PAID

Platform for Active Information Dissemination

Client Acceptance Test

Agenda

- Purpose of Meeting
  - To present and demonstrate the PAID system.
- Desired Outcome of Meeting
  - Successful demonstration of test scenarios.
  - Client acceptance of the PAID project.
  - Minutes and VCR tape of the demonstration.

Presentation Outline

- Introduction - David Garmire (5 min)
- Project Overview - Andy Zimdars (15 min)
- Network and Authentication (10 min)
  - Presented by Anthony Watkins
- Learning and Database (10 min)
  - Presented by Rudy Setiawan
- User Interface (15 min)
  - Presented by Jonathan Hsieh
  - Visionary Scenario

Demonstration Outline

- Demo Scenario III (5 min)
  - James Lampe, Brian Woo, Jonathan Hsieh
- Demo Scenario I (10 min)
  - Pooja Saksena, Michael Smith, Kent Ma, Stephane Zermatten, Georgios Markakis, and Reynald Ong
- Demo Scenario II (10 min)
  - Will Ross, Rudy Setiawan, Andy Zimdars, Arnaldo Piccinelli, and Michael Smith
- Wrap Up - Andy Zimdars (5 min)
- Questions and Answers

System Architecture

Presenter: **Andrew Zimdars**

Architecture Team: **Luis Alonso**

Kent Ma

Georgios Markakis

Michael Smith

Anthony Watkins

Outline

- Deliverables
- Architecture Review
- Scenarios Supported
- Deferred Work
- Future Directions

Deliverables

- Requirements Analysis Document
- Software Project Management Plan
- System Design Document
- Object Design Document

Architecture Review

- **Business Goals**
- **Design Goals**
- **Topology**
- **System Decomposition**
- **Conceptual Object Model**
- **System Architecture**
- **Deployment**

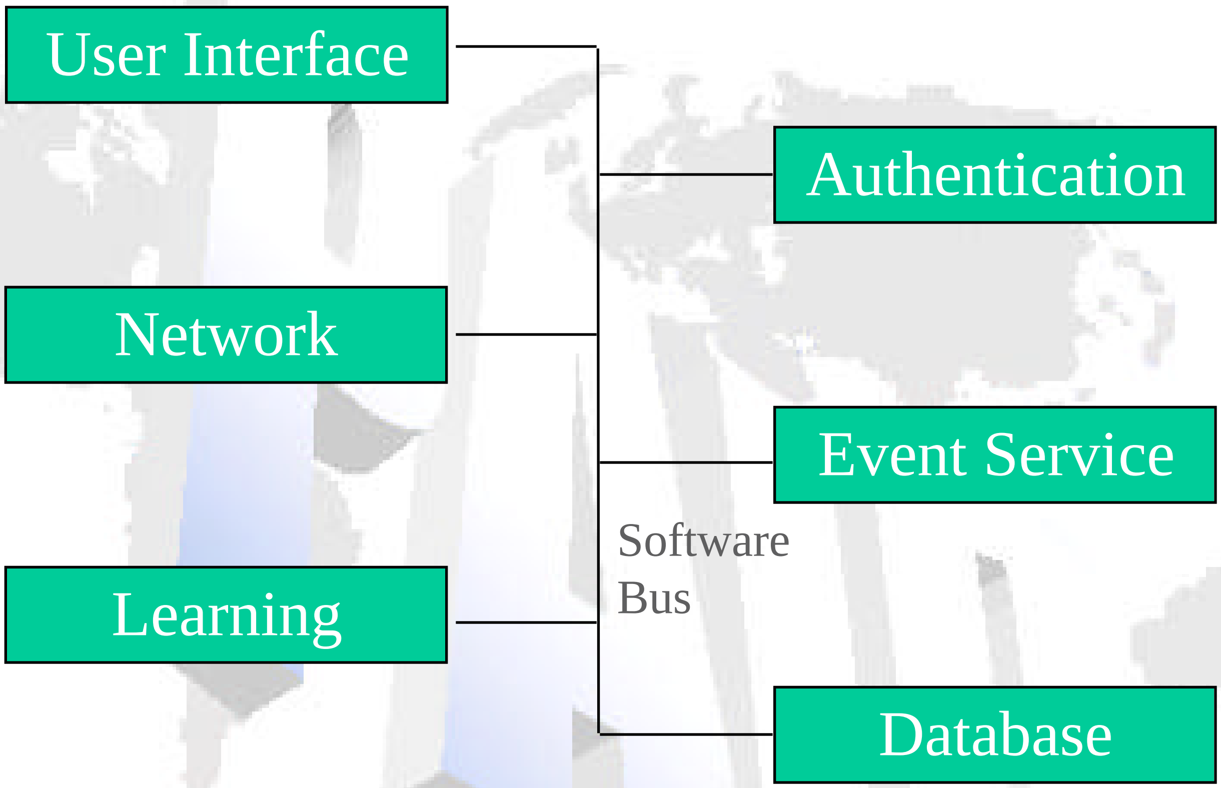
Business Goals

- Integration with StarNetwork applications
- Easy development of new applications
- Low entry and administrative cost
- Fast response time
- Up-to-date information
- Security

Review: Design Goals

- **Extensibility**
- **Scalability**
- **Location Transparency**
- **Actuality**
- **Reliability**
- **Adaptability**

PAID Topology



User Interface

Network

Learning

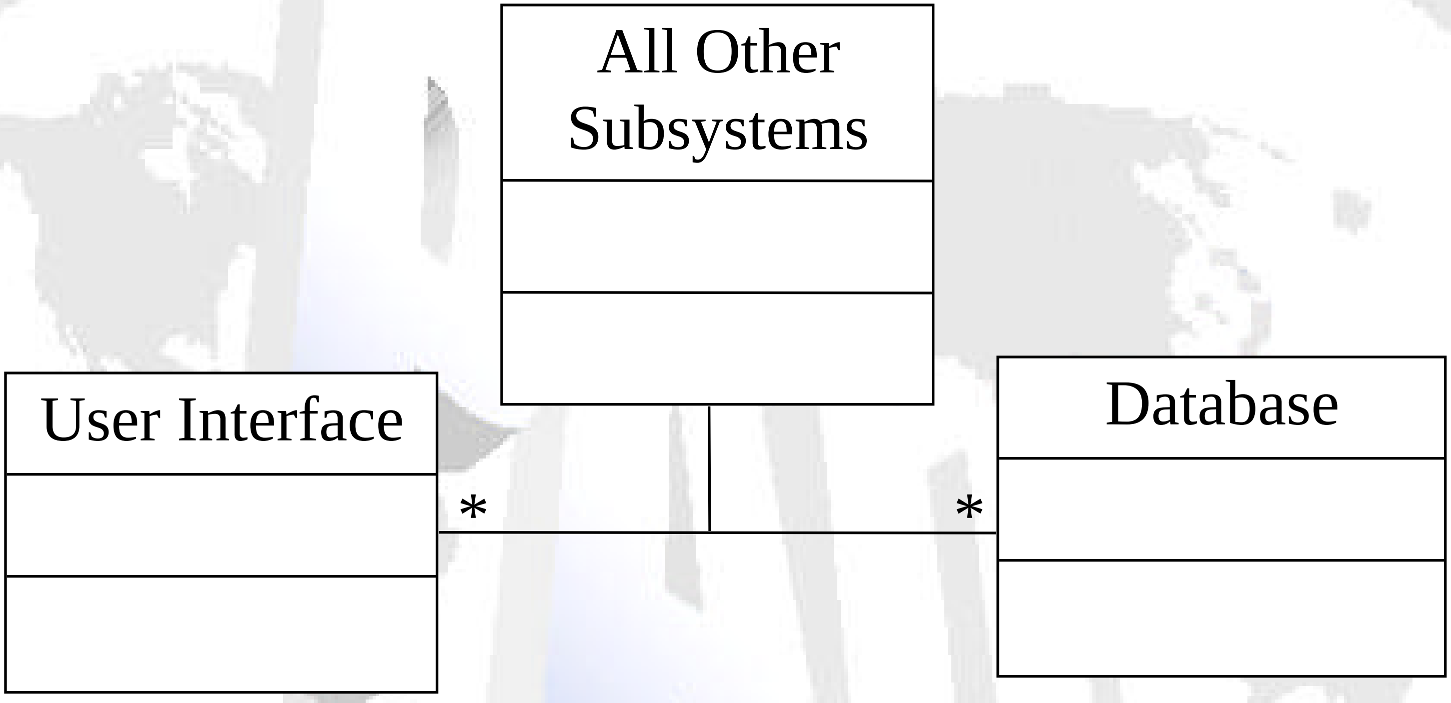
Authentication

Event Service

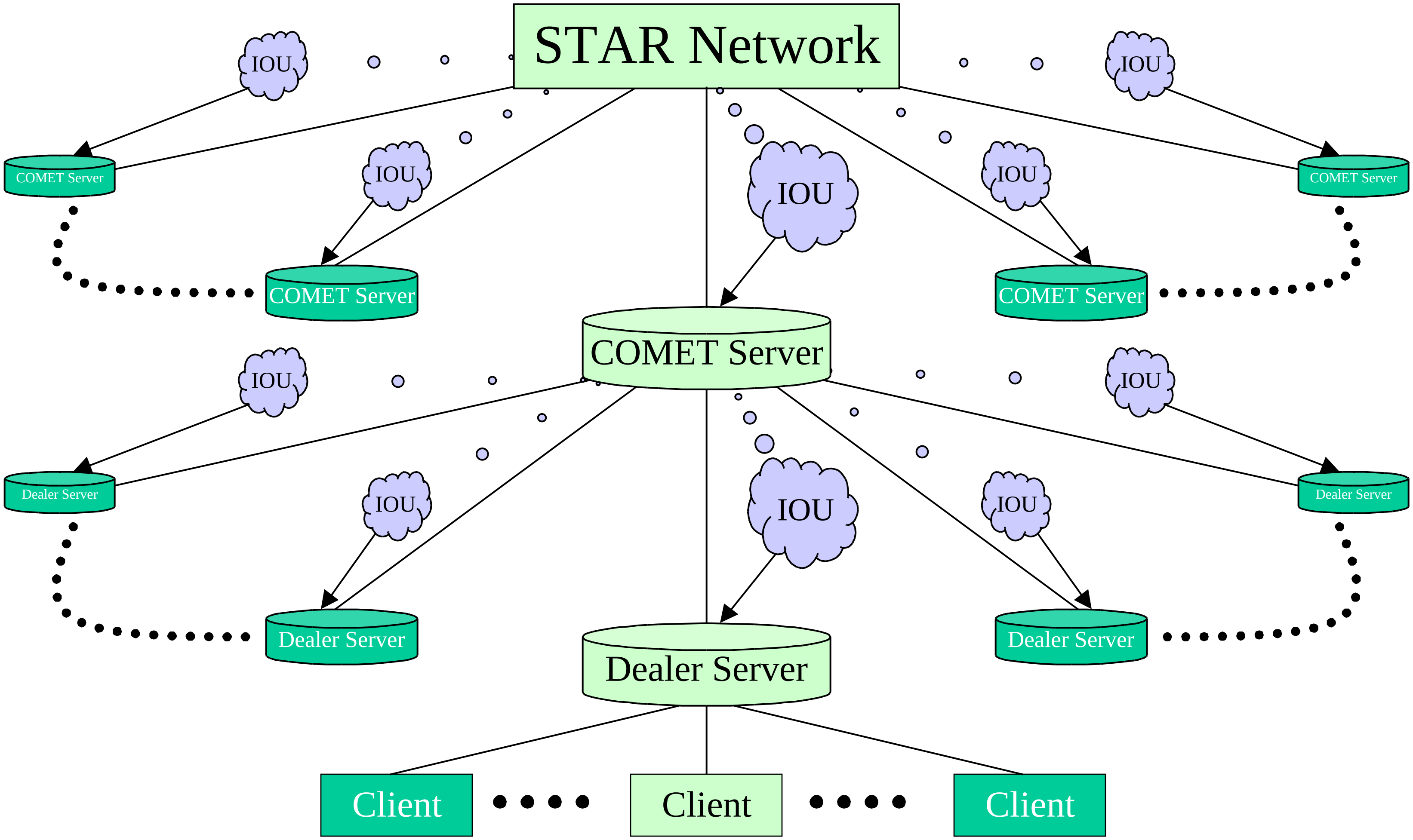
Database

Software Bus

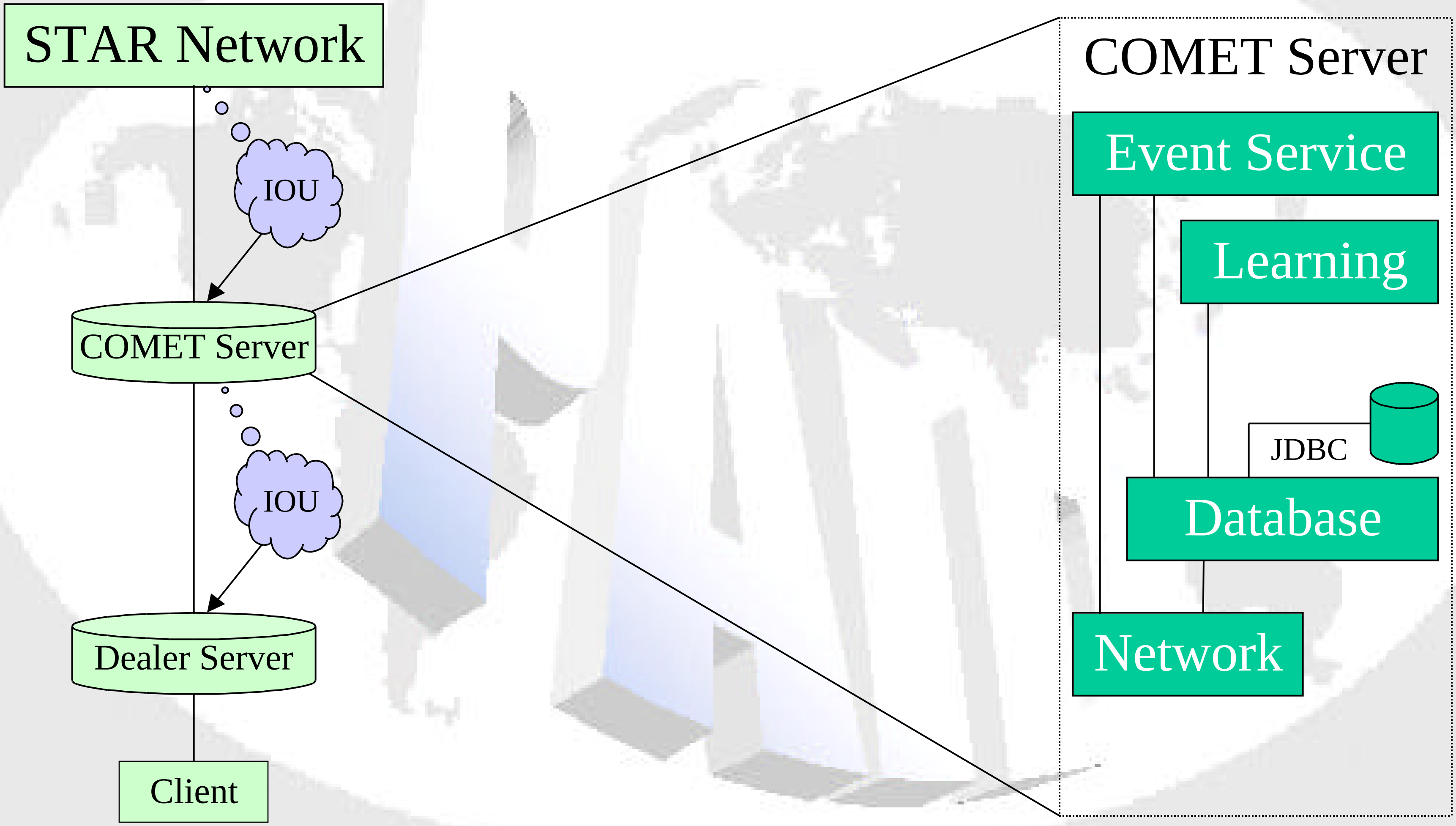
PAID Conceptual Object Model



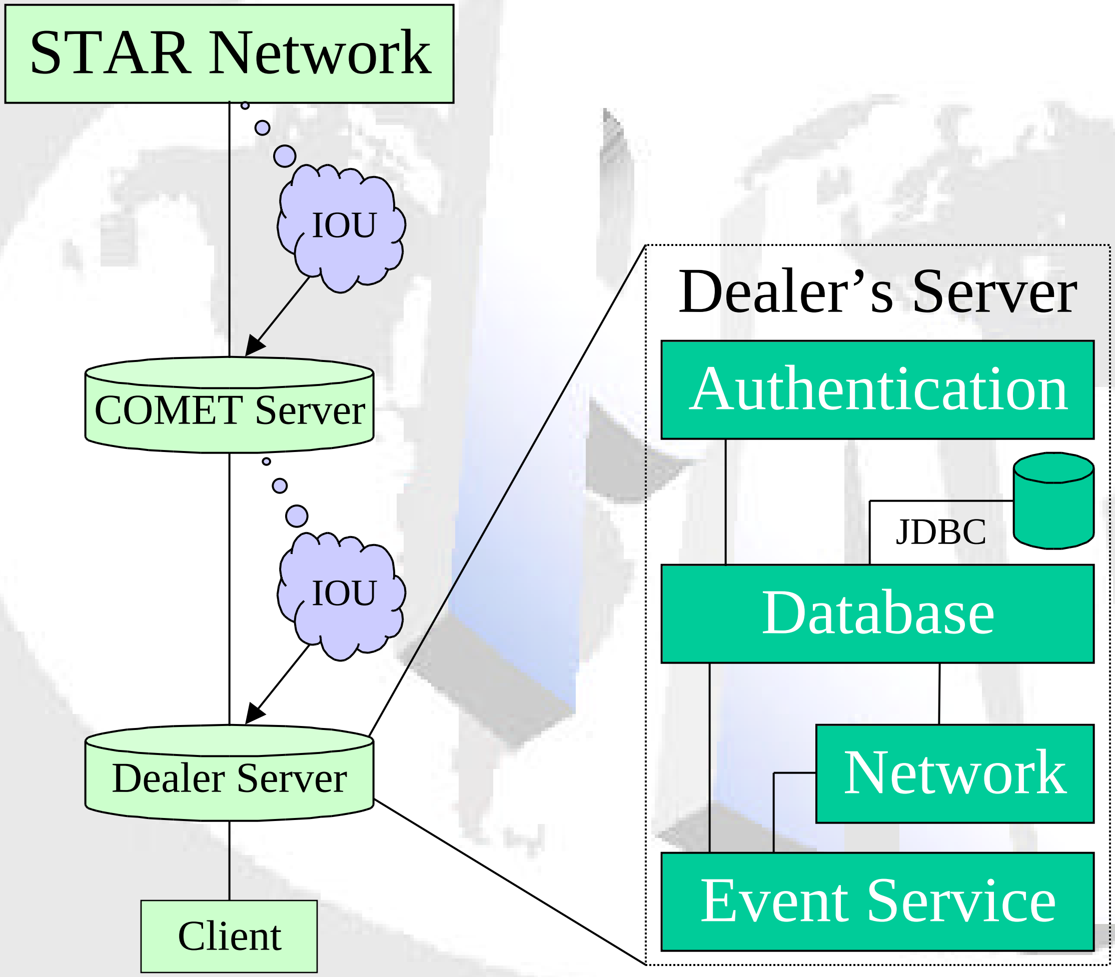
PAID System Architecture



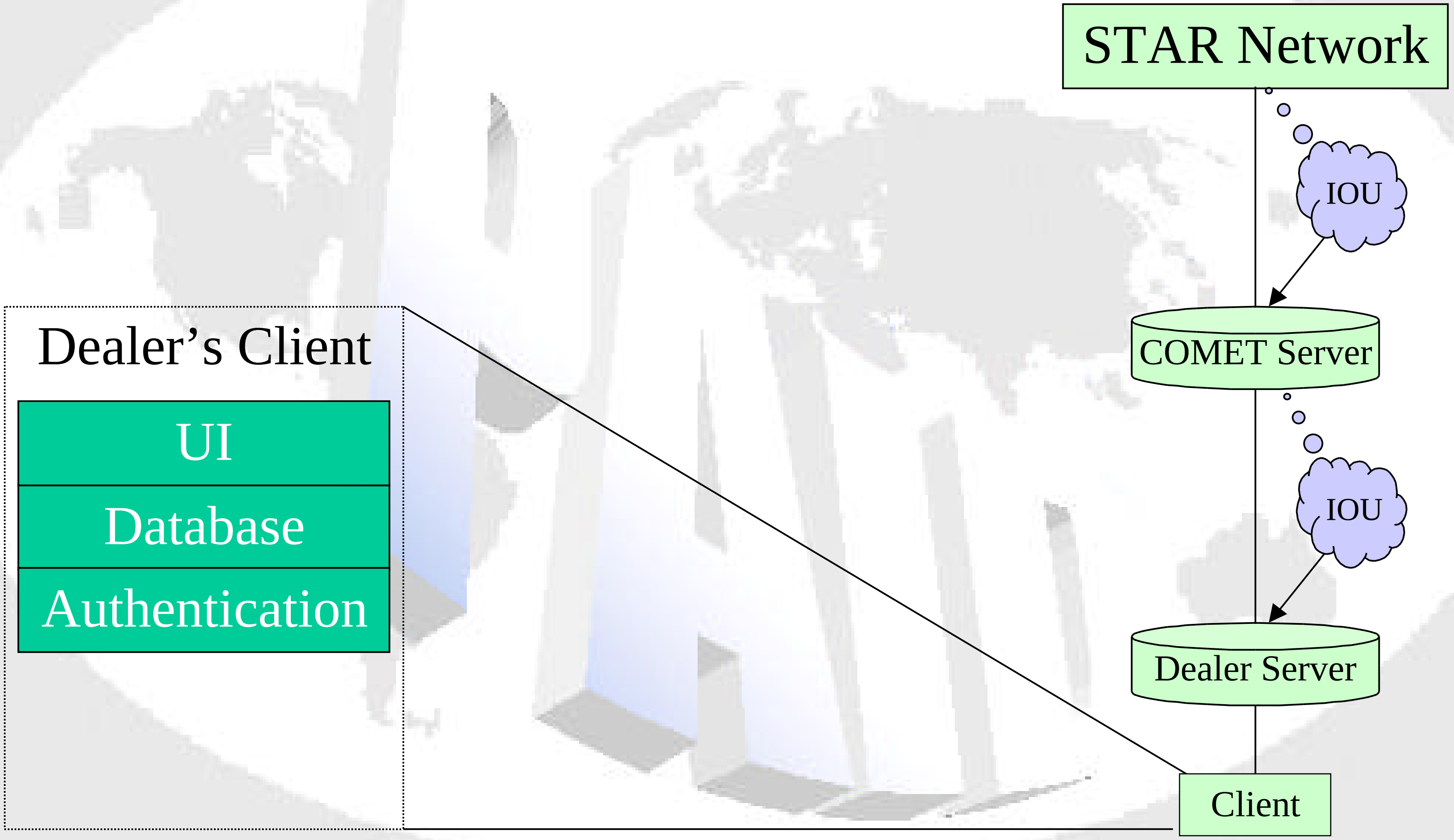
PAID System Deployment



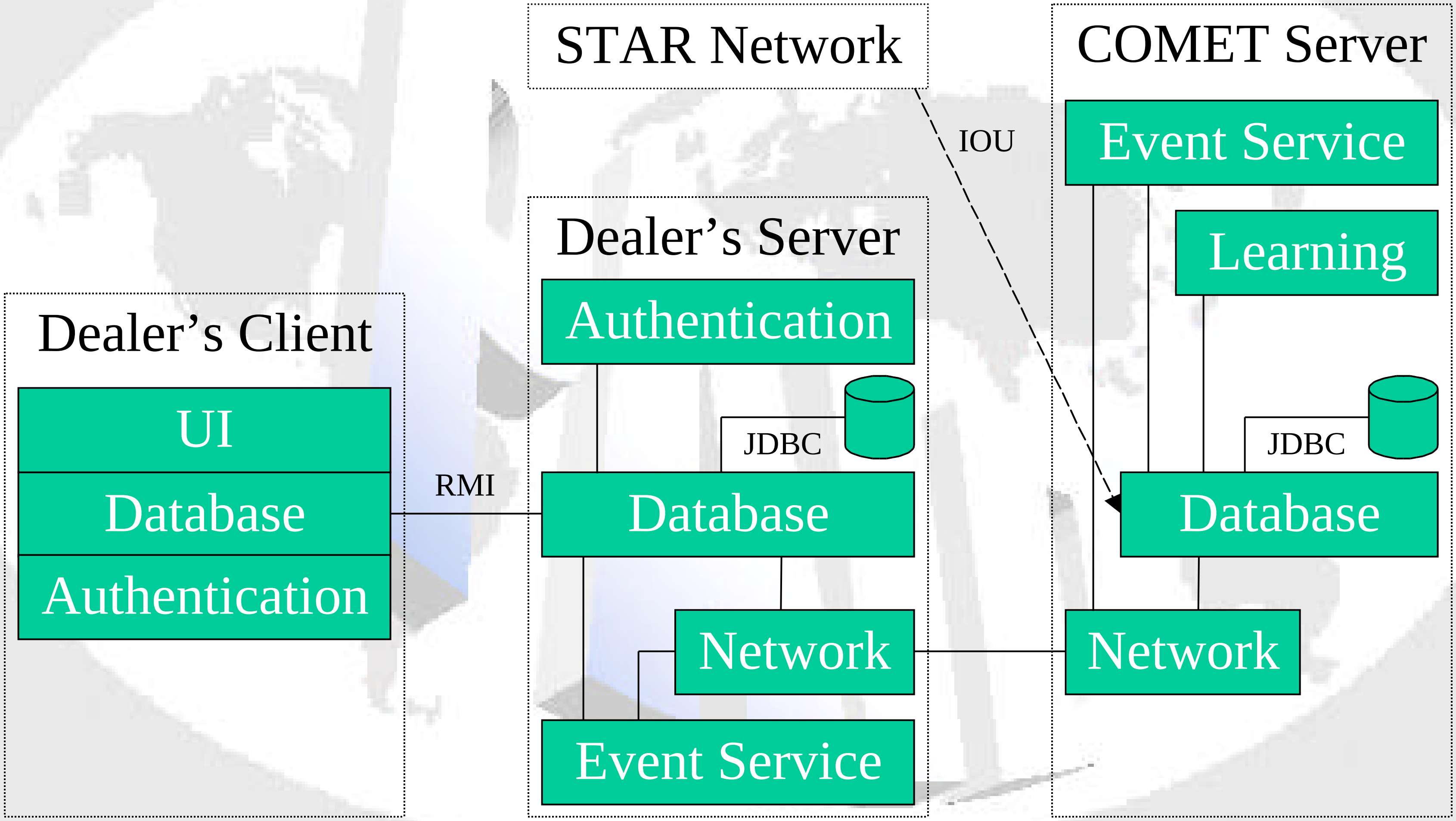
PAID System Deployment



PAID System Deployment



PAID System Deployment



Scenarios Supported

- Three demonstrations
- Each demo presented will incorporate aspects of several problem statement scenarios

Demo I

- Problem Statement Scenario 2
  - No service due to poor network performance
- Problem Statement Scenario 3
  - Dealer’s workshop at 8AM
  - Deferring scheduled downloads due to high traffic
- Problem Statement Scenario 8
  - Security by smart-card authentication

Demo II

- Problem Statement Scenario 4
  - Introduction of the M-Class in Germany
  - System performance improves in response to download patterns
- Problem Statement Scenario 5
  - Minimizing connection costs
  - Download recommendations change according to dealer connection

Demo III

- **Problem Statement Scenario 6**
  - **Projected use of handheld device in mobile garage application**
  - **Use of handheld device with PAID to improve service**

Major Design Challenges

- Lack of sample data
- Design for Java performance and security
- Routing by data location
- Maintaining a sufficiently thin client architecture
- Learning subsystem topology

Deferred Work

- Problem Statement Scenario 1
  - Adding a dealer
  - Administrative interface limited
- Problem Statement Scenario 7
  - User billing
  - User-level information available, but not yet tracked
- Non-affiliated Dealers
  - Implementation for non-affiliated dealer exists
  - Custom proxy software not implemented; off-the-shelf solutions available

Authentication and Network Subsystems Overview

Presenter: Anthony Watkins

Authentication Team:

Luis Alonso
Pooja Saksena
David Garmire
Qiang Rao
Arnaldo Piccinelli

Network Team:

Barrett Trask
Adam Phelps
Will Ross
Orly Canlas
Anthony Watkins

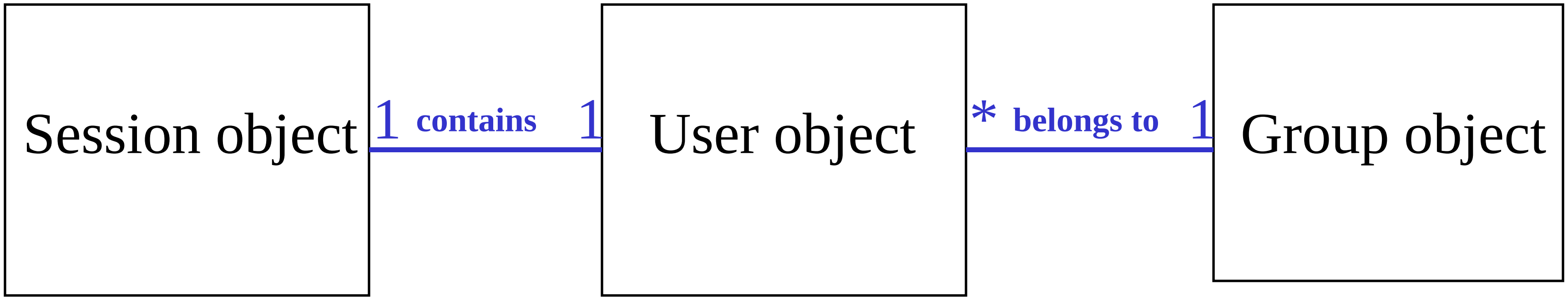
Mission: Authentication

Provide a secure, smart-card based access to the PAID system for different types of users.

Functions Supported: Authentication

- Encrypt/Decrypt using RSA
- Employ Java-card as user identification tool
- Identify all users and their corresponding access rights
- Establish a secure connection over the network to the comet server
- Ensure secure data transmission over the network
- Implement application-level security to all relevant parts of the PAID system

Design: Authentication



Design Rationale: Authentication

- **Employ RSA as method of encryption/decryption**
    - It is one of the strongest and most trusted encryption algorithms in use today
    - It is relatively easy to implement
    - Illustrates proof of concept for unaffiliated dealer
- **Proxy not implemented, but recommended**
    - Can be used to block unauthorized users from Daimler-Benz intranet
    - Is not implemented due to complexity and time constraints
- **Implement application-level security**
    - Secures access to all relevant parts of the PAID system
    - Provides less overhead on database servers (as opposed to database level access control)

Implementation Status: Authentication

- Java-card is functional
- Interaction with user interface system complete
- Interaction with database subsystem complete
- Interaction with network subsystem near complete (encrypt/decrypt implemented, but not fully functional)

Mission: *Network*

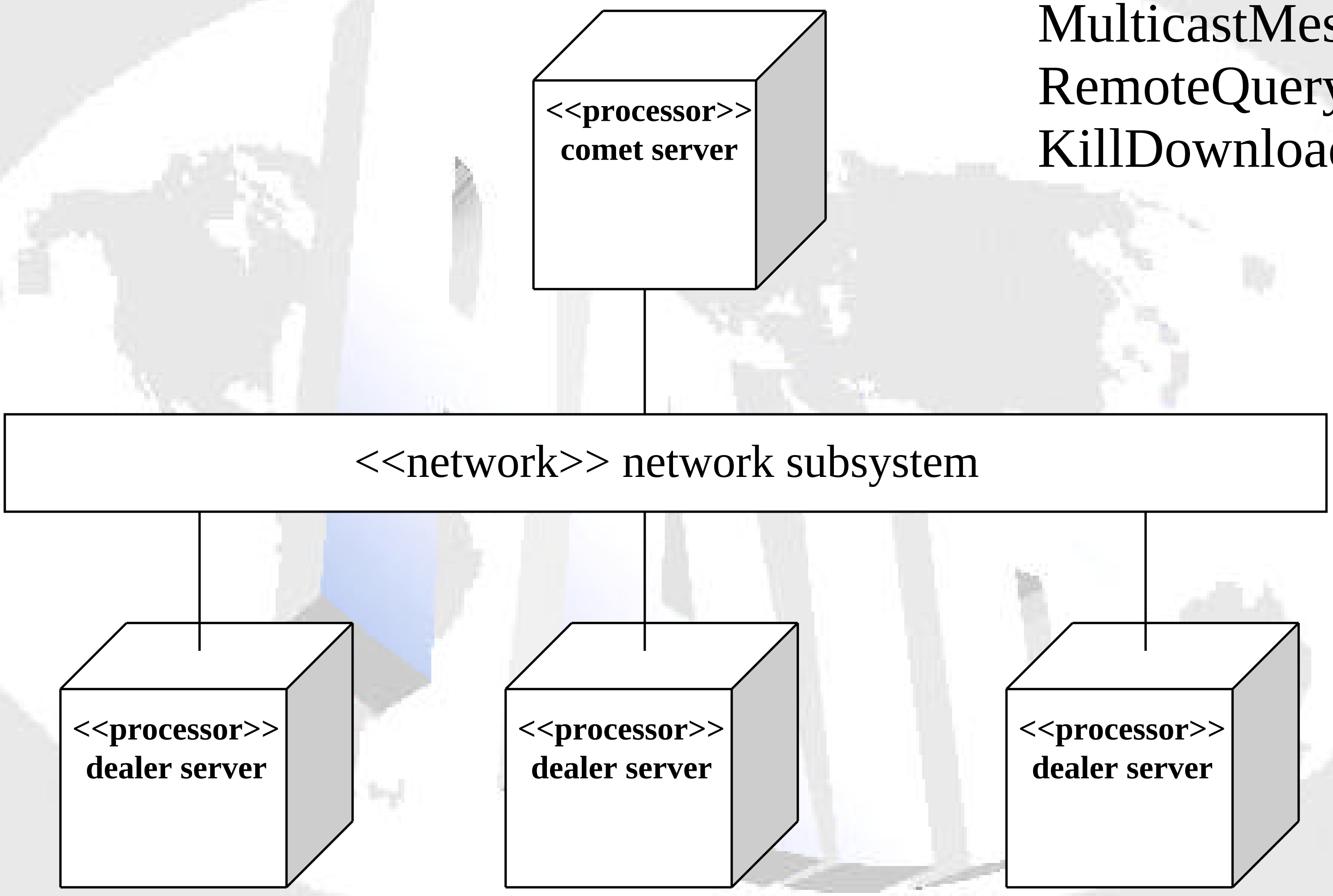
To provide an efficient, adaptive, selective, multicasting transport mechanism that deals with all kinds of information within the PAID system.

Functions Supported: Network

- **Request of remote data**
- **Initiating connection with server**
- **Killing the download**
- **Report status of download**
- **Notification of network down**

Design - Deployment Diagram: ***Network***

MulticastMessage()
RemoteQuery()
KillDownload()



Design Rationale: Network

- Use Voyager for RMI between the dealer server and comet server
- Encrypt/decrypt messages using a method provided by the authentication subsystem
- Break data sent over the network into packets

Implementation Status: ***Network***

- All functions in the Network API (NAPI) are fully implemented and functional
- Integration with database subsystem complete
- Integration with authentication is complete
- Code complete and ready for integration with UI subsystem

Database, Learning, & Event Service Overview

Presenter: Rudy Setiawan

Database Team:
Georgios Markakis
Richard Markwart
Timothy Shirley
Ivan Tumanov

Learning &
Event Service Team:
Jonathan Hsieh
James Lampe
Yun Ching Lee
Wing Ling Leung
Rudy Setiawan
Jonathan Wildstrom
Andrew Zimdars

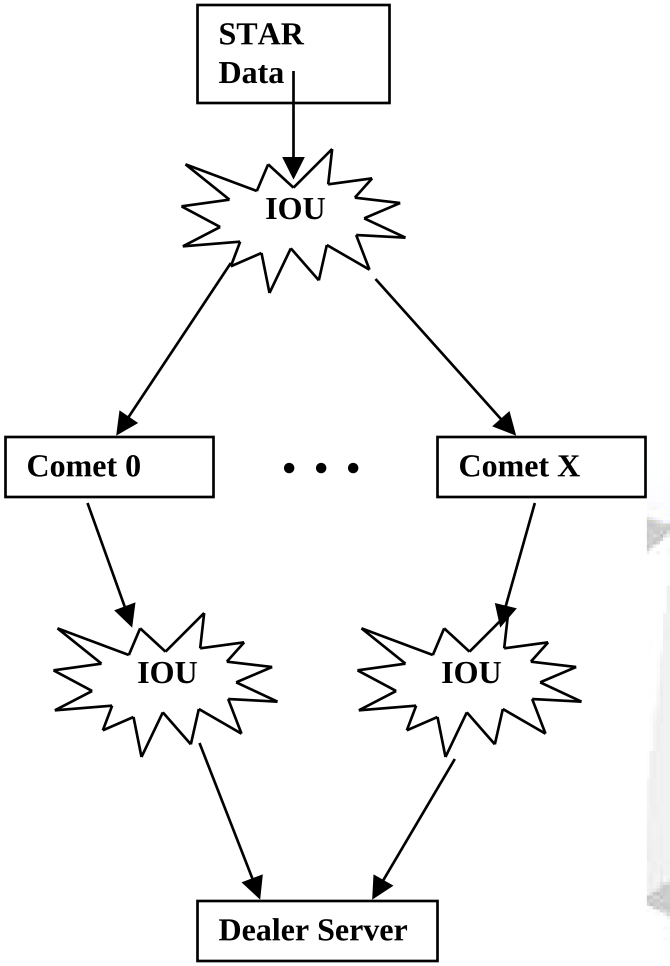
Database: Objective

- **Provide persistent storage and data management**

Database: Functionality

- **Access to after-sales database and persistent storage**
- **Replication of the database to client systems**
- **Management of subsets and integrity of data**

Database: Subsystem Design



- Data Organization:
  - – Data divided into subsets
  - – Each COMET and dealer server will store one or more subsets locally
  - – Updates to a given subset are only sent to those servers which store that subset

Database: Subsystem Design (cont.)

- **Generic Data Storage:**
  - **Persistent storage for other subsystems**
  - **Platform and implementation independent**

Database: Design Rationale

- **JDBC used to provide data abstraction to Java modules**
- **Interbase as DBMS of choice for PAID prototype**
  - **native JDBC support**
  - **ease of use**
  - **robust**

Database: Implementation Status

- **Integration with Authentication is complete**
- **Integration with Network is complete**
- **Integration with UI and Learning is partially complete**

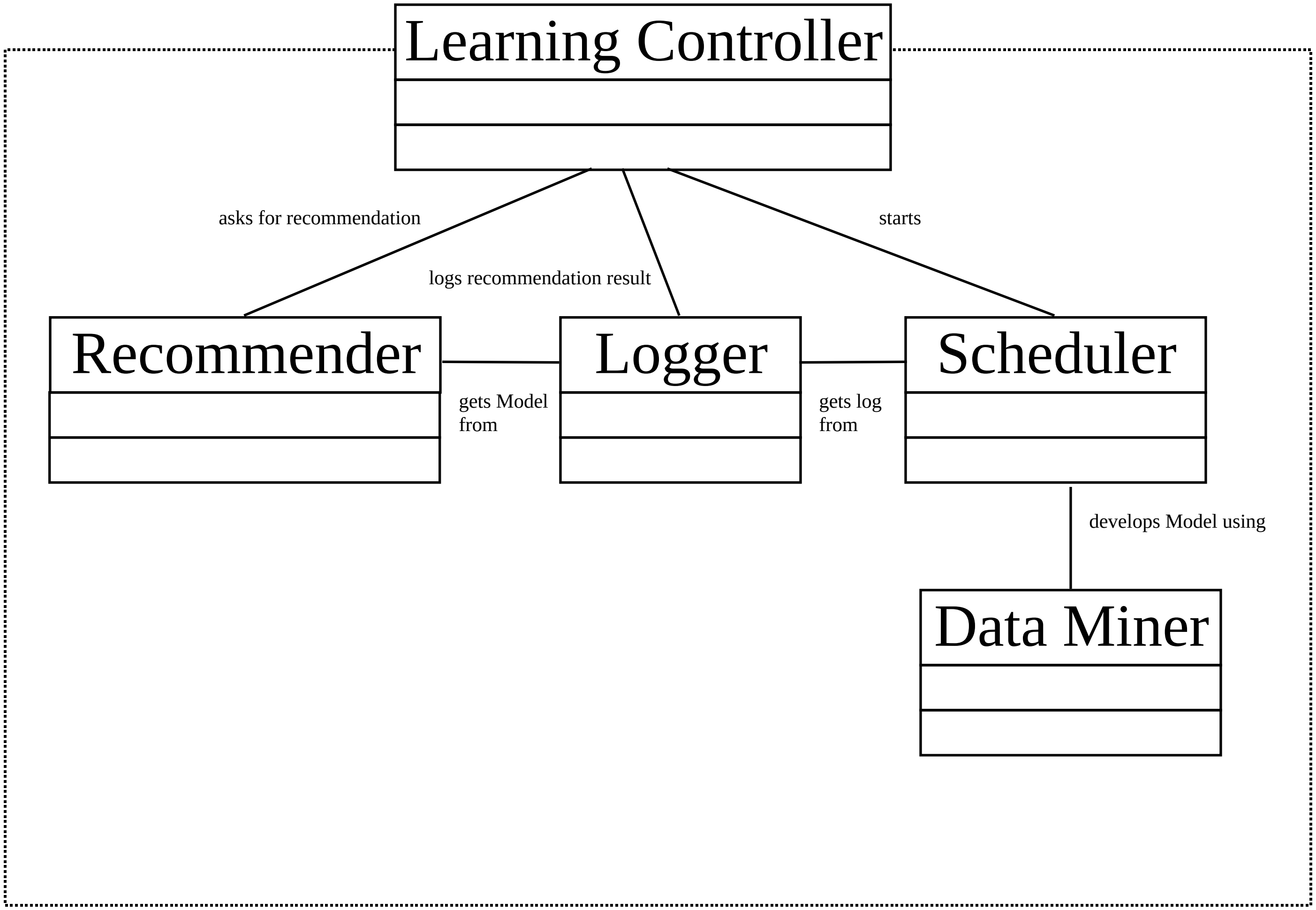
Learning: Objective

- **Optimize system performance through learning about network and database usage**

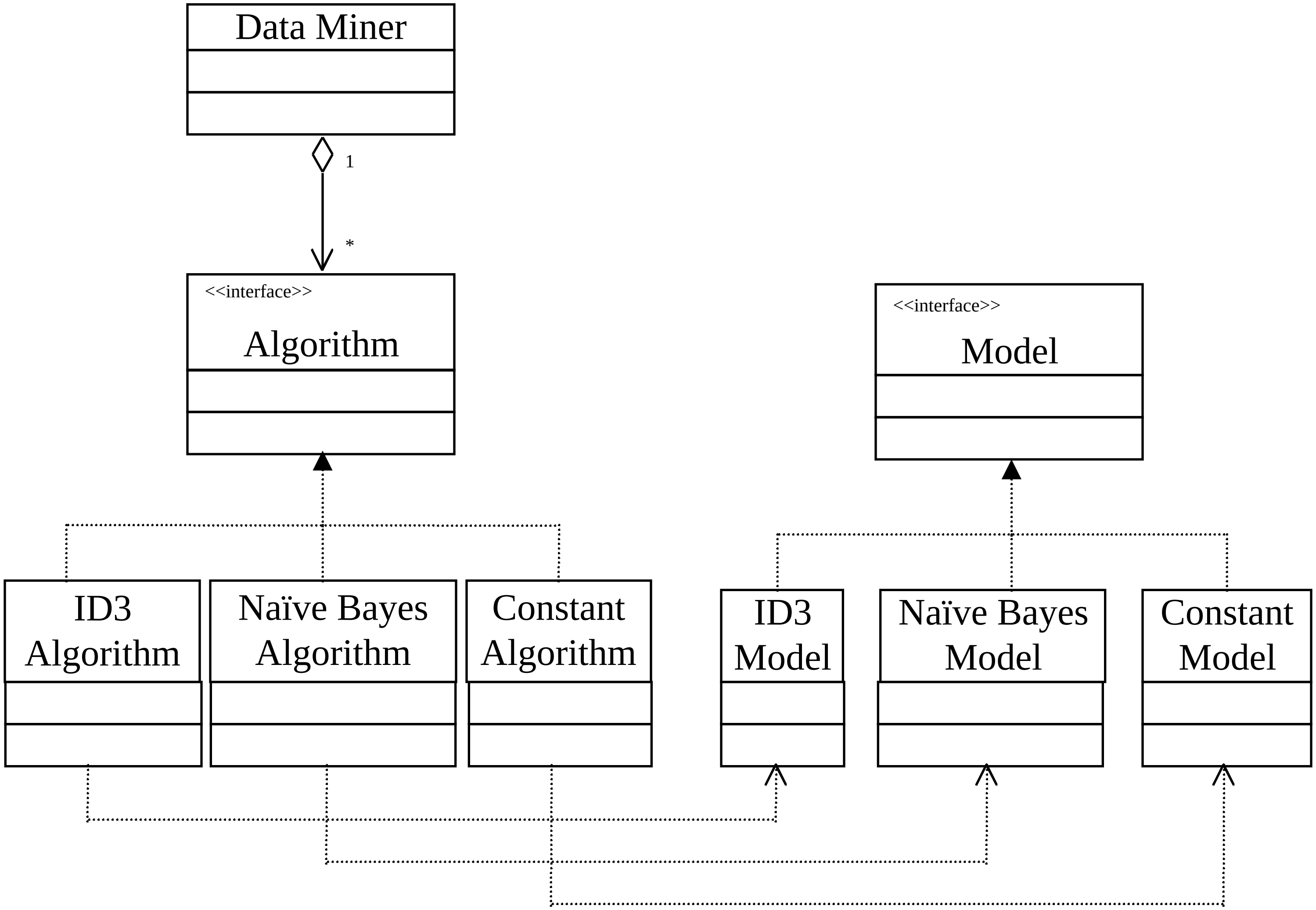
Learning: Functionality

- Log information on network & database activities
- Develop learning models for performance improvements
- Recommend actions to other subsystems for improving performance

Learning: Subsystem Design



Learning: Object Diagram



Learning: Design Rationale

- **Dynamic learning algorithm selection**
  - **extensible**
  - **faster implementation**
- **One behavior model per learning task**
  - **adequate for representing current learning tasks**
  - **simpler storage**

Learning: Design Rationale (cont.)

- **Server-side learning**
  - **capture more information**
  - **do not have to worry about replication**

Learning: Implementation Status

- Subsystem implementation is complete
- Testing has been done using data set from public repository, not with data from STAR network
- Integration with Database is partially complete

Event Service

- Provide notification mechanism for asynchronous information
- Uses Voyager’s Event mechanism

User Interface (UI)

Presenter: Jonathan Hsieh

User Interface Team: Reynald Ong
Euijung Ra
Brian Woo
Stephane Zermatten

UI Team Mission

- **To assure the product is usable by the end user.**
  - **Displaying data simply and aesthetically**
  - **Handling data requests and processing**
  - **Supporting Multi-language/culture**
  - **Enabling disconnected and connected modes**
  - **Setting preferences**

Design Considerations -- for whom?

- For a wide range of people
  - mechanics, administrators, sales personnel
  - novice and expert users
  - different languages and cultures
- For varying environmental conditions
  - garage
  - office
  - roadside mobile garage

Design Considerations -- for what?

- For future applications
  - acts as a style guide
- For running on different platforms
  - desktop PC
  - laptop PC
  - mobile and handheld devices

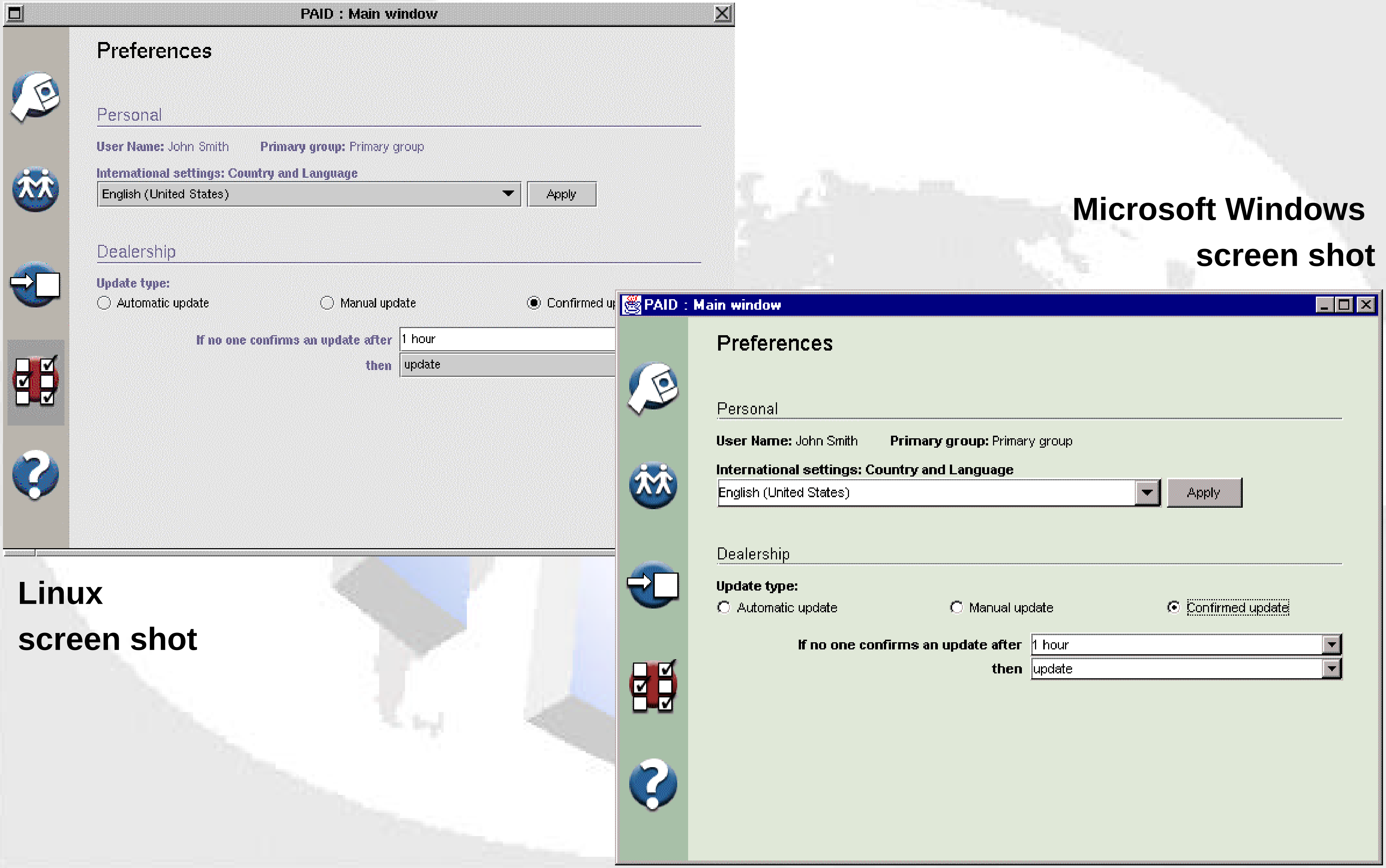
Subsystem Interface Design

- UI object follows the singleton pattern
- Login and Logout
- Part search
- Customer search
- Update status
- Set preferences
- Show Error

Rationale: Look and Feel

- **Which look and feel to support?**
  - **Resolution: Inherit platform’s look and feel.**
    - **faster development time**
    - **avoid confusing widgets**

User Preferences



PAID : Main window

Preferences

Personal

User Name: John Smith **Primary group:** Primary group

International settings: Country and Language

English (United States) ▾ Apply

Dealership

Update type:

○ Automatic update ○ Manual update ● Confirmed u

If no one confirms an update after 1 hour

then update

PAID : Main window

Preferences

Personal

User Name: John Smith **Primary group:** Primary group

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Dealership

Update type:

○ Automatic update ○ Manual update ● Confirmed update

If no one confirms an update after 1 hour ▾

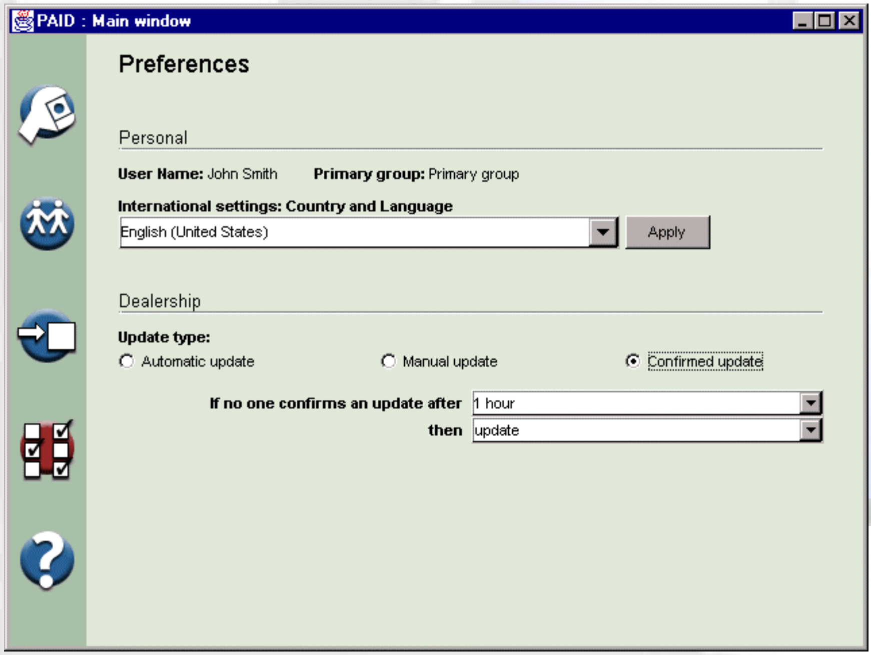
then update ▾

Microsoft Windows screen shot

Linux screen shot

Rationale: Multilingual support

- **Which Languages to demonstrate?**
  - **Resolution: English and Chinese**
    - **development team has knowledge in both**
    - **demonstrates radically different languages.**



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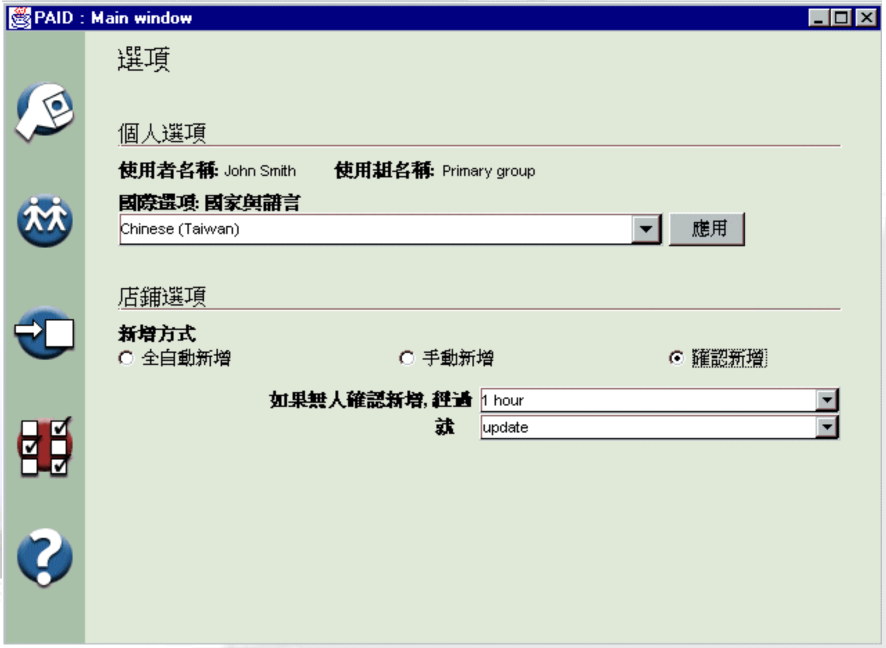


PAID : Main window

選項

個人選項

使用者名稱: John Smith **使用組名稱:** Primary group

國際選項: 國家與語言

Chinese (Taiwan) ▾ 應用

店鋪選項

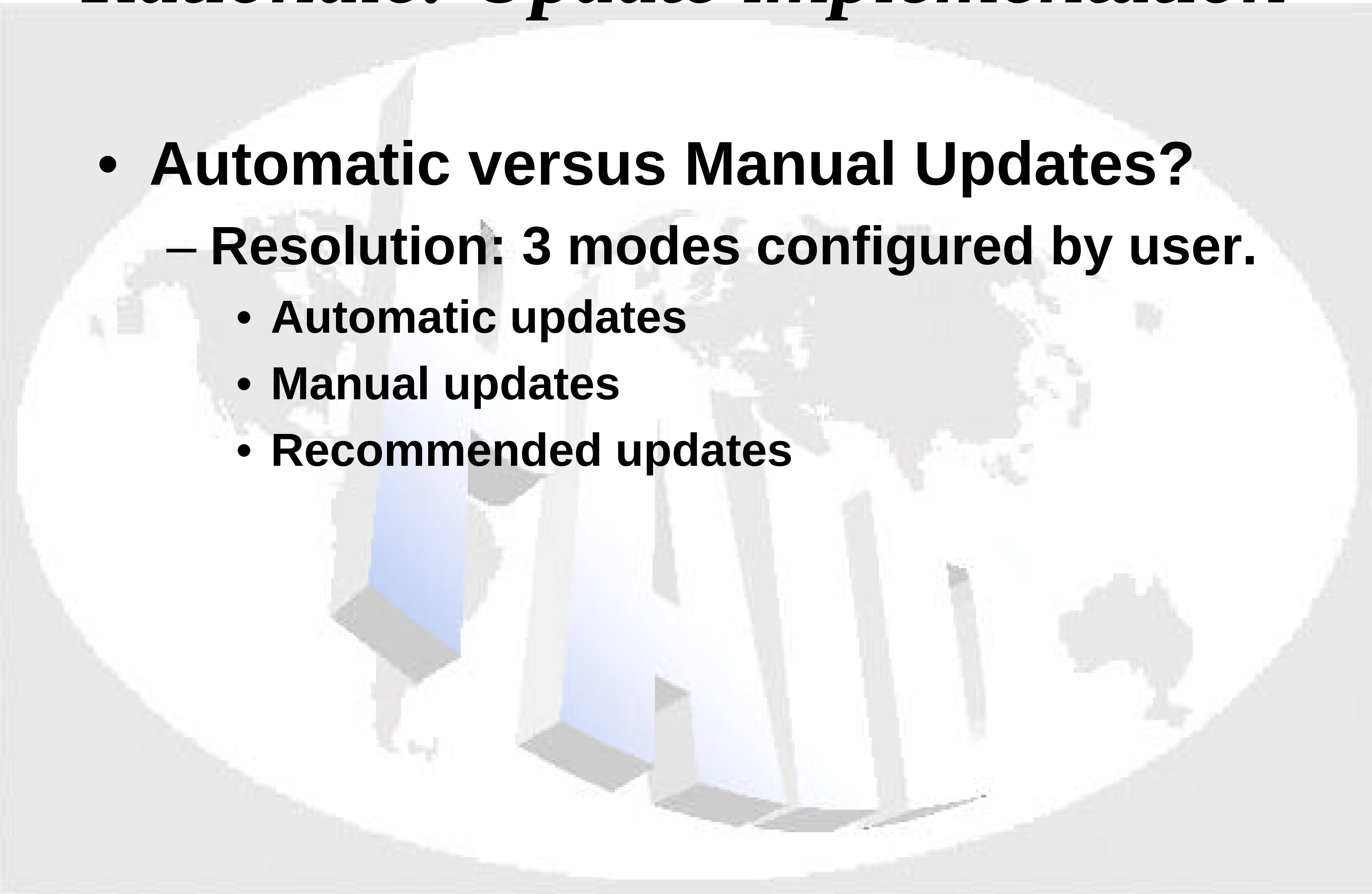
新增方式

○ 全自動新增 ○ 手動新增 ● 確認新增

如果無人確認新增, 經過 1 hour ▾

就 update ▾

Rationale: Update implementation



- **Automatic versus Manual Updates?**
  - **– Resolution: 3 modes configured by user.**
    - **Automatic updates**
    - **Manual updates**
    - **Recommended updates**

Implementation status

- Java Swing 1.1 based GUI
- Full English and partial-Chinese implementations
- Fully Integrated with Authentication
- Database integration in progress
- Network integration in progress

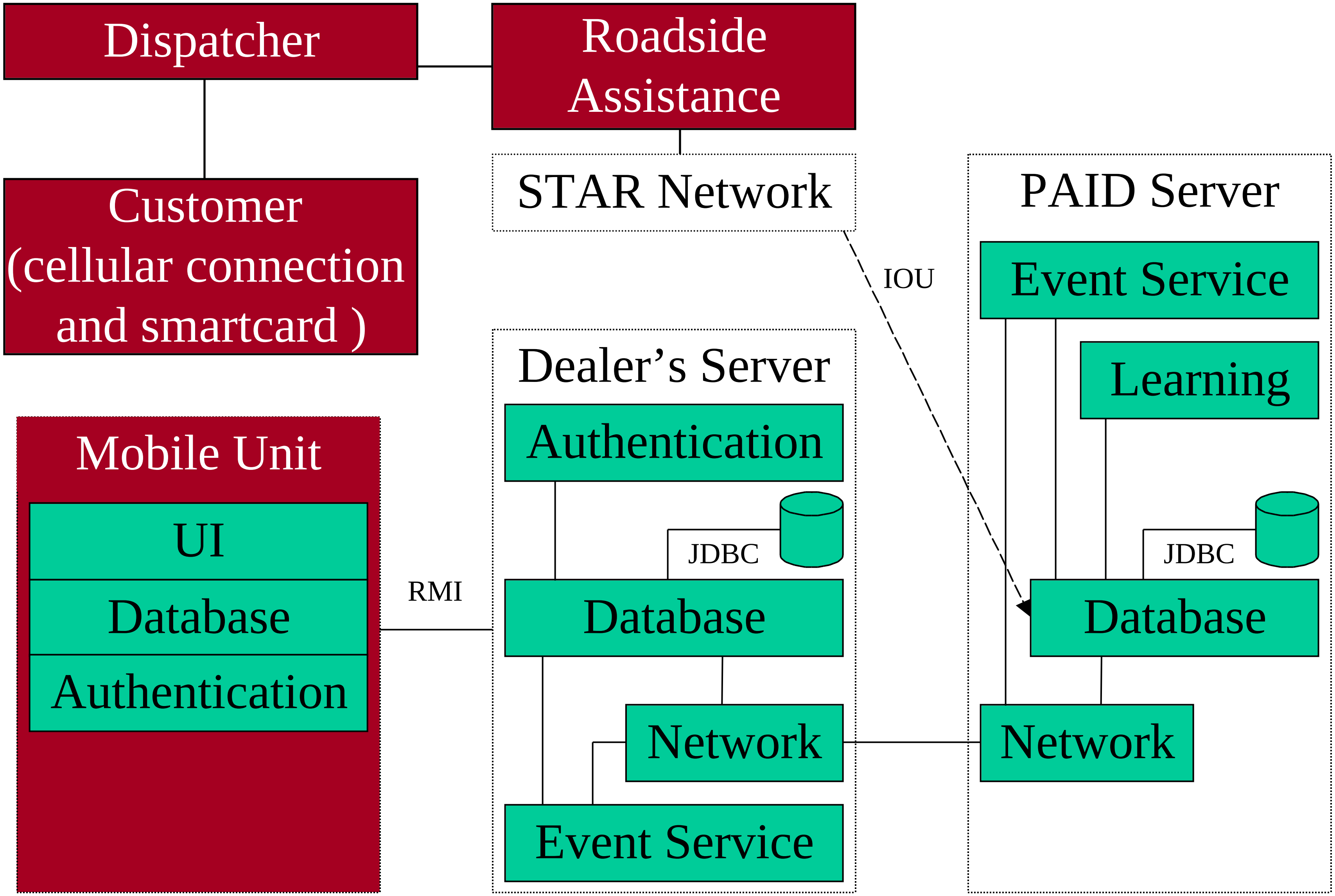
Demo 3: Mobile Garage

Visionary Scenario

The Vision

- **Servicing the customer: Providing vehicle repair at any time and at any place.**
  - **Access to data/people**
  - **Ability to deal with a wide range of repair problems <u>without</u> having to return to a dealership**

Architecture


Dispatcher

Roadside Assistance

Customer (cellular connection and smartcard)

STAR Network

PAID Server

Mobile Unit

UI

Database

Authentication

Dealer's Server

Authentication

Database

Network

Event Service

Event Service

Learning

Database

Network

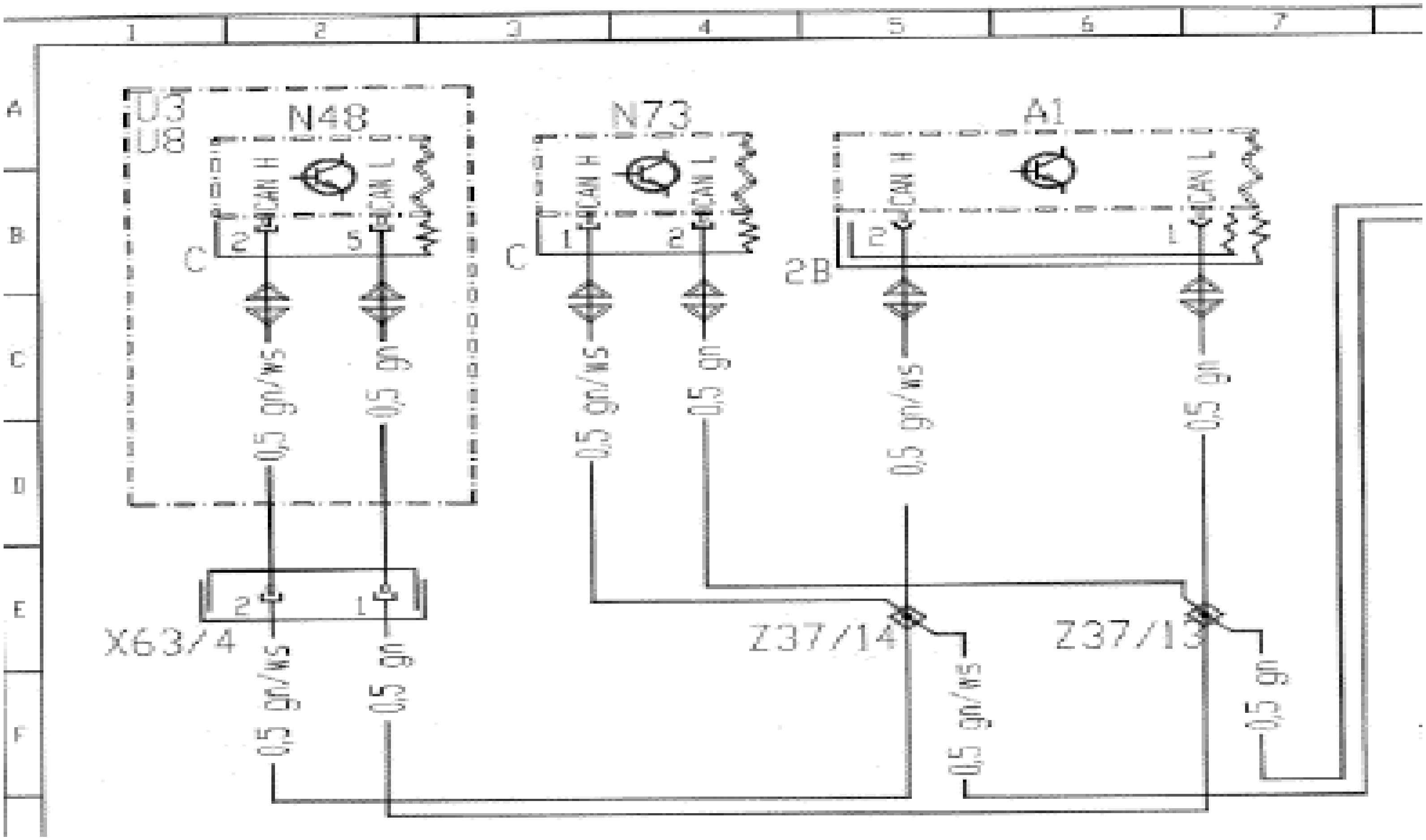
Mechanic greets Mr. Smith

Mr. Smith points out the problem

Mechanic checks out the car

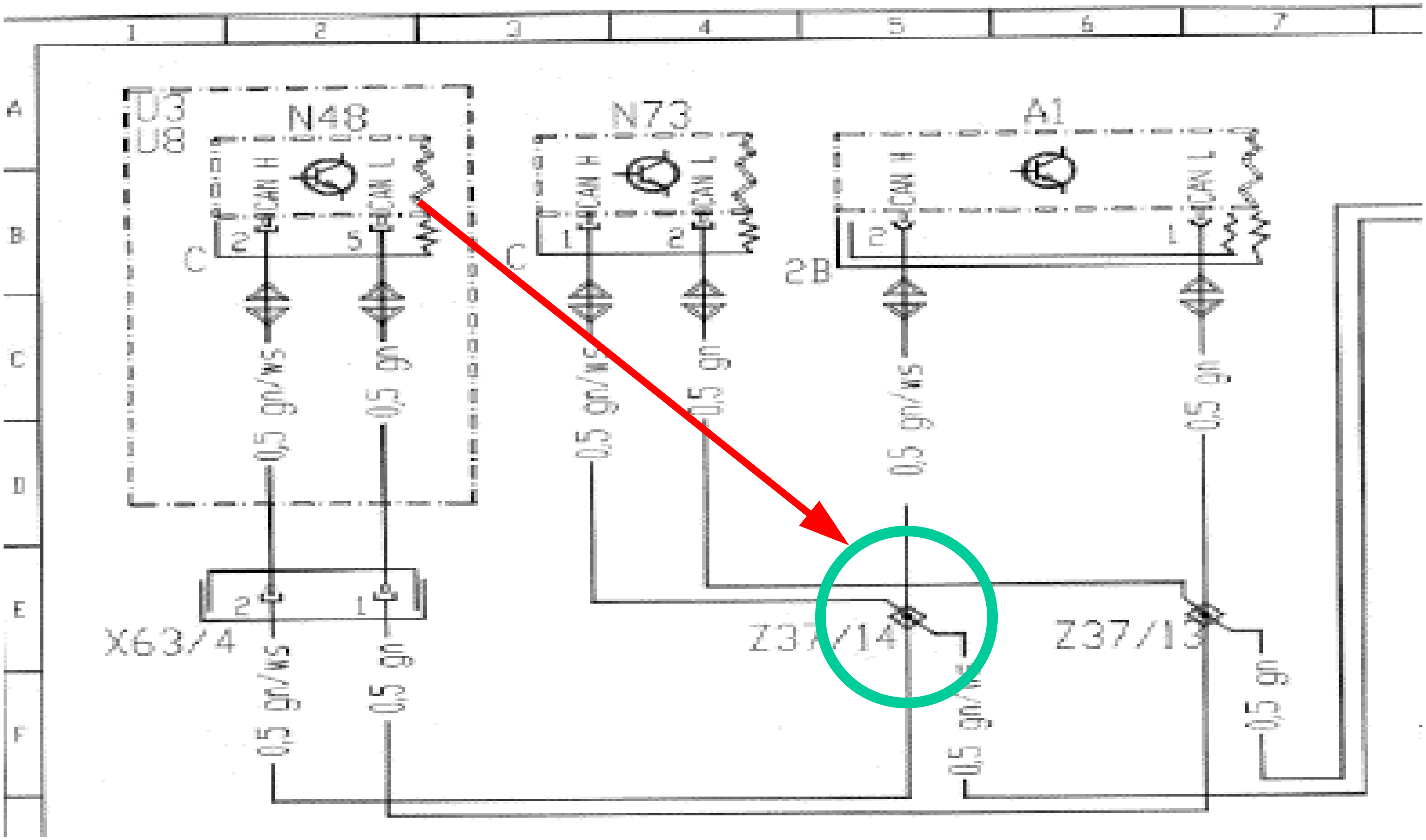
Mechanic connects for additional information

Mechanic looks at wiring schematic



Mechanic takes picture and connects with an expert technician

Mechanic works with technical service representative



Mechanic shows the customer what repair has been made

Mechanic updates Mr. Smith's smartcard

Requirements

- The mobile garage
  - Handheld/mobile computer
  - Digital camera
  - Headset for communication
- Access to information
  - Client information
  - Repair procedures
  - Expertise

Feasibility

- Technology is available.
- Usability issues.

Future Directions

- **CORBA-compliant software bus**
  - More robust system with fuller feature set required
- **Intelligent software routing**
  - Balance load across COMET servers without requiring full replication
- **Knowledge discovery in learning**
  - Learning subsystem as now implemented is largely “reactive”
  - Stronger predictive apparatus to prepare for user needs

Future Directions

- **Alternative client platforms**
  - – Continuing maturation of handheld and wireless systems
- **Testbed Development**
- **Integration of StarNetwork with PAID**
  - – Focus of TUM user interface team

Transfer of Materials

- Electronic copies of PAID deliverables are available from the course web site
  - Requirements Analysis Document
  - Software Project Management Plan
  - System Design Document
  - Object Design Documents (presentation)
- CVS Root:

  /afs/cs/academic/class/15413/repositories/official/

Conclusion

- **Captures most objectives indicated by problem statement**
- **Provides extensible framework for future iterations**
  - Continued work to address problem statement
  - Incorporation of newer or more robust technology

Conclusion

- **Client:** Thanks for your informative comments
- **Management:** Thanks for maintaining perspective even when we couldn’t
- **Students:** **We kick ass!**

Questions