Trends in Distributed Computing

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Abstract

A short presentation looking at current trends in distributed computing research and in industry developments to be given to Fujitsu Laboratories, September 1995.
TRENDS IN DISTRIBUTED COMPUTING

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Presentation to Fujitsu Laboratories
STRUCTURE OF PRESENTATION

TRENDS

CONCLUSIONS
TRENDS IN DISTRIBUTED COMPUTING

1. CORBA and Distributed OLE technology convergence for electronic commerce
2. Active content paradigm for electronic information
3. Distributed information processing
4. Syntax independent programming
5. Distributed control of broadband multimedia networks
6. End-to-End Security
1: DISTRIBUTED TECHNOLOGY FOR ELECTRONIC COMMERCE

- Distributed OLE
- CORBA
- Convergence
Distributed OLE

- **Document component linking**
  - A file system driven view - objects are persistent data
  - Infrastructure takes on many responsibilities transparently
  - Will OLE and DCOM scale?

- **Applications**
  - Hypertext approach to cooperative work - but can users cope with the complexity?
  - How does business process automation fit in?
  - Component oriented applications - but these benefit the vendor more than the user
CORBA

- CORBA supports applications integration across networks
  - Business process driven view
  - Objects manage and secure themselves
  - Infrastructure is an extensible core
  - Transparency is selective

- Applications
  - Networked systems management
  - Networked data integration, management and distribution
  - Task automation
OLE / CORBA Convergence

- OLE learns from DCE?
  - and gains cells, management, security, transactions
- CORBA learns from OPENdoc?
  - and gains lightweight implementations for small objects
- Need both for electronic commerce in wide area open information networks
- Outcome?

Diagram:
- User interface
- OLE
- Desktop
- CORBA
- Workstation
- Intelligence, Coordination, Mediation
- Corporate data
- Mainframe
2: ACTIVE CONTENT

Federated Repository

Meta-Data

Object

Data

Process

• automate management, navigate, filter, monitor

Semantics-based processing

• the content
  - life > 100 years...

• protect integrity of data
  - objects protect themselves
  - objects manage themselves
  - replace / upgrade ‘in service’

• choose best presentation
3: DISTRIBUTED INFORMATION PROCESSING

- Business process driven (e.g. case work)
- Declarative (e.g. scripting, event-condition-action, deductive, ...)
- Semantic understanding of applications
  - Agent-based computing with feature interaction resolution
  - Automatic content-based indexing, analysis and transformation and retrieval of information resources in a whole range of media
- Loose information consistency
  - Robust, self healing algorithms and data models
- Charging and licensing services in federated systems
- Mobility
  - Detached information handling and subsequent reconciliation
4: SYNTAX INDEPENDENT PROGRAMMING

- Store source as an Abstract Syntax Tree (AST)
  - Transformation tools convert from high to low level
  - Debuggers, checkers, compilers, editors work on tree
- Read in legacy code
- More expressive programming
- Cross-language re-use
- Called *Intentional Programming* by MicroSoft
- ASTs used in ANSA tools since 1991
5: Distributed Control Of Broadband Multimedia Networks

Services and management outside the network

Application

Connection management

Device management

Broadband ORB

Supports time critical functions
Integrated with nanokernel
Isochronous stream I/O

CORBA interface

Cell level interface

Basic Switching

Transmission

QoS guaranteed bit pipes

Simple devices

Processors

Services and management outside the network
6: END-TO-END SECURITY

- Secure operating systems don’t scale or interoperate
  - Move security out into the applications
  - Provide a library of security functions
  - Only require *ENCAPSULATION* from operating system

- Principles:
  - Develop business driven models for setting up and managing dynamic networks of trust
  - Self-defence
  - Transfer authority (delegation)
  - Transfer trust
CONCLUSIONS

- Interoperability is more important than portability
- Small nanokernel to support distributed objects
- End-to-end management of security and quality of service
- Broadband and multimedia require new-style operating systems
- Increasing automation/intelligent help through agents