

Professional online training course layout for the topic:

Title: “**Advancement of DBMS technologies in conjunction with the UNIX enterprise system technologies**”

Purpose:

To teach how the advancement of both DBMS & the UNIX enterprise systems, has been complementing each others in the high tech. industry for over 40 years, along with a few Tech. industry Use Case Studies from the UNIX enterprise system tech. industry.

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Syllabus:

- 1) Why this training topic is very relevant in the current tech industry and how does it matters to you as an engineering student or graduate or IT professional?
- 2) Evolution of DBMS technologies from simple DBMS model to RDBMS to DDBMS to BigData
- 3) Evolution of UNIX enterprise system technologies from UNIX desktop to Workstation to Low-end, Mid-end, High-end UNIX enterprise systems.
- 4) How the advancement of UNIX enterprise system industry has been complimenting with the advancement of DBMS technology historically?
- 5) What are the few examples of UNIX platform based system software solutions which supports the advancement of both RDBMS & DDBMS technologies?
- 6) When do we need to use high end geographically spread out UNIX enterprise Clustering system?
- 7) A few UNIX platform based well known system software solutions which inherently uses distributed data base system concepts

- 8) Some of UNIX OS features and System software solutions which inherently adopt the BigData concept to manage UNIX enterprise system data?
 - 9) Microsoft SQL Server platform based Tech. Industry Use Case Study:
 - ❖ Data Mart (Denormalized SQL includes Star schema)
 - 10) Summary of some of the most commonly used software toolkit by the IT professionals in the current tech. industry:
 - DBMS specific:-
 - UNIX enterprise system platform specific:
 - 11) Conclusions
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What you as a student will learn from this online professional training course?

- In terms of expansion of your technical knowledge base in the following areas:
 - 1) Evolutions of some of the major DBMS technologies: Relational DBMS, Distributed DBMS, BigData
 - 2) Some of the major tech. companies who are the pioneers of advancement of: Relational DBMS, Distributed DBMS, BigData
 - 3) Evolutions of the major UNIX enterprise technologies: UNIX enterprise Low-end to Mid-end to High-end data server & storage system products including Clustering.
 - 4) Some of the major tech. companies who are the pioneers of advancement of: UNIX enterprise technologies
 - 5) Some of the major Industry demands & requirements (i.e. influencing factors) for the usage of Distributed DBMS & BigData?
 - 6) Some of the relevant tech. industry Use Case Studies, covering both DBMS technologies & UNIX enterprise system technologies as well.
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Layout of this training course:

- 1) Why this training topic is very relevant in the current tech industry and how does it matters to you as engineering student or graduate or IT professional?
 - How evolutions of both DBMS & UNIX enterprise system technologies are interrelated since 1960 till present?

- From Student perspective, why expansion of technical knowledge base, gaining work exposure & expertise in both DBMS & UNIX enterprise technologies, is major plus in terms of expansion of some of the industry demand technical skill set & job opportunities in the current tech. industry?
 - What are the learning values i.e. take a ways from this online pro-training course?

2) Evolution of DBMS technologies from simple DBMS model to RDBMS to DDBMS to BigData

- Evolution of DBMS from the Traditional DBMS which is based on Structural data storage management to Big Data which is based on Unstructured data storage management
- Some of the major tech. Companies who are the pioneers of innovations of some of the major types of DBMS technologies.
 - Relational Data Base system (RDBMS also can be referred as Traditional DBMS)
 - IBM Db2 (i.e. Traditional DBS) and contains database server products and is Object-RDBMS which internally uses Structured Query Language (SQL) to define, query, and update the database
 - Oracle Database (Latest Release version:- 12c Release 2: 12.2.0.1) is an Object-Relational Data Base Management System (i.e. Traditional DBS) which internally uses SQL to define, query, and update the database
 - Microsoft SQL database (i.e. Traditional RDBS)
 - Distributed Data Base system (DDBMS)
 - Oracle DB supports Distributed SQL
 - NoSQL DBMS supports DDBMS architecture
 - BigData
 - IBM Hadoop (Open Source)
 - NoSQL (Open Source)
 - Oracle DB supports BigData up to some extent.
- **What are the industry demands & requirements (i.e. influencing factors) for the usage of distributed data base management system & BigData?**
 - Increase in the adoption of Offshore & Onsite PM business model in the Multi-National Companies including Computer IT (including Video, Gaming), Banking, Automobile, Hotel industry, which has globally expanding business.
 - This has resulted in the exponential expansion of Global customer/client, employee, and finance data base.
 - Exponential increase in the usage of wifi based mobile devices such as smart phone, IPOD, by the millions of people across the globe.
 - This has resulted in the exponential increase in the size of incoming user unstructured data (in terms of multiple peta-bytes per day) via these smart devices due to app(s) such as Google search engine, Facebook, Twitter, YouTube, ...

- Traditional RDBMS such as IBM Db2, Oracle DB has failed to manage such unstructured data of exponentially increasing size, that too in terms of multi-peta, since these traditional RDBMS were originally designed to manage structured data only.

3) Evolution of UNIX enterprise system technologies which has supported for the advancement of DBMS technologies.

(i) Some of the major internal components of UNIX enterprise system technologies:

- Low-end, Mid-end & High-end UNIX data Server,
- Low-end, Mid-end & High-end UNIX Storage server
- Few variants of UNIX OS such as Solaris, Linux, ONTAP, ...
- Some of the major tech. Companies who are the pioneers of innovations of UNIX enterprise system technologies.
- Some of the major variants of UNIX Operating Systems exist in the current high tech. industry:
 - Solaris from Oracle (originally from Sun Microsystems)
 - Open Source Linux (+ Oracle Linux)
 - BSD UNIX
 - HP-UX
 - ONTAP (NetApp Storage OS)
 - (Embedded & Open Source) Linux & Google Android OS (for wifi based smart mobile devices)
 - Apple iOS (for wifi based Apple smart mobile devices such as iPhone, iPod)

4) How the advancement of UNIX enterprise system industry has been complimenting with the advancement of DBMS technology historically?

- Innovations of both Oracle (originally Sun Microsystems) Solaris OS & Oracle RDBMS has been complimenting each other for over 30 years
 - Solaris OS feature set: Cluster, Volume Manager, UFS, NFS, ZFS, SMF, FMA, Zones (Virtual Machine), DTrace
 - **Tech. industry Use Case Study 2:**
Storage Management optimization techniques of multiple Solaris OS features including ZFS which supported the advancement & stability of DBMS including Oracle RDBMS:-
 - **Solaris OS ZFS:-**
 - RAID-Z3, Continuous Data Integrity check, Live Storage expansion support, Copy on write, Backup (snapshot clones),
 - Supports external storage space of multiple peta-bytes,
 - High scalability of external storage space expansion

▪ **Tech. industry Use Case Study 3:**

Oracle ZFS Storage Appliance box has been successfully integrated in to high performance Oracle data base and has been proven that its best fit for very heavy Oracle database workloads.

▪ **Tech. industry Use Case Study 4:**

Oracle ZFS Storage Appliance box has been well tested & has been proven that it is one of the best fit for one of the major Big Data application Hadoop.

- Innovations of both IBM UNIX OS & Db2 RDBMS has been complimenting each other for over 40 years
- Innovations of both Open Source Linux OS & IBM Db2 RDBMS, Oracle RDBMS, has been complimenting each other for over 25 years
- Innovations of Oracle RDBMS & UNIX enterprise data server & storage product lines from Sun Microsystems, HP, NetApp, & Intel processor technologies, has been complimenting each other for over 25 years
- Innovations of Storage System Software solutions & Oracle RDBMS has been complimenting each other for over 30 years:
 - Veritas/Symantec Storage System Software solutions: Cluster, Volume Manager, File System
 - Sequent/IBM Storage System Software solutions: Cluster, Volume Manager, File System
 - NetApp Storage System Software solutions: ONTAP Storage OS (Cluster, WAFL, Volume Manager)

❖ **Tech. industry Use Case Study 5:**

Storage Management optimization techniques of multiple NetApp Storage OS features which supported the advancement & stability of DBMS including Oracle RDBMS:-

- **NetApp ONTAP Storage OS feature: WAFL:-**
 - RAID-5, Continuous Data Integrity check, Copy on write,
- **NetApp ONTAP Storage OS feature: Content Repository (BigData):-**
 - Supports external storage space of multiple peta-bytes,
- **NetApp ONTAP Storage OS feature: NFS:-**
 - NFSv4.2 which is one of the most advanced NFS release, supporting many advanced NFS optimization techniques.
- **NetApp ONTAP Storage OS feature: snapshot:-**

- HP UNIX OS: HPUX
- Innovations of Open Source (Embedded) Linux OS & BigData DBMS such as NoSQL, IBM Hadoop, & wifi based mobile devices such as smart phone, iPod, has been complimenting each other for over 5 years

5) What are the few examples of UNIX platform based system software solutions which supports the advancement of both RDBMS & DDBMS collectively (i.e. in combination)?

- Cluster, [Sun Microsystem Solaris OS feature, Veritas, Sequent,]
- Volume Manager, [Sun Microsystem Solaris OS feature, Veritas, Sequent, NetApp,]
- CFS, ZFS [Sun Microsystem Solaris OS feature]
- WAFL [NetApp ONTAP Storage OS feature]

6) When do we need to use high end geographically spread out UNIX enterprise Clustering system?

❖ Why high end geographically spread out UNIX enterprise Clustering system is the natural choice for the distributed data base system & BigData too?

❖ **Tech. industry Use Case Study 1:-**

System architecture of UNIX enterprise High end Clustering system based on the following real work life example scenarios:

- **Real work life example scenario 1** which involves maintenance of Global Banking data via DDBMS
- **Real work life example scenario 2** which involves maintenance of Google Search engine and/or Facebook and/or Twitter or YouTube app(s) based user data via BigData

7) A few UNIX platform based well known system software solutions which inherently uses distributed data base system concepts:

- Cluster Management data base [being used by Sequent/IBM Cluster system software solution] for the Cluster nodes heartbeat mechanism.
- FMA data base, [being used by the Solaris OS FMA feature]

8) Some of UNIX OS features and System software solutions which inherently adopt the BigData concept to manage UNIX enterprise system data?

❖ **Tech. industry Use Case Study 6: Solaris FMA OS feature** & internal FMA data bases on each of UNIX data server node(s) & System Controller(s)

❖ System architecture of Solaris FMA OS feature

➤ System Error Data Analytics engines:-

- cpumem-diagnosis engine which analyzes cpu/memory DIMM specific errors & generates fault-event,

- io-diagnosis engine which analyzes I/O (PCI/PCI-E card) specific errors & generates fault-event,
- Response Agent(s):- performs Cognitive Data (i.e. System error) Analysis of fault-event(s) and generates recommendations to Sys-admin on what is the appropriate action to be taken to rectify the faulty component(s)
- ❖ **Tech. industry Use Case Study 7: Solaris ZFS OS feature**
 - ❖ System architecture of Solaris FMA OS feature
 - Underlying zfs controlled storage Error Data Analytics engines:-
 - zfs-diagnosis engine which analyzes zfs controlled storage device specific errors & generates fault-event,
 - Response Agent(s):- performs Cognitive Data (i.e. zfs controlled storage device error) Analysis of fault-event(s) and generates recommendations to Sys-admin on what is the appropriate action to be taken to rectify the faulty component(s)
- ❖ **Tech. industry Use Case Study 8: ONTAP Content Repository Storage OS feature**
 - ❖ System architecture of ONTAP Content Repository OS feature
 - This involves management of Client site UNIX server status data based on DDBMS & BigData concepts.

9) Microsoft SQL Server platform based Tech. Industry Use Case Study:

- ❖ **Data Mart (Denormalized SQL includes Star schema)**

10) Summary of some of the most commonly used software toolkit by the IT professionals in the current tech. industry:

- **DBMS specific:-**
 - **SQL (Sequel) Server**
 - Oracle db
- **UNIX enterprise system platform specific:-**
 - Oracle Solaris & Linux **ZFS API set**
 - **DTrace**: Solaris OS System diagnosis tool
 - Oracle Solaris & Linux OS **FMA, SMF CLI set**

11) Conclusions

References:

- (i) <http://marketrealist.com/2014/07/must-know-big-data-gave-way-to-the-arrival-of-nosql-hadoop/>
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- (iii) https://en.wikipedia.org/wiki/Comparison_of_relational_database_management_systems
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