

Performance Testing

In Large Distributed
Telecom Networks

Presenter. Ashutosh Madan



What Cannot be Measured, Cannot be Managed

Contents

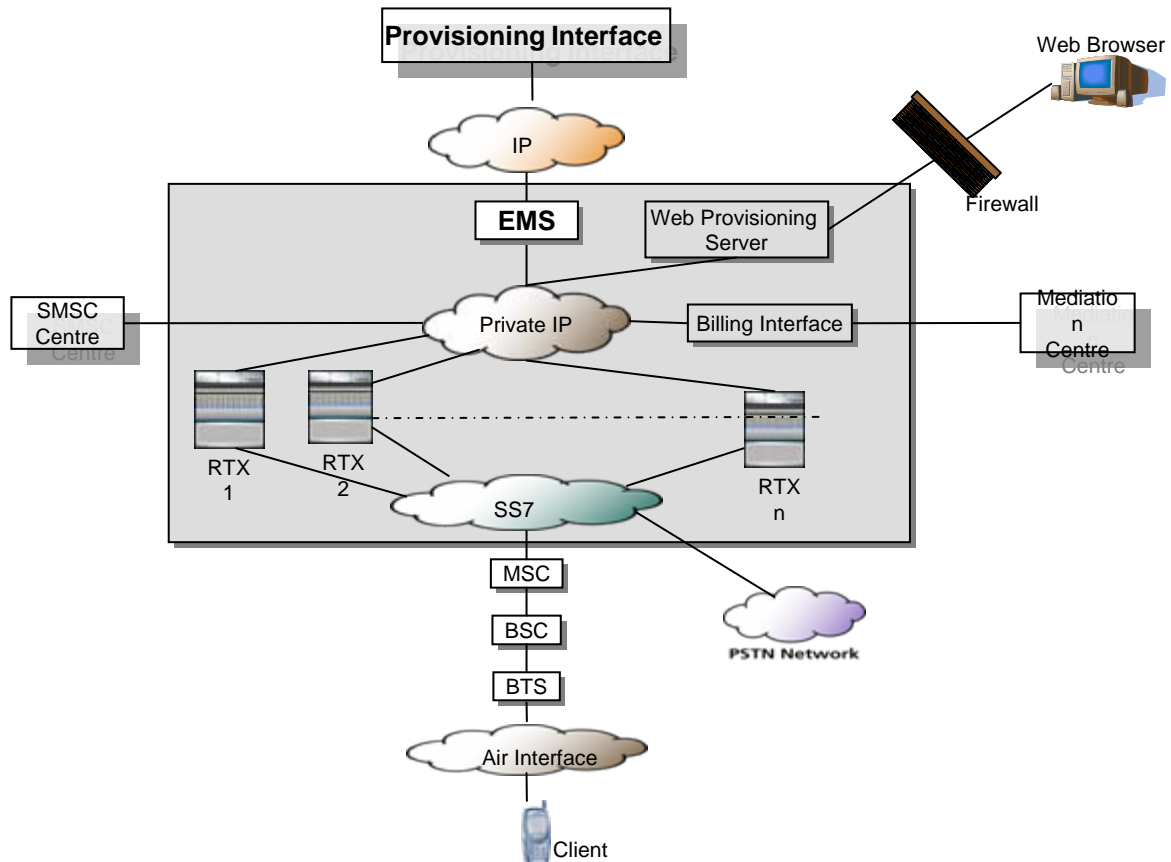
- Case Study Based Approach
- Problems Related to Performance Testing
- System Modeling
- Test Phases
- Test Analysis
- Test Frequency
- Learning's
- Road Ahead
- Conclusion

Product Overview

Term	Description
Push To Talk (PTT)	This feature enables to make instant (real-time) private or group calls. At any point of time, only one member of a group talks and the others listen.
Voice Notes / Instant Voice Messages	This service enables a Voice Notes subscriber to send voice messages to one or more PTT groups / contacts simultaneously.
Voice Bridge	This feature allows the PTT subscribers to make regular voice conference calls to a group.
Private and Group Call	Call involving two participants is called as a Private call. Call which involves more than two participants is called as a group call
Presence	Presence indicates whether the subscriber is on-line or off-line. It also communicates the availability status of one subscriber to the other subscribers in the group.

Product Overview

- (contd.)



Issues Related to Performance Testing

- System Modeling
- Simulation of Real World Network
 - Large Number of Nodes (Hardware Requirements)
 - Geographically Distributed Network (Delay)
- Complexity
 - Number of Variables / Node
 - Number of Nodes
 - Redundancy

System Modeling

Module	Operation
Call Processing	Grade of Service
	Erlang traffic per subscriber for Private PTT Calls, Group PTT calls, Voice Bridge Calls and Voice Notes Calls
	Call hold times for PTT, Voice Bridge and Voice Notes calls
	Average legs / Group Call
Presence	Number of login / logout request per subscriber / per day
	Number of power-on / power-off cycles per subscriber / per day
	Number of group creation requests per subscriber / per day
	Number of contact additions per subscriber / per day
	Percentage of users who are in roaming state
	Percentage of users changing their presence state

System Modeling

- (contd.)

Module	Operation
EMS	Subscriber Provisioning
	Alarms Propagation
	Performance Data Collection
	Number of Simultaneous GUIs
Web Group Provisioning	Login, Create Group, Delete Group, Add Contact, Delete Contact
Database	Contacts / Subscribers
	Groups / Subscribers
	Subscribers / Group
	Subscribers / RTX
	Subscribers in the whole system

System Modeling

- (contd.)

- Initial System Model
 - Work Flow Identification
 - Projection based on Market Study
 - Limited Market Data
 - Cultural Influences
- Model Refinement
 - Based on Customer Usage Data
 - Periodic Activity

Performance Testing Phases

- Component Level Load Testing
- System Soak Testing
- System Capacity Determination
- Overload Testing
- Robustness Testing
- Sensitivity Analysis
- Customer Specific Load Testing
- Hardware Platform Testing

Performance Testing Phases - *(contd.)*

- Component Level Load Testing
 - To identify performance bottlenecks at module level
 - Load each module separately
 - Granularity restricted to all work-flows in a module

Performance Testing Phases

- System Soak Testing
 - To ensure system stability under moderate load conditions
 - System as a whole is loaded
 - Load values selected based upon System Model
 - Load testing for 72 hours

Performance Testing Phases

- (contd.)

- System Capacity Estimation
 - To identify maximum load handling capacity of system
 - Relative ratio of work-flows is kept same as soak testing
 - Increase load keeping the work-flow ratios constant
 - Ensure that critical health indicators (CPU, Memory, Latency) are within acceptable limits

Performance Testing Phases

- (contd.)

- Overload Testing
 - Short load *Bursts* for small duration
 - Ensure that system handles *Bursts* gracefully
 - Measure time needed to recover completely

Performance Testing Phases

- (contd.)

- Robustness Testing
 - Failure and error path testing under Soak load conditions
 - Pull out / Power down the cards
 - Invalid operations by the user
 - Invalid operations from the network
 - Remove physical connectivity
 - Switchovers

Performance Testing Phases

- (contd.)

- Sensitivity Analysis (vary one set of parameters keeping other constant)
 - Effect of traffic variables
 - Vary Presence traffic
 - Vary Call traffic
 - Effect of non traffic variables
 - Log Level
 - Number of open GUIs

Performance Testing Phases

- *(contd.)*

- Customer specific load Testing
 - More of Roaming calls
 - Different call triggers

Performance Testing Phases

- *(contd.)*

- Hardware Platform Testing
 - Carried out when Hardware Changes
 - System Stability on New Hardware
 - Performance Comparisons with respect to the Existing Hardware
 - Re-determine the System Capacity

Test Analysis

- CPU
 - Plot as a function of time
 - Average CPU
 - Peak CPU
 - CPU Spikes

Test Analysis

- (contd.)

- Memory
 - Plot as a function of time
 - RAM
 - Swap
 - Disk
 - Memory Leaks

Test Analysis

- (contd.)

- Latency
 - Time between initiation of a request to its response
 - Plot as a function of time
 - Latency Build-up

Test Frequency

Activity	Frequency
Work Flow Identification	Every Major Release
Traffic and Data Modeling	Every 6 Months / Data from a New Customer
Component Level Load Testing	Every Release
System Soak Testing	Every Release
System Capacity Determination	Every Major Release
Overload Testing	Every Major Release
Robustness Testing	Every Major Release
Sensitivity Analysis	Every Major Release
Customer Specific Load Testing	Customer Specific Variations
Hardware Platform Testing	Whenever Hardware Changes

Learning's

- Network Delays
 - Distributed Network
 - Remote Queries
 - Builds up Latency
- Effect of Large Configuration
 - Distinguish between components directly impacted and partially impacted
 - Simulate partially impacted components on desk-top Machines
 - Still, there is pay-off !!!

Road Ahead

- Predictability based upon traffic patterns
 - Gather data points for
 - Each work-flow independently
 - All work-flows in same module
 - System as a whole
- Build Mathematical Model based upon above data points
- Theoretically predict System Behavior (CPU, Memory, Latency) based upon the model

Conclusion

- Engineering
 - System Stability
 - System Capacity
 - System Dimensioning
 - Number of RTX Cards
 - Number of Media Cards
 - Number of SS7 links
 - Number of Billing Cards
 - Number of Web provisioning Servers Operations

Conclusion

- Marketing
 - Data Points to Market Product
- Personal Growth
 - Accelerated Learning
 - Exposure to the Whole System

Thank You

Ashutosh Madan
