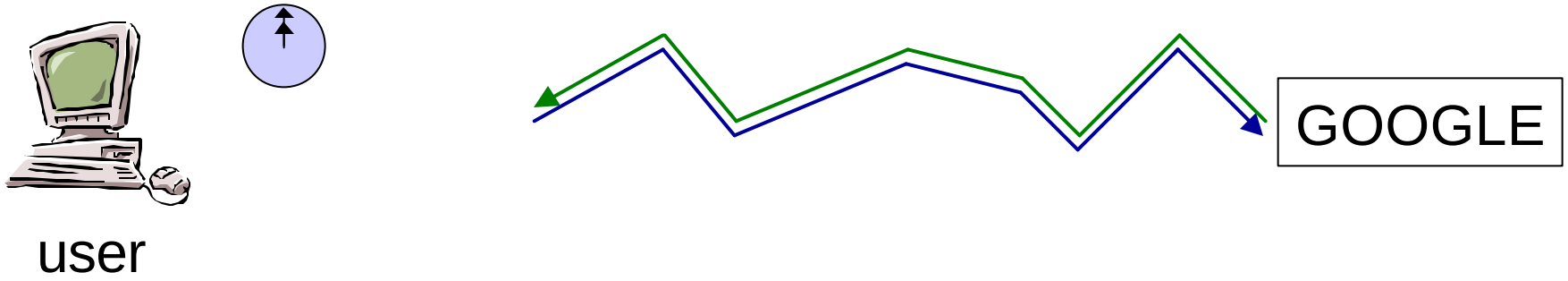
The TEK System: Browsing the Web in Low-Connectivity Communities

Bill Thies, Libby Levison, Saman Amarasinghe

MIT Laboratory for Computer Science

http://cag.lcs.mit.edu/tek

Web Browsing: Current Method



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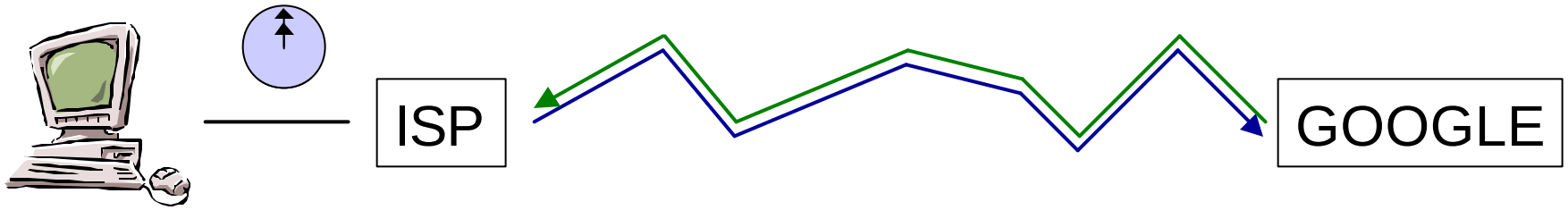

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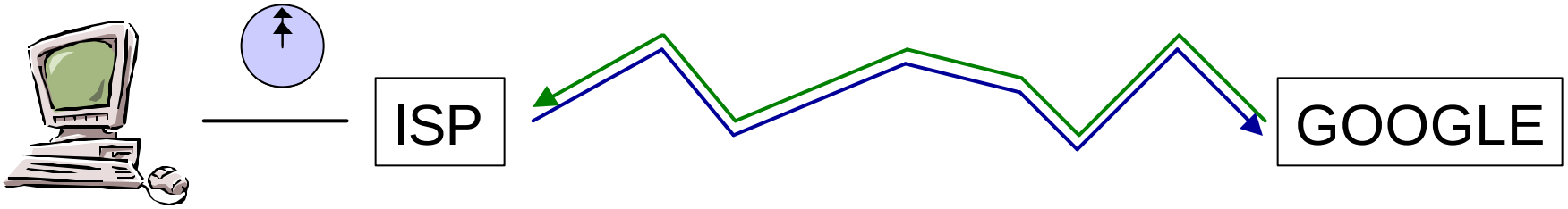

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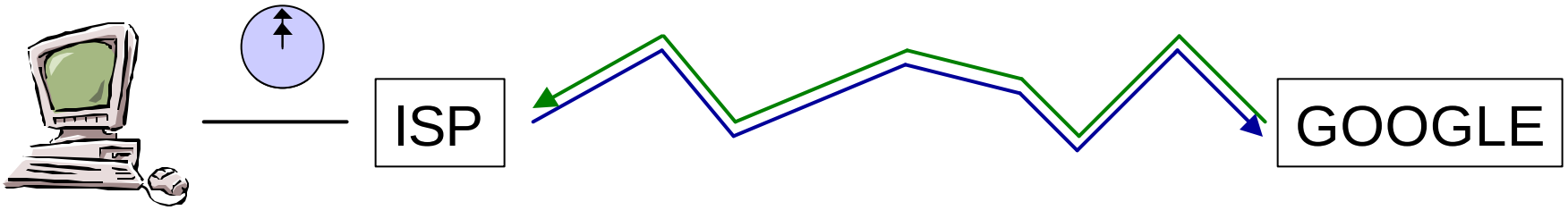

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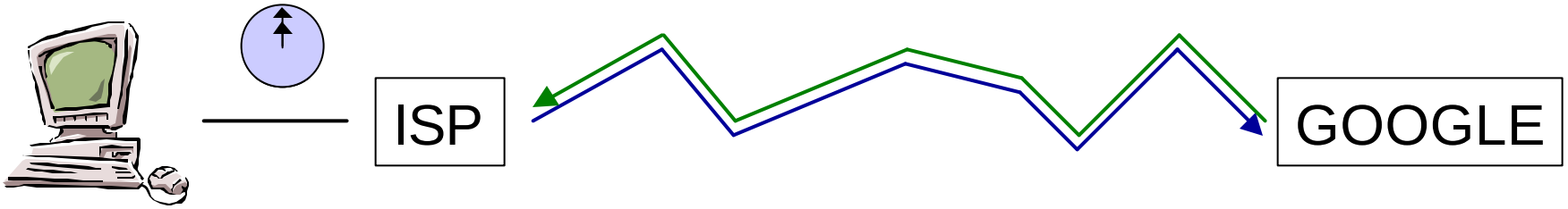

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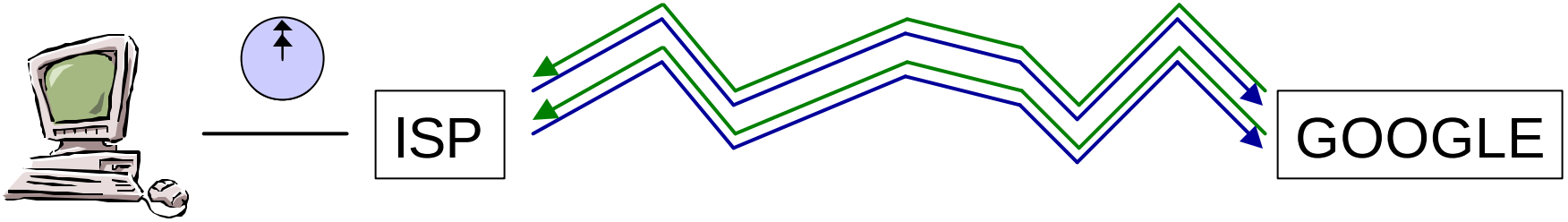

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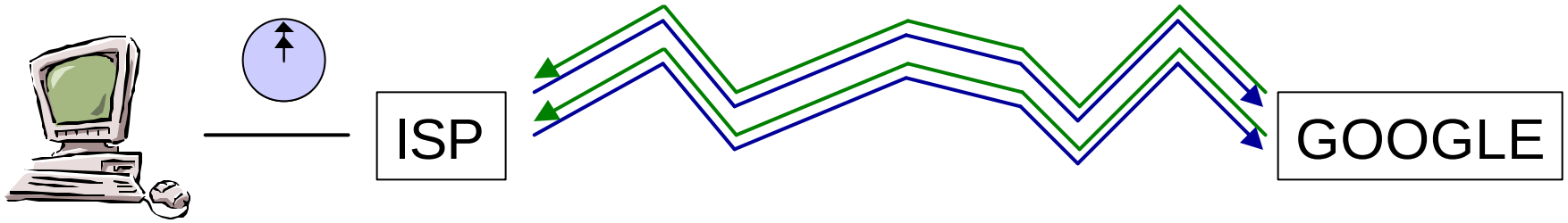

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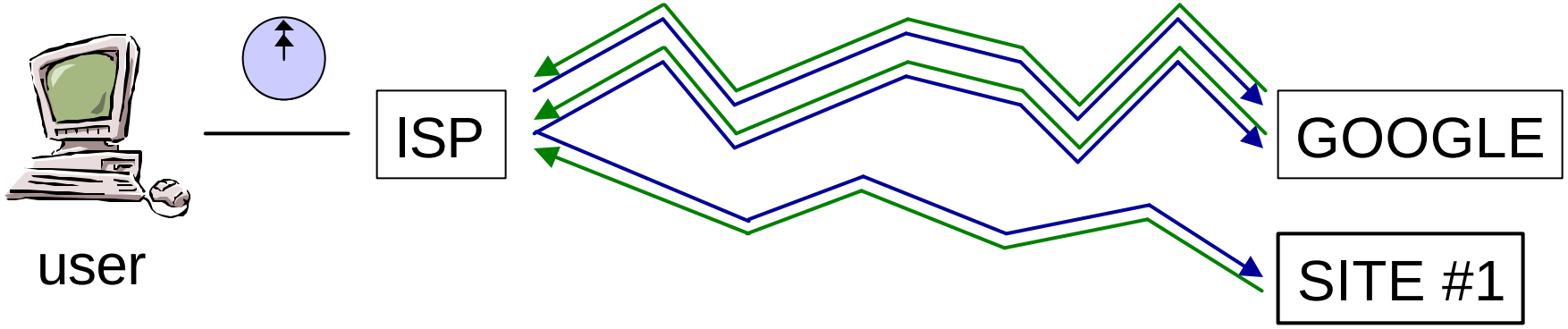

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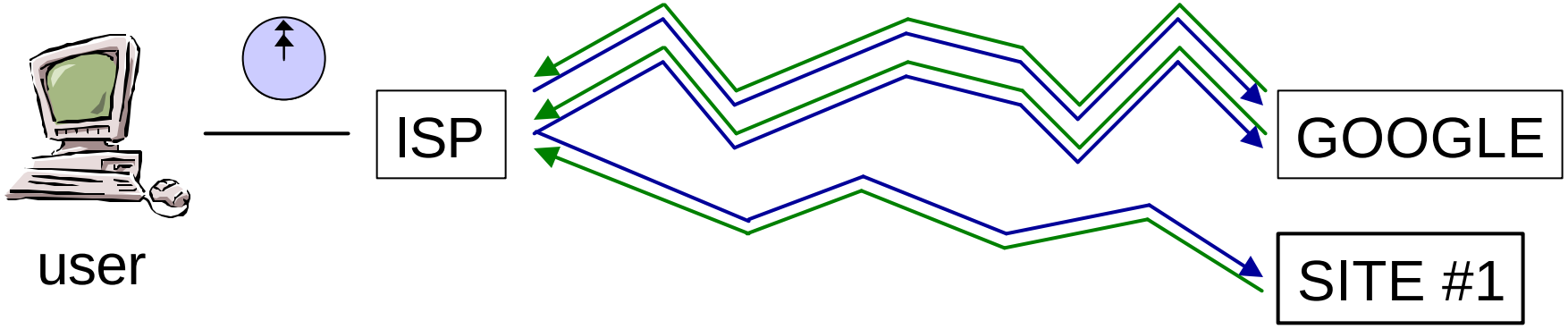

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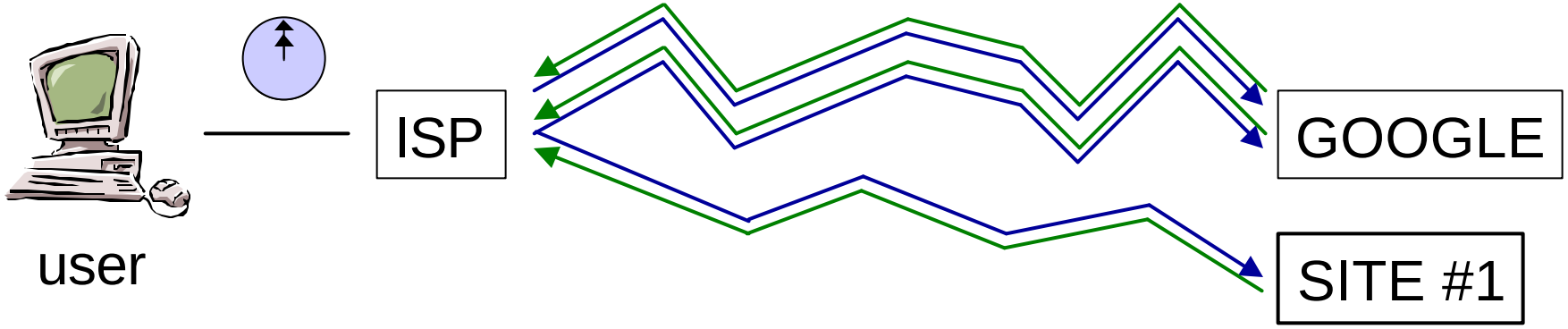

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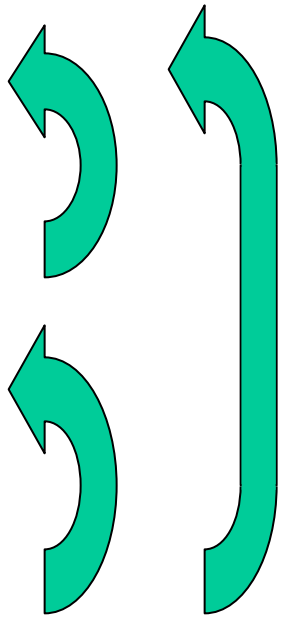

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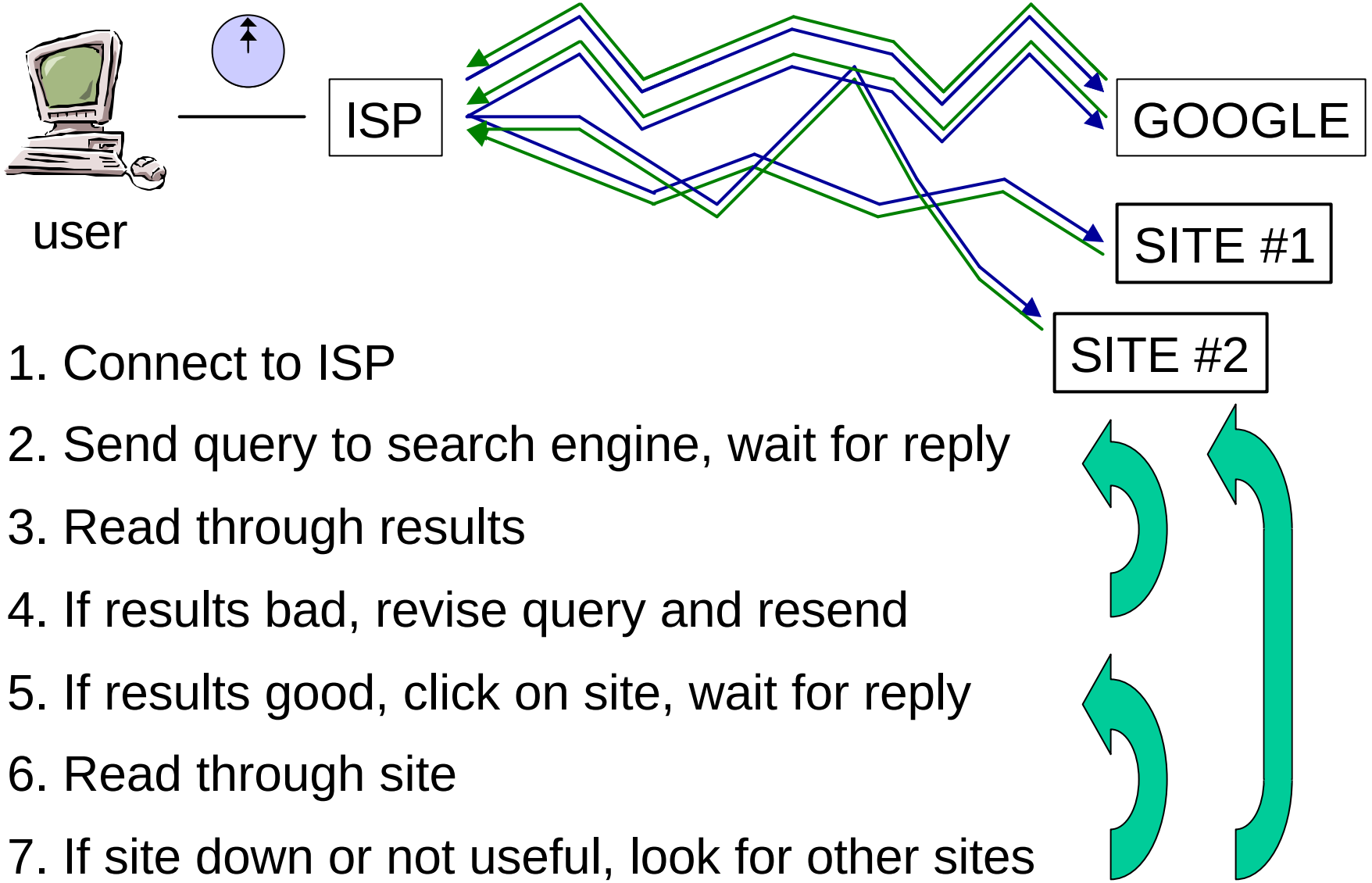

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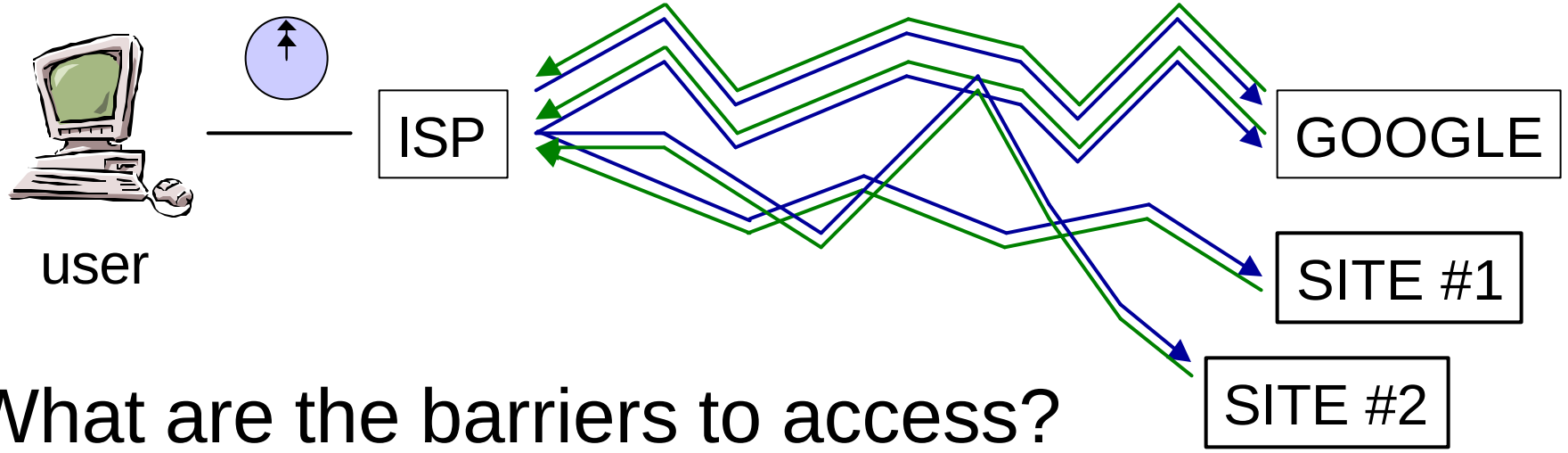

What are the barriers to access?

1. High telephone fees
2. High ISP fees
3. Low-Bandwidth
4. Low-Connectivity

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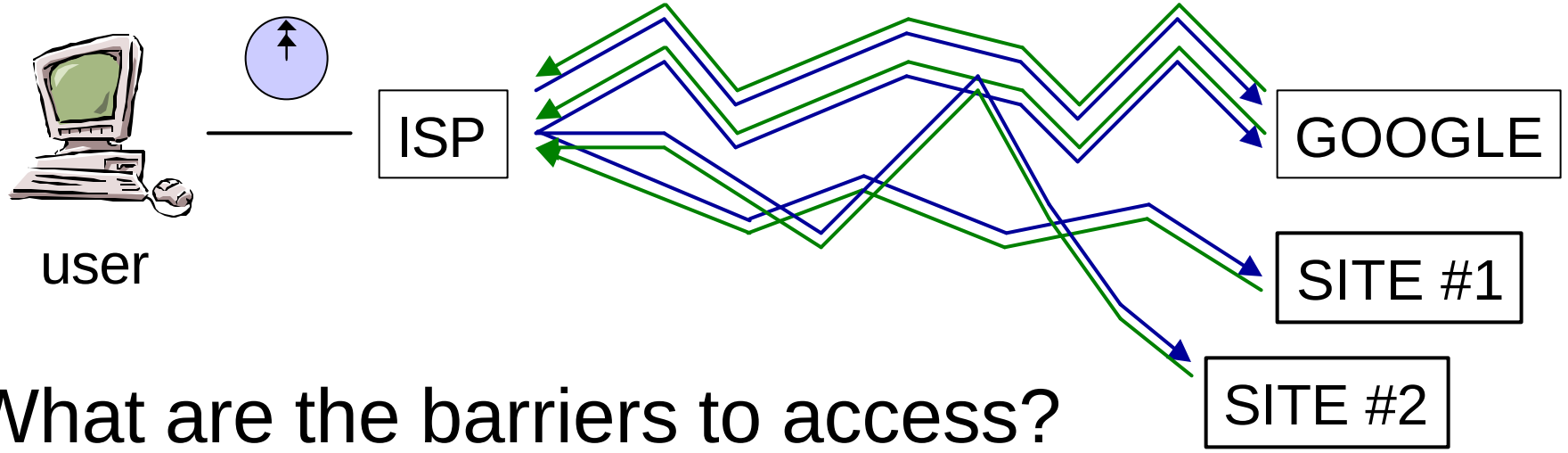

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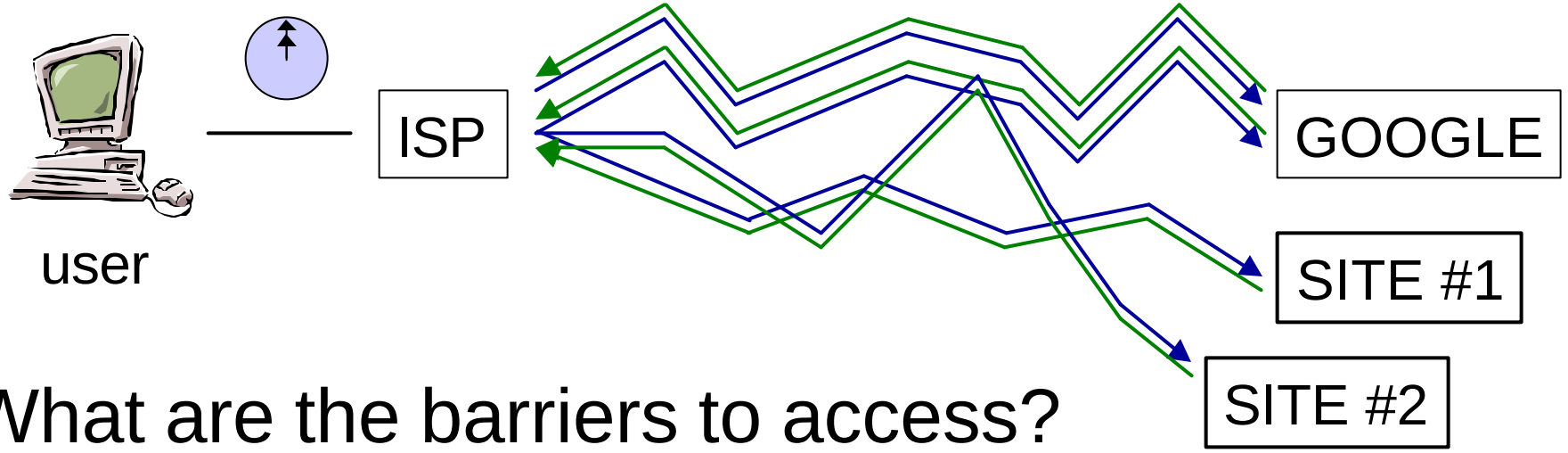

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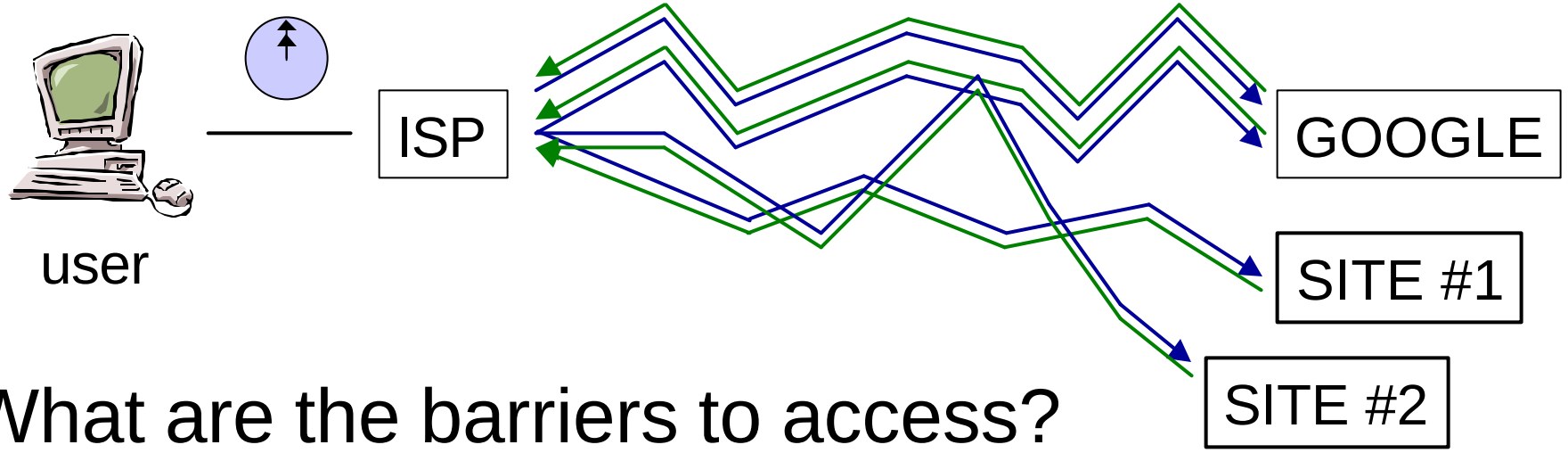

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➡ *Current method is inappropriate!*

Web Browsing: TEK Approach

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ISP

GOOGLE

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SITE #2

Solution has two components:

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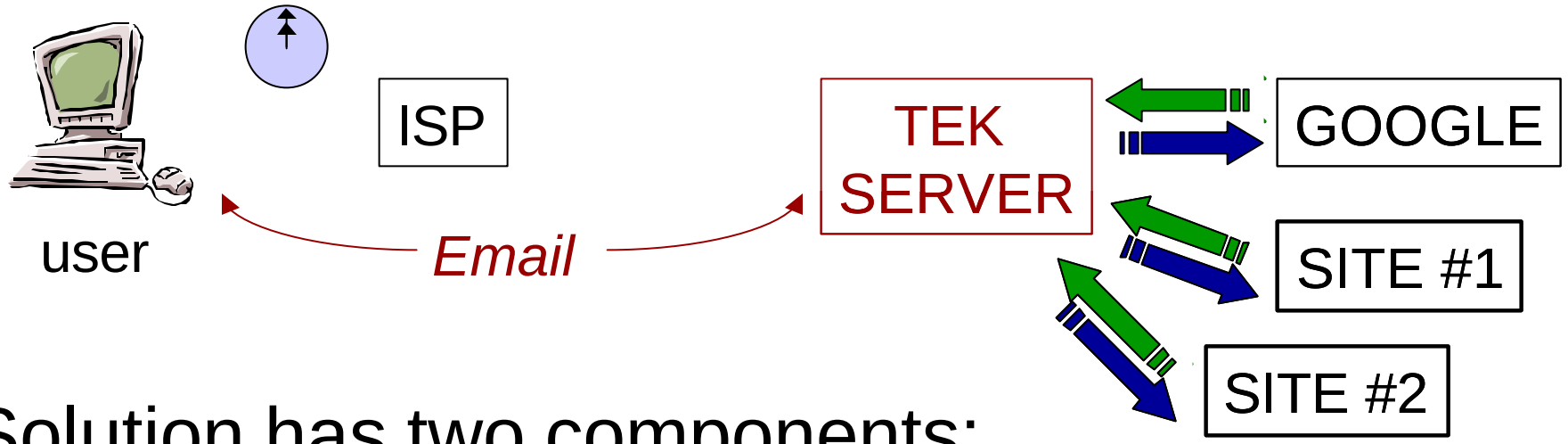

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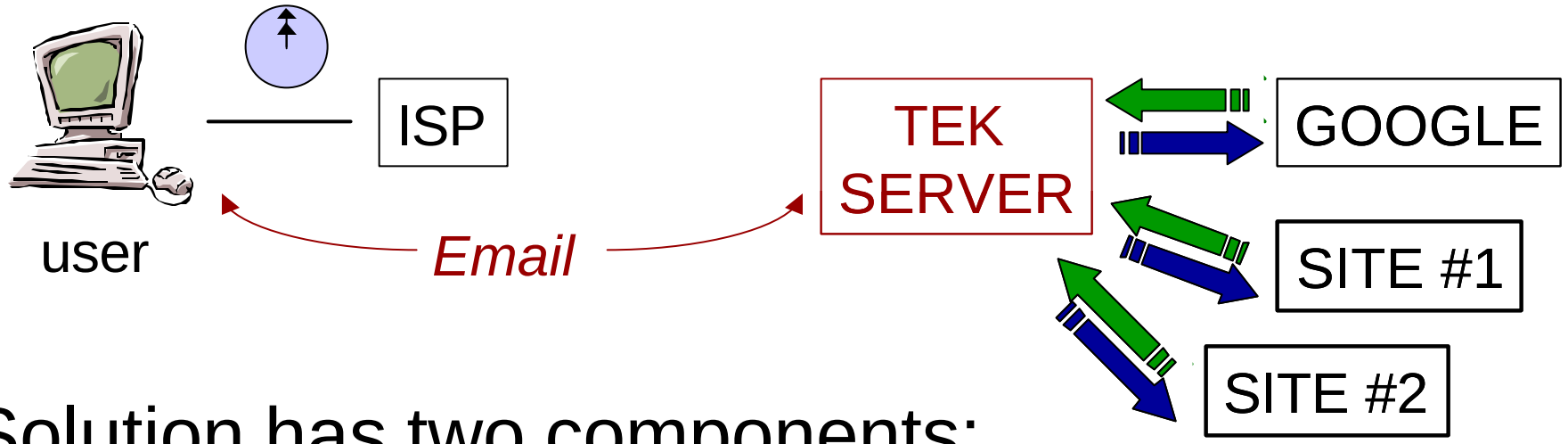

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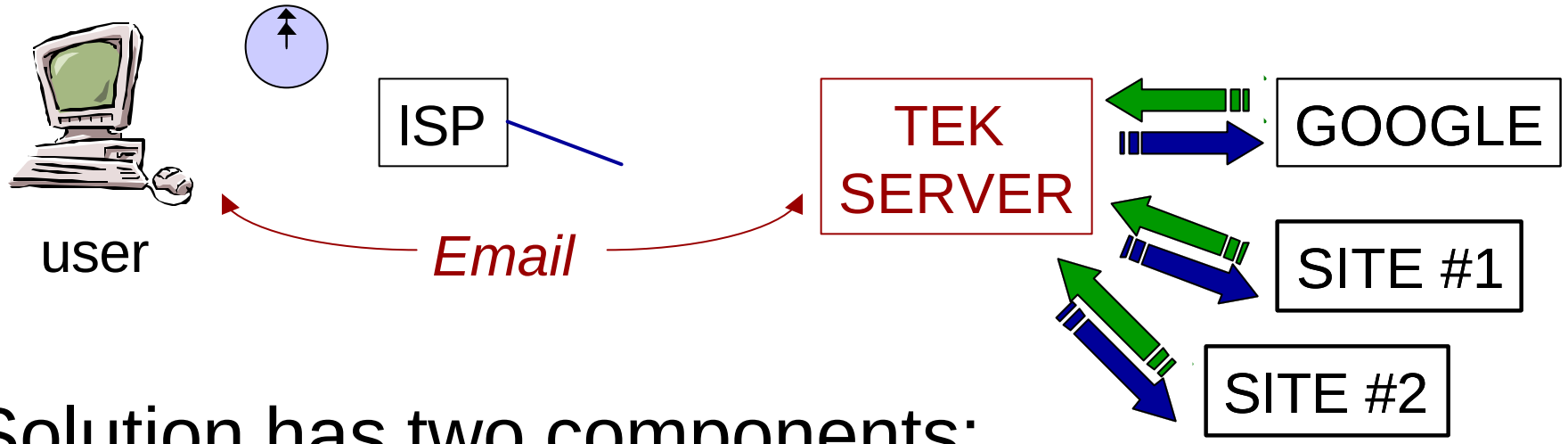

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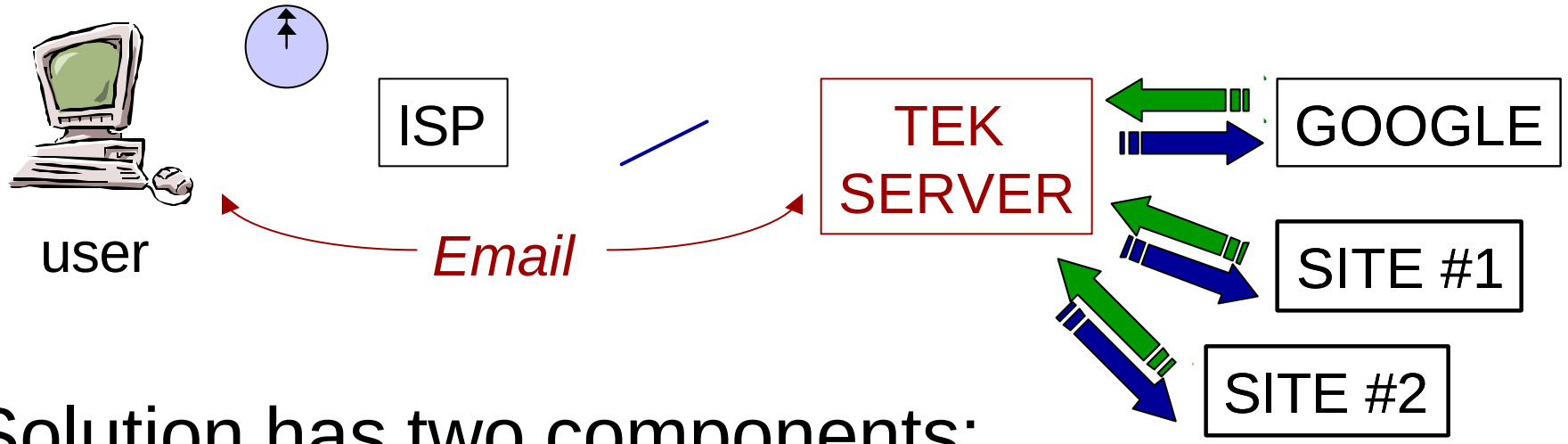

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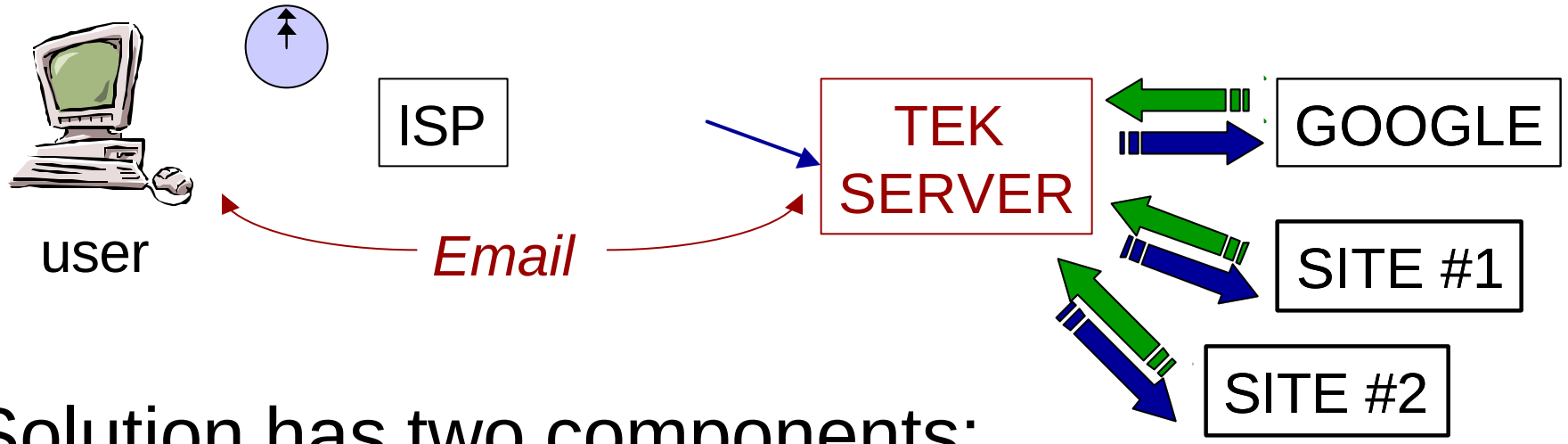

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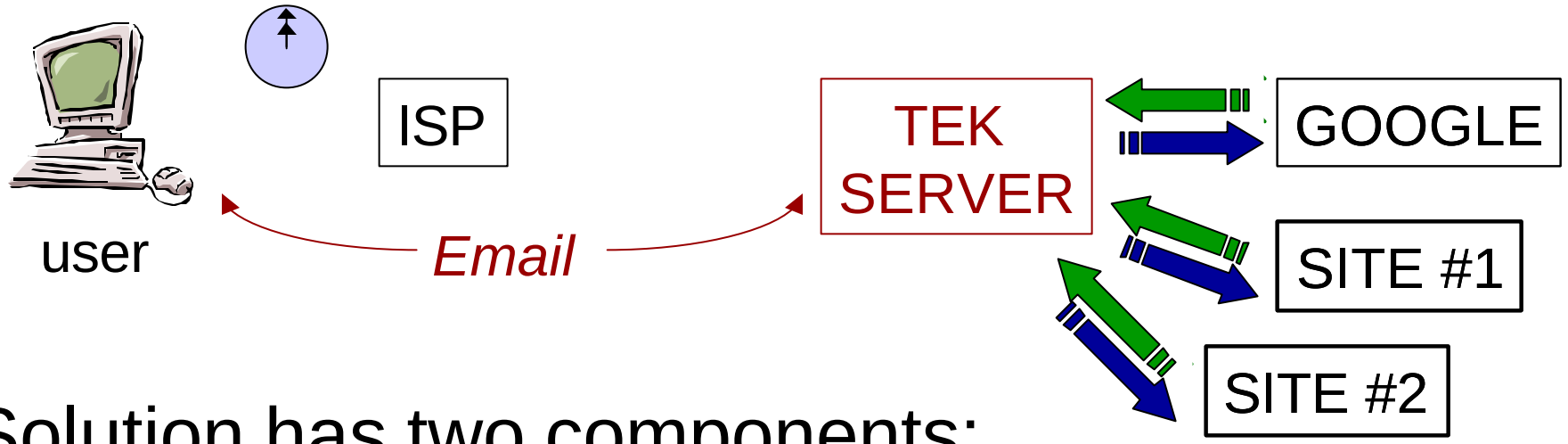

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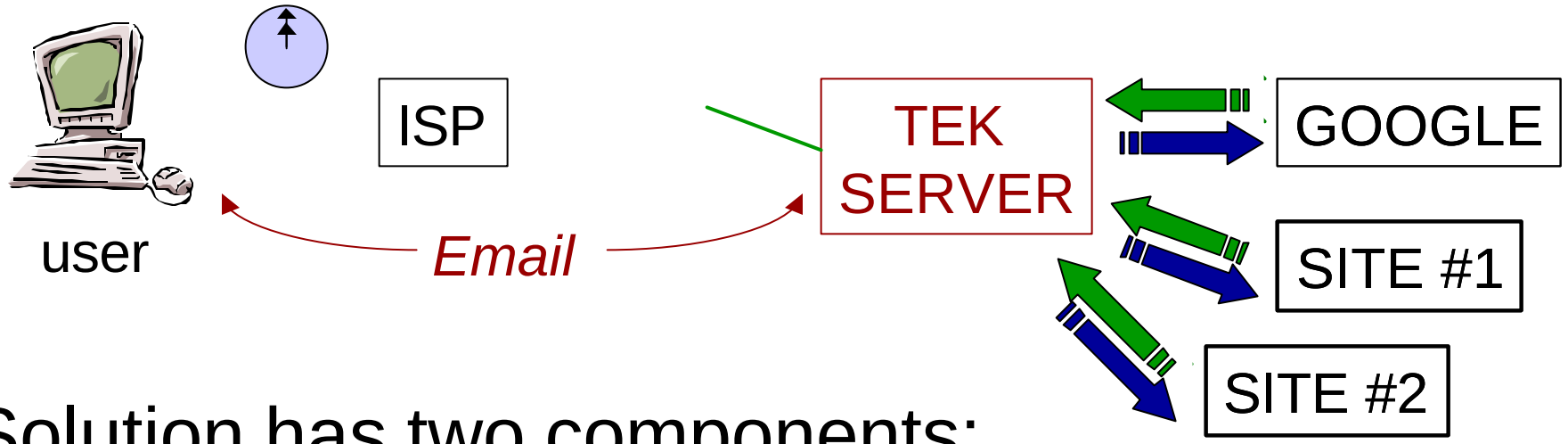

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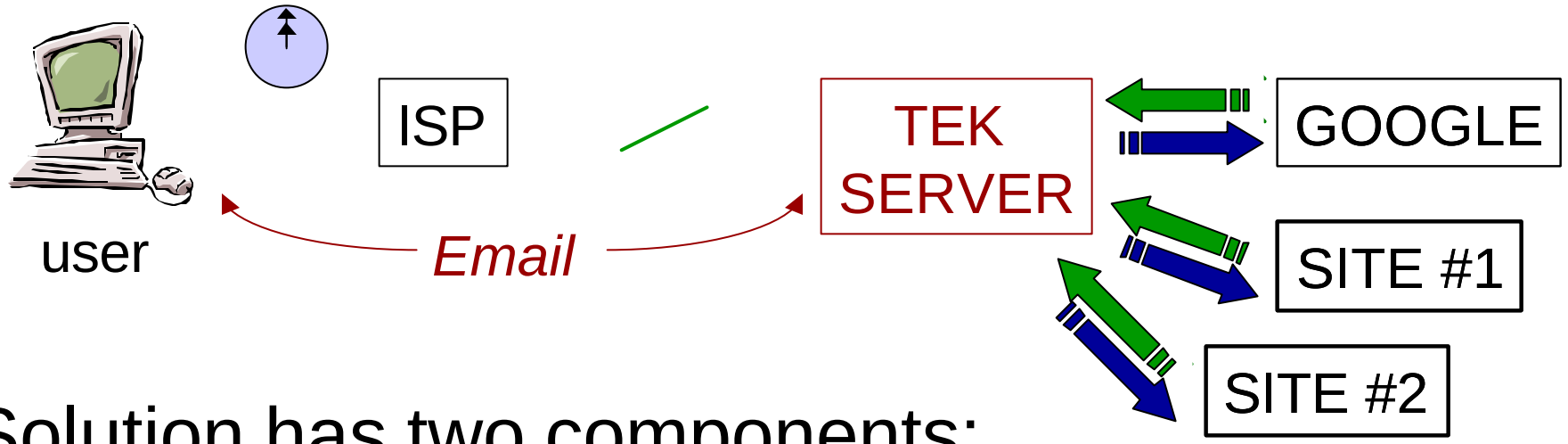

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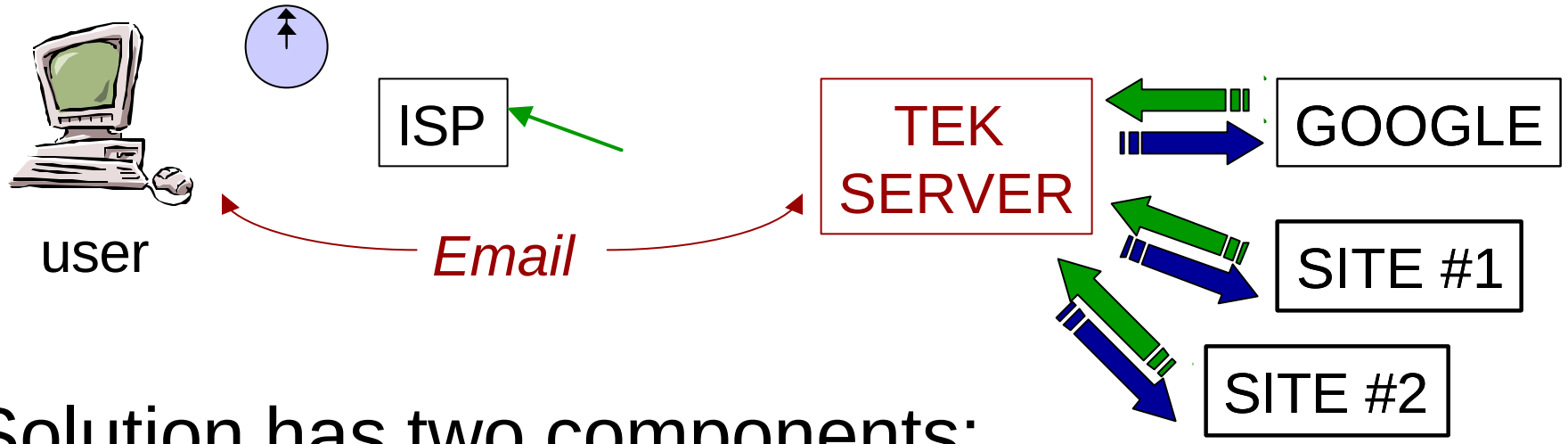

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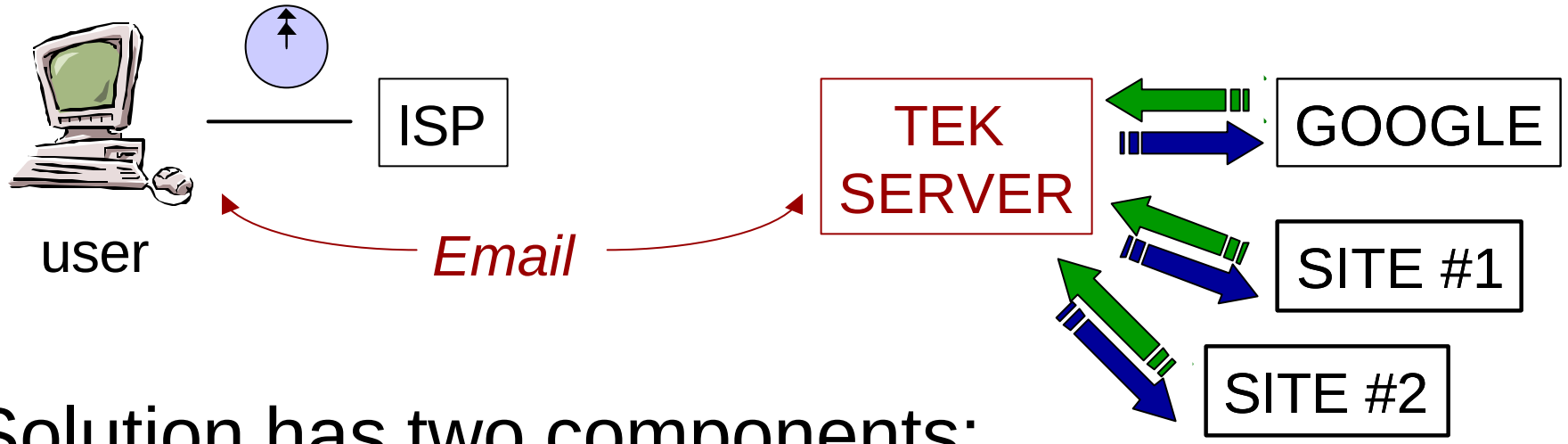

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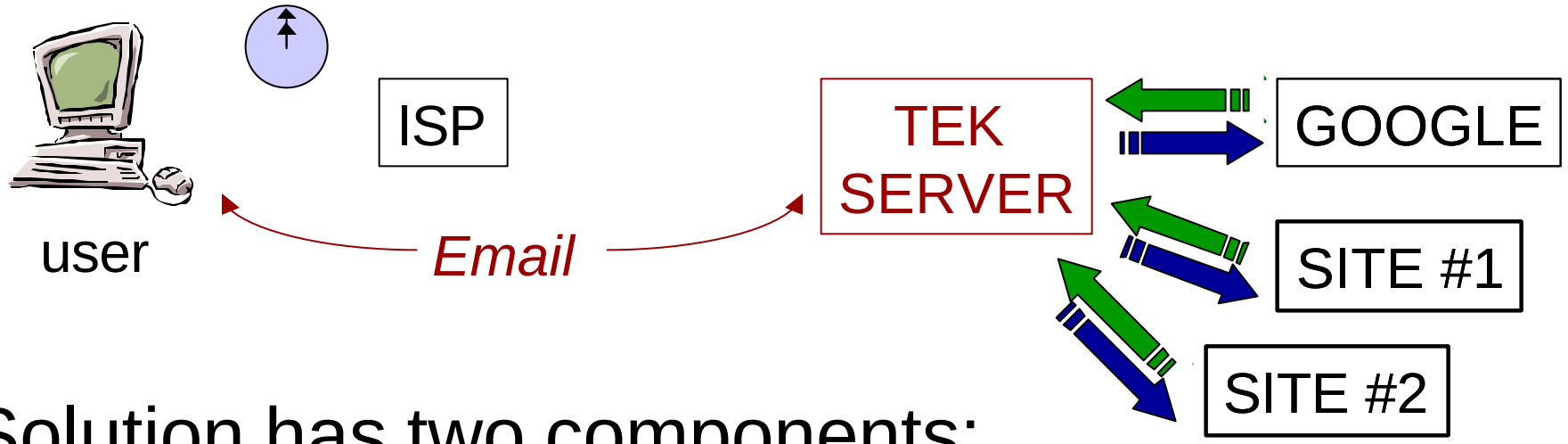

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TEK: "Time Equals Knowledge"

Outline

- Protocol Details
- Rationale
- Server Details
- Current Status / Demo

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Protocol Details

user

ISP

TEK SERVER

GOOGLE

SITE #1

SITE #2

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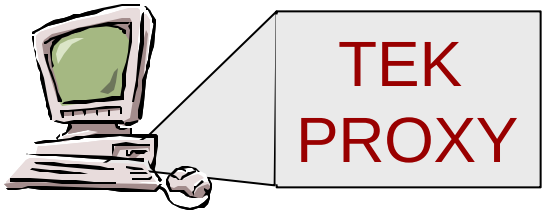

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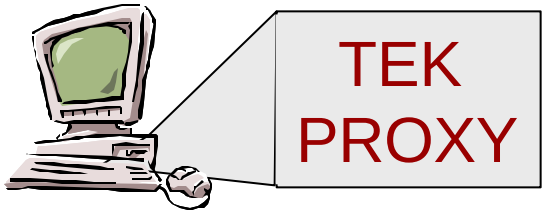

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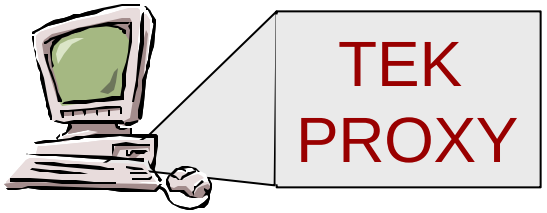

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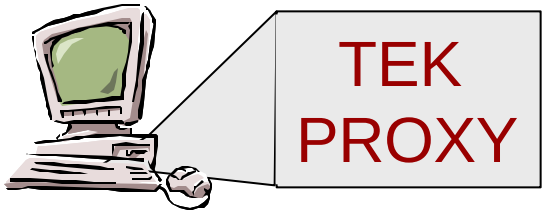

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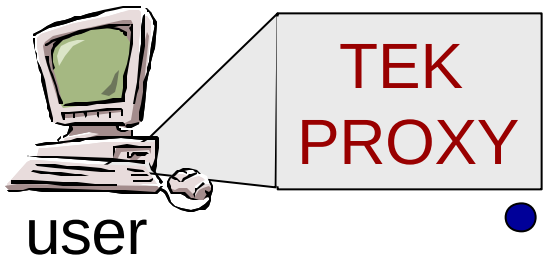

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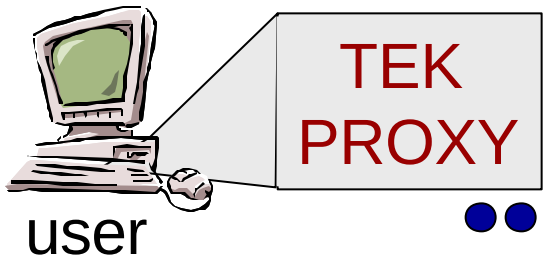

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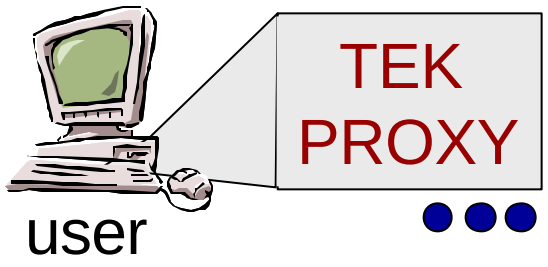

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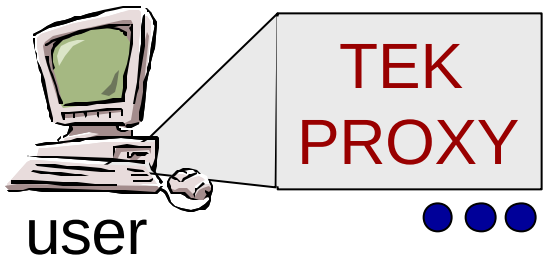

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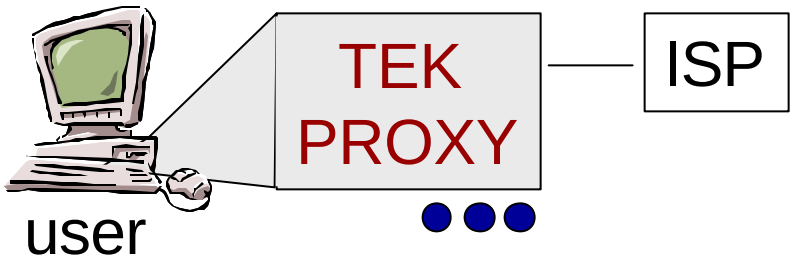

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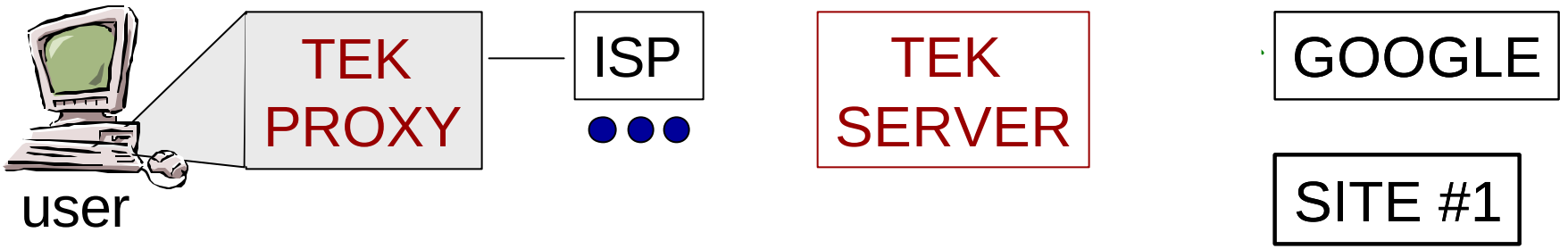

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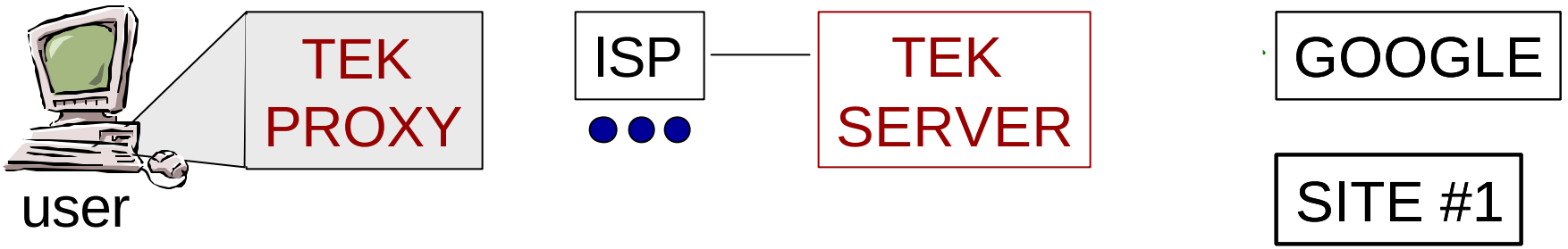

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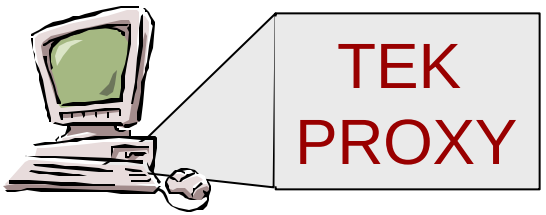

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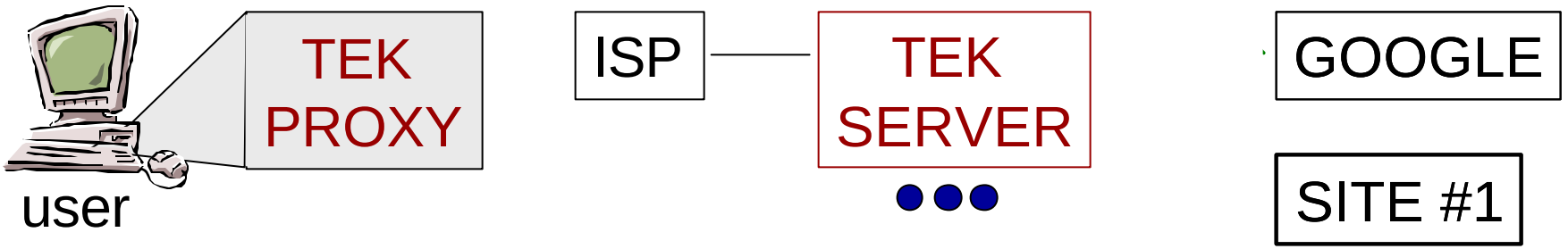

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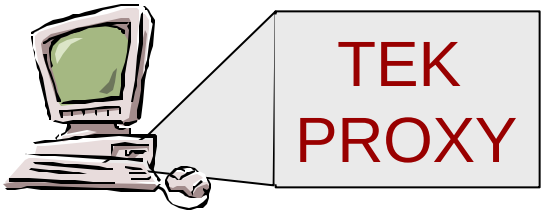

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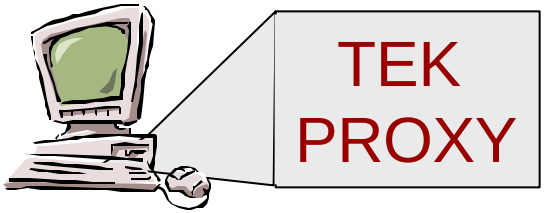

ISP

TEK
SERVER

GOOGLE

SITE #1

SITE #2

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5. Server performs search, filters results and replies

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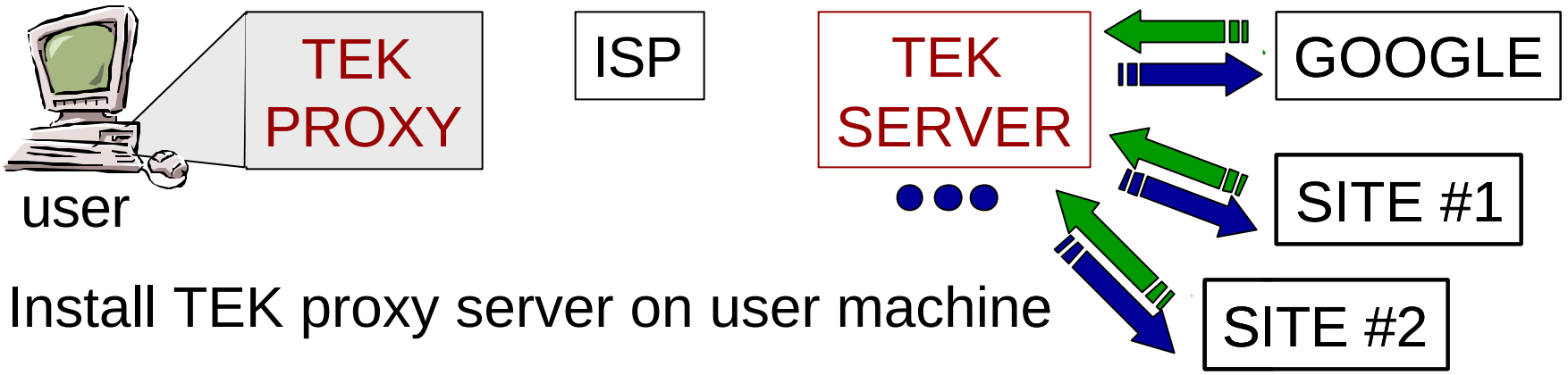

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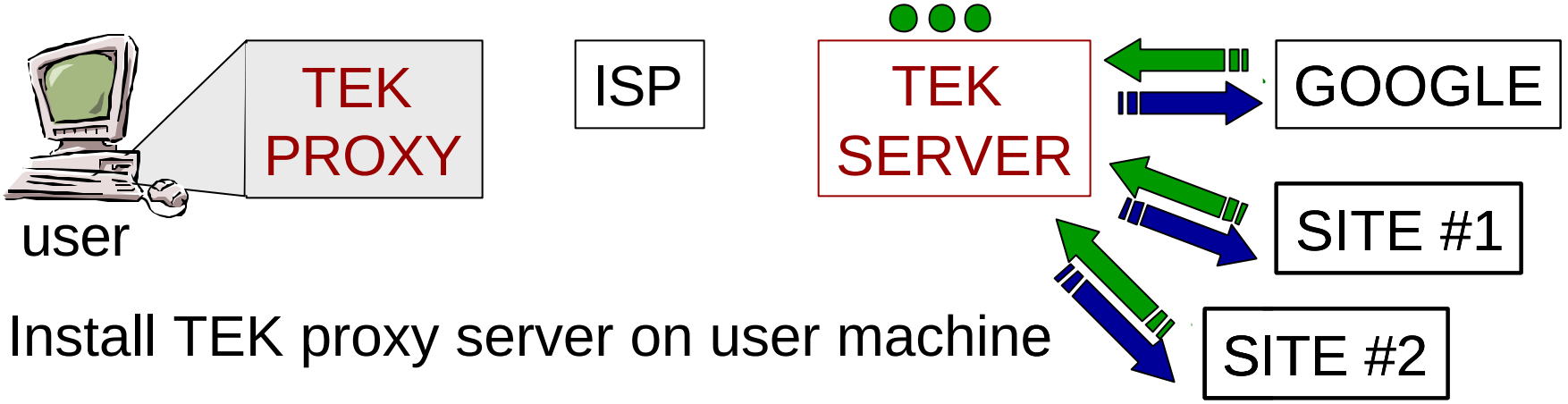

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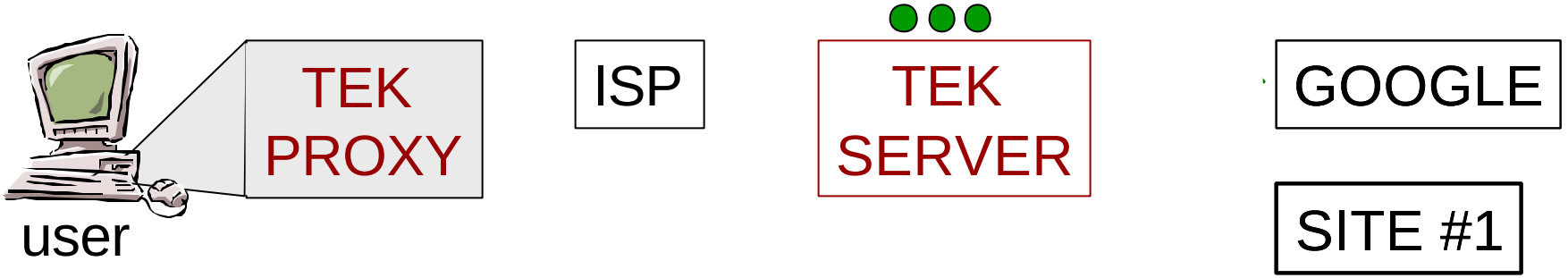

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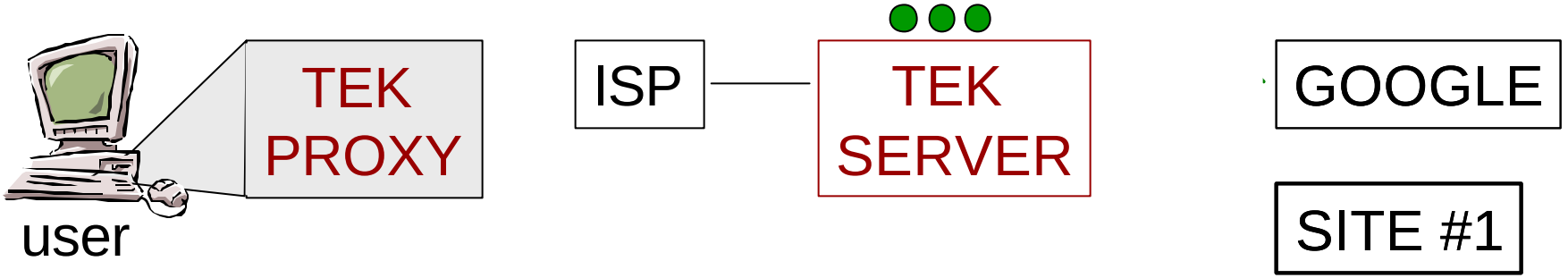

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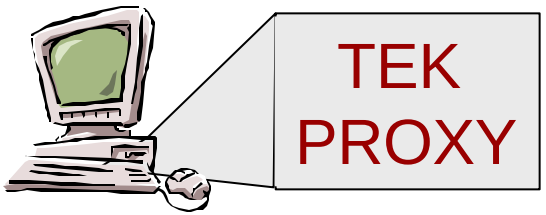

user

ISP — TEK SERVER

GOOGLE

SITE #1

SITE #2

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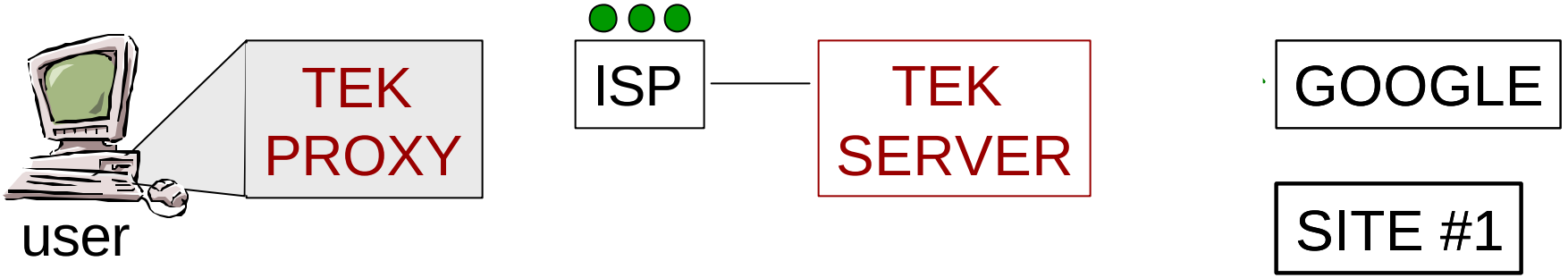

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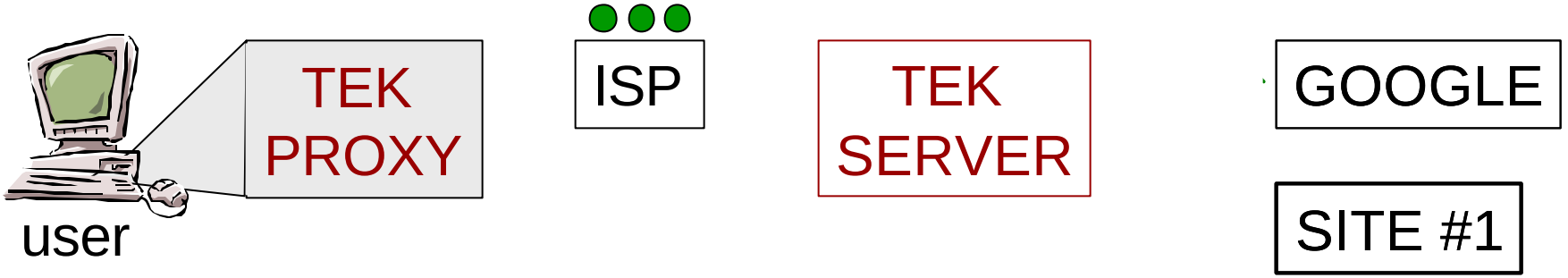

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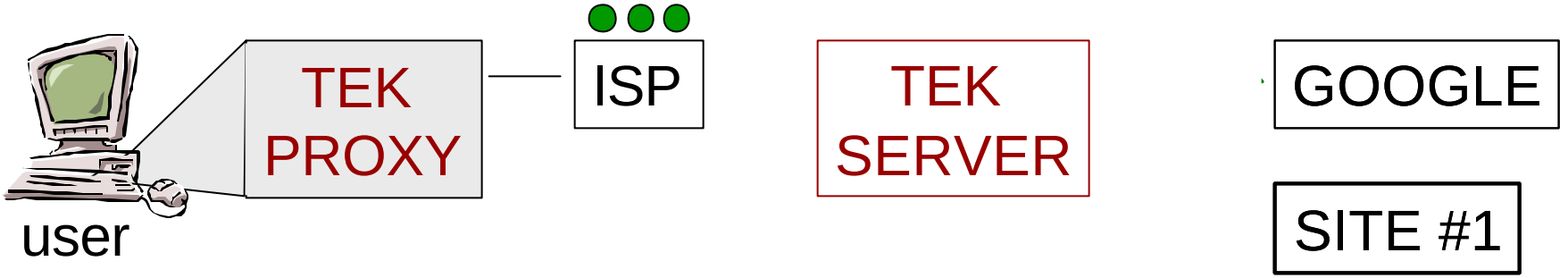

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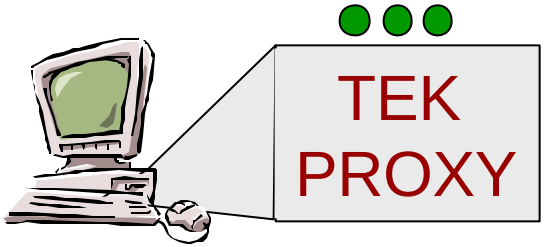

ISP

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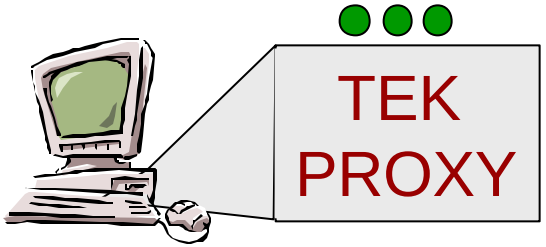

user

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5. Server performs search, filters results and replies
6. Administrator finds results in email and opens them

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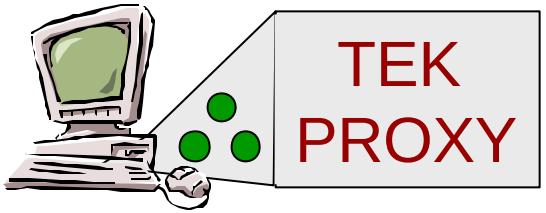

user

ISP

TEK
SERVER

GOOGLE

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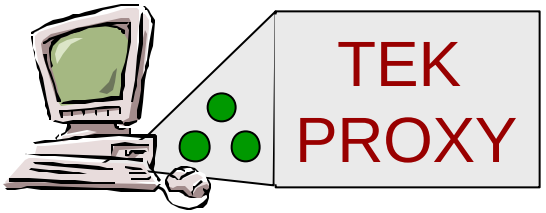

user

ISP

TEK
SERVER

GOOGLE

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6. Administrator finds results in email and opens them
7. Users can view results on future logins

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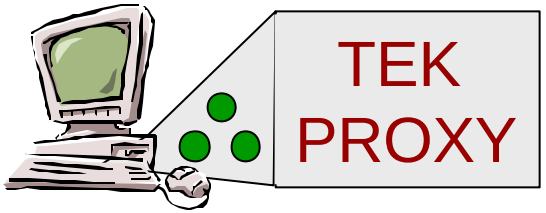


user

ISP

TEK
SERVER

GOOGLE

SITE #1

Additional features

1. Accumulates digital reference library on client
2. Reliable email-based communication protocol

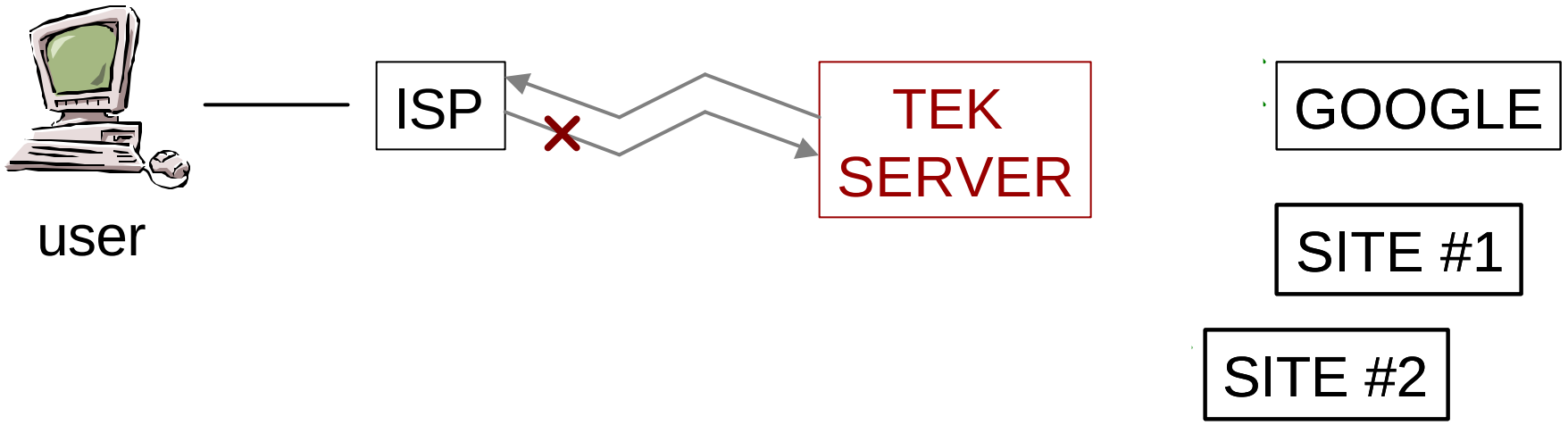
Outline

- Protocol Details
- Rationale
- Server Details
- Current Status / Demo

Rationale I: Decreased Cost

- Email accounts cheaper than web access
- Phone lines are cheaper, clearer, and more stable during off-peak hours
- Connection time is shorter
  - User reads pages offline, not while connected
  - Content is direct from ISP, not a distant server
  - Results are more compact due to TEK Server
- Local web cache can prevent some searches

Rationale II: Improved Reliability



- Email reduces dependence on network
- Never need continuous path from client to server

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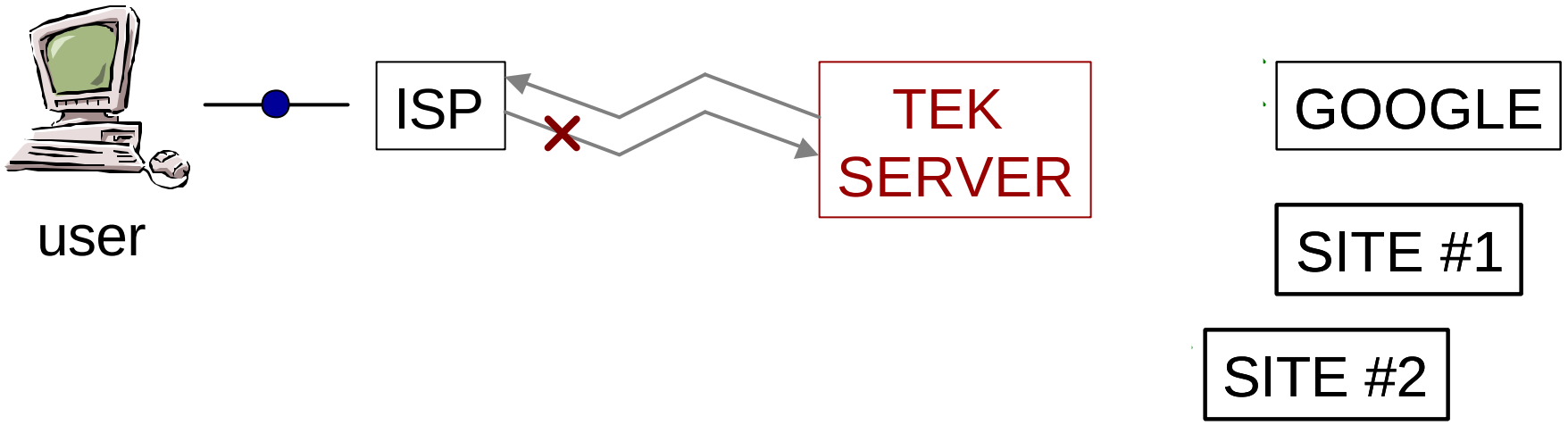

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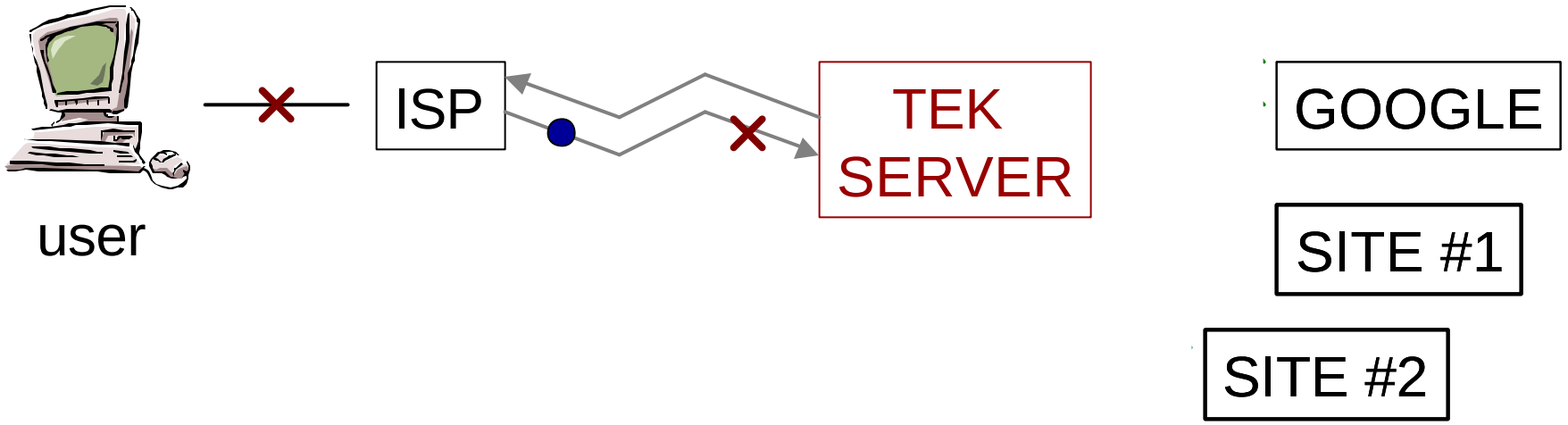

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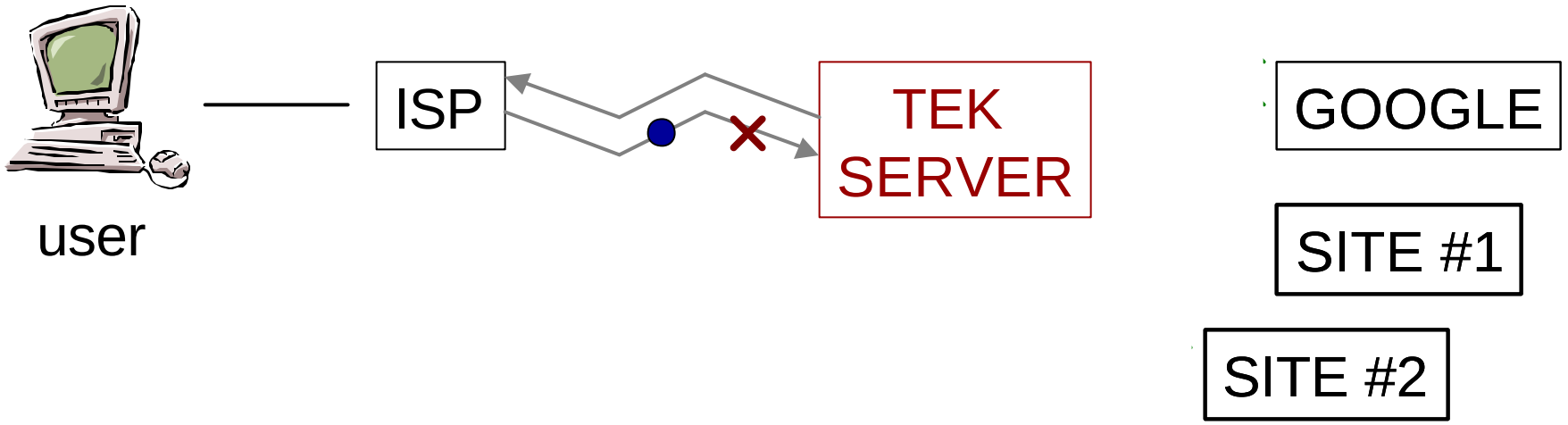

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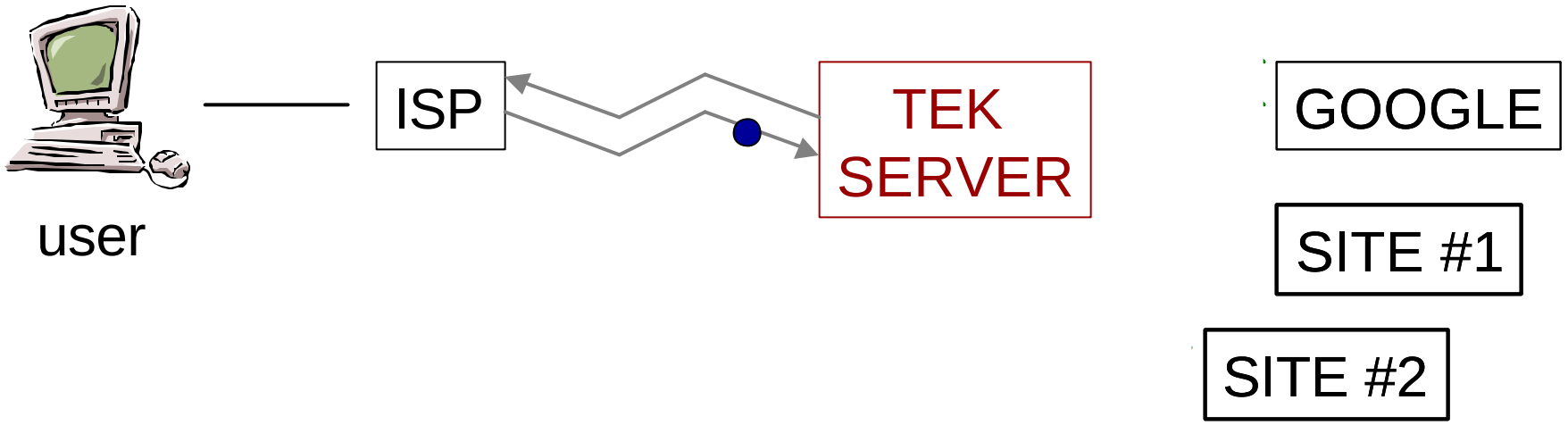

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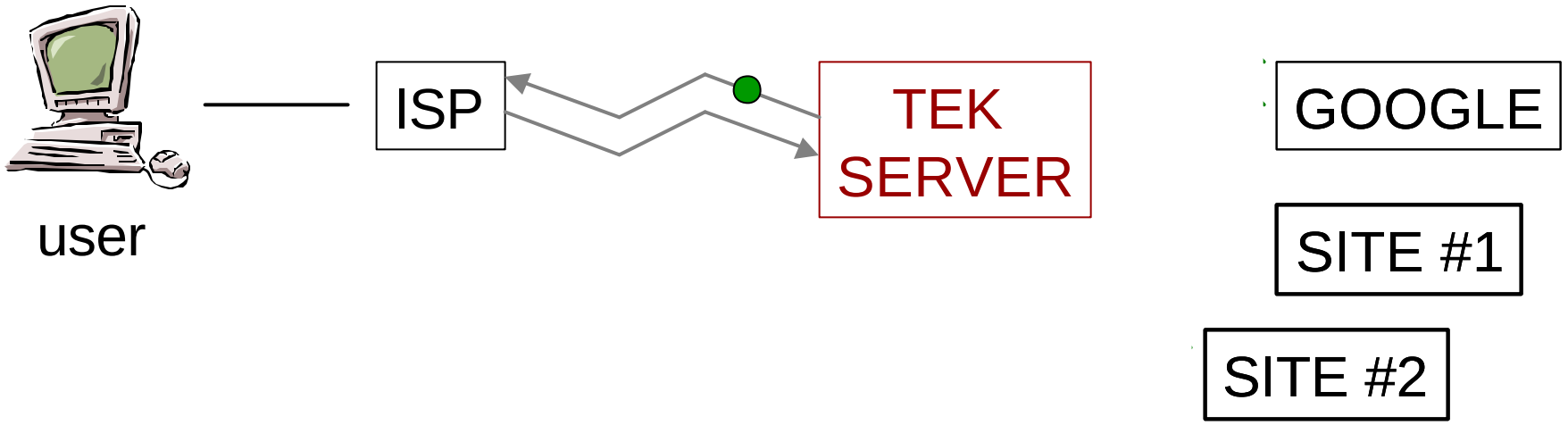

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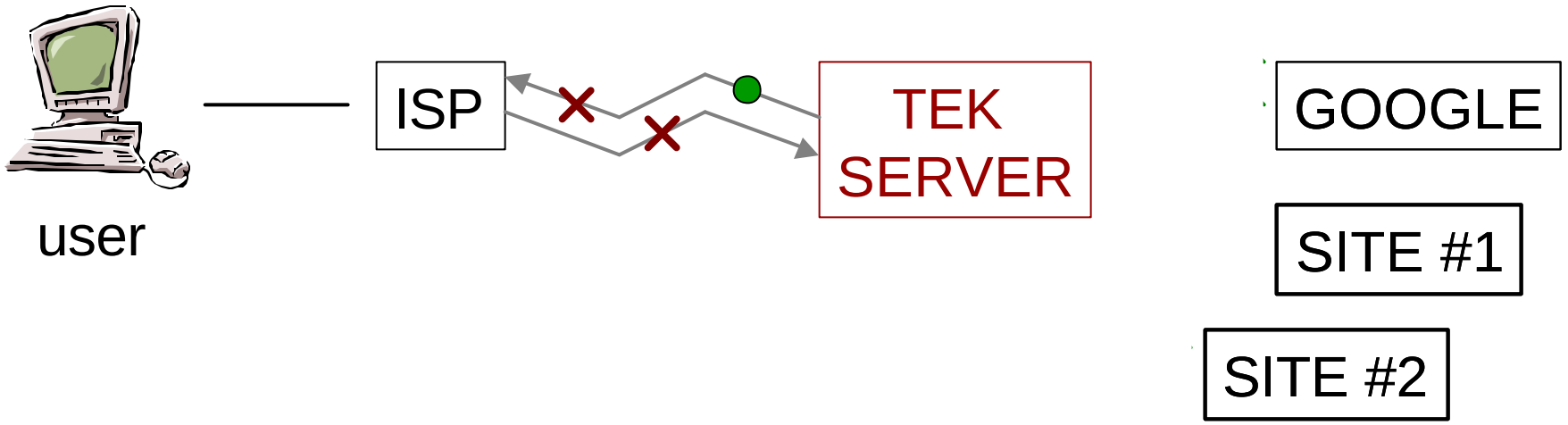

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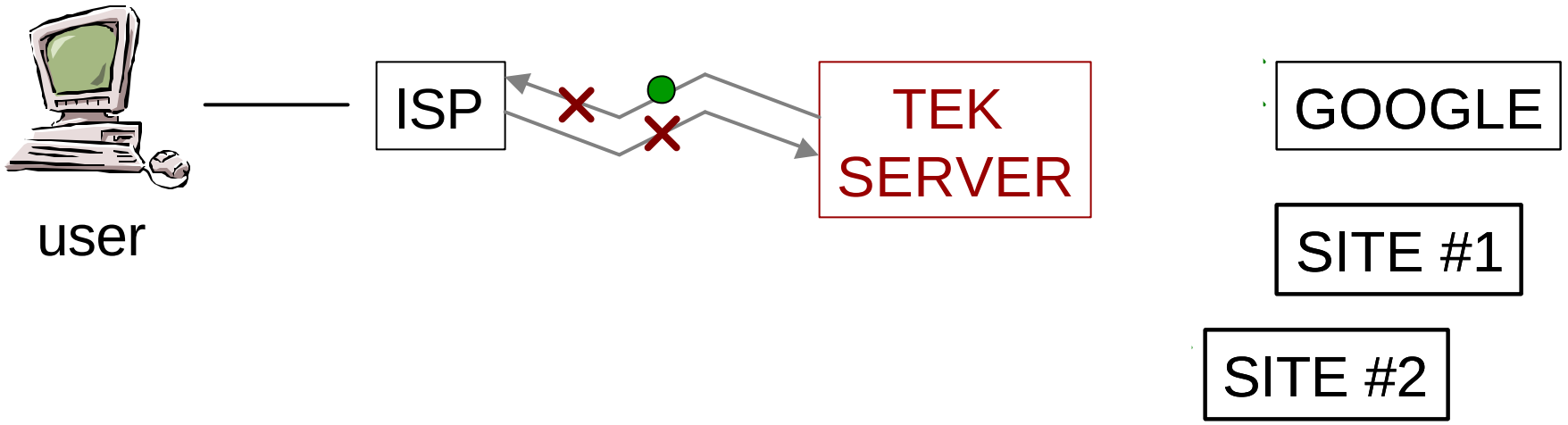

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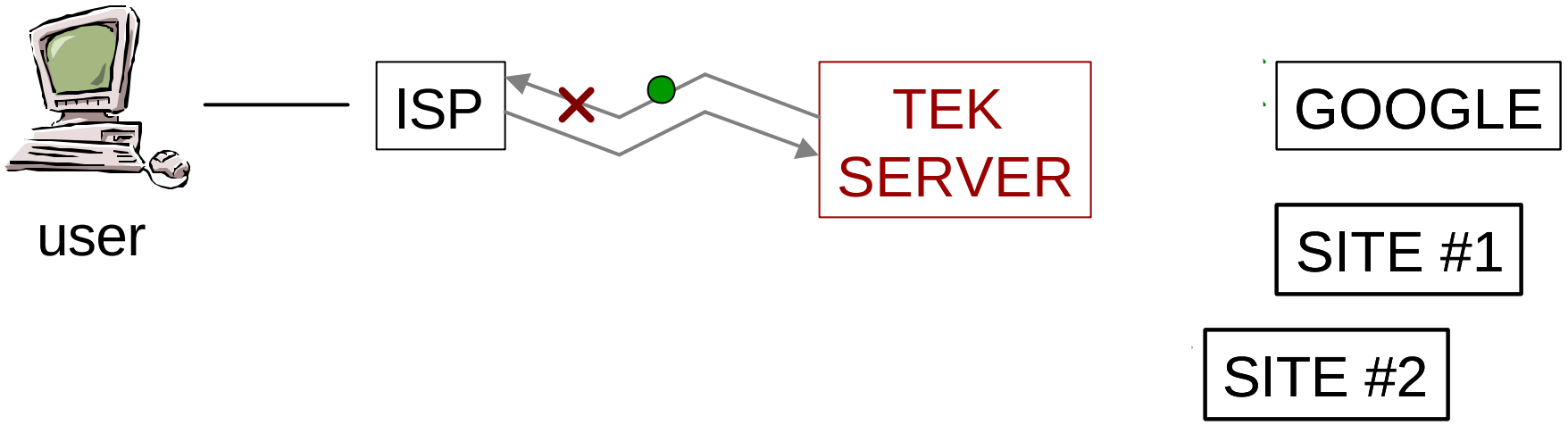

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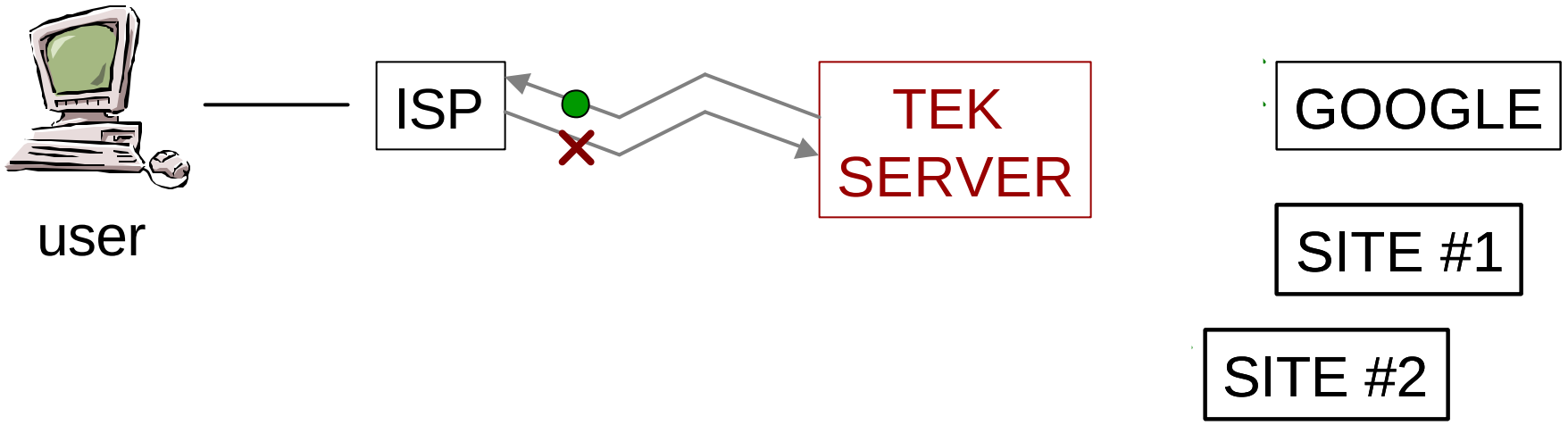

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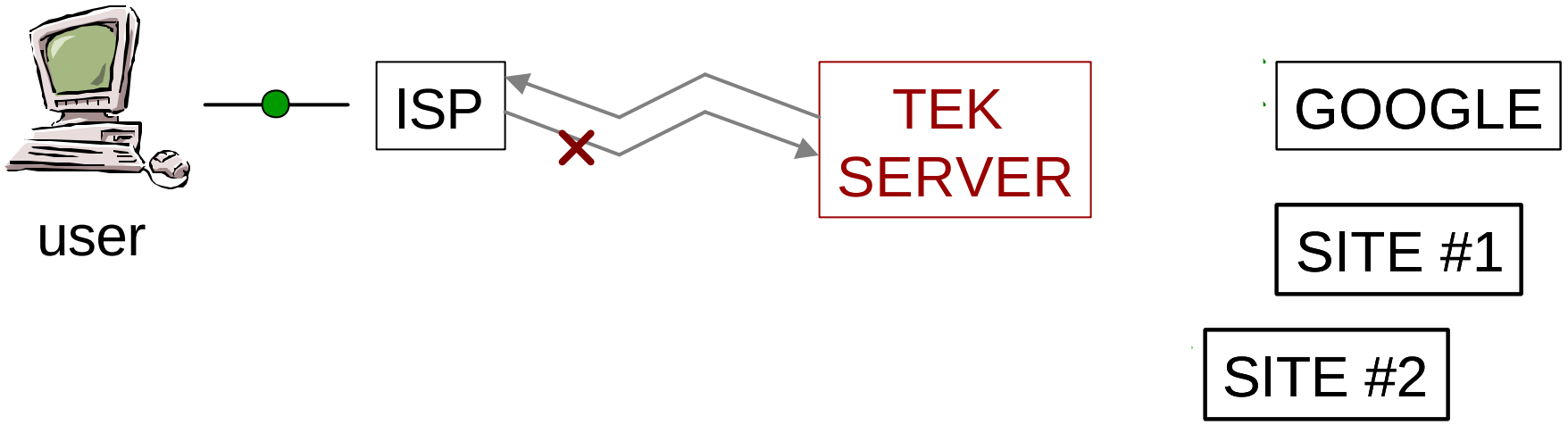

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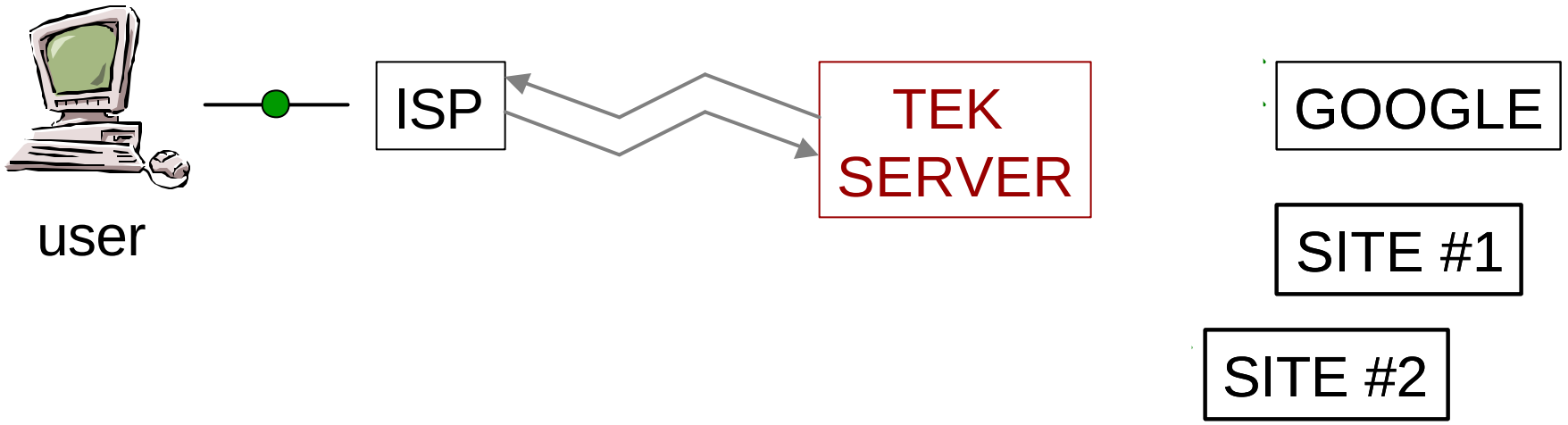

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Rationale III: Improved Convenience

- Sending email at night:
  - Frees telephone for other daytime uses
  - Avoids daytime traffic in connecting to ISP
- Offline viewing of results is quick and reliable
  - More people can use computer during daytime
- More relevant results thanks to TEK server

Outline

- Protocol Details
- Rationale
- Server Details
- Current Status / Demo

Server Details

- Extensive server-side processing
  - Optimized for bandwidth, not speed
  - Gathers pages from other search engines
  - Filtering
    - Removes duplicate or similar pages
    - Looks for paragraph text, not just links
    - Dither or remove images
  - Compresses the result set
- Keeps track of each user
  - Avoids sending a page twice to a given machine
  - Enables more intelligent page ranking

Outline

- Protocol Details
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Status

- Fully-functional prototype of TEK system
  - Implemented in Java
- Looking for users by summer 2002
- Future Work
  - More intelligent query-builder on client
  - Consider multi-language interfaces
- Demo