



# Dynamic DNS support for EGI Federated Cloud

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# Requirements

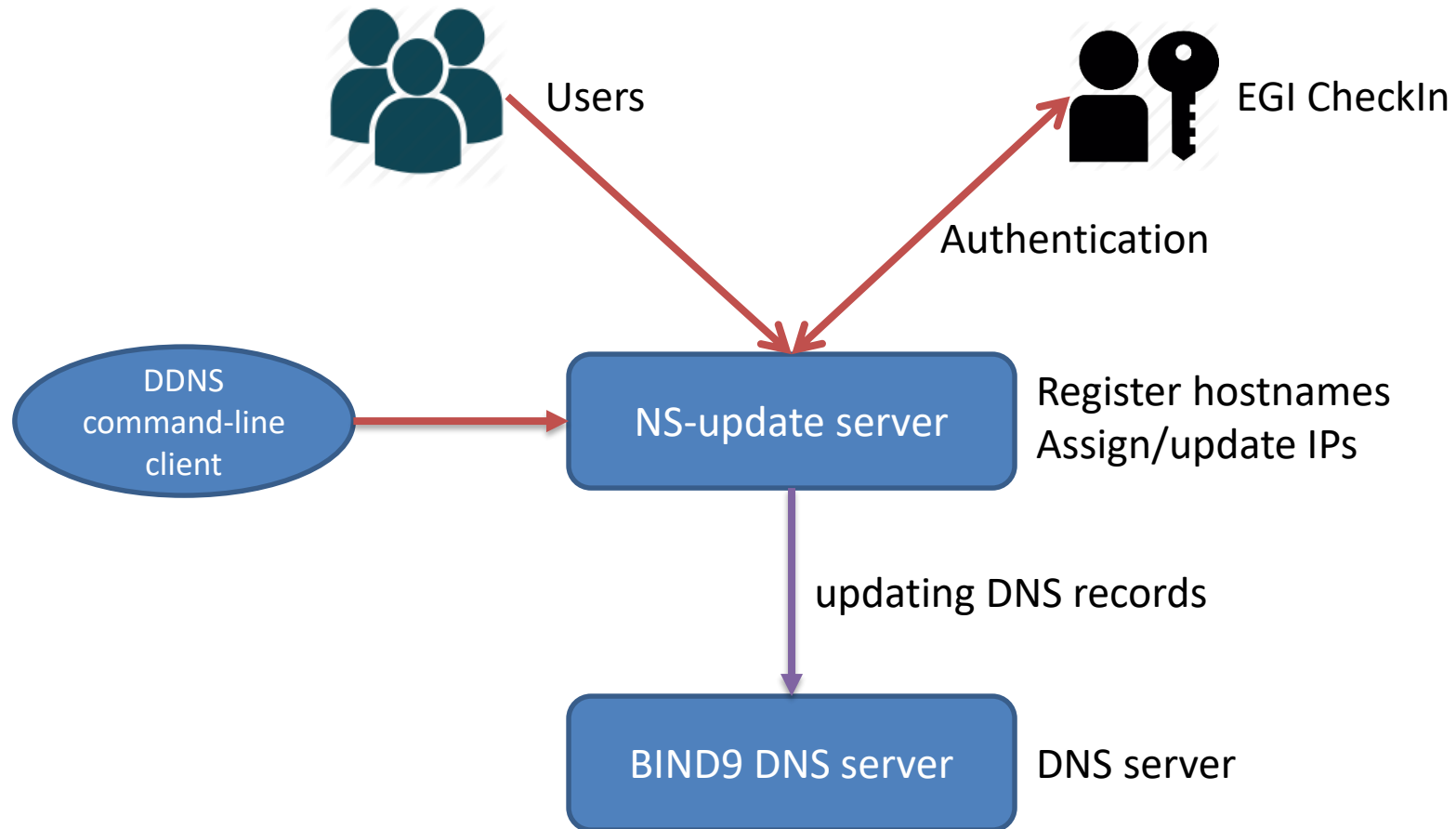
- More and more services are deployed in Cloud
- In principle, any service hosted in cloud will need a valid DNS hostname
  - For security reasons: getting SSL host certificates
  - For simple deployment: setting hostnames in configuration files
  - For simple access: via hostnames instead of IP addresses
- Supports for DNS in EGI Federated Cloud are very limited and fragmented
  - Some sites have new hostname for every new VM
  - Some have fixed hostname for each IP
  - Some do not support at all
  - ⇒ Random, encrypted and unpredictable hostnames for services hosted in clouds
  - ⇒ Users need to reconfigure servers and clients for every start



# FedCloud-wide Dynamic DNS support

- For users: can register hostnames and assign them to VMs:
  - Memorable, sensible hostnames for services hosted in FedCloud
  - Predictable, reusable hostnames for clients/servers setting, no reconfiguration of clients and servers for every start
  - Common domains for VMs in whole federation, independent from location of VMs in FedCloud
- For sites: no changes, no additional support required
- For FedCloud: promotion of federated approach

# Architecture





# Standards and compliance

- All communications between components are supported by standards:
  - OIDC authentication (NS-update – EGI CheckIn)
  - dyndns2 protocol (command-line client – NS-update)
  - RFC 2136 standard (NS-update – BIND9 server)
  - ⇒ Implementation-independent
- All relationships are many-to-many, e.g.
  - One NS-update server – many OpenID identity providers
  - One NS-update server – many DNS servers (one portal for many domains)
  - Many NS-update servers – one DNS server (many portal for one domain)
  - ⇒ Sustainable and extensible



# Implementation

- Developed and hosted at IISAS
- Integrated with EGI CheckIn
- Can be used everywhere (VMs in EGI FedCloud, commercial clouds, local servers)
- No requirements on target clouds
- Simple, secure IP assignment/updating without user credentials



# Usage

- Log into <https://nsupdate.fedcloud.eu/> via EGI CheckIn and register a hostname
- Assign/update an IP address to the hostname



# Registering hostnames

- Support multiple domains/subdomains
  - By default, subdomains from organization-neutral domain fedcloud.eu
  - Support for other domains/subdomain on requests
- Web portal with authentication via EGI CheckIn
  - Just log in and register a hostname in an available domain
  - Server will give error message if the hostname is occupied by other users
  - See instruction/demo at the end of presentation





# Assigning/updating IPs

- Each registered hostname has its own secret (password)
  - Once hostname is registered, no user credential is needed for assigning/updating IP address
  - ⇒ No user credential stored on VMs, just hostname and its own secret
- Very simple usage
  - For most users, just simple command on the host/VM  
“curl <https://HOSTNAME:SECRET@nsupdate.fedcloud.eu/nic/update>”
  - Can be included into any deployment tools (e.g. cloud-init)
  - Compatible with existing DDNS clients
  - Users can do it without knowing the IP address of the VM



# Usage scenarios

- Testing and development
  - Register a hostname and assign it to local server
  - Develop/configure/test the service on local server using the hostname
  - Move the service to cloud and update hostname
  - No additional changes in configurations (both clients and servers)

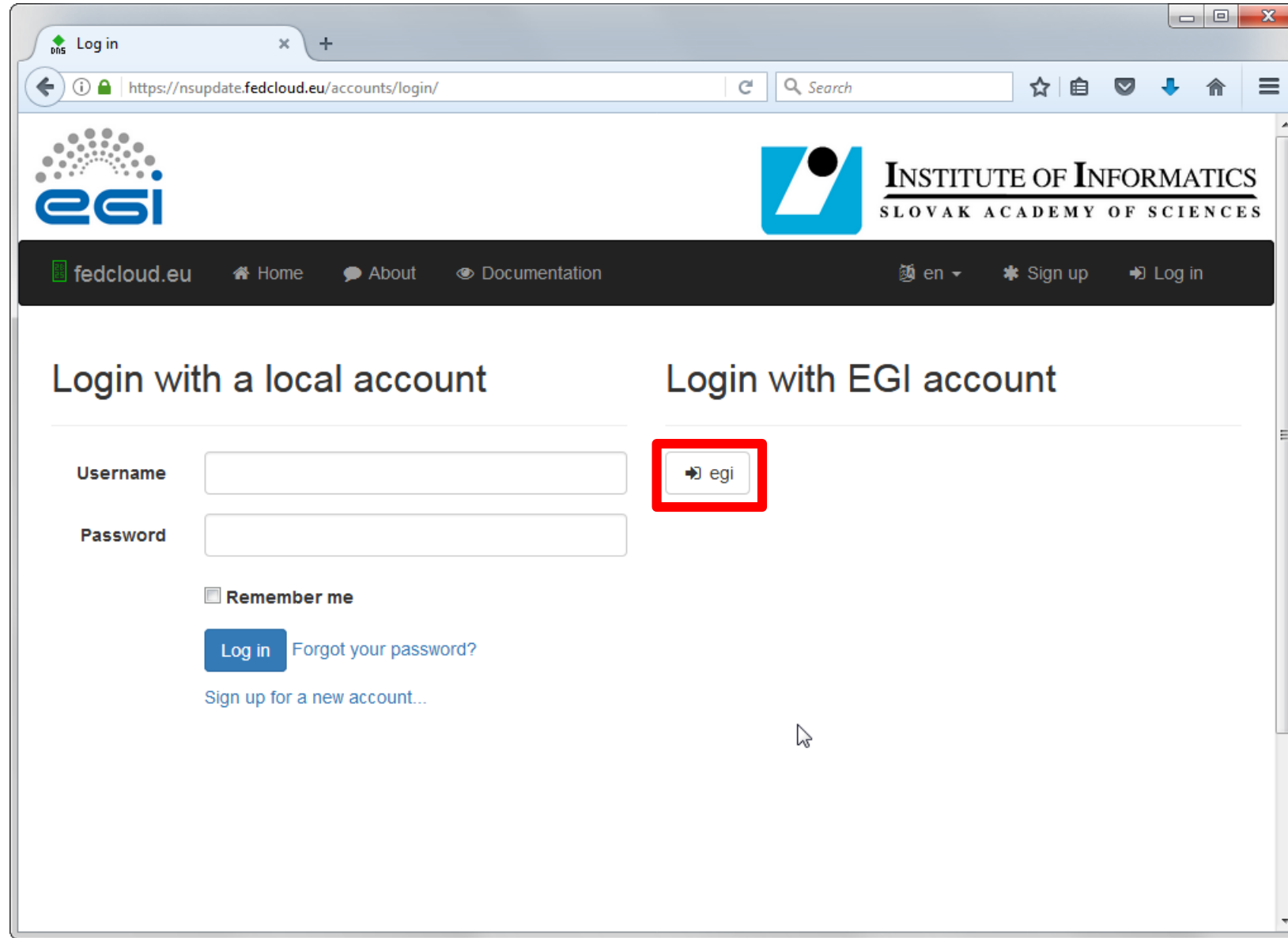


# Usage scenarios

- Configuring clients before deploying services
- Migrating services between different cloud sites without changing clients
- Getting host certificates
- Configuration of connected services
- ...
- Simply, no need to remember IP address anymore



# NS-update portal (1)



The screenshot shows a web browser window with the URL `https://nsupdate.fedcloud.eu/accounts/login/`. The page features the EGI logo on the left and the Institute of Informatics logo on the right. A navigation bar includes links for `fedcloud.eu`, `Home`, `About`, and `Documentation`, along with language selection (`en`), `Sign up`, and `Log in`. The main content area is divided into two sections: `Login with a local account` and `Login with EGI account`. The local account section has input fields for `Username` and `Password`, a `Remember me` checkbox, a `Log in` button, and a `Forgot your password?` link. The EGI account section has a button labeled `egi` with a right-pointing arrow, which is highlighted with a red square. A `Sign up for a new account...` link is located at the bottom of the local account section.



# NS-update portal (2)

The screenshot shows the NS-update portal interface. At the top, there is a navigation bar with links for Home, Overview, Status, About, and Documentation. The user profile is displayed as `1041894abafd93ee564ab1bbba35b91b2cac9f7f25b7980f450afff23be88de@egi.eu`. Below the navigation bar, there is a section for "Your Hosts" with an "Add Host" button. The "Your Hosts" table lists two hosts: `myserver.test.fedcloud.eu` and `demo-server.test.fedcloud.eu`. Below this, there is a section for "Domains (yours first, then public)" with an "Add Domain" button. The "Domains" table shows one domain: `viet02`.

Host	Available	Faults C / S	IPv4 Address (last update)	IPv6 Address (last update)
<code>myserver.test.fedcloud.eu</code>	yes	0 / 0	147.213.76.106 (1 month, 4 weeks ago, TLS)	none
<code>demo-server.test.fedcloud.eu</code>	yes	0 / 0	147.213.76.129 (1 month, 3 weeks ago, TLS)	none

Domain	Public	Available	Owner	Comment
<code>viet02</code>	yes	yes	viet02	Testing subdomain, available for all



# NS-update portal (3)

The screenshot shows a web browser window with the URL `https://nsupdate.fedcloud.eu/host/add/`. The page features the EGI logo on the left and the Institute of Informatics logo on the right. A navigation bar includes links for Home, Overview (selected), Status, About, and Documentation. Below the navigation bar, there is a language selector set to 'en' and a user profile icon with the email `1041894abafd93ee564ab1bbba35b91b2cac9f7f25b7980f450a7fff23be88de@egi.eu`.

The main content area is divided into two columns. The left column is titled "Create a new Host" and contains a form with the following fields:

- Name:** A text input field containing "demo". Below it is the text "The name of your host."
- Domain:** A dropdown menu showing "test.fedcloud.eu".
- Comment:** A text area containing "This is a demo server". Below it is the text "Some arbitrary comment about your host, e.g who / what / where this host is".

A blue "Create" button is located at the bottom of the form, highlighted with a red rectangular border.

The right column is titled "Help" and contains the following text:

Here you can add new hosts (like routers, PCs, servers, ...).

You need to be able to configure one of your machines so it sends dyndns2 compatible updates to us when your IP changes. Routers usually have some builtin software that does this, but you can also use some software on another system (like a PC or server).

Just make sure your update client either is customizable well enough or has specific support for our service.

We'll show you configuration examples after you add a host.



# NS-update portal (4)

The screenshot shows a web browser window with the URL `https://nsupdate.fedcloud.eu/generate_secret/51/`. The page title is "Host Secret Generated". The main content area contains the following text:

New secret generated for you. We store it hashed, so save it now, or you have to generate a new one again. Everytime you visit this page a new secret will be generated and the old one becomes invalid.

Secret: **KZpvFEpDEm**

Below this, there is a section titled "How to configure automated dynamic DNS updates?" with tabs for "General", "AVM Fritz!Box", "DD-WRT", "ddclient", "inadyn", "m0n0wall", "OpenWRT", "pfSense", and "Browser". The "General" tab is selected.

**General configuration hints**

Usually, you should configure one system on your network to update the DNS. This can be either your router or a host on your network and it will run some software called the update client.

We have some specific configuration hints for some devices and update clients, please see the tabs above. If you don't find yours there, use the generic hints below.

**Important note about security and compatibility:** For update URLs, we always give the https (not: http) URL as that will use an encrypted connection to transfer your data (including your update secret). Depending on your update client (router firmware or PC software) *and* the specific nsupdate.info-based service, https might be not supported. So, if it does not work, you have the choice of using a different update client and/or a different service, or transmitting your data using an unencrypted connection (using http: instead of https:).

**On fedcloud.eu https is supported.**

Your update client needs to access the following URLs to update the DNS:

For IPv4 updates:

`https://demo.test.fedcloud.eu:KZpvFEpDEm@nsupdate.fedcloud.eu/nic/update`



# Assigning/updating IP to the hostname

- Just single command on the VM

```
curl https://HOSTNAME:SECRET@nsupdate.fedcloud.eu/nic/update
```

- Or anywhere else

```
curl https://HOSTNAME:SECRET@nsupdate.fedcloud.eu/nic/update?  
hostname=HOSTNAME&myip=ipaddress
```

- No additional client, no user credential, no dependency on IP address if running on target server



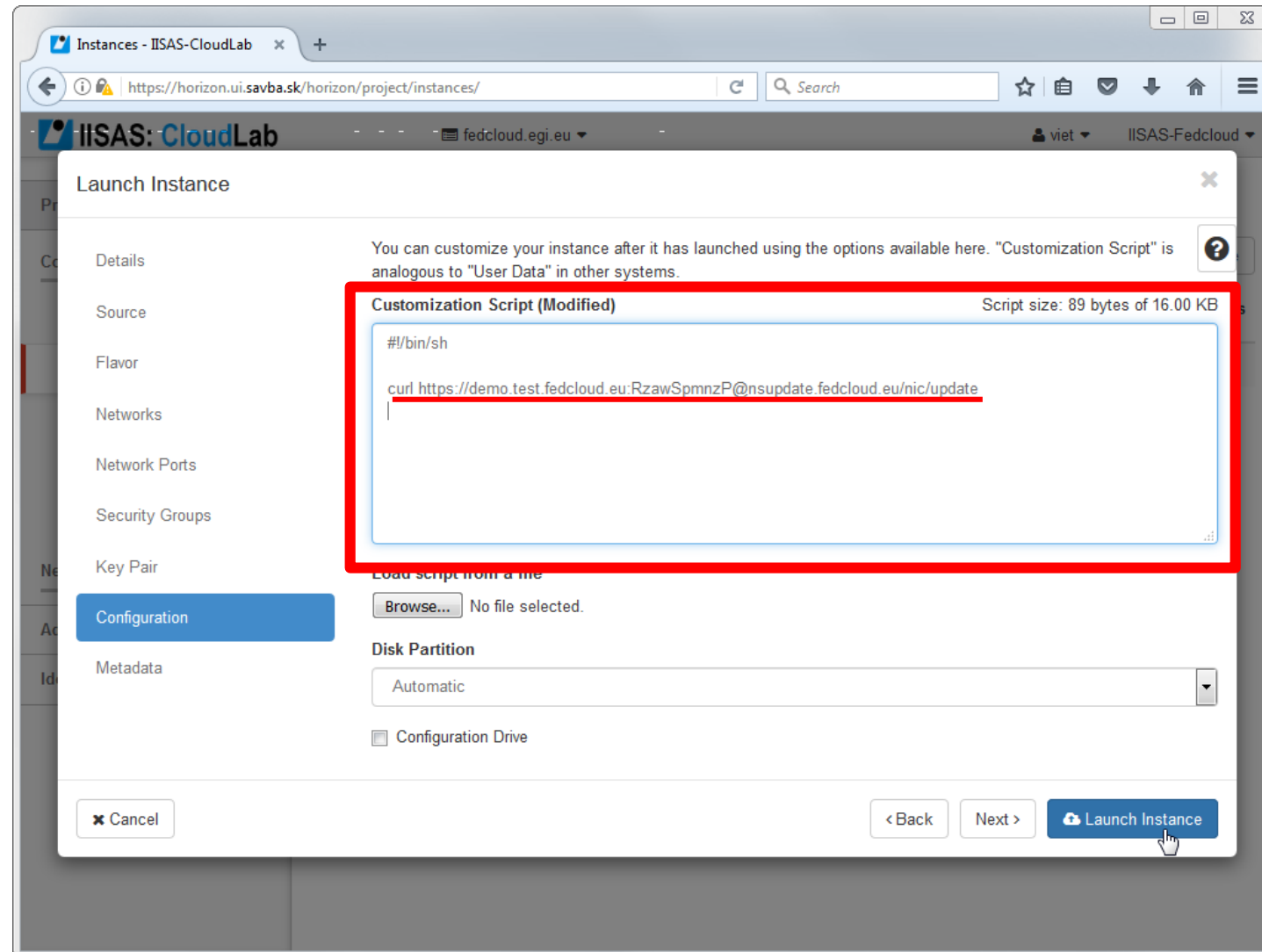


# Integration with deployment tools

- Easy to integrate with other deployment tools like Ansible, cloud-init, ...
- Example of cloud-init file

```
#cloud-config
users:
  - name: cloudadm
    sudo: ALL=(ALL) NOPASSWD:ALL
    lock-passwd: true
    ssh-import-id: cloudadm
    ssh-authorized-keys:
      - ssh-rsa AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
runcmd:
  - curl "https://HOSTNAME:SECRET@nsupdate.fedcloud.eu/nic/update"
```

# Integration with deployment tools



Instances - IISAS-CloudLab

https://horizon.ui.savba.sk/horizon/project/instances/

IISAS: CloudLab

fedcloud.egi.eu

viet IISAS-Fedcloud

### Launch Instance

You can customize your instance after it has launched using the options available here. "Customization Script" is analogous to "User Data" in other systems.

**Customization Script (Modified)** Script size: 89 bytes of 16.00 KB

```
#!/bin/sh\n\ncurl https://demo.test.fedcloud.eu:RzawSpmnzP@nsupdate.fedcloud.eu/nic/update
```

Load script from a file

No file selected.

**Disk Partition**

Automatic

Configuration Drive



# Summary

- Dynamic DNS service is
  - Simple, easy to use
  - Easy to integrate with existing deployment tools/services
  - No additional requirements/supports from cloud sites
  - No user credential stored in cloud for updating IP
- For service developers/providers, Dynamic DNS service can
  - Simplify service configuration
  - Enable securing services with SSL host certificates
  - Enable migrating services from local servers to clouds and between clouds without reconfiguring service URL and client tools
- For users
  - No need to use of IP addresses for accessing services in cloud
- For cloud providers
  - Nothing need to do