



ProtoTrust: An Environment for Improved Trust Management in Internet Auctions

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ProtoTrust: Problem



- Only the most simple reputation systems are used (comments counting)
- Possibility of cheating by "reputation boosting"
- No distinction between different types of non-positive comment
- Reading all comments is time-consuming
- "Comment Wars" which do not help with making the right decision
- Lack of decision support tools for Internet auctions

The TM system should increase the safety and comfort of the user by providing additional information not available on auction sites today.

ProtoTrust: Solution



Extension for web browser (Firefox).

- Automatic crawling parts of the auction site (with category awareness)
- Possibility of choosing algorithm type and decision Rules
- Graphical presentation of computed Results
- Possibility of tune the parameters to special purpose

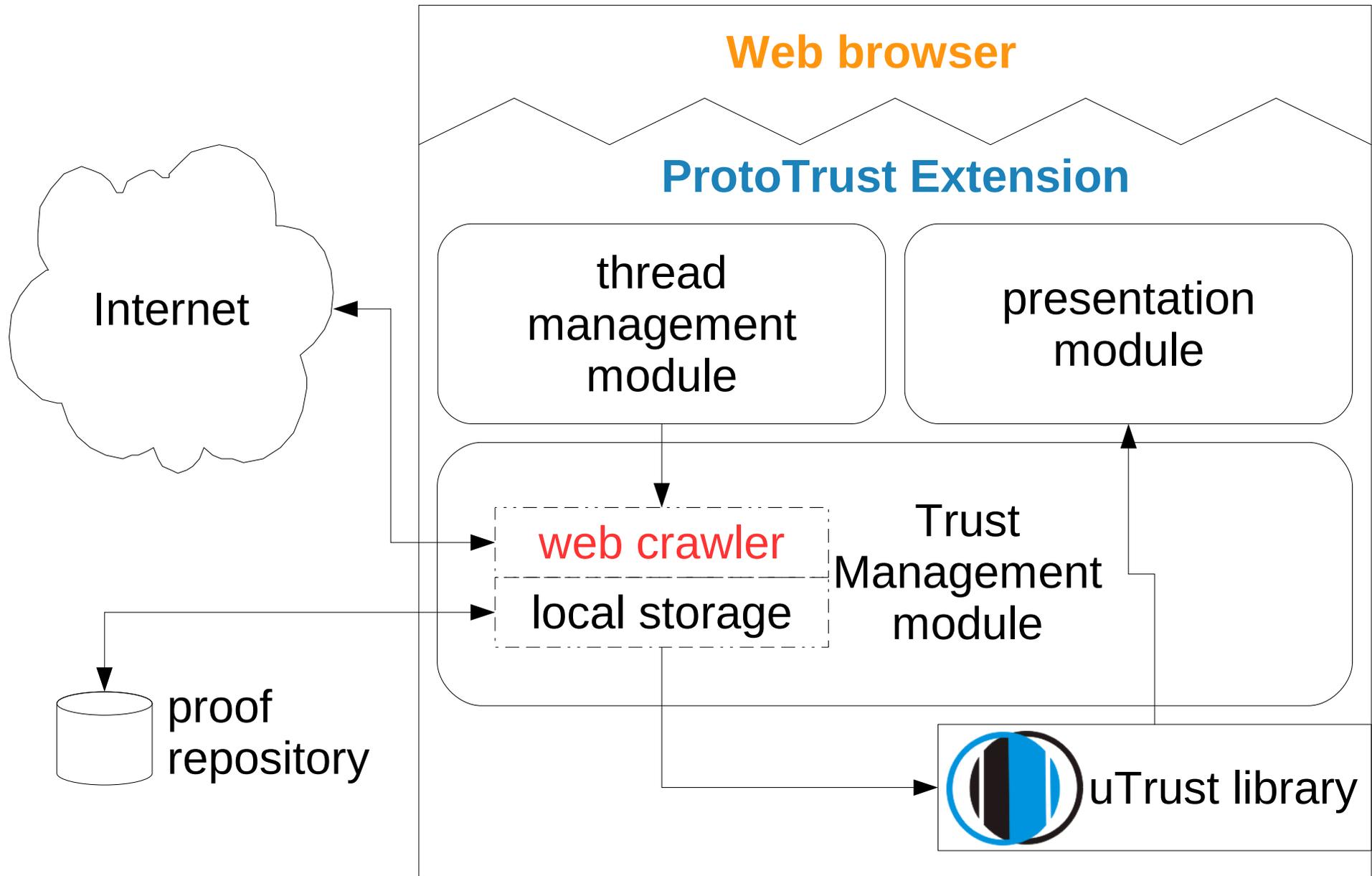
ProtoTrust: Solution



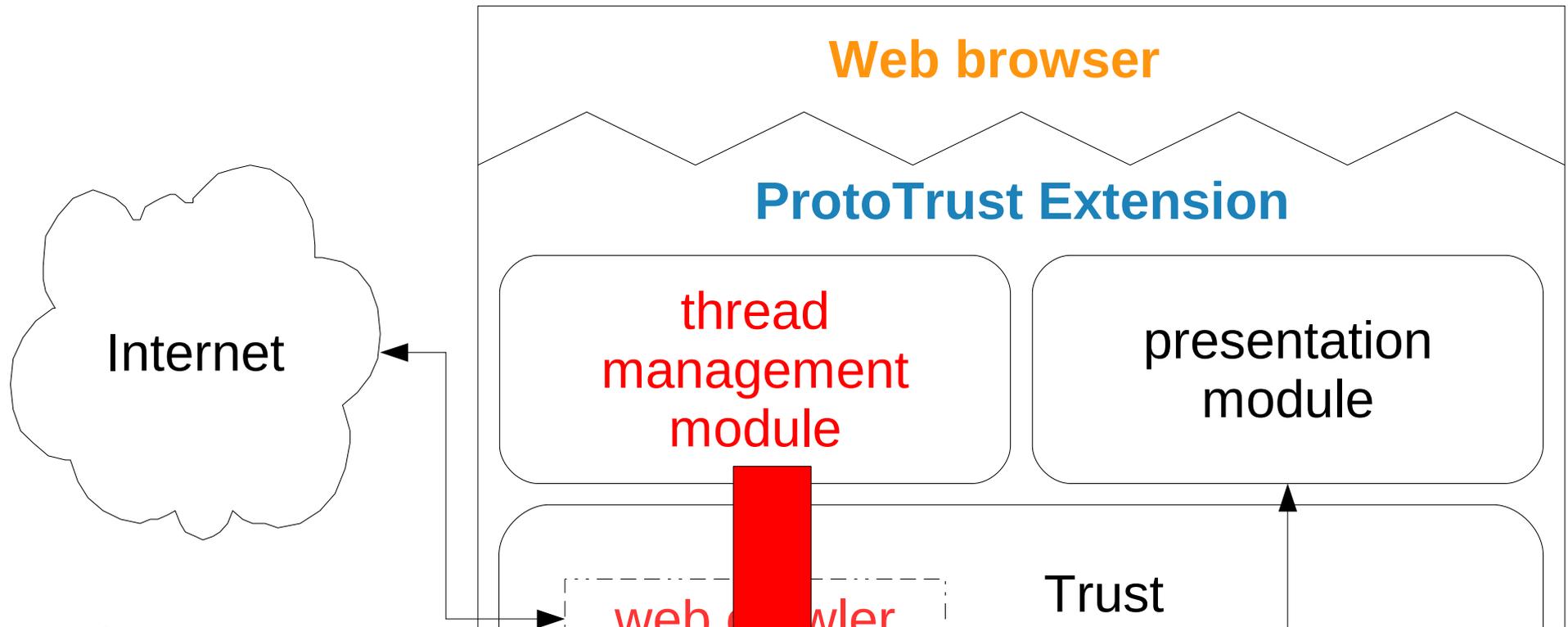
Integration with web browser? Why?

- Firefox add-on's mechanism to easy install and update
- Platform independent
- Easy to set the starting point (item page). No need to copy and paste any data from auction site.
- Possibility to access more information after login (future).

ProtoTrust: Architecture



ProtoTrust: Architecture

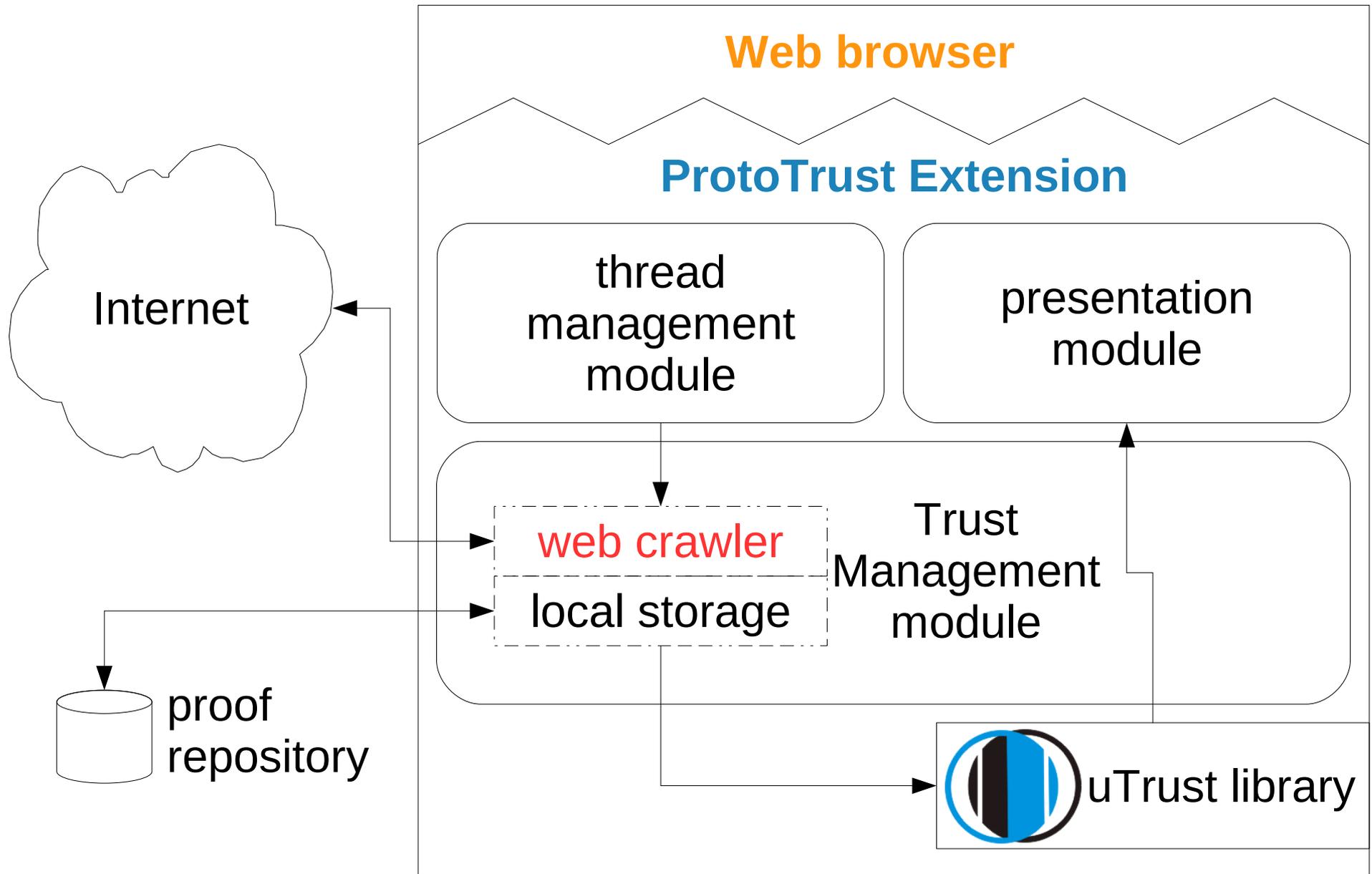


Thread management module

synchronizes all crawling and presentation threads with the web browser main thread.

controls network load and the memory load of the system.

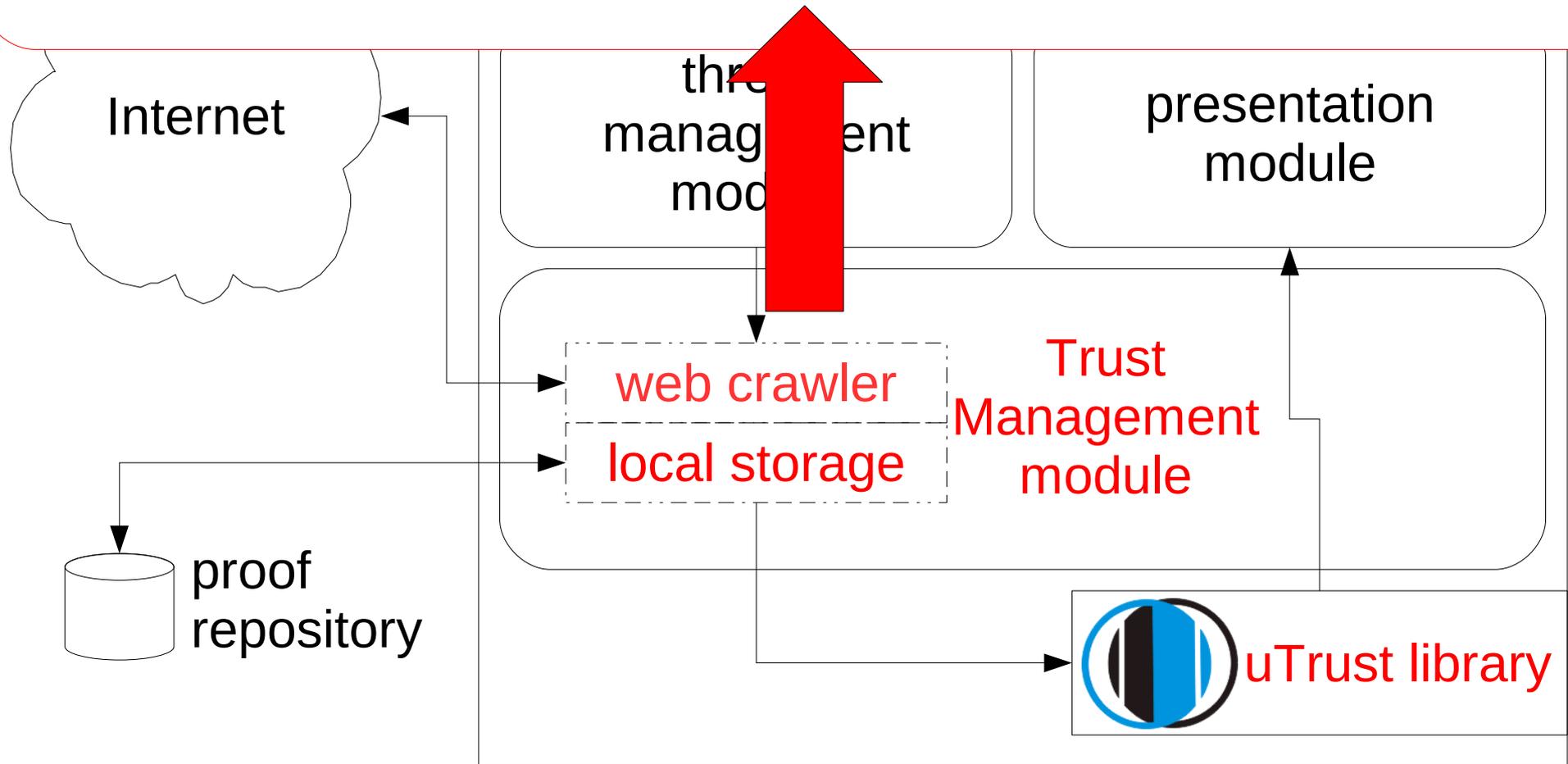
ProtoTrust: Architecture



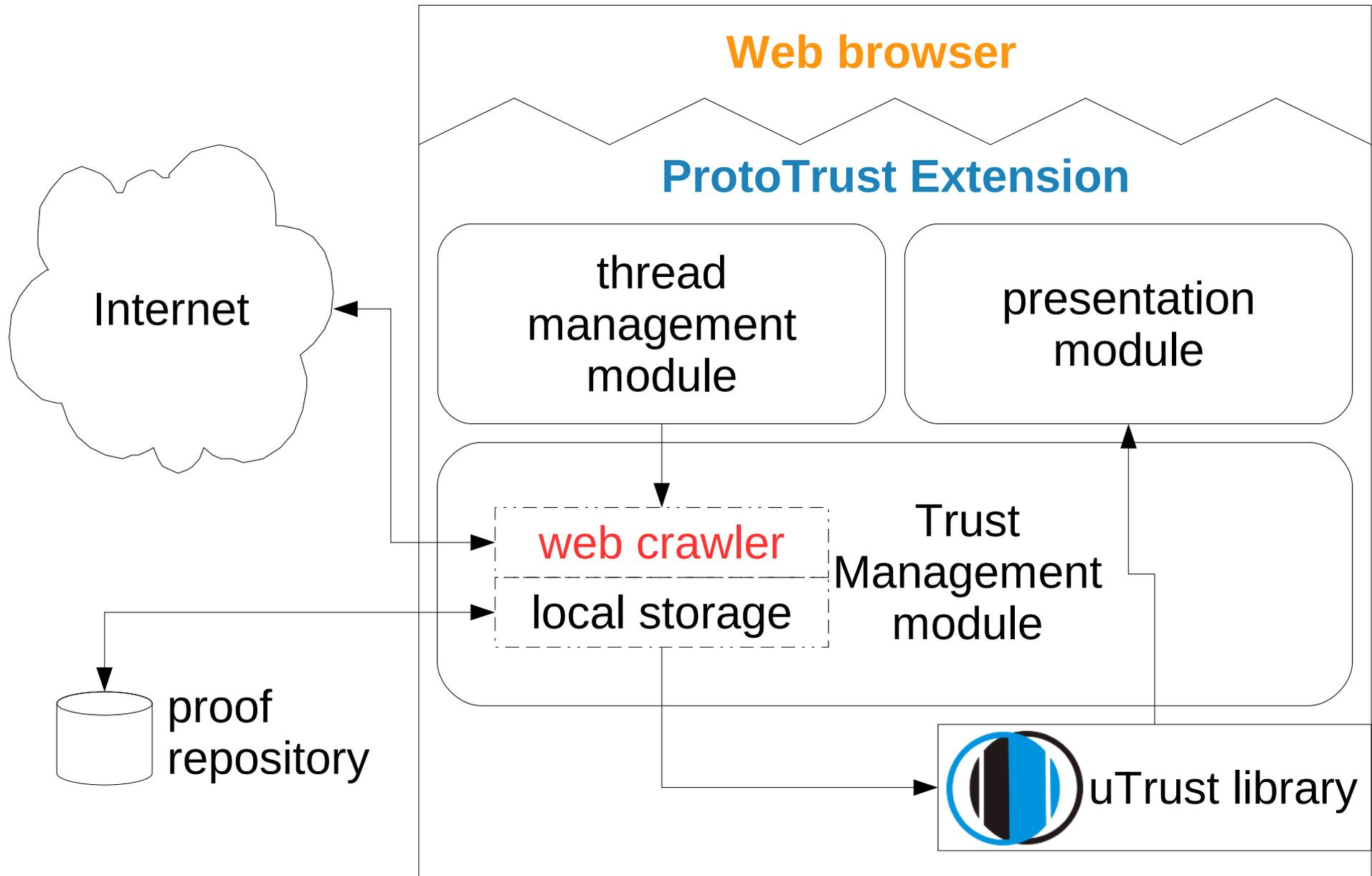
ProtoTrust: Architecture

Trust Management module

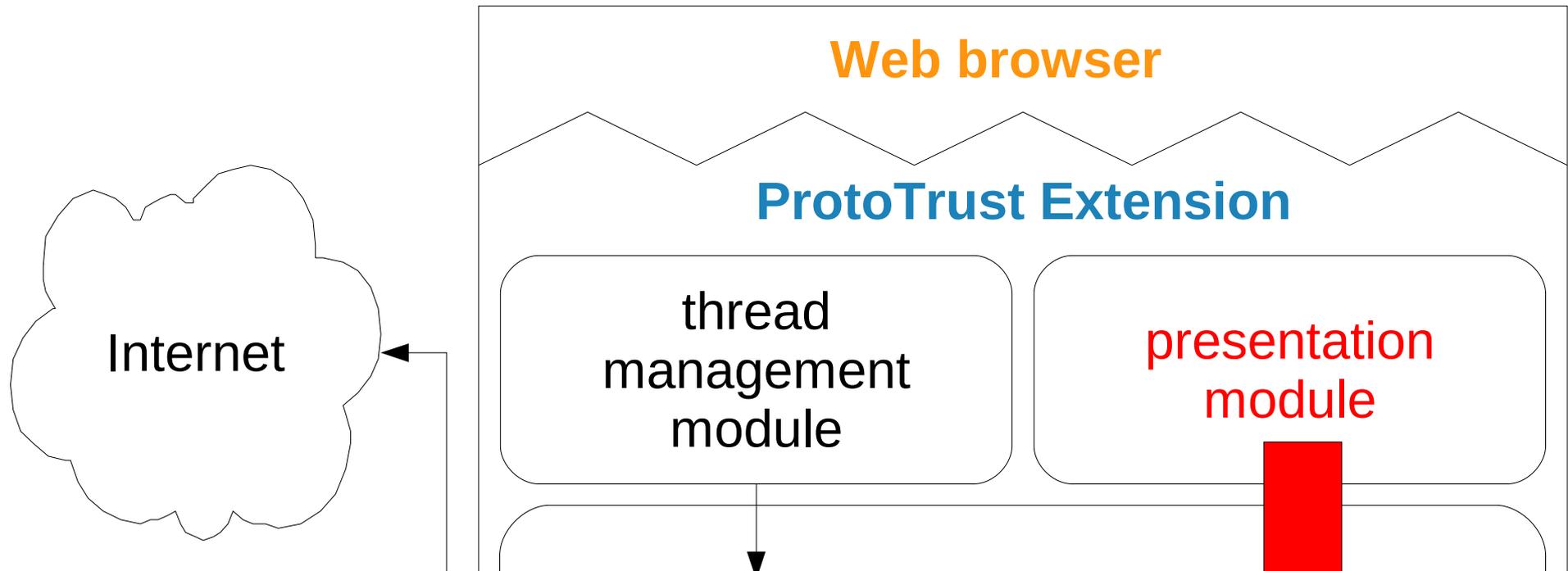
access the network and local storage in the search for informations. Module uses *Universal Trust (uTrust) library* to compute the results.



ProtoTrust: Architecture



ProtoTrust: Architecture

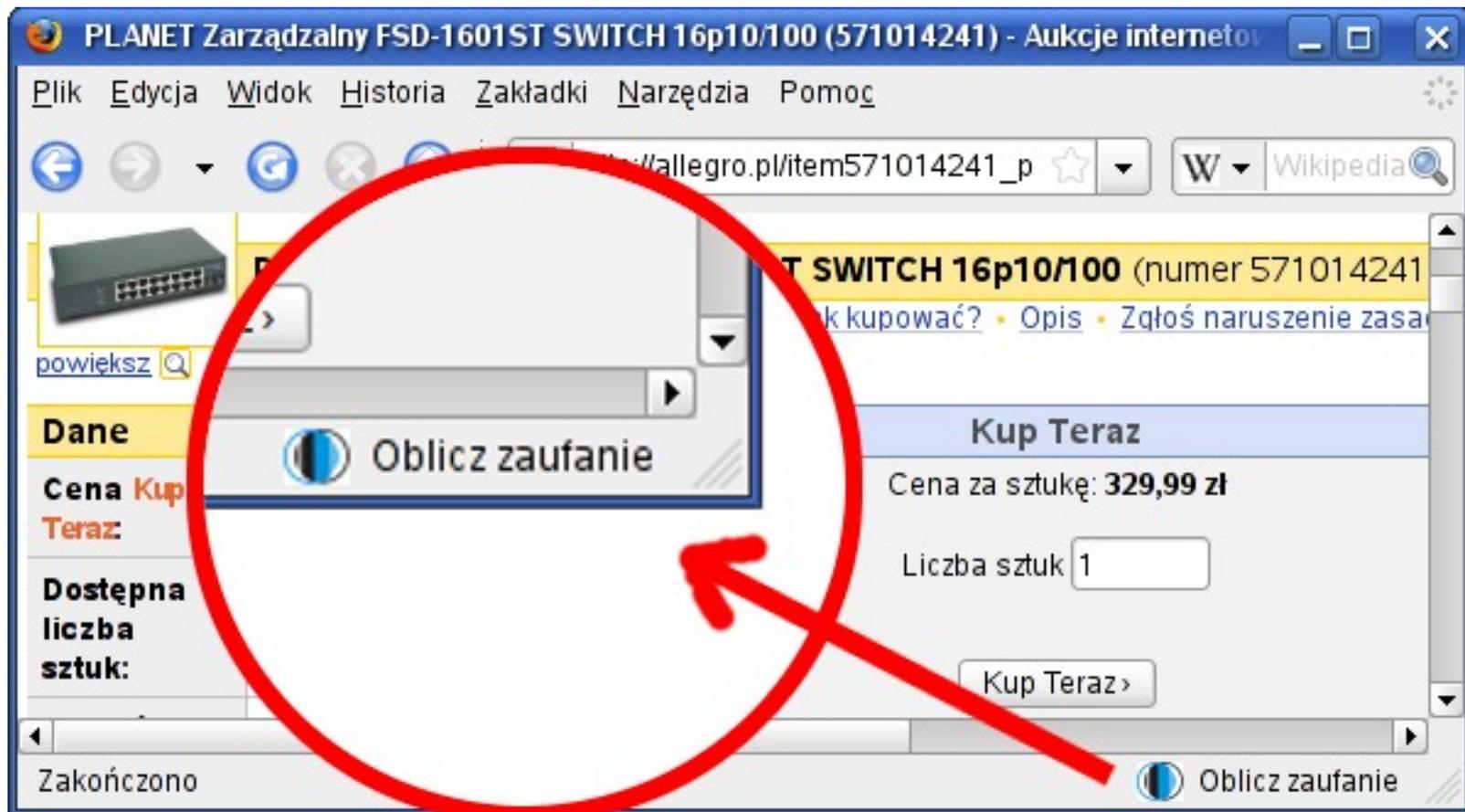


Presentation module

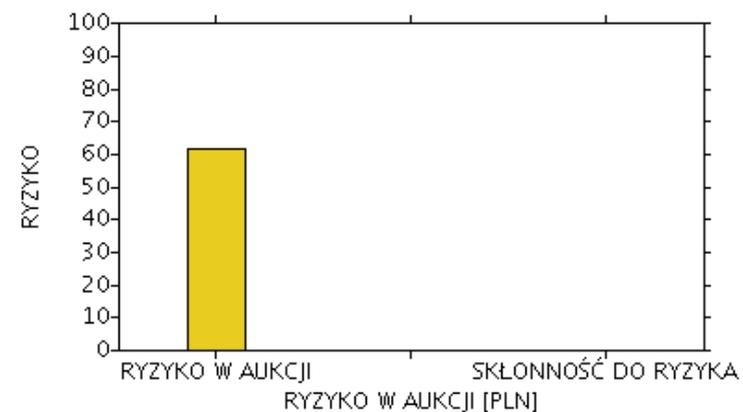
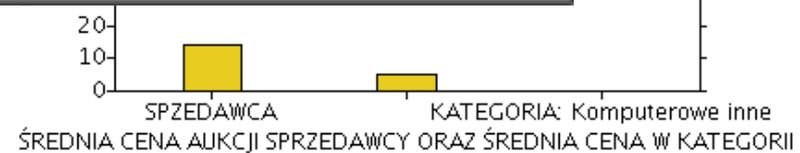
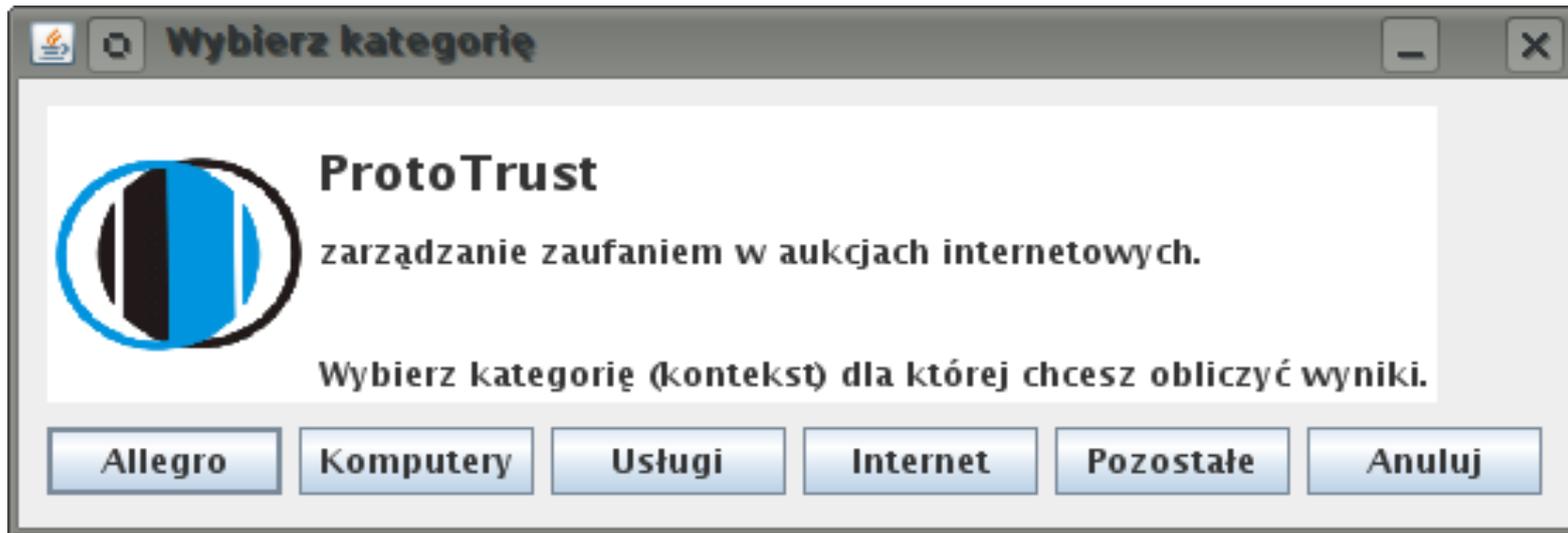
shows the computed results graphically and can suggest the decision to make.

Using this module user can also change her preferences

ProtoTrust: Interface



ProtoTrust: Interface



Preferencje użytkownika	AKCJE	Aktualnie przechowywane informacje
Skłonność do ryzyka:	<input type="text" value="200.0"/>	Użytkownicy <input type="text" value="0"/>
Wachania średniej ceny	<input type="text" value="1400.0"/>	Aukcje <input type="text" value="0"/>
Prog oszustwa	<input type="text" value="0.0030"/>	Kategorie <input type="text" value="0"/>
	<input type="text" value="animate test"/>	Komentarze <input type="text" value="0"/>
	<input type="text" value="compute"/>	
	<input type="text" value="domyślne wartości"/>	

ProtoTrust: Algorithms



Algorithms were adapted to Internet auctions.
The algorithms were implemented in *uTrust* library.

MEASURES	MONEY DEPENDENT	PROBABILITY DEPENDENT
Fraud Probability	-	+
Average Price	+	-
Risk	+	+
Min Price With Neg	+	-
Reputation	-	-

We have selected best algorithms and included them into our extension.

ProtoTrust: Preferences

Risk propensity R_{prop} amount of money which user lost if the seller is fraudulent.

Risk threshold R_{thres} is the threshold level for the probability methods.

Feedback age

- * feedbacks older than 1 week are ignored
- * feedbacks older than 2 weeks are ignored
- * feedbacks older than 1 month are ignored
- * all feedback taken into consideration

Context (auction category)

- * feedbacks for user in selected category (and subcategories)
- * all comments for user (all categories)
- * all comments for all users in selected category

ProtoTrust: Algorithms



Fraud Probability is the standard measure provided by any Internet auction service.

It is proportion between count of negative feedback M and total count of feedback N . We compute several variation of this measure with change of feedback validity in time t .

Decision rule:

System warns user from this seller's auction when seller s has carried out too much fraudulent operations:

$$\text{FraudProb}_{s,t} > R_{\text{thres}}$$

ProtoTrust: Algorithms



Average Price is seller's s weighted average price in which weights are dependent on value of the auction's feedback. Weights are -1 for negative 0 for neutral and 1 for positive feedback.

Decision rule:

System alerts when Average Price for seller s is much lower than Average Price of context c (which is the item category):

$$\text{AvgPrice}_s + R_{\text{prop}} < \text{AvgPrice}_c$$

ProtoTrust: Algorithms



Risk is the valued amount of money that user can lost if the seller is fraudulent. Our risk measure $Risk_i$ is the multiplication of actual bid P_i and the Fraud Probability of category C in which the item is listed. We compare it to the user's R_{prop} which is the amount of money that user wants to risk in this auction.

Decision rule:

Our system warns user when $Risk_i$ is greater than user's risk propensity R_{prop}

$$Risk_i > R_{prop}$$

ProtoTrust: Experiments



We have obtained our results on a real world dataset.
The dataset has been acquired from www.allegro.pl which is the leading Polish on-line auction provider.

9500 sellers

186000 auctions

6300 categories

We test our algorithms by selecting all 328000 feedbacks which are sent by the buyers.

ProtoTrust: Experiments



Running the tests:

- Sort the auctions according to the termination date.
- For each auction in the set
 - compute all the algorithms using only the data that is available until that moment
 - store the result
- Test if they are good predictors of the real feedback value.



ProtoTrust: Evaluation Criteria

probability of fraud detection (recall)

$$\text{FrD} = \text{Trueneg} / M$$

M – the total number of negative feedbacks

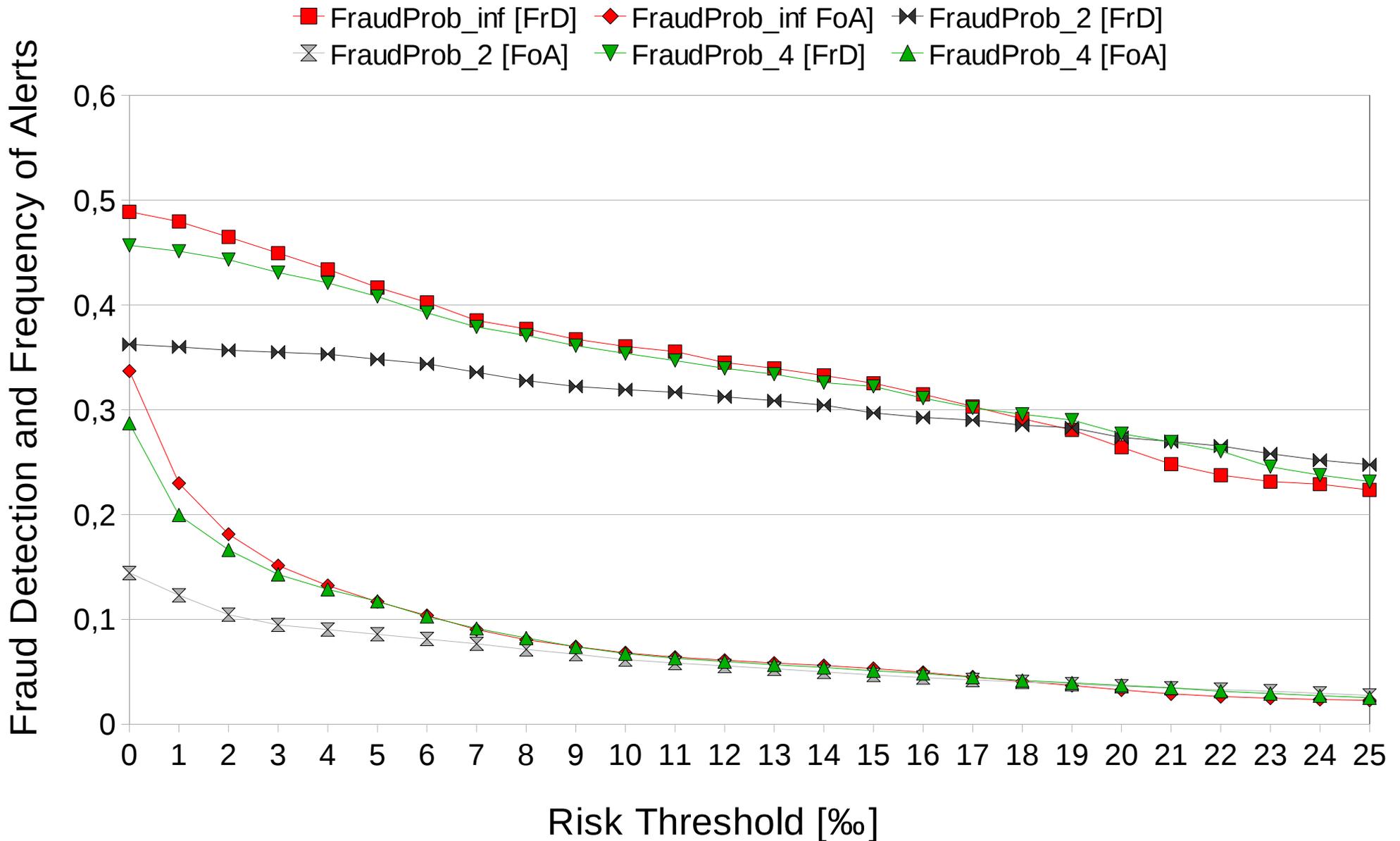
frequency of alerts (precision)

$$\text{FoA} = (\text{Trueneg} + \text{Falseneg}) / N$$

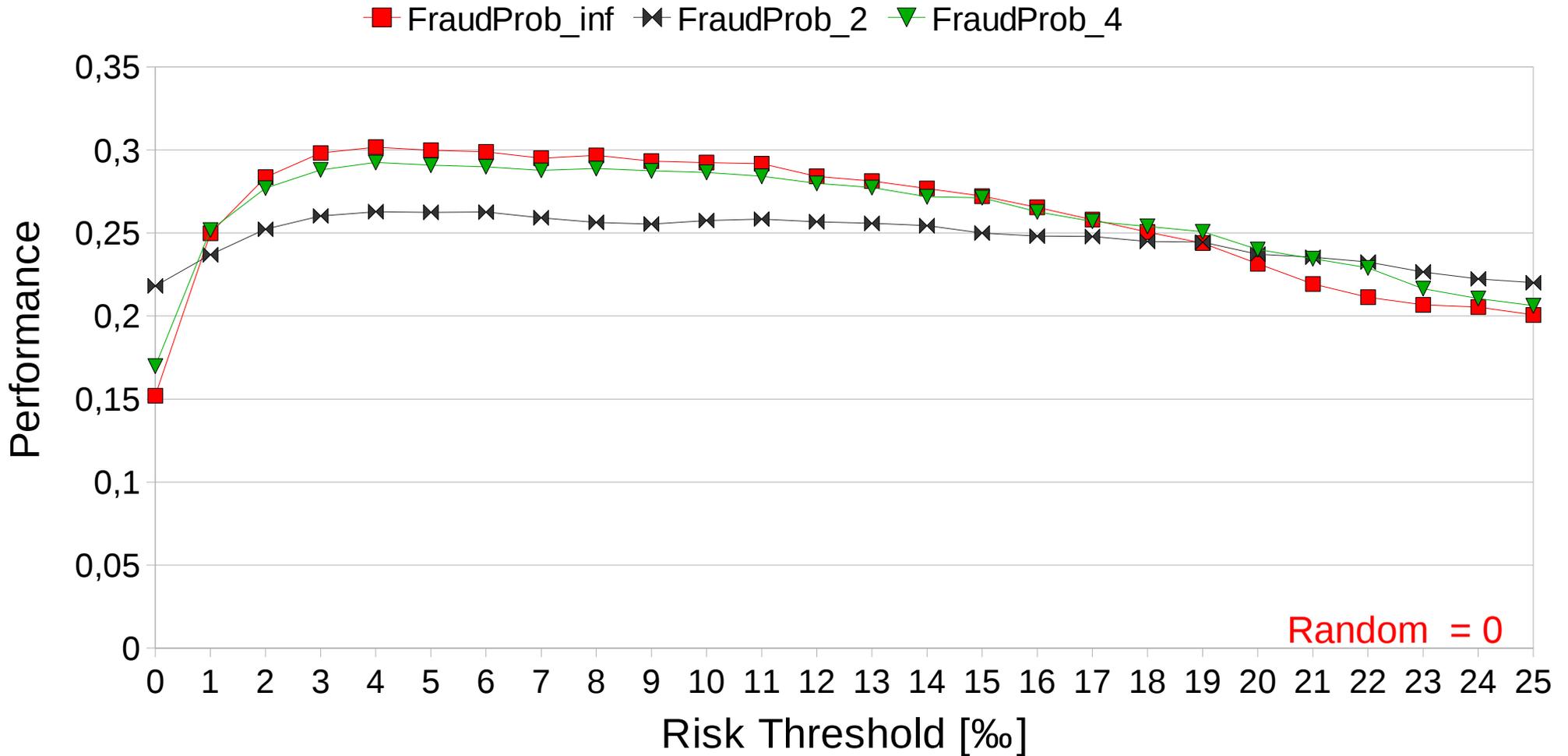
N – the total number of feedbacks

Random algorithm - both values equal
(for example when we raise an alert in 50% of cases we detect 50% of all fraudulent auctions)

ProtoTrust: Results

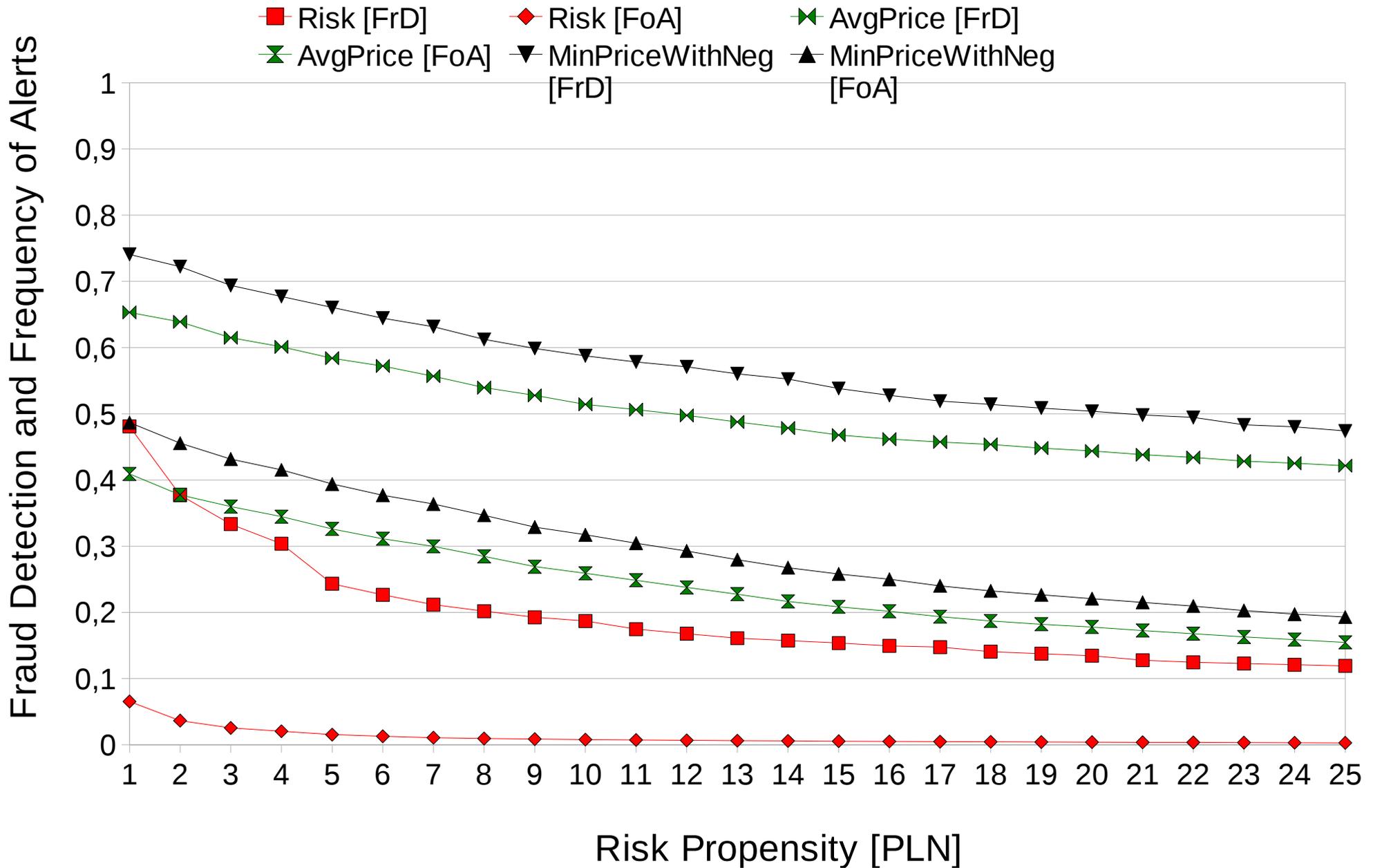


ProtoTrust: Results

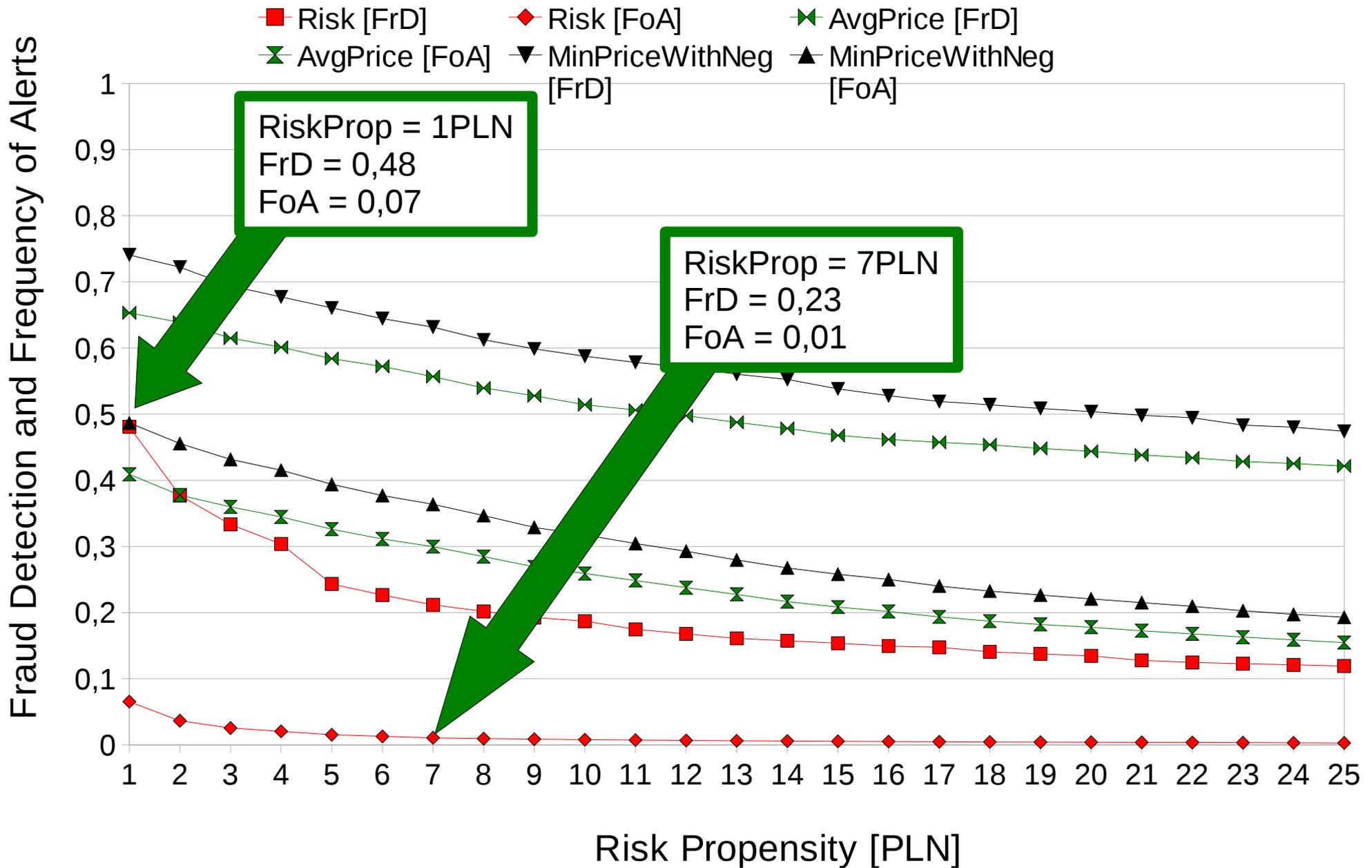


We can forgive the fraud but we can't forget it !

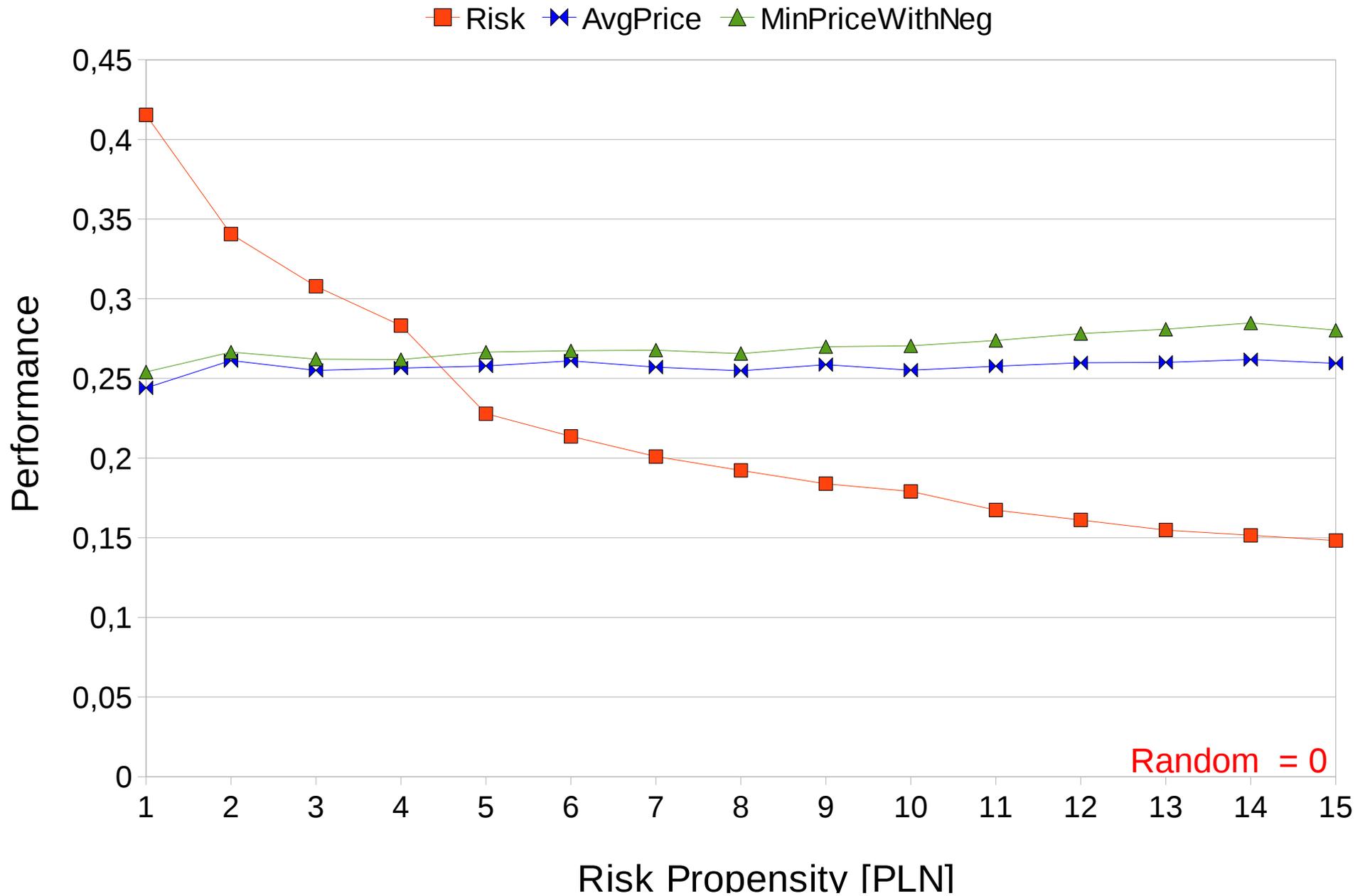
ProtoTrust: Results



ProtoTrust: Results



ProtoTrust: Results



ProtoTrust: Future



- Test the extension and implement the user friendly presentation module
- Discover new algorithms / parameters to improve the performance (minimize the Frequency of Alerts)
- Launch the stable version of ProtoTrust to the society
- Distribution of computation (and crawling) – result sharing, recommendations etc.

ProtoTrust: WWW



**ACTUAL (WORKING) VERSION OF PROTOTRUST
CAN BE DOWNLOADED (SOON) FROM:
<http://ustrust.pjwstk.edu.pl>**