



## Network Controls & Configuration

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# OPG Nuclear Training Simulators



# 77 Trainers use OPG simulators

- 19 Pickering 1-4 Authorization Trainers
- 20 Pickering 5-8 Authorization Trainers
- 26 Darlington 1-4 Authorization Trainers
- 6 Darlington Unit 0 Authorization Trainers
- 6 Fuel Handling Trainers

# Simulator Background -OPEX

- Low Simulator Training Availability: 98%
- Originally each Full Scope Simulator had local disk drive & removable drive failures
- Backup data for removable disk drives was a loss control issue
- Instructor left keys at home to locked cabinet for removable disk drive – had to cut lock off with hacksaw delaying start of simulator regulatory licensing examination

# Modern Training Requirements

Trainers require simulator configuration including any newly developed initial conditions and lesson plans to be available instantly everywhere on:

- Full Scope Simulator [at DLC and PLC for Darlington]
- Glass Touch Screen Simulators at Pickering Learning Centre [PLC] or Darlington Learning Centre [DLC]
- On projection screens or big screen TVs in any classroom
- Desktop IT business office PC via MS-windows 7 at any building location anywhere in OPG

# Modern Training Requirements

- Trainers require ability to create new lesson plans and initial conditions: at home, in the office, in the classroom & on full scope simulators
- Simulator technology Maintainers require desktop simulators at work or at home since full scope simulators must be available for training  
24 hours per day

# Nuclear Regulator

## Simulator Exams / Re-Qual Testing

- Regulator – *Canadian Nuclear Safety Commission* – require confidentiality for simulator initial licensing exams and continuing re-qualification testing for licensed authorized nuclear operators and shift supervisors
- Software security and physical security required for simulators and for exam/test development on desktop
- Quote Nuclear Regulatory Requirements to negotiate with OPG Corporate IT to use business network for simulator software access
- Desktop & Classroom simulators via network required to improve success rate in Regulatory Licensing Exams

# How to meet requirements?

- Make **same** Simulator Software Configuration Executable, Initial Conditions and Lesson Plans available to run everywhere **via the network**: office, home, classroom and full scope simulator



PLC Pickering Unit 5-8 Simulator



PLC Darlington Unit 1-4 Simulator



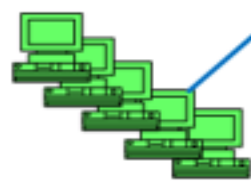
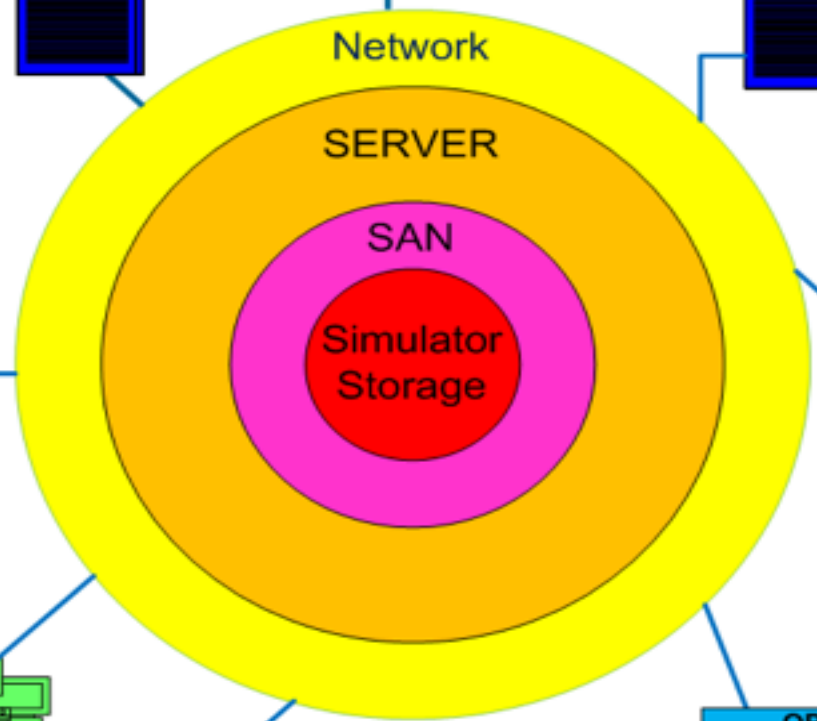
DLC Darlington Unit 1-4 Simulator



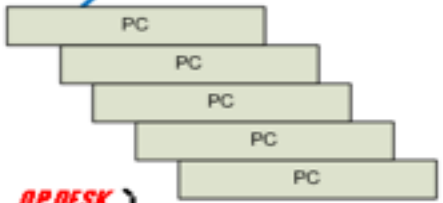
PLC Pickering Unit 1-4 Simulator



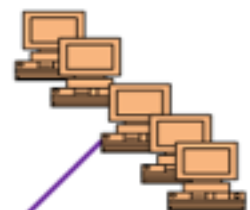
5 PLC Glass Simulators  
3 DLC Glass Simulators



200+ Users PC's  
(Kiosks, Classrooms,  
IT Business Office PCs)



**OP.DESK**  
CPU Pool



Home PCs over VPN

# Central Disk Storage System Hardware

- HP EVA6400 - Enterprise Virtual Array of disks – failures transparent to user since 2005
- Scalable low end IT enterprise system
- redundant RAID disk controllers
- O/S independent: Linux, Unix, MS-Windows
- Software mirrored or copied automatically to second storage system via the network

# Central Server

- Linux Simulator and Account Cluster Server
- Triplicated Server for high availability
- Network File System server - access all simulators' software on storage system
- Server to manage user accounts for all simulators
- Print server
- Tape Backups

# Cyber Security

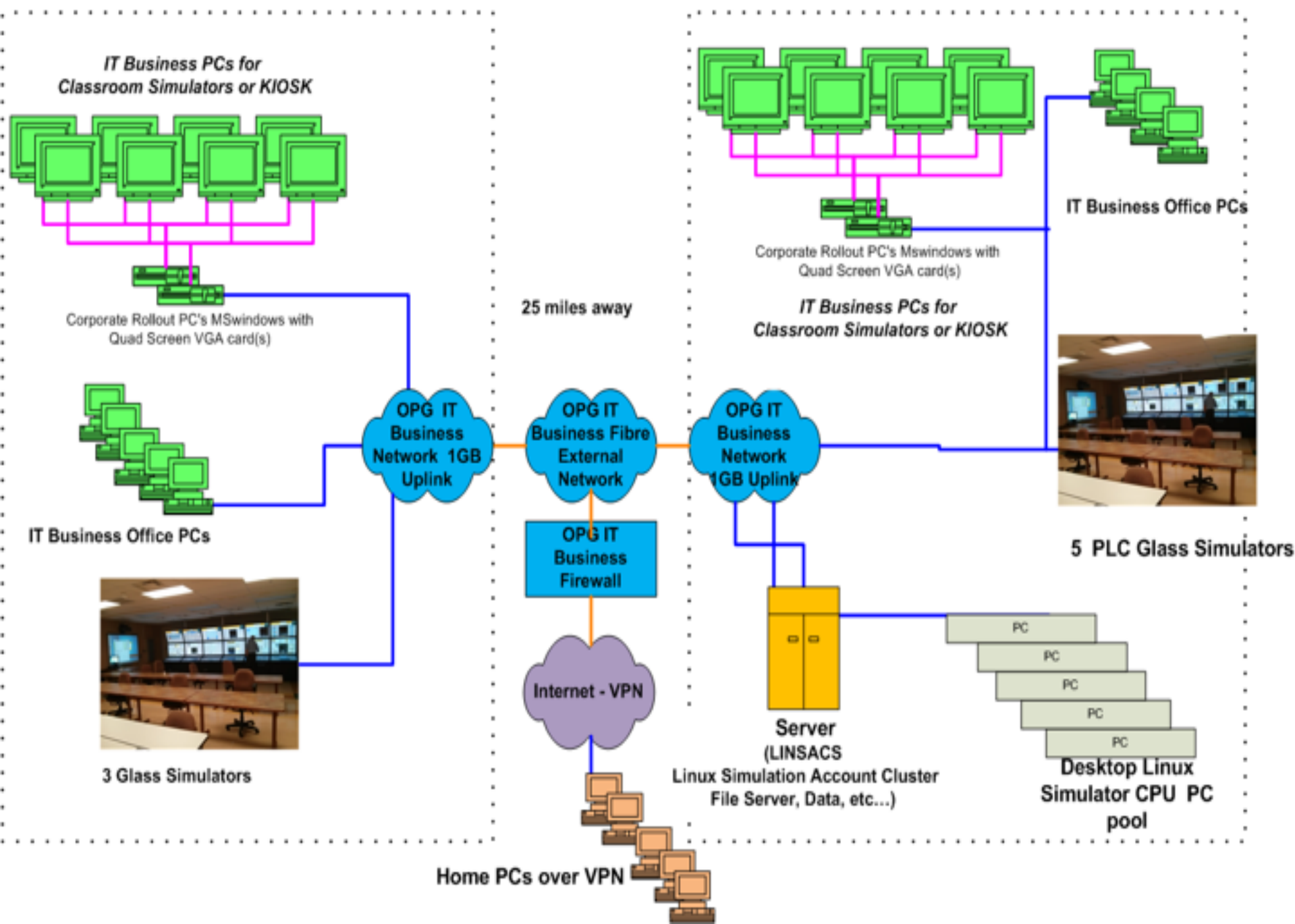
- IT Business requirement: Removable Media [Disk Drives & USB drive] require encryption + password protection and be scanned for malware
- A lot of malware, virus, *ransom-ware*, etc. target MS-windows for maximum damage & gain \$\$
- Internet login from home via *VPN* [FOB with random# plus password] then second login to *Citrix Server* for Business IT account & another password before third login to *Desktop Simulator* account & different password

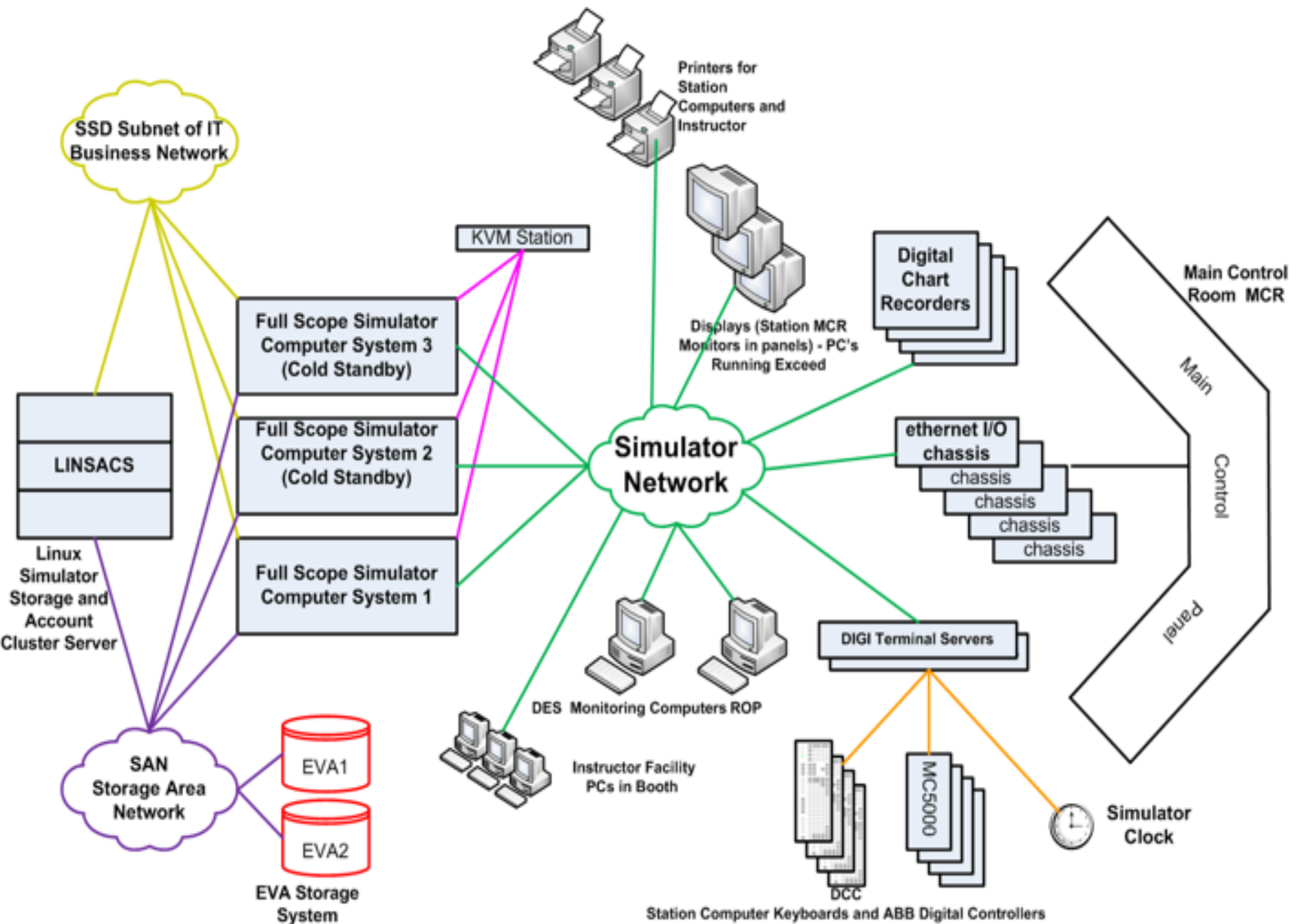
# Cyber Security

- Rely on OPG IT Business Network Firewall and Security updates and patches to protect from internet security threats
- We use Linux for our simulators & install Linux Security updates & patches
- Control with Linux User accounts + strong passwords + file protections for groups of Training Instructors / Users
- Linux email not used & do not use removable media on Linux simulators

# Darlington Learning Centre DLC

# Pickering Learning Centre PLC





# Issues

- If network or server fails – all simulators down
- Enterprise Disk Storage System is expensive yet essential to mission critical application with large number of Users
- Call vendor maintenance support for disk controller replacement when fails – expensive
- Delete file [ie: lesson plan] – mirror deletion – must still recover from tape if required



# Benefits

- High simulator training availability: 99.9%
- Meets requirements: 24hrs/day - 7days/week
- Effective & efficient training/exam development & delivery/test on simulators
- Data backed up for disaster recovery
- Hardware failures invisible to user due to redundancy / fault tolerance

Questions ?

