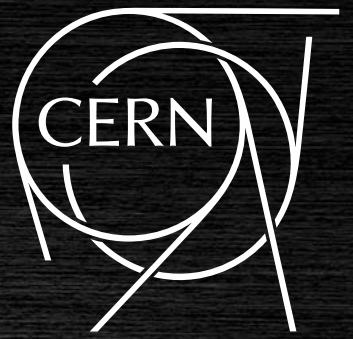
knowledge14®

April 27–May 1, 2014 • Moscone Center • San Francisco, CA



Introducing performance analytics in a not fully matured and heterogeneous environment

Reinoud MARTENS
Service Manager
CERN

servicenow®

CERN

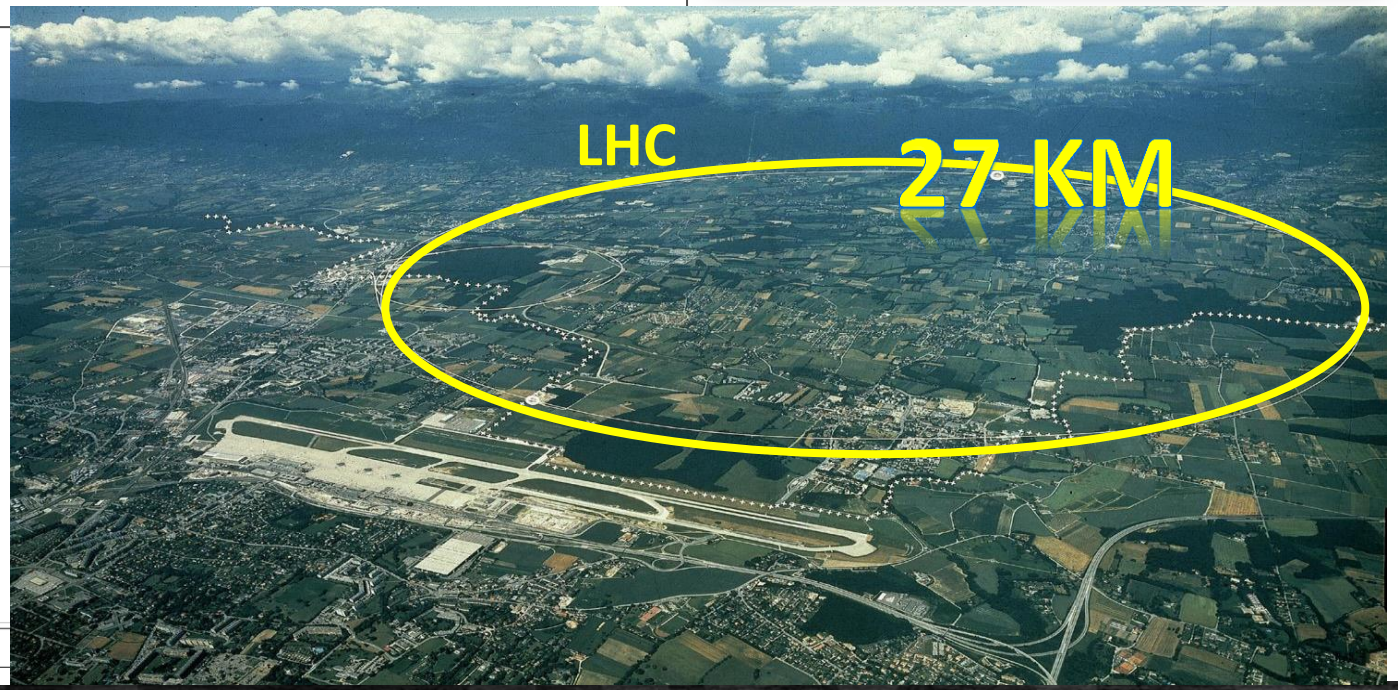
- World's largest particle physics centre
- World's largest scientific instrument
- 1954 - Europe's first joint ventures
- 2014 - 21 member states.

  Austria, Belgium, Bulgaria, Czech republic, Denmark, Finland, France, Germany, Greece, Hungary, Italy, Israel, Netherlands, Norway, Poland, Portugal, Slovak republic, Spain, Sweden, Switzerland, United Kingdom

- Annual budget 1246.5 million CHF.
- ~ 2300 Staff BUT >> 10000 Users

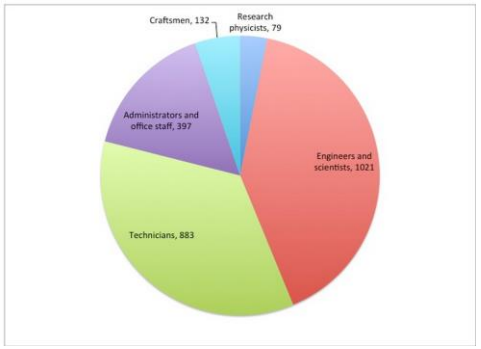
CERN opening the door…

- Membership for all countries independent of geographical location
- Associate Membership possible
- **Israel** welcomed to Membership by Council 12/2013
- **Romania** in accession to Membership since 2010
- **Serbia** Associate Member in the pre-Stage to Membership since 2012
- **Cyprus and Ukraine** Agreement concerning Associate Member (in the pre-Stage to Membership for Cyprus) in ratification process
- **Brazil, Russia, Slovenia, Turkey** Agreements under discussion
- **Pakistan** application received for associate membership

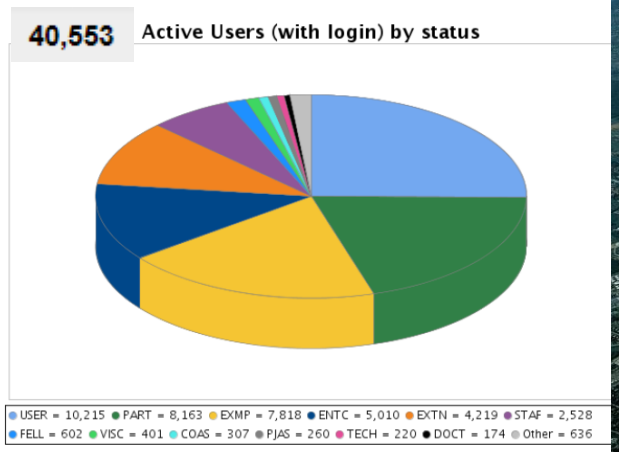


Staff

Staff members as of 31 December 2012 (includes externally funded): 2512



40,553 Active Users (with login) by status



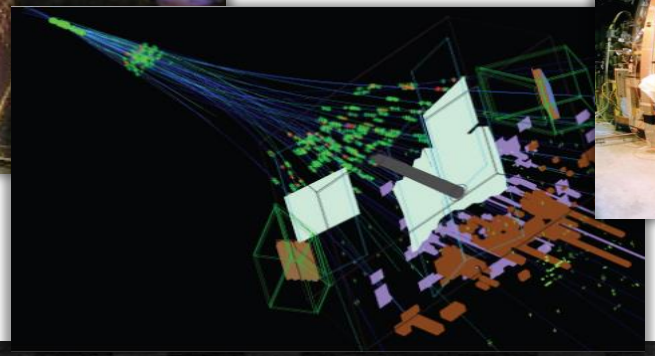
CERN's mission

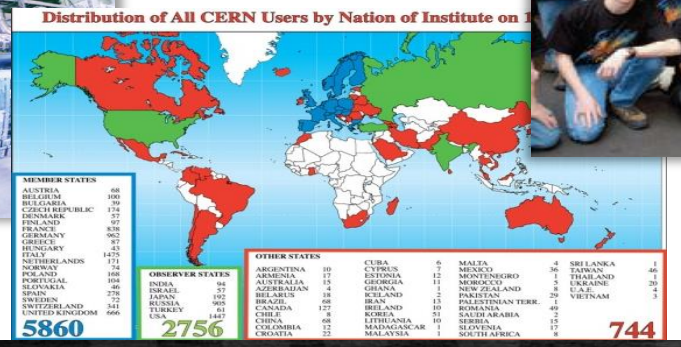
Seeking answers to questions about the Universe.
What is it made of?
How did it come to be the way it is?

Advancing the frontiers of technology and engineering.

Uniting nations together through science. Today >10000 visiting scientists from more than 100 countries.

Training young scientists and engineers who will be the experts of tomorrow.



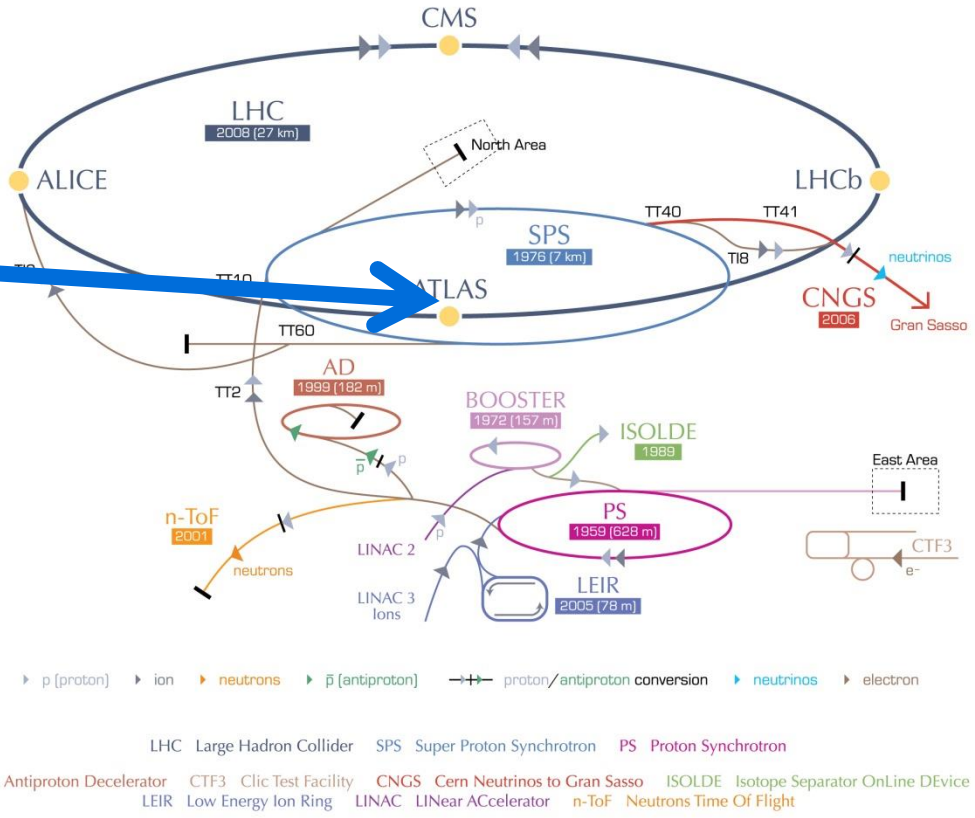


CERN Experiments and Topics

EXPERIMENTS

- ACE
- AEGIS
- ALICE
- ALPHA
- AMS
- ASACUSA
- ATLAS
- ATRAP
- AWAKE
- CAST
- CLOUD
- CMS
- COMPASS
- DIRAC
- ISOLDE
- LHCb
- LHCf
- MOEDAL
- NA61/SHINE
- NA62
- nTOF
- OSQAR
- TOTEM
- UA9

CERN's accelerator complex



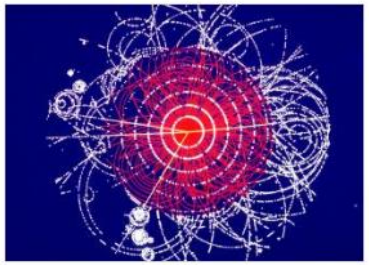
LHC Large Hadron Collider SPS Super Proton Synchrotron PS Proton Synchrotron

AD Antiproton Decelerator CTF3 Clic Test Facility CNGS Cern Neutrinos to Gran Sasso ISOLDE Isotope Separator OnLine DEvice
LEIR Low Energy Ion Ring LINAC LINear ACcelerator n-ToF Neutrons Time Of Flight

More than 3000 scientists from 174 institutes in 38 countries work on the ATLAS experiment (February 2012).

Antimatter

The big bang should have created equal amounts of matter and antimatter. So why is there far more matter than antimatter in the universe?



The Higgs boson

Elementary particles may have gained their mass from an elusive particle – the Higgs boson

The Large Hadron Collider

The 27-kilometre LHC is the world's largest particle accelerator. It collides protons or lead ions at energies approaching the speed of light

The birth of the web

The World Wide Web, invented at CERN in 1989 by British scientist Tim Berners-Lee, has grown to revolutionize communications worldwide

Service Management @ CERN: WHY

1. Do **more** with **less**.
   - 1983: 2000 Users and Staff 'down' to 3452 → 1.7 staff per user
   - 2013: >>10000 Users 'at CERN' and ~2300 Staff → 0.2 staff per user

   → **In 30 years ratio changed with factor 8**

   Obviously infrastructure evolved in same pace over this period.
   Roughly constant budget in value over last 30 years.

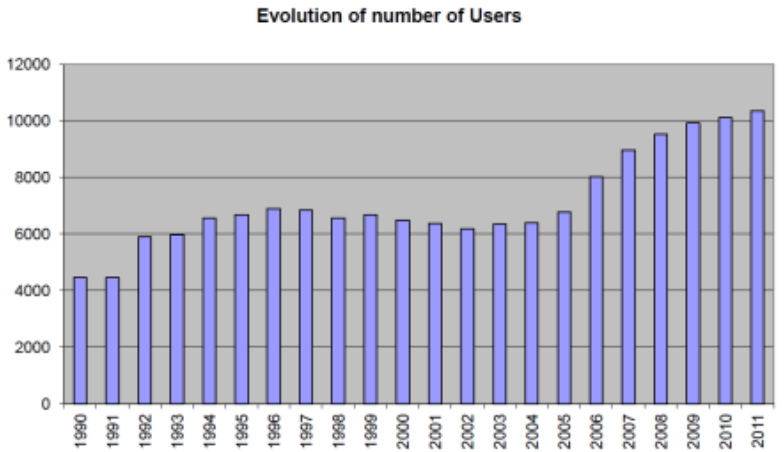
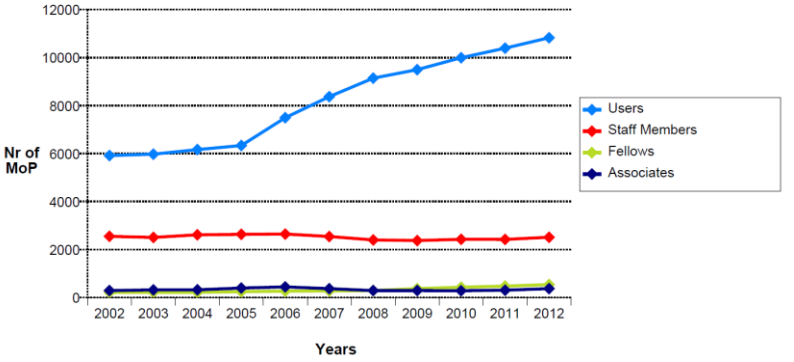


Figure 2. Evolution in the number of Staff Members, Fellows and Associates over the last 10 years (Students and Apprentices excluded)



2. Resources under scrutiny →
   Demonstrate optimization of **efficiency** and **effectiveness**

3. Shift from project (build LHC) to operate (run LHC) →
   Customer/User Service Orientation (**Culture Change**)

4. **Lack of visibility** on service delivery from management perspective

Service Management @ CERN: GOALS

1. **Simplify users** and supporters life by providing:
   - **ONE** point of contact (**ONE** #, **ONE** url, **ONE** place)
   - **ONE** behavior; Unified processes for all services
   - **ONE** tool shared by all service providers (sharing information and knowledge)
   - **ONE** business service catalog

     (clearly defining what services are provided to whom by whom at what quality levels).

2. **Optimize** efficiency and effectiveness (@ **CERN**)
   - Alignment with good practice (ITILv3 and ISO20k)
   - High level of automation
   - Framework for continuous improvement

3. **Improve** monitoring and control for **management** (**Dashboards!**)

AND DO THIS FOR ALL SERVICES (NOT ONLY IT)

Service Mgmt. Beyond IT: Scope

- Civil engineering services
- Material Management & Storage Services
- Fire protection services (Fire Brigade)
- Registration, access & safety services
- Facility management services
- Business application services
- Alarm system services
- Mail, Removal & Distribution of Goods Services
- Transport, Shipping & Goods Reception Services
- Waste Management Services
- Person mobility services (Cars, Bicycles, Shuttles, ..)
- Library & Archive Services
- Housing & Hotel Services
- Finance & Purchasing Services
- HR Services
- …





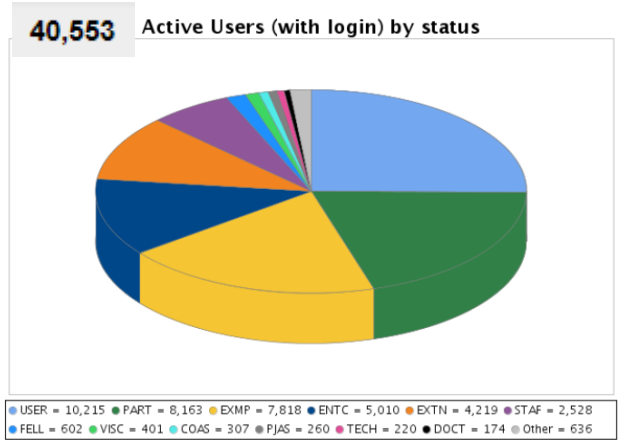


Service Mgmt. @ CERN: Numbers

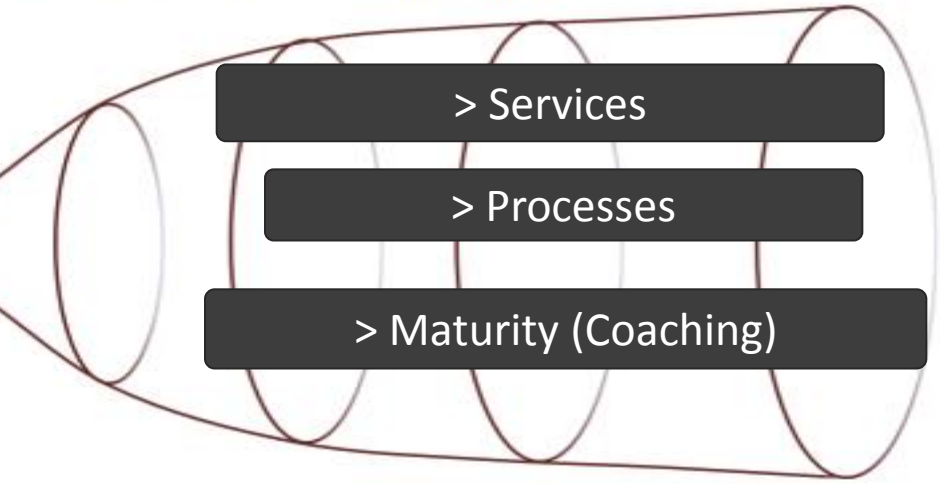
- 495 hotel rooms, 3 restaurants
- 2 main Sites, 657 Buildings, 238 Barracks
- > 15000 active access cards
- > 1000 cars
- > 10000 desktops & laptops
- 10000 servers / 90000 cores
- 77000 disks 30 PB disk space
- 70 PB tape storage
- 20000 network ports
- Internet exchange point

Hungary Computer Centre extension

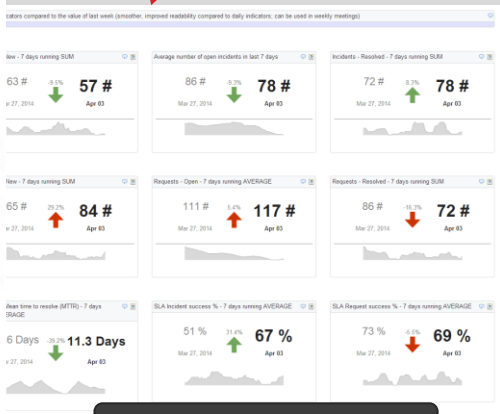
- 20000 cores 5.5 PB disk space



Timeline



KPI's & DASHBOARDS !



KPI Dashboards

Catalog and Processes and Portal in **ServiceNow**

Convince Peers & Management

Tool Selection

Eureka !

IT joins; Project Starts

ServiceNow

Go Live

1000 Supporters

2009 | 2010 | 2011 | 2012 | 2013 | 2014

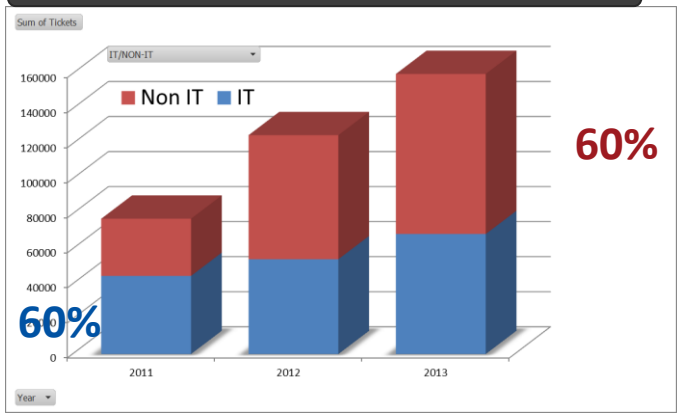
MANAGEMENT REQUESTS KPI DASHBOARD

Extend Catalog and Processes to IT

Train 400 **Supporters**

Recruit and train **Service Desk**

>350000 End User Inc/Req Resolved



Define **Business Service Catalog** for Non IT

Define user Facing Processes for Non IT (**Request and Incident**)

Business Service Catalogue

Matrix structure with 2 dimensions:

- Columns: Services (What, User View) (today > **300**)
- Rows: Functions (How, Supporters View) (today > **500**)

Service Area	Site Infrastructure Services											
Customer S	Material Lifecycle Service				Passenger Mobility Services			Registration and Access Services				
Services Ele	Material Request Service	Sales and Recuperation Service	Storage Service	Waste Management Service	Bike Sharing Service	Car Pool and Rental Service	Shuttle Service	Dosimeter Distribution Service	Guards Service	Locks and Key Service		
Customs and Fiscal Advice												
Car Plates Provision												
Confidential Mail Management												
Conventional Waste Collection & Classification												
Dangerous Waste Collection and Classification												
Goods Internal Distribution												
Goods Reception												
Mail Office												
Relocation												
Shipping Management												
Storage Area Operation												
Transvoirie												
Car Pool												
Car Pool Management												
Car Registration												
Car Rental												
Car Sharing												
CERN Apartments												
Cleaning Management												
Contractors' personnel and Biometrics Registration												
DGS-Dosimeters												
Entrance Control & Guards												
Exhibitions at CERN												
Green Space management												
Hotel Management												
Hotel Operation												
Housing Operation												
Locks and Keys												
ONET Cleaning												
Shuttle Management												
Shuttle Rental												
Topnet Cleaning												
Visitor access card												

What

How

Service Portal

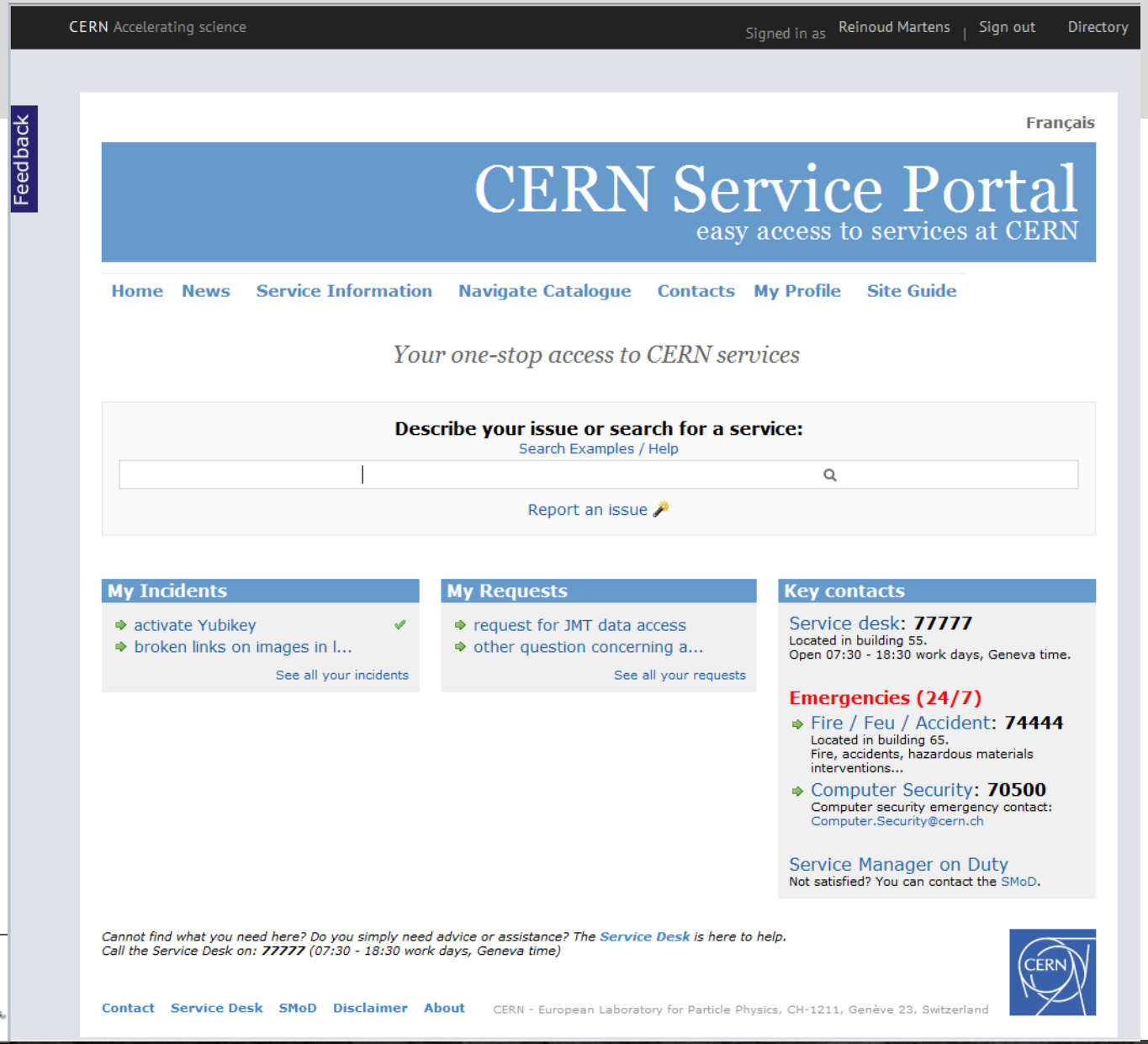
- Easy access to all services
- Search function
- Browse the catalogue
- Report issues
- Follow-up issues
- Access knowledge base
- Access to service status board

servicenow

December 08, 2011 12:08 ET

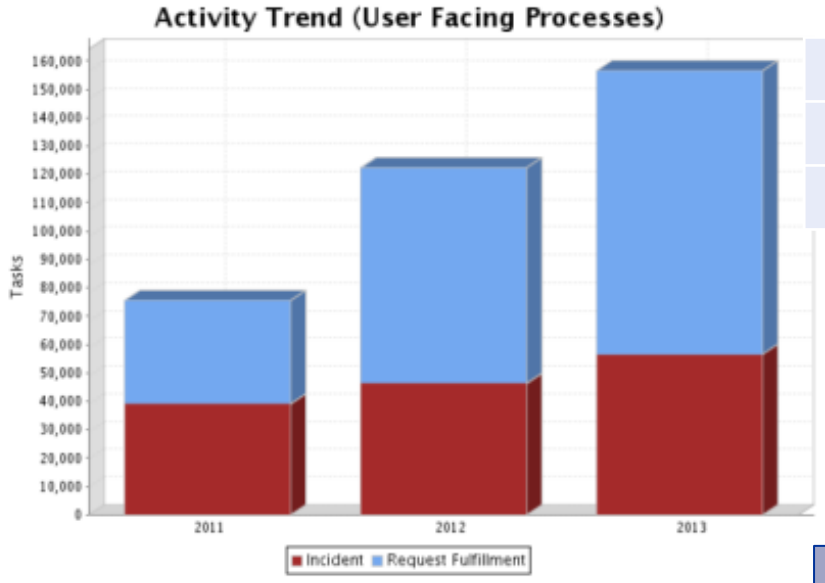
CERN Wins ServiceNow 2011 Innovation of the Year Award for Development of the CERN Service Portal That Provides More Than 650 Services to 10,000 Users

Finalists at ServiceNow's Knowledge11 Europe Event Included Fermilab, Inchcape, Queensland Department of Transport & Main Roads, Swiss Re and VeriSign

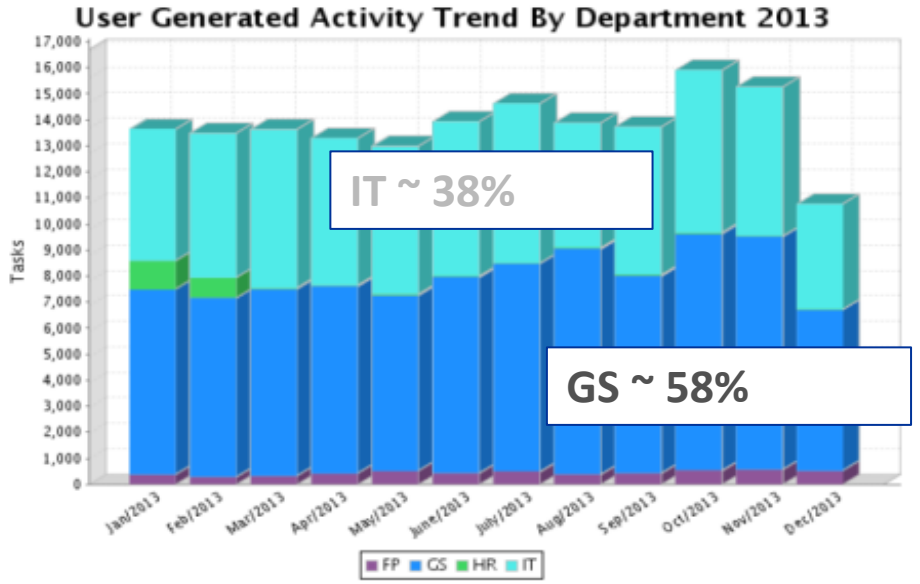


Service Management Status after 3 years

Excluding ‘monitoring’ generated tickets



2011 Total	77,211	
2012 Total	124,926	+62%
2013 Total	159,871	+28%



Service Desk acts on ~8k tickets/month ~ 50%

- **ONE** point of contact (**ONE** #, **ONE** url, **ONE** place)
- **ONE** behavior; Unified processes for all services
- **ONE** tool shared by all service providers (sharing information and knowledge)
- **ONE** business service catalog

What about dashboards?

Do kinst net ferbetterejen watsto net kinne mjitte

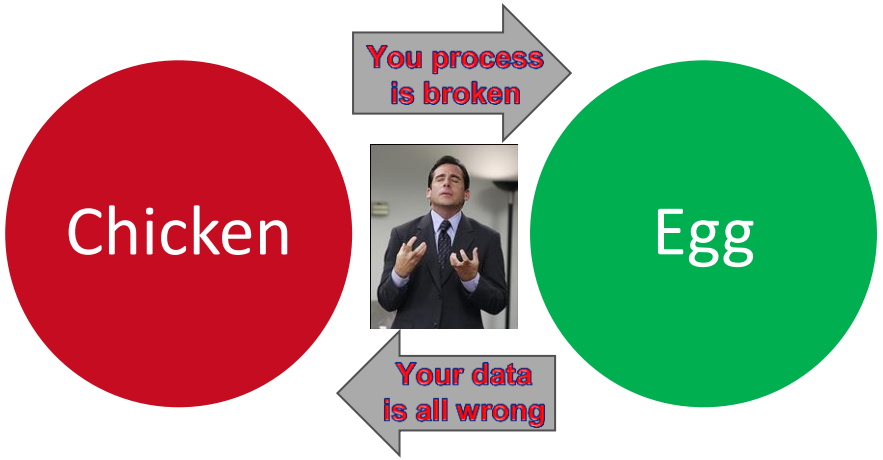
(You cannot improve what you cannot measure)

Is the cake ready for the cherry?

Can we obtain reliable metrics and KPI?

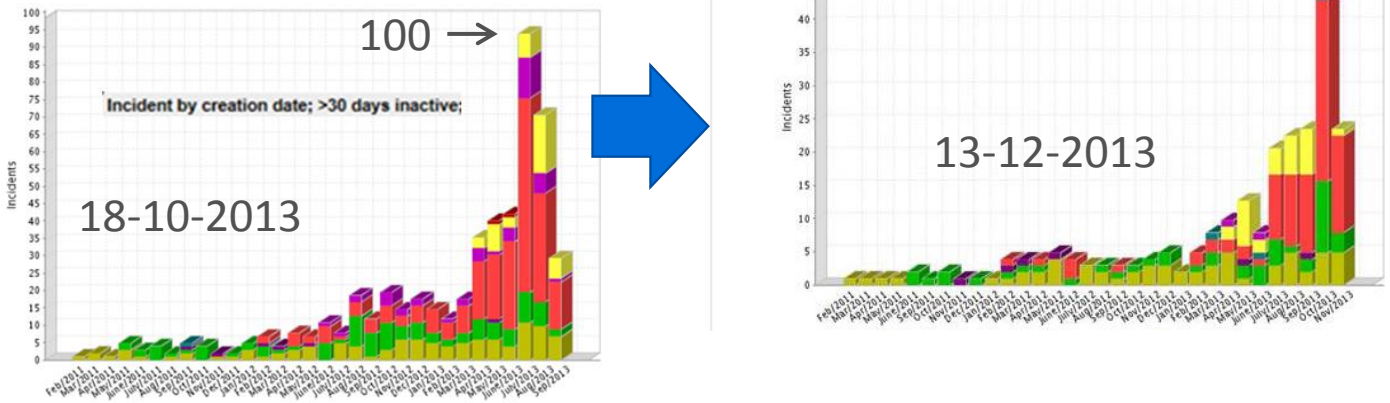
Dashboards; the cherry on the cake?!

- Rubbish In - Rubbish Out: and a little bit of ‘rubbish’ can ruin a cake
  - Data not aligned with reality (work done but update of ticket delayed)
  - Wrong use of process (e.g. incident ‘in progress’ for over a year, although workaround existed)
- Wide scope → Wide distribution in maturity
- CONSOLIDATE THE CAKE BEFORE “RELEASING” THE CHERRY



Data cleansing and maturity coaching

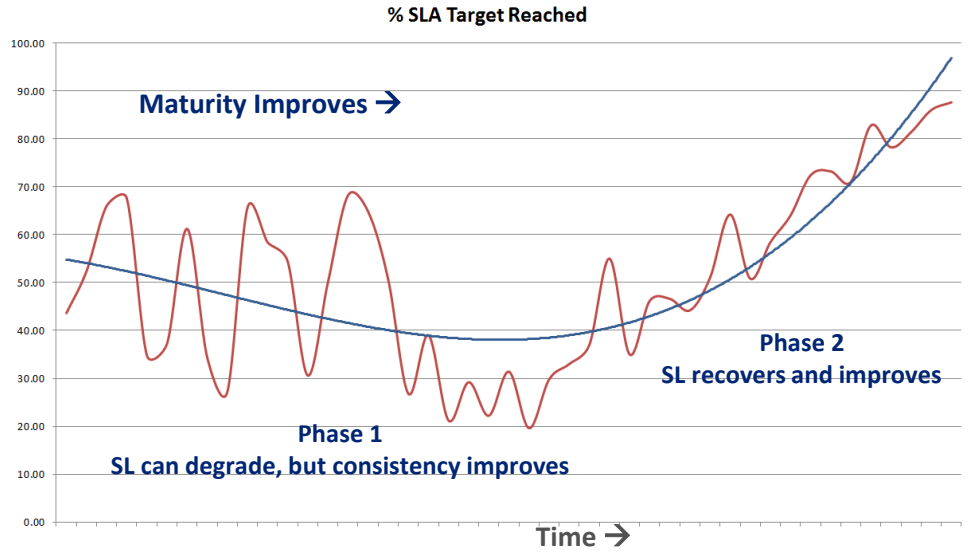
- Identify “forgotten tickets” and push the people in charge to take action…



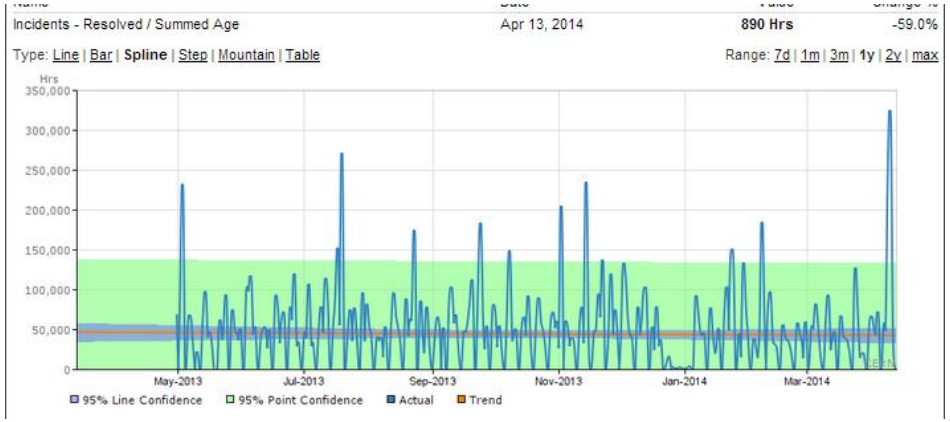
- Coaching for more consistency;
  whenever possible simplify process (e.g. impact and urgency → priority)
- Change processes/tools to capture changes in near real time

Priority Matrix		Impact			
		1 >5 users affected	2 2-5 users affected	3 1 user affected, service down	4 1 user affected, service degraded
Urgency	1 - High	1 Major	2 High	3 Moderate	4 Low
	2 - Medium	2 High	3 Moderate	4 Low	5 Planning
	3 - Low	3 Moderate	4 Low	5 Planning	6 Very Low

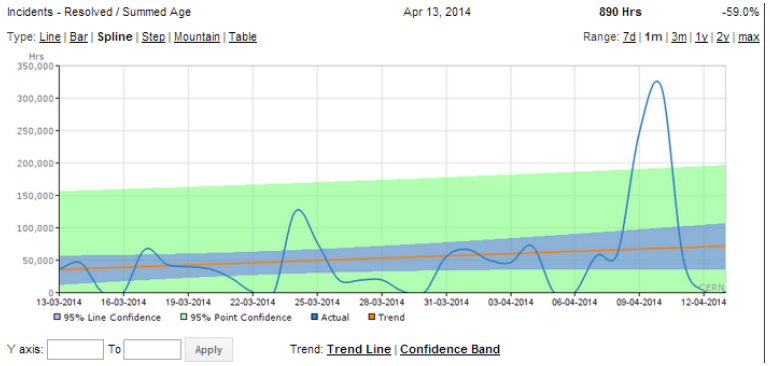
Priority Matrix		(Business) Impact		
		1 High Large number of users affected AND service down.	2 Medium Considerable percentage of users affected OR service partly available.	3 Low Few users affected OR workaround exists OR small part of service unavailable.
Urgency	1 High: The damage caused by the Incident increases rapidly.	1 Major	2 High	3 Moderate
	2 Medium: The damage caused by the Incident increases slowly.	2 High	3 Moderate	4 Low
	3 Low: The damage caused by the Incident does not increase over time	3 Moderate	4 Low	5 Very Low



But that was not enough



- Pareto rule also for data quality….
  2% of errors will destroy 98% of your effort
- Impossible to remove these ‘outliers’ by hand
- We needed an automatic process to weed out the ‘mistakes’



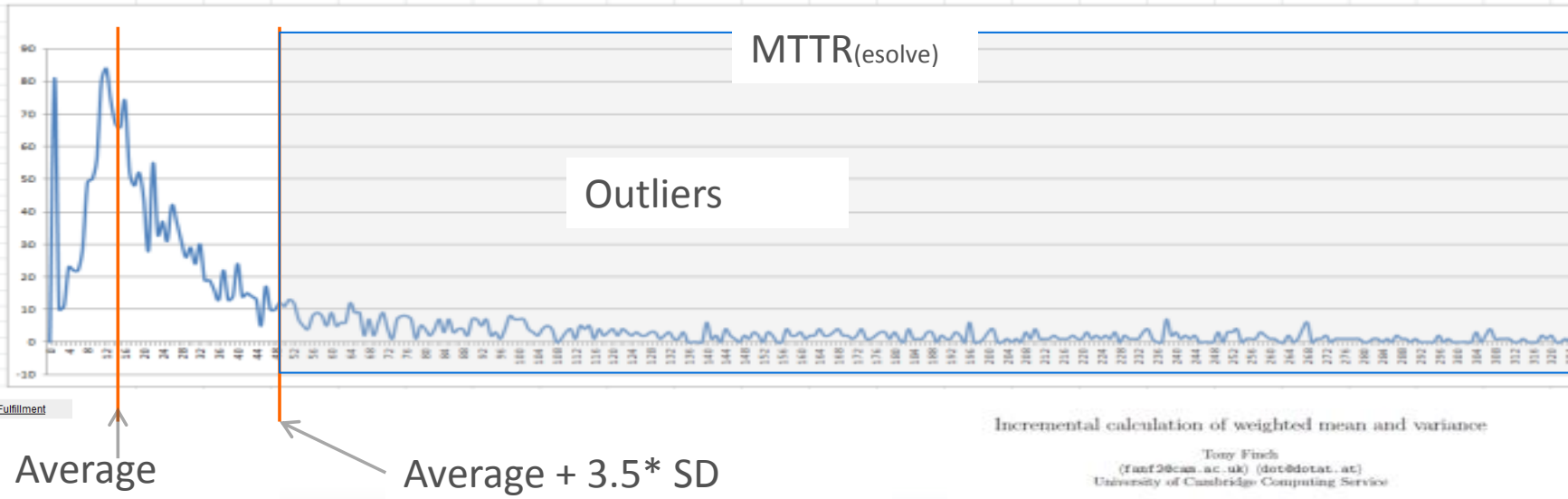
Outliers (How)

- Calculate average AV and Standard Deviation SD (by service and process)
- Filter out outliers (AV+3.5*SD) during metric collection (but keep their numbers for maturity reporting)
- Flag outliers for closed tickets and update AV and SD incrementally (weighted moving average)

TTR Statistics | New | Go to: Functional Element

All

Functional Element	Number of Tickets	TTR Average	TTR Sigma	Table
AFS	557	3.9001897	8.3759284	Request
AFS	895	6.439164	14.6306019	Incident
BTE Desktop Support	4,668	9.9565109	12.4803766	Request
CAD	2,337	5.469164	15.3997431	Request
Car Registration	1,156	0.3714589	0.9140917	Request
Car Rental	1,584	2.5348125	3.6049686	Request
Car Sharing	514	1.2417257	2.2766686	Incident
CASTOR	1,193	13.5254596	29.2688484	Incident
Castor Tape	3,670	0.4677336	0.9292418	Incident
CERN Document Server	1,924	8.0828121	27.598724	Request Fulfillment



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Outlier

From Wikipedia, the free encyclopedia

This article is about the statistical term. For other uses, see Outlier (disambiguation).

In statistics, an **outlier** is an observation point that is distant from other observations.[1] An outlier may be due to variability in the measurement or it may indicate experimental error; the latter are sometimes excluded from the data set.[2]

Outliers can occur by chance in any distribution, but they are often indicative either of measurement error or that the population has a heavy-tailed distribution. In the former case one wishes to discard them or use statistics that are robust to outliers, while in the latter case they indicate that the distribution has high kurtosis and that one should be very cautious in using tools or intuitions that

Incremental calculation of weighted mean and variance

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February 2009

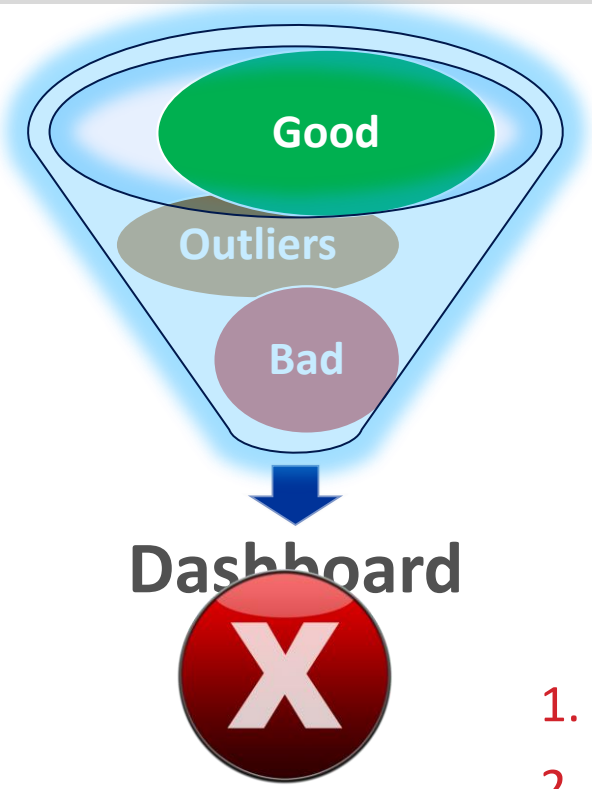
Abstract

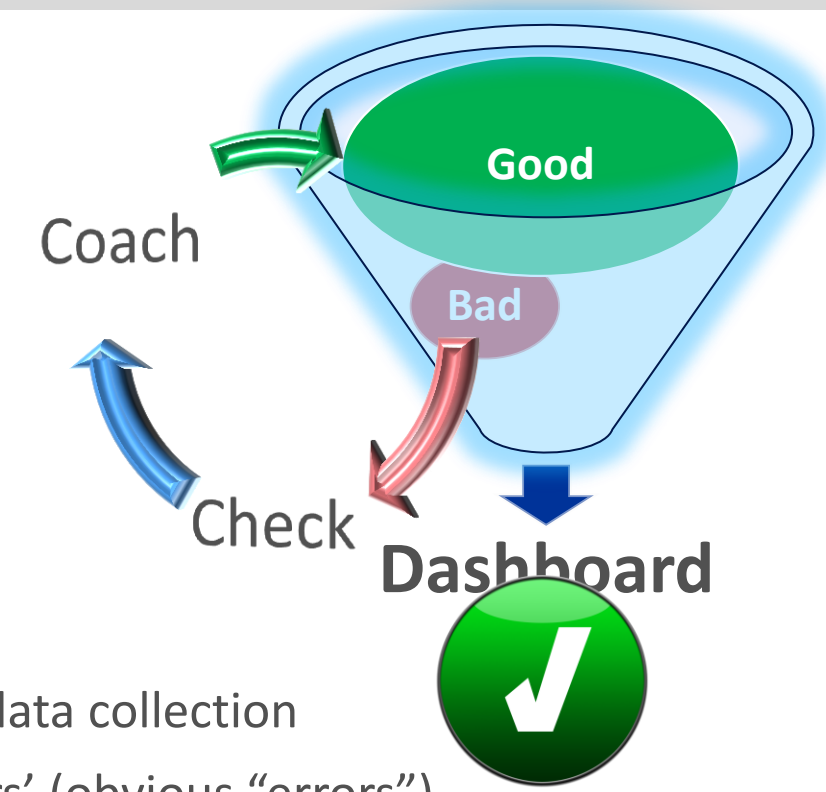
In these notes I explain how to derive formulae for numerically stable calculation of the mean and standard deviation, which are also suitable for incremental on-line calculation. I then generalise these formulae to weighted means and standard deviations. I unpick the difficulties that arise when generalising further to normalised weights. Finally I show that the exponentially weighted moving average is a special case of the incremental normalised weighted mean formula, and derive a formula for the exponentially weighted moving standard deviation.

1 Simple mean

Straightforward translation of equation 1 into code can suffer from loss of precision because of the difference in magnitude between a sample and the sum of all samples. Equation 4 calculates the mean in a way that is more numerically stable because it avoids accumulating large sums.

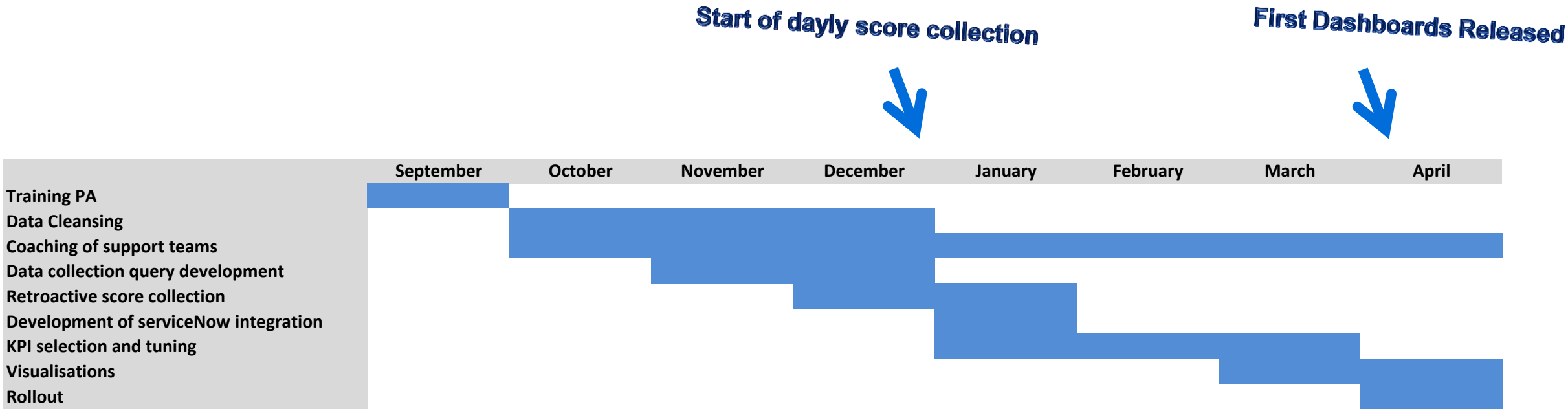
Pragmatic approach to consolidate the cake





1. Data cleaning period prior to ‘production’ data collection
2. Identify and automatically filter out ‘outliers’ (obvious “errors”)
   Don’t hide the truth, show the % of outliers
   (as a KPI for service management maturity)
3. Coach the ‘bad’ to become ‘better’

Timeline for PA rollout



Metrics Status

Done:

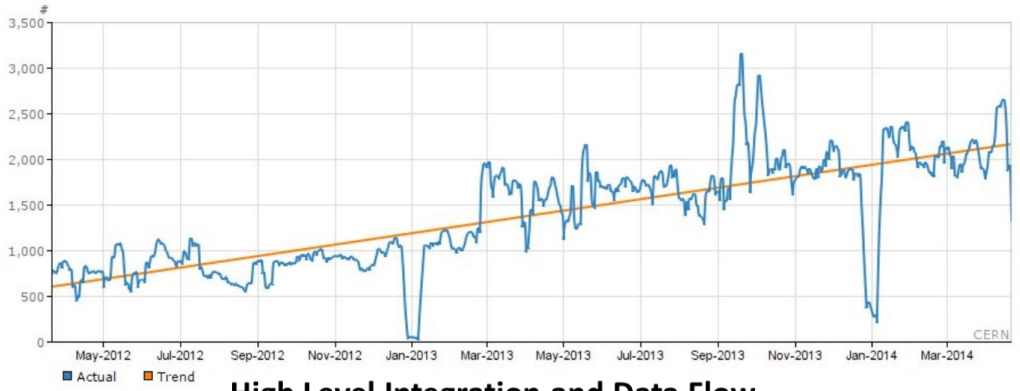
- Data cleaning campaigns (end 2013)
- ~ 100 metrics defined
- 2 years of history recovered
- ‘external’ sources supported
- Role based dashboards access mechanism implemented
- First process dashboards defined and working

Work in progress

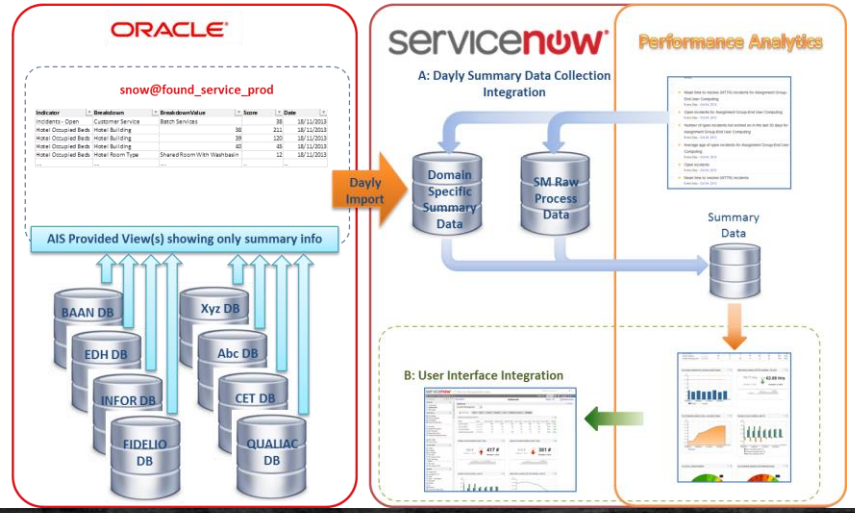
- Define domain specific metrics, KPI’s and dashboards (Hotel, Stores, Car Pool, Health, HVAC, Electricity, etc..)

Scorecard: Incidents - Resolved - 7 days running SUM

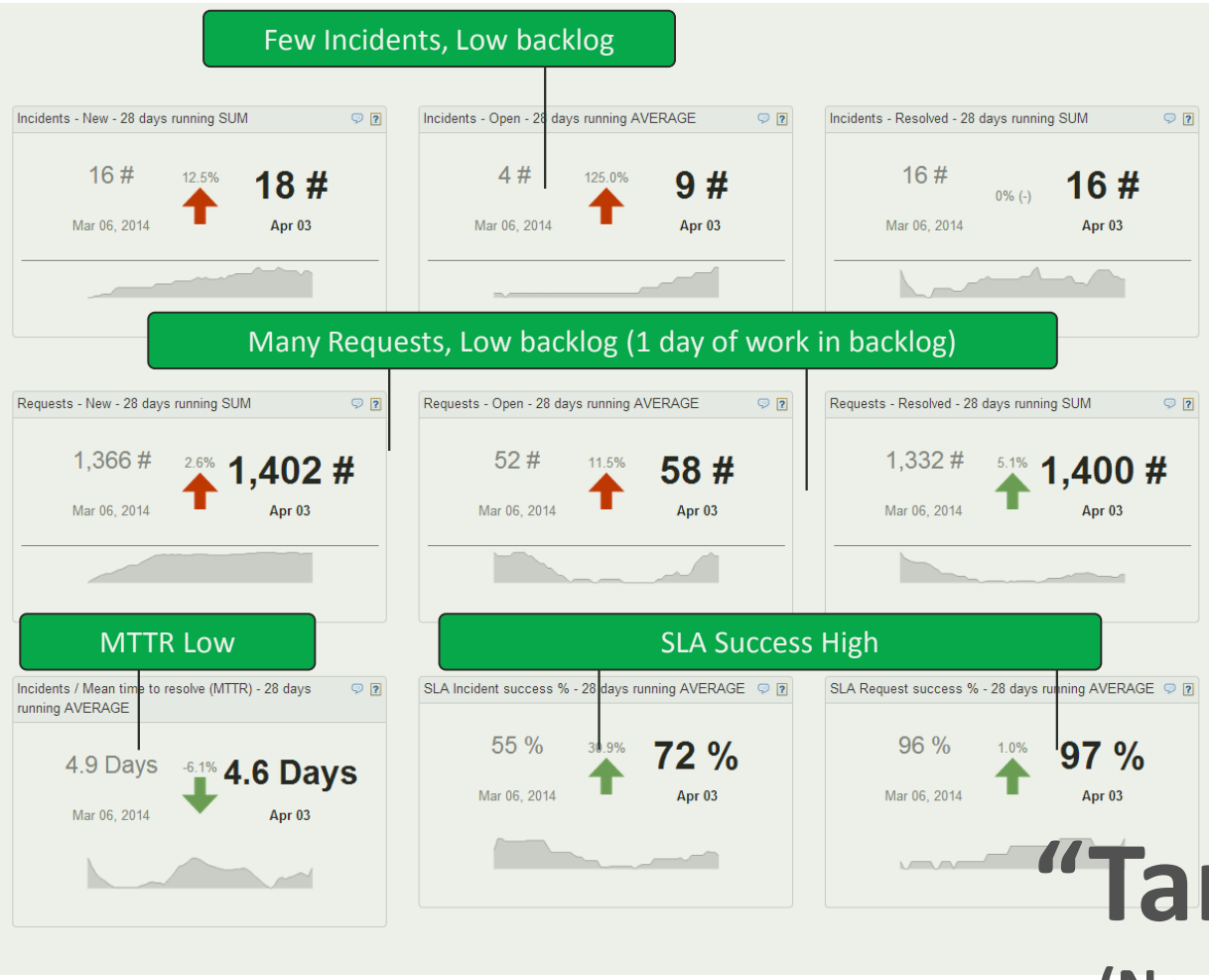
Name	Date	Value
Incidents - Resolved - 7 days running SUM	Apr 21, 2014	**1,328 #**

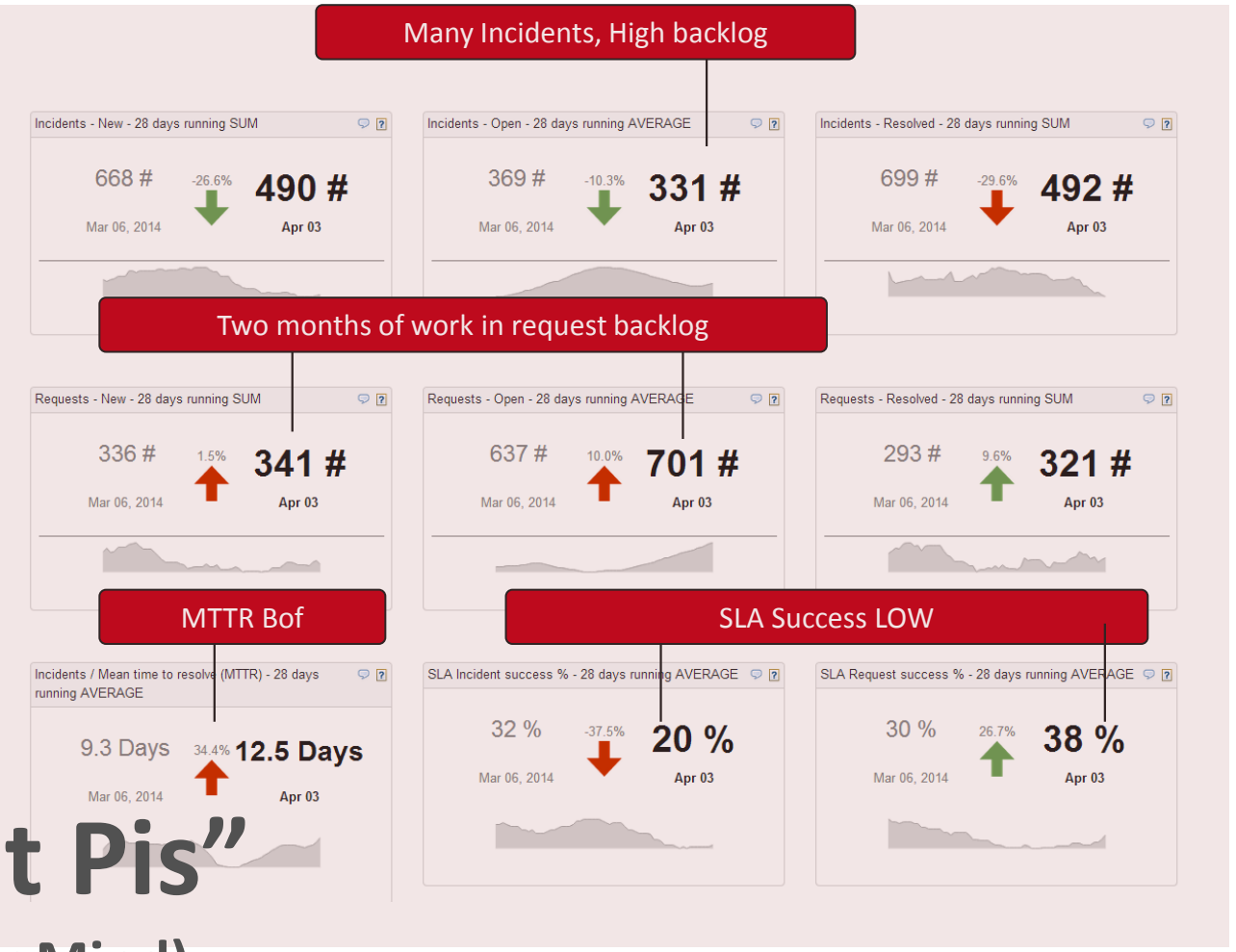


High Level Integration and Data Flow



The Good & The Not So Good



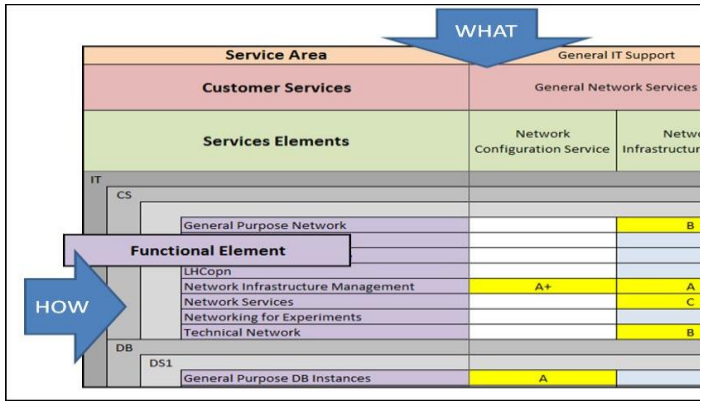


“Tant Pis”

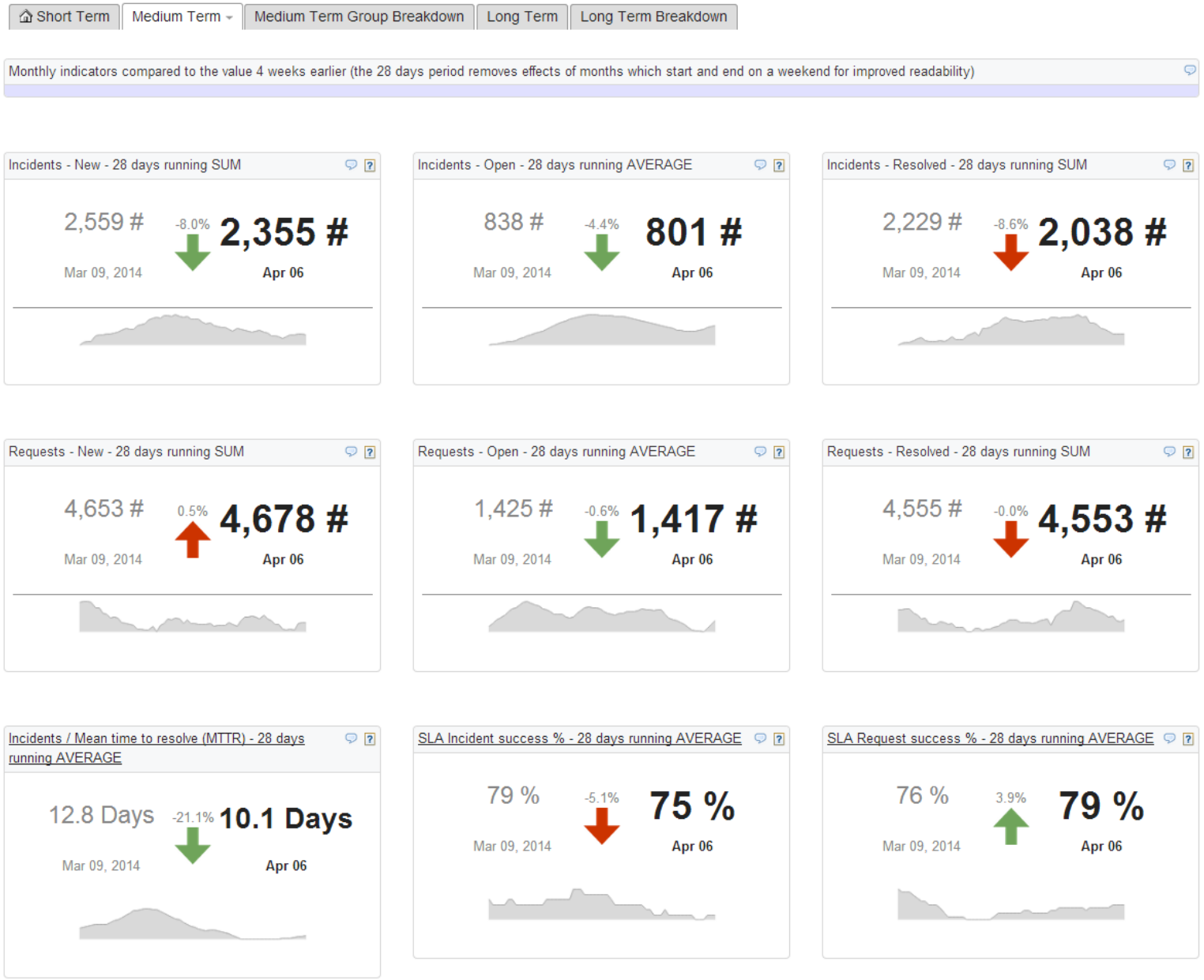
(Never Mind)

Create awareness and drive improvement

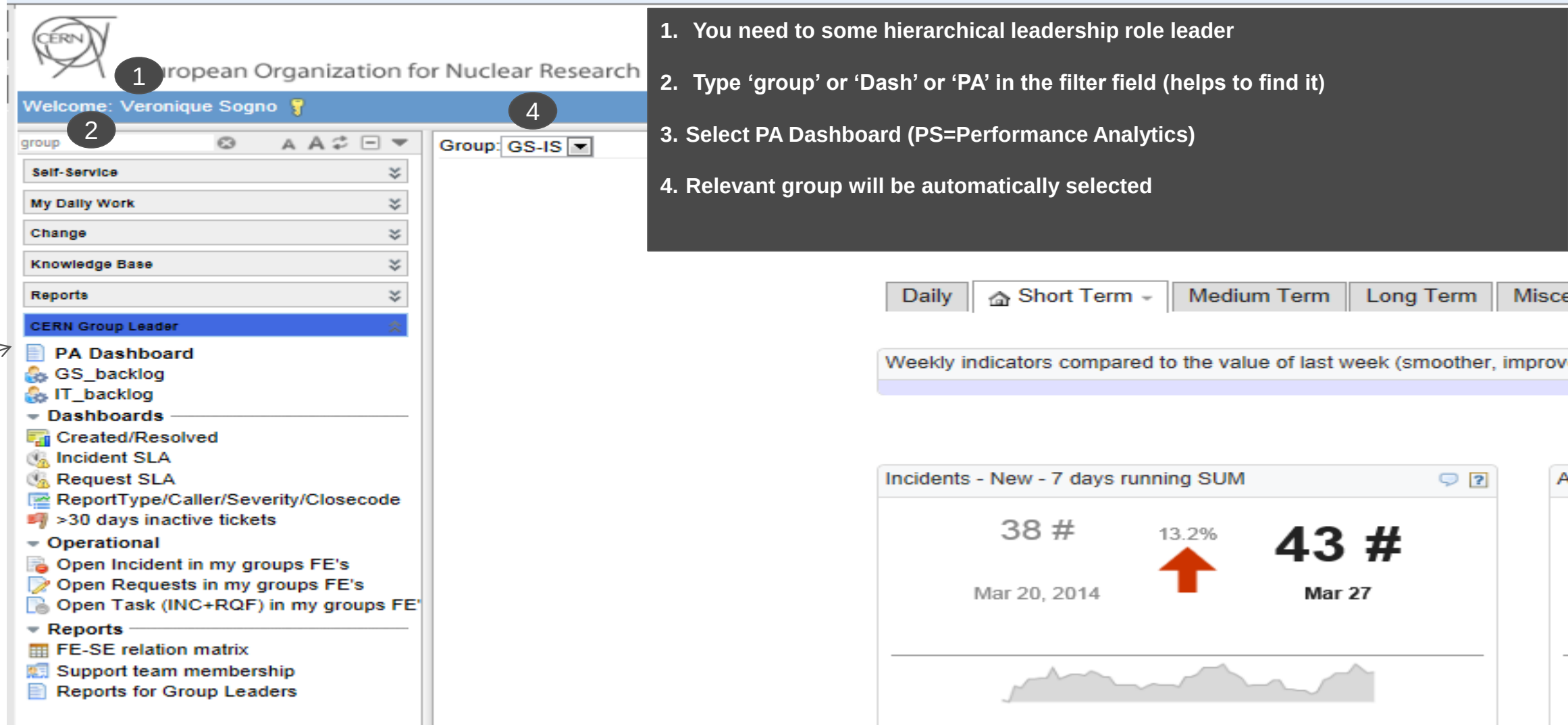
- Dashboards by
  - Service Area, Customer Service and Service Element (What)
  - By Department, Group and Function (How)



- **Finally we can improve ☺**



Role based access



1. You need to some hierarchical leadership role leader
2. Type 'group' or 'Dash' or 'PA' in the filter field (helps to find it)
3. Select PA Dashboard (PS=Performance Analytics)
4. Relevant group will be automatically selected

Organization: Tabs per Period

Weekly indicators compared to the value of last week (smoother, improved readability compared to daily indicators; can be used in weekly meetings)

Incidents - New - 7 days running SUM

78 # Mar 20, 2014 -19.2% 63 # Mar 27

Average number of open incidents in last 7 days

102 # -15.7% 86 #

Incidents - Resolved - 7 days running SUM

112 # -35.7% 72 #

Requests - New - 7 days running SUM

61 # Mar 20, 2014 6.6% 65 # Mar 27

Requests -

Incidents / Mean time to resolve (MTTR) - 7 days running AVERAGE

26.6 Days Mar 20, 2014 -30.1% 18.6 Days Mar 27

SLA Incident success % - 7 days running AVERAGE

51 % Mar 20, 2014 0% (-) 51 % Mar 27

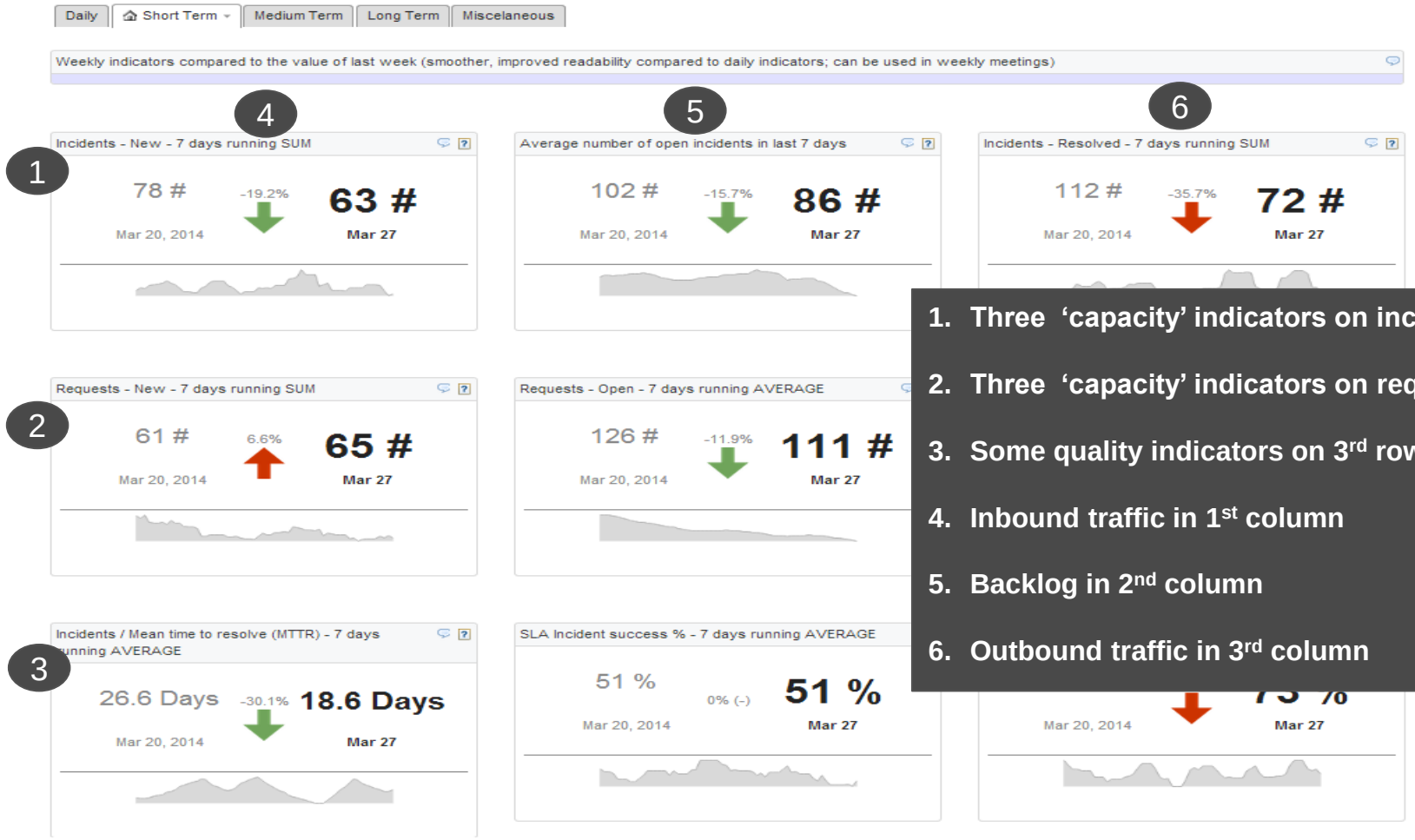
SLA Request success % - 7 days running AVERAGE

82 % Mar 20, 2014 -11.0% 73 % Mar 27

Tabs per period

1. Dayly (‘hairy’, for micro managers)
2. Weekly (good for weekly meetings, 7 days averages)
3. ‘Monthly’ (28 days to eliminate weekend effects)
4. Yearly (longer term trends)
5. Other information on data quality etc…

Organization: Rows and Cols

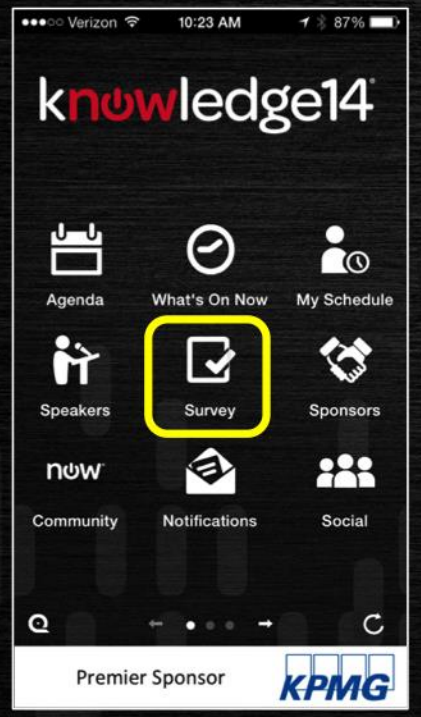


1. Three ‘capacity’ indicators on incidents in 1st row
2. Three ‘capacity’ indicators on requests on 2nd row
3. Some quality indicators on 3rd row
4. Inbound traffic in 1st column
5. Backlog in 2nd column
6. Outbound traffic in 3rd column

Top Takeaways

1. **PA works** (but laborious setup, will hopefully improve with EUREKA)
2. **Reasonable maturity level highly desirable**
   (if necessary consolidate the cake before adding the cherry)
3. **Automatic “outlier” filtering for us a must**

Tell us what you think!



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