

## What is the Year 2000 Problem?

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Use of two-digit-year (YYMMDD) format to represent dates in

- computer hardware and firmware
- computer programs
- databases
- embedded microprocessors/controllers

Saved storage space and data entry time (like your checkbook!)

Saved about \$30 billion over 30 years (industry estimate)

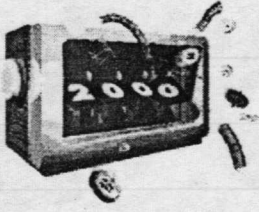
Does not account for Century Change without "special kludges"

No standard was ever adopted for these "kludges"

Only fully reliable approach is to use four-digit YYYYMMDD

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## What's so Hard About Adding Two Digits?

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**The problem is in billions of lines of code** written over 30+ years

- huge "discovery" task for banks, governments etc.
- estimated costs \$600 billion worldwide, not budgeted
- original programmers moved on, documentation poor or lost
- new programmers in short supply as deadline same everywhere

**The problem pervades global database, can't change it all at once!**

- world financial system depends on fast, reliable data exchange
- no standard for fix exists but all changes must co-operate  
(they won't ... at first)

**The problem is in embedded systems and process controllers:**

- power generation (incl. nuclear) and distribution
  - telecommunications systems (phones, faxes, switches)
  - transportation (air traffic control, rail, ships, intersections?)
  - manufacturing (process controllers)
  - distribution (inventory control)
  - retail (point of sale systems)
  - buildings (HVAC, security systems)
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NEWS



*Working for IT professionals*

## Embedded chips pose threat to staff safety

One in five embedded systems responsible for running critical processes in UK oil, petrochemical, power and aviation manufacturing firms will fail in the year 2000.

Applications at risk include key safety systems such as those to detect fires. This alarming finding is contained in a report by Glasgow-based Real Time Engineering which was commissioned last month by the Health and Safety Executive. Nearly a fifth of the 150 embedded systems Real Time Engineering identified as being business-critical failed year 2000 tests.

Most industries use real-time IT systems to control mechanical equipment. Those in the oil, gas and power industry have so far received the most attention. But other industries, including retail distribution, food and drink manufacture, water and sewage all stand to be affected.

One large food manufacturing plant, tested by Real Time Engineering, has computer controlled production lines that use steam. According to the report, the embedded chips in the lines are not millennium compliant. If they shut down in the year 2000 while steam continues to be generated, there could be an explosion, it says.

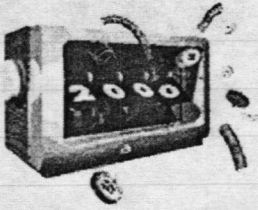
"It's small and medium-sized factories and firms that we're really worried about," said Gerry Docherty, managing director at Real Time Engineering. Some may not even be aware of the problem or if they are, they lack the financial and technical resources to put it right.

"The problem will be exacerbated by staff shortages. Only a very small percentage of the IT workforce can deal with embedded systems. And those that can will be swallowed up by the larger firms.

"There's no hope of all these systems being compliant by the year 2000. But it's crucial that systems affecting safety are dealt with."

In the short-term, Docherty advises firms to employ extra staff to replace automated systems while the millennium fixes are being completed.

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## What Happens if Nothing is Done?

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If 2000 came "tomorrow", with all systems "as is", chaos.

### Date ambiguities:

order dates, ship dates, expiry dates, destroy dates, release dates, arrival dates, correction dates, log dates, reservation dates, change dates, version dates, delinquency dates, payroll dates, personnel records.

All bad for "just-in-time" manufacturing and distributing, payroll and accounting systems, database interchange. *"ripple effect", common sense out of the loop*

Interval ambiguities in interest, tax and billing calculations.

### Year "00" date-aware embedded chip behaviors may surprise:

e.g. many PC RTC chip + BIOS reset date at post-2000 reboot to 4-Jan-1980 (human intervention needed)

A bank ATM has been caught showing a `c:>` prompt!

Failure mode is highly chip-dependent. Many (most?) will not fail. Some will continue working but incorrectly. Some will cease working. Human intervention is not possible for some embedded chips (not designed for reprogramming, or inaccessible).

Fidelity Investments: computer room UPS systems failed in a Year 2000 test.

Smith-Kline: two "identical" pharmaceutical production lines behave differently in Year 2000 test, "identical" embedded chipsets, manufactured at different times in different countries, failed differently.

2 of 3 "smart" HVAC systems failed a Year 2000 test; one could not be reset and had to be replaced.

*Maine electrical utility - non compliant chips in distribution systems.*

**Doing nothing is not a viable option.**

*Smokestack scrubbers.*

*Real Time Engineering (UK)  
→ 1 in 5 date-aware embedded systems fail in practice.*



**OMB's Governmentwide Year 2000 Milestones**

<b>Phase</b>	<b>Completion measure</b>	<b>Completion date</b>
<b><i>AWARENESS</i></b>	<b>Agency strategy approved by CIO</b>	<b>12/96</b>
<b><i>ASSESSMENT</i></b>	<b>Inventory and scope completed</b>	<b>3/97</b>
	<b>System plans/schedules approved by CIO</b>	<b>6/97</b>
<b><i>RENOVATION</i></b>	<b>Coding completed</b>	<b>12/98</b>
<b><i>VALIDATION</i></b>	<b>Management sign-off</b>	<b>1/99</b>
<b><i>IMPLEMENTATION</i></b>	<b>Integrated testing completed</b>	<b>11/99</b>

Source: OMB.

## G. ACQUISITION SCHEDULE

At this time, the acquisitions schedule includes the following critical milestone dates:

Activity	Date
◆ Issuance of Request for Comments (RFC)	May 15, 1997
◆ Overall Technical Conference	June 16, 1997
◆ Offerer Requested Technical Conferences	TBA from May 15, 1997 Through July 11, 1997
◆ Closing Date for Written Comments from Potential Offerers	July 15, 1997
◆ Issuance of a Final Draft Request for Proposals (RFP)	October 1, 1997
◆ Closing Date for Written Comments from Potential Offerers	November 1, 1997
◆ Issuance of Final Request for Proposals(s) RFP	December 1, 1997
◆ Proposal Submission	May 1, 1998
◆ <u>Contract Award</u>	<u>October 1, 1998</u> !!

## H. ADDITIONAL INFORMATION TO BE INCLUDED IN THE FINAL PRIME RFP

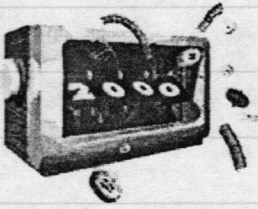
At a minimum, the Final PRIME RFP will include the following information to facilitate development of Technical and Business Proposals:

- ◆ **Essential data concerning Phase I, "Customer Service Through Accessing Corporate Data"** that would be derived from the Phase I Business Case which, in turn, would be developed from Level III *Modernization Blueprint* documentation.

These data should assist offerers to prepare the Technical and Business Proposals for developing, integrating and implementing Phase I systems.

- ◆ **Essential data concerning the Pilot Paper Submissions Processing Program (PPSPP)** that would include the business functions within the scope of the Pilot and the government costs for currently performing these functions as documented by the Chief Financial Officer's Independent Verification and Validation.





## It's Here Already!

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Credit cards with 00 expiry years rejected as expired by point-of-sale systems.

VISA and MasterCard have authorized banks to issue 00 cards October 1997.

Debit cards with 00 expiry years crashing point-of-sale systems.

Detroit lawsuit: supermarket suing POS vendor whose systems crashed for hours. (Tec-América)

Driver's licenses with 00 expiry years refused by rental car agency computers.

Some states have removed readable mag strips from their licenses now. (e.g., Virginia)

DoD contractor got 5-yr contract. 90 days later, 95-year delinquency notice!

Major bank had "keep until" date with 00 on data tapes.

Auto tape vault released tapes (caught by alert human).

Problem will affect many automated inventories, e.g. pharmaceuticals, well before 2000. - "Dallas" auto warehouse problem in Australia

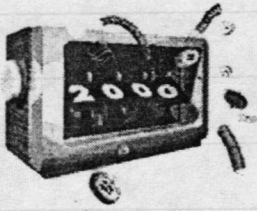
Forecasting spreadsheets discovered that *Lotus 1-2-3* and "compatible" programs did not know that 2000 is a Leap Year.

Ahead-schedulers unable to handle events after 1999.

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## **Almost Year 2000 ..... but not quite**

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**August 21-22, 1999**

Many older GPS receivers will believe it is 6 January 1980

GPS week count starts at JD 2444244.50 and is modulo 1024

Up to user to account for this, some manufacturers did not

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**September 9, 1999**

9/9/99 used as "never" or "do not do" by accounting/admin packages, especially in mainframe/COBOL environments.

Obvious problems using a legitimate date as a special-function key.

Prevents actions being taken on that date, or opens a Pandora's box of "do nevers" on the date.

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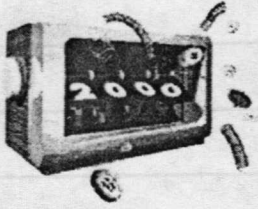
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It's not just me!

Here are some assessments  
by normally sober agencies!



## How Serious a Problem is This?

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*The Year 2000 Computer Problem is now one of the most important issues facing businesses, governments and other institutions worldwide...we continue to believe business and government leaders globally do not fully appreciate the dilemma facing them...[Merrill Lynch]*

*The ITU fears that once we reach the new millennium, countries that have remedied the situation will not be able to communicate with those who have not dealt with the issue. In broad terms this would cut the developing world off from the developed world, which has the resources to take corrective measures. [International Telecommunications Union]*

*It is possible, in the light of the enormous scale and range of financial market participants, that certain applications may fail to operate smoothly on 1st January 2000. It is therefore important that all financial institutions, and in particular market bodies such as exchanges and clearing houses, develop appropriate contingency plans to deal with any interruptions to counterparty trades and payments [Central Bank Governors of the G-10, Basle, September 8 1997]*

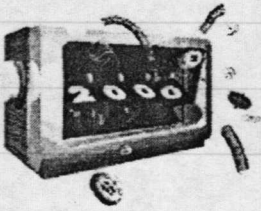
*Larger banks ... appear capable of renovating their critical operating systems by year-end 1998 ... smaller banks are ... working on the problem...however their progress is less visible. Although operational contingency is something that the Federal Reserve is confronted with on a daily basis, preparation for contingency in the century date change environment does offer some new and significant challenges ... the normal contingency of falling back to a prior release of the software is not a viable option ... we recognize that, despite their best efforts, some depository institutions may experience operating difficulties ... [E.W.Keller Jr., Governor of the Federal Reserve Bank, in congressional testimony July 30, 1997]*



" Efficiency of electronic data processing  
has taken people out of the loop in  
banking and commerce. Instantaneous  
interchange needed or.

Don't have backup system

- paper trail time consuming
- or people who can do arithmetic
- falling back on a backup comp. program  
or an earlier version does not  
help a Y2K situation!



## Where Could Year 2000 Problems Affect us at the NRAO?

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### Computers

- Hardware (clocks, firmware)
- Operating Systems and utilities
- Software (applications)
- Networking

### Any Date-Aware Embedded Systems

- Telescope control systems
- Electronics
- Infrastructure (e.g. building security, "smart" HVAC)
- Communications (PBX)

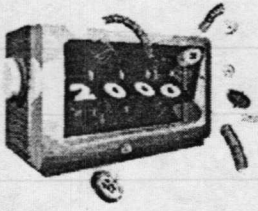
### Payroll/Fiscal

- Out-sourced software packages (ADP, J.D.Edwards)
- Customized (in-house) software (Personnel, purchasing?)
- Databases and data exchange
- Customized interfaces, e.g. to J.D.Edwards

### Outside Suppliers

- Electrical power
- Banking/financial
- Government
- Transportation
- Telecommunications
- General retail/distribution





## What do we do about Internal Year 2000 Problems?

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**Inventory all computers and software critical to NRAO mission, including PC's.**

Tackle "show-stoppers" first.   
 ← telescope operations  
 ← business/personnel systems

Assess Year 2000 compliance of computers and software together by **testing** wherever possible.

If non-compliant: **retire, refurbish, or replace?**

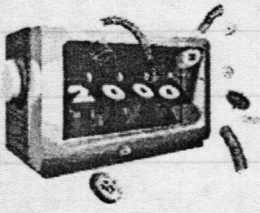
Inventory other date-aware devices: **anything on which we can set a date.**

Test for Year 2000 compliance if critical to operations. (NOAC)

**Start now!** Remediation may be more difficult later.

Remember: deadline is inflexible and the same everywhere in the world.

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## **What do we do about External Year 2000 Problems?**

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Use federal Year 2000 Compliance language in all new purchase orders and contracts.

Ask for, document, and assess, compliance statements from vendors of critical systems and ongoing services.

If they won't provide such a statement, pursue alternatives now, not later.

If they will, exactly what does it commit them to?

If they will become compliant "later", when will that be?

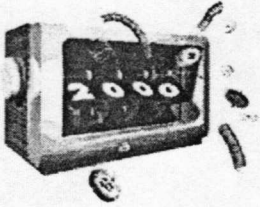
What changes, if any, must we make to be compatible with their product when compliant?

Monitor progress as we would monitor a contractor in a construction project.

Develop contingency plans for the most critical areas ... the rest of the world may not be working quite "normally" in January 2000.

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## NRAO Year 2000 Working Group

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### *Task 1:*

Inventory/assess vulnerable systems at the NRAO.

Focus first on most critical functions (and people), identify software and hardware combinations they *must* have to do their jobs. Move on to less critical functions later ....

### *Task 2:*

Testing!

### *Task 3:*

Increase awareness and share knowledge around NRAO Year 2000 Web Pages ... <http://www.cv.nrao.edu/y2k/>

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