POST: A Secure, Resilient, Cooperative Messaging System

A. Mislove, A. Post, C. Reis, P. Willmann, P. Druschel,
D. S. Wallach *Rice University*

X. Bonnaire, P. Sens, J.-M. Busca, L. Arantes-Bezerra
University of Paris 6 (LIP6)

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Motivation

- Provide a generic, serverless platform for user-driven collaborative applications (email, IM, calendars, etc.)
- Show that a wide range collaborative services can be supported by one serverless platform securely, with high availability
- Demonstrate that p2p paradigm is mature enough to support secure, resilient, “mission-critical” applications

POST Architecture

- Provides three basic services to applications:
  - Secure single-copy message storage
  - User metadata based on single-writer logs
  - Event notification
- These basic services are sufficient to support a variety of collaborative applications

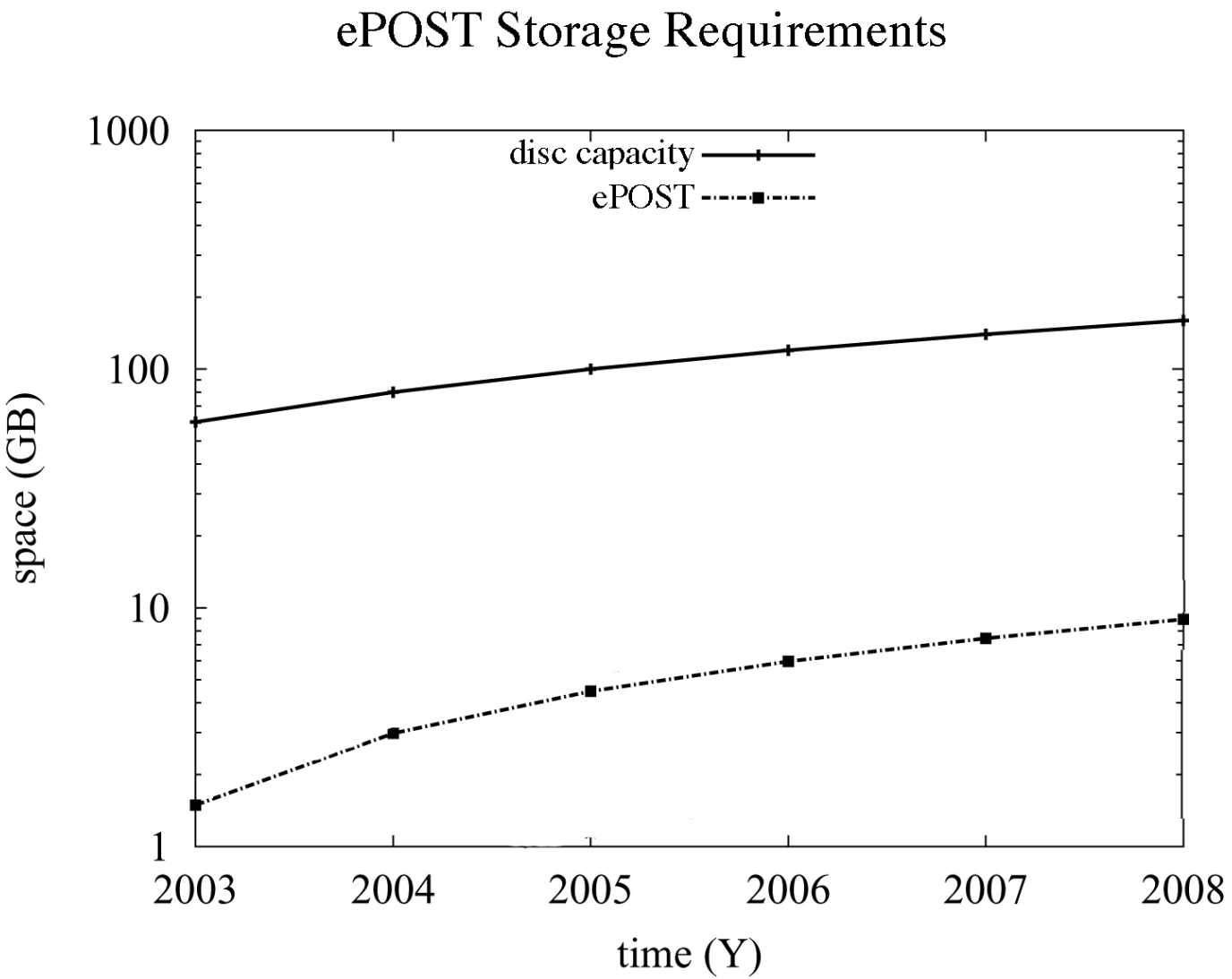
Sample Application: ePOST

- Email service based on POST
  - Email is a well-understood, demanding application
  - Availability of realistic workloads
- Interoperates seamlessly with existing email protocols and clients (IMAP, SMTP, Outlook, etc…)
- Participating organizations remain autonomous
  - Local storage controlled by local participants by scoped insertion
- Provides better spam prevention
  - Crypto-based message authentication and privacy
  - Sender overhead is proportional to the number of recipients
  - Receivers pull messages

Experimental Setup

- Implemented ePOST prototype
  - Performs well
- Realistic ePOST storage requirements?
  - Examined email usage by ~250 members of Rice CS department
  - Conservative assumptions:
    - No deletion
    - Local insertion
    - Full replication with 10 replicas
    - All messages are unique

ePOST Storage Requirements

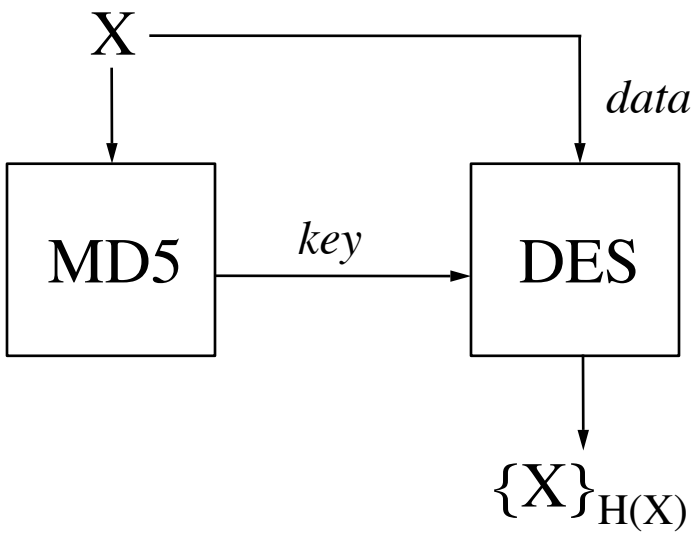


Status and Conclusions

- Ongoing work:
  - We plan to begin using prototype as primary email system this summer
  - Answer open questions
    - Appropriate level of replication
    - Measures to ensure failure independence
    - Administrative cost
- Also working on IM and calendar applications on POST
- Related effort: p2p incentives for fair sharing of resources

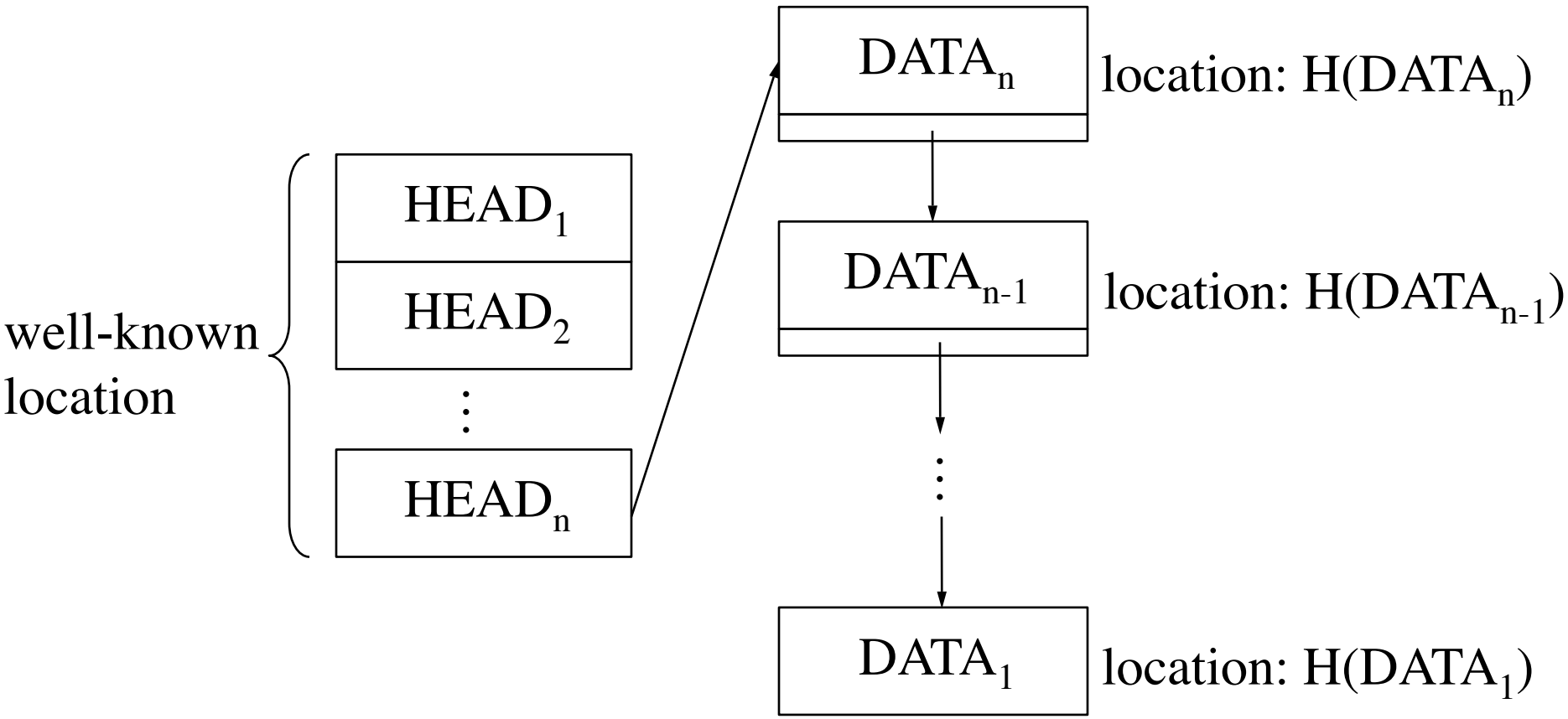
Single-copy Message Storage

- Achieved using convergent encryption
- Allows multiple copies of encrypted data to be coalesced



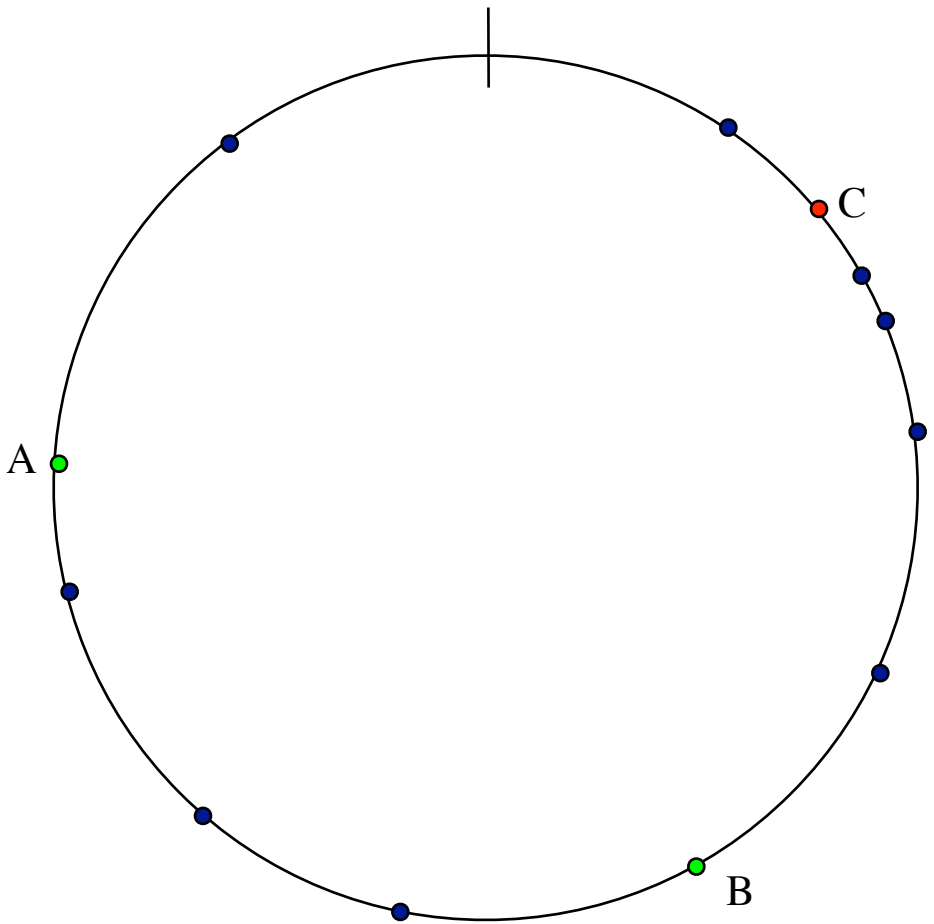
User-specific Metadata

- Based on the Ivy file system



User Notification

- Suppose A and B want to send to C



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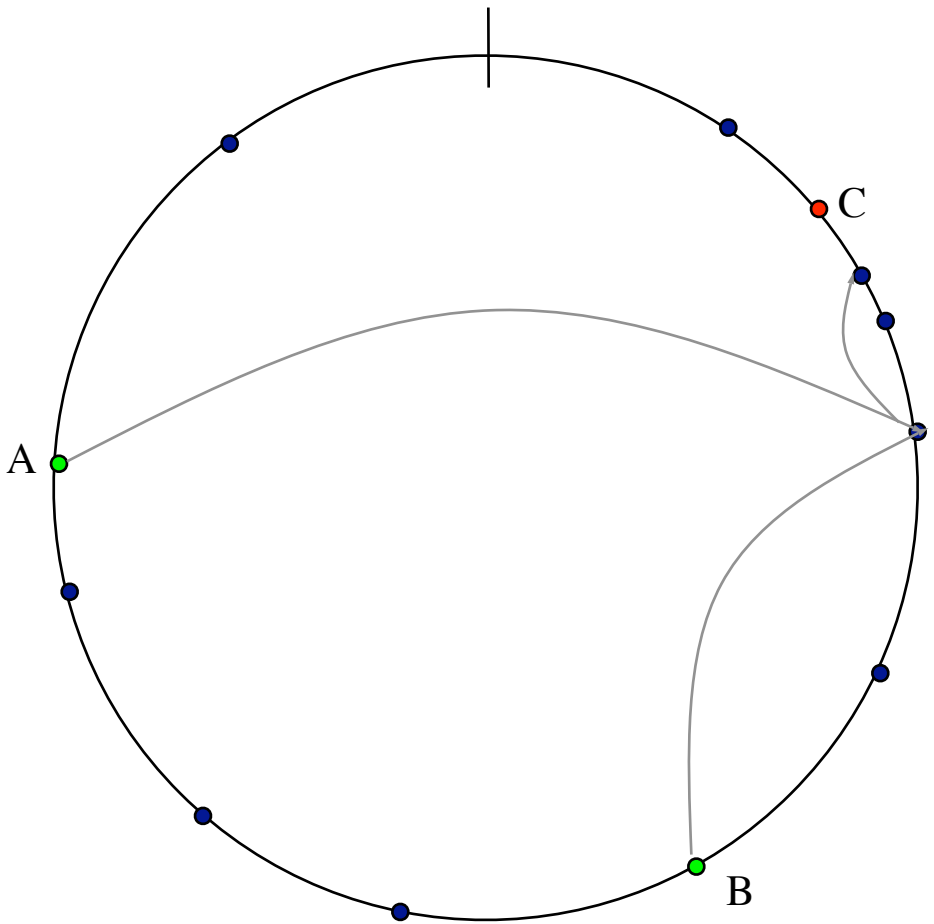

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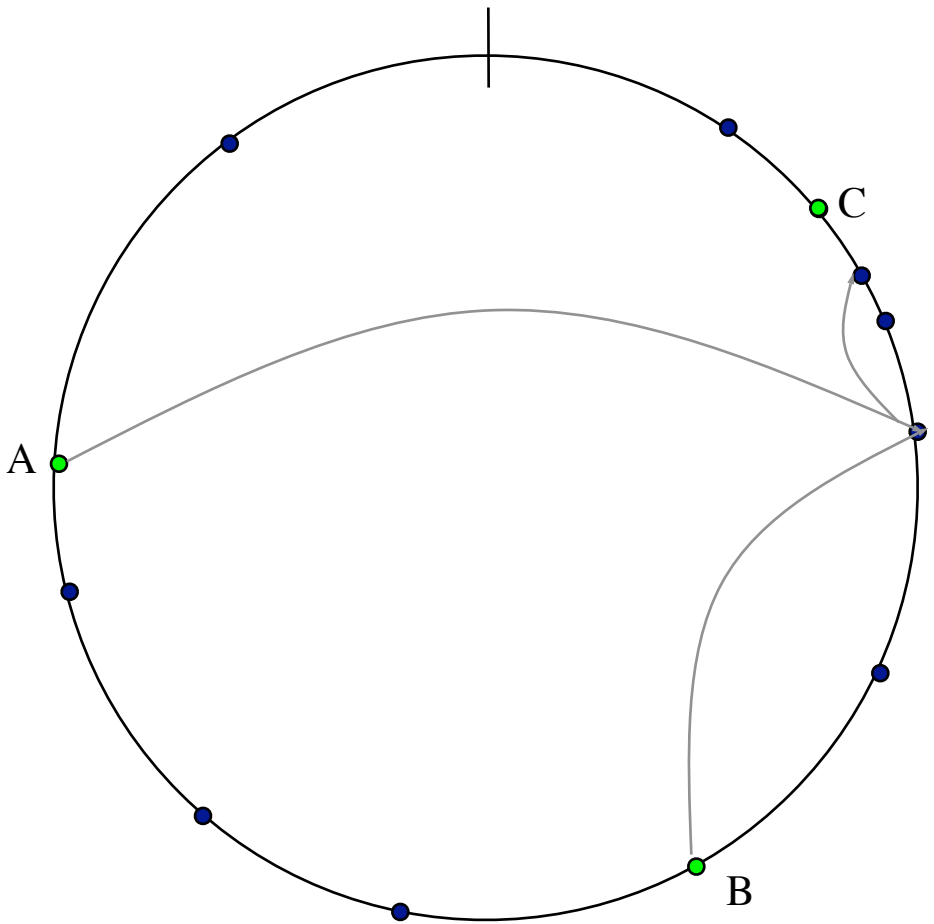

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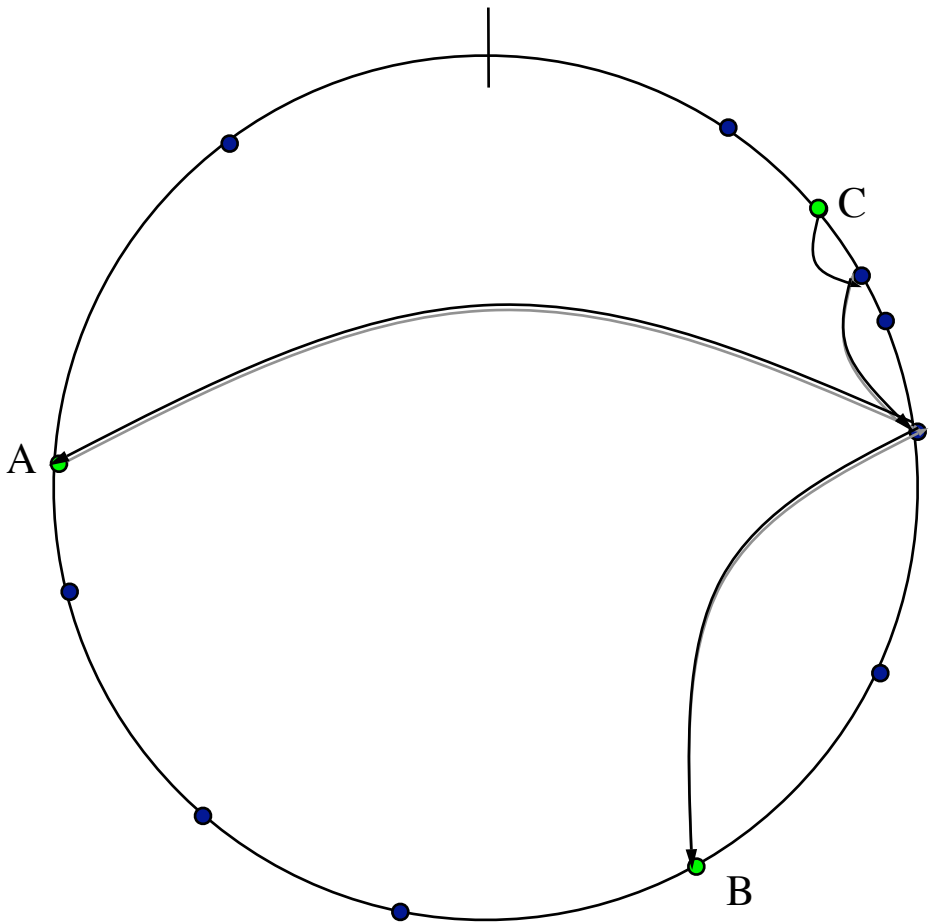

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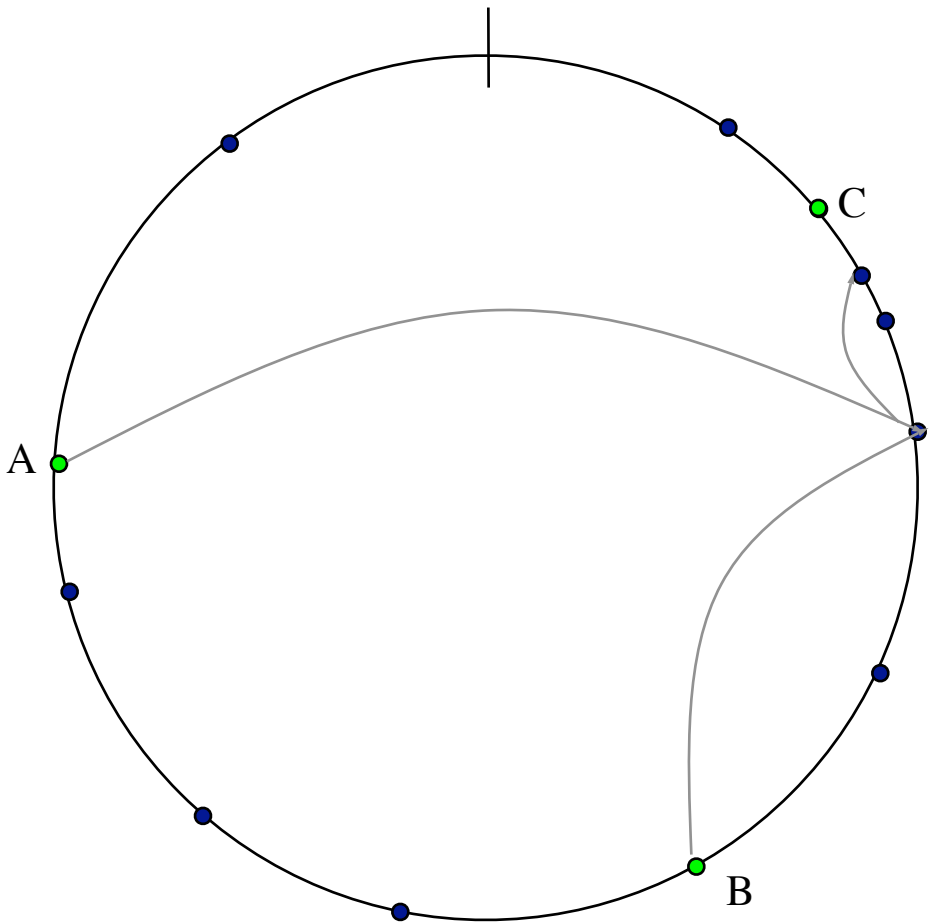

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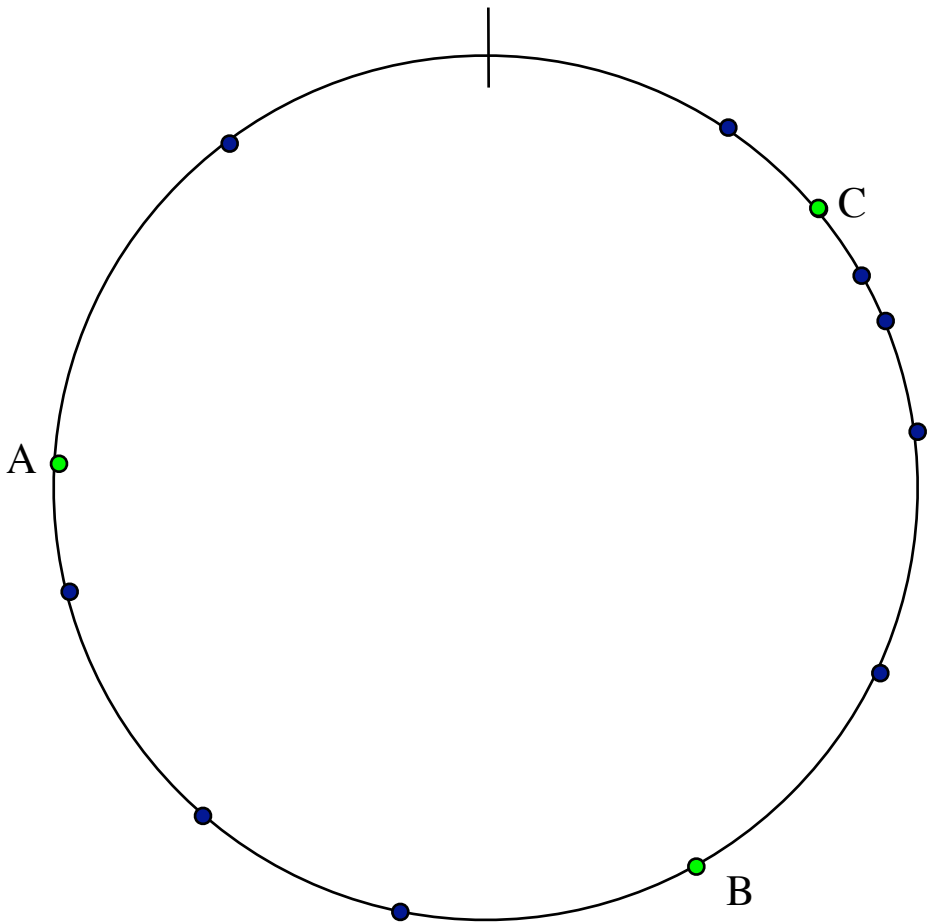

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