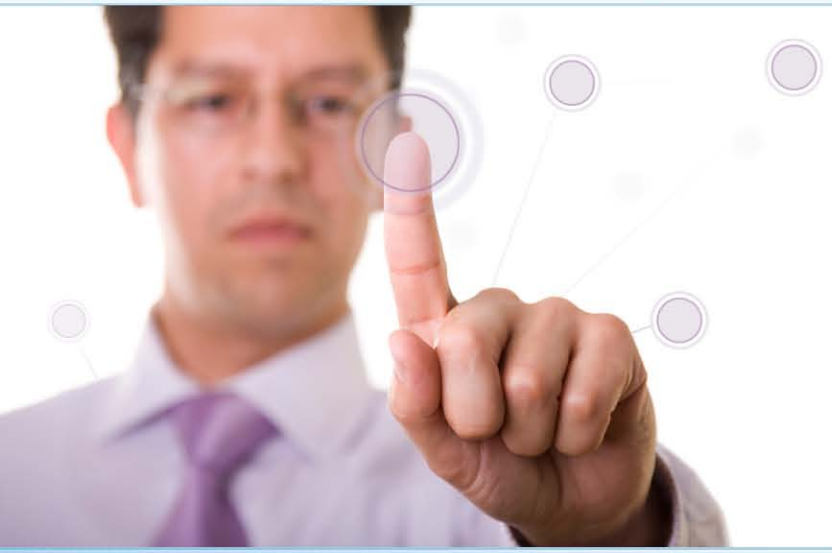


connect NONSTOP Symposium & Expo 2010

Time-Zone Simulation Helps Royal Bank of Canada Consolidate Data Centers

Grant Lowe, Royal Bank of Canada
Jack Di Giacomo, TANDsoft, Inc.

Introducing Grant Lowe

- **Manager, HP NonStop Systems Support Team for Royal Bank of Canada (RBC)**
- **Developer for 2 years**
- **With RBC for 21 years**
- **2004: ASE-Certification**
- **Program (TAL and C): NetBatch Monitor, PCGEVE, DTECT, PCGALTPR, PCGSTOP**

Royal Bank of Canada

- **Largest bank in Canada as measured by market capitalization *($68 billion USD)***
- **Among the 20 largest banks worldwide**
- **78,000 employees; 18 million customers**
- **Operates in 46 countries**
- **A NonStop shop since 1987**

NonStop Systems Support Team

- Team of 4 has average experience of 18 years at RBC and 22 years on NSK
- Manages 9 HP NonStop Systems
- Installs operating system and 3rd party tools
- Automation and EMS filtering
- Trains operations staff
- 24/7 on-call 3rd level support

RBC and NonStop

Hardware

4 Production Systems

- 2 S88010
- 2 Itanium NS16012 *(highly available)* - one in central site, one in DRP site
- 1 XP10000 (*Itanium system)*

2 Disaster/QA Systems in DRP Site

- 2 S88010
- 1 XP10000 *(Itanium system)*

3 Test Systems in DRP Site

- 2 NS1000 *(4-way and 2-way highly available)*
- 1 S7204 *(development)*

RBC and NonStop

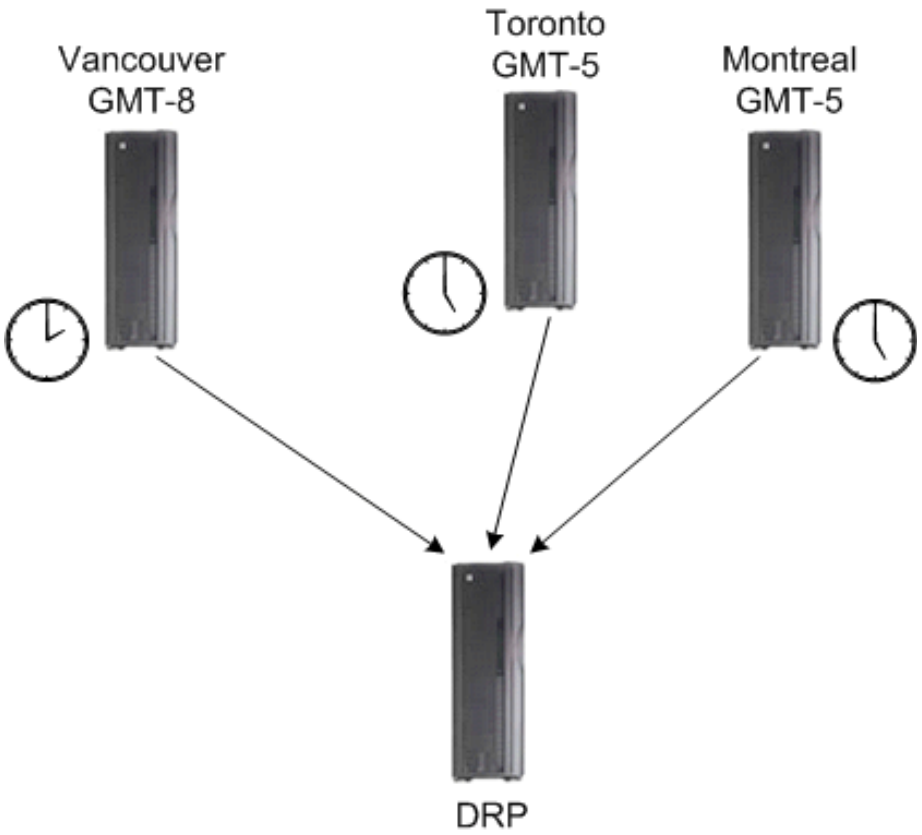
Applications

- **ACI BASE24 for ATM *(SCD)* and POS**

  Montreal (GMT-5), Toronto (GMT-5), and Vancouver (GMT-8)

- **Logica (*Bess*)**
- **Capital Markets *(3 in-house applications)***
- **Wealth Management *(1 in-house application)***

RBC Decides to Consolidate



Originally

ACI BASE24 ATM and POS

3 Production Sites

2 Time Zones

Objectives

Consolidate to 1 Production Site, 2 Time Zones

Seek Active/Active Solution

Reduce Planned Outage Time to 20 Minutes

RBC Decides to Consolidate

Drivers

- Cost initiative
- Wasted capacity
- Time to market
- Expertise in remote sites
- DRP system had to be sized to the biggest production system

RBC Decides to Consolidate

Challenges

Hard-coded TCP/IP Addresses

HP NonStop System Moves Before Mainframe

- **Bandwidth between data centres**

Communication Costs

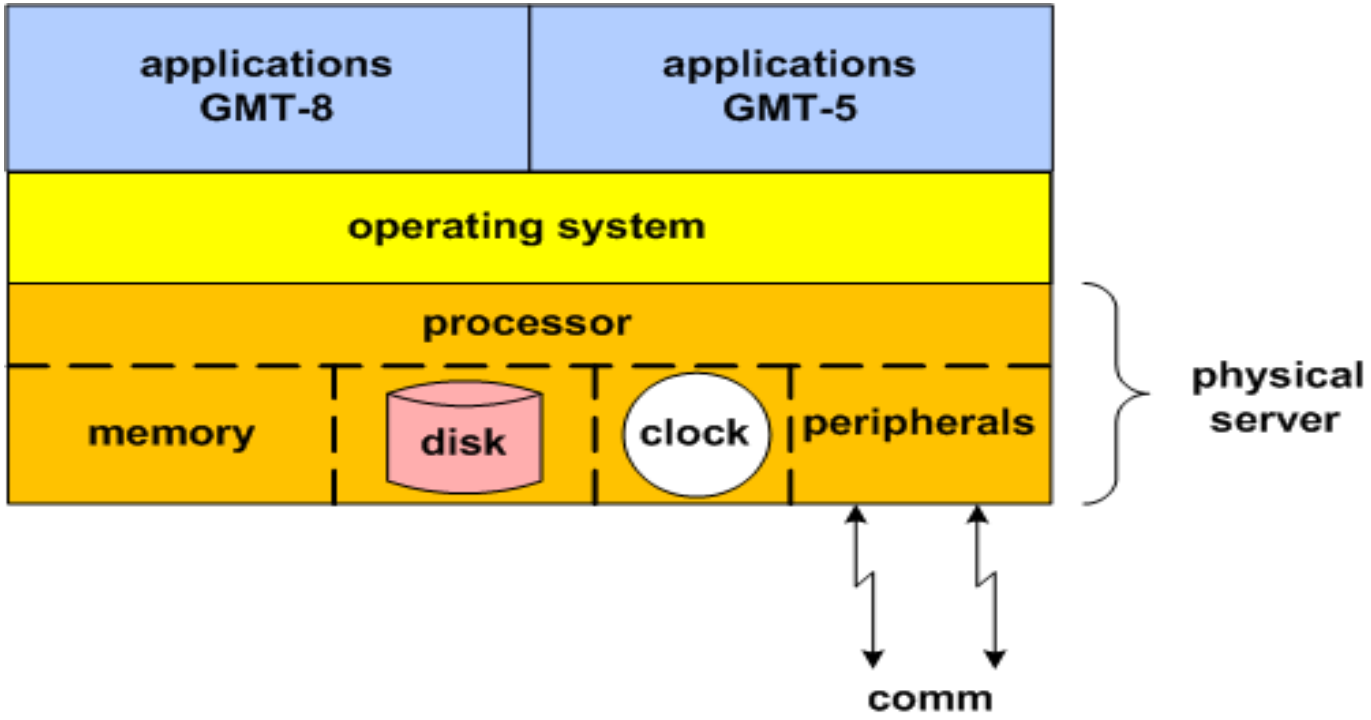
- **Internal *(POS devices)***
- **External clients *(merchant-owned lines)***

Application Databases Consolidation

Simulate PST *(GMT-8)* on an EST *(GMT-5)* System

RBC Decides to Consolidate

RBC Faced a Time-Zone Challenge



One system clock. One current time. Multiple time zones.

Time-Zone Simulation

A Consolidation Challenge

Time-sensitive applications cannot be constrained by…

…one system clock. one current time. multiple time zones.

How do you support the hosting of multiple applications with different date/time requirements on the same platform…

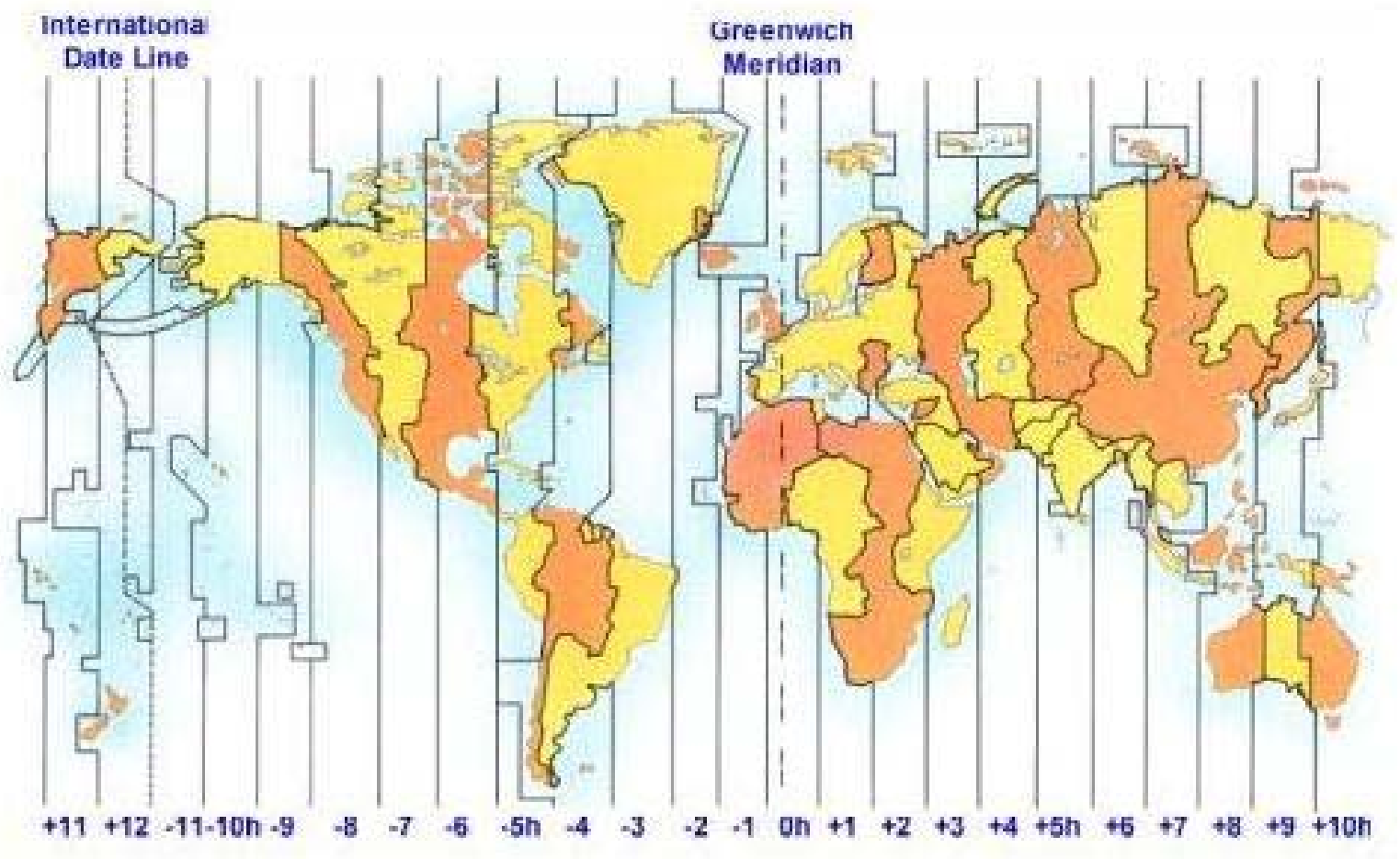
…without constantly resetting the system clock?

Introducing Jack Di Giacomo

- **President, TANDsoft, Inc.**
- **20+ years experience with NonStop systems**
- **Former Tandem instructor**
- **Specialist in intercept technology**

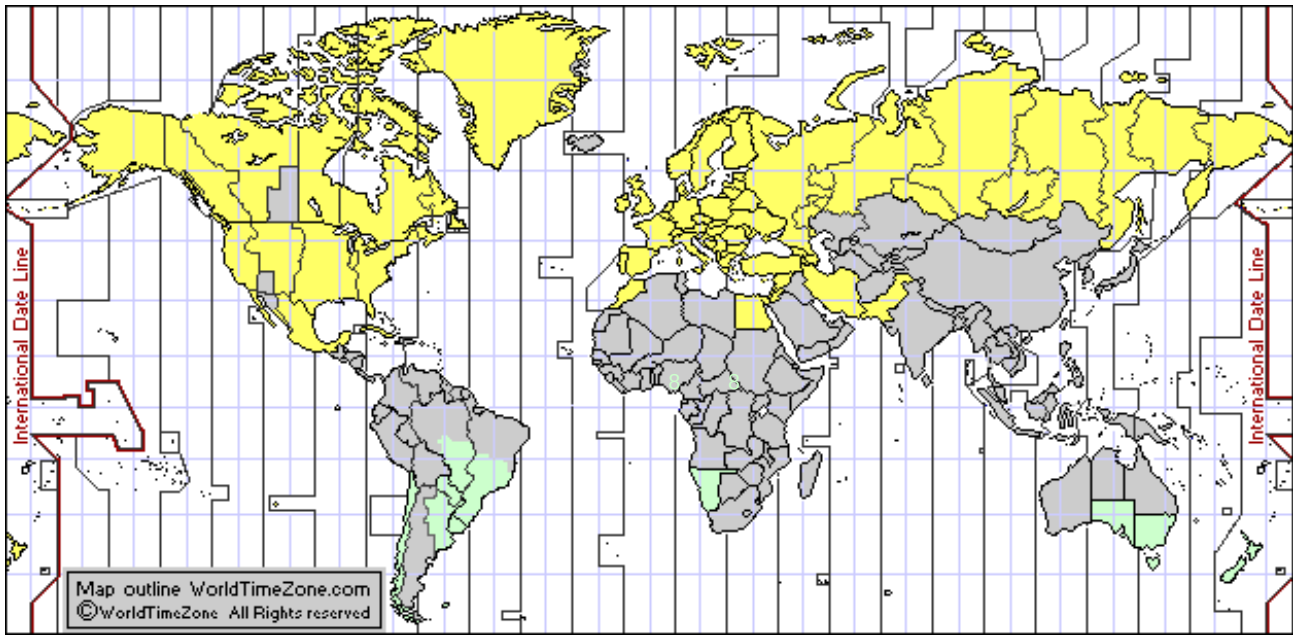
Time-Zone Simulation

How Does Time-Zone Simulation Work?



Time-Zone Simulation

How Does Time-Zone Simulation Work?

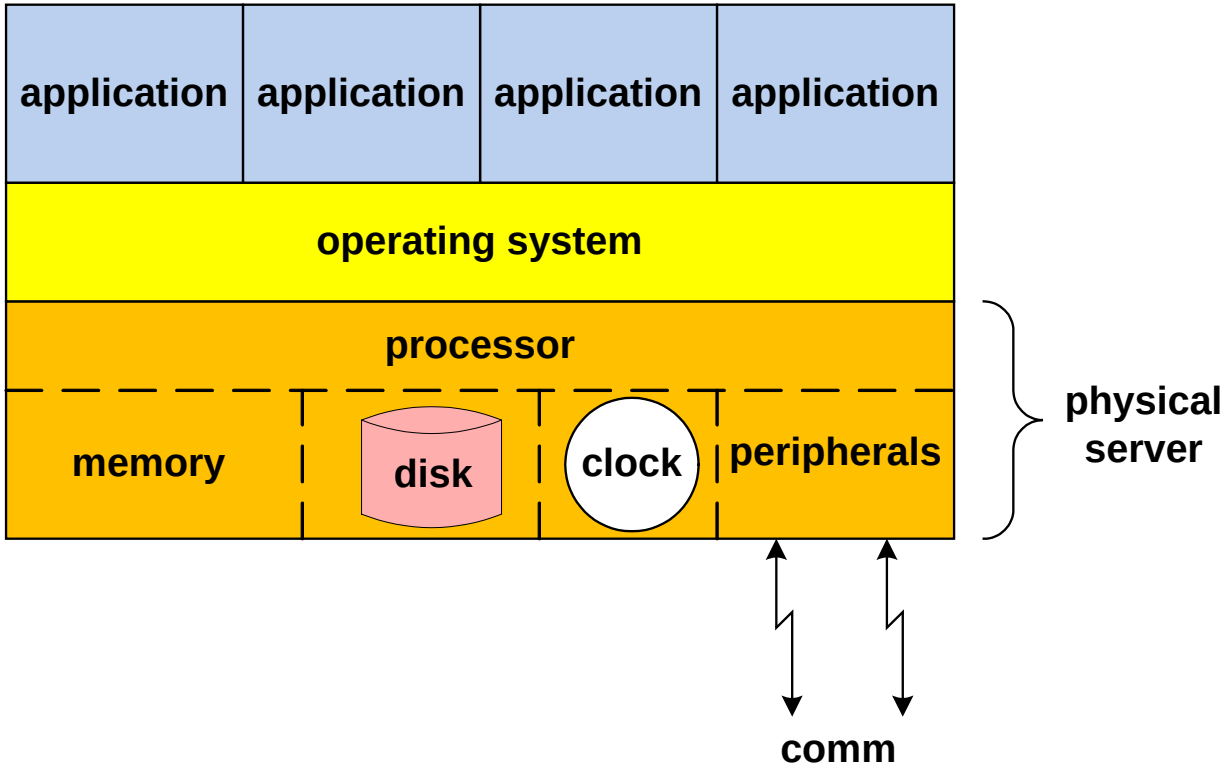


Countries and territories operating Daylight Saving Time (2008/2009) (Note: Many countries/territories change days of transitions to DST from year to year.)	
- Countries / Territories operating DST	- Countries / Territories do not use Daylight Time

Daylight Saving Time (DST)

Time-Zone Simulation

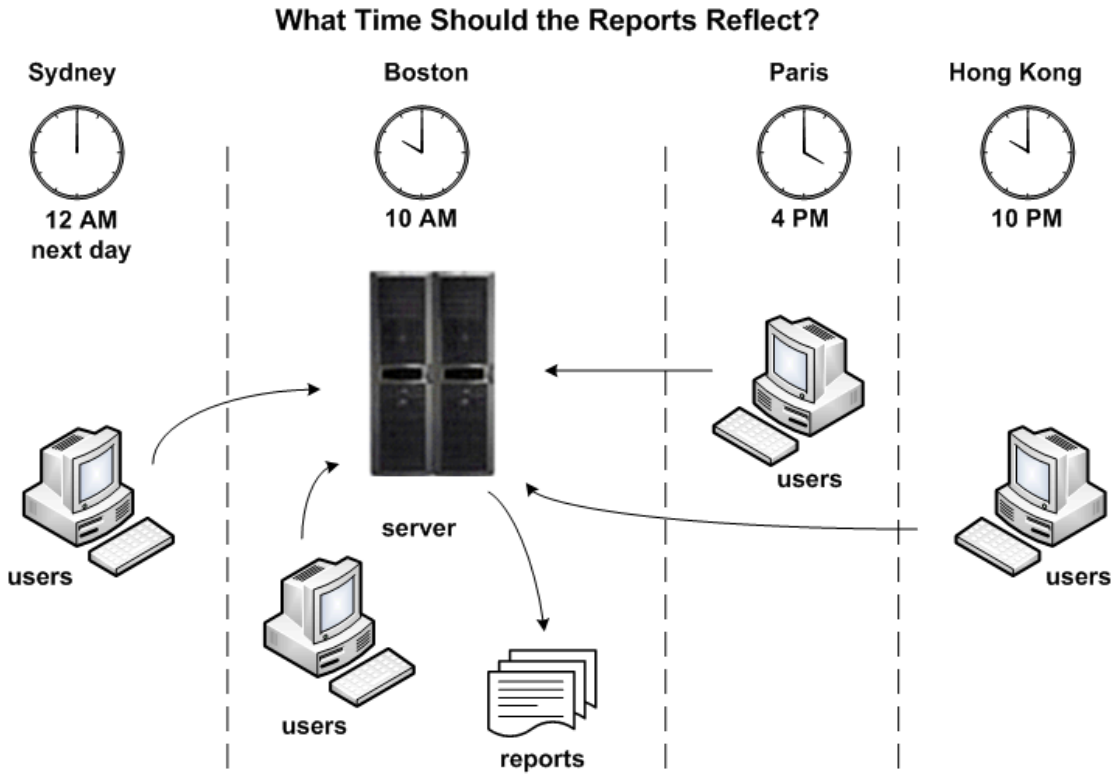
Typically, all applications run off system clock



One system clock. One current time. One time zone.

Time-Zone Simulation

Consolidation requires virtual time zones



One system clock. One current time. Multiple time zones.

Time-Zone Simulation

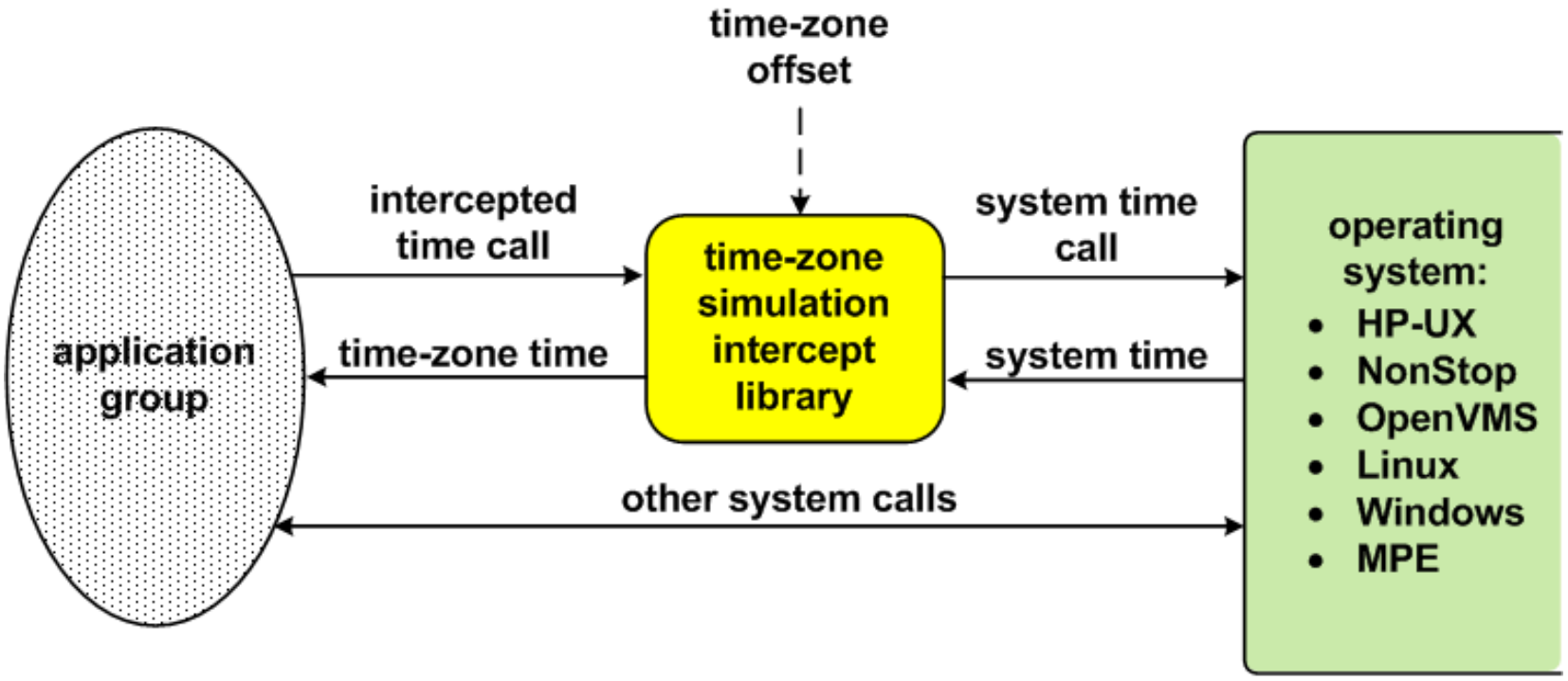
Here's the challenge!

What must you do to accommodate applications that need to run in *user* time, not *system* time?

One system clock. One current time. Multiple time zones.

Time-Zone Simulation

Here's the solution!



Typical Time-Zone Simulation Architecture

One system clock. One current time. Multiple time zones.

No Problem!

Time-Zone Simulation

Time-Zone Simulation

Creates virtual time zones that allow existing production and backup systems to support worldwide consolidated environments.

One system clock. One current time. Multiple time zones.

Resolving the Time-Zone Dilemma

Option 1: Don't consolidate. Maintain servers in each time zone affected.

<u>Expensive, Expensive, Expensive</u>

- **Massive costs**
- **Loss of consolidation benefits**

Resolving the Time-Zone Dilemma

Option 2: Allow applications to be GMT-dependent. Don't convert to local times.

Disgruntled Users

- **People think in local time**
- **Customers want local timestamp, not GMT on**
  - **bills • statements • receipts**
  - **email • reservations • reports**

Resolving the Time-Zone Dilemma

Option 3: Create a custom time-sensitive solution

Expensive, Risky

- **Source code required. Do you have it?**
- **Potentially huge programming effort**
- **Expensive**
- **Why risk damaging an application that works well?**

Resolving the Time-Zone Dilemma

Option 4: Use off-the shelf product

Does one exist for your environment?

If so, they are usually

- **user friendly**
- **easily installed**
- **cost-effective**
- **require no application modifications**

RBC's Consolidation Challenge

RBC Considered Several Options

Option 1 – Don't Consolidate *(variation)*

Maintain separate system for each time zone in Toronto

Maintain 4 systems – 2 production and 2 DR systems

Option 2 – Application Defined as GMT

Not an option for users

RBC's Consolidation Challenge

RBC Considered Several Options

Option 3 – Application Changes

Costly to Maintain

Option 4 – Use Off-the-Shelf Product

Most Desirable option

RBC's Consolidation Challenge

RBC Opted Against Option 1

Instead, consolidated sites *and* systems.

Savings

Hardware, building, power and cooling, software license, capacity

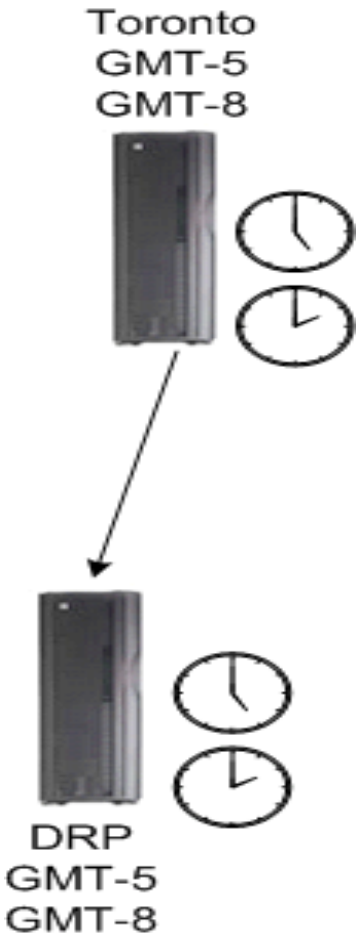
RBC's Consolidation Challenge

RBC Chose Option 4

Use off-the-shelf time-zone simulation product

- **Cost-effective alternative to Options 1, 2, & 3**
- **Permits ease of operations**
- **Permits ease of maintenance**
- **Permits faster failover**

RBC Decides to Consolidate



Consolidated System

Production Site with 2 Time Zones

DRP Site with 2 Time Zones

RBC Futures

Migrate from Integrity to Blades

Upgrade to XP12000

Thank You For Attending

Any Questions?

Ask them now, or contact us later at

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jack.digiacomo@tandsoft.com