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# Extensible Provisioning Protocol (EPP) RESTful Transport

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## Abstract

This document specifies a 'RESTful transport for EPP' (REPP) with the aim to improve efficiency and interoperability of EPP.

This document includes a new EPP Protocol Extension as well as a mapping of [RFC5730] XML-commands to an HTTP based (RESTful) interface. Existing semantics and mappings as defined in [RFC5731], [RFC5732] and [RFC5733] are largely retained and reusable in RESTful EPP.

With REPP, no session is created on the EPP server. Each request from client to server will contain all of the information necessary to understand the request. The server will close the connection after each HTTP request.

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## 1. Introduction

This document describes a new transport protocol for EPP, based on the [\[REST\]](#) architectural style. The newly defined transport leverages the HTTP protocol [\[RFC2616\]](#) and the principles of [\[REST\]](#). Conforming to the REST constraints is generally referred to as being "RESTful". Hence we dubbed the new transport protocol: "RESTful transport for EPP" or "REPP" for short.

This new transport mechanism includes an new EPP Protocol Extension and a mapping of [\[RFC5730\]](#) XML-commands to [\[URI\]](#) resources. REPP, in contrast to the EPP specification, is stateless. It aims to provide a mechanism that is more suitable for complex, high availability environments, as well as for environments where TCP connections can be unreliable.

RFC 5730 [\[RFC5730\]](#) Section 2.1 describes that EPP can be layered over multiple transport protocols. Currently, the EPP transport over TCP [\[RFC5734\]](#) is the only widely deployed transport mapping for EPP. This same section defines that newly defined transport mappings must preserve the stateful nature of EPP.

The stateless nature of REPP dictates that no session state is maintained on the EPP server. Each request from client to server will contain all of the information necessary to understand the request. The server will close the connection after each HTTP request.

With a stateless mechanism, some drawbacks of EPP (as mentioned in Section 5) are circumvented.

A good understanding of the EPP base protocol specification [\[RFC5730\]](#) is advised, to grasp the extension and command mapping described in this document.

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [\[RFC2119\]](#).

## 2. Terminology

In this document the following terminology is used.

REST - Representational State Transfer ([[REST](#)]). An architectural style.

RESTful - A RESTful web service is a web service or API implemented using HTTP and the principles of [[REST](#)].

EPP RFCs - This is a reference to the EPP version 1.0 specifications [[RFC5730](#)], [[RFC5731](#)], [[RFC5732](#)] and [[RFC5733](#)].

Stateful EPP - The definition according to Section 2 of [[RFC5730](#)].

Stateless EPP or REPP - The RESTful transport for EPP described in this document.

URL - A Uniform Resource Locator as defined in [[RFC3986](#)].

Resource - A network data object or service that can be identified by a URL.

Command mapping - The mapping of [[RFC5730](#)] XML commands to Stateless EPP.

### 3. Conventions Used in This Document

XML is case sensitive. Unless stated otherwise, XML specifications and examples provided in this document MUST be interpreted in the character case presented to develop a conforming implementation.

### 4. RESTful transport for EPP or REPP

REPP is designed to solve, in the spirit of [[RFC3375](#)], the drawbacks as mentioned in the next paragraph and yet maintain compatibility with existing object mapping definitions.

The design intent is to provide a clear, clean and self-explanatory interface that can easily be integrated with existing software systems. On the basis of these principles a [[REST](#)] architectural style was chosen. A client interacts with a REPP server via HTTP requests.

A server implementing REPP, MUST NOT keep any client state. Every client request needs to provide all of the information necessary to process the request.

REPP conforms to the EPP transport mapping considerations as defined in [[RFC5730](#)], Section 2.1. With REPP, the EPP [[RFC5730](#)] XML commands are mapped to REST URL resources. Since REPP relies on a newly defined XSD schema with protocol elements, REPP can also be referred to as an [[RFC5730](#)], Section 2.7.1 protocol extension.

### 5. Drawbacks Associated with Stateful EPP

[[RFC5734](#)] requires a stateful session between a client and the EPP server. This is accomplished by setting up a session with a <login> and keeping it alive for some time until issuing a <logout>. This may pose challenges in load-balanced environments, when a running session for whatever reason suddenly has to be switched from one EPP server to another and state is kept on a per server basis.

[RFC5734] EPP sessions can wind up in a state where they are no longer linked to an active TCP connection, especially in an environment where TCP connectivity is flaky. This may raise problems in situations where session limits are enforced.

REPP is designed to avoid these drawbacks, hence making the interaction between an EPP client and an EPP server more robust and efficient.

## 6. EPP Extension Framework

According to [RFC3735], Section 2, EPP provides an extension framework that allows features to be added at the protocol, object, and command-response levels. REPP affects the following levels:

Protocol extension: REPP defines a new namespace "urn:ietf:params:xml:ns:restful-epp-1.0". It declares new elements, which MUST be used for REPP. The root element for the new namespace is the <repp> element. This element MUST contain an object mapping defined by the object mapping schemas.

Object extension: REPP does not define any new object level extensions. The existing object level extensions can be reused. However, any existing object mapping element, including any added extension elements it might contain, SHALL be added as a child to the new <repp> element.

Command-Response extension: REPP does not use the "command" concept, because the 'command' concept is part of a RPC style and not a RESTful style. A REST URL and HTTP method combination have replaced the command structure. All command extensions can be reused as a rest extension.

REPP reuses the existing response messages defined in the EPP RFCs. The EPP response MUST be added to the standard <epp> element and SHALL NOT be part of any <repp> element.

The DNSSEC [RFC5910], E.164 number [RFC4114] and ENUM validation information [RFC5076] extension mapping elements can be added as children of the <repp> element.

## 7. Resource Naming Convention

A resource can be a single uniquely object identifier e.g. a domain name, or a collection of objects. The complete set of objects a client can use in registry operations MUST be identified by {context- root}/{version}/{collection}

o {context-root} is the base URL which MUST be specified by each registry. The {context-root} MAY be an empty, zero length string.

o {version} is a label which identifies the interface version. This is the equivalent of the <version> element in the EPP RFCs.

o {collection} MUST be substituted by "domains", "hosts" or "contacts", referring to either [RFC5731], [RFC5732] or [RFC5733].

o A trailing slash MAY be added to each request. Implementations MUST consider requests which only differ with respect to this trailing slash as identical.

A specific object instance MUST be identified by {context-root}/{version}/{collection}/{id} where {id} is a unique object identifier described in EPP RFCs.

An example domain name resource following this naming convention, would look like this:

/rest/v1/domains/example.com

The level below a collection MUST be used to identify an object instance, the level below an object instance MUST be used to identify attributes of the object instance.

With REPP the object identifiers are embedded in URLs. This makes any object identifier in the request messages superfluous. However, since the goal of REPP is to stay compatible with the existing EPP object mapping schemas, this redundancy is accepted as a trade off. Removing the object identifier from the request message would require new object mapping schemas.

The server MUST return HTTP Status-Code 412 when the object identifier (for example [domain:name](#), [host:name](#) or [contact:id](#)) in the HTTP message-body does not match the {id} object identifier in the URL.

## 8. Message Exchange

A [RFC5730](#) XML request includes a command- and object mapping to which a command must be applied. With REPP XML request messages are expressed by using a combination of a URL resource and an HTTP method.

Data (payload) belonging to a request or response is added to the HTTP message- body or sent as using an HTTP header, depending on the nature of the request as defined in Section 9.

An HTTP request MUST contain no more than one EPP command. HTTP requests MUST be processed independently of each other and in the same order as the server receives them.

### 8.1. HTTP Method Definition

The operations on resources MUST be performed by using an HTTP method. The server MUST support the following "verbs" ([REST](#)).

GET: Request a representation of a resource or a collection of resources.

PUT: Update an existing resource.

POST: Create a new resource.

DELETE: Delete an existing resource.

HEAD: Check for the existence of a resource.

OPTIONS: Request a greeting.

The server **MUST** not support the following "verbs"

PATCH: Partial updating of a resource is **MUST** not be allowed.

## **8.2. REPP Request**

### **8.2.1. EPP Data**

The payload data for a REPP request **MAY** be transmitted to the server using the POST, PUT and GET HTTP methods.

POST and PUT: Payload data, when required, **MUST** be added to the message-body.

GET: When payload data is required, it concerns <authInfo>. This **SHALL** be put in the "X-REPP-authinfo" HTTP request-header.

### **8.2.2. REPP Request Headers**

HTTP request-headers are used to transmit additional or optional request data to the server. All REPP HTTP headers must have the "X-REPP-" prefix.

X-REPP-cltrid: The client transaction identifier is the equivalent of the <clTRID> element in the EPP RFCs and **MUST** be used accordingly. When this header is present in a client request, an equivalent element in the message-body **MAY** also be present, but **MUST** than be consistent with the header.

X-REPP-authinfo: The X-REPP-authinfo request-header is the alternative of the <authInfo> element in the EPP RFCs and **MUST** be used accordingly. It **MUST** contain the entire authorization information element as mentioned in Section 11.1.

### **8.2.3. Generic HTTP Headers**

Generic HTTP headers **MAY** be used as defined in HTTP/1.1 [[RFC2616](#)]. For REPP, the following general-headers are **REQUIRED** in HTTP requests.

Accept-Language: This request-header is equivalent to the <lang> element in the EPP <login> command, expect that the usage of this header by the client is **OPTIONAL**. The server **MUST** support the use of HTTP Accept-Language header in client requests. The client **MAY** issue a <hello> to discover the languages known by the server. Multiple servers in a load-balanced environment **SHOULD** reply with consistent <lang> elements in a <greeting>. Clients **SHOULD NOT** expect that obtained <lang> information remains consistent between different requests. Languages not supported by the server default to "en".

Content-Type: ...

## **8.3. REPP Response**

The server response is made up out of a HTTP Status-Code, HTTP response-headers and it **MAY** contain an EPP XML message in the HTTP message-body.

### 8.3.1. REPP Response Headers

HTTP response-headers are used to transmit additional response data to the client. All REPP HTTP headers must have the "X-REPP-" prefix.

X-REPP-svtrid: This header is the equivalent of the <svTRID> element in the EPP RFCs and MUST be used accordingly. If an HTTP message-body with the EPP XML equivalent <svTRID> exists, both values MUST be consistent.

X-REPP-cltrid: This header is the equivalent of the <clTRID> element in the EPP RFCs and MUST be used accordingly. If an HTTP message-body with the EPP XML equivalent <clTRID> exists, both values MUST be consistent.

X-REPP-eppcode: This header is the equivalent of the <result code> element in the EPP RFCs and MUST be used accordingly. If an HTTP message-body with the EPP XML equivalent <result code> exists, both values MUST be consistent.

X-REPP-avail: The EPP avail header is the alternative of the "avail" attribute of the [object:name](#) element in a check response and MUST be used accordingly.

### 8.3.2. Generic Headers

Generic HTTP headers MAY be used as defined in HTTP/1.1 [[RFC2616](#)]. For REPP, the following general-headers are REQUIRED in HTTP responses.

Cache-Control: ... TBD: the idea is to prohibit caching. Even though it will probably work and be useful in some scenario's, it also complicates matters.]

Connection: ....

#### ## Error Handling

REPP is designed atop of the HTTP protocol, both are an application layer protocol with their own status- and result codes. The value of an EPP result code and HTTP Status-Code MUST remain independent of each other. E.g. an EPP result code indicating an error can be combined with an HTTP request with Status-Code 200.

HTTP Status-Code: MUST only return status information related to the HTTP protocol, When there is a mismatch between the object identifier in the HTTP message-body and the resource URL HTTP Status-Code 412 MUST be returned.

The following EPP result codes specify an interface-, authorization-, authentication- or an internal server error and MUST NOT be used in REPP. Instead, when the related error occurs, an HTTP Status-Code MUST be returned in accordance to the mapping shown in Table 1.

EPP result code: MUST only return EPP result information relating to the EPP protocol. The HTTP header "X-REPP-eppcode" MUST be used for EPP result code information.



EPP result code and HTTP Status-Code mapping.

EPP result code	HTTP Status-Code
2000 unknown command	400
2201 authorization error	401
2202 Invalid authorization information	401
2101 unimplemented command	501

Table 1

## 9. Command Mapping

This section describes the details of the REST interface by referring to the [\[RFC5730\]](#) Section 2.9 Protocol Commands and defining how these are mapped to RESTful requests.

Each RESTful operation consists of four parts: 1. the resource, 2. the HTTP method 3. the request payload, which is the HTTP message- body of the request, 4. the response payload, being the HTTP message- body of the response.

Table 2 list a mapping for each EPP to REPP, the subsequent sections provide details for each request. Each URL in the table is prefixed with "/repp/v1/". To make the table fit we use the following abbreviations:

{c}: An abbreviation for {collection}: this MUST be substituted with "domains", "hosts", "contacts" or "messages".

{i}: An abbreviation for {id}: a domain name, host name, contact id or a message id.

(opt): The item is optional.

Command mapping from EPP to REPP.

EPP command	Method	Resource	Request payload	Response payload
Hello	OPTIONS	/	N/A	<greeting>
Login	N/A		N/A	N/A
Logout	N/A		N/A	N/A
Check	HEAD	{c}/{i}	N/A	N/A

EPP command	Method	Resource	Request payload	Response payload
Info	GET	{c}/{i}	AUTH(opt)	<info>
Poll request	GET	messages	N/A	<poll>
Poll ack	DELETE	messages/{i}	N/A	<poll> ack
Transfer (query)	GET	{c}/{i}/transfer	AUTH(opt)	<transfer>
New password	PUT	password	password	N/A
Create	POST	{c}	<create>	<create>
Delete	DELETE	{c}/{i}	N/A	<delete>
Renew	PUT	{c}/{i}/validity	<renew>	<renew>
Transfer (create)	POST	{c}/{i}/transfer	<transfer>	<transfer>
Transfer (cancel)	DELETE	{c}/{i}/transfer	N/A	<transfer>
Transfer (approve)	PUT	{c}/{i}/transfer	N/A	<transfer>
Transfer (reject)	DELETE	{c}/{i}/transfer	N/A	<transfer>
Update	PUT	{c}/{i}	<update>	<update>

Table 2

## 9.1. Hello

- Request: OPTIONS /repp/v1
- Request payload: N/A
- Response payload: <greeting>

The <greeting> (Section 2.4 RFC 5730) MUST NOT be automatically transmitted by the server with each new HTTP connection. The server MUST send a <greeting> element in response to a OPTIONS method on the root "/" resource.

A REPP client MUST NOT use a <hello> XML payload.

## 9.2. Password

- Request: PUT /repp/v1/password

- Request payload: New password
- Response payload: N/A

The client MUST use the HTTP PUT method on the password resource. This is the equivalent of the <newPW> element in the <login> command described in [RFC5730]. The request message-body MUST contain the new password which MUST be encoded using Base64 [RFC4648].

After a successful password change, the HTTP header "X-REPP-eppcode" must contain EPP result code 1000, otherwise an appropriate 2xxx range EPP result code.

### 9.3. Session Management Resources

The server MUST NOT create a client session. Login credentials MUST be added to each client request. This SHOULD be done by using any of the available HTTP authentication mechanisms. Basic authentication MAY be, all authentication mechanisms MUST be combined with TLS [RFC5246] for additional security.

To protect information exchanged between an EPP client and an EPP server [RFC5734] Section 9 level of security is REQUIRED.

#### 9.3.1. Login

The <login> command MUST NOT be implemented by a server. The <newPW> element has been replaced by the Password resource. The <lang> element has been replaced by the Accept-Language HTTP request-header. The <svcs> element has no equivalent in RESTful EPP, the client can use a <hello> to discover the server supported namespace URIs. The server MUST check every XML namespace used in client XML requests. An unsupported namespace MUST result in the appropriate EPP result code.

#### 9.3.2. Logout

The <logout> command MUST NOT be implemented by the server.

### 9.4. Query Resources

#### 9.4.1. Check

- Request: HEAD {collection}/{id}
- Request payload: N/A
- Response payload: N/A

The HTTP header X-REPP-avail with a value of "1" or "0" is returned, depending on whether the object can be provisioned or not.

A <check> request MUST be limited to checking only one resource {id} at a time. This may seem a step backwards when compared to the check command defined in the object mapping of the EPP RFCs where multiple object-ids are allowed inside a check command. The RESTful check operation can be load balanced more efficient when there is only a single resource {id} that needs to be checked.

The server MUST NOT support any [object:reason](#) elements described in the EPP object mapping RFCs.

### 9.4.2. Info

- Request: GET {collection}/{id}
- Request payload: OPTIONAL X-REPP-authinfo HTTP header with <authInfo>.
- Response payload: Object <info> response.

A object <info> request MUST be performed with the HTTP GET method on a resource identifying an object instance. The response MUST be a response message as described in object mapping of the EPP RFCs, possibly extended with an [RFC3915] extension element (<rgp: infData>).

#### 9.4.2.1. Domain Name

A domain name <info> differs from a contact- and host <info> in the sense that EPP Domain Name Mapping [RFC5731], Section 3.1.2 describes an OPTIONAL "hosts" attribute for the [domain:name](#) element. This attribute is mapped to additional REST resources to be used in a domain name info request.

The specified default value is "all". This default is mapped to a shortcut, the resource object instance URL without any additional labels.

- default: GET domains/{id}
- Hosts=all: GET domains/{id}/all
- Hosts=del: GET domains/{id}/del
- Hosts=sub: GET domains/{id}/sub
- Hosts=none: GET domains/{id}/none

The server MAY require the client to include additional authorization information. The authorization data MUST be sent with the "X-REPP- authinfo" HTTP request-header.

### 9.4.3. Poll

#### 9.4.3.1. Poll Request

- Request: GET messages/
- Request payload: N/A
- Response payload: Poll request response message.

A client MUST use the HTTP GET method on the messages collection to request the message at the head of the queue.

#### 9.4.3.2. Poll Ack

- Request: DELETE messages/{id}
- Request payload: N/A
- Response payload: Poll ack response message

A client MUST use the HTTP DELETE method on a message instance to remove the message from the message queue.

#### 9.4.3.3. Transfer Query Op

- Request: GET {collection}/{id}/transfer
- Request payload: Optional X-REPP-authinfo HTTP header with <authInfo>
- Response payload: Transfer query response message.

A <transfer> query MUST be performed with the HTTP GET method on the transfer resource of a specific object instance.

## 10. Security Considerations

TODO Security

## 11. IANA Considerations

This document has no IANA actions.

## 12. Acknowledgments

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