

Configuring in the Browser, Really!

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CWG 2015, Prague 2015-04-28



Our History

- Product configuration since 2002,
with SAP since 2007
- Built and maintained
 - Models
 - Modeling environments
 - Configuration frameworks

Problem 1: Modeling

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- Framework-specific modeling tools

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- Lack of abstraction features and data structures
 - Loops, functions
 - Arrays, objects (with methods)

Problem 1: Modeling

- Framework-specific modeling tools
- Lack of abstraction features and data structures
 - Loops, functions
 - Arrays, objects (with methods)
- Models not represented as human-readable text
 - Edit, search & replace
 - Discuss, annotate
 - Compare, manage revisions

Problem 1: Modeling – Solution A



Problem 1: Modeling – Solution B

Problem 1: Modeling – Solution B

Our solution so far:

Problem 1: Modeling – Solution B

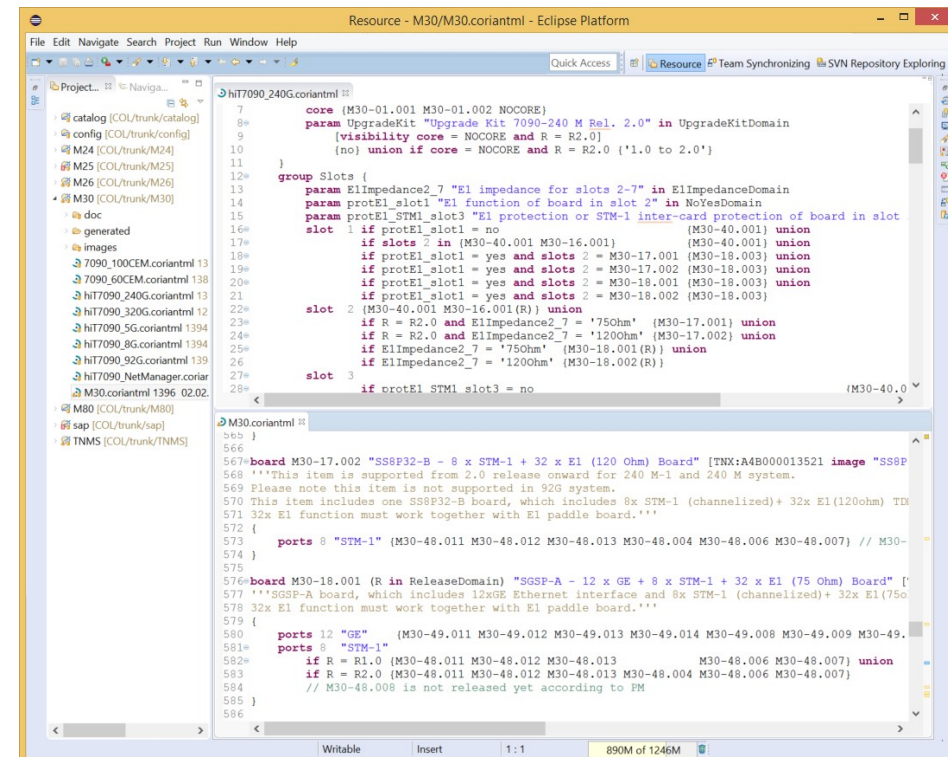
Our solution so far:

- Customer-specific modeling languages

Problem 1: Modeling – Solution B

Our solution so far:

- Customer-specific modeling languages
- Modeling environments based on Eclipse and Xtext



```
Resource - M30/M30.coriantml - Eclipse Platform
File Edit Navigate Search Project Run Window Help
Quick Access Resource Team Synchronizing SVN Repository Exploring

Project... | Naviga...
  catalog [COL/trunk/catalog]
  config [COL/trunk/config]
  M24 [COL/trunk/M24]
  M25 [COL/trunk/M25]
  M26 [COL/trunk/M26]
  M30 [COL/trunk/M30]
    doc
    generated
    images
    7090_100CEM.coriantml 13
    7090_60CEM.coriantml 138
    hi7090_240G.coriantml 13
    hi7090_320G.coriantml 12
    hi7090_5G.coriantml 1394
    hi7090_8G.coriantml 1394
    hi7090_92G.coriantml 139
    hi7090_NetManager.coriar
    M30.coriantml 1396 02.02
  M80 [COL/trunk/M80]
  sap [COL/trunk/sap]
  TNMS [COL/trunk/TNMS]

hi7090_240G.coriantml
7
8 core {M30-01.001 M30-01.002 NOCORE}
9 param UpgradeKit "Upgrade Kit 7090-240 M Rel. 2.0" in UpgradeKitDomain
10 [visibility core = NOCORE and R = R2.0]
11 (no) union if core = NOCORE and R = R2.0 {'1.0 to 2.0'}
12
13 group Slots {
14   param E1Impedance2_7 "E1 impedance for slots 2-7" in E1ImpedanceDomain
15   param protE1_slot1 "E1 function of board in slot 2" in NoYesDomain
16   param protE1_STM1_slot3 "E1 protection or STM-1 inter-card protection of board in slot
17   slot 1 if protE1_slot1 = no (M30-40.001) union
18     if slots 2 in {M30-40.001 M30-16.001} (M30-40.001) union
19     if protE1_slot1 = yes and slots 2 = M30-17.001 (M30-18.003) union
20     if protE1_slot1 = yes and slots 2 = M30-17.002 (M30-18.003) union
21     if protE1_slot1 = yes and slots 2 = M30-18.001 (M30-18.003) union
22     if protE1_slot1 = yes and slots 2 = M30-18.002 (M30-18.003)
23   slot 2 (M30-40.001 M30-16.001 (R)) union
24     if R = R2.0 and E1Impedance2_7 = '75Ohm' (M30-17.001) union
25     if R = R2.0 and E1Impedance2_7 = '120ohm' (M30-17.002) union
26     if E1Impedance2_7 = '75ohm' (M30-18.001 (R)) union
27     if E1Impedance2_7 = '120ohm' (M30-18.002 (R))
28   slot 3
29   if protE1_STM1_slot3 = no (M30-40.0
30 }

M30.coriantml
365
566
567 board M30-17.002 "SSSP32-B - 8 x STM-1 + 32 x E1 (120 Ohm) Board" [TNX:A4B000013521 image "SSSP
568 '''This item is supported from 2.0 release onward for 240 M-1 and 240 M system.
569 Please note this item is not supported in 92G system.
570 This item includes one SSSP32-B board, which includes 8x STM-1 (channelized)+ 32x E1(120ohm) TD
571 32x E1 function must work together with E1 paddle board.'''
572 {
573   ports 8 "STM-1" {M30-48.011 M30-48.012 M30-48.013 M30-48.004 M30-48.006 M30-48.007} // M30-
574 }
575
576 board M30-18.001 (R in ReleaseDomain) "SGSP-A - 12 x GE + 8 x STM-1 + 32 x E1 (75 Ohm) Board" [
577 '''SGSP-A board, which includes 12xGE Ethernet interface and 8x STM-1 (channelized)+ 32x E1(75o
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579 {
580   ports 12 "GE" {M30-49.011 M30-49.012 M30-49.013 M30-49.014 M30-49.008 M30-49.009 M30-49.
581   ports 8 "STM-1"
582   if R = R1.0 {M30-48.011 M30-48.012 M30-48.013 M30-48.006 M30-48.007} union
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- Automated generation of for target framework

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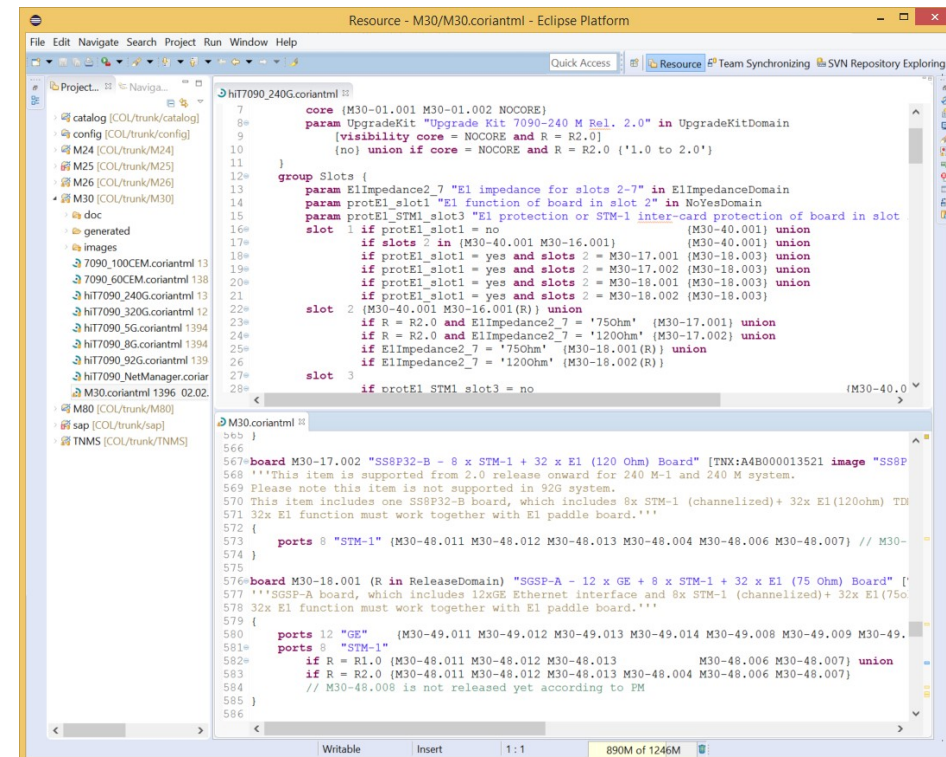
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52 if R = R2.0 (M30-48.011 M30-48.012 M30-48.013 M30-48.004 M30-48.006 M30-48.007)
53 // M30-48.008 is not released yet according to PM
54
55 }
56
57 Writable Insert 1:1 890M of 1246M
```

Problem 1: Modeling – Solution B

Our solution so far:

- Customer-specific modeling languages
- Modeling environments based on Eclipse and Xtext
- Automated generation of model representation for target framework
- See also CWG talks
 - Vienna 2010:
ConfigModeler and VClipse -
languages and IDEs
for product modeling
 - Cologne 2011:
Domain-Specific Languages
for Product Modeling
 - Berlin 2012:
How to Build Your Own
Product-Modeling Environment?



Problem 1: Modeling – Solution C

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- Use a programming language
 - For application-specific inferencing
 - But also to build up the model

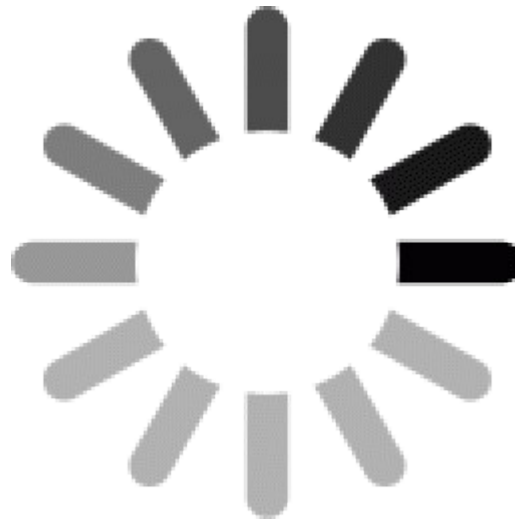
Problem 1: Modeling – Solution C

- Use a programming language
 - For application-specific inferencing
 - But also to build up the model
- Use programming tools
 - Editors/IDEs
 - Debuggers and profilers
 - Revision control
 - Test and CI frameworks

Problem 1: Modeling – Solution C

- Use a programming language
 - For application-specific inferencing
 - But also to build up the model
- Use programming tools
 - Editors/IDEs
 - Debuggers and profilers
 - Revision control
 - Test and CI frameworks
- General purpose tools and languages
 - Maturity
 - Re-usable knowledge, may already be available
 - Large communities and „ecosystems“

Problem 2: User Experience



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- Performance

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- Performance
 - Client-server round trips

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- Rigid UI
 - UI structure imposed by framework
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Problem 2: User Experience

- Performance
 - Client-server round trips
- Rigid UI
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 - High costs for application-specific UI
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Increasing gap:

Configurators ↔ Modern web applications

In the meantime ...



In the meantime ...

In the meantime ...

Client hardware
improved



In the meantime ...

Client hardware improved

- CPU
- Memory



In the meantime ...

Client hardware improved

- CPU
- Memory
- Even on mobiles



In the meantime ...

Client hardware improved

- CPU
- Memory
- Even on mobiles



... but the speed of light remained the same.

In the meantime ...

In the meantime ...

Browser improvements:


In the meantime ...

Browser improvements:

- JavaScript performance

In the meantime ...

Browser improvements:

- JavaScript performance
- Standardized features 
 - UI extensions
 - Offline applications
 - Local storage
 - ...

In the meantime ...

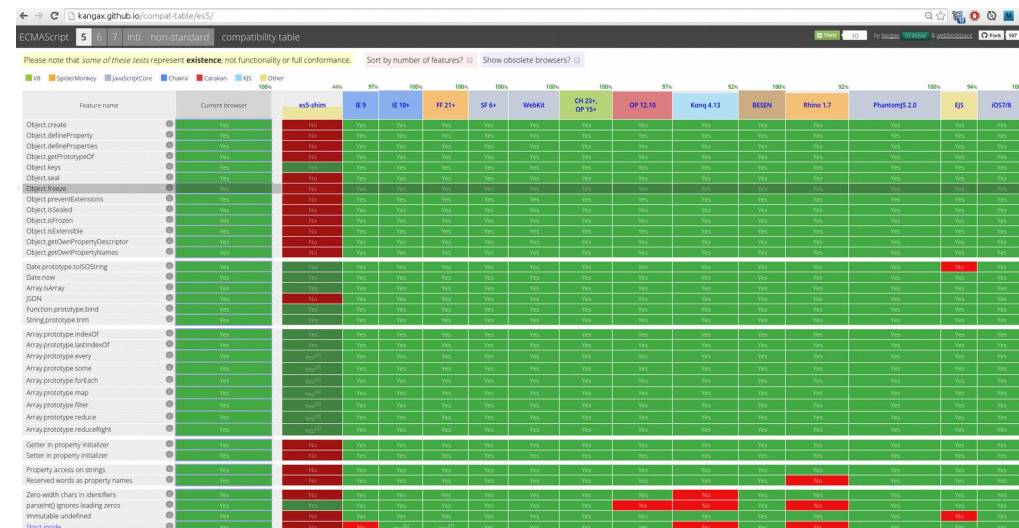
Browser improvements:

- JavaScript performance
- Standardized features



- UI extensions
- Offline applications
- Local storage
- ...

- Improved compatibility



The screenshot shows a web browser displaying the ECMAScript compatibility table. The table lists various ECMAScript features and their support status across different browsers. The features are listed on the left, and the browsers are listed on the top. The support status is indicated by a color-coded cell: green for 'Yes', red for 'No', and yellow for 'Partial'. The table is sorted by the number of features supported by each browser.

Feature name	Current browser	es5-shim	IE 9	IE 10	FF 21+	SF 6+	WebKit	CH 29+ OP 15+	OP 12.10	Kang 4.13	BSLN	Rhino 1.7	PhantomJS 2.0	ES	IOS78
Object.create	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Object.defineProperty	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Object.defineProperties	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Object.getPrototypeOf	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Object.keys	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Object.seal	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Object.freeze	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Object.preventExtensions	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Object.isFrozen	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Object.isSealed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Object.isExtensible	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Object.getPrototypeOf	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Object.getPrototypeOf	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Date.prototype.toJSON	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Date.now	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Array.isArray	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
JSON	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Function.prototype.bind	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
String.prototype.trim	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Array.prototype.indexOf	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Array.prototype.lastIndexOf	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Array.prototype.every	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Array.prototype.some	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Array.prototype.forEach	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Array.prototype.map	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Array.prototype.filter	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Array.prototype.reduce	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Array.prototype.reduceRight	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Getter in property initializer	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Setter in property initializer	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Property access on strings	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Reserved words as property names	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Zero-width chars in identifiers	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
parsed() ignores leading zeros	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Immutable undefined	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

In the meantime ...

A software ecosystem for web applications flourished:

- Web-application frameworks
- Preprocessors for JavaScript/HTML/CSS
- Libraries
- Build tools



In the meantime ...

In the meantime ...

Web browsers have become a serious application platform.

In the meantime ...

Web browsers have become a serious application platform.

Even for the business logic.

In the meantime ...

Web browsers have become a serious application platform.

Even for the business logic.

And they are getting better and better.

Configuring in the Browser:

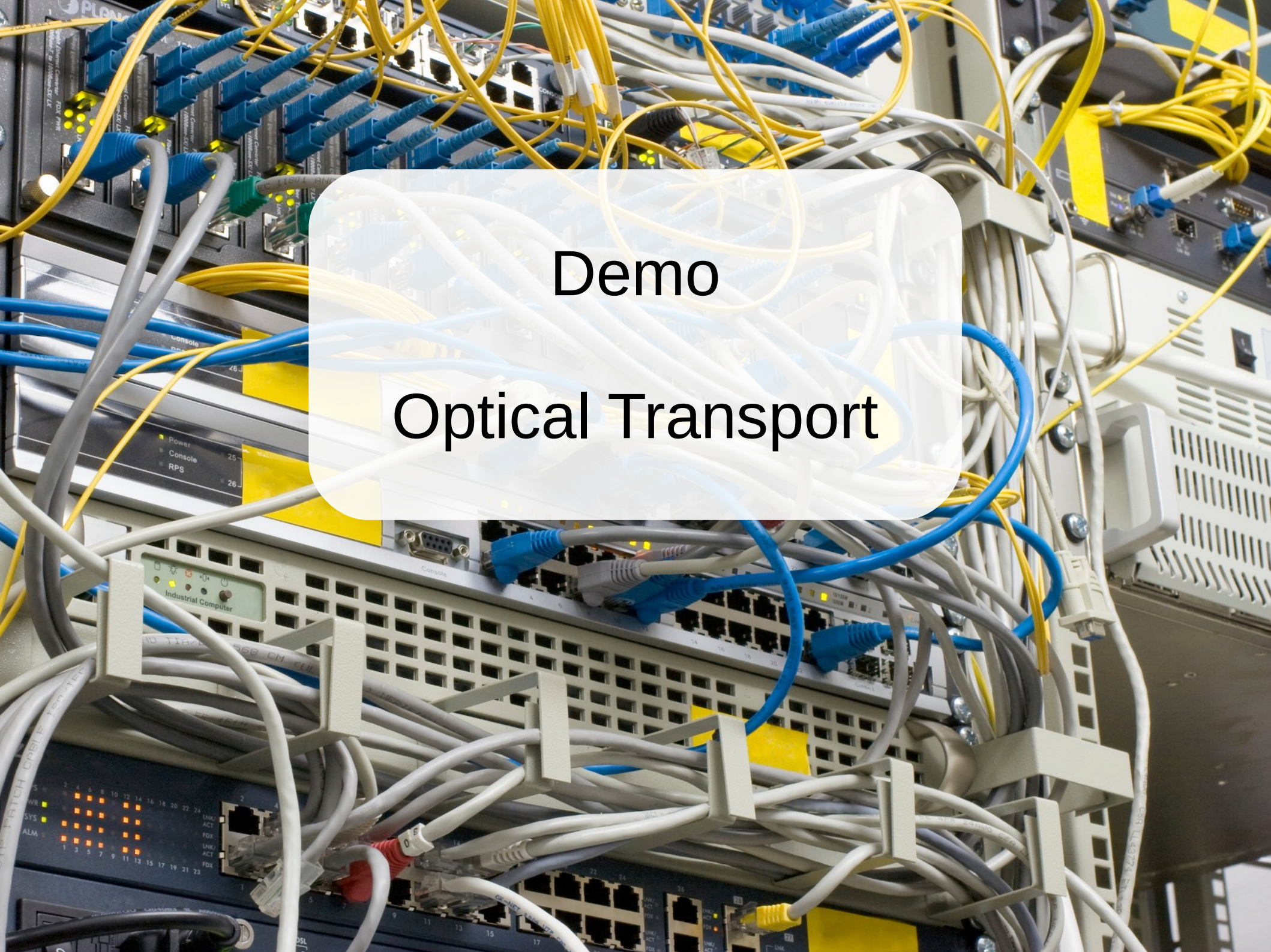
Configuring in the Browser:

Implement configurators in JavaScript.

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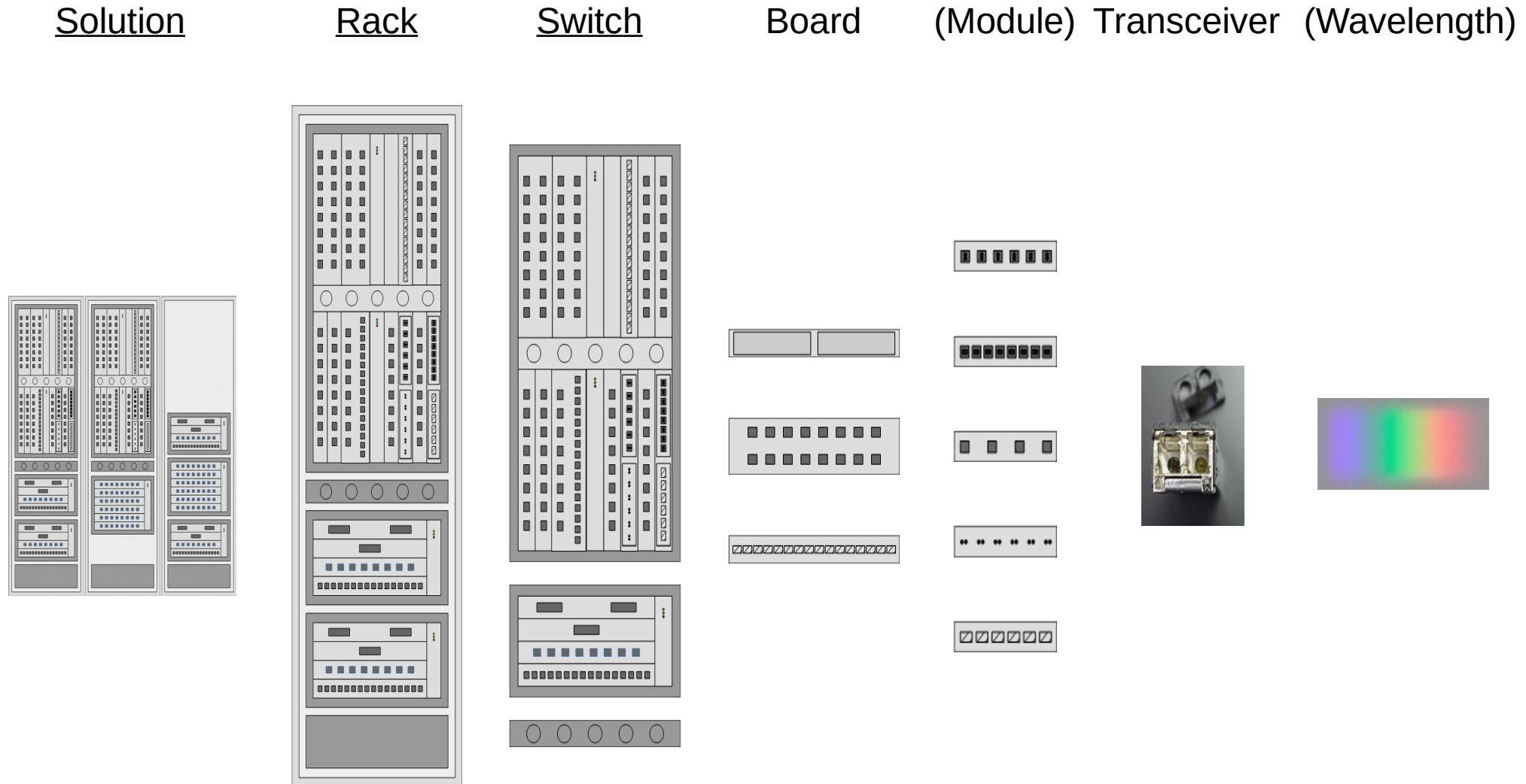
JavaScript is also
a reasonable choice for modeling.



Demo

Optical Transport

Demo Example: Hierarchical Configuration



Demo

<http://opencpq.webxcerpt.com/examples/optical-transport/>

← → ↺

opencpq.webxcerpt.com/examples/optical-transport/

🔍

🛡️

JB

💬

☰

open

📁

📁

📁

↶ undo

↷ redo

⏮ reset

💾 save

🔄 restore

📁 Datei auswählen Keine ausgewählt

📁 import

📁 export

Configuration

Solution ▾ ×

Project Settings

Release

Rel. 1.0 ▾ ✓

Rack Type

ANSI ▾ ✓

Uninterruptible Power Supply (default for each rack)

☒ ✓

Racks

+

#

Rack

▾

1

✓

Uninterruptible Power Supply

☒ ✓

Switches

+

#

Product

▾

2

×

Optical Switch OS6 ▾ ×

Slot 1

16 x 10 G board ▾ ×

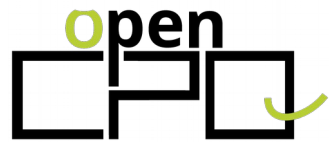
Contents

- [Project Settings](#)
- [#1: Rack](#)
 - [#1: 2 × OS6](#)
 - [#2: OS6](#)
- [#2: Rack](#)
 - [#1: OS4](#)
- [Network Management](#)
- [Services](#)

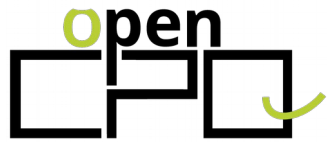
Bill of Materials

export as CSV

	Material		
#	No.	Description	Price (€)
3	SFP+:SR	SFP+ SR (850 nm, up to 300 m)	1.000,00
3	B:16x10	16 x 10 G board	25.000,00
16	B:FP	Blank faceplate for board slots	20,00

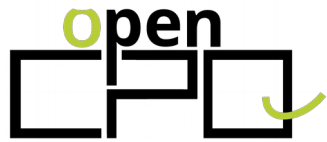


– a JavaScript-based Configurator Framework



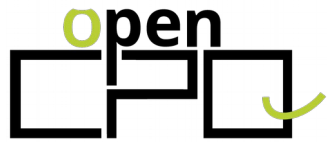
– a JavaScript-based Configurator Framework

- Building-block library
 - Components
 - Dependencies



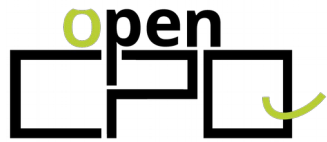
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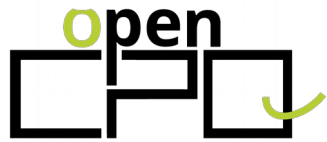
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 - Components
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- Combine building blocks with JavaScript
- Add application-specific building blocks



– a JavaScript-based Configurator Framework

- Building-block library
 - Components
 - Dependencies
- Combine building blocks with JavaScript
- Add application-specific building blocks
- A light-weight layer based on ReactJS and Bootstrap

 – an Open-Source Project

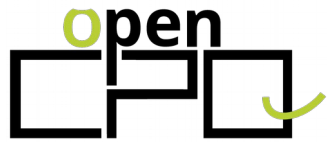


– an Open-Source Project

Source code and links to live demos
available on Github:

<https://github.com/webXcerpt/openCPQ>

The screenshot shows the GitHub repository page for `webXcerpt/openCPQ`. The repository is described as "A browser-based product-configuration framework". It has 99 commits, 2 branches, 0 releases, and 2 contributors. The current branch is `master`. The commit history shows a recent commit by `TimGeisler` 22 hours ago, titled "added details for a select case". The file list includes `doc`, `examples`, `lib`, `editorconfig`, `gignore`, `LICENSE`, `README.md`, `index.js`, `openCPQ-logo-black-100x41.png`, `openCPQ-logo-white-100x41.png`, `package.json`, and `style.css`. The `README.md` file is expanded, showing the project title "openCPQ", a description "A browser-based product-configuration framework", a link to the documentation, and a section for "Demos".



– an Open-Source Project

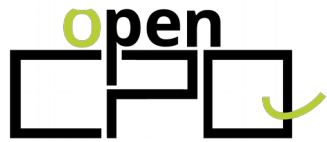
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Liberal MIT license

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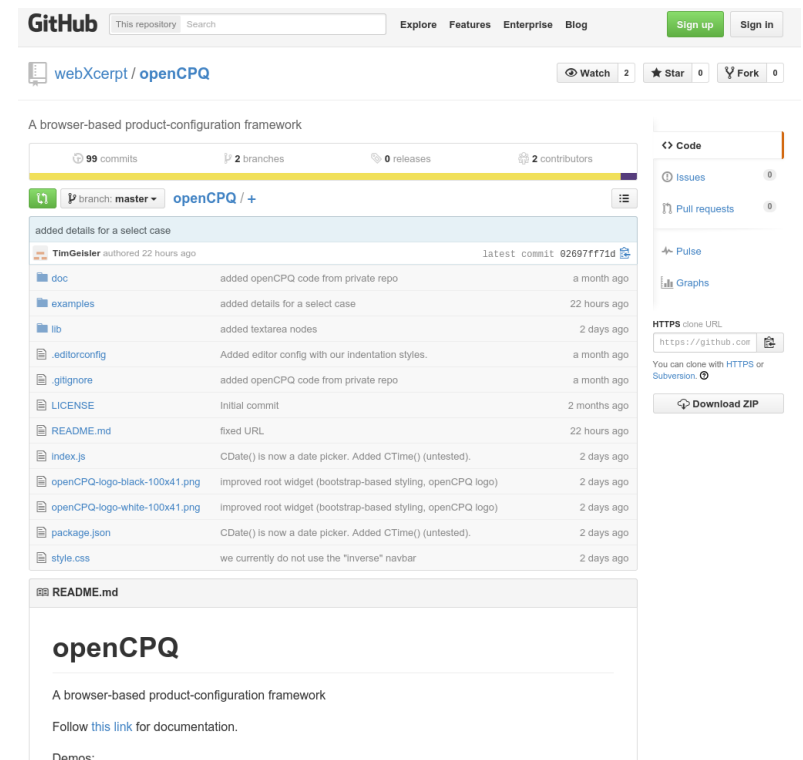
– an Open-Source Project

Source code and links to live demos
available on Github:

<https://github.com/webXcerpt/openCPQ>

Liberal MIT license

Use, adapt,
integrate, contribute!



Modeling with openCPQ: Cases with Details

Modeling with openCPQ: Cases with Details

The screenshot shows the openCPQ web interface. At the top, there is a 'Solution' dropdown menu and a 'cases' tab. Below this, the 'Project Settings' section is visible, containing three items: 'Release' with a dropdown set to 'Rel. 1.0', 'Rack Type' with a dropdown set to 'ANSI', and 'Uninterruptible Power Supply' with a checkbox. A green box highlights the 'Project Settings' section, and the word 'details' is written in green at the bottom right of this box. The word 'Racks' is partially visible at the bottom left of the interface.

```
var configuration = CSelect([
  unansweredCase("Select Configuration Mode"),
  ccase("Switches", "Optical Switches",
    CQuantifiedList({}, "Optical Switch",
      opticalSwitches)),
  ccase("Rack", "Racks",
    CQuantifiedList({}, "Rack",
      rack)),
  ccase("Solution", "Solution",
    solution),
]);
```

Modeling with openCPQ: Cases with Details

Solution ▼ **cases**

Project Settings

Release

Rel. 1.0 ▼ ✓

Rack Type

ANSI ▼ ✓

Uninterruptible Power Supply

☐ ✓ **details**

Racks

```
var configuration = CSelect([
  unansweredCase("Select Configuration Mode"),
  ccase("Switches", "Optical Switches",
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  ccase("Rack", "Racks",
    CQuantifiedList({}, "Rack",
      rack)),
  ccase("Solution", "Solution",
    solution),
]);
```

Slot 1

16 x 10 G board ▼ **cases**

SFP+ ports

	#	Transceiver
▼	1 ✓	CWDM (40 km) ▼ × 1471.00 nm ▼ ✓

⚠ Only 1 of 16 ports configured. **details**

Slot 2
occupied

```
function boards(isDoubleWidthSlot) {
  return CSelect([
    for (b of components.boards)
      if (!b.doubleWidth ||
        isDoubleWidthSlot)
        ccaseBOM(b.name, b.label,
          ports(b.ports))
  ]);
}
```

Data-Driven Modeling with openCPQ

Data-Driven Modeling with openCPQ

Boards						
Name	Label	Double <u>width</u>	Power	Ports Label	<u>Count</u>	Type
B:FP	<u>unequipped</u>					
B:8x10_16x1	8 x 10 G + 16 x 1 G <u>board</u>	y	45	SFP+ <u>ports</u>	8	SFP+
				SFP <u>ports</u>	16	SFP
B:8x10	8 x 10 G <u>board</u>		30	SFP+ <u>ports</u>	8	SFP+
B:16x10	16 x 10 G <u>board</u>	y	50	SFP+ <u>ports</u>	16	SFP+
B:16xE1_75	16 x E1 <u>electrical board</u> (75 Ohm)		40			
B:16xE1_120	16 x E1 <u>electrical board</u> (120 Ohm)		40			
B:2x40	2 x 40 G <u>board</u>		60	QSFP+ <u>ports</u>	2	QSFP+
B:1x100	1 x 100 G <u>board</u>		60	CFP <u>ports</u>	1	CFP

Data-Driven Modeling with openCPQ

Boards						
Name	Label	Double width	Power	Ports Label	Count	Type
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B:16x10	16 x 10 G board	y	50	SFP+ ports	16	SFP+
B:16xE1_75	16 x E1 electrical board (75 Ohm)		40			
B:16xE1_120	16 x E1 electrical board (120 Ohm)		40			
B:2x40	2 x 40 G board		60	QSFP+ ports	2	QSFP+
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Slot 1

8 x 10 G + 16 x 1 G board

SFP+ ports

+

#

Transceiver

-

2

×

SR (850 nm, up to 300 m)

✓

-

6

×

LR (1310 nm, up to 10 km)

×

All 8 ports used.

SFP ports

+

#

Transceiver

-

1

✓

CWDM (40 km)

×

1491.00 nm

×

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Slot 2

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Data-Driven Modeling with openCPQ

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}
```

Slot 1

8 x 10 G + 16 x 1 G board ▾ ✕

SFP+ ports

+	#	Transceiver	
▾	2 ✕	SR (850 nm, up to 300 m) ▾	✓
▾	6 ✕	LR (1310 nm, up to 10 km) ▾	✕

All 8 ports used.

SFP ports

+	#	Transceiver	
▾	1 ✓	CWDM (40 km) ▾	✕
		1491.00 nm ▾	✕

Only 1 of 16 ports configured.

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All 8 ports used.

SFP ports

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-	1 ✓	CWDM (40 km) ▾ ✕ 1491.00 nm ▾ ✕

Only 1 of 16 ports configured.

Slot 2
occupied



Concise specification of complex models

Modeling with openCPQ: Application-specific Abstractions

Modeling with openCPQ: Application-specific Abstractions

Configuration Type

New Configuration ▾ ×

Server

New Configuration

Connected clients ×

Server size

small ▾ ×

Redundant server ☒ ×

Modeling with openCPQ: Application-specific Abstractions

Configuration Type

New Configuration ▾ ✕

Server

New Configuration

Connected clients ✕

Server size ✕

Redundant server ☒ ✕

Configuration Type

Upgrade / Extension ▾ ✕

Server

	Existing Configuration	Planned Configuration
Connected clients	<input type="text" value="20"/> ✕	<input type="text" value="20"/> ✓
Server size	<input type="text" value="medium"/> ✕	<input type="text" value="small"/> ✕ ⚠ Downgrade not supported
Redundant server	<input type="checkbox"/> ✓	<input checked="" type="checkbox"/> ✕

Modeling with openCPQ: Application-specific Abstractions

Configuration Type

New Configuration ▾ ✕

Server

New Configuration

Connected clients ✕

Server size ✕

Redundant server ☒ ✕

Configuration Type

Upgrade / Extension ▾ ✕

Server

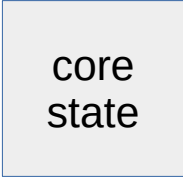
	Existing Configuration	Planned Configuration
Connected clients	<input type="text" value="20"/> ✕	<input type="text" value="20"/> ✓
Server size	<input type="text" value="medium"/> ✕	<input type="text" value="small"/> ✕ ⚠ Downgrade not supported
Redundant server	<input type="checkbox"/> ✓	<input checked="" type="checkbox"/> ✕

```
CNamespace("props", CGroup([
  cmember("ConfigType", "Configuration Type",
    CNamed("props", "ConfigType", {valueAccessor: n => n.value}, CSelect([
      ccase("NEW", "New Configuration"), ccase("EXT", "Upgrade / Extension"),
    ]))),
  cmember("Server", "Server", ep.table([
    ep.rowInteger("clients", "Connected clients"),
    crow("Size", "Server size", ({props}) => props.ConfigType === "EXT"
      ? [ep.eCell("Size", CSelect([for (s of serverSizes) ccase(s)])),
        () => ep.pCell("Size", CSelect([for (s of serverSizes)
          onlyIf(serverSizes.indexOf(s) >= serverSizes.indexOf(ep.E(props.Size)),
            "Downgrade not supported", [ccase(s)]))]
        : [ep.pCell("Size", CSelect([for (s of serverSizes) ccase(s)]))]
      ],
    ep.rowBoolean("redundancy", "Redundant server"),
  ])),
]))),
```



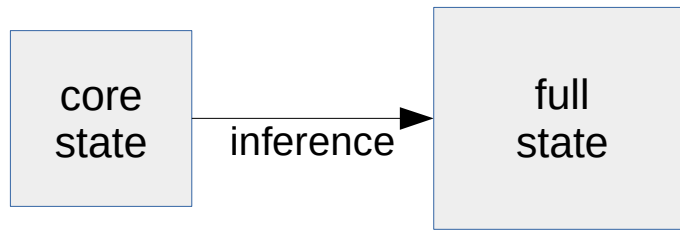

How it Works

Change Propagation

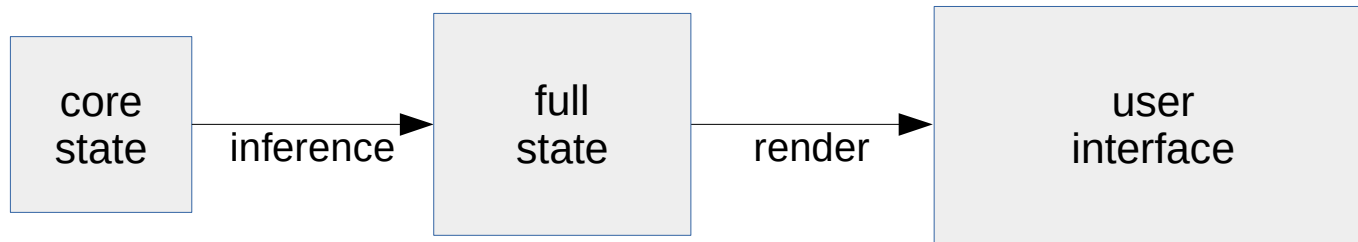


core
state

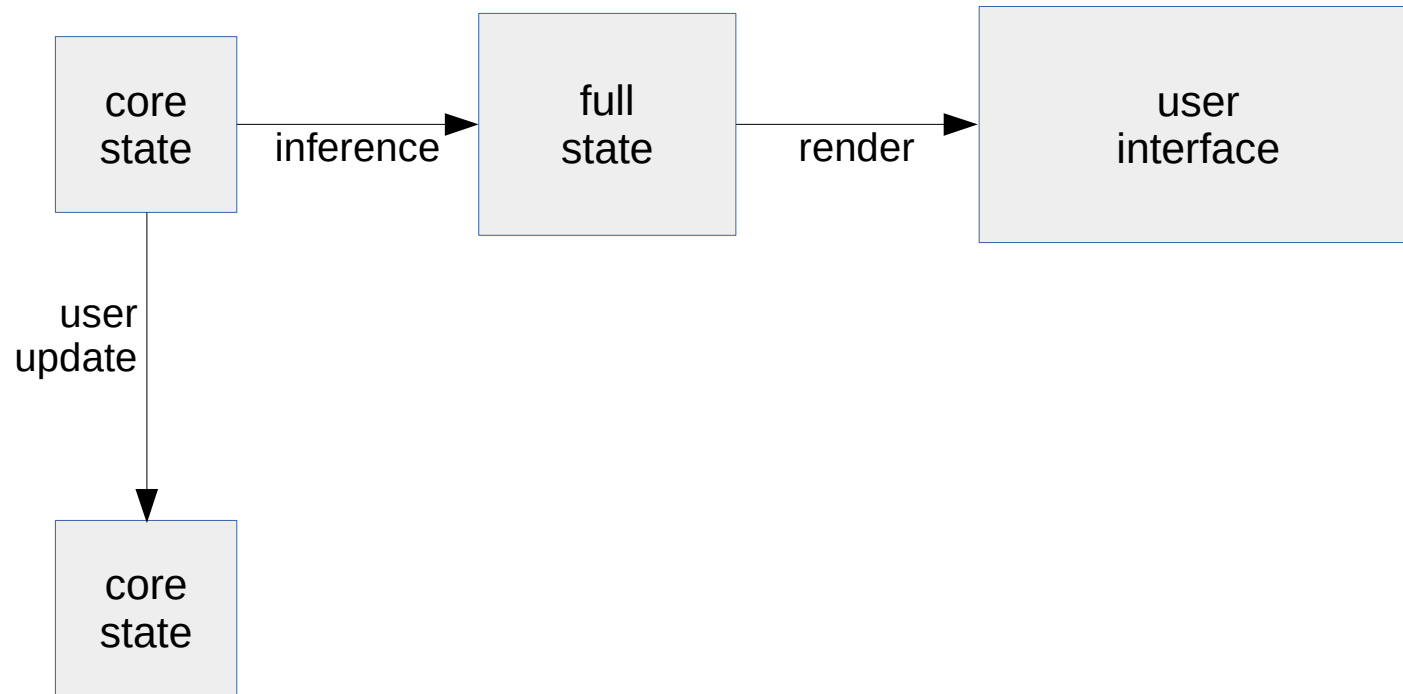
Change Propagation



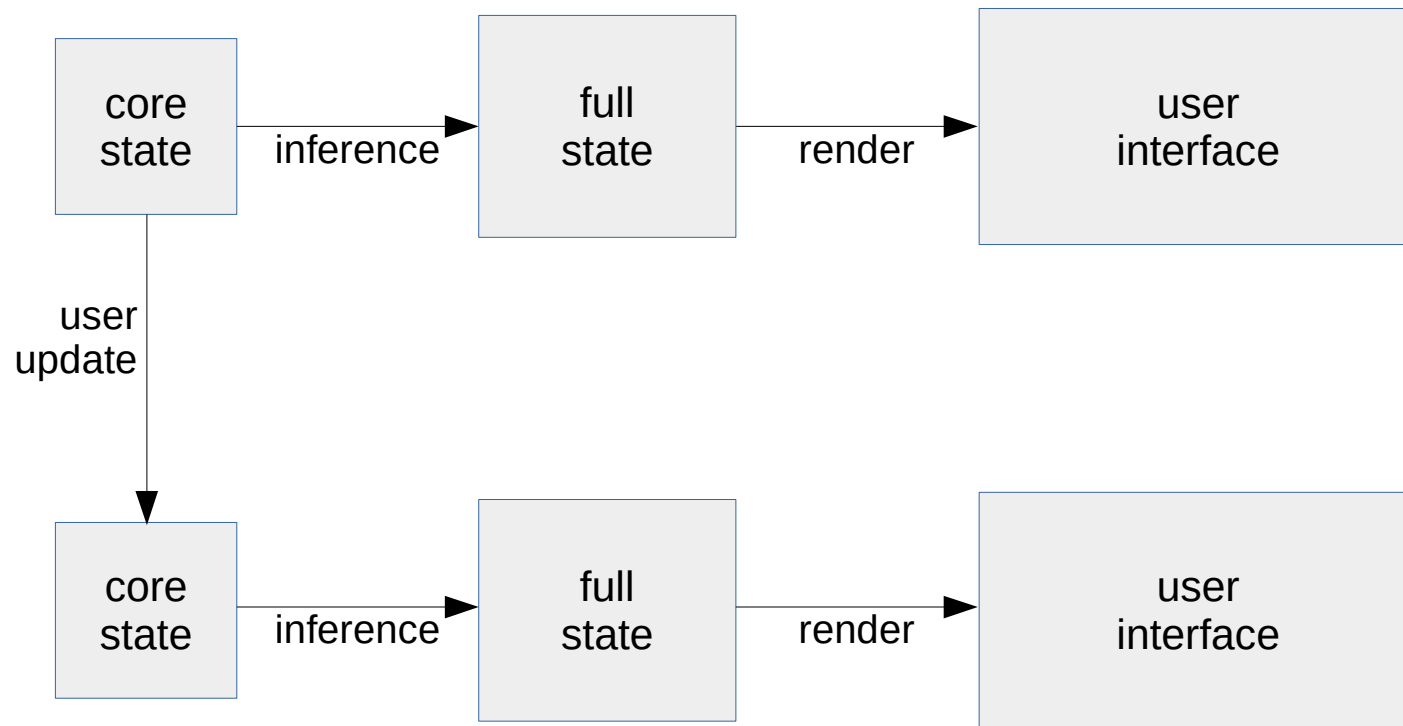
Change Propagation



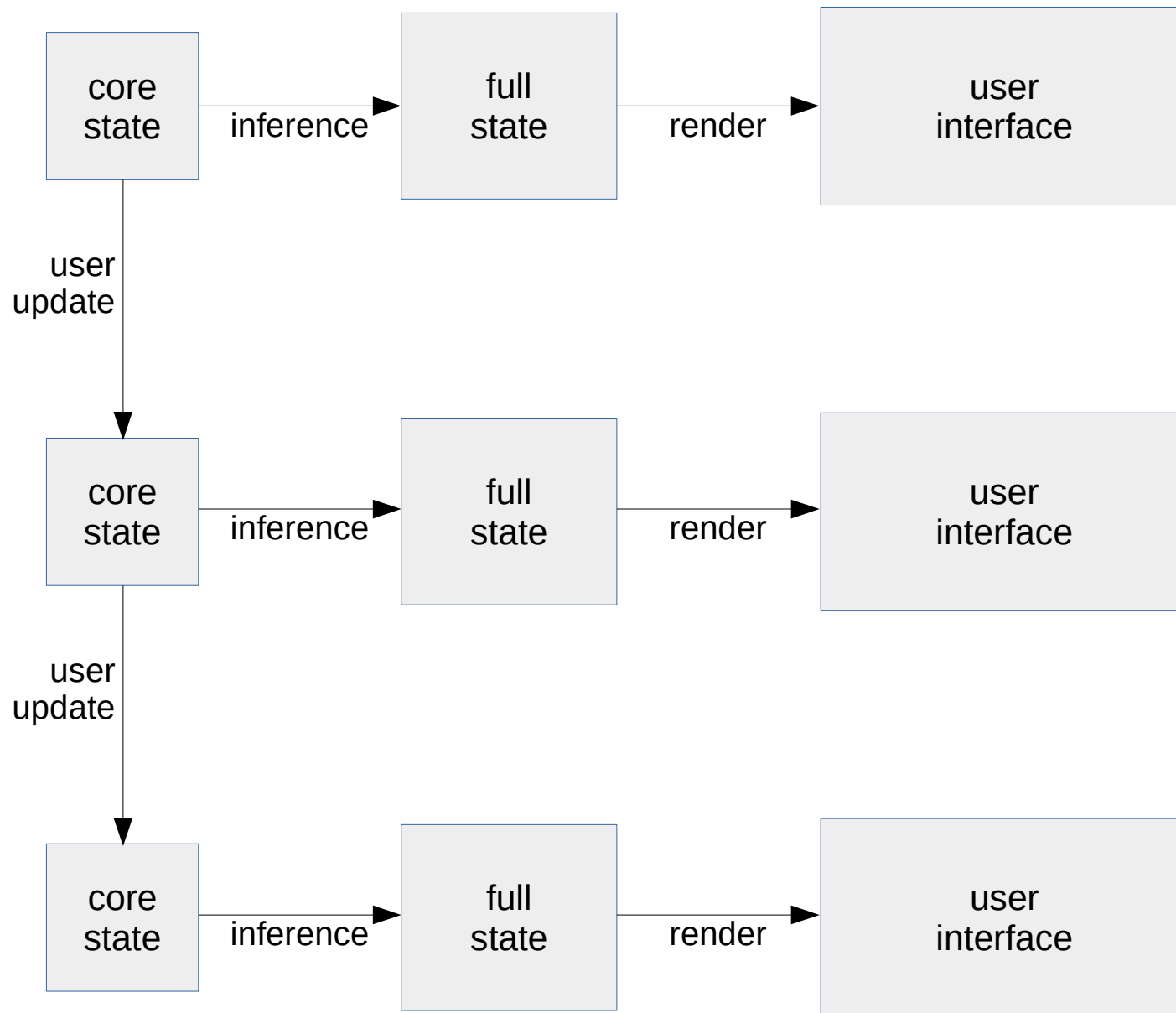
Change Propagation



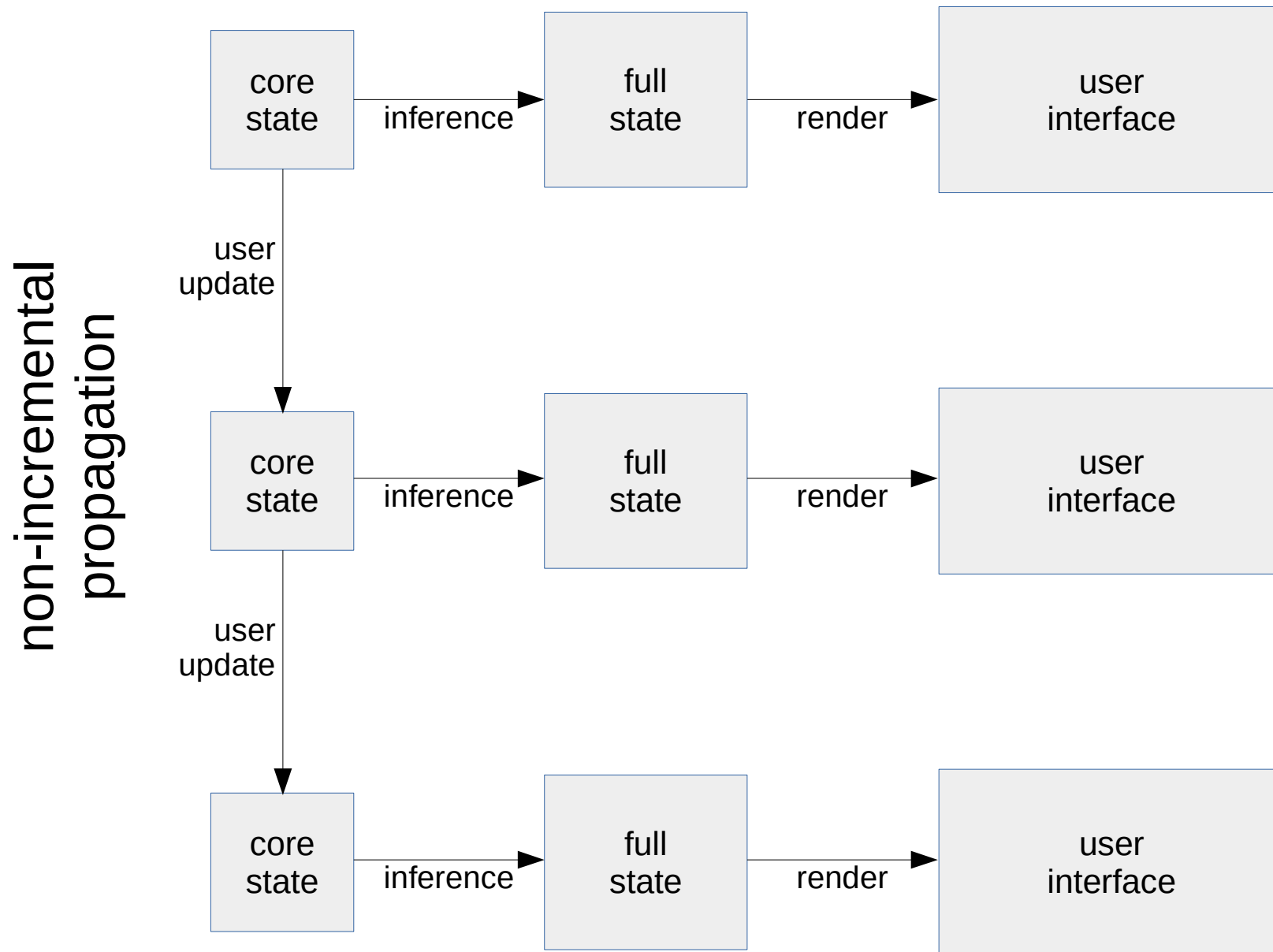
Change Propagation



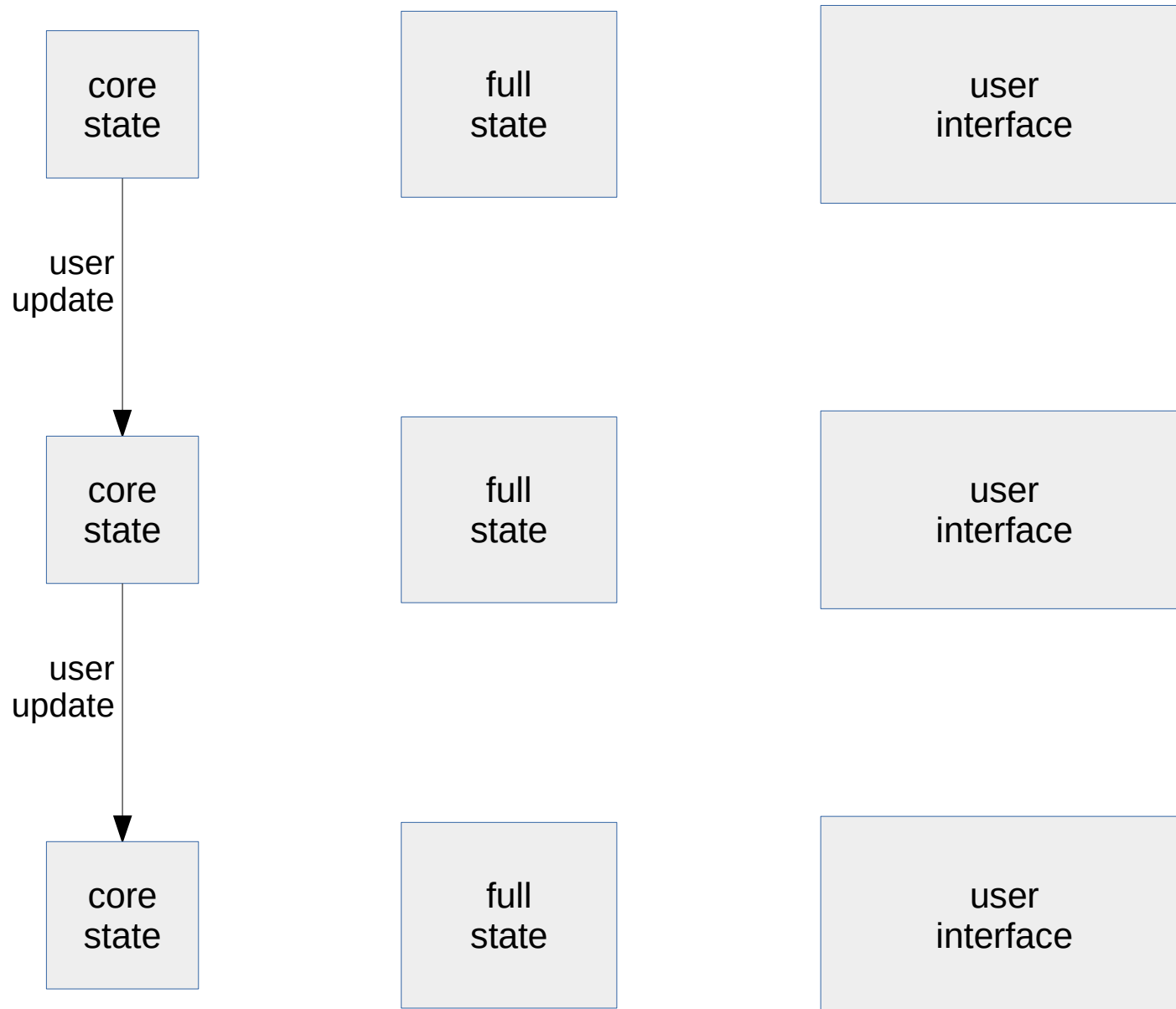
Change Propagation



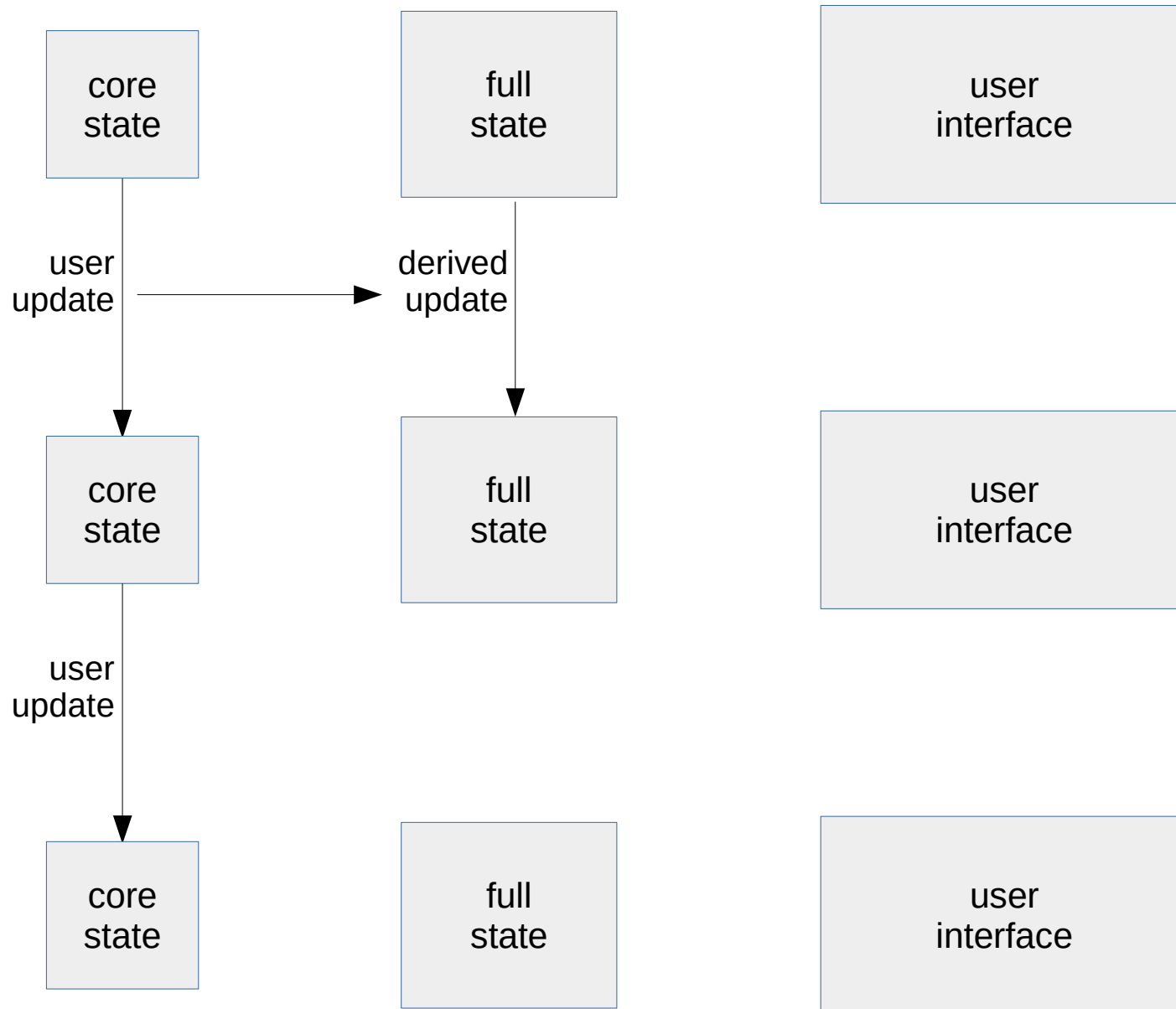
Change Propagation



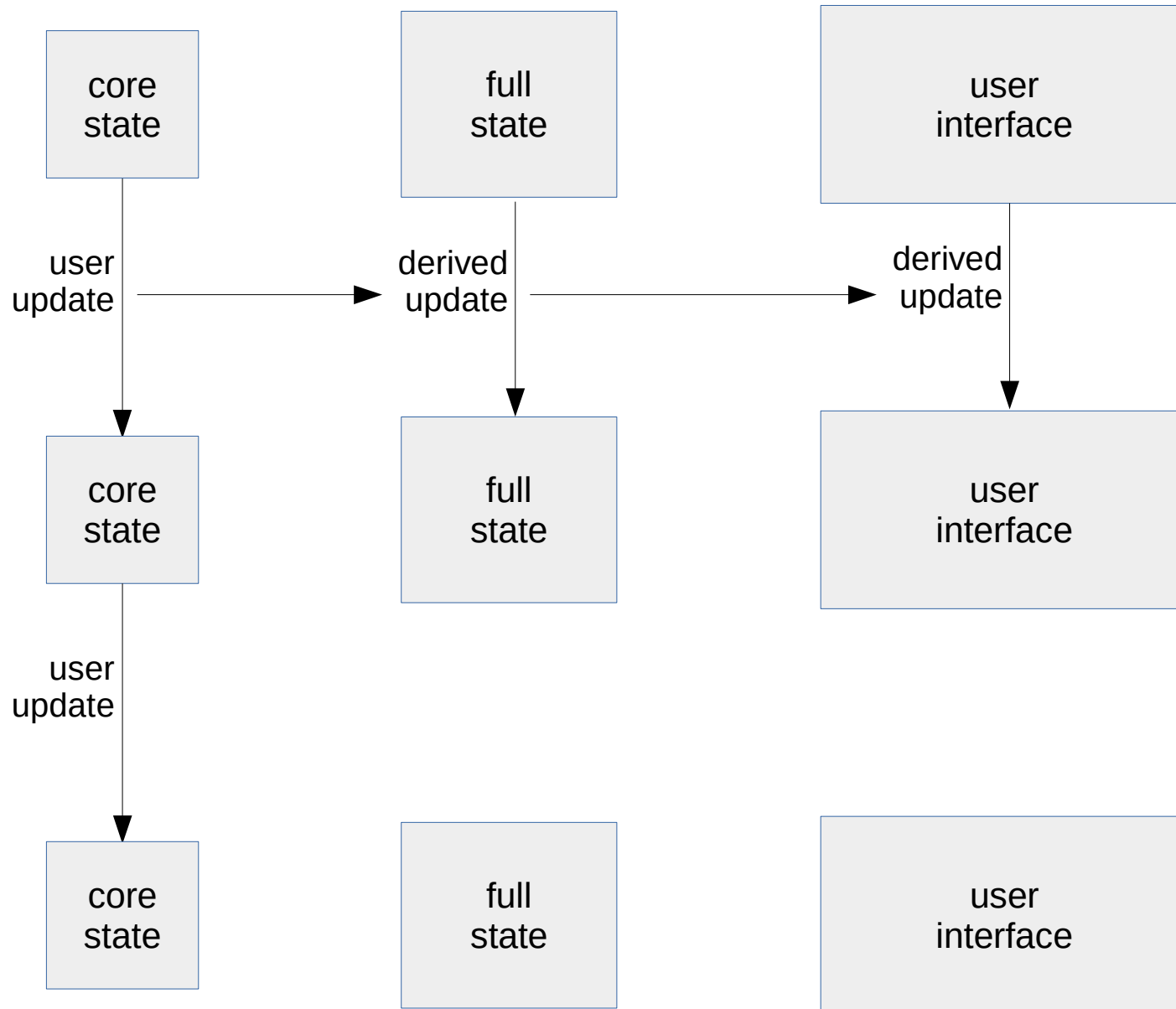
Change Propagation



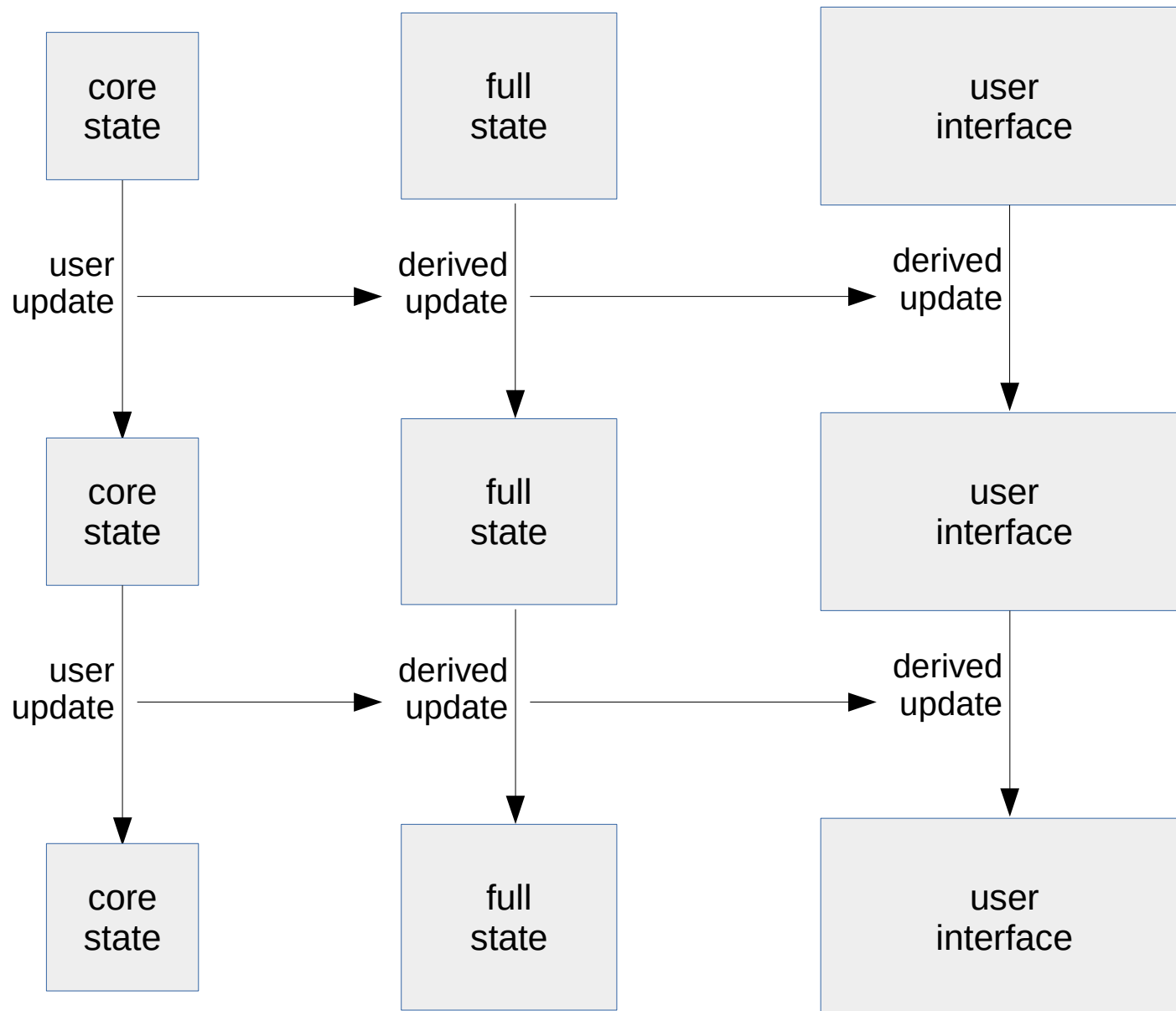
Change Propagation



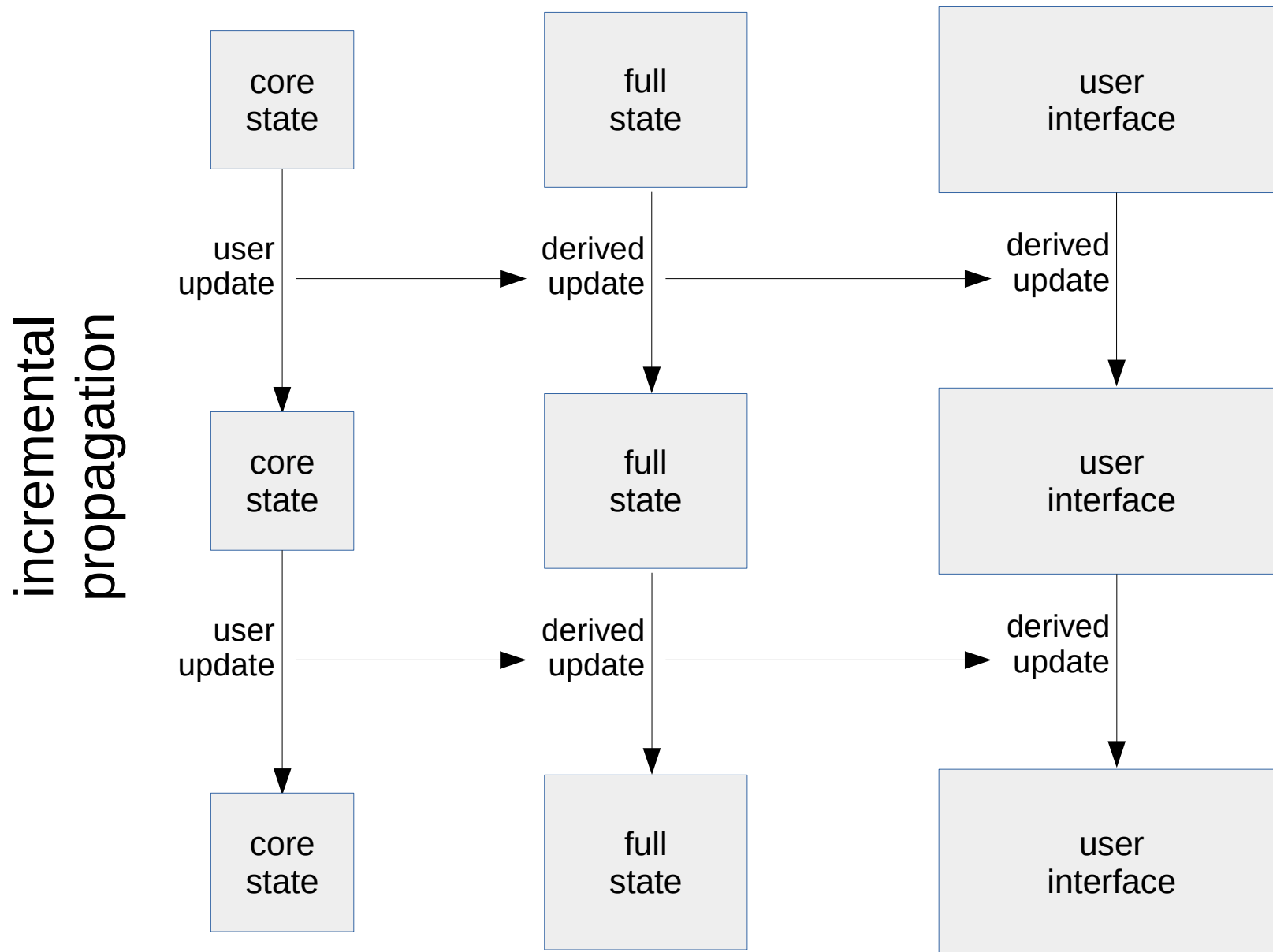
Change Propagation



Change Propagation



Change Propagation



Change Propagation

Change Propagation

Trade-off:

- Non-incremental propagation:

Change Propagation

Trade-off:

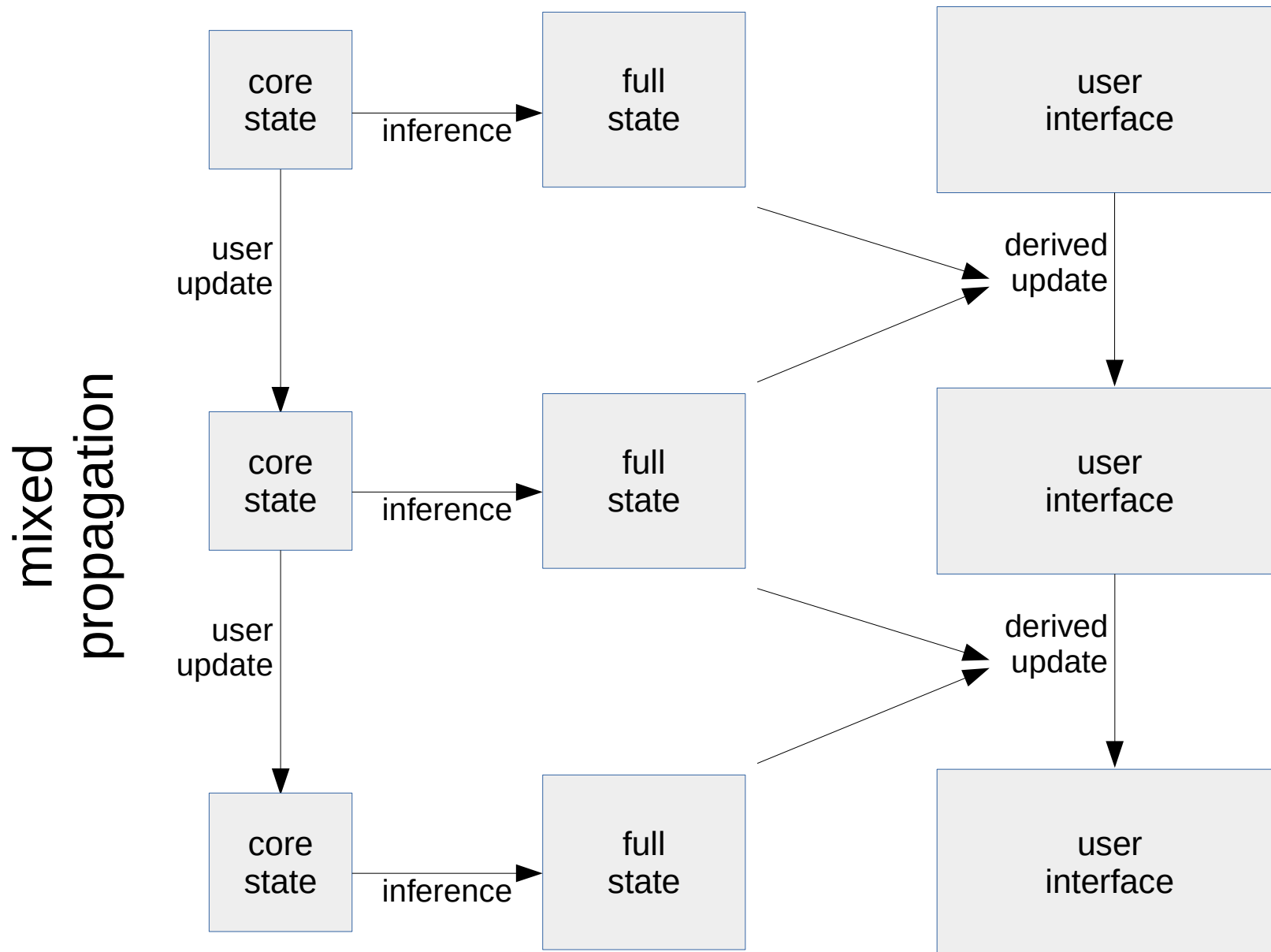
- Non-incremental propagation:
 - Redo inference steps
 - CPU consumption
 - Redo rendering
 - CPU consumption
 - Flicker, loss of UI state (focus, scroll, selection), ...
- Incremental propagation:

Change Propagation

Trade-off:

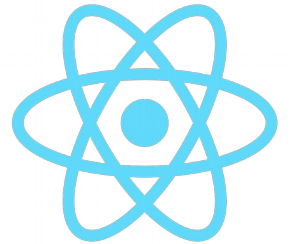
- Non-incremental propagation:
 - Redo inference steps
 - CPU consumption
 - Redo rendering
 - CPU consumption
 - Flicker, loss of UI state (focus, scroll, selection), ...
- Incremental propagation:
 - Keep track of dependencies
 - Error-prone (unless completely shielded from the modeler)
 - Consumes memory and CPU

Change Propagation



React:

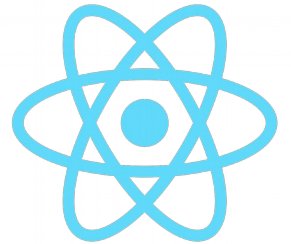
A JavaScript library for building user interfaces



React:

A JavaScript library for building user interfaces

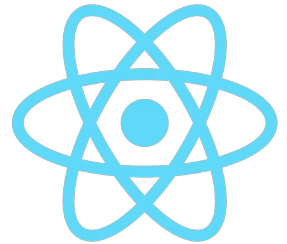
- Unique approach:
 - not a widget library
 - not an MVC framework



React:

A JavaScript library for building user interfaces

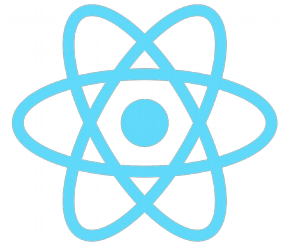
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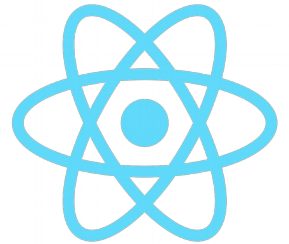
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React:

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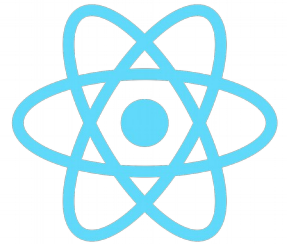
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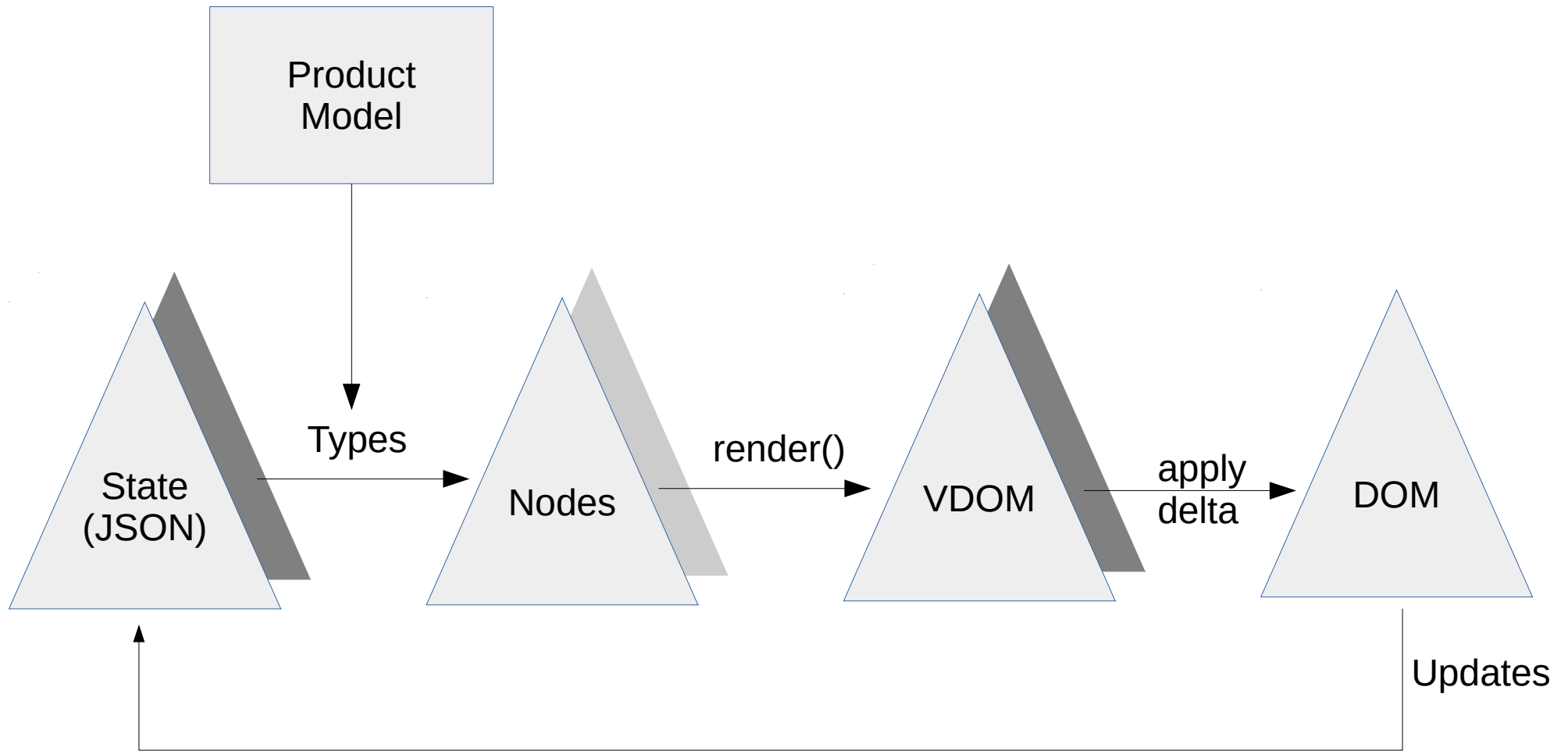
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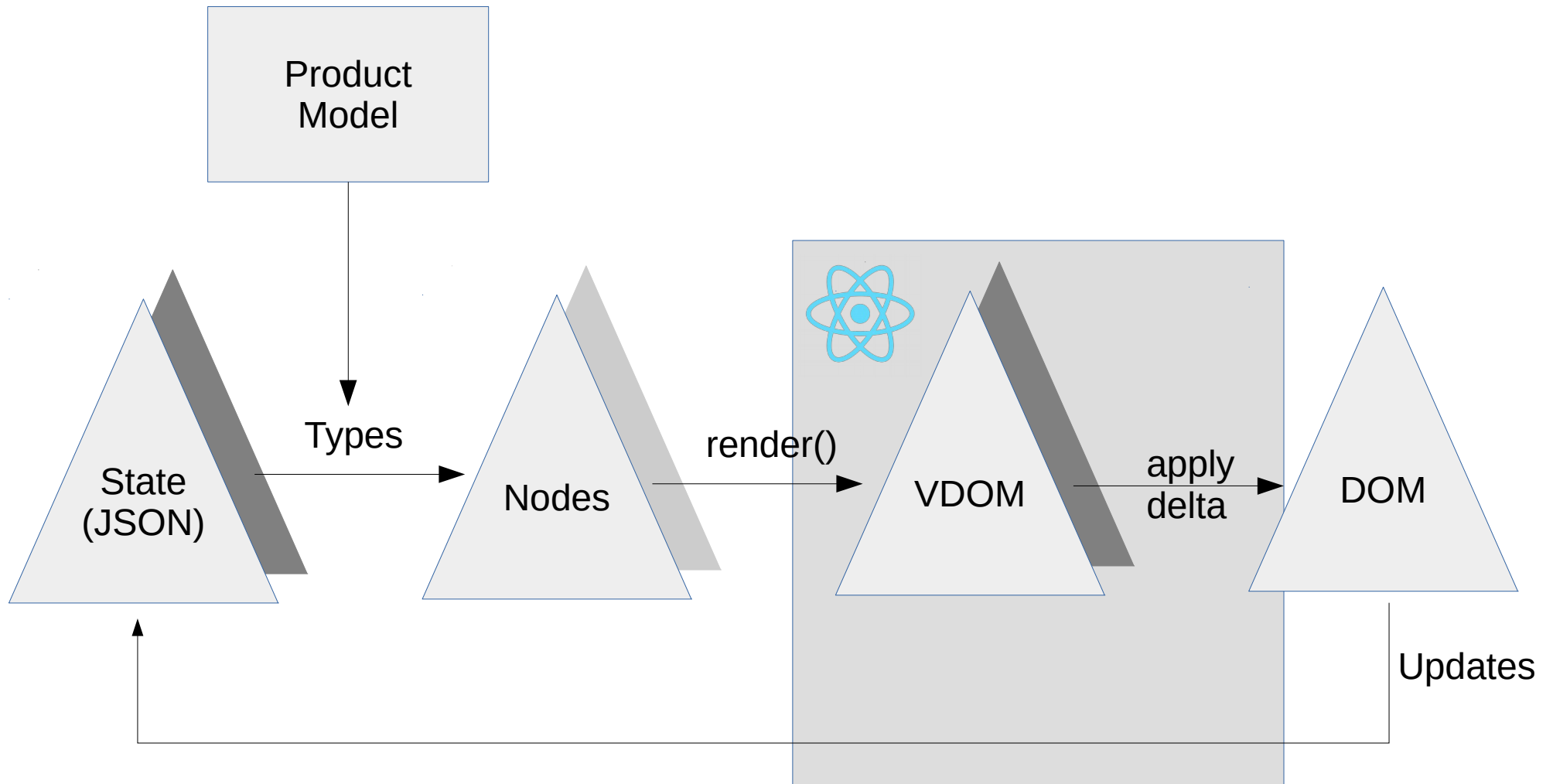
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 - User code
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 - possibly using XML templating integrated into JavaScript ("JSX")
 - React
 - diffs the VDOM with the previous VDOM
 - applies only the diff to the actual DOM



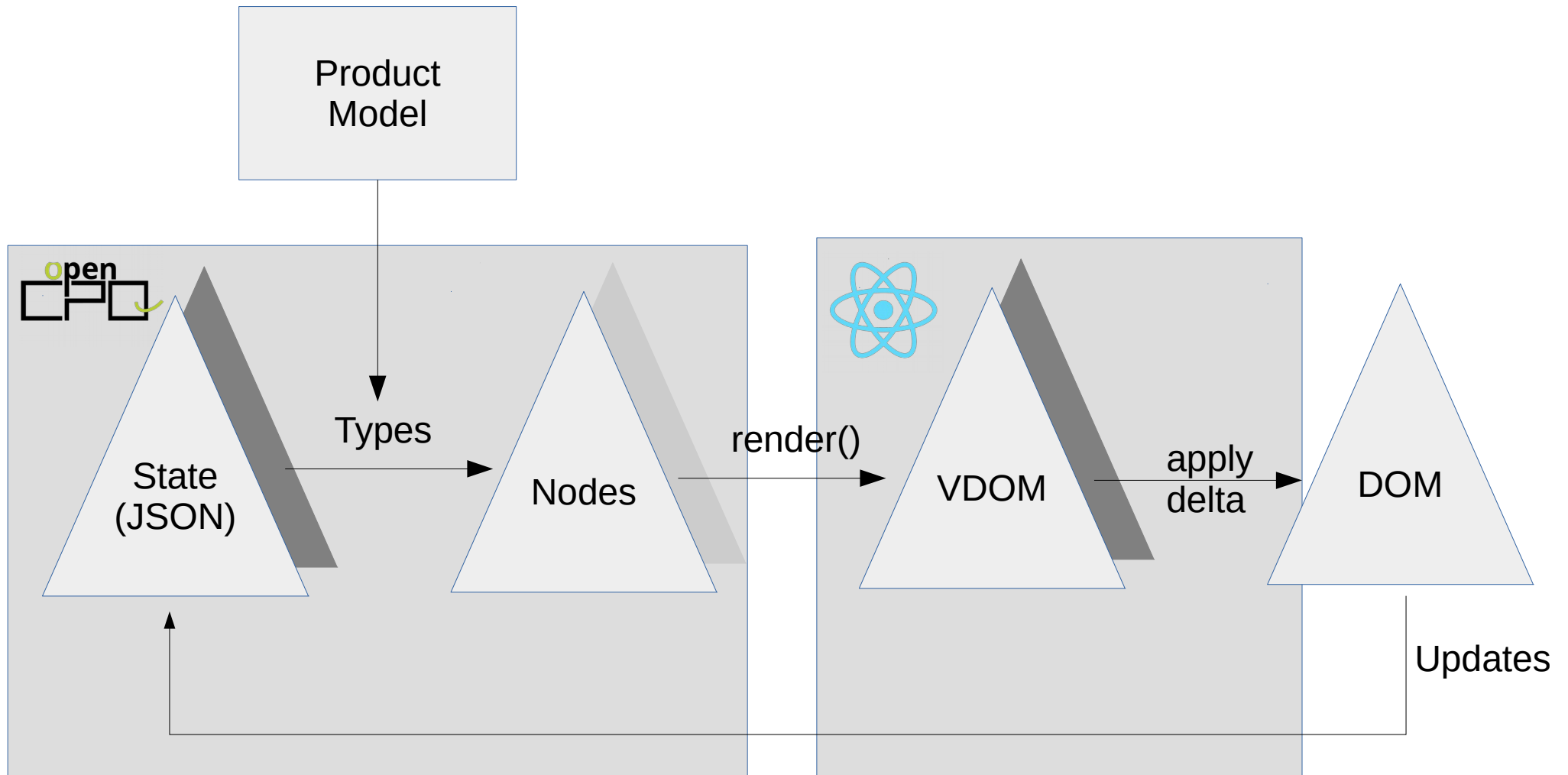
Architecture



Architecture



Architecture



SAP Integration

SAP Integration

- Models
 - Conversion of LO-VC and IPC models to openCPQ
 - Schema, basic logic: automatable with Vclipse extension
 - Complex logic: manual conversion

SAP Integration

- Models
 - Conversion of LO-VC and IPC models to openCPQ
 - Schema, basic logic: automatable with Vclipse extension
 - Complex logic: manual conversion
 - Model storage and management
 - Just static resources
 - App server not needed (but can be used)

SAP Integration

SAP Integration

- Data
(e.g. materials with classification information)
 - Live vs. pre-exported
 - Bundling with application vs. loading on demand

SAP Integration

- Data
(e.g. materials with classification information)
 - Live vs. pre-exported
 - Bundling with application vs. loading on demand
- Runtime
 - Loading and saving configurations
 - External configurator API
 - Mimic IPC

Summary

Summary

Take advantage of modern **browser technology** for product configuration.

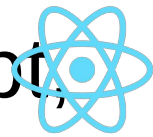


Summary

Take advantage of modern **browser technology** for product configuration.



Powerful **modeling** based on JavaScript, React, and openCPQ.

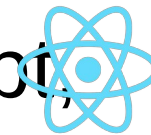


Summary

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Flexible and fast **user interface**.



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Use, adapt, integrate, contribute!

<https://github.com/webXcerpt/openCPQ>



Our Offer



Our Offer

Discuss:

- Use cases, modeling challenges, ...
- Integrations



Our Offer

Discuss:

- Use cases, modeling challenges, ...
- Integrations

Cooperate:

- Professional services, training, ...
- For end users or integrators

