Adaptive Extents-Based File System for Object-Based Storage Devices

W-K For and W-Y Xi

Data Storage Institute (DSI)

A*STAR DSI

Outline

2. Introduction
3. Object-Based Storage Device File System (OSDFS)
4. Evaluation Results

Vision

" HIGH PERFORMANCE STORAGE SYSTEM FOR e-TIME "

"To develop a real-time large-scale distributed Object-Based Storage System, where OSDFS is embedded in every OSD to furnish high performance storage devices for heterogeneous workloads."

A*STAR DSI

OSDFS Challenges

- High Throughput:
  - Provide substantial high throughput for large file-size object
- High Utilization:
  - Maintain high hard drive utilization when dealing with small file-size object
- Heterogeneous Workload:
  - Able to handle various kind of workloads

OSDFS Challenges

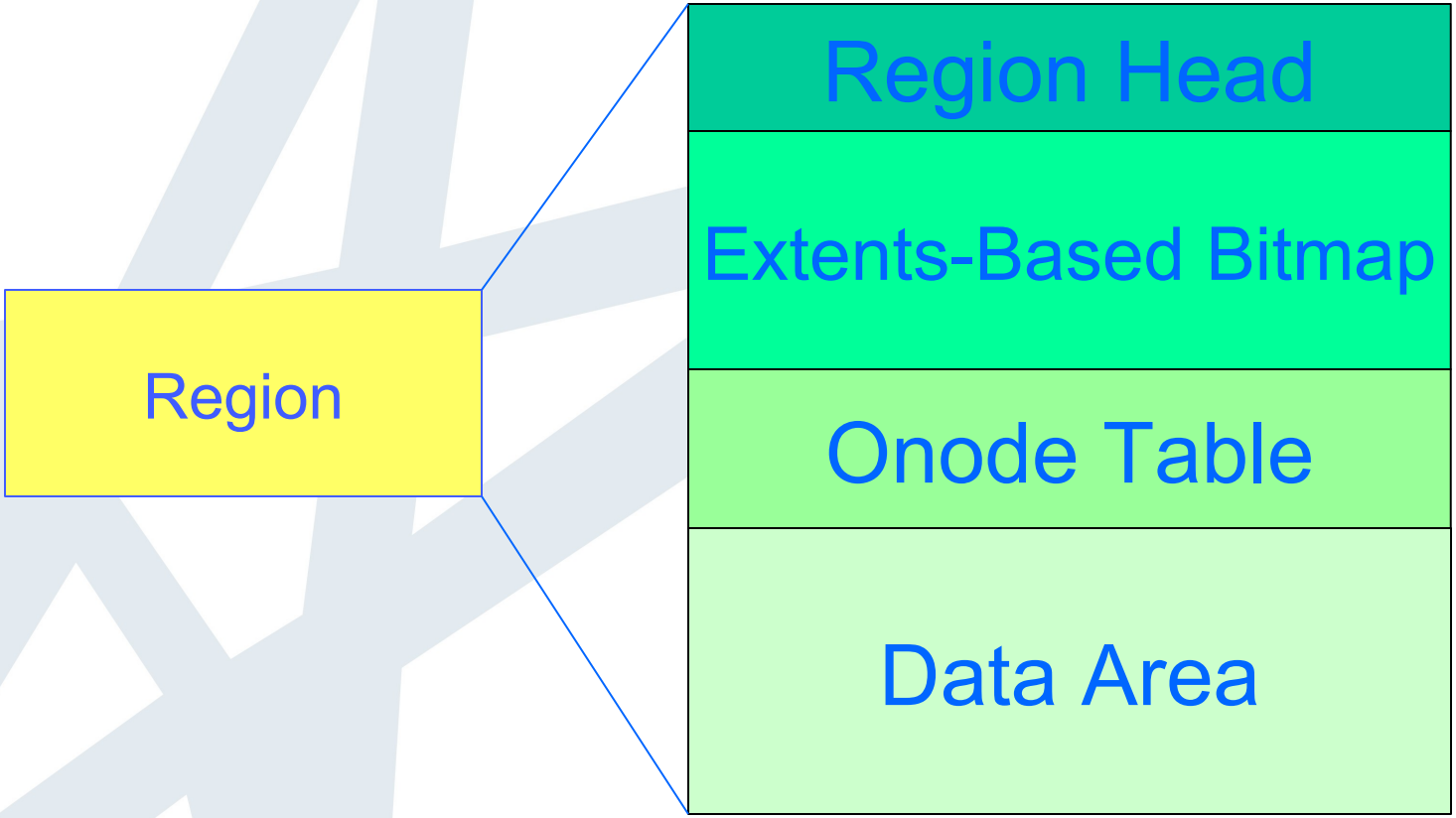
Solutions:

- Separate hard drive into regions
- Use multiple variable-size blocks concept for different regions
- Group similar size of workload into same region

OSDFS Architecture

A*STAR DSI

OSDFS Architecture



Our OSDFS Novelty

- An extent-based bitmap and onode
  - Ease for free space management and continuous free space searching
  - Storing logical block address in an extents format in onode

Our OSDFS Novelty

Onode Index	Length	30	5

Extents-Based Bitmap

Our OSDFS Novelty

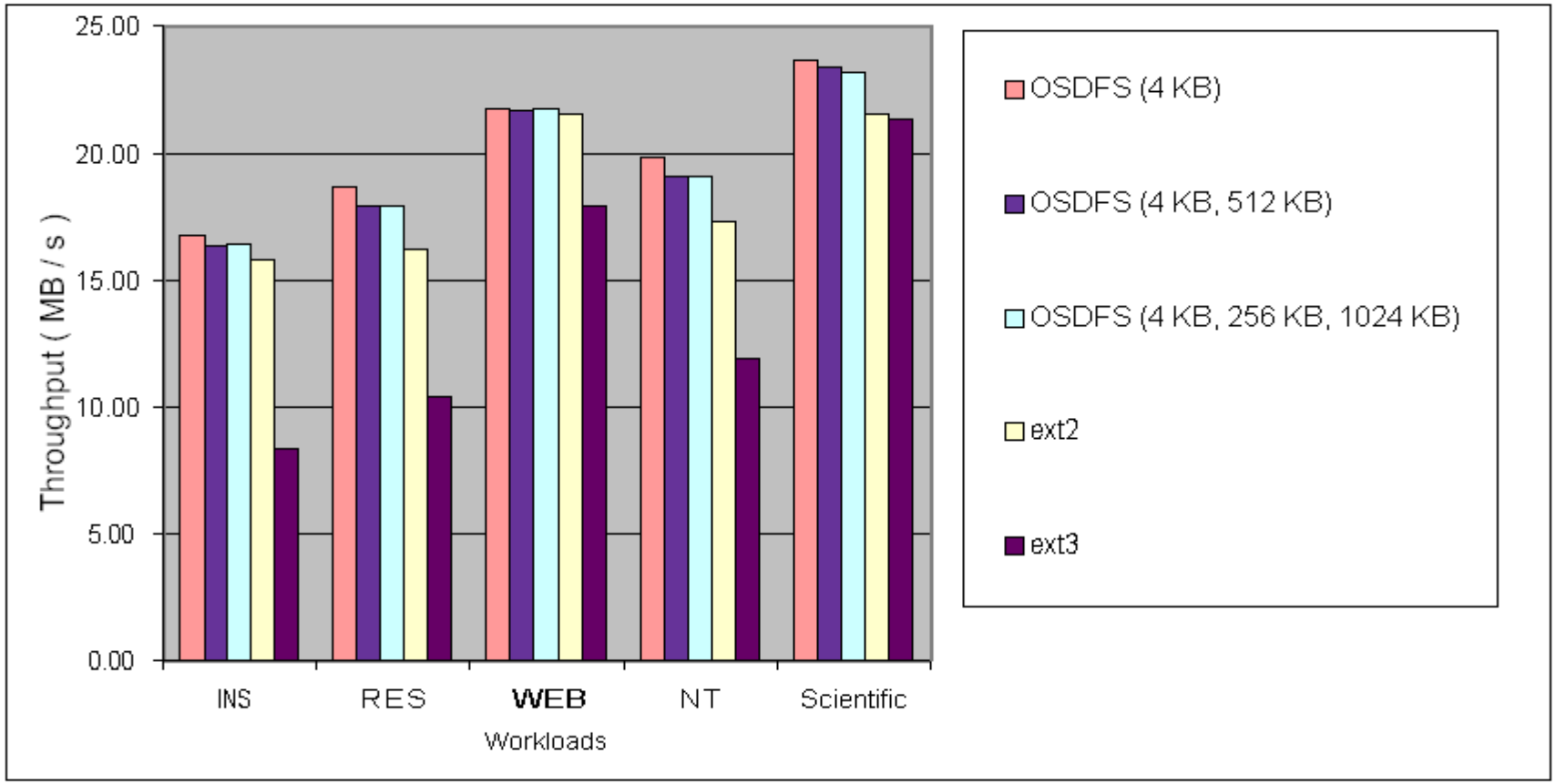
- An innovation data allocation scheme
  - Data allocated to different region based on wasted disk space scheme
  - Adaptive metadata updating scheme (either based on total requests' size or total number of request)
  - Continuous free space searching using extents-based bitmap

A*STAR DSI

Our OSDFS Novelty

- Data searching using embedded-Metadata Onode ID
  - Location of continuous data in a disk can be calculated based on the metadata embedded in Onode ID
  - Avoid reading data from onode table which will involve a seek time

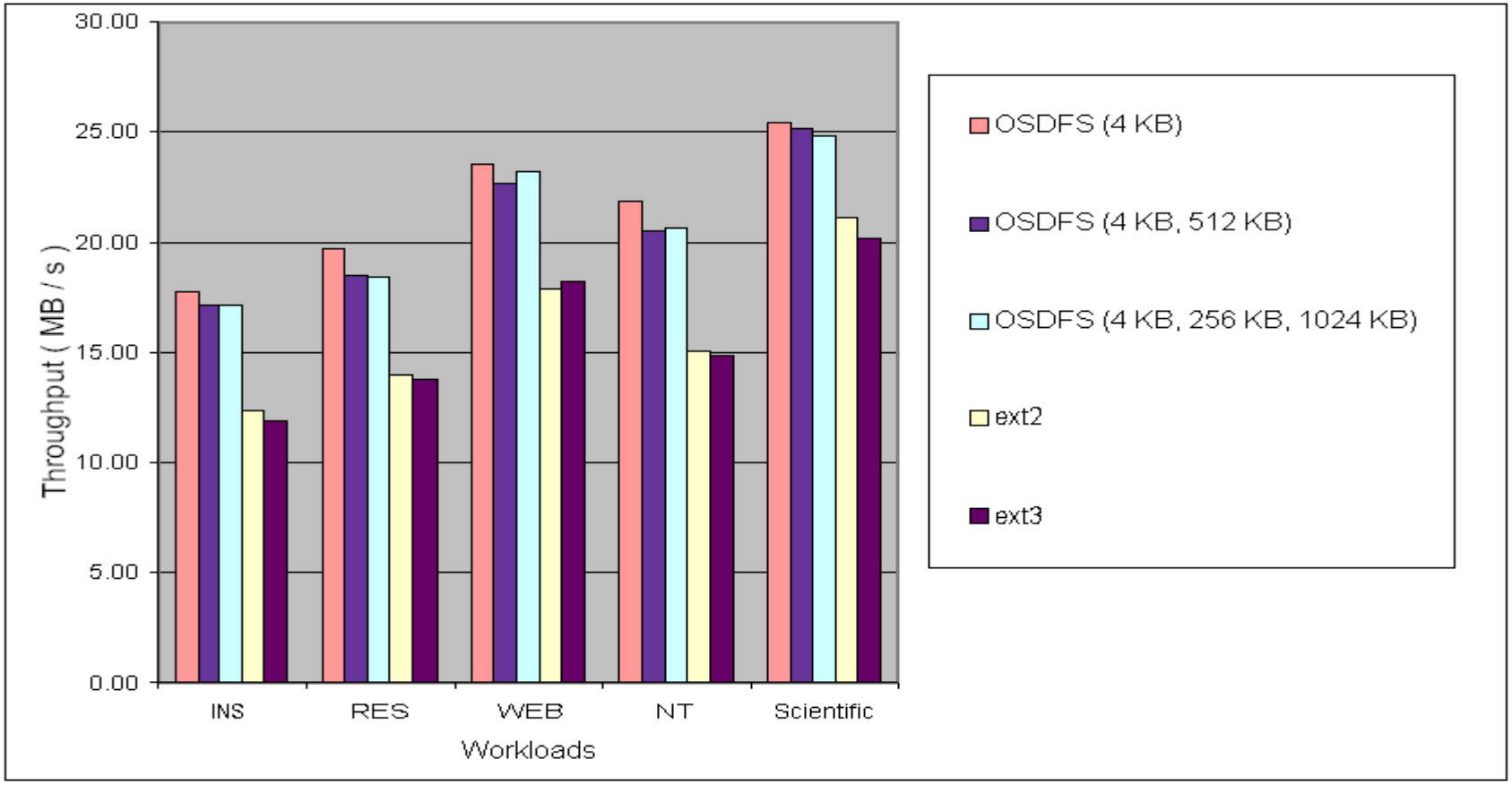
Evaluation Results



WRITE Request

A*STAR DSI

Evaluation Results



READ Request

A*STAR DSI

Thank you

A*STAR DSI