specify. simplify. explore.

with ComplexValues

counseling developer Thomas J. Schrader

Smalltalked Visuals GmbH Christian Haider

data workflows fragile,
systems complicated,
maintenance difficult

?

conventional OO misses something

Values - functional style taps the full potential of OO

„values | objects“ !

[MacLennan, 1982]

Value is abstract concept

42

abstraction
no lifecycle
stateless
context-free

Why?

Adequate

- Objects and Values ARE different
- There are Values – why use Objects?

Solid

- No side effects
- No cycles
- No illegal Values

Pretty

- Readable at a glance
- Concise
- Understandable

Practical

- Record and replay
- Print and transportable
- Supported by tools (references, refactoring, formatter, syntax highlighter)
- Trivial

Value is literal - understand objects at a glance

Time

h: 16 m: 30

ComplexValue is immutable composite

top down tree

```
Text
    string: 'ComplexValue...'
    style:  (Textstyle
        font:  #{Helvetica}
        size:  60)
```

ComplexValues are
real objects
but without identity

Value = behavior + content

same class & content = same Value

ComplexValue is generated from a specification

```
aValueClass>>localSpecification

    <constant: #... class: #{aClass}>
    <optional: #... class #{aClass}
            default: aDefaultValue>
    <sequence: #...>
    <map: #...>
```

ComplexValues: configure in Smalltalk

```
Store class>>publicCincom
    ^PostgreSQL
        name: #publicCincom
        source: #psql_public_cst
        environment:
'store.cincom...'
        user: (User
            name: 'guest'
            password: 'guest')
```

Standard Values

Immediates

SmallInteger 42 Character $a

Literal

Float 13.5 Symbol #none

String 'abc' Array #(1 'xyz' #one)

Value like

Point 1@20 Association #abc -> 42

Date Time Rectangle (0@0 extent: 5@5)

ColorValue (ColorValue red: 1 green: 0 blue: 0)

Complex Values

```
ChartText
    style: (Textstyle
        color: (CmykColor
            cyan: 1
            magenta: 0.3
            yellow: 0
            black: 0.3
            rgb: #[0 101 157])
        font: #{SmallCharts.Helvetica}
        size: 12)
    string: 'This is a ' , self name asString
    position: 5 @ 10
```

Defining a Value

```
localSpecification
    <constant: #constant class: #{Symbol}>
    <optional: #optional class: #{Symbol} default: '#a'>
    <sequence: #array>
    <map: #dictionary>
```

Constructor

```
constant: const optional: opt array: arr dictionary: dict
    | inst |
    inst := self new.
    inst
        initializeConstant: const
        optional: opt
        array: arr
        dictionary: dict.
    ^inst
```

Optional Constructors

```
constant: const
    | inst |
    inst := self new.
    inst initializeConstant: const optional: nil array: nil dictionary: nil.
    ^inst
constant: const optional: opt                          (…)
constant: const optional: opt array: arr               (…)
constant: const optional: opt dictionary: dict         (…)
constant: const array: arr                             (…)
constant: const array: arr dictionary: dict            (…)
constant: const dictionary: dict                       (…)
```

Initializer

```
initializeConstant: const optional: opt array: arr dictionary: dict
    constant := const.

    (opt notNil and: [self optional ~= opt]) ifTrue: [
        optional := opt].

    (arr notNil and: [arr notEmpty]) ifTrue: [
        array := (Array withAll: arr) beImmutable].

    (dict notNil and: [dict notEmpty]) ifTrue: [
        | od |
        od := OrderedDictionary new.
        dict keysAndValuesDo: [:key :value | od at: key put: value].
        dictionary := od beImmutable].

    self beImmutable
```

Accessors

```
constant
    "<Symbol>"
    ^constant

optional
    "<Symbol>"
    ^optional ifNil: [#a]
```

```
array
    "<Array>"
    ^array ifNil: [#()]

dictionary
    "<Dictionary>"
    ^dictionary ifNil: [
        Dictionary new
            beImmutable]
```

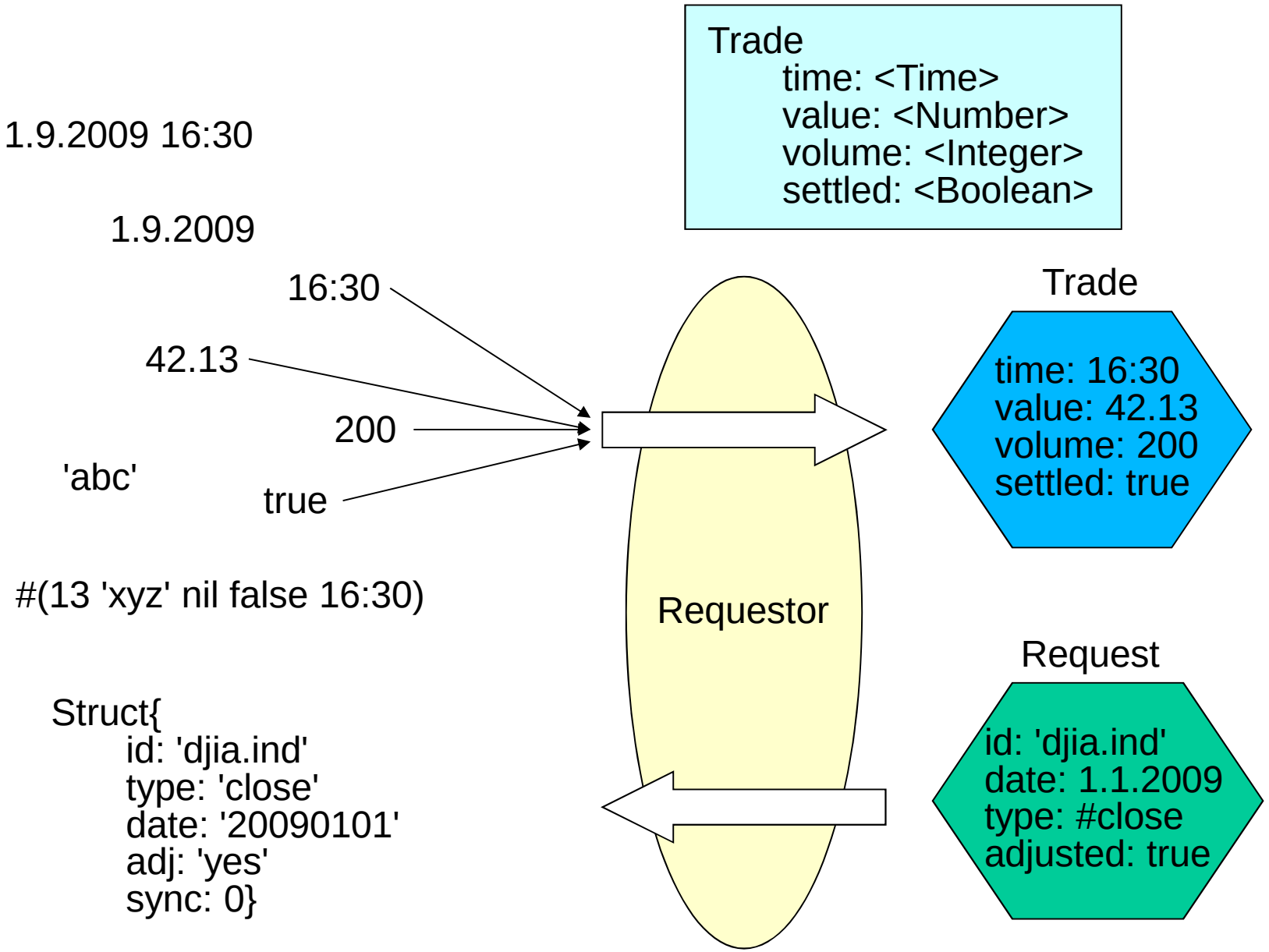
Printer

```
printvalueWith: printer
    | args |
    args := OrderedCollection new.
    args add: (printer constant: 'constant' value: self constant).
    args add: (printer optional: 'optional' value: optional).
    args add: (printer array: 'array' value: self array).
    args add: (printer dictionary: 'dictionary' value: self dictionary).
    ^printer printvalue: self arguments: args
```

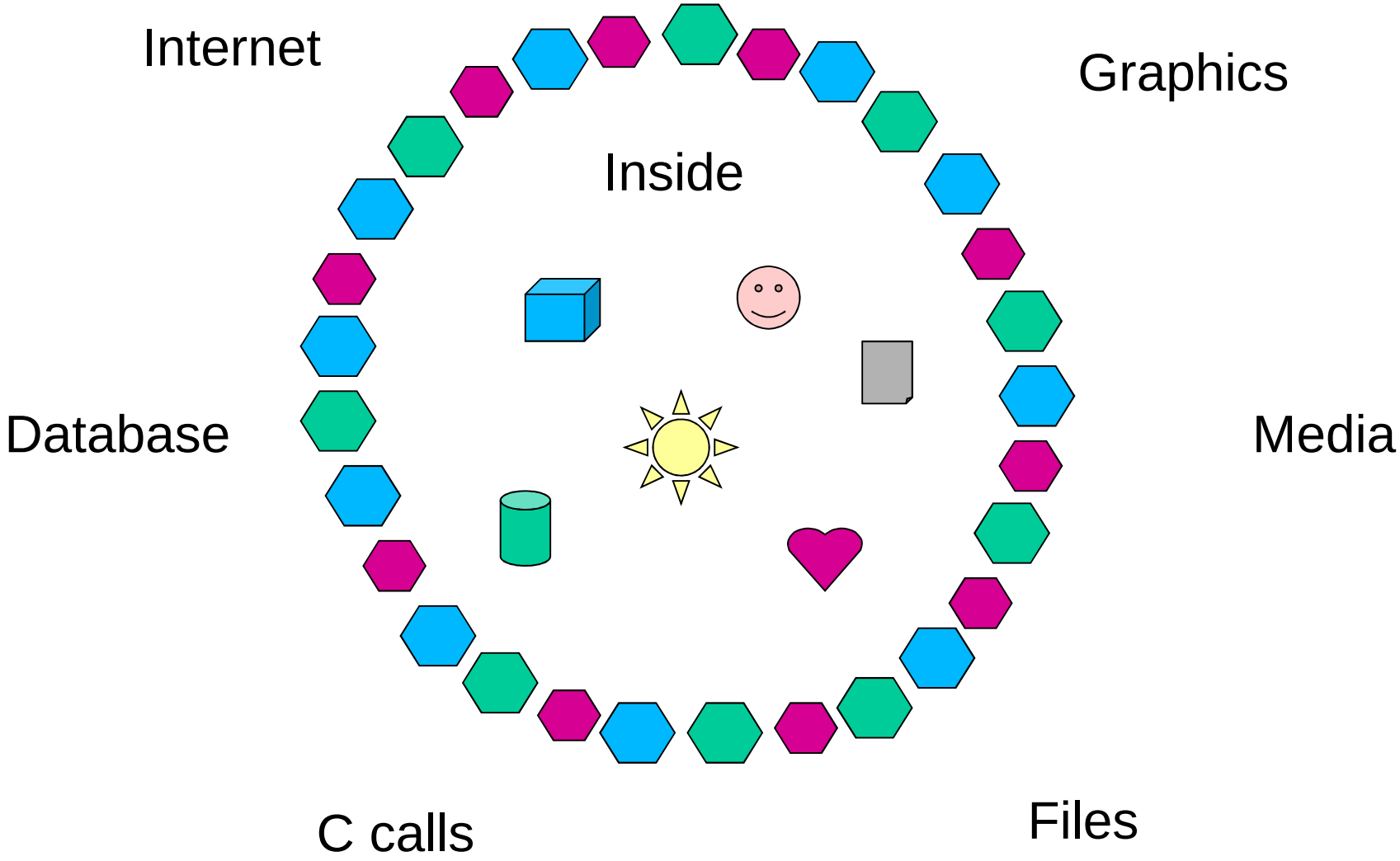
Opentalk Service

```
passInstVars
    "for OpenTalk StSt"
    ^#(#default #default #default #value)
```

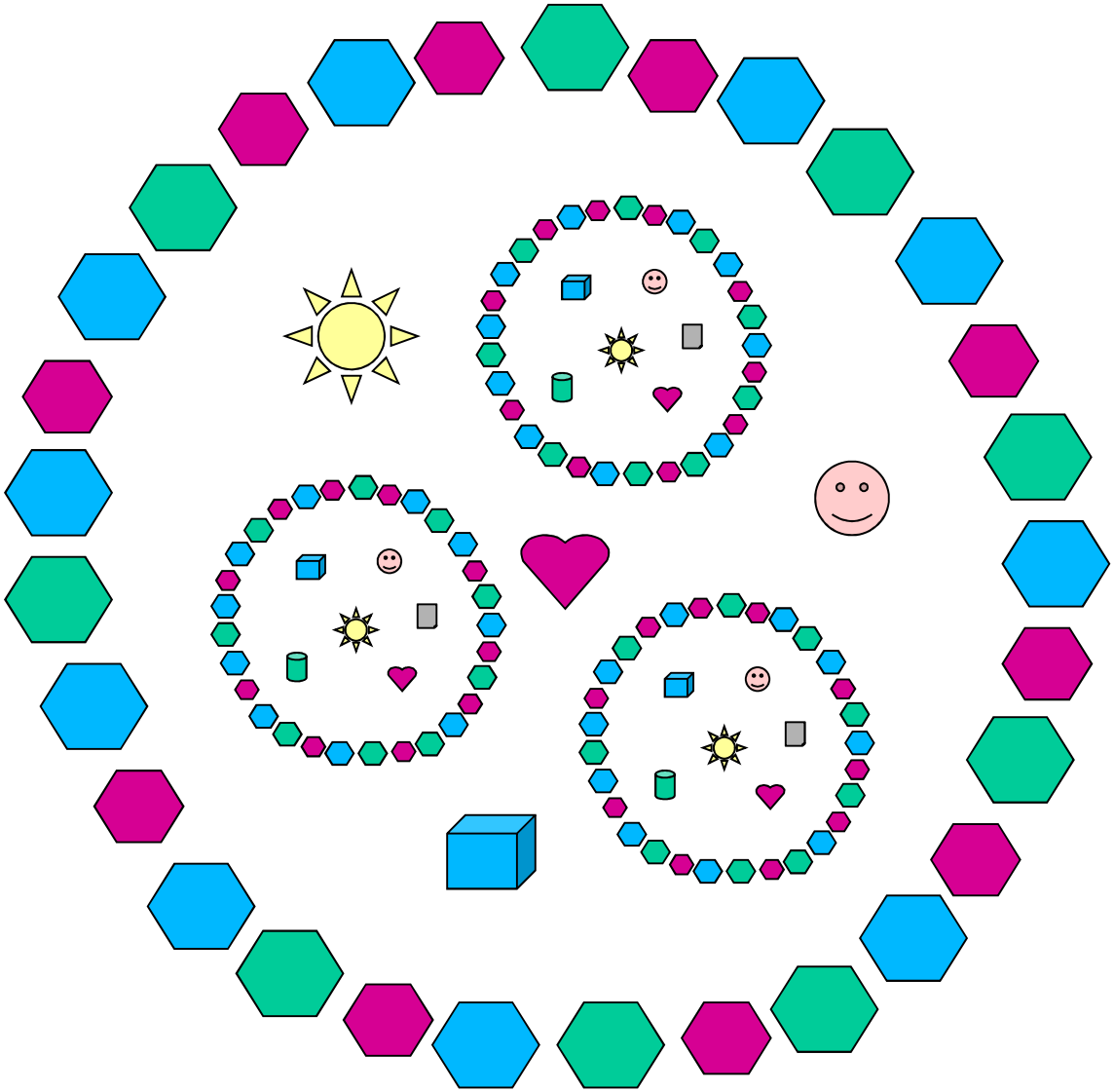
Interface


Trade
time: <Time>
value: <Number>
volume: <Integer>
settled: <Boolean>
1.9.2009 16:30
1.9.2009
16:30
42.13
200
'abc'
true
#(13 'xyz' nil false 16:30)
Struct{
id: 'djia.ind'
type: 'close'
date: '20090101'
adj: 'yes'
sync: 0}
Requestor
Trade
time: 16:30
value: 42.13
volume: 200
settled: true
Request
id: 'djia.ind'
date: 1.1.2009
type: #close
adjusted: true

System Interface



Module Interfaces



Configuration

```
#(#{UI.FullSpec}
    #window:
    #(#{UI.WindowSpec}
      #label: #(#{Kernel.UserMessage}
        #key: #UnlabeledCanvas …)
      #bounds: #(#{Graphics.Rectangle} …) )
    #component:
    #(#{UI.SpecCollection}
      #collection: #(
        #(#{UI.TextEditorSpec}
          #layout: #(#{Graphics.LayoutFrame} … )
          #name: #textEditor
          #model: #textHolder
          #isReadOnly: true
          #tabRequiresControl: true ) ) ) )
```

```
FullSpec
    window: (WindowSpec
        label: (UserMessage
            key: #UnlabeledCanvas …)
        bounds: (Rectangle …))
    component: (SpecCollection
        collection: (Array
            with: (TextEditorSpec
                layout: (LayoutFrame …)
                name: #textEditor
                model: #textHolder
                isReadOnly: true
                tabRequiresControl: true)))
```

as Value

```
FullSpec
    window: (WindowSpec
        label: (UserMessage
            key: #UnlabeledCanvas
            defaultString: 'Unlabeled Canvas'
            catalogID: #labels)
        bounds: (Rectangle origin: 512@384 corner: 858@635))
    component: (SpecCollection collection: (Array with: (TextEditorSpec
        layout: (LayoutFrame
            leftFraction: 0 offset: 10 rightFraction: 1 offset: -10
            topFraction: 0 offset: 10 bottomFraction: 1 offset: -10)
        name: #textEditor
        model: #textHolder
        isReadOnly: true)))
```

VW Setting

```
<?xml version="1.0"?>
<settings domain="VisualWorksSettings">
    <setting>
     <id>
          <key>tools</key>
          <key>browser</key>
          <key>defaultBrowserType</key>
     </id>
     <state>
          <choice-key>Package</choice-key>
     </state>
    </setting>
</settings>
```

as Value

```
Settings
    domain: 'VisualWorksSettings'
    setting: (Id
        with: #tools
        with: #browser
        with: #defaultBrowserType)
    state: (ChoiceKey value: 'Package')
```

Opentalk

```
(BasicBrokerConfiguration new
    adaptor: (
        ConnectionAdaptorConfiguration new
            isBiDirectional: false;
            processingPolicy: WSProcessingPolicy new;
            transport: (
                #{HTTPTransportConfiguration} value new
                    marshaler: (
                        SOAPMarshalerConfiguration new
                            binding: aWsdlBinding;
                            yourself)))
    ) newAt: anIPSocketAddress
```

as Value

```
(BasicBrokerConfiguration
    adaptor: (ConnectionAdaptorConfiguration
        isBiDirectional: false
        processingPolicy: WSProcessingPolicy new
        transport: (HTTPTransportConfiguration
            marshaler: (SOAPMarshalerConfiguration
                binding: aWsdlBinding)))
) newAt: anIPSocketAddress
```