DMARC – A FREE CONTROL TO PROTECT BRANDS

PRESENTED BY JASON WRIGHT

WHOAMI

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AGENDA

- Why would you want/need DMARC
- What is DMARC?
- Components of DMARC
- Configuring SPF
- Configuring DKIM
- DMARC Workflow
- DMARC Configuration
- DMARC Forensics
- Recap
- How to approach DMARC

WHY WOULD YOU WANT/NEED DMARC

- Palo Altos Unit 42's Response Report 2022 Outlines
  - BEC (Business Email Compromise) and Ransomware have been the most prevalent incident types.
  - "BEC heists, on average, earned cybercriminals in the range of $286,000."
  - Domain spoofing/typo squatting/phishing attacks are typically what led to the initial BEC.
- Free control
- Protects your brand from email spoofing
- Most recently become a requirement for some cyber insurance policies
- Verifying that you're validating SPF/DKIM/DMARC for inbound emails can help prevent you from accepting an spoofed email
  - Note: Typically inbound rules for validating these lookups are not configured by default in O365 and many ESG (Email Security Gateways)

WHAT IS DMARC?

- Domain-based Message Authentication, Reporting & Conformance
  - RFC 7489
  - Builds on SPF and DKIM protocols
  - Purpose of DMARC is to give policies for message recipients to follow
  - Policies are P=None, P=Quarantine and P=Reject
  - Protects your brand from email spoofing
  - Should be configured for Parked Domains as well
  - Record is published in DNS and is available to anyone that can look up DNS
  - Completely free to implement

COMPONENTS OF DMARC

- Sender Policy Framework (SPF)
  - Formally Sender Permitted From
  - Path based email authentication technique
  - Specifies which IP addresses are authorized to send on behalf of the organization
  - Started as an experimental protocol by the IETF in 2006 as RFC 4408
  - Updated to RFC 7208 as of 2014

COMPONENTS OF DMARC

- DKIM – Domain Keys Identified Message
  - Signature based email authentication
  - Based off Domain Keys or DK, signature based email authentication developed by Yahoo
    - Documented as RFC 4870
    - Superseded by DKIM
  - Introduced by the IETF in 2007 as RFC 4871
  - Updated to RFC 6376 in 2011
  - Tells the recipient that the email came from trusted infrastructure
  - Will fail if the message is altered in traffic

CONFIGURING SPF

- Sender Policy Framework (SPF)
  - v=spf1 include:_spf.google.com ~all
  - V=spf1 ip:192.168.0.0/24 ip:192.168.0.1 –all
  - V=Version SPFv1
  - Mechanisms
    - ALL = Matches Always
    - A = Domain has an A record
    - IP4 = Sender is in a given IPv4 Range
    - IP6 = Sender is in a given IPv6 Range
- Mechanisms Continued
  - MX = domain has an MX record
  - PTR = Should be avoided – complicated DNS configuration with forward confirmed reverse DNS
  - EXISTS = Resolves to any address, pass
  - Include = references the policy of another domain. If that domain passes, it matches
- Qualifiers
  - + = Pass result, ? = Neutral, ~ = Soft fail, - = FAIL

CONFIGURING SPF

spf:google.com

Solve Email Delivery Problems

spf

```
v=spf1 include:_spf.google.com ~all
```

Prefix	Type	Value	PrefixDesc	Description
	v	spf1		The SPF record version
+	include	_spf.google.com	Pass	The specified domain is searched for an 'allow'.
~	all		SoftFail	Always matches. It goes at the end of your record.

	Test	Result
✓	SPF Record Published	SPF Record found
✓	SPF Record Deprecated	No deprecated records found
✓	SPF Multiple Records	Less than two records found
✓	SPF Contains characters after ALL	No items after 'ALL'.
✓	SPF Syntax Check	The record is valid
✓	SPF Included Lookups	Number of included lookups is OK
✓	SPF Type PTR Check	No type PTR found
✓	SPF Void Lookups	Number of void lookups is OK
✓	SPF MX Resource Records	Number of MX Resource Records is OK
✓	SPF Record Null Value	No Null DNS Lookups found

CONFIGURING SPF

spf:_spf.google.com Solve Email Delivery Problems spf

```
v=spf1 include:_netblocks.google.com include:_netblocks2.google.com include:_netblocks3.google.com ~all
```

Prefix	Type	Value	PrefixDesc	Description
	v	spf1		The SPF record version
+	include	_netblocks.google.com	Pass	The specified domain is searched for an 'allow'.
+	include	_netblocks2.google.com	Pass	The specified domain is searched for an 'allow'.
+	include	_netblocks3.google.com	Pass	The specified domain is searched for an 'allow'.
~	all		SoftFail	Always matches. It goes at the end of your record.

	Test	Result
✓	SPF Record Published	SPF Record found
✓	SPF Record Deprecated	No deprecated records found
✓	SPF Multiple Records	Less than two records found
✓	SPF Contains characters after ALL	No items after 'ALL'.
✓	SPF Syntax Check	The record is valid
✓	SPF Included Lookups	Number of included lookups is OK
✓	SPF Type PTR Check	No type PTR found
✓	SPF Void Lookups	Number of void lookups is OK
✓	SPF MX Resource Records	Number of MX Resource Records is OK
✓	SPF Record Null Value	No Null DNS Lookups found

CONFIGURING SPF

spf:_netblocks.google.com Find Problems Solve Email Delivery Problems spf

```
v=spf1 ip4:35.190.247.0/24 ip4:64.233.160.0/19 ip4:66.102.0.0/20 ip4:66.249.80.0/20 ip4:72.14.192.0/18 ip4:74.125.0.0/16 ip4:108.177.8.0/21 ip4:173.194.0.0/16 :
```

Prefix	Type	Value	PrefixDesc	Description
	v	spf1		The SPF record version
+	ip4	35.190.247.0/24	Pass	Match if IP is in the given range.
+	ip4	64.233.160.0/19	Pass	Match if IP is in the given range.
+	ip4	66.102.0.0/20	Pass	Match if IP is in the given range.
+	ip4	66.249.80.0/20	Pass	Match if IP is in the given range.
+	ip4	72.14.192.0/18	Pass	Match if IP is in the given range.
+	ip4	74.125.0.0/16	Pass	Match if IP is in the given range.
+	ip4	108.177.8.0/21	Pass	Match if IP is in the given range.
+	ip4	173.194.0.0/16	Pass	Match if IP is in the given range.
+	ip4	209.85.128.0/17	Pass	Match if IP is in the given range.
+	ip4	216.58.192.0/19	Pass	Match if IP is in the given range.
+	ip4	216.239.32.0/19	Pass	Match if IP is in the given range.
~	all		SoftFail	Always matches. It goes at the end of your record.

CONFIGURING DKIM

- DKIM – Domain Keys Identified Message
  - From: Example User <example@contoso.com>
  - DKIM-Signature: v=1; a=rsa-sha256; q=dns/txt; c=relaxed/relaxed;
  - s=selector1; d=contoso.com; t=1429912795;
  - h=From:To:Message-ID:Subject:MIME-Version:Content-Type;
  - bh=<body hash>;
  - b=<signed field>;

- DKIM – Domain Keys Identified Message
  - V=version a= signing algorithm, d=signing domain identifier s=selector c=optional canonicalization algorithm for header and body q=optional default query method i=optional agent or user identifier t=signature timestamp x=expire time l=body length h=header z=optional header fields bh=body hash b=signature of headers and body

CONFIGURING DKIM

- Authentication-Results: mx.google.com;
- dkim=pass header.i=@chesapeake.edu header.s=selector2 header.b=huCQ9VrH;
- arc=pass (i=1 spf=pass spfdomain=chesapeake.edu dkim=pass dkdomain=chesapeake.edu dmarc=pass fromdomain=chesapeake.edu);
- spf=pass (google.com: domain of XXXXX@chesapeake.edu designates 40.107.96.133 as permitted sender) smtp.mailfrom=xxxxxx@chesapeake.edu;
- dmarc=pass (p=NONE sp=NONE dis=NONE) header.from=chesapeake.edu

CONFIGURING DKIM

dkim:chesapeake.edu:selector2 Find Problems

dkim


```
v=DKIM1; k=rsa; p=MIGfMA0GCSqGSIb3DQEBAQUAA4GNADCBiQKBgQC7ojGv4DAmp4L8cIBERnZNVgjiCDhSZcbRqHAuw5KT1UdWFHR4DmZSe9te+y3aTQIHI/7JG3lK24qCLu4PidBIXn3I7b8xvnXkRfTeG
```

Tag	TagValue	Name	Description
v	DKIM1	Version	Identifies the record retrieved as a DKIM record. It must be the first tag in the record.
k	rsa (Length: 1024 bits)	Key Type	The type of the key used by tag (p).
p	MIGfMA0GCSqGSIb3DQEBAQUAA4GNADCBiQKBgQC7ojGv4DAmp4L8cIBERnZNVgjiCDhSZcbRqHAuw5KT1UdWFHR4DmZSe9te+y3aTQIHI/7JG3lK24qCLu4PidBIXn3I7b8xvnXkRfTeGdde/H7pNKrQG0PiLnKHlVGXQKMMQzKTKIsnv0mCYAdS9PpasSk86f9gF8D2uMqyDS1WCQIDAQAB	Public Key	The syntax and semantics of this tag value before being encoded in base64 are defined by the (k) tag.

DMARC WORKFLOW

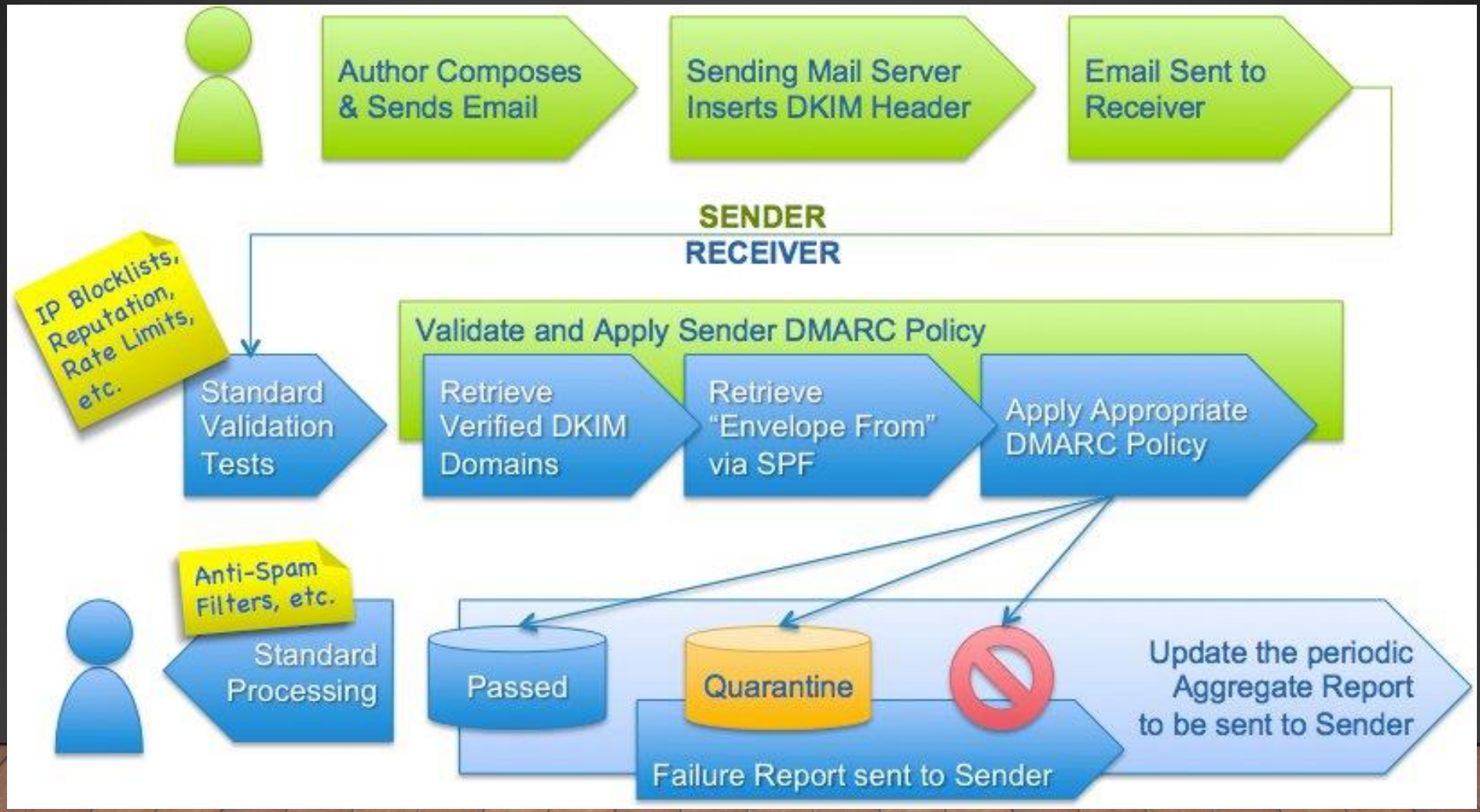


Image retrieved from: https://dmarc.org/wp-content/uploads/2015/02/DMARC_author-to-recipient_flow.jpg

DMARC CONFIGURATION

- v=DMARC1;p=reject;pct=100;rua=mailto:postmaster@dmarcdomain.com

- Tag Name — Purpose — Sample
- v — Protocol version — v=DMARC1
- pct — Percentage of messages subjected to filtering — pct=20
- ruf — Reporting URI for forensic reports — ruf=mailto:authfail@example.com
- rua — Reporting URI of aggregate reports — rua=mailto:aggrep@example.com
- p — Policy for organizational domain — p=quarantine
- sp — Policy for subdomains of the OD — sp=reject
- adkim — Alignment mode for DKIM — adkim=s (strict or relaxed)
- aspf — Alignment mode for SPF — aspf=r (Strict or relaxed)

DMARC CONFIGURATION

Aggregate Reports ••••• RUA •••••	Forensic Reports ••••• RUF •••••
Combined data on a group of emails	Details of an individual email
Not real-time, they are sent everyday by default	Sent almost immediately after the failures
Sent in XML format	Plain text format
No PII *Personal Identifiable Information*	Contains PII *Personal Identifiable Information*
Supported in all DMARC-compliant mailbox providers	Supported in only a handful of mailbox providers

Image retrieved from: https://dmarcian.com/rua-vs-ruf/

DMARC CONFIGURATION

- Date and time range of the report
- The domain
- The IP address that sent the message
- Whether SPF and DKIM have passed or failed
- The DMARC policy applied
- The domain associated with SPF and DKIM

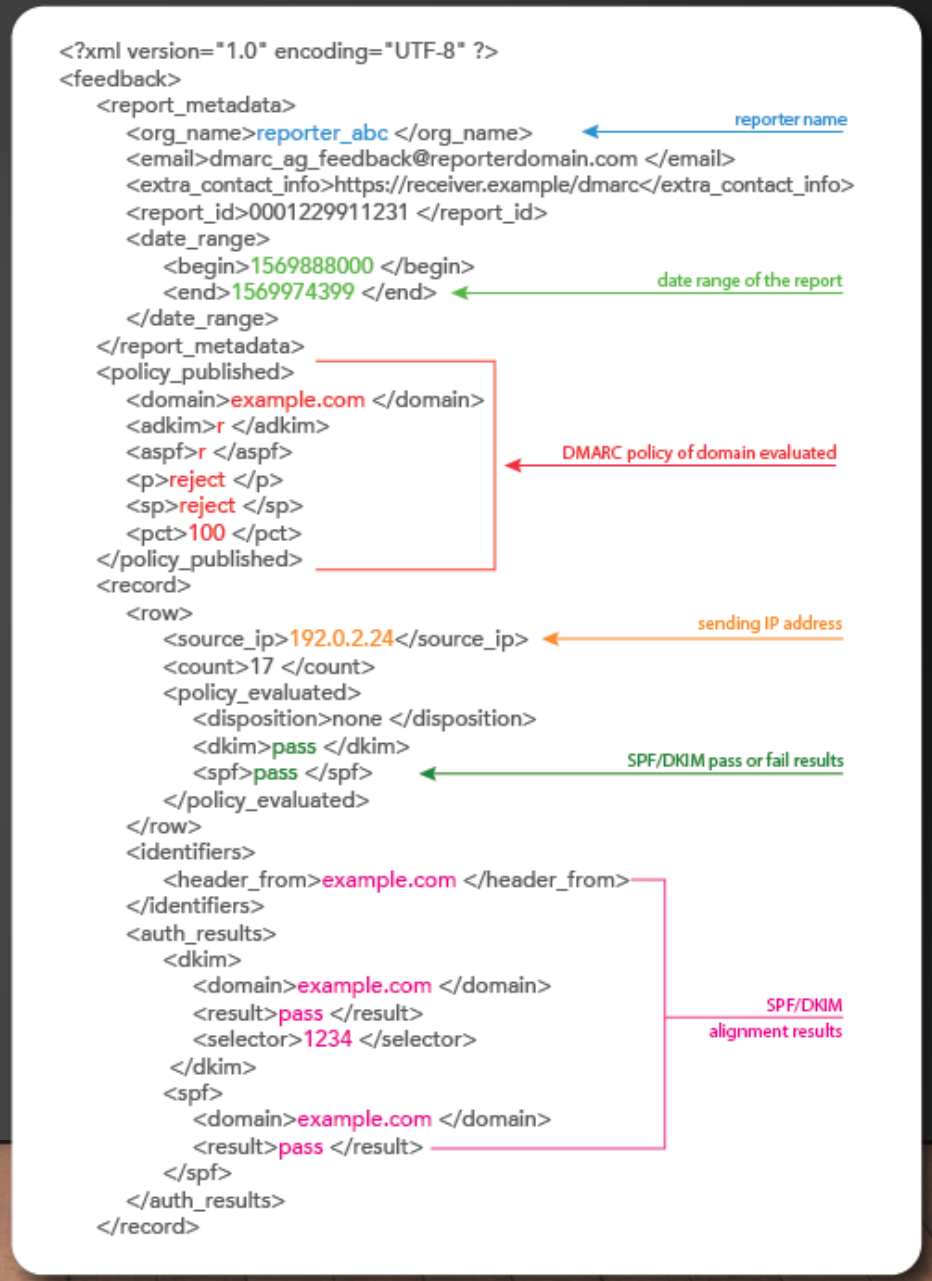
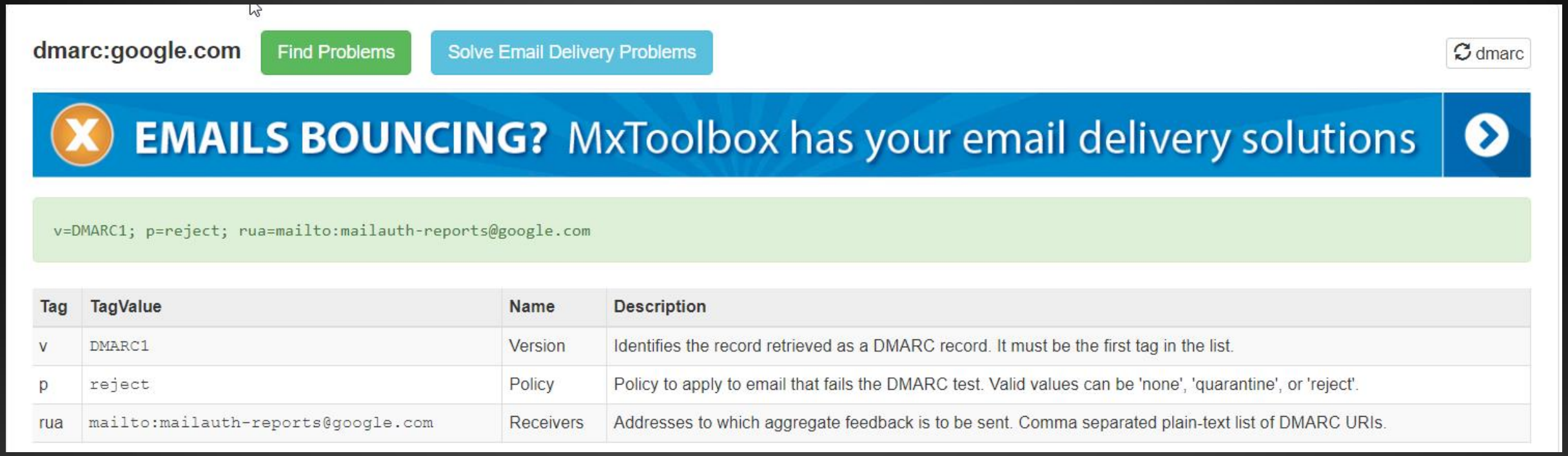


Image retrieved from: https://dmarcian.com/rua-vs-ruf/

DMARC CONFIGURATION



Tag	TagValue	Name	Description
v	DMARC1	Version	Identifies the record retrieved as a DMARC record. It must be the first tag in the list.
p	reject	Policy	Policy to apply to email that fails the DMARC test. Valid values can be 'none', 'quarantine', or 'reject'.
rua	mailto:mailauth-reports@google.com	Receivers	Addresses to which aggregate feedback is to be sent. Comma separated plain-text list of DMARC URIs.

DMARC FORENSICS

- Point them to a log aggregator, no one wants to read XML files trying to determine what service is sending email on behalf of the organization this way.
  - Tons of DMARC Analyzer/Aggregator options out there.
  - These services provide a graphical UI to analyze this information and they're typically free services up to a certain number of domains.
    - Typically cut off after 2-5 domains.
  - ValiMail, Dmarc Analyzer (bought by Mimecast), DMARCIAN, among others.

RECAP

- Why you want a DMARC Record
- What DMARC is
- The Components of DMARC
- How to configure the components (SPF/DKIM)
- DMARC Workflow, configuration and lookup and forensic records

HOW TO APPROACH DMARC

- DMARC Game plan
  - Decide on a log aggregator. No many free services to stare at XML Files.
  - Initial DMARC Configuration – P=None and point forensic records (RUA ONLY!!) to the aggregator. Wait for logs to trickle in.
  - Verify current position for SPF and DKIM for your know senders
    - IE – Check DNS, there should be SPF records for each sending service and a corresponding DKIM record. If not, one is missing and needs to be configured.
  - Verify position on validating inbound SPF, DKIM and DMARC lookups. If someone is going through the work of configuring this for their domain, trust that they did it right.
  - Open discussions with Marketing / IT on developing and maintaining a list of senders and the records in DNS.

HOW TO APPROACH DMARC

- DMARC Gameplan
  - Open discussions with Marketing / IT on developing and maintaining a list of senders and the records in DNS.
    - These records should be audited yearly depending on the environment.
    - SPF has a RFC limit of 10, after that you must use a A record lookup (Think Google Example).
    - Remove any stagnant records. If you stop using a service, make sure to remove them from the list.
  - Once all records are validating and no failures are being see via the aggregator, set p=quarantine and pct=XXX.
  - Eventually, P=reject.

WRAP UP

- DMARC is a Journey. The larger the environment, the longer the journey.
- Once its configured, just maintain it.
- Honorable Mentions
  - Microsoft Defender ARC - ARC will help reduce SPF, DKIM, and DMARC delivery failures that happen due to legitimate indirect mail flows.
  - Cloud to Cloud – Tenant to Tenant.
  - Configured by default by Microsoft and most cloud providers.

QUESTIONS

- Jwright@Chesapeake.edu
- LinkedIn

REFERENCES

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