

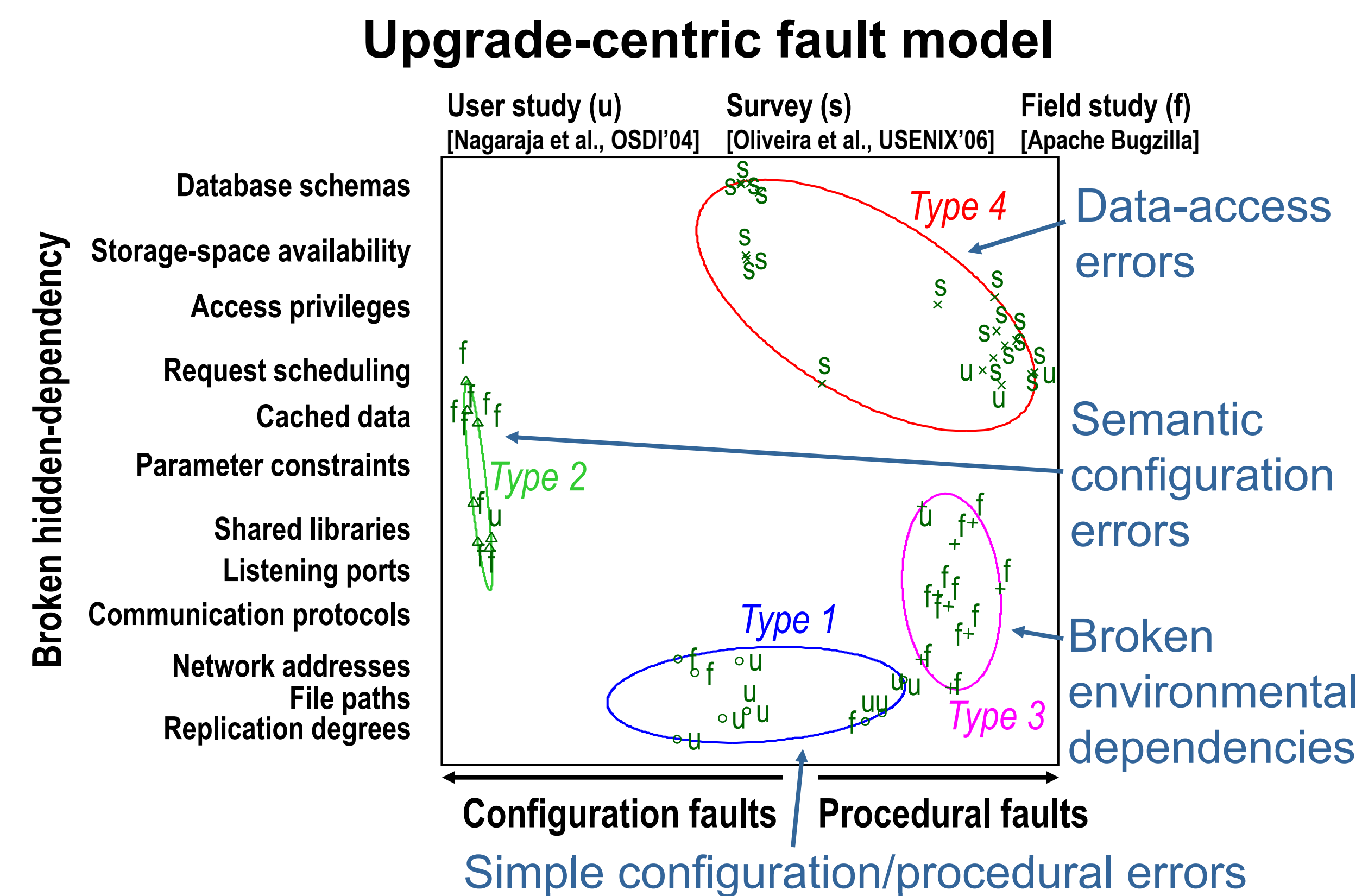
# Dependable, Online Upgrades in Enterprise Systems

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Software upgrades are unreliable, often causing downtime or data loss.

## Leading Causes of Upgrade-Related Downtime

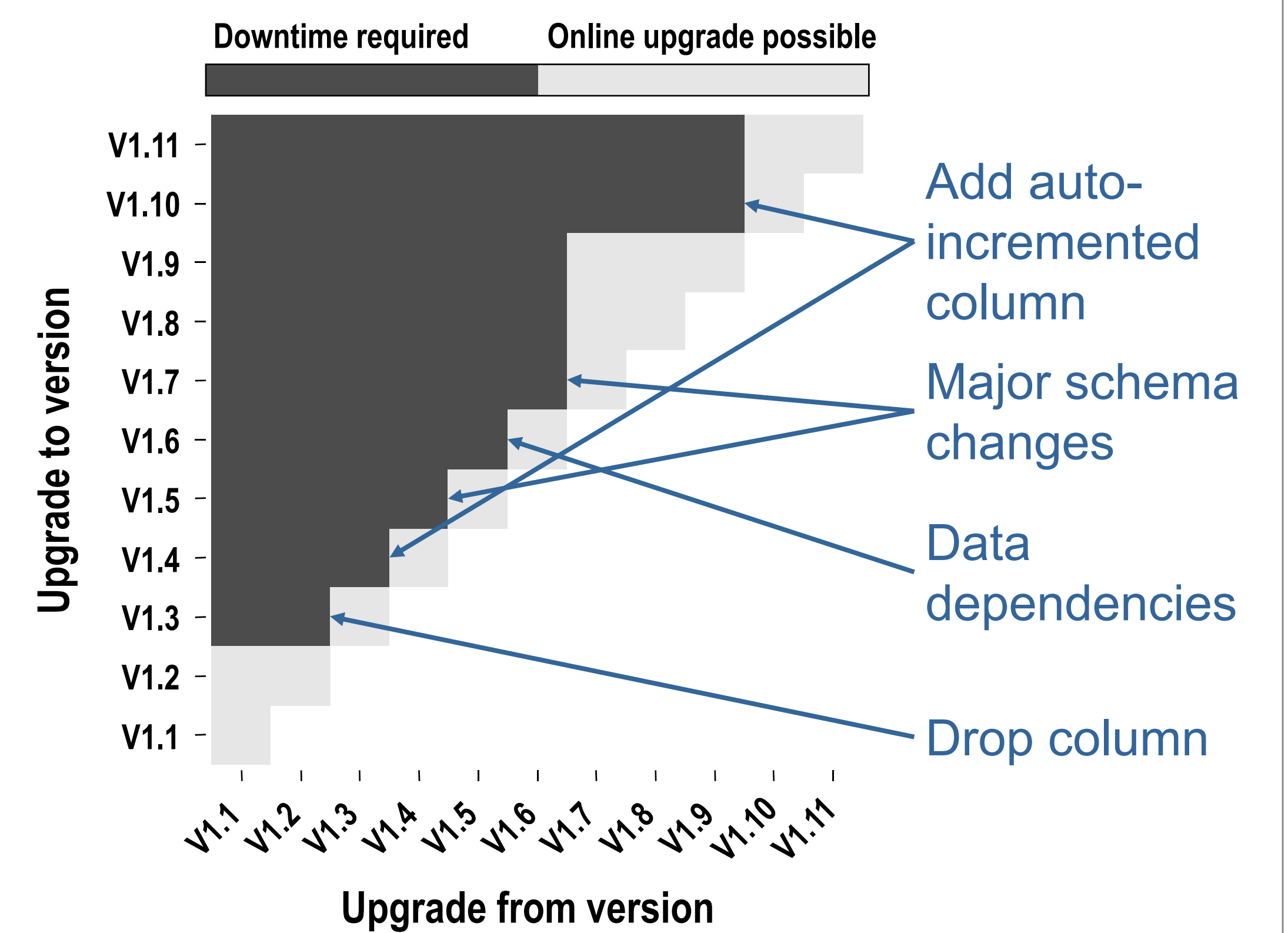


**Unplanned downtime:**  
• Broken dependencies

**Planned downtime:**  
• Data migrations

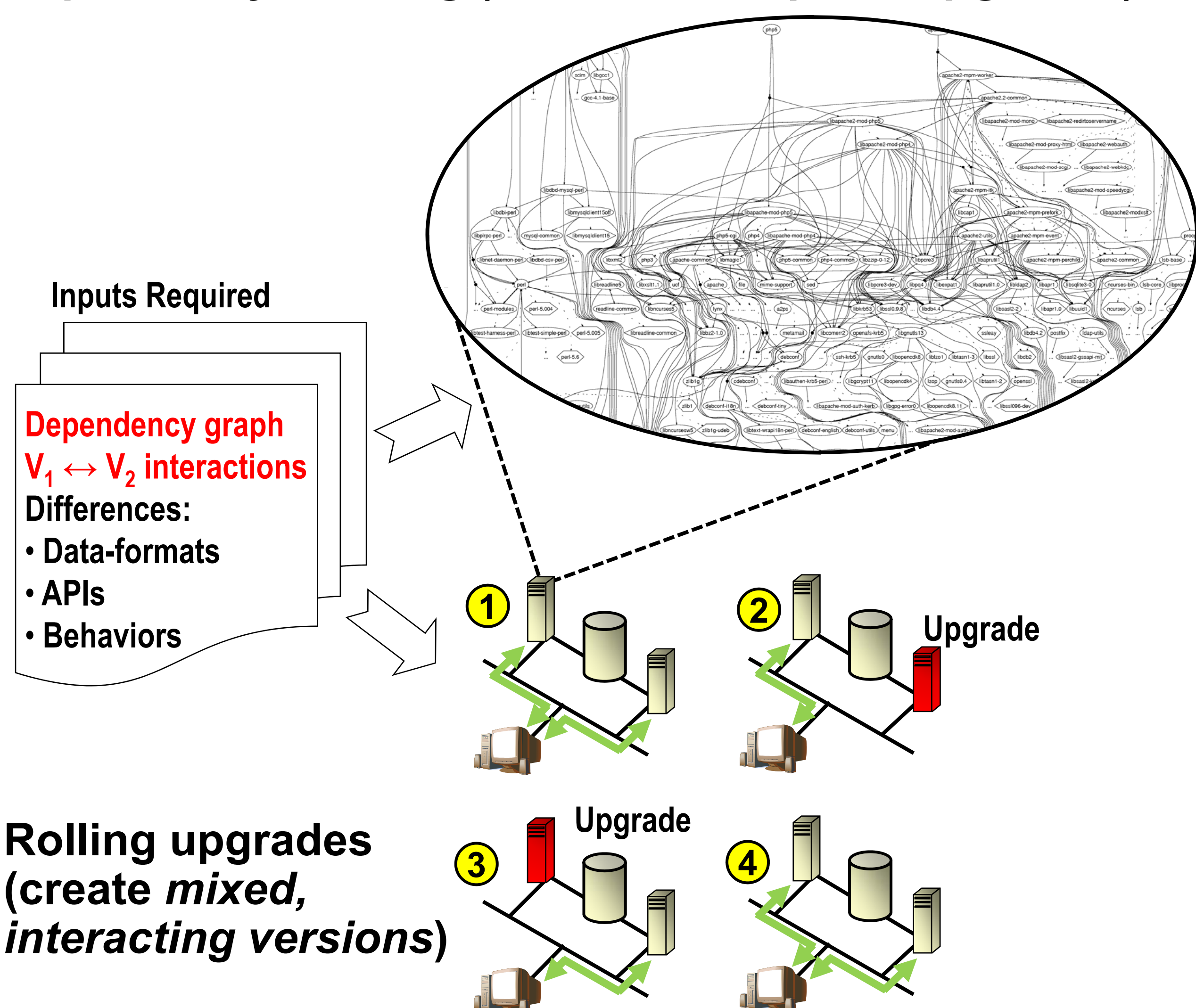
## Wikipedia's Upgrade History

[Curino et al., ICEIS'08][Wikipedia Village Pump]



## Current Approaches

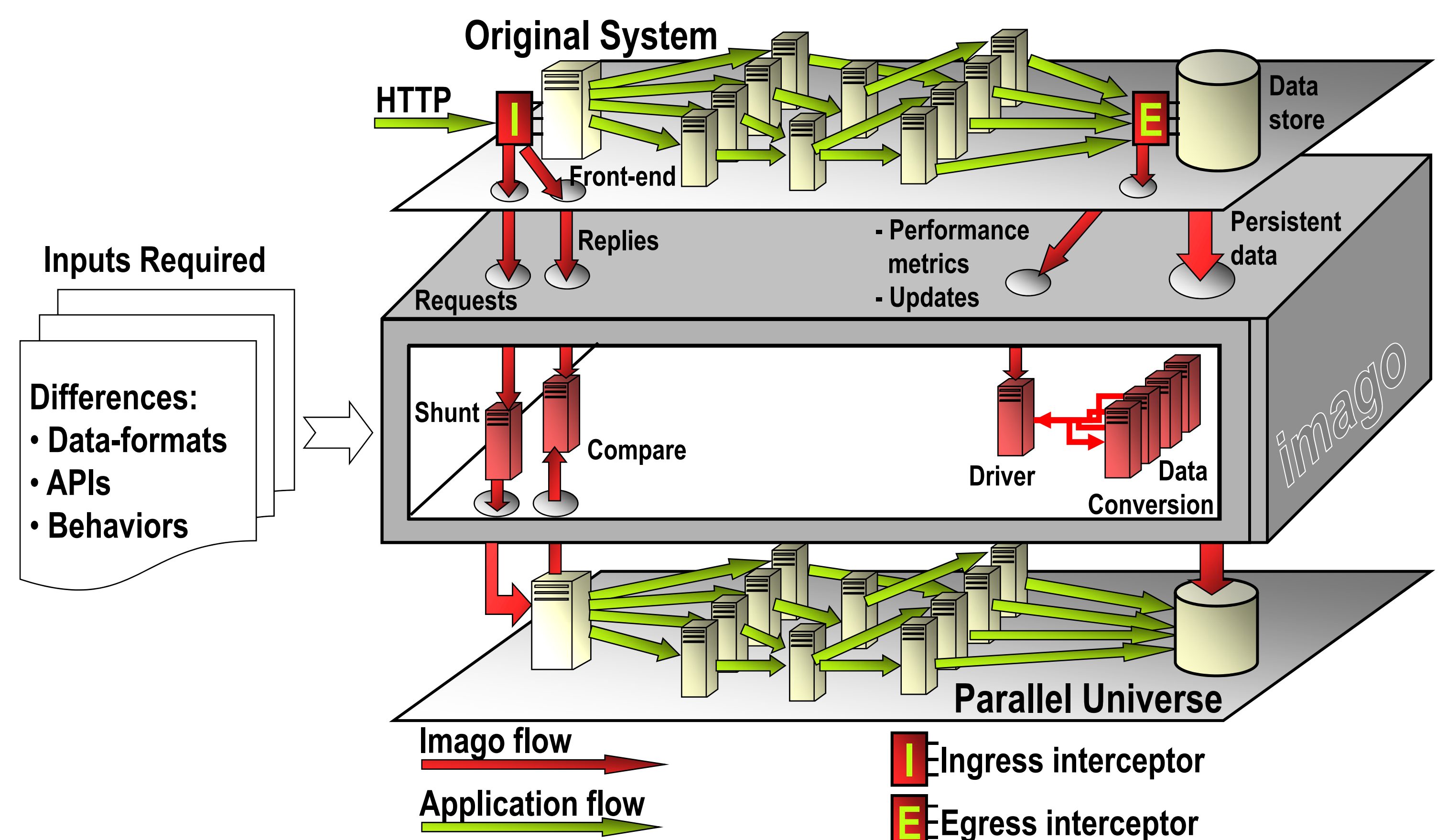
- Dependency-tracking (needed for *in-place upgrades*)



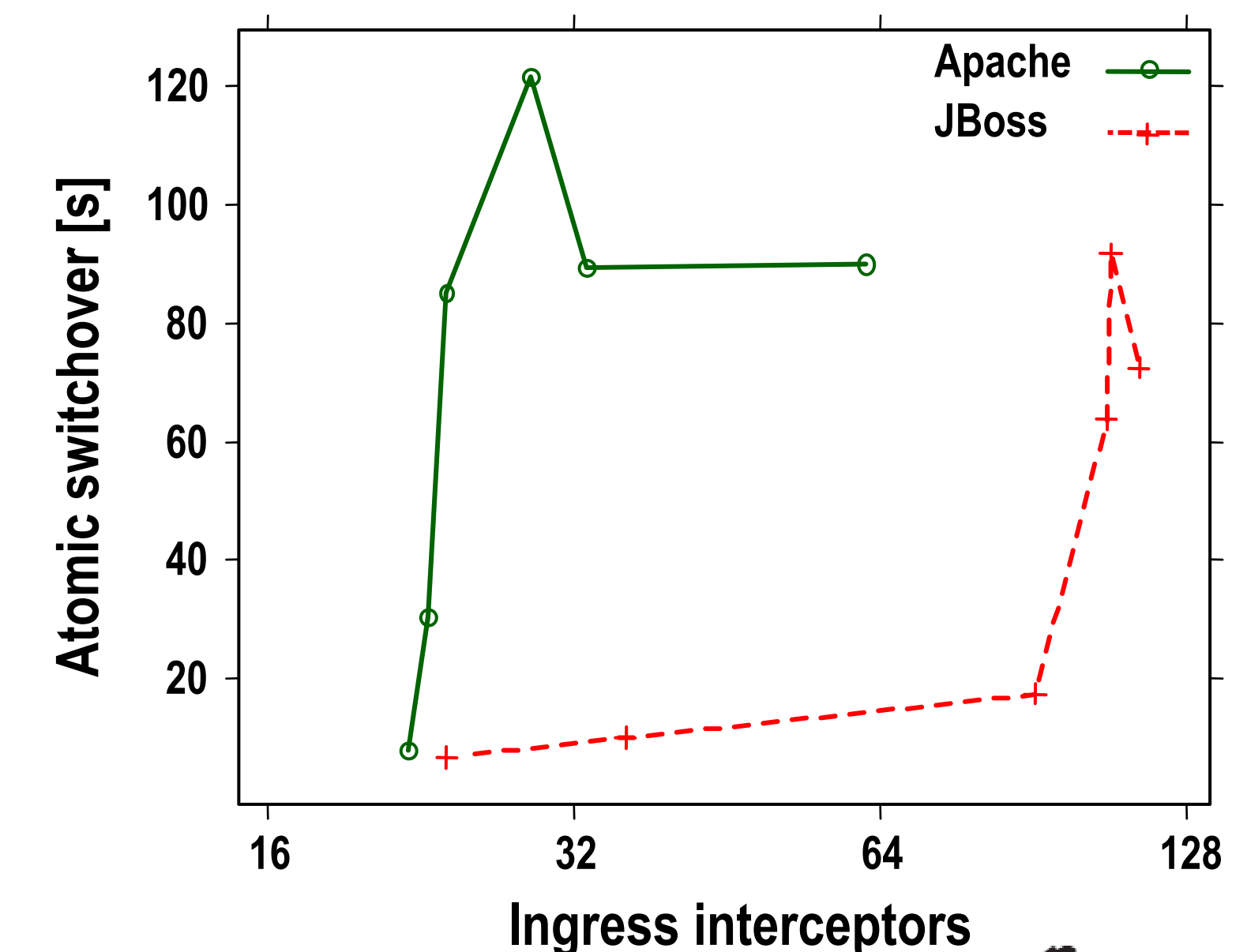
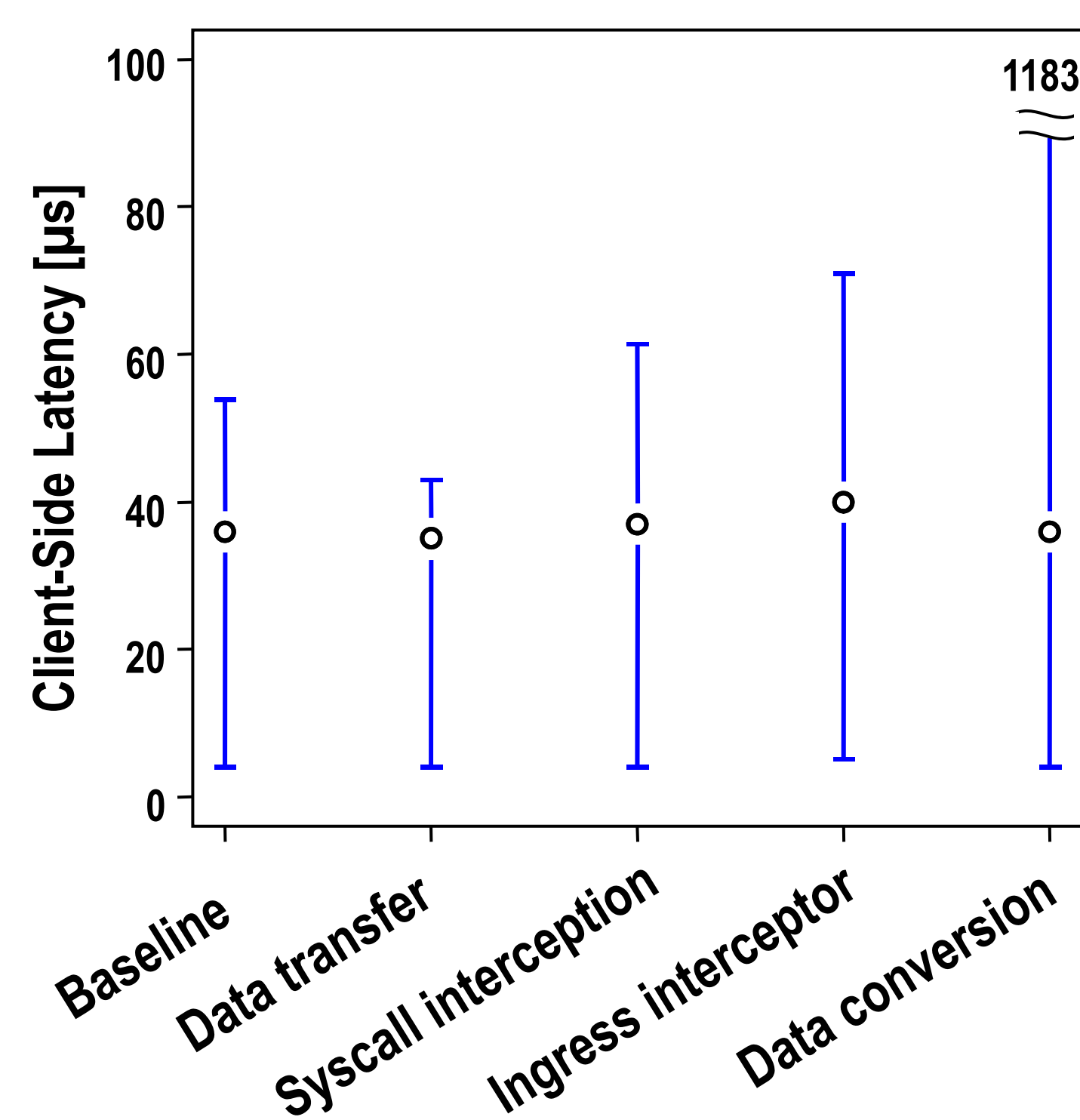
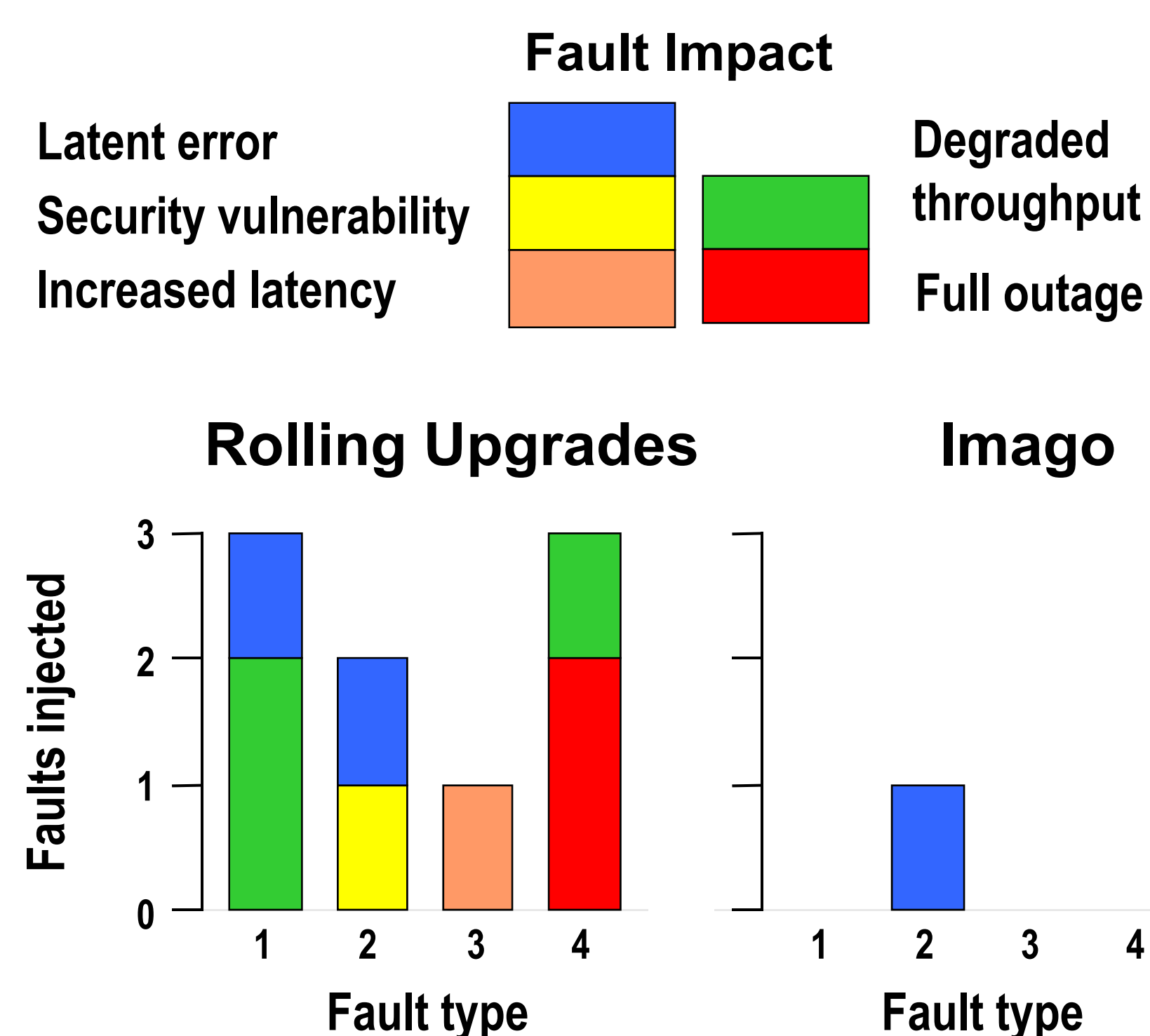
- Rolling upgrades (create *mixed, interacting versions*)

## Imago: Dependable, Online Upgrades

- **Isolation:** does not modify the dependencies of the production system
- **Atomicity:** either the old or the new version is available
- **Fidelity:** testing & deployment environments are identical



## Experimental Evaluation\*



Carnegie Mellon \*Experiments conducted with Rice University Bidding Server (RUBIS)

Parallel Data Laboratory

