Incremental Consistency Checking for Distributed Configuration Stores

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A thesis submitted in fulfilment of the requirements
for the degree of Doctor of Philosophy

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2026

Declaration

I declare that this thesis is my own work, that it has not been submitted for any other degree or professional qualification, and that all sources of information and all quotations, whether direct or paraphrased, have been acknowledged in the text and in the bibliography.

Priya Raghunathan

Date

Abstract

Distributed configuration stores accept writes from many independent services, each of which validates its own subtree against a schema that other services never see. Whole-store consistency checks therefore run in time proportional to the whole store, and are too slow to gate a write.

This thesis develops an incremental checking algorithm that revalidates only the subtrees a write can affect, derived from a static dependency analysis of the schema set rather than from runtime instrumentation. On a production trace of 2.1 million writes the algorithm reduces median validation latency from 340 ms to 4 ms while rejecting exactly the same writes as the whole-store check, and we prove the two are equivalent for any schema set without cyclic cross-subtree constraints.

Acknowledgements

Thank the people who made the work possible: your supervisor, your funders (most funding bodies require an explicit grant number here), your colleagues, and whoever read the drafts.

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List of Tables

1.1 A caption goes above a table; memoir puts it there by default. 1

Chapter 1

Introduction

Replace this chapter with your own. The point of this starter is everything above: the front matter is the part a thesis regulation is prescriptive about, and it is now in place and editable.

1.1 Motivation

Cite as usual [Knuth, 1984]. Cross-references work the same way: see Chapter 1 and Table 1.1.

1.2 Contributions

Table 1.1: A caption goes above a table; memoir puts it there by default.

Method	Median latency (ms)	Writes rejected
Whole-store check	340	11 482
Incremental check	4	11 482

Figure 1.1: A caption goes below a figure. Replace the rule with `\includegraphics`; it is here only so the list of figures has an entry to show.

Figure 1.1 is referenced so the cross-reference resolves.

Chapter 2

Background

Set up the ideas the rest of the thesis depends on.

Chapter 3

Conclusion

Say what it means.

Bibliography

Donald E. Knuth. *The TEXbook*. Addison-Wesley, Reading, Massachusetts, 1984.