PA193 Security technologies

Team projects: parser for cryptocurrency blockchain entry

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Project idea

1. Write custom parser for selected cryptocurrency
2. Code review of other team parser
3. Create patch for a selected flow and pull request

Project

1. Identify, design and implement cryptocurrency blockchain parser (now)
   - Parser will take two consecutive blocks, assume validity of a first one and verify the validity of the second one
   - Must be written completely from scratch, your own code
   - For cryptographic functions (sign, hash) use some existing library
   - Use git (GitHub), document functions, create tests
   - Not Bitcoin or its direct copycats (with same or very similar block structure)
   - Parse original binary format of the block (not some postprocessed JSON etc.)
   - See https://www.worldcoinindex.com/ for list of coins
2. Review of code of other group's parser
   - Find bugs by code review, using automated tools etc. (static analyzers, fuzzers…)
   - Prepare presentation with findings
3. Implement bugfix for one selected issue and create pull request

Teams

- 3 people per team
  - Assigned today (within group)
- Teams must use GitHub for cooperation
  - Distribute work load between all members
  - Contribution from all team members must be visible in commits (git commits from the member)
  - Your evaluation will be partially based on your participation
- Start working early, especially with implementation

Immediate next steps

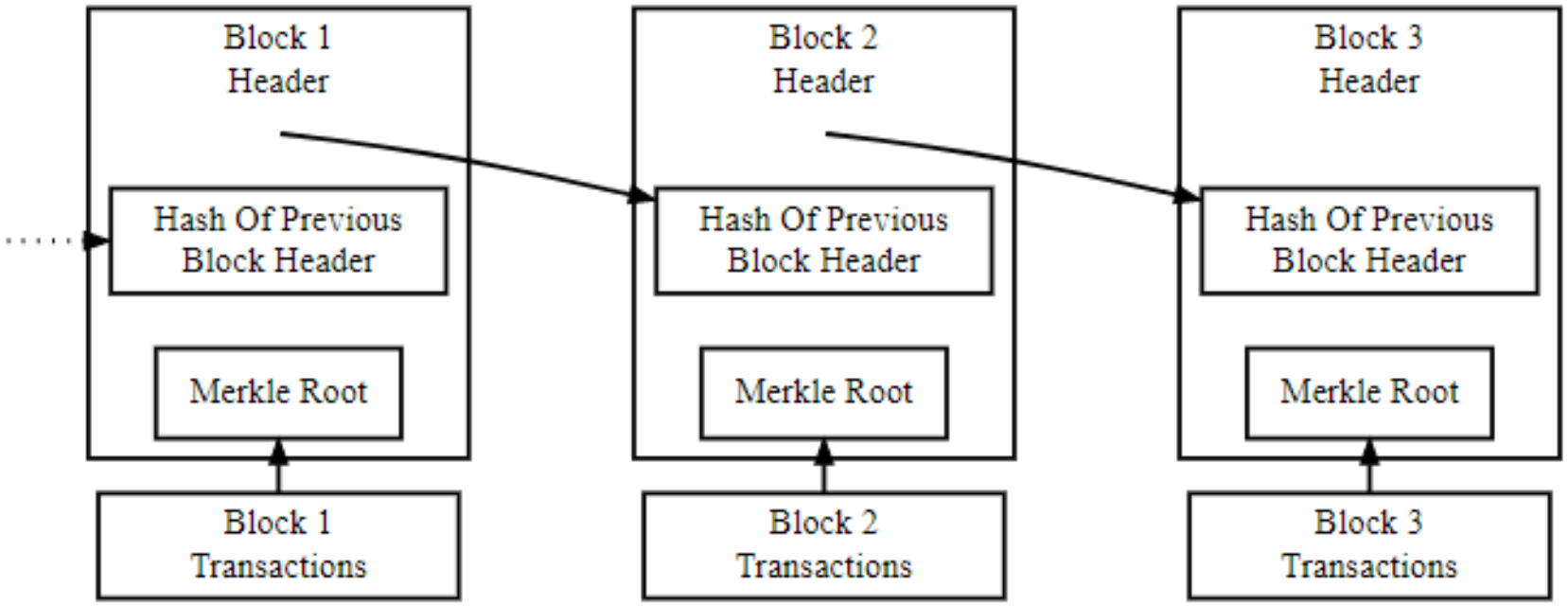
- Form group, exchange emails
- Get together and select your favorite currency
- Find example of valid binary blockchain blocks
- Send me email with your selection together with an example block (**25.09.2017**)
  - Wait for confirmation
- Setup repo at GitHub '*PA193_test_parser_XXX*' where XXX is name of your currency
- Write parser implementation together with Tests!

Projects - timeline

1. Write code (GitHub): **10 points** (**5.10.2017 & 9.11.2017**)
   - Demonstrate basic setup, Github repo, Travis CI, example inputs blocks (valid & invalid) [short presentation 5.10.2017 at your seminar]
   - Completed implementation + presentation [9.11.2017, your seminar group, random team member]
2. Review and attack implementations: **7 points** (**14.12.2017**)
   - Review and attack implementations of other teams
   - Initial kickoff together with implementation team [9.11.2017]
   - Report + presentations [14.12.2017]
3. Write patch for a selected bug: **3 points** (**19.1.2018**)
   - Notify me once patch is committed and accepted by target team

- At least 10 points (total) from project are required

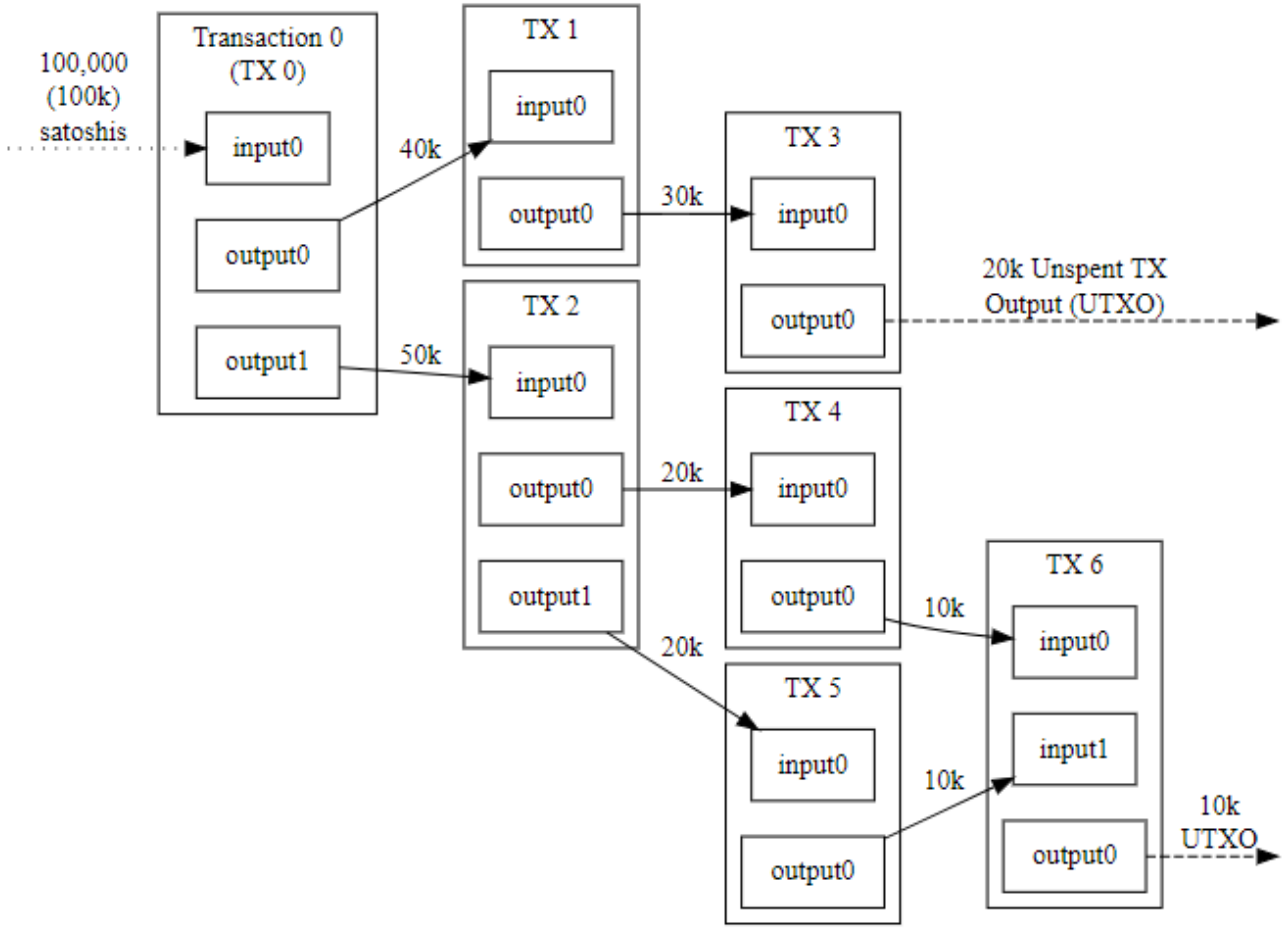
Basics of block chain



Simplified Bitcoin Block Chain

https://bitcoin.org/en/developer-guide#block-chain

Basics of block chain II.



Triple-Entry Bookkeeping (Transaction-To-Transaction Payments) As Used By Bitcoin

https://bitcoin.org/en/developer-guide#block-chain

Bitcoin block (example invalid)

- Bitcoin block 74638 (15

CBlock(hash=000000000790ab3, ver=1, hashPrevBlock=0000000000068d8
nTime=1281891957, nBits=1c0080
CTransaction(hash=012cd8, ver=
CTxIn(COutPoint(000000, -1), c
CTxOut(nValue= 50.51000000, scriptPubKey=0x4F4BA55D1580F8C5A8A
CTransaction(hash=1d5e51, ver=1, vin.size=1, vout.size=2, nLockTime=0
CTxIn(COutPoint(237fe8, 0), scriptSig=0xA87C02384E1F184B79C6AC)
CTxOut(nValue=**92233720368.54275808**, scriptPubKey=OP_DUP OP_H
CTxOut(nValue=**92233720368.54275808**, scriptPubKey=OP_DUP OP_H
vMerkleTree: 012cd8 1d5e51 618eba

Block hash: 000000
Transaction hash: 1d5e512a97

Mining block reward
(was 50BTC at 2010, is 12.50BTC now)

Input transaction (with 0.5BTC)
https://blockexplorer.com/tx/237fe8348fc77ace11049931058abb034c99698c7fe99b1cc022b1365a705d39

2 output transactions (each with $9*10^{10}$ BTC) !!!

Should have been rejected by miners as value(output) >> value(input), but was not!

NOTE: Teams with 4 members are expected to implement full verification of the whole blockchain instead of single block

TEAMS

- Ethereum, C++: https://github.com/kasparjarek/PA193_test_parser_Ethereum
  - Jaroslav Kašpar
  - Šimon Struk
  - Vojta Polasek
- Litecoin, C++: https://github.com/Urvek/PA193_test_parser_litecoin
  - Urvekkumar C Shah
  - Hitesh Lilhare
  - Akhilesh kumar Soni
  - Vikas Lamba

- Novacoin, C++:
- https://github.com/arvindrao7589/PA193_test_parser_Novacoin
  - Arvind Rao <476357@mail.muni.cz>
  - Kuldeep Goyal <goyalkuldeep@gmail.com>
  - Surendra Kumar Yadav <476364@mail.muni.cz>
- Dash, C++: https://github.com/JakubMar/PA193_test_parser_dash
  - Jakub Martinka,
  - Marek Vančík
  - Peter Benčík

- Peercoin, Java: REPO
  - Yevhenii Babichenko , UCO 468589;
  - Ram Singh, UCO 476358;
  - Sushma Verma
- Monero, C++: https://github.com/adamjanovsky/PA193_test_parser_monero/
  - Adam Janovský | 410390,
  - Kristián Kozák | 422361,
  - Jegruš Lysý | 374217.

- Litecoin, C/C++: https://github.com/coolsujit/PA193_test_parser_Litecoin
  - Sujeet Deshmukh - 476359@mail.muni.cz
  - Bhupendra Singh - 476370@mail.muni.cz
  - Nidhi Pokhriyal - 476361@mail.muni.cz

- NEM, C++: REPO
  - Jakub Kremláček <410131@mail.muni.cz>
  - Richard Kalinec

- Qtum, C++: https://github.com/mitko501/PA193_test_parser_Qtum
  - Michal Hajas(422190)
  - Lenka Svetlovská(433637)
  - Andrea Turiaková(422387)
- SixEleven, LANG: https://github.com/dogukanucak/PA193_test_parser_SixEleven
  - Deniz Ağaoğlu (459192@mail.muni.cz)
  - Doğukan Uçak (476348@mail.muni.cz)

- DogdeCoin, Java: https://github.com/securecodingproject/PA193_test_parser_dogecoin
  - Eduardo Roldan
  - Clement Thiallet
  - Barna Bruder
- ZCash, C++: https://github.com/nirajkalra/PA193_test_parser_ZEC
  - Niraj Kalra <476365@mail.muni.cz>
  - Chintan Khanna <476362@mail.muni.cz>
  - Gajraj Kuldeep <476369@mail.muni.cz>