OpenStack RESTful API

Compatible or Consistent

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Agenda

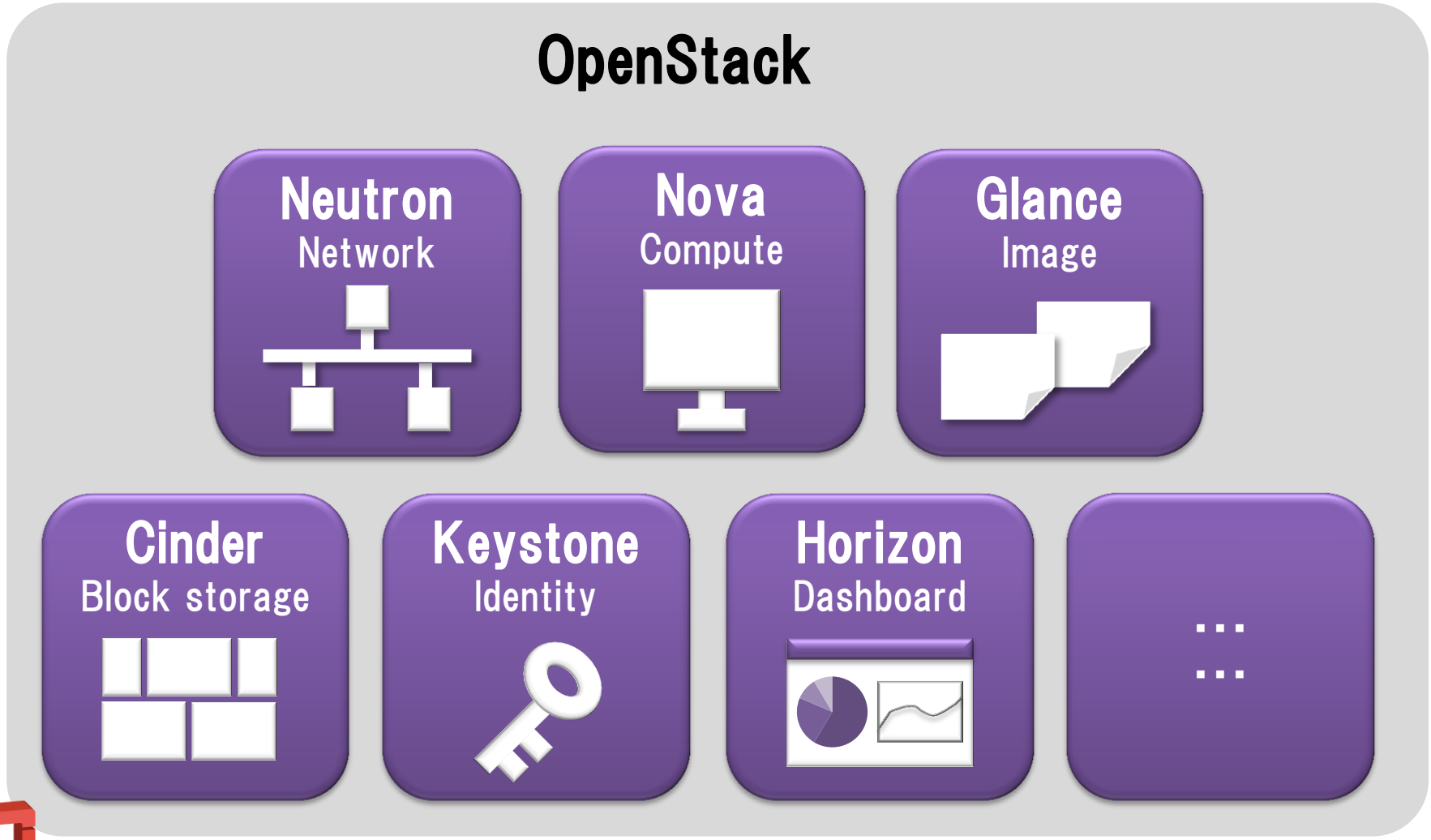
- Who am I
- OpenStack
- OpenStack RESTful API
- Nova RESTful API
- Issues of Nova RESTful API
- Going Solutions
- Current Situation
- Summary

$ who am i

- Software developer
- Join OpenStack community for its quality assurance since 2012
- A core developer of
  - OpenStack Compute (Nova)
  - OpenStack QA (Quality Assurance)


OpenStack

- OpenStack components



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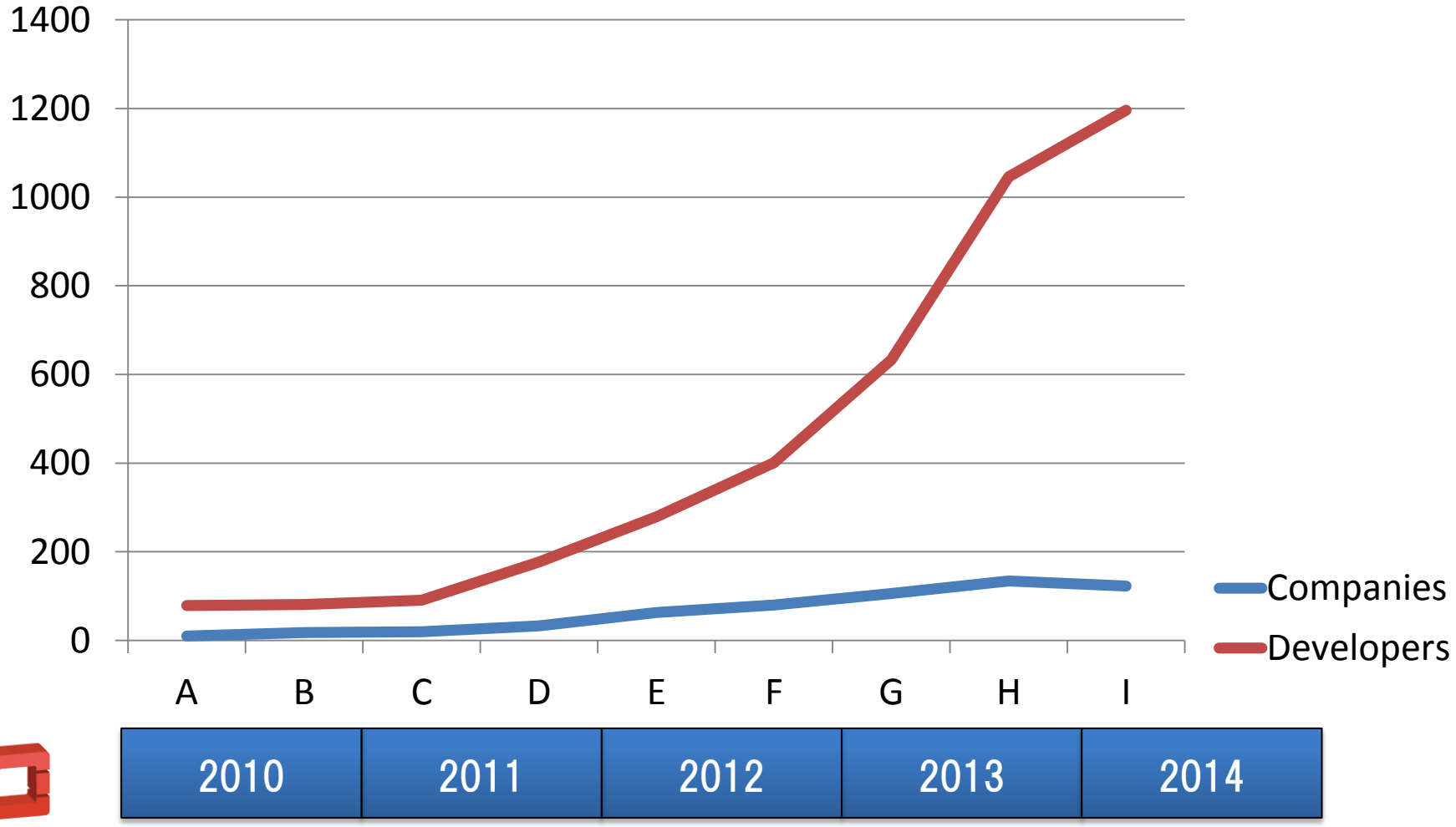
- OpenStack community
  - Rapid Growth



- Community development
  - Importance of code review
    - Can know the internal implementation
    - Can know the trend
    - Can get folks
  - Importance of communication
    - Daily　: IRC or e-mail
    - Weekly: IRC meeting
    - Version: F2F at Design Summit

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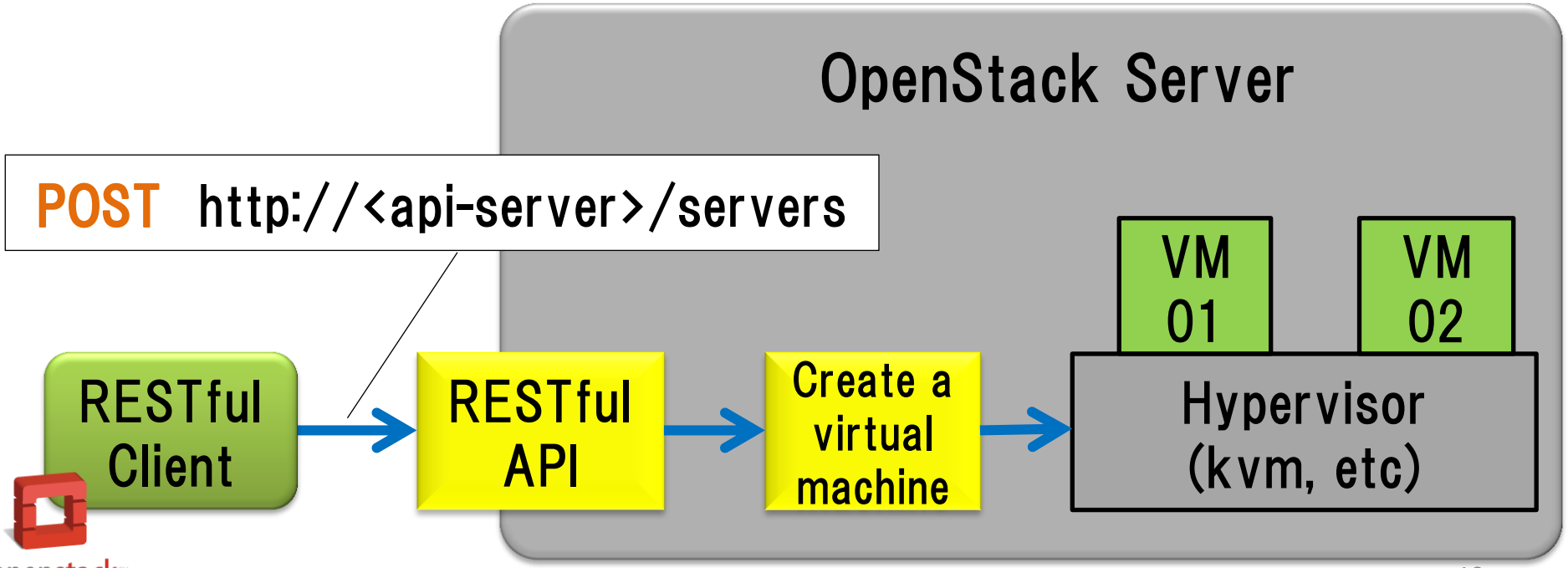
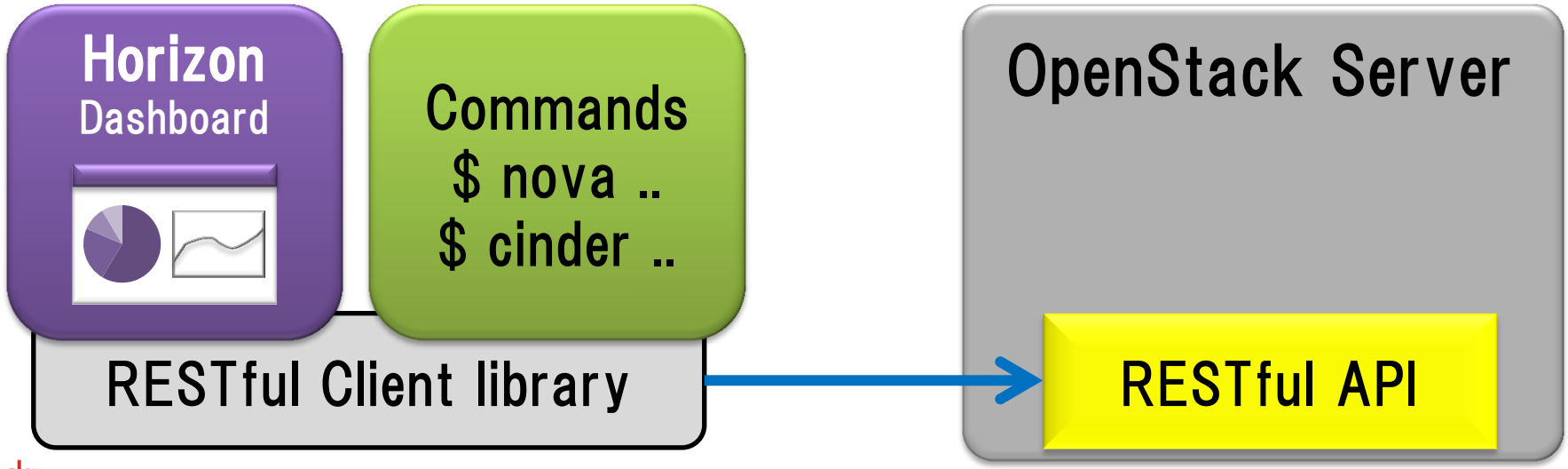
OpenStack RESTful API

- RESTful API
  - Scalable and stateless
  - Simple and consistent interfaces
- OpenStack provides many features through RESTful API



- Many RESTful client libraries are available for OpenStack
  - Python
  - Java
  - .NET
  - ...
- Dashboard and commands request operations via RESTful APIs



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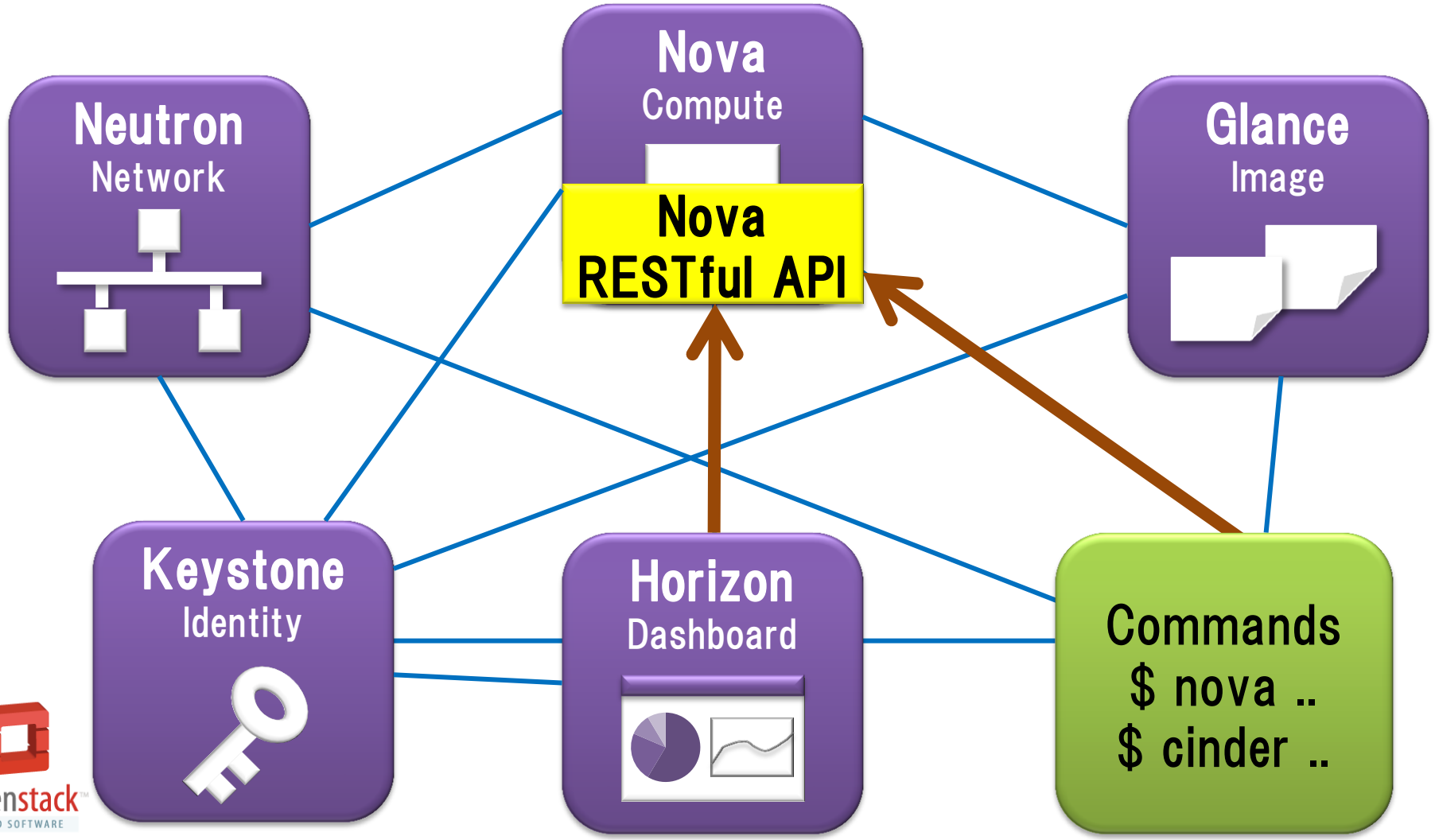
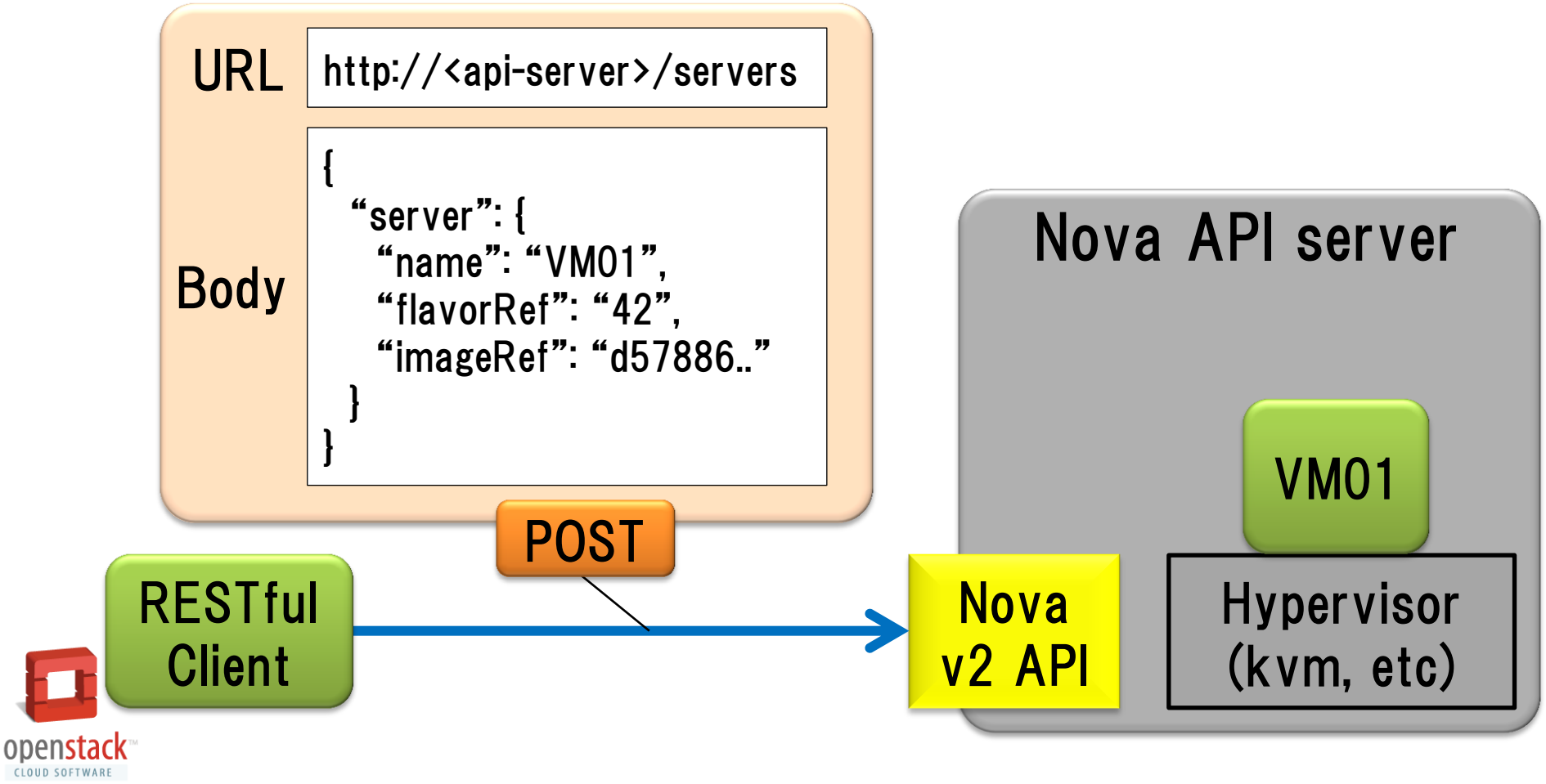
- Each OpenStack component also is connected via RESTful APIs

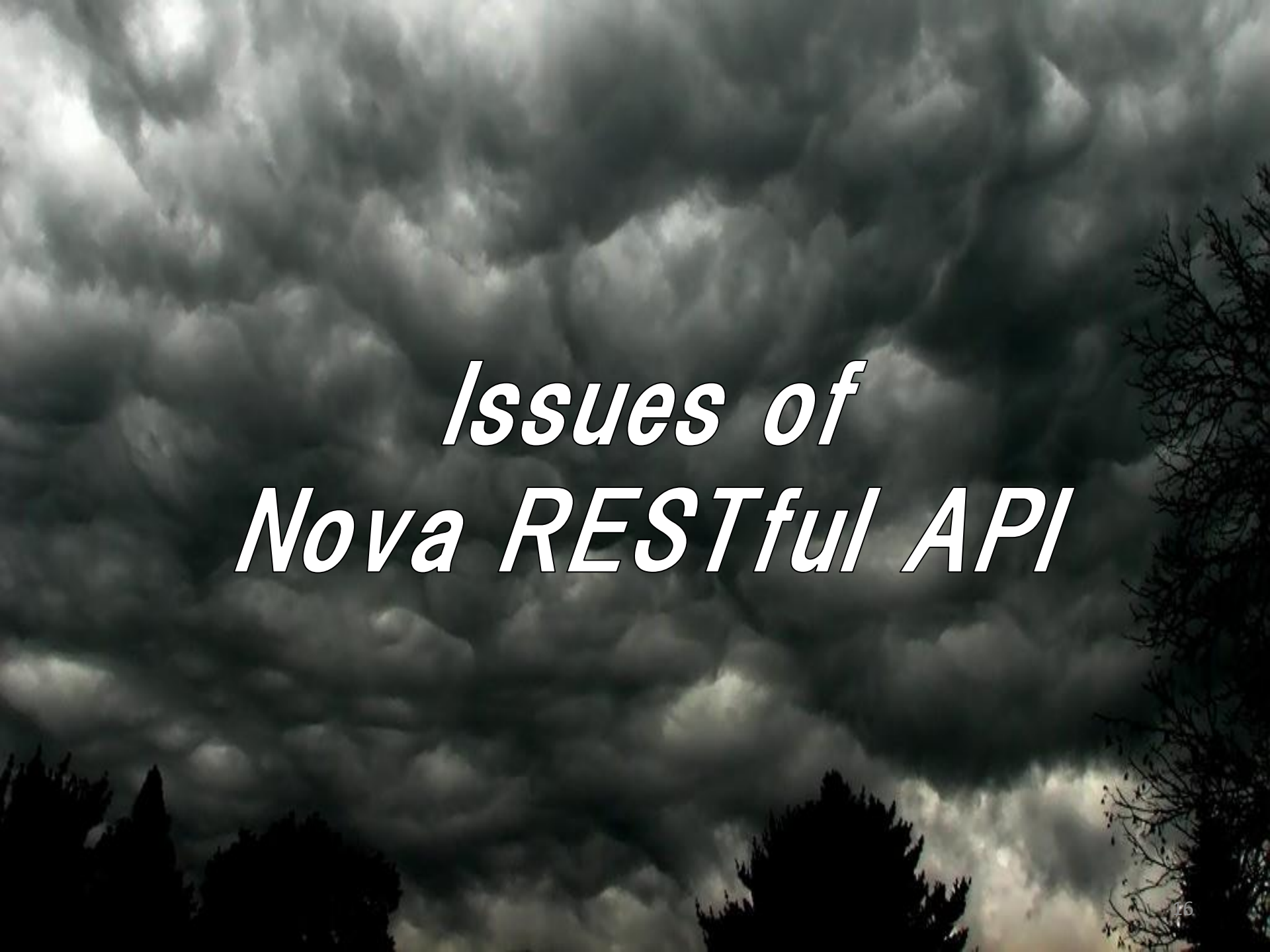



Nova RESTful API

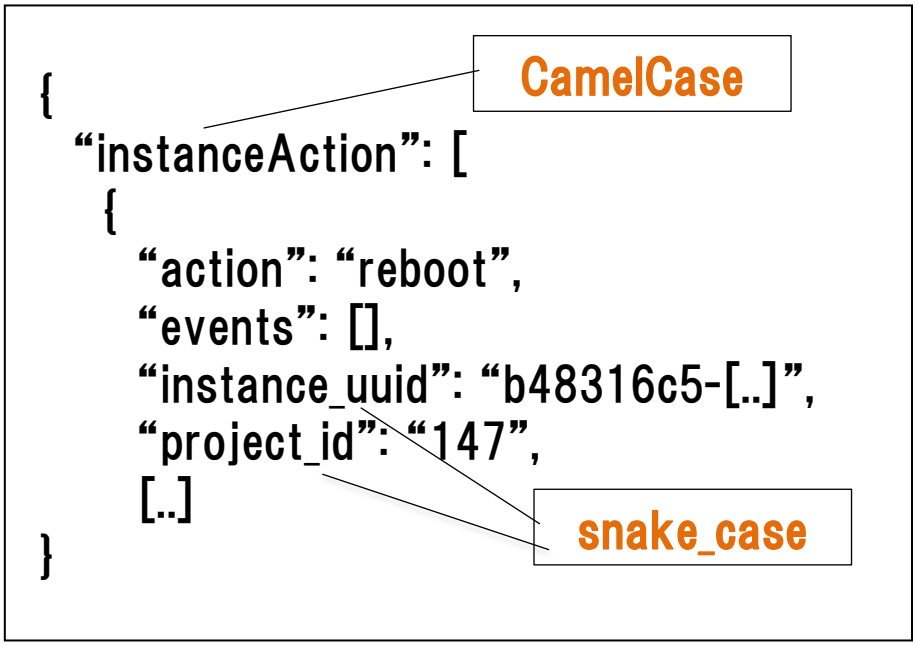
- OpenStack core functions
  - Create a VM (virtual machine)
  - Delete a VM
  - Attach a volume to a VM
  - ...
- Scalability
- Stability
- Current API version is v2
- Nova v2 API contains 250+ APIs (Icehouse)

- API usage
  - Create a VM (virtual machine)

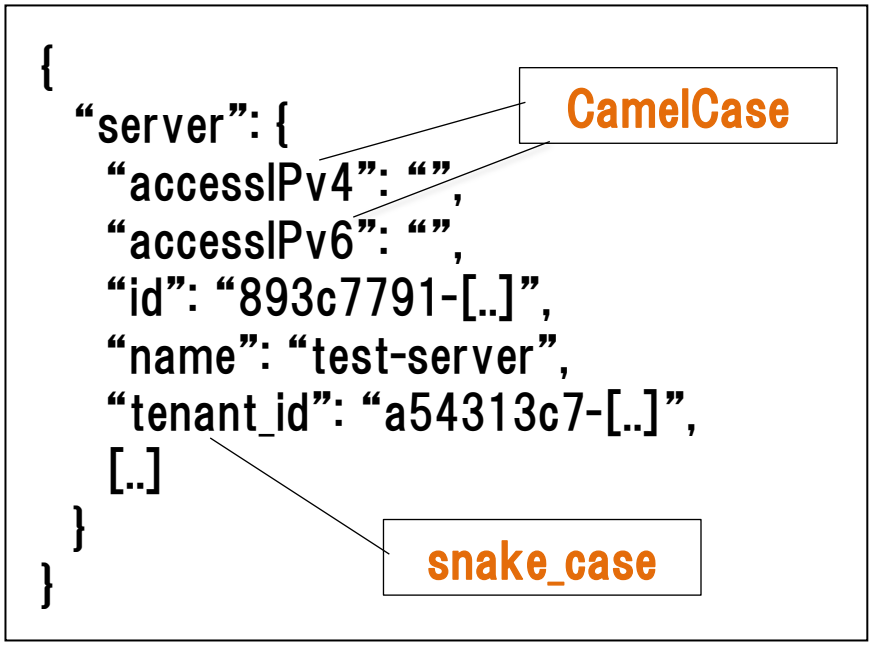



Issues of
Nova RESTful API

- Inconsistent interfaces
  - Inconsistent naming
    - “instance” or “server”, “project” or “tenant”
    - CamelCase, or snake_case



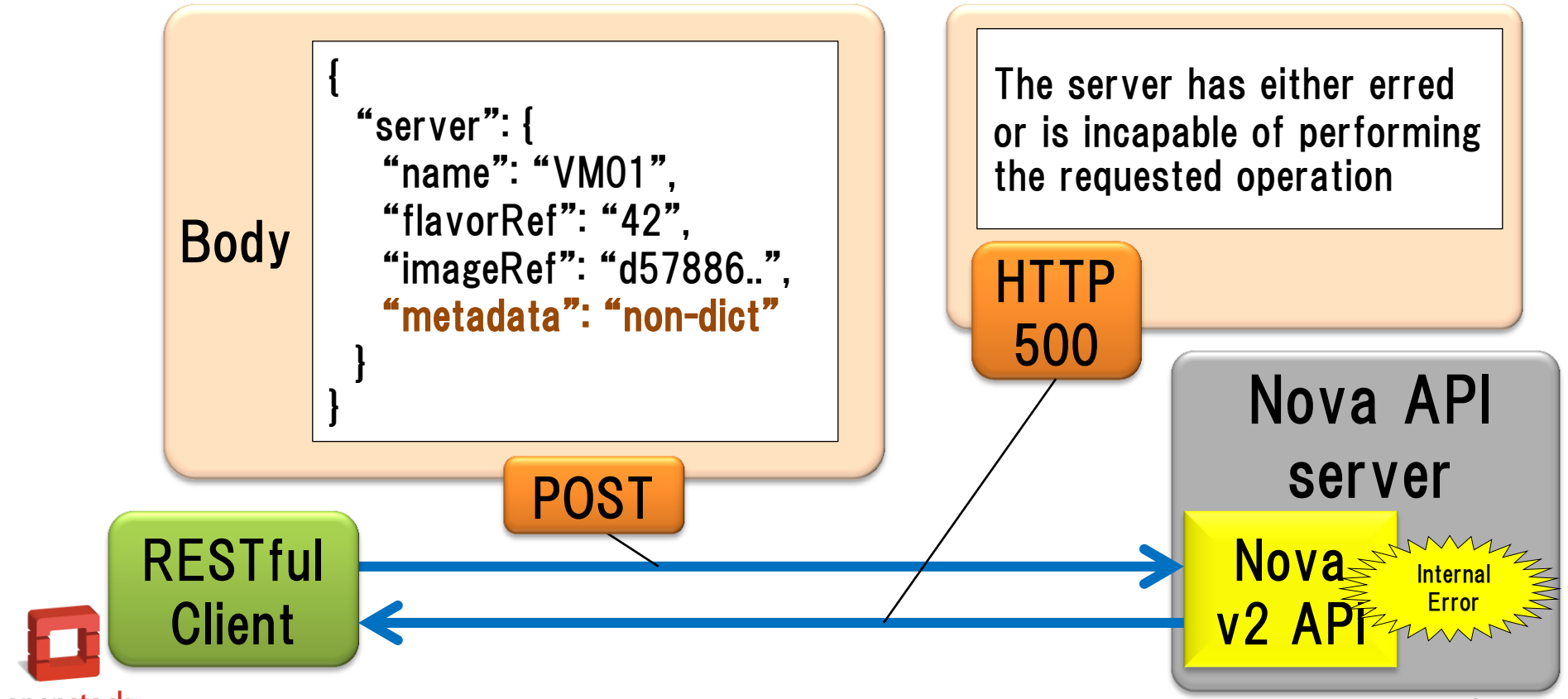
“Show insance actions” API



“Show server” API

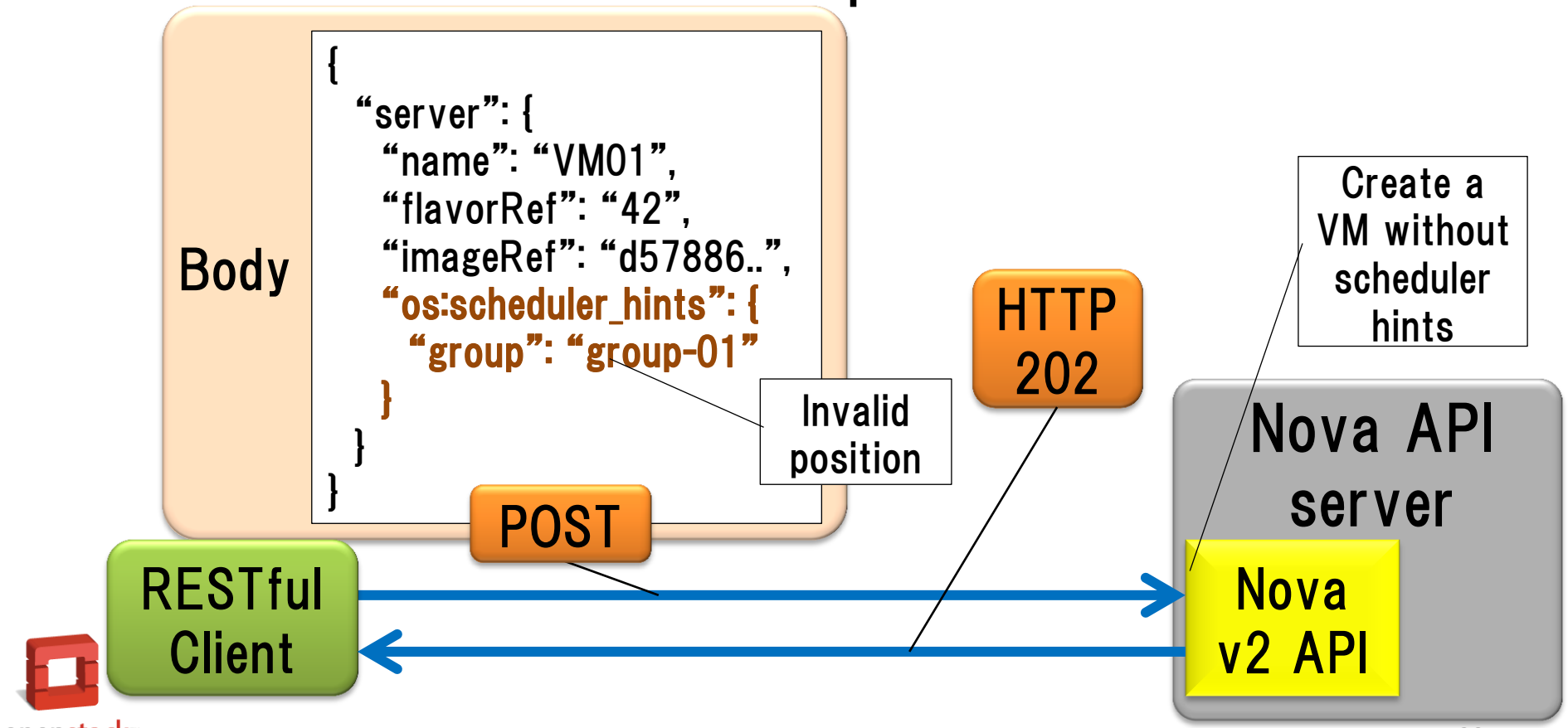
- Inconsistent interfaces
  - Return incorrect success codes
    - Should return 202(ACCEPTED) but some APIs return 201(CREATED) even if not complete to create a resource yet.

- Input validation lacks
  - Cause internal errors, output a lot of error logs in server, and return useless error messages
    - Ex) Pass non-dict as metadata to “create a VM”



this bug has been already fixed.

- Input validation lacks
  - Ignore unexpected data which a client sends, and the request operates without some details which a client should expect



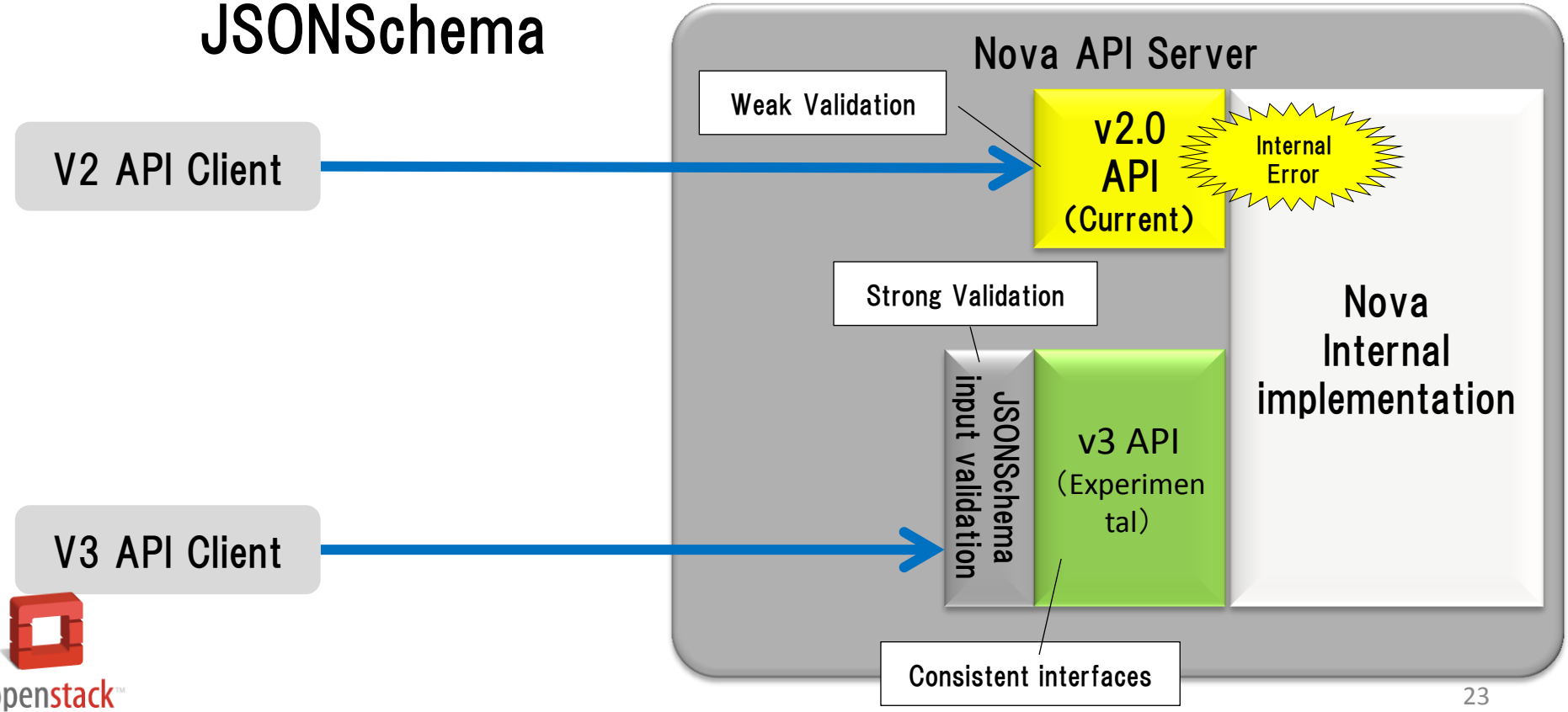
- Problems of input validation lacks
  - Clients cannot understand what happens and what they should do
    - Error response message doesn't contain any hints:

> The server has either erred or is incapable of performing the requested operation

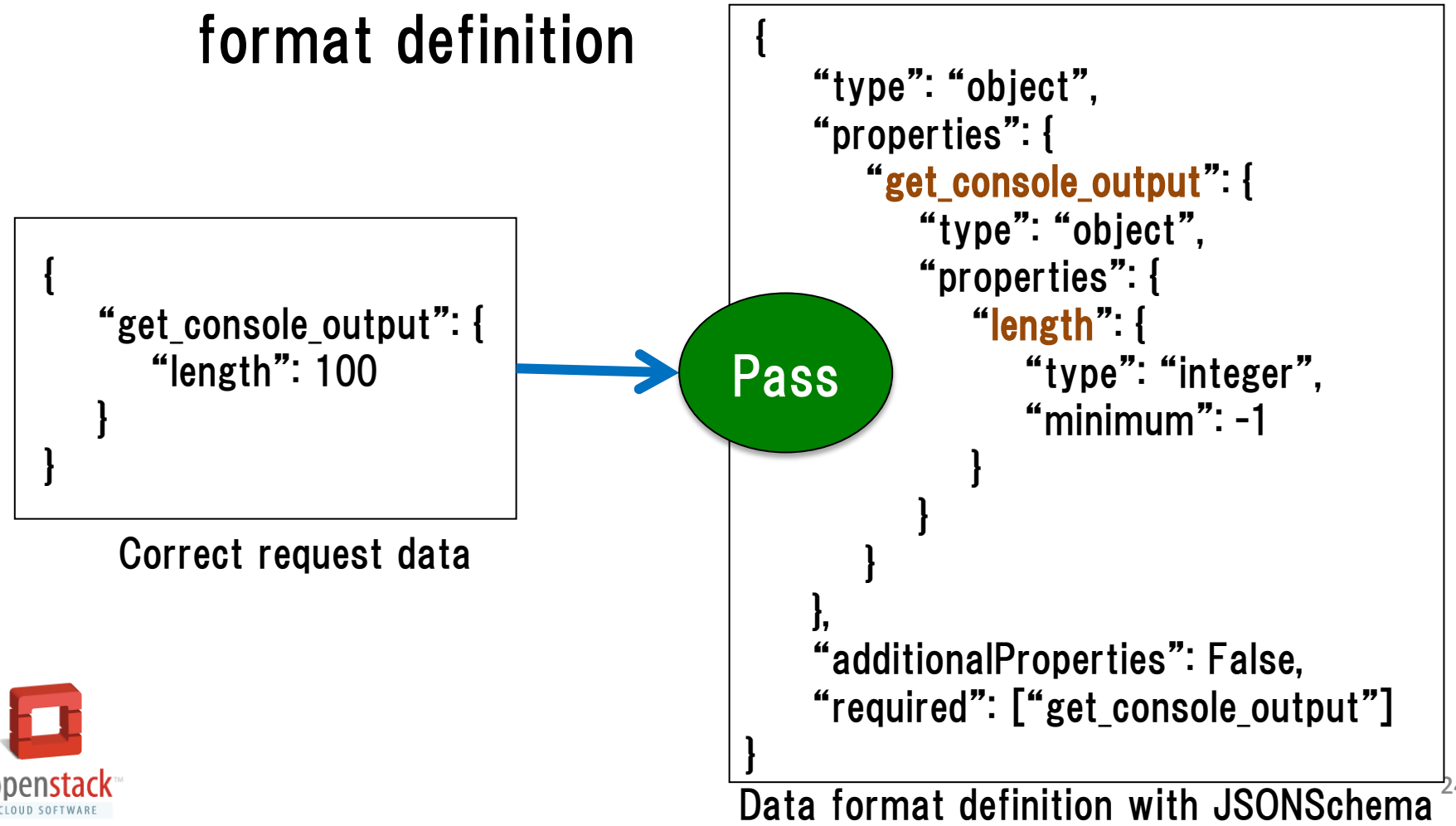
  - Cloud operators should investigate internal errors and explain the reasons to clients
  - Database inconsistencies happened sometimes and cloud operators should fix them by hands


Possible Solutions

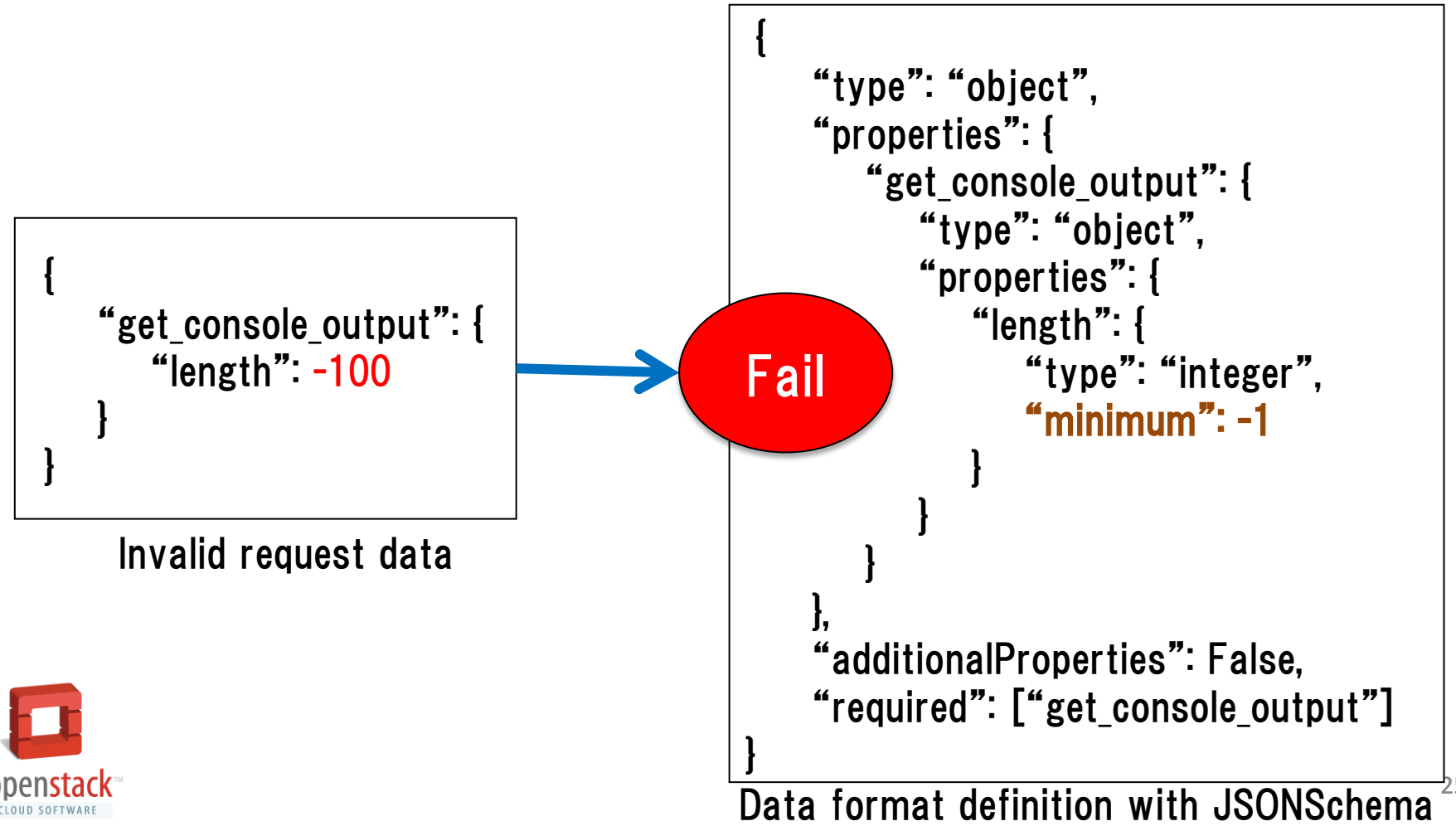
- Nova v3 API (Havana -> Juno)
  - Re-define consistent success codes
  - Re-define consistent naming
  - Comprehensive input validation with JSONSchema



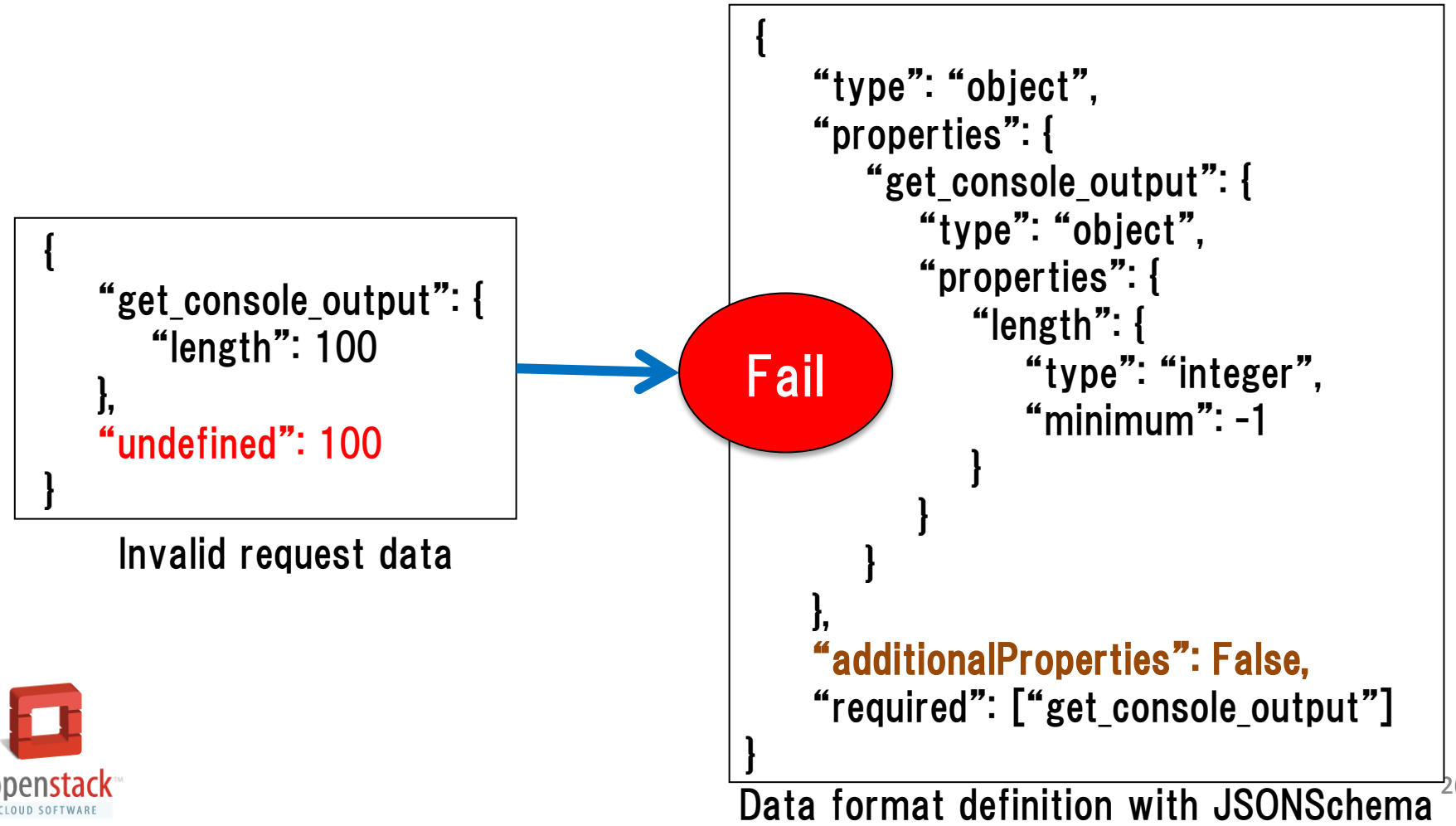
- JSONSchema
  - Common data format definition library
  - Clear, human- and machine-readable data format definition



- JSONSchema
  - Contains basic validation features in nature
  - Ex) minimum



- JSONSchema
  - Can deny undefined parameters
  - Ex) additionalProperties: False



- Use JSONSchema for input validation
  - Strong validation, then avoid internal errors
  - Return useful error message if a client sends invalid format data

The server has either erred or is incapable of performing the requested operation	Invalid input for field/attribute name. Value: 1. 1 is not of type 'string'
before JSONSchema validation	after JSONSchema validation

- Use JSONSchema for input validation
  - Clean up logic code by separating validation code
  - Validation code also can be reduced

```
try:
  min_count = int(str(min_count))
except ValueError:
  msg = _('min_count must be an integer value')
  raise exc.HTTPBadRequest(explanation=msg)
if min_count < 1:
  msg = _('min_count must be > 0')
  raise exc.HTTPBadRequest(explanation=msg)
```

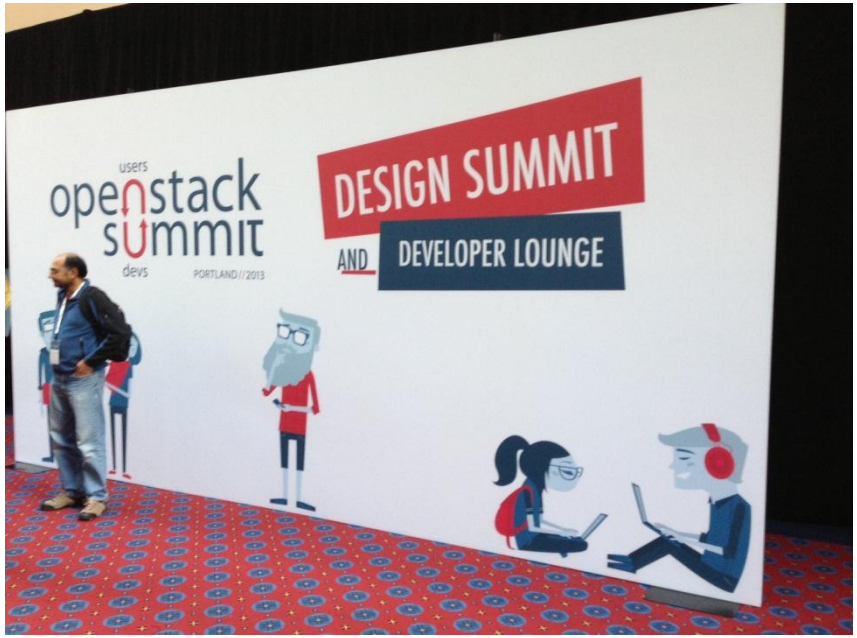
Validation code of v2 API

```
'min_count': {
  'type': 'integer', 'minimum': 1
}
```

Validation code of v3 API


Current Situation

- Input validation development status
  - 2013.03 The prototype proposal
  - 2013.04 The first proposal in Portland summit
  - 2013.07 The framework part was approved, but merger failed
  - 2013.08 Do not merge * 2



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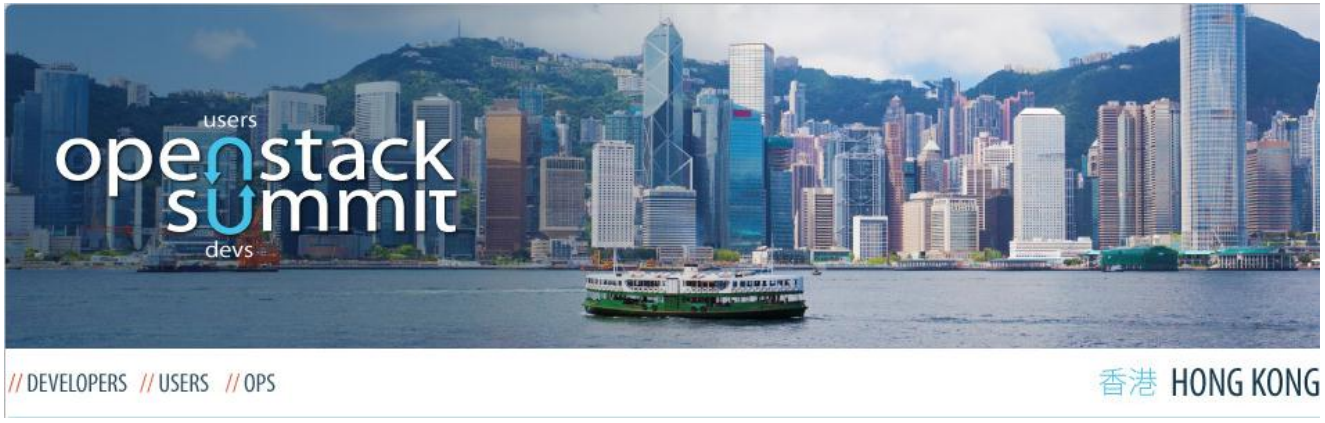
- Input validation development status
  - 2013.08 Investigated input validations of all API parameters and proposed necessary features.
  - 2013.11 The second proposal in Hong Kong summit. We have gotten a consensus.
  - 2014.09 All 38 patches are merged.

Complete!!!



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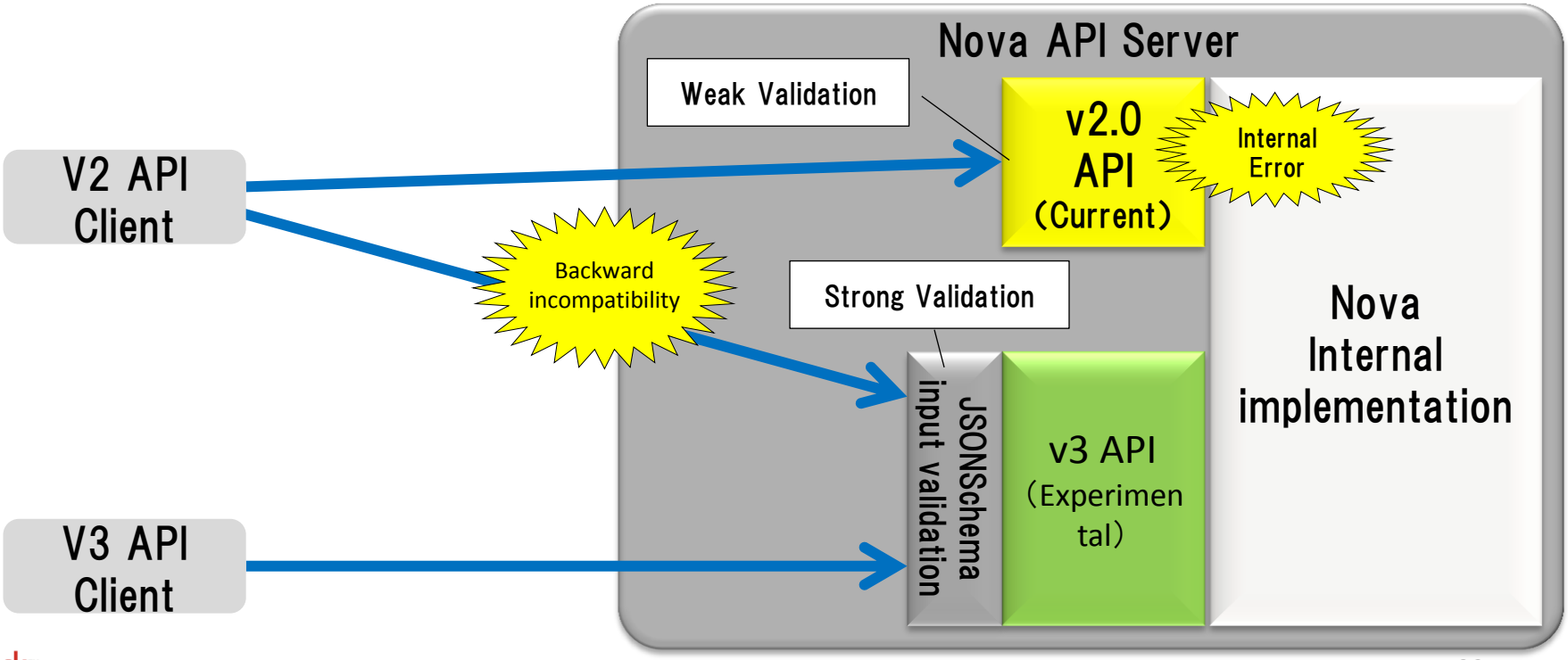
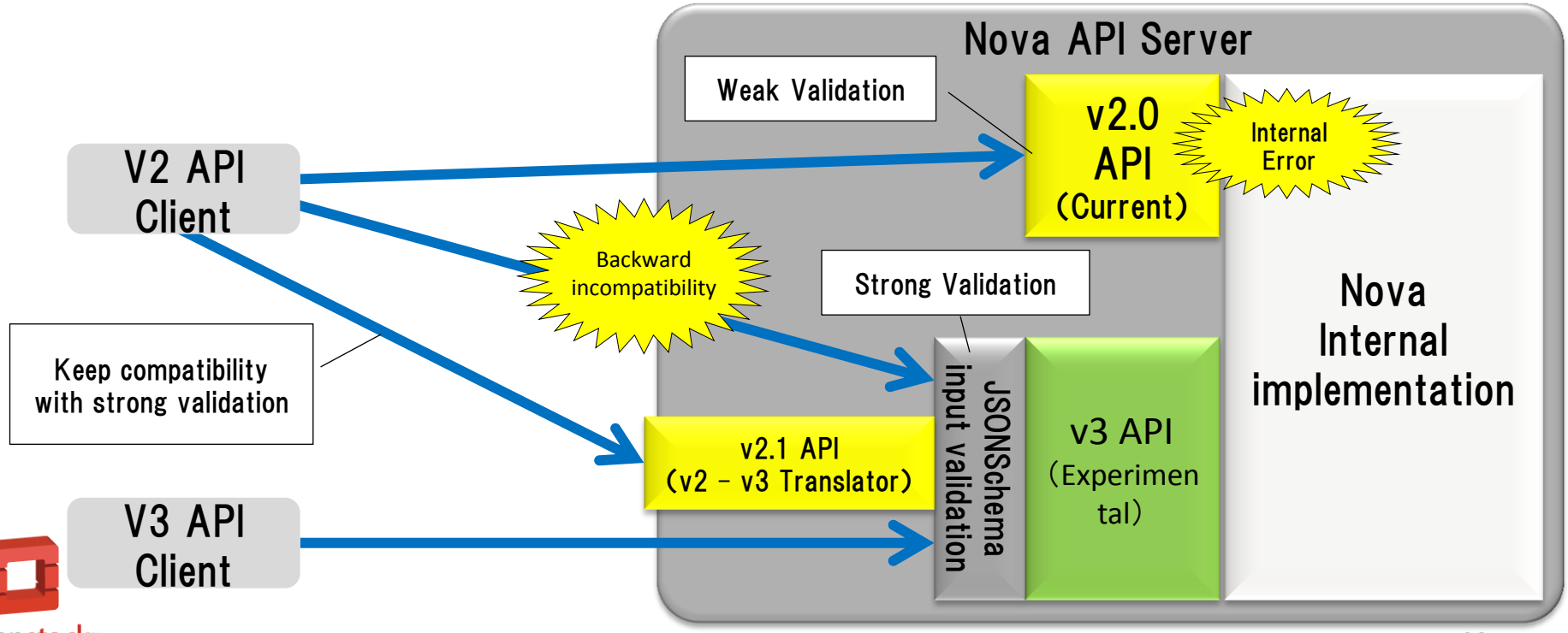
- Stopped v3 API development
  - Backward incompatibility against v2 API
  - Large maintenance cost due to 250+ APIs for each API version
  - Huge mail thread to keep/drop v3 API

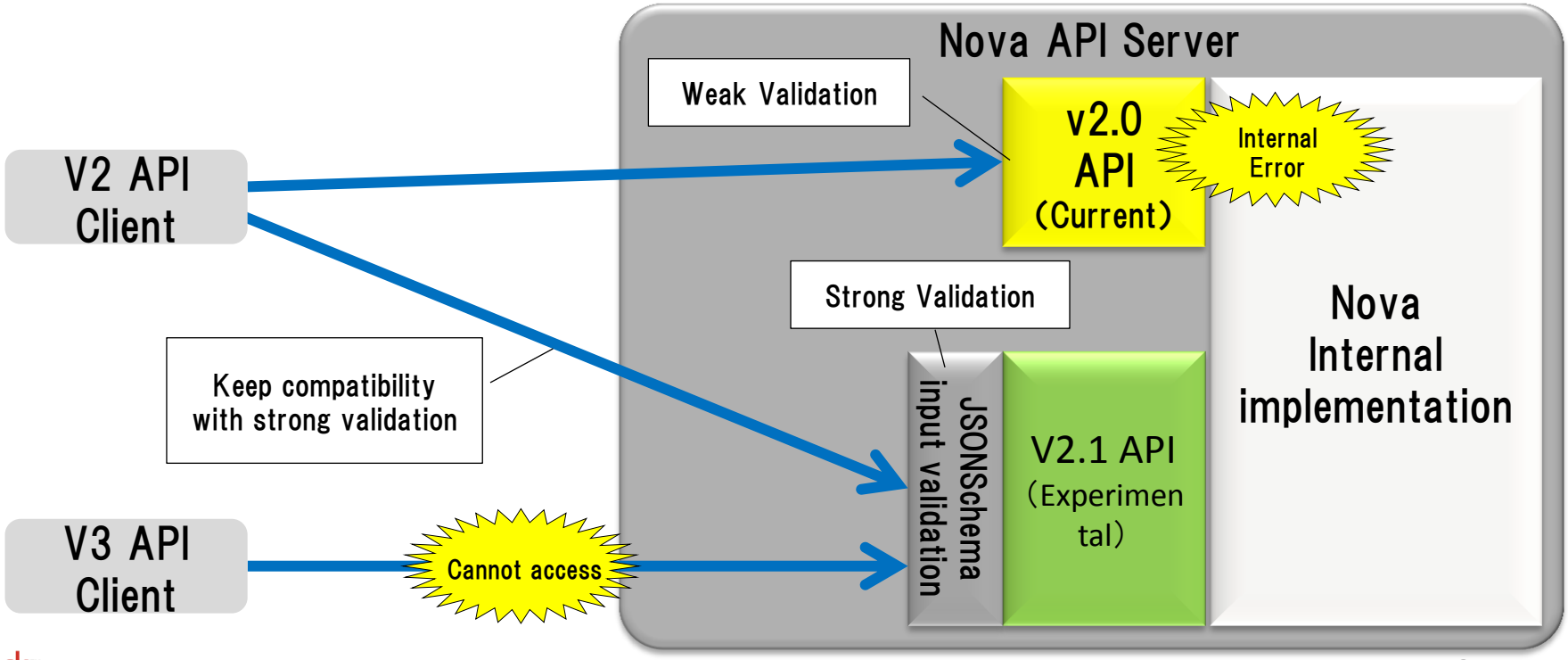


- Proposed v2.1 API for both APIs
  - Translate v2 request/response and use v3 implementation
  - Strong API validation
  - Keep maintenance cost low



- Problem of v2.1 API for both APIs
  - Could not be sure the interfaces of v3 API is the best for API consistency
  - Avoid many backwards incompatibilities
  - Need to build a consensus of API consistency for whole OpenStack projects before making backwards incompatible changes

- Implementing v2.1 API for v2 API only
  - Revert (inconsistent) v2 interfaces by removing (consistent) v3 interfaces on v3 code
  - Strong API validation



- V2.1 API development status
  - Built a consensus and implementing v2.1 API in Juno cycle
  - But some works still remain and need to implement them in Kilo cycle
  - Hope v2.1 API will be complete in Kilo cycle and the API will be CURRENT(not EXPERIMENTAL)

- Future Works
  - Microversioning
    - Idea for making consistent interfaces by small steps
    - Change interfaces by enough considering on each step and provide old behaviors during the deprecated period
      - Example of microversions (just one idea)
        3.0.0: Rename all CamelCase parameters to snake_case
        4.0.0: Change status codes of all sync creations to HTTP201
        5.0.0: Change status codes of all sync deletions to HTTP204
        ...
    - Clients can choose microversion by writing it on an accept header
      - Example:
        Accept: application/vnd.openstack-org.compute-v3.0.0+json
    - Still discussing this for the design

- Future Works
  - JSON-Home
    - Current API feature discovery way is Nova-specific, not common way
    - Idea for discovering API features with common way
    - OpenStack Identification (Keystone) has already implemented this feature
    - I will implement this feature for v2.1 API


Summary

- Nova v2.1 API will be available after Kilo
  - Current v2 compatible interfaces
  - Strong input validation
  - JSON-Home as a common feature discovery (my hope)
- Nova v3 API has been disappeared
  - But the part of v3 consistent interfaces will be appeared by microversions (my hope)
- Join OpenStack community
  - Code review is important
  - Communication is important

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Thanks