

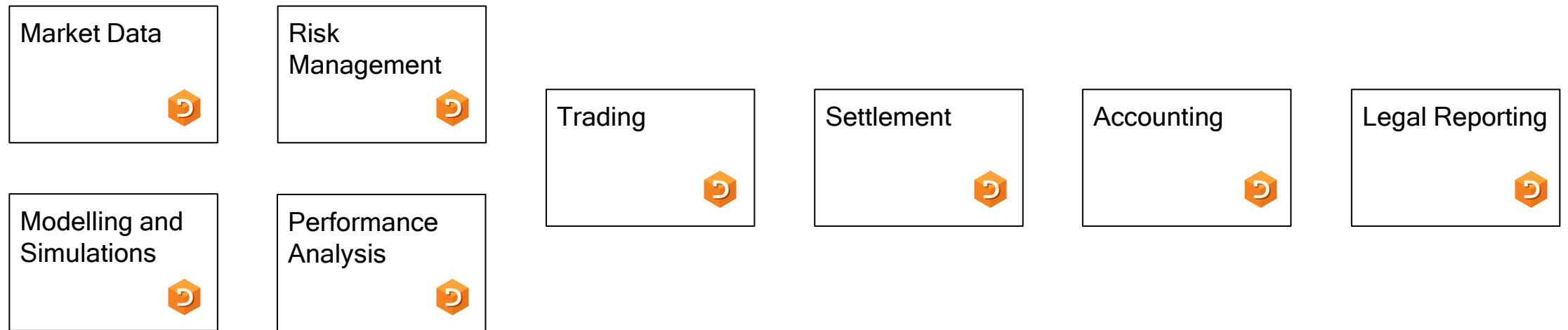
Dyalog'24

Dyalog APL in the largest data centers at the heart of the investment management industry

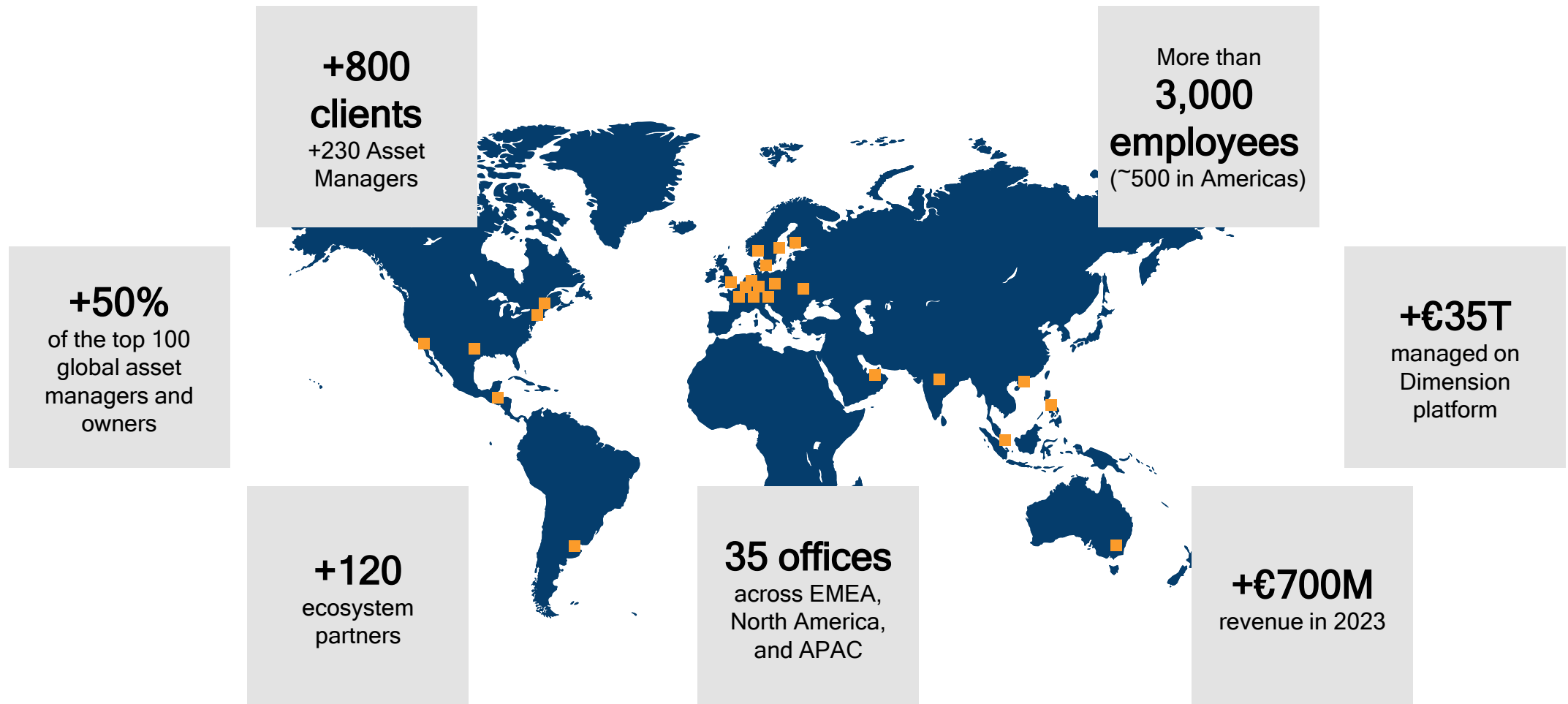


- I have been programming computers for 35 years
- First contact with APL in 2002
- Considered myself as expert in C/C++ - 20 years ago
- I typically stay away from user interfaces, but devote my time to distributed processing, operational efficiency and security
- Enjoy APL for prototyping, ad-hoc analysis, production, and support

Our value chain a nutshell



Who we are



My personal take on our business

[The fund](#) | [Norges Bank Investment Management \(nbim.no\)](#)



[The fund](#)

[Responsible investment](#)

[Publications](#)

[Organisation](#)

[Search](#) 🔍

[Norsk](#)

The fund's market value

18 606 860 482 827 NOK

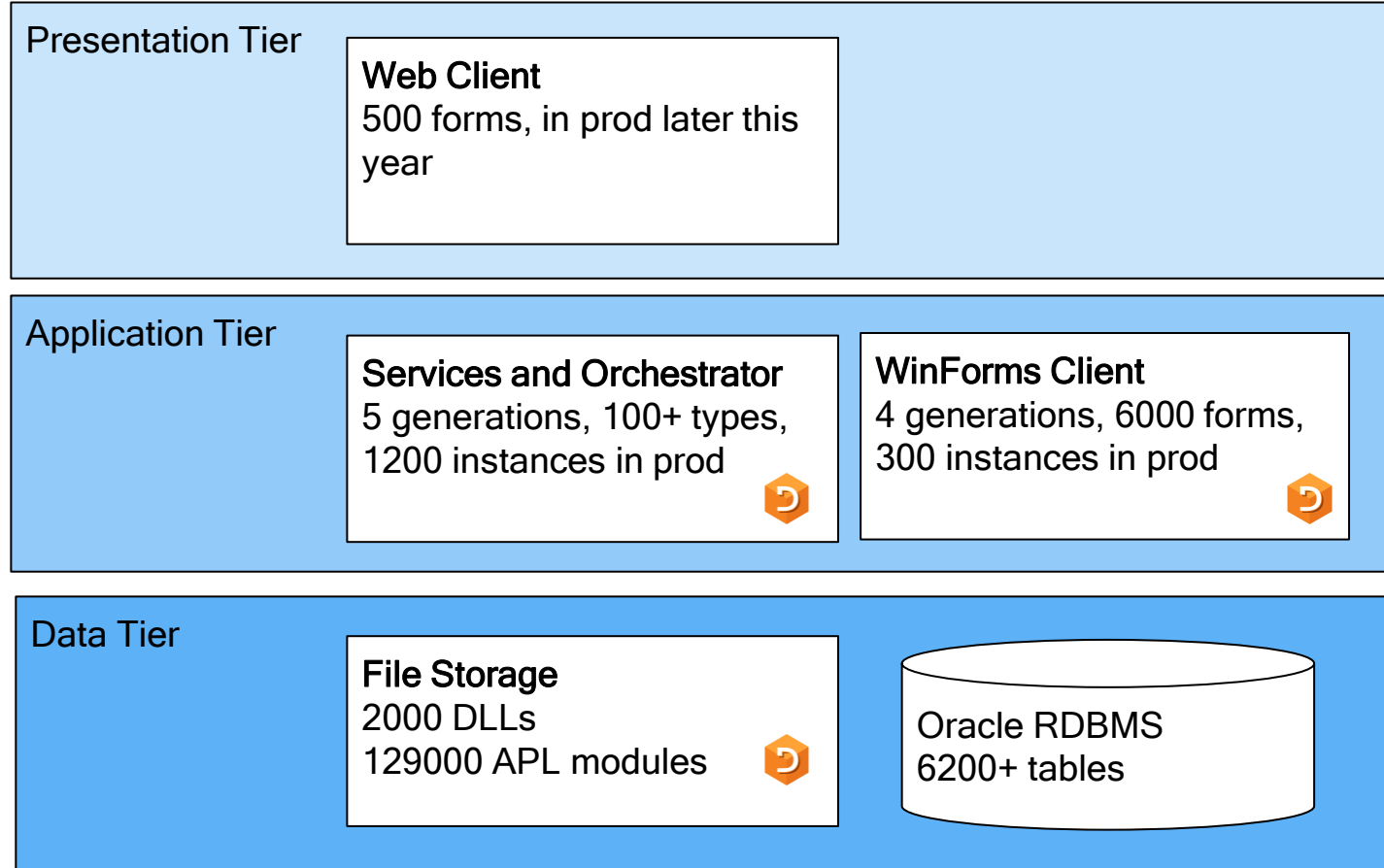
We work to safeguard and build
financial wealth for future generations



Architecture

Super high level

SimCorp Dimension - Super High Level Components



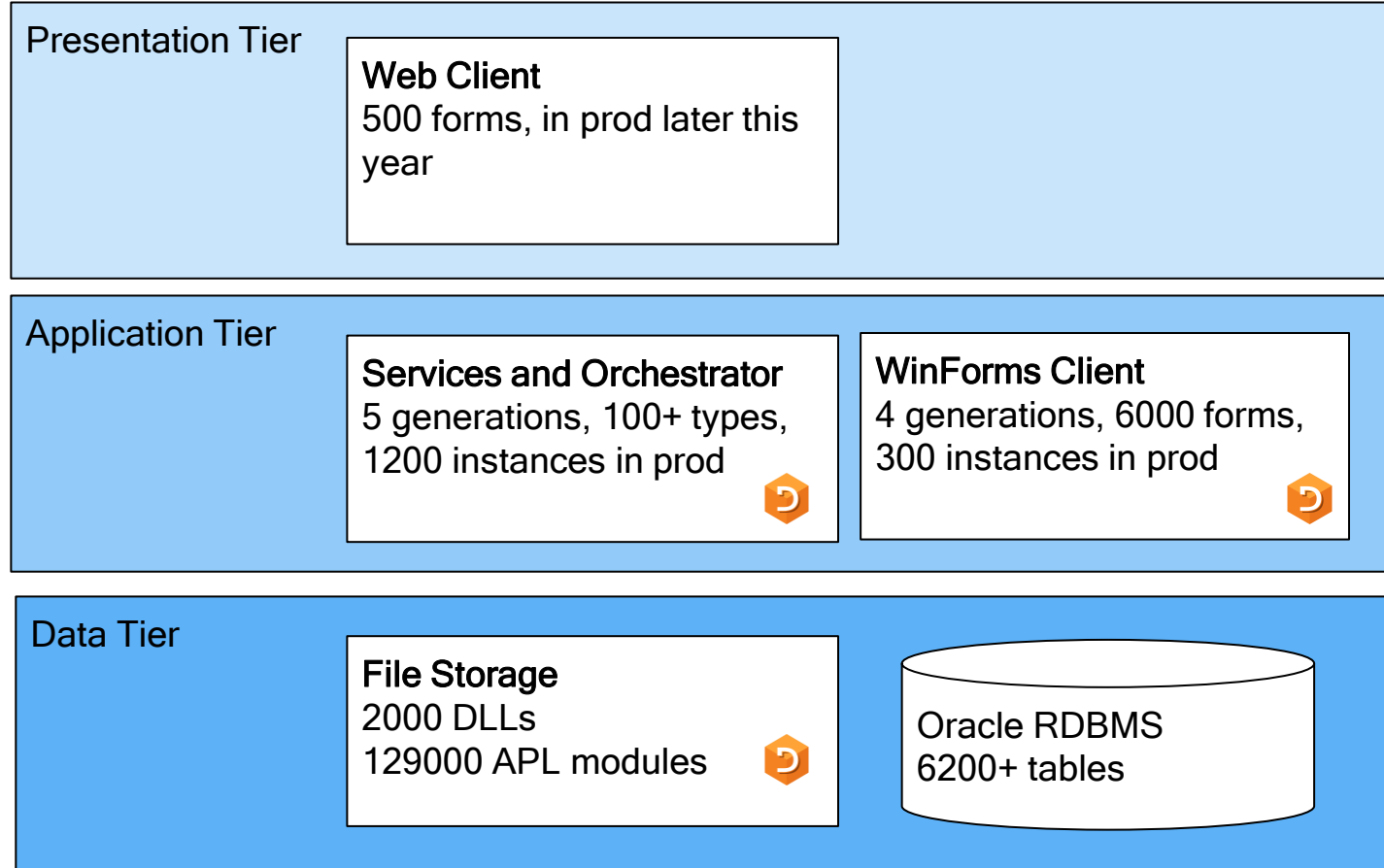
- Current version under development is 24.10
- Running on APL 18.2, .NET 4.8, Oracle 22c, and Windows Server 2022
- 40m lines of code
 - 6.6m lines of APL code
 - 12.3m lines of C# code
 - 800k lines of C/C++
 - 5m lines of other code (PL/SQL, JS, MSBuild, Gherkin, etc)
 - 9.8m line of object definitions
- Estimates on effort
 - Estimated Schedule Effort (organic) 227.51 months
 - Estimated People Required (organic) 628.69

Nature is the limitation

Data access	Time in ms	Effort illustrated
▪ L2 cache	3 - 5ns	1 step
▪ RAM	50 - 100ns	10m
▪ SSD	50 - 100μs	10km, Glasgow
▪ Raw network	0.1 - 1ms	100km, Edinburgh
▪ REST API LAN	1 - 10ms	1000km, Oslo, Norway
▪ REST API remote	50 - 200ms	17000km, Wellington, New Zealand

Bringing the processing to the data, instead of sending the data to where it is processed has its merits. Especially if eventual consistency is not good enough.

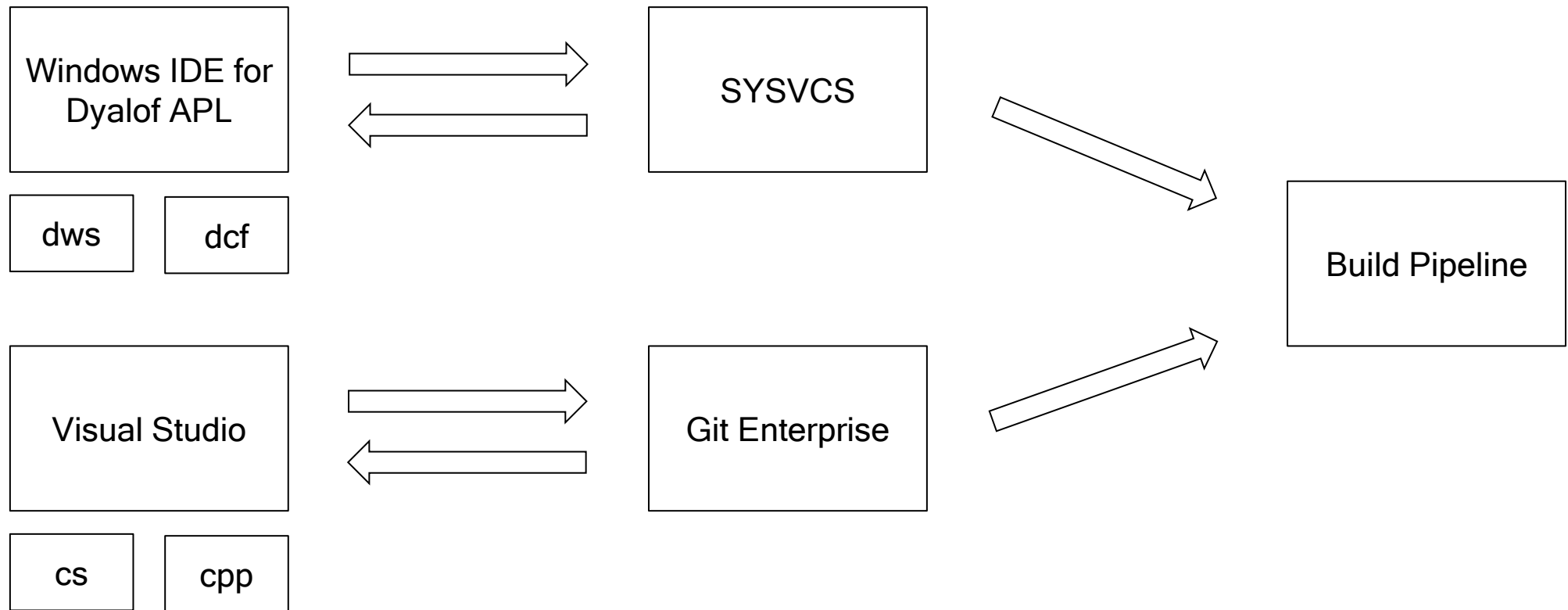
SimCorp Dimension - Super High Level Components



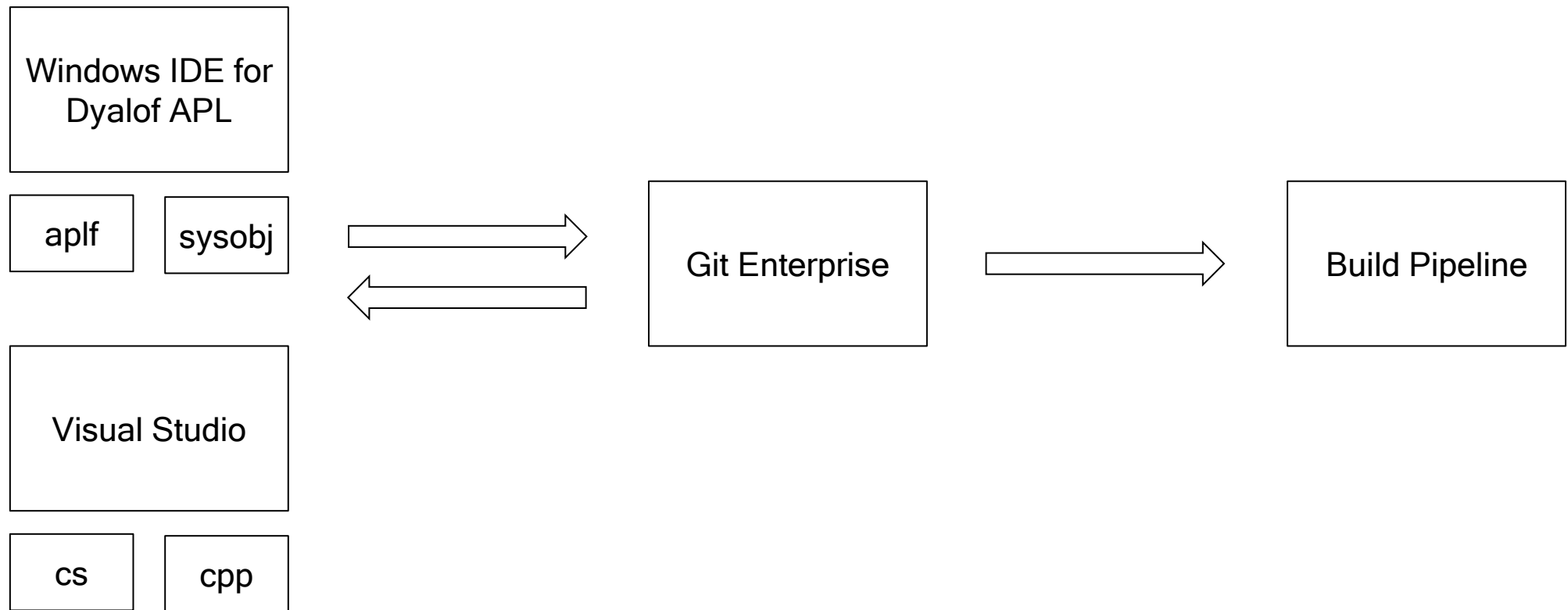
- Large processes, 500MB to 50GB each
 - Warm up a few seconds to 30 minutes
- Deployment on few massive VMs, or hundreds of small VMs
- Typically 1 prod system, 1 UAT system, and multiple project systems.

Developing with 500+ people

Development Environment



Development Environment



"We help business bring their applications fast and safely into production, and provide efficient operations for self-hosted customers as well as SaaS. We protect many years of IP. We lead architecture transformations and provide migration paths so our core product stays competitive in SaaS without disruption of the business."



</>



</>

450 active software engineers in business and platform

Frameworks for 6000+ applications and 100+ services

Daily 150 feature commits

25M+ lines of code

300 daily builds

20M+ automated tests per day

Daily high quality builds on multiple versions

Preview drops, releases, patches



SaaS Clients



Continuous deployment to test customer

Variable Type Definitions							
File Edit View Search Functions Help							
	Variable type (excluding vt prefix)	Description	Has parameter	Category	ProgID	Parent variable type	Chang by con
1	AINFOBJ	Accounting Information	<input type="checkbox"/>	Namespace	AinfoObj	vtTYPECHK_INFO	KVM
2							

Variable Type D	
File Edit View Sea	
	Variable type (excluding vt pref
1	AINFOBJ
2	AINFOBJ
3	AINFOBJ
4	AINFOBJ

Variable Type Definition Methods								
File Edit View Search Functions Help								
	Variable type (excluding vt prefix)	Method name	Description	Argument	Return value	Assignable	Referencing scope	C b
1	AINFOBJ	CacheFlds	Cache fields for current row	vtPTR[]	vtVOID	<input type="checkbox"/>	Protected	K
2	AINFOBJ	CustomShape	Shape of the internal data matrix...	vtNULL	vtUINT[2]	<input type="checkbox"/>	Protected	K
3	AINFOBJ	CustomTypeChk	Type check of vtAINFOBJ	vtVARIANT	vtBOOL	<input type="checkbox"/>	Protected	K
4	AINFOBJ	GetDrawnval	Get the Drawn value	vtNULL	vtVARIANT[:]	<input type="checkbox"/>	Public	K
5	AINFOBJ	GetFrankCredDr...	Special treatmeant for non-prl fr...	vtENUM(accFwksAllFwksAll)	vtBOOL vtD...	<input type="checkbox"/>	Public	K
6	AINFOBJ	Init	Initialise Accounting Information ...	vtPTR[] vtVARIANT[:]	vtVOID	<input type="checkbox"/>	Public	K
7	AINFOBJ	Read	Read fields from RowCache	vtPTR[]	vtVARIANT[]	<input type="checkbox"/>	Public	K
8	AINFOBJ	ReadByAix	Read fields from specific accou...	vtUINT[] vtPTR[]	vtVARIANT[:]	<input type="checkbox"/>	Public	K
9	AINFOBJ	ReadOne	Read only one field. Cover to av...	vtPTR	vtVARIANT	<input type="checkbox"/>	Public	K
10	AINFOBJ	ResetCache	Reset current cache	vtNULL	vtVOID	<input type="checkbox"/>	Protected	K
11	AINFOBJ	RestoreOldStruct	Restore old ainfmt ainff aix vari...	vtNULL	vtVARIANT[:]	<input type="checkbox"/>	Public	K
12	AINFOBJ	SetDrawnval	Set the Drawn value	vtVARIANT[:]	vtVOID	<input type="checkbox"/>	Public	K
13	AINFOBJ	SetRowix	Set rowix to cache	vtUINT	vtVOID	<input type="checkbox"/>	Public	K
14						<input type="checkbox"/>		

- SCD have its own implemented static and runtime checks

```

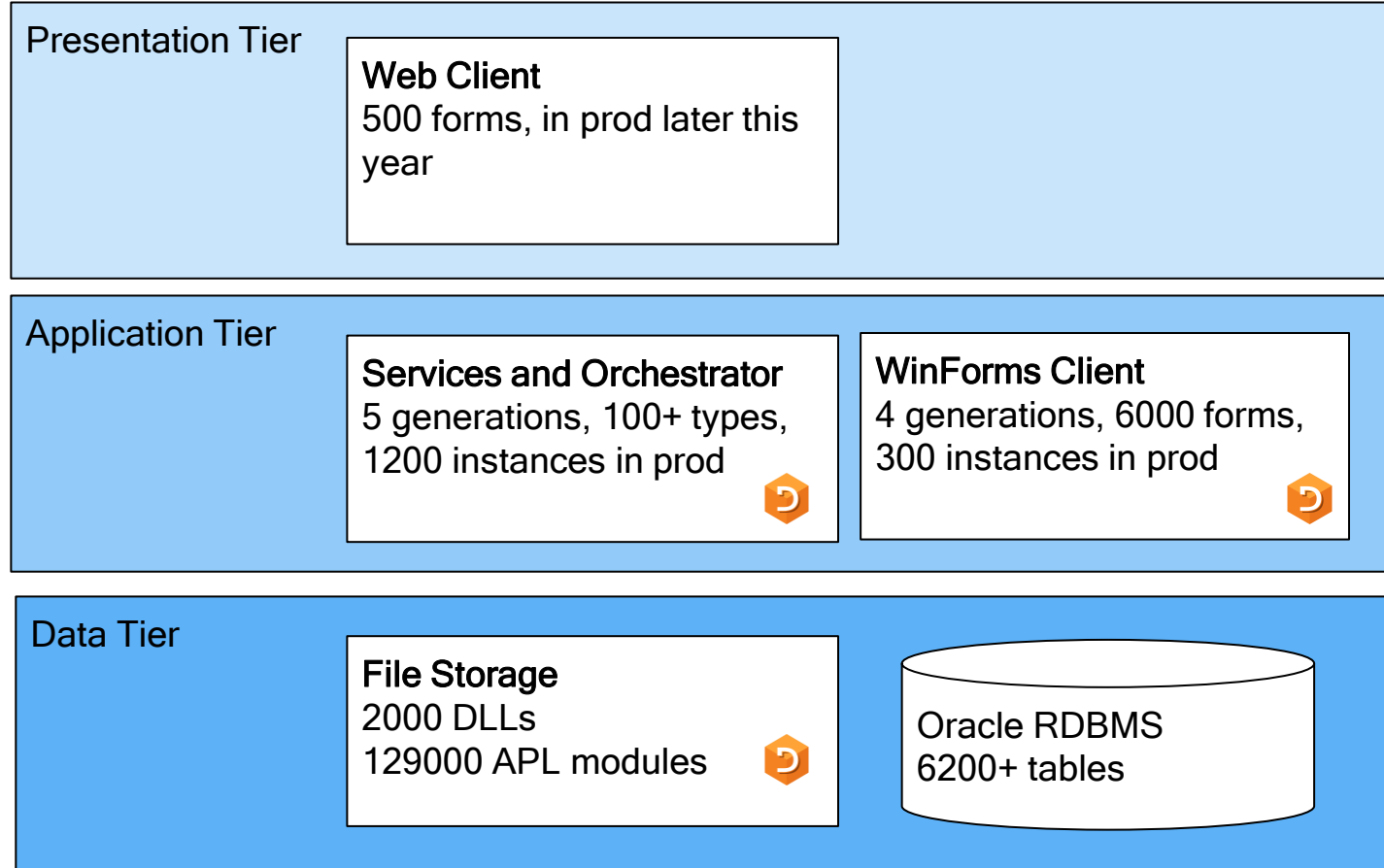
▪ A2: larg[1] : inst As vtINST()
▪ A2:      [2] : ainfo As vtAINFOBJ
▪ A3: arg[1] : trm  As vtVARIANT[;]
▪ A3:      [2] : trf  As vtPTR[$3:trm:2,unique]
▪ A3:      [3] : busno As vtUINT
▪ A4: res[1] : sotv  As {vtVARIANT[;]}[]
▪ A4:      [2] : sotf  As vtPTR[unique]

```

- castAs - useful to help CHK function.
 - iayv castAs '{vtVARIANT[]}[3]'

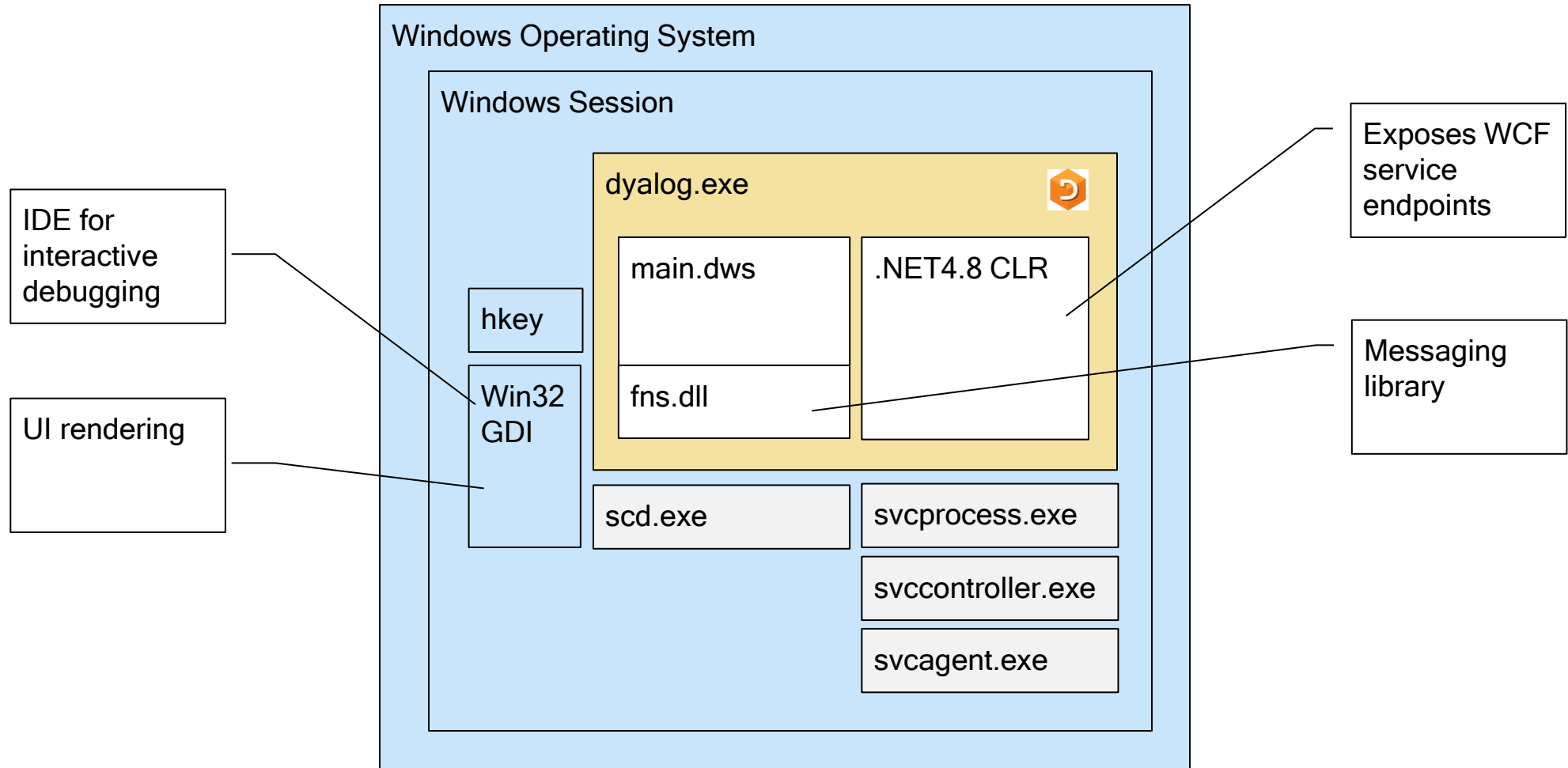
Product Architecture

SimCorp Dimension - Super High Level Components



- Services and Client in the application tier have a very similar architecture
- Most calculations that are done by services could be done also by clients.

Tech stack for services and WinForms client



Security

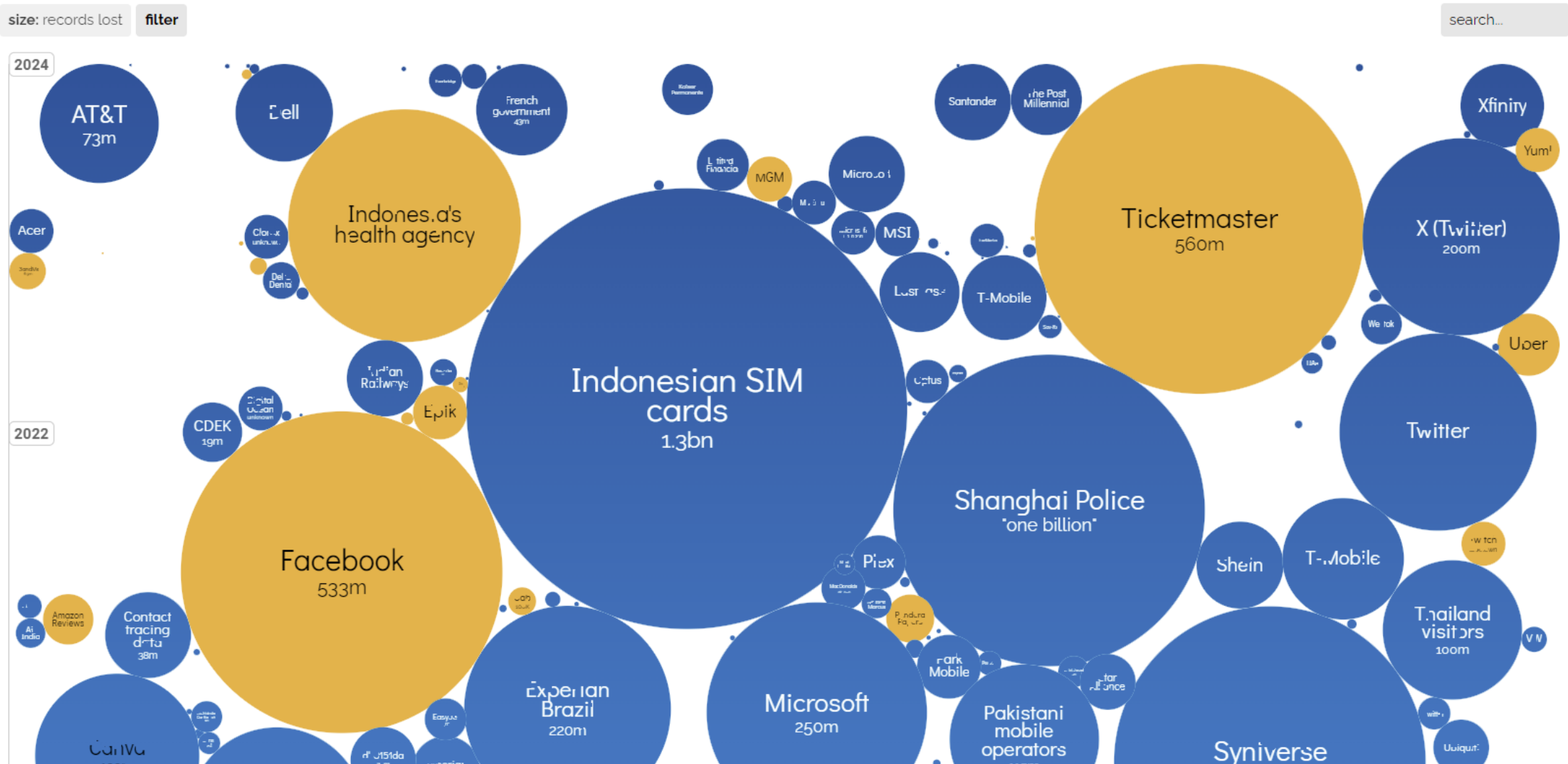
#1 driver of change

World's Biggest Data Breaches & Hacks

[World's Biggest Data Breaches & Hacks – Information is Beautiful](#)

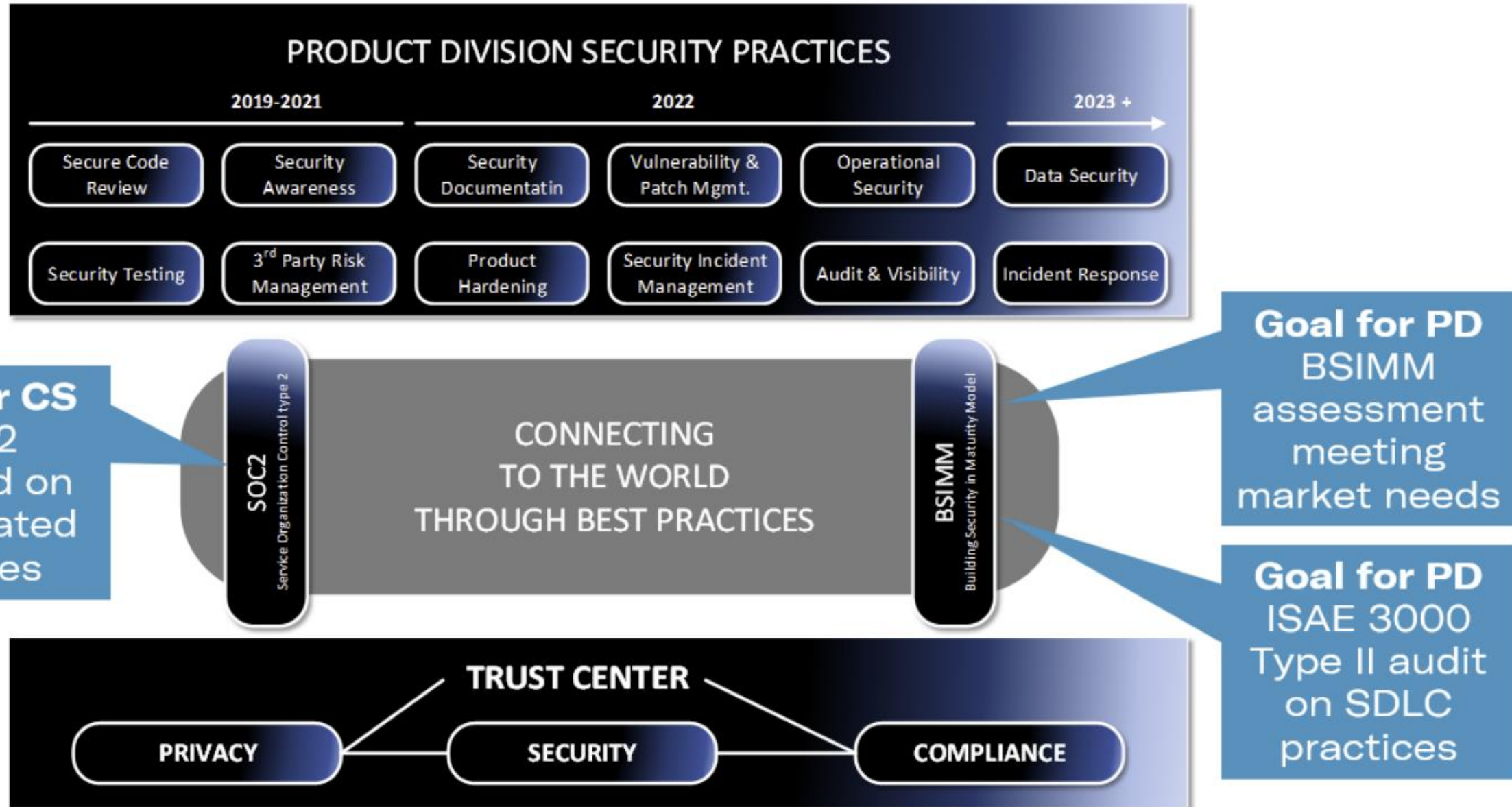
Selected events over 30,000 records stolen

UPDATED: Jun 2024





SDLC is our documented Ways of Working



Working closely with Dyalog

Scope: Security as in Confidentiality, Integrity and Availability

Focus: Doing things right, and have documentation that it is done so (Type II audits).

- Code scanning
 - For common mistakes
 - Build on TypeCheck experience
 - Better if the scanning tool is provided by the vendor
- Supply Chain Security
 - Signing our code
 - BSIMM at Dyalog
 - DORA legislation



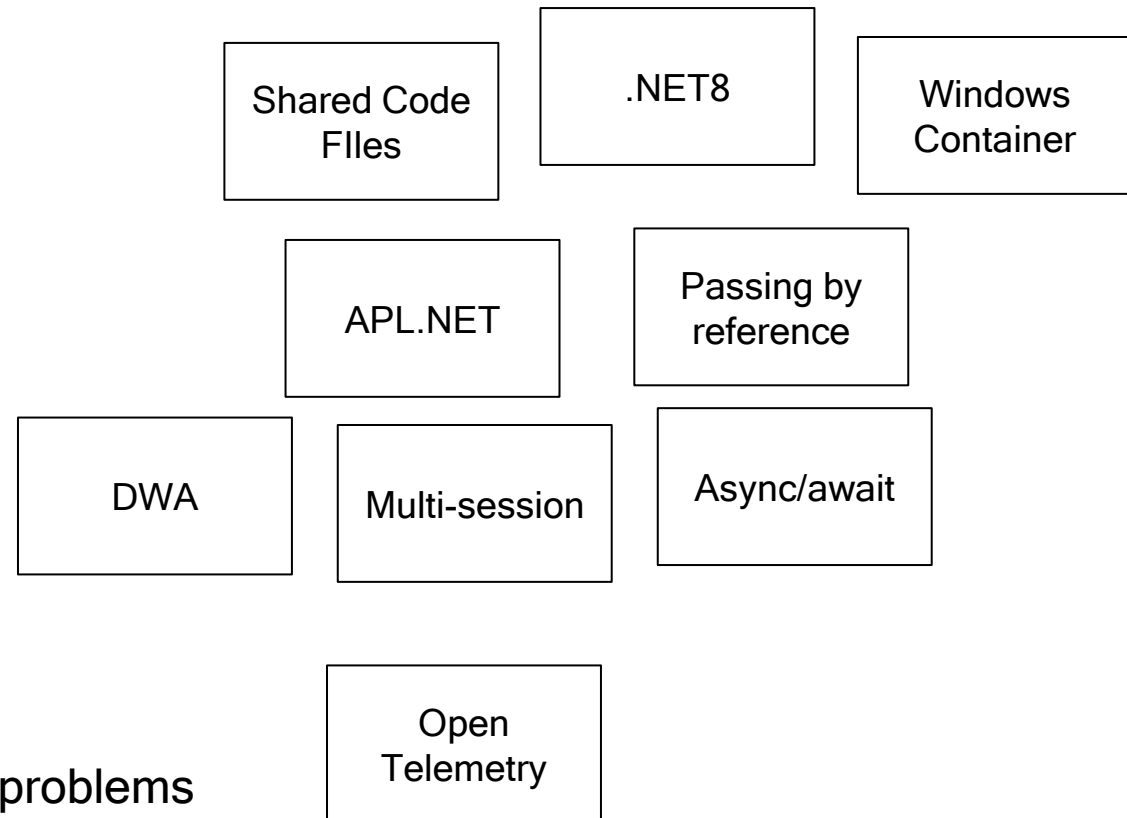
Cost of Ownership

#2 driver of change

Cost initiatives

And what we are doing with Dyalog

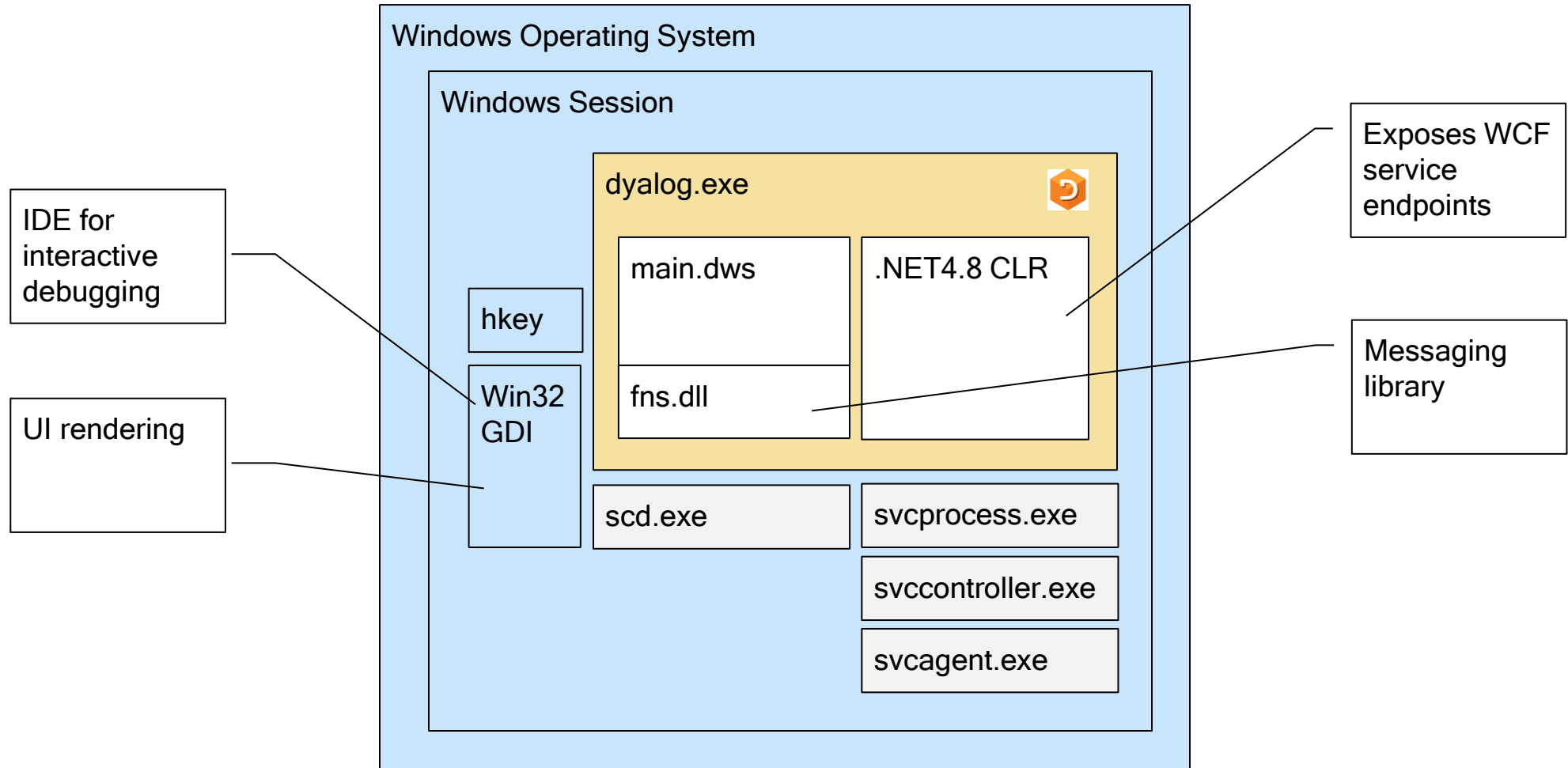
- Economy of scale
 - Efficient use of hardware
 - Lesser Windows IT infrastructure
 - Better volume license deals
 - Automate and re-use
- Economy of speed
 - Frequent deployment
 - Ability to spot issues before they become problems



Evolving the architecture

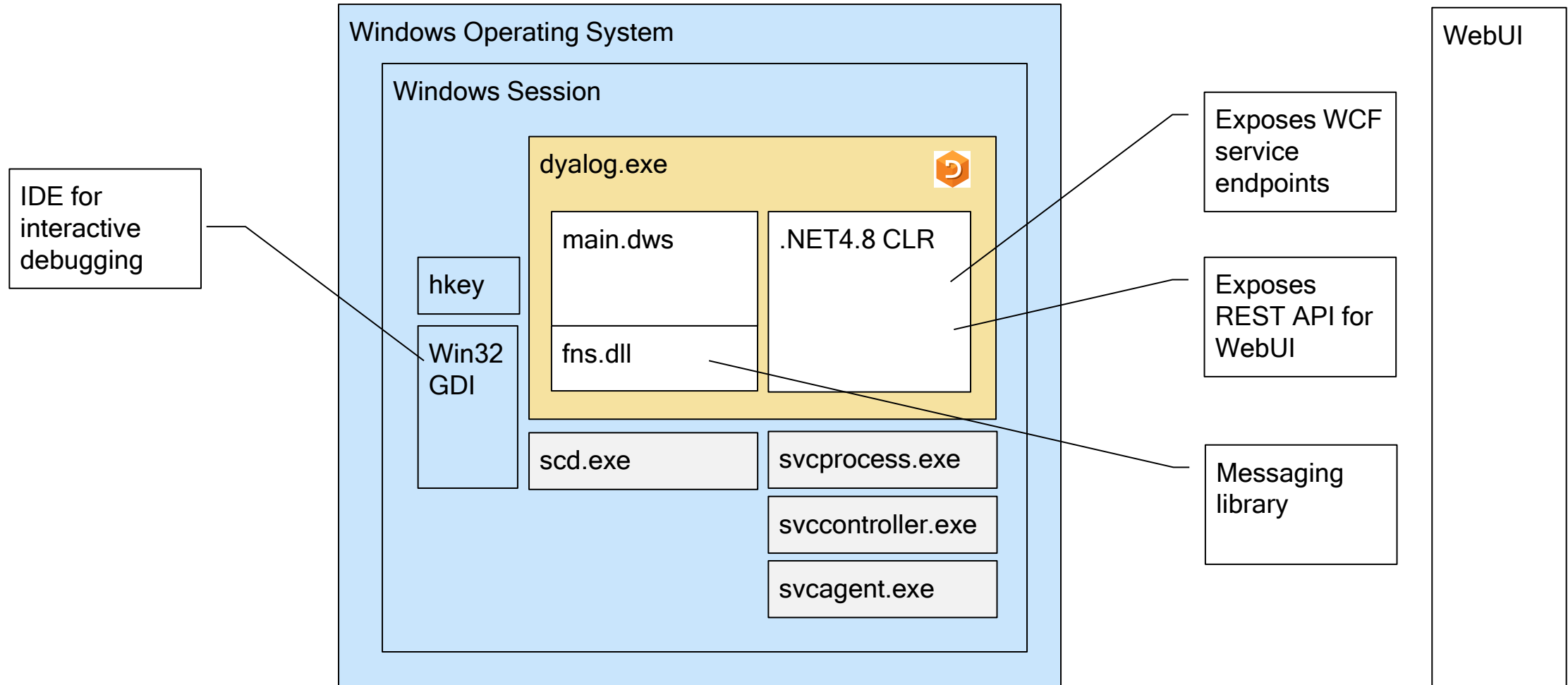
Tech stack for services and WinForms client

Starting point



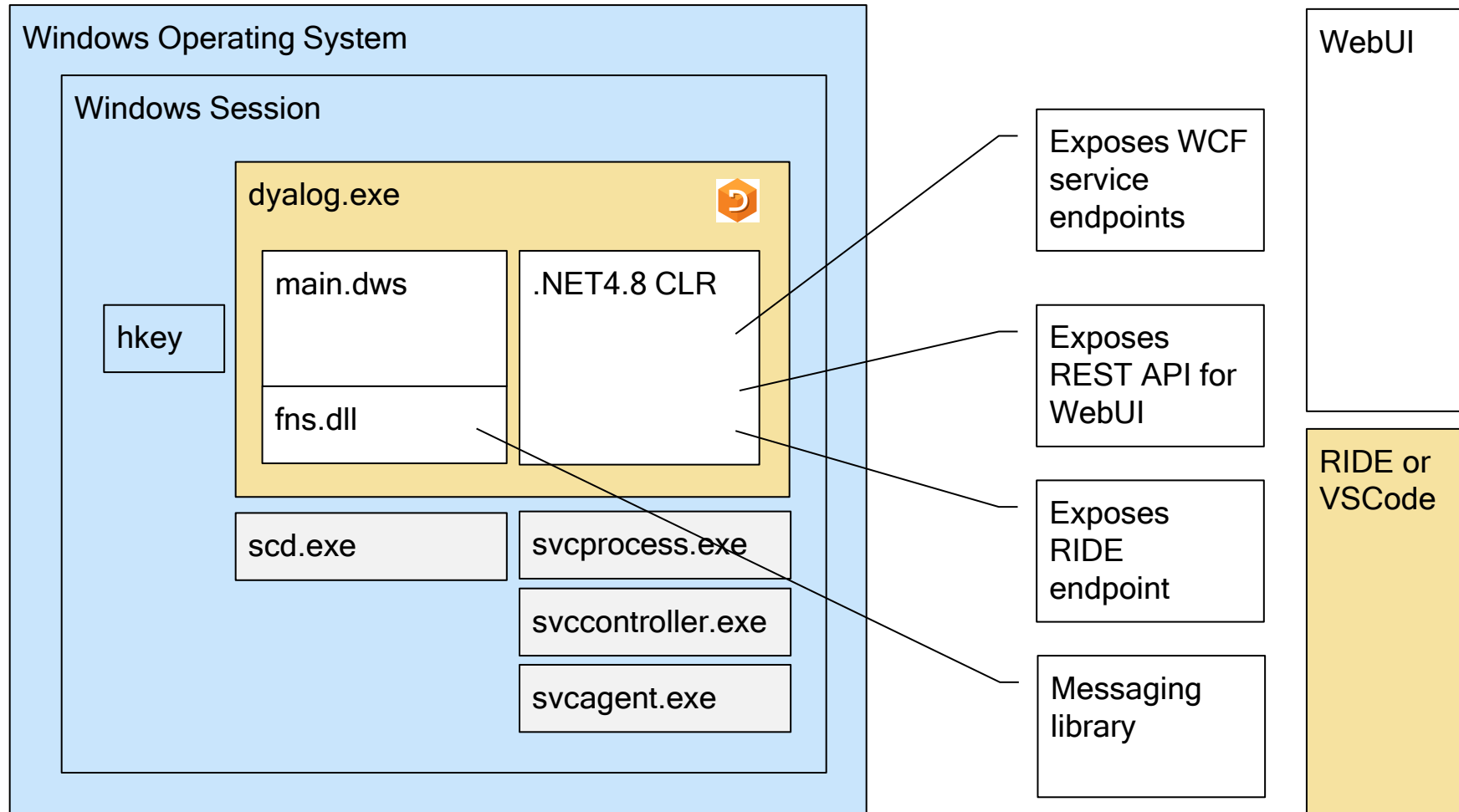
Tech stack for services (aspiration)

API-first, replace the WinForms client



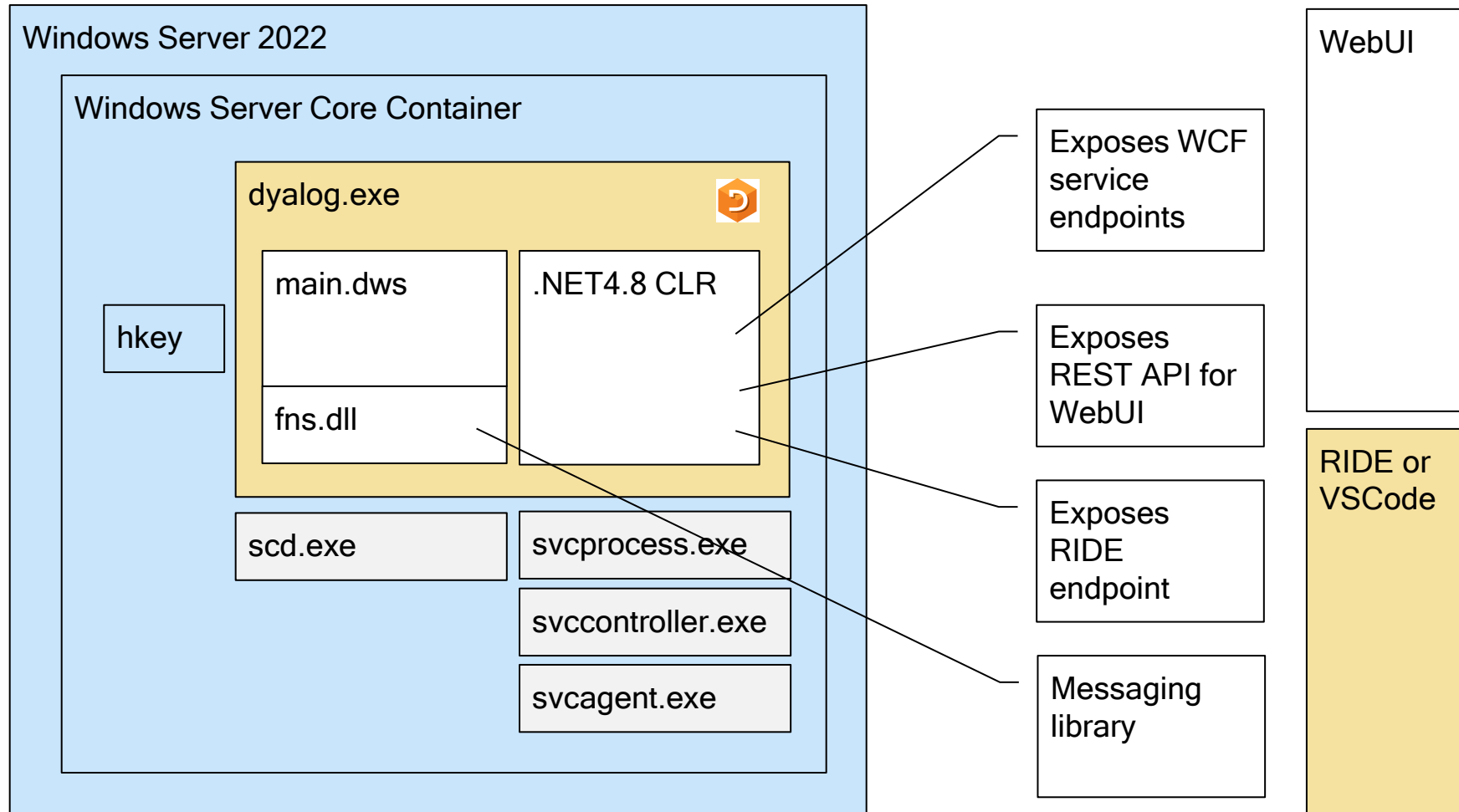
Tech stack for services (aspiration)

Remove reliance on GDI, adopt RIDE for remote debugging



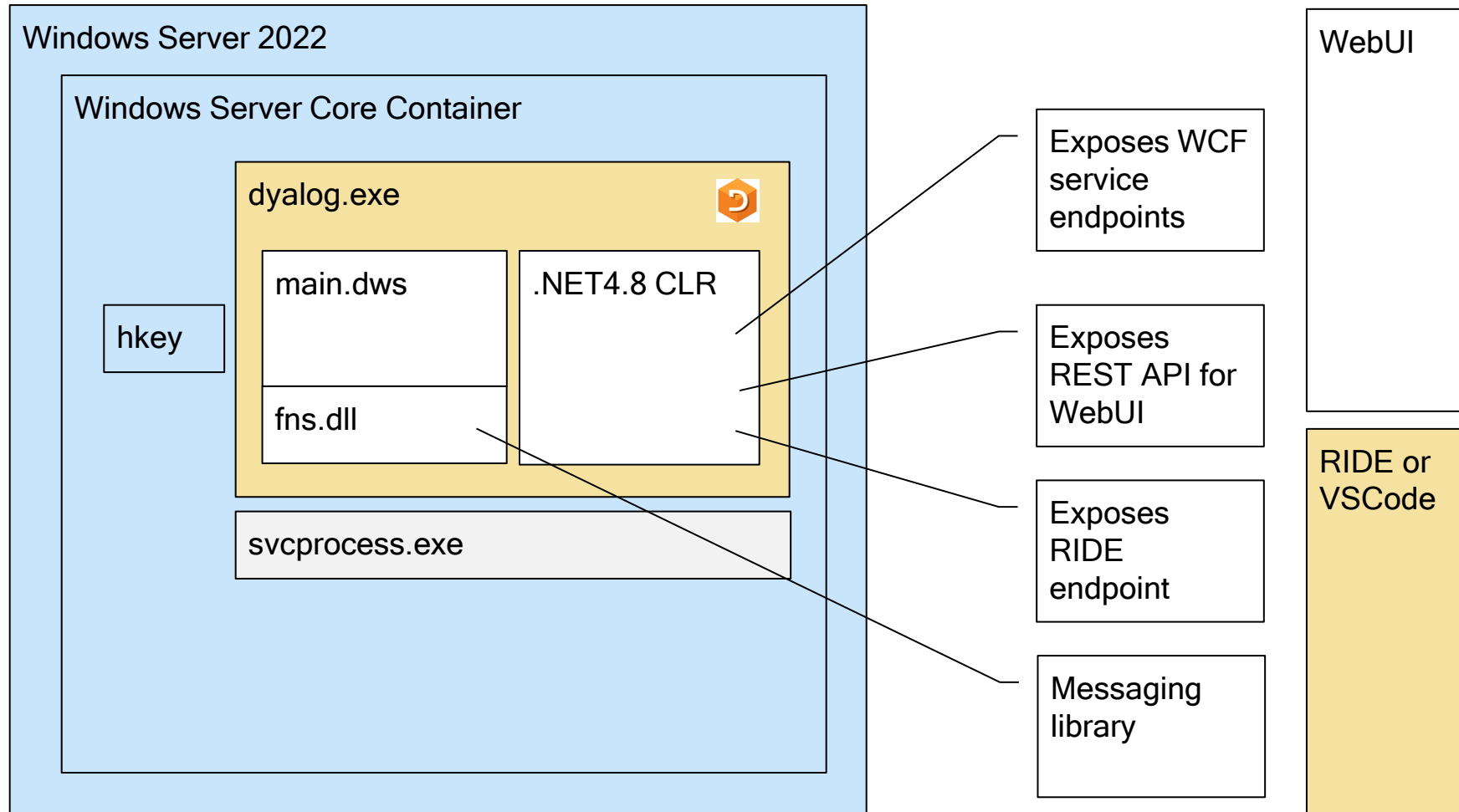
Tech stack for services (aspiration)

Containerized service



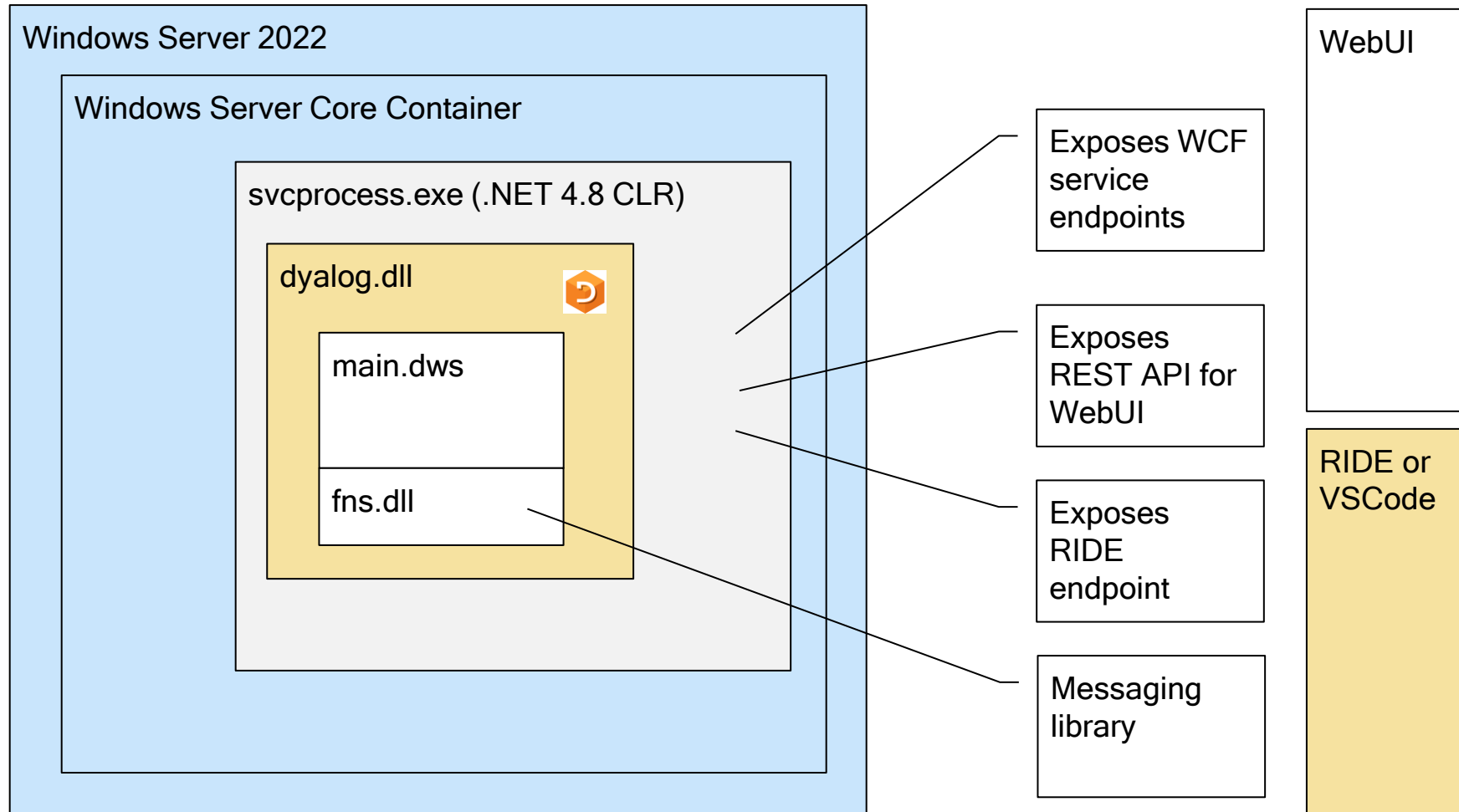
Tech stack for services (aspiration)

Simplify bootstrapping, single host process



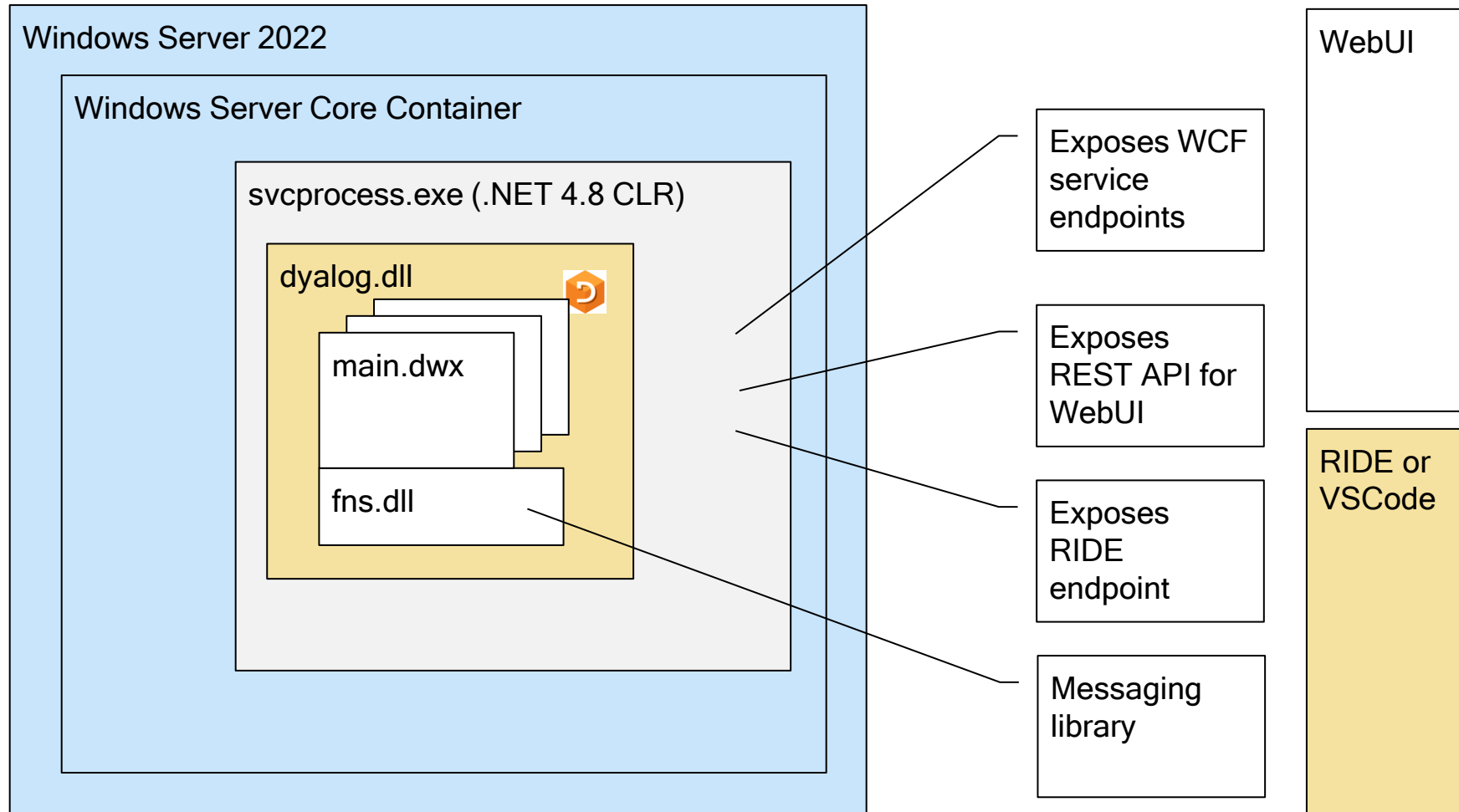
Tech stack for services (aspiration)

APL.NET, OOAPL, Dyalog bridge



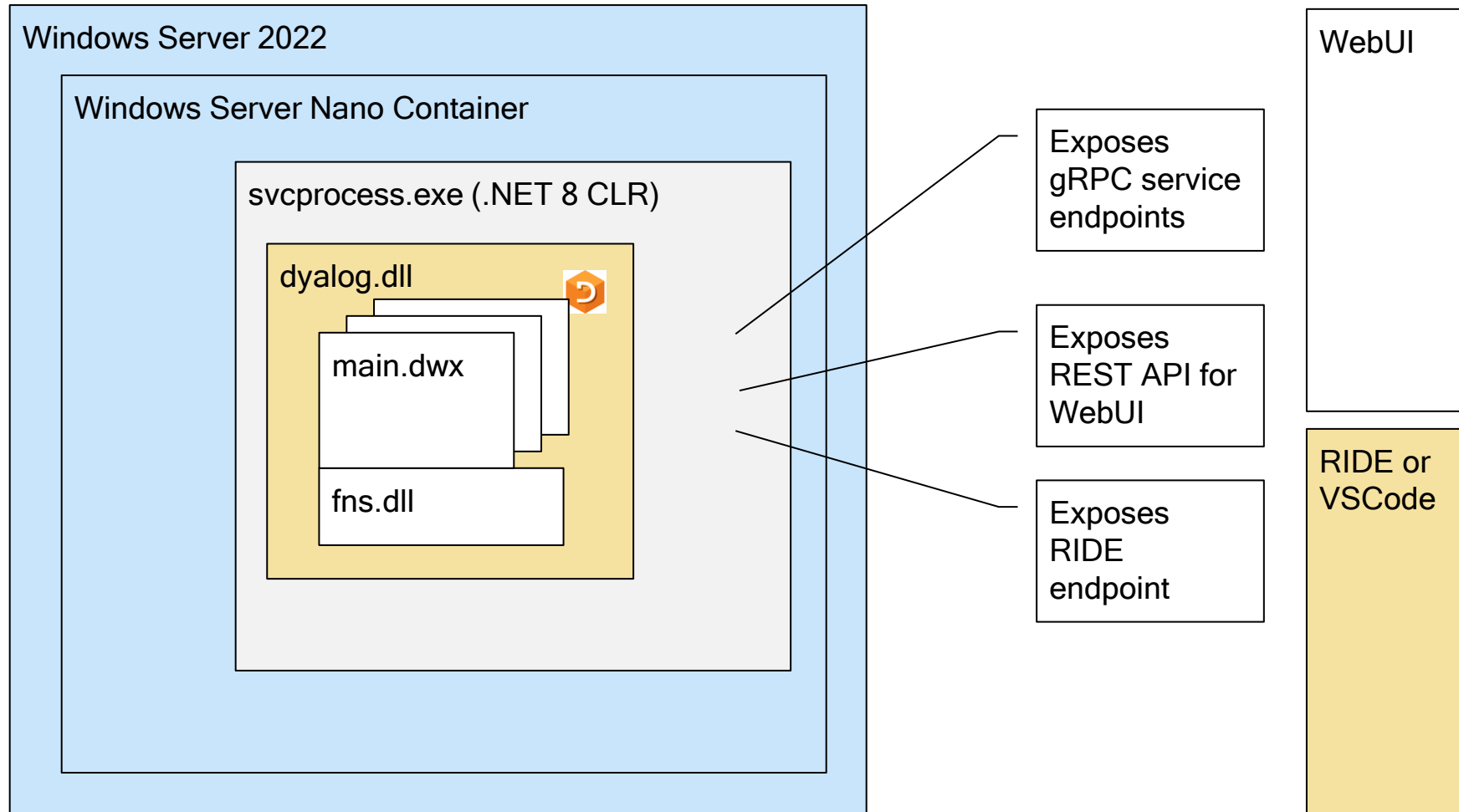
Tech stack for services (aspiration)

Multi-session, Dyalog bridge



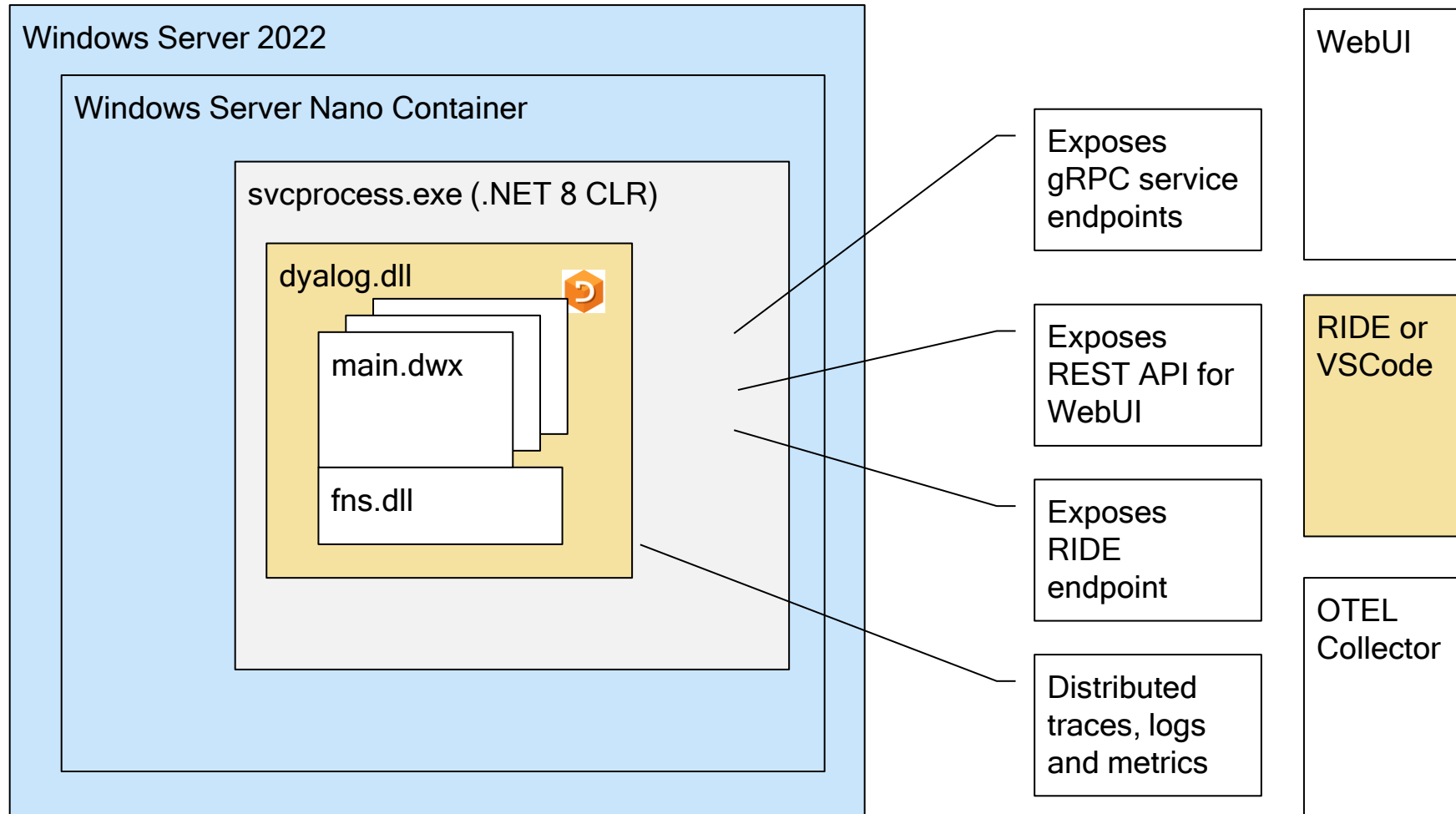
Tech stack for services (aspiration)

.NET 8



Tech stack for services (aspiration)

Open Telemetry Collector



Thank You!



Legal notice

The contents of this publication are for general information and illustrative purposes only and are used at the reader's own risk. SimCorp uses all reasonable endeavors to ensure the accuracy of the information. However, SimCorp does not guarantee or warrant the accuracy, completeness, factual correctness, or reliability of any information in this publication and does not accept liability for errors, omissions, inaccuracies, or typographical errors. The views and opinions expressed in this publication are not necessarily those of SimCorp. © 2024 SimCorp A/S. All rights reserved. Without limiting rights under copyright, no part of this document may be reproduced, stored in, or introduced into a retrieval system, or transmitted in any form, by any means (electronic, mechanical, photocopying, recording, or otherwise), or for any purpose without the express written permission of SimCorp A/S. SimCorp, the SimCorp logo, SimCorp®, and SimCorp Services are either registered trademarks or trademarks of SimCorp A/S in Denmark and/or other countries. Refer to www.simcorp.com/trademarks for a full list of SimCorp A/S trademarks. Other trademarks referred to in this document are the property of their respective owners.