

# Dexter: Faster Troubleshooting of Misconfiguration Problems Using System Logs

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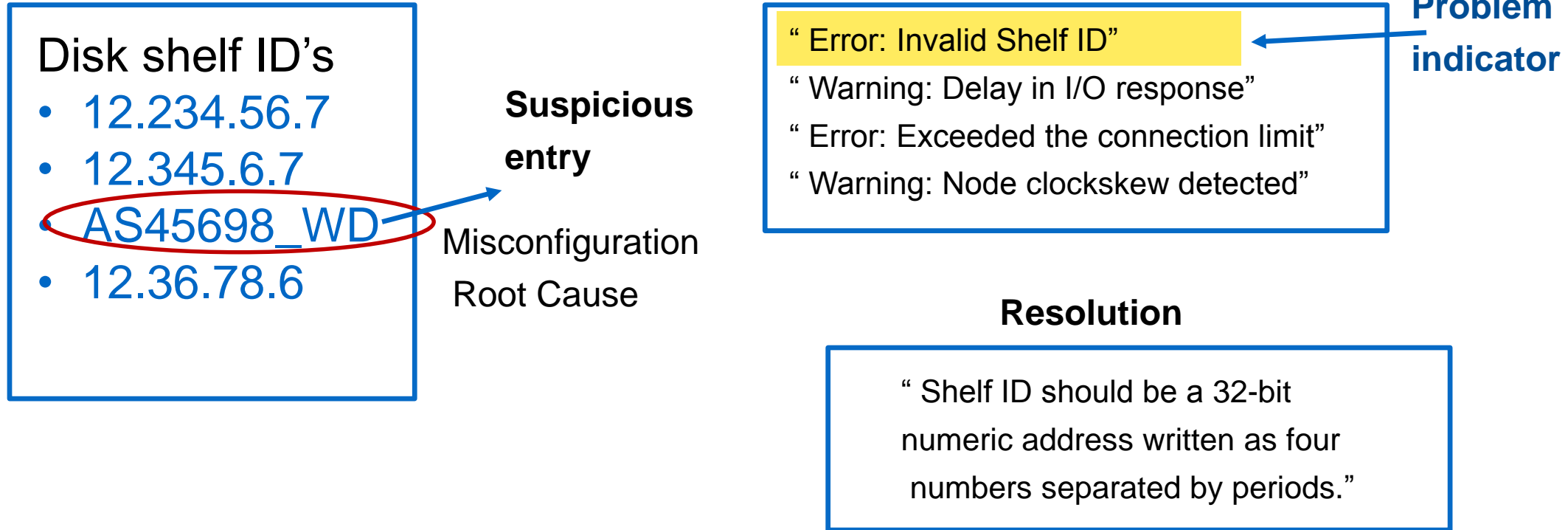
Presented at SYSTOR 2017



# Software Misconfigurations are a big deal!

- There is a much sprawl: nearly 2K options in Firefox and over 36K options in LibreOffice
- Complex interaction between configuration settings and execution environment renders the configuration effort difficult and error-prone
- Significant portion of the operational cost (over 70%) is made up by people costs
  - Change of hands via escalations
  - Communication logistics

# Misconfiguration troubleshooting workflow



***Dexter is a misconfiguration troubleshooting tool!***

# Dexter Spotlights

Dexter's role is two-fold

## Problem Spotlights



*Ranked list of system log messages, one or more of which correlate with the ongoing misconfiguration problem.*

## Resolution Spotlights



Heuristically derived possible solutions to the given misconfiguration problem by mining the command history logs of the system.

**Note:** AutoSupport<sup>®</sup> is a digital exhaust of system operations from various customer installations, sent back to NetApp periodically.



# Problem Spotlights

# Extracting System Log features (metrics)

Dexter considers the following features:

1. Reported timestamp
2. software module and/or sub system which logged the message
3. The actual error message
4. Message severity.

A sample Apache HTTP server log

```
[Fri Sep 09 10:42:29.902022 2011] [core:error] [pid 35708:tid 4328636416] [client 72.15.99.187] File does not exist: /usr/local/apache2/htdocs/favicon.ico
```

# Finding Problem Spotlights

Metrics that matter

## Log Metrics defined by Dexter:

- **Message Recency:** messages temporally correlated with the problem are potential clues
- **Message Severity:** messages with higher severity are more concerning than a warning message
- **Message Frequency:** more frequently appearing error message which is also recent is possibly correlated

**Ranked list of log messages is presented to the support engineer**



# Resolution Spotlights



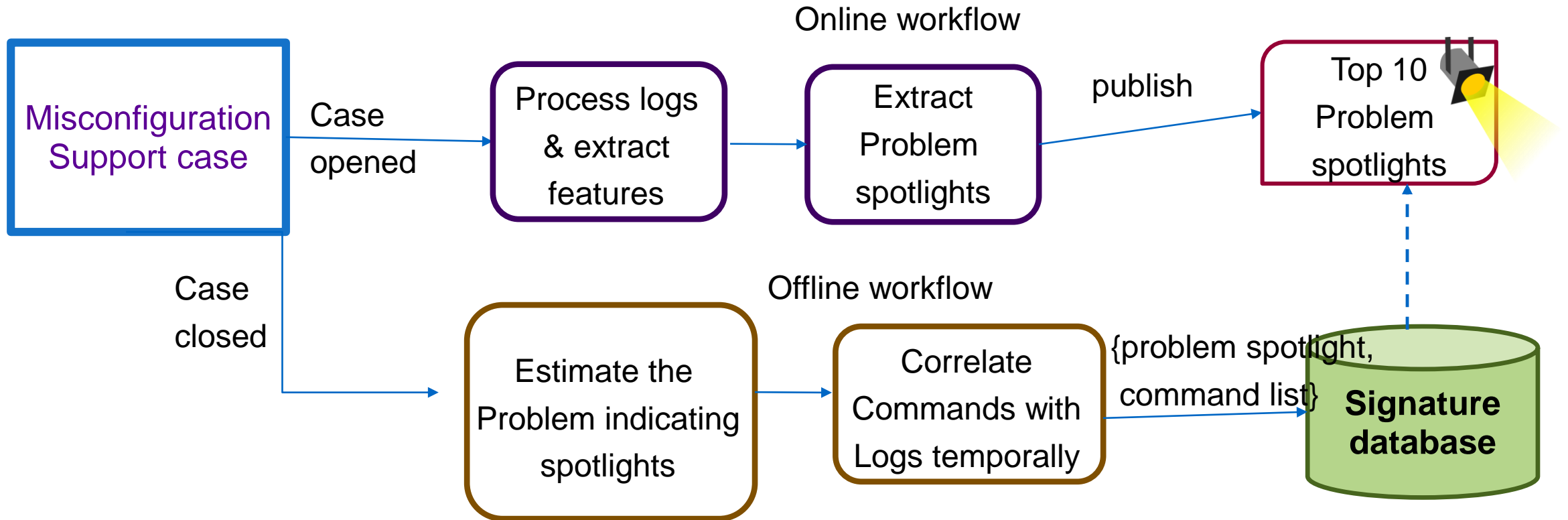
# Resolution Spotlights

A heuristics approach for offline resolution prediction component

- 1) Dexter checks for disappearance of problem spotlights post case closure in the system logs.
- 2) Correlates disappearance of problem spotlights with:
  - Execution of a new command
  - Re-execution of the new argument or an option with a new value.
  - And time correlation of the command execution with the message disappearance.

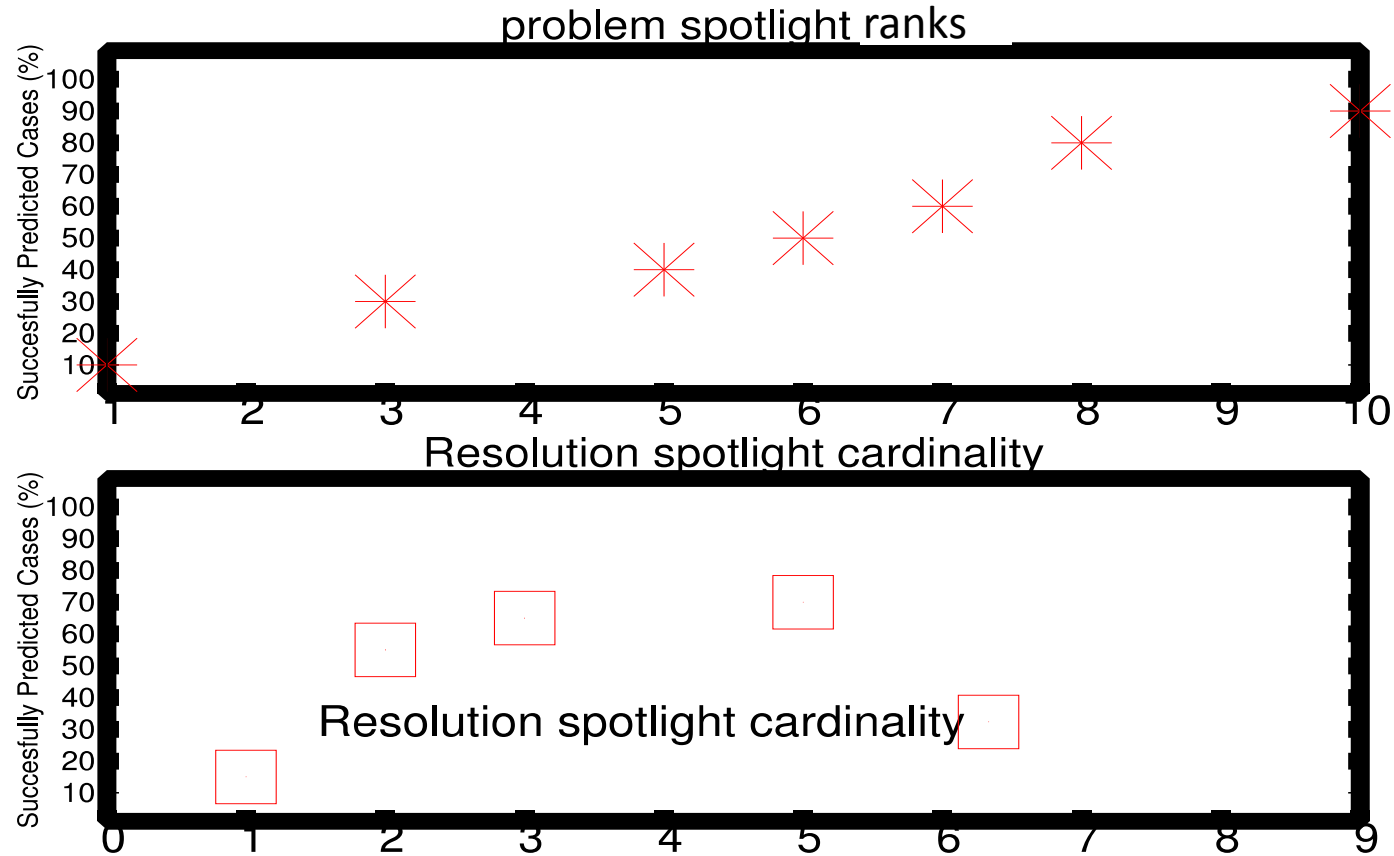
# Dexter Workflow

online and offline components



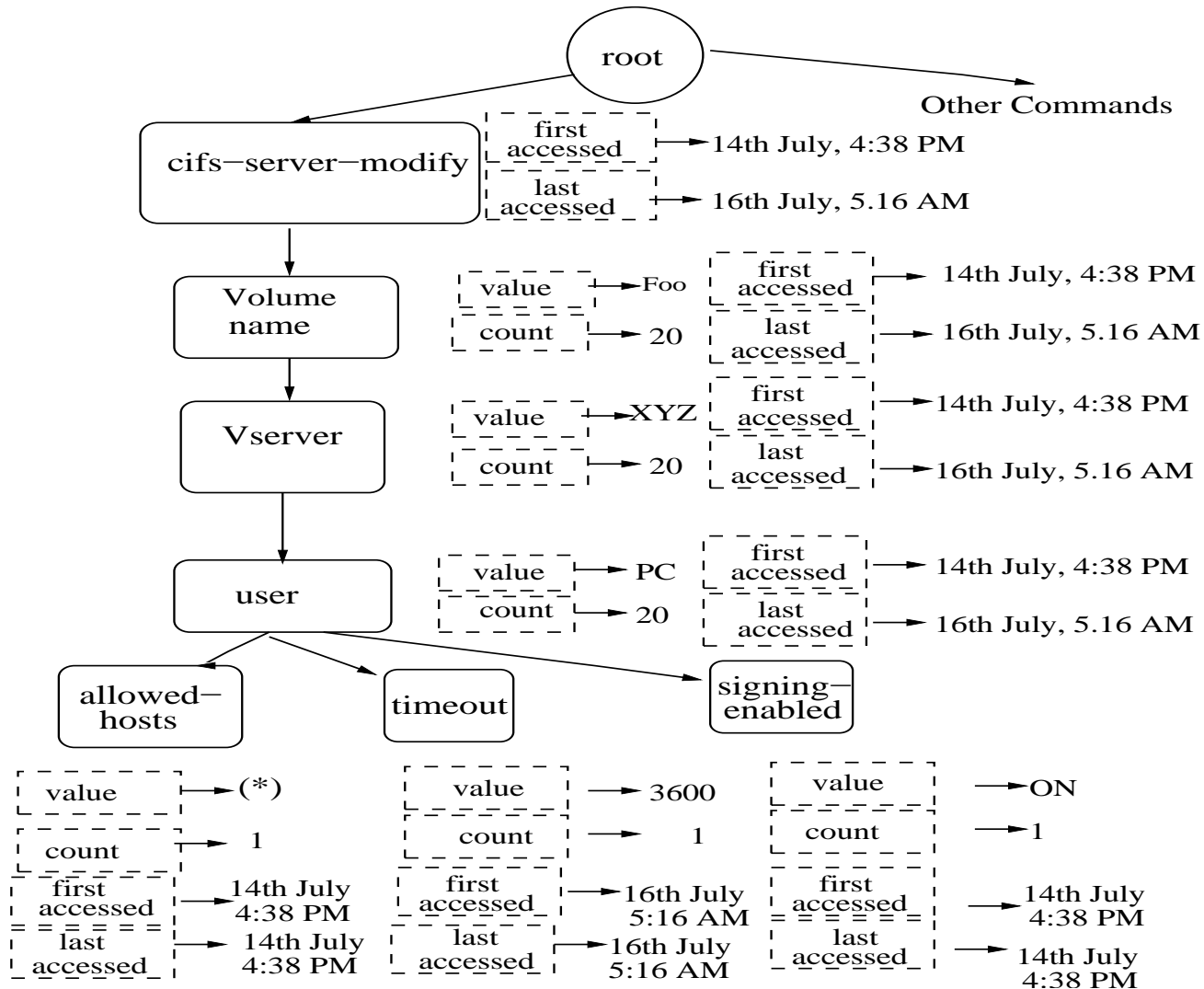
# Results

Validation on a sample set of 600 cases.



# Q&A

# An example of resolution prediction.



# Evaluation Criteria

## Effectiveness of Dexter

### Problem Spotlights

Dexter posts the *top 10* problem spotlights to the misconfiguration support case

- AutoSupports were enabled and available
- The problem indicating log message:
  - was contained (Recorded) in the logs
  - was ranked within the top 10 log messages for the system at the time Dexter was invoked.

### Resolution Spotlights

All (- pre-filtered) correlated commands are presented as a possible solution

- AutoSupports were enabled and available
- The solution indicating command log:
  - was contained (Recorded) in the command history logs.