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Training

Challenges (Intro to ANSA)

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Abstract

The business problem addressed is...

The technical problem created by that business problem is ...

The solution being offered is....

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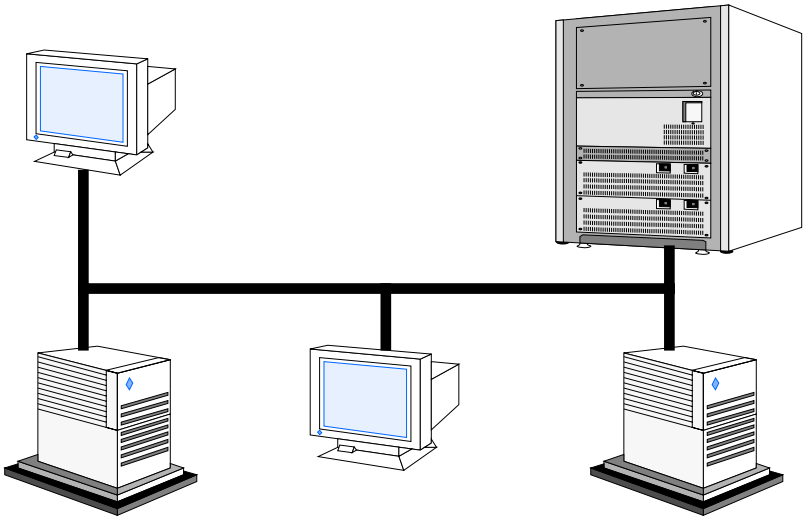
Briefing Note

Distribution:
Supersedes:
Superseded by:

The Challenge: Problems and Opportunities



In this session

- ***Explain in what ways distributed systems are different***
- ***Explain the problems and opportunities of distribution***
- ***Build towards a general approach that helps you build distributed systems***

Distributed systems are different

- **Many traditional system design assumptions must be reversed**

Traditional	*Reversed*
Local	Remote
Sequential	Concurrent
Homogeneous Environment	Diverse Environment
Fixed Location	Mobile
Single Copy	Multiple Copies
Synchronous	Asynchronous
Direct	Indirect
Shared	Separate
Global	Context Relative
Complete Failures	Partial Failures
Early Binding	Late Binding
Global time	Different local times
Single view	Multiple views

- ***A systematic approach is needed to avoid these assumptions***

Features of distributed systems

- *Diversity: many types of machines in the same system*
- *Legacy: evolution and interworking of existing systems*
- *Scalability: low cost of computing per machine*
- *Decentralization: no single point of control*
- *.... these differences are fundamental*

Distributed systems are fundamentally different - Separation

- ***Separation***
  - **remoteness**
  - **migration**
  - **no shared memory**
  - **partial failure**
  - **weak global consistency**

Distributed systems are fundamentally different - Diversity

- *Diversity*
  - diversity of scale
  - diverse data representations
  - diverse naming schemes
  - diverse hardware and software
  - diverse communications mechanisms

Distributed systems are fundamentally different - Federalism and Concurrency

- ***Federalism***
  - **no central authority**
- ***Concurrency***
  - **simultaneous operation**
  - **multiple copies**

Possible solutions on offer?

- *Client-server*
- *Object-orientation*
- *Open systems*
- *Rightsizing*
- *... no single approach or technology will dominate*

These are not solutions, but they are useful

Different policies for different applications

- ***Availability*** **versus** ***Consistency***
- ***Autonomy*** **versus** ***Uniformity***
- ***Security*** **versus** ***Convenience***
- ***... and many other unavoidable trade-offs***
- ***Leading to: No single solution/system will satisfy everybody***

Summary

- ***The different physics of distributed systems require us to think differently: discard or reverse many of the assumptions made implicitly in centralized systems***
- ***For more information: contact APM for papers and workshops on ANSA - the Advanced Networked Systems Architecture***
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