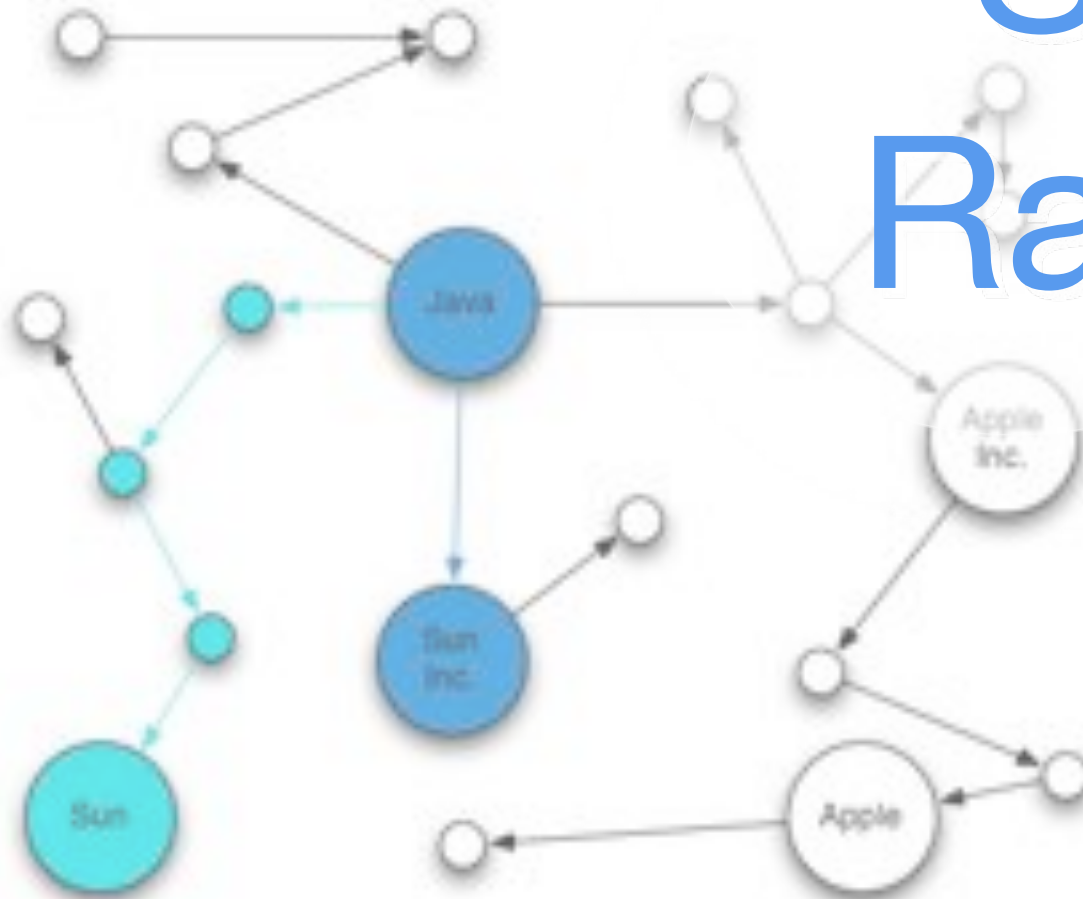


# Efficient Search Ranking

↓ **Concept**  
Demo  
↓ Final



*Benjamin Emde  
& Eyk Kny  
17 November 2009*

Use Case  
Problem  
Solution

# Use Case



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## Java (software platform)

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*Not to be confused with [JavaScript](#).*

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On November 13, 2006, Sun Microsystems made the bulk of its implementation of garbage collection becoming by the Java Virtual Machine (JVM).

Java



The Java logo.

<b>Original author(s)</b>	James Gosling
<b>Developer(s)</b>	Sun Microsystems
<b>Developer(s)</b>	Sun Microsystems
<b>Developer(s)</b>	Sun Microsystems

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(MPL) instead built and licensed under the terms of the Java Virtual Machine (JVM)



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**Java**



The Java logo.

**Original author(s)** James Gosling

**Developer(s)** Sun Microsystems

**Developer(s)** Oracle Corporation

**Developer(s)** Red Hat

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On November 13, 2006, Sun Microsystems made the bulk of its implementation of Java open source under the terms of the GNU General Public License (GPL).

The Java logo.

**Original author(s)** James Gosling

**Developer(s)** Sun Microsystems

**Developer(s)** Oracle Corporation

**Original author(s)** Oracle Corporation



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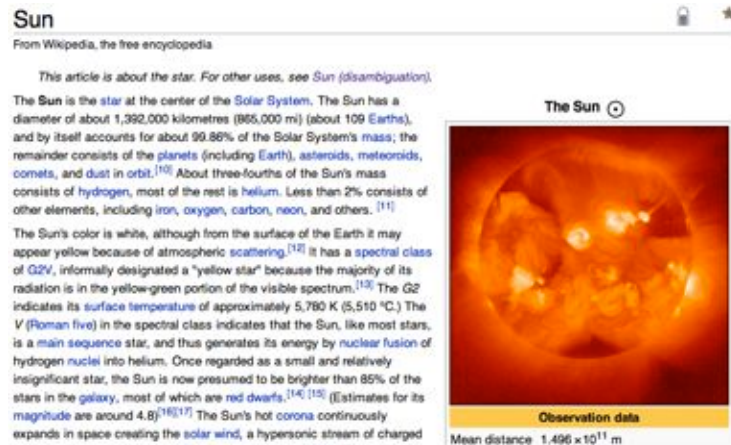
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## Sun

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*This article is about the star. For other uses, see Sun (disambiguation).*

The **Sun** is the star at the center of the Solar System. The Sun has a diameter of about 1,392,000 kilometres (865,000 mi) (about 109 Earths), and by itself accounts for about 99.86% of the Solar System's mass; the remainder consists of the planets (including Earth), asteroids, meteoroids, comets, and dust in orbit.<sup>[10]</sup> About three-fourths of the Sun's mass consists of hydrogen, most of the rest is helium. Less than 2% consists of other elements, including iron, oxygen, carbon, neon, and others.<sup>[11]</sup>

The Sun's color is white, although from the surface of the Earth it may appear yellow because of atmospheric scattering.<sup>[12]</sup> It has a spectral class of G2V, informally designated a "yellow star" because the majority of its radiation is in the yellow-green portion of the visible spectrum.<sup>[13]</sup> The G2 indicates its surface temperature of approximately 5,780 K (5,510 °C.) The V (Roman five) in the spectral class indicates that the Sun, like most stars, is a main sequence star, and thus generates its energy by nuclear fusion of hydrogen nuclei into helium. Once regarded as a small and relatively insignificant star, the Sun is now presumed to be brighter than 85% of the stars in the galaxy, most of which are red dwarfs.<sup>[14]</sup><sup>[15]</sup> (Estimates for its magnitude are around 4.8)<sup>[16]</sup><sup>[17]</sup> The Sun's hot corona continuously expands in space creating the solar wind, a hypersonic stream of charged

**The Sun**

**Observation data**

Mean distance 1.496 × 10<sup>11</sup> m

## Sun Microsystems

From Wikipedia, the free encyclopedia

**Sun Microsystems, Inc.** (NASDAQ: JAVA )<sup>[2]</sup> is a multinational vendor of computers, computer components, computer software, and information technology services, founded on February 24, 1982.<sup>[4]</sup> The company is headquartered in Santa Clara, California (part of Silicon Valley), on the former west campus of the Agnews Developmental Center.

Products include computer servers and workstations based on its own SPARC processors as well as AMD's Opteron and Intel's Xeon processors; storage systems; and, a suite of software products including the Solaris operating system, developer tools, Web infrastructure software, and identity management applications. Other technologies of note include the Java platform, MySQL and NFS. Sun is a proponent of open systems in general and Unix in particular, and a major contributor to open source software.<sup>[5]</sup>

On April 20, 2009, Sun and Oracle Corporation announced that they entered into a definitive agreement under which Oracle will acquire Sun for \$7.4 billion.<sup>[6]</sup><sup>[7]</sup> Sun shareholders approved the acquisition on July 16, 2009. As of October 2009 the acquisition is pending regulatory approval.<sup>[8]</sup>

Sun's manufacturing facilities are located in Hillsboro, Oregon, USA and Linnithgow, Scotland.

**Sun Microsystems**

**Type** Public (NASDAQ: JAVA )

**Founded** 1982

**Headquarters** Santa Clara, California, United States

**Key people** Scott McNeely, Chairman  
Jonathan I. Schwartz, President and CEO  
William MacGowan, Executive Vice President, People and Places, and D&O  
Greg Papadopoulos, Executive Vice President and CTO



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The Java logo.  
Original author(s) James Gosling




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Original author(s) [James Gosling](#)

Developer(s) [Sun Microsystems](#)

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## Apple

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*"Apple Blossom" redirects here. For other uses, see Apple Blossom (disambiguation).*

*This article is about the fruit. For the computer company, see Apple Inc.. For other uses, see Apple (disambiguation).*

The **apple** is the pomaceous fruit of the apple tree, species *Malus domestica* in the rose family *Rosaceae*. It is one of the most widely cultivated tree fruits. The tree is small and deciduous, reaching 3 to 12 metres (9.8 to 39 ft) tall, with a broad, often densely twiggy crown.<sup>[c]</sup> The leaves are alternately arranged simple ovals 5 to 12 cm long and 3–6 centimetres (1.2–2.4 in) broad on a 2 to 5 centimetres (0.79 to 2.0 in) petiole with an acute tip, serrated margin and a slightly downy underside. Blossoms are produced in spring simultaneously with the budding of the leaves. The flowers are white with a pink tinge that gradually fades, five petaled, and 2.5 to 3.5 centimetres (0.98 to 1.4 in) in diameter. The fruit matures in autumn, and is typically 5 to 9 centimetres (2.0 to 3.5 in) diameter. The center of the fruit contains five carpels arranged in a five-point star, each carpel containing one to three seeds.<sup>[c]</sup>

The tree originated from Central Asia, where its wild ancestor is still found today. There are more than 7,500 known cultivars of apples resulting in a range of desired characteristics. Cultivars vary in their yield and the ultimate size of the tree, even when grown on the same rootstock.<sup>[c]</sup>





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## Apple Inc.

From Wikipedia, the free encyclopedia

Coordinates: 37°30′18″N 122°02′66″W﻿ / ﻿37.50500°N 122.05167°W﻿ / 37.50500; -122.05167

For other companies also named *Apple*, see *Apple (disambiguation)*.

Not to be confused with *Apple Corps*.

**Apple Inc.** is an American multinational corporation that designs and manufactures consumer electronics and computer software products. The company's best-known hardware products include Macintosh computers, the iPod and the iPhone. Apple software includes the Mac OS X operating system, the iTunes media browser, the iLife suite of multimedia and creativity software, the iWork suite of productivity software, Final Cut Studio, a suite of professional audio and film-industry software products, and Logic Studio, a suite of audio tools. The company operates more than 250 retail stores in nine countries and an online store where hardware and software products are sold.<sup>[2]</sup>

Established in Cupertino, California on April 1, 1976 and incorporated January 3, 1977,<sup>[2]</sup> the company was called **Apple Computer, Inc.** for its first 30 years, but dropped the word "Computer" on January 9, 2007<sup>[2]</sup> to reflect the company's ongoing expansion into the consumer electronics market in addition to its traditional focus on personal computers.<sup>[7]</sup> Apple has about 35,000 employees worldwide<sup>[2]</sup> and had

Apple Inc.	
	
<b>Type</b>	Public NASDAQ: AAPL <span><span><span><span></span></span></span></span> , LSE: 0HCZ <span><span><span><span></span></span></span></span> , FWB: APC <span><span><span><span></span></span></span></span>
<b>Founded</b>	Cupertino, California, United States (April 1, 1976) as Apple Computer, Inc.
<b>Founder(s)</b>	Steve Jobs, Steve Wozniak, Ronald Wayne <sup>[1]</sup>



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<b>Founder(s)</b>	Steve Jobs, Steve Wozniak, Ronald Wayne <sup>[1]</sup>

# The Paper

## Efficient Search Ranking in Social Networks

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Berthier Ribeiro-Neto<sup>1,2</sup>  
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Belo Horizonte, Brazil

<sup>2</sup>Computer Science Department  
Federal University of Minas Gerais  
Belo Horizonte, Brazil

### ABSTRACT

In social networks such as Orkut, [www.orkut.com](http://www.orkut.com), a large portion of the user queries refer to names of other people. Indeed, more than 50% of the queries in Orkut are about names of other users, with an average of 1.8 names per query. Further, the users usually search for people with whom they maintain relationships in the network. These relationships can be modeled as edges in a *friendship graph*, a graph in which the nodes represent the users. In this context, search

### Keywords

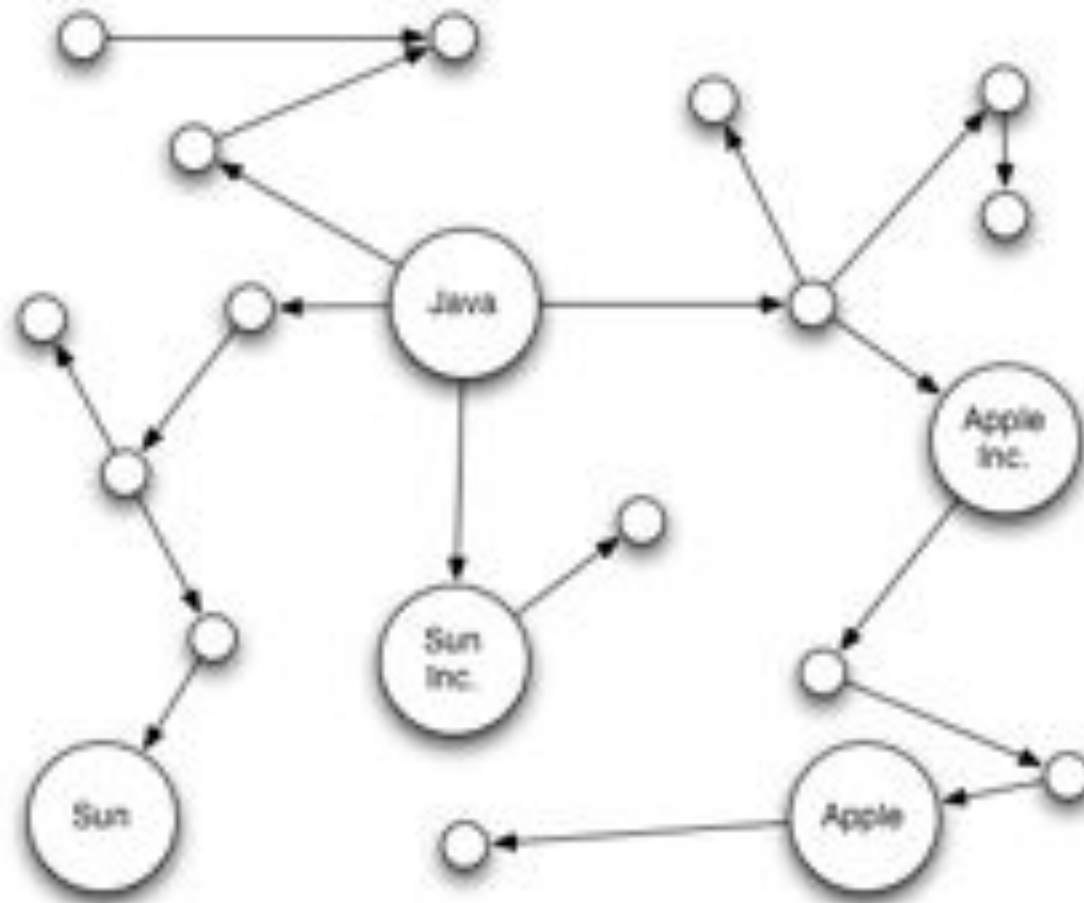
Social networks, shortest paths, graphs.

### 1. INTRODUCTION

Social networks are sites that allow people to interact and share social experiences through the exchange of multimedia objects (text, audio, video) associated with the people themselves and their actions. In a social network, each

# Problem

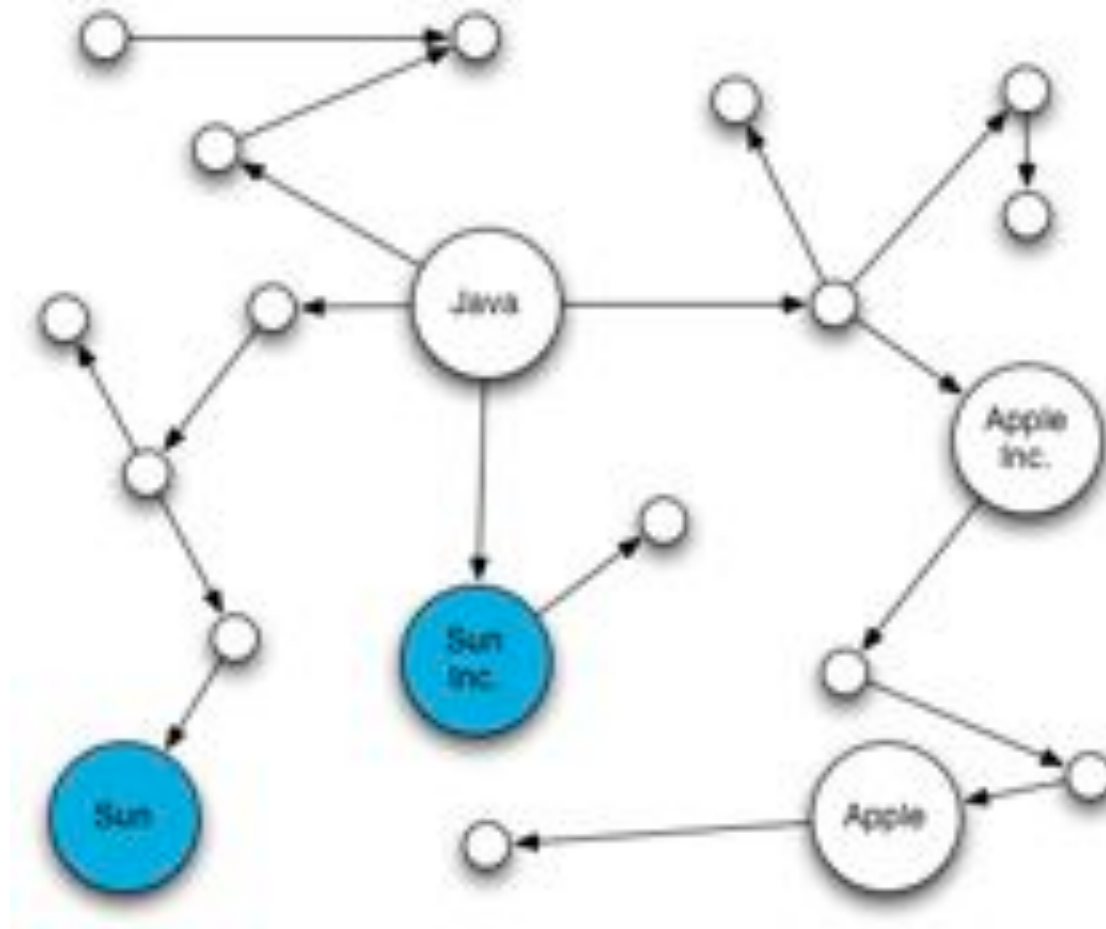
# DBPedia Pagelink-Graph



Input

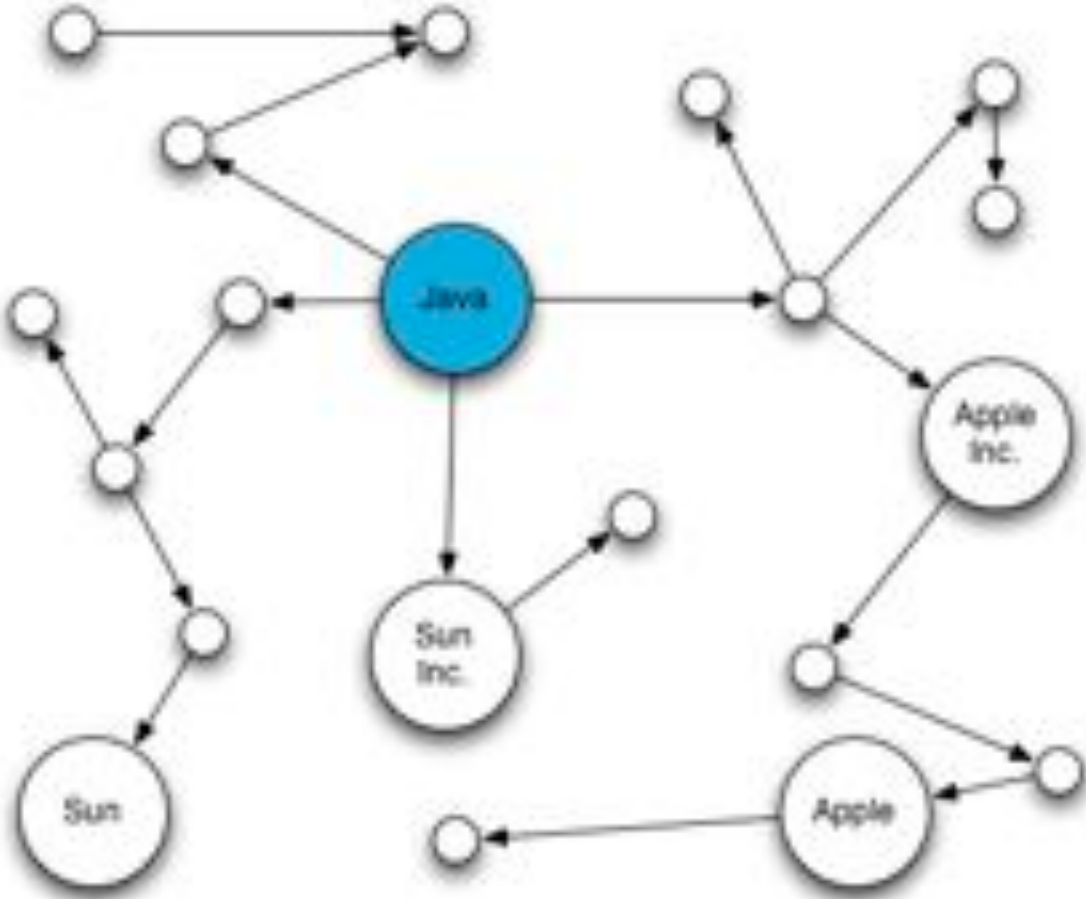


# Suchbegriff



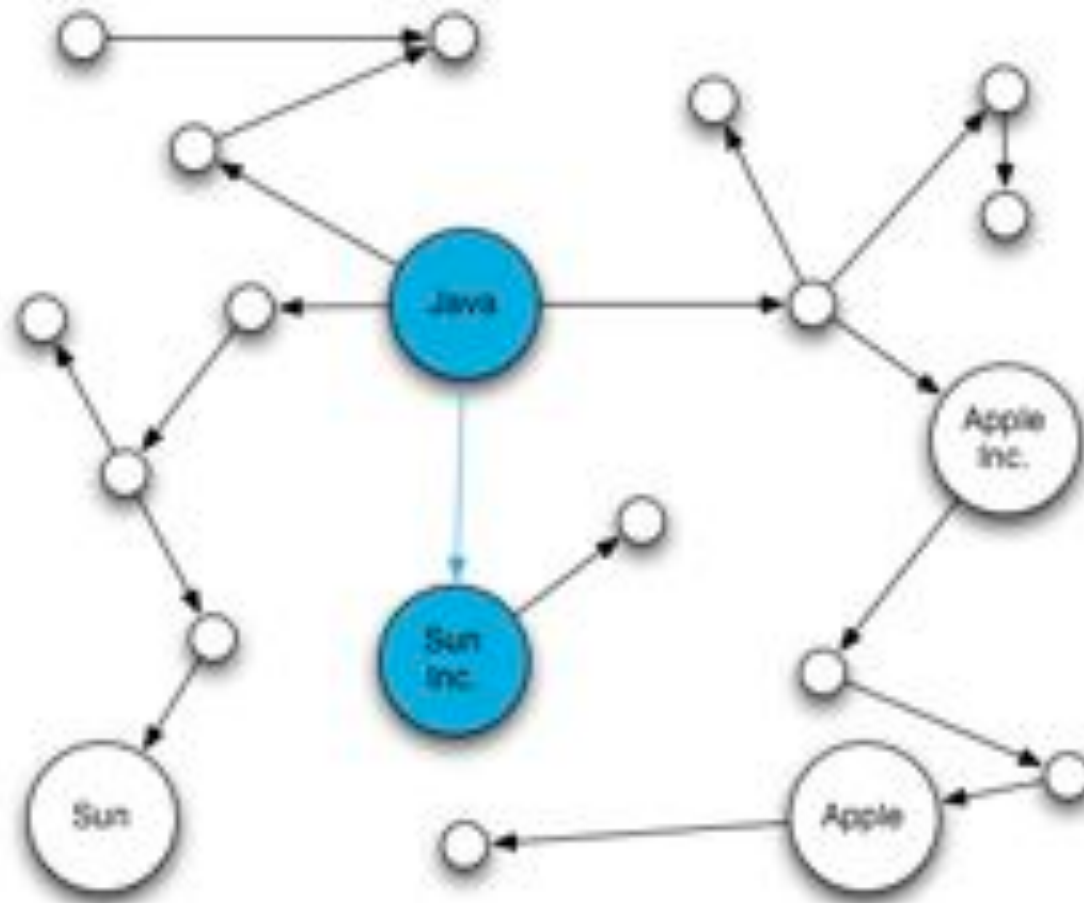
Input

# Ausgangs-Seite



Input

# Ranking der Suchergebnisse



Output

1. **Offline Index** (Seed distance vector) **computation**
2. **Online** (approx.) **Ranking** through Seed distances

# Steps

[http://en.wikipedia.org/wiki/Linked\\_Data](http://en.wikipedia.org/wiki/Linked_Data)



[http://dbpedia.org/page/Linked\\_Data](http://dbpedia.org/page/Linked_Data)



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# Mapping to IDs

Input: (23,65), (23,74), (23,98), (24,16), ...



MapReduce



Output: 23 [1, -1, 2, -1, -1, ..., -1]



Seed Distance Vector

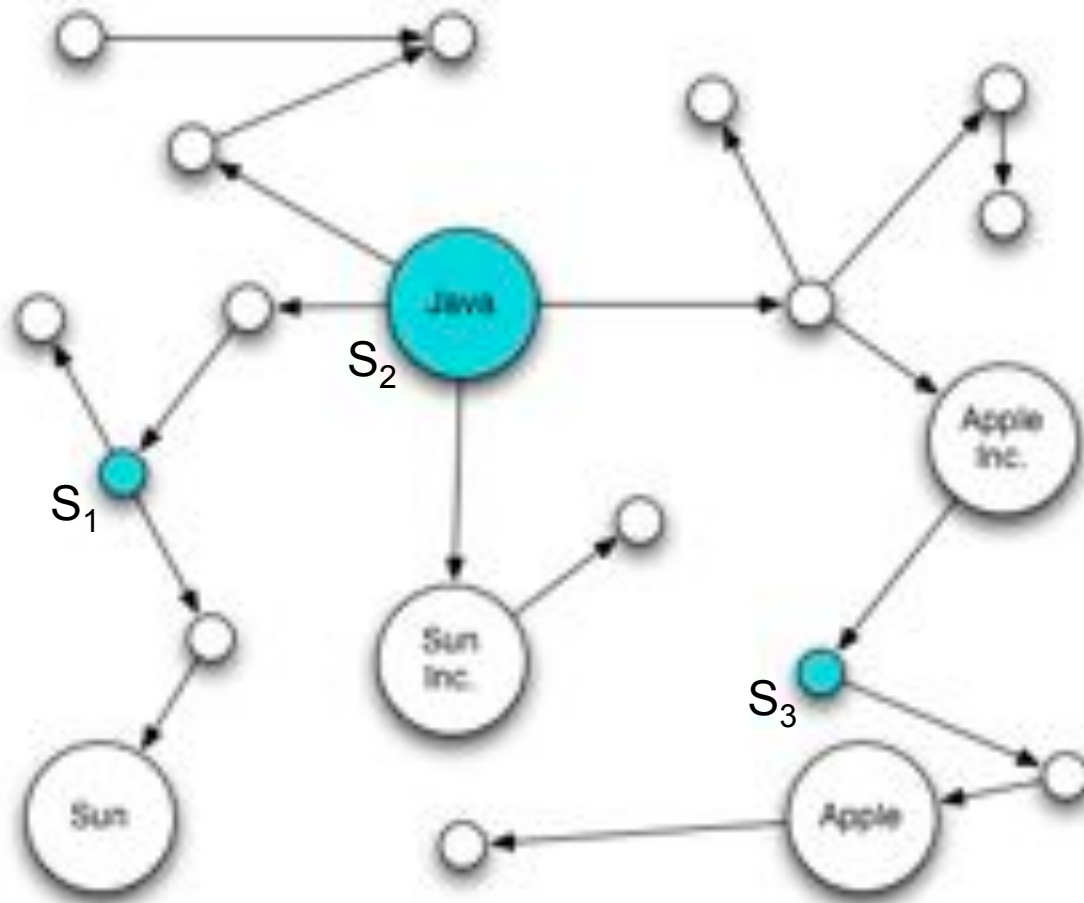


Ranking

# Offline SDV computation

Solution

Seed distance: 0



$$SDV_{Java} = [-1, 0, -1]$$

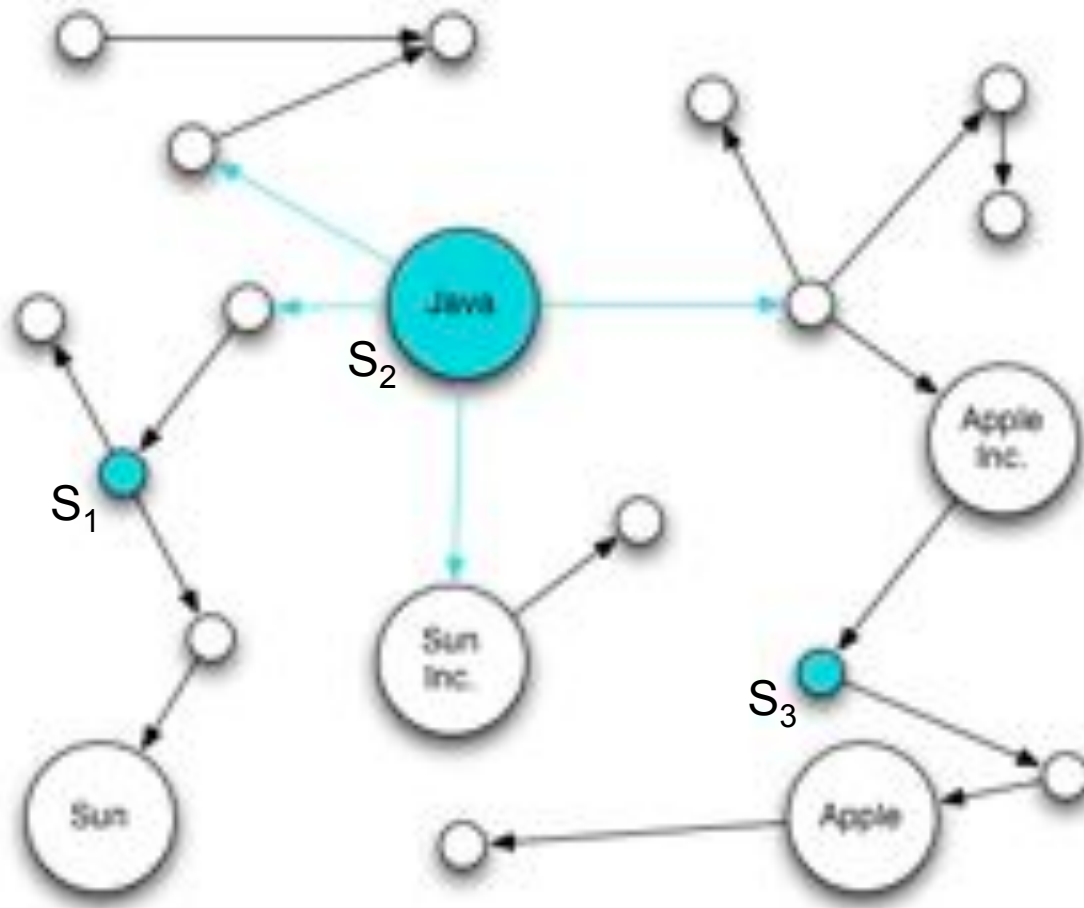
$$SDV_{Sun\ Inc.} = [-1, -1, -1]$$

$$SDV_{Sun} = [-1, -1, -1]$$

# Example



Seed distance: 1



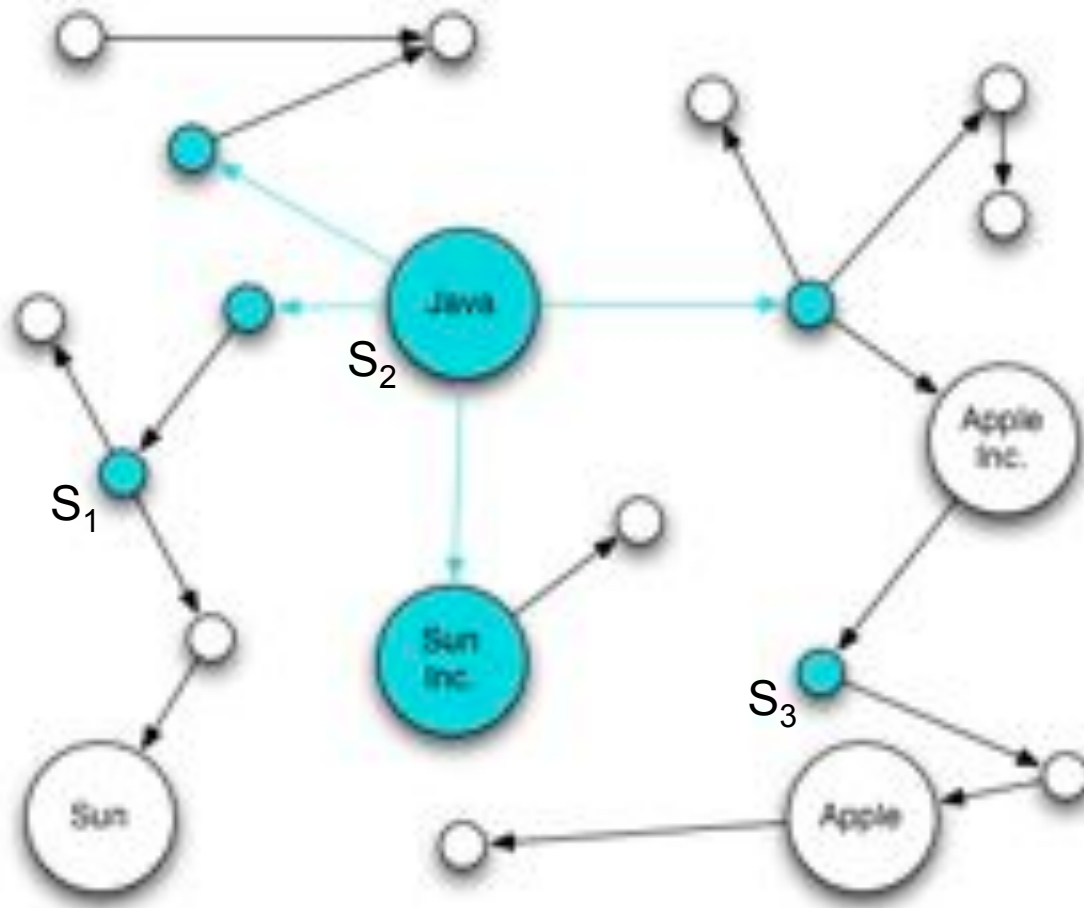
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Seed distance: 1



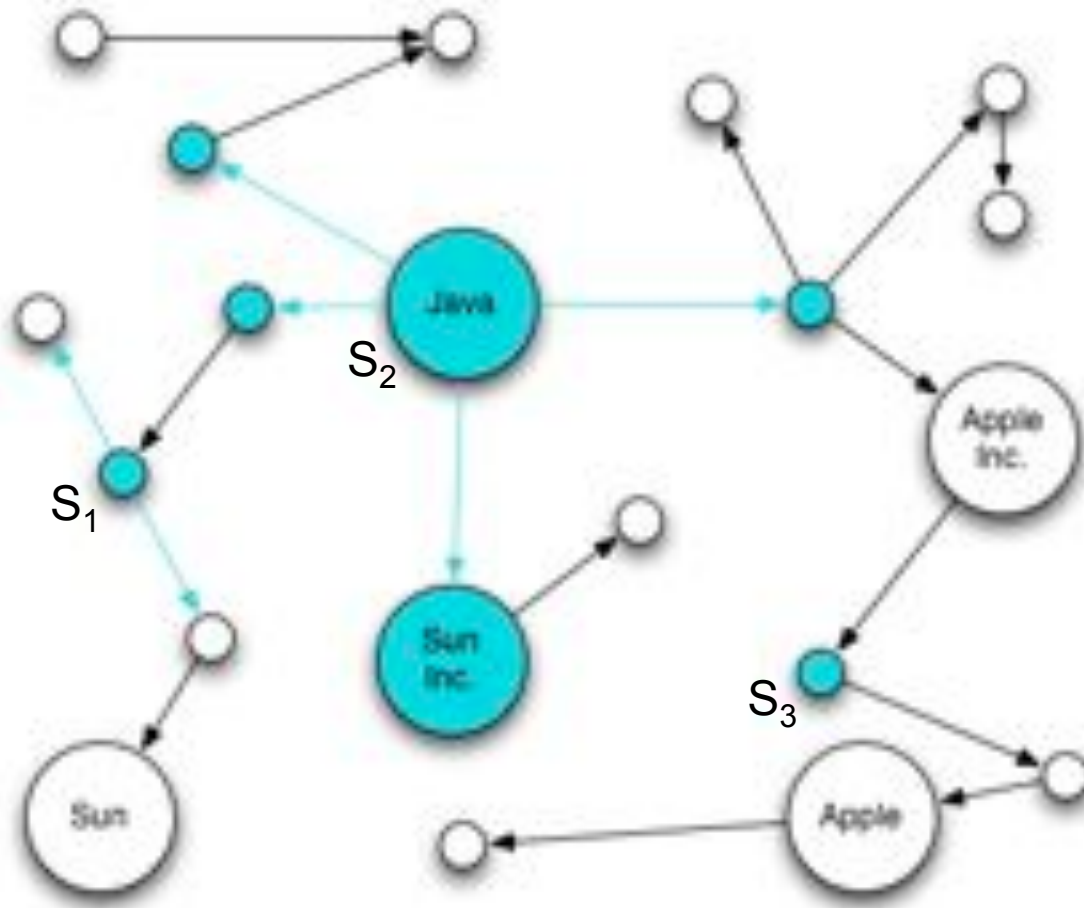
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Seed distance: 1



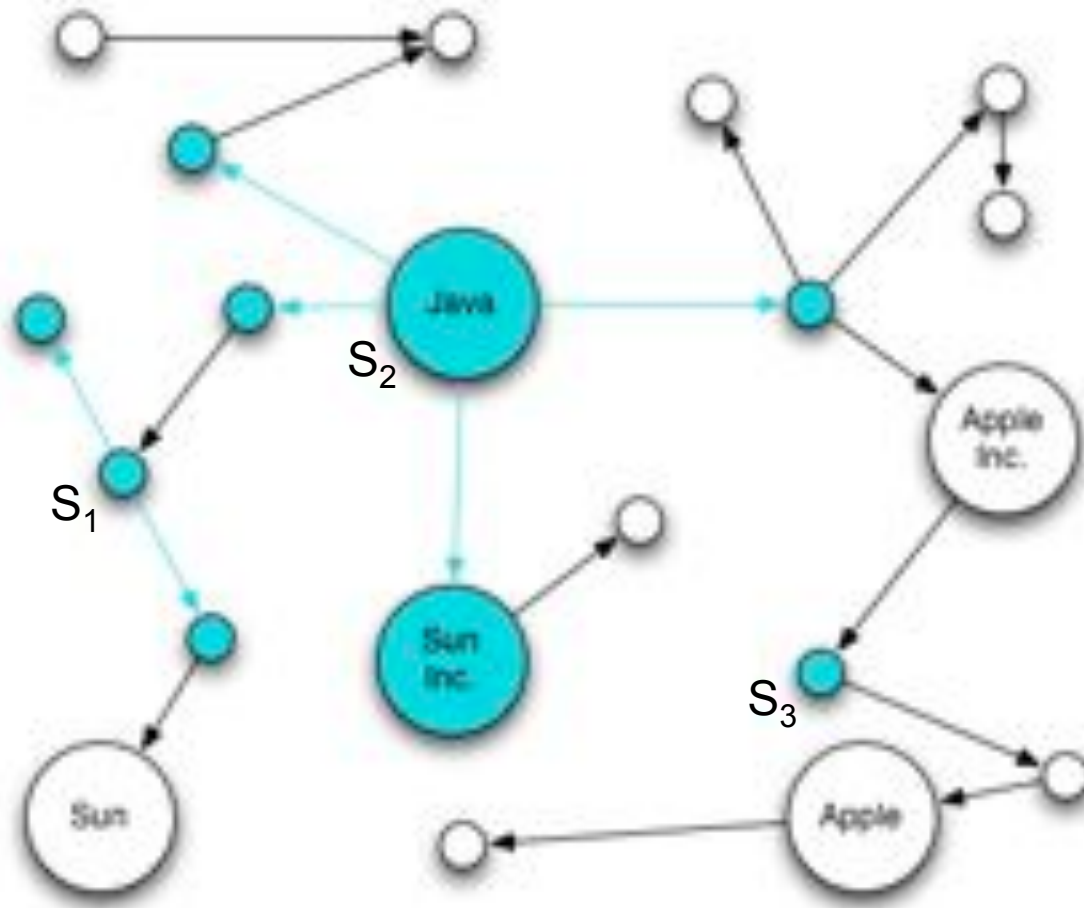
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# Example

Seed distance: 1



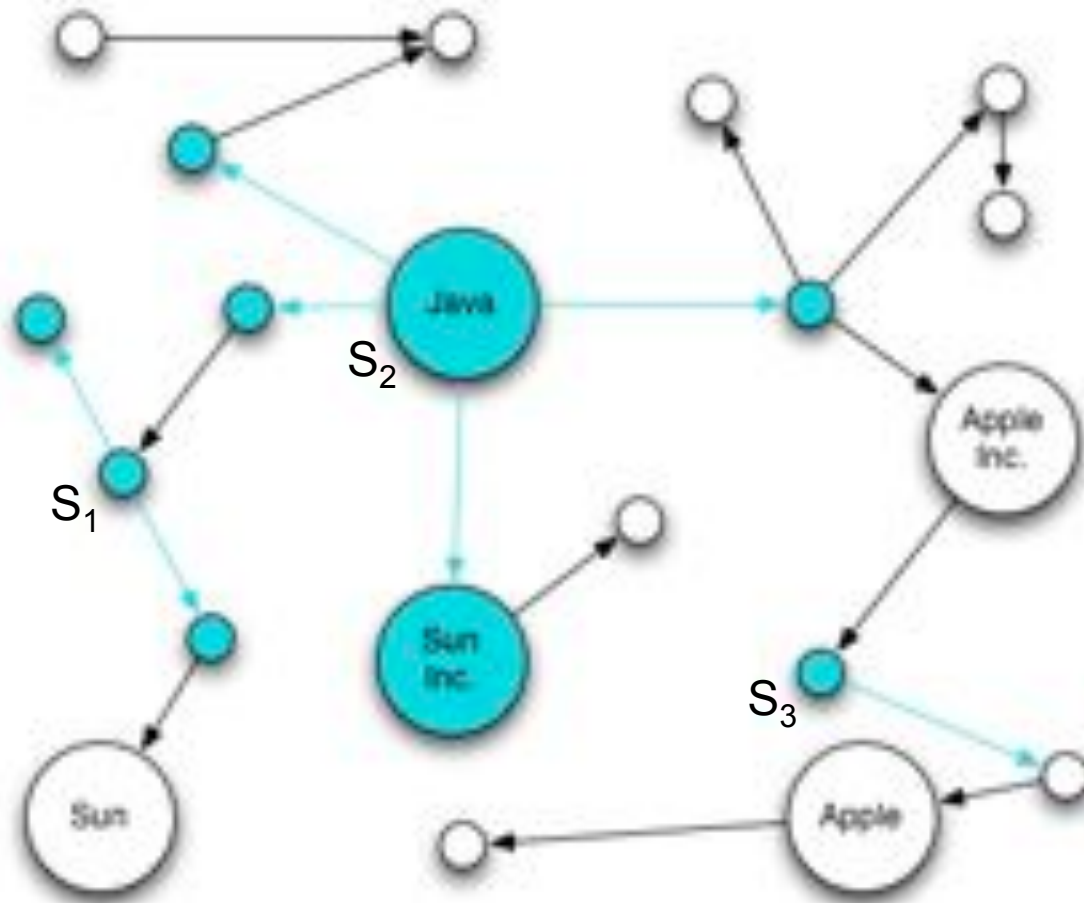
$$SDV_{Java} = [-1, 0, -1]$$

$$SDV_{Sun\ Inc.} = [-1, 1, -1]$$

$$SDV_{Sun} = [-1, -1, -1]$$

# Example

Seed distance: 1



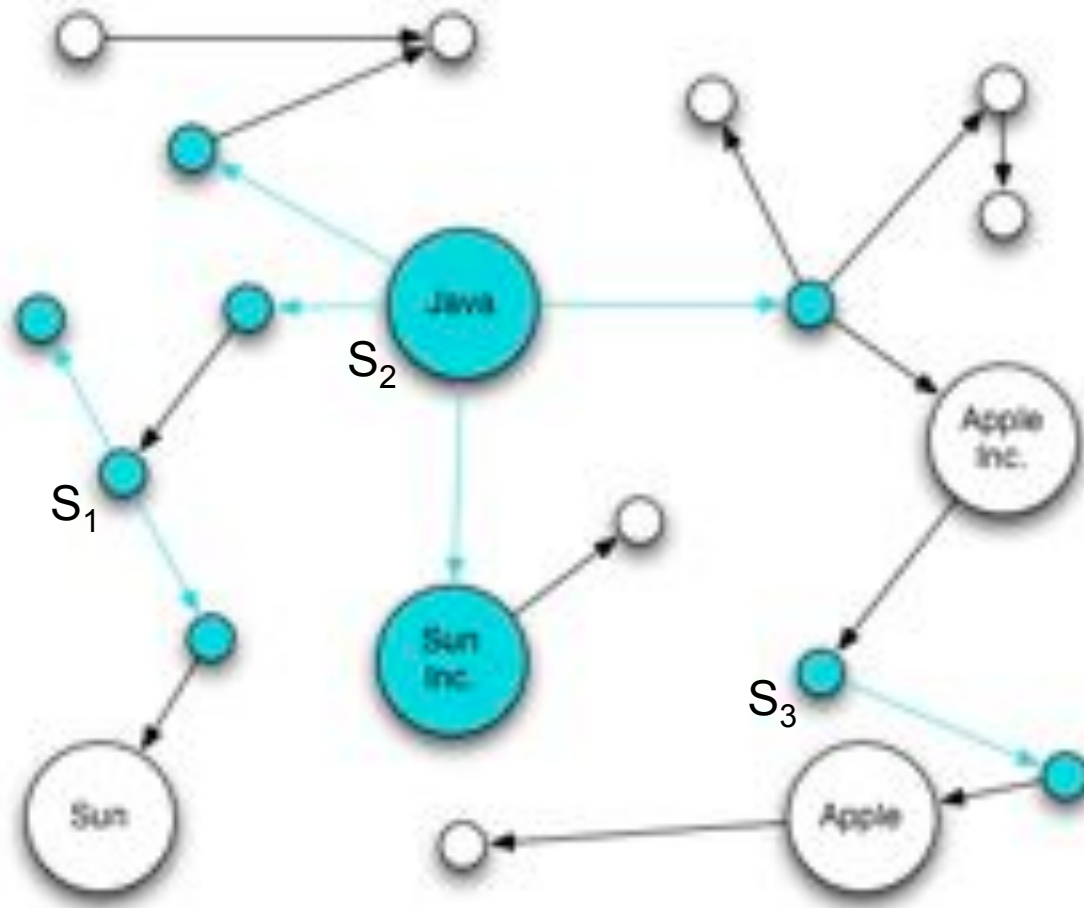
$$SDV_{Java} = [-1, 0, -1]$$

$$SDV_{Sun\ Inc.} = [-1, 1, -1]$$

$$SDV_{Sun} = [-1, -1, -1]$$

# Example

Seed distance: 1



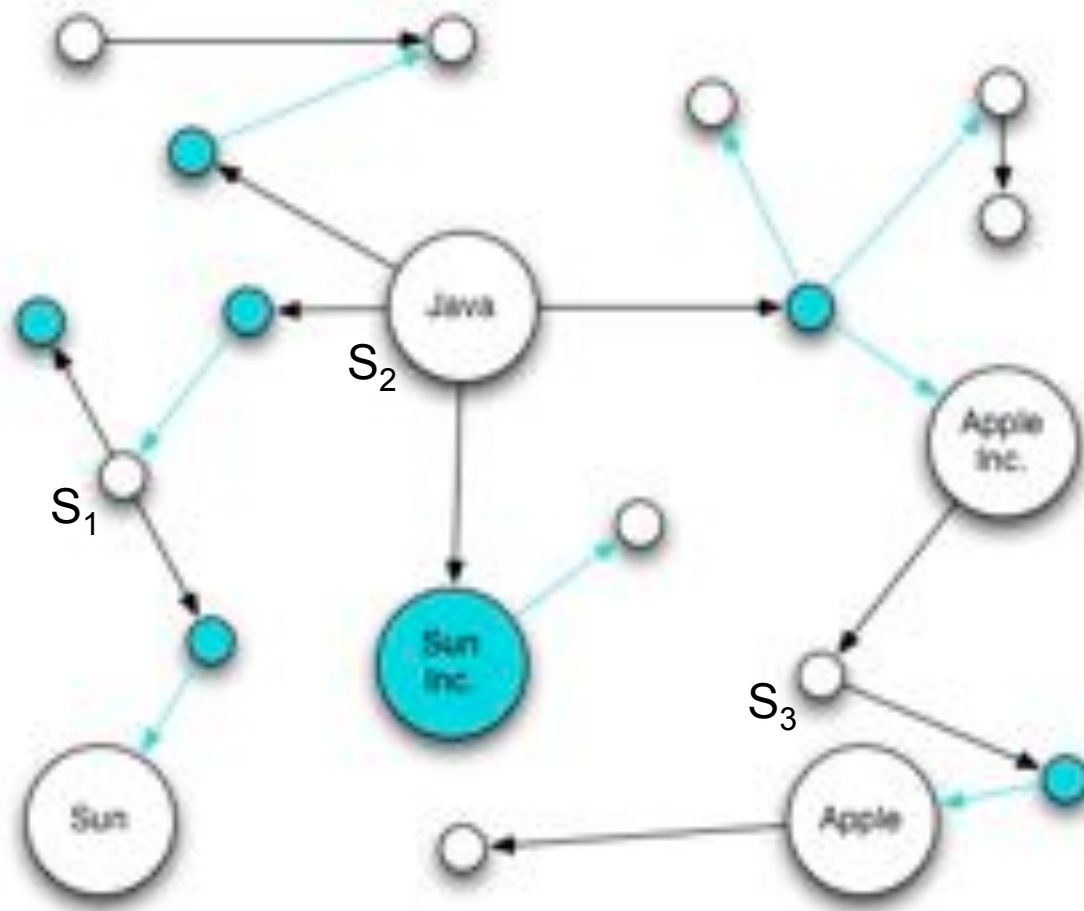
$$SDV_{Java} = [-1, 0, -1]$$

$$SDV_{Sun\ Inc.} = [-1, 1, -1]$$

$$SDV_{Sun} = [-1, -1, -1]$$

# Example

Seed distance: 2



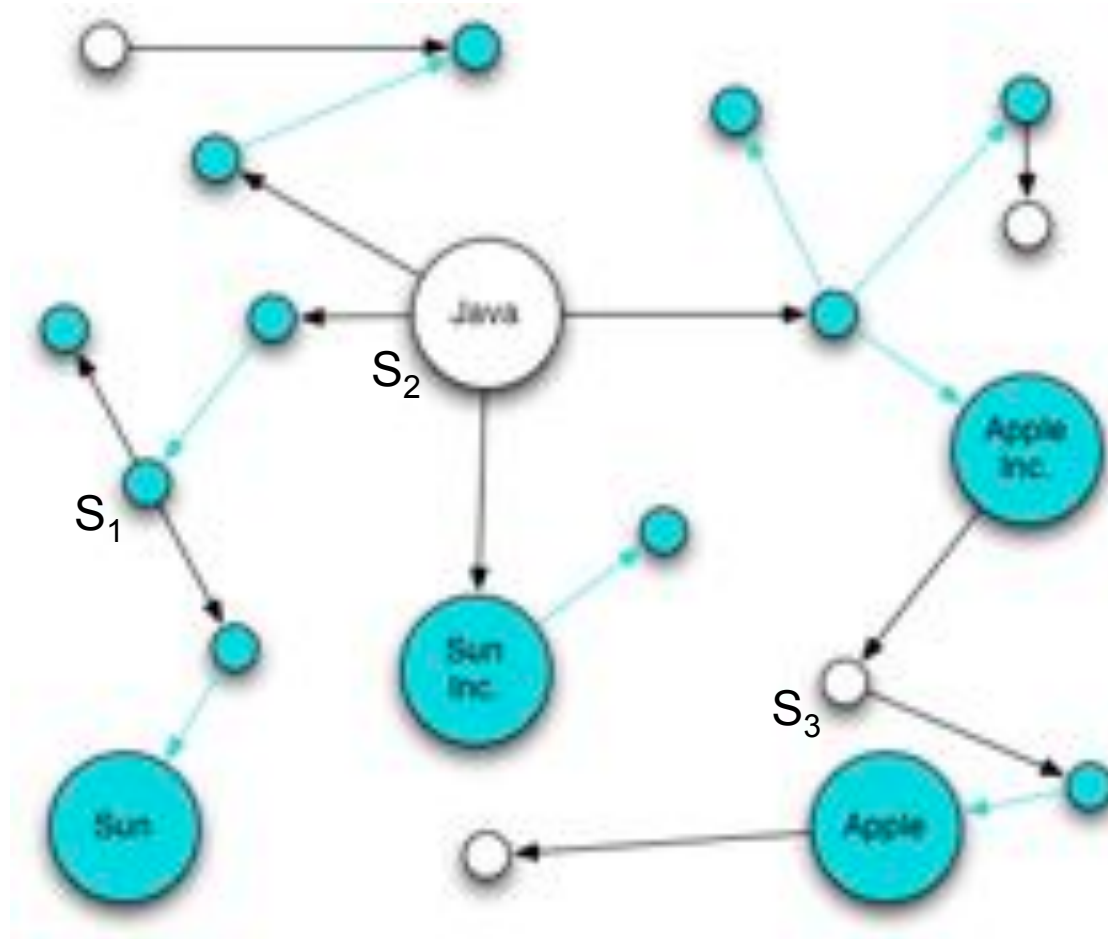
$$SDV_{Java} = [-1, 0, -1]$$

$$SDV_{Sun\ Inc.} = [-1, 1, -1]$$

$$SDV_{Sun} = [-1, -1, -1]$$

# Example

Seed distance: 2



$$SDV_{Java} = [-1, 0, -1]$$

$$SDV_{Sun\ Inc.} = [-1, 1, -1]$$

$$SDV_{Sun} = [2, -1, -1]$$

# Example



```
int MAX_DIST = 2;
int phase_number = 0;
buildMapInput();
while phase_number < MAX_DIST {
    Map
    Reduce
    updateMapInput();
    phase_number++;
}
```

# Algorithm

23,65



23 (65, 74, 43, 98) [-1, 0, -1]



list of friends

SDV

Build Map input

K: (Zeilennr.) V: 23(65, 74, 43, 98)[-1, 0, -1]

```
int[] friends = parseFriends(value);
int[] sdv = parseSdv(value);
for sd in sdv {
    if ( sd == phase_number ) {
        for f in friends {
            context.write( f, [-1, sd+1, -1] );
        }
    }
}
```

# Map

**K:** 65 (friend) **V:**  $[\text{sdv}_1, \dots, \text{sdv}_n]_{65}$  (Liste der SDVs)

```
int[] res = [-1,-1,-1];
for sdvi in [sdv1, ..., sdvn]65 {
    for j in 1..NUM_SEEDS {
        if(sdvi[j] != -1 && (res[j] == -1 || sdvi[j] < res[j] )) {
            res[j] = sdvi[j];
        }
    }
}
context.write(65, res);
```

# Reduce

Messen von:

- 1) Laufzeit (MapReduce-Alg. und Ranking)
- 2) Speicherbedarf (MapReduce-Alg. und Ranking)

Tuning der Parameter: (Algorithmus)

- 1) Anzahl der Seeds
- 2) MAX\_DIST

Variieren der Größen: (Hadoop)

- 1) Input Split Size
- 2) Input Graph Size

# Evaluation

