Meter iT - Optimize iT

Benefits of Usage Metering in Cloud Solutions

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Today's Agenda

- Introduction
- AWS Cost Optimization
  - AWS offer a menu of choices
- Various Cloud Providers
  - Comparison
- Dig deeper into usage data:
  - CPU, memory and IO
  - Storage
  - Software License
- Combine cloud and non-cloud metering
- Summary and QA

Industry Trends and Economic Backdrop

Public IT cloud services will drive **17%** of IT product spending by 2017.

Source: International Data Corporation (IDC)

Industry Trends and Economic Backdrop

How can we get more out of every dollar spent?

Cloud Billing Challenges

- **Over-provisioning.** IT builds on on-premises standards instead of current use. The benefit of cloud is to add resources as needed. On-premise requires capacity planning for 3-5 years.

- **Forgetting temporary resources**. Test Dev Servers, short term projects, etc. may be provisioned and forgotten, thus creating huge bills.

- **User error in provisioning.** Lack of knowledge or experience in provisioning may lead the IT administrator to select the wrong package, which would drive up costs.

- **Not understanding license implications.** IT administrators must know how applications are licensed. The IT administrator may increase capacity in the cloud platform from the on-premises apps and cause larger costs in licenses such as Oracle or IBM, which licenses on capacity. Or he may put up an SQL instance on a pubic facing server that now requires a different type of license with a much different cost structure.

Cost and Performance

AMAZON WEB SERVICES

Amazon EC2 Instance Purchasing Options

- **"Hardware"**:
  - m1(S, M, L, XL)
  - m3(M, L, XL, XXL)
- **Type of OS:**
- **Purchasing Options:**
  - **On-Demand Instances** – On-Demand Instances let you pay for compute capacity by the hour with no long-term commitments.
  - **Reserved Instances** – Reserved Instances provide you with a significant discount (up to 75%) compared to On-Demand Instance pricing.
  - **Spot Instances** – Spot Instances allow customers to bid on unused Amazon EC2 capacity and run those instances for as long as their bid exceeds the current Spot Price.

Select the right EC2 instance

CloudVertical

Features   Cloud Costs   Stream   Plans & Pricing   Blog   Log in   Signup

Select pricing criteria

Provider [AWS ▾]   Region [US-East (N. Virginia) ▾] @   Currency [USD... ▾]   Price for [hour ▾] @

Current EC2 AWS compute costs

EC2 Pricing

Instances [Summary ▾]   Platform [Linux/UNIX ▾]   Reserved offering [1 year/medium ▾]   ☐ Reserved prices include upfront amortization @

Instance type	CPU	RAM	On-demand	Spot @	Reserved
Second Generation Medium (m3.medium)	1	3.75	$0.070	N/A	$0.027
Second Generation Large (m3.large)	2	7.5	$0.140	N/A	$0.055
Second Generation Extra Large (m3.xlarge)	13	15	$0.280	N/A	$0.109
Second Generation Double Extra Large (m3.2xlarge)	26	30	$0.560	N/A	$0.219
Small (m1.small)	1	1.7	$0.044	min $0.0270 < $0.700 < max $3.000	$0.015
Medium (m1.medium)	2	3.75	$0.087	min $0.0380 < $0.038 < max $3.000	$0.031
Large (m1.large)	4	7.5	$0.175	min $0.1080 < $0.108 < max $0.120	$0.061
Extra Large (m1.xlarge)	8	15	$0.350	min $0.2160 < $0.216 < max $0.900	$0.123
Second Generation High-CPU Large (c3.large)	7	3.75	$0.105	N/A	$0.039

How to Save Costs in your AWS Billing

Table 1: Savings Comparison of 1 Year Reserved Instances over On-Demand Instances

Utilization Rate	On-Demand	1 Year Medium Utilization	1 Year Heavy Utilization
10%	$122.98	-234%	-525%
20%	$245.95	-86%	-212%
30%	$368.93	-37%	-108%
40%	$491.90	-13%	-56%
50%	$614.88	2%	-25%
60%	$737.86	12%	-4%
70%	$860.83	19%	11%
80%	$983.81	24%	22%
90%	$1,106.78	28%	31%
100%	$1,229.76	31%	38%

Utilization Rate = % of time your instance is running; Prices shown for US East Region as of July 20th 2014

As shown in Table 1, if your Amazon EC2 instance is running at more than 50% utilization or more than 6 months over a 1 year term, you can achieve savings over **On-Demand instances**. Using **Heavy Utilization Reserved Instances**, you can save up to 38% over a 1 year term.

How to Save Costs in your AWS Billing

Table 2: Savings Comparison of 3 Year Reserved Instances over On-Demand Instances

Utilization Rate	On-Demand	3 Yr. Medium Utilization	3 Yr. Heavy Utilization
10%	$368.93	-85%	-297%
20%	$737.86	-8%	-98%
30%	$1,106.78	18%	-32%
40%	$1,475.71	31%	1%
50%	$1,844.64	38%	21%
60%	$2,213.57	43%	34%
70%	$2,582.50	47%	43%
80%	$2,951.42	50%	50%
90%	$3,320.35	52%	56%
100%	$3,689.28	54%	60%

Utilization Rate = % of time your instance is running; Prices shown for US East Region as of July 20th 2014

As shown in table 2, if our Amazon EC2 instance is running at more than 30% utilization or more than 10.8 months over a 3 year term, you can achieve savings over **On-Demand instances**. Using **Heavy Utilization Reserved Instances**, you can save up to 60% over a 3 year term.

AWS Sample Cloud Invoice

Greetings from Amazon Web Services,

We're writing to provide you with an electronic invoice for your use of AWS services. Your account will be charged $ 136.38. Additional information regarding your bill, individual service charge details, and your account history are available on the Account Summary Page.

Account ID	Invoice No	Statement Date	Payment Due Date
	7758303	09/03/2010	09/03/2010

Bill To	Service Provider
Attn. Jeff Barr	Amazon Web Services LLC
	410 Terry Avenue North
Sammamish, WA 98074, US	Seattle WA 98109-5210

Billing Period: Aug 1 - Aug 31, 2010

Service Name	Amount Due
Amazon CloudFront	$ 1.27
AWS Data Transfer	$ 1.59
Amazon Simple Storage Service	$ 41.34
Amazon SimpleDB	$ 6.75
Amazon Simple Notification Service	$ 0.00
Amazon Elastic Compute Cloud	$ 85.13
Amazon Simple Queue Service	$ 0.00
Taxes*:	$ 0.00
Total due in US Dollars	$ 136.38

* This is not a VAT invoice

All web services are sold by Amazon Web Services LLC.
The above charges include charges incurred by your account as well as by all accounts you are responsible for through Consolidated Billing
For customers who need to remit consumption tax in Japan, the Account Summary Page provides details of services from Japan.

1

Other components in your AWS Bill

CloudVertical

Features   Cloud Costs   Stream   Plans & Pricing   Blog   Log in   Signup

Select pricing criteria

Provider [AWS ▼]   Region [US-East (N. Virginia) ▼] ⊘   Currency [USD.. ▼]   Price for [hour ▼] ⊘

Storage (Instance storage, EBS and S3)

EBS Standard	$0.050 per GB-month (provisioned)
EBS PIOPS	$0.125 per GB-month (provisioned)
EBS Requests	$0.050 per million
EBS Provisioned IOPS	$0.100 per IOPS-month
EBS Snapshot	$0.095 per GB-month (stored)
S3 Standard	$0.085 per GB-month (stored)
S3 Reduced Redundancy	$0.068 per GB-month (stored)
Glacier	$0.010 per GB-month (stored)

Network (Data transfer and network appliances)

Data IN	FREE
Data OUT	$0.120 per GB
Data within AZ	FREE
Data within Region	$0.010 per GB
Load Balancer	$0.025 per hour
Load Balancer Traffic	$0.008 per GB
IP Address Per Instance	FREE
Extra or Unused IP Address	$0.005 per hour
Managed Data (EIP/ELB)	$0.010 per GB

Other components in your AWS Bill

Amazon S3   Scalable storage in the cloud

Amazon Glacier   Low-cost archive storage in the cloud

Amazon EBS   Persistent block storage volumes for Amazon EC2 virtual machines

Provider [AWS ▼]   Region [US-East (N. Virginia) ▼] ⊙   Currency [USD.. ▼]   Price for [hour ▼] ⊙

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Amazon's Simple Monthly Calculator

Standard Cost Optimization:

COMPARING CLOUD PROVIDERS

CloudVertical Cloud Price Comparison - Linux

CloudVertical

Features   **Cloud Costs**   **Stream**   **Plans & Pricing**   **Blog**   **Log in**   **Signup**

Select pricing criteria

Provider [Comparison ▾]   Region [US ▾] ⊚   Currency [USD... ▾]   Price for [hour ▾] ⊚

Base provider [Amazon ▾]   Platform [Linux ▾]

Instance Type	AWS	AWS Spot	AWS Reserved [1 year/... ▾]	Google Compute	Windows Azure	HP Cloud	Rackspace
Second Generation Medium (1CPU, 3.75GB) (m3.medium)	$0.070	N/A	$0.027 (-61.43%)	$0.063 (-10%)	$0.094 (34%)	$0.120 (71%)	$0.160 (129%)
Second Generation Large (2CPU, 7.5GB) (m3.large)	$0.140	N/A	$0.055 (-60.71%)	$0.126 (-10%)	$0.188 (34%)	$0.240 (71%)	$0.320 (129%)
Second Generation Extra Large (13CPU, 15GB) (m3.xlarge)	$0.280	N/A	$0.109 (-61.07%)	$0.252 (-10%)	$0.376 (34%)	$0.450 (61%)	$0.680 (143%)
Second Generation Double Extra Large (26CPU, 30GB) (m3.2xlarge)	$0.560	N/A	$0.219 (-60.89%)	$0.504 (-10%)	$0.500 (-10.71%)	$0.900 (61%)	$1.360 (143%)
Small (1CPU, 1.7GB) (m1.small)	$0.044	$0.700 (1491%)	$0.015 (-65.91%)	$0.032 (-27.27%)	$0.047 (7%)	$0.060 (36%)	$0.080 (82%)
Medium (2CPU, 3.75GB) (m1.medium)	$0.087	N/A	$0.027 (-68.97%)	$0.063 (-27.59%)	$0.094 (8%)	$0.120 (38%)	$0.160 (84%)

CloudVertical Cloud Price Comparison - Windows

CloudVertical

Features | Cloud Costs | Stream | Plans & Pricing | Blog | Log in | Signup

Select pricing criteria

Provider [Comparison ▾] Region [US ▾] ⊚ Currency [USD... ▾] Price for [hour ▾] ⊚

Base provider [Amazon ▾] Platform [Windows ▾]

Instance Type	AWS	AWS Spot	AWS Reserved 1 year/... ▾	Google Compute	Windows Azure	HP Cloud	Rackspace
Second Generation Medium (1CPU, 3.75GB) (m3.medium)	$0.133	N/A	$0.064 (-51.88%)	N/A	$0.154 (16%)	$0.180 (35%)	$0.200 (50%)
Second Generation Large (2CPU, 7.5GB) (m3.large)	$0.266	N/A	$0.129 (-51.5%)	N/A	$0.308 (16%)	$0.360 (35%)	$0.580 (118%)
Second Generation Extra Large (13CPU, 15GB) (m3.xlarge)	$0.532	N/A	$0.258 (-51.5%)	N/A	$0.616 (16%)	$0.720 (35%)	$0.800 (50%)
Second Generation Double Extra Large (26CPU, 30GB) (m3.2xlarge)	$1.064	N/A	$0.516 (-51.5%)	N/A	$0.660 (-37.97%)	$1.440 (35%)	$1.600 (50%)
Small (1CPU, 1.7GB) (m1.small)	$0.075	$0.045 (-40%)	$0.037 (-50.67%)	N/A	$0.077 (3%)	$0.090 (20%)	$0.100 (33%)
Medium (2CPU, 3.75GB) (m1.medium)	$0.149	N/A	$0.064 (-57.05%)	N/A	$0.154 (3%)	$0.180 (21%)	$0.200 (34%)
Large (4CPU, 7.5GB) (m1.large)	$0.299	N/A	$0.129 (-56.86%)	N/A	$0.308 (3%)	$0.360 (20%)	$0.580 (94%)

A menu of tools to monitor costs

Imagine: Host/instance and total usage is not enough

- I want to know which
  - Applications
  - Users
  - Projects
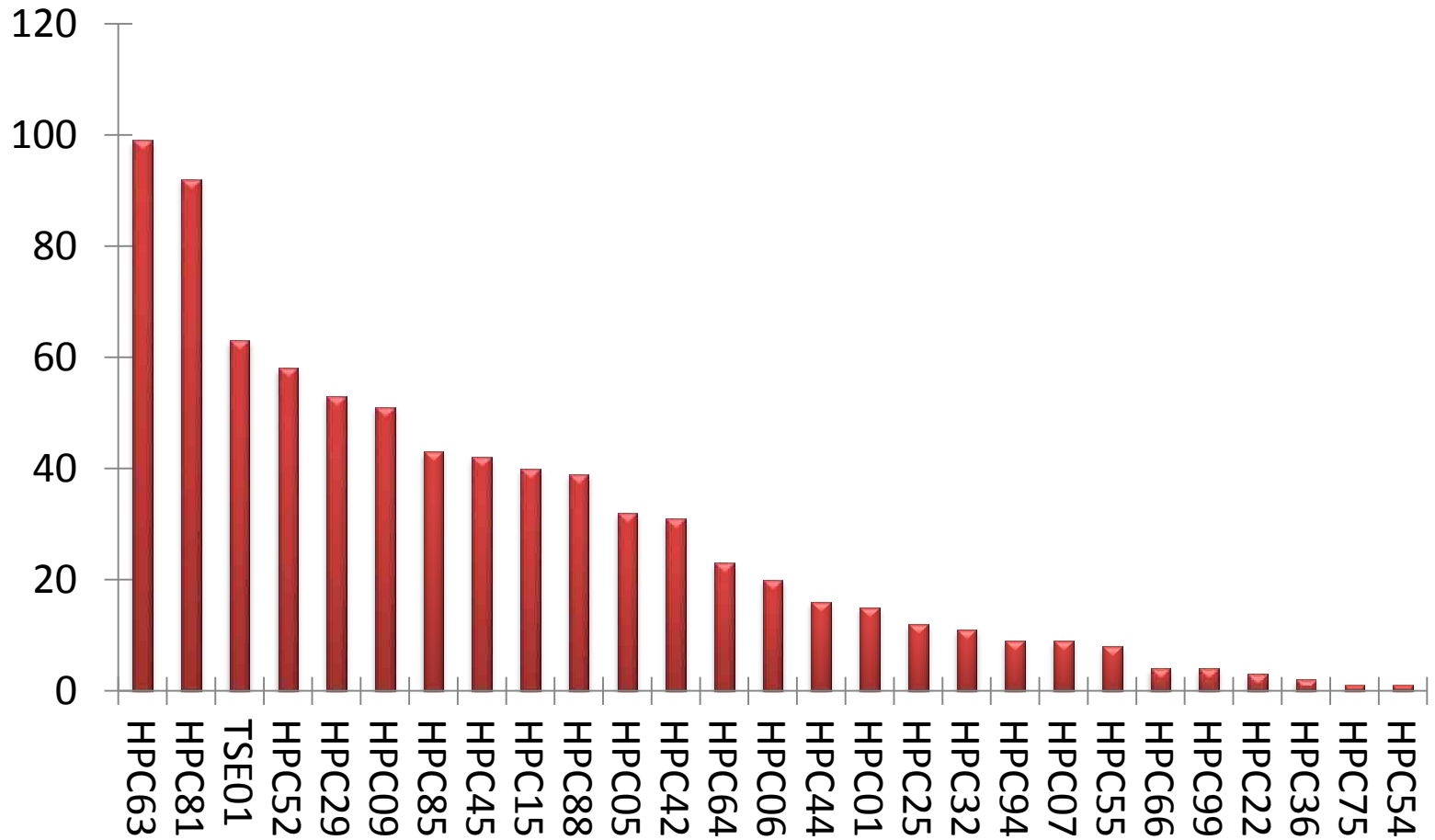 - Departments
  - Etc…
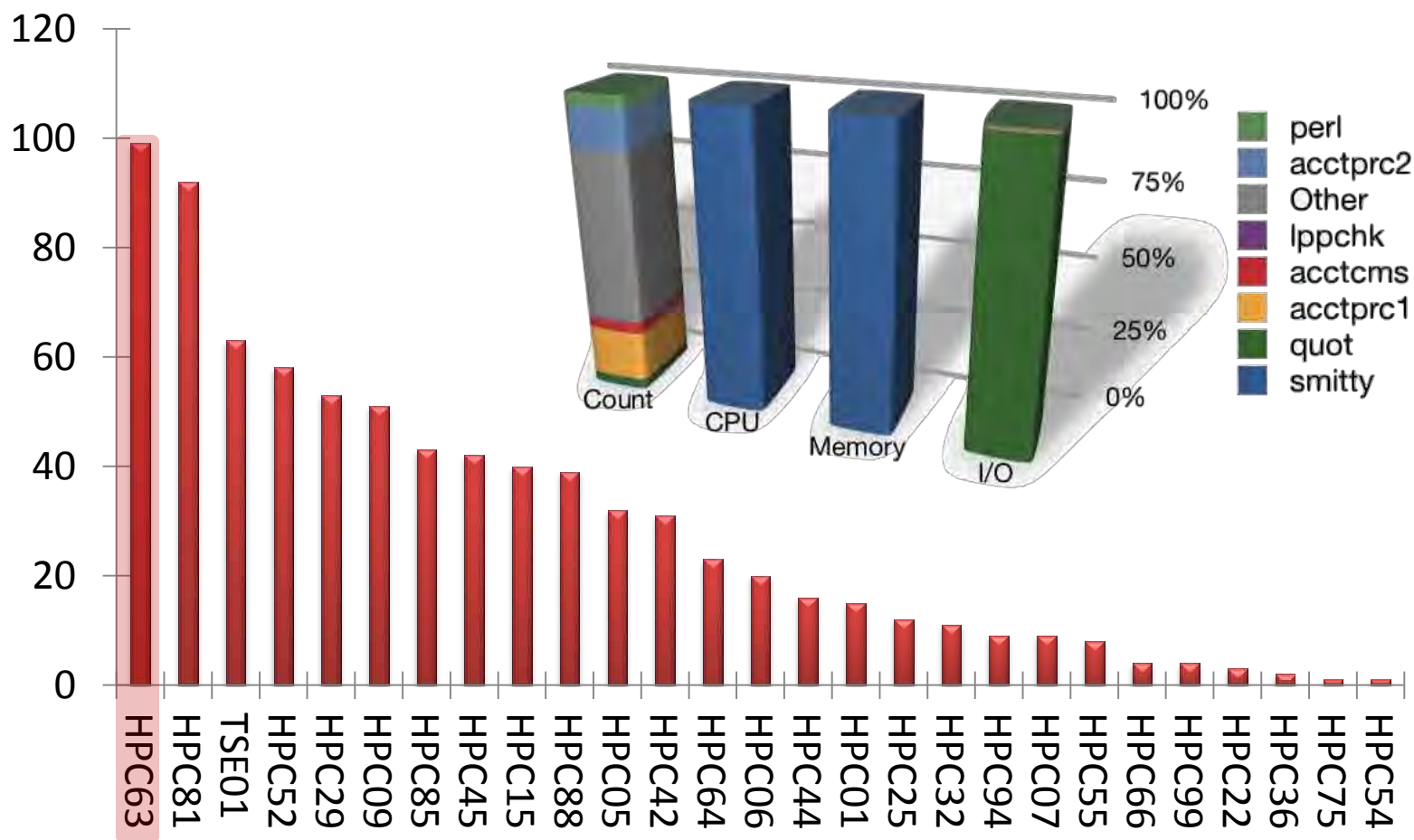
  …are consuming the resources.
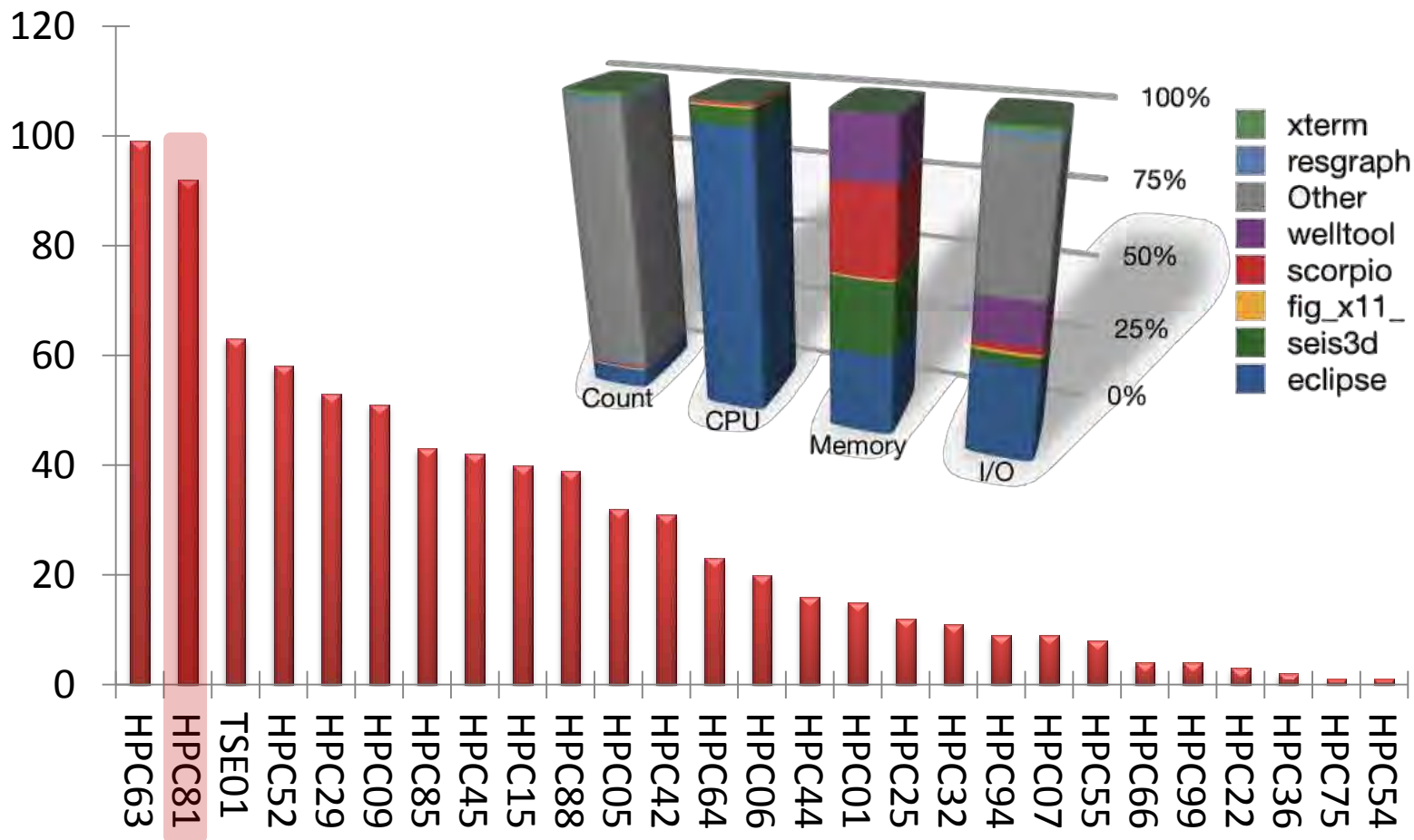
Dig Deeper into Usage Data

CPU-usage in percent

CPU-usage in percent

CPU-usage in percent
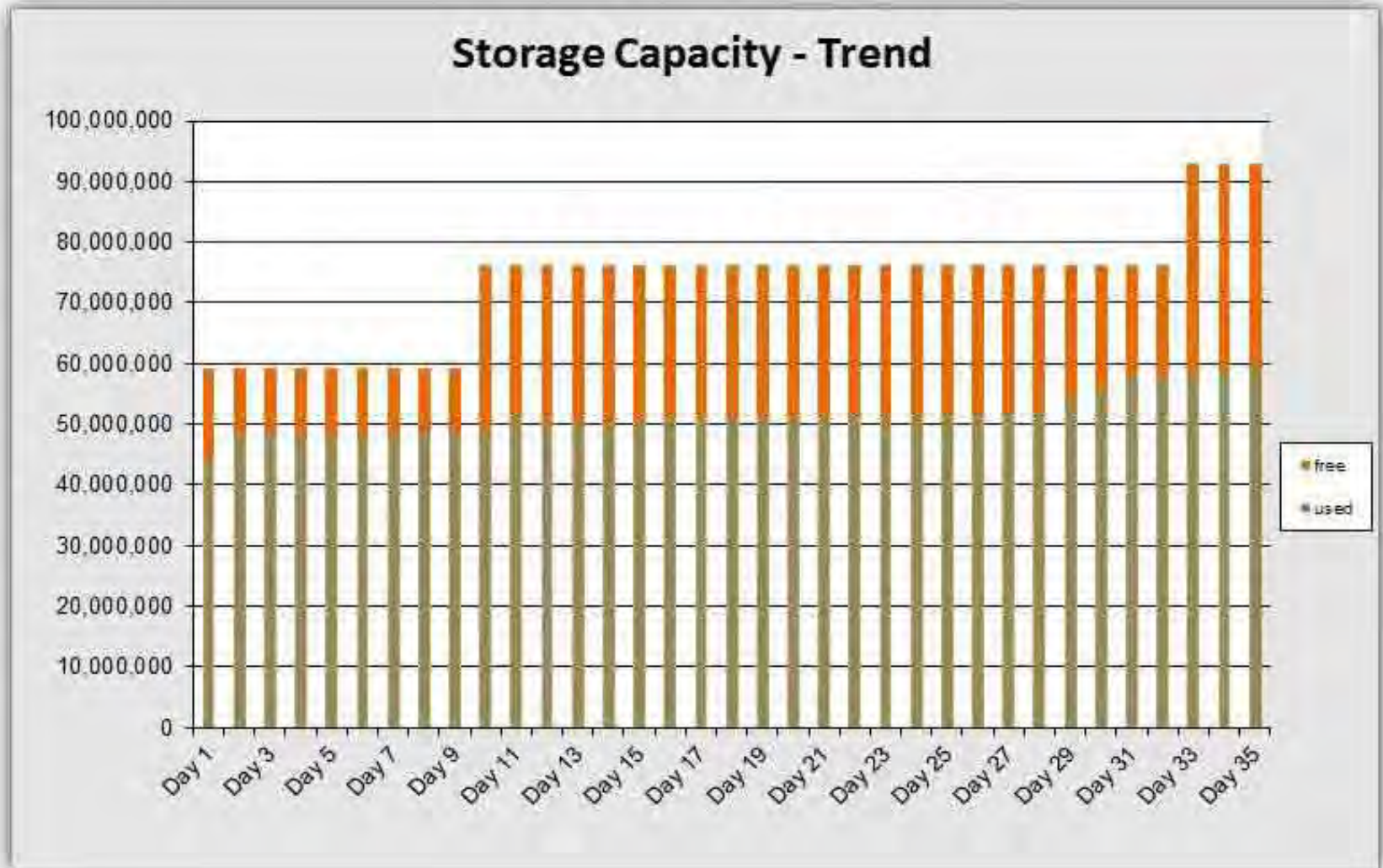
IT Usage Reports

Metering Reports for Storage Resources

Storage Capacity Trend

File Types vs. File Age

File Types vs. File Age
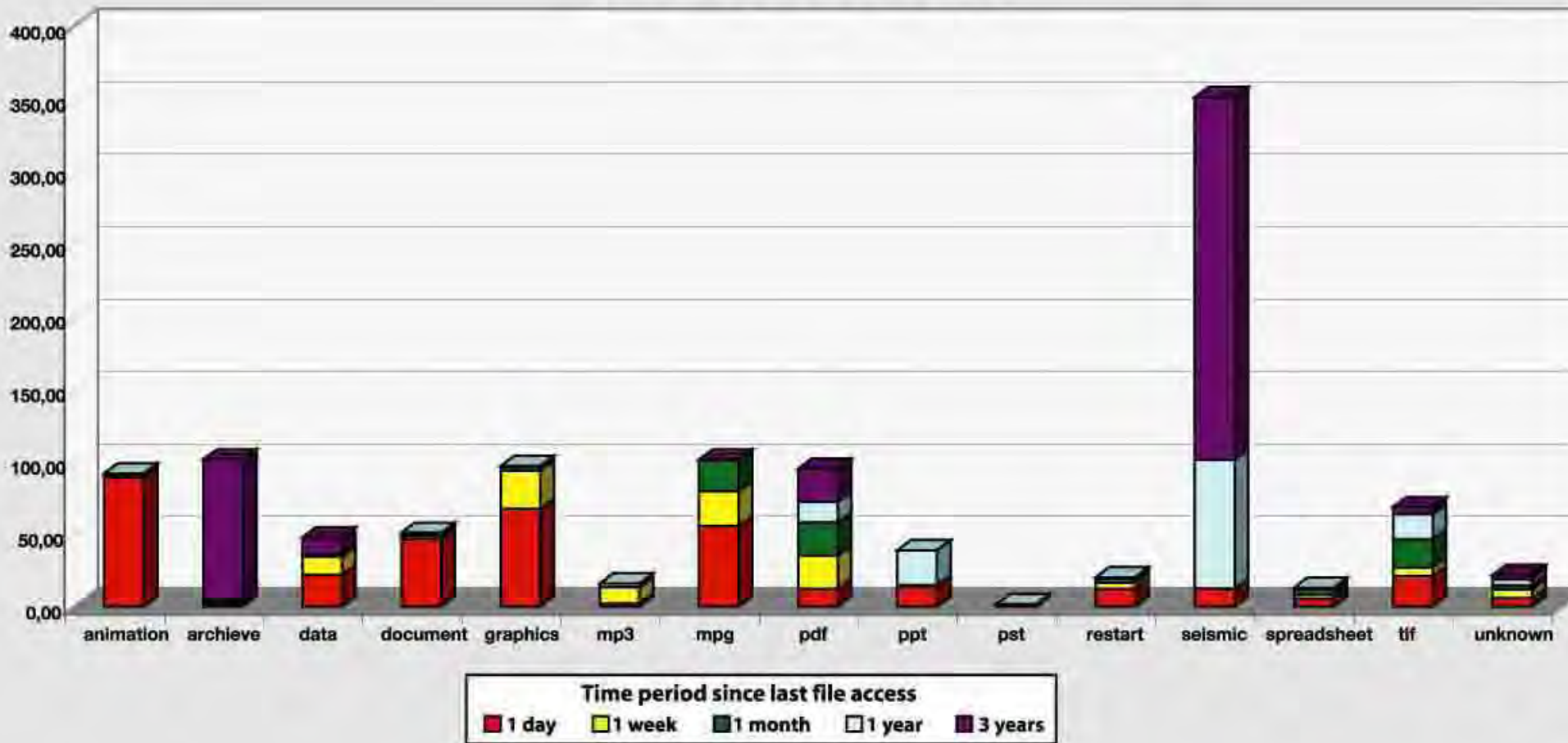
Time period since last file access
- 1 day
- 1 week
- 1 month
- 1 year
- 3 years

Various Software Licensing Methods

- **Device** – Also known as 'machine based'. License is locked to an individual machine.

- **User** – License is assigned to a named user who must be identified to ensure the license agreement is validated and the license terms are adhered to.

- **Networked (WAN & LAN)** – A license that covers machines that is on the same network infrastructure. This is either in Wide Area Network or a Local Area Network format. Also known as 'concurrent license'.

- **Subscription (user or device)** – License only available during time of subscription. No rights to use it pre or post agreement dates (unless agreement renewed).

- **Cloud based credits' subscription** – Cloud credits are the unit of measurement required to perform certain tasks or rights to run certain applications provided by the vendor. Hosted in the cloud and are usually a subscription model.

- **General Public License (GPL)** – License and software available for free. Allows users to use, share, copy and modify the software. Separate legal metrics to 'freeware'.

- **Client Access License (CAL, includes both device and user metrics)** – Allows users to connect to server software to use the software's features/functions.

- **Capacity Based License** - License is based on the capacity of the CPU/Hard Drive or other hardware configuration elements.

- **Font licenses** – Font specific license. Related to the fonts used online or internally by an organization.

- **Freeware** – License requires no purchase but the copyrights are still held by the developer. Developer can sell the software in the future and does not distribute the source code.

Source: ITAssetManagement.net

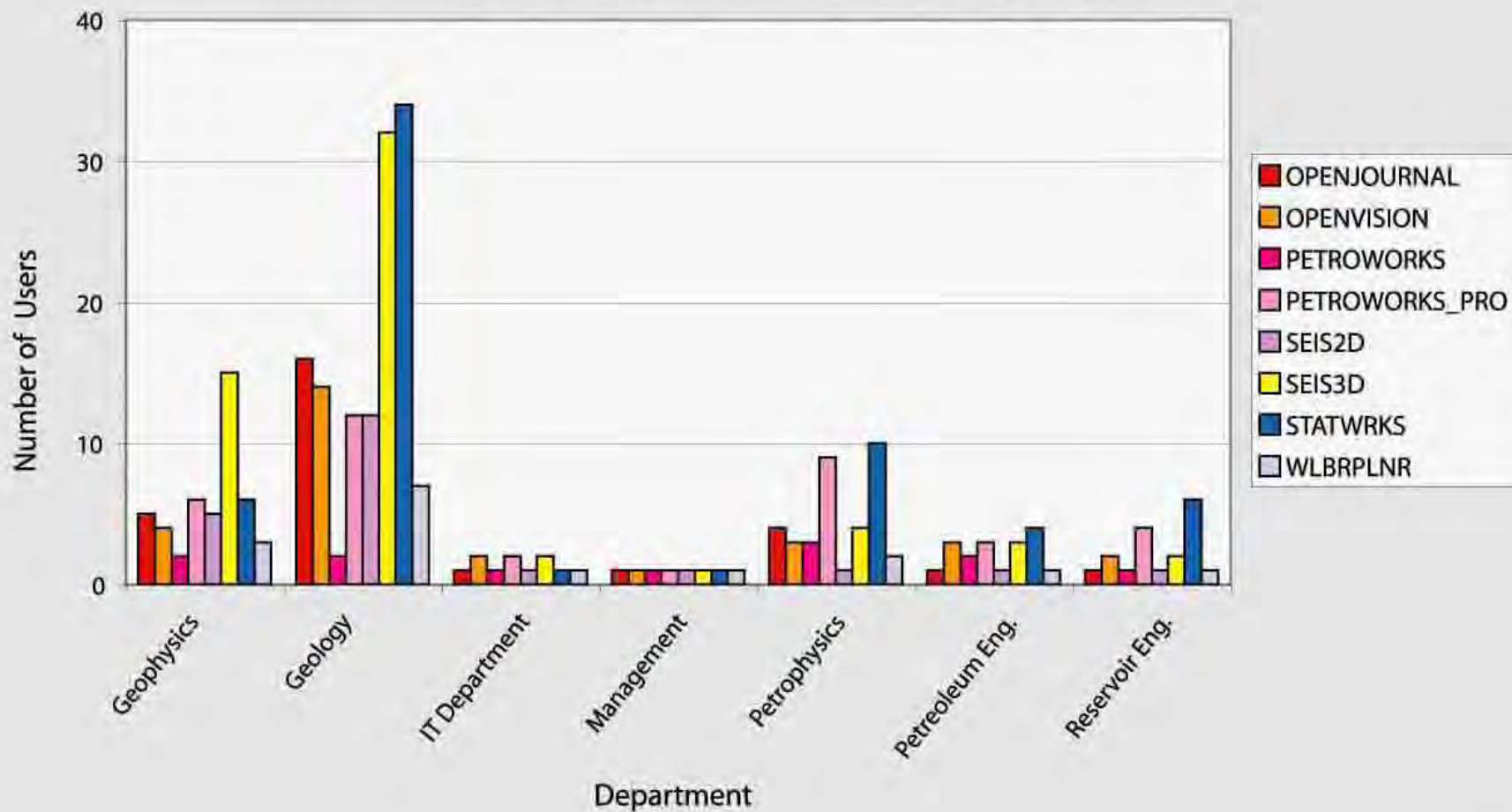# Who is using the software?

Max Concurrent/Days Since Last Use for: *shou01lmkr21;lgcx, shou01lmkr21;licsrv*
**Query Period:** *2011-08-01 00:00 to 2011-09-28 00:00*

Application Name	User Id	User Full Name	Max In Use	Elapsed Time	Days Since Last Used
DATALOAD	bap010	James Moore	1	1.17 h	5
	cbw005	Kim Mills	1	56.00 h	15
	cnw009	Russell Billington	1	7.67 h	18
	dam004	Helen Dunham	1	47.50 h	14
	dhs013	Ricardo Corry	1	165.42 h	41
	dkr023	William Bonner	1	0.17 h	39
	gol011	Joan Bryant	1	0.17 h	20
	kbu026	Jeffery Hand	1	0.50 h	18
	ldu015	Adriene Bland	1	2.50 h	41
	nja044	Kimberly Banister	1	22.75 h	1
	nav010	Kevin Levesque	1	0.17 h	25

Split Usage on Departments

Distinct Users for OpenWorks Features by Department

Perceived Use vs Actual Use

Active vs Inactive use of selected applications
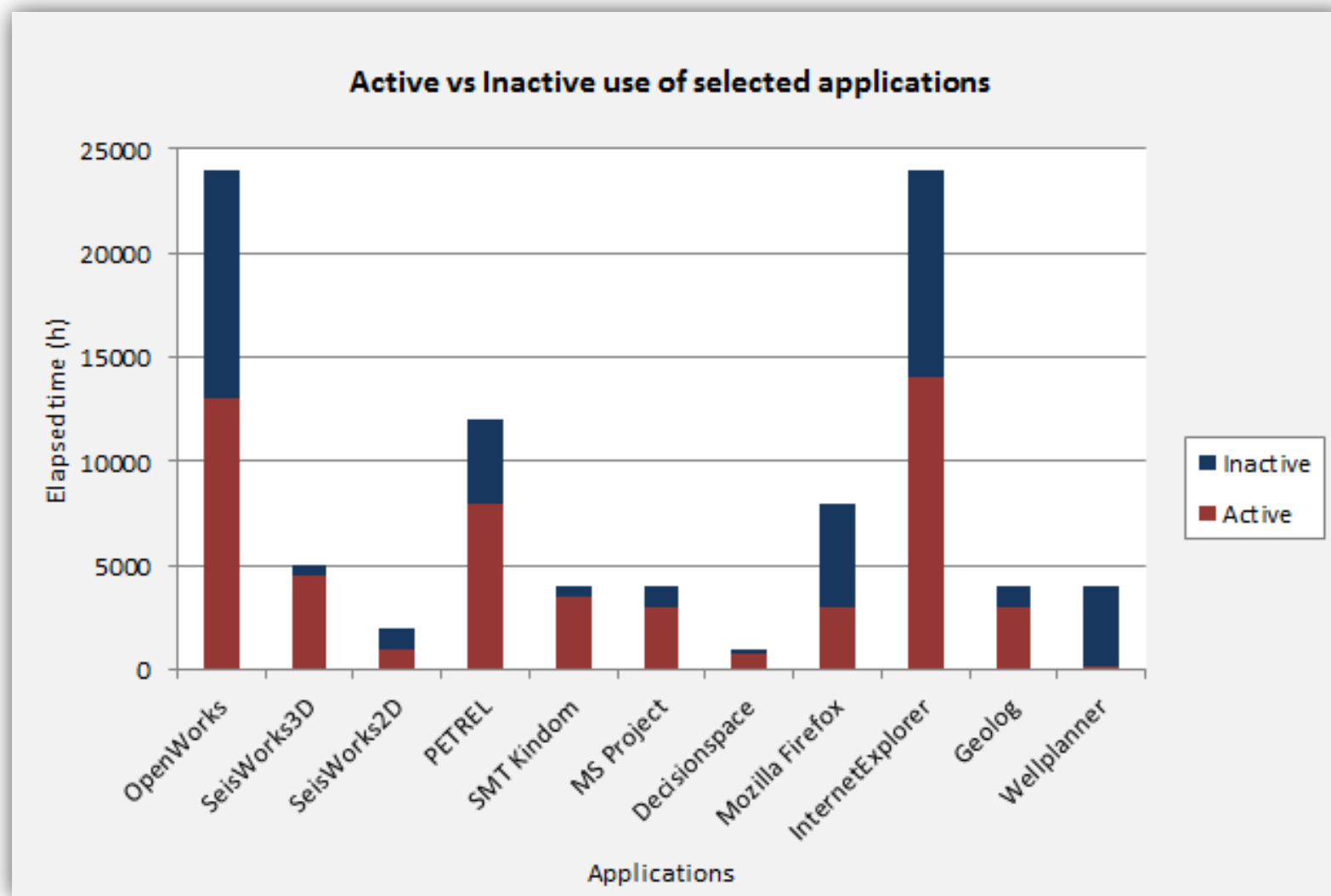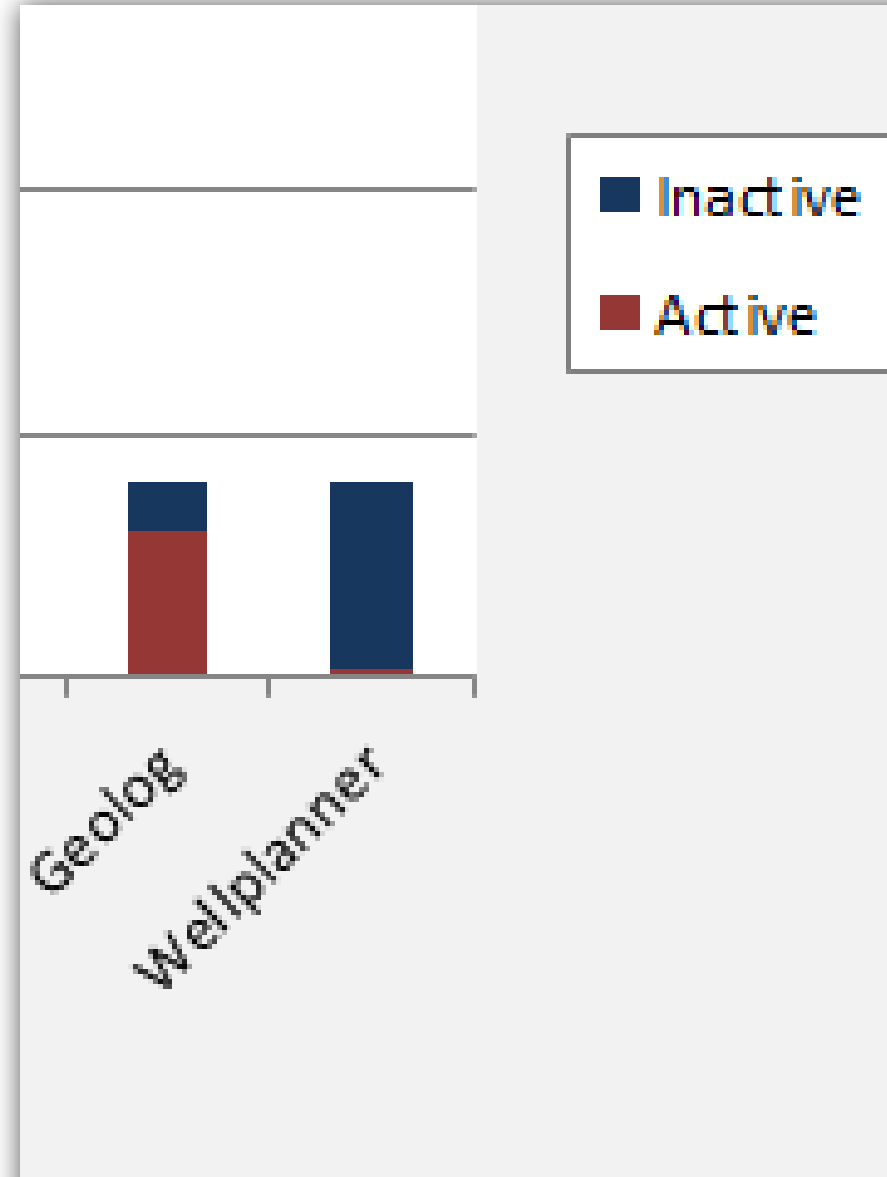
Perceived Use vs Actual Use

- Geolog and Wellplanner have both been used for about the same about of time.

- Whereas Geolog has been actively used about 80% of its time,

- Wellplanner is only been actively used 3% of its time!

Metering and Optimization:
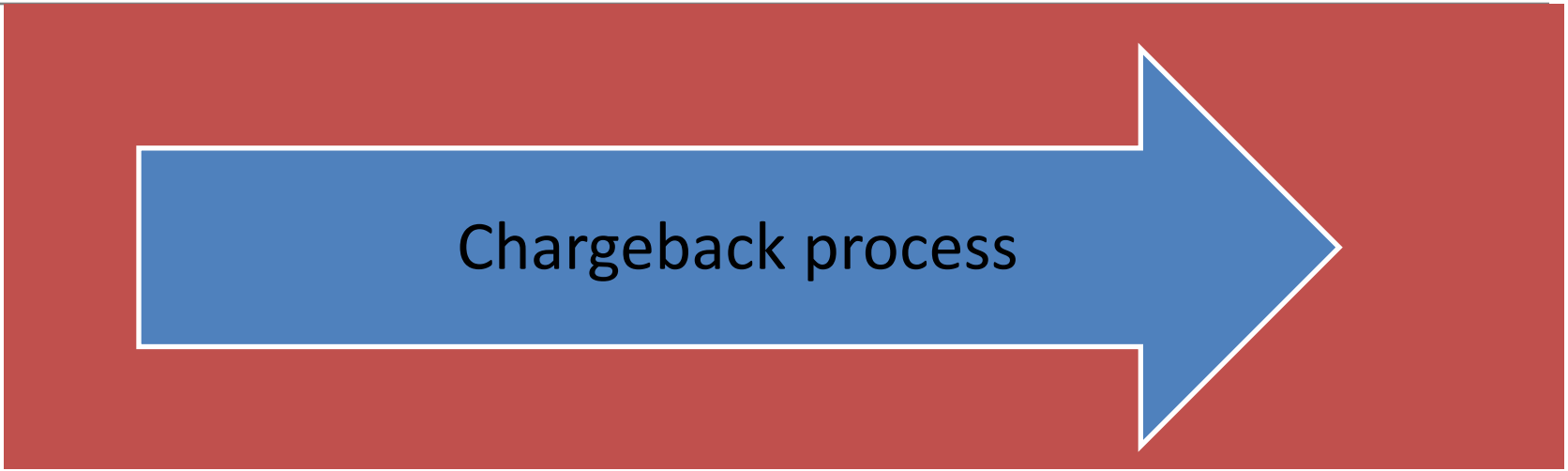
MIXED CLOUD AND ON-PREMISES

Why not just echo the cloud bill to the end user?

- Charge for internal and external usage at actual cost:
  - What if using internal resources are cheaper for the company but more expensive for the end user?
    - Equipment and Software have already been bought, and need to be paid for anyway!

- Charge only for "cloud usage"
  - Fixed price for all – only cloud users will be billed per use.
    - The unlucky one being thrown out in the cloud, has to pay, while the others get a "free lunch".

«Do things as simple as possible, but not simpler.»
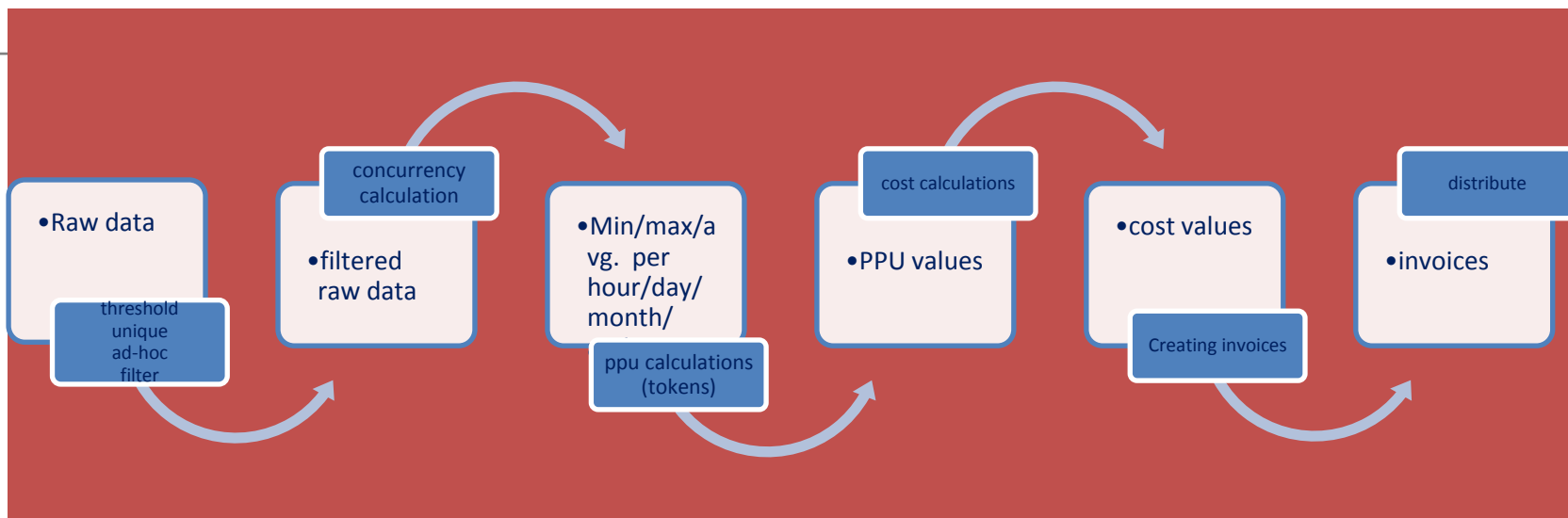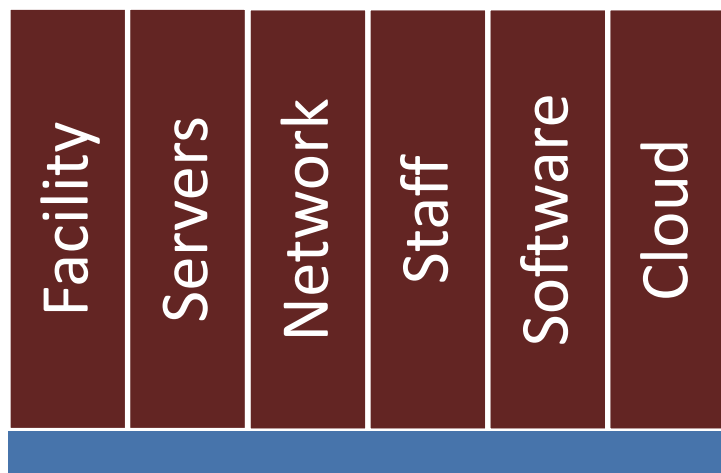
Make a unified chargeback process

![Open iT logo]

Process flow

- Raw data
  - threshold unique ad-hoc filter
- filtered raw data
  - concurrency calculation
- Min/max/avg. per hour/day/month/
  - ppu calculations (tokens)
- PPU values
  - cost calculations
- cost values
  - Creating invoices
- invoices
  - distribute

Cost Generators

Facility	Servers	Network	Staff	Software	Cloud

Cost Centers

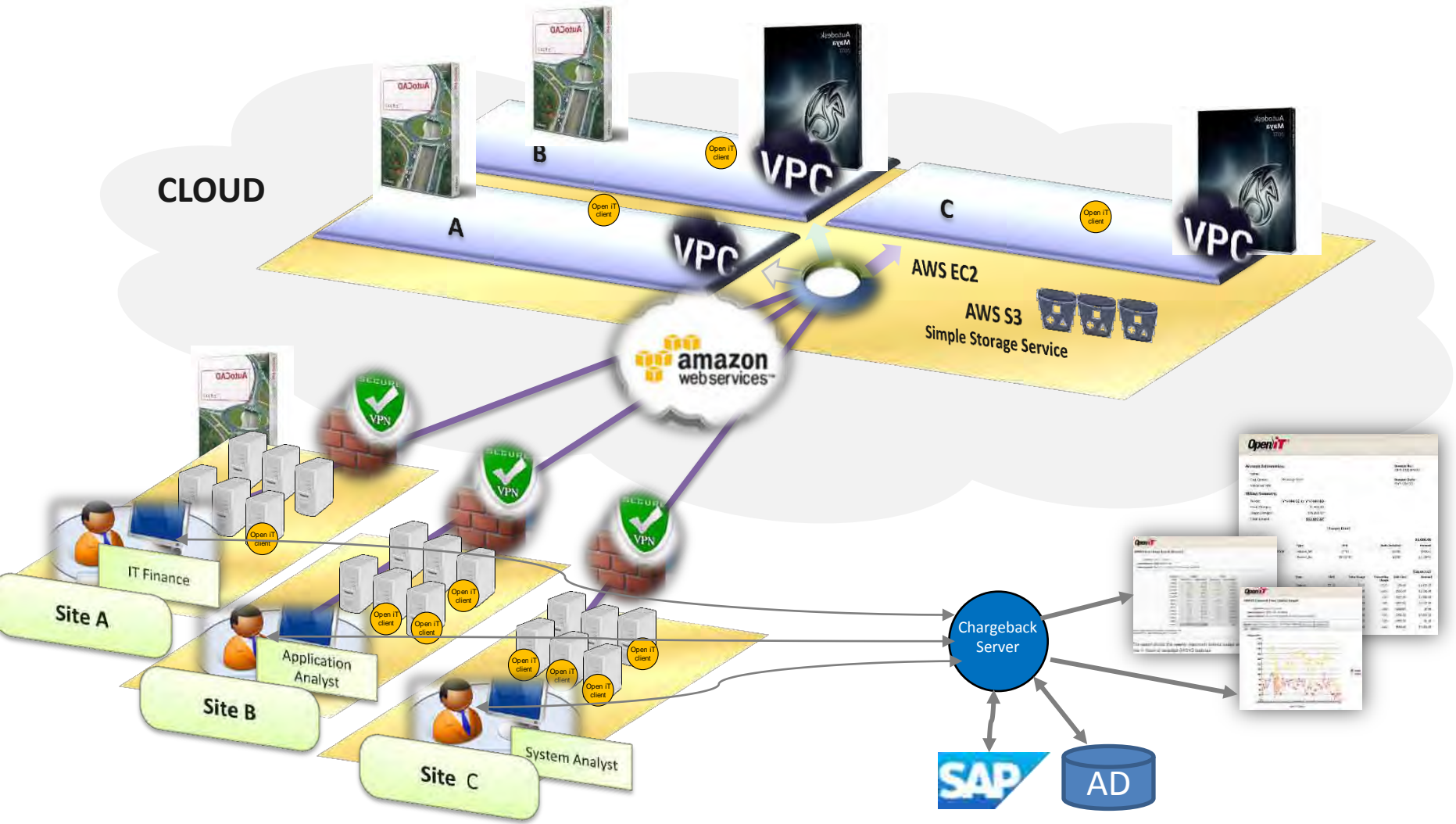| Departments	Projects	Companies

Integrated Cloud/Non Cloud Reporting

Conclusion

- Know your option

- Don't over-provision

- Cloud Metering and Chargeback:
  - Add metering agent to your cloud instances, just like if they where on-premises.
  - Integrate it with your enterprise chargeback model.
  - Advantages: You will enable your own policy of the cloud usage, enforcing behaviors that gain the whole enterprise.

- Start now
  - Start collecting data early
  - Showback before Chargeback
  - Make sure to have enough flexibility in your model to be able to adjust as you go.

![Open iT logo]

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Q & A