WebSphere eXtreme Scale as a Use Case for Packed Objects

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WebSphere eXtreme Scale

- "Elastic, scalable, in-memory data-grid"
  - Provides a data grid to store data
  - Huge amount of features, especially suited for scalability

Packed Objects[1]

- Improves serialization and I/O of Java objects
  - Reduced headers & references
  - In-lined data allows for optimal caching and pre-fetching
- Allows direct access to "native" (off-heap) data
  - Elimination of data copies
- Allows for explicit source-level representation of compact data-structures
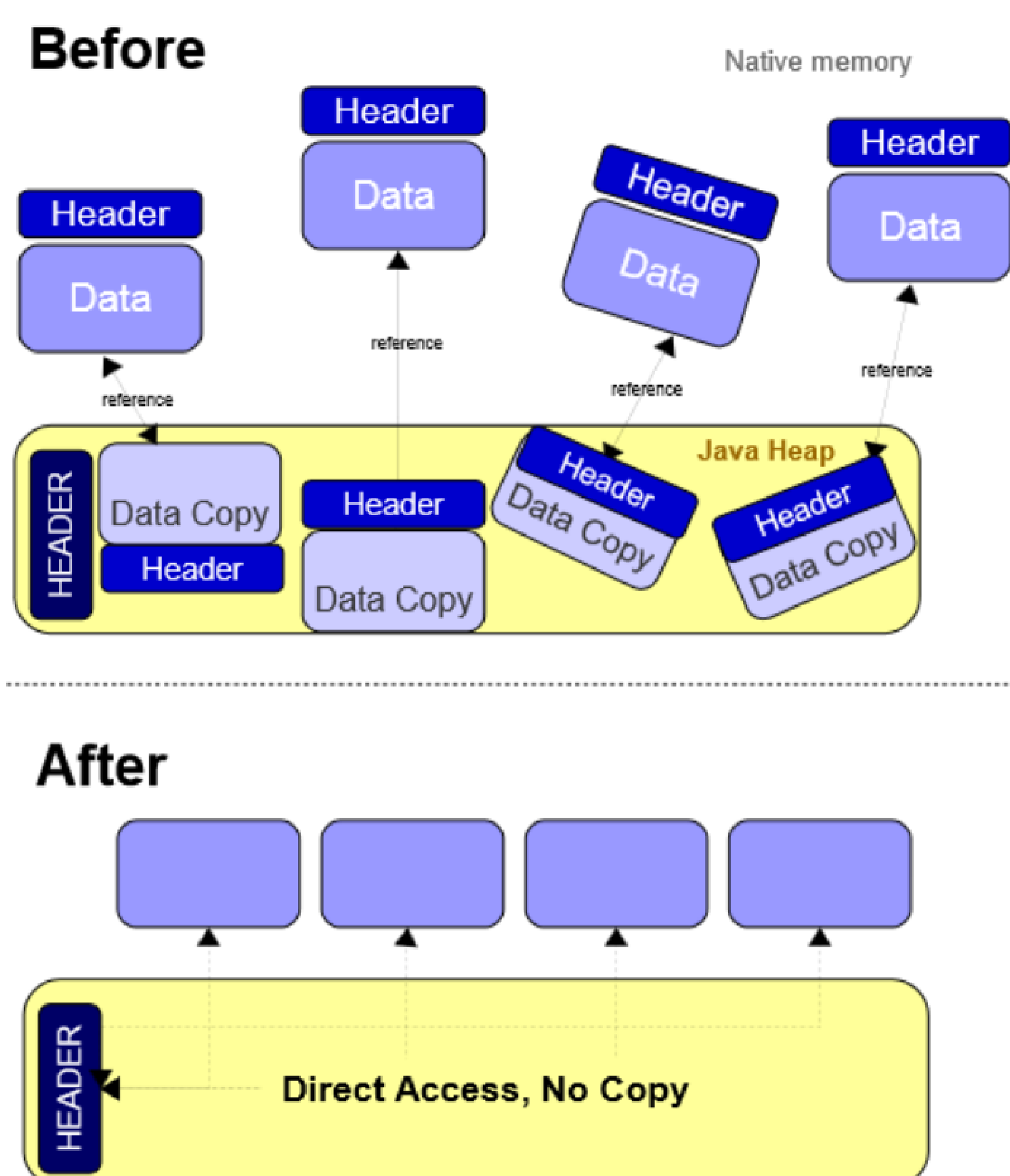
[1]PackedObject is an experimental feature in IBM J9 Virtual Machine

Project Goal

- Establishing a proof-of-concept for packed objects
  - Modifying *WebSphere eXtreme Scale* by implementing packed objects
  - Measuring and validating the potential gains
- *IBM's WebSphere eXtreme Scale* application serves as a suitable use case for packed objects
  - Heavy use of off-heap memory
  - Packed objects promise performance gain and reduced memory footprint especially for off-heap usage
  - *WebSphere eXtreme Scale* is a product by *IBM*
    - Used by a lot of customers
      - Relevant, commercial product
      - Improvements could lead to direct benefits to customers
    - Internal knowledge about the product is available

```
@Packed
public final class PackedPrimitives {
    public byte byteField;
    public boolean booleanField;
    public char charField;
    public float floatField;
    public double doubleField;
    public long longField;
}
                                  //allocate an on-heap Struct object
                                  PackedPrimitives pp = new PackedPrimitives();
                                  pp.byteField = 0x20;
                                  pp.booleanField = true;
                                  pp.charField = 'a';
                                  pp.floatField = 2.50f;
                                  pp.doubleField = 7.12;
                                  pp.longField = 25034234;
```

Evaluation

- Evaluation of performance and memory footprint improvements
  - Setting up suitable test-cases
  - Profiling *WebSphere eXtreme Scale* before and after modifications
  - Comparison and interpretation of results

Outlook

- If concept of packed objects can be proven successful
  - Shows the high potential of packed objects for optimizing certain types of Java applications to a substantial degree
  - Might lead to more attention and further research on packed objects

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