

Sophia Antipolis, French Riviera  
20-22 October 2015



# AUTOMATED TESTING OF A RATING ENGINE

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# CALL RATING

- Determination of a charge or treatment for a mobile call is done via a rating engine in an operator's Charging or Billing System.
- Based on the outcome of this rule engine, a rate is applied to the call.
- The rate or treatment applied can be based on many factors:
  - Call scenario
  - Rate Plan
  - Add-On Features
  - Location of subscriber
  - Number dialed
  - Time of Day
- Possibility of millions of use cases



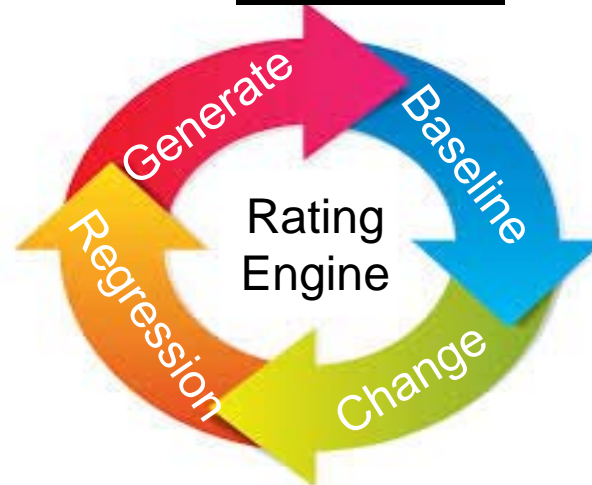
## TYPICAL CHALLENGES

- Due to intense competition, operator's are frequently changing or adding new rate plans and offerings.
- There is often limited or no documentation on how the rating engine is structured
- Due to time and cost, testing is often limited to a small scope of manual test cases
- Faults that slip through to production result in customer dissatisfaction for overcharges or revenue loss for the operator.



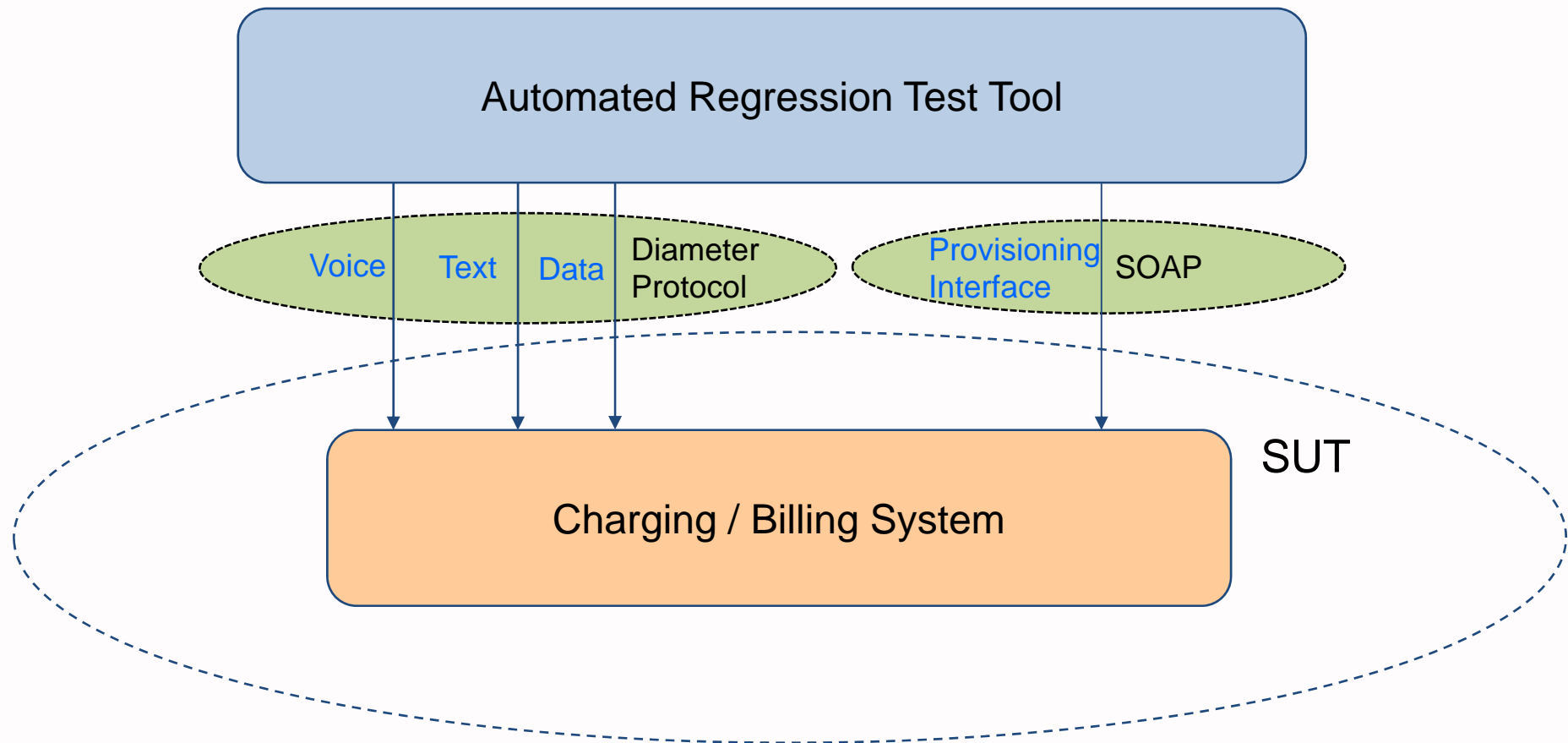
# AUTOMATED REGRESSION TEST FRAMEWORK

1. Automated test case generation using exhaustive permutations.
2. Initial execution of test cases to collect test results establishing reference baseline.
3. Change applied to System Under Test (SUT).
4. Test cases re-executed to regression test changes.





# LOGICAL NETWORK DIAGRAM

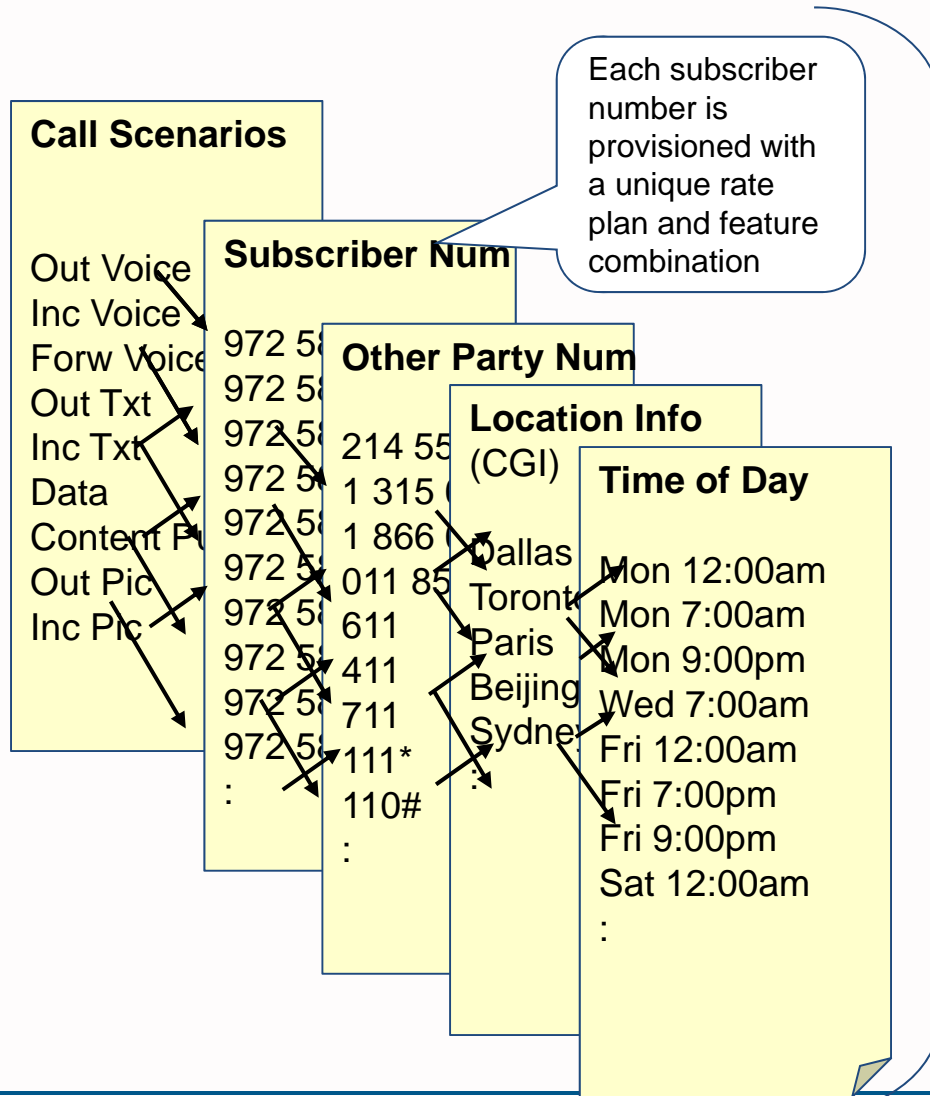


# PARAMETER MATRIX

The following table shows an example list of parameters which apply to different call scenarios:

Parameter Matrix									
Call Scenarios	Applicable Parameters								
	Subscriber Number	Other Party Number	Time of Call Day	Call Duration	Location	M2M Indicator	Device Type	Consumed Units	Charge of Purchase
Outgoing Voice Call	X	X	X	X	X	X			
Incoming Voice Call	X	X	X	X	X	X			
Forwarded Voice Call	X	X	X	X					
Outgoing Text Message	X	X	X		X	X			
Incoming Text Message	X	X	X		X	X			
Refunded Text Message	X	X			X				
Data	X		X	X			X	X	
Content Purchase	X								X
Outgoing txt with pic	X	X	X		X	X		X	
Incoming txt with pic	X	X	X		X	X		X	

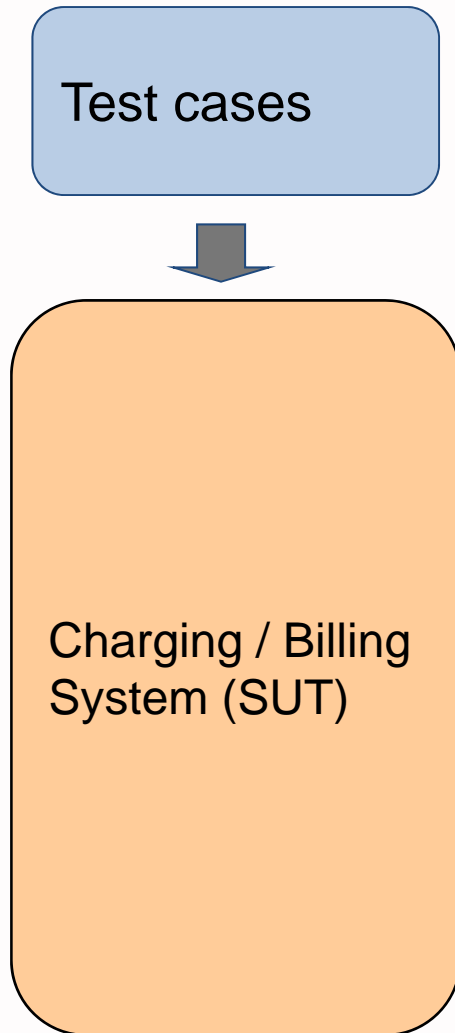
# TEST CASE GENERATION



Call Scenarios are crossed together with all permutations of parameters to produce an exhaustive list of test cases

Call Scenario	Subscriber Number	Other Party Number	Location Info	Time of Day
Out Voice	972 583 0000	214 555 6666	Dallas	Mon 12:00am
				Mon 7am
				Mon 9am
			Toronto	Mon 12:00am
				Mon 7am
				Mon 9am
		1 315 666 7777	Paris	Mon 12:00am
				Mon 7am
	972 583 0001			Mon 9am
				Mon 12:00am
				Mon 7am
Inc Voice				Mon 9am
				Mon 12:00am

# COLLECT MODE

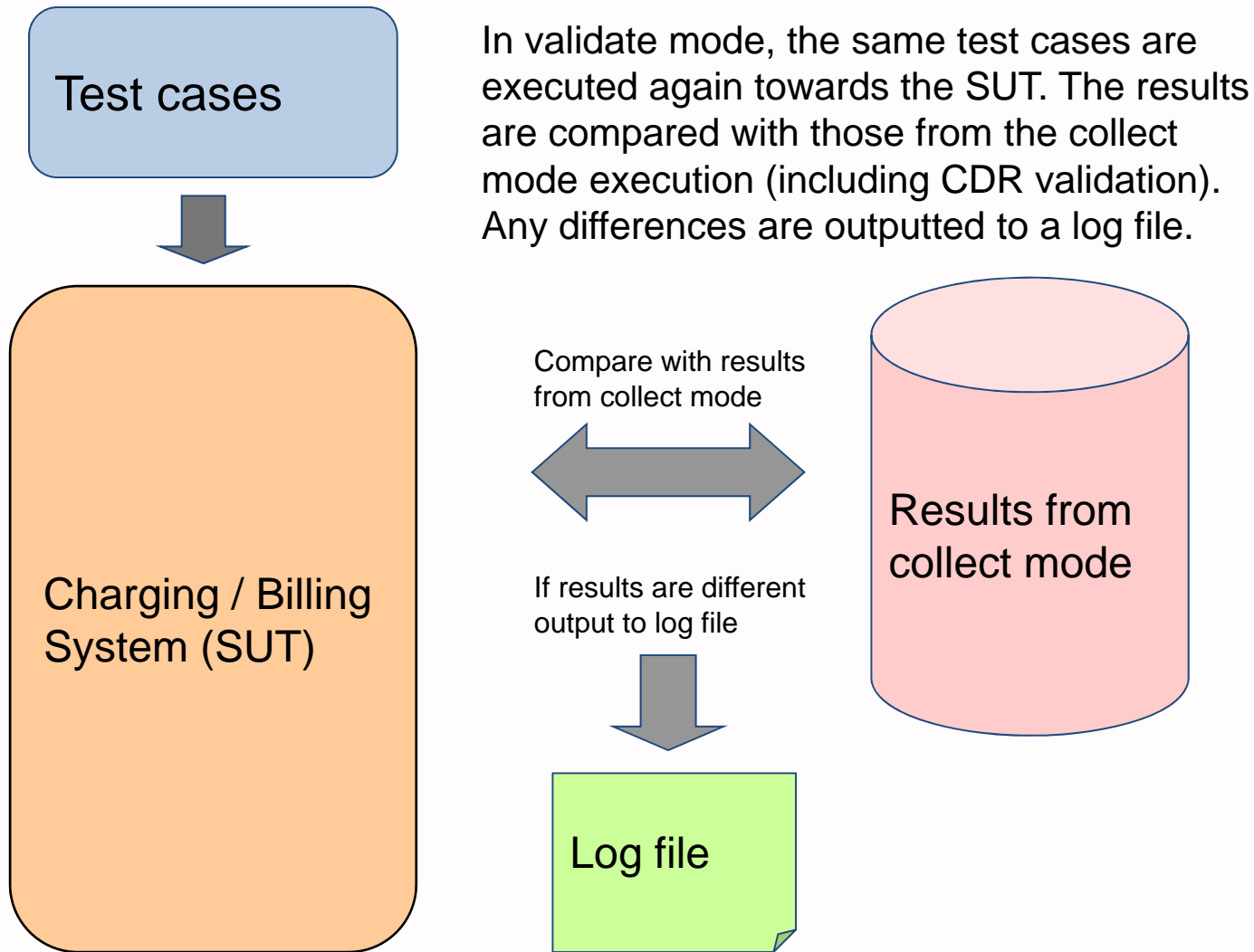


In collect mode, test cases are executed towards the System Under Test. The results of all test cases are stored in a database table creating the baseline. Results can also include collecting the Call Data Records (CDRs).

Call Scenario	Subscriber Number	Other Party Number	Location	Time of Day	Main Balance Charge	Package Charge	Result code	Annc Code
Out Voice	972 583 0000	214 555 6666	Dallas	Mon 12:00am	0.05	0		
				Mon 7am	0	0		6010
				Mon 9am	0.10	0		
			Toronto	Mon 12:00am	0.20	0		
				Mon 7am	0.20	0		
				Mon 9am	0.20	0		
Out Tx		1 315 666 7777	Paris	Mon 12:00am	0.00	1	2001	
				Mon 7am	0.00	1	2001	
	972 583 0001			Mon 9am	0.00	1	2001	
				Mon 12:00am	0.10	0	2001	
				Mon 7am	0.00	1	2001	
				Mon 9am	0	1	4010	



# VALIDATE MODE



# WORKFLOW

1. Update input parameter sheet



2. Execute tool in 'collect' mode



3. Operator introduces new rate plan



4. Create individual test cases for new rate plan

	A	B	C	D	E
1	Subscriber Type	Subscriber Number	Parameter Type2	Parameter Value2	Parameter Typ
2	Outgoing Voice	6228884791	MO OPN	9998880000	TOD
3	Incoming Voice	6228884791	MT OPN	9998881000	TOD
4	Forwarded Voice	6228884715	MF COND OPN	9998881000	TOD
5	Data	6228884716	DATA OPN	9998881000	TOD
6	Data	6228884705	DATA OPN	n/a	TOD
7	Data	6228884707	DATA OPN	n/a	TOD
8	Content Purchase	6228884709	Content Purch OPN	n/a	TOD
9	Outgoing Text	6228884708	Outgoing Text OPN	9998881000	TOD
10	Incoming Text	6228884708	Incoming Text OPN	9998881000	TOD
11	Incoming Picture	6228884708	Incoming Pic OPN	9998881000	TOD
12	Outgoing Voice	6228884711	MO OPN	9998880000	TOD
13	Incoming Voice	6228884712	MT OPN	9998881000	TOD
14	Forwarded Voice	6228884713	MF COND OPN	9998881000	TOD
15	Content Purchase	6228884714	Content Purch OPN	n/a	TOD
16	Data	6228884720	DATA OPN	n/a	TOD
17	Outgoing Picture	6228884710	Outgoing Pic OPN	9998881000	TOD
18					



Stores baseline of regression test cases for existing rate plans



Executes regression test comparing with previous baseline test results



7. Run tool in 'validate' mode to regression test legacy rate plans

6. Testing completed for new rate plan



5. Execute test cases for new rate plan



8. Take new baseline with new rate plan included.

## OTHER USES

- This regression test framework is also extremely useful for platform upgrades or transformations. CDR side-by-side comparisons are normally mandatory and very time consuming and costly.
- This concept is not only limited to testing a telecom operator's rating engine.
- It can also be applied to test other types of rating or rule engines. For example:
  - Policy Managers
  - Service Brokers
  - Insurance Rating Engines
  - Loan application processes





## SUMMARY

- ❖ This automation framework is currently used by several different North American telecom operators.
- ❖ There are on average 40 to 50 updates per year to a given operator's rating engine.
- ❖ Manual regression test is time consuming and costly.
- ❖ This framework allows for a wider scope of regression execution.
- ❖ Testing can be done more frequently and cost effectively.
- ❖ Revenue leakage reduction by eliminating under-charges.
- ❖ Increased customer satisfaction by eliminating over-charges.