

A Critical Analysis of the Council of Europe Recommendations on e-voting

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- (CoE)

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- (CoE)
- 46 member states

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- (CoE)
- 46 member states
- Founded 1949

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- (CoE)
- 46 member states
- Founded 1949
- Not directly connected with EU

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- (CoE)
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- Not directly connected with EU
- Open to countries that:

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- (CoE)
- 46 member states
- Founded 1949
- Not directly connected with EU
- Open to countries that:
 - follow principle of rule of law

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- (CoE)
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- Founded 1949
- Not directly connected with EU
- Open to countries that:
 - follow principle of rule of law
 - uphold fundamental human rights

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 - uphold fundamental human rights
 - provide freedom for citizens

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- (CoE)
- 46 member states
- Founded 1949
- Not directly connected with EU
- Open to countries that:
 - follow principle of rule of law
 - uphold fundamental human rights
 - provide freedom for citizens
- Statute - “The aim of the Council of Europe is to achieve a greater unity between its members for the purpose of safeguarding and realising the **ideals and principles** which are their **common heritage** and facilitating their economic and social progress.”

CoE recommendations

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- CoE created committee to develop standards doc.

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- CoE created committee to develop standards doc.
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- Terms of reference

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- CoE created committee to develop standards doc.
- Multidisciplinary Ad Hoc Group of Specialists on legal, operational and technical standards for e-enabled voting
- Terms of reference
 - “develop an intergovernmentally agreed set of standards for e-enabled voting, that reflect Council of Europe member states differing circumstances, and can be expected to be followed by the **ICT industry**.”

Use in Europe

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- Netherlands - 1982

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- Netherlands - 1982
- Belgium - 1991

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- Netherlands - 1982
- Belgium - 1991
- UK, Italy, Spain, Ireland - 2000's

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- Netherlands - 1982
- Belgium - 1991
- UK, Italy, Spain, Ireland - 2000's
- experimental, or limited scope

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- Netherlands - 1982
- Belgium - 1991
- UK, Italy, Spain, Ireland - 2000's
- experimental, or limited scope
- UK, Ireland pulling back

Contrasting approaches

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- US standards effort is older

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- US standards effort is older
 - CoE doc. is now two years old

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 - First FEC standards were produced in 1990

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- US standards effort is older
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 - US standards nominally voluntary, legally required in many states

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- Size

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 - US standards – 2 volumes = 22 documents = almost 300 pages

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 - CoE doc 21 pages (explanatory memorandum 67 pages)

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- EAC doc. has much finer granularity

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- EAC doc. has much finer granularity
 - eg CoE doc. passing reference to testing (standard 111)

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 - US standards – 2 volumes = 22 documents = almost 300 pages
 - CoE doc 21 pages (explanatory memorandum 67 pages)
- EAC doc. has much finer granularity
 - eg CoE doc. passing reference to testing (standard 111)
 - EAC standards list and elaborate on 5 categories of testing

Standards, analysis, requirements capture

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- Analysis - maximising problem domain understanding

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- General analysis makes specific analysis easier

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- Analysis - maximising problem domain understanding
- Interaction w/customer, potential users
- General analysis makes specific analysis easier
- Standards doc in general problem domain
 - useful in requirements capture for a specific system

Standards and the public

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- Standards could increase trust

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- Standards could increase trust
 - Associations with CoE alone could increase trust (rightly or wrongly)

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 - If written to address specific concerns ...

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 - Associations with CoE alone could increase trust (rightly or wrongly)
 - If written to address specific concerns ...
 - Standards used to reject inadequate systems

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- Govs need expert advise

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- Standards are reusable expertise

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- Standards are reusable expertise
- Should help procure better systems

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- Improve quality of product

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- Improve quality of product
- Maintain, identify customer base

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- Maintain, identify customer base
- Aid design decisions - by making priorities clear

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- Maintain, identify customer base
- Aid design decisions - by making priorities clear
- Feedback to improve standards

Original Standards Themselves

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- First glance
 - Clearly written by committee

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- First glance
 - Clearly written by committee
 - Vague and ill-defined, or overly technical, or nonsensical

Soft/eng view of original standards

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- Consistency

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- Consistency
- Completeness, scope

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- Over specification

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- Redundancy, repetition

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- Completeness, scope
- Over specification
- Underspecification
- Redundancy, repetition
- Maintainability, extensibility

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- Categorized according to five rights

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- Categorized according to five rights
- Universal, equal, free, secret, direct suffrage

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- Original began like this, but didn't follow it through
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 - “the ballots cast by the voters directly determine the person(s) elected”

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- Direct suffrage
 - “the ballots cast by the voters directly determine the person(s) elected”
 - any measure used to protect the votes from tampering

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 - any measure to ensure that the results are tabulated correctly.

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 - any measure to ensure that the results are tabulated correctly.
- Organising reqs like this helps

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- Organising reqs like this helps
 - prevent inconsistency and redundancy

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- Organising reqs like this helps
 - prevent inconsistency and redundancy
 - maximise cover - prevent underspecification

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 - any measure used to protect the votes from tampering
 - any measure to ensure that the results are tabulated correctly.
- Organising reqs like this helps
 - prevent inconsistency and redundancy
 - maximise cover - prevent underspecification
 - easier to understand and use

New structured reqs

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- About 80

New structured reqs

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- About 80
- Most needed rewording

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- About 80
- Most needed rewording
- Many covered more than one idea
 - Divided with letters (a, b, ...)

New structured reqs

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- About 80
- Most needed rewording
- Many covered more than one idea
 - Divided with letters (a, b, ...)
- Many could be grouped together

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- About 80
- Most needed rewording
- Many covered more than one idea
 - Divided with letters (a, b, ...)
- Many could be grouped together
- 15 left out
 - Irrelevant, inadvisable, undecipherable, unjustifiable

New structured reqs

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- About 80
- Most needed rewording
- Many covered more than one idea
 - Divided with letters (a, b, ...)
- Many could be grouped together
- 15 left out
 - Irrelevant, inadvisable, undecipherable, unjustifiable
- Phrase “competent electoral authorities”

Requirements added

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- 19 (3d)
 - There shall be a bug-tracking system.

Requirements added

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- 19 (3d)
 - There shall be a bug-tracking system.
- 20 (4)
 - Security arrangements shall ensure that, for the duration of operation, each component is the version tested and approved for use.

Requirements rephrased

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- (original)
 - 76. Where incidents that could threaten the integrity of the system occur, those responsible for operating the equipment shall immediately inform the *competent electoral authorities*, who will take the necessary steps to mitigate the effects of the incident. The **level of incident** which shall be reported shall be specified in advance by the electoral authorities.

Requirements rephrased

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- (original)
 - 76. Where incidents that could threaten the integrity of the system occur, those responsible for operating the equipment shall immediately inform the *competent electoral authorities*, who will take the necessary steps to mitigate the effects of the incident. The **level of incident** which shall be reported shall be specified in advance by the electoral authorities.
- (our revision)
 - 20 (5). Incident levels shall be defined and appropriate responses identified.

Requirements rephrased

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- (original)
 - 74b. Any substantial changes to key equipment shall be **notified**.

Requirements rephrased

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- (original)
 - 74b. Any substantial changes to key equipment shall be **notified**.
- (our revision)
 - 20 (6f). Any changes to key equipment shall be notified to the authorities identified in the control procedure.

Requirements merged

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- (original)

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- (original)
 - 25. Before any e-voting system is introduced, and at appropriate intervals thereafter, and in particular after any changes are made to the system, an independent body, appointed by the *electoral authorities*, shall verify that the e-voting system is **working correctly** and that all the necessary security measures have been taken.

Requirements merged

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- (original)
 - 25. Before any e-voting system is introduced, and at appropriate intervals thereafter, and in particular after any changes are made to the system, an independent body, appointed by the *electoral authorities*, shall verify that the e-voting system is **working correctly** and that all the necessary security measures have been taken.
 - 31. Before any e-election or e-referendum takes place, the *competent electoral authority* shall satisfy itself that the e-voting system is **genuine and operates correctly**.

Requirements merged

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Conclusion

- (original)
 - 25. Before any e-voting system is introduced, and at appropriate intervals thereafter, and in particular after any changes are made to the system, an independent body, appointed by the *electoral authorities*, shall verify that the e-voting system is **working correctly** and that all the necessary security measures have been taken.
 - 31. Before any e-election or e-referendum takes place, the *competent electoral authority* shall satisfy itself that the e-voting system is **genuine and operates correctly**.
 - 73. Before each election or referendum, the equipment shall be checked and approved in accordance with a protocol drawn up by the competent electoral authorities. The equipment shall be checked to ensure that it **complies with technical specifications**. The findings shall be submitted to the *competent electoral authorities*.

Requirements merged

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- (our revision)
 - 19 (6). The certification authority shall develop a test plan which covers testing to be carried out: before the system is introduced, at regular intervals, and triggered by specific events (for example software updates, upcoming elections) as well as the timing of such tests.

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- (original)

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- (original)
 - 72a. Those responsible for the equipment shall use special procedures to ensure that during the polling period the voting equipment and its use satisfy requirements.

Requirements merged

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- (original)
 - 72a. Those responsible for the equipment shall use special procedures to ensure that during the polling period the voting equipment and its use satisfy requirements.
 - 79a. The e-voting system shall perform regular checks to ensure that its components operate in accordance with its technical specifications.

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- (original)
 - 72a. Those responsible for the equipment shall use special procedures to ensure that during the polling period the voting equipment and its use satisfy requirements.
 - 79a. The e-voting system shall perform regular checks to ensure that its components operate in accordance with its technical specifications.
- (our revision)
 - 20 (3). The system shall be monitored during operation for compliance with requirements.

Requirements contradicted

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- (original)
 - 84. The e-voting system shall maintain reliable synchronised **time sources**. The accuracy of the time source shall be sufficient to maintain time marks for audit trails and observations data, as well as for maintaining the time limits for registration, nomination, voting, or counting.

Requirements contradicted

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- (original)
 - 84. The e-voting system shall maintain reliable synchronised **time sources**. The accuracy of the time source shall be sufficient to maintain time marks for audit trails and observations data, as well as for maintaining the time limits for registration, nomination, voting, or counting.
- (our revision)
 - 19(2). Components' access to time sources shall be strictly limited on a "need to know" basis.

Requirements contradicted

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- (original)

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- (original)
 - 24. The components of the e-voting system shall be disclosed, at least to the competent electoral authorities, as required for verification and certification purposes.

Requirements contradicted

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- (original)
 - 24. The components of the e-voting system shall be disclosed, at least to the competent electoral authorities, as required for verification and certification purposes.
 - 69a. The competent electoral authorities shall publish an official list of the software used in an e-election or e-referendum. Member states **may exclude from this list data protection software for security reasons**. At the very least it shall indicate the software used, the versions, its date of installation and a brief description.

Requirements contradicted

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- (original)
 - 24. The components of the e-voting system shall be disclosed, at least to the competent electoral authorities, as required for verification and certification purposes.
 - 69a. The competent electoral authorities shall publish an official list of the software used in an e-election or e-referendum. Member states **may exclude from this list data protection software for security reasons**. At the very least it shall indicate the software used, the versions, its date of installation and a brief description.
 - 105. Disclosure of the audit information to unauthorised persons shall be prevented.

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- (original)
 - 24. The components of the e-voting system shall be disclosed, at least to the competent electoral authorities, as required for verification and certification purposes.
 - 69a. The competent electoral authorities shall publish an official list of the software used in an e-election or e-referendum. Member states **may exclude from this list data protection software for security reasons**. At the very least it shall indicate the software used, the versions, its date of installation and a brief description.
 - 105. Disclosure of the audit information to unauthorised persons shall be prevented.
 - 110. Member states shall take adequate steps to ensure that the confidentiality of any information obtained by any person while carrying out auditing functions is guaranteed.

Requirements contradicted

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- (our revision)
 - 19(7). All components of the system and software used, and all audit information, shall be publicly disclosed. Exceptions to this rule shall only be allowed where it can be shown that such a disclosure would either: endanger the security of the system or, genuinely endanger the intellectual property of the vendor. In either of these cases, full disclosure shall be made to the certification authority for verification and certification purposes.

Requirements left out

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- 39. There shall be a voters register which is regularly updated. The voter shall be able to check, as a minimum, the information which is held about him/her on the register, and request corrections. (covered by other CoE documents)

Requirements left out

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- 39. There shall be a voters register which is regularly updated. The voter shall be able to check, as a minimum, the information which is held about him/her on the register, and request corrections. (covered by other CoE documents)
- 36. Domestic legal provisions governing an e-election or e-referendum shall provide for clear timetables concerning all stages of the election or referendum, both before and after the election or referendum. (outside scope)

Requirements left out

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- 10. The way in which voters are guided through the e-voting process shall be such as to prevent their voting precipitately or without reflection.

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- 10. The way in which voters are guided through the e-voting process shall be such as to prevent their voting precipitately or without reflection.
- 72b. The backup services shall be regularly supplied with monitoring protocols.

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- After writing, developed list of terms (in an effort to follow our own advice :))

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- After writing, developed list of terms (in an effort to follow our own advice :))
- Uncovered inconsistent use of terminology in our own req.s

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- After writing, developed list of terms (in an effort to follow our own advice :))
- Uncovered inconsistent use of terminology in our own req.s
- Small example of the value of this kind of analysis

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- CoE standards flawed, but have potential

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- CoE standards flawed, but have potential
- Terms of reference

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- CoE standards flawed, but have potential
- Terms of reference
 - “develop an intergovernmentally agreed set of standards for e-enabled voting, that reflect Council of Europe member states differing circumstances, and **can be expected to be followed by the ICT industry.**”

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- CoE standards flawed, but have potential
- Terms of reference
 - “develop an intergovernmentally agreed set of standards for e-enabled voting, that reflect Council of Europe member states differing circumstances, and **can be expected to be followed by the ICT industry.**”
- Fails second point

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- CoE standards flawed, but have potential
- Terms of reference
 - “develop an intergovernmentally agreed set of standards for e-enabled voting, that reflect Council of Europe member states differing circumstances, and **can be expected to be followed by the ICT industry.**”
- Fails second point
- Examples of inconsistency, incompleteness, over- and under-specification, redundancy and repetition

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- CoE standards flawed, but have potential
- Terms of reference
 - “develop an intergovernmentally agreed set of standards for e-enabled voting, that reflect Council of Europe member states differing circumstances, and **can be expected to be followed by the ICT industry.**”
- Fails second point
- Examples of inconsistency, incompleteness, over- and under-specification, redundancy and repetition
- Potentially bad systems certified and good systems failed

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- Computer systems, need computer experts advise

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- Computer systems, need computer experts advise
- Recommend:

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- Computer systems, need computer experts advise
- Recommend:
 - Take advantage of expertise

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- Computer systems, need computer experts advise
- Recommend:
 - Take advantage of expertise
 - Develop broadly applicable doc.,

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- Computer systems, need computer experts advise
- Recommend:
 - Take advantage of expertise
 - Develop broadly applicable doc.,
 - Useful to Governments, vendors, citizens

Questions?

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- Recommendations -
[http://www.coe.int/T/e/integrated_projects/democracy/02 Activities/02 e-voting/](http://www.coe.int/T/e/integrated_projects/democracy/02_Activities/02_e-voting/)
- Our full redrafted version is in the paper
http://www.usenix.org/events/evt06/tech/full_papers/mcgaley/mcgaley_html
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