

---

# CLASSATTENDANCE

---

## Contributors

| Name           | Organization                               |
|----------------|--|
| José Henriquez | Hyperledger Latinoamérica Regional Chapter |
| Alfonso Govela | Hyperledger Latinoamérica Regional Chapter |

Taxonomy Formula:  $tF\{\sim d, t, g, SC\}$

## Token Specification Summary

### Token Classification

| Template Type:       | SingleToken | This token has no sub or child tokens.   |
|----------------------|-------------|--|
| Token Type:          | Fungible    | Tokens have interchangeable value with one another, where any quantity of them has the same value as another equal quantity if they are in the same class or series.   |
| Token Unit:          | Whole       | There can be many instances of this token, but they cannot be divided.   |
| Value Type:          | Intrinsic   | This token is purely a digital token represents value directly, it represents no external physical form and cannot be a receipt or title for a material item or property.  |
| Representation Type: | Common      | This token is simply represented as a balance or quantity attributed to an owner address where all the balances are recorded on the same balance sheet, like a bank account. All instances can easily share common properties and locating them is simple. |
| Supply:              | Infinite    | Infinite supply indicates that tokens in the class can be created and removed with no cap and also potentially reflect negative supply for certain business cases.   |

*This is a Transferable Whole Fungible Token that uses the behavior group Supply Control to manage the circulating supply, so at creation can be set an initial supply that can be increased or removed as needed. It is whole by setting the decimals property on the dividable behavior to 0, that way it cannot be fractioned. It is Transferable, which means that the owner can transfer the ownership of the tokens to another party.*

## Example

This token definition's purpose is to register the student attendance to a course, it will be minted according to the number of classes of the course, and transferred to students once they have completed the course. The amount received will depend on the number of classes the student attended.

## Analogy

| Name                                     | Description   |
|--|---|
| <b>Student Attendance Loyalty Points</b> | A Student can earn a point/token for each class which the student attended and then hold these points/tokens to serve as proof of attendance to the course. |

## Comments

In the future they could be useful as vouchers redeem some sort of compensation.

## ClassAttendance is:

- Indivisible
- Transferable
- Delegable
- Burnable
- Roles
- Mintable

## ClassAttendance Details

### Whole Fungible

|              |                |
|--------------|----------------|
| <b>Type:</b> | Base           |
| <b>Name:</b> | Whole Fungible |

**Id:** b1eacdf8-35d8-454a-b1af-92eb0b6f45d4

**Visual:** &tau;<sub>F</sub><i>~d</i>

**Tooling:** tF{~d}

**Version:** 1.0

## Definition

*Whole Fungible tokens have interchangeable value with each other, where any owned sum of them from a class has the same value as another owned sum from the same class. A whole token cannot be sub-divided so it doesn't support the notion of 'making change'.*

## Example

An inventory item or SKU, where an item is treated as a whole because it makes no sense to own a fraction of a SKU or loyalty point.

## Analogies

| Name                                  | Description  |
|---------------------------------------|--|
| <b>Loyalty Points</b>                 | Most credit card or retail loyalty point programs deal with whole numbers so that redeeming points is easy to understand for their customers.  |
| <b>General Admission Movie Ticket</b> | Purchasing a general admission ticket to a movie only allows for you to have a seat, but the seat that you actually get depends on factors like when you arrive. Your not likely to want to share a seat with another adult. |

## Dependencies

| Artifact Type | Symbol | Description           |
|---------------|--------|-----------------------|
| <b>Base</b>   | t      | Base Token Definition |

## Incompatible With

| Artifact Type   | Symbol | Id                                   |
|-----------------|--------|--------------------------------------|
| <b>Behavior</b> | d      | 6e3501dc-5800-4c71-b59e-ad11418a998c |

## Influenced By

| Description | Symbol | Applies To |
|-------------|--------|------------|
|-------------|--------|------------|

## Artifact Files

| Content Type | File Name            | File Content |
|--------------|----------------------|--------------|
| Control      | whole-fungible.proto |              |
| Uml          | whole-fungible.md    |              |

## Code Map

| Map Type   | Name                     | Platform         | Location  |
|------------|--------------------------|------------------|---|
| SourceCode | Open Zeppelin - ERC-1155 | EthereumSolidity | <a href="https://github.com/OpenZeppelin/openzeppelin-contracts/tree/master/contracts/token/ERC1155">https://github.com/OpenZeppelin/openzeppelin-contracts/tree/master/contracts/token/ERC1155</a> |

## Implementation Map

| Map Type       | Name                     | Platform         | Location  |
|----------------|--------------------------|------------------|---|
| Implementation | Open Zeppelin - ERC-1155 | EthereumSolidity | <a href="https://docs.openzeppelin.com/contracts/4.x/api/token/erc1155">https://docs.openzeppelin.com/contracts/4.x/api/token/erc1155</a> |

## Resource Map

| Map Type | Name | Location | Description |
|----------|------|----------|-------------|
|----------|------|----------|-------------|

## Base Details

Token Name:

|                             |             |
|-----------------------------|-------------|
| <b>Token Type:</b>          | Fungible    |
| <b>Representation Type:</b> | Common      |
| <b>Value Type:</b>          | Intrinsic   |
| <b>Token Unit:</b>          | Whole       |
| <b>Symbol:</b>              |             |
| <b>Owner:</b>               |             |
| <b>Quantity:</b>            | 0           |
| <b>Decimals:</b>            | 0           |
| <b>Constructor Name:</b>    | Constructor |

## Behaviors

### Specification Behavior

## Indivisible

Taxonomy Symbol: ~d

*An ability or restriction on the token where it cannot be divided from a single whole token into fractions. Sets the base token-Decimals property to 0 which will make the token indivisible and a whole token is the smallest ownable unit of the token.*

## Example

Indivisible is common for items where division does not make sense, like a property title, inventory item or invoice.

## Analogies

| Name                  | Description   |
|-----------------------|---|
| <b>Non-Fractional</b> | It is not possible to own a fraction of this token. |
| <b>Barrel of Oil</b>  | Barrels of Oil don't make sense to divide.          |

|          |                                      |
|----------|--------------------------------------|
| Type:    | Behavior                             |
| Name:    | Indivisible                          |
| Id:      | d5807a8e-879b-4885-95fa-f09ba2a22172 |
| Visual:  | <i>~d</i>                            |
| Tooling: | ~d                                   |
| Version: | 1.0                                  |

## Dependencies

| Artifact Type | Symbol | Description |
|---------------|--------|-------------|
|---------------|--------|-------------|

## Incompatible With

| Artifact Type | Symbol | Id                                   |
|---------------|--------|--------------------------------------|
| Behavior      | d      | 6e3501dc-5800-4c71-b59e-ad11418a998c |

## Influenced By

| Description | Symbol | Applies To |
|-------------|--------|------------|
|-------------|--------|------------|

## Artifact Files

| Content Type | File Name         | File Content |
|--------------|-------------------|--------------|
| Control      | indivisible.proto |              |
| Uml          | indivisible.md    |              |

## Code Map

| Map Type | Name | Platform | Location |
|----------|------|----------|----------|
|----------|------|----------|----------|

## Implementation Map

| Map Type | Name | Platform | Location |
|----------|------|----------|----------|
|----------|------|----------|----------|

## Resource Map

| Map Type | Name | Location | Description |
|----------|------|----------|-------------|
|----------|------|----------|-------------|

**Is External:** True

**Constructor:**

## Indivisible responds to these Invocations

### Properties

*Name: Decimals*

Value Description: Set to Zero, not allowing any division, usually this is applied to the base token.

Template Value: 0

### Invocations

*GetDecimals*

Id: 2ca7fbb2-ce98-4dda-a6ae-e4ac2527bb33

Description: Should return 0

### Request

Control Message: GetDecimalsRequest

Description:

### Parameters

| Name | Value |
|------|-------|
|------|-------|

### Response

Control Message: GetDecimalsResponse

Description: Return 0

### Parameters

| Name     | Value |
|----------|-------|
| Decimals | 0     |

### *GetDecimals*

Id: 2ca7fbb2-ce98-4dda-a6ae-e4ac2527bb33

Description: Should return 0

### Request

Control Message: GetDecimalsRequest

Description:

### Parameters

| Name | Value |
|------|-------|
|------|-------|

### Response

Control Message: GetDecimalsResponse

Description: Return 0

### Parameters

| Name     | Value |
|----------|-------|
| Decimals | 0     |

### Specification Behavior

## Transferable

### Taxonomy Symbol: t

*Every token instance has an owner. The Transferable behavior provides the owner the ability to transfer the ownership to another party or account.*

*This behavior is often inferred by other behaviors that might exist like*



*Redeem, Sell, etc. This behavior is Delegable. If the token definition is Delegable, TransferFrom will be available.*

## Example

## Analogyes

| Name             | Description                        |
|------------------|------------------------------------|
| <b>Analogy 1</b> | transferable analogy 1 description |

| Type:           | Behavior                             |
|-----------------|--------------------------------------|
| <b>Name:</b>    | Transferable                         |
| <b>Id:</b>      | af119e58-6d84-4ca6-9656-75e8d312f038 |
| <b>Visual:</b>  | <i>t</i>                             |
| <b>Tooling:</b> | t                                    |
| <b>Version:</b> | 1.0                                  |

## Dependencies

| Artifact Type | Symbol | Description |
|---------------|--------|-------------|
|---------------|--------|-------------|

## Incompatible With

| Artifact Type   | Symbol | Id                                   |
|-----------------|--------|--------------------------------------|
| <b>Behavior</b> | ~t     | a4fa4ca8-6afd-452b-91f5-7103b6fee5e5 |

## Influenced By

| Description  | Symbol | Applies To |
|--|--------|------------|
| <b>If the token is Delegable, TransferFrom should be enabled.</b>  | g      | [ ]        |
| <b>If Compliance is present, a CheckTransferAllowed request has to be made and verified before a Transfer request or a TransferFrom request.</b> | c      | [ ]        |

|   |   |    |
|---|---|----|
| If issuable is present, an AcceptTokenRequest from the token issuer, in response to a RequestTokens, has to be made and verified before a Transfer request. | i | [] |
|---|---|----|

## Artifact Files

| Content Type   | File Name          | File Content |
|----------------|--------------------|--------------|
| <b>Control</b> | transferable.proto |              |
| <b>Uml</b>     | transferable.md    |              |

## Code Map

| Map Type | Name | Platform | Location |
|----------|------|----------|----------|
|----------|------|----------|----------|

## Implementation Map

| Map Type | Name | Platform | Location |
|----------|------|----------|----------|
|----------|------|----------|----------|

## Resource Map

| Map Type | Name | Location | Description |
|----------|------|----------|-------------|
|----------|------|----------|-------------|

**Is External:** True

**Constructor:**

## Transferable responds to these Invocations

### *Transfer*

Id: 5d4b8f10-7857-4a2f-9b8c-d61e367a6bcc

Description: >A transfer request will invoke a transfer from the owner of the token to the party or account provided in the To field of the request. For fungible or dividable non-fungible tokens, this request may also include value in the Amount field of the request to transfer more than one token of the class in a single request.

## Request Message:

TransferRequest

Description: The request

### Request Parameters

| Name            | Value                               |
|-----------------|-------------------------------------|
| <b>To</b>       | AccountId to transfer ownership to. |
| <b>Quantity</b> | Number of tokens to transfer.       |

## Response Message

TransferResponse

Description: The response

### Response Parameters

| Name                | Value  |
|---------------------|--|
| <b>Confirmation</b> | A confirmation receipt or error may be returned to the owner based on the outcome of the transfer request. |

## TransferFrom

Id: 516b4e2f-4a14-4c4f-a6f2-1419d4af35c6

Description: >A transfer request will invoke a transfer from the owner of the token to the party or account provided in the To field of the request. For fungible or dividable non-fungible tokens, this request may also include value in the Amount field of the request to transfer more than one token of the class in a single request.

## Request Message:

TransferFromRequest

Description: The request

### Request Parameters

| Name        | Value                                 |
|-------------|---------------------------------------|
| <b>From</b> | AccountId to transfer ownership from. |

|                 |                                     |
|-----------------|-------------------------------------|
| <b>To</b>       | AccountId to transfer ownership to. |
| <b>Quantity</b> | Number of tokens to transfer.       |

## Response Message

TransferFromResponse

Description: The response

### Response Parameters

| Name                | Value   |
|---------------------|---|
| <b>Confirmation</b> | A confirmation receipt or error may be returned to the owner based on the outcome of the transfer from request. |

## Specification Behavior

### Delegable

Taxonomy Symbol: g

*A token class that implements this behavior will support the delegation of certain behaviors to another party or account to invoke them on the behalf of the owner. When applied to a token, behaviors that are Delegable will enable delegated request invocations. This is useful to provide another party to automatically be able to perform the behaviors that can be delegated without seeking permission up to a certain allowance.*

## Example

## Analogies

| Name          | Description   |
|---------------|---|
| <b>Broker</b> | You may allow a broker to transfer your tokens as a part of an investment strategy. Setting an allowance can cap the total number of tokens the broker is allowed to perform delegated behaviors, when exceeded a new allowance |

|  |                                  |
|--|----------------------------------|
|  | request will need to be granted. |
|--|----------------------------------|

## Comments

Applied to behaviors that are Delegable.

|                 |                                      |
|-----------------|--------------------------------------|
| <b>Type:</b>    | <b>Behavior</b>                      |
| <b>Name:</b>    | Delegable                            |
| <b>Id:</b>      | a3d02076-6009-4a65-9ed4-2deffe5291e1 |
| <b>Visual:</b>  | <i>g</i>                             |
| <b>Tooling:</b> | g                                    |
| <b>Version:</b> | 1.0                                  |

## Dependencies

| Artifact Type | Symbol | Description |
|---------------|--------|-------------|
|---------------|--------|-------------|

## Incompatible With

| Artifact Type | Symbol | Id |
|---------------|--------|----|
|---------------|--------|----|

## Influenced By

| Description | Symbol | Applies To |
|-------------|--------|------------|
|-------------|--------|------------|

## Artifact Files

| Content Type   | File Name       | File Content |
|----------------|-----------------|--------------|
| <b>Control</b> | delegable.proto |              |
| <b>Uml</b>     | delegable.md    |              |

## Code Map

| Map Type | Name | Platform | Location |
|----------|------|----------|----------|
|----------|------|----------|----------|

## Implementation Map

| Map Type | Name | Platform | Location |
|----------|------|----------|----------|
|----------|------|----------|----------|

## Resource Map

| Map Type | Name | Location | Description |
|----------|------|----------|-------------|
|----------|------|----------|-------------|

Is External: True

Constructor:

## Delegable responds to these Invocations

### *Allowance*

Id: 2e0fd8e5-2090-4c62-b094-232c32a78022

Description: A Request by a party or account to the owner of a token(s) to have the right to perform a delegated behavior on their behalf.

### **Request Message:**

AllowanceRequest

Description: The request

### Request Parameters

| Name     | Value                           |
|----------|---------------------------------|
| Quantity | Number of Tokens to be allowed. |

### **Response Message**

AllowanceResponse

Description: The response

### Response Parameters

| Name                | Value  |
|---------------------|--|
| <b>Confirmation</b> | A confirmation receipt or denial be returned to the allowance requestor. |

### *Approve Allowance*

Id: 6d5df99d-2f5e-4c7a-aea4-d2d54176abfd

Description: Same control message as the AllowanceRequest. This could allow for an AllowanceRequest to be forwarded to multiple parties needed to Approve and shield this from the requestor. When all Approvals are obtained, an AllowanceResponse could be sent.

#### **Request Message:**

AllowanceRequest

Description: The request

### Request Parameters

| Name            | Value                           |
|-----------------|---------------------------------|
| <b>Quantity</b> | Number of Tokens to be allowed. |

#### **Response Message**

ApproveResponse

Description: The response

### Response Parameters

| Name                | Value  |
|---------------------|--|
| <b>Confirmation</b> | A confirmation response from the owner approving the an allowance request, indicating a allowance quantity the requestor has the option to invoke the Delegable behaviors on the token(s). |

## Specification Behavior

### Burnable

#### Taxonomy Symbol: b

*A token class that implements this behavior will support the burning or decommissioning of token instances of the class. This does not delete a token, but rather places it in a permanent non-use state. Burning is a one way operation and cannot be reversed. This behavior is Delegable. If the token definition is Delegable, BurnFrom will be available.*

#### Example

When a token is used in a certain way, you may want to remove it from circulation or from being used again. Since the ledger doesn't allow for deletions, burning a token essentially 'deletes' the token from being used, but not from history.

#### Analogies

| Name               | Description   |
|--------------------|---|
| <b>Oil Barrels</b> | If you mint a new token for each barrel of oil created, you may transfer ownership several times until the barrel is refined. The refining process should burn the barrel of oil to remove it from circulation. |
| <b>Redeem</b>      | A token that is a coupon or single use ticket, should be burned when it is redeemed.  |

| Type:           | Behavior                             |
|-----------------|--------------------------------------|
| <b>Name:</b>    | Burnable                             |
| <b>Id:</b>      | 803297a1-c0f9-4898-9d44-29c9d41cca97 |
| <b>Visual:</b>  | <i>b</i>                             |
| <b>Tooling:</b> | b                                    |
| <b>Version:</b> | 1.0                                  |



## Dependencies

| Artifact Type | Symbol | Description |
|---------------|--------|-------------|
|---------------|--------|-------------|

## Incompatible With

| Artifact Type | Symbol | Id |
|---------------|--------|----|
|---------------|--------|----|

## Influenced By

| Description   | Symbol | Applies To |
|---|--------|------------|
| Delegable or not, will determine if the BurnFrom Control will be available in the implementation.                             | g      | [ ]        |
| If Compliance is present, a CheckBurnAllowed request has to be made and verified before a Burn request or a BurnFrom request. | c      | [ ]        |

## Artifact Files

| Content Type | File Name      | File Content |
|--------------|----------------|--------------|
| Control      | burnable.proto |              |
| Uml          | burnable.md    |              |

## Code Map

| Map Type   | Name         | Platform         | Location  |
|------------|--------------|------------------|---|
| SourceCode | OpenZeppelin | EthereumSolidity | <a href="https://github.com/OpenZeppelin/openzeppelin-contracts/blob/master/contracts/token/ERC20/ERC20Burnable.sol">https://github.com/OpenZeppelin/openzeppelin-contracts/blob/master/contracts/token/ERC20/ERC20Burnable.sol</a> |

## Implementation Map

| Map Type | Name | Platform | Location |
|----------|------|----------|----------|
|----------|------|----------|----------|

## Resource Map

| Map Type | Name | Location | Description |
|----------|------|----------|-------------|
|----------|------|----------|-------------|

Is External: False

Constructor:

### Burnable responds to these Invocations

#### *Burn*

Id: f063dcaa-49f9-4c49-bf0f-2766301e1033

Description: A request to burn a token instance(s) in the class by the owner of the token instance(s).  
Optional Quantity field in the request.

#### **Request Message:**

BurnRequest

Description: The request to Burn or Retire tokens.

#### Request Parameters

| Name            | Value  |
|-----------------|--|
| <b>Quantity</b> | The number of tokens to burn, might not apply to the implementation. |

#### **Response Message**

BurnResponse

Description: The response from the request to burn.

#### Response Parameters

| Name                | Value   |
|---------------------|---|
| <b>Confirmation</b> | A confirmation receipt or error may be returned to the invoker based on the outcome of the burn request |

## BurnFrom

Id: 49b53152-3360-426f-9e0a-24a0b4e7c881

Description: Requires Delegable. A request to burn token instance(s) in the class by a party or account that has allowance to do so. Requires a From and Quantity fields in the request.

### Request Message:

BurnFromRequest

Description: The request to Burn or Retire tokens.

#### Request Parameters

| Name            | Value  |
|-----------------|--|
| <b>From</b>     | AccountId from which tokens are burnt                                |
| <b>Quantity</b> | The number of tokens to burn, might not apply to the implementation. |

### Response Message

BurnFromResponse

Description: The response from the request to burn.

#### Response Parameters

| Name                | Value  |
|---------------------|--|
| <b>Confirmation</b> | A confirmation receipt or error may be returned to the invoker based on the outcome of the burn from request |

## Specification Behavior

Draft

## Roles

### Taxonomy Symbol: r

*A token can have behaviors that the class will restrict invocations to a select set of parties or accounts that are members of a role or group. This is a generic behavior that can apply to a token many times to represent many*

*role definitions within the template. This behavior will allow you to define what role(s) to create and what behavior(s) to apply the role to in the TemplateDefinition.*

## Example

## Analogies

| Name           | Description  |
|----------------|--|
| <b>Minters</b> | A role called 'Minters' for a token can have accounts in the role. The MintTo behavior invocation will be bound to the role check to ensure only account in the 'Minters' role are allowed to mint new instances in the class. |

## Comments

Roles has a constructor control that creates roles and applies them to certain behaviors of the token at creation of the class from the template.

|                 |                                      |
|-----------------|--------------------------------------|
| <b>Type:</b>    | <b>Behavior</b>                      |
| <b>Name:</b>    | Roles                                |
| <b>Id:</b>      | c32726da-9787-4dd8-8de3-d07d1733d0f6 |
| <b>Visual:</b>  | <i>r</i>                             |
| <b>Tooling:</b> | r                                    |
| <b>Version:</b> | 1.0                                  |

## Dependencies

| Artifact Type | Symbol | Description |
|---------------|--------|-------------|
|---------------|--------|-------------|

## Incompatible With

| Artifact Type | Symbol | Id |
|---------------|--------|----|
|---------------|--------|----|

## Influenced By

| Description | Symbol | Applies To |
|-------------|--------|------------|
|-------------|--------|------------|

## Artifact Files

| Content Type | File Name   | File Content |
|--------------|-------------|--------------|
| Control      | roles.proto |              |
| Uml          | roles.md    |              |

## Code Map

| Map Type   | Name                  | Platform         | Location  |
|------------|-----------------------|------------------|---|
| SourceCode | Open Zeppelin - Roles | EthereumSolidity | <a href="https://github.com/OpenZeppelin/openzeppelin-contracts/blob/master/contracts/access/Roles.sol">https://github.com/OpenZeppelin/openzeppelin-contracts/blob/master/contracts/access/Roles.sol</a> |

## Implementation Map

| Map Type | Name | Platform | Location |
|----------|------|----------|----------|
|----------|------|----------|----------|

## Resource Map

| Map Type | Name | Location | Description |
|----------|------|----------|-------------|
|----------|------|----------|-------------|

Is External: False

Constructor:

## Roles responds to these Invocations

### *RoleCheck*

Id: 00a665e3-1dda-441e-8262-5750435c153c

Description: Internal invocation when the applied behavior is called to check if the requestor is a member of the role.

ClassAttendance - 1e0cdca730ba6661cc87bb19a98eb8fe7e274b847ff477dd12fac65f2f68188621

## Request Message:

IsInRole

Description: The request

### Request Parameters

| Name      | Value                       |
|-----------|-----------------------------|
| AccountId | AccountId of the requestor. |

## Response Message

True/False

Description: The response

### Response Parameters

| Name     | Value      |
|----------|------------|
| IsInRole | True/False |

## Properties

*Name: Role*

Value Description: A group or list an account can be a member or be in.

Template Value: Minters

## Invocations

*GetRoleMembers*

Id:

Description: Request the the list of member accounts in the role.

## Request

Control Message: GetRoleMembersRequest

Description: The request

### Parameters

| Name | Value |
|------|-------|
|------|-------|

## Response

Control Message: GetRoleMembersResponse

Description: The response

### Parameters

| Name           | Value                                       |
|----------------|---|
| <b>Members</b> | Returning the list of accounts in the role. |

## AddRoleMember

Id: 600357f8-0499-47f8-87a5-eedf4ad034af

Description: Add a member to the group or role property.

## Request

Control Message: AddRoleMemberRequest

Description: The request

### Parameters

| Name                  | Value  |
|-----------------------|--|
| <b>RoleName</b>       | Name of the role you are adding a member to. Optional parameter if there is only one role. |
| <b>AccountAddress</b> | Address, name or identifier of the account to be added to the role.                        |

## Response

Control Message: AddRoleMemberResponse

Description: The response

### Parameters

| Name | Value |
|------|-------|
|------|-------|

|              |                |
|--------------|----------------|
| <b>Added</b> | True or False. |
|--------------|----------------|

## *RemoveRoleMember*

Id: 97e160bb-6c60-4f1d-923b-813b07b89638

Description: Remove a member to the group or role property.

### Request

Control Message: RemoveRoleMemberRequest

Description: The request

#### Parameters

| Name                  | Value  |
|-----------------------|--|
| <b>RoleName</b>       | Name of the role you are adding a member to. Optional parameter if there is only one role. |
| <b>AccountAddress</b> | Address, name or identifier of the account to be removed from the role.                    |

### Response

Control Message: RemoveRoleMemberResponse

Description: The response

#### Parameters

| Name         | Value          |
|--------------|----------------|
| <b>Added</b> | True or False. |

## *IsInRole*

Id: e42b1b16-074a-4d7d-b9f9-f69a2397a21b

Description: Check to see if an account is in the role.

### Request

Control Message: IsInRoleRequest

Description: The request may be internal only and not exposed externally.



### Parameters

| Name                  | Value  |
|-----------------------|--|
| <b>RoleName</b>       | Name of the role you are checking membership of. Optional parameter if there is only one role. |
| <b>AccountAddress</b> | Address, name or identifier of the account to be checked.                                      |

### Response

Control Message: IsInRoleRequestResponse

Description: The response

### Parameters

| Name          | Value          |
|---------------|----------------|
| <b>InRole</b> | True or False. |

### *GetMinters*

Id:

Description: Request the the list of member accounts in the 'Minters' role.

### Request

Control Message: GetMintersRequest

Description: The request

### Parameters

| Name | Value |
|------|-------|
|------|-------|

### Response

Control Message: GetMintersResponse

Description: The response

### Parameters

| Name           | Value   |
|----------------|---|
| <b>Members</b> | Returning the list of accounts in the 'Minters' role. |

## *AddRoleMember*

Id: 600357f8-0499-47f8-87a5-eedf4ad034af

Description: Add a member to the group or role property.

### Request

Control Message: AddRoleMemberRequest

Description: The request

#### Parameters

| Name                  | Value   |
|-----------------------|---|
| <b>RoleName</b>       | Value is always set to 'Minters'  |
| <b>AccountAddress</b> | Address, name or identifier of the account to be added to the 'Minters' role. |

### Response

Control Message: AddRoleMemberResponse

Description: The response

#### Parameters

| Name         | Value          |
|--------------|----------------|
| <b>Added</b> | True or False. |

## *RemoveRoleMember*

Id: 97e160bb-6c60-4f1d-923b-813b07b89638

Description: Remove a member to the group or role property.

### Request

Control Message: RemoveRoleMemberRequest

Description: The request

#### Parameters

| Name | Value |
|------|-------|
|------|-------|

|                       |   |
|-----------------------|---|
| <b>RoleName</b>       | Always set to 'Minters'   |
| <b>AccountAddress</b> | Address, name or identifier of the account to be removed from the role. |

## Response

Control Message: RemoveRoleMemberResponse

Description: The response

### Parameters

| Name         | Value          |
|--------------|----------------|
| <b>Added</b> | True or False. |

## IsInRole

Id: e42b1b16-074a-4d7d-b9f9-f69a2397a21b

Description: Check to see if an account is in the role.

## Request

Control Message: IsInRoleRequest

Description: The request may be internal only and not exposed externally.

### Parameters

| Name                  | Value   |
|-----------------------|---|
| <b>RoleName</b>       | Always be bound to 'Minters'                              |
| <b>AccountAddress</b> | Address, name or identifier of the account to be checked. |

## Response

Control Message: IsInRoleRequestResponse

Description: The response

### Parameters

| Name | Value |
|------|-------|
|------|-------|

|        |                |
|--------|----------------|
| InRole | True or False. |
|--------|----------------|

## Specification Behavior

### Mintable

#### Taxonomy Symbol: m

*A token class that implements this behavior will support the minting or issuing of new token instances in the class. These new tokens can be minted and belong to the owner or minted to another account. This behavior may be invalidated by a restrictive behavior like Singleton, where only a single instance of the token can exist. Mintable is technically delegable, but it's delegation should be controlled by a behavior like Roles.*

#### Example

A consortium of oil producers needs to create tokens for each barrel of oil they are putting on the market to trade. There are separate classes of tokens for each grade of oil. Producers of barrels will need be have the ability to mint new tokens in order to facilitate the trading of them in the supply chain.

#### Analogies

| Name | Description  |
|------|--|
| SKU  | A token class can represent a particular item SKU, where the manufacturer of the item has the ability to mint or issue new inventory of the SKU into the supply chain. |

| Type:    | Behavior                             |
|----------|--------------------------------------|
| Name:    | Mintable                             |
| Id:      | f9224e90-3cab-45bf-b5dc-0175121e2ead |
| Visual:  | <i>m</i>                             |
| Tooling: | m                                    |

Version: 1.0

## Dependencies

| Artifact Type | Symbol | Description |
|---------------|--------|-------------|
|---------------|--------|-------------|

## Incompatible With

| Artifact Type | Symbol | Id |
|---------------|--------|----|
|---------------|--------|----|

## Influenced By

| Description   | Symbol | Applies To |
|---|--------|------------|
| Roles is common to implement to provide authorization checks for invoking the behavior. Highly Recommended that Role restrictions be applied to MintTo invocations. | r      | [ ]        |
| If Compliance is present, a CheckMintAllowed request has to be made and verified before a Mint request or a MintTo request.   | c      | [ ]        |

## Artifact Files

| Content Type | File Name      | File Content |
|--------------|----------------|--------------|
| Control      | mintable.proto |              |
| Uml          | mintable.md    |              |

## Code Map

| Map Type   | Name         | Platform         | Location  |
|------------|--------------|------------------|---|
| SourceCode | OpenZeppelin | EthereumSolidity | <a href="https://github.com/OpenZeppelin/openzeppelin-contracts/blob/master/contracts/token/ERC20/ERC20Mintable.sol">https://github.com/OpenZeppelin/openzeppelin-contracts/blob/master/contracts/token/ERC20/ERC20Mintable.sol</a> |

## Implementation Map

| Map Type       | Name             | Platform    | Location |
|----------------|------------------|-------------|----------|
| Implementation | Implementation 1 | ChaincodeGo |          |

## Resource Map

| Map Type | Name                   | Location | Description |
|----------|------------------------|----------|-------------|
| Resource | Regulation Reference 1 |          |             |

Is External: False

Constructor:

## Mintable responds to these Invocations

Binding Is Influenced by Roles's Invocation RoleCheckRoles's Invocation RoleCheck Intercepts this behavior's invocation.'

### *RoleCheck*

Id: 00a665e3-1dda-441e-8262-5750435c153c

Description: Check to see if the account is in the Role called 'Minters'

### **Request Message:**

IsInRole

Description: Checking the 'Minters' role.

### Request Parameters

| Name      | Value                       |
|-----------|-----------------------------|
| AccountId | AccountId of the requestor. |

### **Response Message**

True/False

Description: Respond true if the account is in the 'Minters' role.

### Response Parameters

| Name            | Value      |
|-----------------|------------|
| <b>IsInRole</b> | True/False |

### *MintTo*

Id: 70499b23-a1dd-4c87-90d6-6e45400f28b5

Description: A request to create new token instances in the class by the owner or a party or account in a role that is granted this permission to another party or account. Requires a To and Quantity fields in the request.

### Request Message:

MintToRequest

Description: The request

### Request Parameters

| Name             | Value                             |
|------------------|-----------------------------------|
| <b>ToAccount</b> | Account Id to mint the tokens to. |
| <b>Quantity</b>  | Number of new tokens to create.   |

### Response Message

MintToResponse

Description: The response

### Response Parameters

| Name                | Value  |
|---------------------|--|
| <b>Confirmation</b> | A confirmation receipt or error may be returned to the invoker based on the outcome of the MintTo request. |

### *Mint*

Id: 3ddf15db-c919-4f72-a57b-d089931bc901

Description: A request to create new token instances in the class by the owner or a party or account in a role that is granted this permission. Minted tokens using this invocation will be owned by the owner or token pool account. Requires a Quantity field in the request.

## Request Message:

MintRequest

Description: The request

### Request Parameters

| Name     | Value                           |
|----------|---------------------------------|
| Quantity | Number of new tokens to create. |

## Response Message

MintResponse

Description: The response

### Response Parameters

| Name         | Value  |
|--------------|--|
| Confirmation | A confirmation receipt or error may be returned to the invoker based on the outcome of the mint request. |

## Supply Control

|          |                                      |
|----------|--------------------------------------|
| Type:    | BehaviorGroup                        |
| Name:    | Supply Control                       |
| Id:      | 91cb89b6-a2ce-44ff-b3a0-f0cb3f117e56 |
| Visual:  | <i>SC</i>                            |
| Tooling: | SC                                   |
| Version: | 1.0                                  |



## Definition

*A token class that implements this behavior will provide controls to increase and decrease supply of tokens within the class. Additionally, it will include the ability to support a role, like Minters, that will be allowed to invoke the Mintable behavior. The owner can add accounts to the role and any account that is a member of the role will be able to mint tokens in the class.*

## Example

## Analogies

| Name                | Description                                  |
|---------------------|--|
| <b>Central Bank</b> | Implementing monetary policy for this token. |

## Comments

Define a Minters role and apply the role to the mintable behavior.

## Dependencies

| Artifact Type | Symbol | Description |
|---------------|--------|-------------|
|---------------|--------|-------------|

## Incompatible With

| Artifact Type   | Symbol | Id                                   |
|-----------------|--------|--------------------------------------|
| <b>Behavior</b> | s      | c1189d7a-e142-4504-bf26-44c35b76c9d6 |

## Influenced By

| Description   | Symbol | Applies To |
|---|--------|------------|
| <b>Create a Minters Role and apply it to the Mintable behavior to provide authorization checks for invoking the behavior.</b> | r      | [ ]        |

## Artifact Files

| Content Type | File Name            | File Content |
|--------------|----------------------|--------------|
| Control      | supply-control.proto |              |
| Uml          | supply-control.md    |              |

## Code Map

| Map Type | Name | Platform | Location |
|----------|------|----------|----------|
|----------|------|----------|----------|

## Implementation Map

| Map Type | Name | Platform | Location |
|----------|------|----------|----------|
|----------|------|----------|----------|

## Resource Map

| Map Type | Name | Location | Description |
|----------|------|----------|-------------|
|----------|------|----------|-------------|

*The behaviors belonging to this group are included in the Behaviors section of this specification.*

Draft