View Transactions and the Relaxation of Consistency Checks in STM

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Motivation

- Read-write conflicts may not imply a true program-level conflict.

- Want to let such cases commit too.
Past approaches

• Relax STM consistency checks.
  – How conflicts are detected & handled.

• Early release [HLMS 03], Elastic transactions [FGG 09].

• Responsibility for correctness shifted to programmer.
Our goal

- Ease of use and reasoning
- Relaxed models
- View Txns

Performance vs. Ease of use and reasoning
View transactions model

• Txns operate on **consistent snapshot** (opacity).

• Ok to **light read** a stale (consistent) value, using multi-versioning.

• Can reread location if we decide it should be verified.
Obtaining serializability

- **List contains() operation:**

![Diagram showing list operations and Not found! message]

T1
Critical views

- Execution on commit snapshot yields the same result as real execution → Serializable.
- Only check consistency of programmer-identified view.
View pointers

- Try to automate view detection.
View txns allow composition

- *contains()* result checked at commit time.

- <10 minutes to apply in STAMP.
View txns simplify reasoning

• No violations of sequential invariants.

• Easier to argue correctness.
Flexibility

- Consistency checking controlled by programmer.
- Can emulate rules of models like elastic txns.
- Still maintaining ability to compose.
## Summary

<table>
<thead>
<tr>
<th></th>
<th>General</th>
<th>Snapshot</th>
<th>Composable</th>
<th>Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early release</td>
<td>yes</td>
<td>maybe</td>
<td>yes</td>
<td>without snapshot</td>
</tr>
<tr>
<td>Elastic Txns</td>
<td>dictated by model</td>
<td>x</td>
<td>sometimes</td>
<td>yes</td>
</tr>
<tr>
<td>View Txns</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
</tbody>
</table>
Conclusion

- Performance
- Ease of use and reasoning

- Relaxed models
- View Tx
- TM

Ease of use and reasoning

Performance