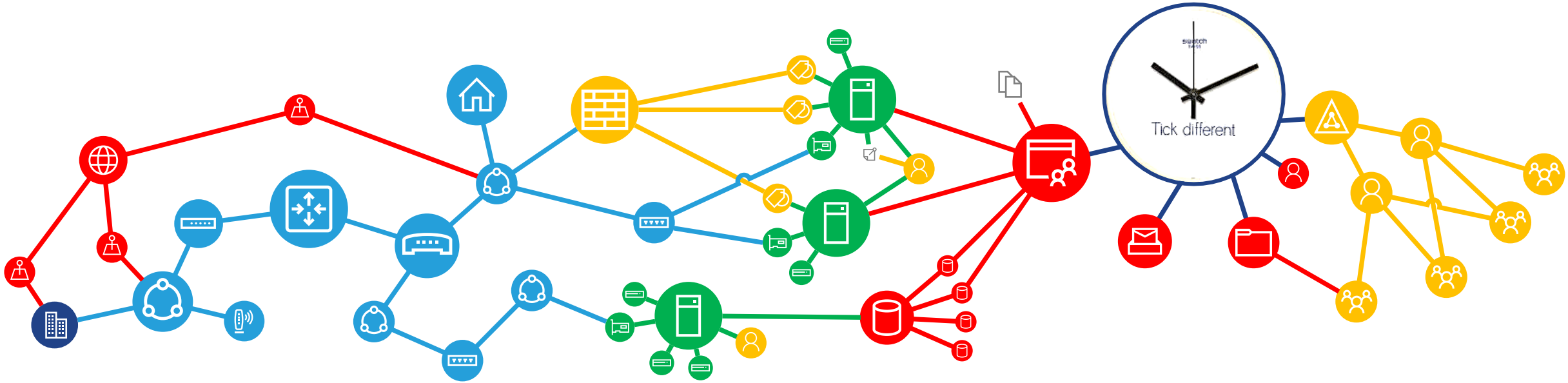


an Enterprise Graph in full production at Swatch Group Services in Biel

Peter Hutzli, Teamlead Infrastructure Platforms

Sylvain Messerli, Louis Voegeli, Dr. D. Toggweiler, J.M. Haeberli

tick different in 3 acts

prologue: the business
brands, datacenters, automation, many systems, many assets

act 1: stumbling
RFP, evaluation, discovery, playing, business case, project approval

act 2: making
the learning curve, early mistakes, architecture, data model

act 3: succeeding
go-life, adoption, unexpected uses, evolution, benefits

epilogue
migration to new product

prologue

companies, datacenters, automation, many systems, many assets

Omega production

stock, logistics, quality and certification highly integrated with IT,

production steps still by hand!

Swatch Retail

video streaming, network, cashiers, payment terminals, security equipment, customer WiFi, …

the business and IT

- vertical integration → lot's of varying needs
- different cultures → lot's of varying needs
- federation → lot's of varying needs
- 150 companies, from tiny to large

the datacenter services and functions

- compute
- storage
- network
- databases
- applications
- backup
- monitoring

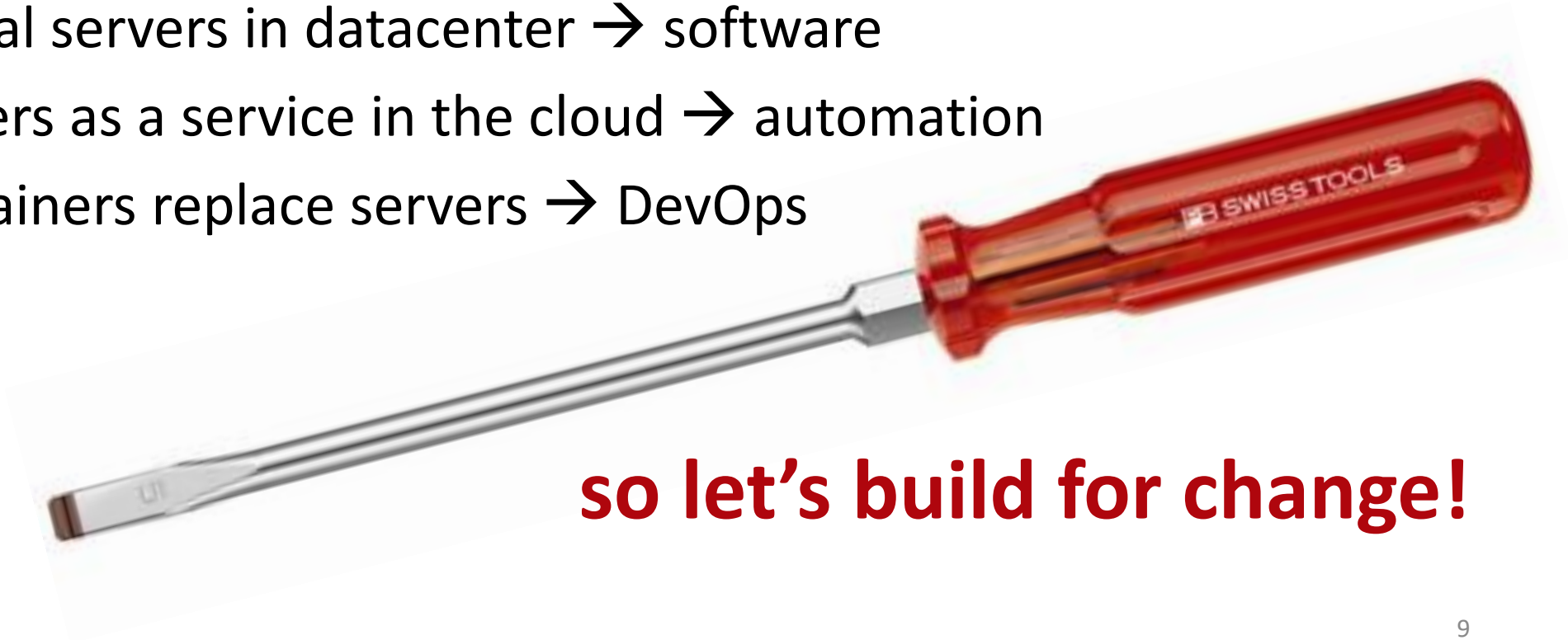
- support
- operations
- sales
- consulting
- projects
- engineering
- architecture
- finance

the team at «the Swatch Group Services Ltd.»

- Sylvain Messerli, lead developer
- Louis Voegeli, developer
- Peter Hutzli, teamlead
- Reto Gmür, consultant
- Sylvain Kuchen, student EPFL
- Daniel Toggweiler, CTO

the only constant is change

- 2005: physical servers in local room → screwdriver
- 2010: virtual servers in datacenter → software
- 2015: servers as a service in the cloud → automation
- 2020: containers replace servers → DevOps



so let's build for change!

act 1: stumbling

RFP, evaluation, discovery, playing, business case, project approval

goal

build a CMDB

Configuration Management Database (CMDB) to track IT assets

challenge

manage thousands of objects

from several dozens of systems

dilemma

many CMDB projects fail

due to stale data, hard to model relationships,
static data model, multi-dimensional queries

evaluation

RFP	HP	BMC	Microsoft	Cherwell	Realtech	fluidOps
Scope	OK	OK	Limited	Not OK		OK
Consulting days	101	108	135	20 (200)	declined	62
Cost 1st year	95x	70x	26x	38x		25x
Discovery						
Applications	Very limited	Very limited	Very limited	None		None
Infrastructure	Good	Good	OK	PC, Mac only		Good
General						
Risk	Medium	Low	Low	High		Low
Security	Credential exposure for crawling	Credential exposure for crawling	OK	OK		OK
Comment	“9 headed monster”	Good crawler	Too rigid	Never done before		Extremely fast setup!

entering: semantic Graph

what sold us?

a whitepaper addressing *exactly* the pain-points of managing IT assets

1. brown-field
2. disjoint silos
3. long dependency chains
4. **constant change, migration & evolution**

Semantic Technologies for Enterprise Cloud Management

Peter Haase, Tobias Mathäß, Michael Schmidt,
Andreas Eberhart, Ulrich Walther

fluid Operations, D-69190 Walldorf, Germany
firstname.lastname@fluidops.com

Abstract. Enterprise clouds apply the paradigm of cloud computing to enterprise IT infrastructures, with the goal of providing easy, flexible, and scalable access to both computing resources and IT services. Realizing the vision of the fully automated enterprise cloud involves addressing a range of technological challenges. In this paper, we focus on the challenges related to intelligent information management in enterprise clouds and discuss how semantic technologies can help to fulfill them. In particular, we address the topics of *data integration, collaborative documentation and annotation* and *intelligent information access and analytics* and present solutions that are implemented in the newest addition to our eCloudManager product suite: The Intelligence Edition.

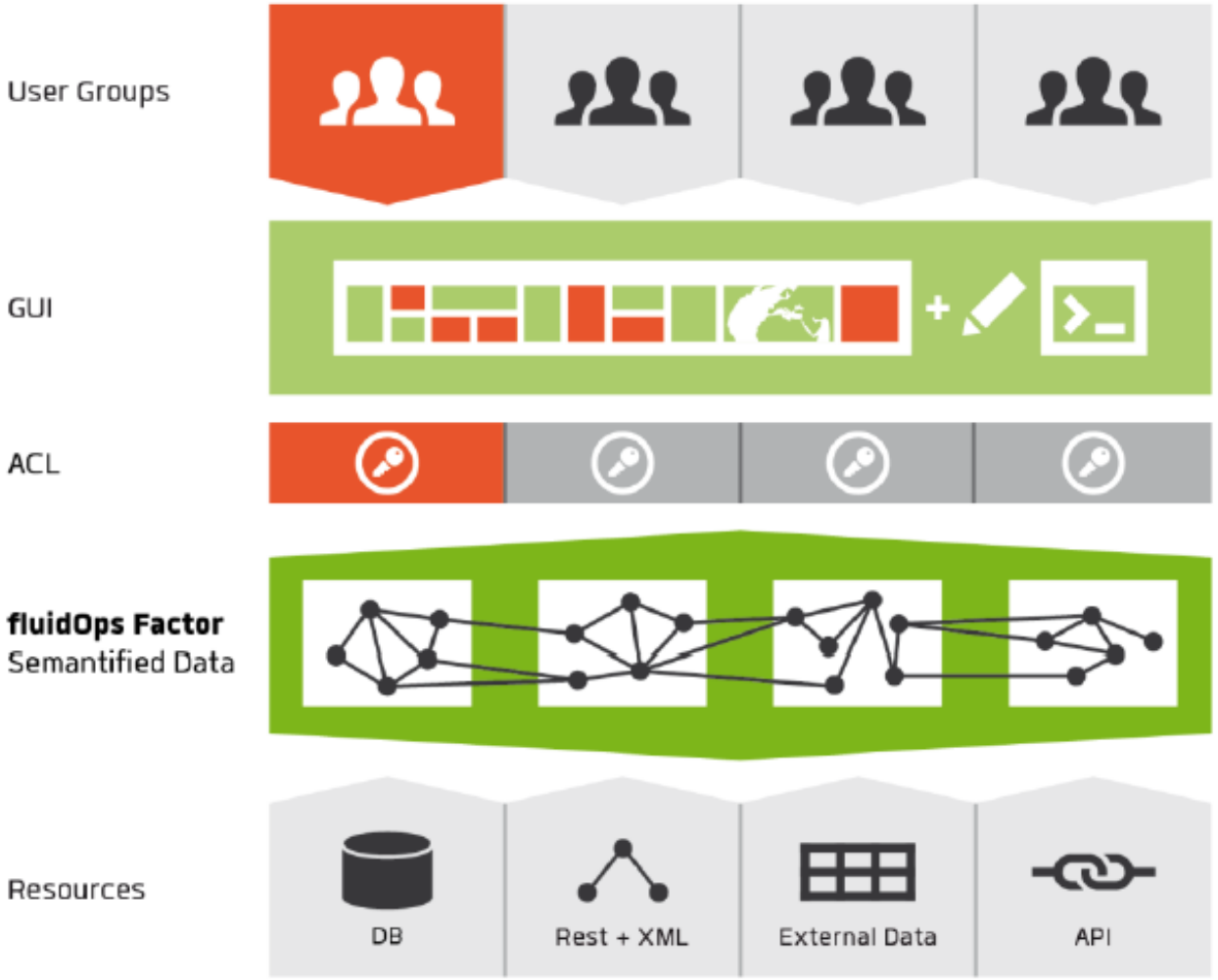
1 Introduction

Cloud computing has emerged as a model in support of "everything-as-a-service" (XaaS) [9]. Cloud services have three distinct characteristics that differentiate them from traditional hosting. First, cloud services are sold on demand, typically by the minute or the hour; second, they are elastic – users can have as much or as little of a service as they want at any given time; and third, cloud services are fully managed by the provider (while the consumer needs nothing but a personal computer and Internet access) [13]. Significant innovations in virtualization and distributed computing, as well as improved access to high-speed Internet and a weak economy, have accelerated interest in cloud computing.

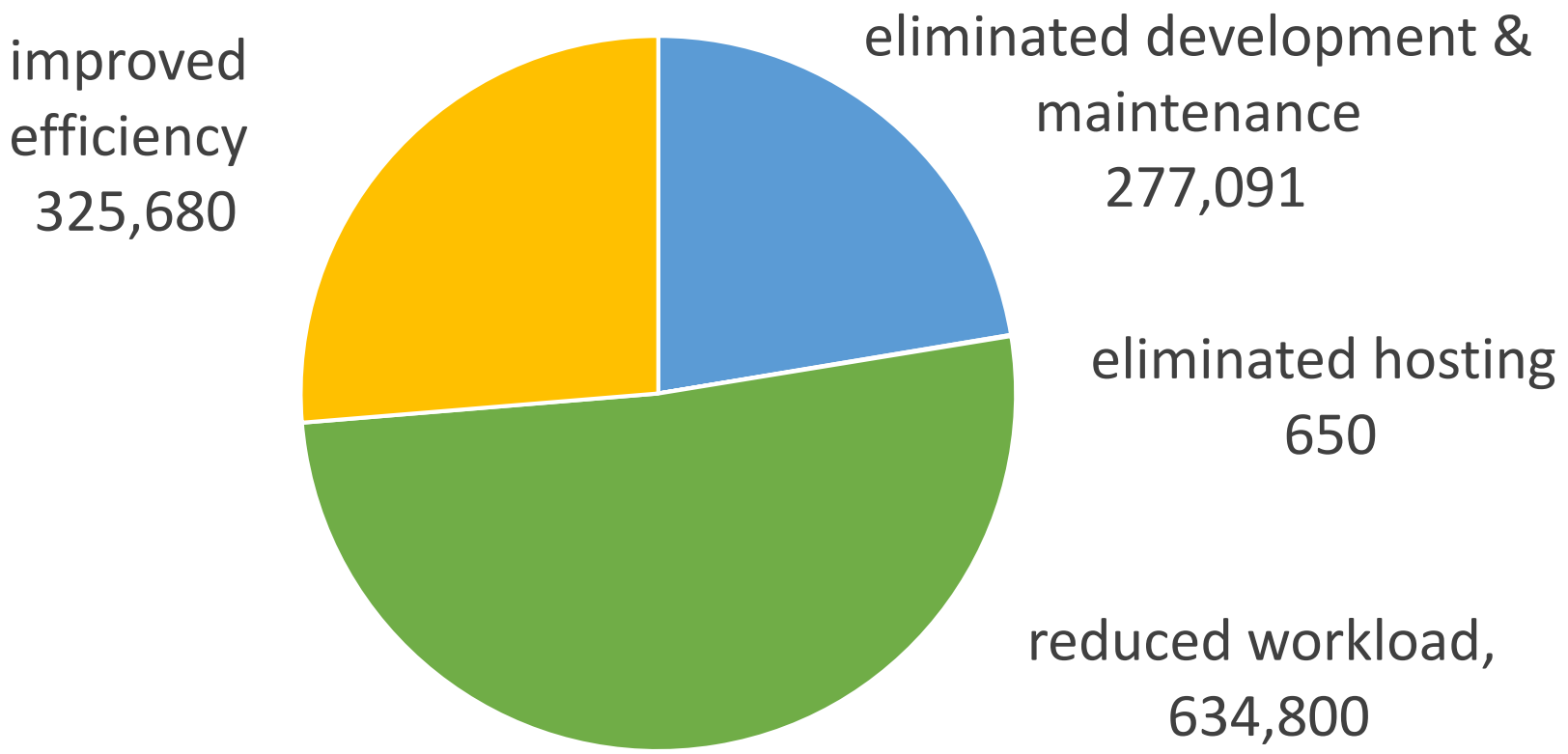
While the paradigm of cloud computing is best known from so called public clouds, its promises have also caused significant interest in the context of running enterprise IT infrastructures as private clouds [11]. A private cloud is a network or a data center that supplies hosted services to a limited number of people, e.g. an enterprise cloud. As with public clouds, the goal of enterprise clouds is to provide easy, scalable access to computing resources and IT services [14].

The emergence of cloud offerings such as Amazon AWS or Salesforce.com demonstrates that the vision of a fully automated data center is feasible. Recent advances in the area of virtualization make it possible to deploy servers, activate network links, and allocate disk space virtually via an API rather than having to employ administrators who physically carry out these jobs. Note that

the fluidOps solution



business case: 1 mio saved over 5 years



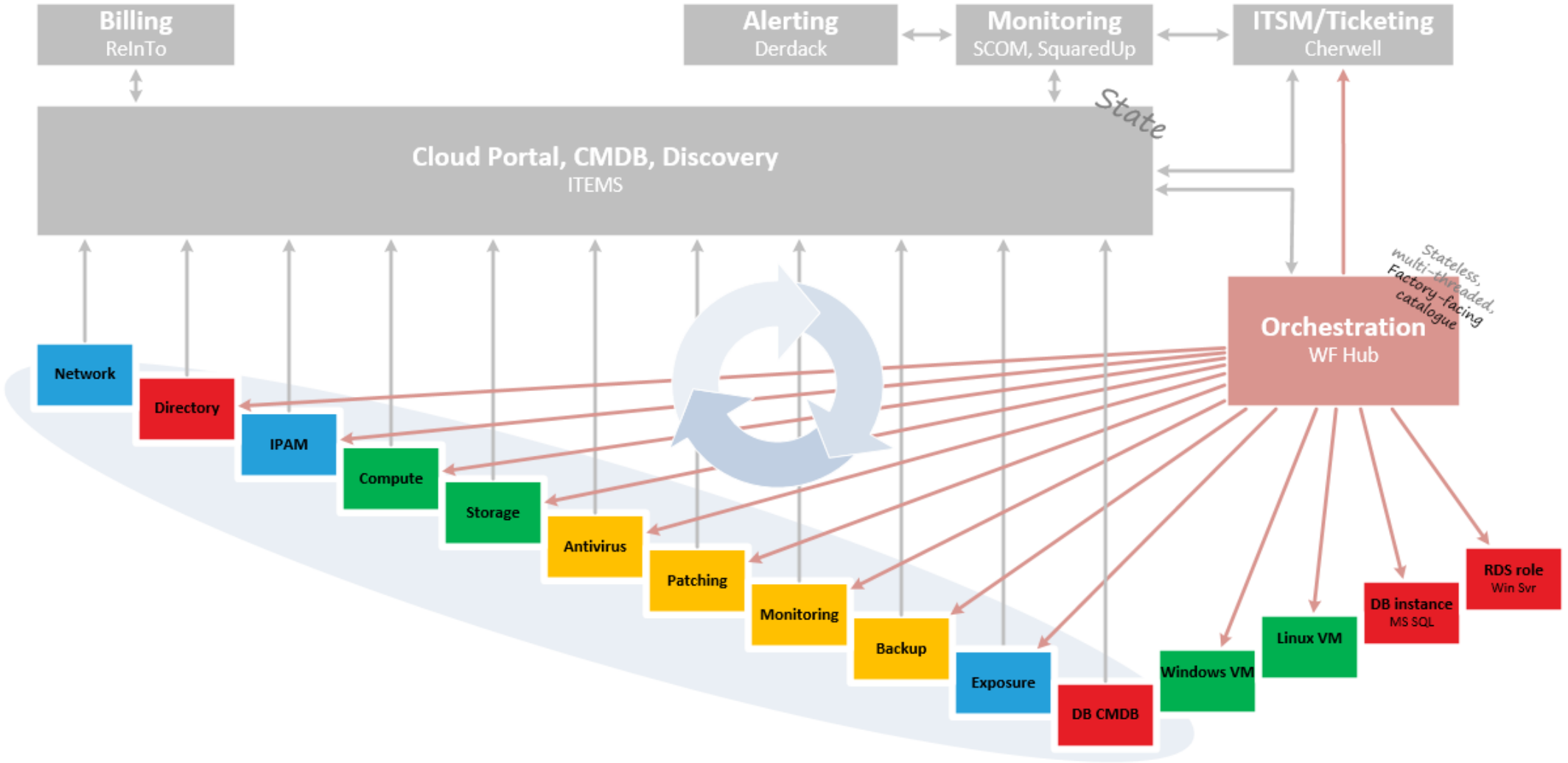
act 2: making

the learning curve, early mistakes, architecture, data model

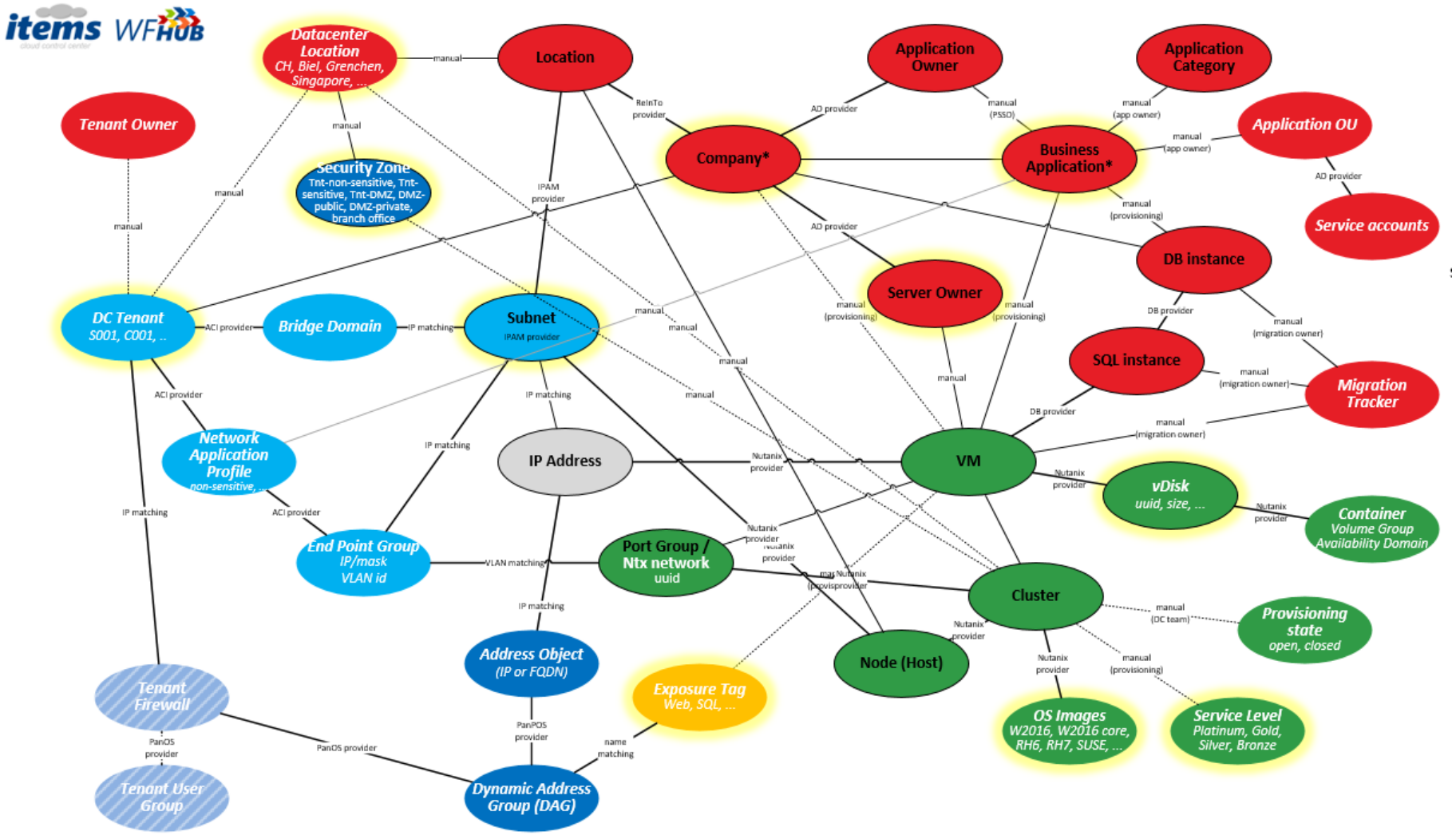
climbing the mountain

- install was easy
- learn RDF, SPARQL
- learn Eclipse IDE
- write wiki pages with widgets and SPARQL
- integrate data sources (REST)
- integrate automation
- steep learning curve!

components


Billing
ReInTo
Alerting
Derdack
Monitoring
SCOM, SquaredUp
ITSM/Ticketing
Cherwell
State
Cloud Portal, CMDB, Discovery
ITEMS
Stateless, multi-threaded, Factory-facing catalogue
Orchestration
WF Hub
Network
Directory
IPAM
Compute
Storage
Antivirus
Patching
Monitoring
Backup
Exposure
DB CMDB
Windows VM
Linux VM
DB instance
MS SQL
RDS role
Win Svr

data model extract



early mistakes we laugh about now…

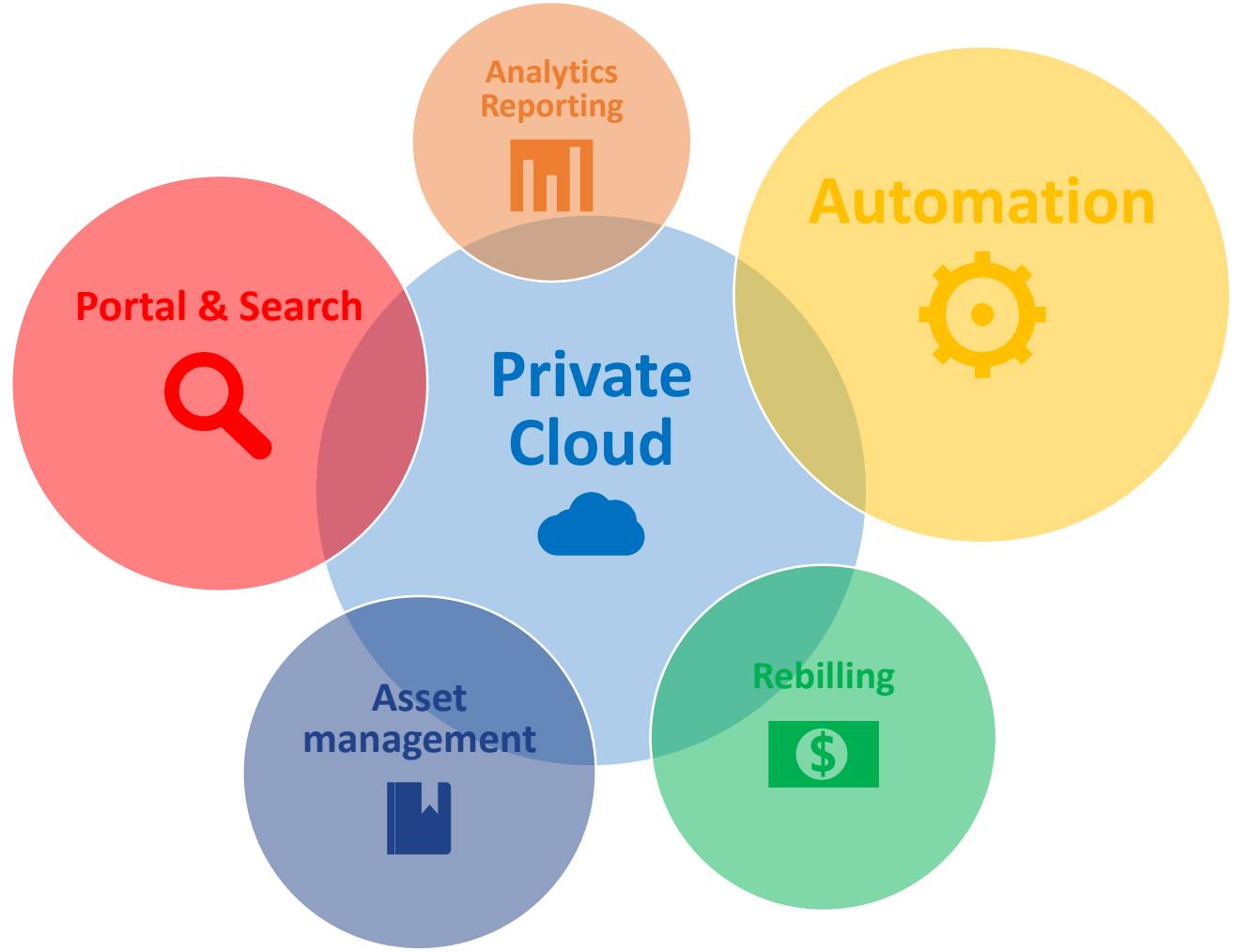
- proper identifiers
  reconciliation based on string compare
- crooked data model
  used class name as property name
- implicit queries using properties
  all objects with a disk attached are servers
- unique names not unique
  special cases where a unique name is not unique due to cloning
- missing history
  if object disappears in the source system, it would disappear from the graph
- flip-flopping sources
  when the source system is instable, we had tons of fake historical data

act 3: succeeding

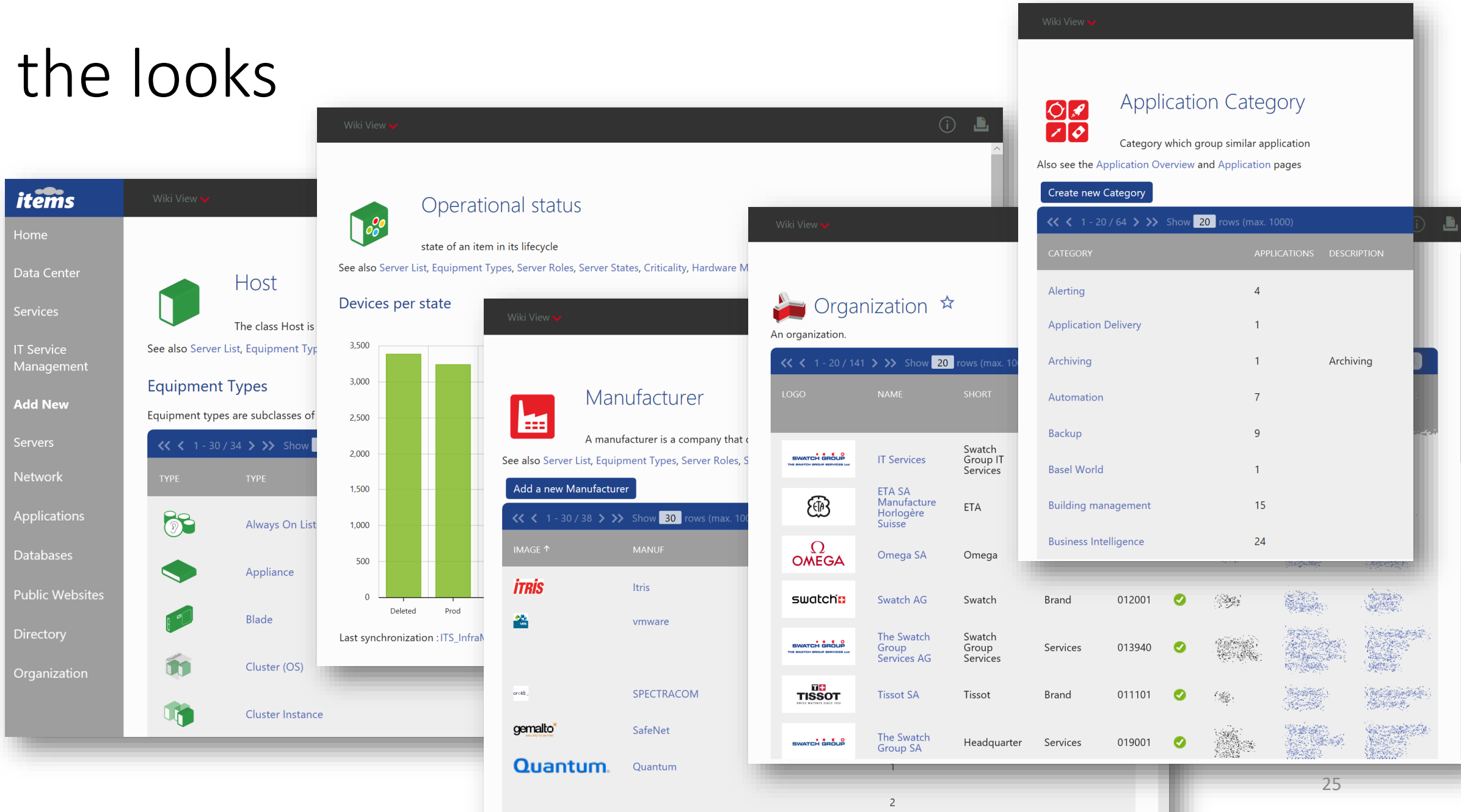
go-life, adoption, unexpected uses, evolution, benefits

go-life

- went very smoothly (NOT!)
- acceptance was high quickly
  everybody knows how to google
- we actually built a
  private cloud platform
  by accident ☺



the looks


items
Wiki View
Home
Data Center
Services
IT Service Management
Add New
Servers
Network
Applications
Databases
Public Websites
Directory
Organization
Host
The class Host is
See also Server List, Equipment Typ
Equipment Types
Equipment types are subclasses of
1 - 30 / 34
Show
TYPE
TYPE
Always On List
Appliance
Blade
Cluster (OS)
Cluster Instance
Operational status
state of an item in its lifecycle
See also Server List, Equipment Types, Server Roles, Server States, Criticality, Hardware M
Devices per state
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Deleted
Prod
Last synchronization : ITS_InfraM
Manufacturer
A manufacturer is a company that
See also Server List, Equipment Types, Server Roles, S
Add a new Manufacturer
1 - 30 / 38
Show 30 rows (max. 10
IMAGE
MANUF
Itris
vmware
SPECTRACOM
SafeNet
Quantum
Organization
An organization.
1 - 20 / 141
Show 20 rows (max. 10
LOGO
NAME
SHORT
IT Services
Swatch Group IT Services
ETA SA Manufacture Horlogère Suisse
ETA
Omega SA
Omega
Swatch AG
Swatch
Brand
012001
The Swatch Group Services AG
Swatch Group Services
Services
013940
Tissot SA
Tissot
Brand
011101
The Swatch Group SA
Headquarter
Services
019001
Application Category
Category which group similar application
Also see the Application Overview and Application pages
Create new Category
1 - 20 / 64
Show 20 rows (max. 1000)
CATEGORY
APPLICATIONS
DESCRIPTION
Alerting
4
Application Delivery
1
Archiving
1
Archiving
Automation
7
Backup
9
Basel World
1
Building management
15
Business Intelligence
24

now comes the bragging

CHF 1 mio
5 Year net return

20+
systems integrated
the solution is unique in its **breadth**

Swatch may have the most
integrated view
of an enterprise datacenter in Switzerland (claim)

high user **acceptance** due to **fresh** data

96x faster
refresh cycles

4x faster
implementation

and more stats

500k
rebilled monthly

45 VM
deployments monthly

250 actions
triggered monthly

1 mio
objects

10 mio
triples

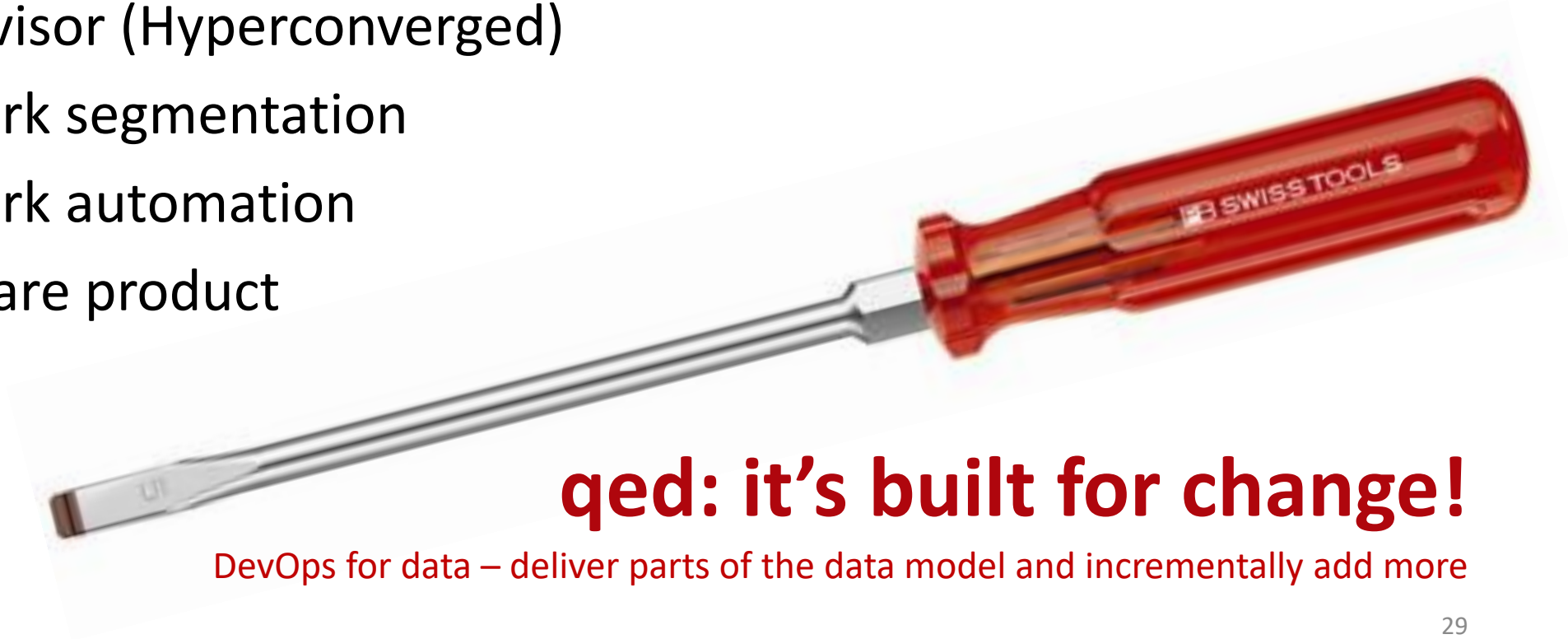
100 users
daily

qualitative benefits

flexibility	the **application adapts to us**, not we adapt to the application (vRA, Calm, OpenStack) the engineering teams are **free** to choose their technologies (must have API) the Graph is **flexible** to integrate new concepts and **phase out** old concepts (migrations)
speed	the subject matter experts build their own application, **delivery in weeks** the graph is much **faster** to change and extend compared to relational DB deep queries are faster compared to relational
efficiency	low code: discovery allows us to **re-use the native mgmt. tools** the same solution can be used over **many years** **less code** to write

extensions

- new branch office datacenters (ROBO)
- new Point of Sales management (POS)
- new hypervisor (Hyperconverged)
- new network segmentation
- new network automation
- new file share product



qed: it’s built for change!

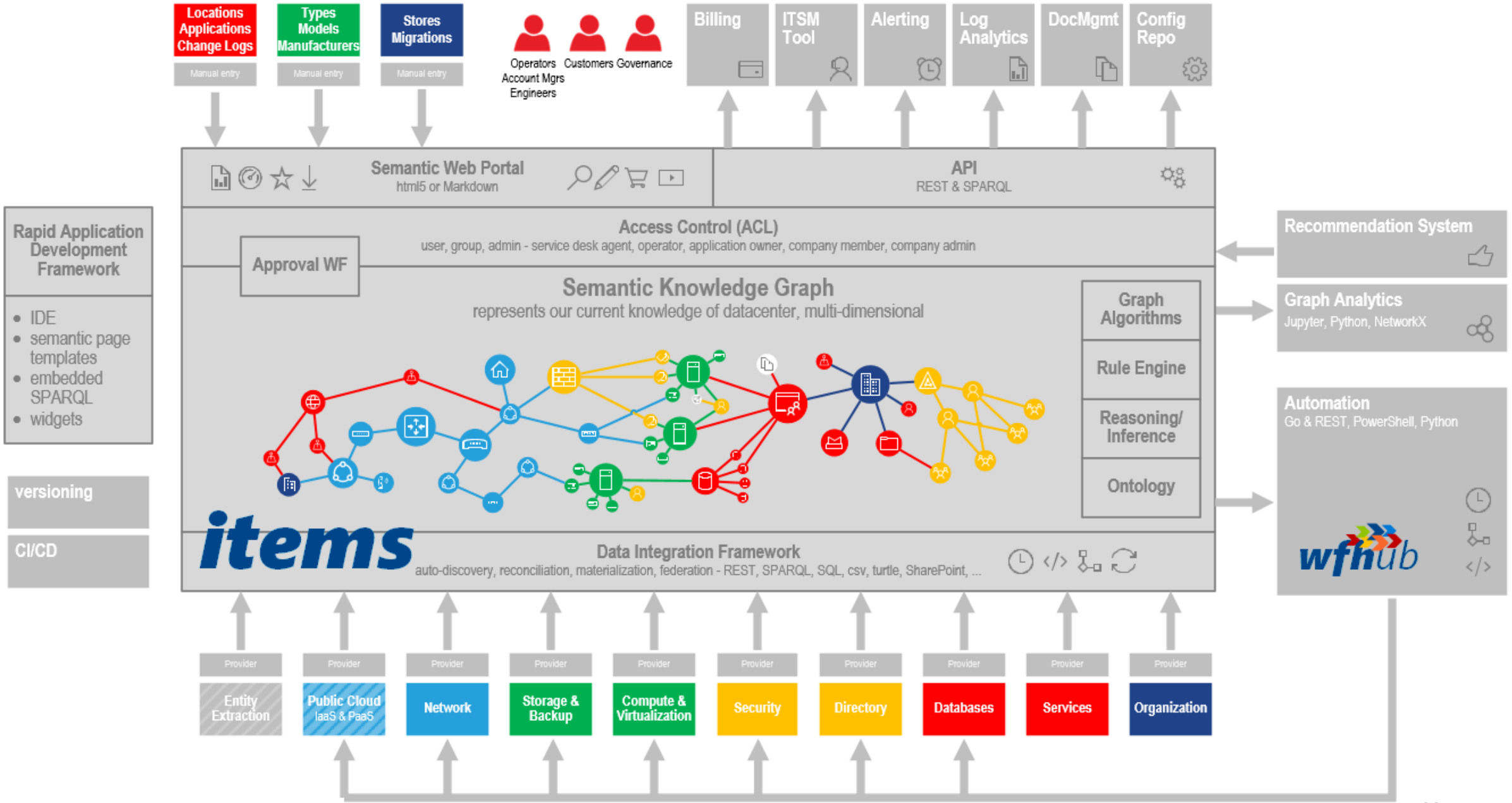
DevOps for data – deliver parts of the data model and incrementally add more

epilogue

migration to new product and new frontiers

bitter pill

- fluidOps was bought by Veritas, Veritas shut down the product line
- new RFP with
  - metaphacts
  - eccenca
  - intelligent views
  - triply
  - net-IT services
  - zazuko

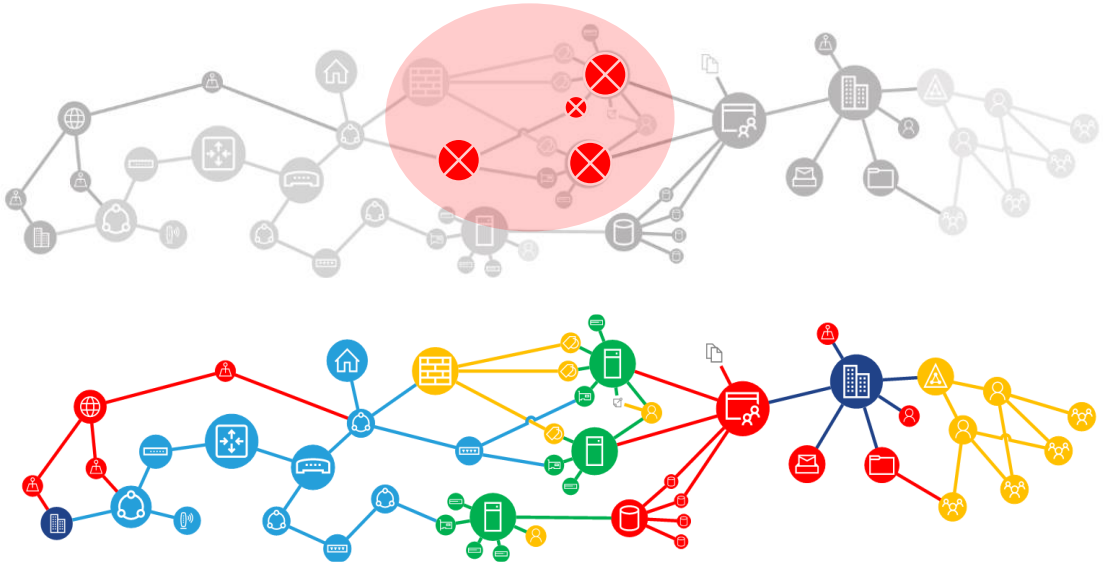

Locations
Applications
Change Logs
Manual entry
Types
Models
Manufacturers
Manual entry
Stores
Migrations
Manual entry
Operators
Account Mgrs
Engineers
Customers
Governance
Billing
ITSM Tool
Alerting
Log Analytics
DocMgmt
Config Repo
Semantic Web Portal
html5 or Markdown
API
REST & SPARQL
Rapid Application Development Framework
IDE
semantic page templates
embedded SPARQL
widgets
versioning
CI/CD
Access Control (ACL)
user, group, admin - service desk agent, operator, application owner, company member, company admin
Approval WF
Semantic Knowledge Graph
represents our current knowledge of datacenter, multi-dimensional
Graph Algorithms
Rule Engine
Reasoning/ Inference
Ontology
items
Data Integration Framework
auto-discovery, reconciliation, materialization, federation - REST, SPARQL, SQL, csv, turtle, SharePoint, ...
Recommendation System
Graph Analytics
Jupyter, Python, NetworkX
Automation
Go & REST, PowerShell, Python
wfhub
Provider
Entity Extraction
Public Cloud
IaaS & PaaS
Network
Storage & Backup
Compute & Virtualization
Security
Directory
Databases
Services
Organization

current research: graph analytics

- bipartite graph, neighborhood formation, similar to PageRank
- recommendation system for new hires, anomaly detection
- Jupyter, networkx, scipy
- internship EPFL

future: AI Ops?

- further research: can Knowledge Based AI (KBAI) allow us to build an operations assistant?
- e.g. combine health state & business data with graph topology to find most urgent hot-spots
- re-construct application diagrams from graph



bottom line

flexible solution

multi dimensional

growing scope

fast turnaround

door opener for graph analytics and **AI Ops**

semantic graph

invisible enabler