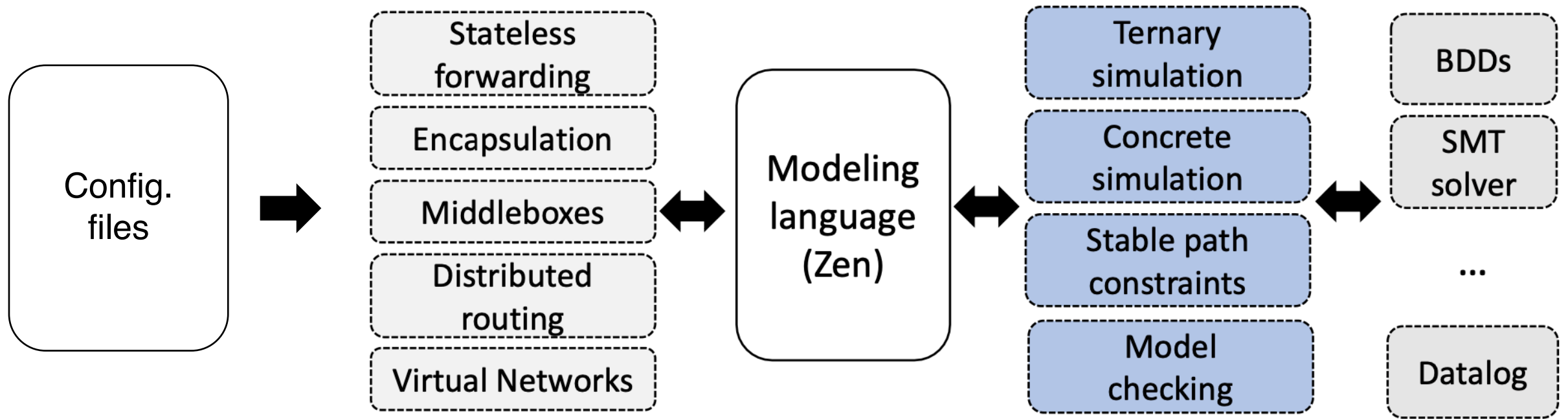
No support for the network configuration currently





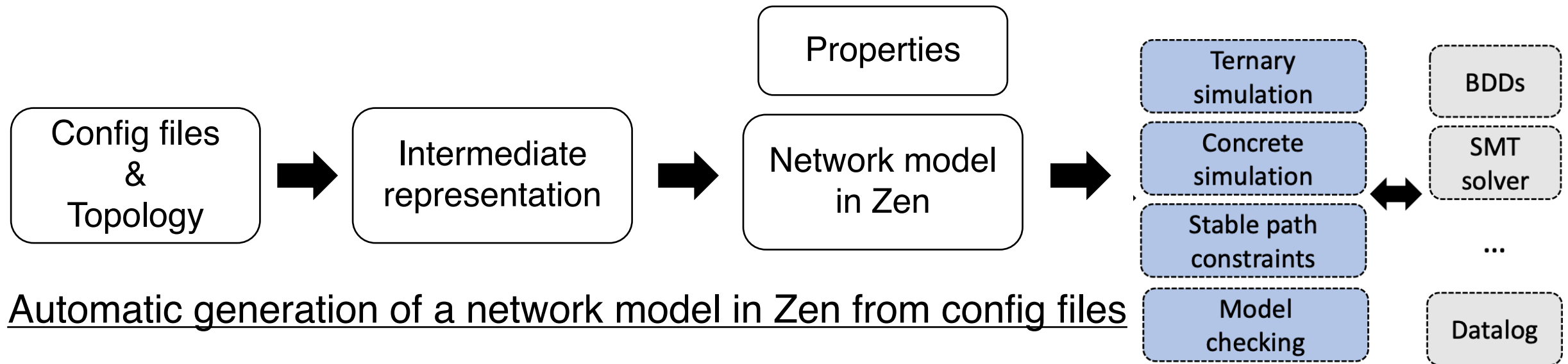
# New research point ... ?

Bridging the gap between config. files and Zen modeling



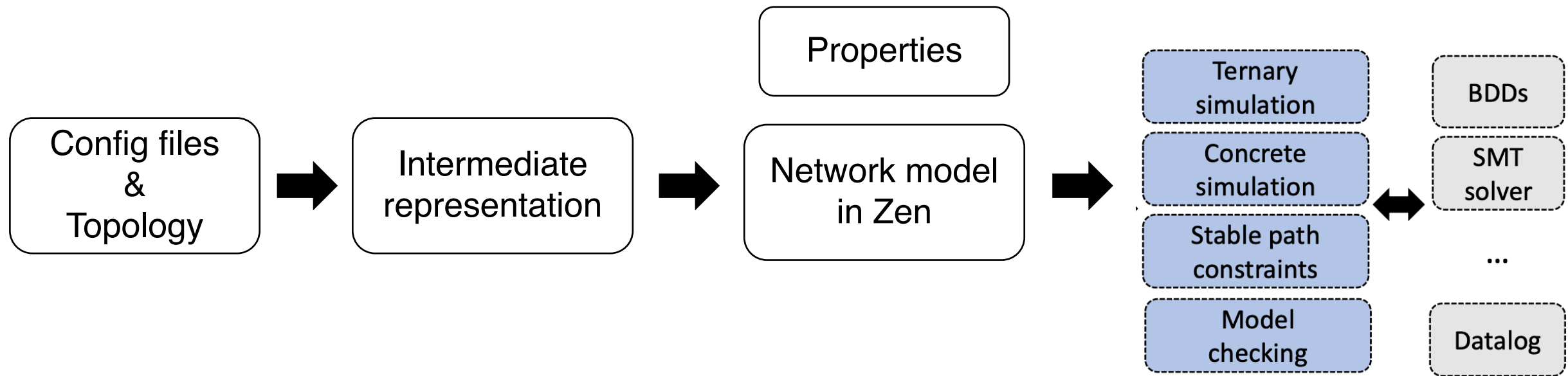
# New research point ... ?

Bridging the gap between config. files and Zen modeling



# New research point ... ?

Achieve useability for the verification in the real operation env.  
while providing extensibility for the new functions



# Reference

- [1] GRoot: Proactive Verification of DNS Configurations  
Siva Kesava Reddy Kakarla et al.,(SIGCOM'20)
- [2] A General Framework for Compositional Network Modeling  
Ryan Beckett (HotNet'20)