This is your PostgreSQL on drugs

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Electronic Medical Office Logistics
EMOL
Who am I?

- Computer & Database Geek, just like you
- Formerly a SysAdmin at Autoweb Communications
  - PostgreSQL Build Your Car
- Presently a IT manager at a EMOL
- PostgreSQL Evangelist
- Penguicon Organizer
With PostgreSQL and other Open Source software EMOL is

- Allowing Data collection from EMRs and other sources
- Aiding in Adherence to national standards
- Providing Physician and Practice level benchmarking
- Data Brokering
- Enabling Automation of National initiatives, such as the CMS PQRI
EMOL PostgreSQL Data

- Patient Records
- Billing Records
- Lab Results
- Clinical Records
- Inventory Management
- Patient Reported Data
Metadata

- Physicians Dictations
- Scanned Documents
- Images
  - XRAYs
  - MIRIs
  - CAT Scans
Metadata Storage

- ReiserFS with tail packing
- Each practice/doctor has a folder
- Files are stored with the same file name as the primary key in the database

- ReiserFS is a killer filesystem

- OpenSolaris & ZFS???
- Netapp Waffle???
EMOL Software Building Blocks

- Ubuntu Linux LTS (8.04)
- PostgreSQL (8.3)
- Perl (5.8.x)
- Windows Unified Data Storage Server 2003 (R2)
  - Yes Windows
EMOL Hardware Building Blocks

- HP ProCurve Switches
  - Support considerably cheaper than Smartnet
- SonicWall Firewalls
  - Support considerably cheaper than Smartnet
- Large number of SCSI and SATA Hard Drives
- Aberdeen Servers and DAS (Direct Attached Storage) Systems
Why PostgreSQL?

- Capable
- Required Features
- Database Team Experience
- Community
  - Documentation Project
  - Mailing Lists
  - IRC
  - Events Like This!
Why Perl?

- Practical Extraction and Report Language
- Development team experienced with Perl
- Unix-centric, and available for Windows
- Text parsing and normalizing
- I know it Perl is not sexy like
  - `INSERT 'new_popular_language' INTO languages;`

- Rapid prototyping
  - Weakly typed
  - Interpreted, though very fast
  - Supports objects
Who is Where?

- **OS and PostgreSQL binaries on local disks**
  - RAID 1 Mirror
  - 15k spindle drives
  - EXT3
- **WAL Buffers on local disks**
  - RAID 1 Mirror
  - 15k spindle speed
  - EXT2
- **INDEXs**
  - DAS (Direct Attached Storage) Units
  - RAID 6
  - 10k spindle speed SCSI
  - EXT3
- **TABLES**
  - Multiple ISCSI Servers on SANS
  - 4 x 1 Gigabit Ethernet Interfaces Bonded
  - 8 x 1 Terabyte SATA drives per SAN Node RAID 6
  - EXT3
Data Daily

- Loading 10 GB data daily into PostgreSQL
- Loading 10 GB metadata daily
Data Size

SELECT relname, (relpages*8)/1024 as MB
FROM pg_class
ORDER BY relpages DESC;
How much data are we talking

- Largest Table: 1,844.73 GB
- Second Largest Table: 1,289.36 GB
- Largest Index: 411.91 GB
- Second Largest Index: 405.08 GB
- Total DB size on disk: 16,800.39 GB
Run it twice and make it faster

- Maintain a 1/500 set of random sample data
- ALL queries hit that data base first
- Only once query result is successful is the query moved onto production server
How do I sleep at night

- First Name
- Last Names
- Social Security Numbers
- Birth Dates

- Needed to track people over time and geography
Protecting the Warehouse

- Simple processes that are followed
- Intrusion Prevention & Firewalls
- Security Monitoring & Management - MSSP
- Encrypted Communication
- Identity Management - Centralized management of users and groups – mitigates vulnerabilities that occur due to inconsistencies
Protecting the Warehouse

- Role-based security
- Functions everyplace we can
- Identity data symmetrically encrypted
- Data is anonymized in all but a few tables
- Role-based security
- All data is anonymized before it is sent out
Lessons Learned

- Server Ethernet Cards are not all made the same
- With 100+ drives be ready to RMA some disks
- You can never have to many DIMM slots
- You do get what you pay for with RAID controllers
- You can never have to many PCI-X Slots
- You can’t have to big a cache on your RAID controller
More Lessons Learned

- Auto-vacuum is not always your friend
- Worry when a developer says “I have an idea”
- Some mistakes are just too much fun to make only once
- Never ask for directions from a two-headed tourist!

  - Big Bird
Questions

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