



# Wendelin Exanalytics *Security & Safety Design*

2014-07-07 – Shanghai



# Agenda



## **Architecture Overview**

- **Design Goals**
- **Security**
- **Safety**

# Wendelin Core

100% open source

100% Python

Numpy / OpenCV-Python / Scikit-learn / etc.

Data Analytics

NEO

Distributed Storage



ERP5

Elastic PaaS

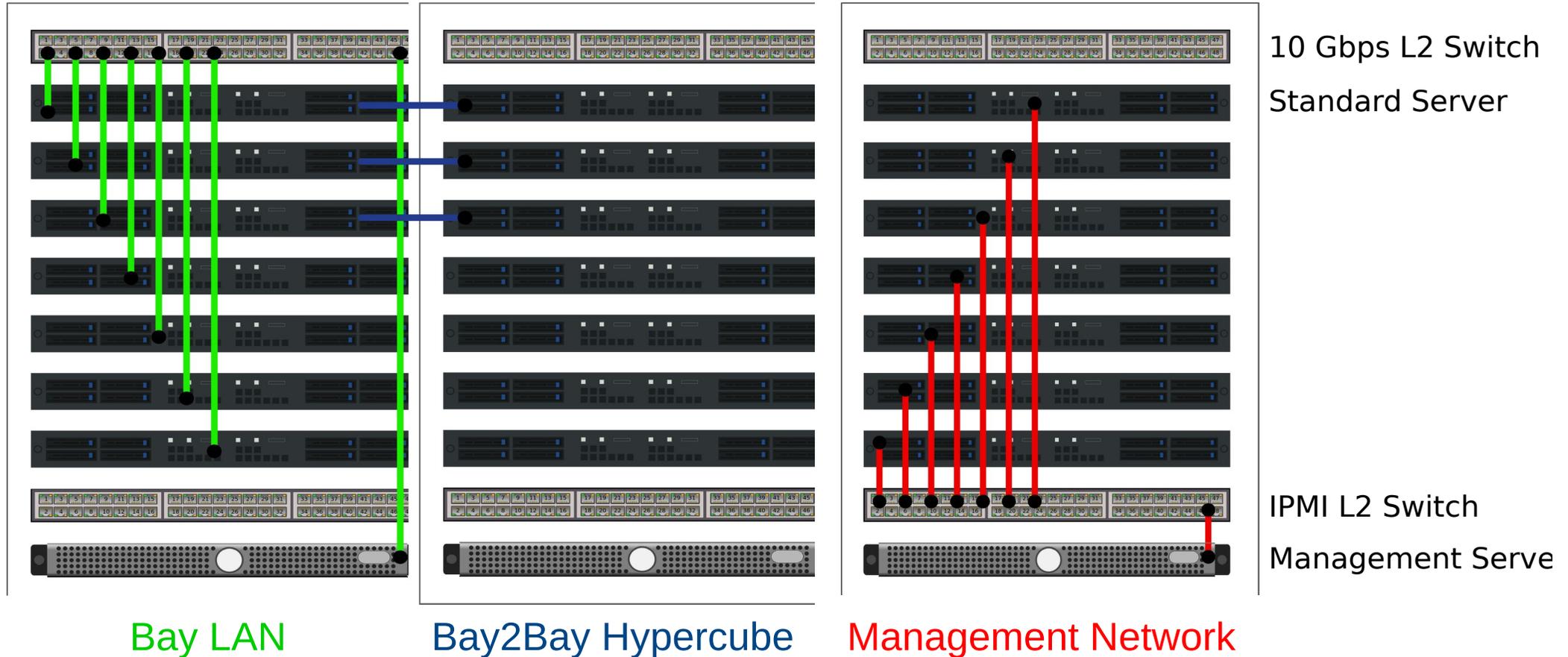
SlapOS

Multicloud Deployment

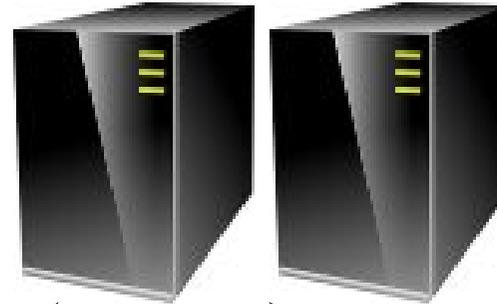


Multi Data Center

# Data Center Overview



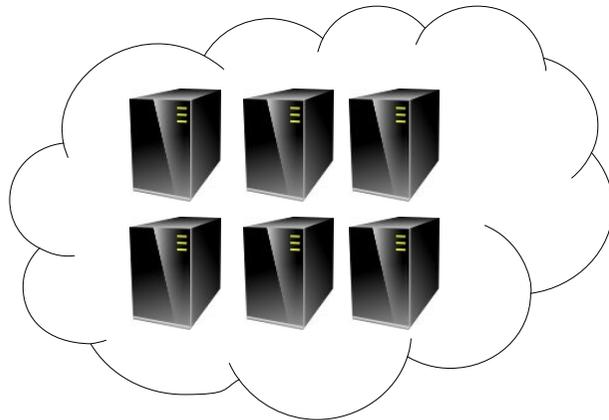
# SlapOS Master Overview



- SlapOS Master**
- Deployment
  - Orchestration
  - Accounting
  - Disaster Recovery

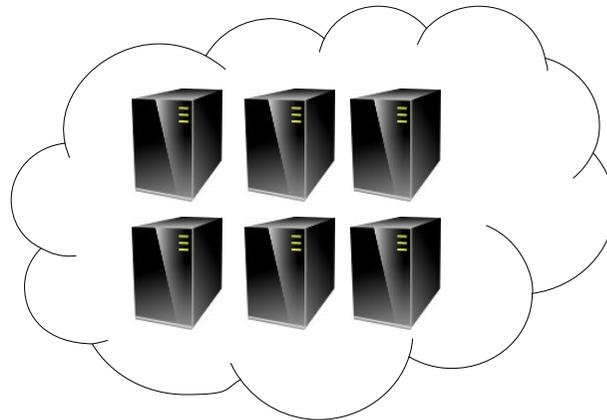
SLAP Protocol

SlapOS Nodes



Data Center 1

SlapOS Nodes



Data Center 2

SlapOS Nodes



Data Center 3

# SlapOS Node Overview

100+ software instances per server



SlapOS Node



Data Center

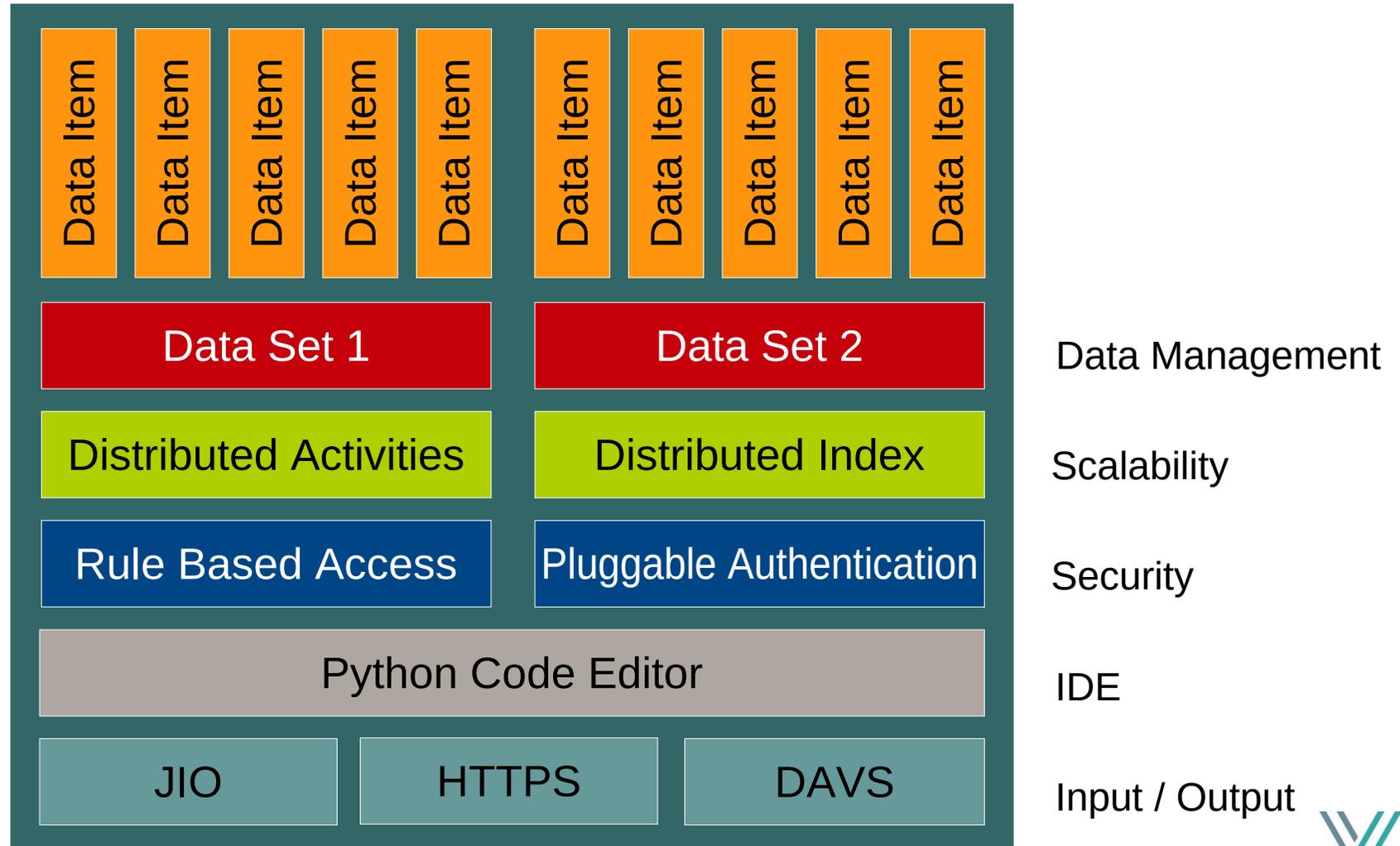


Software Instance

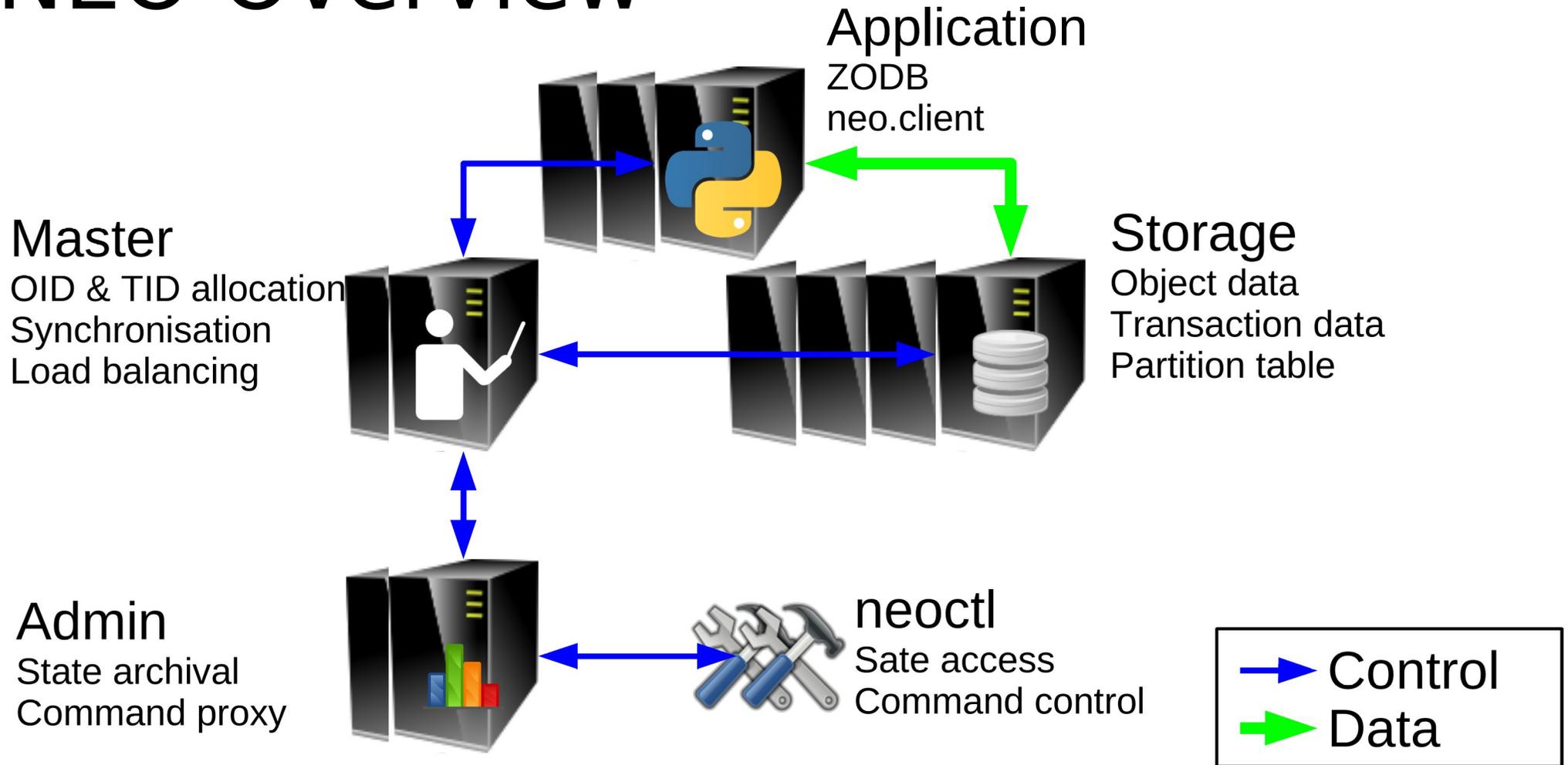
Software Release

SlapOS Kernel

# ERP5 PaaS Overview



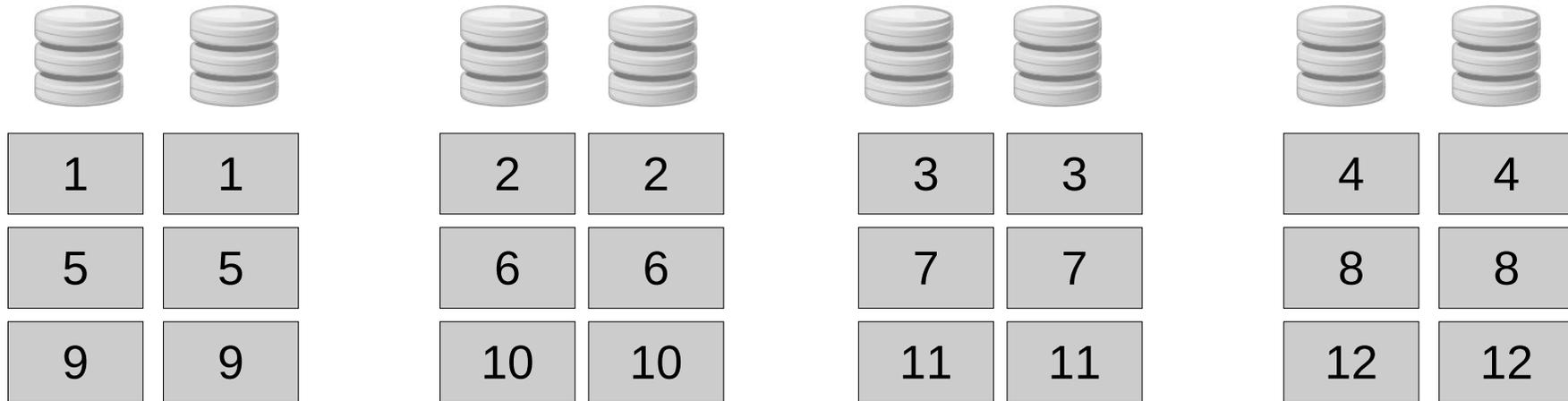
# NEO Overview



# Numpy Overview

neo.ndarray

1	2	3	4	5	6	7	8	9	10	11	12
---	---	---	---	---	---	---	---	---	----	----	----



# Agenda

- **Architecture Overview**



## **Design Goals**

- **Security**
- **Safety**

# Security & Safety

- **Security**

- Data Encryption
- Data Access Rule
- User Authentication
- Computer Authentication
- Software Authentication
- Service Authentication
- Zero Knowledge
- Intrusion protection
- Public Key Infrastructure

- **Safety**

- Availability
- Consistency
- Scalability
- Persistence
- Disaster Recovery

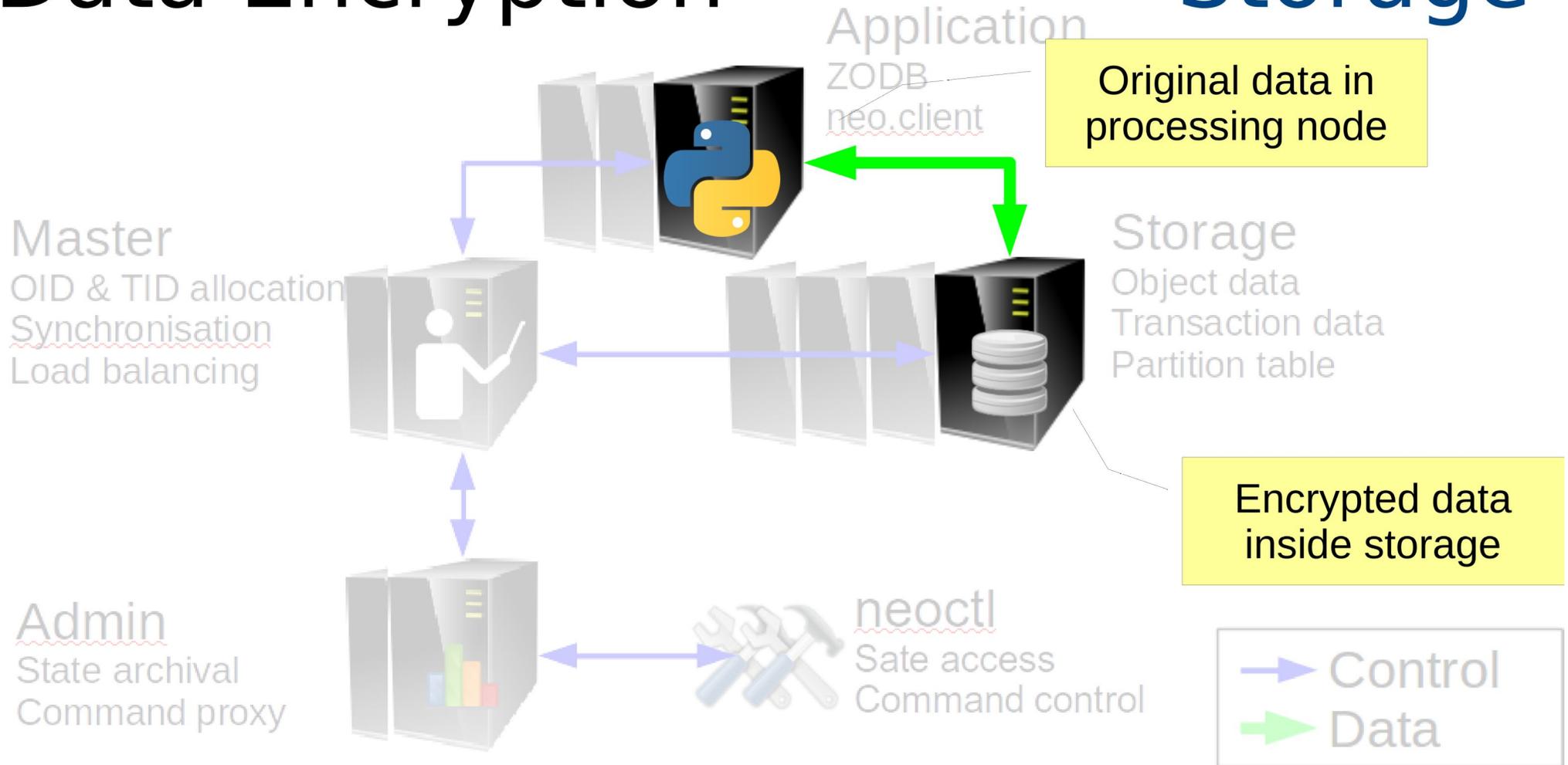
# Agenda

- **Architecture Overview**
- **Design Goals**
- **Security**
- **Safety**



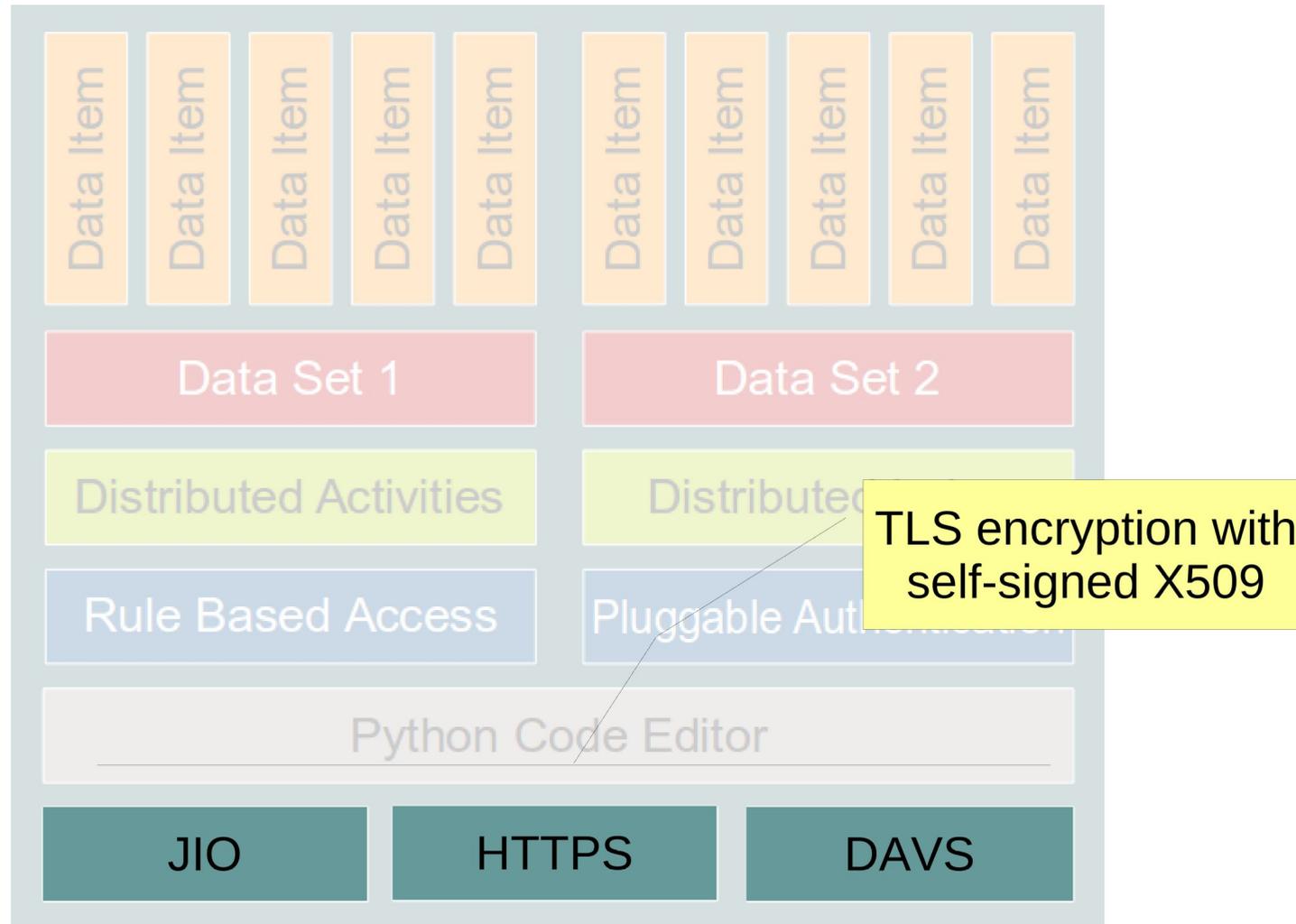
# Data Encryption

# Storage



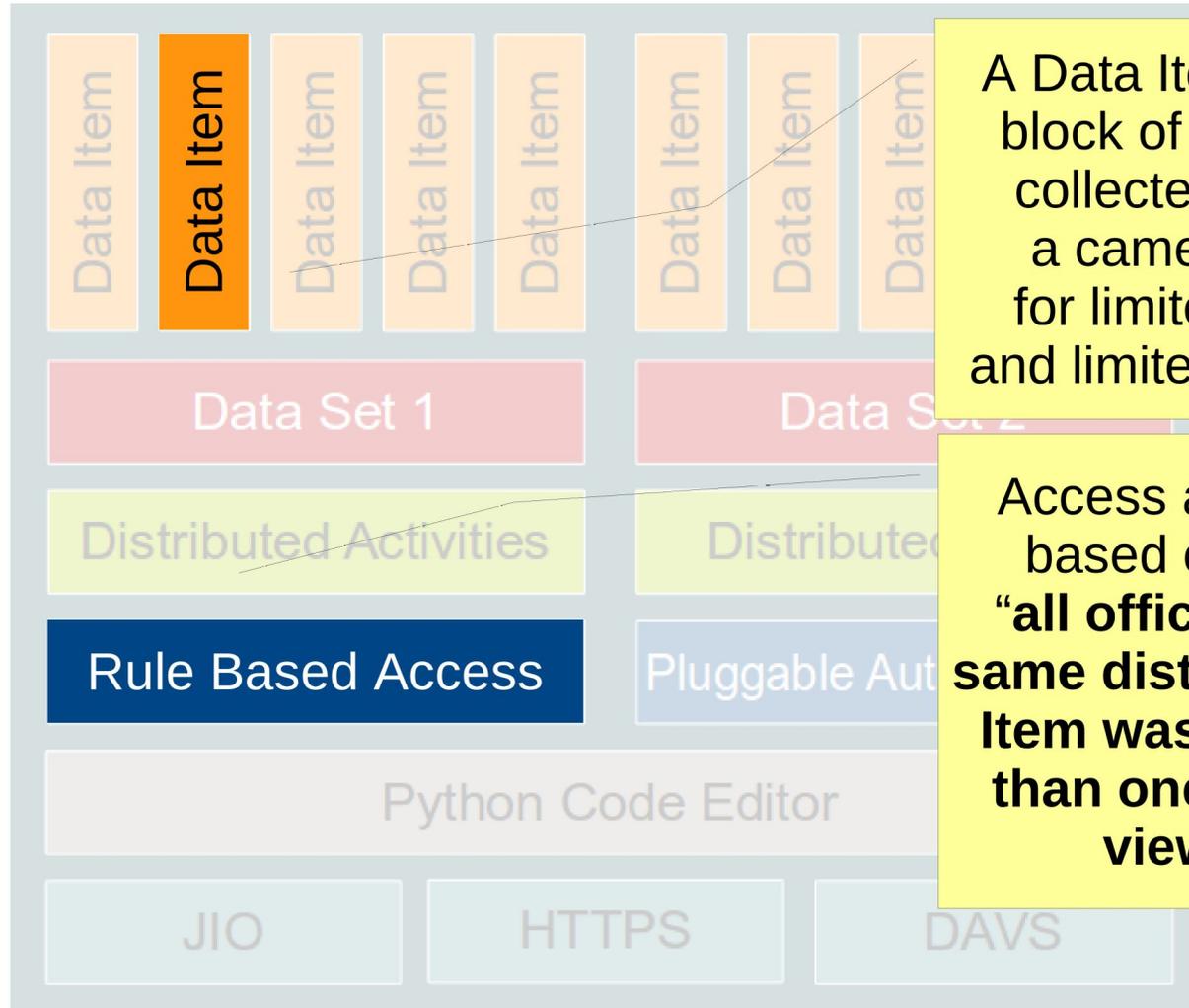
# Data Encryption

I/O



# Data Access Rules

# Data Item

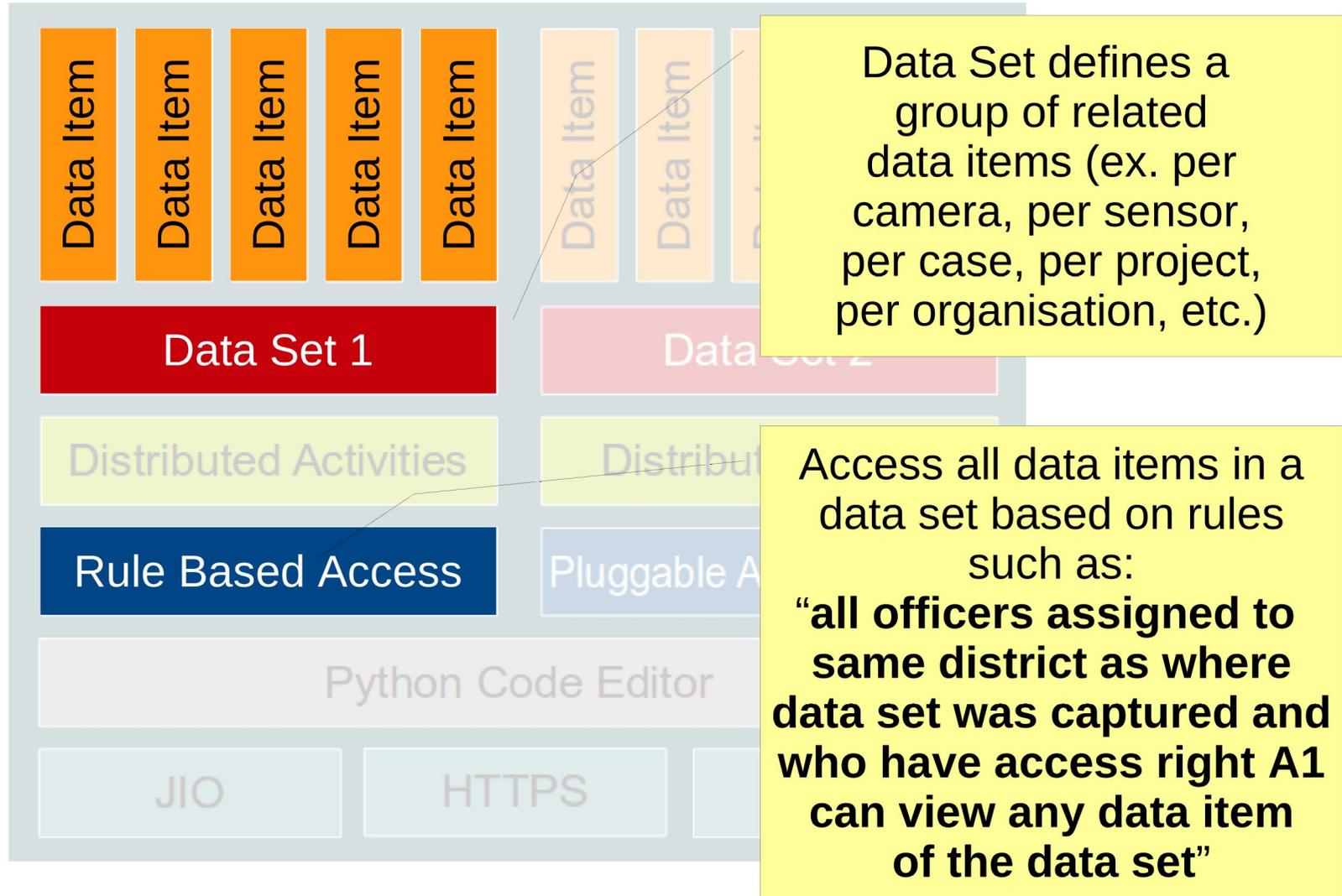


A Data Item is the smallest block of data. It is usually collected from a sensor, a camera or a database for limited period of time and limited geographic area

Access a single data item based on rules such as **“all officers assigned to same district as where data item was captured earlier than one month ago can view data item”**

# Data Access Rules

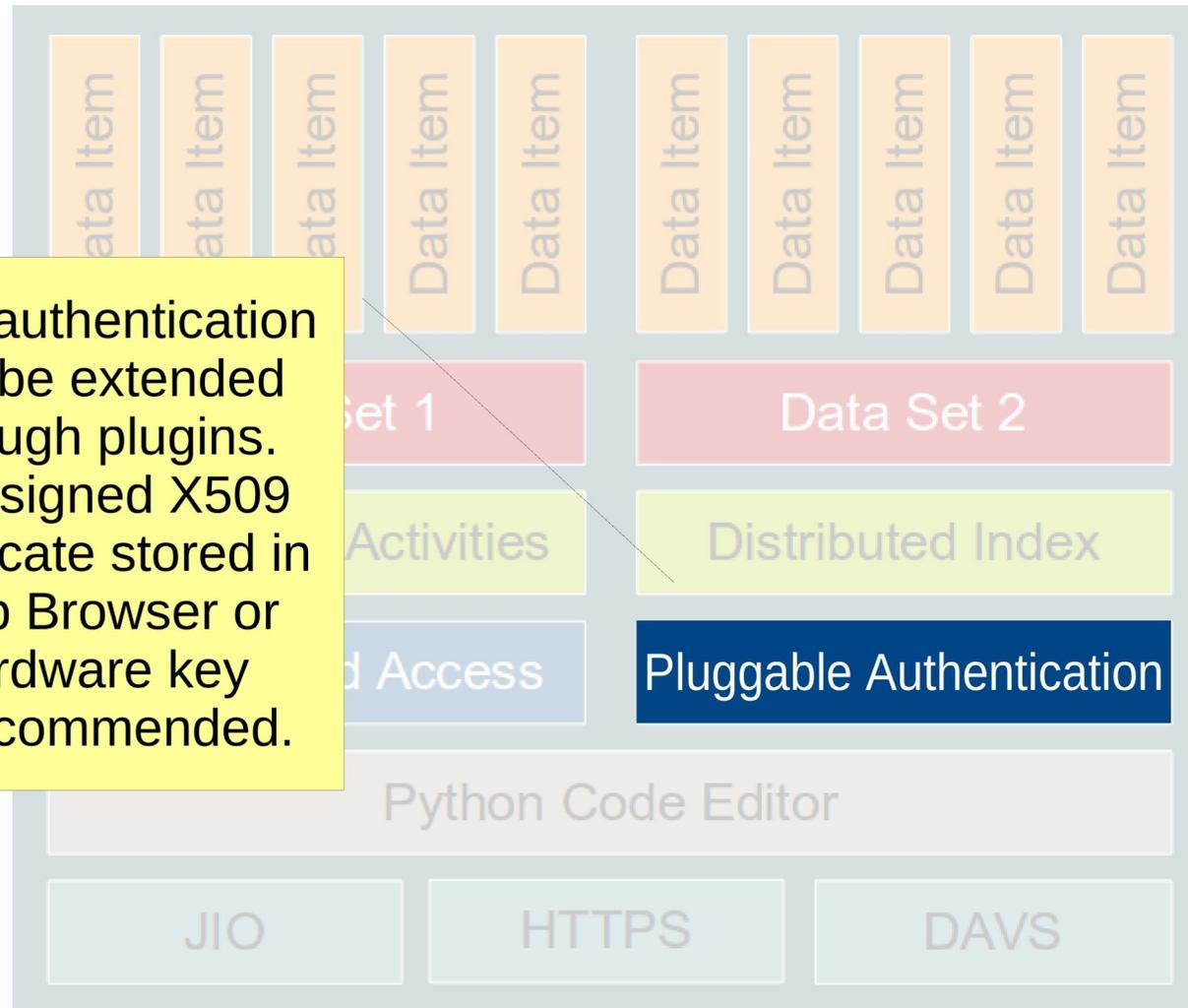
# Data Set



# User Authentication

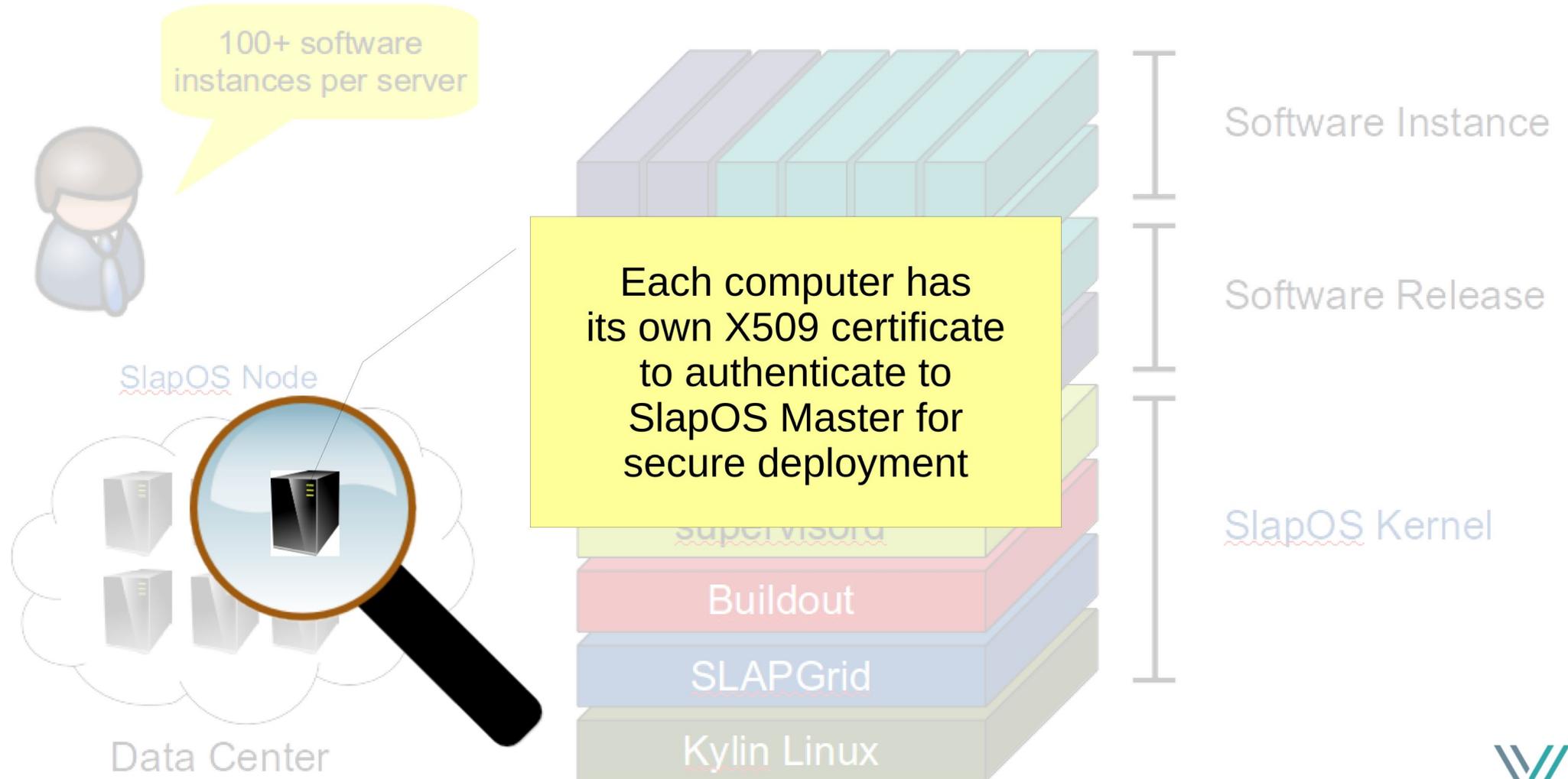
# X509

User authentication can be extended through plugins. Self-signed X509 certificate stored in Web Browser or hardware key is recommended.



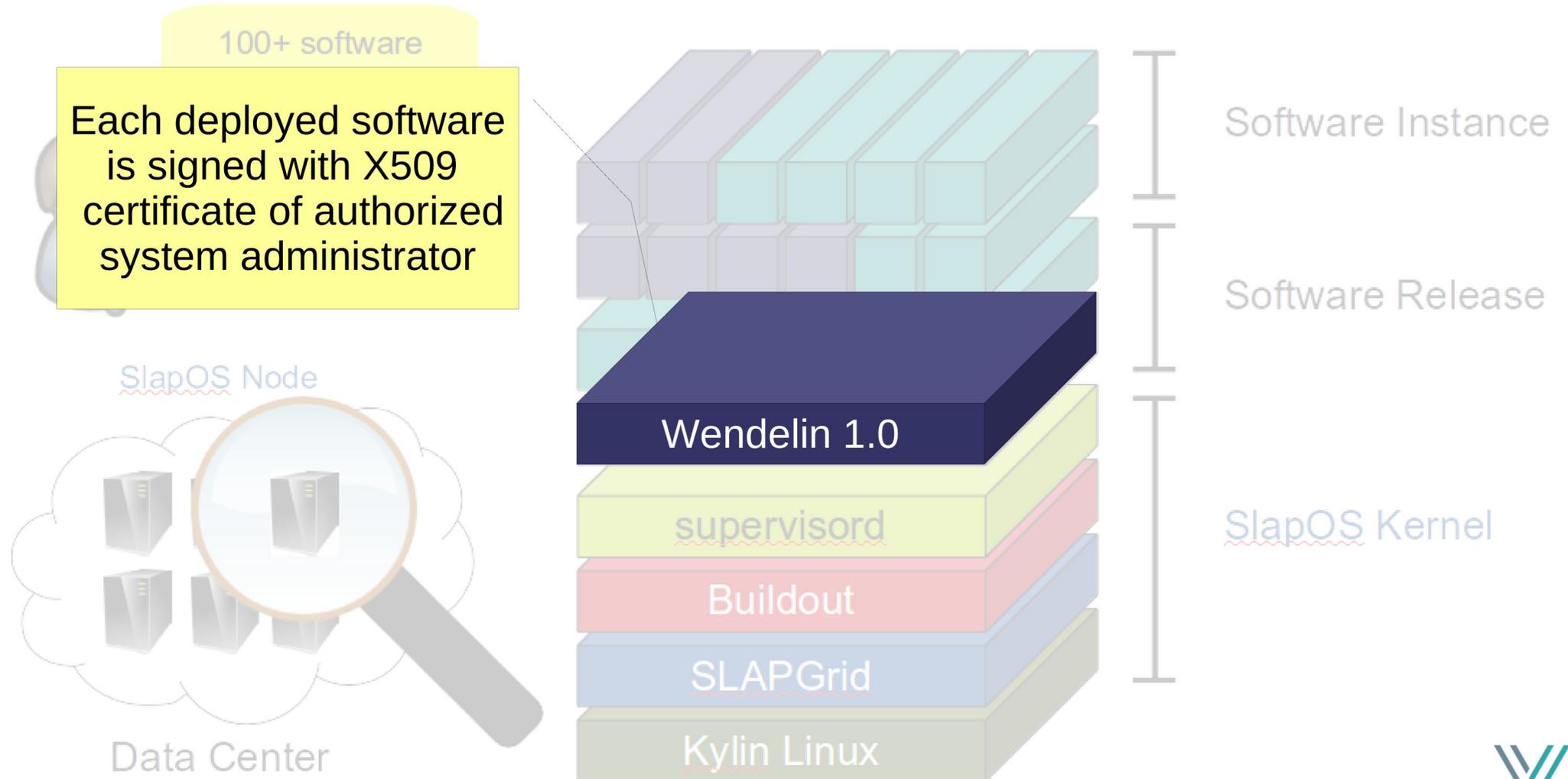
# Computer Authentication

# X509



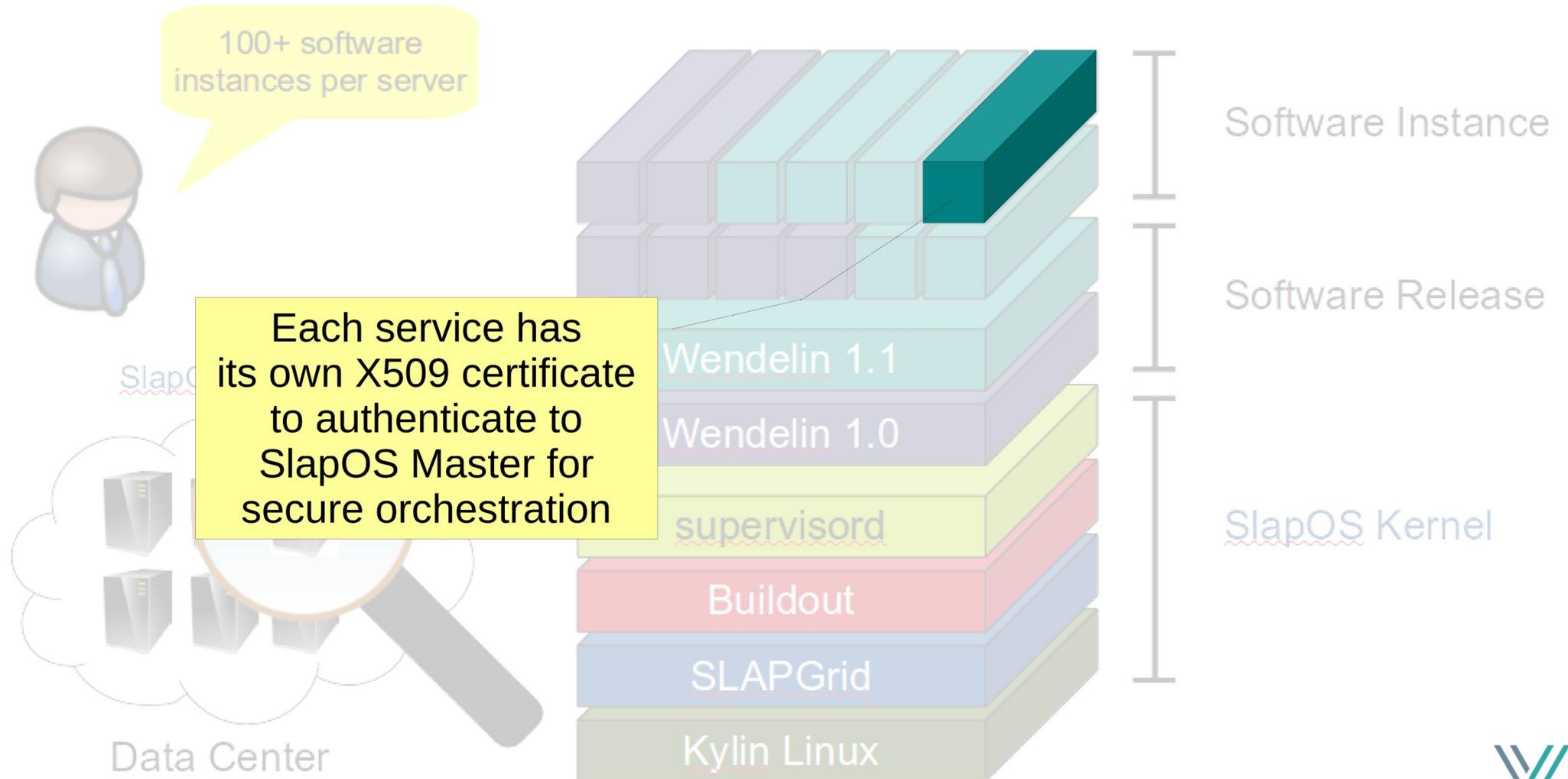
# Software Authentication

# X509



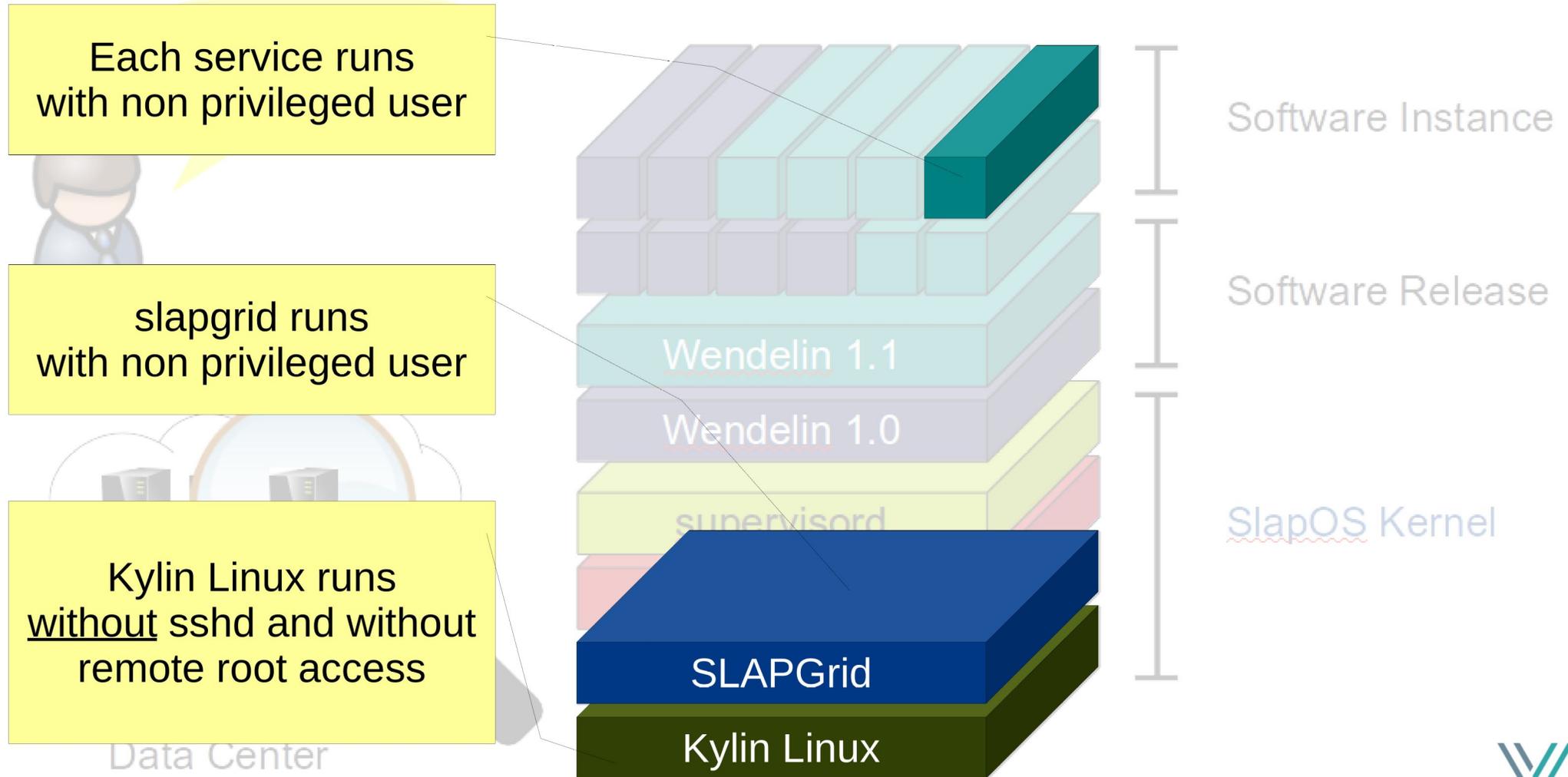
# Service Authentication

# X509



# Zero Knowledge

zero root



# Zero Knowledge

# zero password

No password or credential to access running services is kept in SlapOS Master



## SlapOS Master

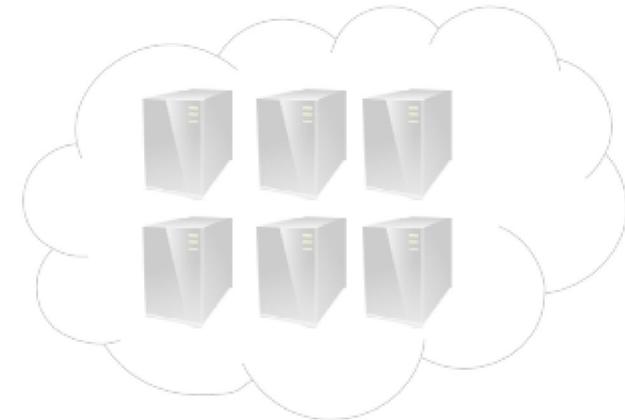
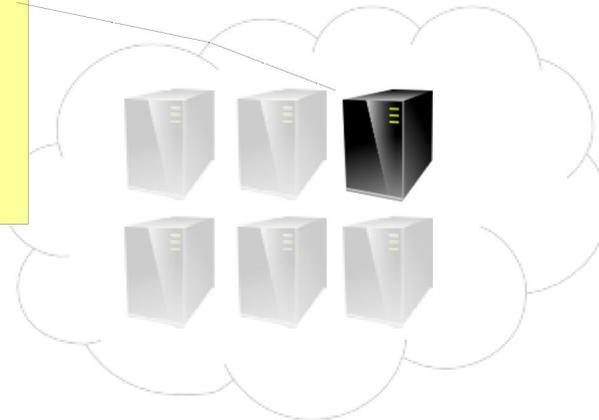
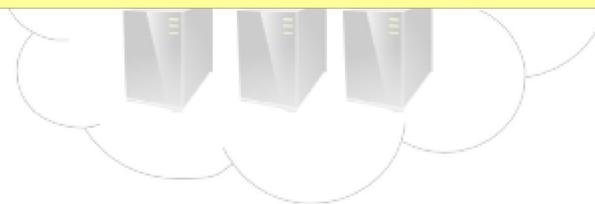
- Deployment
- Orchestration
- Accounting
- Disaster Recovery

SLAP Protocol

Credentials to access a service are kept as a hash in the computer that runs the service

## SlapOS Nodes

## SlapOS Nodes

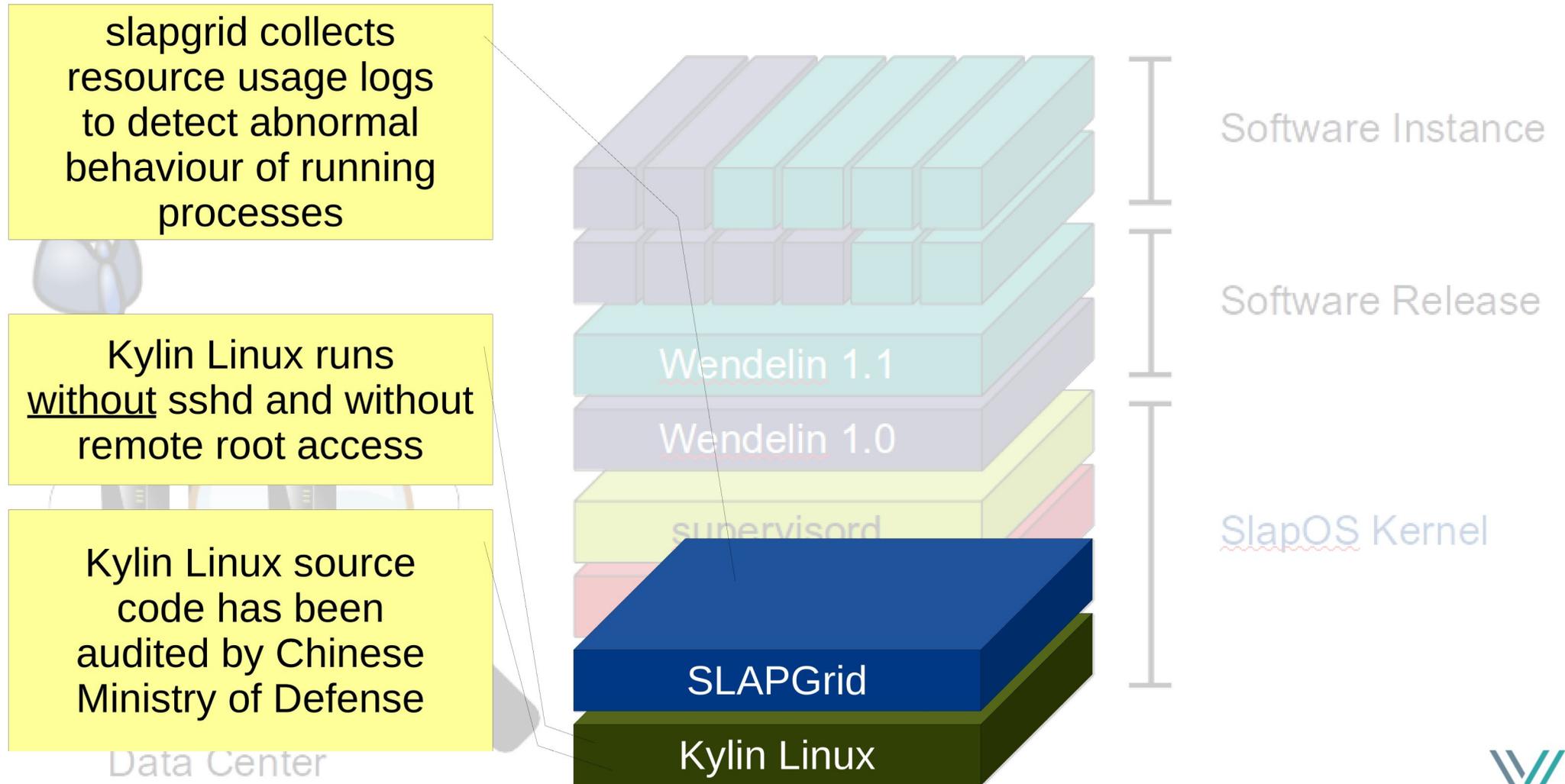


Data Center 1

Data Center 2

Data Center 3

# Intrusion Protection



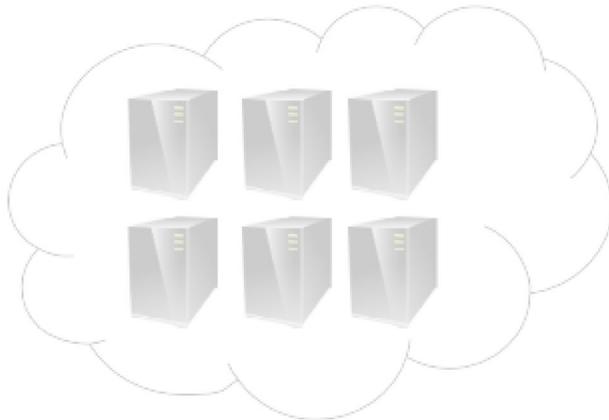
# Public Key Infrastructure (PKI)

SlapOS Master acts as PKI and generates X509 certificates for users, computers, software and services



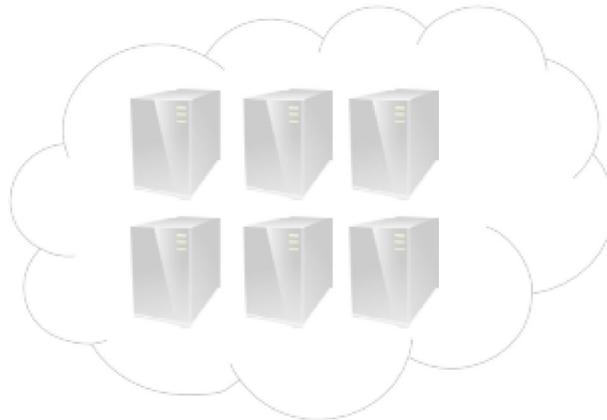
SlapOS Master  
- Deployment  
- Orchestration  
- Accounting  
- Disaster Recovery

SlapOS Nodes



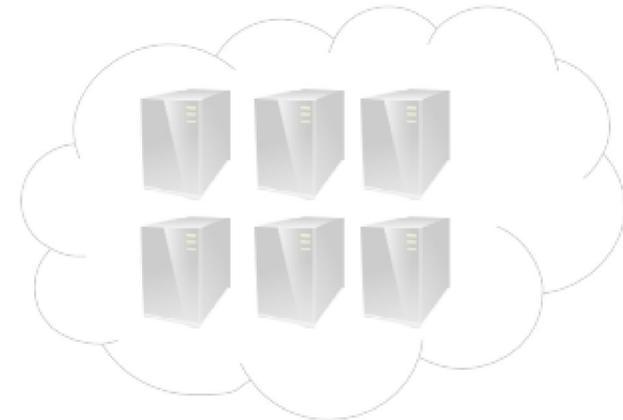
Data Center 1

SlapOS Nodes



Data Center 2

SlapOS Nodes



Data Center 3

# Agenda

- **Architecture Overview**
- **Design Goals**
- **Security**



**Safety**

# Availability

# SlapOS

System remains available  
in case of unavailability  
of SlapOS master

System remains available  
in case of unavailability  
of SlapOS node



## SlapOS Master

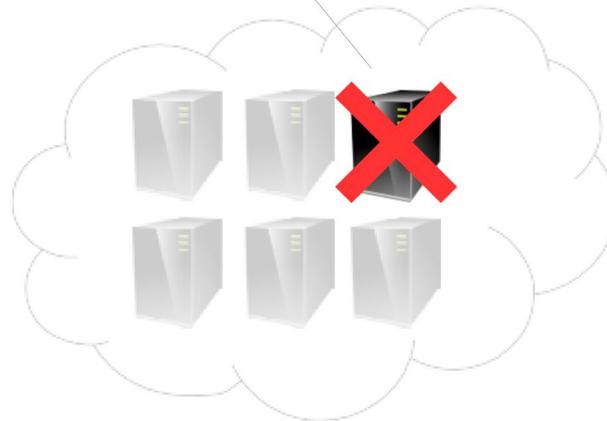
- Deployment
- Orchestration
- Accounting
- Disaster Recovery

## SlapOS Nodes



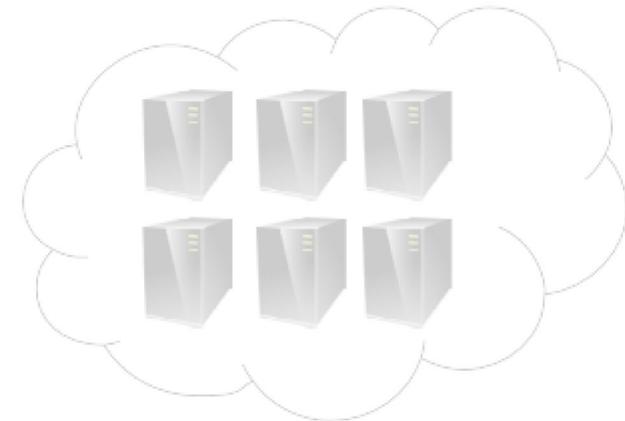
Data Center 1

## SlapOS Nodes



Data Center 2

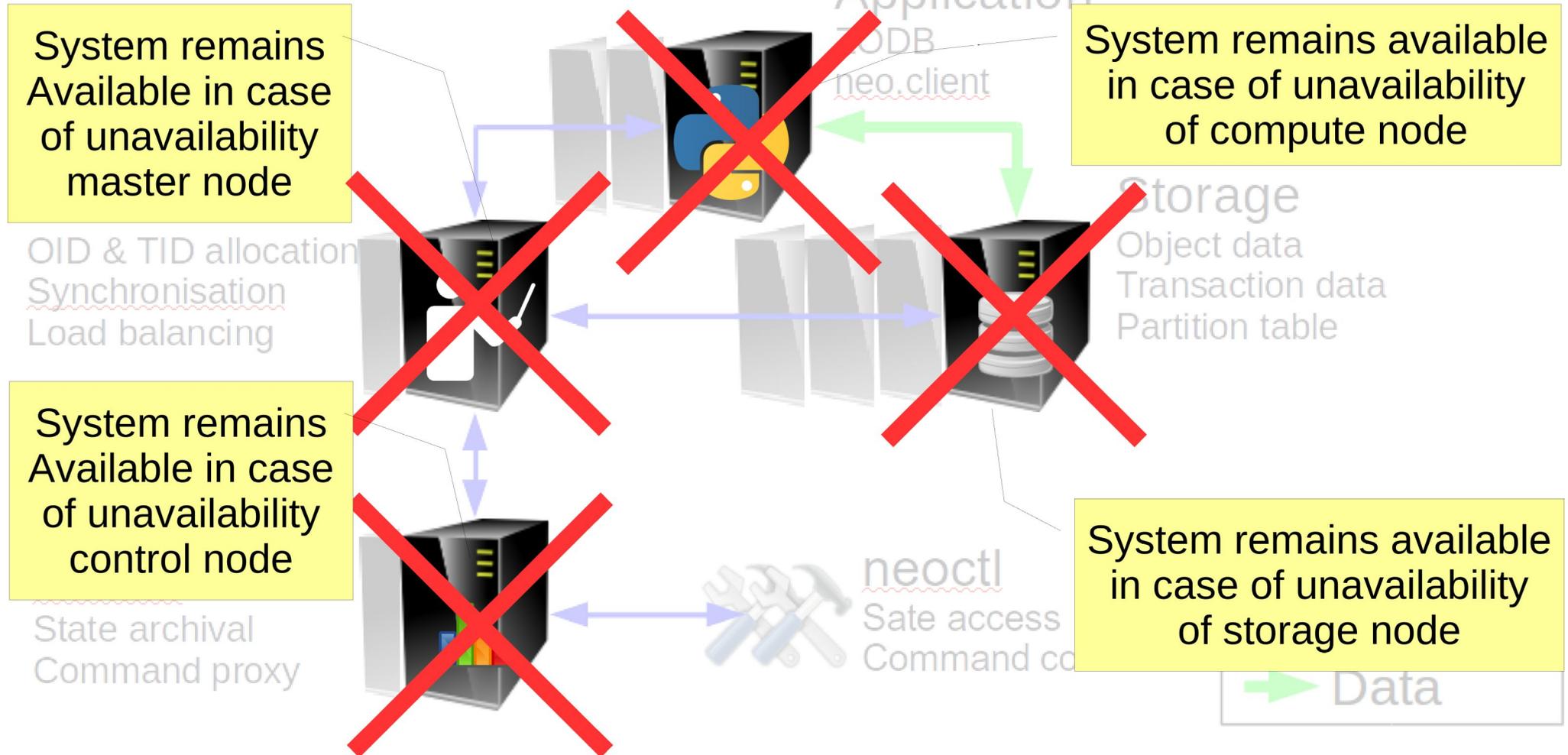
## SlapOS Nodes



Data Center 3

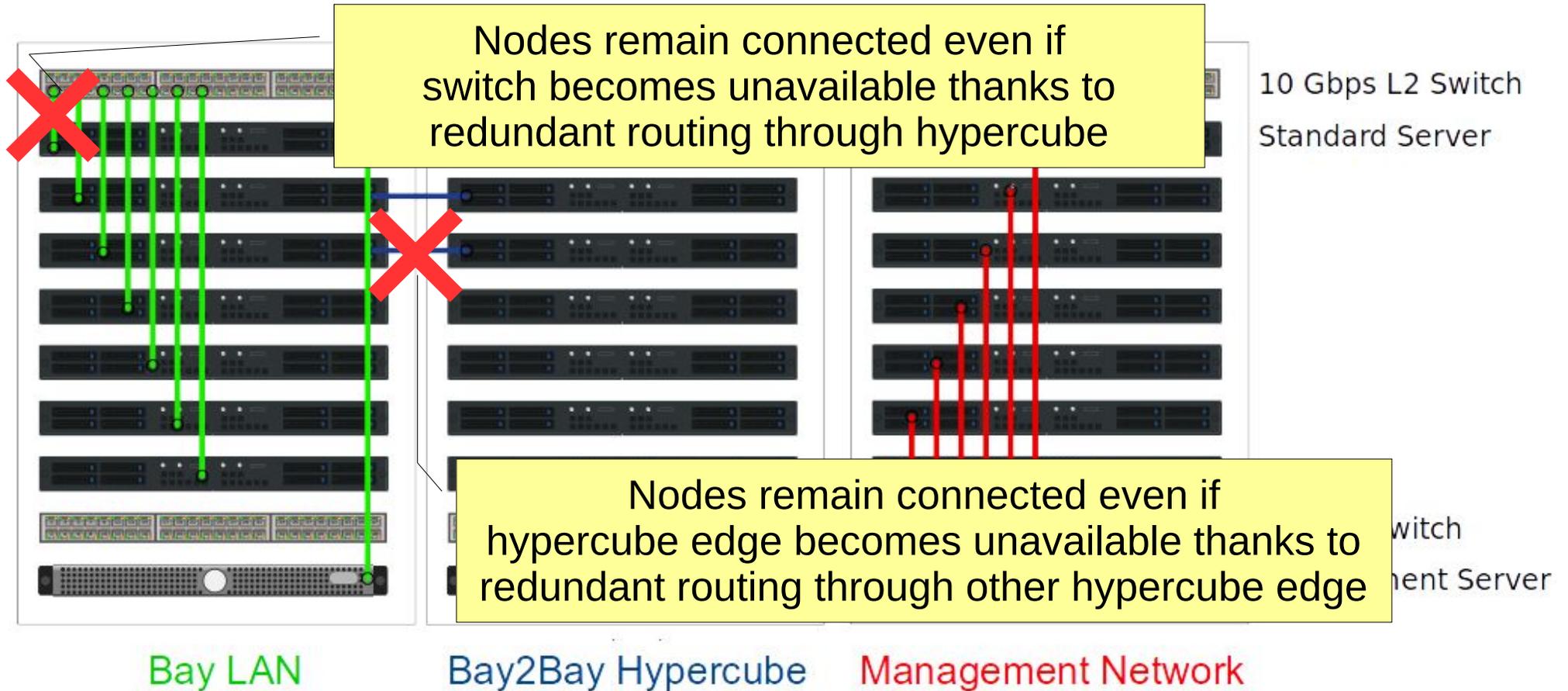
# Availability

# NEO



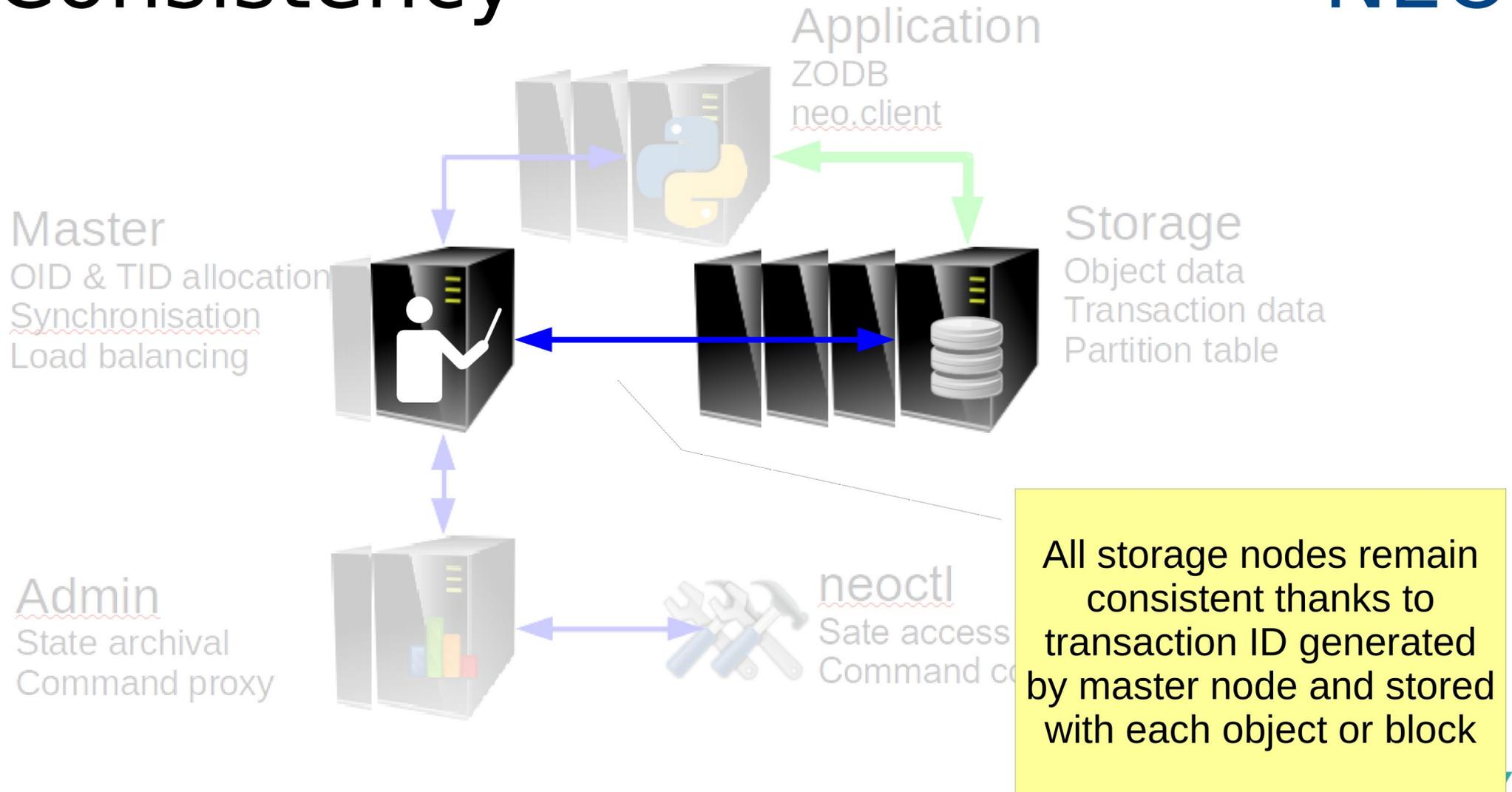
# Availability

LAN



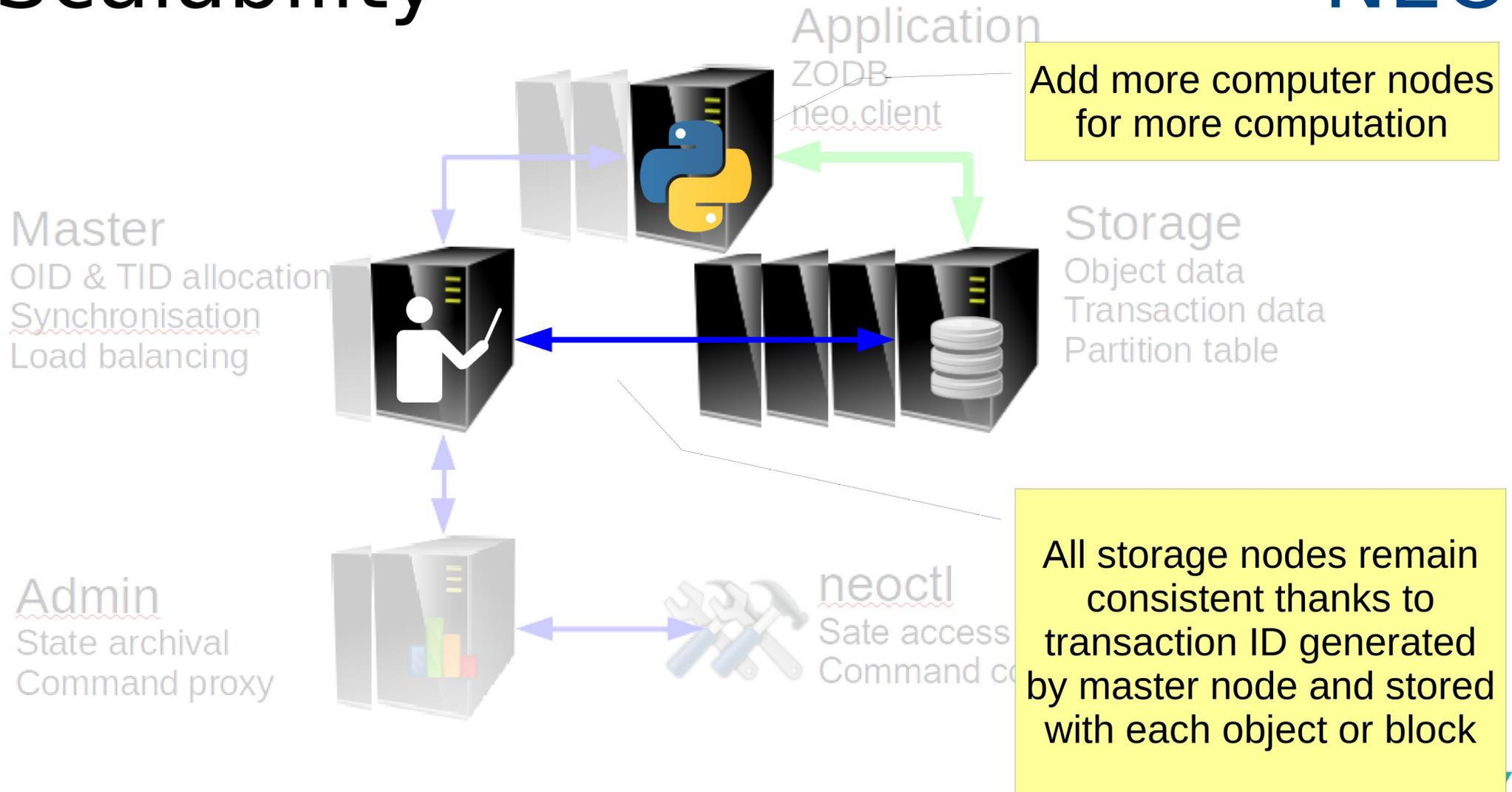
# Consistency

# NEO



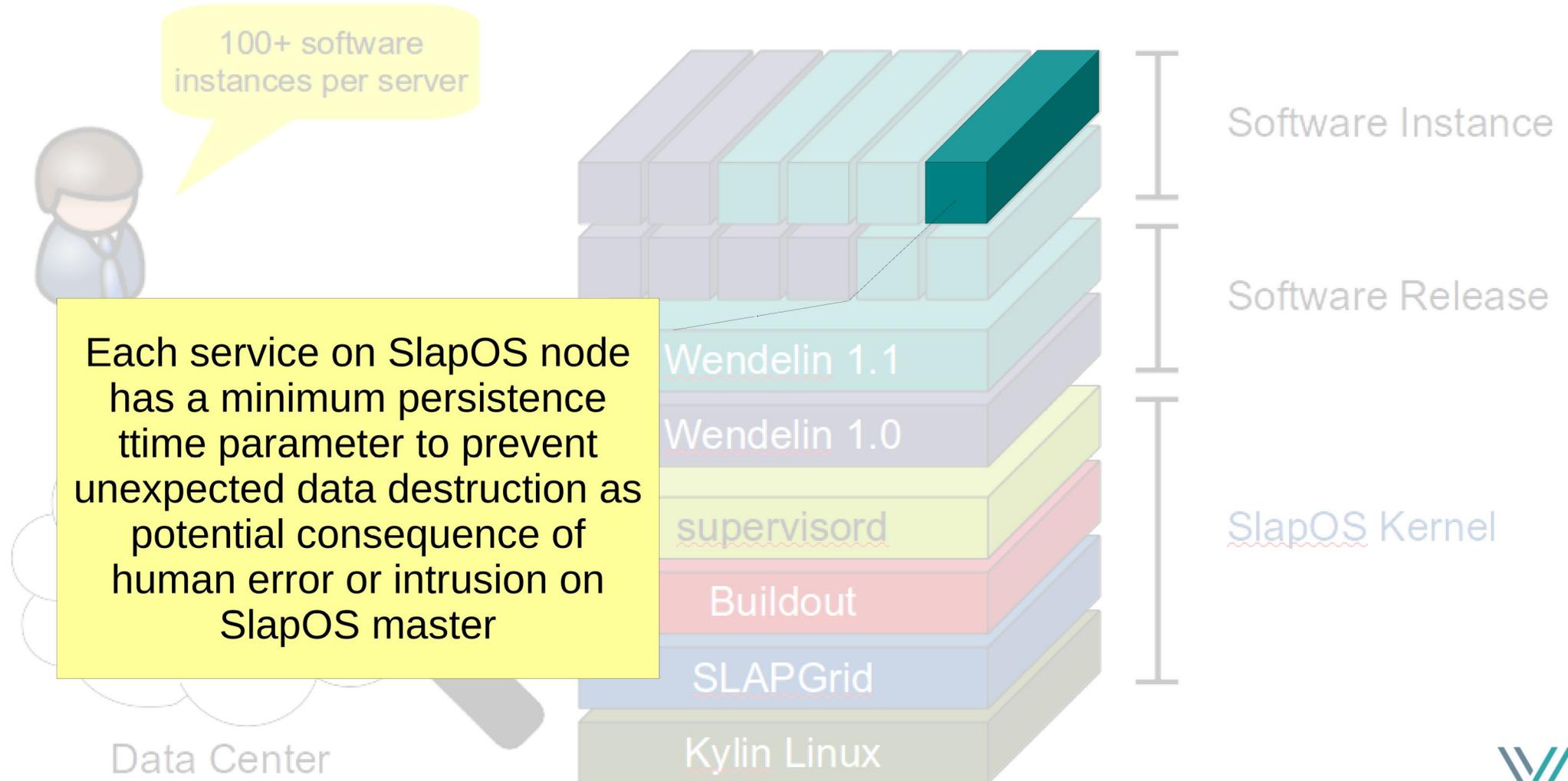
# Scalability

# NEO



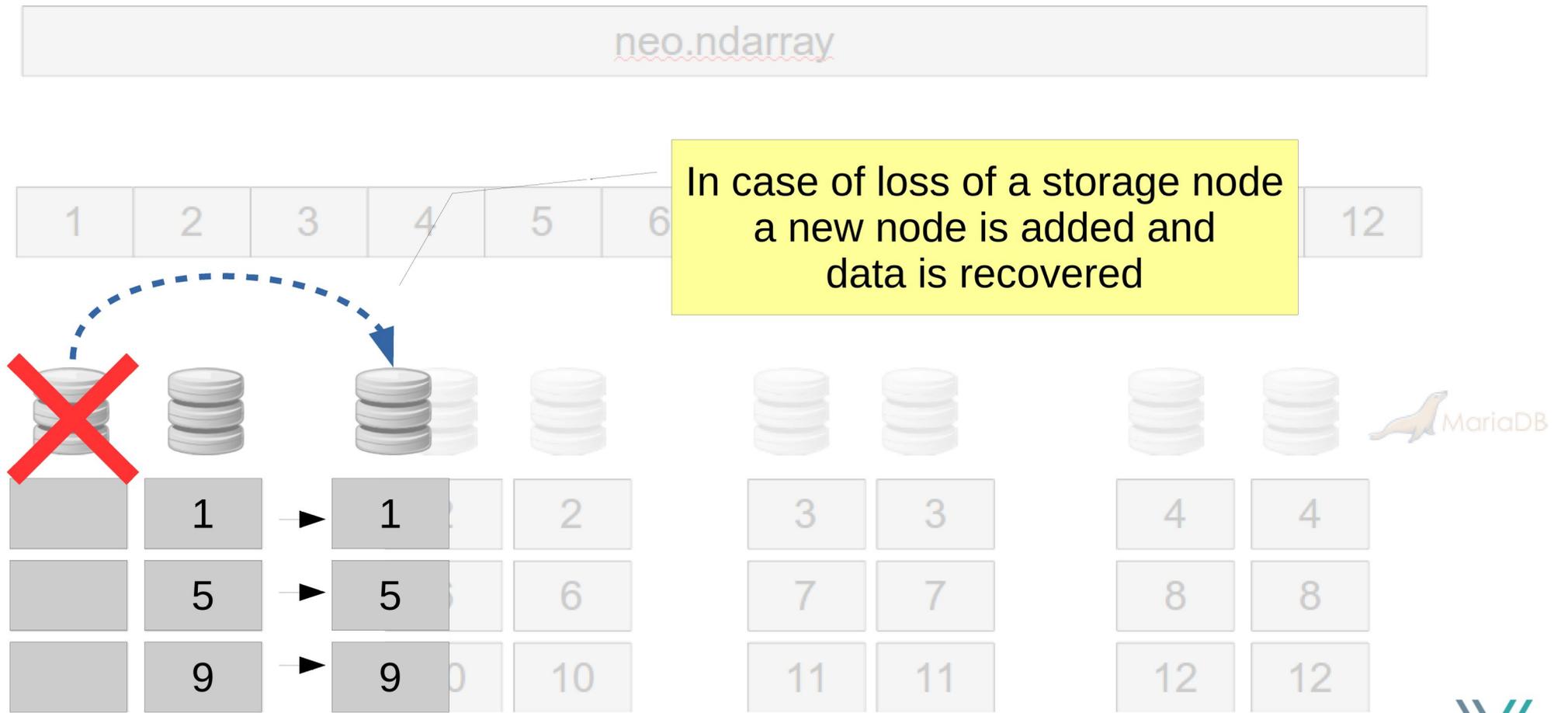
# Persistence

# SlapOS



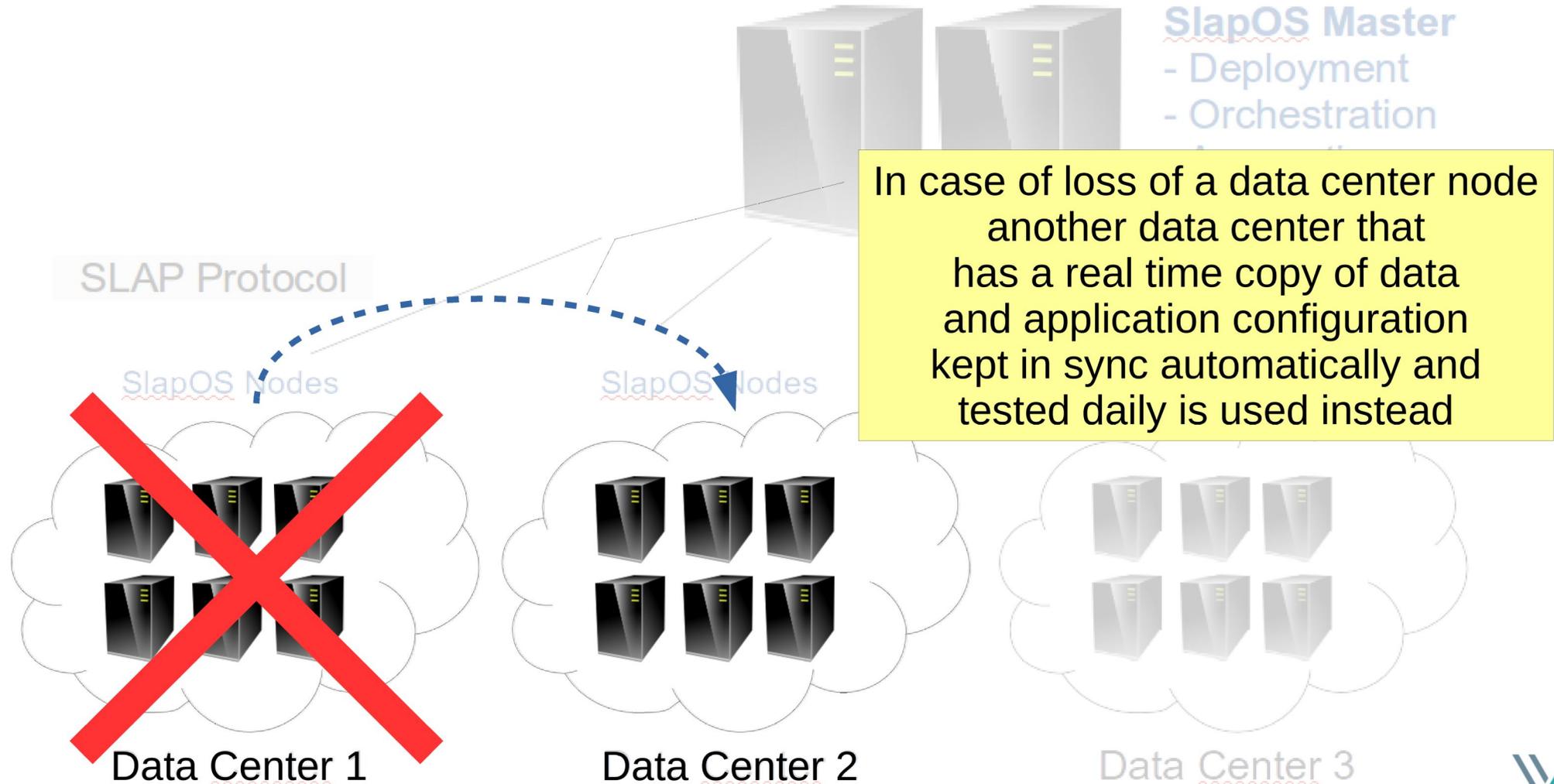
# Disaster Recovery

# Storage



# Disaster Recovery

# Datacenter





## Wendelin Exanalytics *Security & Safety Design*

2014-07-07 – Shanghai



© 2014 Wendelin Project et al. – CC SA-NC

[www.wendelin.io](http://www.wendelin.io)



# Agenda

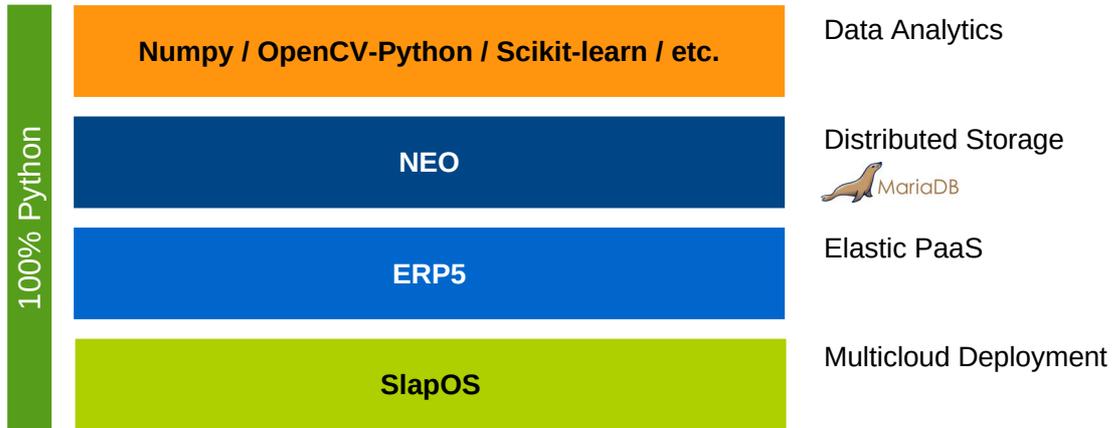


## **Architecture Overview**

- **Design Goals**
- **Security**
- **Safety**

# Wendelin Core

100% open source

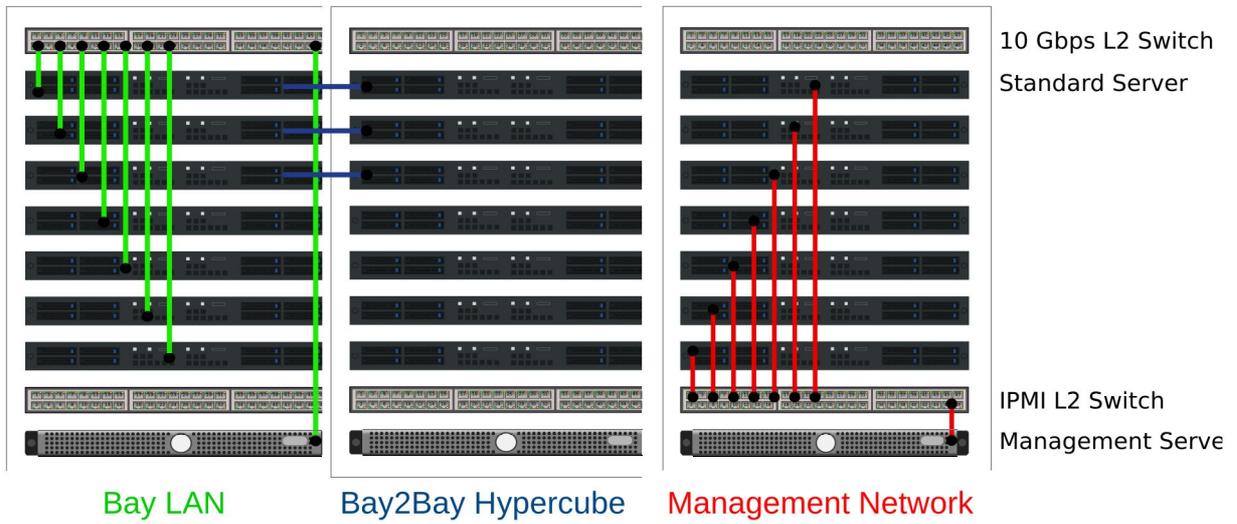


Multi Data Center

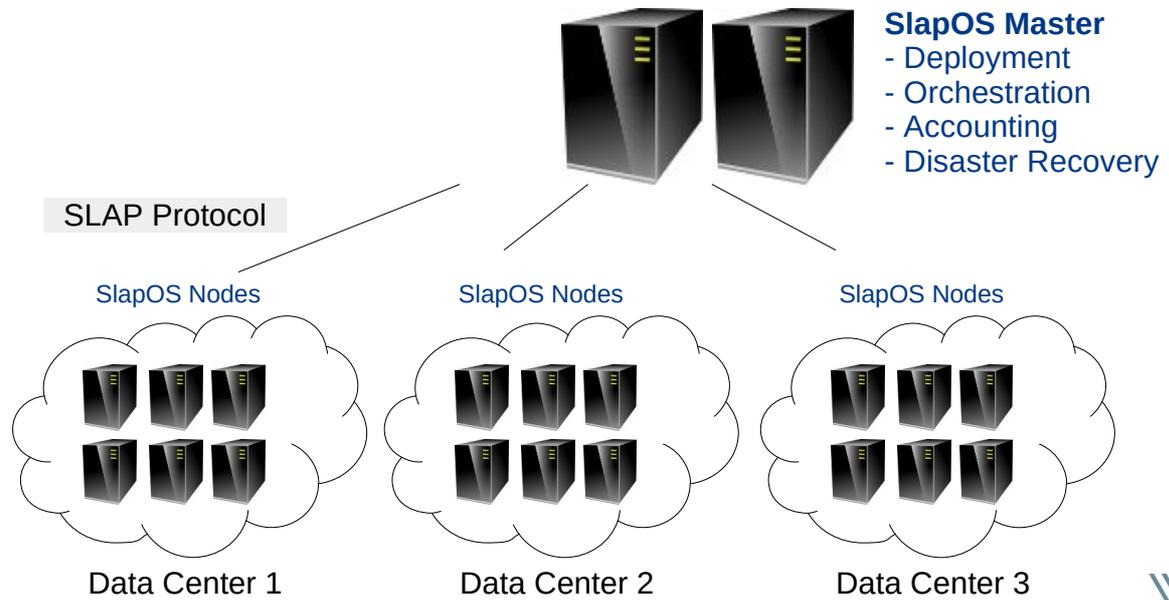
© 2014 Wendelin Project et al. – CC SA-NC



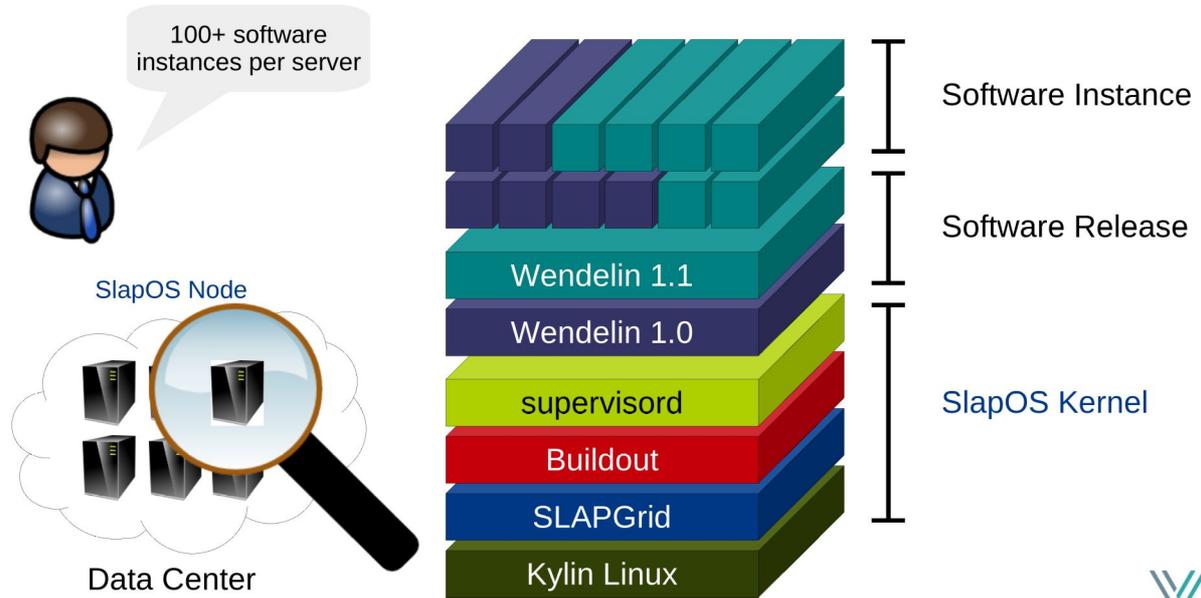
# Data Center Overview



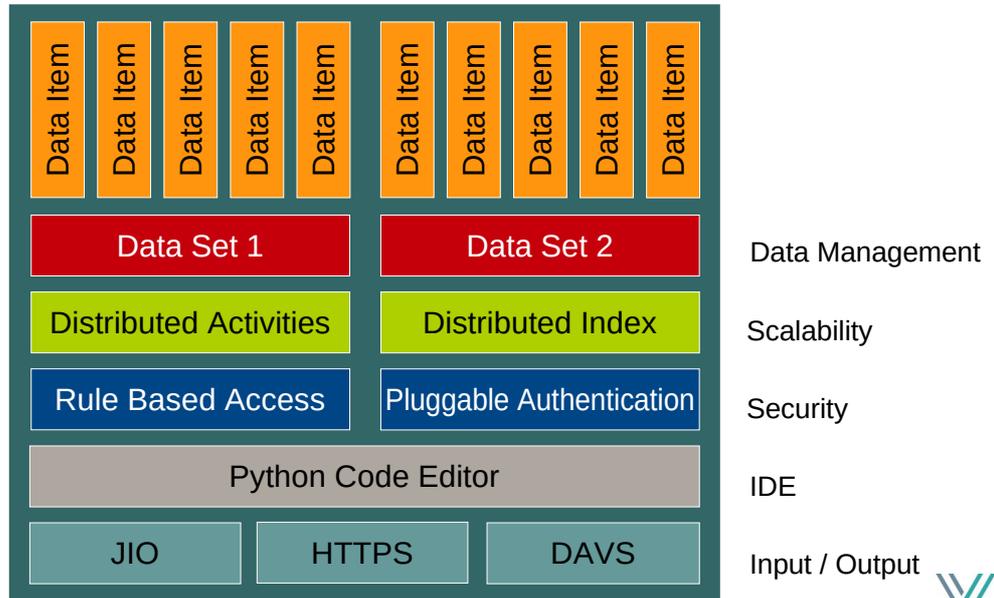
# SlapOS Master Overview



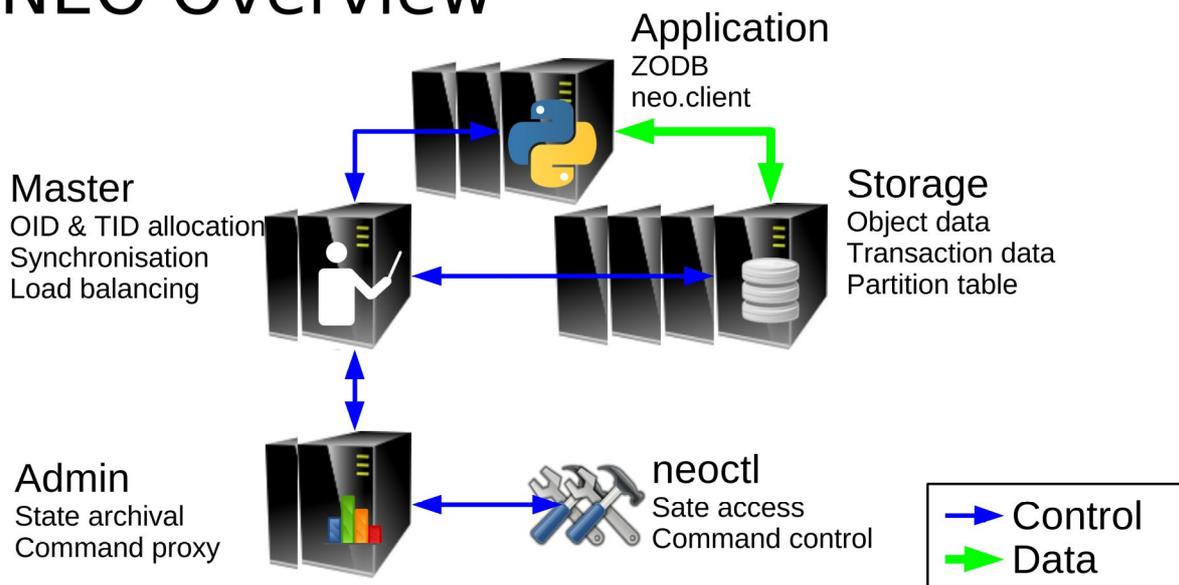
# SlapOS Node Overview



# ERP5 PaaS Overview



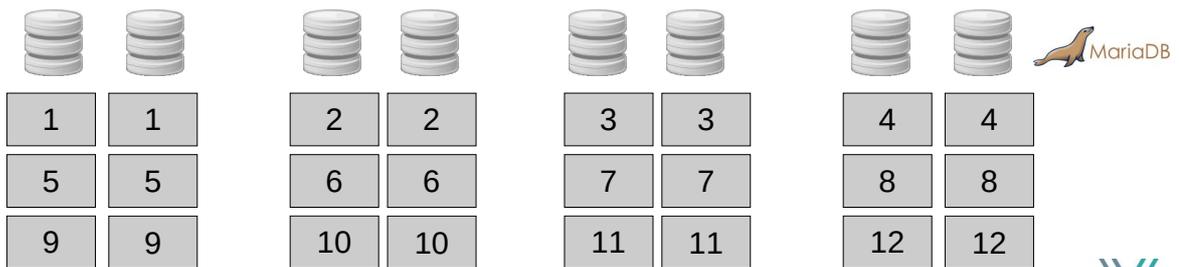
# NEO Overview



# Numpy Overview

neo.ndarray

1	2	3	4	5	6	7	8	9	10	11	12
---	---	---	---	---	---	---	---	---	----	----	----



# Agenda

- **Architecture Overview**
-  **Design Goals**
- **Security**
- **Safety**

# Security & Safety

- **Security**

- **Data Encryption**
- **Data Access Rule**
- **User Authentication**
- **Computer Authentication**
- **Software Authentication**
- **Service Authentication**
- **Zero Knowledge**
- **Intrusion protection**
- **Public Key Infrastructure**

- **Safety**

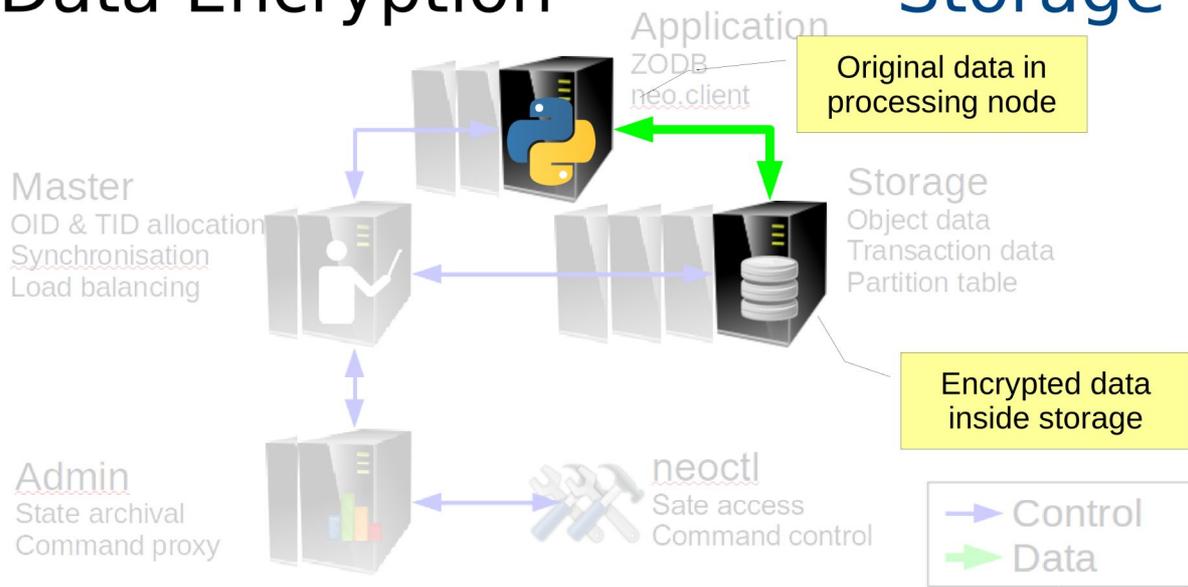
- **Availability**
- **Consistency**
- **Scalability**
- **Persistence**
- **Disaster Recovery**

# Agenda

- **Architecture Overview**
- **Design Goals**
-  • **Security**
- **Safety**

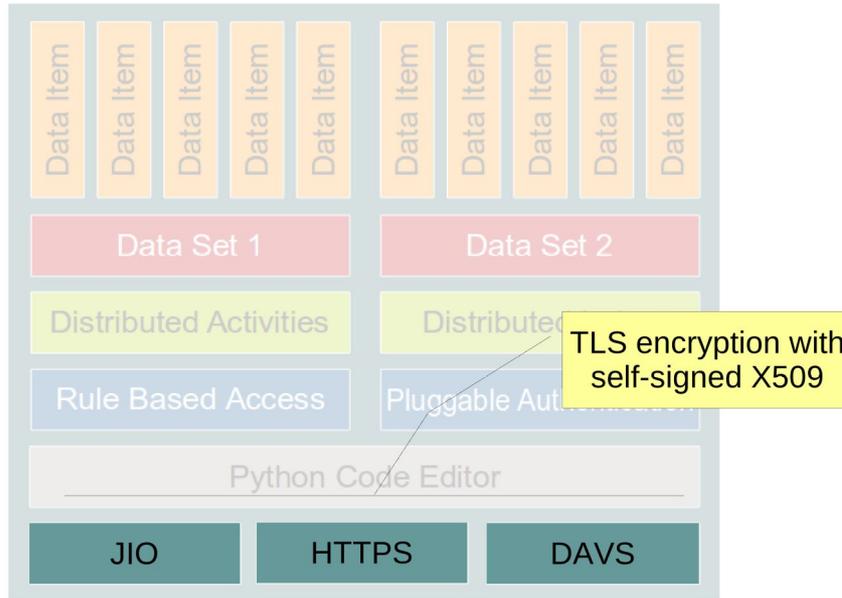
# Data Encryption

# Storage



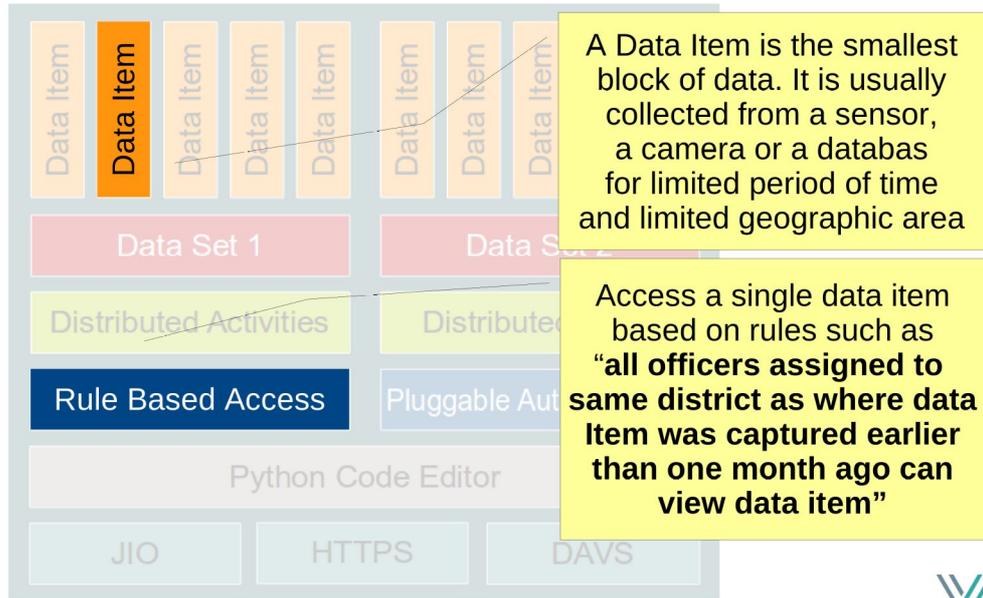
# Data Encryption

I/O



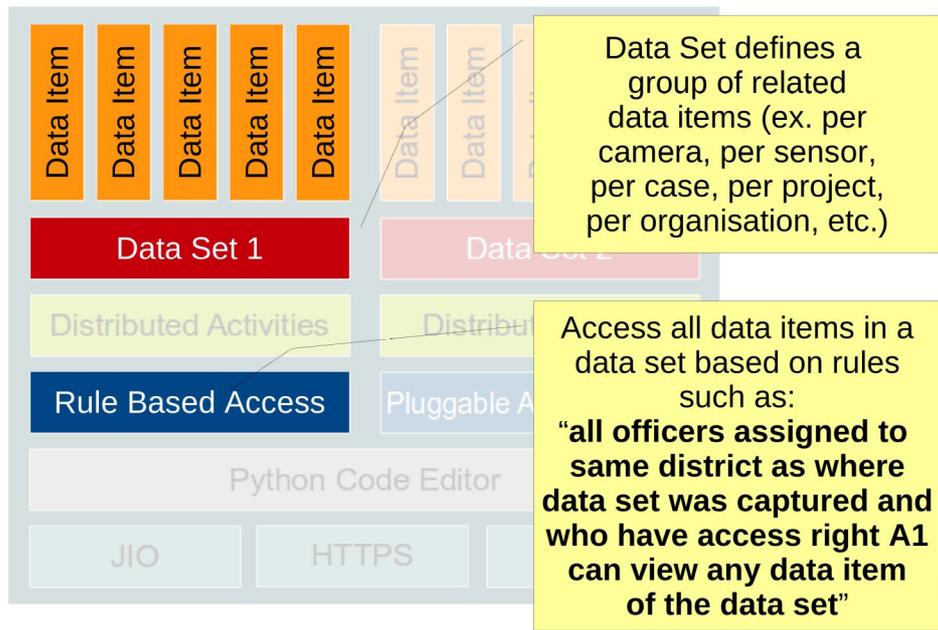
# Data Access Rules

# Data Item



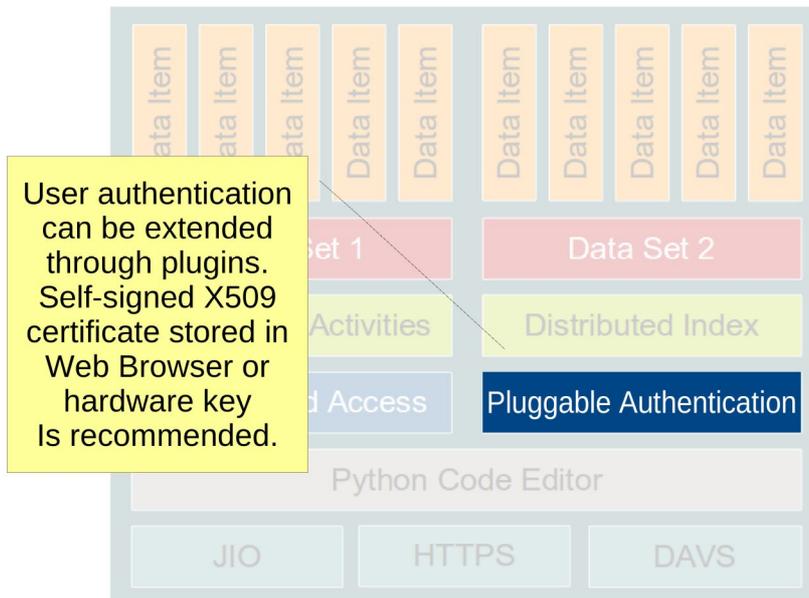
# Data Access Rules

# Data Set



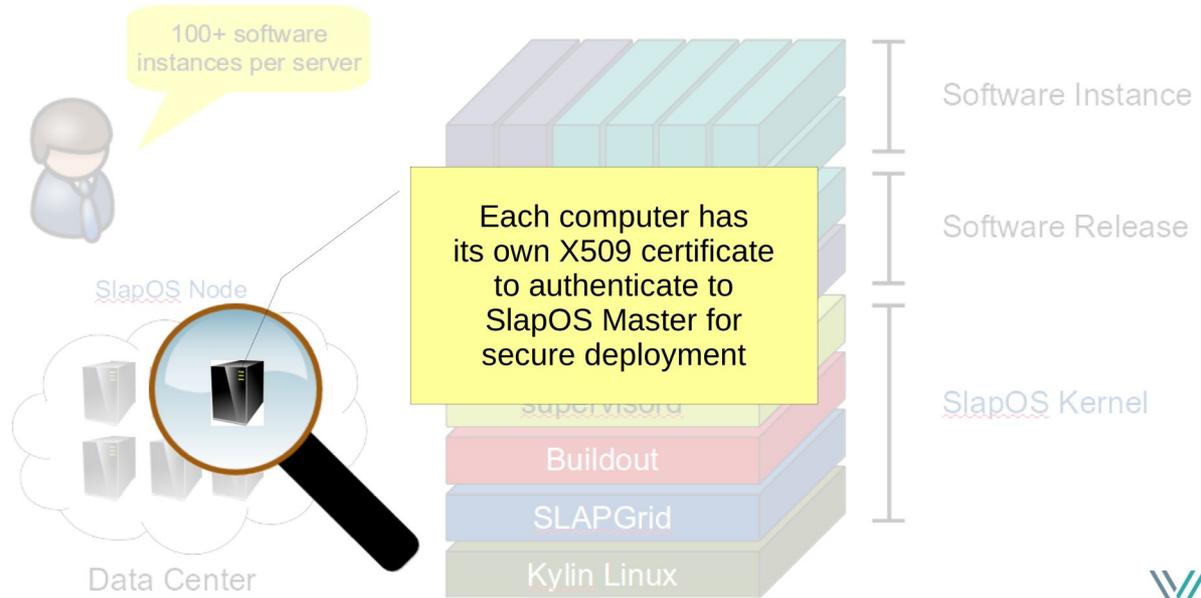
# User Authentication

# X509



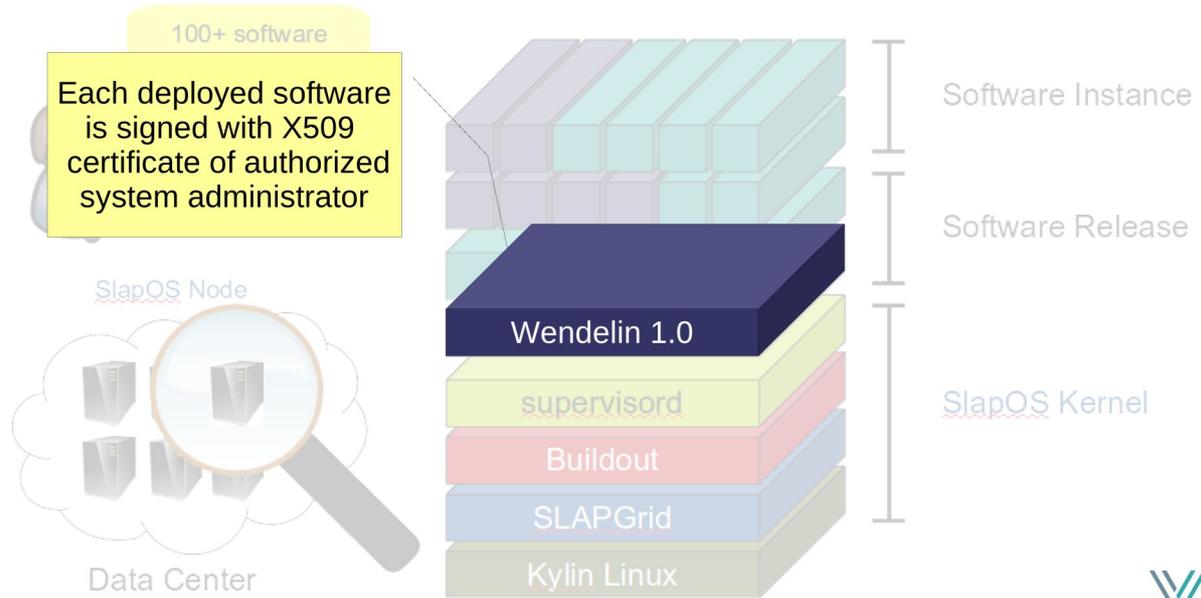
# Computer Authentication

## X509



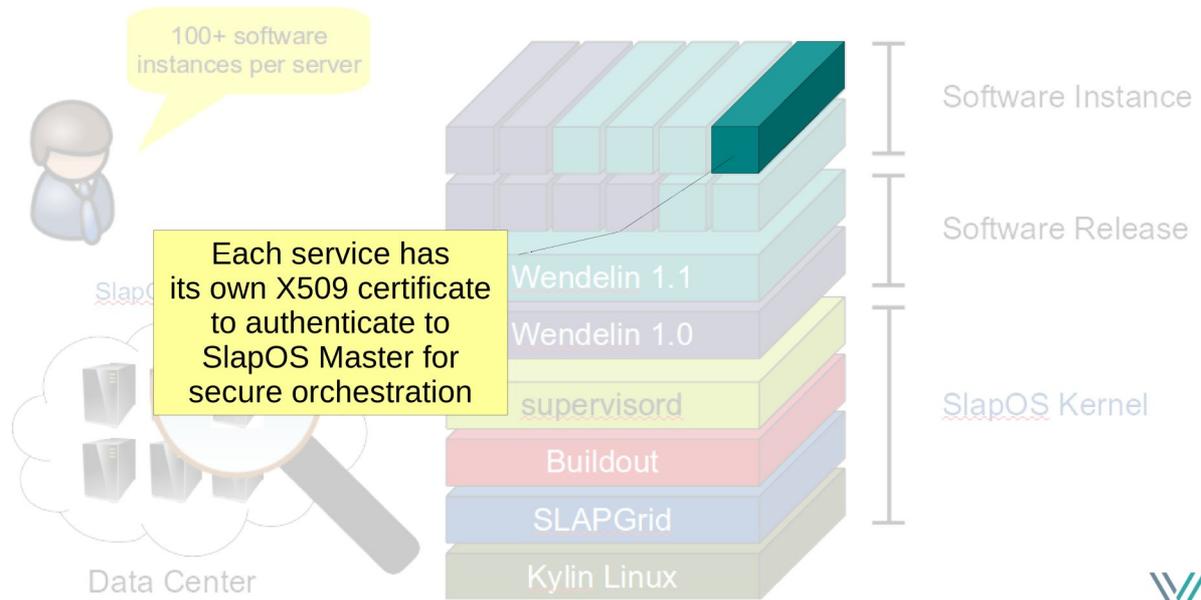
# Software Authentication

# X509



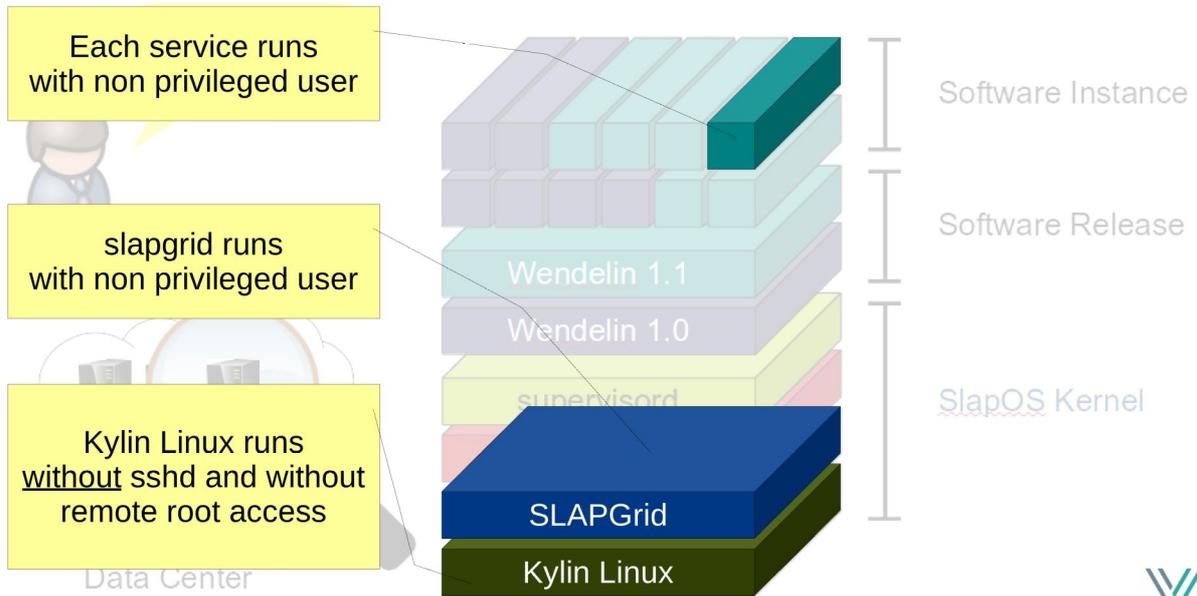
# Service Authentication

# X509



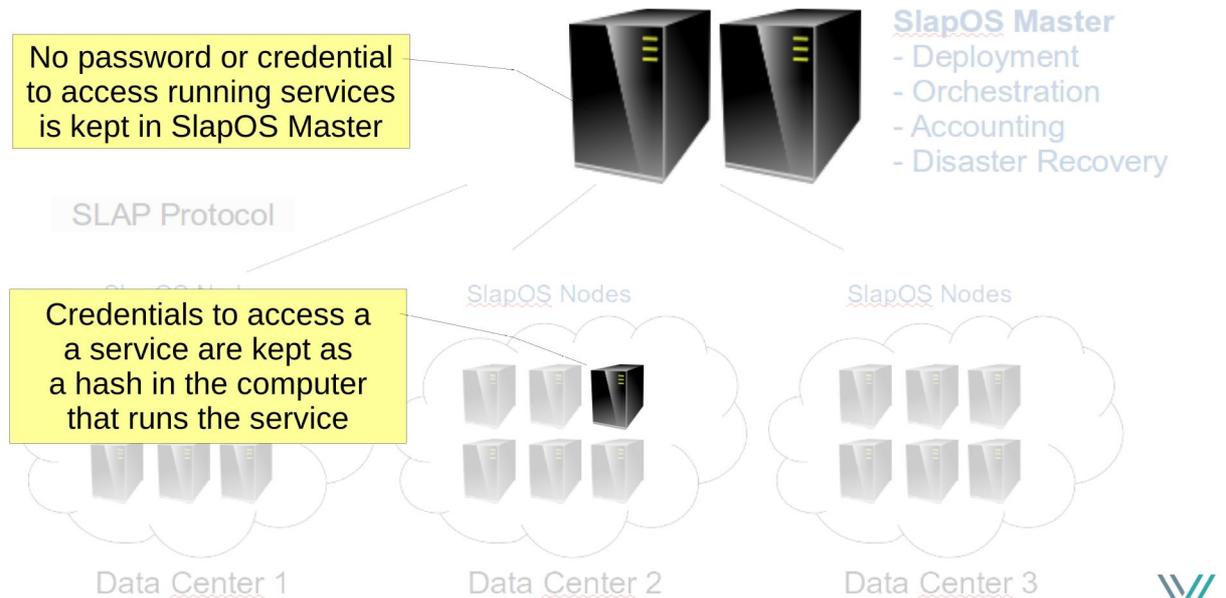
# Zero Knowledge

# zero root

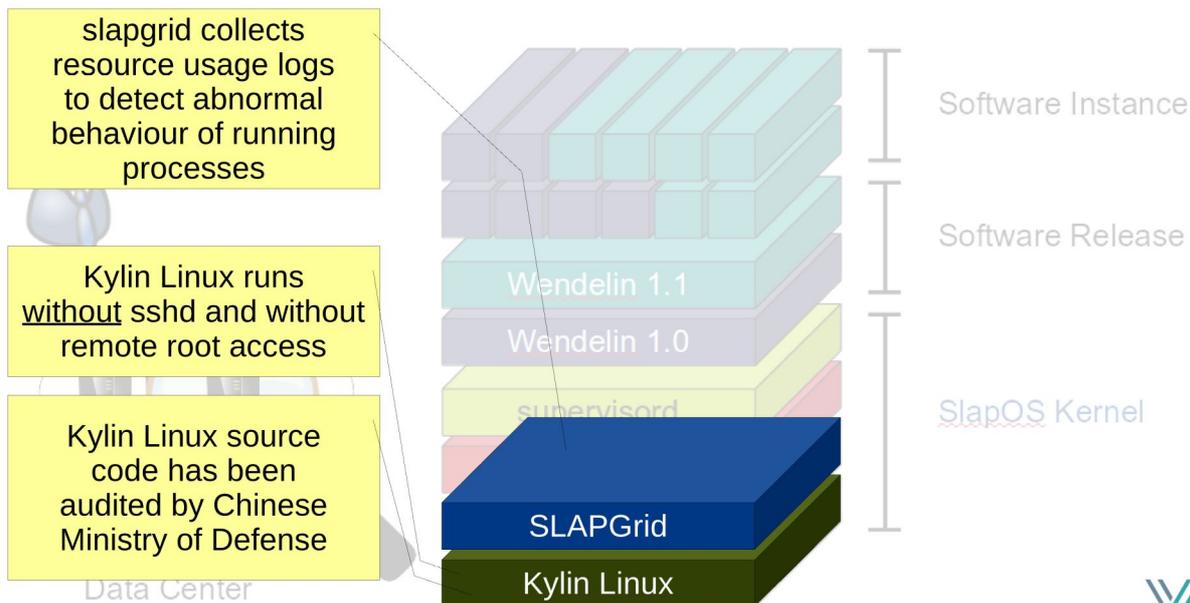


# Zero Knowledge

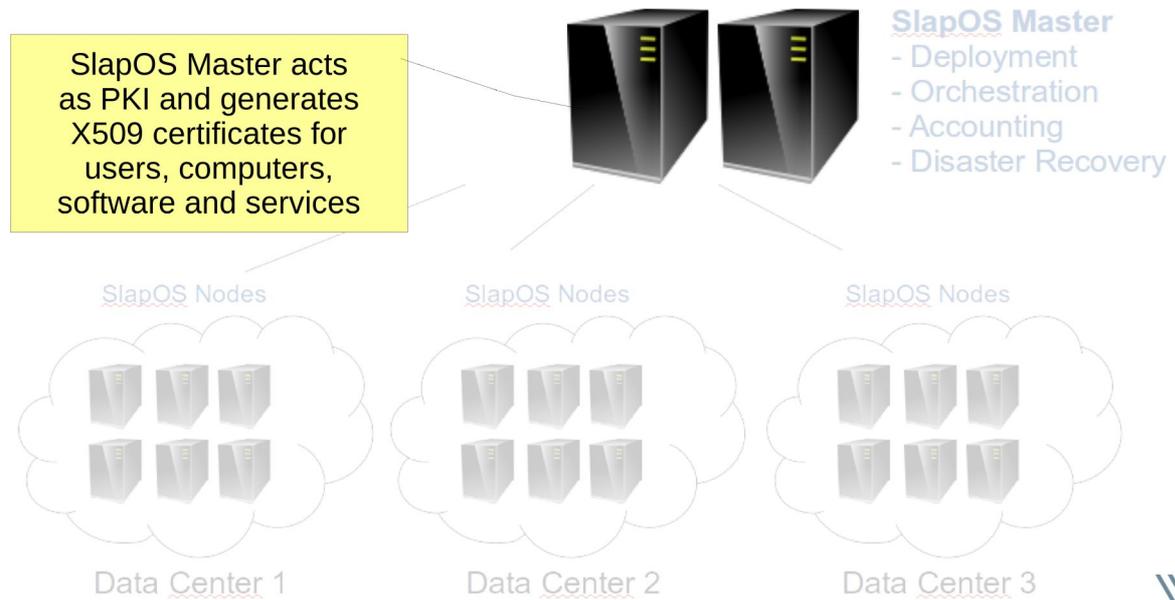
# zero password



# Intrusion Protection



# Public Key Infrastructure (PKI)



# Agenda

- **Architecture Overview**
- **Design Goals**
- **Security**



**Safety**

# Availability

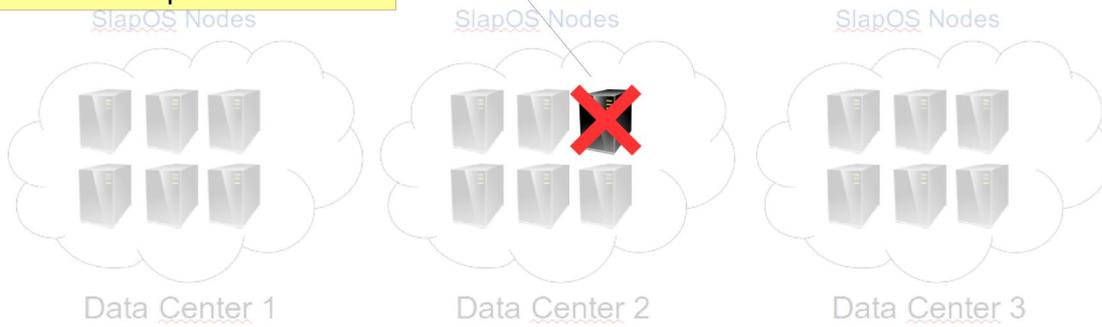
# SlapOS

System remains available in case of unavailability of SlapOS master

System remains available in case of unavailability of SlapOS node

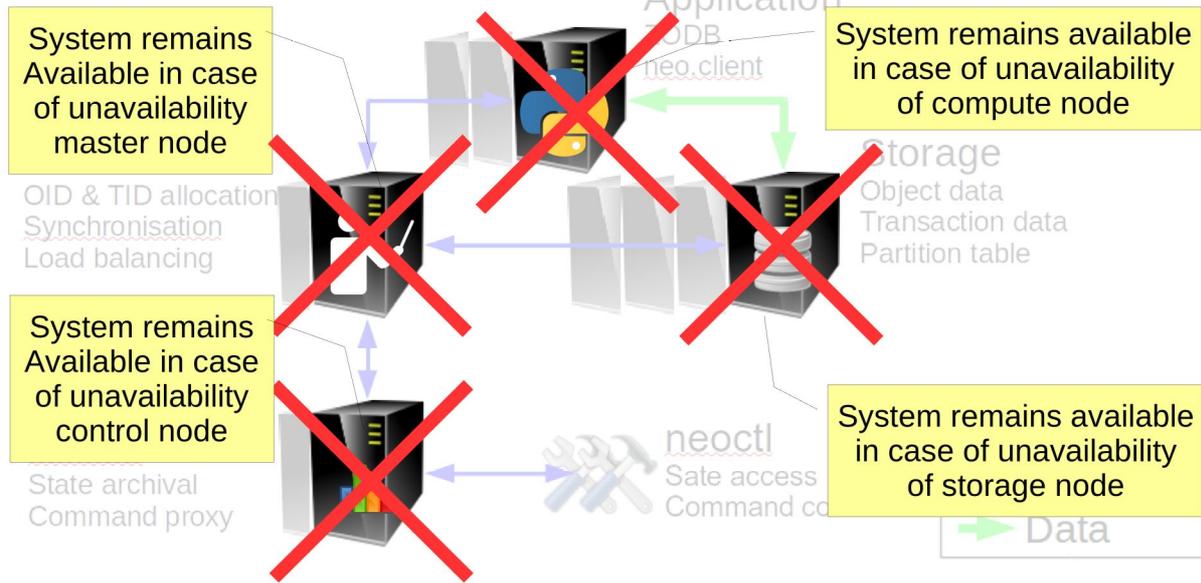


- SlapOS Master**
- Deployment
  - Orchestration
  - Accounting
  - Disaster Recovery



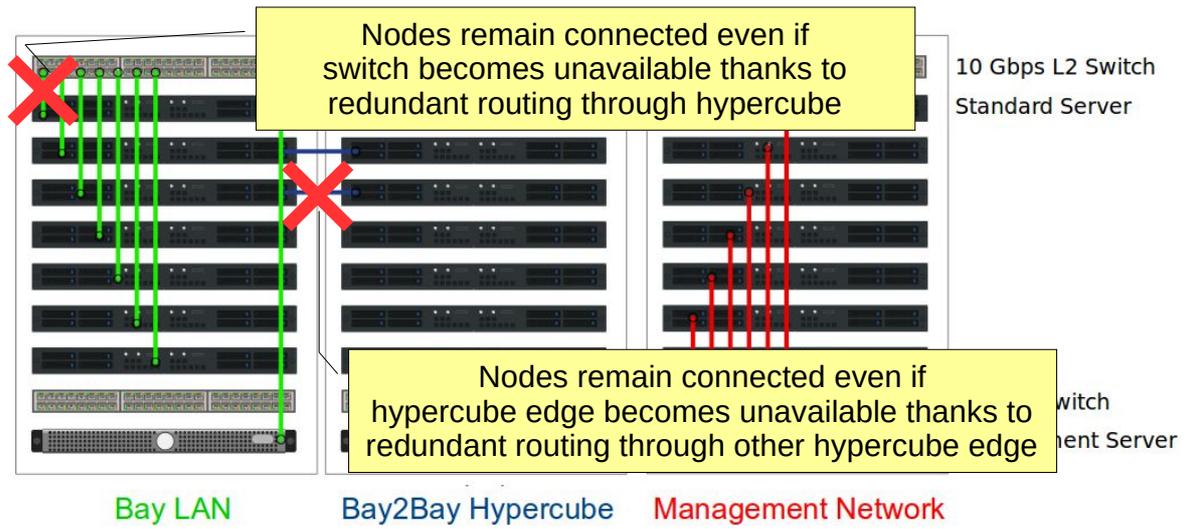
# Availability

# NEO



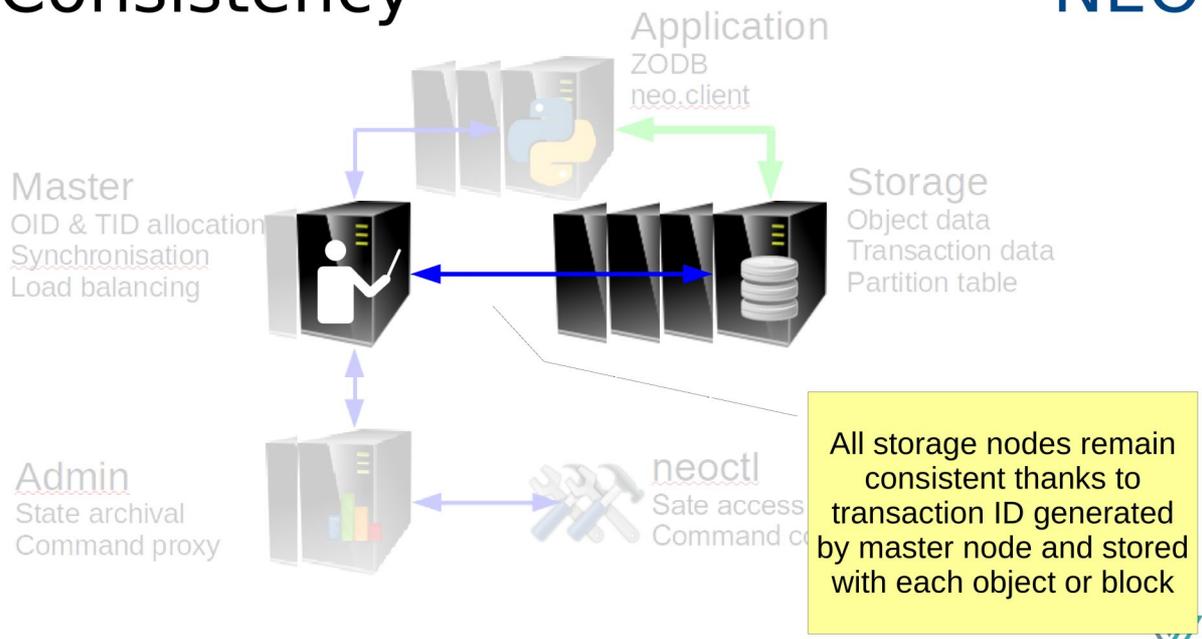
# Availability

## LAN



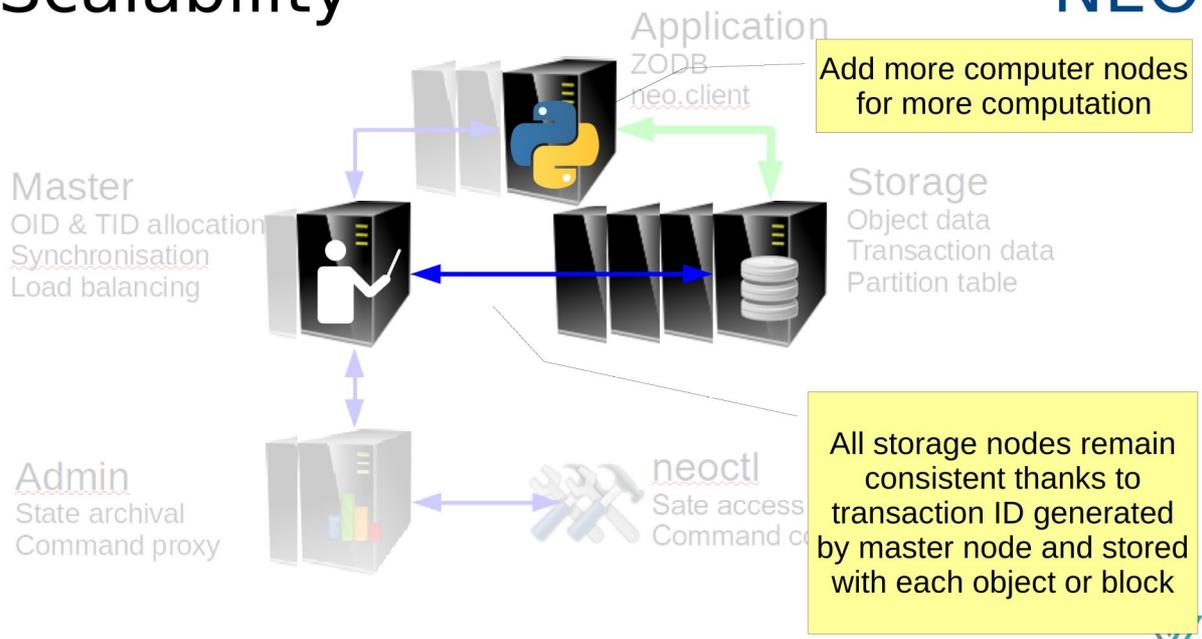
# Consistency

# NEO



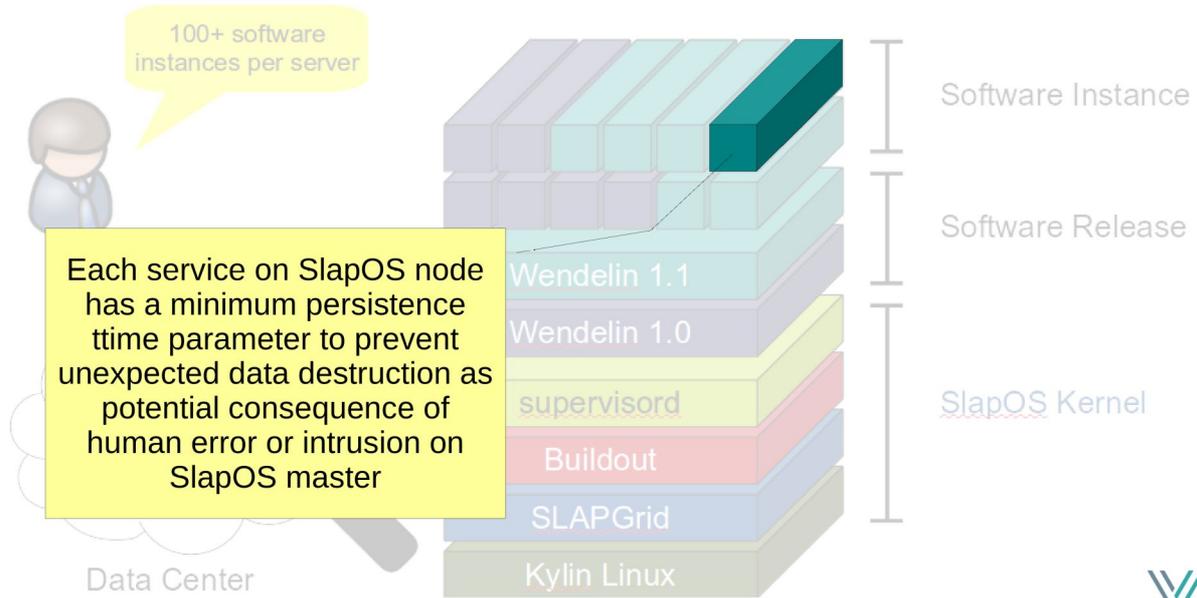
# Scalability

# NEO



# Persistence

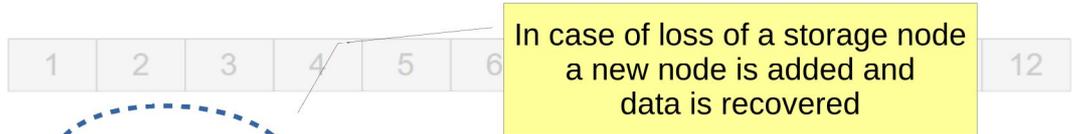
# SlapOS



# Disaster Recovery

# Storage

neo.ndarray



# Disaster Recovery

# Datacenter

