

Hyperspectral Imaging in Cloud Computing Environment

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Outline

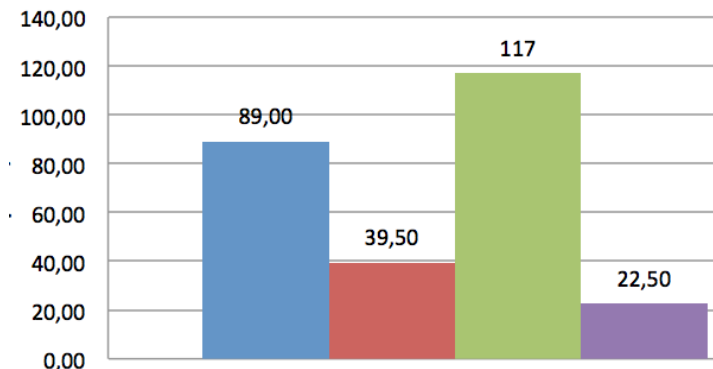
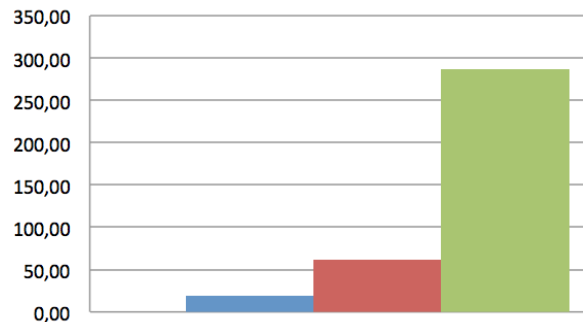
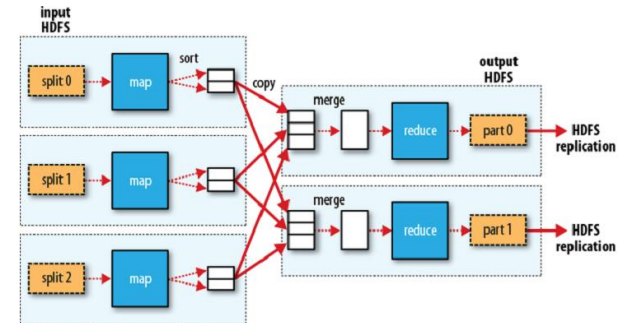
- Issues of Traditional Approach
- Core principles of big data technology
- Cloud Architecture for Hyperspectral Imaging
- Distributed Hyperspectral Image (HSI)
- Processing Organization

Traditional Approach



Hyperspectral Imaging by Hadoop

- Row data move to HDFS
- Partitioning without responsiveness to inner structure of HSI
- Poor accordance MapReduce paradigm to basic HSI processing procedures



Core principles of big data technology

- Divide and Conquer
- Move Code to Data
- No UPDATE (Data Are Forever!)



- In-Memory Processing
- Lazy Evaluation

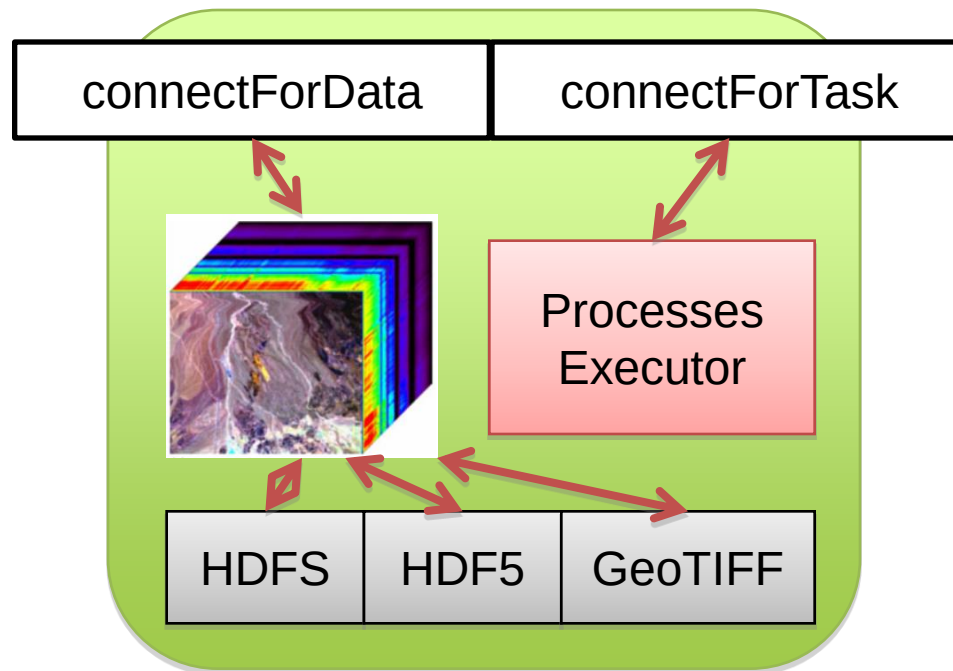


Architecture for Hyperspectral Imaging in the Cloud

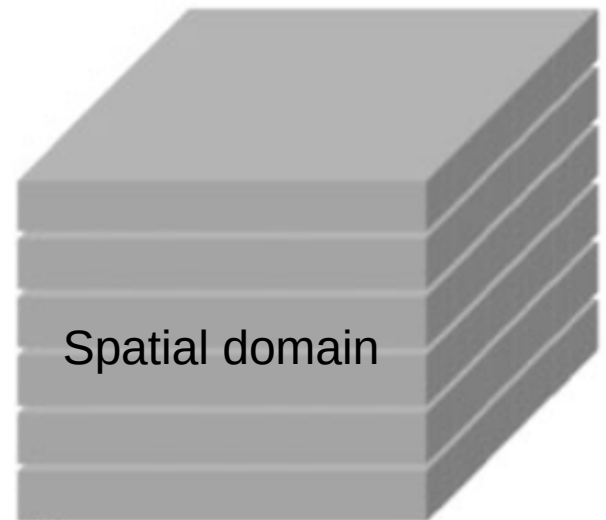
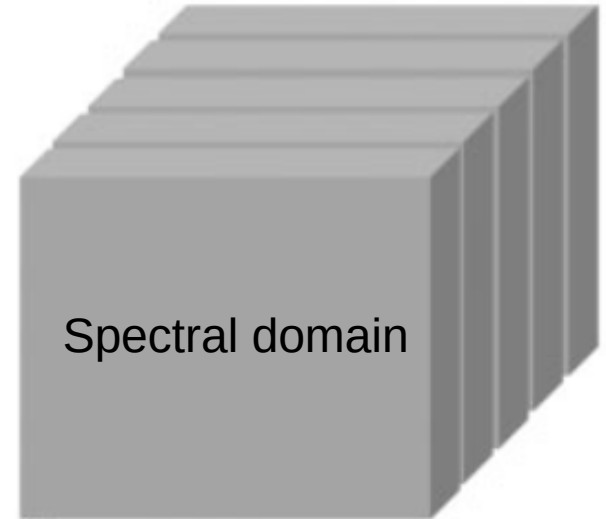
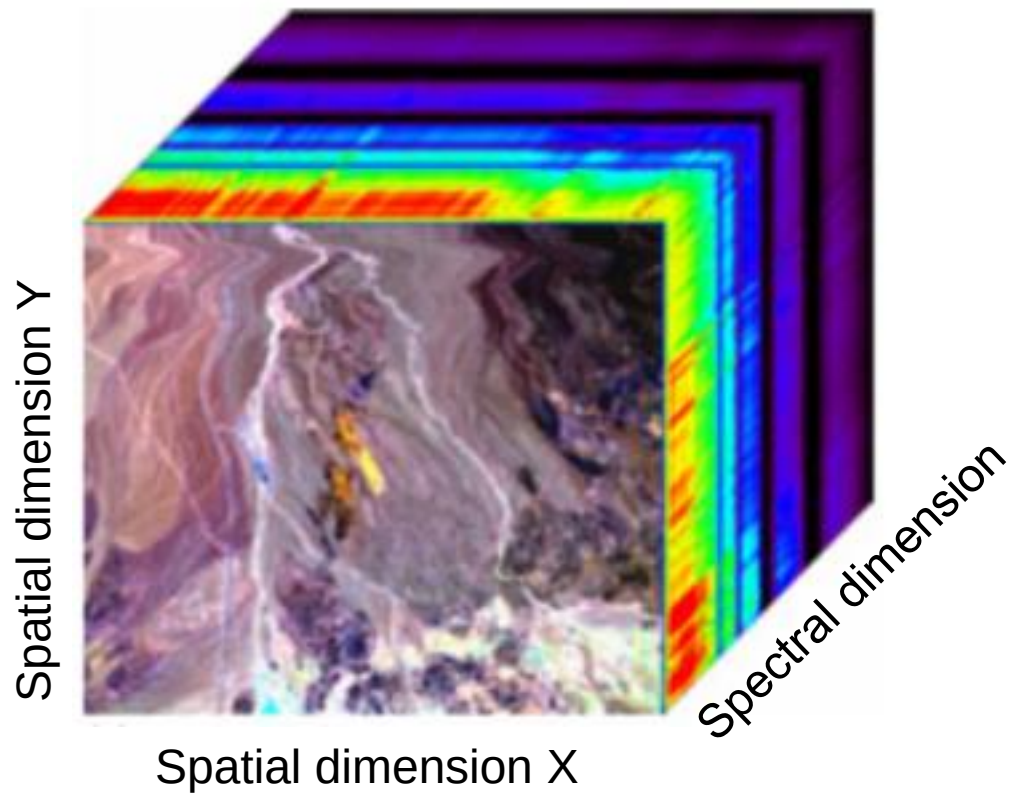
- Data as a Service
- In-Memory Store
- Distributed Hyperspectral Image (DHSI)
- Federation of Frame-Services
- Coordination via Hierarchical Namespace
- Move Code to Data
- No UPDATE when Processing

Distributed In-Memory Store

- Hypercube in Frame Service construct at Startup
- Plug-In Modules to load data in different formats



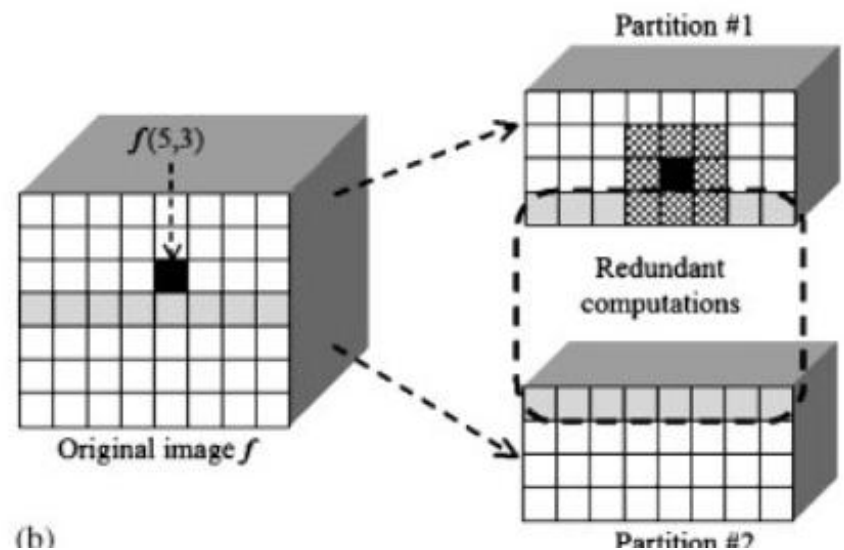
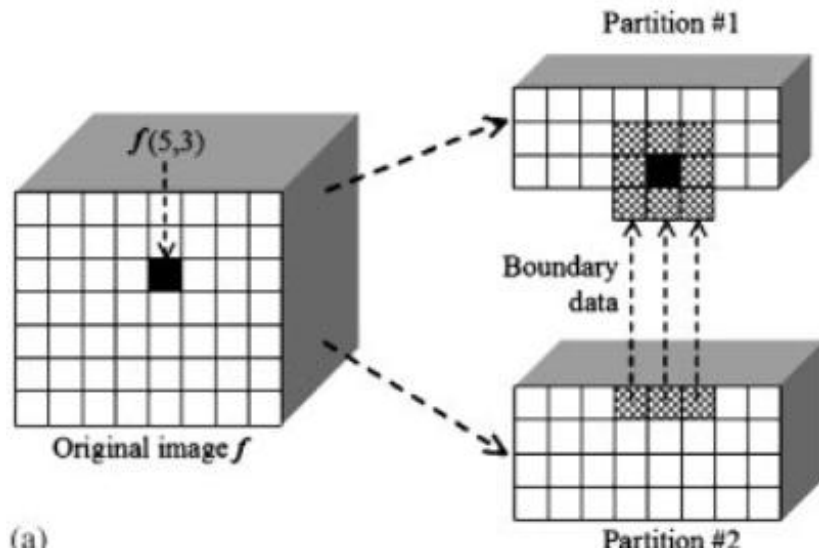
Data Partitioning Strategies



Data Partitioning Strategies

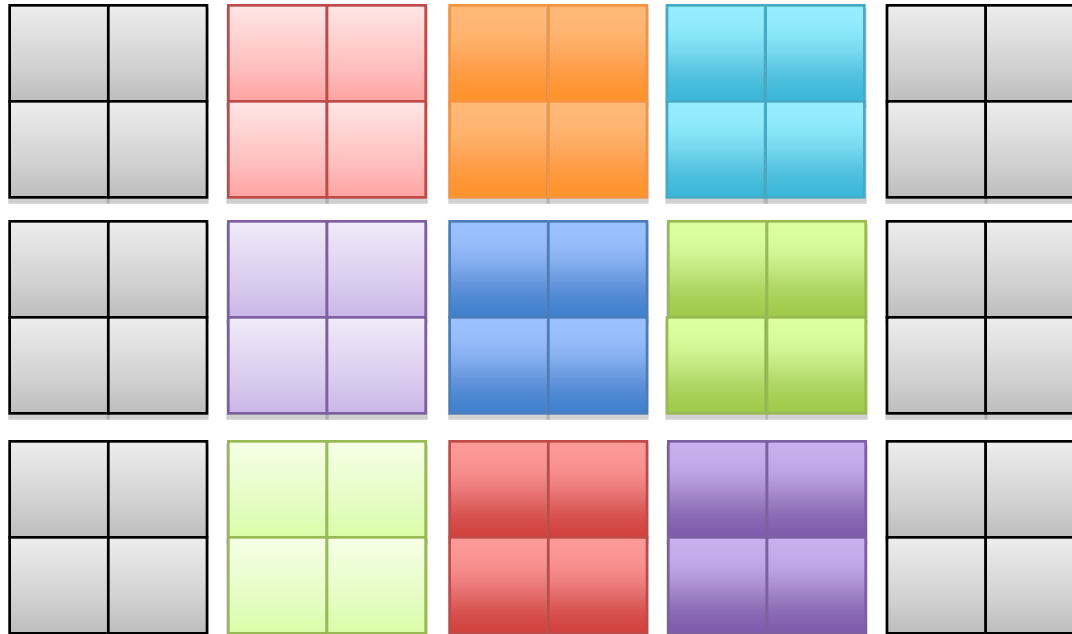
(a) 3x3 kernel computation split among 2 PE

(b) intro overlap to avoid inter-process communication in 3x3 kernel computation

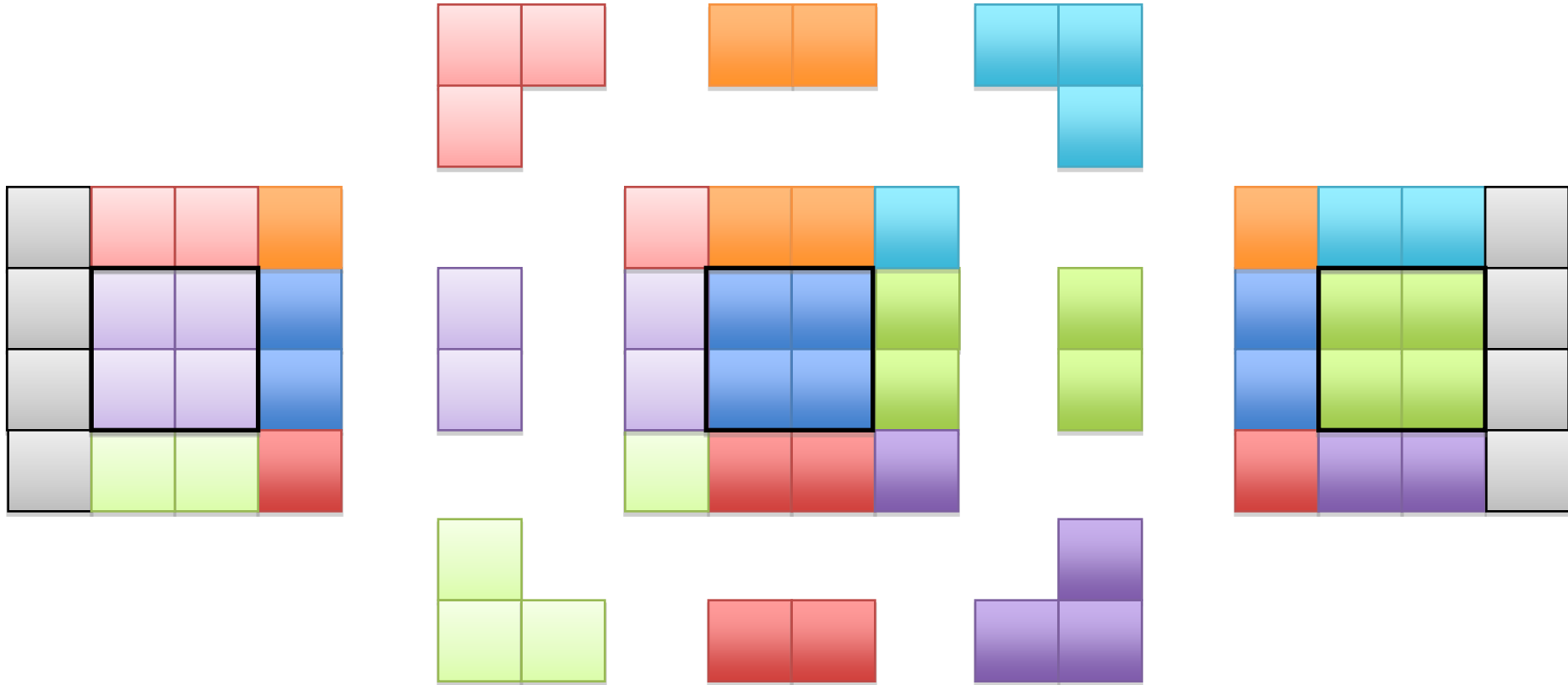


Data Partitioning Strategies

- 2D Spatial Decomposition with Overlap
- Overlap Size
- Fault Tolerance

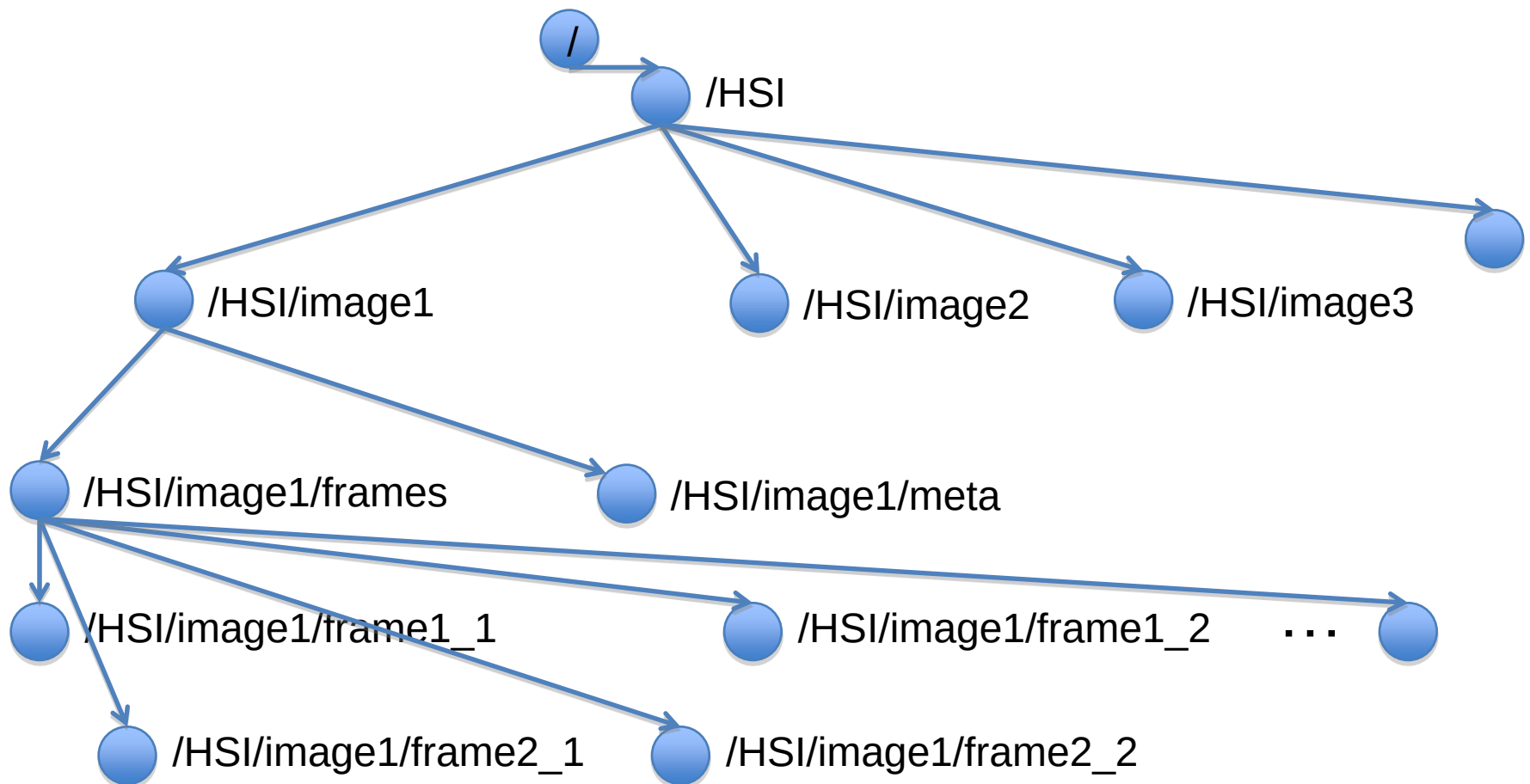


Data Partitioning Strategies



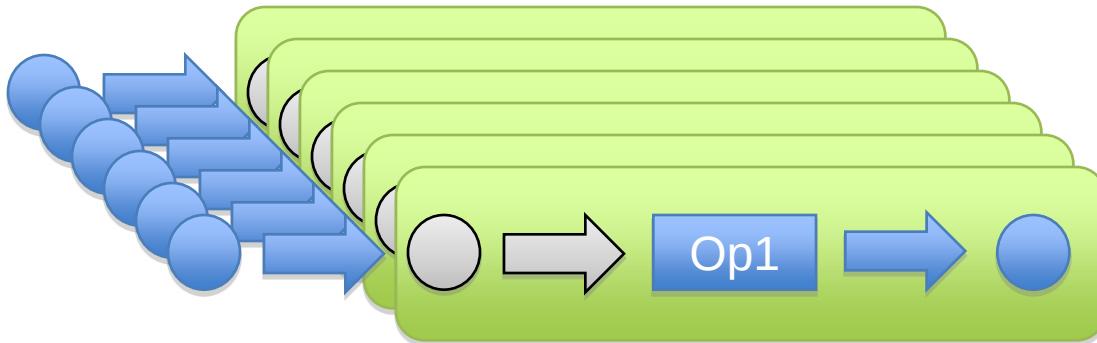
Coordination via Hierarchical Namespace

- Distributed coordination service ZooKeeper



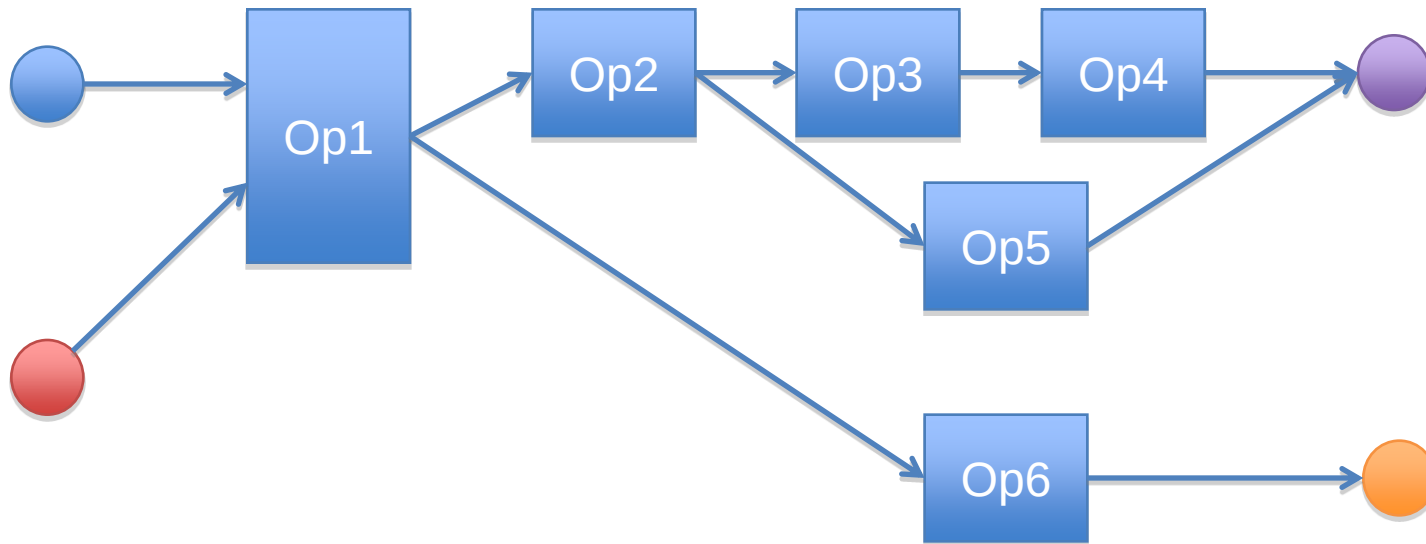
Data Processing Strategies

- **Task – One Operation**
- **Job – Graph Operations**



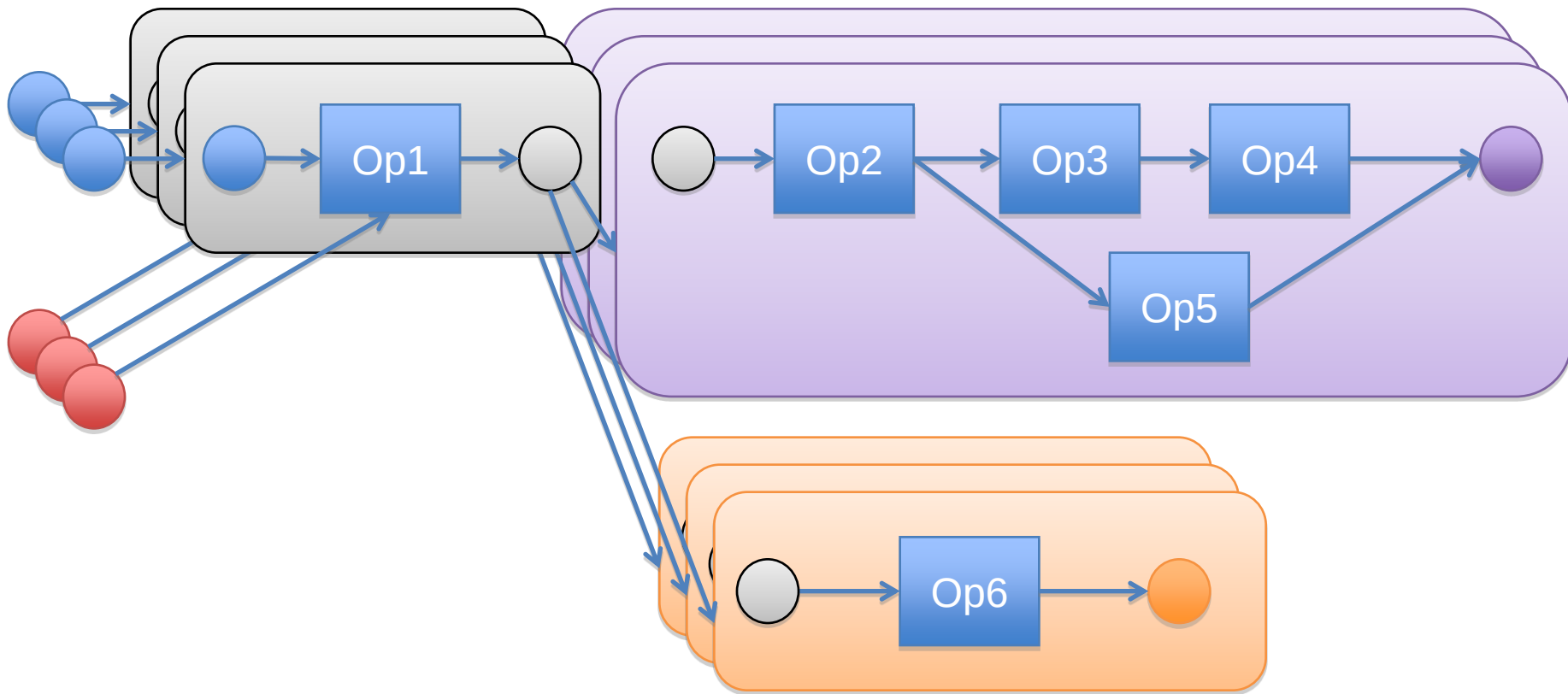
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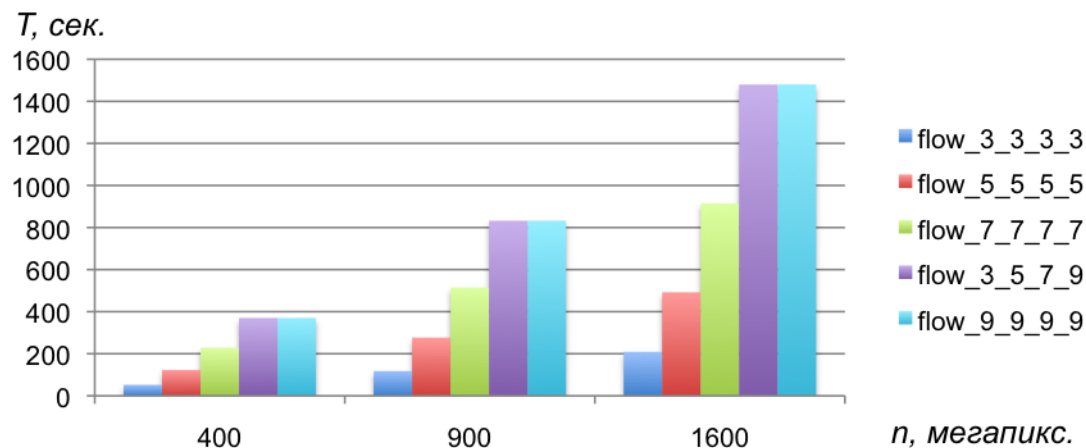
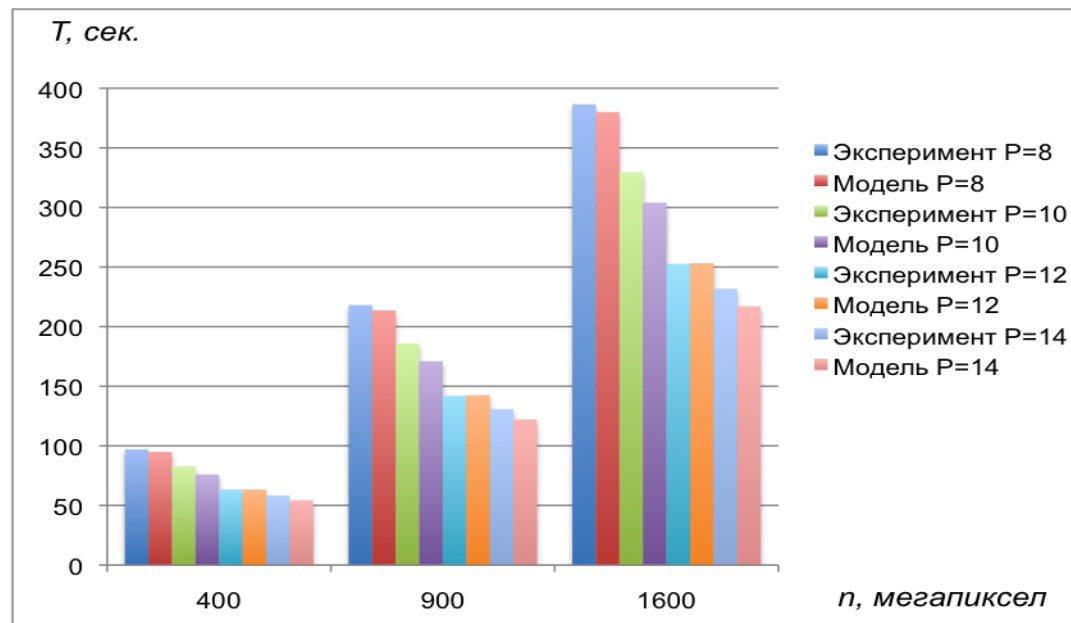
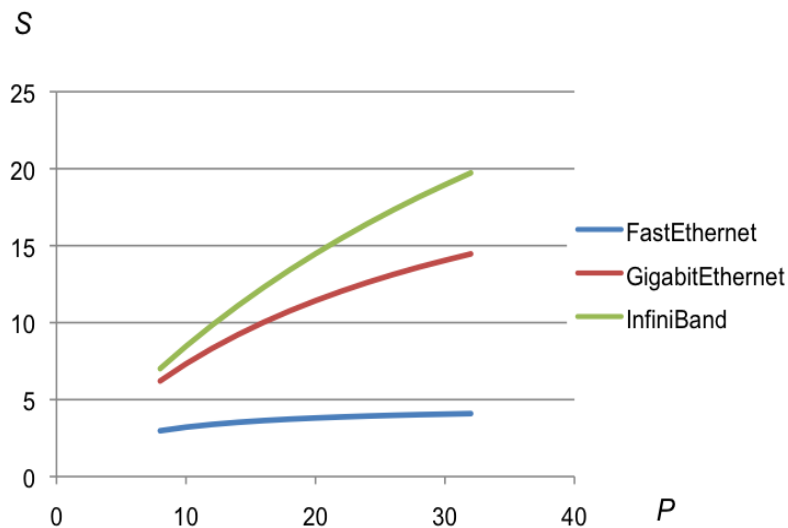


Data Processing Strategies

- Task – One Operation
- **Job – Graph Operations**



Prototype Experiments



- Questions?
- Попов Сергей Борисович
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Thank you for the attention!