Towards Securing Internet eXchange Points Against Curious onlooKers

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ON ROUTES EXCHANGE AT IXPs AND PRIVACY

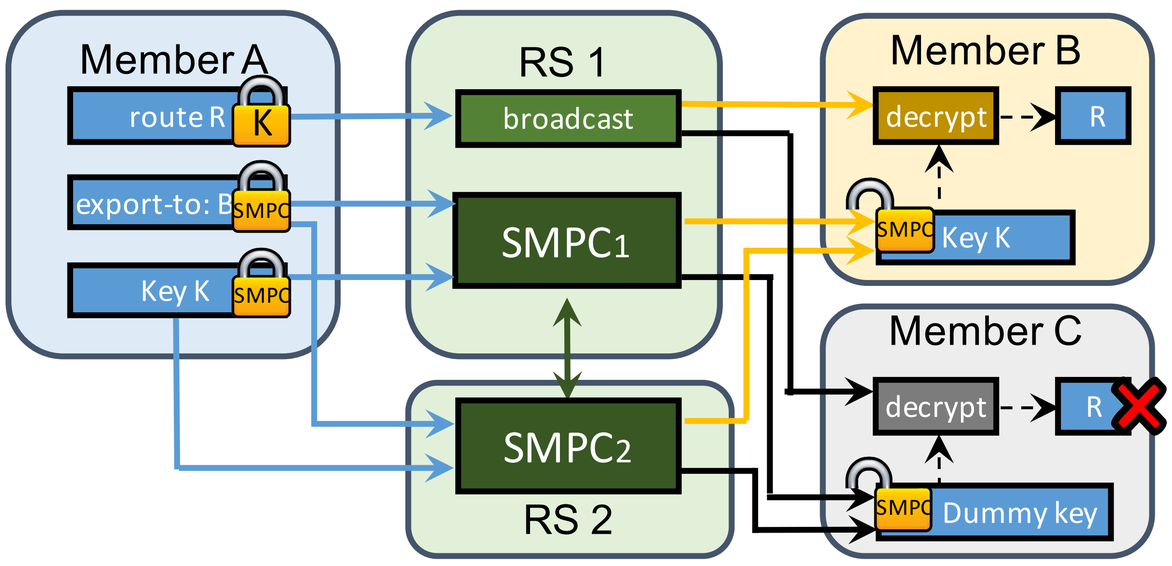
- Internet eXchange Points (IXPs) are physical networks where members connect to exchange traffic.
- Routing information exchanged via BGP sessions among members.
- Route Servers (RSes) at IXPs ease BGP route-dispatch
- Members that use RSes must **disclose** their confidential route-export policies to the IXP.
    - Export-policy: what BGP routes a member is willing to announce to other members.
- Privacy concerns **deter** some networks from subscribing to RS services.
- **How can a member leverage the functionalities of a centralized RS without disclosing its export policies?**

SIXPACK!

- A **privacy-preserving** route dispatching service.
- Based on provable security guarantees and recent developments in Secure Multi-Party Computation (SMPC).
- Two non-colluding entities perform SMPC computation in order to dispatch the BGP routes to participants.
- Two approaches:
    - **ALL**: dispatch all exportable BGP routes.
    - **SINGLE**: dispatch the "best" exportable BGP route according to the RS ranking.

EXAMPLE - "ALL" APPROACH

- Member *A* wants to announce a route *R* to member *B*.
- Route *R* is encrypted with key *K* and sent to each member.
- The export policy of *A* is secret-shared between *RS1* and *RS2* as an input to the SMPC.
- SMPC is responsible for dispatching *K* only to member *B*.
- Neither *RS1* nor *RS2* learns anything about the export policy of member *A*.



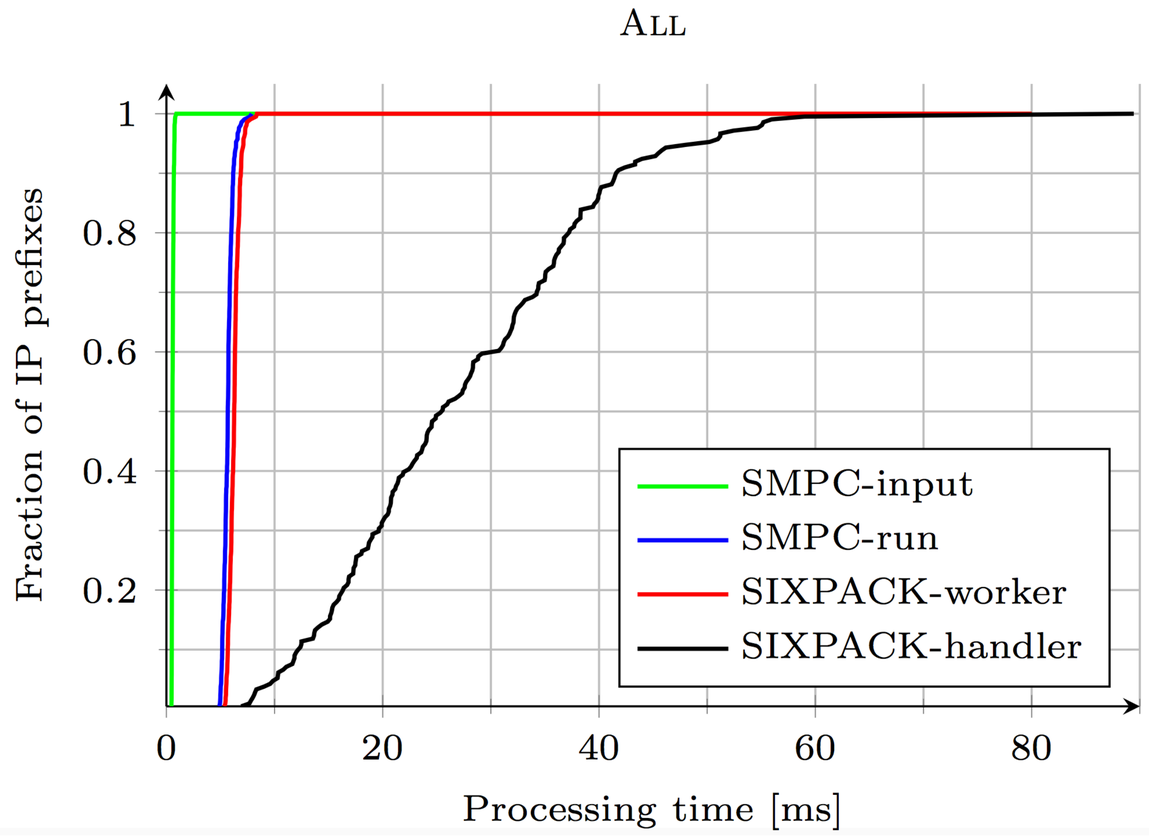
PRACTICALLY GOOD SMPC PERFORMANCE

- Emulate large IXP with 750 members.
- 1 Gbps link connection between the two parties.
- ABY framework based on the GMW protocol.
- The setup phase is independent of the actual inputs and can be precomputed.

Approach	Inputs	Setup [ms]	Online [ms]
ALL	2	1.7	0.6
SINGLE	2	41.7	1.6
	4	42.2	3.3
	16	54.8	9.2
	32	66.0	19.1

PROTOTYPE EVALUATION

- Based on a real-world trace of BGP updates from one of the largest IXPs worldwide.
- More than 600 members, 10.62 BGP route announcements/withdrawals per second.
- SIXPACK prototype in Python.
- Bandwidth requirement RS1 ←→ RS2 below 11Mbps.



FUTURE RESEARCH

- Enhancing RS ranking by incorporating members' local-preference and IXP's ranking.
- Extending our approach to Software-Defined-eXchanges.
- Optimizing the SIXPACK prototype.

PRESENTER CONTACT

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