PDA: A Tool for Automated Problem Determination

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OVERVIEW

- Motivation
- Solution Approach
- Problem Characterization
- High Level Design of PDA
- Problem Determination Experiences with PDA
- Strength & Weakness
MOTIVATION

- Problem management process – complicated
  - Problem Report -> Diagnosis -> Solution
- Proposed & developed an automated tool for System Administrators
  - Problem Determination Advisor (PDA)
- Why?
  - Reduction in the time & effort

SOLUTION APPROACH

- Problem characterization
- Automated tool for problem diagnosis
OVERVIEW

- Motivation
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- **Problem Characterization**
  - Information Collection
  - Observations
- High Level Design of PDA
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PROBLEM CHARACTERIZATION

- Only 1 phase: Information Collection
- Input: Problem tickets
  - Sources of information
  - Contains – problem description, name of the affected system, timestamp, severity, identity of the System Admin handling the request etc.
- Goal: Derive statistical characteristics
  - Which application?
  - What are the most common causes?
  - Is it an application or OS level issue?
  - How much time spent in resolving?
INFORMATION COLLECTED

- Product information:
  - Name: Windows
    - Component: Explorer
      - Module: Navigation, move/copy files, search
  - Ticket type:
    - Ex. Error / Performance / Info
  - Cause code:
    - Useful when component and modules are not specific.

OBSERVATIONS

- Most of the tickets arise from a few products
- Within each product, most of the problems come from a few modules
- OS tickets are not as prominent
  - Exception: Windows related tickets comprise 11% of all tickets
  - However, most difficult and require significant effort to diagnose
  - Interesting: Unix related tickets require most effort and time
- Focus of PDA:
  - OS problems on UNIX platform
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HIGH LEVEL DESIGN OF PDA

- Two level approach:
  - Level 1: Periodic subsystem health monitoring
  - Level 2: Exhaustive Probing
- Probing:
  - Detailed diagnostic probes when a problem is detected
  - Problem determination rules with decision tree based structures
EXAMPLE

1) Is ibm.com reachable?
   - ping 127.0.0.1

2) Check TCP stack
   - TCP/IP stack problems

3) Route table ok?
   - For route table
   - Default gateway reachable?

4) Check local router

5) Check network interface adaptor

6) Check NIC

7) Check DNS

SYSTEM ARCHITECTURE

- Managed servers
- Probe controller
- Probe daemon
- Network
- Application
- Storage
- Connectivity
- History DB
- Probe server
- Web-based interface
- Management station
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INTERESTING EXPERIENCES WITH DIFFERENT PROBLEMS

- NFS Problems:
  - Finding root cause can take a significant amount of time
  - Intuitive rules for checking liveness of NFS service daemons
  - Observation: Majority of the problems can be addressed by the simpler checks.
  - Automation improves efficiency

- Storage Problems:
  - 90% of the problems related to storage problems were capacity related issues
  - Low overhead profiler for early detection and mitigation of such problems
CONT.

- Application problems:
  - Application: SendMail
  - Complicated setup process
  - Observation: most of the problems were caused by very simple reasons
STRENGTH & WEAKNESSES

Strength
- Real life problem tickets
- A large working prototype
- An extensible architecture
- PDA works on real problems

Weakness
- No graph showing the efficiency of the system in terms of how fast a problem was diagnosed by PDA vs that by a human System Admin.
- Not much detail of how to categorized problems using tickets. Was it an automated system or manual?

THANK YOU