

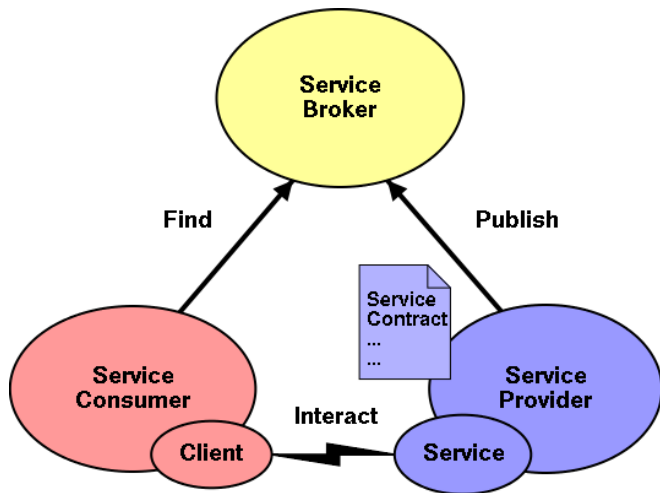
A contract-oriented middleware

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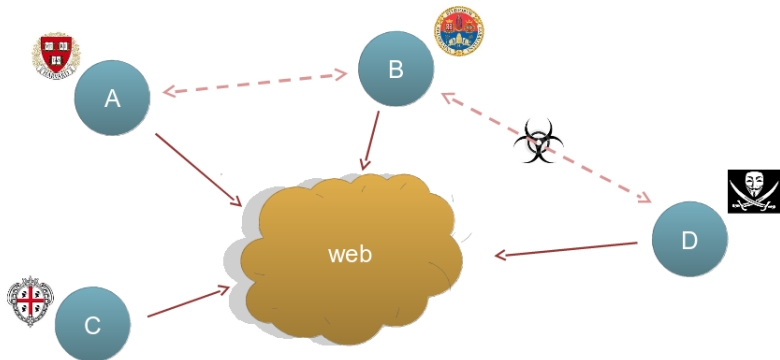
London, Apr 17th, 2015

Service brokering

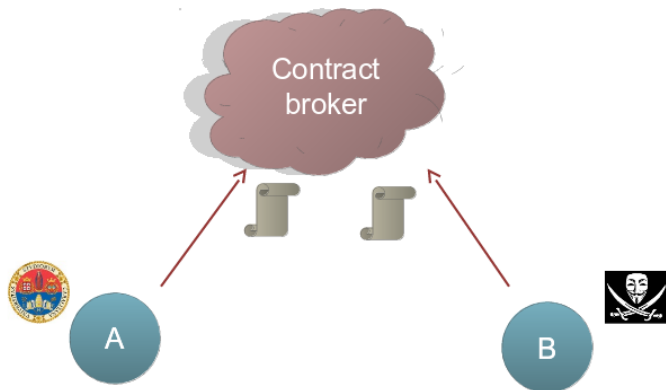


"Designing the architecture for Web services" — Hugo Haas, W3C, 2003

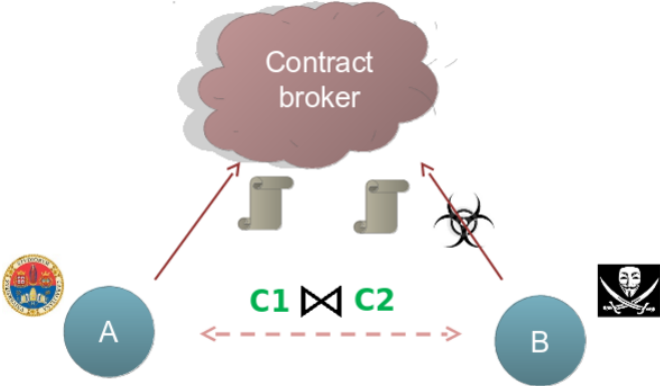
Service brokering with untrusted participants



A contract-oriented middleware



A contract-oriented middleware



Timed Session Types in a nutshell

Contracts = Timed Session Types

- ▶ Timed extension of binary (synchronous) session types
 - ▶ **Internal choices** $!a\{t < 7\} + !b\{5 < t < 10\}$
 - ▶ **External choice** $?a\{t < 10\} \& ?b\{7 < t < 10\}$
- ▶ Decidable notions for:
 - ▶ progress (`checkCompliance()`)
 - ▶ dual construction (`dualOf()`)
 - ▶ runtime monitoring (`send()`, `receive()`)
 - ▶ subtyping

M. Bartoletti, T. Cimoli, M. Murgia, A.S. Podda, L. Pompianu
Compliance and subtyping in timed session types. FORTE 2015.

Example: Paypal User Protection Agreement

$p = ?\text{pay} \{t_{\text{pay}}\} . (?\text{ok} \ \&$
 $\qquad \qquad \qquad ?\text{dispute} \{t_{\text{pay}} < 180, t_d\} . p')$

$p' = ?\text{ok} \{t_d < 20\} \ \&$
// escalate the dispute to a claim
 $\qquad ?\text{claim} \{t_d < 20 \wedge t_{\text{pay}} > 7, t_c\} .$
 $\qquad \qquad ?\text{rcpt} \{t_c < 3, t_c\} .$
 $\qquad \qquad \qquad !\text{refund} \{t_c < 7\} \ \&$
 $\qquad ?\text{abort}$

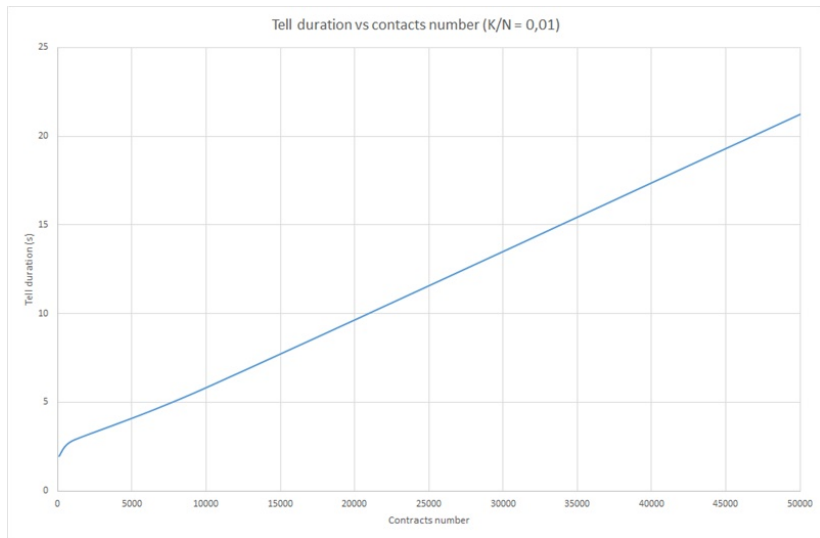
TOOL DEMO

co2.unica.it

Case studies

- ▶ COReserve: a generic reservation marketplace
 - ▶ clients + resource providers
 - ▶ TSTs describe resource usage protocols
 - ▶ violating contracts decrements reputation
 - ▶ demo: coreserve.unica.it
- ▶ A generic trouble ticketing service
 - ▶ TSTs describe tickets workflow
 - ▶ (early development stage)

Performance statistics



Conclusions

- ▶ Idea: bottom-up service composition, in an adversarial setting
 - ▶ contract-agnostic middleware + TSTs
 - ▶ can be extended with other contract models (e.g. multiparty)
 - ▶ secure distributed implementation (early development stage)
- ▶ Challenge 1: empirical validation of the paradigm
 - ▶ functional + non-functional aspects in contracts
 - ▶ other forms of punishment: sanctions
 - ▶ find other challenging case studies
- ▶ Challenge 2: verification of contract-oriented services:
 - ▶ goal: analyse your service in isolation
 - ▶ “honesty by typing” not enough
 - ▶ quantitative analysis wrt random service populations
 - ▶ statistical model checking?
 - ▶ from CO₂ specifications to Java-CO₂
- ▶ try it! co2.unica.it

Thanks!