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Internet charging and access

A charging addiction and the road to rehab

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The Addiction

- Hello, My name is Tim Brown, from CSU.
  - Audience Participation "Hello Tim"
- I am an "Internet Traffic Charging Alcoholic"
- It has been 146 days since I have made an outrageous profit from Staff and Students internet traffic charges.

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The Addiction

- As of Early February this year, CSU charging the following for internet traffic.
  - Cost per Gig
    - Staff $10
    - Students $11 inc GST

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The Addiction

- In addition to this CSU also charge a network access fee (A network TAX if you will)
  - Staff
    - Any Staff device connecting to the CSU network is charged $24 per month for the privilege. This includes PCs, Laptops, Printers, Building management devices, IP cameras.
    - If it gets an IP, IT get the cash
    - Netreg – No $, No IP
  - On Campus Residential Students
    - Students with an on campus accommodation room are supplied with a data point (100Mb/s) and a Voip Phone. They get no phone call credit or any data credit
    - For this we charge them $240 per year

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The Addiction

- So IT at CSU is an enormous Jabba the Hutt like creature sucking up all cash before it

The Addiction

- Well, sort of. Like a lot of things we need to take a look behind the scenes to understand how we got to where we are
  - Queue going back in time effect

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Once upon a time

- In the past IT was given a Communications budget to cover operating and maintenance costs for the CSU communications infrastructure
- When major upgrades or projects came up, IT would go cap in hand to the appropriate committee and ask for the money

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Once upon a time

- A lot of financial modelling was carried out, probably by a guy who looks like this

- A decision was made to change this arrangement
- The IT communications account was setup to be an Enterprise code (like a business)

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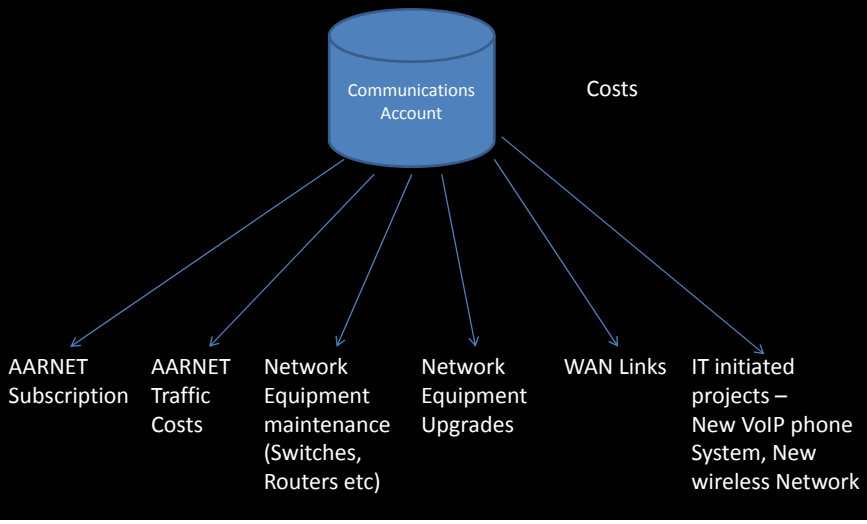
Once upon a time

IT were now responsible for funding the communications infrastructure



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Once upon a time

- That's all well and good.
- IT pay for the comms stuff, but this will now no longer be directly centrally funded.
- So how do IT pay for this?
  - It was decreed that IT will now be charging a rental amount (Network Tax) for all connected staff devices
  - A communications levy will be charged to all on campus accommodation students.
  - DIT will manage and recover all costs associated with internet traffic charges

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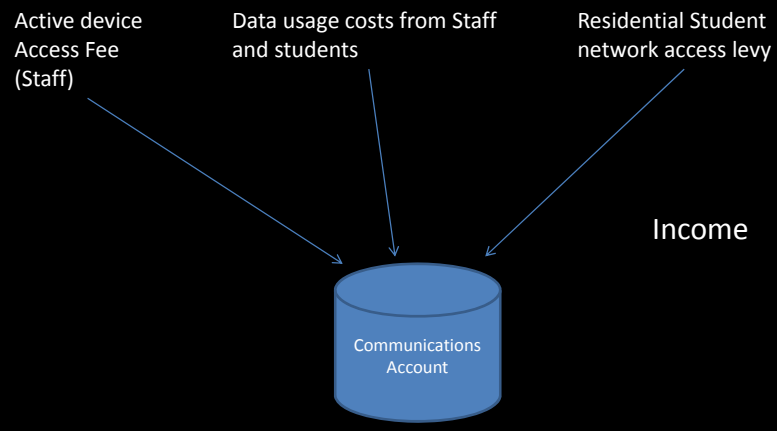
Once upon a time

IT were now responsible for recovering costs for providing the communications infrastructure



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Once upon a time

That's all very interesting but what is your point

- IT have to fund communications expenses
- IT can not go back to central funding for these purposes
- These expenses include the AARNET Subscription and Data costs
- One of the 3 income sources for the communications account is Data charges
- Data charges have been kept high because IT are addicted to the revenue and have a fear of budget shortfalls should they be reduced

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The Addiction

Back to the here and now

- Staff
  - $10 Per Gig
  - $24 per month device access fee
- Students
  - $11 inc GST Per Gig
  - $240 per year network access levy

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The Addiction

- So in all this, it is the cost of internet to students that has caused the most concern within the uni (Mostly to students)
- The $240 levy was high and they don't see any real value for it. Especially now that any student can access wireless without paying the Levy
- The $11 per gig was outrageously high (a 3G service is cheaper)

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Methadone

- To stop us being burned alive, some more financial modelling was done by someone who may or may not look like this

- The modelling showed that the Access Fee and the Access Levy was the most important part of the income stream and that we could indeed drastically reduce the cost of internet traffic to students and staff and not send our self broke (Probably)

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Methadone

- The Plan for this year
  - If there is no cost to IT for traffic then there is no cost to the user for traffic (We charged for all traffic at the flat rate regardless of its real cost to IT) – NO On Net/Off Net, On peak/Off Peak
  - On campus residential students will get a Quota of 10 Gig per month, giving them some value for their Levy
  - Data in addition to the quota - $2.50 per Gig + GST
  - All students (on, off campus or distance) will be given a 1Gig getting started quota at the beginning of the year
  - Staff Data costs to be - $2.50 per gig
  - And while doing this, make the way students connect to the internet easier and less restrictive

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Side Note

- The high cost of internet Traffic has had a side effect.
- The number of Takedown letters from the “Copyright Police” that we received on a monthly basis has been very small
- It was cheaper to go to the movies and pay for the ticket than it is to download the movie off the internet
- As our current policy is to take the letters seriously, each is investigated, substantiated and the user located and disciplined (Including an internet ban for 2 weeks)
- This is fine in small volumes, but the new charges will greatly reduce the cost of downloading copyright material and we were expecting a surge in these letters, which will require a change in the way they are processed

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Side Note

Figures on copyright breaches

Feb 2011	3
March 2011	16
April 2011	3
May 2011	11
June 2011	2
July 2011	none so far

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Our Old System

Ok so we have a cunning plan, now how do we do that

- Our old system consisted of a Squid Proxy server for HTTP/S access and a home grown auth solution for other traffic

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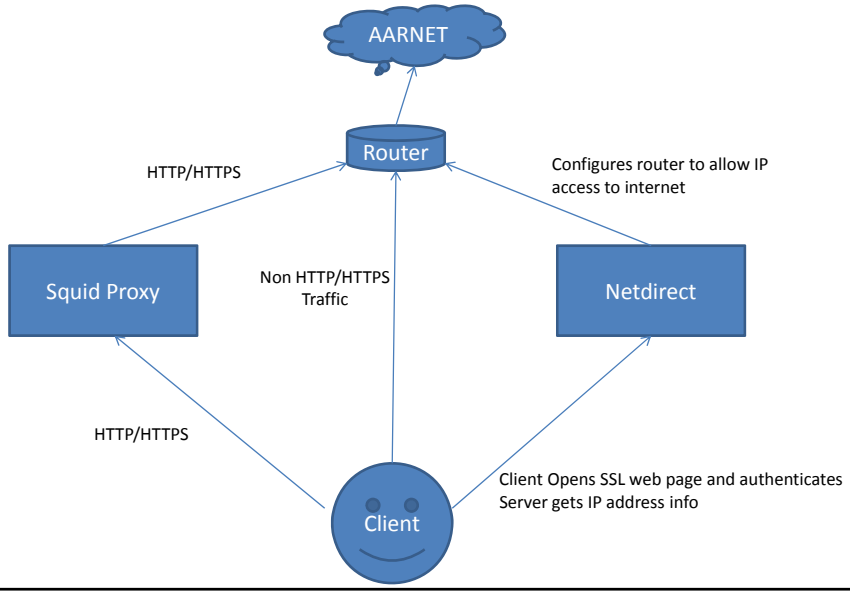
The old setup



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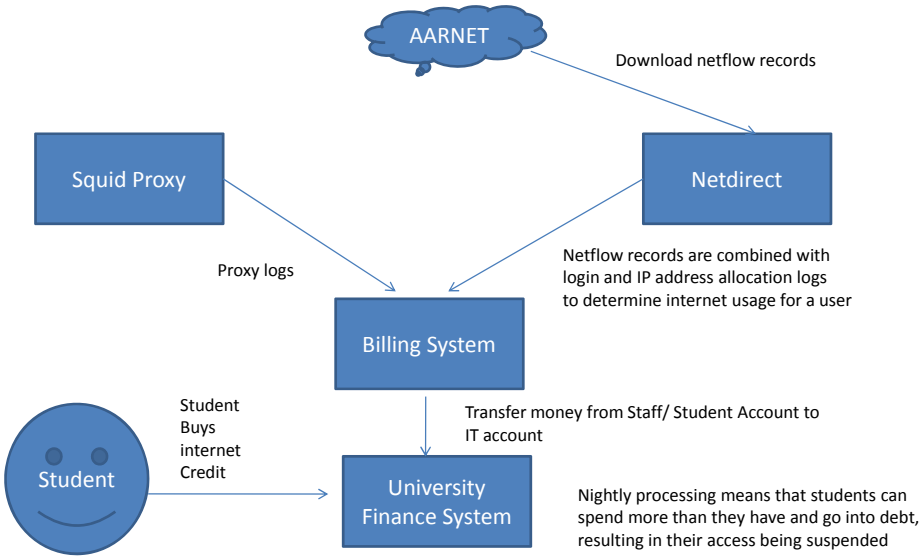
The old setup



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Our Old System

Ok so we have a cunning plan, now how do we do that with our current system

- Student internet access is pre paid, students add credit through the finance cashier or web payment portal – (Not a problem in itself)
- Usage records from both systems are batch processed nightly and student internet credit is adjusted accordingly
- This means that students can use more credit than then have and when processing occurs they go into debt. Resulting in Internet access being suspended until the internet credit balance is above $0
- The proxy is slow
- The netdirect system has scaling issues
- The netdirect system was written by staff that have left - changes and maintenance is problematic at best
- There is no quota management
- There is no user or group rate limiting
- There is no user reporting
- Limited budget manager reporting
- System level reporting is non existent

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The way forward

- Last year CSU deployed a Voip telephony solution
- As part of that deployment we replaced the in house telephony billing system with a product from TSA Software – (CAAB)
- As part of this purchase a very good price was negotiated on the Data billing and internet access control modules (Excellent up selling from the salesman)
- So a cost effective replacement for the in house data billing system was found in a product that was already deployed as our telephony billing solution

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The way forward

- So this made the process of picking the solution quick and easy. The TSA solution met our requirements and more and presented us with one integrated billing system. The price negotiated for the additional modules was also pleasing.

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The way forward

- Because selecting the product was so easy it was decided to just tack the implementation of this new system onto the other work the vendor is doing (Telephony charging system) and not really setup another.
- The project to implement the solution was well planned and went off without a hitch and we all had cake

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The way forward

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The way forward

- Issues
  - The project was tacked onto the tail of the Telephony charging project but Telephony billing was not yet complete and the external vendors time had to be prioritised on the completion of telephony billing
  - There was no trained project solutions coordinator/project manager assigned to the project
  - No business analyst assigned to project
  - Internal resource allocation has been problematic (More projects active than resources available)

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The way forward

- So we have the technical (only) staff assigned to the project also trying to
  - Manage the project timelines
  - Define the business requirements (After the solution had been selected)
  - Scope the integration work for the vendor (Integration with systems the network technical staff had no real knowledge of)
  - Still finalising the implementation of a new VoIP phone system and phone charging system
  - Implementing a new University wide wireless network.

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The way forward

Surprisingly that didn't go so well

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The way forward

- Time frames blew out as time lines were not monitored properly and managed and resources were not made available
- Back end integration designs missed certain types of students (Students that are also staff, PHD students that are having their data paid for by their school)
- Requirements were missed in the vendor scoping
- Fire and Brimstone, Cats and Dogs Living together etc

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The way forward

- As a result of all this the project had to be split into stages to meet the requirement that student charging was in place for session start this year
- After much pleading for resources and the now obvious imminent car crash, project management and application design architects were assigned to the project at the 11th hour

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The way forward

- STAGE 1
- Allow internet access only to authorised users or devices
- Allocate all internet traffic to authenticated users or devices to enable reporting and notional usage charging and enforcement of quotas via shaping and denying access.
- Provide management of all types of internet traffic
- Enable the prioritisation of internet traffic based on flexible criteria
- Enable both summary and detailed reporting of usage down to the user/device, external site/address and port/protocol level
- Enable internet access to be restricted to nominated protocols or external sites for specific users or devices
- Provide an authentication mechanism that is as transparent as possible by relying on single sign-on authentication to existing authentication systems rather than issuing additional login/authentication requests
- Minimise day-to-day management tasks via integration with existing operational support systems
- Interface between the CSU Unicard system via the Unicard API.
- Differentiate between On and Off net traffic for real time billing
- Ability for a student to add personal Quota via API from CSUCard system
- Ability for a student to view their current quota balances and traffic history
- Reporting needs to handle GST charging for Students, and non GST charging for Staff
- Need to migrate any money on a student's current internet balance on existing charging system to their personal Quota amount on CAAB (one time only process)

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The way forward

- STAGE 2
- Reporting and Financial Export of Staff Data usage charges.
- Machine registration details from Netreg – for $24 per month PC rental charging – Ongoing sync
- Ability to register a device with the SCE that does not have the ability to have browser window left open
- Squid Proxy integration
  - Process proxy logs and merge this data with SCE data (non real time, every 1 hours)
  - When a student has no monthly or personal quota access is stopped through Proxy server
- Need a group for Ip addresses or hosts that don't need to authenticate
  - Static IP to charge code mapping for these hosts through Netreg
- Need group/s to do rate limiting
  - Group level rate limiting eg all students eg 70% of total bandwidth
  - Public facing servers get a guaranteed 20% of total bandwidth
  - Per user rate limiting is a desired option

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The way forward

- Stage 1
  - This went live on Feb 28 2011
  - We are still plugging holes left by lack of analysis early in the project
- Stage2
  - Not yet implemented

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The New System

- Despite all the issues we had in getting the first stage of this over the line, we did deliver a working internet access and charging system by go live date.
- Major Components
  - Cisco SCE
  - Collection manager (VM)
  - Subscription Manager (VM)
  - IIS Servers (2 VM)
  - SQL Database server

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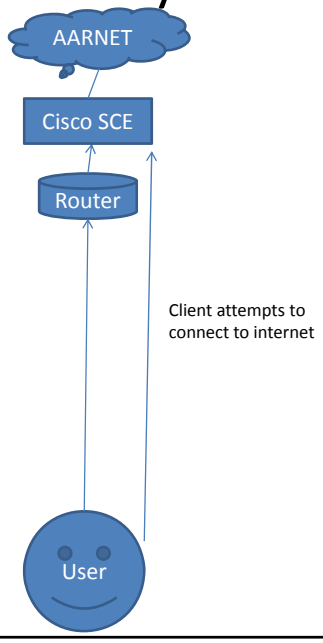
Using the Web Portal

The new system



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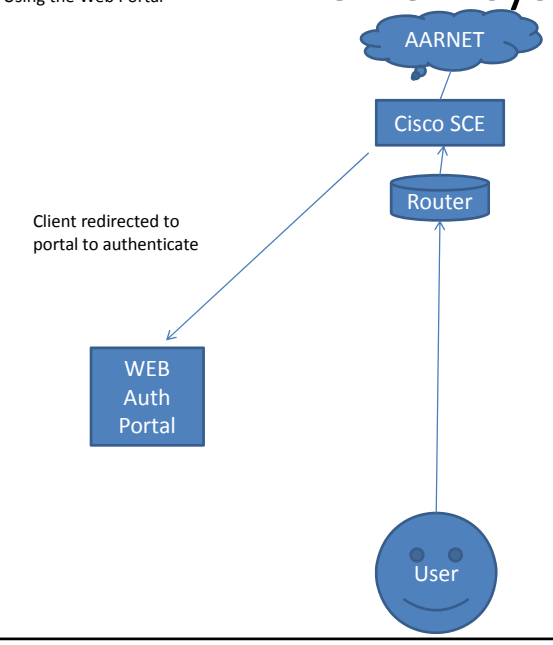
Using the Web Portal

The new system



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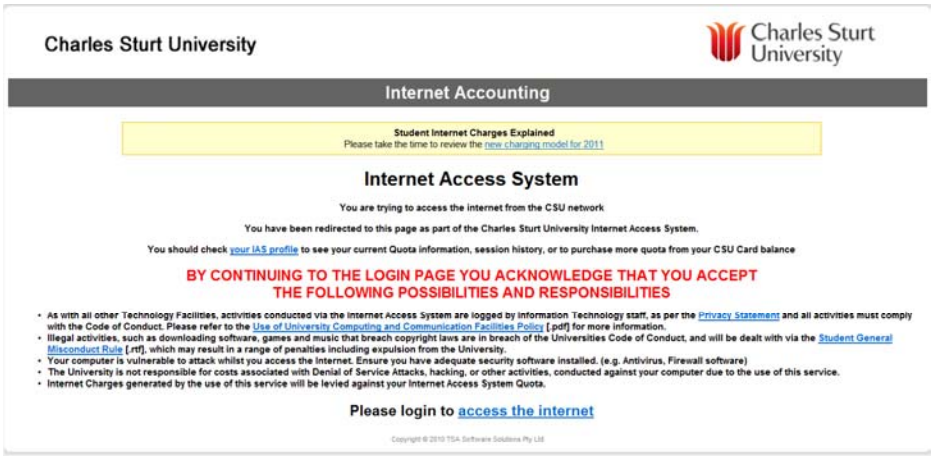
The New System



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The New System

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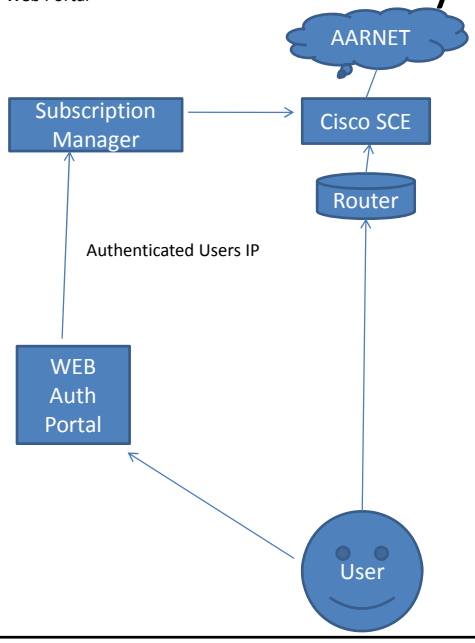
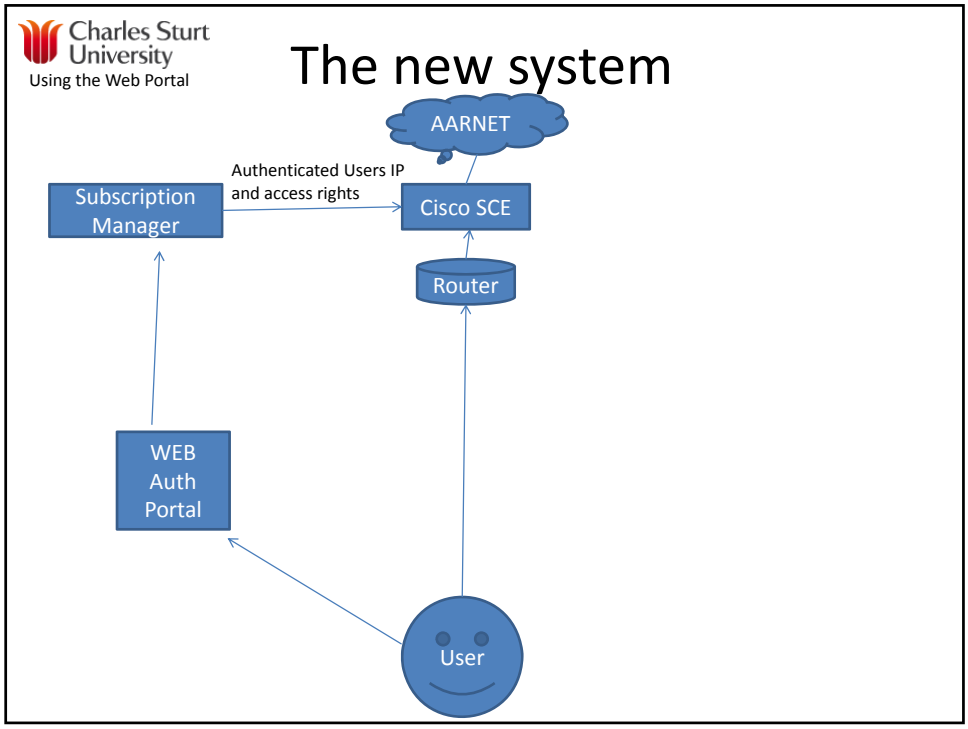
Using the Web Portal

The new system

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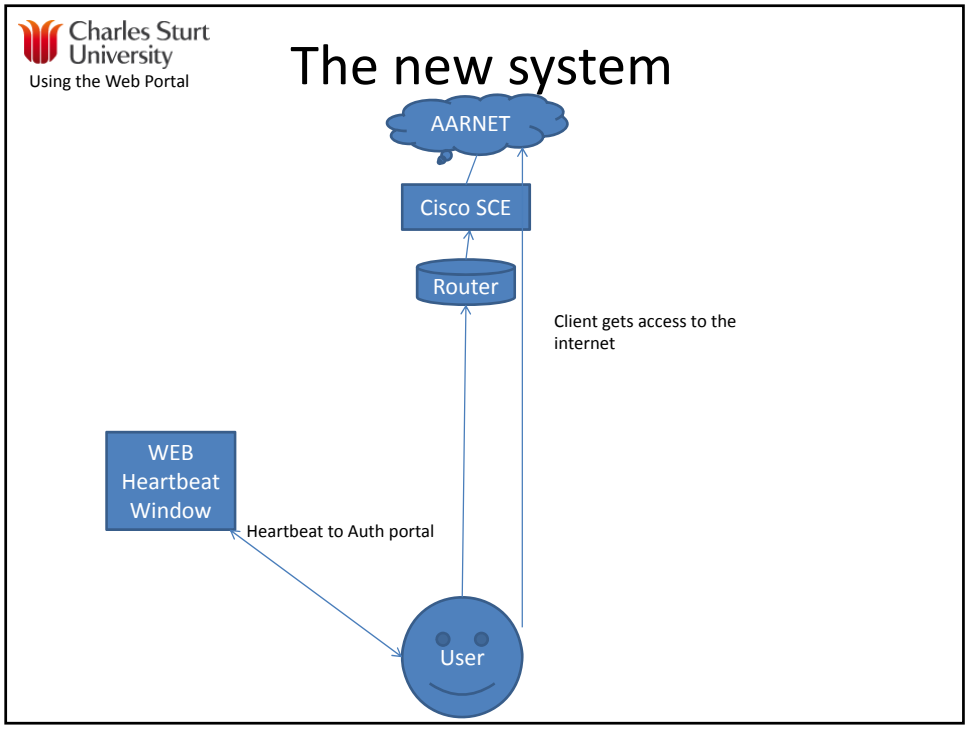
Using the Web Portal
The new system
AARNET
Authenticated Users IP and access rights
Subscription Manager
Cisco SCE
Router
WEB Auth Portal
User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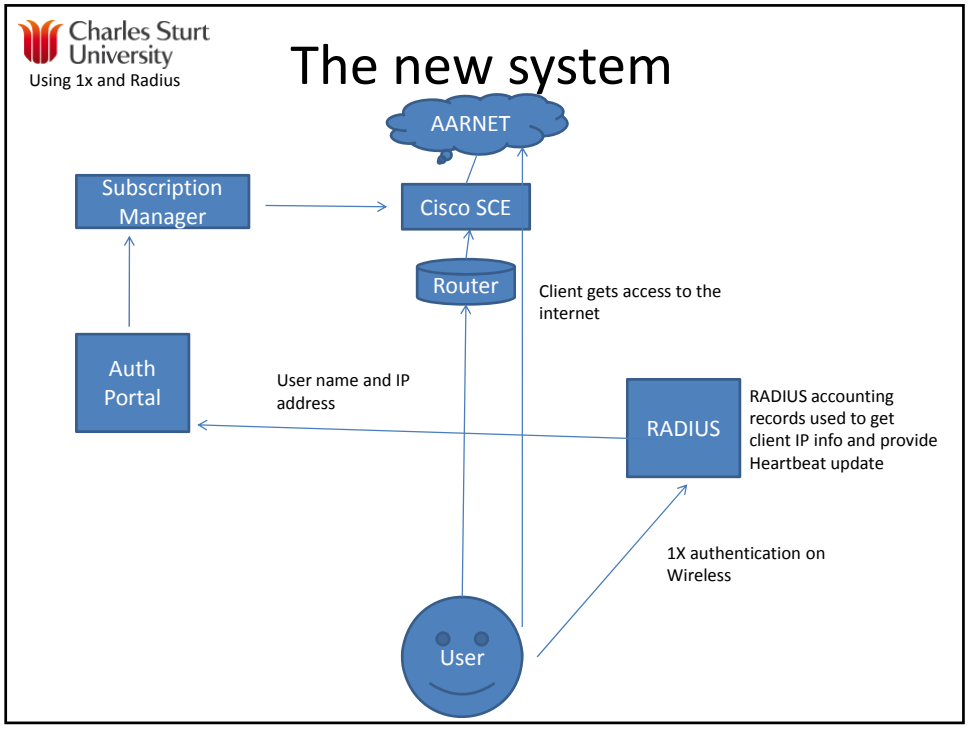
Using the Web Portal
The new system
AARNET
Cisco SCE
Router
Client gets access to the internet
WEB Heartbeat Window
Heartbeat to Auth portal
User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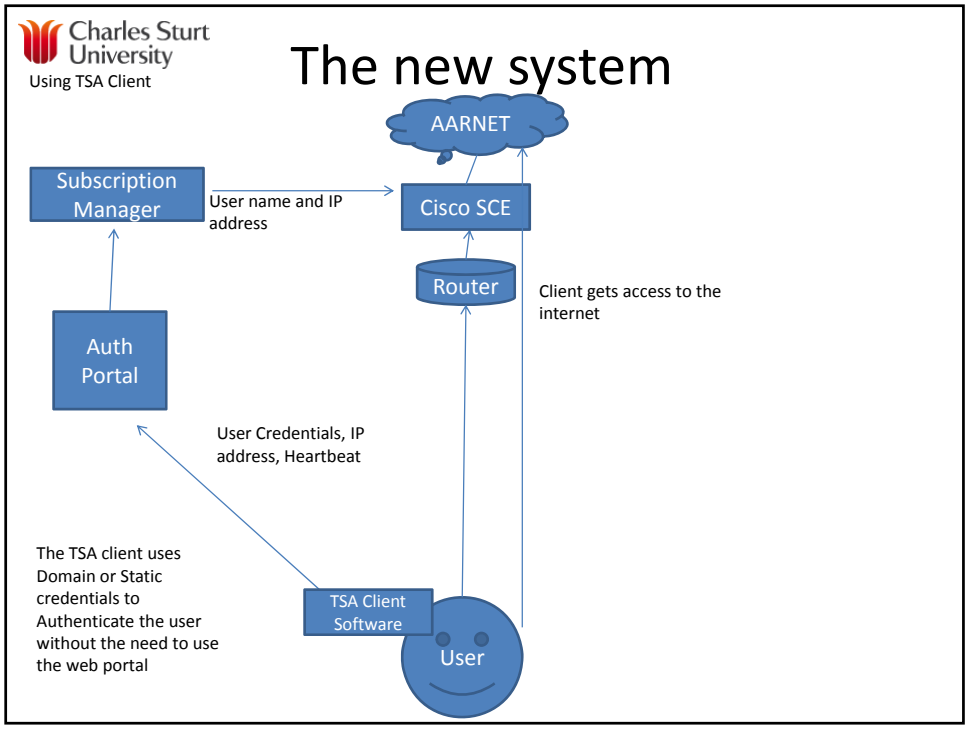
Using 1x and Radius
The new system
AARNET
Subscription Manager
Cisco SCE
Router
Client gets access to the internet
Auth Portal
User name and IP address
RADIUS
RADIUS accounting records used to get client IP info and provide Heartbeat update
1X authentication on Wireless
User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Using TSA Client
The new system
AARNET
Subscription Manager
User name and IP address
Cisco SCE
Router
Client gets access to the internet
Auth Portal
User Credentials, IP address, Heartbeat
The TSA client uses Domain or Static credentials to Authenticate the user without the need to use the web portal
TSA Client Software
User

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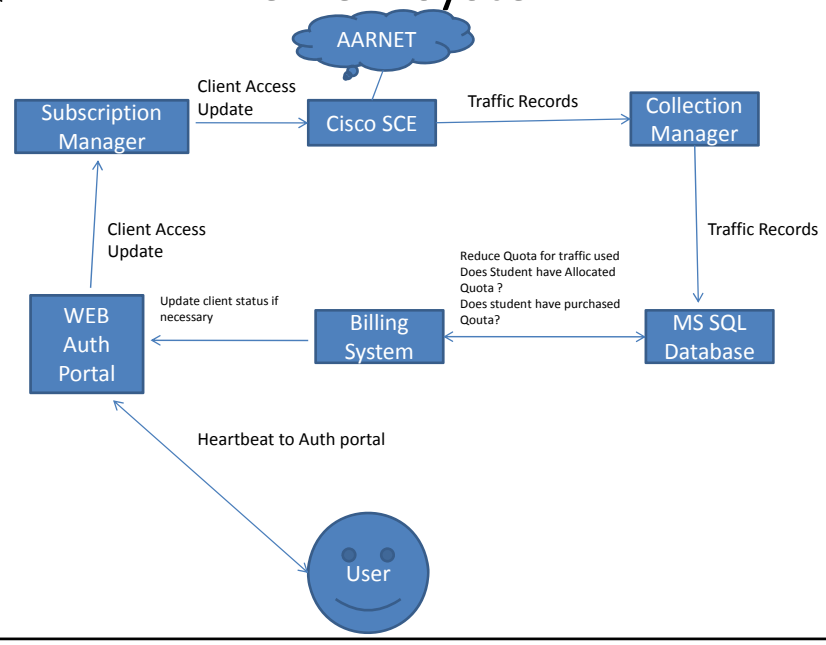
Back end

The new system



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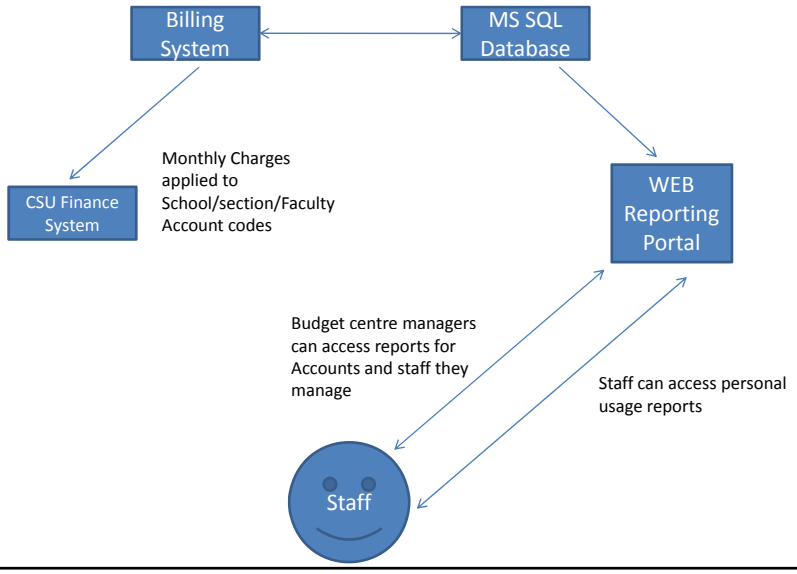
Staff Billing and Reporting

The new system



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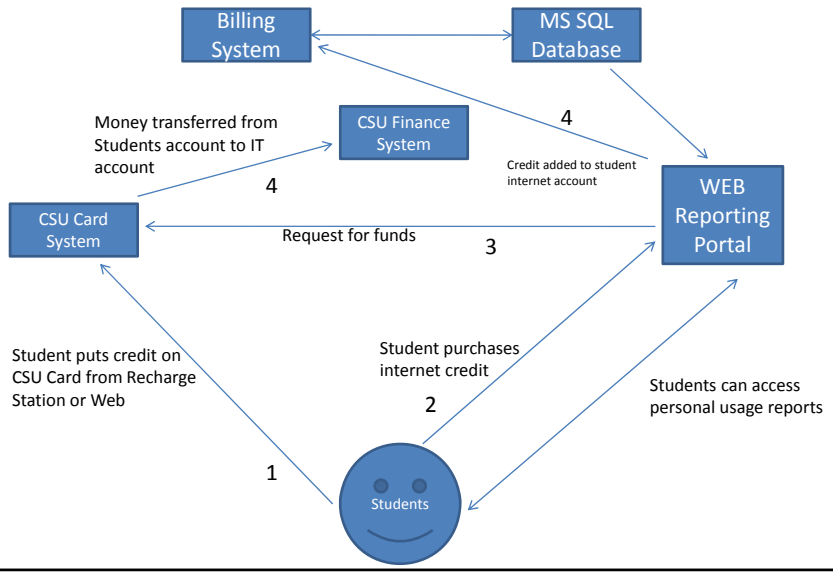
Student Billing

The new system



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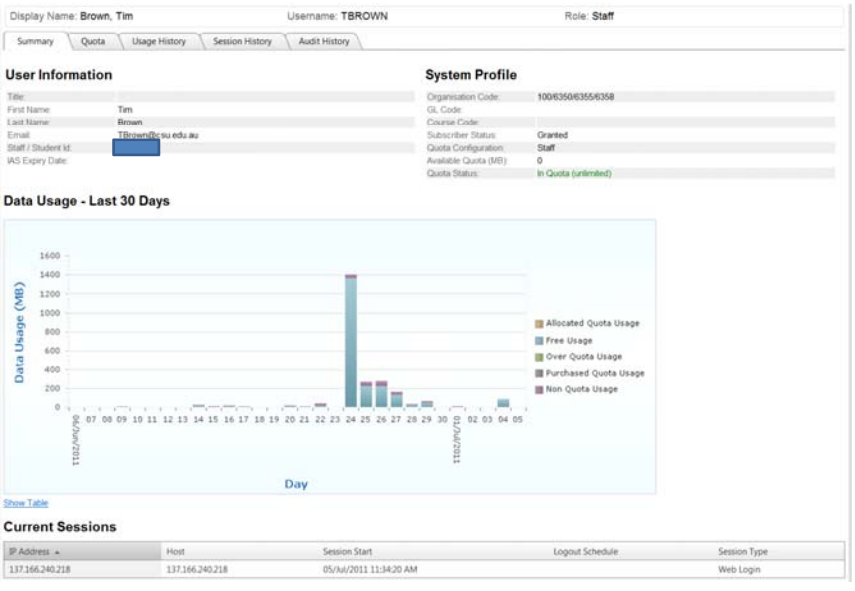
IAS



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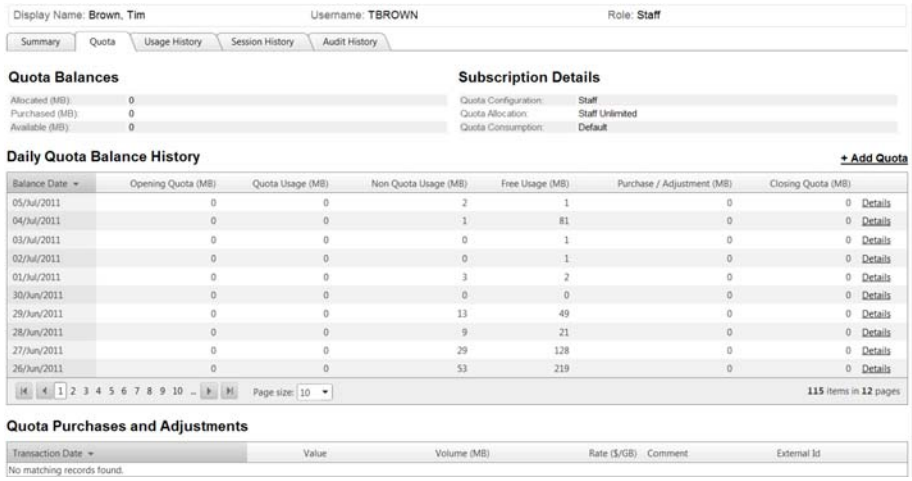

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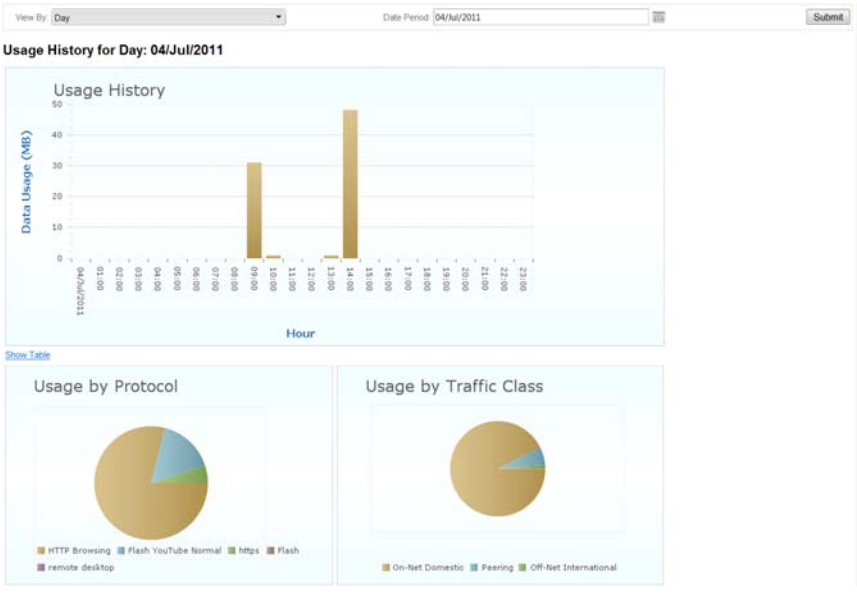

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Management and their insatiable hunger for a good graph

The new system delivers this for us. We now have some visibility into usage, by amount ip range, type etc

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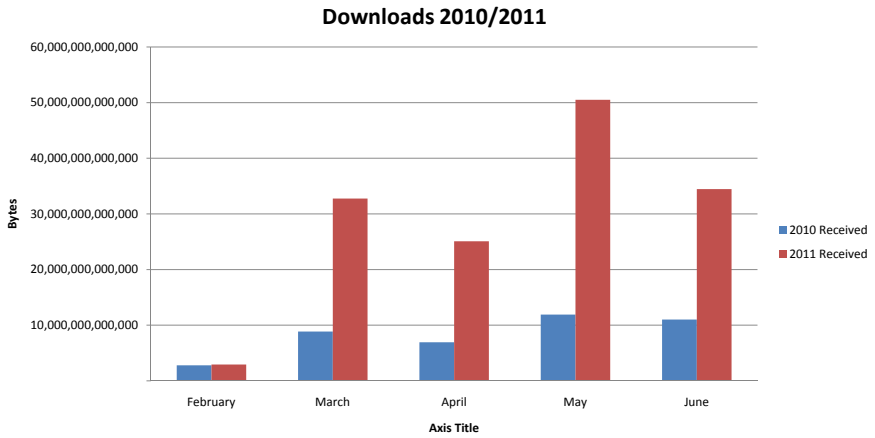
Everyone likes a good Graph



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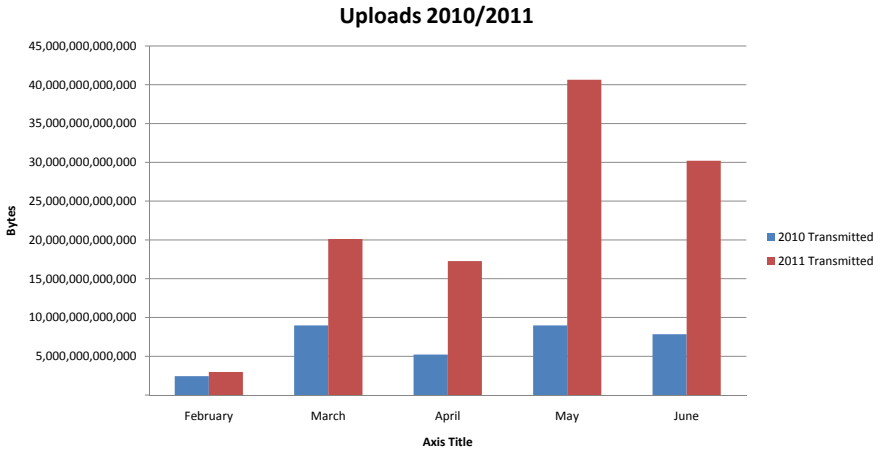

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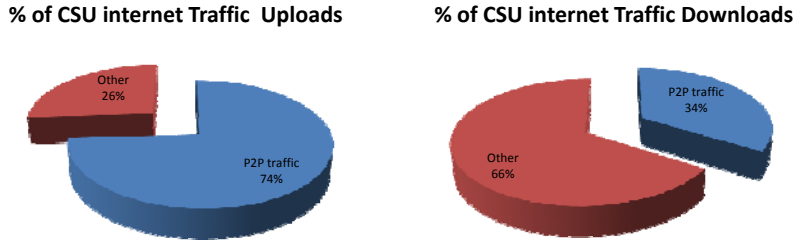

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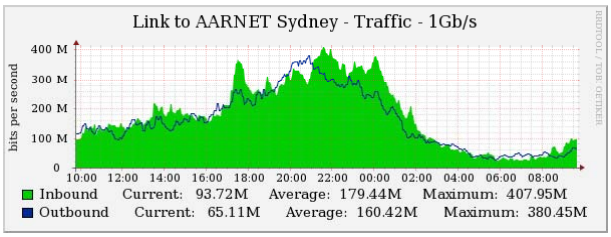
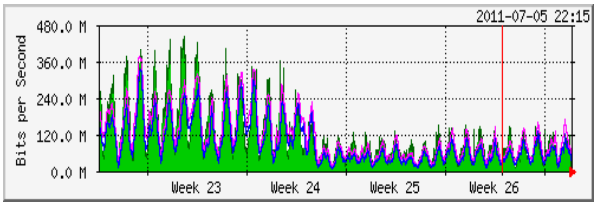
Everyone likes a good Graph

Typical daily usage



Monthly usage showing when students leave



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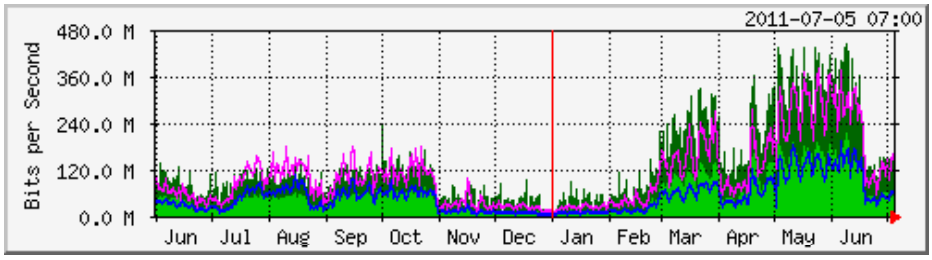
Everyone likes a good Graph

Usage over the last year



GREEN ### Incoming Traffic in Bits per Second
BLUE ### Outgoing Traffic in Bits per Second
DARK GREEN ### Maximal 5 Minute Incoming Traffic
MAGENTA ### Maximal 5 Minute Outgoing Traffic

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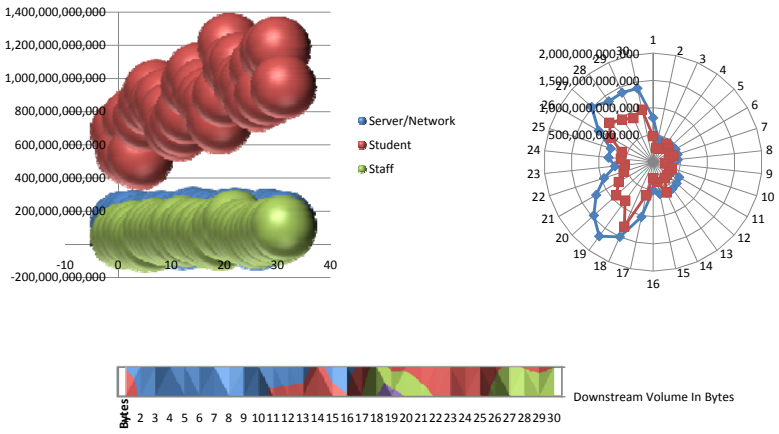

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Everyone likes a good Graph

Nice Graphs – So what?

- The new system has provided
  - Usage information to students
  - Usage and trend information to IT
  - Information of traffic types (What makes up our traffic)
- This sort of information was never available to students before and info for IT was either not available or very hard to get
- Does any one care?
  - Students, very quick to report anything they think is wrong with their download quotas
  - IT/Management – Already proving very useful in planning and understanding student internet usage

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Summary

- CSU was charging too much for internet access
- IT need to be careful about maintaining our income stream to be able to provide communication services
- A decision was made to wean our self off the profit we make from internet charges
- We have deployed a new charging model which is fairer and better value to students
- We have upgraded our billing and reporting system to
  - Help us implement our new charging model
  - Allow us to better manage internet access (quotas, rate limiting etc)
  - Provide a better user experience for both staff and students
  - Give us much needed reporting information to help in future cost planning and usage trends
  - Give users and managers access to usage reporting
- Our deployment of the new system could have been better managed.
- Don't let network nerds run projects that are primarily about deploying a new software applications
- We were only just ready for go live for the beginning of session