

EPILOGUE TO AAS 11-668: SURVEY RESULTS

The editors have included responses to the 2011 IERS Earth Orientation Center survey as an epilogue to Gambis *et al.* (2011).^{*} Each available recorded response includes:

- i. The date of response, followed by the contributor's declared name.
- ii. The contributor's declared professional affiliation and nationality.
- iii. The contributor's declared domain of activity.
- iv. The contributor's preference indicated by the following number:
 1. Satisfaction with the status quo (with leap seconds).
 2. Preference that UTC be redefined as a uniformly increasing atomic timescale without leap seconds.
 3. Another preference.
 4. No preferential opinion.
- v. Optional commentary (up to 1600 characters).

To enhance the readability of the responses, some typographical errors were corrected. Majuscule (upper case) or minuscule (lower-case) typing for names, locations, *etc.*, was also changed to enhance readability. To conserve space, salutations, closings, signature blocks, and personal information (such as business URLs, email, and postal addresses), were omitted. Some country names were also abbreviated to conserve space. The sequencing of a few responses was changed for more efficient pagination; the included date reveals original sequencing.

As of October 26, 2011, 447 responses were available, which includes responses unavailable when Gambis *et al.* (2011) was submitted. An updated tabulation of the response percentages is provided in Table 1 of this epilogue, but these are not significantly different than before. A separate letter was received by Royal Institute of Navigation (RIN), which is also appended.

Table 1. Tally of Available Responses (as of October 26, 2011)

Response #1 (<i>status quo</i>)	341	(76.3%)
Response #2 (decouple UTC and Earth rotation)	80	(17.9%)
Response #3 (another preference)	21	(4.7%)
Response #4 (no opinion)	5	(1.1%)

^{*} As available via <http://hpiers.obspm.fr/eop-pc/questionnaire/result.php> on October 26, 2011.

08 July 2011; Woltz, Lawrence
NASA, USA
Satellite precipitation measurement
Response = 1

08 July 2011; van Schellen, Remco
Omroep Zeeland, the Netherlands
Media
Response = 1

08 July 2011; Savoie, Denis
SYRTE-Observatory of Paris, France
Astronomy-Astrophysics
Response = 1
The redefinition of UTC will cause serious difficulties for fans of sundials. The conversion of solar time in standard time will be even more complicated to explain to the public and students! The calculation of analemma (directly indicating Universal Time by integrating the equation of time and the longitude) will become problematic. Sundials are nothing in front of the lobby GPS; but their role in teaching astronomy is very important

08 July 2011; Marmet, Louis
NRC Canada, Canada
Time-laboratory
Response = 1
The time scale TAI is already implemented for applications where a leap second would be a problem. I consider that a change of the definition of UTC will reduce the credibility of our institution (time standards community) in the eye of the public. Seriously affected will be the users who use the position of the sun. A redefinition of UTC will change the calendar date of these events and have serious social impacts once it becomes known to the public. There is not enough room here to bring more arguments...

08 July 2011; Olsson, Sten
Lockheed Martin Corporation, USA
Air Traffic Control
Response = 1

08 July 2011; Tang, Jingshi
Astronomy department, Nanjing University, China
Astronomy-Astrophysics Celestial-mechanics Geodesy
Response = 1

08 July 2011; Cooper Jr., Peter
None, USA
Hobbyist that finds time interesting
Response = 1

08 July 2011; Gambis, Perceval
Thales, France
Air Traffic Control
Response = 2
In the field of Civil Air Navigation, UTC time is the reference. We don't really care about TAI. Leap seconds have always been an issue and sometimes a 1 second jump in the clocks can cause major problems in our complex air traffic control systems and subsystems. Getting rid of the leap seconds is preferable.

08 July 2011; Gonzalez, Hervé
Airbus Operations SAS, France
Aeronautics
Response = 1

08 July 2011; Williams, David
Fidelity Bank, USA
Telecommunication Information Technology
Response = 1
Civil time reckoning has always been tied with the Earth's rotation. Leap seconds are small enough that few people are inconvenienced and frequent enough that there are tested procedures on how to deal with them. Leap minutes or leap hours would be very disruptive. To drop the relationship with Earth's rotation is to not deal with the issue and to kick the can down the road for someone else to deal with at a later time.

08 July 2011; Enfinger, Eugene Bryan
Enfinger & Assoc., LLC, USA
Astronomy-Astrophysics Celestial-mechanics Geodesy
Response = 1
LEAVE THE CURRENT SYSTEM AS IS!!!!!!

08 July 2011; Finch, Tony
Univ. of Cambridge Computing Service, England
Telecommunication
Response = 2
If we are to continue leap seconds, they will be much more easy to handle if they are announced several years in advance, such that leap second tables can be distributed as part of a computer system's software.

08 July 2011; Smith, Eric
Total Spectrum Software, Canada
Computer software

Response = 3

I am generally satisfied with the current definition of UTC which includes leap seconds. However, I think it would be useful for leap seconds to be scheduled further in advance (for example several years, rather than 6 months). This would allow makers of computer systems to more readily schedule and prepare for leap seconds. This advantage would, I think, outweigh the difficulties in keeping DUT1 within 1 second over such a long period -- particularly if the alternative is to allow DUT1 to grow without bound!

08 July 2011; Hall, Shannon
JHU/APL, USA
Astronomy-Astrophysics Geophysics
Response = 1

08 July 2011; Seaman, Rob
National Optical Astronomy Observatory, USA
Astronomy-Astrophysics
Response = 1

I would support lengthening the forecast interval immediately to whatever value permits remaining within the 0.9s DUT1 limit - note that no change would be required to TF-460 to do this. The state of the art of EOP forecasts has improved dramatically since 1972 and we should benefit from that. I might additionally consider supporting the relaxation of the 0.9s limit to later permit lengthening the forecast interval further. Care should be taken with planning for any change to UTC. Due diligence has not been met by the current ITU-R process.

08 July 2011; Vince, Peter
BBC Television, UK
Broadcast radio and television
Response = 2

UTC currently gives an accurate indication of the Earth's orientation - something most people have no interest in, particularly to the degree of accuracy achieved. Most people assume noon (12:00) to be when the sun is at its highest, but with the analemma effect, and especially daylight savings time, that is certainly not true. Modern broadcasting and communication equipment needs an accurately synchronised reference, so variable frequencies tracking the Earth's rotation is not an option. With 24-hour broadcasting of mainly pre-recorded programmes, it is essential for

professional continuity that the duration of the programme is known, and changing the clock time during the transmission of a programme negates this accuracy.

Leap-seconds were a good idea in 1972 when people just had a few inaccurate analogue clocks, but now so much equipment has a clock, it is a nightmare to correct it all. There is also a cost penalty to do this, for the time and effort of the staff involved, and the confusion, if not danger, of them not being corrected and synchronised.

I believe daylight-saving time should also be abolished, but that is another argument. At least let us take this opportunity to simplify time-keeping for the majority. There will be a cost penalty for the astronomers, but that is nothing to the cost currently incurred by everyone else. They already have to compensate for sidereal time and polar wobble - a slightly larger DUT-1 should be a very minor change.

But please ensure DUT-1 *IS* available to everyone, including modifying the LF radio time-signal data formats.

08 July 2011; Müller, Ulrich
Institut für Kernphysik, Univ. Mainz, Germany
Astronomy-Astrophysics
Response = 1

08 July 2011; Theodosiou, Georgios
None, France
jobless
Response = 3

Redefinition, or better, new name, for example: Universal Civil Time (UCT) with its own unit, UCT second, defined as $1/86400$ of mean solar day, under condition $|UT1-UCT| < 1$ sec. Due to earth slowing and variation in LOD some slight increase (10-20 nanosec) every 19 years (metonian cycle, largest periodic element in LOD) will be needful in UCT sec. It's possible this increase be allocated each year or even each day. Atomic time and its second will remain time scale for scientific and technical purposes, GPS etc., and UT1 and its second for astronomical purposes.

08 July 2011; Sokolov, Michael
Citizen of the Universe, Republic of New Poseidia
moral and political philosophy
Response = 1

For thousands of years the effective definition of a day has been the mean solar day. Hours, minutes and seconds are merely subdivisions of the millennia-old concept of the day. In other words, for thousands and thousands of years the definition of "day" and the time of day has been given by Mother Nature, i.e., by the Sun in the sky. What the outrageous ITU proposal is effectively asking us to do is to give up our trust in Mother Nature in the matters of time of day and to vest our trust instead in the racks of strange equipment operated by a bunch of guys in lab coats.

Universal Time means mean solar time. Anyone who attempts to redefine UTC as something that isn't Universal Time should be arrested and prosecuted for treason against nature / crimes against humanity.

08 July 2011; Deniel, Laurent
Thales, France
Telecommunication
Response = 2

08 July 2011; Griesbach, Jacob
Analytical Graphics, Inc., USA
Astronomy-Astrophysics
Response = 1

I believe it's important that UTC retain its celestial meaning. The rather infrequent use of leap seconds is only a light burden to maintain this synchronicity.

08 July 2011; Hujsak, Richard
Analytic Graphics, Inc, USA
Celestial-mechanics orbit determination and prediction
Response = 1

There are too many software systems with the current definitions embedded. The costs of changing that many systems for a frivolous change in definition is too great to be worthwhile. The danger is some systems would convert to the new definition, while others would not. And that mismatch can have expensive consequences. In the words of a famous procrastinator "If it ain't broke, don't fix it."

08 July 2011; Viceré, Andrea
Università di Urbino, Italy
Astronomy-Astrophysics Gravitational Waves
Response = 2
In my field, we rely on GPS counts as a uniformly increasing timescale. UTC would replace it very well and serve as a reference solution.

08 July 2011; Gupta, Sanjeev
DCS1, Singapore
Telecommunication
Response = 1
I prefer that UTC closely follow a smoothed UT1. I would accept an increase in the allowed value of DUT1, if it would help in long-range predictions of leap seconds.

08 July 2011; Candey, Robert
NASA, USA
Space-sciences
Response = 2

08 July 2011; West, Michael
Geophys. Inst., Univ. Alaska Fairbanks, USA
Geophysics
Response = 2

08 July 2011; Meagher, Kevin
University of Maryland, USA
Astronomy-Astrophysics
Response = 1
I think that is important for astronomy to keep UT and UTC as close together as possible. As far as I know, all of the problems associated with leap seconds are due do substandard software. These problems could be mitigated by standard software libraries to handle leap seconds.

08 July 2011; Dewar, Duncan
none, Scotland
Astronomy-Astrophysics Telecommunication
Response = 1

08 July 2011; Clark, Richard
National Solar Observatory, USA
Astronomy-Astrophysics
Response = 1
There is already TAI and the GPS timescale. Why do we need STILL ANOTHER constant uniform timescale?
Keep UTC as it is.

08 July 2011; Finkleman, David
CSSI and ISO TC20/SC14, USA
Astronomy-Astrophysics Space-sciences
Response = 1

I appreciate that we are referenced, but this matter is scientific and concrete, not abstract or a matter of opinion. I ask why opinion is important and whether the results of this survey will be cited to support or claim any collective consensus. Also, you might cite our American Scientist Magazine article instead of the AIAA paper. The former is more widely accessible at no cost and captures the issues more concisely.

08 July 2011; Kenworthy, Matthew
Leiden Observatory, The Netherlands
Astronomy-Astrophysics
Response = 1

08 July 2011; Wyatt, William
Smithsonian Astrophysical Observatory, USA
Astronomy-Astrophysics
Response = 1

The worst case would be for UTC to be redefined as proposed, i.e. without a name change to distinguish it from earlier UTC.

08 July 2011; Hochschild, Peter
Google, USA
Large Scale Distributed Computing
Response = 2

08 July 2011; Laney, C. David
Brigham Young University, USA
Astronomy-Astrophysics
Response = 1

08 July 2011; Buinoud, Maxime
French Navy, France
Studies
Response = 1

08 July 2011; Scott, Mike
Vercet LLC, USA
Design of Geophysical Recording Systems
Response = 2
I would like a system that makes corrections no more than once every 10 years, and gives a minimum of 1 year's notice of any changes, thank you for giving me the opportunity of having my say

09 July 2011; Townsend, Gregg
University of Arizona (retired), USA
Telecommunication Computer Science
Response = 2

09 July 2011; Osvaldo, Osvaldo Fernández
Ex professor of The Patagonia University, Argentina
Astronomy-Astrophysics Geodesy
Response = 1
I enjoy making astronomical measures of latitude and longitude by theodolite and chronograph. I need DUT1.

09 July 2011; Pfyffer, Gregor
Royal Observatory of Belgium, Belgium
Geodesy Geophysics
Response = 1

09 July 2011; Hansen, Ask
The NTP Pool project, USA
Time synchronization; computer systems
Response = 2
I operate a system providing time services for tens of millions of computers via about 2000 volunteered NTP servers. Analyzing the performance of the time servers during the 2008/2009 leap second showed a worrying percentage of (otherwise well configured and well maintained) systems being a second out of sync with everyone else for hours and in some cases even days! For computer system operations at both small and late scale the leap second comes at a great cost. For less time critical systems it "just" means that any logs or any other timed information around the leap second are unusable or at best suspect. For time critical systems to cost is shutting down the system around the leap second or if that isn't possible then great and difficult engineering around it.

09 July 2011; Barnes, Howard
Georgi Dobrovolski Solar Observatory, New Zealand
Astronomy-Astrophysics
Response = 1
Perhaps, a "leap minute" once a century might do. That would be better than this silly idea of a "leap hour".

09 July 2011; Wilkinson, James
Google, Australia
Internet
Response = 1

09 July 2011; Withers, Laurence
Geophysical Systems Ltd, UK
Geophysics

Response = 2

For seismology, which my company generally focuses on, and other areas of geophysics, we must use a global time reference so that data from geographically distant measurement stations can be correlated. Furthermore, this time reference must be constant (i.e. the definition of one second must not vary), as otherwise any frequency-based calculations would be inaccurate. Unfortunately, seismologists universally use UTC and not TAI for this time source. As a software engineer dealing with acquisition, transmission and processing systems I know from my own experience and from observing other software in the field that leap seconds are an area of huge complexity, often doubling the amount of code required for any timestamp-related task. Furthermore, each leap second occurrence leads to a raft of system failures across all manufacturers. Changing the definition of UTC to be TAI with a constant offset would greatly simplify the task of writing and maintaining software and remove an area of significant concern.

09 July 2011; Trueblood, Mark
National Optical Astronomy Observatory, USA
Astronomy-Astrophysics

Response = 1

Can you imagine the havoc created by this proposal to make UTC an atomic time? The civil time of day MUST be tied to the Earth's rotation. This rotation is gradually slowing due to tidal friction with the Moon. Therefore, we need to continue to introduce leap seconds into the time to keep our clocks in synch with where the Sun is in the sky. Over a period of centuries, the proposed change to an atomic time would make us rise at odd hours of the day, and make it impossible to point telescopes accurately. This proposal is sheer nonsense.

09 July 2011; McCartney, Craig
On-Site Training International, USA
Telecommunication Time-laboratory

Response = 1

09 July 2011; Kulda, Tomas
Charity, Czech Republic
computer programmer

Response = 2

10 July 2011; Deines, Steve
Donatech Corporation, Inc., USA
Navigation

Response = 1

Until the timekeeping community understands Universal Time, it is best to keep the status quo with UTC. Tidal friction is a torque that causes a quadratic deceleration of Earth's orientation. The simplest model of tidal friction is a constant deceleration that will cause the angular velocity (Earth's inertial spin) to decrease linearly and its angular displacement to lag in a quadratic curve. The current definition of UT1 comes from the formula from Capitaine et al, and that formula converts Earth orientation angle into UT1. Since the formula was first published in 1986, the epoch associated with the data is circa 1980, maybe 1981. The last two leap seconds roughly fit a quadratic curve after that epoch, which remarkably fits the tidal friction curve. Christodoulidis et al (1988) obtained $-5.98 \pm 2.2 \times 10^{-22}$ rad/sec² from analyzing 17 artificial satellites. From the fossil record, I obtained a value of $-5.99 \pm 1.77 \times 10^{-22}$ rad/sec² was obtained from 17 studies involving 44 fossils. It is a straightforward statistical test to show that the last two leap seconds do not come from the same population of leap seconds between 1972 and 1998. The Dec 2005 leap second was 11.96 st. dev. off and the Dec 2008 leap second was 3.96 s.d. off. Both fail the 99.9% acceptance test. Knowing that result, the divergence between TAI and UT1 between 1958 and 1998 is nearly linear. If you review the processing of that time, (See Markowitz 1968 in Telescopes) the operational epoch was advanced every day when PZT data were taken and processed. Moving the epoch would hide tidal friction under the noise in the measurements. Now, VLBI gets Earth orientation data very precisely. The operational epoch is now frozen (embedded in Capitaine et al formula), and tidal friction is now revealed in divergence between UT1 and TAI. There is no uniform divergence anymore. In a few decades, tidal friction will invalidate the Capitaine et al formula that obtains UT1, because tidal friction was never incorporated into the derivation. I firmly believe that the timekeeping community should postpone the vote until it thoroughly reviews the effects of tidal friction, which is not incorporated into the current prediction models for the divergence between UT and TAI, and definitely not in the Capitaine et al formula that defines UT1.

10 July 2011; Bertou, Xavier
Centro Atómico Bariloche, Argentina
Astronomy-Astrophysics
Response = 2

10 July 2011; Goodwin, Julien
-, Australia
Telecommunication
Response = 1

10 July 2011; Lynch-Aird, Nicolas
Independent, UK
Telecommunication
Response = 1
Leap seconds should be retained as the ongoing mechanism for maintaining UTC close to UT1. Allowing UTC to drift away from UT1 will necessitate larger corrections to be made at some unspecified point in the future which will be far more disruptive than the current system of introducing leap seconds. It would be of greater benefit to extend the time code transmission standards in such a way as to enable automated systems to be able to detect an upcoming leap second in advance of the event. Assuming that the transmission of DUT1 is retained then this only requires one extra bit of information - the sign of the leap second can be determined from the sign of the preceding value of DUT1. It would be beneficial also to include additional flags in the transmitted data to indicate an upcoming change in the transmitted value of DUT1. Finally the time code standard should be made freely and publicly available. In this way equipment manufacturers will be more readily able to develop systems that can respond in a wholly automated manner to changes in DUT1 and the introduction of leap seconds.

10 July 2011; Scott-Thoennes, Yitzhak
Shiftboard, USA
Telecommunication
Response = 1

10 July 2011; Kapounek, Petr
Comerce Sphere, Czech Republic
Telecommunication
Response = 1

10 July 2011; Verhaege, Christophe
Laboratoire de Météorologie Physique, France
Astronomy-Astrophysics
Response = 1

11 July 2011; Lim, Peter
Nil, Singapore
Nil
Response = 2

11 July 2011; Siddiqui, Hassan
ESA/ESAC, Spain
Astronomy-Astrophysics
Response = 2
Having a time scale that is discontinuous causes a lot of problems with writing and maintaining software for processing non-ground-based astronomical missions, and in particular the link to the spacecraft and the ground segment. It would help immensely if UTC is redefined such that it represents terrestrial time in as simple a way as possible. Of course, a counter-argument for my request is to simply use TAI right now instead of UTC - if in the future the difference would be a constant. This is in fact my preference. However, a lot of ground based activities are heavily intertwined to UTC, it is best to work on making that system simpler.

11 July 2011; Herrero, Javier
HV Sistemas S.L., Spain
Space-sciences
Response = 2

11 July 2011; Meyer, François
Observatoire de Besançon, France
Time-laboratory
Response = 1
It seems that addressing the main engineering concerns generated by leap seconds, could be greatly simplified by enhancing the accessibility and timespan of the leap second table : such a table, would list not only past leap seconds but also scheduled leap seconds for the next 10 years (instead of the 6 month notice that is in use today), and should be made widely available. Involving only minimal changes, this would be a good, conservative compromise, both preserving the UT feature of UTC (which should not be thrown away lightly in my opinion) and smoothing its engineering drawbacks, at least for the next centuries as long as the average frequency of leap seconds remains below one per month.

11 July 2011; Ochsenbein, Francois
CDS, Obs. Strasbourg, France
Astronomy-Astrophysics
Response = 2
Some adjustment would however be necessary in the future to avoid a too large difference (>15min? >1hr?) with Earth rotation but there will be plenty of time to converge on a consensus :-)

11 July 2011; Vallado, David
Center For Space Standards And Innovation, USA
Celestial-mechanics
Response = 1
There are a great number of systems that include processing for leap seconds. Adding the leap seconds maintains uniformity between the actual earth rotation and time systems. I see no need to change that.

11 July 2011; Bernstein, Gary
University of Pennsylvania, USA
Astronomy-Astrophysics
Response = 1

11 July 2011; Francis, Gribbin
Isaac Newton Group, Spain
Astronomy-Astrophysics
Response = 1
At the Isaac Newton Group we use UTC (from atomic clock) as input to the Telescope Control System. We receive notifications of leap seconds via the IERS bulletin. Our systems can be programmed such that the leap second is introduced automatically: this involves setting hardware switches on the clocks to specify when the leap second is to be introduced and updating control system parameter to say when it is to be expected. Since the clock is autonomous we have also omitted programming the leap second (e.g. on 31-Dec-2011) and introduced manually it later (when it's not a holiday). So we can cope fine with leap seconds. Omitting leap seconds will create some more work (although with our independent clocks we could avoid this). Overall I think the argument is about whether UTC should be related to the sun. Since all of us still live on the planet (earth) it make sense to continue the current regime.

11 July 2011; Swaters, Robert
NOAO, USA
Astronomy-Astrophysics
Response = 1

11 July 2011; Main, Andrew
no affiliation, UK
software engineering
Response = 3
I have no strong opinion on whether the main broadcast time scale, or the basis of civil time, should continue to track UT1. However, I have opinions about other aspects of the process. Any time scale that does not closely track UT1 would not be a form of UT, and should not have a UT-related name. Specifically, the time scale resulting from initially synchronising with present UTC and then not applying leap seconds would not be a form of UT, and so should not be called "UTC". The name "International Time" with initialism "TI" has been proposed for such a time scale, and I would find that entirely satisfactory. It should, of course, be clearly defined whether proleptic TI matches UTC over UTC's prior period of operation or remains a constant offset from TAI; I think the latter is more manageable. Although many users would prefer a leap-second-less time scale, and many more can at least accept one, it is not feasible to force such a time scale on all present users of UTC. Some would continue to desire a time scale behaving like the present form of UTC, with leap seconds. If such a scale is not readily available then it will be necessary to invent one, but local reinvention repeated by many users would cause a proliferation of badly-managed not-quite-compatible time scales. Thus it would remain useful for IERS to issue canonical leap second decisions for such users, defining a standard time scale that would continue to behave as the current UTC does. This time scale should probably be named "UTC". The decision about the time scale that is used in broadcast dissemination of time should be divorced from other questions about UTC. The broadcast time scale may sensibly be UTC as presently defined, TAI plus an offset (TI as described above), or plain TAI. Whichever is chosen as the primary broadcast time scale, broadcasts should where possible carry the parameters needed to convert between UTC-with-leap-seconds and TI/TAI. Where those parameters are readily available, the exact choice of primary time scale becomes much less significant.

11 July 2011; Murray, Stephen
Johns Hopkins University, USA
Astronomy-Astrophysics
Response = 1
I do not think a change in the current definition of UTC is good for astronomy and celestial navigation activities. There is a great deal invested in the current definition and the software that uses it and any change would likely lead to errors for many years as the transition would need to propagate across many systems and users.

11 July 2011; Flanders, Tony
Sky & Telescope, USA
Astronomy-Astrophysics
Response = 1
Presumably, civil time would continue to be tied to UTC. This would cause sunrise and sunset times to become unpredictable, which seems like a very bad thing in the long run. Julius Caesar tried adopting a simple, uniform time scale in his eponymous calendar; it turned out to be a short-sighted solution. Until the day when we all live in underground enclosures, as foreseen by many science-fiction writers, let's not allow the convenience of a few technologists to take precedence over the Sun!

11 July 2011; Paget, James
The Aerospace Corporation, USA
Astronomy-Astrophysics Celestial-mechanics
Space-sciences
Response = 1
Please be sure to make UT1 or UT1C available (such as by radio signals) if you decide to allow UTC to drift more than 1 second from UT1. Please consider renaming UTC if leap seconds are no longer included.

11 July 2011; Martin-Mur, Tomas
JPL, USA
Celestial-mechanics
Response = 2

11 July 2011; Greve, Tora
Tycho Brahe Observatory, Sweden
Astronomy-Astrophysics
Response = 1

11 July 2011; Lee, Steven
AAO, Australia
Astronomy-Astrophysics
Response = 1

11 July 2011; Dicker, Simon
Upenn, USA
Astronomy-Astrophysics
Response = 2
5 years may be too soon to switch.

12 July 2011; Laidler, Victoria
Space Telescope Science Institute, USA
Astronomy-Astrophysics
Response = 1
I am primarily a developer and maintainer of astronomical software.
Although it is somewhat annoying to have to update some software to account for the latest leap second, it would be far more annoying to have to use "a separate access to UT1, such as through the publication of DUT1 by other means" and implement support for both kinds of time.
From my perspective, the current system works. It is not broken. Let's not fix it.

12 July 2011; Fulco, Charles
Port Chester Middle School, USA
Astronomy-Astrophysics Space-sciences
Response = 1

12 July 2011; Kamp, Poul-Henning
The FreeBSD Project, Denmark
Telecommunication Operating System Design & Implementation
Response = 3
The main operational problem with leap seconds is the very short warning. 6-10 months is not nearly enough for operating systems to propagate this information to all installed copies. If leap seconds were announced 10-20 years in advance, tables could be distributed with operating systems and their updates, and computer systems consequently could be trusted to always have up to date tables when leap seconds strikes. If this is not a possible compromise, leap seconds should be abolished.

12 July 2011; Tricarico, Pasquale
Planetary Science Institute, USA
Astronomy-Astrophysics Celestial-mechanics
Space-sciences
Response = 1

I think that UTC should stay as it is. If you want to create another timescale, like UTC but without leap seconds, go ahead, just call it something else than UTC. How difficult is that? That said, scientific arguments should prevail over surveys and votes. If there is a strong scientific argument for changing UTC, so be it. But it seems to me that this is not the case, and as you state, a UTC without leap second would be of lesser value than the current UTC definition, so really I don't see the point of it.

12 July 2011; Chenal, Jonathan
Institut Geographique National, France
Geodesy
Response = 1

Continuous timescales still exists, as TAI. In my opinion, it is important to have a basis for legal times (UTC) which follows solar times (UT1). If UTC is a source of problems because of its discontinuities, UTC should simply disappear et be replaced by TAI. UTC is useful precisely because of its discontinuities. A temporary solution could be to create a new timescale, continuous, in parallel to UTC, which would stay the basis of legal timescales. This new continuous timescale would be used for tests only, and could have a permanent entire offset with TAI, which could be the actual value of TAI-UTC. But my preference is to keep the actual definition of UTC, which includes leap second.

12 July 2011; Tang, Jingshi
Astronomy department, Nanjing University, China
Astronomy-Astrophysics Celestial-mechanics Geodesy
Response = 1

12 July 2011; Schittel, Christoph
Plusnet GmbH & Co. KG, Germany
Telecommunication
Response = 1

12 July 2011; Schrama, Ernst
TU Delft, The Netherlands
Geodesy Space-sciences
Response = 1

Please do not change standards, we agreed once upon a time on a definition, textbooks spend text on this problem, etc., so why change that.

12 July 2011; Thivillon, Alain
N/A, France
Telecommunication
Response = 1

12 July 2011; Maisonobe, Luc
CS Communication & Systèmes, France
Celestial-mechanics
Response = 1

Leap seconds are already well understood and well implemented in many space systems. Systems that handle several time scales (say TAI and UTC) either already support leap seconds introduction in real time or have a constant TAI-UTC offset in a configuration file and need a restart a few days after the leap. Systems that handle only one time scale simply don't see anything and run seamlessly when leap seconds occur. So for ALL these systems, regardless of their implementation, leap seconds are clearly not a problem. However, ALL these systems are based on assumption DUT1 remains small (less than 0.9s in the current setup). A few high precision systems track this value from IERS files, almost all systems do not track it and consider it to be 0. Removing the leap second would mean ALL systems should track DUT1 as the simplifying assumption would not hold anymore. This would imply modifying data handling, importing external data in operational systems that did not import anything beforehand, modifying ALL software layers to propagate this DUT1 down to the lower layers for frames transforms, revalidating EVERY space flight dynamics in the world. So for all systems except the very few high precision and costly ones that have already done this work, removing the leap second would in fact induce a lot of difficult work. There are plenty of fixed time scales already available (TAI, GPS, Galileo ...) and only one time scale that is a convenient compromise between purely geometric TU1 and regular physics TAI, let's keep it.

12 July 2011; Defraigne, Pascale
Royal Observatory Of Belgium, Belgium
Time-laboratory
Response = 2

12 July 2011; Street, Jim
N/A, USA
Telecommunication
Response = 2

12 July 2011; Poggi, Jerome
-, France
Government
Response = 1

12 July 2011; Saers, Paul
private, Sweden
Computing industry
Response = 1

12 July 2011; Aerts, Wim
ROB, Belgium
Telecommunication Time-laboratory
Response = 3
Why not introducing leap minutes instead of leap seconds?

12 July 2011; Helk, Frank
-, Germany
process computing
Response = 1
If there's a need for another time reference - like the proposed "UTC without leap seconds" or otherwise - it should be defined as a new entity and be distributed separately. Redefining a widely used standard would only lead to problems ... if anybody needs the new reference, he should use it on a "new service" base.

12 July 2011; Widdas, Brian
n/a, UK
Telecommunication
Response = 1

12 July 2011; Brouw, WN
Groningen University, Netherlands
Astronomy-Astrophysics Celestial-mechanics
Response = 1

July 2011, 11h34; West, Richard
University of Leicester, UK
Astronomy-Astrophysics
Response = 2

12 July 2011, 11h34; Clarke, Peter
Newcastle University, UK
Geodesy Geophysics
Response = 1

12 July 2011, 11h51; Mueller, Juergen
Institute of Geodesy, Univ. of Hannover, Germany
Celestial-mechanics Geodesy
Response = 1

12 July 2011, 12h41; Nothnagel, Axel
IGG, University of Bonn, Germany
Geodesy
Response = 1

12 July 2011, 13h01; Pardo, Jeff
SES, USA
Celestial-mechanics
Response = 1

12 July 2011, 13h57; Ewell, Douglas
Individual, USA
Software development
Response = 1

12 July 2011, 14h15; Wallace, Patrick
RAL Space, UK
Astronomy-Astrophysics observatory automation
Response = 3
Leap seconds are a nuisance, and surprisingly difficult to deal with reliably in software. However, there are unknown numbers of applications in existence which, explicitly or implicitly, rely on the distributed time to be close to UT1. So the choice is between continuing to distribute an approximation to UT1 or accepting that problems will occur. With the ubiquitous use of NTP, I believe there is now an opportunity to separate civil time from the high-precision time/frequency dissemination services. This would be done by providing UT1-based NTP servers, for dissemination of ordinary time-of-day and expressly intended for applications not requiring accuracies of better than 0.1s. We could call it GMT, which many countries still refer to in their laws. (The fact the US law was changed not long ago to say UTC is regrettable but should not be allowed to influence the debate.) The existing time/frequency dissemination services would by default distribute leap-less UTC. As the difference between this and UT1 grows, developers of computer applications would become used to the idea that they had to make a choice - which they do now, in principle.

12 July 2011, 14h16; Jubier, Xavier
None, France
Astronomy-Astrophysics
Response = 1

I have nothing against a change. However, I would point out that each definition has its merit. So why change if it doesn't really bring anything or simplify computations. As for predictions of eclipses in future years (especially within the next 100 years) the proposal to cease inserting leap seconds (that is, keeping UTC fixed with respect to TT) has significant merit – it will allow accurate UTC predictions to be issued many years before the event. Nevertheless it doesn't change anything since the difference between UT1 and UTC would henceforth be unconstrained! At the same time, the current prediction methodology contains two 'unknowns' for future predictions: the conversion from TT to UTC, and the rotational position of the Earth (UT1-UTC). Of these, the effect of the uncertainty in prediction times resulting from the conversion from TT to UTC is an order of magnitude greater than the effects of the rotation of the Earth over the same time period. However if leap seconds are discontinued, the two uncertainties are reduced to just one – the rotational orientation of the Earth. And of the two uncertainties, this is the one that has the lesser impact on actual prediction times.

12 July 2011, 14h16; Ray, Jim
U.S. National Geodetic Survey, USA
Geodesy
Response = 1

12 July 2011, 14h18; Goerres, Barbara
Instiutut for Geodesy, University Bonn, Germany
Geodesy
Response = 1

12 July 2011, 14h21; Willmott, Paul
AMSAT-BDA, Bermuda
Astrodynamics
Response = 1
We have no wish to reprogram thousands of lines of complex astrodynamics code. Given that we will have to maintain the original UTC definition for our historical data, it will all be very confusing.

12 July 2011, 14h28; Schoene, Tilo
GFZ Potsdam, Germany
Geodesy
Response = 1

12 July 2011, 14h29; Grant, Mike
Plymouth Marine Laboratory, UK
Remote Sensing (satellite and airborne)
Response = 2

12 July 2011, 14h45; Newhal, X X (Skip)
Jet Propulsion Laboratory (Retired), USA
Astronomy-Astrophysics Celestial-mechanics
Planetary Ephemerides
Response = 1

12 July 2011, 14h53; Beyerle, Georg
GeoForschungsZentrum Potsdam, Germany
Geodesy GNSS Remote Sensing
Response = 2

12 July 2011, 14h57; Lennon, Christopher
MIT Lincoln Laboratory, USA
Radar Systems
Response = 1
GPS time exists as a free running clock alternative to UTC. One needs to maintain the list of leap seconds to go back an forth, but that is only a minor pain in the neck.
I have a mild preference that UTC maintain its connection with the rotation of the earth.

12 July 2011, 15h02; Kidger, Mark
ESA, Spain
Astronomy-Astrophysics
Response = 1
The current system has worked for years, why change it? Keep the day linked to the rotation of the Earth.

12 July 2011, 15h05; Svalgaard, Leif
Stanford University, USA
Space-sciences
Response = 2

12 July 2011, 15h08; Fani, Paolo
-, Italy
Astronomy (amateur)
Response = 1

12 July 2011, 15h19; Visser, Pieter
Delft University of Technology, Netherlands
Celestial-mechanics Geodesy Geophysics Space-sciences
Response = 1

12 July 2011, 15h42; Seidelmann, P. Kenneth
University of Virginia, USA
Astronomy-Astrophysics Celestial-mechanics
Space-sciences
Response = 1

I think the definition of UTC should be considered by much wider scientific and administrative organizations than the ITU. The full impact of the change and its implications need to be considered.

12 July 2011, 15h44; Hestroffer, Daniel
IMCCE, France
Astronomy-Astrophysics Celestial-mechanics
Response = 4

12 July 2011, 15h47; Mueller, Ivan
The Ohio State University, USA
Geodesy Geophysics
Response = 1

12 July 2011, 16h11; Dr. Federspiel, Martin
Planetarium Freiburg, Germany
Astronomy-Astrophysics
Response = 1

12 July 2011, 16h20; Hase, Hayo
Bundesamt für Kartographie und Geodäsie, Germany
Astronomy-Astrophysics Geodesy
Response = 1

Based on my personal experience: The existence of the leap second convinces common people to understand the need of geodetic VLBI and justify its expensive operation. If the product "leap second" becomes officially superfluous, the current VLBI programmes are put in danger. The importance of VLBI is not only based in the "leap second". But it is the easiest argument to communicate to politicians and administrators of financial resources. Both cited articles mention "VLBI" only once and do not focus on the global VLBI infrastructure which is still contributing to the "leap second" determinations. The number of arguments for pro and contra shows the need for both timescales: - the atomic time scale - the earth rotation time scale.

12 July 2011, 17h19; Martin, Thomas
Van Martin Systems, Inc., USA
Geodesy Space-sciences Precision satellite orbit determination
Response = 1

UTC serves a very useful purpose. For those for whom UTC leap seconds present a problem, we

already have TAI and GPS time which are uniformly increasing atomic time scales. With the advent of GNSS, anyone anywhere in the world has access to GPS time at very little cost. GLONASS, and I believe some SBAS systems, provide UTC. Additional systems coming on-line, including QZSS and Galileo, essentially also provide GPS time with extremely small offsets. Conversion algorithms between UTC and TAI or GPS border on trivial and are readily available. Those of us who perform precision calculations will continue to require time transformations, even if the leap seconds are eliminated going forward. If you want to hide leap seconds from public view, simply coordinate public clocks to TAI or GPS time!

12 July 2011, 17h28; Johnson, Thomas
National Geospatial-Intelligence Agency, USA
Astronomy-Astrophysics Geodesy Geophysics
Response = 1

While one may think that knowledge and understanding of our universe is a true goal of science, in reality, it is not. The ultimate goal of science and its pursuit of greater knowledge is for the improvement of society. While predicting and keeping UTC aligned with the earth's rotation is not an easy task, it has benefits to society and therefore, should be maintained. For example, there are many users of UTC from around the world that have built their systems on the assumption of UTC being coordinated with the earth rotation. The decoupling of these systems would result in a great deal of work and financial expense to correct, all of which is unnecessary. Furthermore, this is one indirect benefit to having leap seconds. Every time a leap second is inserted, the public media has to reach out to the scientific community to educate its consumer on the physics behind the need for this adjustment. Therefore, the general population gets a science lesson reminding them of the importance of astronomy and geophysics in their daily lives.

12 July 2011, 17h42; Stefan, Krista
Royal Astronomical Society of Canada, Canada
Astronomy-Astrophysics
Response = 1

12 July 2011, 17h42; Capitaine, Nicole
Bureau des longitudes& Paris Observatory, France
Astronomy-Astrophysics Celestial-mechanics Geodesy

Response = 2

- Separating the two concepts (angle for UT1,time for UTC) would be an improvement for high-accuracy applications.
- UT1 is defined by a conventional linear relation to ERA and benefits from the accuracy of that angle; for its best scientific use, that angle varying with time must be referred to a uniform time scale.
- The definition of UT1 is such that it is kept approximately (but not strictly) in phase with the mean solar time; so it in fact differs from the mean solar time +12 h and the difference is increasing with time.
- The definition of UTC based on leap seconds was designed to provide sufficient approximation to UT1 to celestial navigation; this is obsolete. For scientific applications, the use of the best uniform time scale is required (without leap seconds).
- If leap seconds are removed, the gap between UTC and UT1 will reach 3 min in 2100, 30 min in 2700, differences that are below those between legal time and solar time (+12h) that we tolerate.
- Scientific applications requiring prediction of UT1-UTC, such as precise astronomical ephemerides, can be established based on an IERS UT1-UTC prediction, leading to an accuracy at least as good as access to the UT1 derived from UTC with leap seconds.
- The responsibility of the IERS will be increased with the new interesting charge of providing predictions of the difference between UT1 and UTC, or UT1(UTC), in order to provide access to UT1 in real time. These values can easily be disseminated by positioning systems, such as GPS, which would give access to UT1 in real time to wide categories of users.

12 July 2011, 17h48; Mabie, Justin
NOAA, USA

Space-sciences

Response = 1

No such change in the definition of UTC should be considered. Instead, the community should propose a new timescale that is referenced off of UTC. There are several reasons for this.

- 1) It seems there is no proposed mechanism for the transition, between conversion of data to the new timescale or to update algorithms, instruments, and models that depend on the current definition of

UTC.

- 2) Any change in the definition of UTC would require a secondary timescale so that conversions can be made from the old definition to the new definition. Any such timescale would in of itself serve the same purpose as the proposed change and is therefore unnecessary.
- 3) This proposal would create unnecessary confusion that could be avoided with an alternate such as the option of creating a new timescale.
- 4) Any errors or failure to adequately track conversions from the old to the new definitions could seriously affect research, particularly with regard to dynamics on timescales of one second or less. It should be noted that international metadata standards, although robust, do not even adequately address the needs of modern datasets, and are not used sufficiently to provide the capabilities for which they are intended. Certainly, application of a redefined timescale would add serious problems to metadata tracking. In addition to this, historical datasets that have not yet been fully modernized, do not abide by any metadata standard, and risk having their proper time stamps corrupted during the modernization process.

12 July 2011, 18h09; Wilson, Keith
Jet Propulsion Laboratory, USA

Geodesy

Response = 1

I am also concerned about the change in delivery of the dEps, dPsi,EOP parameters. These seem to lag their dX and dY counterparts by 1 month. Is there a way to convert these dX and dY parameters to dEps and dPsi?

12 July 2011, 18h14; Byun, Sung
Jet Propulsion Laboratory, USA
Celestial-mechanics Geodesy Geophysics

Response = 3

If there is no leap second (keeping up with Earth rotation) what is the point of having UTC time scale? It doesn't have much meaning other than some offset from TAI. But I do understand that inserting UTC will become more frequent in the future and will become quite a nuisance. I am wondering there has been enough discussion regarding introducing 'leap minute' instead of leap second.

12 July 2011, 19h12; Horan, Karen
NOAA, USA
Space-sciences
Response = 4

12 July 2011, 19h24; Haywood, Gerald
Jubilee Office Supplies, England
Business.
Response = 1
It isn't broken. Please don't fix it.

12 July 2011, 19h31; Melnick, Jorge
ESO, Chile
Astronomy-Astrophysics
Response = 1
Human time is a measure of the position of the Sun on the sky, which is determined by the rotation of the Earth and the portion of the Earth on its orbit around the Sun. Decoupling human time from the rotation of the Earth would take humanity one step further on the path to virtual existence. This is probably inevitable, but should be delayed as much as possible. Our organisms are still ruled by night/day cycles.

12 July 2011, 20h22; Francou, Gerard
Observatoire De Paris - SYRTE, France
Astronomy-Astrophysics Celestial-mechanics Geodesy
Response = 1

12 July 2011, 20h23; Bolotin, Sergei
NVI, Inc./NASA GSFC, USA
Astronomy-Astrophysics Geodesy
Response = 1
I believe that redefining of UTC time scale is unwise move. If one-second leap time adjustment is too complicated for civilian time keeping they can invent an appropriate time scale or use one of already existing continuous time scales, e.g. TAI.

12 July 2011, 20h36; Podesta, Ricardo
Observatorio Felix Aguilar (OAFa), San Juan, Argentina
Astronomy-Astrophysics Geodesy
Response = 1

12 July 2011, 21h05; Boyson, Andrew
Home, UK
Time enthusiast
Response = 1
Would like to see NTP provide TAI. Internal PC clocks and file timestamps in TAI.

PCs could easily adjust the displayed time from infrequently downloaded leap seconds and daylight savings information. Telescopes could map TAI against predicted earth rotation to provide an accurate position. In a few thousand years we would need to redefine the earth's angular second as some fraction of the TAI second in order to not exceed more than about 10 leap seconds per year.

12 July 2011, 21h16; Abarca del Rio, Rodrigo
DGEO, Chile
Geodesy Geophysics Space-sciences
Response = 2

13 July 2011, 00h32; young, larry
jet propulsion lab, USA
Space-sciences
Response = 2

13 July 2011, 02h15; Wildermann, Eugen
Universidad del Zulia, Venezuela
Geodesy
Response = 1
The current close connection with earth rotation seemed to me a great advantage of UTC, so eliminating this purpose UTC afterwards mainly will be a simple TAI offset. I don't see much sense of this at my current workspace (I'm interested at UTC TAI difference mainly for tide calculations for precise gravity observation would be influenced).

13 July 2011, 02h45; Carter, Bill
University of Houston, USA
Geodesy
Response = 1

13 July 2011, 03h02; Hu, Songjie
Aerospace Flight Dynamics Lab, China
Celestial-mechanics Space-sciences
Response = 1

13 July 2011, 03h09; McGlaun, Daniel
none, USA
Astronomy-Astrophysics
Response = 1
I am an advanced amateur total eclipse chaser, involved also with calculating local circumstances. I see no tangible benefit to modifying the current definition of UTC; in fact, I see that for the purposes of maintaining the ability to perform historical calculations, the community would have to maintain two different sets of time measurement.

13 July 2011, 04h43; Senne, Joseph
Univ. of Missouri Science & Technology, USA
Geodesy
Response = 1

13 July 2011, 07h55; Roberto, Roldan
European Satellite Services Provider, Spain
GNSS
Response = 2

13 July 2011, 09h59; De Greef, Didier
ESSP, Spain
Navigation
Response = 1

13 July 2011, 10h03; Loyer, Sylvain
CLS, France
Geodesy
Response = 1
Unless with a large consensual opinion to change something, it is better to keep the conventional usages as they are, since "they are JUST conventions".

13 July 2011, 11h24; DENIS, Carlo
IAGO Liège, Belgium
Geodesy Geophysics
Response = 1

13 July 2011, 11h30; Piriz, Ricardo
GMV, Spain
Celestial-mechanics Geodesy Geophysics
Response = 1
Our department is involved in software development for GNSS orbit determination, timing, and positioning. In general we are quite satisfied with the current definition of UTC, leap seconds do not pose a problem for us. In any case, for detailed UT1 information we need to access specific IERS files, and this would not change if the UTC definition changes, so there is no impact. So the only benefit for us of a new UTC definition would be a constant offset between GPS Time and UTC, this means that we would have one interface less, we would not need to update GPSt-UTC when leap seconds happen (normally a text file in our system). On the other hand, having UTC tied to UT1 (current definition) is very nice for approximate calculations and simple software tools. For example, if you are using Two Line Elements (TLEs) to calculate approximate satellite orbits, it is quite useful to know that if you interpolate the model using UTC (current) instead of UT1 the resulting

accuracy will be within the noise of the TLEs. There is also the issue of backward compatibility, if the UTC definition changes, there might be some side effects in our software that could make it fail, we would have to review the current code carefully. From a "philosophical" point of view, I feel more comfortable knowing that UTC, the time on my watch, is also linked to the Earth rotation and not only to atomic clocks, I believe the current definition is a good compromise between the "two worlds" and that is why it was invented.

13 July 2011, 15h42; Woodburn, James
AGI, USA
Celestial-mechanics
Response = 1

The proposed redefinition of UTC would cause a gradual degradation of many satellite systems which assume alignment between UT1 and civil time. While these systems could be updated, at considerable cost, I am concerned that many operators or users of these systems may not even be aware of the assumption and therefore would not recognize the need for change. As the degradation would be very gradual, system performance would slowly suffer but perhaps not come to a breaking point until the redefinition of civil time was a distant memory.

13 July 2011, 17h10; Guinot, Bernard
Obs. de Paris, Bureau des longitudes, France
Astronomy-Astrophysics Geodesy Space-sciences
Time-laboratory Former sailor (navigation officer)
Response = 2
Present definition of UTC causes an ambiguity of date at the occurrence of a positive leap second which is potentially dangerous. It favors the existence of several time scales differing by an integer number of seconds. The present system was devised in 1972 in order to provide directly by radio time signals the needed accuracy of UT1 for celestial navigation (+/- 1 second). This need (which may persist for safety reasons) can be fulfilled by expressing hour angles in printed nautical ephemerides as a function of a continuous UTC (based on a prediction which can be made at the second level over 3 years). For a better precision, UT1 is easily available by internet in real time at the level of a few milliseconds. I recall that a continuous UTC will diverge from UT1 by one or two minutes in 2100 and will reach half an hour toward 2500-2600. Presently the offset of legal time with respect to solar time may exceed two hours in some countries...

13 July 2011, 16h18; Dries, Jan
VITO, Belgium
Earth Observation
Response = 1

13 July 2011, 16h35; Chandler, John
Smithsonian Astrophysical Observatory, USA
Astronomy-Astrophysics
Response = 1

13 July 2011, 17h59; McCann, Stephen
Private, UK
Telecommunication
Response = 1
The rotation of the Earth is not constant. A system that allows dynamic updates must be maintained. Although a change to the definition of UTC will not be noticeable to the vast majority of people who use accurate time keeping, it is not irrelevant. Initially inconvenient 'leap seconds' will be no longer required, but after several decades errors will accrue and at some point in the future a correction will be required. Who will care, as by then we'll all have passed on anyway.

13 July 2011, 19h06; Levine, Judah
National Institute of Standards and Tech, USA
Telecommunication Time-laboratory
Response = 2
It would also be possible to change the leap second to a leap hour when the dut1 correction was greater than about 2000 s. This method would limit the divergence of UT1 from UTC while minimizing the disruptions that occur when a leap second is realized.

13 July 2011, 19h18; McCarthy, Dennis
U. S. Naval Observatory, USA
Astronomy-Astrophysics
Response = 2
This questionnaire is poorly written and appears to be one of a series of such questionnaires. It makes the IERS look bad when it keeps sending out such poorly written and repetitive questionnaires. The second reference listed above is not in a peer-reviewed journal and should not even be listed as a reference. This questionnaire serves no useful purpose for either side of this issue.

13 July 2011, 19h35; Oltrogge, Daniel
Earth Research, LLC, USA
Celestial-mechanics Space-sciences
Response = 1
I feel that the current system has worked sufficiently well and there is intrinsic value in having UTC tied closely with Earth rotation. I understand the desire to eliminate leap seconds and the discontinuities that they cause. But I feel that we'd have to do extensive surveys, research and careful evaluation before we could determine the extent (likely quite a large impact) of software modifications, financial impacts and programmer/developer time required to eliminate the leap second (thereby potentially causing existing applications to 'break').

13 July 2011, 19h45; ACTIS, Eloy
Observatorio m Astronómico Félix Aguilar, Argentina
Astronomy-Astrophysics Geodesy Satellite Laser Ranging
Response = 1
Current definition of UTC works very good and I don't feel necessity of changing it.

13 July 2011, 19h58; Kouprianov, Vladimir
Pulkovo Observatory, Russia
Astronomy-Astrophysics Space-sciences
Response = 1

13 July 2011, 21h23; Connors, John
Private Individual, USA
Astronomy-Astrophysics GPS commercial user, Astro & Celest Nav
Response = 1
After thoroughly reading the provided references, the cost of changing the UTC leap second system / time standard (ref #2, V The Debate, D Costs of Changing) is not justified or technically warranted. The assumptions favoring the change are weak and favor academia and the scientific community. The commercial realm and public "users" are not well represented in these papers and government (tax payers), including commercial end users, are expected or assumed to absorb the cost (of redesign). Removing the leap second or making UTC "more" dynamically linked to the earth's rotation is an expensive step backwards.

13 July 2011, 23h36; Simpson, David
NASA Goddard Space Flight Center, USA
Astronomy-Astrophysics Celestial-mechanics
Space-sciences
Response = 1

Keep UTC defined as it currently is. The most compelling reason for eliminating leap seconds seems to be that they will have to be introduced with increasing frequency in the future; however, that should not become an important concern for several centuries. Meanwhile, eliminating leap seconds now would leave us with four time atomic scales that differ from TAI only by a fixed offset (TAI, TT, GPS, and UTC), while providing no atomic-based time scale that maintains synchronization with UT1 (an important consideration for civil timekeeping). Dropping leap seconds from the definition of UTC now would be, at best, premature.

14 July 2011, 01h09; Shawhan, Peter
University of Maryland, USA
Astronomy-Astrophysics
Response = 2

14 July 2011, 04h25; Bizouard, Marie-Anne
Laboratoire de l'Accelérateur Lineaire, France
Astronomy-Astrophysics
Response = 1

14 July 2011, 07h54; Cannon, Kipp
Canadian Institute for Theoretical Astr., Canada
Astronomy-Astrophysics
Response = 1

The motivation for removing the leap seconds from UTC is a mystery. If UTC is not the correct time scale for an application, then there are many more to choose from. UTC is just one of a dozen or more time scales that are in regular use: TAI, UT0, UT1, UT1R, UT2, UT2R, UTC, GMST, GPS time, Julian day number, Unix time, In particular, several of them are atomic time scales free of leap seconds. For example, TAI, the count of GPS seconds, Unix time, and so on. Anyone who wishes to use a leap-second-free atomic time scale for their application is already free to use one of these. The conversions between these time scales and UTC are simple and well-documented.

14 July 2011, 10h08; McIver, Jessica
University of Massachusetts Amherst, USA
Gravitational wave physics
Response = 1

14 July 2011, 11h52; Skinner, Laurence
-, England
Host an NTP Pool time server
Response = 2

14 July 2011, 13h26; Loh, Jürgen
Alpermann+Velte e.e. GmbH, Germany
Telecommunication
Response = 2

We're a manufacturer of Timecode systems for radio and television broadcasting stations. SMPTE/EBU Timecode is often used to synchronize the equipment to civil time.

14 July 2011, 20h28; Standish, E Myles
Caltech/JPL - Retired, USA
Astronomy-Astrophysics
Response = 1

UTC now approximates the earth's rotation (within 0.9 seconds). There is a lot of software throughout astronomy and navigation which subtly makes use of this fact. To change it would cause many unforeseen problems.

14 July 2011, 20h40; Scott, Stephen
Caltech/Owens Valley Radio Observatory, USA
Astronomy-Astrophysics
Response = 2

14 July 2011, 22h18; Poutanen, Markku
Finnish Geodetic Institute, Finland
Geodesy
Response = 1

It is a much deeper principle than a technical or practical question about the leap second. Quitting the leap second we accept that UTC is no more fixed to the rotation of the Earth and our concept of time is not related to the variation of day and night. But we cannot quit the fact that half of the Earth is illuminated by the Sun, half is in darkness, and due to the rotation of the Earth we see the regular variation of day and night. If we accept the concept that this has no meaning in our life, we can quit the connection of the UTC to the rotation of the Earth. We can as well quit then the time zones, length of 24h day or incompatible length of the year with leap days every fourth year. All these are as well technically possible. But if we want follow day and night variation, then within decades we'll need a leap minute or within millennia a leap hour... Are these any better than the leap seconds?

15 July 2011, 01h15; Boriani, Azelio
SSBT spa, Italy
Digital TV broadcast equipment
Response = 1

15 July 2011, 07h41; Spencer, Mark
Aligned Solutions, Canada
Telecommunication Information technology
Response = 1

15 July 2011, 09h33; Orlati, Andrea
INAF-IRA, Italy
Astronomy-Astrophysics
Response = 1

15 July 2011, 09h51; Young, Iain
n/a, UK
Telecommunication Time-laboratory
Response = 1
TAI and GPS timescales are already available should folks need or want a timescale without leap seconds. It seems to make little sense to me to add a third. Maybe we should consider having a different name for a UTC based timescale w/o leap seconds. But changing the current standard is most likely to just cause confusion, especially amongst the general public

15 July 2011, 09h58; Fenn, David
Of Materials, UK
Astronomy-Astrophysics Telecommunication Materials engineering
Response = 1
If it ain't broke, don't fix it!

15 July 2011, 10h15; Plant, Hannah
Physics, England
Physics
Response = 1

15 July 2011, 11h10; Maccaferri, Giuseppe
Institute of Radioastronomy, Italy
Astronomy-Astrophysics Geodesy Space-sciences Time-laboratory
Response = 1

15 July 2011, 11h12; Verkindt, Didier
LAPP, CNRS, France
Astronomy-Astrophysics gravitational waves detection
Response = 2
I prefer to put the operation of leap seconds addition when getting the UT1 (or local time) and to have a universal UTC date which is earth independent.

15 July 2011, 14h47; Combrinck, Ludwig
HartRAO, South Africa
Geodesy
Response = 1
Changes required to existing software, precompiled library binaries etc. (some of which may not have original source code, so that they cannot be modified) will create chaos. The result will be unworkable and un-fixable software. Who will foot the bill for this? Who will do this work? It is easy enough to maintain UTC, so I say do not fix that which is not broken.

15 July 2011, 15h15; Hildebrand, Andreas
ALC NetworX GmbH, Germany
Professional Broadcast
Response = 3
Speed up Earth rotation accordingly...
If this does not work out, leave UTC as it is - there are many reasons why it has been defined the way it is. If it would be changed to TAI + offset, you could use TAI at first instance.

15 July 2011, 17h04; Hohenkerk, Catherine
HM Nautical Almanac Office (UKHO), UK
Astronomy-Astrophysics
Response = 1
It is useful to have $|\text{UTC}-\text{UT1}| < 0.9\text{s}$. Navigation almanacs, produced in advance, may be inaccurate as the prediction of UT1-UTC at the time of production that is needed to determine GHA may not be good enough. Textbooks etc. will become invalid. The fact that sunrise/sunset times repeat over a 4-year cycle will no longer be necessarily true. Science & Technology ought to be able produce a solution without having to drop leap seconds.

16 July 2011, 03h06; Pogorelc, Scott
USG contractor, USA
Satellite Navigation / OD
Response = 2

16 July 2011, 17h12; Fesler, Jason
Yahoo, Inc, USA

Internet related industry

Response = 2

UTC affects *every computer* on this planet. And every OS implements coping with it differently. The last leap second event caused a global outage for me - across 50,000+ machines, and affecting 100M+ customers - due to a bug in the way leap second was handled. We now have to test every kernel version we operate (300+ kernels across 300,000+ machines) to simulate leap second. Even without a hard lock up, leap seconds across devices that don't handle leap second correctly (not in the kernel, or ntpd not receiving the notice 24 hours in advance) cause the machines to have to skew to make up for it. This means that around the event, I can't correlate events between machines. Not until everything is back within tolerance.

17 July 2011, 17h22; Schoedel, John
Myself, USA

Telecommunication

Response = 1

17 July 2011, 20h25; Noel, Jean-Louis
Education, Belgium

Telecommunication

Response = 1

18 July 2011, 05h39; GULYAEV, SERGEI
Auckland University of Technology, New Zealand
Astronomy-Astrophysics Geodesy

Response = 1

18 July 2011, 10h28; Kutođlu, Denol Hakan
Zonguldak Karaelmas University, Turkey
Geodesy

Response = 2

18 July 2011, 10h50; Yule, Andy
u-blox, UK

Telecommunication

Response = 1

If it ain't broke, don't try to fix it!

18 July 2011, 11h17; Planesas, Pere
Observatorio Astronomico Nacional, Spain
Astronomy-Astrophysics

Response = 3

A leap minute could be introduced preferably at the end of June 30th whenever the UT1-UTC difference is predicted to reach 60 s. The announcement

would have to be made several years ahead so by the time it is applied the difference would be strictly larger than 55.0 seconds (goal > 60 s) and smaller than 65.5 s. A new DUT1 would need to be defined, and its resolution likely increased down to 1 ms to fulfill high precision applications, Main advantages:

- Keep UTC close to the mean solar time.
- Keep UTC's name and legal status.
- Fewer changes per century (TAI-UTC difference constant for decades),
- Able to cope with the UT1-TAI quadratic growth.
- DUT1 would become more widely used for those who really need it (astronomers, navigators) resulting in higher precision calculations, being a better representation of the astronomical time UT1.

Moreover:

- No need to allow for negative corrections.
- The first leap minute would take place in several decades, allowing for all clocks, time-aware devices, software and time dissemination standards to be able to cope with the extra ("60") minute.
- Might lead to the unification of the time systems by forcing them to follow a unique (new) standard.
- A change in June 30th is less disruptive than on New Year's Eve.

- The new DUT1 will give more visibility to those who determine it. The new DUT1 could be disseminated in a 20-bit word:

- 1 sign bit
- 16 bits to cover time from 0 to 65535 ms.
- 1 measured/predicted bit
- 1 checksum bit
- 1 spare bit

A second 20-bit word could contain the DJM (as an integer), up to the year 4595.

18 July 2011, 13h43; Possenti, Andrea
INAF-Osservatorio Astronomico Cagliari, Italy
Astronomy-Astrophysics

Response = 2

18 July 2011, 16h15; Cooper, Stanley
Johns Hopkins Univ. Applied Physics Lab., U.S.A.
Space mission timekeeping systems

Response = 2

18 July 2011, 17h04; Colomer, Francisco
National Astronomical Observatory, Spain
Astronomy-Astrophysics Geodesy

Response = 1

Alternatively, the concept would remain for DUT1 but change only when added up to a "leap minute".

18 July 2011, 19h02; Talty, Richard
Science Horizons, Inc., USA
Geophysics

Response = 1

It seems to me that there are two classes of users of UTC, and neither should have problems with leap seconds:

1) Users who do not need 1-second accuracy. Typical human scheduling (stores, classes, trains, etc.) operates with more than 1 second of slop. A leap second can be considered another type of unexpected time error and absorbed into that budget.

2) Users who need synchronization to 1 second or better. Stock trading, electricity grid, possibly traffic lights, etc.

Type 2 applications are, in practice, automatically synchronized to some UTC source. From this source, they can both measure their own time error, and obtain warning of upcoming leap seconds. While it is theoretically possible to track UTC to within 1 second on 1-year timescales using a rubidium oscillator, it is far cheaper and more common to use a GPS receiver which provides ample warning of leap seconds.

Some UTC broadcasts provide little (DCF77) or no (MSF) leap-second warning, but that seems like a simpler technical problem to solve. As internet connectivity is more and more widely used, it gets easier to disseminate leap second information.

The great benefit of leap seconds over less frequent larger corrections to maintain 12h00 at roughly mid-day is that they can be ignored by a large number of time users, and that they are (barely) frequent enough to allow software to be tested. People arguing for fewer, larger time scale jumps are just throwing the problem over the wall to some future legislators who will have to redefine local time to UTC offsets. which will invariably not be done in a coordinated way, leading to a mess similar to the introduction of the Gregorian calendar. (If hopefully without the Protestant Reformation.)

Given free choice, I would suggest more frequent smaller time corrections, but 1-second leap seconds are deeply entrenched and not worth changing now.

If you want a time scale without leap seconds, use TAI. Or GPS time. UTC, like all historical universal times, should remain basically coupled to the position of the sun.

19 July 2011, 03h05; Seago, John
Analytical Graphics, Inc., USA
Celestial-mechanics Space-sciences
Response = 1

19 July 2011, 10h24; Brumfitt, Jon
ESAC, Spain
Astronomy-Astrophysics Space-sciences
Response = 2

19 July 2011, 13h15; Miguel J., Sevilla
Facultad de Matematicas. UCM, Spain
Geodesy
Response = 1

19 July 2011, 17h01; Thornton, Tim
Smartcom Software, UK
Astronomy-Astrophysics Geodesy
Response = 1
Although dropping leap seconds would no doubt be convenient for some members of the scientific community, for everyone else it is necessary for "official" time to be in synch with "natural" time. Also, it appears that the implications and means of management of time without leap seconds has not yet been fully thought out.

19 July 2011, 18h37; Santos, Marcelo
University of New Brunswick, Canada
Geodesy
Response = 1

19 July 2011, 19h02; Hrudkova, Marie
Isaac Newton Group of Telescopes, Spain
Astronomy-Astrophysics
Response = 1

19 July 2011, 19h07; Ghigo, Frank
National Radio Astronomy Observatory, USA
Astronomy-Astrophysics
Response = 1

20 July 2011, 02h28; Robinson, Rob
International Occultation Timing Assn, USA
Astronomy-Astrophysics Celestial-mechanics
Space-sciences
Response = 1

20 July 2011, 02h47; Breit, Derek
IOTA, USA
Astronomy-Astrophysics
Response = 1

20 July 2011, 09h30; Quiles, Alfredo
ESA, Netherlands

Response = 1

20 July 2011, 12h11; Woan, Graham
University of Glasgow, UK

Astronomy-Astrophysics
Response = 2

My personal experience is that leap seconds create more problems than they solve, especially when implemented by non-experts, and that time differences between events should be easily computable. One of the technicians at the Lords Bridge Observatory in Cambridge had tape measure with 2 feet missing in the middle. *He* had no problem using it, but I don't think it was a popular tape measure.

20 July 2011, 14h49; Gonzalez, Francisco
ESA, The Netherlands

Geodesy
Response = 2

20 July 2011, 15h04; Zebhauser, Benedikt
Hexagon Technology Center, Switzerland

Geodesy Surveying
Response = 1

Why having another timescale without leap seconds parallel to TAI? That makes no sense. TAI can already accessed precise enough for the most applications in real-time e.g. from GPS time with a constant offset of 19 sec. The introduction of leap seconds into UTC in 1972 was made for practical reasons that are still valid today. Many applications would have to acquire current corrections from services. Why complicating? In case of unnecessarily changing the definition of UTC one would have to re-introduce a further time-scale with the current UTC definition including leap-seconds.

20 July 2011, 17h35; Buie, Marc
Southwest Research Institute, USA
Astronomy-Astrophysics Celestial-mechanics
Space-sciences

Response = 1

Decoupling UTC from the Earth's rotation is sheer madness. We already have a dynamical time definition and that serves for the computational needs of a uniformly increasing time scale. UTC with its coupling to local time needs to stay as it is. From my point of view there is no advantage to changing the present system. The disadvantages are many, including the modification of ALL data acquisition

and data reduction software for astronomical and spacecraft observations. The fact that this rewrite leads to no benefit argues strongly against the change.

20 July 2011, 18h58; Graham, Francis
Kent State University, USA
Astronomy-Astrophysics Space-sciences
Response = 1

21 July 2011, 00h34; Ray, Paul
Naval Research Laboratory, USA
Astronomy-Astrophysics
Response = 2

21 July 2011, 13h08; Wood, Derek
Open University, Scotland
Marine
Response = 1
None

22 July 2011, 12h24; Doom, Claude
Hogeschool-Universiteit Brussel, Belgium
Astronomy-Astrophysics
Response = 2

22 July 2011, 19h31; Karimbi, Mahesh
Faculdade Ciência e Tecnologia / UNL, Portugal
physical sciences
Response = 1

Everyone agrees that the occurrence of astronomical events are not exactly periodic, so also, the relative movement of the Earth, Sun, Moon and some considered Stars. Since the known history and in known civilisations, the measurement of time depended on the astronomical events. Further, it is still practised at almost all the fields ranging from the civil life, cultural observations, military practices, sea navigations, to judge the future astronomical events etc., except, in the laboratory scientific experiments. Therefore, practice of having the 'leap' time magnitudes, such as, year, month etc., and recently, seconds have been in course. Further, in the regions where, 'day light saving phenomenon' is observed, the adjustment of the time is again a mandatory. The only difference in the adjustment process of the time in the all the cases, except 'leap second', is that they are predefined and predetermined. As with the latest technology, the job of predicting and publishing the introduction of leap second is already done by IERS twice a year, it can be well implemented for majority of the purposes except the laboratory scientific experiments.

22 July 2011, 23h42; Wheatley, Peter
University of Warwick, UK
Astronomy-Astrophysics
Response = 2

23 July 2011, 01h40; Douglas, White
NA, Australia
Astronomy-Astrophysics
Response = 1

24 July 2011, 03h46; Anonymous, Anonymous
None, USA
none
Response = 1

If you want a timescale with a constant offset from TAI, why not just use TAI? UTC is still important for keeping track of Earth's actual rotation (corrected for accuracy). The purpose of timekeeping is to keep a stable relationship with the cycles of the day and year. This proposed redefinition would end this link and leave UTC completely arbitrary. This will have a disastrous impact on professions such as astronomy, which require a timescale that corresponds with planetary cycles. Why rob it from them? If you hate leap seconds, use TAI, while people who need UTC can use it for themselves. The system, as it currently is, works.

24 July 2011, 07h05; Banhatti, Dilip G.
Madurai Kamaraj University, India
Astronomy-Astrophysics Physics, Science Numeracy / Outreach
Response = 3

Comments meant to generate a middle path between the two alternatives.
In early 1950s, Megh Nad Saha headed a team of scientists charged with developing a suitable calendar. The team came up with a solar calendar displaced from our usual January-to-December one, but otherwise marking time at the same rate, along with leap years & so forth, so as to serve festive Indian culture better. This was adopted legally by Government of India, and is, in principle, legal from then on, even to date. However, in practice, everyone in India uses what the world does, perhaps mainly for commercial reasons. In fact, very few people are aware that another "Indian" calendar IS (also) legal!
For pulsar timing (especially), and pretty much all other time variable / cyclic astro phenomena, Julian Day (JD) is used. Actual observations have time markers of the observatory making them. Any astro calculation then must convert to JD using

standard conversion which includes any jumps (like leap seconds).
(# Paul A M Dirac used laser lunar ranging data in a most imaginative way. Was his use of these data in the way he did possible only due to some subtle issue of timekeeping?)
My preference: Retain both the alternatives for the different purposes where they are needed, with the overheads for the needed change(s) minimized / optimized in each of the two domains.
I guess astrodynamists essentially use the same standard data on timekeeping that astronomers (at least currently) use to a lesser extent. Eventually, we may have timekeeping tied to solar system barycentre.

25 July 2011, 00h12; Manchester, Richard
CSIRO Astronomy and Space Science, Australia
Astronomy-Astrophysics
Response = 2

25 July 2011, 07h05; Powers, Patrick
Formerly Logica PLC, UK
Information Technology
Response = 1
We are in tune with the sun. We have an important circadian rhythm tuned to the sun. This is the essence of time as we experience it. High noon when the sun is at its apex is midday, halfway between sunrise and sunset, not 13:23:34 DST (Digital Daylight Standard Mean Civil Clock Time). We cannot get past our innate sense of solar time, the rhythm and duration of solar cycles. It is part of our being. This is what sundials show, true solar time. Granted the change to atomic time is a minor adjustment from solar astronomical time, at this time. But the difference is cumulative. The difference will accumulate through the centuries. In the future we would be getting up in the morning at 12:00 or whatever abstract number is defined by vibrating Cesium atoms. The odd leap second can adjust for the slower rotation of the earth. Is this better than the riots when an abrupt shift like the Gregorian correction is required? Computers are easier to reprogram than people. It will simply not be possible for all humanity to be aware of a time measure that is out of synchronism with the sun and this will generate years of requests for a return to the present status. Let us not even go there. "Cogito ergo sum". Thinking people rule, technology serves.

25 July 2011, 09h42; Foschini, Luigi
INAF Osservatorio Astronomico di Brera, Italy
Astronomy-Astrophysics Space-sciences
Response = 1

25 July 2011, 13h23; McEnery, Julie
NASA/GSFC, USA
Astronomy-Astrophysics
Response = 2

25 July 2011, 15h16; Roth, Martin
AIP, Germany
Astronomy-Astrophysics
Response = 1

25 July 2011, 17h54; Noël, Fernando
National Astronomical Observatory, Chile
Astronomy-Astrophysics
Response = 2

25 July 2011, 19h50; Grandi, Steven
National Optical Astronomy Observatory, USA
Astronomy-Astrophysics
Response = 1

26 July 2011, 21h40; Rundle, Nicholas
Rockwell Collins, USA
Telecommunication
Response = 2
In satellite communications, time needs to be very accurate between terrestrial terminals and the payload on the space vehicle. The time source is entered from UTC. Since most computer systems have no notion of a leap second, they must be added to the UTC time in order to create the actual time used by the communications network. This creates enormous complexity especially when leap seconds are added. Since the communications systems are all computer controlled, the notion of time in relation to the Earth's rotation is not important as it is to the human population. Please redefine UTC to be uniformly increasing without leap seconds.

27 July 2011, 03h14; Brown, Kyle
Unassigned, USA
Web Applications Programmer
Response = 4

27 July 2011, 10h39; Ron, Cyril
Astronomical Institute of Acad. Sciences, Czech Republic
Astronomy-Astrophysics Celestial-mechanics Geodesy Geophysics
Response = 1

27 July 2011, 16h04; Kaplan, George
(Contractor to U.S. Naval Observatory), USA
Astronomy-Astrophysics
Response = 1
Applications that require a continuous time scale (without leap seconds) should use TAI.
In previous discussion of this issue, the necessity of the proposed change has not been clearly articulated, while the consequences of the proposed change, for large numbers of software systems, have been discounted. A full assessment of the number of software systems that assume that UT1=UTC has not been carried out. In fact, such an assessment would be difficult to carry out as a limited exercise because the UT1=UTC assumption is often implicit. Leap seconds are a well-defined international standard that, although inconvenient, are within the capabilities of current technology, just as they were within the capabilities of the technology of 1972. "Inconvenience" is not a justification for so fundamental a change. Furthermore, the ITU is not the correct international entity to change the definition of the worldwide system of civil time. This is more than just a change to a radio signal; it involves the very definition of what we mean by civil time and potentially affects every person within the developed or developing world.

27 July 2011, 20h02; Pinto, Heitor David
NASA, USA
Global navigation satellite systems
Response = 1
The problems created by leap seconds are rare and manageable, and therefore do not justify the adoption of a time scale no longer related to the rotation of the Earth.

28 July 2011, 08h11; Mohaseb, Mohamed
Arab Academy for Science and Technology, Egypt
Geodesy
Response = 1

28 July 2011, 10h53; Vondrak, Jan
Astron. Inst., Acad. Sci. Czech Rep., Czech Republic
Astronomy-Astrophysics Celestial-mechanics Geodesy
Response = 2

28 July 2011, 22h29; Himwich, William
NASA GSFC, USA
Astronomy-Astrophysics Geodesy
Response = 1
It is more than that we are satisfied with the current definition of UTC. We depend on it. It is built implicitly into many systems that we use and support world-wide for radio astronomy and geodesy. It will be a significant perturbation on these systems, many extremely difficult to modify, if the definition changes. If there is no way to stop eliminating leap seconds, the proposal to have a "leap hour" is unrealistic and appears to just be an attempt to make time coordination someone (who hasn't been born yet) else's problem. This option also has serious undesirable effect. A more realistic option with less undesirable effects would be a "leap minute", but that would also defer difficult issues irresponsibly. The fundamental problem is that most (if not all) computer operating systems as they exist now do not properly recognize leap seconds. This can be corrected now, in the present day, and would provide a long term solution.

29 July 2011, 11h25; Steeghs, Danny
University of Warwick, UK
Astronomy-Astrophysics
Response = 1

31 July 2011, 20h15; Ste. Marie, Paul
Amazon.com, USA
software development
Response = 1

01 August 2011, 10h05; Smith, Marlyn
British Astronomical Association, GBR
Astronomy-Astrophysics
Response = 1

01 August 2011, 10h41; Boomkamp, Henno
IAG WG 1.1.1 / ESOC, Germany
Geodesy Space-sciences
Response = 3
The essence of the current UTC definition is its sub-second offset from UT1. Take that property away, and UTC no longer exists: it becomes identi-

cal to TAI apart from the arbitrary constant offset. The discussion on stopping further leap seconds is therefore equivalent to a proposal for shifting the origin of the TAI time by the arbitrary amount of 34 seconds, and calling this shifted TAI scale "UTC", as if it is significantly different from TAI. It is not: it is exactly the same as TAI, apart from an arbitrarily different origin. The origin of TAI is already arbitrary, so what would be the point in having this UTC scale in parallel to it? Arguments in favor of stopping further leap seconds are usually related to software issues, or to the political authority of announcing a formal leap second. We have always managed to live with these issues in the past. Furthermore, the increasingly important reprocessing activities of the scientific community imply that our software will forever have to be capable of dealing with past leap seconds (historic data often has UTC time stamps), even if no new leap seconds would occur in the future. The software argument is therefore rather weak.

Our "other preference" is therefore as follows. We introduce a new UTC definition without leap seconds, but call it "TAI2000" rather than UTC. Instead of the arbitrary shift of 34 seconds between the UTC and TAI origin, we use the offset at the J2000 epoch, which was 32 seconds. This (forever) constant offset between TAI and TAI2000 is just as arbitrary as when we would keep the current number of leap seconds frozen forever, but at least there would be some physical meaning to it. Also, it makes sense to call this new scale TAI2000 rather than UTC2000. The old UTC should then continue as it is - with leap seconds - because that is the only relevant way in which UTC is different from TAI.

01 August 2011, 13h39; Boot, Teco
Infinity Networks, Netherlands
Telecommunication
Response = 2

01 August 2011, 19h30; Gordon, David
NASA/GSFC, USA
Astronomy-Astrophysics Geodesy
Response = 1

01 August 2011, 21h33; Ruppert, Lyle
Ball Aerospace & Technologies Corp, USA
Celestial-mechanics Geodesy Space-sciences
Response = 1
UTC as presently defined is an optimal choice of timescales in many applications. Other options are

already available for applications in which a leap second might be inconvenient.

02 August 2011, 13h26; Luzum, Brian
USNO, USA
Geodesy
Response = 2

02 August 2011, 15h45; Cook, Mike
n/a, France
Time-laboratory
Response = 3

The issue in hand is more than redefining UTC. There are three requirements of time transmission that are met by the current recommendation of ITU-R TF.460-6.

- a) Ticks of SI seconds, used by all.
- b) Current value for DUT1.
- c) A civil time scale, UTC, used worldwide as a legal time scale, directly descending from and now synonymous with GMT which is still the legal definition in many countries laws. The current proposition to change ITU-R TF.460 provides for ONLY the first of the above requirements. Although there has been no consensus on change in the last 10 years, I think the whole issue should go back to ITU-R WPA7 with the remit to devise a recommendation that includes ALL of the above requirements and to postpone any change until that recommendation is finalised. The current system will be quite satisfactory out to about 2300. As there is no need for precipitation, WPA7 could start from scratch and ask what is and will be required in future for time transmission.

03 August 2011, 13h11; Visser, Hans
Fugro Satellite Positioning BV, Netherlands
Geodesy
Response = 2

04 August 2011, 01h55; Sutton, Jordan
Cascade Climatology Consulting Corp., USA
Meteorologist
Response = 1

I feel that the leap second is necessary to keep time as accurate as possible. There can be no "perfect clock" or "perfect calendar", since the earth's rotation is not constant, and therefore, the earth is not a perfect timekeeper. Due to tidal drag, the earth's rotation rate is slowing down at a very slight rate; the slowing is measured by the quantity Δt , which is usually expressed in seconds. So, when Δt increases by a second, a leap second becomes necessary.

Over time, leap seconds will be needed more frequently due to the fact that Δt is proportional to the square of elapsed time. Currently, a leap second is typically added every one to two years. As time progresses, leap seconds will be needed several times a year, then every month, then every week, then every day, ..., and so forth. At this point, millennia into the future, it might be more logical to insert a leap minute, or better yet, perhaps once a century make accurate clocks that run just a bit slower, thus redefining the length of the second.

04 August 2011, 04h50; Channon, Tim
private, UK
various technical fields
Response = 1

The arguments in favour of a change are weak whereas longer term trust in a system which is consistent is vital. The risks of unintended consequences are considerable. (side effects) We had a good example of bad argument acting as a justification for change here in England. This was about a move of currency system to decimal. The bad argument was about newly introduced digital computers. Some years later the stupidity of the argument is forgotten, is a trivial problem for computing. Whether losing a human sized unit of measuring was good or bad is not the point here. The degree of reliance on GPS etc. is a grave concern. Any argument about the dire consequences of trouble with GPS ought to raise questions about existing safety and fixed independently. If GPS internally needs a fixed time that is a GPS problem, could for example be fixed elsewhere, time altered for display. Awkward system updates? It is their job and the job of a competent design. Design out the problem. From a design perspective, if you absolutely require local reliability you split the system, disconnect dependence. As an equipment designer I have had to do this on timing, whereas relying on an external clock as reference is cheap and asking for trouble. Plenty try to do this. Live with it.

05 August 2011, 23h15; Levandowski, Robert
MacWhiz Technologies, USA
Information technology; Finance

Response = 1

UTC reflects the reality of the universe in which we live. The proposal to redefine UTC will cause UTC to drift away from reality, making it inaccurate. In the case of the systems I maintain, it will cause immense disruption due to the need to change code and procedures that currently understand UTC to include leap seconds. Accurate, synchronized time is vital for the operation of many computer protocols. It's also vital to tracking down issues that occur between systems used by different organizations, and a sub-second accuracy can be crucial in aligning events. The possibility that some organizations will use a redefined UTC while others use DUT1 would cause massive disruption. Please stop the insanity.

06 August 2011, 23h14; Little, Matthew
none, USA
general public interested in metrology

Response = 3

I would like the plan to be to correct UTC to UT1 when the divergence has reached an hour (3600 seconds) as that could be implemented as no net change as countries go to Daylight or Summer Time and such correction wouldn't have to be applied for much longer periods of time than the leap second. Everyone would still subtract an hour to go to the adjusted standard time at the end of that year's Daylight or Summer time. Yes, places that don't observe Daylight/Summer Time would have to change their clocks an hour at some point, I realize. I believe it is appealing to keep the solar crossing of the zero meridian noon UTC *generally*, just that the correction can be allowed to accumulate to a quantity that can be planned for conveniently long in advance and then the next correction need not be worried about for another long period rather than worrying about "nudging" all the clocks so often. However, looking at the situation from the point of view of correcting one's clocks, I note that when corrections are applied does not make much practical difference with my computer set via Internet time server and a separate clock set automatically via WWVB as these clocks would set themselves to the updated time and involve very little effort on my part whether the leap second policy is changed or not. Those relying on UT1 would likely need to track it just as much whether UTC is being corrected by leap seconds or not and

we agree UT1 is the less predictable scale that needs to be tracked and analyzed regardless of agreement with UTC.

06 August 2011, 23h26; Skehan, Sean
City of Los Angeles - Government Agency, USA
Transportation

Response = 1

Significant amounts of transportation infrastructure in the USA are dependent on the accuracy of UTC for communications, coordination and operation. Leap seconds play an important part in keeping this equipment in sync. Allowing UTC to diverge from UT1 will in the long term be problematic. Also, the small and predictable leap second increments are much more tolerable than larger step adjustments proposed (leap minute or leap hour) and less troubling than letting UTC drift away from UT1. Please save the Leap Second!

07 August 2011, 21h58; Kisselov, Ivo
n/a, Bulgaria
Telecommunication

Response = 1

As UTC is often referred to and used in numerous calculations in all sectors and activities by a really very wide, diffuse and in fact hard to reach community at present, it would be better to leave it defined as it is today for official use. After several decades when the new generation of satellite navigation and time keeping systems are fully developed and integrated, and our accuracy and modeling capabilities improve by a couple of orders, this probably would be reconsidered with a far longer perspective in mind, by a more understanding user community, and in a truly global manner. Meanwhile - not to hamper the scientific work - probably a new "UTC0" (or so) can be defined that would drift away from solar time and progress uniformly (with the inevitable frequent improvements and changes to come with our development). Competent researchers will no doubt be able to easily handle such a change and make good use of it, without throwing hundreds of thousands of non-specialists into the next half-baked "measurement system bog" just because we have noticed an imperfection and want to try to impose a fix at once. Change is inevitable and needed, but should be done intelligently, not impatiently.

07 August 2011, 12h25; King, Frank
British Sundial Society (Chairman), UK
Celestial-mechanics

Response = 1

Leap seconds are as crucial for synchronising the daily rotation of the earth to clock time as leap days are for synchronising the seasons to the calendar. Please retain the current definition of UTC and the leap second.

07 August 2011, 12h34; Mohamadi, Jahanbakhsh
Zanjan_University, Iran
Astronomy-Astrophysics Geodesy
Response = 1

08 August 2011, 14h36; Theuillon, Gwladys
SHOM, France
Geodesy Geophysics Hydrography
Response = 4

08 August 2011, 15h32; Hartmann, Wilfried
IGP, ETH Zürich, Switzerland
Geodesy Geophysics
Response = 2

09 August 2011, 14h32; Rodin, Alexander
Pushchino Radio Astronomy Observatory, Russia
Astronomy-Astrophysics
Response = 3
I prefer "leap minute" introduced every 50 or 100 years.

10 August 2011, 12h31; Sauve, Michael
Alien Technology, LLC, USA
Astronomy-Astrophysics Telecommunication
Time-laboratory
Response = 1

All needs for a timescale which lacks discontinuities (leap seconds) can be fulfilled by using TAI. There is simply NO rational argument for redefining UTC, which is historically linked to earth rotation, and used for that reason, to be something it was never meant to be. There is no need for yet another time scale with a fixed offset from TAI such as GPS and SMPTE timescales.

12 August 2011, 21h30; Klepczynski, William
Global Timing Services, LLC, USA
Astronomy-Astrophysics
Response = 2

If UT1 is needed, it can easily be obtained from the IERS to even greater precision than that available through transmitted time signals.

In this day and age, it should be a relatively easy task to re-program computers to run at UT1 with known and predicted corrections to UTC. It is even possible to have a digital clock which keeps UT1 using the published offsets of UT1 from UTC if one is needed for guiding telescopes.

I see no technical reason for keeping the existing system other than TRADITION. Even for celestial navigation, the published corrections to UTC can easily be applied to sextant observations.

13 August 2011, 04h35; Schuh, Harald
IGG, Vienna University of Technology, Austria
Astronomy-Astrophysics Geodesy
Response = 1

13 August 2011, 04h43; Ohnuki, Tohru
Northrop Grumman Aerospace Systems, USA
Astronomy-Astrophysics Space-sciences
Response = 1

16 August 2011, 00h32; Frankston, Bob
Frankston, USA
Information Systems
Response = 2

We needn't fit all definitions of time into a single framework. Whether we call this UTC or not is secondary. We do, however, need to recognize that times in databases since 1972 have been indeterminate since we can't be sure that leap seconds were honored and, in fact, most databases can't deal with leap seconds and interval calculations can't. For this reason we need to unwind leap seconds. This would be facilitated by adopting a designation that is explicit about being uniform since 1972. We can then adopt measures appropriate to domains that need to take into account celestial objects and other considerations.

16 August 2011, 09h39; Davis, John
British Sundial Society, UK
Celestial-mechanics Sundial design and consultancy
Response = 1

Leap seconds are crucial to keeping timekeeping locked to the rotation of the earth. I (or my descendants) do not wish to have noon drift into the middle of the night.

16 August 2011, 11h27; Oja, Heikki
Helsinki University Almanac Office, Finland
Astronomy-Astrophysics
Response = 1

17 August 2011, 09h25; Gupta, Sanjeev
DCS1, Singapore
Telecommunication Network Research
Response = 1
Changing the definition of UTC will cause a discontinuity. I have no objections to a non-leap-second scale, but there is no reason to use the same name. There is no shortage of new names that can be used for such a scale, or call it TAI-34.

17 August 2011, 23h03; Cabeen, Ted
UCSB, USA
Telecommunication
Response = 1

18 August 2011, 04h52; Altman, Jeffrey
OpenAFS, USA
File system developer
Response = 2

18 August 2011, 05h32; Buhrmaster, Gary
Gary Buhrmaster, USA
Telecommunication
Response = 1

18 August 2011, 08h10; Eggert, Paul
UCLA Computer Science Department, USA
Software engineering
Response = 1
My background is software engineering. I help maintain many widely used computer programs that deal with leap seconds, including the GNU C library and the TZ (timezone) database and code. I see no real need for this change, and some reasonable arguments against it, mostly in terms of complexity of transitioning to software implementing the new system.

18 August 2011, 14h56; Zijlstra, Mark
Royal Netherlands Navy / CAMS-ForceVisio, the Netherlands
Astronomy-Astrophysics Celestial-mechanics Geodesy Defense
Response = 2

18 August 2011, 19h57; Colebourne, Stephen
OpenGamma, UK
Computing
Response = 1
I believe it is fundamentally wrong for civil time-keeping to be altered in a way that separates us from the solar day and that this has moral and ethical issues beyond science or broadcasting. I also

believe that it is wrong to continue to use UTC for something different to what the UT prefix implies. TAI already provides what this change seeks. I believe that a large part of the problem has been computer systems that are not setup to deal with leap seconds, however Java via JSR-310 is bringing full leap second support and I expect others to follow. My experience as JSR-310 spec lead indicates that developers (and humans generally) really like the concept of 24 hours of exactly 60 minutes of exactly 60 seconds, and they would prefer to see that maintained (such as via rubber seconds) rather than having to cope with an occasional 61 second minute. I believe that the best solution to the issues here are to publish leap seconds 5 years in advance, with the understanding that DUT may exceed 0.9 seconds by a small amount if the prediction is wrong. Leap seconds should be permitted at the end of any month. I also believe that UTC-SLS (whether smoothed over 1000s, 600s or 1200s) should be more widely published as the standard mechanism for mapping TAI + leap seconds to civil time. Finally, I want to see the atomic duration of "SI seconds" renamed (to duronds?) allowing the "second" to be used for civil time. The duration of 1 second is 1 durond except near a leap, where it may be longer or shorter (see UTC-SLS).

19 August 2011, 08h27; Emanov, Alexey
Altay-Sayan branch of Geophysical Survey,
RUSSIA
Geophysics
Response = 2

19 August 2011, 23h53; Storz, Mark
Air Force Space Command, USA
Astronomy-Astrophysics Celestial-mechanics Geodesy Geophysics Space-sciences Telecommunication
Response = 1
The Office of the Secretary of Defense (through a letter from ASD/NII to the State Department - June 29, 2009) has already agreed to support the elimination of leap seconds, but no earlier than January 1, 2019. Although no real cost estimate for upgrading Air Force Space Command software has been performed, many subject matter experts expect costs could be in the \$100s of millions. A schedule risk could also be incurred if the complexity of the software upgrades is such that they cannot be tested and implemented by 1 Jan 2018 (date suggested by ITU-R).

19 August 2011, 17h50; Vasconcelos, Manuela
Portuguese Geographic Institute, Portugal
Geodesy
Response = 1

20 August 2011, 22h29; Klein, Stanley
United States Power Squadrons, USA
Celestial-mechanics
Response = 1

22 August 2011, 15h00; Mäkinen, Jaakko
Finnish Geodetic Institute, Finland
Geodesy Geophysics Metrology
Response = 2

22 August 2011, 18h35; Fischer, Michael
Marin Amateur Radio Society, USA
Telecommunication
Response = 1
Thank you for maintaining the status quo!

22 August 2011, 20h16; Kerns, Carrol
Kerns Associates, USA
Meteorology
Response = 1

22 August 2011, 21h13; Deovlet, Benjamin
Stanford University, USA
Telecommunication
Response = 1

22 August 2011, 21h23; Abraham, James
Retired, USA
Telecommunication
Response = 1

22 August 2011, 23h30; Denny, Douglas
Ex-Institute of Measurement and Control, England
Astronomy-Astrophysics Celestial-mechanics
Response = 1
A common, globally used system, linked to the Earth's rotation/variation and adjusted to be within one second at all times, or better, adjusted to within 100milliseconds (or better) by more frequent and automatic adjustments, promulgated by the international time-standard radio systems, is the common-sense way forward for the future use by the maximum number of people with the least trouble to any of them. Scientific use is more normally restricted to a relatively miniscule number of people and systems, and can be promulgated via GPS signal embedded data and is readily obtained for specialist use by specialist receivers. Let the few have

the greater trouble obtaining a continuous dynamical time system. Dynamical Time can be linked to pulsars or continue to be defined by the latest hydrogen maser, caesium fountain or other atomic systems technology.

23 August 2011, 00h26; Posick, Steven
ESPN, USA
Media and Broadcast
Response = 1

The purpose of tracking time has historically been associated to the rotation of the earth and the suns position within the sky. What's to point of a time based system that does not reflect this? Who does it benefit and why? How will this help everyday software engineers/architects like myself in making software applications that function at a global scale (remember timezones)? Currently, UTC is used; if UTC is changed then the impact will be far reaching as most developers won't even understand the divergence. If someone needs a time standard like this for scientific applications, make a new standard. Leave the one everyone has become familiar with alone.

23 August 2011, 05h09; Bliss, Gerald
Retired, USA
Telecommunication
Response = 4
Just so we all are on the same tick !

23 August 2011, 07h25; Ekne, Ignidz E
GS SB RAS, Russia
Geophysics
Response = 2
Remove leap seconds! Because it's very difficult to create programs with it support. As result today 99% of programs have no support of them. For example if we try to show graph of data in real time we should to do correction from system time (if system have support of it). And we should introduce correctly 60 second.

23 August 2011, 09h19; Stephansen, Helge
T-VIPS, Norway
Broadcasting
Response = 2
For synchronisation of Single Frequency Transmitters in DVB-T2 ETSI EN 302 755 v1.1.1 Number of UTC seconds since 1.1 2000 is used as reference for time. The handling of leap seconds adds a considerable complexity for equipment manufacturers and for operators in order to prepare and pre-program for the insertion/removal of a leap second.

23 August 2011, 05h26; Evans, Andrew
MSK, USA
Telecommunication
Response = 1

23 August 2011, 11h06; Cook, Bert
Member of American Radio Relay League, USA
Telecommunication Amateur Radio
Response = 1
Presently UTC is the world accepted time standard used in worldwide radio communication. It is also the basis for the worlds established time zones. It would be very awkward to have to refer to another time standard and further a change might make it more difficult and more costly to maintain than the current method. I realize that while the atomic time standard may be necessary for some extremely delicate scientific needs in laboratories, etc.; the present system is the easiest and less expensive system to maintain and use in my practice of Amateur Radio and Amateur Astronomy.

23 August 2011, 12h50; Reis Paulino Cascalheira, Telmo José
Geographic of Portuguese Army, Portugal
Geodesy GIS
Response = 1
Avoiding the leap seconds, will bring with time some problems that we cannot figure out at the present time the consequences that will have. I strongly recommend that a deep study into this subject is done and assess all the consequences that might have. Only then the community is ready to discuss the subject.

23 August 2011, 13h33; Schaal, Ricardo
EESC- Universitu os São Paulo, Brazil
GPS applications
Response = 1

23 August 2011, 13h43; TRABANCO, JORGE
UNICAMP, Brasil
Geodesy
Response = 1

23 August 2011, 15h17; Martins, Paulo
Portuguese Army Geographic, Portugal
Geodesy Geophysics
Response = 1
It is very well described in the reference number two table 1 of the appendix the pros and the cons of the UTC redefinition. From the perspective of our institution this will bring additional and not quanti-

fied costs with no foreseen benefits.

24 August 2011, 05h08; Calabretta, Mark
Australia Telescope National Facility, Australia
Astronomy-Astrophysics
Response = 1

I am a software engineer with over 25 years' experience in astronomical software development and maintenance. It is common for astronomical software to take advantage of the fact that UTC approximates UT1 sufficiently well to be used for purposes such as Doppler correction or low-precision calculation of apparent coordinates. If leap seconds are dropped, the approximation UTC ~ UT1 will degrade slowly over a period of years, only becoming obvious after decades. Inevitably some, possibly much, software would not be adapted to the altered definition of UTC. The error may go unnoticed at first, leading progressively to ever more erroneous results over a timescale of years to decades. The famous mis-identification of the first "pulsar planet" in the early 1990s, due to an error in calculation of the Earth's ephemeris, illustrates the potential harm that might result. It is difficult to say how much software may be affected without conducting an extensive y2k-type audit. Indeed, identifying potentially affected software, and remediating that found, would in itself would be an expensive undertaking for the astronomical community. Dropping leap seconds would fundamentally alter the meaning of UTC, effectively turning it into yet another atomic timescale offset by an integral number of seconds from TAI. It would even devalue the meaning of "UTC" for the period before leap seconds were dropped. This would affect the timestamps recorded in a vast archive of astronomical data so that a distinction would have to be made between "UTC with leap seconds" before a particular date and "UTC without leap seconds after it. Aside from astronomical considerations, there is an implicit assumption that UTC, as the basis for civil time, is tied to the motion of the Sun. The very existence of daylight savings time supports this observation. The proposal to drop leap seconds essentially ignores this. There are only vague notions of "leap hours", or resetting time zones in 600 years' time when the error has accumulated to one hour. I feel that this aspect of the proposal has not been adequately addressed. For these reasons I strongly oppose the proposal to drop leap seconds.

23 August 2011, 15h22; Goncalves Ferreira, Vagner
Hohai University, China
Geodesy
Response = 2

23 August 2011, 16h25; Rui, Dias
Instituto Geográfico do Exército, Portugal
Geodesy
Response = 1

23 August 2011, 18h14; Aranha Ribeiro, Selma Regina
University State of Ponta Grossa - PR, Brasil
Geodesy remote sensing data
Response = 2

24 August 2011, 07h58; SUAGHER, Françoise
Association Astronomique de Franche-Comt, France
Astronomy-Astrophysics Space-sciences
Response = 1

24 August 2011, 15h33; ARANA, JOSÉ MILTON
FCT/UNESP, BRAZIL
Astronomy-Astrophysics Geodesy
Response = 1

24 August 2011, 23h50; Isaacs, Michael
BSS, UK
Horology, gnomics
Response = 1
Leap seconds are as crucial for synchronising clock time to the daily rotation of the earth as leap days are for synchronising the calendar to the seasons. Please retain the current definition of UTC and the leap second.

25 August 2011, 08h20; Mele, Francesco
INGV, Italy
Geophysics
Response = 1

25 August 2011, 11h54; Maria, Escuer
Instituto de Meteorologia, PORTUGAL
Geophysics
Response = 1

25 August 2011, 14h26; Earl, Zmijewski
Renesys, USA
Telecommunication
Response = 1
A change at this point would break A LOT.

25 August 2011, 15h11; Hansen, Tony
AT&T Laboratories, USA
Telecommunication
Response = 1

25 August 2011, 15h22; Adolf, Alexander
Condition-ALPHA Digital Broadcast Techno, Germany
TV Broadcast
Response = 1
We fully understand and support the need for a non-leaping and unconstrained time source. This will be very useful in many scientific and technical use-cases.
Due to the very widespread use of UTC in commercial applications, we would however be concerned over redefining UTC. It's major role in commercial applications is providing a time-zone neutral (and hence reliable) way of specifying points in time for applications which are linked to, or depend on human activities (e.g. radio/TV broadcast or air travel) and therefore need to be aligned with day/night cycles (i.e. Earth rotation). In this role, UTC has become a brand name, and has been referred to in literally hundreds of standards, and in countless computer software interfaces.

We would hence like to kindly suggest that - instead of redefining UTC - a new time source should be defined with the described properties. This would allow commercial implementations using UTC to realize a migration path towards the new time source. Whilst existing standards and implementations could remain unchanged, new standards and application designs could make use of the new time source. This would for sure be a commercially viable solution.
Redefining UTC with a 5-year deadline for updating all implementations would imply huge investments for the commercial sector, without any perceived or visible commercial advantage though. We are hence concerned that the de-definition approach could lead to the change being largely ignored outside the scientific community. Hence our suggestion for defining a new time source.

25 August 2011, 15h52; Hanna, Stephen
Juniper Networks, USA
Telecommunication
Response = 1

25 August 2011, 16h28; Michael, Richardson
CREDIL, Canada

Telecommunication

Response = 1

Given that computers all over the world (except some of the toys made in Redmond), already have code to deal with leap seconds (and timezones), and we all use a standard set of TIC files maintained by NIST.gov, I see no advantage to removing leap second calculations. It isn't like we can remove that code, nor is that code particularly big.

25 August 2011, 19h01; Daniel, Christopher
British Sundial Society, UK

Astronomy-Astrophysics sundial design & delineation

Response = 1

Leap seconds are as important, indeed crucial for the synchronisation of clock time to the diurnal rotation of the Earth as leap days are for rectifying the calendar with the seasons. I see absolutely no point in abandoning the use of leap seconds, which have stood the test of time, and ask that the current definition of UTC be retained together with the leap second.

25 August 2011, 20h06; Ellermann, Frank
meta.wikimedia.org/wiki/Template:YMD2MJD,
Germany

Computer Science, Mathematics

Response = 1

Whatever happens to UTC, I need POSIX timestamps based on $24*60*60$ seconds per day, and Modified Julian Days counting "observed" days corresponding to various calendar dates.

25 August 2011, 20h31; McQuillan, Bill
Bill McQuillan, USA

Telecommunication

Response = 1

Making UTC exactly track TAI (with a constant offset?) is redundant. Why have two standards with the same characteristics? If a user needs an atomic time without unpredictable "leaps" use TAI. Also, for consistency TAI should NOT be expressed in terms of terrestrial motions like days and years but rather in multiples of seconds (e.g., Kiloseconds, Megaseconds,...) Computers that cannot handle leap seconds should be replaced by ones that were developed by competent engineers. Leave UTC as-is for those of us that like our sun overhead at noon!

25 August 2011, 22h17; Carpenter, Brian
Individual expert, New Zealand

Telecommunication Internet protocol design

Response = 1

UTC diverging from UT1 would become a major headache for future generations. We should continue to support the mild inconvenience of leap seconds.

26 August 2011, 04h21; Chapin, Lyman
Interisle Consulting Group, USA

Telecommunication

Response = 1

26 August 2011, 11h09; Vesely, Alessandro
TANA, IT

Telecommunication

Response = 1

26 August 2011, 11h11; Weilbier, Joerg
SIEMENS AG, Germany

Telecommunication Energy distribution

Response = 2

I think, the proposal will reduce unexpected malfunctions in computer networks, containing some components, can't handle current UTC definition of leap seconds right. It's really difficult to detect erroneous (regarding leap seconds) components of a heterogeneous network and to predict behavior of functions, depending from exact time. It seems to me, that almost all current implementations - erroneous_and_well_made - of UTC handling devices will work right with the new proposal.

26 August 2011, 12h47; Vicente, Raimundo
Faculty of Sciences, Lisbon, Portugal
Astronomy-Astrophysics Celestial-mechanics Geodesy Geophysics

Response = 1

In order to avoid the introduction of another discontinuity in the actual system of units, constants and parameters, employed in astronomy, geodesy and geophysics, which already presents lack of consistency. I am therefore satisfied with the current definition of UTC which includes leap second.

26 August 2011, 13h43; Pereira, Jorge
Servicio Hidrografico y Oceanografico de, Chile
Hydrography and Oceanography

Response = 1

Many users of our products, as well as surveyors support point 1 and indicate they are satisfied with current definition of UTC

28 August 2011, 16h20; Heard, Charles
Private Consultant, USA
Telecommunication

Response = 1

For applications where leap seconds are significant nuisance, direct use of TAI would be appropriate.

It is not necessary to redefine UTC for that purpose. On the other hand, if UTC were redefined to have a constant offset from TAI, the lack of a time scale tied to the Earth's rotation would necessitate inventing something very similar to the current UTC to replace it. So my strong preference is to leave it as is. By way of background, I have in the past written software for test equipment to convert UTC (as reported from a commercial GPS receiver) to something with a constant offset from TAI for time-stamping purposes, so I am aware of the issues involved.

28 August 2011, 17h25; Eichenstein, Yisrael
Jewish Calendar Institute - Scientist, Israel
Astronomy-Astrophysics Celestial-mechanics
Space-sciences Time-laboratory Jewish Time-Studies

Response = 1

My opinion is that the proposed change in the concept of UTC in a way it will not keep pace with the diurnal rotation of Earth is a significant deviation from the way humanity is measuring time along the history and the way we always perceived the concept of Day and Second.

I think that just like there is an accepted consensus that the Calendar is synchronized with the annual revolution of the heavenly bodies, and there is no idea to change it, the same is with the UTC concept which is not different, and for sure it's not something which could be changed in a narrow assembly, but it needs a worldwide referendum which it's currently not possible, because of this my opinion is to strongly oppose such a redefinition in the UTC concept.

About the problem of the increasing amount of machines which depends on UTC, I think that's very easy to create a universal protocol which should be programmed in such a way it should easy accept the Leap Second, also regarding the Julian Day when measured according to UTC, it's possible to program that at the day a Leap Second will be added, already in the beginning of that day the Second of that day should be measured a 86,401 part of the Day and not a 1/86,400.

Regarding the problem that the number of Leap Seconds that's will be required to inset will in-

crease during the next tens and hundreds of years, it's possible to introduce a system that every hundred years (or any other time span) should the length of the second be determined anew according the LOD at that time, so it will be avoided the need of frequent insertion of Leap Seconds.

28 August 2011, 17h28; Genut, Mordche
Jewish Calendar Institute - President, Israel
Astronomy-Astrophysics Celestial-mechanics
Space-sciences
Response = 1

28 August 2011, 22h21; Bortzmeyer, Stéphane
AFNIC, France

Telecommunication

Response = 1

After reading the two excellent papers mentioned as reference, and after discussing the matter with several persons, I tend to think that the fundamental problem is the existence of several user communities, each with different (but perfectly legitimate) requirements. Because these requirements are different, there is zero chance to find a way to satisfy them all with one time scale. The only solution is therefore to have several scales and to let each community choose the one which fits its requirements.

Of course, there are already several time scales. I feel that most of the needs of people who want the end of leap seconds would be satisfied by TAI (a very regular time scale, without "steps" and without link with the solar time). If, for one reason or the other, TAI is not perfect for them, and there is no existing time scale suitable, it may be interesting to develop a new time scale (I'm not convinced it will be necessary: many proposals, such as the one for the "new UTC", are YATSCOT - "Yet Another Time Scale with a Constant Offset to Tai"). But using the term UTC for a new time scale seems confusing because people and software are now used to the existing definition of UTC.

The root cause of the dispute, I believe, is that too many people would like to have a "primary" time scale, one which is "more equal than others", hence the fight over UTC (actually, over the name "UTC"). The proper framework of thought would be, not only to have several time scales, but also to recognize them are "equal" and chosen at will by the different communities.

28 August 2011, 20h51; Vincent, Fiona
University of St. Andrews, Scotland, UK
Astronomy-Astrophysics

Response = 1

The abstract idea of "Time" is a concept which humans find difficult to deal with, but its embodiment in the cycle of day and night allows us to feel comfortable with it. I think it would be morally undesirable to divorce our time-keeping system from the basic rhythms of life.

28 August 2011, 21h54; Stapleton, Roger
University of St. Andrews, UK
Astronomy-Astrophysics

Response = 1

My work is on the control system for a 1m class telescope (built about 1960). Its pointing system is not super-accurate so I only need UT1 \pm 1sec to get the pointing accuracy needed. This is at present supplied by UTC via the internet and the NTP service. If UTC is abandoned by the removal of leap seconds I require easy access to the error between UT1 of the new timescale. I have seen no suggestion that such a service will be part of the change. There will also be a cost in programming time to incorporate this service - assuming that it is created.

28 August 2011, 23h05; Arnold, Mathieu
Absolight, France
Telecommunication

Response = 1

28 August 2011, 23h24; Rascanu, Theodor
Institut für Kernphysik Frankfurt, Germany
Astronomy-Astrophysics

Response = 1

In my opinion there is no logic behind setting UTC constant to TAI, since in that case one could directly use TAI.

29 August 2011, 11h05; Ferreira, Rui
MOG Technologies, Portugal

Broadcasting

Response = 2

29 August 2011, 12h15; Da Silva Costa, Paulo
LNEG, Portugal

Space-sciences

Response = 1

29 August 2011, 18h48; OGDEN, Andrew
Worshipful Company Of Clockmakers, Republic
Of Ireland

Geophysics

Response = 1

Leap seconds are crucial for synchronising clock time with the daily rotation of the earth. Please retain the current definition of UTC and the leap second.

29 August 2011, 21h30; Auerbach, David
Technical University Eindhoven, Netherlands
Geophysics

Response = 1

29 August 2011, 22h45; Mann, Christopher
Michael Fields, USA

Agriculture

Response = 1

29 August 2011, 22h49; Leneweit, Gero
Carl Gustav Carus-Institute, Germany

Nanotechnology

Response = 1

29 August 2011, 22h52; Winiwarter, Verena
IFF Social Ecology, Austria

Environmental History

Response = 1

The symbolic significance of giving up our attachment to natural rhythms should not be underestimated.

29 August 2011, 22h58; Schaerer, Alec
Geography -- U of Basel, Switzerland
Integral Methodology

Response = 1

29 August 2011, 23h19; Weigl, Herwig
Dept. of History, Univ. Vienna, Austria

history

Response = 1

30 August 2011, 00h04; Jacobi, Johanna
University of Berne, Switzerland

Space-sciences

Response = 1

30 August 2011, 00h27; Giorgini, Jon
NASA/Jet Propulsion Laboratory, USA
Astronomy-Astrophysics Celestial-mechanics
Space-sciences solar system ephemerides
Response = 1
Redefining UTC and dropping leap-seconds must not be imposed on those already successfully using it for the mild or theoretical convenience of others. Perpetually troublesome communication problems with the ephemeris-using public would be introduced; it is not simply a numerical and software modification issue.

30 August 2011, 04h06; Woo, Wang Chun
The Hong Kong Observatory, Hong Kong, China
Astronomy-Astrophysics Geophysics Time-laboratory
Response = 2
1. Designing, operating and testing time service equipment for leap seconds require tremendous efforts, yet they are still error-prone as leap seconds are introduced only occasionally.
2. The possibility of leap seconds makes it impossible to compile calendar valid for decades/centuries.
3. It is difficult to explain to the public why leap seconds are necessary, given that the time shift of sunrise/transit/sunset occur over hundreds of years.

30 August 2011, 04h39; Koehler, Reinhard,
Carl Gustav Carus-Institut, Germany
Geophysics Hydrodynamics in Pharmazeutics
Response = 1

30 August 2011, 07h32; Heertsch, Andreas
Verein für Krebsforschung, Switzerland
Medical devices
Response = 1

30 August 2011, 08h06; FICHMEISTER, Hellmut
Graz University of Technology, AT
Astronomy-Astrophysics
Response = 1

30 August 2011, 08h30; Auerbach, Raymond
Nelson Mandela Metropolitan University, South Africa
Agriculture
Response = 1
It is important in my field to have the connection with the actual astronomical events to which time is related in terms of daylight, planetary cycles and seasons. Please keep it as it is!

30 August 2011, 08h40; RAMM, Hartmut
Hiscia, Switzerland
Cancer research
Response = 1
The Sun is the source of life - let's keep connected.

30 August 2011, 09h16; SCHWARZ, Reinhard
Ordination, Austria
Medicine
Response = 1

30 August 2011, 09h27; Sutter, Christine
Institut für Stroemungswissenschaften, France
Astronomy-Astrophysics
Response = 1

30 August 2011, 10h03; Lukas, Dostal
none, Czech Republic
Astronomy as hobby / medicine
Response = 1

30 August 2011, 10h07; Baur, Felix
private, CH
medicine
Response = 1

30 August 2011, 10h51; Moser, Max
Institute for Physiology, Med Uni Graz, Austria
Medicine, Physiology
Response = 1

30 August 2011, 11h08; Schmitt, Tobias
Gabriel-Tech, Germany
Telecommunication
Response = 1

30 August 2011, 11h10; Seifert, Georg
Charité UniversitätsMedicine Berlin, Germany
Medicine
Response = 1

30 August 2011, 11h17; Kranz, Christoph,
none, Austria
pedagogic
Response = 1

30 August 2011, 11h21; Landl, Richard
Bund der Freien Waldorfschulen, Germany
Pädagogical Science
Response = 1

30 August 2011, 12h23; Haberl, Helmut
 Institute of Social Ecology, AAU, Austria
 Social Ecology
 Response = 1

30 August 2011, 12h49; Van der Wal, Jacob
 Dynamension, Netherlands
 Medicine
 Response = 1

30 August 2011, 12h50; McKeen, Claudia
 Fachschule/Kindergartenseminar, Germany
 Medicine und Pädagogik
 Response = 1

30 August 2011, 12h50; Els, Ruitenberg
 Dynamension, Netherlands
 none
 Response = 1

30 August 2011, 13h18; Crawford, Athalie
 Quaker Peace Centre, South Africa
 Diversity
 Response = 1

30 August 2011, 13h36; Gelinek, Oskar
 STENUM, Austria
 Environmental Consulting
 Response = 1

30 August 2011, 13h45; Barrett, Paul
 US Naval Observatory, USA
 Astronomy-Astrophysics
 Response = 2

30 August 2011, 14h03; Kiene, Helmut
 IFAEMM, Germany
 medicine
 Response = 1

30 August 2011, 14h08; Raderschatt, Bert
 Praxis, Germany
 General Practitioner
 Response = 1

30 August 2011, 14h24; Merimaa, Mikko
 Centre for Metrology and Accreditation, Finland
 Time-laboratory National Metrology Institute
 Response = 2
 Considering seasonal deviations of the apparent
 solar time and quantization caused by time zones,
 leap seconds introduced to UTC are of minor im-
 portance to the general public. In a modern society,

there are relatively few applications that require
 time synchronized to UT1, while leap seconds cre-
 ate problems in data logging, time stamping, tele-
 communication systems and time distribution ser-
 vices. Thus, a serious consideration should be giv-
 en to stop corrections to UTC while the published
 difference between UTC and UT1 could be used in
 applications where UT1 is needed.

30 August 2011, 14h57; Mayer, Helmut
 IPMR, Austria Vienna
 Rehabilitation Medicine
 Response = 1

30 August 2011, 14h57; Moravansky, Johann
 Private Practice, Austria
 Medicine
 Response = 1

30 August 2011, 15h05; Liess, Christian
 HTWG Konstanz, Germany
 Fluid dynamics engineer
 Response = 1

30 August 2011, 15h21; Seelbach, Dr. Volker
 Waldorfschool at Wangen / Allgäu, Germany
 Biology- and Chemistry-Teacher
 Response = 1

30 August 2011, 15h44; Volkmann, Juern-Hinrich
 DGI, Germany
 Literature
 Response = 1

30 August 2011, 16h33; Rabethge, Helga
 NaturheilMedicine, Germany
 Astronomy-Astrophysics Geisteswissenschaft
 Response = 1

30 August 2011, 17h01; Albonico, Hans-Ulrich
 Cosmic Intuitive System Promotion CISP, Switzer-
 land
 Biochronology
 Response = 1

30 August 2011, 17h24; Bauer, Hermann
 School, Germany
 Astronomy-Astrophysics
 Response = 1

30 August 2011, 17h27; Cimino, Giancarlo
 ASL8 Cagliari, Italy
 Physician
 Response = 1

30 August 2011, 17h32; Malicky, Michael
Oberösterreichische Landesmuseen, Austria
Informatics
Response = 1

30 August 2011, 17h35; Allen, John
Edinburgh University, Scotland
Astronomy-Astrophysics
Response = 1

I acknowledge that UTC needs to follow the atomic time for astronomical and computing needs but it means changes to the way we read time from the sun (sundials being one example). Also it means that the meridian, now at Greenwich will effectively move slowly eastwards - which is confusing. Can astronomers and computing people (the minority of the population) use another system that keeps in step with atomic time? (I believe there are some already available.) Let us not confuse the ordinary folk with this change and keep the status quo!

30 August 2011, 18h24; Weaver, Nicholas
ICSI, USA
Telecommunication
Response = 1

The leap-second addition, when it occurs, is transparent to most computer users, programmers, etc., as systems are synced using NTP (Network Time Protocol) to UTC. But if UTC, by removing leap-second addition, is allowed to diverge from Earth rotational time, when the accumulated divergence is over >1 minute, there will be pressure to redefine local times in terms of UTC - 60s, which will significantly disrupt a large number of computers, programs, etc, which rely on twin assumptions:
a) That UTC represents human-scale time
b) That the offset between UTC and local time doesn't suffer discontinuities.

The proposed change in definition of UTC will cause significant disruptions in the future on effectively every computer on the planet, as these assumptions about UTC \approx UT1 is baked into all these devices we use today.

30 August 2011, 19h02; Schwarz, Anneliese
Physik, Austria
Astronomy-Astrophysics
Response = 1

30 August 2011, 19h11; Schröter, Astrid
GCC, China
Industry and Trade
Response = 1

30 August 2011, 20h16; Schmidt, Martina
IPSUM, Germany
physician
Response = 1

30 August 2011, 20h36; Noest, Ingrid
privat, Austria
Floristic
Response = 1

30 August 2011, 20h51; Dickson, Brian
VeriSign, USA
Telecommunication Networking protocols, equipment, service
Response = 1

Since TAI exists, any need for a fixed offset from TAI can be achieved by... a fixed offset from TAI. UTC is different from TAI because it is different than TAI. (Duh.) UTC exists for many reasons, and is an accepted standard, which is the basis for an entire category of time-related functions:

- astronomy (consistent and accurate measurements require consistent and accurate time)
- GPS
- GPS-derived super-accurate clocks for synchronized network transmission equipment
- GPS-derived super-accurate clocks for networking protocols
- GPS-derived super-accurate clocks for security logs
- GPS-derived super-accurate clocks for satellite communication buffering (Doppler effect cancellation)
- GPS-derived super-accurate clocks for keeping computers synchronized for inter-machine communication/coordination (file systems, schedulers, etc.)

All of these require that UTC be consistent, and have not much to do with TAI-UTC drift. All systems that derive nanosecond-level clocking from GPS, do so with knowledge of leap seconds, and do not experience frequency-shift off of TAI nanosecond-level clocking. All systems that derive clock-face-time do so with knowledge of leap seconds, and maintain their synchronization across leap-second events. Changing UTC to not implement leap-seconds can obviously be easily implemented, by not counting leap seconds. However, this achieves nothing of value, and does so at a significant detriment to every human activity that currently relies on UTC and GPS. Please reject this, permanently.

30 August 2011, 20h58; Jacobi, Michael
Institut für Strömungswissenschaften, Germany
Astronomy-Astrophysics
Response = 1

30 August 2011, 21h23; Kestel, Tobias
White Elephant Design Lab, Austria
Industrial Design
Response = 1

30 August 2011, 21h26; Dr. Kindt, Reinhard
Anthroposophical Society, Germany
Medical Doctor
Response = 1

30 August 2011, 21h55; Schwarz, Valentin
Weleda AG, Germany
Life Science/Microbiology
Response = 1

30 August 2011, 22h06; Kröswagn, Armin
private, Österreich
Pediatrician
Response = 1

30 August 2011, 22h14; Varga, Marta
TU Budapest, Hungary
Celestial-mechanics Geodesy Space-sciences
Response = 1

30 August 2011, 22h17; Jacobi, Martin
Sozialtherap. Gemeinschaften Ww e. V., Germany
musician (a=432 Hertz)
Response = 1
No doubt to me - by shifting time one hour ahead
what happens every year end of March time is
spoiled enough. "Summer Time" to me means
more worrying, more distress, less enthusiasm.
Redefining the second in the above way would
mean wrong tone system; music would not have to
do with human feelings any more. Never can I ac-
cept that.

30 August 2011, 22h22; Conrard, Oliver
Section for Mathematics and Astronomy, G, Swit-
zerland
Astronomy-Astrophysics
Response = 1

30 August 2011, 22h27; Miller, Gary
Rellim, USA
Time-laboratory
Response = 1

Please do NOT do this! There are many GPS in the
field that are over 20 years old and have no chance
of a firmware update. Incompatible changes to a
long established standard would lead to many prob-
lems.

Ain't broke, don't fix it.

30 August 2011, 23h07; Jacobi, Freimut
Schwarz.Jacobi Architekten BDA, Germany
Architecture
Response = 1

31 August 2011, 02h30; Wright, Frederick
Google, USA
Software Engineering
Response = 1

The effort to eliminate leap seconds seems to be
the beast that won't die. At least the Julian calendar
had the excuse that it was trying to do the right
thing and merely wasn't accurate enough. Here the
proposal is to knowingly break the correspondence
between the time scale and the Earth, leaving it for
future generations to clean up the mess when the
error becomes sufficiently large. Note that very
few modern computer systems have difficulty with
the much larger one-hour step adjustments of the
local time scale that occur as Daylight Time goes
on and off. This is not because local time has been
eliminated or redefined, but because computer sys-
tems have learned not to expect local time to be a
well-behaved time scale, while continuing to use it
in appropriate contexts. The only reason leap se-
conds pose problems is that the move away from
local time didn't go quite far enough. The correct
solution is to use TAI (or TAI-K) for internal
timestamps, while converting to and from UTC
and/or LT as needed. This is precisely what GPS
does, including not only using TAI-K for internal
purposes, but also tracking the UTC offset and
thereby making current UTC available. The use of
UTC with leap seconds for NTP synchronization
does pose a couple of difficulties, but both can be
dealt with:

- 1) The parties involved need to agree on the timing
of leap seconds, in order to avoid apparent glitches
in the internal time scale, which should be a
"smooth" leap-free time scale.
- 2) The last UTC second of a day in which a leap
second occurs is ambiguous.
No room for the answers. :-)

30 August 2011, 23h11; Jacobi, Georg
BSO, Switzerland
Musician
Response = 1

30 August 2011, 23h30; Pechmann, Heidi
Arztpraxis, Deutschland
Medicine
Response = 1

30 August 2011, 23h43; Pechmann, Michael
Novalisgesellschaft, 37351 Dingelstädt
Geodesy
Response = 1

31 August 2011, 01h23; Killian, Gotthard
Music-Healing-Space, Australia
Musician
Response = 1

31 August 2011, 07h27; Vogt, Jürgen
Freie Waldorfschule Kassel, Germany
Teacher
Response = 1

31 August 2011, 08h10; Taylor, David
SatSignal Software, UK
Space-sciences
Response = 1

31 August 2011, 08h32; Ziegler, Renuat
Verein für Krebsforschung, Switzerland
research scientist, mathematician
Response = 1

31 August 2011, 08h58; Seaton, Daniel
Royal Observatory of Belgium, Belgium
Astronomy-Astrophysics Space-sciences
Response = 1

31 August 2011, 09h01; Hart, Dave
ntp.org, USA
Software Developer maintaining ntpd
Response = 1
Redefining technical terms is the wrong way to
tackle the perceived problem(s).

31 August 2011, 10h01; Rang, Matthias
Research institute at the Goetheanum, Switzerland
Optics
Response = 1

31 August 2011, 10h13; Nicula, Bogdan
Royal Observatory of Belgium, Belgium
Astronomy-Astrophysics Celestial-mechanics
Response = 2

31 August 2011, 10h29; Hobbensiefken, Sönke
CERES, South Africa
agriculture
Response = 1

31 August 2011, 10h37; Daniele, Antonio
Italian Institute Of Navigation, Italy
Air Navigation
Response = 3

Thank you for having sent this questionnaire to all IAIN members. It has been a very good and appreciable initiative. In Italian Institute of Navigation, after wide and long discussion, we agreed the UTC timing and TAI timing should be the same (as, it was before 1972). This sentence from the consideration that time measuring in hours, minutes, seconds and other fractions is a convention originally starting from measuring the position of the Sun in relation with the Earth surface due to its rotation. From a practical point of view, there are no reasons to maintain two different timing scales just because of the yearly revealed difference in Earth rotation by the strong precision of the atomic clocks. We see the problem by a practical approach that means: which use would be done of such a precise but different timing on respect of Earth surface positioning to the Sun every day? And, which kind of use may we do in the next hundred or thousand years of a timing progressively diverging from the upper indicated position relationship between Earth and Sun? And also to maintain the current definition of UTC including the leap second, always on a practice point of view, would be unsatisfactory, because it will become without any significance as the years will pass. The space here do not permit the complete exposure of our discussions, anyway, if you need more information, we are ready to send them to you anytime.

31 August 2011, 11h07; Dr. Rose, Ernst
Freie Waldorfschule Graz OG, Austria
biology; chemistry
Response = 1

31 August 2011, 12h27; Ferrandiz, Jose M.
University of Alicante, Spain
Celestial-mechanics Earth rotation, satellite dy-
namics

Response = 1

I cannot appreciate no real advantage in changing the definition of UTC but a lot of associated problems and risk of computation flows together with a large overhead to prevent them. Therefore my opinion is to keep UTC in present form. Of course new time definitions may be introduced, but not representing an alternative of UTC in the short term but with research purposes to avoid un-useful, costly changes

31 August 2011, 12h30; Schmit, Scott
N/A, USA
Telecommunication Software development
Response = 1

31 August 2011, 12h57; Steiner, Bernhard
Institut für Gegenwartsfragen, Germany
Space-sciences
Response = 1

31 August 2011, 13h39; Massey, Robert
Royal Astronomical Society, UK
Learned society (on behalf of the RAS)
Response = 3

a. If the definition is changed, then the name of UTC should also change. While the proposed re-definition will make only minor differences over the next few decades, it is a major conceptual change. It would decouple UTC from Earth rotation as represented by the UT1 timescale - and thereby break away from the original concept of universal time introduced by the IAU in 1925. We believe that it is poor practice to make changes that invalidate existing text books, especially at the conceptual level. Good practice demands a name change – to stimulate people to probe into definitions of terms.

b. Whatever is decided at the ITU-R meeting in January 2012, there needs to be an easily accessible source of information on current and historical values of $dUT = UT1 - UTC$ (or whatever succeeds UTC). This is a fundamental requirement for anyone pointing observing systems at objects away from Earth, whether astronomers with telescopes or engineers tracking spacecraft. This information needs to be freely and easily available to all, including the amateur astronomical community. Until now, both amateur astronomers and professional

scientists have relied on this and if the change is implemented, future generations should continue to have equivalent access.

c. In the UK there is also a specific political issue: the proposed re-definition would necessitate primary legislation to change the basis of UK legal time from GMT to the new system derived from UTC, something the British Government has been reluctant to do in the past.

31 August 2011, 14h45; Galvin, James
eList eXpress, USA
Internet networking
Response = 1
My network applications and services depend on the current UTC definition.

31 August 2011, 14h46; Soma, Mitsuru
Natl. Astron. Observatory of Japan, Japan
Astronomy-Astrophysics
Response = 1
We live with the Sun. If no leap seconds will be introduced, the time we use will diverge from the ideal one which is in harmony with the apparent position of the Sun, so in any case we will need to make some adjustment to the time in the future. If there is no rule for the adjustment, there will be serious confusion in the future. When one calculates the times of past and future astronomical phenomena, such as solar eclipses, sunrise, sunset etc., we need the value of TT-UT1 (for precise calculations one also needs UT1-UTC, but for most cases it is not needed). If UTC diverges from UT1, we will always need both of TT-UT1 and UT1-UTC, which complicates such calculations, and I do not like that situation.

31 August 2011, 17h52; Kirby, John
none, USA
Telecommunication
Response = 1
This change could have far reaching consequences that affect public safety and public services. Time changes will affect radio system configuration and end user service management, geographical positioning navigational aids, computer aided dispatch systems, SCADA systems, and event logging and recording systems. In the event of severe solar weather, time changes could render systems such as navigational aids inaccurate or ineffective in helping to direct the delivery of emergency services, gaining and maintaining situational awareness, or coordinating with multiple agencies.

31 August 2011, 14h58; Parker, Terry
KCOM, UK
Telecommunication
Response = 1

31 August 2011, 17h07; Schulthess-Roozen, Marjolein
Ita Wegmanklinik, Switzerland
Medicine
Response = 1

31 August 2011, 20h54; Malone, David
School of Mathematics, Trinity College D, Ireland
Public NTP Server Operator
Response = 1
We have not experienced any difficulties during leap seconds. Legal time in Ireland still seems to depend on GMT and consequently I think there would be a preference here for keeping UTC close to historical definitions of GMT.

31 August 2011, 21h37; Cornec, Jean-Paul
Retired, France
Astronomy-Astrophysics Telecommunication
Response = 2

31 August 2011, 21h47; Drury, Luke
Dublin Institute for Advanced Studies, Ireland
Astronomy-Astrophysics
Response = 2

31 August 2011, 23h34; William, Thompson
NASA Goddard Space Flight Center, USA
Astronomy-Astrophysics
Response = 1

01 September 2011, 09h44; Gelinek, Christian
N/A, Australia
Electronics
Response = 1

01 September 2011, 10h45; Monstein, Christian
ETH Zurich, Switzerland
Astronomy-Astrophysics
Response = 1

01 September 2011, 12h23; Escapa, Alberto
University of Alicante, Spain
Astronomy-Astrophysics Celestial-mechanics
Space-sciences
Response = 1

01 September 2011, 12h55; Gary, Dale
New Jersey Institute of Technology, USA
Astronomy-Astrophysics
Response = 1

01 September 2011, 16h10; Dominique, Marie
Royal Observatory of Belgium, Belgium
Astronomy-Astrophysics
Response = 3
I do not like the idea of having UTC increasingly diverging from UT1. Nevertheless, leap seconds considerably complicate the processing of data that must be accurately time-tagged. Confusion and mistakes are frequent. Although there is no perfect solution, I think that the situation would be simpler if time correction was applied on a deterministic date, and more rarely. I would be in favor of a correction applied, for example, on January 01 00:00 every 10 years. Or even better, apply them on each Feb 29.

01 September 2011, 16h16; Parenti, Timothy
University of Pittsburgh, USA
Student
Response = 1

01 September 2011, 16h18; Gamby, Emmanuel
Belgian Institute for Space Aeronomy, Belgium
computer science
Response = 3
I do not like the idea of having UTC increasingly diverging from UT1, but I think that the offset between both could be bigger than one sec. In addition, leap seconds considerably complicate the time-stamping of data. Although there is no perfect solution, I think that the situation would be simpler if time correction would be applied on a deterministic date: for instance, on Feb 29 every 10 years or so.

01 September 2011, 17h55; Pechmann, Johanna
Ridterapi Novalis, Sverige
Horseback Riding
Response = 1

01 September 2011, 22h19; Allen, Steve
UCO/Lick Observatory, USA
Astronomy-Astrophysics

Response = 3

I appreciate the problems faced by systems which have to handle conflicting requirements under the current implementation of leap seconds. Nevertheless, the current problems with leap seconds are largely one of representation. A better representation can preserve the existing and traditional meaning of UTC as civil time while also alleviating the problems faced by software systems. I have written a detailed description of an alternative to the draft revision of ITU-R Rec. 460. This alternative is truly a compromise. It makes use of an existing, deployed, and routinely-exercised mechanism. It also changes leap seconds into a form which is easily-testable by systems and engineers. The description can be seen here
<http://www.ucolick.org/~sla/leapsecs/right+gps.html>

I urge that this scheme be presented for wide consideration.

02 September 2011, 01h14; Homeyer, Gernot
Dr.med., Germany
Astronomy-Astrophysics

Response = 1

02 September 2011, 03h45; Tschannen, Ruth
Cascadia Society, Canada
Eurythmist

Response = 1

02 September 2011, 13h47; Scott-Stapleton, Graham

British Sundial Society, Britain
Astronomy-Astrophysics

Response = 1

To disconnect time keeping from the earth's rotation will be to render time an entirely theoretical entity. To discontinue leap seconds is, in the long term, as ill-advised as discontinuing leap days.

02 September 2011, 19h53; Fischer, Gwendolyn
Christian Community, Germany
Telecommunication

Response = 1

02 September 2011, 20h46; Stuart, Robin
., USA

Astronomy-Astrophysics

Response = 1

Surely the mandate of UTC is to provide a measure that is closely aligned with the principal driver of civil activity, namely time of daylight hours and the position of the Sun in the sky. While it may be argued that the existence of time zones and artificial lighting make the leap second of relatively little practical importance, at least in the near term, the drift will eventually become unacceptable on time scales that will depend on the particular application. Celestial navigation will likely be amongst the first disciplines to be affected but I suspect that even casual sky watchers will find it profoundly disturbing to know that the time of sunrise on mid-summer's day will vary over time, they cannot reliably specify the date of earliest sunrise from their location and that sundials can no longer be relied upon. As scientists we seek uniform operating principals wherever possible. It may be argued that modern life and time keeping is no longer regulated by the exact position the Sun in the sky. But since few of us sow and reap the same arguments apply to the Gregorian calendar. If we do away with leap seconds then we should also revert to the Julian calendar. Of course astronomers do make use of Julian date which is fine for the conduct of science but I think that few would attempt to inflict it on the public at large just for their own convenience. This is what is effectively what is being done with regard to UTC. What a tragedy years from now when sundials no longer work and our hard won mastery over the clockwork of the universe can no longer be demonstrated and accessible to the common man.

02 September 2011, 23h01; Miguel, Martinez-Falero del Pozo

Other, Spain
Medical Doctor

Response = 1

03 September 2011, 02h04; Mischanko, Edward
None, USA

Time-laboratory

Response = 1

03 September 2011, 18h29; Saltzwedel, Gerhard
Praxis für AllgemeinMedicine, Germany

Medicine

Response = 1

04 September 2011, 04h19; Senturia, Philip
None, USA

Interested Layperson

Response = 1

04 September 2011, 19h26; Neuwirt, Rudolf
Institute for Geometry; TU Graz, Austria
Mathematics and Geometry
Response = 1

05 September 2011, 04h37; Excoffier, Denis
Ecole Normale Supérieure, France
computer science
Response = 3
UTC to be defined by IERS (or equivalent) instead of radio ticks. $\text{abs}(\text{UTC} - \text{UT1})$ to be kept small (like currently) $\text{TI} - \text{TAI}$ is fixed. $\text{UTC} - \text{TI}$ is an integer number of (SI) seconds, 0 at time of transition (2022, see torino/closure.pdf). Use the "right" branch in the zoneinfo database. Rename the "leap second" posterior to 2022 into another name ("intercalary second" would not be my preferred choice) Now a question: if transition is to occur on 2022-01-01, is the last possible leap second: 2021-12-31Z23:59:60 or 2021-12-30Z23:59:60 ?

05 September 2011, 08h04; Kozisek, Frantisek
National Institute of Public Health, Czech Republic
Environmental Health
Response = 1

05 September 2011, 09h54; VOLK, Gerhard
LVermGeo RP, Koblenz, Germany
Geodesy
Response = 1

05 September 2011, 12h46; Bos, Mara
none, Netherlands
religion
Response = 1

05 September 2011, 22h34; Schmidt, Thomas
Waldorf-School, Germany
Astronomy-Astrophysics Teaching
Response = 1

06 September 2011, 10h38; Arias, Elisa Felicitas
Bureau International des Poids et Mesure, --
Astronomy-Astrophysics Celestial-mechanics time metrology
Response = 2
UTC was defined in 1972 when UT1 which had limited ways of dissemination. Celestial navigation and astronomical observations were the most concerned applications. The methods of dissemination of time, of information, the communications in the seventies were not significantly affected by intentional unpredictable discontinuities of UTC, and

this remained the case until the advent of GNSS and the development of the various communication networks. Different possible ways of accessing UT1 appeared, and scientists were able to improve the uncertainty of its prediction. Real-time predictions are calculated, and their dissemination through different networks is possible today; even we can think of dissemination via satellite navigation messages. Who is today using UTC because it represents a "unique" access to UT1? Who is using dUT1 as regularly published by the IERS? Celestial navigation is no more the case; astronomers can have rapid access to UT1 by its predictions. The leap seconds represent a nuisance for the modern applications requiring time synchronization. For avoiding the leap second, internal timescales are constructed (case of GNSS), offset of several integral seconds. Inconsistencies within a system using different references (with and without leap seconds) in different components have an impact in security. UTC without leap seconds will increase its offset with respect to UT1, not significantly affecting human activities, but it will positively impact and enhance modern applications. The IERS will increase visibility, disseminating real-time UT1.

07 September 2011, 04h01; Erdi, Jacobi
N/A, Canada
complementary Medicine
Response = 1

07 September 2011, 09h51; Coll, Guillermo
Hydrographic Office, Spain
Geodesy Nautical Chart production
Response = 1
The Official Position of the Spanish Navy Hydrographic Office is to maintain the current definition of UTC which includes leap second.

07 September 2011, 10h44; Husemann, Armin
Eugen - Kolisko - Akademie, Deutschland
Medicine
Response = 1
The system of Human Physiology is coordinated by several "Biorhythms" which depended all on the Earth rotation. Earth rotation, transformed in Sun - Light - intensity, is transferred via the eye and Melatonin - Response of the Epiphysis in the whole System of human biorhythms. So the connection of Biorhythms in man with Earth rotation is a result of evolution and in no concern arbitrary.

07 September 2011, 10h58; Kühl, Johannes
Science Section, Goetheanum, Switzerland
Physics

Response = 1

The system of human Physiology is coordinated by several "Biorhythms" which depended all on the Earth rotation. Earth rotation, transformed in Sun - Light - intensity, is transferred via the eye and Melatonin - Response of the Epiphysis in the whole System of human biorhythms. So the connection of Biorhythms in man with Earth rotation is a result of evolution and in no concern arbitrary.

07 September 2011, 20h36; Barlier, Francois
Observatoire de la Côte d'azur, France
Geodesy

Response = 2

Today, it is extremely easy to forecast DUT1 (Internet and space navigation and telecommunication) . On the contrary, it will be extremely useful and more simple to have a uniform time for dynamical studies and ephemerides in space geodesy and space mechanics. I fully approved the position on the future status of UTC and UT1 adopted by the Bureau des longitudes in Paris in May 2007.

08 September 2011, 10h08; Bonnefond, Pascal
OCA-GéoAzur, France
Celestial-mechanics Geodesy Space-sciences
Response = 2

08 September 2011, 15h49; Achkar, Joseph
Observatoire de Paris, France
Time-laboratory

Response = 2

- As a scientist involved in the Time metrology, I prefer that UTC be redefined as a uniformly increasing atomic timescale without leap seconds and constantly offset from TAI.

- The UTC system with leap seconds was essentially introduced to give access to UT1 within the necessary approximation for astronomical navigation. This astronomical navigation has almost completely disappeared. For scientific applications, the use of an accuracy uniform timescale (atomic timescale) is required.

- It is sometimes said that the present form of UTC does not present any inconvenience and that users of continuous time are able to cope with leap seconds without encountering major problems. The low frequency of occurrence of leap seconds in the last few years might support this opinion. But the general behaviour is the increase of this frequency.

Due to decadal fluctuations of the rotation of the Earth, this frequency may reach two leap seconds per year in a few years' time. This will make the probability of omitting or of making errors non negligible.

09 September 2011, 15h07; Grob, Herbert
Freie Waldorfschule, Germany
Education

Response = 1

12 September 2011, 18h13; Gambis, Daniel
Observatoire de Paris, France
Astronomy-Astrophysics Geodesy

Response = 1

The present system is a good compromise between Earth rotation and atomic time scale. Leap seconds introductions could be a nuisance for some restricted scientific communities but the system works well. Arguments to change are not sufficient compared to the advantages of a coordinated UTC time scale linked to the earth rotation. Few problems were reported after the 2009 leap second introduction. The issue is not only scientific, all scientists are able to adapt to any definition of UTC. A majority of UTC users are not aware of the difference between UT1 and UTC. If the new definition is adopted, they should. When the difference DUT1 increases, 30s, 10 min, 1 hour, a lot of problems will arise. There is too much software with the assumption of UTC being coordinated with the earth rotation. The costs of change would be important. Unforeseen problems could happen. Why having another timescale in addition to UT (GPS) parallel to TAI without leap seconds? The idea of suppressing TAI and to entrust the task of deriving a new continuous UTC by BIPM does not solve anything unless UTC be operational. The possible adoption of a continuous time UTC time scale with the introduction of leap hours putting off to future generations is much worse than the present system. The ITU does not appear to be the correct international body to change the definition of the worldwide system of civil time. There is no strong justification to adopt a time scale no longer related to the rotation of the Earth. In any case, more time should be needed to evaluate the consequences of such a change.

12 September 2011, 18h20; Moshuber, Jöran
private, Austria
Medicine

Response = 1

08 September 2011, 22h45; McBurnett, Neal
Boulder Community Network, USA

Systems software

Response = 1

The worst approach is to redefine UTC so that the basic meaning changes (i.e. no longer linked to rotation of the earth) without changing the name "UTC". This would fundamentally confuse the name, require endless clarifications for the rest of time, and be a huge waste. For people that want a timescale without leap seconds, let them simply use TAI, or if really necessary some variation on TAI like GPS time. If the goal is to redefine a legal notion of time, this should be undertaken by a different body than ITU-R, which has no remit to disassociate clock time from solar time. E.g. the United Nations, or individual countries.

15 September 2011, 11h28; Bizouard, Christian
Observatoire de Paris, FRANCE

Astronomy-Astrophysics Celestial-mechanics Geodesy Geophysics Space-sciences

Response = 1

There is no practical requirement for changing the definition of UTC. If for some practical issues, continuous time scale is required, one has already at hand UT GPS or TAI. Moreover this definition appears to be recent (the 1970's) in light of the long astronomical tradition going back to Sumerian civilisation. The current UTC concept is the fruit of a long scientific ripening, combining technological progress (atomic clock) and the natural, biological rhythm, founded on the succession of days and nights. Changing a definition too often has the same effect as to permanently produce new laws without fundamental reason: few people will note it, and this will diminish its force.

15 September 2011, 14h48; Lefebvre, Pierre,
None, France

Astronomy-Astrophysics (not professionally)

Response = 1

The proposal to remove leap seconds from UTC appears contradictory with the definition of UTC: if UTC is not synchronized with Earth's rotation (within a 1 second accuracy), why maintain it ? What will be the meaning and interest of UTC in a few decades, when it will be 34 seconds behind TAI but, say, 10 seconds ahead of UT1 ? Should the proposal be adopted, I would recommend keeping only 2 time-scales:
- TAI (as base for civil time around the world), introducing a one-time 34 seconds shift in all

clocks worldwide

- UT1 (for astronomical applications)

16 September 2011, 00h54; Glaser, Thorsten,
MirSolutions, Germany

Telecommunication computing

Response = 3

I have a strong preference for the current system with leap seconds and keeping UTC an integral offset to TAI aligned with the real earth rotation. Computing systems have coped for decades; changing things now will introduce more new breakage than can ever be saved by changing systems. Astronomically, it's the only thing that makes any sense, too.

16 September 2011, 21h19; Tobin, William, (re-
tired from University of Canterbury), France

Astronomy-Astrophysics

Response = 1

If I was setting up UTC again, I would decouple it from the Earth's rotation, because it has the same flaw as the French revolutionary calendar, i.e. you cannot tell how many seconds there will be from now to the end of the decade, just as the Revolutionary Calendar could not tell you how many dates until some date several millennia hence. But as presently defined, UTC is a standard, and so should not be changed lightly. The consequences on many pieces of hardware are far from clear...for example where UTC and UTC1 are hard-wired/programmed under the assumption that there can never be more than 1 second between them. Further UTC is specifically referred to in many countries' legislation. If there is to be a redefinition, it *must certainly* be given a new name and not called UTC. In fact, what I'd say is that we should just jump 34 seconds and start using TAI for civil timekeeping (but I believe there is some flaw in this because TAI is not known in real time, so something similar to TAI). Finally, of course, with the spread of computer networks we are moving to a point where it would be appropriate to abandon time zones and have everyone use a common time wherever they are on the planet. Already this is what some of the banks do when I pay on-line with my credit card. Any change to UTC should be coordinated with a change to a common time everywhere on the planet.

18 September 2011, 05h57; Gerstman, Larry, Long Beach Schools, USA

Astronomy-Astrophysics

Response = 1

Sorry for my late response, but I only just found your questionnaire. I feel that the current system of defining UTC and adding leap seconds when needed is ideal and accurate. Please do NOT abolish the current system which works well and is vital to astronomical calculations throughout the world. No other system is even adequate. A proverb we live by, "If it ain't broke, then don't fix it."

18 September 2011, 13h57; Citro, Gary, Elmont

U.F.S.D., USA

Astronomy-Astrophysics

Response = 1

18 September 2011, 14h29; Kozma, Michael, CUNY, USA

Astronomy-Astrophysics Telecommunication

Response = 1

The time scale approach was tried in the past using atomic oscillation frequencies. It quickly lost favor since it was impossible to remember the constants. The current definition is more than adequate.

23 September 2011, 17h19; Coy, Robert, -, UK

Telecommunication Transportation

Response = 1

25 September 2011, 14h35; Dawson, Hylton,

British Sundial Society, England

Celestial-mechanics

Response = 1

Leap seconds are as crucial for synchronising clock time to the daily rotation of the earth as leap days are for synchronising the calendar to the seasons. Please retain the current definition of UTC and the leap second

29 September 2011, 20h47; Novosielski, Gary,

Fort Lee (NJ) Board of Education, USA

Education

Response = 1

I believe that the current definition, which is useful to all persons as long as they do not require access to earth rotation time more precisely than the nearest second, will be useful to many more people than a definition that is permitted to drift to an undefined degree. Those who require UT1 precision closer than one second presumably already have access to such a standard, but changing the defini-

tion would require many more people to arrange access to one. UTC is currently far more widely available than UT1. It can be determined to sub-second precision over any internet and radio sources nearly anywhere. Changing its precision from sub-second to indeterminately sloppy is, in my view, unwarranted.

06 October 2011, 11h55; Maltin., Michael, Navigation., UK.

surveying.

Response = 1

The present system should remain. It is best suited for the purposes of Navigation.

11 October 2011, 12h45; Vultaggio, Mario, Italian Institute of Navigation, Italy

Astronomy-Astrophysics Celestial-mechanics

Response = 1

We focus our attention on the consequences of possible changes in the definition of UTC from the navigation point of view. Currently UTC timescale is constrained to Earth rotation, by the introduction of leap seconds such that the difference between UTC and UT1 is maintained within 1 second. GPS is currently the most common navigation system and its timescale is related to UTC; GPS time and UTC differ for an integer number of seconds (the leap seconds accumulated since the GPS turn on) and the difference between GPS and UTC(USNO) (the UTC maintained by US Naval Observatory) is continuously sent to users. A change in the UTC definition, omitting the leap seconds correction, would not affect directly the navigation performance with GPS; this change would only affect the time reference of navigation, not more linked to GMT (whose UTC is an approximation).

The main problem related to the proposed change to UTC definition is that the output time from GPS is not related to legal timescale with consequences for all the application based on GPS time dissemination. Similar problems are present also in the other satellite navigation systems as GLONASS and Galileo.

For these reasons the change to UTC is not recommended.

07 October 2011, 22h26; Lefebvre, Christine,
None, France
Individual
Response = 1
Personally, I am satisfied with the current situation.
I would be very disappointed to see the Earth's
rotation totally absent from the usual time defini-
tion, after having been used by humanity for thou-

sands of years to measure time. If it is decided to
redefine UTC as a constant offset from TAI, it
should not be called UTC anymore:
- it will not be UT because not related to the Earth's
rotation
- it will not be "Coordinated", because there will
not be any coordination anymore between an atom-
ic time and the Earth's rotation.

Possible Changes to Co-ordinated Universal Time (UTC)—RIN's Response, 30 September 2011

1. UTC is a man-made, atomic timescale that is constrained to approximate the Earth's rotation to within one second by the inclusion of periodic adjustments known as "leap seconds."
2. The technical reason for the proposed change, eliminating these adjustments, appear esoteric and the benefits extremely limited—bearing in mind that a main means of dissemination of time is GPS.
3. UTC (approximating to GMT) is the legal timescale in many countries and so a change of definition is likely to require
 - a. a legal impact assessment to understand which laws need to be modified, and
 - b. a technical impact assessment to understand how the change will affect existing systems.
4. In the UK UTC is disseminated using many different mechanisms including: satellite navigation, (*e.g.*, GPS System Time automatically corrected to UTC), low frequency radio (*e.g.*, 60 kHz MSF), and the Internet (NTP servers), hence there is a need for a technical assessment of the proposed change.
5. We note the role of timing in distributed systems (including transport, finance, communications, energy), many of which are safety or mission critical and impact on the critical national infrastructure.
6. We note the existing GPS vulnerability concerns and the almost impossible task of understanding fully the impact of a loss of GPS-based timing because many users (*e.g.*, defence, transport, finance communications, energy) are simply unaware that they are using GPS timing in their systems.
7. We note that a UTC impact assessment will be far more complex given the different dissemination techniques.
8. The technical impact is likely to require a lot of
 - a. significant public relations activity (*e.g.*, similar to that of the "Millennium Bug")
 - b. time, and
 - c. systems engineering activity.
9. One top of this there may be a need to upgrade or replace existing subsystems or components. The cost could be very significant for a single country, let alone globally, at a time when many national economies are still in recession or at best fragile.
10. In summary making this change to UTC has a rather esoteric rationale, limited benefits and potentially significant costs. Many governments will require a formal business case comparing this change scenario with a 'do-nothing' scenario and the change scenario is likely to fail at this point.
11. For these reasons the imperative for change is not compelling to the Royal Institute of Navigation.