

*Living in an Imperfect World –  
Disasters and Service Interruptions  
Large and Small*

**Robert Gezelter Software Consultant  
35 – 20 167th Street, Suite 215  
Flushing, New York 11358 – 1731  
United States of America**

**+1 718 463 1079  
gezelter@rlgsc.com**

**Tuesday, December 5, 1995  
5:00 pm – 5:50 pm  
Room 309**

**Fall 1995 US DECUS Symposium  
Moscone Convention Center  
San Francisco, California**

"Sooner or later, it was bound to happen. On June 30, 1908, Moscow escaped destruction by 3 hours and 4,000 km – a margin invisibly small by the standards of the universe. On February 12, 1947, another Russian city had a still narrower escape, when the second great meteorite of the 20th century detonated less than 400 kilometers from Vladivostok, with an explosion rivaling that of the newly invented uranium bomb.

In those days, there was nothing that men could do to protect themselves against the last random shots in the cosmic bombardment that had once scarred the face of the Moon. The meteorites of 1908 and 1947 had struck uninhabited wilderness; but by the end of the twenty-first century, there was no region left on Earth that could be safely used for celestial target practice. The human race had spread from pole to pole. And so, inevitably ...

Living in an Imperfect World: Disasters and Service Interruptions  
Slide 2  
© 1992, Robert Gezelter, All Rights Reserved

**Robert Gezelter**  
Software Consultant

At 0946 GMT on the morning of September 11 in the exceptionally beautiful summer of the year 2077, most of the inhabitants of Europe saw a dazzling fireball appear in the eastern sky. Within seconds it was brighter than the Sun, and as it moved across the heavens - at first in utter silence - it left behind it a churning column of dust and smoke.

Somewhere above Austria, it began to disintegrate, producing a series of concussions so violent that more than a million people had their hearing permanently damaged. They were the lucky ones.

Living in an Imperfect World: Disasters and Service Interruptions  
Slide 3  
© 1992, Robert Gezelter, All Rights Reserved

**Robert Gezelter**  
Software Consultant

## NOTES

Moving at 50 kilometers a second, a thousand tons of rock and metal impacted on the plains of northern Italy, destroying in a few flaming moments the labor of centuries. The cities of Padua and Verona were wiped from the face of the Earth; and the last glories of Venice sank forever beneath the sea as the waters of the Adriatic came thundering landward after the hammer blow from space."

— *Rendezvous with Rama*  
Arthur Clarke  
copyright 1973

Living in an Imperfect World: Disasters and Service Interruptions  
Slide 4  
© 1992, Robert Gezelter, All Rights Reserved

**Robert Gezelter**  
Software Consultant

*Or,*  
*if you prefer the real world –*  
**World Trade Center,  
New York, New York**  
**12:18 EST, 2/28/93**

Living in an Imperfect World: Disasters and Service Interruptions  
Slide 5  
© 1992, Robert Gezelter, All Rights Reserved

**Robert Gezelter**  
Software Consultant

## NOTES

***Chicago "Loop" District  
Spring 1992***

*50 years ago:*

***Power – 1 week outage not unusual  
Telephone – rarely present  
Computers – non-existent***

Living in an Imperfect World: Disasters and Service Interruptions  
Slide 6 © 1992, Robert Gezelter, All Rights Reserved

**Robert Gezelter**  
Software Consultant

Living in an Imperfect World: Disasters and Service Interruptions  
Slide 7 © 1992, Robert Gezelter, All Rights Reserved

**Robert Gezelter**  
Software Consultant

**NOTES**

*40 years ago:*

***Power – 1 week outage not unusual***

***Telephone – 1 week outage not fatal***

***Computers – non-existent***

*30 years ago:*

***Power – 1 day outage unusual***

***Telephone – outage inconvenient***

***Computers – rare***

## NOTES

*20 years ago:*

***Power – 1 day outage unusual***  
***Telephone – important, outage***  
***impairs normal business***  
***Computers – common, but not***  
***mission critical in most***  
***businesses***

*10 years ago:*

***Power – 1 hour outage unusual***  
***Telephone – mission critical***  
***Computers – any interruption***  
***impairs business;***  
***Arrival of PC***

Living in an Imperfect World: Disasters and Service Interruptions  
Slide 10  
© 1992, Robert Gezelter, All Rights Reserved

**Robert Gezelter**  
Software Consultant

Living in an Imperfect World: Disasters and Service Interruptions  
Slide 11  
© 1992, Robert Gezelter, All Rights Reserved

**Robert Gezelter**  
Software Consultant

## NOTES

## *Today*

***Power – "Normal" outage less than 5 minutes***

***Telephone – absolutely vital for most businesses***

***Computers – mission critical, any unavailability has severe impact***

***Networks – absolutely vital to all business operations***

## *Today:*

***PCs/Workstations***

***Servers/Superminicomputers***

***PBX/Phones***

***LANs/WANs***

Living in an Imperfect World: Disasters and Service Interruptions

Slide 12

© 1992, Robert Gezelter, All Rights Reserved

**Robert Gezelter**  
Software Consultant

Living in an Imperfect World: Disasters and Service Interruptions

Slide 13

© 1992, Robert Gezelter, All Rights Reserved

**Robert Gezelter**  
Software Consultant

## **NOTES**

*Today:*

***No phones***  
***No E-mail***  
***No Voicemail***  
***No Customer Information***  
***No Inventory***  
***No Charge Cards***  
***No Databases***

*Service interruptions,  
like Death & Taxes,  
are a Fact of Life*

Living in an Imperfect World: Disasters and Service Interruptions  
Slide 14  
© 1992, Robert Gezelter, All Rights Reserved

**Robert Gezelter**  
Software Consultant

Living in an Imperfect World: Disasters and Service Interruptions  
Slide 15  
© 1992, Robert Gezelter, All Rights Reserved

**Robert Gezelter**  
Software Consultant

## NOTES

## *The Issue:*

***Computers inspire visions of omnipotence. The reality is quite different.***

***When designing any type of network your control over the network infrastructure is limited***

Living in an Imperfect World: Disasters and Service Interruptions  
Slide 16 © 1992, Robert Gezelter, All Rights Reserved

**Robert Gezelter**  
Software Consultant

Living in an Imperfect World: Disasters and Service Interruptions  
Slide 17 © 1992, Robert Gezelter, All Rights Reserved

**Robert Gezelter**  
Software Consultant

## **NOTES**

## *Common Hazards*

***Custodial personnel***  
***Trades personnel***  
***Common carriers***

## *Acts of Clod*

## *Common Hazards (Cont'd)*

***Weather***  
***Earthquakes***  
***Floods***  
***Auto, Rail, Plane Incidents***  
***Structural failure***

## *Acts of God*

Living in an Imperfect World: Disasters and Service Interruptions  
Slide 18  
© 1992, Robert Gezelter, All Rights Reserved

**Robert Gezelter**  
Software Consultant

Living in an Imperfect World: Disasters and Service Interruptions  
Slide 19  
© 1992, Robert Gezelter, All Rights Reserved

**Robert Gezelter**  
Software Consultant

## **NOTES**

*Any hazard, in an instant,  
can turn your perfectly  
functioning high-speed  
network into a useless  
collection of inert copper  
wire and glass fiber*

## *Hardware and Human Factors:*

***Live Wire Cut – AT&T 1/4/91***  
***Power outage at NYC***  
***Switching Center***  
***– AT&T 9/17/91***  
***Hinsdale Fire***  
***– Illinois Bell 5/9/88***  
***Second Avenue Fire***  
***– NY Bell, 2/27/75***

Living in an Imperfect World: Disasters and Service Interruptions  
Slide 20  
© 1992, Robert Gezelter, All Rights Reserved

**Robert Gezelter**  
Software Consultant

Living in an Imperfect World: Disasters and Service Interruptions  
Slide 21  
© 1992, Robert Gezelter, All Rights Reserved

**Robert Gezelter**  
Software Consultant

## NOTES

## *Software Failure*

**Arpanet Naturally Occuring Virus**  
– 10/27/80

**Switch Failures in  
three major cities**  
– DSC 6/91

Living in an Imperfect World: Disasters and Service Interruptions  
Slide 22 © 1992, Robert Gezelter, All Rights Reserved

**Robert Gezelter**  
Software Consultant

## *Conclusion:*

***There are tigers in the woods!***

***The world is a nasty place, you  
can get hurt!***

Living in an Imperfect World: Disasters and Service Interruptions  
Slide 23 © 1992, Robert Gezelter, All Rights Reserved

**Robert Gezelter**  
Software Consultant

## **NOTES**

**Amateurs study tactics,  
Professionals study logistics.**

– Red Storm Rising  
Tom Clancy  
copyright 1986

### *Lesson from World History*

**Supply lines are your umbilical cord. England, Japan, Hawaii, North Africa. Long Supply lines are fatal**

Living in an Imperfect World: Disasters and Service Interruptions  
Slide 24  
© 1992, Robert Gezelter, All Rights Reserved

**Robert Gezelter**  
Software Consultant

Living in an Imperfect World: Disasters and Service Interruptions  
Slide 25  
© 1992, Robert Gezelter, All Rights Reserved

**Robert Gezelter**  
Software Consultant

## NOTES

*The longer your umbilical cord  
– the greater the danger*

**99% uptime =  
 $n * .01$  probability of failure**

**where there are  $n$  links  
in the chain**

Living in an Imperfect World: Disasters and Service Interruptions  
Slide 26  
© 1992, Robert Gezelter, All Rights Reserved

**Robert Gezelter**  
Software Consultant

Living in an Imperfect World: Disasters and Service Interruptions  
Slide 27  
© 1992, Robert Gezelter, All Rights Reserved

**Robert Gezelter**  
Software Consultant

## NOTES

*Your PC is:*

***connected to the LAN  
3 servers  
bridged to 4 other offices  
each servers has its own  
connections***

*Very quickly, in realtime  
terms, your data becomes  
unreachable*

Living in an Imperfect World: Disasters and Service Interruptions  
Slide 28  
© 1992, Robert Gezelter, All Rights Reserved

**Robert Gezelter**  
Software Consultant

Living in an Imperfect World: Disasters and Service Interruptions  
Slide 29  
© 1992, Robert Gezelter, All Rights Reserved

**Robert Gezelter**  
Software Consultant

## NOTES

*Possible Solutions:*

***Backup Connectivity (partial)  
Realtime independence***

***Backup Connectivity***

***"Last Mile" problem  
The Data still exists,  
yet is unreachable.***

Living in an Imperfect World: Disasters and Service Interruptions  
Slide 30  
© 1992, Robert Gezelter, All Rights Reserved

**Robert Gezelter**  
Software Consultant

Living in an Imperfect World: Disasters and Service Interruptions  
Slide 31  
© 1992, Robert Gezelter, All Rights Reserved

**Robert Gezelter**  
Software Consultant

## NOTES

*Backup of Data  
on other systems  
Avoids loss of data.  
No answer to "Last Mile"*

## *Last Mile Problem*

***Most connections generally go through a single routing for the last mile (or kilometer). A single accident has a high probability of disrupting all paths.***

## **NOTES**

## *Solution to Last Mile Problem*

***Data required in realtime  
must be in the local facility,  
within the campus, building,  
floor, or workgroup***

## *Example Applications: Electronic Mail*

***OpenVMS Mail normally  
requires the local node  
and remote node online,  
and a connection path  
between them to send a  
message.***

Living in an Imperfect World: Disasters and Service Interruptions  
Slide 34 © 1992, Robert Gezelter, All Rights Reserved

**Robert Gezelter**  
Software Consultant

Living in an Imperfect World: Disasters and Service Interruptions  
Slide 35 © 1992, Robert Gezelter, All Rights Reserved

**Robert Gezelter**  
Software Consultant

## **NOTES**

## Drawback

**If any link in the chain is down, you cannot send Electronic mail. In a large network, some link or node is always out of service.**

## Alternate:

**Store and Forward Systems  
e.g. Internet Mail**

**Mail program spools message into system spool directory (mailbags) for transmission (possible later) to next link in chain.**

**Mail Exchangers**

**Process continues until destination**

## NOTES

## *Conclusion:*

***Store and Forward permits even severe outages to disappear from outside view. Front office requirements for long distance online connections MUST be viewed in context.***

## *Principles:*

***Constant Online Access***

***– Local Data***

***Occasional, non-realtime Access***

***– Remote via deferred***

***Store and Forward facilities***

Living in an Imperfect World: Disasters and Service Interruptions

Slide 38

© 1992, Robert Gezelter, All Rights Reserved

**Robert Gezelter**  
Software Consultant

Living in an Imperfect World: Disasters and Service Interruptions

Slide 39

© 1992, Robert Gezelter, All Rights Reserved

**Robert Gezelter**  
Software Consultant

## **NOTES**

*Network component failures are inevitable. Planning must take these failures into account when configuring the network.*

*It is possible to provide extremely high levels of availability IF proper precautions are taken.*

*However, 100%, 7 day a week, 24 hour a day availability for every network component is unrealistic and not cost effective*

Living in an Imperfect World: Disasters and Service Interruptions  
Slide 40  
© 1992, Robert Gezelter, All Rights Reserved

**Robert Gezelter**  
Software Consultant

Living in an Imperfect World: Disasters and Service Interruptions  
Slide 41  
© 1992, Robert Gezelter, All Rights Reserved

**Robert Gezelter**  
Software Consultant

## NOTES

# Questions?

**Robert Gezelter Software Consultant**

**35 – 20 167th Street, Suite 215**

**Flushing, New York 11358 – 1731**

**United States of America**

**+1 718 463 1079**

**gezelter@rlgsc.com**

Living in an Imperfect World: Disasters and Service Interruptions

Slide 42

© 1992, Robert Gezelter, All Rights Reserved

**Robert Gezelter**

Software Consultant 35 – 20 167th Street, Suite 215, Flushing, New York 11358 – 1731 USA

## NOTES