WHOIS No More: The Future of Registration Metadata

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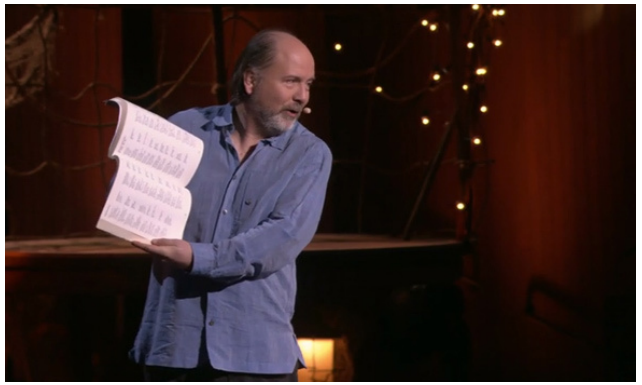
WHOIS? What's WHOIS?

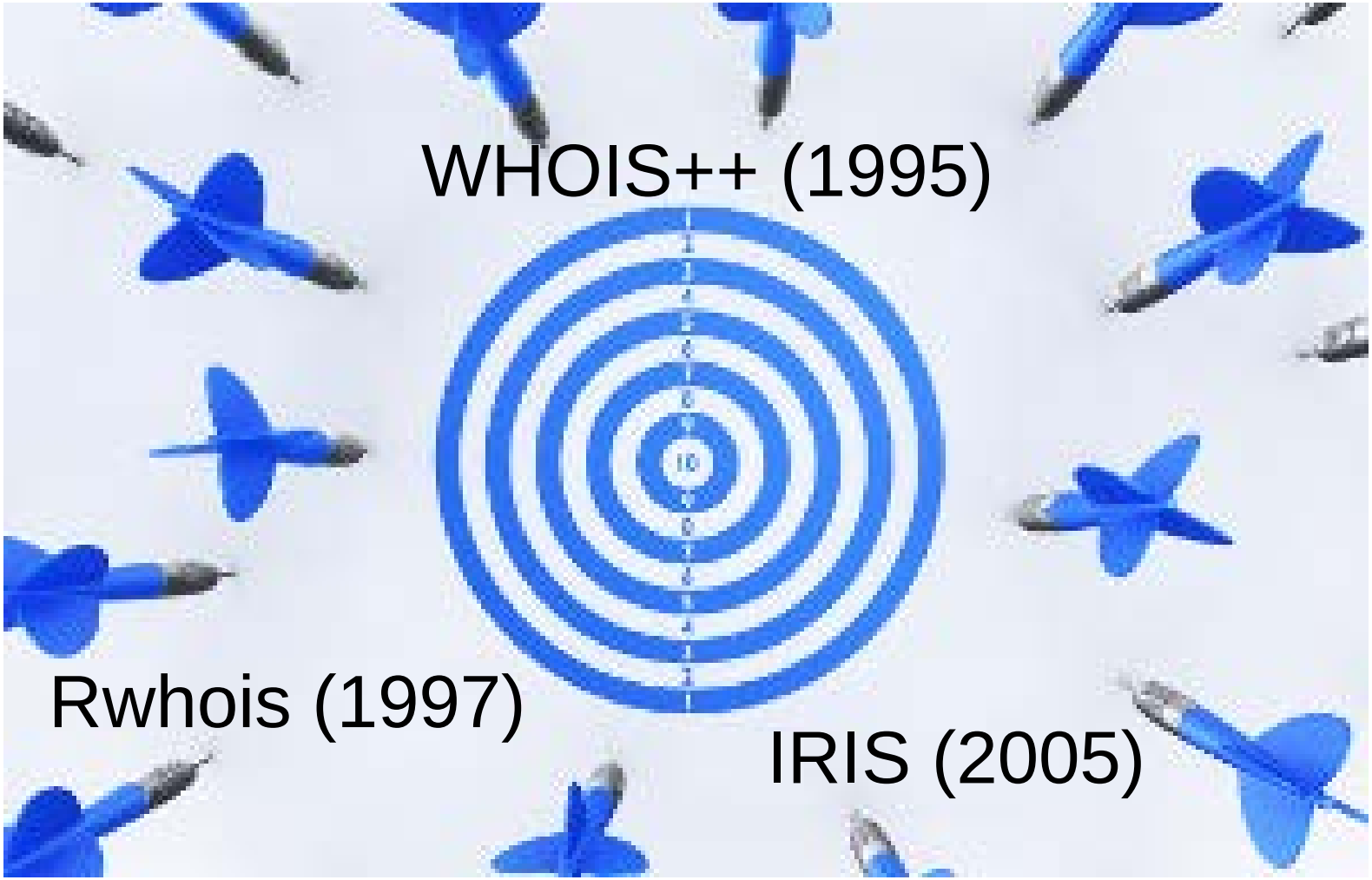
- WHOIS first documented in RFC 812 – *from 1982*!
  - Predates the domain name system (1983 - 1985)
  - Predates the World Wide Web (alt.hypertext publication in 1991)
  - Updated by RFC 954 (1985) and 3912 (2004)
  - Original purpose? From RFC 812:
    - *"it delivers the full name, U.S. mailing address, telephone number, and network mailbox for ARPANET users"*



- Designed for use *within a small community of cooperating users*
- Today: public Internet resource directory
  - Many challenges!
    - …and many contentious attempts to fix via protocol and policy

Image source: http://blog.ted.com/what-the-internet-looked-like-in-1982-a-closer-look-at-danny-hillis-vintage-directory-of-users/

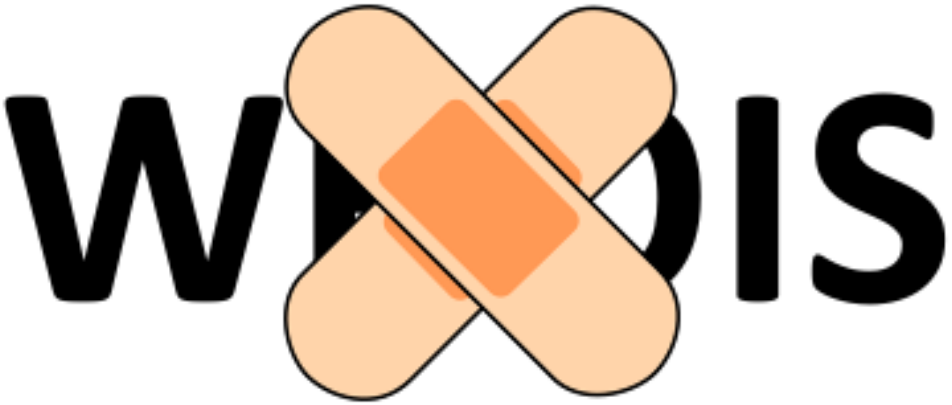
WHOIS Evolution



Evolutionary Dead Ends – Why?

- 30+ years of use
- Desire to add new features, bad platform to build on
- Business dependencies
- Resistance to change/inertia
- Contractual obligations
- Attempts to address issues with bandages
- No easy “change” button!

So what can we do?



We need to take a different approach!

Expert Working Group on gTLD Directory Services

- Expert Working Group (EWG) formed in February 2013 to:
  - *"Define the purpose of collecting and maintaining gTLD registration data, and consider how to safeguard the data"*[1]
  - *"Provide a proposed model for managing gTLD directory services that addresses related data accuracy and access issues, while taking into account safeguards for protecting data"*[1]
- EWG released final report on 6 June 2014[2]
  - Recommendation
    - *"The EWG recommends that a new approach be taken for registration data access, abandoning entirely anonymous access by everyone to everything in favor of a new paradigm that combines public access to some data with gated access to other data"*
- The big question: *how*?

1. https://www.icann.org/news/announcement-2-2012-12-14-en
2. https://www.icann.org/en/system/files/files/final-report-06jun14-en.pdf

A New Approach Using RDAP

- RDAP: Registration Data Access Protocol
  - *RDAP ≠ WHOIS!*
- Specified in RFCs 7480 – 7484, published March 2015
  - WHOIS inventory and object analysis in RFC 7485
  - Additional specifications still needed for operational use
- Designed to address *technical* issues with WHOIS
  - Lack of standardized command structures
  - Lack of standardized output and error structures
  - Lack of support for internationalization and localization
  - Lack of support for security features including data privacy, identification, authentication, and access control
  - *Technical solutions can help address policy issues*
- Designed to be easy to implement and operate

Standardized Structures with RDAP

- WHOIS: no consistent structure
  - Format varies by implementation
- RDAP: web service with JSON encoding
  - HTTP use specified in RFC 7480
  - Security services specified in RFC 7481
  - Command structures specified in RFC 7482
  - Response structures specified in RFC 7483
  - Client bootstrapping described in RFC 7484
  - HTTP responses defined in RFCs 7480, 7481, 7482, and 7483

Internationalization with RDAP

- WHOIS: ASCII only
- RDAP: JSON encoding with language identification
  - Text encoded in UTF-8, UTF-16, or UTF-32 (default UTF-8)
    - See RFC 7159 for more info
  - Language tag (e.g. “en-US”) included with RDAP responses

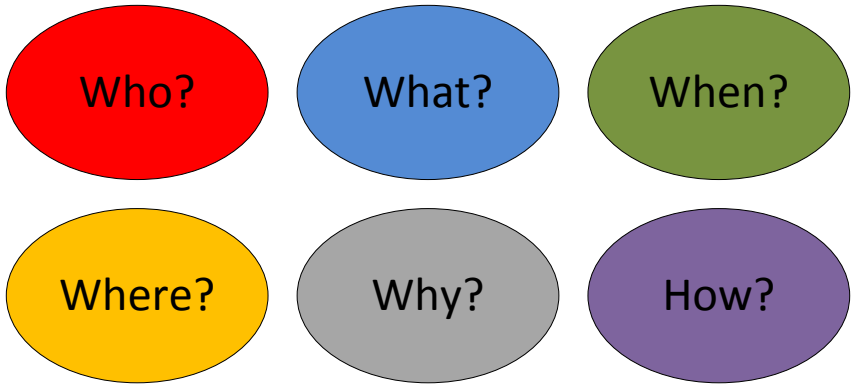
RDAPが良いです

RDAP хорошо

RDAP είναι καλό

Data Privacy with RDAP

- WHOIS: All clients see all data (more or less)
- RDAP: What a client sees can depend on
  - *Who* is asking
  - *What* they're asking for
  - *When* they're asking
  - *Where* they're asking from
  - *Why* they're asking, and
  - *How* they're asking



- RDAP allows a server to make access control decisions based on
  - Client identity
  - Client authorization

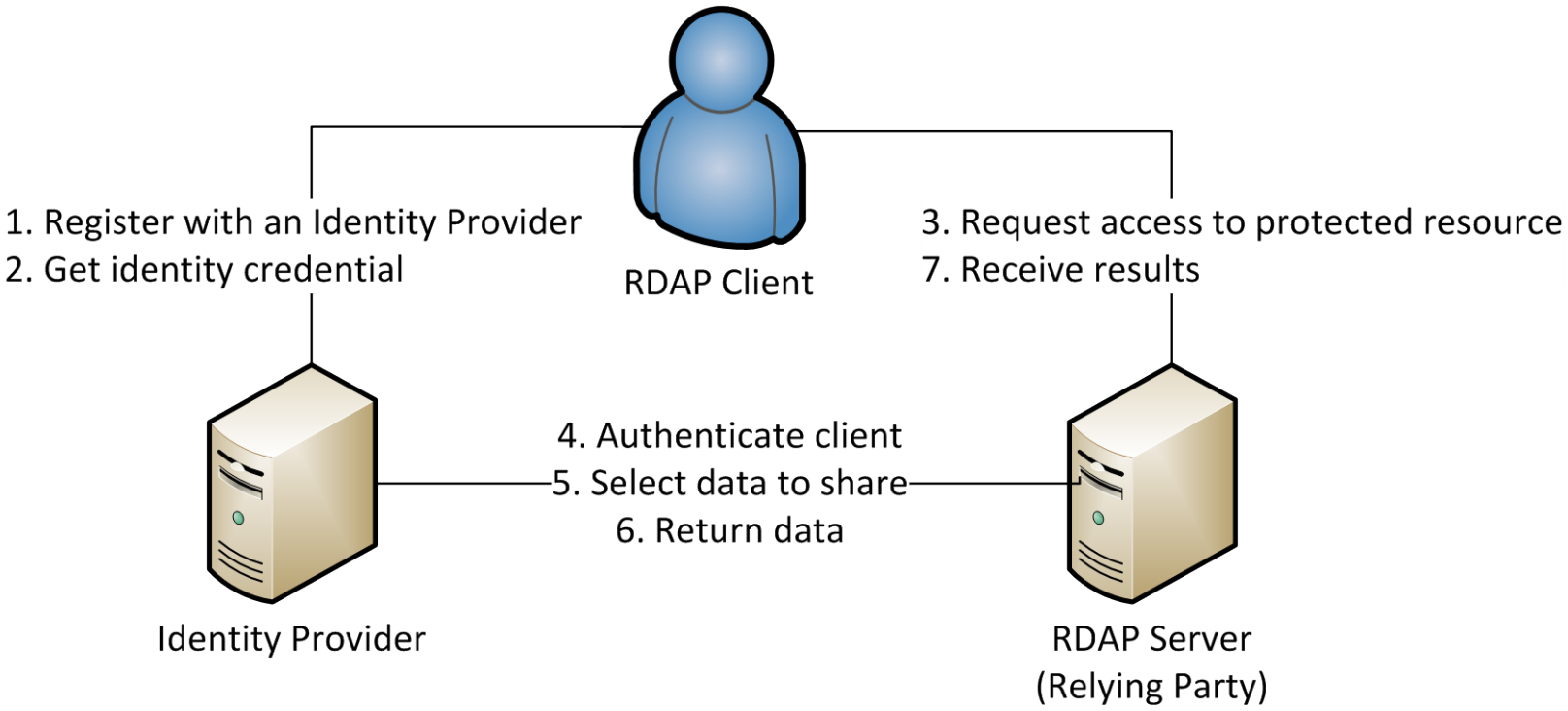
Client Identification and Authorization with RDAP

- Clients must be *identified* and *authenticated* before a server can make access control and authorization decisions
- Managing individual client credentials will be cumbersome for both client and server
- More than a user name and password is needed
  - Controls are needed to protect *both* client and data privacy
- Must be supported by today's web services
- *More in RFC 7481*

One Solution

- Federated authentication!
- Federated authentication?
  - Similar to the “single sign on” concept
  - A means of identifying and authenticating entities based on mutual trust between members of a common community, or federation
  - Credentials are issued to clients by identity providers
  - Credentials are presented by clients to server operators (relying parties)
  - Credentials are sent from server to identity provider for validation
  - Client selects information to be shared with server
  - If all is well – *access granted*!

How does it work?



Sample Unauthenticated Query Result

```
{
  "handle": "XXXXXXX-YYYY",
  "objectClassName": "domain",
  "notices": [
    …
  ],
  "rdapConformance": [
    "rdap_level_0"
  ],
  "ldhName": "example.com",
  "secureDNS": {
    …
  },
  "nameservers": [
    …
  ]
}
```

Sample Basic Authenticated Query Result


```
{
  (Unauthenticated results),
  "events": [
    {
      "eventAction": "registration",
      "eventDate": "2001-10-08T13:07:03Z"
    },
    {
      "eventAction": "last changed",
      "eventDate": "2015-08-21T18:01:34Z"
    },
    {
      "eventAction": "expiration",
      "eventDate": "2017-10-08T13:07:03Z"
    }
  ],
  "status": [
    "clientDeleteProhibited -- http://www.icann.org/epp#clientDeleteProhibited",
    "clientRenewProhibited -- http://www.icann.org/epp#clientRenewProhibited",
    "clientTransferProhibited -- http://www.icann.org/epp#clientTransferProhibited",
    "clientUpdateProhibited -- http://www.icann.org/epp#clientUpdateProhibited",
    "serverTransferProhibited -- http://www.icann.org/epp#serverTransferProhibited"
  ]
}
```

Sample Extended Authenticated Query Result

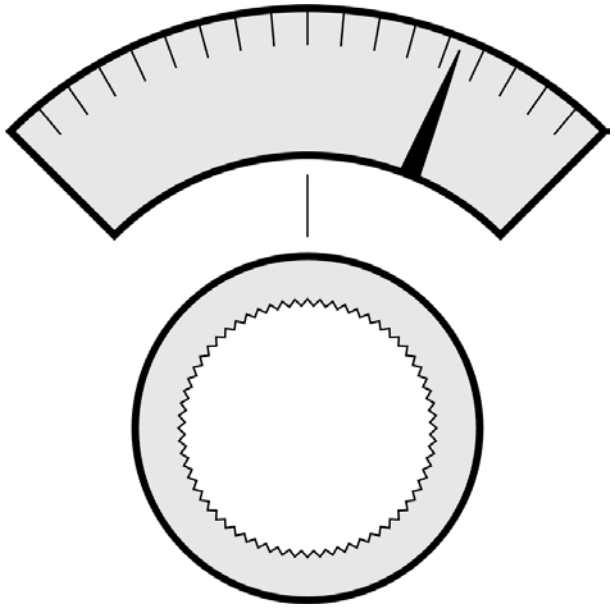
```
{
  (Basic authenticated results),
  "entities": [
    {
      "links": [
        {
          "href": "http://rdap.verisign.com/rdap/entity/XXXXX",
          "rel": "self",
          "type": "application/rdap+json",
          "value": "http://rdap.verisign.com/rdap/entity/XXXXX"
        }
      ],
      "objectClassName": "entity",
        "roles": [
          "technical",
          "billing",
          "administrative",
          "registrant"
        ],
        "vcardArray": [
          …
        ]
    }
  ]
}
```

The Approach

- Proposal described in an Internet-Draft
  - draft-hollenbeck-weirds-rdap-openid
- Uses OpenID Connect
  - http://openid.net/connect/
  - Built on existing OpenID and OAuth standards
  - *“allows Clients to verify the identity of the End-User based on the authentication performed by an Authorization Server, as well as to obtain basic profile information about the End-User in an interoperable and REST-like manner”*
- Prototype implementation in progress at Verisign Labs

To Do

- Test implementations and share results
  - Open to everyone
  - More server operators needed
- Find appropriate settings for RDAP's "knobs and dials"
- Continue standardization work based on implementation experience
- Inform policy work
  - Among everything else, need policy for identity providers, client authorization, and data access



Thank you!

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