

Docker Registry v2.0





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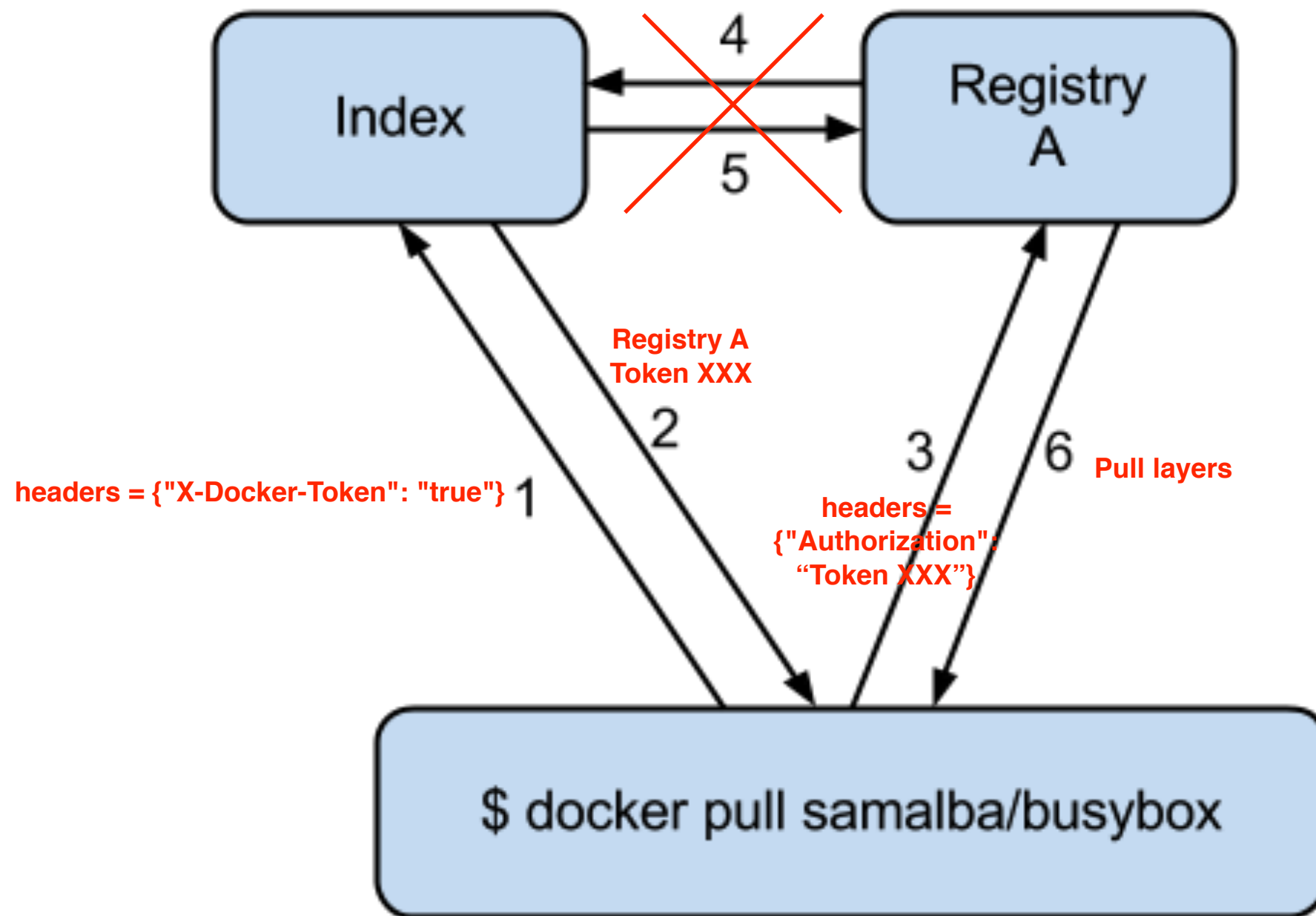


The Docker Hub and the Docker Registry v1

- Docker Hub
 - User accounts
 - Metadata
 - Authentication service
 - Tokenization
- Docker Registry v1
 - Images (Layers)
 - S3, local FS, cloud files
- Docker
 - Pull/Push/Run

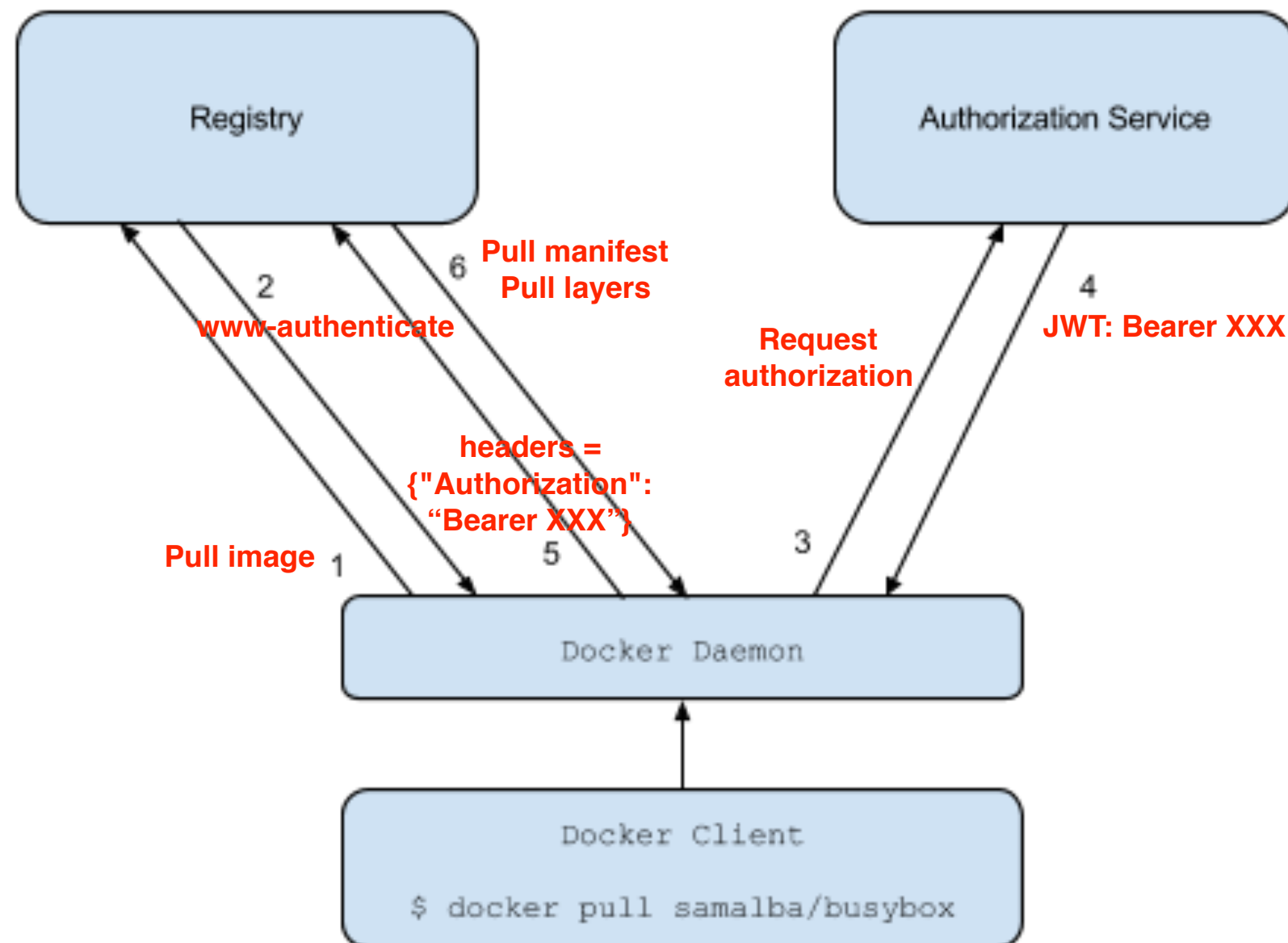


Docker Registry v1





Docker Registry v2





Docker Registry v2 Features

- JWT Authorization (scope)
 - base64-encoded signature
 - JSON Web Token signed using the authorization server's private key (kid or public certificate to verify signature)
- Rewritten in Golang
- Image Verification
 - signed push (--disable-content-trust=true)
 - verifies the manifest's signature
 - verifies the digest of the layer, ensuring that the content matches that specified by the manifest
- Allows parallel layer pulls
- Resumable Pull/Push



```
GET /token?service=registry.docker.io&scope=repository:tutum/hello-world:pull&account=tutumrobot HTTP/1.1 200 (auth.docker.io)
```

"eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCIsIng1Yyl6WyJNSUJDTGpDQ0FkU2dBd0lCQWdJQkFEQUtCZ2dxaGtqT1BRUURBakJHTVVRd1FnWURWUWFERXp0Uk5Gb3pPa2RYTjBrNldGUlFSRHBJVFRSUk9rOVVWRmc2TmtGRlF6cFNUVE5ET2tGU01rTTZUMFkzTnpwQ1ZrVkJPa2xHUIVrNlExazFTekFlRncweE5UQTJNaV4T1RVMU5EWmFGdzB4TmpBMk1qUXhPVFUxTkRaYU1FWXhSREJDQmdOVkjbTVRPMGhHU1UwNldGZFZWam8yUVZkSU9sWlplUVEk2TTFnMVREcFNWREkxT2s5VFNrZzZTMVExUmpwWVRsSkIPbFJMTmtmNlMxUkxOanBCUVV0VU1Ga3dFd1lIS29aSXpqMENBUVlJS29aSXpqMERBUWNEUWdBRXl2UzIvdEI3T3JlMkVxcGRDeFdtS1NqV1N2VmJ2TWUrWGVFTUNVMDByQjl0akNiUVhreFdmOSs0MUxQMlZNQ29BK0RMRklwVjBGZGdwajlOWU5rL2pxT0JzakNCcnpBT0JnTlZlUThCQWY4RUJBTUNBSUF3RHdZRFZSMGxCQWd3QmdZRVZSMGxBREJFQmdOVkhrNEVQUVE3U0VaSIRUcFIWMVZXT2paQlYwZzZWbGxOTWpveldeV1k1PbEpVTWpVNIQxTktTanBMVkrRWR09saE9Va2c2VkVzMINEcExWRXMyT2tGQlMxUXdSZ1lEVllwakJEOHdQWUE3VVRSYU16cEhWemRKT2xoVWVFUTZTRTAwVVRwUFZGUlPalpCUlVNNlVrMHPRenBCVWpKRE9rOUdOemM2UWxaRlFUcEpSa1ZKT2tOWk5Vc3dDZ1lJS29aSXpqMEVBd0lEU1FBd1JnSWhBTXZiT2h4cHhrTktqSDRhMFBNS0lFdXRmTjZtRDFvMWs4ZEJOVGxuWVFudkFpRUF0YVJGSGJSR2o4ZlVSSzZ4UVJHRURvQm1ZZ3dZelR3Z3BMaGJBZzNOUmFvPSJdfQ.eyJhY2Nlc3MiOiI7InR5cGUlOiJyZXBvc2l0b3J5IiwibmFtZSI6InR1dHVtL2h1bGxvLXdvcmxkliwiYWw0aW9ucyl6WyJwdWxsIl19XSwiYXVkljoicmVnaXN0cnkuZG9ja2VyLmlvliwiZXhwIjoxNDQxMDEyNjU0LCJpYXQiOiJlNDUwMTIzNTQsImZlcnVzcyI6ImF1dGguZG9ja2VyLmlvliwianRpljoiViN5UlhaTEQyTm9xYmM5Zm9rNm0iLCJyYmYiOiJlNDUwMTIzNTQsInN1Yil6InR1dHVtcml9ib3QifQ.A-Xep3RmOx-mj_XyEG-7ob7cWETMKf70Zis1tf_Gh7sL2d58Ap19Bn7eyD6jLMx5qjQUtnJsFjQSIQfSU2k7EQ"}



JSON Web Token (JWT)

HEADER: ALGORITHM & TOKEN TYPE

```
{
  "alg": "ES256",
  "typ": "JWT",
  "x5c": [

    "MIICLzCCAdSgAwIBAgIBADAKBggqhkiZOPQDAjBGMUQwQgYDVQQDEztRNFOz
    OkdXN0k6WFRQRDpITTRR0k9UVFg6NkFFQzpSTTND0kFSMkM6T0Y3NzpcVkvBO
    k1GRUK6Q1k1SzAeFw0xNTA2MjUxOTU1NDZaFw0xNjA2MjQxOTU1NDZaMEYxRD
    BCBgNVBAMTO0hGSU06WFdVVjo2QVdIOlZZTTI6M1g1TDpSVDI10k9TSko6S1Q
    1RjpYTlJIOlRLNkg6S1RLNjpBQUtUMFkwEwYHKOZIZj0CAQYIKoZIZj0DAQcD
    QgAEyvS2/tB70re2EqpdCxWmKSjWSvVbvMe+XeEMCU00rB24jCbQXkxWf9+41
    LP2VMCoA+DLFB0V0Fdgpj9NYNk/jq0BsJCBRzA0BgNVHQ8BAf8EBAMCAIAwDw
    YDVR0lBAgwBgYEVR0lADBEBgNVHQ4EPQQ7SEZJTTpYV1VW0jZBV0g6V1lNMjo
    zWDVM0lJUMjU6T1NKSjpLVdVG0lh0Ukg6VEs2SDpLVEs20kFBS1QwRgYDVR0j
    BD8wPYYA7UTRaMzphVzdJOlhUUEQ6SE00UTpPVFRY0jZBRUM6Uk0zQzpbUjJDO
    k9GNzc6QlZFQTpJRkVJOkNZNUswCgYIKoZIZj0EAWIDSQAARgIhAMvb0hxpXk
    NKjH4a0PMKIEutfn6mD1o1k8dBNTlnYQnvA1EAtaRFHbRGj8fURK6xQRGEDoB
    mYgwYzTwgpLhbAg3NRao="
  ]
}
```

PAYLOAD: DATA

```
{
  "access": [
    {
      "type": "repository",
      "name": "tutum/hello-world",
      "actions": [
        "pull"
      ]
    }
  ],
  "aud": "registry.docker.io",
  "exp": 1441012654,
  "iat": 1441012354,
  "iss": "auth.docker.io",
  "jti": "VSyRXZLD2Noqbc9fok6m",
  "nbf": 1441012354,
  "sub": "tutumrobot"
}
```




v1 vs v2 Compatibility

Push to Docker Registry v2: Client Version \geq Docker 1.6

	Pull v1	Pull v2
Push v1	✓	✓ (Client fallback)
Push v2	✓ (Compatibility Layer)	✓



```
{
  u'signatures': [
    {
      u'header': {
        u'alq': u'ES256',
        u'jwk': {
          u'y': u'wQABg2Jh7C1UteCc6LiZ-dXe7xxBPUXAhV_BG2xkgFM',
          u'x': u'OxBNMMTv_-c9_2gFlO04QikAJQaikYr6Wo7lVOT1_k',
          u'crv': u'P-256',
          u'kty': u'EC',
          u'kid': u'LQBL: ADJC: 25QN: D0XE: E34T: 3K7B: EQLK: A5MD: KE4N: 6JTN: 4NPJ: 4JUI'
        }
      },
      u'protected': u'eyJmb3JtYXRhbnR5bm9udGgiOiJlMmNm4LzCmb3JtYXRUZWlsIjoiaQ24wIiwidGltZSI6IjIwMTU0MDU0HjBUNTk6NTI6NDdaIn0',
      u'signature': u'ID6YtnQIFivpcqq5MK7UDg-clASFLST-20CSMBYdUGS1OKBxt0TOIJ2ryllBQNTqQqJupeOhNkiutPoU94xg'
    }
  ],
  u'name': u'tutum/hello-world',
  u>tag': u'latest',
  u'architecture': u'amd64',
  u'filesystemLayers': [
    {
      u'blobSum': u'sha256: a3ed95caeb02ffe68cdd9fd84406680ae93d633cb16422d00e8a7c22955b46d4'
    },
    {
      u'blobSum': u'sha256: a3ed95caeb02ffe68cdd9fd84406680ae93d633cb16422d00e8a7c22955b46d4'
    },
    {
      u'blobSum': u'sha256: a3ed95caeb02ffe68cdd9fd84406680ae93d633cb16422d00e8a7c22955b46d4'
    },
    {
      u'blobSum': u'sha256: 9057990185077d43a83ccf465472d38739fb12d6010e7e759363b961587d89bc'
    },
    {
      u'blobSum': u'sha256: f96d5fb89048f8ba61c5aef1cf39a33139da757993c94741a09863509b87c98d'
    },
    {
      u'blobSum': u'sha256: e7e8de7ecc9b377b8a07e97e19724c831a9b01c1e5dcbbdb8118612e3f5b57f36'
    },
    {
      u'blobSum': u'sha256: 16bc49c068d70b7ff5fe9874c83f5041e45f8b03339cc39fd65ee6e56ee19b53'
    },
    {
      u'blobSum': u'sha256: a3ed95caeb02ffe68cdd9fd84406680ae93d633cb16422d00e8a7c22955b46d4'
    },
    {
      u'blobSum': u'sha256: delflae900b1663dca9f1c0fba95a7dfbc9f9bb86738ae28548818a36c4dbc83'
    }
  ],
  u'schemaVersion': 1,
  u'historical': [
    {
      u'compatibility': u'{
        "id": "c833a1892a158851945aaeaf1c5bdelce198dbe701ec824f8b0f417d374945e4",
        "parent": "8989fc3642f568c156c3f6a7659014d3a7a9bea2af6215246add2c8637a135d3",
        "created": "2015-05-20T19:51:23.800367185Z",
        "container": "efbf0d9c9de7a51b122ca807deb204d4ce89dd88389f547a528a7a23f8158f1b",
        "container_config": {
          "Hostname": "19621702fa97",
          "Domainname": "",
          "User": "",
          "Memory": 0,
          "MemorySwap": 0,
          "CpuShares": 0,
          "Cpuset": "",
          "AttachStdin": false,
          "AttachStdout": false,
          "AttachStderr": false,
          "PortSpecs": null,
          "ExposedPorts": {
            "80/tcp": {}
          }
        },
        "TTY": false,
        "OpenStdin": false,
        "StdinOnce": false
      }
  ]
}
```



API v1 vs v2

	v1	v2
list tags	/v1/repositories/tutum/hello-world/tags	/v2/tutum/hello-world/tags/list
image id	/v1/repositories/tutum/hello-world/tags/latest OR /v1/repositories/tutum/hello-world/tags	/v2/tutum/hello-world/manifests/latest
get inspect	/v1/repositories/tutum/hello-world/tags/latest AND /v1/images/ c833a1892a158851945aaeaf1c5bde1ce198db e701ec824f8b0f417d374945e4/json	/v2/tutum/hello-world/manifests/latest
pull layer	/v1/images/ c833a1892a158851945aaeaf1c5bde1ce198db e701ec824f8b0f417d374945e4/layer	/v2/tutum/hello-world/blobs/sha256: a3ed95caeb02ffe68cdd9fd84406680ae93d633cb 16422d00e8a7c22955b46d4



API v1 vs v2

- Pull image api v1
 - GET /v1/repositories/tutum/hello-world/images (get token and registry)
 - GET /v1/repositories/tutum/hello-world/tags/latest
 - GET /v1/images/c833a1892a158851945aaeaf1c5bde1ce198dbe701ec824f8b0f417d374945e4/ancestry
 - For each id:
 - GET /v1/images/<id>/json
 - GET /v1/images/<id>/layer



API v1 vs v2

- Pull image api v2
 - GET /token?service=registry.docker.io&scope=repository:tutum/hello-world:pull&account=tutumrobot
 - GET /v2/tutum/hello-world/manifests/latest
 - For each digest (fs layer):
 - GET /v2/tutum/hello-world/blobs/<digest>

Thanks!

@tutumcloud

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