第2回「オープンアクセス新任担当者相談会」実務紹介（1）

学術コミュニケーションと機関リポジトリの基礎知識

2023年8月8日

JPCOAR イベント運営作業部会

本講の内容

1. 学術コミュニケーションの基礎知識

① 学術雑誌とはどのようなものか
② 論文とはどのようなものか
③ オープンアクセスとはどういうことか

2. 機関リポジトリの基礎知識

① 機関リポジトリとは
② 機関リポジトリのシステム連携

1. 学術コミュニケーションの基礎知識

①学術雑誌とはどのようなものか

②論文とはどのようなものか

③オープンアクセスとはどういうことか

「1. 学術コミュニケーションの基礎知識」の内容は、杉田 茂樹,「学術コミュニケーションの基礎知識」, 2020 を基にしています。


科学的発見／知見
それを生み出したのが私だと世界に認知してほしい
その科学的真価を認めてほしい
世に広まってほしい
後世にも伝えたい
“Smaismrmilmepoetalevmibunenugttaviras”
altissimum planetam tergeminum observari.

“学術雑誌の4機能”

それを生み出したのが私だと世界に認知してほしい

論文の先取権の確立

査読による質の保証

その科学的真価を認めてほしい

世に広まってほしい

知見を世に知らせる

知見を後世に伝える

後世にも伝えたい

ヘンリー・オルデンバーグ氏の書簡（1664～1665）より。同氏は、世界最古の学術雑誌と言われるイギリス王立協会「フィロソフィカル・トランザクション」（1665～）創刊時の事務総長

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Nawata S, Maki A, Hikihara T. (2018)
Power packet transferability via symbol propagation matrix.
Proc. R. Soc. A 474: 20170552. http://dx.doi.org/10.1098/rspa.2017.0552

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Research

Cite this article: Nawata S, Maki A, Hikihara T. 2018 Power packet transferability via symbol propagation matrix. *Proc. R. Soc. A* 474: 20170552. http://dx.doi.org/10.1098/rspa.2017.0552

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power packet, router, network flow problem, electrical energy network

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Power packet transferability via symbol propagation matrix

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A power packet is a unit of electric power composed of a power pulse and an information tag. In Shannon's information theory, messages are represented by symbol sequences in a digitized manner. Referring to this formulation, we define symbols in power packetization as a minimum unit of power transferred by a tagged pulse. Here, power is digitized and quantized. In this paper, we consider packetized power in networks for a finite duration, giving symbols and their energies to the networks. A network structure is defined using a graph whose nodes represent routers, sources and destinations. First, we introduce the concept of a symbol propagation matrix (SPM) in which symbols are transferred at links during unit times. Packetized power is described as a network flow in a spatio-temporal structure. Then, we study the problem of selecting an SPM in terms of transferability, that is, the possibility to represent given energies as sources and destinations during the finite duration. To select an SPM, we consider a network flow problem of packetized power. The problem is formulated as an M-convex submodular flow problem which is a solvable generalization of the minimum cost flow problem. Finally, through examples, we verify that this formulation provides reasonable packetized power.

1. Introduction

Electric power has been considered as a continuous flow based on circuit theory, in which power flow is governed by Kirchhoff Laws and Tellegen's theorem [1]. The circuit theory can be generalized to represent various nonlinear complex systems in the system topology with energy dissipation and energy storage as a network

a power pulse with an information tag. Here, packetized power is spatially and temporally transferred as symbols in a digitized and quantized manner. At each node, the energy is represented as the total amount of energy of symbols which are sent to and received from neighbouring nodes during a finite duration.

To mathematically represent such transmission of packetized power, we introduced the SPM, in which a symbol is transferred at a link during a unit time. Via SPM, packetized power is described as a network flow in a spatio-temporal structure. Then, we considered a network flow problem for selecting an SPM in terms of transferability, that is, the possibility to represent given energies at sources and destinations during the finite duration. In networks, packetized power appears as supplied energy from sources and supplied energy to destinations (V1), transferred energy at each link during each unit time (V2), and change of stored energy in each router (V3). Setting a laminar family of subsets of nodes in spatio-temporal structure for the cases of V1 and V3, we can formulate this problem as an M-convex submodular flow problem which is a solvable generalization of the minimum cost flow problem. Unlike conventional minimum cost flow problems, here, we weighted not only values of network flow (V2) but also values of boundary of network flow and their time integrals (V1 and V3). Finally, the formulation was discussed through examples and it is shown that power can be packetized and be controllable while preserving reasonable properties of power.

The established packet-centric framework is completely different from the circuit theory, in which power is handled in a continuous manner and is governed by Kirchhoff Laws and Tellegen's theorem [1]. Here, the concept of a power packet is introduced as a unit of electric power, so that power is digitized and quantized. The results of this paper suggest a mathematical framework which integrates energy and information in electrical energy networks.

Data accessibility. This work does not have any experimental data. All computational results were obtained with the cycle-cancelling algorithm [29].

Authors' contributions. The concept of SPM was conceived by S.N. and A.M. The network flow problem was formulated and numerically simulated by S.N. T.H. designed the power packet network and initiated the study. The paper was drafted by S.N. and carefully revised by all the authors. All authors gave final approval for publication.

Competing interests. We declare we have no competing interests.

Funding. This work of this work were financially supported by the Cross-Ministerial Strategic Innovation Program from New Energy and Industrial Technology Development Organization, Japan, and by the Super Cluster Program (Kyoto) from the Japan Science and Technology Agency. The work of the author (S.N.) was financially supported, in part, by Kyoto University.

Acknowledgements. The author (S.N.) thanks the current and former members of the Robotics, Perception and Learning Laboratory of the Royal Institute of Technology (KTH) for fruitful discussions. The authors acknowledge three anonymous referees for their helpful comments on the initial draft.

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6. Takuno T, Koyama M, Hikihara T. 2010 In-home power distribution systems by circuit switching and power packet dispatching. In *Proc. 1st IEEE Int. Conf. Smart Grid Commun., Gaithersburg, MD, 4–6 October*, pp. 427–430. Piscataway, NJ: IEEE.
7. Takahashi R, Takuno T, Hikihara T. 2012 Estimation of power packet transfer properties on indoor power line channel. *Energies* **5**, 2141–2149. (doi:10.3390/en5072141)

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A power packet is a unit of electric power composed of a power pulse and an information tag. In Shannon's information theory, messages are represented by symbol sequences in a digitized manner. Referring to this formulation, we define symbols in power packetization as a minimum unit of power transferred by a tagged pulse. Here, power is digitized and quantized. In this paper, we consider packetized power in networks for a finite duration, giving symbols and their energies to the networks. A network structure is defined using a graph whose nodes represent routers, sources and destinations. First, we introduce the concept of a symbol propagation matrix (SPM) in which symbols are transferred at links during unit times. Packetized power is described as a network flow in a spatio-temporal structure. Then, we study the problem of selecting an SPM in terms of transferability, that is, the possibility to represent given energies at sources and destinations during the finite duration. To select an SPM, we consider

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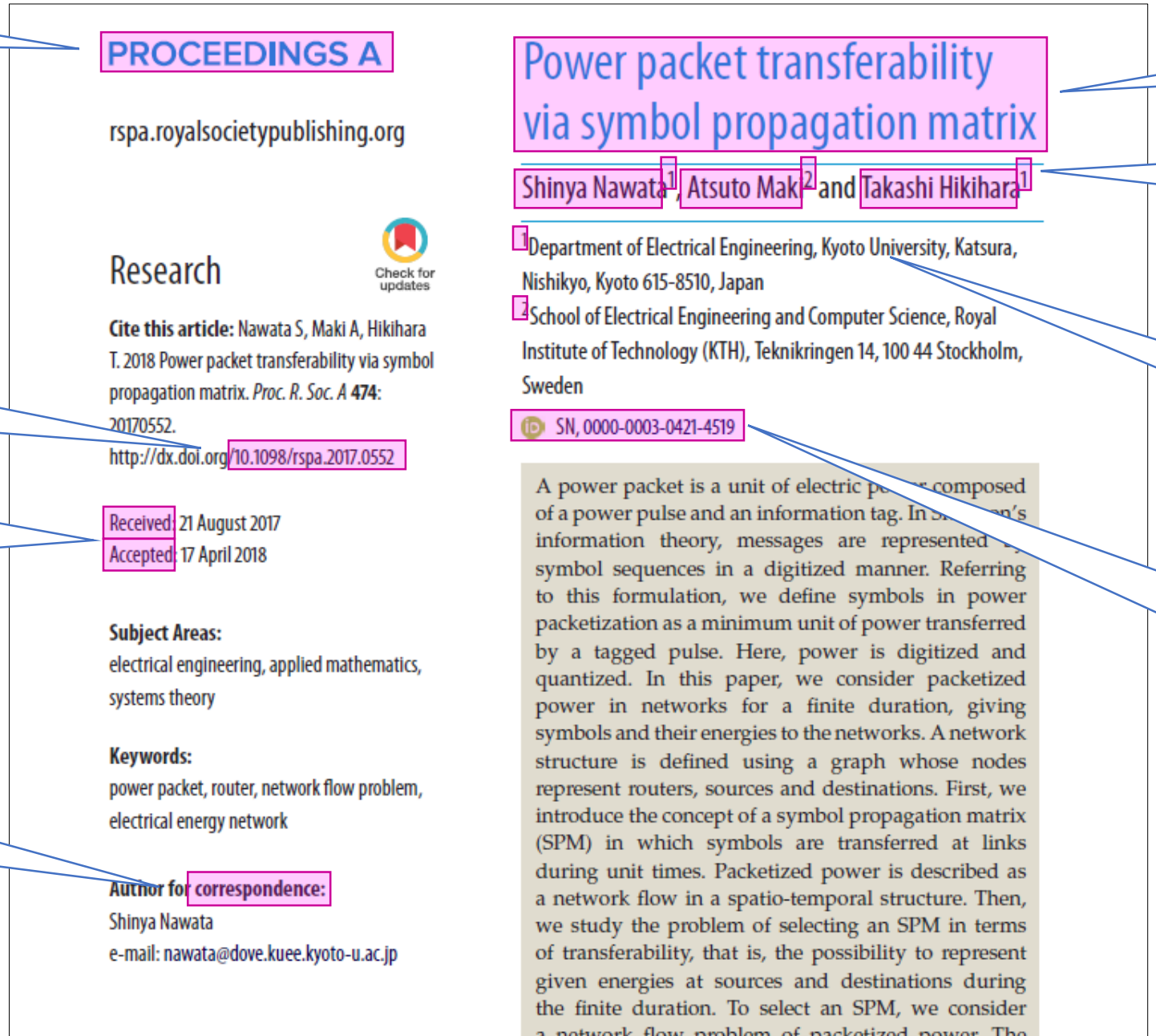

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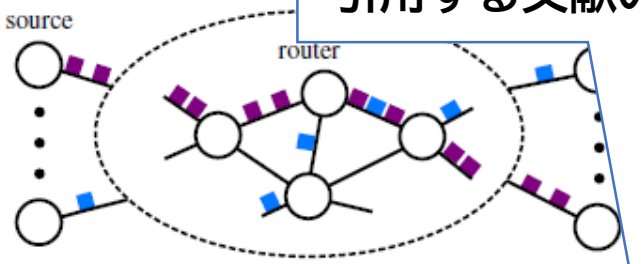

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igure 1. A schematic of power packet dispatching network. (Online version in colour.)

ermodynamics [2]. Here, energy flow is handled in a continuous manner under the conservation energy. On the other hand, it is shown in Shannon's information theory [3] that 'all technical ommunications are essentially digital; more precisely, that all technical communications e equivalent to the generation, transmission and reception, of random binary digits' [4]. ommunication networks have been developed in a digitized manner by using packet switching, hich breaks messages into smaller pieces named 'packets', for dynamic assignment of network sources [5]. If we handle electric power in a digitized manner, power distribution will be anged completely different from the conventional. In this paper, we consider electrical energy etworks i

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nd evaluated for residential applications [22]. On the other hand, in most of these proposals,

power, so that power is digitized and quantized. The results of this paper suggest a mathematical framework which integrates energy and information in electrical energy networks.

Data accessibility. This work does not have any experimental data. All computational results were obtained with the cycle-cancelling algorithm [29].
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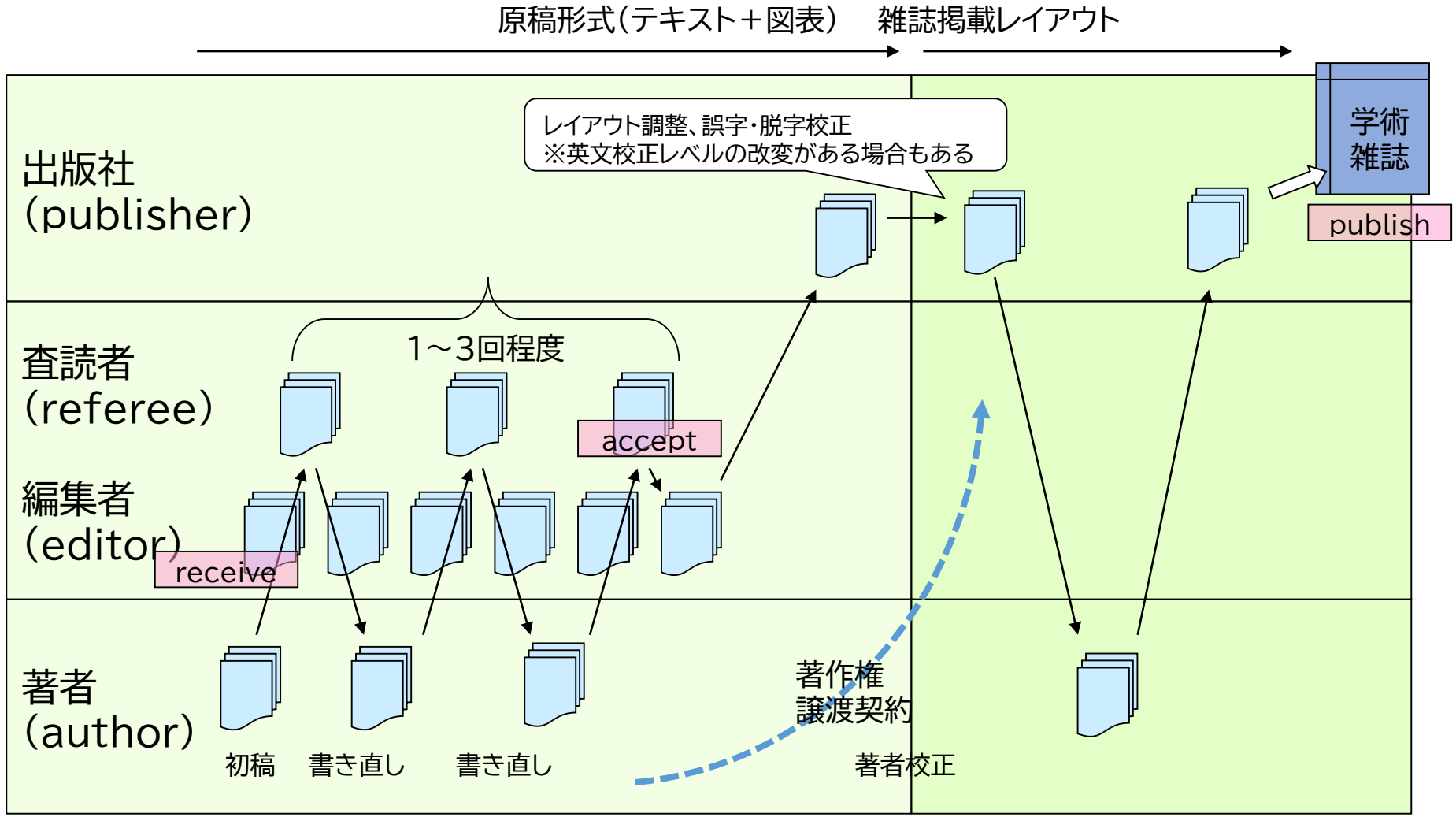

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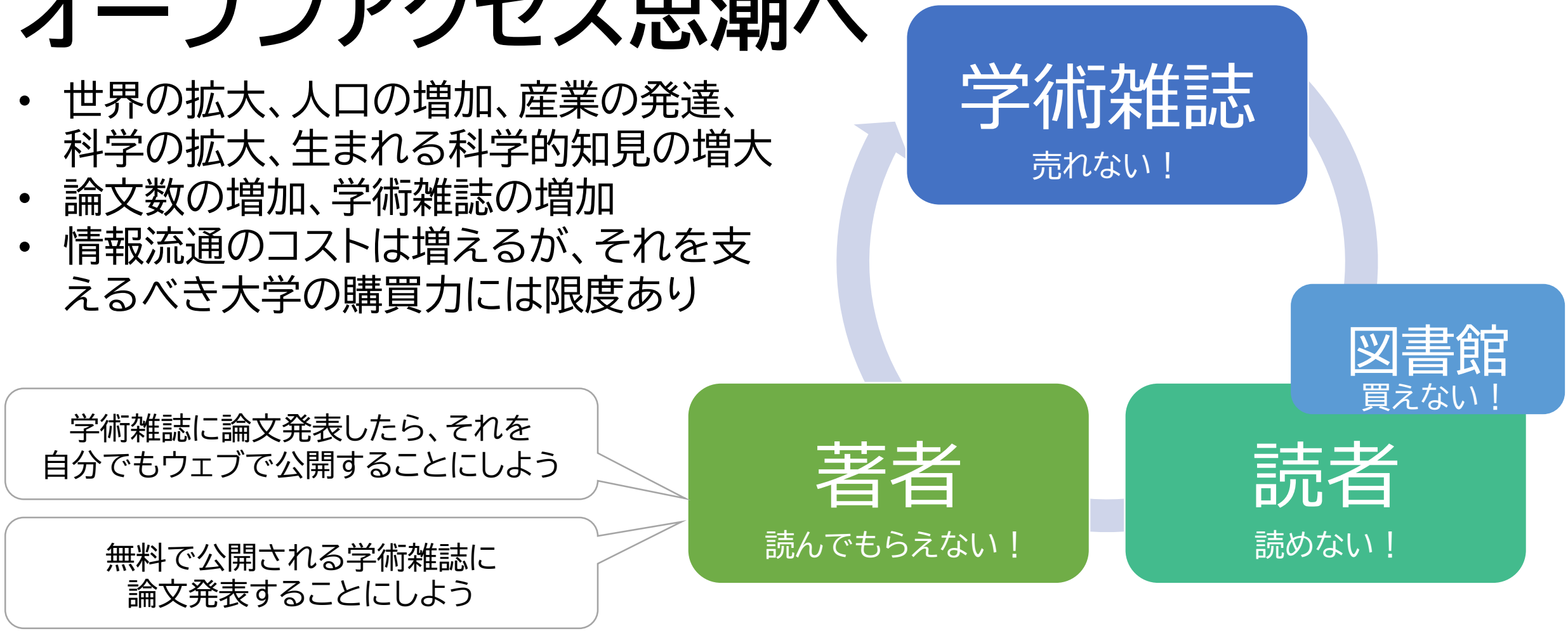

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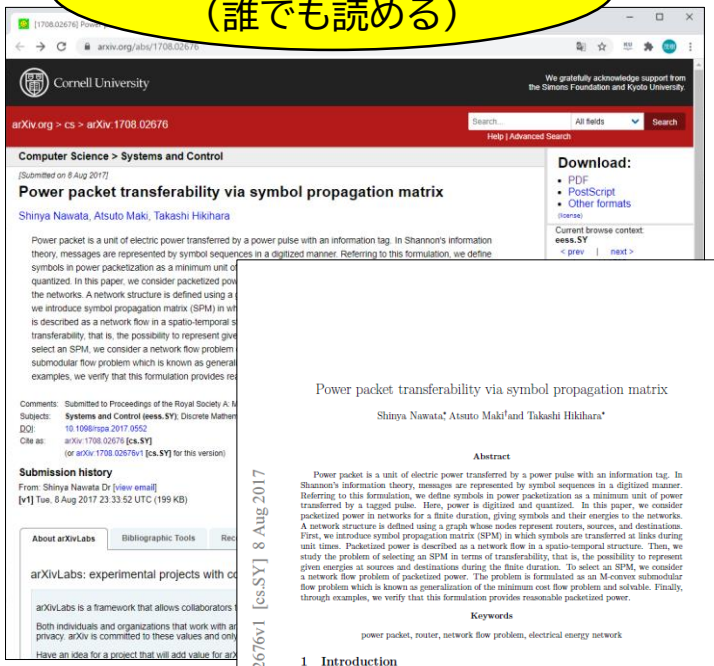

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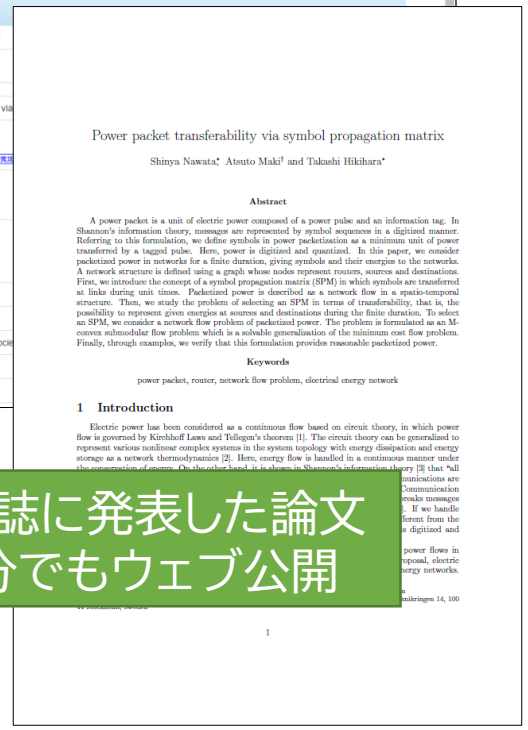

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2. 機関リポジトリの基礎知識

①機関リポジトリとは

②機関リポジトリのシステム連携

＜当初＞

大学などの研究機関に所属する研究者が、
論文などをインターネット上に保存し発信する「セルフ・アーカイブ」を行うためのプラットフォームサービスとして開始＊1）

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研究機関が各機関内に所有している学術情報を総合的に管理・発信するための基盤へと発展

＊1)Clifford A. Lynch, “Institutional Repositories: Essential Infrastructure for Scholarship in the Digital Age”, ARL Bimonthly Report, no. 226 (February 2003): 1-7.

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機関リポジトリは、登録されたコンテンツのデータを様々なシステムへと受け渡すことで、
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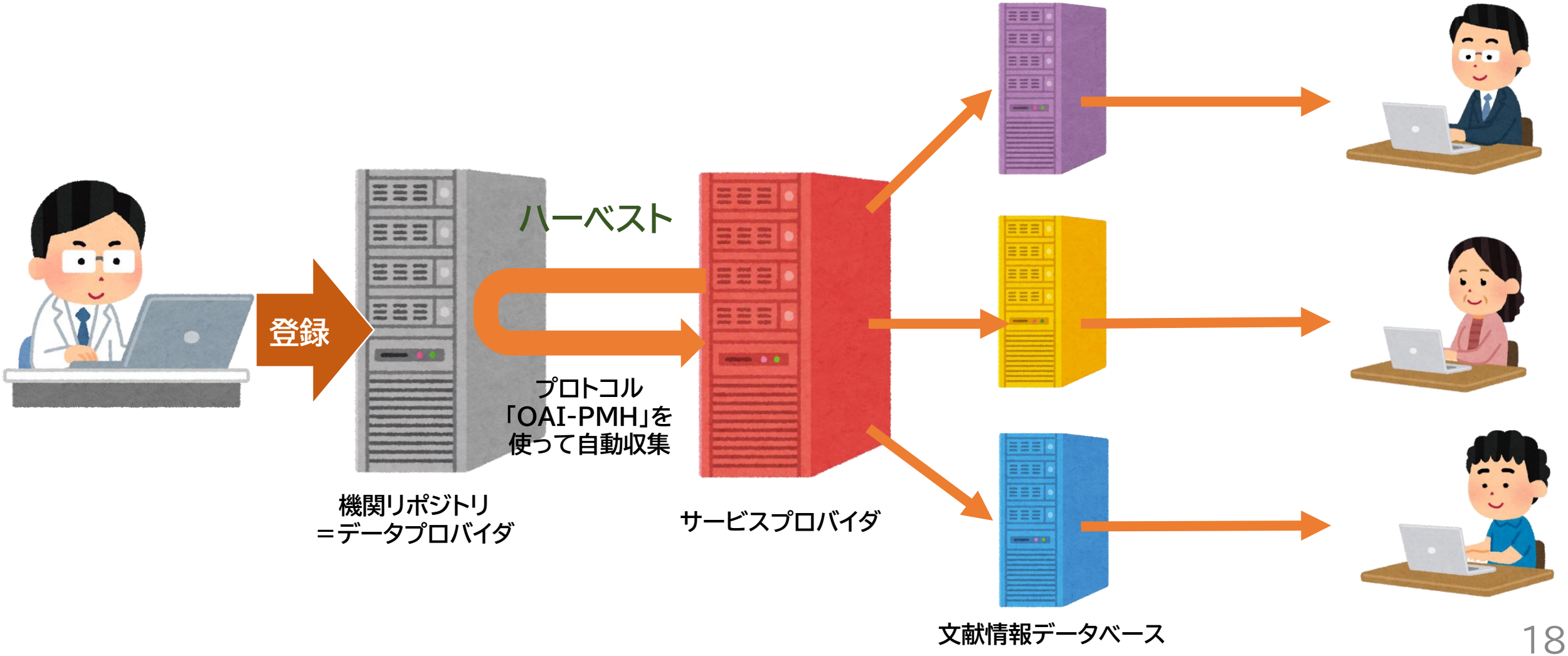
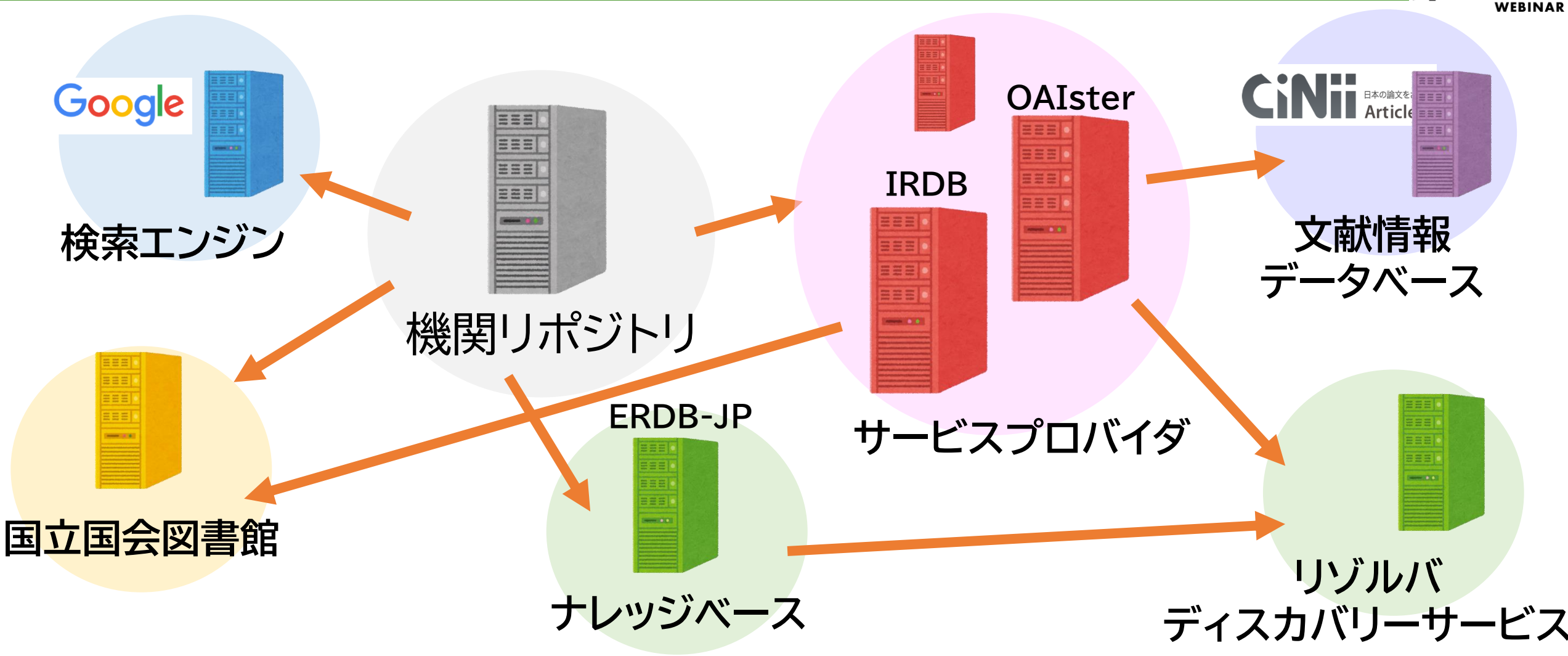


2. 機関リポジトリの基礎知識　②機関リポジトリのシステム連携



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