bcp for a large scale carrier-level VoIP system using p2psip

draft-zhang-p2psip-bcp-04

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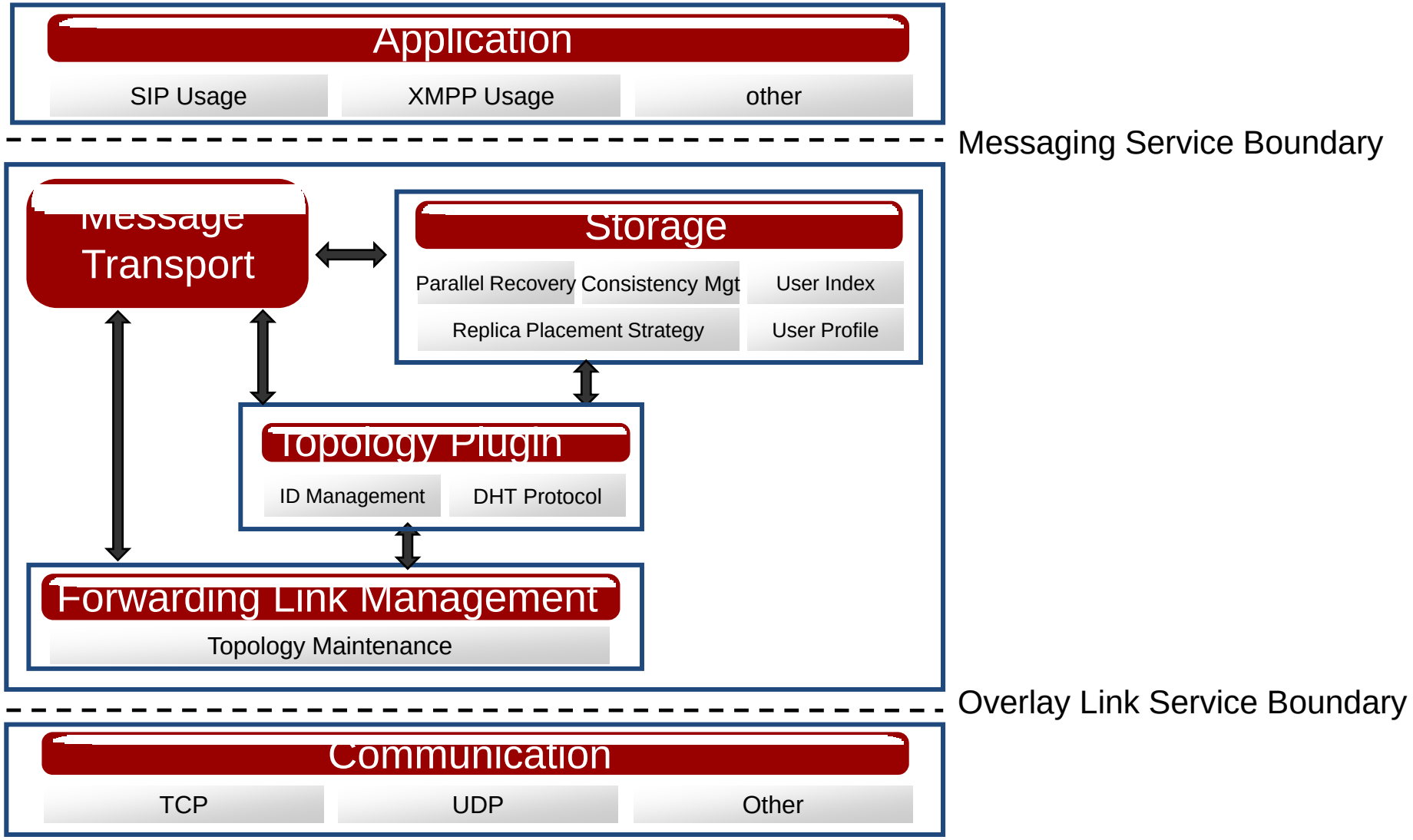
Outline

1. DSN VoIP System Overview
2. Validation of DSN VoIP system in lab environment
3. Validation of DSN VoIP system in real environment
4. Conclusions

The design target of DSN VoIP system

- carrier-grade P2P VoIP system
- Requirements(incomplete)
  - Qos-guaranteed
  - High Availability
  - Scalability
  - Load balance
  - Cost-effectiveness
  - Maintainability
  - TBD

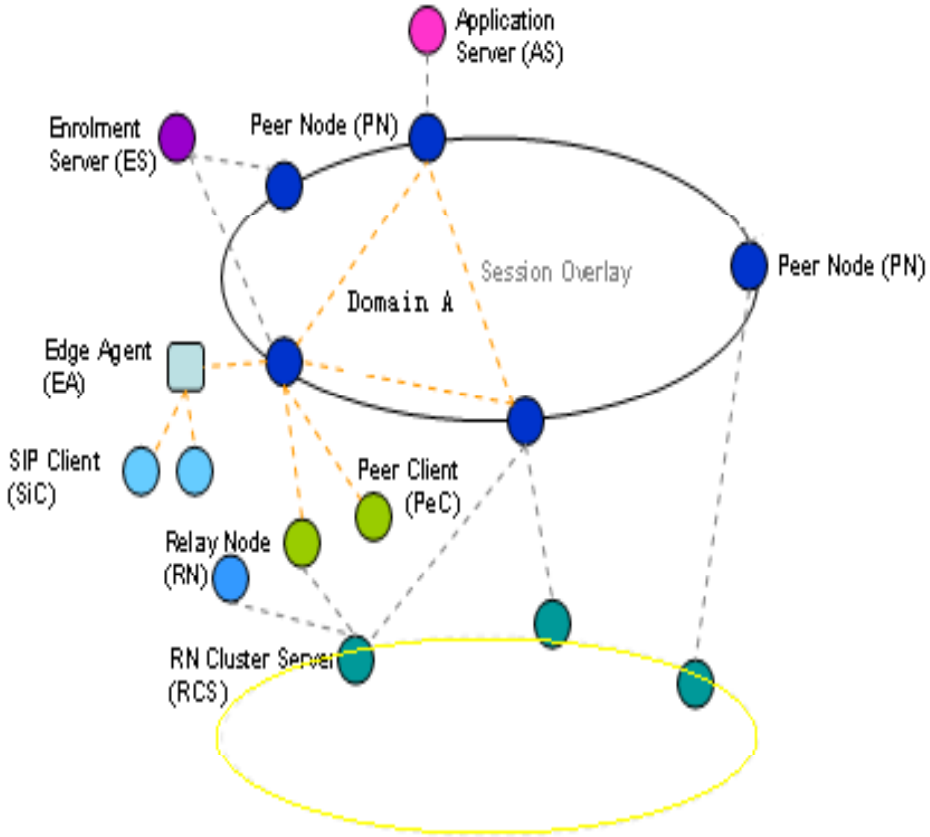
The Introduction of DSN VoIP system



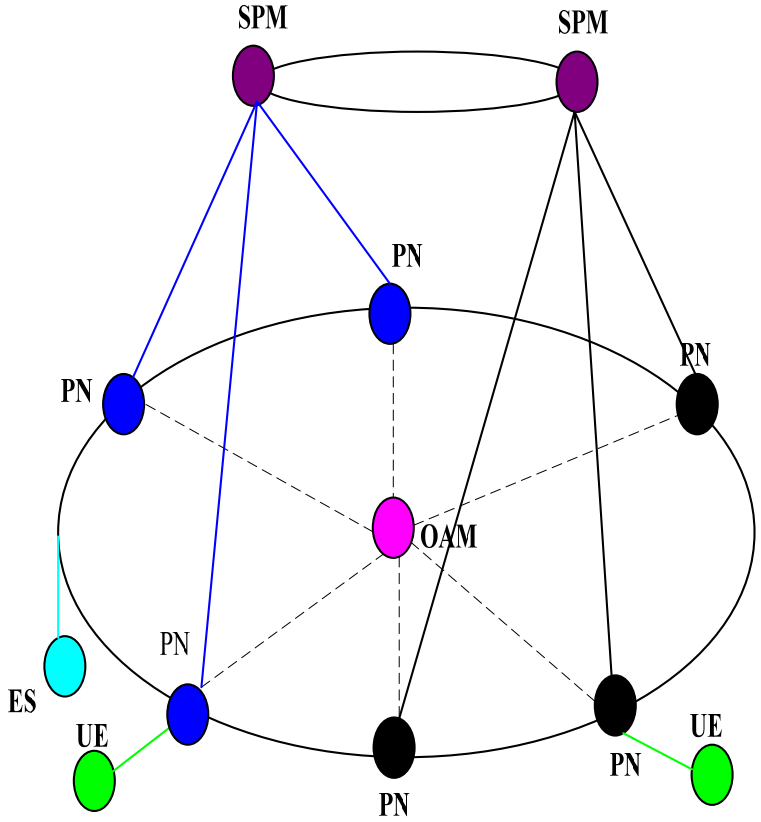
System Key technologies to solve some key problems

Key technologies(incomplete)	Key problem(incomplete)
SPM assisted one hop route	Routing efficiency and performance
Traffic Localization	P2P topology mismatch problem and Redundant traffic across AS
Replica Placement strategy	subscribers' data backup and recovery for reliability
Consistency Strategy	subscribers' data availability and consistency
Strip Segmentation method Based ID Assignment	subscriber ID uniformity among PNs for Load balance
Single node failure handle	Service reliability
TBD	TBD

Deployment of DSN network

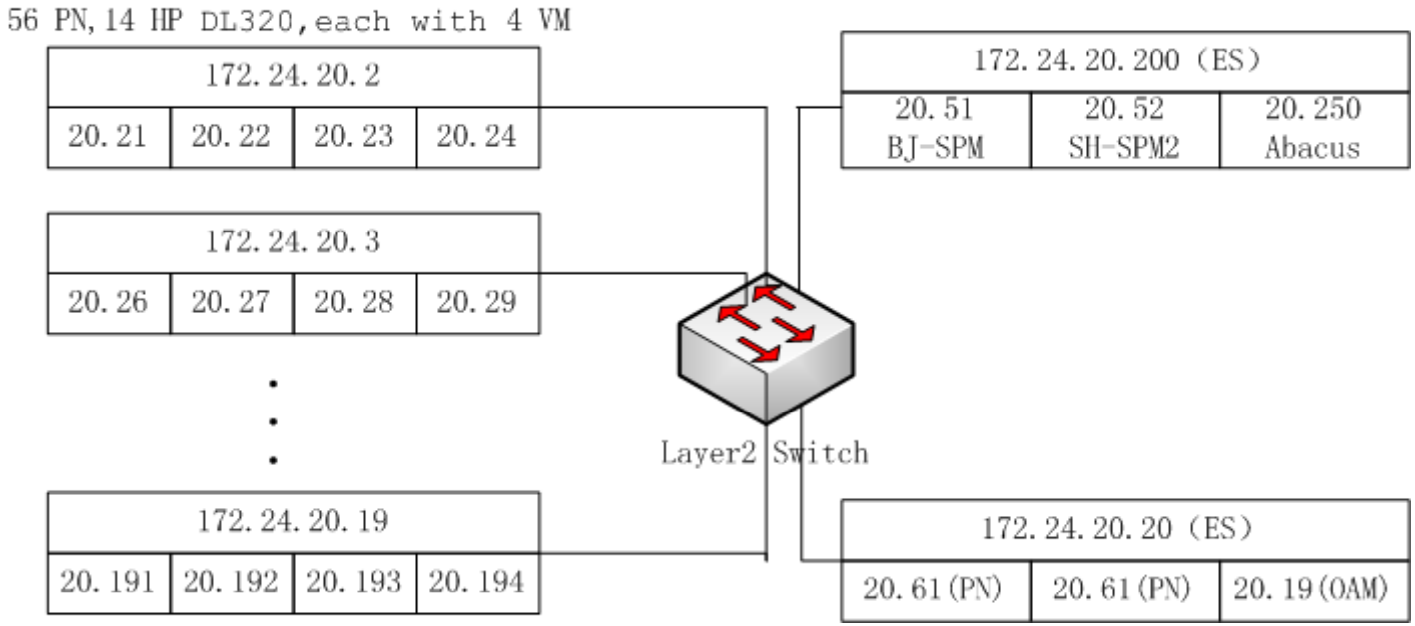


Future system



Demo system

DSN VoIP Demo system in lab environment



- Under this environment, we do two measurement
  - System bulk call performance measurement
  - Churn measurement

System bulk call performance measurement

- bulk call transaction performance for the demo system which respectively included 24, 32, 40, 48, 56 PN nodes
- Measurement parameters:
  - Registration statistics: average register time
  - Call Establishment time: average call setup time, average call tear down time, Post dial delay
  - Call finish: call success ratio, call attempts per second(CAPS)
- two measurement:
  - Pure bulk call performance measurement : there are only callers and callees in the demo system;
  - Mix Bulk call performance measurement : except the callers and callees, there are some other users which originate registration for simulating the transfer from one place to another and the number of these users is one fifth of the total users.

System bulk call performance measurement results

Pure bulk call measurement

1.average register time

Node number	24	32	40	48
average time(ms):	21	21	22	22

2. average call setup time

Node number	24	32	40	48
average time(ms):	338	423	311	223

3. average call tear down time

Node number	24	32	40	48
average time(ms):	139	152	140	97

4. Post dial delay

Node number	24	32	40	48
average time (ms):	338	423	310	223

5. call success ratio

Node number	24	32	40	48
call success ratio(%):	99.97	99.95	99.89	99.91

6. call attempts per second(CAPS)

Node number	24	32	40	48
System CAPS:	1252	1708	2221	2562
PN's average CAPS:	52.2	53.4	55.5	53.4

Mix bulk call measurement

1.average register time

Node number	24	32	40	48
average time(ms):	21	24	22	21

2. average call setup time

Node number	24	32	40	48
average time(ms):	346	376	319	244

3. average call tear down time

Node number	24	32	40	48
average time(ms):	138	176	137	115

4. Post dial delay

Node number	24	32	40	48
average time(ms):	346	439	318	244

5. call success ratio

Node number	24	32	40	48
call success ratio(%):	99.98	99.06	99.96	99.77

6. call attempts per second(CAPS)

Node number	24	32	40	48
System CAPS:	1196	1591	1986	2267
PN's average CAPS:	49.8	49.7	49.7	47.2

- Conclusions
  - The DSN VoIP system has the capability for call transaction.
  - The system capability can approximately linearly increase as the number of PN nodes increase.

Churn measurement

Churn model:

1) one node has the the probability p% to arise churn in an hour for leaving or poweroff etc and the churning node will equably distribute in the network.
2) The churn will occur with the periods of T1 minutes in the P2P network and p% of all nodes will leave the P2P overlay.
3) After T2 minutes, the total leaving nodes will return the P2P overlay with the probability q%.

Churn Parameters:

1) p = 5, 10, 20, q = 80.
2) T1 = 10 minutes, T2 = 4 minutes.
3) Number of users = 100 thousands, 300 thousands, 500 thousands, 1000 thousands.

Measurement parameters :

1) Call success ratio: call success establishment compared to all call.
2) Call error: call fail caused by either caller or callee.
3) sampled recover traffics: we randomly get the recover traffics from two arbitrary nodes which leave and return the overlay.

Churn measurement result

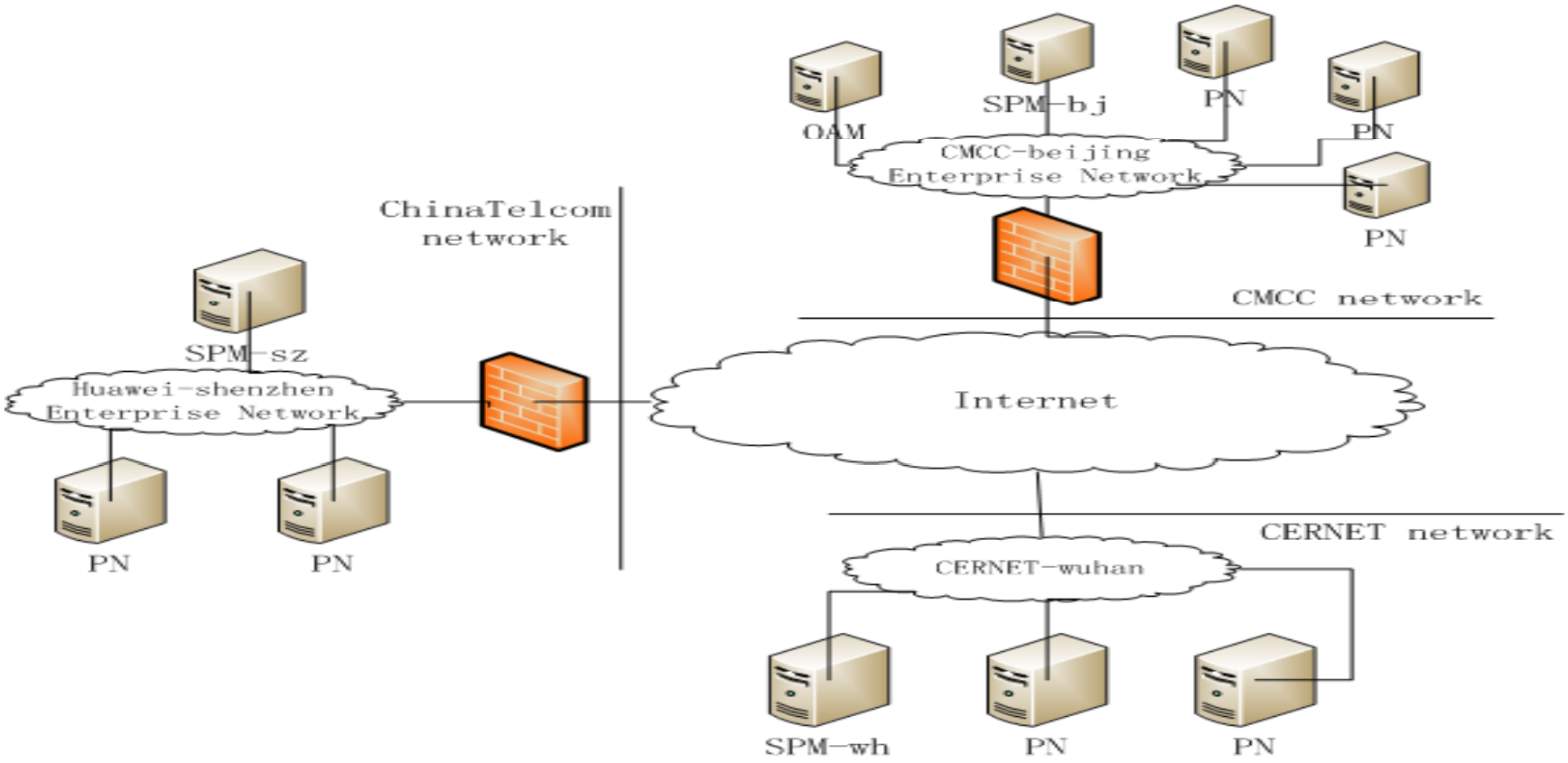
p%	5%				
Number of PN down	3				
Number of uses(thousand)	0	100	300	500	1000
Real Number of uses(thousand)	0	75	225	474	1010
Call success ratio%	99.58	99.00	99.31	99.52	99.93
Recovery traffic for two random PNs(kb)	531 582	999 880	490 117	198 441	12372 11613
Number of errors(total/orig)	28314/ 24819	34283/ 32676	22702/ 22290	16240/ 15681	3316/ 2545

p%	10%				
Number of PN down	6				
Number of uses(thousand)	0	100	300	500	1000
Real Number of uses(thousand)	0	101	297	495	1010
Call success ratio%	99.65	99.74	99.65	99.67	99.71
Recovery traffic for two random PNs(kb)	343 380	1430 117	360 1020	2500 670	13840 9720
Number of errors(total/orig)	29617/ 26049	10299/ 9020	13041/ 12038	12532/ 11445	15256/ 12055

p%	20%				
Number of PN down	12				
Number of uses(thousand)	0	100	300	500	1000
Real Number of uses(thousand)	0	102	307	485	1010
Call success ratio%	99.57	99.11	99.16	98.98	98.93
Recovery traffic for two random PNs(kb)	432 336	250 220	450 410	660 600	5397 10888
Number of errors(total/orig)	27935/ 24645	28276/ 28275	26684/ 26684	32474/ 32474	51705/ 42942

- Conclusions
  - The recover traffic will increase as the total users increase.
  - If the churn involves a small quantity of PN nodes, the churn has little effect to the system call transaction performance and almost is independent of the total user's number..

DSN VoIP Demo system in real environment



Measurement parameters :

1) Call Response time
2) Call setup
3) Tear Down.
4) Post Dial delay

results for the system in real environment

1 . Call Response time(msec)—CR time

Min: 63 Average: 195 Max: 6122

about 85% CR times in successful calls doesn't exceed 1000ms

2. Call setup(msec)—CS time

Min: 73 Average: 1548 Max: 24525

about 76% CS times in successful calls doesn't exceed 2400ms

3. Tear Down(msec)—TD time

Min: 17 Average: 919 Max: 19735

about 82% TD times in successful calls doesn't exceed 700ms

4. Post Dial delay(msec)—PD time

Min: 73 Average: 1544 Max: 24528

less than 45% PD times in successful calls doesn't exceed 350ms

- Some reasons
  - Different operators' network and long transmission delay.
  - Behind firewall and shared bandwidth.
  - Heterogeneous PN with different hardware and software configuration
- Conclusions
  - The DSN VoIP system can work in global internet and doesn't perform well compared with the tests in lab environment.
  - Some issues obviously affect the performance of the system, e.g. limited IP interconnection bandwidth, firewall configuration, heterogeneous platform configuration.

Conclusions

- DSN VoIP system is based on RELAOD Architecture and has its own protocols according to RELOAD framework.
- DSN VoIP system good call transaction capability, high reliability and excellent anti-churn capability .
- The measurement for DSN VoIP system verifies that the design for architecture and protocols in DSN is feasible and accords with the principles of RELAOD.
- The measurement in real WAN shows that the DSN VoIP system can be deployed in the internet and affected by many unpredictable issues.

Open issues

- QoS-guaranteed service: DSN VoIP system runs well in lab but just passably in internet, there are many unpredictable reasons which affect the QoS, so this must be considered in the RELOAD protocols design.
- operational and administrable service: when providing VoIP services to the public, the services must be administrable, controllable and chargeable, this will involve the management and billing functions for NEs and services. We think that RELOAD protocols will be perfected for these functions.
- Relationship with other groups: can we use the production from other groups in RELOAD? Such as ALTO, DECADE, etc
- Others.

Thanks for your attention!

Questions?