

FIW'00 Contest Entry – ISAT

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PHASE 1:

- CFB - Call Forwarding on Busy
- CW - Call Waiting
- TC - Three-way Calling
- TL - Teen Line
- TCS - Terminating Call Screening
- RC - Reverse Charging
- CNDB - Calling Number Delivery Blocking
- RB - Ringback when Free
- VM - Voice Mail
- SB - Split Billing

PHASE 2:

- CT - Call Transfer
- GR - Group Ringing

Full Details:

[ftp://ftp.research.att.com/dist/hall/papers/isat/
fiw00-contest-data.txt](ftp://ftp.research.att.com/dist/hall/papers/isat/fiw00-contest-data.txt)

ISAT-based Method

Foreground/Background Models:

- Background: Basic Call Model (BCM)
- Foreground: One each per feature

Feature Interaction Types:

- Type I: next-state or output inconsistencies
- Type II: state invariant violations
- Type III: All others (high or low level)

Methodology:

- Create models
- Apply ISAT tools:
 - Type I detection
 - (Type II detection not attempted)
 - (New) Type III detection method: *Asymmetric, coverage-based scenario selection, simulation, and inspection*

Asymmetric, Coverage-based Scenario Selection

Problem: Too many scenarios \Rightarrow even if tool can generate, human can't inspect

Heuristic Solution Methodology:

1. Construct and validate scenarios for each primitive feature. (ISAT tool suite)
2. For each pair of primitive features f_1, f_2 :
 - Human selects subset of f_1 scenarios as "of interest" to f_2
 - For each such *seed* scenario, construct set of scenarios such that
 - * call is placed from f_1 to f_2
 - * executes same path through f_1 as seed
 - * set *covers* responses of f_2
 - formal coverage metric

Note *asymmetry* requires **ordered** feature pairs

- e.g. forward-to-RC vs RC-to-forward

Interactions Found (Summary)

Binary Feature Interactions Numerical Summary												
	GR	CT	CFB	CW	TC	TL	TCS	RC	CNDB	RB	VM	SB
GR	1	2	5	3	1	0	3	3	0	6	3	3
CT	...	3	14	20	17	6	3	1	1	17	5	1
CFB		1	6	12	1	2	1	0	3	3	1
CW			2	16	1	2	0	0	5	3	0
TC				0	3	4	2	2	2	4	2
TL					0	0	0	0	2	1	0
TCS						0	0	1	1	0	0
RC							0	0	1	0	1
CNDB								0	2	0	0
RB									1	3	1
VM										0	0
SB											0

210 Total (Both Phases, Binary Feature Interactions) (10 are TYPE I)

Essential Trinary Feature Interactions Summary

I discovered a total of 14 "essential trinary interactions". Note that none of these could be TYPE I interactions because one can show that all such conflicts must occur between some pair of features if they occur at all. In this study, all found are TYPE III.

All 14 involve TCS (terminating call screening) in some way. The following table lists all feature triples for which at least one were found.

TCS/GR/CT (2)
 TCS/GR/CFB
 TCS/GR/TC (2)
 TCS/GR/RC
 TCS/GR/RB
 TCS/GR/SB
 TCS/CFB/RC
 TCS/CFB/SB
 TCS/CW/RC
 TCS/CW/SB
 TCS/CNDB/RC
 TCS/CNDB/SB

Effort Estimate

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EFFORT ESTIMATE

These are rough estimates of the numbers of hours for various tasks.
For this summary, I have added the times for the two phases.

Phases I and II:

Modeling:

12 initial modeling
6 debugging, fixing

Binary Interactions:

Type I interactions:

1 finding
1.5 checking (incl scenario generation)

Type III interactions:

12 finding
22.5 checking (incl scenario generation)

Trinary Interactions:

Type III interactions:

3 finding
3 checking

Total (Both Phases): 61 hours

WRITEUP: 6 hours (includes documentation types which probably
would not normally be part of the natural software process
in dealing with interactions)

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