OAuth 2.0 Security Best Current Practice

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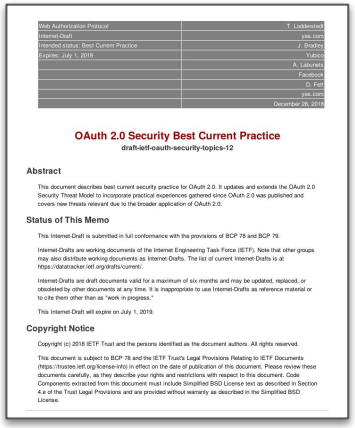
- Refines and enhances security guidance for OAuth 2.0 implementers
- Updates, but does not replace:
  - OAuth 2.0 Threat Model and Security Considerations (RFC 6819)
  - OAuth 2.0 Security Considerations (RFC 6749 & 6750)



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Internet-Draft	yes.com
Intended status: Best Current Practice	J. Bradley
Expires: July 1, 2019	Yubico
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	December 28, 2018

OAuth 2.0 Security Best Current Practice

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Abstract

This document describes best current security practice for OAuth 2.0. It updates and extends the OAuth 2.0 Security Threat Model to incorporate practical experiences gathered since OAuth 2.0 was published and covers new threats relevant due to the broader application of OAuth 2.0.

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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- Updated, more comprehensive Threat Model
- Description of Attacks and Mitigations
- Simple and actionable recommendations

Changes Since IETF-104 (-12..-13)

Discourage use of Resource Owner Password Credentials Grant

- → R.O.P.C.G. MUST NOT be used
- Exposes credentials to the client
- Increased attack surface
- Not or not easily adaptable to modern authentication methods
  - 2FA
  - WebAuthn
  - WebCrypto
  - Multi-step authentication

Client impersonating Resource Owner

- Input from Neil Madden
- Confusion between “sub” used for client in client credentials grant and “sub” for a resource owner in auth code grant
- E.g.: client uses dynamic registration and can influence its “sub” value such that it becomes identical to a “sub” of a resource owner
- → client SHOULD NOT be able to select “sub” value

PKCE

- Encourage use of PKCE mode “S256” (instead of PLAIN)
  - “… SHOULD use PKCE code challenge methods that do not expose the PKCE verifier in the authorization request”
- AS MUST support PKCE
- AS SHOULD publish PKCE support
- PKCE MAY replace `state` for CSRF protection
  - … under certain conditions!
  - → see later

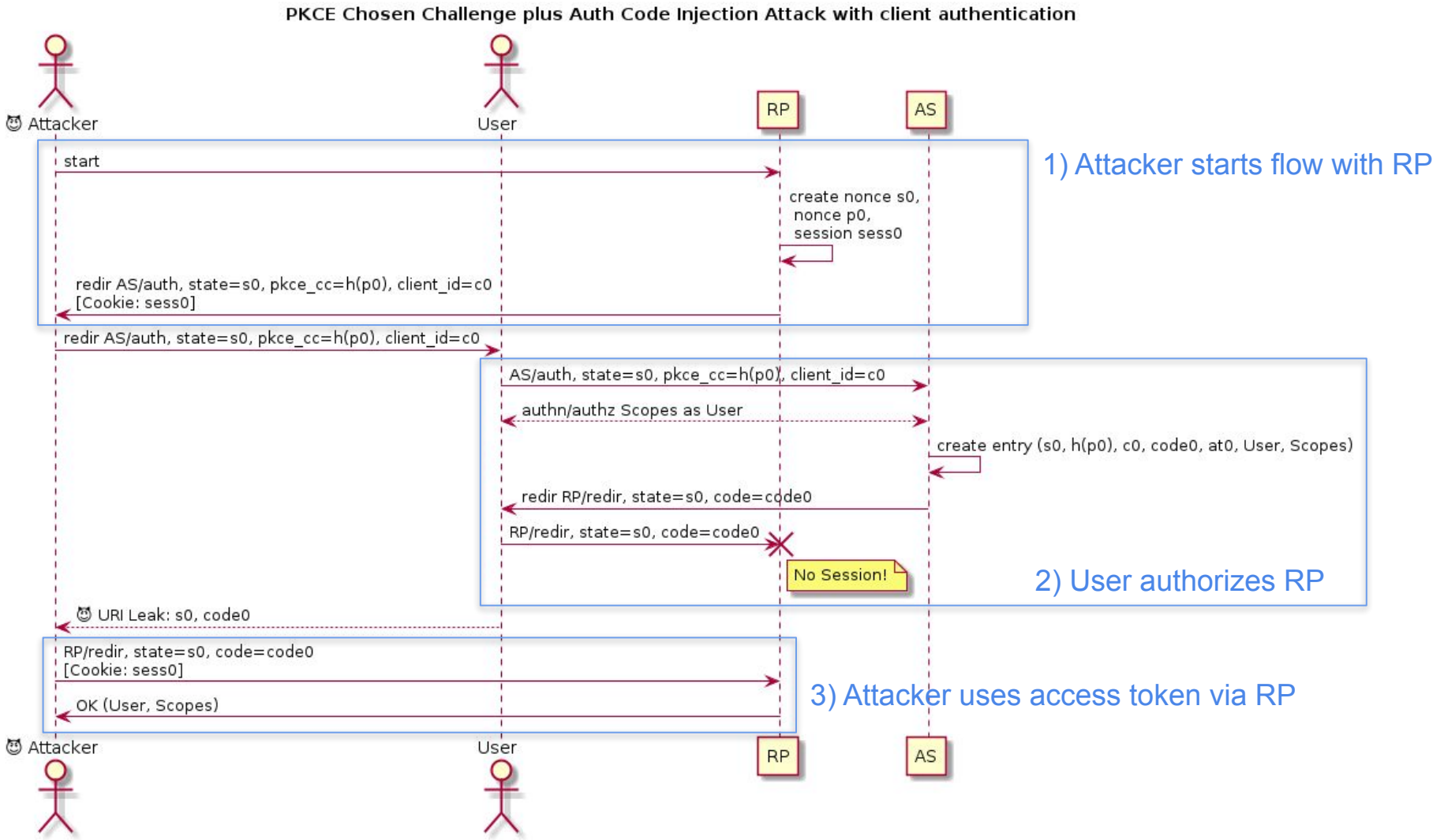
Open Questions

Make Metadata Mandatory?

- Clients can **rely on PKCE** only when they know that AS supports PKCE
  - In particular, clients need to know if the AS supports PKCE when they want to drop other CSRF countermeasures
- Current status: AS SHOULD use metadata to announce support for PKCE
- “MUST” would make RFC8414 (AS Metadata) mandatory for ALL implementations

PKCE Chosen Challenge Attack

- Prerequisites:
  - Attacker can read authorization response
    (through a leaked/logged URI, Mix-Up, …)
  - Attacker can bring his victim to visit a URI and authorize “honest RP”
    (e.g., malicious app, phishing website, …)

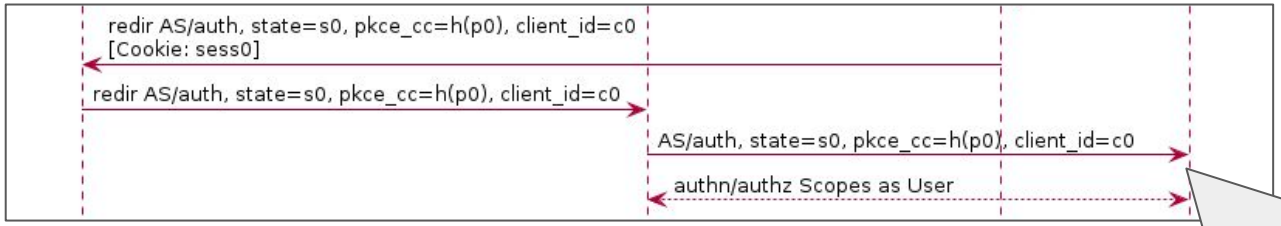

PKCE Chosen Challenge plus Auth Code Injection Attack with client authentication
Attacker
User
RP
AS
start
create nonce s0,
nonce p0,
session sess0
redir AS/auth, state=s0, pkce_cc=h(p0), client_id=c0
[Cookie: sess0]
1) Attacker starts flow with RP
redir AS/auth, state=s0, pkce_cc=h(p0), client_id=c0
AS/auth, state=s0, pkce_cc=h(p0), client_id=c0
authn/authz Scopes as User
create entry (s0, h(p0), c0, code0, at0, User, Scopes)
redir RP/redir, state=s0, code=code0
RP/redir, state=s0, code=code0
No Session!
2) User authorizes RP
URI Leak: s0, code0
RP/redir, state=s0, code=code0
[Cookie: sess0]
OK (User, Scopes)
3) Attacker uses access token via RP
Attacker
User
RP
AS

What can we do about this?

- Use Token Binding (lack of support)
- Use Form Post Response Mode (relatively big change)
- Check Origin/Referer header at AS (lack of support; spec not suitable)
- ???
- IVAR!

IVAR

Integrity Verification for Authorization Requests

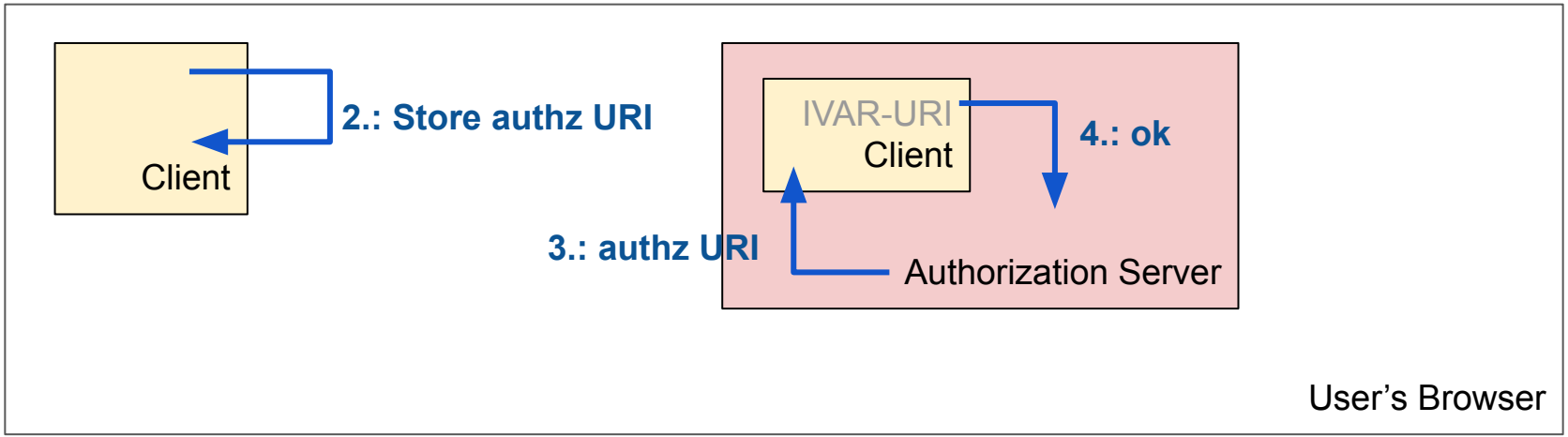


After receiving authz request, AS checks with client if

- the request came from the client's session with the user,
- and whether it was manipulated.

IVAR Protocol

1. The client signals in its **metadata** that it supports IVAR and publishes its **IVAR URI**.
2. The client **stores the authorization request URI** in the user browser's web storage.
3. AS **opens the IVAR URI in an iframe** and sends the authz URI in a postMessage.
4. JavaScript at IVAR URI **checks web storage** and answers "ok" if match for authz URI is found.



IVAR

- Provides a fallback if JavaScript is disabled.
- Checks the integrity/origin of `state`, `nonce`, `request_uri`, …, and `redirect_uri`!
- Thus protects against
  - PKCE Chosen Challenge Attack
  - Attacks using manipulated redirect URIs
  - A variant of the Mix-Up attack
  - …

Feedback welcome!
https://tools.ietf.org/html/draft-fett-oauth-ivar-00

Ready for Publication?

Q & A