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# Deep Dive CoreDNS

Yong Tang – MobileIron

John Belamaric – Google



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CoreDNS



**CLOUD NATIVE  
COMPUTING FOUNDATION**

# Speakers



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- Yong Tang
  - GitHub: [yongtang](https://github.com/yongtang)
  - Maintainer: CoreDNS and Docker
  - SIG IO Lead & Maintainer: TensorFlow
  - Director of Engineering, MobileIron
- John Belamaric
  - GitHub: [johnbelamaric](https://github.com/johnbelamaric)
  - Maintainer: CoreDNS
  - Reviewer/Approver, Kubernetes SIG-network
  - Author: *Learning CoreDNS* (preview at <https://book.coredns.opensourcesoftware.rocks>)
  - Author: *OpenStack Cloud Application Development*
  - Senior Staff Software Engineer, Google



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# Agenda



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- Introduction
- Status Update
- Google Summer of Code
- Technical Deep Dive
- Demo Plugin: Source Based Service Discovery
- Q & A



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# CoreDNS



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- 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 Route53 DNS sync up
- Started and led by Miek Gieben



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# CoreDNS Community

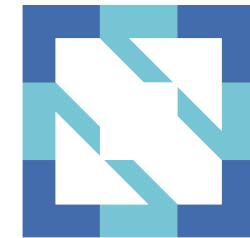


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- 148 Contributors (Big Thanks!)
- 16 Maintainers
- 29 Public Adopters
- 4000+ Stars



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# CoreDNS Community



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- 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)
  - Mailing list/group (not very active):
    - [coredns-discuss@googlegroups.com](mailto:coredns-discuss@googlegroups.com)



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# Google Summer of Code



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- Participated 3 years in a row (2017-2019)
- 2017: Varyoo (GitHub: varyoo)
- 2018: Jiacheng Xu (GitHub: jiachengxu)
- 2019: Proposal accepted



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# Technical Deep Dive



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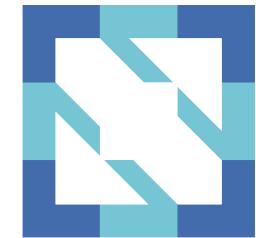
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- Updates for Kubernetes Users
- How Queries Are Resolved
- Building Your Own Plugin



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# Updates for Kubernetes Users



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- Kubernetes 1.11 - 1.14 use CoreDNS 1.2.6
- Key, relevant changes from 1.2.6 to 1.5.0
  - k8s\_external plugin proxy -> forward
  - health -> health & ready
  - grpc
  - kubernetes TTLs now apply to negative responses (e.g., NXDOMAIN)
  - upstream option no longer needed
  - multiple API server endpoints no longer supported
  - API server resync disabled



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# Updates for Kubernetes Users



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- **BACKWARDS INCOMPATIBLE CHANGES**

- These are why 1.5.0 is not yet used by default in Kubernetes - different deprecation policies
- Corefile migration tool in progress
- proxy -> forward
- health -> health & ready
- upstream option changes
- multiple API endpoints no longer supported

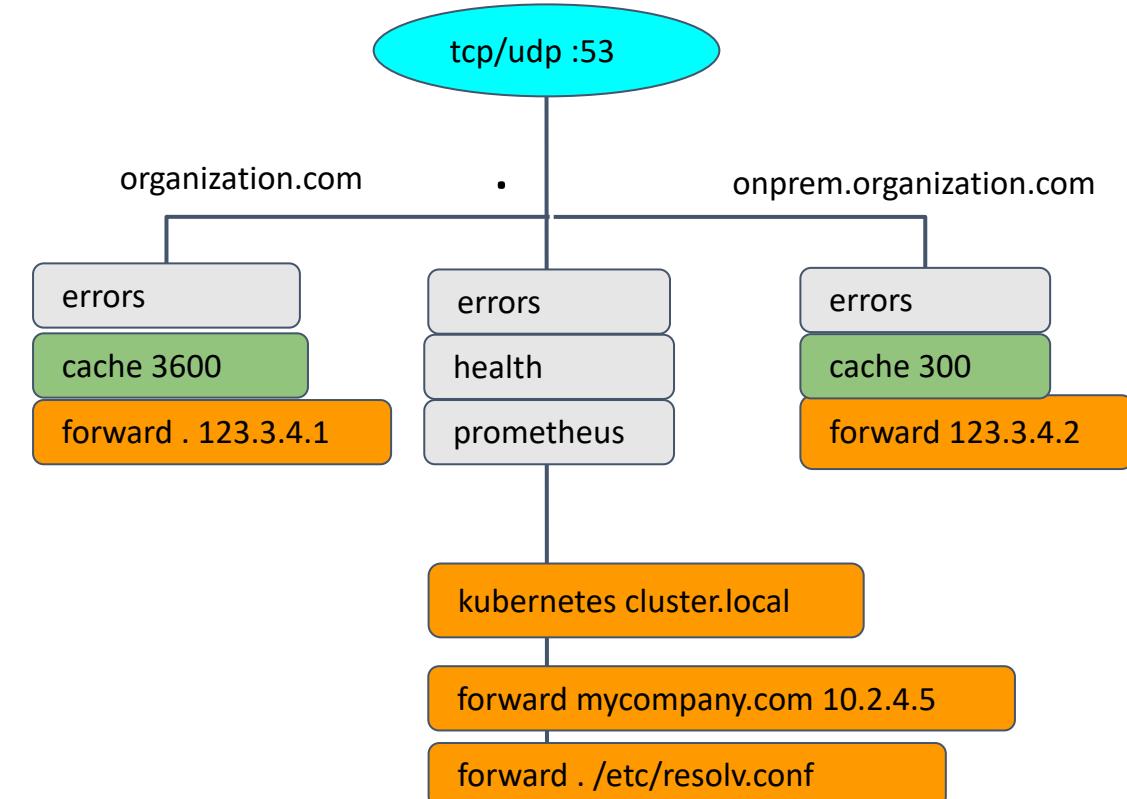


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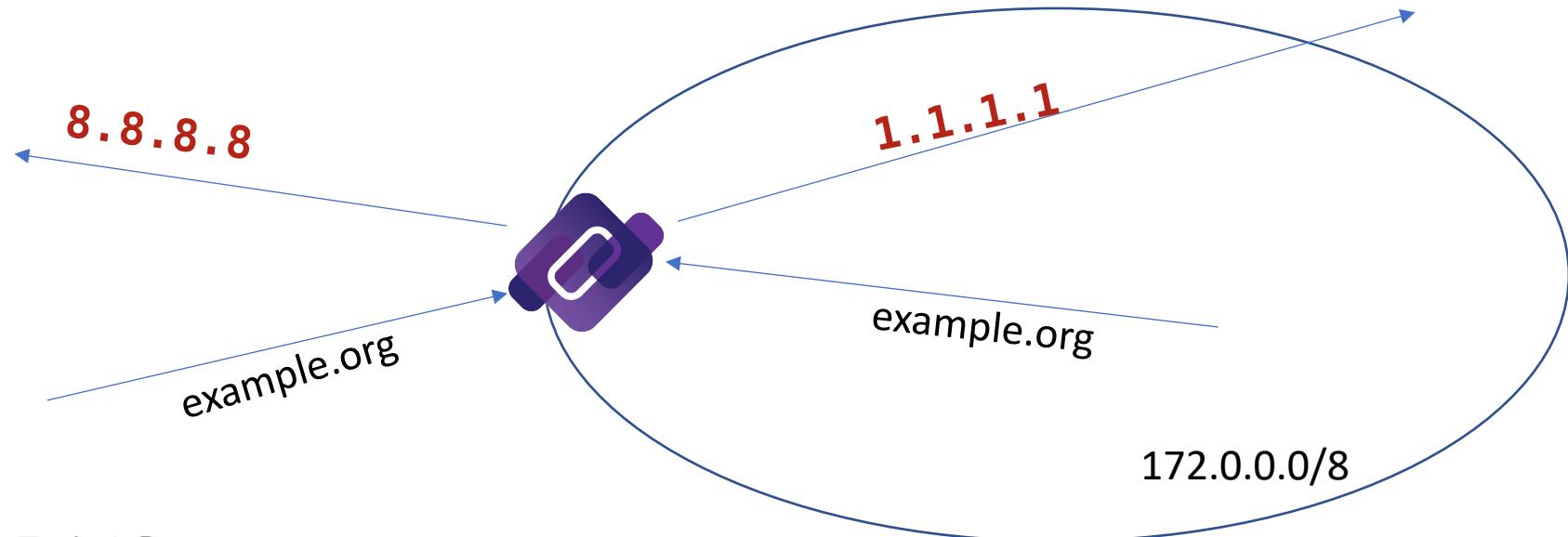
# Resolving a Query

```
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

- 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: Three Functions



## 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



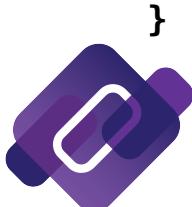
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# Demo Plugin: Setup

```
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 Part 1



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```
// 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: ServeDNS Part 2



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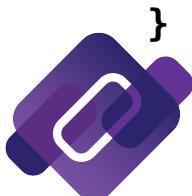


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```
func (p Demo) ServeDNS(ctx context.Context, w dns.ResponseWriter, r *dns.Msg) (int, error) {
    ...
    rr := new(dns.A)
    rr.Hdr = dns.RR_Header{Name: qname, Rrtype: dns.TypeA, Class: dns.ClassINET}
    rr.A = net.ParseIP(reply).To4()
    answers = append(answers, rr)
    m := new(dns.Msg)
    m.SetReply(r)
    m.Authoritative = true
    m.Answer = answers

    w.WriteMsg(m)
    return dns.RcodeSuccess, nil
}
```



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# Demo Plugin: Corefile



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



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# Demo Plugin: Build



```
$  
$ # 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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# CoreDNS: Contribution Welcome



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- 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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# THANK YOU



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