Ethics Pledge

Consistent with the above statements, all homework exercises, tests and exams that are designated as individual assignments MUST contain the following signed statement before they can be accepted for grading.

I pledge on my honor that I have not given or received any unauthorized assistance on this assignment/examination. I further pledge that I have not copied any material from a book, article, the Internet or any other source except where I have expressly cited the source.

Signature: Haodong Zhao Date: Mar 5th. 2019

Please note that assignments in this class may be submitted to

www.turnitin.com, a web-based anti-plagiarism system, for an evaluation of their originality.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Reading review**

**Perspective on the CAP Theorem**

The CAP theorem is an idea that Eric Brewer introduced in 2000 to have a fundamental trade-off between consistency, availability, and partition tolerance.

**Consistency** is the correct response based on the desired service specification. These services include: trivial services, weakly consistent services, simple services and complex services.

**Liveness** (availability) means that every request will eventually be affected accordingly.

**Partition tolerance** can be seen as a statement about the underlying system: communication between servers is unreliable, messages may be delayed, and sometimes lost forever.

Based on the above information, the CAP theorem can be expressed as: In a network that fails communication, it is impossible for any Web service to implement atomic read/write shared memory to guarantee a response to each request.

**Theoretical background** of the CAP theorem: It is impossible to guarantee security and activity in an unreliable distributed system.

**Practical impact**: Since it is not possible to achieve consistency and practicability in an unreliable system, one of these two required features must be sacrificed in practice.

1. Best effort availability

The most common way to handle an unreliable network might be to involve a service that guarantees consistency, that is, correct operation, regardless of network behavior. This design makes sense when operating in a network that is reliable and timely, and only in rare cases where partitioning or other network anomalies occur. The article brings together the example of Chubby Lock Service, a service built by Google and widely used in Google infrastructure.

1. Best effort consistency

When users require services to respond in all situations, achieving sufficient availability requires a sacrifice of consistency.

1. trading consistency for availability

Sometimes we can adjust the trade-off between consistency and availability more precisely. By setting the data outdated threshold, system designers can accurately define CAP trade-offs. The article describes the TACT toolkit, which dynamically updates the level of consistency required as the application executes.

1. Segmentation consistency and availability

Many systems do not have uniform requirements. Some aspects of the system require strong consistency, while others require high availability. A very natural way to limit the limitations of the CAP theorem is to redesign the system and break it down into components that provide different types of guarantees:

* Data division
* Operational division
* Functional division
* User division
* Hierarchical division

Because the network changes quickly, we need to have a new theoretical introduction to meet the new challenges:

**Scalability**. We are increasingly demanding that our systems be scalable, not only for today's customers, but also for future growth, effectively leveraging new resources to handle more load.

**Tolerate attacks**. Tolerating service disruptions due to attacks on the network requires some different understanding of basic consistency and availability trade-offs.

**Mobile wireless network**. Today, mobile Internet traffic has grown significantly, and many of the same trade-offs explored in the context of the CAP theorem also exist in mobile networks, and many problems are even more difficult to resolve.