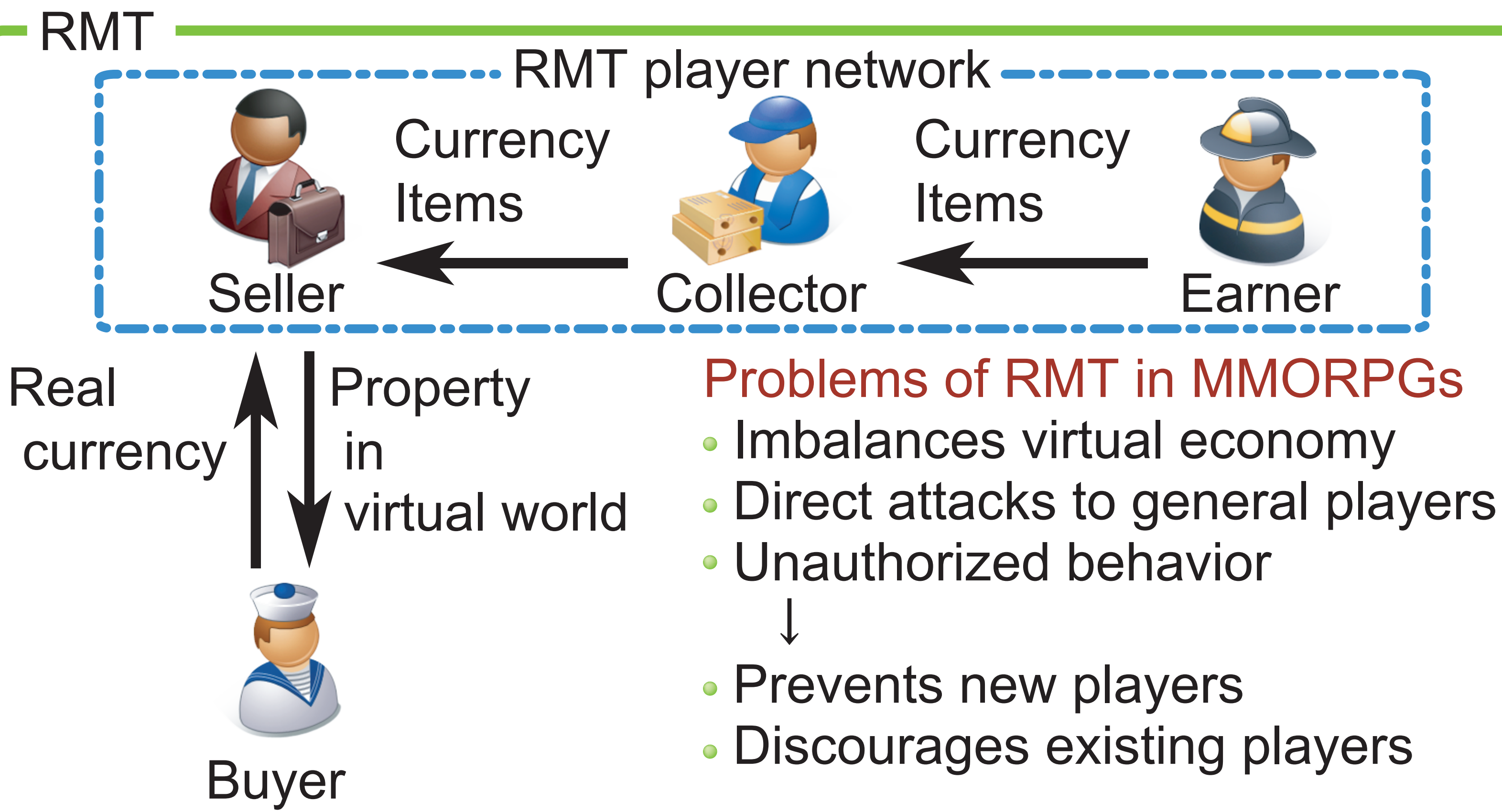# Exploiting MMORPG Log Data toward Efficient RMT Player Detection

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Summary
Automatic detection of RMT players using log data
- Ranking all players with regard to their "suspiciousness"
- Manual verification starting from rank 1

Issues of Operating MMORPG
MMORPG: Multi-player online role-playing game
Countermeasure against unfavarable behavior
- RMT: Real-money trading
- Harassment (PK, robbing)
and it's automation
- Manual investigation requires human effort and time
- Effective use of huge volume of log data

RMT

RMT player network

Seller ← Currency Items ← Collector ← Currency Items ← Earner

Real currency / Property in virtual world

Buyer

Problems of RMT in MMORPGs
- Imbalances virtual economy
- Direct attacks to general players
- Unauthorized behavior
↓
- Prevents new players
- Discourages existing players

Solution
Computes "suspecthood" using statistics derived from log data

Provided data
- Log data (Action log, Chat log)
- List of manually identified RMT players

Derived four types of statistics from both types of data
- TCC: The total number of utterances recorded
- TAC: The total number of action records
- AT: The amount of minutes in which at least one action is taken
- TCH: The amount of virtual currency handled in the period
  (The absolute values of currency increase and decrease)

Target Commercial MMORPG
"Uncharted Waters Online"
- TECMO KOEI GAMES CO., LTD.
- http://global.netmarble.com/uwo/

Target period
2009/8/30~2009/9/13
(in which the operators had identified RMT players)

Preliminary Investigation

0. Assumption
RMT players handle huge amount of currency
15,250 players ⇒ top 1,000 players based on TCH

1. Statistical Analysis
Significant differences between RMT players and others

Table 1: Mean Values of Statistics

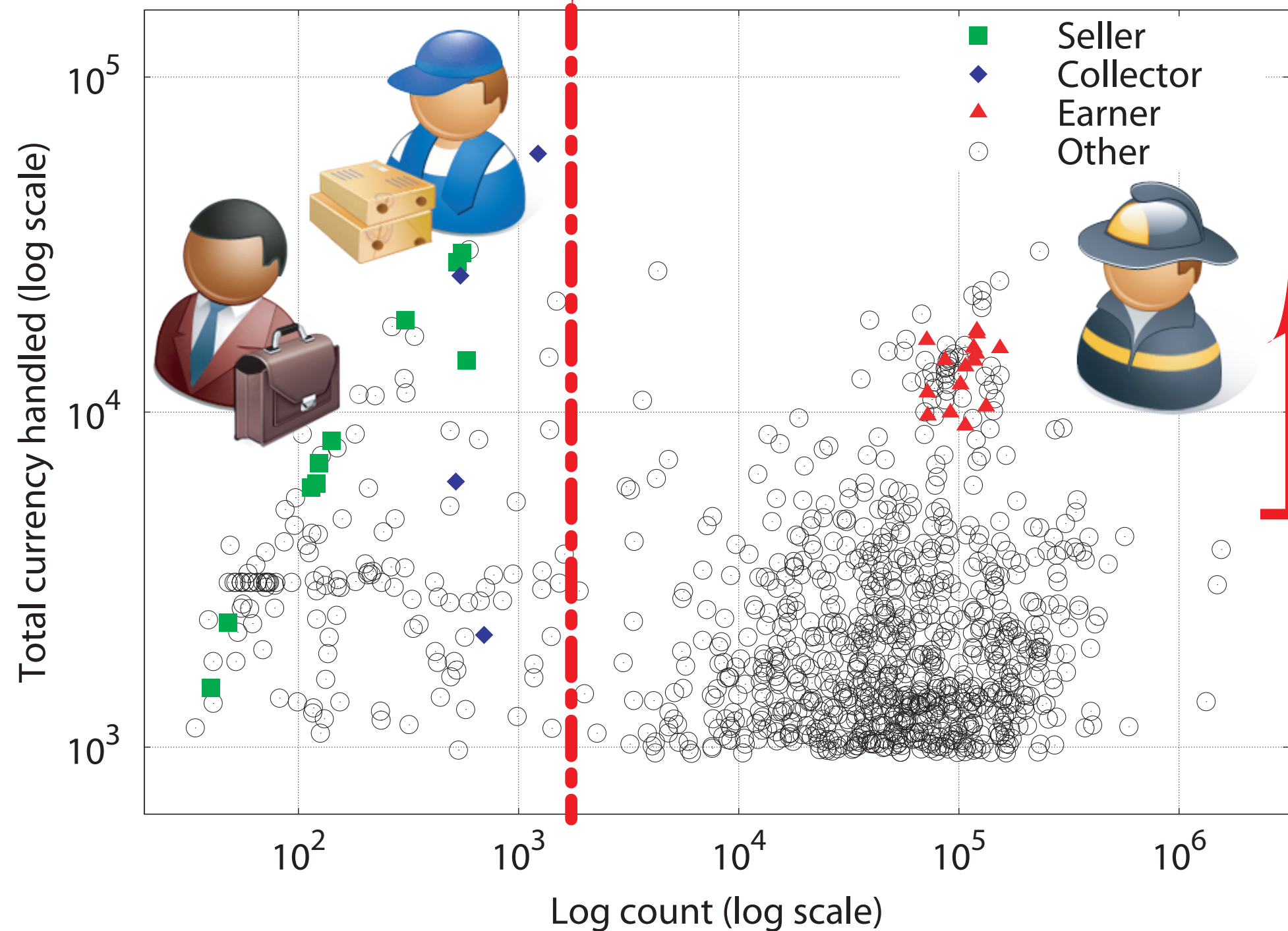| Type	n	TAC	AT	TCC	TCH
Seller	10	254.4	55.8	1.3	12,209.2
Collector	4	745.5	138.3	46.8	23,247.0
Earner	15	106,137.8	16,772.5	11.0	13,438.7
Others	971	75,008.8	3,718.0	951.0	3,111.0
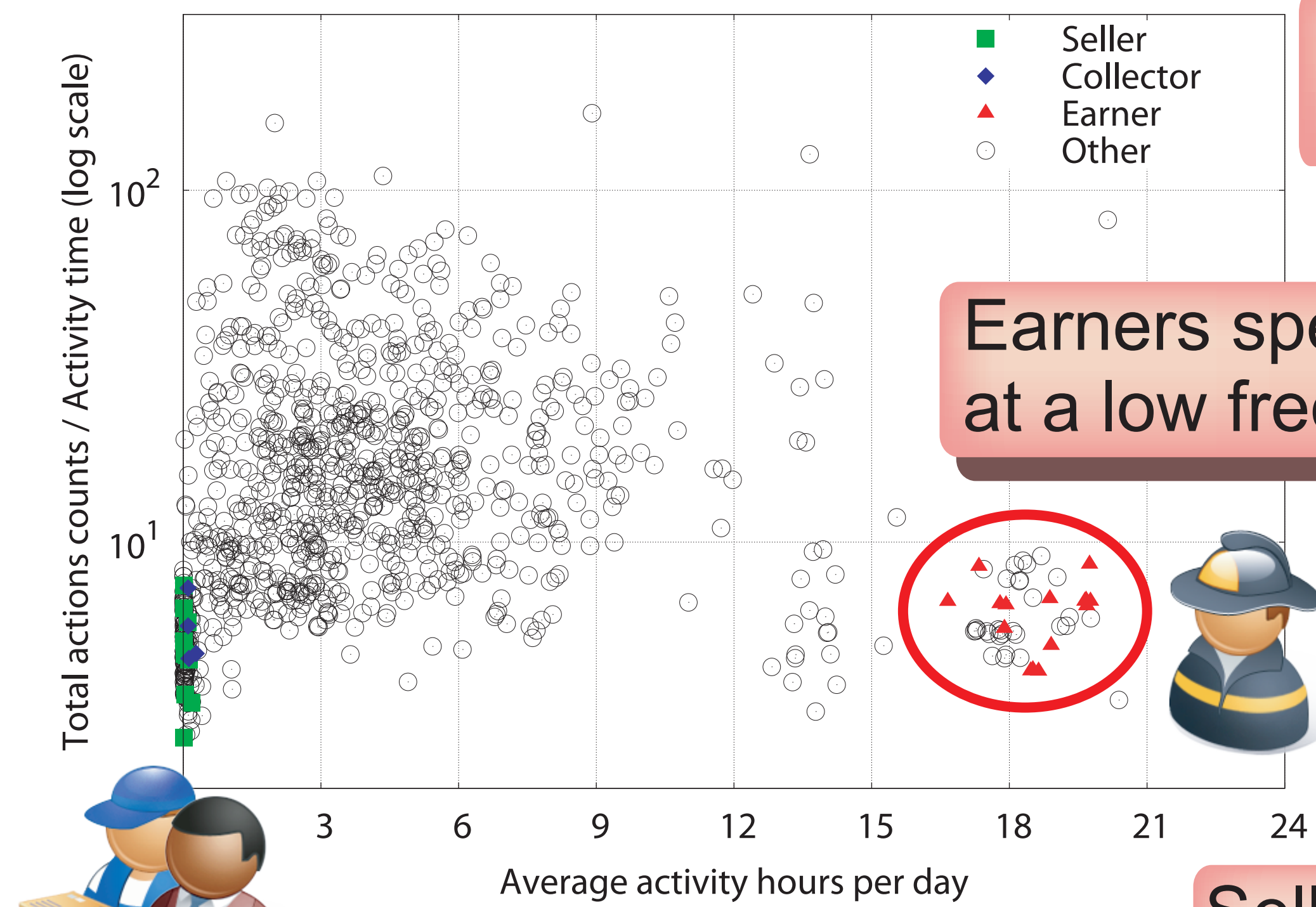
Most of the RMT players are silent

Earners spend long time at a low frequency of action

Sellers and collectors take actions less frequently

RMT players deal with a huge volume of virtual currency

2. RMT Player Detection
Different statistics achieved the best results for each type of RMT players

Table 2: The Number of Extracted RMT Suspects

Statistics	Seller	Collector	Earner	All
n	10	4	15	29
TCH	639	452	80	639
TAC	998	889	360	998
TCC	1,000	1,000	1,000	1,000
AT	990	891	48	990
TCH/TAC	72	133	419	419
TCH/TCC	226	347	349	349
TCH/AT	81	123	643	643

Earners (15)

sellers (10)
collectors (4)
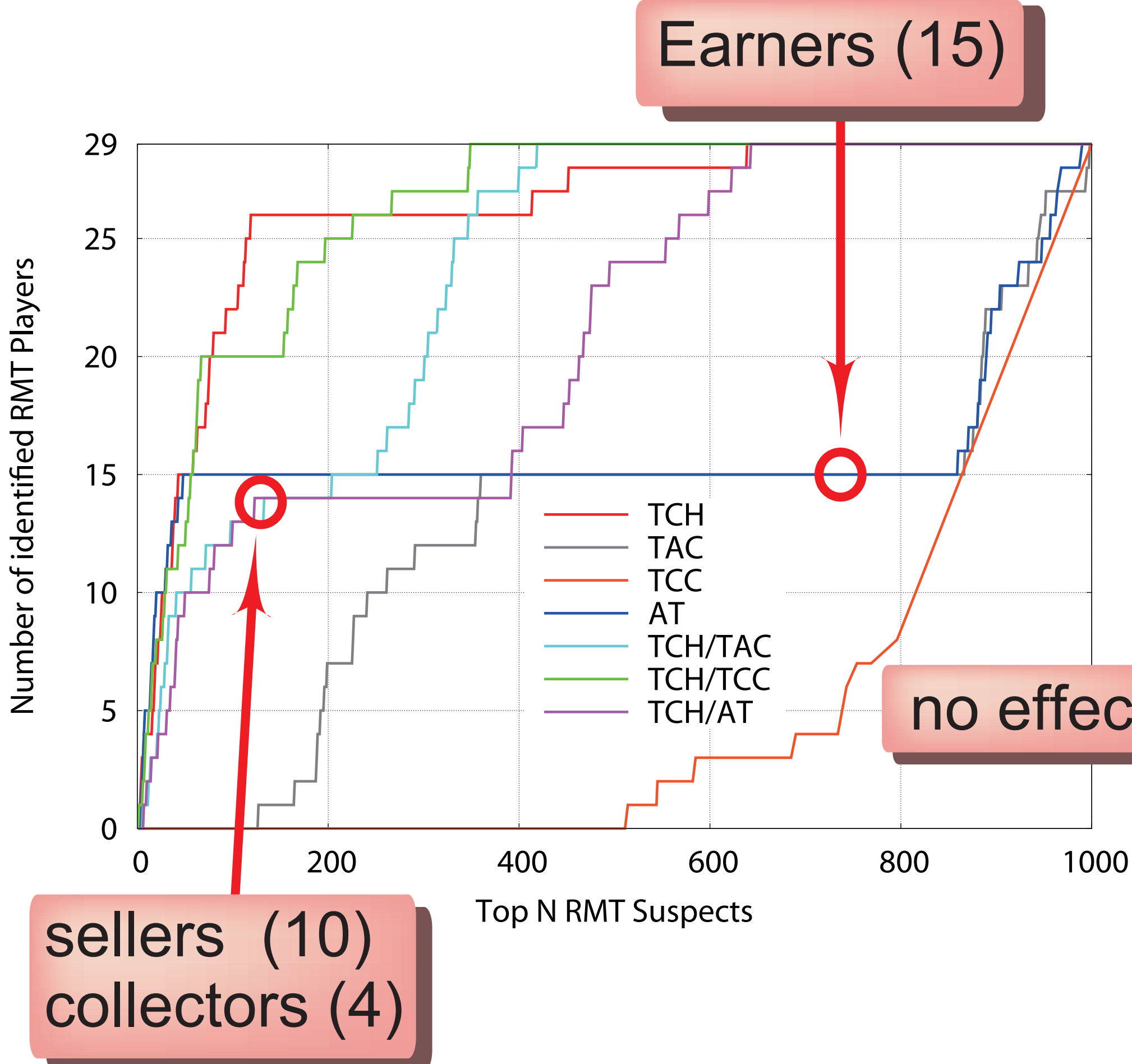
no effect

Future Work
Explore a more effective statistics
- especially from short-term log data
Apply to other game titles