Registration Directory Service (RDS) Implementation Model Cost Analysis Executive Summary

Approach

During February/March 2014, a budgetary cost analysis was conducted, comparing the realization of a Synchronized[1] and Federated RDS implementations. A phased approach was used:

- Step 1: Gather baseline requirements for each of the implementation models.
- Step 2: Define and agree key volumetric assumptions provided by ICANN and based largely upon monthly WHOIS query reports supplied by gTLD Registries. Use these assumptions to derive the expected system workload and define a high level baseline solution outline for each of the two implementation models.
- Step 3: Create cost model and perform a budgetary costing of each of the baseline solution outlines.
- Step 4: Formulate findings.

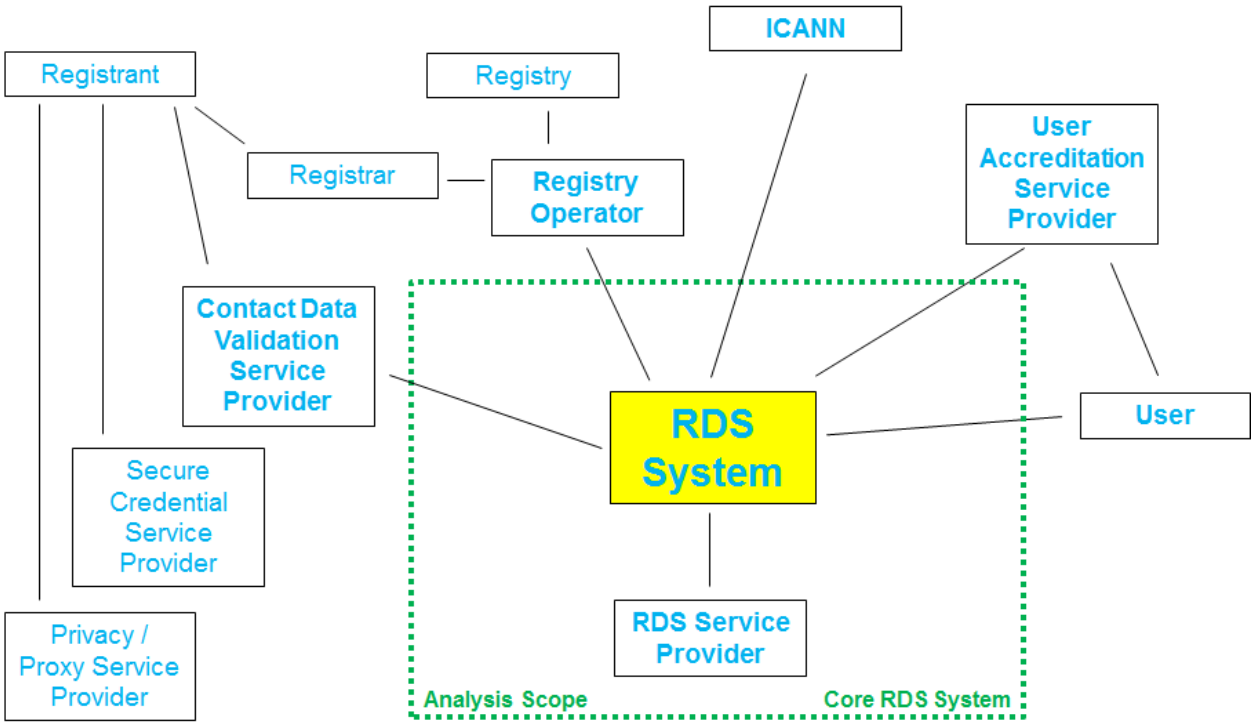
Engagement Starting Points

- Create a budgetary cost estimate for the central "RDS system/provider". Registry Operator costs are not estimated.
- A Managed Service cost model and estimate is created. That is, assume the setup and ongoing operations of a managed RDS service and estimate the related costs.
- For purposes of cost comparison, the solution and costs are based largely on IBM's portfolio (primarily IBM's SoftLayer IaasS offering), using third party solution components only where no alternative exists in the IBM portfolio.
- Cost estimations are created for the baseline requirement/solution outline only, not for variants; no detailed cost driver analysis is performed.

[1] For alignment with the EWG's Final Report, this summary refers to the Synchronized RDS (SRDS), the model described in earlier EWG reports as the Aggregated RDS (ARDS).

Core Analysis Scope and Volumetrics

The focus of the cost analysis was the "Core RDS System" as depicted below.



The core use cases to support in each of the models (Synchronized and Federated) were defined.

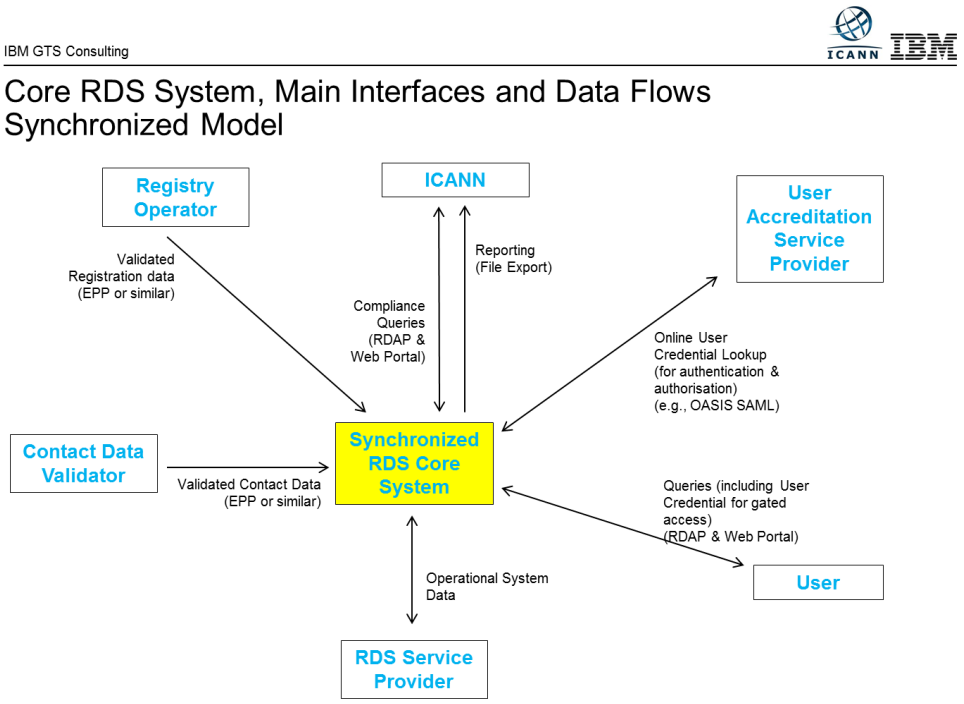
In addition, key volumetric assumptions were defined:

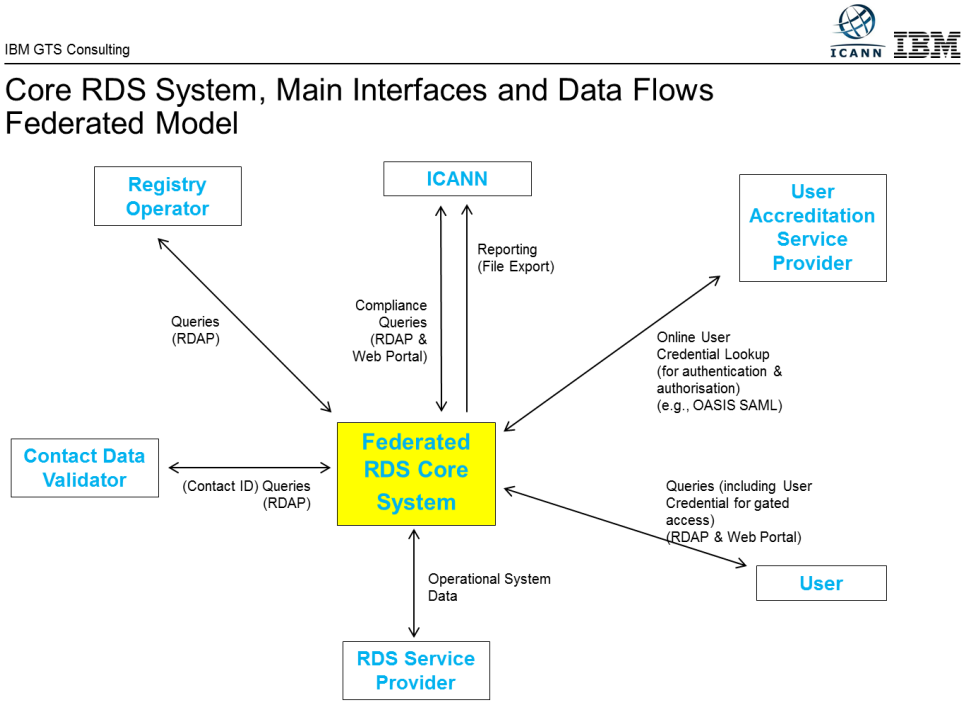
YEARLY GROWTH RATE	22%	nr of DN records added in a year, assumed to include the growth in the nr of gTLDs					
Nr of DN RECORDS, YEARLY UPDATE RATE	100%	nr of DN records updated in a year					
		start yr1 (2015)	start yr2 (2016)	start yr3 (2017)	start yr4 (2018)	start yr5 (2019)	end yr 5 (2020)
	Nr of gTLDs	2000	3000	4000	5000	6000	7000
	growth rate		50%	33%	25%	20%	17%
	December 2013, ICANN input	start yr1 (2015)	start yr2 (2016)	start yr3 (2017)	start yr4 (2018)	start yr5 (2019)	end yr 5 (2020)
NR OF DOMAIN NAMES	151.196.101	184.459.243	225.040.277	274.549.138	334.949.948	408.638.936	498.539.502
NR OF QUERIES/MONTH	9.031.522.529	11.018.457.485	13.442.518.132	16.399.872.121	20.007.843.988	24.409.569.665	29.779.674.992
AVERAGE NR OF QUERIES/SEC	3.484	4.251	5.186	6.327	7.719	9.417	11.489
NR OF QUERIES/PEAK SEC		42.509	51.862	63.271	77.191	94.173	114.891
AVERAGE NR OF QUERIES/HOUR	12.543.781	15.303.413	18.670.164	22.777.600	27.788.672	33.902.180	41.360.660
NR OF QUERIES IN PEAK HOUR	25.087.563	30.606.826	37.340.328	45.555.200	55.577.344	67.804.360	82.721.319
USER VISITS IN PEAK HOUR	16.892.292	20.608.596	25.142.488	30.673.835	37.422.079	45.654.936	55.699.022
CONCURRENT VISITS IN PEAK HOUR	563.076	686.953	838.083	1.022.461	1.247.403	1.521.831	1.856.634
NEW VISITS IN PEAK SEC		28.623	34.920	42.603	51.975	63.410	77.360

% of reverse queries	1,0%

RDS Implementation Models

The following implementation models were derived from the EWG's Initial and Status Update Reports for purposes of cost analysis:



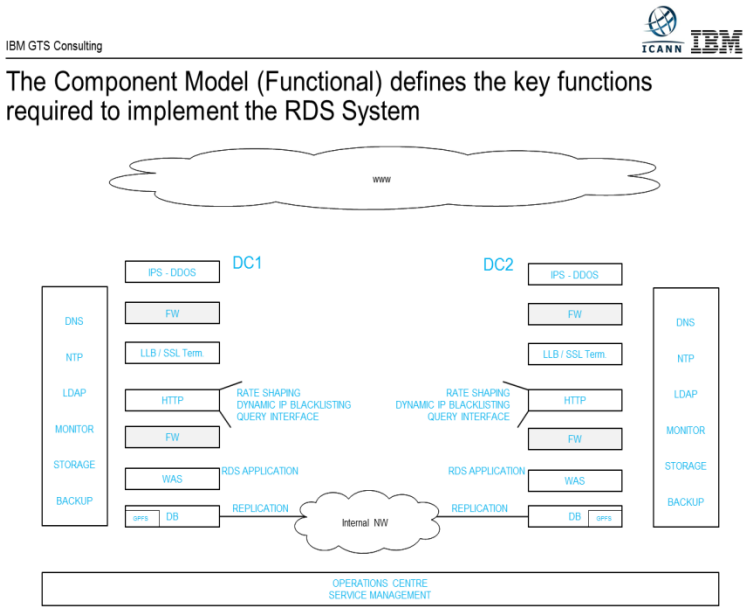


RDS Functional Components

The following component model was created for purposes of cost analysis, incorporating all of the key functions required to implement the RDS system. Standard systems design best practice assumptions were used when costing both the SRDS and FRDS, such as replicating the RDS core system and database across two geographically diverse data centers, with load balancing and fail-over to ensure redundancy and availability, and IPS to deflect DDoS. It should be understood that these functional components APPLY TO BOTH IMPLEMENTATION MODELS.

Functional Components:

- Inter-DC Load Balancing/Routing
- IPS DDoS Mitigation
- Intra-DC Load Balancing & SSL
- Web (HTTP) Server
- Web Application Server (WAS)
- WAS Admin Node
- Database (DB) Caching System
- DB Member System
- Storage Server
- Systems Monitoring
- DNS
- NTP
- LDSP
- Syslog Repository
- Backup Server
- Backup Storage Server
- DB Backup Client System
- Network Zoning, Firewall/IPS
- Internet and DC Connectivity



For example, a two Data Center setup was assumed for the core RDS system in both the SRDS and FRDS model, using an active-active design where each core RDS is capable of handling 50% of peak load. This cost analysis did not include clustering for High Availability within each data center; this could be added without changing the relative costs of the two RDS models.

Cost Estimates (assuming 1% Reverse queries)

The costing summarized below does in no sense constitute an IBM implementation proposal. The costing has been created for the sole purpose of and is only to be used and considered as part of a budgetary costing analysis aimed at comparing two RDS implementation models. Based on the key volumetric inputs, workload requirements, and solution outline given above, the cost per domain name per year for the **Core FRDS and SRDS Systems only** are estimated as:

SRDS Budgetary Cost Estimate

€	0,0183	average cost/domain/year

cost per domain name

yr1	yr2	yr3	yr4	yr5
€ 0,041	€ 0,023	€ 0,017	€ 0,020	€ 0,019

FRDS Budgetary Cost Estimate

€	0,0173	average cost/domain/year

cost per domain name

yr1	yr2	yr3	yr4	yr5
€ 0,041	€ 0,018	€ 0,017	€ 0,021	€ 0,017

Differences in cost were further analysed and compared as follows:

FRDS – SRDS Budgetary Cost Estimate Differences

COST MODEL FRDS		SHARE IN TOTAL		DIFFERENCE WITH SRDS	
SETUP COSTS		**5,9%**		10,5%	
INFRASTRUCTURE SETUP COSTS	ARCHITECTURE & DESIGN	**1,5%**	0,2%	15,6%	0,0%
	PROVISION & CONFIGURE		1,2%		19,2%
	INFRASTRUCTURE TESTING		0,1%		18,4%
APPLICATION SETUP COSTS	ANALYSIS, DESIGN, CODE, UNIT TEST	**1,2%**	1,2%	0,0%	0,0%
TESTING	INTEGRATION TESTING & DEPLOYMENT	**1,7%**	0,8%	7,8%	0,0%
	E2E SYSTEM TESTING		0,2%		38,2%
	PERFORMANCE		0,2%		33,3%
	SECURITY (ETHICAL HACK)		0,5%		0,0%
TRANSITION TO BAU	TRANSITION TO BAU	**0,6%**	0,5%	26,6%	37,7%
	SERVICE DESK SETUP		0,1%		0,0%
MANAGEMENT	PROJECT MANAGEMENT	**0,9%**	0,9%	13,4%	13,4%

The FRDS model implies a higher computing power requirement (more systems required to handle the envisaged load) in the web and web application server layer.

Due to a higher amount of systems to interface with in an on-line manner when handling queries, the FRDS model is estimated to involve more testing effort

FRDS – SRDS Budgetary Cost Estimate Differences

COST MODEL FRDS		SHARE IN TOTAL		DIFFERENCE WITH SRDS	
		100,0%		-5,4%	
RUN COSTS		**94,1%**		-6,3%	
INFRASTRUCTURE COSTS	PUBLIC NW	**30,5%**	8,1%	-22,4%	-55,9%
	DC NW, GLB, LLB, IPS/DDOS		5,7%		10,7%
	HTTP SERVERS		2,2%		236,0%
	WAS SERVERS		3,7%		218,5%
	DB SERVERS		2,2%		-52,0%
	STORAGE		6,3%		-3,8%
	BACKUP		1,9%		-19,0%
	GENERIC SYSTEMS		0,3%		0,0%
SW LICENCE & MAINTENANCE COSTS	DB	**32,7%**	13,7%	-17,5%	-59,5%
	WAS		18,8%		234,6%
	BACKUP		0,3%		0,0%
OPERATIONS AND MANAGEMENT COSTS	INFRA OPERATIONS & MAINTENANCE	**30,9%**	19,4%	44,0%	63,6%
	APPLICATION OPERATIONS		2,6%		20,0%
	APPLICATION MAINTENANCE		1,3%		27,3%
	SERVICE GOVERNANCE		5,2%		0,0%
	SERVICE DESK		2,4%		100,0%

The Public NW cost is lower in the FRDS case due to the IBM SoftLayer NW charging model: incoming traffic is free; per server 20 TB/month outgoing traffic is free, i.e. you get a total free outgoing volume of #servers x 20 TB per month. As the number of servers increases in the FRDS model, the total amount of free TB outgoing NW volume/month increases.

The FDRS model implies a higher NW throughput requirement. Impact on Firewall and Intrusion Prevention Component.

The FRDS model implies a higher computing power requirement in the web and web application server layer.

The FRDS model implies less storage and backup storage capacity as less data is stored centrally.

The DB compute requirement is estimated to be higher in the SRDS model.

Due to a higher amount of systems to interface with in an on-line manner when handling queries, the FRDS model is estimated to involve a higher application operations, support & maintenance release testing workload

Main Conclusions

With the assumptions used the Core RDS system is slightly less expensive in the Federated RDS (FRDS) model than the Synchronized RDS (SRDS) model.

The FRDS model is highly sensitive to variations in the reverse query load. With a higher amount of reverse queries, the FRDS model becomes substantially more expensive: With a 3% reverse query load instead of a 1% reverse query load, the cost of the FRDS model is estimated to increase close to 35%. This is an important factor of uncertainty and risk associated with the FRDS model. The SRDS model to the contrary is believed to be less sensitive to the amount of reverse queries.

The FDRS model is expected to require higher application operations, support, maintenance and test effort as more interactions with Registry Operators are expected.

In addition, the FRDS model has more impact on the Registry Operators. In the FRDS model, each Registry Operator will have to implement support – under SLA – for online queries, including reverse queries and historical ownership queries (aka WhoWas). For the latter historical data would have to be maintained by the Registry Operators.