Distributed computing systems

Taxonomy Of DCS

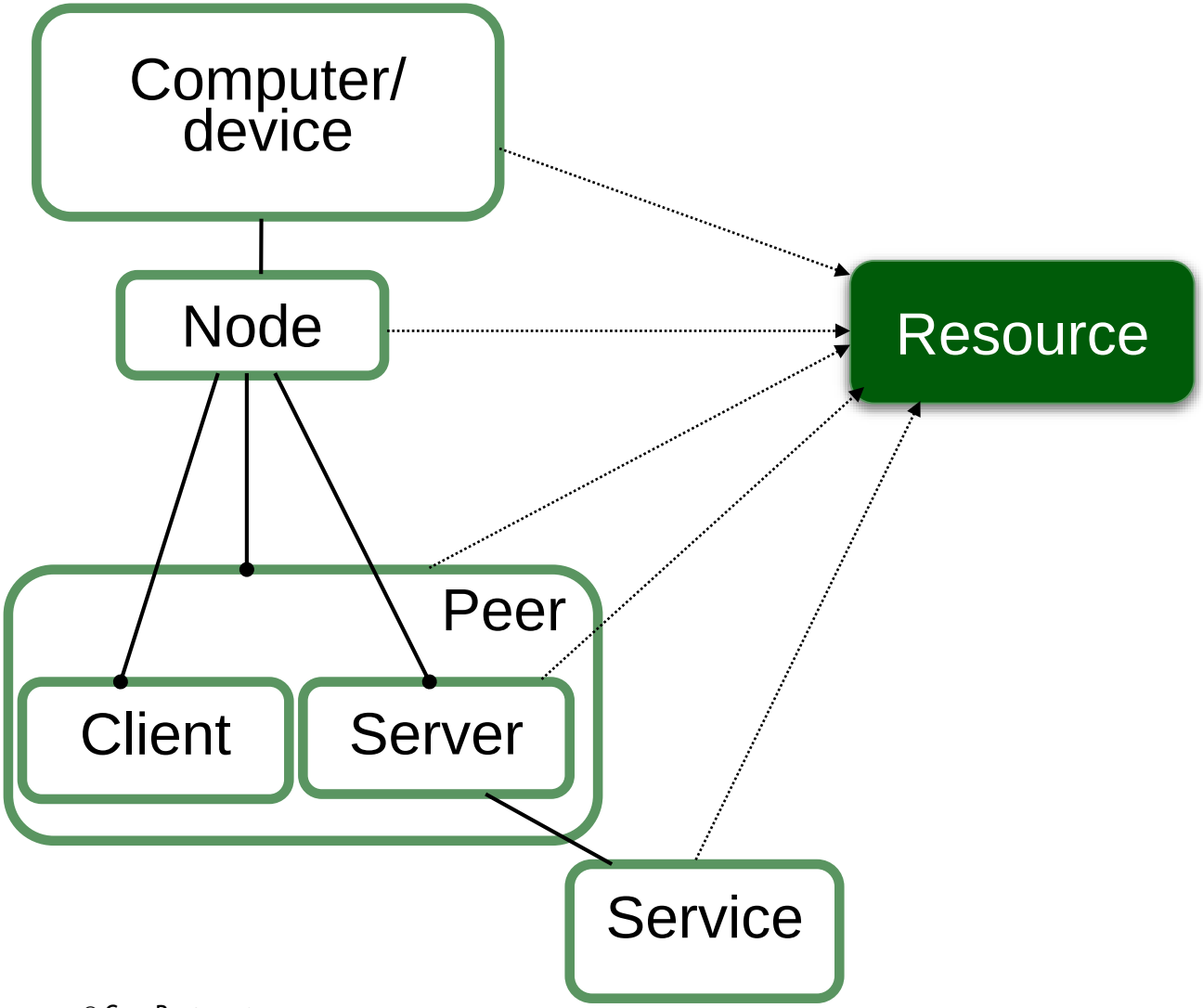
© Gleb Radchenko

Terminology of Distributed Computing Systems

- **Resource:** any hardware or software entity being represented or shared on a distributed network. For example, a resource could be any of the following: a computer; a file storage system; a file; a communication channel; a service.
- **Node:** a generic term used to represent any device on a distributed network. A node that performs one (or more) capabilities is often exposed as a service.
- **Client:** is a consumer of information, e.g., a Web browser.
- **Server:** is a provider of information, e.g., a Web server or a peer offering a file-sharing service.
- **Service:** a network-enabled entity that provides some capability; e.g., a simple Web server could just provide a remote HTTP file-retrieval service. A single device can expose several capabilities as individual services.
- **Peer:** a peer is a device that acts as both a consumer and provider of information

© Радченко Г.И., кафедра СП ЮУрГУ

Basic terms of DCS



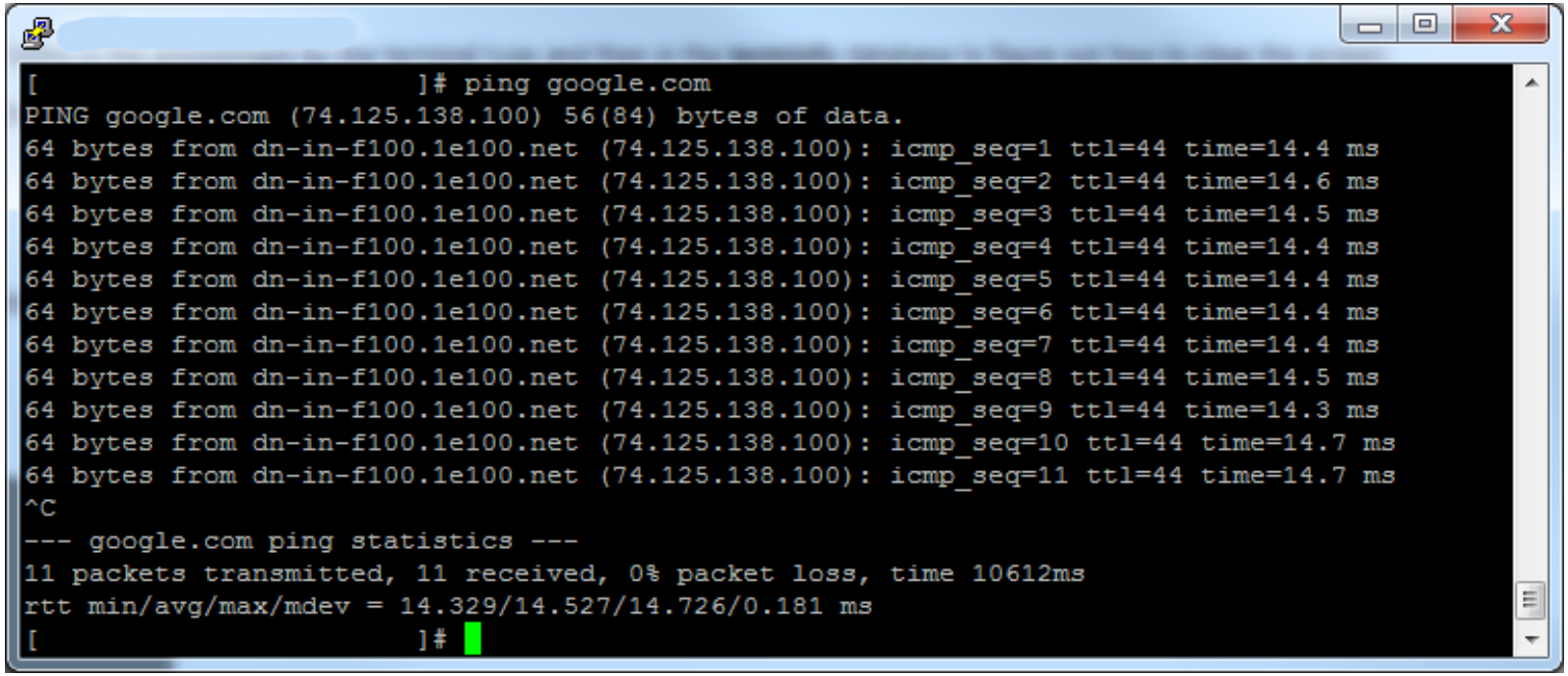
© Gleb Radchenko

Distributed Systems Issues

- Distributed systems are inherently different from non-distributed systems.
  - Latency - network speed
  - Memory access - not shared
  - Partial Failure
    - remote failure does not mean local failure
    - no global coordination (like an OS)
  - Guaranteed Concurrency
    - combined with latency, events are not received in the same order as they are generated
  - Indeterminacy
    - Your system is not in control of the whole system
    - With partial failure, a system may just disappear with no indication of status.
    - was it the remote machine or a network link?

Check a latency

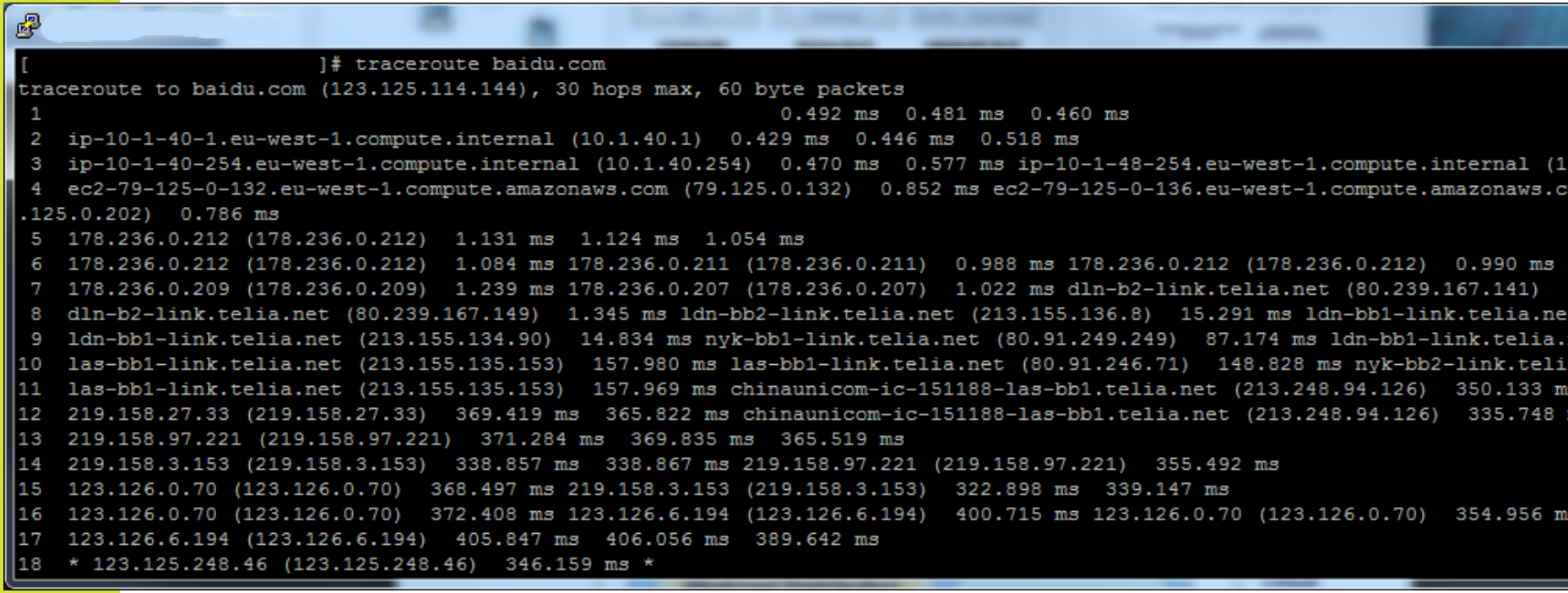
- Start -> run -> ping [URI or IP-address]



- time – what time it took to a network package to reach the destination

Check a path of a package

- Start -> run -> tracert [URI or IP-address]



Taxonomy Of DCS

Characteristics of DCS

We can highlight the following classification characteristics of DCS:

- Resource discovery methods
- Resources accessibility
- Methods of interaction

© Gleb Radchenko

Resource discovery methods

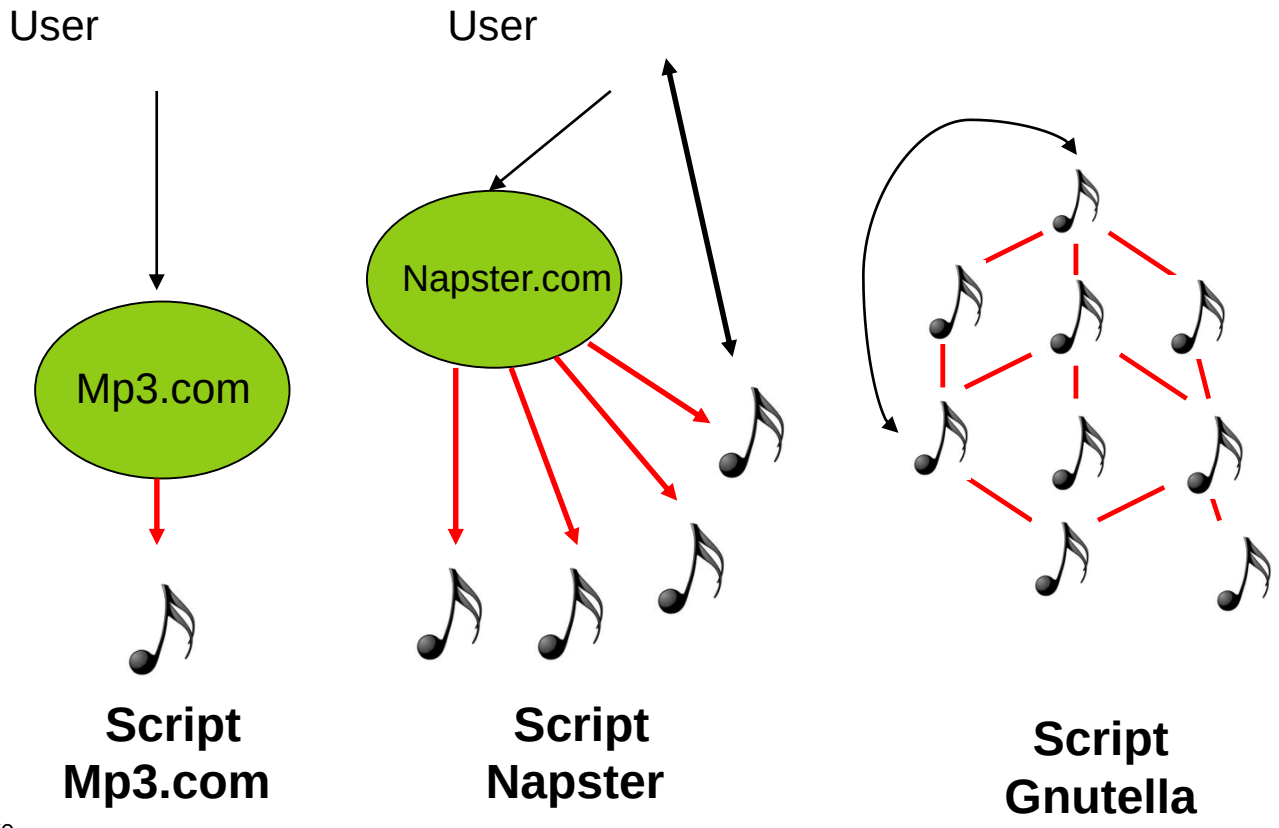
How does the resource search and discovery implemented in DCS?

- **Centralized:** there is a site (or multiple sites), which are responsible for resource search and discovery (UDDI, DNS)
- **Decentralized:** resource search and discovery is conducted without the use of selected central hubs (Gnutella)

© Gleb Radchenko

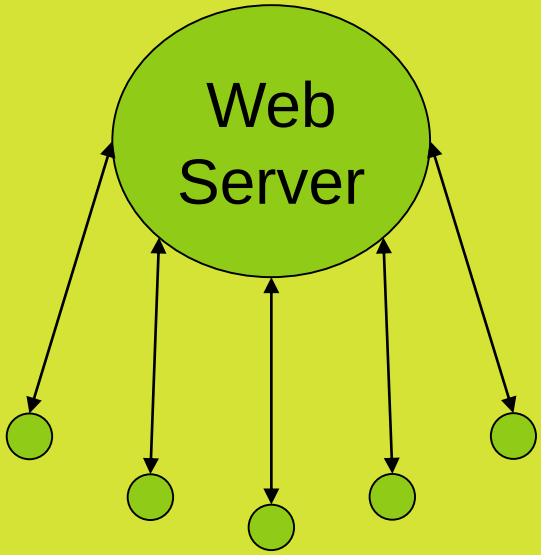
Resources accessibility

Is there a set of resources that provide similar opportunities?

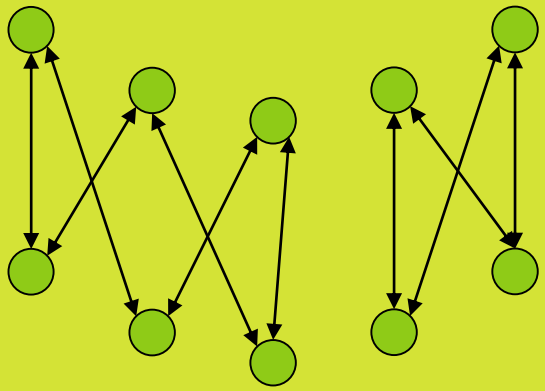


© Gleb Radchenko

Methods of interaction



Centralized



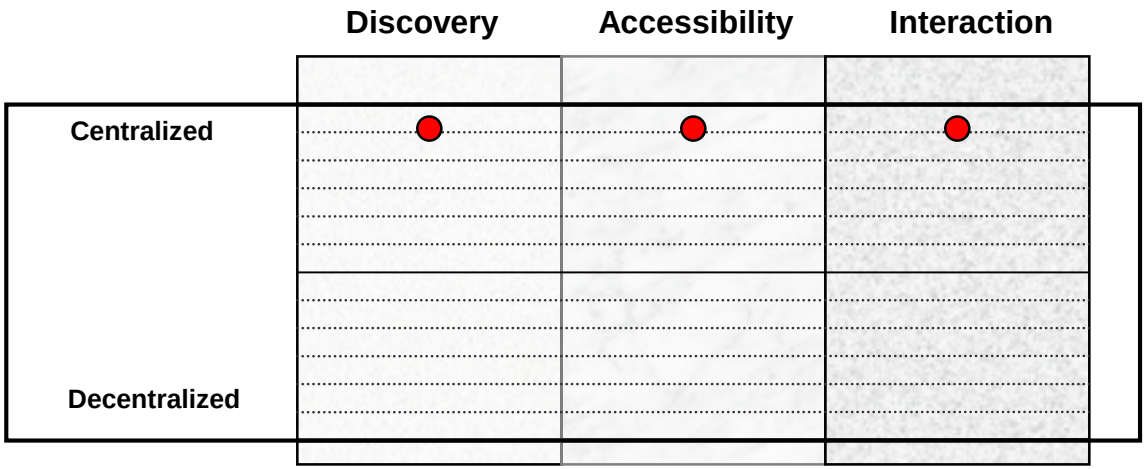
Decentralized

Peer-to-peer (P2P) networks

© Gleb Radchenko

Examples Of DCS

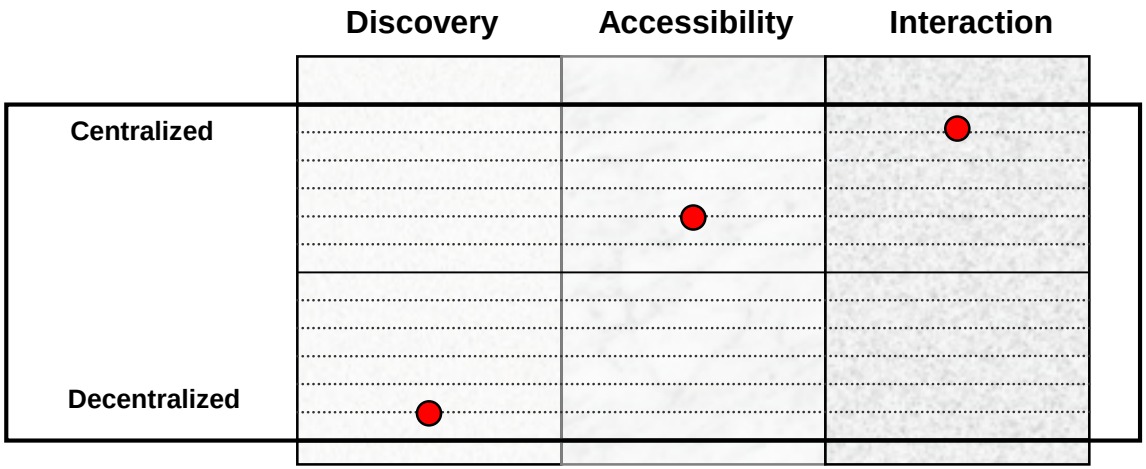
One Web server



- **Discovery**: centralized, DNS
- **Accessibility :** available or not
- **Interaction:** a single server

© Gleb Radchenko

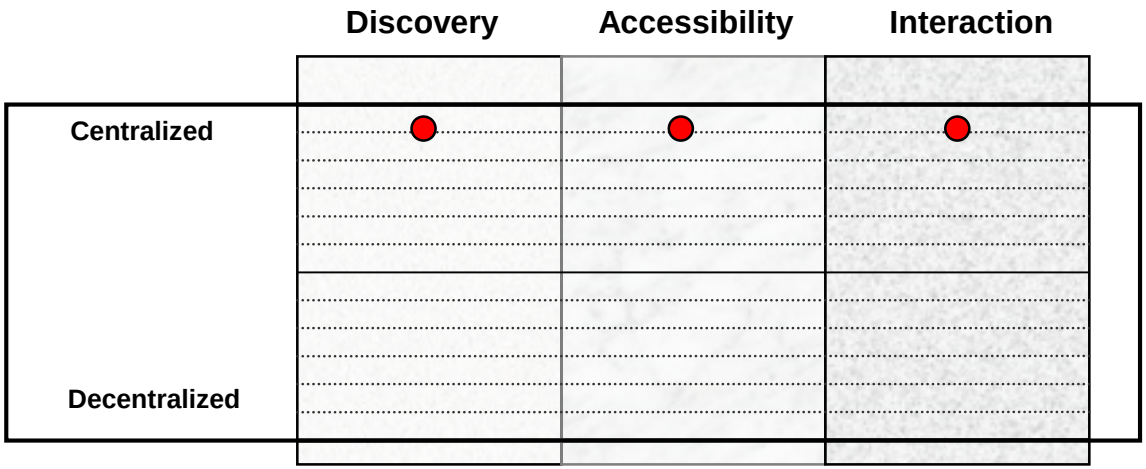
The World Wide Web



- **Discovery:** the links to various search engines, etc.
- **Accessibility:** depending on resource – there is some amount of replicated and cached resources
- **Interaction:** inside the centralized servers

© Gleb Radchenko

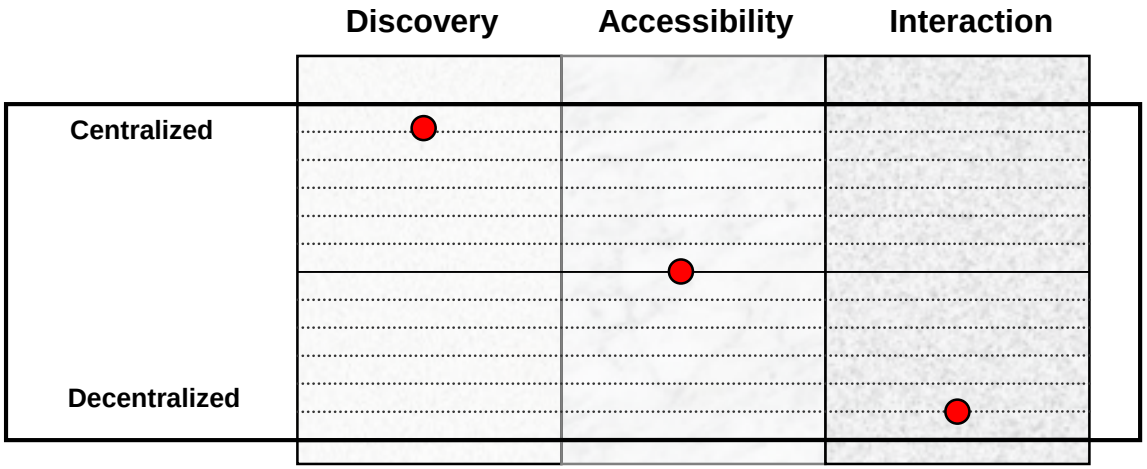
The SETI@home Project

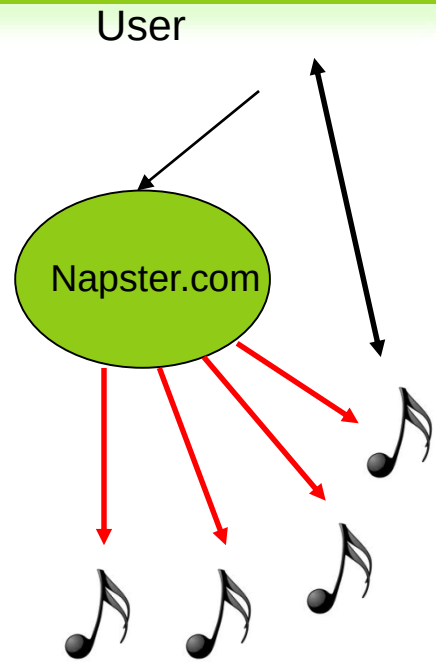


- **Discovery:** Central search site
- **Availability:** Hubs
- **Interaction:** receiving and transmitting of data only from the central server

© Gleb Radchenko

The Napster

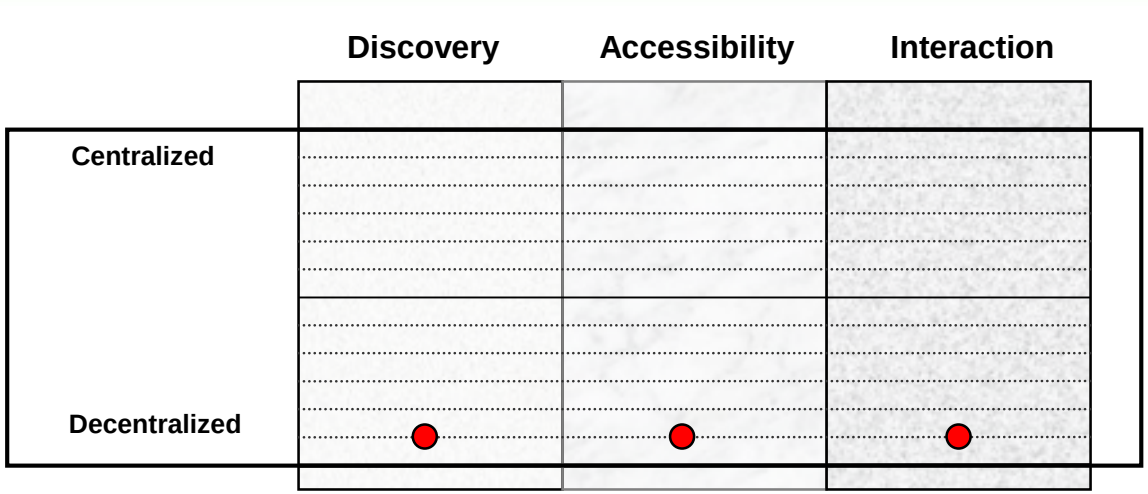


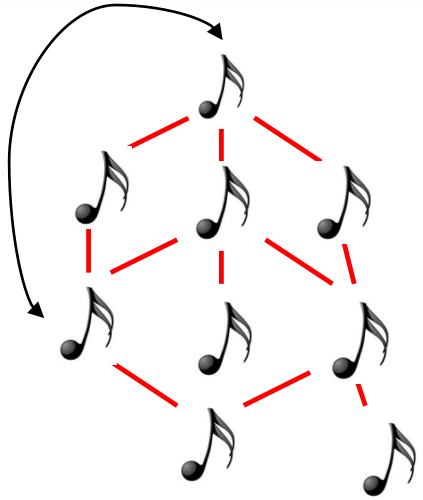


- **Discovery:** Central search engine
- **Accessibility:** links to numerous identical resources
- **Interaction:** decentralized, between the resource owners

© Gleb Radchenko

The Gnutella





- **Discovery:** through the messaging system (ping/pong mechanism)
- **Accessibility:** many alternative paths to a single resource
- **Interaction:** decentralized, between the resource owners

© Gleb Radchenko