

PRINCIPLES AND PRACTICE OF SESSION TYPES

Nobuko Yoshida

Imperial College
London

Mobility Research Group



π -calculus, Session Types research at Imperial College

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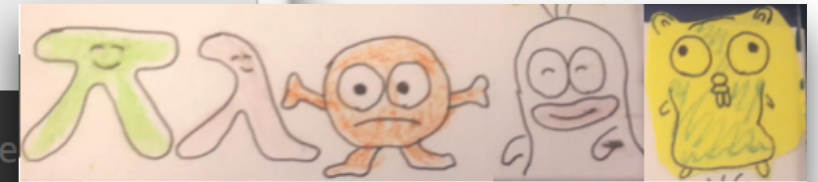
Talks

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NEWS

The paper *Multiparty asynchronous session types* by Kohei Honda, Nobuko Yoshida, and Marco Carbone, published in POPL 2008 has been awarded the ACM SIGPLAN Most Influential POPL Paper Award today at POPL 2018.

» more

10 Jan 2018

Estafet has published a page on their usage of the Scribble language developed in our group with RedHat and other industry partners.

» more

25 Sep 2017

Nick spoke at Golang UK 2017 on applying behavioural types to verifv concurrent Go programs.

SELECTED PUBLICATIONS

2018

Julien Lange , Nicholas Ng , Bernardo Toninho , Nobuko Yoshida : [A Static Verification Framework for Message Passing in Go using Behavioural Typing](#). *To appear in ICSE 2018 .*

Bernardo Toninho , Nobuko Yoshida : [Depending On Session Typed Processes](#). *To appear in FoSSaCS 2018 .*

Bernardo Toninho , Nobuko Yoshida : [On Polymorphic Sessions And Functions: A Talk of Two \(Fully Abstract\) Encodings](#). *To appear in ESOP 2018 .*

Rumyana Neykova , Raymond Hu , Nobuko Yoshida , Fahd Abdeljallal : [Session Type Providers: Compile-time API Generation for Distributed Protocols with Interaction Refinements in F#](#). *To appear in CC 2018 .*

Post-docs:

Simon CASTELLAN

David CASTRO

Francisco FERREIRA

Raymond HU

Rumyana NEYKOVA

Nicholas NG

Alceste SCALAS

PhD Students:

Assel ALTAYEVA

Juliana FRANCO

Eva GRAVERSEN

Interactions with Industries

Strange Loop

SEPTEMBER 15-17 2016 / PEABODY OPERA HOUSE / ST. LOUIS, MO



Nobuko Yoshida
Imperial College, London

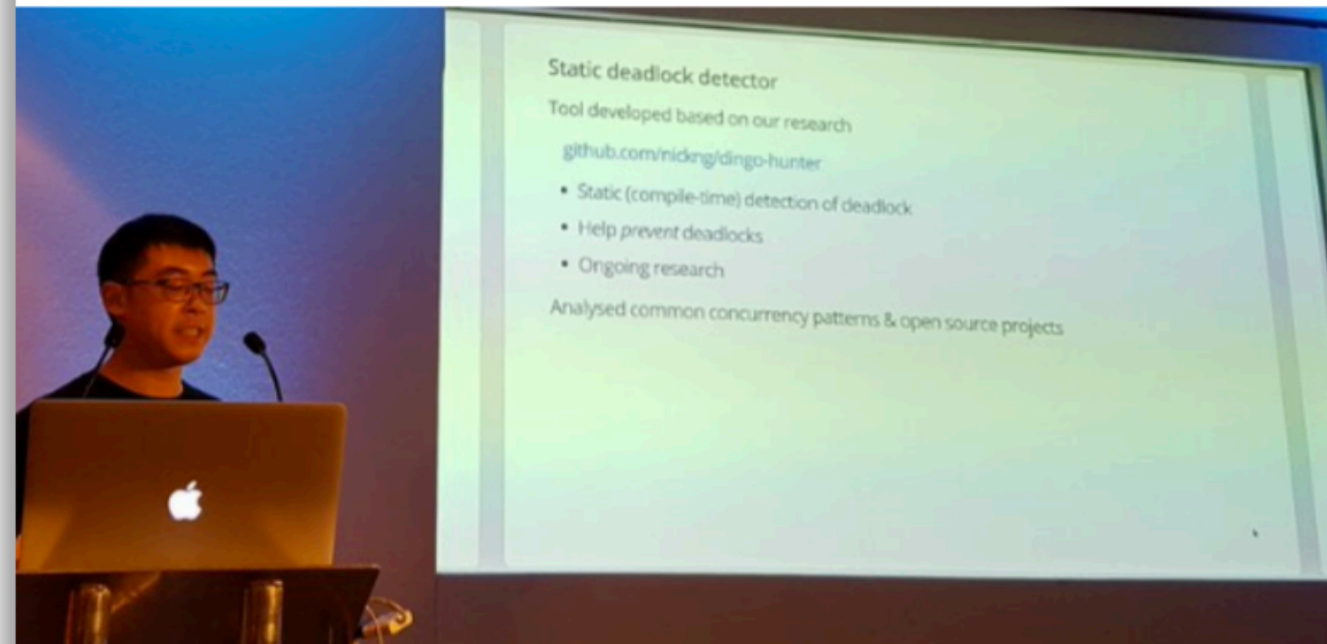


Adam Bowen @adamnbowen · Sep 15

I didn't even know that session types existed an hour ago, but thanks to Nobuko Yoshida's great talk at [#pwlconf](#), I want to learn more.

DoC researcher to speak at Golang UK conference

by Vicky Kapogianni
20 July 2016



DoC researcher to speak at industry-focused Golang UK conference on results of concurrency research

[Click here to add content](#)



.@nicholascwng rocking on @GolangUKconf about static deadlock detection in [#golang](#) [#gouk16](#)



Interactions with Industries

#unctional Londoners Meetup Group

6 days ago · 6:30 PM

Session Types with Fahd Abdeljallal



43 Members

Synopsis: Session types are a formalism to codify the structure of a communication, using types to specify the communication protocol used. This formalism provides the... [LEARN MORE](#)

ECOOP'17

Distributed Systems vs. Compositionality

Dr. Roland Kuhn
@rolandkuhn — CTO of Actyx

actyx

Current State

- behaviors can be composed both sequentially and concurrently
- effects are not yet tracked
- Scribble generator for Scala not yet there
- theoretical work at Imperial College, London (Prof. Nobuko Yoshida & Alceste Scalas)

ECOOP'16

Behavioural Type-Based Static Verification Framework for

GO



Julien Lange



Nicholas Ng



Bernardo
Toninho



Nobuko
Yoshida



Go concurrency verification research at DoC grabs headline



A paper by DoC researchers at POPL on Go concurrency verification was featured in a tech blog and generates a buzz outside of the research community.

A [paper](#) by researchers at the department was recently featured in the morning paper, a [blog](#) by venture capitalist Adrian Colye, which summarises an important, influential, topical or otherwise interesting paper in the field of computer science every weekday in an easily digestible way by non-researchers. On the [2 Feb 2017 issue](#) of the morning paper, It was highlighted as "the true spirit of POPL (Principles of Programming Languages)".

the morning paper

ICSE'18

an interesting/influential/important paper from the world of CS every weekday morning, as selected by Adrian Colyer

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A static verification framework for message passing in Go using behavioural types

JANUARY 25, 2018

tags: [Concurrency](#), [Programming Languages](#)

A static verification framework for message passing in Go using behavioural types Lange et al., *ICSE 18*

With thanks to Alexis Richardson who first forwarded this paper to me.

We're jumping ahead to ICSE 18 now, and a paper that has been accepted for publication there later this year. It fits with the theme we've been exploring this week though, so I thought I'd cover it now. We've seen verification techniques applied in the context of **Rust** and **JavaScript**, looked at the integration of **linear types in Haskell**, and today it is the turn of Go!

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- ▶ **[CC'18]** Romyana Neykova , Raymond Hu, NY, Fahd Abdeljallal: Session Type Providers: Compile-time API Generation for Distributed Protocols with Interaction Refinements in F#.
- ▶ **[FoSSaCS'18]** Bernardo Toninho, NY: Depending On Session Typed Process.
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- ▶ **[ICSE'18]** Julien Lange, Nicholas Ng, Bernardo Toninho, NY : A Static Verification Framework for Message Passing in Go using Behavioural Types.
- ▶ **[ECOOP'17]** Alceste Scala, Raymond Hu, Ornela Darda, NY: A Linear Decomposition of Multiparty Sessions for Safe Distributed Programming.
- ▶ **[COORDINATION'17]** Keigo Imai, NY, Shoji Yuen: Session-ocaml: a session-based library with polarities and lenses.
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- ▶ **[CC'17]** Romyana Neykova, NY: Let It Recover: Multiparty Protocol-Induced Recovery.
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Dialogue between Industry and Academia

Binary Session Types [PARL'94, ESOP'98]



Milner, Honda and Yoshida joined W3C WS-CDL (2002)



Formalisation of W3C WS-CDL [ESOP'07]



Scribble at π^4 Technology

CDL Equivalent

- Basic example:

```
package HelloWorld {
    roleType YouRole, WorldRole;
    participantType You{YouRole}, World{WorldRole};
    relationshipType YouWorldRel between YouRole and WorldRole;
    channelType WorldChannelType with roleType WorldRole;

    choreography Main {
        WorldChannelType worldChannel;

        interaction operation=hello from=YouRole to=WorldRole
            relationship=YouWorldRel channel=worldChannel {
                request messageType=Hello;
            }
    }
}
```

Scribble Protocol

- *"Scribbling is necessary for architects, either physical or computing, since all great ideas of architectural construction come from that unconscious moment, when you do not realise what it is, when there is no concrete shape, only a whisper which is not a whisper, an image which is not an image, somehow it starts to urge you in your mind, in so small a voice but how persistent it is, at that point you start scribbling" - Kohei Honda 2007*

- **Basic example:**

```
protocol HelloWorld {  
  role You, World;  
  Hello from You to World;  
}
```

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Multiparty Session Types [POPL'08]



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