

Service Discovery with CoreDNS Plugins in Golang

*Yong Tang, MobileIron
John Belamaric, Google*



Speakers



Virtual

- Yong Tang
 - GitHub: yongtang
 - Maintainer: CoreDNS and Docker
 - SIG IO Lead & Maintainer: TensorFlow
 - Director of Engineering, MobileIron
- John Belamaric
 - GitHub: johnbelamaric
 - Maintainer: CoreDNS
 - Co-chair Kubernetes SIG Architecture
 - Reviewer/Approvers, Kubernetes SIG Network
 - Author: *Learning CoreDNS* (<https://book.coredns.opensourcesoftware.rocks>)
 - Author: *OpenStack Cloud Application Development*
 - Senior Staff Software Engineer, Google



CoreDNS

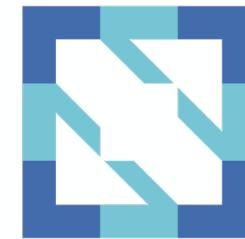


Agenda

- Introduction
- Status Update
- CommunityBridge and Google Summer of Code programs
- Demo Plugin in Golang: Source Based Service Discovery
- Q & A



CoreDNS



CoreDNS



- Flexible DNS server written in Go
- Focus on service discovery
- Plugin based architecture, easily extended
- Default DNS server in Kubernetes
- Supports DNS, DNS over TLS, DNS over gRPC
- Support AWS Route53, Azure DNS, Google Cloud DNS sync up
- Started and led by Miek Gieben



CoreDNS Updates



Virtual

- 1.6.0 - 1.6.9
 - 1.6.0 released on July 28, 2019
 - New plugins: **azure**, **acl**, **bufsize**, **clouddns**
 - **cache** plugin adds `serve_stale` option
 - **reload** plugin checks imports not just main Corefile
- 1.7.0 - 1.7.1
 - 1.7.0 released on June 17, 2020
 - New plugins: **dns64** (was external, now default)
 - **federation** plugin removed
 - New metrics names (backwards incompatible)
- 1.8.0
 - Expected October 23, 2020
 - New plugins: **transfer**



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CoreDNS Community

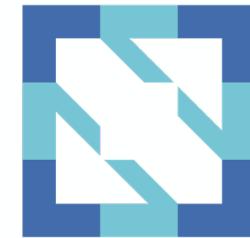


Virtual

- 238 Contributors (Big Thanks!)
- 24 Maintainers
- 30 Public Adopters
- 6600+ Stars



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CoreDNS Community



Virtual

- Most active:
 - GitHub: <https://github.com/coredns/coredns>
 - Slack: **#coredns** on <https://slack.cncf.io>
- More resources:
 - Web: <https://coredns.io>
 - Blog: <https://blog.coredns.io>
 - Twitter: [@corednsio](https://twitter.com/corednsio)



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CommunityBridge Program



Virtual

- Sponsored by Linux Foundation
- Participated 2 years in a row (2019-2020)
- 2019: Palash Nigam (GitHub: `palash25`)
 - Google CloudDNS plugin
- 2020: Jayesh Sharma (GitHub: `wjayesh`)
 - CoreDNS Healthcheck on Kubernetes



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Google Summer of Code



Virtual

- Participated 4 years in a row (2017-2020)
- 2017: Varyoo (GitHub: varyoo)
- 2018: Jiacheng Xu (GitHub: jiachengxu)
- 2019: An Xiao (GitHub: ihac)
- 2020: Chanakya Ekbote (GitHub: cekbote)
 - Machine Learning-based DNS threat detection



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Machine Learning + CoreDNS

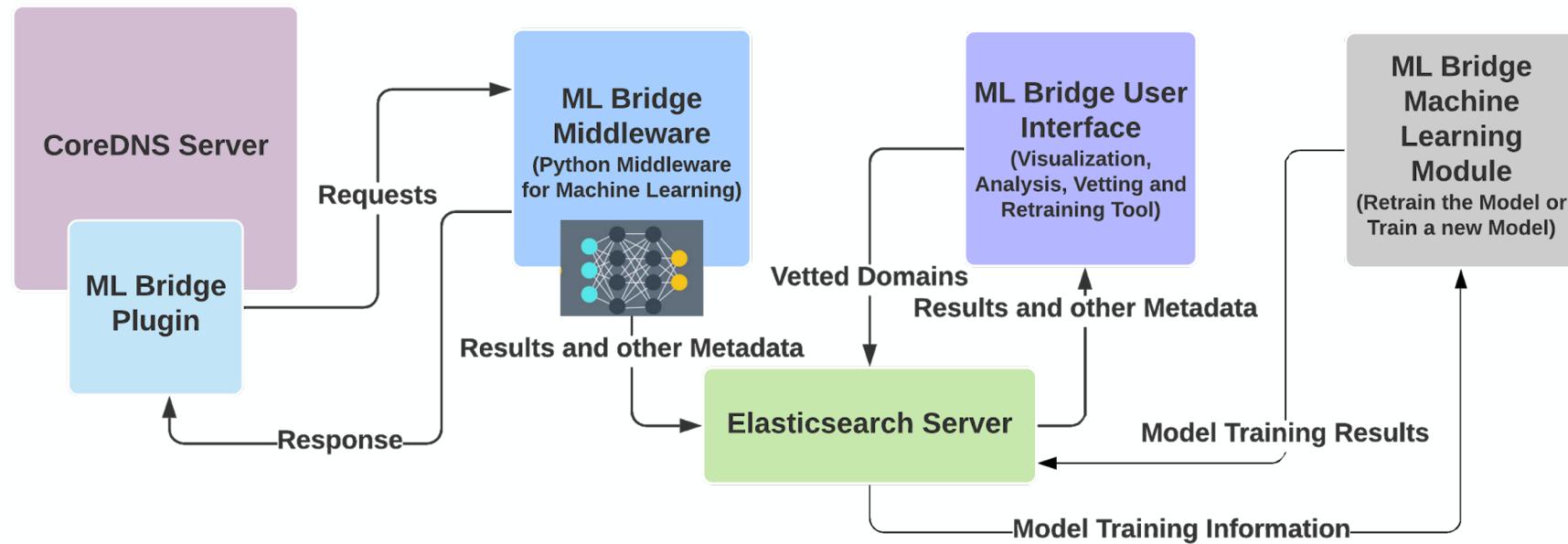
KubeCon
CloudNativeCon
North America 2020

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ML BRIDGE

<https://mlbridge.github.io/>



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Machine Learning + CoreDNS

KubeCon
CloudNativeCon
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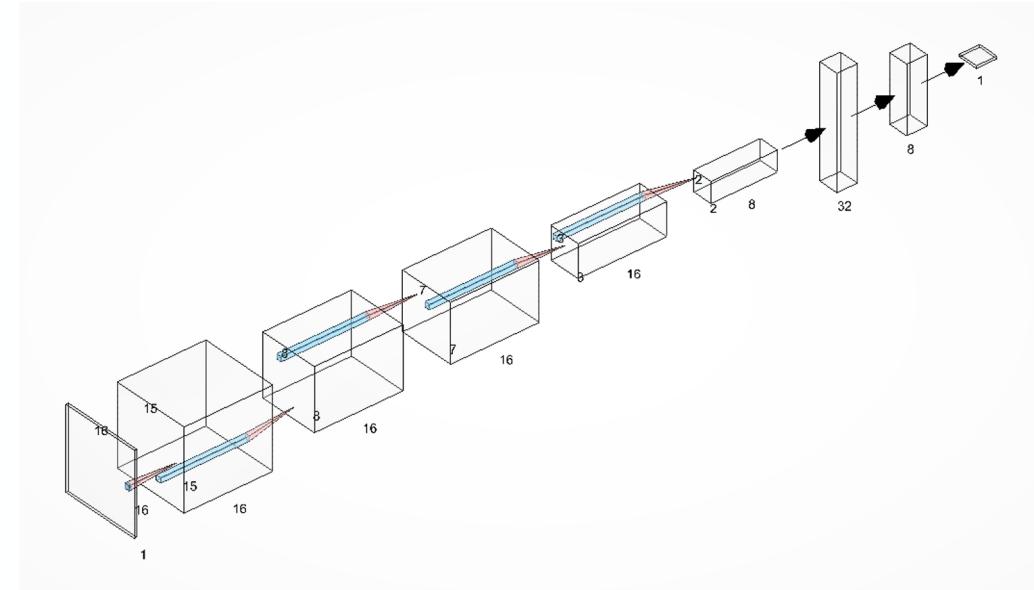
Virtual



ML BRIDGE

<https://mlbridge.github.io/>

The screenshot shows the ML BRIDGE web application interface. At the top, there's a navigation bar with tabs for 'Dash', 'Analysis', 'Vetting', 'Training', and 'Learn More'. Below the navigation, the title 'Domain Name Cyber Security' is displayed. On the left side, there are several input fields and dropdown menus: 'Domain Name' (with placeholder 'Enter a Domain Name'), 'Start Date' and 'End Date' for date range selection, and 'Requests per' (with options 'Day', 'Hour', and 'Minute'). There's also a 'Submit' button. To the right of these inputs is a 'Requests Plot' section containing a grid with axes labeled 'Requests' (Y-axis) and 'Time' (X-axis). Below the plot are buttons for 'IP Address', 'Malicious Domains', 'Benign Domains', and 'Whois Info'. A 'Learn More' button is located in the top right corner of the main content area.



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Service Discovery with DNS

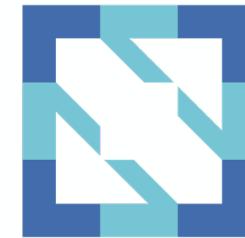


Virtual

- DNS is a nice indirection
- Maximum flexibility
- Easy and simple to change
- Distributed in nature, scales to Internet
- DNS Pervasive in IT infrastructure



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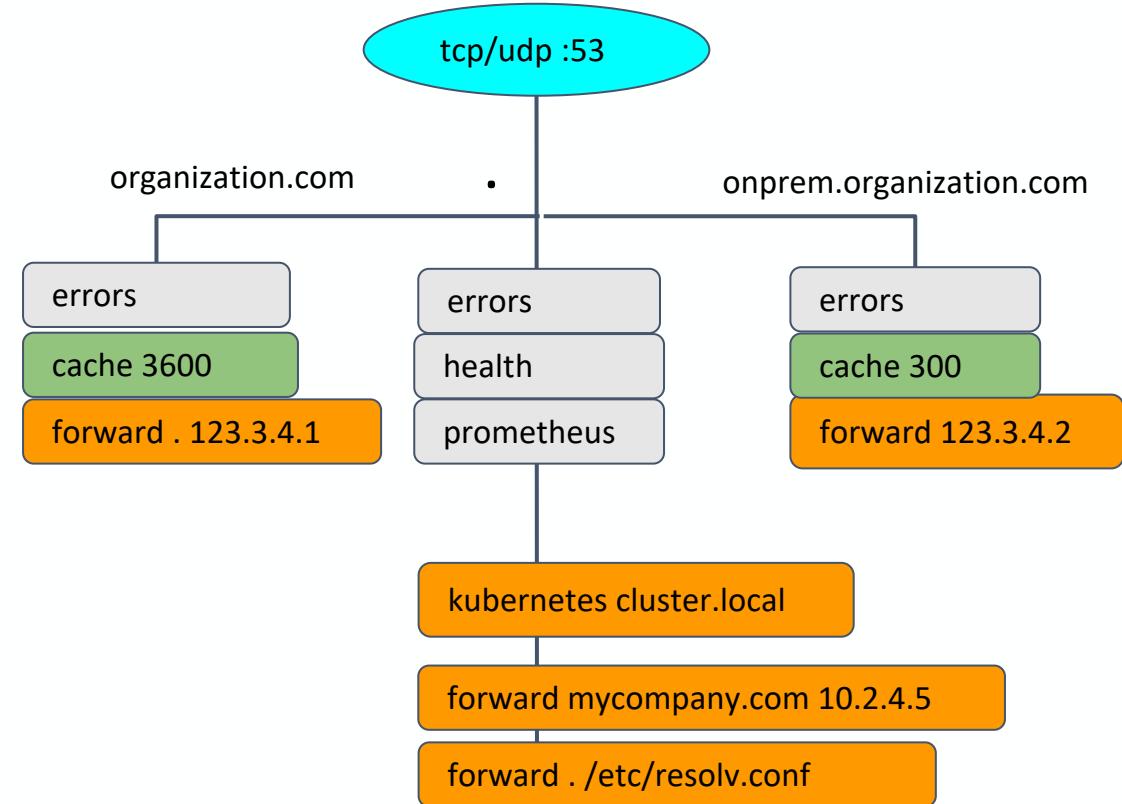


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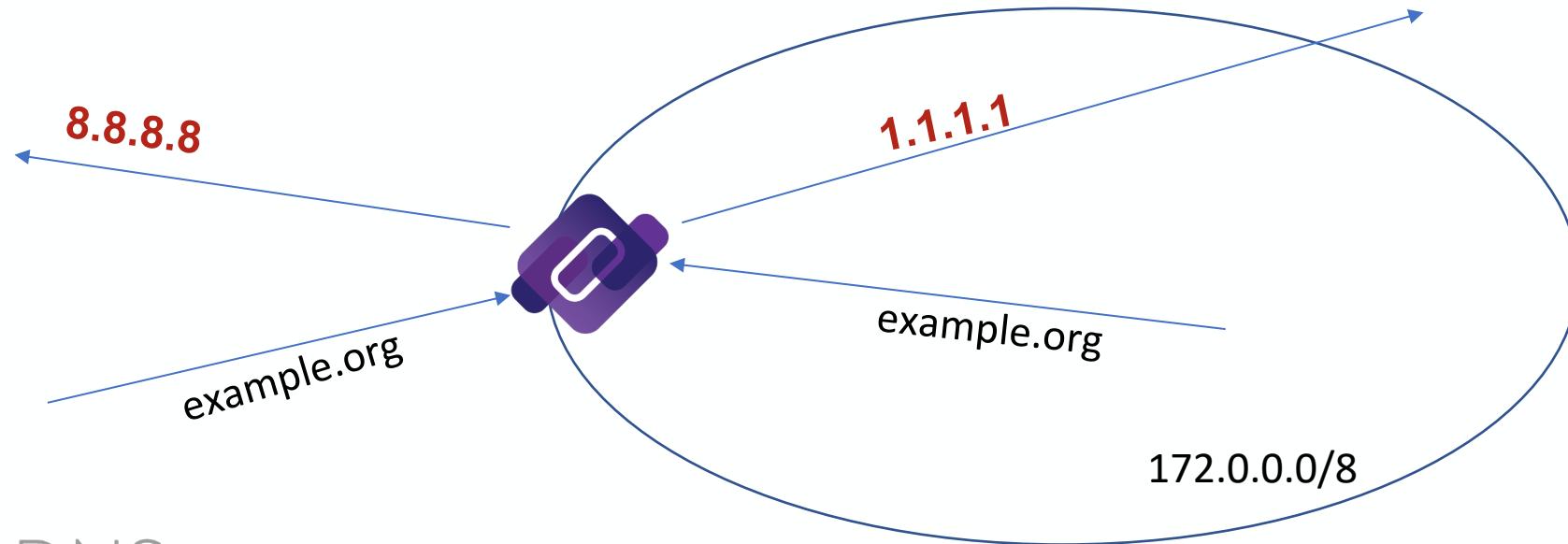
Resolving a Query

```
organization.com:53 {  
    errors  
    cache 3600  
    forward . 123.3.4.1  
}  
  
onprem.organization.com:53 {  
    errors  
    cache 300  
    forward . 123.3.4.2  
}  
  
.::53 {  
    errors  
    health  
    kubernetes cluster.local ... {  
        ...  
    }  
    forward mycompany.com 10.2.4.5  
    forward . /etc/resolv.com  
}
```



Demo Plugin in Golang

- Source IP based service discovery
 - Returns "**1.1.1.1**" for 172.0.0.0/8 or 127.0.0.0/8
 - Returns "**8.8.8.8**" otherwise



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Demo Plugin – Functions



Virtual

setup.go

init()

- Performs one-time initializations, register the setup function with Caddy

setup(c *caddy.Controller) error

- Parses the configuration from the file and captures it in a struct
- Adds the handler to the Config object (represents a stanza)
- Called once for each use of the plugin in the Corefile

demo.go

ServeDNS(context.Context, dns.ResponseWriter, *dns.Msg) (int, error)

- Processes the DNS request and returns a response, or passes it down the chain



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Demo Plugin – Setup



Virtual

```
func init() {
    caddy.RegisterPlugin("demo", caddy.Plugin{
        ServerType: "dns",
        Action:     setup,
    })
}

func setup(c *caddy.Controller) error {
    c.Next() // 'demo'
    if c.NextArg() {
        return plugin.Error("demo", c.ArgErr())
    }
    dnsserver.GetConfig(c).AddPlugin(func(next plugin.Handler) plugin.Handler {
        return Demo{}
    })
    return nil
}
```



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Demo Plugin – ServeDNS



Virtual

```
// ServeDNS implements the plugin.Handler.ServeDNS.

func (p Demo) ServeDNS(ctx context.Context, w dns.ResponseWriter, r *dns.Msg) (int, error) {
    state := request.Request{W: w, Req: r}
    qname := state.Name()
    reply := "8.8.8.8"
    if strings.HasPrefix(state.IP(), "172.") || strings.HasPrefix(state.IP(), "127.") {
        reply = "1.1.1.1"
    }
    fmt.Printf("Received query %s from %s, expected to reply %s\n", qname, state.IP(), reply)
    ...
}
```



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Demo Plugin – Corefile



Virtual

```
.:1053 {  
    # By default all plugins  
    # are disabled initially,  
    # unless enabled explicitly  
    #  
    demo  
}
```



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Demo Plugin – Build



Virtual

```
$  
$ # add demo:demo to plugin.cfg  
$  
$ # build with docker (golang:1.12)  
$ docker run --rm -i -t -v \  
$     $PWD:/v -w /v golang:1.12 sh -c 'make gen && make'  
$  
$ # configure Corefile and run coredns  
$  
$ ./coredns  
$
```



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Demo Plugin – Source Code



Virtual

<https://github.com/coredns/demo>



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CoreDNS: Contribution



Virtual

- Star CoreDNS in GitHub:
 - <https://github.com/coredns/coredns>
- Add the name to **ADOPTERS.md**
- Participate in GitHub or Slack discussions
 - Slack: **#coredns** on <https://slack.cncf.io>
- Create a PR to become a contributor
- Become a maintainer
 - One significant pull request
 - Sponsored by one current maintainer



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KubeCon



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THANK YOU



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