
FROM OFFLINE CONTENT
TO ONLINE CONTENT
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Current state

- Web security depends on TLS connections
- Service Workers aim to support transitions from online to offline
  - Lots of push messaging, not as much offline content
- Two main drivers for real offline solutions
  - Lots of people who aren't online much
  - Interest in new content delivery methods

Basic problem

- ~~User finds USB drive in car park~~
- ~~User plugs said USB drive into their computer~~
- Content arrives by something other than TLS
- Content needs to be usable
- User later goes online
- Content needs to be more usable after

The state problem

- The Web is a communications medium
- So assume that use of the Web offline means someone wants to communicate **later**
- Typically state about what happened is saved
- When someone goes online,
  that state has to be available for use

Challenge

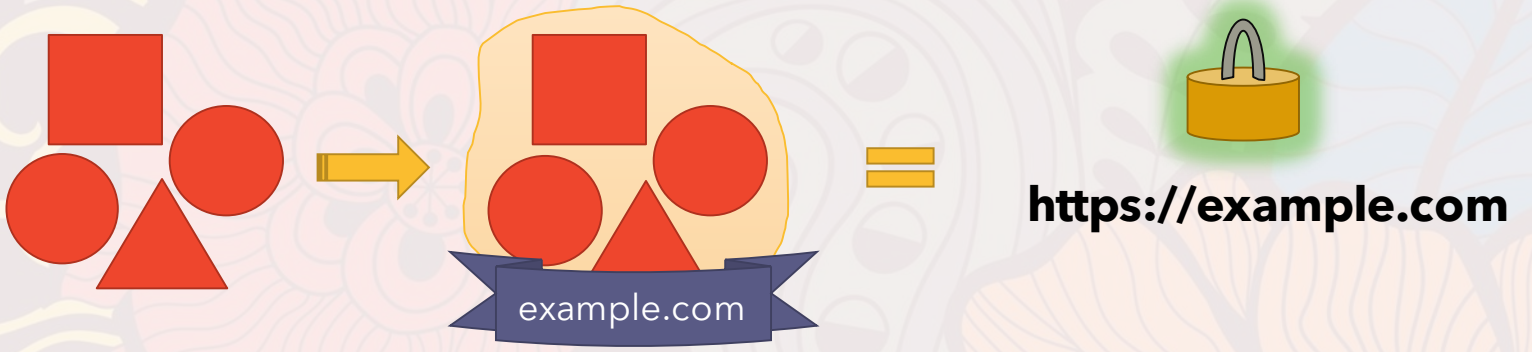
- Authority on the Web is based on connections
- If someone can't or won't connect,
  how do we enable the full experience?

Necessary sacrifices

- What things do we have to lose?
  - updates to server state
  - communication with others
  - real-time bidding for advertising
  - tracking of user activity
- What else can we afford to sacrifice?
  - This is a much harder question to answer

Option 1:
Take Web origins offline

- In short, don't sign connections, sign content
- A bundling format is critical
  - It's largely uncontroversial, even good
  - It's just an XKCD 927 problem
- Just sign the bundle… right?



Limitations

- It is hard to know what is safe to sign
- Potential weakening of the basis of authority
  - DNS lookups are seen as a weak second factor
- Revocation status cannot be communicated
  - Over-signing, compromise, or certificate miss-issuance all lead to a need to revoke
  - Bugs are exposed to exploitation by attackers
  - Content has a **limited shelf-life** to compensate
- A bunch of other minor issues

Option 2 (Proposal): Give content its own origin

- State for bundled content is saved in a store that is specific to that bundle
  - The identity of that origin can be meaningless
- A bundle can identify a target origin
- The target origin can accept the bundle
  - Content and state is transferred if successful
  - Origin aliases provide additional continuity
- A transfer can be rejected by a site

Offline Usage

- A bundle is given a new type of origin
  - `ni:///sha-256;ypeBEsobvcr6wjGzmiPcTaeG7_gUfE5yuYB3ha_uSLs`
- The browser treats this like any other origin
  - Content can make HTTP requests
    (though these are unlikely to work if truly offline)

Transfer

- The bundle can designate a target URL
- The bundle requests a transfer to that URL
- The browser fetches the URL with a challenge
- If the site answers the challenge correctly…
  - Navigation to the target URL happens
  - State is transferred to the target origin
  - The content origin is aliased to the target origin
  - Content from the bundle can be used in place of making requests (performance gain)

Origin Aliasing

- New concept
- After transfer, the content origin becomes an alias for the target origin
- Messages sent to the content origin can be received by the target origin

Failed Transfer

- A **failed** transfer keeps the content origin
  - HTTP 503, connection failures, being offline still
- A **rejected** transfer is when the server fails the challenge sent by the browser
  - Manifests as a navigation to the target URL
  - No continuity
  - Navigation information passing options only: URL and maybe Referer
  - Useful if server believes content is somehow bad

Limitations

- Content can't be attributed to its target origin
  - Content has a "potential" origin
  - This is really hard to explain
- Transition to online takes 1 round trip
- State transfer is non-trivial
  - One origin could have multiple bundles
  - Even 1:1 transfer is likely technically challenging
- Likely a bunch of minor issues

AMP usage

- AMP delivers content to an online recipient
  - The recipient is effectively offline by choice
- AMP is an offline case for a very short time
- Transfer happens immediately
  - State is likely zero
  - State is only created in case of a failed transfer
- This case is likely much easier to handle


THANK YOU

Backup: Comparison

Signed Exchanges

- Requires a bundle format that includes signatures
- Decision about continuity made up front
- Limitations on what can be signed
- Time limited usage
- Immediate transition

Content Origin

- Requires a bundle format
- Decision about continuity made afterwards
  - Potentially tricky transfers
  - And maybe state merges
- Limitations on what can be signed
- No(fewer?) usage limitations
- Transition requires a request
- Possibly strange UX