Co-dfns
Status Report

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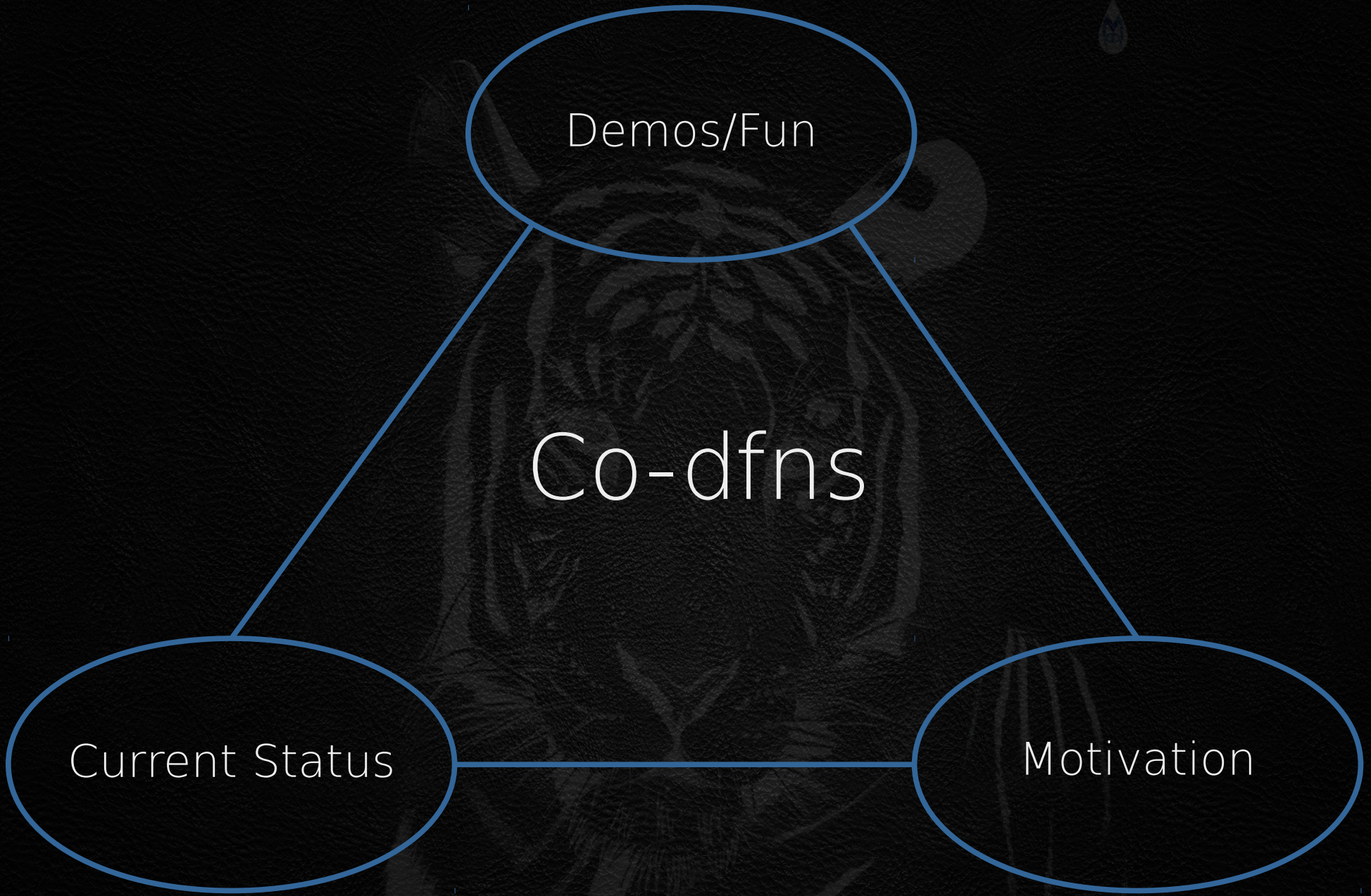
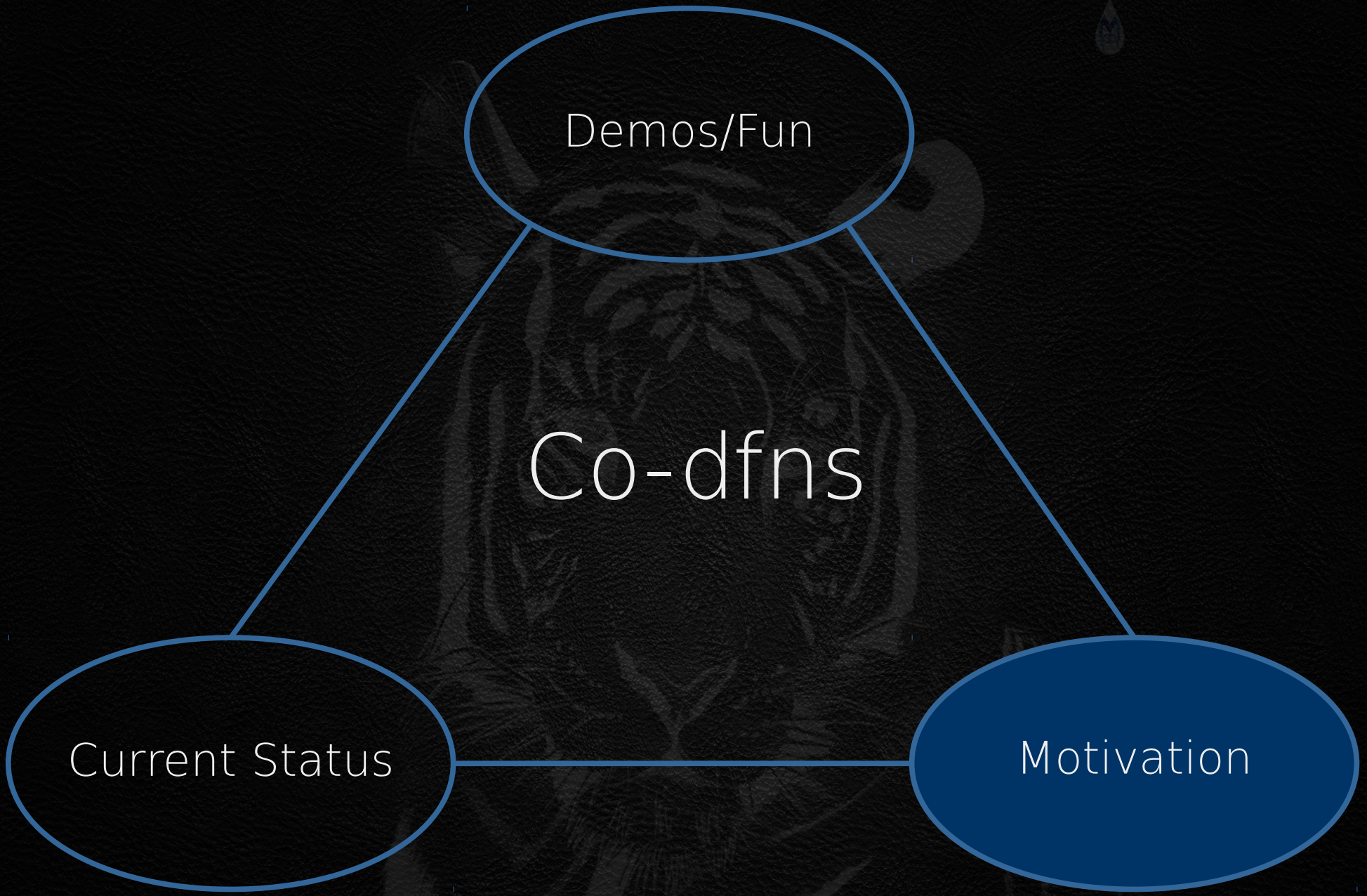
Dyalog “Conference” 2014


Demos/Fun
Co-dfns
Current Status
Motivation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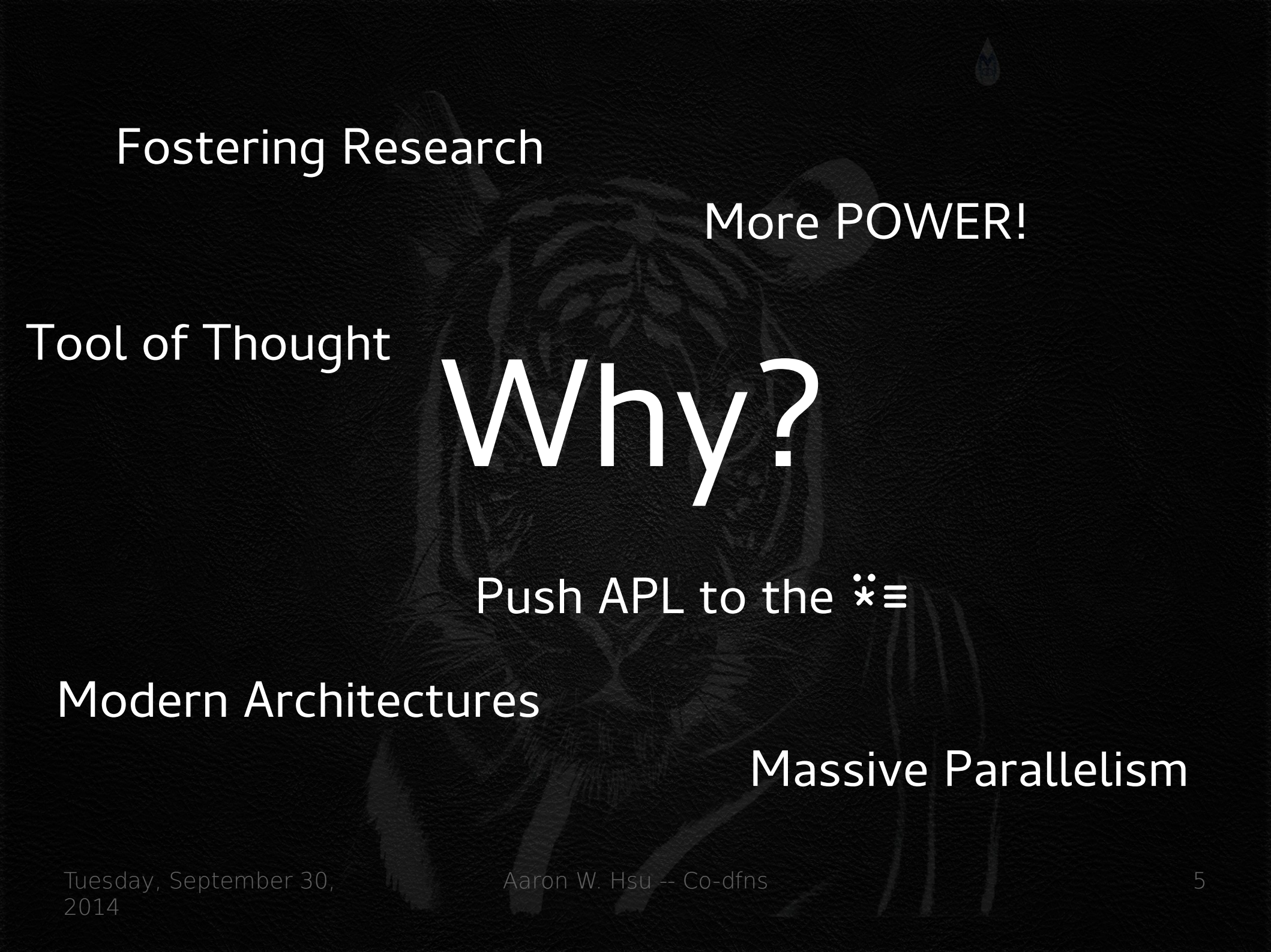
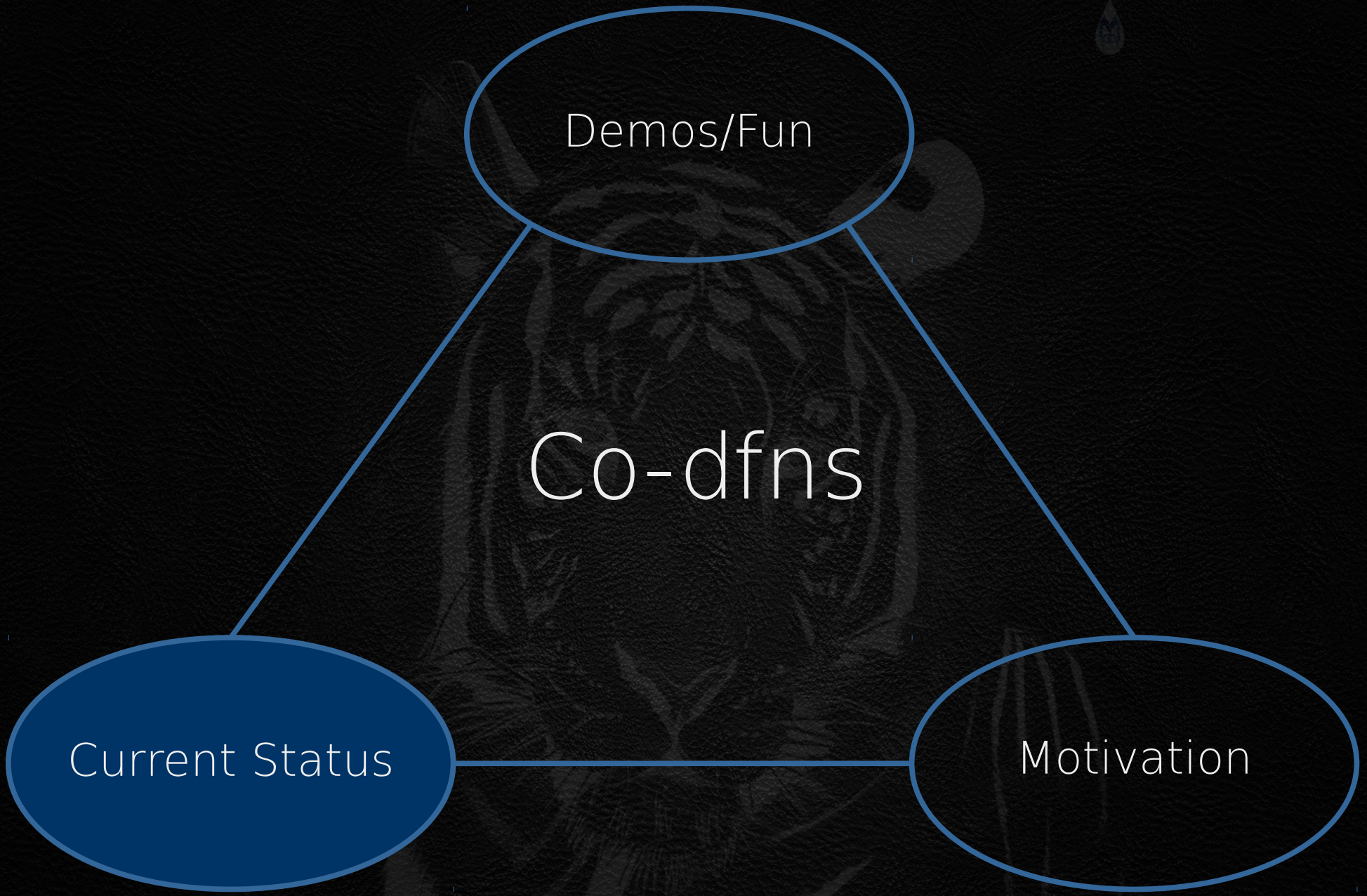
Why?


Fostering Research
More POWER!
Tool of Thought
Why?
Push APL to the ⍣≡
Modern Architectures
Massive Parallelism


What?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Current Status

ARRAY '14

Black Scholes

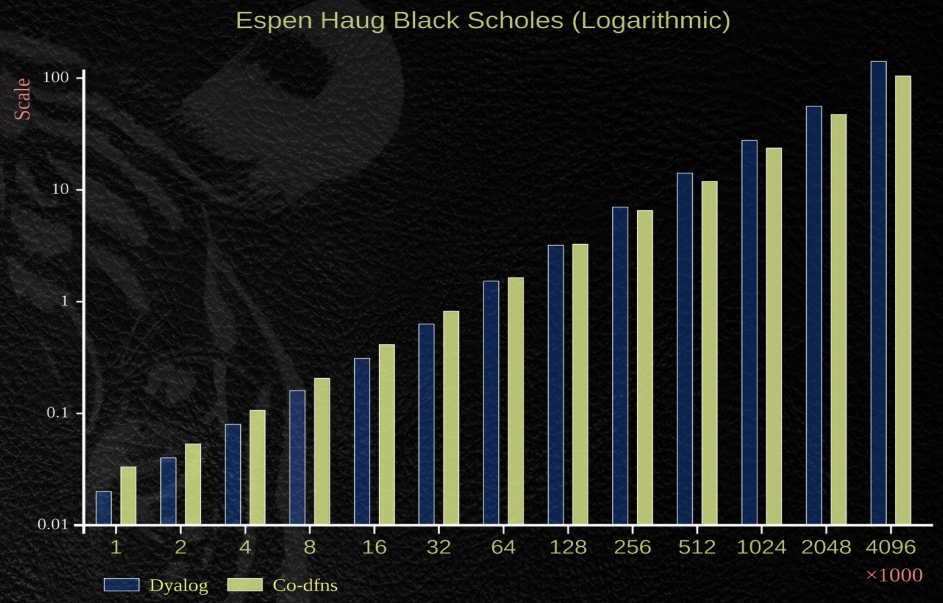
Runtime design

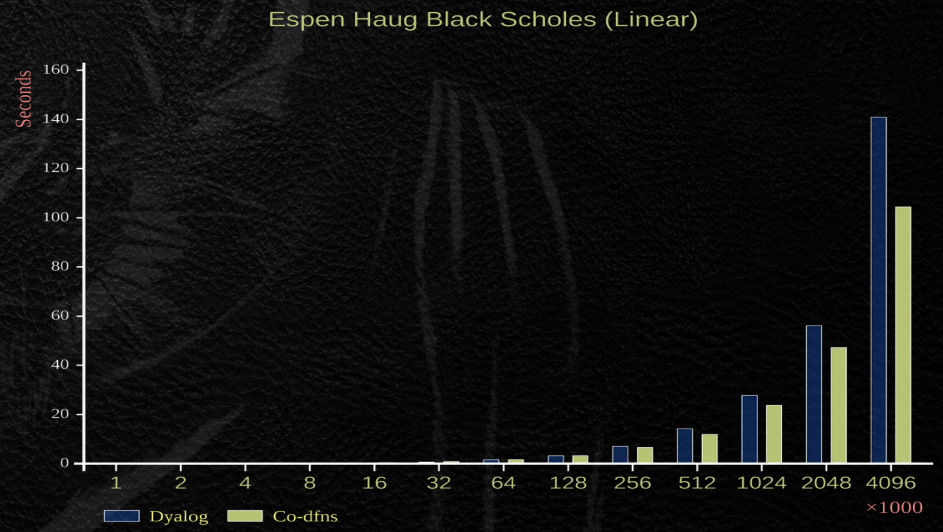
C Generation

Mystika

Type system

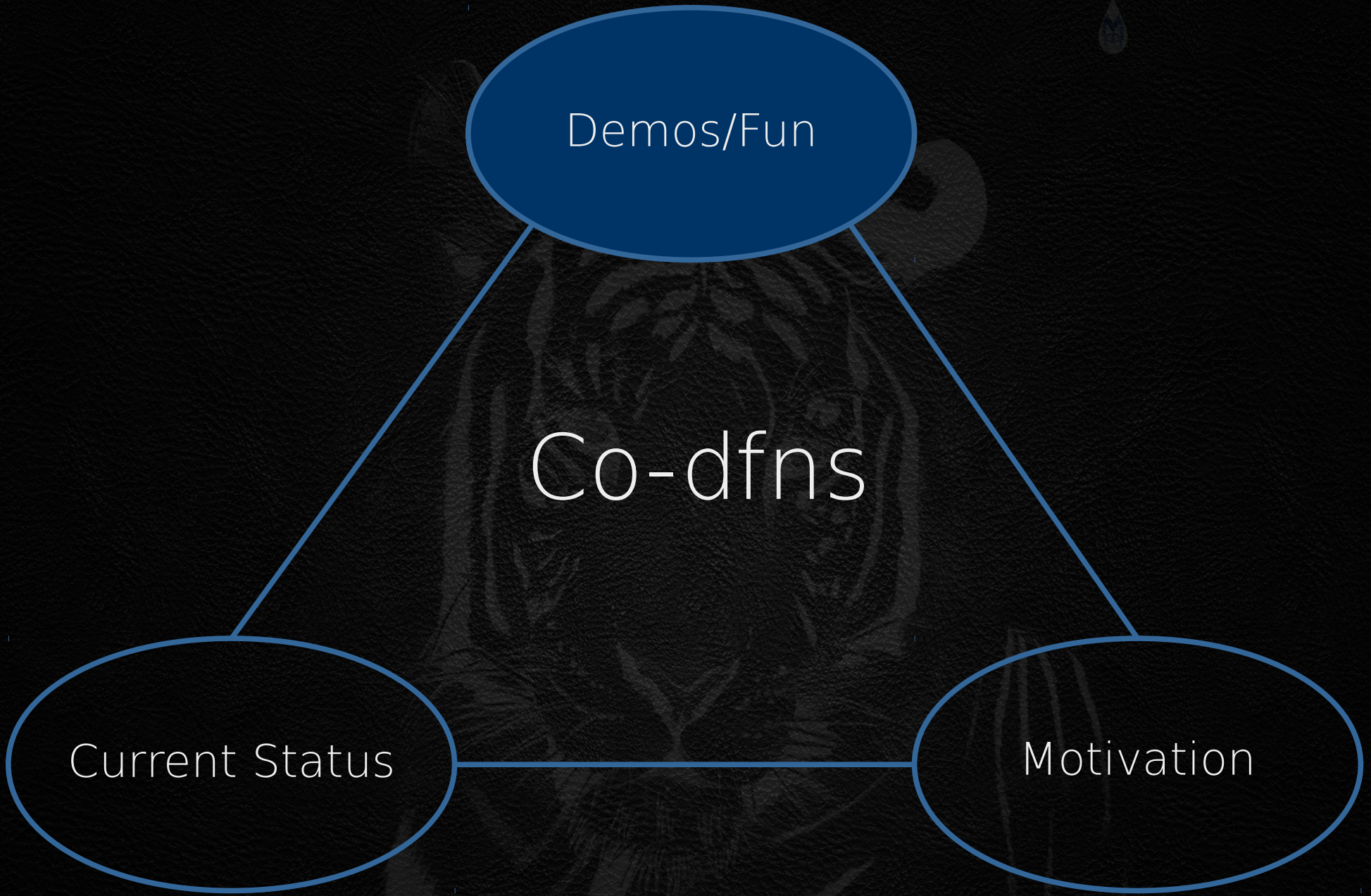
A *little* more...;-)





Optimizations

~~Optimizations~~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Choose your own ~~adventure~~ demo

Basic Compiler Example

Black Scholes Benchmark

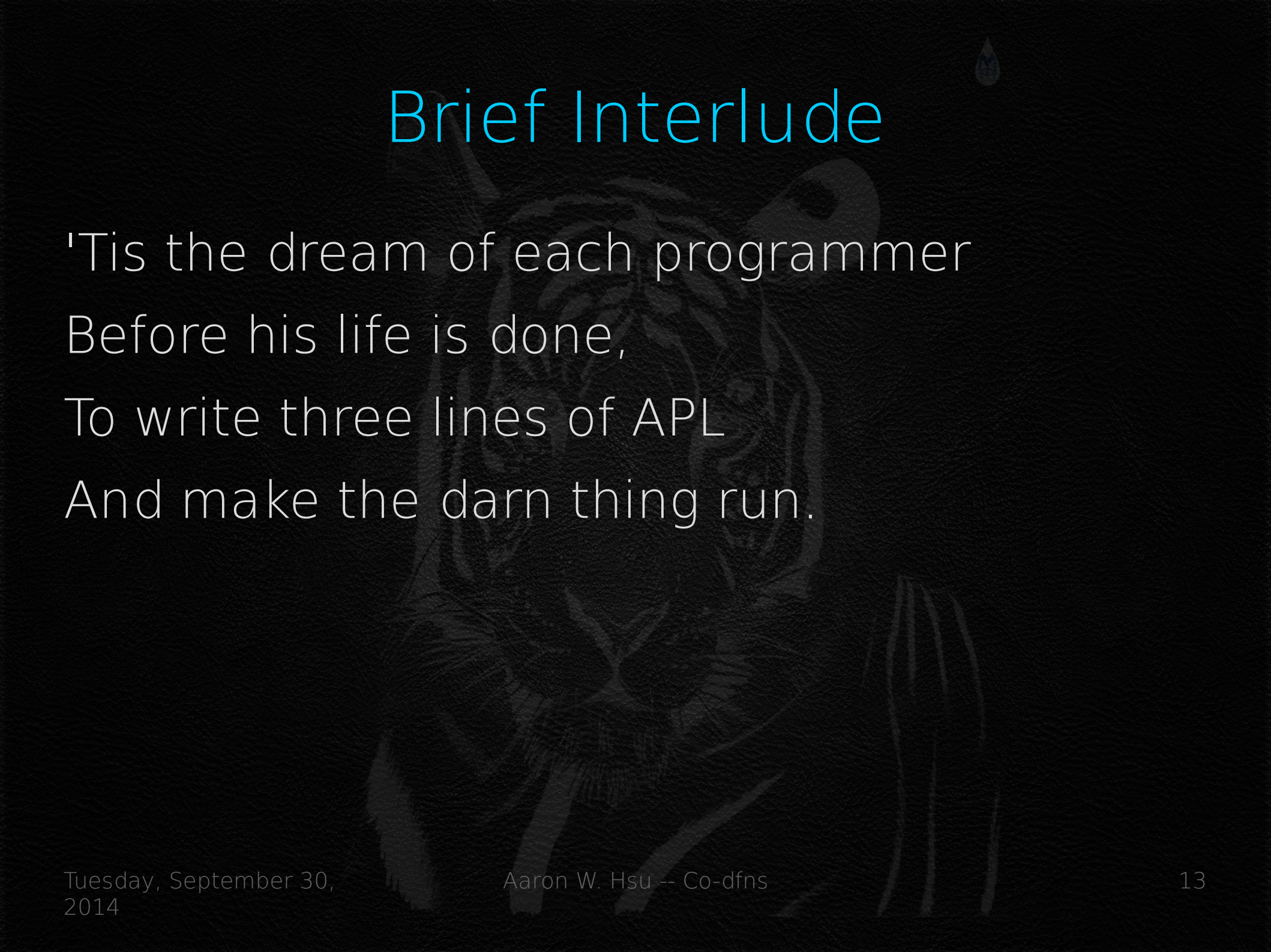
Special Sauce

Mystika

Compiler Design/Development/Architecture

Brief Interlude

'Tis the dream of each programmer
Before his life is done,
To write three lines of APL
And make the darn thing run.



Fun Stuff

Compiler Sans Parser → 187 lines

Runtime System → 500-900 lines

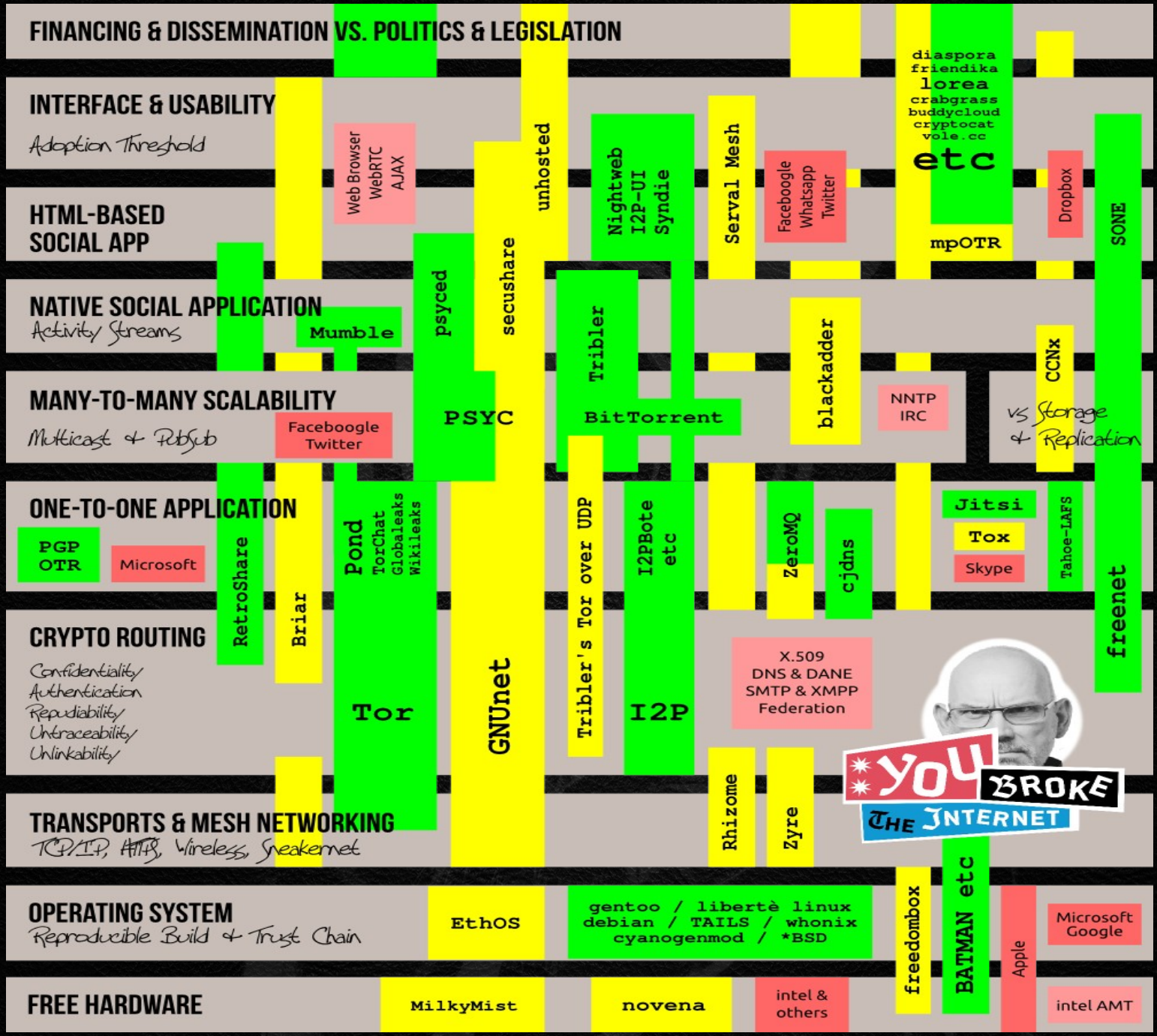
A compiler with almost no branching/recursion

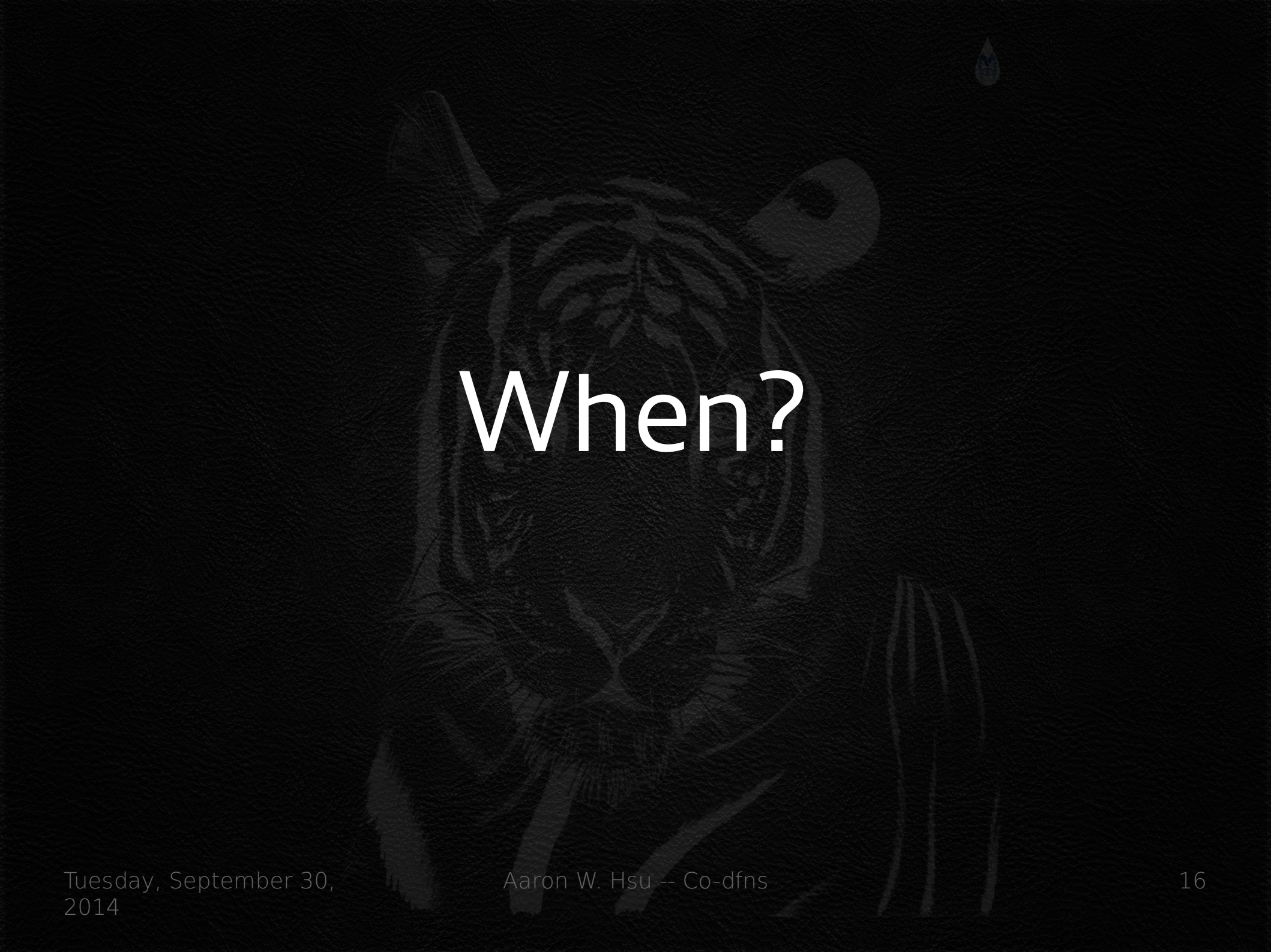
A **real** solution to APL Type Systems

Leverages Index-of and Key/Rank

Plenty of Function Trains

Trivially switch from GPU to CPU and back


FINANCING & DISSEMINATION VS. POLITICS & LEGISLATION
INTERFACE & USABILITY
Adoption Threshold
HTML-BASED SOCIAL APP
NATIVE SOCIAL APPLICATION
Activity Streams
MANY-TO-MANY SCALABILITY
Multicast + PubSub
ONE-TO-ONE APPLICATION
CRYPTO ROUTING
Confidentiality
Authentication
Repudiability
Untraceability
Unlinkability
TRANSPORTS & MESH NETWORKING
TCP/IP, HTTP, Wireless, Sneakernet
OPERATING SYSTEM
Reproducible Build + Trust Chain
FREE HARDWARE
Web Browser
WebRTC
AJAX
unhosted
Nightweb
I2P-UI
Syndie
Serval Mesh
Faceboogle
Whatsapp
Twitter
diaspora
friendika
lorea
crabgrass
buddycloud
cryptocat
vole.cc
etc
mpOTR
Dropbox
SONE
Mumble
psyced
secushare
Tribler
BitTorrent
blackadder
NNTP
IRC
CCNx
vs Storage
+ Replication
PSYC
Faceboogle
Twitter
PGP
OTR
Microsoft
RetroShare
Briar
Pond
TorChat
Globaleaks
Wikileaks
Tor
GNUnet
Tribler's Tor over UDP
I2PBote
etc
I2P
ZeroMQ
cjdns
Jitsi
Tox
Skype
Tahoe-LAFS
freenet
X.509
DNS & DANE
SMTP & XMPP
Federation
Rhizome
Zyre
YOU BROKE THE INTERNET
EthOS
gentoo / libertè linux
debian / TAILS / whonix
cyanogenmod / *BSD
freedombox
BATMAN etc
Apple
Microsoft
Google
MilkyMist
novena
intel &
others
intel AMT


When?

Thank You

Gratipay.com/arcfide

Github.com/arcfide

Sacrideo.us

SEND MORE CODE!

Community-ready parser

Intermediate Reuse

```
D1←(⊛S÷X)+(r+2÷⍤¨v*2)×T
```

```
int p(A *z, A *l, A *r)
```

```
div(t1, s, x)
log(t1, NULL, t1)
```

```
T1←⊛S÷X
D1←T1×T
T1←r+2÷⍤¨v*2
D1←T1+D1
```

Frame Size Reduction

Register allocation for array variables

Reduce function call overhead

Better memory locality

```
{X←⍺×⍵ ⋄ Y←2*X ⋄ ⍴Y}
```

Scalar Function Fusion

```
D1←(⊛S÷X)+(r+2÷⍨⍣¨v*2)×T
```

```
D1←{S←⍵⌷⍨,S ⋄ X←⍵⌷⍨,X ⋄ T←⍵⌷⍨,T
  (⊛S÷X)+(r+2÷⍨⍣¨v*2)×T
}¨⍳×/⍴T
```

Stack Functions/Operators

```
g←{a←7×⍵ ⋄ b←3×⍺ ⋄ f←{⍵+a+b} ⋄ _ f _}

f←{ ⍵ Depth 1
  ⍵+(0 ⎕ENV 1)+(1 ⎕ENV 1)
}
g←{a←7×⍵ ⋄ b←3×⍺ ⋄ f(_ _ _ (⎕ENV 0))}
```

Lazy Data Copying

- Structure primitives don't touch data values
- Don't copy data until needed (copy on write)
- Allows very fast manipulation of arrays
- Should be possible without reference counting