

MIDDLEWARE FOR MULTIMEDIA

INF5040 - Group 1

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AGENDA

- Motivation and background
- Goals
- Key concepts
- MULTE and ADAPT
- Conclusion

BACKGROUND

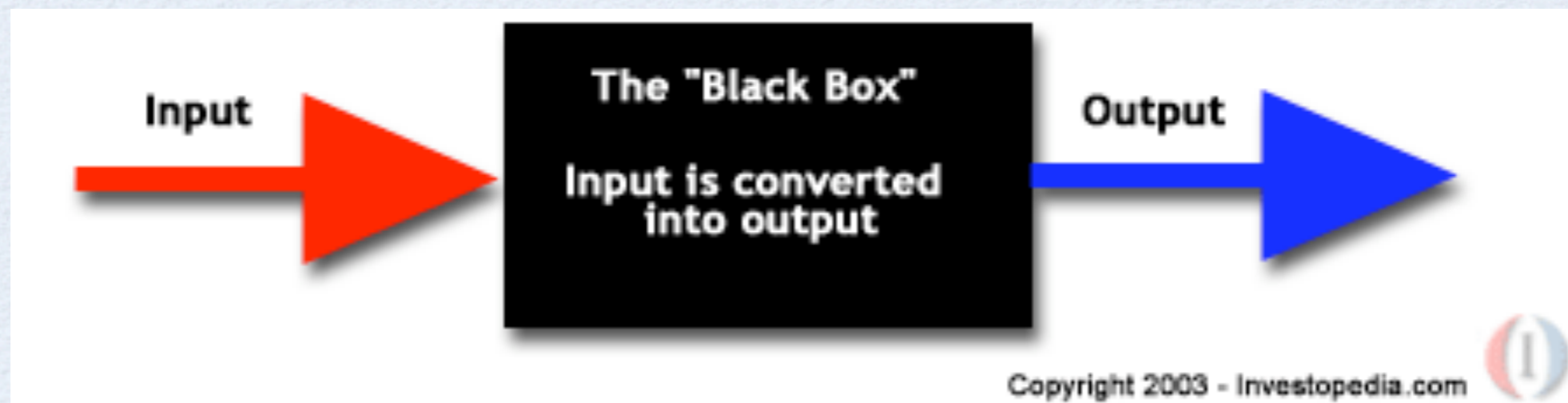
- Middleware support for?
 - Continuous streaming of multimedia
 - Variations in:
 - Connectivity
 - Client resources
 - Quality of Service (QoS)
- Hidden implementation (“Black Boxes”)

GOALS FOR MULTIMEDIA MIDDLEWARE

- Middleware that can adapt to the dynamic properties of streaming media
- Support heterogeneous clients
- Provide Quality of Service
 - And be able to renegotiate if necessary
- Provide best quality, not incremental quality

THE BLACK BOX

- No need to worry not dangerous.. We think



- No control over implementation..

HIDDEN OR OPEN?

- Middleware provides useful abstraction
- We need to be able to see and influence the implementation
- This is not easily accomplished with current middleware.. If possible at all
- As such, a new model is necessary

KEY CONCEPTS

- Reflection
 - Introspection
 - Adaption
- Open Bindings
- Object Request Broker
- Quality of Service

REFLECTION

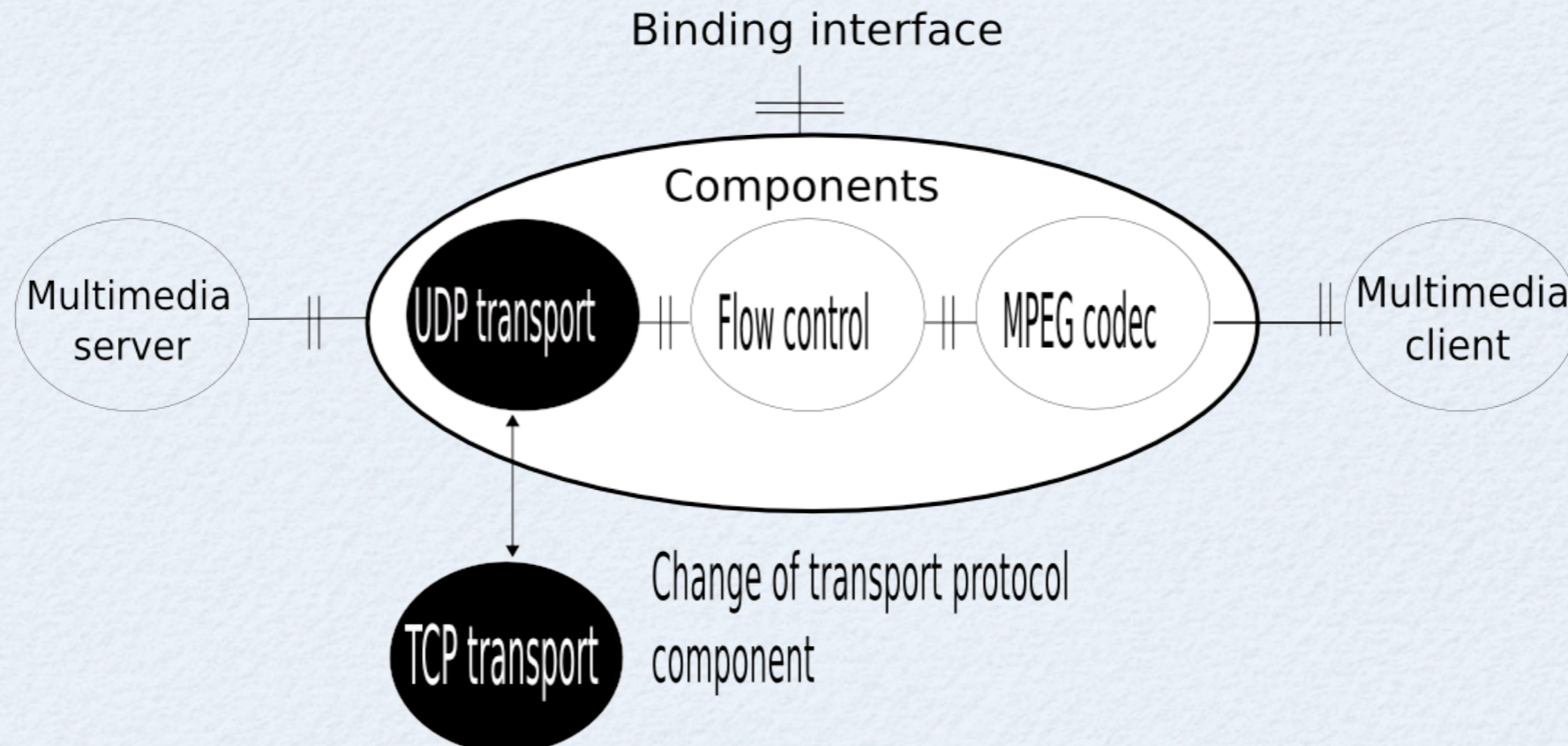
- Perform computation about one-self
 - Structural
 - Behavioural
- Suddenly not a black box - white box?

OPEN BINDINGS

Traditional CORBA-binding



Open binding



OPEN BINDINGS

- Is a composite distributed object
- Consists of several components
- Components
 - Protocols
 - Codecs
 - QoS monitors
 - ...
- Dynamic - components can be added, removed or changed at any time

OBJECT REQUEST BROKER

- Enables remote objects
- Manages communication
 - Serializing / De-serializing
 - Locates remote object
 - Activates remote object (if necessary)
- Implementation details commonly hidden
- Basis of Common Object Request Broker Architecture-CORBA

QUALITY OF SERVICE

- A mechanism to provide different priorities to different users or data flows
- Also to guarantee a certain level of performance
- Affected by various factors, which can be divided into "human" and "technical" factors.
 - Human factors include: stability of service, availability of service, delays, user information.
 - Technical factors include: reliability, scalability, effectiveness, maintainability, Grade of Service, etc

ADAPT

- Almost the same goals and approach as MULTE.
- Not as flexible signalling facilities as MULTE

GOALS FOR MULTÉ:

- General goal: Flexible protocol support for multimedia applications.
- Selection of optimal protocol configuration.
- Support for system evolution (Integration of new components should not require changes)
- Enhanced interoperable stream multicast for heterogeneous environments

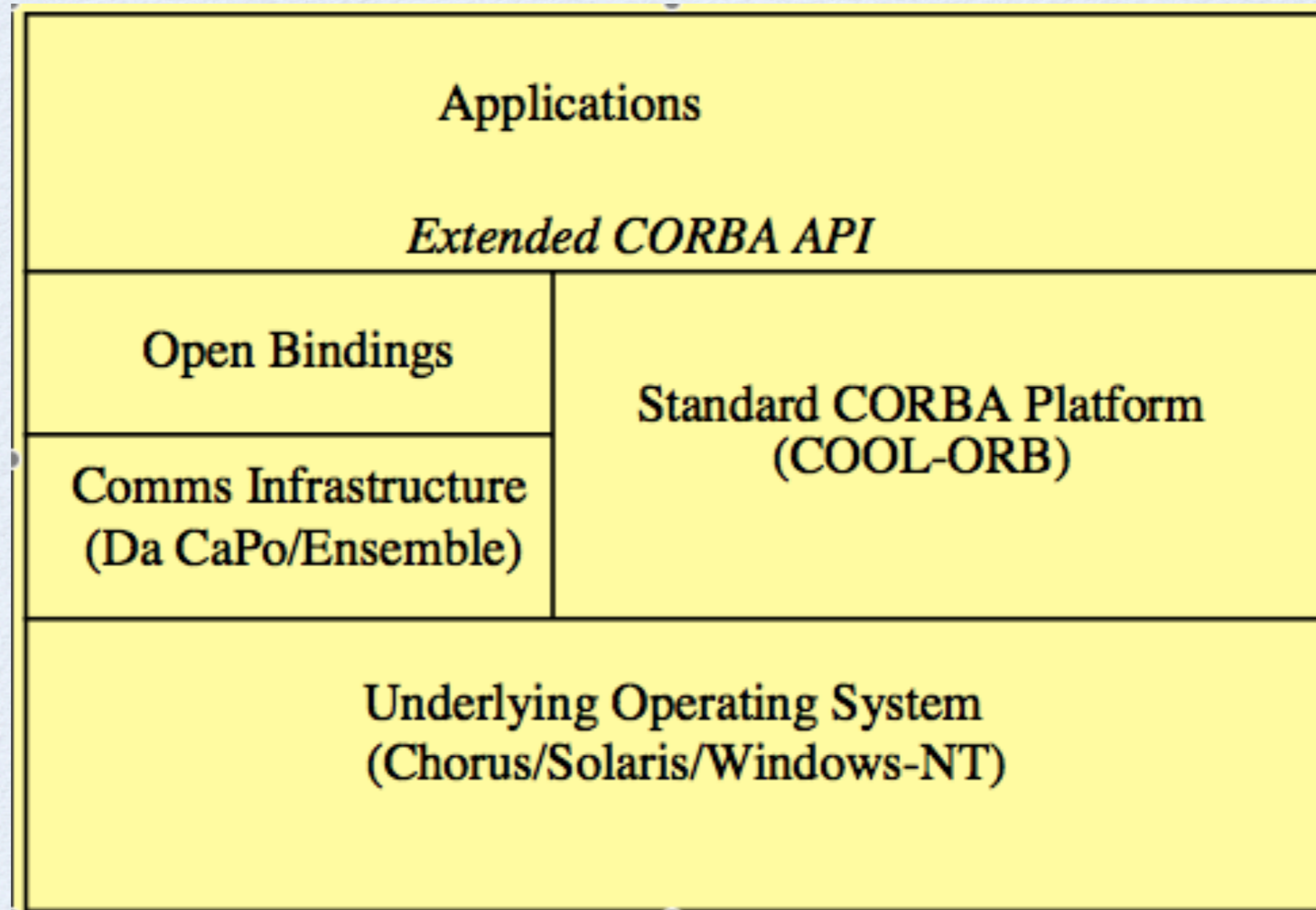
APPROACH FOR MULTI-ORB

- An ORB based on the CORBA 2.0 implementation COOL.
- Da CaPo integrated in the ORB. (Dynamic Configuration of Protocols, to be described shortly...)
- Two ways for the application to communicate with the middleware:
 - Management toolkit
 - Data protocol

"DYNAMIC CONFIGURATION OF PROTOCOLS" - DA CAPO

- Used as transport protocol in the MULTE-ORB.
- Runtime negotiation of minimal protocols for given QoS requirements
- The implementation of a protocol function corresponds to a component in the binding framework.

ADAPT/MULTI ARCHITECTURE



BINDINGS - EXTRA FUNCTIONALITY:

- QoS requirements are specified through a flow interface definition language (FIDL) so the components can understand them.
- If two participants in a binding do not support common behavior, certain media gateways may be inserted into the binding to work around it.
- Users are able to control the behavior of components via their own policies.

INTERACTION MODEL

- Offers support for interfaces with different semantics:
 - Operational interfaces:
 - Basically a remote method invocation like RPC and RMI
 - Stream interfaces:
 - Continuous stream of data between a producer and a consumer
 - Signal interfaces
 - Real-time events

SIGNALLING

- Term for real-time control events in the system
- Signals are for instance breach of the QoS contract, resource reservation, QoS negotiation, admission control, binding management, etc.
- A flexible signalling facility needs separation between the signal processing itself and the policy describing what action to be taken.

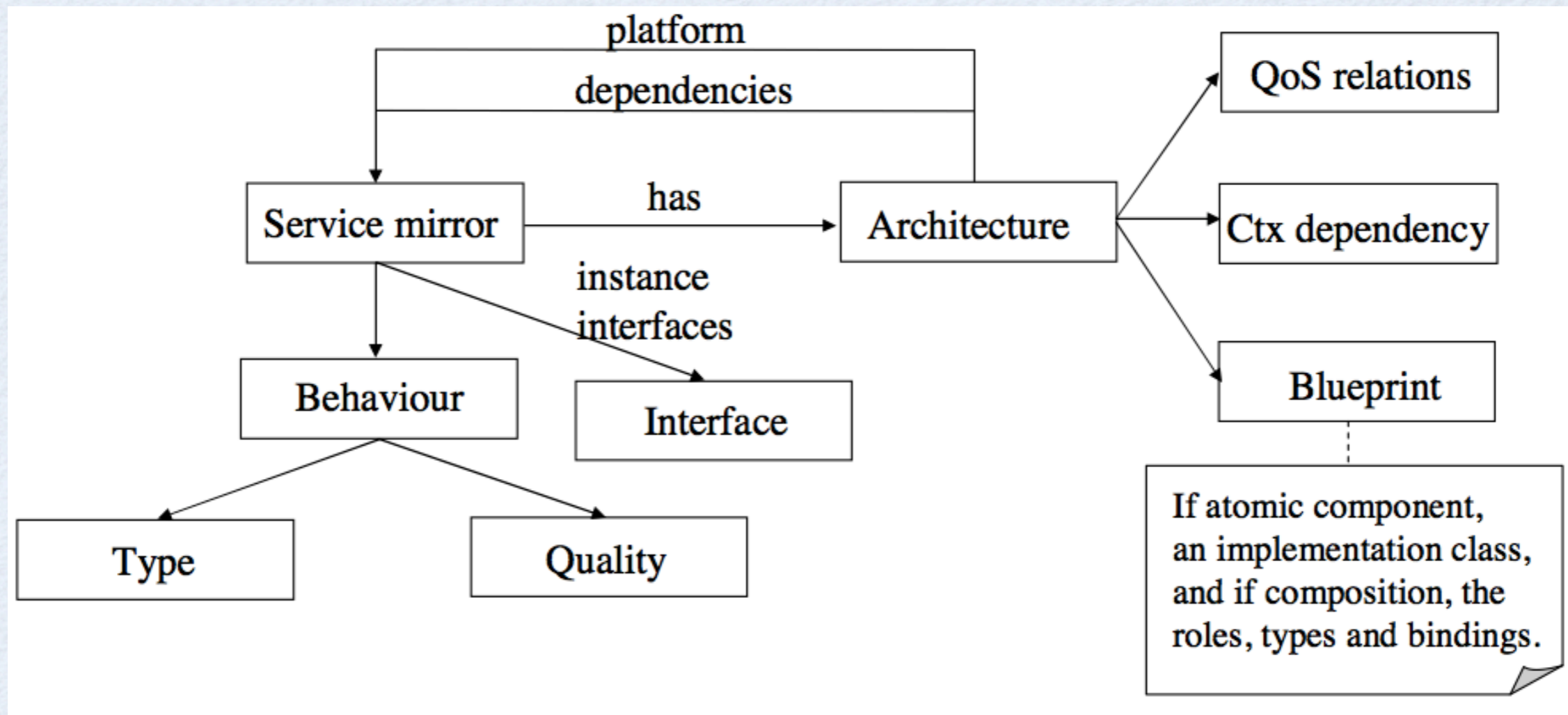
THE MANAGEMENT TOOLKIT

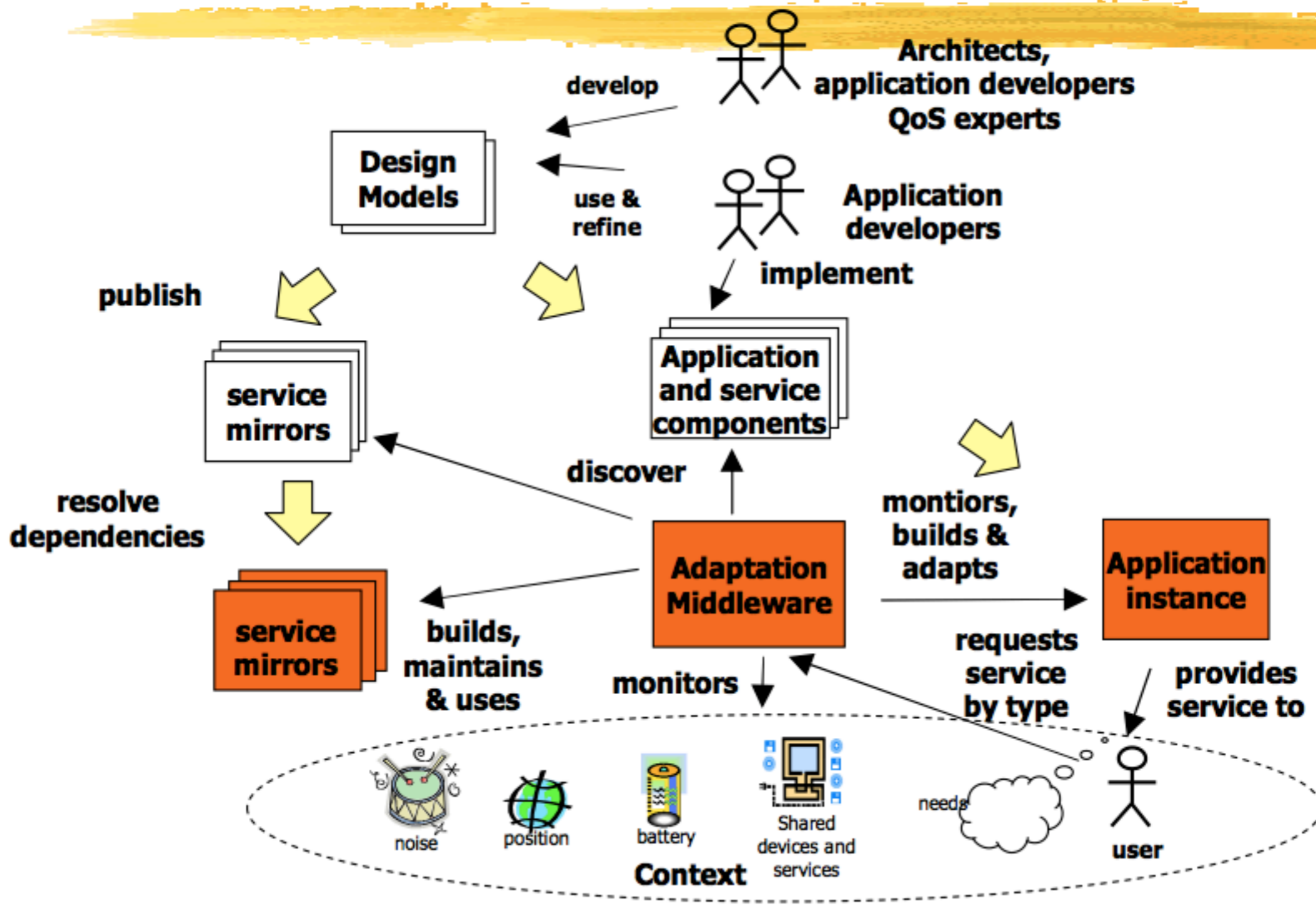
- Handles the signals
- Manipulates the components in the bindings in order to accommodate the policy
- Designed to integrate new signalling and management policies.
- Not available in ADAPT, which uses simpler and less flexible signal management

THE QVA APPROACH

- Problem with MULTE:
 - Application developers need to know a lot about QoS and architectures.
 - Maybe total control is not what we want after all?
- Mirror-based reflection

SERVICE MIRROR





CONCLUSIONS

- Very complex solutions.
- Alternatives?
 - Network-Integrated Multimedia Middleware (NMM)
 - Scalable Video Coding (SVC) + packet filtering
 - ...