



A UNIFIED DNS FOR AMATEUR RADIO: AR-DNS.NET

MANY APPLICATION DEVELOPERS FOR AMATEUR RADIO CREATE APPLICATION SPECIFIC METHODS FOR DISTRIBUTING AND RESOLVING HOST ADDRESSES AND ANCILLARY NETWORK INFORMATION. [AR-DNS.NET](https://ar-dns.net) IS A COMMON REPOSITORY AND DNS INFRASTRUCTURE TO STORE AND DISTRIBUTE THIS INFORMATION.

HISTORY

- TCP/IP applications have been in amateur radio since the late 1970s
- AMPRnet (Net-44) is a 16 million address network for Amateur Radio
 - Traditionally RF based and low baud rate
 - Internet tunnels to interconnect islands of networked nodes
 - High speed links now available with Internet peering (BGP), e.g. HamWAN and Hamnet
 - Manually maintained host files with DNS

HISTORY

- VOIP (Voice Over IP) and (Video Over IP)
 - Linking (IRLP, Echolink, AllStar, Reflector Systems)
 - Routing (D-STAR, Fusion, DMR)
 - Remote Base Audio
- Command, Control, and Monitoring
 - Remote Base
 - Security
 - Telemetry

HISTORY

- Email, File Sharing, Bulletin Boards, Webservers, Services
 - JNOS
 - WinLink
 - DX Clusters
 - APRS-IS
 - Etc.

LEGACY NETWORK DESIGN

AD HOC AND MANUAL

- In the early days, computers had a host file of the addresses used by computers in their network (i.e. /etc/hosts \windows\hosts)
- A general lookup service for hosts is not common
 - Host files were copied and distributed to participants in these separate networks
 - Similar in form, but not always.
 - Always out of date

ENTER THE INTERNET

- The Internet is designed to bring interoperation on separate networks through a common set of network protocols and services
 - Supercedes 'Vendor Specific' networking
 - DECnet, XNS, Novell, SNA, AppleTalk, ...
 - Address Space for Hosts and Devices
 - IPv4 (32 Bits) – $x.x.x.x = 4,294,967,296$ unique addresses
 - IPv6 (128 bits) – $x:x:x:x:x:x:x:x = 3.4 \times 10^{38}$ or 340 undecillion addresses

ENTER THE DOMAIN NAME SYSTEM (DNS)

The Domain Name System (DNS) is a hierarchical decentralized naming system for computers, services, or other resources connected to the Internet or a private network. It associates various information with domain names assigned to each of the participating entities. Most prominently, it translates more readily memorized domain names to the numerical IP addresses needed for locating and identifying computer services and devices with the underlying network protocols. By providing a worldwide, distributed directory service, the Domain Name System is an essential component of the functionality of the Internet, that has been in use since 1985. -- Wikipedia

AR-DNS.NET

AMATEUR RADIO – DOMAIN NAME SYSTEM NETWORK

AR-DNS.NET creates a common naming service for all amateur related hosts, services, devices, protocols, etc. using well developed DNS services, giving application developers and end users a unified name to address resolution service.

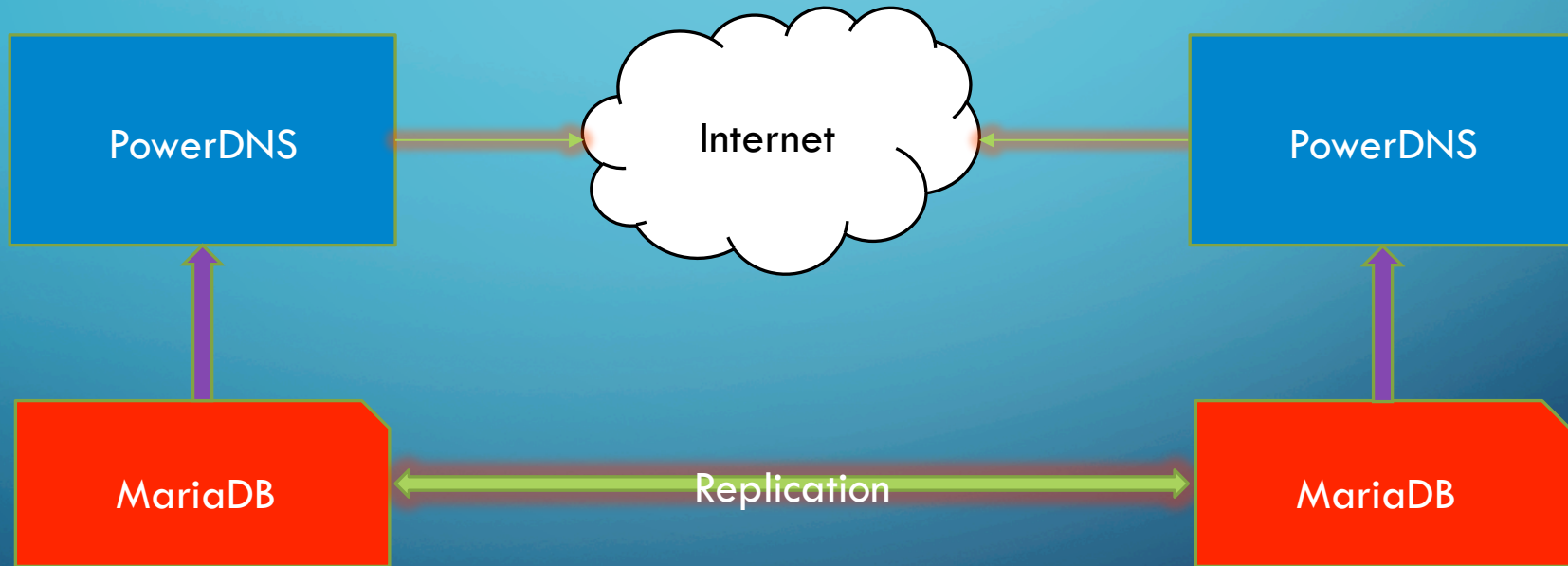
GETTING FROM HERE TO THERE

- Establish a domain namespace for the service DONE
- Build a prototype name server with secondary servers DONE
- Collect data to populate the name server UNDERWAY
 - Import legacy host files
 - Update on a frequent basis
 - Collect dynamic address information
- Introduce to application developers UNDERWAY
- Provide lookup service and legacy files UNDERWAY

PROTOTYPE DNS SERVER

- Using PowerDNS, a full service name service that uses one or more data repositories for storage and retrieval of DNS records.
- Backend storage is using the MariaDB (compatible with MySQL) engine
 - Currently a single copy but will migrate to replicated servers
 - Easily perform CRUD (Create, Read, Update, and Delete) operations on database records which, in turn, drive the DNS records.

DNS SERVER ARCHITECTURE



DATA COLLECTOR – IRCDDDB (EXTRACT)

```
while running:
    try:
        readbuffer=readbuffer+s.recv(1024)
        temp=string.split(readbuffer, "\n")
        readbuffer=temp.pop( )
        for line in temp:
            line=string.rstrip(line)
            line=string.split(line)

            tokens=line[0].split('!')
            if(len(tokens) > 1):
                addr=tokens[1].split('@')
                call = addr[0].lower()
                UpdateAddRec(call +
                    '.dgw.ar-dns.net','A',addr[1],'dgw',int(time.time()));
```


DATA COLLECTION – HOST FILE COLLECTED

```
body = buffer.getvalue()
lines = body.splitlines()
for line in lines:
    m = re.match(r"(\w+)\s+([\w+\.]
+).*$",line.lower())
    if m is not None:
        call = m.group(1) + '.dcs.ar-dns.net'
        dest = m.group(2)
        if isFQDN(dest):
            rtype = 'CNAME'
        elif isIPv4(dest):
            rtype = 'A'
        UpdateAddRec(call,rtype,dest,'dcs',int(time
.time())-7200);
```

COLLECTED DATA OBJECTS IN QUEUE

```
"nw7dr.dgw.ar-dns.net": {  
  "content": "192.231.186.5",  
  "delta": 3600,  
  "dirty": false,  
  "subdomain": "dgw",  
  "timestamp": 1489344258,  
  "type": "A"  
},
```

```
"xrf001.dextra.ar-dns.net": {  
  "content": "xref.homepc.it",  
  "delta": 3600,  
  "dirty": true,  
  "subdomain": "dextra",  
  "timestamp": 1489342095,  
  "type": "CNAME"  
},
```

SEND NEW AND UPDATED RECORDS TO MARIADB

```
count = 0

for key in list(records):

    if records[key]['dirty']:

        count = count + 1

        ttl = records[key]['delta']

        query = "call dnsupdate(1,'" + key + "','" +
records[key]['type'] + "','" + records[key]['content'] + "','" +
str(ttl) + "');"

        try:

            cur.execute(query)

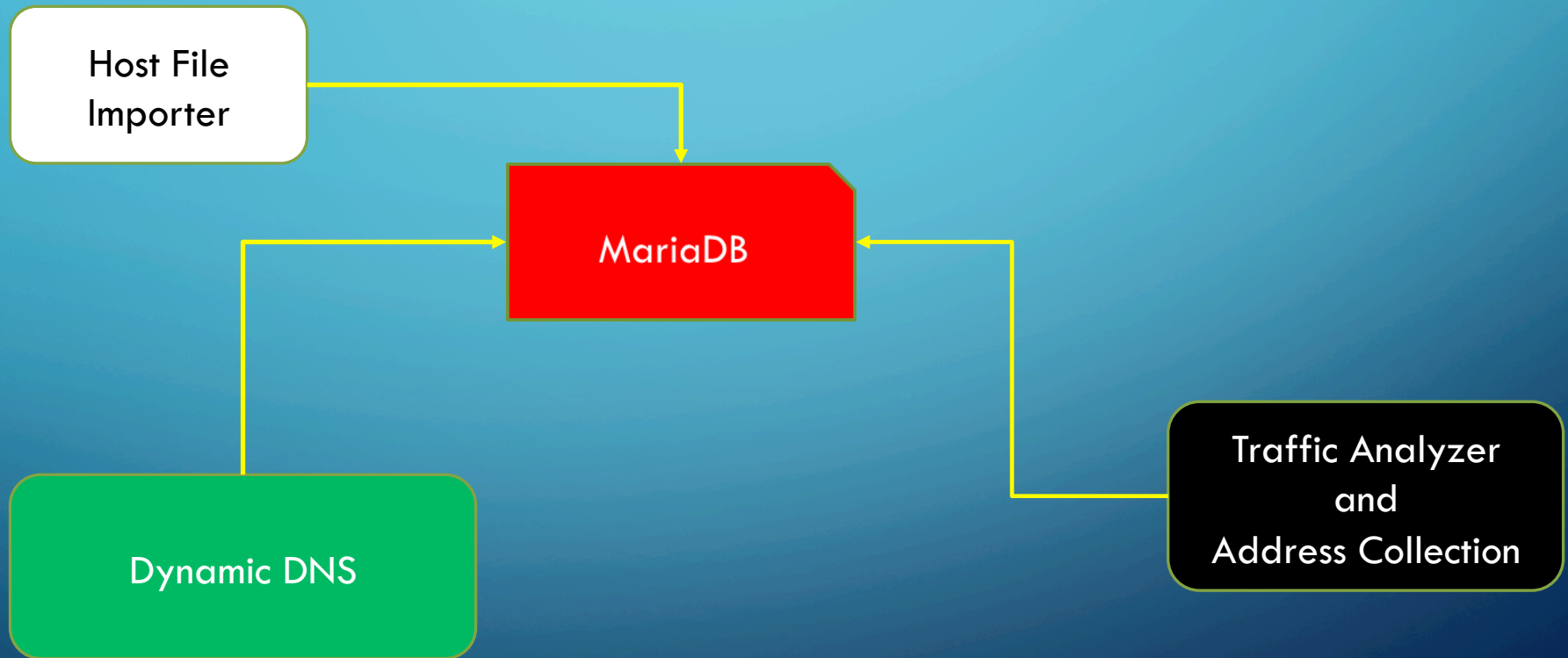
            db.commit()

        except:

            db.rollback()

            records[key]['dirty'] = False
```

COLLECTORS FEEDING DATABASE



COMMON DNS QUERIES TO SUPPORT

- A, AAAA, CNAME – For addressing of hosts
- SRV – For named services and assigned ports
- LOC – Location Records (e.g. Position Reporting)
- TXT – Information about a host

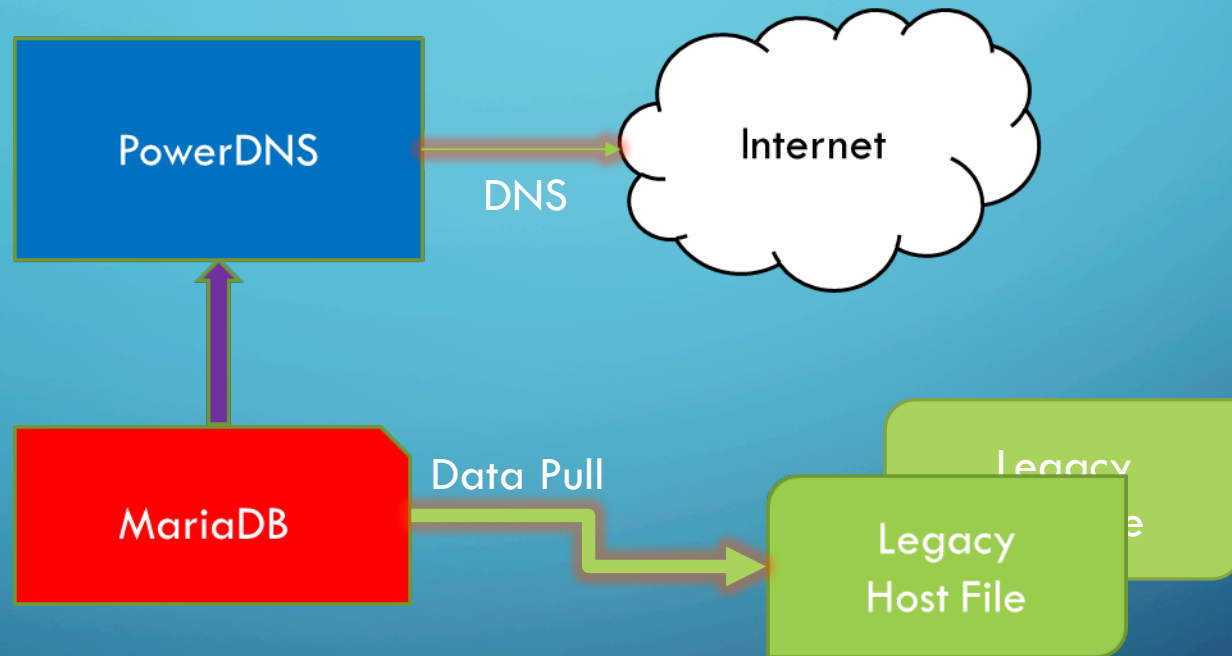
dig -t A nw7dr.dgw.ar-dns.net returns 192.231.186.5

LEGACY FILE PULL

```
app.get('/gateways', function (req, res) {  
  var clientIp = requestIp.getClientIp(req);  
  res.writeHead(200, {'Content-Type': 'text/plain'});  
  
  con.query('SELECT name,type,content FROM records  
WHERE name like \'%.dgw.ar-dns.net\' ORDER BY  
name',function(err,rows){  
    if(err) throw err;  
  
    var date = new Date();  
  
    res.write("# Prepared at ar-dns.net - " +  
date.toUTCString() + "\n");
```

```
    for (var i = 0; i < rows.length; i++) {  
      var name = rows[i].name.split(".")  
[0].toUpperCase();  
      res.write(name + '\t' + rows[i].content + "\n");  
    }  
    res.end();  
  }  
});
```

APPLICATIONS USING DNS AND LEGACY FILES



NEXT STEPS

- Work with application developers to use DNS with host file backup
 - Some work already underway in D-STAR area
- Find volunteers with data center grade servers and bandwidth
 - Geographically Diverse
 - Master / Master core for failover
 - Master / Slave for DNS servers
- API development for additional feeders and collectors

Q&A

Thank You

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